

# Raydium



## RM68180 Data Sheet

Single Chip Driver with 16.7M color

for 480RGBx864 a-Si TFT LCD

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# Revision History

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|-------------|------------|----------|----------------------------|
| 0.0         | 2012/04/05 |          | Initial                    |
| 0.1         | 2012/04/20 | Page. 74 | Update DPI vertical timing |
|             |            |          |                            |
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## 1. General Description

RM68180 is a 16.7 million-color single-chip SoC driver for a-si TFT LCD driver IC that supply resolution of 480RGBx360, 480RGBx640, 480RGBx720, 480RGBx800, 480RGBx854, 480RGBx864 with internal GRAM and 480RGB x 1024 by pass internal GRAM. RM68180 comprise a 1440-channel source driver, gate control timing by level shift, 1,244,160 bytes GRAM for graphic data of 480RGBx864 dots, and power supply circuit. The RM68180 supports 24-/16-/8-bit data bus interface, I2C interface and serial peripheral interfaces (SPI). It also supplies 24bit, 18-bit or 16-bit RGB interface, MDDI interface and MIPI interface for driving video signal directly from application controller. The moving picture area can be specified in internal GRAM by window address function. The specified window area can be updated selectively, so that moving picture can be displayed simultaneously independent of still picture area.

RM68180 can operate with 1.65V I/O interface voltage, and an incorporated voltage follower circuit to generate voltage levels for driving a TFT LCD panel. The RM68180 also supports a function to display in 8 colors and a sleep mode, allowing for precise power control by software and these features make the RM68180 an ideal driver for portable products such as digital cellular phones, smart phone, MP3 and PMP where long battery life is a major concern.

## 2. Features

- I A single-chip controller driver for a WVGA panel type a-si TFT LCD display
- I Display resolution option
  - (1). With GRAM:
    - 1. 480RGB x 360
    - 2. 480RGB x 480
    - 3. 480RGB x 640
    - 4. 480RGB x 720
    - 5. 480RGB x 800
    - 6. 480RGB x 854
    - 7. 480RGB x 864
  - (2). By pass GRAM:
    - 1. 480RGB x 1024
- I RAM size:  $480 \times 3 \times 864 = 1,244,160$  bytes
- I System interface
  - (1). 8-, 16-, 24-bits 80-series MPU interface
  - (2). 16-bits serial peripheral interface
  - (3). I2C interface
- I Moving picture display interface
  - (1). 16-, 18-, 24-bit RGB interface (SYNC and DE mode)
- I High speed interface
  - (1). Mobile Display Digital Interface (MDDI V1.2, 1 clock and 1 or 2 data lane pairs)
  - (2). MIPI Display Serial Interface (DSI V1.01 r11 and D-PHY V1.0, 1 clock and 1 or 2 data lane pairs)
- I Display color mode
  - (1). Full color mode: 16.7M colors
  - (2). Reduce color mode:
    - 1. 262k colors



- 2. 65k colors
- 3. 8 colors (Idle mode)
- I Window address function to specify a rectangular area writing data in the internal RAM
- I Abundant color display and drawing functions
  - (1). Programmable  $\gamma$ -correction function for 16.7 million color display
  - (2). Individual gamma correction setting for RGB dots
  - (3). Partial display function
- I Low power consumption architecture
  - (1). Deep standby mode
  - (2). Sleep mode
  - (3). 8-color display function
- I Power supply startup sequencer
- I Support 1-, 2-, 3-, 4-dot, column and zigzag inversion
- I Four GPO pins for external control
- I On chip checksums check
- I Operating temperate:  $-30^{\circ}\text{C} \sim 70^{\circ}\text{C}$
- I On module DC/DC converter
  - (1). DDVDH=4.5V to 6.5V
  - (2). DDVDL=-4.5V to -6.5V
  - (3). VCL=-2.5V to -4.0V
  - (4). Positive gamma high voltage level: VGMP=3.5V to 5V
  - (5). Positive gamma low voltage level: VGSP=0.0V, 0.3V to 3.7V
  - (6). Negative gamma high voltage level: VGMN=-5V to -3.5V
  - (7). Negative gamma low voltage level: VGSN=0.0V, -0.3V to -3.7V
  - (8). Positive gate driver output voltage level: VGH=+8V to +18V
  - (9). Negative gate driver output voltage level: VGL=-2V to -15V
  - (10). VCOM=-3.5V to 0V
- I Input power supply voltages:
  - (1). IOVCC (VDDI) = 1.65V~3.3V

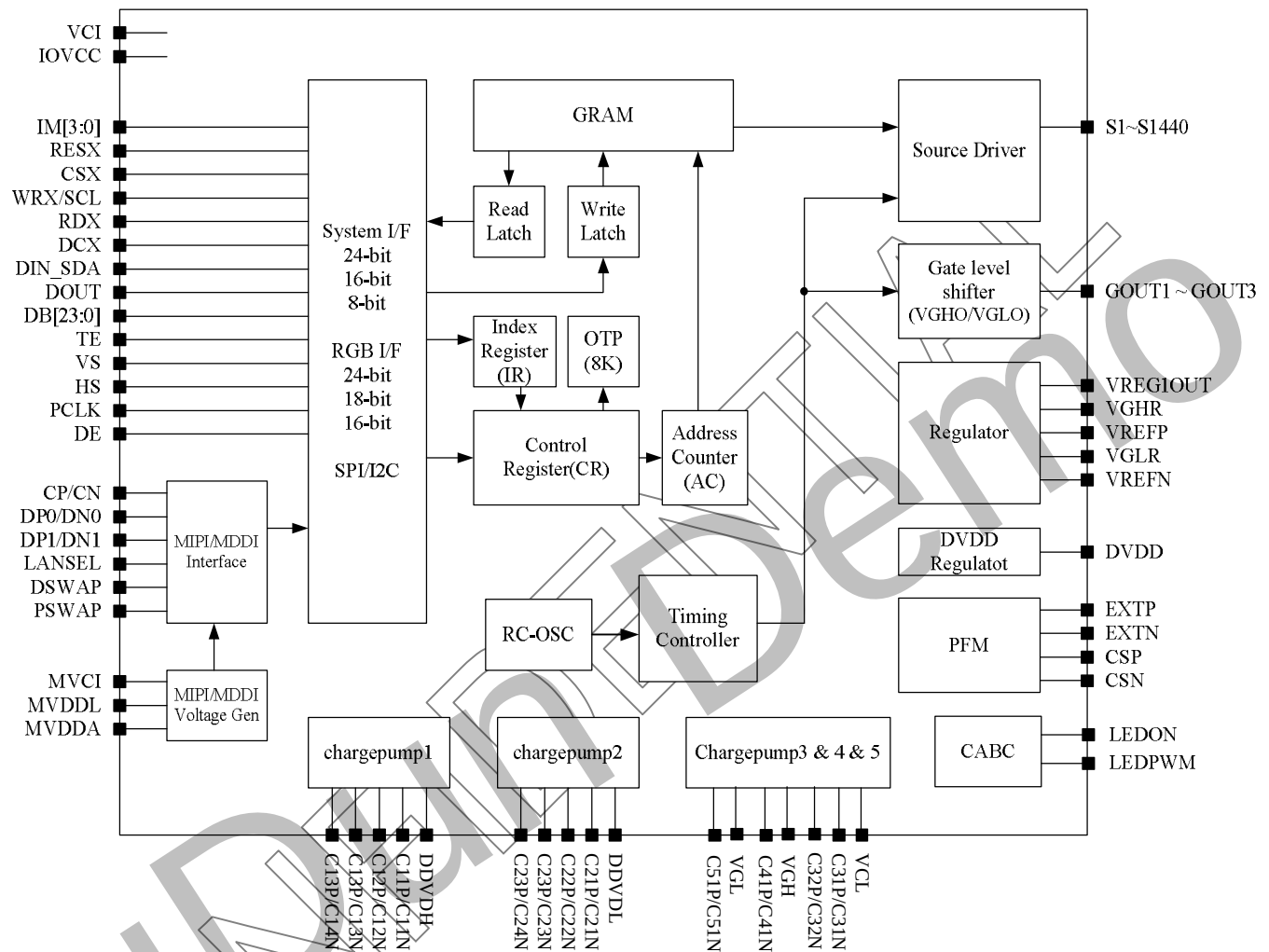
(2). IOVCCL (VDDIL) = 1.1V~1.3V

(3). VCI = 2.3V~4.8V

(4). MIPI/MDDI regulator supply voltage range: 2.3V ~ 4.8V

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### 3. Block Diagram



## 4. Pin Description

| 80-System Interface Pins |     |                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pin Name                 | I/O | Descriptions                                                                                                                                                                                                                                                                                                                                                                                           |
| CSX                      | I   | Chip select input pin ("Low" enable) in 80-series MPU I/F and SPI I/F.<br>This pin is not used for MIPI or MDDI I/F, please connect to VSSI this pin.                                                                                                                                                                                                                                                  |
| WRX / SCL /<br>I2C_SCL   | I   | WRX: Writes strobe signal to write data when WRX is "Low" in 80-series MPU I/F.<br>SCL: A synchronous clock signal in SPI I/F.<br>I2C_SCL: Serial input clock in I2C I/F.<br>This pin is not used for MIPI I/F, please connect to VSSI this pin.                                                                                                                                                       |
| RDX                      | I   | Reads strobe signal to write data when RDX is "Low" in 80-series MPU interface.<br>This pin is not used for RGB+SPI, MIPI or MDDI I/F, please connect to VSSI this pin.                                                                                                                                                                                                                                |
| D/CX                     | I   | Display data / command selection in 80-series MPU I/F.<br>D/CX = "0" : Command<br>D/CX = "1" : Display data or Parameter<br>This pin is not used for RGB+3-SPI, MIPI or MDDI I/F, please connect to VSSI this pin.                                                                                                                                                                                     |
| D[23:0]                  | I/O | 24-bit bi-directional data bus for 80-series MPU I/F and 24-bit input data bus for RGB I/F.<br>For 8080-series MPU I/F:<br>8-bit interface: D[7:0] are used, D[23:8] should be connected to VSSI<br>16-bit interface: D[15:0] are used, D[23:16] should be connected to VSSI<br>24-bit interface: D[23:0] are used<br>These pins are not used for MIPI or MDDI I/F, please connect to VSSI these pins. |
| SPI / I2C Interface Pins |     |                                                                                                                                                                                                                                                                                                                                                                                                        |
| Pin Name                 | I/O | Descriptions                                                                                                                                                                                                                                                                                                                                                                                           |
| SDI / I2C_SDA            | I/O | SDI: Serial input signal in SPI I/F. The data is input on the rising/falling edge of the SCL signal.<br>I2C_SDA: Serial input/output signal in I2C I/F. The data is input/output on the rising edge of the I2C_SCL signal.<br>This pin is not used for 80-series MPU or MIPI I/F, please connect to VSSI this pin.                                                                                     |
| SDO                      | O   | Serial output signal in SPI I/F. The data is output on the rising/falling edge of the SCL signal. If the host places the SDI line into high-impedance state during the read interval, the SDI and SDO can be tied together.<br>This pin is not used for 80-series MPU, MIPI or MDDI I/F, please open this pin.                                                                                         |
| RGB Interface Pins       |     |                                                                                                                                                                                                                                                                                                                                                                                                        |
| Pin Name                 | I/O | Descriptions                                                                                                                                                                                                                                                                                                                                                                                           |
| PCLK                     | I   | Pixel clock signal in RGB I/F.<br>This pin is not used for 80-series MPU, MIPI or MDDI I/F, please connect to VSSI this pin.                                                                                                                                                                                                                                                                           |
| VS                       | I   | Vertical sync. Signal in RGB I/F.<br>This pin is not used for 80-series MPU, MIPI or MDDI I/F, please connect to VSSI this pin.                                                                                                                                                                                                                                                                        |

|                                     |                    |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
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| HS                                  | I                  | Horizontal sync. Signal in RGB I/F.<br>This pin is not used for 80-series MPU, MIPI or MDDI I/F, please connect to VSSI this pin.    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| DE                                  | I                  | Data enable signal in RGB I/F DE mode.<br>This pin is not used for 80-series MPU, MIPI or MDDI I/F, please connect to VSSI this pin. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| MIPI / MDDI Interface Pins          |                    |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| Pin Name                            |                    | I/O                                                                                                                                  | Descriptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| HSSI_CLK_P<br>HSSI_CLK_N            |                    | I                                                                                                                                    | These pins are DSI-CLK+/- differential clock signals if MIPI interface is used.<br>These pins are MDDI_STB_P/N differential strobe signals if MDDI interface is used.<br>HSSI_CLK_P/N are differential small amplitude signals. Ensure the trace length is shortest so that the COG resistance is less than 10 ohm.<br>Please connect these pins to VSSAM if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| HSSI_D0_P<br>HSSI_D0_N              |                    | I/O                                                                                                                                  | These pins are DSI-D0+/- differential data signals if MIPI interface is used.<br>These pins are MDDI_DATA0_P/N differential strobe signals if MDDI interface is used.<br>HSSI_D0_P/N are differential small amplitude signals. Ensure the trace length is shortest so that the COG resistance is less than 10 ohm.<br>Please connect these pins to VSSAM if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| HSSI_D1_P<br>HSSI_D1_N              |                    | I                                                                                                                                    | These pins are DSI-D1+/- differential data signals if MIPI interface is used.<br>These pins are MDDI_DATA1_P/N differential strobe signals if MDDI interface is used.<br>HSSI_D1_P/N are differential small amplitude signals. Ensure the trace length is shortest so that the COG resistance is less than 10 ohm.<br>Please connect these pins to VSSAM if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| ERR                                 |                    | O                                                                                                                                    | CRC and ECC error output pin for MIPI interface. This pin is output low when it is not activated. When this pin is activated, it output high if CRC/ECC error found.<br>Please open this pin if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| LANSEL                              |                    | I                                                                                                                                    | Input pin to select 1 data lane or 2 data lanes in MIPI/MDDI interface.<br>0: 1 data lane<br>1: 2 data lanes<br>Please connect to VSSI if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| DSWAP<br>PSWAP                      |                    | I                                                                                                                                    | Input pin to select HSSI_D0/D1 data lane sequence and polarity in high speed interface only.<br>For MIPI interface, both DSWAP and PSWAP function are available.<br>For MDDI interface, only PSWAP function is available. i.e. DSWAP=1 in below table is invalid. <table><tr><td colspan="2">Pin Name</td><td>HSSI_D0_P</td><td>HSSI_D0_N</td><td>HSSI_CLK_P</td><td>HSSI_CLK_N</td><td>HSSI_D1_P</td><td>HSSI_D1_N</td></tr><tr><td rowspan="4">MIPI/<br/>MDDI</td><td>DSWAP=0<br/>PSWAP=0</td><td>DSI-D0+</td><td>DSI-D0-</td><td>DSI-CLK+</td><td>DSI-CLK-</td><td>DSI-D1+</td><td>DSI-D1-</td></tr><tr><td>DSWAP=0<br/>PSWAP=1</td><td>DSI-D0-</td><td>DSI-D0+</td><td>DSI-CLK-</td><td>DSI-CLK+</td><td>DSI-D1-</td><td>DSI-D1+</td></tr><tr><td>DSWAP=1<br/>PSWAP=0</td><td>DSI-D1+</td><td>DSI-D1-</td><td>DSI-CLK+</td><td>DSI-CLK-</td><td>DSI-D0+</td><td>DSI-D0-</td></tr><tr><td>DSWAP=1<br/>PSWAP=1</td><td>DSI-D1-</td><td>DSI-D1+</td><td>DSI-CLK-</td><td>DSI-CLK+</td><td>DSI-D0-</td><td>DSI-D0+</td></tr></table> |            |            |           |           |  |  |  | Pin Name |  | HSSI_D0_P | HSSI_D0_N | HSSI_CLK_P | HSSI_CLK_N | HSSI_D1_P | HSSI_D1_N | MIPI/<br>MDDI | DSWAP=0<br>PSWAP=0 | DSI-D0+ | DSI-D0- | DSI-CLK+ | DSI-CLK- | DSI-D1+ | DSI-D1- | DSWAP=0<br>PSWAP=1 | DSI-D0- | DSI-D0+ | DSI-CLK- | DSI-CLK+ | DSI-D1- | DSI-D1+ | DSWAP=1<br>PSWAP=0 | DSI-D1+ | DSI-D1- | DSI-CLK+ | DSI-CLK- | DSI-D0+ | DSI-D0- | DSWAP=1<br>PSWAP=1 | DSI-D1- | DSI-D1+ | DSI-CLK- | DSI-CLK+ | DSI-D0- | DSI-D0+ |
| Pin Name                            |                    | HSSI_D0_P                                                                                                                            | HSSI_D0_N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | HSSI_CLK_P | HSSI_CLK_N | HSSI_D1_P | HSSI_D1_N |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| MIPI/<br>MDDI                       | DSWAP=0<br>PSWAP=0 | DSI-D0+                                                                                                                              | DSI-D0-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DSI-CLK+   | DSI-CLK-   | DSI-D1+   | DSI-D1-   |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
|                                     | DSWAP=0<br>PSWAP=1 | DSI-D0-                                                                                                                              | DSI-D0+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DSI-CLK-   | DSI-CLK+   | DSI-D1-   | DSI-D1+   |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
|                                     | DSWAP=1<br>PSWAP=0 | DSI-D1+                                                                                                                              | DSI-D1-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DSI-CLK+   | DSI-CLK-   | DSI-D0+   | DSI-D0-   |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
|                                     | DSWAP=1<br>PSWAP=1 | DSI-D1-                                                                                                                              | DSI-D1+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DSI-CLK-   | DSI-CLK+   | DSI-D0-   | DSI-D0+   |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| Please connect to VSSI if not used. |                    |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |
| Logic Pins                          |                    |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |            |           |           |  |  |  |          |  |           |           |            |            |           |           |               |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |                    |         |         |          |          |         |         |

| Pin Name      | I/O                            | Descriptions                                                                                                                                                                                                                                     |                                |                |          |                |          |
|---------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|----------|----------------|----------|
| RESX          | I                              | This signal will reset the device and must be applied to properly initialize the chip. Signal is active low. The input voltage range for RESX pin is related to DSTB_SEL and VSEL pins.                                                          |                                |                |          |                |          |
|               |                                | Input Voltage Level (DSTB_SEL="1")                                                                                                                                                                                                               |                                | VDDI=1.65~3.3V |          | VDDIL=1.1~1.3V |          |
|               |                                |                                                                                                                                                                                                                                                  |                                | Min.           | Max.     | Min.           | Max.     |
|               |                                | VSEL = 1                                                                                                                                                                                                                                         | Logic high level input voltage | 0.7xVDDI       | VDDI     | 1.155          | 1.95     |
|               |                                |                                                                                                                                                                                                                                                  | Logic low level input voltage  | VSSI           | 0.3xVDDI | VSSI           | 0.585    |
|               |                                | VSEL = 0                                                                                                                                                                                                                                         | Logic high level input voltage | 0.88           | 1.35     | 0.88           | 1.35     |
|               |                                |                                                                                                                                                                                                                                                  | Logic low level input voltage  | VSSI           | 0.55     | VSSI           | 0.55     |
|               |                                | Input Voltage Level (DSTB_SEL="0")                                                                                                                                                                                                               |                                |                |          | Min. (v)       | Max. (v) |
|               |                                | VDDI=1.65~3.3V                                                                                                                                                                                                                                   | Logic High level input voltage | 0.7xVDDI       |          | VDDI           |          |
|               |                                |                                                                                                                                                                                                                                                  | Logic Low level input voltage  | VSSI           |          | 0.3xVDDI       |          |
| VDDI=1.1~1.3V | Logic High level input voltage | 0.88                                                                                                                                                                                                                                             |                                | 1.35           |          |                |          |
|               | Logic Low level input voltage  | VSSI                                                                                                                                                                                                                                             |                                | 0.55           |          |                |          |
| TE_L          | O                              | Tearing effect output pin to synchronize MCU to frame writing, activated by SW command. When this pin is not activated, this pin is output low. Please open this pin if not used.                                                                |                                |                |          |                |          |
| TE_R          | O                              | Tearing effect output pin to synchronize MCU to frame writing, activated by SW command. When this pin is not activated, this pin is output low. Please open this pin if not used.                                                                |                                |                |          |                |          |
| RGBBP         | I                              | Display data written path control in RGB interface.<br>RGBBP="0", display data written to frame memory.<br>RGBBP="1", display data written to line buffer (frame memory by pass mode)<br>Please connect to VSSI if not used in other interfaces. |                                |                |          |                |          |

|         |   |                                                                                                              |                                    |                                                                                  |
|---------|---|--------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------------|
| IM[3:0] | I | Interface type selection. The connections of IM[3:0] which not shown in table are invalid.                   |                                    |                                                                                  |
|         |   | IM[3:0]                                                                                                      | Display Data                       | Command                                                                          |
|         |   | 0000                                                                                                         | 80-series 8-bit MPU I/F, D[7:0]    | 80-series 8-bit MPU I/F, D[7:0]                                                  |
|         |   | 0001                                                                                                         | 80-series 16-bit MPU I/F, D[15:0]  | 80-series 16-bit MPU I/F, D[15:0]                                                |
|         |   | 0010                                                                                                         | 80-series 24-bit MPU I/F, D[23:0]  | 80-series 24-bit MPU I/F, D[23:0]                                                |
|         |   | 1001                                                                                                         | RGB I/F, D[23:0]                   | 8-bit SPI, SDI/SDO                                                               |
|         |   | 1010                                                                                                         | RGB I/F, D[23:0]                   | 9-bit SPI, SDI/SDO                                                               |
|         |   | 0011                                                                                                         | RGB I/F, D[23:0]                   | 16-bit SPI (SCL rising edge trigger), SDI/SDO                                    |
|         |   | 1011                                                                                                         | RGB I/F, D[23:0]                   | 16-bit SPI (SCL falling edge trigger), SDI/SDO                                   |
|         |   | 0100                                                                                                         | RGB I/F, D[23:0]                   | I2C I/F, I2C_SDA                                                                 |
|         |   | 0101                                                                                                         | MIPI DSI, HSSI_D0_P/N, HSSI_D1_P/N | MIPI DSI, HSSI_D0_P/N, HSSI_D1_P/N                                               |
|         |   | 0110                                                                                                         | MDDI, HSSI_D0_P/N, HSSI_D1_P/N     | MDDI, HSSI_D0_P/N, HSSI_D1_P/N<br>16-bit SPI (SCL rising edge trigger), SDI/SDO  |
|         |   | 1110                                                                                                         | MDDI, HSSI_D0_P/N, HSSI_D1_P/N     | MDDI, HSSI_D0_P/N, HSSI_D1_P/N<br>16-bit SPI (SCL falling edge trigger), SDI/SDO |
|         |   | 0111                                                                                                         | MDDI, HSSI_D0_P/N, HSSI_D1_P/N     | MDDI, HSSI_D0_P/N, HSSI_D1_P/N<br>I2C I/F, I2C_SDA serial data                   |
| I2C_SA  | I | Select the I2C interface address from MPU. Please connect to VSSI if not used.<br>0: 100_1100<br>1: 100_1101 |                                    |                                                                                  |

| VSEL                                                                                                                                                                                                                                                                  | I          | Input pin to switch the I/O voltage.<br>This VSEL function only apply for RESX, TE, LEDPWM, LEDON, KBBC pins.<br>The VSEL dual IO function is valid when DSTB_SEL="1".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------|--------|-----------------------------------|------------------------------|--------------|------------------|--------------------------------|--------|----------------------|---------|-------------------------------|--------------|-------|--------------------------|---|-----|----------------------|------------------------------|---|-----------|-----|------|----------------------|---------------------|------|------|-----------------------------------|------------------------------|---|----------|-----|------|----------------------|----------------------|------|------|----------------------|----------------------|
|                                                                                                                                                                                                                                                                       |            | <table><tr><th rowspan="2">DSTB_S<br/>EL</th><th rowspan="2">VDDI</th><th rowspan="2">VSEL</th><th rowspan="2">DIOPWR</th><th colspan="2">Output Voltage Level</th></tr><tr><th>TE</th><th>LEDON/LEDPWM</th></tr><tr><td>0</td><td>1.65~3.3v or<br/>1.1~1.3v</td><td>X</td><td>Off</td><td>VOH=VDDI<br/>VOL=VSSI</td><td>VOH=VDDI or VDDA<br/>VOL=VSSI</td></tr><tr><td rowspan="2">1</td><td rowspan="2">1.65~3.3v</td><td>Low</td><td>1.2v</td><td>VOH=1.2v<br/>VOL=VSSI</td><td>VOH=1.2<br/>VOL=VSSI</td></tr><tr><td>High</td><td>1.8v</td><td>VOH=VDDI<br/>or DIOPWR<br/>VOL=VSSI</td><td>VOH=VDDI or VDDA<br/>VOL=VSSI</td></tr><tr><td rowspan="2">1</td><td rowspan="2">1.1~1.3v</td><td>Low</td><td>1.2v</td><td>VOH=1.2v<br/>VOL=VSSI</td><td>VOH=1.2v<br/>VOL=VSSI</td></tr><tr><td>High</td><td>1.8v</td><td>VOH=1.8v<br/>VOL=VSSI</td><td>VOH=1.8v<br/>VOL=VSSI</td></tr></table> |                          |               |        |                                   |                              | DSTB_S<br>EL | VDDI             | VSEL                           | DIOPWR | Output Voltage Level |         | TE                            | LEDON/LEDPWM | 0     | 1.65~3.3v or<br>1.1~1.3v | X | Off | VOH=VDDI<br>VOL=VSSI | VOH=VDDI or VDDA<br>VOL=VSSI | 1 | 1.65~3.3v | Low | 1.2v | VOH=1.2v<br>VOL=VSSI | VOH=1.2<br>VOL=VSSI | High | 1.8v | VOH=VDDI<br>or DIOPWR<br>VOL=VSSI | VOH=VDDI or VDDA<br>VOL=VSSI | 1 | 1.1~1.3v | Low | 1.2v | VOH=1.2v<br>VOL=VSSI | VOH=1.2v<br>VOL=VSSI | High | 1.8v | VOH=1.8v<br>VOL=VSSI | VOH=1.8v<br>VOL=VSSI |
|                                                                                                                                                                                                                                                                       |            | DSTB_S<br>EL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VDDI                     | VSEL          | DIOPWR | Output Voltage Level              |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |               |        | TE                                | LEDON/LEDPWM                 |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.65~3.3v or<br>1.1~1.3v | X             | Off    | VOH=VDDI<br>VOL=VSSI              | VOH=VDDI or VDDA<br>VOL=VSSI |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.65~3.3v                | Low           | 1.2v   | VOH=1.2v<br>VOL=VSSI              | VOH=1.2<br>VOL=VSSI          |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          | High          | 1.8v   | VOH=VDDI<br>or DIOPWR<br>VOL=VSSI | VOH=VDDI or VDDA<br>VOL=VSSI |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1.1~1.3v                 | Low           | 1.2v   | VOH=1.2v<br>VOL=VSSI              | VOH=1.2v<br>VOL=VSSI         |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          | High          | 1.8v   | VOH=1.8v<br>VOL=VSSI              | VOH=1.8v<br>VOL=VSSI         |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            | The input voltage range for VSEL pin:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| <table><tr><td colspan="2">Input Voltage Level</td><td>Min.</td><td>Max.</td></tr><tr><td colspan="2">Logic High level input voltage</td><td>0.88</td><td>VDDI</td></tr><tr><td colspan="2">Logic Low level input voltage</td><td>VSSI</td><td>0.55</td></tr></table> |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |               |        | Input Voltage Level               |                              | Min.         | Max.             | Logic High level input voltage |        | 0.88                 | VDDI    | Logic Low level input voltage |              | VSSI  | 0.55                     |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| Input Voltage Level                                                                                                                                                                                                                                                   |            | Min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Max.                     |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| Logic High level input voltage                                                                                                                                                                                                                                        |            | 0.88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | VDDI                     |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| Logic Low level input voltage                                                                                                                                                                                                                                         |            | VSSI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.55                     |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| If not used, please connect to VDDI.                                                                                                                                                                                                                                  |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| GPO[3:0]                                                                                                                                                                                                                                                              | O          | General purpose output pins. The output voltage swing is VDDI to VSSI.<br>Please open these pins if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| VGSW[3:0]                                                                                                                                                                                                                                                             | I          | Input pin to select the different application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| EXB1T                                                                                                                                                                                                                                                                 | I          | Input pin to select the external DDVDH DC/DC voltage.<br>0: Use internal DC/DC for DDVDH<br>1: Use external DC/DC for DDVDH<br>Please connect to VSSI if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| NBWSEL                                                                                                                                                                                                                                                                | I          | Input pin to select the voltage sequence of V0 ~ V255.<br>0: V(00h)>V(01h)>...>V(FEh)>V(FFh) (Normally White)<br>1: V(00h)<V(01h)<...<V(FEh)<V(FFh) (Normally Black)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| DSTB_SEL                                                                                                                                                                                                                                                              | I          | Input pin to control DIOPWR regulator on/off.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            | <table><tr><td>DSTB_SEL</td><td>DIOPWR Regulator</td><td>VSEL Function</td></tr><tr><td>0</td><td>DIOPWR Off</td><td>Invalid</td></tr><tr><td>1</td><td>DIOPWR On</td><td>Valid</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          |               |        |                                   |                              | DSTB_SEL     | DIOPWR Regulator | VSEL Function                  | 0      | DIOPWR Off           | Invalid | 1                             | DIOPWR On    | Valid |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            | DSTB_SEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | DIOPWR Regulator         | VSEL Function |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| 0                                                                                                                                                                                                                                                                     | DIOPWR Off | Invalid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| 1                                                                                                                                                                                                                                                                     | DIOPWR On  | Valid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
|                                                                                                                                                                                                                                                                       |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| CABC and LABC Pins                                                                                                                                                                                                                                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| Pin Name                                                                                                                                                                                                                                                              | I/O        | Descriptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |
| LEDON                                                                                                                                                                                                                                                                 | O          | This pin is connect to the external LED driver.<br>It is a LED driver control signal which is used for turning ON/OFF the LED backlight.<br>Please open these pins if not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |               |        |                                   |                              |              |                  |                                |        |                      |         |                               |              |       |                          |   |     |                      |                              |   |           |     |      |                      |                     |      |      |                                   |                              |   |          |     |      |                      |                      |      |      |                      |                      |



| LEDPWM              | O                    | This pin is connect to the external LED driver.<br>It is a PWM type control signal for brightness of the LED backlight. The width of LEDPWM signal is set from 256 values between 0% (Low) and 100% (High).<br>Please open these pins if not used. |
|---------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power supply</b> |                      |                                                                                                                                                                                                                                                    |
| Pin Name            | I/O                  | Descriptions                                                                                                                                                                                                                                       |
| VDDDB               | DC/DC<br>Power       | Power supply for DC/DC converter<br>VDDDB, VDDA and VDDR should be the same input voltage level                                                                                                                                                    |
| VDDA                | Analog<br>Power      | Power supply for analog system<br>VDDDB, VDDA and VDDR should be the same input voltage level                                                                                                                                                      |
| VDDR                | Regulator<br>Power   | Power supply for regulator system<br>VDDDB, VDDA and VDDR should be the same input voltage level                                                                                                                                                   |
| VDD_DET             | Detection<br>Power   | Connect to VDDDB/VDDA/VDDR for detection.                                                                                                                                                                                                          |
| VDDAM               | MIPI<br>Power        | Power supply for MIPI/MDDI analog regulator system                                                                                                                                                                                                 |
| VDDI                | I/O<br>Power         | Power supply for interface system except MIPI/MDDI interface                                                                                                                                                                                       |
| DVDD                | Digital<br>Voltage   | Regulator output for logic system power (1.5V typical)<br>Connect a capacitor for stabilization.                                                                                                                                                   |
| DIOPWR              | Dual I/O<br>Voltage  | Regulator output for dual I/O voltage system (1.2V/1.8V typical).<br>Connect a capacitor for stabilization.                                                                                                                                        |
| MVDDA               | MIPI/MDDI<br>Voltage | Regulator output for internal MIPI/MDDI analog system (1.5V typical) Connect a capacitor for stabilization.<br>If not use MIPI/MDDI interface, please open this pin.                                                                               |
| MVDDL               | MIPI<br>Voltage      | Regulator output for internal MIPI low power system (1.2V typical)<br>Connect a capacitor for stabilization.<br>If not use MIPI interface, please open this pin                                                                                    |
| VSSB                | DC/DC<br>GND         | System ground for DC/DC converter                                                                                                                                                                                                                  |
| VSSA                | Analog<br>GND        | System ground for analog system                                                                                                                                                                                                                    |
| VSSR                | Regulator<br>GND     | System ground for regulator system                                                                                                                                                                                                                 |
| VSSAM               | MIPI<br>GND          | System ground for internal MIPI/MDDI analog system                                                                                                                                                                                                 |

| VSSI                                                 | I/O GND       | System ground for interface system except MIPI/MDDI interface                                                                                           |
|------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| DVSS                                                 | Digital GND   | System ground for internal digital system                                                                                                               |
| AVSS                                                 | Source OP GND | System ground for source OP system                                                                                                                      |
| MTP_PWR                                              | MTP Power     | MTP programming power supply pin (7.4 to 7.6V and 7.5V typical) Must be left open or connected to DVSS in normal condition                              |
| <b>Step-up Circuit</b>                               |               |                                                                                                                                                         |
| Pin Name                                             | I/O           | Descriptions                                                                                                                                            |
| AVDD (DDVDH)                                         | O             | Output voltage from step-up circuit 1, generated from VDDB.<br>Connect a capacitor for stabilization.                                                   |
| AVEE (DDVDL)                                         | O             | Output voltage from step-up circuit 2, generated from VDDB.<br>Connect a capacitor for stabilization.                                                   |
| VCL                                                  | O             | Output voltage from step-up circuit 3, generated from VDDB.<br>Connect a capacitor for stabilization.                                                   |
| VGH                                                  | O             | Output voltage from step-up circuit 4.<br>Connect a capacitor for stabilization.                                                                        |
| VGLX                                                 | O             | Output voltage from step-up circuit 5.<br>Connect a capacitor for stabilization.                                                                        |
| VGL                                                  | I             | Substrate voltage for driver IC. Please connect VGL to VGLX.                                                                                            |
| C11P, C11N<br>C12P, C12N<br>C13P, C13N<br>C14P, C14N | O             | Capacitor connection pins for the step-up circuit which generate AVDD.<br>Connect capacitor as requirement.<br>When not in use, please open these pins. |
| C21P, C21N<br>C22P, C22N<br>C23P, C23N<br>C24P, C24N | O             | Capacitor connection pins for the step-up circuit which generate AVEE.<br>Connect capacitor as requirement.<br>When not in use, please open these pins. |
| C31P, C31N<br>C32P, C32N                             | O             | Capacitor connection pins for the step-up circuit which generate VCL.<br>Connect capacitor as requirement.                                              |
| C41P, C41N                                           | O             | Capacitor connection pins for the step-up circuit which generate VGH.<br>Connect capacitor as requirement.                                              |
| C51P, C51N                                           | O             | Capacitor connection pins for the step-up circuit which generate VGLX.<br>Connect capacitor as requirement.                                             |
| VRGH                                                 | O             | Output voltage generated from AVDD.<br>Connect a capacitor for stabilization.<br>When not in use, please open this pin.                                 |

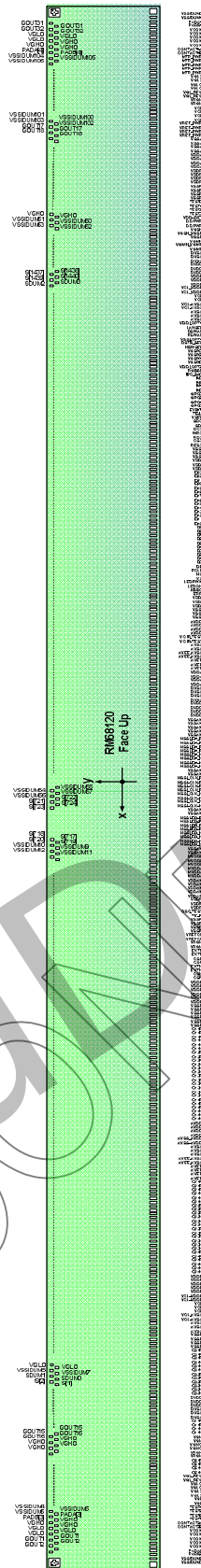
| VGL_REG            | O   | Output voltage generated from VGLX. LDO output used for panel voltage. Connect a capacitor for stabilization. When not in use, please open this pin. |
|--------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|
| EXTP               | O   | PFM1 control output for DC/DC converter to generate AVDD. Connect to gate of external NMOS device. When not in use, please open this pin.            |
| EXTN               | O   | PFM2 control output for DC/DC converter to generate AVEE. Connect to gate of external PMOS device. When not in use, please open this pin.            |
| CSP                | I   | Current sensing input for PFM1 DC/DC converter (generate AVDD). When not in use, please connect to VSSB.                                             |
| CSN                | I   | Current sensing input for PFM2 DC/DC converter (generate AVEE). When not in use, please connect to VSSB.                                             |
| VREF_PWR           | O   | Regulator output for power voltage. Connect a capacitor for stabilization.                                                                           |
| VREFCP             | O   | Reference voltage for internal voltage generating circuit. Connect capacitor for stabilization.                                                      |
| VGMP               | O   | Output voltage generated from AVDD. LDO output for positive gamma high voltage generator.                                                            |
| VGSP               | O   | Output voltage generated from AVDD. LDO output for positive gamma low voltage generator.                                                             |
| VGMN               | O   | Output voltage generated from AVEE. LDO output for negative gamma high voltage generator.                                                            |
| VGSN               | O   | Output voltage generated from AVEE. LDO output for negative gamma low voltage generator.                                                             |
| <b>Output Pins</b> |     |                                                                                                                                                      |
| Pin Name           | I/O | Descriptions                                                                                                                                         |
| S1~S1440           | O   | Pixel electrode driving output.                                                                                                                      |
| GOUT1 ~ GOUT32     | O   | Gate control signals for panel.<br>The swing voltage level is VGHO to VGLO                                                                           |
| SDUM0 ~ 3          | O   | Dummy Source. Leave it Open if not used.                                                                                                             |
| VGHO               | O   | High voltage level for gate control signals and gate circuit of panel.                                                                               |
| VGLO               | O   | Low voltage level for gate control signals and gate circuit of panel.                                                                                |
| LVGL               | O   | Low voltage level for gate circuit of panel.                                                                                                         |

| VCOM                                                                 | O   | Regulator output for common voltage of panel.<br>Connect a capacitor for stabilization.                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test and Dummy pins</b>                                           |     |                                                                                                                                                                                                                                                                                                                                                      |
| Pin Name                                                             | I/O | Descriptions                                                                                                                                                                                                                                                                                                                                         |
| PADA1<br>PADA2<br>PADA3<br>PADA4<br>PADB1<br>PADB2<br>PADB3<br>PADB4 | I/O | These test pins for chip attachment detection.<br>PADA1 to PADA4 are output pins and PADB1 to PADB4 are input pins.<br>For normal operation:<br>Connect PADA1 and PADB1 together by ITO trace.<br>Connect PADA2 and PADB2 together by ITO trace.<br>Connect PADA3 and PADB3 together by ITO trace.<br>Connect PADA4 and PADB4 together by ITO trace. |
| CONTACT1A,<br>CONTACT1B,<br>CONTACT2A,<br>CONTACT2B                  | I/O | Test pin, for test bonding quality, IC internal will connect<br>CONTACT1A with CONTACT1B, CONTACT2A with CONTACT2B                                                                                                                                                                                                                                   |
| AVSS_AVDD                                                            | I   | Test pin, must be connected to AVSS                                                                                                                                                                                                                                                                                                                  |
| AVEE_AVSS                                                            | I   | Test pin, must be connected to AVEE                                                                                                                                                                                                                                                                                                                  |
| VCL_VDDDB                                                            | I   | Test pin, must be connected to VCL                                                                                                                                                                                                                                                                                                                   |
| VCL_AVSS                                                             | I   | Test pin, must be connected to VCL                                                                                                                                                                                                                                                                                                                   |
| VGMN_VGMP                                                            | I   | Test pin, must be connected to VGMN                                                                                                                                                                                                                                                                                                                  |
| VGSN_VGSP                                                            | I   | Test pin, must be connected to VGSN                                                                                                                                                                                                                                                                                                                  |
| KBBC                                                                 | I   | Test pin, not accessible to user. Must be left open.                                                                                                                                                                                                                                                                                                 |
| TEST0~7                                                              | I/O | Test pin, not accessible to user. Must be left open.                                                                                                                                                                                                                                                                                                 |
| OSC_TEST                                                             | I/O | Test pin, not accessible to user, Must left open                                                                                                                                                                                                                                                                                                     |
| VDDI_OPT1~2                                                          | O   | Use them to fix the electrical potentials of unused interface pins and fixed pins.<br>When not in use, leave it open.                                                                                                                                                                                                                                |
| VSSI_OPT1                                                            | O   | Use them to fix the electrical potentials of unused interface pins and fixed pins.<br>When not in use, leave it open.                                                                                                                                                                                                                                |
| VSSIDUM0~106                                                         | O   | These pins are dummy with VSSI potential (not have any function inside).<br>Signal traces can't pass through on glass under these pads.                                                                                                                                                                                                              |

**A-Si TFT LCD Drive Power Supply Specifications Table**

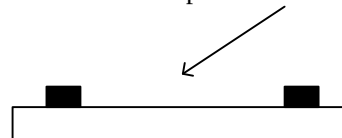
| No. | Item                          | Description              |
|-----|-------------------------------|--------------------------|
| 1   | TFT source driver             | 1440 pins (S1 ~ S1440)   |
| 2   | TFT gate driver               | 32 pins (GOUT1 ~ GOUT32) |
| 3   | Liquid crystal drive output   | S1~S1440                 |
|     |                               | GOUT1 ~ GOUT32           |
|     |                               | VCOM                     |
| 4   | Input voltage                 | IOVCC                    |
|     |                               | VCI                      |
| 5   | Liquid crystal drive voltages | DDVDH                    |
|     |                               | DDVDL                    |
|     |                               | VGH                      |
|     |                               | VGL                      |
|     |                               | VGH-VGL                  |
| 6   | Internal step-up circuits     | DDVDH                    |
|     |                               | DDVDL                    |
|     |                               | VCL                      |
|     |                               | VGH                      |
|     |                               | VGLX                     |

## 5. Pad Diagram and Coordination

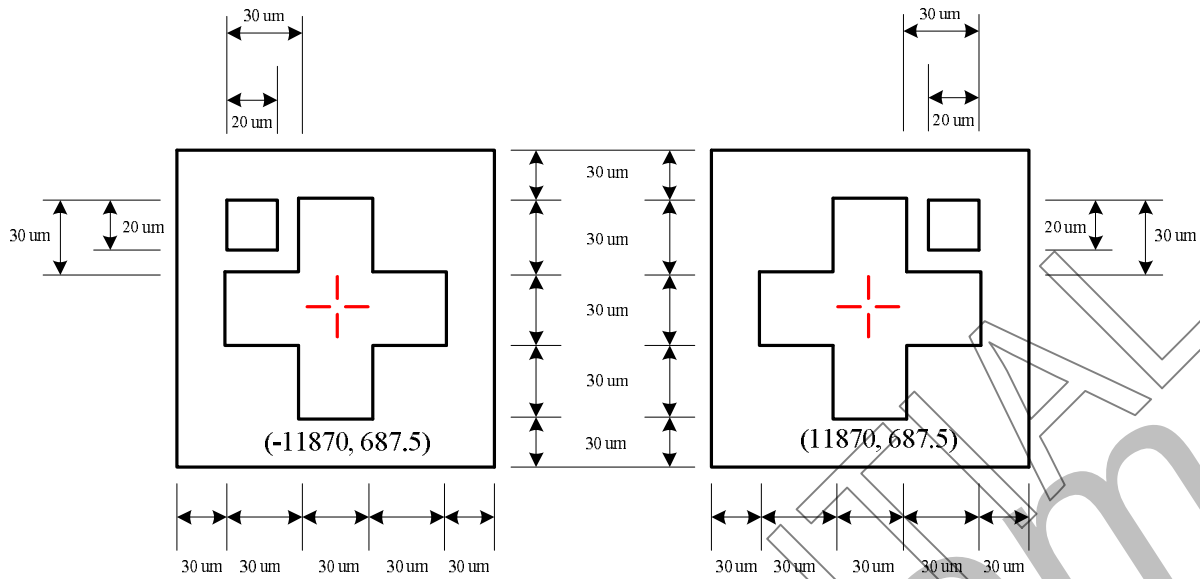


Chip size: 24000um x 1635um  
Chip thickness: 275um  
Au bump height: 12um  
Au bump input size: 40um x 120um  
Au bump output size: 14um x 115um

bump view

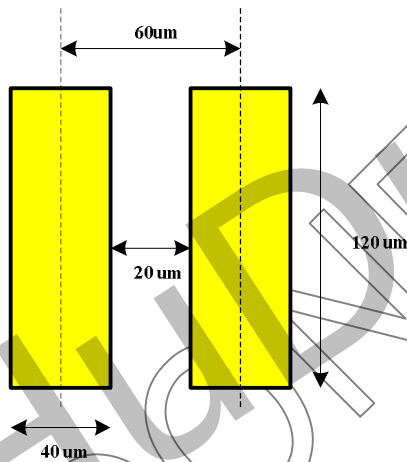


## Alignment Mark:



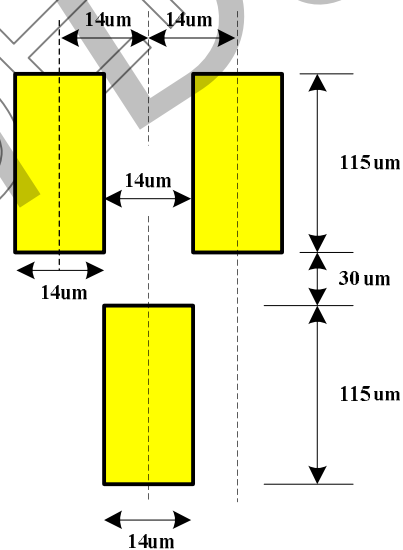
## Bump Arrangement:

Input:



Input Pad

Output:



Output Pad



**Coordinate:**

| Pad No. | Name      | X-axis | Y-axis |
|---------|-----------|--------|--------|
| 1       | VSSIDUM0  | -11880 | -702.5 |
| 2       | VSSIDUM1  | -11790 | -702.5 |
| 3       | PADA1     | -11730 | -702.5 |
| 4       | PADB1     | -11670 | -702.5 |
| 5       | VCOM      | -11610 | -702.5 |
| 6       | VCOM      | -11550 | -702.5 |
| 7       | VCOM      | -11490 | -702.5 |
| 8       | VCOM      | -11430 | -702.5 |
| 9       | VCOM      | -11370 | -702.5 |
| 10      | CONTACT1A | -11310 | -702.5 |
| 11      | CONTACT1B | -11250 | -702.5 |
| 12      | MTP_PWR   | -11190 | -702.5 |
| 13      | MTP_PWR   | -11130 | -702.5 |
| 14      | MTP_PWR   | -11070 | -702.5 |
| 15      | MTP_PWR   | -11010 | -702.5 |
| 16      | MTP_PWR   | -10950 | -702.5 |
| 17      | VGLX      | -10890 | -702.5 |
| 18      | VGLX      | -10830 | -702.5 |
| 19      | VGLO      | -10770 | -702.5 |
| 20      | VGLO      | -10710 | -702.5 |
| 21      | VGL_REG   | -10650 | -702.5 |
| 22      | VGL_REG   | -10590 | -702.5 |
| 23      | VRGH      | -10530 | -702.5 |
| 24      | VRGH      | -10470 | -702.5 |
| 25      | VCL       | -10410 | -702.5 |
| 26      | VCL       | -10350 | -702.5 |
| 27      | VCL       | -10290 | -702.5 |
| 28      | VCL       | -10230 | -702.5 |
| 29      | VREF_PWR  | -10170 | -702.5 |
| 30      | VREF_PWR  | -10110 | -702.5 |
| 31      | VREF_PWR  | -10050 | -702.5 |
| 32      | VREF_PWR  | -9990  | -702.5 |
| 33      | VSSA      | -9930  | -702.5 |
| 34      | VSSA      | -9870  | -702.5 |
| 35      | VSSA      | -9810  | -702.5 |
| 36      | VSSA      | -9750  | -702.5 |
| 37      | VDDA      | -9690  | -702.5 |
| 38      | VDDA      | -9630  | -702.5 |
| 39      | VDDA      | -9570  | -702.5 |
| 40      | VDDA      | -9510  | -702.5 |
| 41      | VDDR      | -9450  | -702.5 |
| 42      | VDDR      | -9390  | -702.5 |
| 43      | VDDR      | -9330  | -702.5 |
| 44      | VDDR      | -9270  | -702.5 |
| 45      | VSSR      | -9210  | -702.5 |
| 46      | VSSR      | -9150  | -702.5 |
| 47      | VSSR      | -9090  | -702.5 |
| 48      | VSSR      | -9030  | -702.5 |
| 49      | TEST0     | -8970  | -702.5 |
| 50      | TEST1     | -8910  | -702.5 |
| 51      | TEST2     | -8850  | -702.5 |
| 52      | TEST3     | -8790  | -702.5 |
| 53      | VDD_DET   | -8730  | -702.5 |
| 54      | DIOPWR    | -8670  | -702.5 |

|     |           |       |        |
|-----|-----------|-------|--------|
| 55  | DIOPWR    | -8610 | -702.5 |
| 56  | VGSN      | -8550 | -702.5 |
| 57  | VGSN_VGSP | -8490 | -702.5 |
| 58  | VGSP      | -8430 | -702.5 |
| 59  | VGMN      | -8370 | -702.5 |
| 60  | VGMN_VGMP | -8310 | -702.5 |
| 61  | VGMP      | -8250 | -702.5 |
| 62  | DVSS      | -8190 | -702.5 |
| 63  | DVSS      | -8130 | -702.5 |
| 64  | DVSS      | -8070 | -702.5 |
| 65  | DVDD      | -8010 | -702.5 |
| 66  | DVDD      | -7950 | -702.5 |
| 67  | DVDD      | -7890 | -702.5 |
| 68  | Vddb      | -7830 | -702.5 |
| 69  | Vddb      | -7770 | -702.5 |
| 70  | Vddb      | -7710 | -702.5 |
| 71  | VCL_Vddb  | -7650 | -702.5 |
| 72  | VCL_Vddb  | -7590 | -702.5 |
| 73  | VCL       | -7530 | -702.5 |
| 74  | VCL       | -7470 | -702.5 |
| 75  | VCL_AVSS  | -7410 | -702.5 |
| 76  | VCL_AVSS  | -7350 | -702.5 |
| 77  | AVSS      | -7290 | -702.5 |
| 78  | AVSS      | -7230 | -702.5 |
| 79  | AVSS      | -7170 | -702.5 |
| 80  | VDDI_OPT1 | -7110 | -702.5 |
| 81  | LANSEL    | -7050 | -702.5 |
| 82  | DSWAP     | -6990 | -702.5 |
| 83  | PSWAP     | -6930 | -702.5 |
| 84  | VSSI_OPT1 | -6870 | -702.5 |
| 85  | DSTB_SEL  | -6810 | -702.5 |
| 86  | NBWSEL    | -6750 | -702.5 |
| 87  | VGSW3     | -6690 | -702.5 |
| 88  | VGSW2     | -6630 | -702.5 |
| 89  | VGSW1     | -6570 | -702.5 |
| 90  | VGSW0     | -6510 | -702.5 |
| 91  | VDDI_OPT2 | -6450 | -702.5 |
| 92  | RGBBP     | -6390 | -702.5 |
| 93  | I2C_SA0   | -6330 | -702.5 |
| 94  | IM3       | -6270 | -702.5 |
| 95  | IM2       | -6210 | -702.5 |
| 96  | IM1       | -6150 | -702.5 |
| 97  | IM0       | -6090 | -702.5 |
| 98  | GPO3      | -6030 | -702.5 |
| 99  | GPO2      | -5970 | -702.5 |
| 100 | GPO1      | -5910 | -702.5 |
| 101 | GPO0      | -5850 | -702.5 |
| 102 | EXB1T     | -5790 | -702.5 |
| 103 | TE_L      | -5730 | -702.5 |
| 104 | VSEL      | -5670 | -702.5 |
| 105 | SDO       | -5610 | -702.5 |
| 106 | SDI       | -5550 | -702.5 |
| 107 | DCX       | -5490 | -702.5 |
| 108 | WRX       | -5430 | -702.5 |
| 109 | RDX       | -5370 | -702.5 |
| 110 | CSX       | -5310 | -702.5 |
| 111 | RESX      | -5250 | -702.5 |



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| 112 | VSSI      | -5190 | -702.5 |
| 113 | VSSI      | -5130 | -702.5 |
| 114 | VSSI      | -5070 | -702.5 |
| 115 | VDDI      | -5010 | -702.5 |
| 116 | VDDI      | -4950 | -702.5 |
| 117 | VDDI      | -4890 | -702.5 |
| 118 | D23       | -4830 | -702.5 |
| 119 | D22       | -4770 | -702.5 |
| 120 | D21       | -4710 | -702.5 |
| 121 | D20       | -4650 | -702.5 |
| 122 | D19       | -4590 | -702.5 |
| 123 | D18       | -4530 | -702.5 |
| 124 | D17       | -4470 | -702.5 |
| 125 | D16       | -4410 | -702.5 |
| 126 | D15       | -4350 | -702.5 |
| 127 | D14       | -4290 | -702.5 |
| 128 | D13       | -4230 | -702.5 |
| 129 | D12       | -4170 | -702.5 |
| 130 | D11       | -4110 | -702.5 |
| 131 | D10       | -4050 | -702.5 |
| 132 | D9        | -3990 | -702.5 |
| 133 | D8        | -3930 | -702.5 |
| 134 | D7        | -3870 | -702.5 |
| 135 | D6        | -3810 | -702.5 |
| 136 | D5        | -3750 | -702.5 |
| 137 | D4        | -3690 | -702.5 |
| 138 | D3        | -3630 | -702.5 |
| 139 | D2        | -3570 | -702.5 |
| 140 | D1        | -3510 | -702.5 |
| 141 | D0        | -3450 | -702.5 |
| 142 | DE        | -3390 | -702.5 |
| 143 | PCLK      | -3330 | -702.5 |
| 144 | HS        | -3270 | -702.5 |
| 145 | VS        | -3210 | -702.5 |
| 146 | LEDPWM    | -3150 | -702.5 |
| 147 | LEDON     | -3090 | -702.5 |
| 148 | KBBC      | -3030 | -702.5 |
| 149 | ERR       | -2970 | -702.5 |
| 150 | VDDI      | -2910 | -702.5 |
| 151 | VDDI      | -2850 | -702.5 |
| 152 | VDDI      | -2790 | -702.5 |
| 153 | VSSI      | -2730 | -702.5 |
| 154 | VSSI      | -2670 | -702.5 |
| 155 | VSSI      | -2610 | -702.5 |
| 156 | AVDD      | -2550 | -702.5 |
| 157 | AVDD      | -2490 | -702.5 |
| 158 | AVDD      | -2430 | -702.5 |
| 159 | AVDD      | -2370 | -702.5 |
| 160 | AVSS_AVDD | -2310 | -702.5 |
| 161 | AVSS_AVDD | -2250 | -702.5 |
| 162 | AVSS      | -2190 | -702.5 |
| 163 | AVSS      | -2130 | -702.5 |
| 164 | AVEE_AVSS | -2070 | -702.5 |
| 165 | AVEE_AVSS | -2010 | -702.5 |
| 166 | AVEE      | -1950 | -702.5 |
| 167 | AVEE      | -1890 | -702.5 |
| 168 | AVEE      | -1830 | -702.5 |

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|-----|------------|-------|--------|
| 169 | VDDA       | -1770 | -702.5 |
| 170 | VDDA       | -1710 | -702.5 |
| 171 | VDDA       | -1650 | -702.5 |
| 172 | VDDA       | -1590 | -702.5 |
| 173 | DVSS       | -1530 | -702.5 |
| 174 | DVSS       | -1470 | -702.5 |
| 175 | DVSS       | -1410 | -702.5 |
| 176 | DVSS       | -1350 | -702.5 |
| 177 | DVDD       | -1290 | -702.5 |
| 178 | DVDD       | -1230 | -702.5 |
| 179 | DVDD       | -1170 | -702.5 |
| 180 | DVDD       | -1110 | -702.5 |
| 181 | VSSAM      | -1050 | -702.5 |
| 182 | VSSAM      | -990  | -702.5 |
| 183 | VSSAM      | -930  | -702.5 |
| 184 | VSSAM      | -870  | -702.5 |
| 185 | VSSAM      | -810  | -702.5 |
| 186 | HSSI_D1_P  | -750  | -702.5 |
| 187 | HSSI_D1_P  | -690  | -702.5 |
| 188 | HSSI_D1_P  | -630  | -702.5 |
| 189 | HSSI_D1_P  | -570  | -702.5 |
| 190 | HSSI_D1_N  | -510  | -702.5 |
| 191 | HSSI_D1_N  | -450  | -702.5 |
| 192 | HSSI_D1_N  | -390  | -702.5 |
| 193 | HSSI_D1_N  | -330  | -702.5 |
| 194 | VSSAM      | -270  | -702.5 |
| 195 | VSSAM      | -210  | -702.5 |
| 196 | HSSI_CLK_P | -150  | -702.5 |
| 197 | HSSI_CLK_P | -90   | -702.5 |
| 198 | HSSI_CLK_P | -30   | -702.5 |
| 199 | HSSI_CLK_P | 30    | -702.5 |
| 200 | HSSI_CLK_N | 90    | -702.5 |
| 201 | HSSI_CLK_N | 150   | -702.5 |
| 202 | HSSI_CLK_N | 210   | -702.5 |
| 203 | HSSI_CLK_N | 270   | -702.5 |
| 204 | VSSAM      | 330   | -702.5 |
| 205 | VSSAM      | 390   | -702.5 |
| 206 | HSSI_D0_P  | 450   | -702.5 |
| 207 | HSSI_D0_P  | 510   | -702.5 |
| 208 | HSSI_D0_P  | 570   | -702.5 |
| 209 | HSSI_D0_P  | 630   | -702.5 |
| 210 | HSSI_D0_N  | 690   | -702.5 |
| 211 | HSSI_D0_N  | 750   | -702.5 |
| 212 | HSSI_D0_N  | 810   | -702.5 |
| 213 | HSSI_D0_N  | 870   | -702.5 |
| 214 | VSSAM      | 930   | -702.5 |
| 215 | VSSAM      | 990   | -702.5 |
| 216 | MVDDL      | 1050  | -702.5 |
| 217 | MVDDL      | 1110  | -702.5 |
| 218 | MVDDL      | 1170  | -702.5 |
| 219 | MVDDA      | 1230  | -702.5 |
| 220 | MVDDA      | 1290  | -702.5 |
| 221 | MVDDA      | 1350  | -702.5 |
| 222 | VDDAM      | 1410  | -702.5 |
| 223 | VDDAM      | 1470  | -702.5 |
| 224 | VDDAM      | 1530  | -702.5 |
| 225 | VDDAM      | 1590  | -702.5 |

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| 226 | VDDAM    | 1650 | -702.5 |
| 227 | VDDR     | 1710 | -702.5 |
| 228 | VDDR     | 1770 | -702.5 |
| 229 | VDDR     | 1830 | -702.5 |
| 230 | OSC_TEST | 1890 | -702.5 |
| 231 | TE_R     | 1950 | -702.5 |
| 232 | VSSR     | 2010 | -702.5 |
| 233 | VSSR     | 2070 | -702.5 |
| 234 | VSSR     | 2130 | -702.5 |
| 235 | VSSR     | 2190 | -702.5 |
| 236 | VREFCP   | 2250 | -702.5 |
| 237 | VREFCP   | 2310 | -702.5 |
| 238 | VRGH     | 2370 | -702.5 |
| 239 | VRGH     | 2430 | -702.5 |
| 240 | EXTP     | 2490 | -702.5 |
| 241 | EXTP     | 2550 | -702.5 |
| 242 | CSP      | 2610 | -702.5 |
| 243 | CSP      | 2670 | -702.5 |
| 244 | EXTN     | 2730 | -702.5 |
| 245 | EXTN     | 2790 | -702.5 |
| 246 | CSN      | 2850 | -702.5 |
| 247 | CSN      | 2910 | -702.5 |
| 248 | VDDDB    | 2970 | -702.5 |
| 249 | VDDDB    | 3030 | -702.5 |
| 250 | VDDDB    | 3090 | -702.5 |
| 251 | VDDDB    | 3150 | -702.5 |
| 252 | VDDDB    | 3210 | -702.5 |
| 253 | VDDDB    | 3270 | -702.5 |
| 254 | VSSB     | 3330 | -702.5 |
| 255 | VSSB     | 3390 | -702.5 |
| 256 | VSSB     | 3450 | -702.5 |
| 257 | VSSB     | 3510 | -702.5 |
| 258 | VSSB     | 3570 | -702.5 |
| 259 | VSSB     | 3630 | -702.5 |
| 260 | C11P     | 3690 | -702.5 |
| 261 | C11P     | 3750 | -702.5 |
| 262 | C11P     | 3810 | -702.5 |
| 263 | C11N     | 3870 | -702.5 |
| 264 | C11N     | 3930 | -702.5 |
| 265 | C11N     | 3990 | -702.5 |
| 266 | C12P     | 4050 | -702.5 |
| 267 | C12P     | 4110 | -702.5 |
| 268 | C12P     | 4170 | -702.5 |
| 269 | C12N     | 4230 | -702.5 |
| 270 | C12N     | 4290 | -702.5 |
| 271 | C12N     | 4350 | -702.5 |
| 272 | C13P     | 4410 | -702.5 |
| 273 | C13P     | 4470 | -702.5 |
| 274 | C13P     | 4530 | -702.5 |
| 275 | C13N     | 4590 | -702.5 |
| 276 | C13N     | 4650 | -702.5 |
| 277 | C13N     | 4710 | -702.5 |
| 278 | C14P     | 4770 | -702.5 |
| 279 | C14P     | 4830 | -702.5 |
| 280 | C14P     | 4890 | -702.5 |
| 281 | C14N     | 4950 | -702.5 |
| 282 | C14N     | 5010 | -702.5 |

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| 283 | C14N      | 5070 | -702.5 |
| 284 | AVDD      | 5130 | -702.5 |
| 285 | AVDD      | 5190 | -702.5 |
| 286 | AVDD      | 5250 | -702.5 |
| 287 | AVDD      | 5310 | -702.5 |
| 288 | AVSS_AVDD | 5370 | -702.5 |
| 289 | AVSS_AVDD | 5430 | -702.5 |
| 290 | AVSS      | 5490 | -702.5 |
| 291 | AVSS      | 5550 | -702.5 |
| 292 | AVSS      | 5610 | -702.5 |
| 293 | AVEE_AVSS | 5670 | -702.5 |
| 294 | AVEE_AVSS | 5730 | -702.5 |
| 295 | AVEE      | 5790 | -702.5 |
| 296 | AVEE      | 5850 | -702.5 |
| 297 | AVEE      | 5910 | -702.5 |
| 298 | AVEE      | 5970 | -702.5 |
| 299 | C21P      | 6030 | -702.5 |
| 300 | C21P      | 6090 | -702.5 |
| 301 | C21P      | 6150 | -702.5 |
| 302 | C21N      | 6210 | -702.5 |
| 303 | C21N      | 6270 | -702.5 |
| 304 | C21N      | 6330 | -702.5 |
| 305 | C22P      | 6390 | -702.5 |
| 306 | C22P      | 6450 | -702.5 |
| 307 | C22P      | 6510 | -702.5 |
| 308 | C22N      | 6570 | -702.5 |
| 309 | C22N      | 6630 | -702.5 |
| 310 | C22N      | 6690 | -702.5 |
| 311 | C23P      | 6750 | -702.5 |
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| 314 | C23N      | 6930 | -702.5 |
| 315 | C23N      | 6990 | -702.5 |
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| 317 | C24P      | 7110 | -702.5 |
| 318 | C24P      | 7170 | -702.5 |
| 319 | C24P      | 7230 | -702.5 |
| 320 | C24N      | 7290 | -702.5 |
| 321 | C24N      | 7350 | -702.5 |
| 322 | C24N      | 7410 | -702.5 |
| 323 | VDDDB     | 7470 | -702.5 |
| 324 | VDDDB     | 7530 | -702.5 |
| 325 | VDDDB     | 7590 | -702.5 |
| 326 | VDDDB     | 7650 | -702.5 |
| 327 | VDDDB     | 7710 | -702.5 |
| 328 | VCL_VDDDB | 7770 | -702.5 |
| 329 | VCL_VDDDB | 7830 | -702.5 |
| 330 | VCL       | 7890 | -702.5 |
| 331 | VCL       | 7950 | -702.5 |
| 332 | VCL       | 8010 | -702.5 |
| 333 | VCL_AVSS  | 8070 | -702.5 |
| 334 | VCL_AVSS  | 8130 | -702.5 |
| 335 | AVSS      | 8190 | -702.5 |
| 336 | AVSS      | 8250 | -702.5 |
| 337 | AVSS      | 8310 | -702.5 |
| 338 | VSSB      | 8370 | -702.5 |
| 339 | VSSB      | 8430 | -702.5 |

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| 340 | VSSB      | 8490  | -702.5 |
| 341 | VSSB      | 8550  | -702.5 |
| 342 | C31P      | 8610  | -702.5 |
| 343 | C31P      | 8670  | -702.5 |
| 344 | C31P      | 8730  | -702.5 |
| 345 | C31N      | 8790  | -702.5 |
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| 350 | C32P      | 9090  | -702.5 |
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| 352 | C32N      | 9210  | -702.5 |
| 353 | C32N      | 9270  | -702.5 |
| 354 | DVDD      | 9330  | -702.5 |
| 355 | DVDD      | 9390  | -702.5 |
| 356 | DVDD      | 9450  | -702.5 |
| 357 | DVSS      | 9510  | -702.5 |
| 358 | DVSS      | 9570  | -702.5 |
| 359 | DVSS      | 9630  | -702.5 |
| 360 | C41P      | 9690  | -702.5 |
| 361 | C41P      | 9750  | -702.5 |
| 362 | C41N      | 9810  | -702.5 |
| 363 | C41N      | 9870  | -702.5 |
| 364 | VGH       | 9930  | -702.5 |
| 365 | VGH       | 9990  | -702.5 |
| 366 | VGHO      | 10050 | -702.5 |
| 367 | VGHO      | 10110 | -702.5 |
| 368 | VRGH      | 10170 | -702.5 |
| 369 | VRGH      | 10230 | -702.5 |
| 370 | C51P      | 10290 | -702.5 |
| 371 | C51P      | 10350 | -702.5 |
| 372 | C51N      | 10410 | -702.5 |
| 373 | C51N      | 10470 | -702.5 |
| 374 | VGL_REG   | 10530 | -702.5 |
| 375 | VGL_REG   | 10590 | -702.5 |
| 376 | VGLO      | 10650 | -702.5 |
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| 382 | TEST4     | 11010 | -702.5 |
| 383 | TEST5     | 11070 | -702.5 |
| 384 | TEST6     | 11130 | -702.5 |
| 385 | TEST7     | 11190 | -702.5 |
| 386 | CONTACT2A | 11250 | -702.5 |
| 387 | CONTACT2B | 11310 | -702.5 |
| 388 | VCOM      | 11370 | -702.5 |
| 389 | VCOM      | 11430 | -702.5 |
| 390 | VCOM      | 11490 | -702.5 |
| 391 | VCOM      | 11550 | -702.5 |
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| 393 | PADA2     | 11670 | -702.5 |
| 394 | PADB2     | 11730 | -702.5 |
| 395 | VSSIDUM2  | 11790 | -702.5 |
| 396 | VSSIDUM3  | 11880 | -702.5 |

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| 397 | VSSIDUM4 | 11760 | 705 |
| 398 | VSSIDUM5 | 11732 | 560 |
| 399 | VSSIDUM6 | 11718 | 705 |
| 400 | PADA3    | 11704 | 560 |
| 401 | PADB3    | 11690 | 705 |
| 402 | VGHO     | 11676 | 560 |
| 403 | VGHO     | 11662 | 705 |
| 404 | VGHO     | 11648 | 560 |
| 405 | VGLO     | 11634 | 705 |
| 406 | VGLO     | 11620 | 560 |
| 407 | VGLO     | 11606 | 705 |
| 408 | GOUT1    | 11592 | 560 |
| 409 | GOUT1    | 11578 | 705 |
| 410 | GOUT2    | 11564 | 560 |
| 411 | GOUT2    | 11550 | 705 |
| 412 | LVGL     | 11536 | 560 |
| 413 | LVGL     | 11522 | 705 |
| 414 | LVGL     | 11508 | 560 |
| 415 | VRGH     | 11494 | 705 |
| 416 | VRGH     | 11480 | 560 |
| 417 | VRGH     | 11466 | 705 |
| 418 | VGLO     | 11452 | 560 |
| 419 | VGLO     | 11438 | 705 |
| 420 | VGLO     | 11424 | 560 |
| 421 | GOUT3    | 11410 | 705 |
| 422 | GOUT3    | 11396 | 560 |
| 423 | GOUT4    | 11382 | 705 |
| 424 | GOUT4    | 11368 | 560 |
| 425 | GOUT5    | 11354 | 705 |
| 426 | GOUT5    | 11340 | 560 |
| 427 | GOUT6    | 11326 | 705 |
| 428 | GOUT6    | 11312 | 560 |
| 429 | GOUT7    | 11298 | 705 |
| 430 | GOUT7    | 11284 | 560 |
| 431 | GOUT8    | 11270 | 705 |
| 432 | GOUT8    | 11256 | 560 |
| 433 | GOUT9    | 11242 | 705 |
| 434 | GOUT9    | 11228 | 560 |
| 435 | GOUT10   | 11214 | 705 |
| 436 | GOUT10   | 11200 | 560 |
| 437 | GOUT11   | 11186 | 705 |
| 438 | GOUT11   | 11172 | 560 |
| 439 | GOUT12   | 11158 | 705 |
| 440 | GOUT12   | 11144 | 560 |
| 441 | GOUT13   | 11130 | 705 |
| 442 | GOUT13   | 11116 | 560 |
| 443 | GOUT14   | 11102 | 705 |
| 444 | GOUT14   | 11088 | 560 |
| 445 | GOUT15   | 11074 | 705 |
| 446 | GOUT15   | 11060 | 560 |
| 447 | GOUT16   | 11046 | 705 |
| 448 | GOUT16   | 11032 | 560 |
| 449 | VGHO     | 11018 | 705 |
| 450 | VGHO     | 11004 | 560 |
| 451 | VGHO     | 10990 | 705 |
| 452 | VGHO     | 10976 | 560 |
| 453 | VGHO     | 10962 | 705 |

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| 454 | VGHO     | 10948 | 560 |
| 455 | VGHO     | 10934 | 705 |
| 456 | VGHO     | 10920 | 560 |
| 457 | VGLO     | 10906 | 705 |
| 458 | VGLO     | 10892 | 560 |
| 459 | VGLO     | 10878 | 705 |
| 460 | VGLO     | 10864 | 560 |
| 461 | VGLO     | 10850 | 705 |
| 462 | VGLO     | 10836 | 560 |
| 463 | VGLO     | 10822 | 705 |
| 464 | VGLO     | 10808 | 560 |
| 465 | VGLO     | 10794 | 705 |
| 466 | VSSIDUM7 | 10780 | 560 |
| 467 | VSSIDUM8 | 10766 | 705 |
| 468 | SDUM0    | 10752 | 560 |
| 469 | SDUM1    | 10738 | 705 |
| 470 | S1       | 10724 | 560 |
| 471 | S2       | 10710 | 705 |
| 472 | S3       | 10696 | 560 |
| 473 | S4       | 10682 | 705 |
| 474 | S5       | 10668 | 560 |
| 475 | S6       | 10654 | 705 |
| 476 | S7       | 10640 | 560 |
| 477 | S8       | 10626 | 705 |
| 478 | S9       | 10612 | 560 |
| 479 | S10      | 10598 | 705 |
| 480 | S11      | 10584 | 560 |
| 481 | S12      | 10570 | 705 |
| 482 | S13      | 10556 | 560 |
| 483 | S14      | 10542 | 705 |
| 484 | S15      | 10528 | 560 |
| 485 | S16      | 10514 | 705 |
| 486 | S17      | 10500 | 560 |
| 487 | S18      | 10486 | 705 |
| 488 | S19      | 10472 | 560 |
| 489 | S20      | 10458 | 705 |
| 490 | S21      | 10444 | 560 |
| 491 | S22      | 10430 | 705 |
| 492 | S23      | 10416 | 560 |
| 493 | S24      | 10402 | 705 |
| 494 | S25      | 10388 | 560 |
| 495 | S26      | 10374 | 705 |
| 496 | S27      | 10360 | 560 |
| 497 | S28      | 10346 | 705 |
| 498 | S29      | 10332 | 560 |
| 499 | S30      | 10318 | 705 |
| 500 | S31      | 10304 | 560 |
| 501 | S32      | 10290 | 705 |
| 502 | S33      | 10276 | 560 |
| 503 | S34      | 10262 | 705 |
| 504 | S35      | 10248 | 560 |
| 505 | S36      | 10234 | 705 |
| 506 | S37      | 10220 | 560 |
| 507 | S38      | 10206 | 705 |
| 508 | S39      | 10192 | 560 |
| 509 | S40      | 10178 | 705 |
| 510 | S41      | 10164 | 560 |

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| 511 | S42 | 10150 | 705 |
| 512 | S43 | 10136 | 560 |
| 513 | S44 | 10122 | 705 |
| 514 | S45 | 10108 | 560 |
| 515 | S46 | 10094 | 705 |
| 516 | S47 | 10080 | 560 |
| 517 | S48 | 10066 | 705 |
| 518 | S49 | 10052 | 560 |
| 519 | S50 | 10038 | 705 |
| 520 | S51 | 10024 | 560 |
| 521 | S52 | 10010 | 705 |
| 522 | S53 | 9996  | 560 |
| 523 | S54 | 9982  | 705 |
| 524 | S55 | 9968  | 560 |
| 525 | S56 | 9954  | 705 |
| 526 | S57 | 9940  | 560 |
| 527 | S58 | 9926  | 705 |
| 528 | S59 | 9912  | 560 |
| 529 | S60 | 9898  | 705 |
| 530 | S61 | 9884  | 560 |
| 531 | S62 | 9870  | 705 |
| 532 | S63 | 9856  | 560 |
| 533 | S64 | 9842  | 705 |
| 534 | S65 | 9828  | 560 |
| 535 | S66 | 9814  | 705 |
| 536 | S67 | 9800  | 560 |
| 537 | S68 | 9786  | 705 |
| 538 | S69 | 9772  | 560 |
| 539 | S70 | 9758  | 705 |
| 540 | S71 | 9744  | 560 |
| 541 | S72 | 9730  | 705 |
| 542 | S73 | 9716  | 560 |
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| 545 | S76 | 9674  | 705 |
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| 547 | S78 | 9646  | 705 |
| 548 | S79 | 9632  | 560 |
| 549 | S80 | 9618  | 705 |
| 550 | S81 | 9604  | 560 |
| 551 | S82 | 9590  | 705 |
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| 553 | S84 | 9562  | 705 |
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| 555 | S86 | 9534  | 705 |
| 556 | S87 | 9520  | 560 |
| 557 | S88 | 9506  | 705 |
| 558 | S89 | 9492  | 560 |
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| 563 | S94 | 9422  | 705 |
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| 566 | S97 | 9380  | 560 |
| 567 | S98 | 9366  | 705 |

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| 568 | S99  | 9352 | 560 |
| 569 | S100 | 9338 | 705 |
| 570 | S101 | 9324 | 560 |
| 571 | S102 | 9310 | 705 |
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| 1617 | S1099 | -5334 | 705 |
| 1618 | S1100 | -5348 | 560 |
| 1619 | S1101 | -5362 | 705 |
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| 1621 | S1103 | -5390 | 705 |
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| 1623 | S1105 | -5418 | 705 |
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| 1625 | S1107 | -5446 | 705 |
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| 1627 | S1109 | -5474 | 705 |
| 1628 | S1110 | -5488 | 560 |
| 1629 | S1111 | -5502 | 705 |
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| 1631 | S1113 | -5530 | 705 |
| 1632 | S1114 | -5544 | 560 |
| 1633 | S1115 | -5558 | 705 |
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| 1635 | S1117 | -5586 | 705 |
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| 1646 | S1128 | -5740 | 560 |
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| 1649 | S1131 | -5782 | 705 |
| 1650 | S1132 | -5796 | 560 |

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| 1706 | S1188 | -6580 | 560 |
| 1707 | S1189 | -6594 | 705 |



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| 1725 | S1207 | -6846 | 705 |
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| 1762 | S1244 | -7364 | 560 |
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| 1764 | S1246 | -7392 | 560 |

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| 1775 | S1257 | -7546 | 705 |
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| 1792 | S1274 | -7784 | 560 |
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| 1814 | S1296 | -8092 | 560 |
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| 1818 | S1300 | -8148 | 560 |
| 1819 | S1301 | -8162 | 705 |
| 1820 | S1302 | -8176 | 560 |
| 1821 | S1303 | -8190 | 705 |



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| 1823 | S1305 | -8218 | 705 |
| 1824 | S1306 | -8232 | 560 |
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| 1826 | S1308 | -8260 | 560 |
| 1827 | S1309 | -8274 | 705 |
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| 1832 | S1314 | -8344 | 560 |
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| 1835 | S1317 | -8386 | 705 |
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| 1860 | S1342 | -8736 | 560 |
| 1861 | S1343 | -8750 | 705 |
| 1862 | S1344 | -8764 | 560 |
| 1863 | S1345 | -8778 | 705 |
| 1864 | S1346 | -8792 | 560 |
| 1865 | S1347 | -8806 | 705 |
| 1866 | S1348 | -8820 | 560 |
| 1867 | S1349 | -8834 | 705 |
| 1868 | S1350 | -8848 | 560 |
| 1869 | S1351 | -8862 | 705 |
| 1870 | S1352 | -8876 | 560 |
| 1871 | S1353 | -8890 | 705 |
| 1872 | S1354 | -8904 | 560 |
| 1873 | S1355 | -8918 | 705 |
| 1874 | S1356 | -8932 | 560 |
| 1875 | S1357 | -8946 | 705 |
| 1876 | S1358 | -8960 | 560 |
| 1877 | S1359 | -8974 | 705 |
| 1878 | S1360 | -8988 | 560 |

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| 1879 | S1361 | -9002 | 705 |
| 1880 | S1362 | -9016 | 560 |
| 1881 | S1363 | -9030 | 705 |
| 1882 | S1364 | -9044 | 560 |
| 1883 | S1365 | -9058 | 705 |
| 1884 | S1366 | -9072 | 560 |
| 1885 | S1367 | -9086 | 705 |
| 1886 | S1368 | -9100 | 560 |
| 1887 | S1369 | -9114 | 705 |
| 1888 | S1370 | -9128 | 560 |
| 1889 | S1371 | -9142 | 705 |
| 1890 | S1372 | -9156 | 560 |
| 1891 | S1373 | -9170 | 705 |
| 1892 | S1374 | -9184 | 560 |
| 1893 | S1375 | -9198 | 705 |
| 1894 | S1376 | -9212 | 560 |
| 1895 | S1377 | -9226 | 705 |
| 1896 | S1378 | -9240 | 560 |
| 1897 | S1379 | -9254 | 705 |
| 1898 | S1380 | -9268 | 560 |
| 1899 | S1381 | -9282 | 705 |
| 1900 | S1382 | -9296 | 560 |
| 1901 | S1383 | -9310 | 705 |
| 1902 | S1384 | -9324 | 560 |
| 1903 | S1385 | -9338 | 705 |
| 1904 | S1386 | -9352 | 560 |
| 1905 | S1387 | -9366 | 705 |
| 1906 | S1388 | -9380 | 560 |
| 1907 | S1389 | -9394 | 705 |
| 1908 | S1390 | -9408 | 560 |
| 1909 | S1391 | -9422 | 705 |
| 1910 | S1392 | -9436 | 560 |
| 1911 | S1393 | -9450 | 705 |
| 1912 | S1394 | -9464 | 560 |
| 1913 | S1395 | -9478 | 705 |
| 1914 | S1396 | -9492 | 560 |
| 1915 | S1397 | -9506 | 705 |
| 1916 | S1398 | -9520 | 560 |
| 1917 | S1399 | -9534 | 705 |
| 1918 | S1400 | -9548 | 560 |
| 1919 | S1401 | -9562 | 705 |
| 1920 | S1402 | -9576 | 560 |
| 1921 | S1403 | -9590 | 705 |
| 1922 | S1404 | -9604 | 560 |
| 1923 | S1405 | -9618 | 705 |
| 1924 | S1406 | -9632 | 560 |
| 1925 | S1407 | -9646 | 705 |
| 1926 | S1408 | -9660 | 560 |
| 1927 | S1409 | -9674 | 705 |
| 1928 | S1410 | -9688 | 560 |
| 1929 | S1411 | -9702 | 705 |
| 1930 | S1412 | -9716 | 560 |
| 1931 | S1413 | -9730 | 705 |
| 1932 | S1414 | -9744 | 560 |
| 1933 | S1415 | -9758 | 705 |
| 1934 | S1416 | -9772 | 560 |
| 1935 | S1417 | -9786 | 705 |

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| 1936 | S1418     | -9800  | 560 |
| 1937 | S1419     | -9814  | 705 |
| 1938 | S1420     | -9828  | 560 |
| 1939 | S1421     | -9842  | 705 |
| 1940 | S1422     | -9856  | 560 |
| 1941 | S1423     | -9870  | 705 |
| 1942 | S1424     | -9884  | 560 |
| 1943 | S1425     | -9898  | 705 |
| 1944 | S1426     | -9912  | 560 |
| 1945 | S1427     | -9926  | 705 |
| 1946 | S1428     | -9940  | 560 |
| 1947 | S1429     | -9954  | 705 |
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| 1949 | S1431     | -9982  | 705 |
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| 1951 | S1433     | -10010 | 705 |
| 1952 | S1434     | -10024 | 560 |
| 1953 | S1435     | -10038 | 705 |
| 1954 | S1436     | -10052 | 560 |
| 1955 | S1437     | -10066 | 705 |
| 1956 | S1438     | -10080 | 560 |
| 1957 | S1439     | -10094 | 705 |
| 1958 | S1440     | -10108 | 560 |
| 1959 | SDUM2     | -10122 | 705 |
| 1960 | SDUM3     | -10136 | 560 |
| 1961 | VSSIDUM58 | -10150 | 705 |
| 1962 | VSSIDUM59 | -10164 | 560 |
| 1963 | VGLO      | -10178 | 705 |
| 1964 | VGLO      | -10192 | 560 |
| 1965 | VGLO      | -10206 | 705 |
| 1966 | VGLO      | -10220 | 560 |
| 1967 | VGLO      | -10234 | 705 |
| 1968 | VGLO      | -10248 | 560 |
| 1969 | VGLO      | -10262 | 705 |
| 1970 | VGLO      | -10276 | 560 |
| 1971 | VGLO      | -10290 | 705 |
| 1972 | VGHO      | -10304 | 560 |
| 1973 | VGHO      | -10318 | 705 |
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| 1975 | VGHO      | -10346 | 705 |
| 1976 | VGHO      | -10360 | 560 |
| 1977 | VGHO      | -10374 | 705 |
| 1978 | VGHO      | -10388 | 560 |
| 1979 | VGHO      | -10402 | 705 |
| 1980 | VSSIDUM60 | -10416 | 560 |
| 1981 | VSSIDUM61 | -10430 | 705 |
| 1982 | VSSIDUM62 | -10444 | 560 |
| 1983 | VSSIDUM63 | -10458 | 705 |
| 1984 | VSSIDUM64 | -10472 | 560 |
| 1985 | VSSIDUM65 | -10486 | 705 |
| 1986 | VSSIDUM66 | -10500 | 560 |
| 1987 | VSSIDUM67 | -10514 | 705 |
| 1988 | VSSIDUM68 | -10528 | 560 |
| 1989 | VSSIDUM69 | -10542 | 705 |
| 1990 | VSSIDUM70 | -10556 | 560 |
| 1991 | VSSIDUM71 | -10570 | 705 |
| 1992 | VSSIDUM72 | -10584 | 560 |

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|------|------------|--------|-----|
| 1993 | VSSIDUM73  | -10598 | 705 |
| 1994 | VSSIDUM74  | -10612 | 560 |
| 1995 | VSSIDUM75  | -10626 | 705 |
| 1996 | VSSIDUM76  | -10640 | 560 |
| 1997 | VSSIDUM77  | -10654 | 705 |
| 1998 | VSSIDUM78  | -10668 | 560 |
| 1999 | VSSIDUM79  | -10682 | 705 |
| 2000 | VSSIDUM80  | -10696 | 560 |
| 2001 | VSSIDUM81  | -10710 | 705 |
| 2002 | VSSIDUM82  | -10724 | 560 |
| 2003 | VSSIDUM83  | -10738 | 705 |
| 2004 | VSSIDUM84  | -10752 | 560 |
| 2005 | VSSIDUM85  | -10766 | 705 |
| 2006 | VSSIDUM86  | -10780 | 560 |
| 2007 | VSSIDUM87  | -10794 | 705 |
| 2008 | VSSIDUM88  | -10808 | 560 |
| 2009 | VSSIDUM89  | -10822 | 705 |
| 2010 | VSSIDUM90  | -10836 | 560 |
| 2011 | VSSIDUM91  | -10850 | 705 |
| 2012 | VSSIDUM92  | -10864 | 560 |
| 2013 | VSSIDUM93  | -10878 | 705 |
| 2014 | VSSIDUM94  | -10892 | 560 |
| 2015 | VSSIDUM95  | -10906 | 705 |
| 2016 | VSSIDUM96  | -10920 | 560 |
| 2017 | VSSIDUM97  | -10934 | 705 |
| 2018 | VSSIDUM98  | -10948 | 560 |
| 2019 | VSSIDUM99  | -10962 | 705 |
| 2020 | VSSIDUM100 | -10976 | 560 |
| 2021 | VSSIDUM101 | -10990 | 705 |
| 2022 | VSSIDUM102 | -11004 | 560 |
| 2023 | VSSIDUM103 | -11018 | 705 |
| 2024 | GOUT17     | -11032 | 560 |
| 2025 | GOUT17     | -11046 | 705 |
| 2026 | GOUT18     | -11060 | 560 |
| 2027 | GOUT18     | -11074 | 705 |
| 2028 | GOUT19     | -11088 | 560 |
| 2029 | GOUT19     | -11102 | 705 |
| 2030 | GOUT20     | -11116 | 560 |
| 2031 | GOUT20     | -11130 | 705 |
| 2032 | GOUT21     | -11144 | 560 |
| 2033 | GOUT21     | -11158 | 705 |
| 2034 | GOUT22     | -11172 | 560 |
| 2035 | GOUT22     | -11186 | 705 |
| 2036 | GOUT23     | -11200 | 560 |
| 2037 | GOUT23     | -11214 | 705 |
| 2038 | GOUT24     | -11228 | 560 |
| 2039 | GOUT24     | -11242 | 705 |
| 2040 | GOUT25     | -11256 | 560 |
| 2041 | GOUT25     | -11270 | 705 |
| 2042 | GOUT26     | -11284 | 560 |
| 2043 | GOUT26     | -11298 | 705 |
| 2044 | GOUT27     | -11312 | 560 |
| 2045 | GOUT27     | -11326 | 705 |
| 2046 | GOUT28     | -11340 | 560 |
| 2047 | GOUT28     | -11354 | 705 |
| 2048 | GOUT29     | -11368 | 560 |
| 2049 | GOUT29     | -11382 | 705 |

|      |            |        |     |
|------|------------|--------|-----|
| 2050 | GOUT30     | -11396 | 560 |
| 2051 | GOUT30     | -11410 | 705 |
| 2052 | VGLO       | -11424 | 560 |
| 2053 | VGLO       | -11438 | 705 |
| 2054 | VGLO       | -11452 | 560 |
| 2055 | VRGH       | -11466 | 705 |
| 2056 | VRGH       | -11480 | 560 |
| 2057 | VRGH       | -11494 | 705 |
| 2058 | LVGL       | -11508 | 560 |
| 2059 | LVGL       | -11522 | 705 |
| 2060 | LVGL       | -11536 | 560 |
| 2061 | GOUT31     | -11550 | 705 |
| 2062 | GOUT31     | -11564 | 560 |
| 2063 | GOUT32     | -11578 | 705 |
| 2064 | GOUT32     | -11592 | 560 |
| 2065 | VGLO       | -11606 | 705 |
| 2066 | VGLO       | -11620 | 560 |
| 2067 | VGLO       | -11634 | 705 |
| 2068 | VGHO       | -11648 | 560 |
| 2069 | VGHO       | -11662 | 705 |
| 2070 | VGHO       | -11676 | 560 |
| 2071 | PADA4      | -11690 | 705 |
| 2072 | PADB4      | -11704 | 560 |
| 2073 | VSSIDUM104 | -11718 | 705 |
| 2074 | VSSIDUM105 | -11732 | 560 |
| 2075 | VSSIDUM106 | -11760 | 705 |

|                 |        |       |
|-----------------|--------|-------|
| Alighmark LEFT  | -11870 | 687.5 |
| Alignmark RIGHT | 11870  | 687.5 |

## 6. Block Function Description

### Interface

The RM68180 incorporates command method 24-/16-/8-bits bus display command interface. WDR stores data to be written into GRAM or parameters temporarily while RDR stores data read out from GRAM temporarily. When data is written from microcomputer to GRAM, the RM68180 writes firstly to WDR, and then the data is written to GRAM automatically by internal operation. Because read out operation from GRAM is conducted through RDR, first read out data is invalid. Normal data is read out from 2nd read out data.

### Address Counter (AC)

Address counter (AC) gives address to GRAM. When command setting address is written to CR, the data is transferred from CR to AC.

When data is written to GRAM, address counter (AC) increments by +1 or -1 automatically. AC after data is read out increments by +1 or -1 likewise. The RM68180 writes data to only rectangular area that was specified by GRAM.

### Graphic RAM (GRAM)

The graphic RAM (GRAM) stores 1,244,160 bytes pattern data using 24 bits for one pixel, enabling maximum 480RGB x 864 dot graphic display.

### Grayscale Voltage Generating Circuit

Grayscale voltage generating circuit generates an TFT-LCD drive voltage, which corresponds to grayscale level set in the  $\gamma$  correction register. The RM68180 displays 16.7M colors at the maximum.

### Power Supply Circuit

The power supply circuit generates supply voltages to TFT-LCD panel, VREG1OUT, VGH, and VGL.

### Timing Generating

The timing generator generates timing signals for internal circuits such as the internal GRAM. The timing for display operation such as RAM read operation and the timing for internal operation such as RAM access by MPU is outputted separately so that they do not interfere with each other.

### Oscillator

The RM68180 incorporates RC oscillator circuit. The frame frequency is changeable by command settings.

**Panel Driver Circuit**

The TFT-LCD display driver circuit consists of 1440 source drivers (S1~S1440). Display pattern data is latched when 1440 data is input. This latched data controls source drivers and outputs drive waveform. The shift direction of 1440-dot output from the source driver can be changed by setting commands. The gate signal consists from GOUT1 to GOUT32 and outputs either VGHR or VGLR level.

CONFIDENTIAL Demo

## 7. Function Description

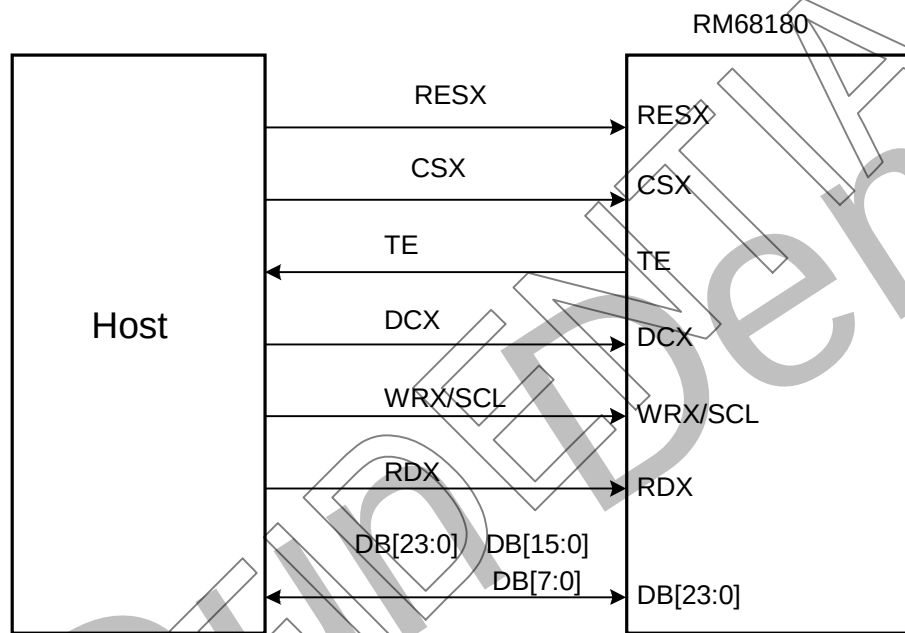
### 7.1 Interface Type Selection

The selection of a given interfaces are done by setting IM3, IM2, IM1 and IM0 pins as show below.

| IM[3:0] | Display Data                       | Command                                                                          |
|---------|------------------------------------|----------------------------------------------------------------------------------|
| 0000    | 80-series 8-bit MPU I/F, D[7:0]    | 80-series 8-bit MPU I/F, D[7:0]                                                  |
| 0001    | 80-series 16-bit MPU I/F, D[15:0]  | 80-series 16-bit MPU I/F, D[15:0]                                                |
| 0010    | 80-series 24-bit MPU I/F, D[23:0]  | 80-series 24-bit MPU I/F, D[23:0]                                                |
| 1001    | RGB I/F, D[23:0]                   | 8-bit SPI, SDI/SDO                                                               |
| 1010    | RGB I/F, D[23:0]                   | 9-bit SPI, SDI/SDO                                                               |
| 0011    | RGB I/F, D[23:0]                   | 16-bit SPI (SCL rising edge trigger), SDI/SDO                                    |
| 1011    | RGB I/F, D[23:0]                   | 16-bit SPI (SCL falling edge trigger), SDI/SDO                                   |
| 0100    | RGB I/F, D[23:0]                   | I2C I/F, I2C_SDA                                                                 |
| 0101    | MIPI DSI, HSSI_D0_P/N, HSSI_D1_P/N | MIPI DSI, HSSI_D0_P/N, HSSI_D1_P/N                                               |
| 0110    | MDDI, HSSI_D0_P/N, HSSI_D1_P/N     | MDDI, HSSI_D0_P/N, HSSI_D1_P/N<br>16-bit SPI (SCL rising edge trigger), SDI/SDO  |
| 1110    | MDDI, HSSI_D0_P/N, HSSI_D1_P/N     | MDDI, HSSI_D0_P/N, HSSI_D1_P/N<br>16-bit SPI (SCL falling edge trigger), SDI/SDO |
| 0111    | MDDI, HSSI_D0_P/N, HSSI_D1_P/N     | MDDI, HSSI_D0_P/N, HSSI_D1_P/N<br>I2C I/F, I2C_SDA serial data                   |

## 7.2 Display Bus Interface (DBI)

The RM68180 uses a 28-wires 24-bit parallel interface. The chip-select CSX (active low) enables and disables the DBI interface. RESX (active low) is an external reset signal. WRX is the data write, RDX is the data read and DB[23:0] is parallel DBI data. There are three 24/16/8-bit types interface supported for the display data transfer. The graphics controller chip reads the data at the rising edge of RDX signal. The DCX is data/command flag. When DCX = "1", D23 to D0 bits are display RAM data or command parameters. When DCX = "0", D7 to D0 bits are commands.

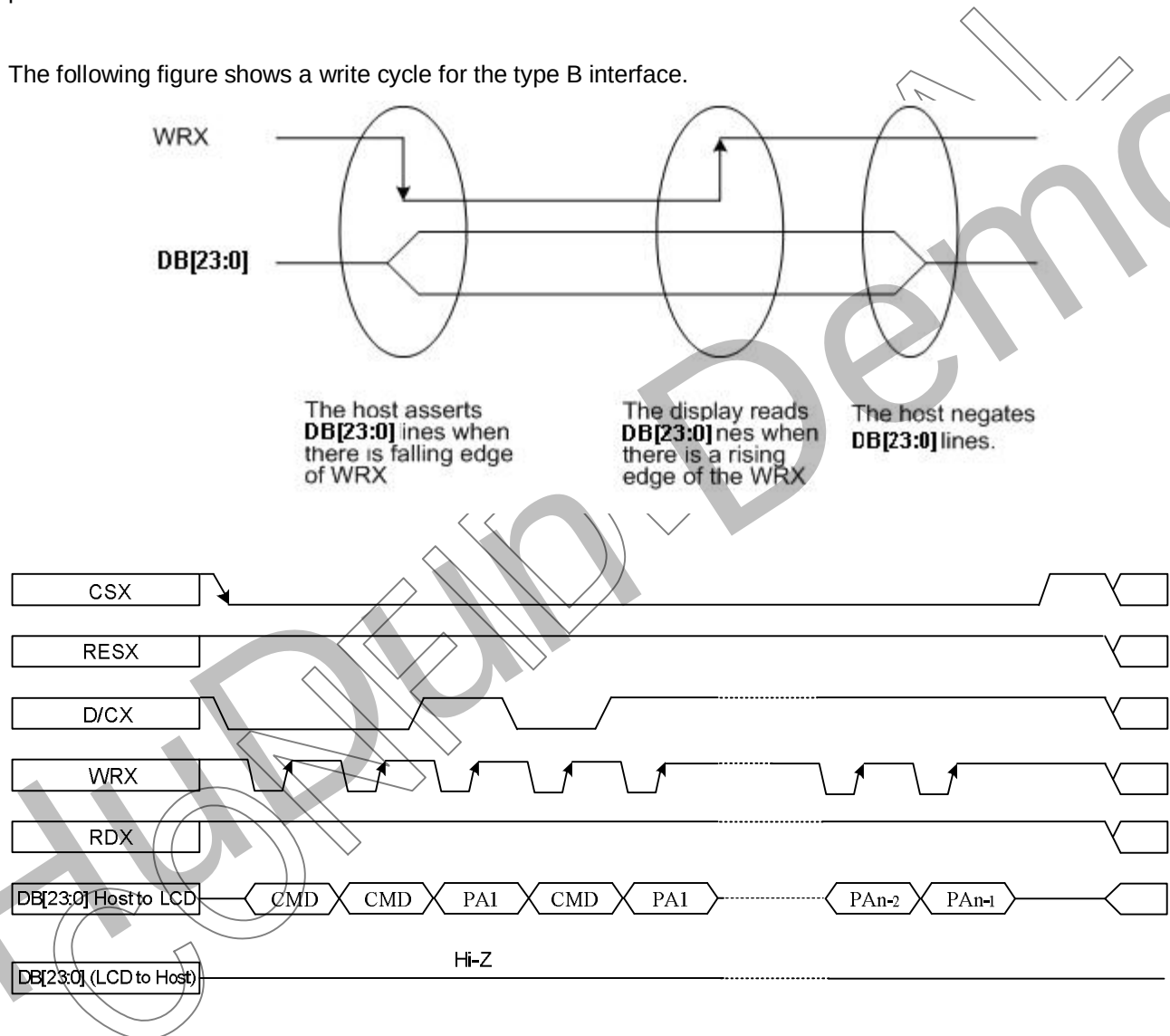




### 7.2.1 Write Cycle

During a write cycle the host processor sends data to the display module via the interface. The Type B interface utilizes DCX, RDX and WRX signals as well as all information signals (DB[23:0]). WRX is driven from high to low then pulled back to high during the write cycle. The host processor provides information during the write cycle while the display module reads the host processor information on the rising edge of WRX. DCX is driven low while command information is on the interface and is pulled high when data is present.

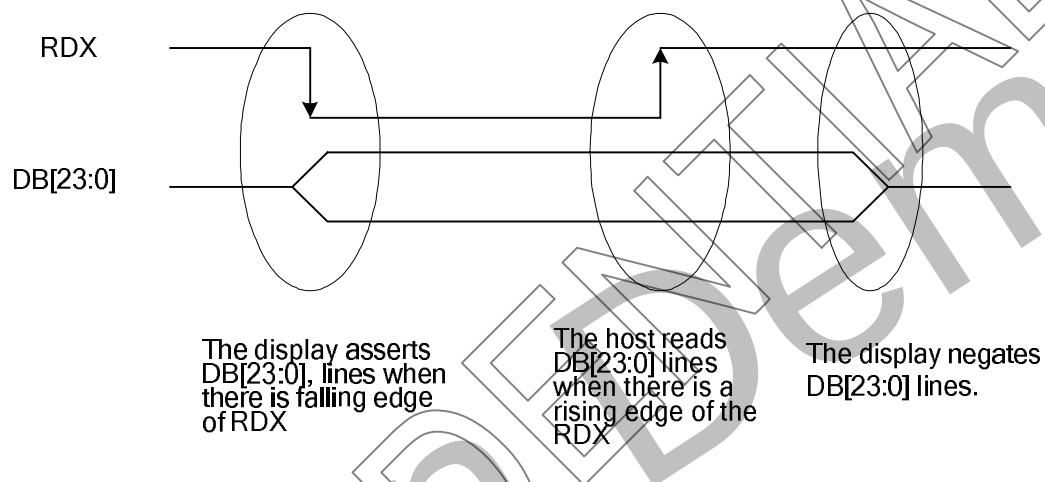
The following figure shows a write cycle for the type B interface.



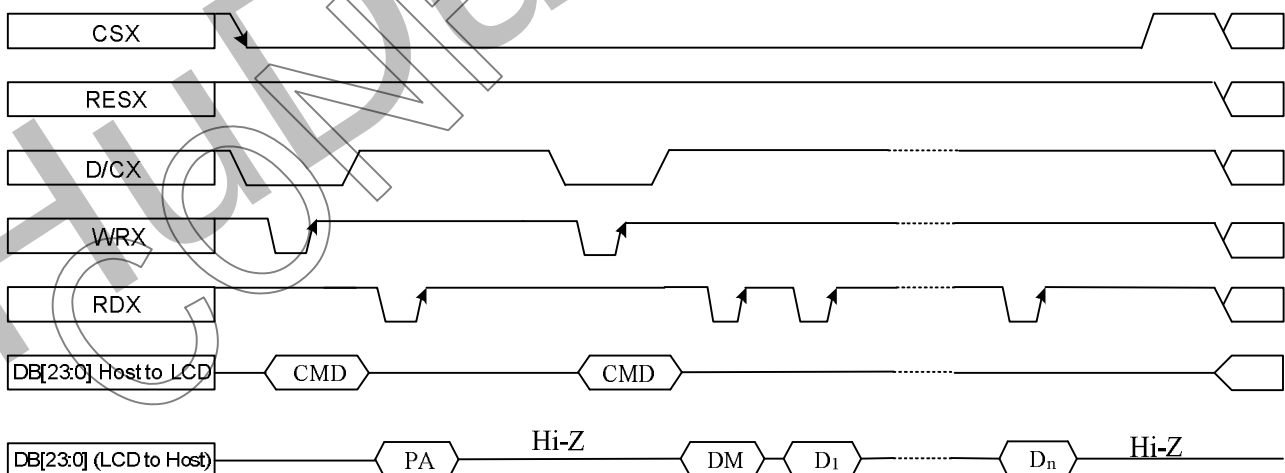
### 7.2.2 Read Cycle

During a read cycle the host processor reads data from the display module via the interface. The Type B interface utilizes DCX, RDX and WRX signals as well as all information signals (D[23:0]). RDX is driven from high to low then allowed to be pulled back to high during the read cycle. The display module provides information to the host processor during the read cycle while the host processor reads the display module information on the rising edge of RDX. DCX is driven high during the read cycle.

The following figure shows the read cycle for the type B interface.



Note: RDX is an unsynchronized signal (It can be stopped).



Note: Read Data is only valid when the DCX input is pulled high. If DCX is driven low during read then the display information outputs will be High-Z.

## DBI Type B Interface

24-bit data bus DB[23:0] interface, IM[3:0] = 0010

IFPF[3:0]: command\_3A[3:0]

|               | IFPF | DB 23 | DB 22 | DB 21 | DB 20 | DB 19 | DB 18 | DB 17 | DB 16 | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | Register |
|---------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|----------|
| Command Write | *    |       |       |       |       |       |       |       |       | 0     | 1     | 0     | 0     | 1     | 1     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 2C00     |

|              | IFPF | DB 23 | DB 22 | DB 21 | DB 20 | DB 19 | DB 18 | DB 17 | DB 16 | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | color |
|--------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|-------|
| Memory Write | 5    |       |       |       |       |       |       |       |       | R[4]  | R[3]  | R[2]  | R[1]  | R[0]  | G[5]  | G[4] | G[3] | G[2] | G[1] | G[0] | B[4] | B[3] | B[2] | B[1] | B[0] | 65K   |
|              | 6    |       |       |       |       |       |       | R[5]  | R[4]  | R[3]  | R[2]  | R[1]  | R[0]  | G[5]  | G[4]  | G[3] | G[2] | G[1] | G[0] | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] | 262K  |
|              | 7    | R[7]  | R[6]  | R[5]  | R[4]  | R[3]  | R[2]  | R[1]  | R[0]  | G[7]  | G[6]  | G[5]  | G[4]  | G[3]  | G[2]  | G[1] | G[0] | B[7] | B[6] | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] | 16.7M |

The read data for RGB is 24 bit output as below.

|              | IFPF | DB 23 | DB 22 | DB 21 | DB 20 | DB 19 | DB 18 | DB 17 | DB 16 | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | Register |
|--------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|----------|
| Command Read | *    |       |       |       |       |       |       |       |       | 0     | 1     | 0     | 0     | 1     | 1     | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 2E00     |

|             | DB 23 | DB 22 | DB 21 | DB 20 | DB 19 | DB 18 | DB 17 | DB 16 | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | color |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|-------|
| Memory Read | R[7]  | R[6]  | R[5]  | R[4]  | R[3]  | R[2]  | R[1]  | R[0]  | G[7]  | G[6]  | G[5]  | G[4]  | G[3]  | G[2]  | G[1] | G[0] | B[7] | B[6] | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] | 16.7M |

16-bit data bus DB[15:0] interface, IM[3:0] = 0001

|               | IFPF | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | Register |
|---------------|------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|----------|
| Command Write | *    | 0     | 1     | 0     | 0     | 1     | 1     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 2C00     |

|              | IFPF | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | color |
|--------------|------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|-------|
| Memory Write | 5    | R[4]  | R[3]  | R[2]  | R[1]  | R[0]  | G[5]  | G[4] | G[3] | G[2] | G[1] | G[0] | B[4] | B[3] | B[2] | B[1] | B[0] | 65K   |
|              |      | R[5]  | R[4]  | R[3]  | R[2]  | R[1]  | R[0]  | X    | X    | G[5] | G[4] | G[3] | G[2] | G[1] | G[0] | X    | X    | 262K  |
|              | 6    | B[5]  | B[4]  | B[3]  | B[2]  | B[1]  | B[0]  | X    | X    | R[5] | R[4] | R[3] | R[2] | R[1] | R[0] | X    | X    |       |
|              |      | G[5]  | G[4]  | G[3]  | G[2]  | G[1]  | G[0]  | X    | X    | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] | X    | X    |       |
|              | 7    | R[7]  | R[6]  | R[5]  | R[4]  | R[3]  | R[2]  | R[1] | R[0] | G[7] | G[6] | G[5] | G[4] | G[3] | G[2] | G[1] | G[0] | 16.7M |
|              |      | B[7]  | B[6]  | B[5]  | B[4]  | B[3]  | B[2]  | B[1] | B[0] | R[7] | R[6] | R[5] | R[4] | R[3] | R[2] | R[1] | R[0] |       |
|              |      | G[7]  | G[6]  | G[5]  | G[4]  | G[3]  | G[2]  | G[1] | G[0] | B[7] | B[6] | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] |       |

The read data for RGB is 16 bit output as below.

|              | IFPF | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | Register |
|--------------|------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|----------|
| Command Read | *    | 0     | 1     | 0     | 0     | 1     | 1     | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 2E00     |

|             | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 9 | DB 8 | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | color |
|-------------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|-------|
| Memory Read | R[7]  | R[6]  | R[5]  | R[4]  | R[3]  | R[2]  | R[1] | R[0] | G[7] | G[6] | G[5] | G[4] | G[3] | G[2] | G[1] | G[0] | 16.7M |
|             | B[7]  | B[6]  | B[5]  | B[4]  | B[3]  | B[2]  | B[1] | B[0] |      |      |      |      |      |      |      |      |       |

8-bit data bus DB[7:0] interface, IM[3:0] = 0000

|               | IFPF | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | Register |
|---------------|------|------|------|------|------|------|------|------|------|----------|
| Command Write | *    | 0    | 1    | 0    | 0    | 1    | 1    | 0    | 0    | 2C       |
| Command Write | *    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 00       |

|              | IFPF | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | color |
|--------------|------|------|------|------|------|------|------|------|------|-------|
| Memory Write | 5    | R[4] | R[3] | R[2] | R[1] | R[0] | G[5] | G[4] | G[3] | 65K   |
|              |      | G[2] | G[1] | G[0] | B[4] | B[3] | B[2] | B[1] | B[0] |       |
|              | 6    | R[5] | R[4] | R[3] | R[2] | R[1] | R[0] | X    | X    | 262K  |
|              |      | G[5] | G[4] | G[3] | G[2] | G[1] | G[0] | X    | X    |       |
|              |      | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] | X    | X    |       |
|              | 7    | R[7] | R[6] | R[5] | R[4] | R[3] | R[2] | R[1] | R[0] | 16.7M |
|              |      | G[7] | G[6] | G[5] | G[4] | G[3] | G[2] | G[1] | G[0] |       |
|              |      | B[7] | B[6] | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] |       |

The read data for RGB is 8 bit output as below.

|              | IFPF | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | Register |
|--------------|------|------|------|------|------|------|------|------|------|----------|
| Command Read | *    | 0    | 1    | 0    | 0    | 1    | 1    | 1    | 0    | 2E       |
| Command Read | *    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 00       |

|             | DB 7 | DB 6 | DB 5 | DB 4 | DB 3 | DB 2 | DB 1 | DB 0 | color |
|-------------|------|------|------|------|------|------|------|------|-------|
| Memory Read | R[7] | R[6] | R[5] | R[4] | R[3] | R[2] | R[1] | R[0] | 16.7M |
|             | G[7] | G[6] | G[5] | G[4] | G[3] | G[2] | G[1] | G[0] |       |
|             | B[7] | B[6] | B[5] | B[4] | B[3] | B[2] | B[1] | B[0] |       |

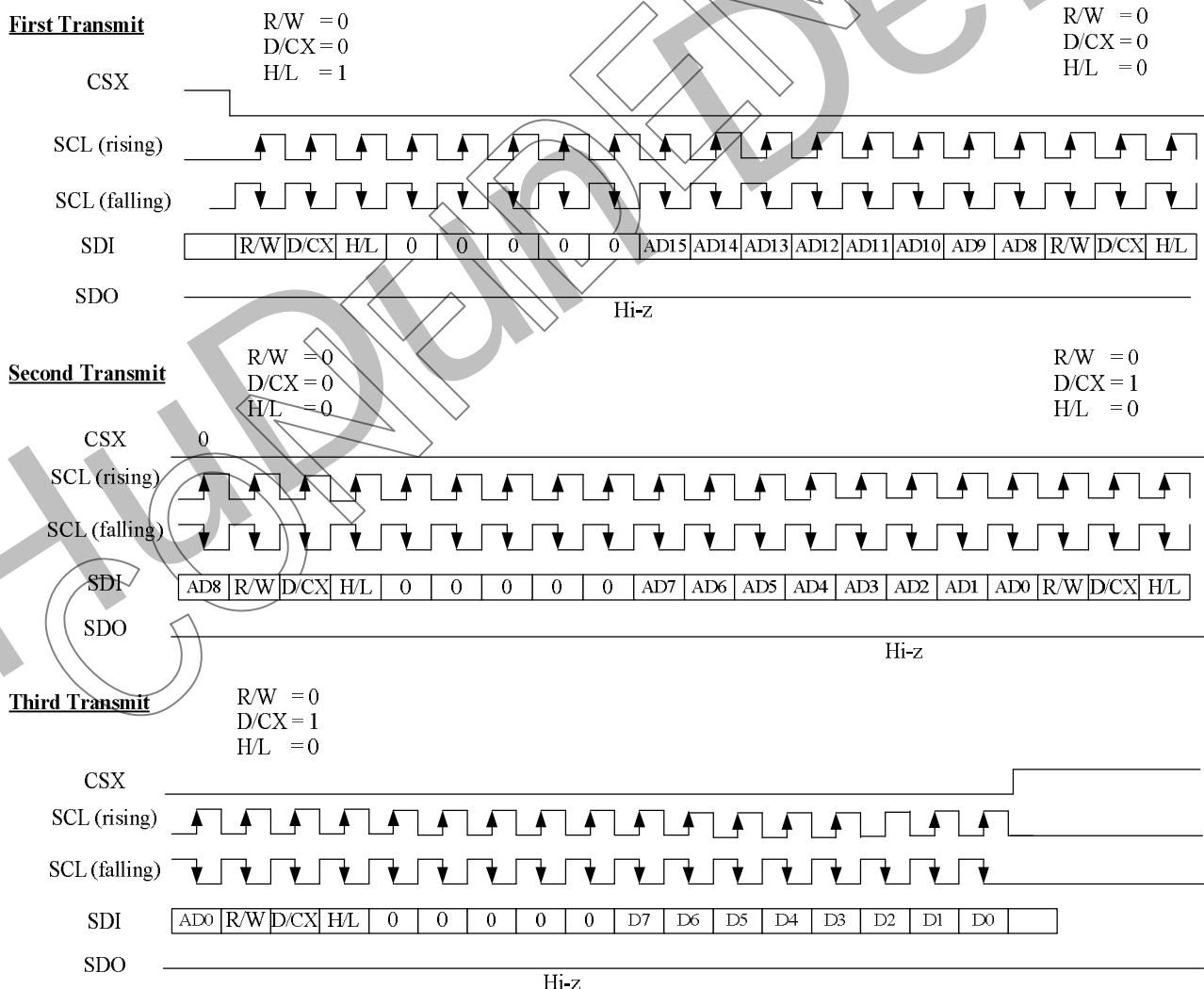
## 7.3 Serial Interface

### 7.3.1 Write Cycle and Sequence

During a write cycle the host processor sends a single bit of data to the display module via the interface. The SPI interface utilizes CSX, SCL and SDI and SDO signals. SCL is driven from high to low then pulled back to high during the write cycle. The host processor provides information during the write cycle while the display module reads the host processor information on the rising edge of SCL.

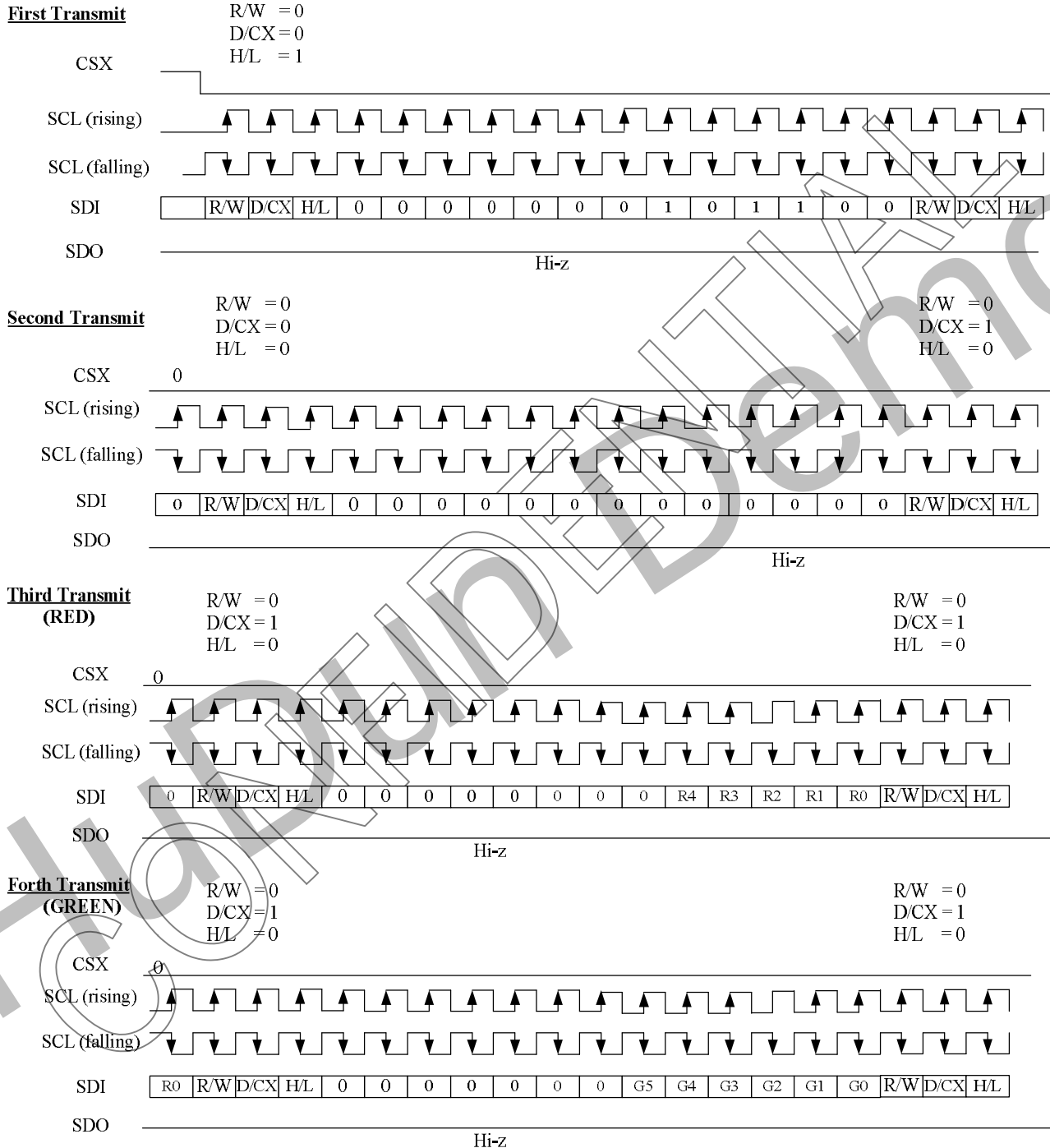
During the write sequence the host processor writes one or more bytes of information to the display module via the interface. The write sequence is initiated when CSX is driven from high to low and ends when CSX is pulled high. Each byte is either nine or sixteen write cycles in length. If the optional DCX signal is used a byte is eight write cycles long. DCX is driven low while command information is on the interface and is pulled high when data is present.

The SPI interface write command sequences are described in the following figure.



The SPI interface write data sequences are described in the following figure.

SRAM write: 65K colors, RGB 5-6-5 pixel data input (parameter of command 3A00h is 0x0005)

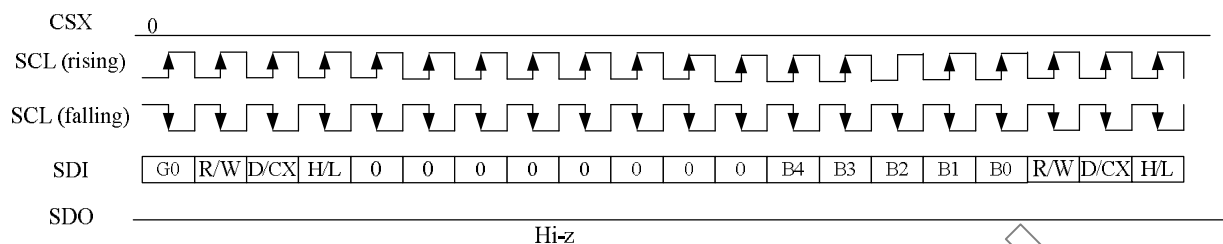




## Fifth Transmit (BLUE)

R/W = 0  
D/CX = 1  
H/L = 0

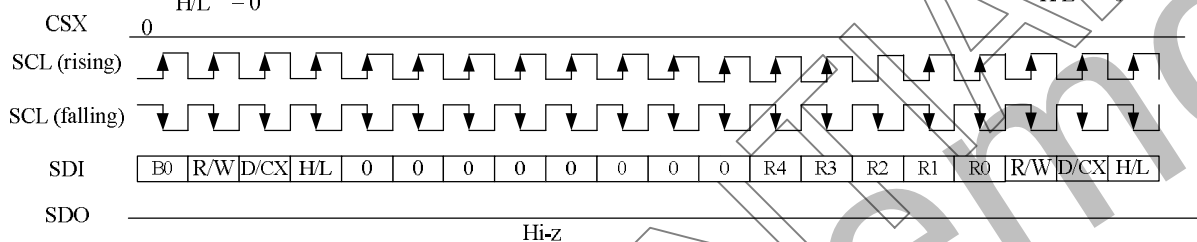
R/W = 0  
D/CX = 1  
H/L = 0



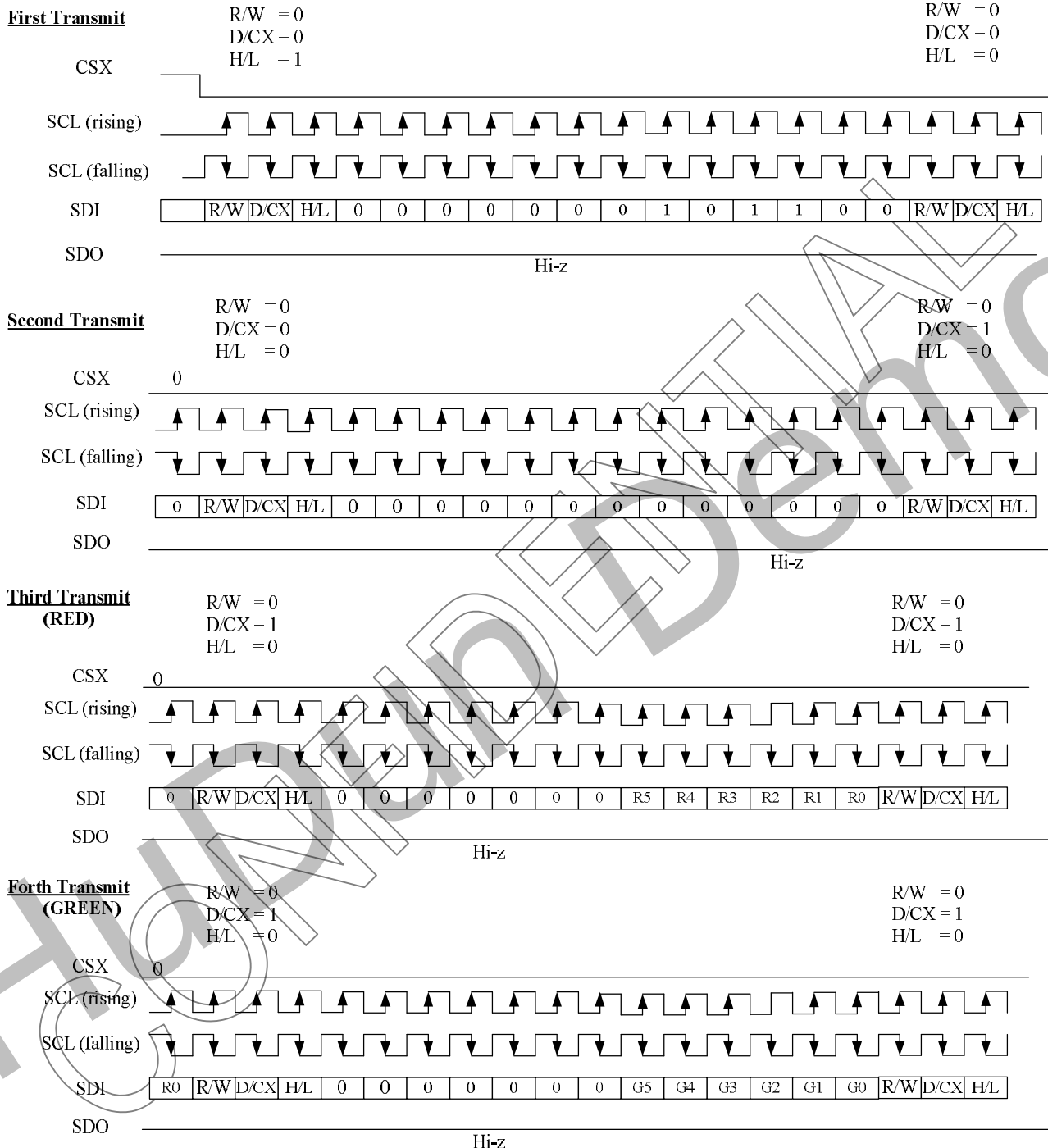
## Sixth Transmit (RED)

R/W = 0  
D/CX = 1  
H/L = 0

R/W = 0  
D/CX = 1  
H/L = 0



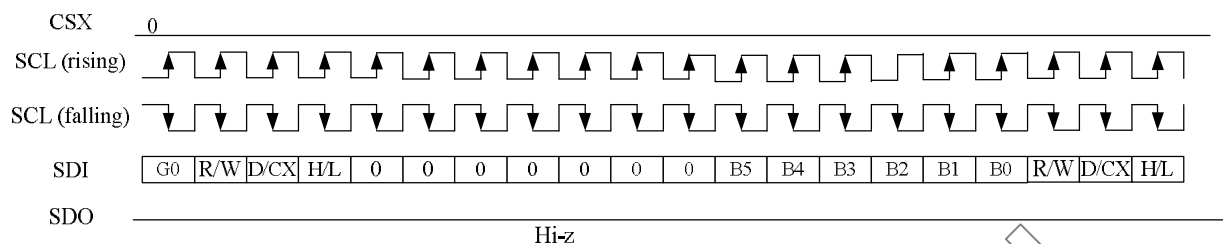
SRAM write: 262K colors, RGB 6-6-6 pixel data input (parameter of command 3A00h is 0x0006)



## Fifth Transmit (BLUE)

R/W = 0  
D/CX = 1  
H/L = 0

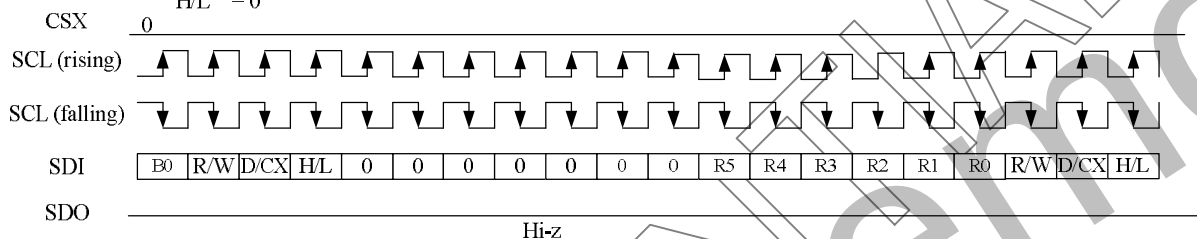
R/W = 0  
D/CX = 1  
H/L = 0



## Sixth Transmit (RED)

R/W = 0  
D/CX = 1  
H/L = 0

R/W = 0  
D/CX = 1  
H/L = 0

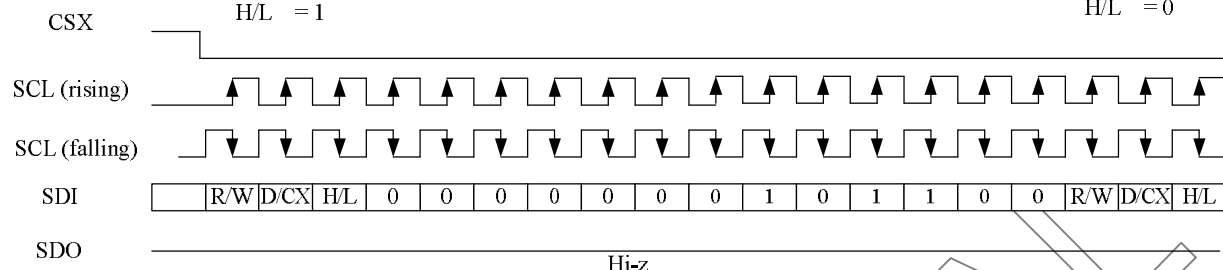


SRAM write: 16.7K colors, RGB 8-8-8 pixel data input (parameter of command 3A00h is 0x0007)

## First Transmit

R/W = 0  
D/CX = 0  
H/L = 1

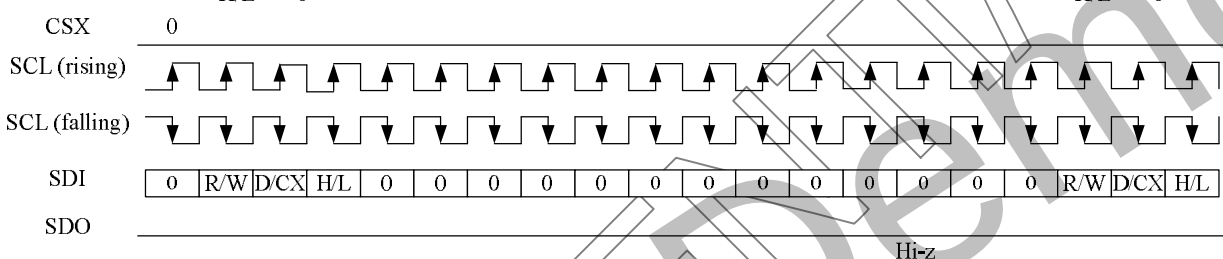
R/W = 0  
D/CX = 0  
H/L = 0



## Second Transmit

R/W = 0  
D/CX = 0  
H/L = 0

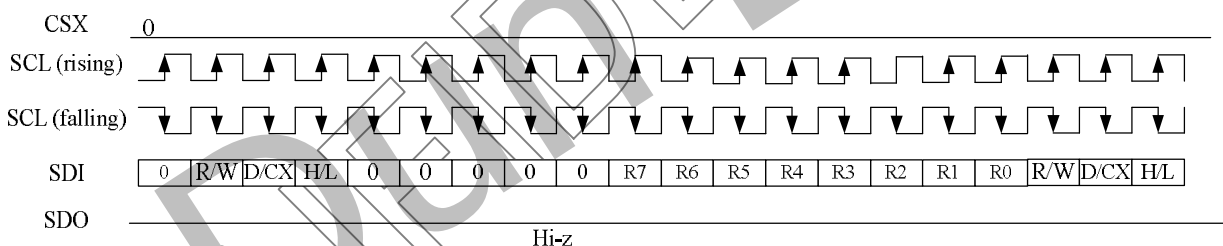
R/W = 0  
D/CX = 1  
H/L = 0



## Third Transmit (RED)

R/W = 0  
D/CX = 1  
H/L = 0

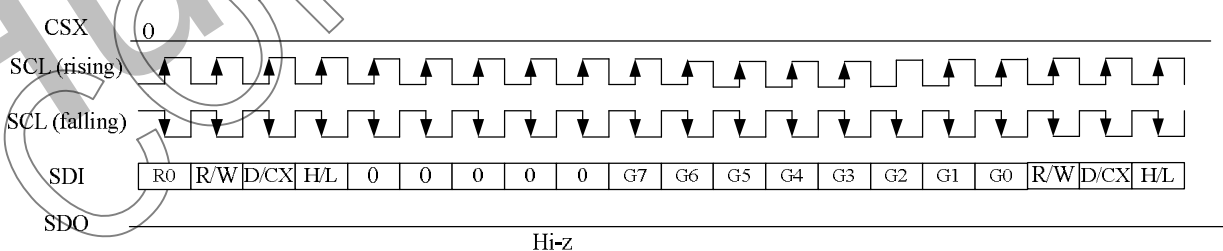
R/W = 0  
D/CX = 1  
H/L = 0



## Forth Transmit (GREEN)

R/W = 0  
D/CX = 1  
H/L = 0

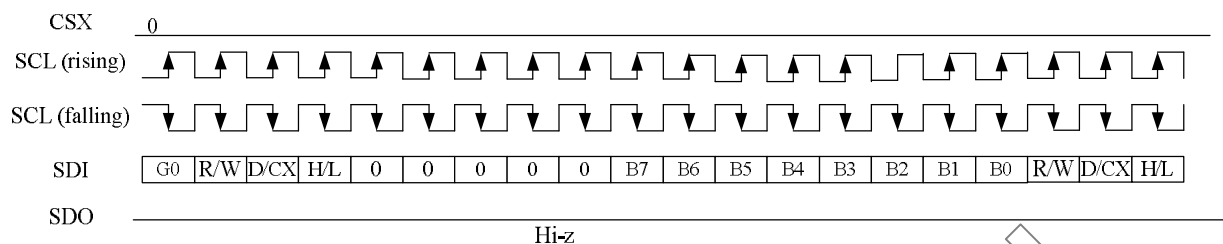
R/W = 0  
D/CX = 1  
H/L = 0



**Fifth Transmit  
(BLUE)**

R/W = 0  
D/CX = 1  
H/L = 0

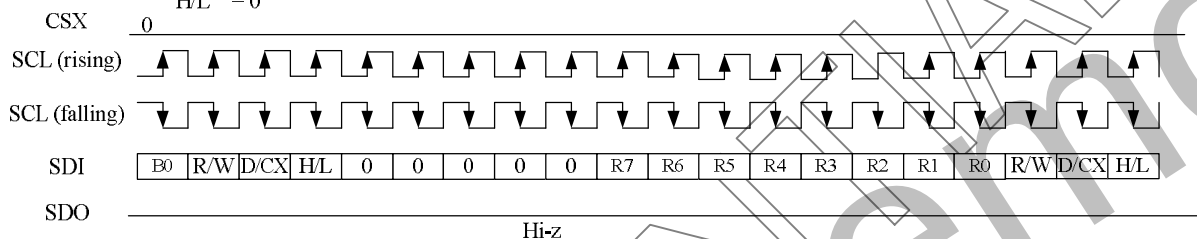
R/W = 0  
D/CX = 1  
H/L = 0



**Sixth Transmit  
(RED)**

R/W = 0  
D/CX = 1  
H/L = 0

R/W = 0  
D/CX = 1  
H/L = 0

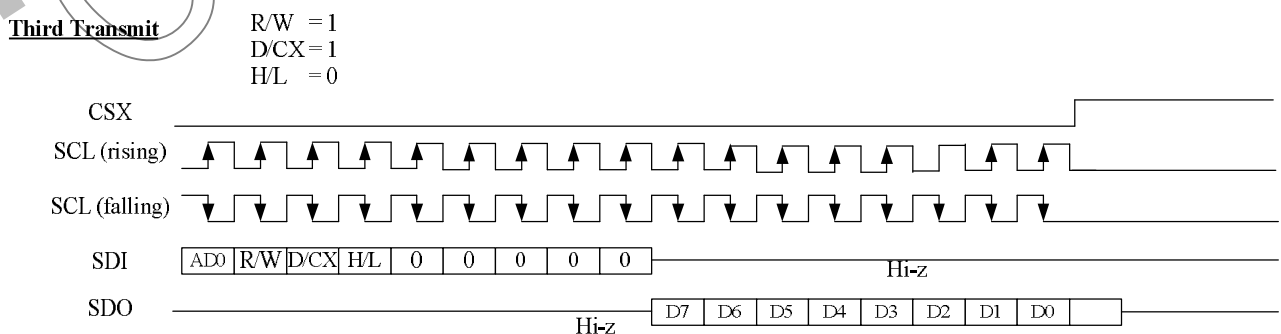
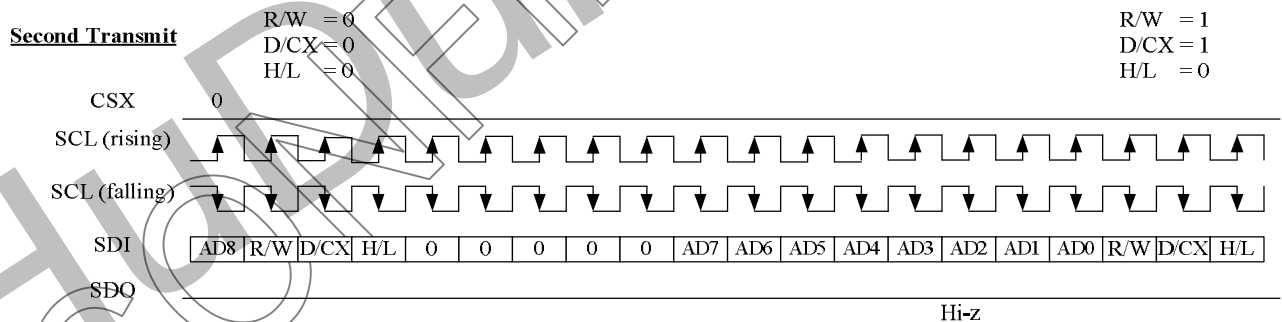
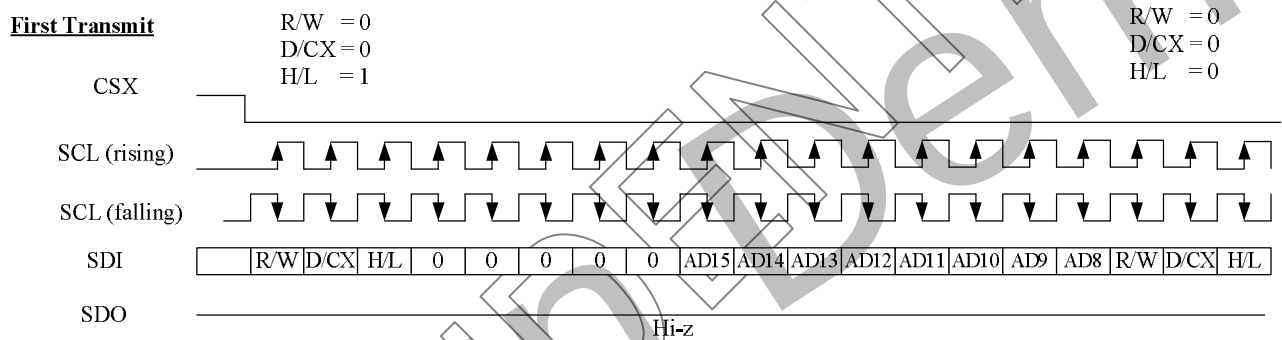


### 7.3.2 Read Cycle and Sequence

During a read cycle the host processor reads a single bit of data from the display module via the interface. The SPI interface utilizes CSX, SCL and DIN signals. SCL is driven from high to low then pulled back to high during the read cycle. The display module provides information during the read cycle while the host processor reads the display module information on the rising edge of SCL.

During the read sequence the host processor reads one or more bytes of information from the display module via the interface. The read sequence is initiated when CSX is driven from high to low and ends when CSX is pulled high. Each byte is either nine or sixteen write cycles in length. If the optional DCX signal is used a byte is eight read cycles long. DCX is driven low while command information is on the interface and is pulled high when data is present.

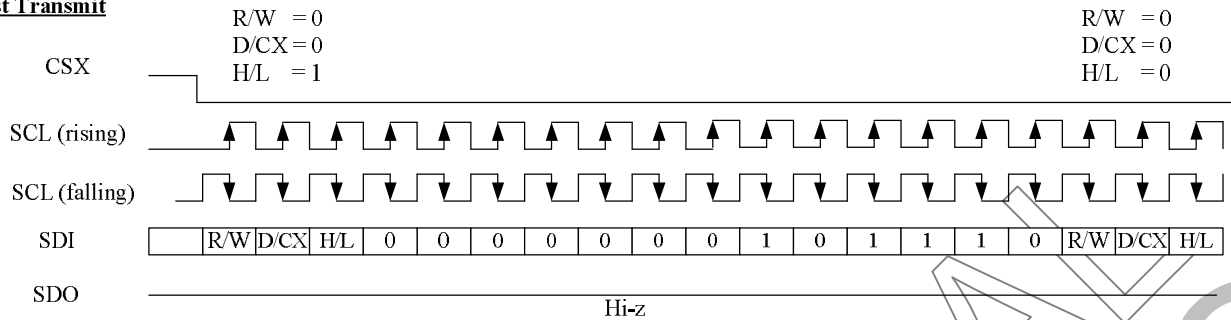
The SPI interface read command sequences are described in the following figure.



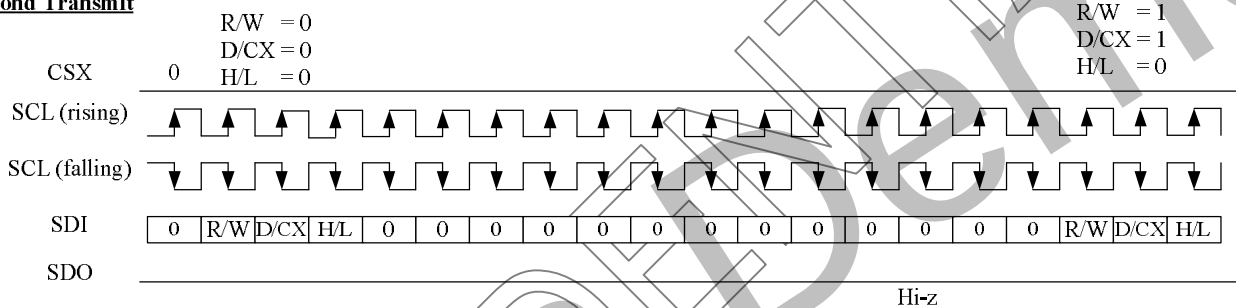
The SPI interface read data sequences are described in the following figure.

SRAM read: 65K colors, RGB 5-6-5 pixel data input (parameter of command 3A00h is 0x0005)

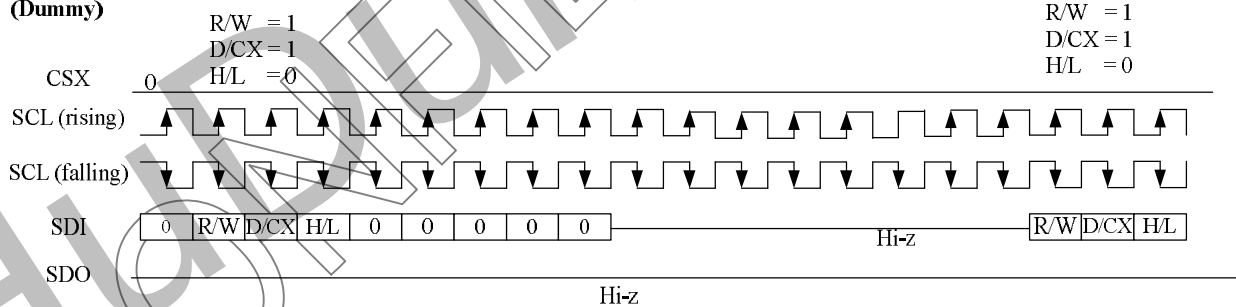
### First Transmit



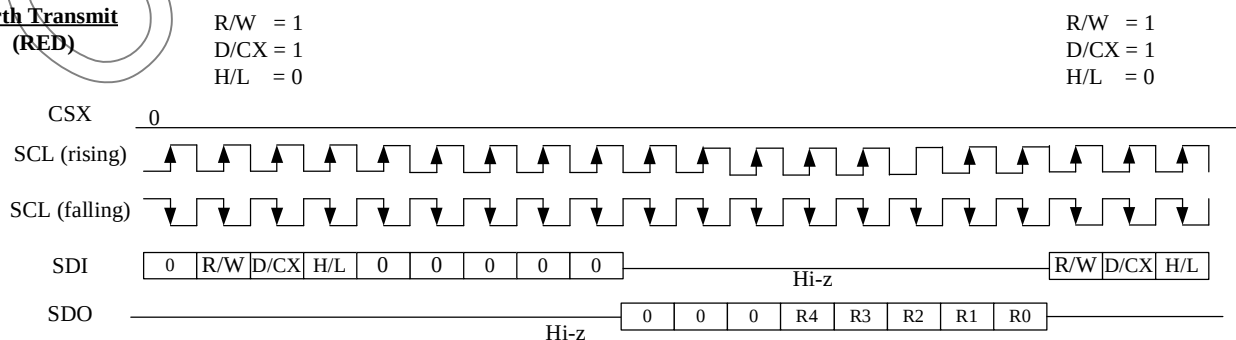
### Second Transmit



### Third Transmit (Dummy)



### Fourth Transmit (RED)

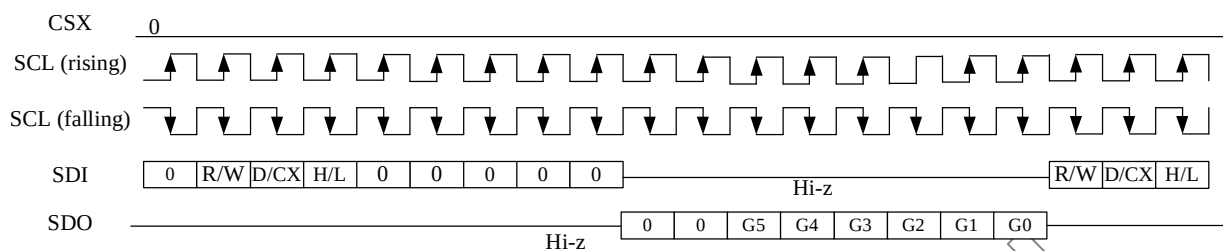




## Fifth Transmit (GREEN)

R/W = 1  
D/CX = 1  
H/L = 0

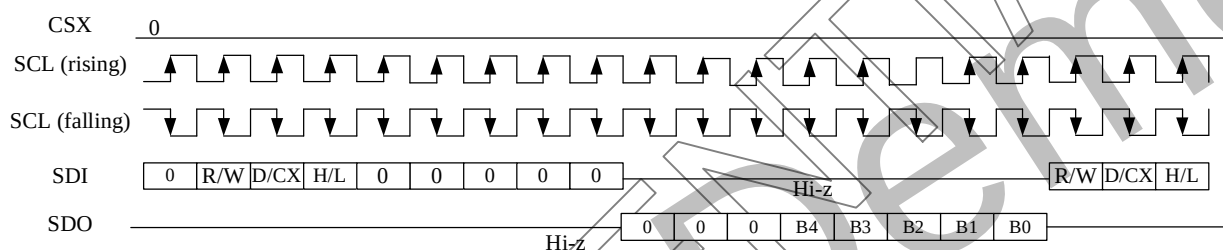
R/W = 1  
D/CX = 1  
H/L = 0



## Sixth Transmit (BLUE)

R/W = 1  
D/CX = 1  
H/L = 0

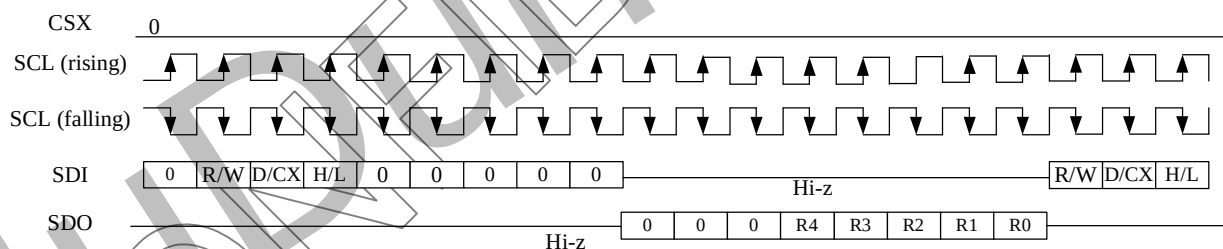
R/W = 1  
D/CX = 1  
H/L = 0



## Seventh Transmit (RED)

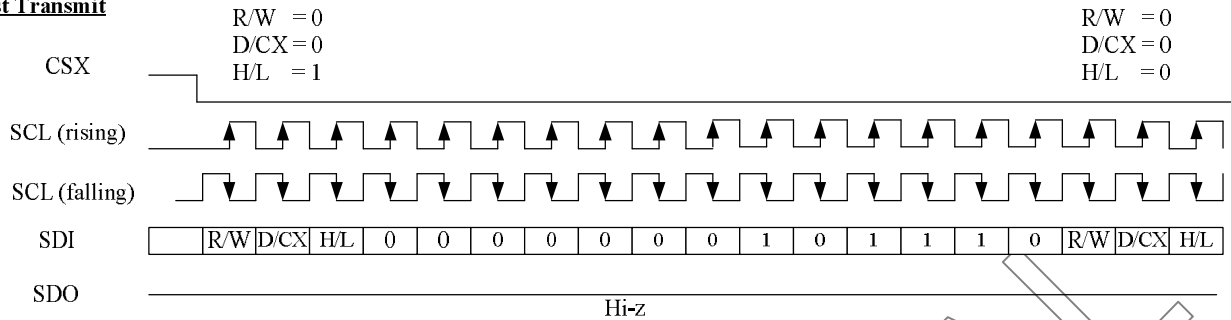
R/W = 1  
D/CX = 1  
H/L = 0

R/W = 1  
D/CX = 1  
H/L = 0

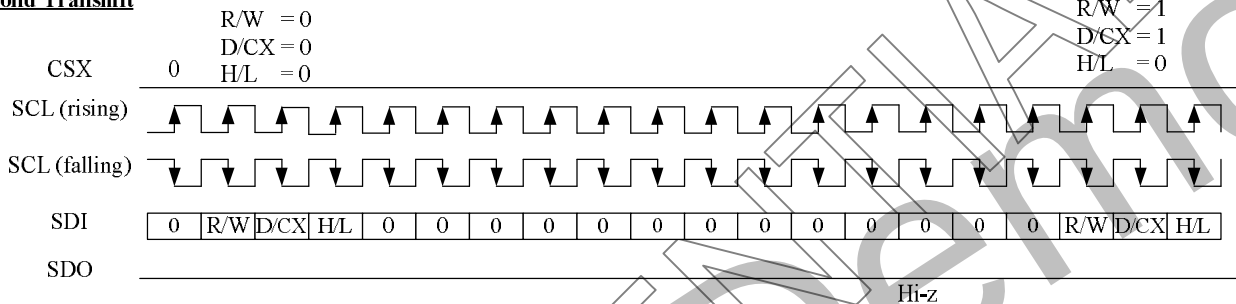


SRAM read: 262K colors, RGB 6-6-6 pixel data input (parameter of command 3A00h is 0x0006)

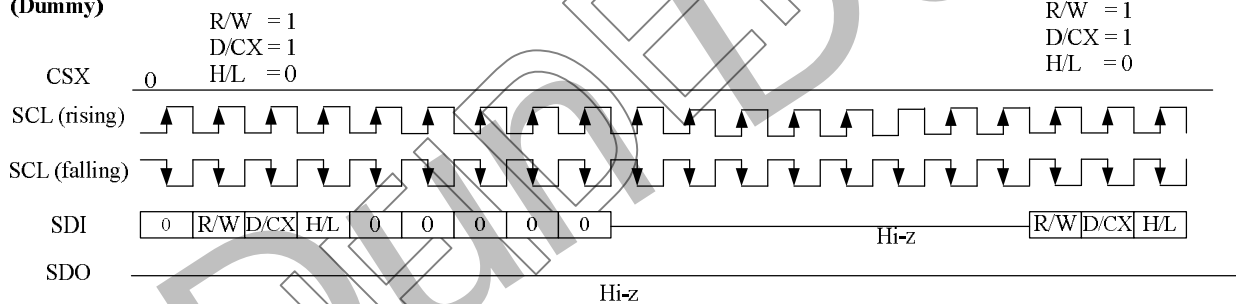
### First Transmit



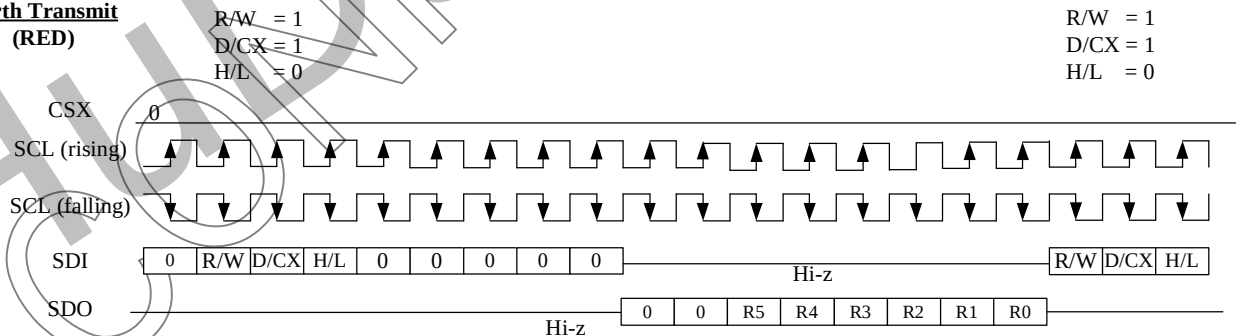
### Second Transmit



### Third Transmit (Dummy)



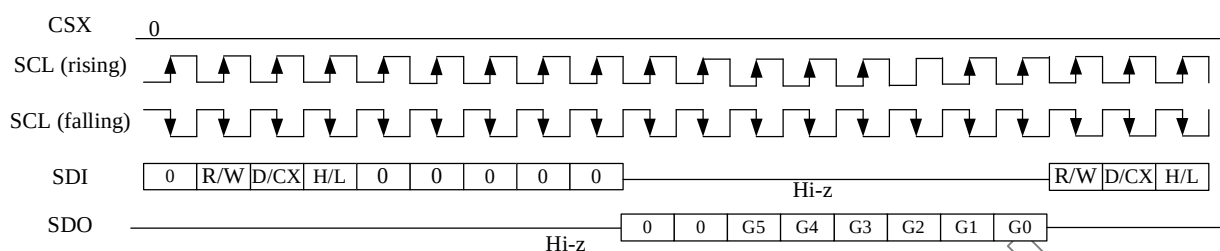
### Forth Transmit (RED)



## Fifth Transmit (GREEN)

R/W = 1  
D/CX = 1  
H/L = 0

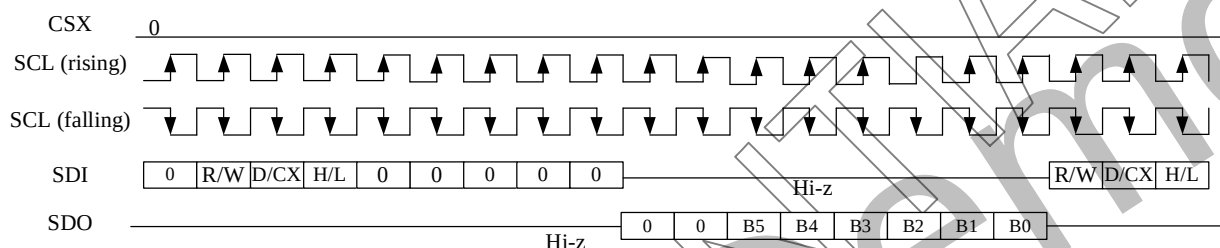
R/W = 1  
D/CX = 1  
H/L = 0



## Sixth Transmit (BLUE)

R/W = 1  
D/CX = 1  
H/L = 0

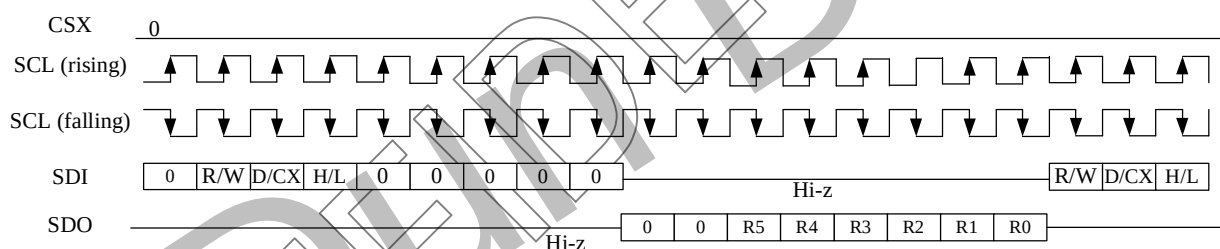
R/W = 1  
D/CX = 1  
H/L = 0



## Seventh Transmit (RED)

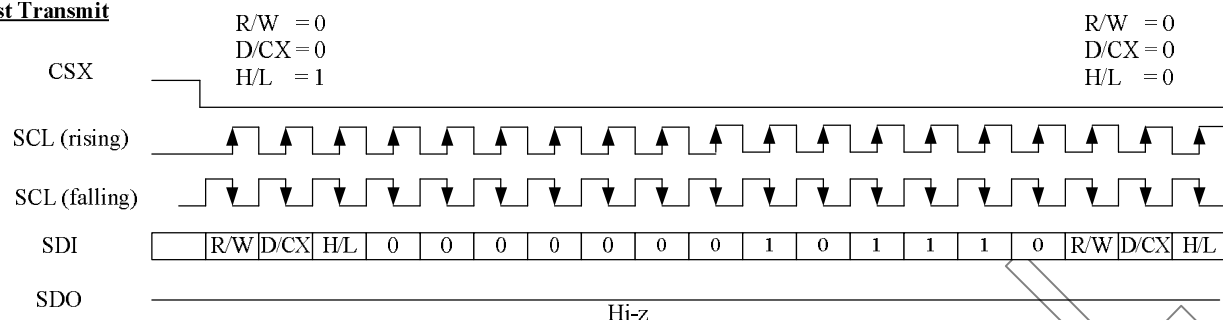
R/W = 1  
D/CX = 1  
H/L = 0

R/W = 1  
D/CX = 1  
H/L = 0

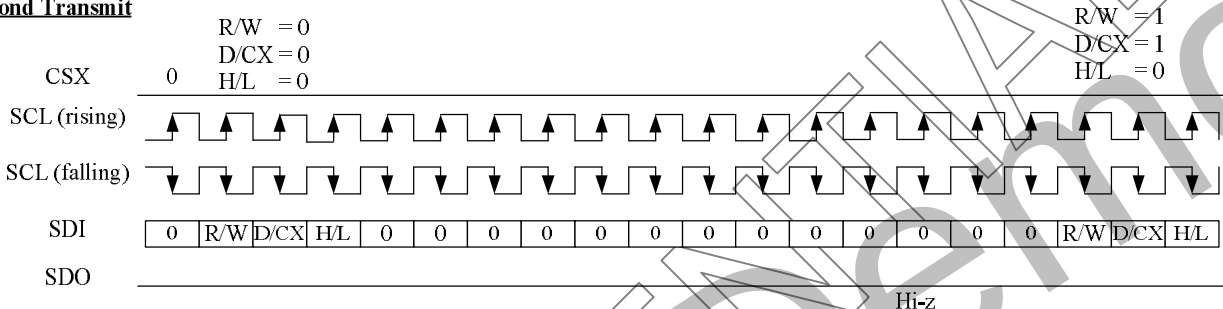


SRAM read: 16.7M colors, RGB 8-8-8 pixel data input (parameter of command 3A00h is 0x0007)

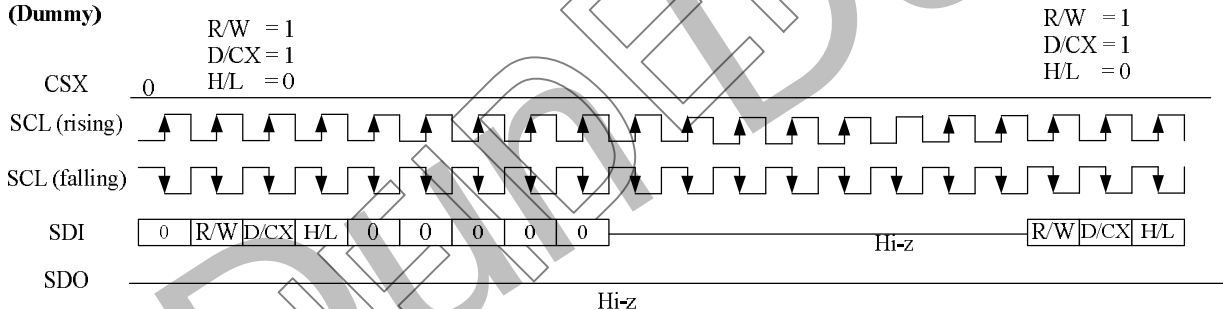
## First Transmit



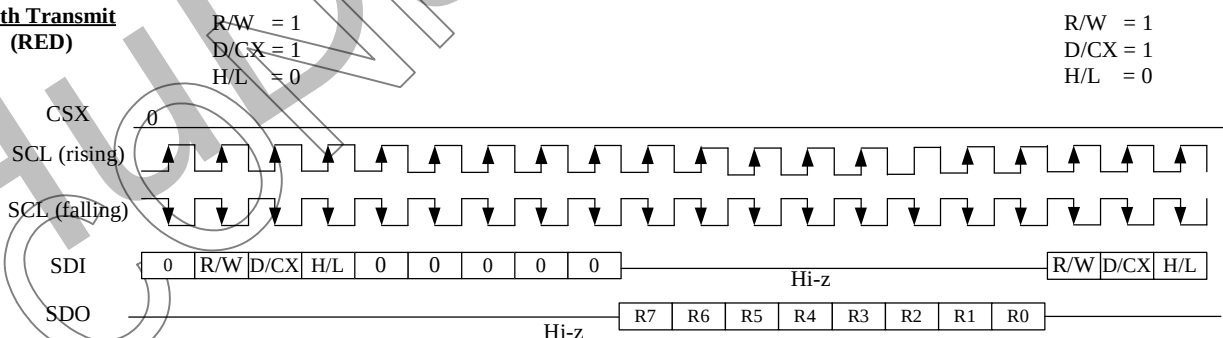
## Second Transmit



## Third Transmit (Dummy)



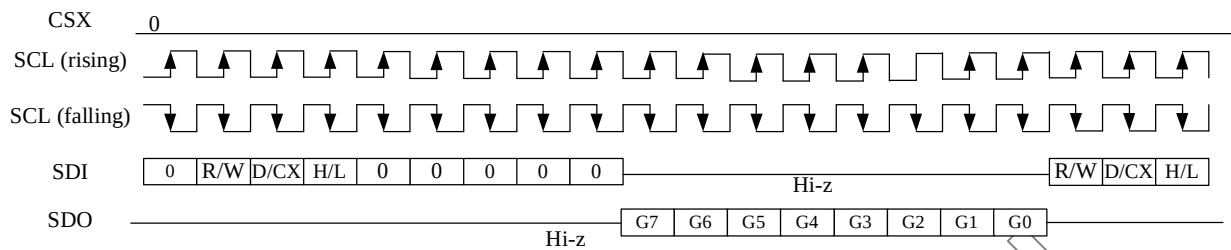
## Forth Transmit (RED)



## Fifth Transmit (GREEN)

R/W = 1  
D/CX = 1  
H/L = 0

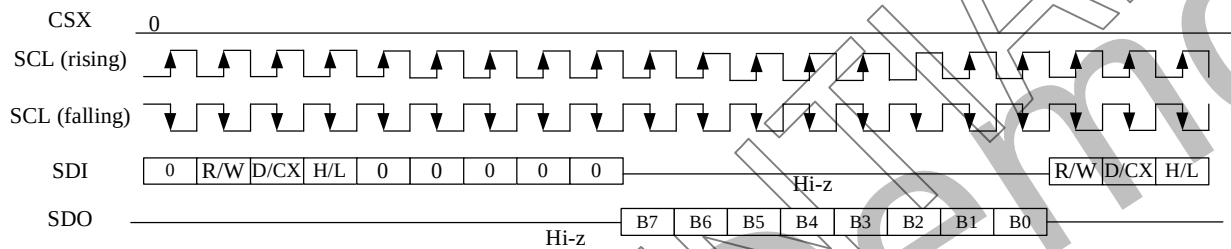
R/W = 1  
D/CX = 1  
H/L = 0



## Sixth Transmit (BLUE)

R/W = 1  
D/CX = 1  
H/L = 0

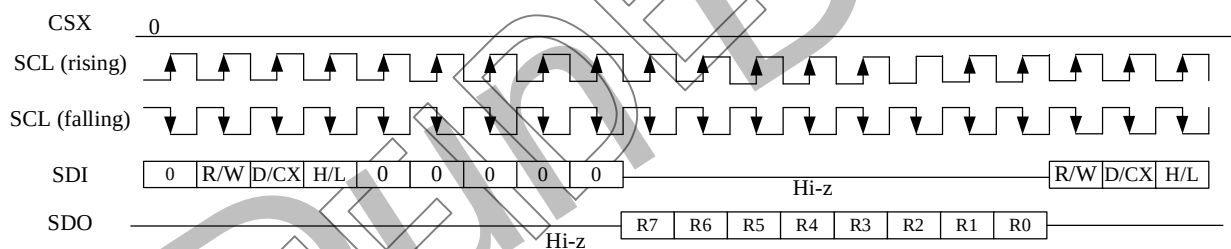
R/W = 1  
D/CX = 1  
H/L = 0



## Seventh Transmit (RED)

R/W = 1  
D/CX = 1  
H/L = 0

R/W = 1  
D/CX = 1  
H/L = 0

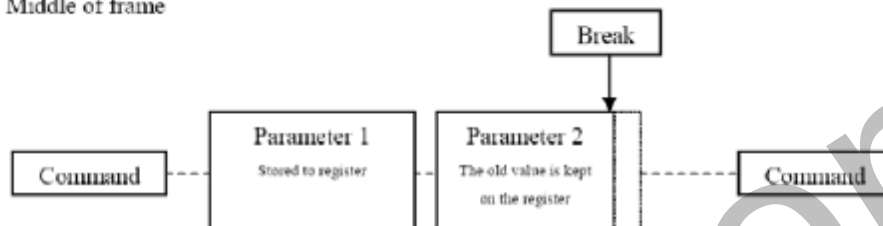


### 7.3.3 Break and Pause Sequences

The host processor can break a read or write sequence by pulling the CSX signal high during a command or data byte. The display module shall reset its interface so it will be ready to receive the same byte when CSX is again driven low.

The host processor can pause a read or write sequence by pulling the CSX signal high between command or data bytes. The display module shall wait for the host processor to drive CSX low before continuing the read or write sequence at the point where the sequence was paused.

#### 1. Middle of frame

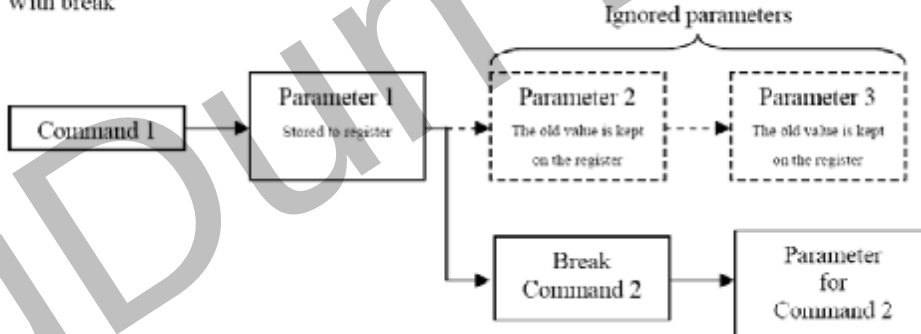


#### 2. Between frames

Without break



With break



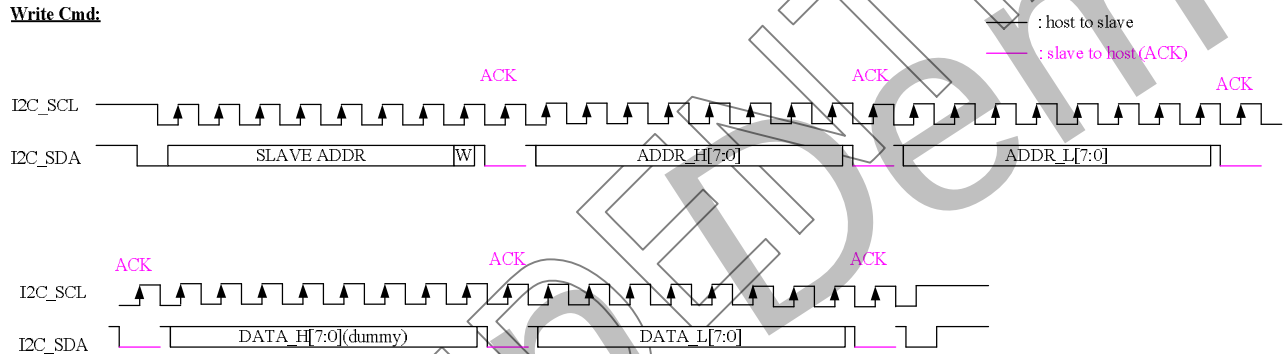
Break can be e.g. another command or noise pulse.

## 7.4 I2C Interface

The I2C-bus is for bi-directional, two-line communication between different ICs or modules. The two lines are the Serial Data line (I2C\_SDA) and the Serial Clock Line (I2C\_SCL). Both lines must be connected to a positive supply via pull-up resistors. Data transfer can be initiated only when the bus is not busy. Each byte of eight bits is followed by an acknowledge bit. The acknowledge bit is a HIGH level signal put on the bus by the transmitter during which time the master generates an extra acknowledgement related clock pulse. A slave receiver which is addressed must generate an acknowledgement after the reception of each byte. Also a master receiver must generate an acknowledgement after the reception of each byte that has been clocked out of the slave transmitter.

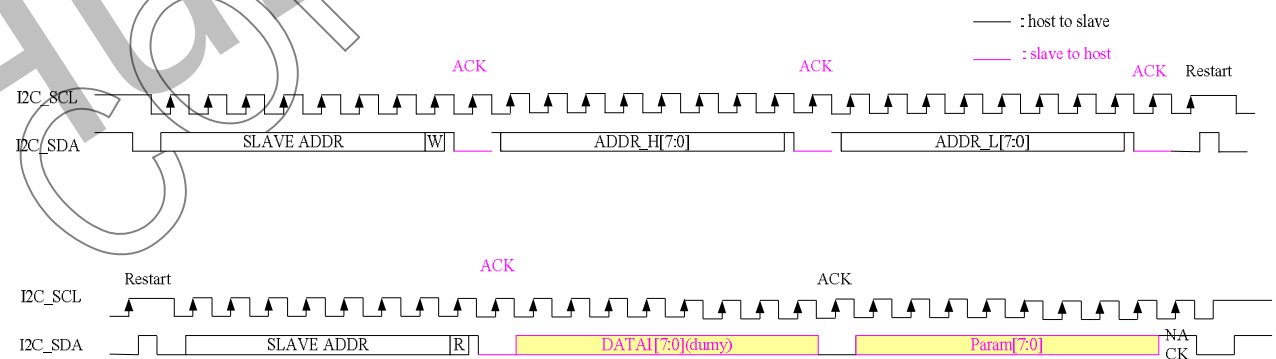
The I2C interface write command sequences are described in the following figure.

### Write Cmd:



The I2C interface read command sequences are described in the following figure.

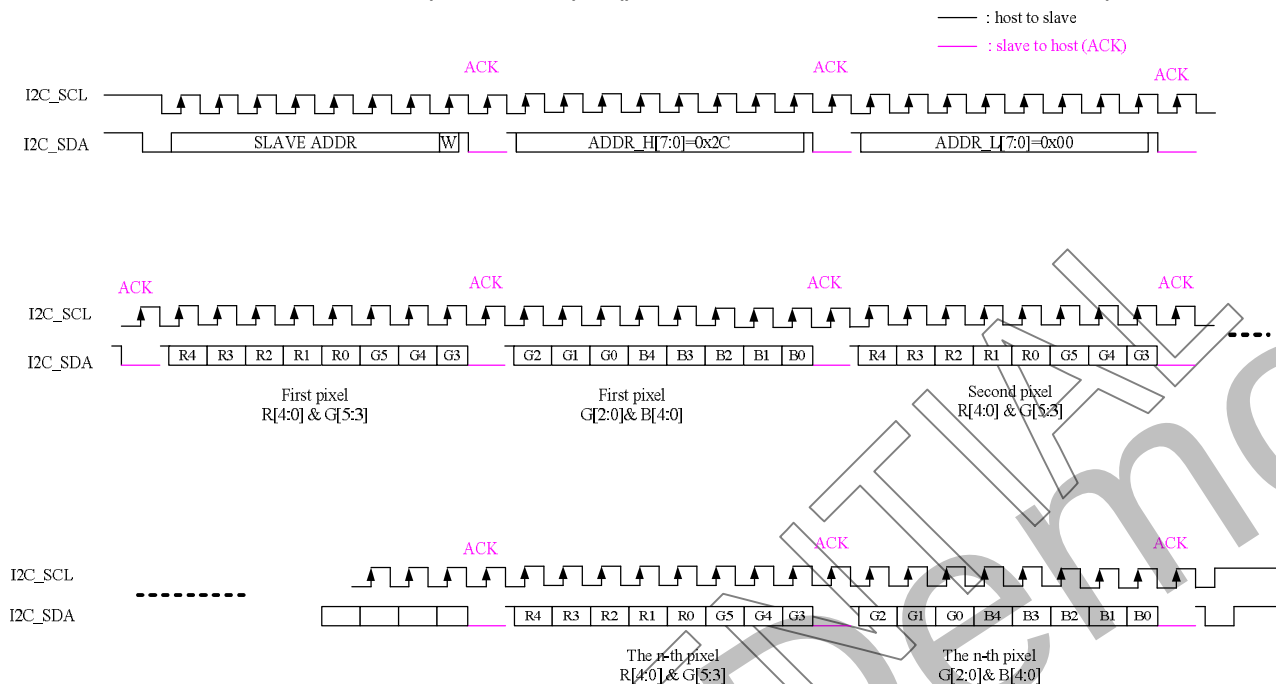
### Read Cmd:



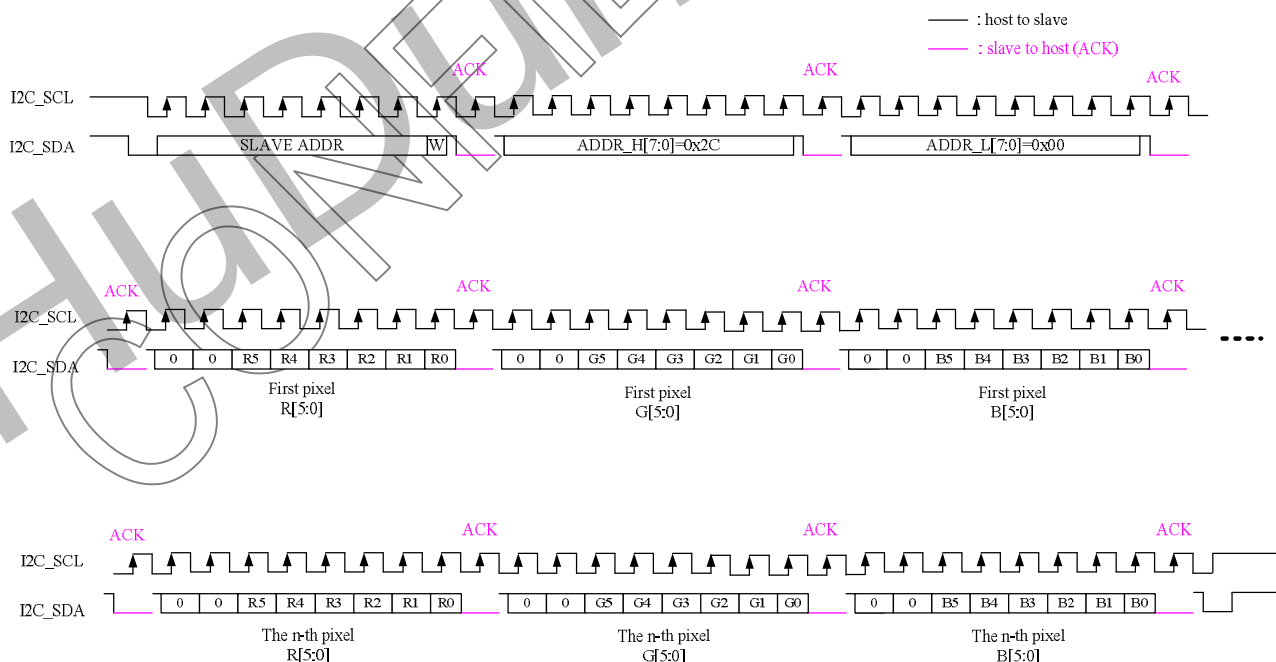


The I2C interface write data sequences are described in the following figure.

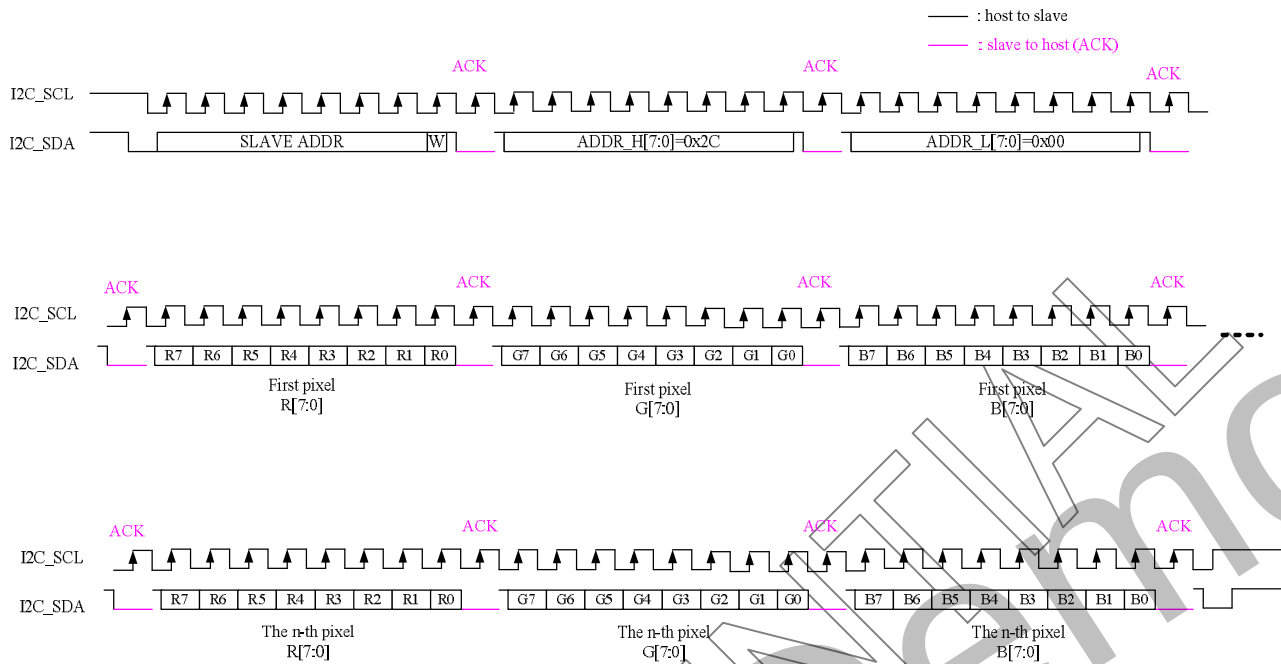
SRAM write: 65k colors, RGB 5-6-5 pixel data input (parameter of command 3A00h is 0x0005)



SRAM write: 262k colors, RGB 6-6-6 pixel data input (parameter of command 3A00h is 0x0006)

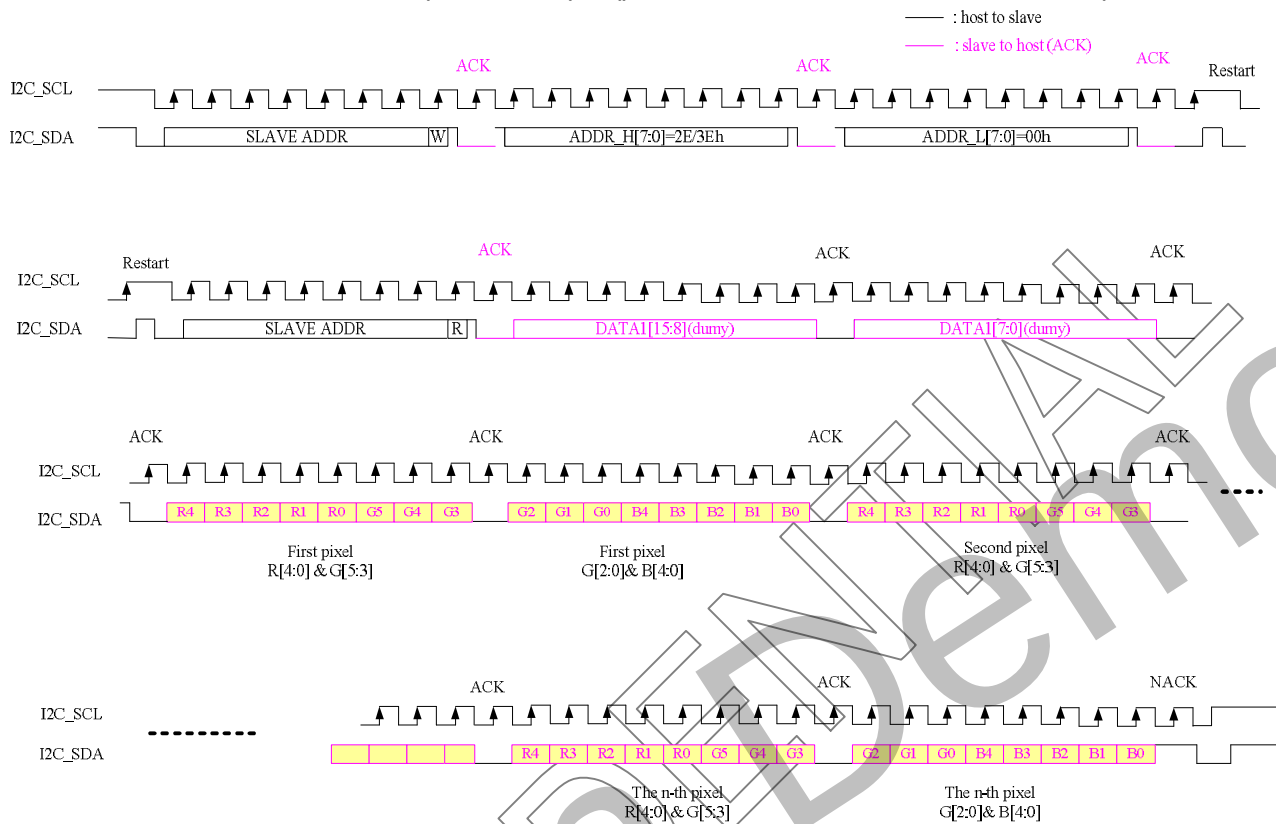


SRAM write: 16.7M colors, RGB 8-8-8 pixel data input (parameter of command 3A00h is 0x0007)

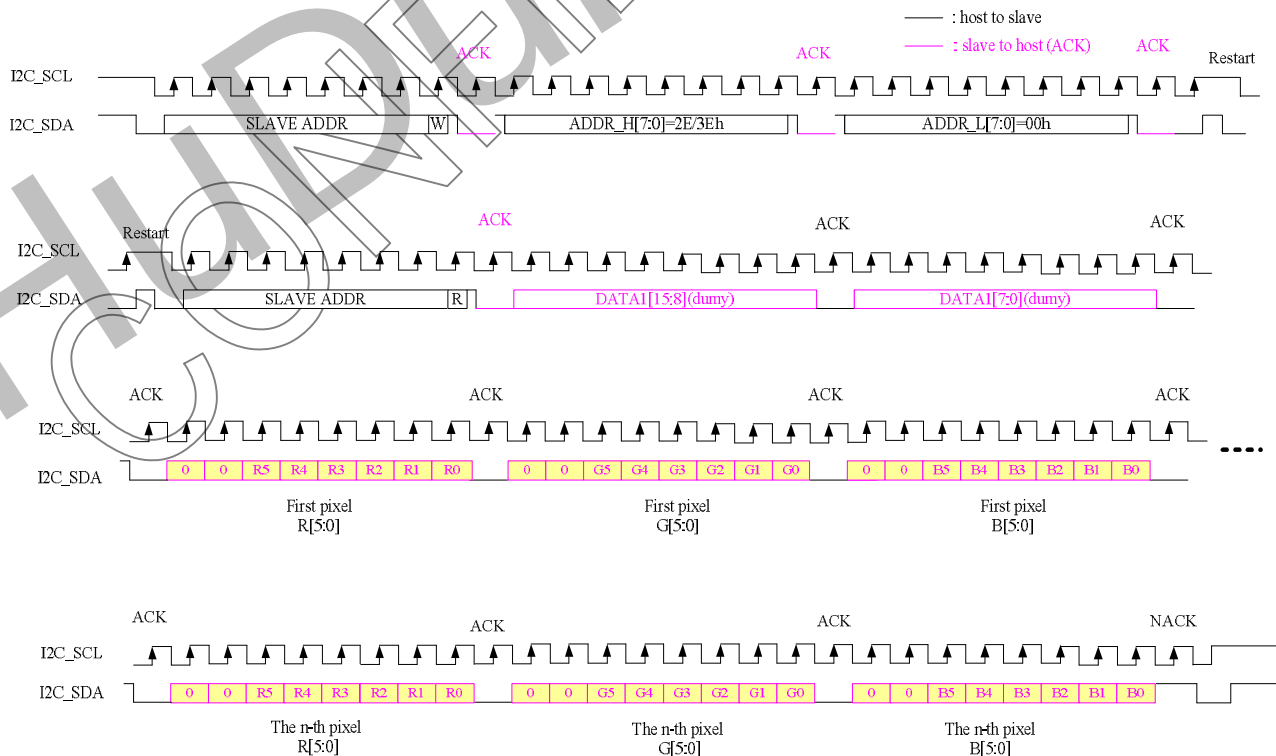


The I2C interface read data sequences are described in the following figure.

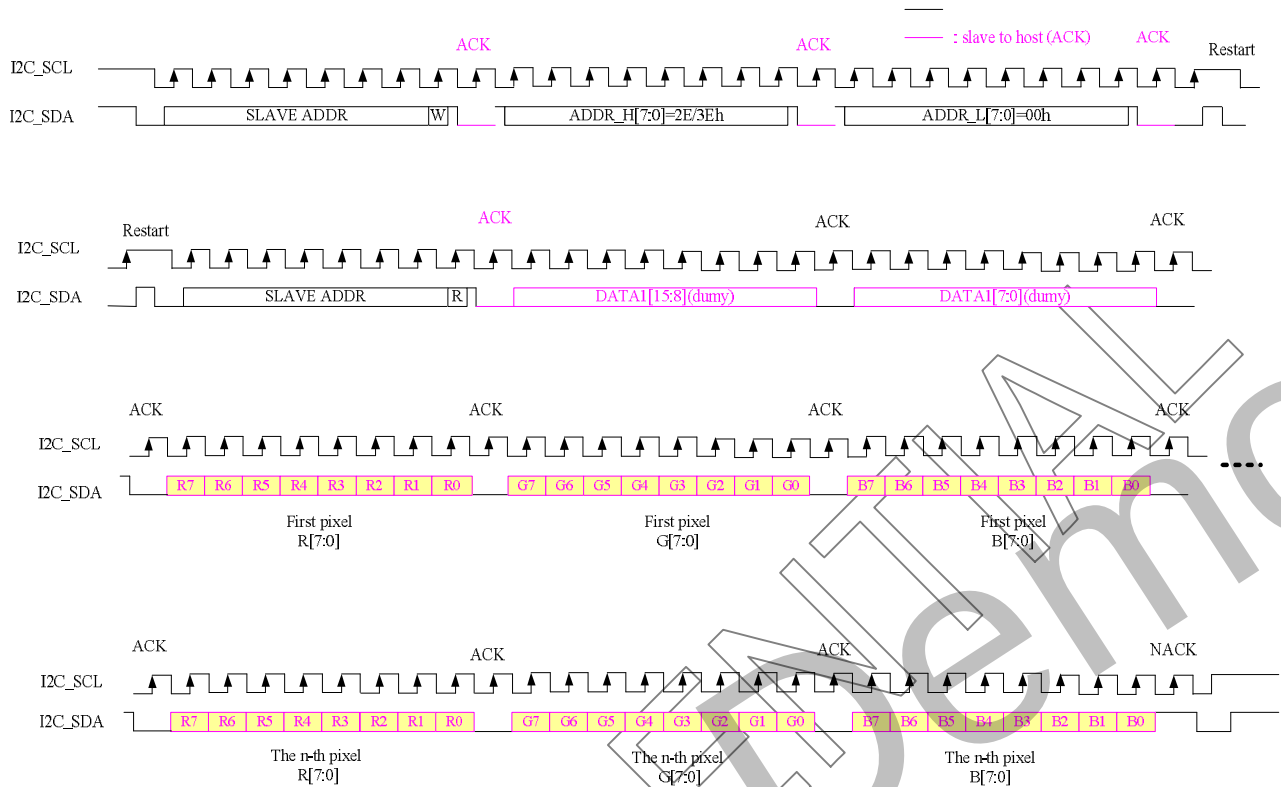
SRAM read: 65k colors, RGB 5-6-5 pixel data input (parameter of command 3A00h is 0x0005)



SRAM read: 262k colors, RGB 6-6-6 pixel data input (parameter of command 3A00h is 0x0006)



SRAM read: 16.7M colors, RGB 8-8-8 pixel data input (parameter of command 3A00h is 0x0007)



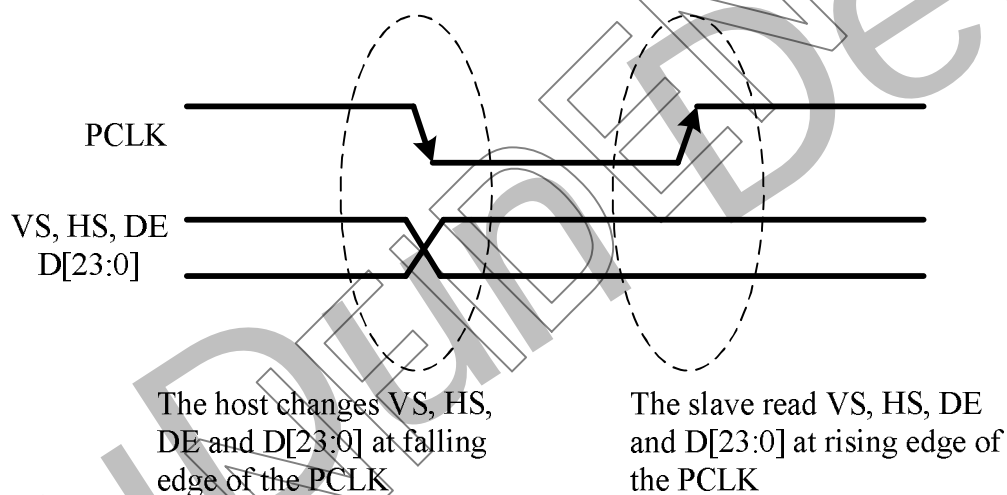
## 7.5 Display Pixel Interface (DPI)

In normal operation, systems based on DPI architecture rely on the host processor to continuously provide complete frames of image data at a sufficient frame rate to avoid flicker or other visible artifacts. The displayed image, or frame, is comprised of a rectangular array of pixels. The frame is transmitted from the host processor to a display module as a sequence of pixels, with each horizontal line of the image data sent as a group of consecutive pixels.

Vsync indicates the beginning of each frame of the displayed image. Hsync signals the beginning of each horizontal line of pixels.

Each pixel value (16, 18 or 24-bit data) is transferred from the host processor to the display module during one pixel period. The rising edge of PCLK is used by the display module to capture pixel data. Since PCLK runs continuously, control signal DE is required to indicate when valid pixel data is being transmitted on the pixel data signals.

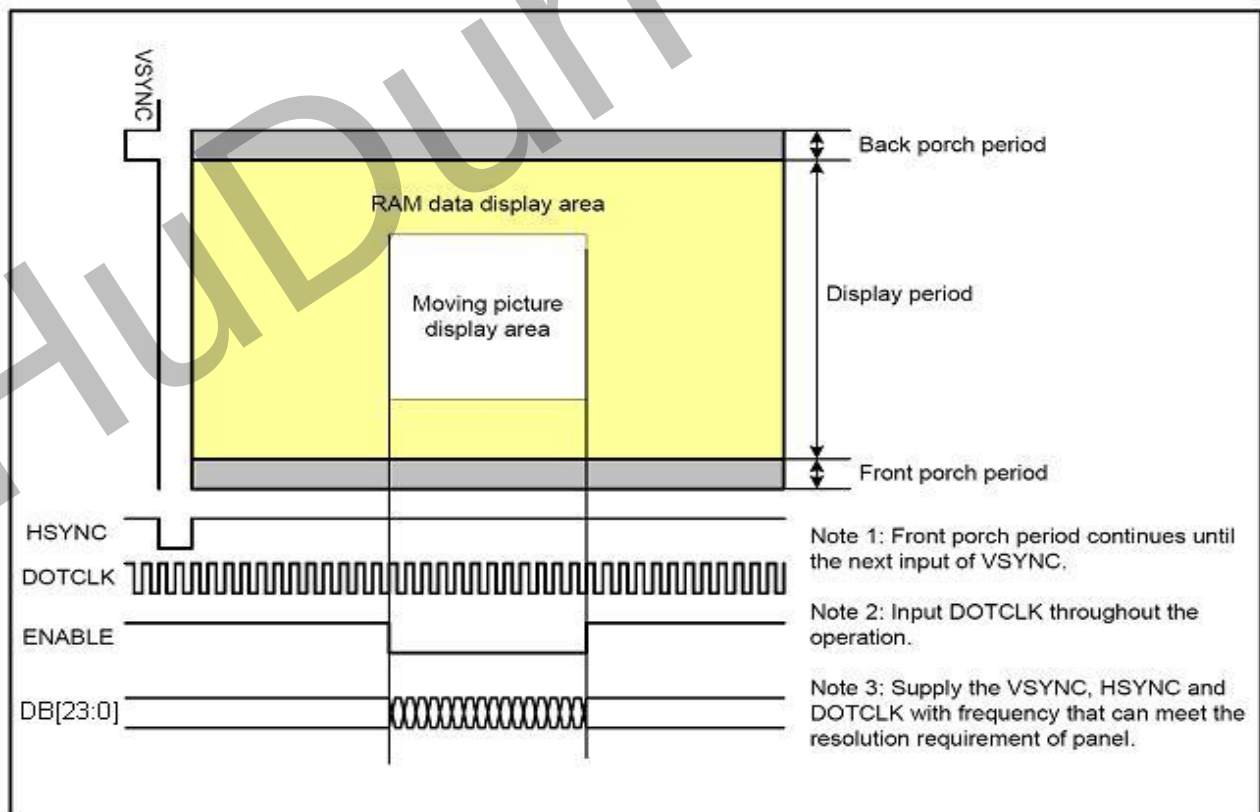
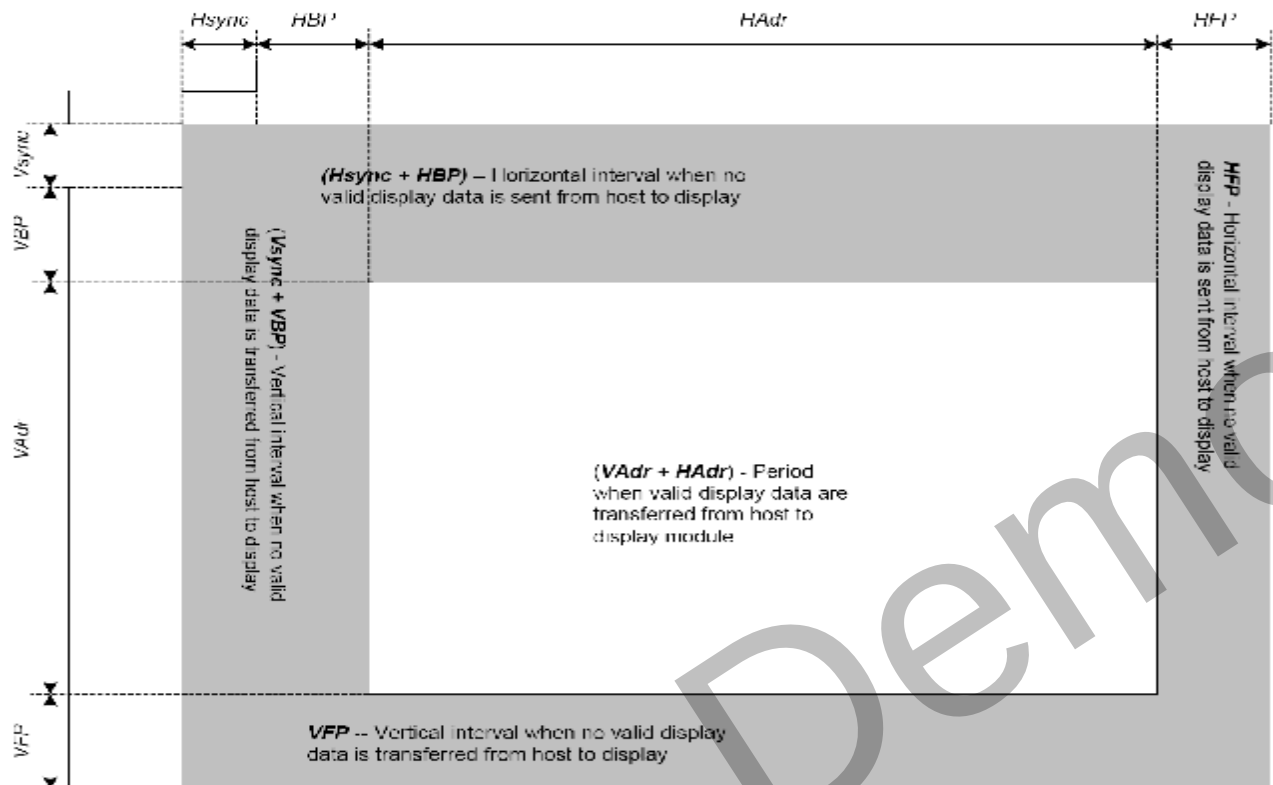
DPI signals are described in the follow figure.



DPI Interface data bus format: (Selected by VIPF[3:0])

| VIPF | DB <sub>23</sub> | DB <sub>22</sub> | DB <sub>21</sub> | DB <sub>20</sub> | DB <sub>19</sub> | DB <sub>18</sub> | DB <sub>17</sub> | DB <sub>16</sub> | DB <sub>15</sub> | DB <sub>14</sub> | DB <sub>13</sub> | DB <sub>12</sub> | DB <sub>11</sub> | DB <sub>10</sub> | DB <sub>9</sub> | DB <sub>8</sub> | DB <sub>7</sub> | DB <sub>6</sub> | DB <sub>5</sub> | DB <sub>4</sub> | DB <sub>3</sub> | DB <sub>2</sub> | DB <sub>1</sub> | DB <sub>0</sub> | color |      |
|------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------|------|
| 5    |                  |                  |                  | R[4]             | R[3]             | R[2]             | R[1]             | R[0]             |                  |                  | G[5]             | G[4]             | G[3]             | G[2]             | G[1]            | G[0]            |                 |                 |                 | B[4]            | B[3]            | B[2]            | B[1]            | B[0]            | 65K   |      |
| 6    |                  |                  |                  | R[5]             | R[4]             | R[3]             | R[2]             | R[1]             | R[0]             |                  |                  | G[5]             | G[4]             | G[3]             | G[2]            | G[1]            | G[0]            |                 |                 | B[5]            | B[4]            | B[3]            | B[2]            | B[1]            | B[0]  | 262K |
| 7    | R[7]             | R[6]             | R[5]             | R[4]             | R[3]             | R[2]             | R[1]             | R[0]             | G[7]             | G[6]             | G[5]             | G[4]             | G[3]             | G[2]             | G[1]            | G[0]            | B[7]            | B[6]            | B[5]            | B[4]            | B[3]            | B[2]            | B[1]            | B[0]            | 16.7M |      |

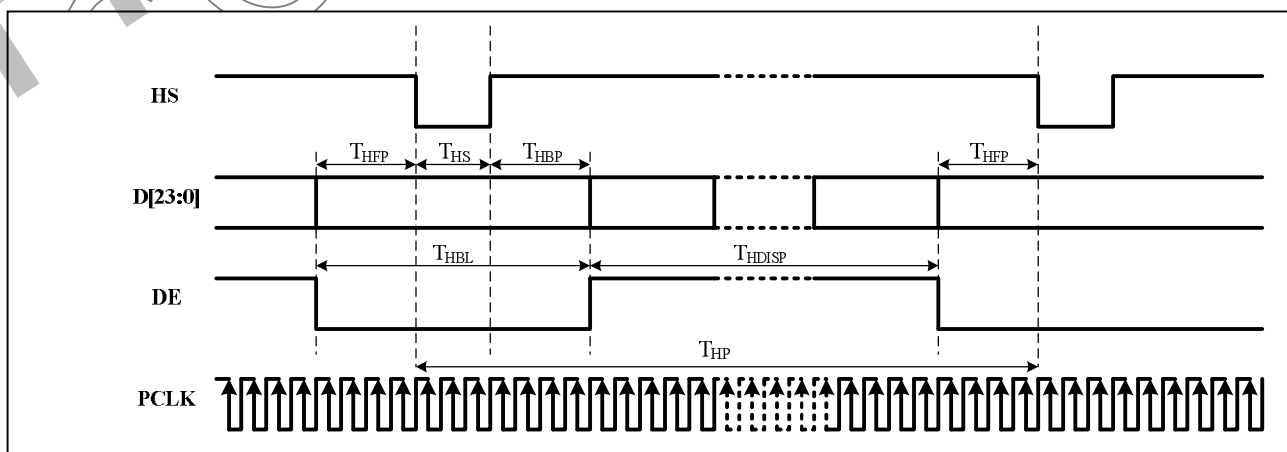
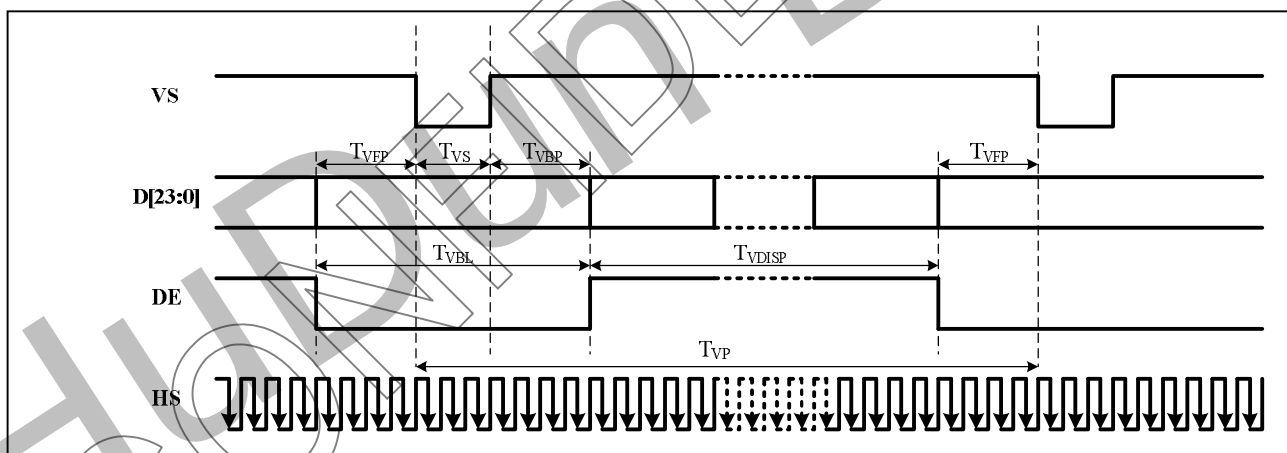
# DPI Interface Timing Chart.



### 7.5.1 DPI Vertical and Horizontal Timing

| Item                       | Symbol        | Condition                | Min  | Typ | Max | Unit |
|----------------------------|---------------|--------------------------|------|-----|-----|------|
| Vertical Timing            |               |                          |      |     |     |      |
| Vertical cycle period      | $T_{VP}$      | 480x864                  | 874  |     |     | HS   |
|                            |               | 480x854                  | 864  |     |     | HS   |
|                            |               | 480x800                  | 810  |     |     | HS   |
| Vertical low pulse width   | $T_{VS}$      |                          | 2    |     |     | HS   |
| Vertical front porch       | $T_{VFP}$     |                          | Note |     | 255 | HS   |
| Vertical back porch        | $T_{VBP}$     |                          | Note |     | 255 | HS   |
| Vertical data start line   |               | $T_{VS}+T_{VBP}$         | Note |     |     | HS   |
| Vertical blanking period   | $T_{VBL}$     | $T_{VS}+T_{VBP}+T_{VFP}$ | Note |     |     | HS   |
| Vertical active area       | $T_{VDISP}$   |                          |      | 864 |     | HS   |
|                            |               |                          |      | 854 |     | HS   |
|                            |               |                          |      | 800 |     | HS   |
| Horizontal Timing          |               |                          |      |     |     |      |
| Horizontal cycle period    | $T_{HP}$      |                          | 496  |     |     | PCLK |
| Horizontal low pulse width | $T_{HS}$      |                          | 2    |     |     | PCLK |
| Horizontal front porch     | $T_{HFP}$     |                          | 2    |     | 255 | PCLK |
| Horizontal back porch      | $T_{HBP}$     |                          | 12   |     | 255 | PCLK |
| Horizontal data start line |               | $T_{HS}+T_{HBP}$         | 14   |     |     | PCLK |
| Horizontal blanking period | $T_{HBL}$     | $T_{HS}+T_{HBP}+T_{HFP}$ | 16   |     |     | PCLK |
| Horizontal active area     | $T_{HDISP}$   |                          |      | 480 |     | PCLK |
| Pixel clock cycle          | $f_{PCLKSYS}$ |                          | 8    |     | 30  | MHz  |

Note. Please refer to application note.



## 7.6 Display Serial Interface (DSI)

DSI-compliant peripherals support either of two basic modes of operation: Command Mode and Video Mode. The mode definitions reflect the primary intended use of DSI for display interconnect, but are not intended to restrict DSI from operating in other applications.

RM68180 is capable of both Command Mode operation and Video Mode operation. Command Mode refers to operation in which transactions primarily take the form of sending commands and data to a display module that incorporates a display controller. The display controller may include local registers and a frame buffer. Systems using Command Mode write to, and read from, the registers and frame buffer memory. The host processor indirectly controls activity at the peripheral by sending commands, parameters and data to the display controller. The host processor can also read display module status information or the contents of the frame memory. Command Mode operation requires a bidirectional interface. Video Mode refers to operation in which transfers from the host processor to the peripheral take the form of a real-time pixel stream. In normal operation, the display module relies on the host processor to provide image data at sufficient bandwidth to avoid flicker or other visible artifacts in the displayed image. Video information should only be transmitted using High Speed Mode. RM68180 Video Mode architectures also include a simple timing controller and partial frame buffer, used to maintain a partial-screen or lower-resolution image in standby or Low Power Mode. This permits the interface to reduce power consumption.

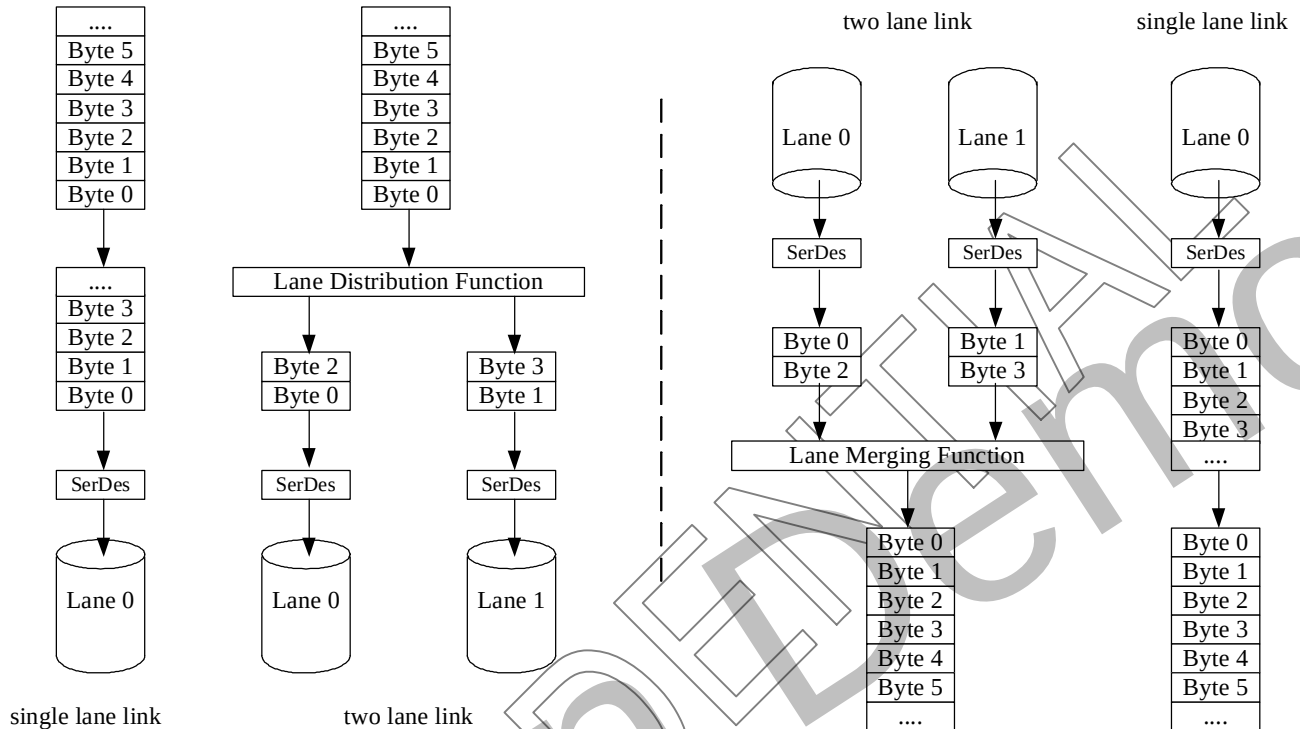
RM68180 Configuration:

|             |                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lane Pair   | MCU(Master) RM68180(Slave)                                                                                                                                                |
| Clock Lane  | Unidirectional Lane<br>Clock only                                                                                                                                         |
| Data Lane 0 | Bi-directional Lane<br><input type="checkbox"/> Forward High-speed<br><input type="checkbox"/> Bi-directional Escape Mode<br><input type="checkbox"/> Bi-directional LPDT |
| Data Lane 1 | Unidirectional Lane<br><input type="checkbox"/> Forward High-Speed<br><input type="checkbox"/> Escape Mode                                                                |



### 7.6.1 DSI Protocol

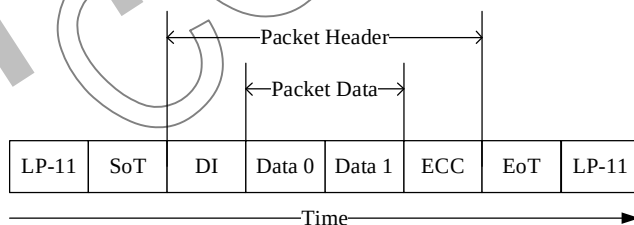
On the transmitter side of a DSI Link, parallel data, signal events, and commands are converted to packets. These packets are sent across the serial Link. The receiver side of a DSI Link performs the converse of the transmitter side, decomposing the packet into parallel data, signal events and commands.



There are two kinds of packets, **short packet and long packet**.

Ø Short packet structure:

LP-11: low power mode  
SoT: start of transmission  
DI: data identification  
Data 0, Data1: packet data  
ECC: error correction code  
EoT: End of Transmission



DI structure:

Virtual Channel: these two bits identify the data as directed to one of four virtual channels

Data Type: It specifies the packet structure and packet format

| Virtual Channel (VC) |       | Data Type (DT) |       |       |       |       |       |
|----------------------|-------|----------------|-------|-------|-------|-------|-------|
| Bit 7                | Bit 6 | Bit 5          | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

Ø Long packet structure:

LP-11: low power mode

SoT: start of transmission

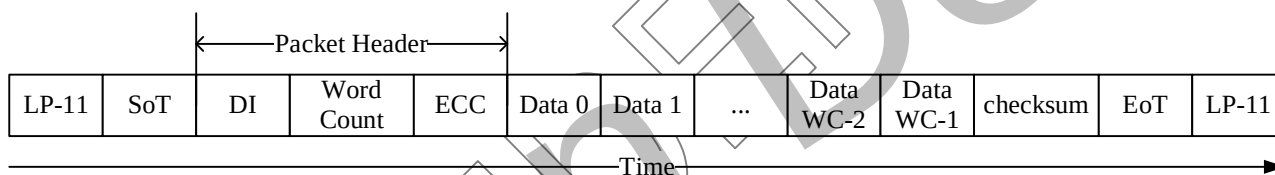
DI: data identification

Word Count: the number of data bytes of packet data

ECC: error correction code

Checksum: The 16-bit CRC generator to check packet data. If the calculated checksum of receiver are equal to the packet data, the packet data is correct. If the calculated checksum of receiver are not equal, the packet data are not correct.

EoT: end of transmission



## 7.6.2 Processor to Peripheral Transactions

### Processor to Peripheral Direction Packet Data Types

| Data Type | Data Type binary | Description                                           | Packet Size |
|-----------|------------------|-------------------------------------------------------|-------------|
| 01h       | 00 0001          | Sync Event, V Sync Start                              | Short       |
| 11h       | 01 0001          | Sync Event, V Sync End                                | Short       |
| 21h       | 10 0001          | Sync Event, H Sync Start                              | Short       |
| 31h       | 11 0001          | Sync Event, H Sync End                                | Short       |
| 08h       | 00 1000          | End of Transmission packet (EoTp)                     | Short       |
| 02h       | 00 0010          | Color Mode (CM) Off Command                           | Short       |
| 12h       | 01 0010          | Color Mode (CM) On Command                            | Short       |
| 22h       | 10 0010          | Shut Down Peripheral Command                          | Short       |
| 32h       | 11 0010          | Turn On Peripheral Command                            | Short       |
| 03h       | 00 0011          | reserved                                              | Short       |
| 13h       | 01 0011          | Generic Short WRITE, 1 parameter                      | Short       |
| 23h       | 10 0011          | Generic Short WRITE, 2 parameters                     | Short       |
| 04h       | 00 0100          | reserved                                              | Short       |
| 14h       | 01 0100          | Generic READ, 1 parameter                             | Short       |
| 24h       | 10 0100          | Generic READ, 2 parameters                            | Short       |
| 05h       | 00 0101          | DCS Short WRITE, no parameters                        | Short       |
| 15h       | 01 0101          | DCS Short WRITE, 1 parameter                          | Short       |
| 06h       | 00 0110          | DCS READ, no parameters                               | Short       |
| 37h       | 11 0111          | Set Maximum Return Packet Size                        | Short       |
| 09h       | 00 1001          | Null Packet, no data                                  | Long        |
| 19h       | 01 1001          | Blanking Packet, no data                              | Long        |
| 29h       | 10 1001          | Generic Long Write                                    | Long        |
| 39h       | 11 1001          | DCS Long Write/write_LUT Command Packet               | Long        |
| 0Eh       | 00 1110          | Packed Pixel Stream, 16-bit RGB, 5-6-5 Format         | Long        |
| 1Eh       | 01 1110          | Packed Pixel Stream, 18-bit RGB, 6-6-6 Format         | Long        |
| 2Eh       | 10 1110          | Loosely Packed Pixel Stream, 18-bit RGB, 6-6-6 Format | Long        |
| 3Eh       | 11 1110          | Packed Pixel Stream, 24-bit RGB, 8-8-8 Format         | Long        |

#### Ø Sync Event, Data Type = xx 0001

Sync Events are all short packets and time-accurately. They can perform like the start and end of sync pulses. To represent timing information as accurately as possible, a V Sync Start event represents the start of the VSA and also implies an H Sync Start event for the first line of the VSA. Hence, a V Sync End event implies an H Sync Start event for the last line of the VSA. Sync events may be concatenated with blanking packets to convey inter-line timing accurately and avoid the overhead of switching between LPS and HS for every event. Note there is a power penalty for keeping the data line in HS mode.

#### Ø EoT packet

This short packet is used to indicate the end of a high speed (HS) transmission. This packet will enhance overall system reliability. Although the main objective of the EoTp is to enhance robustness during HS transmission mode, RM68180 can detect and interpret arriving EoTps regardless of transmission mode (HS or LP modes)

#### Ø Color Mode Off / On Command

They are short packet commands to switch video display module between normal display mode and low-color mode for power saving.

#### Ø Generic short write / read packet

Generic Short WRITE command is a Short packet type for sending generic data to the peripheral. Generic READ request is a Short packet requesting data from the peripheral.

#### Ø DCS commands

##### n DCS short write command

DCS short write command is used to write a single data byte command to display module. If there is a valid parameter byte, data type bit 4 shall be set to 1. If there is no valid parameter byte, data type bit 4 shall be set to 0 and the parameter byte shall be 00h.

##### n DCS read commands

The commands are used to request data from s display module.

##### n DCS Long Write / write\_LUT command

The commands are used to send larger blocks of data to a display module.

##### n Maximum return packet size

This command specifies the maximum size of the payload in a long packet transmission from a display module to host processor.

**n** Null Packet

This is a mechanism for keeping the data lane(s) in high speed mode while sending dummy data.

**n** Blanking Packet

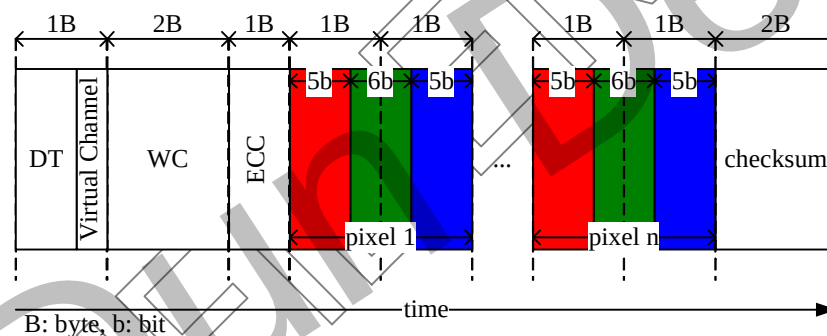
A Blanking packet is used to convey blanking timing information in a Long packet. The packet represents a period between active scan lines of a Video Mode display, where traditional display timing is provided from the host processor to the display module. The blanking period may have Sync Event packets interspersed between blanking segments. Blanking packets may contain arbitrary data as payload.

**n** Generic Long Write

This is used to transmit arbitrary blocks of data from a host processor to a peripheral.

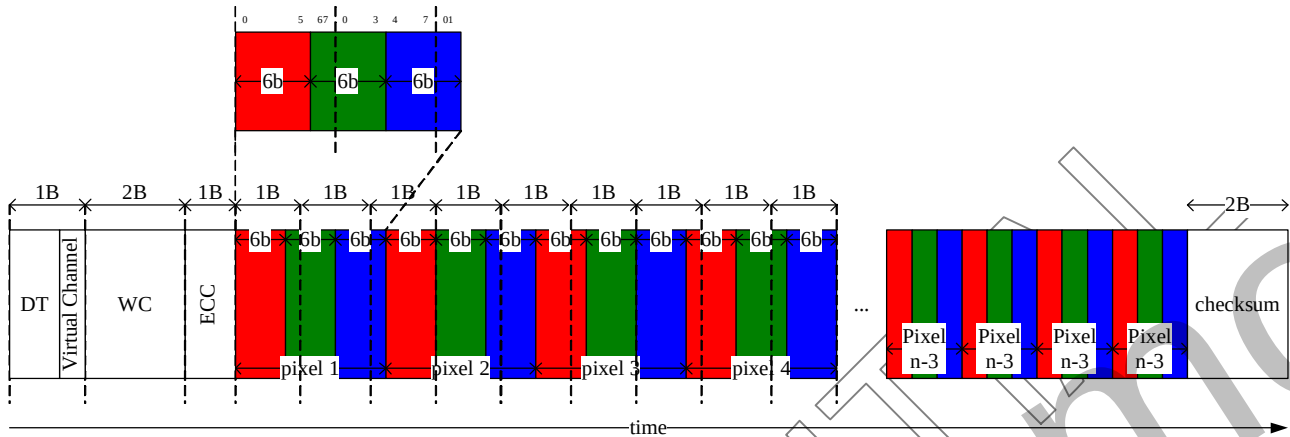
**n** Packed Pixel Stream, 16-bit Format, Data Type: 00 1110

The pixel format is five bits red, six bits green and five bits blue. The green component is split across two bytes. Within a color component, the LSB is sent first, the MSB last.



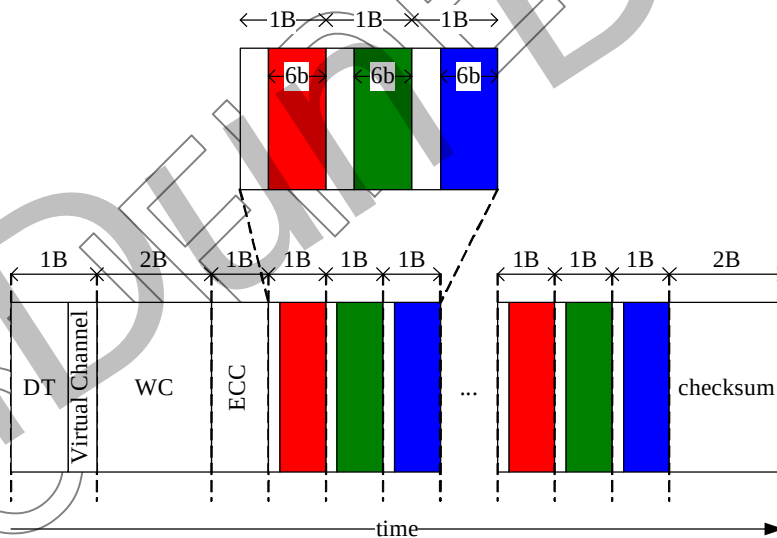
**n** Packet pixel stream, 18-bit format, Data Type: 01 1110

The pixel format is six bits red, six bits green and six bits blue. Within a color component, the LSB is sent first, the MSB last.



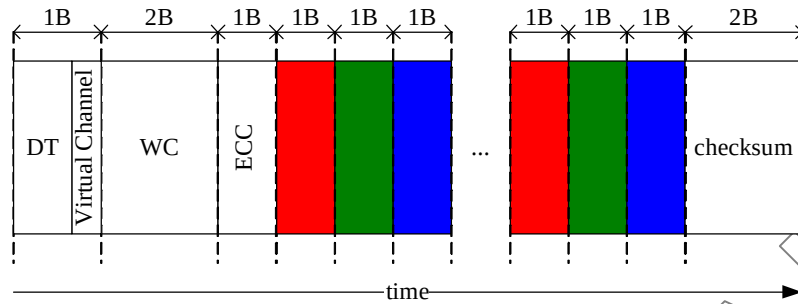
**n** Packet pixel stream, 18-bit format in three bytes, Data Type: 10 1110

This is 18-bit pixel lossely packed format, each R, G or B color component is six bits but shifted to the upper bits of byte.



**n** Packet pixel stream, 24-bit format, Data Type: 11 1110

The pixel format is eight bits red, eight bits green and eight bits blue.



### 7.6.3 Peripheral-to-Processor LP Transmission

All Command Mode systems require bidirectional capability for returning READ data, acknowledge, or error information to the host processor. Multi-Lane systems shall use Lane 0 for all peripheral-to-processor transmissions. Reverse-direction signaling shall only use low power mode transmission. Packet structure for peripheral-to-processor transaction is the same as for the processor-to-peripheral direction. For the processor-to-peripheral direction, two basic packet formats are the same as the peripheral-to-processor direction: Short and Long packet structure. BTA shall take place after every peripheral-to-processor transaction. This returns bus control to the host processor following the completion of the LP transmission from the peripheral.

There are four basic types of peripheral-to-processor transactions.

- Ø Tearing Effect: It is a Trigger message sent to convey display timing information to the host processor.
- Ø Acknowledge: It is a Trigger Message sent when the current transmission, as well as all preceding transmissions since the last peripheral to host communication.
- Ø Acknowledge and Error Report: It is a Short packet sent if any errors were detected in preceding transmissions from the host processor.
- Ø Response to Read Request: It may be a Short or Long packet that returns data requested by the preceding READ command from the processor.

Interpretation of processor-to-peripheral transactions with BTA asserted, and the expected responses, are as follows:

- Ø Following a non-Read command: If no errors were detected, the peripheral shall respond with Acknowledge.
- Ø Following a Read request: The peripheral shall send the requested READ data if no errors were detected and stored since the last peripheral to host communication.
- Ø Following a Read request: If only a single-bit ECC error was detected and corrected, the peripheral shall send the requested READ data in a Long or Short packet and a 4-byte Acknowledge and Error Report packet in the same LP transmission.
- Ø Following a non-Read command: If only a single-bit ECC error was detected and corrected, the peripheral shall respond to BTA by sending a 4-byte Acknowledge and Error Report packet.
- Ø Following a Read request: If multi-bit ECC errors were detected and not corrected, the peripheral shall send a 4-byte Acknowledge and Error Report packet without sending Read data.
- Ø Following a non-Read command: If multi-bit ECC errors were detected and not corrected, the peripheral shall not execute the command, and shall send a 4-byte Acknowledge and Error Report packet.
- Ø Following any command: If SoT Error, SoT Sync Error, the VC of DSI or the ID of DSI Invalid or DSI protocol violation was detected, or the DSI command was not recognized, the peripheral shall send a 4-byte Acknowledge and Error Report response.
- Ø Following any command: If EoT Sync Error or LP Transmit Sync Error is detected, or a checksum error



is detected in the payload, the peripheral shall send a 4-byte Acknowledge and Error Report packet.

### Error Report Format

The following table shows the bit assignment for all error report.

| Bit | Description                                    |
|-----|------------------------------------------------|
| 0   | SoT Error                                      |
| 1   | SoT Sync Error                                 |
| 2   | EoT Sync Error                                 |
| 3   | Escape Mode Entry Command Error                |
| 4   | Low-Power Transmit Sync Error                  |
| 5   | HS Receive Timeout Error                       |
| 6   | False Control Error                            |
| 7   | Reserved                                       |
| 8   | ECC Error, single-bit (detected and corrected) |
| 9   | ECC Error, multi-bit (detected, not corrected) |
| 10  | Checksum Error (Long packet only)              |
| 11  | DSI Data Type Not Recognized                   |
| 12  | DSI VC ID Invalid                              |
| 13  | reserved                                       |
| 14  | reserved                                       |
| 15  | reserved                                       |

**Peripheral-to-Processor Transaction – Detail Format Description**

The following list is the complete set of peripheral-to-processor data types.

| Data type,<br>hex | Data type<br>binary | Description                             | Packet<br>size |
|-------------------|---------------------|-----------------------------------------|----------------|
| 02h               | 00 0010             | Acknowledge and error report            | short          |
| 08h               | 00 1000             | reserved                                | short          |
| 11h               | 01 0001             | GEN short read reponse, 1byte returned  | short          |
| 12h               | 01 0010             | GEN short read reponse, 2bytes returned | short          |
| 1Ah               | 01 1010             | Generic long read reponse               | long           |
| 1Ch               | 01 1100             | DCS long read reponse                   | long           |
| 21h               | 10 0001             | DCS short read reponse, 1byte returned  | short          |
| 22h               | 10 0010             | DCS short read reponse, 2bytes returned | short          |

- Ø Acknowledge and error report: It is sent with BTA asserted when a reportable error is detected in the preceding, or earlier, transmission from the host processor.
- Ø Generic Short Read Response: This is the short-packet response to Generic READ Request. Packet composition is the Data Identifier (DI) byte, two bytes of payload data and an ECC byte. If the command itself is possibly corrupt, due to an uncorrectable ECC error, SoT or SoT Sync error, the requested READ data packet shall not be sent and only the Acknowledge and Error Report packet shall be sent.
- Ø Generic long read reponse: This is the long-packet response to Generic READ Request. Packet composition is DI followed by a two-byte Word Count, an ECC byte, N bytes of payload, and a two-byte Checksum. If the command itself is possibly corrupt, due to an uncorrectable ECC error, SoT or SoT Sync error, the requested READ data packet shall not be sent and only the Acknowledge and Error Report packet shall be sent.
- Ø DCS long read reponse: This is a Long packet response to DCS Read Request. Packet composition is DI followed by a two-byte Word Count, an ECC byte, N bytes of payload, and a two-byte Checksum. If the DCS command itself is possibly corrupt, due to uncorrectable ECC error, SoT or SoT Sync error, the requested READ data packet shall not be sent and only the Acknowledge and Error Report packet shall be sent.
- Ø DCS short read reponse: This is the short-packet response to DCS Read Request. Packet composition is DI, two bytes of payload data and an ECC byte. If the command itself is possibly corrupt, due to an uncorrectable ECC error, SoT or SoT Sync error, the requested READ data packet shall not be sent and only the Acknowledge and Error Report packet shall be sent.

**7.6.4 Notice**

1. We recommend users to stay in STOP state for 500ns when switching from LPDT to HSDT.
2. We recommend users to adopt EoTp to enhance overall robustness of the system during HSDT.

## 7.7 MDDI Interface

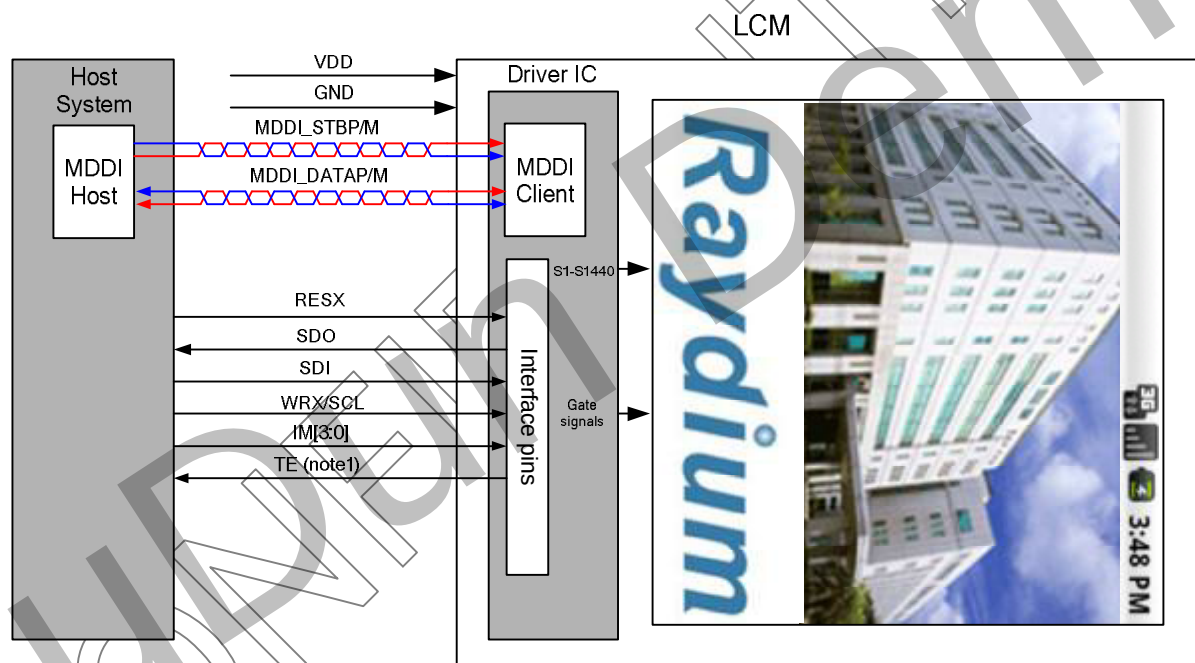
The RM68180 supports the Mobile Display Digital Interface (MDDI) is a differential small amplitude serial interface for high-speed data transfer through the following lines: DATA0\_P/M, DATA1\_P/M and STB\_P/M.

The specifications of MDDI supported by the RM68180 meet the MDDI specifications Version 1.2 as published by the Video Electronics Standards Association (VESA).

The RM68180 offers the bi-direction link to use for the register and display data read / write.

For power saving, the RM68180 offers both hibernation mode (Send shutdown packet), and enter deep standby mode to reduce power consumption.

The RM68180 supports the MDDI Type-I and Type-II of the MDDI specifications Version 1.2 and the application diagram is illustrated as follow.



### Notes:

1. Based on the system configuration, use TE signal as the reference signal for moving picture display to avoid the tearing effect.
2. When enter to the MDDI interface from other interface, the Host needs to wait 100ms and can start to send any packet. For example wake up packet.
3. After shutting down the MDDI interface the Host needs to wait 500ns and can start to send wake up packet to wake up the MDDI link.
4. The terminal resistors are embedded between MDDI\_DATA0\_P/M, MDDI\_DATA1\_P/M and MDDI\_STB\_P/M.

### 7.7.1 MDDI Link Protocol

The RM68180's MDDI Link Protocol is in accordance with the MDDI specifications as published by VESA; refer to these specifications for more information on the MDDI Link Protocol.

DO NOT send any packets that are not supported by the RM68180 into a system containing the RM68180.

Supported MDDI packets are as follows:

| RM68180<br>MDDI<br>packets             | Packet Name                          | Packet Type    | Direction       | Supported Type                                           |
|----------------------------------------|--------------------------------------|----------------|-----------------|----------------------------------------------------------|
| Link Control<br>Packet                 | Sub-frame header packet              | 15359 (0x3BFF) | Forward         | Type I/Type II                                           |
|                                        | Filler packet                        | 0              | Forward/Reverse | Type I/ Type II<br>(Forward)<br>Type I Only<br>(Reverse) |
|                                        | Link Shutdown packet                 | 69 (0x45)      | Forward         | Type I/Type II                                           |
|                                        | Reverse link encapsulation packet    | 65 (0x41)      | Forward         | Type I Only                                              |
|                                        | Round-trip delay measurement packet  | 82 (0x52)      | Forward         | Type I/Type II                                           |
|                                        | Forward link skew calibration packet | 82 (0x52)      | Forward         | Type I/Type II                                           |
| Client Status<br>and Control<br>Packet | Client capability packet             | 66 (0x42)      | Reverse         | Type I Only                                              |
|                                        | Client request and status packet     | 70 (0x46)      | Reverse         | Type I Only                                              |
|                                        | Register access packet               | 146 (0x92)     | Forward/Reverse | Type I/ Type II<br>(Forward)<br>Type I Only<br>(Reverse) |
| Basic Media<br>Stream<br>Packet        | Video stream packet                  | 16 (0x10)      | Forward         | Type I/Type II                                           |
|                                        | Flexible video stream packet         | 20 (0x14)      | Forward         | Type I/Type II                                           |
|                                        | Windowless video stream packet       | 22 (0x16)      | Forward         | Type I/Type II                                           |

## 7.7.2 MDDI Link Packet Descriptions

### Sub-frame Header Packet

The Sub-Frame Header Packet is the first packet of every sub-frame.

#### Sub-frame Header Packet

| Packet Length | Packet Type<br>=0x3bff | Unique word<br>=0x005a | Reversed 1 | Sub-frame<br>Length | Protocol<br>Version | Sub-frame Count | Media-frame<br>Count | CRC     |
|---------------|------------------------|------------------------|------------|---------------------|---------------------|-----------------|----------------------|---------|
| 2 bytes       | 2 bytes                | 2 bytes                | 2 bytes    | 4 bytes             | 2 bytes             | 2 bytes         | 4 bytes              | 2 bytes |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 0x3bff

Unique Word: unique word is 0x005a

Reserved 1: not used (set to zero)

Sub-frame Length: specify the number of bytes per sub-frame

Protocol version: set to zero

**n** Bit [15:2] – Reserved for future expansion. These should be set to all zero.

**n** Bits[1:0] – Sub-frame operational mode

“00” – Sub-frame lengths strictly followed.

“01” – Sub-frame lengths are flexible. Sub-frame packets should be sent at the first opportunity after the sub-frame length has been transmitted.

“10” – Sub-frame lengths are unlimited. No more sub-frame packets are required to be transmitted after the first sub-Frame packet at startup.

Sub-frame Count: specify the number of sub-frame header packet

Media-frame Count: specify the number of media-frames

CRC: error check

## Filler Packet

The Filler Packet is sent when no other information is available to be sent on the forward or reverse link.

Filler Packet

| Packet Length | Packet Type=0 | Filler Bytes<br>(all zero recommended) | CRC     |
|---------------|---------------|----------------------------------------|---------|
| 2 bytes       | 2 bytes       | (Packet Length – 4) bytes              | 2 bytes |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 0

Filler Bytes: set to zero

CRC: error check

## Link Shutdown Packet

The Link Shutdown Packet is sent from the host to the client to indicate that the MDDI data and strobe will be shut down and go into a low-power hibernation state.

Link Shutdown Packet

| Packet Length | Packet Type=69 | CRC     | All Zero                  |
|---------------|----------------|---------|---------------------------|
| 2 bytes       | 2 bytes        | 2 bytes | (Packet Length – 4) bytes |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 69

CRC: error check

All Zero: set to zero (Type I: size is 16 bytes, Type II: size is 32 bytes)

## Reverse Link Encapsulation Packet

Data is transferred in the reverse direction using the Reverse Link Encapsulation Packet.

Reverse Link Encapsulation Packet

| Packet Length | Packet Type=65 | hClient ID | Reversed Link Flags | Reverse Rate Divisor | Turn-Around 1<br>Length | Turn-Around 2<br>Length |
|---------------|----------------|------------|---------------------|----------------------|-------------------------|-------------------------|
| 2 bytes       | 2 bytes        | 2 bytes    | 1 byte              | 1 byte               | 1 byte                  | 1 byte                  |

| Parameter CRC | All Zero 1 | Turn-Around 1 | Reversed Data Packets              | Turn-Around 2 | All Zero 2 |
|---------------|------------|---------------|------------------------------------|---------------|------------|
| 2 bytes       | 8 bytes    | x bytes       | (Packet Length – x – y – 26) bytes | y bytes       | 8 bytes    |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 65

hClient ID: set to zero

Reverse Link Flags:

**n** Bit 0 – 0: No packet request

1: Host needs the Client Capability Packet

**n** Bit 1 – 0: No packet request

1: Host needs the Client Request and Status Packet

**n** Bit [7:2] – set to zero

Reverse Rate Divisor: reverse data rate = reverse link data clock

Turn-Around 1 Length: the length of Turn-Around 1 is the forward link data rate

Turn-Around 2 Length: the length of Turn-Around 2 is determined by Round-trip delay of the link

Parameter CRC: error check

All zero: set to zero

Turn-Around 1: First turn-around period

Reverse Data Packets: A series of data packets transferred from the client to host

Turn-Around 2: The second turn-around period

### Round-Trip Delay Measurement Packet

The Round-Trip Delay Measurement Packet is used to measure the propagation delay from the host to the client plus the delay from the client back to the host. This packet is most useful when the MDDI link is running at the maximum speed intended for a particular application. The packet may be sent in Type I mode and at a lower data rate to increase the range of the Round-Trip delay measurement.

Round Trip Measurement Packet

|               |                |            |               |
|---------------|----------------|------------|---------------|
| Packet Length | Packet Type=82 | hClient ID | Parameter CRC |
| 2 bytes       | 2 bytes        | 2 bytes    | 2 byte        |

|              |                    |          |              |
|--------------|--------------------|----------|--------------|
| Guard Time 1 | Measurement Period | All Zero | Guard Time 2 |
| 64 bytes     | 64 bytes           | 2 bytes  | 64 bytes     |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 82



hCilent ID: set to zero

Parameter CRC: error check

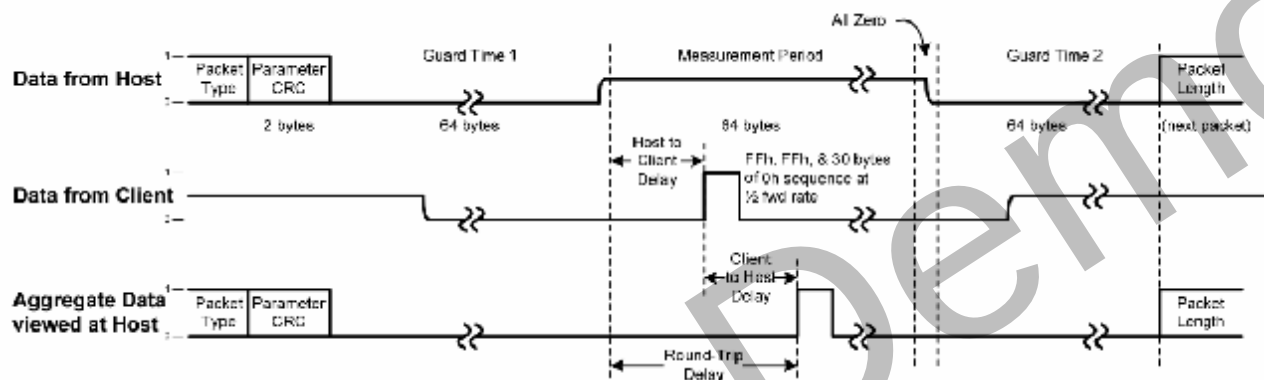
Guard Time 1: allow overlap of the host and client

Measurement Period: a 64 bytes window to allow the client to respond

All Zero: set to zero

Guard Time 2: allow overlap of the measurement period by the client

The timing of events during the Round-Trip Delay Measurement Packet illustrates as follow.



### Forward Link Skew Calibration Packet

This packet allows the client to calibrate itself for differences in the propagation delay of the MDDI\_DATA signals with respect to the MDDI\_STB signal. Without delay skew compensation the maximum data rate must be limited to account for the worst-case variation in these delays. It is recommended that this packet only be sent when the forward link data rate is configured to 50 Mbps or lower. After sending this packet to calibrate the client the data rate may be stepped up above 50 Mbps. With the data rate set too high during the skew calibration process the client might synchronize to an alias of the bit period which would cause the delay skew compensation setting to be off by more than one bit time, resulting in erroneous data clocking. The greatest possible Interface Type must be selected prior to sending the Forward Link Skew Calibration Packet so that all existing data bits are calibrated. The client must indicate its ability to support the Forward Link Skew Calibration Packet via bit 19 of Client Feature Capability Indicators field of the Client Capability Packet.

Prior to performing skew calibration the host must not send data faster than the rate specified by the Pre-calibration Data Rate Capability field of the Client Capability Packet. However, after calibration is performed, the host may send data up to the rate defined by the Post-calibration Data Rate Capability field. It is recommended that the host send the Forward Link Skew Calibration Packet at regular intervals to correct

changes in the relative delay between the different signal pairs due to changes in temperature.

### Forward Link Skew Calibration Packet

| Packet Length | Packet Type=83 | hClient ID | Parameter CRC | All Zero 1 | Calibration Data Sequence | All Zero 2 |
|---------------|----------------|------------|---------------|------------|---------------------------|------------|
| 2 bytes       | 2 bytes        | 2 bytes    | 2 bytes       | 2 bytes    | Paket Length – 22 bytes   | 2 bytes    |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 83

hClient ID: set to zero

Parameter CRC: error check from packet length to the hClient ID.

All Zero 1:

8 bytes that contain eight 8-bit unsigned integers equal to zero. This field ensures that there will be a transition on MDDI\_STB at the beginning of the Calibration Data Sequence field. It also provides sufficient time for the client core logic to change the mode of the clock recovery circuit from using the XOR of MDDI\_Data0 and MDDI\_STB to simply using MDDI\_STB as the recovered clock.

Calibration Data Sequence:

a data sequence that causes the MDDI\_Data signals to toggle at every data period. The length of the Calibration Data Sequence field is determined by the interface type being used on the forward link. During the Calibration Data Sequence the MDDI host controller sets all MDDI\_Data signals equal to the strobe signal. The client clock recovery circuit must use only MDDI\_STB rather than MDDI\_STB XOR MDDI\_Data0 to recover the data clock while the Calibration Data Sequence field is being received by the client.

Depending on the exact phase of MDDI\_STB at the beginning of the Calibration Data Sequence field the Calibration Data Sequence will be one of the following based on the interface Type being used when this packet is sent:

**n** Type 1 – (64 byte data sequence) AAh, AAh ... or 55h, 55h...

**n** Type 2 – (128 byte data sequence) CCh, CCh ... or 33h, 33h...

All Zero 2:

8 bytes that contain eight 8-bit unsigned integers equal to zero. This field provides sufficient time for the client core logic to change the mode of the clock recovery circuit back to the original state, from using MDDI\_STB as the recovered clock to using the XOR of MDDI\_Data0 and MDDI\_STB.

### Client Capability Packet

It is recommended that the client send a Client Capability Packet to the host after forward link

synchronization is acquired, and it is required when requested by the host via the Reverse Link Flags in the Reverse Link Encapsulation Packet.

### Client Capability Packet

|               |                |            |                  |                      |                                      |                           |
|---------------|----------------|------------|------------------|----------------------|--------------------------------------|---------------------------|
| Packet Length | Packet Type=66 | cClient ID | Protocol Version | Min Protocol Version | Pre-calibration Data Rate Capability | Interface Type Capability |
| 2 bytes       | 2 bytes        | 2 bytes    | 2 bytes          | 2 bytes              | 2 bytes                              | 1 byte                    |

|                       |                                       |              |               |                      |                       |                |
|-----------------------|---------------------------------------|--------------|---------------|----------------------|-----------------------|----------------|
| Number of Alt Display | Post-calibration Data Rate Capability | Bitmap Width | Bitmap Height | Display Window Width | Display Window Height | Color Map Size |
| 1 byte                | 2 bytes                               | 2 bytes      | 2 bytes       | 2 bytes              | 2 bytes               | 4 bytes        |

|                     |                |                       |            |                    |                  |            |
|---------------------|----------------|-----------------------|------------|--------------------|------------------|------------|
| Color Map RGB Width | RGB Capability | Monochrome Capability | Reversed 1 | Y Cb Cr Capability | Bayer Capability | Reversed 2 |
| 2 bytes             | 2 bytes        | 1 byte                | 1 byte     | 2 bytes            | 2 bytes          | 2 bytes    |

|                           |                      |                      |                    |                    |                          |                              |
|---------------------------|----------------------|----------------------|--------------------|--------------------|--------------------------|------------------------------|
| Client Feature Capability | Max Video Frame Rate | Min Video Frame Rate | Min Sub-frame Rate | Audio Buffer Depth | Audio Channel Capability | Audio Sample Rate Capability |
| 4 bytes                   | 1 byte               | 1 byte               | 2 bytes            | 2 bytes            | 2 bytes                  | 2 bytes                      |

|                         |                       |                            |                      |                             |                         |          |
|-------------------------|-----------------------|----------------------------|----------------------|-----------------------------|-------------------------|----------|
| Audio Sample Resolution | Mic Sample Resolution | Mic Sample Rate Capability | Keyboard Data Format | Pointing Device Data Format | Content Protection Type | Mfr Name |
| 1 byte                  | 1 byte                | 2 bytes                    | 1 byte               | 1 byte                      | 2 bytes                 | 2 bytes  |

|              |            |               |             |             |         |
|--------------|------------|---------------|-------------|-------------|---------|
| Product Code | Reversed 3 | Serial Number | Week of Mfr | Year of Mfr | CRC     |
| 2 bytes      | 2 bytes    | 4 bytes       | 1 byte      | 1 byte      | 2 bytes |

### Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 66

cClient ID: set to zero

Protocol Version: set to 0002h

Min Protocol Version: specify the minimum protocol version (0001h)

Pre-Calibration Data Rate Capability: specify the maximum data rate the client can receive (190h)

Interface Type Capability: Client can function in Type 2 (2-bit) mode on the forward link (01h)

Number of Alt Displays: set to zero

Post-Calibration Data Rate Capability: specify the maximum data rate the client can receive (190h)

Bitmap Width: specify the width of the bitmap (1E0h)  
Bitmap Height: specify the height of the bitmap (320h)  
Display Window Width: specify the width of the display window (1E0h)  
Display Window Height: specify the height of the display window (320h)  
Color Map Size: set to zero  
Color Map RGB Width: set to zero  
RGB Capability: specify the resolution of RGB format (0888h)  
Monochrome Capability: set to zero  
Reserved 1: set to zero  
Y Cb Cr Capability: set to zero  
Bayer Capability: set to zero  
Reserved 2: set to zero  
Client Feature Capability Indicators: 00CC8000h  
Maximum Video Frame Rate Capability: specify the maximum video frame (3Ch)  
Minimum Video Frame Rate Capability: specify the minimum video frame (3Ch)  
Minimum Sub-frame Rate: specify the minimum sub-frame rate (00h)  
Audio Buffer Depth: set to zero  
Audio Channel Capability: set to zero  
Audio Sample Rate Capability: Set to zero  
Audio Sample Resolution: set to zero  
Mic Audio Sample Resolution: set to zero  
Mic Sample Rate Capability: set to zero  
Keyboard Data Format: set to zero  
Pointing Device Data Format: set to zero  
Content Protection Type: set to zero  
Mfr Name: set to 0000h  
Product Code: set to 6812h  
Reserved 3: set to zero  
Serial Number: set to zero  
Week of Manufacture: set to zero  
Year of Manufacture: 00h  
CRC: error check

## Client Request and Status Packet

The host needs a small amount of information from the client so it can configure the host-to-client link in an optimum manner. The Client Request and Status Packet is required to report errors and status to the host.

Client Request and Status Packet

| Packet Length | Packet Type=70 | cClient ID | Reverse Link Request | CRC Error Count | Client Status | Client Busy Flags | CRC     |
|---------------|----------------|------------|----------------------|-----------------|---------------|-------------------|---------|
| 2 bytes       | 2 bytes        | 2 bytes    | 2 bytes              | 1 byte          | 1 byte        | 2 bytes           | 2 bytes |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 70

cClient ID: set to zero

Reverse Link Request: specify the number of bytes the client needs in the reverse link in the next sub-frame to send information to the host.

CRC Error Count: count the number of CRC errors occurred

Client Status:

- n** Bit 0 - 1: capability has changed  
0: capability has not changed
- n** Bit 1 - indicates the client has detected an error
- n** Bit [7:2] - set to zero

Client Busy Flags:

- n** Bit 0 - bitmap block transfer function is busy
- n** Bit 1 - bitmap area fill function is busy
- n** Bit 2 - bitmap pattern fill function is busy
- n** Bit 3 - the graphics subsystem is busy
- n** Bit [15:4] - set to zero

CRC: error check

## Register Access Packet

Register Access Packet is utilized when setting instruction to the RM68180. This packet cannot be used for RAM access.

Register Access Packet

| Packet Length | Packet Type=146 | bClient ID | Read/Write Info | Register Address | Parameter CRC | Register Data List        | Register Data CRC |
|---------------|-----------------|------------|-----------------|------------------|---------------|---------------------------|-------------------|
| 2 bytes       | 2 bytes         | 2 bytes    | 2 bytes         | 4 bytes          | 2 bytes       | (Packet Length -14) bytes | 2 bytes           |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 146

bClient ID: set to zero

Read/Write Info:

| Bits[15:14] | Read/Write Flags |
|-------------|------------------|
| 00          | Write            |
| 01          | Reserved         |
| 10          | Read             |
| 11          | Response to read |

Bit [13:0] – specifies the number of 32-bit register data list items to be transferred in the Register Data List Filed.

Register Address: upper bits shall set to zero

Parameter CRC: error check from packet length to the register address

Register Data List: written (or read) registers to (from) client

Register Data CRC: error check of the register data list

## Video Stream Packet

The RM68180 supports the Video Stream Packet to transfer display data including RGB data to RAM.

### Video Stream Packet

| Packet Length | Packet Type=16 | bClient ID | Video Data Format Desriptor | Pixel Data Attributes | X Left Edge | Y Top Edge |
|---------------|----------------|------------|-----------------------------|-----------------------|-------------|------------|
| 2 bytes       | 2 bytes        | 2 bytes    | 2 bytes                     | 2 bytes               | 2 bytes     | 2 bytes    |

| X Right Edge | Y Bottom Edge | X Start | Y Start | Pixel Count | Parameter CRC | Pixel Data                | Pixel Data CRC |
|--------------|---------------|---------|---------|-------------|---------------|---------------------------|----------------|
| 2 bytes      | 2 bytes       | 2 bytes | 2 bytes | 2 bytes     | 2 bytes       | (Packet Length -26) bytes | 2 bytes        |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 16

bClient ID: set to zero

Video Data Format Descriptor

| [15:12]                 | [11:18] | [7:4] | [3:0] | Transfer pixel format                         |
|-------------------------|---------|-------|-------|-----------------------------------------------|
| 0101                    | 0x8     | 0x8   | 0x8   | Packed 24 bits pixel RGB format (R:G:B=8:8:8) |
| 0101                    | 0x6     | 0x6   | 0x6   | Packed 18 bits pixel RGB format (R:G:B=6:6:6) |
| 0101                    | 0x5     | 0x6   | 0x5   | Packed 16 bits pixel RGB format (R:G:B=5:6:5) |
| Others setting disabled |         |       |       |                                               |

Pixel Data Attributes: The pixel data is written to RAM buffer of RM68180 (00C3h)

X Left Edge: Specify the X coordinate of the left edge of the screen window filled by the Pixel Data field.

Y Top Edge: Specify the Y coordinate of the top edge of the screen window filled by the Pixel Data field

X Right Edge: Specify the X coordinate of the right edge of the window being updated.

Y Bottom Edge: Specify the Y coordinate of the bottom edge of the window being updated.

X Start: Specify X start address for the first pixel in the Pixel Data field below.

Y Start: Specify Y start address for the first pixel in the Pixel Data field below.

Pixel Count: specify the number of pixels

Parameter CRC: error check from packet length to the pixel count

Pixel Data: the raw video data

Pixel Data CRC: error check of the pixel data

Pixel Data Format

| MDDI data byte |          | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Color                                        |
|----------------|----------|----|----|----|----|----|----|----|----|----------------------------------------------|
| RGB<br>5:6:5   | Byte n   | G2 | G1 | G0 | B4 | B3 | B2 | B1 | B0 | 65-Color<br>(1 pixel/ 16 bits RGB format)    |
|                | Byte n+1 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 |                                              |
| RGB<br>6:6:6   | Byte n   | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 | 262K-Color<br>(1 pixel/ 18 bits RGB format)  |
|                | Byte n+1 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 |                                              |
|                | Byte n+2 | B5 | B4 | B3 | B2 | B1 | B0 | R5 | R4 |                                              |
| RGB<br>8:8:8   | Byte n   | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | 16.7M-Color<br>(1 pixel/ 24 bits RGB format) |
|                | Byte n+1 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 |                                              |
|                | Byte n+2 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |                                              |

## Flexible Video Stream Packet

The RM68180 supports the Flexible Video Stream Packet to transfer display data including RGB data to

RAM. This allows for a reduction in the number of fields sent in an environment where one or more fields are



not changing values.

## Flexible Video Stream Packet

| Packet Length | Packet Type=20 | bClient ID | Field Present<br>Flags | Video Data Format<br>Description | Pixel Data<br>Attributes | X Left Edge | Y Top Edge |
|---------------|----------------|------------|------------------------|----------------------------------|--------------------------|-------------|------------|
| 2 bytes       | 2 bytes        | 2 bytes    | 2 bytes                | 2 bytes                          | 2 bytes                  | 2 bytes     | 2 bytes    |

| X Right Edge | Y Bottom Edge | X Start | Y Start | Pixel Count | Parameter CRC | Pixel Data                              | Pixel Data CRC |
|--------------|---------------|---------|---------|-------------|---------------|-----------------------------------------|----------------|
| 2 bytes      | 2 bytes       | 2 bytes | 2 bytes | 2 bytes     | 2 bytes       | Packet Length –<br>present header bytes | 2 bytes        |

### Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 20

bClient ID: set to zero

Field Present Flags: indicates the field in the packet is present (value “1”) or not present (value “0”).

- Bit 0: indicates the presence of the Video Data Format Description Field.
- Bit 1: indicates the presence of the Pixel Data Attributes Field.
- Bit 2: indicates the presence of the X Left Edge Field.
- Bit 3: indicates the presence of the Y Top Edge Field.
- Bit 4: indicates the presence of the X Right Edge Field.
- Bit 5: indicates the presence of the Y Bottom Edge Field.
- Bit 6: indicates the presence of the X Start Field.
- Bit 7: indicates the presence of the Y Start Field.
- Bit 8: indicates the presence of the Pixel Count Field.
- Bits [15:9] are all “0”.

### Video Data Format Descriptor

| [15:12]                 | [11:18] | [7:4] | [3:0] | Transfer pixel format                         |
|-------------------------|---------|-------|-------|-----------------------------------------------|
| 0101                    | 0x8     | 0x8   | 0x8   | Packed 24 bits pixel RGB format (R:G:B=8:8:8) |
| 0101                    | 0x6     | 0x6   | 0x6   | Packed 18 bits pixel RGB format (R:G:B=6:6:6) |
| 0101                    | 0x5     | 0x6   | 0x5   | Packed 16 bits pixel RGB format (R:G:B=5:6:5) |
| Others setting disabled |         |       |       |                                               |

X Left Edge: Specify the X coordinate of the left edge of the screen window filled by the Pixel Data field.

Y Top Edge: Specify the Y coordinate of the top edge of the screen window filled by the Pixel Data field



X Right Edge: Specify the X coordinate of the right edge of the window being updated.

Y Bottom Edge: Specify the Y coordinate of the bottom edge of the window being updated.

X Start: Specify X start address for the first pixel in the Pixel Data field below.

Y Start: Specify Y start address for the first pixel in the Pixel Data field below.

Pixel Data Attributes: The pixel data is written to RAM buffer of RM68180 (00C3h)

Pixel Count: specify the number of pixels

Parameter CRC: error check from packet length to the pixel count

Pixel Data: the raw video data

Pixel Data CRC: error check of the pixel data

## Windowless Video Stream Packet

The RM68180 supports the Windowless Video Stream Packet to transfer display data including RGB data to RAM. This packet type assumes that full screen updates are always occurring and therefore there is no need for the window information.

### Windowless Video Stream Packet

| Packet Length | Packet Type=22 | bClient ID | Video Data Format Description | Pixel Data Attributes | Pixel Count | Parameter CRC |
|---------------|----------------|------------|-------------------------------|-----------------------|-------------|---------------|
| 2 bytes       | 2 bytes        | 2 bytes    | 2 bytes                       | 2 bytes               | 2 bytes     | 2 bytes       |

| Pixel Data               | Pixel Data CRC |
|--------------------------|----------------|
| Packet Length – 14 bytes | 2 bytes        |

Packet Contents:

Packet Length: packet length not including the packet length field

Packet Type: packet type is 22

bClient ID: set to zero

Video Data Format Descriptor

| [15:12]                 | [11:18] | [7:4] | [3:0] | Transfer pixel format                         |
|-------------------------|---------|-------|-------|-----------------------------------------------|
| 0101                    | 0x8     | 0x8   | 0x8   | Packed 24 bits pixel RGB format (R:G:B=8:8:8) |
| 0101                    | 0x6     | 0x6   | 0x6   | Packed 18 bits pixel RGB format (R:G:B=6:6:6) |
| 0101                    | 0x5     | 0x6   | 0x5   | Packed 16 bits pixel RGB format (R:G:B=5:6:5) |
| Others setting disabled |         |       |       |                                               |

Pixel Data Attributes: The pixel data is written to RAM buffer of RM68180 (00C3h)

Pixel Count: specify the number of pixels

Parameter CRC: error check from packet length to the pixel count

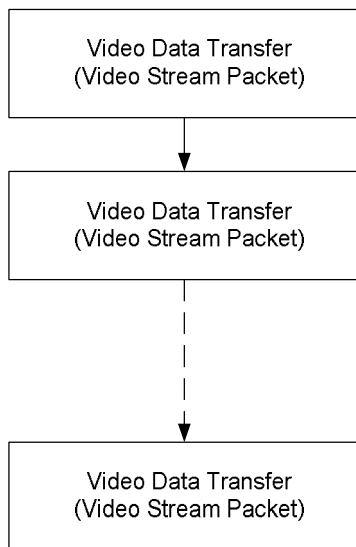
Pixel Data: the raw video data

Pixel Data CRC: error check of the pixel data

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### 7.7.3 Writing Video Data to Memory Sequence

In order to write video data to memory, the following sequence should be programmed. This packet should be followed by video stream packets.

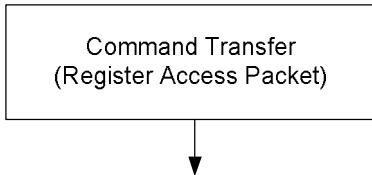


Writing Video Data to Memory Sequence

#### 7.7.4 Writing Register Sequence

In order to write registers, register access packet should be used. Register access packet is used to write data to register.

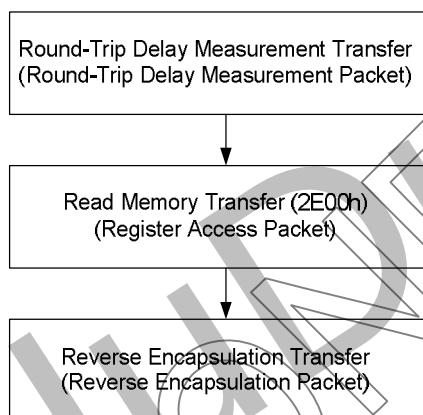
Writing Register Sequence:



#### 7.7.5 Reading Video Data from Memory Sequence

In order to read a pixel data from memory (readable one pixel only), the following sequence should be programmed. Memory read command (2E00h) is followed by reverse encapsulation packet. DDI transmits video pixel data through encapsulation packet. Please refer to VESA spec for detailed description.

Reading Video Data from Memory Sequence:



Notes:

1. X addresses for memory data read is set by 2A00h and 2A01h (XS[15:0]).

The parameters of 2A00h and 2A01h are stored on relative registers while command 2A00h~2A03h are executed completely. See also section “6.1 User Command Set” and Note 2.

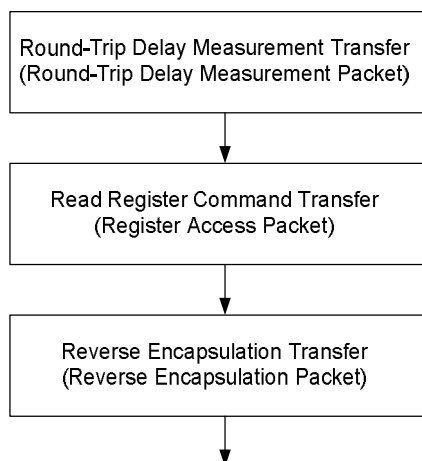
2. Y addresses for memory data read is set by 2B00h and 2B01h (YS[15:0]).

The parameters of 2B00h and 2B01h are stored on relative registers while command 2B00h~2B03h are executed completely. See also section “6.1 User Command Set” and Note 2.

### 7.7.6 Reading Register Sequence

In order to read registers, the following sequence should be programmed. Next, register read command is followed by reverse encapsulation packet. DDI transmits register data through encapsulation packet. Please refer to VESA spec for detailed description.

Reading Register Sequence:



### 7.7.7 Hibernation Setting

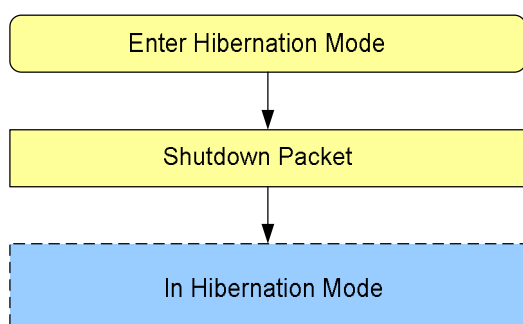
The Client MDDI of the RM68180 provides a hibernation setting. The methods for waking up the hibernation mode can be determined based on actual usage.

| Wake-up                | Condition                          |
|------------------------|------------------------------------|
| Host-Initiated Wake-up | Wake up the MDDI link by MDDI Host |

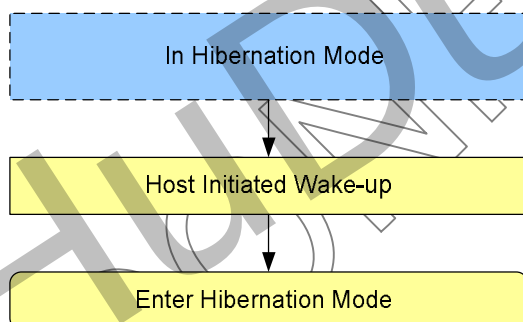
Note: In the Hibernation state, the data is retained in RAM and the display operation is maintained.

Hibernation setting and wake-up sequence must in accordance with VESA-MDDI specifications.

#### Hibernation setting sequence



#### Hibernation Wake-up sequence



### 7.7.8 MDDI Deep Standby Mode Setting

The Client MDDI of the RM68180 includes a MDDI deep standby mode setting so it can enter a off state and reduce power consumption during Hibernation mode.

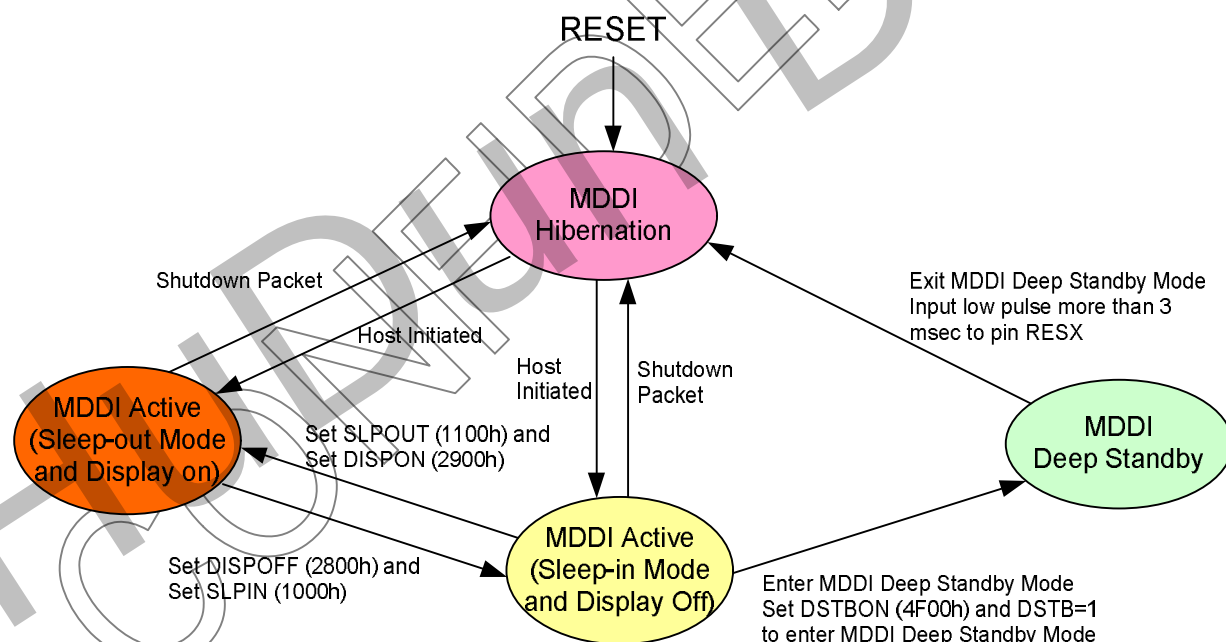
The MDDI enters Hibernation mode when a Shutdown Packet is sent. The standby power needs of the Client MDDI can be reduced, even while the MDDI Link is maintained in Hibernation mode.

When entering MDDI deep standby mode, the RM68180 stops operation rather than maintaining Hibernation mode. Input low pulse 3 msec from RESX pin to cancel deep standby mode, after which a Host-Initiated Wake-up should cancel the Hibernation mode.

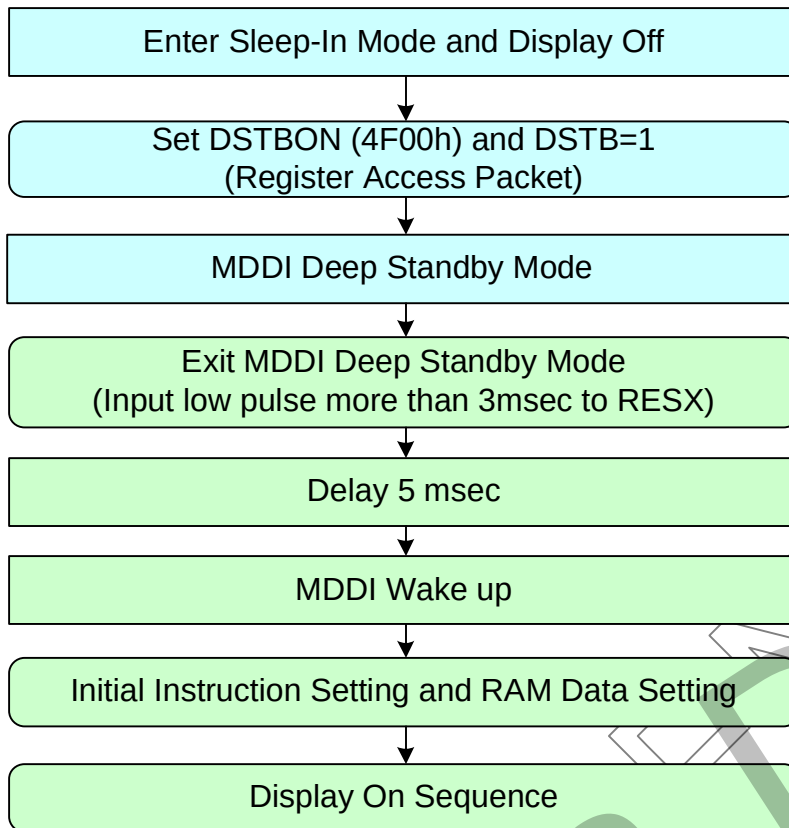
When in deep standby mode, instruction settings and RAM data are not stored, so they must be reset after Hibernation mode is cancelled.

Follow the sequence indicated in the VESA MDDI specifications when initiating or canceling the Hibernation mode.

State Transitions in MDDI Deep Standby Mode:



Note: When the RM68180 is in the MDDI Hibernation mode or MDDI deep standby mode, both links are in the link hibernation states.

**MDDI Deep Standby Mode Sequence**

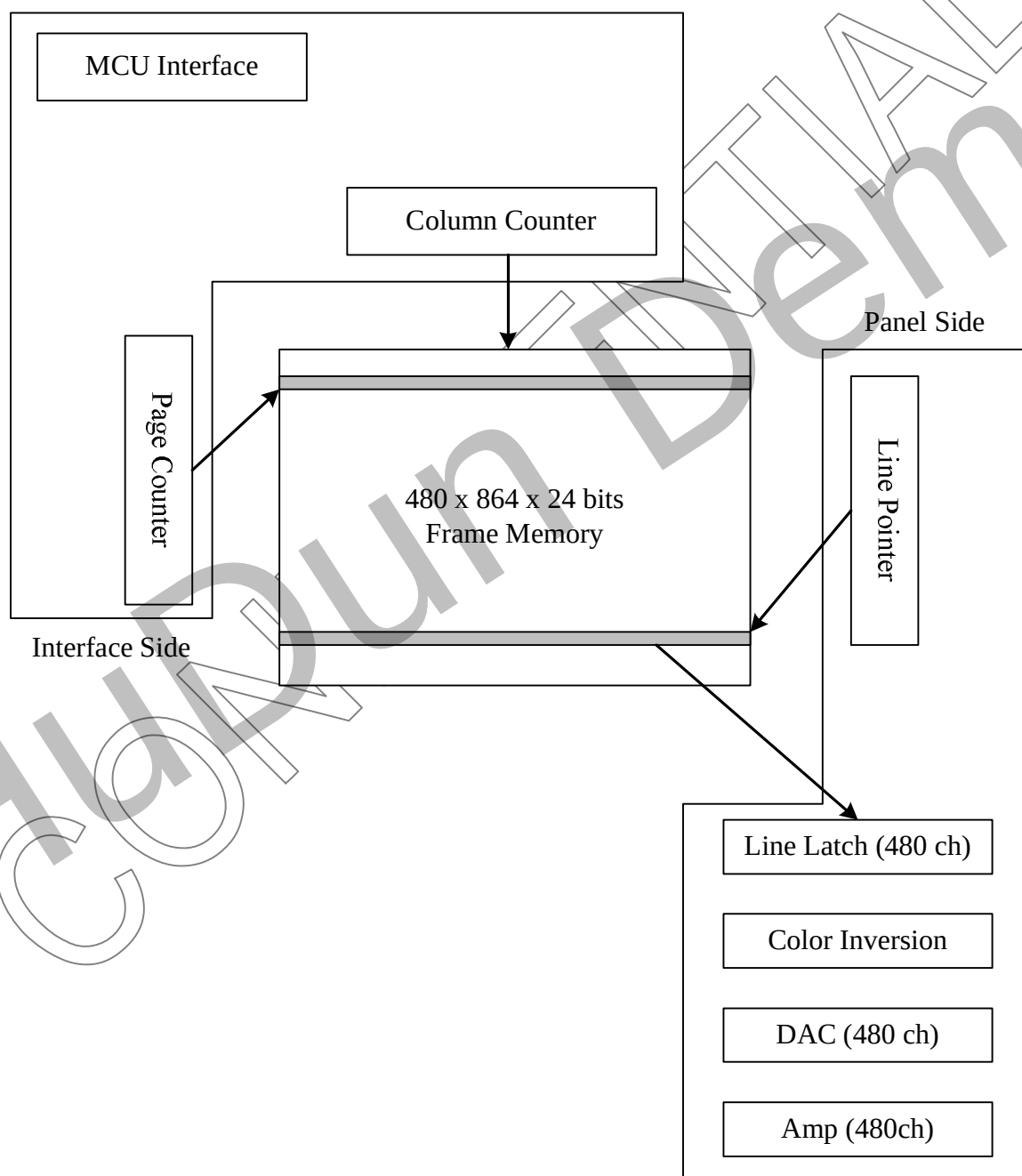
Note: When in MDDI Deep Standby mode, instruction settings and RAM data are not stored, so they must be reset after Hibernation mode is cancelled.



## 7.8 Display Data RAM

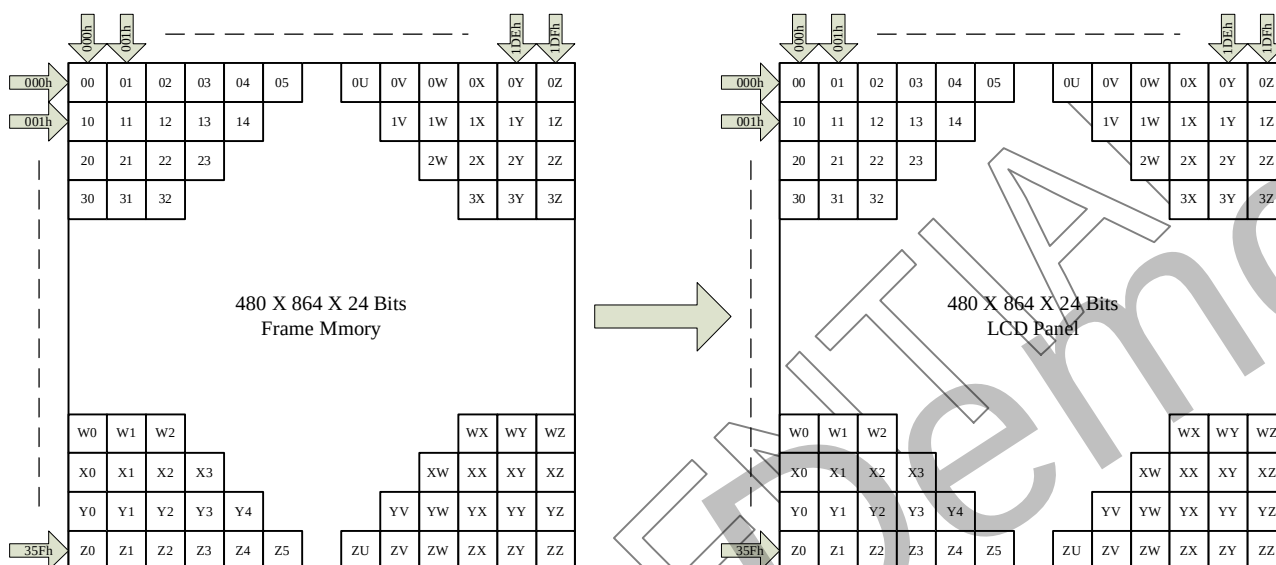
### 7.8.1 Configuration

The display data RAM stores display dots and consists of 9,953,280bits (480 x 24 x 864 bits). There is no restriction on access to the RAM even when the display data on the same address is loaded to DAC. There will be no abnormal visible effect on the display when there is a simultaneous Panel Read and Interface Read or Write to the same location of the frame memory.



## 7.8.2 Memory to Display Address Mapping

In this mode, content of the frame memory within an area where column pointer is 0000h to 01DFh and page pointer 0000h to 035Fh is displayed. To display a dot on leftmost top corner, store the dot data at (column pointer, page pointer) = (0, 0).

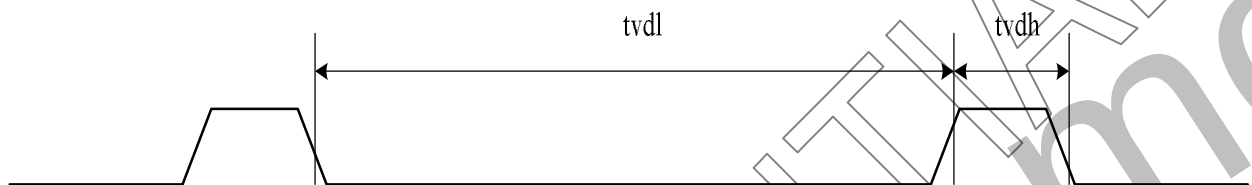


## 7.9 Tearing Effect Output

The tearing effect output line supplies to the MCU a panel synchronization signal. This signal can be enabled or disabled by the `set_tear_off` (34h) and `set_tear_on` (35h) commands. The mode of the tearing effect signal is defined by the parameter of the `set_tear_on` (35h) and `set_tear_scanline`(44h) commands. The signal can be used by the MCU to synchronize Frame Memory Writing when displaying video images.

### 7.9.1 Tearing Effect Line Mode

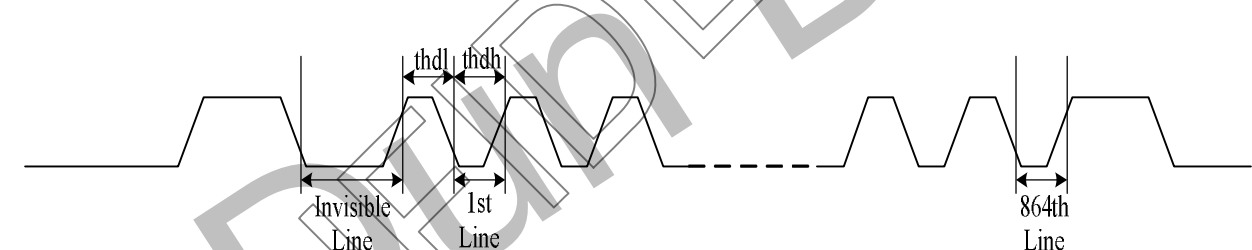
Mode 1, the tearing effect output signal consist of V-sync information only:



tvdh = The LCD display is not updated from the frame memory.

tvdh = The LCD display is updated from the frame memory.

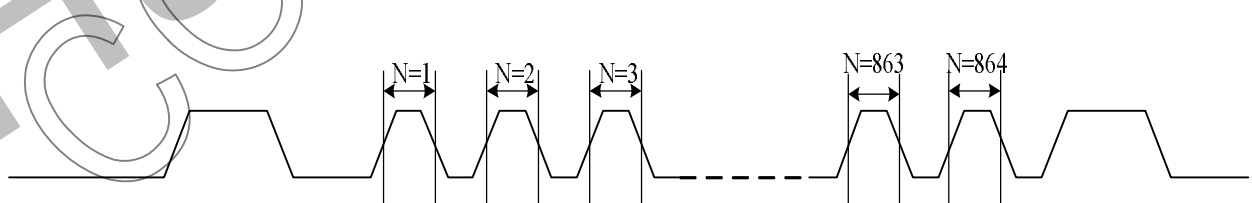
Mode 2, the tearing effect output signal consist of V-sync and H-sync information:



thdh = The LCD display is not updated from the frame memory.

thdh = The LCD display is updated from the frame memory.

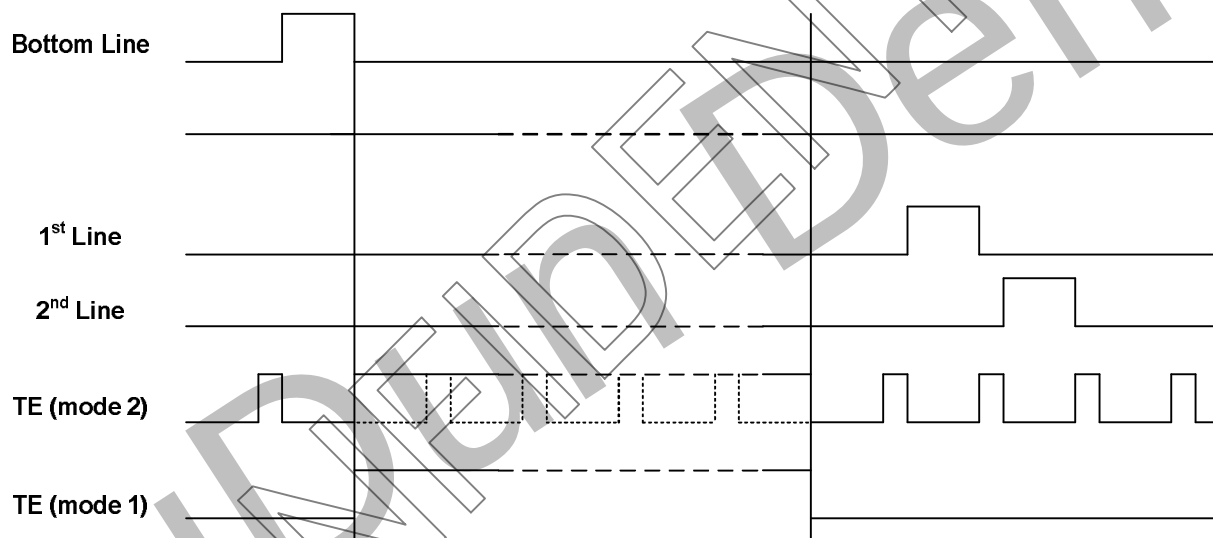
Mode 3, this mode turn on the tearing effect output signal when vertical scanning reaches line N.



N = The N-th scanning line which set by register N[15:0] of command `STESL`(44h).

The TE mode selection is described as below table:

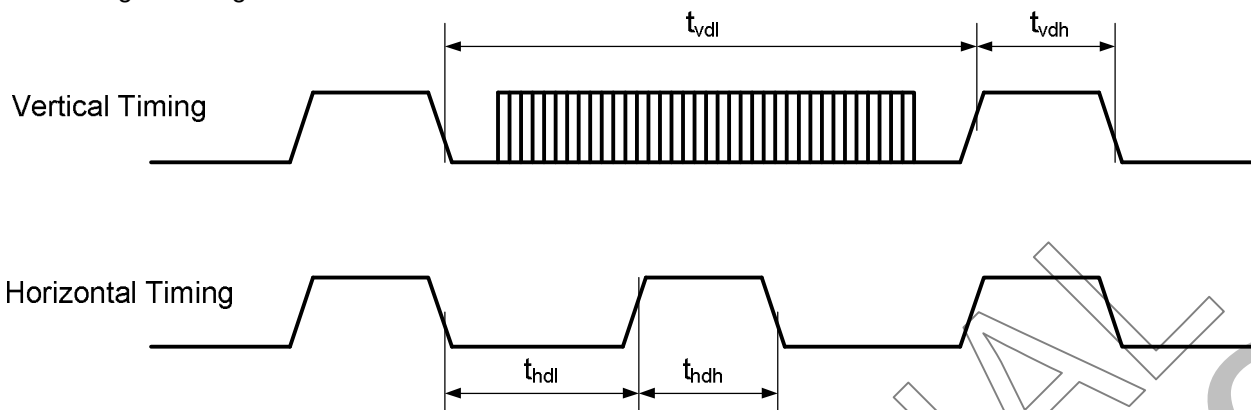
| DOPCTR<br>(B100h) | TEOFF (34h)<br>TEON (35h) | STESL (44h) | TE Output                                         |
|-------------------|---------------------------|-------------|---------------------------------------------------|
| DSITE             | TELOM                     | N[15:0]     |                                                   |
| 0                 | X                         | X           | TE off (output keep low)                          |
| 1                 | 34h                       | X           | TE off (output keep low)                          |
| 1                 | 35h and TELOM=0           | N[15:0]=0   | Mode 1: TE high in V-porch region                 |
| 1                 | 35h and TELOM=0           | N[15:0]≠0   | Mode 3: TE high at N-th line                      |
| 1                 | 35h and TELOM=1           | X           | Mode 2: TE high in all V-porch and H-porch region |



Note. During Sleep In mode, the tearing effect output signal is active low.

### 7.9.2 Tearing Effect Line Timing

The tearing effect signal is described as below:

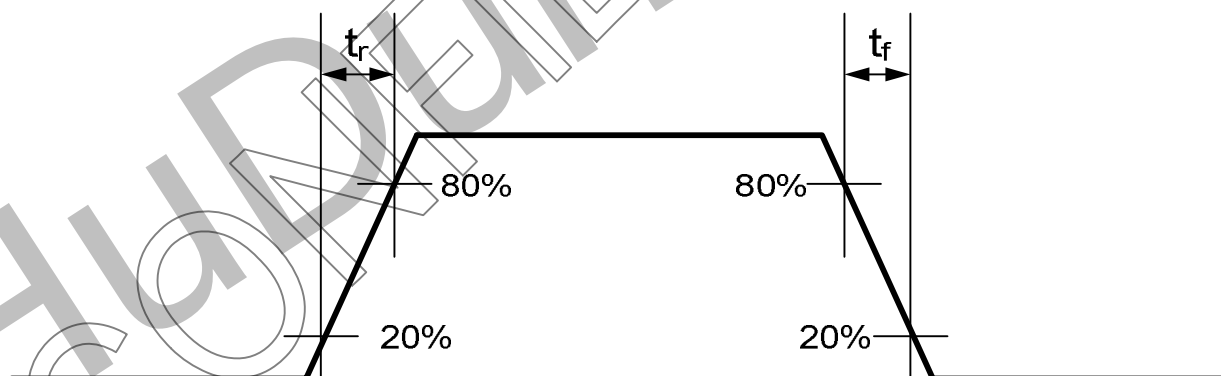


AC characteristics of Tearing Effect Signal (Frame Rate = 60.5Hz)

| Symbol | Parameter                       | Min. | Max. | Unit | Description |
|--------|---------------------------------|------|------|------|-------------|
| tvdl   | Vertical timing low duration    | TBD  |      | ms   |             |
| tvdh   | Vertical timing high duration   | TBD  |      | us   |             |
| thdl   | Horizontal timing low duration  | TBD  |      | us   |             |
| thdh   | Horizontal timing high duration | TBD  |      | us   |             |

Notes:

1. The timings apply when MADCTL B4=0 and B4=1
2. The signal's rise and fall times ( $t_f$ ,  $t_r$ ) are stipulated to be equal to or less than 15ns.

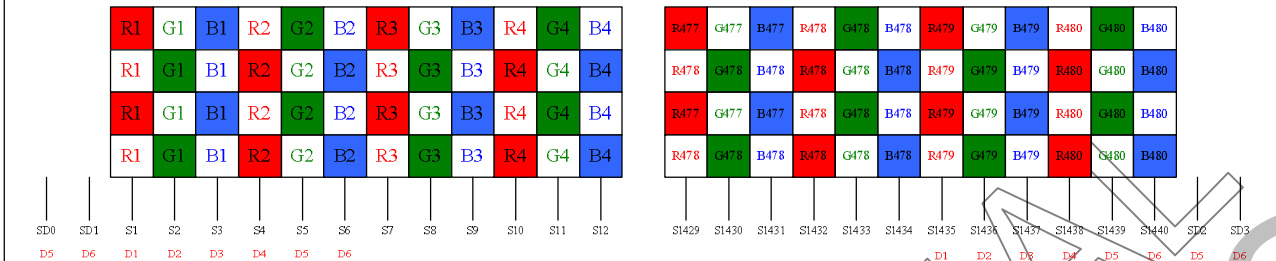


## 7.10 Panel Type

### 7.10.1 Normal Type

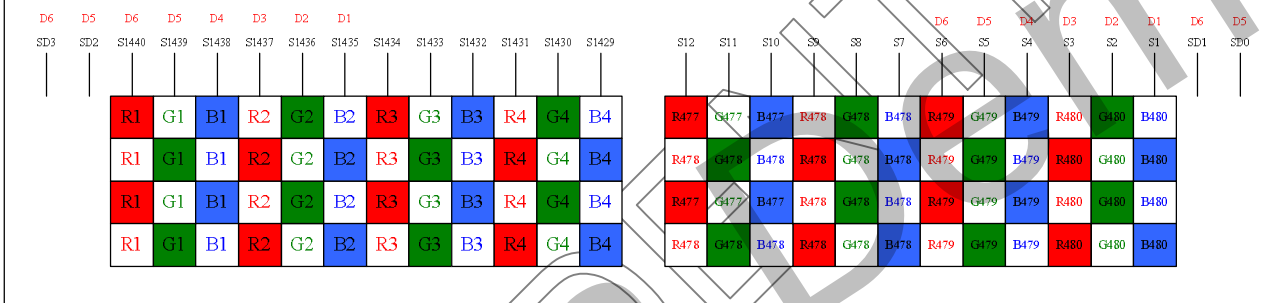
Bottom Side

normal (CTB=0, CRL=0, CRGB=0)



Upper Side

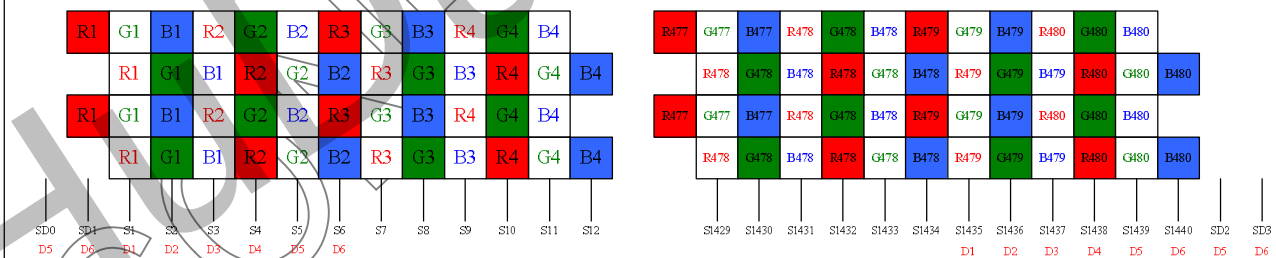
normal (CTB=0, CRL=1, CRGB=1)



### 7.10.2 Zigzag Type 1

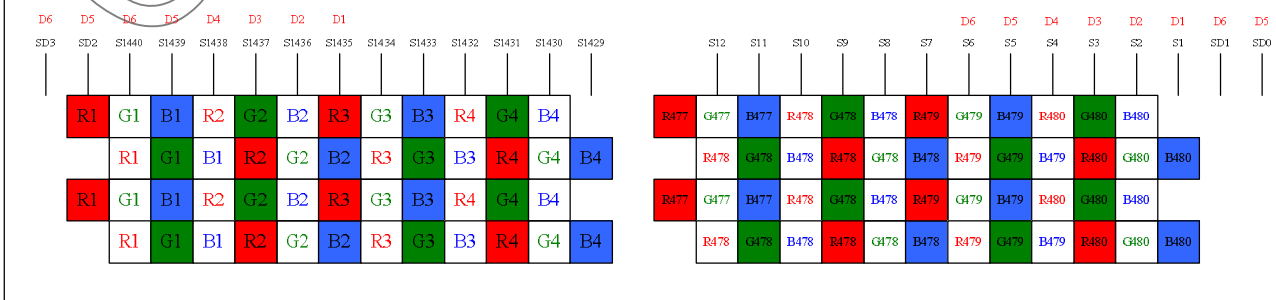
Bottom Side

Type 1 : ZZ\_RL=1, ZZ\_EO=0 (CTB=0, CRL=0, CRGB=0)



Upper Side

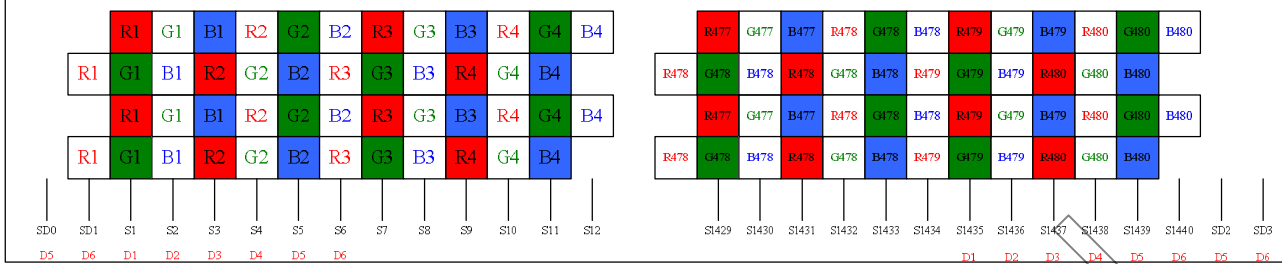
Type 1 : ZZ\_RL=0, ZZ\_EO=0 (CTB=0, CRL=1, CRGB=1)



## 7.10.3 Zigzag Type 2

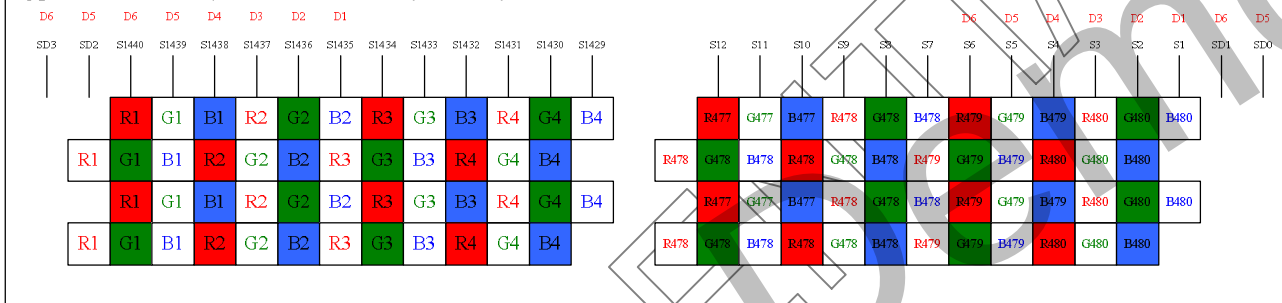
### Bottom Side

Type 2 : ZZ\_RL=1, ZZ\_EO=1(CTB=0, CRL=0, CRGB=0)



### Upper Side

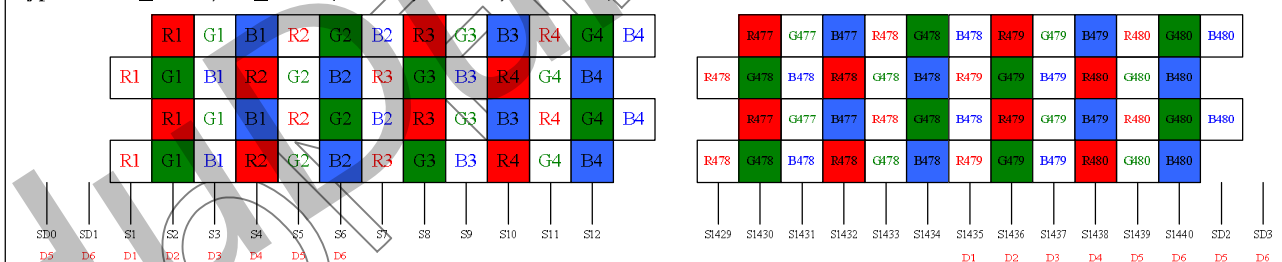
Type 2 : ZZ\_RL=0, ZZ\_EO=1(CTB=0, CRL=1, CRGB=1)



## 7.10.4 Zigzag Type 3

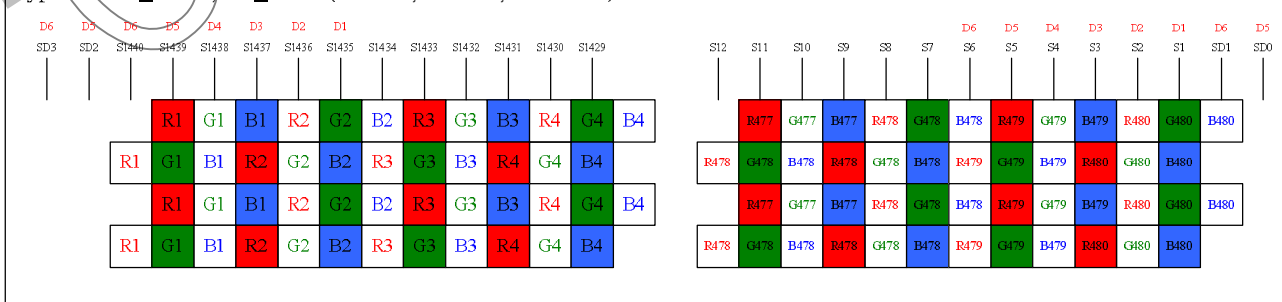
### Bottom Side

Type 3 : ZZ\_RL=0, ZZ\_EO=0(CTB=0, CRL=0, CRGB=0)



### Upper Side

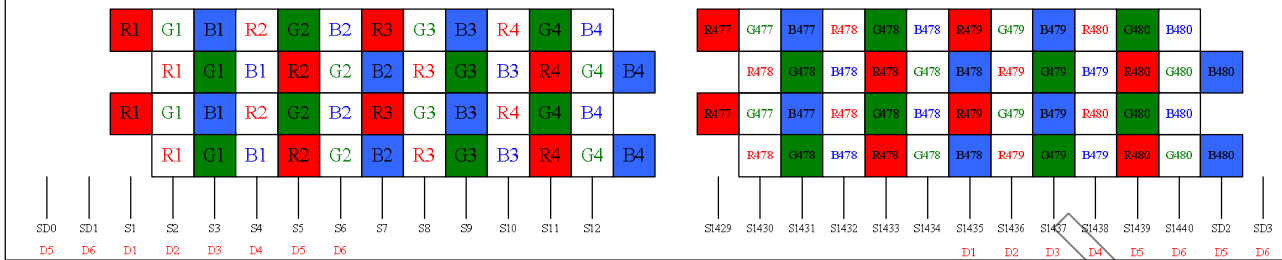
Type 3 : ZZ\_RL=1, ZZ\_EO=0(CTB=0, CRL=1, CRGB=1)



## 7.10.5 ZigZag Type 4

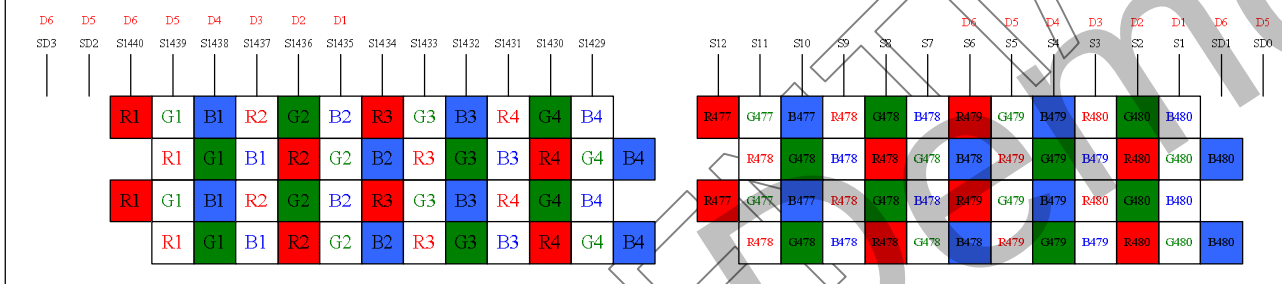
### Bottom Side

Type 4 : ZZ\_RL=0, ZZ\_EO=1(CTB=0, CRL=0, CRGB=0)



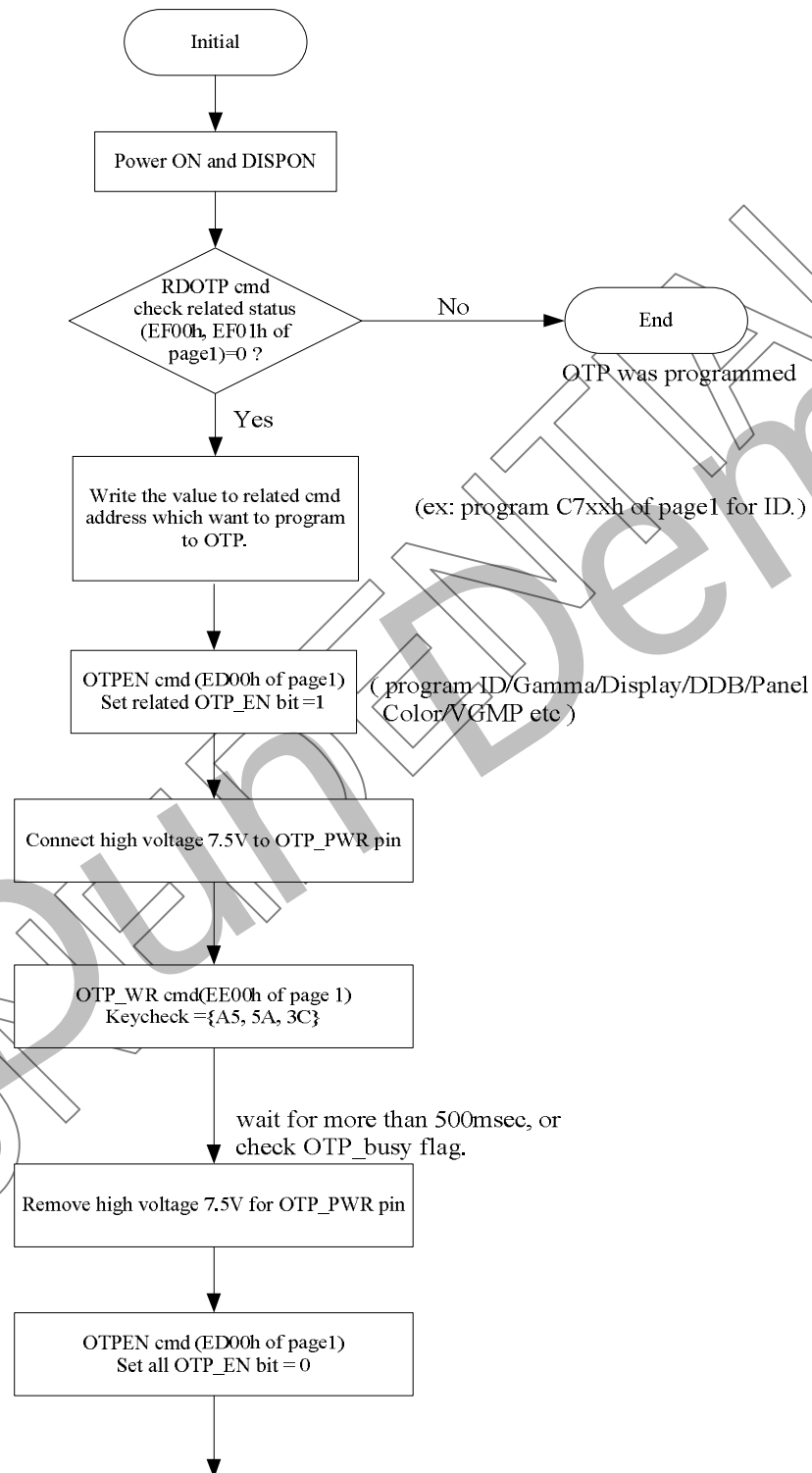
### Upper Side

Type 4 : ZZ\_RL=1, ZZ\_EO=1(CTB=0, CRL=1, CRGB=1)





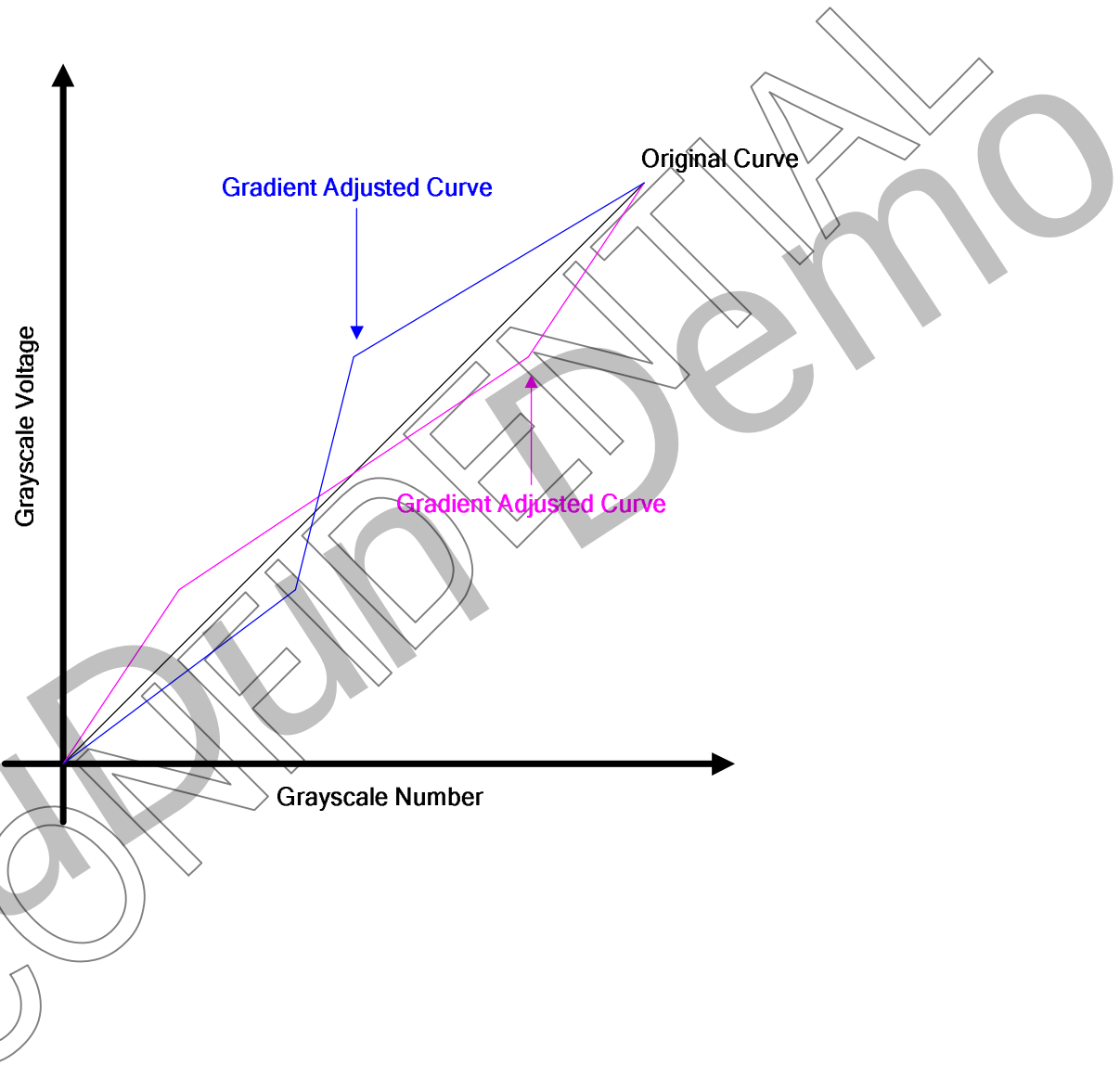
## 7.11 OTP Program Sequence



## OTP Programming Flow

## 7.12 Independent Gamma Correction Function

The RM68180 supports independent gamma adjustment function for R color, G color and B color to display in 16.7M colors. The function is performed by determining grayscale levels that use gamma adjustment registers. The RM68180 also provides gradient control registers for adjustments of gamma curve.



### 7.13 Dynamic Backlight Control

The function of Dynamic Display Backlight is used to reduce the power consumption of display backlight. It includes Content Adaptive Brightness Control (CABC) and Light-Sensor Automatic Brightness Control (LABC) functions. Both two functions are used to generate a proper PWM signal according to display image and ambient light information. User could apply this PWM signal to control other device(s) (Such as power IC or LED driver IC). When the CABC and LABC functions are enabled and cooperate with external circuits (such as LED driver circuit), the power consumption of backlight will be reduced with keeping acceptable display quality.

The CABC function is used to reduce the power consumption of display backlight. Contents adaptation means that the grayscale level of image contents is raised while lowering brightness of the backlight simultaneously to keep same perceived brightness. The adjustment of grayscale level and brightness reduction is based on the display image contents. Thus the power consumption reduction depends on the contents of the image. The display image and brightness are dynamically processed by CABC block.

In order to achieve a better display quality and reduce power consumption of the backlight at the same time, there are 3 different modes, user interface image mode, still picture mode and moving image mode, for user selections.

The LABC function combines several mechanisms to provide a smooth control of sensed light information. Flicker Removal is used to eliminate external light source flicker (e.g. 50 and 60 Hz). Hysteresis is used for preventing the transient variation of luminance. When the LABC function is enabled, the information of the ambient light is sent to the brightness control block. The user can read ambient light information or this information can be used for automatic brightness control by the brightness control block. It is also possible to control the brightness manually.

With combination of the CABC and the LABC processed results, the display output brightness is adjusted.

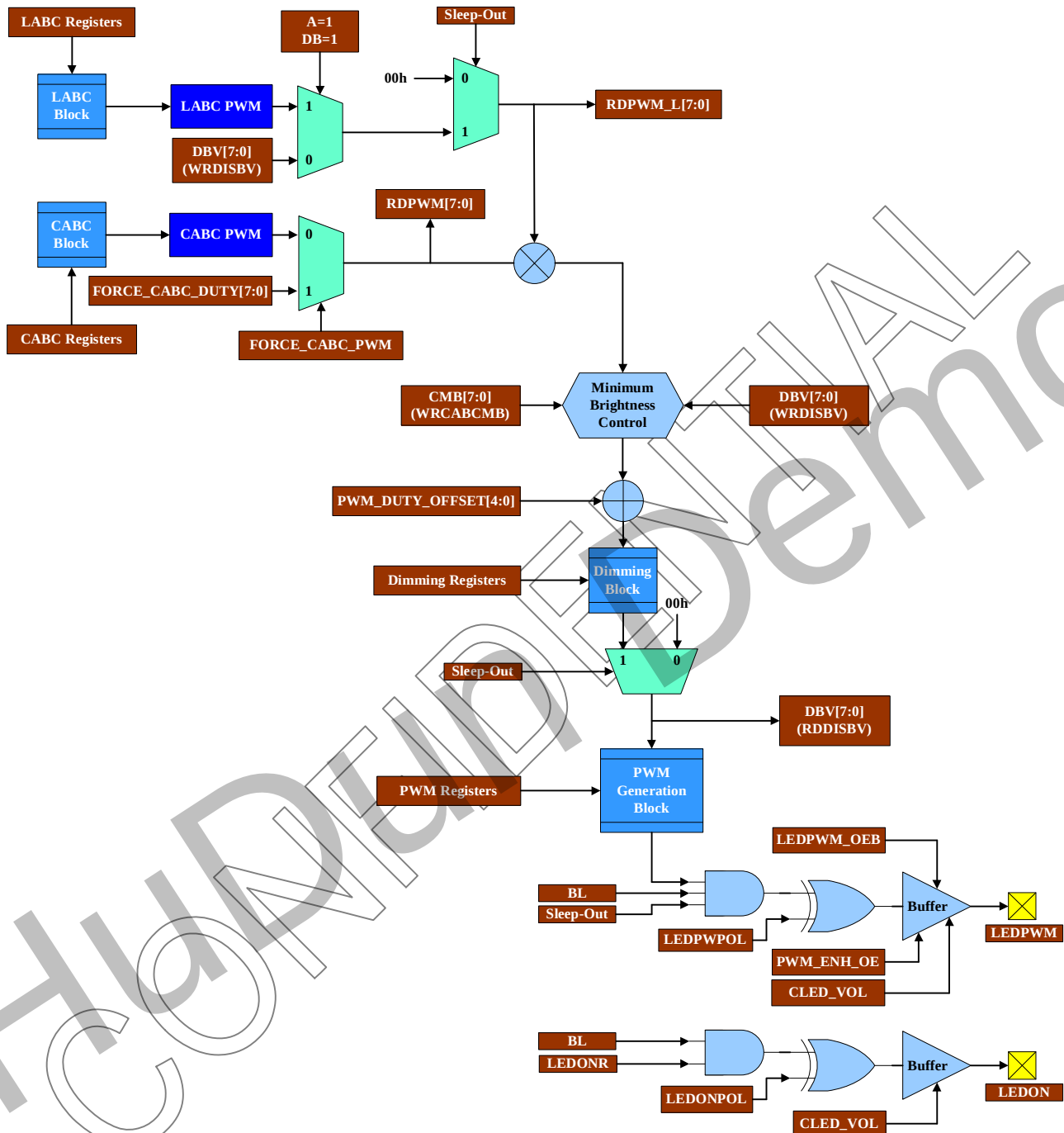
Display Backlight Brightness = LABC Brightness Ratio (or Manual Setting Ratio) x CABC Brightness Ratio

The function of CABC affects both display brightness ratio and grayscale level. The function of LABC affects display brightness ratio only.

Display Brightness Output of combinations of CABC and LABC function

|               | LABC(Manual)<br>Brightness Ratio | CABC(Manual)<br>Brightness Ratio | Calculation<br>Ratio | Brightness Output<br>of LEDPWM | Image Status  |
|---------------|----------------------------------|----------------------------------|----------------------|--------------------------------|---------------|
| <b>Case 1</b> | 70%                              | 60%                              | 42%                  | 42%                            | CABC modified |
| <b>Case 2</b> | 50%                              | 100%                             | 50%                  | 50%                            | CABC modified |
| <b>Case 3</b> | 40%                              | 30%                              | 12%                  | 12%                            | CABC modified |

### 7.13.1 PWM Control Architecture



Internal Display Backlight Control

The register bit “BL” is used to turn on or turn off backlight control lines, “LEDPWM” pin and “LEDON” pin. Normally, if user want to disable the display backlight completely and immediately, user can set “BL = 0”. Relations between “BL” and control lines are list below.

| BL | LEDPWPOL | Status of LEDPWM Pin            | BL | LEDONPOL | Status of LEDON Pin |
|----|----------|---------------------------------|----|----------|---------------------|
| 0  | 0        | 0                               | 0  | 0        | 0                   |
|    | 1        | 1                               |    | 1        | 1                   |
| 1  | 0        | Original polarity of PWM signal | 1  | 0        | LEDONR              |
|    | 1        | Inversed polarity of PWM signal |    | 1        | Inverted LEDONR     |

The register bit “BCTRL” is used to turn on or turn off backlight control block. Display brightness which is controlled by LEDPWM will be turn off when user set “BCTRL = 0”.

| BCTRL | Value of DBV[7:0] (RDDISBV) | Display Backlight Status |
|-------|-----------------------------|--------------------------|
| 0     | 00h                         | off                      |
| 1     | Determined by CABC and LABC | on                       |

The register bit “PWM\_ENH\_OE” is used to adjust the driving ability of “LEDPWM” pin (“PWM\_ENH\_OE” can not affect the driving ability of “LEDON” pin).

The register bit “CLED\_VOL” is used to choose different output logical voltage level for LEDON, LEDPWM pins. This bit is valid when:

(1) DSTB\_DEL=low, or (2) DSTB\_SEL=high, VDDI=1.65~3.3V and VSEL=high

(The output level is VSSI to DIOPWR for other VDDI and VSEL conditions in DSTB\_SEL=high). See below for the selection output level

| CLED_VOL | LEDON/LEDPWM Output Level | PWM_ENH_OE | Driving Ability of LEDPWM Pin |
|----------|---------------------------|------------|-------------------------------|
| 0        | VSSI to VDDI              | 0          | 1X driving ability of LEDPWM  |
| 1        | VSSI to VDDA              | 1          | 2X driving ability of LEDPWM  |

The register bit “A” is used to enable / disable LABC functions. Sampling of ambient light information started after setting the register bit “A”. User has to write the ambient light information into the register “LS[15:0]” via system interface.

The register bit “DB” is used to select manual or automatic brightness control. When “DB=0”, the display backlight brightness can be affected by setting register “DBV[7:0]” (WRDISBV) manually. When “DB =1” display backlight is affected by automatic brightness control. Relations between register bits “DB”, “A”, DBV[7:0] (WRDISBV), RDPWM[7:0], and RDPWM\_L[7:0] are listed in below tables.

| Driver IC State | A | DB | Display Backlight Control                    |
|-----------------|---|----|----------------------------------------------|
| Sleep-In        | x | x  | Disable                                      |
| Sleep-Out       | 0 | 0  | Control by manual setting DBV[7:0] (WRDISBV) |
| Sleep-Out       | 0 | 1  | Control by manual setting DBV[7:0] (WRDISBV) |
| Sleep-Out       | 1 | 0  | Control by manual setting DBV[7:0] (WRDISBV) |
| Sleep-Out       | 1 | 1  | Control by LABC function                     |

| “FORCE_CABC_PWM=0”, “CMB[7:0] = 00h” (WRCABCMB),<br>“PWM_DUTY_OFFSET[4:0]=00h”, “BL=1”, “BCTRL=1”, Sleep-Out Mode |   |    |                                  |                             |                                                  |
|-------------------------------------------------------------------------------------------------------------------|---|----|----------------------------------|-----------------------------|--------------------------------------------------|
| CABC Status                                                                                                       | A | DB | RDPWM_L[7:0]                     | RDPWM[7:0]                  | Display Backlight Brightness                     |
| Off Mode                                                                                                          | 0 | 0  | Determined by DBV[7:0] (WRDISBV) | FFh                         | Determined by DBV[7:0] (WRDISBV)                 |
|                                                                                                                   | 0 | 1  |                                  |                             |                                                  |
|                                                                                                                   | 1 | 0  | Determined by LABC Function      | FFh                         | Determined by LABC Function                      |
|                                                                                                                   | 1 | 1  |                                  |                             |                                                  |
| UI-Mode /<br>Still-Mode /<br>Moving-Mode                                                                          | 0 | 0  | Determined by DBV[7:0] (WRDISBV) | Determined by CABC Function | Determined by DBV[7:0] (WRDISBV) x CABC Function |
|                                                                                                                   | 0 | 1  |                                  |                             |                                                  |
|                                                                                                                   | 1 | 0  | Determined by LABC Function      | Determined by CABC Function | Determined by LABC Function x CABC Function      |
|                                                                                                                   | 1 | 1  |                                  |                             |                                                  |

The writing register DBV[7:0] (WRDISBV) is used to adjust the backlight brightness value manually when LABC function is disabled (register bit “A=0” and “DB=0”). Note that reading register DBV[7:0] (RDDISBV) is used to indicate the output PWM signal duty variation. That means DBV[7:0] (RDDISBV) is also affected by CABC function when CABC function is enable.

The register setting CMB[7:0] (WRCABCCMB) is used to limit the minimum PWM duty in order to prevent the backlight brightness from being too dark.

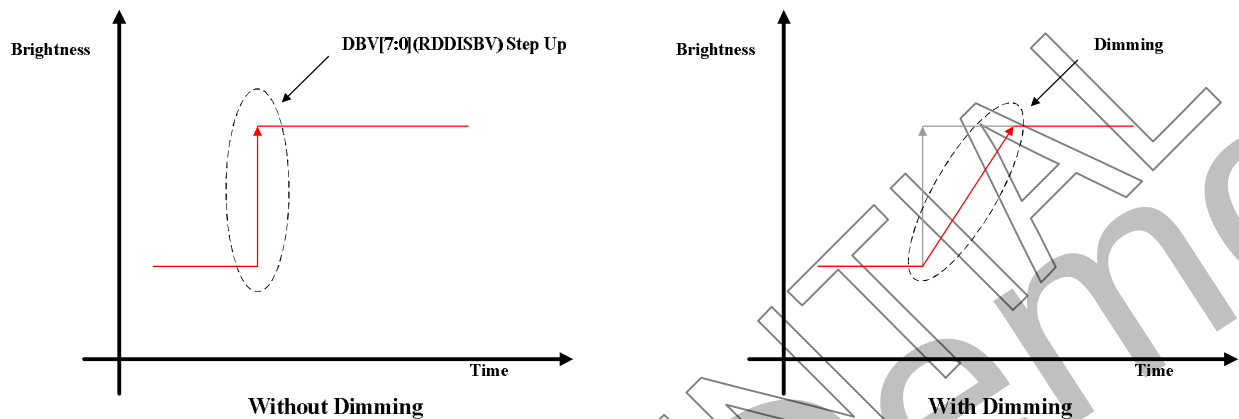
The register FORCE\_CABC\_DUTY[7:0] is used to perform a fixed PWM duty of CABC output when the register bit “FORCE\_CABC\_PWM=1”.

The register bit “DD” is used to enable or disable the dimming function for LABC / Manual Brightness Control. Smooth transition of PWM duty is performed when “DD=1”. Dimming function is applied only when driver IC is in sleep-out status. CABC function and LABC function are available only when driver IC is in sleep-out status. Availability of functions is listed in below table.

| Driver IC Status | CABC Function | LABC Function | Dimming Function | Display Backlight Status |
|------------------|---------------|---------------|------------------|--------------------------|
| <b>Sleep-In</b>  | Not Available | Not Available | Not Available    | Turn-Off                 |
| <b>Sleep-Out</b> | Available     | Available     | Available        | Controllable             |

### 7.13.2 Dimming Function for LABC and Manual Brightness Control

A dimming function (how fast to change the brightness from old to new level and what are brightness levels during the change) is used when changing from one brightness level to another. The dimming function curves for LABC and Manual Brightness Control can be configured the same or not the same in increment and decrement directions. The basic idea is described below.



Basic Concept of Dimming Function

The RM68180 provides two types of PWM duty dimming mechanism, “Fixed-Time Dimming” and “Fixed-Slope Dimming”, for LABC and manual brightness control. The setting of dimming types for rising dimming and falling dimming is independent. The register bit “SEL\_IN” is for rising dimming (increment dimming), and the register bit “SEL\_DE” is for falling dimming (decrement dimming).

| SEL_IN | SEL_DE | Rising Dimming Type | Falling Dimming Type |
|--------|--------|---------------------|----------------------|
| 0      | 0      | Fixed-Time Dimming  | Fixed-Time Dimming   |
| 0      | 1      | Fixed-Time Dimming  | Fixed-Slope Dimming  |
| 1      | 0      | Fixed-Slope Dimming | Fixed-Time Dimming   |
| 1      | 1      | Fixed-Slope Dimming | Fixed-Slope Dimming  |



## Fixed-Time Dimming Type

The total dimming steps and can be set by registers “DMSTP\_L[2:0]”, “DM\_IN[3:0]”, and “DM\_DE[3:0]”, respectively. These three registers can determine the total dimming time.

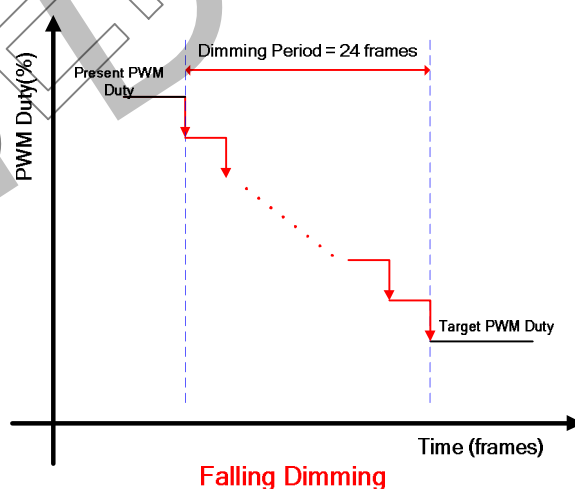
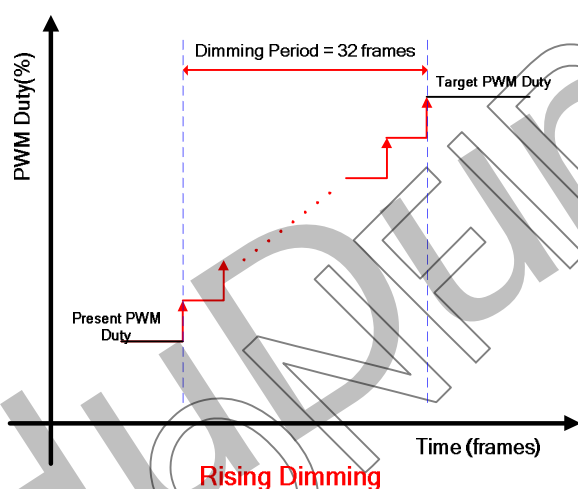
The unit of registers “DM\_IN[3:0]” and “DM\_DE[3:0]” is “frame(s) per step”. The unit of register DMSTP\_L[2:0] is “step(s)”

### For Example:

| Register Name | Value | Description                            |
|---------------|-------|----------------------------------------|
| SEL_IN        | 0     | Fixed-Time dimming for rising dimming  |
| SEL_DE        | 0     | Fixed-Time dimming for falling dimming |
| DM_IN[3:0]    | 7h    | 8 frames time for each step            |
| DN_DE[3:0]    | 5h    | 6 frames time for each step            |
| DMSTP_L[2:0]  | 1h    | dimming steps is 4 steps               |

Total dimming time of “rising dimming” is 32-frames time length (8 frames x 4).

Total dimming time of “falling dimming” is 24-frames time length (6 frames x 4).



## Fixed-Slope Dimming Type

The increasing / decreasing PWM duty during a time period can be set by register “STEP\_IN[3:0]”, “STEP\_DE[3:0]”, “DM\_IN[3:0]”, and “DM\_DE[3:0]”, respectively. These three registers can determine some characteristics of dimming curves.

The unit of registers STEP\_IN[3:0] and STEP\_DE [3:0] is “duty ratio” (FFh is 100%, and 00h is 0%). The unit of register DM\_IN[3:0] and DM\_DE[3:0] is “frame(s) per step”.

### For Example:

| Register Name | Value | Description                             |
|---------------|-------|-----------------------------------------|
| SEL_IN        | 1     | Fixed-Slope dimming for rising dimming  |
| SEL_DE        | 1     | Fixed-Slope dimming for falling dimming |
| STEP_IN[3:0]  | 8h    | PWM increment is 8 for each step        |
| STEP_DN[3:0]  | 5h    | PWM decrement is 5 for each step        |
| DM_IN[3:0]    | 3h    | 4 frames time for each step             |
| DM_DE[3:0]    | 5h    | 6 frames time for each step             |

When present PWM duty is “0x64” (100 in decimal), target PWM duty is 0x14 (20 in decimal), so the total dimming steps will be:

Total dimming steps = (Present PWM Duty - Target PWM duty) / (PWM decrement)

= (100 - 20) / 5 = 16 steps

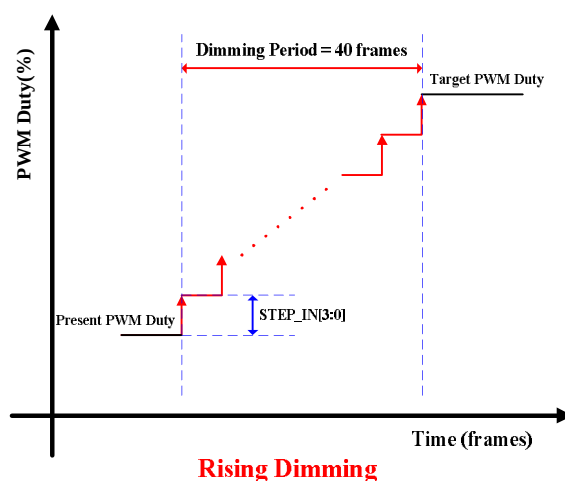
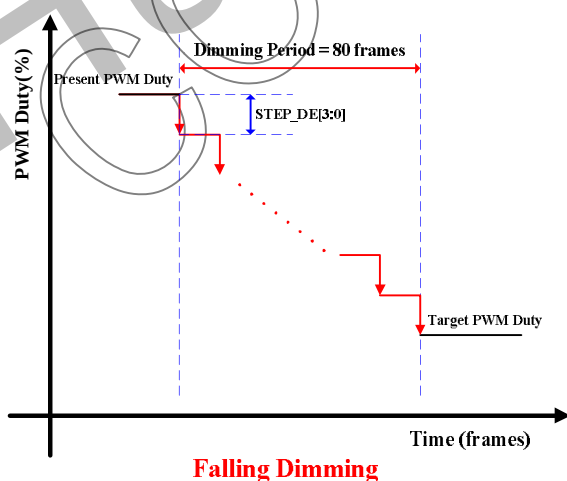
So total dimming time for falling dimming is 80 frames (16 Steps x 5)

When new target PWM duty is “0x64”, the total dimming steps will be:

Total dimming steps = (Target PWM Duty - Present PWM duty) / (PWM increment)

= (100 - 20) / 8 = 10 steps

So total dimming time for rising dimming is 40 frames (10 Steps x 4)



### 7.13.3 PWM Signal Setting for CABC and LABC

The registers “PWMDIV[7:0]” can change the frequency of PWM signal(LEDPWM) and the register “PWM\_DUTY\_OFFSET[4:0]” can perform a duty compensation of the PWM signal. The “FOSC” is used to provide clock source for the internal PWM circuit. Three PWM operation frequency can be chosen by setting register “PWMF[1:0]”, and the real PWM frequency can be quickly estimated by the bellow formula.

| PWMF[1:0] | PWM Operation Frequency (F <sub>osc</sub> ) |
|-----------|---------------------------------------------|
| 00        | 7 MHz                                       |
| 01        | 14 MHz                                      |
| 10        | 3.5 MHz                                     |
| 11        | (not used)                                  |

$$PWM \text{ Frequency} = \frac{F_{osc}}{256 \times PWMDIV[7:0]}$$

$$PWM \text{ Duty} = \frac{DBV[7:0](RDDISBV) + 1}{256}$$

For example:

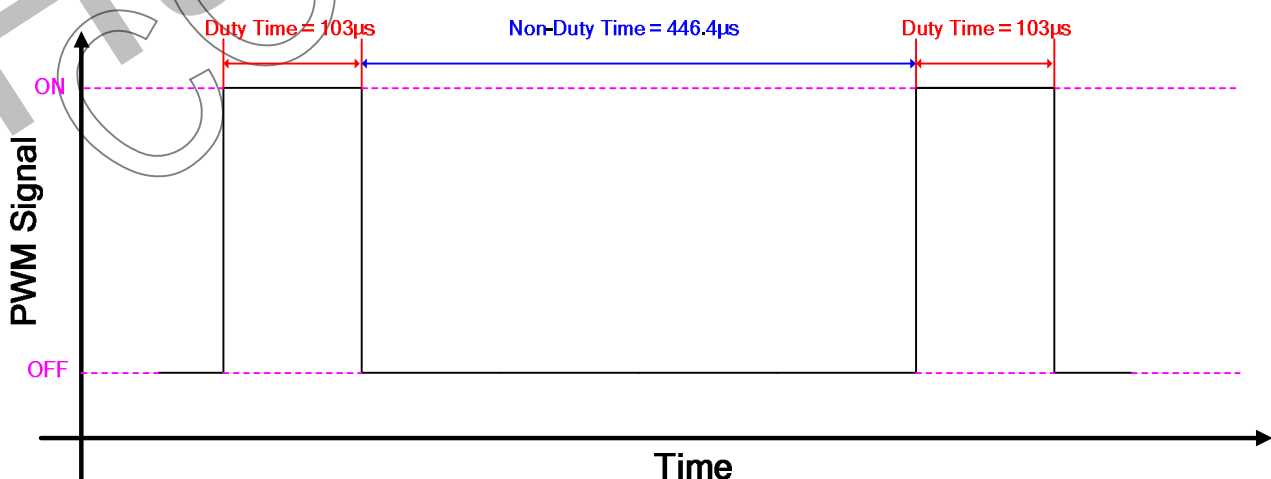
If “PWMDIV[7:0]=0x0F”, “PWMF[1:0]=0x0”, “DBV[7:0]=2Fh”(RDDISBV)

$$PWM \text{ Frequency} = \frac{7MHz}{256 \times 15} \approx 1.82KHz$$

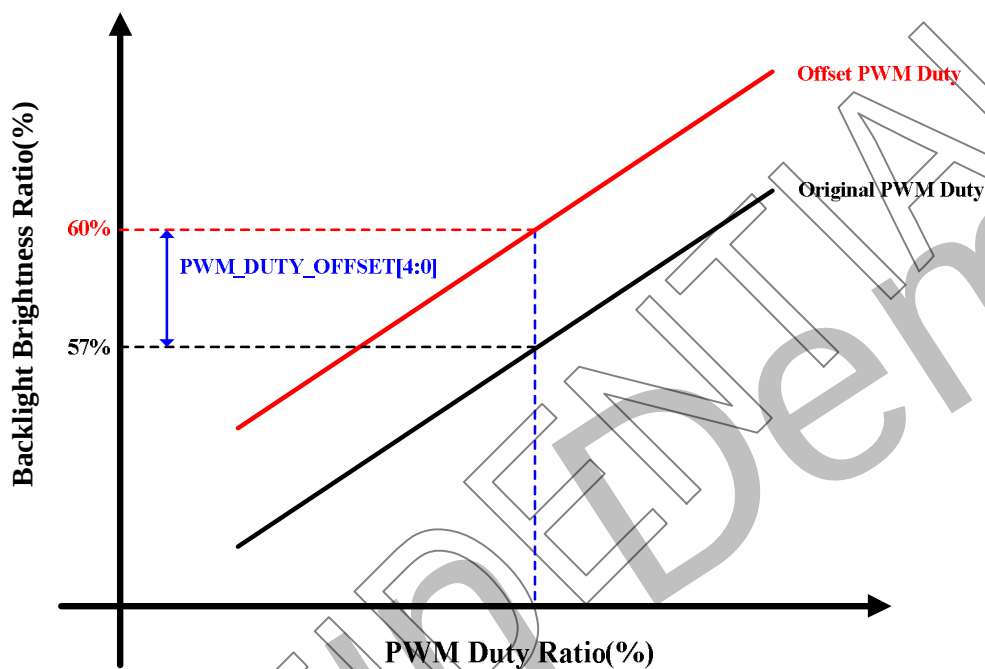
“DBV[7:0]=2Fh” means PWM duty ratio is about 18.75%

$$PWM \text{ Duty Time} = 18.75\% \times \frac{1}{1.82KHz} \approx 103.0ms$$

$$PWM \text{ non-Duty Time} = 81.25\% \times \frac{1}{1.82KHz} \approx 446.4ms$$



Since the external LED driver needs some stable time to drive the LED backlight, this necessary stable time will reduce the effective PWM duty period. The PWM\_DUTY\_OFFSET[4:0] is simply used to compensate the loss of PWM duty period. For example, assume original PWM duty of LEDPWM signal is 60%, but the actual backlight brightness driven by LED driver is 57%. User can set "PWM\_DUTY\_OFFSET[4:0]" to achieve 60% backlight brightness.



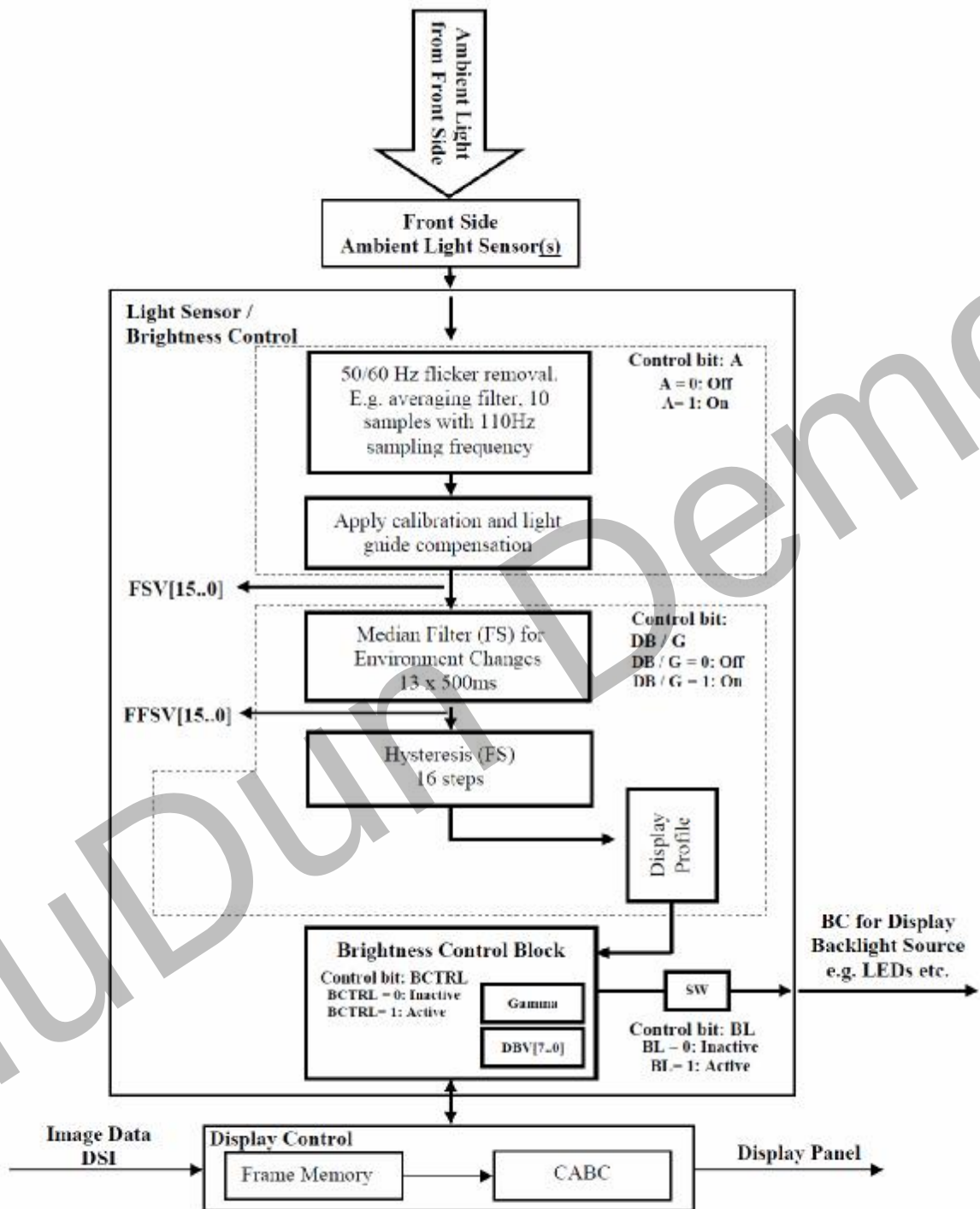
#### 7.13.4 Content Adaptive Brightness Control (CABC)

A Content Adaptive Brightness Control function can be used to reduce the power consumption of the luminance source. Content adaptation means that content grey level scale can be increased while simultaneously lowering brightness of the backlight to achieve same perceived brightness. The adjusted grey level scale and thus the power consumption reduction depend on the content of the image. There are four different modes of CABC that can be controlled through register "C[1:0]" (WRCABC).

Descriptions of these four modes are listed below:

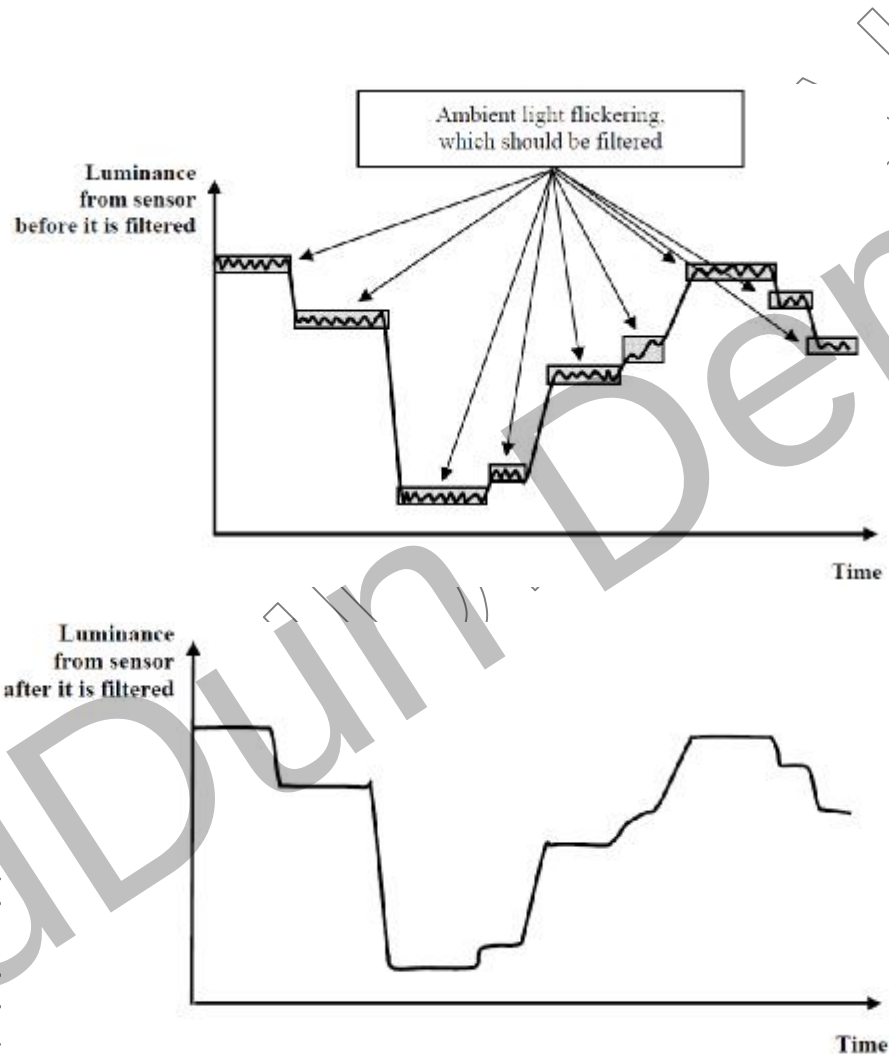
1. Off mode: Content Adaptive Brightness Control functionality is totally off.
2. UI [User interface] image mode: Optimized for UI image. It is kept image quality as much as possible. Target power consumption reduction ratio: 10% or less. User can achieve preferred brightness for UI-Mode by setting the registers "CABC\_UI\_PWM0[7:0]" ~ "CABC\_UI\_PWM3[7:0]".
3. Still picture mode: Optimized for still picture. Some image quality degradation would be acceptable. Target power consumption reduction ratio: more than 30%. The RM68180 will automatically estimate a better gamma setting based on image contents. User can achieve preferred brightness for still picture mode by setting the registers "CABC\_PWM0[7:0]" ~ "CABC\_PWM9[7:0]".
4. Moving image mode: Optimized for moving image e.g. Video clip. It is focused on the biggest power reduction with image quality degradation. Target power consumption reduction ratio: more than 30%. The RM68180 will automatically estimate a better gamma setting based on image contents. User can achieve preferred brightness for still picture mode by setting the registers "CABC\_MOV\_PWM0[7:0]" ~ "CABC\_MOV\_PWM9[7:0]".

### 7.13.5 Light-Sensor Automatic Brightness Control (LABC)



## 50/60Hz FLICKER REMOVAL

“50/60 Hz flicker removal” block is to sample light sensor information via system interface. Same block is for filtering external light source flicker (e.g. 50 and 60 Hz), which maybe present in ambient light source measurements. This functionality is possible to implement with e.g. an averaging filter, 10 samples with 110Hz sampling frequency. These samples are pipelined so that the oldest value is dropped out when a new value is entered (First In-First Out queue). Sampling of ambient light is started after receiving “Write CTRL Display (5300h)” command with applicable parameters.



### Light Guide Variation Compensation

Filtered luminance value is inputted into “Apply calibration and light guide compensation” block. “Apply calibration and light guide compensation” block is to calibrate and to compensate variation of light guide which is covered on the ambient light sensor. Compensated luminance value can be read by the user (16 bit value, see chapters: “Read MSBs of FSV Value (5A00h)” and Read LSBs of FSV Value (5B00h”).

In order to perform a calibration for the ambient light sensor system, “Read Light Sensor Compensation Coefficient Value MSBs (66h)” and “Read Light Sensor Compensation Coefficient Value LSBs (67h)” commands can be used to retrieve measured illuminance. User can define a compensation coefficient for the light guide variation. This additional compensation coefficient CC works as a factor multiplying the ambient light value before the value is returned by “Read FS Value MSBs (5A00h)” and “Read FS Value LSBs (5B00h)” commands or used in hysteresis comparison.

$$FS\_compensated = CC * FS\_filtered$$

FS\_compensated: Ambient light information where light guide variation has been taken into account

CC: Compensation coefficient, value range [0.5 – 1.9999]

FS\_filtered: Ambient light information after flicker removal

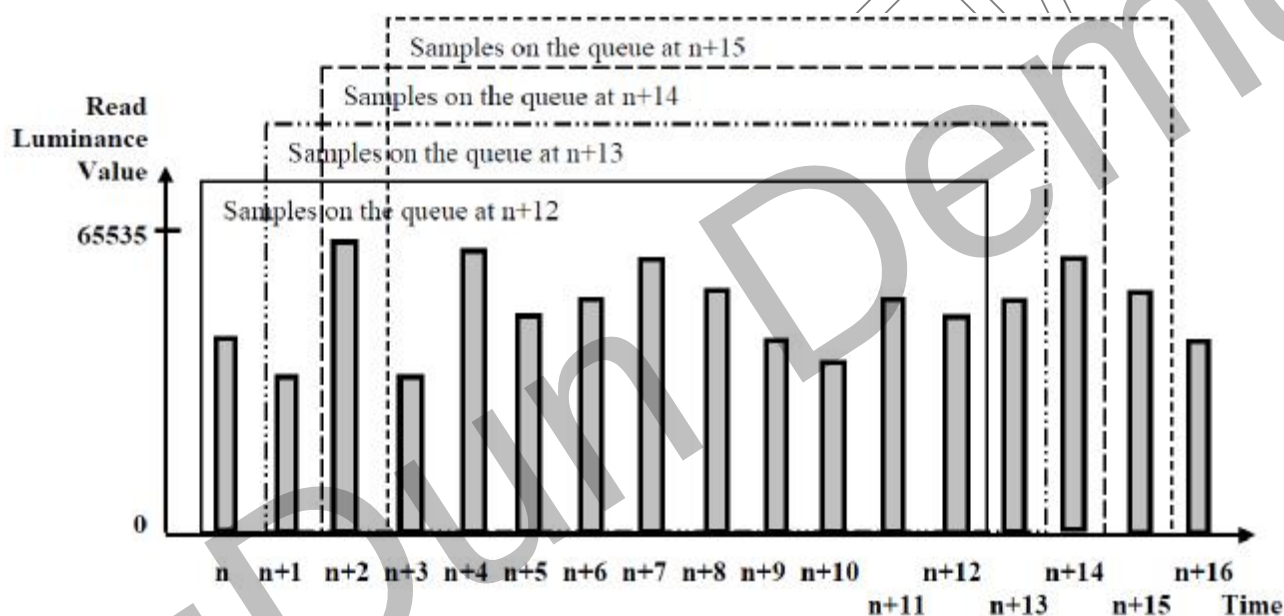


## MEDIAN FILTER

Median Filter for Environment Changes block is filtering information received from “Apply calibration and light guide compensation” block.

Median filter receives number of values, which are stored in a queue. The length of the queue is 13 samples. The oldest value stored in the queue is also the first value to drop when a new value is queued (First In-First Out queue). The median filter will sort these values of the queue in ascending order. The median filter selects one of those values based on order of magnitude. Selected value is the 7th value which is the median of the sorted queue.

Selected median filter values are inputted into “Hysteresis” block.



Luminance values of this example are defined on the following table.

| Time | Luminance Value<br>(0 – 65535) | Time | Luminance Value<br>(0 – 65535) | Time | Luminance Value<br>(0 – 65535) |
|------|--------------------------------|------|--------------------------------|------|--------------------------------|
| n    | 40960                          | n+6  | 51200                          | n+12 | 47360                          |
| n+1  | 30720                          | n+7  | 58880                          | n+13 | 51200                          |
| n+2  | 64000                          | n+8  | 53760                          | n+14 | 58880                          |
| n+3  | 32768                          | n+9  | 40960                          | n+15 | 53760                          |
| n+4  | 62720                          | n+10 | 38400                          | n+16 | 40960                          |
| n+5  | 47360                          | n+11 | 51200                          |      |                                |

Queues (Read Luminance Values) of this example are defined below.

| Time | Values of the Queue |       |       |       |       |       |       |       |       |       |       |       |       |
|------|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|      | 1st                 | 2nd   | 3rd   | 4th   | 5th   | 6th   | 7th   | 8th   | 9th   | 10th  | 11th  | 12th  | 13th  |
| n+6  | 40960               | 30720 | 64000 | 32768 | 62720 | 47360 | 51200 | 58880 | 53760 | 40960 | 38400 | 51200 | 47360 |
| n+7  | 30720               | 64000 | 32768 | 62720 | 47360 | 51200 | 58880 | 53760 | 40960 | 38400 | 51200 | 47360 | 51200 |
| n+8  | 64000               | 32768 | 62720 | 47360 | 51200 | 58880 | 53760 | 40960 | 38400 | 51200 | 47360 | 51200 | 58880 |
| n+9  | 32768               | 62720 | 47360 | 51200 | 58880 | 53760 | 40960 | 38400 | 51200 | 47360 | 51200 | 58880 | 53760 |

The median filter will sort these values in ascending order. Example of sorted values are as below table.

| Time | Sorted values in the order of magnitude |       |       |       |       |       |       |       |       |       |       |       |       |
|------|-----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|      | 1st                                     | 2nd   | 3rd   | 4th   | 5th   | 6th   | 7th   | 8th   | 9th   | 10th  | 11th  | 12th  | 13th  |
| n+6  | 30720                                   | 32768 | 38400 | 40960 | 40960 | 47360 | 47360 | 51200 | 51200 | 53760 | 58880 | 62720 | 64000 |
| n+7  | 30720                                   | 32768 | 38400 | 40960 | 47360 | 47360 | 51200 | 51200 | 51200 | 53760 | 58880 | 62720 | 64000 |
| n+8  | 32768                                   | 38400 | 40960 | 47360 | 47360 | 51200 | 51200 | 51200 | 53760 | 58880 | 58880 | 62720 | 64000 |
| n+9  | 32768                                   | 38400 | 40960 | 47360 | 47360 | 51200 | 51200 | 51200 | 53760 | 53760 | 58880 | 58880 | 62720 |

The median filter selects one of those values based on order of magnitude. Selected value is the 7th value (values highlighted on the table).

## HYTERESIS

“Write Gamma setting (58h)” and “Write Profile Values (50h)”.

For each step number ‘n’, the following values are defined:

An 8-bit value ( $V_n$ ) which sets the display brightness.

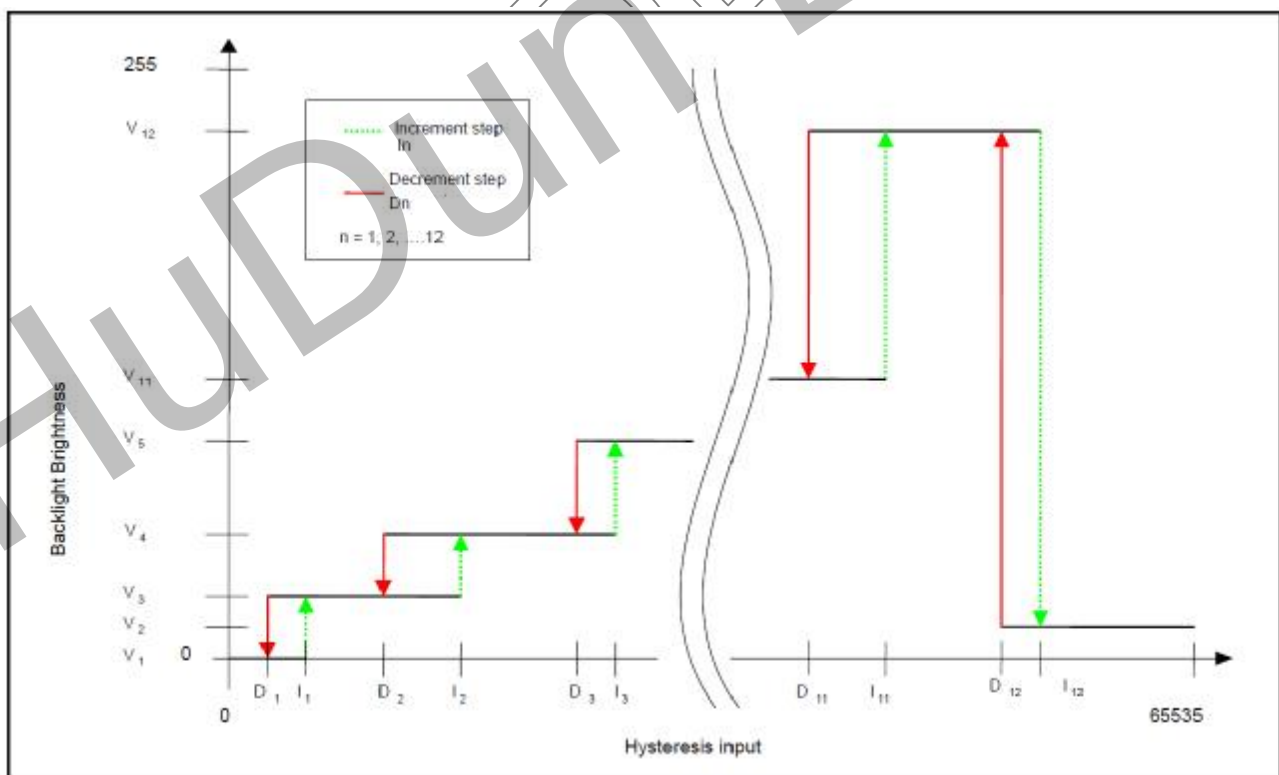
A 16-bit value ( $I_n$ ) ‘increment step’ value. If the output value of the median filter is greater than the previous one, then the  $I_n$  values represent the transition from the step “n” to step “n + 1”.

A 16-bit value ( $D_n$ ) ‘decrement step’ value. If the output value of the median filter is smaller than the previous one, then the  $D_n$  values represent the transition from the step “n” to step “n + 1”.

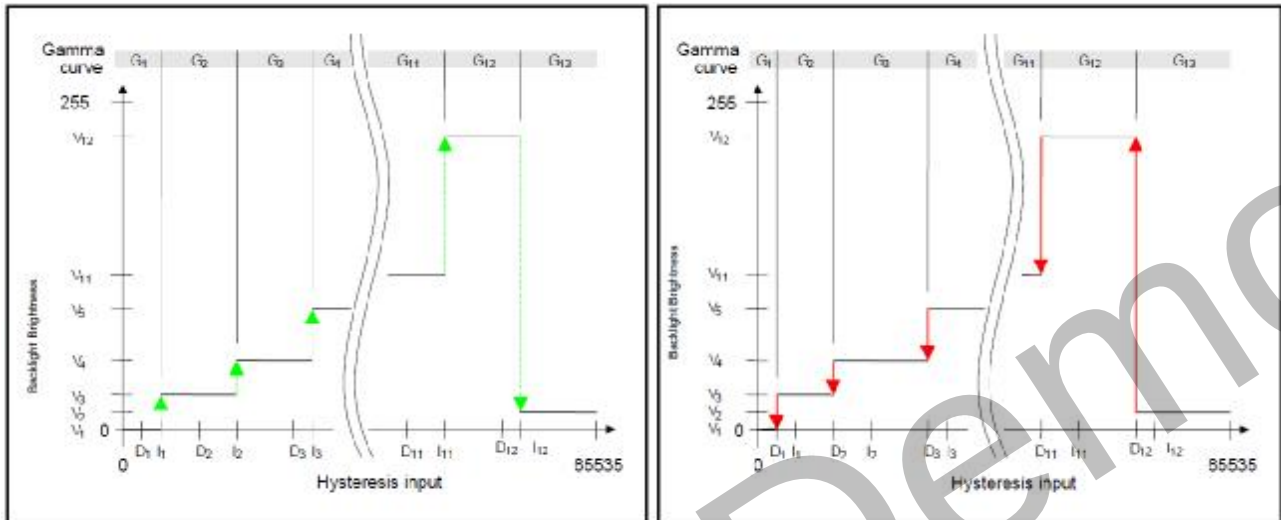
A 4-bit ( $G_n$ ) ‘gamma curve select’ value. This uses a 1-hot encoding to select which gamma curve will be used for each step.

Maximum step number (n) is 16.

The following figure shows a graph of hysteresis input value vs. display backlight brightness output for an arbitrary hysteresis curve. For this graph, step 12 is before the last step in the current profile, and so doesn’t have any increment or decrement step values associated with it. For the last step both increment and decrement values are set to 65535 (FFFFh).



This curve can be split into two separate cases, one for increasing input, and one for decreasing input (see below figure). Once the hysteresis is known to be increasing or decreasing, it can choose correct graph. Then it is relatively simple to go through each of the levels in turn, checking against the increment or decrement values as necessary.

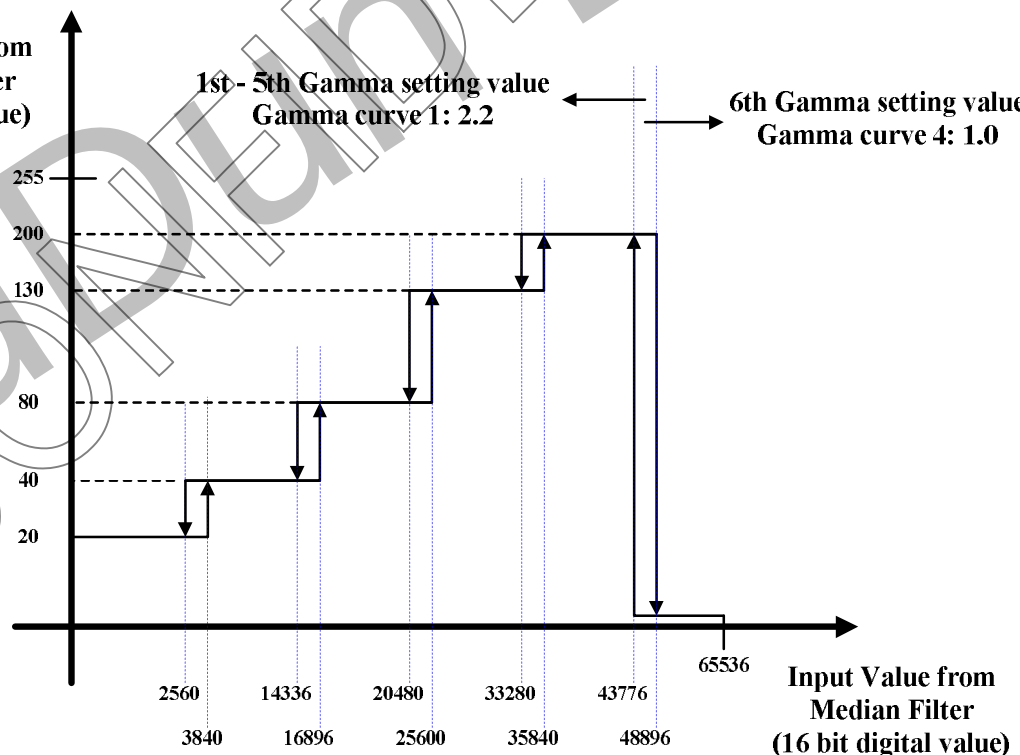


The following example is using 6 steps (6 increment and 6 decrement) for hysteresis 6.

Output Value from  
Hysteresis Filter  
(8 bit digital value)

1st - 5th Gamma setting value  
Gamma curve 1: 2.2

6th Gamma setting value  
Gamma curve 4: 1.0

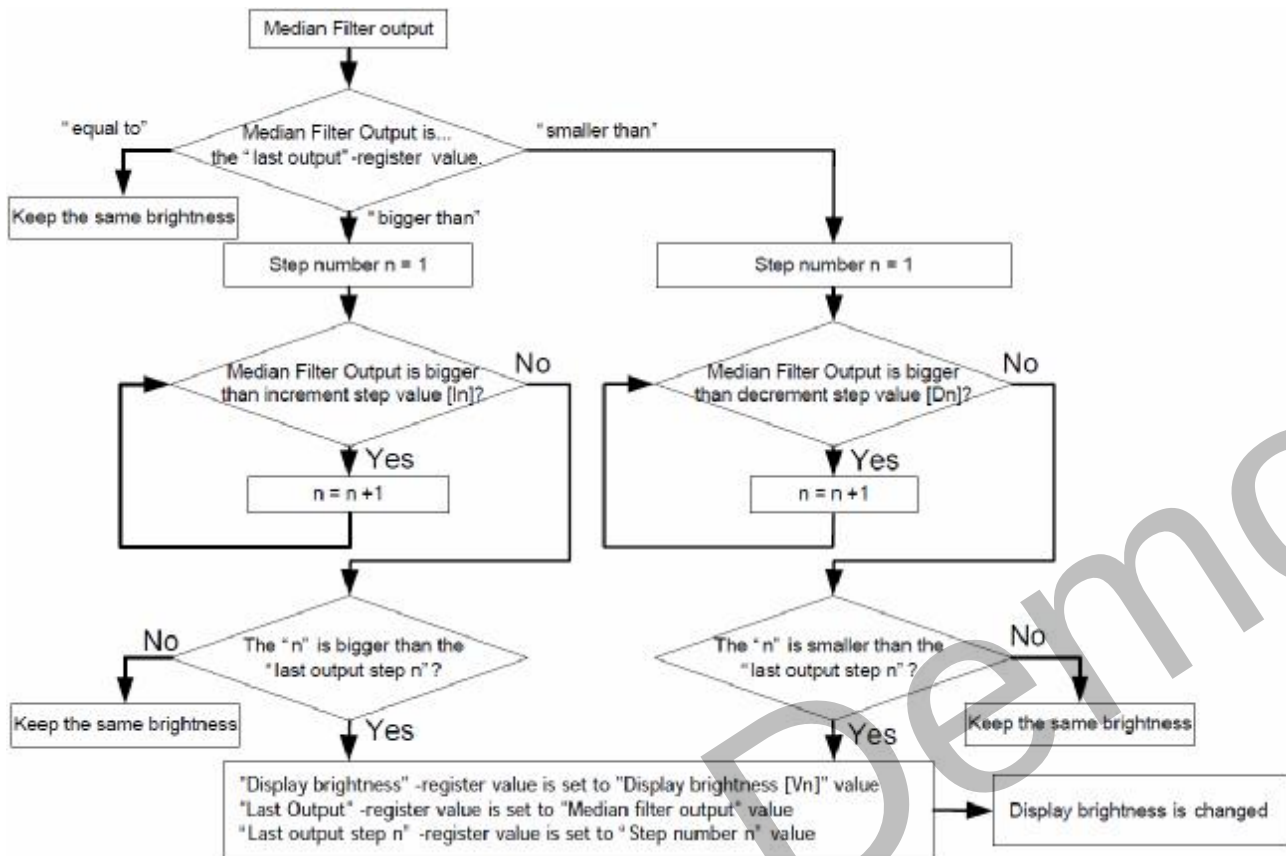


The following table is specified the relationship between each parameters and step numbers as the above example of hysteresis and profiles.

| Step number (n) | Increment Value (In) | Decrement Value (Dn) | Display Brightness (Vn) | Gamma Curve (Gn) |
|-----------------|----------------------|----------------------|-------------------------|------------------|
| 1               | 3840(F00h)           | 2560(A00h)           | 20(14h)                 | 2.2(1h)          |
| 2               | 16896(4200h)         | 14336(3800h)         | 40(28h)                 | 2.2(1h)          |
| 3               | 25600(6400h)         | 20480(5000h)         | 80(50h)                 | 2.2(1h)          |
| 4               | 35840(8C00h)         | 33280(8200h)         | 130(82h)                | 2.2(1h)          |
| 5               | 48896(BF00h)         | 43776(AB00h)         | 200(C8h)                | 2.2(1h)          |
| 6               | 65535(FFFFh)         | 65535(FFFFh)         | 0                       | 1.0(8h)          |
| 7               | X                    | X                    | X                       | X                |
| 8               | X                    | X                    | X                       | X                |
| 9               | X                    | X                    | X                       | X                |
| 10              | X                    | X                    | X                       | X                |
| 11              | X                    | X                    | X                       | X                |
| 12              | X                    | X                    | X                       | X                |
| 13              | X                    | X                    | X                       | X                |
| 14              | X                    | X                    | X                       | X                |
| 15              | X                    | X                    | X                       | X                |
| 16              | X                    | X                    | X                       | X                |

Step number of increment-value and decrement-value is 16 steps. Don't care about the parameter values after "65535 (FFFFh)" of increment value and decrement value, e.g. "X" in the above table. 16th increment and decrement values are always set to "65535 (FFFFh)" internally, if increment and decrement values before 16th parameters are less than "65535 (FFFFh)".

Once the hysteresis curve has been stored using the commands above, the flowchart is used to select the correct hysteresis level after getting median filter output as a reference. Flow chart for adjust correct hysteresis level is as below one.



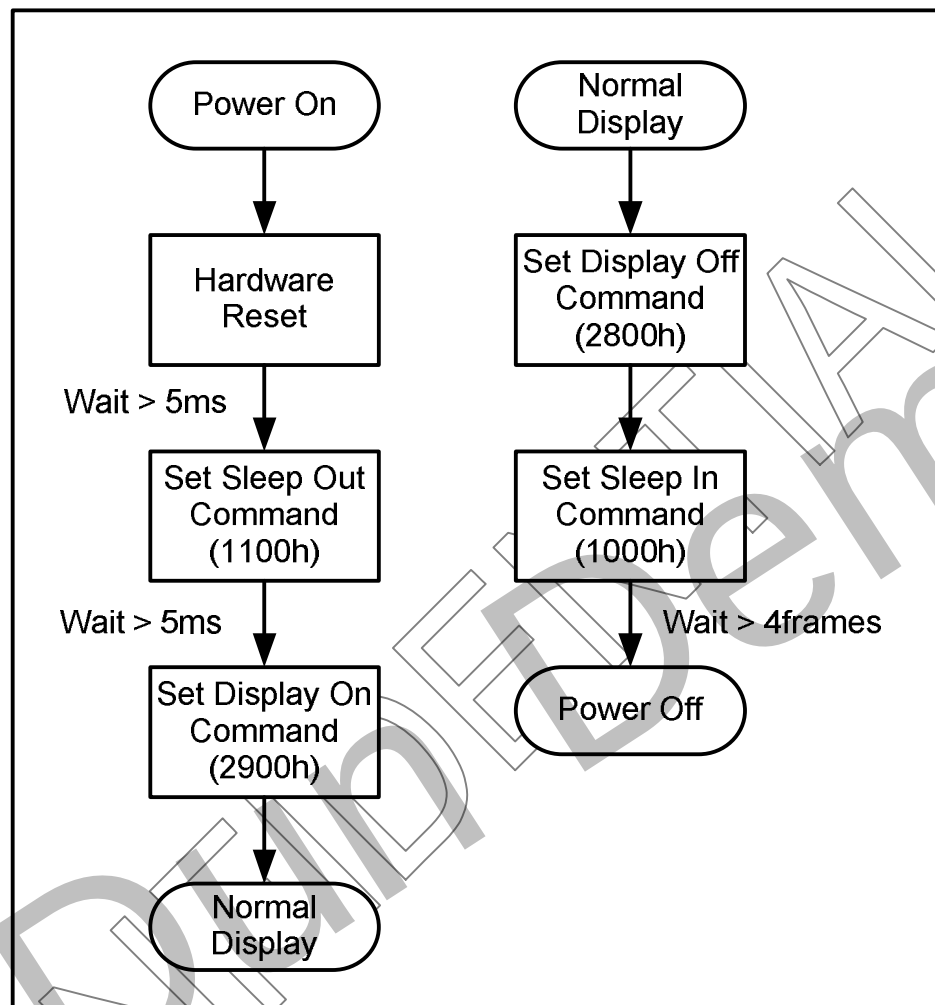
### 7.14 Power On/Off Sequence

VDDI and VDD (VDDA) can be applied in any order. VDD (VDDA) and VDDI can be powered down in any order. During power off, if LCD is in the Sleep Out mode, VDD (VDDA) and VDDI must be powered down minimum 120msec after RESX has been released. During power off, if LCD is in the Sleep In mode, VDDI or VDD (VDDA) can be powered down minimum 0msec after RESX has been released. CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

Notes:

1. There will be no damage to the display module if the power sequences are not met.
2. There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.
3. There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.
4. If RESX line is not held stable by host during Power On Sequence, then it will be necessary to apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.
5. There is not a limit for Rise/Fall time on VDDI and VDD (VDDA).
6. The display module can also initialize and calibrate DSI-CLK+/- and DSI-D0+/- lanes within 5ms after LP-11 (Clock and Data Channels), VDDI and VDD (VDDA) are applied and H/W Reset is not active (5ms is as same as the Reset Cancelling Time).

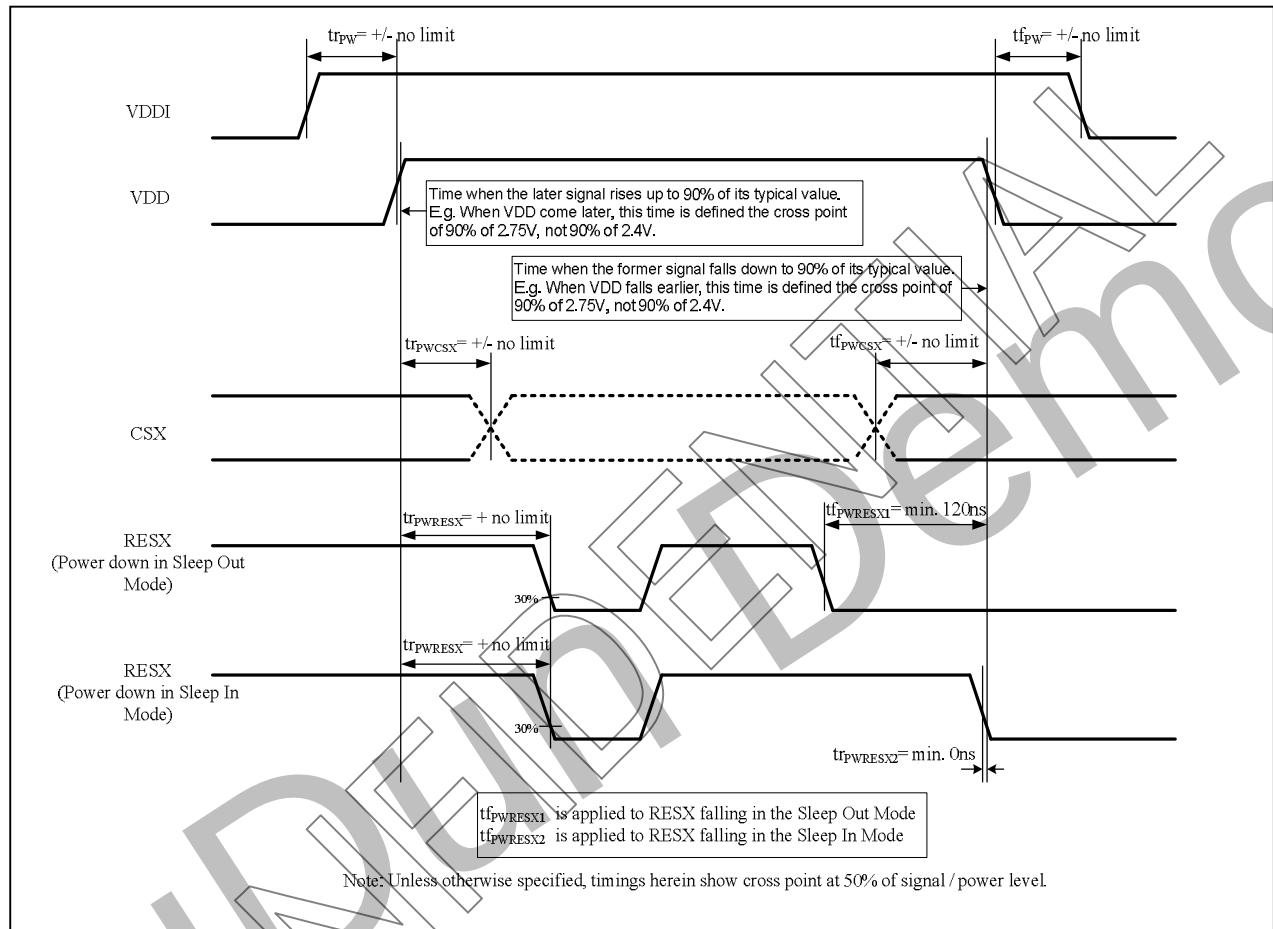
The power supply ON/OFF setting for Display ON/OFF, Standby Set/Exit, and Sleep Set/Exit sequences is illustrated in figure below.





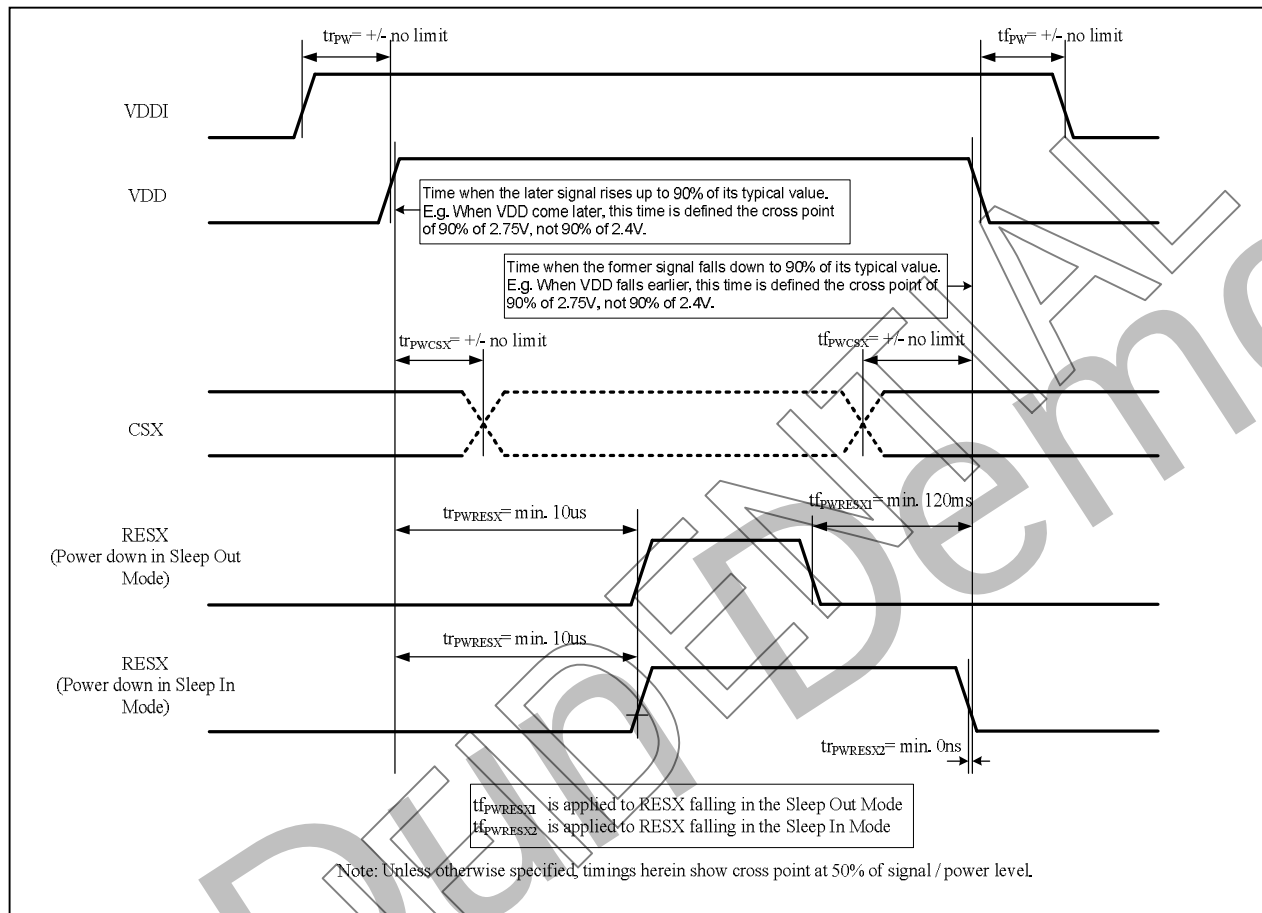
### 7.14.1 Case 1 – RESX line is held High or Unstable by Host at Power On

If RESX line is held High or unstable by the host during Power On, then a Hardware Reset must be applied after both VDD (VDDA) and VDDI have been applied – otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.



### 7.14.2 Case 2 –RESX line is held Low by host at Power On

If RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for minimum 10μsec after both VDD (VDDA) and VDDI have been applied.



### 7.14.3 Uncontrolled Power Off

The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. There will not be any damages for the display module or the display module will not cause any damages for the host or lines of the interface. At an uncontrolled power off the display will go blank and there will not be any visible effects within 1 second on the display (blank display) and remains blank until "Power On Sequence" powers it up.

CONFIDENTIAL Demo

## 8. Command

### 8.1. Command List

| Operational Code (Hex) | Command               | Command(C) /Read(R) /Write(W) | Number Of Parameter |
|------------------------|-----------------------|-------------------------------|---------------------|
| 00h                    | nop                   | C                             | 0                   |
| 01h                    | soft reset            | C                             | 0                   |
| 04h                    | get_display_ID        | R                             | 3                   |
| 05h                    | get_DSI_err           | R                             | 1                   |
| 0Ah                    | get_power_mode        | R                             | 1                   |
| 0Bh                    | get_address_mode      | R                             | 1                   |
| 0Ch                    | get_pixel_format      | R                             | 1                   |
| 0Dh                    | get_display_mode      | R                             | 1                   |
| 0Eh                    | get_signal_mode       | R                             | 1                   |
| 0Fh                    | get_diagnostic_result | R                             | 1                   |
| 10h                    | enter_sleep_mode      | C                             | 0                   |
| 11h                    | exit_sleep_mode       | C                             | 0                   |
| 12h                    | enter_partial_mode    | C                             | 0                   |
| 13h                    | enter_normal_mode     | C                             | 0                   |
| 20h                    | exit_invert_mode      | C                             | 0                   |
| 21h                    | enter_invert_mode     | C                             | 0                   |
| 22h                    | set_all_pixel_off     | C                             | 0                   |
| 23h                    | set_all_pixel_on      | C                             | 0                   |
| 26h                    | Gamma curve select    | W                             | 1                   |
| 28h                    | set_display_off       | C                             | 0                   |
| 29h                    | set_display_on        | C                             | 0                   |
| 2Ah                    | set_column_address    | W                             | 4                   |
| 2Bh                    | set_page_address      | W                             | 4                   |
| 2Ch                    | write memory start    | W                             | Variable            |
| 2Eh                    | read memory start     | R                             | Variable            |
| 30h                    | set partial area      | W                             | 4                   |
| 33h                    | set scroll area       | W                             | 6                   |
| 34h                    | set tear off          | C                             | 0                   |
| 35h                    | set tear on           | W                             | 1                   |
| 36h                    | set_address_mode      | W                             | 1                   |
| 38h                    | exit idle mode        | C                             | 0                   |
| 39h                    | enter idle mode       | C                             | 0                   |
| 3Ah                    | set_pixel_format      | W                             | 1                   |
| 3Ch                    | write_memory_continue | W                             | Variable            |
| 3Eh                    | read_memory_continue  | R                             | Variable            |
| 44h                    | set_tear_scanline     | W                             | 2                   |
| 45h                    | get_scanline          | R                             | 2                   |
| 4Fh                    | set_deep_standby_mode | W                             | 1                   |

| Operational Code (Hex) | Command                                   | Command(C) /Read(R) /Write(W) | Number Of Parameter |
|------------------------|-------------------------------------------|-------------------------------|---------------------|
| 50h                    | set_profile_value for display             | W                             | 16                  |
| 51h                    | set_display_brightness                    | W                             | 1                   |
| 52h                    | get_display_brightness                    | R                             | 1                   |
| 53h                    | set_control_display                       | W                             | 1                   |
| 54h                    | get_control_display                       | R                             | 1                   |
| 55h                    | set_cabc_mode                             | W                             | 1                   |
| 56h                    | get_cabc_mode                             | R                             | 1                   |
| 57h                    | set_hysteresis                            | W                             | 32                  |
| 58h                    | set_gamma_setting                         | W                             | 8                   |
| 5Ah                    | get_FS_value_MSBs                         | R                             | 1                   |
| 5Bh                    | get_FS_value_LSBs                         | R                             | 1                   |
| 5Ch                    | get_median_filter_FS_value_MSBs           | R                             | 1                   |
| 5Dh                    | get_median_filter_FS_value_LSBs           | R                             | 1                   |
| 5Eh                    | set_cabc_min_brightness                   | W                             | 1                   |
| 5Fh                    | get_cabc_min_brightness                   | R                             | 1                   |
| 65h                    | set_light_sensor_compensation_coefficient | W                             | 2                   |
| 66h                    | get_LSCC_MSBs                             | R                             | 1                   |
| 67h                    | get_LSCC_LSBs                             | R                             | 1                   |
| 70h                    | get_black/white low bit                   | R                             | 1                   |
| 71h                    | get_Bkx                                   | R                             | 1                   |
| 72h                    | get_Bky                                   | R                             | 1                   |
| 73h                    | get_Wx                                    | R                             | 1                   |
| 74h                    | get_Wy                                    | R                             | 1                   |
| 75h                    | get_red/green low bit                     | R                             | 1                   |
| 76h                    | get_Rx                                    | R                             | 1                   |
| 77h                    | get_Ry                                    | R                             | 1                   |
| 78h                    | get_Gx                                    | R                             | 1                   |
| 79h                    | get_Gy                                    | R                             | 1                   |
| 7Ah                    | get_blue/Acolor low bit                   | R                             | 1                   |
| 7Bh                    | get_Bx                                    | R                             | 1                   |
| 7Ch                    | get_By                                    | R                             | 1                   |
| 7Dh                    | get_Ax                                    | R                             | 1                   |
| 7Eh                    | get_Ay                                    | R                             | 1                   |
| A1h                    | read_DDB_start                            | R                             | 5                   |
| A8h                    | read_DDB_continue                         | R                             | 5                   |
| AAh                    | read_first_checksum                       | R                             | 1                   |
| AFh                    | read_continue_checksum                    | R                             | 1                   |
| DAh                    | read_ID1                                  | R                             | 1                   |
| DBh                    | read_ID2                                  | R                             | 1                   |
| DCh                    | read_ID3                                  | R                             | 1                   |

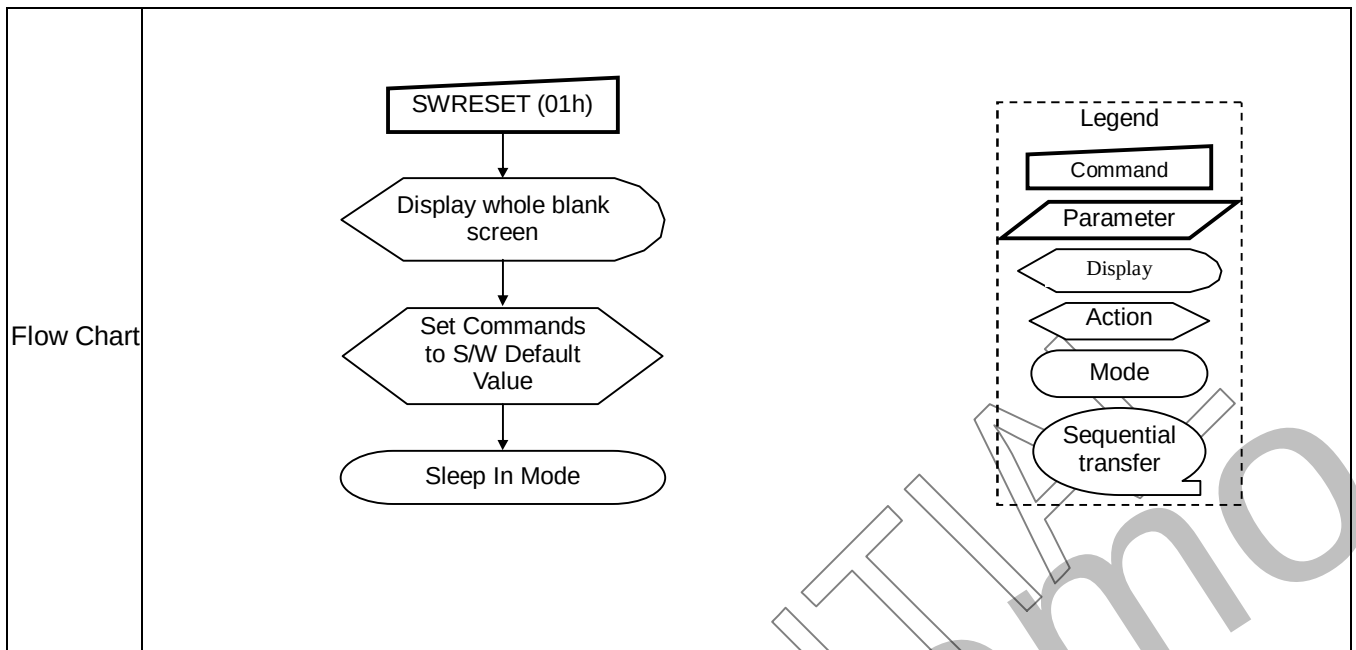
## 8.2. Command Description

### NOP (0000h)

| 0000H                                     | NOP (No Operation)                                                                                                                                                                                                                                                                                                                                                                         |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|--------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D17-D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | X      | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Parameter                                 | NO PARAMETER                                                                                                                                                                                                                                                                                                                                                                               |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | This command is an empty command; it does not have any effect on the display module. However it can be used to terminate Frame Memory Write or Read as described in RAMWR (Memory Write) and RAMRD (Memory Read) Commands.<br><br>X = Don't care.                                                                                                                                          |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | None                                                                                                                                                                                                                                                                                                                                                                                       |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |        |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>N/A</td></tr><tr><td>SW Reset</td><td>N/A</td></tr><tr><td>HW Reset</td><td>N/A</td></tr></table>                                                                                                                                                                                                   |     |     |        |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | N/A | SW Reset                                | N/A | HW Reset                                  | N/A |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | N/A                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | None                                                                                                                                                                                                                                                                                                                                                                                       |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

# SWRESET(0100h) : Software Reset

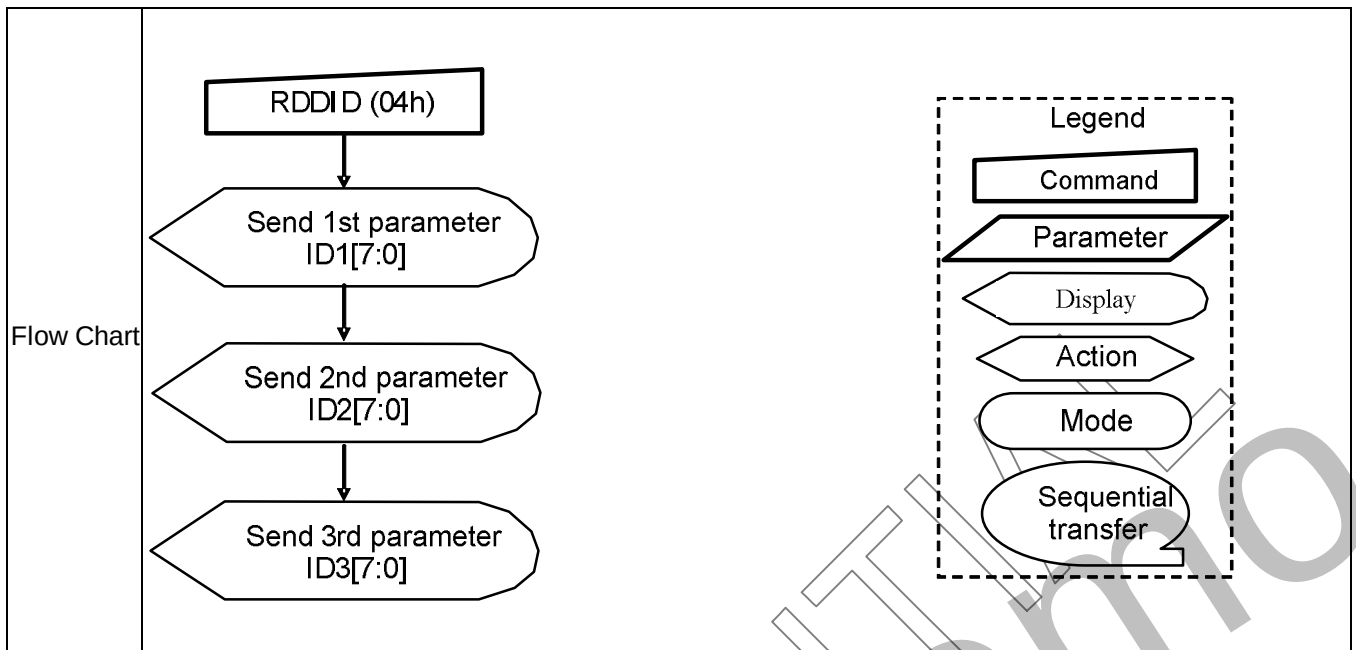
| 0100H                                     | SWRESET(Software Reset)                                                                                                                                                                                                                                                                                                                                                                    |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|--------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | X      | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 01  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Parameter                                 | NO PARAMETER                                                                                                                                                                                                                                                                                                                                                                               |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>When the Software Reset command is written, it causes software reset. It resets the commands and parameters to their S/W Reset default values. (See default tables in each command description.)</p> <p>Note: The Frame Memory contents are affected by this command.</p> <p>X = Don't care</p>                                                                                         |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | <p>Software Reset Command cannot be sent during Sleep Out sequence.</p> <p>Any new command is cannot be sent for 10-frame period until the RM68180 enters Sleep-In mode. Do not send any command.</p>                                                                                                                                                                                      |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |        |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>N/A</td></tr><tr><td>SW Reset</td><td>N/A</td></tr><tr><td>HW Reset</td><td>N/A</td></tr></table>                                                                                                                                                                                                   |     |     |        |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | N/A | SW Reset                                | N/A | HW Reset                                  | N/A |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | N/A                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                        |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |





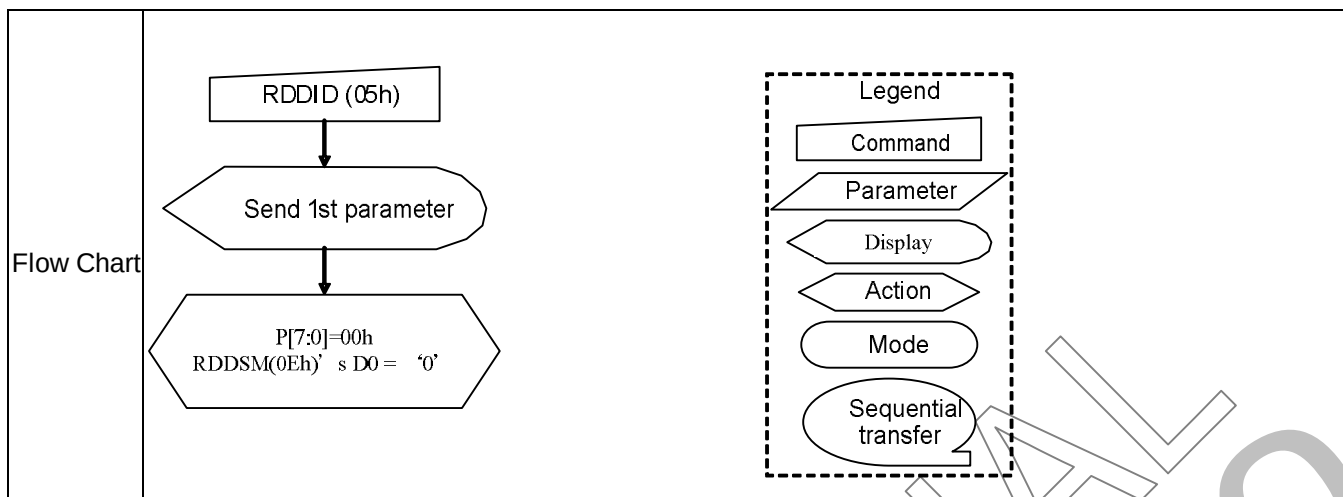
# RDDID(0400h~0402h) : Read Display ID

| 0400H                                     | RDDID                                                                                                                                                                                                                                                                                                                                                                                        |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----|--------|------|------|------|------|------|------|------|------|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----------------------------|------------------------------------------|-----------|-----------------------------|----------|-----------|-----------------------------|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                          | RDX                         | WRX | D15-D8 | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | HEX |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                            | 1                           | ↑   | 00h    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 04  |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| 1 <sup>st</sup>                           | 1                                                                                                                                                                                                                                                                                                                                                                                            | ↑                           | 1   | 00h    | ID17 | ID16 | ID15 | ID14 | ID13 | ID12 | ID11 | ID10 | 00  |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| 2 <sup>nd</sup>                           | 1                                                                                                                                                                                                                                                                                                                                                                                            | ↑                           | 1   | 00h    | ID27 | ID26 | ID25 | ID24 | ID23 | ID22 | ID21 | ID20 | 80  |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| 3 <sup>rd</sup>                           | 1                                                                                                                                                                                                                                                                                                                                                                                            | ↑                           | 1   | 00h    | ID37 | ID36 | ID35 | ID34 | ID33 | ID32 | ID31 | ID30 | 00  |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Parameter                                 | -                                                                                                                                                                                                                                                                                                                                                                                            |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Description                               | <p>The 1<sup>st</sup> parameter (ID1): the module's manufacture ID</p> <p>The 2<sup>nd</sup> parameter (ID2): the module/driver version ID</p> <p>The 3<sup>rd</sup> parameter (ID3): the module/driver ID</p> <p>Note: Commands RDID1/2/3 (DAh/DBh/DCh) read data correspond to the parameter 1, 2, 3 of command 04h, respectively.</p>                                                     |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                            |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>   |                             |     |        |      |      |      |      |      |      |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes                         | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In                    | Yes      |           |                             |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                 |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                          |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                          |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                          |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                          |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                          |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Default                                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP value</td><td>ID1=00h / ID2=80h / ID3=00h</td></tr><tr><td>SW Reset</td><td>MTP value</td><td>ID1=00h / ID2=80h / ID3=00h</td></tr><tr><td>HW Reset</td><td>MTP value</td><td>ID1=00h / ID2=80h / ID3=00h</td></tr></table> |                             |     |        |      |      |      |      |      |      |      |      |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP value                                 | ID1=00h / ID2=80h / ID3=00h | SW Reset                                 | MTP value | ID1=00h / ID2=80h / ID3=00h | HW Reset | MTP value | ID1=00h / ID2=80h / ID3=00h |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                |                             |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
|                                           | After MTP                                                                                                                                                                                                                                                                                                                                                                                    | Before MTP                  |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| Power On Sequence                         | MTP value                                                                                                                                                                                                                                                                                                                                                                                    | ID1=00h / ID2=80h / ID3=00h |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| SW Reset                                  | MTP value                                                                                                                                                                                                                                                                                                                                                                                    | ID1=00h / ID2=80h / ID3=00h |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |
| HW Reset                                  | MTP value                                                                                                                                                                                                                                                                                                                                                                                    | ID1=00h / ID2=80h / ID3=00h |     |        |      |      |      |      |      |      |      |      |     |        |               |                                          |           |                                         |                   |                                           |                             |                                          |           |                             |          |           |                             |



# RDNUMED(0500h) : Read Number of Errors on DSI

| 0500H                                     | RDNUMED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|--------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RDX | WRX | D15-D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1   | ↑   | X      | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 05  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup>                           | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ↑   | 1   | x      | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Parameter                                 | NO PARAMETER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>The first parameter is telling a number of the parity errors on DSI. The more detailed description of the bits is below.</p> <p>P[6..0] bits are telling a number of the parity errors.</p> <p>P[7] is set to “1” if there is overflow with P[6..0] bits.</p> <p>P[7..0] bits are set to “0”s (as well as RDDSM(0Eh)’s D0 are set “0” at the same time) after there is sent the first parameter information (= The read function is completed).</p> <p>This command is used for MIPI DSI only. It is no function for others interface operation.</p> |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                              |     |     |        |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                |     |     |        |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |        |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |



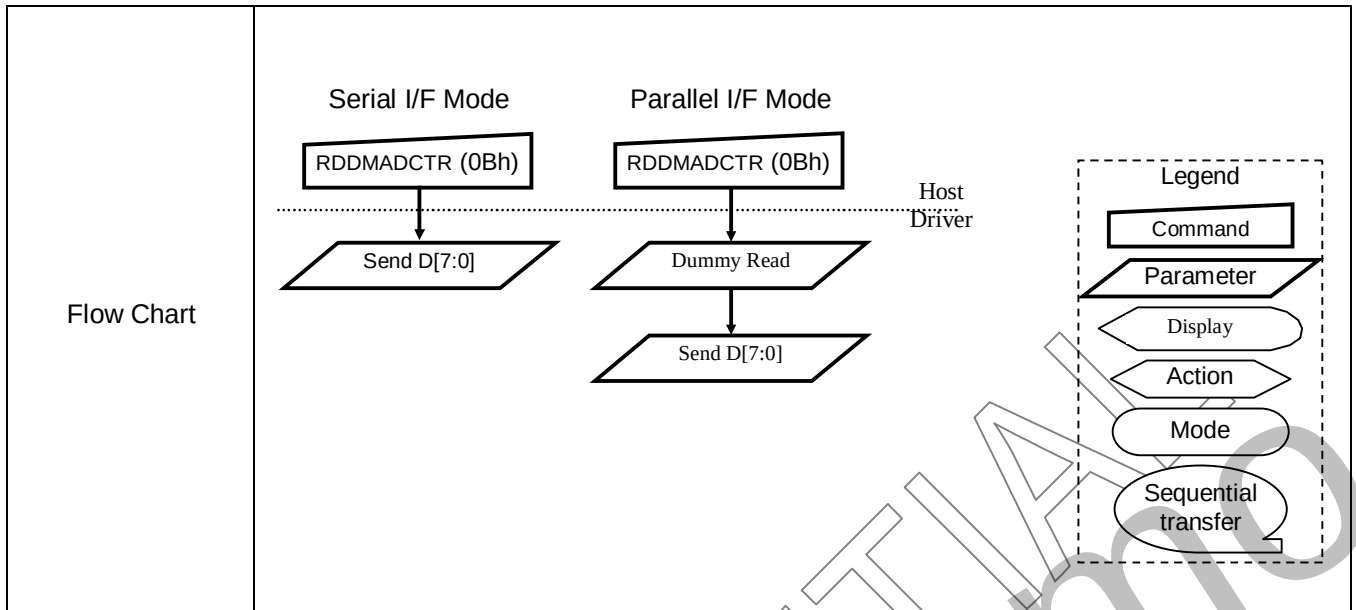
### RDDPM (0A00h) : Read Display Power Mode

| 0A00H                     |                                                                                           | RDDPM (Read Display Power Mode) |                            |       |    |    |                                                  |    |    |    |    |    |     |
|---------------------------|-------------------------------------------------------------------------------------------|---------------------------------|----------------------------|-------|----|----|--------------------------------------------------|----|----|----|----|----|-----|
|                           | DCX                                                                                       | RDX                             | WRX                        | D15-8 | D7 | D6 | D5                                               | D4 | D3 | D2 | D1 | D0 | HEX |
| Command                   | 0                                                                                         | 1                               | ↑                          | x     | 0  | 0  | 0                                                | 0  | 1  | 0  | 1  | 0  | 0A  |
| 1 <sup>st</sup> parameter | 1                                                                                         | ↑                               | 1                          | x     | D7 | D6 | D5                                               | D4 | D3 | D2 | D1 | D0 | 08  |
| Description               | This command indicates the current status of the display as described in the table below: |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           | Bit                                                                                       | Symbol                          | Description                |       |    |    | Comment                                          |    |    |    |    |    |     |
|                           | D7                                                                                        | BSTON                           | Booster Voltage Status     |       |    |    | '1'=Booster on,<br>'0'=Booster off               |    |    |    |    |    |     |
|                           | D6                                                                                        | IDMON                           | Idle Mode On/Off           |       |    |    | '1' = Idle Mode On,<br>'0' = Idle Mode Off       |    |    |    |    |    |     |
|                           | D5                                                                                        | PTLON                           | Partial Mode On/Off        |       |    |    | '1' = Partial Mode On,<br>'0' = Partial Mode Off |    |    |    |    |    |     |
|                           | D4                                                                                        | SLPON                           | Sleep In/Out               |       |    |    | '1' = Sleep Out,<br>'0' = Sleep In               |    |    |    |    |    |     |
|                           | D3                                                                                        | NORON                           | Display Normal Mode On/Off |       |    |    | '1' = Normal Display,<br>'0' = Partial Display   |    |    |    |    |    |     |
|                           | D2                                                                                        | DISON                           | Display On/Off             |       |    |    | '1' = Display On,<br>'0' = Display Off           |    |    |    |    |    |     |
|                           | D1                                                                                        | Reserved                        |                            |       |    |    | 0                                                |    |    |    |    |    |     |
|                           | D0                                                                                        | Reserved                        |                            |       |    |    | 0                                                |    |    |    |    |    |     |
| Register Availability     |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |
|                           |                                                                                           |                                 |                            |       |    |    |                                                  |    |    |    |    |    |     |

| Default           | <table border="1"> <thead> <tr> <th>Status</th><th>Default Value</th></tr> </thead> <tbody> <tr> <td>Power On Sequence</td><td>08h</td></tr> <tr> <td>SW Reset</td><td>08h</td></tr> <tr> <td>HW Reset</td><td>08h</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Status | Default Value | Power On Sequence | 08h | SW Reset | 08h | HW Reset | 08h |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|-------------------|-----|----------|-----|----------|-----|
| Status            | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |        |               |                   |     |          |     |          |     |
| Power On Sequence | 08h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |               |                   |     |          |     |          |     |
| SW Reset          | 08h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |               |                   |     |          |     |          |     |
| HW Reset          | 08h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |               |                   |     |          |     |          |     |
| Flow Chart        | <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Serial I/F Mode</p> <pre> graph TD     A[RDDPM (0Ah)] --&gt; B[/Send D[7:0]/]             </pre> </div> <div style="text-align: center;"> <p>Parallel I/F Mode</p> <pre> graph TD     A[RDDPM (0Ah)] --&gt; B[/Dummy Read/]     B --&gt; C[/Send D[7:0]/]             </pre> </div> <div style="border: 1px dashed black; padding: 5px;"> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> </div> </div> <p style="text-align: center; margin-top: 10px;">Host Driver</p> |        |               |                   |     |          |     |          |     |

## RDDMADCTR (0B00h): Read Display MADCTR

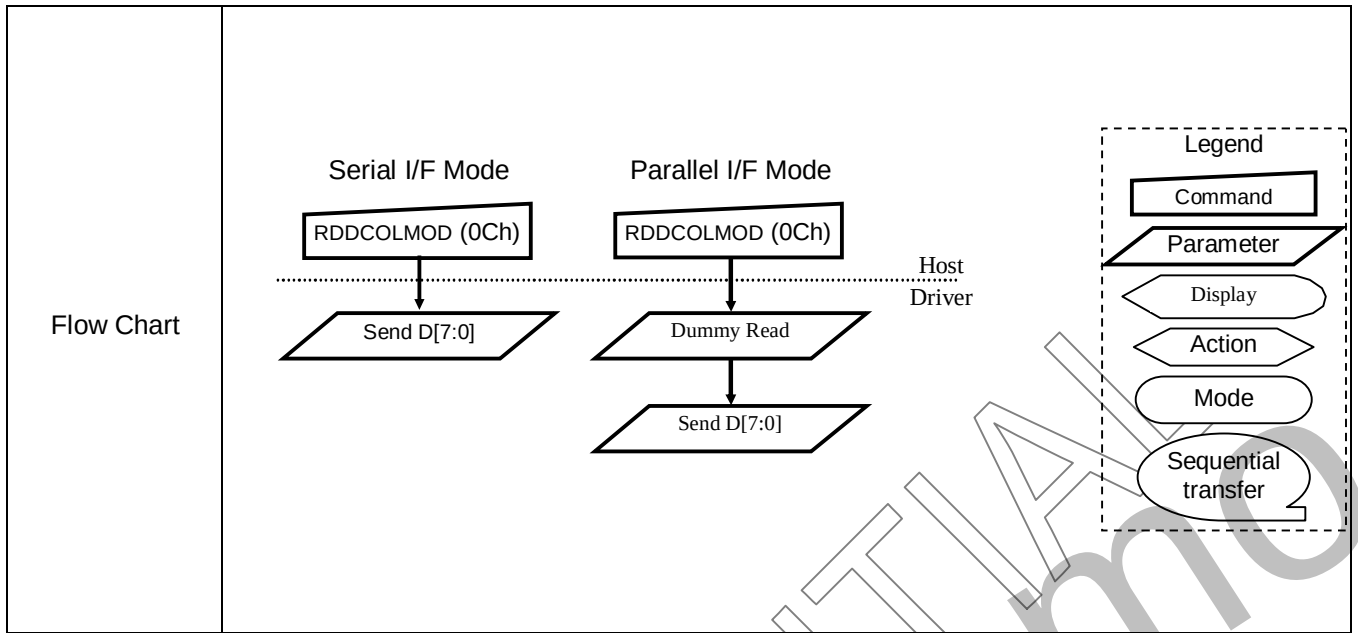
| 0B00H                     | RDDMADCTR (Read Display MADCTR)                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|---------------------------|-------------------------------------------------------------------------------------------|--------|--------------------------|-------|----|----------------------------------------------------------------------------|----|----|----|----|----|----|-----|
|                           | DCX                                                                                       | RDX    | WRX                      | D15-0 | D7 | D6                                                                         | D5 | D4 | D3 | D2 | D1 | D0 | HEX |
| Command                   | 0                                                                                         | 1      | ↑                        | x     | 0  | 0                                                                          | 0  | 0  | 1  | 0  | 1  | 1  | 0B  |
| 1 <sup>st</sup> parameter | 1                                                                                         | ↑      | 1                        | x     | D7 | D6                                                                         | D5 | D4 | D3 | D2 | D1 | D0 | 00  |
| Description               | This command indicates the current status of the display as described in the table below: |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           | Bit                                                                                       | Symbol | Description              |       |    | Comment                                                                    |    |    |    |    |    |    |     |
|                           | D7                                                                                        | MY     | Row Address Order        |       |    | '1' = Bottom to Top (36H-D7='1')<br>'0' = Top to Bottom (36H-D7='0')       |    |    |    |    |    |    |     |
|                           | D6                                                                                        | MX     | Column Address Order     |       |    | '1' = Right to Left (MADCTL-D6='1')<br>'0' = Left to Right (MADCTL-D6='0') |    |    |    |    |    |    |     |
|                           | D5                                                                                        | MV     | Row/Column Order (MV)    |       |    | '1' = Row/column exchange(36H-D5='1')<br>'0' = Normal (36H-D5='0')         |    |    |    |    |    |    |     |
|                           | D4                                                                                        | ML     | Vertical Refresh Order   |       |    | '1' =LCD Refresh Top to Bottom<br>'0' =LCD Refresh Bottom to Top           |    |    |    |    |    |    |     |
|                           | D3                                                                                        | RGB    | RGB/BGR Order            |       |    | '1' =BGR, '0'=RGB                                                          |    |    |    |    |    |    |     |
|                           | D2                                                                                        | MH     | Horizontal Refresh Order |       |    | '0' = LCD Refresh Left to Right<br>'1' = LCD Refresh Right to Left         |    |    |    |    |    |    |     |
|                           | D1                                                                                        | RSMX   | Horizontal Flip          |       |    | '0' = Normal display(36H-D1='1')<br>'1' = Flipped display(36H-D1='1')      |    |    |    |    |    |    |     |
|                           | D0                                                                                        | RSMY   | Vertical Flip            |       |    | '0' = Normal display(36H-D0='1')<br>'1' = Flipped display(36H-D0='1')      |    |    |    |    |    |    |     |
| Register Availability     |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
| Default                   |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |
|                           |                                                                                           |        |                          |       |    |                                                                            |    |    |    |    |    |    |     |





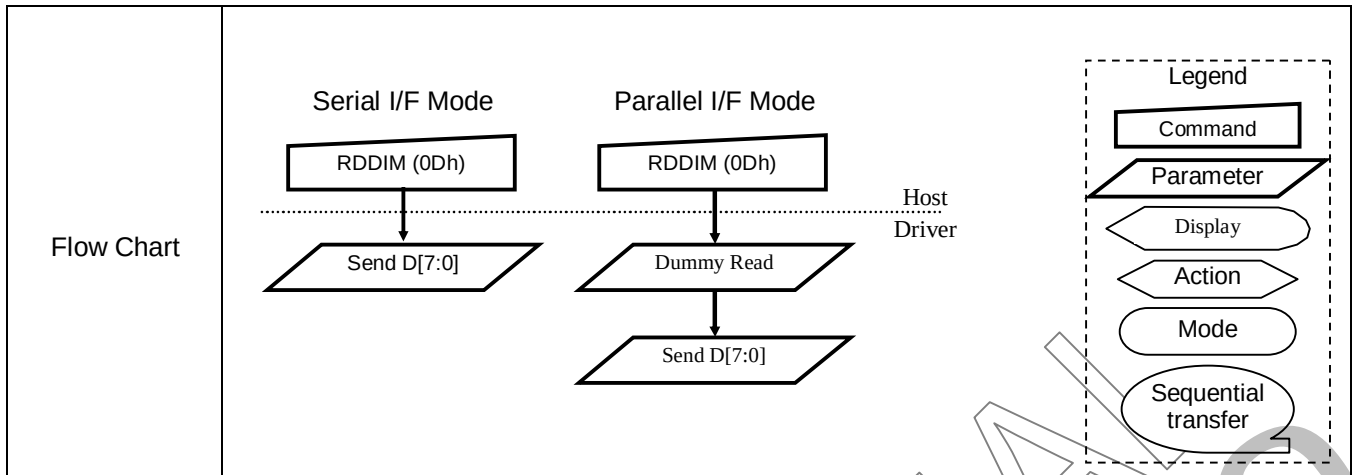
## RDDCOLMOD (0C00h): Read Display Pixel Format

| 0C00H                     | RDDCOLMOD (Read Display Pixel Format)                                                     |          |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|---------------------------|-------------------------------------------------------------------------------------------|----------|--------------------------------------------------|-------|----|----|----------------------------------------------------------------------------------------------------------|----|----|----|---------------|----|-----|
|                           | DCX                                                                                       | RDX      | WRX                                              | D15-8 | D7 | D6 | D5                                                                                                       | D4 | D3 | D2 | D1            | D0 | HEX |
| Command                   | 0                                                                                         | 1        | ↑                                                | x     | 0  | 0  | 0                                                                                                        | 0  | 1  | 1  | 0             | 0  | 0C  |
| 1 <sup>st</sup> parameter | 1                                                                                         | ↑        | 1                                                | x     | D7 | D6 | D5                                                                                                       | D4 | D3 | D2 | D1            | D0 | 66  |
| Description               | This command indicates the current status of the display as described in the table below: |          |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|                           | Bit                                                                                       | Symbol   | Description                                      |       |    |    | Comment                                                                                                  |    |    |    |               |    |     |
|                           | D7                                                                                        | Reserved |                                                  |       |    |    | '0'                                                                                                      |    |    |    |               |    |     |
|                           | D6                                                                                        | VIPF[2]  | DPI Pixel Format(RGB Interface Color Format)     |       |    |    | '101' = 16-bits / pixel,<br>'110' = 18-bits / pixel,<br>'111' = 24-bits / pixel,<br>others are no define |    |    |    |               |    |     |
|                           | D5                                                                                        | VIPF[1]  |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|                           | D4                                                                                        | VIPF[0]  |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|                           | D3                                                                                        | Reserved |                                                  |       |    |    | '0'                                                                                                      |    |    |    |               |    |     |
|                           | D2                                                                                        | IFPF[2]  | DBI Pixel Format(Control Interface Color Format) |       |    |    | '101' = 16-bits / pixel,<br>'110' = 18-bits / pixel,<br>'111' = 24-bits / pixel,<br>others are no define |    |    |    |               |    |     |
|                           | D1                                                                                        | IFPF[1]  |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|                           | D0                                                                                        | IFPF[0]  |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
| Register Availability     |                                                                                           |          |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|                           | Status                                                                                    |          |                                                  |       |    |    |                                                                                                          |    |    |    | Availability  |    |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                  |          |                                                  |       |    |    |                                                                                                          |    |    |    | Yes           |    |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                   |          |                                                  |       |    |    |                                                                                                          |    |    |    | Yes           |    |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                 |          |                                                  |       |    |    |                                                                                                          |    |    |    | Yes           |    |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                  |          |                                                  |       |    |    |                                                                                                          |    |    |    | Yes           |    |     |
| Default                   |                                                                                           |          |                                                  |       |    |    |                                                                                                          |    |    |    |               |    |     |
|                           | Status                                                                                    |          |                                                  |       |    |    |                                                                                                          |    |    |    | Default Value |    |     |
|                           | Power On Sequence                                                                         |          |                                                  |       |    |    |                                                                                                          |    |    |    | 66h           |    |     |
|                           | SW Reset                                                                                  |          |                                                  |       |    |    |                                                                                                          |    |    |    | No Change     |    |     |
|                           | HW Reset                                                                                  |          |                                                  |       |    |    |                                                                                                          |    |    |    | 66h           |    |     |



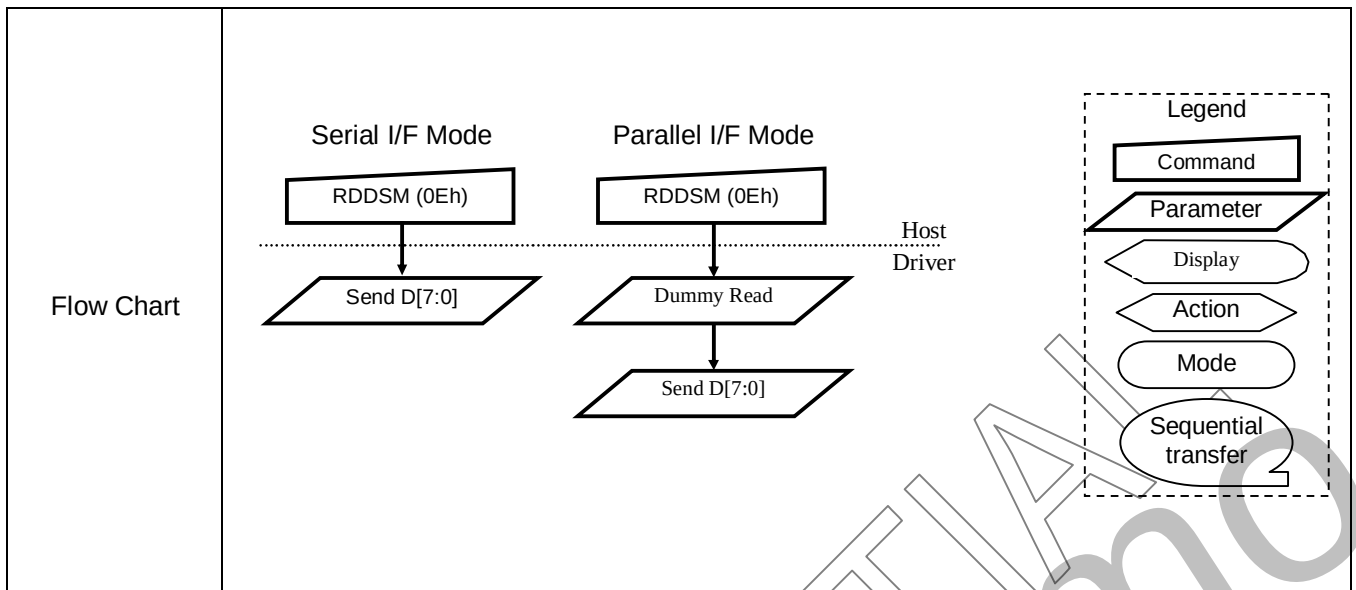
# RDDIM (0D00h): Read Display Image Mode

| 0D00H                     | RDDIM (Read Display Image Mode)                           |          |                       |       |    |    |                                                      |    |    |    |     |               |     |
|---------------------------|-----------------------------------------------------------|----------|-----------------------|-------|----|----|------------------------------------------------------|----|----|----|-----|---------------|-----|
|                           | DCX                                                       | RDX      | WRX                   | D15-8 | D7 | D6 | D5                                                   | D4 | D3 | D2 | D1  | D0            | HEX |
| Command                   | 0                                                         | 1        | ↑                     | x     | 0  | 0  | 0                                                    | 0  | 1  | 1  | 0   | 1             | 0D  |
| 1 <sup>st</sup> Parameter | 1                                                         | ↑        | 1                     | x     | D7 | D6 | D5                                                   | D4 | D3 | D2 | D1  | D0            | 00  |
| Description               | The display module returns the display image mode status. |          |                       |       |    |    |                                                      |    |    |    |     |               |     |
|                           | Bit                                                       | Symbol   | Description           |       |    |    | Comment                                              |    |    |    |     |               |     |
|                           | D7                                                        | Reserved |                       |       |    |    | '0'                                                  |    |    |    |     |               |     |
|                           | D6                                                        | Reserved |                       |       |    |    | '0'                                                  |    |    |    |     |               |     |
|                           | D5                                                        | INVON    | Inversion On/Off      |       |    |    | "1" = Inversion is On,<br>"0" = Inversion is Off     |    |    |    |     |               |     |
|                           | D4                                                        | ALLON    | All Pixel On          |       |    |    | '0' = Normal display<br>'1' = White display          |    |    |    |     |               |     |
|                           | D3                                                        | ALLOFF   | All Pixel Off         |       |    |    | '0' = Normal display<br>'1' = Black display          |    |    |    |     |               |     |
|                           | D2~D0                                                     | GAMSET   | Gamma Curve Selection |       |    |    | '000' = GC0, '001' = GC1<br>'010' = GC2, '011' = GC3 |    |    |    |     |               |     |
| Register Availability     |                                                           |          |                       |       |    |    |                                                      |    |    |    |     |               |     |
|                           | Status                                                    |          |                       |       |    |    |                                                      |    |    |    |     | Availability  |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                  |          |                       |       |    |    |                                                      |    |    |    |     | Yes           |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                   |          |                       |       |    |    |                                                      |    |    |    |     | Yes           |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                 |          |                       |       |    |    |                                                      |    |    |    |     | Yes           |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                  |          |                       |       |    |    |                                                      |    |    |    |     | Yes           |     |
| Default                   | Sleep In                                                  |          |                       |       |    |    |                                                      |    |    |    |     | Yes           |     |
|                           |                                                           |          |                       |       |    |    |                                                      |    |    |    |     |               |     |
|                           | Status                                                    |          |                       |       |    |    |                                                      |    |    |    |     | Default Value |     |
|                           | Power On Sequence                                         |          |                       |       |    |    |                                                      |    |    |    |     | 00h           |     |
| SW Reset                  |                                                           |          |                       |       |    |    |                                                      |    |    |    | 00h |               |     |
| HW Reset                  |                                                           |          |                       |       |    |    |                                                      |    |    |    | 00h |               |     |



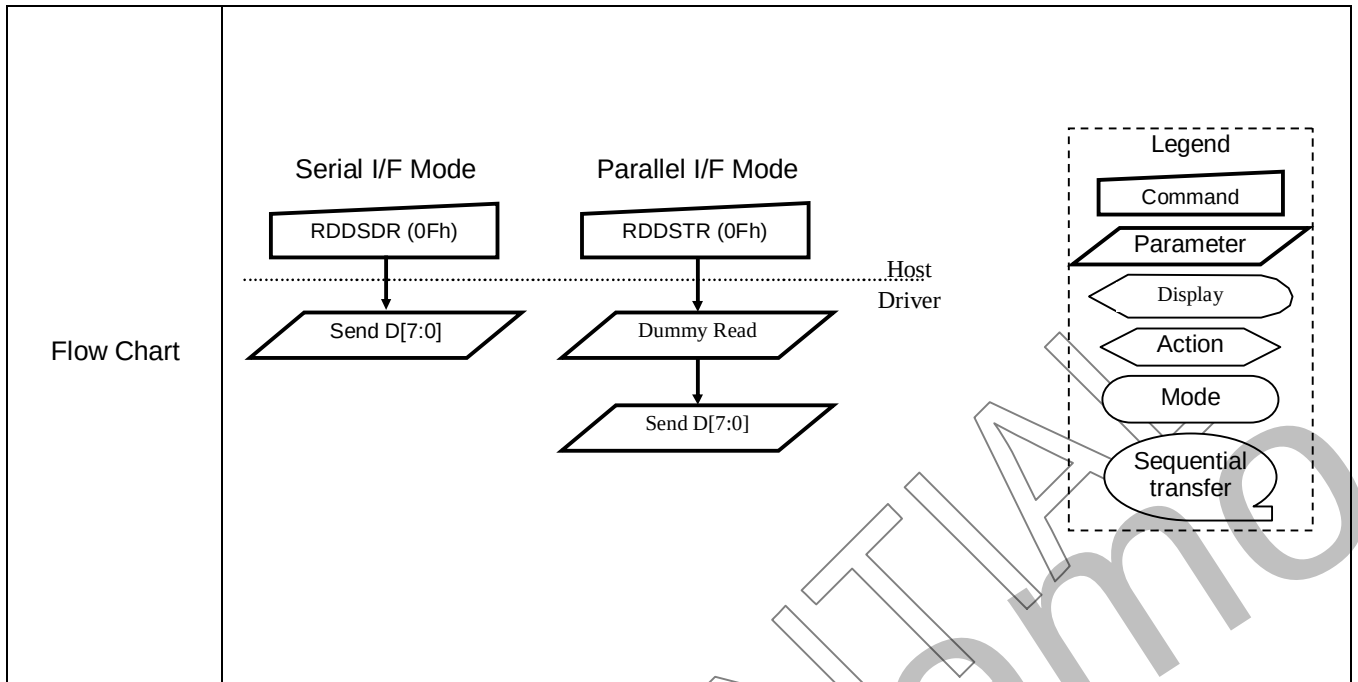
# RDDSM (0E00h): Read Display Signal Mode

| 0E00H                     | RDDSM (Read Display Signal Mode)                    |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|---------------------------|-----------------------------------------------------|--------------|----------------------------|-------|----|----|----------------------------------------|----|----|----|----|----|-----|
|                           | DCX                                                 | RDX          | WRX                        | D15-8 | D7 | D6 | D5                                     | D4 | D3 | D2 | D1 | D0 | HEX |
| Command                   | 0                                                   | 1            | ↑                          | x     | 0  | 0  | 0                                      | 0  | 1  | 1  | 1  | 0  | 0E  |
| 1 <sup>st</sup> parameter | 1                                                   | ↑            | 1                          | x     | D7 | D6 | D5                                     | D4 | D3 | D2 | D1 | D0 | 00  |
| Description               | The display module returns the Display Signal Mode. |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           | Bit                                                 | Symbol       | Description                |       |    |    | Comment                                |    |    |    |    |    |     |
|                           | D7                                                  | TEON         | Tearing Effect Line On/Off |       |    |    | "1" = On, "0" = Off                    |    |    |    |    |    |     |
|                           | D6                                                  | TELOM        | Tearing effect line mode   |       |    |    | "0" = mode1,<br>"1" = mode2            |    |    |    |    |    |     |
|                           | D5                                                  | HS           | Horizontal Sync On/Off     |       |    |    | '0' = HS bit is 0<br>'1' = HS bit is 1 |    |    |    |    |    |     |
|                           | D4                                                  | VS           | Vertical Sync On/Off       |       |    |    | '0' = VS bit is 0<br>'1' = VS bit is 1 |    |    |    |    |    |     |
|                           | D3                                                  | PCLK         | Pixel Clock On/Off         |       |    |    | '0' = PCLK is Off<br>'1' = PCLK is On  |    |    |    |    |    |     |
|                           | D2                                                  | DE           | Data Enable On/Off         |       |    |    | '0' = DE is 0<br>'1' = DE is 1         |    |    |    |    |    |     |
|                           | D1                                                  | Reserved     |                            |       |    |    | '0'                                    |    |    |    |    |    |     |
|                           | D0                                                  | Error on DSI | Error on DSI               |       |    |    | '0' = No Error<br>'1' = Error          |    |    |    |    |    |     |
| Register Availability     |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
| Default                   |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |
|                           |                                                     |              |                            |       |    |    |                                        |    |    |    |    |    |     |



# RDDSDR (0F00h): Read Display Self-Diagnostic Result

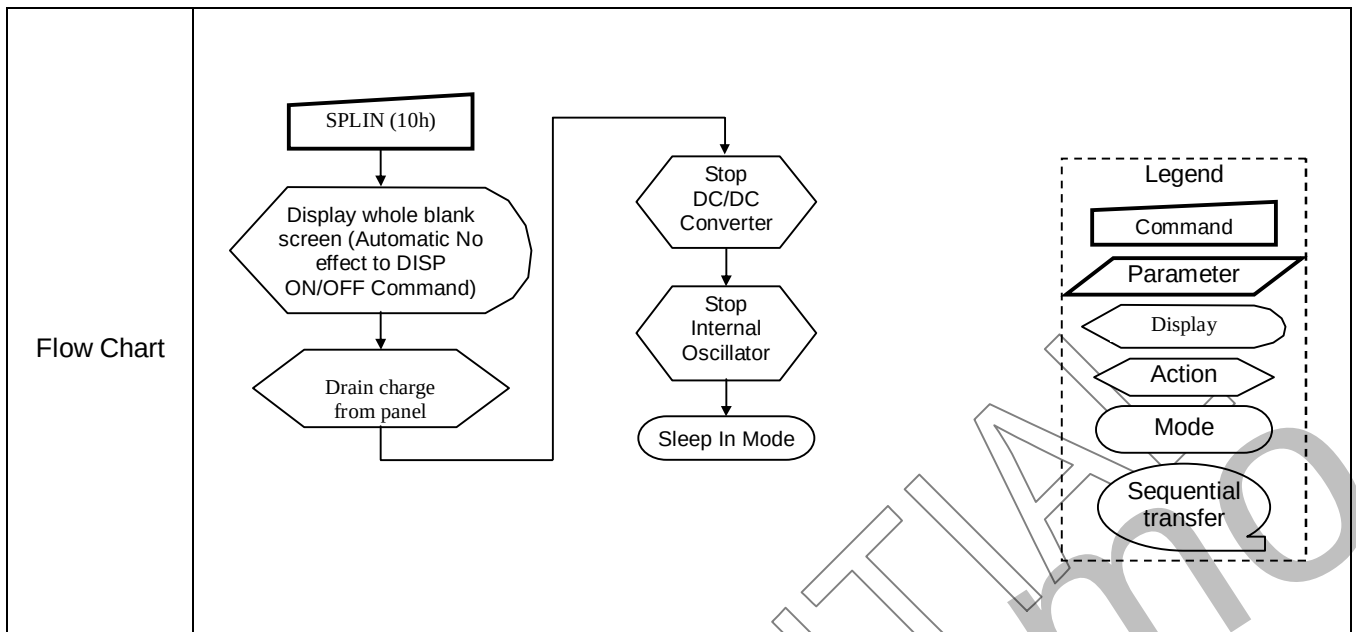
| 0F00H                     | RDDSDR (Read Display Self-Diagnostic Result)                                          |          |                               |       |    |    |    |                              |    |    |               |    |     |
|---------------------------|---------------------------------------------------------------------------------------|----------|-------------------------------|-------|----|----|----|------------------------------|----|----|---------------|----|-----|
|                           | DCX                                                                                   | RDX      | WRX                           | D15-8 | D7 | D6 | D5 | D4                           | D3 | D2 | D1            | D0 | HEX |
| Command                   | 0                                                                                     | 1        | ↑                             | x     | 0  | 0  | 0  | 0                            | 1  | 1  | 1             | 1  | 0F  |
| 1 <sup>st</sup> Parameter | 1                                                                                     | ↑        | 1                             | x     | D7 | D6 | D5 | D4                           | D3 | D2 | D1            | D0 | 00  |
| Description               | The display module returns the self-diagnostic results following a Sleep Out command. |          |                               |       |    |    |    |                              |    |    |               |    |     |
|                           | Bit                                                                                   | Symbol   | Description                   |       |    |    |    | Comment                      |    |    |               |    |     |
|                           | D7                                                                                    | RELD     | Register Loading Detection    |       |    |    |    |                              |    |    |               |    |     |
|                           | D6                                                                                    | FUND     | Functionality Detection       |       |    |    |    |                              |    |    |               |    |     |
|                           | D5                                                                                    | CAD      | Chip Attachment Detection     |       |    |    |    |                              |    |    |               |    |     |
|                           | D4                                                                                    | DGBD     | Display Glass Break Detection |       |    |    |    |                              |    |    |               |    |     |
|                           | D3                                                                                    | Reserved |                               |       |    |    |    | '0'                          |    |    |               |    |     |
|                           | D2                                                                                    | Reserved |                               |       |    |    |    | '0'                          |    |    |               |    |     |
|                           | D1                                                                                    | Reserved |                               |       |    |    |    | '0'                          |    |    |               |    |     |
|                           | D0                                                                                    | CSC      | Checksums Comparison          |       |    |    |    | '0' = Same<br>'1' = Not Same |    |    |               |    |     |
| Register Availability     |                                                                                       |          |                               |       |    |    |    |                              |    |    |               |    |     |
|                           | Status                                                                                |          |                               |       |    |    |    |                              |    |    | Availability  |    |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                              |          |                               |       |    |    |    |                              |    |    | Yes           |    |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                               |          |                               |       |    |    |    |                              |    |    | Yes           |    |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                             |          |                               |       |    |    |    |                              |    |    | Yes           |    |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                              |          |                               |       |    |    |    |                              |    |    | Yes           |    |     |
| Default                   |                                                                                       |          |                               |       |    |    |    |                              |    |    |               |    |     |
|                           | Status                                                                                |          |                               |       |    |    |    |                              |    |    | Default Value |    |     |
|                           | Power On Sequence                                                                     |          |                               |       |    |    |    |                              |    |    | 00h           |    |     |
|                           | SW Reset                                                                              |          |                               |       |    |    |    |                              |    |    | 00h           |    |     |
|                           | HW Reset                                                                              |          |                               |       |    |    |    |                              |    |    | 00h           |    |     |





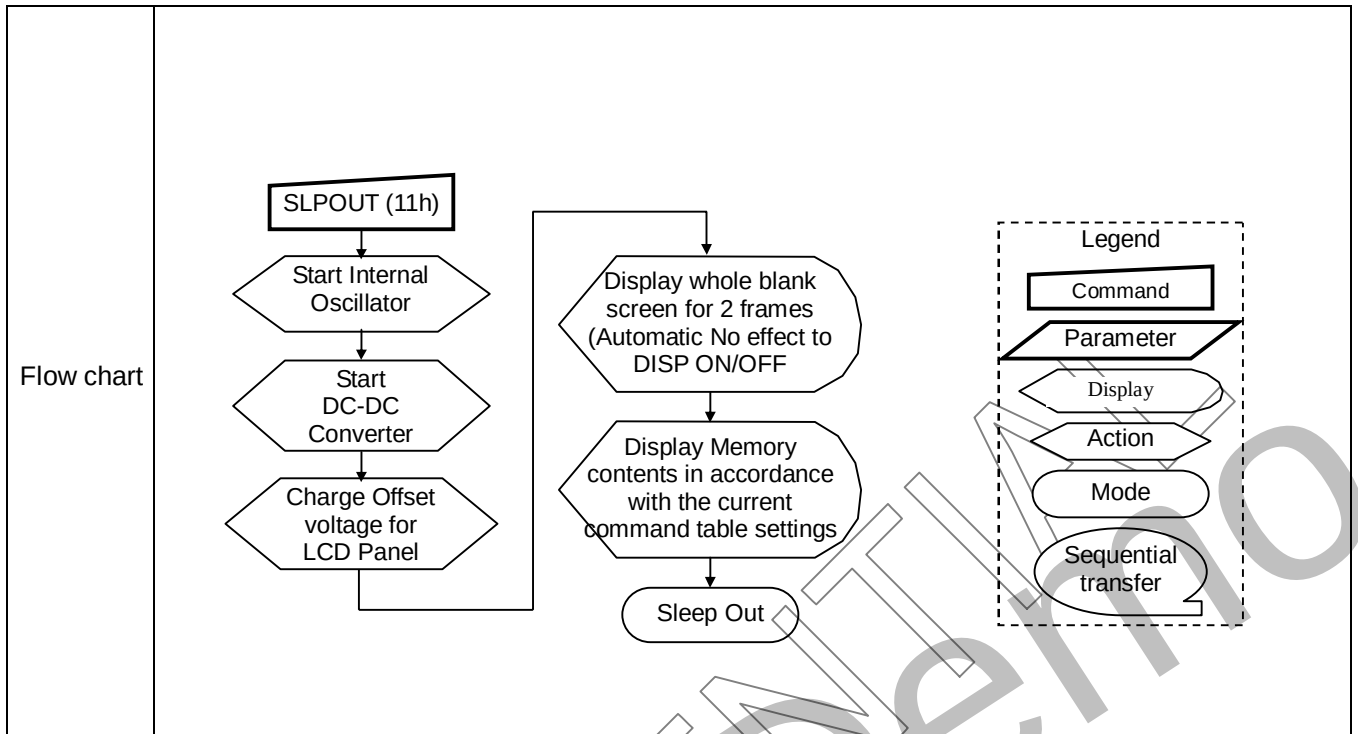
## SLPIN (1000h): Sleep In

| 1000H                                     | SLPIN (Sleep In)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|---------------|-----------------------------------------|---------------|-------------------------------------------|---------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | ↑   | x     | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 10  |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Description                               | <p>This command causes the display module to enter the Sleep mode.</p> <p>This command causes the AMOLED module to enter the Sleep mode. In this mode, the DC/DC converter, internal oscillator and panel scanning stop. DBI or DSI Command Mode remains operational and the frame memory maintains its contents. The host processor continues to send PCLK, HS and VS information to display modules for two frames after this command is sent when the display module is in Normal mode.</p> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Restriction                               | <p>This command has no effect when the display module is already in Sleep mode.</p> <p>The host processor must wait 5 milliseconds before sending any new commands to a display module following this command to allow time for the supply voltages and clock circuits to stabilize. The host processor must wait 120 milliseconds after sending a Sleep Out command before sending an Sleep In command.</p>                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes           | Normal Mode On, Idle Mode On, Sleep Out | Yes           | Partial Mode On, Idle Mode Off, Sleep Out | Yes           | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Sleep In Mode</td></tr><tr><td>SW Reset</td><td>Sleep In Mode</td></tr><tr><td>HW Reset</td><td>Sleep In Mode</td></tr></table>                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Sleep In Mode | SW Reset                                | Sleep In Mode | HW Reset                                  | Sleep In Mode |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Power On Sequence                         | Sleep In Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| SW Reset                                  | Sleep In Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| HW Reset                                  | Sleep In Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |



## SLPOUT (1100h): Sleep Out

| 1100H                                     | SLPOUT (Sleep Out)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|---------------|-----------------------------------------|---------------|-------------------------------------------|---------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | ↑   | x     | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 11  |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Description                               | This command causes the display module to exit Sleep mode. All blocks inside the display module are enabled. The host processor sends PCLK, HS and VS information to display modules two frames before this command is sent when the display module is in Normal Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Restriction                               | <p>This command shall not cause any visible effect on the display device when the display module is not in Sleep mode. The host processor must wait five milliseconds after sending this command before sending another command. This delay allows the supply voltages and clock circuits to stabilize.</p> <p>The host processor must wait 120 milliseconds after sending a Sleep Out command before sending a Sleep-In command. The display module loads the display module's default values to the registers when exiting the Sleep mode. There shall not be any abnormal visual effect on the display device when loading the registers if the factory default and register values are the same or when the display module is not in Sleep mode. The display module runs the self-diagnostic functions after this command is received.</p> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes           | Normal Mode On, Idle Mode On, Sleep Out | Yes           | Partial Mode On, Idle Mode Off, Sleep Out | Yes           | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Sleep In Mode</td></tr><tr><td>SW Reset</td><td>Sleep In Mode</td></tr><tr><td>HW Reset</td><td>Sleep In Mode</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Sleep In Mode | SW Reset                                | Sleep In Mode | HW Reset                                  | Sleep In Mode |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Power On Sequence                         | Sleep In Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| SW Reset                                  | Sleep In Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| HW Reset                                  | Sleep In Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |



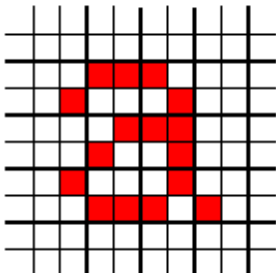
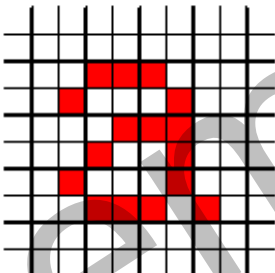
# PTLON (1200h): Partial Display Mode On

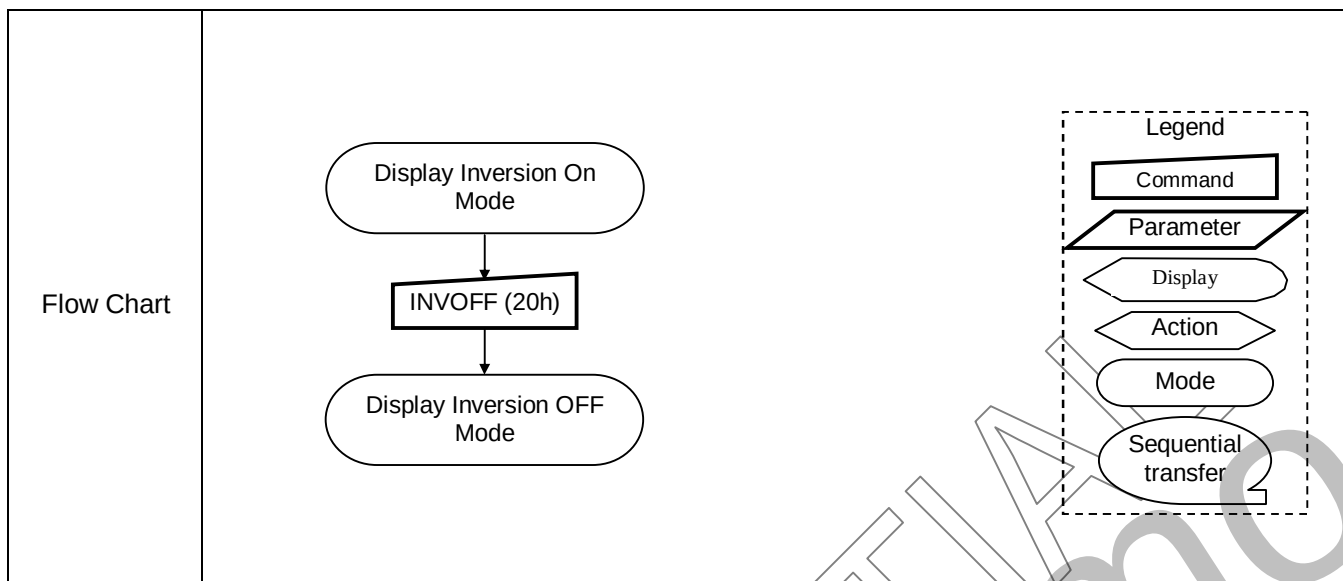
| 1200H                                     | PTLON (Partial Display Mode On)                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|------------------------|-----------------------------------------|------------------------|-------------------------------------------|------------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | ↑   | x     | 0  | 0  | 0  | 1  | 0  | 0  | 1  | 0  | 12  |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Description                               | <p>This command causes the display module to enter the Partial Display Mode. The Partial Display Mode window is described by the Partial Area (30h) command.</p> <p>To leave Partial Display Mode, the Normal Display Mode On (13h) command should be written. The host processor continues to send PCLK, HS and VS information to display modules for two frames after this command is sent when the display module is in Normal Display Mode.</p> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Restriction                               | This command has no effect when Partial Display Mode is already active.                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                          |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                    | Normal Mode On, Idle Mode On, Sleep Out | Yes                    | Partial Mode On, Idle Mode Off, Sleep Out | Yes                    | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Normal display mode On</td></tr><tr><td>SW Reset</td><td>Normal display mode On</td></tr><tr><td>HW Reset</td><td>Normal display mode On</td></tr></table>                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Normal display mode On | SW Reset                                | Normal display mode On | HW Reset                                  | Normal display mode On |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Power On Sequence                         | Normal display mode On                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| SW Reset                                  | Normal display mode On                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| HW Reset                                  | Normal display mode On                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Flow Chart                                | Refer to Partial Area (30h)                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |

# **NORON (1300h): Normal Display Mode On**

| 1300H                                     | NORON (Normal Display Mode On)                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|------------------------|-----------------------------------------|------------------------|-------------------------------------------|------------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0  | 0  | 0  | 1  | 0  | 0  | 1  | 1  | 13  |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Description                               | <p>This command causes the display module to enter the Normal mode. Normal Mode is defined as Partial Display mode and Scroll mode are off.</p> <p>The host processor sends PCLK, HS and VS information to Type 2 display modules two frames before this command is sent when the display module is in Partial Display Mode.</p>                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Restriction                               | This command has no effect when Normal Display mode is already active.                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                    | Normal Mode On, Idle Mode On, Sleep Out | Yes                    | Partial Mode On, Idle Mode Off, Sleep Out | Yes                    | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Normal Display Mode On</td></tr><tr><td>SW Reset</td><td>Normal Display Mode On</td></tr><tr><td>HW Reset</td><td>Normal Display Mode On</td></tr></table>                                                                                                                                          |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Normal Display Mode On | SW Reset                                | Normal Display Mode On | HW Reset                                  | Normal Display Mode On |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Power On Sequence                         | Normal Display Mode On                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| SW Reset                                  | Normal Display Mode On                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| HW Reset                                  | Normal Display Mode On                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |
| Flow Chart                                | Refer to the description of Partial Area (3000h)                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                        |                                         |                        |                                           |                        |                                          |     |          |     |

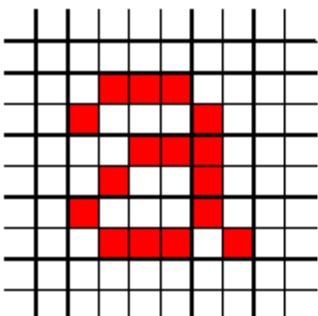
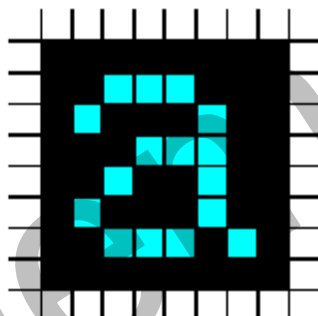
## INVOFF (2000H): Display Inversion Off

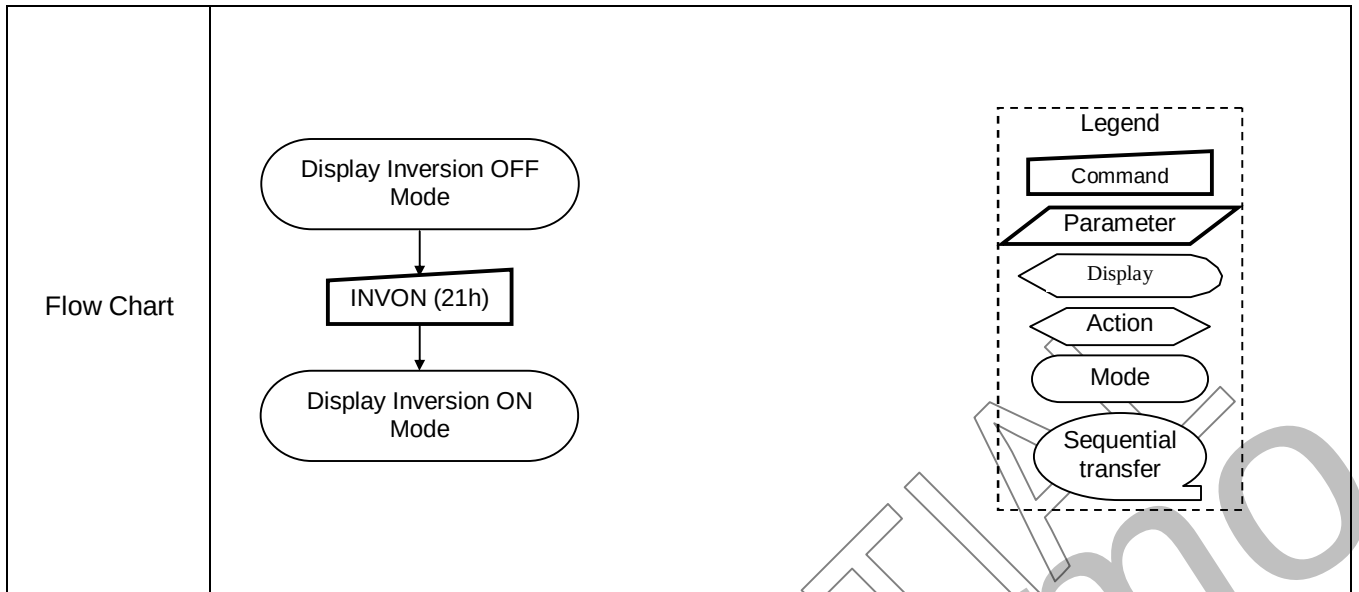
| 2000H                                     | INVOFF (Display Inversion Off)                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----------------------|-----------------------------------------|-----------------------|-------------------------------------------|-----------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                              | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | ↑   | x     | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 20  |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Description                               | <p>This command causes the display module to stop inverting the image data on the display device. The frame memory contents remain unchanged. No status bits are changed.</p> <div><div><p>Memory</p></div><div>⇒</div><div><p>Display Panel</p></div></div> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Restriction                               | This command has no effect when the display module is not inverting the display image.                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                       |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                   | Normal Mode On, Idle Mode On, Sleep Out | Yes                   | Partial Mode On, Idle Mode Off, Sleep Out | Yes                   | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Display Inversion off</td></tr><tr><td>SW Reset</td><td>Display Inversion off</td></tr><tr><td>HW Reset</td><td>Display Inversion off</td></tr></table>                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Display Inversion off | SW Reset                                | Display Inversion off | HW Reset                                  | Display Inversion off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Power On Sequence                         | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| SW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| HW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |



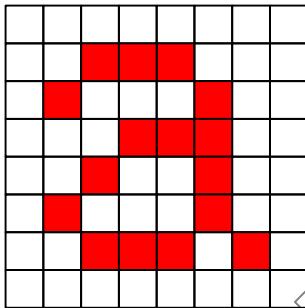
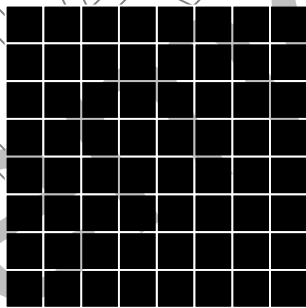


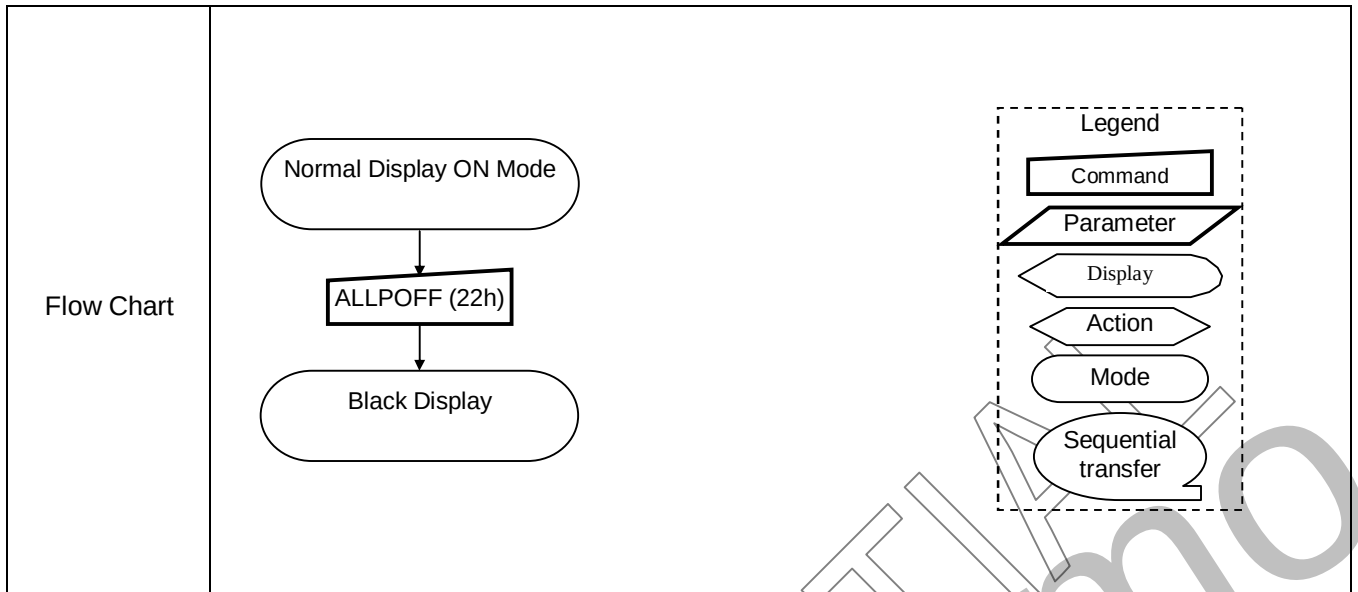
## INVON (2100H): Display Inversion On

| 2100H                                     | INVON (Display Inversion On)                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----------------------|-----------------------------------------|-----------------------|-------------------------------------------|-----------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                           | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | ↑   | x     | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 1  | 21  |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Description                               | <p>This command causes the display module to invert the image data only on the display device. The frame memory contents remain unchanged. No status bits are changed.</p> <div><div><p>Memory</p></div><div>➔</div><div><p>Display Panel</p></div></div> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Restriction                               | This command has no effect when module is already in inversion on mode.                                                                                                                                                                                                                                                                                                                                                       |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                    |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                   | Normal Mode On, Idle Mode On, Sleep Out | Yes                   | Partial Mode On, Idle Mode Off, Sleep Out | Yes                   | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Display Inversion off</td></tr><tr><td>SW Reset</td><td>Display Inversion off</td></tr><tr><td>HW Reset</td><td>Display Inversion off</td></tr></table>                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Display Inversion off | SW Reset                                | Display Inversion off | HW Reset                                  | Display Inversion off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Power On Sequence                         | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| SW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| HW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |

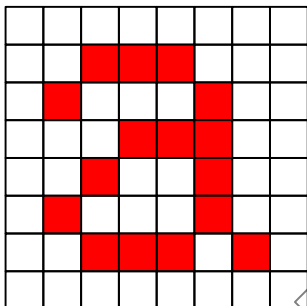
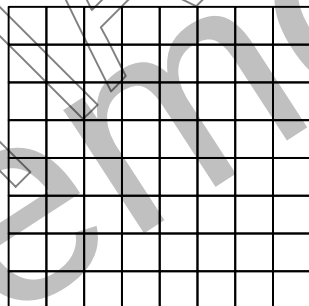


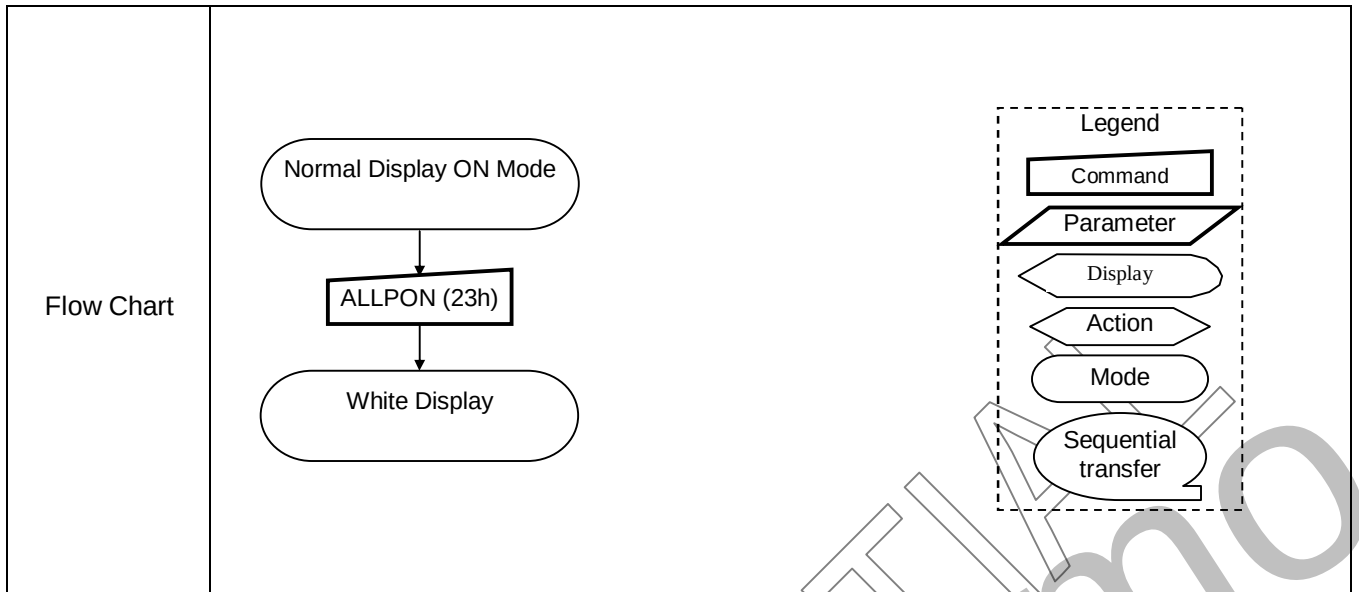
## ALLPOFF (2200H): All Pixel Off

| 2200H                                     | ALLPOFF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----------------------|-----------------------------------------|-----------------------|-------------------------------------------|-----------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | ↑   | x     | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 0  | 22  |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Description                               | <p>This command turns the display panel black in Sleep Out mode and a status of the Display On/Off register can be on or off.</p> <p>This command makes no change of contents of frame memory.</p> <p>This command does not change any other status.</p> <div><div><p>Memory</p></div><div><p>→</p></div><div><p>Display</p></div></div> <p>“All Pixels On”, “Normal Display Mode On” or “Partial Mode On” commands are used to leave this mode. The display panel is showing the content of the frame memory after “Normal Display On” and “Partial Mode On” commands.</p> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                   | Normal Mode On, Idle Mode On, Sleep Out | Yes                   | Partial Mode On, Idle Mode Off, Sleep Out | Yes                   | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Display Inversion off</td></tr><tr><td>SW Reset</td><td>Display Inversion off</td></tr><tr><td>HW Reset</td><td>Display Inversion off</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Display Inversion off | SW Reset                                | Display Inversion off | HW Reset                                  | Display Inversion off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Power On Sequence                         | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| SW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| HW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |



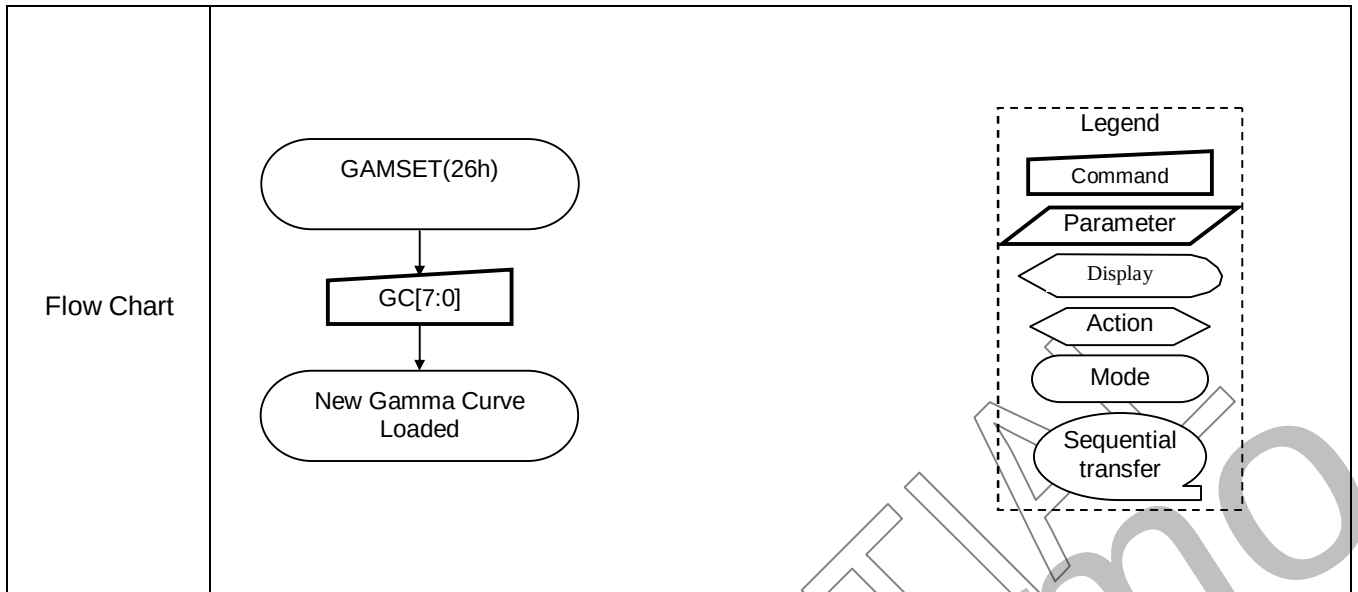
## ALLPON (2300H): All Pixel On

| 2300H                                     | ALLPON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----------------------|-----------------------------------------|-----------------------|-------------------------------------------|-----------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1   | ↑   | x     | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 1  | 23  |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Description                               | <p>This command turns the display panel white in Sleep Out mode and a status of the Display On/Off register can be on or off.</p> <p>This command makes no change of contents of frame memory.</p> <p>This command does not change any other status.</p> <div><div><p>Memory</p></div><div><p>→</p></div><div><p>Display</p></div></div> <p>“All Pixels Off”, “Normal Display Mode On” or “Partial Mode On” commands are used to leave this mode. The display panel is showing the content of the frame memory after “Normal Display On” and “Partial Mode On” commands.</p> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                   | Normal Mode On, Idle Mode On, Sleep Out | Yes                   | Partial Mode On, Idle Mode Off, Sleep Out | Yes                   | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Display Inversion off</td></tr><tr><td>SW Reset</td><td>Display Inversion off</td></tr><tr><td>HW Reset</td><td>Display Inversion off</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Display Inversion off | SW Reset                                | Display Inversion off | HW Reset                                  | Display Inversion off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| Power On Sequence                         | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| SW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |
| HW Reset                                  | Display Inversion off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |                       |                                         |                       |                                           |                       |                                          |     |          |     |



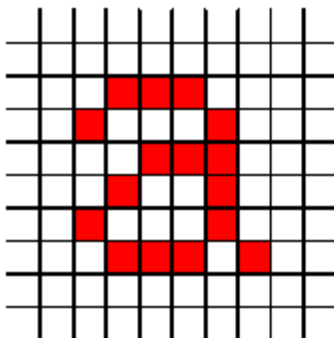
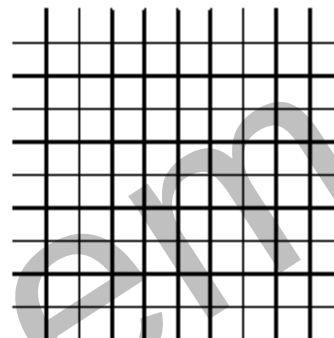
# GAMSET (2600H): Gamma Set

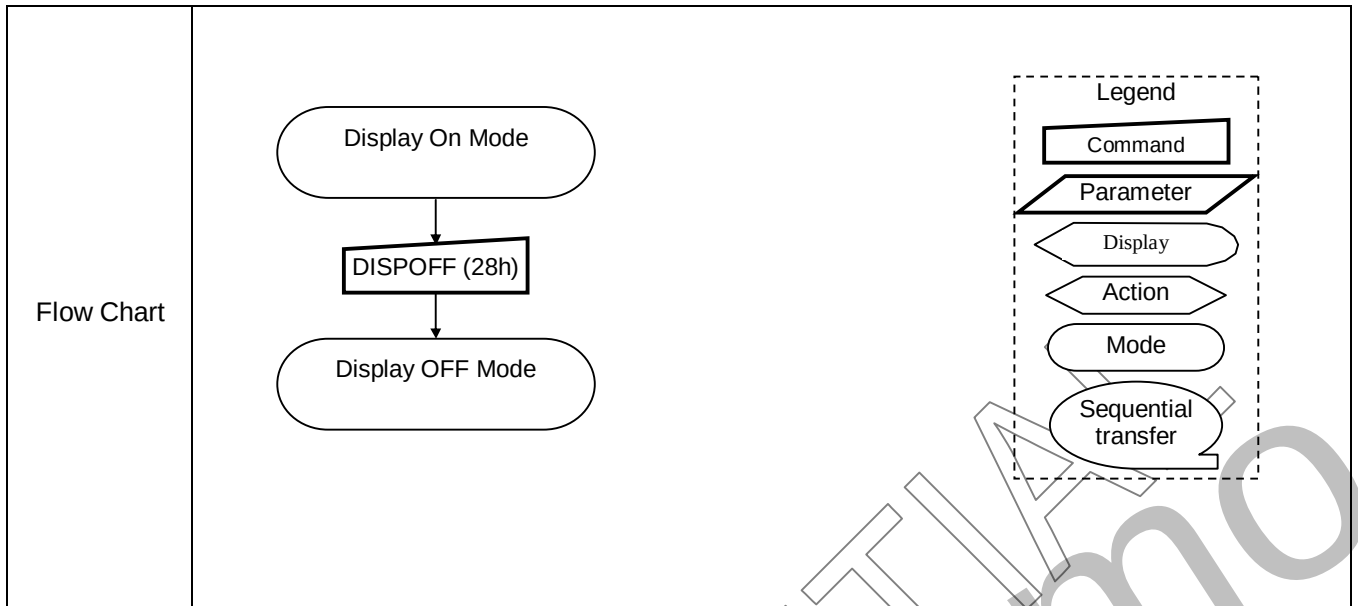
| 2600H                     | GAMSET                                                                                                                                                                                                                  |     |     |       |           |     |     |     |                    |     |     |     |     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-----------|-----|-----|-----|--------------------|-----|-----|-----|-----|
|                           | DCX                                                                                                                                                                                                                     | RDX | WRX | D15-8 | D7        | D6  | D5  | D4  | D3                 | D2  | D1  | D0  | HEX |
| Command                   | 0                                                                                                                                                                                                                       | 1   | ↑   | x     | 0         | 0   | 1   | 0   | 0                  | 1   | 1   | 0   | 26  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                       | 1   | ↑   | x     | GC7       | GC6 | GC5 | GC4 | GC3                | GC2 | GC1 | GC0 | 01  |
| Parameter                 | No Parameter                                                                                                                                                                                                            |     |     |       |           |     |     |     |                    |     |     |     |     |
| Description               | This command is used to select the desired Gamma curve for the current display. A maximum of 4 curves can be selected. The curve is selected by setting the appropriate bit in the parameter as described in the Table. |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           | GC[7:0]                                                                                                                                                                                                                 |     |     |       | Parameter |     |     |     | Curve              |     |     |     |     |
|                           | 01h                                                                                                                                                                                                                     |     |     |       | GC0       |     |     |     | Gamma Curve (G2.2) |     |     |     |     |
|                           | 02h                                                                                                                                                                                                                     |     |     |       | GC1       |     |     |     | Reserved           |     |     |     |     |
|                           | 04h                                                                                                                                                                                                                     |     |     |       | GC2       |     |     |     | Reserved           |     |     |     |     |
|                           | 08h                                                                                                                                                                                                                     |     |     |       | GC3       |     |     |     | Reserved           |     |     |     |     |
|                           | Note: All other values are undefined.                                                                                                                                                                                   |     |     |       |           |     |     |     |                    |     |     |     |     |
| Restriction               | Values of GC [7:0] not shown in table above are invalid and will not change the current selected gamma                                                                                                                  |     |     |       |           |     |     |     |                    |     |     |     |     |
| Register Availability     |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
| Default                   |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |
|                           |                                                                                                                                                                                                                         |     |     |       |           |     |     |     |                    |     |     |     |     |





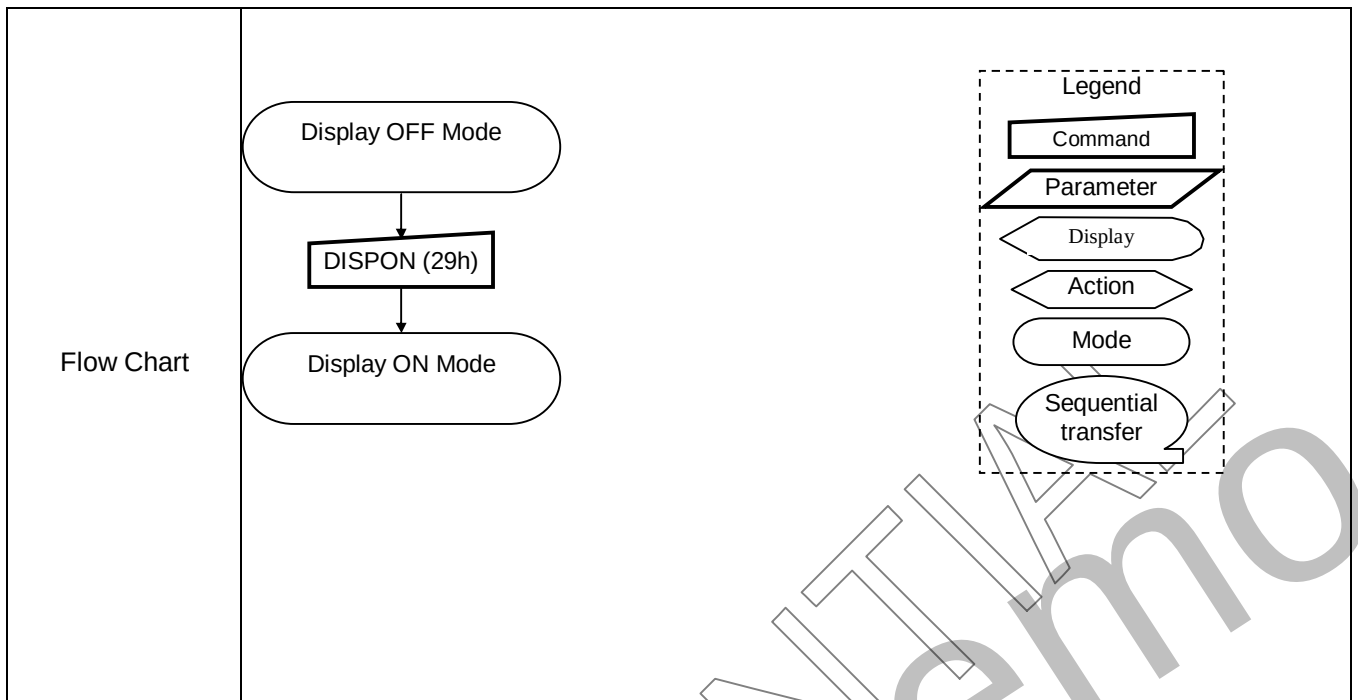
## DISPOFF (2800h): Display Off

| 2800H                                     | DISPOFF (Display Off)                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-------------|-----------------------------------------|-------------|-------------------------------------------|-------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                   | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | x     | 0  | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 28  |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Description                               | <p>This command causes the display module to stop displaying the image data on the display device. The frame memory contents remain unchanged. No status bits are changed.</p> <div><div><p>Memory</p></div><div><p>Display Panel</p></div></div> |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Restriction                               | This command has no effect when module is already in display off mode.                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                            |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes         | Normal Mode On, Idle Mode On, Sleep Out | Yes         | Partial Mode On, Idle Mode Off, Sleep Out | Yes         | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Display Off</td></tr><tr><td>SW Reset</td><td>Display Off</td></tr><tr><td>HW Reset</td><td>Display Off</td></tr></table>                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Display Off | SW Reset                                | Display Off | HW Reset                                  | Display Off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Power On Sequence                         | Display Off                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| SW Reset                                  | Display Off                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| HW Reset                                  | Display Off                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |

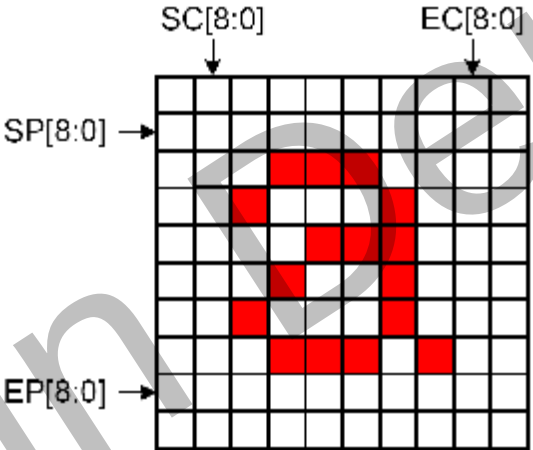


## DISPON (2900h): Display On

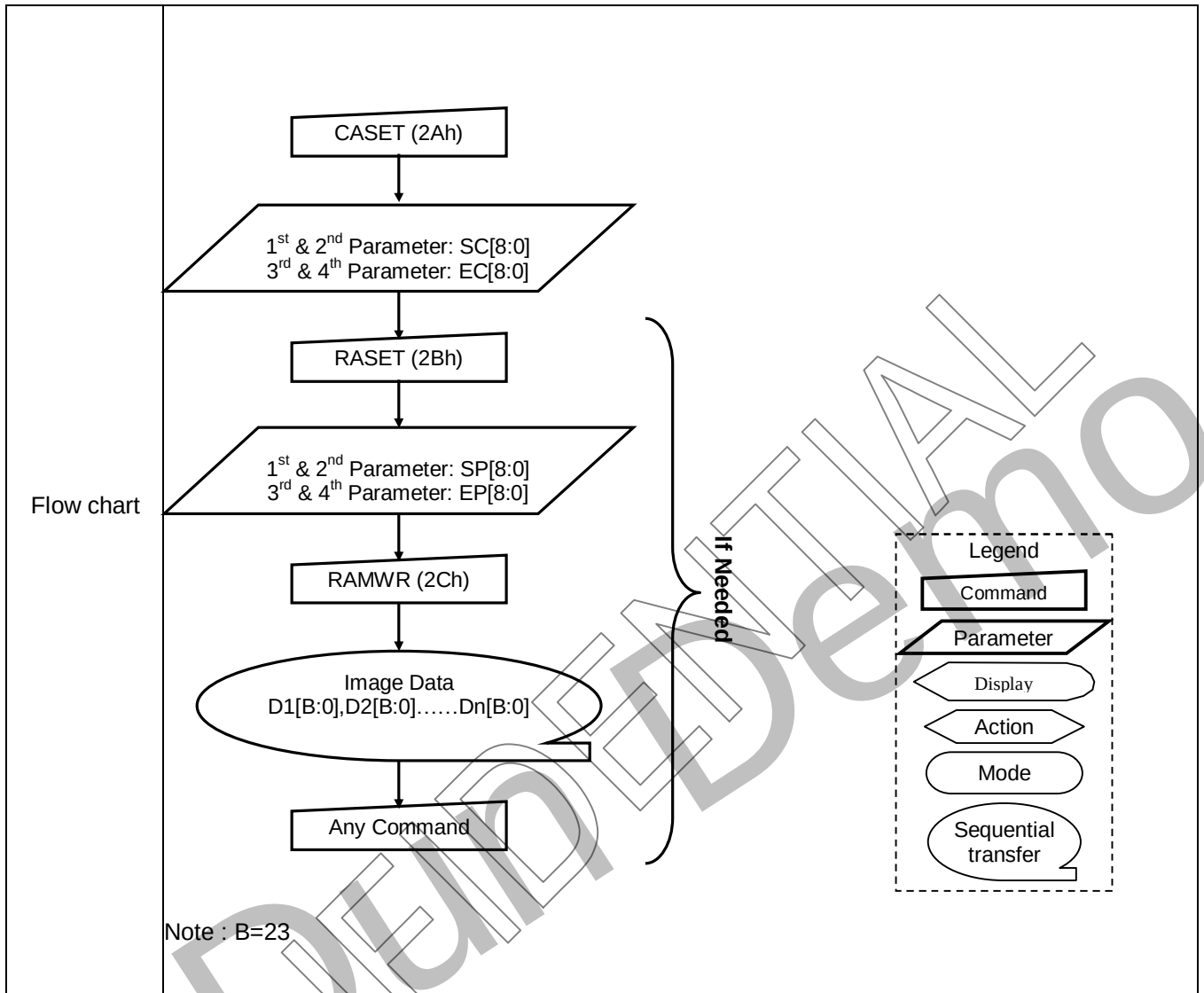
| 2900H                                     | DISPON (Display On)                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-------------|-----------------------------------------|-------------|-------------------------------------------|-------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0  | 0  | 1  | 0  | 1  | 0  | 0  | 1  | 29  |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Parameter                                 | No Parameter                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Description                               | <p>This command causes the display module to start displaying the image data on the display device. The frame memory contents remain unchanged. No status bits are changed.</p> <div><div><p>Memory</p><p>→</p></div><div><p>Display Panel</p></div></div>                                                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Restriction                               | This command has no effect when module is already in display on mode.                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes         | Normal Mode On, Idle Mode On, Sleep Out | Yes         | Partial Mode On, Idle Mode Off, Sleep Out | Yes         | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Display Off</td></tr><tr><td>SW Reset</td><td>Display Off</td></tr><tr><td>HW Reset</td><td>Display Off</td></tr></table>                                                                                                                                                                           |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Display Off | SW Reset                                | Display Off | HW Reset                                  | Display Off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| Power On Sequence                         | Display Off                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| SW Reset                                  | Display Off                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |
| HW Reset                                  | Display Off                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |             |                                         |             |                                           |             |                                          |     |          |     |



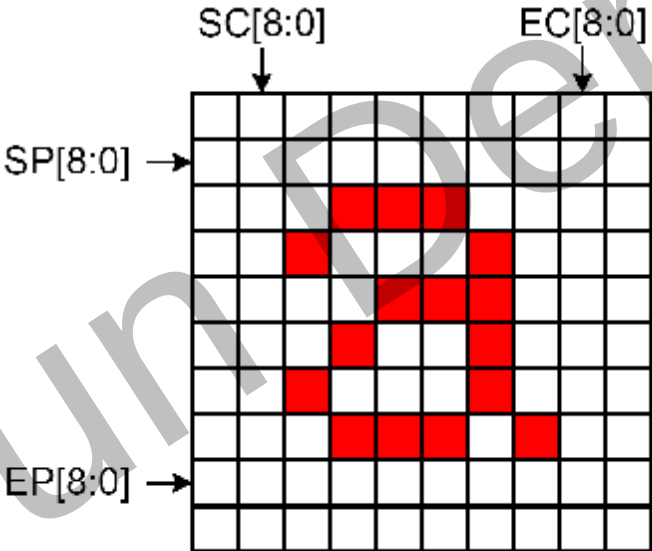
## CASET (2A00h): Column Address Set

| 2A00H                     | CASET (Column Address Set)                                                                                                                                                                                                                             |     |     |       |     |     |     |     |     |     |     |     |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           | DCX                                                                                                                                                                                                                                                    | RDX | WRX | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |
| Command                   | 0                                                                                                                                                                                                                                                      | 1   | ↑   | x     | 0   | 0   | 1   | 0   | 1   | 0   | 1   | 0   | 2A  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                      | 1   | ↑   | x     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | SC8 | 00  |
| 2 <sup>nd</sup> parameter | 1                                                                                                                                                                                                                                                      | 1   | ↑   | x     | SC7 | SC6 | SC5 | SC4 | SC3 | SC2 | SC1 | SC0 | 00  |
| 3 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                      | 1   | ↑   | x     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | EC8 | 01  |
| 4 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                      | 1   | ↑   | x     | EC7 | EC6 | EC5 | EC4 | EC3 | EC2 | EC1 | EC0 | DF  |
| Description               | <p>This command defines the column extent of the frame memory accessed by the host processor with the read_memory_continue and write_memory_continue commands.</p>  |     |     |       |     |     |     |     |     |     |     |     |     |

| Restriction                              | SC [8:0] always must be equal to or less than EC[8:0]                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                            |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------|---------------|--------------|------------------------------------------|-------------------|-----------------------------------------|-------|-------------------------------------------|----------|------------------------------------------|-------|----------|-------|-------|
|                                          | 7                                                                                                                                                                                                                                                                                                                   | GCM[7:0] = 70h : 480x864<br>MV(36h-B5)=0 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 479(01DFh)$<br>MV(36h-B5)=1 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 863(035Fh)$                                                                                                                                                                                               |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | 8                                                                                                                                                                                                                                                                                                                   | GCM[7:0] = 6Bh : 480x854<br>MV(36h-B5)=0 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 479(01DFh)$<br>MV(36h-B5)=1 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 853(0355h)$                                                                                                                                                                                               |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | 9                                                                                                                                                                                                                                                                                                                   | GCM[7:0] = 50h : 480x800<br>MV(36h-B5)=0 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 479(01DFh)$<br>MV(36h-B5)=1 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 799(031Fh)$                                                                                                                                                                                               |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | 10                                                                                                                                                                                                                                                                                                                  | GCM[7:0] = 28h : 480x720<br>MV(36h-B5)=0 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 479(01DFh)$<br>MV(36h-B5)=1 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 719(02CFh)$                                                                                                                                                                                               |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | 11                                                                                                                                                                                                                                                                                                                  | GCM[7:0] = 00h : 480x640<br>MV(36h-B5)=0 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 479(01DFh)$<br>MV(36h-B5)=1 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 639(027Fh)$                                                                                                                                                                                               |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | 12                                                                                                                                                                                                                                                                                                                  | GCM[7:0] = FEh : 480x360<br>MV(36h-B5)=0 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 479(01DFh)$<br>MV(36h-B5)=1 : Parameter range : $0 \leq SC[8:0] \leq EC[8:0] \leq 359(0167h)$                                                                                                                                                                                               |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | Register Availability                                                                                                                                                                                                                                                                                               | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |                   |        | Status        | Availability | Normal Mode On, Idle Mode Off, Sleep Out | Yes               | Normal Mode On, Idle Mode On, Sleep Out | Yes   | Partial Mode On, Idle Mode Off, Sleep Out | Yes      | Partial Mode On, Idle Mode On, Sleep Out | Yes   | Sleep In | Yes   |       |
|                                          |                                                                                                                                                                                                                                                                                                                     | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability      |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          |                                                                                                                                                                                                                                                                                                                     | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes               |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          |                                                                                                                                                                                                                                                                                                                     | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes               |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          |                                                                                                                                                                                                                                                                                                                     | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes               |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
| Partial Mode On, Idle Mode On, Sleep Out |                                                                                                                                                                                                                                                                                                                     | Yes                                                                                                                                                                                                                                                                                                                                                                                        |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
| Sleep In                                 | Yes                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                            |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
| Default                                  | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>SC[8:0]</th><th>EC[8:0](36h-B5=0)</th></tr><tr><td>Power On Sequence</td><td>0000h</td><td>01DFh</td></tr><tr><td>SW Reset</td><td>0000h</td><td>01DFh</td></tr><tr><td>HW Reset</td><td>0000h</td><td>01DFh</td></tr></table> |                                                                                                                                                                                                                                                                                                                                                                                            |                   | Status | Default Value |              | SC[8:0]                                  | EC[8:0](36h-B5=0) | Power On Sequence                       | 0000h | 01DFh                                     | SW Reset | 0000h                                    | 01DFh | HW Reset | 0000h | 01DFh |
|                                          | Status                                                                                                                                                                                                                                                                                                              | Default Value                                                                                                                                                                                                                                                                                                                                                                              |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          |                                                                                                                                                                                                                                                                                                                     | SC[8:0]                                                                                                                                                                                                                                                                                                                                                                                    | EC[8:0](36h-B5=0) |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | Power On Sequence                                                                                                                                                                                                                                                                                                   | 0000h                                                                                                                                                                                                                                                                                                                                                                                      | 01DFh             |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
|                                          | SW Reset                                                                                                                                                                                                                                                                                                            | 0000h                                                                                                                                                                                                                                                                                                                                                                                      | 01DFh             |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |
| HW Reset                                 | 0000h                                                                                                                                                                                                                                                                                                               | 01DFh                                                                                                                                                                                                                                                                                                                                                                                      |                   |        |               |              |                                          |                   |                                         |       |                                           |          |                                          |       |          |       |       |

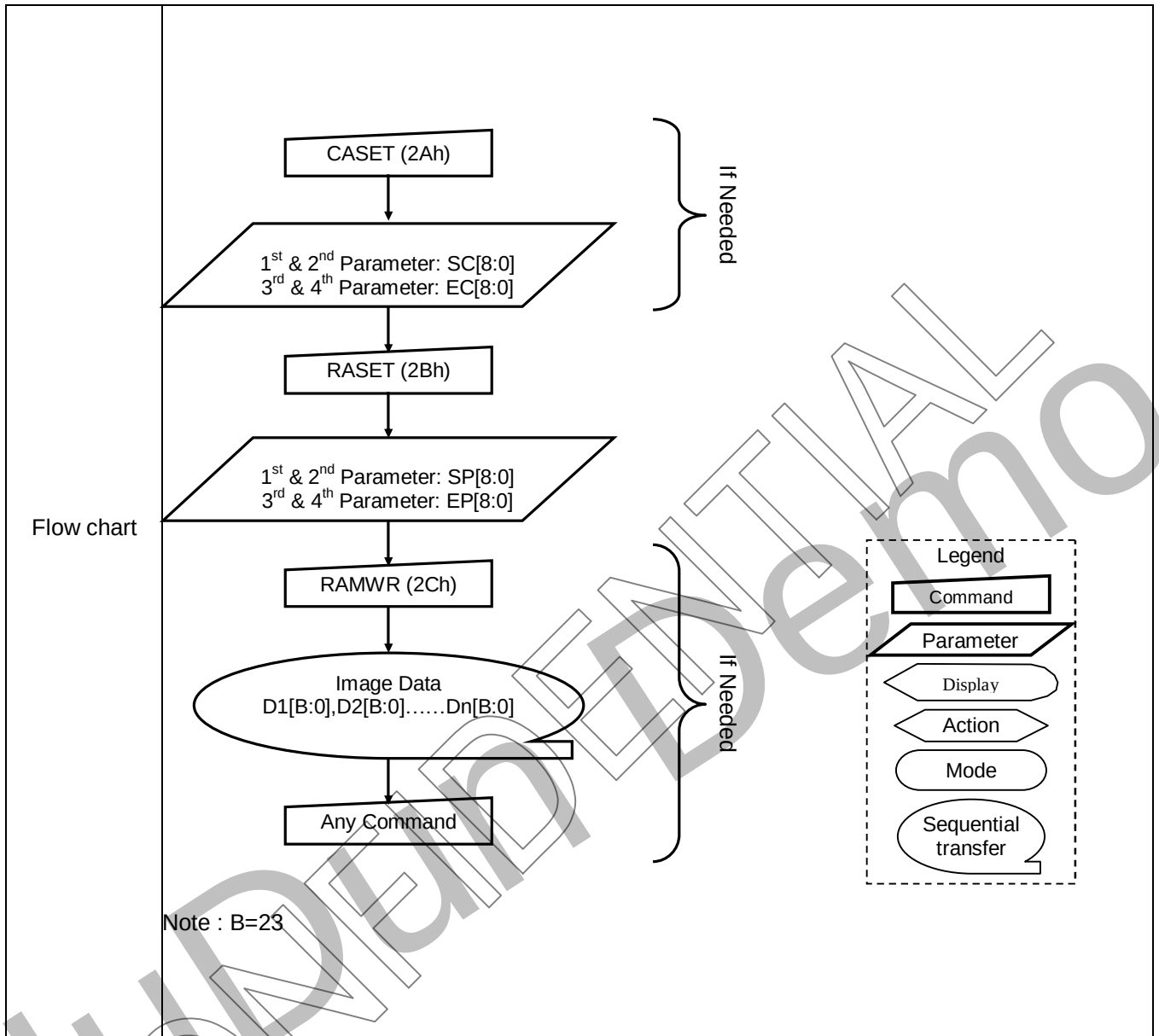


## RASET (2B00h): Row Address Set

| 2B00H                     | RASET (Row Address Set)                                                                                                                                                                                                                             |     |     |       |     |     |     |     |     |     |     |     |     |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           | DCX                                                                                                                                                                                                                                                 | RDX | WRX | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |
| Command                   | 0                                                                                                                                                                                                                                                   | 1   | ↑   | x     | 0   | 0   | 1   | 0   | 1   | 0   | 1   | 1   | 2B  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                   | 1   | ↑   | x     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | SP8 | 00  |
| 2 <sup>nd</sup> parameter | 1                                                                                                                                                                                                                                                   | 1   | ↑   | x     | SP7 | SP6 | SP5 | SP4 | SP3 | SP2 | SP1 | SP0 | 00  |
| 3 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                   | 1   | ↑   | x     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | EP8 | 03  |
| 4 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                   | 1   | ↑   | x     | EP7 | EP6 | EP5 | EP4 | EP3 | EP2 | EP1 | EP0 | 1F  |
| Description               | <p>This command defines the page extent of the frame memory accessed by the host processor with the write_memory_continue and read_memory_continue command.</p>  |     |     |       |     |     |     |     |     |     |     |     |     |



|                                           |                                                                                                                                                                                                                                          |               |                   |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| Restriction                               | SP [8:0] always must be equal to or less than EP [8:0].                                                                                                                                                                                  |               |                   |
|                                           | 1. GCM[7:0]= 70h : 480x864<br>MV(36h-B5)=0 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 863(035\text{Fh})$<br>MV(36h-B5)=1 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 479(01\text{DFh})$ |               |                   |
|                                           | 2. GCM[7:0]= 6Bh : 480x854<br>MV(36h-B5)=0 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 853(0355\text{h})$<br>MV(36h-B5)=1 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 479(01\text{DFh})$ |               |                   |
|                                           | 3. GCM[7:0]= 50h : 480x800<br>MV(36h-B5)=0 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 799(031\text{Fh})$<br>MV(36h-B5)=1 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 479(01\text{DFh})$ |               |                   |
|                                           | 4. GCM[7:0]= 28h : 480x720<br>MV(36h-B5)=0 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 719(02\text{CFh})$<br>MV(36h-B5)=1 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 479(01\text{DFh})$ |               |                   |
|                                           | 5. GCM[7:0]= 00h : 480x640<br>MV(36h-B5)=0 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 639(027\text{Fh})$<br>MV(36h-B5)=1 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 479(01\text{DFh})$ |               |                   |
|                                           | 6. GCM[7:0]= FEh : 480x360<br>MV(36h-B5)=0 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 359(0167\text{h})$<br>MV(36h-B5)=1 : Parameter range : $0 \leq \text{SP}[8:0] \leq \text{EP}[8:0] \leq 479(01\text{DFh})$ |               |                   |
|                                           |                                                                                                                                                                                                                                          |               |                   |
|                                           |                                                                                                                                                                                                                                          |               |                   |
|                                           | Register Availability                                                                                                                                                                                                                    |               |                   |
| Status                                    |                                                                                                                                                                                                                                          | Availability  |                   |
| Normal Mode On, Idle Mode Off, Sleep Out  |                                                                                                                                                                                                                                          | Yes           |                   |
| Normal Mode On, Idle Mode On, Sleep Out   |                                                                                                                                                                                                                                          | Yes           |                   |
| Partial Mode On, Idle Mode Off, Sleep Out |                                                                                                                                                                                                                                          | Yes           |                   |
| Partial Mode On, Idle Mode On, Sleep Out  |                                                                                                                                                                                                                                          | Yes           |                   |
| Sleep In                                  |                                                                                                                                                                                                                                          | Yes           |                   |
| Default                                   |                                                                                                                                                                                                                                          |               |                   |
|                                           | Status                                                                                                                                                                                                                                   | Default Value |                   |
|                                           |                                                                                                                                                                                                                                          | SC[8:0]       | EC[8:0](36h-B5=0) |
|                                           | Power On Sequence                                                                                                                                                                                                                        | 0000h         | 031Fh             |
|                                           | SW Reset                                                                                                                                                                                                                                 | 0000h         | 031Fh             |
|                                           | HW Reset                                                                                                                                                                                                                                 | 0000h         | 031Fh             |



## RAMWR (2C00h): Memory Write

| 2C00H                      | RAMWR (Memory Write)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |           |     |     |     |     |     |     |     |     |     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                            | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RDX | WRX | D15-8     | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |
| Command                    | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | ↑   | xx        | 0   | 0   | 1   | 0   | 1   | 1   | 0   | 0   | 2C  |
| 1 <sup>st</sup> pixel data | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | ↑   | D1[24..8] | D17 | D16 | D15 | D14 | D13 | D12 | D11 | D10 |     |
| :                          | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | ↑   | Dx[24..8] | Dx7 | Dx6 | Dx5 | Dx4 | Dx3 | Dx2 | Dx1 | Dx0 |     |
| N <sup>th</sup> pixel data | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | ↑   | Dn[24..8] | Dn7 | Dn6 | Dn5 | Dn4 | Dn3 | Dn2 | Dn1 | Dn0 |     |
| Description                | <p>This command transfers image data from the host processor to the display module's frame memory starting at the pixel location specified by preceding CASET (2Ah) and RASET (2Bh) commands.</p> <p>If MV(36h-B5) = 0:</p> <p>The column and page registers are reset to the Start Column (SC) and Start Page (SP), respectively. Pixel Data 1 is stored in frame memory at (SC, SP). The column register is then incremented and pixels are written to the frame memory until the column register equals the End Column (EC) value. The column register is then reset to SC and the page register is incremented. Pixels are written to the frame memory until the page register equals the End Page (EP) value or the host processor sends another command. If the number of pixels exceeds <math>(EC - SC + 1) * (EP - SP + 1)</math> the extra pixels are ignored.</p> <p>If MV(36h-B5) = 1:</p> <p>The column and page registers are reset to the Start Column (SC) and Start Page (SP), respectively. Pixel Data 1 is stored in frame memory at (SC, SP). The page register is then incremented and pixels are written to the frame memory until the page register equals the End Page (EP) value. The page register is then reset to SP and the column register is incremented. Pixels are written to the frame memory until the column register equals the End column (EC) value or the host processor sends another command. If the number of pixels exceeds <math>(EC - SC + 1) * (EP - SP + 1)</math> the extra pixels are ignored.</p> |     |     |           |     |     |     |     |     |     |     |     |     |
| Restriction                | <p>A Memory Write should follow a CASET(2Ah), RASET(2Bh) or MADCTR(36h) to define the write location. Otherwise, data written with RAMWR(2Ch) and any following RAMWRC(3Ch) commands is written to undefined locations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |           |     |     |     |     |     |     |     |     |     |

| Register Availability                     | <table> <tr> <th>Status</th><th>Availability</th></tr> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                                | Normal Mode On, Idle Mode On, Sleep Out | Yes                               | Partial Mode On, Idle Mode Off, Sleep Out | Yes                               | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|-------------------------------------------|-----------------------------------|------------------------------------------|-----|----------|-----|
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                            |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Default                                   | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>Contents of memory is set randomly</td></tr> <tr> <td>SW Reset</td><td>Contents of memory is not cleared</td></tr> <tr> <td>HW Reset</td><td>Contents of memory is not cleared</td></tr> </table>                                                                                                            | Status | Default Value | Power On Sequence                        | Contents of memory is set randomly | SW Reset                                | Contents of memory is not cleared | HW Reset                                  | Contents of memory is not cleared |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                           |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Power On Sequence                         | Contents of memory is set randomly                                                                                                                                                                                                                                                                                                                                                                      |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| SW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                       |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| HW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                       |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Flow chart                                | <pre> graph TD     A[RAMWR (2Ch)] --&gt; B([Image Data<br/>D1[B:0], D2[B:0]..... Dn[B:0]])     B --&gt; C[Any Command]     </pre> <p>Note : B=23</p> <div> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> </div>                                                                |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |

## RAMRD (2E00h): Memory Read

| 2E00H                     | RAMRD (Memory Read)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |           |     |     |     |     |     |     |     |     |     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RDX | WRX | D15-8     | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | x         | 0   | 0   | 1   | 0   | 1   | 1   | 1   | 0   | 2E  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ↑   | 1   | x         | x   | x   | x   | x   | x   | x   | x   | x   | x   |
| 2 <sup>nd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ↑   | 1   | D1[24..8] | D17 | D16 | D15 | D14 | D13 | D12 | D11 | D10 |     |
| :                         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ↑   | 1   | Dx[24..8] | Dx7 | Dx6 | Dx5 | Dx4 | Dx3 | Dx2 | Dx1 | Dx0 |     |
| (N+1)th parameter         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ↑   | 1   | Dn[24..8] | Dn7 | Dn6 | Dn5 | Dn4 | Dn3 | Dn2 | Dn1 | Dn0 |     |
| Description               | <p>This command transfers image data from the display module's frame memory to the host processor starting at the pixel location specified by preceding CASET (2Ah) and RASET (2Bh) commands.</p> <p>If MV(36h-B5) = 0:<br/>The column and page registers are reset to the Start Column (SC) and Start Page (SP), respectively. Pixels are read from frame memory at (SC, SP). The column register is then incremented and pixels read from the frame memory until the column register equals the End Column (EC) value. The column register is then reset to SC and the page register is incremented. Pixels are read from the frame memory until the page register equals the End Page (EP) value or the host processor sends another command.</p> <p>If MV(36h-B5) = 1:<br/>The column and page registers are reset to the Start Column (SC) and Start Page (SP), respectively. Pixels are read from frame memory at (SC, SP). The page register is then incremented and pixels read from the frame memory until the page register equals the End Page (EP) value. The page register is then reset to SP and the column register is incremented. Pixels are read from the frame memory until the column register equals the End Column (EC) value or the host processor sends another command.</p> |     |     |           |     |     |     |     |     |     |     |     |     |
| Restriction               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |     |           |     |     |     |     |     |     |     |     |     |

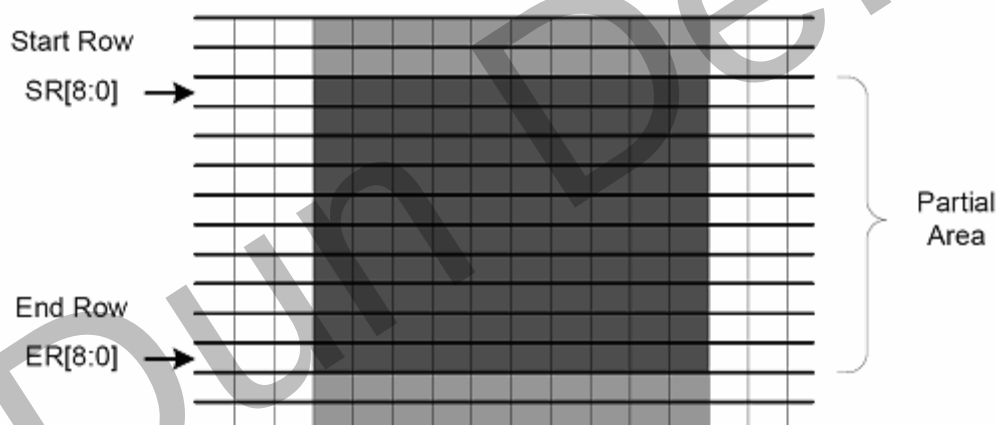
| Register Availability                     | <table border="1"> <thead> <tr> <th>Status</th><th>Availability</th></tr> </thead> <tbody> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </tbody> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                                | Normal Mode On, Idle Mode On, Sleep Out | Yes                               | Partial Mode On, Idle Mode Off, Sleep Out | Yes                               | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|-------------------------------------------|-----------------------------------|------------------------------------------|-----|----------|-----|
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                         |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Default                                   | <table border="1"> <thead> <tr> <th>Status</th><th>Default Value</th></tr> </thead> <tbody> <tr> <td>Power On Sequence</td><td>Contents of memory is set randomly</td></tr> <tr> <td>SW Reset</td><td>Contents of memory is not cleared</td></tr> <tr> <td>HW Reset</td><td>Contents of memory is not cleared</td></tr> </tbody> </table>                                                                                                            | Status | Default Value | Power On Sequence                        | Contents of memory is set randomly | SW Reset                                | Contents of memory is not cleared | HW Reset                                  | Contents of memory is not cleared |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Power On Sequence                         | Contents of memory is set randomly                                                                                                                                                                                                                                                                                                                                                                                                                   |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| SW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                                                                    |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| HW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                                                                    |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Flow chart                                | <pre> graph TD     A[RAMRD 2Eh] --&gt; B[/Dummy Read/]     B --&gt; C([Image Data<br/>D1[B:0], D2[B:0], ..., Dn[B:0]])     C --&gt; D[Any Command]     </pre> <p>Note : B=23</p> <div> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> </div>                                                                                 |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |

PTLAR (3000h): Partial Area

| 3000H                     | PTLAR (Partial Area) |     |     |       |     |     |     |     |     |     |     |     |     |
|---------------------------|----------------------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           | DCX                  | RDX | WRX | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |
| Command                   | 0                    | 1   | ↑   | x     | 0   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 30  |
| 1 <sup>st</sup> parameter | 1                    | 1   | ↑   | x     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | SR8 | 00  |
| 2 <sup>nd</sup> parameter | 1                    | 1   | ↑   | x     | SR7 | SR6 | SR5 | SR4 | SR3 | SR2 | SR1 | SR0 | 00  |
| 3 <sup>rd</sup> parameter | 1                    | 1   | ↑   | x     | 0   | 0   | 0   | 0   | 0   | 0   | 0   | ER8 | 03  |
| 4 <sup>th</sup> parameter | 1                    | 1   | ↑   | x     | ER7 | ER6 | ER5 | ER4 | ER3 | ER2 | ER1 | ER0 | 1F  |

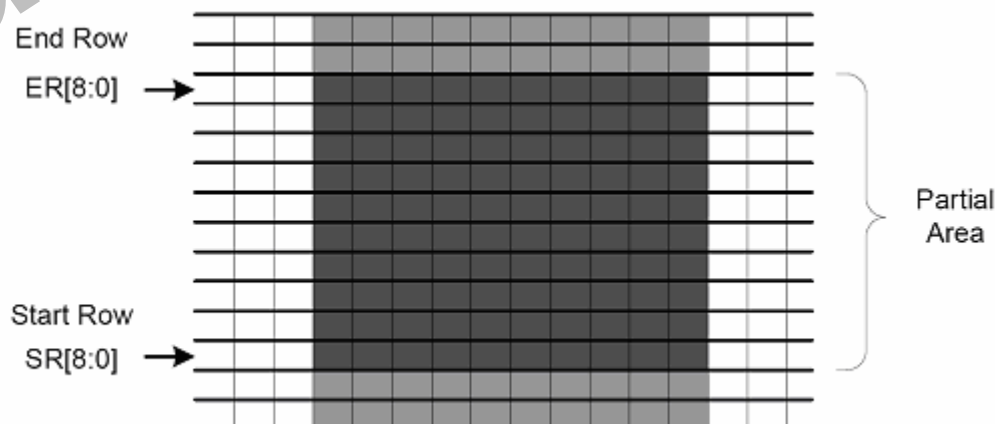
This command defines the Partial Display mode's display area. There are two parameters associated with this command, the first defines the Start Row (SR) and the second the End Row (ER), as illustrated in the following figure. SR and ER refer to the Frame Memory.

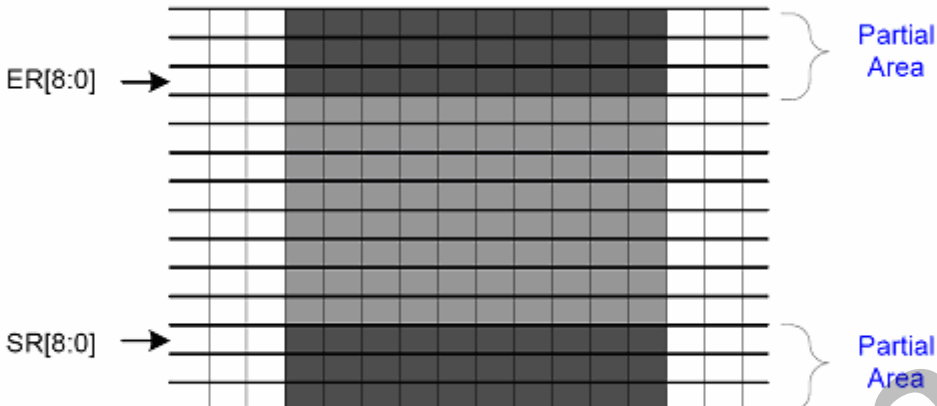
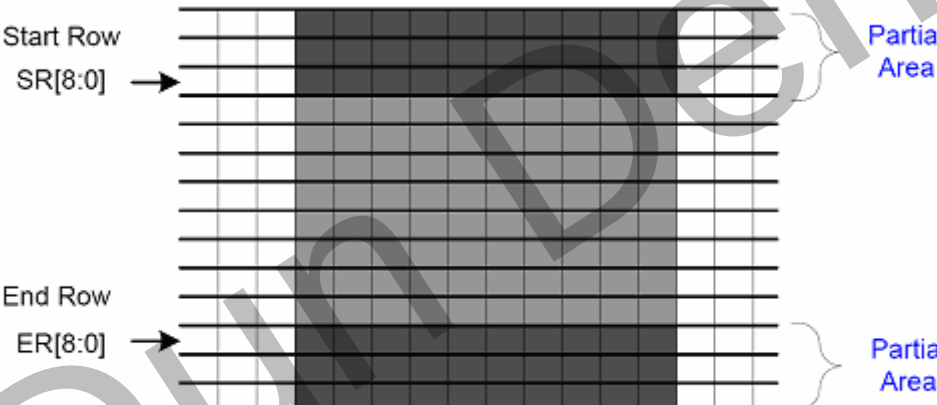
-If End Row > Start Row, when ML(36h-B4) = '0'



Description

-If End Row > Start Row, when ML(36h-B4) = '1'



|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | <p>-If End Row &lt; Start Row, when ML(36h-B4) = '0'</p>  <p>-If End Row &lt; Start Row, when ML(36h-B4) = '1'</p>  <p>-If End Row = Start Row then the Partial Area will be one row deep.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Restriction | <p>CGM[7:0] = "70h" (480 x 864): <math>0 \leq SR[15:0], ER[15:0] \leq 863</math> (035Fh), <math> ER-SR  \leq 863</math> (035Fh)</p> <p>CGM[7:0] = "6Bh" (480 x 854): <math>0 \leq SR[15:0], ER[15:0] \leq 853</math> (0355h), <math> ER-SR  \leq 853</math> (0355h)</p> <p>CGM[7:0] = "50h" (480 x 800): <math>0 \leq SR[15:0], ER[15:0] \leq 799</math> (031Fh), <math> ER-SR  \leq 799</math> (031Fh)</p> <p>CGM[7:0] = "28h" (480 x 720): <math>0 \leq SR[15:0], ER[15:0] \leq 719</math> (02CFh), <math> ER-SR  \leq 719</math> (02CFh)</p> <p>CGM[7:0] = "00h" (480 x 640): <math>0 \leq SR[15:0], ER[15:0] \leq 639</math> (027Fh), <math> ER-SR  \leq 639</math> (027Fh)</p> <p>CGM[7:0] = "FEh" (480 x 360): <math>0 \leq SR[15:0], ER[15:0] \leq 359</math> (0167h), <math> ER-SR  \leq 359</math> (0167h)</p> |



| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                              | Status  | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes     | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes   | Partial Mode On, Idle Mode On, Sleep Out | Yes   | Sleep In | Yes      |       |       |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------|------------------------------------------|---------|-----------------------------------------|-------------------|-------------------------------------------|-------|------------------------------------------|-------|----------|----------|-------|-------|
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Default                                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>SR[8:0]</th><th>ER[8:0]</th></tr><tr><td>Power On Sequence</td><td>0000h</td><td>031Fh</td></tr><tr><td>SW Reset</td><td>0000h</td><td>031Fh</td></tr><tr><td>HW Reset</td><td>0000h</td><td>031Fh</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Status  | Default Value |                                          | SR[8:0] | ER[8:0]                                 | Power On Sequence | 0000h                                     | 031Fh | SW Reset                                 | 0000h | 031Fh    | HW Reset | 0000h | 031Fh |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
|                                           | SR[8:0]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ER[8:0] |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Power On Sequence                         | 0000h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 031Fh   |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| SW Reset                                  | 0000h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 031Fh   |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| HW Reset                                  | 0000h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 031Fh   |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |
| Flow chart                                | <div><div><p>1. To Enter Partial Mode</p><pre>graph TD; PTLAR[PTLAR 30h] --&gt; P1[/1st &amp; 2nd Parameter: SR[8:0]/]; P1 --&gt; P2[/3rd &amp; 4th Parameter: ER[8:0]/]; P2 --&gt; PTLON[PTLON 12h]; PTLON --&gt; PM([Partial Mode]);</pre></div><div><p>2. To Exit Partial Mode</p><pre>graph TD; PM([Partial Mode]) --&gt; DISPOFF[DISPOFF 28h]; DISPOFF --&gt; NORON[NORON 13h]; NORON --&gt; PMOFF([Partial Mode OFF]); PMOFF --&gt; RAMRW[RAMRW 2Ch]; RAMRW --&gt; ID[/Image Data D1[B:0], D2[B:0]... Dn[B:0]/]; ID --&gt; DISON[DISON 29h];</pre><p>Optional to prevent tearing effect image display</p></div><div><p>Legend</p><ul style="list-style-type: none"><li>Command</li><li>Parameter</li><li>Display</li><li>Action</li><li>Mode</li><li>Sequential transfer</li></ul></div></div> <p>Note : B=23</p> |         |               |                                          |         |                                         |                   |                                           |       |                                          |       |          |          |       |       |

## TEOFF (3400h): Tearing Effect Line OFF

| 3400H                                     | TEOFF (Tearing Effect Line OFF)                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0  | 0  | 1  | 1  | 0  | 1  | 0  | 0  | 34  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Parameter                                 | NO PARAMETER                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | This command turns off the display module's Tearing Effect output signal on the TE signal line.                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | This command has no effect when the Tearing Effect output is already off.                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>OFF</td></tr><tr><td>SW Reset</td><td>OFF</td></tr><tr><td>HW Reset</td><td>OFF</td></tr></table>                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | OFF | SW Reset                                | OFF | HW Reset                                  | OFF |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | OFF                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | OFF                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | OFF                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | <div><div><div>TE Line Output ON</div><div>↓</div><div>TEOFF (34h)</div><div>↓</div><div>TE Line Output OFF</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                 |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## TEON (3500h): Tearing Effect Line ON

| 3500H                     | TEON (Tearing Effect Line ON)                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----|-------|----|----|----|----|----|----|----|-------|-----|--------|--------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RDX          | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0    | HEX |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1            | ↑   | x     | 0  | 0  | 1  | 1  | 0  | 1  | 0  | 1     | 35  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1            | ↑   | x     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | TELOM | 00  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description               | <p>This command turns on the tearing Effect output signal on the TE signal line. The TE signal is not affected by changing MADCTR (36h) B4 (Line Address Order).</p> <p>The Tearing Effect Line On has one parameter that describes the Tearing Effect Output Line mode.</p> <p>If TELOM = 0:</p> <p>The Tearing Effect Output line consists of V-Blanking information only.</p>  |              |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | <p>If TELOM = 1:</p> <p>The Tearing Effect Output Line consists of both V-Blanking and H-Blanking information.</p>                                                                                                                                                                                                                                                              |              |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | <p><i>The Tearing Effect Output line shall be active low when the display module is in Sleep mode.</i></p>                                                                                                                                                                                                                                                                                                                                                          |              |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction               | This command has no effect when Tearing Effect output is already ON.                                                                                                                                                                                                                                                                                                                                                                                                |              |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                          |              |     |       |    |    |    |    |    |    |    |       |     | Status | Availability | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Availability |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                            | Yes          |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                             | Yes          |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes          |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                            | Yes          |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |              |     |       |    |    |    |    |    |    |    |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

| Default           | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>OFF</td></tr> <tr> <td>SW Reset</td><td>OFF</td></tr> <tr> <td>HW Reset</td><td>OFF</td></tr> </table>                                                                                                                                              | Status | Default Value | Power On Sequence | OFF | SW Reset | OFF | HW Reset | OFF |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|-------------------|-----|----------|-----|----------|-----|
| Status            | Default Value                                                                                                                                                                                                                                                                                                                                  |        |               |                   |     |          |     |          |     |
| Power On Sequence | OFF                                                                                                                                                                                                                                                                                                                                            |        |               |                   |     |          |     |          |     |
| SW Reset          | OFF                                                                                                                                                                                                                                                                                                                                            |        |               |                   |     |          |     |          |     |
| HW Reset          | OFF                                                                                                                                                                                                                                                                                                                                            |        |               |                   |     |          |     |          |     |
| Flow Chart        | <pre> graph TD     A([TE Line Output OFF]) --&gt; B[TEON (35h)]     B --&gt; C[/1<sup>st</sup> Parameter: TELOM/]     C --&gt; D([TE Line Output ON])     </pre> <p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> |        |               |                   |     |          |     |          |     |

**MADCTR (3600h): Memory Data Access Control**

| 3600H                     | MADCTR (Memory Data Access Control)                                                                                          |        |                          |                                                                  |    |    |    |    |    |    |    |    |     |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------|------------------------------------------------------------------|----|----|----|----|----|----|----|----|-----|
|                           | DCX                                                                                                                          | RDX    | WRX                      | D24-8                                                            | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |
| Command                   | 0                                                                                                                            | 1      | ↑                        | x                                                                | 0  | 0  | 1  | 1  | 0  | 1  | 1  | 0  | 36  |
| 1 <sup>st</sup> parameter | 1                                                                                                                            | 1      | ↑                        | x                                                                | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | 00  |
| Description               | This command defines read/write scanning direction of frame memory. This command makes no change on the other driver status. |        |                          |                                                                  |    |    |    |    |    |    |    |    |     |
|                           | Bit                                                                                                                          | Symbol | Description              | Comment                                                          |    |    |    |    |    |    |    |    |     |
|                           | B7                                                                                                                           | MY     | Row Address Order        | '1' = Bottom to Top<br>'0' = Top to Bottom                       |    |    |    |    |    |    |    |    |     |
|                           | B6                                                                                                                           | MX     | Column Address Order     | '1' = Right to Left<br>'0' = Left to Right                       |    |    |    |    |    |    |    |    |     |
|                           | B5                                                                                                                           | MV     | Row/Column Order (MV)    | '1' = Row/column exchange<br>'0' = Normal                        |    |    |    |    |    |    |    |    |     |
|                           | B4                                                                                                                           | ML     | Vertical Refresh Order   | '0' =LCD Refresh Top to Bottom<br>'1' =LCD Refresh Bottom to Top |    |    |    |    |    |    |    |    |     |
|                           | B3                                                                                                                           | RGB    | RGB/BGR Order            | '1' =BGR, "0"=RGB                                                |    |    |    |    |    |    |    |    |     |
|                           | B2                                                                                                                           | MH     | Horizontal Refresh Order | '0' =LCD Refresh Left to Right<br>'1' =LCD Refresh Right to Left |    |    |    |    |    |    |    |    |     |
|                           | B1                                                                                                                           | H_FLIP | Horizontal Flip          | '0' = Normal display<br>'1' = Flipped display                    |    |    |    |    |    |    |    |    |     |
|                           | B0                                                                                                                           | V_FLIP | Vertical Flip            | '0' = Normal display<br>'1' = Flipped display                    |    |    |    |    |    |    |    |    |     |

|                                                                                                                                                                                                                                                                   | <table><tr><th>B5</th><th>B6</th><th>B7</th><th>Image in Frame Memory</th></tr><tr><td>0</td><td>0</td><td>0</td><td></td></tr><tr><td>0</td><td>0</td><td>1</td><td></td></tr><tr><td>0</td><td>1</td><td>0</td><td></td></tr><tr><td>0</td><td>1</td><td>1</td><td></td></tr></table> |               |    |                       | B5 | B6 | B7 | Image in Frame Memory | 0        | 0             | 0 |  | 0 | 0      | 1        |               | 0 | 1 | 0 |  | 0 | 1 | 1 |  | <table><tr><th>B5</th><th>B6</th><th>B7</th><th>Image in Frame Memory</th></tr><tr><td>1</td><td>0</td><td>0</td><td></td></tr><tr><td>1</td><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td>1</td><td></td></tr></table> |  |  |  | B5 | B6 | B7 | Image in Frame Memory | 1 | 0 | 0 |  | 1 | 0 | 1 |  | 1 | 1 | 0 |  | 1 | 1 | 1 |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----|-----------------------|----|----|----|-----------------------|----------|---------------|---|--|---|--------|----------|---------------|---|---|---|--|---|---|---|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|----|----|----|-----------------------|---|---|---|--|---|---|---|--|---|---|---|--|---|---|---|--|
|                                                                                                                                                                                                                                                                   | B5                                                                                                                                                                                                                                                                                      | B6            | B7 | Image in Frame Memory |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   | 0                                                                                                                                                                                                                                                                                       | 0             | 0  |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   | 0                                                                                                                                                                                                                                                                                       | 0             | 1  |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   | 0                                                                                                                                                                                                                                                                                       | 1             | 0  |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   | 0                                                                                                                                                                                                                                                                                       | 1             | 1  |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   | B5                                                                                                                                                                                                                                                                                      | B6            | B7 | Image in Frame Memory |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   | 1                                                                                                                                                                                                                                                                                       | 0             | 0  |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| 1                                                                                                                                                                                                                                                                 | 0                                                                                                                                                                                                                                                                                       | 1             |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| 1                                                                                                                                                                                                                                                                 | 1                                                                                                                                                                                                                                                                                       | 0             |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| 1                                                                                                                                                                                                                                                                 | 1                                                                                                                                                                                                                                                                                       | 1             |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| <p>B3 = 0</p> <table><tr><td>Memory</td><td>Sent RGB</td><td>Display Panel</td></tr><tr><td></td><td></td><td></td></tr></table> <p>B3 = 1</p> <table><tr><td>Memory</td><td>Sent BGR</td><td>Display Panel</td></tr><tr><td></td><td></td><td></td></tr></table> |                                                                                                                                                                                                                                                                                         |               |    |                       |    |    |    | Memory                | Sent RGB | Display Panel |   |  |   | Memory | Sent BGR | Display Panel |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| Memory                                                                                                                                                                                                                                                            | Sent RGB                                                                                                                                                                                                                                                                                | Display Panel |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                         |               |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| Memory                                                                                                                                                                                                                                                            | Sent BGR                                                                                                                                                                                                                                                                                | Display Panel |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
|                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                         |               |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |
| <p>Restriction</p>                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                         |               |    |                       |    |    |    |                       |          |               |   |  |   |        |          |               |   |   |   |  |   |   |   |  |                                                                                                                                                                                                                                                                                         |  |  |  |    |    |    |                       |   |   |   |  |   |   |   |  |   |   |   |  |   |   |   |  |

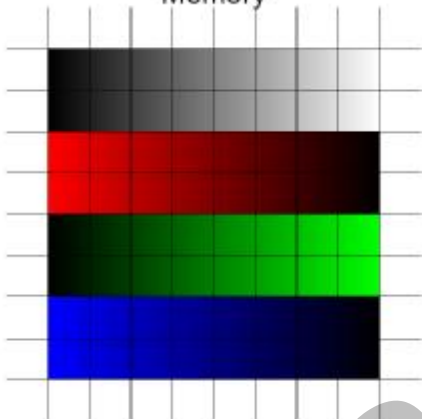
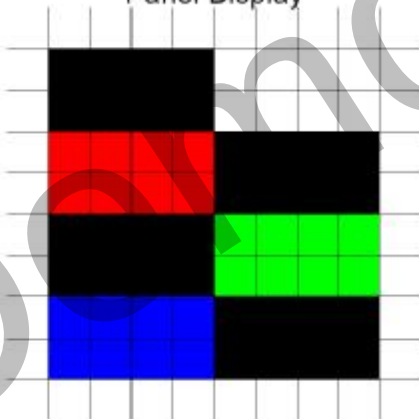
| Register Availability                     | <table> <tr> <th>Status</th><th>Availability</th></tr> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes       | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----------|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                            |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Default                                   | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>00h</td></tr> <tr> <td>SW Reset</td><td>No Change</td></tr> <tr> <td>HW Reset</td><td>00h</td></tr> </table>                                                                                                                                                                                                 | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | No Change | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                           |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| SW Reset                                  | No Change                                                                                                                                                                                                                                                                                                                                                                                               |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |
| Flow chart                                | <pre> graph TD     MADCTR[MADCTR (36h)] --&gt; Param[1st Parameter]     </pre> <p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Command: Rectangle</li> <li>Parameter: Parallelogram</li> <li>Display: Oval</li> <li>Action: Arrow</li> <li>Mode: Rounded rectangle</li> <li>Sequential transfer: Oval with tail</li> </ul>                                                                  |        |               |                                          |     |                                         |           |                                           |     |                                          |     |          |     |

## IDMOFF (3800h): Idle Mode Off

| 3800H                                     | IDMOFF (Idle Mode Off)                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|----|-----|--------|---------------|------------------------------------------|---------------|-----------------------------------------|---------------|-------------------------------------------|---------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0  | 0  | 1  | 1  | 1  | 0  | 0  | 0  | 38  |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Parameter                                 | NO PARAMETER                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Description                               | This command causes the display module to exit Idle mode.                                                                                                                                                                                                                                                                                                                                  |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Restriction                               | This command has no effect when the display module is not in Idle mode.                                                                                                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |    |    |    |    |    |    |    |    |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes           | Normal Mode On, Idle Mode On, Sleep Out | Yes           | Partial Mode On, Idle Mode Off, Sleep Out | Yes           | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>Idle Mode Off</td></tr><tr><td>SW Reset</td><td>Idle Mode Off</td></tr><tr><td>HW Reset</td><td>Idle Mode Off</td></tr></table>                                                                                                                                                                     |     |     |       |    |    |    |    |    |    |    |    |     | Status | Default Value | Power On Sequence                        | Idle Mode Off | SW Reset                                | Idle Mode Off | HW Reset                                  | Idle Mode Off |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Power On Sequence                         | Idle Mode Off                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| SW Reset                                  | Idle Mode Off                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| HW Reset                                  | Idle Mode Off                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |
| Flow Chart                                | <div><div><div>Idle mode ON</div><div>IDMOFF (38h)</div><div>Idle mode OFF</div></div><div><div>Legend</div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |    |     |        |               |                                          |               |                                         |               |                                           |               |                                          |     |          |     |



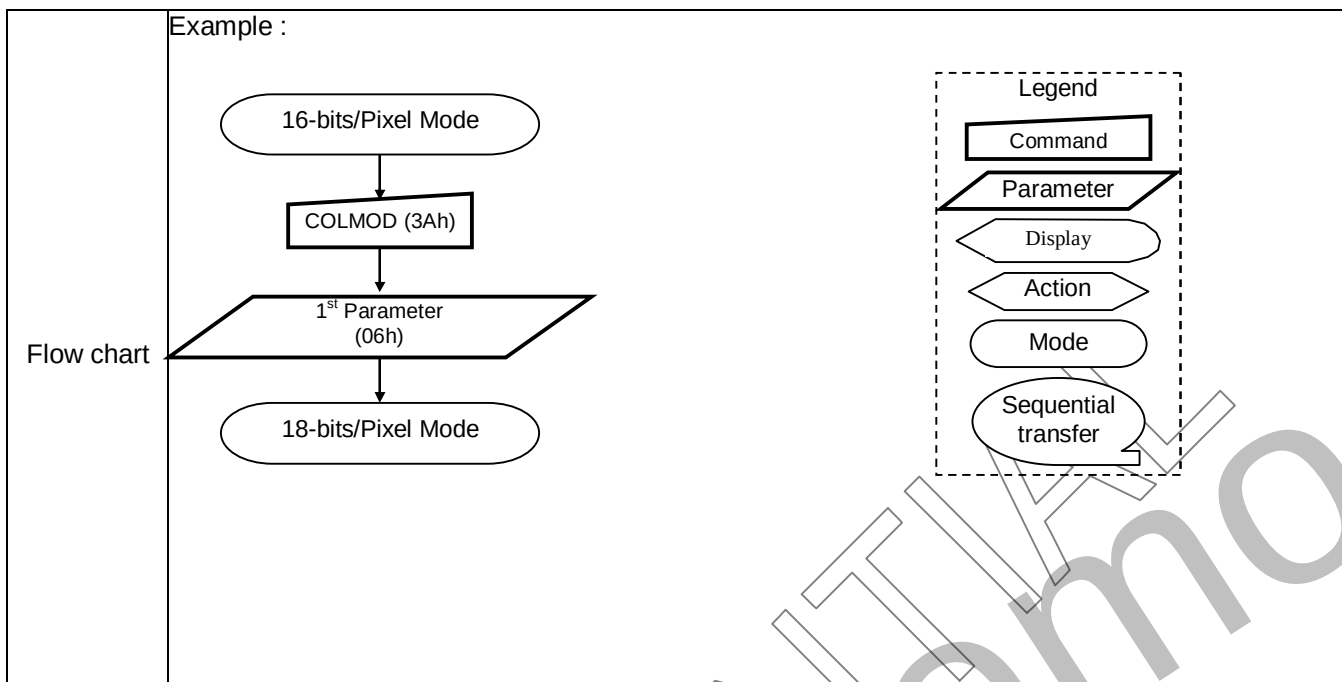
## IDMON (3900h): Enter\_idle\_mode

| 3900H                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Enter_idle_mode         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|----|----|----|----|----|----|----|----|-----|--------|-------------------------|------------------------------------------|-------------------------|-----------------------------------------|----------|-------------------------------------------|----------|------------------------------------------|----------|----------|----------|-----|----------|----------|----------|---------|----------|----------|----------|-------|----------|----------|----------|------|----------|----------|----------|--------|----------|----------|----------|-------|----------|----------|----------|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RDX                     | WRX                     | D15-8                   | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1                       | ↑                       | x                       | 0  | 0  | 1  | 1  | 1  | 0  | 0  | 1  | 39  |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Parameter                                 | NO PARAMETER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Description                               | <p>This command causes the display module to enter Idle Mode.</p> <p>In Idle Mode, color expression is reduced. Colors are shown on the display device using the MSB of each of the R, G and B color components in the frame memory.</p> <div><div><p>Memory</p></div><div><p>Panel Display</p></div></div> <table><tr><th>Color</th><th>R7 R6 R5 R4 R3 R2 R1 R0</th><th>G7 G6 G5 G4 G3 G2 G1 G0</th><th>B7 B6 B5 B4 B3 B2 B1 B0</th></tr><tr><td>Black</td><td>0XXXXXXX</td><td>0XXXXXXX</td><td>0XXXXXXX</td></tr><tr><td>Blue</td><td>0XXXXXXX</td><td>0XXXXXXX</td><td>1XXXXXXX</td></tr><tr><td>Red</td><td>1XXXXXXX</td><td>0XXXXXXX</td><td>0XXXXXXX</td></tr><tr><td>Magenta</td><td>1XXXXXXX</td><td>0XXXXXXX</td><td>1XXXXXXX</td></tr><tr><td>Green</td><td>0XXXXXXX</td><td>1XXXXXXX</td><td>0XXXXXXX</td></tr><tr><td>Cyan</td><td>0XXXXXXX</td><td>1XXXXXXX</td><td>1XXXXXXX</td></tr><tr><td>Yellow</td><td>1XXXXXXX</td><td>1XXXXXXX</td><td>0XXXXXXX</td></tr><tr><td>White</td><td>1XXXXXXX</td><td>1XXXXXXX</td><td>1XXXXXXX</td></tr></table> |                         |                         |                         |    |    |    |    |    |    |    |    |     | Color  | R7 R6 R5 R4 R3 R2 R1 R0 | G7 G6 G5 G4 G3 G2 G1 G0                  | B7 B6 B5 B4 B3 B2 B1 B0 | Black                                   | 0XXXXXXX | 0XXXXXXX                                  | 0XXXXXXX | Blue                                     | 0XXXXXXX | 0XXXXXXX | 1XXXXXXX | Red | 1XXXXXXX | 0XXXXXXX | 0XXXXXXX | Magenta | 1XXXXXXX | 0XXXXXXX | 1XXXXXXX | Green | 0XXXXXXX | 1XXXXXXX | 0XXXXXXX | Cyan | 0XXXXXXX | 1XXXXXXX | 1XXXXXXX | Yellow | 1XXXXXXX | 1XXXXXXX | 0XXXXXXX | White | 1XXXXXXX | 1XXXXXXX | 1XXXXXXX |
|                                           | Color                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | R7 R6 R5 R4 R3 R2 R1 R0 | G7 G6 G5 G4 G3 G2 G1 G0 | B7 B6 B5 B4 B3 B2 B1 B0 |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
|                                           | Black                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0XXXXXXX                | 0XXXXXXX                | 0XXXXXXX                |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
|                                           | Blue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0XXXXXXX                | 0XXXXXXX                | 1XXXXXXX                |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Red                                       | 1XXXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0XXXXXXX                | 0XXXXXXX                |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Magenta                                   | 1XXXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0XXXXXXX                | 1XXXXXXX                |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Green                                     | 0XXXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1XXXXXXX                | 0XXXXXXX                |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Cyan                                      | 0XXXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1XXXXXXX                | 1XXXXXXX                |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Yellow                                    | 1XXXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1XXXXXXX                | 0XXXXXXX                |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| White                                     | 1XXXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1XXXXXXX                | 1XXXXXXX                |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Restriction                               | This command has no effect when module is already in idle on mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                         |                         |                         |    |    |    |    |    |    |    |    |     | Status | Availability            | Normal Mode On, Idle Mode Off, Sleep Out | Yes                     | Normal Mode On, Idle Mode On, Sleep Out | Yes      | Partial Mode On, Idle Mode Off, Sleep Out | Yes      | Partial Mode On, Idle Mode On, Sleep Out | Yes      | Sleep In | Yes      |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                         |                         |                         |    |    |    |    |    |    |    |    |     |        |                         |                                          |                         |                                         |          |                                           |          |                                          |          |          |          |     |          |          |          |         |          |          |          |       |          |          |          |      |          |          |          |        |          |          |          |       |          |          |          |

| Default           | <table border="1"> <thead> <tr> <th>Status</th><th>Default Value</th></tr> </thead> <tbody> <tr> <td>Power On Sequence</td><td>Idle Mode Off</td></tr> <tr> <td>SW Reset</td><td>Idle Mode Off</td></tr> <tr> <td>HW Reset</td><td>Idle Mode Off</td></tr> </tbody> </table>      | Status | Default Value | Power On Sequence | Idle Mode Off | SW Reset | Idle Mode Off | HW Reset | Idle Mode Off |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|-------------------|---------------|----------|---------------|----------|---------------|
| Status            | Default Value                                                                                                                                                                                                                                                                     |        |               |                   |               |          |               |          |               |
| Power On Sequence | Idle Mode Off                                                                                                                                                                                                                                                                     |        |               |                   |               |          |               |          |               |
| SW Reset          | Idle Mode Off                                                                                                                                                                                                                                                                     |        |               |                   |               |          |               |          |               |
| HW Reset          | Idle Mode Off                                                                                                                                                                                                                                                                     |        |               |                   |               |          |               |          |               |
| Flow Chart        | <pre> graph TD     A[/Idle mode OFF/] --&gt; B[IDMON 39h]     B --&gt; C[/Idle mode ON/]     </pre> <p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> |        |               |                   |               |          |               |          |               |

### COLMOD (3A00h): Interface Pixel Format

| 3A00H                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | COLMOD (Interface Pixel Format) |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------|-------|----|----|----|----|----|----|----|----|-----|--------------------------------|---------------|------------------------------------------|-------|-----------------------------------------|-----------|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|-------------|---|---|---|-------------|---|---|---|-------------|---|---|---|-----------------------------|---|---|---|------------------------------|---|---|---|----------------------------|---|---|---|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX                             | WRX   | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                               | ↑     | x     | 0  | 0  | 1  | 1  | 1  | 0  | 1  | 0  | 3A  |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                               | ↑     | x     | 0  | D6 | D5 | D4 | 0  | D2 | D1 | D0 | 66  |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| Description               | <p>This command sets the pixel format for the RGB image data used by the interface.</p> <p>Bits D[6:4] – DPI Pixel Format Definition</p> <p>Bits D[2:0] – DBI Pixel Format Definition</p> <p>Bits D7 and D3 are not used.</p> <p>If a particular interface, either DBI or DPI, is not used then the corresponding bits in the parameter are ignored.</p> <table><tr><th>Control Interface Color Format</th><th>D6/D2</th><th>D5/D1</th><th>D4/D0</th></tr><tr><td>Not defined</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Not defined</td><td>0</td><td>0</td><td>1</td></tr><tr><td>Not defined</td><td>0</td><td>1</td><td>0</td></tr><tr><td>Not defined</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Not defined</td><td>1</td><td>0</td><td>0</td></tr><tr><td>16bit/pixel (65,536 colors)</td><td>1</td><td>0</td><td>1</td></tr><tr><td>18bit/pixel (262,144 colors)</td><td>1</td><td>1</td><td>0</td></tr><tr><td>24bit/pixel (16.7M colors)</td><td>1</td><td>1</td><td>1</td></tr></table> |                                 |       |       |    |    |    |    |    |    |    |    |     | Control Interface Color Format | D6/D2         | D5/D1                                    | D4/D0 | Not defined                             | 0         | 0                                         | 0   | Not defined                              | 0   | 0        | 1   | Not defined | 0 | 1 | 0 | Not defined | 0 | 1 | 1 | Not defined | 1 | 0 | 0 | 16bit/pixel (65,536 colors) | 1 | 0 | 1 | 18bit/pixel (262,144 colors) | 1 | 1 | 0 | 24bit/pixel (16.7M colors) | 1 | 1 | 1 |
|                           | Control Interface Color Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | D6/D2                           | D5/D1 | D4/D0 |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Not defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                               | 0     | 0     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Not defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                               | 0     | 1     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Not defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                               | 1     | 0     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Not defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                               | 1     | 1     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Not defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                               | 0     | 0     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | 16bit/pixel (65,536 colors)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                               | 0     | 1     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | 18bit/pixel (262,144 colors)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1                               | 1     | 0     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | 24bit/pixel (16.7M colors)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1                               | 1     | 1     |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| Restriction               | There is no visible effect until the Frame Memory is written to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                 |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                 |       |       |    |    |    |    |    |    |    |    |     | Status                         | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes   | Normal Mode On, Idle Mode On, Sleep Out | Yes       | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Availability                    |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Yes                             |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes                             |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Yes                             |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Yes                             |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                 |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| Default                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>66h</td></tr><tr><td>SW Reset</td><td>No Change</td></tr><tr><td>HW Reset</td><td>66h</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                 |       |       |    |    |    |    |    |    |    |    |     | Status                         | Default Value | Power On Sequence                        | 66h   | SW Reset                                | No Change | HW Reset                                  | 66h |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value                   |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 66h                             |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No Change                       |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |
| HW Reset                  | 66h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                 |       |       |    |    |    |    |    |    |    |    |     |                                |               |                                          |       |                                         |           |                                           |     |                                          |     |          |     |             |   |   |   |             |   |   |   |             |   |   |   |                             |   |   |   |                              |   |   |   |                            |   |   |   |



# RAMWRC(3C00h) : Write\_Memory\_Continue

| 3C00H                     | Write_Memory_Continue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |           |       |       |       |       |       |       |       |       |     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RDX | WRX | D15-8     | D7    | D6    | D5    | D4    | D3    | D2    | D1    | D0    | HEX |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | x         | 0     | 0     | 1     | 1     | 1     | 1     | 0     | 0     | 3C  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | D1[24..8] | D1[7] | D1[6] | D1[5] | D1[4] | D1[3] | D1[2] | D1[1] | D1[0] |     |
| X <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | Dx[24..8] | Dx[7] | Dx[6] | Dx[5] | Dx[4] | Dx[3] | Dx[2] | Dx[1] | Dx[0] |     |
| N <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | Dn[24..8] | Dn[7] | Dn[6] | Dn[5] | Dn[4] | Dn[3] | Dn[2] | Dn[1] | Dn[0] |     |
| Description               | <p>This command transfers image data from the host processor to the display module's frame memory continuing from the pixel location following the previous write_memory_continue or write_memory_start command.</p> <p>If MV(36h-B5) = 0:</p> <p>Data is written continuing from the pixel location after the write range of the previous RAMWR(2Ch) or RAMWRC(3Ch). The column register is then incremented and pixels are written to the frame memory until the column register equals the End Column (EC) value. The column register is then reset to SC and the page register is incremented. Pixels are written to the frame memory until the page register equals the End Page (EP) value or the host processor sends another command. If the number of pixels exceeds <math>(EC - SC + 1) * (EP - SP + 1)</math> the extra pixels are ignored.</p> <p>If MV(36h-B5) = 1:</p> <p>Data is written continuing from the pixel location after the write range of the previous RAMWR(2Ch) or RAMWRC(3Ch). The page register is then incremented and pixels are written to the frame memory until the page register equals the End Page (EP) value. The page register is then reset to SP and the column register is incremented. Pixels are written to the frame memory until the column register equals the End column (EC) value or the host processor sends another command. If the number of pixels exceeds <math>(EC - SC + 1) * (EP - SP + 1)</math> the extra pixels are ignored.</p> <p>Frame Memory Access and Interface setting (B3h), WEMODE=0</p> <p>When the transfer number of data exceeds <math>(EC-SC+1)*(EP-SP+1)</math>, the exceeding data will be ignored.</p> |     |     |           |       |       |       |       |       |       |       |       |     |

|                                           | <p>Frame Memory Access and Interface setting (B3h), WEMODE=1</p> <p>When the transfer number of data exceeds (EC-SC+1)*(EP-SP+1), the column and page number will be reset, and the exceeding data will be written into the following column and page.</p>                                                                                                                                                                                           |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|-------------------------------------------|-----------------------------------|------------------------------------------|-----|----------|-----|
| Restriction                               | <p>A Memory Write should follow a CASET(2Ah), RASET(2Bh) or MADCTR(36h) to define the write location. Otherwise, data written with RAMWR(2Ch) and any following RAMWRC(3Ch) commands is written to undefined locations.</p>                                                                                                                                                                                                                          |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Register Availability                     | <table border="1"> <thead> <tr> <th>Status</th><th>Availability</th></tr> </thead> <tbody> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </tbody> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                                | Normal Mode On, Idle Mode On, Sleep Out | Yes                               | Partial Mode On, Idle Mode Off, Sleep Out | Yes                               | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                         |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Default                                   | <table border="1"> <thead> <tr> <th>Status</th><th>Default Value</th></tr> </thead> <tbody> <tr> <td>Power On Sequence</td><td>Contents of memory is set randomly</td></tr> <tr> <td>SW Reset</td><td>Contents of memory is not cleared</td></tr> <tr> <td>HW Reset</td><td>Contents of memory is not cleared</td></tr> </tbody> </table>                                                                                                            | Status | Default Value | Power On Sequence                        | Contents of memory is set randomly | SW Reset                                | Contents of memory is not cleared | HW Reset                                  | Contents of memory is not cleared |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Power On Sequence                         | Contents of memory is set randomly                                                                                                                                                                                                                                                                                                                                                                                                                   |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| SW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                                                                    |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| HW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                                                                    |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Flow chart                                | <pre> graph TD     A[RAMWRC (3Ch)] --&gt; B([Image Data<br/>D1[B:0], D2[B:0].....Dn[B:0]])     B --&gt; C[Any Command]     </pre> <p>Note : B = 23</p>                                                                                                                                                                                                                                                                                               |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |

### RAMRDC(3E00h) : Read\_Memory\_Continue

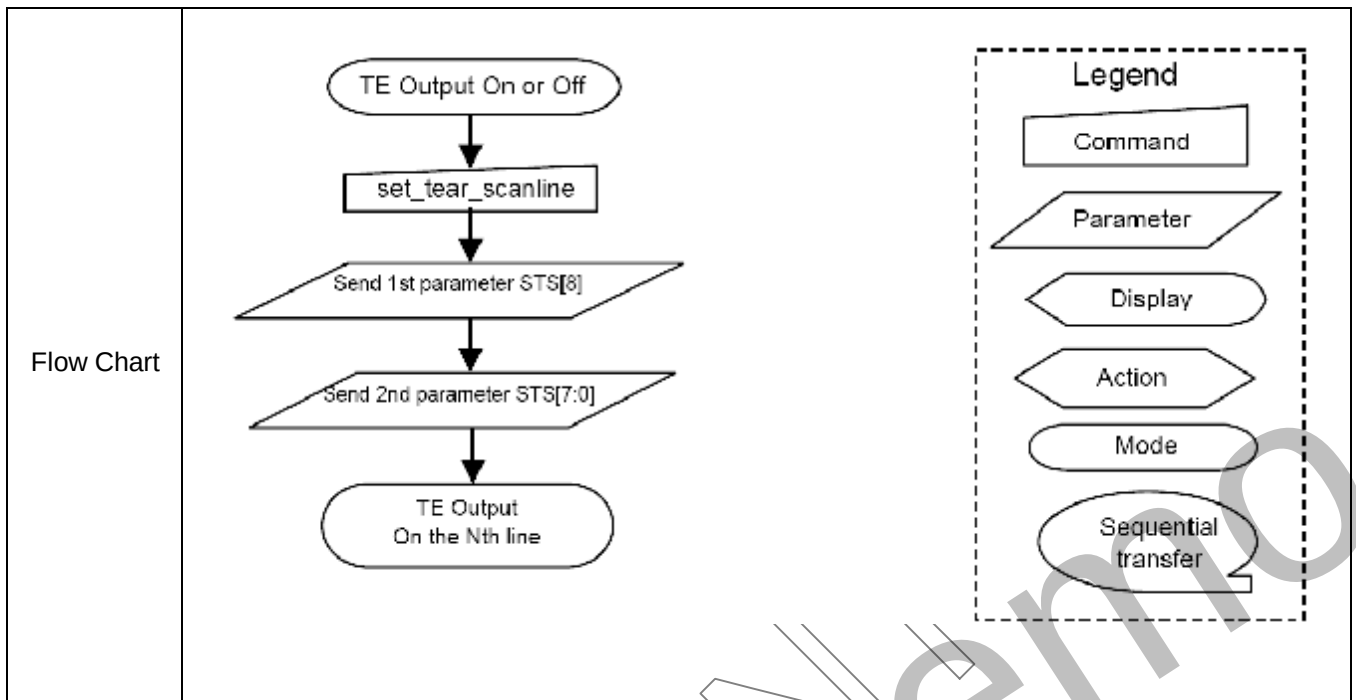
| 3E00H                     | Read_Memory_Continue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |           |       |       |       |       |       |       |       |       |     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RDX | WRX | D24-8     | D7    | D6    | D5    | D4    | D3    | D2    | D1    | D0    | HEX |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1   | ↑   | x         | 0     | 0     | 1     | 1     | 1     | 1     | 1     | 0     | 3E  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ↑   | 1   | x         | x     | x     | x     | x     | x     | x     | x     | x     | x   |
| 2 <sup>nd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ↑   | 1   | D1[24..8] | D1[7] | D1[6] | D1[5] | D1[4] | D1[3] | D1[2] | D1[1] | D1[0] |     |
| X <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ↑   | 1   | Dx[24..8] | Dx[7] | Dx[6] | Dx[5] | Dx[4] | Dx[3] | Dx[2] | Dx[1] | Dx[0] |     |
| N <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ↑   | 1   | Dn[24..8] | Dn[7] | Dn[6] | Dn[5] | Dn[4] | Dn[3] | Dn[2] | Dn[1] | Dn[0] |     |
| Description               | <p>This command transfers image data from the display module's frame memory to the host processor continuing from the location following the previous read_memory_continue or read_memory_start command.</p> <p>If MV(36h-B5) = 0:<br/>Pixels are read continuing from the pixel location after the read range of the previous RAMWR(2Ch) or RAMWRC(3Ch). The column register is then incremented and pixels are read from the frame memory until the column register equals the End Column (EC) value. The column register is then reset to SC and the page register is incremented. Pixels are read from the frame memory until the page register equals the End Page (EP) value or the host processor sends another command.</p> <p>If MV(36h-B5) B5 = 1:<br/>Pixels are read continuing from the pixel location after the read range of the previous RAMWR(2Ch) or RAMWRC(3Ch). The page register is then incremented and pixels are read from the frame memory until the page register equals the End Page (EP) value. The page register is then reset to SP and the column register is incremented. Pixels are read from the frame memory until the column register equals the End Column (EC) value or the host processor sends another command.</p> |     |     |           |       |       |       |       |       |       |       |       |     |
| Restriction               | A Memory Read should follow a CASET(2Ah), RASET(2Bh) or MADCTR(36h) to define the write location. Otherwise, data written with RAMRD(2Eh) and any following RAMRDC(3Eh) commands is written to undefined locations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |           |       |       |       |       |       |       |       |       |     |

| Register Availability                     | <table> <tr> <th>Status</th><th>Availability</th></tr> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes                                | Normal Mode On, Idle Mode On, Sleep Out | Yes                               | Partial Mode On, Idle Mode Off, Sleep Out | Yes                               | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|-------------------------------------------|-----------------------------------|------------------------------------------|-----|----------|-----|
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                            |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Default                                   | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>Contents of memory is set randomly</td></tr> <tr> <td>SW Reset</td><td>Contents of memory is not cleared</td></tr> <tr> <td>HW Reset</td><td>Contents of memory is not cleared</td></tr> </table>                                                                                                            | Status | Default Value | Power On Sequence                        | Contents of memory is set randomly | SW Reset                                | Contents of memory is not cleared | HW Reset                                  | Contents of memory is not cleared |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                           |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Power On Sequence                         | Contents of memory is set randomly                                                                                                                                                                                                                                                                                                                                                                      |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| SW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                       |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| HW Reset                                  | Contents of memory is not cleared                                                                                                                                                                                                                                                                                                                                                                       |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |
| Flow chart                                | <pre> graph TD     A[RAMRDC (3Eh)] --&gt; B[/Dummy Read/]     B --&gt; C([Image Data<br/>D1[B:0], D2[B:0].....Dn[B:0]])     C --&gt; D[Any Command]     </pre> <p>Note : B=23</p> <div> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> </div>                                   |        |               |                                          |                                    |                                         |                                   |                                           |                                   |                                          |     |          |     |



## STESL(4400h) : Set\_Tear\_Scanline

| 4400H                                     | STESL(Set_Tear_Scanline)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|--------|--------|--------|--------|--------|--------|--------|--------|-----|--------|---------------|------------------------------------------|------------------|-----------------------------------------|-----------|-------------------------------------------|------------------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RDX | WRX | D15-8 | D7     | D6     | D5     | D4     | D3     | D2     | D1     | D0     | HEX |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1   | ↑   | x     | 0      | 1      | 0      | 0      | 0      | 1      | 0      | 0      | 44  |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1   | ↑   | xx    | 0      | 0      | 0      | 0      | 0      | 0      | STS[9] | STS[8] | 00  |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| 2 <sup>nd</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1   | ↑   | xx    | STS[7] | STS[6] | STS[5] | STS[4] | STS[3] | STS[2] | STS[1] | STS[0] | 00  |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Description                               | <p>This command turns on the display Tearing Effect output signal on the TE signal line when the display reaches line N. The TE signal is not affected by changing set_address_mode bit B4. The Tearing Effect Line On has one parameter that describes the Tearing Effect Output Line mode.</p> <div><p>Vertical Time Scale</p><p>The Tearing Effect Output line shall be active low when the display module is in Sleep mode.</p></div> |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Restriction                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Default                                   | <table><thead><tr><th>Status</th><th>Default Value</th></tr></thead><tbody><tr><td>Power On Sequence</td><td>STS[9:0]=10'h000</td></tr><tr><td>SW Reset</td><td>No change</td></tr><tr><td>HW Reset</td><td>STS[9:0]=10'h000</td></tr></tbody></table>                                                                                                                                                                                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     | Status | Default Value | Power On Sequence                        | STS[9:0]=10'h000 | SW Reset                                | No change | HW Reset                                  | STS[9:0]=10'h000 |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| Power On Sequence                         | STS[9:0]=10'h000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| SW Reset                                  | No change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |
| HW Reset                                  | STS[9:0]=10'h000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |        |        |        |        |        |        |        |        |     |        |               |                                          |                  |                                         |           |                                           |                  |                                          |     |          |     |



## GSL (4500h) : Get\_Scanline

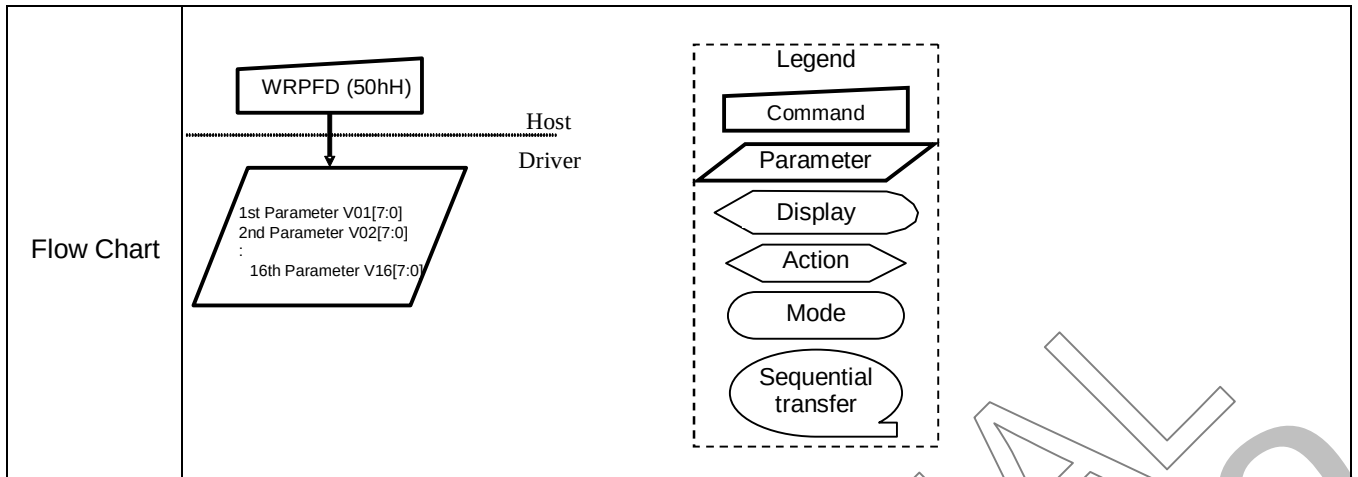
| 4500H                                     | GSL(Get_Scanline)                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|--------|--------|--------|--------|--------|--------|--------|--------|-----|--------|--------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                      | RDX | WRX | D15-8 | D7     | D6     | D5     | D4     | D3     | D2     | D1     | D0     | HEX |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | 0      | 1      | 0      | 0      | 0      | 1      | 0      | 1      | 45  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | ↑   | 1   | x     | x      | x      | x      | x      | x      | x      | x      | x      | x   |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 2 <sup>nd</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | ↑   | 1   | xx    | 0      | 0      | 0      | 0      | 0      | 0      | 0      | GTS[8] | 0x  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 3 <sup>rd</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | ↑   | 1   | xx    | GTS[7] | GTS[6] | GTS[5] | GTS[4] | GTS[3] | GTS[2] | GTS[1] | GTS[0] | xx  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>The display returns the current scan line, N, used to update the display device. The total number of scan lines on a display device is defined as VSYNC + VBP + VACT + VFP. The first scan line is defined as the first line of V-Sync and is denoted as Line 0.</p> <p>When in Sleep Mode, the value returned by get_scanline is undefined.</p>                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | <div><div><div>get_scanline</div><div>Wait 3us</div><div>Dummy Read</div><div>Send 1st parameter GTS[9:0]</div><div>Send 2nd parameter GTS[7:0]</div></div><div><div>Legend</div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                      |     |     |       |        |        |        |        |        |        |        |        |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## DSTBON (4F00h): Deep Standby Mode On

| 4F00H                                     | DSTBON(Deep Standby Mode On)                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|----|----|----|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                      | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | 0  | 1  | 0  | 0  | 1  | 1  | 1  | 1    | 4F  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | DSTB | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command is used to enter deep standby mode.</p> <p>DSTB="1", enter deep standby mode.</p> <p>Notes:</p> <p>1. To exit Deep Standby Mode, input low pulse more than 3 msec to pin RESX.</p>                                                                                                                                                                                                                       |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | There is no visible effect until the Frame Memory is written to.                                                                                                                                                                                                                                                                                                                                                         |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><thead><tr><th>Status</th><th>Default Value</th></tr></thead><tbody><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></tbody></table>                                                                                                                                                                                                   |     |     |       |    |    |    |    |    |    |    |      |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow chart                                | <div><div><div>DSTBON (4Fh)</div><div>↓</div><div>Parameter DSTB=1</div><div>↓</div><div>Deep Standby Mode</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                                                |     |     |       |    |    |    |    |    |    |    |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

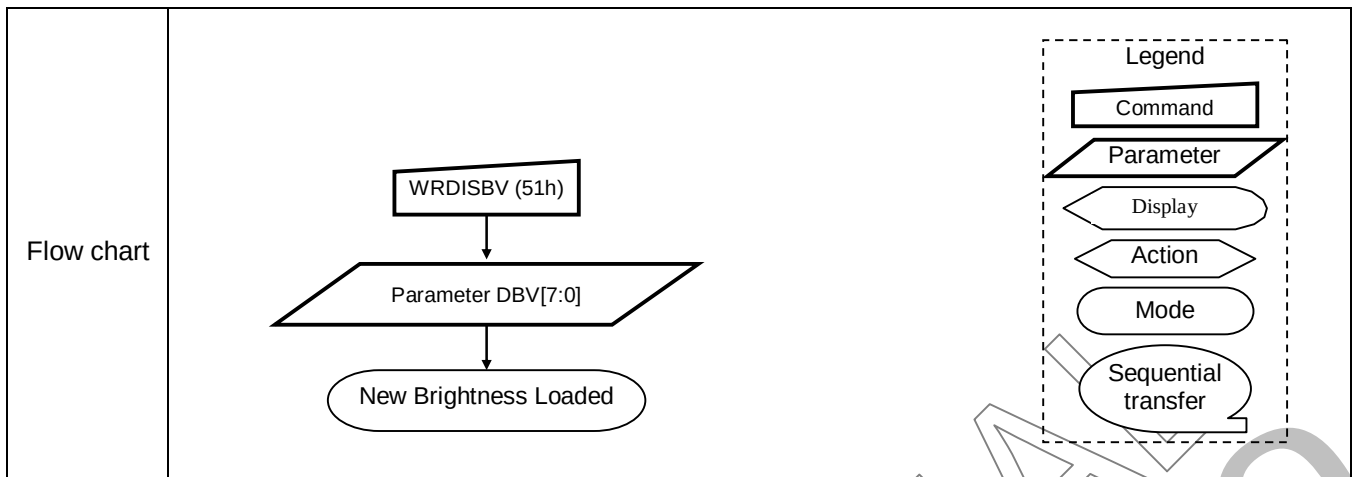
## WRPFD(5000h) : Write Profile Value for Display

| 5000H                      | WRPFD                                                                                                                                                                                                                                                                                                                                                                                      |               |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|-------|------|------|------|------|------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                            | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                    | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑   | X     | 0    | 1    | 0    | 1    | 0    | 0    | 0    | 0    | 50  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1   | X     | x    | x    | x    | x    | x    | x    | x    | x    | x   |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 2 <sup>nd</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1   | xx    | V017 | V016 | V015 | V014 | V013 | V012 | V011 | V010 | FF  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 3 <sup>rd</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1   | xx    | V027 | V026 | V025 | V024 | V023 | V022 | V021 | V020 | FF  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| n <sup>th</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1   | xx    | ⋮    | ⋮    | ⋮    | ⋮    | ⋮    | ⋮    | ⋮    | ⋮    | ⋮   |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 15 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1   | xx    | V157 | V156 | V155 | V154 | V153 | V152 | V151 | V150 | FF  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 16 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1   | xx    | V167 | V166 | V165 | V164 | V163 | V162 | V161 | V160 | FF  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                | This command is used to define profile values for display.                                                                                                                                                                                                                                                                                                                                 |               |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                | -                                                                                                                                                                                                                                                                                                                                                                                          |               |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability      | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |     |       |      |      |      |      |      |      |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|                            | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                            | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                            | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                            | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                            | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                    | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>FFh</td></tr><tr><td>SW Reset</td><td>FFh</td></tr><tr><td>HW Reset</td><td>FFh</td></tr></table>                                                                                                                                                                                                   |               |     |       |      |      |      |      |      |      |      |      |     | Status | Default Value | Power On Sequence                        | FFh | SW Reset                                | FFh | HW Reset                                  | FFh |                                          |     |          |     |
|                            | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                            | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | FFh           |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                            | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | FFh           |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                   | FFh                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |



# WRDISBV (5100h): Write Display Brightness

| 5100H                                     | WRDISBV                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|--------------------|------|------|------|----------------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7                 | D6   | D5   | D4   | D3             | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0                  | 1    | 0    | 1    | 0              | 0    | 0    | 1    | 51  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | DBV7               | DBV6 | DBV5 | DBV4 | DBV3           | DBV2 | DBV1 | DBV0 | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | This command is used to adjust brightness value.<br><br>In principle relationship is that 00h value means the lowest brightness and FFh value means the highest brightness.                                                                                                                                                                                                                |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                                           | DBV[7:0]                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       | Brightness (ratio) |      |      |      | Brightness (%) |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                                           | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       | 0/256              |      |      |      | 0%             |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                                           | 01h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       | 2/256              |      |      |      | 0.78125%       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                                           | :                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       | :                  |      |      |      | :              |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                                           | FEh                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       | 255/256            |      |      |      | 99.609375%     |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                                           | FFh                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       | 256/256            |      |      |      | 100%           |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | The display supplier cannot use this command for tuning                                                                                                                                                                                                                                                                                                                                    |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |                    |      |      |      |                |      |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                   |     |     |       |                    |      |      |      |                |      |      |      |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |                    |      |      |      |                |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |





## RDDISBV (5200h): Read Display Brightness

| 5200H                                     | RDDISBV                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0    | 1    | 0    | 1    | 0    | 0    | 1    | 0    | 52  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑   | 1   | x     | DBV7 | DBV6 | DBV5 | DBV4 | DBV3 | DBV2 | DBV1 | DBV0 | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns brightness value.</p> <p>In principle relationship is that 00h value means the lowest brightness and FFh value means the highest brightness.</p>                                                                                                                                                                                                                   |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |      |      |      |      |      |      |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                   |     |     |       |      |      |      |      |      |      |      |      |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | <div><div><div>RDDISBV (52hH)</div><div>Send parameter DBV[7:0]</div></div><div>Host Driver</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## WRCTRLD (5300h): Write CTRL Display

| 5300H                     | WRCTRLD |     |     |       |    |    |       |    |    |    |    |    |     |
|---------------------------|---------|-----|-----|-------|----|----|-------|----|----|----|----|----|-----|
|                           | DCX     | RDX | WRX | D15-8 | D7 | D6 | D5    | D4 | D3 | D2 | D1 | D0 | HEX |
| Command                   | 0       | 1   | ↑   | x     | 0  | 1  | 0     | 1  | 0  | 0  | 1  | 1  | 53  |
| 1 <sup>st</sup> parameter | 1       | 1   | ↑   | x     | 0  | 0  | BCTRL | A  | DD | BL | DB | G  | 00  |

CONFIDENTIAL

|             |                                                                                                                                                                                                                                                                   |                                                                                                     |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Description | This command is used to control ambient light, brightness and gamma setting.                                                                                                                                                                                      |                                                                                                     |
|             | BCTRL: Brightness Control Block On/Off                                                                                                                                                                                                                            |                                                                                                     |
|             | The BCTRL bit is always used to switch brightness for display with dimming effect (according to DD bit).                                                                                                                                                          |                                                                                                     |
|             | BCTRL                                                                                                                                                                                                                                                             | DESCRIPTION LEDPWM Pin                                                                              |
|             | 0                                                                                                                                                                                                                                                                 | Off, DBV[7:0] and KBV[7:0] are 00h.                                                                 |
|             | 1                                                                                                                                                                                                                                                                 | On, DBV[7:0] and KBV[7:0] are active                                                                |
|             | LED PWM Pin                                                                                                                                                                                                                                                       |                                                                                                     |
|             | LEDPWPOL="0": keep low (0%)                                                                                                                                                                                                                                       |                                                                                                     |
|             | LEDPWPOL="1": keep high (0%)                                                                                                                                                                                                                                      |                                                                                                     |
|             | LEDPWPOL="0": PWM output (high level is duty)                                                                                                                                                                                                                     |                                                                                                     |
|             | LEDPWPOL="1": PWM output (low level is duty)                                                                                                                                                                                                                      |                                                                                                     |
|             | A: LABC Block On/Off                                                                                                                                                                                                                                              |                                                                                                     |
|             | The BCTRL bit is used to control LABC block.                                                                                                                                                                                                                      |                                                                                                     |
|             | A                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Off                                                                                                 |
|             | 1                                                                                                                                                                                                                                                                 | On                                                                                                  |
|             | PWM duty for LEDPWM Pin                                                                                                                                                                                                                                           |                                                                                                     |
|             | By DBV[7:0] of command "WRDISBV (5100h)"                                                                                                                                                                                                                          |                                                                                                     |
|             | By LABC block                                                                                                                                                                                                                                                     |                                                                                                     |
|             | DD: Display Dimming Control On/Off                                                                                                                                                                                                                                |                                                                                                     |
|             | DD                                                                                                                                                                                                                                                                | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Display dimming is off                                                                              |
|             | 1                                                                                                                                                                                                                                                                 | Display dimming is on                                                                               |
|             | BL: Backlight Control On/Off without Dimming Effect                                                                                                                                                                                                               |                                                                                                     |
|             | When BL bit change from "On" to "Off", display brightness is turned off without gradual dimming, even if dimming on (DD="1") is selected.                                                                                                                         |                                                                                                     |
|             | BL                                                                                                                                                                                                                                                                | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Off                                                                                                 |
|             | 1                                                                                                                                                                                                                                                                 | On                                                                                                  |
|             | LEDON Pin                                                                                                                                                                                                                                                         |                                                                                                     |
|             | LEDONPOL="0": keep low (non-lit)                                                                                                                                                                                                                                  |                                                                                                     |
|             | LEDONPOL="1": keep high (non-lit)                                                                                                                                                                                                                                 |                                                                                                     |
|             | LEDONPOL="0": keep high (lit)                                                                                                                                                                                                                                     |                                                                                                     |
|             | LEDONPOL="1": PWM output (lit)                                                                                                                                                                                                                                    |                                                                                                     |
|             | DB: Display Brightness Manual/Automatic                                                                                                                                                                                                                           |                                                                                                     |
|             | DB                                                                                                                                                                                                                                                                | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Manual, the user has to use this setting for manual adjustment of the brightness to have an effect. |
|             | 1                                                                                                                                                                                                                                                                 | Automatic, information about the used brightness is included in the active profile.                 |
|             | <i>Note: All read and write commands are valid, but there is no effect (except registers can be changed) when write commands are used.</i>                                                                                                                        |                                                                                                     |
|             | G: Gamma Curve Manual/Automatic                                                                                                                                                                                                                                   |                                                                                                     |
|             | G                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Manual, by GAMSET-command                                                                           |
|             | 1                                                                                                                                                                                                                                                                 | Automatic, information about the used gamma is included in the active profile.                      |
|             | The dimming function is adapted to the brightness registers for display when bit BCTRL is changed at DD="1", e.g. BCTRL: 0→1 or 1→0.                                                                                                                              |                                                                                                     |
|             | When the ambient light sensing off-mode (A="0"), display brightness and gamma setting should be manual setting (DB="0" and G="0"). Setting values are the last one written with "Write Display Brightness (5100h)" command and GAMSET-command or the default one. |                                                                                                     |
|             | When the ambient light control on, light sensor control block is always working, even if backlight off (BL="0") and display brightness manual (DB="0") are selected.                                                                                              |                                                                                                     |

| Restriction                               | The display supplier cannot use this command for tuning                                                                                                                                                                                                                                                                                                                                                 |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
| Register Availability                     | <table> <tr> <th>Status</th><th>Availability</th></tr> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                            |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>00h</td></tr> <tr> <td>SW Reset</td><td>00h</td></tr> <tr> <td>HW Reset</td><td>00h</td></tr> </table>                                                                                                                                                                                                       | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                           |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow chart                                | <pre> graph TD     A[WRCTRLD (53h)] --&gt; B[/BCTRL, A, DD, BL, DB/]     B --&gt; C([New Control Value])     </pre> <p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul>                                                                                                       |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

**RDCTRLD (5400h): Read CTRL Display Value**

| 5400H                     | RDCTRLD |     |     |       |    |    |       |    |    |    |    |    |     |
|---------------------------|---------|-----|-----|-------|----|----|-------|----|----|----|----|----|-----|
|                           | DCX     | RDX | WRX | D15-8 | D7 | D6 | D5    | D4 | D3 | D2 | D1 | D0 | HEX |
| Command                   | 0       | 1   | ↑   | x     | 0  | 1  | 0     | 1  | 0  | 0  | 1  | 1  | 53  |
| 1 <sup>st</sup> parameter | 1       | ↑   | 1   | x     | 0  | 0  | BCTRL | A  | DD | BL | DB | G  | 00  |

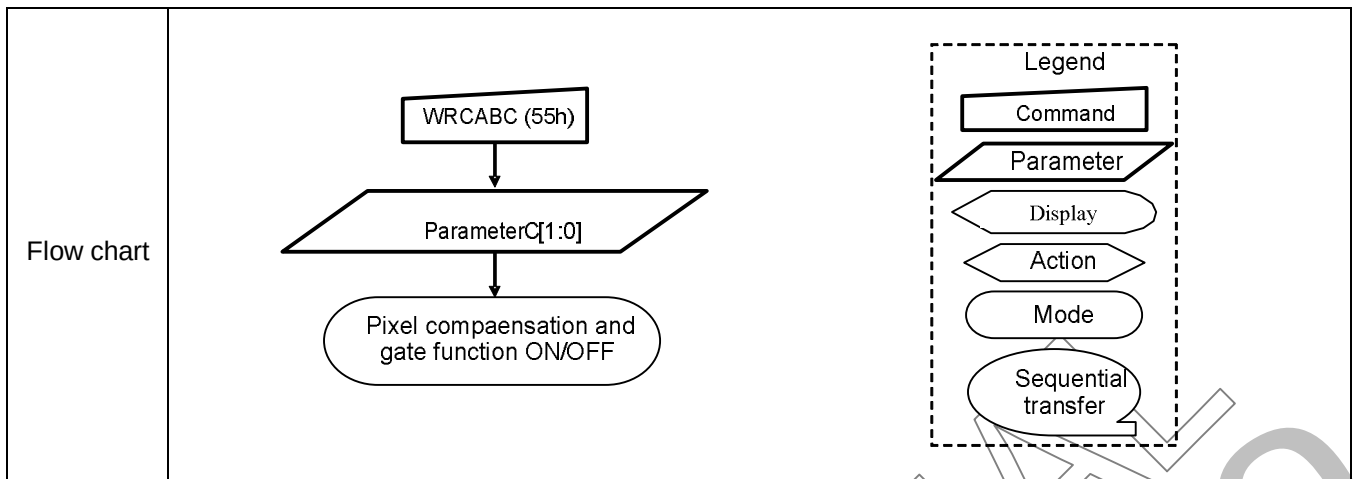
|             |                                                                                                                                                                                                                                                                   |                                                                                                     |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Description | This command is used to control ambient light, brightness and gamma setting.                                                                                                                                                                                      |                                                                                                     |
|             | BCTRL: Brightness Control Block On/Off                                                                                                                                                                                                                            |                                                                                                     |
|             | The BCTRL bit is always used to switch brightness for display with dimming effect (according to DD bit).                                                                                                                                                          |                                                                                                     |
|             | BCTRL                                                                                                                                                                                                                                                             | DESCRIPTION LEDPWM Pin                                                                              |
|             | 0                                                                                                                                                                                                                                                                 | Off, DBV[7:0] and KBV[7:0] are 00h.                                                                 |
|             | 1                                                                                                                                                                                                                                                                 | On, DBV[7:0] and KBV[7:0] are active                                                                |
|             | LED PWM Pin                                                                                                                                                                                                                                                       |                                                                                                     |
|             | LEDPWM POL="0": keep low (0%)                                                                                                                                                                                                                                     |                                                                                                     |
|             | LEDPWM POL="1": keep high (0%)                                                                                                                                                                                                                                    |                                                                                                     |
|             | LED PWM Pin                                                                                                                                                                                                                                                       |                                                                                                     |
|             | LEDPWM POL="0": PWM output (high level is duty)                                                                                                                                                                                                                   |                                                                                                     |
|             | LEDPWM POL="1": PWM output (low level is duty)                                                                                                                                                                                                                    |                                                                                                     |
|             | A: LABC Block On/Off                                                                                                                                                                                                                                              |                                                                                                     |
|             | The BCTRL bit is used to control LABC block.                                                                                                                                                                                                                      |                                                                                                     |
|             | A                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Off                                                                                                 |
|             | 1                                                                                                                                                                                                                                                                 | On                                                                                                  |
|             | PWM duty for LEDPWM Pin                                                                                                                                                                                                                                           |                                                                                                     |
|             | By DBV[7:0] of command "WRDISBV (5100h)"                                                                                                                                                                                                                          |                                                                                                     |
|             | By LABC block                                                                                                                                                                                                                                                     |                                                                                                     |
|             | DD: Display Dimming Control On/Off                                                                                                                                                                                                                                |                                                                                                     |
|             | DD                                                                                                                                                                                                                                                                | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Display dimming is off                                                                              |
|             | 1                                                                                                                                                                                                                                                                 | Display dimming is on                                                                               |
|             | BL: Backlight Control On/Off without Dimming Effect                                                                                                                                                                                                               |                                                                                                     |
|             | When BL bit change from "On" to "Off", display brightness is turned off without gradual dimming, even if dimming on (DD="1") is selected.                                                                                                                         |                                                                                                     |
|             | BL                                                                                                                                                                                                                                                                | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Off                                                                                                 |
|             | 1                                                                                                                                                                                                                                                                 | On                                                                                                  |
|             | LED ON Pin                                                                                                                                                                                                                                                        |                                                                                                     |
|             | LEDON POL="0": keep low (non-lit)                                                                                                                                                                                                                                 |                                                                                                     |
|             | LEDON POL="1": keep high (non-lit)                                                                                                                                                                                                                                |                                                                                                     |
|             | LEDON POL="0": keep high (lit)                                                                                                                                                                                                                                    |                                                                                                     |
|             | LEDON POL="1": PWM output (lit)                                                                                                                                                                                                                                   |                                                                                                     |
|             | DB: Display Brightness Manual/Automatic                                                                                                                                                                                                                           |                                                                                                     |
|             | DB                                                                                                                                                                                                                                                                | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Manual, the user has to use this setting for manual adjustment of the brightness to have an effect. |
|             | 1                                                                                                                                                                                                                                                                 | Automatic, information about the used brightness is included in the active profile.                 |
|             | <i>Note: All read and write commands are valid, but there is no effect (except registers can be changed) when write commands are used.</i>                                                                                                                        |                                                                                                     |
|             | G: Gamma Curve Manual/Automatic                                                                                                                                                                                                                                   |                                                                                                     |
|             | G                                                                                                                                                                                                                                                                 | DESCRIPTION                                                                                         |
|             | 0                                                                                                                                                                                                                                                                 | Manual, by GAMSET-command                                                                           |
|             | 1                                                                                                                                                                                                                                                                 | Automatic, information about the used gamma is included in the active profile.                      |
|             | The dimming function is adapted to the brightness registers for display when bit BCTRL is changed at DD="1", e.g. BCTRL: 0→1 or 1→0.                                                                                                                              |                                                                                                     |
|             | When the ambient light sensing off-mode (A="0"), display brightness and gamma setting should be manual setting (DB="0" and G="0"). Setting values are the last one written with "Write Display Brightness (5100h)" command and GAMSET-command or the default one. |                                                                                                     |
|             | When the ambient light control on, light sensor control block is always working, even if backlight off (BL="0") and display brightness manual (DB="0") are selected.                                                                                              |                                                                                                     |

| Restriction                               | The display supplier cannot use this command for tuning                                                                                                                                                                                                                                                                                                                                    |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |  | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                   |  | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | <div><div><div>RDCTRLD (54hH)</div><div>Send parameter<br/>BCTRL, A,<br/>DD, BL, DB</div></div><div>Host<br/>Driver</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                              |  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## WRCABC (5500h): Write Content Adaptive Brightness Control

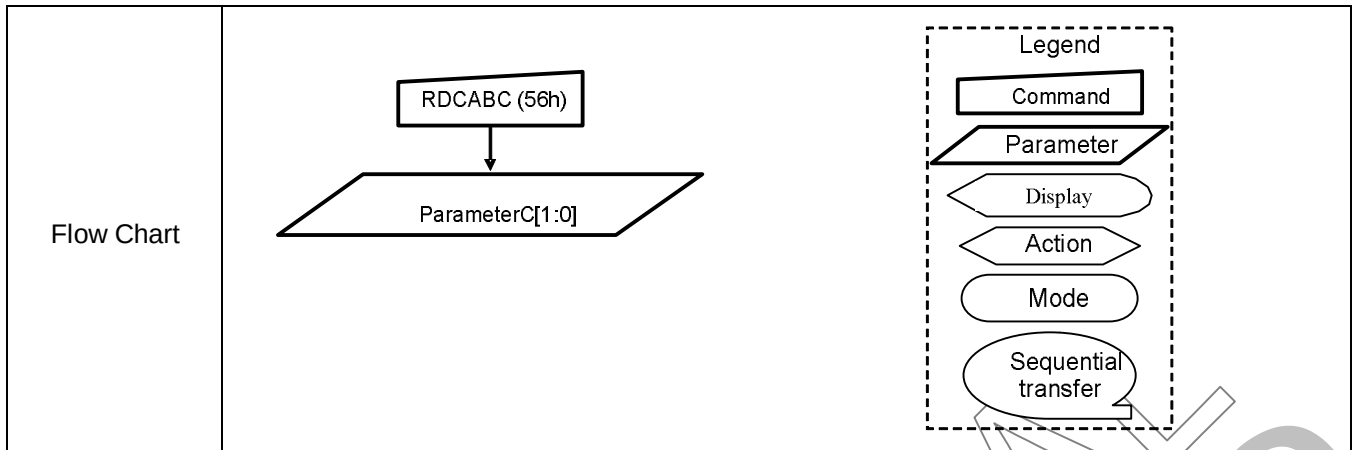
| 5500H                     | WRCABC                                                                                                                                                                                                                             |     |     |       |    |    |    |    |             |    |    |    |     |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|----|----|----|----|-------------|----|----|----|-----|
|                           | DCX                                                                                                                                                                                                                                | RDX | WRX | D15-8 | D7 | D6 | D5 | D4 | D3          | D2 | D1 | D0 | HEX |
| Command                   | 0                                                                                                                                                                                                                                  | 1   | ↑   | x     | 0  | 1  | 0  | 1  | 0           | 0  | 0  | 1  | 51  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                  | 1   | ↑   | x     | 0  | 0  | 0  | 0  | 0           | 0  | C1 | C0 | 00  |
| Description               | This command is used to set parameters for image content based adaptive brightness control functionality. There is possible to use 4 different modes for content adaptive image functionality, which are defined on a table below. |     |     |       |    |    |    |    |             |    |    |    |     |
|                           | C1                                                                                                                                                                                                                                 |     |     |       | C0 |    |    |    | Function    |    |    |    |     |
|                           | 0                                                                                                                                                                                                                                  |     |     |       | 0  |    |    |    | Off         |    |    |    |     |
|                           | 0                                                                                                                                                                                                                                  |     |     |       | 1  |    |    |    | UI Mode     |    |    |    |     |
|                           | 1                                                                                                                                                                                                                                  |     |     |       | 0  |    |    |    | Still Mode  |    |    |    |     |
|                           | 1                                                                                                                                                                                                                                  |     |     |       | 1  |    |    |    | Moving Mode |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
| Restriction               | This register is synchronized with V-sync by internal circuit.                                                                                                                                                                     |     |     |       |    |    |    |    |             |    |    |    |     |
| Register Availability     |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
| Default                   |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |
|                           |                                                                                                                                                                                                                                    |     |     |       |    |    |    |    |             |    |    |    |     |





## RDCABC (5600h): Read Content Adaptive Brightness Control

| 5600H                     | RDCABC                                                                                                                                                                                                                                 |     |     |       |             |    |    |    |               |    |    |     |              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-------------|----|----|----|---------------|----|----|-----|--------------|
|                           | DCX                                                                                                                                                                                                                                    | RDX | WRX | D15-8 | D7          | D6 | D5 | D4 | D3            | D2 | D1 | D0  | HEX          |
| Command                   | 0                                                                                                                                                                                                                                      | 1   | ↑   | x     | 0           | 1  | 0  | 1  | 0             | 1  | 1  | 0   | 56           |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                      | ↑   | 1   | x     | 0           | 0  | 0  | 0  | 0             | 0  | C1 | C0  | 00           |
| Description               | This command is used to read the settings for image content based adaptive brightness control functionality. There is possible to use 4 different modes for content adaptive image functionality, which are defined on a table below.. |     |     |       |             |    |    |    |               |    |    |     |              |
|                           | C1                                                                                                                                                                                                                                     |     | C0  |       | Function    |    |    |    |               |    |    |     |              |
|                           | 0                                                                                                                                                                                                                                      |     | 0   |       | Off         |    |    |    |               |    |    |     |              |
|                           | 0                                                                                                                                                                                                                                      |     | 1   |       | UI Mode     |    |    |    |               |    |    |     |              |
|                           | 1                                                                                                                                                                                                                                      |     | 0   |       | Still Mode  |    |    |    |               |    |    |     |              |
|                           | 1                                                                                                                                                                                                                                      |     | 1   |       | Moving Mode |    |    |    |               |    |    |     |              |
| Restriction               | -                                                                                                                                                                                                                                      |     |     |       |             |    |    |    |               |    |    |     |              |
| Register Availability     |                                                                                                                                                                                                                                        |     |     |       |             |    |    |    |               |    |    |     |              |
|                           | Status                                                                                                                                                                                                                                 |     |     |       |             |    |    |    |               |    |    |     | Availability |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                               |     |     |       |             |    |    |    |               |    |    |     | Yes          |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                |     |     |       |             |    |    |    |               |    |    |     | Yes          |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                              |     |     |       |             |    |    |    |               |    |    |     | Yes          |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                               |     |     |       |             |    |    |    |               |    |    |     | Yes          |
| Sleep In                  |                                                                                                                                                                                                                                        |     |     |       |             |    |    |    |               |    |    | Yes |              |
| Default                   |                                                                                                                                                                                                                                        |     |     |       |             |    |    |    |               |    |    |     |              |
|                           | Status                                                                                                                                                                                                                                 |     |     |       |             |    |    |    | Default Value |    |    |     |              |
|                           | Power On Sequence                                                                                                                                                                                                                      |     |     |       |             |    |    |    | 00h           |    |    |     |              |
|                           | SW Reset                                                                                                                                                                                                                               |     |     |       |             |    |    |    | 00h           |    |    |     |              |
|                           | HW Reset                                                                                                                                                                                                                               |     |     |       |             |    |    |    | 00h           |    |    |     |              |



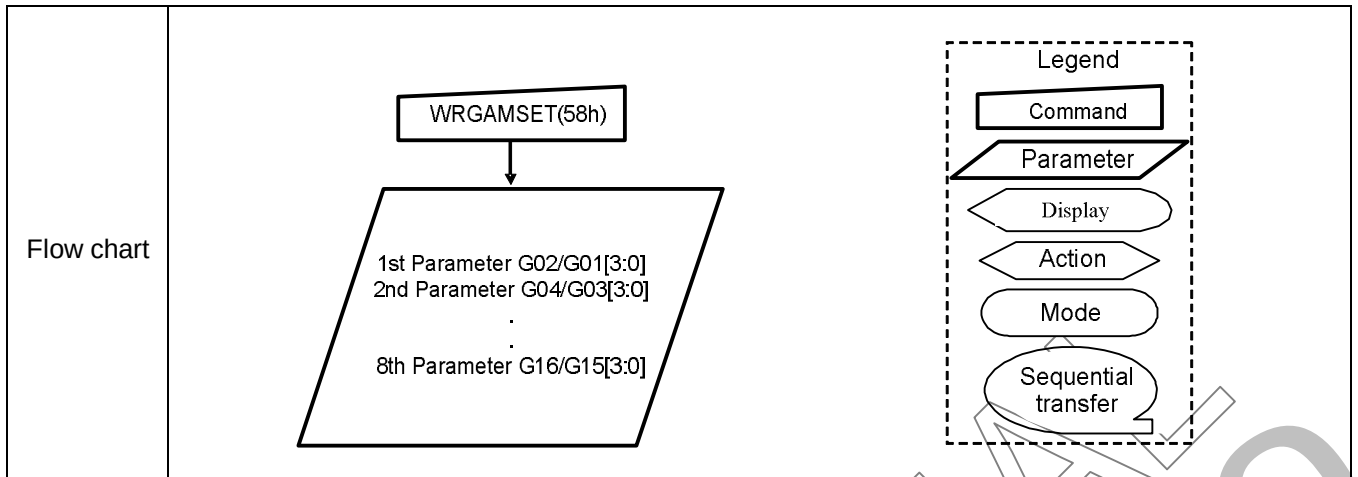
# WRHYSTE (5700h): Write Hystersis

| 5700H                      | WRHYSTE                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-------|-------|-------|-------|-------|-------|------|------|-----|
|                            | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | RDX | WRX | D15-8 | D7    | D6    | D5    | D4    | D3    | D2    | D1   | D0   | HEX |
| Command                    | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | 0     | 1     | 0     | 1     | 0     | 1     | 1    | 1    | 57  |
| 1 <sup>st</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I0115 | I0114 | I0113 | I0112 | I0111 | I0110 | I019 | I018 | FF  |
| 2 <sup>nd</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I017  | I016  | I015  | I014  | I013  | I012  | I011 | I010 | FF  |
| 3 <sup>rd</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I0215 | I0214 | I0213 | I0212 | I0211 | I0210 | I029 | I028 | FF  |
| 4 <sup>th</sup> parameter  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I027  | I026  | I025  | I024  | I023  | I022  | I021 | I020 | FF  |
| :                          | :                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | :   | :   | :     | :     | :     | :     | :     | :     | :     | :    | :    | :   |
| 28 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I1515 | I1514 | I1513 | I1512 | I1511 | I1510 | I159 | I158 | FF  |
| 29 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I157  | I156  | I155  | I154  | I153  | I152  | I151 | I150 | FF  |
| 30 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I1615 | I1614 | I1613 | I1612 | I1611 | I1610 | I169 | I168 | FF  |
| 31 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | I167  | I166  | I165  | I164  | I163  | I162  | I161 | I160 | FF  |
| 32 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D0115 | D0114 | D0113 | D0112 | D0111 | D0110 | D019 | D018 | FF  |
| 33 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D017  | D016  | D015  | D014  | D013  | D012  | D011 | D010 | FF  |
| 34 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D0215 | D0214 | D0213 | D0212 | D0211 | D0210 | D029 | D028 | FF  |
| 35 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D027  | D026  | D025  | D024  | D023  | D022  | D021 | D020 | FF  |
| :                          | :                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | :   | :   | :     | :     | :     | :     | :     | :     | :     | :    | :    | :   |
| 60 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D1515 | D1514 | D1513 | D1512 | D1511 | D1510 | D159 | D158 | FF  |
| 61 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D157  | D156  | D155  | D154  | D153  | D152  | D151 | D150 | FF  |
| 62 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D1615 | D1614 | D1613 | D1612 | D1611 | D1610 | D169 | D168 | FF  |
| 63 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1   | ↑   | x     | D167  | D166  | D165  | D164  | D163  | D162  | D161 | D160 | FF  |
| Description                | <p>This command is used to define Hysteresis filter function.</p> <p>I<sub>n</sub>[15:0] defines increment values and D<sub>n</sub>[15:0] defines decrement values.</p> <p>Don't care about the parameter values after "65535 (FFFFh)".</p> <p>I<sub>16</sub>[15 : 0] bits and D<sub>16</sub>[15 : 0] bits are always set to "65535 (FFFFh)" internally, if I<sub>15</sub>[15 : 0] bits and D<sub>15</sub>[15 : 0] bit are still valid and less than "65535 (FFFFh)".</p> |     |     |       |       |       |       |       |       |       |      |      |     |
| Restriction                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |       |       |       |       |       |       |      |      |     |

| Register Availability                     | <table> <tr> <th>Status</th><th>Availability</th></tr> <tr> <td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr> <tr> <td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr> <tr> <td>Sleep In</td><td>Yes</td></tr> </table> | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                            |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>FFh</td></tr> <tr> <td>SW Reset</td><td>FFh</td></tr> <tr> <td>HW Reset</td><td>FFh</td></tr> </table>                                                                                                                                                                                                       | Status | Default Value | Power On Sequence                        | FFh | SW Reset                                | FFh | HW Reset                                  | FFh |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                           |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | FFh                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | FFh                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | FFh                                                                                                                                                                                                                                                                                                                                                                                                     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow chart                                | <p>WRHYTE(57h)</p> <p>1st Parameter I01[15:8]<br/>2nd Parameter I01[7:0]<br/>.<br/>63th Parameter D16[15:8]<br/>64th Parameter D16[7:0]</p> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul>                                                                                      |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

# WRGAMMASET (5800h): Write Gamma Setting

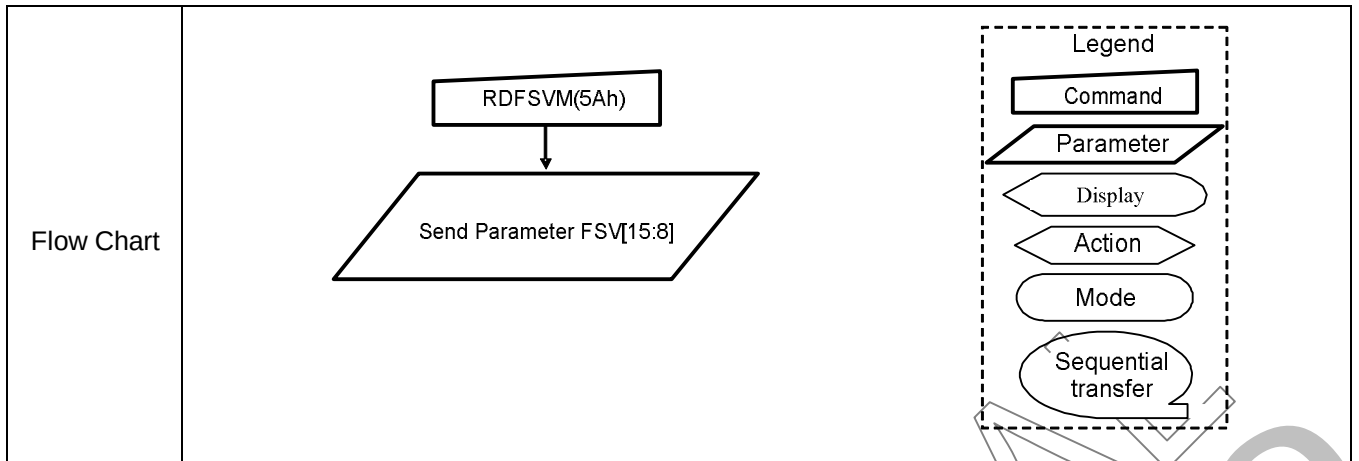
| 5800H                     | WRGAMMASET                                                                                                                                                                                                                                                                                                                                                                                 |               |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|-------|-----------|------|------|------|-----------------------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX | D15-8 | D7        | D6   | D5   | D4   | D3                    | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑   | x     | 0         | 1    | 0    | 1    | 1                     | 0    | 0    | 0    | 58  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑   | x     | G023      | G022 | G021 | G020 | G013                  | G012 | G011 | G010 | 01  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 2 <sup>nd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑   | x     | G043      | G042 | G041 | G040 | G033                  | G032 | G031 | G030 | 01  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| :                         | :                                                                                                                                                                                                                                                                                                                                                                                          | :             | :   | :     | :         | :    | :    | :    | :                     | :    | :    | :    | 01  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 7 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑   | x     | G143      | G142 | G141 | G140 | G133                  | G132 | G131 | G130 | 01  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 8 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑   | x     | G163      | G162 | G161 | G160 | G153                  | G152 | G151 | G150 | 01  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description               | This command is used to define gamma setting values for each luminance level.<br>Gamma value is defined on command “Gamma Set (2600h)”.                                                                                                                                                                                                                                                    |               |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Gn[3:0]                                                                                                                                                                                                                                                                                                                                                                                    |               |     |       | Parameter |      |      |      | Curve Selected        |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | 01h                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       | GC0       |      |      |      | Gamma Curve 1 (G=2.2) |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | 02h                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       | GC1       |      |      |      | Reserved              |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | 04h                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       | GC2       |      |      |      | Reserved              |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | 08h                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       | GC3       |      |      |      | Reserved              |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                          |               |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |     |       |           |      |      |      |                       |      |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Sleep In                                                                                                                                                                                                                                                                                                                                                                                   | Yes           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>01h</td></tr><tr><td>SW Reset</td><td>01h</td></tr><tr><td>HW Reset</td><td>01h</td></tr></table>                                                                                                                                                                                                   |               |     |       |           |      |      |      |                       |      |      |      |     | Status | Default Value | Power On Sequence                        | 01h | SW Reset                                | 01h | HW Reset                                  | 01h |                                          |     |          |     |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | 01h           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | 01h           |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                  | 01h                                                                                                                                                                                                                                                                                                                                                                                        |               |     |       |           |      |      |      |                       |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |



## RDFSVM (5A00h): Read FS Value MSBs

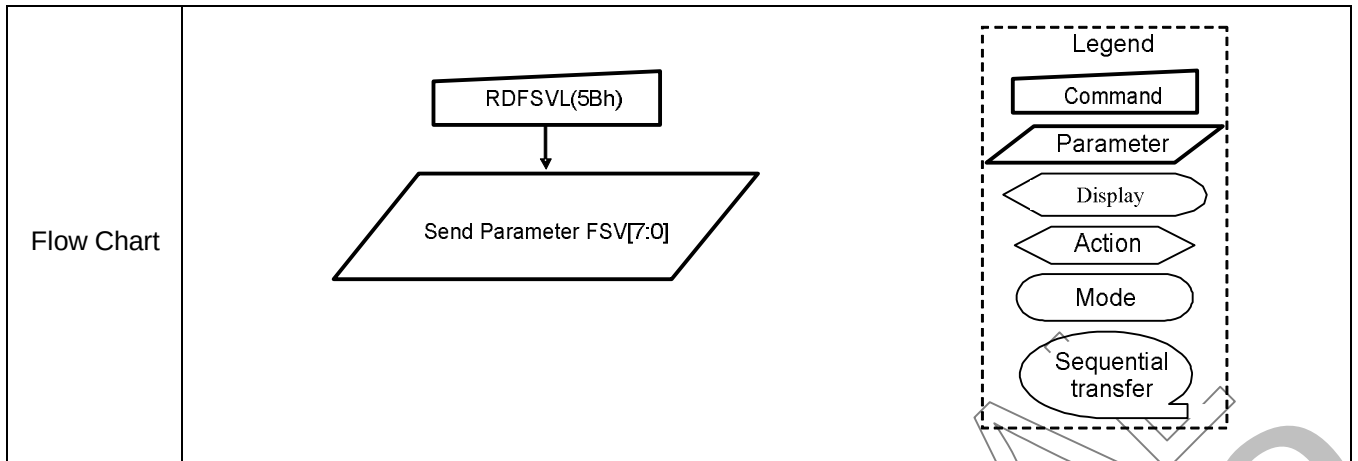
| 5A00H                                     | RDFSVM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-------|-------|-------|-------|-------|-------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RDX | WRX | D15-8 | D7    | D6    | D5    | D4    | D3    | D2    | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1   | ↑   | x     | 0     | 1     | 0     | 1     | 1     | 0     | 1    | 0    | 5A  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ↑   | 1   | x     | FSV15 | FSV14 | FSV13 | FSV12 | FSV11 | FSV10 | FSV9 | FSV8 | FF  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns MSBs (FSV[15:8]) of the "Front Side Ambient Light Sensor Value" after the flicker has been removed from ambient light reading.</p> <p>Another command for LSBs (FSV[7:0]). See the command "Read FS Value LSBs (5B00h)".</p> <p>When using read LSBs/MSBs command, corresponding MSBs/LSBs should be locked so that they refer to the same value when LSBs/MSBs are read. After reading both values, registers for MSBs and LSBs should be released. And that if e.g. LSBs are read and there is no MSBs read command, the next LSBs read will also update MSBs. If MSBs are read at first, the next MSBs read will update LSBs.</p> <p>If <i>any other</i> commands are received between LSBs read command and MSBs read command, the <i>registers</i> for MSBs and LSBs should be released.</p> <p>FSV[15:8] should be 00h when bit 'A' of the "Write CTRL Display (5300h)" command is "0".</p> <p><i>Note: Although FSV[15:0] is 16-bit length register, the valid value range is 0 ~ 65535 (0000h ~ FFFFh), In other words, user don't care about the parameter values over than "65535 (FFFFh)".</i></p> |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |       |       |       |       |       |       |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |       |       |       |       |       |       |      |      |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |       |       |       |       |       |       |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |





# RDFSVL (5B00h): Read FS Value LSBs

| 5B00H                                     | RDFSVL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1   | ↑   | x     | 0    | 1    | 0    | 1    | 1    | 0    | 1    | 1    | 5B  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ↑   | 1   | x     | FSV7 | FSV6 | FSV5 | FSV4 | FSV3 | FSV2 | FSV1 | FSV0 | FF  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns LSBs (FSV[7:0]) of the "Front Side Ambient Light Sensor Value" after the flicker has been removed from ambient light reading.</p> <p>Another command for MSBs (FSV[15:8]). See the command "Read FS Value MSBs (5A00h)".</p> <p>When using read LSBs/MSBs command, corresponding MSBs/LSBs should be locked so that they refer to the same value when LSBs/MSBs are read. After reading both values, registers for MSBs and LSBs should be released. And that if e.g. LSBs are read and there is no MSBs read command, the next LSBs read will also update MSBs. If MSBs are read at first, the next MSBs read will update LSBs.</p> <p>If any other commands are received between LSBs read command and MSBs read command, the registers for MSBs and LSBs should be released.</p> <p>FSV[7:0] should be 00h when bit 'A' of the "Write CTRL Display (5300h)" command is "0".</p> <p><i>Note: Although FSV[15:0] is 16-bit length register, the valid value range is 0 ~ 65535 (0000h ~ FFFFh), In other words, user don't care about the parameter values over than "65535 (FFFFh)".</i></p> |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |      |      |      |      |      |      |      |      |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |      |      |      |      |      |      |      |      |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |



# RDMFFSV (5C00h): Read Median Filter FS Value MSBs

| 5C00H                                     | RDMFFSVM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|--------|--------|--------|--------|--------|--------|-------|-------|-----|--------|--------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RDX | WRX | D15-8 | D7     | D6     | D5     | D4     | D3     | D2     | D1    | D0    | HEX |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1   | ↑   | x     | 0      | 1      | 0      | 1      | 1      | 1      | 0     | 0     | 5A  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ↑   | 1   | x     | FFSV15 | FFSV14 | FFSV13 | FFSV12 | FFSV11 | FFSV10 | FFSV9 | FFSV8 | FF  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns MSBs (FFSV[15:8]) of the "Front Side Ambient Light Sensor Value" after the median filter.</p> <p>Another command for LSBs (FFSV[7:0]). See the command "Read Median Filter FS Value LSBs (5D00h)".</p> <p>When using read LSBs/MSBs command, corresponding MSBs/LSBs should be locked so that they refer to the same value when LSBs/MSBs are read. After reading both values, registers for MSBs and LSBs should be released. And that if e.g. LSBs are read and there is no MSBs read command, the next LSBs read will also update MSBs. If MSBs are read at first, the next MSBs read will update LSBs.</p> <p>If any other commands are received between LSBs read command and MSBs read command, the registers for MSBs and LSBs should be released.</p> <p>FFSV[15:8] should be 00h when bit 'A' of the "Write CTRL Display (5300h)" command is "0".</p> <p><i>Note: Although FFSV[15:0] is 16-bit length register, the valid value range is 0 ~ 65535 (0000h ~ FFFFh), In other words, user don't care about the parameter values over than "65535 (FFFFh)".</i></p> |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |        |        |        |        |        |        |       |       |     | Status | Availability | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |        |        |        |        |        |        |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

| Default           | <table> <tr> <th>Status</th><th>Default Value</th></tr> <tr> <td>Power On Sequence</td><td>00h</td></tr> <tr> <td>SW Reset</td><td>00h</td></tr> <tr> <td>HW Reset</td><td>00h</td></tr> </table>                                                                        | Status | Default Value | Power On Sequence | 00h | SW Reset | 00h | HW Reset | 00h |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|-------------------|-----|----------|-----|----------|-----|
| Status            | Default Value                                                                                                                                                                                                                                                            |        |               |                   |     |          |     |          |     |
| Power On Sequence | 00h                                                                                                                                                                                                                                                                      |        |               |                   |     |          |     |          |     |
| SW Reset          | 00h                                                                                                                                                                                                                                                                      |        |               |                   |     |          |     |          |     |
| HW Reset          | 00h                                                                                                                                                                                                                                                                      |        |               |                   |     |          |     |          |     |
| Flow Chart        | <pre> graph TD     A[RDMFFSVM(5Ch)] --&gt; B[/Send Parameter FFSV[15:8]/]     </pre> <div> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> </div> |        |               |                   |     |          |     |          |     |

# RDMFFSVL (5D00h): Read Median Filter FS Value LSBs

| 5D00H                                     | RDMFFSVL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|--------|--------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RDX | WRX | D15-8 | D7    | D6    | D5    | D4    | D3    | D2    | D1    | D0    | HEX |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | ↑   | x     | 0     | 1     | 0     | 1     | 1     | 1     | 0     | 1     | 5D  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ↑   | 1   | x     | FFSV7 | FFSV6 | FFSV5 | FFSV4 | FFSV3 | FFSV2 | FFSV1 | FFSV0 | FF  |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns LSBs (FDSV[7:0]) of the "Front Side Ambient Light Sensor Value" after the median filter.</p> <p>Another command for MSBs (FFSV[15:8]). See the command "Read Median Filter FS Value MSBs (5C00h)".</p> <p>When using read LSBs/MSBs command, corresponding MSBs/LSBs should be locked so that they refer to the same value when LSBs/MSBs are read. After reading both values, registers for MSBs and LSBs should be released. And that if e.g. LSBs are read and there is no MSBs read command, the next LSBs read will also update MSBs. If MSBs are read at first, the next MSBs read will update LSBs.</p> <p>If any other commands are received between LSBs read command and MSBs read command, the registers for MSBs and LSBs should be released.</p> <p>FFSV[7:0] should be 00h when bit 'A' of the "Write CTRL Display (5300h)" command is "0".</p> <p><i>Note: Although FSV[15:0] is 16-bit length register, the valid value range is 0 ~ 65535 (0000h ~ FFFFh), In other words, user don't care about the parameter values over than "65535 (FFFFh)".</i></p> |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |       |       |       |       |       |       |       |       |     | Status | Availability | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |       |       |       |       |       |       |       |       |     |        |              |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

| Default           | <table border="1"> <thead> <tr> <th>Status</th><th>Default Value</th></tr> </thead> <tbody> <tr> <td>Power On Sequence</td><td>00h</td></tr> <tr> <td>SW Reset</td><td>00h</td></tr> <tr> <td>HW Reset</td><td>00h</td></tr> </tbody> </table>                    | Status | Default Value | Power On Sequence | 00h | SW Reset | 00h | HW Reset | 00h |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|-------------------|-----|----------|-----|----------|-----|
| Status            | Default Value                                                                                                                                                                                                                                                     |        |               |                   |     |          |     |          |     |
| Power On Sequence | 00h                                                                                                                                                                                                                                                               |        |               |                   |     |          |     |          |     |
| SW Reset          | 00h                                                                                                                                                                                                                                                               |        |               |                   |     |          |     |          |     |
| HW Reset          | 00h                                                                                                                                                                                                                                                               |        |               |                   |     |          |     |          |     |
| Flow Chart        | <pre> graph TD     A[RDMFFSVL(5Dh)] --&gt; B[/Send Parameter FFSV[7:0]/]     </pre> <p><b>Legend</b></p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> |        |               |                   |     |          |     |          |     |

## WRCABCMB (5E00h): Write CABC Minimum Brightness

| 5E00H                                     | WRCABCMB                                                                                                                                                                                                                                                                                                                                                                                                                 |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                      | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | 0    | 1    | 0    | 1    | 1    | 1    | 1    | 0    | 5E  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | CMB7 | CMB6 | CMB5 | CMB4 | CMB3 | CMB2 | CMB1 | CMB0 | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command is used to set the minimum brightness value of the display for CABC function</p> <p>In principle relationship is that 00h value means the lowest brightness for CABC and FFh value means the highest brightness for CABC.</p>                                                                                                                                                                            |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow chart                                | <div><div><div>WRCABCMB(5Eh)</div><div>↓</div><div>Parameter CMB[7:0]</div><div>↓</div><div>New Display Luminance Value Loaded</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                            |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |



## RDCABCMB (5F00h): Read CABC Minimum Brightness

| 5F00H                                     | RDCABCMB                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|------|------|------|------|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0    | 1    | 0    | 1    | 1    | 1    | 1    | 1    | 5F  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | CMB7 | CMB6 | CMB5 | CMB4 | CMB3 | CMB2 | CMB1 | CMB0 | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command return the minimum brightness value of CABC function</p> <p>In principle relationship is that 00h value means the lowest brightness for CABC and FFh value means the highest brightness for CABC.</p> <p>CMB[7:0] is minimum brightness forCABC specified with “WRCABCMB Write CABC minimum brightness (5Eh)” command.</p>                                                 |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                   |     |     |       |      |      |      |      |      |      |      |      |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow chart                                | <div><div>RDCABCMB(5Fh)</div><div>↓</div><div>Send Parameter CMB[7:0]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                            |     |     |       |      |      |      |      |      |      |      |      |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## WRLSCC (6500h): Write Light Sensor Compensation Coefficient Value

| 6500H                                     | WRLSCC                                                                                                                                                                                                                                                                                                                                                                                                                   |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|------|------|-----|-----|-----|--------|---------------|------------------------------------------|-------|-----------------------------------------|-------|-------------------------------------------|-------|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                      | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1  | D0  | HEX |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | 0    | 1    | 1    | 0    | 0    | 1    | 0   | 1   | 65  |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | CC15 | CC14 | CC13 | CC12 | CC11 | CC10 | CC9 | CC8 | 80  |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| 2 <sup>nd</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | CC7  | CC6  | CC5  | CC4  | CC3  | CC2  | CC1 | CC0 | 00  |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Description                               | This command is used to send the compensation coefficient value (CC[15 : 0]).<br>Default value for compensation coefficient is 1.0 (1000 0000 0000 0000 in binary).                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Restriction                               | The display supplier cannot use this command for tuning (e.g. factory tuning, etc.).                                                                                                                                                                                                                                                                                                                                     |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Default                                   | <table><thead><tr><th>Status</th><th>Default Value</th></tr></thead><tbody><tr><td>Power On Sequence</td><td>8000h</td></tr><tr><td>SW Reset</td><td>8000h</td></tr><tr><td>HW Reset</td><td>8000h</td></tr></tbody></table>                                                                                                                                                                                             |     |     |       |      |      |      |      |      |      |     |     |     | Status | Default Value | Power On Sequence                        | 8000h | SW Reset                                | 8000h | HW Reset                                  | 8000h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Power On Sequence                         | 8000h                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| SW Reset                                  | 8000h                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| HW Reset                                  | 8000h                                                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |
| Flow chart                                | <div><div><div>WRLSCC(65h)</div><div>↓</div><div>1st Parameter CC[15:8]</div><div>↓</div><div>2nd Parameter CC[7:0]</div><div>↓</div><div>New CC Value Loaded</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                             |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |       |                                         |       |                                           |       |                                          |     |          |     |

## RDLSCCM (6600h): Read Light Sensor Compensation Coefficient Value MSBs

| 6600H                                     | RDLSCCM                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|------|------|-----|-----|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                      | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3   | D2   | D1  | D0  | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                        | 1   | ↑   | x     | 0    | 1    | 1    | 0    | 0    | 1    | 1   | 0   | 66  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                        | ↑   | 1   | x     | CC15 | CC14 | CC13 | CC12 | CC11 | CC10 | CC9 | CC8 | 80  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns MSBs of the compensation coefficient value (CC[15:8]) which is stored by “Write Light Sensor Compensation Coefficient Value (6500h)” command.</p> <p>It can read MSBs/LSBs of "Light Sensor Compensation Coefficient value" with any order.</p> <p>Default value for compensation coefficient is 1.0 (1000 0000 0000 0000 in binary). MSBs are “1000 000”.</p>                                   |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | The display supplier cannot use this command for tuning (e.g. factory tuning, etc.).                                                                                                                                                                                                                                                                                                                                     |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                                                             |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
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| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                                                            |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 80h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 80h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 80h                                                                                                                                                                                                                                                                                                                                                                                                                      |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | <div><div><div>RDLSCCM(66h)</div><div>↓</div><div>Send Parameter<br/>CC[15:8]</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                                                                             |     |     |       |      |      |      |      |      |      |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## RDLSCCL (6700h): Read Light Sensor Compensation Coefficient Value LSBs

| 6700H                                     | RDLSCCL                                                                                                                                                                                                                                                                                                                                                                                    |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----|-----------------------------------------|-----|-------------------------------------------|-----|------------------------------------------|-----|----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1   | ↑   | x     | 0   | 1   | 1   | 0   | 0   | 1   | 1   | 1   | 67  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑   | 1   | x     | CC7 | CC6 | CC5 | CC4 | CC3 | CC2 | CC1 | CC0 | 00  |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Description                               | <p>This command returns LSBs of the compensation coefficient value (CC[7:0]) which is stored by “Write Light Sensor Compensation Coefficient Value (6501h)” command.</p> <p>It can read MSBs/LSBs of “Light Sensor Compensation Coefficient value” with any order.</p> <p>Default value for compensation coefficient is 1.0 (1000 0000 0000 0000 in binary). MSBs are “0000 000”.</p>      |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Restriction                               | The display supplier cannot use this command for tuning (e.g. factory tuning, etc.).                                                                                                                                                                                                                                                                                                       |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |     |     |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes | Normal Mode On, Idle Mode On, Sleep Out | Yes | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes | Sleep In | Yes |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Default                                   | <table><tr><th>Status</th><th>Default Value</th></tr><tr><td>Power On Sequence</td><td>00h</td></tr><tr><td>SW Reset</td><td>00h</td></tr><tr><td>HW Reset</td><td>00h</td></tr></table>                                                                                                                                                                                                   |     |     |       |     |     |     |     |     |     |     |     |     | Status | Default Value | Power On Sequence                        | 00h | SW Reset                                | 00h | HW Reset                                  | 00h |                                          |     |          |     |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Power On Sequence                         | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| SW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| HW Reset                                  | 00h                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |
| Flow Chart                                | <div><div><div>RDLSCCL(67h)</div><div>↓</div><div>Send Parameter<br/>CC[7:0]</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                                                |     |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |     |                                         |     |                                           |     |                                          |     |          |     |

## RDBWLB (7000h): Read Black/White Low Bits

| 7000H                                     | RDBWLB                                                                                                                                                                                                                                                                                                                                                                                     |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-------|------|------|------|------|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX        | WRX | D15-8 | D7   | D6   | D5   | D4   | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1          | ↑   | x     | 0    | 1    | 1    | 1    | 0   | 0   | 0   | 0   | 70  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑          | 1   | x     | Bkx1 | Bkx0 | Bky1 | Bky0 | Wx1 | Wx0 | Wy1 | Wy0 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description                               | This command returns the lowest bits of black and white color characteristic.<br><br>Black: Bkx and Bky<br><br>White: Wx and Wy                                                                                                                                                                                                                                                            |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                          |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |            |     |       |      |      |      |      |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |            |     |       |      |      |      |      |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                                           | After MTP                                                                                                                                                                                                                                                                                                                                                                                  | Before MTP |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Power On Sequence                         | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| SW Reset                                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                                | <div><div>RDBWLB(70h)</div><div>Send Parameter<br/>Bkx[1:0], Bky[1:0],<br/>Wx[1:0], Wy[1:0]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                      |            |     |       |      |      |      |      |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDBkx (7100h): Read Bkx

| 7100H                     | RDBkx                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|------|------|--------------|------|------|------|------|------|-----|--------|---------------|--|-----------|------------|-------------------|--------------|-----|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|----------|--|--|--|--|--|-----|--|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7   | D6   | D5           | D4   | D3   | D2   | D1   | D0   | HEX |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0    | 1    | 1            | 1    | 0    | 0    | 0    | 1    | 71  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Bkx9 | Bkx8 | Bkx7         | Bkx6 | Bkx5 | Bkx4 | Bkx3 | Bkx2 | 00  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Description               | This command returns the Bkx bit (Bkx[9:2]) of black color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="6">Status</th><th colspan="7">Availability</th></tr><tr><td colspan="6">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Sleep In</td><td colspan="7">Yes</td></tr></table> |               |            |       |      |      |              |      |      |      |      |      |     | Status |               |  |           |            |                   | Availability |     |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Sleep In |  |  |  |  |  | Yes |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |      |      | Availability |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |      | Yes  |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |      |      |              |      |      |      |      |      |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value    | 00h | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Flow Chart                | <div><div><div>RDBkx(71h)</div><div>↓</div><div>Send Parameter Bkx[9:2]</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                                                                                                                                                                                                     |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |

## RDBky (7200h): Read Bky

| 7200H                     | RDBky                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|------|------|--------------|------|------|------|------|------|-----|--------|---------------|--|-----------|------------|-------------------|--------------|-----|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|----------|--|--|--|--|--|-----|--|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7   | D6   | D5           | D4   | D3   | D2   | D1   | D0   | HEX |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0    | 1    | 1            | 1    | 0    | 0    | 0    | 1    | 71  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Bky9 | Bky8 | Bky7         | Bky6 | Bky5 | Bky4 | Bky3 | Bky2 | 00  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Description               | This command returns the Bky bit (Bky[9:2]) of black color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="6">Status</th><th colspan="7">Availability</th></tr><tr><td colspan="6">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Sleep In</td><td colspan="7">Yes</td></tr></table> |               |            |       |      |      |              |      |      |      |      |      |     | Status |               |  |           |            |                   | Availability |     |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Sleep In |  |  |  |  |  | Yes |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |      |      | Availability |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |      |      | Yes          |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |      | Yes  |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |      |      |              |      |      |      |      |      |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value    | 00h | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Flow Chart                | <div><div><div>RDBky(72h)</div><div>↓</div><div>Send Parameter Bky[9:2]</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                                                                                                                                                                                                     |               |            |       |      |      |              |      |      |      |      |      |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |

## RDWx (7300h): Read Wx

| 7300H                     | RDWx                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1   | 0   | 0   | 1   | 1   | 73  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Wx9 | Wx8 | Wx7 | Wx6 | Wx5 | Wx4 | Wx3 | Wx2 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description               | This command returns the Wx bit (Wx[9:2]) of black color characteristic.                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |            |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |               |            |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           |                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                | <div><div>RDWx(73h)</div><div>Send Parameter Wx[9:2]</div></div> <div><div>Legend</div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div>                                                                                                                                                                        |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |



## RDWy (7400h): Read Wy

| 7400H                     | RDWy                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1   | 0   | 1   | 0   | 0   | 74  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Wy9 | Wy8 | Wy7 | Wy6 | Wy5 | Wy4 | Wy3 | Wy2 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description               | This command returns the Bky bit (Bky[9:2]) of black color characteristic.                                                                                                                                                                                                                                                                                                                 |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |            |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |               |            |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           |                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                | <div><div>RDWy(74h)</div><div>Send Parameter Wy[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                             |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDRGLB (7500h): Read Red/Green Low Bits

| 7500H                                     | RDRGLB                                                                                                                                                                                                                                                                                                                                                                                     |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX        | WRX | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1          | ↑   | x     | 0   | 1   | 1   | 1   | 0   | 1   | 0   | 1   | 75  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑          | 1   | x     | Rx1 | Rx0 | Ry1 | Ry0 | Gx1 | Gx0 | Gy1 | Gy0 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description                               | This command returns the lowest bits of red and green color characteristic.<br><br>Red: Rx and Ry<br><br>Green: Gx and Gy                                                                                                                                                                                                                                                                  |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                          |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |            |     |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |            |     |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                                           | After MTP                                                                                                                                                                                                                                                                                                                                                                                  | Before MTP |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Power On Sequence                         | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| SW Reset                                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                                | <div><div>RDRGLB(75h)</div><div>Send Parameter<br/>Rx[1:0], Ry[1:0],<br/>Gx[1:0], Gy[1:0]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDRx (7600h): Read Rx

| 7600H                     | RDRx                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1   | 0   | 1   | 1   | 0   | 76  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Rx9 | Rx8 | Rx7 | Rx6 | Rx5 | Rx4 | Rx3 | Rx2 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description               | This command returns the Rx bit (Rx[9:2]) of red color characteristic.                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |            |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |               |            |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           |                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                | <div><div>RDRx(76h)</div><div>↓</div><div>Send Parameter Rx[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                 |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDRy (7700h): Read Ry

| 7700H                     | RDRy                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1   | 0   | 1   | 1   | 1   | 77  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Wy9 | Wy8 | Wy7 | Wy6 | Wy5 | Wy4 | Wy3 | Wy2 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description               | This command returns the Ry bit (Ry[9:2]) of red color characteristic.                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |            |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |               |            |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           |                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                | <div><div>RDRy(77h)</div><div>↓</div><div>Send Parameter Ry[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                 |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDGx (7800h): Read Gx

| 7800H                     | RDGx                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|--------------|-----|-----|-----|-----|-----|-----|--------|---------------|--|-----------|------------|-------------------|--------------|-----|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|----------|--|--|--|--|--|-----|--|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5           | D4  | D3  | D2  | D1  | D0  | HEX |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1            | 1   | 1   | 0   | 0   | 0   | 78  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Gx9 | Gx8 | Gx7          | Gx6 | Gx5 | Gx4 | Gx3 | Gx2 | 00  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Description               | This command returns the Gx bit (Gx[9:2]) of green color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="6">Status</th><th colspan="7">Availability</th></tr><tr><td colspan="6">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Sleep In</td><td colspan="7">Yes</td></tr></table> |               |            |       |     |     |              |     |     |     |     |     |     | Status |               |  |           |            |                   | Availability |     |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Sleep In |  |  |  |  |  | Yes |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     | Availability |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |     | Yes |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value    | 00h | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Flow Chart                | <div><div>RDGx(78h)</div><div>↓</div><div>Send Parameter<br/>Gx[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                                                                                                                                                             |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |

## RDGy (7900h): Read Gy

| 7900H                     | RDGy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|--------------|-----|-----|-----|-----|-----|--------|---------------|--|-----------|------------|-------------------|-----------|--------------|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|------------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|----------|--|--|--|--|--|--|-----|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4           | D3  | D2  | D1  | D0  | HEX |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1            | 1   | 0   | 0   | 1   | 79  |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Gy9 | Gy8 | Gy7 | Gy6          | Gy5 | Gy4 | Gy3 | Gy2 | 00  |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Description               | This command returns the Gy bit (Gy[9:2]) of green color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="7">Status</th><th colspan="6">Availability</th></tr><tr><td colspan="7">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Sleep In</td><td colspan="6">Yes</td></tr></table> |               |            |       |     |     |     |              |     |     |     |     |     | Status |               |  |           |            |                   |           | Availability |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Sleep In |  |  |  |  |  |  | Yes |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     |     | Availability |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |     |     | Yes |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |     |     |     |              |     |     |     |     |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value | 00h          | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Flow Chart                | <div><div>RDGy(79h)</div><div>↓</div><div>Send Parameter Gy[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                                                                                                                                                                 |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |

## RDBALB (7A00h): Read Red/Green Low Bits

| 7A00H                                     | RDBALB                                                                                                                                                                                                                                                                                                                                                                                     |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX        | WRX | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1          | ↑   | x     | 0   | 1   | 1   | 1   | 1   | 0   | 1   | 0   | 7A  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter                 | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑          | 1   | x     | Bx1 | Bx0 | By1 | By0 | Ax1 | Ax0 | Ay1 | Ay0 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description                               | This command returns the lowest bits of blue and A color characteristic.<br><br>Blue: Bx and By<br><br>A: Ax and Ay                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction                               | -                                                                                                                                                                                                                                                                                                                                                                                          |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability                     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |            |     |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
| Status                                    | Availability                                                                                                                                                                                                                                                                                                                                                                               |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Normal Mode On, Idle Mode Off, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Normal Mode On, Idle Mode On, Sleep Out   | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Partial Mode On, Idle Mode Off, Sleep Out | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Partial Mode On, Idle Mode On, Sleep Out  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |            |     |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
| Status                                    | Default Value                                                                                                                                                                                                                                                                                                                                                                              |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                                           | After MTP                                                                                                                                                                                                                                                                                                                                                                                  | Before MTP |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Power On Sequence                         | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| SW Reset                                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h        |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                                | <div><div>RDBALB(7Ah)</div><div>Send Parameter<br/>Bx[1:0], By[1:0],<br/>Ax[1:0], Ay[1:0]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                        |            |     |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDBx (7B00h): Read Rx

| 7B00H                     | RDBx                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|--------------|-----|-----|-----|-----|-----|-----|--------|---------------|--|-----------|------------|-------------------|--------------|-----|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|----------|--|--|--|--|--|-----|--|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5           | D4  | D3  | D2  | D1  | D0  | HEX |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1            | 1   | 1   | 0   | 1   | 1   | 7B  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Bx9 | Bx8 | Bx7          | Bx6 | Bx5 | Bx4 | Bx3 | Bx2 | 00  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Description               | This command returns the Bx bit (Bx[9:2]) of blue color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="6">Status</th><th colspan="7">Availability</th></tr><tr><td colspan="6">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Sleep In</td><td colspan="7">Yes</td></tr></table> |               |            |       |     |     |              |     |     |     |     |     |     | Status |               |  |           |            |                   | Availability |     |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Sleep In |  |  |  |  |  | Yes |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     | Availability |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |     | Yes |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value    | 00h | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Flow Chart                | <div><div>RDBx(7Bh)</div><div>Send Parameter Bx[9:2]</div></div> <div><div>Legend</div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div>                                                                                                                                                                                                                                                                                                                        |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |



## RDBy (7C00h): Read By

| 7C00H                     | RDBy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|--------------|-----|-----|-----|-----|-----|--------|---------------|--|-----------|------------|-------------------|-----------|--------------|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|------------------------------------------|--|--|--|--|--|--|-----|--|--|--|--|--|----------|--|--|--|--|--|--|-----|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4           | D3  | D2  | D1  | D0  | HEX |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1            | 1   | 1   | 0   | 0   | 7C  |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | By9 | By8 | By7 | By6          | By5 | By4 | By3 | By2 | 00  |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Description               | This command returns the By bit (By[9:2]) of blue color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="7">Status</th><th colspan="6">Availability</th></tr><tr><td colspan="7">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="6">Yes</td></tr><tr><td colspan="7">Sleep In</td><td colspan="6">Yes</td></tr></table> |               |            |       |     |     |     |              |     |     |     |     |     | Status |               |  |           |            |                   |           | Availability |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  |  | Yes |  |  |  |  |  | Sleep In |  |  |  |  |  |  | Yes |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     |     | Availability |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     |     | Yes          |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |     |     | Yes |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |     |     |     |              |     |     |     |     |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value | 00h          | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |
| Flow Chart                | <div><div>RDBy(7Ch)</div><div>↓</div><div>Send Parameter By[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                                                                                                                                                                 |               |            |       |     |     |     |              |     |     |     |     |     |        |               |  |           |            |                   |           |              |          |           |     |          |           |                                          |  |  |  |  |  |  |     |  |  |  |  |  |                                         |  |  |  |  |  |  |     |  |  |  |  |  |                                           |  |  |  |  |  |  |     |  |  |  |  |  |                                          |  |  |  |  |  |  |     |  |  |  |  |  |          |  |  |  |  |  |  |     |  |  |  |  |  |

## RDAx (7D00h): Read Ax

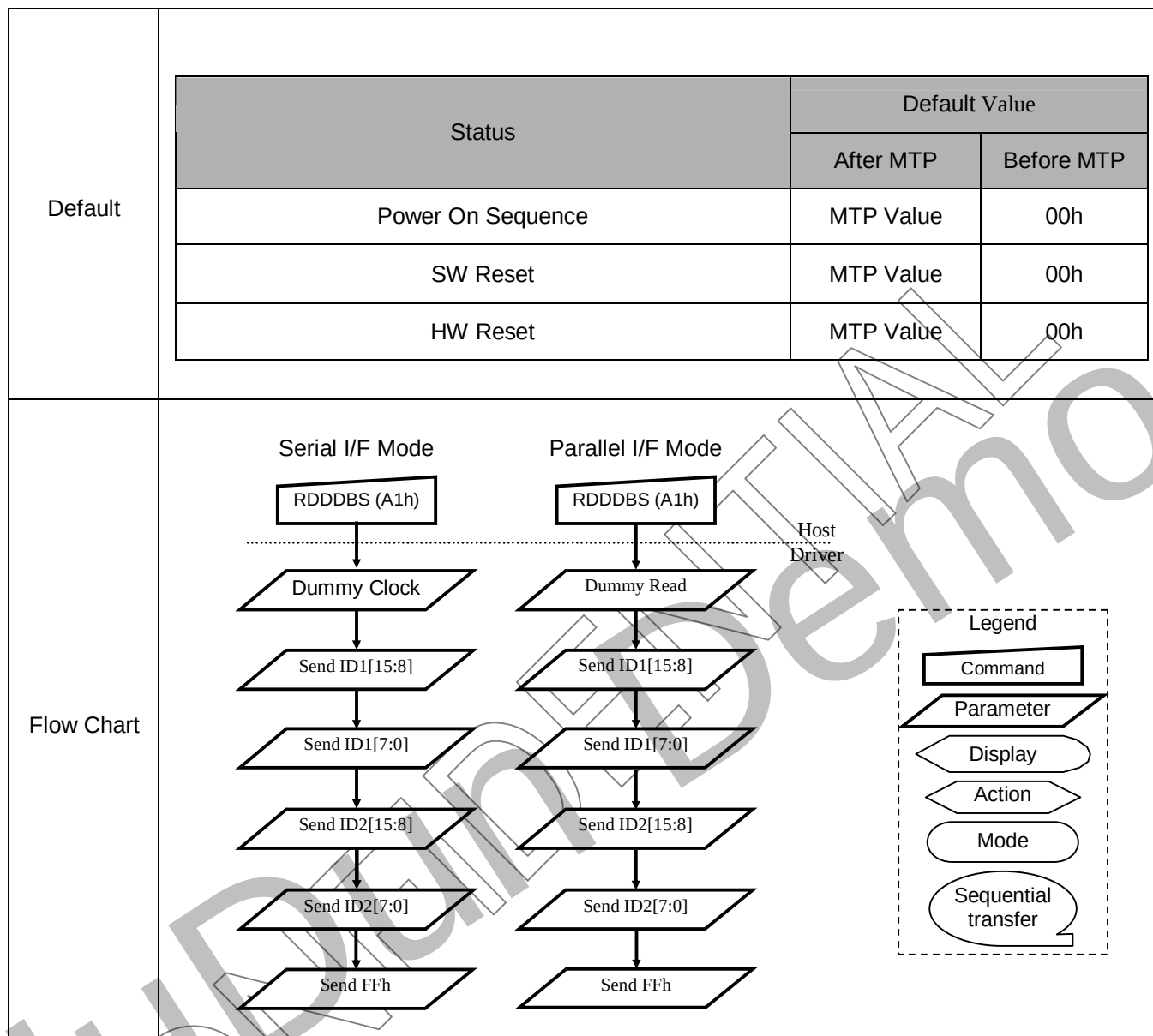
| 7D00H                     | RDAx                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|---------------|------------------------------------------|-----------|-----------------------------------------|-------------------|-------------------------------------------|-----|------------------------------------------|-----------|----------|----------|-----------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | HEX |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1   | 1   | 1   | 1   | 0   | 1   | 7D  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Ax9 | Ax8 | Ax7 | Ax6 | Ax5 | Ax4 | Ax3 | Ax2 | 00  |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Description               | This command returns the Ax bit (Ax[9:2]) of A color characteristic.                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Register Availability     | <table><tr><th>Status</th><th>Availability</th></tr><tr><td>Normal Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Normal Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode Off, Sleep Out</td><td>Yes</td></tr><tr><td>Partial Mode On, Idle Mode On, Sleep Out</td><td>Yes</td></tr><tr><td>Sleep In</td><td>Yes</td></tr></table> |               |            |       |     |     |     |     |     |     |     |     |     | Status | Availability  | Normal Mode On, Idle Mode Off, Sleep Out | Yes       | Normal Mode On, Idle Mode On, Sleep Out | Yes               | Partial Mode On, Idle Mode Off, Sleep Out | Yes | Partial Mode On, Idle Mode On, Sleep Out | Yes       | Sleep In | Yes      |           |     |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Availability  |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                    | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                  | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                   | Yes           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Sleep In                  | Yes                                                                                                                                                                                                                                                                                                                                                                                        |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                       |               |            |       |     |     |     |     |     |     |     |     |     | Status | Default Value |                                          | After MTP | Before MTP                              | Power On Sequence | MTP Value                                 | 00h | SW Reset                                 | MTP Value | 00h      | HW Reset | MTP Value | 00h |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           |                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |
| Flow Chart                | <div><div><div>RDAx(7Dh)</div><div>Send Parameter Ax[9:2]</div></div><div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div></div>                                                                                                                                                   |               |            |       |     |     |     |     |     |     |     |     |     |        |               |                                          |           |                                         |                   |                                           |     |                                          |           |          |          |           |     |

## RDAy (7E00h): Read Ay

| 7E00H                     | RDAy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-------|-----|-----|--------------|-----|-----|-----|-----|-----|-----|--------|---------------|--|-----------|------------|-------------------|--------------|-----|----------|-----------|-----|----------|-----------|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-----------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|------------------------------------------|--|--|--|--|--|-----|--|--|--|--|--|--|----------|--|--|--|--|--|-----|--|--|--|--|--|--|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDX           | WRX        | D15-8 | D7  | D6  | D5           | D4  | D3  | D2  | D1  | D0  | HEX |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1             | ↑          | x     | 0   | 1   | 1            | 1   | 1   | 1   | 1   | 0   | 7E  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ↑             | 1          | x     | Ay9 | Ay8 | Ay7          | Ay6 | Ay5 | Ay4 | Ay3 | Ay2 | 00  |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Description               | This command returns the Ay bit (Ay[9:2]) of A color characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Restriction               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Register Availability     | <table><tr><th colspan="6">Status</th><th colspan="7">Availability</th></tr><tr><td colspan="6">Normal Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Normal Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode Off, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Partial Mode On, Idle Mode On, Sleep Out</td><td colspan="7">Yes</td></tr><tr><td colspan="6">Sleep In</td><td colspan="7">Yes</td></tr></table> |               |            |       |     |     |              |     |     |     |     |     |     | Status |               |  |           |            |                   | Availability |     |          |           |     |          |           | Normal Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Normal Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode Off, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Partial Mode On, Idle Mode On, Sleep Out |  |  |  |  |  | Yes |  |  |  |  |  |  | Sleep In |  |  |  |  |  | Yes |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |            |       |     |     | Availability |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |            |       |     |     | Yes          |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Sleep In                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |            |       |     | Yes |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Default                   | <table><tr><th rowspan="2">Status</th><th colspan="2">Default Value</th></tr><tr><th>After MTP</th><th>Before MTP</th></tr><tr><td>Power On Sequence</td><td>MTP Value</td><td>00h</td></tr><tr><td>SW Reset</td><td>MTP Value</td><td>00h</td></tr><tr><td>HW Reset</td><td>MTP Value</td><td>00h</td></tr></table>                                                                                                                                                                                                                       |               |            |       |     |     |              |     |     |     |     |     |     | Status | Default Value |  | After MTP | Before MTP | Power On Sequence | MTP Value    | 00h | SW Reset | MTP Value | 00h | HW Reset | MTP Value | 00h                                      |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Default Value |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | After MTP     | Before MTP |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | Power On Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MTP Value     | 00h        |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
|                           | SW Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MTP Value     | 00h        |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| HW Reset                  | MTP Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 00h           |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |
| Flow Chart                | <div><div>RDAy(7Eh)</div><div>↓</div><div>Send Parameter Ay[9:2]</div></div> <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div>                                                                                                                                                                                                                                                                                                 |               |            |       |     |     |              |     |     |     |     |     |     |        |               |  |           |            |                   |              |     |          |           |     |          |           |                                          |  |  |  |  |  |     |  |  |  |  |  |  |                                         |  |  |  |  |  |     |  |  |  |  |  |  |                                           |  |  |  |  |  |     |  |  |  |  |  |  |                                          |  |  |  |  |  |     |  |  |  |  |  |  |          |  |  |  |  |  |     |  |  |  |  |  |  |

## RDDDBS(A1h) : Read\_DDB\_Start (A1h)

| A1H                       | RDDDBS(Read_DDB_Start)                      |     |     |       |         |         |         |         |         |         |        |        |     |
|---------------------------|---------------------------------------------|-----|-----|-------|---------|---------|---------|---------|---------|---------|--------|--------|-----|
|                           | DCX                                         | RDX | WRX | D15-8 | D7      | D6      | D5      | D4      | D3      | D2      | D1     | D0     | HEX |
| Command                   | 0                                           | 1   | ↑   | x     | 1       | 0       | 1       | 0       | 0       | 0       | 0      | 1      | A1  |
| 1 <sup>st</sup> parameter | 1                                           | ↑   | 1   | x     | x       | x       | x       | x       | x       | x       | x      | x      | x   |
| 2 <sup>nd</sup> parameter | 1                                           | ↑   | 1   | xx    | ID1[15] | ID1[14] | ID1[13] | ID1[12] | ID1[11] | ID1[10] | ID1[9] | ID1[8] | 00  |
| 3 <sup>rd</sup> parameter | 1                                           | ↑   | 1   | xx    | ID1[7]  | ID1[6]  | ID1[5]  | ID1[4]  | ID1[3]  | ID1[2]  | ID1[1] | ID1[0] | 00  |
| 4 <sup>th</sup> parameter | 1                                           | ↑   | 1   | xx    | ID2[15] | ID2[14] | ID2[13] | ID2[12] | ID2[11] | ID2[10] | ID2[9] | ID2[8] | 00  |
| 5 <sup>th</sup> parameter | 1                                           | ↑   | 1   | xx    | ID2[7]  | ID2[6]  | ID2[5]  | ID2[4]  | ID2[3]  | ID2[2]  | ID2[1] | ID2[0] | 00  |
| 6 <sup>th</sup> parameter | 1                                           | ↑   | 1   | xx    | 1       | 1       | 1       | 1       | 1       | 1       | 1      | 1      | FF  |
| Description               | 1 <sup>st</sup> parameter: Dummy read       |     |     |       |         |         |         |         |         |         |        |        |     |
|                           | 2 <sup>nd</sup> parameter: Supplier ID code |     |     |       |         |         |         |         |         |         |        |        |     |
|                           | 3 <sup>rd</sup> parameter: Supplier ID code |     |     |       |         |         |         |         |         |         |        |        |     |
|                           | 4 <sup>th</sup> parameter: Module ID        |     |     |       |         |         |         |         |         |         |        |        |     |
|                           | 5 <sup>th</sup> parameter: Module ID        |     |     |       |         |         |         |         |         |         |        |        |     |
| Restriction               |                                             |     |     |       |         |         |         |         |         |         |        |        |     |
| Register Availability     |                                             |     |     |       |         |         |         |         |         |         |        |        |     |
|                           |                                             |     |     |       |         |         |         |         |         |         |        |        |     |
|                           |                                             |     |     |       |         |         |         |         |         |         |        |        |     |
|                           |                                             |     |     |       |         |         |         |         |         |         |        |        |     |
|                           |                                             |     |     |       |         |         |         |         |         |         |        |        |     |
|                           |                                             |     |     |       |         |         |         |         |         |         |        |        |     |



# RDDDBC(A800h) : Read DDB Contin

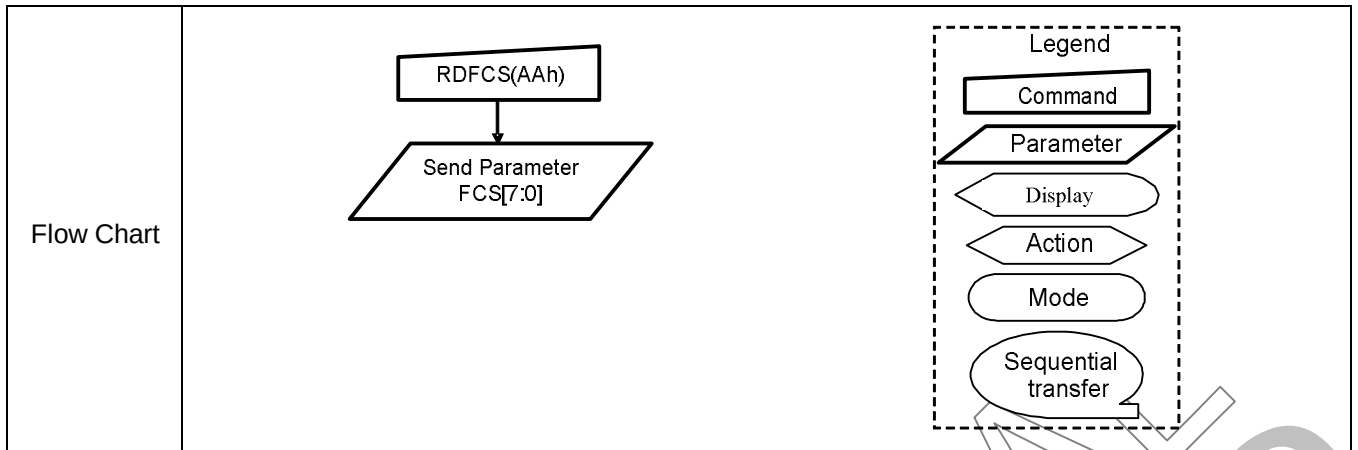
| A800H                     | RDDDBC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |         |         |         |         |              |         |        |        |     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|---------|---------|---------|---------|--------------|---------|--------|--------|-----|
|                           | DCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RDX | WRX | D15-8 | D7      | D6      | D5      | D4      | D3           | D2      | D1     | D0     | HEX |
| Command                   | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1   | ↑   | x     | 1       | 0       | 1       | 0       | 1            | 0       | 0      | 0      | A8  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ↑   | 1   | x     | x       | x       | x       | x       | x            | x       | x      | x      | x   |
| 2 <sup>nd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ↑   | 1   | xx    | ID1[15] | ID1[14] | ID1[13] | ID1[12] | ID1[11]      | ID1[10] | ID1[9] | ID1[8] | 00  |
| 3 <sup>rd</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ↑   | 1   | xx    | ID1[7]  | ID1[6]  | ID1[5]  | ID1[4]  | ID1[3]       | ID1[2]  | ID1[1] | ID1[0] | 00  |
| 4 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ↑   | 1   | xx    | ID2[15] | ID2[14] | ID2[13] | ID2[12] | ID2[11]      | ID2[10] | ID2[9] | ID2[8] | 00  |
| 5 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ↑   | 1   | xx    | ID2[7]  | ID2[6]  | ID2[5]  | ID2[4]  | ID2[3]       | ID2[2]  | ID2[1] | ID2[0] | 00  |
| 6 <sup>th</sup> parameter | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ↑   | 1   | xx    | 1       | 1       | 1       | 1       | 1            | 1       | 1      | 1      | FF  |
| Description               | <p>This command returns the supplier identification and display module mode/revision information from the point where RDDDBS command was interrupted by an other command.</p> <p><i>Note: Parameter 0xFF is an “Exit Code”, this means that there is no more data in the DDB block.</i></p> <p><i>Note: For use example,</i></p> <ol style="list-style-type: none"><li>1. Set maximum return packet size=3</li><li>2. Read 0xA1, return 3 bytes SID[7:0], SID[15:8], MID[7:0]</li><li>3. Read 0xA8, return 2 bytes MID[15:8] and 0xFF</li></ol> |     |     |       |         |         |         |         |              |         |        |        |     |
| Restriction               | <p>A Read DDB Start command (RDDDBS) should be executed at least once before a Read DDB Continue command (RDDDBC) to define the read location. Otherwise, data read with a Read DDB Continue command is undefined.</p>                                                                                                                                                                                                                                                                                                                          |     |     |       |         |         |         |         |              |         |        |        |     |
| Register Availability     | Status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |     |       |         |         |         |         | Availability |         |        |        |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |         |         |         |         | Yes          |         |        |        |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |       |         |         |         |         | Yes          |         |        |        |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |     |       |         |         |         |         | Yes          |         |        |        |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |         |         |         |         | Yes          |         |        |        |     |
|                           | Sleep In                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |     |       |         |         |         |         | Yes          |         |        |        |     |

|            |                                                                                                                                                                                                                                                                                    |               |            |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| Default    |                                                                                                                                                                                                                                                                                    |               |            |
|            | Status                                                                                                                                                                                                                                                                             | Default Value |            |
|            |                                                                                                                                                                                                                                                                                    | After MTP     | Before MTP |
|            | Power On Sequence                                                                                                                                                                                                                                                                  | MTP Value     | 00h        |
|            | SW Reset                                                                                                                                                                                                                                                                           | MTP Value     | 00h        |
|            | HW Reset                                                                                                                                                                                                                                                                           | MTP Value     | 00h        |
| Flow Chart |                                                                                                                                                                                                                                                                                    |               |            |
|            | <pre> graph TD     A[RDDDBC(A8h)] --&gt; B([RDDDBS Data<br/>D1[7:0],<br/>D2[7:0], ..., Dn[7:0]])     </pre> <p>Legend</p> <ul style="list-style-type: none"> <li>Command</li> <li>Parameter</li> <li>Display</li> <li>Action</li> <li>Mode</li> <li>Sequential transfer</li> </ul> |               |            |

# RDFCS(AA00h) : Read First Checksum

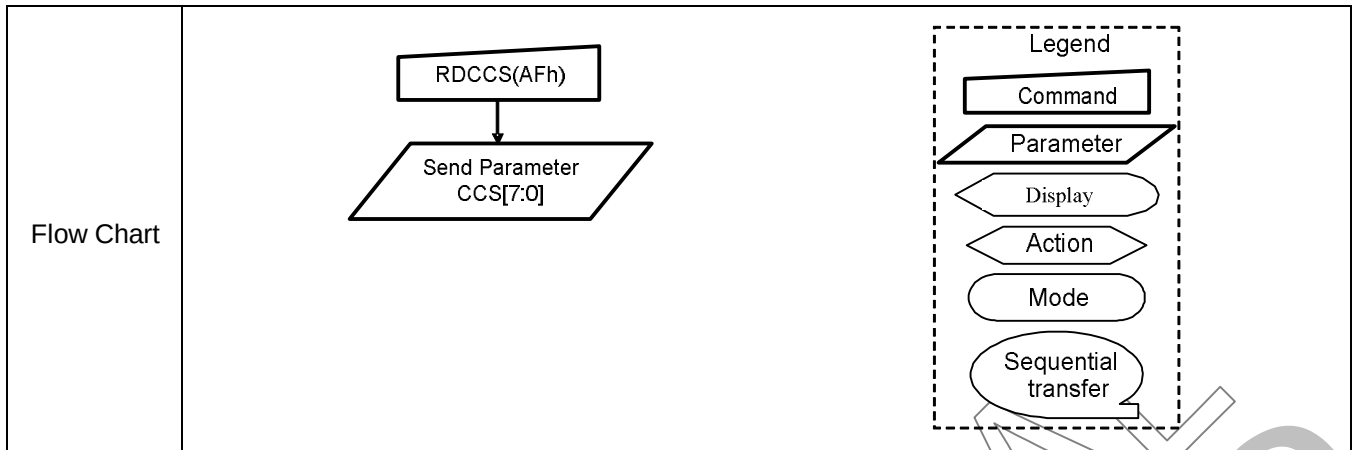
| AA00H                     | RDFCS                                                                                                                                                                                                                                            |     |     |       |      |      |      |               |              |      |      |      |     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|---------------|--------------|------|------|------|-----|
|                           | DCX                                                                                                                                                                                                                                              | RDX | WRX | D15-8 | D7   | D6   | D5   | D4            | D3           | D2   | D1   | D0   | HEX |
| Command                   | 0                                                                                                                                                                                                                                                | 1   | ↑   | x     | 1    | 0    | 1    | 0             | 1            | 0    | 1    | 0    | AA  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                | ↑   | 1   | x     | FCS7 | FCS6 | FCS5 | FCS4          | FCS3         | FCS2 | FCS1 | FCS0 | 00  |
| Description               | This command returns the first checksum what has been calculated from “User Command Set” area registers (not include “Manufacture Command Set) and the frame memory after the write access to those registers and/or frame memory has been done. |     |     |       |      |      |      |               |              |      |      |      |     |
| Restriction               | It will be necessary to wait 150ms after there is the last write access on “User Command Set” area registers before there can read this checksum value.                                                                                          |     |     |       |      |      |      |               |              |      |      |      |     |
| Register Availability     | Status                                                                                                                                                                                                                                           |     |     |       |      |      |      |               | Availability |      |      |      |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                         |     |     |       |      |      |      |               | Yes          |      |      |      |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                          |     |     |       |      |      |      |               | Yes          |      |      |      |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                        |     |     |       |      |      |      |               | Yes          |      |      |      |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                         |     |     |       |      |      |      |               | Yes          |      |      |      |     |
|                           | Sleep In                                                                                                                                                                                                                                         |     |     |       |      |      |      |               | Yes          |      |      |      |     |
| Default                   | Status                                                                                                                                                                                                                                           |     |     |       |      |      |      | Default Value |              |      |      |      |     |
|                           | Power On Sequence                                                                                                                                                                                                                                |     |     |       |      |      |      | 00h           |              |      |      |      |     |
|                           | S/W Reset                                                                                                                                                                                                                                        |     |     |       |      |      |      | 00h           |              |      |      |      |     |
|                           | H/W Reset                                                                                                                                                                                                                                        |     |     |       |      |      |      | 00h           |              |      |      |      |     |
|                           |                                                                                                                                                                                                                                                  |     |     |       |      |      |      |               |              |      |      |      |     |





## RDCCS(AF00h) : Read Continue Checksum

| AF00H                     | RDCCS                                                                                                                                                                                                                                                             |     |     |       |      |      |      |      |               |      |      |      |     |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|---------------|------|------|------|-----|
|                           | DCX                                                                                                                                                                                                                                                               | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3            | D2   | D1   | D0   | HEX |
| Command                   | 0                                                                                                                                                                                                                                                                 | 1   | ↑   | x     | 1    | 0    | 1    | 0    | 1             | 1    | 1    | 1    | AF  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                                                                                 | ↑   | 1   | x     | CCS7 | CCS6 | CCS5 | CCS4 | CCS3          | CCS2 | CCS1 | CCS0 | 00  |
| Description               | This command returns the continue checksum what has been calculated continuously after the first checksum has calculated from “User Command Set” area registers and the frame memory after the write access to those registers and/or frame memory has been done. |     |     |       |      |      |      |      |               |      |      |      |     |
| Restriction               | It will be necessary to wait 300ms after there is the last write access on “User Command Set” area registers before there can read this checksum value in the first time.                                                                                         |     |     |       |      |      |      |      |               |      |      |      |     |
| Register Availability     |                                                                                                                                                                                                                                                                   |     |     |       |      |      |      |      |               |      |      |      |     |
|                           | Status                                                                                                                                                                                                                                                            |     |     |       |      |      |      |      | Availability  |      |      |      |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                          |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                           |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                                                                         |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                                                                          |     |     |       |      |      |      |      | Yes           |      |      |      |     |
| Default                   |                                                                                                                                                                                                                                                                   |     |     |       |      |      |      |      |               |      |      |      |     |
|                           | Status                                                                                                                                                                                                                                                            |     |     |       |      |      |      |      | Default Value |      |      |      |     |
|                           | Power On Sequence                                                                                                                                                                                                                                                 |     |     |       |      |      |      |      | 00h           |      |      |      |     |
|                           | S/W Reset                                                                                                                                                                                                                                                         |     |     |       |      |      |      |      | 00h           |      |      |      |     |
|                           | H/W Reset                                                                                                                                                                                                                                                         |     |     |       |      |      |      |      | 00h           |      |      |      |     |
|                           |                                                                                                                                                                                                                                                                   |     |     |       |      |      |      |      |               |      |      |      |     |

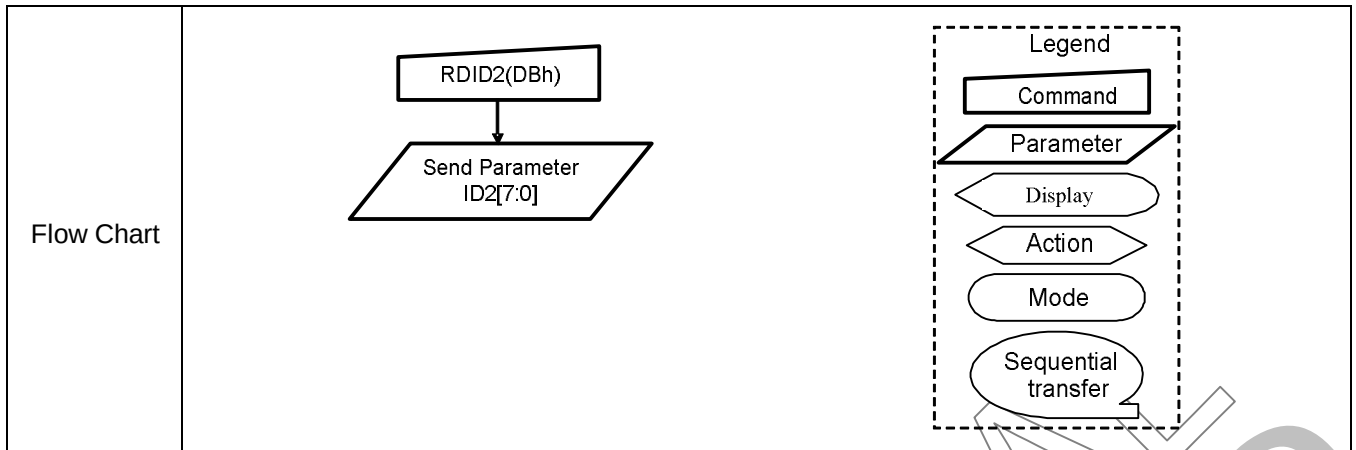


## RDID1(DA00h) : Read ID1

| DA00H                     | RDID1                                                                                                                                                         |     |     |       |      |      |      |      |               |      |      |      |     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|---------------|------|------|------|-----|
|                           | DCX                                                                                                                                                           | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3            | D2   | D1   | D0   | HEX |
| Command                   | 0                                                                                                                                                             | 1   | ↑   | x     | 1    | 1    | 0    | 1    | 1             | 0    | 1    | 0    | DA  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                             | ↑   | 1   | x     | ID17 | ID16 | ID15 | ID14 | ID13          | ID12 | ID11 | ID10 | 1   |
| Description               | This read byte identifies the TFT LCD module's manufacture ID.                                                                                                |     |     |       |      |      |      |      |               |      |      |      |     |
| Restriction               | -                                                                                                                                                             |     |     |       |      |      |      |      |               |      |      |      |     |
| Register Availability     | Status                                                                                                                                                        |     |     |       |      |      |      |      | Availability  |      |      |      |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                      |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                       |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                     |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                      |     |     |       |      |      |      |      | Yes           |      |      |      |     |
|                           | Sleep In                                                                                                                                                      |     |     |       |      |      |      |      | Yes           |      |      |      |     |
| Default                   | Status                                                                                                                                                        |     |     |       |      |      |      |      | Default Value |      |      |      |     |
|                           | Power On Sequence                                                                                                                                             |     |     |       |      |      |      |      | 11h           |      |      |      |     |
|                           | SW Reset                                                                                                                                                      |     |     |       |      |      |      |      | 1h            |      |      |      |     |
|                           | HW Reset                                                                                                                                                      |     |     |       |      |      |      |      | 11h           |      |      |      |     |
| Flow Chart                | <div><div>RDID1(DAh)</div><div>↓</div><div>Send Parameter ID1[7:0]</div></div>                                                                                |     |     |       |      |      |      |      |               |      |      |      |     |
|                           | <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div> |     |     |       |      |      |      |      |               |      |      |      |     |

## RDID2(DB00h) : Read ID2

| DB00H                     | RDID2                                                                                                                                                                                                      |     |     |       |      |      |      |      |               |      |            |      |     |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|---------------|------|------------|------|-----|
|                           | DCX                                                                                                                                                                                                        | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3            | D2   | D1         | D0   | HEX |
| Command                   | 0                                                                                                                                                                                                          | 1   | ↑   | x     | 1    | 1    | 0    | 1    | 1             | 0    | 1          | 1    | DB  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                                                                          | ↑   | 1   | x     | ID27 | ID26 | ID25 | ID24 | ID23          | ID22 | ID21       | ID20 | 82  |
| Description               | This read byte is used to track the TFT LCD module/driver version. It is changed each time a version is made to the display, material or construction specifications.<br>Parameter Range: ID2 = 80h to FFh |     |     |       |      |      |      |      |               |      |            |      |     |
| Restriction               | -                                                                                                                                                                                                          |     |     |       |      |      |      |      |               |      |            |      |     |
| Register Availability     | Status                                                                                                                                                                                                     |     |     |       |      |      |      |      | Availability  |      |            |      |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                   |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                                                                    |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                                                                  |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                                                                   |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Sleep In                                                                                                                                                                                                   |     |     |       |      |      |      |      | Yes           |      |            |      |     |
| Default                   | Status                                                                                                                                                                                                     |     |     |       |      |      |      |      | Default Value |      |            |      |     |
|                           |                                                                                                                                                                                                            |     |     |       |      |      |      |      | After MTP     |      | Before MTP |      |     |
|                           | Power On Sequence                                                                                                                                                                                          |     |     |       |      |      |      |      | MTP Value     |      | 82h        |      |     |
|                           | SW Reset                                                                                                                                                                                                   |     |     |       |      |      |      |      | MTP Value     |      | 82h        |      |     |
|                           | HW Reset                                                                                                                                                                                                   |     |     |       |      |      |      |      | MTP Value     |      | 82h        |      |     |



## RDID3(DC00h) : Read ID3

| DC00H                     | RDID3                                                                                                                                                         |     |     |       |      |      |      |      |               |      |            |      |     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|------|------|------|---------------|------|------------|------|-----|
|                           | DCX                                                                                                                                                           | RDX | WRX | D15-8 | D7   | D6   | D5   | D4   | D3            | D2   | D1         | D0   | HEX |
| Command                   | 0                                                                                                                                                             | 1   | ↑   | x     | 1    | 1    | 0    | 1    | 1             | 1    | 0          | 0    | DC  |
| 1 <sup>st</sup> parameter | 1                                                                                                                                                             | ↑   | 1   | x     | ID37 | ID36 | ID35 | ID34 | ID33          | ID32 | ID31       | ID30 | 00  |
| Description               | This parameter read byte identifies the TFT LCD module/driver.                                                                                                |     |     |       |      |      |      |      |               |      |            |      |     |
| Restriction               | -                                                                                                                                                             |     |     |       |      |      |      |      |               |      |            |      |     |
| Register Availability     | Status                                                                                                                                                        |     |     |       |      |      |      |      | Availability  |      |            |      |     |
|                           | Normal Mode On, Idle Mode Off, Sleep Out                                                                                                                      |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Normal Mode On, Idle Mode On, Sleep Out                                                                                                                       |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Partial Mode On, Idle Mode Off, Sleep Out                                                                                                                     |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Partial Mode On, Idle Mode On, Sleep Out                                                                                                                      |     |     |       |      |      |      |      | Yes           |      |            |      |     |
|                           | Sleep In                                                                                                                                                      |     |     |       |      |      |      |      | Yes           |      |            |      |     |
| Default                   | Status                                                                                                                                                        |     |     |       |      |      |      |      | Default Value |      |            |      |     |
|                           |                                                                                                                                                               |     |     |       |      |      |      |      | After MTP     |      | Before MTP |      |     |
|                           | Power On Sequence                                                                                                                                             |     |     |       |      |      |      |      | MTP Value     |      | 00h        |      |     |
|                           | SW Reset                                                                                                                                                      |     |     |       |      |      |      |      | MTP Value     |      | 00h        |      |     |
|                           | HW Reset                                                                                                                                                      |     |     |       |      |      |      |      | MTP Value     |      | 00h        |      |     |
| Flow Chart                | <div><div>RDID3(DCh)</div><div>↓</div><div>Send Parameter ID3[7:0]</div></div>                                                                                |     |     |       |      |      |      |      |               |      |            |      |     |
|                           | <div><div>Legend</div><div><div>Command</div><div>Parameter</div><div>Display</div><div>Action</div><div>Mode</div><div>Sequential transfer</div></div></div> |     |     |       |      |      |      |      |               |      |            |      |     |

## 9. Electrical Characteristics

### 9.1 Absolute Maximum Ratings

The absolute maximum rating is listed on following table. When RM68180 is used out of the absolute maximum ratings, the RM68180 may be permanently damaged. To use the RM68180 within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the RM68180 will malfunction and cause poor reliability.

| item                                                                                                                                                                                                                                                                                                     | Symbol                      | Value            | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------|------|
| Power supply voltage                                                                                                                                                                                                                                                                                     | VDDI                        | -0.3 ~ + 5.5     | V    |
| Power supply voltage                                                                                                                                                                                                                                                                                     | VDDA, VDDDB,<br>VDDR, VDDAM | -0.3 ~ + 5.5     | V    |
| Supply voltage (Digital)                                                                                                                                                                                                                                                                                 | DVDD, DIOPWR                | -0.3 ~ + 2.0     | V    |
| Supply voltage (MV)                                                                                                                                                                                                                                                                                      | AVDD-AVSS                   | -0.3 ~ + 6.6     | V    |
|                                                                                                                                                                                                                                                                                                          | AVEE-AVSS                   | -0.3 ~ + 6.6     | V    |
| Supply voltage (HV)                                                                                                                                                                                                                                                                                      | VGH - VGLX                  | -0.3 ~ + 33      | V    |
| Input voltage                                                                                                                                                                                                                                                                                            | VIN                         | -0.3 ~ VDDI+ 0.3 | V    |
| Output voltage                                                                                                                                                                                                                                                                                           | VO                          | -0.3 ~ VDDI+ 0.3 | V    |
| Differential input voltage                                                                                                                                                                                                                                                                               | HSSI_CLK_P/N                | -0.3 ~ +1.8      | V    |
|                                                                                                                                                                                                                                                                                                          | HSSI_DATA0_P/N              |                  |      |
|                                                                                                                                                                                                                                                                                                          | HSSI_DATA1_P/N              |                  |      |
| Operating temperature                                                                                                                                                                                                                                                                                    | Topr                        | -40 ~ + 85       | °C   |
| Storage temperature                                                                                                                                                                                                                                                                                      | Tstg                        | -55 ~ + 125      | °C   |
| Notes:<br>If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation. Therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range. |                             |                  |      |

### 9.2 ESD Protection Level

| Model           | Test Condition            | Level   |
|-----------------|---------------------------|---------|
| Human Body Mode | R = 1.5 kohm / C = 100 pF | > 2.5KV |
| Machine Mode    | R = 0 ohm / C = 200 pF    | > 250V  |

### 9.3 Latch-Up Protection Level

The device will not latch up at trigger current levels less than  $\pm 200$  mA.

### 9.4 Light Sensitivity

The operation of the IC will not be materially altered by incident light.



## 9.5 DC Characteristics

### 9.5.1 Basic Characteristics

| Parameter                                         | Symbol              | Condition                                         | Min.           | Typ. | Max.           | Unit | Related Pins |
|---------------------------------------------------|---------------------|---------------------------------------------------|----------------|------|----------------|------|--------------|
| Analog Power Supply Voltage                       | VCI                 | Operation Voltage                                 | 2.3            | 3.7  | 4.8            | V    | Note 1       |
| I/O pin Power Supply Voltage                      | VDDI                | I/O supply voltage                                | 1.65           | 2.8  | 3.3            | V    | Note 1       |
|                                                   | VDDIL               | I/O supply voltage                                | 1.1            | 1.2  | 1.3            | V    | Note 1       |
| Logic High level input voltage                    | VIH                 | VDDI = 1.65V ~ 3.3V                               | 0.8* VDDI      | -    | VDDI           | V    | Note 2       |
| Logic Low level input voltage                     | VIL                 | VDDI = 1.65V ~ 3.3V                               | 0.0            | -    | 0.2* VDDI      | V    | Note 2       |
| Logic High level Output voltage                   | VOH                 | I <sub>out</sub> = -1 mA                          | 0.8* VDDI      | -    | VDDI           | V    | Note 2       |
| Logic Low level Output voltage                    | VOL                 | I <sub>out</sub> = +1 mA                          | 0.0            | -    | 0.2* VDDI      | V    | Note 2       |
| Logic High level input current (Except MIPI/MDDI) | IIHD                | V <sub>in</sub> =0~VDDI                           | -1             | -    | 1              | uA   | Note 2       |
| Logic Low level input current (Except MIPI/MDDI)  | IILD                | V <sub>in</sub> =0~VDDI                           | -1             | -    | 1              | uA   | Note 2       |
| Logic High level input current (MIPI/MDDI)        | IIHD                | V <sub>in</sub> =0~VDDAM                          | -1             | -    | 1              | uA   | Note 2       |
| Logic Low level input current (MIPI/MDDI)         | IILD                | V <sub>in</sub> =0~VDDAM                          | -1             | -    | 1              | uA   | Note 2       |
| AVDD booster voltage                              | AVDD                |                                                   | 4.5            | -    | 6.5            | V    |              |
| AVEE booster voltage                              | AVEE                |                                                   | -6.5           | -    | -4.5           | V    |              |
| VCL booster voltage                               | VCL                 |                                                   | -2.5           | -    | -4             | V    |              |
| VGH booster voltage                               | VGH                 |                                                   | AVDD<br>+VDDDB |      | 2AVDD<br>-AVEE | V    |              |
| VGLX booster voltage                              | VGLX                |                                                   | AVEE<br>+VCL   |      | 2AVEE<br>-AVDD | V    |              |
| Voltage difference between VGH and VGLX           | VGHL                | VGH-VGLX                                          |                |      | 30             | V    |              |
| VCOM Amplitude voltage                            | VCOM                |                                                   | -3.5           |      | 0.0            | V    |              |
| Gamma reference voltage                           | VGMP                |                                                   | 3.0            |      | 6.3            | V    | Note 3       |
|                                                   | VGSP                |                                                   | 0.0            |      | 3.7            | V    | Note 3       |
|                                                   | VGMN                |                                                   | -6.3           |      | -3.0           | V    | Note 3       |
|                                                   | VGSN                |                                                   | -3.7           |      | 0.0            | V    | Note 3       |
| Output offset voltage                             | V <sub>OFFSET</sub> |                                                   |                |      | 45             | mV   | Note 3       |
| Output deviation voltage                          | V <sub>DEV</sub>    | S <sub>out</sub> ≥4.0V,<br>S <sub>out</sub> ≤1.0V |                |      | 20             | mV   | Note 3       |
|                                                   |                     | 1.0V<S <sub>out</sub> <4.0V                       |                |      | 10             | mV   | Note 3       |

Notes: 1. VDDI=1.65 to 3.3V, VDD=2.3 to 4.8V, VSSI=VSS=DVSS=0V, VDD means VDDA, VDDR, VDDDB, VDDIM, VDDAM and VSS means VSSA, VSSR, VSSB, AVSS, VSSIM, VSSAM. VDDDB, VDDA and VDDR should be the same input voltage level.

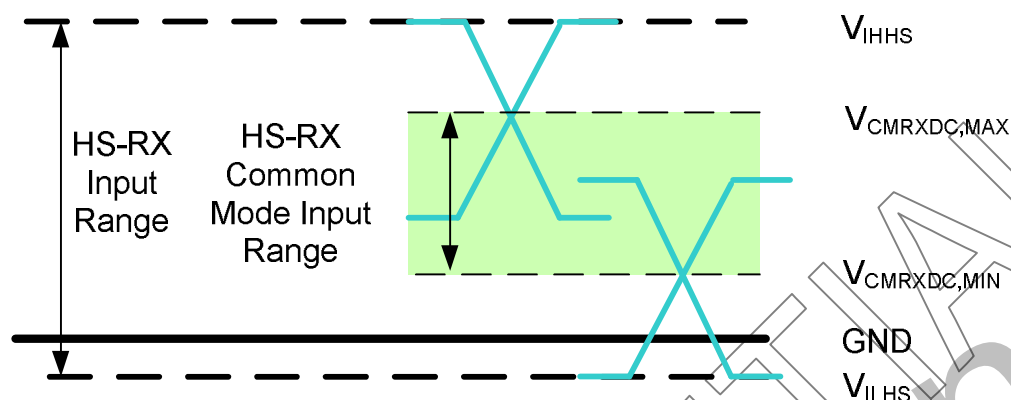
2. T<sub>A</sub> = -30 to 85 °C.

3. Source channel loading =5KΩ+55pF/channel.

## 9.5.2 MIPI Characteristics

### High-Speed Receiver Specification

#### DC Specifications



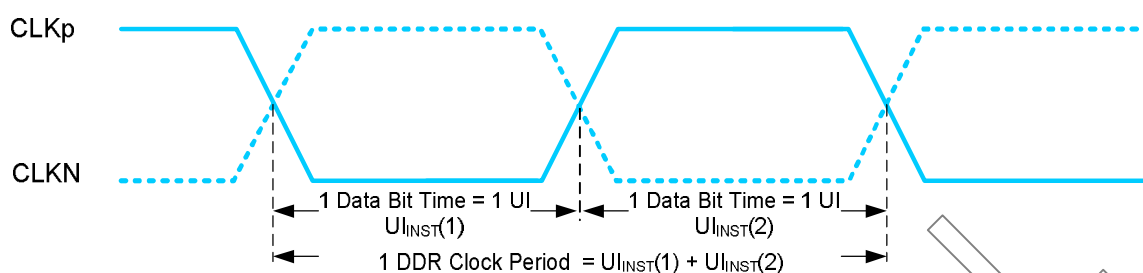
| Parameter      | Description                         | Min | Typ | Max | Units    | Note |
|----------------|-------------------------------------|-----|-----|-----|----------|------|
| $V_{CMRX(DC)}$ | Common-mode voltage HS receive mode | 70  |     | 330 | mV       | 1,2  |
| $V_{IDTH}$     | Differential input high threshold   |     |     | 70  | mV       |      |
| $V_{IDTL}$     | Differential input low threshold    | -70 |     |     | mV       |      |
| $V_{IHHS}$     | Single-ended input high voltage     |     |     | 460 | mV       | 1    |
| $V_{ILHS}$     | Single-ended input low voltage      | -40 |     |     | mV       | 1    |
| $Z_{ID}$       | Differential input impedance        | 80  | 100 | 125 | $\Omega$ |      |

Notes:

1. Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
2. This table value includes a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz

## Forward high speed transmissions

### DDR Clock Definition

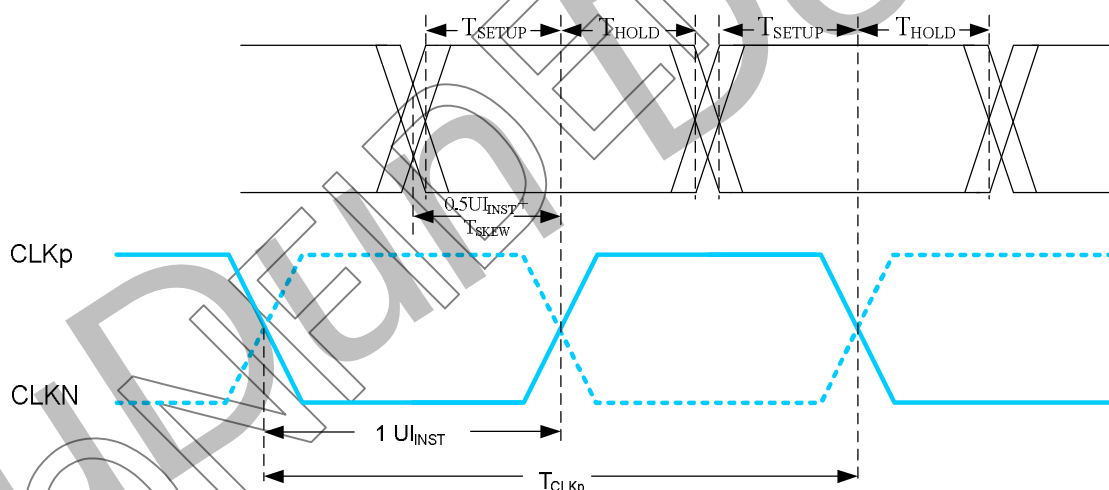


| Clock Parameter  | Symbol      | Min | Typ | Max  | Units | Notes |
|------------------|-------------|-----|-----|------|-------|-------|
| UI instantaneous | $UI_{INST}$ |     |     | 12.5 | ns    | 1,2   |

Notes:

1. This value corresponds to a minimum 80 Mbps data rate.
2. The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a data burst.

### Data to Clock Timing Definitions



### Data-Clock Timing Specifications

| Parameter                                    | Symbol          | Min   | Typ | Max  | Units       | Notes |
|----------------------------------------------|-----------------|-------|-----|------|-------------|-------|
| Data to Clock Skew [measured at transmitter] | $T_{SKEW[TX]}$  | -0.15 |     | 0.15 | $UI_{INST}$ | 1     |
| Data to Clock Setup Time [receiver]          | $T_{SETUP[RX]}$ | 0.15  |     |      | $UI_{INST}$ | 2     |
| Clock to Data Hold Time [receiver]           | $T_{HOLD[RX]}$  | 0.15  |     |      | $UI_{INST}$ | 2     |

Notes:

1. Total silicon and package delay budget of  $0.3 \cdot UI_{INST}$
2. Total setup and hold window for receiver of  $0.3 \cdot UI_{INST}$

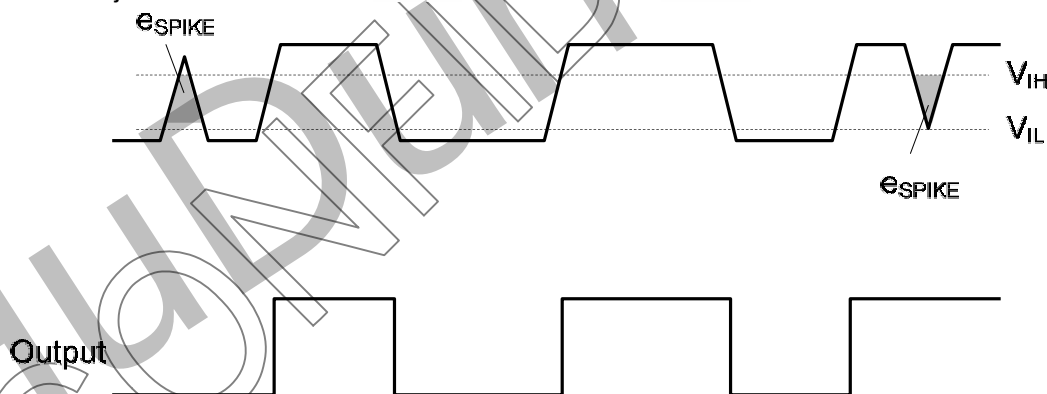
## Low power transceiver specifications

| Parameters                     | Symbol        | Condition                              | Min | Typ | Max  | Unit |
|--------------------------------|---------------|----------------------------------------|-----|-----|------|------|
| Logic high level input voltage | $V_{IHCD}$    | Contention Detection (Lane_D0)         | 450 |     | 1350 | mV   |
| Logic low level input voltage  | $V_{ILCD}$    | Contention Detection (Lane_D0)         | 0   |     | 200  | mV   |
| Logic high level input voltage | $V_{IH-LPRX}$ | LP-Rx (Lane_CK, Lane_D0, Lane_D1)      | 880 | -   | 1350 | mV   |
| Logic low level input voltage  | $V_{IL-LPRX}$ | LP-Rx (Lane_CK, Lane_D0, Lane_D1)      | 0   |     | 550  | mV   |
| Logic low level input voltage  | $V_{IL-ULPS}$ | LP-Rx ULPS (Lane_CK, Lane_D0, Lane_D1) | 0   |     | 300  | mV   |
| Logic high level input voltage | $V_{OH-LPTX}$ | Contention Detection (Lane_D0)         | 1.1 | 1.2 | 1.3  | V    |
| Logic low level input voltage  | $V_{OL-LPTX}$ | Contention Detection (Lane_D0)         | -50 | 0   | 50   | mV   |
| eSPIKE <sup>(1,2,3)</sup>      | Fig. 2        | Input pulse rejection                  |     |     | 300  | V.ps |

Notes:

- I Time-voltage integration of a spike above  $V_{IL}$  when being in LP-0 state or below  $V_{IH}$  when being in LP-1 State.
- I An impulse less than this will not change the receiver state.
- I In addition to the required glitch rejection, implementers shall ensure rejection of known RF-interferers.

Input Glitch Rejection of Low Power Receivers as follow.



### 9.5.3 MDDI Characteristics

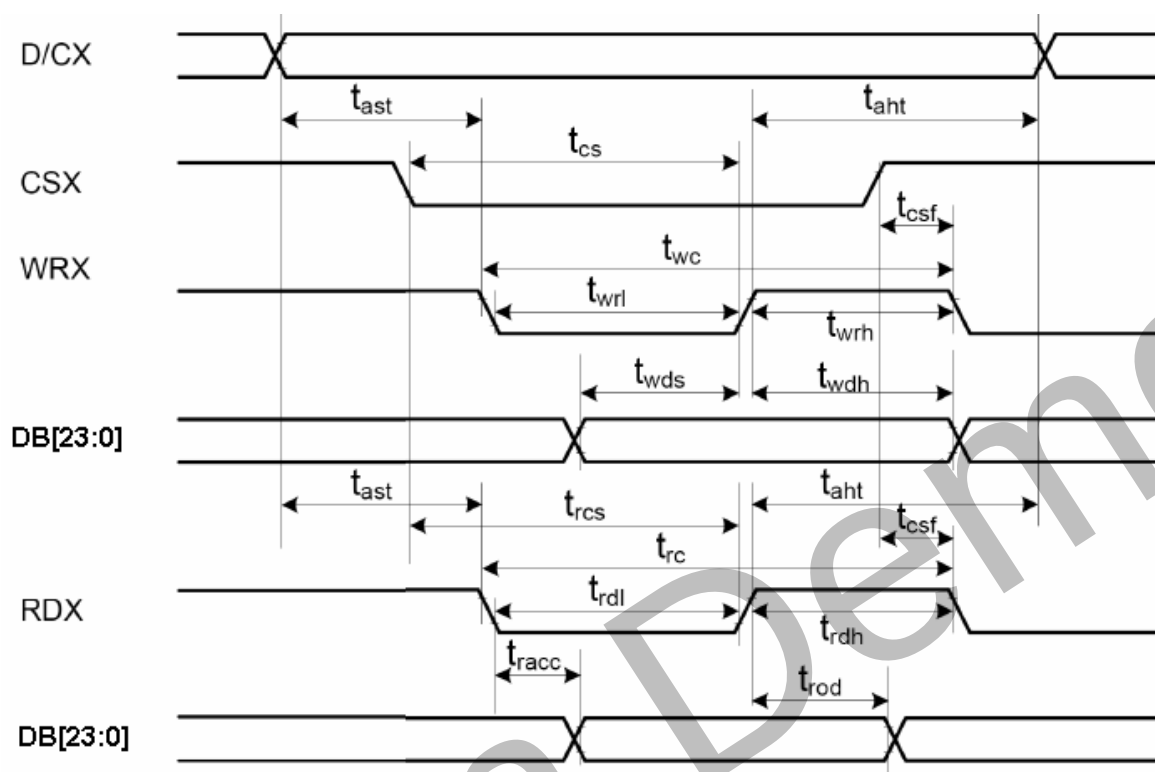
#### Characteristics

| Parameter                                                           | Symbol          | Conditions                                     | Specification |     |     | UNIT |
|---------------------------------------------------------------------|-----------------|------------------------------------------------|---------------|-----|-----|------|
|                                                                     |                 |                                                | MIN           | TYP | MAX |      |
| Differential input "High"<br>level voltage<br>(hibernation wake-up) | $V_{IT+offset}$ | $V_T=125\text{mv}$ (MDDI_DATA_P/M)             | -             | 100 | 125 | mv   |
| Differential input "Low"<br>level voltage<br>(hibernation wake-up)  | $V_{IT-offset}$ | $V_T=125\text{mv}$ (MDDI_DATA_P/M)             | 75            | 100 | -   | mv   |
| Differential input "High"<br>level voltage                          | $V_{IT+}$       | $V_T=0\text{mv}$ (MDDI_STB_P/M ,MDDI_DATA_P/M) | -             | 0   | 50  | mv   |
| Differential input "Low"<br>level voltage                           | $V_{IT-}$       | $V_T=0\text{mv}$ (MDDI_STB_P/M ,MDDI_DATA_P/M) | -50           | 0   | -   | mv   |
| Terminal impedance                                                  | $Z_t$           | -                                              | 80            | -   | 125 | ohm  |

Note 1) VDDI= 1.65~3.3V, VDD=2.3 to 4.8V, VSSI=VSS=VSSAM=0V,  $T_a=-30$  to  $70^\circ\text{C}$  (to  $+85^\circ\text{C}$  no damage). VDD means VDDAM, VDDA, VDDR, Vddb and VSS means VSSAM, VSSA, VSSR, VSSB, AVSS.

## 9.6 AC Characteristics

### 9.6.1 Parallel Interface Characteristics (80-Series MCU)

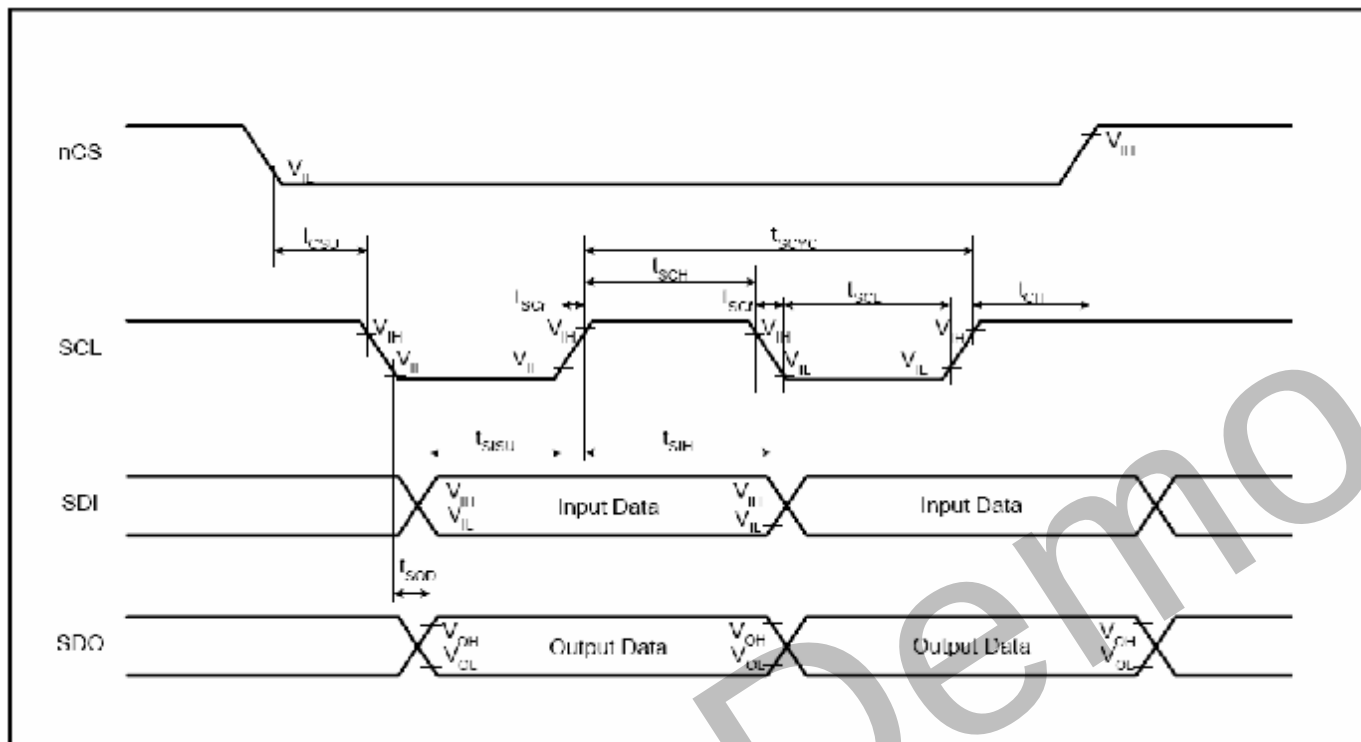


| Signal   | Symbol     | Parameter                          | min | max | Unit | Description            |
|----------|------------|------------------------------------|-----|-----|------|------------------------|
| DCX      | $T_{ast}$  | Address setup time                 | 10  | -   | ns   |                        |
|          | $T_{aht}$  | Address hold time (Write/Read)     | 2   | -   | ns   |                        |
| CSX      | $T_{cs}$   | Chip Select setup time (Write)     | 20  | -   | ns   |                        |
|          | $T_{RCS}$  | Chip Select setup time (Read)      | 20  | -   | ns   |                        |
|          | $T_{csf}$  | Chip Select Wait time (Write/Read) | 20  | -   | ns   |                        |
| WRX      | $T_{wc}$   | Write cycle                        | 33  | -   | ns   |                        |
|          | $T_{wrh}$  | Write Control pulse H duration     | 15  | -   | ns   |                        |
|          | $T_{wrl}$  | Write Control pulse L duration     | 15  | -   | ns   |                        |
| RDX      | $T_{rc}$   | Read cycle                         | 400 | -   | ns   | Read from frame memory |
|          | $T_{rdh}$  | Read Control pulse H duration      | 250 | -   | ns   |                        |
|          | $T_{rdl}$  | Read Control pulse L duration      | 150 | -   | ns   |                        |
| DB[23:0] | $T_{wds}$  | Write data setup time              | 15  | -   | ns   |                        |
|          | $T_{wdh}$  | Write data hold time               | 10  | -   | ns   |                        |
|          | $T_{racc}$ | Read access time                   |     | 150 | ns   |                        |
|          | $T_{rdh}$  | Read output disable time           | 5   | -   | ns   |                        |

Note: Logic high and low levels are specified as 20% and 80% of IOVCC for Input signals.

Note:  $T_a = -30$  to  $70\text{ }^{\circ}\text{C}$ , IOVCC=1.65V to 3.3V, VCI=2.5V to 4.8V, GND=0V

## 9.6.2 Serial Interface Characteristics

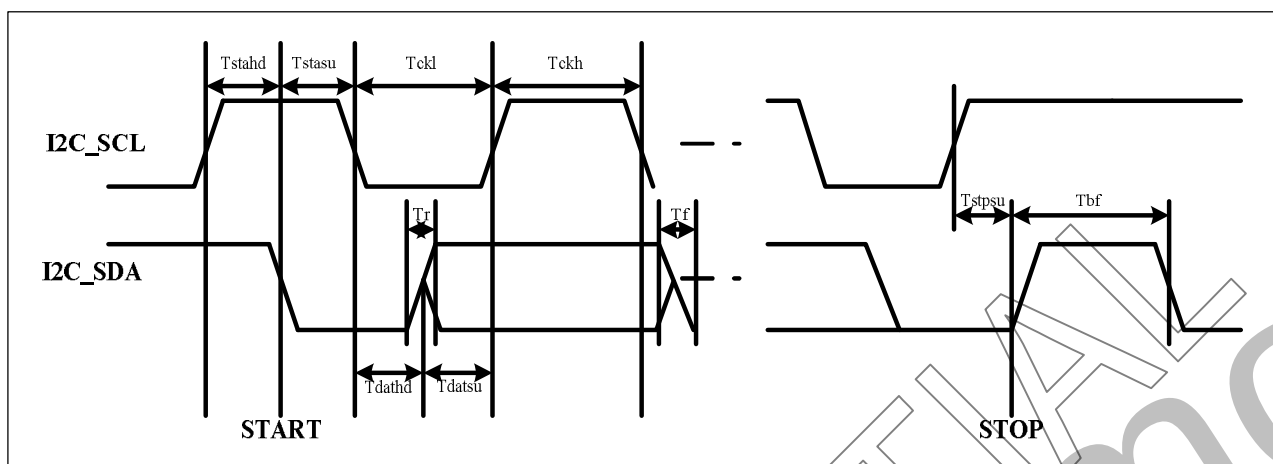


| Signal | Symbol            | Parameter                     | MIN | MAX | Unit | Description |
|--------|-------------------|-------------------------------|-----|-----|------|-------------|
| SCL    | T <sub>SCYC</sub> | Clock cycle (Write)           | 100 |     | ns   | -           |
|        | T <sub>SCYC</sub> | Clock cycle (Read)            | 300 |     | ns   |             |
|        | T <sub>SCH</sub>  | Clock "H" pulse width (Write) | 40  |     | ns   |             |
|        | T <sub>SCH</sub>  | Clock "H" pulse width (Read)  | 140 |     | ns   |             |
|        | T <sub>SCL</sub>  | Clock "L" pulse width (Write) | 40  |     | ns   |             |
|        | T <sub>SCL</sub>  | Clock "L" pulse width (Read)  | 140 |     | ns   |             |
|        | T <sub>scr</sub>  | Clock rise time               |     | 5   | ns   |             |
|        | T <sub>scf</sub>  | Clock fall time               |     | 5   | ns   |             |
| nCS    | T <sub>CSU</sub>  | Chip select setup time        | 20  |     | ns   | -           |
|        | T <sub>CH</sub>   | Chip select hold time         | 50  |     | ns   | -           |
| SDI    | T <sub>SISU</sub> | Data input setup time         | 20  |     | ns   | -           |
|        | T <sub>SIH</sub>  | Data input hold time          | 20  |     | ns   | -           |
| SDO    | T <sub>SOD</sub>  | Data output setup time        |     | 120 | ns   | -           |
|        | T <sub>SOH</sub>  | Data output hold time         | 5   |     | ns   | -           |

Note: Logic high and low levels are specified as 20% and 80% of IOVCC for Input signals.

Note: Ta = -30 to 70 °C, IOVCC=1.65V to 3.3V, VCI=2.5V to 4.8V, GND=0V

### 9.6.3 I2C Bus Timing Characteristics



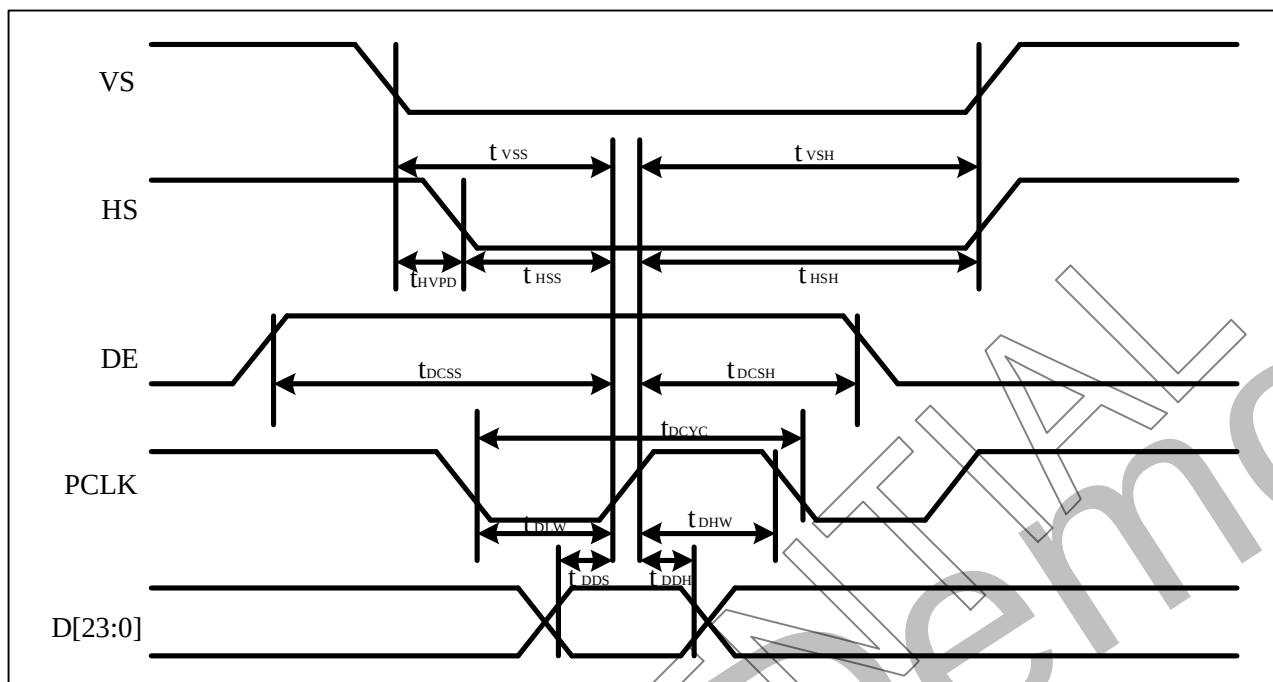
| Signal  | Symbol      | Parameter         | MIN  | MAX | Unit |
|---------|-------------|-------------------|------|-----|------|
| I2C_SCL | Tckl + Tckh | Operate frequency | -    | 400 | KHz  |
|         | Tckl        | CLK low           | 1300 | -   | ns   |
|         | Tckh        | CLK high          | 600  | -   | ns   |
| I2C_SDA | Tr          | Data rising time  | -    | 300 | ns   |
|         | Tf          | Data falling time | -    | 300 | ns   |
|         | Tdathd      | Data hold time    | 0    | 900 | ns   |
|         | Tdatsu      | Data setup time   | 100  | -   | ns   |
|         | Tstahd      | Start hold time   | 600  | -   | ns   |
|         | Tstasu      | Start setup time  | 600  | -   | ns   |
|         | Tstpsu      | Stop setup time   | 600  | -   | ns   |
|         | Tbf         | Bus free time     | 1300 | -   | ns   |

Note: Logic high and low levels are specified as 20% and 80% of IOVCC for Input signals.

Note: Ta = -30 to 70 °C, IOVCC=1.65V to 3.3V, VCI=2.5V to 4.8V, GND=0V



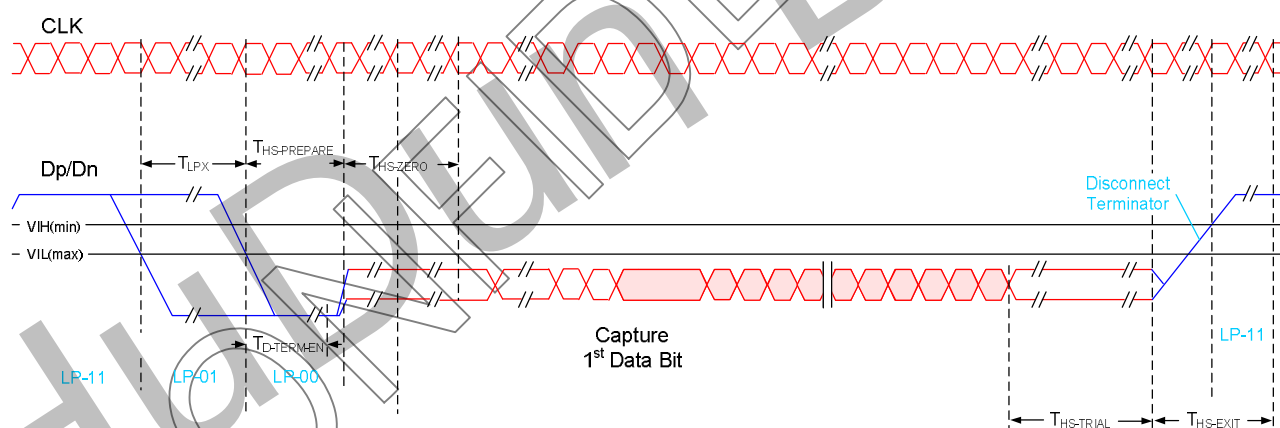
#### 9.6.4 RGB Interface Characteristics



| Signal  | Symbol      | Parameter             | MIN | TYP | MAX | Unit |
|---------|-------------|-----------------------|-----|-----|-----|------|
| VS      | $t_{VSS}$   | VS setup time         | 10  | -   | -   | ns   |
|         | $t_{VSH}$   | VS hold time          | 10  | -   | -   | ns   |
| HS      | $t_{HSS}$   | HS setup time         | 10  | -   | -   | ns   |
|         | $t_{HSH}$   | HS hold time          | 10  | -   | -   | ns   |
|         | $t_{HVPD}$  | HS to VS falling edge | 400 | -   | -   | ns   |
| PCLK    | $t_{DCYC}$  | PCLK cycle time       | 33  | -   | 125 | ns   |
|         | $t_{DLW}$   | PCLK low pulse width  | 11  | -   | -   | ns   |
|         | $t_{DHW}$   | PCLK high pulse width | 11  | -   | -   | ns   |
|         | $f_{DFREQ}$ | PCLK frequency        | 8   | -   | 30  | MHz  |
| DE      | $t_{DCSS}$  | DE setup time         | 10  | -   | -   | ns   |
|         | $t_{DCSH}$  | DE hold time          | 10  | -   | -   | ns   |
| D[23:0] | $t_{DDS}$   | Data setup time       | 10  | -   | -   | ns   |
|         | $t_{DDH}$   | Data hold time        | 10  | -   | -   | ns   |

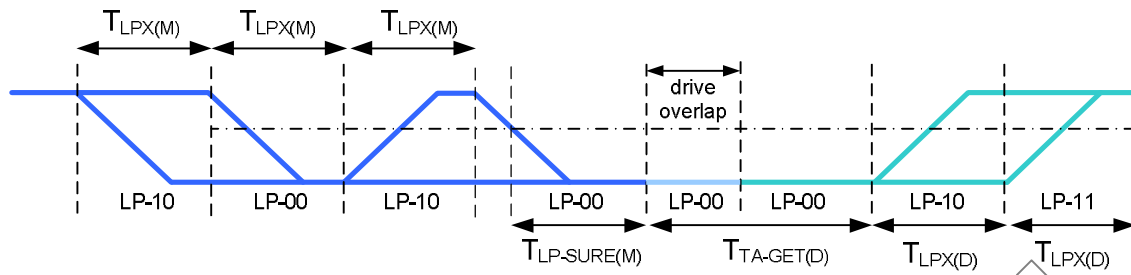
Note: Logic high and low levels are specified as 20% and 80% of IOVCC for Input signals.

Note:  $T_a = -30$  to  $70\text{ }^{\circ}\text{C}$ , IOVCC=1.65V to 3.3V, VCI=2.5V to 4.8V, GND=0V

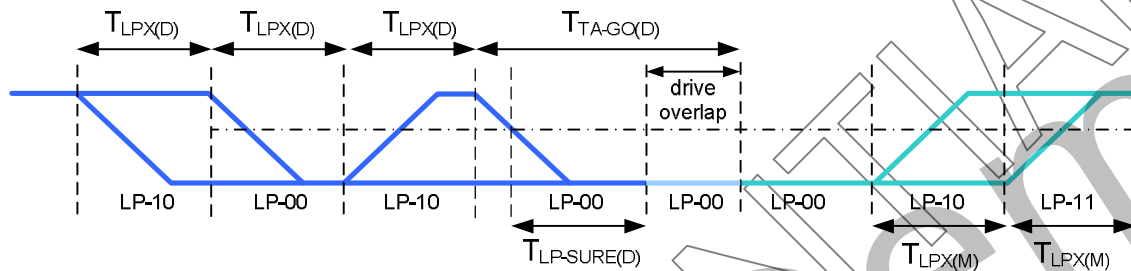


| Parameter                        | Description                                                                                                                                                                                                                  | Min                                | Typ | Max            | Unit |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----|----------------|------|
| $T_{CLK-POST}$                   | Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$ . | $60ns + 52*UI$                     |     |                | ns   |
| $T_{CLK-TRAIL}$                  | Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.                                                                                                                 | 60                                 |     |                | ns   |
| $T_{HS-EXIT}$                    | Time that the transmitter drives LP-11 following a HS burst.                                                                                                                                                                 | 300                                |     |                | ns   |
| $T_{CLK-TERM-EN}$                | Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$ .                                                                                              | Time for Dn to reach $V_{TERM-EN}$ |     | 38             | ns   |
| $T_{CLK-PREPARE}$                | Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.                                                                                        | 38                                 |     | 95             | ns   |
| $T_{CLK-PRE}$                    | Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.                                                                                     | 8                                  |     |                | UI   |
| $T_{CLK-PREPARE} + T_{CLK-ZERO}$ | $T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.                                                                                                                             | 300                                |     |                | ns   |
| $T_{D-TERM-EN}$                  | Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$ .                                                                                               | Time for Dn to reach $V_{TERM-EN}$ |     | $35 ns + 4*UI$ |      |
| $T_{HS-PREPARE}$                 | Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission                                                                                          | $40ns + 4*UI$                      |     | $85 ns + 6*UI$ | ns   |
| $T_{HS-PREPARE} + T_{HS-ZERO}$   | $T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.                                                                                                                  | $145ns + 10*UI$                    |     |                | ns   |
| $T_{HS-TRAIL}$                   | Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst                                                                                                       | $60ns + 4*UI$                      |     |                | ns   |

## Ø Turnaround Procedure



Bus turnaround (BAT) from MPU to display module timing



Bus turnaround (BAT) from display module to MPU timing

| Parameter        | Description                                                                                                                     | Min          | Typ                  | Max                  | Unit | Notes |
|------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------|----------------------|------|-------|
| $T_{LPX(M)}$     | Transmitted length of any Low-Power state period of MCU to display module                                                       | 50           |                      | 150                  | ns   | 1,2   |
| $T_{TA-SURE(M)}$ | Time that the display module waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround. | $T_{LPX(M)}$ |                      | $2 \cdot T_{LPX(M)}$ | ns   | 2     |
| $T_{LPX(D)}$     | Transmitted length of any Low-Power state period of display module to MCU                                                       | 50           |                      | 150                  | ns   | 1,2   |
| $T_{TA-GET(D)}$  | Time that the display module drives the Bridge state (LP-00) after accepting control during a Link Turnaround.                  |              | $5 \cdot T_{LPX(D)}$ |                      | ns   | 2     |
| $T_{TA-GO(D)}$   | Time that the display module drives the Bridge state (LP-00) before releasing control during a Link Turnaround.                 |              | $4 \cdot T_{LPX(D)}$ |                      | ns   | 2     |
| $T_{TA-SURE(D)}$ | Time that the MPU waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link Turnaround.            | $T_{LPX(D)}$ |                      | $2 \cdot T_{LPX(D)}$ | ns   | 2     |

### NOTE:

- $T_{LPX}$  is an internal state machine timing reference. Externally measured values may differ slightly from the specified values due to asymmetrical rise and fall times.
- Transmitter-specific parameter

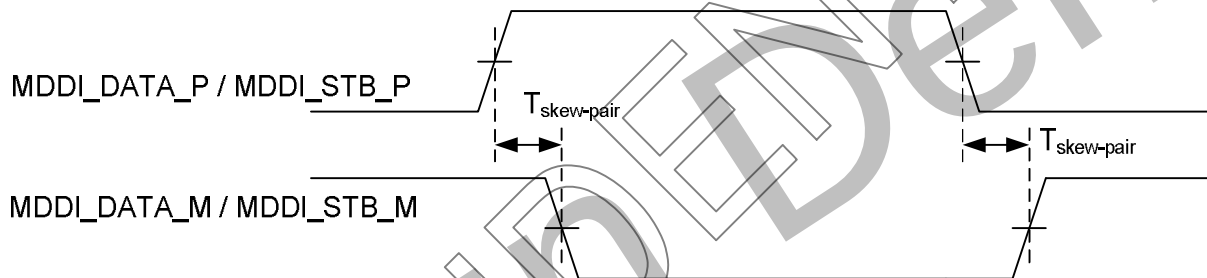
### 9.6.6 MDDI Timing Characteristics

(VSS=VSSI=DVSS=0V, VDDI=1.65V to 3.3V, VDD=2.3V to 4.8V, Ta = -30 to 70°C)

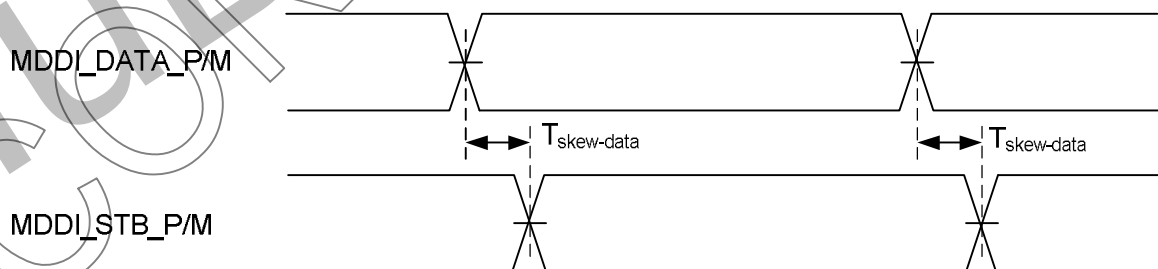
| Signal                        | Symbol     | Parameter                        | MIN | TYP | MAX  | Unit |
|-------------------------------|------------|----------------------------------|-----|-----|------|------|
| MDDI_STB_P/M<br>MDDI_DATA_P/M | 1/Tbit     | Data transfer rate               | -   | 384 | 450  | Mbps |
| MDDI_STB_P/M<br>MDDI_DATA_P/M | Tskew-pair | Differential transfer input skew | -   | -   | 0.05 | ns   |
| MDDI_STB_P/M<br>MDDI_DATA_P/M | Tskew-data | Data/Strobe input skew           | -   | -   | 0.3  | ns   |

Note) MDDI\_DATA\_P/M = MDDI\_DATA0\_P/M and MDDI\_DATA1\_P/M.

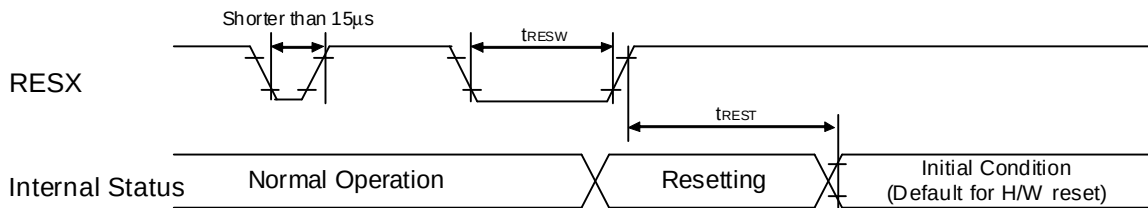
Skew between MDDI positive and negative signal pair



Skew between MDDI\_DATA\_P/N and MDDI\_STB\_P/M



### 9.6.7 Reset Timing



Reset input timing:

IOVCC=1.65 to 3.6V, VCI=2.5 to 3.6V, AGND=DGND=0V, Ta=-40 to 85°C

| Symbol     | Parameter                 | Related Pins | MIN | TYP | MAX | Note                                     | Unit |
|------------|---------------------------|--------------|-----|-----|-----|------------------------------------------|------|
| $t_{RESW}$ | *1) Reset low pulse width | RESX         | 15  | -   | -   | -                                        | µs   |
| $t_{REST}$ | *2) Reset complete time   | -            | -   | -   | 5   | When reset applied during Sleep in mode  | ms   |
|            |                           | -            | -   | -   | 120 | When reset applied during Sleep out mode | ms   |

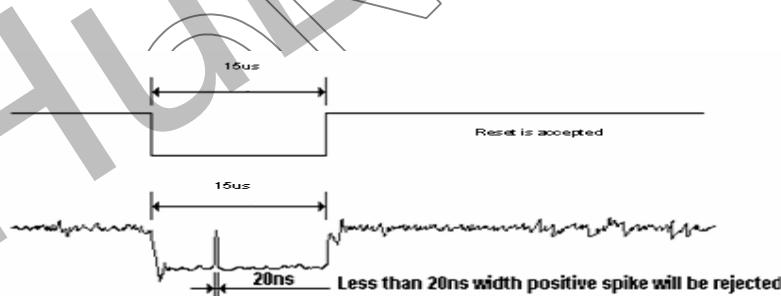
Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

| RESX Pulse           | Action                                                             |
|----------------------|--------------------------------------------------------------------|
| Shorter than 5µs     | Reset Rejected                                                     |
| Longer than 15µs     | Reset                                                              |
| Between 5µs and 15µs | Reset starts<br>(It depends on voltage and temperature condition.) |

Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.

Note 3. During Reset Complete Time, data in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time ( $t_{REST}$ ) within 5ms after a rising edge of RESX.

Note 4. Spike Rejection also applies during a valid reset pulse as shown below:



Note 5. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.