



2.7 inch E-paper Display Series



GDEH027Z70

Dalian Good Display Co., Ltd.

Product Specifications

| | |
|--------------------|-----------------------------|
| Customer | Standard |
| Description | 2.7" E-PAPER DISPLAY |
| Model Name | GDEH027Z70 |
| Date | 2020/08/06 |
| Revision | 1.0 |

| | Design Engineering | | |
|--|---|---|---|
| | Approval | Check | Design |
| |  |  |  |

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| Version | Content | Date | Producer |
|---------|-------------|----------|----------|
| 1.0 | New release | 2020/8/6 | June |
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1. General Description

1.1 Overview

GDEH027Z70 is an Active Matrix Electrophoretic Display (AMEPD), with interface and a reference system design. The 2.7" active area contains 176×264 pixels, and has 1-bit B/W/R full display capabilities. An integrated circuit contains gate buffer, source buffer, interface, timing control logic, oscillator, DC-DC. SRAM.LUT, VCOM and border are supplied with each panel.

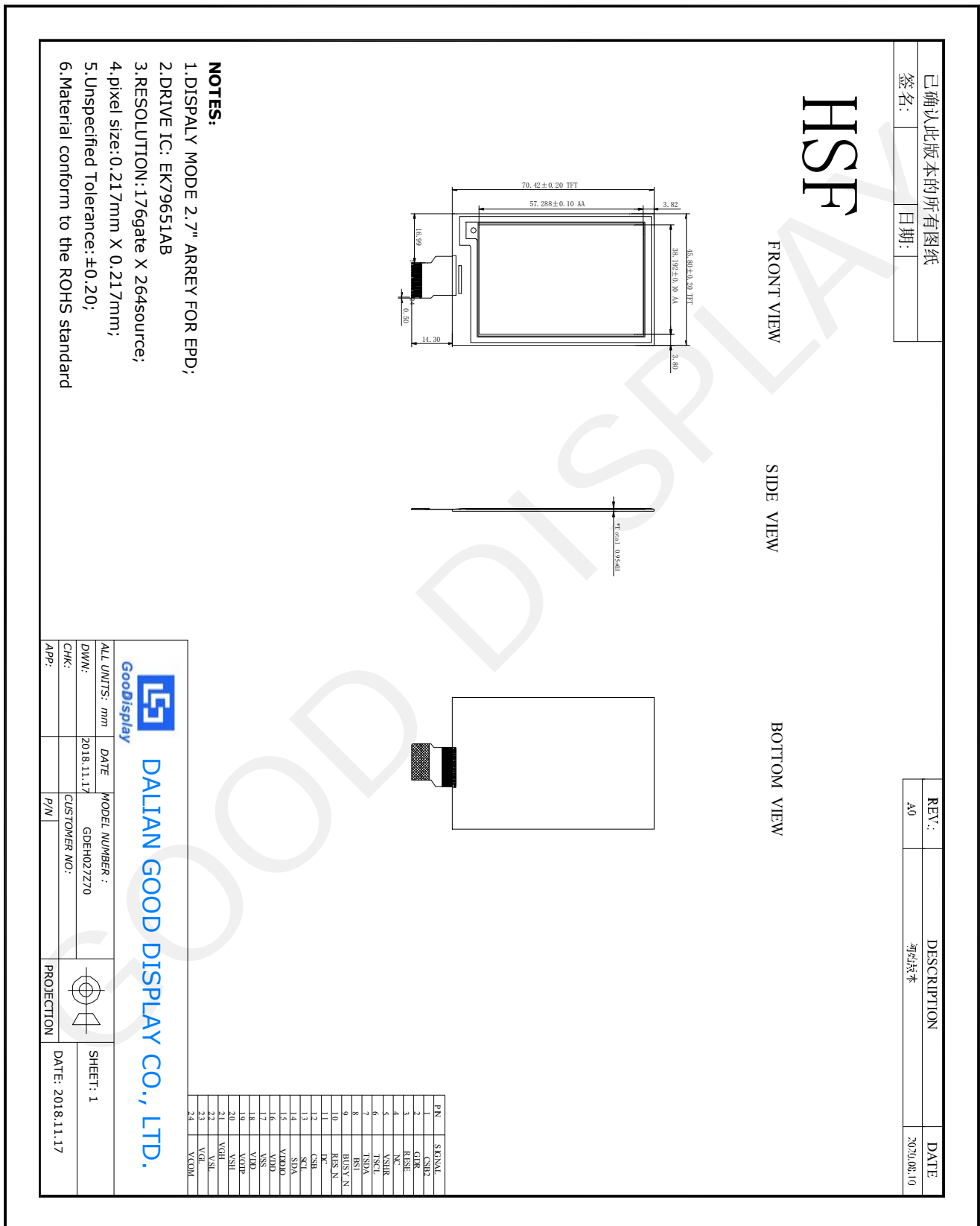
1.2 Features

- 176×264 pixels display
- High contrast
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable display
- Commercial temperature range
- Landscape, portrait modes
- Hard-coat antiglare display surface
- Ultra Low current deep sleep mode
- On chip display RAM
- Waveform stored in On-chip OTP
- Serial peripheral interface available
- On-chip oscillator
- On-chip booster and regulator control for generating VCOM, Gate and Source driving voltage
- I2C signal master interface to read external temperature sensor/built-in temperature sensor

1.3 Mechanical Specifications

| Parameter | Specifications | Unit | Remark |
|---------------------|---------------------------|-------|---------|
| Screen Size | 2.7 | Inch | |
| Display Resolution | 176(H)×264(V) | Pixel | Dpi:117 |
| Active Area | 38.192(H)×57.288(V) | mm | |
| Pixel Pitch | 0.217×0.217 | mm | |
| Pixel Configuration | Rectangle | | |
| Outline Dimension | 45.8(H)×70.42(V) ×0.95(D) | mm | |
| Weight | 5.0±0.2 | g | |

1.4 Mechanical Drawing of EPD module



1.5 Input/Output Terminals

| Pin # | Single | Description | Remark |
|-------|----------|--|------------|
| 1 | NC | No connection and do not connect with other NC pins | Keep Open |
| 2 | GDR | N-Channel MOSFET Gate Drive Control | |
| 3 | RESE | Current Sense Input for the Control Loop | |
| 4 | NC | No connection and do not connect with other NC pins e | Keep Open |
| 5 | VSHR | Positive source voltage for Red | |
| 6 | TSCL | I2C Interface to digital temperature sensor Clock pin | |
| 7 | TSDA | I2C Interface to digital temperature sensor Date pin | |
| 8 | BS | Bus selection pin | Note 1.5-5 |
| 9 | BUSY N | Busy state output pin | Note 1.5-4 |
| 10 | RST N | Reset | Note 1.5-3 |
| 11 | DC | Data /Command control pin | Note 1.5-2 |
| 12 | CSB | Chip Select input pin | Note 1.5-1 |
| 13 | SCL | serial clock pin (SPI) | |
| 14 | SDA | serial data pin (SPI) | |
| 15 | VDDIO | IO voltage supply | |
| 16 | VDD | Digital/Analog power. | |
| 17 | VSS | Digital ground | |
| 18 | VDD 1.8V | 1.8V voltage input &output | |
| 19 | VOTP | OTP program power (7.5V) | |
| 20 | VSH | Positive Source driving voltage | |
| 21 | VGH | Power Supply pin for Positive Gate driving voltage and VSH | |
| 22 | VSL | Negative Source driving voltage | |
| 23 | VGL | Power Supply pin for Negative Gate driving voltage, VCOM and VSL | |
| 24 | VCOM | VCOM driving voltage | |

Note 6-1: This pin (CSB) is the chip select input connecting to the MCU. The chip is enabled for MCU communication: only when CSB is pulled LOW.

Note 6-2: This pin (DC) is Data/Command control pin connecting to the MCU. When the pin is pulled HIGH, the data will be interpreted as data. When the pin is pulled LOW, the data will be interpreted as command.

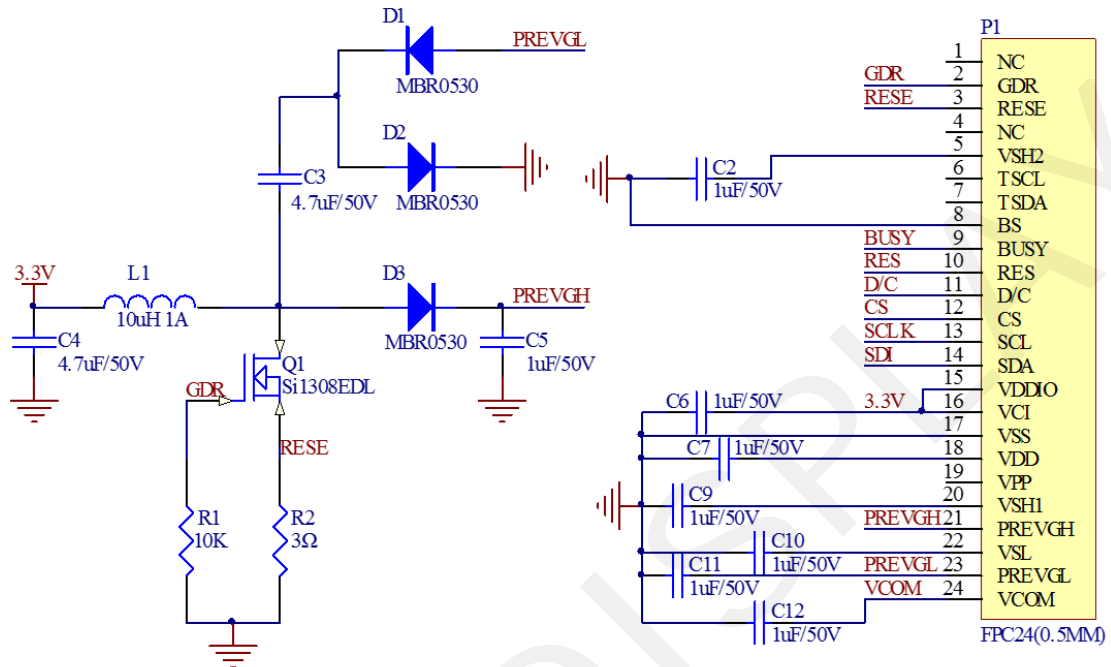
Note 6-3: This pin (RST_N) is reset signal input. The Reset is active low.

Note 6-4: This pin (BUSY_N) is Busy state output pin. When Busy_N is High the operation of chip should not be interrupted and any commands should not be issued to the module. The driver IC will put Busy_N pin High when the driver IC is working such as:

- Outputting display waveform; or
- Communicating with digital temperature sensor

Note 6-5: This pin (BS1) is for 3-line SPI or 4-line SPI selection. When it is "Low", 4-line SPI is selected. When it is "High", 3-line SPI (9 bits SPI) is selected.

1.6 Reference Circuit



1.7 Matched Development Kit

Our Development Kit designed for SPI E-paper Display aims to help users to learn how to use E-paper Display more easily. It can refresh black-white E-paper Display and three-color (black, white and red/Yellow) Good Display 's E-paper Display. And it is also added the functions of USB serial port, Raspberry Pi and LED indicator light ect.

DESPI Development Kit consists of the development board and the pinboard.

More details about the Development Kit, please click to the following link:

<https://www.good-display.com/product/53/>

GOOD DISPLAY

2. Environmental

2.1 HANDLING, SAFETY AND ENVIRONMENTAL REQUIREMENTS

| WARNING |
|--|
| The display glass may break when it is dropped or bumped on a hard surface. Handle with care. Should the display break, do not touch the electrophoretic material. In case of contact with electrophoretic material, wash with water and soap. |

| CAUTION |
|--|
| The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronic components. |
| Disassembling the display module can cause permanent damage and invalidate the warranty agreements. |
| IPA solvent can only be applied on active area and the back of a glass. For the rest part, it is not allowed. |

Observe general precautions that are common to handling delicate electronic components. The glass can break and front surfaces can easily be damaged. Moreover the display is sensitive to static electricity and other rough environmental conditions.

| Mounting Precautions | |
|--|---|
| (1) It`s recommended that you consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. | |
| (2) It`s recommended that you attach a transparent protective plate to the surface in order to protect the EPD. Transparent protective plate should have sufficient strength in order to resist external force. | |
| (3) You should adopt radiation structure to satisfy the temperature specification. | |
| (4) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the PS at high temperature and the latter causes circuit break by electro-chemical reaction. | |
| (5) Do not touch, push or rub the exposed PS with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of PS for bare hand or greasy cloth. (Some cosmetics deteriorate the PS) | |
| (6) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach the PS. Do not use acetone, toluene and alcohol because they cause chemical damage to the PS. | |
| (7) Wipe off saliva or water drops as soon as possible. Their long time contact with PS causes deformations and color fading. | |
| Product specification | The data sheet contains final product specifications. |

| Limiting values |
|--|
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |
| Application information |
| Where application information is given, it is advisory and does not form part of the specification. |

| Product Environmental certification |
|---|
| ROHS |
| REMARK |
| All The specifications listed in this document are guaranteed for module only. Post-assembled operation or component(s) may impact module performance or cause unexpected effect or damage and therefore listed specifications is not warranted after any Post-assembled operation. |

2.2 Reliability test

| | TEST | CONDITION | METHOD | REMARK |
|----|---|---|--------------------------|--------|
| 1 | High-Temperature Operation | T=40℃ , RH=35%RH, For 240Hr | IEC 60 068-2-2Bb | |
| 2 | Low-Temperature Operation | T = 0℃ for 240 hrs | IEC 60 068-2-2Ab | |
| 3 | High-Temperature Storage | T=60℃ RH=35%RH For 240Hr Test in white pattern | IEC 60 068-2-2Bb | |
| 4 | Low-Temperature Storage | T = -25℃ for 240 hrs Test in white pattern | IEC 60 068-2-2Ab | |
| 5 | High Temperature, High-Humidity Operation | T=40℃ , RH=80%RH, For 240Hr | IEC 60 068-2-3CA | |
| 6 | High Temperature, High-Humidity Storage | T=50℃ , RH=80%RH, For 240Hr Test in white pattern | IEC 60 068-2-3CA | |
| 7 | Temperature Cycle | -25℃(30min)~60℃(30min) , 50 Cycle Test in white pattern | IEC 60 068-2-14NB | |
| 8 | Package Vibration | 1.04G,Frequency : 10~500Hz Direction : X,Y,Z Duration:1hours in each direction | Full packed for shipment | |
| 9 | Package Drop Impact | Drop from height of 122 cm on Concrete surface Drop sequence:1 corner, 3edges, 6face One drop for each. | Full packed for shipment | |
| 10 | UV exposure Resistance | 765 W/m ² for 168hrs,40℃ | IEC 60068-2-5 Sa | |
| 11 | Electrostatic discharge | Machine model: +/-250V,0 Ω ,200pF | IEC61000-4-2 | |

Actual EMC level to be measured on customer application.

Note1: The protective film must be removed before temperature test.

Note2: Stay white pattern for storage and non-operation test.

3. ELECTRICAL CHARACTERISTICS

3.1 ABSOLUTE MAXIMUM RATING

Table 3.1-1: Maximum Ratings

| | Parameter | Rating | Unit |
|------------------|----------------------------------|-------------|------|
| V _{CI} | Logic supply voltage | -0.3to +6.0 | V |
| T _{OPR} | Operation temperature range | 0 to40 | °C |
| T _{TTG} | Transportation temperature range | -25 to 60 | °C |

Note: T_{ttg} is the transportation condition, the transport time is within 10 days for -25°C~0°C or 40°C~60°C.

3.2 DC CHARACTERISTICS

The following specifications apply for: V_{SS}=0V, V_{CI}=3.3V, T_{OPR}=25°C.

Table 3.2-1: DC Characteristics

| Symbol | Parameter | Test Condition | Applicable pin | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|-----------------------|----------------------|----------------------|------|----------------------|------|
| V _{CI} | V _{CI} operation voltage | - | V _{CI} | 2.5 | 3.3 | 3.6 | V |
| V _{IH} | High level input voltage | - | SDA, SCL, CS#, D/C#, | 0.8V _{DDIO} | - | - | V |
| V _{IL} | Low level input voltage | - | RES#, BS1 | - | - | 0.2V _{DDIO} | V |
| V _{OH} | High level output voltage | IOH = -100uA | BUSY, | 0.9V _{DDIO} | - | - | V |
| V _{OL} | Low level output voltage | IOL = 100uA | | - | - | 0.1V _{DDIO} | V |
| I _{update} | Module operating current | - | - | - | 2.6 | - | mA |
| I _{sleep} | Deep sleep mode | V _{CI} =3.3V | - | - | 0.2 | 3 | uA |

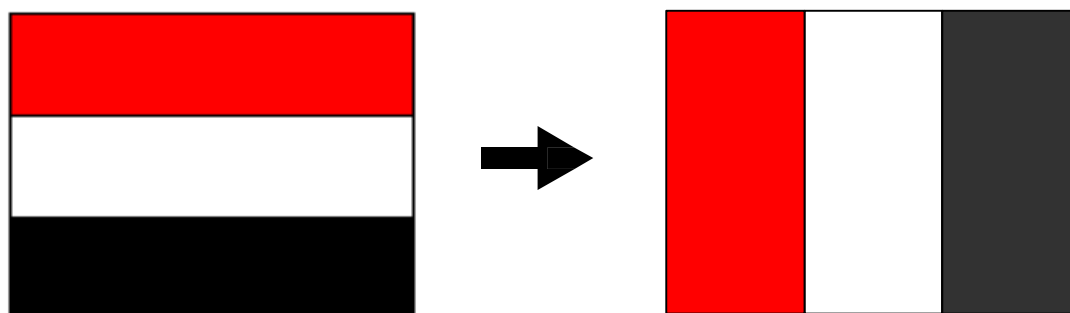
- The Typical power consumption is measured using associated 25°C waveform with following pattern transition: from horizontal scan pattern to vertical scan pattern. (Note 3.2-1)

- The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by Good Display.

- V_{com} value will be OTP before in factory or present on the label sticker.

Note 3.2-1

The Typical power consumption



3.3 Serial Peripheral Interface Timing

The following specifications apply for: VSS=0V, VCI=2.5V to 3.6V, TOPR=25℃

Write mode

| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|--|-----|-----|-----|------|
| fSCL | SCL frequency (Write Mode) | | | 20 | MHz |
| tCSSU | Time CSB has to be low before the first rising edge of SCLK | 20 | | | ns |
| tCSHLD | Time CSB has to remain low after the last falling edge of SCLK | 20 | | | ns |
| tCSHIGH | Time CSB has to remain high between two transfers | 100 | | | ns |
| tSCLHIGH | Part of the clock period where SCL has to remain high | 25 | | | ns |
| tSCLLOW | Part of the clock period where SCL has to remain low | 25 | | | ns |
| tSISU | Time SI (SDA Write Mode) has to be stable before the next rising edge of SCL | 10 | | | ns |
| tSIHLD | Time SI (SDA Write Mode) has to remain stable after the rising edge of SCL | 40 | | | ns |

Read mode

| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|--|-----|-----|-----|------|
| fSCL | SCL frequency (Read Mode) | | | 2.5 | MHz |
| tCSSU | Time CSB has to be low before the first rising edge of SCLK | 100 | | | ns |
| tCSHLD | Time CSB has to remain low after the last falling edge of SCLK | 50 | | | ns |
| tCSHIGH | Time CSB has to remain high between two transfers | 250 | | | ns |
| tSCLHIGH | Part of the clock period where SCL has to remain high | 180 | | | ns |
| tSCLLOW | Part of the clock period where SCL has to remain low | 180 | | | ns |
| tSOSU | Time SO(SDA Read Mode) will be stable before the next rising edge of SCL | | 50 | | ns |
| tSOHLD | Time SO (SDA Read Mode) will remain stable after the falling edge of SCL | | 0 | | ns |

Note: All timings are based on 20% to 80% of VDDIO-VSS

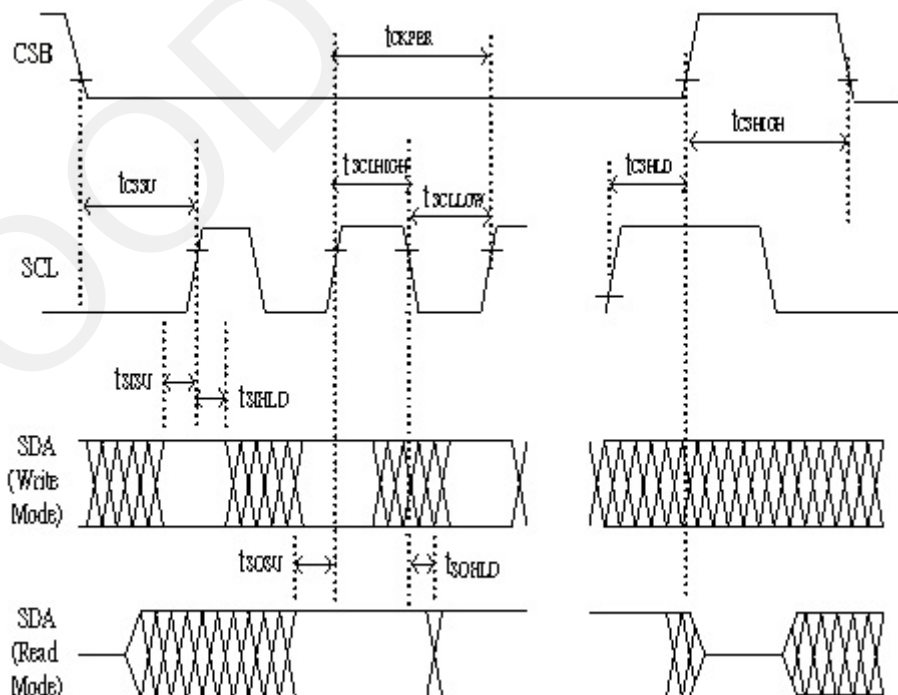


Figure 3.3-1: Serial peripheral interface characteristics

3.4 Power ON /OFF Sequence

In order to prevent IC fail in power on resetting, the power sequence must be followed as below.

Power ON Sequence

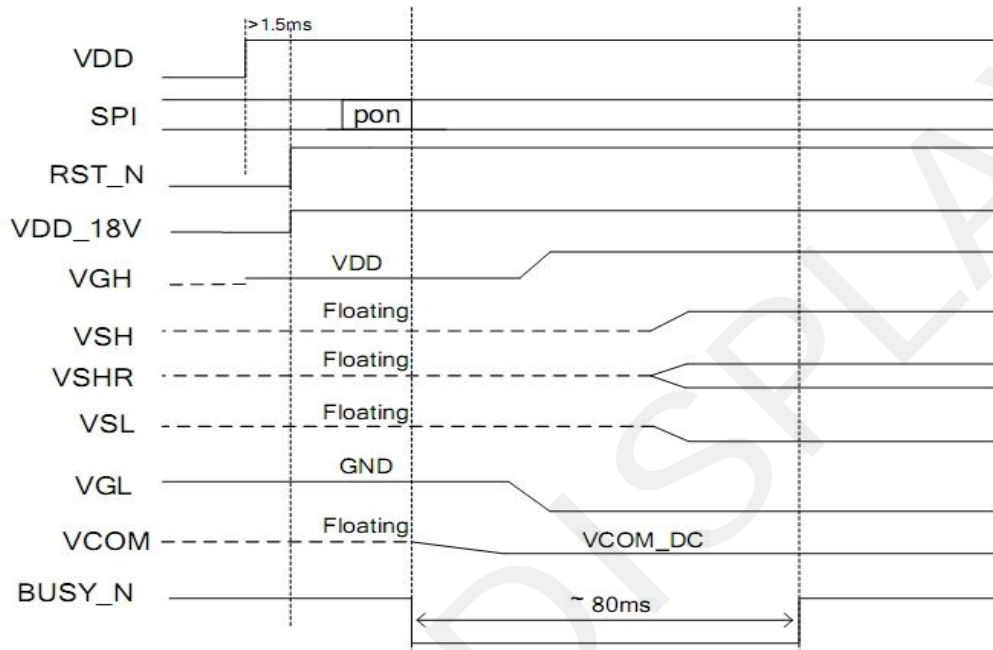


Figure 1: Power on sequence

Power OFF Sequence

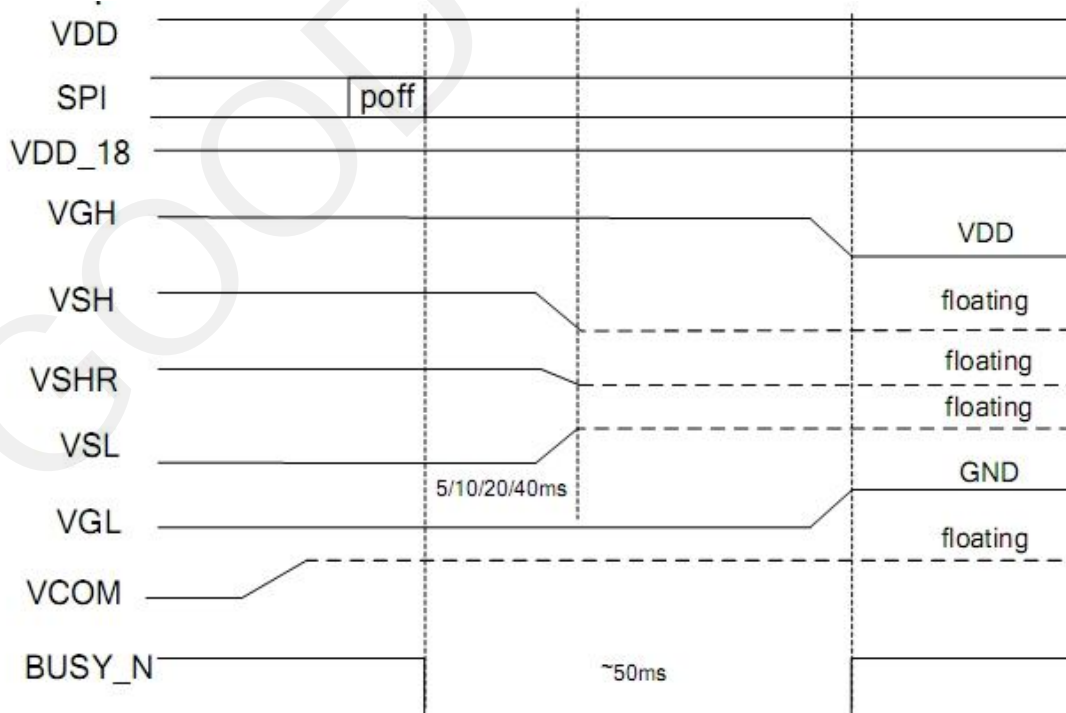


Figure 2: Power off sequence

DSLP sequence

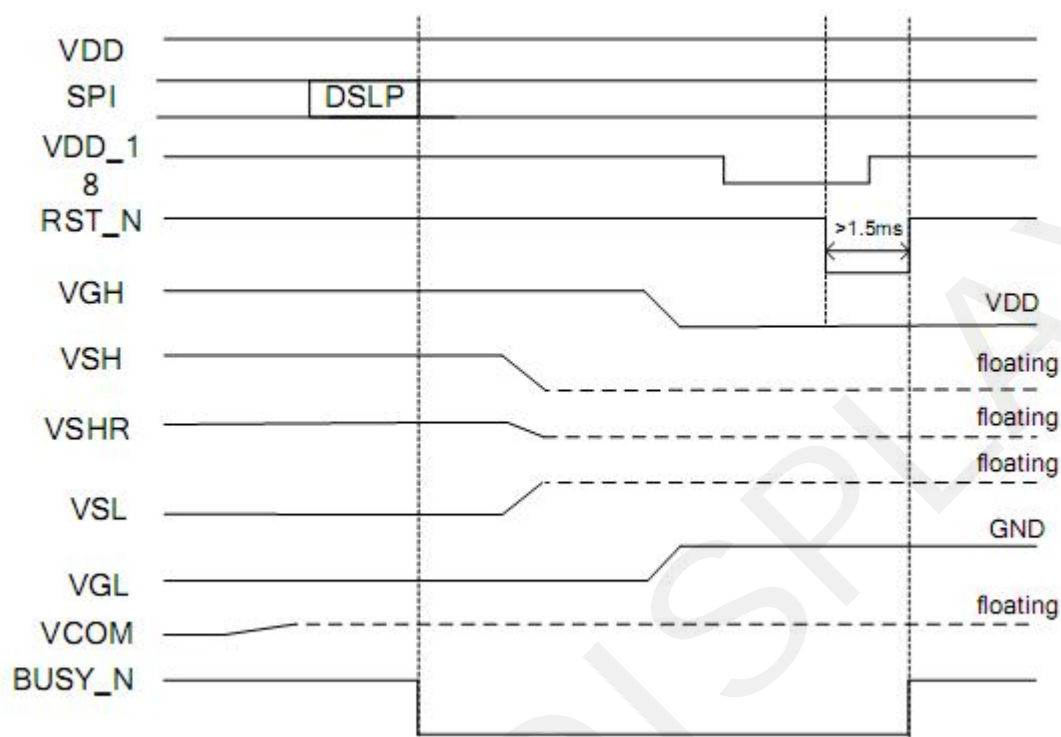


Figure 3: DSLP sequence

3.5 Power Consumption

| Parameter | Symbol | Conditions | TYP | Max | Unit | Remark |
|---------------------------------------|--------|------------|-----|-----|------|--------|
| Panel power consumption during update | - | 25°C | 40 | - | mAs | - |
| Deep sleep mode | - | 25°C | 0.2 | 3 | uA | - |

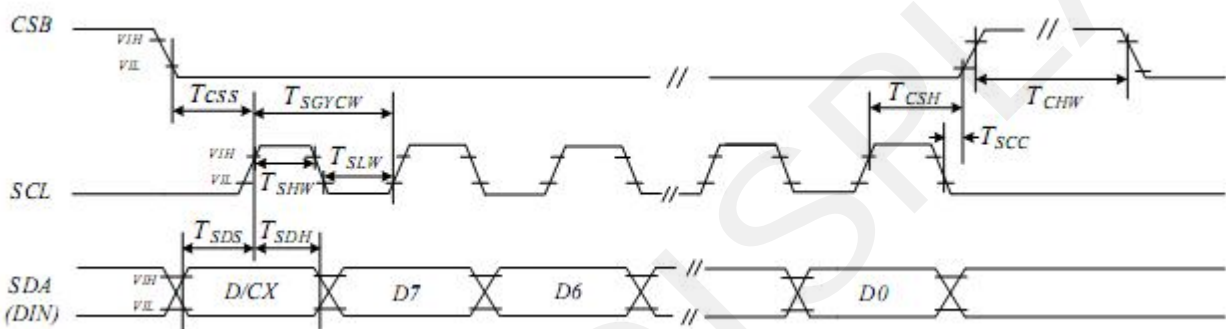
mAs=update average current×update time

4. SPI COMMAND DESCRIPTION

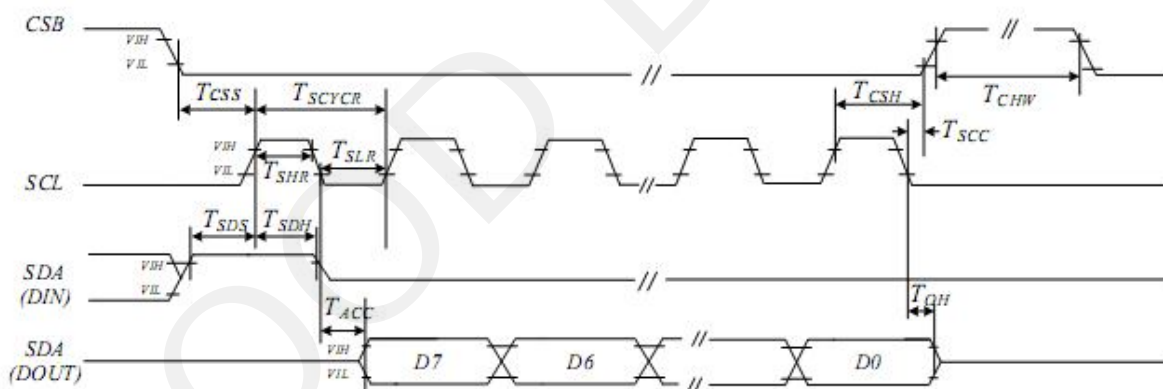
4.1 "3-Wire" Serial Port Interface

JD79651 use the 3-wire serial port as communication interface for all the function and command setting. 3-Wire communication can be bi-directional controlled by the "R/W" bit in address field. JD79651 3-Wire engine act as a "slave mode" for all the time, and will not issue any command to the 3-Wire bus itself.

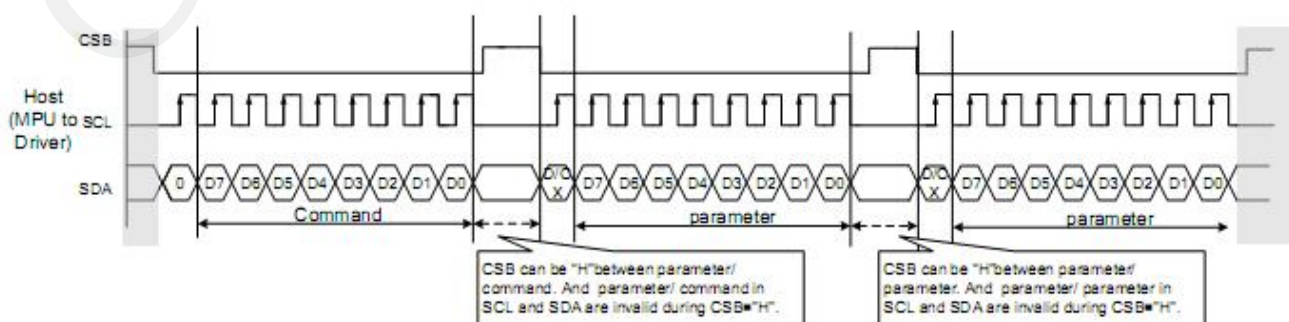
Under read mode, 3-Wire engine will return the data during "Data phase". The returned data should be latched at the rising edge of SCL by external controller. Data in the "Hi-Z phase" will be ignored by 3-Wire engine during write operation, and should be ignored during read operation also. During read operation, external controller should float SDA pin under "Hi-Z phase" and "Data phase".



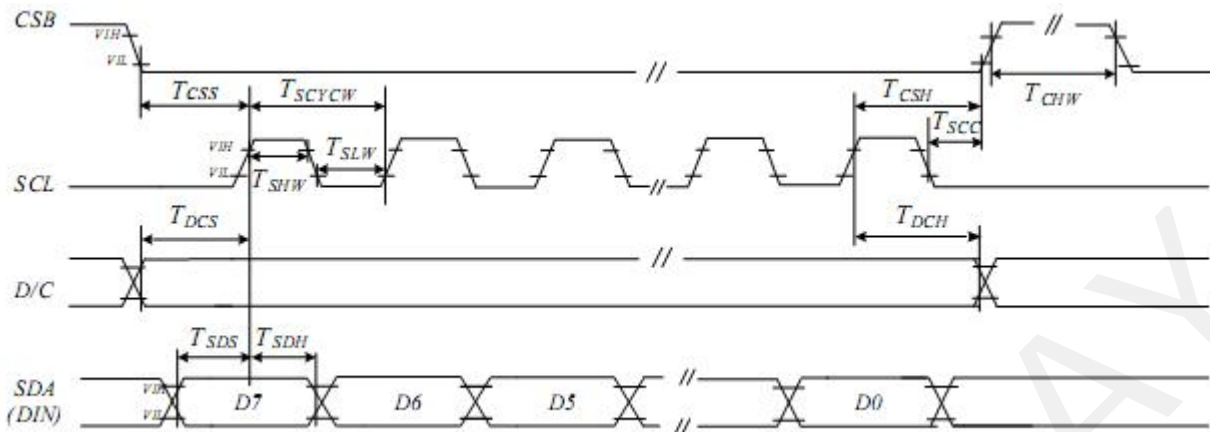
3 pin serial interface characteristics (write mode)



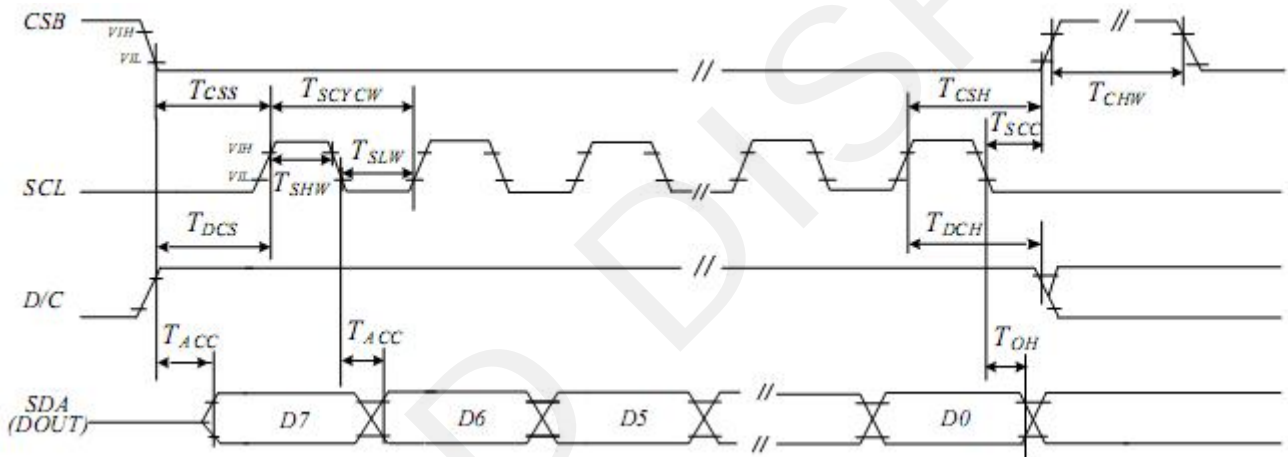
3 pin serial interface characteristics (read mode)



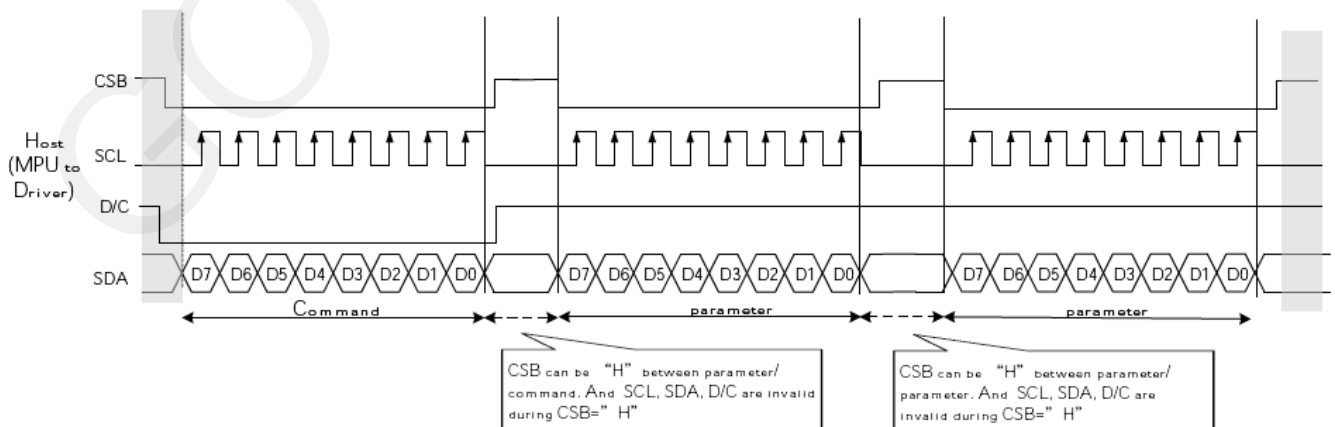
4.2 "4-Wire" Serial Port Interface



4 pin serial interface characteristics(write mode)



4 pin serial interface characteristics(read mode)



5. COMMAND TABLE

5.1 Register Table

Following table list all the SPI control registers and bit name definition for EK79686. Refer to the next section for detail register function description.3

| Address | command | Bit | | | | | | | | | | Code |
|---------|---|-----|------|-----------|----------|--------------|--------------|----------|------------|------------|------------|------|
| | | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| R00H | Panel setting (PSR) | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00H |
| | | W | 1 | RES[1] | RES[0] | REG_EN | BWR | UD | SHL | SHD_N | RST_N | 8h |
| R01H | Power setting (PWR) | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 01H |
| | | W | 1 | - | - | - | - | - | - | VDS_EN | VDG_EN | 03H |
| | | W | 1 | | | - | - | VCOM_HV | VCOM_LV[2] | VCOM_LV[1] | VCOM_LV[0] | 00H |
| | | W | 1 | | | VSH [5] | VSH [4] | VSH [3] | VSH [2] | VSH [1] | VSH [0] | 26H |
| | | W | 1 | | | VSL [5] | VSL [4] | VSL [3] | VSL [2] | VSL [1] | VSL [0] | 26H |
| | | W | 1 | | VSHR [6] | VSHR [5] | VSHR [4] | VSHR [3] | VSHR [2] | VSHR [1] | VSHR [0] | 06H |
| | | W | 1 | | | | | | | | | |
| R02H | Power OFF(POF) | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 02H |
| R03H | Power off Sequence Setting(PFS) | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 03H |
| | | W | 1 | - | - | T_VDS_OFF[1] | T_VDS_OFF[0] | | | | | 00H |
| R04H | Power ON (PON) | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 04H |
| R05H | Power ON Measure (PMES) | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 05H |
| R06H | Booster Soft Start (BTST) | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 06H |
| | | W | 1 | BT_PH A7 | BT_PH A6 | BT_PHA5 | BT_PHA4 | BT_PHA3 | BT_PHA2 | BT_PHA1 | BT_PHA0 | 17h |
| | | W | 1 | BT_PHB 7 | BT_PHB 6 | BT_PHB5 | BT_PHB4 | BT_PHB3 | BT_PHB2 | BT_PHB1 | BT_PHB0 | 17h |
| | | W | 1 | - | | BT_PHC5 | BT_PHC4 | BT_PHC3 | BT_PHC2 | BT_PHC1 | BT_PHC0 | 17h |
| R07H | Deep Sleep(DSLP) | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 07H |
| | | W | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | A5h |
| R10H | Data Start transmission 1 (DTM1) | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 10H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00H |
| R11H | Data Stop (DSP) | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 11H |
| | | R | 1 | Data_flag | - | - | - | - | - | - | - | - |
| R12H | Display Refresh (DRF) | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 12H |
| R13H | Data Start transmission 2(DTM2) | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 13H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R14H | Partial Data Start transmission 1 (PDTM1) | W | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 14H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R15H | Partial Data Start transmission 2 (PDTM2) | W | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 15H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R16H | Partial Display Refresh(PDRF) | W | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 16H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R20H | LUT for VCOM (LUT1) | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 20H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R21H | White to | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 21H |

| | | | | | | | | | | | | |
|------|--------------------------------------|---|---|-------------|-------------|-------------|-------------|-------------------|-------------|------------------|-------------|-----|
| | White LUT (LUTWW) | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R22H | Black to White LUT (LUTBW/LUTR) | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 22H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R23H | White to Black LUT (LUTWB/LUTW) | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 23H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R24H | Black to Black LUT (LUTBB/LUTB) | W | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 24H |
| | | W | 1 | # | # | # | # | # | # | # | # | 00h |
| R25H | LUTC option | W | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 25H |
| | | W | 1 | | | | | | | XON [9:8] | | 00h |
| | | W | 1 | XON [7:0] | | | | | | | | 00h |
| | | W | 1 | | | | | | | VCOMH [9:8] | | 00h |
| | | W | 1 | VCOMH [7:0] | | | | | | | | 00h |
| R26H | Set Vcom/Red states | W | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 26H |
| | | W | 1 | 0 | 0 | | | vcom_stg_sel[1:0] | | b2w_stg_sel[1:0] | | 00h |
| R30H | OSC control (OSC) | W | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 30H |
| | | W | 1 | - | | M [2:0] | | | N [2:0] | | | 3Ah |
| R40H | Temperature Sensor Command (TSC) | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 40H |
| | | R | 1 | D10/TS[7] | D9/TS[6] | D8/TS[8] | D7/TS[7] | D6/TS[9] | D5/TS[8] | D4/TS[10] | D3/TS[9] | -- |
| | | R | 1 | D2 | D1 | D0 | - | - | - | - | - | -- |
| R41H | Temperature Sensor Calibration (TSE) | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 41H |
| | | W | 1 | TSE | - | - | - | TO[3] | TO[2] | TO[1] | TO[0] | 00h |
| R42H | Temperature Sensor Write (TSW) | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 42H |
| | | W | 1 | WATTR [7] | WATTR [6] | WATTR [5] | WATTR [4] | WATTR [3] | WATTR [2] | WATTR [1] | WATTR [0] | 00h |
| | | W | 1 | WMSB [7] | WMSB [6] | WMSB [5] | WMSB [4] | WMSB [3] | WMSB [2] | WMSB [1] | WMSB [0] | 00h |
| | | W | 1 | WLSB [7] | WLSB [6] | WLSB [5] | WLSB [4] | WLSB [3] | WLSB [2] | WLSB [1] | WLSB [0] | 00h |
| R43H | Temperature Sensor Read (TSR) | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 43H |
| | | R | 1 | RMSB [7] | RMSB [6] | RMSB [5] | RMSB [4] | RMSB [3] | RMSB [2] | RMSB [1] | RMSB [0] | - |
| | | R | 1 | RLSB [7] | RLSB [6] | RLSB [5] | RLSB [4] | RLSB [3] | RLSB [2] | RLSB [1] | RLSB [0] | - |
| R50H | VCOM and DATA interval setting (CDI) | W | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 50H |
| | | W | 1 | VBD [1] | VBD [0] | DDX [1] | DDX [0] | CDI [3] | CDI [2] | CDI [1] | CDI [0] | D7h |
| R51H | Lower Power Detection (LPD) | W | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 51H |
| | | R | 1 | - | - | - | - | - | - | - | LPD | - |
| R60H | TCON setting (TCO N) | W | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 60H |
| | | W | 1 | S2G [3] | S2G [2] | S2G [1] | S2G [0] | G2S [3] | G2S [2] | G2S [1] | G2S [0] | 22h |
| R61H | Resolution setting (TRES) | W | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 61H |
| | | W | 1 | HRES (7) | HRES (6) | HRES (5) | HRES (4) | HRES (3) | - | - | - | 00H |
| | | W | 1 | - | - | - | - | - | - | - | VRES (8) | 00H |
| | | W | 1 | VRES (7) | VRES (6) | VRES (5) | VRES (4) | VRES (3) | VRES (2) | VRES (1) | VRES (0) | 00H |
| R62H | Source & gate start setting | W | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 62H |
| | | W | 1 | S_start (7) | S_start (6) | S_start (5) | S_start (4) | S_start (3) | - | - | - | 00H |
| | | W | 1 | | | | gscan | | | | G_start [8] | 00H |
| | | W | 1 | G_start (7) | G_start (6) | G_start (5) | G_start (4) | G_start (3) | G_start (2) | G_start (1) | G_start (0) | 00H |
| R70H | REVISION (REV) | W | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 70H |
| | | R | 1 | REV [7] | REV [6] | REV [5] | REV [4] | REV [3] | REV [2] | REV [1] | REV [0] | - |

| | | R | 1 | REV[15] | REV[14] | REV[13] | REV[12] | REV[11] | REV[10] | REV[9] | REV[8] | - |
|------|------------------------------------|---|---|-----------|-----------|-----------|---------------|-------------------|-------------------|-------------------|-------------------|-----|
| R71H | Status register (FLG) | W | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 71H |
| | | R | 1 | - | PTL_flag | I2C_ERR | I2C_BUSYN | Data_flag | PON | POF | BUSY_N | - |
| R80H | Auto Measure VcomMeasure Vcom(AMV) | W | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 80H |
| | | W | 1 | - | - | AMVT[1] | AMVT[0] | XON | AMVS | AMV | AMV | 10H |
| R81H | Vcom Value (VV) | W | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 81H |
| | | R | 1 | - | - | VV[5] | VV[4] | VV[3] | VV[2] | VV[1] | VV[0] | - |
| R82H | Vcom_DC Setting register (VDCS) | W | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 82H |
| | | W | 1 | - | - | VCDS[5] | VCDS[4] | VCDS[3] | VCDS[2] | VCDS[1] | VCDS[0] | 00H |
| RA0H | Program Mode (PGM) | W | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | A0H |
| | | W | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | A5h |
| RA1H | Active program (APG) | W | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | A1H |
| RA2H | Read OTP Data (ROTP) | W | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | A2H |
| | | R | 1 | # | # | # | # | # | # | # | # | - |
| RE0H | CASCADE setting (CCSET) | W | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | E0H |
| | | W | 1 | - | - | - | - | Cce-sel | Cce-lr | TSFLX | CCCEIN | 00H |
| RE5H | Force Temperature | W | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | E5H |
| | | W | 1 | TS_SET[7] | TS_SET[6] | TS_SET[5] | TS_SET[4] | TS_SET[3] | TS_SET[2] | TS_SET[1] | TS_SET[0] | 00h |
| RE6H | LVD voltage Select | W | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | E6H |
| | | W | 1 | - | - | - | - | - | - | LVD_SEL[0] | LVD_SEL[0] | 03h |
| RE7H | Panel Break Check | W | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | E7H |
| | | R | 1 | - | - | - | - | - | - | - | PSTA | - |
| RE8H | Power saving | W | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | E8H |
| | | W | 1 | VCOM_W[3] | VCOM_W[2] | VCOM_W[1] | VCOM_W[0] | SD_W[3] | SD_W[2] | SD_W[1] | SD_W[0] | 00h |
| RE9H | AUTO sequence | W | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | E9H |
| | | W | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 00h |
| REFH | Checksum program to OTP | W | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 11 | EFH |
| RF0H | Remap LUT | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | F0H |
| | | W | 1 | - | - | - | Bkup-lut-2-en | Rmp2-table-sel[3] | Rmp2-table-sel[2] | Rmp2-table-sel[1] | Rmp2-table-sel[0] | 1Fh |
| | | W | 1 | - | - | - | Bkup-lut-1-en | Rmp1-table-sel[3] | Rmp1-table-sel[2] | Rmp1-table-sel[1] | Rmp1-table-sel[0] | 1Fh |
| RF1H | Set OTP program | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | F1H |
| | | W | 1 | - | - | - | - | - | - | LUT_bank | reg_bank | 03h |
| RF2H | Read checksum | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | F2H |
| | | R | 1 | # | # | # | # | # | # | # | # | - |
| RF3H | Calculate Checksum | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | F3H |

5.2 Register Description

5.2.1 R00H (PSR): Panel setting Register

| R00H | Bit | | | | | | | | | | |
|---------------|-----|------|--------|--------|--------|-----|----|-----|-------|-------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PSR | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00H |
| 1st Parameter | W | 1 | RES[1] | RES[0] | REG_EN | BWR | UD | SHL | SHD_N | RST_N | 8Fh |

NOTE: “-” Don’t care, can be set to VDD or GND level

Description

-The command defines as :

| Bit | Name | Description |
|---|----------|--|
| 0 | RST_N | RST_N function 1 : no effect. (default) 0: Booster OFF, Register data are set to their default values, and SEG/BG/VCOM:floating |
| 1 | SHD_N | SHD_N function 0 : Booster OFF, register data are kept, and SEG/BG/VCOM are kept floating. 1 : Booster on. (default) |
| 2 | SHL | SHL function 0: Shift left; First data=Sn → Sn-1 → ⋯→ S2 → Last data=S1. 1: Shift right: First data=S1 → S2 → ⋯→ Sn-1 → Last data=Sn. (default) |
| 3 | UD | UD function 0:Scan down; First line=Gn→Gn-1 → ⋯→ G2 → Last line=G1. 1:Scan up; First line=G1 → G2 → ⋯→ Gn-1 → Last line=Gn. (default) |
| 4 | BWR | Color selection setting 0: Pixel with B/W/Red. Run both LU1 and LU2. (default) 1: Pixel with B/W. Run LU1 only |
| 5 | REG_EN | LUT selection setting 0 : Using LUT from OTP(default) 1 : Using LUT from register |
| 7-6 | RES[1,0] | Resolution setting 00: Display resolution is 96x230 01: Display resolution is 96x252 10: Display resolution is 128x296 (default) 11: Display resolution is 160x296 |
| Notes | | |
| 1. When SHD_N become low, DCDC will turn off. Register and SRAM data will keep until VDD turn off. SD output and VCOM will base on previous condition and keep floating. | | |
| 2. When RST_N become low, driver will reset. All register will reset to default value. All of the driver' s functions will disable. SD output and VCOM will base on previous condition and keep floating. | | |

5.2.2 R01H (PWR): Power setting Register

| R01H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----------|----------|----------|----------|--------------|--------------|--------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PWR | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 01h |
| 1st Parameter | W | 1 | - | - | - | - | - | - | VDS_EN | VDS_EN | 03h |
| 2nd Parameter | W | 1 | - | - | - | - | VCOM_HV | VGHL_L V [2] | VGHL_L V [1] | VGHL_L V [0] | 00h |
| 3rd Parameter | W | 1 | - | - | VSH [5] | VSH [4] | VSH [3] | VSH [2] | VSH [1] | VSH [0] | 26h |
| 4th Parameter | W | 1 | - | - | VSL [5] | VSL [4] | VSL [3] | VSL [2] | VSL [1] | VSL [0] | 26h |
| 5th Parameter | W | 1 | - | VSHR [6] | VSHR [5] | VSHR [4] | VSHR [3] | VSHR [2] | VSHR [1] | VSHR [0] | 06h |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | |
|-------------|-----------------------------|---------|--|
| Description | -The command defines as :E4 | | |
| | 1st Parameter: | | |
| | Bit | Name | Description |
| | 0 | VDG_EN | Source power selection. 0 : External source power from VSH/VSL/VSHR pins. 1 : Internal DC/DC function for generate VSH/VSL/VSHR (default) |
| | 1 | VDS_EN | Source power selection. 0 : External source power from VSH/VSL/VSHR pins. 1 : Internal DC/DC function for generate VSH/VSL/VSHR (default) |
| | 2nd Parameter: | | |
| | Bit | Name | Description |
| | 2-0 | VGHL_LV | VGHL_LV Voltage Level. 000: VGH=20 v, VGL=-20v 001: VGH=19 v, VGL=-19v 010: VGH=18 v, VGL=-18v 011: VGH=17 v, VGL=-17v 100: VGH=16 v, VGL=-16v 101: VGH=15 v, VGL=-15v 110: VGH=14 v, VGL=-14v 111: VGH=13 v, VGL=-13v |
| | 3 | VCOM_HV | VCOM Voltage Level 0: VCOMH=VSH+VCOMDC, VCOML=VSL+VCOMDC(default) 1: VCOMH=VGH, VCOML=VGL |

| 3rd Parameter: Internal VSH power selection for B/W LUT. | | | | | | | |
|--|------|-------------------------------|-----|-------------|----------|-----|------------|
| Bit | Name | Description | | | | | |
| 5-0 | VSH | Internal VSH power selection. | | | | | |
| | | VSH[5:0] | | Voltage(V) | VSH[5:0] | | Voltage(V) |
| | | 000000 | 00h | 2.4 | 100000 | 20h | 8.8 |
| | | 000001 | 01h | 2.6 | 100001 | 21h | 9 |
| | | 000010 | 02h | 2.8 | 100010 | 22h | 9.2 |
| | | 000011 | 03h | 3 | 100011 | 23h | 9.4 |
| | | 000100 | 04h | 3.2 | 100100 | 24h | 9.6 |
| | | 000101 | 05h | 3.4 | 100101 | 25h | 9.8 |
| | | 000110 | 06h | 3.6 | 100110 | 26h | 10 |
| | | 000111 | 07h | 3.8 | 100111 | 27h | 10.2 |
| | | 001000 | 08h | 4 | 101000 | 28h | 10.4 |
| | | 001001 | 09h | 4.2 | 101001 | 29h | 10.6 |
| | | 001010 | 0Ah | 4.4 | 101010 | 2Ah | 10.8 |
| | | 001011 | 0Bh | 4.6 | 101011 | 2Bh | 11 |
| | | 001100 | 0Ch | 4.8 | 101100 | 2Ch | 11.2 |
| | | 001101 | 0Dh | 5 | 101101 | 2Dh | 11.4 |
| | | 001110 | 0Eh | 5.2 | 101110 | 2Eh | 11.6 |
| | | 001111 | 0Fh | 5.4 | 101111 | 2Fh | 11.8 |
| | | 010000 | 10h | 5.6 | 110000 | 30h | 12 |
| | | 010001 | 11h | 5.8 | 110001 | 31h | 12.2 |
| | | 010010 | 12h | 6 | 110010 | 32h | 12.4 |
| | | 010011 | 13h | 6.2 | 110011 | 33h | 12.6 |
| | | 010100 | 14h | 6.4 | 110100 | 34h | 12.8 |
| | | 010101 | 15h | 6.6 | 110101 | 35h | 13 |
| | | 010110 | 16h | 6.8 | 110110 | 36h | 13.2 |
| | | 010111 | 17h | 7 | 110111 | 37h | 13.4 |
| | | 011000 | 18h | 7.2 | 111000 | 38h | 13.6 |
| | | 011001 | 19h | 7.4 | 111001 | 39h | 13.8 |
| | | 011010 | 1Ah | 7.6 | 111010 | 3Ah | 14 |
| | | 011011 | 1Bh | 7.8 | 111011 | 3Bh | 14.2 |
| | | 011100 | 1Ch | 8 | 111100 | 3Ch | 14.4 |
| | | 011101 | 1Dh | 8.2 | 111101 | 3Dh | 14.6 |
| | | 011110 | 1Eh | 8.4 | 111110 | 3Eh | 14.8 |
| | | 011111 | 1Fh | 8.6 | 111111 | 3Fh | 15 |

4th Parameter: Internal VSL power selection for B/W LUT.

| Bit | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|------|--|----------|------------|------------|----------|------------|------------|--------|-----|------|--------|-----|------|--------|-----|------|--------|-----|----|--------|-----|------|--------|-----|------|--------|-----|----|--------|-----|------|--------|-----|------|--------|-----|------|--------|-----|------|--------|-----|------|--------|-----|------|--------|-----|-----|--------|-----|------|--------|-----|-------|--------|-----|----|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-----|--------|-----|------|--------|-----|-------|--------|-----|----|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-----|--------|-----|------|--------|-----|-------|--------|-----|----|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-----|--------|-----|------|--------|-----|-------|--------|-----|----|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-----|--------|-----|------|--------|-----|-------|--------|-----|----|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-------|--------|-----|------|--------|-----|-----|
| 5-0 | VSL | Internal VSH power selection. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table><tr><th>VSH[5:0]</th><th></th><th>Voltage(V)</th><th>VSH[5:0]</th><th></th><th>Voltage(V)</th></tr><tr><td>000000</td><td>00h</td><td>-2.4</td><td>100000</td><td>20h</td><td>-8.8</td></tr><tr><td>000001</td><td>01h</td><td>-2.6</td><td>100001</td><td>21h</td><td>-9</td></tr><tr><td>000010</td><td>02h</td><td>-2.8</td><td>100010</td><td>22h</td><td>-9.2</td></tr><tr><td>000011</td><td>03h</td><td>-3</td><td>100011</td><td>23h</td><td>-9.4</td></tr><tr><td>000100</td><td>04h</td><td>-3.2</td><td>100100</td><td>24h</td><td>-9.6</td></tr><tr><td>000101</td><td>05h</td><td>-3.4</td><td>100101</td><td>25h</td><td>-9.8</td></tr><tr><td>000110</td><td>06h</td><td>-3.6</td><td>100110</td><td>26h</td><td>-10</td></tr><tr><td>000111</td><td>07h</td><td>-3.8</td><td>100111</td><td>27h</td><td>-10.2</td></tr><tr><td>001000</td><td>08h</td><td>-4</td><td>101000</td><td>28h</td><td>-10.4</td></tr><tr><td>001001</td><td>09h</td><td>-4.2</td><td>101001</td><td>29h</td><td>-10.6</td></tr><tr><td>001010</td><td>0Ah</td><td>-4.4</td><td>101010</td><td>2Ah</td><td>-10.8</td></tr><tr><td>001011</td><td>0Bh</td><td>-4.6</td><td>101011</td><td>2Bh</td><td>-11</td></tr><tr><td>001100</td><td>0Ch</td><td>-4.8</td><td>101100</td><td>2Ch</td><td>-11.2</td></tr><tr><td>001101</td><td>0Dh</td><td>-5</td><td>101101</td><td>2Dh</td><td>-11.4</td></tr><tr><td>001110</td><td>0Eh</td><td>-5.2</td><td>101110</td><td>2Eh</td><td>-11.6</td></tr><tr><td>001111</td><td>0Fh</td><td>-5.4</td><td>101111</td><td>2Fh</td><td>-11.8</td></tr><tr><td>010000</td><td>10h</td><td>-5.6</td><td>110000</td><td>30h</td><td>-12</td></tr><tr><td>010001</td><td>11h</td><td>-5.8</td><td>110001</td><td>31h</td><td>-12.2</td></tr><tr><td>010010</td><td>12h</td><td>-6</td><td>110010</td><td>32h</td><td>-12.4</td></tr><tr><td>010011</td><td>13h</td><td>-6.2</td><td>110011</td><td>33h</td><td>-12.6</td></tr><tr><td>010100</td><td>14h</td><td>-6.4</td><td>110100</td><td>34h</td><td>-12.8</td></tr><tr><td>010101</td><td>15h</td><td>-6.6</td><td>110101</td><td>35h</td><td>-13</td></tr><tr><td>010110</td><td>16h</td><td>-6.8</td><td>110110</td><td>36h</td><td>-13.2</td></tr><tr><td>010111</td><td>17h</td><td>-7</td><td>110111</td><td>37h</td><td>-13.4</td></tr><tr><td>011000</td><td>18h</td><td>-7.2</td><td>111000</td><td>38h</td><td>-13.6</td></tr><tr><td>011001</td><td>19h</td><td>-7.4</td><td>111001</td><td>39h</td><td>-13.8</td></tr><tr><td>011010</td><td>1Ah</td><td>-7.6</td><td>111010</td><td>3Ah</td><td>-14</td></tr><tr><td>011011</td><td>1Bh</td><td>-7.8</td><td>111011</td><td>3Bh</td><td>-14.2</td></tr><tr><td>011100</td><td>1Ch</td><td>-8</td><td>111100</td><td>3Ch</td><td>-14.4</td></tr><tr><td>011101</td><td>1Dh</td><td>-8.2</td><td>111101</td><td>3Dh</td><td>-14.6</td></tr><tr><td>011110</td><td>1Eh</td><td>-8.4</td><td>111110</td><td>3Eh</td><td>-14.8</td></tr><tr><td>011111</td><td>1Fh</td><td>-8.6</td><td>111111</td><td>3Fh</td><td>-15</td></tr></table> | VSH[5:0] | | Voltage(V) | VSH[5:0] | | Voltage(V) | 000000 | 00h | -2.4 | 100000 | 20h | -8.8 | 000001 | 01h | -2.6 | 100001 | 21h | -9 | 000010 | 02h | -2.8 | 100010 | 22h | -9.2 | 000011 | 03h | -3 | 100011 | 23h | -9.4 | 000100 | 04h | -3.2 | 100100 | 24h | -9.6 | 000101 | 05h | -3.4 | 100101 | 25h | -9.8 | 000110 | 06h | -3.6 | 100110 | 26h | -10 | 000111 | 07h | -3.8 | 100111 | 27h | -10.2 | 001000 | 08h | -4 | 101000 | 28h | -10.4 | 001001 | 09h | -4.2 | 101001 | 29h | -10.6 | 001010 | 0Ah | -4.4 | 101010 | 2Ah | -10.8 | 001011 | 0Bh | -4.6 | 101011 | 2Bh | -11 | 001100 | 0Ch | -4.8 | 101100 | 2Ch | -11.2 | 001101 | 0Dh | -5 | 101101 | 2Dh | -11.4 | 001110 | 0Eh | -5.2 | 101110 | 2Eh | -11.6 | 001111 | 0Fh | -5.4 | 101111 | 2Fh | -11.8 | 010000 | 10h | -5.6 | 110000 | 30h | -12 | 010001 | 11h | -5.8 | 110001 | 31h | -12.2 | 010010 | 12h | -6 | 110010 | 32h | -12.4 | 010011 | 13h | -6.2 | 110011 | 33h | -12.6 | 010100 | 14h | -6.4 | 110100 | 34h | -12.8 | 010101 | 15h | -6.6 | 110101 | 35h | -13 | 010110 | 16h | -6.8 | 110110 | 36h | -13.2 | 010111 | 17h | -7 | 110111 | 37h | -13.4 | 011000 | 18h | -7.2 | 111000 | 38h | -13.6 | 011001 | 19h | -7.4 | 111001 | 39h | -13.8 | 011010 | 1Ah | -7.6 | 111010 | 3Ah | -14 | 011011 | 1Bh | -7.8 | 111011 | 3Bh | -14.2 | 011100 | 1Ch | -8 | 111100 | 3Ch | -14.4 | 011101 | 1Dh | -8.2 | 111101 | 3Dh | -14.6 | 011110 | 1Eh | -8.4 | 111110 | 3Eh | -14.8 | 011111 | 1Fh | -8.6 | 111111 | 3Fh | -15 |
| | | VSH[5:0] | | Voltage(V) | VSH[5:0] | | Voltage(V) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000000 | 00h | -2.4 | 100000 | 20h | -8.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000001 | 01h | -2.6 | 100001 | 21h | -9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000010 | 02h | -2.8 | 100010 | 22h | -9.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000011 | 03h | -3 | 100011 | 23h | -9.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000100 | 04h | -3.2 | 100100 | 24h | -9.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000101 | 05h | -3.4 | 100101 | 25h | -9.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000110 | 06h | -3.6 | 100110 | 26h | -10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 000111 | 07h | -3.8 | 100111 | 27h | -10.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001000 | 08h | -4 | 101000 | 28h | -10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001001 | 09h | -4.2 | 101001 | 29h | -10.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001010 | 0Ah | -4.4 | 101010 | 2Ah | -10.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001011 | 0Bh | -4.6 | 101011 | 2Bh | -11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001100 | 0Ch | -4.8 | 101100 | 2Ch | -11.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001101 | 0Dh | -5 | 101101 | 2Dh | -11.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001110 | 0Eh | -5.2 | 101110 | 2Eh | -11.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 001111 | 0Fh | -5.4 | 101111 | 2Fh | -11.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010000 | 10h | -5.6 | 110000 | 30h | -12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010001 | 11h | -5.8 | 110001 | 31h | -12.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010010 | 12h | -6 | 110010 | 32h | -12.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010011 | 13h | -6.2 | 110011 | 33h | -12.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010100 | 14h | -6.4 | 110100 | 34h | -12.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010101 | 15h | -6.6 | 110101 | 35h | -13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010110 | 16h | -6.8 | 110110 | 36h | -13.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 010111 | 17h | -7 | 110111 | 37h | -13.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 011000 | 18h | -7.2 | 111000 | 38h | -13.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 011001 | 19h | -7.4 | 111001 | 39h | -13.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 011010 | 1Ah | -7.6 | 111010 | 3Ah | -14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 011011 | 1Bh | -7.8 | 111011 | 3Bh | -14.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 011100 | 1Ch | -8 | 111100 | 3Ch | -14.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 011101 | 1Dh | -8.2 | 111101 | 3Dh | -14.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 011110 | 1Eh | -8.4 | 111110 | 3Eh | -14.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 011111 | 1Fh | -8.6 | 111111 | 3Fh | -15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

5th Parameter: Internal VSHR power selection for Red LUT.

| Bit | Name | Description | | | | | | | | |
|-----|------|-------------------------------|---------|----------------|----------|-----|----------------|-----------|-----|------------|
| 6-0 | VSHR | Internal VSH power selection. | | | | | | | | |
| | | VSH[5:0] | | Volta ge(V) | VSH[5:0] | | Volta ge(V) | VSHR[6:0] | | Voltage(V) |
| | | 0000000 | 00h | 2.4 | 0011101 | 1Dh | 5.3 | 0111010 | 3Ah | 8.2 |
| | | 0000001 | 01h | 2.5 | 0011110 | 1Eh | 5.4 | 0111011 | 3Bh | 8.3 |
| | | 0000010 | 02h | 2.6 | 0011111 | 1Fh | 5.5 | 0111100 | 3Bh | 8.4 |
| | | 0000011 | 03h | 2.7 | 0100000 | 20h | 5.6 | 0111101 | 3Dh | 8.5 |
| | | 0000100 | 04h | 2.8 | 0100001 | 21h | 5.7 | 0111110 | 3Eh | 8.6 |
| | | 0000101 | 05h | 2.9 | 0100010 | 22h | 5.8 | 0111111 | 3Fh | 8.7 |
| | | 0000110 | 06h | 3. | 0100011 | 23h | 5.9 | 0111111 | 40h | 8.8 |
| | | 0000111 | 07h | 3.1 | 0100100 | 24h | 6.0 | 1000001 | 41h | 8.9 |
| | | 0001000 | 08h | 3.2 | 0100101 | 25h | 6.1 | 1000010 | 42h | 9 |
| | | 0001001 | 09h | 3.3 | 0100110 | 26h | 6.2 | 1000011 | 43h | 9.1 |
| | | 0001010 | 0A h | 3.4 | 0100111 | 27h | 6.3 | 1000100 | 44h | 9.2 |
| | | 0001011 | 0Bh | 3.5 | 0101000 | 28h | 6.4 | 1000101 | 45h | 9.3 |
| | | 0001100 | 0Ch | 3.6 | 0101001 | 29h | 6.5 | 1000110 | 46h | 9.4 |
| | | 0001101 | 0D h | 3.7 | 0101010 | 2Ah | 6.6 | 1000111 | 47h | 9.5 |
| | | 0001110 | 0Eh | 3.8 | 0101011 | 2Bh | 6.7 | 1001000 | 48h | 9.6 |
| | | 0001111 | 0Fh | 3.9 | 0101100 | 2Ch | 6.8 | 1001001 | 49h | 9.7 |
| | | 0010000 | 10h | 4 | 0101101 | 2Dh | 6.9 | 1001010 | 4Ah | 9.8 |
| | | 0010001 | 11h | 4.1 | 0101110 | 2Eh | 7 | 1001011 | 4Ah | 9.9 |
| | | 0010010 | 12h | 4.2 | 0101111 | 2Fh | 7.1 | 1001100 | 4Ch | 10 |
| | | 0010011 | 13h | 4.3 | 0110000 | 30h | 7.2 | 1001101 | 4Dh | 10.1 |
| | | 0010100 | 14h | 4.4 | 0110001 | 31h | 7.3 | 1001110 | 4Eh | 10.2 |
| | | 0010101 | 15h | 4.5 | 0110010 | 32h | 7.4 | 1001110 | 4Eh | 10.3 |
| | | 0010110 | 16h | 4.6 | 0110011 | 33h | 7.5 | 1010000 | 50h | 10.4 |
| | | 0010111 | 17h | 4.7 | 0110100 | 34h | 7.6 | 1010001 | 51h | 10.5 |
| | | 0011000 | 18h | 4.8 | 0110101 | 35h | 7.7 | 1010010 | 52h | 10.6 |
| | | 0011001 | 19h | 4.9 | 0110110 | 36h | 7.8 | 1010010 | 53h | 10.7 |
| | | 0011010 | 1A h | 5 | 0110111 | 37h | 7.9 | 1010100 | 53h | 10.8 |
| | | 0011011 | 1Bh | 5.1 | 0111000 | 38h | 8 | 1010101 | 55h | 10.9 |
| | | 0011100 | 1Ch | 5.2 | 0111001 | 39h | 8.1 | 1010110 | 56h | 11 |
| | | Note: 1.VSH>VSHR | | | | | | | | |

Restr
iction

5.2.3 R02H (POF): Power OFF Command

| R02H | Bit | | | | | | | | | | |
|-----------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| POF | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 02H |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|--|--|
| Description | -The command defines as : ●After power off command, driver will power off base on power off sequence. ●After power off command, BUSY_N signal will drop from high to low. When finish the power off sequence, BUSY_N signal will rise from low to high. ●Power off command will turn off charge pump, T-con, source driver, gate driver, VCOM, temperature sensor, but register and SRAM data will keep until VDD off. ●SD output and VCOM will keep floating. | | | | | | | | | | |
| Restriction | | | | | | | | | | | |

5.2.4 R03H (PFS): Power off Sequence Setting Register

| R03H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|----------------|----------------|----------------|----------------|----------------|-----------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PFS | W | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 03H |
| 1st Parameter | W | 1 | - | - | Vsh_of f[1] | Vsh_of f[0] | Vsl_of f[1] | vsl_o ff[0] | vshr off[1] | vshr_off [0] | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | | |
|-------------|---|----------|--|
| Description | -The command defines as : 1st Parameter: | | |
| | Bit | Name | Description |
| | 1-0 | vshr_off | 00: 5ms. (default) 01: 10ms 10: 20ms 11: 40ms |
| | 3-2 | vsl_off | 00: 5ms. (default) 01: 10ms 10: 20ms 11: 40ms |
| | 5-4 | vsh_off | 00: 5ms. (default) 01: 10ms 10: 20ms 11: 40ms |
| Restriction | | | |

5.2.5 R04H (PON): Power ON Command

| R04H | Bit | | | | | | | | | | |
|-----------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PON | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 04H |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|--|--|
| Description | -The command defines as : ●After power on command, driver will power on base on power on sequence. ●After power on command, BUSY_N signal will drop from high to low. When finishing the power off sequence, BUSY_N signal will rise from low to high. | | | | | | | | | | |
| Restriction | | | | | | | | | | | |

5.2.6 R05H (PMES): Power ON Measure Command

| R05H | Bit | | | | | | | | | | |
|-----------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PMES | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 05H |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|---|--|--|--|--|--|--|--|--|--|--|
| Description | -The command defines as : ■ If user wants to read temperature sensor or detect low power in power off mode, user has to send this command. After power on measure command, driver will switch on relevant command with Low Power detection (R51H) and temperature measurement. (R40H). | | | | | | | | | | |
| Restriction | | | | | | | | | | | |

5.2.7 R06H (BTST): Booster Soft Start Command

| R06H | Bit | | | | | | | | | | |
|---------------|-----|------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| BTST | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 06H |
| 1st Parameter | W | 1 | BT_PH A7 | BT_PH A6 | BT_PH A5 | BT_PHA 4 | BT_PHA 3 | BT_PHA 2 | BT_PHA 1 | BT_PHA 0 | 17h |
| 2nd Parameter | W | 1 | BT_PH B7 | BT_PH B6 | BT_PH B5 | BT_PHB 4 | BT_PHB 3 | BT_PHB 2 | BT_PHB 1 | BT_PHB 0 | 17h |
| 3rd Parameter | W | 1 | - | - | BT_PH C5 | BT_PHC 4 | BT_PHC 3 | BT_PHC 2 | BT_PHC 1 | BT_PHC 0 | 17h |

| | | | | | | | | | | | |
|-------------|---|------------------------------|---------------------------|--|--|--|--|--|--|--|--|
| Description | -The command define as follows: 1st Parameter: | | | | | | | | | | |
| | Bit | Name | Description | | | | | | | | |
| | 2-0 | Driving strength of phase A | 000: period 1 | | | | | | | | |
| | | | 001: period 2 | | | | | | | | |
| | | | 010: period 3 | | | | | | | | |
| | | | 011: period 4 | | | | | | | | |
| | | | 100: period 5 | | | | | | | | |
| | | | 101: period 6 | | | | | | | | |
| | | | 110: period 7 | | | | | | | | |
| | | | 111: period 8 (default) | | | | | | | | |
| | 5-3 | Driving strength of phase A | 000: Strength 1 | | | | | | | | |
| | | | 001: Strength 2 | | | | | | | | |
| | | | 010: Strength 3 (default) | | | | | | | | |
| | | | 011: Strength 4 | | | | | | | | |
| | | | 100: Strength 5 | | | | | | | | |
| | | | 101: Strength 6 | | | | | | | | |
| | | | 110: Strength 7 | | | | | | | | |
| | | | 111: Strength 8 | | | | | | | | |
| | 7-6 | Soft start period of phase A | 00: 10mS (default) | | | | | | | | |
| | | | 01: 20mS | | | | | | | | |
| | | | 10: 30mS | | | | | | | | |
| | | | 11: 40mS | | | | | | | | |

| | | | |
|----------------|--|------------------------------|---------------------------|
| Description | 2nd Parameter: | | |
| | Bit | Name | Description |
| | 2-0 | Driving strength of phase B | 000: period 1 |
| | | | 001: period 2 |
| | | | 010: period 3 |
| | | | 011: period 4 |
| | | | 100: period 5 |
| | | | 101: period 6 |
| | | | 110: period 7 |
| | | | 111: period 8 (default) |
| | 5-3 | | 000: Strength 1 |
| | | | 001: Strength 2 |
| | | | 010: Strength 3 (default) |
| | | | 011: Strength 4 |
| | | | 100: Strength 5 |
| | | | 101: Strength 6 |
| | | | 110: Strength 7 |
| | | | 111: Strength 8 |
| | 7-6 | Soft start period of phase B | 00: 10mS (default) |
| | | | 01: 20mS |
| 10: 30mS | | | |
| 11: 40mS | | | |
| 3rd Parameter: | | | |
| Bit | Name | Description | |
| 2-0 | Minimum OFF time setting of GDR in phase C | 000: period 1 | |
| | | 001: period 2 | |
| | | 010: period 3 | |
| | | 011: period 4 | |
| | | 100: period 5 | |
| | | 101: period 6 | |
| | | 110: period 7 | |
| | | 111: period 8 (default) | |
| 5-3 | Driving strength of phase C | 000: Strength 1 | |
| | | 001: Strength 2 | |
| | | 010: Strength 3 (default) | |
| | | 011: Strength 4 | |
| | | 100: Strength 5 | |
| | | 101: Strength 6 | |
| | | 110: Strength 7 | |
| | | 111: Strength 8 | |
| Restriction | | | |

5.2.8 R07H (DSLP): Deep Sleep

| R07H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| DSLP | W | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 07H |
| 1st Parameter | W | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | A5h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | |
|-------------|---|
| Description | <p>The command define as follows: After this command is transmitted, the chip would enter the deep-sleep mode to save power. The deep sleep mode would return to standby by hardware reset. The only one parameter is a check code, the command would be excited if check code = 0xA5.</p> |
| Restriction | |

5.2.9 R10H (DTM1): Data Start transmission 1 Register

| R10H | Bit | | | | | | | | | | |
|---------------|-----|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| DTM1 | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 10H |
| 1st Parameter | W | 1 | KPixel1 | KPixel2 | KPixel3 | KPixel4 | KPixel5 | KPixel6 | KPixel7 | KPixel8 | 00H |
| 2nd Parameter | W | 1 | | | | | | | | | 00H |
| ... | W | 1 | | | | | | | | | 00H |
| Mth Parameter | W | 1 | KPixel(n-7) | KPixel(n-6) | KPixel(n-5) | KPixel(n-4) | KPixel(n-3) | KPixel(n-2) | KPixel(n-1) | KPixel(n) | 00H |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | |
|-------------|--|
| Description | <p>The command define as follows: The register is indicates that user start to transmit data, then write to SRAM. While data transmission complete, user must send command 11H. Then chip will start to send data/VCOM for panel. In B/W mode, this command writes “OLD” data to SRAM. In B/W/Red mode, this command writes “B/W” data to SRAM. In Program mode, this command writes “OTP” data to SRAM for programming.</p> |
| Restriction | |

5.2.10 R11H (DSP): Data Stop Command

| R11H | Bit | | | | | | | | | | |
|---------------|-----|------|-----------|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| DSP | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 11H |
| 1st Parameter | R | 1 | Data_flag | - | - | - | - | - | - | - | - |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|--|---|
| Description | -The command defines as : | |
| | ■ While finished the data transmitting, user must send this command to driver and read Data_flag information. | |
| | 1st Parameter: | |
| | Bit | Description |
| | 7 | - |
| | Name | Description |
| | | 0: Driver didn't receive all the data. 1: Driver has already received all of the one frame data. |
| | After “Data Start” (10h) or “Data Stop” (11h) commands and when data_flag=1, BUSY_N signal will become “0” and the refreshing of panel starts. | |
| Restriction | This command only actives when BUSY_N = “1”. | |

5.2.11 R12H (DRF): Display Refresh Command

| R12H | Bit | | | | | | | | | | |
|-----------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| DRF | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 12H |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|--|--|
| Description | -The command defines as : ■ While users send this command, driver will refresh display (data/VCOM) base on SRAM data and LUT. After display refresh command, BUSY_N signal will become "0". | | | | | | | | | | |
| Restriction | This command only actives when BUSY_N = "1". | | | | | | | | | | |

5.2.12 R13H (DTM2): Data Start transmission 2 Register

| R13H | Bit | | | | | | | | | | |
|---------------|-----|------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| DTM2 | W | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 13H |
| 1st Parameter | W | 1 | KPixe 11 | KPixel 2 | KPixel 3 | KPixel4 | KPixel5 | KPixel6 | KPixel7 | KPixel 8 | 00H |
| 2nd Parameter | W | 1 | | | | | | | | | 00H |
| | W | 1 | | | | | | | | | 00H |
| Mth Parameter | W | 1 | KPixe l(n-7) | KPixel (n-6) | KPixel(n-5) | KPixel(n -4) | KPixel(n -3) | KPixel(n -2) | KPixel(n -1) | KPixel (n) | 00H |

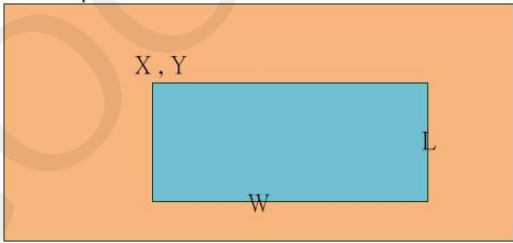
NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|---|--|--|--|--|--|--|--|--|--|--|
| Description | The command define as follows: The register is indicates that user start to transmit data, then write to SRAM. While data transmission complete, user must send command 11H. Then chip will start to send data/VCOM for panel. In B/W mode, this command writes "NEW" data to SRAM. In B/W/Red mode, this command writes "RED" data to SRAM. | | | | | | | | | | |
| Restriction | | | | | | | | | | | |

5.2.13 R14H (PDTM1): Partial Data Start transmission 1 Register

| R14H | Bit | | | | | | | | | | |
|---------------|-----|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PDTM1 | W | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 14H |
| 1st Parameter | W | 1 | X[7] | X[6] | X[5] | X[4] | X[3] | 0 | 0 | 0 | 00h |
| 2nd Parameter | | | | | | | | | | Y[8] | 00h |
| 3rd Parameter | W | 1 | Y[7] | Y[6] | Y[5] | Y[4] | Y[3] | Y[2] | Y[1] | Y[0] | 00h |
| 4th Parameter | W | 1 | W[7] | W[6] | W[5] | W[4] | W[3] | 0 | 0 | 0 | 00h |
| 5th Parameter | | | | | | | | | | L[8] | 00h |
| 6th Parameter | W | 1 | L[7] | L[6] | L[5] | L[4] | L[3] | L[2] | L[1] | L[0] | 00h |
| 7th Parameter | W | 1 | KPixel1 | KPixel2 | KPixel3 | KPixel4 | KPixel5 | KPixel6 | KPixel7 | KPixel8 | 00h |
| | W | 1 | | | | | | | | | 00h |
| Mth Parameter | W | 1 | KPixel(n-7) | KPixel(n-6) | KPixel(n-5) | KPixel(n-4) | KPixel(n-3) | KPixel(n-2) | KPixel(n-1) | KPixel(n) | 00h |

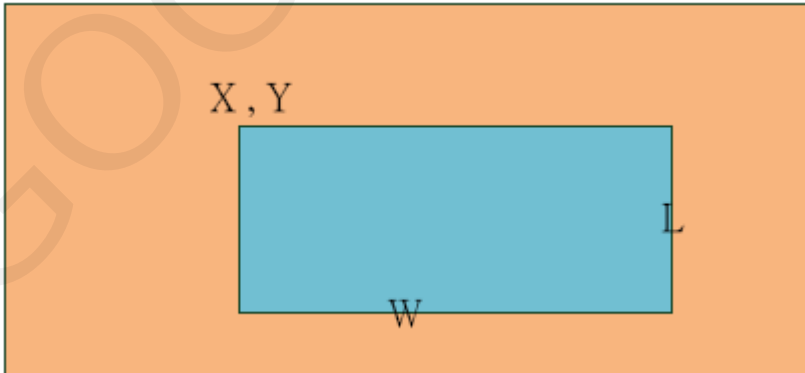
NOTE: “-” Don’t care, can be set to VDD or GND level

| | |
|-------------|--|
| Description | The command define as follows: |
| | <p>The register is indicates that user start to transmit data, then write to SRAM. While data transmission complete, user must send command 11H. Then chip will start to send data/VCOM for panel.</p> <p>In B/W mode, this command writes “OLD” data to SRAM.</p> <p>In B/W/Red mode, this command writes “B/W” data to SRAM.</p> <p>Partial update location and area</p>  <p>Note: X and W should be the multiple of 8.</p> |
| Restriction | |

5.2.14 R15H (PDTM2): Partial Data Start transmission 2 Register

| R15H | Bit | | | | | | | | | | |
|---------------|-----|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PDTM2 | W | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 15H |
| 1st Parameter | W | 1 | X[7] | X[6] | X[5] | X[4] | X[3] | 0 | 0 | 0 | 00h |
| 2nd Parameter | | | | | | | | | | Y[8] | 00h |
| 3rd Parameter | W | | Y[7] | Y[6] | Y[5] | Y[4] | Y[3] | Y[2] | Y[1] | Y[0] | 00h |
| 4th Parameter | W | 1 | W[7] | W[6] | W[5] | W[4] | W[3] | 0 | 0 | 0 | 00h |
| 5th Parameter | | | | | | | | | | L[8] | 00h |
| 6th Parameter | W | 1 | W[7] | W[6] | W[5] | W[4] | W[3] | 0 | 0 | 0 | 00h |
| 7th Parameter | W | 1 | KPixel1 | KPixel2 | KPixel3 | KPixel4 | KPixel5 | KPixel6 | KPixel7 | KPixel8 | 00h |
| | W | 1 | | | | | | | | | 00h |
| Mth Parameter | W | 1 | KPixel(n-7) | KPixel(n-6) | KPixel(n-5) | KPixel(n-4) | KPixel(n-3) | KPixel(n-2) | KPixel(n-1) | KPixel(n) | 00h |

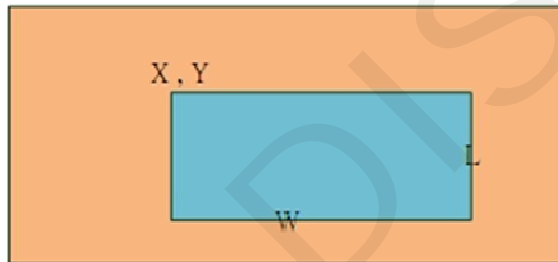
NOTE: "-" Don't care, can be set to VDD or GND level

| | |
|-------------|--|
| Description | <p>The command define as follows: The register is indicates that user start to transmit data, then write to SRAM. While data transmission complete, user must send command 11H. Then chip will start to send data/VCOM for panel.</p> <p>In B/W mode, this command writes "NEW" data to SRAM. In B/W/Red mode, this command writes "RED" data to SRAM. Partial update location and area</p>  <p>Note: X and W should be the multiple of 8.</p> |
| Restriction | |

5.2.15 R16H (PDRF): Partial Display Refresh Command

| R16H | Bit | | | | | | | | | | |
|---------------|-----|------|--------|------|------|------|------|------|------|------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PDRF | W | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 16H |
| 1st Parameter | W | 1 | X[7] | X[6] | X[5] | X[4] | X[3] | 0 | 0 | 0 | 00h |
| | | | DFV_EN | | | | | | | Y[8] | 00h |
| 3rd Parameter | W | 1 | Y[7] | Y[6] | Y[5] | Y[4] | Y[3] | Y[2] | Y[1] | Y[0] | 00h |
| 4th Parameter | W | 1 | W[7] | W[6] | W[5] | W[4] | W[3] | 0 | 0 | 0 | 00h |
| | | | | | | | | | | L[8] | 00h |
| 6th Parameter | W | 1 | L[7] | L[6] | L[5] | L[4] | L[3] | L[2] | L[1] | L[0] | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | |
|-------------|--|
| Description | -The command define as follows: |
| | <p>While user sent this command, driver will refresh display (data/VCOM) base on SRAM data and LUT. Only the area (X,Y, W, L) would update, the others pixel output would follow VCOM LUT</p> <div data-bbox="467 927 1027 1187" data-label="Image">  </div> <p>Note: X and W should be the multiple of 8. DFV_EN: data follow VCOM function on display area. DFV_EN=1: Only effective in B/W mode, if pixel from “New data” SRAM equal to “Old data” SRAM on display area, this pixel output would follow VCOM LUT. DFV_EN=0: Data doesn’t follow VCOM LUT.</p> |
| Restriction | this command only active when BUSY_N = “1”. |

5.2.16 R20H (LUTC): LUT for Vcom

| R20H | Bit | | | | | | | | | | | |
|-----------------------------|-----|------|---------------------------|----|---------------------------|----|---------------------------|----|--------------------------|----|------|-----|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code | |
| LUTC | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 20H | |
| 1st Parameter | W | 1 | 1st Level selection [1:0] | | 2nd Level selection [1:0] | | 3rd Level selection [1:0] | | 4th level selection[1:0] | | 00h | |
| 2nd Parameter | W | 1 | 1st Frame number [7:0] | | | | | | | | | 00h |
| 3rd Parameter | W | 1 | 2nd Frame number [7:0] | | | | | | | | | 00h |
| 4th Parameter | W | 1 | 3rd Frame number [7:0] | | | | | | | | | 00h |
| 5th Parameter | W | 1 | 4th Frame number [7:0] | | | | | | | | | 00h |
| 6th Parameter | W | 1 | Repeat numbers[7:0] | | | | | | | | | 00h |
| 7th~13th Parameter | W | 1 | 2nd state | | | | | | | | | 00h |
| | W | 1 | 3rd ~9th state | | | | | | | | | 00h |
| 55th ~60h Parameter | W | 1 | 10th state | | | | | | | | | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|---|--|
| Description | -The command defines as: | |
| | <p>This register is set for VCOM LUT.</p> <p>This command stores VCOM Look-Up Table with 10 states of data. Each group contains information for one state and is stored with 6 bytes, while the sixth byte indicates how many times that phase will repeat. If BWR=0 (BWR mode), User could choose 7~10 groups by R26H (SET_STG)</p> <p>If BWR=1 (BW mode), only 7 groups are used.</p> | |
| | define | description |
| | Level selection [1:0] | 00: -VCM_DC 01: VSH+VCM_DC. 10: VSL+VCM_DC. 11: Floating. |
| | Frame number [7:0] | 00000000 : 0 frame 00000001: 1 frame ... 11111110: 254 frame 11111111: 255 frame |
| Restriction | Repeat numbers [7:0] | 00000000 : 0 00000001: 1 ... 11111110: 254 11111111: 255 |

5.2.17 R21H (LUTWW): White to White LUT Register

| R21H | Bit | | | | | | | | | | | |
|--------------------------------|-----|------|------------------------------|----|------------------------------|----|------------------------------|----|-----------------------------|----|------|-----|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code | |
| LUTWW | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 21H | |
| 1st Parameter | W | 1 | 1st Level selection [1:0] | | 2nd Level selection [1:0] | | 3rd Level selection [1:0] | | 4th level selection[1:0] | | 00h | |
| 2nd Parameter | W | 1 | 1st Frame number [7:0] | | | | | | | | | 00h |
| 3rd Parameter | W | 1 | 2nd Frame number [7:0] | | | | | | | | | 00h |
| 4th Parameter | W | 1 | 3rd Frame number [7:0] | | | | | | | | | 00h |
| 5th Parameter | W | 1 | 4th Frame number [7:0] | | | | | | | | | 00h |
| 6th Parameter | W | 1 | Repeat numbers[7:0] | | | | | | | | | 00h |
| 7th~12th Parameter | W | 1 | 2nd state | | | | | | | | | 00h |
| | W | 1 | 3rd ~6th state | | | | | | | | | 00h |
| 37th ~42th Parameter | W | 1 | 7th state | | | | | | | | | 00h |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | |
|-------------|---|---|
| Description | -The command defines as: | |
| | This command stores White-to-White Look-Up Table with 7 groups of data. Each group contains information for one state and is stored with 6 bytes, while the sixth byte indicates how many times that phase will repeat. | |
| | define | description |
| | Level selection [1:0] | 00: GND 01: VSH 10: VSL 11: VSHR |
| | Frame number [7:0] | 00000000 :0 frame 00000001: 1 frame . 11111110: 254 frame 11111111: 255 frame |
| Restriction | Repeat numbers [7:0] | 00000000 : 0 time 00000001: 1 time . 11111110: 254 times 11111111: 255 times |
| | - This command only actives when BUSY_N = "1". | |

5.2.18 R22H (LUTBW/LUTR): Black to White LUT or Red LUT Register

| R22H | Bit | | | | | | | | | | | |
|--------------------------------|-----|------|------------------------------|----|------------------------------|----|------------------------------|----|-----------------------------|----|------|-----|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code | |
| LUTBW/L UTR | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 22H | |
| 1st Parameter | W | 1 | 1st Level selection [1:0] | | 2nd Level selection [1:0] | | 3rd Level selection [1:0] | | 4th level selection[1:0] | | 00h | |
| 2nd Parameter | W | 1 | 1st Frame number [7:0] | | | | | | | | | 00h |
| 3rd Parameter | W | 1 | 2nd Frame number [7:0] | | | | | | | | | 00h |
| 4th Parameter | W | 1 | 3rd Frame number [7:0] | | | | | | | | | 00h |
| 5th Parameter | W | 1 | 4th Frame number [7:0] | | | | | | | | | 00h |
| 6th Parameter | W | 1 | Repeat numbers[7:0] | | | | | | | | | 00h |
| 7th~12th Parameter | W | 1 | 2nd state | | | | | | | | | 00h |
| | W | 1 | 3rd ~9th state | | | | | | | | | 00h |
| 55th ~60th Parameter | W | 1 | 10th state | | | | | | | | | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|--|--|
| Description | <p>-The command defines as:</p> <p>This command stores White-to-White Look-Up Table with 10 groups of data. Each group contains information for one state and is stored with 6 bytes, while the sixth byte indicates how many times that phase will repeat.</p> <p>If BWR=0 (BWR mode), User could choose 7~10 groups by R26H (SET_STG)</p> <p>If BWR=1 (BW mode), only 7 groups are used.</p> | |
| | define | description |
| | Level selection [1:0] | 00: GND 01: VSH 10: VSL 11: VSHR |
| | Frame number [7:0] | 00000000 : 0 frame 00000001: 1 frame . 11111110: 254 frame 11111111: 255 frame |
| | Repeat numbers [7:0] | 00000000 : 0 time 00000001: 1 time . 11111110: 254 times 11111111: 255 times |
| Restriction | - This command only actives when BUSY_N = “1”. | |

5.2.19 R23H (LUTWB/LUTW): White to Black LUT or White LUT Register

| R23H | Bit | | | | | | | | | | | |
|--------------------------------|-----|------|------------------------------|----|------------------------------|----|------------------------------|----|-----------------------------|----|------|-----|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code | |
| LUTBW/L UTR | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 23H | |
| 1st Parameter | W | 1 | 1st Level selection [1:0] | | 2nd Level selection [1:0] | | 3rd Level selection [1:0] | | 4th level selection[1:0] | | 00h | |
| 2nd Parameter | W | 1 | 1st Frame number [7:0] | | | | | | | | | 00h |
| 3rd Parameter | W | 1 | 2nd Frame number [7:0] | | | | | | | | | 00h |
| 4th Parameter | W | 1 | 3rd Frame number [7:0] | | | | | | | | | 00h |
| 5th Parameter | W | 1 | 4th Frame number [7:0] | | | | | | | | | 00h |
| 6th Parameter | W | 1 | Repeat numbers[7:0] | | | | | | | | | 00h |
| 7th~12th Parameter | W | 1 | 2nd state | | | | | | | | | 00h |
| | W | 1 | 3rd ~6th state | | | | | | | | | 00h |
| 37th ~42th Parameter | W | 1 | 7th state | | | | | | | | | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|---|---|
| Description | -The command defines as: | |
| | This command stores White-to-White Look-Up Table with 7 groups of data. Each group contains information for one state and is stored with 6 bytes, while the sixth byte indicates how many times that phase will repeat. | |
| | define | description |
| | Level selection [1:0] | 00: GND 01: VSH 10: VSL 11: VSHR |
| | Frame number [7:0] | 00000000 :0 frame 00000001: 1 frame . 11111110: 254 frame 11111111: 255 frame |
| Restriction | Repeat numbers [7:0] | 00000000 : 0 time 00000001: 1 time . 11111110: 254 times 11111111: 255 times |
| | - This command only actives when BUSY_N = “1”. | |

5.2.20 R24H (LUTBB/LUTB): Black to Black LUT or Black LUT Register

| R24H | Bit | | | | | | | | | | | |
|--------------------------------|-----|------|------------------------------|----|------------------------------|----|------------------------------|----|-----------------------------|----|------|-----|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code | |
| LUTBB/LU TB | W | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 24H | |
| 1st Parameter | W | 1 | 1st Level selection [1:0] | | 2nd Level selection [1:0] | | 3rd Level selection [1:0] | | 4th level selection[1:0] | | 00h | |
| 2nd Parameter | W | 1 | 1st Frame number [7:0] | | | | | | | | | 00h |
| 3rd Parameter | W | 1 | 2nd Frame number [7:0] | | | | | | | | | 00h |
| 4th Parameter | W | 1 | 3rd Frame number [7:0] | | | | | | | | | 00h |
| 5th Parameter | W | 1 | 4th Frame number [7:0] | | | | | | | | | 00h |
| 6th Parameter | W | 1 | Repeat numbers[7:0] | | | | | | | | | 00h |
| 7th~12th Parameter | W | 1 | 2nd state | | | | | | | | | 00h |
| | W | 1 | 3rd ~6th state | | | | | | | | | 00h |
| 37th ~42th Parameter | W | 1 | 7th state | | | | | | | | | 00h |

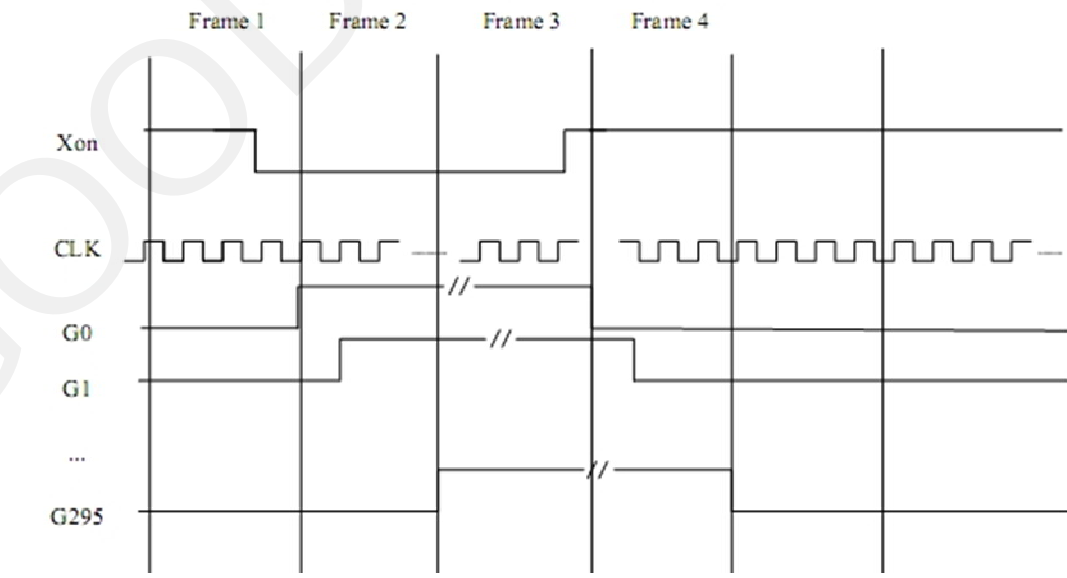
NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|--|--|
| Description | <p>-The command defines as:</p> <p>This command stores White-to-White Look-Up Table with 7 groups of data. Each group contains information for one state and is stored with 6 bytes, while the sixth byte indicates how many times that phase will repeat.</p> | |
| | define | description |
| | Level selection [1:0] | 00: GND 01: VSH 10: VSL 11: VSHR |
| | Frame number [7:0] | 00000000 : 0 frame 00000001: 1 frame . 11111110: 254 frame 11111111: 255 frame |
| | Repeat numbers [7:0] | 00000000 : 0 time 00000001: 1 time . 11111110: 254 times 11111111: 255 times |
| Restriction | - This command only activates when BUSY_N = “1”. | |

5.2.21 R25H (LUTC Option): LUTC option

| R25H | Bit | | | | | | | | | | |
|---------------|-----|------|--------------|----|----|----|----|----|--------------|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| LUTC option | W | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 25H |
| 1st Parameter | W | 1 | | | | | | | XON [9:8] | | 00h |
| 2nd Parameter | W | 1 | XON [7:0] | | | | | | | | 00h |
| 3rd Parameter | W | 1 | | | | | | | ST_CHV [9:8] | | 00h |
| 4th Parameter | W | 1 | ST_CHV [7:0] | | | | | | | | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|--|--|---|
| Description | -The command defines as: This register is set for VCOM LUT. | |
| | XON[9:0] | All Gate ON 0000000000: No all gate on. 0000000001: State1 gate power on 1111111111: State1~10 all gate power on |
| | ST_CHV[9:0] | Control VCOM Power as High 0000000000: No VCOM High voltage 0000000001: State1 VCOM High voltage 1111111111: State1~10 VCOM High voltage |
| <p>Xon function:</p>  | | |
| Restriction | - This command only actives when BUSY_N = “1”. | |

5.2.22 R26H (SET_STG): Set VCOM/Red States

| R26H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|----|----|-------------------|----|------------------|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| SET_STG | W | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 26H |
| 1st Parameter | W | 1 | | | - | - | vcom_stg_sel[1:0] | | b2w_stg_sel[1:0] | | 00h |

Description This command is used to set VCOM/Red LUT states
Function of vcom_stg_sel [1:0]/ b2w_stg_sel[1:0] are shown below

| Value | Stages |
|-------|--------|
| 00 | 7 |
| 01 | 8 |
| 10 | 9 |
| 11 | 10 |

Default is set as 7 stages.

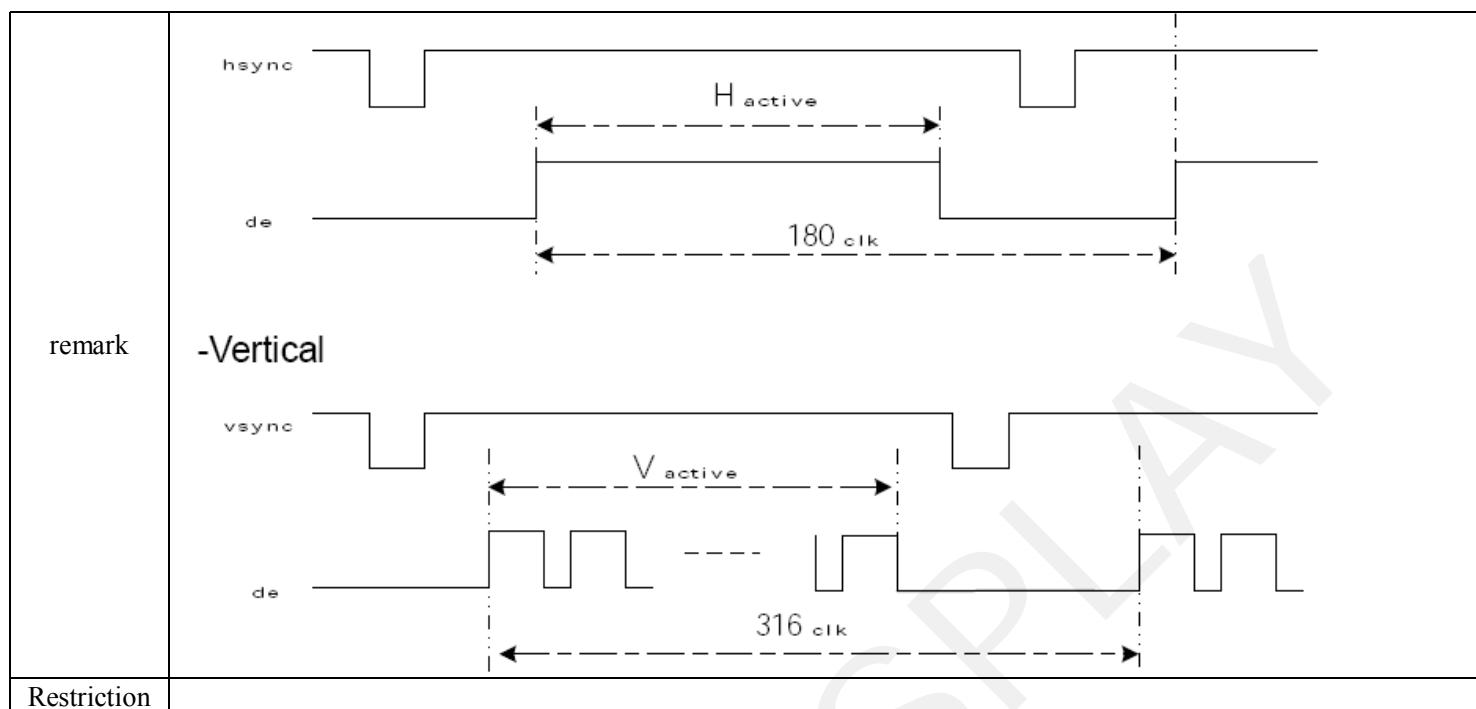
Restriction These settings are valid for BWR mode.

5.2.23 R30H (OSC): OSC control Register

| R30H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|--------|----|----|--------|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| OSC | W | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 30H |
| 1st Parameter | W | 1 | - | - | M[2:0] | | | N[2:0] | | | 3Ah |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | | | | | | | | | | | |
|-------------|---|------|------------|---|-------|------------|---|-------|------------|---|----------------|------------|
| Description | -The command defines as: The command controls the OSC clock frequency. The OSC structure must support the following frame rates: | | | | | | | | | | | |
| | M | N | Frame rate | M | N | Frame rate | M | N | Frame rate | M | N | Frame rate |
| 1 | 1 | 29HZ | 3 | 1 | 86HZ | 5 | 1 | 150HZ | 7 | 1 | 200HZ | |
| | 2 | 14HZ | | 2 | 43HZ | | 2 | 72HZ | | 2 | 100HZ | |
| | 3 | 10HZ | | 3 | 29HZ | | 3 | 48HZ | | 3 | 67HZ | |
| | 4 | 7HZ | | 4 | 21HZ | | 4 | 36HZ | | 4 | 50HZ (default) | |
| | 5 | 6HZ | | 5 | 17HZ | | 5 | 29HZ | | 5 | 40HZ | |
| | 6 | 5HZ | | 6 | 14HZ | | 6 | 24HZ | | 6 | 33HZ | |
| | 7 | 4HZ | | 7 | 12HZ | | 7 | 20HZ | | 7 | 29HZ | |
| 2 | 1 | 57HZ | 4 | 1 | 114HZ | 6 | 1 | 171HZ | | | | |
| | 2 | 29HZ | | 2 | 57HZ | | 2 | 86HZ | | | | |
| | 3 | 19HZ | | 3 | 38HZ | | 3 | 57HZ | | | | |
| | 4 | 14HZ | | 4 | 29HZ | | 4 | 43HZ | | | | |
| | 5 | 11HZ | | 5 | 23HZ | | 5 | 34HZ | | | | |
| | 6 | 10HZ | | 6 | 19HZ | | 6 | 29HZ | | | | |
| | 7 | 8HZ | | 7 | 16HZ | | 7 | 24HZ | | | | |



5.2.24 R40H (TSC): Temperature Sensor Command

| R40H | Bit | | | | | | | | | | |
|---------------|-----|------|-----------|----------|----------|----------|----------|----------|----------|----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TSC | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 40H |
| 1st Parameter | R | 1 | D10/TS[9] | D9/TS[8] | D8/TS[7] | D7/TS[6] | D6/TS[5] | D5/TS[4] | D4/TS[3] | D3/TS[2] | - |
| 2nd Parameter | R | 1 | D2/TS[1] | D1/TS[0] | D0 | - | - | - | - | - | - |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|---|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|---------|--|
| Description | <p>-The command define as follows: This command indicates the temperature value. If R41H(TSE) bit7 set to 0, this command reads internal temperature sensor value. If R41H(TSE) bit7 set to 1, this command reads external (LM75) temperature sensor value</p> | | | | | | | | | | |
| | TS[9:2]/D[10:3] | T (° C) | TS[9:2]/D[10:3] | T (° C) | TS[9:2]/D[10:3] | T (° C) | TS[9:2]/D[10:3] | T (° C) | TS[9:2]/D[10:3] | T (° C) | |
| | 11100111 | -25 | 00000000 | 0 | 00011001 | 25 | | | | | |
| | 11101000 | -24 | 00000001 | 1 | 00011010 | 26 | | | | | |
| | 11101001 | -23 | 00000010 | 2 | 00011011 | 27 | | | | | |

| | | | | | | | | | | | | | | | | | |
|-------------|---|--|----------|----|----------|----|--|---------|---------|----|----|----|-------|----|------|----|-------|
| | 11101010 | -22 | 00000011 | 3 | 00011100 | 28 | | | | | | | | | | | |
| | 11101011 | -21 | 00000100 | 4 | 00011101 | 29 | | | | | | | | | | | |
| | 11101100 | -20 | 00000101 | 5 | 00011110 | 30 | | | | | | | | | | | |
| | 11101101 | -19 | 00000110 | 6 | 00011111 | 31 | | | | | | | | | | | |
| | 11101110 | -18 | 00000111 | 7 | 00100000 | 32 | | | | | | | | | | | |
| | 11101111 | -17 | 00001000 | 8 | 00100001 | 33 | | | | | | | | | | | |
| | 11110000 | -16 | 00001001 | 9 | 00100010 | 34 | | | | | | | | | | | |
| | 11110001 | -15 | 00001010 | 10 | 00100011 | 35 | | | | | | | | | | | |
| | 11110010 | -14 | 00001011 | 11 | 00100100 | 36 | | | | | | | | | | | |
| | 11110011 | -13 | 00001100 | 12 | 00100101 | 37 | | | | | | | | | | | |
| | 11110100 | -12 | 00001101 | 13 | 00100110 | 38 | | | | | | | | | | | |
| | 11110101 | -11 | 00001110 | 14 | 00100111 | 39 | | | | | | | | | | | |
| | 11110110 | -10 | 00001111 | 15 | 00101000 | 40 | | | | | | | | | | | |
| | 11110111 | -9 | 00010000 | 16 | 00101001 | 41 | | | | | | | | | | | |
| | 11111000 | -8 | 00010001 | 17 | 00101010 | 42 | | | | | | | | | | | |
| | 11111001 | -7 | 00010010 | 18 | 00101011 | 43 | | | | | | | | | | | |
| | 11111010 | -6 | 00010011 | 19 | 00101100 | 44 | | | | | | | | | | | |
| | 11111011 | -5 | 00010100 | 20 | 00101101 | 45 | | | | | | | | | | | |
| | 11111100 | -4 | 00010101 | 21 | 00101110 | 46 | | | | | | | | | | | |
| | 11111101 | -3 | 00010110 | 22 | 00101111 | 47 | | | | | | | | | | | |
| | 11111110 | -2 | 00010111 | 23 | 00110000 | 48 | | | | | | | | | | | |
| | 11111111 | -1 | 00011000 | 24 | 00110001 | 49 | | | | | | | | | | | |
| | | <table><tr><td>TS[1:0]</td><td>T (° C)</td></tr><tr><td>00</td><td>+0</td></tr><tr><td>01</td><td>+0.25</td></tr><tr><td>10</td><td>+0.5</td></tr><tr><td>11</td><td>+0.75</td></tr></table> | | | | | | TS[1:0] | T (° C) | 00 | +0 | 01 | +0.25 | 10 | +0.5 | 11 | +0.75 |
| | | TS[1:0] | T (° C) | | | | | | | | | | | | | | |
| 00 | | +0 | | | | | | | | | | | | | | | |
| 01 | | +0.25 | | | | | | | | | | | | | | | |
| 10 | | +0.5 | | | | | | | | | | | | | | | |
| 11 | +0.75 | | | | | | | | | | | | | | | | |
| Restriction | This command only actives after R04H(PON) or R05H(PMES) | | | | | | | | | | | | | | | | |

5.2.25 R41H (TSE): Temperature Sensor Calibration Register

| R41H | Bit | | | | | | | | | | |
|---------------|-----|------|-----|----|----|----|-------|-------|-------|-------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TSE | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 41H |
| 1st Parameter | W | 1 | TSE | - | - | - | TO[3] | TO[2] | TO[1] | TO[0] | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|--|-------------------------------|--|--|--|--|--|--|--|--|--|
| Description | -The command defines as: This command indicates the driver IC temperature sensor enable and calibration function. | | | | | | | | | | |
| | Bit | temperature | | | | | | | | | |
| | 2-0 | mean temperature offset value | | | | | | | | | |
| | | 000:0°C | | | | | | | | | |
| | | 001:1°C | | | | | | | | | |
| | | 010:2°C | | | | | | | | | |
| | | ... | | | | | | | | | |
| | | 111:7°C | | | | | | | | | |
| | 3 | Positive and negative value | | | | | | | | | |
| | | 0: " + " | | | | | | | | | |
| | | 1: " - " | | | | | | | | | |

| | | | |
|--------------------|---|---|--|
| | 7 | Internal temperature sensor enable | |
| | | 0: Internal temperature sensor enable.(default) | |
| | | 1: Internal temperature sensor disable, using externaltemperature sensor. | |
| | For example: | | |
| | 1100: - 4 degree c | | |
| 0111: + 7 degree c | | | |
| Restriction | This command only actives after R04H(PON) or R05H(PMES) | | |

5.2.26 R42H (TSW): Temperature Sensor Write Register

| R42H | Bit | | | | | | | | | | |
|---------------|-----|------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TSW | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 42H |
| 1st Parameter | W | 1 | WATTR[7] | WATTR[6] | WATTR[5] | WATTR[4] | WATTR[3] | WATTR[2] | WATTR[1] | WATTR[0] | 00h |
| 2nd Parameter | W | 1 | WMSB[7] | WMSB[6] | WMSB[5] | WMSB[4] | WMSB[3] | WMSB[2] | WMSB[1] | WMSB[0] | 00h |
| 3rd Parameter | W | 1 | WLSB[7] | WLSB[6] | WLSB[5] | WLSB[4] | WLSB[3] | WLSB[2] | WLSB[1] | WLSB[0] | 00h |

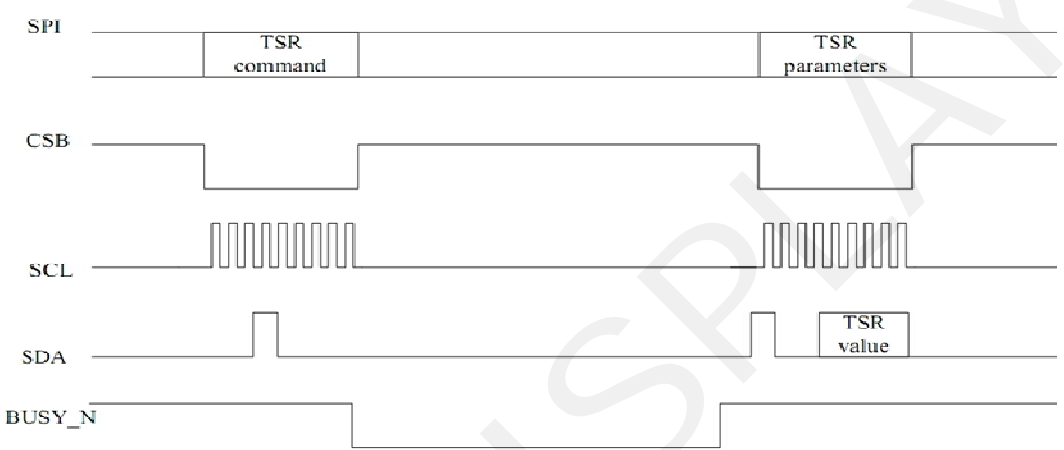
NOTE: "-" Don't care, can be set to VDD or GND level

| | | |
|-------------|--|---|
| Description | -The command defines as: This command writes the temperature. 1st Parameter: | |
| | Bit | temperature |
| | 2-0 | Pointer setting |
| | 5-3 | User-defined address bits (A2, A1, A0) |
| | 7-6 | I2C Write Byte Number 00: 1 byte (head byte only) 01: 2 bytes (head byte + pointer) 10: 3 bytes (head byte + pointer + 1st parameter) 11: 4 bytes (head byte + pointer + 1st parameter + 2nd parameter) |
| | 2nd Parameter: | |
| | Bit | temperature |
| | 7-0 | MSByte of write-data to external temperature sensor |
| | 3rd Parameter: | |
| | Bit | temperature |
| | 7-0 | LSByte of write-data to external temperature sensor |
| | Restriction | This command only actives after R04H(PON) or R05H(PMES) |

5.2.27 R43H (TSR): Temperature Sensor Read Register

| R43H | Bit | | | | | | | | | | |
|---------------|-----|------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TSC | W | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 43H |
| 1st Parameter | R | 1 | RMSB[7] | RMSB[6] | RMSB[5] | RMSB[4] | RMSB[3] | RMSB[2] | RMSB[1] | RMSB[0] | - |
| 2nd Parameter | R | 1 | RLSB[7] | RLSB[6] | RLSB[5] | RLSB[4] | RLSB[3] | RLSB[2] | RLSB[1] | RLSB[0] | - |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | |
|---|--|---|
| Description | -The command defines as: This command reads the temperature sensed by the temperature sensor. | |
| | 1st Parameter: | |
| | Bit | temperature |
| | 7-0 | MSByte of read-data from external temperature sensor |
| | 2nd Parameter: | |
| | Bit | temperature |
| | 7-0 | LSByte of write-data from external temperature sensor |
|  | | |
| Restriction | This command only actives after R04H(PON) or R05H(PMES) | |

5.2.28 R50H (CDI): VCOM and DATA interval setting Register

| R50H | Bit | | | | | | | | | | |
|---------------|-----|------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| CDI | W | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 50H |
| 1st Parameter | W | 1 | VBD[1] | VBD[0] | DDX[1] | DDX[0] | CDI[3] | CDI[2] | CDI[1] | CDI[0] | D7h |

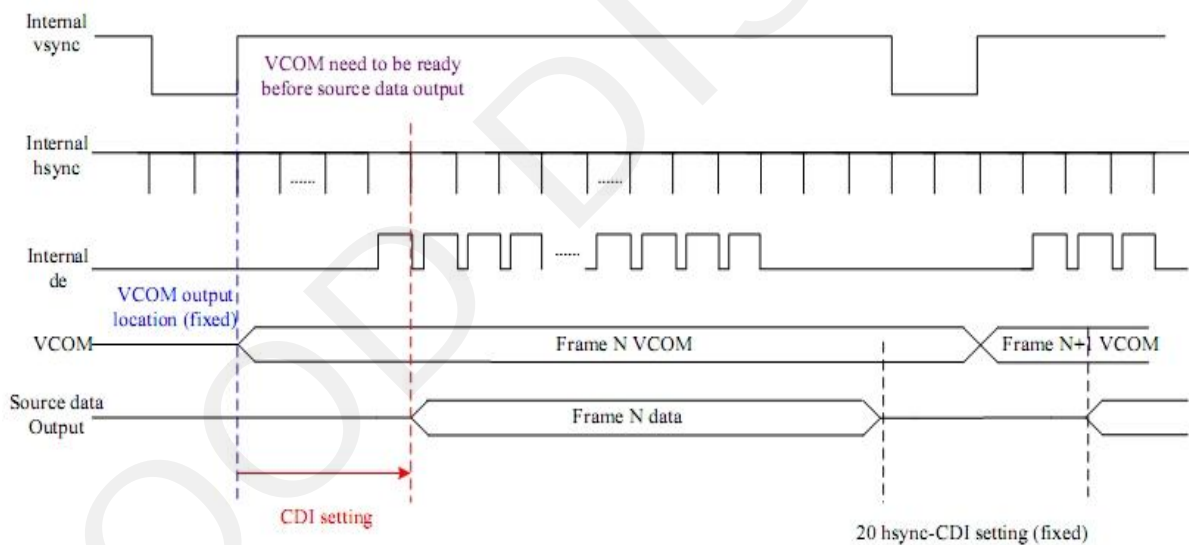
NOTE: "-" Don't care, can be set to VDD or GND level

Description -The command defines as:

1st Parameter:

CDI[1:0]: This command indicates the interval of VCOM and data output. When setting the vertical back porch, the total blanking will be keep (20hsync).

| Bit | |
|-----|--|
| 3-0 | <p>Vcom and data interval</p> <p>0000: 17 hsync</p> <p>0001:16 hsync</p> <p>0010:15 hsync</p> <p>0011:14 hsync</p> <p>0100:13 hsync</p> <p>0101:12 hsync</p> <p>0110:11 hsync</p> <p>0111:10 hsync</p> <p>1000:9 hsync</p> <p>1001:8 hsync</p> <p>1010:7 hsync</p> <p>1011:6 hsync</p> <p>1100:5 hsync</p> <p>1101:4 hsync</p> <p>1110:3 hsync</p> <p>1111:2 hsync</p> |



VBD[1:0] Border data selection.

B/W/Red mode(BWR=0)

| Bit 5-4 | Bit7-6 | Description |
|-------------|--------------|-------------|
| DDX[0] | VBD[1:0] | LUT |
| 0 | 00 | Floating |
| | 01 | LUTR |
| | 10 | LUTW |
| | 11 | LUTB |
| 1 (default) | 00 | LUTB |
| | 01 | LUTW |
| | 10 | LUTR |
| | 11 (default) | Floating |

| B/W mode (BWR=1) | | |
|---|----------------|--------------|
| Bit 5-4 | Bit7-6 | description |
| DDX[0] | VBD[1:0] | LUT |
| 00 | 00 | Floating |
| | 01 | LUTBW (1->0) |
| | 10 | LUTWB (0->1) |
| | 11 | Floating |
| 01 (default) | 00 | Floating |
| | 01 | LUTWB (1->0) |
| | 10 | LUTBW (0->1) |
| | 11 | Floating |
| DDX[1:0]: Data polarity 1. DDX[1] for RED data, DDX[0] for BW data in the B/W/Red mode 2. DDX[0] for B/W mode | | |
| B/W/Red mode(BWR=0) | | |
| Bit 5-4 | Description | |
| DDX[1:0] | Data (Red/B/W) | LUT |
| 00 | 00 | LUTW |
| | 01 | LUTB |
| | 10 | LUTR |
| | 11 | LUTR |
| 01(default) | 00 | LUTB |
| | 01 | LUTW |
| | 10 | LUTR |
| | 11 | LUTR |
| 10 | 00 | LUTR |
| | 01 | LUTR |
| | 10 | LUTW |
| | 11 | LUTB |
| 11 | 00 | LUTR |
| | 01 | LUTR |
| | 10 | LUTB |
| | 11 | LUTW |
| B/W mode (BWR=1) | | |
| Bit 5-4 | Description | |
| DDX[0] | Data (B/W) | LUT |
| 00 | 00 | LUTWW (0->0) |
| | 01 | LUTBW(1->0) |
| | 10 | LUTWB(0->1) |
| | 11 | LUTBB(1->1) |
| 1 (default) | 00 | LUTBB(0->0) |
| | 01 | LUTWB(1->0) |
| | 10 | LUTBW(0->1) |
| | 11 | LUTWW(1->1) |

5.2.29 R51H (LPD): Lower Power Detection Register

| R51H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|----|----|----|----|----|-----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| LPD | W | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 51H |
| 1st Parameter | R | 1 | - | - | - | - | - | - | - | LPD | - |

NOTE: “-” Don’t care, can be set to VDD or GND level

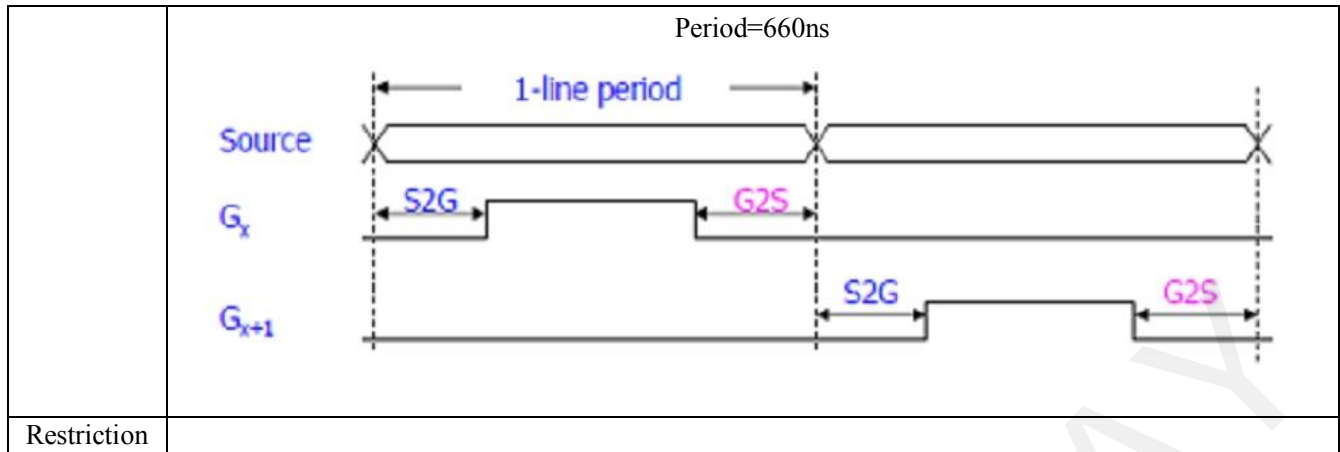
| | | |
|-------------|--|------------------|
| Description | -The command defines as: This command indicates the input power condition. Host can read this data to understand the battery' s condition. When LPD=" 1 " , system input power is normal. When LPD=" 0 " , system input power is lower (VDD<2.5v, which could be select in RE6H (LVSEL)). 1st Parameter: | |
| | Bit 0 | LPD |
| | 0 | Low power input. |
| | 1 | Normal status |
| Restriction | | |

5.2.30 R60H (TCON): TCON setting

| R60H | Bit | | | | | | | | | | |
|---------------|-----|------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TCON | W | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 60H |
| 1st Parameter | W | 1 | S2G[3] | S2G[2] | S2G[1] | S2G[0] | G2S[3] | G2S[2] | G2S[1] | G2S[0] | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|--|--|
| Description | - The command define Non-overlap period of gate and source as below: 1st Parameter: | |
| | Bit | Period |
| | S2G[3:0]/G2S[3:0] | 0000: 4 clock(default) 0001: 8 clock 0010: 12 clock 0011:16 clock 0100: 20 clock 0101: 24 clock 0110: 28 clock 0111: 32 clock 1000: 36 clock 1001: 40 clock 1010: 44 clock 1011: 48 clock 1100: 52 clock 1101: 56 clock 1110: 60 clock 1111: 64 clock |
| | Period=660ns | |



5.2.31 R61H (TRES): Resolution setting

| R61H | Bit | | | | | | | | | | |
|---------------|-----|------|---------|---------|---------|---------|---------|---------|---------|----------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TRES | W | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 61H |
| 1st Parameter | W | 1 | HRES(7) | HRES(6) | HRES(5) | HRES(4) | HRES(3) | - | - | - | 00h |
| 2nd Parameter | W | 1 | | | | | | | | -VRES(8) | 00h |
| 3rd Parameter | W | 1 | VRES(7) | VRES(6) | VRES(5) | VRES(4) | VRES(3) | VRES(2) | VRES(1) | VRES(0) | 00h |

NOTE: "-" Don't care, can be set to VDD or GND level

| | |
|-------------|--|
| Description | <p>-The command define as follows: When using register: Horizontal display resolution = HRES Vertical display resolution = VRES Channel disable calculation: GD : First G active = G0; LAST active GD= first active +VRES[8:0] -1 SD : First active channel: =S0 ; LAST active SD= first active +HRES[7:3]*8-1 EX :128X272 GD: First G active = G0 LAST active GD= 0+272-1= 271; (G271) SD : First active channel: =S0</p> |
| Restriction | |

5.2.32 R62H (TSGS): Source & gate start setting

| R62H | Bit | | | | | | | | | | |
|---------------|-----|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TSGS | W | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 62H |
| 1st Parameter | W | 1 | S_Start (7) | S_Start (6) | S_Start (5) | S_Start (4) | S_Start (3) | | | | 00h |
| 2nd Parameter | W | 1 | | | | gscan | | - | - | -G_start [8] | 00h |
| 3rd Parameter | W | 1 | G_Start (7) | G_Start (6) | G_Start (5) | G_Start (4) | G_Start (3) | G_Start (2) | G_Start (1) | G_Start (0) | 00h |

NOTE: "-" Don't care, can be set to VDD or GND level

| | |
|-------------|---|
| Description | -The command define as follows: 1.S_Start [8:0] describe which source output line is the first date line 2.G_Start[8:0] describe which gate line is the first scan line 3. gscan :Gate scan select 0: Normal scan 1: Cascade type 2 scan |
| Restriction | S_Start should be the multiple of 8 |

5.2.33 R70H (REV): REVISION register

| R70H | Bit | | | | | | | | | | |
|---------------|-----|------|---------|---------|---------|---------|---------|---------|--------|--------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| REV | W | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 70H |
| 1st Parameter | R | 1 | REV[7] | REV[6] | REV[5] | REV[4] | REV[3] | REV[2] | REV[1] | REV[0] | - |
| 2nd Parameter | R | 1 | REV[15] | REV[14] | REV[13] | REV[12] | REV[11] | REV[10] | REV[9] | REV[8] | - |

NOTE: "-" Don't care, can be set to VDD or GND level

| | |
|-------------|---|
| Description | -The command define as follows: The LUT_REV is read from OTP address = 0x001.& 0x002 |
| Restriction | - This command only actives when BUSY_N = "1" . |

5.2.34 R71H (FLG): Status register

| R71H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|---------|-----------|-----------|-----|-----|--------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| FLG | W | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 71H |
| 1st Parameter | R | 1 | | | I2C_ERR | I2C_BUSYN | Data_flag | PON | POF | BUSY_N | - |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|--|--|-------------------------------------|--|--|--|--|--|--|--|--|
| Description | -The command defines as: This command indicates the IC status. Host can read this data to understand the IC status. 1st Parameter: | | | | | | | | | | |
| | Bit | | Function | | | | | | | | |
| | 5 | | I2C master error status | | | | | | | | |
| | 4 | | I2C master busy status (low active) | | | | | | | | |

| | | |
|-------------|--|--|
| | 3 | Driver has already received one frame data |
| | 2 | PON 0: Not in PON mode 1: In PON mode |
| | 1 | POF 0: Not in POF mode(default) 1: In POF mode |
| | 0 | Driver busy status(low active) |
| | | |
| Restriction | User can send this command in any time. It doesn't have restriction of BUSY_N. | |

5.2.35 R80H (AMV): Auto Measure VCOM register

| R80H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|---------|---------|-----|------|-----|------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| AMV | W | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 80H |
| 1st Parameter | W | 1 | - | - | AMVT[1] | AMVT[0] | XON | AMVS | AMV | AMVE | 10H |

NOTE: “-” Don't care, can be set to VDD or GND level

| | | |
|-------------|---|--|
| Description | -The command define as follows: This command indicates the IC status. Host can read this data to understand the IC status. 1st Parameter: | |
| | Bit | Function |
| | 0 | AMVE: Auto Measure Vcom Setting 0:Auto measure VCOM disable (default) 1: Auto measure VCOM enable |
| | 1 | AMV: Analog signal 0:Get Vcom value from R81h(default) 1:Get Vcom value in analog signal |
| | 2 | AMVS: setting for Source output of AMV 0: Source output 0V during Auto Measure VCOM period. (default) 1: Source output VSHR during Auto Measure VCOM period. |
| | 3 | XON: setting for all Gate ON of AMVB 0: Gate normally scan during Auto Measure VCOM period. (default) 1: All Gate ON during Auto Measure VCOM period. |
| | 5-4 | The sensing time of VCOM detection 00: 3s 01: 5s (default) 10: 8s 11: 10s |
| | | |
| Restriction | This command only actives when BUSY_N = “1” . | |

5.2.36 R81H (VV): Vcom Value register

| R81H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|-------|-------|-------|-------|-------|-------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| VV | W | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 81H |
| 1st Parameter | R | 1 | - | - | VV[5] | VV[4] | VV[3] | VV[2] | VV[1] | VV[0] | |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|---|------------|-----|------------|--|-----------|-----|------------|--|-----------|-----|
| Description | -The command defines as: This command could get the Vcom value 1st Parameter: | | | | | | | | | | |
| | Bit | Function | | | | | | | | | |
| | 5-0 | Vcom value | | | | | | | | | |
| | | VCOM[5:0] | | Voltage(V) | | VCOM[5:0] | | Voltage(V) | | VCOM[5:0] | |
| | | 000000 | 00h | -0.1 | | 010100 | 14h | -1.1 | | 101000 | 28h |
| | | 000001 | 01h | -0.15 | | 010101 | 15h | -1.15 | | 101001 | 28h |
| | | 000010 | 02h | -0.2 | | 010110 | 16h | -1.2 | | 101001 | 2Ah |
| | | 000011 | 03h | -0.25 | | 010111 | 17h | -1.25 | | 101011 | 2Bh |
| | | 000100 | 04h | -0.3 | | 011000 | 18h | -1.3 | | 101100 | 2Ch |
| | | 000100 | 05h | -0.35 | | 011001 | 19h | -1.35 | | 101101 | 2Dh |
| | | 000110 | 06h | -0.4 | | 011010 | 1Ah | -1.4 | | 101110 | 2Eh |
| | | 000111 | 07h | -0.45 | | 011011 | 1Bh | -1.45 | | 101111 | 2Fh |
| | | 001000 | 08h | -0.5 | | 011100 | 1Ch | -1.5 | | 101111 | 30h |
| | | 001001 | 09h | -0.55 | | 011101 | 1Dh | -1.55 | | 110001 | 31h |
| | | 001010 | 0Ah | -0.6 | | 011110 | 1Eh | -1.6 | | 110010 | 32h |
| | | 001010 | 0Bh | -0.65 | | 011111 | 1Fh | -1.65 | | 110011 | 33h |
| | | 001100 | 0Ch | -0.7 | | 011111 | 20h | -1.7 | | 110100 | 34h |
| | | 001101 | 0Dh | -0.75 | | 100001 | 21h | -1.75 | | 110101 | 35h |
| | | 001110 | 0Eh | -0.8 | | 100010 | 22h | -1.8 | | 110110 | 36h |
| | | 001111 | 0Fh | -0.85 | | 100011 | 23h | -1.85 | | 110110 | 37h |
| | | 010000 | 10h | -0.9 | | 100100 | 24h | -1.9 | | 111000 | 38h |
| | | 010001 | 10h | -0.95 | | 100100 | 25h | -1.95 | | 111001 | 39h |
| | | 010010 | 12h | -1 | | 100110 | 26h | -2 | | 111010 | 3Ah |
| | | 010010 | 13h | -1.05 | | 100111 | 27h | -2.05 | | | |
| Restriction | This command only actives when BUSY_N = "1". | | | | | | | | | | |

5.2.37 R82H (VDCS): Vcom_DC Setting register

| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
|---------------|-----|------|----|----|---------|----------|----------|----------|----------|----------|------|
| VDCS | W | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 82H |
| 1st Parameter | W | 1 | - | - | VDCS[5] | VDCS [4] | VDCS [3] | VDCS [2] | VDCS [1] | VDCS [0] | 00h |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | |
|-------------|--|------------|------------|-----------|------------|-----------|------------|-----------|------------|
| Description | -The command defines as: This command set the VCOM DC value. Driver will base on this value for VCM_DC. 1st Parameter: | | | | | | | | |
| | Bit | Function | | | | | | | |
| | 5-0 | VCOM value | | | | | | | |
| | | VCOM[5:0] | Voltage(V) | VCOM[5:0] | Voltage(V) | VCOM[5:0] | Voltage(V) | VCOM[5:0] | Voltage(V) |
| | 000000 | 00h | -0.1 | 010100 | 14h | -1.1 | 101000 | 28h | -2.1 |
| | 000001 | 01h | -0.15 | 010101 | 15h | -1.15 | 101001 | 28h | -2.15 |
| | 000010 | 02h | -0.2 | 010110 | 16h | -1.2 | 101001 | 2Ah | -2.2 |
| | 000011 | 03h | -0.25 | 010111 | 17h | -1.25 | 101011 | 2Bh | -2.25 |
| | 000100 | 04h | -0.3 | 011000 | 18h | -1.3 | 101100 | 2Ch | -2.3 |
| | 000100 | 05h | -0.35 | 011001 | 19h | -1.35 | 101101 | 2Dh | -2.35 |
| | 000110 | 06h | -0.4 | 011010 | 1Ah | -1.4 | 101110 | 2Eh | -2.4 |
| | 000111 | 07h | -0.45 | 011011 | 1Bh | -1.45 | 101111 | 2Fh | -2.45 |
| | 001000 | 08h | -0.5 | 011100 | 1Ch | -1.5 | 101111 | 30h | -2.5 |
| | 001001 | 09h | -0.55 | 011101 | 1Dh | -1.55 | 110001 | 31h | -2.55 |
| | 001010 | 0Ah | -0.6 | 011110 | 1Eh | -1.6 | 110010 | 32h | -2.6 |
| | 001010 | 0Bh | -0.65 | 011111 | 1Fh | -1.65 | 110011 | 33h | -2.65 |
| | 001100 | 0Ch | -0.7 | 011111 | 20h | -1.7 | 110100 | 34h | -2.7 |
| | 001101 | 0Dh | -0.75 | 100001 | 21h | -1.75 | 110101 | 35h | -2.75 |
| | 001110 | 0Eh | -0.8 | 100010 | 22h | -1.8 | 110110 | 36h | -2.8 |
| | 001111 | 0Fh | -0.85 | 100011 | 23h | -1.85 | 110110 | 37h | -2.85 |
| | 010000 | 10h | -0.9 | 100100 | 24h | -1.9 | 111000 | 38h | -2.9 |
| | 010001 | 10h | -0.95 | 100100 | 25h | -1.95 | 111001 | 39h | -2.95 |
| | 010010 | 12h | -1 | 100110 | 26h | -2 | 111010 | 3Ah | -3 |
| | 010010 | 13h | -1.05 | 100111 | 27h | -2.05 | | | |
| Restriction | This command only actives when BUSY_N = "1". | | | | | | | | |

5.2.38 RA0H (PGM): Program Mode

| RA0H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| PTIN | W | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | A0H |
| 1st Parameter | W | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | A5h |

NOTE: "-" Don't care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|---|--|--|--|--|--|--|--|--|--|--|
| Description | -The command define as follows: After this command is issued, the chip would enter the program mode. The mode would return to standby by hardware reset. The only one parameter is a check code, the command would be executed if check code = 0xA5. | | | | | | | | | | |
| | This command only actives when BUSY_N = "1" . | | | | | | | | | | |

5.2.39 RA1H (APG): Active Program

| RA1H | Bit | | | | | | | | | | |
|-----------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| APG | W | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | A1H |

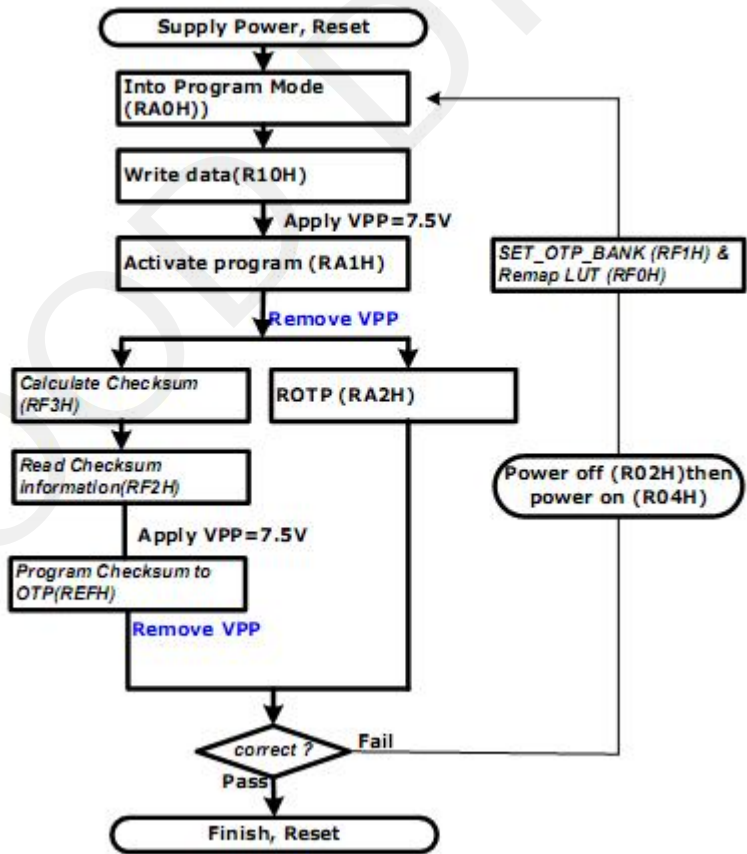
NOTE: "-" Don't care, can be set to VDD or GND level

| | |
|-------------|---|
| Description | -The command define as follows: After this command is transmitted, the programming state machine would be activated. |
| Restriction | -- The BUSY flag would fall to 0 while the programming is completed. |

5.2.40 RA2H (ROTP): Read OTP Data

| RA2H | Bit | | | | | | | | | | |
|------------------------|-----|------|--------------------------------------|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| ROTP | W | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | A2H |
| 1st Parameter | R | 1 | Dummy | | | | | | | | - |
| 2nd Parameter | R | 1 | The data of address 0x000 in the OTP | | | | | | | | - |
| 3rd Parameter | R | 1 | The data of address 0x001 in the OTP | | | | | | | | - |
| 4th Parameter | R | 1 | : | | | | | | | | - |
| 5th Parameter | R | 1 | The data of address (n-1) in the OTP | | | | | | | | - |
| 6th~ (m-1)th Parameter | R | 1 | ... | | | | | | | | - |
| mth Parameter | R | 1 | The data of address (n) in the OTP | | | | | | | | - |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | |
|-------------|---|
| Description | <p>-The command define as follows: The command is used for reading the content of OTP for checking the data of programming. The value of (n) is depending on the amount of programmed data, the max address = 0xFFFF.</p>  <p>The sequence of programming OTP</p> |
| Restriction | This command only actives when BUSY_N = “1” . |

5.2.41 RE0H (CCSET): Cascade Setting

| RE0H | Bit | | | | | | | | | | |
|---------------|-----|------|----|----|----|----|----|----|-------|-------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| CCSET | W | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | E0H |
| 1st Parameter | W | 1 | - | - | - | - | - | - | TSFIX | CCEIN | 00h |

NOTE: “-” Don’t care, can be set to VDD or GND level

| | | |
|-------------|---|---|
| Description | This command is used for cascade. | |
| | 1st Parameter: | |
| | Bit | |
| | 0 | Output clock enable/disable. 0: Output 0V at CL pin. (default) 1: Output clock at CL pin for slave chip. |
| | 1 | Let the value of slave' s temperature is same as the master' s. 0: Temperature value is defined by internal temperature sensor / external LM75. (default) 1: Temperature value is defined by TS_SET [7:0] registers. |
| Restriction | This command only actives when BUSY_N = “1” . | |

5.2.42 RE5H (TSSET): Force Temperature

| RE5H | Bit | | | | | | | | | | |
|---------------|-----|------|------------|------------|------------|------------|------------|------------|------------|------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| TSSET | W | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | E5H |
| 1st Parameter | W | 1 | TS_SE T[7] | TS_SET [6] | TS_SET [5] | TS_SET [4] | TS_SET [3] | TS_SE T[2] | TS_SET [1] | TS_SET [0] | 00h |

NOTE: “-” Don’ t care, can be set to VDD or GND level

| | | | | | | | | | | | |
|-------------|---|--|--|--|--|--|--|--|--|--|--|
| Description | -The command define as follows: | | | | | | | | | | |
| | This command is used to fix the temperature value of master and salve | | | | | | | | | | |
| Restriction | | | | | | | | | | | |

5.2.43 RE6H (LVSEL): LVD voltage Select

| RE6H | Bit | | | | | | | | | | |
|--------------------|-----|------|----|----|----|----|----|----|------------|------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| Select LVD Voltage | W | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | E6H |
| 1st Parameter | W | 1 | | | | | | | LVD_SEL[1] | LVD_SEL[0] | 03h |

| | | |
|-------------|---|-----------|
| Description | LVD_SEL[1:0]: Low power Voltage selection | |
| | LVD_SEL[1:0] | LVD value |
| | 00 | < 2.2 V |
| | 01 | < 2.3 V |
| | 10 | < 2.4 V |
| | 11(default) | < 2.5 V |
| | | |
| Restriction | | |

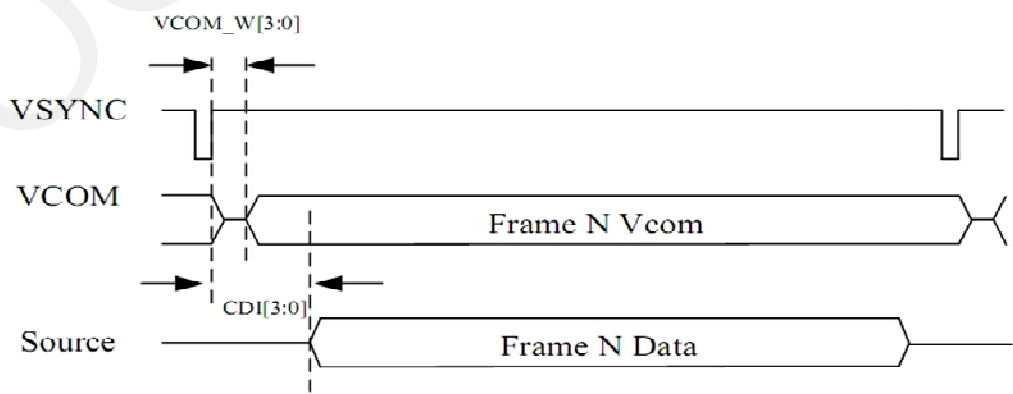
5.2.44 RE7H (PBC): Panel Break Check

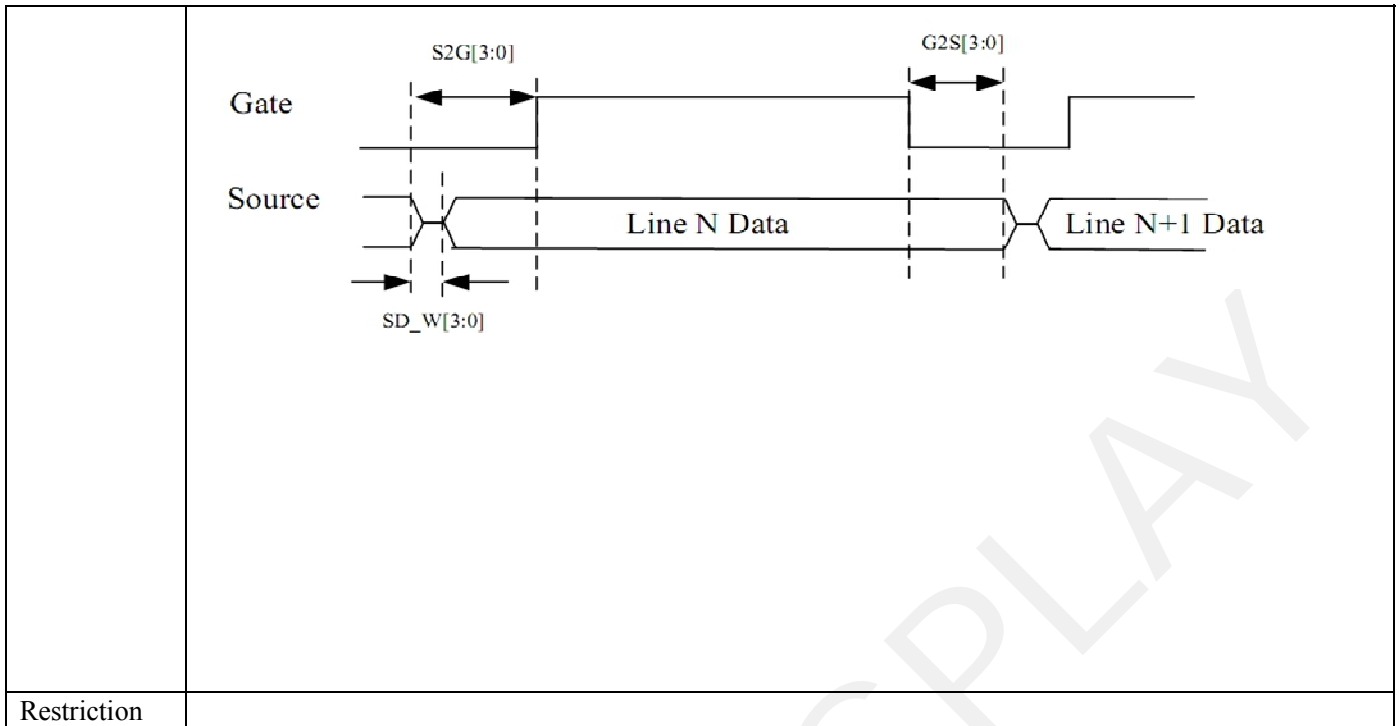
| RE7H | Bit | | | | | | | | | | |
|--------------------|-----|------|----|----|----|----|----|----|----|------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| Select LVD Voltage | W | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | E7H |
| 1st Parameter | R | 1 | | | | | | | | PSTA | - |

| | | |
|--------------|--|----------------------------------|
| Description` | This command is used to enable panel check, and to disable after reading result. 1st Parameter: | |
| | Bit | PSTA |
| | 0 | Panel check fail (panel broken). |
| | 1 | Panel check pass |
| | | |
| | | |
| Restriction | | |

5.2.45 RE8H (PWS): Power Saving

| RE8H | Bit | | | | | | | | | | |
|---------------|-----|------|---------------|---------------|---------------|---------------|-------------|-------------|-------------|-------------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| Power Saving | W | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | E8H |
| 1st Parameter | W | 1 | VCOM_ W[3] | VCOM_ W[2] | VCOM_ W[1] | VCOM_ W[0] | SD_W [3] | SD_W [2] | SD_W [1] | SD_W [0] | 00H |

| | | | | | | | | | | | |
|-------------|---|--|--|--|--|--|--|--|--|--|--|
| Description | This command is set for saving power during refreshing period. If the output voltage of VCOM / Source is from negative to positive or from positive to negative, the power saving mechanism will be activated. The active period width is defined by the following two parameters. 1st Parameter: | | | | | | | | | | |
| | <p>Vcom_W[3:0]: VCOM power saving width (unit = line period)</p>  <p>SD_W[3:0]: Source power saving width (unit = 660nS)</p> | | | | | | | | | | |



5.2.46 RE9H (AUTO): AUTO Sequence

| RE9H | Bit | | | | | | | | | | |
|---------------|-----|------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| AUTO Sequence | W | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | E9H |
| 1st Parameter | W | 1 | Code[7] | Code[6] | Code[5] | Code[4] | Code[3] | Code[2] | Code[1] | Code[0] | 00H |

| | |
|-------------|--|
| Description | <p>The command can enable the internal sequence to execute several commands continuously. The successive execution can minimize idle time to avoid unnecessary power consumption and reduce the complexity of host' s control procedure. The sequence contains several operations, including PON, DRF, POF, DSLP.</p> <p>AUTO (0xE9) + Code(0xA5) = (PON->DRF->POF)</p> <p>AUTO (0xE9) + Code(0xA7) = (PON->DRF->POF->DSLP)</p> |
| Restriction | |

5.2.47 REBH (LUT_BACKUP1_PG): OTP LUT backup1 program

| REBH | Bit | | | | | | | | | | |
|-----------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| CHKSUM_PG | W | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | EFH |

| | |
|-------------|---|
| Description | This command is used to Program Checksum of LUT Table |
| Restriction | Apply VPP to OTP before use this command |

5.2.48 RE0H (LUT_BACKUP1_RD): Read OTP LUT backup1

| RFOH | Bit | | | | | | | | | | |
|----------------|-----|----------|----|----|----|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|------|
| Inst/Para | R/W | D/C X | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| RM_LUT_CM D | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | F0H |
| 1st Parameter | W | 1 | - | - | - | tr10_lut_ en | rmp2_table_s el[3] | rmp2_table_s el[2] | rmp2_table_s el[1] | rmp2_tab le_sel[0] | 1FH |
| 2nd Parameter | W | 1 | - | - | - | tr9_lut_e n | rmp1_table_s el[3] | rmp1_table_s el[2] | rmp1_table_s el[1] | rmp1_tab le_sel[0] | 1FH |

NOTE: “-” Don’t care, can be set to VDD or GND level

Description

The command is used for indicating backup OTP blocks to remap for LUTs

| Addr (hex) | OTP Bank 0 (3K Bytes) | Addr (hex) | OTP Bank 1 (3K Bytes) |
|------------|-----------------------|------------|-----------------------|
| 00h~0Fh | Temp. segment | C00h~C0Fh | Temp. segment |
| 20h~60h | Default setting | C20h~C60h | Default setting |
| 100h | TR0 WF | D00h | TR0 WF |
| 200h | TR1 WF | E00h | TR1 WF |
| 300h | TR2 WF | F00h | TR2 WF |
| 400h | TR3 WF | 1000h | TR3 WF |
| 500h | TR4 WF | 1100h | TR4 WF |
| 600h | TR5 WF | 1200h | TR5 WF |
| 700h | TR6 WF | 1300h | TR6 WF |
| 800h | TR7 WF | 1400h | TR7 WF |
| 900h | TR8 WF | 1500h | TR8 WF |
| A00h | TR9 WF / Backup 1 | 1600h | TR9 WF / Backup 1 |
| B00h | TR10 WF / Backup 2 | 1700h | TR10 WF / Backup 2 |

1st Parameter:
tr10_lut_en :

| Value | Function |
|-------|---|
| 1 | OTP Address B00h~BFFh is used as “TR10 WF” |
| 0 | OTP Address B00h~BFFh is used as “Backup 2” , And you can replace one of TR0 ~TR9. |

rmp2_tab_sel [3:0] :

Only be functional when tr10_lut_en is set “0”, target LUTs to be replaced is shown below

| Value | Target LUTs |
|-----------|-------------|
| 0001 | TR0 |
| 0010 | TR1 |
| 0011 | TR2 |
| 0100 | TR3 |
| 0101 | TR4 |
| 0110 | TR5 |
| 0111 | TR6 |
| 1000 | TR7 |
| 1001 | TR8 |
| 1010 | TR9 |
| 1011~1111 | None |

| | 2nd Parameter tr9_lut_en : | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|--|-------|-------------|------|---|------|---|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|-----------|------|
| | <table> <tr> <th>Value</th><th>Function</th></tr> <tr> <td>1</td><td>OTP Address B00h~BFFh is used as “TR9 WF”</td></tr> <tr> <td>0</td><td>OTP Address B00h~BFFh is used as “Backup 1” , And you can replace one of TR0 ~TR8.</td></tr> </table> | Value | Function | 1 | OTP Address B00h~BFFh is used as “TR9 WF” | 0 | OTP Address B00h~BFFh is used as “Backup 1” , And you can replace one of TR0 ~TR8. | | | | | | | | | | | | | | | | | | |
| Value | Function | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | OTP Address B00h~BFFh is used as “TR9 WF” | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | OTP Address B00h~BFFh is used as “Backup 1” , And you can replace one of TR0 ~TR8. | | | | | | | | | | | | | | | | | | | | | | | | |
| | rmp1_tab_sel[3:0] Only be functional when tr9_lut_en is set “0”, target LUTs to be replaced is shown below | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table> <tr> <th>Value</th><th>Target LUTs</th></tr> <tr><td>0001</td><td>TR0</td></tr> <tr><td>0010</td><td>TR1</td></tr> <tr><td>0011</td><td>TR2</td></tr> <tr><td>0100</td><td>TR3</td></tr> <tr><td>0101</td><td>TR4</td></tr> <tr><td>0110</td><td>TR5</td></tr> <tr><td>0111</td><td>TR6</td></tr> <tr><td>1000</td><td>TR7</td></tr> <tr><td>1001</td><td>TR8</td></tr> <tr><td>1010</td><td>TR9</td></tr> <tr><td>1011~1111</td><td>None</td></tr> </table> | Value | Target LUTs | 0001 | TR0 | 0010 | TR1 | 0011 | TR2 | 0100 | TR3 | 0101 | TR4 | 0110 | TR5 | 0111 | TR6 | 1000 | TR7 | 1001 | TR8 | 1010 | TR9 | 1011~1111 | None |
| Value | Target LUTs | | | | | | | | | | | | | | | | | | | | | | | | |
| 0001 | TR0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0010 | TR1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0011 | TR2 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0100 | TR3 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0101 | TR4 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0110 | TR5 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0111 | TR6 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1000 | TR7 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1001 | TR8 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1010 | TR9 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1011~1111 | None | | | | | | | | | | | | | | | | | | | | | | | | |
| | Notice : If rmp1_tab_sel = rmp2_tab_sel , the control hardware will reload “backup 1” block to replace target LUT. | | | | | | | | | | | | | | | | | | | | | | | | |
| Restriction | This command only actives when BUSY_N = “1” . | | | | | | | | | | | | | | | | | | | | | | | | |

5.2.49 RF1H (SET_OTP_BANK): Set OTP program bank

| RF1H | Bit | | | | | | | | | | |
|------------------|-----|----------|----|----|----|----|----|----|-----------|-----------|------|
| Inst/Para | R/W | D/C X | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| SET_OTP_BANK | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | F1H |
| 1st Parameter | W | 1 | | | - | - | - | - | LUT_bank0 | reg_bank0 | 03H |

| | | | | |
|-------------|---|---|------------|-----------------------|
| Description | This command is used to set program bank for registers and LUTs | | | |
| | Addr (hex) | OTP Bank 0 (3K Bytes) | Addr (hex) | OTP Bank 1 (3K Bytes) |
| | 00h~0Fh | Temp. segment | C00h~C0Fh | Temp. segment |
| | 20h~60h | Default setting | C20h~C60h | Default setting |
| | 100h~BFFh | LUTs | D00h~17FFh | LUTs |
| | reg_bank : | | | |
| | Value | Function | | |
| | 1 | Program “Temp. segment” and “Default Setting” in bank 0 | | |
| | 0 | Program “Temp. segment” and “Default Setting” in bank 1 | | |
| | LUT_bank : | | | |
| | Value | Function | | |
| | 1 | Program “LUTs” in bank 0 | | |
| | 0 | Program “LUTs” in bank 1 | | |
| Restriction | | | | |

5.2.50 RF2H (RD_CHKSUM): Read checksum information

| RF2H | Bit | | | | | | | | | | |
|--------------------|-----|------|--|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| RD_CHKSUM | W | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | F2H |
| 1st ~9th Parameter | R | 1 | Checksum from “TR0 WF” to “TR8 WF” | | | | | | | | - |
| 10th Parameter | R | 1 | Checksum of “TR9 WF / backup 1” | | | | | | | | - |
| 11th Parameter | R | 1 | Checksum of “TR10 WF / backup 2” | | | | | | | | - |
| 12th Parameter | R | 1 | Checksum comparison result from “TR0 WF” to “TR7 WF” | | | | | | | | - |
| 13th Parameter | R | 1 | Checksum comparison result from “TR8” and “TR10 WF / backup 2” | | | | | | | | - |

| | | | | | | | | |
|--|--|---------------------------------|-----------|-----------|----------------------------|---------------------------|-----------|-----------|
| Description | This command is to read checksum information from OTP. | | | | | | | |
| | 1st to 11th Parameter : Checksum from “TR0 WF” to “TR10 WF / backup 2” | | | | | | | |
| | 12th Parameter command is to read checksum information from OTP. | | | | | | | |
| | 1st to 11th Parameter : Checksum from “TR0 WF” to “TR10 WF / backup 2” | | | | | | | |
| | 12th Parameter | | | | | | | |
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| | fault_TR7 | fault_TR6 | fault_TR5 | fault_TR4 | fault_TR3 | fault_TR2 | fault_TR1 | fault_TR0 |
| | | | | | | | | |
| | 13th Parameter | | | | | | | |
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| - | - | - | - | - | fault_TR10 / fault_backup2 | fault_TR9 / fault_backup1 | fault_TR9 | |
| | | | | | | | | |
| definition of fault_TRx / fault_backup_x | | | | | | | | |
| Value | | Function | | | | | | |
| 0 | | Checksum comparison : Equal | | | | | | |
| 1 | | Checksum comparison : Not Equal | | | | | | |
| Restriction | | | | | | | | |

5.2.51 RF3H (CAL_CHKSUM): Calculate Checksum

| RF3H | Bit | | | | | | | | | | |
|------------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| CAL_CHKSUM | W | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | F3H |

| | |
|-------------|---|
| Description | This command is used to Calculate Checksum of LUT Table |
| Restriction | |

6. Optical characteristics

6.1 Specifications

Measurements are made with that the illumination is under an angle of 45 degrees, the detection is perpendicular unless otherwise specified.

T=25°C

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYPE | MAX | UNIT | Note |
|--------------|--------------------|----------------------------|-----|--------------------------------|-----|------|-----------|
| R | Reflectance | White | 30 | 35 | - | % | Note 6-1 |
| Gn | 2Grey Level | - | - | $DS+(WS-DS) \times n(m-1)$ | - | L* | - |
| RS_a* | Red State a* value | Red | 35 | 45 | 48 | - | Note 6-1 |
| CR | Contrast Ratio | indoor | - | 15 | - | - | - |
| Panel's life | - | 0°C ~ 40°C | - | 5years | - | - | Note 6-2- |
| Panel | Image Update | Storage and transportation | - | Update the white screen | - | - | - |
| | Update Time | Operation | - | at least update 1 time per day | - | - | - |

WS: White state, DS : Dark state

Note 6-1: Luminance meter : Eye - One Pro Spectrophotometer

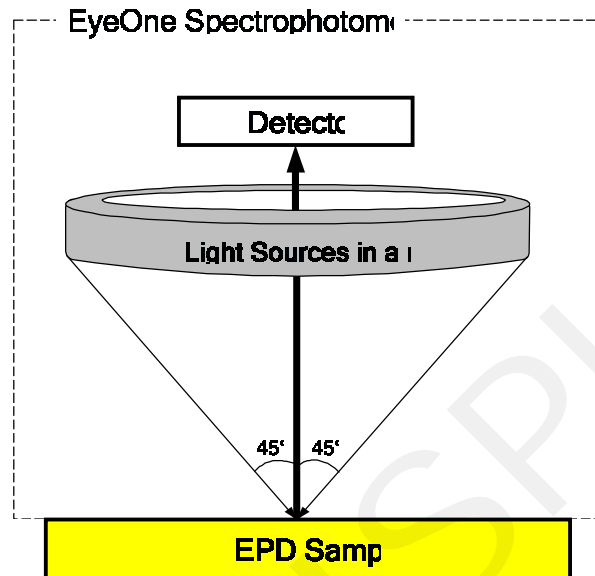
Note 6-2: We don't guarantee 5 years pixels display quality for humidity below 45%RH or above 70%RH; at least update 1 time per day.

Note 6-3: To increases the black and white screen clear screen when red has refreshed for a long time , the effect is better.

6.2 Definition of contrast ratio

The contrast ratio (CR) is the ratio between the reflectance in a full white area (RI) and the reflectance in a dark area (Rd):

$$CR = RI/Rd$$

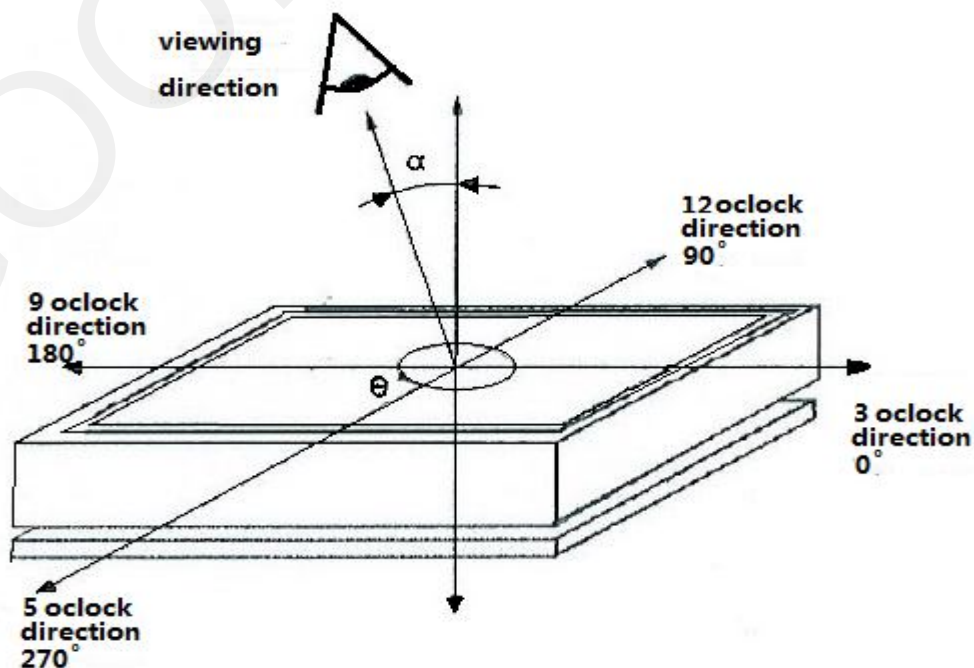


6.3 Reflection Ratio

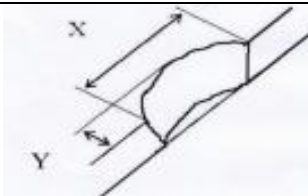
The reflection ratio is expressed as:

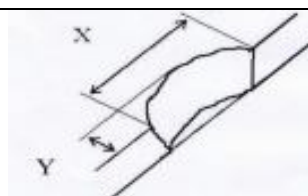
$$R = \text{Reflectance Factor}_{\text{white board}} \times (L_{\text{center}} / L_{\text{white board}})$$

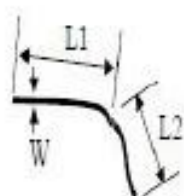
L_{center} is the luminance measured at center in a white area ($R=G=B=1$). $L_{\text{white board}}$ is the luminance of a standard white board. Both are measured with equivalent illumination source. The viewing angle shall be no more than 2 degrees.



7. Point and line standard

| Shipment Inspection Standard | | | | | | |
|---|--|--|-------------|-------------|--------|-------------|
| Equipment: Electrical test fixture, Point gauge | | | | | | |
| Outline dimension | 45.8(H)×70.42(V) × 0.95 (D) | Unit: mm | Part-A | Active area | Part-B | Border area |
| Environment | Temperature | Humidity | Illuminance | Distance | Time | Angle |
| | 19℃～25℃ | 55%±5%RH | 800～1300Lux | 300 mm | 35Sec | |
| Defet type | Inspection method | Standard | | Part-A | | Part-B |
| Spot | Electric Display | D≤0.25 mm | | Ignore | | Ignore |
| | | 0.25 mm<D≤0.4 mm | | N≤4 | | Ignore |
| | | D>0.4 mm | | Not Allow | | Ignore |
| Display unwork | Electric Display | Not Allow | | Not Allow | | Ignore |
| Display error | Electric Display | Not Allow | | Not Allow | | Ignore |
| Scratch or line defect(include dirt) | Visual/Film card | L≤2 mm, W≤0.2 mm | | Ignore | | Ignore |
| | | 2.0mm<L≤5.0mm, 0.2<W≤0.3mm, | | N≤2 | | Ignore |
| | | L>5 mm, W>0.3 mm | | Not Allow | | Ignore |
| PS Bubble | Visual/Film card | D≤0.2mm | | Ignore | | Ignore |
| | | 0.2mm≤D≤0.35mm & N≤4 | | N≤4 | | Ignore |
| | | D>0.35 mm | | Not Allow | | Ignore |
| Corner /Edge chipping | Visual/Film card | X≤6mm, Y≤0.4mm, Do not affect the electrode circuit (Edge chipping) | | | | |
| | | X≤1mm, Y≤1mm, Do not affect the electrode circuit((Corner chipping) | | | | |
| Remark |  | | | | | |
| | 1.Cannot be defect & failure cause by appearance defect; | | | | | |
| | 2.Cannot be larger size cause by appearance defect; | | | | | |
| L=long W=wide D=point size N=Defects NO | | | | | | |





$$L = L1 + L2$$

Line Defect

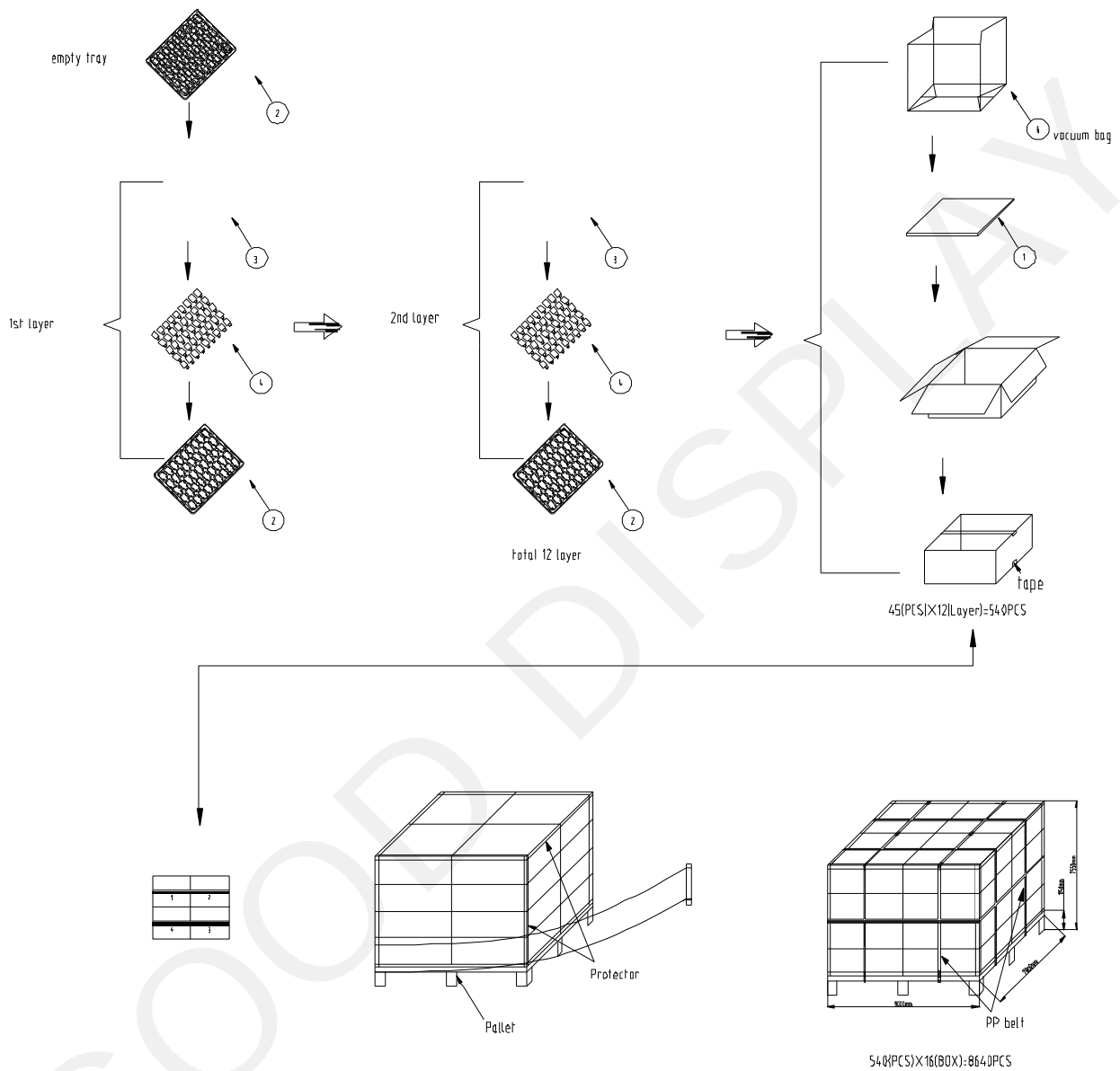


$$D = (L + W) / 2$$

Spot Defect

L=long W=wide D=point size

8. Packing



9. Precautions

- (1) Do not apply pressure to the EPD panel in order to prevent damaging it.
- (2) Do not connect or disconnect the interface connector while the EPD panel is in operation.
- (3) Do not touch IC bonding area. It may scratch TFT lead or damage IC function.
- (4) Please be mindful of moisture to avoid its penetration into the EPD panel, which may cause damage during operation.
- (5) If the EPD Panel / Module is not refreshed every 24 hours, a phenomena known as "Ghosting" or "Image Sticking" may occur. It is recommended to refreshed the ESL /EPD Tag every 24 hours in use case. It is recommended that customer ships or stores the ESL / EPD Tag with a completely white image to avoid this issue
- (6) High temperature, high humidity, sunlight or fluorescent light may degrade the EPD panel's performance. Please do not expose the unprotected EPD panel to high temperature, high humidity, sunlight, or fluorescent for long periods of time.
- (7) For more precautions, please click on the link:
<https://www.good-display.com/news/80.html>