

ST7703 Data Sheet

TFT Mobile Single Chip Driver
For 720RGB x 1280 dot, a-Si TFT LCD, 16.7M color
With MIPI Interface

Version 01 Preliminary
October 2015

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Revision History

Version	Date	Description of Changes
01	2015/10/05	1. New setup

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1. General Description

The ST7703 is a single-chip solution for a-Si TFT LCD that combines a source driver, power supply circuit to drive a-Si TFT dot matrix LCD with 720RGBx1280 dots at maximum. The ST7703 supports MIPI Interface.

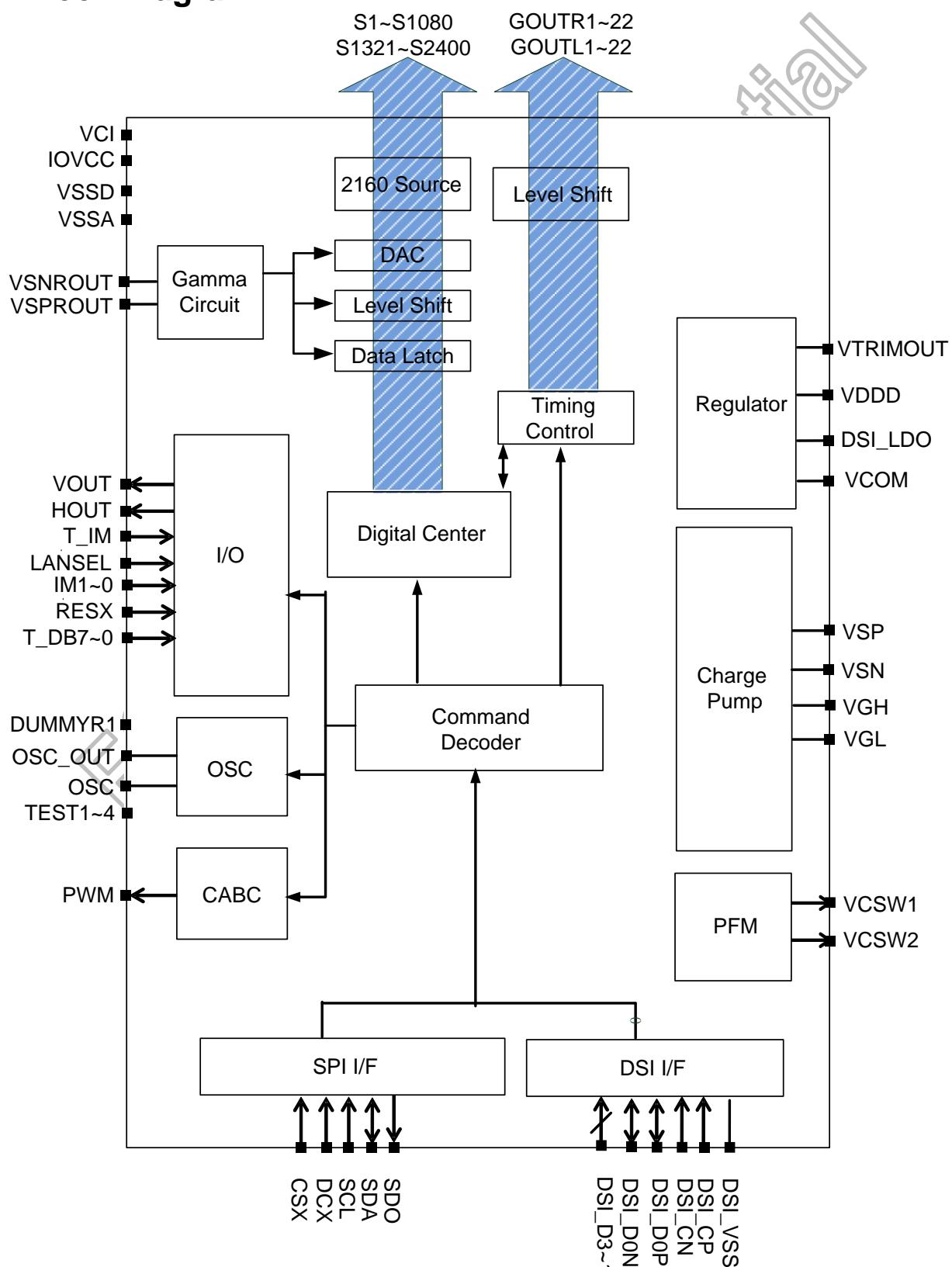
The ST7703 incorporates step-up and voltage follower circuits to generate drive voltage required for a-Si TFT and gate in panel (GIP) which including a dynamic backlight control function to control backlight brightness depending on image data, reducing power consumption at the backlight with the slightest influence on image quality.

The ST7703 is suitable for small or medium-sized portable mobile solutions requiring long-term driving capabilities, such as digital mobile phones, PDAs and Smartphones.

2. Features

- Single chip solution for a HD720 GIP (Gate In Panel) type TFT LCD display
- Display Resolution :
 - 720RGB x (480 + 4xNL + RES_V_LSB)
 - 640RGB x (480 + 4xNL + RES_V_LSB)
 - 600RGB x (480 + 4xNL + RES_V_LSB)
 - 540RGB x (480 + 4xNL + RES_V_LSB)
- Display Color Modes :
 - Full color mode: 16.7M colors
 - Reduce color mode: 262k colors
 - Reduce color mode: 65k colors
 - Idle mode: 8 colors
- Display Interface :
 - MIPI Display Serial Interface (DSI V1.01)
- On chip :
 - VGH/VGL for GIP gate control
 - 1-dot / 1+2-dot / 2-dot / 3-dot / 4-dot / 8-dot / column / Zig-Zag inversion
 - Gamma correction function
 - Oscillator for display clock generation
 - Internal OTP programming voltage generator
 - 4 times MTP for VCOM setting、ID setting
 - CABC (Content Adaptive Brightness Control) function
 - DGC (Digital Gamma Correction) function
 - Color Enhancement function
 - 3 temperature sensing voltage
- Input power :
 - External power IC and PFM :
 - I/O and interface power supply (IOVCC) : 1.65V to 2.0V
 - Analog power supply (VCI) : 2.5V to 3.3V
 - Three-Power Mode :
 - I/O and interface power supply (IOVCC) : 1.65V to 2.0V
 - Analog power supply (VSP) : 4.5V to 6.0V
 - Analog power supply (VSN) : -4.5V to -6.0V
- Output voltage :
 - Positive source output voltage level: VSPR=3.3V to 5.6V
 - Negative source output voltage level: VSNR=-5.6V to -3.3V
 - Positive gate driver output voltage level: VGH=+10V to +20V
 - Negative gate driver output voltage level: VGL=-7.5V to -15V
 - VCOM=-3.5V to 0V

3. Block Diagram



4. Pin Description

4.1 Power Supply Pins

Symbol	Name	Description	Connection when not used
IOVCC	I/O Power	Power supply for logic circuit.	-
VCI	Analog Power	Power supply for analog circuit.	-
VSSA	Analog GND	System ground for analog system.	-
VSSD	I/O GND	System ground for logic circuit.	-
DSI_VSS	MIPI GND	DSI interface analog ground.	-

4.2 Interface Logic Pins

Symbol	I/O	Description	Connection when not used																																																																								
IM1~0 LANSEL	I	Interface mode select pins. IM1~IM0 and LANSEL are used for the combination of polarity swap and data lane swap of DSI. <table border="1" style="margin-left: 20px;"> <tr> <th>IM1</th><th>IM0</th><th>LANSEL</th><th>D0P/N</th><th>D1P/N</th><th>CP/N</th><th>D2P/N</th><th>D3/P/N</th></tr> <tr> <td>0</td><td>0</td><td>0</td><td>D3P/N</td><td>D2P/N</td><td>CP/N</td><td>D1P/N</td><td>D0P/N</td></tr> <tr> <td>0</td><td>1</td><td>0</td><td>D3N/P</td><td>D2N/P</td><td>CN/P</td><td>D1N/P</td><td>D0N/P</td></tr> <tr> <td>1</td><td>0</td><td>0</td><td>D0P/N</td><td>D1P/N</td><td>CP/N</td><td>D2P/N</td><td>D3P/N</td></tr> <tr> <td>1</td><td>1</td><td>0</td><td>D0N/P</td><td>D1N/P</td><td>CN/P</td><td>D2N/P</td><td>D3N/P</td></tr> <tr> <td>0</td><td>0</td><td>1</td><td>D2P/N</td><td>D1P/N</td><td>CP/N</td><td>D0P/N</td><td>D3P/N</td></tr> <tr> <td>0</td><td>1</td><td>1</td><td>D2N/P</td><td>D1N/P</td><td>CN/P</td><td>D0N/P</td><td>D3N/P</td></tr> <tr> <td>1</td><td>0</td><td>1</td><td>D3P/N</td><td>D0P/N</td><td>CP/N</td><td>D1P/N</td><td>D2P/N</td></tr> <tr> <td>1</td><td>1</td><td>1</td><td>D3N/P</td><td>D0N/P</td><td>CN/P</td><td>D1N/P</td><td>D2N/P</td></tr> </table>	IM1	IM0	LANSEL	D0P/N	D1P/N	CP/N	D2P/N	D3/P/N	0	0	0	D3P/N	D2P/N	CP/N	D1P/N	D0P/N	0	1	0	D3N/P	D2N/P	CN/P	D1N/P	D0N/P	1	0	0	D0P/N	D1P/N	CP/N	D2P/N	D3P/N	1	1	0	D0N/P	D1N/P	CN/P	D2N/P	D3N/P	0	0	1	D2P/N	D1P/N	CP/N	D0P/N	D3P/N	0	1	1	D2N/P	D1N/P	CN/P	D0N/P	D3N/P	1	0	1	D3P/N	D0P/N	CP/N	D1P/N	D2P/N	1	1	1	D3N/P	D0N/P	CN/P	D1N/P	D2N/P	GND
IM1	IM0	LANSEL	D0P/N	D1P/N	CP/N	D2P/N	D3/P/N																																																																				
0	0	0	D3P/N	D2P/N	CP/N	D1P/N	D0P/N																																																																				
0	1	0	D3N/P	D2N/P	CN/P	D1N/P	D0N/P																																																																				
1	0	0	D0P/N	D1P/N	CP/N	D2P/N	D3P/N																																																																				
1	1	0	D0N/P	D1N/P	CN/P	D2N/P	D3N/P																																																																				
0	0	1	D2P/N	D1P/N	CP/N	D0P/N	D3P/N																																																																				
0	1	1	D2N/P	D1N/P	CN/P	D0N/P	D3N/P																																																																				
1	0	1	D3P/N	D0P/N	CP/N	D1P/N	D2P/N																																																																				
1	1	1	D3N/P	D0N/P	CN/P	D1N/P	D2N/P																																																																				
RESX	I	Reset pin. This signal will reset the device and must be applied to properly initialize the chip.	-																																																																								
VOUT	O	Frame synchronization output signal pin.	OPEN																																																																								
HOUT	O	Scan line synchronization output signal pin.	OPEN																																																																								

Note: "1" = IOVCC Level , "0" = VSSD Level.

4.3 MIPI Interface Pins

Symbol	I/O	Description	Connection when not used
DSI_D0P, DSI_D0P	I/O	High speed interface data differential signal input/output pins.	OPEN/GND
DSI_CP, DSI_CN	I	High speed interface clock differential signal input pins.	OPEN/GND
DSI_D3P~1P, DSI_D3N~1N	I	High speed interface data differential signal input pins.	OPEN/GND

4.4 Driver Output Pins

Symbol	I/O	Description		Connection when not used
S1 to S1080 S1321 to S2400	O	Pixel electrode driving output		
		Display Resolution	Used Source Pins	
		720RGB	S1~S1080 and S1321~S2400	Open
		640RGB	S1~S960 and S1441~S2400	
		600RGB	S1~S900 and S1501~S2400	
		540RGB	S1~S810 and S1591~S2400	
CGOUTL_1~22 CGOUTR_1~22	O	Gate control signals for panel.		Open
VCOM	O	Regulator output for common voltage of panel		-

4.5 DC/DC Converter Pins

Symbol	I/O	Description	Connection when not used
VSP	I	Input voltage from the set-up circuit.	-
VSN	I	Input voltage from the set-up circuit.	-
VGH	O	Output voltage from the step-up circuit.	-
VGL	O	Output voltage from the step-up circuit.	-
DSI_LDO	O	High speed interface regulator output pin.	Open
VSPROUT	O	Output voltage generated from VSP. Output for positive gamma voltage generator.	-
VSNROUT	O	Output voltage generated from VSN. Output for negative gamma voltage generator.	-
VDDD	O	Reference voltage for internal logic.	-
VTRIMOUT	O	Reference voltage for internal voltage generating circuit.	-
VCSW1	O	PFM and Power IC control output for DC/DC converter to generate VSP.	-
VCSW2	O	PFM and Power IC control output for DC/DC converter to generate VSN.	-

4.6 CABC Control Pins

Symbol	I/O	Description	Connection when not used
PWM	O	This pin is connecting with the external LED driver.	Open

4.7 Test Pins

Symbol	I/O	Description	Connection when not used
OSC	I	Oscillator test pin	Open
CSX	I	Chip select input pin ("Low" enable) in RGB I/F test mode.	OPEN
DCX	I	Command/parameter selection in RGB I/F test mode. Low: Select command. High: Select data.	IOVCC/GND/ OPEN
SCL	I	A synchronous clock signals in RGB I/F test mode.	IOVCC/GND/ OPEN
SDA	I/O	Serial data input/output pin in RGB I/F test mode.	IOVCC/GND/ OPEN
SDO	O	A serial data output pin in RGB I/F test mode.	OPEN
T_DB7~0	I	8-bit input data bus in RGB I/F test mode.	IOVCC/GND/ OPEN
T_IM	I	Let driver IC into RGB I/F test mode if set T_IM= high.	Open
OSC_OUT	O	Test pin.	Open
NVDDDOUT	O	Test pin.	Open
NVTRIMOUT	O	Test pin.	Open
VREFOUT	O	Test pin.	Open
NVREFOUT	O	Test pin.	Open
VTESTOUTP	O	Test pin.	Open
VTESTOUTN	O	Test pin.	Open
DUMMYR1	-	Test pin for bonding quality test. They are short-circuited within the chip.	Open
DUMMY406~1	-	Not used. Let it open.	Open
DUMMY_PM0	-	No use. Let them open.	Open
DUMMY_PM1	-	No use. Let them open.	Open
DUMMY_RS0	-	No use. Let them open.	Open
DUMMY_RS1	-	No use. Let them open.	Open
DUMMY_YEMP	-	No use. Let them open.	Open

Note: "1" = IOVCC Level , "0" = VSSD Level.

Note: "X" = Don't care.

4.8 BOM

Power IC Mode

NO.	IC Pin Name	Capacitance (uF)	Permissible Voltage (V)	Note
1	VCI	-	-	Don't need Capacitance
2	IOVCC	-	-	Don't need Capacitance
3	VSP	2.2	10	-
4	VSN	2.2	10	-
5	VGH	-	-	Don't need Capacitance
6	VGL	-	-	Don't need Capacitance
7	VSPROUT	-	-	Don't need Capacitance
8	VSNROUT	-	-	Don't need Capacitance
9	VTRIMOUT	-	-	Don't need Capacitance
10	VDDD	-	-	Don't need Capacitance
11	DSI_LDO	-	-	Don't need Capacitance
12	VCOM	-	-	Don't need Capacitance

Table 4-1: BOM of Power IC Mode

3 Power Mode

NO.	IC Pin Name	Capacitance (uF)	Permissible Voltage (V)	Note
1	VCI	-	-	Don't need Capacitance
2	IOVCC	-	-	Don't need Capacitance
3	VSP	-	-	Don't need Capacitance
4	VSN	-	-	Don't need Capacitance
5	VGH	-	-	Don't need Capacitance
6	VGL	-	-	Don't need Capacitance
7	VSPROUT	-	-	Don't need Capacitance
8	VSNROUT	-	-	Don't need Capacitance
9	VTRIMOUT	-	-	Don't need Capacitance
10	VDDD	-	-	Don't need Capacitance
11	DSI_LDO	-	-	Don't need Capacitance
12	VCOM	-	-	Don't need Capacitance

Table 4-2: BOM of 3 Power Mode

5. Function Description

5.1 SPI Interface

The selection of serial interface is by T_IM. ST7703 can support DPI/DBI type-C Option 1.

T_IM	Interface mode
0	MIPI Interface
1	DPI/DBI type-C Option 1 (9-bit SPI)

Table 5.1: DBI TYPE-C Serial Interface Selection Table

The serial interface is used to communication between the MPU and the LCD driver chip. It contains CSX (chip select), SCL (serial clock), SDA (serial data input/output). Serial clock (SCL) can be stopped when no communication is necessary.

5.1.1 SPI Interface Write Mode

In SPI I/F Write Mode, the serial data packet contains a control bit DCX and a transmission byte. If DCX is low, the transmission byte is command byte. If DCX is high, the transmission byte is stored in to command register. The MSB is transmitted first. The serial interface is initialized when CSX is high. In this state, SCL clock pulse or serial input/output data (SDA/SDO) have no effect. A falling edge on CSX enables the serial interface and indicates the start of data transmission.

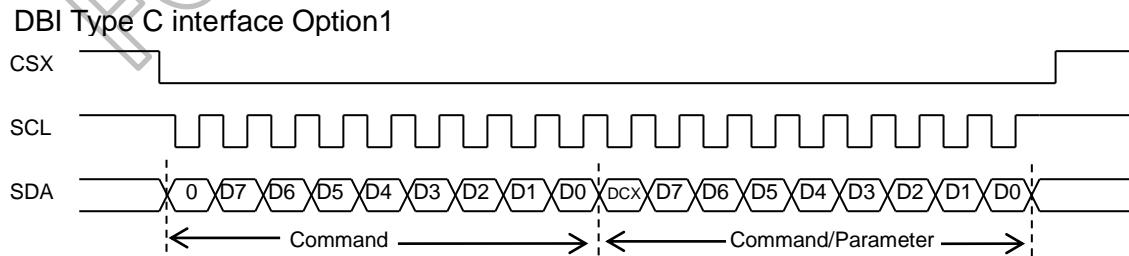
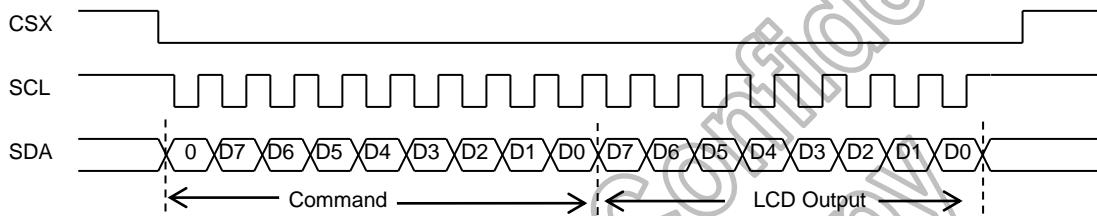


Figure 5.1: DBI Type C interface Option 1 write mode

5.1.2 SPI Interface Read Mode

In SPI I/F Read Mode, the host controller first has to send a command and then the following byte is transmitted to host controller in the SDA. The read mode has two type : one is command data 8-bits read and one is over 8-bits read.

DBI Type C interface Option1: Read 8bits



DBI Type C interface Option1: Read Over 8bits

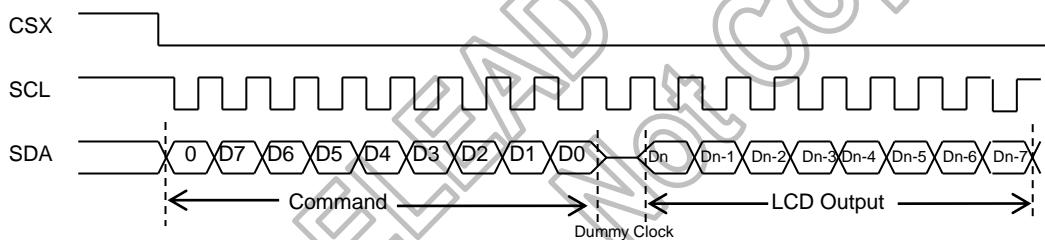


Figure 5.2: DBI Type C interface Option 1 read mode

5.1.3 Break and Pause Sequences

If there is a break on data transmission when transmit a command before a whole byte has been completed, then the driver IC will have reset the interface such that it will be ready to receive the same byte re-transmitted when the chip select line (CSX) is next activated. See the following figure.

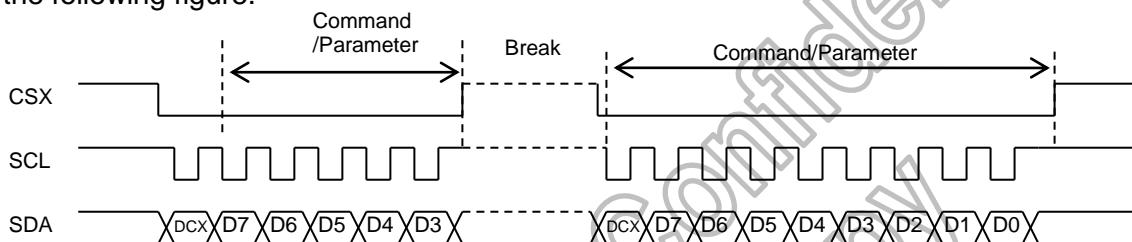


Figure 5.3: Driver IC data transfer recovery

If a one or more parameter command is being sent and a break occurs while sending any parameter before the last one and if the host then sends a new command rather than retransmitting the parameter that was interrupted, then the parameters that were successfully sent are stored and the parameter where the break occurred is rejected. The interface is ready to receive next byte as shown:

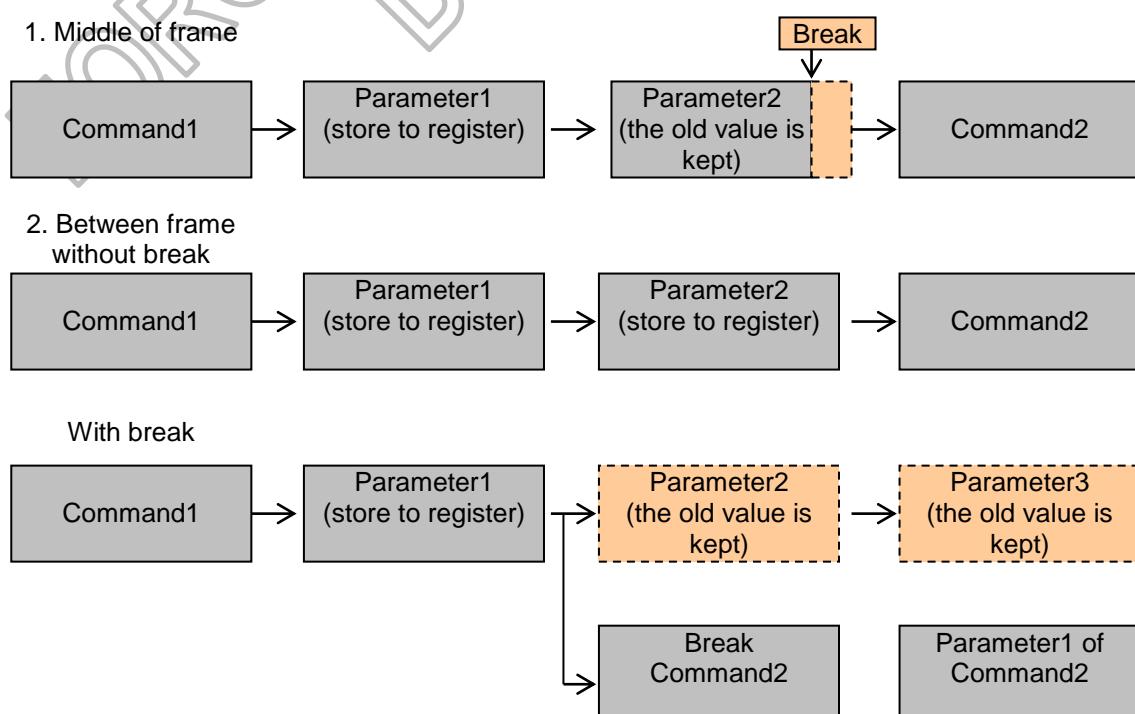


Figure 5.4: Break during parameter

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

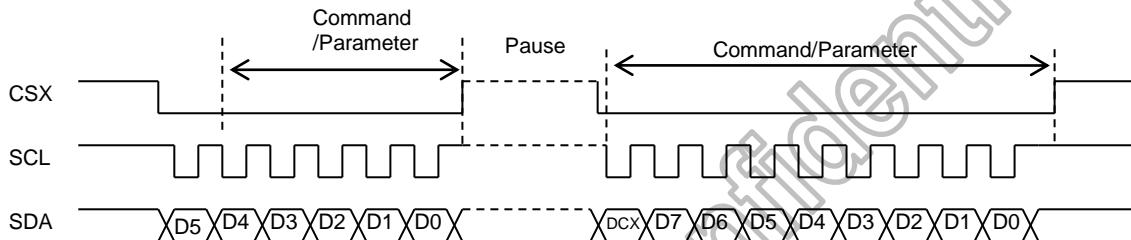


Figure 5.5: Driver IC data transfer pause

There are 4 cases where there is possible to see this kind of pause:

1. Command – Pause – Command
2. Command – Pause – Parameter
3. Parameter – Pause – Command
4. Parameter – Pause – Parameter

5.2 MIPI Interface

The Display Serial Interface standard defines protocols between a host processor and peripheral devices that adhere to MIPI Alliance standards for mobile device interfaces. The DSI standard builds on existing standards by adopting pixel formats and command set defined in MIPI Alliance standards.

DSI-compliant peripherals support either of two basic modes of operation: Command Mode and Video Mode. Which mode is used depends on the architecture and capabilities of the peripheral. The ST7703 only support Video mode.

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 driver IC 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.

Lane Pair	HOST(Master)/ Driver IC(Slave)
Clock Lane	<ul style="list-style-type: none">- Unidirectional Lane- Clock Only- Escape mode (ULPS only)
Data Lane 0	<ul style="list-style-type: none">- Bi-directional Lane- Forward High Speed- Bi-directional Escape Mode- Bi-directional LPDT
Data Lane 1 Data Lane 2 Data Lane 3	<ul style="list-style-type: none">- Unidirectional Lane- Forward High Speed- Escape mode (ULPS only)- NO LPDT

Table 5.2: MIPI Interface Configuration

5.2.1 DSI General Interface Communication

The driver IC uses data and clock lane differential pairs for DSI. Both differential lane pairs can be driven Low Power (LP) or High Speed (HS) mode. Low Power mode means that each line of the differential pair is used in single end mode and a differential receiver is disable (A termination resistor of the receiver is disable) and it can be driven into a low power mode.

High Speed mode means that differential pairs (The termination resistor of the receiver is enable) are not used in the single end mode. There are used different modes and protocol in each mode when there is wanted to transfer information from the HOST to the driver IC and vice versa.

State code	Line voltage Levels		High speed	Low power	
	DP	DN		Control mode	Escape mode
HS-0	HS Low	HS High	Differential-0	Note 1	Note 1
HS-1	HS High	HS Low	Differential-1	Note 1	Note 1
LP-00	LP Low	LP Low	N/A	Bridge	Space
LP-01	LP Low	LP High	N/A	HS-Rqst	Mark-0
LP-10	LP High	LP Low	N/A	LP-Rqst	Mark-1
LP-11	LP High	LP High	N/A	Stop	Note 2

Note 1 : During high-speed transmission, the low power receivers observe LP-00 on the lines.

Note 2 : If LP-11 occurs during Escape mode, the lane returns to Stop state (Control mode LP-11)

Table 5.3: Lane State Description

5.2.1.1 DSI Clock Lane

The principle flow chart of the different clock lanes power modes is illustrated below.

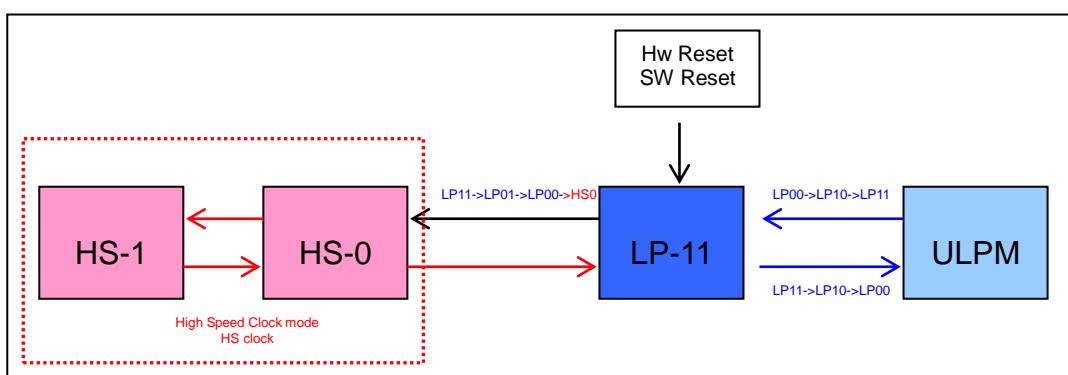


Figure 5.6: DSI Clock Lane State Diagram

LK+/- lanes can be driven to the Low Power Mode (LPM), when DSI-CLK lanes are entering LP-11:

1. After SW Reset, HW Reset or Power On Sequence =>LP-11
2. After DSI-CLK+/- lanes are leaving Ultra Low Power Mode (ULPM, LP-00) =>LP-10 =>LP-11 (LPM). This sequence is illustrated below.

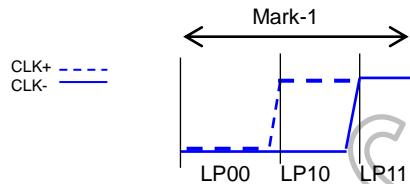


Figure 5.7: From ULPM to LPM

3. After DSI-CLK+/- lanes are leaving High Speed Clock Mode (HSCM, HS-0 or HS-1 State Code) =>HS-0 =>LP-11 (LPM). This sequence and all three mode changes are illustrated below.

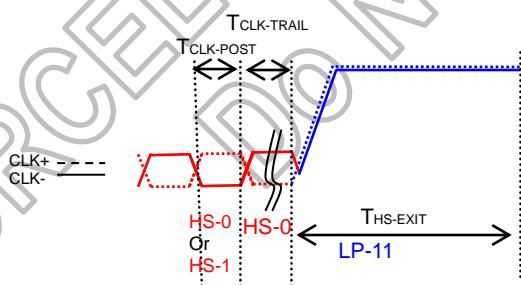


Figure 5.8: From High Speed Clock mode to LPM

Ultra Low Power Mode (LP-00: ULPM)

DSI-CLK+/- lanes can be driven to the Ultra Low power Mode (ULPM), when DSI-CLK lanes are entering LP-00 State. The entering way is from the Low Power Mode (LPM, LP-11 State) =>LP-10 =>LP-00 (ULPM). This sequence is illustrated below.

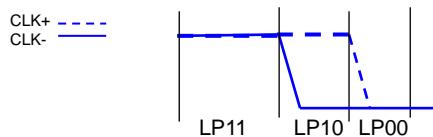


Figure 5.9: From LPM mode to ULPM

High Speed Clock Mode (HSCM)

DSI-CLK+/- lanes can be driven to the High Speed Clock Mode (HSCM), when DSI-CLK lanes are starting to work between HS-0 and HS-1 State. The entering way is from the Low Power Mode (LPM, LP-11 State) =>LP-01 =>LP-00 =>HS-0 =>HS-0/1 (HSCM). This sequence is illustrated below.

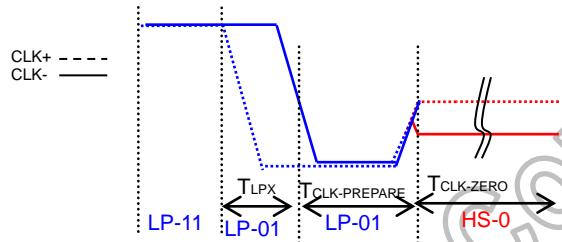


Figure 5.10: From LPM mode to HSCM

High Speed Clock Burst

The high speed clock (DSI-CLK+/-) is started before high speed data is sent via DSI-Dn+/- lanes. The high speed clock continues clocking after the high speed data sending has been stopped.

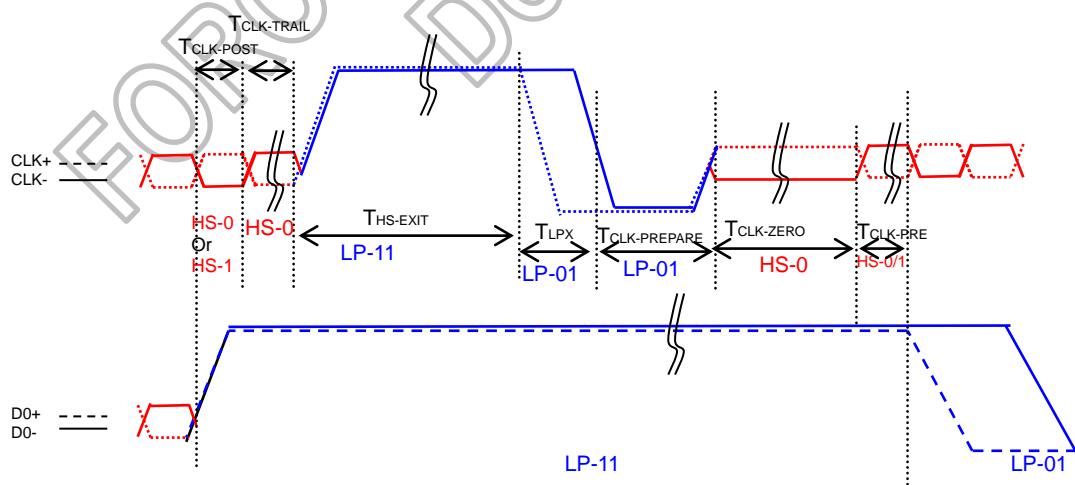


Figure 5.11: Switching the Clock Lane between HSCM and LPM

5.2.1.2 DSI-D0 Data Lane

DSI-D0+/- Data Lanes can be driven in different modes which are: Escape Mode, High-Speed Data Transmission and Bus Turnaround Request. The flow chart of the D0 data lanes is illustrated below.

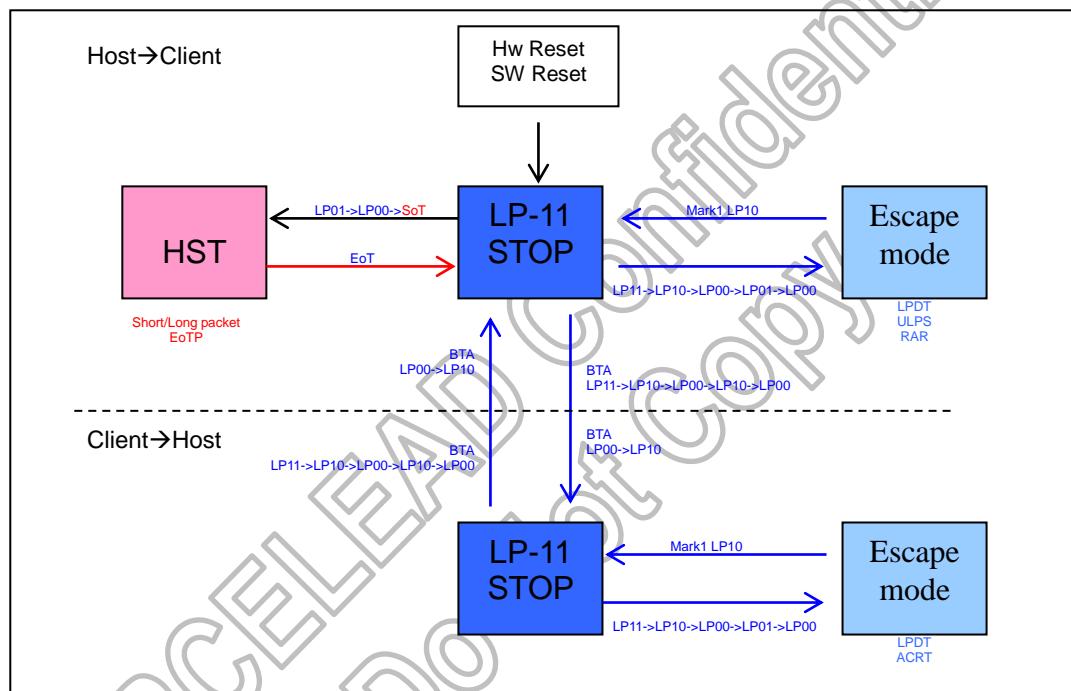


Figure 5.12: DSI Data Lane D0 State Diagram

Description	Operation Code
High Speed Data Transmission Burst	LP11->LP01->LP00
Escape mode entry	LP11->LP10->LP00->LP01->LP00
Bus turn around	LP11->LP10->LP00->LP10->LP00
Exit Escape mode (Mark-1)	LP00->LP10->LP11

Table 5.4: Data Lane D0 Operation Modes

ESCAPE MODE

Data lanes (DSI-D0+/-) can be used in different Escape Modes when data lanes are in Low Power (LP) mode.

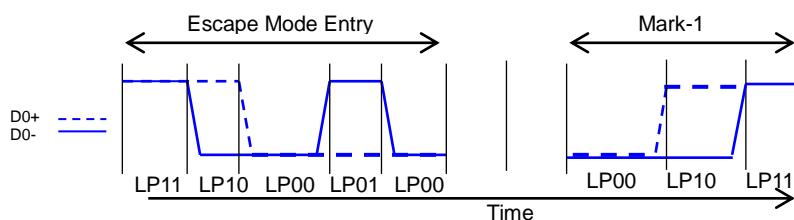


Figure 5.13: DSI Data Lane D0 general escape mode sequence

ST7703 can support three different Escape Commands. The commands (EC) can be divided 2 different groups: Mode or Trigger. The HOST is informing to the driver IC that it is controlling data lanes (DSI-D0+/-) with the mode. Escape commands are defined as below table.

Escape Command	Command Type	Entry Command Pattern (First Bit→Last Bit Transmitted)
Low Power Data Transmission	Mode	1110 0001
Ultra-Low Power mode	Mode	0001 1110
Remote Application Reset	Trigger	0110 0010
Tearing Effect	Trigger	0101 1101
Acknowledge	Trigger	0010 0001

Table 5.5: Escape Mode Commands

Low-Power Data Transmission (LPDT)

The HOST can send data to the driver IC in Low-Power Data Transmission (LPDT) mode when data lanes are entering in Escape Mode and Low-Power Data Transmission (LPDT) command will been sent to this driver IC. The driver IC is also using the same sequence when it is sending data to the HOST. The Low Power Data Transmission (LPDT) is using a following sequence:

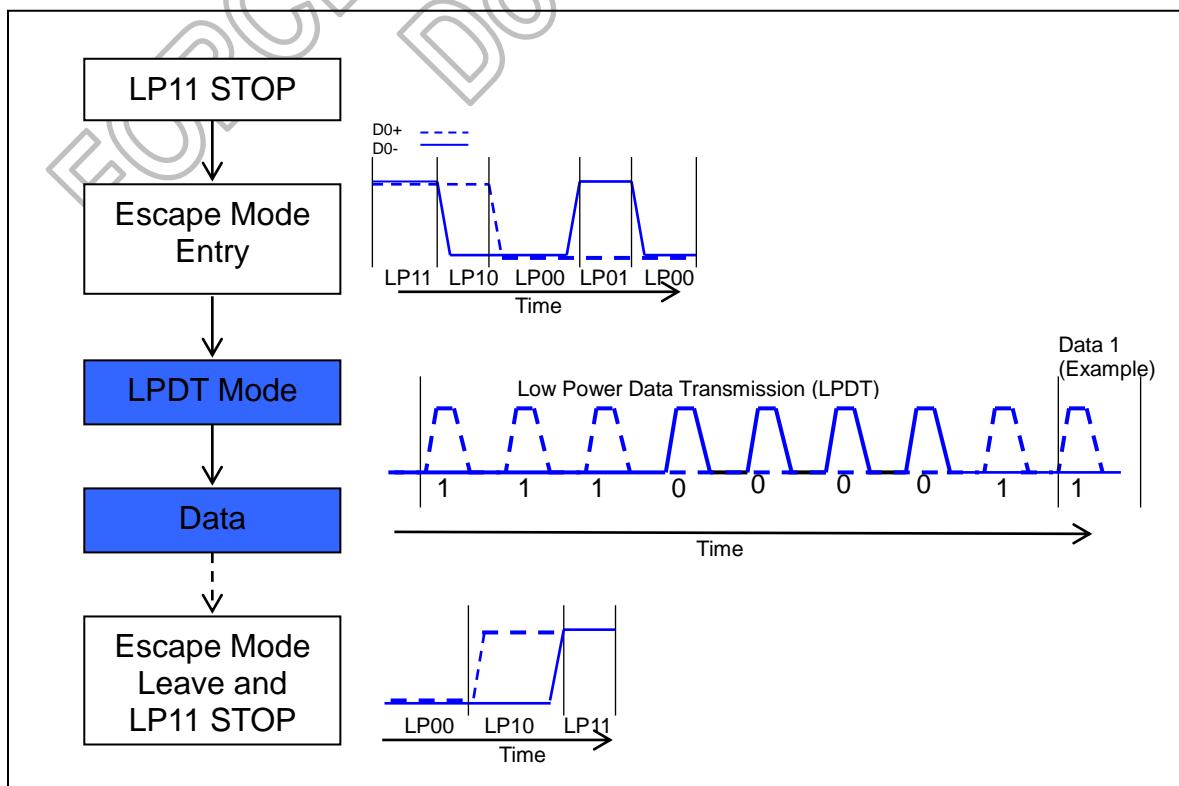


Figure 5.14: DSI Data Lane D0 LPDT sequence

Ultra Low Power State (ULPS)

The driver IC can enter this Ultra Low Power Sate to save power consumption when HOST send this ULPS command. Ultra Low Power State is using below sequence:

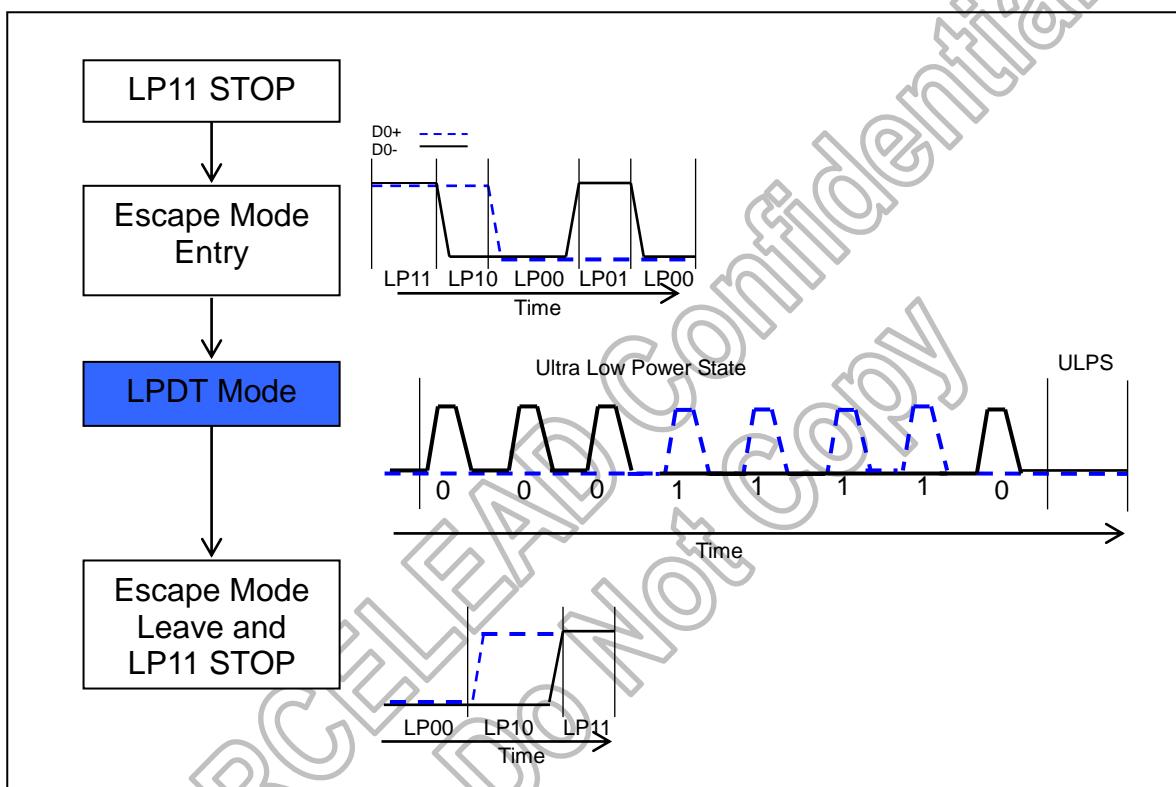


Figure 5.15: DSI Data Lane D0 ULPS sequence

Remote Application Reset (RAR)

The HOST can inform to the driver IC that it should be reset in Remote Application Reset (RAR) trigger when data lanes are entering in Escape Mode. The Remote Application Reset (RAR) is using a following sequence:

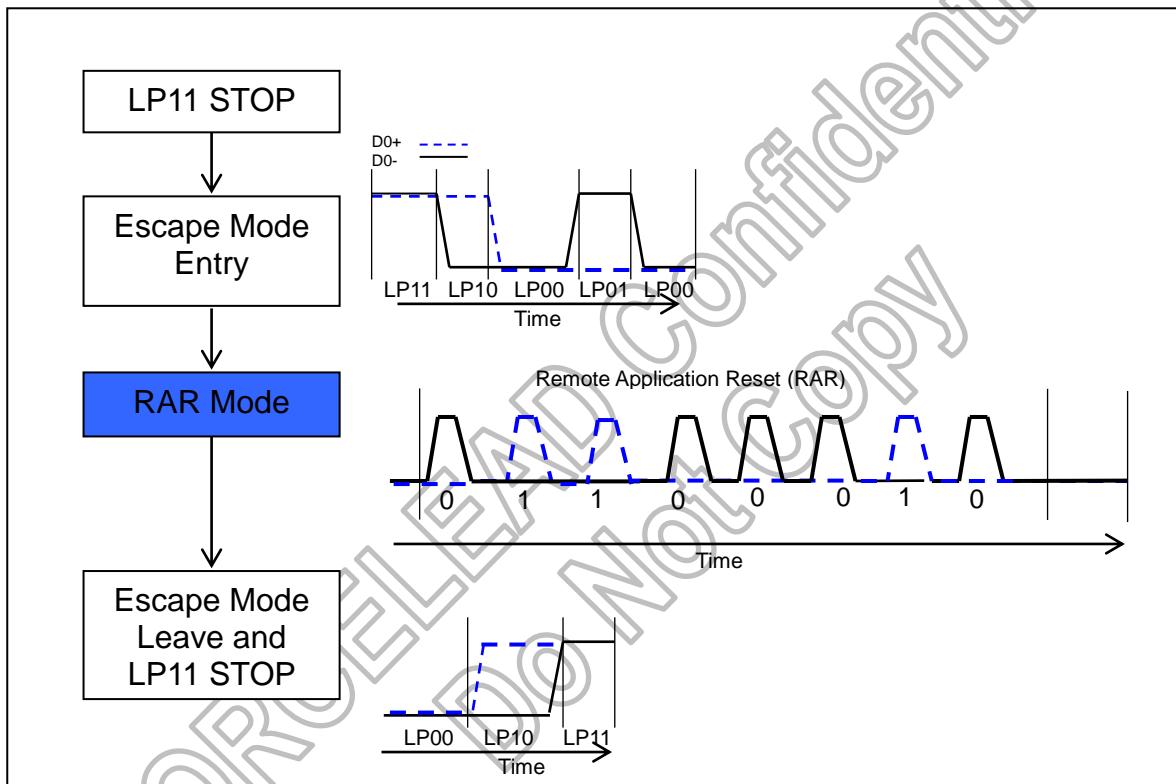


Figure 5.16: DSI Data Lane D0 RAR sequence

Tearing Effect (TEE)

The driver IC can inform to the HOST when a tearing effect event (New V-synch) has been happen on the driver IC by Tearing Effect (TEE). The Tearing Effect (TEE) is using a following sequence:

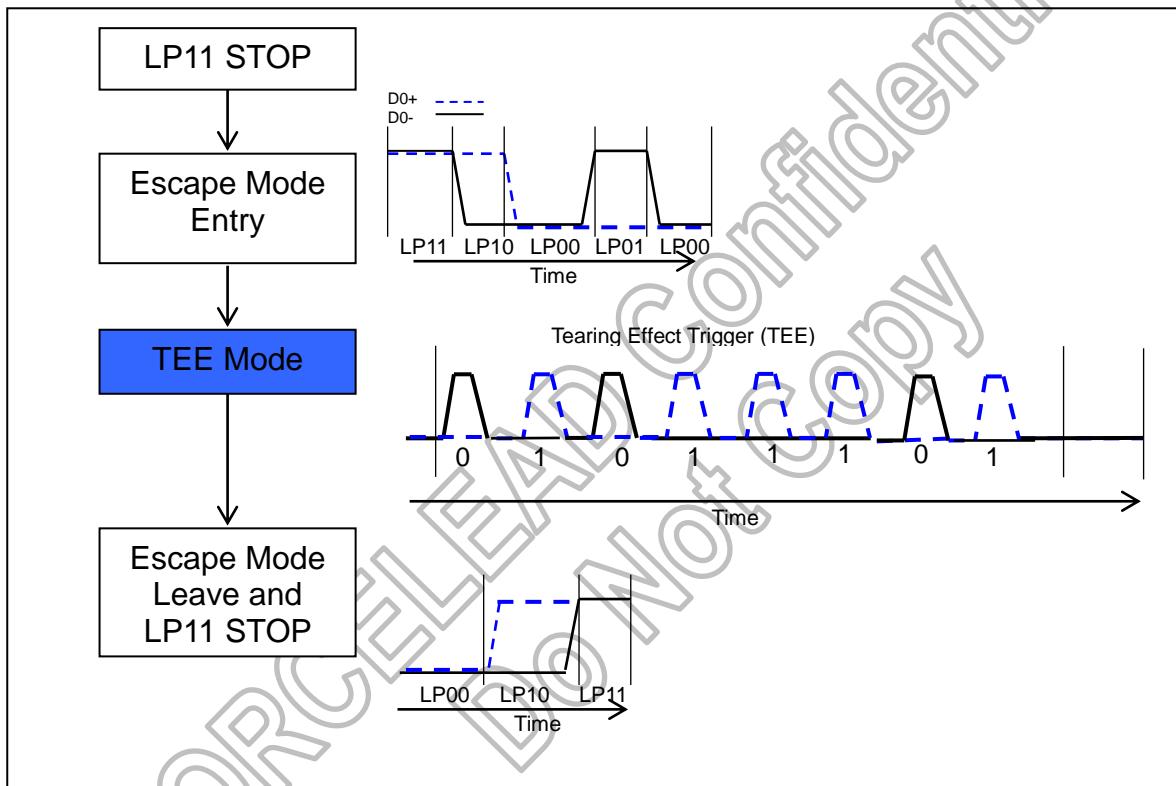


Figure 5.17: DSI Data Lane D0 TEE sequence

Acknowledge (ACK)

The driver IC can inform to the HOST when an error has not recognized on it by Acknowledge (ACK). The Acknowledge (ACK) is using a following sequence:

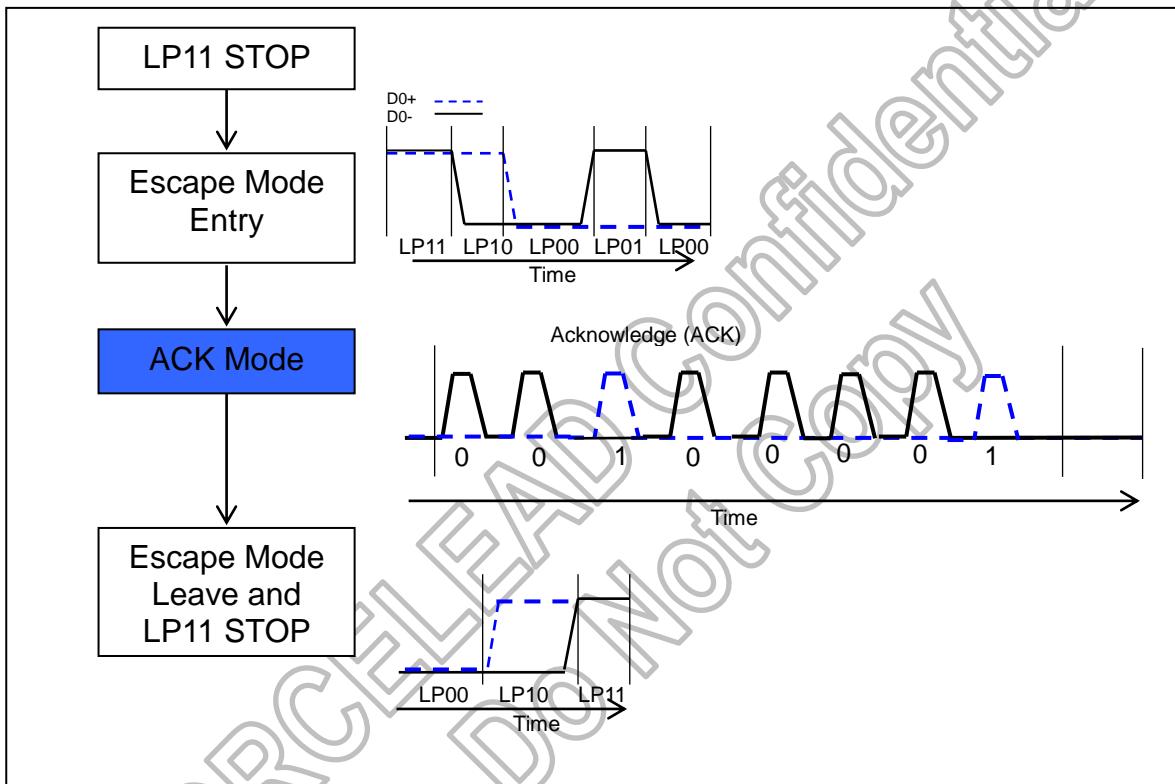


Figure 5.18: DSI Data Lane D0 ACK sequence

High Speed Data Transmission

The driver IC is entering High-Speed Data Transmission when Clock lanes DSI-CLK+/- have already been entered in the High-Speed Clock Mode by the HOST. Data lanes of the driver IC are entering (TSOT) in the High-Speed Data Transmission (HSDT) as below figure.

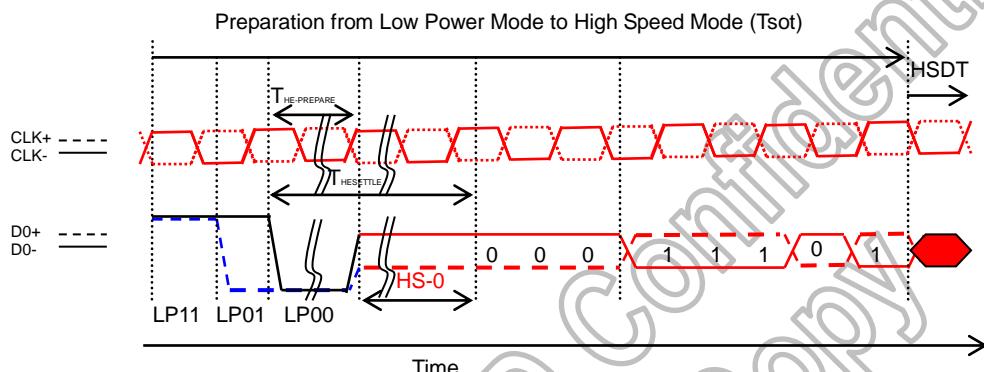


Figure 5.19: DSI Data Lane Entering High Speed Data Transmission

Leaving High Speed Data Transmission

The driver IC is leaving the High-Speed Data Transmission (TEOT of HSDT) when Clock lanes DSI-CLK+/- are in the High-Speed Clock Mode by the HOST and it is kept until data lanes are in LP-11 mode. Data lanes of the driver IC are leaving from the High-Speed Data Transmission (TEOT of HSDT) as follows

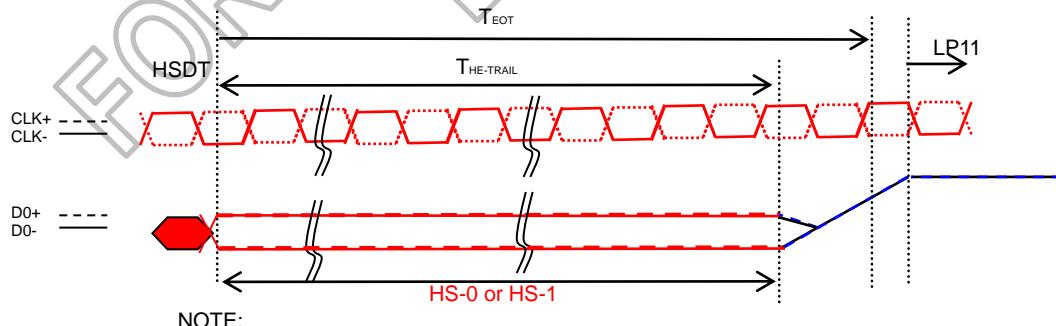


Figure 5.20: DSI Data Lane Entering High Speed Data Transmission

Bus Turnaround (BTA)

The HOST or driver IC, which is controlling DSI-D0+/- Data Lanes, can start a bus turnaround procedure when it wants information from a receiver, which can be the HOST or driver IC. The HOST or driver IC is using the same sequence when this bus turnaround procedure is used. This sequence is described for reference purposes, when the HOST wants to do the bus turnaround procedure to the driver IC, as below.

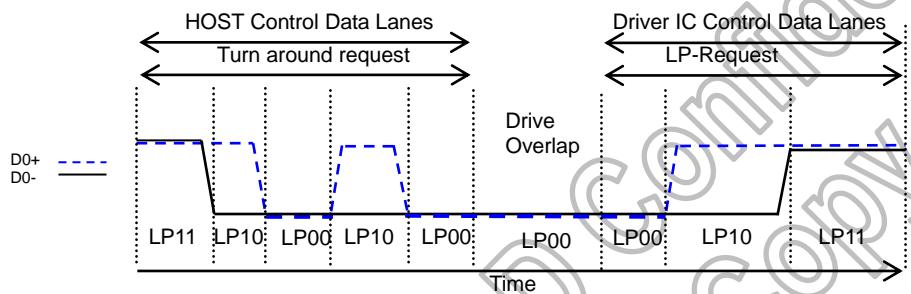
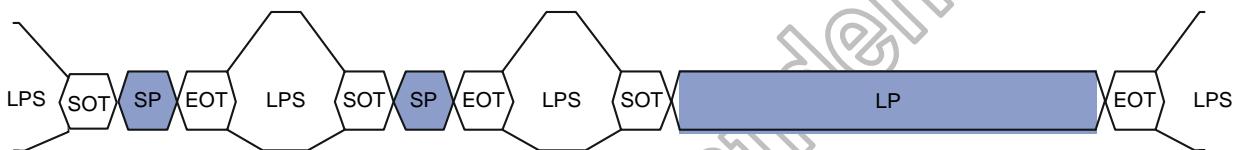


Figure 5.21: DSI Bus Turn Around Procedure

5.2.2 DSI Packet Level Communication

The DSI protocol permits multiple packets which is useful for events such as peripheral initialization, where many registers may be loaded separate write commands at system startup. Below figure illustrates multiple HS Transmission packets.



LPS : Low power state
SOT : Start of Transmission
SP : Short Packet
LP : Long Packet
EOT : End of Transmission

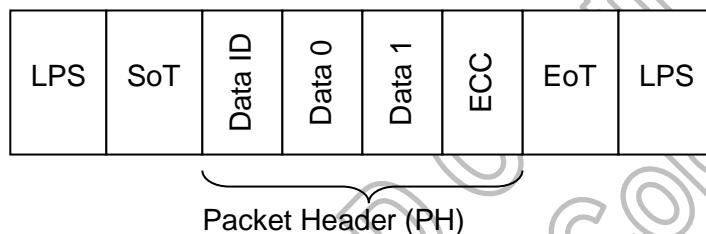
Figure 5.22: DSI multiple HS transmission packets

The packet includes two types which are Long packet and short packet. The first byte of the packet, the Data Identifier (DI), includes information specifying the length of the packet. Command Mode systems send commands and an associated set of parameters, with the number of parameters depending on the command type.

5.2.2.1 General Packet Structure

Short packets

Specify the payload length using the Data Type field and are from two to nine bytes in length. Short packet is used for most Command Mode commands and associated parameters. Where short packets format include an 8-bit Data ID followed by zero to seven bytes and an 8-bit ECC. Below figure shows the structure of the Short packet.



SOT: Start of Transmission

DI(Data ID): 8-bit Contain Virtual Channel Identifier and Data Type.

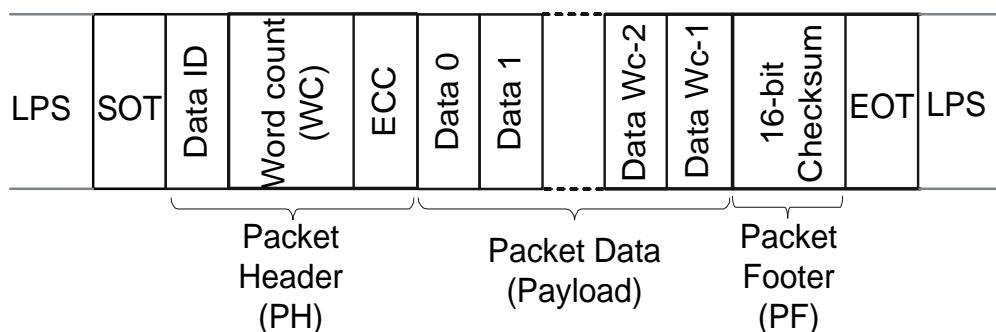
Data 0 and Data 1: Packet Data (8+8bit)

ECC(Error Correction Code): The Error Correction Code allows single-bit errors to be corrected and 2-bit errors to be detected in the Packet Header.

Figure 5.23: Structure of the short packet

Long packets

Specify the payload length using a two-byte Word Count field and then the payload maybe from 0 to 65,541 bytes in length. Long packets permit transmission of large blocks of pixel or other data. Below figure shows the structure of the Long packet. Long Packet Header composed of three elements: an 8-bit Data Identifier, a 16-bit Word Count, and 8-bit ECC. The Packet Footer has one element, a 16-bit checksum. Long packets can be from 6 to 65,541 bytes in length. Where $65,541 \text{ bytes} = (216-1) + 4 \text{ bytes PH} + 2 \text{ bytes PF}$



DI (Data ID) : Contain Virtual Channel Identifier and Data Type.

WC (Word Count) : 8+8 bits The receiver use WC to define packet end.

ECC (Error Correction Code) : The Error Correction Code allows single-bit errors to be corrected and 2-bit errors to be detected in the Packet Header.

PF(Packet Footer) : Mean 16-bit Checksum.

Figure 5.24: Structure of the long packet

According to packet form, basic elements include DI and ECC. Figure 4.44 shows format of Data ID.

DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0
VC (Virtual Channel)	DT (Data Type)						

DI[7:6] → These two bits identify the data as directed to one of four virtual channels.

DI[5:0]: These six bits specify the Data Type, which specifies the size, format and, in some cases, the interpretation of the packet contents.

Figure 5.25: Format of data ID

Virtual Channel (VC)

Virtual Channel (VC) is a part of Data Identification (DI[7...6]) structure and it is used to address where a packet is wanted to send from the HOST. The ST7703 supports Virtual Channel only when VC = 00.

Data Type (DT)

Data Type (DT) is a part of Data Identification (DI[5...0]) structure and it is used to define a type of the used data on a packet.

Data type, hex	Data type, binary	Description packet	Size
05h	00 0101	DCS Write, no parameters	Short
15h	01 0101	DCS Write, 1 parameter	Short
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
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
13h	01 0011	Generic Short Write, 1 parameter	Short
23h	10 0011	Generic Short Write, 2 parameter	Short
14h	01 0100	Generic Read, 1 parameter	Short
29h	10 1001	Generic Long Write	Long
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
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
X0h and XFh, unspecified	xx 0000 xx 1111	DO NOT USE All unspecified codes are reserved	-

Table 5.6: Data Types from Host to the Driver IC

Data type, hex	Data type, binary	Description packet	Size
02h	00 0010	Acknowledge with Error Report	Short
21h	01 0001	Generic short READ Response, 1 byte returned	Short
22h	01 0010	Generic short READ Response, 2 byte returned	Short
1Ah	01 1010	Generic Read Long Response	Long
1Ch	01 1100	DCS Long READ Response	Long

Table 5.7: Data Types from the Driver IC to Host

Error Correction Code (ECC)

Error Correction Code (ECC) is a part of Packet Header (PH) and its purpose is to identify an error or errors on the Packet Header (PH).

Bits (P[7...0]) of the Error Correction Code (ECC) are defined, where the symbol '^' is presenting XOR function, as follows.

- P7 = 0
- P6 = 0
- P5 = D10^D11^D12^D13^D14^D15^D16^D17^D18^D19^D21^D22^D23
- P4 = D4^D5^D6^D7^D8^D9^D16^D17^D18^D19^D20^D22^D23
- P3 = D1^D2^D3^D7^D8^D9^D13^D14^D15^D19^D20^D21^D23
- P2 = D0^D2^D3^D5^D6^D9^D11^D12^D15^D18^D20^D21^D22
- P1 = D0^D1^D3^D4^D6^D8^D10^D12^D14^D17^D20^D21^D22^D23
- P0 = D0^D1^D2^D4^D5^D7^D10^D11^D13^D16^D20^D21^D22^D23

PACKET DATA (PD) ON THE LONG PACKET

Packet Data (PD) of the Long Packet is defined after Packet Header (PH) of the Long Packet. The number of the data bytes is defined on chapter "Word Count (WC) on the Long Packet".

PACKET FOOTER (PF) ON THE LONG PACKET

Packet Footer (PF) of the Long Packet is defined after the Packet Data (PD) of the Long Packet. The Packet Footer (PF) is a checksum value what is calculated from the Packet Data of the Long Packet. The checksum is using a 16-bit Cyclic Redundancy Check (CRC) value which is generated with a polynomial $X^{16}+X^{12}+X^5+X^0$.

5.2.2.2 Detail Format Description

Generic Write, 1 Parameter, Data Type = 01 0011 (13h)

Generic Write, 1 Parameter is always using a Short Packet from the HOST to the driver IC. The content of 2 payload bytes is “command” and “00h”.

Generic Write, 2 Parameter, Data Type = 10 0011 (23h)

Generic Write, 2 Parameter is always using a Short Packet from the HOST to the driver IC. The content of 2 payload bytes is “command” and “parameter”.

Generic Long Write, Data Type = 10 1001 (29h)

Generic Long Write is always using a Long Packet from the HOST to the driver IC. The content can include Command (No Parameters) or Command with 1 or more parameters.

Generic Read, 1 Parameter, Data Type = 01 0100 (14h)

Generic Read, 1 Parameter is always using a Short Packet from the HOST to the driver IC. The HOST has to define to the driver IC, what is the maximum size of the return packet. A command, what is used for this purpose, is “Set Maximum Return Packet Size”, which Data Type is 11 0111 and which is using Short Packet before the HOST can send “Generic Read, 1 Parameter” to the driver IC.

Display Command Set Write, No Parameter, Data Type = 00 0101 (05h)

Display Command Set (DCS) Write, No Parameter is always using a Short Packet from the HOST to the driver IC. The content of 2 payload bytes is “command” and “00h”.

Display Command Set Write, 1 Parameter, Data Type = 01 0101 (15h)

Display Command Set (DCS) Write, 1 Parameter is always using a Short Packet from the HOST to the driver IC. The content of 2 payload bytes is “command” and “parameter”.

Display Command Set Long Write, Data Type = 11 1001 (39h)

Display Command Set (DCS) Long Write is always using a Long Packet from the HOST to the driver IC. The content can include Command (No Parameters) or Command with 1 or more parameters.

Display Command Set (DCS) Read, No Parameter, Data Type = 00 0110 (06h)

Display Command Set (DCS) Read, No Parameter is always using a Short Packet, from the HOST to the driver IC. The HOST has to define to the driver IC, what is the maximum size of the return packet. A command, what is used for this purpose, is “Set Maximum Return Packet Size”, which Data Type is 11 0111 and which is using Short Packet before the HOST can send “Display Command Set (DCS) Read, No Parameter” to the driver IC.

Null Packet, No Data , Data Type = 00 1001 (09h)

Null Packet, No Data is always using a Long Packet, what is defined on Data Type from the HOST to the driver IC. The purpose of this command is keeping data lanes in the high speed mode, if it is needed. The driver IC is ignored Packet Data what the HOST is sending.

Set Maximum Return Packet Size, Data Type = 11 0011 (37h)

Set Maximum Return Packet Size is always using a Long Packet, what is defined on Data Type from the HOST to the driver IC. The purpose of this command is specifies the maximum size of the payload in a Long packet transmitted from peripheral back to the host processor.

Sync Event (H Start, H End, V Start, V End), Data Type = XX 0001 (0xX1)

Sync Events are Short packets and, therefore, can time-accurately represent events like the start and end of sync pulses. As “start” and “end” are separate and distinct events, the length of sync pulses, as well as position relative to active pixel data, The Sync Events are defined as follows:

- Data Type = 00 0001 (01h) V Sync Start
- Data Type = 01 0001 (11h) V Sync End
- Data Type = 10 0001 (21h) H Sync Start
- Data Type = 11 0001 (31h) H Sync End

Color Mode On Command, and, Data Type = 01 0010 (12h)

Color Mode On is a Short packet command that switches a Video Mode driver IC to 8-colors mode for power saving.

Color Mode Off Command, Data Type = 00 0010 (02h)

Color Mode Off is a Short packet command that returns a Video Mode driver IC from 8-colors mode to normal display operation.

Shutdown Peripheral Command, Data Type = 10 0010 (22h)

Shutdown Peripheral command is a Short packet command that turns off the display in a Video Mode driver IC for power saving. Note the interface shall remain powered in order to receive the turn-on, or wake-up command.

Turn On Peripheral Command, Data Type = 11 0010 (32h)

Turn On Peripheral command is Short packet command that turns on the display in a Video Mode driver IC for normal display operation.

Blanking Packet (Long), Data Type = 01 1001 (19h)

A Blanking packet is used to convey blanking timing information in a Long packet. Normally, 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 driver IC.

Packed Pixel Stream, 16-bit Format, Long packet, Data Type = 00 1110 (0Eh)

Packed Pixel Stream 16-Bit Format is a Long packet used to transmit image data formatted as 16-bit pixels to a Video Mode driver IC. Pixel format is five bits red, six bits green, five bits blue, in that order. Note that the “Green” component is split across two bytes. Within a color component, the LSB is sent first, the MSB last.

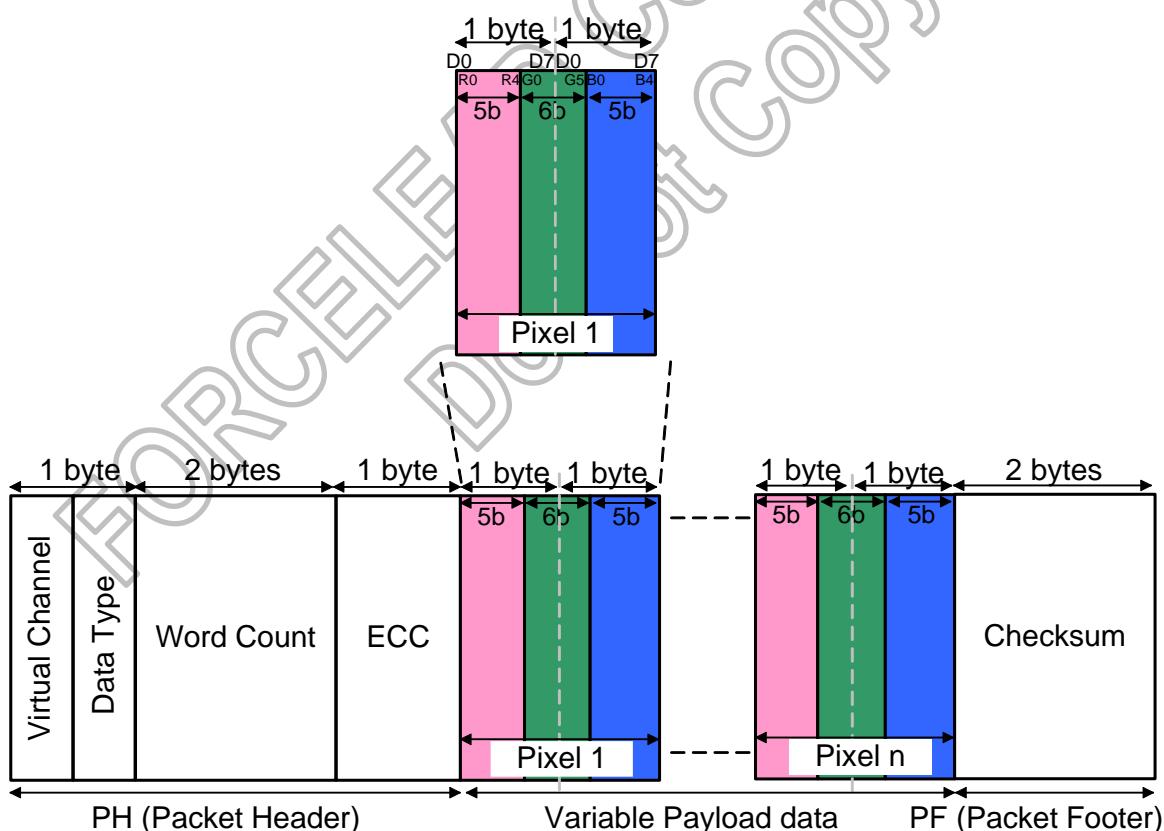
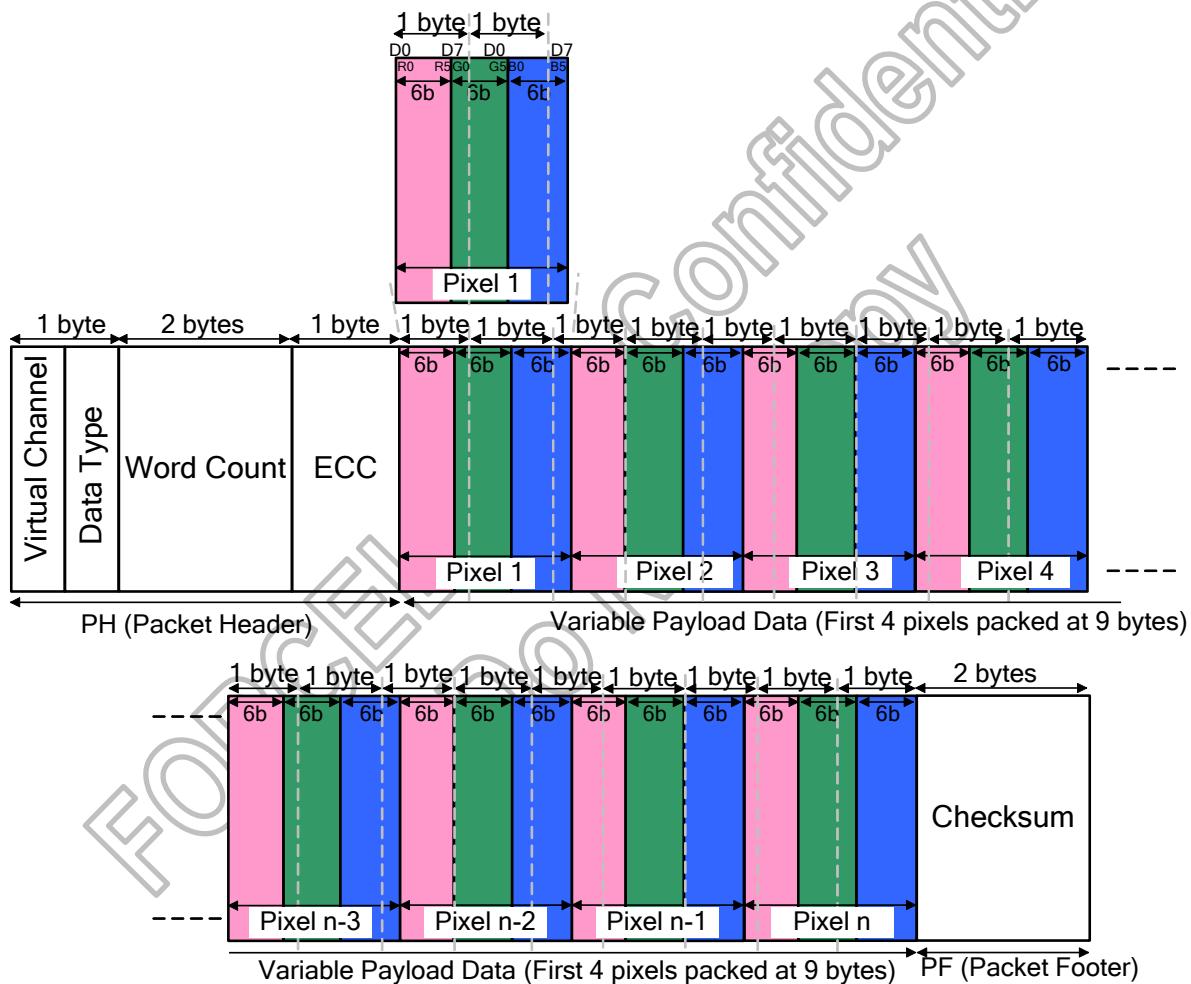


Figure 5.26: 16-bit RGB Color Format, Long packet

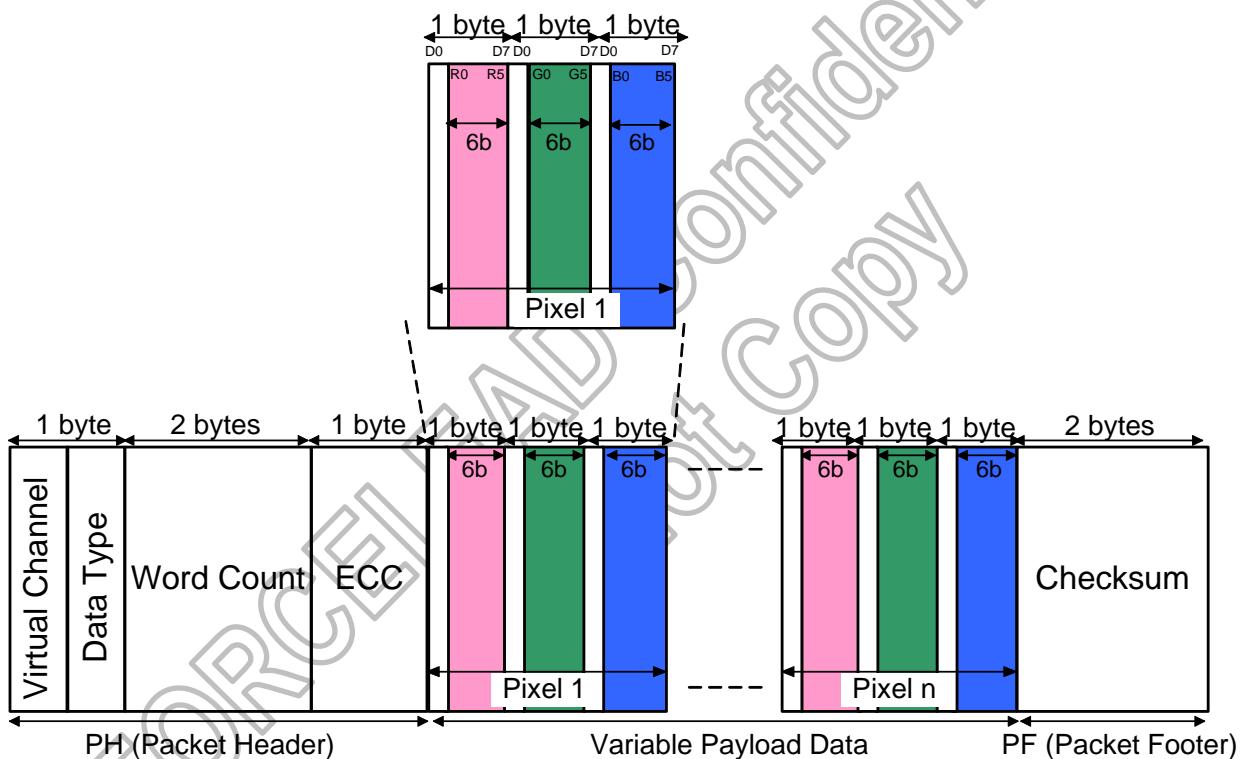
Packed Pixel Stream, 18-bit Format, Long packet, Data type = 01 1110 (1Eh)

Packed Pixel Stream 18-Bit Format is a Long packet used to transmit image data formatted as 18-bit pixels to a Video Mode driver IC. Pixel format is six bits red, six bits green, six bits blue, in that order.



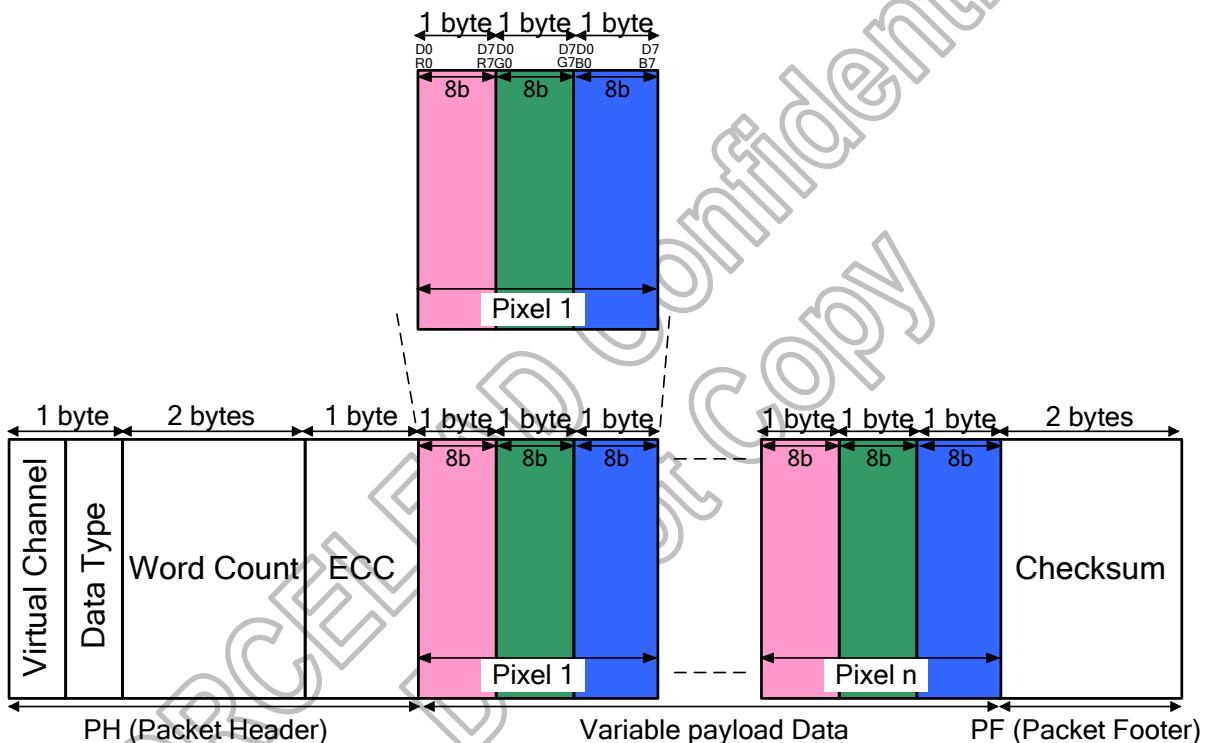
Pixel Stream, 18-bit Format in Three Bytes, Long packet, Data Type = 101110 (2Eh)

Packed Pixel Stream 18-Bit Format is a Long packet used to transmit image data formatted as 18-bit pixels to a Video Mode driver IC. Each R, G, or B color component is six bits but is shifted to the upper bits of the byte, such that the valid pixel bits occupy bits [7:2] of each byte. Bits [1:0] of each payload byte representing active pixels are ignored.



Packed Pixel Stream, 24-bit Format, Long packet, Data Type = 11 1110 (3Eh)

Packed Pixel Stream 24-Bit Format is a Long packet used to transmit image data formatted as 18-bit pixels to a Video Mode driver IC. Pixel format is eight bits red, eight bits green, eight bits blue, in that order.



Acknowledge with Error Report, Data Type = 00 0010(02h)

“Acknowledge with Error Report” is always using a Short Packet, from the driver IC to the HOST. The Packet Data can include bits, which are defining the current error, when a corresponding bit is set to ‘1’, as they are defined on the following table.

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	Reserved
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

These errors of the previous packets can check “Read Display Signal Mode (0Eh)” and “Read Number of the Errors on DSI (05h)” commands. The bit D0 of the “Read Display Signal Mode (0Eh)” command has been set to ‘1’ if a received packet includes an error.

The number of the packets, which are including an ECC or CRC error, are calculated on the RDNUMED register, which can read “Read Number of the Errors on DSI (05h)” command.

DCS Read Long Response, Data Type = 01 1100(1Ch)

DCS Read Long Response is always using a Long Packet, from the driver IC to the Host. “DCS Read Long Response” is used when the driver IC wants to response a DCS Read command, which the Host has sent to the driver IC.

DCS Read Short Response, 1 Byte Returned, Data Type = 10 0001(21h)

DCS Read Short Response, 1 Byte Returned is always using a Short Packet from the driver IC to the Host. “DCS Read Short Response, 1 Byte Returned” is used when the driver IC wants to response a DCS Read command, which the Host has sent to the driver IC.

DCS Read Short Response, 2 Bytes Returned, Data Type = 10 0010(22h)

DCS Read Short Response, 2 Bytes Returned is always using a Short Packet from the driver IC to the Host. “DCS Read Short Response, 2 Bytes Returned” is used when the driver IC wants to response a DCS Read command, which the Host has sent to the driver IC.

Generic Read Long Response, Data Type = 01 1010(1Ah)

Generic Read Long Response is always using a Long Packet from the driver IC to the HOST. “Generic Read Long Response” is used when the driver IC wants to response a Generic Read command.

Generic Read Short Response, 1 Byte Returned, Data Type = 01 0001(11h)

Generic Read Short Response, 1 Byte Returned is always using a Short Packet from the driver IC to the HOST. “Generic Read Short Response, 1 Byte Returned” is used when the driver IC wants to response a Generic Read command, which the HOST has sent to the driver IC.

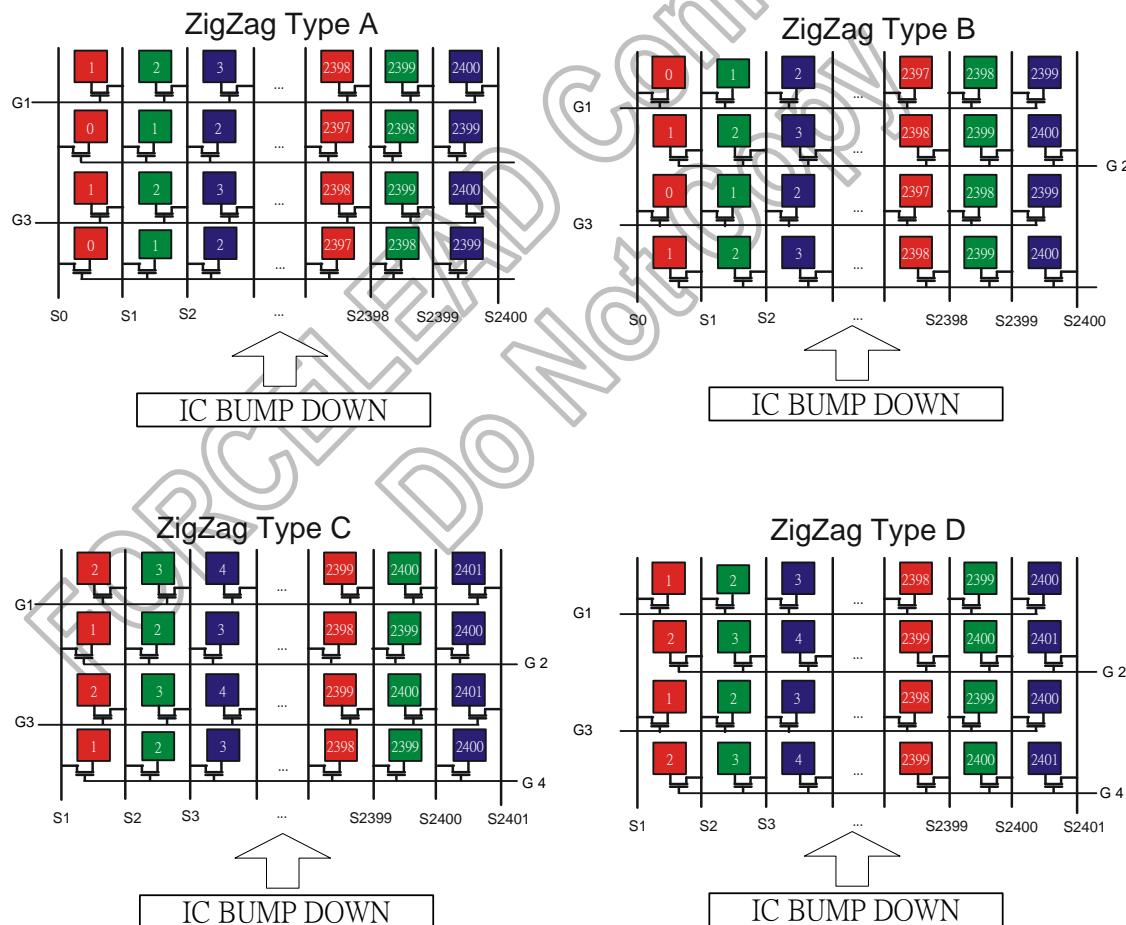
Generic Read Short Response, 2 Bytes Returned, Data Type = 01 0010(12h)

Generic Read Short Response, 2 Bytes Returned is always using a Short Packet from the driver IC to the HOST. “Generic Read Short Response, 2 Bytes Returned” is used when the driver IC wants to response a Generic Read command, which the HOST has sent to the driver IC.

5.3 Inversion

The ST7703 can support the column, 1-dot, 1+2-dot, 2-dot, 3-dot, 4-dot and 8-dot inversion of liquid crystal. These inversions can provide a solution for improving display quality. In determining the inversion drive for the inversion cycle, check the quality of display on the liquid crystal panel.

The ST7703 also can support the ZigZag inversion. Eight kinds of ZigZag inversion can be selected by software setting. These kinds are as below figure:



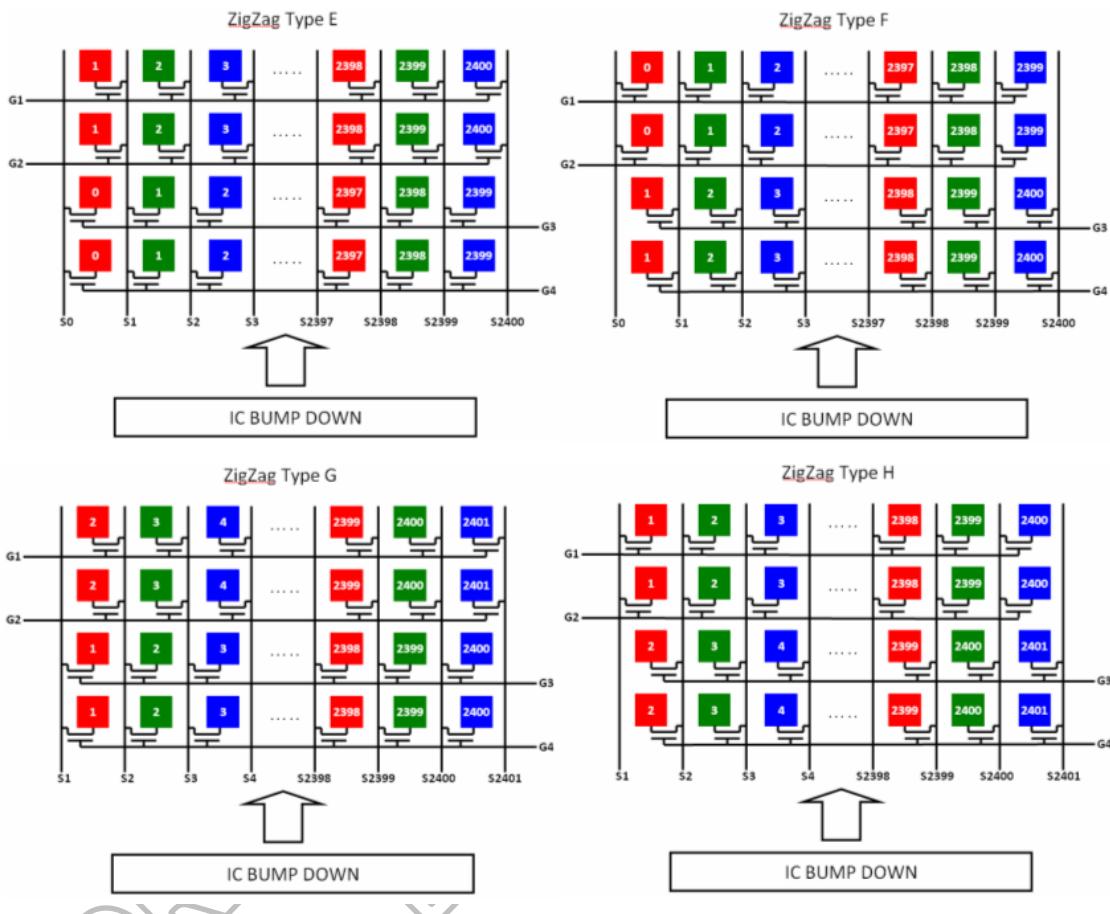


Figure 5.27: Source channels of ZigZag inversion mode

5.4 Gamma Function

The ST7703 offers two kinds of Gamma adjustment ways to come to accord with LC characteristic, one kind is through Source Driver directly, another one is adjusted by the digital gamma correction. The adjustment of digital gamma is selected by internal register DGC_EN bit.

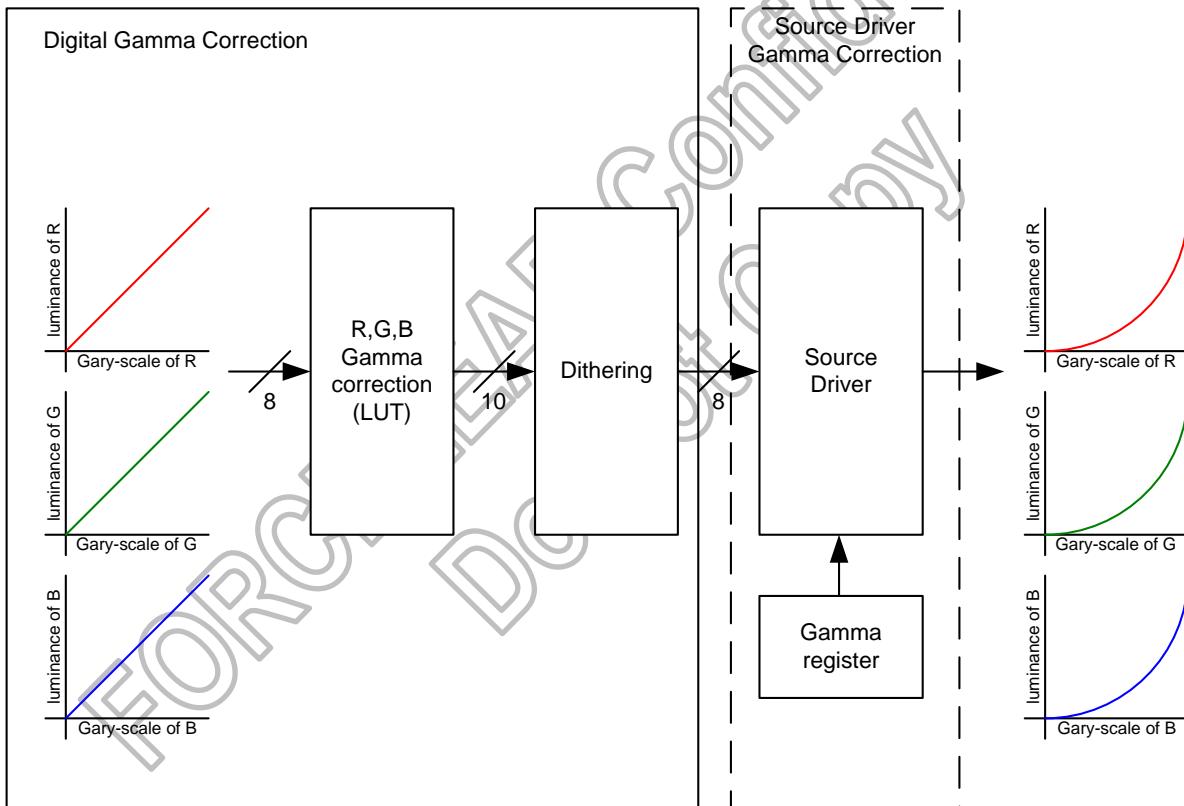
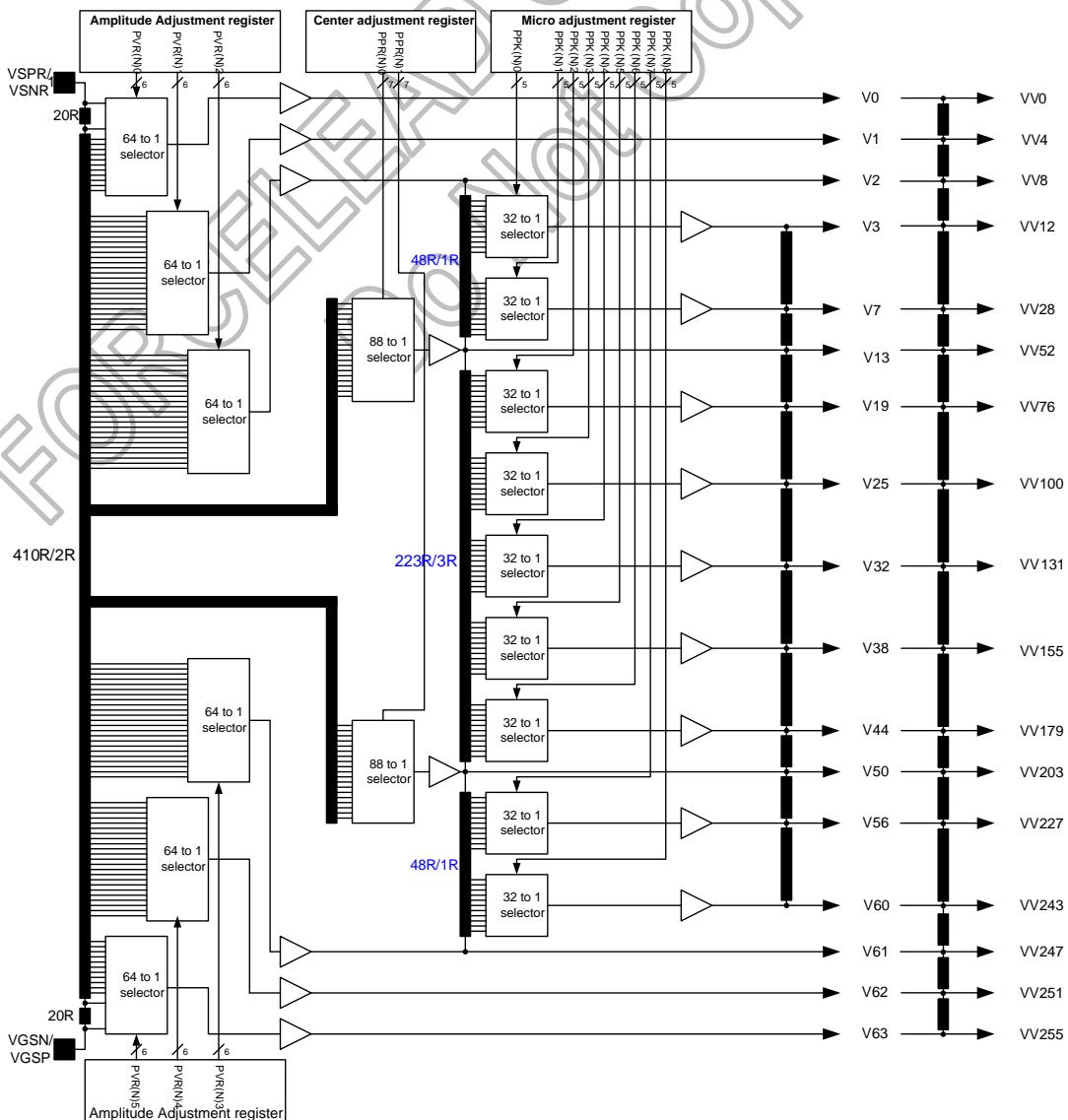


Figure 5.28: Gamma adjustments different of source driver with digital gamma correction

5.4.1 Gamma Characteristic Correction Function

The ST7703 incorporates gamma adjustment function for the 16.7m-color display. Gamma adjustment operation is implemented by deciding the 17 grayscale levels firstly in gamma adjustment control registers to match the LCD panel. These registers are available both for positive polarities and negative polarities.

The block consists of two gamma resistor streams one is for positive polarity and the other is for negative polarity, each one including 17 gamma reference voltages. VgP/N (0, 4, 8, 12, 28, 52, 76, 100, 131, 155, 179, 203, 227, 273, 247, 251, 255).



5.4.2 Gray Voltage Generator for Digital Gamma Correction

The ST7703 digital gamma correction can reach the independent GAMMA curve of RGB. The ST7703 utilizes DGC_LUT (Digital Gamma Correction Look Up Table) to change input data from 8-bit into 10-bit and sends 10-bit data to Dithering circuit, and then drive Source Driver via Dithering circuit. The following of the block diagram of the function.

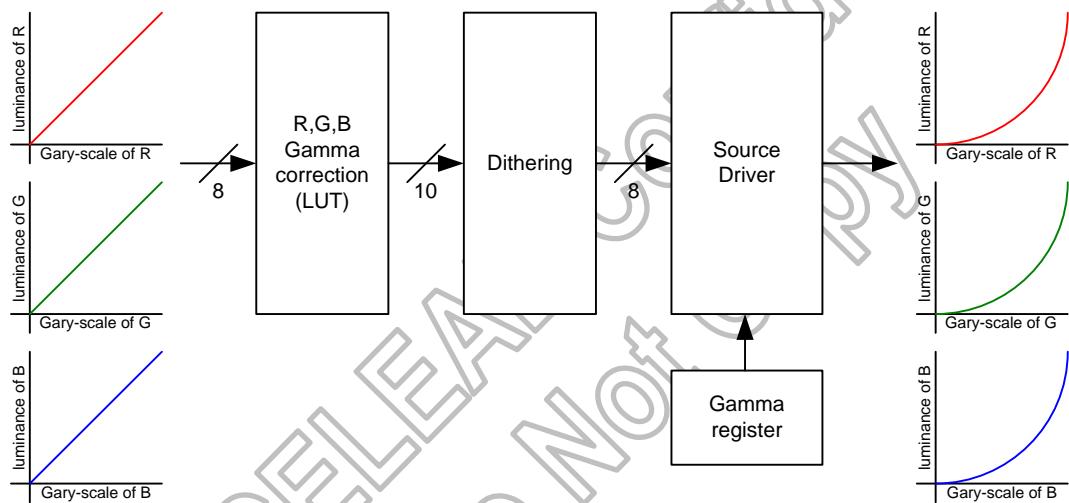


Figure 5.29: Block diagram of digital gamma correction

There are 99 bytes DGC LUT to set R, G, B gamma independently. When DGC_EN=1, R, G, B gamma will mapping V0, V8, V16, ..., V240, V248, V255 voltage to the LUT register setting gray level voltage.

CDh	DGC_R								
Parameter	D7	D6	D5	D4	D3	D2	D1	D0	Default
1st	x	x	x	x	x	x	x	DGC_EN	00
2nd	DGC_LU_T_R00	80							
3rd	DGC_LU_T_R01	80							
:	:	:	:	:	:	:	:	:	:
33rd	DGC_LU_T_R31	80							
34th	DGC_LU_T_R32	80							

CEh	DGC_G								
Parameter	D7	D6	D5	D4	D3	D2	D1	D0	Default
1st	DGC_LU_T_G00	80							
2nd	DGC_LU_T_G01	80							
:	:	:	:	:	:	:	:	:	:
32rd	DGC_LU_T_G31	80							
33th	DGC_LU_T_G32	80							

CFh	DGC_B								
Parameter	D7	D6	D5	D4	D3	D2	D1	D0	Default
1st	DGC_LU_T_B00	80							
2nd	DGC_LU_T_B01	80							
:	:	:	:	:	:	:	:	:	:
32rd	DGC_LU_T_B31	80							
33th	DGC_LU_T_B32	80							

5.5 Sleep Out - command and Self-diagnostic Functions of the display module

5.5.1 Register Loading Detection

Sleep Out-command (11h) is a trigger for an internal function of the display module, which indicates, if the display module loading function of factory default values from OTP (or similar device) to registers of the display controller is working properly. There are compared factory values of the OTP and register values of the display controller by the display controller. If those both values (OTP and register values) are same, there is inverted (=increased by 1) a bit, which is defined in command “Read Display Self-Diagnostic Result (0Fh)” (=RDDSDR) (The used bit of this command is D7). If those both values are not same, this bit (D7) is not inverted (=increased by 1).

The flow chart for this internal function is following:

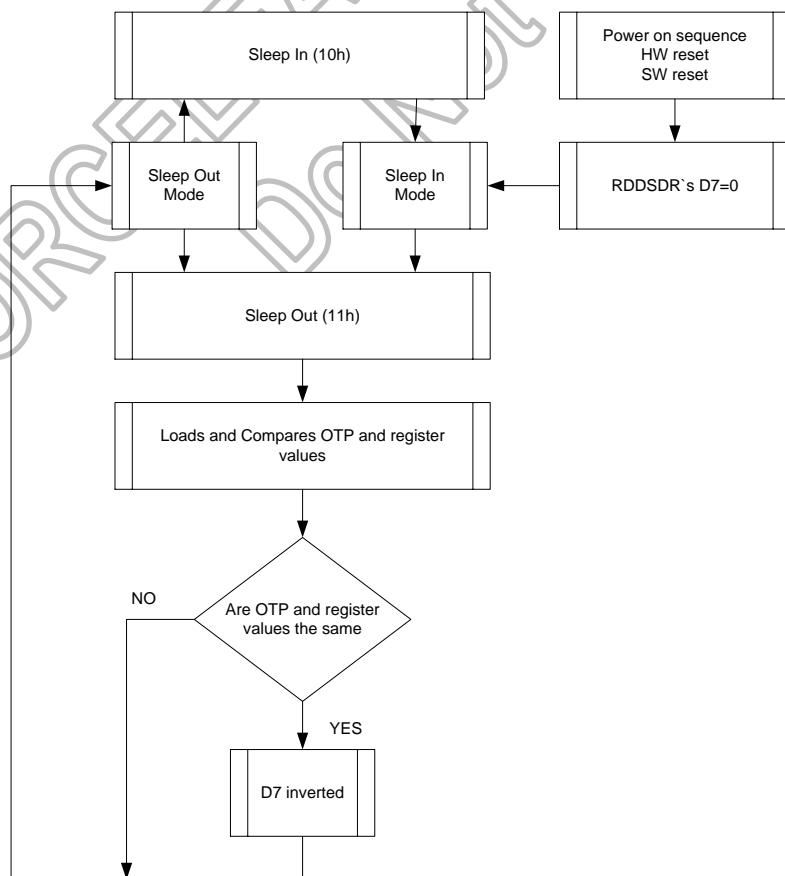


Figure 5.30: Sleep out flow chart—command and self-diagnostic functions

5.5.2 Functionality Detection

Sleep Out-command (11h) is a trigger for an internal function of the display module, which indicates, if the display module is still running and meets functionality requirements.

The internal function is comparing, if the display module still meets functionality requirements (e.g. booster voltage levels, timings, etc.). If functionality requirement is met, 1 bit will be inverted (=increased by 1), which is defined in command “Read Display Self-Diagnostic Result (0Fh)” (=RDDSDR) (The used bit of this command is D6). If functionality requirement is not the same, this bit (D6) is not inverted (=increased by 1). The flow chart for this internal function is shown as below.

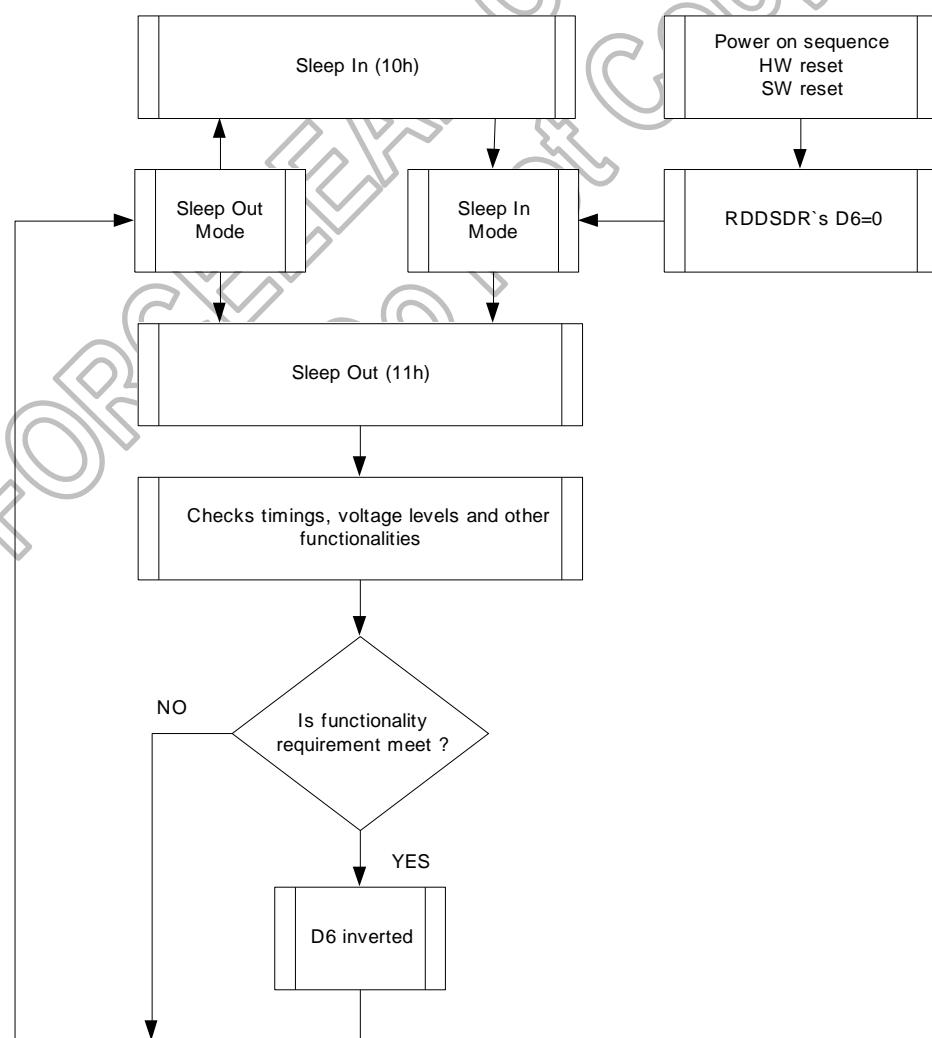


Figure 5.31: Sleep out flow chart internal function detection

5.6 Power on/off Sequence

Power source IOVCC, VCI can be applied and powered down in any order. IOVCC, VCI can be powered down in any order.

During power off, if LCD is in the Sleep Out mode, IOVCC, VCI must be powered down minimum 120msec after NRESET has been released.

During power off, if LCD is in the Sleep In mode, IOVCC, VCI can be powered down minimum 0msec after NRESET has been released.

NCS can be applied at any timing or can be permanently grounded. NRESET has priority over NCS.

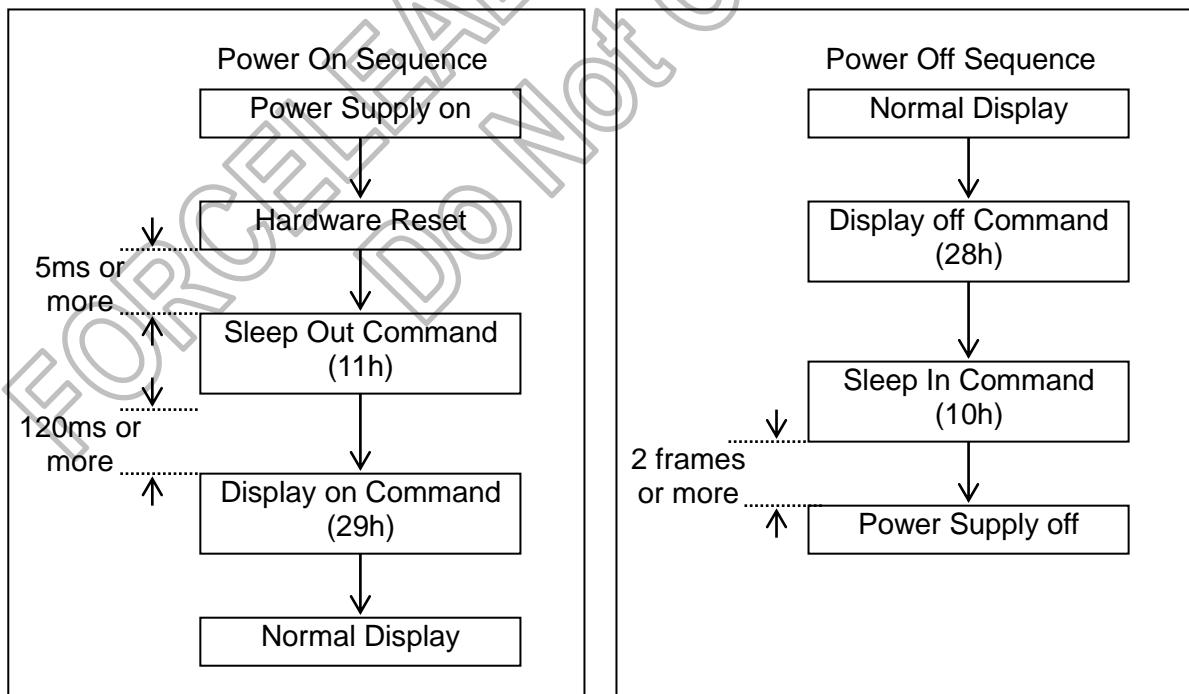


Figure 5.32: The power supply ON/OFF setting for Display ON/OFF and Sleep In/out

5.6.1 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 VDD1, VDD2 and VDD3 have been applied- otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.

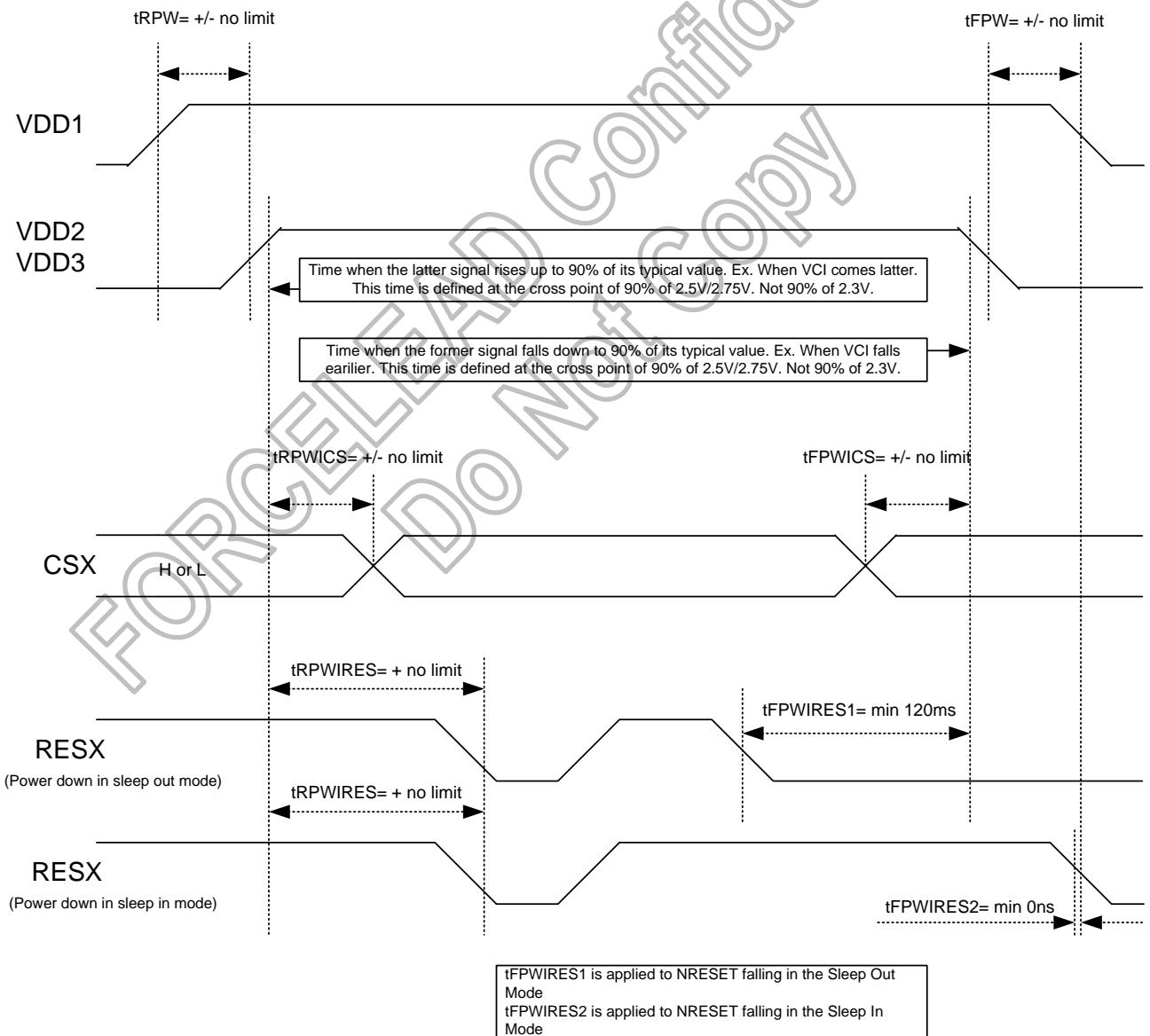
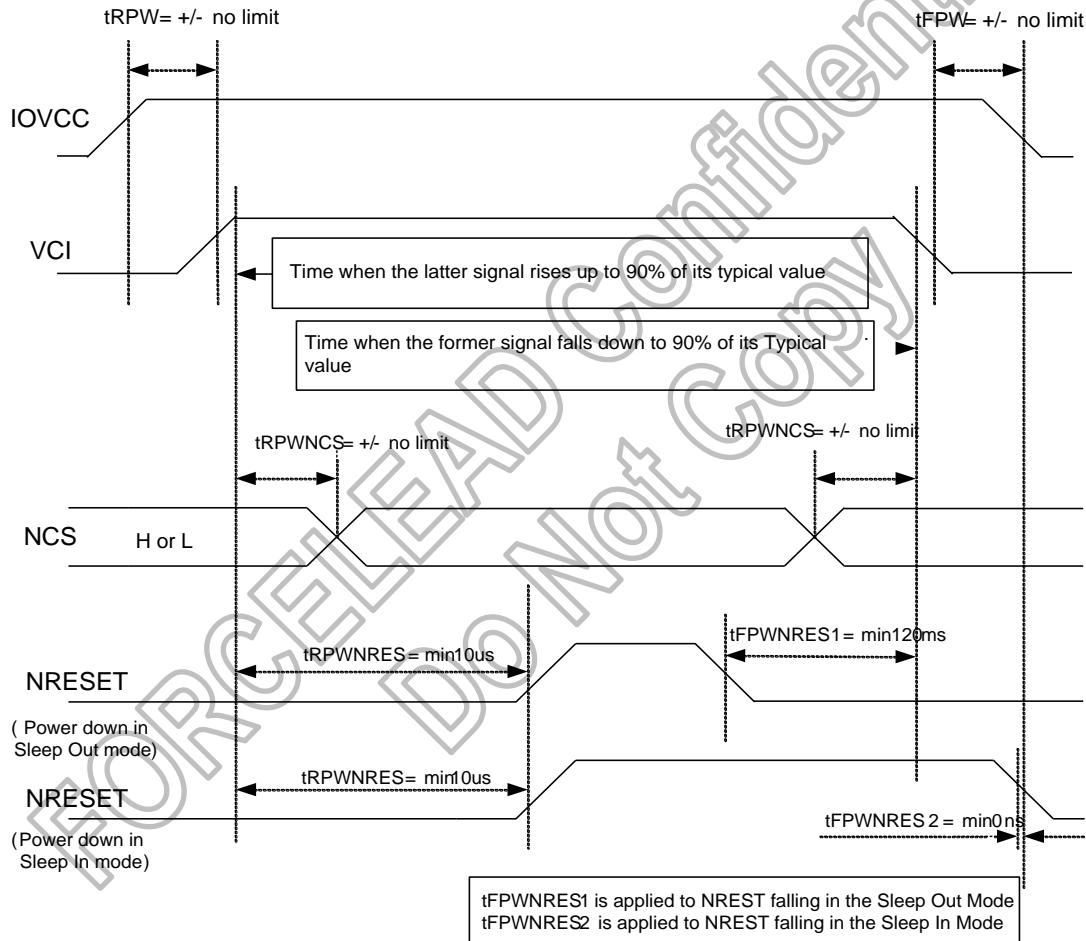


Figure 5.33: Case 1: RESX line is held high or unstable by host at power on

5.6.2 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 10 μ sec after both VDD1, VDD2 and VDD3 have been applied.



Note: Unless otherwise specified timings herein show cross point at 50% of signal/power level

Figure 5.34: Case 2: RESX line is held low by host at power on

5.7 Power Levels Definition

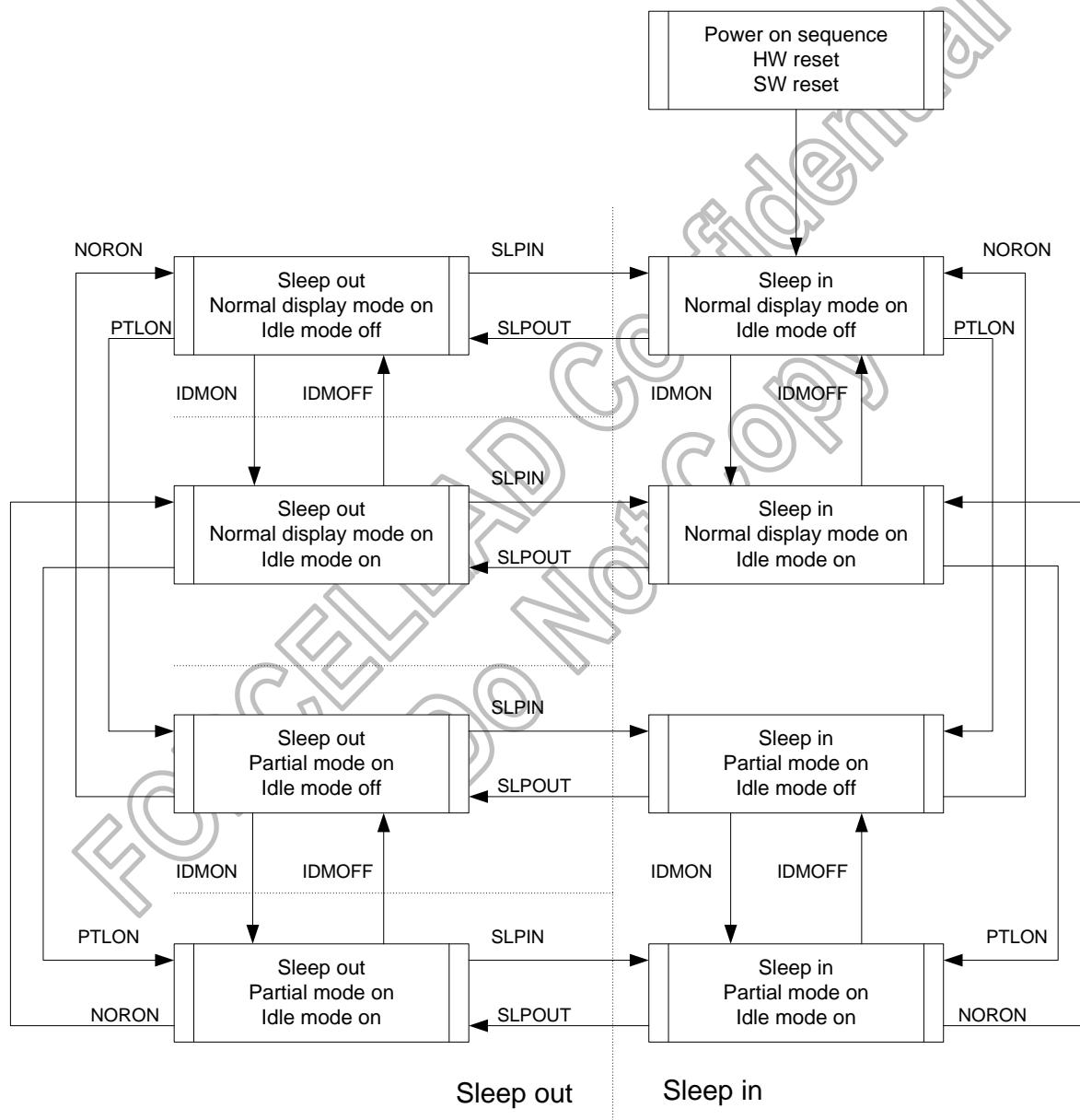


Figure 5.35: Power flow chart for different power modes

5.8 Reset function

5.8.1 Standard Command Default Value

Item	Register	After Power On	After Hardware Reset	After Software Reset
RDDPM	0Ah	08h	08h	08h
RDDMADCTR	0Bh	00h	00h	No Change
RDDCOLMOD	0Ch	70h	70h	No Change
RDDIM	0Dh	00h	00h	00h
RDDSM	0Eh	00h	00h	00h
RDDSDR	0Fh	00h	00h	00h
Sleep In/Out	10h/ 11h	In	In	In
Display On/Off	29h/ 28h	Off	Off	Off
Display mode (normal/partial)	13h/ 12h	Normal	Normal	Normal
Display Inversion On/Off	21h/ 20h	Off	Off	Off
All pixel On/Off	23h/ 22h	Off	Off	Off
Display Idle Mode On/Off	39h/ 38h	Off	Off	Off
Gamma setting	26H	GC0	GC0	GC0
Memory Data Access Control (MY/MX/RGB)	36H	0/0/0/0	0/0/0/0	No Change
Interface Pixel Color Format	3AH	70h	70h	No Change
Display Brightness	51h/ 52h	00h	00h	00h
CTRL Display	53h/ 54h	00h	00h	00h
CABC Control	55h/ 56h	00h	00h	00h
ID1	DAH	NO OTP	38h	38h
		OTPed	OTP Value	OTP Value
ID2	DBH	NO OTP	21h	21h
		OTPed	OTP Value	OTP Value
ID3	DCH	NO OTP	1Fh	1Fh
		OTPed	OTP Value	OTP Value

Table 5.8: Standard Command Default Value

5.8.2 Input Pins

Input pins	After Power On	After Hardware Reset	After Software Reset
RESX	Input valid	Input valid	Input valid
HS_DSI_D0P HS_DSI_D0P	Input valid	Input valid	Input valid
HS_DSI_D1P HS_DSI_D1P	Input valid	Input valid	Input valid
HS_DSI_D2P HS_DSI_D2P	Input valid	Input valid	Input valid
HS_DSI_D3P HS_DSI_D3N	Input valid	Input valid	Input valid
HS_DSI_CP HS_DSI_CN	Input valid	Input valid	Input valid

Table 5.9: Characteristics of Input Pins

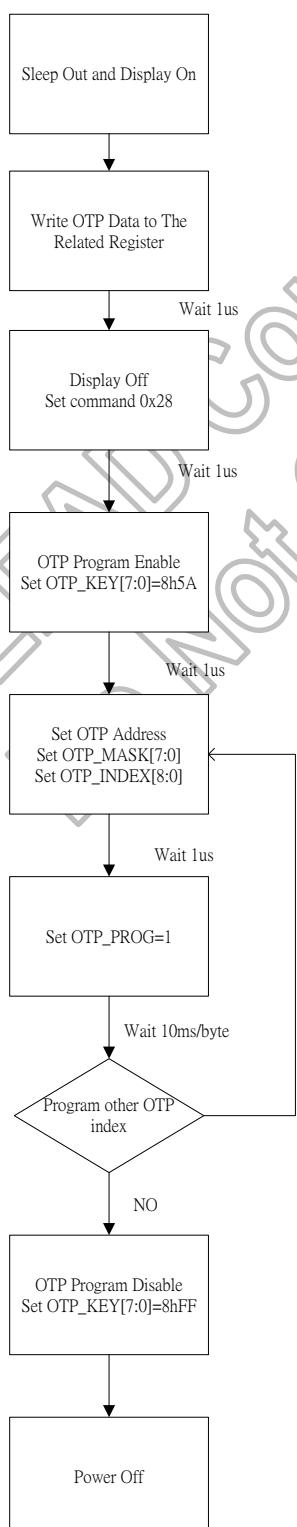
5.8.3 Output or Bi-directional Pins

Output or Bi-directional pins	After Power On	After Hardware Reset	After Software Reset
Source Output	VSSA	VSSA	VSSA
DSI_D0P DSI_D0P	High-Z (Inactive)	High-Z (Inactive)	High-Z (Inactive)
CGOUTL1~22	VSSA	VSSA	VSSA
CGOUTR1~22	VSSA	VSSA	VSSA

Table 5.10: Characteristics of Output or Bi-directional Pins

5.9 OTP Sequence

5.9.1 OTP Sequence



5.9.2 OTP Standard Programming Table

Programming Index (Hex)	D7	D6	D5	D4	D3	D2	D1	D0	Storage Index (Hex)
01	ID1_1[7:0]								01
	ID2_1[7:0]								02
	ID3_1[7:0]								03
	ID1_2[7:0]								04
	ID2_2[7:0]								05
	ID3_2[7:0]								06
	ID1_3[7:0]								07
	ID2_3[7:0]								08
	ID3_3[7:0]								09
	ID1_4[7:0]								0A
	ID2_4[7:0]								0B
	ID3_4[7:0]								0C
0D	VCOM_F1[7:0]								0D
	VCOM_B1[7:0]								0E
	VCOM_F2[7:0]								0F
	VCOM_B2[7:0]								10
	VCOM_F3[7:0]								11
	VCOM_B3[7:0]								12
	VCOM_F4[7:0]								13
	VCOM_B4[7:0]								14

5.10 CABC

This driver IC provides a dynamic backlight control function as CABC (Content adaptive brightness control) to reduce the power consumption of the luminance source. There are two module architectures for CABC operation as below figure.

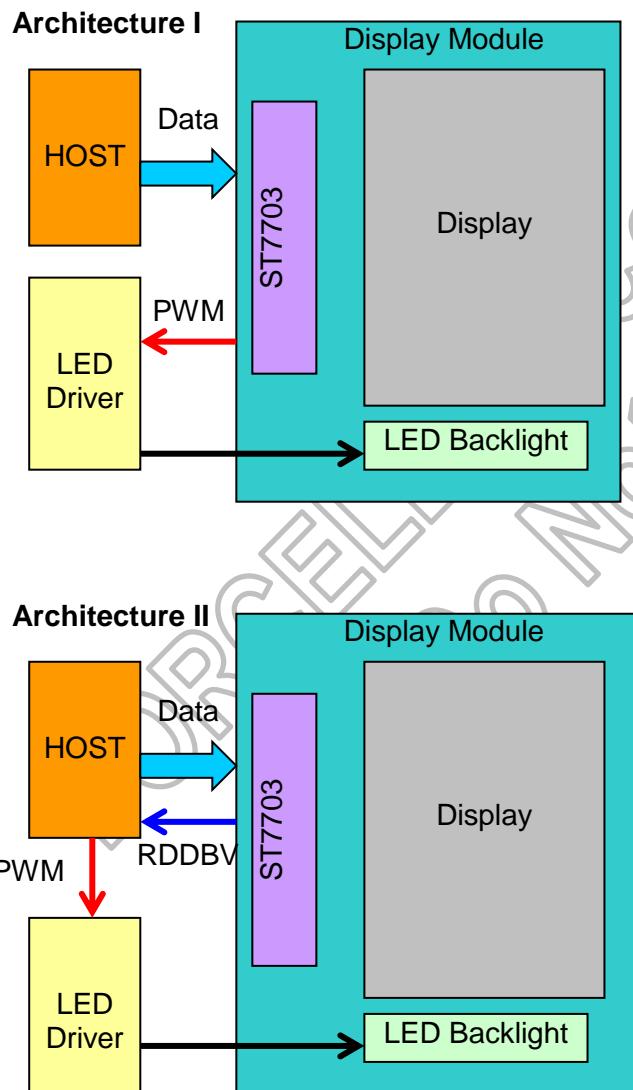
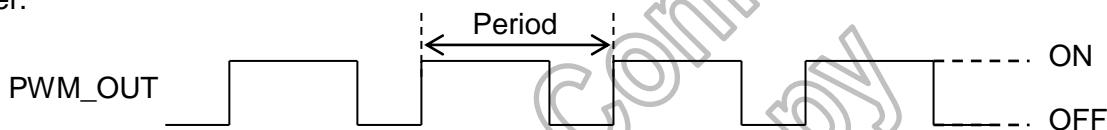


Figure 5.36: Two kinds of CABC Architecture

The driver IC will refer the gray scale content of display image to output a PWM waveform to LED driver for backlight brightness control. The PWM frequency can be adjusted by PWM_DIV parameters and the calculating equation as below:

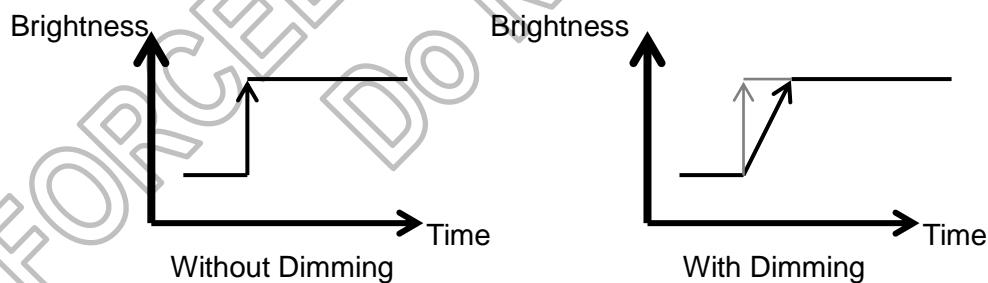
$$F_{\text{pwm_out}} = \frac{36\text{MHz} / (2^{\text{PWMDIV}[2:0]})}{(\text{PWM_PERIOD}[7:0]+1) \times 255}$$

The figure in the following is the basic timing diagram which is applied ST7703 to control LED driver.



Display Backlight Dimming Control

A dimming function is used when changing from brightness level to another. This dimming function curve is the same in increment and decrement directions. Dimming function can be enabled and disabled by software register. The basic idea is described below.



6. Command Description

6.1 Command Table

Standard Command

(Hex)	Operation code	R/W	D7	D6	D5	D4	D3	D2	D1	D0	Function	Default (Hex)
00h	NOP	W	0	0	0	0	0	0	0	0	No Operation	-
01h	SWRESET	W	0	0	0	0	0	0	0	1	Software Reset	-
04h	RDDIDIF	R	0	0	0	0	0	1	0	0	Read Display ID	-
			ID1[7:0]						ID1		83h	
			ID2[7:0]						ID2		12h	
			ID3[7:0]						ID3		F1h	
0Ah	RDDPM	R	0	0	0	0	1	0	1	0	Read display power mode	-
			D7	D6	D5	D4	D3	D2	0	0	-	08h
0Bh	RDDMADCTL	R	0	0	0	0	1	0	1	1	Read display MADCTL	-
			D7	D6	D5	D4	D3	D2	0	0	-	00h
0Ch	RDDCOLMOD	R	0	0	0	0	1	1	0	0	Read display pixel format	-
			-	D6	D5	D4	-	-	-	-	-	70h
0Dh	RDDIM	R	0	0	0	0	1	1	0	1	Read display image mode	-
			D7	D6	D5	0	0	D2	D1	D0	-	00h
0Eh	RDDSM	R	0	0	0	0	1	1	1	0	Read display signal mode	-
			D7	D6	0	0	0	0	0	D0	-	00h
0Fh	RDDSDR	R	0	0	0	0	1	1	1	1	Read display self-diagnostic result	-
			D7	D6	0	0	0	0	0	D0	-	00h
10h	SLPIN	W	0	0	0	1	0	0	0	0	Sleep In	-
11h	SLPOUT	W	0	0	0	1	0	0	0	1	Sleep Out	-

(Hex)	Operation code	R/W	D7	D6	D5	D4	D3	D2	D1	D0	Function	Default (Hex)
13h	NORON	W	0	0	0	1	0	0	1	1	Normal Display mode	-
20h	INVOFF	W	0	0	1	0	0	0	0	0	Display inversion off	-
21h	INVON	W	0	0	1	0	0	0	0	1	Display inversion on	-
22h	ALLPOFF	W	0	0	1	0	0	0	1	0	All pixel off	-
23h	ALLPON	W	0	0	1	0	0	0	1	1	All pixel on	-
28h	DISPOFF	W	0	0	1	0	1	0	0	0	Display off	-
29h	DISPON	W	0	0	1	0	1	0	0	1	Display on	-
36h	MADCTL	W	0	0	1	1	0	1	1	0	Memory Access Control	-
			MY	MX	x	x	RGB	x	x	x		00h
38h	IDMOFF	W	0	0	1	1	1	0	0	0	Idle mode off	-
39h	IDMON	W	0	0	1	1	1	0	0	1	Idle mode on	-
51h	WRDISBV	W	0	1	0	1	0	0	0	1	Write display brightness value	-
			DBV7	DBV6	DBV5	DBV4	DBV3	DBV2	DBV1	DBV0		00h
52h	RDRDISBV	R	0	1	0	1	0	0	1	0	Read display brightness value	-
			DBV7	DBV6	DBV5	DBV4	DBV3	DBV2	DBV1	DBV0		00h
53h	WRCTRLD	W	0	1	0	1	0	0	1	1	Write CTRL display	-
			x	x	BCTRL	x	x	DD	BL	x		00h
54h	RDCTRLD	R	0	1	0	1	0	1	0	0	Read CTRL display	-
			x	x	BCTRL	x	x	DD	BL	x		00h
55h	WRCABC	W	0	1	0	1	0	1	0	1	Write CABC mode	-
			x	x	x	x	x	x	C1	C0		00h
56h	RDCABC	R	0	1	0	1	0	1	1	0	Read CABC mode	-
			x	x	x	x	x	x	C1	C0		00h
68h	RDABCSDR	R	0	1	0	1	0	1	1	0	Read ABC Self-diagnostic result	-
			D7	D6	x	x	x	x	x	x		00h
70	RDBWLB	R	0	1	1	1	0	0	0	0	Read Black/White Low Bits	-
			Bkx1	Bkx0	Bky1	Bky0	Wx1	Wx0	Wy1	Wy0		-
71	RDBkx	R	0	1	1	1	0	0	0	1	Read Bkx	-
			Bkx9	Bkx8	Bkx7	Bkx6	Bkx5	Bkx4	Bkx3	Bkx2		-
72	RDBky	R	0	1	1	1	0	0	1	0	Read Bky	-
			Bky9	Bky8	Bky7	Bky6	Bky5	Bky4	Bky3	Bky2		-
73	RDWx	R	0	1	1	1	0	0	1	1	Read Wx	-
			Wx9	Wx8	Wx7	Wx6	Wx5	Wx4	Wx3	Wx2		-
74	RDWy	R	0	1	1	1	0	1	0	0	Read Wy	-
			Wy9	Wy8	Wy7	Wy6	Wy5	Wy4	Wy3	Wy2		-
75	RDRGLB	R	0	1	1	1	0	1	0	1	Read Red/Green Low Bits	-
			Rx1	Rx0	Ry1	Rx0	Gx1	Gx0	Gy1	Gy0		-
76	RDRx	R	0	1	1	1	0	1	1	0	Read Rx	-
			Rx9	Rx8	Rx7	Rx6	Rx5	Rx4	Rx3	Rx2		-

(Hex)	Operation code	R/W	D7	D6	D5	D4	D3	D2	D1	D0	Function	Default (Hex)
77	RDRy	R	0	1	1	1	0	1	1	1	Read Ry	-
			Ry9	Ry8	Ry7	Ry6	Ry5	Ry4	Ry3	Ry2		-
78	RDGx	R	0	1	1	1	1	0	0	0	Read Gx	-
			Gx9	Gx8	Gx7	Gx6	Gx5	Gx4	Gx3	Gx2		-
79	RDRy	R	0	1	1	1	1	0	0	1	Read Gy	-
			Gy9	Gy8	Gy7	Gy6	Gy5	Gy4	Gy3	Gy2		-
7A	RDBALB	R	0	1	1	1	1	0	1	0	Read Blue/A Colour Low Bits	-
			Bx1	Bx0	By1	Bx0	Ax1	Ax0	Ay1	Ay0		-
7B	RDBx	R	0	1	1	1	1	0	1	1	Read Bx	-
			Bx9	Bx8	Bx7	Bx6	Bx5	Bx4	Bx3	Bx2		-
7C	RDBy	R	0	1	1	1	1	1	0	0	Read By	-
			By9	By8	By7	By6	By5	By4	By3	By2		-
7D	RDAx	R	0	1	1	1	1	1	0	1	Read Ax	-
			Ax9	Ax8	Ax7	Ax6	Ax5	Ax4	Ax3	Ax2		-
7E	RDAY	R	0	1	1	1	1	1	1	0	Read Ay	-
			Ay9	Ay8	Ay7	Ay6	Ay5	Ay4	Ay3	Ay2		-
A1	Read_DDB_start	R	1	0	1	0	0	0	0	1	Read the DDB from the provided location.	-
			x	x	x	x	x	x	x	x		-
			x	x	x	x	x	x	x	x		00h
			x	x	x	x	x	x	x	x		00h
			x	x	x	x	x	x	x	x		00h
			1	1	1	1	1	1	1	1		FFh
			1	0	1	0	1	0	0	0		-
A8	Read_DDB_continue	R	x	x	x	x	x	x	x	x	Continue reading the DDB from the last read location.	00h
			x	x	x	x	x	x	x	x		00h
			x	x	x	x	x	x	x	x		00h
			x	x	x	x	x	x	x	x		00h
			1	1	x	x	x	x	x	x		00h
DA	RDID1	R	1	1	0	1	1	0	1	0	Read ID1	-
			module's manufacturer[7:0]									38h
DB	RDID2	R	1	1	0	1	1	0	1	1	Read ID2	-
			LCD module/driver version [7:0]									21h
DC	RDID3	R	1	1	0	1	1	1	0	0	Read ID3	-
			LCD module/driver ID[7:0]									1Fh

User Command

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
B9h	SETEXTC		1	0	1	1	1	0	0	1	-
		1	EXTC1[7] 1	EXTC1[6]	EXTC1[5]	EXTC1[4]	EXTC1[3]	EXTC1[2]	EXTC1[1]	EXTC1[0]	00
		2	EXTC2[7] 1	EXTC2[6]	EXTC2[5]	EXTC2[4]	EXTC2[3]	EXTC2[2]	EXTC2[1]	EXTC2[0]	00
		3	EXTC3[7] 1	EXTC3[6]	EXTC3[5]	EXTC3[4]	EXTC3[3]	EXTC3[2]	EXTC3[1]	EXTC3[0]	00
B2h	SETDISP		1	0	1	1	0	0	1	0	
		1	NL[7]	NL[6]	NL[5]	NL[4]	NL[3]	NL[2]	NL[1]	NL[0]	C8
		2	RES_V_LSB[1]	RES_V_LSB[0]	BLK_CON[1]	BLK_CON[0]	x	RESO_SE_L[2]	RESO_SE_L[1]	RESO_SE_L[0]	12
		3	WHITE_GND_EN	WHITE_F RAME_S EL[2]	WHITE_F RAME_S EL[1]	WHITE_F RAME_S EL[0]	x	ISC[2]	ISC[1]	ISC[0]	A0
B3h	SETRGBIF		1	0	1	1	0	0	1	1	
		1	VBP_RG_B_GEN[7] 1	VBP_RGB_GEN[6]	VBP_RGB_GEN[5]	VBP_RGB_GEN[4]	VBP_RGB_GEN[3]	VBP_RGB_GEN[2]	VBP_RGB_GEN[1]	VBP_RGB_GEN[0]	28
		2	VFP_RG_B_GEN[7] 1	VFP_RGB_GEN[6]	VFP_RGB_GEN[5]	VFP_RGB_GEN[4]	VFP_RGB_GEN[3]	VFP_RGB_GEN[2]	VFP_RGB_GEN[1]	VFP_RGB_GEN[0]	28
		3	DE_BP_RGB_GEN_N[7]	DE_BP_R GB_GEN[6]	DE_BP_R GB_GEN[5]	DE_BP_R GB_GEN[4]	DE_BP_R GB_GEN[3]	DE_BP_R GB_GEN[2]	DE_BP_R GB_GEN[1]	DE_BP_R GB_GEN[0]	28
		4	DE_FP_RGB_GEN_N[7]	DE_FP_R GB_GEN[6]	DE_FP_R GB_GEN[5]	DE_FP_R GB_GEN[4]	DE_FP_R GB_GEN[3]	DE_FP_R GB_GEN[2]	DE_FP_R GB_GEN[1]	DE_FP_R GB_GEN[0]	28
B4h	SETCYC		1	0	1	1	0	1	0	0	
		1	ZINV_S2_401_EN	ZINV_G_EVEN_EN	ZINV_EN	ZINV2_E_N	x	N_NW[2]	N_NW[1]	N_NW[0]	80
		2	x	x	x	x	x	I_NW[2]	I_NW[1]	I_NW[0]	00

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
B5h	SETBGP	1	0	1	1	0	1	0	1	1	
		1	x	x	x	VREF_SE_L[4]	VREF_SE_L[3]	VREF_SE_L[2]	VREF_SE_L[1]	VREF_SE_L[0]	09
		2	x	x	x	NVREF_SEL[4]	NVREF_SEL[3]	NVREF_SEL[2]	NVREF_SEL[1]	NVREF_SEL[0]	09
B6h	SETCOM	1	0	1	1	0	1	1	0		
		1	VCOMDC_C_F[7]	VCOMDC_F[6]	VCOMDC_F[5]	VCOMDC_F[4]	VCOMDC_F[3]	VCOMDC_F[2]	VCOMDC_F[1]	VCOMDC_F[0]	4D
		2	VCOMDC_C_B[7]	VCOMDC_B[6]	VCOMDC_B[5]	VCOMDC_B[4]	VCOMDC_B[3]	VCOMDC_B[2]	VCOMDC_B[1]	VCOMDC_B[0]	4D
		3	x	x	x	x	x	VCOM_O_TP_TIME[2]	VCOM_O_TP_TIME[1]	VCOM_O_TP_TIME[0]	00
B7h	SETOTP	1	0	1	1	0	1	1	1	1	-
		1	OTP_KEY_Y[7]	OTP_KEY[6]	OTP_KEY[5]	OTP_KEY[4]	OTP_KEY[3]	OTP_KEY[2]	OTP_KEY[1]	OTP_KEY[0]	FF
		2	OTP_MAC_SK[7]	OTP_MAC_SK[6]	OTP_MAC_SK[5]	OTP_MAC_SK[4]	OTP_MAC_SK[3]	OTP_MAC_SK[2]	OTP_MAC_SK[1]	OTP_MAC_SK[0]	00
		3	x	VPP_SEL[2]	VPP_SEL[1]	VPP_SEL[0]	x	x	x	OTP_IND_EX[8]	30
		4	OTP_IND_EX[7]	OTP_IND_EX[6]	OTP_IND_EX[5]	OTP_IND_EX[4]	OTP_IND_EX[3]	OTP_IND_EX[2]	OTP_IND_EX[1]	OTP_IND_EX[0]	00
		5	Load_DI_S	VPP_EN	OTP_SEL	OTP_PWE	OTP_PTM[1]	OTP_PTM[0]	OTP_POR	OTP_POR	00
		6	OTP_DA_TA[7]	OTP_DAT_A[6]	OTP_DAT_A[5]	OTP_DAT_A[4]	OTP_DAT_A[3]	OTP_DAT_A[2]	OTP_DAT_A[1]	OTP_DAT_A[0]	00
B8h	SET POWER_EXT	1	0	1	1	1	0	0	0	0	
		1	x	PCCS[2]	PCCS[1]	PCCS[0]	ECP_DC_DIV[3]	ECP_DC_DIV[2]	ECP_DC_DIV[1]	ECP_DC_DIV[0]	34
		2	x	SINGLE_PUMP	DT[1]	DT[0]	SYNC_STB	XDK_ECP[1]	XDK_ECP[0]	x	22
		3	x	x	x	x	x	PFM_DC_DIV[2]	PFM_DC_DIV[1]	PFM_DC_DIV[0]	00
		4	x	x	x	x	x	x	ECP_SYN_C_EN	VGX_SYN_C_EN	03
		5	A_DC[1]	A_DC[0]	A_DTP[2]	A_DTP[1]	A_DTP[0]	A_DTN[2]	A_DTN[1]	A_DTN[0]	ED
BAh	SETMIPI	1	0	1	1	1	0	1	0		
		1	x	x	x	x	VC_Main[1]	VC_Main[0]	Lane_Number[1]	Lane_Number[0]	33
		2	DSI_LDO_SEL[2]	DSI_LDO_SEL[1]	DSI_LDO_SEL[0]	x	x	x	RTERM[1]	RTERM[0]	61
		3	x	x	x	x	IHSRX[3]	IHSRX[2]	IHSRX[1]	IHSRX[0]	06
		4	x	x	x	x	Tx_clk_sel[1]	Tx_clk_sel[0]	x	x	F9
		5	HFP_OS_C[7]	HFP_OS_C[6]	HFP_OS_C[5]	HFP_OS_C[4]	HFP_OS_C[3]	HFP_OS_C[2]	HFP_OS_C[1]	HFP_OS_C[0]	FF
		6	HBP_OS_C[7]	HBP_OS_C[6]	HBP_OS_C[5]	HBP_OS_C[4]	HBP_OS_C[3]	HBP_OS_C[2]	HBP_OS_C[1]	HBP_OS_C[0]	0A

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
BCh	SET VDC		1	0	1	1	1	1	0	0	
		1	x	NVDDD_SEL[2]	NVDDD_SEL[1]	NVDDD_SEL[0]	x	VDDD_SE_L[2]	VDDD_SE_L[1]	VDDD_SE_L[0]	47
C0h	SETSCR		1	1	0	0	0	0	0	0	-
		1	N_POPO_N[7]	N_POPO_N[6]	N_POPO_N[5]	N_POPO_N[4]	N_POPO_N[3]	N_POPO_N[2]	N_POPO_N[1]	N_POPO_N[0]	73
		2	N_NOPO_N[7]	N_NOPO_N[6]	N_NOPO_N[5]	N_NOPO_N[4]	N_NOPO_N[3]	N_NOPO_N[2]	N_NOPO_N[1]	N_NOPO_N[0]	73
		3	I_POPON[7]	I_POPON[6]	I_POPON[5]	I_POPON[4]	I_POPON[3]	I_POPON[2]	I_POPON[1]	I_POPON[0]	50
		4	I_NOPON[7]	I_NOPON[6]	I_NOPON[5]	I_NOPON[4]	I_NOPON[3]	I_NOPON[2]	I_NOPON[1]	I_NOPON[0]	50
		5	SCR[31]	SCR[30]	SCR[29]	SCR[28]	SCR[27]	SCR[26]	SCR[25]	SCR[24]	C0
		6	SCR[23]	SCR[22]	SCR[21]	SCR[20]	SCR[19]	SCR[18]	SCR[17]	SCR[16]	00
		7	SCR[15]	SCR[14]	SCR[13]	SCR[12]	SCR[11]	SCR[10]	SCR[9]	SCR[8]	08
		8	SCR[7]	SCR[6]	SCR[5]	SCR[4]	SCR[3]	SCR[2]	SCR[1]	SCR[0]	70
C1h	SETPOWER		1	1	0	0	0	0	0	1	-
		1	VBTHS[3]	VBTHS[2]	VBTHS[1]	VBTHS[0]	VBTLS[3]	VBTLS[2]	VBTLS[1]	VBTLS[0]	53
		2	FBOFF_V_GH	FBOFF_V_GL	x	x	x	x	x	x	53
		3	x	x	VRP[5]	VRP[4]	VRP[3]	VRP[2]	VRP[1]	VRP[0]	C0
		4	x	x	VRN[5]	VRN[4]	VRN[3]	VRN[2]	VRN[1]	VRN[0]	16
		5	x	x	x	x	x	x	x	x	00
		6	VGL_DET_EN	VGH_DET_EN	VGL_TUR_BO	VGH_TU_RBO	x	APS[2]	APS[1]	APS[0]	77
		7	VGH1_L_DIV[3]	VGH1_L_DIV[2]	VGH1_L_DIV[1]	VGH1_L_DIV[0]	VGL1_L_DIV[3]	VGL1_L_DIV[2]	VGL1_L_DIV[1]	VGL1_L_DIV[0]	D1
		8	VGH1_R_DIV[3]	VGH1_R_DIV[2]	VGH1_R_DIV[1]	VGH1_R_DIV[0]	VGL1_R_DIV[3]	VGL1_R_DIV[2]	VGL1_R_DIV[1]	VGL1_R_DIV[0]	CC
		9	VGH2_L_DIV[3]	VGH2_L_DIV[2]	VGH2_L_DIV[1]	VGH2_L_DIV[0]	VGL2_L_DIV[3]	VGL2_L_DIV[2]	VGL2_L_DIV[1]	VGL2_L_DIV[0]	DD
		10	VGH2_R_DIV[3]	VGH2_R_DIV[2]	VGH2_R_DIV[1]	VGH2_R_DIV[0]	VGL2_R_DIV[3]	VGL2_R_DIV[2]	VGL2_R_DIV[1]	VGL2_R_DIV[0]	67
		11	VGH3_L_DIV[3]	VGH3_L_DIV[2]	VGH3_L_DIV[1]	VGH3_L_DIV[0]	VGL3_L_DIV[3]	VGL3_L_DIV[2]	VGL3_L_DIV[1]	VGL3_L_DIV[0]	77
		12	VGH3_R_DIV[3]	VGH3_R_DIV[2]	VGH3_R_DIV[1]	VGH3_R_DIV[0]	VGL3_R_DIV[3]	VGL3_R_DIV[2]	VGL3_R_DIV[1]	VGL3_R_DIV[0]	33
		13	VGH4_L_DIV[3]	VGH4_L_DIV[2]	VGH4_L_DIV[1]	VGH4_L_DIV[0]	VGL4_L_DIV[3]	VGL4_L_DIV[2]	VGL4_L_DIV[1]	VGL4_L_DIV[0]	33
		14	VGH4_R_DIV[3]	VGH4_R_DIV[2]	VGH4_R_DIV[1]	VGH4_R_DIV[0]	VGL4_R_DIV[3]	VGL4_R_DIV[2]	VGL4_R_DIV[1]	VGL4_R_DIV[0]	11
		15	VGH5_L_DIV[3]	VGH5_L_DIV[2]	VGH5_L_DIV[1]	VGH5_L_DIV[0]	VGL5_L_DIV[3]	VGL5_L_DIV[2]	VGL5_L_DIV[1]	VGL5_L_DIV[0]	11
		16	VGH5_R_DIV[3]	VGH5_R_DIV[2]	VGH5_R_DIV[1]	VGH5_R_DIV[0]	VGL5_R_DIV[3]	VGL5_R_DIV[2]	VGL5_R_DIV[1]	VGL5_R_DIV[0]	00
C3h	SETID		1	1	0	0	0	0	1	1	-
		1	ID1[7]	ID1[6]	ID1[5]	ID1[4]	ID1[3]	ID1[2]	ID1[1]	ID1[0]	38h
		2	ID2[7]	ID2[6]	ID2[5]	ID2[4]	ID2[3]	ID2[2]	ID2[1]	ID2[0]	21h
		3	ID3[7]	ID3[6]	ID3[5]	ID3[4]	ID3[3]	ID3[2]	ID3[1]	ID3[0]	1Fh
C4h	SETDDB							ID_TIMES_2	ID_TIMES_1	ID_TIMES_0	
		1	DDB1[7]	DDB1[6]	DDB1[5]	DDB1[4]	DDB1[3]	DDB1[2]	DDB1[1]	DDB1[0]	00h
		2	DDB2[7]	DDB2[6]	DDB2[5]	DDB2[4]	DDB2[3]	DDB2[2]	DDB2[1]	DDB2[0]	00h
		3	DDB3[7]	DDB3[6]	DDB3[5]	DDB3[4]	DDB3[3]	DDB3[2]	DDB3[1]	DDB3[0]	00h
		4	DDB4[7]	DDB4[6]	DDB4[5]	DDB4[4]	DDB4[3]	DDB4[2]	DDB4[1]	DDB4[0]	00h

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
C7h	SETIO		1	1	0	0	0	1	1	1	-
		1	PWM_OE	x	INVPWM	VOUT_O_E	HOUT_O_E	x	x	x	00
		2	x	V_DELAY[2]	V_DELAY[1]	V_DELAY[0]	x	H_DELAY[2]	H_DELAY[1]	H_DELAY[0]	00
C8h	SETCABC		1	1	0	0	1	0	0	0	-
		1	x	PWMDIV[2]	PWMDIV[1]	PWMDIV[0]	x	x	x	x	10
		2	PWM_PE_RIOD[7]	PWM_PE_RIOD[6]	PWM_PE_RIOD[5]	PWM_PE_RIOD[4]	PWM_PE_RIOD[3]	PWM_PE_RIOD[2]	PWM_PE_RIOD[1]	PWM_PE_RIOD[0]	40
CCh	SETPANEL		1	1	0	0	1	1	0	0	-
		1	x	x	x	x	SS_PANE_L	GS_PANE_L	REV_PAN_EL	BGR_PA_NEL	00h
			1	1	0	0	1	1	0	1	-
CDh	DGC_R	1	x	x	x	x	x	DITH_EN	DITH_OP_T	DGC_EN	00
		2	DGC_LUT_R00[7]	DGC_LUT_R00[6]	DGC_LUT_R00[5]	DGC_LUT_R00[4]	DGC_LUT_R00[3]	DGC_LUT_R00[2]	DGC_LUT_R00[1]	DGC_LUT_R00[0]	80
		3	DGC_LUT_R01[7]	DGC_LUT_R01[6]	DGC_LUT_R01[5]	DGC_LUT_R01[4]	DGC_LUT_R01[3]	DGC_LUT_R01[2]	DGC_LUT_R01[1]	DGC_LUT_R01[0]	80
		4	DGC_LUT_R02[7]	DGC_LUT_R02[6]	DGC_LUT_R02[5]	DGC_LUT_R02[4]	DGC_LUT_R02[3]	DGC_LUT_R02[2]	DGC_LUT_R02[1]	DGC_LUT_R02[0]	80
		:	:	:	:	:	:	:	:	:	
		10	DGC_LUT_R08[7]	DGC_LUT_R08[6]	DGC_LUT_R08[5]	DGC_LUT_R08[4]	DGC_LUT_R08[3]	DGC_LUT_R08[2]	DGC_LUT_R08[1]	DGC_LUT_R08[0]	80
		11	DGC_LUT_R09[7]	DGC_LUT_R09[6]	DGC_LUT_R09[5]	DGC_LUT_R09[4]	DGC_LUT_R09[3]	DGC_LUT_R09[2]	DGC_LUT_R09[1]	DGC_LUT_R09[0]	80
		12	DGC_LUT_R10[7]	DGC_LUT_R10[6]	DGC_LUT_R10[5]	DGC_LUT_R10[4]	DGC_LUT_R10[3]	DGC_LUT_R10[2]	DGC_LUT_R10[1]	DGC_LUT_R10[0]	80
		13	DGC_LUT_R11[7]	DGC_LUT_R11[6]	DGC_LUT_R11[5]	DGC_LUT_R11[4]	DGC_LUT_R11[3]	DGC_LUT_R11[2]	DGC_LUT_R11[1]	DGC_LUT_R11[0]	80
		:	:	:	:	:	:	:	:	:	
		20	DGC_LUT_R18[7]	DGC_LUT_R18[6]	DGC_LUT_R18[5]	DGC_LUT_R18[4]	DGC_LUT_R18[3]	DGC_LUT_R18[2]	DGC_LUT_R18[1]	DGC_LUT_R18[0]	80
		21	DGC_LUT_R19[7]	DGC_LUT_R19[6]	DGC_LUT_R19[5]	DGC_LUT_R19[4]	DGC_LUT_R19[3]	DGC_LUT_R19[2]	DGC_LUT_R19[1]	DGC_LUT_R19[0]	80
		22	DGC_LUT_R20[7]	DGC_LUT_R20[6]	DGC_LUT_R20[5]	DGC_LUT_R20[4]	DGC_LUT_R20[3]	DGC_LUT_R20[2]	DGC_LUT_R20[1]	DGC_LUT_R20[0]	80
		23	DGC_LUT_R21[7]	DGC_LUT_R21[6]	DGC_LUT_R21[5]	DGC_LUT_R21[4]	DGC_LUT_R21[3]	DGC_LUT_R21[2]	DGC_LUT_R21[1]	DGC_LUT_R21[0]	80
		:	:	:	:	:	:	:	:	:	
		31	DGC_LUT_R29[7]	DGC_LUT_R29[6]	DGC_LUT_R29[5]	DGC_LUT_R29[4]	DGC_LUT_R29[3]	DGC_LUT_R29[2]	DGC_LUT_R29[1]	DGC_LUT_R29[0]	80
		32	DGC_LUT_R30[7]	DGC_LUT_R30[6]	DGC_LUT_R30[5]	DGC_LUT_R30[4]	DGC_LUT_R30[3]	DGC_LUT_R30[2]	DGC_LUT_R30[1]	DGC_LUT_R30[0]	80
		33	DGC_LUT_R31[7]	DGC_LUT_R31[6]	DGC_LUT_R31[5]	DGC_LUT_R31[4]	DGC_LUT_R31[3]	DGC_LUT_R31[2]	DGC_LUT_R31[1]	DGC_LUT_R31[0]	80
		34	DGC_LUT_R32[7]	DGC_LUT_R32[6]	DGC_LUT_R32[5]	DGC_LUT_R32[4]	DGC_LUT_R32[3]	DGC_LUT_R32[2]	DGC_LUT_R32[1]	DGC_LUT_R32[0]	80

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
CEh	DGC_G	1	1	0	0	1	1	1	1	0	
		1	DGC_LUT_G00[7]	DGC_LUT_G00[6]	DGC_LUT_G00[5]	DGC_LUT_G00[4]	DGC_LUT_G00[3]	DGC_LUT_G00[2]	DGC_LUT_G00[1]	DGC_LUT_G00[0]	80
		2	DGC_LUT_G01[7]	DGC_LUT_G01[6]	DGC_LUT_G01[5]	DGC_LUT_G01[4]	DGC_LUT_G01[3]	DGC_LUT_G01[2]	DGC_LUT_G01[1]	DGC_LUT_G01[0]	80
		3	DGC_LUT_G02[7]	DGC_LUT_G02[6]	DGC_LUT_G02[5]	DGC_LUT_G02[4]	DGC_LUT_G02[3]	DGC_LUT_G02[2]	DGC_LUT_G02[1]	DGC_LUT_G02[0]	80
		4	DGC_LUT_G03[7]	DGC_LUT_G03[6]	DGC_LUT_G03[5]	DGC_LUT_G03[4]	DGC_LUT_G03[3]	DGC_LUT_G03[2]	DGC_LUT_G03[1]	DGC_LUT_G03[0]	80
		:	:	:	:	:	:	:	:	:	
		10	DGC_LUT_G09[7]	DGC_LUT_G09[6]	DGC_LUT_G09[5]	DGC_LUT_G09[4]	DGC_LUT_G09[3]	DGC_LUT_G09[2]	DGC_LUT_G09[1]	DGC_LUT_G09[0]	80
		11	DGC_LUT_G10[7]	DGC_LUT_G10[6]	DGC_LUT_G10[5]	DGC_LUT_G10[4]	DGC_LUT_G10[3]	DGC_LUT_G10[2]	DGC_LUT_G10[1]	DGC_LUT_G10[0]	80
		12	DGC_LUT_G11[7]	DGC_LUT_G11[6]	DGC_LUT_G11[5]	DGC_LUT_G11[4]	DGC_LUT_G11[3]	DGC_LUT_G11[2]	DGC_LUT_G11[1]	DGC_LUT_G11[0]	80
		13	DGC_LUT_G12[7]	DGC_LUT_G12[6]	DGC_LUT_G12[5]	DGC_LUT_G12[4]	DGC_LUT_G12[3]	DGC_LUT_G12[2]	DGC_LUT_G12[1]	DGC_LUT_G12[0]	80
		:	:	:	:	:	:	:	:	:	
		19	DGC_LUT_G18[7]	DGC_LUT_G18[6]	DGC_LUT_G18[5]	DGC_LUT_G18[4]	DGC_LUT_G18[3]	DGC_LUT_G18[2]	DGC_LUT_G18[1]	DGC_LUT_G18[0]	80
		20	DGC_LUT_G19[7]	DGC_LUT_G19[6]	DGC_LUT_G19[5]	DGC_LUT_G19[4]	DGC_LUT_G19[3]	DGC_LUT_G19[2]	DGC_LUT_G19[1]	DGC_LUT_G19[0]	80
		21	DGC_LUT_G20[7]	DGC_LUT_G20[6]	DGC_LUT_G20[5]	DGC_LUT_G20[4]	DGC_LUT_G20[3]	DGC_LUT_G20[2]	DGC_LUT_G20[1]	DGC_LUT_G20[0]	80
		22	DGC_LUT_G21[7]	DGC_LUT_G21[6]	DGC_LUT_G21[5]	DGC_LUT_G21[4]	DGC_LUT_G21[3]	DGC_LUT_G21[2]	DGC_LUT_G21[1]	DGC_LUT_G21[0]	80
		:	:	:	:	:	:	:	:	:	
		30	DGC_LUT_G29[7]	DGC_LUT_G29[6]	DGC_LUT_G29[5]	DGC_LUT_G29[4]	DGC_LUT_G29[3]	DGC_LUT_G29[2]	DGC_LUT_G29[1]	DGC_LUT_G29[0]	80
		31	DGC_LUT_G30[7]	DGC_LUT_G30[6]	DGC_LUT_G30[5]	DGC_LUT_G30[4]	DGC_LUT_G30[3]	DGC_LUT_G30[2]	DGC_LUT_G30[1]	DGC_LUT_G30[0]	80
		32	DGC_LUT_G31[7]	DGC_LUT_G31[6]	DGC_LUT_G31[5]	DGC_LUT_G31[4]	DGC_LUT_G31[3]	DGC_LUT_G31[2]	DGC_LUT_G31[1]	DGC_LUT_G31[0]	80
		33	DGC_LUT_G32[7]	DGC_LUT_G32[6]	DGC_LUT_G32[5]	DGC_LUT_G32[4]	DGC_LUT_G32[3]	DGC_LUT_G32[2]	DGC_LUT_G32[1]	DGC_LUT_G32[0]	80
CFh	DGC_B	1	1	0	0	1	1	1	1	1	
		1	DGC_LUT_B00[7]	DGC_LUT_B00[6]	DGC_LUT_B00[5]	DGC_LUT_B00[4]	DGC_LUT_B00[3]	DGC_LUT_B00[2]	DGC_LUT_B00[1]	DGC_LUT_B00[0]	80
		2	DGC_LUT_B01[7]	DGC_LUT_B01[6]	DGC_LUT_B01[5]	DGC_LUT_B01[4]	DGC_LUT_B01[3]	DGC_LUT_B01[2]	DGC_LUT_B01[1]	DGC_LUT_B01[0]	80
		3	DGC_LUT_B02[7]	DGC_LUT_B02[6]	DGC_LUT_B02[5]	DGC_LUT_B02[4]	DGC_LUT_B02[3]	DGC_LUT_B02[2]	DGC_LUT_B02[1]	DGC_LUT_B02[0]	80
		4	DGC_LUT_B03[7]	DGC_LUT_B03[6]	DGC_LUT_B03[5]	DGC_LUT_B03[4]	DGC_LUT_B03[3]	DGC_LUT_B03[2]	DGC_LUT_B03[1]	DGC_LUT_B03[0]	80
		:	:	:	:	:	:	:	:	:	
		10	DGC_LUT_B09[7]	DGC_LUT_B09[6]	DGC_LUT_B09[5]	DGC_LUT_B09[4]	DGC_LUT_B09[3]	DGC_LUT_B09[2]	DGC_LUT_B09[1]	DGC_LUT_B09[0]	80
		11	DGC_LUT_B10[7]	DGC_LUT_B10[6]	DGC_LUT_B10[5]	DGC_LUT_B10[4]	DGC_LUT_B10[3]	DGC_LUT_B10[2]	DGC_LUT_B10[1]	DGC_LUT_B10[0]	80
		12	DGC_LUT_B11[7]	DGC_LUT_B11[6]	DGC_LUT_B11[5]	DGC_LUT_B11[4]	DGC_LUT_B11[3]	DGC_LUT_B11[2]	DGC_LUT_B11[1]	DGC_LUT_B11[0]	80
		13	DGC_LUT_B12[7]	DGC_LUT_B12[6]	DGC_LUT_B12[5]	DGC_LUT_B12[4]	DGC_LUT_B12[3]	DGC_LUT_B12[2]	DGC_LUT_B12[1]	DGC_LUT_B12[0]	80
		:	:	:	:	:	:	:	:	:	
		19	DGC_LUT_B18[7]	DGC_LUT_B18[6]	DGC_LUT_B18[5]	DGC_LUT_B18[4]	DGC_LUT_B18[3]	DGC_LUT_B18[2]	DGC_LUT_B18[1]	DGC_LUT_B18[0]	80
		20	DGC_LUT_B19[7]	DGC_LUT_B19[6]	DGC_LUT_B19[5]	DGC_LUT_B19[4]	DGC_LUT_B19[3]	DGC_LUT_B19[2]	DGC_LUT_B19[1]	DGC_LUT_B19[0]	80
		21	DGC_LUT_B20[7]	DGC_LUT_B20[6]	DGC_LUT_B20[5]	DGC_LUT_B20[4]	DGC_LUT_B20[3]	DGC_LUT_B20[2]	DGC_LUT_B20[1]	DGC_LUT_B20[0]	80
		:	:	:	:	:	:	:	:	:	
		30	DGC_LUT_B29[7]	DGC_LUT_B29[6]	DGC_LUT_B29[5]	DGC_LUT_B29[4]	DGC_LUT_B29[3]	DGC_LUT_B29[2]	DGC_LUT_B29[1]	DGC_LUT_B29[0]	80
		31	DGC_LUT_B30[7]	DGC_LUT_B30[6]	DGC_LUT_B30[5]	DGC_LUT_B30[4]	DGC_LUT_B30[3]	DGC_LUT_B30[2]	DGC_LUT_B30[1]	DGC_LUT_B30[0]	80

		32	DGC_LUT _B31[7]	DGC_LUT _B31[6]	DGC_LUT _B31[5]	DGC_LUT _B31[4]	DGC_LUT _B31[3]	DGC_LUT _B31[2]	DGC_LUT _B31[1]	DGC_LUT _B31[0]	80
		33	DGC_LUT _B32[7]	DGC_LUT _B32[6]	DGC_LUT _B32[5]	DGC_LUT _B32[4]	DGC_LUT _B32[3]	DGC_LUT _B32[2]	DGC_LUT _B32[1]	DGC_LUT _B32[0]	80

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(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
E0h	SETGAMMA		1	1	0	0	0	0	0	1	
		1	x	x	PVR0[5]	PVR0[4]	PVR0[3]	PVR0[2]	PVR0[1]	PVR0[0]	0B
		2	x	x	PVR1[5]	PVR1[4]	PVR1[3]	PVR1[2]	PVR1[1]	PVR1[0]	0C
		3	x	x	PVR2[5]	PVR2[4]	PVR2[3]	PVR2[2]	PVR2[1]	PVR2[0]	11
		4	x	x	PVR3[5]	PVR3[4]	PVR3[3]	PVR3[2]	PVR3[1]	PVR3[0]	1D
		5	x	x	PVR4[5]	PVR4[4]	PVR4[3]	PVR4[2]	PVR4[1]	PVR4[0]	25
		6	x	x	PVR5[5]	PVR5[4]	PVR5[3]	PVR5[2]	PVR5[1]	PVR5[0]	37
		7	x	PPR0[6]	PPR0[5]	PPR0[4]	PPR0[3]	PPR0[2]	PPR0[1]	PPR0[0]	43
		8	x	PPR1[6]	PPR1[5]	PPR1[4]	PPR1[3]	PPR1[2]	PPR1[1]	PPR1[0]	4B
		9	x	x	PPK0[4]	PPK0[3]	PPK0[2]	PPK0[1]	PPK0[0]	PPK0[0]	4E
		10	x	x	PPK1[4]	PPK1[3]	PPK1[2]	PPK1[1]	PPK1[0]	PPK1[0]	47
		11	x	x	PPK2[4]	PPK2[3]	PPK2[2]	PPK2[1]	PPK2[0]	PPK2[0]	41
		12	x	x	PPK3[4]	PPK3[3]	PPK3[2]	PPK3[1]	PPK3[0]	PPK3[0]	39
		13	x	x	PPK4[4]	PPK4[3]	PPK4[2]	PPK4[1]	PPK4[0]	PPK4[0]	35
		14	x	x	PPK5[4]	PPK5[3]	PPK5[2]	PPK5[1]	PPK5[0]	PPK5[0]	31
		15	x	x	PPK6[4]	PPK6[3]	PPK6[2]	PPK6[1]	PPK6[0]	PPK6[0]	2E
		16	x	x	PPK7[4]	PPK7[3]	PPK7[2]	PPK7[1]	PPK7[0]	PPK7[0]	21
		17	x	x	PPK8[4]	PPK8[3]	PPK8[2]	PPK8[1]	PPK8[0]	PPK8[0]	1C
		18	x	x	NVR0[5]	NVR0[4]	NVR0[3]	NVR0[2]	NVR0[1]	NVR0[0]	1D
		19	x	x	NVR1[5]	NVR1[4]	NVR1[3]	NVR1[2]	NVR1[1]	NVR1[0]	1D
		20	x	x	NVR2[5]	NVR2[4]	NVR2[3]	NVR2[2]	NVR2[1]	NVR2[0]	26
		21	x	x	NVR3[5]	NVR3[4]	NVR3[3]	NVR3[2]	NVR3[1]	NVR3[0]	31
		22	x	x	NVR4[5]	NVR4[4]	NVR4[3]	NVR4[2]	NVR4[1]	NVR4[0]	44
		23	x	x	NVR5[5]	NVR5[4]	NVR5[3]	NVR5[2]	NVR5[1]	NVR5[0]	4E
		24	x	NPR0[6]	NPR0[5]	NPR0[4]	NPR0[3]	NPR0[2]	NPR0[1]	NPR0[0]	56
		25	x	NPR1[6]	NPR1[5]	NPR1[4]	NPR1[3]	NPR1[2]	NPR1[1]	NPR1[0]	44
		26	x	x	NPK0[4]	NPK0[3]	NPK0[2]	NPK0[1]	NPK0[0]	NPK0[0]	3F
		27	x	x	NPK1[4]	NPK1[3]	NPK1[2]	NPK1[1]	NPK1[0]	NPK1[0]	39
		28	x	x	NPK2[4]	NPK2[3]	NPK2[2]	NPK2[1]	NPK2[0]	NPK2[0]	33
		29	x	x	NPK3[4]	NPK3[3]	NPK3[2]	NPK3[1]	NPK3[0]	NPK3[0]	31
		30	x	x	NPK4[4]	NPK4[3]	NPK4[2]	NPK4[1]	NPK4[0]	NPK4[0]	2E
		31	x	x	NPK5[4]	NPK5[3]	NPK5[2]	NPK5[1]	NPK5[0]	NPK5[0]	28
		32	x	x	NPK6[4]	NPK6[3]	NPK6[2]	NPK6[1]	NPK6[0]	NPK6[0]	1D
		33	x	x	NPK7[4]	NPK7[3]	NPK7[2]	NPK7[1]	NPK7[0]	NPK7[0]	E0
		34	x	x	NPK8[4]	NPK8[3]	NPK8[2]	NPK8[1]	NPK8[0]	NPK8[0]	00

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
E3h	SETSEQ	1	1	1	0	0	0	1	1	-	
		1	PNOEQ[7]	PNOEQ[6]	PNOEQ[5]	PNOEQ[4]	PNOEQ[3]	PNOEQ[2]	PNOEQ[1]	PNOEQ[0]	00
		2	NNOEQ[7] 1	NNOEQ[6] 1	PEOEQ[5] 1	NNOEQ[4] 1	NNOEQ[3] 1	NNOEQ[2] 1	NNOEQ[1] 1	NNOEQ[0] 1	00
		3	PEQGND[7] 1	PEQGND[6] 1	PEQGND[5] 1	PEQGND[4] 1	PEQGND[3] 1	PEQGND[2] 1	PEQGND[1] 1	PEQGND[0] 1	03
		4	NEQGND[7] 1	NEQGND[6] 1	NEQGND[5] 1	NEQGND[4] 1	NEQGND[3] 1	NEQGND[2] 1	NEQGND[1] 1	NEQGND[0] 1	03
		5	PEQVCI[7] 1	PEQVCI[6] 1	PEQVCI[5] 1	PEQVCI[4] 1	PEQVCI[3] 1	PEQVCI[2] 1	PEQVCI[1] 1	PEQVCI[0] 1	03
		6	NEQVCI[7] 1	NEQVCI[6] 1	NEQVCI[5] 1	NEQVCI[4] 1	NEQVCI[3] 1	NEQVCI[2] 1	NEQVCI[1] 1	NEQVCI[0] 1	03
		7	PEQVCI1[7] 1	PEQVCI1[6] 1	PEQVCI1[5] 1	PEQVCI1[4] 1	PEQVCI1[3] 1	PEQVCI1[2] 1	PEQVCI1[1] 1	PEQVCI1[0] 1	03
		8	NEQVCI1[7] 1	NEQVCI1[6] 1	NEQVCI1[5] 1	NEQVCI1[4] 1	NEQVCI1[3] 1	NEQVCI1[2] 1	NEQVCI1[1] 1	NEQVCI1[0] 1	03
		9	x	x	x	x	x	x	x	x	00
		10	x	x	x	x	x	x	x	x	00
		11	x	x	x	x	x	x	x	x	00
		12	x	x	x	x	x	x	x	x	00
		13	ESD_DET _DATA_W _HITE	ESD_WH I_TE_EN	ESD_OPT _P[1]	ESD_OPT _P[0]	ESD_OPT _G[1]	ESD_OPT _G[0]	ESD_OPT _S[1]	ESD_OPT _S[0]	C0
		14	x	x	x	SLPIN_O PTION	VEDIO_N O_CHEC K_EN	ESD_WH I_TE_GND EN	ESD_DET _TIME_S EL[1]	ESD_DET _TIME_S EL[0]	14
E4h	SET_ROI	1	1	1	0	0	1	0	0	-	
		1	x	x	x	x	x	x	x	CE_MAS K	01
E5h	SETCOLOR _EN	1	1	1	0	0	1	0	1	-	
		1	SP_Leve L[1]	SP_Leve L[0]	CE_EN	x	x	x	x	x	00
		2	x	x	x	x	x	x	x	x	00
		3	x	x	x	Blue_3[12] 1	Blue_3[11] 1	Blue_3[10] 1	Blue_3[9]	Blue_3[8]	08
		4	Blue_3[7]	Blue_3[6]	Blue_3[5]	Blue_3[4]	Blue_3[3]	Blue_3[2]	Blue_3[1]	Blue_3[0]	32
		5	x	x	x	Blue_2[12] 1	Blue_2[11] 1	Blue_2[10] 1	Blue_2[9]	Blue_2[8]	1c
		6	Blue_2[7]	Blue_2[6]	Blue_2[5]	Blue_2[4]	Blue_2[3]	Blue_2[2]	Blue_2[1]	Blue_2[0]	71
		7	x	x	x	Blue_1[12] 1	Blue_1[11] 1	Blue_1[10] 1	Blue_1[9]	Blue_1[8]	1F
		8	Blue_1[7]	Blue_1[6]	Blue_1[5]	Blue_1[4]	Blue_1[3]	Blue_1[2]	Blue_1[1]	Blue_1[0]	90
		9	x	x	x	Green_3[12] 1	Green_3[11] 1	Green_3[10] 1	Green_3[9] 1	Green_3[8] 1	1E
		10	Green_3[7] 1	Green_3[6] 1	Green_3[5] 1	Green_3[4] 1	Green_3[3] 1	Green_3[2] 1	Green_3[1] 1	Green_3[0] 1	CD
		11	x	x	x	Green_2[12] 1	Green_2[11] 1	Green_2[10] 1	Green_2[9] 1	Green_2[8] 1	07
		12	Green_2[7] 1	Green_2[6] 1	Green_2[5] 1	Green_2[4] 1	Green_2[3] 1	Green_2[2] 1	Green_2[1] 1	Green_2[0] 1	4C
		13	x	x	x	Green_1[12] 1	Green_1[11] 1	Green_1[10] 1	Green_1[9] 1	Green_1[8] 1	1E
		14	Green_1[7] 1	Green_1[6] 1	Green_1[5] 1	Green_1[4] 1	Green_1[3] 1	Green_1[2] 1	Green_1[1] 1	Green_1[0] 1	06
		15	x	x	x	Red_3[12]	Red_3[11]	Red_3[10]	Red_3[9]	Red_3[8]	1F
		16	Red_3[7]	Red_3[6]	Red_3[5]	Red_3[4]	Red_3[3]	Red_3[2]	Red_3[1]	Red_3[0]	66
		17	x	x	x	Red_2[12]	Red_2[11]	Red_2[10]	Red_2[9]	Red_2[8]	1E
		18	Red_2[7]	Red_2[6]	Red_2[5]	Red_2[4]	Red_2[3]	Red_2[2]	Red_2[1]	Red_2[0]	2A
		19	x	x	x	Red_1[12]	Red_1[11]	Red_1[10]	Red_1[9]	Red_1[8]	06

		20	Red_1[7]	Red_1[6]	Red_1[5]	Red_1[4]	Red_1[3]	Red_1[2]	Red_1[1]	Red_1[0]	70
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(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
E9h	SETGIP1	1	1	1	0		1	0	0	1	-
		1	REF_EN	x	x	x	PANEL_S EL[3]	PANEL_S EL[2]	PANEL_S EL[1]	PANEL_S EL[0]	24
		2	x	x	x	SHR0[12]	SHR0[11]	SHR0[10]	SHR0[9]	SHR0[8]	00
		3	SHR0[7]	SHR0[6]	SHR0[5]	SHR0[4]	SHR0[3]	SHR0[2]	SHR0[1]	SHR0[0]	00
		4	x	x	x	SHR0[12]	SHR1[11]	SHR1[10]	SHR1[9]	SHR1[8]	00
		5	SHR1[7]	SHR1[6]	SHR1[5]	SHR1[4]	SHR1[3]	SHR1[2]	SHR1[1]	SHR1[0]	00
		6	SPON[7]	SPON[6]	SPON[5]	SPON[4]	SPON[3]	SPON[2]	SPON[1]	SPON[0]	00
		7	SPOFF[7]	SPOFF[6]	SPOFF[5]	SPOFF[4]	SPOFF[3]	SPOFF[2]	SPOFF[1]	SPOFF[0]	00
		8	SHR0_1[3] 1	SHR0_1[2] 1	SHR0_1[1] 1	SHR0_1[0] 1	SHR0_2[3] 1	SHR0_2[2] 1	SHR0_2[1] 1	SHR0_2[0] 1	00
		9	SHR0_3[3] 1	SHR0_3[2] 1	SHR0_3[1] 1	SHR0_3[0] 1	SHR1_1[3] 1	SHR1_1[2] 1	SHR1_1[1] 1	SHR1_1[0] 1	00
		10	SHR1_2[3] 1	SHR1_2[2] 1	SHR1_2[1] 1	SHR1_2[0] 1	SHR1_3[3] 1	SHR1_3[2] 1	SHR1_3[1] 1	SHR1_3[0] 1	00
		11	SHP[3]	SHP[2]	SHP[1]	SHP[0]	SCP[3]	SCP[2]	SCP[1]	SCP[0]	00
		12	CHR [7]	CHR [6]	CHR [5]	CHR [4]	CHR [3]	CHR [2]	CHR [1]	CHR [0]	02
		13	CON [7]	CON [6]	CON [5]	CON [4]	CON [3]	CON [2]	CON [1]	CON [0]	02
		14	COF [7]	COF [6]	COF [5]	COF [4]	COF [3]	COF [2]	COF [1]	COF [0]	00
		15	CHP[3]	CHP[2]	CHP[1]	CHP[0]	CCP[3]	CCP[2]	CCP[1]	CCP[0]	00
		16	USER_GI P_GATE[7]	USER_GI P_GATE[6]	USER_GI P_GATE[5]	USER_GI P_GATE[4]	USER_GI P_GATE[3]	USER_GI P_GATE[2]	USER_GI P_GATE[1]	USER_GI P_GATE[0]	00
		17	x	x	CGTS_L[2] 1	CGTS_L[2] 0	CGTS_L[1] 9	CGTS_L[1] 8	CGTS_L[1] 7	CGTS_L[1] 6	00
		18	CGTS_L[1] 5	CGTS_L[1] 4	CGTS_L[1] 3	CGTS_L[1] 2	CGTS_L[1] 1	CGTS_L[1] 0	CGTS_L[9] 1	CGTS_L[8] 1	00
		19	CGTS_L[7] 1	CGTS_L[6] 1	CGTS_L[5] 1	CGTS_L[4] 1	CGTS_L[3] 1	CGTS_L[2] 1	CGTS_L[1] 1	CGTS_L[0] 1	00
		20	x	x	CGTS_IN V_L[21]	CGTS_IN V_L[20]	CGTS_IN V_L[19]	CGTS_IN V_L[18]	CGTS_IN V_L[17]	CGTS_IN V_L[16]	00
		21	CGTS_IN V_L[15]	CGTS_IN V_L[14]	CGTS_IN V_L[13]	CGTS_IN V_L[12]	CGTS_IN V_L[11]	CGTS_IN V_L[10]	CGTS_IN V_L[9]	CGTS_IN V_L[8]	00
		22	CGTS_IN V_L[7]	CGTS_IN V_L[6]	CGTS_IN V_L[5]	CGTS_IN V_L[4]	CGTS_IN V_L[3]	CGTS_IN V_L[2]	CGTS_IN V_L[1]	CGTS_IN V_L[0]	00
		23	x	x	CGTS_R[21]	CGTS_R[20]	CGTS_R[19]	CGTS_R[18]	CGTS_R[17]	CGTS_R[16]	00
		24	CGTS_R[15]	CGTS_R[14]	CGTS_R[13]	CGTS_R[12]	CGTS_R[11]	CGTS_R[10]	CGTS_R[9]	CGTS_R[8]	00
		25	CGTS_R[7]	CGTS_R[6]	CGTS_R[5]	CGTS_R[4]	CGTS_R[3]	CGTS_R[2]	CGTS_R[1]	CGTS_R[0]	00
		26	x	x	CGTS_IN V_R[21]	CGTS_IN V_R[20]	CGTS_IN V_R[19]	CGTS_IN V_R[18]	CGTS_IN V_R[17]	CGTS_IN V_R[16]	00
		27	CGTS_IN V_R[15]	CGTS_IN V_R[14]	CGTS_IN V_R[13]	CGTS_IN V_R[12]	CGTS_IN V_R[11]	CGTS_IN V_R[10]	CGTS_IN V_R[9]	CGTS_IN V_R[8]	00
		28	CGTS_IN V_R[7]	CGTS_IN V_R[6]	CGTS_IN V_R[5]	CGTS_IN V_R[4]	CGTS_IN V_R[3]	CGTS_IN V_R[2]	CGTS_IN V_R[1]	CGTS_IN V_R[0]	00
		29	COS1_L[3] 1	COS1_L[2] 1	COS1_L[1] 1	COS1_L[0] 1	COS2_L[3] 1	COS2_L[2] 1	COS2_L[1] 1	COS2_L[0] 1	00
		30	COS3_L[3] 1	COS3_L[2] 1	COS3_L[1] 1	COS3_L[0] 1	COS4_L[3] 1	COS4_L[2] 1	COS4_L[1] 1	COS4_L[0] 1	00
		31	COS5_L[3] 1	COS5_L[2] 1	COS5_L[1] 1	COS5_L[0] 0	COS6_L[3] 1	COS6_L[2] 1	COS6_L[1] 1	COS6_L[0] 1	00
		:	:	:	:	:	:	:	:	:	
		37	COS17_L[3]	COS17_L[2]	COS17_L[1]	COS17_L[0]	COS18_L[3]	COS18_L[2]	COS18_L[1]	COS18_L[0]	00
		38	COS19_L[3]	COS19_L[2]	COS19_L[1]	COS19_L[0]	COS20_L[3]	COS20_L[2]	COS20_L[1]	COS20_L[0]	00
		39	COS21_L[3]	COS21_L[2]	COS21_L[1]	COS21_L[0]	COS22_L[3]	COS22_L[2]	COS22_L[1]	COS22_L[0]	00
		40	COS1_R[3]	COS1_R[2]	COS1_R[1]	COS1_R[0]	COS2_R[3]	COS2_R[2]	COS2_R[1]	COS2_R[0]	00

E9h	SETGIP1	41	COS3_R[3]	COS3_R[2]	COS3_R[1]	COS3_R[0]	COS4_R[3]	COS4_R[2]	COS4_R[1]	COS4_R[0]	00
		42	COS5_R[3]	COS5_R[2]	COS5_R[1]	COS5_R[0]	COS6_R[3]	COS6_R[2]	COS6_R[1]	COS6_R[0]	00
		:	:	:	:	:	:	:	:	:	
		48	COS17_R[3]	COS17_R[2]	COS17_R[1]	COS17_R[0]	COS18_R[3]	COS18_R[2]	COS18_R[1]	COS18_R[0]	00
		49h	COS19_R[3]	COS19_R[2]	COS19_R[1]	COS19_R[0]	COS20_R[3]	COS20_R[2]	COS20_R[1]	COS20_R[0]	00
		50	COS21_R[3]	COS21_R[2]	COS21_R[1]	COS21_R[0]	COS22_R[3]	COS22_R[2]	COS22_R[1]	COS22_R[0]	00
		51	TCON_O PT[7]	TCON_O PT[6]	TCON_O PT[5]	TCON_O PT[4]	TCON_O PT[3]	TCON_O PT[2]	TCON_O PT[1]	TCON_O PT[0]	00
		52	x	GIP_OPT[22]	GIP_OPT[21]	GIP_OPT[20]	GIP_OPT[19]	GIP_OPT[18]	GIP_OPT[17]	GIP_OPT[16]	00
		53	GIP_OPT[15]	GIP_OPT[14]	GIP_OPT[13]	GIP_OPT[12]	GIP_OPT[11]	GIP_OPT[10]	GIP_OPT[9]	GIP_OPT[8]	00
		54	GIP_OPT[7]	GIP_OPT[6]	GIP_OPT[5]	GIP_OPT[4]	GIP_OPT[3]	GIP_OPT[2]	GIP_OPT[1]	GIP_OPT[0]	00
		55	CHR2[7]	CHR2[6]	CHR2[5]	CHR2[4]	CHR2[3]	CHR2[2]	CHR2[1]	CHR2[0]	00
		56	CON2[7]	CON2[6]	CON2[5]	CON2[4]	CON2[3]	CON2[2]	CON2[1]	CON2[0]	02
		57	COFF2[7]	COFF2[6]	COFF2[5]	COFF2[4]	COFF2[3]	COFF2[2]	COFF2[1]	COFF2[0]	02
		58	CHP2[3]	CHP2[2]	CHP2[1]	CHP2[0]	CCP2[3]	CCP2[2]	CCP2[1]	CCP2[0]	00
		59	x	x	CKS[21]	CKS[20]	CKS[19]	CKS[18]	CKS[17]	CKS[16]	00
		60	CKS[15]	CKS[14]	CKS[13]	CKS[12]	CKS[11]	CKS[10]	CKS[9]	CKS[8]	00
		61	CKS[7]	CKS[6]	CKS[5]	CKS[4]	CKS[3]	CKS[2]	CKS[1]	CKS[0]	00
		62	COFF[9]	COFF[8]	CON[9]	CON[8]	SPOFF[9]	SPOFF[8]	SPON[9]	SPON[8]	00
		63	COFF2[9]	COFF[8]	CON2[9]	CON2[8]	x	x	x	x	00

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
EAh	SETGIP2		1	1	1	0	1	0	1	0	-
		1	YS2_SEL[1]	YS2_SEL[0]	YS1_SEL[1]	YS1_SEL[0]	YS2_XOR	YS1_XOR	YS_FLAG_EN	ALL_ON_EN	94
		2	GATE[7]	GATE[6]	GATE[5]	GATE[4]	GATE[3]	GATE[2]	GATE[1]	GATE[0]	00
		3	CK_ALL_ON_EN	STV_ALL_ON_EN	CK_ALL_ON_WIDT_H1[5]	CK_ALL_ON_WIDT_H1[4]	CK_ALL_ON_WIDT_H1[3]	CK_ALL_ON_WIDT_H1[2]	CK_ALL_ON_WIDT_H1[1]	CK_ALL_ON_WIDT_H1[0]	00
		4	x	x	CK_ALL_ON_WIDT_H2[5]	CK_ALL_ON_WIDT_H2[4]	CK_ALL_ON_WIDT_H2[3]	CK_ALL_ON_WIDT_H2[2]	CK_ALL_ON_WIDT_H2[1]	CK_ALL_ON_WIDT_H2[0]	00
		5	x	x	CK_ALL_ON_WIDT_H3[5]	CK_ALL_ON_WIDT_H3[4]	CK_ALL_ON_WIDT_H3[3]	CK_ALL_ON_WIDT_H3[2]	CK_ALL_ON_WIDT_H3[1]	CK_ALL_ON_WIDT_H3[0]	00
		6	YS_FLAG_PERIOD[7]	YS_FLAG_PERIOD[6]	YS_FLAG_PERIOD[5]	YS_FLAG_PERIOD[4]	YS_FLAG_PERIOD[3]	YS_FLAG_PERIOD[2]	YS_FLAG_PERIOD[1]	YS_FLAG_PERIOD[0]	00
		7	YS2_SEL_2[1]	YS2_SEL_2[0]	YS1_SEL_2[1]	YS1_SEL_2[0]	YS2_XOR_2	YS1_XOR_2	YS_FLAG_EN_2	ALL_ON_EN_2	94
		8	USER_GI_P_GATE1_2[7]	USER_GI_P_GATE1_2[6]	USER_GI_P_GATE1_2[5]	USER_GI_P_GATE1_2[4]	USER_GI_P_GATE1_2[3]	USER_GI_P_GATE1_2[2]	USER_GI_P_GATE1_2[1]	USER_GI_P_GATE1_2[0]	00
		9	CK_ALL_ON_EN_2	STV_ALL_ON_EN_2	CK_ALL_ON_WIDT_H1_2[5]	CK_ALL_ON_WIDT_H1_2[4]	CK_ALL_ON_WIDT_H1_2[3]	CK_ALL_ON_WIDT_H1_2[2]	CK_ALL_ON_WIDT_H1_2[1]	CK_ALL_ON_WIDT_H1_2[0]	00
		10	x	x	CK_ALL_ON_WIDT_H2_2[5]	CK_ALL_ON_WIDT_H2_2[4]	CK_ALL_ON_WIDT_H2_2[3]	CK_ALL_ON_WIDT_H2_2[2]	CK_ALL_ON_WIDT_H2_2[1]	CK_ALL_ON_WIDT_H2_2[0]	00
		11	x	x	CK_ALL_ON_WIDT_H3_2[5]	CK_ALL_ON_WIDT_H3_2[4]	CK_ALL_ON_WIDT_H3_2[3]	CK_ALL_ON_WIDT_H3_2[2]	CK_ALL_ON_WIDT_H3_2[1]	CK_ALL_ON_WIDT_H3_2[0]	00
		12	YS_FLAG_PERIOD_2[7]	YS_FLAG_PERIOD_2[6]	YS_FLAG_PERIOD_2[5]	YS_FLAG_PERIOD_2[4]	YS_FLAG_PERIOD_2[3]	YS_FLAG_PERIOD_2[2]	YS_FLAG_PERIOD_2[1]	YS_FLAG_PERIOD_2[0]	00
		13	COS1_L_GS[3]	COS1_L_GS[2]	COS1_L_GS[1]	COS1_L_GS[0]	COS2_L_GS[3]	COS2_L_GS[2]	COS2_L_GS[1]	COS2_L_GS[0]	00
		14	COS3_L_GS[3]	COS3_L_GS[2]	COS3_L_GS[1]	COS3_L_GS[0]	COS4_L_GS[3]	COS4_L_GS[2]	COS4_L_GS[1]	COS4_L_GS[0]	00
		15	COS5_L_GS[3]	COS5_L_GS[2]	COS5_L_GS[1]	COS5_L_GS[0]	COS6_L_GS[3]	COS6_L_GS[2]	COS6_L_GS[1]	COS6_L_GS[0]	00
		:	:	:	:	:	:	:	:	:	
		21	COS17_L_GS[3]	COS17_L_GS[2]	COS17_L_GS[1]	COS17_L_GS[0]	COS18_L_GS[3]	COS18_L_GS[2]	COS18_L_GS[1]	COS18_L_GS[0]	00
		22	COS19_L_GS[3]	COS19_L_GS[2]	COS19_L_GS[1]	COS19_L_GS[0]	COS20_L_GS[3]	COS20_L_GS[2]	COS20_L_GS[1]	COS20_L_GS[0]	00
		23	COS21_L_GS[3]	COS21_L_GS[2]	COS21_L_GS[1]	COS21_L_GS[0]	COS22_L_GS[3]	COS22_L_GS[2]	COS22_L_GS[1]	COS22_L_GS[0]	00
		24	COS1_R_GS[3]	COS1_R_GS[2]	COS1_R_GS[1]	COS1_R_GS[0]	COS2_R_GS[3]	COS2_R_GS[2]	COS2_R_GS[1]	COS2_R_GS[0]	00
		25	COS3_R_GS[3]	COS3_R_GS[2]	COS3_R_GS[1]	COS3_R_GS[0]	COS4_R_GS[3]	COS4_R_GS[2]	COS4_R_GS[1]	COS4_R_GS[0]	00
		26	COS5_R_GS[3]	COS5_R_GS[2]	COS5_R_GS[1]	COS5_R_GS[0]	COS6_R_GS[3]	COS6_R_GS[2]	COS6_R_GS[1]	COS6_R_GS[0]	00
		:	:	:	:	:	:	:	:	:	
		32	COS17_R_GS[3]	COS17_R_GS[2]	COS17_R_GS[1]	COS17_R_GS[0]	COS18_R_GS[3]	COS18_R_GS[2]	COS18_R_GS[1]	COS18_R_GS[0]	00
		33	COS19_R_GS[3]	COS19_R_GS[2]	COS19_R_GS[1]	COS19_R_GS[0]	COS20_R_GS[3]	COS20_R_GS[2]	COS20_R_GS[1]	COS20_R_GS[0]	00
		34	COS21_R_GS[3]	COS21_R_GS[2]	COS21_R_GS[1]	COS21_R_GS[0]	COS22_R_GS[3]	COS22_R_GS[2]	COS22_R_GS[1]	COS22_R_GS[0]	00
		35	x	x	EQOPT[1]	EQOPT[0]	x	x	EQ_SEL[1]	EQ_SEL[0]	30
		36	EQ_DELA_Y[7]	EQ_DELA_Y[6]	EQ_DELA_Y[5]	EQ_DELA_Y[4]	EQ_DELA_Y[3]	EQ_DELA_Y[2]	EQ_DELA_Y[1]	EQ_DELA_Y[0]	00
		37	x	x	x	x	EQ_DELA_Y_HSYNC[3]	EQ_DELA_Y_HSYNC[2]	EQ_DELA_Y_HSYNC[1]	EQ_DELA_Y_HSYNC[0]	00

		38	x	x	x	x	x	x	HSYNC_T_O_CL1_C_NT10[9]	HSYNC_T_O_CL1_C_NT10[8]	00
		39	HSYNC_T_O_CL1_C_NT10[7]	HSYNC_T_O_CL1_C_NT10[6]	HSYNC_T_O_CL1_C_NT10[5]	HSYNC_T_O_CL1_C_NT10[4]	HSYNC_T_O_CL1_C_NT10[3]	HSYNC_T_O_CL1_C_NT10[2]	HSYNC_T_O_CL1_C_NT10[1]	HSYNC_T_O_CL1_C_NT10[0]	02
EBh	SETCOLOR	1	1	1	0	1	0	1	1	-	
		1	Bkx[1]	Bkx[0]	Bky[1]	Bky[0]	Wx[1]	Wx[0]	Wy[1]	Wy[0]	00
		2	BKx[9]	BKx[8]	BKx[7]	BKx[6]	BKx[5]	BKx[4]	BKx[3]	BKx[2]	00
		3	BKy[9]	BKy[8]	BKy[7]	BKy[6]	BKy[5]	BKy[4]	BKy[3]	BKy[2]	00
		4	Wx[9]	Wx[8]	Wx[7]	Wx[6]	Wx[5]	Wx[4]	Wx[3]	Wx[2]	00
		5	Wy[9]	Wy[8]	Wy[7]	Wy[6]	Wy[5]	Wy[4]	Wy[3]	Wy[2]	00
		6	Rx[1]	Rx[0]	Ry[1]	Ry[0]	Gx[1]	Gx[0]	Gy[1]	Gy[0]	00
		7	Rx[9]	Rx[8]	Rx[7]	Rx[6]	Rx[5]	Rx[4]	Rx[3]	Rx[2]	00
		8	Ry[9]	Ry[8]	Ry[7]	Ry[6]	Ry[5]	Ry[4]	Ry[3]	Ry[2]	00
		9	Gx[9]	Gx[8]	Gx[7]	Gx[6]	Gx[5]	Gx[4]	Gx[3]	Gx[2]	00
		10	Gy[9]	Gy[8]	Gy[7]	Gy[6]	Gy[5]	Gy[4]	Gy[3]	Gy[2]	00
		11	Bx[1]	Bx[0]	By[1]	By[0]	Ax[1]	Ax[0]	Ay[1]	Ay[0]	00
		12	Bx[9]	Bx[8]	Bx[7]	Bx[6]	Bx[5]	Bx[4]	Bx[3]	Bx[2]	00
		13	By[9]	By[8]	By[7]	By[6]	By[5]	By[4]	By[3]	By[2]	00
		14	Ax[9]	Ax[8]	Ax[7]	Ax[6]	Ax[5]	Ax[4]	Ax[3]	Ax[2]	00
		15	Ay[9]	Ay[8]	Ay[7]	Ay[6]	Ay[5]	Ay[4]	Ay[3]	Ay[2]	00
F1h	TEMP_SEN_SOR	1	1	1	1	0	0	0	1	-	
		1	PASSWO_RD[7]	PASSWO_RD[6]	PASSWO_RD[5]	PASSWO_RD[4]	PASSWO_RD[3]	PASSWO_RD[2]	PASSWO_RD[1]	PASSWO_RD[0]	00
		2	TEMP_ST[3]	TEMP_ST[2]	TEMP_ST[1]	TEMP_ST[0]	TEMP_FR_A[3]	TEMP_FR_A[2]	TEMP_FR_A[1]	TEMP_FR_A[0]	3F
		3	x	x	L_TH[5]	L_TH[4]	L_TH[3]	L_TH[2]	L_TH[1]	L_TH[0]	14
		4	x	x	H_TH[5]	H_TH[4]	H_TH[3]	H_TH[2]	H_TH[1]	H_TH[0]	30
		5	x	L_PLUS[2]	L_PLUS[1]	L_PLUS[0]	x	L_MINUS[2]	L_MINUS[1]	L_MINUS[0]	55
		6	x	H_PLUS[2]	H_PLUS[1]	H_PLUS[0]	x	H_MINUS[2]	H_MINUS[1]	H_MINUS[0]	55
		7	TEMP_FI_LTER_EN	x	x	x	SAME_NUM[3]	SAME_NUM[2]	SAME_NUM[1]	SAME_NUM[0]	0F

(Hex)	Operation code	Para.	D7	D6	D5	D4	D3	D2	D1	D0	Default (Hex)
F2h	TEMP_VOLTAGE		1	1	1	1	0	0	1	0	-
		1	VBTHS1[3]	VBTHS1[2]	VBTHS1[1]	VBTHS1[0]	VBTLS1[3]	VBTLS1[2]	VBTLS1[1]	VBTLS1[0]	53
		2	ECP_DC_DIV1[3]	ECP_DC_DIV1[2]	ECP_DC_DIV1[1]	ECP_DC_DIV1[0]	VGLREG1[3]	VGLREG1[2]	VGLREG1[1]	VGLREG1[0]	43
		3	VCOMDC_F1[7]	VCOMDC_F1[6]	VCOMDC_F1[5]	VCOMDC_F1[4]	VCOMDC_F1[3]	VCOMDC_F1[2]	VCOMDC_F1[1]	VCOMDC_F1[0]	4D
		4	VCOMDC_B1[7]	VCOMDC_B1[6]	VCOMDC_B1[5]	VCOMDC_B1[4]	VCOMDC_B1[3]	VCOMDC_B1[2]	VCOMDC_B1[1]	VCOMDC_B1[0]	4D
		5	x	x	PVR01[5]	PVR01[4]	PVR01[3]	PVR01[2]	PVR01[1]	PVR01[0]	00
		6	x	x	PVR51[5]	PVR51[4]	PVR51[3]	PVR51[2]	PVR51[1]	PVR51[0]	00
		7	x	x	NVR01[5]	NVR01[4]	NVR01[3]	NVR01[2]	NVR01[1]	NVR01[0]	00
		8	x	x	NVR51[5]	NVR51[4]	NVR51[3]	NVR51[2]	NVR51[1]	NVR51[0]	00
		9	x	x	x	x	N_NW_H_T[2]	N_NW_H_T[1]	N_NW_H_T[0]	00	
		10	VBTHS4[3]	VBTHS4[2]	VBTHS4[1]	VBTHS4[0]	VBTLS4[3]	VBTLS4[2]	VBTLS4[1]	VBTLS4[0]	53
		11	ECP_DC_DIV4[3]	ECP_DC_DIV4[2]	ECP_DC_DIV4[1]	ECP_DC_DIV4[0]	VGLREG4[3]	VGLREG4[2]	VGLREG4[1]	VGLREG4[0]	43
		12	VCOMDC_F4[7]	VCOMDC_F4[6]	VCOMDC_F4[5]	VCOMDC_F4[4]	VCOMDC_F4[3]	VCOMDC_F4[2]	VCOMDC_F4[1]	VCOMDC_F4[0]	4D
		13	VCOMDC_B4[7]	VCOMDC_B4[6]	VCOMDC_B4[5]	VCOMDC_B4[4]	VCOMDC_B4[3]	VCOMDC_B4[2]	VCOMDC_B4[1]	VCOMDC_B4[0]	4D
		14	x	x	PVR04[5]	PVR04[4]	PVR04[3]	PVR04[2]	PVR04[1]	PVR04[0]	00
		15	x	x	PVR54[5]	PVR54[4]	PVR54[3]	PVR54[2]	PVR54[1]	PVR54[0]	00
		16	x	x	NVR04[5]	NVR04[4]	NVR04[3]	NVR04[2]	NVR04[1]	NVR04[0]	00
		17	x	x	NVR54[5]	NVR54[4]	NVR54[3]	NVR54[2]	NVR54[1]	NVR54[0]	00
		18	x	x	x	x	N_NW_LT[2]	N_NW_LT[1]	N_NW_LT[0]	00	
		19	x	x	x	x	x	x	x	TEMP_SENSOR_ON	00

6.2 Command description

6.2.1 NOP (00h)

00 H											NOP (No Operation)												
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	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.																						
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																						
Default	<table border="1"> <thead> <tr> <th>Status</th> <th>Default Value</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>N/A</td> </tr> <tr> <td>S/W Reset</td> <td>N/A</td> </tr> <tr> <td>H/W Reset</td> <td>N/A</td> </tr> </tbody> </table>										Status	Default Value	Power On Sequence	N/A	S/W Reset	N/A	H/W Reset	N/A					
Status	Default Value																						
Power On Sequence	N/A																						
S/W Reset	N/A																						
H/W Reset	N/A																						
Flow Chart	-																						

6.2.2 Software reset (01h)

01 H		SWRESET (Software Reset)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	0	0	0	0	0	1	01													
Parameter	NO PARAMETER																						
Description	When the Software Reset command is written, it causes a software reset. It resets the commands and parameters to their S/W Reset default values. (See default tables in each command description.) The display is blank immediately.																						
Restriction	It will be necessary to wait 5msec before sending new command following software reset. The display module loads all display suppliers' factory default values to the registers during this 5m sec. If SW Reset is applied during Sleep Out mode, it will be necessary to wait 120m sec before sending Sleep Out command. SW Reset command cannot be sent during Sleep Out sequence.																						
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 or Booster Off</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 or Booster Off	Yes									
Status	Availability																						
Normal Mode On, Idle Mode Off, Sleep Out	Yes																						
Normal Mode On, Idle Mode On, Sleep Out	Yes																						
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Partial Mode On, Idle Mode On, Sleep Out	Yes																						
Sleep In or Booster Off	Yes																						
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Status	Default Value																						
Power On Sequence	N/A																						
S/W Reset	N/A																						
H/W Reset	N/A																						
Flow Chart	<pre> graph TD A[SWRESET (01H)] --> B{Display whole blank screen} B --> C[Set Commands to S/W Default Value] C --> D{Sleep In Mode} </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																						

6.2.3 Read Display ID (04h)

RDDID (Read Display ID)																						
04 H	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	0	0	0	0	1	0	0	04												
1 st parameter	-	ID17	ID16	ID15	ID14	ID13	ID12	ID11	ID10	38												
2 nd parameter	-	ID27	ID26	ID25	ID24	ID23	ID22	ID21	ID20	21												
3 rd parameter	-	ID37	ID36	ID35	ID34	ID33	ID32	ID31	ID30	1F												
Description	This read byte returns 24-bit display identification information.																					
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																					
Default	<table border="1"> <thead> <tr> <th>Status</th> <th>Default Value</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>38</td> </tr> <tr> <td>S/W Reset</td> <td>21</td> </tr> <tr> <td>H/W Reset</td> <td>1F</td> </tr> </tbody> </table>										Status	Default Value	Power On Sequence	38	S/W Reset	21	H/W Reset	1F				
Status	Default Value																					
Power On Sequence	38																					
S/W Reset	21																					
H/W Reset	1F																					
Flow Chart	<pre> graph TD RDDID[RDDID (04H)] --> SendID1[Send ID1[7:0]] SendID1 --> SendID2[Send ID2[7:0]] SendID2 --> SendID3[Send ID3[7:0]] </pre> <p>The flowchart illustrates the process of reading the display ID. It begins with the command RDDID (04H), which is sent from the Host Driver. This is followed by three sequential transfers of 8-bit data: ID1[7:0], ID2[7:0], and ID3[7:0].</p> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.4 Read Display Power Mode (0Ah)

0A H		RDDPM (Read Display Power Mode)																		
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX										
Command	Read	0	0	0	0	1	0	1	0	0A										
1 st parameter	-	D7	D6	D5	D4	D3	D2	0	0	-										
		This command indicates the current status of the display as described in the table below:																		
Description	Bit	Description		Value																
	D7	Booster Voltage Status		'1'=Booster on, '0'=Booster off																
	D6	Idle Mode On/Off		'1'=Idle Mode on, '0'=Idle Mode off																
	D5	Partial Mode On/Off		'1'=Partial Mode on, '0'= Partial Mode off																
	D4	Sleep In/Out		'1'=Sleep out , '0'=Sleep in																
	D3	Display Normal Mode On/Off		'1'=Display Normal on, '0'=Display Normal off																
	D2	Display On/Off		'1'=Display on, '0'=Display off																
	D1	Not Defined		Set to '0'																
	D0	Not Defined		Set to '0'																
□																				
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															
Default			Sleep In or Booster Off		Yes															
			Status		Default Value															
			Power On Sequence		08h															
		S/W Reset		08h																
		H/W Reset		08h																
Flow Chart	<pre> graph TD RDDPM["RDDPM (0AH)"] --> HostDriver[Host Driver] HostDriver -- "Send D[7:0]" --> BusLine[D[7:0]] </pre>																			
<table border="1"> <tr> <td>Legend</td> </tr> <tr> <td>Command</td> </tr> <tr> <td>Parameter</td> </tr> <tr> <td>Display</td> </tr> <tr> <td>Action</td> </tr> <tr> <td>Mode</td> </tr> <tr> <td>Sequential transfer</td> </tr> </table>												Legend	Command	Parameter	Display	Action	Mode	Sequential transfer		
Legend																				
Command																				
Parameter																				
Display																				
Action																				
Mode																				
Sequential transfer																				

6.2.5 Read Display MADCTR (0Bh)

0B H		RDDMADCTR (Read Display MADCTR)																																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																												
Command	Read	0	0	0	0	1	0	1	1	0B																												
1 st parameter	-	D7	D6	0	0	D3	D2	0	0	-																												
This command indicates the current status of the display as described in the table below:																																						
Description	<table border="1"> <thead> <tr> <th>Bit</th><th>Description</th><th>Value</th></tr> </thead> <tbody> <tr> <td>D7</td><td>Page Address Order (MY)</td><td>'0'=Increment, '1' = Decrement</td></tr> <tr> <td>D6</td><td>Column Address Order (MX)</td><td>'0'=Increment, '1' = Decrement</td></tr> <tr> <td>D5</td><td>Page/Column Exchange (MV)</td><td>Set to '0'</td></tr> <tr> <td>D4</td><td>Line Address Order (ML)</td><td>Set to '0'</td></tr> <tr> <td>D3</td><td>RGB/BGR Order</td><td>'0'=Increment, '1' = Decrement</td></tr> <tr> <td>D2</td><td>Display Data Latch Order (MH)</td><td>'0'=Increment, '1' = Decrement</td></tr> <tr> <td>D1</td><td>Flip horizontal</td><td>Set to '0'</td></tr> <tr> <td>D0</td><td>Flip vertical</td><td>Set to '0'</td></tr> </tbody> </table>											Bit	Description	Value	D7	Page Address Order (MY)	'0'=Increment, '1' = Decrement	D6	Column Address Order (MX)	'0'=Increment, '1' = Decrement	D5	Page/Column Exchange (MV)	Set to '0'	D4	Line Address Order (ML)	Set to '0'	D3	RGB/BGR Order	'0'=Increment, '1' = Decrement	D2	Display Data Latch Order (MH)	'0'=Increment, '1' = Decrement	D1	Flip horizontal	Set to '0'	D0	Flip vertical	Set to '0'
Bit	Description	Value																																				
D7	Page Address Order (MY)	'0'=Increment, '1' = Decrement																																				
D6	Column Address Order (MX)	'0'=Increment, '1' = Decrement																																				
D5	Page/Column Exchange (MV)	Set to '0'																																				
D4	Line Address Order (ML)	Set to '0'																																				
D3	RGB/BGR Order	'0'=Increment, '1' = Decrement																																				
D2	Display Data Latch Order (MH)	'0'=Increment, '1' = Decrement																																				
D1	Flip horizontal	Set to '0'																																				
D0	Flip vertical	Set to '0'																																				
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 or Booster Off</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 or Booster Off	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 or Booster Off	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>S/W Reset</td><td>00h</td></tr> <tr> <td>H/W Reset</td><td>00h</td></tr> </tbody> </table>											Status	Default Value	Power On Sequence	00h	S/W Reset	00h	H/W Reset	00h																			
Status	Default Value																																					
Power On Sequence	00h																																					
S/W Reset	00h																																					
H/W Reset	00h																																					
Flow Chart	<p>The flow chart illustrates the transmission of the RDDMADCTL command (0BH) from the Host Driver to the device. The command is sent as a sequence of bytes: D7, D6, D5, D4, D3, D2, D1, D0. The Host Driver sends the data over a bus, indicated by a dashed line with an arrow pointing to the device.</p> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																																					

6.2.6 Read Display Pixel Format (0Ch)

0C H										HEX														
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	0	0	0	1	1	0	0	0C														
1 st parameter	-	D7	D6	0	0	D3	D2	0	0	-														
This command indicates the current status of the display as described in the table below:																								
Description	Bit	Description				Value																		
	D7	Reserved				Set to '0'																		
	D6	RGB Interface Pixel format				'101' =16-bit/pixel																		
	D5					'110' =18-bit/pixel																		
	D4					'111' =24-bit/pixel																		
	D3	Reserved				Set to '0'																		
	D2	DBI Interface Pixel format				Set to '0'																		
	D1					Set to '0'																		
	D0					Set to '0'																		
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																						
Default	Status	Default Value																						
	Power On Sequence	70h																						
	S/W Reset	No Change																						
	H/W Reset	70h																						
Flow Chart	<pre> graph TD A[RDDCOLMOD (0CH)] --> B[Host Driver] B -- "Send D[7:0]" --> C[] </pre> <p>The flowchart shows a rectangular box labeled "RDDCOLMOD (0CH)" at the top. An arrow points down from it to a trapezoidal box labeled "Host Driver". From the "Host Driver" box, an arrow points right to a small empty rectangular box.</p>																							
	<table border="1"> <tr> <td>Legend</td> </tr> <tr> <td>Command</td> </tr> <tr> <td>Parameter</td> </tr> <tr> <td>Display</td> </tr> <tr> <td>Action</td> </tr> <tr> <td>Mode</td> </tr> <tr> <td>Sequential transfer</td> </tr> </table>										Legend	Command	Parameter	Display	Action	Mode	Sequential transfer							
Legend																								
Command																								
Parameter																								
Display																								
Action																								
Mode																								
Sequential transfer																								

6.2.7 Read Display Image Mode (0Dh)

0D H										RDDIM (Read Display Image Mode)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																						
Command	Read	0	0	0	0	1	1	0	1	0D																						
1 st parameter	-	D7	D6	0	0	D3	D2	0	0	-																						
This command indicates the current status of the display as described in the table below:																																
Description	Bit	Description				Value																										
	D7	Vertical Scrolling On/Off				Set to '0'																										
	D6	Horizontal Scrolling On/off				Set to '0'																										
	D5	Inversion On/off				'1'= Inversion On, '0'= Inversion Off																										
	D4	All Pixel On				'1'= White display, '0'= Normal display																										
	D3	All Pixel Off				'1'= Black display, '0'= Normal display																										
	D2	Gamma Curve Selection				'000'=GC0, '001'=GC1																										
	D1					'010'=GC2, '011'=GC3																										
	D0					'100' to '111'= not define																										
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																													
Default	Status		Default Value																													
	Power On Sequence		00h																													
	S/W Reset		00h																													
	H/W Reset		00h																													
Flow Chart	<pre> graph TD RDDIM["RDDIM (0DH)"] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end SendD --> Display[Display] </pre>																															
	<table border="1"> <caption>Legend</caption> <tr> <td>Command</td> </tr> <tr> <td>Parameter</td> </tr> <tr> <td>Display</td> </tr> <tr> <td>Action</td> </tr> <tr> <td>Mode</td> </tr> <tr> <td>Sequential transfer</td> </tr> </table>																		Command	Parameter	Display	Action	Mode	Sequential transfer								
Command																																
Parameter																																
Display																																
Action																																
Mode																																
Sequential transfer																																

6.2.8 Read Display Signal Mode (0Eh)

0E H		RDDSM (Read Display Signal Mode)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	0	0	0	1	1	1	0	0E												
1 st parameter	-	D7	D6	0	0	D3	D2	0	0	-												
Description	This command indicates the current status of the display as described in the table below:																					
	Bit	Description			Value																	
	D7	Tearing Effect Line On/Off			Set to '0'																	
	D6	Tearing Effect Line Mode			Set to '0'																	
	D5	Horizontal Sync. On/Off			'1'= HS bit is '1', '0' = HS bit is '0'																	
	D4	Vertical Sync. On/Off			'1'= VS bit is '1', '0' = VS bit is '0'																	
	D3	Pixel Clock. On/Off			'1'= PCLK line is '1', '0' = PCLK line is '0'																	
	D2	Data Enable On/Off			'1'= DE bit is '1', '0' = DE bit is '0'																	
	D1	Not Define			Set to '0'																	
	D0	Error on DSI			'1'= Error, '0' = No Error																	
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 or Booster Off</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 or Booster Off	Yes
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Status	Default Value																					
Power On Sequence	00h																					
S/W Reset	00h																					
H/W Reset	00h																					
Flow Chart	<pre> graph TD RDDSM[RDDSM (0EH)] --> SendD[/Send D[7:0]/] SendD --> HostDriver[Host Driver] </pre> <p>The flowchart illustrates the communication process. It starts with the RDDSM (0EH) command being sent from the host to the driver. This is followed by the transmission of the data register (D[7:0]).</p>																					
	<p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

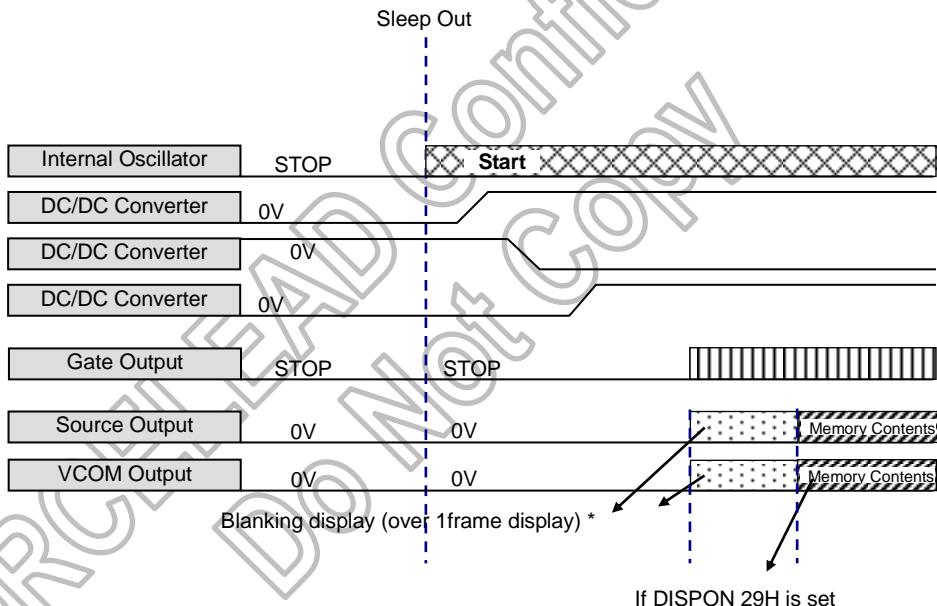
6.2.9 Read Display Self-Diagnostic Result (0Fh)

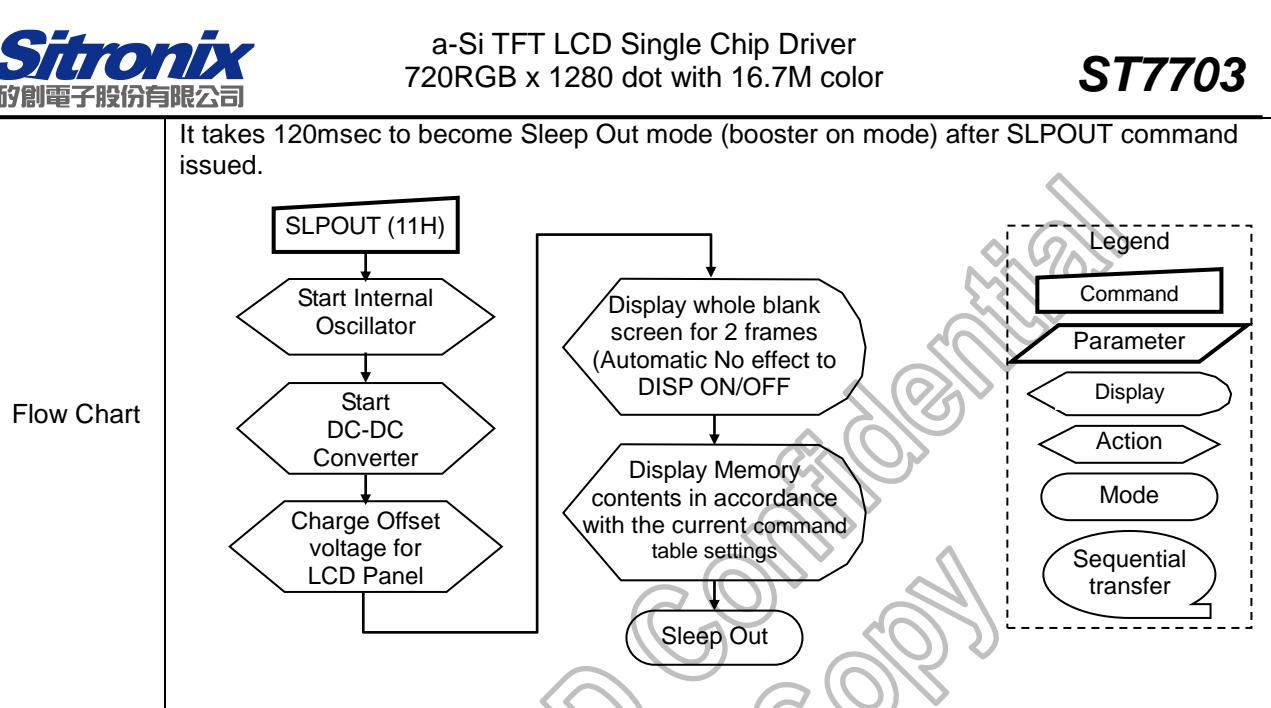
0F H		RDDSDR (Read Display Self-Diagnostic Result)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Read	0	0	0	0	1	1	1	1	0F													
1 st parameter	-	D7	D6	0	0	0	0	0	0	-													
Description	This command indicates the current status of the display as described in the table below:																						
	Bit	Description			Value																		
	D7	Register Loading Detection			See Section 5.5.1																		
	D6	Functionality Detection			See Section 5.5.2																		
	D5	Chip Attachment Detection			Set to '0'																		
	D4	Display Glass Break Detection			Set to '0'																		
	D3	Not Define			Set to '0'																		
	D2	Not Define			Set to '0'																		
	D1	Not Define			Set to '0'																		
	D0	Checksums Comparison			'1'= Checksums are not the same '0'= Checksums are the same																		
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 or Booster Off</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 or Booster Off	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 or Booster Off	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>S/W Reset</td> <td>00h</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td> </tr> </tbody> </table>											Status	Default Value	Power On Sequence	00h	S/W Reset	00h	H/W Reset	00h				
Status	Default Value																						
Power On Sequence	00h																						
S/W Reset	00h																						
H/W Reset	00h																						
Flow Chart	<pre> graph TD RDDSDR[RDDSDR] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] RDDSDR SendD end subgraph Legend [Legend] direction TB C[Command] P[Parameter] D[Display] A[Action] M[Mode] ST[Sequential transfer] end RDDSDR --> SendD </pre> <p>The flowchart shows the RDDSDR command being sent, followed by the sending of data D[7:0]. The Host Driver section contains the RDDSDR box and the Send D[7:0] box. The Legend section defines symbols for Command (rectangle), Parameter (triangle), Display (left-pointing arrow), Action (right-pointing arrow), Mode (oval), and Sequential transfer (double-headed oval).</p>																						

6.2.10 Sleep In (10h)

10 H		SLPIN (Sleep In)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	0	1	0	0	0	0	10													
Parameter	No Parameter																						
Description	<p>This command causes the LCD module to enter the minimum power consumption mode. In this mode the DC/DC converter is stopped, Internal display oscillator is stopped, and panel scanning is stopped.</p> <p>The timing diagram illustrates the state changes for various components during Sleep In:</p> <ul style="list-style-type: none"> Gate Output: High until Sleep In, then low (STOP). Source Output: Low until Sleep In, then high (0V). An arrow points to this segment with the label "Blanking display (over 1frame display) *". VCOM Output: Low until Sleep In, then high (0V). Internal Oscillator: High until Sleep In, then low (STOP). DC/DC Converter: High until Sleep In, then low (OFF). An arrow points to this segment with the label "0V or VDD". 																						
Restriction	<p>This command has no effect when module is already in sleep in mode. Sleep In Mode can only be exit by the Sleep Out Command (11H). It will be necessary to wait 5msec before sending next command; this is to allow time for the supply voltages and clock circuits to stabilize. It will be necessary to wait 120msec after sending Sleep Out command (when in Sleep In Mode) before Sleep In command can be sent.</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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																						
Default	<table border="1"> <thead> <tr> <th>Status</th> <th>Default Value</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>Sleep In mode</td> </tr> <tr> <td>S/W Reset</td> <td>Sleep In mode</td> </tr> <tr> <td>H/W Reset</td> <td>Sleep In mode</td> </tr> </tbody> </table>											Status	Default Value	Power On Sequence	Sleep In mode	S/W Reset	Sleep In mode	H/W Reset	Sleep In mode				
Status	Default Value																						
Power On Sequence	Sleep In mode																						
S/W Reset	Sleep In mode																						
H/W Reset	Sleep In mode																						
Flow Chart	<p>It takes about 120msec to get into Sleep In mode after SLPIN command issued.</p> <pre> graph TD SLPIN[SLPIN (10H)] --> Display[Display whole blank screen (Automatic No effect to DISP ON/OFF Command)] Display --> Drain[Drain charge from LCD panel] Drain --> StopDC[Stop DC/DC Converte] StopDC --> StopIO[Stop Internal Oscillator] StopIO --> SleepIn[Sleep In] </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																						

6.2.11 Sleep Out (11h)

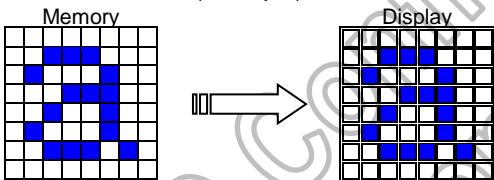
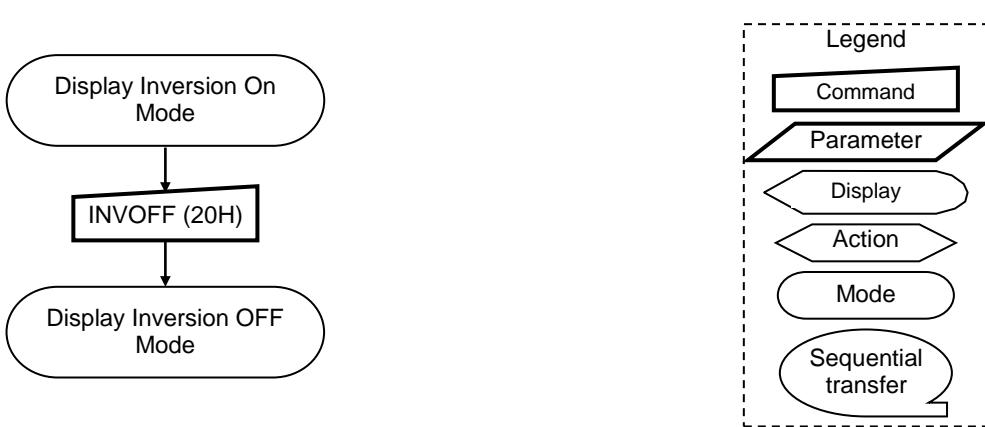
11 H		SLPOUT (Sleep Out)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	0	1	0	0	0	1	11													
Parameter	No Parameter																						
Description	<p>This command turns off sleep mode. In this mode the DC/DC converter is enabled, Internal display oscillator is started, and panel scanning is started.</p>  <p>The diagram illustrates the state changes of various components during the Sleep Out process. A vertical dashed line marks the transition from Sleep Mode to Sleep Out Mode. - Internal Oscillator: Changes from STOP to Start (represented by a hatched pattern). - DC/DC Converter: Changes from 0V to VDD. - Gate Output: Changes from STOP to VDD. - Source Output: Changes from 0V to VDD. - VCOM Output: Changes from 0V to VDD. Arrows point from the Source and VCOM outputs to 'Memory Contents' blocks, indicating they are updated during the transition. A note at the bottom states: 'Blanking display (over 1frame display) *' and 'If DISPON 29H is set'.</p>																						
Restriction	<p>This command has no effect when module is already in sleep out mode. Sleep Out Mode can only be left by the Sleep In Command (10h). It will be necessary to wait 15msec before sending next command, this is to allow time for the supply voltages and clock circuits to stabilize.</p> <p>The display module loads all display supplier's factory default values to the registers during this 15msec and there cannot be any abnormal visual effect on the display image if factory default and register values are same when this load is done and when the display module is already Sleep Out –mode.</p> <p>The display module is doing self-diagnostic functions during this 15msec.</p> <p>It will be necessary to wait 120msec after sending Sleep In command (when in Sleep Out mode) before Sleep Out command can be sent.</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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																						
Default	<table border="1"> <thead> <tr> <th>Status</th> <th>Default Value</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>Sleep In mode</td> </tr> <tr> <td>S/W Reset</td> <td>Sleep In mode</td> </tr> <tr> <td>H/W Reset</td> <td>Sleep In mode</td> </tr> </tbody> </table>											Status	Default Value	Power On Sequence	Sleep In mode	S/W Reset	Sleep In mode	H/W Reset	Sleep In mode				
Status	Default Value																						
Power On Sequence	Sleep In mode																						
S/W Reset	Sleep In mode																						
H/W Reset	Sleep In mode																						



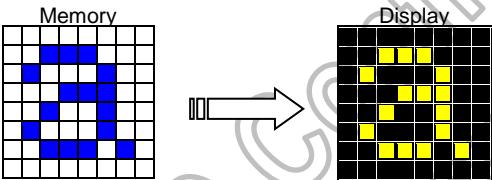
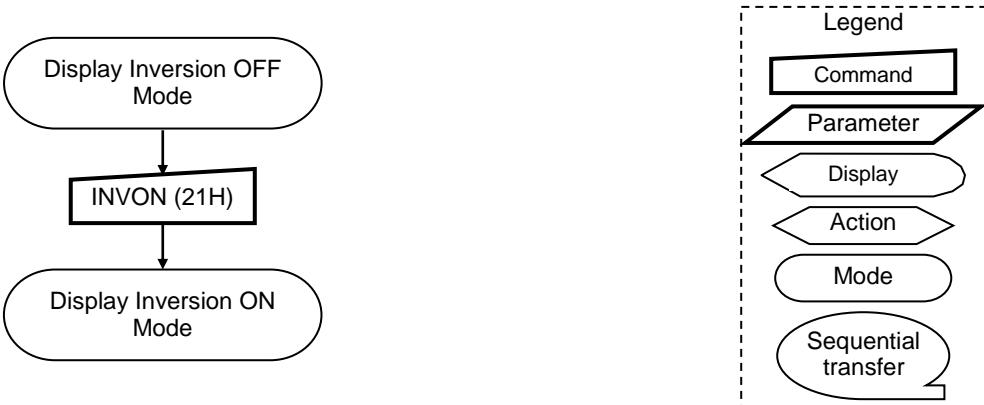
6.2.12 Normal Display Mode On (13h)

13 H		NORMON (Normal Display Mode On)									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	Write	0	0	0	1	0	0	1	1	13	
Parameter	No Parameter										
Description	This command returns the display to normal mode. Normal display mode on means Partial mode off, Scroll mode Off.										
Restriction	This command has no effect when module is already in Normal Display mode.										
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		Normal mode ON								
	S/W Reset		Normal mode ON								
	H/W Reset		Normal mode ON								

6.2.13 Display Inversion Off (20h)

20 H		INVOFF (Display Inversion Off)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	1	0	0	0	0	0	20													
Parameter	No Parameter																						
Description	This command is used to recover from display inversion mode. This command makes no change of contents of frame memory. This command does not change any other status.																						
	(Example)																						
																							
Restriction	This command has no effect when module is already in inversion off mode																						
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																						
Default	<table border="1"> <thead> <tr> <th>Status</th> <th>Default Value</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>Display Inversion off</td> </tr> <tr> <td>S/W Reset</td> <td>Display Inversion off</td> </tr> <tr> <td>H/W Reset</td> <td>Display Inversion off</td> </tr> </tbody> </table>											Status	Default Value	Power On Sequence	Display Inversion off	S/W Reset	Display Inversion off	H/W Reset	Display Inversion off				
Status	Default Value																						
Power On Sequence	Display Inversion off																						
S/W Reset	Display Inversion off																						
H/W Reset	Display Inversion off																						
Flow Chart	 <pre> graph TD A([Display Inversion On Mode]) --> B[INVOFF (20H)] B --> C([Display Inversion OFF Mode]) </pre>																						

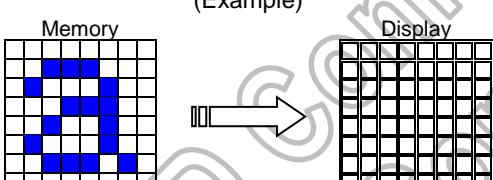
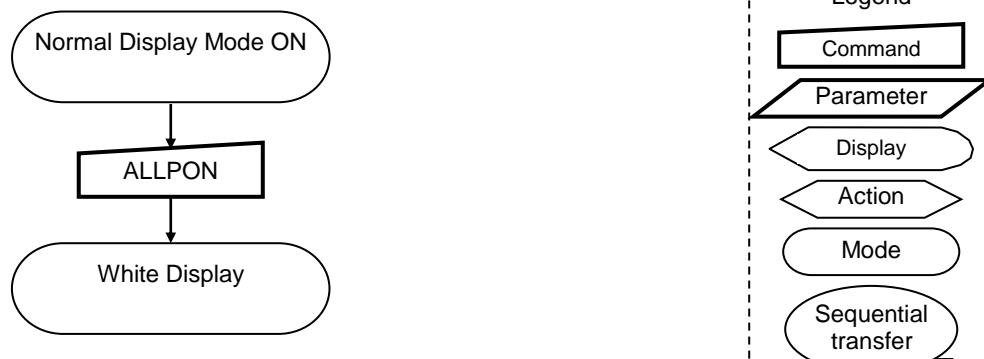
6.2.14 Display Inversion On (21h)

21 H		INVON (Display Inversion On)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Write	0	0	1	0	0	0	0	1	21												
Parameter	No Parameter																					
Description	<p>This command is used to recover from display inversion mode. This command makes no change of contents of frame memory. This command does not change any other status.</p> <p>(Example)</p> 																					
Restriction	This command has no effect when module is already in inversion on mode																					
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																					
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Status	Default Value																					
Power On Sequence	Display Inversion off																					
S/W Reset	Display Inversion off																					
H/W Reset	Display Inversion off																					
Flow Chart	 <pre> graph TD A([Display Inversion OFF Mode]) --> B[INVON (21H)] B --> C([Display Inversion ON Mode]) </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.15 All Pixel Off (22h)

22 H		ALLPOFF (All Pixel Off)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	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> <p>(Example)</p>																						
Restriction	This command has no effect when module is already in all pixel off mode																						
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																						
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Status	Default Value																						
Power On Sequence	All pixel off																						
S/W Reset	All pixel off																						
H/W Reset	All pixel off																						
Flow Chart	<pre> graph TD A([Normal Display Mode ON]) --> B[ALLPOFF] B --> C([Black Display]) </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																						

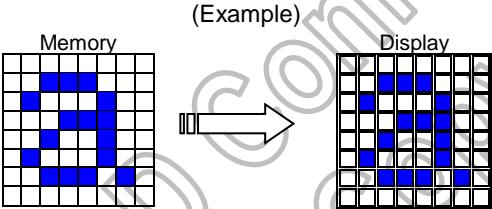
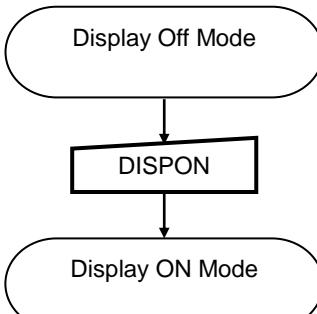
6.2.16 All Pixel On (23h)

23 H		ALLPON (All Pixel On)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	1	0	0	0	1	1	23													
Parameter	No Parameter																						
Description	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. This command makes no change of contents of frame memory. This command does not change any other status.																						
	 <p>(Example)</p>																						
Restriction	This command has no effect when module is already in all pixel on mode																						
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																						
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Status	Default Value																						
Power On Sequence	All pixel off																						
S/W Reset	All pixel off																						
H/W Reset	All pixel off																						
Flow Chart	 <pre> graph TD A([Normal Display Mode ON]) --> B[ALLPON] B --> C([White Display]) </pre> <p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																						

6.2.17 Display Off (28h)

28 H		DISPOFF (Display off)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	1	0	1	0	0	0	28													
Parameter	NO Parameter																						
Description	<p>This command is used to enter into DISPLAY OFF mode. In this mode, the output from Frame Memory is disabled and blank page inserted.</p> <p>This command makes no change of contents of frame memory.</p> <p>This command does not change any other status.</p> <p>There will be no abnormal visible effect on the display.</p>																						
Restriction	This command has no effect when module is already in display off mode.																						
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																						
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Status	Default Value																						
Power On Sequence	Display Off																						
S/W Reset	Display Off																						
H/W Reset	Display Off																						
Flow Chart	<pre> graph TD A([Display On Mode]) --> B[DISPOFF] B --> C([Display OFF Mode]) </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																						

6.2.18 Display On (29h)

29 H		DISPON (Display on)																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX													
Command	Write	0	0	1	0	1	0	0	1	29													
Parameter	NO Parameter																						
Description	This command is used to recover from DISPLAY OFF mode. Output from the Frame Memory is enabled. This command makes no change of contents of frame memory. This command does not change any other status.																						
																							
Restriction	This command has no effect when module is already in display on mode.																						
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																						
Normal Mode On, Idle Mode Off, Sleep Out	Yes																						
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Status	Default Value																						
Power On Sequence	Display Off																						
S/W Reset	Display Off																						
H/W Reset	Display Off																						
Flow Chart	 <pre> graph TD A([Display Off Mode]) --> B[DISPON] B --> C([Display ON Mode]) </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																						

6.2.19 Memory Access Control (36h)

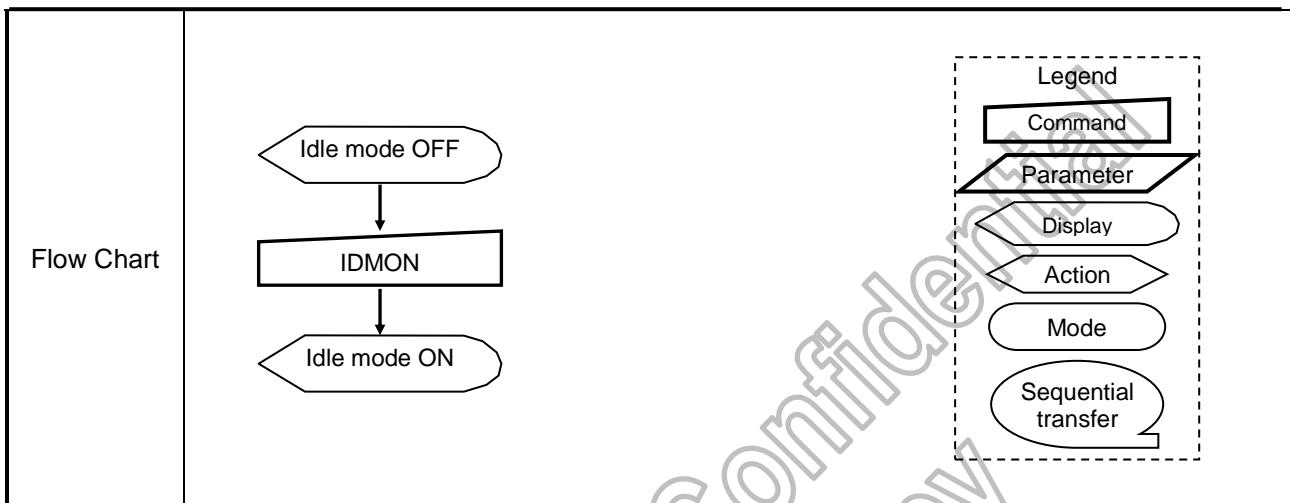
36 H		MADCTR (Memory Access Control)										
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	Write	0	0	1	1	0	1	1	0	36		
Parameter	-	MY	MX	-	-	RGB	SS	-	-	-		
		This command defines read/write scanning direction of frame memory. This command makes no change on the other driver status.										
Description	Bit Assignment											
	BIT	NAME	DESCRIPTION									
	D7	PAGE ADDRESS ORDER (MY)	These 2 bits controls interface to display direction									
	D6	COLUMN ADDRESS ORDER (MX)										
	D3	RGB-BGR ORDER (BGR)	Color selector switch control 0=RGB color sequence, 1=BGR color sequence									
Restriction	D2											
	Horizontal ORDER (SS) LCD horizontal refresh direction control											
Register Availability	-											
Default												
Flow Chart												
<pre> graph TD MADCTR[MADCTR] --> Parameter[/Parameter/] </pre>										Legend Command Parameter Display Action Mode Sequential transfer		

6.2.20 Idle Mode Off (38h)

38 H		IDMOFF (Idle Mode Off)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Write	0	0	1	1	1	0	0	0	38												
Parameter	No Parameter																					
Description	This command is used to recover from idle mode on In the idle off mode, display panel can display maximum 16.7M colors																					
Restriction	This command has no effect when module is already in idle off mode.																					
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 or Booster Off</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 or Booster Off	Yes
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Status	Default Value																					
Power On Sequence	Idle Mode Off																					
S/W Reset	Idle Mode Off																					
H/W Reset	Idle Mode Off																					
Flow Chart	<pre> graph TD A([Idle mode ON]) --> B[IDMOFF (38)] B --> C([Idle mode OFF]) </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.21 Idle Mode On (39h)

39 H		IDMON (Idle Mode on)																																													
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																					
Command	Write	0	0	1	1	1	0	0	1	39																																					
Parameter	No Parameter																																														
Description	<p>This command is used to enter idle mode on.</p> <p>In the idle on mode, color expression is reduced. The primary and the secondary colors using MSB of each R, G and B in the Frame Memory, 8 color depth data is displayed.</p> <p>(Example)</p> <p>"x" Don't care</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td>Black</td> <td>0xxx xxxx</td> <td>0xxx xxxx</td> <td>0xxx xxxx</td> </tr> <tr> <td>Blue</td> <td>0xxx xxxx</td> <td>0xxx xxxx</td> <td>1xxx xxxx</td> </tr> <tr> <td>Red</td> <td>1xxx xxxx</td> <td>0xxx xxxx</td> <td>0xxx xxxx</td> </tr> <tr> <td>Magenta</td> <td>1xxx xxxx</td> <td>0xxx xxxx</td> <td>1xxx xxxx</td> </tr> <tr> <td>Green</td> <td>0xxx xxxx</td> <td>1xxx xxxx</td> <td>0xxx xxxx</td> </tr> <tr> <td>Cyan</td> <td>0xxx xxxx</td> <td>1xxx xxxx</td> <td>1xxx xxxx</td> </tr> <tr> <td>Yellow</td> <td>1xxx xxxx</td> <td>1xxx xxxx</td> <td>0xxx xxxx</td> </tr> <tr> <td>White</td> <td>1xxx xxxx</td> <td>1xxx xxxx</td> <td>1xxx xxxx</td> </tr> </tbody> </table>											Color	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	Black	0xxx xxxx	0xxx xxxx	0xxx xxxx	Blue	0xxx xxxx	0xxx xxxx	1xxx xxxx	Red	1xxx xxxx	0xxx xxxx	0xxx xxxx	Magenta	1xxx xxxx	0xxx xxxx	1xxx xxxx	Green	0xxx xxxx	1xxx xxxx	0xxx xxxx	Cyan	0xxx xxxx	1xxx xxxx	1xxx xxxx	Yellow	1xxx xxxx	1xxx xxxx	0xxx xxxx	White	1xxx xxxx	1xxx xxxx	1xxx xxxx
Color	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																																												
Black	0xxx xxxx	0xxx xxxx	0xxx xxxx																																												
Blue	0xxx xxxx	0xxx xxxx	1xxx xxxx																																												
Red	1xxx xxxx	0xxx xxxx	0xxx xxxx																																												
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Green	0xxx xxxx	1xxx xxxx	0xxx xxxx																																												
Cyan	0xxx xxxx	1xxx xxxx	1xxx xxxx																																												
Yellow	1xxx xxxx	1xxx xxxx	0xxx xxxx																																												
White	1xxx xxxx	1xxx xxxx	1xxx xxxx																																												
Restriction	This command has no effect when module is already in idle on mode.																																														
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H/W Reset	Idle Mode Off																																														



6.2.22 Write Display Brightness (51h)

51 H		WRDISBV (Write Display Brightness)																									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																	
Command	Write	0	1	0	1	0	0	0	1	51																	
Parameter	Write	DBV7	DBV6	DBV5	DBV4	DBV3	DBV2	DBV1	DBV1	-																	
Description		This command is used to adjust brightness value. In principle relationship is that 00h value means the lowest brightness and FFh value means the highest brightness.																									
		<table border="1"> <thead> <tr> <th>DBV[7:0]</th><th>Brightness Ratio</th><th>Brightness %</th></tr> </thead> <tbody> <tr> <td>00h</td><td>0/256</td><td>0%</td></tr> <tr> <td>01h</td><td>2/256</td><td>0.78%</td></tr> <tr> <td>:</td><td>:</td><td>:</td></tr> <tr> <td>FEh</td><td>255/256</td><td>99.6%</td></tr> <tr> <td>FFH</td><td>256/256</td><td>100%</td></tr> </tbody> </table>										DBV[7:0]	Brightness Ratio	Brightness %	00h	0/256	0%	01h	2/256	0.78%	:	:	:	FEh	255/256	99.6%	FFH
DBV[7:0]	Brightness Ratio	Brightness %																									
00h	0/256	0%																									
01h	2/256	0.78%																									
:	:	:																									
FEh	255/256	99.6%																									
FFH	256/256	100%																									
The display supplier cannot use this command for tuning (e.g. factory tuning, etc.).																											
<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 or Booster Off</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 or Booster Off	Yes						
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Status	Default Value																										
Power On Sequence	00h																										
S/W Reset	00h																										
H/W Reset	00h																										
<pre> graph TD WRDISBV[WRDISBV] --> DBV[DBV[7:0]] DBV --> NewBrightness[New Brightness Loaded] </pre> <p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																											

6.2.23 Read Display Brightness (52h)

52 H		RDDISBV (Read Display Brightness)									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	Read	0	1	0	1	0	0	1	0	52	
Parameter	Read	DBV7	DBV6	DBV5	DBV4	DBV3	DBV2	DBV1	DBV1	-	
Description	This command is used to read brightness value. In principle relationship is that 00h value means the lowest brightness and FFh value means the highest brightness.										
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				
Default			Status				Default Value				
			Power On Sequence				00h				
			S/W Reset				00h				
			H/W Reset				00h				
Flow Chart	<pre> graph TD RDDISBV[RDDISBV] --> SendD[Send D[7:0]] </pre> <p>The flowchart shows a rectangular box labeled "RDDISBV" connected by a downward arrow to a trapezoidal box labeled "Send D[7:0]". To the right of the flowchart, the text "Host Driver" is written vertically above a dashed-line box labeled "Legend". Inside the legend box are six items: "Command" (rectangle), "Parameter" (trapezoid), "Display" (left-pointing arrow), "Action" (right-pointing arrow), "Mode" (oval), and "Sequential transfer" (double-headed oval).</p>										

6.2.24 Write CTRL Display (53h)

WRCTRLD (Write CTRL Display Value)																						
53 H	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Write	0	1	0	1	0	0	1	1	53												
Parameter	Write	0	0	BCTRL	0	DD	BL	0	0	-												
Description	This command is used to control display brightness. <table border="1"><thead><tr><th>Bits</th><th>Value</th></tr></thead><tbody><tr><td>BCTRL</td><td>'0' off, DBV[7:0] is 00h; PWM keep low '1' On, DBV[7:0] is active; PWM output</td></tr><tr><td>DD</td><td>'0' Brightness dimming is off '1' Brightness dimming is on</td></tr><tr><td>BL</td><td>'0' Backlight Control is off '1' Backlight Control is on</td></tr></tbody></table>										Bits	Value	BCTRL	'0' off, DBV[7:0] is 00h; PWM keep low '1' On, DBV[7:0] is active; PWM output	DD	'0' Brightness dimming is off '1' Brightness dimming is on	BL	'0' Backlight Control is off '1' Backlight Control is on				
Bits	Value																					
BCTRL	'0' off, DBV[7:0] is 00h; PWM keep low '1' On, DBV[7:0] is active; PWM output																					
DD	'0' Brightness dimming is off '1' Brightness dimming is on																					
BL	'0' Backlight Control is off '1' Backlight Control is on																					
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Status	Availability																					
Normal Mode On, Idle Mode Off, Sleep Out	Yes																					
Normal Mode On, Idle Mode On, Sleep Out	Yes																					
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Status	Default Value																					
Power On Sequence	00h																					
S/W Reset	00h																					
H/W Reset	00h																					

6.2.25 Read CTRL Display Value (54h)

54 H		RDCTRLD (Read CTRL Display Value)										
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	Read	0	1	0	1	0	1	0	0	54		
Parameter	Read	0	0	BCTRL	0	DD	BL	0	0	-		
Description	This command is used to read brightness value. In principle relationship is that 00h value means the lowest brightness and FFh value means the highest brightness.											
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 or Booster Off		Yes									
Default	Status		Default Value									
	Power On Sequence		00h									
	S/W Reset		00h									
	H/W Reset		00h									
Flow Chart	<pre> graph TD RDCTRLD[RDCTRLD] --> SendD[Send D[7:0]] SendD --> HostDriver[Host Driver] </pre> <p>The flowchart illustrates the command sequence. It starts with a rectangular box labeled "RDCTRLD". An arrow points from this box down to a trapezoidal box labeled "Send D[7:0]". A horizontal dotted line extends from the bottom of the "Send D[7:0]" box to the right, where it is labeled "Host Driver".</p>											
	<p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 											

6.2.26 Write Content Adaptive Brightness Control (55h)

6.2.27 Read Content Adaptive Brightness Control (56h)

56 H		RDCABC (Read Content Adaptive Brightness Control)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	0	1	1	1	1	0	56														
Parameter	Read	0	0	0	0	0	0	C1	C0	-														
Description	This command is used to read parameters for image content based adaptive brightness control functionality. <table border="1"> <tr> <th>C1</th><th>C0</th><th>Function</th></tr> <tr> <td>0</td><td>0</td><td>Off</td></tr> <tr> <td>0</td><td>1</td><td>User Interface Image (UI mode)</td></tr> <tr> <td>1</td><td>0</td><td>Still Picture Image (Still mode)</td></tr> <tr> <td>1</td><td>1</td><td>Moving Picture Image (Moving mode)</td></tr> </table>									C1	C0	Function	0	0	Off	0	1	User Interface Image (UI mode)	1	0	Still Picture Image (Still mode)	1	1	Moving Picture Image (Moving mode)
C1	C0	Function																						
0	0	Off																						
0	1	User Interface Image (UI mode)																						
1	0	Still Picture Image (Still mode)																						
1	1	Moving Picture Image (Moving mode)																						
Restriction	-																							
Register Availability	<table border="1"> <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 or Booster Off</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 or Booster Off	Yes			
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Status	Default Value																							
Power On Sequence	00h																							
S/W Reset	00h																							
H/W Reset	00h																							
Flow Chart	<p>Host Driver</p> <p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																							

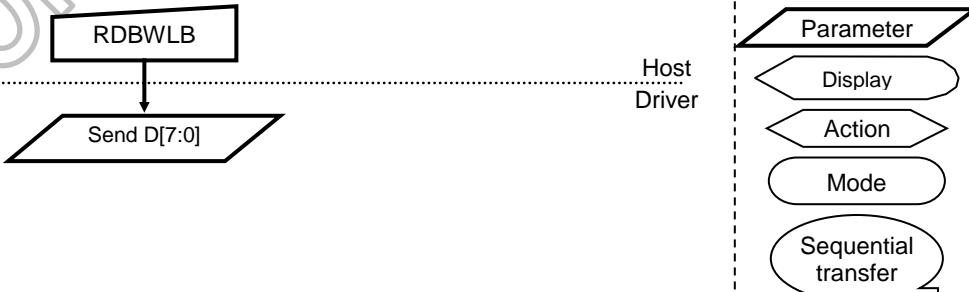
6.2.28 Write CABC Minimum Brightness (5Eh)

5E H		WRCABCMB (Write CABC minimum brightness)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Write	0	1	0	1	1	1	1	0	5E												
Parameter	Write	CMB7	CMB6	CMB5	CMB4	CMB3	CMB2	CMB1	CMB0	-												
Description	This command is used to set the minimum brightness value of the display for CABC function. In principle relationship is that 00h value means the lowest brightness for CABC and FFh value means the highest brightness for CABC.																					
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 or Booster Off</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 or Booster Off	Yes
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Status	Default Value																					
Power On Sequence	00h																					
S/W Reset	00h																					
H/W Reset	00h																					
Flow Chart	<pre> graph TD A[WRCABCMB] --> B[CMB[7:0]] B --> C{New Display Luminance Value Loaded} </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.29 Read CABC minimum brightness (5Fh)

5F H		RDCABCMB (Read CABC minimum brightness)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	0	1	1	1	1	1	5F												
Parameter	Read	CMB7	CMB6	CMB5	CMB4	CMB3	CMB2	CMB1	CMB0	-												
Description	This command is used to read the minimum brightness value of the display for CABC function. In principle relationship is that 00h value means the lowest brightness for CABC and FFh value means the highest brightness for CABC.																					
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 or Booster Off</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 or Booster Off	Yes
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Status	Default Value																					
Power On Sequence	00h																					
S/W Reset	00h																					
H/W Reset	00h																					
Flow Chart	<pre> graph TD RDCABCMB[RDCABCMB] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] RDCABCMB SendD end </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.30 Read Black/White Low Bits (70h)

RDBWLB (Read Black White Low Bits)										HEX														
70 H	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	0	0	0	0	70														
Parameter	Read	Bkx1	Bkx0	Bky1	Bky0	Wx1	Wx0	Wy1	Wy0	-														
Description	This command returns the lowest bits of black and white color characteristic. Black: Bkx and Bky White: Wx and Wy																							
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 or Booster Off</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 or Booster Off	Yes		
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	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	 <p>The flow chart illustrates the command sequence. It starts with a rectangular box labeled "RDBWLB" with an arrow pointing down to a trapezoidal box labeled "Send D[7:0]". To the right of the trapezoid is the text "Host Driver". Above the trapezoid is a dashed line labeled "Host Driver". To the right of the flowchart is a legend enclosed in a dashed box:</p> <ul style="list-style-type: none"> Command: rectangle Parameter: horizontal bar Display: left-pointing arrow Action: right-pointing arrow Mode: oval Sequential transfer: double-headed oval 																							

6.2.31 Read Bkx (71h)

71 H		RDBkx (Read Bkx)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	0	0	0	1	71														
Parameter	Read	Bkx9	Bkx8	Bkx7	Bkx6	Bkx5	Bkx4	Bkx3	Bkx2	-														
Description	This command returns the Bkx bits of black color characteristic.																							
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 or Booster Off</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 or Booster Off	Yes		
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Normal Mode On, Idle Mode On, Sleep Out	Yes																							
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	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	<pre> graph TD RDBkx[RDBkx] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end legend[Legend] legend -- Command --> RDBkx legend -- Parameter --> SendD legend -- Display --> None legend -- Action --> None legend -- Mode --> None legend -- Sequential transfer --> None </pre> <p>The flowchart illustrates the RDBkx command sequence. It starts with the 'RDBkx' command, which is sent by the Host Driver. This is followed by the data bytes 'Send D[7:0]'. A legend on the right side defines the symbols used in the flowchart: a rectangle for 'Command', a parallelogram for 'Parameter', and arrows for 'Display', 'Action', 'Mode', and 'Sequential transfer'.</p>																							

6.2.32 Read Bky (72h)

72 H		RDBky (Read Bky)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	0	0	1	0	72														
Parameter	Read	Bky9	Bky8	Bky7	Bky6	Bky5	Bky4	Bky3	Bky2	-														
Description	This command returns the Bky bits of black color characteristic.																							
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 or Booster Off</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 or Booster Off	Yes		
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Normal Mode On, Idle Mode On, Sleep Out	Yes																							
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	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	<pre> graph TD RDBky[RDBky] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end legend[Legend] legend -- Command --> CommandBox legend -- Parameter --> ParameterBox legend -- Display --> DisplayBox legend -- Action --> ActionBox legend -- Mode --> ModeBox legend -- Sequential transfer --> SequentialTransferBox </pre> <p>The flowchart shows the RDBky command being sent to the Host Driver, which then sends the data D[7:0]. A legend on the right side defines the symbols used in the flowchart:</p> <ul style="list-style-type: none"> Command: Box Parameter: Box Display: Left-pointing arrow Action: Right-pointing arrow Mode: Oval Sequential transfer: Ellipse 																							

6.2.33 Read Wx (73h)

73 H		RDWx (Read Wx)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	0	0	1	1	73														
Parameter	Read	Wx9	Wx8	Wx7	Wx6	Wx5	Wx4	Wx3	Wx2	-														
Description	This command returns the Wx bits of White color characteristic.																							
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 or Booster Off</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 or Booster Off	Yes		
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S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	<p>The flowchart illustrates the command sequence. It starts with a rectangular box labeled "RDWx" at the top, followed by a downward-pointing arrow. This leads to a trapezoidal box labeled "Send D[7:0]" at the bottom. To the right of the flowchart, a dashed-line box contains a legend with six entries: "Command" (rectangle), "Parameter" (rectangle with diagonal line), "Display" (left-pointing arrow), "Action" (right-pointing arrow), "Mode" (oval), and "Sequential transfer" (oval with diagonal line).</p>																							

6.2.34 Read Wy (74h)

74 H		RDWy (Read Wy)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	0	1	0	0	74														
Parameter	Read	Wy9	Wy8	Wy7	Wy6	Wy5	Wy4	Wy3	Wy2	-														
Description	This command returns the Wy bits of White color characteristic.																							
Restriction	-																							
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H/W Reset	00h	OTP Value																						
Flow Chart	<p>Flow Chart</p> <p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																							

6.2.35 Read Red/Green Low Bits (75h)

75 H		RDRGLB (Read Red Green Low Bits)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	0	1	0	1	75														
Parameter	Read	Rx1	Rx0	Ry1	Ry0	Gx1	Gx0	Gy1	Gy0	-														
Description	This command returns the lowest bits of Red and Green color characteristic. Red: Rx and Ry Green: Gx and Gy																							
Restriction	-																							
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	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	<p>The flowchart illustrates the command sequence. It starts with a rectangular box labeled "RDRGLB" with an arrow pointing down to a trapezoidal box labeled "Send D[7:0]". To the right of the flowchart is a legend enclosed in a dashed box:</p> <ul style="list-style-type: none"> Command: Represented by a rectangle. Parameter: Represented by a horizontal bar. Display: Represented by a left-pointing triangle. Action: Represented by a right-pointing triangle. Mode: Represented by an oval. Sequential transfer: Represented by a double-headed vertical oval. 																							

6.2.36 Read Rx (76h)

76 H		RDRx (Read Rx)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	0	1	1	0	76												
		Dummy Cycle																				
Parameter	Read	Rx9	Rx8	Rx7	Rx6	Rx5	Rx4	Rx3	Rx2	-												
Description	This command returns the Rx bits of Red color characteristic.																					
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																					
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Partial Mode On, Idle Mode Off, Sleep Out	Yes																					
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Sleep In or Booster Off	Yes																					
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Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<p>Host Driver</p> <p>Legend</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.37 Read Ry (77h)

77 H		RDRy (Read Ry)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	0	1	1	1	77												
Dummy Cycle																						
Parameter	Read	Ry9	Ry8	Ry7	Ry6	Ry5	Ry4	Ry3	Ry2	-												
Description	This command returns the Ry bits of Red color characteristic.																					
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																					
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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 or Booster Off	Yes																					
Default	<table border="1"> <thead> <tr> <th>Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Power On Sequence</th> <th>Before OTP</th><th>After OTP</th> </tr> </thead> <tbody> <tr> <td>S/W Reset</td> <td>00h</td><td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td><td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Power On Sequence	Before OTP	After OTP	S/W Reset	00h	OTP Value	H/W Reset	00h	OTP Value
Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<pre> graph TD RDRy[\"RDRy\"] --> SendD[\"Send D[7:0]\"] subgraph HostDriver [Host Driver] SendD end subgraph Display [Display] RDRy end </pre> <p>The flowchart illustrates the RDRy command sequence. It starts with a rectangular box labeled "RDRy". An arrow points from this box down to a trapezoidal box labeled "Send D[7:0]". This diagram is enclosed within a dashed-line box labeled "Host Driver" at the top right. To the right of this box is a legend titled "Legend" containing five entries: "Command" (represented by a rectangle), "Parameter" (represented by a parallelogram), "Display" (represented by a left-pointing triangle), "Action" (represented by a right-pointing triangle), and "Mode" (represented by an oval). Below the "Display" entry, there is also an entry for "Sequential transfer" (represented by an oval).</p>																					

6.2.38 Read Gx (78h)

78 H		RDGx (Read Gx)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	1	0	0	0	78												
Dummy Cycle																						
Parameter	Read	Gx9	Gx8	Gx7	Gx6	Gx5	Gx4	Gx3	Gx2	-												
Description	This command returns the Gx bits of Green color characteristic.																					
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																					
Normal Mode On, Idle Mode Off, Sleep Out	Yes																					
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Partial Mode On, Idle Mode Off, Sleep Out	Yes																					
Partial Mode On, Idle Mode On, Sleep Out	Yes																					
Sleep In or Booster Off	Yes																					
Default	<table border="1"> <thead> <tr> <th>Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Power On Sequence</th> <th>Before OTP</th><th>After OTP</th> </tr> </thead> <tbody> <tr> <td>S/W Reset</td> <td>00h</td><td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td><td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Power On Sequence	Before OTP	After OTP	S/W Reset	00h	OTP Value	H/W Reset	00h	OTP Value
Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<pre> graph TD RDGx[RDGx] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.39 Read Gy (79h)

79 H		RDGy (Read Gy)																								
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																
Command	Read	0	1	1	1	1	0	0	1	79																
Dummy Cycle																										
Parameter	Read	Gy9	Gy8	Gy7	Gy6	Gy5	Gy4	Gy3	Gy2	-																
Description	This command returns the Gy bits of Green color characteristic.																									
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 or Booster Off</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 or Booster Off	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																									
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Sleep In or Booster Off	Yes																									
Default	<table border="1"> <thead> <tr> <th>Status</th> <th>Default Value</th> <th>Before OTP</th> <th>After OTP</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>00h</td> <td>OTP Value</td> <td>OTP Value</td> </tr> <tr> <td>S/W Reset</td> <td>00h</td> <td>OTP Value</td> <td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td> <td>OTP Value</td> <td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value	Before OTP	After OTP	Power On Sequence	00h	OTP Value	OTP Value	S/W Reset	00h	OTP Value	OTP Value	H/W Reset	00h	OTP Value	OTP Value
Status	Default Value	Before OTP	After OTP																							
Power On Sequence	00h	OTP Value	OTP Value																							
S/W Reset	00h	OTP Value	OTP Value																							
H/W Reset	00h	OTP Value	OTP Value																							
Flow Chart	<pre> graph TD RDGy[RDGy] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command: Box Parameter: Horizontal arrow Display: Left-pointing arrow Action: Right-pointing arrow Mode: Oval Sequential transfer: Ellipse 																									

6.2.40 Read Blue/AColor Low Bits (7Ah)

7A H		RDBALB (Read Blue AColor Low Bits)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	0	1	1	1	1	0	1	0	7A														
Dummy Cycle																								
Parameter	Read	Bx1	Bx0	By1	By0	Ax1	Ax0	Ay1	Ay0	-														
Description	This command returns the lowest bits of Blue and AColor color characteristic. Blue: Bx and By A: Ax and Ay																							
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																							
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Status	Default Value																							
	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	<pre> graph TD RDBALB[RDBALB] --> SendD[Send D[7:0]] subgraph Legend [Legend] direction TB C[Command] --- P[Parameter] P --- D[Display] D --- A[Action] A --- M[Mode] M --- ST[Sequential transfer] end subgraph HostDriver [Host Driver] SendD end </pre>																							

6.2.41 Read Bx (7Bh)

7B H		RDBx (Read Bx)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	1	0	1	1	7B												
Dummy Cycle																						
Parameter	Read	Bx9	Bx8	Bx7	Bx6	Bx5	Bx4	Bx3	Bx2	-												
Description	This command returns the Bx bits of Blue color characteristic.																					
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 or Booster Off</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 or Booster Off	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																					
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Default	<table border="1"> <thead> <tr> <th>Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Power On Sequence</th> <th>Before OTP</th><th>After OTP</th> </tr> </thead> <tbody> <tr> <td>S/W Reset</td> <td>00h</td><td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td><td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Power On Sequence	Before OTP	After OTP	S/W Reset	00h	OTP Value	H/W Reset	00h	OTP Value
Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<pre> graph TD RDBx[RDBx] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command: Box Parameter: Horizontal arrow Display: Left-pointing arrow Action: Right-pointing arrow Mode: Oval Sequential transfer: Ellipse 																					

6.2.42 Read By (7Ch)

7C H		RDBy (Read By)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	1	1	0	0	7C												
Dummy Cycle																						
Parameter	Read	By9	By8	By7	By6	By5	By4	By3	By2	-												
Description	This command returns the By bits of Blue color characteristic.																					
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																					
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Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<pre> graph TD RDBy[RDBy] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end </pre> <p>The flowchart illustrates the RDBy command sequence. It starts with a rectangular box labeled "RDBy". An arrow points from this box down to a trapezoidal box labeled "Send D[7:0]". To the right of the trapezoid is the text "Host Driver". To the right of the "Host Driver" text is a legend box with a dashed border. Inside the legend box are six items: "Command" (rectangle), "Parameter" (trapezoid), "Display" (left-pointing arrow), "Action" (right-pointing arrow), "Mode" (oval), and "Sequential transfer" (elliptical arrow).</p>																					

6.2.43 Read Ax (7Dh)

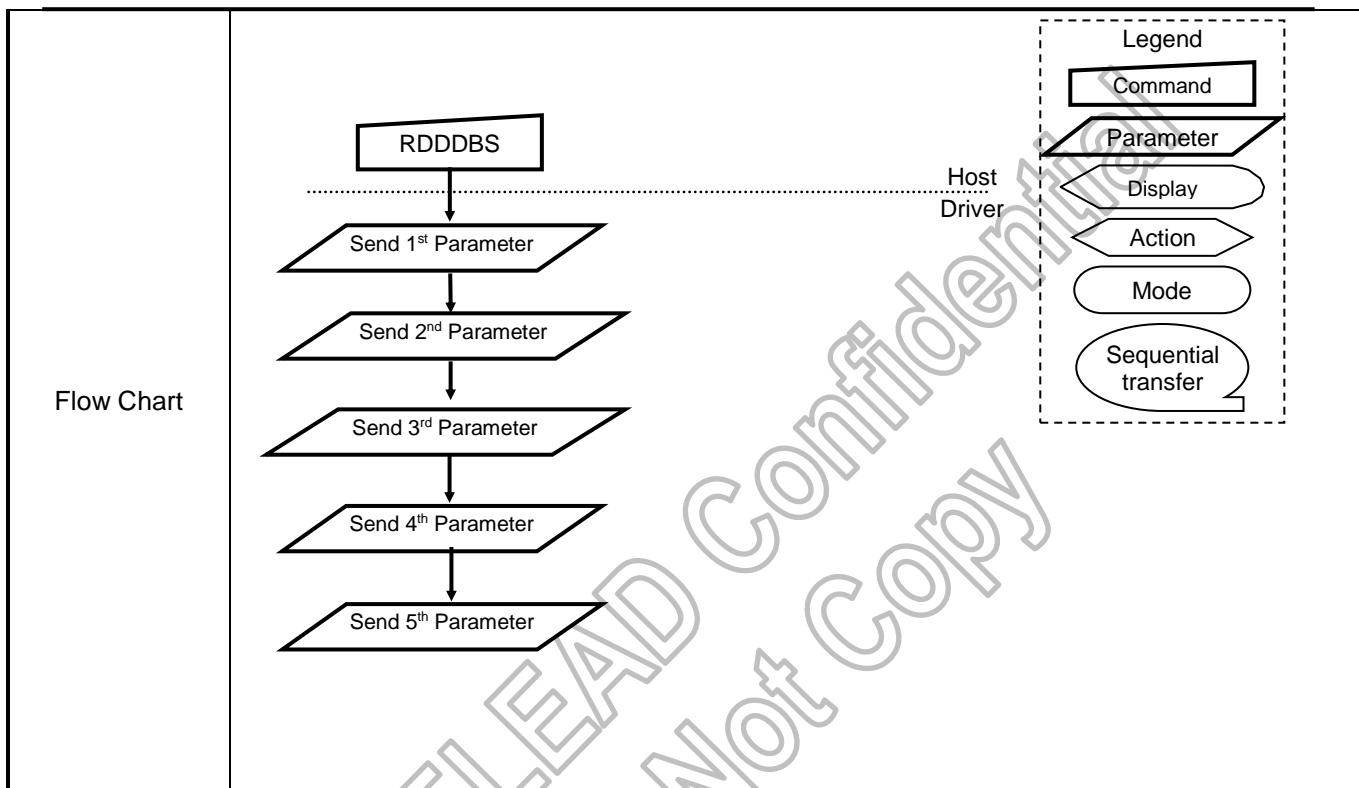
7D H		RDAX (Read Ax)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	1	1	0	1	7D												
Dummy Cycle																						
Parameter	Read	Ax9	Ax8	Ax7	Ax6	Ax5	Ax4	Ax3	Ax2	-												
Description	This command returns the Ax bits of A color characteristic.																					
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 or Booster Off</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 or Booster Off	Yes
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Partial Mode On, Idle Mode Off, Sleep Out	Yes																					
Partial Mode On, Idle Mode On, Sleep Out	Yes																					
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Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<pre> graph TD RDAx[RDAX] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.44 Read Ay (7Eh)

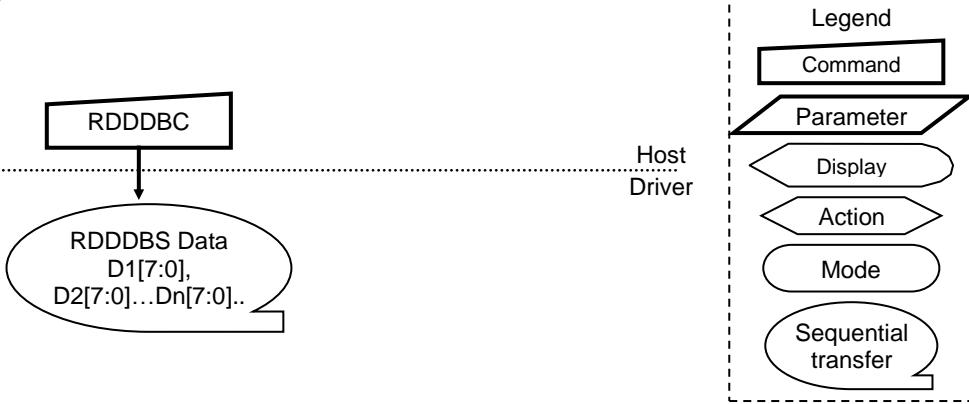
7E H		RDAy (Read Ay)																				
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	Read	0	1	1	1	1	1	1	0	7E												
Dummy Cycle																						
Parameter	Read	Ay9	Ay8	Ay7	Ay6	Ay5	Ay4	Ay3	Ay2	-												
Description	This command returns the Ay bits of A color characteristic.																					
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 or Booster Off</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 or Booster Off	Yes
Status	Availability																					
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Status	Default Value																					
Power On Sequence	Before OTP	After OTP																				
S/W Reset	00h	OTP Value																				
H/W Reset	00h	OTP Value																				
Flow Chart	<pre> graph TD RDAy[RDAy] --> SendD[Send D[7:0]] subgraph HostDriver [Host Driver] SendD end </pre> <p>Legend:</p> <ul style="list-style-type: none"> Command Parameter Display Action Mode Sequential transfer 																					

6.2.45 Read DDB Start (A1h)

A1 H		RDDDBS (Read DDB Start)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	1	0	1	0	0	0	0	1	A1														
1 st Parameter	Read	x	x	x	x	x	x	x	x	-														
2 nd Parameter		x	x	x	x	x	x	x	x															
3 Rd Parameter		x	x	x	x	x	x	x	x															
4 th parameter		x	x	x	x	x	x	x	x															
5 th parameter		1	1	1	1	1	1	1	1															
Description	<p>This command returns the supplier identification and display module mode/revision information.</p> <p>Note: This information is not the same what “Read ID1 (DAh)”, “Read ID2 (DBh)” and “Read ID3 (DCh)” commands are returning.</p> <p>Note: Parameter 0xFF is an “Exit Code”, this means that there is no more data in the DDB block.</p> <p>This read sequence can be interrupted by any command and it can be continued by “Read DDB Continue (A8h)” command when the first parameter, what has been transferred, is the parameter, which has not been sent e.g. RDDDBS => 1st parameter has been sent => 2nd parameter has been sent=> interrupt => RDDDBC => 3rd parameter of the RDDDBS has been sent.</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 or Booster Off</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 or Booster Off	Yes		
Status	Availability																							
Normal Mode On, Idle Mode Off, Sleep Out	Yes																							
Normal Mode On, Idle Mode On, Sleep Out	Yes																							
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Partial Mode On, Idle Mode On, Sleep Out	Yes																							
Sleep In or Booster Off	Yes																							
Default	<table border="1"> <thead> <tr> <th rowspan="2">Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Before OTP</th> <th>After OTP</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>00h</td> <td>OTP Value</td> </tr> <tr> <td>S/W Reset</td> <td>00h</td> <td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td> <td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Before OTP	After OTP	Power On Sequence	00h	OTP Value	S/W Reset	00h	OTP Value	H/W Reset	00h	OTP Value
Status	Default Value																							
	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						



6.2.46 Read DDB Continue (A8h)

A8 H		RDDDBC (Read DDB Continue)																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	1	0	1	0	1	0	0	0	A8														
1 st Parameter	Read	x	x	x	x	x	x	x	x	-														
2 nd Parameter		x	x	x	x	x	x	x	x															
3 Rd Parameter		x	x	x	x	x	x	x	x															
4 th parameter		x	x	x	x	x	x	x	x															
5 th parameter		1	1	1	1	1	1	1	1															
Description	This command returns the supplier identification and display module mode/revision information from the point where RDDDBS command was interrupted by an other command. Note: Parameter 0xFF is an "Exit Code", this means that there is no more data in the DDB block.																							
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 or Booster Off</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 or Booster Off	Yes		
Status	Availability																							
Normal Mode On, Idle Mode Off, Sleep Out	Yes																							
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Partial Mode On, Idle Mode On, Sleep Out	Yes																							
Sleep In or Booster Off	Yes																							
Default	<table border="1"> <thead> <tr> <th rowspan="2">Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Before OTP</th> <th>After OTP</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>00h</td> <td>OTP Value</td> </tr> <tr> <td>S/W Reset</td> <td>00h</td> <td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>00h</td> <td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Before OTP	After OTP	Power On Sequence	00h	OTP Value	S/W Reset	00h	OTP Value	H/W Reset	00h	OTP Value
Status	Default Value																							
	Before OTP	After OTP																						
Power On Sequence	00h	OTP Value																						
S/W Reset	00h	OTP Value																						
H/W Reset	00h	OTP Value																						
Flow Chart	 <p>The flowchart illustrates the sequence of commands. It starts with the 'RDDDBC' command, which then leads to the 'RDDDBS Data' block. This data block contains fields D1[7:0], D2[7:0] through Dn[7:0]. To the right of the flowchart is a legend that defines the symbols used in the sequence diagram:</p> <ul style="list-style-type: none"> Command: Represented by a rectangle. Parameter: Represented by a rectangle containing a diagonal line. Display: Represented by a left-pointing arrow. Action: Represented by a right-pointing arrow. Mode: Represented by an oval. Sequential transfer: Represented by an oval containing a diagonal line. 																							

6.2.47 Read ID1 Value (DAh)

DA H	RDID1 (Read ID1 Value)																							
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	1	1	0	1	1	0	1	0	DA														
Parameter	Read	ID17	ID16	ID15	ID14	ID13	ID12	ID11	ID10	-														
Description	This read byte identifies the LCD module's manufacturer.																							
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																							
Default	<table border="1"> <thead> <tr> <th rowspan="2">Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Before OTP</th> <th>After OTP</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>38h</td> <td>OTP Value</td> </tr> <tr> <td>S/W Reset</td> <td>38h</td> <td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>38h</td> <td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Before OTP	After OTP	Power On Sequence	38h	OTP Value	S/W Reset	38h	OTP Value	H/W Reset	38h	OTP Value
Status	Default Value																							
	Before OTP	After OTP																						
Power On Sequence	38h	OTP Value																						
S/W Reset	38h	OTP Value																						
H/W Reset	38h	OTP Value																						
Flow Chart	<p>The flowchart starts with a rectangular box labeled "RDID1". An arrow points down from this box to a trapezoidal box labeled "Send ID1[7:0]". A horizontal dotted line connects the bottom of the "RDID1" box to the top of the "Send ID1[7:0]" box. To the right of the flowchart, there is a legend titled "Host Driver" enclosed in a dashed box. The legend contains five entries: "Command" (rectangle), "Parameter" (rectangle), "Display" (left-pointing arrow), "Action" (right-pointing arrow), "Mode" (oval), and "Sequential transfer" (double-headed oval).</p>																							

6.2.48 Read ID2 Value (DBh)

DB H	RDID2 (Read ID2 Value)																							
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	1	1	0	1	1	0	1	1	DB														
Parameter	Read	ID27	ID26	ID25	ID24	ID23	ID22	ID21	ID20	-														
Description	This read byte identifies the LCD module version.																							
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																							
Default	<table border="1"> <thead> <tr> <th rowspan="2">Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Before OTP</th> <th>After OTP</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>21h</td> <td>OTP Value</td> </tr> <tr> <td>S/W Reset</td> <td>21h</td> <td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>21h</td> <td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Before OTP	After OTP	Power On Sequence	21h	OTP Value	S/W Reset	21h	OTP Value	H/W Reset	21h	OTP Value
Status	Default Value																							
	Before OTP	After OTP																						
Power On Sequence	21h	OTP Value																						
S/W Reset	21h	OTP Value																						
H/W Reset	21h	OTP Value																						
Flow Chart	<pre> graph TD RDID1[RDID1] --> Send[Send ID2[7:0]] </pre> <p>The flowchart shows a rectangular box labeled "RDID1" at the top, with a downward-pointing arrow pointing to a trapezoidal box labeled "Send ID2[7:0]" at the bottom. To the right of the flowchart is a legend titled "Legend" enclosed in a dashed box. The legend contains five entries: "Command" (represented by a rectangle), "Parameter" (represented by a rectangle), "Display" (represented by a left-pointing arrow), "Action" (represented by a right-pointing arrow), and "Mode" (represented by a horizontal oval). Below the legend, the text "Host Driver" is written.</p>																							

6.2.49 Read ID3 Value (DCh)

DC H	RDID3 (Read ID3 Value)																							
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX														
Command	Read	1	1	0	1	1	1	0	0	DC														
Dummy Cycle																								
Parameter	Read	ID37	ID36	ID35	ID34	ID33	ID32	ID31	ID30	-														
Description	This read byte identifies the LCD module/driver.																							
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 or Booster Off</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 or Booster Off	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 or Booster Off	Yes																							
Default	<table border="1"> <thead> <tr> <th rowspan="2">Status</th> <th colspan="2">Default Value</th> </tr> <tr> <th>Before OTP</th> <th>After OTP</th> </tr> </thead> <tbody> <tr> <td>Power On Sequence</td> <td>1Fh</td> <td>OTP Value</td> </tr> <tr> <td>S/W Reset</td> <td>1Fh</td> <td>OTP Value</td> </tr> <tr> <td>H/W Reset</td> <td>1Fh</td> <td>OTP Value</td> </tr> </tbody> </table>										Status	Default Value		Before OTP	After OTP	Power On Sequence	1Fh	OTP Value	S/W Reset	1Fh	OTP Value	H/W Reset	1Fh	OTP Value
Status	Default Value																							
	Before OTP	After OTP																						
Power On Sequence	1Fh	OTP Value																						
S/W Reset	1Fh	OTP Value																						
H/W Reset	1Fh	OTP Value																						
Flow Chart	<pre> graph TD RDID1[RDID1] --> Send[Send ID3[7:0]] </pre> <p>The flowchart shows a rectangular box labeled "RDID1" connected by a downward arrow to a trapezoidal box labeled "Send ID3[7:0]". To the right of the flowchart, the text "Host Driver" is written vertically above a dashed-line box. Inside this box is a legend titled "Legend" containing six items: "Command" (rectangle), "Parameter" (parallelogram), "Display" (left-pointing triangle), "Action" (right-pointing triangle), "Mode" (oval), and "Sequential transfer" (double-headed horizontal oval).</p>																							

6.2.50 SETEXTC (B9h)

SETEXTC										
B9 H	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	0	1	1	1	0	0	1	B9
Parameter 1st	W	EXTC1[7]	EXTC1[6]	EXTC1[5]	EXTC1[4]	EXTC1[3]	EXTC1[2]	EXTC1[1]	EXTC1[0]	00
Parameter 2nd	W	EXTC2[7]	EXTC2[6]	EXTC2[5]	EXTC2[4]	EXTC2[3]	EXTC2[2]	EXTC2[1]	EXTC2[0]	00
Parameter 3rd	W	EXTC3[7]	EXTC3[6]	EXTC3[5]	EXTC3[4]	EXTC3[3]	EXTC3[2]	EXTC3[1]	EXTC3[0]	00
Description	This command is used to enable USER Command. Enable User command: Set B9H=F1h, 12h, 83h Disable User command: Set B9H=00h, 00h, 00h									

6.2.51 SETDISP (B2h)

B2 H		SETDISP																																		
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																										
Command	W	1	0	1	1	0	0	1	0	B2																										
Parameter 1st	R/W	NL[7]	NL[6]	NL[5]	NL[4]	NL[3]	NL[2]	NL[1]	NL[0]	C8																										
Parameter 2nd	R/W	RES_V_LSB[1]	RES_V_LSB[0]	BLK_CO_N[1]	BLK_CO_N[0]	x	RESO_S_EL[2]	RESO_S_EL[1]	RESO_S_EL[0]	02																										
Parameter 3rd	R/W	WHITE_GND_EN	WHITE_FRAME_SEL[2]	WHITE_FRAME_SEL[1]	WHITE_FRAME_SEL[0]	x	ISC[2]	ISC[1]	ISC[0]	A0																										
Description	<p>This command is used to control the display resolution.</p> <ul style="list-style-type: none"> • NL[7:0] / RES_V_LSB[1:0] : Specify the gate number of vertical direction. - Gate Number = 480 + NL*4 + RES_V_LSB • BLK_CON[1:0] : Non-display area source output control. <table border="1" style="margin-left: 20px;"> <tr> <th>BLK_CON</th> <th>Source output</th> </tr> <tr> <td>0 0</td> <td>Keep last data</td> </tr> <tr> <td>0 1</td> <td>VSSD</td> </tr> <tr> <td>1 0</td> <td>Hi-Z</td> </tr> <tr> <td>1 1</td> <td>Setting inhibited</td> </tr> </table> • RESO_SEL[2:0] : Specify the channel number of source direction. <table border="1" style="margin-left: 20px;"> <tr> <th>RESO_SEL[2:0] (Hex)</th> <th>Channel number</th> </tr> <tr> <td>0</td> <td>-</td> </tr> <tr> <td>1</td> <td>-</td> </tr> <tr> <td>2</td> <td>720RGB</td> </tr> <tr> <td>3</td> <td>640RGB</td> </tr> <tr> <td>4</td> <td>600RGB</td> </tr> <tr> <td>5</td> <td>540RGB</td> </tr> <tr> <td>others</td> <td>Setting inhibited</td> </tr> </table> • WHITE_GND_EN : Determine source voltage during Blanking Time when accessing Sleep-Out / Sleep-In command. <ul style="list-style-type: none"> - 1 : Source Voltage = GND - 0 : Source Voltage = Lowest Voltage 										BLK_CON	Source output	0 0	Keep last data	0 1	VSSD	1 0	Hi-Z	1 1	Setting inhibited	RESO_SEL[2:0] (Hex)	Channel number	0	-	1	-	2	720RGB	3	640RGB	4	600RGB	5	540RGB	others	Setting inhibited
BLK_CON	Source output																																			
0 0	Keep last data																																			
0 1	VSSD																																			
1 0	Hi-Z																																			
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0	-																																			
1	-																																			
2	720RGB																																			
3	640RGB																																			
4	600RGB																																			
5	540RGB																																			
others	Setting inhibited																																			

- **WHITE_FRAME_SEL[2:0]** : Blank timing control when access sleep out command.

WHITE_FRAME			Blank Frame Period
0	0	0	0 frame
0	0	1	1 frame
0	1	0	2 frames
0	1	1	3 frames
1	0	0	4 frames
1	0	1	5 frames
1	1	0	6 frames
1	1	1	7 frames

- **ISC[2:0]** : Source output refresh control.

ISC			Refresh Period
0	0	0	0 frame
0	0	1	1 frame
0	1	0	2 frames
:			:
1	1	1	7 frames

6.2.52 SETRGBIF (B3h)

B3 H	SETRGBIF																																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																													
Command	W	1	0	1	1	0	0	1	1	B3																													
Parameter 1st	R/W	VBP_RG_B_GEN[7]]	VBP_RG_B_GEN[6]]	VBP_RG_B_GEN[5]]	VBP_RG_B_GEN[4]]	VBP_RG_B_GEN[3]]	VBP_RG_B_GEN[2]]	VBP_RG_B_GEN[1]]	VBP_RG_B_GEN[0]]	28																													
Parameter 2nd	R/W	VFP_RG_B_GEN[7]]	VFP_RG_B_GEN[6]]	VFP_RG_B_GEN[5]]	VFP_RG_B_GEN[4]]	VFP_RG_B_GEN[3]]	VFP_RG_B_GEN[2]]	VFP_RG_B_GEN[1]]	VFP_RG_B_GEN[0]]	28																													
Parameter 3rd	R/W	DE_BP_RGB_GE_N[7]]	DE_BP_RGB_GE_N[6]]	DE_BP_RGB_GE_N[5]]	DE_BP_RGB_GE_N[4]]	DE_BP_RGB_GE_N[3]]	DE_BP_RGB_GE_N[2]]	DE_BP_RGB_GE_N[1]]	DE_BP_RGB_GE_N[0]]	28																													
Parameter 4th	R/W	DE_FP_RGB_GE_N[7]]	DE_FP_RGB_GE_N[6]]	DE_FP_RGB_GE_N[5]]	DE_FP_RGB_GE_N[4]]	DE_FP_RGB_GE_N[3]]	DE_FP_RGB_GE_N[2]]	DE_FP_RGB_GE_N[1]]	DE_FP_RGB_GE_N[0]]	28																													
Description	<p>This command is used to control RGB I/F porch timing for internal use.</p> <ul style="list-style-type: none"> • VBP_RGB_GEN[7:0] : Vertical back porch HS number selection in Blank Frame Period. • VFP_RGB_GEN[7:0] : Vertical front porch HS number selection in Blank Frame Period. <table border="1"> <thead> <tr> <th>VBP_RGB_GEN[7:0] VFP_RGB_GEN[7:0] (Hex)</th> <th>Hsync number</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Setting inhibited</td> </tr> <tr> <td>1</td> <td>Setting inhibited</td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>:</td> <td>:</td> </tr> <tr> <td>FE</td> <td>254</td> </tr> <tr> <td>FF</td> <td>Setting inhibited</td> </tr> </tbody> </table> <p>• DE_BP_RGB_GEN[7:0] : HBP OSC number selection in Blank Frame Period.</p> <p>• DE_FP_RGB_GEN[7:0] : HFP OSC number selection in Blank Frame Period.</p> <table border="1"> <thead> <tr> <th>DE_BP_RGB_GEN[7:0] DE_FP_RGB_GEN[7:0] (Hex)</th> <th>OSC number</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Setting inhibited</td> </tr> <tr> <td>1</td> <td>Setting inhibited</td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>:</td> <td>:</td> </tr> <tr> <td>FE</td> <td>254</td> </tr> <tr> <td>FF</td> <td>Setting inhibited</td> </tr> </tbody> </table>											VBP_RGB_GEN[7:0] VFP_RGB_GEN[7:0] (Hex)	Hsync number	0	Setting inhibited	1	Setting inhibited	2	2	:	:	FE	254	FF	Setting inhibited	DE_BP_RGB_GEN[7:0] DE_FP_RGB_GEN[7:0] (Hex)	OSC number	0	Setting inhibited	1	Setting inhibited	2	2	:	:	FE	254	FF	Setting inhibited
VBP_RGB_GEN[7:0] VFP_RGB_GEN[7:0] (Hex)	Hsync number																																						
0	Setting inhibited																																						
1	Setting inhibited																																						
2	2																																						
:	:																																						
FE	254																																						
FF	Setting inhibited																																						
DE_BP_RGB_GEN[7:0] DE_FP_RGB_GEN[7:0] (Hex)	OSC number																																						
0	Setting inhibited																																						
1	Setting inhibited																																						
2	2																																						
:	:																																						
FE	254																																						
FF	Setting inhibited																																						

6.2.53 SETCYC (B4h)

B4 H		SETCYC																																											
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																			
Command	W	1	0	1	1	0	1	0	0	B4																																			
Parameter 1st	R/W	ZINV_S2_401_EN	ZINV_G_EVEN_EN	ZINV_EN	ZINV2_EN	x	N_NW[2]	N_NW[1]	N_NW[0]	80																																			
Parameter 2nd	R/W	x	x	x	x	x	I_NW[2]	I_NW[1]	I_NW[0]	00																																			
Description	This command is used to control display inversion type. • ZINV_S2401_EN : Specify extra source for Zig-Zag Inversion. - 1 : S2401 for use - 0 : S0 for use • ZINV_G_EVEN_EN : Specify in which row source data dislocates. - 1 : Odd row - 0 : Even row • ZINV_EN : Enable Zig-Zag inversion. - 1 : Enable Zig-Zag Inversion - 0 : Disable Zig-Zag Inversion. • ZINV2_EN : Specify Zig-Zag inversion selection. - 1 : Enable Zig-Zag2 Inversion - 0 : Enable Zig-Zag1 Inversion. ◎ For Zig-Zag2 Inversion Type Definition, please refer to the following table.																																												
	<table border="1"> <thead> <tr> <th>ZINV2_EN</th> <th>ZINV_S2401_EN</th> <th>ZINV_G_EVEN_EN</th> <th>Zig-Zag Inversion Type</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>1</td><td>Type A</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>Type B</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>Type C</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>Type D</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>Type E</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>Type F</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>Type G</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>Type H</td></tr> </tbody> </table>										ZINV2_EN	ZINV_S2401_EN	ZINV_G_EVEN_EN	Zig-Zag Inversion Type	0	0	1	Type A	0	0	0	Type B	0	1	0	Type C	0	1	1	Type D	1	0	1	Type E	1	0	0	Type F	1	1	0	Type G	1	1	1
ZINV2_EN	ZINV_S2401_EN	ZINV_G_EVEN_EN	Zig-Zag Inversion Type																																										
0	0	1	Type A																																										
0	0	0	Type B																																										
0	1	0	Type C																																										
0	1	1	Type D																																										
1	0	1	Type E																																										
1	0	0	Type F																																										
1	1	0	Type G																																										
1	1	1	Type H																																										
• N_NW[2:0] : Normal mode inversion type selection. • I_NW[2:0] : IDLE mode inversion type selection.																																													
<table border="1"> <thead> <tr> <th colspan="3">N_NW[2:0] I_NW[2:0]</th> <th>Inversion Type</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>Column inversion</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1-dot inversion</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1+2-dot inversion</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>3-dot inversion</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>4-dot inversion</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>8-dot inversion</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>2-dot inversion</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>Setting invalid</td></tr> </tbody> </table>										N_NW[2:0] I_NW[2:0]			Inversion Type	0	0	0	Column inversion	0	0	1	1-dot inversion	0	1	0	1+2-dot inversion	0	1	1	3-dot inversion	1	0	0	4-dot inversion	1	0	1	8-dot inversion	1	1	0	2-dot inversion	1	1	1	Setting invalid
N_NW[2:0] I_NW[2:0]			Inversion Type																																										
0	0	0	Column inversion																																										
0	0	1	1-dot inversion																																										
0	1	0	1+2-dot inversion																																										
0	1	1	3-dot inversion																																										
1	0	0	4-dot inversion																																										
1	0	1	8-dot inversion																																										
1	1	0	2-dot inversion																																										
1	1	1	Setting invalid																																										

6.2.54 SETBGP (B5h)

B5 H		SETBGP																																																																												
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																																																				
Command	W	1	0	1	1	0	1	0	1	B5																																																																				
Parameter 1st	R/W	x	x	x	VREF_S EL[4]	VREF_S EL[3]	VREF_S EL[2]	VREF_S EL[1]	VREF_S EL[0]	09																																																																				
Parameter 2nd	R/W	x	x	x	NVREF_ SEL[4]	NVREF_ SEL[3]	NVREF_ SEL[2]	NVREF_ SEL[1]	NVREF_ SEL[0]	09																																																																				
Description	This command is used for internal reference voltage setting.																																																																													
	<ul style="list-style-type: none"> • VREF_SEL[4:0] / NVREF_SEL[4:0] : Specify the VREF/NVREF voltage. 																																																																													
	<table border="1"> <thead> <tr> <th>VREF_SEL[4:0] NVREF_SEL[4:0] (Hex)</th><th>VREF NVREF (V)</th><th>VREF_SEL[4:0] NVREF_SEL[4:0] (Hex)</th><th>VREF NVREF (V)</th></tr> </thead> <tbody> <tr><td>0</td><td>3.5</td><td>10</td><td>5.1</td></tr> <tr><td>1</td><td>3.6</td><td>11</td><td>5.2</td></tr> <tr><td>2</td><td>3.7</td><td>12</td><td>5.3</td></tr> <tr><td>3</td><td>3.8</td><td>13</td><td>5.4</td></tr> <tr><td>4</td><td>3.9</td><td>14</td><td>5.45</td></tr> <tr><td>5</td><td>4.0</td><td>15</td><td>5.5</td></tr> <tr><td>6</td><td>4.1</td><td>16</td><td>5.55</td></tr> <tr><td>7</td><td>4.2</td><td>17</td><td>5.6</td></tr> <tr><td>8</td><td>4.3</td><td>18</td><td>5.65</td></tr> <tr><td>9</td><td>4.4</td><td>19</td><td>5.7</td></tr> <tr><td>A</td><td>4.5</td><td>1A</td><td>5.75</td></tr> <tr><td>B</td><td>4.6</td><td>1B</td><td>5.8</td></tr> <tr><td>C</td><td>4.7</td><td>1C</td><td>5.85</td></tr> <tr><td>D</td><td>4.8</td><td>1D</td><td>5.9</td></tr> <tr><td>E</td><td>4.9</td><td>1E</td><td>5.95</td></tr> <tr><td>F</td><td>5.0</td><td>1F</td><td>6.0</td></tr> </tbody> </table>											VREF_SEL[4:0] NVREF_SEL[4:0] (Hex)	VREF NVREF (V)	VREF_SEL[4:0] NVREF_SEL[4:0] (Hex)	VREF NVREF (V)	0	3.5	10	5.1	1	3.6	11	5.2	2	3.7	12	5.3	3	3.8	13	5.4	4	3.9	14	5.45	5	4.0	15	5.5	6	4.1	16	5.55	7	4.2	17	5.6	8	4.3	18	5.65	9	4.4	19	5.7	A	4.5	1A	5.75	B	4.6	1B	5.8	C	4.7	1C	5.85	D	4.8	1D	5.9	E	4.9	1E	5.95	F	5.0	1F
VREF_SEL[4:0] NVREF_SEL[4:0] (Hex)	VREF NVREF (V)	VREF_SEL[4:0] NVREF_SEL[4:0] (Hex)	VREF NVREF (V)																																																																											
0	3.5	10	5.1																																																																											
1	3.6	11	5.2																																																																											
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D	4.8	1D	5.9																																																																											
E	4.9	1E	5.95																																																																											
F	5.0	1F	6.0																																																																											

6.2.55 SETVCOM (B6h)

B6 H	SETVCOM									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	0	1	1	0	1	1	0	B6
Parameter 1st	R/W	VCOMD C_F[7]	VCOMD C_F[6]	VCOMD C_F[5]	VCOMD C_F[4]	VCOMD C_F[3]	VCOMD C_F[2]	VCOMD C_F[1]	VCOMD C_F[0]	4D
Parameter 2nd	R/W	VCOMD C_B[7]	VCOMD C_B[6]	VCOMD C_B[5]	VCOMD C_B[4]	VCOMD C_B[3]	VCOMD C_B[2]	VCOMD C_B[1]	VCOMD C_B[0]	4D
Parameter 3rd	R	x	x	x	x	x	VCOM_O TP_TIME [2]	VCOM_O TP_TIME [1]	VCOM_O TP_TIME [0]	00

This command is used to set VCOM Voltage.

- **VCOMDC_F[7:0]** : Specify the VCOMDC voltage at GS_PANEL="0".
- **VCOMDC_B[7:0]** : Specify the VCOMDC voltage at GS_PANEL="1".

VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)
0	0	10	-0.36	20	-0.55
1	-0.025	11	-0.375	21	-0.56
2	-0.05	12	-0.39	22	-0.57
3	-0.075	13	-0.405	23	-0.58
4	-0.1	14	-0.42	24	-0.59
5	-0.125	15	-0.435	25	-0.6
6	-0.15	16	-0.45	26	-0.61
7	-0.175	17	-0.46	27	-0.62
8	-0.2	18	-0.47	28	-0.63
9	-0.225	19	-0.48	29	-0.64
A	-0.25	1A	-0.49	2A	-0.65
B	-0.275	1B	-0.5	2B	-0.66
C	-0.3	1C	-0.51	2C	-0.67
D	-0.315	1D	-0.52	2D	-0.68
E	-0.33	1E	-0.53	2E	-0.69
F	-0.345	1F	-0.54	2F	-0.7

Description

VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)
30	-0.71	40	-0.87	50	-1.03
31	-0.72	41	-0.88	51	-1.04
32	-0.73	42	-0.89	52	-1.05
33	-0.74	43	-0.9	53	-1.06
34	-0.75	44	-0.91	54	-1.07
35	-0.76	45	-0.92	55	-1.08
36	-0.77	46	-0.93	56	-1.09
37	-0.78	47	-0.94	57	-1.1
38	-0.79	48	-0.95	58	-1.11
39	-0.8	49	-0.96	59	-1.12
3A	-0.81	4A	-0.97	5A	-1.13
3B	-0.82	4B	-0.98	5B	-1.14
3C	-0.83	4C	-0.99	5C	-1.15
3D	-0.84	4D	-1	5D	-1.16
3E	-0.85	4E	-1.01	5E	-1.17
3F	-0.86	4F	-1.02	5F	-1.18

VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)
60	-1.19	70	-1.35	80	-1.51
61	-1.2	71	-1.36	81	-1.52
62	-1.21	72	-1.37	82	-1.53
63	-1.22	73	-1.38	83	-1.54
64	-1.23	74	-1.39	84	-1.55
65	-1.24	75	-1.4	85	-1.56
66	-1.25	76	-1.41	86	-1.57
67	-1.26	77	-1.42	87	-1.58
68	-1.27	78	-1.43	88	-1.59
69	-1.28	79	-1.44	89	-1.6
6A	-1.29	7A	-1.45	8A	-1.61
6B	-1.3	7B	-1.46	8B	-1.62
6C	-1.31	7C	-1.47	8C	-1.63
6D	-1.32	7D	-1.48	8D	-1.64
6E	-1.33	7E	-1.49	8E	-1.65
6F	-1.34	7F	-1.5	8F	-1.66

VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)
90	-1.67	A0	-1.845	B0	-2.085
91	-1.68	A1	-1.86	B1	-2.1
92	-1.69	A2	-1.875	B2	-2.115
93	-1.7	A3	-1.89	B3	-2.13
94	-1.71	A4	-1.905	B4	-2.145
95	-1.72	A5	-1.92	B5	-2.16
96	-1.73	A6	-1.935	B6	-2.175
97	-1.74	A7	-1.95	B7	-2.19
98	-1.75	A8	-1.965	B8	-2.205
99	-1.76	A9	-1.98	B9	-2.22
9A	-1.77	AA	-1.995	BA	-2.235
9B	-1.78	AB	-2.01	BB	-2.25
9C	-1.79	AC	-2.025	BC	-2.265
9D	-1.8	AD	-2.04	BD	-2.28
9E	-1.815	AE	-2.055	BE	-2.295
9F	-1.83	AF	-2.07	BF	-2.31

VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)	VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)
C0	-2.325	D0	-2.565	E0	-2.88
C1	-2.34	D1	-2.58	E1	-2.9
C2	-2.355	D2	-2.6	E2	-2.92
C3	-2.37	D3	-2.62	E3	-2.94
C4	-2.385	D4	-2.64	E4	-2.96
C5	-2.4	D5	-2.66	E5	-2.98
C6	-2.415	D6	-2.68	E6	-3
C7	-2.43	D7	-2.7	E7	-3.02
C8	-2.445	D8	-2.72	E8	-3.04
C9	-2.46	D9	-2.74	E9	-3.06
CA	-2.475	DA	-2.76	EA	-3.08
CB	-2.49	DB	-2.78	EB	-3.1
CC	-2.505	DC	-2.8	EC	-3.12
CD	-2.52	DD	-2.82	ED	-3.14
CE	-2.535	DE	-2.84	EE	-3.16
CF	-2.55	DF	-2.86	EF	-3.18

VCOMDC_F[7:0] VCOMDC_B[7:0] (Hex)	VCOMDC (V)
F0	-3.2
F1	-3.22
F2	-3.24
F3	-3.26
F4	-3.28
F5	-3.3
F6	-3.32
F7	-3.34
F8	-3.36
F9	-3.38
FA	-3.4
FB	-3.42
FC	-3.44
FD	-3.46
FE	-3.48
FF	-3.5

- VCOM OTP TIME[2:0] : Read VCOM OTP programming times.

VCOM OTP TIME[2:0]	OTP Programming times
0	NO OTPED
1	1
2	2
3	3
4	4

6.2.56 SETOTP (B7h)

B7 H	SETOTP																											
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																		
Command	W	1	0	1	1	0	1	1	1	B7																		
Parameter 1st	R/W	OTP_KEY Y[7]	OTP_KEY Y[6]	OTP_KEY Y[5]	OTP_KEY Y[4]	OTP_KEY Y[3]	OTP_KEY Y[2]	OTP_KEY Y[1]	OTP_KEY Y[0]	FF																		
Parameter 2nd	R/W	OTP_MA SK[7]	OTP_MA SK[6]	OTP_MA SK[5]	OTP_MA SK[4]	OTP_MA SK[3]	OTP_MA SK[2]	OTP_MA SK[1]	OTP_MA SK[0]	00																		
Parameter 3rd	R/W	x	VPP_SE L[2]	VPP_SE L[1]	VPP_SE L[0]	x	x	x	OTP_IND EX[8]	30																		
Parameter 4th	R/W	OTP_IND EX[7]	OTP_IND EX[6]	OTP_IND EX[5]	OTP_IND EX[4]	OTP_IND EX[3]	OTP_IND EX[2]	OTP_IND EX[1]	OTP_IND EX[0]	00																		
Parameter 5th	R/W	Load_DIS	VPP_EN	OTP_SE L	OTP_PW E	OTP_PT M[1]	OTP_PT M[0]	OTP_PO R	OTP_PO RG	00																		
Parameter 6th	R	OTP_DA TA[7]	OTP_DA TA[6]	OTP_DA TA[5]	OTP_DA TA[4]	OTP_DA TA[3]	OTP_DA TA[2]	OTP_DA TA[1]	OTP_DA TA[0]	00																		
Description	<p>This command is used to set OTP related setting.</p> <ul style="list-style-type: none"> • OTP_KEY[7:0] : Enable OTP function key. <ul style="list-style-type: none"> - OTP_KEY = “5A”, enable OTP function. - OTP_KEY = “00”, disable OTP function. • OTP_MASK[7:0] : Mask function for OTP programming. <ul style="list-style-type: none"> - 1 : Means this bit will not be OTP in all programming process. - 0 : Means this bit will be OTP in all programming process. • VPPSEL[2:0] : Specify VPP Voltage selection. <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th>VPPSEL[2:0]</th> <th>VPP Voltage (V)</th> </tr> </thead> <tbody> <tr><td>0</td><td>7.2</td></tr> <tr><td>1</td><td>7.3</td></tr> <tr><td>2</td><td>7.4</td></tr> <tr><td>3</td><td>7.5</td></tr> <tr><td>4</td><td>7.6</td></tr> <tr><td>5</td><td>7.7</td></tr> <tr><td>6</td><td>7.8</td></tr> <tr><td>7</td><td>External Power</td></tr> </tbody> </table> • OTP_INDEX[8:0] : Set OTP Index of target register or byte. • Load_DIS : Disable OTP load function. <ul style="list-style-type: none"> - 1 : Disable OTP load function. - 0 : Enable OTP load function. • VPP_EN : Enable VPP Power. <ul style="list-style-type: none"> - 1 : Enable VPP Power. - 0 : Disable VPP Power. • OTP_SEL : OTP functional block selection. <ul style="list-style-type: none"> - Automatically set by IC in auto OTP. - Manually set by user in manual OTP of DG register. 										VPPSEL[2:0]	VPP Voltage (V)	0	7.2	1	7.3	2	7.4	3	7.5	4	7.6	5	7.7	6	7.8	7	External Power
VPPSEL[2:0]	VPP Voltage (V)																											
0	7.2																											
1	7.3																											
2	7.4																											
3	7.5																											
4	7.6																											
5	7.7																											
6	7.8																											
7	External Power																											

Description	<ul style="list-style-type: none">• OTP_PWE : OTP Write Signal.<ul style="list-style-type: none">- 1 : OTP Write- 0 : OTP don't Write• OTP_PT[1:0] : For testing OTP robustness in test mode.<ul style="list-style-type: none">- For CP usage.• OTP_POR : OTP Read Signal.<ul style="list-style-type: none">- 1 : OTP Read- 0 : OTP don't Read• OTP_PORG : OTP Auto programming with related register.<ul style="list-style-type: none">- 1 : OTP auto programming start.- 0 : OTP auto programming stop.• OTP_DATA[7:0] : OTP Data read back when VPP_POR="1".
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6.2.57 SETPOWER_EXT (B8h)

B8 H	SETPOWER_EXT																																																																																										
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																																																																	
Command	W	1	0	1	1	1	0	0	0	B8																																																																																	
Parameter 1st	R/W	x	PCCS[2]	PCCS[1]	PCCS[0]	ECP_DC_DIV[3]	ECP_DC_DIV[2]	ECP_DC_DIV[1]	ECP_DC_DIV[0]	34																																																																																	
Parameter 2nd	R/W	x	SINGLE_PUMP	DT[1]	DT[0]	SYNC_STB	XDK_EC_P[1]	XDK_EC_P[0]	x	22																																																																																	
Parameter 3rd	R/W	x	x	x	x	x	PFM_DC_DIV[2]	PFM_DC_DIV[1]	PFM_DC_DIV[0]	00																																																																																	
Parameter 4th	R/W	x	x	x	x	x	x	ECP_SYNC_EN	VGX_SYNC_EN	03																																																																																	
Parameter 5th	R/W	A_DC[1]	A_DC[0]	A_DTP[2]	A_DTP[1]	A_DTP[0]	A_DTN[2]	A_DTN[1]	A_DTN[0]	ED																																																																																	
Parameter 6th	R/W	DCS[1]	DCS[0]	DTPS[2]	DTPS[1]	DTPS[0]	DTNS[2]	DTNS[1]	DTNS[0]	00																																																																																	
Description	This command is used to set display related register. <ul style="list-style-type: none"> PCCS[2:0] : External power IC or PFM selection. <table border="1" data-bbox="346 804 1140 1006"> <thead> <tr> <th>PCCS[2:0]</th><th>IOVCC</th><th>VCI</th><th>VSP</th><th>VSN</th></tr> </thead> <tbody> <tr><td>0 0 0</td><td>IOVCC</td><td>VCI</td><td>PFM TYPE-A</td><td>PFM TYPE-A</td></tr> <tr><td>0 0 1</td><td>IOVCC</td><td>VCI</td><td>PFM TYPE-C</td><td>PFM TYPE-C</td></tr> <tr><td>0 1 0</td><td>IOVCC</td><td>VCI</td><td>FL1002</td><td>FL1002</td></tr> <tr><td>0 1 1</td><td>IOVCC</td><td>VCI</td><td>PFM TYPE-B</td><td>PFM TYPE-B</td></tr> <tr><td>1 0 0</td><td>IOVCC</td><td>VCI</td><td>PFM TYPE-A</td><td>PFM TYPE-A</td></tr> <tr><td>1 1 1</td><td>IOVCC</td><td>VCI</td><td>External VSP</td><td>External VSN</td></tr> </tbody> </table> ECP_DC_DIV[3:0] : Specify VCSW1 / VCSW2 Frequency for Pumping VSP / VSN. <table border="1" data-bbox="346 1073 1235 1343"> <thead> <tr> <th>ECP_DC_DIV[3:0]</th><th>VCSW1/2 Period</th><th>ECP_DC_DIV[3:0]</th><th>VCSW1/2 Period</th></tr> </thead> <tbody> <tr><td>0</td><td>8 Hsync</td><td>8</td><td>1/12 Hsync</td></tr> <tr><td>1</td><td>4 Hsync</td><td>9</td><td>1/16 Hsync</td></tr> <tr><td>2</td><td>2 Hsync</td><td>A</td><td>1/20 Hsync</td></tr> <tr><td>3</td><td>1 Hsync</td><td>B</td><td>1/25 Hsync</td></tr> <tr><td>4</td><td>1/2 Hsync</td><td>C</td><td>1/36 Hsync</td></tr> <tr><td>5</td><td>1/4 Hsync</td><td>D</td><td>1/56 Hsync</td></tr> <tr><td>6</td><td>1/6 Hsync</td><td>E</td><td>1/72 Hsync</td></tr> <tr><td>7</td><td>1/8 Hsync</td><td>F</td><td>Setting invalid</td></tr> </tbody> </table> SINGLE_PUMP: Specify signal pump state. <ul style="list-style-type: none"> - 1 : VCSW1 Toggle ; VSCW2 GND. - 0 : VCSW1 / VCSW2 Toggle. DT[1:0] : Specify VCSW1/VCSW2 soft start time. <table border="1" data-bbox="346 1545 727 1686"> <thead> <tr> <th>DT[1:0]</th><th>Period (ms)</th></tr> </thead> <tbody> <tr><td>0</td><td>5</td></tr> <tr><td>1</td><td>10</td></tr> <tr><td>2</td><td>15</td></tr> <tr><td>3</td><td>20</td></tr> </tbody> </table> SYNC_STB : Enter synchronous standby mode. <ul style="list-style-type: none"> - 1 : All power signal synchronous turn off. - 0 : All power signal sequence turn off. 										PCCS[2:0]	IOVCC	VCI	VSP	VSN	0 0 0	IOVCC	VCI	PFM TYPE-A	PFM TYPE-A	0 0 1	IOVCC	VCI	PFM TYPE-C	PFM TYPE-C	0 1 0	IOVCC	VCI	FL1002	FL1002	0 1 1	IOVCC	VCI	PFM TYPE-B	PFM TYPE-B	1 0 0	IOVCC	VCI	PFM TYPE-A	PFM TYPE-A	1 1 1	IOVCC	VCI	External VSP	External VSN	ECP_DC_DIV[3:0]	VCSW1/2 Period	ECP_DC_DIV[3:0]	VCSW1/2 Period	0	8 Hsync	8	1/12 Hsync	1	4 Hsync	9	1/16 Hsync	2	2 Hsync	A	1/20 Hsync	3	1 Hsync	B	1/25 Hsync	4	1/2 Hsync	C	1/36 Hsync	5	1/4 Hsync	D	1/56 Hsync	6	1/6 Hsync	E	1/72 Hsync	7	1/8 Hsync	F	Setting invalid	DT[1:0]	Period (ms)	0	5	1	10	2	15	3	20
PCCS[2:0]	IOVCC	VCI	VSP	VSN																																																																																							
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0 0 1	IOVCC	VCI	PFM TYPE-C	PFM TYPE-C																																																																																							
0 1 0	IOVCC	VCI	FL1002	FL1002																																																																																							
0 1 1	IOVCC	VCI	PFM TYPE-B	PFM TYPE-B																																																																																							
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1 1 1	IOVCC	VCI	External VSP	External VSN																																																																																							
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3	20																																																																																										

- **XDK_ECP[1:0]** : Specify Pumping ratio of VSP / VSN with VCI.

XDK_ECP[1:0]	Ratio
0	X1.5
1	X2
2	X3
3	Setting Inhibited

- **PFM_DC_DIV[2:0]** : Specify PFM operation frequency FoscD.

PFM_DC_DIV[2:0]	FoscD
0	Fosc/1
1	Fosc/2
2	Fosc/3
3	Fosc/4
4	Fosc/5
5	Fosc/6
6	Fosc/7
7	Fosc/8

- **ECP_SYNC_EN** : Enable power IC pumping frequency synchronization.

- 1 : Synchronize with external Hsync.
- 0 : Synchronize with internal Hsync.

- **VGX_SYNC_EN** : Enable VGH/VGL pumping frequency synchronization.

- 1 : Synchronize with external Hsync.
- 0 : Synchronize with internal Hsync.

- **A_DC[1:0]** : Specify PFM operation half period.

A_DC[1:0]	Period
0	4/FoscD
1	6/FoscD
2	8/FoscD
3	12/FoscD

- **A_DTP[2:0]** : Specify PFM period of VSP.

- **A_DTN[2:0]** : Specify PFM period of VSN.

- **DTPS[2:0]** : Specify PFM period of VSP at soft start stage.

- **DTNS[2:0]** : Specify PFM period of VSN at soft start stage.

DTN[2:0] DTP[2:0] DTPS[2:0] DTNS[2:0]	Period
0	1/FoscD
1	2/FoscD
2	3/FoscD
3	4/FoscD
4	5/FoscD
5	6/FoscD
6	7/FoscD
7	8/FoscD

- **DCS[1:0]** : Specify PFM operation half period at soft start stage.

DCS[1:0]	Period
0	12/FoscD
1	24/FoscD
2	48/FoscD
3	60/FoscD

Description

6.2.58 SETMIPI (BAh)

BA H	SETMIPI									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	0	1	1	1	0	1	0	BA
Parameter 1st	R/W	x	x	x	x	VC_Main[1]	VC_Main[0]	Lane_Number[1]	Lane_Number[0]	33
Parameter 2nd	R/W	DSI_LDO_SEL[2]	DSI_LDO_SEL[1]	DSI_LDO_SEL[0]	x	x	x	RTERM[1]	RTERM[0]	61
Parameter 3rd	R/W	x	x	x	x	IHSRX[3]	IHSRX[2]	IHSRX[1]	IHSRX[0]	06
Parameter 4th	R/W	x	x	x	x	Tx_clk_se[1]	Tx_clk_se[0]	x	x	F9
Parameter 5th	R/W	HFP_OS_C[7]	HFP_OS_C[6]	HFP_OS_C[5]	HFP_OS_C[4]	HFP_OS_C[3]	HFP_OS_C[2]	HFP_OS_C[1]	HFP_OS_C[0]	FF
Parameter 6th	R/W	HBP_OS_C[7]	HBP_OS_C[6]	HBP_OS_C[5]	HBP_OS_C[4]	HBP_OS_C[3]	HBP_OS_C[2]	HBP_OS_C[1]	HBP_OS_C[0]	0A

Description	<p>This command is used to set MIPI related register.</p> <ul style="list-style-type: none"> • VC_Main [1:0] : Specify the virtual channel ID for multiple slave ID. • Lane_Number [1:0] : Specify the lane number selection. <table border="1"> <thead> <tr> <th>Lane[1:0]</th><th>MIPI Lane</th></tr> </thead> <tbody> <tr> <td>0</td><td>1 lane</td></tr> <tr> <td>1</td><td>2 lanes</td></tr> <tr> <td>2</td><td>3 lanes</td></tr> <tr> <td>3</td><td>4 lanes</td></tr> </tbody> </table> <ul style="list-style-type: none"> • DSI_LDO_SEL[2:0] : Specify the MIPI LDO voltage selection. <table border="1"> <thead> <tr> <th>DSI_LDO_SEL[2:0]</th><th>LDO voltage (V)</th><th>DSI_LDO_SEL[2:0]</th><th>LDO voltage (V)</th></tr> </thead> <tbody> <tr> <td>0</td><td>1.4</td><td>4</td><td>1.7</td></tr> <tr> <td>1</td><td>1.45</td><td>5</td><td>1.8</td></tr> <tr> <td>2</td><td>1.5</td><td>6</td><td>1.9</td></tr> <tr> <td>3</td><td>1.6</td><td>7</td><td>2.0</td></tr> </tbody> </table> <ul style="list-style-type: none"> • RTERM[1:0] : Specify the terminal resistance <table border="1"> <thead> <tr> <th>RTERM [1:0]</th><th>Resistance (Ω)</th></tr> </thead> <tbody> <tr> <td>0</td><td>80</td></tr> <tr> <td>1</td><td>90</td></tr> <tr> <td>2</td><td>100</td></tr> <tr> <td>3</td><td>110</td></tr> </tbody> </table> <ul style="list-style-type: none"> • IHSRX[3:0] : Specify the MIPI Low High Speed driving ability . <table border="1"> <thead> <tr> <th>IHSRX [3:0]</th><th>Driving Ability</th><th>IHSRX [3:0]</th><th>Driving Ability</th></tr> </thead> <tbody> <tr> <td>0</td><td>X1</td><td>8</td><td>X9</td></tr> <tr> <td>1</td><td>X2</td><td>9</td><td>X10</td></tr> <tr> <td>2</td><td>X3</td><td>10</td><td>X11</td></tr> <tr> <td>3</td><td>X4</td><td>11</td><td>X12</td></tr> <tr> <td>4</td><td>X5</td><td>12</td><td>X13</td></tr> <tr> <td>5</td><td>X6</td><td>13</td><td>X14</td></tr> <tr> <td>6</td><td>X7</td><td>14</td><td>X15</td></tr> <tr> <td>7</td><td>X8</td><td>15</td><td>X16</td></tr> </tbody> </table> <ul style="list-style-type: none"> • Tx_clk[1:0] : Specify TXCLK speed in DSI LP mode for transmission. <table border="1"> <thead> <tr> <th>Tx_clk[1:0]</th><th>TXCLK</th></tr> </thead> <tbody> <tr> <td>0</td><td>fDSICLK/4</td></tr> <tr> <td>1</td><td>fDSICLK/8</td></tr> <tr> <td>2</td><td>fDSICLK/16</td></tr> <tr> <td>3</td><td>fDSICLK/32</td></tr> </tbody> </table> <ul style="list-style-type: none"> • HFP_OSC[7:0] : Specify the min. HFP number in DSI mode. • HPB_OSC[7:0] : Specify the min. HBP number in DSI mode. 	Lane[1:0]	MIPI Lane	0	1 lane	1	2 lanes	2	3 lanes	3	4 lanes	DSI_LDO_SEL[2:0]	LDO voltage (V)	DSI_LDO_SEL[2:0]	LDO voltage (V)	0	1.4	4	1.7	1	1.45	5	1.8	2	1.5	6	1.9	3	1.6	7	2.0	RTERM [1:0]	Resistance (Ω)	0	80	1	90	2	100	3	110	IHSRX [3:0]	Driving Ability	IHSRX [3:0]	Driving Ability	0	X1	8	X9	1	X2	9	X10	2	X3	10	X11	3	X4	11	X12	4	X5	12	X13	5	X6	13	X14	6	X7	14	X15	7	X8	15	X16	Tx_clk[1:0]	TXCLK	0	fDSICLK/4	1	fDSICLK/8	2	fDSICLK/16	3	fDSICLK/32
Lane[1:0]	MIPI Lane																																																																																						
0	1 lane																																																																																						
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2	3 lanes																																																																																						
3	4 lanes																																																																																						
DSI_LDO_SEL[2:0]	LDO voltage (V)	DSI_LDO_SEL[2:0]	LDO voltage (V)																																																																																				
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1	1.45	5	1.8																																																																																				
2	1.5	6	1.9																																																																																				
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1	X2	9	X10																																																																																				
2	X3	10	X11																																																																																				
3	X4	11	X12																																																																																				
4	X5	12	X13																																																																																				
5	X6	13	X14																																																																																				
6	X7	14	X15																																																																																				
7	X8	15	X16																																																																																				
Tx_clk[1:0]	TXCLK																																																																																						
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1	fDSICLK/8																																																																																						
2	fDSICLK/16																																																																																						
3	fDSICLK/32																																																																																						

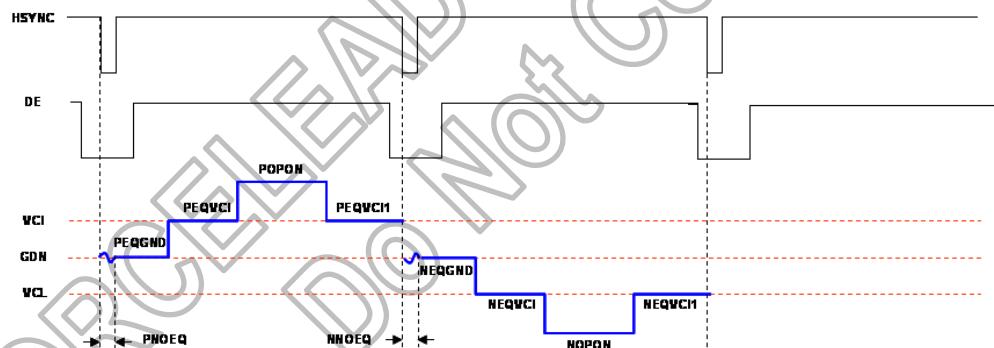
6.2.59 SETVDC (BCh)

BC H	SETVDC																																													
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																				
Command	W	1	0	1	1	1	1	0	0	BC																																				
Parameter 1st	R/W	x	NVDDD_SEL[2]	NVDDD_SEL[1]	NVDDD_SEL[0]	x	VDDD_S EL[2]	VDDD_S EL[1]	VDDD_S EL[0]	47																																				
Description	This command is used to control NVDDD/VDDD Voltage. <ul style="list-style-type: none"> • NVDDD_SEL[2:0] : Specify the NVDDD voltage selection. <table border="1"> <thead> <tr> <th>NVDDD_SEL[2:0]</th><th>NVDDD (V)</th></tr> </thead> <tbody> <tr><td>0</td><td>-1.5</td></tr> <tr><td>1</td><td>-1.6</td></tr> <tr><td>2</td><td>-1.7</td></tr> <tr><td>3</td><td>-1.75</td></tr> <tr><td>4</td><td>-1.8</td></tr> <tr><td>5</td><td>-1.85</td></tr> <tr><td>6</td><td>-1.9</td></tr> <tr><td>7</td><td>-2.0</td></tr> </tbody> </table> <ul style="list-style-type: none"> • VDDD_SEL[2:0] : Specify the VDDD voltage selection. <table border="1"> <thead> <tr> <th>VDDD_SEL[2:0]</th><th>VDDD (V)</th></tr> </thead> <tbody> <tr><td>0</td><td>1.5</td></tr> <tr><td>1</td><td>1.6</td></tr> <tr><td>2</td><td>1.7</td></tr> <tr><td>3</td><td>1.75</td></tr> <tr><td>4</td><td>1.8</td></tr> <tr><td>5</td><td>1.85</td></tr> <tr><td>6</td><td>1.9</td></tr> <tr><td>7</td><td>2.0</td></tr> </tbody> </table>										NVDDD_SEL[2:0]	NVDDD (V)	0	-1.5	1	-1.6	2	-1.7	3	-1.75	4	-1.8	5	-1.85	6	-1.9	7	-2.0	VDDD_SEL[2:0]	VDDD (V)	0	1.5	1	1.6	2	1.7	3	1.75	4	1.8	5	1.85	6	1.9	7	2.0
NVDDD_SEL[2:0]	NVDDD (V)																																													
0	-1.5																																													
1	-1.6																																													
2	-1.7																																													
3	-1.75																																													
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3	1.75																																													
4	1.8																																													
5	1.85																																													
6	1.9																																													
7	2.0																																													

6.2.60 SETSCR (C0h)

C0 H	SETSCR									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	0	0	0	0	0	0	C0
Parameter 1st	R/W	N_POPO N[7]	N_POPO N[6]	N_POPO N[5]	N_POPO N[4]	N_POPO N[3]	N_POPO N[2]	N_POPO N[1]	N_POPO N[0]	73
Parameter 2nd	R/W	N_NOPO N[7]	N_NOPO N[6]	N_NOPO N[5]	N_NOPO N[4]	N_NOPO N[3]	N_NOPO N[2]	N_NOPO N[1]	N_NOPO N[0]	73
Parameter 3rd	R/W	I_POPON N[7]	I_POPON N[6]	I_POPON N[5]	I_POPON N[4]	I_POPON N[3]	I_POPON N[2]	I_POPON N[1]	I_POPON N[0]	50
Parameter 4th	R/W	I_NOPO N[7]	I_NOPO N[6]	I_NOPO N[5]	I_NOPO N[4]	I_NOPO N[3]	I_NOPO N[2]	I_NOPO N[1]	I_NOPO N[0]	50
Parameter 5th	R/W	SCR[31]	SCR[30]	SCR[29]	SCR[28]	SCR[27]	SCR[26]	SCR[25]	SCR[24]	C0
Parameter 6th	R/W	SCR[23]	SCR[22]	SCR[21]	SCR[20]	SCR[19]	SCR[18]	SCR[17]	SCR[16]	00
Parameter 7th	R/W	SCR[15]	SCR[14]	SCR[13]	SCR[12]	SCR[11]	SCR[10]	SCR[9]	SCR[8]	08
Parameter 8th	R/W	SCR[7]	SCR[6]	SCR[5]	SCR[4]	SCR[3]	SCR[2]	SCR[1]	SCR[0]	70

This command is used to set related setting of Source driving.



Description

- **N_POPON [7:0]**
 - Specify the source OP Amp driving period for positive polarity in Normal Mode.
- **N_NOPON[7:0]**
 - Specify the source OP Amp driving period for negative polarity in Normal Mode.
- **I_POPON [7:0]**
 - Specify the source OP Amp driving period for positive polarity in Idle mode.
- **I_NOPON [7:0]**
 - Specify the source OP Amp dirivng period for negative polarity in Idle Mode.

OPON[7:0]	Source OP Period
0	1*4/Fosc
1	1*4/Fosc
2	2*4/Fosc
3	3*4/Fosc
:	:
FD	253*4/Fosc
FE	254*4/Fosc
FF	255*4/Fosc

- **SCR [3:0]** : Source and Gamma bias current core tune.

SCR[3:0]	Ibias	SCR[3:0]	Ibias
0	1	C	3.0
1	1.25	D	3.25
2	1.5	E	3.5
3	1.75	F	3.75
4	2.0		
5	2.25	others	Setting Inhibited
6	2.5		
7	2.75		

- **SCR [8:4]** : Source bias current fine tune.

- **SCR [13:9]** : Gamma bias current fine tune.

Description

SCR[8:4] SCR[13:9] (Hex)	Current xlbias	SCR[8:4] SCR[13:9]	Current xlbias
0	Setting Inhibited	0	16
1	1	1	17
2	2	2	18
3	3	3	19
4	4	4	20
5	5	5	21
6	6	6	22
7	7	7	23
8	8	8	24
9	9	9	25
A	10	A	26
B	11	B	27
C	12	C	28
D	13	D	29
E	14	E	30
F	15	F	31

6.2.61 SETPOWER (C1h)

C1 H	SETPOWER																																																																						
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																																													
Command	W	1	1	0	0	0	0	0	1	C1																																																													
Parameter 1st	R/W	VBTHS[3] 1	VBTHS[2] 1	VBTHS[1] 1	VBTHS[0] 1	VBTLS[3]	VBTLS[2]	VBTLS[1]	VBTLS[0]	53																																																													
Parameter 2nd	R/W	FBOFF_VGH	FBOFF_VGL	x	x	x	x	x	x	C0																																																													
Parameter 3rd	R/W	x	x	VRP[5]	VRP[4]	VRP[3]	VRP[2]	VRP[1]	VRP[0]	16																																																													
Parameter 4th	R/W	x	x	VRN[5]	VRN[4]	VRN[3]	VRN[2]	VRN[1]	VRN[0]	16																																																													
Parameter 5th	R/W	x	x	x	x	x	x	x	x	00																																																													
Parameter 6th	R/W	VGL_DE_T_EN	VGH_DE_T_EN	VGL_TU_RBO	VGH_TU_RBO	x	APS[2]	APS[1]	APS[0]	D1																																																													
Parameter 7th	R/W	VGH1_L_DIV[3]	VGH1_L_DIV[2]	VGH1_L_DIV[1]	VGH1_L_DIV[0]	VGL1_L_DIV[3]	VGL1_L_DIV[2]	VGL1_L_DIV[1]	VGL1_L_DIV[0]	CC																																																													
Parameter 8th	R/W	VGH1_R_DIV[3]	VGH1_R_DIV[2]	VGH1_R_DIV[1]	VGH1_R_DIV[0]	VGL1_R_DIV[3]	VGL1_R_DIV[2]	VGL1_R_DIV[1]	VGL1_R_DIV[0]	DD																																																													
Parameter 9th	R/W	VGH2_L_DIV[3]	VGH2_L_DIV[2]	VGH2_L_DIV[1]	VGH2_L_DIV[0]	VGL2_L_DIV[3]	VGL2_L_DIV[2]	VGL2_L_DIV[1]	VGL2_L_DIV[0]	67																																																													
Parameter 10th	R/W	VGH2_R_DIV[3]	VGH2_R_DIV[2]	VGH2_R_DIV[1]	VGH2_R_DIV[0]	VGL2_R_DIV[3]	VGL2_R_DIV[2]	VGL2_R_DIV[1]	VGL2_R_DIV[0]	77																																																													
Parameter 11h	R/W	VGH3_L_DIV[3]	VGH3_L_DIV[2]	VGH3_L_DIV[1]	VGH3_L_DIV[0]	VGL3_L_DIV[3]	VGL3_L_DIV[2]	VGL3_L_DIV[1]	VGL3_L_DIV[0]	33																																																													
Parameter 12h	R/W	VGH3_R_DIV[3]	VGH3_R_DIV[2]	VGH3_R_DIV[1]	VGH3_R_DIV[0]	VGL3_R_DIV[3]	VGL3_R_DIV[2]	VGL3_R_DIV[1]	VGL3_R_DIV[0]	33																																																													
Parameter 13h	R/W	VGH4_L_DIV[3]	VGH4_L_DIV[2]	VGH4_L_DIV[1]	VGH4_L_DIV[0]	VGL4_L_DIV[3]	VGL4_L_DIV[2]	VGL4_L_DIV[1]	VGL4_L_DIV[0]	11																																																													
Parameter 14h	R/W	VGH4_R_DIV[3]	VGH4_R_DIV[2]	VGH4_R_DIV[1]	VGH4_R_DIV[0]	VGL4_R_DIV[3]	VGL4_R_DIV[2]	VGL4_R_DIV[1]	VGL4_R_DIV[0]	11																																																													
Parameter 15h	R/W	VGH5_L_DIV[3]	VGH5_L_DIV[2]	VGH5_L_DIV[1]	VGH5_L_DIV[0]	VGL5_L_DIV[3]	VGL5_L_DIV[2]	VGL5_L_DIV[1]	VGL5_L_DIV[0]	00																																																													
Parameter 16h	R/W	VGH5_R_DIV[3]	VGH5_R_DIV[2]	VGH5_R_DIV[1]	VGH5_R_DIV[0]	VGL5_R_DIV[3]	VGL5_R_DIV[2]	VGL5_R_DIV[1]	VGL5_R_DIV[0]	00																																																													
Description	<p>This command is used to set related setting of power.</p> <ul style="list-style-type: none"> • VBTHS[3:0] : The voltage adjustment of VGH. - FBOFF_VGH must be 0 <table border="1"> <thead> <tr> <th>VBTHS[3:0] (Hex)</th><th>VGH Voltage (V)</th><th>VBTHS[3:0] (Hex)</th><th>VGH Voltage (V)</th><th>VBTHS[3:0] (Hex)</th><th>VGH Voltage (V)</th></tr> </thead> <tbody> <tr> <td>0</td><td>10</td><td>4</td><td>14</td><td>8</td><td>18</td></tr> <tr> <td>1</td><td>11</td><td>5</td><td>15</td><td>9</td><td>18</td></tr> <tr> <td>2</td><td>12</td><td>6</td><td>16</td><td>A</td><td>18</td></tr> <tr> <td>3</td><td>13</td><td>7</td><td>17</td><td>B~F</td><td>18</td></tr> </tbody> </table> <ul style="list-style-type: none"> • VBTLS[3:0] : The voltage adjustment of VGL. - FBOFF_VGL must be 0 <table border="1"> <thead> <tr> <th>VBTLS[3:0] (Hex)</th><th>VGL Voltage (V)</th><th>VBTLS[3:0] (Hex)</th><th>VGL Voltage (V)</th><th>VBTLS[3:0] (Hex)</th><th>VGL Voltage (V)</th></tr> </thead> <tbody> <tr> <td>0</td><td>-7</td><td>4</td><td>-11</td><td>8</td><td>-15</td></tr> <tr> <td>1</td><td>-8</td><td>5</td><td>-12</td><td>9</td><td>-16</td></tr> <tr> <td>2</td><td>-9</td><td>6</td><td>-13</td><td>A</td><td>-17</td></tr> <tr> <td>3</td><td>-10</td><td>7</td><td>-14</td><td>B~F</td><td>-18</td></tr> </tbody> </table> <ul style="list-style-type: none"> • FBOFF_VGH : Enable VGH feedback detect function. - 1 : Disable VGH feedback voltage detection. Output voltage = 15V - 0 : Enable VGH feedback voltage detection. Output voltage = VBTHS • FBOFF_VGL : Enable VGL feedback detect function. - 1 : Disable VGL feedback voltage detection. Output voltage = -10V. - 0 : Enable VGL feedback voltage detection. Output voltage = VBTLS. 											VBTHS[3:0] (Hex)	VGH Voltage (V)	VBTHS[3:0] (Hex)	VGH Voltage (V)	VBTHS[3:0] (Hex)	VGH Voltage (V)	0	10	4	14	8	18	1	11	5	15	9	18	2	12	6	16	A	18	3	13	7	17	B~F	18	VBTLS[3:0] (Hex)	VGL Voltage (V)	VBTLS[3:0] (Hex)	VGL Voltage (V)	VBTLS[3:0] (Hex)	VGL Voltage (V)	0	-7	4	-11	8	-15	1	-8	5	-12	9	-16	2	-9	6	-13	A	-17	3	-10	7	-14	B~F	-18
VBTHS[3:0] (Hex)	VGH Voltage (V)	VBTHS[3:0] (Hex)	VGH Voltage (V)	VBTHS[3:0] (Hex)	VGH Voltage (V)																																																																		
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3	13	7	17	B~F	18																																																																		
VBTLS[3:0] (Hex)	VGL Voltage (V)	VBTLS[3:0] (Hex)	VGL Voltage (V)	VBTLS[3:0] (Hex)	VGL Voltage (V)																																																																		
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2	-9	6	-13	A	-17																																																																		
3	-10	7	-14	B~F	-18																																																																		

- **VRP[5:0]/VRN[5:0]** : Specify the VSPROUT/VSNROUT voltage.
 - VSPROUT= {Decimal (VRH [5:0]) x0.05+3.3} x (VREF/4.8) if VREF [4] =0.
 - VSNROUT= {Decimal (VRH [5:0]) x0.05+3.3} x (VREF/5.6) if VREF [4] =1.

VRP[5:0] VRN[5:0] (Hex)	VSPROUT VSNROUT (V)	VRP[5:0] VRN[5:0] (Hex)	VSPROUT VSNROUT (V)	VRP[5:0] VRN[5:0] (Hex)	VSPROUT VSNROUT (V)
0	3.23	E	3.92	1C	4.60
1	3.28	F	3.97	1D	4.65
2	3.33	10	4.01	1E	4.70
3	3.38	11	4.06	1F*	4.70
4	3.43	12	4.11	20*	5.2
5	3.48	13	4.16	21*	5.3
6	3.53	14	4.21	22*	5.4
7	3.57	15	4.26	23*	5.5
8	3.62	16	4.31	24*	5.55
9	3.67	17	4.36	25*	5.6
A	3.72	18	4.41	26*	5.65
B	3.77	19	4.46	27*	5.7
C	3.82	1A	4.50	28	STOP
D	3.87	1B	4.55	29~3F	STOP

Note: When VREF [4] =0, the max voltage of VSPROUT/VSNROUT will be 4.7V/-4.7V.

Description

- **VGL_DET_EN** : Enable VGL voltage Detect Function.
 - 09h_01[3] = 1: VGL voltage Abnormal.
 - 09h_01[3] = 0: VGL voltage Normal.
- **VGH_DET_EN** : Enable VGH voltage Detect Function.
 - 09h_01[0] = 1 : VGH voltage Abnormal.
 - 09h_01[0] = 0 : VGH voltage Normal.
- **VGL_TURBO** : Enlarge VGL Voltage at FBOFF_VGL=1.
 - 1 : VGL=-15V
 - 0 : VGL=-10V
- **VGH_TURBO** : Enlarge VGH Voltage at FBOFF_VGH=1.
 - 1 : VGH=20V
 - 0 : VGH=15V

Description	<ul style="list-style-type: none"> • APS[2:0] : Adjust power bias current of all regulator voltage. 																																		
	<table border="1"> <thead> <tr> <th>APS[2:0]</th><th>Bias Current</th></tr> </thead> <tbody> <tr><td>0 0 0</td><td>Stop</td></tr> <tr><td>0 0 1</td><td>Small</td></tr> <tr><td>0 1 0</td><td>Medium Small</td></tr> <tr><td>0 1 1</td><td>Medium Large</td></tr> <tr><td>1 0 0</td><td>Large</td></tr> <tr><td>others</td><td>Setting Invalid</td></tr> </tbody> </table>		APS[2:0]	Bias Current	0 0 0	Stop	0 0 1	Small	0 1 0	Medium Small	0 1 1	Medium Large	1 0 0	Large	others	Setting Invalid																			
APS[2:0]	Bias Current																																		
0 0 0	Stop																																		
0 0 1	Small																																		
0 1 0	Medium Small																																		
0 1 1	Medium Large																																		
1 0 0	Large																																		
others	Setting Invalid																																		
<ul style="list-style-type: none"> • VGH1_L_DIV[3:0] : Specify left side VGH stage 1 pumping frequency. • VGH1_R_DIV[3:0] : Specify right side VGH stage 1 pumping frequency. • VGH2_L_DIV[3:0] : Specify left side VGH stage 2 pumping frequency. • VGH2_R_DIV[3:0] : Specify right side VGH stage 2 pumping frequency. • VGH3_L_DIV[3:0] : Specify left side VGH stage 3 pumping frequency. • VGH3_R_DIV[3:0] : Specify right side VGH stage 3 pumping frequency. • VGH4_L_DIV[3:0] : Specify left side VGH stage 4 pumping frequency. • VGH4_R_DIV[3:0] : Specify right side VGH stage 4 pumping frequency. • VGH5_L_DIV[3:0] : Specify left side VGH stage 5 pumping frequency. • VGH5_R_DIV[3:0] : Specify right side VGH stage 5 pumping frequency. • VGL1_L_DIV[3:0] : Specify left side VGL stage 1 pumping frequency. • VGL1_R_DIV[3:0] : Specify right side VGL stage 1 pumping frequency. • VGL2_L_DIV[3:0] : Specify left side VGL stage 2 pumping frequency. • VGL2_R_DIV[3:0] : Specify right side VGL stage 2 pumping frequency. • VGL3_L_DIV[3:0] : Specify left side VGL stage 3 pumping frequency. • VGL3_R_DIV[3:0] : Specify right side VGL stage 3 pumping frequency. • VGL4_L_DIV[3:0] : Specify left side VGL stage 4 pumping frequency. • VGL4_R_DIV[3:0] : Specify right side VGL stage 4 pumping frequency. • VGL5_L_DIV[3:0] : Specify left side VGL stage 5 pumping frequency. • VGL5_R_DIV[3:0] : Specify right side VGL stage 5 pumping frequency. 																																			
<table border="1"> <thead> <tr> <th>VGH1/2/3/4/5_DIV[3:0] VGL1/2/3/4/5_DIV[3:0]</th><th>Frequency (MHz)</th></tr> </thead> <tbody> <tr><td>0 0 0 0</td><td>36</td></tr> <tr><td>0 0 0 1</td><td>18</td></tr> <tr><td>0 0 1 0</td><td>12</td></tr> <tr><td>0 0 1 1</td><td>9</td></tr> <tr><td>0 1 0 0</td><td>7.2</td></tr> <tr><td>0 1 0 1</td><td>6</td></tr> <tr><td>0 1 1 0</td><td>5.1</td></tr> <tr><td>0 1 1 1</td><td>4.5</td></tr> <tr><td>1 0 0 0</td><td>4</td></tr> <tr><td>1 0 0 1</td><td>3.6</td></tr> <tr><td>1 0 1 0</td><td>3.3</td></tr> <tr><td>1 0 1 1</td><td>3</td></tr> <tr><td>1 1 0 0</td><td>2.6</td></tr> <tr><td>1 1 0 1</td><td>2.1</td></tr> <tr><td>1 1 1 0</td><td>1.8</td></tr> <tr><td>1 1 1 1</td><td>1.5</td></tr> </tbody> </table>		VGH1/2/3/4/5_DIV[3:0] VGL1/2/3/4/5_DIV[3:0]	Frequency (MHz)	0 0 0 0	36	0 0 0 1	18	0 0 1 0	12	0 0 1 1	9	0 1 0 0	7.2	0 1 0 1	6	0 1 1 0	5.1	0 1 1 1	4.5	1 0 0 0	4	1 0 0 1	3.6	1 0 1 0	3.3	1 0 1 1	3	1 1 0 0	2.6	1 1 0 1	2.1	1 1 1 0	1.8	1 1 1 1	1.5
VGH1/2/3/4/5_DIV[3:0] VGL1/2/3/4/5_DIV[3:0]	Frequency (MHz)																																		
0 0 0 0	36																																		
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1 1 0 0	2.6																																		
1 1 0 1	2.1																																		
1 1 1 0	1.8																																		
1 1 1 1	1.5																																		

6.2.62 SETID (C3h)

C3 H	SETID																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX												
Command	W	1	1	0	0	0	0	1	1	C3												
Parameter 1st	R/W	ID1[7]	ID1[6]	ID1[5]	ID1[4]	ID1[3]	ID1[2]	ID1[1]	ID1[0]	38												
Parameter 2nd	R/W	ID2[7]	ID2[6]	ID2[5]	ID2[4]	ID2[3]	ID2[2]	ID2[1]	ID2[0]	21												
Parameter 3rd	R/W	ID3[7]	ID3[6]	ID3[5]	ID3[4]	ID3[3]	ID3[2]	ID3[1]	ID3[0]	1F												
Parameter 4th	R	x	x	x	x	x	ID_TIME[2]	ID_TIME[1]	ID_TIME[0]	00												
Description	This command is used for setting ID. <ul style="list-style-type: none"> • ID1[7:0] / ID2[7:0] / ID3[7:0] : Set ID1 / ID2 / ID3 respectively - 04h / DAh / DBh / DEh change correspondingly • ID_TIME[2:0] : Read ID OTP programming times. <table border="1"> <thead> <tr> <th>ID_TIME[2:0]</th> <th>OTP Programming times</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>NO OTPED</td> </tr> <tr> <td>1</td> <td>1</td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>3</td> </tr> <tr> <td>4</td> <td>4</td> </tr> </tbody> </table>										ID_TIME[2:0]	OTP Programming times	0	NO OTPED	1	1	2	2	3	3	4	4
ID_TIME[2:0]	OTP Programming times																					
0	NO OTPED																					
1	1																					
2	2																					
3	3																					
4	4																					

6.2.63 SETDDB (C4h)

C4 H	SETDDB									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	0	0	0	1	0	0	C4
Parameter 1st	R/W	DDB1[7]	DDB1[6]	DDB1[5]	DDB1[4]	DDB1[3]	DDB1[2]	DDB1[1]	DDB1[0]	00
Parameter 2nd	R/W	DDB2[7]	DDB2[6]	DDB2[5]	DDB2[4]	DDB2[3]	DDB2[2]	DDB2[1]	DDB2[0]	00
Parameter 3rd	R/W	DDB3[7]	DDB3[6]	DDB3[5]	DDB3[4]	DDB3[3]	DDB3[2]	DDB3[1]	DDB3[0]	00
Parameter 4th	R/W	DDB4[7]	DDB4[6]	DDB4[5]	DDB4[4]	DDB4[3]	DDB4[2]	DDB4[1]	DDB4[0]	00
Description	This command is used to set CMD DDB1~4 value. <ul style="list-style-type: none"> • DDB1[7:0] ~ DDB4[7:0] : Set DDB1 ~ DDB4. 									

6.2.64 SETIO (C7h)

C7 H	SETIO																																														
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																																					
Command	W	1	1	0	0	0	1	1	1	C7																																					
Parameter 1st	R/W	PWM_OE	x	INVPWM	VOUT_OE	HOUT_OE	x	x	x	00																																					
Parameter 2nd	R/W	x	V_DELAY[2:0]	V_DELAY[1]	V_DELAY[0]	x	H_DELAY[2:0]	H_DELAY[1]	H_DELAY[0]	00																																					
Description	This command is used to set I/O related register. <ul style="list-style-type: none"> • PWM_OE : PWM output CABC PWM signal. <ul style="list-style-type: none"> - 1 : Enable CABC PWM signal. - 0 : Disable CABC PWM signal. • INVPWM : Inverse polarity of CABC PWM signal. <ul style="list-style-type: none"> - 1 : CABC PWM signal is inverted. - 0 : Original CABC PWM signal. • VOUT_OE : VOUT pin output frame synchronization signal. • HOUT_OE : VOUT pin output horizontal synchronization signal. • V_DELAY[2:0] : Specify Vertical Sync. delay time. <table border="1" style="margin-top: 5px;"> <thead> <tr> <th>V_DELAY[2:0]</th> <th>Delay time (ns)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>1</td><td>1666</td></tr> <tr><td>2</td><td>3332</td></tr> <tr><td>3</td><td>4998</td></tr> <tr><td>4</td><td>6664</td></tr> <tr><td>5</td><td>8330</td></tr> <tr><td>6</td><td>9996</td></tr> <tr><td>7</td><td>11662</td></tr> </tbody> </table> • H_DELAY[2:0] : Specify horizontal sync delay time. <table border="1" style="margin-top: 5px;"> <thead> <tr> <th>H_DELAY[2:0]</th> <th>Delay time (ns)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>1</td><td>1666</td></tr> <tr><td>2</td><td>3332</td></tr> <tr><td>3</td><td>4998</td></tr> <tr><td>4</td><td>6664</td></tr> <tr><td>5</td><td>8330</td></tr> <tr><td>6</td><td>9996</td></tr> <tr><td>7</td><td>11662</td></tr> </tbody> </table> 											V_DELAY[2:0]	Delay time (ns)	0	0	1	1666	2	3332	3	4998	4	6664	5	8330	6	9996	7	11662	H_DELAY[2:0]	Delay time (ns)	0	0	1	1666	2	3332	3	4998	4	6664	5	8330	6	9996	7	11662
V_DELAY[2:0]	Delay time (ns)																																														
0	0																																														
1	1666																																														
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5	8330																																														
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H_DELAY[2:0]	Delay time (ns)																																														
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3	4998																																														
4	6664																																														
5	8330																																														
6	9996																																														
7	11662																																														

6.2.65 SETCABC (C8h)

C8 H		SETCABC																			
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX											
Command	W	1	1	0	0	1	0	0	0	C8											
Parameter 1st	R/W	x	PWM DIV [2]	PWM DIV [1]	PWM DIV [0]	x	x	x	x	10											
Parameter 2nd	R/W	PWM PE RIOD[7]	PWM PE RIOD[6]	PWM PE RIOD[5]	PWM PE RIOD[4]	PWM PE RIOD[3]	PWM PE RIOD[2]	PWM PE RIOD[1]	PWM PE RIOD[0]	40											
Description	This command is used to set CABC related register.																				
	<ul style="list-style-type: none"> • PWM DIV[2:0] : CABC PWM Frequency Fpwm control. 																				
	<table border="1"> <thead> <tr> <th>PWM DIV[2:0]</th><th>PWM Fpwm</th></tr> </thead> <tbody> <tr> <td>0</td><td>Fosc/1</td></tr> <tr> <td>1</td><td>Fosc/2</td></tr> <tr> <td>2</td><td>Fosc/4</td></tr> <tr> <td>3</td><td>Fosc/8</td></tr> <tr> <td>4</td><td>Fosc/16</td></tr> </tbody> </table>										PWM DIV[2:0]	PWM Fpwm	0	Fosc/1	1	Fosc/2	2	Fosc/4	3	Fosc/8	4
PWM DIV[2:0]	PWM Fpwm																				
0	Fosc/1																				
1	Fosc/2																				
2	Fosc/4																				
3	Fosc/8																				
4	Fosc/16																				
<ul style="list-style-type: none"> • PWM PERIOD[7:0] : CABC PWM output frequency control. 																					
<table border="1"> <thead> <tr> <th>PWM PERIOD[7:0]</th><th>PWM frequency</th></tr> </thead> <tbody> <tr> <td>0</td><td>Fpwm/1</td></tr> <tr> <td>1</td><td>Fpwm/1</td></tr> <tr> <td>2</td><td>Fpwm/2</td></tr> <tr> <td>:</td><td>:</td></tr> <tr> <td>3F</td><td>Fpwm/127</td></tr> </tbody> </table>										PWM PERIOD[7:0]	PWM frequency	0	Fpwm/1	1	Fpwm/1	2	Fpwm/2	:	:	3F	Fpwm/127
PWM PERIOD[7:0]	PWM frequency																				
0	Fpwm/1																				
1	Fpwm/1																				
2	Fpwm/2																				
:	:																				
3F	Fpwm/127																				

6.2.66 SETPANEL (CCh)

CC H		SETPANEL									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	W	1	1	0	0	1	1	0	0	CC	
Parameter 1st	R/W		x	x	x	SS_PAN EL	GS_PAN EL	REV_PA NEL	BGR_PA NEL	00	
Description	This command is used to set display related register.										
	<ul style="list-style-type: none"> • SS_PANEL : Reverse the source scan direction. <ul style="list-style-type: none"> - 1 : enable reverse the source scan direction. - 0 : normal scan direction from S1->S1440. 										
	<ul style="list-style-type: none"> • GS_PANEL : Reverse the vertical scan direction. <ul style="list-style-type: none"> - 1 : Enable reverse the vertical scan direction. - 0 : Normal vertical scan direction. 										
	<ul style="list-style-type: none"> • REV_PANEL : Reverse the source polarity. <ul style="list-style-type: none"> - 1 : Normally black panel - 0 : Normally white panel. 										
	<ul style="list-style-type: none"> • BGR_PANEL: reverse the source mapping direction with RGB. <ul style="list-style-type: none"> - 1 : S1:S2:S3 = "B" : "G" : "R" - 0 : S1:S2:S3 = "R" : "G" : "B" 										

6.2.67 DGC_R (CDh)

CD H	DGC_R									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	0	0	1	1	0	1	CD
Parameter 1st	R/W	x	x	x	x	x	x	x	DGC_EN	00
Parameter 2nd	W	DGC_LU T_R00[7]	DGC_LU T_R00[6]	DGC_LU T_R00[5]	DGC_LU T_R00[4]	DGC_LU T_R00[3]	DGC_LU T_R00[2]	DGC_LU T_R00[1]	DGC_LU T_R00[0]	80
Parameter 3rd	W	DGC_LU T_R01[7]	DGC_LU T_R01[6]	DGC_LU T_R01[5]	DGC_LU T_R01[4]	DGC_LU T_R01[3]	DGC_LU T_R01[2]	DGC_LU T_R01[1]	DGC_LU T_R01[0]	80
Parameter 4th	W	DGC_LU T_R02[7]	DGC_LU T_R02[6]	DGC_LU T_R02[5]	DGC_LU T_R02[4]	DGC_LU T_R02[3]	DGC_LU T_R02[2]	DGC_LU T_R02[1]	DGC_LU T_R02[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 10th	W	DGC_LU T_R08[7]	DGC_LU T_R08[6]	DGC_LU T_R08[5]	DGC_LU T_R08[4]	DGC_LU T_R08[3]	DGC_LU T_R08[2]	DGC_LU T_R08[1]	DGC_LU T_R08[0]	80
Parameter 11th	W	DGC_LU T_R09[7]	DGC_LU T_R09[6]	DGC_LU T_R09[5]	DGC_LU T_R09[4]	DGC_LU T_R09[3]	DGC_LU T_R09[2]	DGC_LU T_R09[1]	DGC_LU T_R09[0]	80
Parameter 12th	W	DGC_LU T_R10[7]	DGC_LU T_R10[6]	DGC_LU T_R10[5]	DGC_LU T_R10[4]	DGC_LU T_R10[3]	DGC_LU T_R10[2]	DGC_LU T_R10[1]	DGC_LU T_R10[0]	80
Parameter 13th	W	DGC_LU T_R11[7]	DGC_LU T_R11[6]	DGC_LU T_R11[5]	DGC_LU T_R11[4]	DGC_LU T_R11[3]	DGC_LU T_R11[2]	DGC_LU T_R11[1]	DGC_LU T_R11[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 20th	W	DGC_LU T_R18[7]	DGC_LU T_R18[6]	DGC_LU T_R18[5]	DGC_LU T_R18[4]	DGC_LU T_R18[3]	DGC_LU T_R18[2]	DGC_LU T_R18[1]	DGC_LU T_R18[0]	80
Parameter 21th	W	DGC_LU T_R19[7]	DGC_LU T_R19[6]	DGC_LU T_R19[5]	DGC_LU T_R19[4]	DGC_LU T_R19[3]	DGC_LU T_R19[2]	DGC_LU T_R19[1]	DGC_LU T_R19[0]	80
Parameter 22th	W	DGC_LU T_R20[7]	DGC_LU T_R20[6]	DGC_LU T_R20[5]	DGC_LU T_R20[4]	DGC_LU T_R20[3]	DGC_LU T_R20[2]	DGC_LU T_R20[1]	DGC_LU T_R20[0]	80
Parameter 23th	W:	DGC_LU T_R21[7]	DGC_LU T_R21[6]	DGC_LU T_R21[5]	DGC_LU T_R21[4]	DGC_LU T_R21[3]	DGC_LU T_R21[2]	DGC_LU T_R21[1]	DGC_LU T_R21[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 30th	W	DGC_LU T_R28[7]	DGC_LU T_R28[6]	DGC_LU T_R28[5]	DGC_LU T_R28[4]	DGC_LU T_R28[3]	DGC_LU T_R28[2]	DGC_LU T_R28[1]	DGC_LU T_R28[0]	80
Parameter 31th	W	DGC_LU T_R29[7]	DGC_LU T_R29[6]	DGC_LU T_R29[5]	DGC_LU T_R29[4]	DGC_LU T_R29[3]	DGC_LU T_R29[2]	DGC_LU T_R29[1]	DGC_LU T_R29[0]	80
Parameter 32th	W	DGC_LU T_R30[7]	DGC_LU T_R30[6]	DGC_LU T_R30[5]	DGC_LU T_R30[4]	DGC_LU T_R30[3]	DGC_LU T_R30[2]	DGC_LU T_R30[1]	DGC_LU T_R30[0]	80
Parameter 33th	W	DGC_LU T_R31[7]	DGC_LU T_R31[6]	DGC_LU T_R31[5]	DGC_LU T_R31[4]	DGC_LU T_R31[3]	DGC_LU T_R31[2]	DGC_LU T_R31[1]	DGC_LU T_R31[0]	80
Parameter 34th	W	DGC_LU T_R32[7]	DGC_LU T_R32[6]	DGC_LU T_R32[5]	DGC_LU T_R32[4]	DGC_LU T_R32[3]	DGC_LU T_R32[2]	DGC_LU T_R32[1]	DGC_LU T_R32[0]	80
Description	<p>This command is used to set Red color digital gamma.</p> <ul style="list-style-type: none"> • DGC_EN : Control digital gamma function. <ul style="list-style-type: none"> - 1 : Enable digital gamma function. - 0 : Disable digital gamma function. • DGC_LUT_R00 [7:0] ~ DGC_LUT_R32 [7:0] : Red color digital gamma LUT table. 									

6.2.68 DGC_G (CEh)

CE H	DGC_G									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	0	0	1	1	1	0	CE
Parameter 1st	W	DGC_LU T_G00[7]	DGC_LU T_G00[6]	DGC_LU T_G00[5]	DGC_LU T_G00[4]	DGC_LU T_G00[3]	DGC_LU T_G00[2]	DGC_LU T_G00[1]	DGC_LU T_G00[0]	80
Parameter 2nd	W	DGC_LU T_G01[7]	DGC_LU T_G01[6]	DGC_LU T_G01[5]	DGC_LU T_G01[4]	DGC_LU T_G01[3]	DGC_LU T_G01[2]	DGC_LU T_G01[1]	DGC_LU T_G01[0]	80
Parameter 3rd	W	DGC_LU T_G02[7]	DGC_LU T_G02[6]	DGC_LU T_G02[5]	DGC_LU T_G02[4]	DGC_LU T_G02[3]	DGC_LU T_G02[2]	DGC_LU T_G02[1]	DGC_LU T_G02[0]	80
Parameter 4th	W	DGC_LU T_G03[7]	DGC_LU T_G03[6]	DGC_LU T_G03[5]	DGC_LU T_G03[4]	DGC_LU T_G03[3]	DGC_LU T_G03[2]	DGC_LU T_G03[1]	DGC_LU T_G03[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 10th	W	DGC_LU T_G09[7]	DGC_LU T_G09[6]	DGC_LU T_G09[5]	DGC_LU T_G09[4]	DGC_LU T_G09[3]	DGC_LU T_G09[2]	DGC_LU T_G09[1]	DGC_LU T_G09[0]	80
Parameter 11th	W	DGC_LU T_G10[7]	DGC_LU T_G10[6]	DGC_LU T_G10[5]	DGC_LU T_G10[4]	DGC_LU T_G10[3]	DGC_LU T_G10[2]	DGC_LU T_G10[1]	DGC_LU T_G10[0]	80
Parameter 12th	W	DGC_LU T_G11[7]	DGC_LU T_G11[6]	DGC_LU T_G11[5]	DGC_LU T_G11[4]	DGC_LU T_G11[3]	DGC_LU T_G11[2]	DGC_LU T_G11[1]	DGC_LU T_G11[0]	80
Parameter 13th	W	DGC_LU T_G12[7]	DGC_LU T_G12[6]	DGC_LU T_G12[5]	DGC_LU T_G12[4]	DGC_LU T_G12[3]	DGC_LU T_G12[2]	DGC_LU T_G12[1]	DGC_LU T_G12[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 19th	W	DGC_LU T_G18[7]	DGC_LU T_G18[6]	DGC_LU T_G18[5]	DGC_LU T_G18[4]	DGC_LU T_G18[3]	DGC_LU T_G18[2]	DGC_LU T_G18[1]	DGC_LU T_G18[0]	80
Parameter 20th	W	DGC_LU T_G19[7]	DGC_LU T_G19[6]	DGC_LU T_G19[5]	DGC_LU T_G19[4]	DGC_LU T_G19[3]	DGC_LU T_G19[2]	DGC_LU T_G19[1]	DGC_LU T_G19[0]	80
Parameter 21th	W	DGC_LU T_G20[7]	DGC_LU T_G20[6]	DGC_LU T_G20[5]	DGC_LU T_G20[4]	DGC_LU T_G20[3]	DGC_LU T_G20[2]	DGC_LU T_G20[1]	DGC_LU T_G20[0]	80
Parameter 22th	W	DGC_LU T_G21[7]	DGC_LU T_G21[6]	DGC_LU T_G21[5]	DGC_LU T_G21[4]	DGC_LU T_G21[3]	DGC_LU T_G21[2]	DGC_LU T_G21[1]	DGC_LU T_G21[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 30th	W	DGC_LU T_G29[7]	DGC_LU T_G29[6]	DGC_LU T_G29[5]	DGC_LU T_G29[4]	DGC_LU T_G29[3]	DGC_LU T_G29[2]	DGC_LU T_G29[1]	DGC_LU T_G29[0]	80
Parameter 31th	W	DGC_LU T_G30[7]	DGC_LU T_G30[6]	DGC_LU T_G30[5]	DGC_LU T_G30[4]	DGC_LU T_G30[3]	DGC_LU T_G30[2]	DGC_LU T_G30[1]	DGC_LU T_G30[0]	80
Parameter 32th	W	DGC_LU T_G31[7]	DGC_LU T_G31[6]	DGC_LU T_G31[5]	DGC_LU T_G31[4]	DGC_LU T_G31[3]	DGC_LU T_G31[2]	DGC_LU T_G31[1]	DGC_LU T_G31[0]	80
Parameter 33th	W	DGC_LU T_G32[7]	DGC_LU T_G32[6]	DGC_LU T_G32[5]	DGC_LU T_G32[4]	DGC_LU T_G32[3]	DGC_LU T_G32[2]	DGC_LU T_G32[1]	DGC_LU T_G32[0]	80
Description	This command is used to set Green color digital gamma. <ul style="list-style-type: none"> DGC_LUT_G00 [7:0] ~ DGC_LUT_G32 [7:0] : Green color digital gamma LUT table. 									

6.2.69 DGC_B (CFh)

CF H	DGC_B									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	0	0	1	1	1	1	CF
Parameter 1st	W	DGC_LU T_B00[7]	DGC_LU T_B00[6]	DGC_LU T_B00[5]	DGC_LU T_B00[4]	DGC_LU T_B00[3]	DGC_LU T_B00[2]	DGC_LU T_B00[1]	DGC_LU T_B00[0]	80
Parameter 2nd	W	DGC_LU T_B01[7]	DGC_LU T_B01[6]	DGC_LU T_B01[5]	DGC_LU T_B01[4]	DGC_LU T_B01[3]	DGC_LU T_B01[2]	DGC_LU T_B01[1]	DGC_LU T_B01[0]	80
Parameter 3rd	W	DGC_LU T_B02[7]	DGC_LU T_B02[6]	DGC_LU T_B02[5]	DGC_LU T_B02[4]	DGC_LU T_B02[3]	DGC_LU T_B02[2]	DGC_LU T_B02[1]	DGC_LU T_B02[0]	80
Parameter 4th	W	DGC_LU T_B03[7]	DGC_LU T_B03[6]	DGC_LU T_B03[5]	DGC_LU T_B03[4]	DGC_LU T_B03[3]	DGC_LU T_B03[2]	DGC_LU T_B03[1]	DGC_LU T_B03[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 10th	W	DGC_LU T_B09[7]	DGC_LU T_B09[6]	DGC_LU T_B09[5]	DGC_LU T_B09[4]	DGC_LU T_B09[3]	DGC_LU T_B09[2]	DGC_LU T_B09[1]	DGC_LU T_B09[0]	80
Parameter 11th	W	DGC_LU T_B10[7]	DGC_LU T_B10[6]	DGC_LU T_B10[5]	DGC_LU T_B10[4]	DGC_LU T_B10[3]	DGC_LU T_B10[2]	DGC_LU T_B10[1]	DGC_LU T_B10[0]	80
Parameter 12th	W	DGC_LU T_B11[7]	DGC_LU T_B11[6]	DGC_LU T_B11[5]	DGC_LU T_B11[4]	DGC_LU T_B11[3]	DGC_LU T_B11[2]	DGC_LU T_B11[1]	DGC_LU T_B11[0]	80
Parameter 13th	:W	DGC_LU T_B12[7]	DGC_LU T_B12[6]	DGC_LU T_B12[5]	DGC_LU T_B12[4]	DGC_LU T_B12[3]	DGC_LU T_B12[2]	DGC_LU T_B12[1]	DGC_LU T_B12[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 19th	W	DGC_LU T_B18[7]	DGC_LU T_B18[6]	DGC_LU T_B18[5]	DGC_LU T_B18[4]	DGC_LU T_B18[3]	DGC_LU T_B18[2]	DGC_LU T_B18[1]	DGC_LU T_B18[0]	80
Parameter 20th	W	DGC_LU T_B19[7]	DGC_LU T_B19[6]	DGC_LU T_B19[5]	DGC_LU T_B19[4]	DGC_LU T_B19[3]	DGC_LU T_B19[2]	DGC_LU T_B19[1]	DGC_LU T_B19[0]	80
Parameter 21th	W	DGC_LU T_B20[7]	DGC_LU T_B20[6]	DGC_LU T_B20[5]	DGC_LU T_B20[4]	DGC_LU T_B20[3]	DGC_LU T_B20[2]	DGC_LU T_B20[1]	DGC_LU T_B20[0]	80
Parameter 22th	W	DGC_LU T_B21[7]	DGC_LU T_B21[6]	DGC_LU T_B21[5]	DGC_LU T_B21[4]	DGC_LU T_B21[3]	DGC_LU T_B21[2]	DGC_LU T_B21[1]	DGC_LU T_B21[0]	80
:	:	:	:	:	:	:	:	:	:	
Parameter 30th	W	DGC_LU T_B29[7]	DGC_LU T_B29[6]	DGC_LU T_B29[5]	DGC_LU T_B29[4]	DGC_LU T_B29[3]	DGC_LU T_B29[2]	DGC_LU T_B29[1]	DGC_LU T_B29[0]	80
Parameter 31th	W	DGC_LU T_B30[7]	DGC_LU T_B30[6]	DGC_LU T_B30[5]	DGC_LU T_B30[4]	DGC_LU T_B30[3]	DGC_LU T_B30[2]	DGC_LU T_B30[1]	DGC_LU T_B30[0]	80
Parameter 32th	W	DGC_LU T_B31[7]	DGC_LU T_B31[6]	DGC_LU T_B31[5]	DGC_LU T_B31[4]	DGC_LU T_B31[3]	DGC_LU T_B31[2]	DGC_LU T_B31[1]	DGC_LU T_B31[0]	80
Parameter 33th	W	DGC_LU T_B32[7]	DGC_LU T_B32[6]	DGC_LU T_B32[5]	DGC_LU T_B32[4]	DGC_LU T_B32[3]	DGC_LU T_B32[2]	DGC_LU T_B32[1]	DGC_LU T_B32[0]	80
Description	This command is used to set Blue color digital gamma. • DGC_LUT_B00 [7:0] ~ DGC_LUT_B32 [7:0] : Blue color digital gamma LUT table.									

6.2.70 SETGAMMA (E0h)

E0 H	SETGAMMA									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	1	0	0	0	0	0	E0
Parameter 1st	R/W	x	x	PVR0[5]	PVR0[4]	PVR0[3]	PVR0[2]	PVR0[1]	PVR0[0]	0B
Parameter 2nd	R/W	x	x	PVR1[5]	PVR1[4]	PVR1[3]	PVR1[2]	PVR1[1]	PVR1[0]	0C
Parameter 3rd	R/W	x	x	PVR2[5]	PVR2[4]	PVR2[3]	PVR2[2]	PVR2[1]	PVR2[0]	11
Parameter 4th	R/W	x	x	PVR3[5]	PVR3[4]	PVR3[3]	PVR3[2]	PVR3[1]	PVR3[0]	1D
Parameter 5th	R/W	x	x	PVR4[5]	PVR4[4]	PVR4[3]	PVR4[2]	PVR4[1]	PVR4[0]	25
Parameter 6th	R/W	x	x	PVR5[5]	PVR5[4]	PVR5[3]	PVR5[2]	PVR5[1]	PVR5[0]	37
Parameter 7th	R/W	x	PPR0[6]	PPR0[5]	PPR0[4]	PPR0[3]	PPR0[2]	PPR0[1]	PPR0[0]	43
Parameter 8th	R/W	x	PPR1[6]	PPR1[5]	PPR1[4]	PPR1[3]	PPR1[2]	PPR1[1]	PPR1[0]	4B
Parameter 9th	R/W	x	x	x	PPK0[4]	PPK0[3]	PPK0[2]	PPK0[1]	PPK0[0]	4E
Parameter 10th	R/W	x	x	x	PPK1[4]	PPK1[3]	PPK1[2]	PPK1[1]	PPK1[0]	47
Parameter 11th	R/W	x	x	x	PPK2[4]	PPK2[3]	PPK2[2]	PPK2[1]	PPK2[0]	41
Parameter 12th	R/W	x	x	x	PPK3[4]	PPK3[3]	PPK3[2]	PPK3[1]	PPK3[0]	39
Parameter 13th	R/W	x	x	x	PPK4[4]	PPK4[3]	PPK4[2]	PPK4[1]	PPK4[0]	35
Parameter 14th	R/W	x	x	x	PPK5[4]	PPK5[3]	PPK5[2]	PPK5[1]	PPK5[0]	31
Parameter 15th	R/W	x	x	x	PPK6[4]	PPK6[3]	PPK6[2]	PPK6[1]	PPK6[0]	2E
Parameter 16th	R/W	x	x	x	PPK7[4]	PPK7[3]	PPK7[2]	PPK7[1]	PPK7[0]	21
Parameter 17th	R/W	x	x	x	PPK8[4]	PPK8[3]	PPK8[2]	PPK8[1]	PPK8[0]	1C
Parameter 18th	R/W	x	x	NVR0[5]	NVR0[4]	NVR0[3]	NVR0[2]	NVR0[1]	NVR0[0]	1D
Parameter 19th	R/W	x	x	NVR1[5]	NVR1[4]	NVR1[3]	NVR1[2]	NVR1[1]	NVR1[0]	1D
Parameter 20th	R/W	x	x	NVR2[5]	NVR2[4]	NVR2[3]	NVR2[2]	NVR2[1]	NVR2[0]	26
Parameter 21st	R/W	x	x	NVR3[5]	NVR3[4]	NVR3[3]	NVR3[2]	NVR3[1]	NVR3[0]	31
Parameter 22nd	R/W	x	x	NVR4[5]	NVR4[4]	NVR4[3]	NVR4[2]	NVR4[1]	NVR4[0]	44
Parameter 23rd	R/W	x	x	NVR5[5]	NVR5[4]	NVR5[3]	NVR5[2]	NVR5[1]	NVR5[0]	4E
Parameter 24th	R/W	x	NPR0[6]	NPR0[5]	NPR0[4]	NPR0[3]	NPR0[2]	NPR0[1]	NPR0[0]	56
Parameter 25th	R/W	x	NPR1[6]	NPR1[5]	NPR1[4]	NPR1[3]	NPR1[2]	NPR1[1]	NPR1[0]	44
Parameter 26th	R/W	x	x	x	NPK0[4]	NPK0[3]	NPK0[2]	NPK0[1]	NPK0[0]	3F
Parameter 27th	R/W	x	x	x	NPK1[4]	NPK1[3]	NPK1[2]	NPK1[1]	NPK1[0]	39
Parameter 28th	R/W	x	x	x	NPK2[4]	NPK2[3]	NPK2[2]	NPK2[1]	NPK2[0]	33
Parameter 29th	R/W	x	x	x	NPK3[4]	NPK3[3]	NPK3[2]	NPK3[1]	NPK3[0]	31
Parameter 30th	R/W	x	x	x	NPK4[4]	NPK4[3]	NPK4[2]	NPK4[1]	NPK4[0]	2E
Parameter 31st	R/W	x	x	x	NPK5[4]	NPK5[3]	NPK5[2]	NPK5[1]	NPK5[0]	28
Parameter 32nd	R/W	x	x	x	NPK6[4]	NPK6[3]	NPK6[2]	NPK6[1]	NPK6[0]	1D
Parameter 33rd	R/W	x	x	x	NPK7[4]	NPK7[3]	NPK7[2]	NPK7[1]	NPK7[0]	E0
Parameter 34th	R/W	x	x	x	NPK8[4]	NPK8[3]	NPK8[2]	NPK8[1]	NPK8[0]	00
Description	This command is used to set the gray scale voltage to adjust the gamma characteristics of the TFT panel.									

6.2.71 SETEQ (E3h)

E3 H		SETEQ									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	W	1	1	1	0	0	0	1	1	E3	
Parameter 1st	R/W	PNOEQ[7]	PNOEQ[6]	PNOEQ[5]	PNOEQ[4]	PNOEQ[3]	PNOEQ[2]	PNOEQ[1]	PNOEQ[0]	00	
Parameter 2nd	R/W	NNOEQ[7]	NNOEQ[6]	PEQGND[5]	NNOEQ[4]	NNOEQ[3]	NNOEQ[2]	NNOEQ[1]	NNOEQ[0]	00	
Parameter 3rd	R/W	PEQGND[7]	PEQGND[6]	PEQGND[5]	PEQGND[4]	PEQGND[3]	PEQGND[2]	PEQGND[1]	PEQGND[0]	03	
Parameter 4th	R/W	NEQGN D[7]	NEQGN D[6]	NEQGN D[5]	NEQGN D[4]	NEQGN D[3]	NEQGN D[2]	NEQGN D[1]	NEQGN D[0]	03	
Parameter 5th	R/W	PEQVCI[7]	PEQVCI[6]	PEQVCI[5]	PEQVCI[4]	PEQVCI[3]	PEQVCI[2]	PEQVCI[1]	PEQVCI[0]	03	
Parameter 6th	R/W	NEQVCI[7]	NEQVCI[6]	NEQVCI[5]	NEQVCI[4]	NEQVCI[3]	NEQVCI[2]	NEQVCI[1]	NEQVCI[0]	03	
Parameter 7th	R/W	PEQVCI1[7]	PEQVCI1[6]	PEQVCI1[5]	PEQVCI1[4]	PEQVCI1[3]	PEQVCI1[2]	PEQVCI1[1]	PEQVCI1[0]	03	
Parameter 8th	R/W	NEQVCI1[7]	NEQVCI1[6]	NEQVCI1[5]	NEQVCI1[4]	NEQVCI1[3]	NEQVCI1[2]	NEQVCI1[1]	NEQVCI1[0]	03	
Parameter 9th	R/W	x	x	x	x	x	x	x	x	00	
Parameter 10th	R/W	x	x	x	x	x	x	x	x	00	
Parameter 11th	R/W	x	x	x	x	x	x	x	x	00	
Parameter 12th	R/W	x	x	x	x	x	x	x	x	00	
Parameter 13th	R/W	ESD_DE_T_DATA_WHITE	ESD_WHITE_EN	x	x	x	x	x	x	C0	
Parameter 14th	R/W	x	x	x	SLPIN_OPTION	VEDIO_NO_CHECK_EN	ESD_WHITE_GND_EN	ESD_DET_TIME_SEL[1]	ESD_DET_TIME_SEL[0]	14	
Description	<p>This command is used to set EQ related register.</p> <p>The timing diagram illustrates the sequence of signals during the SETEQ command. It shows the relationship between HSYNC, DE, PEQVCI, PEQVCI1, GND, and VOL. Key points marked include PNOEQ, NNOEQ, PEQGND, NEQGND, PEQVCI, and NEQVCI. The diagram shows how these signals are synchronized and timed relative to each other.</p> <ul style="list-style-type: none"> PNOEQ[7:0] : Specify the temporal spacing between HSYNC and PEQGND. NNOEQ[7:0] : Specify the temporal spacing between HSYNC and NEQGND. PEQGND[7:0] : Specify the source EQ GND period when Source up to positive voltage. NEQGND[7:0] : Specify the source EQ GND period when Source down to negative voltage. PEQVCI[7:0] : Specify the source EQ VCI period when Source up to positive voltage. NEQVCI[7:0] : Specify the source EQ VCI period when Source down to negative voltage. PEQVCI1[7:0] : Specify the temporal period of PEQVCI1. NEQVCI1[7:0] : Specify the temporal period of NEQVCI1. 										

PNOEQ[7:0]	
NNOEQ[7:0]	
PEQGND[7:0]	
NEQGND[7:0]	
PEQVCI[7:0]	
NEQVCI[7:0]	
PEQVCI1[7:0]	
NEQVCI1[7:0]	
0	0*4/Fosc
1	1*4/Fosc
2	2*4/Fosc
3	3*4/Fosc
:	:
FD	253*4/Fosc
FE	254*4/Fosc
FF	255*4/Fosc

Description

- **ESD_DET_DATA_WHITE** : Select white or black pattern to protect GOA glass.
- **ESD_WHITE_EN** : Enable ESD detection function to protect GOA glass.
 - At Sleep-Out State, IC automatically displaying white or black pattern when MIPI-DSI is interrupted or not sent.
- **SLPIN_OPTION**
 - 0 : Need VSYNC (additional frame) after Sleep-In command to display sleep-in blanking frame then into Sleep-In State.
 - 1 : No Need VSYNC (additional frame) after Sleep-In command to display sleep-in blanking frame then into Sleep-In State.
- **VEDIO_NO_CHECK_EN** : Enable vedio function detection.
 - 0 : Enable vedio function detection.
 - 1 : Disable vedio function detection, continually displaying white or black pattern after sleep-out blanking frame without detecting if MIPI video comes or not
- **ESD_WHITE_GND_EN** : Enable ESD white pattern scanning voltage pull ground.
 “0”, Disable scanning voltage pull ground.
 “1”, Enable scanning voltage pull ground.
- **ESD_DET_TIME_SEL[1:0]** : ESD detection function period.

ESD_TIME_SEL[1:0]	Period
0	0 frames
1	1 frames
2	2 frames
3	3 frames

6.2.72 SETCOLOREN (E4h)

SETCOLOREN										
E4 H	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	1	0	0	1	0	0	E4
Parameter 1st	R/W	x	x	x	x	x	x	x	CE_MASK	01
Description	<p>This command is to set color enhancement mode.</p> <ul style="list-style-type: none">• CE_MASK : Enable / Disable the color enhanced mask function.<ul style="list-style-type: none">- 0 : Disable- 1 : Enable									

6.2.73 SETCOLOREN (E5h)

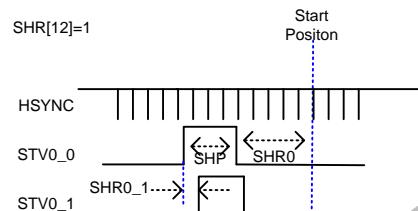
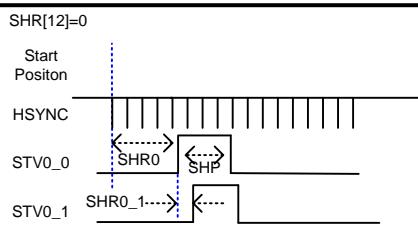
E5 H	SETCOLOREN																			
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX										
Command	W	1	1	1	0	0	1	0	1	E5										
Parameter 1st	R/W	SP_lev EL[1]	SP_lev EL[0]	CE_EN	x	x	x	x	x	00										
Parameter 2nd	R/W	x	x	x	x	x	x	x	x	No use										
Parameter 3rd	R/W	x	x	x	Blue_3[1 2]	Blue_3[1 1]	Blue_3[1 0]	Blue_3[9]	Blue_3[8]	08										
Parameter 4th	R/W	Blue_3[7]	Blue_3[6]	Blue_3[5]	Blue_3[4]	Blue_3[3]	Blue_3[2]	Blue_3[1]	Blue_3[0]	32										
Parameter 5th	R/W	x	x	x	Blue_2[1 2]	Blue_2[1 1]	Blue_2[1 0]	Blue_2[9]	Blue_2[8]	1C										
Parameter 6th	R/W	Blue_2[7]	Blue_2[6]	Blue_2[5]	Blue_2[4]	Blue_2[3]	Blue_2[2]	Blue_2[1]	Blue_2[0]	71										
Parameter 7th	R/W	x	x	x	Blue_1[1 2]	Blue_1[1 1]	Blue_1[1 0]	Blue_1[9]	Blue_1[8]	1F										
Parameter 8th	R/W	Blue_1[7]	Blue_1[6]	Blue_1[5]	Blue_1[4]	Blue_1[3]	Blue_1[2]	Blue_1[1]	Blue_1[0]	90										
Parameter 9th	R/W	x	x	x	Green_3[12]	Green_3[11]	Green_3[10]	Green_3[9]	Green_3[8]	1E										
Parameter 10th	R/W	Green_3[7]	Green_3[6]	Green_3[5]	Green_3[4]	Green_3[3]	Green_3[2]	Green_3[1]	Green_3[0]	CD										
Parameter 11th	R/W	x	x	x	Green_2[12]	Green_2[11]	Green_2[10]	Green_2[9]	Green_2[8]	07										
Parameter 12th	R/W	Green_2[7]	Green_2[6]	Green_2[5]	Green_2[4]	Green_2[3]	Green_2[2]	Green_2[1]	Green_2[0]	4C										
Parameter 13th	R/W	x	x	x	Green_1[12]	Green_1[11]	Green_1[10]	Green_1[9]	Green_1[8]	1E										
Parameter 14th	R/W	Green_1[7]	Green_1[6]	Green_1[5]	Green_1[4]	Green_1[3]	Green_1[2]	Green_1[1]	Green_1[0]	06										
Parameter 15th	R/W	x	x	x	Red_3[12 1]	Red_3[11]	Red_3[10]	Red_3[9]	Red_3[8]	1F										
Parameter 16th	R/W	Red_3[7]	Red_3[6]	Red_3[5]	Red_3[4]	Red_3[3]	Red_3[2]	Red_3[1]	Red_3[0]	66										
Parameter 17th	R/W	x	x	x	Red_2[12]	Red_2[11]	Red_2[10]	Red_2[9]	Red_2[8]	1E										
Parameter 18th	R/W	Red_2[7]	Red_2[6]	Red_2[5]	Red_2[4]	Red_2[3]	Red_2[2]	Red_2[1]	Red_2[0]	2A										
Parameter 19th	R/W	x	x	x	Red_1[12]	Red_1[11]	Red_1[10]	Red_1[9]	Red_1[8]	06										
Parameter 20th	R/W	Red_1[7]	Red_1[6]	Red_1[5]	Red_1[4]	Red_1[3]	Red_1[2]	Red_1[1]	Red_1[0]	70										
Description	This command is to set color enhancement mode. <ul style="list-style-type: none"> • SP_LEVEL[1:0] : Specify sharpness level. <table border="1"> <thead> <tr> <th>SP_LEVEL[1:0]</th> <th>Sharpness Level</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No sharpness</td> </tr> <tr> <td>1</td> <td>Small</td> </tr> <tr> <td>2</td> <td>Medium</td> </tr> <tr> <td>3</td> <td>Large</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • CE_EN : Enable the color enhanced function. 										SP_LEVEL[1:0]	Sharpness Level	0	No sharpness	1	Small	2	Medium	3	Large
SP_LEVEL[1:0]	Sharpness Level																			
0	No sharpness																			
1	Small																			
2	Medium																			
3	Large																			

6.2.74 SETGIP1 (E9h)

E9 H	SETGIP1									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	1	0	1	0	0	1	E9
Parameter 1st	R/W	REF_EN	x	x	x	PANEL_SEL[3]	PANEL_SEL[2]	PANEL_SEL[1]	PANEL_SEL[0]	24
Parameter 2nd	R/W	x	x	x	SHR0[12]	SHR0[11]	SHR0[10]	SHR0[9]	SHR0[8] 1	00
Parameter 3rd	R/W	SHR0[7]	SHR0[6]	SHR0[5]	SHR0[4]	SHR0[3]	SHR0[2]	SHR0[1]	SHR0[0] 1	00
Parameter 4th	R/W	x	x	x	SHR0[12]	SHR1[11]	SHR1[10]	SHR1[9]	SHR1[8] 1	00
Parameter 5th	R/W	SHR1[7]	SHR1[6]	SHR1[5]	SHR1[4]	SHR1[3]	SHR1[2]	SHR1[1]	SHR1[0] 1	00
Parameter 6th	R/W	SPON[7]	SPON[6]	SPON[5]	SPON[4]	SPON[3]	SPON[2]	SPON[1]	SPON[0] 1	00
Parameter 7th	R/W	SPOFF[7] 1	SPOFF[6] 1	SPOFF[5] 1	SPOFF[4] 1	SPOFF[3] 1	SPOFF[2] 1	SPOFF[1] 1	SPOFF[0] 01	00
Parameter 8th	R/W	SHR0_1[3] 3	SHR0_1[2] 2	SHR0_1[1] 1	SHR0_1[0] 0	SHR0_2[3] 3	SHR0_2[2] 2	SHR0_2[1] 1	SHR0_2[0] 0	00
Parameter 9th	R/W	SHR0_3[3] 3	SHR0_3[2] 2	SHR0_3[1] 1	SHR0_3[0] 0	SHR1_1[3] 3	SHR1_1[2] 2	SHR1_1[1] 1	SHR1_1[0] 0	00
Parameter 10th	R/W	SHR1_2[3] 3	SHR1_2[2] 2	SHR1_2[1] 1	SHR1_2[0] 0	SHR1_3[3] 3	SHR1_3[2] 2	SHR1_3[1] 1	SHR1_3[0] 0	00
Parameter 11th	R/W	SHP[3]	SHP[2]	SHP[1]	SHP[0]	SCP[3]	SCP[2]	SCP[1]	SCP[0]	00
Parameter 12th	R/W	CHR[7]	CHR[6]	CHR[5]	CHR[4]	CHR[3]	CHR[2]	CHR[1]	CHR[0]	00
Parameter 13th	R/W	CON[7]	CON[6]	CON[5]	CON[4]	CON[3]	CON[2]	CON[1]	CON[0]	02
Parameter 14th	R/W	COF[7]	COF[6]	COF[5]	COF[4]	COF[3]	COF[2]	COF[1]	COF[0]	02
Parameter 15th	R/W	CHP[3]	CHP[2]	CHP[1]	CHP[0]	CCP[3]	CCP[2]	CCP[1]	CCP[0]	00
Parameter 16th	R/W	USER_G_IP_GATE[7]	USER_G_IP_GATE[6]	USER_G_IP_GATE[5]	USER_G_IP_GATE[4]	USER_G_IP_GATE[3]	USER_G_IP_GATE[2]	USER_G_IP_GATE[1]	USER_G_IP_GATE[0]	00
Parameter 17th	R/W	x	x	CGTS_L[21]	CGTS_L[20]	CGTS_L[19]	CGTS_L[18]	CGTS_L[17]	CGTS_L[16]	00
Parameter 18th	R/W	CGTS_L[15]	CGTS_L[14]	CGTS_L[13]	CGTS_L[12]	CGTS_L[11]	CGTS_L[10]	CGTS_L[9]	CGTS_L[8]	00
Parameter 19th	R/W	CGTS_L[7]	CGTS_L[6]	CGTS_L[5]	CGTS_L[4]	CGTS_L[3]	CGTS_L[2]	CGTS_L[1]	CGTS_L[0]	00
Parameter 20th	R/W	x	x	CGTS_IN_V_L[21]	CGTS_IN_V_L[20]	CGTS_IN_V_L[19]	CGTS_IN_V_L[18]	CGTS_IN_V_L[17]	CGTS_IN_V_L[16]	00
Parameter 21st	R/W	CGTS_I_NV_L[15]	CGTS_IN_V_L[14]	CGTS_IN_V_L[13]	CGTS_IN_V_L[12]	CGTS_IN_V_L[11]	CGTS_IN_V_L[10]	CGTS_IN_V_L[9]	CGTS_I_NV_L[8]	00
Parameter 22nd	R/W	CGTS_I_NV_L[7]	CGTS_IN_V_L[6]	CGTS_IN_V_L[5]	CGTS_IN_V_L[4]	CGTS_IN_V_L[3]	CGTS_IN_V_L[2]	CGTS_IN_V_L[1]	CGTS_I_NV_L[0]	00
Parameter 23rd	R/W	x	x	CGTS_R[21]	CGTS_R[20]	CGTS_R[19]	CGTS_R[18]	CGTS_R[17]	CGTS_R[16]	00
Parameter 24th	R/W	CGTS_R[15]	CGTS_R[14]	CGTS_R[13]	CGTS_R[12]	CGTS_R[11]	CGTS_R[10]	CGTS_R[9]	CGTS_R[8]	00
Parameter 25th	R/W	CGTS_R[7]	CGTS_R[6]	CGTS_R[5]	CGTS_R[4]	CGTS_R[3]	CGTS_R[2]	CGTS_R[1]	CGTS_R[0]	00
Parameter 26th	R/W	x	x	CGTS_IN_V_R[21]	CGTS_IN_V_R[20]	CGTS_IN_V_R[19]	CGTS_IN_V_R[18]	CGTS_IN_V_R[17]	CGTS_I_NV_R[16]	00
Parameter 27th	R/W	CGTS_I_NV_R[15]	CGTS_IN_V_R[14]	CGTS_IN_V_R[13]	CGTS_IN_V_R[12]	CGTS_IN_V_R[11]	CGTS_IN_V_R[10]	CGTS_IN_V_R[9]	CGTS_I_NV_R[8]	00
Parameter 28th	R/W	CGTS_I_NV_R[7]	CGTS_IN_V_R[6]	CGTS_IN_V_R[5]	CGTS_IN_V_R[4]	CGTS_IN_V_R[3]	CGTS_IN_V_R[2]	CGTS_IN_V_R[1]	CGTS_I_NV_R[0]	00
Parameter 29th	R/W	COS1_L[3]	COS1_L[2]	COS1_L[1]	COS1_L[0]	COS2_L[3]	COS2_L[2]	COS2_L[1]	COS2_L[0]	00
Parameter 30th	R/W	COS3_L[3]	COS3_L[2]	COS3_L[1]	COS3_L[0]	COS4_L[3]	COS4_L[2]	COS4_L[1]	COS4_L[0]	00

Parameter 31st	R/W	COS5_L[3]	COS5_L[2]	COS5_L[1]	COS5_L[0]	COS6_L[3]	COS6_L[2]	COS6_L[1]	COS6_L[0]	00
:	:	:	:	:	:	:	:	:	:	
Parameter 37th	R/W	COS17_L[3]	COS17_L[2]	COS17_L[1]	COS17_L[0]	COS18_L[3]	COS18_L[2]	COS18_L[1]	COS18_L[0]	00
Parameter 38th	R/W	COS19_L[3]	COS19_L[2]	COS19_L[1]	COS19_L[0]	COS20_L[3]	COS20_L[2]	COS20_L[1]	COS20_L[0]	00
Parameter 39th	R/W	COS21_L[3]	COS21_L[2]	COS21_L[1]	COS21_L[0]	COS22_L[3]	COS22_L[2]	COS22_L[1]	COS22_L[0]	00
Parameter 40th	R/W	COS1_R[3]	COS1_R[2]	COS1_R[1]	COS1_R[0]	COS2_R[3]	COS2_R[2]	COS2_R[1]	COS2_R[0]	00
Parameter 41st	R/W	COS3_R[3]	COS3_R[2]	COS3_R[1]	COS3_R[0]	COS4_R[3]	COS4_R[2]	COS4_R[1]	COS4_R[0]	00
Parameter 42nd	R/W	COS5_R[3]	COS5_R[2]	COS5_R[1]	COS5_R[0]	COS6_R[3]	COS6_R[2]	COS6_R[1]	COS6_R[0]	00
:	:	:	:	:	:	:	:	:	:	
Parameter 48th	R/W	COS17_R[3]	COS17_R[2]	COS17_R[1]	COS17_R[0]	COS18_R[3]	COS18_R[2]	COS18_R[1]	COS18_R[0]	00
Parameter 49th	R/W	COS19_R[3]	COS19_R[2]	COS19_R[1]	COS19_R[0]	COS20_R[3]	COS20_R[2]	COS20_R[1]	COS20_R[0]	00
Parameter 50th	R/W	COS21_R[3]	COS21_R[2]	COS21_R[1]	COS21_R[0]	COS22_R[3]	COS22_R[2]	COS22_R[1]	COS22_R[0]	00
Parameter 51st	R/W	TCON_O_PT[7]	TCON_O_PT[6]	TCON_O_PT[5]	TCON_O_PT[4]	TCON_O_PT[3]	TCON_O_PT[2]	TCON_O_PT[1]	TCON_O_PT[0]	00
Parameter 52nd	R/W	x	GIP_OPT[22]	GIP_OPT[21]	GIP_OPT[20]	GIP_OPT[19]	GIP_OPT[18]	GIP_OPT[17]	GIP_OPT[16]	00
Parameter 53rd	R/W	GIP_OP_T[15]	GIP_OP_T[14]	GIP_OP_T[13]	GIP_OP_T[12]	GIP_OP_T[11]	GIP_OP_T[10]	GIP_OP_T[9]	GIP_OP_T[8]	00
Parameter 54th	R/W	GIP_OP_T[7]	GIP_OP_T[6]	GIP_OP_T[5]	GIP_OP_T[4]	GIP_OP_T[3]	GIP_OP_T[2]	GIP_OP_T[1]	GIP_OP_T[0]	00
Parameter 55th	R/W	CHR2[7]	CHR2[6]	CHR2[5]	CHR2[4]	CHR2[3]	CHR2[2]	CHR2[1]	CHR2[0]	00
Parameter 56th	R/W	CON2[7]	CON2[6]	CON2[5]	CON2[4]	CON2[3]	CON2[2]	CON2[1]	CON2[0]	02
Parameter 57th	R/W	COFF2[7]	COFF2[6]	COFF2[5]	COFF2[4]	COFF2[3]	COFF2[2]	COFF2[1]	COFF2[0]	02
Parameter 58th	R/W	CHP2[3]	CHP2[2]	CHP2[1]	CHP2[0]	CCP2[3]	CCP2[2]	CCP2[1]	CCP2[0]	00
Parameter 59th	R/W	x	x	CKS[21]	CKS[20]	CKS[19]	CKS[18]	CKS[17]	CKS[16]	00
Parameter 60th	R/W	CKS[15]	CKS[14]	CKS[13]	CKS[12]	CKS[11]	CKS[10]	CKS[9]	CKS[8]	00
Parameter 61st	R/W	CKS[7]	CKS[6]	CKS[5]	CKS[4]	CKS[3]	CKS[2]	CKS[1]	CKS[0]	00
Parameter 62nd	R/W	COFF[9]	COFF[8]	CON[9]	CON[8]	SPOFF[9]	SPOFF[8]	SPON[9]	SPON[8]	00
Parameter 63rd	R/W	COFF2[9]	COFF2[8]	CON2[9]	CON2[8]	x	x	x	x	00

Description	<p>This command is to set forward GIP timing.</p> <p>• REF_EN :</p> <ul style="list-style-type: none"> - 0 : SHR0, SHR1, CHR, CHR2 refer to Internal VSYNC - 1 : SHR0, SHR1, CHR, CHR2 refer to Internal DE ◎ REF_EN=1 : SHR0, SHR1, CHR, CHR2 = MSB Sign Bit. <p>• PANELI_SEL[3:0] : Specify GIP signal at abnormal power off state.</p> <table border="1" style="margin-left: 10px;"> <thead> <tr> <th>Panel_sel[3:0]</th><th>GIP signal State</th></tr> </thead> <tbody> <tr> <td>2</td><td>VGH</td></tr> <tr> <td>4</td><td>VGL</td></tr> <tr> <td>8</td><td>GND</td></tr> </tbody> </table>	Panel_sel[3:0]	GIP signal State	2	VGH	4	VGL	8	GND
Panel_sel[3:0]	GIP signal State								
2	VGH								
4	VGL								
8	GND								



- **SHR0[12:0]** : Specify the starting position of GIP STV group 0 (STV0_0).
- **SHR1[12:0]** : Specify the starting position of GIP STV group 1 (STV1_0).

SHR0[12:0] SHR1[12:0] (Hex)	Starting Position
0	0 HSYNC
1	1 HSYNC
2	2 HSYNC
:	:
FFF	4095 HSYNC

- **SPON[9:0]** : Specify the distance of STV rising edge and HYSNC.
- **SPOFF[9:0]** : Specify the distance of STV falling edge and HYSNC.

Description

SPON[9:0] SPOFF[9:0] (Hex)	Distance
0	0*2 Fosc
1	1*2Fosc
2	2*2Fosc
:	:
3FF	1023*2Fosc

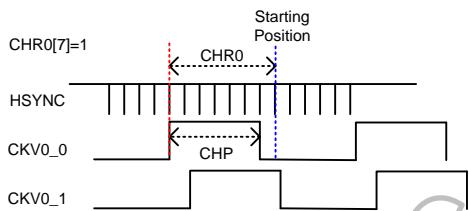
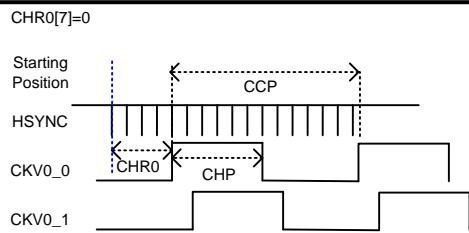
- **SHR0_1[3:0] / SHR0_2[3:0] / SHR0_3[3:0]**: Specify the STV0_x distance with STV0_0.
- **SHR1_1[3:0] / SHR1_2[3:0] / SHR1_3[3:0]**: Specify the STV1_x distance with STV1_0. (X=1~3)
- **SHP[3:0]** : Specify the STV signal high pulse width.

SHP[3:0] (Hex)	Width
0	0 HSYNC
1	1 HSYNC
2	2 HSYNC
:	:
F	16 HSYNC

- **SCP[3:0]** : Specify the total number of STV signal.

SCP[3:0] (Hex)	STV NO.
0	1
1	2
2	3
:	:
F	16

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- **CHR[7:0]** : Specify the starting position of GIP CKV group 0 (CKV0_0).
- **CHR2[7:0]** : Specify the starting position of GIP CKV group 1 (CKV1_0).

CHR[7:0] CHR2[7:0] (Hex)	Starting Position
0	0 HSYNC
1	1 HSYNC
2	2 HSYNC
:	:
FF	255 HSYNC

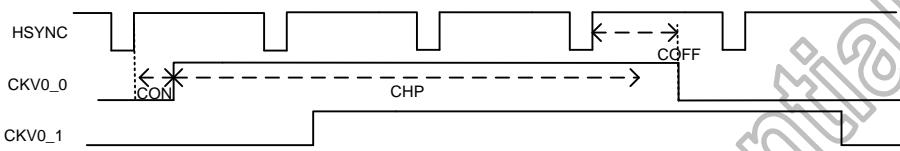
Description

- **CHP[3:0]** : Specify the CKV signal high pulse width.
- **CHP2[3:0]** : Specify the CKV1 signal high pulse width

CHP[3:0] CHP2[3:0] (Hex)	Width
0	1 HSYNC
1	2 HSYNC
2	3 HSYNC
:	:
F	16 HSYNC

- **CCP[3:0]** : Specify the total period cycle of CKV signal.
- **CCP2[3:0]** : Specify the total period cycle of CKV1 signal.

CCP[3:0] CCP2[3:0] (Hex)	CKV Period.
0	1 HSYNC
1	2 HSYNC
2	3 HSYNC
:	:
F	16 HSYNC

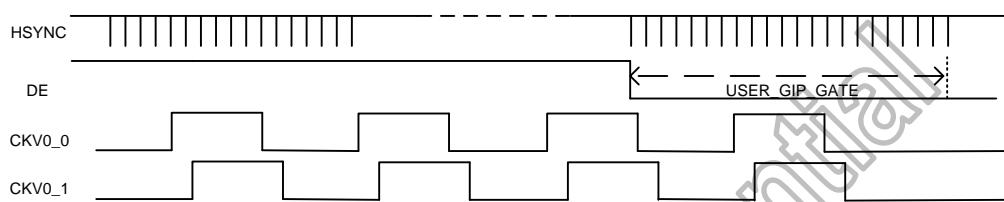


- **CON[9:0]** : Specify the distance of CKV rising edge and HYSNC.
- **COFF[9:0]** : Specify the distance of CKV falling edge and HYSNC.
- **CON2[9:0]** : Specify the distance of CKV1 rising edge and HYSNC.
- **COFF2[9:0]** : Specify the distance of CKV1 falling edge and HYSNC.

CON[9:0] COFF[9:0] CON2[9:0] COFF2[9:0] (Hex)	Distance
0	0*2Fosc
1	1*2Fosc
2	2*2Fosc
:	:
FF	255*2Fosc

Description

- **CGTS_L[21:0]** : Select Left side GIP output pad signal.
 - 1 : Output pad assign as STV.
 - 0 : Output pad assign as CKV.
- **CGTS_R[21:0]** : Select Right side GIP output pad signal.
 - 1 : Output pad assign as STV.
 - 0 : Output pad assign as CKV.
- **CGTS_INV_L[21:0]** : Reverse the polarity of Left side GIP output pad signal.
 - 1 : Reverse the polarity.
 - 0 : Normal polarity.
- **CGTS_INV_R[21:0]** : Reverse the polarity of Right side GIP output pad signal.
 - 1 : Reverse the polarity.
 - 0 : Normal polarity.



- **USER_GIP_GATE[7:0]** : Specify the extra gate counter at blanking area.

USER_GIP_GATE[7:0] (Hex)	Gate number
0	0
1	1
2	2
:	:
FF	255

- **COSx_L[3:0]** : Specify Left side GIP output pad signal.
- **COSx_R[3:0]** : Specify Right side GIP output pad signal.
(x=1~22)

COS (Hex)	GIP OUTPUT			
	CGTS="1"		CGTS="0"	
	CKS="0"	CKS="1"	CKV0_0	CKV1_0
0	STV0_0		CKV0_0	CKV1_0
1	STV0_1		CKV0_1	CKV1_1
2	STV0_2		CKV0_2	CKV1_2
3	STV0_3		CKV0_3	CKV1_3
4	STV1_0		CKV0_4	CKV1_4
5	STV1_1		CKV0_5	CKV1_5
6	STV1_2		CKV0_6	CKV1_6
7	STV1_3		CKV0_7	CKV1_7
8	Always Low		Always Low	
9	STV2_0		CKV All On	
A	STV2_1		YS1_Signal	
B	STV2_2		YS2_Signal	
C	STV2_3		CKV All On_2	
D	-		YS1_Signal_2	
E	-		YS2_Signal_2	
F	Always High		Always High	

- **GIP_OPT[22:0]** : Specify GIP optional setting for GIP signal.

Description

6.2.75 SETGIP2 (EAh)

EA H	SETGIP2									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	1	0	1	0	1	0	EA
Parameter 1st	R/W	YS2_SE_L[1]	YS2_SEL[0]	YS1_SEL[1]	YS1_SEL[0]	YS2_XO_R	YS1_XO_R	YS_FLA_G_EN	ALL_ON_EN	94
Parameter 2nd	R/W	GATE[7]	GATE[6]	GATE[5]	GATE[4]	GATE[3]	GATE[2]	GATE[1]	GATE[0]	00
Parameter 3rd	R/W	CK_ALL_ON_EN	STV_ALL_ON_EN	CK_ALL_ON_WID_TH1[5]	CK_ALL_ON_WID_TH1[4]	CK_ALL_ON_WID_TH1[3]	CK_ALL_ON_WID_TH1[2]	CK_ALL_ON_WID_TH1[1]	CK_ALL_ON_WID_TH1[0]	00
Parameter 4th	R/W	x	x	CK_ALL_ON_WID_TH2[5]	CK_ALL_ON_WID_TH2[4]	CK_ALL_ON_WID_TH2[3]	CK_ALL_ON_WID_TH2[2]	CK_ALL_ON_WID_TH2[1]	CK_ALL_ON_WID_TH2[0]	00
Parameter 5th	R/W	x	x	CK_ALL_ON_WID_TH3[5]	CK_ALL_ON_WID_TH3[4]	CK_ALL_ON_WID_TH3[3]	CK_ALL_ON_WID_TH3[2]	CK_ALL_ON_WID_TH3[1]	CK_ALL_ON_WID_TH3[0]	00
Parameter 6th	R/W	YS_FLA_G_PERI_OD[7]	YS_FLA_G_PERI_OD[6]	YS_FLA_G_PERI_OD[5]	YS_FLA_G_PERI_OD[4]	YS_FLA_G_PERI_OD[3]	YS_FLA_G_PERI_OD[2]	YS_FLA_G_PERI_OD[1]	YS_FLA_G_PERI_OD[0]	00
Parameter 7th	R/W	YS2_SE_L_2[1]	YS2_SEL_2[0]	YS1_SEL_2[1]	YS1_SEL_2[0]	YS2_XO_R_2	YS1_XO_R_2	YS_FLA_G_EN_2	ALL_ON_EN_2	94
Parameter 8th	R/W	USER_G_IP_GATE_1_2[7]	USER_G_IP_GATE_1_2[6]	USER_G_IP_GATE_1_2[5]	USER_G_IP_GATE_1_2[4]	USER_G_IP_GATE_1_2[3]	USER_G_IP_GATE_1_2[2]	USER_G_IP_GATE_1_2[1]	USER_G_IP_GATE_1_2[0]	00
Parameter 9th	R/W	CK_ALL_ON_EN_2	STV_ALL_ON_EN_2	CK_ALL_ON_WID_TH1_2[5]	CK_ALL_ON_WID_TH1_2[4]	CK_ALL_ON_WID_TH1_2[3]	CK_ALL_ON_WID_TH1_2[2]	CK_ALL_ON_WID_TH1_2[1]	CK_ALL_ON_WID_TH1_2[0]	00
Parameter 10th	R/W	x	x	CK_ALL_ON_WID_TH2_2[5]	CK_ALL_ON_WID_TH2_2[4]	CK_ALL_ON_WID_TH2_2[3]	CK_ALL_ON_WID_TH2_2[2]	CK_ALL_ON_WID_TH2_2[1]	CK_ALL_ON_WID_TH2_2[0]	00
Parameter 11th	R/W	x	x	CK_ALL_ON_WID_TH3_2[5]	CK_ALL_ON_WID_TH3_2[4]	CK_ALL_ON_WID_TH3_2[3]	CK_ALL_ON_WID_TH3_2[2]	CK_ALL_ON_WID_TH3_2[1]	CK_ALL_ON_WID_TH3_2[0]	00
Parameter 12th	R/W	YS_FLA_G_PERI_OD_2[7]	YS_FLA_G_PERI_OD_2[6]	YS_FLA_G_PERI_OD_2[5]	YS_FLA_G_PERI_OD_2[4]	YS_FLA_G_PERI_OD_2[3]	YS_FLA_G_PERI_OD_2[2]	YS_FLA_G_PERI_OD_2[1]	YS_FLA_G_PERI_OD_2[0]	00
Parameter 13th	R/W	COS1_L_GS[3]	COS1_L_GS[2]	COS1_L_GS[1]	COS1_L_GS[0]	COS2_L_GS[3]	COS2_L_GS[2]	COS2_L_GS[1]	COS2_L_GS[0]	00
Parameter 14th	R/W	COS3_L_GS[3]	COS3_L_GS[2]	COS3_L_GS[1]	COS3_L_GS[0]	COS4_L_GS[3]	COS4_L_GS[2]	COS4_L_GS[1]	COS4_L_GS[0]	00
Parameter 15th	R/W	COS5_L_GS[3]	COS5_L_GS[2]	COS5_L_GS[1]	COS5_L_GS[0]	COS6_L_GS[3]	COS6_L_GS[2]	COS6_L_GS[1]	COS6_L_GS[0]	00
:	:	:	:	:	:	:	:	:	:	:
Parameter 21th	R/W	COS17_L_GS[3]	COS17_L_GS[2]	COS17_L_GS[1]	COS17_L_GS[0]	COS18_L_GS[3]	COS18_L_GS[2]	COS18_L_GS[1]	COS18_L_GS[0]	00
Parameter 22th	R/W	COS19_L_GS[3]	COS19_L_GS[2]	COS19_L_GS[1]	COS19_L_GS[0]	COS20_L_GS[3]	COS20_L_GS[2]	COS20_L_GS[1]	COS20_L_GS[0]	00
Parameter 23th	R/W	COS21_L_GS[3]	COS21_L_GS[2]	COS21_L_GS[1]	COS21_L_GS[0]	COS22_L_GS[3]	COS22_L_GS[2]	COS22_L_GS[1]	COS22_L_GS[0]	00
Parameter 24th	R/W	COS1_R_GS[3]	COS1_R_GS[2]	COS1_R_GS[1]	COS1_R_GS[0]	COS2_R_GS[3]	COS2_R_GS[2]	COS2_R_GS[1]	COS2_R_GS[0]	00
Parameter 25th	R/W	COS3_R_GS[3]	COS3_R_GS[2]	COS3_R_GS[1]	COS3_R_GS[0]	COS4_R_GS[3]	COS4_R_GS[2]	COS4_R_GS[1]	COS4_R_GS[0]	00
Parameter 26th	R/W	COS5_R_GS[3]	COS5_R_GS[2]	COS5_R_GS[1]	COS5_R_GS[0]	COS6_R_GS[3]	COS6_R_GS[2]	COS6_R_GS[1]	COS6_R_GS[0]	00
:	:	:	:	:	:	:	:	:	:	:
Parameter 32th	R/W	COS17_R_GS[3]	COS17_R_GS[2]	COS17_R_GS[1]	COS17_R_GS[0]	COS18_R_GS[3]	COS18_R_GS[2]	COS18_R_GS[1]	COS18_R_GS[0]	00
Parameter 33th	R/W	COS19_R_GS[3]	COS19_R_GS[2]	COS19_R_GS[1]	COS19_R_GS[0]	COS20_R_GS[3]	COS20_R_GS[2]	COS20_R_GS[1]	COS20_R_GS[0]	00
Parameter 34th	R/W	COS21_R_GS[3]	COS21_R_GS[2]	COS21_R_GS[1]	COS21_R_GS[0]	COS22_R_GS[3]	COS22_R_GS[2]	COS22_R_GS[1]	COS22_R_GS[0]	00
Parameter 35th	R/W	x	x	EQOPT[1]	EQOPT[0]	x	x	EQ_SEL[1]	EQ_SEL[0]	30
Parameter 36th	R/W	EQ_DEL_AY[7]	EQ_DEL_AY[6]	EQ_DEL_AY[5]	EQ_DEL_AY[4]	EQ_DEL_AY[3]	EQ_DEL_AY[2]	EQ_DEL_AY[1]	EQ_DEL_AY[0]	00

Parameter 37th	R/W	x	x	x	x	EQ_DEL_AY_HSY_NC[3]	EQ_DEL_AY_HSY_NC[2]	EQ_DEL_AY_HSY_NC[1]	EQ_DEL_AY_HSY_NC[0]	00								
Parameter 38th	R/W	x	x	x	x	x	x	HSYNC_TO_CL1_CNT10[9]	HSYNC_TO_CL1_CNT10[8]	00								
Parameter 39th	R/W	HSYNC_TO_CL1_CNT10[7]	HSYNC_TO_CL1_CNT10[6]	HSYNC_TO_CL1_CNT10[5]	HSYNC_TO_CL1_CNT10[4]	HSYNC_TO_CL1_CNT10[3]	HSYNC_TO_CL1_CNT10[2]	HSYNC_TO_CL1_CNT10[1]	HSYNC_TO_CL1_CNT10[0]	02								
This command is to set backward GIP timing.																		
<p>The diagram illustrates the timing relationships between various signals. VSYNC is a single pulse. DE is asserted during the GATE period. CKVx is a multi-phase clock signal. INYS1 and INYS2 are asserted during specific CKVx phases, indicated by arrows labeled WIDTH1, WIDTH2, and WIDTH3.</p>																		
<ul style="list-style-type: none"> • YS1_SEL[1:0] : Specify YS1 Signal Mode. • YS2_SEL[1:0] : Specify YS2 Signal Mode. <table border="1"> <thead> <tr> <th>YS1[1:0] YS2[1:0] (Hex)</th> <th>YS1/YS2 Signal Mode</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>INYS1/INYS2</td> </tr> <tr> <td>1</td> <td>INYS1 or INVYS2</td> </tr> <tr> <td>2</td> <td>INYS1 and INVYS2</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • YS_FLAG_EN : Enable YS signal function. • YS1_XOR : Reverse YS1 signal. • YS2_XOR : Reverse YS2 signal. • ALL_ON_EN : Enable ALL ON function. • USER_GIP_GATE[7:0] : Specify the distance of GIP ALL On rising edge and DE. • CK_ALL_ON_WIDTH1[5:0] / CK_ALL_ON_WIDTH2[5:0] / CK_ALL_ON_WIDTH3[5:0] : Specify the timing of YS1 and YS2 signal. 											YS1[1:0] YS2[1:0] (Hex)	YS1/YS2 Signal Mode	0	INYS1/INYS2	1	INYS1 or INVYS2	2	INYS1 and INVYS2
YS1[1:0] YS2[1:0] (Hex)	YS1/YS2 Signal Mode																	
0	INYS1/INYS2																	
1	INYS1 or INVYS2																	
2	INYS1 and INVYS2																	

- **EQOPT[1:0]** : Specify GIP output EQ signal.

EQOTP (Hex)	P_EQ	N_EQ
0	Yes	Yes
1	No	Yes
2	Yes	No
3	No	No

- **EQ_SEL[1:0]** : Specify GIP output EQ signal level.

EQ_SEL (Hex)	P_EQ	N_EQ
0	VCI	VCI
1	GND	VCI
2	VCI	GND
3	GND	GND

- **EQ_DELAY[7:0]** : Specify the distance of EQ rising edge and HYSNC.

EQ_DEALY (Hex)	Distance
0	0 Fosc
1	1 Fosc
2	2 Fosc
:	:
FF	255 Fosc

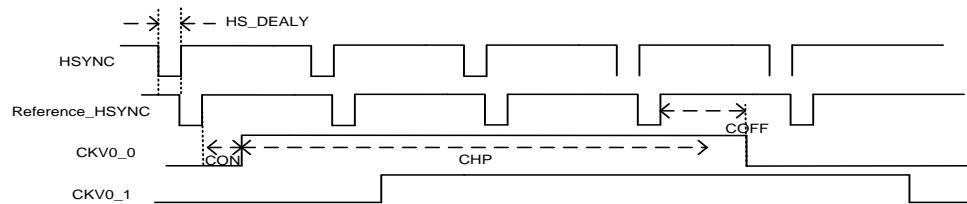
Description

- **EQ_DELAY_HSYNC[3:0]** : Specify the distance of EQ rising edge and HSYNC.

EQ_DEALY_HS (Hex)	Distance
0	0 Hsync
1	1 Hsync
2	2 Hsync
:	:
16	16 Hsync

- **HSYNC_TO_CL1_CNT10[9:0]** : Specify the GIP reference HSYNC between external HSYNC

Hsync_to_Cl1_Cnt10[9:0] (Hex)	Distance
0	0 Fosc
1	1 Fosc
2	2 Fosc
:	:
1FF	511 Fosc



6.2.76 SETCOLOR (EBh)

EB H	SETCOLOR									
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	W	1	1	1	0	1	0	1	1	EB
Parameter 1st	W	Bkx[1]	Bkx[0]	Bky[1]	Bky[0]	Wx[1]	Wx[0]	Wy[1]	Wy[0]	00
Parameter 2nd	W	BKx[9]	BKx[8]	BKx[7]	BKx[6]	BKx[5]	BKx[4]	BKx[3]	BKx[2]	00
Parameter 3rd	W	BKy[9]	BKy[8]	BKy[7]	BKy[6]	BKy[5]	BKy[4]	BKy[3]	BKy[2]	00
Parameter 4th	W	Wx[9]	Wx[8]	Wx[7]	Wx[6]	Wx[5]	Wx[4]	Wx[3]	Wx[2]	00
Parameter 5th	W	Wy[9]	Wy[8]	Wy[7]	Wy[6]	Wy[5]	Wy[4]	Wy[3]	Wy[2]	00
Parameter 6th	W	Rx[1]	Rx[0]	Ry[1]	Ry[0]	Gx[1]	Gx[0]	Gy[1]	Gy[0]	00
Parameter 7th	W	Rx[9]	Rx[8]	Rx[7]	Rx[6]	Rx[5]	Rx[4]	Rx[3]	Rx[2]	00
Parameter 8th	W	Ry[9]	Ry[8]	Ry[7]	Ry[6]	Ry[5]	Ry[4]	Ry[3]	Ry[2]	00
Parameter 9th	W	Gx[9]	Gx[8]	Gx[7]	Gx[6]	Gx[5]	Gx[4]	Gx[3]	Gx[2]	00
Parameter 10th	W	Gy[9]	Gy[8]	Gy[7]	Gy[6]	Gy[5]	Gy[4]	Gy[3]	Gy[2]	00
Parameter 11th	W	Bx[1]	Bx[0]	By[1]	By[0]	Ax[1]	Ax[0]	Ay[1]	Ay[0]	00
Parameter 12th	W	Bx[9]	Bx[8]	Bx[7]	Bx[6]	Bx[5]	Bx[4]	Bx[3]	Bx[2]	00
Parameter 13th	W	By[9]	By[8]	By[7]	By[6]	By[5]	By[4]	By[3]	By[2]	00
Parameter 14th	W	Ax[9]	Ax[8]	Ax[7]	Ax[6]	Ax[5]	Ax[4]	Ax[3]	Ax[2]	00
Parameter 15th	W	Ay[9]	Ay[8]	Ay[7]	Ay[6]	Ay[5]	Ay[4]	Ay[3]	Ay[2]	00
Description	This command is used to record the Panel Optical Performance.									

6.2.77 TEMP_SENSOR (F1h)

F1 H	TEMP_SENSOR																																					
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX																												
Command	W	1	1	1	1	0	0	0	1	F1																												
Parameter 1st	R/W	PASSW ORD[7]	PASSW ORD[6]	PASSW ORD[5]	PASSW ORD[4]	PASSW ORD[3]	PASSW ORD[2]	PASSW ORD[1]	PASSW ORD[0]	00																												
Parameter 2nd	R/W	TEMP_S T[3]	TEMP_S T[2]	TEMP_S T[1]	TEMP_S T[0]	TEMP_F RA [3]	TEMP_F RA [2]	TEMP_F RA [1]	TEMP_F RA [0]	3F																												
Parameter 3rd	R/W	x	x	L_TH[5]	L_TH[4]	L_TH[3]	L_TH[2]	L_TH[1]	L_TH[0]	14																												
Parameter 4th	R/W	x	x	H_TH[5]	H_TH[4]	H_TH[3]	H_TH[2]	H_TH[1]	H_TH[0]	30																												
Parameter 5th	R/W	x	L_PLUS[2]	L_PLUS[1]	L_PLUS[0]	x	L_MINUS[2]	L_MINUS[1]	L_MINUS[0]	55																												
Parameter 6th	R/W	x	H_PLUS[2]	H_PLUS[1]	H_PLUS[0]	x	H_MINUS[2]	H_MINUS[1]	H_MINUS[0]	55																												
Parameter 7th	R/W	TEMP_FI LTER_E N	x	x	x	SAME_N UM[3]	SAME_N UM[2]	SAME_N UM[1]	SAME_N UM[0]	0F																												
Description	<p>This command is used to control the temperature function.</p> <ul style="list-style-type: none"> PASSWORD[7:0] : Enable Temp_sensor function key <ul style="list-style-type: none"> PASSWORD = "A5", enable Temp_sensor function. PASSWORD = "00", disable Temp_sensor function. TEMP_FRA[3:0] : Control the temperature sensing rate <table border="1"> <thead> <tr> <th>TEMP_FRA[3:0] (Hex)</th> <th>Sensing Rate</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1 frame</td> </tr> <tr> <td>1</td> <td>2 frame</td> </tr> <tr> <td>2</td> <td>4 frames</td> </tr> <tr> <td>:</td> <td>:</td> </tr> <tr> <td>E</td> <td>16384 frames</td> </tr> <tr> <td>F</td> <td>STOP</td> </tr> </tbody> </table> TEMP_ST [3:0] : Control the temperature sensing period at vertical blanking period. <table border="1"> <thead> <tr> <th>TEMP_ST[3:0] (Hex)</th> <th>Sensing Period (us)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>25</td> </tr> <tr> <td>1</td> <td>50</td> </tr> <tr> <td>2</td> <td>75</td> </tr> <tr> <td>:</td> <td>:</td> </tr> <tr> <td>E</td> <td>200</td> </tr> <tr> <td>F</td> <td>200</td> </tr> </tbody> </table> TEMP_TEST_EN : Enable temperature sensor test mode. T_TEMP_EN : Enable temperature sensor comparator function. 										TEMP_FRA[3:0] (Hex)	Sensing Rate	0	1 frame	1	2 frame	2	4 frames	:	:	E	16384 frames	F	STOP	TEMP_ST[3:0] (Hex)	Sensing Period (us)	0	25	1	50	2	75	:	:	E	200	F	200
TEMP_FRA[3:0] (Hex)	Sensing Rate																																					
0	1 frame																																					
1	2 frame																																					
2	4 frames																																					
:	:																																					
E	16384 frames																																					
F	STOP																																					
TEMP_ST[3:0] (Hex)	Sensing Period (us)																																					
0	25																																					
1	50																																					
2	75																																					
:	:																																					
E	200																																					
F	200																																					

<ul style="list-style-type: none"> • L_TH[5:0] : Define Low temperature threshold voltage. • H_TH[5:0] : Define High temperature thresholds voltage. • L_PLUS[2:0] : Specify Low temperature Hysteretic Window plus range. • H_PLUS[2:0] : Specify High temperature Hysteretic Window plus range. • L_MINUS[2:0] : Specify Low temperature Hysteretic Window minus range. • H_MINUS[2:0] : Specify High temperature Hysteretic Window minus range. 	
<p>Description</p> <ul style="list-style-type: none"> • TEMP_FILTER_EN : Enable temperature sensor filter function. <ul style="list-style-type: none"> - 0 : Disable - 1 : Enable • SAME_NUM[3:0] : The states machine will change the state if the same output times. 	

6.2.78 TEMP_VOLTAGE (F2h)

F2 H	TEMP_VOLTAGE													
	R/W	D7	D6	D5	D4	D3	D2	D1	D0	HEX				
Command	W	1	1	1	1	0	0	1	0	F2				
Parameter 1st	R/W	VBTHS1[3]	VBTHS1[2]	VBTHS1[1]	VBTHS1[0]	VBTLS1[3]	VBTLS1[2]	VBTLS1[1]	VBTLS1[0]	53				
Parameter 2nd	R/W	ECP_DC_DIV1[3]	ECP_DC_DIV1[2]	ECP_DC_DIV1[1]	ECP_DC_DIV1[0]	VGLREG1[3]	VGLREG1[2]	VGLREG1[1]	VGLREG1[0]	43				
Parameter 3rd	R/W	VCOMDC_F1[7]	VCOMDC_F1[6]	VCOMDC_F1[5]	VCOMDC_F1[4]	VCOMDC_F1[3]	VCOMDC_F1[2]	VCOMDC_F1[1]	VCOMDC_F1[0]	4D				
Parameter 4th	R/W	VCOMDC_B1[7]	VCOMDC_B1[6]	VCOMDC_B1[5]	VCOMDC_B1[4]	VCOMDC_B1[3]	VCOMDC_B1[2]	VCOMDC_B1[1]	VCOMDC_B1[0]	4D				
Parameter 5th	R/W	x	x	PVR01[5]	PVR01[4]	PVR01[3]	PVR01[2]	PVR01[1]	PVR01[0]	00				
Parameter 6th	R/W	x	x	PVR51[5]	PVR51[4]	PVR51[3]	PVR51[2]	PVR51[1]	PVR51[0]	00				
Parameter 7th	R/W	x	x	NVR01[5]	NVR01[4]	NVR01[3]	NVR01[2]	NVR01[1]	NVR01[0]	00				
Parameter 8th	R/W	x	x	NVR51[5]	NVR51[4]	NVR51[3]	NVR51[2]	NVR51[1]	NVR51[0]	00				
Parameter 9th	R/W	x	x	x	x	x	N_NW_H_T[2]	N_NW_H_T[1]	N_NW_H_T[0]	00				
Parameter 10th		VBTHS4[3]	VBTHS4[2]	VBTHS4[1]	VBTHS4[0]	VBTLS4[3]	VBTLS4[2]	VBTLS4[1]	VBTLS4[0]	53				
Parameter 11th	R/W	ECP_DC_DIV4[3]	ECP_DC_DIV4[2]	ECP_DC_DIV4[1]	ECP_DC_DIV4[0]	VGLREG4[3]	VGLREG4[2]	VGLREG4[1]	VGLREG4[0]	43				
Parameter 12th		VCOMDC_F4[7]	VCOMDC_F4[6]	VCOMDC_F4[5]	VCOMDC_F4[4]	VCOMDC_F4[3]	VCOMDC_F4[2]	VCOMDC_F4[1]	VCOMDC_F4[0]	4D				
Parameter 13th	R/W	VCOMDC_B4[7]	VCOMDC_B4[6]	VCOMDC_B4[5]	VCOMDC_B4[4]	VCOMDC_B4[3]	VCOMDC_B4[2]	VCOMDC_B4[1]	VCOMDC_B4[0]	4D				
Parameter 14th	R/W	x	x	PVR04[5]	PVR04[4]	PVR04[3]	PVR04[2]	PVR04[1]	PVR04[0]	00				
Parameter 15th	R/W	x	x	PVR54[5]	PVR54[4]	PVR54[3]	PVR54[2]	PVR54[1]	PVR54[0]	00				
Parameter 16th	R/W	x	x	NVR04[5]	NVR04[4]	NVR04[3]	NVR04[2]	NVR04[1]	NVR04[0]	00				
Parameter 17th	R/W	x	x	NVR54[5]	NVR54[4]	NVR54[3]	NVR54[2]	NVR54[1]	NVR54[0]	00				
Parameter 18th	R/W	x	x	x	x	x	N_NW_L_T[2]	N_NW_L_T[1]	N_NW_L_T[0]	00				
Parameter 19th	R/W	x	x	x	x	x	x	x	TEMP_SENSOR_ON	00				
This command is used to control the voltage at 2 different temperature conditions.														
Description	<table border="1"> <thead> <tr> <th>Voltage</th> <th>Temperature</th> </tr> </thead> <tbody> <tr> <td>VBTHS1/VBTLS1/ ECP_DC_DIV1 VGLREG1/ VCOMDC_F1/ VCOMDC_B1 PVR01/ PVR51/ NVR01/ NVR51</td> <td>HIGH</td> </tr> </tbody> </table>					Voltage	Temperature	VBTHS1/VBTLS1/ ECP_DC_DIV1 VGLREG1/ VCOMDC_F1/ VCOMDC_B1 PVR01/ PVR51/ NVR01/ NVR51	HIGH					
Voltage	Temperature													
VBTHS1/VBTLS1/ ECP_DC_DIV1 VGLREG1/ VCOMDC_F1/ VCOMDC_B1 PVR01/ PVR51/ NVR01/ NVR51	HIGH													
<table border="1"> <tbody> <tr> <td>VBTHS4/VBTLS4/ ECP_DC_DIV4 VGLREG4/ VCOMDC_F4/ VCOMDC_B4 PVR04/ PVR54/ NVR04/ NVR54</td> <td>LOW</td> </tr> </tbody> </table>					VBTHS4/VBTLS4/ ECP_DC_DIV4 VGLREG4/ VCOMDC_F4/ VCOMDC_B4 PVR04/ PVR54/ NVR04/ NVR54	LOW								
VBTHS4/VBTLS4/ ECP_DC_DIV4 VGLREG4/ VCOMDC_F4/ VCOMDC_B4 PVR04/ PVR54/ NVR04/ NVR54	LOW													

7. Electrical Characteristics

7.1 Absolute maximum ratings

Item	Symbol	Unit	Spec.		
			Min.	Typ.	Max.
Power Supply Voltage 1	IOVCC~VSSD	V	-0.3	-	+5.5
Power Supply Voltage 2	VCI ~ VSSA	V	-0.3	-	+6.6
Power Supply Voltage 3	VSP ~ VSSA	V	-0.3	-	+6.6
Power Supply Voltage 4	VSSA ~ VSN	V	-0.3	-	+6.6
Power Supply Voltage 5	VGH ~ VGL	V	-0.3	-	+35
Logic Input Voltage	V _{IN}	V	-0.3	-	IOVCC+0.3
Logic Output Voltage	V _O	V	-0.3	-	IOVCC+0.3
Differential Input Voltage	DSI_CP/DSI_CN DSI_D0P/DSI_D0P, DSI_D1P/DSI_D1N	V	-0.3	-	2.0
Operating Temperature	T _{opr}	°C	-40	-	+85
Storage Temperature	T _{stg}	°C	-55	-	+110

Table 7.1: Absolute Maximum Ratings

7.2 DC characteristics

7.2.1 Basic Characteristics

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Power & Operating Voltages						
Logic Operating voltage	IOVCC	I/O supply voltage	1.65	1.8	2.0	V
Analog Operating voltage	VCI	Operation voltage	2.5	-	6.2	
Input / Output						
Logic High level input voltage	VIH	-	0.7IOVCC	-	IOVCC	V
Logic Low level input voltage	VIL	-	VSSD	-	0.3IOVCC	
Logic High level output voltage	VOH	IOH = -1.0mA	0.8IOVCC	-	IOVCC	
Logic Low level output voltage	VOL	IOL = +1.0mA	VSSD	-	0.2IOVCC	
Input leakage current	IIL	-	-1	-	1	μA
DC/DC Converter Operation						
VSP booster voltage	VSP	IVSP=1mA	4.5		6.2	V
VSN booster voltage	VSN	IVSN=-1mA	-6.2		-4.5	
VGH booster voltage	VGH	Ivgh=1mA	10		20	
VGL booster voltage	VGL	Ivgl=-1mA	-15		-7.5	
VGH and VGL difference	VGH-VGL	-	-	-	32	
Oscillator tolerance	OSC	25°C	-3		3	%
Source Driver						
Gamma reference voltage	VSPR	-	3.3		5.6	V
	VSNR	-	-5.6		-3.3	
Output voltage deviation	DVOS	VSSD+1.0 ~ VSPROUT-1.0	-	-	+/- 20	mV
		VSSD+0.1V ~ VSSD+1.0 VSPR-1.0 ~ VSPR-0.1V	-	-	+/- 50	mV
Output offset voltage	Voff	-	-	-	+/-50	mV

7.2.2 DSI DC Characteristics

LP Mode

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Logic high level input voltage	V_{IHLPCD}	LP-CD	450	-	1350	mV
Logic low level input voltage	V_{ILLPCD}	LP-CD	0	-	200	mV
Logic high level input voltage	V_{IHLPRX}	LP-RX(CLK, D0)	880	-	1350	mV
Logic low level input voltage	V_{ILLPRX}	LP-RX(CLK, D0)	0	-	550	mV
Logic low level input voltage	$V_{ILLPRXULP}$	LP-RX(CLK ULP mode)	0	-	300	mV
Logic high level output voltage	V_{OHLPTX}	LP-TX(D0)	1.1	-	1.3	V
Logic low level output voltage	V_{OLLPTX}	LP-TX(D0)	-50	-	50	mV
Logic high level input current	I_{IH}	LP-CD, LP-RX	-	-	10	uA
Logic low level input current	I_{IL}	LP-CD, LP-RX	-10	-	-	uA
Input pulse rejection	SGD	DSI-CLK+/-, DSI-D0+/1	-	-	300	Vps

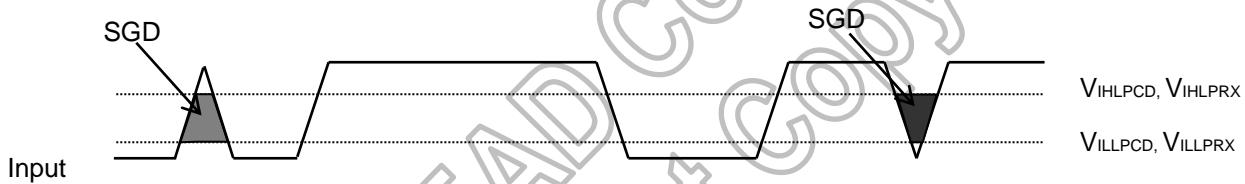


Figure 7.1: Input glitch rejections of low-power receivers

High Speed Mode

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Input common mode	V_{CMCLK} V_{CMDATA}	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	70	-	330	mV
Input common mode variation <450 MHZ	$V_{CMRCLKL}$ $V_{CMRDATAL}$	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-50	-	50	mV
Input common mode variation >450 MHZ	$V_{CMRCLKM}$ $V_{CMRDATAM}$	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-	-	100	mV
Low-level differential Input threshold	V_{THLCLK} $V_{THLDATA}$	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-70	-	-	mV
High-level differential Input threshold	V_{THHCLK} $V_{THHDATA}$	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-	-	70	mV
Single ended input low voltage	V_{ILHS}	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-40	-	-	mV
Single ended input high voltage	V_{IHHS}	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-	-	460	mV
Differential input termination resistor	R_{TERM}	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	80	100	125	Ω
Single-ended threshold voltage for termination enable	V_{TERMEN}	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-	-	450	mV
Termination capacitor	C_{TERM}	DSI_CP/DSI_CN DSI_D0P/DSI_D0P	-	-	-	pF

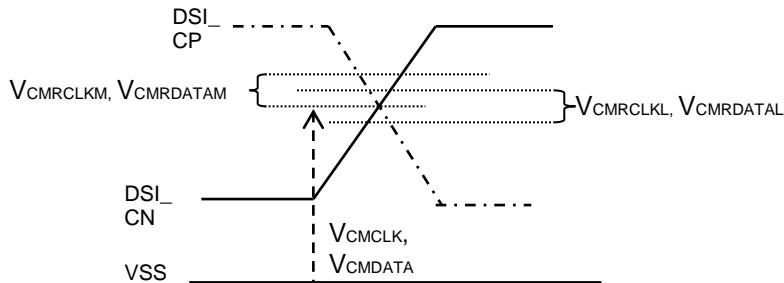
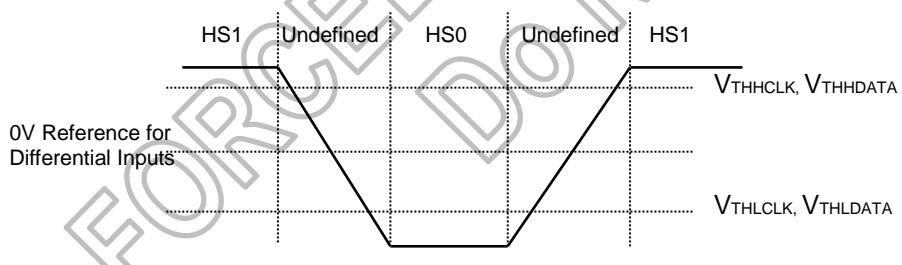


Figure 7.2: Differential voltage range and Command mode voltage

7.3 AC characteristics

7.3.1 Serial Interface Characteristics

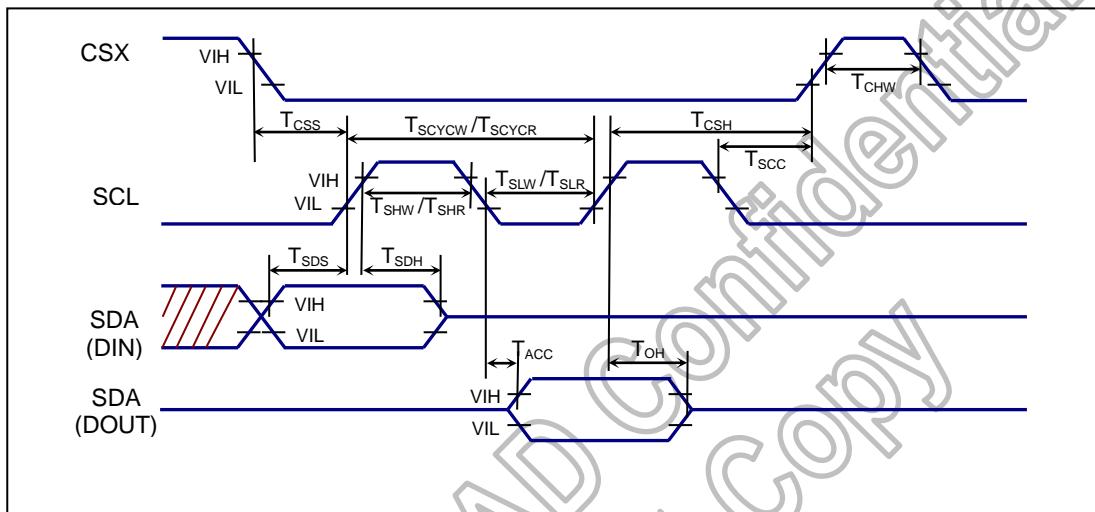


Figure 7.3: Serial Interface Characteristics

(VSSA=0V, IOVCC=1.8V, VCI=2.8V, TA = 25°C)

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	tcss	Chip select setup time (Write)	15	-		
	tcss	Chip select setup time (Read)	60	-	ns	
	tcsch	Chip select hold time (Write)	15	-		
	tcsch	Chip select hold time (Read)	65	-		
DCX	tAST	Address setup time	0	-	ns	
	taHT	Address hold time (Write/Read)	10	-		
SCL (Write)	tWC	Write cycle	66	-		
	tWRH	Control pulse "H" duration	15	-	ns	
	tWRW	Control pulse "L" duration	15	-		
SCL (Read)	tRC	Read cycle	150	-		
	tRDH	Control pulse "H" duration	60	-	ns	
	tRDL	Control pulse "L" duration	60	-		
SDA (Input)	tds	Data setup time	10	-	ns	For maximum CL=30pF
	tdH	Data hold time	10	-		
SDA (Output)	tacc	Read access time	-	100	ns	For minimum CL=8pF
	toH	Output disable time	10	-		

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

Table 7.2: Serial Interface Characteristics

7.3.2 DSI Interface Timing Characteristics

High Speed Mode

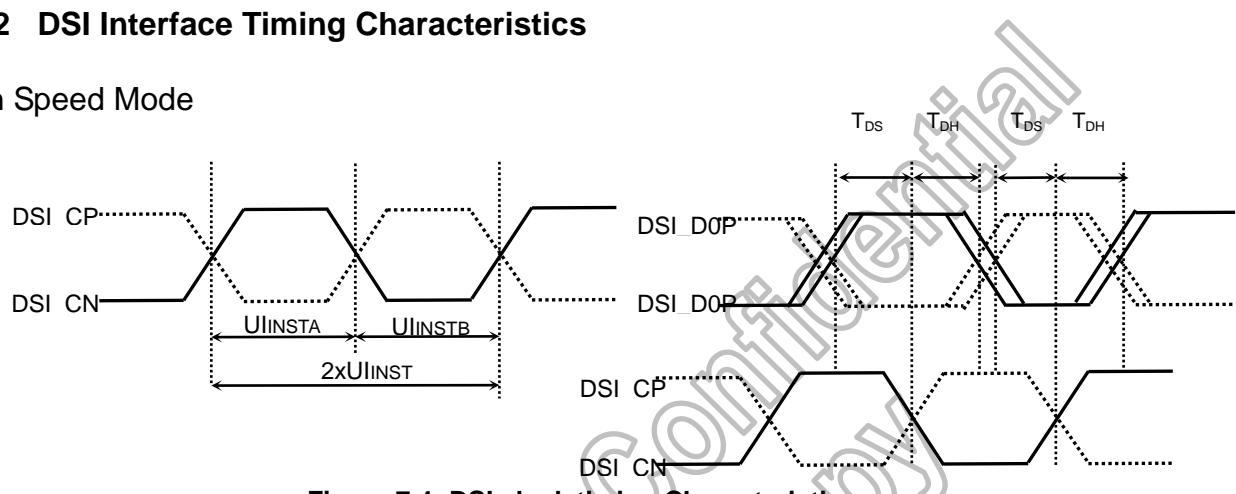


Figure 7.4: DSI clock timing Characteristics

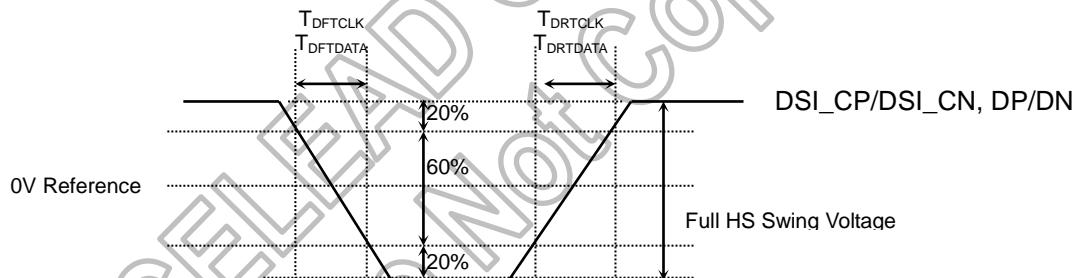


Figure 7.5: Rising and falling time on clock and data channel

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, TA = -30 to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Double UI instantaneous	2xUIINST	TBD	-	25	ns
	UI instantaneous	UIINSTA UIINSTB	TBD	-	12.5	ns
DP/DN	Data to clock setup time	T _{DS}	0.15xUI	-	-	ps
	Data to clock hold time	T _{DH}	0.15xUI	-	-	ps
DSI_CP/ DSI_CN	Differential rise time for clock	T _{DRCLK}	150	-	0.3UI	ps
	Differential fall time for clock	T _{DFTCLK}	150	-	0.3UI	ps
DP/DN	Differential rise time for data	T _{DRDATA}	150	-	0.3UI	ps
	Differential fall time for data	T _{DFTDATA}	150	-	0.3UI	ps

Table 7.3: DSI High Speed Mode Characteristics

Low Power Mode

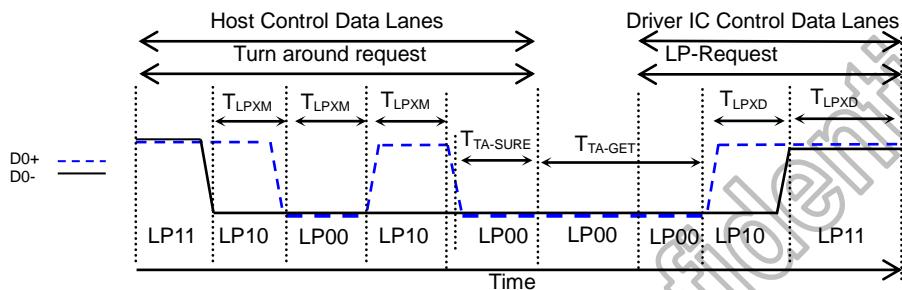


Figure 7.6: BTA from HOST to Display Module Timing

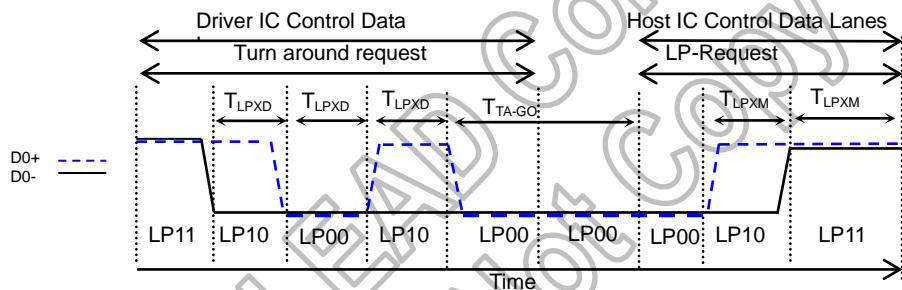


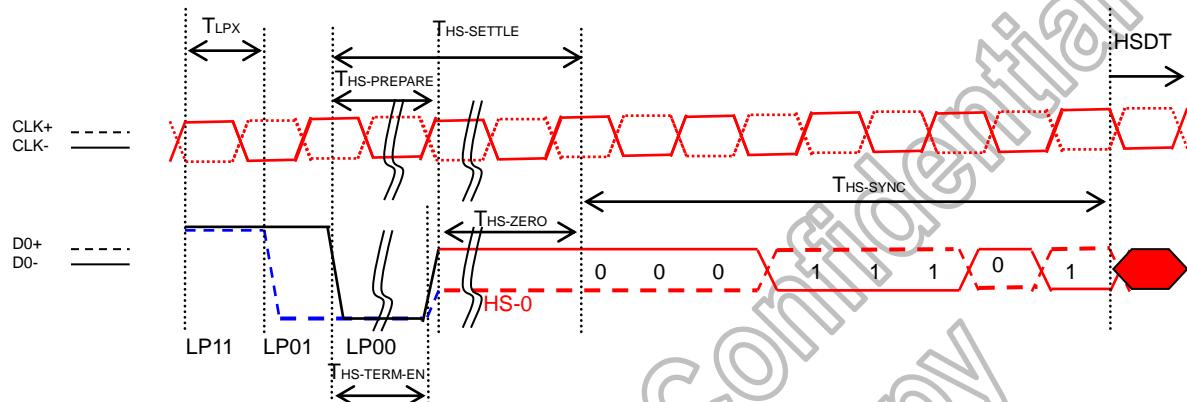
Figure 7.7: BTA from Display Module Timing to HOST

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, $T_A = -30$ to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Length of LP-00/LP01/LP10/LP11 Host → Display module	T_{LPXM}	50	-	-	ns
	Length of LP-00/LP01/LP10/LP11 Display module → Host	T_{LPXD}	50	-	-	ns
	Time-out before the MPU start driver	$T_{TA-SURE}$	T_{LPXD}	-	$2 \times T_{LPXD}$	ns
	Time to drive LP-00 by display module	T_{TA-GET}	$5 \times T_{LPXD}$	-	-	ns
	Time to drive LP-00 after turnaround request Host	T_{TAGO}	$4 \times T_{LPXD}$	-	-	ns

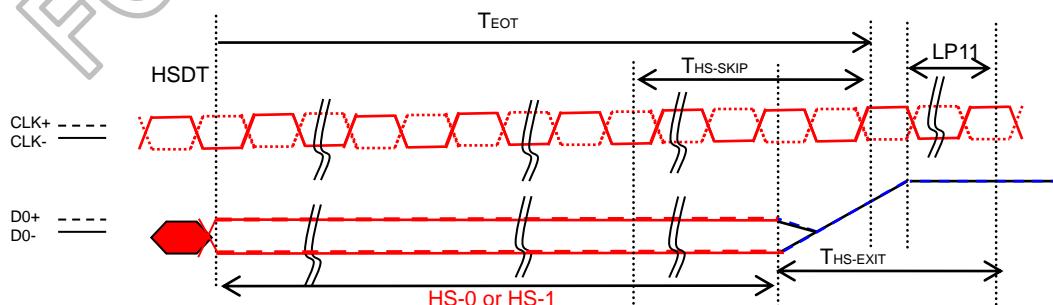
Table 7.4: DSI Low Power Mode Characteristics

DSI BURSTS



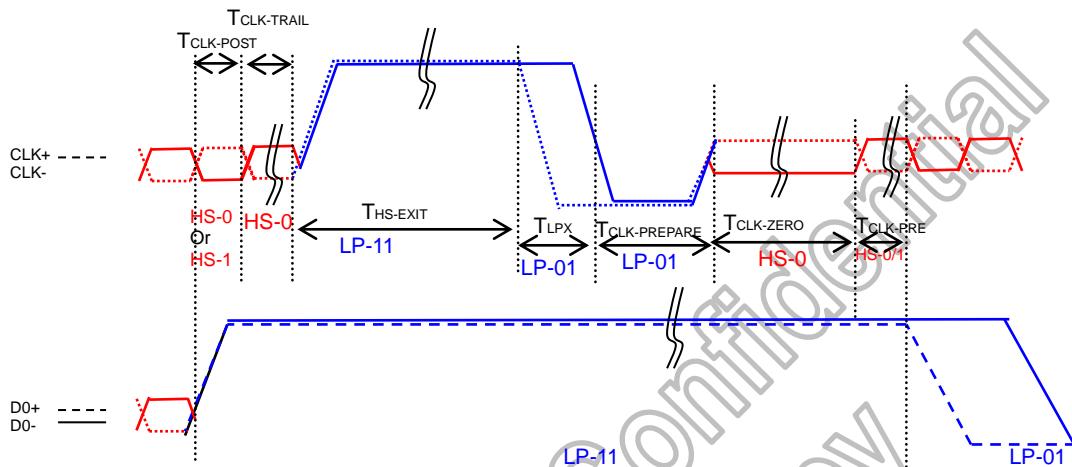
Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Length of LP-00/LP01/LP10/LP11	T _{LPX}	50	-	-	ns
	Time to Driver LP-00 to prepare for HS transmission	T _{HS-PREPARE}	40+4UI	-	85+6UI	ns
	Time to enable data receiver line termination	T _{HS-TERM-EN}	-	-	35+4xUI	ns
	Time to drive LP-00 by display module	T _{TA-GET}	5xT _{LPXD}	-	-	ns
	Time to drive LP-00 after turnaround request	T _{TAGO}	4xT _{LPXD}	-	-	ns

Table 7.5: DSI Low Power Mode to High Speed Mode Timing



Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Time-Out at Display Module to Ignore Transition Period of EoT	T _{HS-SKIP}	40	-	55+4xUI	ns
	Time to Driver LP-11 after HS Burst	T _{HS-EXIT}	100	-	-	ns

Table 7.6: DSI Low Power Mode to High Speed Mode Timing



Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Time that the MCU shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	TCLK-POST	60+52xUI	-	-	ns
	Time to drive HS differential state after last payload clock bit of a HS transmission burst	TCLK-TRAIL	60	-	-	ns
	Time to drive LP-11 after HS burst	THS-EXIT	100	-	-	ns
	Time to drive LP-00 to prepare for HS transmission	TCLK-PREPARE	38	-	95	ns
	Time-out at Clock Lane Display Module to enable HS Termination	TCLK-TERM-EN	-	-	38	ns
	Minimum lead HS-0 drive period before starting Clock	TCLK-PREPARE + TCLK-ZERO	300	-	-	ns
	Time that the HS clock shall be driven prior to any associated data Lane beginning the transition from LP to HS mode	TCLK-PRE	8xUI			

Table 7.7: Clock Lanes High Speed Mode to/from Low Power Mode Timing

7.3.3 Reset input timing

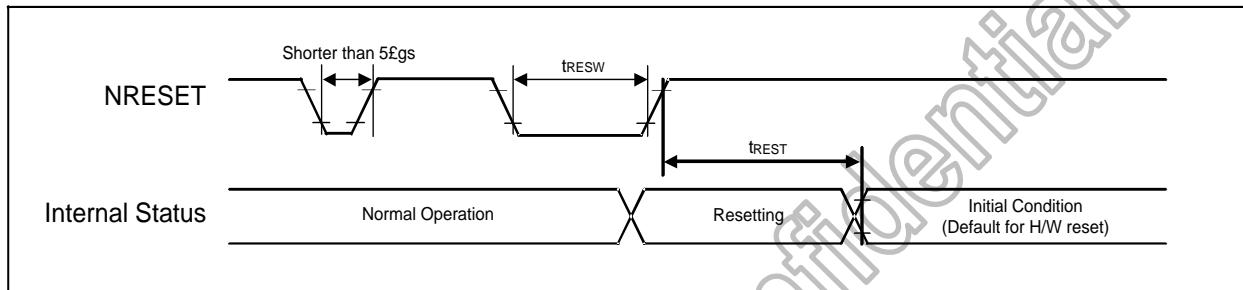


Figure 7.8: Reset input timing

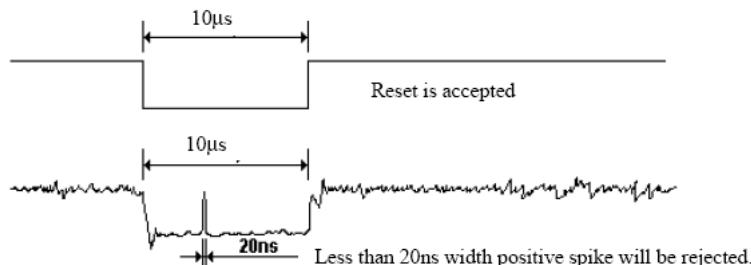
Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width ⁽¹⁾	NRESET	10	-	-	-	μs
tREST	Reset complete time ⁽²⁾	15	-	-	-	When reset applied during SLPIN mode	ms
		120	-	-	-	When reset applied during SLOUT mode	ms

Table 7.8: Reset Input Timing

Note: (1) Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the following table.

NRESET Pulse	Action
Shorter than 5 μs	Reset Rejected
Longer than 10 μs	Reset
Between 5 μs and 10 μs	Reset Start

- (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.
- (3) During Reset Complete Time, ID and VCOM value 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 (tREST) within 15ms after a rising edge of NRESET.
- (4) Spike Rejection also applies during a valid reset pulse as shown as below:



- (5) It is necessary to wait 15msec after releasing NRESET before sending commands. Also Sleep Out command cannot be sent for 120msec.

8. Reference Application

8.1 Interface

The display, which is using DSI interface, is connected to the MPU as it is illustrated below.

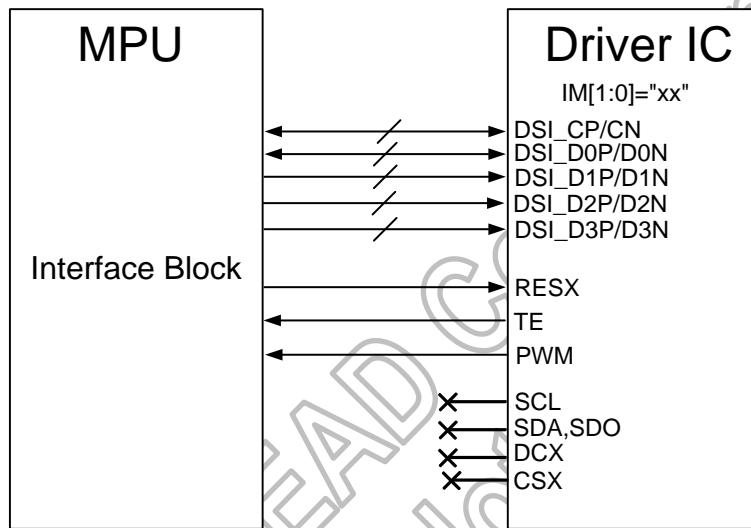


Figure 8.1: Interfacing for MIPI by Setting Lane [1:0] = "11"

Notes :

1. When TE is not in use, please let it open.
2. When PWM is not in use, please let it open.
3. Connect DSI_D3_P/N to DSI_VSS in 3 data lanes application (LANE[1:0] = "10").
4. Connect DSI_D3P/N and DSI_D2P/N to DSI_VSS in 2 data lanes application (LANE[1:0] = "01").

8.2 Connections with Panel

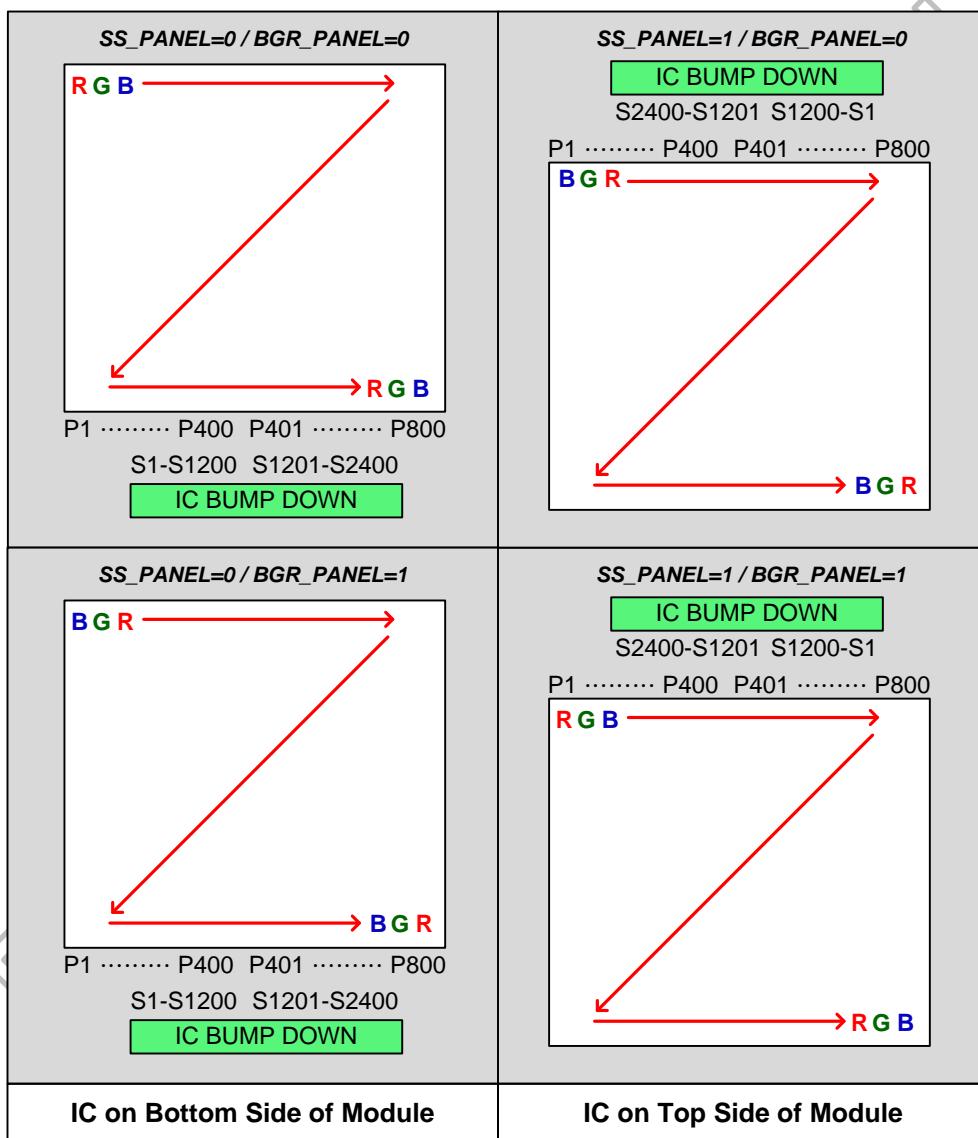


Figure 8.2: Source Pin Connection for Panel

The relationship between Sn output sequence and SS_PANEL / BGR_PANEL.

RESO SEL[2:0]	Resolution	SS PANEL	BGR PANEL	Sn Output Sequence	Used Sn Pin
2	720RGB	0	0	$S1_{(R)} \rightarrow S2_{(G)} \rightarrow S3_{(B)} \rightarrow \dots \rightarrow S1080_{(B)} \rightarrow S1321_{(R)} \rightarrow \dots \rightarrow S2398_{(R)} \rightarrow S2399_{(G)} \rightarrow S2400_{(B)}$	S1~S1080 and S1321~S2400
		0	1	$S1_{(E)} \rightarrow S2_{(G)} \rightarrow S3_{(R)} \rightarrow \dots \rightarrow S1080_{(R)} \rightarrow S1321_{(B)} \rightarrow \dots \rightarrow S2398_{(B)} \rightarrow S2399_{(G)} \rightarrow S2400_{(R)}$	
		1	0	$S2400_{(B)} \rightarrow S2399_{(G)} \rightarrow S2398_{(R)} \rightarrow \dots \rightarrow S1321_{(R)} \rightarrow S1080_{(B)} \rightarrow \dots \rightarrow S3_{(B)} \rightarrow S2_{(G)} \rightarrow S1_{(R)}$	
		1	1	$S2400_{(R)} \rightarrow S2399_{(G)} \rightarrow S2398_{(B)} \rightarrow \dots \rightarrow S1321_{(B)} \rightarrow S1080_{(R)} \rightarrow \dots \rightarrow S3_{(R)} \rightarrow S2_{(G)} \rightarrow S1_{(B)}$	
3	640RGB	0	0	$S1_{(R)} \rightarrow S2_{(G)} \rightarrow S3_{(B)} \rightarrow \dots \rightarrow S960_{(B)} \rightarrow S1441_{(R)} \rightarrow \dots \rightarrow S2398_{(R)} \rightarrow S2399_{(G)} \rightarrow S2400_{(B)}$	S1~S960 and S1441~S2400
		0	1	$S1_{(E)} \rightarrow S2_{(G)} \rightarrow S3_{(R)} \rightarrow \dots \rightarrow S960_{(R)} \rightarrow S1441_{(B)} \rightarrow \dots \rightarrow S2398_{(B)} \rightarrow S2399_{(G)} \rightarrow S2400_{(R)}$	
		1	0	$S2400_{(B)} \rightarrow S2399_{(G)} \rightarrow S2398_{(R)} \rightarrow \dots \rightarrow S1441_{(R)} \rightarrow S960_{(B)} \rightarrow \dots \rightarrow S3_{(B)} \rightarrow S2_{(G)} \rightarrow S1_{(R)}$	
		1	1	$S2400_{(R)} \rightarrow S2399_{(G)} \rightarrow S2398_{(B)} \rightarrow \dots \rightarrow S1441_{(B)} \rightarrow S960_{(R)} \rightarrow \dots \rightarrow S3_{(R)} \rightarrow S2_{(G)} \rightarrow S1_{(B)}$	
4	600RGB	0	0	$S1_{(R)} \rightarrow S2_{(G)} \rightarrow S3_{(B)} \rightarrow \dots \rightarrow S900_{(B)} \rightarrow S1501_{(R)} \rightarrow \dots \rightarrow S2398_{(R)} \rightarrow S2399_{(G)} \rightarrow S2400_{(B)}$	S1~S900 and S1501~S2400
		0	1	$S1_{(E)} \rightarrow S2_{(G)} \rightarrow S3_{(R)} \rightarrow \dots \rightarrow S900_{(R)} \rightarrow S1501_{(B)} \rightarrow \dots \rightarrow S2398_{(B)} \rightarrow S2399_{(G)} \rightarrow S2400_{(R)}$	
		1	0	$S2400_{(B)} \rightarrow S2399_{(G)} \rightarrow S2398_{(R)} \rightarrow \dots \rightarrow S1501_{(R)} \rightarrow S900_{(B)} \rightarrow \dots \rightarrow S3_{(B)} \rightarrow S2_{(G)} \rightarrow S1_{(R)}$	
		1	1	$S2400_{(R)} \rightarrow S2399_{(G)} \rightarrow S2398_{(B)} \rightarrow \dots \rightarrow S1501_{(B)} \rightarrow S900_{(R)} \rightarrow \dots \rightarrow S3_{(R)} \rightarrow S2_{(G)} \rightarrow S1_{(B)}$	
5	540RGB	0	0	$S1_{(R)} \rightarrow S2_{(G)} \rightarrow S3_{(B)} \rightarrow \dots \rightarrow S810_{(B)} \rightarrow S1591_{(R)} \rightarrow \dots \rightarrow S2398_{(R)} \rightarrow S2399_{(G)} \rightarrow S2400_{(B)}$	S1~S810 and S1591~S2400
		0	1	$S1_{(E)} \rightarrow S2_{(G)} \rightarrow S3_{(R)} \rightarrow \dots \rightarrow S810_{(R)} \rightarrow S1591_{(B)} \rightarrow \dots \rightarrow S2398_{(B)} \rightarrow S2399_{(G)} \rightarrow S2400_{(R)}$	
		1	0	$S2400_{(B)} \rightarrow S2399_{(G)} \rightarrow S2398_{(R)} \rightarrow \dots \rightarrow S1591_{(R)} \rightarrow S810_{(B)} \rightarrow \dots \rightarrow S3_{(B)} \rightarrow S2_{(G)} \rightarrow S1_{(R)}$	
		1	1	$S2400_{(R)} \rightarrow S2399_{(G)} \rightarrow S2398_{(B)} \rightarrow \dots \rightarrow S1591_{(B)} \rightarrow S810_{(R)} \rightarrow \dots \rightarrow S3_{(R)} \rightarrow S2_{(G)} \rightarrow S1_{(B)}$	

8.3 DC/DC Converter

8.3.1 External Power IC Mode - FL1002

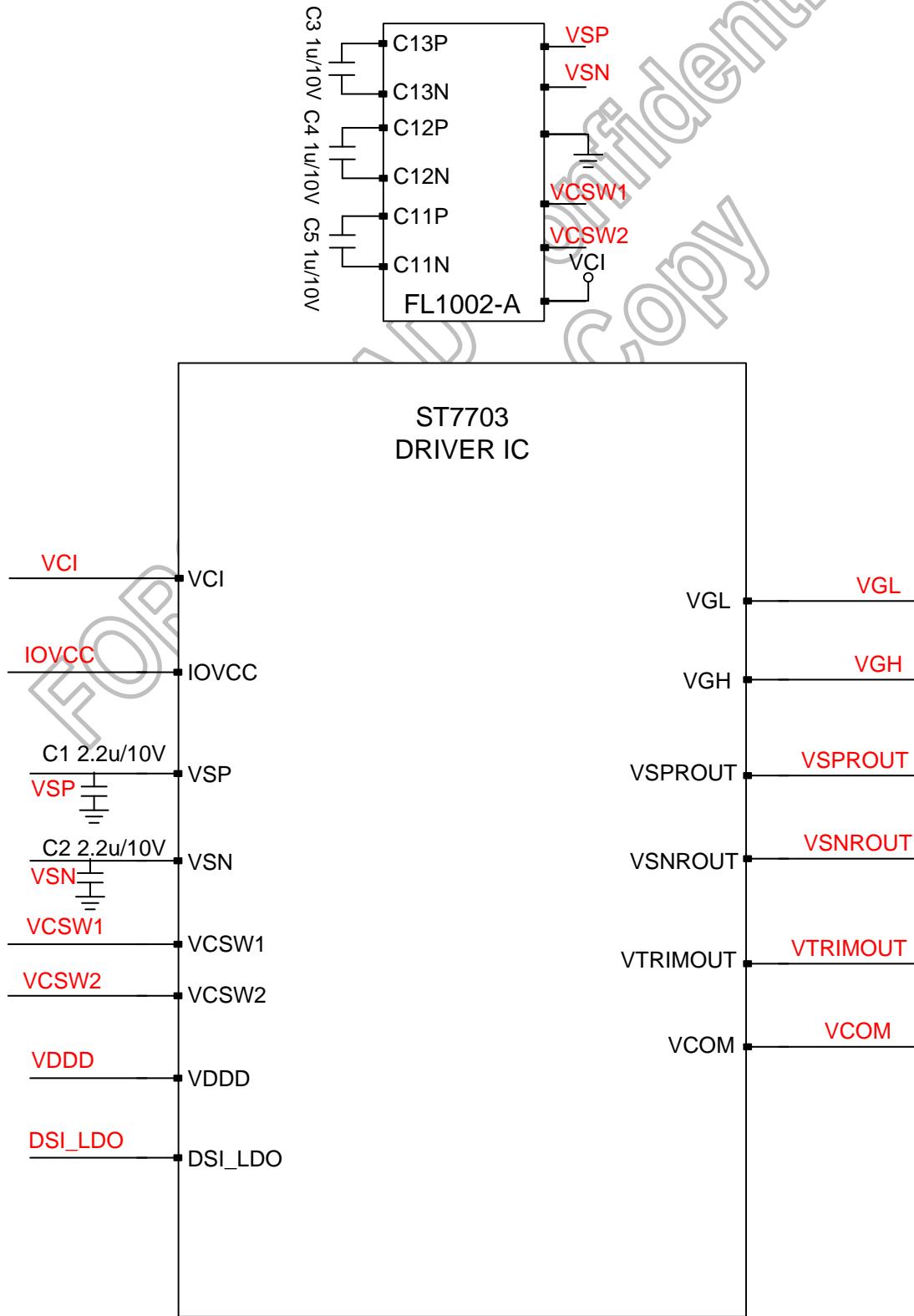


Figure 8.3: Using External Power IC Application

8.3.2 PFM Mode - Type C

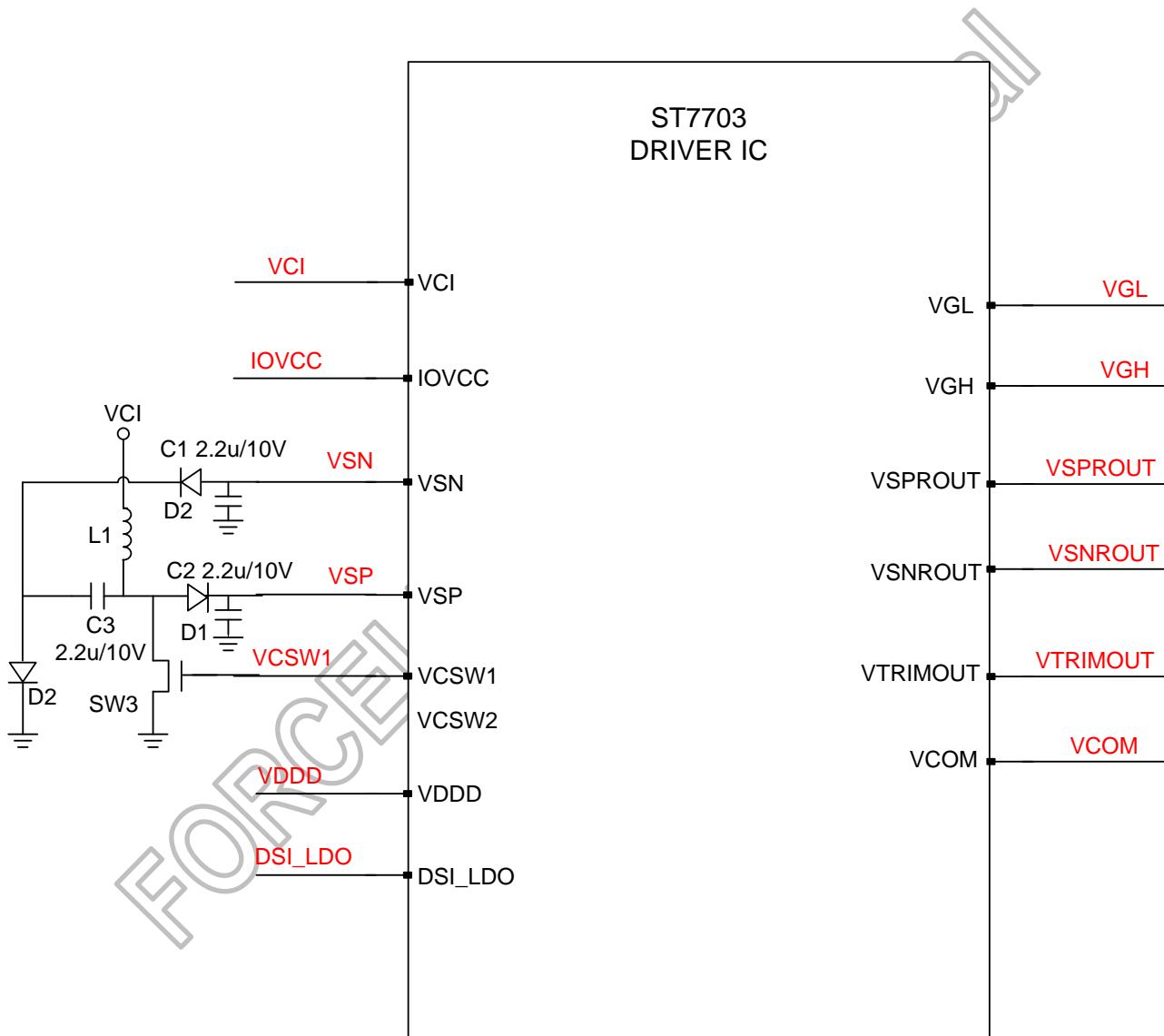


Figure 8.4: Using PFM - Type C Application

8.3.3 Three-Power Mode

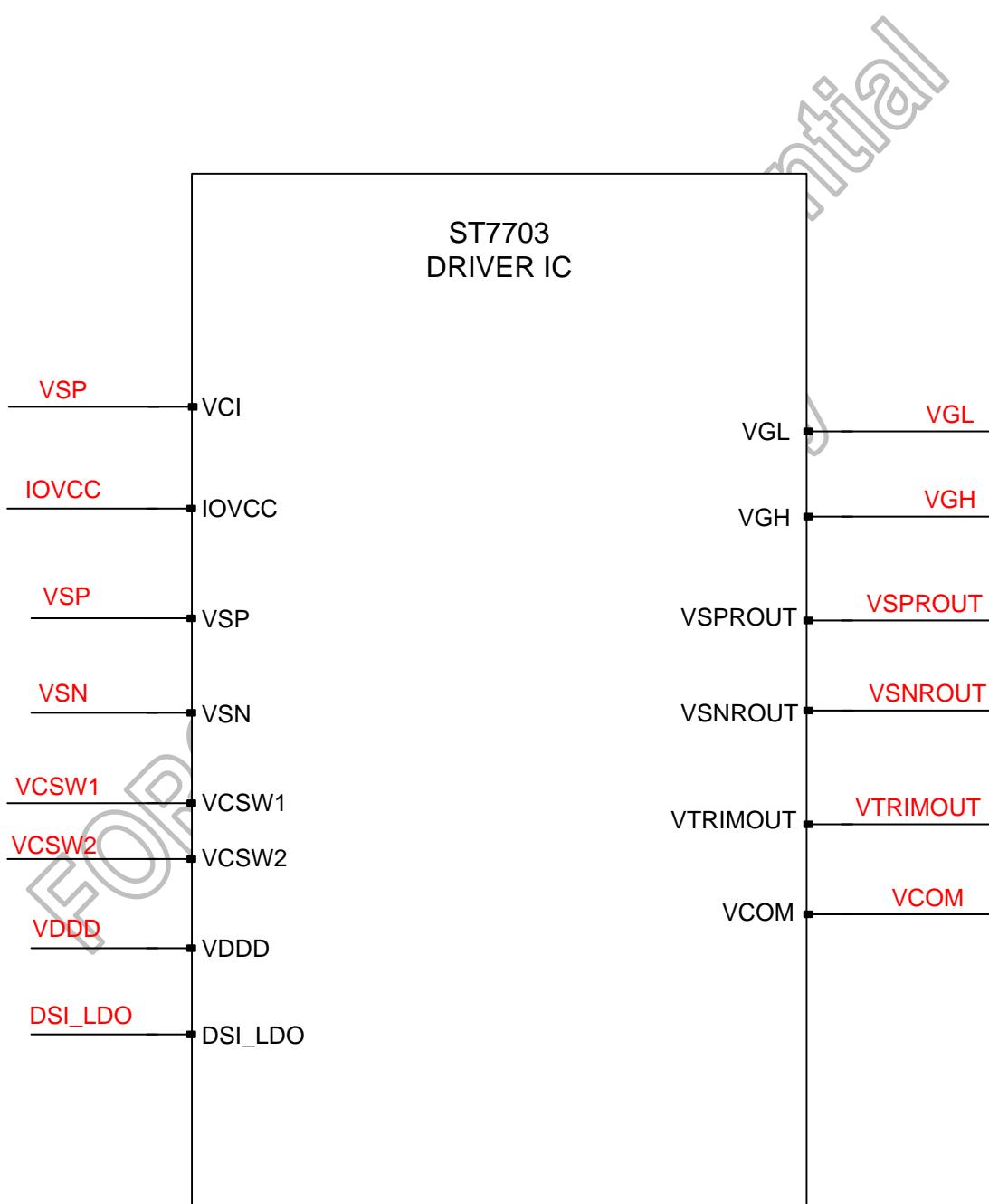


Figure 8.5: Using Three Power Mode Application

8.4 DSI Power On/Off Timing

8.4.1 Power On Timing of External Power IC

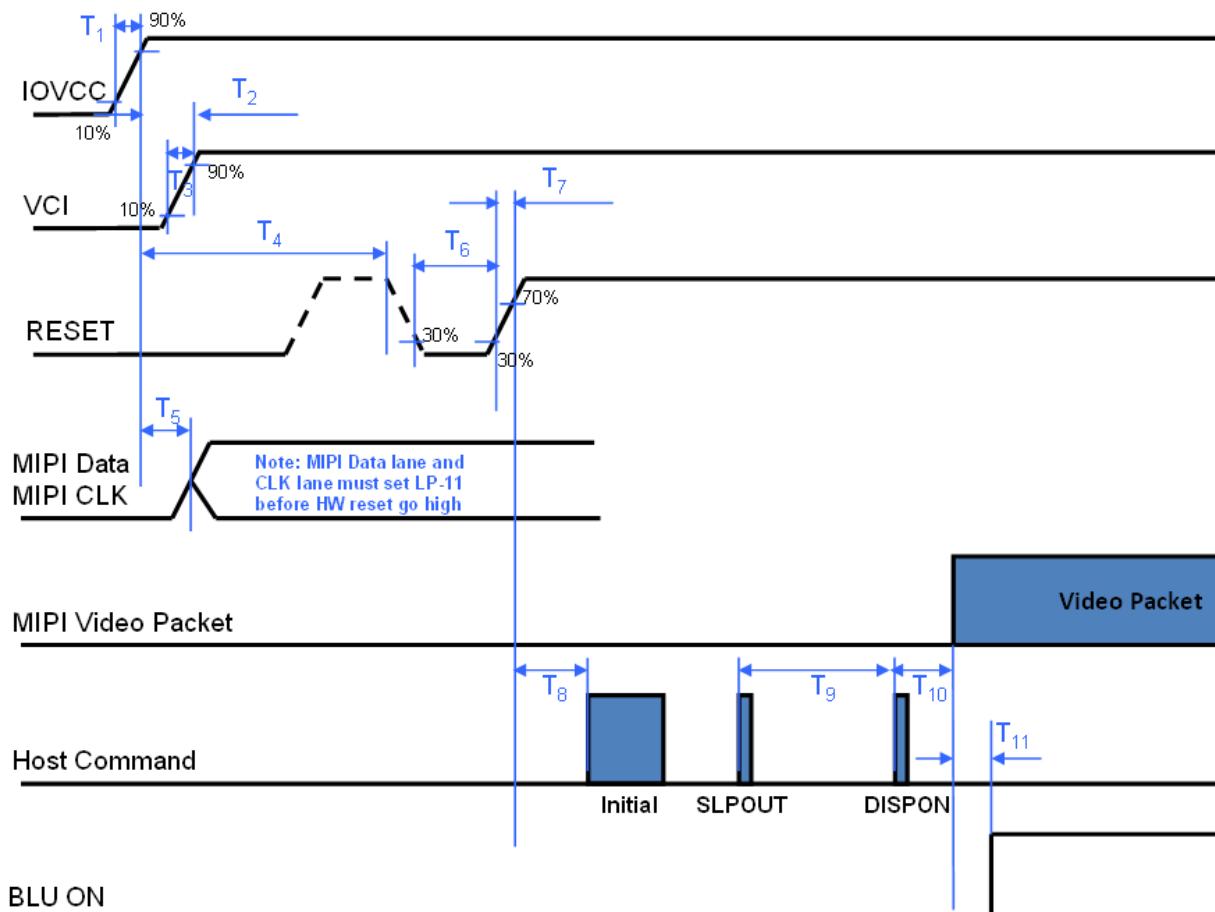


Figure 8-6: DSI Power On Sequence of Power IC Mode

	Min.	Typ.	Max.	Unit
T1	0.01	-	10	ms
T2	No Limit			ms
T3	0.01	-	10	ms
T4	1	-	-	ms
T5	1	-	-	ms
T6	10	-	-	us
T7	No Limit			ns
T8	15	-	-	ms
T9	120	-	-	ms
T10	No Limit			ms
T11	100	150	-	ms

Table 8-1: DSI Power On Timing of Power IC Mode

8.4.2 Power Off Timing of External Power IC

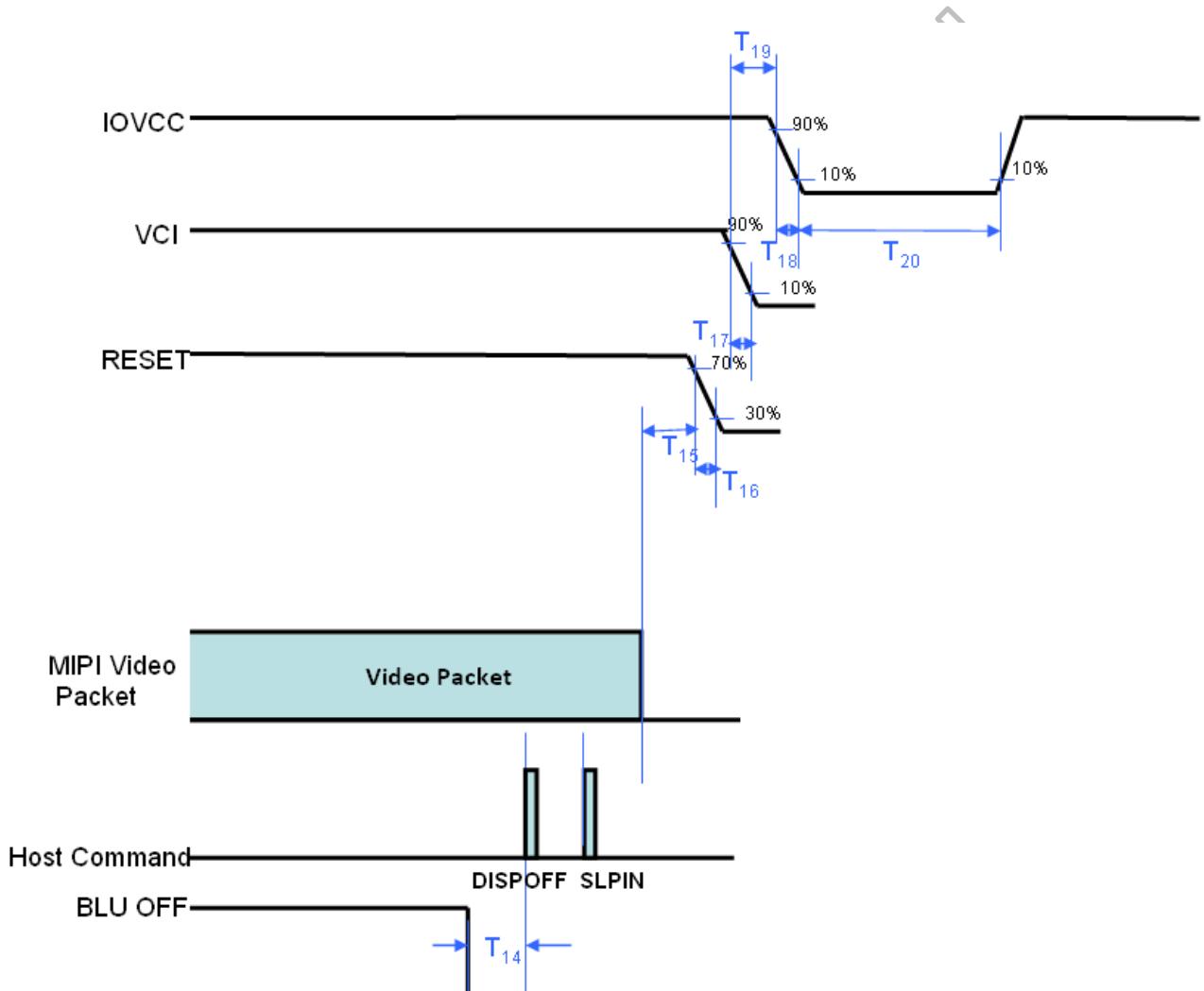


Figure 8-7: DSI Power Off Sequence of Power IC Mode

	Min.	Typ.	Max.	Unit
T14	40	100	-	ms
T15	10	-	-	ms
T16	No Limit			ms
T17	No Limit			ms
T18	No Limit			ms
T19	No Limit			ms
T20	500			ms

Table 8-2: DSI Power Off Timing of Power IC Mode

8.4.3 Power On Timing of 3-Power Mode

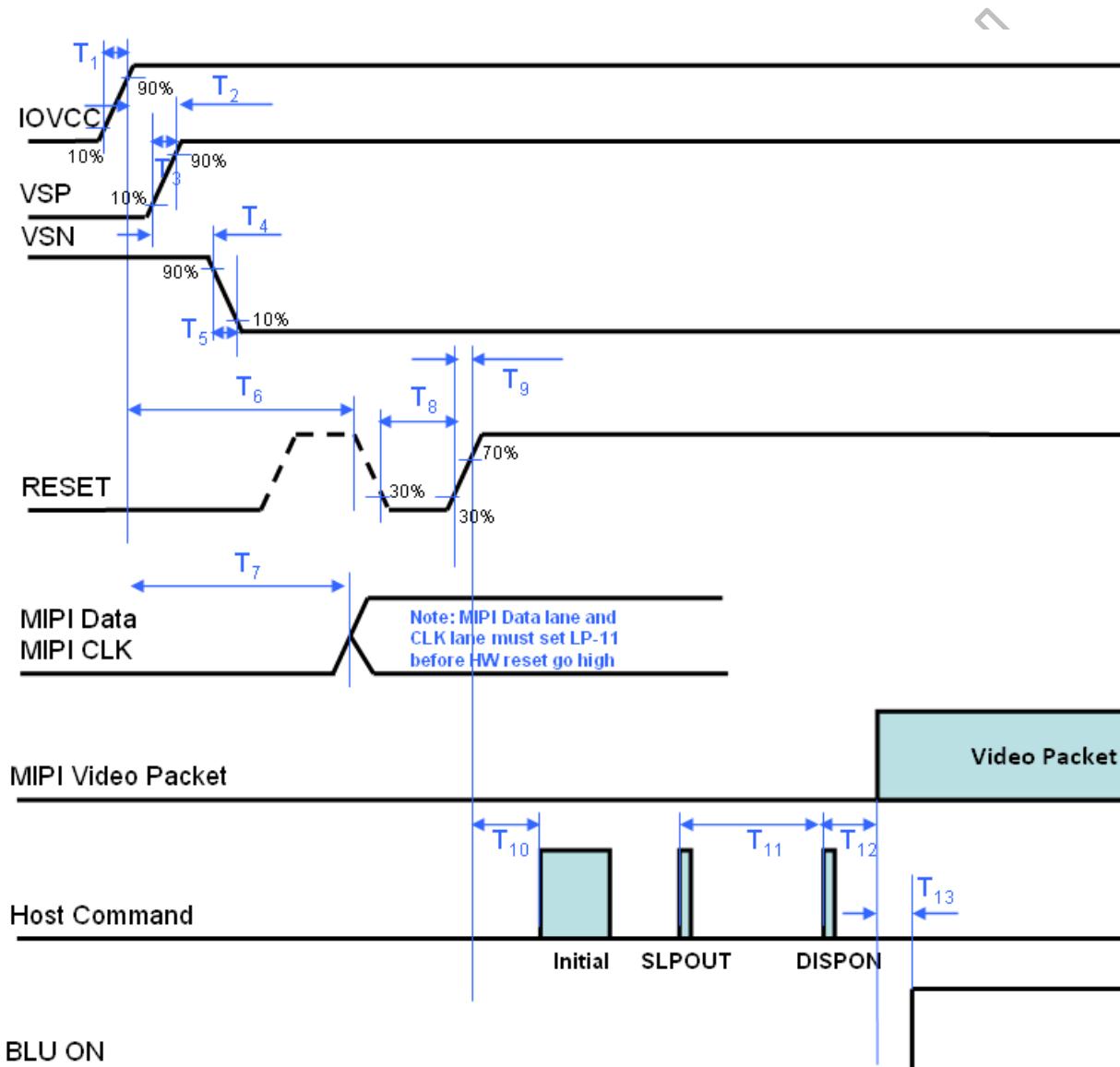


Figure 8-8: DSI Power On Sequence of 3 Power Mode

	Min.	Typ.	Max.	Unit
T1	0.01	-	10	ms
T2		No Limit		ms
T3	0.01	-	10	ms
T4		No Limit		ms
T5	0.01	-	10	ms
T6	1	-	-	ms
T7	1	-	-	ms
T8	10	-	-	us
T9		No Limit		ns
T10	15	-	-	ms
T11	120	-	-	ms
T12		No Limit		ms
T13	100	150	-	ms

Table 8-3: DSI Power On Timing of 3 Power Mode

8.4.4 Power Off Timing of 3-Power Mode

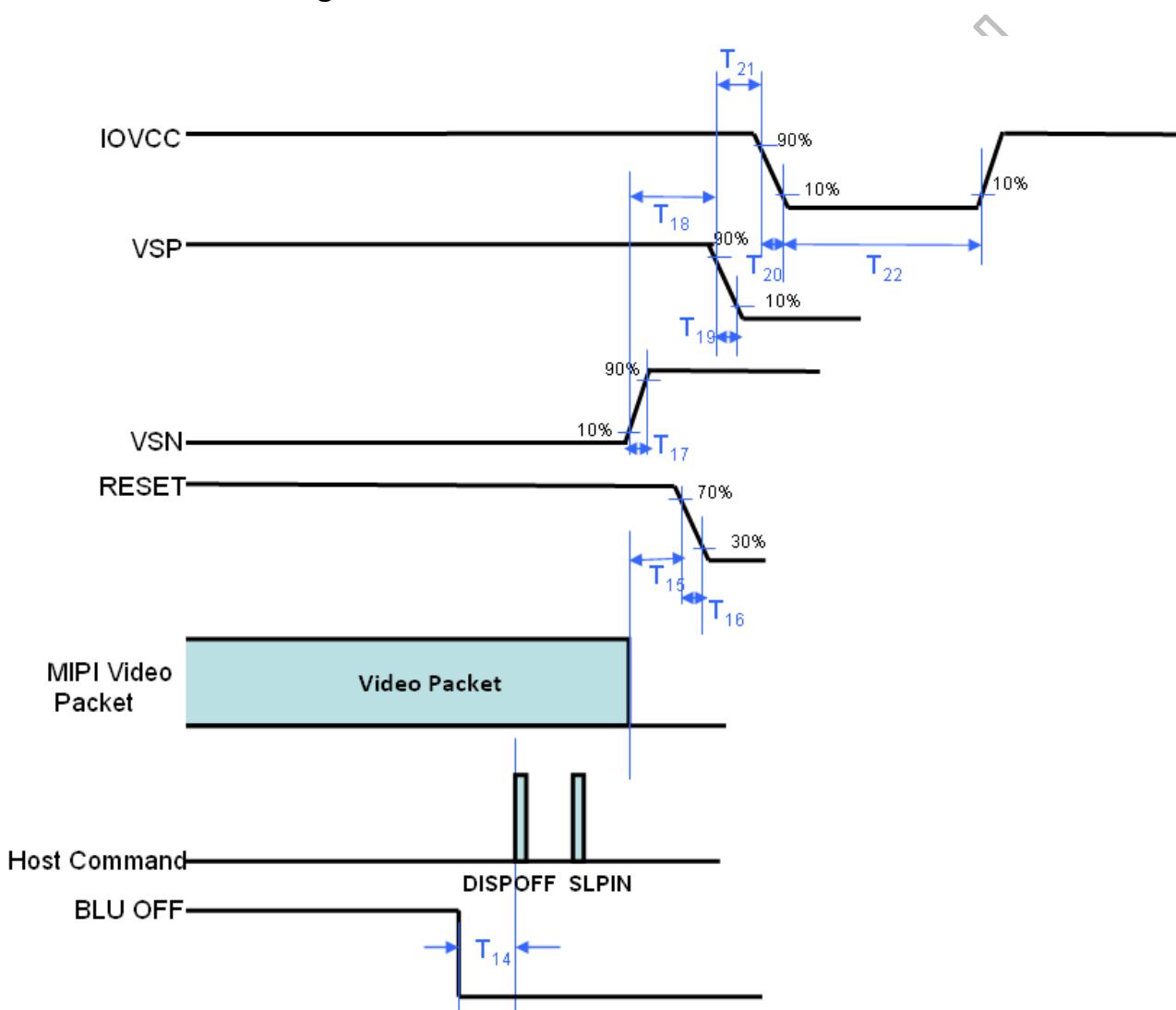


Figure 8-9: DSI Power Off Sequence of 3 Power Mode

	Min.	Typ.	Max.	Unit
T14	40	100	-	ms
T15	10	-	-	ms
T16		No Limit		ms
T17		No Limit		ms
T18		No Limit		ms
T19		No Limit		ms
T20		No Limit		ms
T21		No Limit		ms
T22	500	-	-	ms

Table 8-4: DSI Power Off Timing of 3 Power Mode

8.5 Maximum Layout Resistance

Name	Type	Maximum layout resistance	Unit
IOVCC	Power supply	10	Ω
VCI	Power supply	10	Ω
VSSD	Power supply	10	Ω
VSSA	Power supply	10	Ω
DSI_VSS	Power supply	10	Ω
IM0,IM1,LANSEL	Input	100	Ω
VCSW1, VCSW2	Output	30	Ω
DCX,SCL,CSX,RESX	Input	100	Ω
SDA	Input/Output	100	Ω
SDO	Output	100	Ω
VOUT,HOUT	Output	100	Ω
PWM	Output	100	Ω
VCOM	Output	10	Ω
DSI_D0P	Input/Output	8	Ω
DSI_D0N	Input/Output	8	Ω
DSI_CP	Input	8	Ω
DSI_CN	Input	8	Ω
DSI_D1P	Input	8	Ω
DSI_D1N	Input	8	Ω
DSI_D2P	Input	8	Ω
DSI_D2N	Input	8	Ω
DSI_D3P	Input	8	Ω
DSI_D3N	Input	8	Ω
VDDD	Output	10	Ω
VSP,VSN	Input/Output	10	Ω
VSPROUT, VSNROUT	Output	10	Ω
VTRIMOUT	Output	10	Ω
VGL	Output	10	Ω
VGH	Output	10	Ω
DSI_LDO	Output	10	Ω
OSC	Input	100	Ω
VTESTOUTP, VTESTOUTN	Output	100	Ω
CGOUTL_1~22	Output	30	Ω
CGOUTR_1~22	Output	30	Ω

Table 8-5: Maximum Layout Resistance