

# 睿智皓天（成都）信息技术有限公司

|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 1 of 44       |

## Specification For HINK 2.13''EPD

**Model NO.: LCMEN2R13EFC1**

**Product VER:A0**

### Customer Approval

|                         |  |
|-------------------------|--|
| <b>Customer</b>         |  |
| <b>Approval By</b>      |  |
| <b>Date Of Approval</b> |  |

**It will be agreed by the receiver,if not sign back the Specification within 15days.**

| Prepared By | Checked By | Approval By |
|-------------|------------|-------------|
|             |            |             |

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| Version | Content     | Date       | Producer |
|---------|-------------|------------|----------|
| A0      | New release | 2021/06/05 | WXB      |
|         |             |            |          |
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## 1. General Description

LCMEN2R13EFC1 is an Active Matrix Electrophoretic Display (AMEPD), with interface and a reference system design. The 2.13" active area contains 122×250 pixels, and has 1-bit B/W 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.

## 2. Features

- 122×250 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
- 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 I2C / built-in temperature sensor

## 3. Application

Electronic Shelf Label System

## 4. Mechanical Specifications

| Parameter           | Specifications           | Unit  | Remark                      |
|---------------------|--------------------------|-------|-----------------------------|
| Screen Size         | 2.13                     | Inch  |                             |
| Display Resolution  | 122(H)×250(V)            | Pixel | Dpi:130                     |
| Active Area         | 23.71(H)×48.55(V)        | mm    |                             |
| Pixel Pitch         | 0.194×0.194              | mm    |                             |
| Pixel Configuration | Rectangle                |       |                             |
| Outline Dimension   | 29.2(H)×59.2 (V) ×0.9(D) | mm    | <b>Without masking film</b> |
| Weight              | 3±0.5                    | g     |                             |

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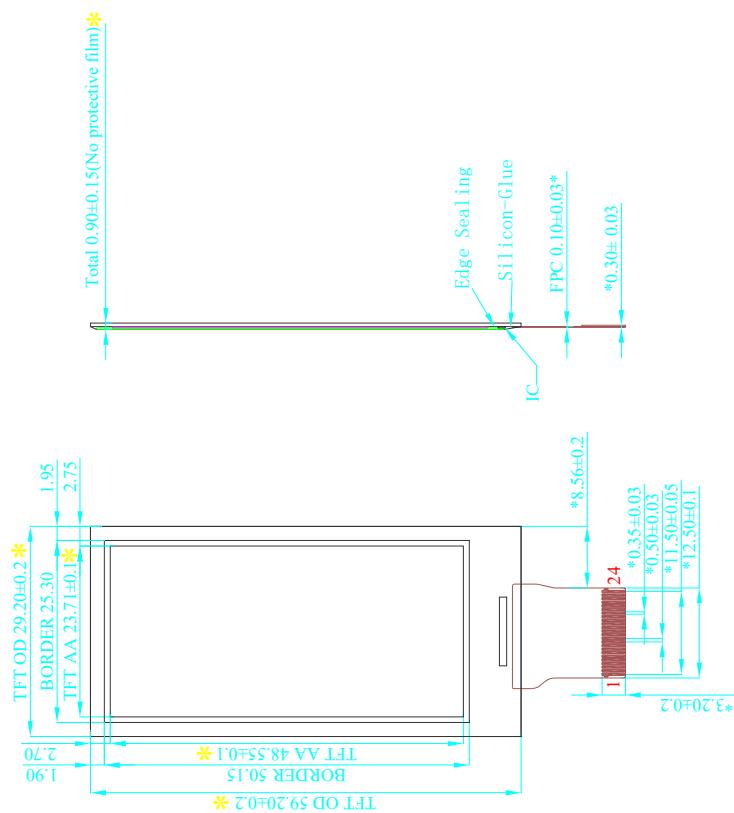
## 5. Mechanical Drawing of EPD module

FRONT VIEW

SIDE VIEW

BOTTOM VIEW

| A0 confirmed |      |
|--------------|------|
| Signature    | Date |



| PIN | SIGNAL |
|-----|--------|
| 1   | NC     |
| 2   | GDR    |
| 3   | RESET  |
| 4   | NC     |
| 5   | VSH2   |
| 6   | TSCL   |
| 7   | BSI    |
| 8   | SDA    |
| 9   | BUSY   |
| 10  | RESET  |
| 11  | D/C#   |
| 12  | CS#    |
| 13  | SCL    |
| 14  | SDA    |
| 15  | VDDIO  |
| 16  | VCL    |
| 17  | VSS    |
| 18  | VDD    |
| 19  | VPP    |
| 20  | VGH    |
| 21  | VGL    |
| 22  | VSL    |
| 23  | VGL    |
| 24  | VCOM   |

WISEVAST

1. DISPLAY MODE 2. 13" ARRAY FOR EPD;
2. DRIVE IC: JD79656;
3. RESOLUTION: 122source X 250gate;
4. pixel size:0.1943mm X 0.1942mm;
5. dpi:130
6. Unspecified Tolerance: ±0.20;
7. Material conform to the ROHS&REACH standard;
8. \* as the focus control size

| ALL UNITS: mm           | DATE | MODEL NUMBER : | SHEET: 1   |                |
|-------------------------|------|----------------|------------|----------------|
| DESIGN:<br>CHK:<br>APP: |      | P/N:           | PROJECTION | DATE: 20211017 |

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## 6. Input/Output Terminals

| Pin # | Single  | Description   | Remark    |
|-------|---------|---|-----------|
| 1     | NC      | No connection and do not connect with other NC pins | Keep Open |
| 2     | GDR     | This pin is N-MOS gate control.                     |           |
| 3     | RESE    | Current sense input for control loop.               |           |
| 4     | NC      | No connection and do not connect with other NC pins | Keep Open |
| 5     | VSHR    | Positive source voltage for Red                     |           |
| 6     | TSCL    | I2C clock for external temperature sensor           | Note 6-6  |
| 7     | TSDA    | I2C data for external temperature sensor            | Note 6-6  |
| 8     | BS      | Input interface setting.                            | Note 6-5  |
| 9     | BUSY_N  | This pin indicates the driver status.               | Note 6-4  |
| 10    | RST_N   | Global reset pin                                    | Note 6-3  |
| 11    | DC      | Serial communication Command/Data input             | Note 6-2  |
| 12    | CSB     | Serial communication chip select.                   | Note 6-1  |
| 13    | SCL     | Serial communication clock input.                   |           |
| 14    | SDA     | Serial communication data input.                    |           |
| 15    | VDDIO   | IO voltage supply                                   |           |
| 16    | VDD     | Digital/Analog power.                               |           |
| 17    | VSS     | Digital ground                                      |           |
| 18    | VDD_15V | 1.5V voltage input &output                          |           |
| 19    | VMTP    | MTP program power (10V)                             |           |
| 20    | VSH     | Positive source voltage                             |           |
| 21    | VGH     | Positive gate voltage                               |           |
| 22    | VSL     | Negative source voltage.                            |           |
| 23    | VGL     | Negative gate voltage.                              |           |
| 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.

L: Command H: data (default) Connect to VDD if BS=High.

Note 6-3: This pin (RST\_N) is Global reset pin. Low reset. ( normal pull high). When RST\_N become low, driver will reset. All register will reset to default value. all driver function will disable. SD output and VCOM will be released to floating.

Note 6-4: This pin (BUSY\_N) is Busy state output pin.

BUSY\_N= "0" : Driver is busy, data/VCOM is transforming.

BUSY\_N= "1" : non-busy. Host side can send command/data to driver.

Note 6-5: This pin (BS) 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.

Note 6-6: If customer don't want to use external temperature sensors,please make TSCL and TSDA to be ground ,not NC.

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## 7.COMMAND DESCRIPTION

R/W: 0: Write Cycle 1: Read Cycle

D/CX: 0: Command / 1: Data

D7-D0: -: Don't Care

### 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  |  |
| 1 <sup>st</sup> Parameter | W   | 1    | RES[1] | RES[0] | REG_EN | BWR  | UD      | SHL     | SHD_N | RST_N   | 0Fh  |  |
| 2 <sup>nd</sup> Parameter | W   | 1    | -      | -      |        | VCMZ | TS_AUTO | VGLTIEG | NORG  | VC_LUTZ | 09h  |  |

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

| Description  | -The command defines as :<br>1st parameter |        |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  | Bit  | Name   | Description   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 0  | RST_N  | RST_N function<br>1: no effect. (default)<br>0: Booster OFF, Register data are set to their default values, and SEG/BG/VCOM:floating          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1  | SHD_N  | SHD_N function<br>0 : Booster OFF, register data are kept, and SEG/BG/VCOM are kept floating.<br>1 : Booster on. (default)                    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2  | SHL    | SHL function<br>0: Shift left; First data=Sn→Sn-1 →...→S2→Last data=S1.<br>1: Shift right: First data=S1→S2 →...→Sn-1→Last data=Sn. (default) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3  | UD     | UD function<br>0:Scan down; First line=Gn→Gn-1 →...→G2→Last line=G1.<br>1:Scan up; First line=G1→G2 →...→Gn-1→Last line=Gn. (default)         |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4  | BWR    | Color selection setting<br>0: Pixel with B/W/Red. Run both LU1 and LU2. (default)<br>1: Pixel with B/W. Run LU1 only                          |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5  | REG_EN | LUT selection setting<br>0 : Using LUT from MTP(default)<br>1 : Using LUT from register   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7-6 RES[1,0]   |  |        |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Resolution setting<br>00: Display resolution is 32x250, S0~S31, G0~G249 (default)<br>01: Display resolution is 64x250, S0~S63, G0~G249<br>10: Display resolution is 96x250, S0~S95, G0~G249<br>11: Display resolution is 128x250, S0~S127, G0~G249   |  |        |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Notes:<br>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.<br>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. |  |        |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| 2 <sup>nd</sup> parameter |         |  |
|---------------------------|---------|--|
| Bit                       | Name    | Description  |
| 0                         | VC_LUTZ | VCOM status function<br>0 : Display off, VCOM keep to power off<br>1 : Display off, VCOM is set to floating (default)  |
| 1                         | NORG    | VCOM status function<br>0 : No effect (default)<br>1 : Expect refreshing display, VCOM is tied to GND  |
| 2                         | VGLTIEG | VGL power off status function<br>0 : Power off, VGL will be floating (default)<br>1 : Power off, VGL will be tied to GND   |
| 3                         | TS_AUTO | Temperature sensing will be activated automatically one time<br>0 : Before enabling refresh, temperature sensing on<br>1 : Before enabling booster, temperature sensing on (default) |
| 4                         | VCMZ    | VCOM status function<br>0 : No effect (default)<br>1 : VCOM is always floating   |

Priority of VCOM setting: VCMZ > NORG > VC\_LUTZ

|             |  |
|-------------|--|
| Restriction |  |
|-------------|--|

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## 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | -     | -        | -        | -        | -           | -           | VDS_EN      | VDG_EN      | 03h  |
| 2 <sup>nd</sup> Parameter | W   | 1    | -     | -        | -        | VCOM_HV  | VGHL_LV [3] | VGHL_LV [2] | VGHL_LV [1] | VGHL_LV [0] | 00h  |
| 3 <sup>rd</sup> Parameter | W   | 1    | -     | -        | VSH [5]  | VSH [4]  | VSH [3]     | VSH [2]     | VSH [1]     | VSH [0]     | 3Fh  |
| 4 <sup>th</sup> Parameter | W   | 1    | -     | -        | VSL [5]  | VSL [4]  | VSL [3]     | VSL [2]     | VSL [1]     | VSL [0]     | 3Fh  |
| 5 <sup>th</sup> Parameter | W   | 1    | OPTEN | VSHR [6] | VSHR [5] | VSHR [4] | VSHR [3]    | VSHR [2]    | VSHR [1]    | VSHR [0]    | 0Dh  |

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

| Description | -The command defines as :   |  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|-------------|---|--|--|-------------|--|--|--|--|--|--|-----|------|-------------|---------|------------------------|--|--|--|--|--|--|-----|--------|--|------|-----------------|--|--|--|--|--|--|---|--------|---|------|---------------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|------------------|--|--|--|--|--|--|--|--|--|------|----|--|--|--|--|--|--|--|--|--|------|--|------|--|---|---------|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|------|-------------|--|--|--|--|--|--|--|--|-----|-----|-------------------------------|--|--|--|--|--|--|--|--|
|             | 1st Parameter:  |  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
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| Bit         | Name  | Description  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
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| 1           | VDS_EN  | Source power selection.<br>0 : External source power from VSH/VSL/VSHR pins.<br>1 : Internal DC/DC function for generate VSH/VSL/VSHR (default)  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 2nd Parameter:  |  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
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| 3-0         | VGHL_LV   | VGHL_LV Voltage Level.   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | code  | VGH/VGL Voltage  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0000  | VGH=20V,VGL=-20V(default)  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0001  | VGH=19V,VGL=-19V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0010  | VGH=18V,VGL=-18V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0011  | VGH=17V,VGL=-17V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0100  | VGH=16V,VGL=-16V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0101  | VGH=15V,VGL=-15V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0110  | VGH=14V,VGL=-14V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 0111  | VGH=13V,VGL=-13V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1000  | VGH=12V,VGL=-12V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1001  | VGH=11V,VGL=-11V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1010  | VGH=10V,VGL=-10V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1011  | VGH=21V,VGL=-21V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1100  | VGH=22V,VGL=-22V   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1101  | NA   |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1110  |  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 1111  |  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 4   | VCOM_HV  | VCOM Voltage Level<br>0: VCOMH=VSH+VCOMDC ,VCOML=VSL+VCOMDC(Default)<br>1: VCOMH=VGH,VCOML=VGL |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | 3rd Parameter: Internal VSH power selection for B/W LUT. (Default value: 111111b)   |  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
|             | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th colspan="9">Description</th></tr> </thead> <tbody> <tr> <td>5-0</td> <td>VSH</td> <td colspan="9">Internal VSH power selection.</td></tr> </tbody> </table>  |  |  |             |  |  |  |  |  |  | Bit | Name | Description |         |                        |  |  |  |  |  |  | 5-0 | VSH    | Internal VSH power selection.  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
| Bit         | Name  | Description  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |
| 5-0         | VSH   | Internal VSH power selection.  |  |             |  |  |  |  |  |  |     |      |             |         |                        |  |  |  |  |  |  |     |        |  |      |                 |  |  |  |  |  |  |   |        |   |      |                           |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |                  |  |  |  |  |  |  |  |  |  |      |    |  |  |  |  |  |  |  |  |  |      |  |      |  |   |         |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |      |             |  |  |  |  |  |  |  |  |     |     |                               |  |  |  |  |  |  |  |  |

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|           |                                  |  |  |  |               |               |  |
|-----------|----------------------------------|--|--|--|---------------|---------------|--|
| File Name | Specification For HINK 2.13" EPD |  |  |  | Module Number | LCMEN2R13EFC1 |  |
| Version   | A0                               |  |  |  | Page Number   | 10 of 44      |  |

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

4th Parameter: Internal VSL power selection for B/W LUT. **Default value: 111111b**

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

5th Parameter: Internal VSHR power selection for Red LUT. (Default value: 00001111b)

OPTEN=1:enable step =0.1 voltage selection(2.4~15V)

Internal VSHR power selection for Red LUT.

| Bit | Name | Description                    |  |  |  |  |  |
|-----|------|--------------------------------|--|--|--|--|--|
| 5-0 | VSHR | Internal VSHR power selection. |  |  |  |  |  |

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| File Name | Specification For HINK 2.13" EPD |     |         |           |           |         | Module Number | LCMEN2R13EFC1 |         |           |     |      |
|-----------|----------------------------------|-----|---------|-----------|-----------|---------|---------------|---------------|---------|-----------|-----|------|
| Version   | A0                               |     |         | Voltage   | VSHR[6:0] |         |               | Page Number   | Voltage | 11 of 44  |     |      |
|           | VSHR[6:0]                        | (V) | Voltage | VSHR[6:0] | (V)       | Voltage | VSHR[6:0]     | (V)           | Voltage | VSHR[6:0] | (V) |      |
|           | 0000000                          | 00h | 2.4     | 0100000   | 20h       | 5.6     | 1000000       | 40h           | 8.8     | 1100000   | 60h | 12   |
|           | 000001                           | 01h | 2.5     | 0100001   | 21h       | 5.7     | 1000001       | 41h           | 8.9     | 1100001   | 61h | 12.1 |
|           | 0000010                          | 02h | 2.6     | 0100010   | 22h       | 5.8     | 1000010       | 42h           | 9       | 1100010   | 62h | 12.2 |
|           | 0000011                          | 03h | 2.7     | 0100011   | 23h       | 5.9     | 1000011       | 43h           | 9.1     | 1100011   | 63h | 12.3 |
|           | 00000100                         | 04h | 2.8     | 0100100   | 24h       | 6       | 1000100       | 44h           | 9.2     | 1100100   | 64h | 12.4 |
|           | 00000101                         | 05h | 2.9     | 0100101   | 25h       | 6.1     | 1000101       | 45h           | 9.3     | 1100101   | 65h | 12.5 |
|           | 00000110                         | 06h | 3       | 0100110   | 26h       | 6.2     | 1000110       | 46h           | 9.4     | 1100110   | 66h | 12.6 |
|           | 00000111                         | 07h | 3.1     | 0100111   | 27h       | 6.3     | 1000111       | 47h           | 9.5     | 1100111   | 67h | 12.7 |
|           | 0001000                          | 08h | 3.2     | 0101000   | 28h       | 6.4     | 1001000       | 48h           | 9.6     | 1101000   | 68h | 12.8 |
|           | 0001001                          | 09h | 3.3     | 0101001   | 29h       | 6.5     | 1001001       | 49h           | 9.7     | 1101001   | 69h | 12.9 |
|           | 0001010                          | 0Ah | 3.4     | 0101010   | 2Ah       | 6.6     | 1001010       | 4Ah           | 9.8     | 1101010   | 6Ah | 13   |
|           | 0001011                          | 0Bh | 3.5     | 0101011   | 2Bh       | 6.7     | 1001011       | 4Bh           | 9.9     | 1101011   | 6Bh | 13.1 |
|           | 0001100                          | 0Ch | 3.6     | 0101100   | 2Ch       | 6.8     | 1001100       | 4Ch           | 10      | 1101100   | 6Ch | 13.2 |
|           | 0001101                          | 0Dh | 3.7     | 0101101   | 2Dh       | 6.9     | 1001101       | 4Dh           | 10.1    | 1101101   | 6Dh | 13.3 |
|           | 0001110                          | 0Eh | 3.8     | 0101110   | 2Eh       | 7       | 1001110       | 4Eh           | 10.2    | 1101110   | 6Eh | 13.4 |
|           | 0001111                          | 0Fh | 3.9     | 0101111   | 2Fh       | 7.1     | 1001111       | 4Fh           | 10.3    | 1101111   | 6Fh | 13.5 |
|           | 0010000                          | 10h | 4       | 0110000   | 30h       | 7.2     | 1010000       | 50h           | 10.4    | 1110000   | 70h | 13.6 |
|           | 0010001                          | 11h | 4.1     | 0110001   | 31h       | 7.3     | 1010001       | 51h           | 10.5    | 1110001   | 71h | 13.7 |
|           | 0010010                          | 12h | 4.2     | 0110010   | 32h       | 7.4     | 1010010       | 52h           | 10.6    | 1110010   | 72h | 13.8 |
|           | 0010011                          | 13h | 4.3     | 0110011   | 33h       | 7.5     | 1010011       | 53h           | 10.7    | 1110011   | 73h | 13.9 |
|           | 0010100                          | 14h | 4.4     | 0110100   | 34h       | 7.6     | 1010100       | 54h           | 10.8    | 1110100   | 74h | 14   |
|           | 0010101                          | 15h | 4.5     | 0110101   | 35h       | 7.7     | 1010101       | 55h           | 10.9    | 1110101   | 75h | 14.1 |
|           | 0010110                          | 16h | 4.6     | 0110110   | 36h       | 7.8     | 1010110       | 56h           | 11      | 1110110   | 76h | 14.2 |
|           | 0010111                          | 17h | 4.7     | 0110111   | 37h       | 7.9     | 1010111       | 57h           | 11.1    | 1110111   | 77h | 14.3 |
|           | 0011000                          | 18h | 4.8     | 0111000   | 38h       | 8       | 1011000       | 58h           | 11.2    | 1111000   | 78h | 14.4 |
|           | 0011001                          | 19h | 4.9     | 0111001   | 39h       | 8.1     | 1011001       | 59h           | 11.3    | 1111001   | 79h | 14.5 |
|           | 0011010                          | 1Ah | 5       | 0111010   | 3Ah       | 8.2     | 1011010       | 5Ah           | 11.4    | 1111010   | 7Ah | 14.6 |
|           | 0011011                          | 1Bh | 5.1     | 0111011   | 3Bh       | 8.3     | 1011011       | 5Bh           | 11.5    | 1111011   | 7Bh | 14.7 |
|           | 0011100                          | 1Ch | 5.2     | 0111100   | 3Ch       | 8.4     | 1011100       | 5Ch           | 11.6    | 1111100   | 7Ch | 14.8 |
|           | 0011101                          | 1Dh | 5.3     | 0111101   | 3Dh       | 8.5     | 1011101       | 5Dh           | 11.7    | 1111101   | 7Dh | 14.9 |
|           | 0011110                          | 1Eh | 5.4     | 0111110   | 3Eh       | 8.6     | 1011110       | 5Eh           | 11.8    | 1111110   | 7Eh | 15   |
|           | 0011111                          | 1Fh | 5.5     | 0111111   | 3Fh       | 8.7     | 1011111       | 5Fh           | 11.9    | others    |     |      |
|           |                                  |     |         |           |           |         |               |               |         |           |     |      |

OPTEN=1:enable step0.2 voltage selection(2.4~15V)  
Internal VSHR power selection for Red LUT.

| Bit | Name | Description |
|-----|------|-------------|
|     |      |             |

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|           |                                  |  |  |  |                  |               |  |
|-----------|----------------------------------|--|--|--|------------------|---------------|--|
| File Name | Specification For HINK 2.13" EPD |  |  |  | Module Number*** | LCMEN2R13EFC1 |  |
| Version   | A0                               |  |  |  | Page Number      | 12 of 44      |  |

| VSHR[5:0] | Voltage (V) | VSHR[5:0] |        | Voltage (V) | VSHR[5:0] |     | Voltage (V) |
|-----------|-------------|-----------|--------|-------------|-----------|-----|-------------|
|           |             | 000000    | 00h    |             | 010110    | 16h |             |
| 000001    | 01h         | 2.4       | 010111 | 6.8         | 101101    | 2Dh | 11.2        |
| 000010    | 02h         | 2.6       | 011000 | 7.0         | 101110    | 2Eh | 11.4        |
| 000011    | 03h         | 2.8       | 011001 | 7.2         | 101111    | 2Fh | 11.6        |
| 000100    | 04h         | 3.0       | 011010 | 1Ah         | 110000    | 30h | 12          |
| 000101    | 05h         | 3.2       | 011011 | 1Bh         | 110001    | 31h | 12.2        |
| 000110    | 06h         | 3.4       | 011100 | 1Ch         | 110010    | 32h | 12.4        |
| 000111    | 07h         | 3.6       | 011101 | 1Dh         | 110011    | 33h | 12.6        |
| 001000    | 08h         | 3.8       | 011110 | 1Eh         | 110100    | 34h | 12.8        |
| 001001    | 09h         | 4         | 011111 | 1Fh         | 110101    | 35h | 13          |
| 001010    | 0Ah         | 4.2       | 100000 | 20h         | 110110    | 36h | 13.2        |
| 001011    | 0Bh         | 4.4       | 100001 | 21h         | 110111    | 37h | 13.4        |
| 001100    | 0Ch         | 4.6       | 100010 | 22h         | 111000    | 38h | 13.6        |
| 001101    | 0Dh         | 4.8       | 100011 | 23h         | 111001    | 39h | 13.8        |
| 001110    | 0Eh         | 5.0       | 100100 | 24h         | 111010    | 3Ah | 14          |
| 001111    | 0Fh         | 5.2       | 100101 | 25h         | 111011    | 3Bh | 14.2        |
| 010000    | 10h         | 5.4       | 100110 | 26h         | 111100    | 3Ch | 14.4        |
| 010001    | 11h         | 5.6       | 100111 | 27h         | 111101    | 3Dh | 14.6        |
| 010010    | 12h         | 5.8       | 101000 | 28h         | 111110    | 3Eh | 14.8        |
| 010011    | 13h         | 6.0       | 101001 | 29h         | 111111    | 3Fh | 15          |
| 010100    | 14h         | 6.2       | 101010 | 2Ah         | 10.8      |     |             |
| 010101    | 15h         | 6.4       | 101011 | 2Bh         | 11.0      |     |             |
|           |             |           |        |             |           |     |             |

Note:1.VSH>VSHR

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|           |                                  |  |  |  |  |  |  |  |                  |               |
|-----------|----------------------------------|--|--|--|--|--|--|--|------------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number "" | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number      | 13 of 44      |

## 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 : <ul style="list-style-type: none"> <li>After power off command, driver will power off base on power off sequence.</li> <li>After power off command, BUSY_N signal will drop from high to low. When finish the power off sequence, BUSY_N singal will rise from low to high.</li> <li>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.</li> <li>SD output and VCOM will keep floating.</li> </ul> |
| Restriction |   |

## 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | -  | -  | T_VDS_OFF<br>[1] | T_VDS_OFF<br>[0] | T_VSHR_OFF<br>[1] | T_VSHR_OFF<br>[0] | -  | -  | 00h  |

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

| Description | -The command defines as : <ul style="list-style-type: none"> <li>1<sup>st</sup> Parameter:</li> </ul> <table border="1"> <thead> <tr> <th>Bit</th><th>Name</th><th>Description</th></tr> </thead> <tbody> <tr> <td>5-4</td><td>T_VDS_OFF</td><td>00: 1 frame (default)<br/>01: 2 frame<br/>10: 3 frame<br/>11: 4 frame</td></tr> <tr> <td>3-2</td><td>T_VSHR_OFF</td><td>00: 1 frame (default)<br/>01: 2 frame<br/>10: 3 frame<br/>11: 4 frame</td></tr> </tbody> </table> | Bit  | Name | Description | 5-4 | T_VDS_OFF | 00: 1 frame (default)<br>01: 2 frame<br>10: 3 frame<br>11: 4 frame | 3-2 | T_VSHR_OFF | 00: 1 frame (default)<br>01: 2 frame<br>10: 3 frame<br>11: 4 frame |
|-------------|--|--|------|-------------|-----|-----------|--|-----|------------|--|
| Bit         | Name   | Description  |      |             |     |           |  |     |            |  |
| 5-4         | T_VDS_OFF  | 00: 1 frame (default)<br>01: 2 frame<br>10: 3 frame<br>11: 4 frame |      |             |     |           |  |     |            |  |
| 3-2         | T_VSHR_OFF   | 00: 1 frame (default)<br>01: 2 frame<br>10: 3 frame<br>11: 4 frame |      |             |     |           |  |     |            |  |
| Restriction |  |  |      |             |     |           |  |     |            |  |

## 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 : <ul style="list-style-type: none"> <li>After power on command, driver will power on base on power on sequence.</li> <li>After power on command, BUSY_N signal will drop from high to low. When finishing the power on sequence, BUSY_N signal will rise from low to high.</li> </ul> |
| Restriction | This command only active when BUSY_N = “1”.  |

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|           |                                  |  |  |  |  |  |  |  |                  |               |
|-----------|----------------------------------|--|--|--|--|--|--|--|------------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number "" | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number      | 14 of 44      |

## 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 :<br>●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 | This command only active when BUSY_N = “1”.  |

## 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | BT_PHA[7] | BT_PHA[6] | BT_PHA[5] | BT_PHA[4] | BT_PHA[3] | BT_PHA[2] | BT_PHA[1] | BT_PHA[0] | 17h  |
| 2 <sup>nd</sup> Parameter | W   | 1    | BT_PHB[7] | BT_PHB[6] | BT_PHB[5] | BT_PHB[4] | BT_PHB[3] | BT_PHB[2] | BT_PHB[1] | BT_PHB[0] | 17h  |
| 3 <sup>rd</sup> Parameter | W   | 1    | -         | -         | BT_PHC[5] | BT_PHC[4] | BT_PHC[3] | BT_PHC[2] | BT_PHC[1] | BT_PHC[0] | 17h  |
| 4 <sup>th</sup> Parameter | W   | 1    | 1         | 0         | 1         | 0         | 0         | 1         | 0         | 1         | A5h  |
| 5 <sup>th</sup> Parameter | W   | 1    | FT_PHC[3] | FT_PHC[2] | FT_PHC[1] | FT_PHC[0] | FT_PHB[3] | FT_PHB[2] | FT_PHB[1] | FT_PHB[0] | 00h  |

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

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|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 15 of 44      |

| Description | <p>-This command only active when BUSY_N = " 1" .</p> <p>-The command define as follows:</p> <p>1st Parameter:</p> <table border="1"> <thead> <tr> <th>Bit</th><th>Name</th><th>Description</th></tr> </thead> <tbody> <tr> <td>2-0</td><td><b>Driving strength of phase A</b></td><td>000: period 1<br/>001: period 2<br/>010: period 3<br/>011: period 4<br/>100: period 5<br/>101: period 6<br/>110: period 7<br/>111: period 8 (default)</td></tr> <tr> <td>5-3</td><td></td><td>000: Strength 1<br/>001: Strength 2<br/>010: Strength 3 (default)<br/>011: Strength 4<br/>100: Strength 5<br/>101: Strength 6<br/>110: Strength 7<br/>111: Strength 8</td></tr> <tr> <td>7-6</td><td><b>Soft start period of phase A</b></td><td>00: 10mS (default)<br/>01: 20mS<br/>10: 30mS<br/>11: 40mS</td></tr> </tbody> </table> <p>2nd Parameter:</p> <table border="1"> <thead> <tr> <th>Bit</th><th>Name</th><th>Description</th></tr> </thead> <tbody> <tr> <td>2-0</td><td><b>Driving strength of phase B</b></td><td>000: period 1<br/>001: period 2<br/>010: period 3<br/>011: period 4<br/>100: period 5<br/>101: period 6<br/>110: period 7<br/>111: period 8 (default)</td></tr> <tr> <td>5-3</td><td></td><td>000: Strength 1<br/>001: Strength 2<br/>010: Strength 3 (default)<br/>011: Strength 4<br/>100: Strength 5<br/>101: Strength 6<br/>110: Strength 7<br/>111: Strength 8</td></tr> <tr> <td>7-6</td><td><b>Soft start period of phase B</b></td><td>00: 10mS (default)<br/>01: 20mS<br/>10: 30mS<br/>11: 40mS</td></tr> </tbody> </table> <p>3rd Parameter:</p> <table border="1"> <thead> <tr> <th>Bit</th><th>Name</th><th>Description</th></tr> </thead> </table> |  |  |  | Bit | Name | Description | 2-0 | <b>Driving strength of phase A</b> | 000: period 1<br>001: period 2<br>010: period 3<br>011: period 4<br>100: period 5<br>101: period 6<br>110: period 7<br>111: period 8 (default) | 5-3 |  | 000: Strength 1<br>001: Strength 2<br>010: Strength 3 (default)<br>011: Strength 4<br>100: Strength 5<br>101: Strength 6<br>110: Strength 7<br>111: Strength 8 | 7-6 | <b>Soft start period of phase A</b> | 00: 10mS (default)<br>01: 20mS<br>10: 30mS<br>11: 40mS | Bit | Name | Description | 2-0 | <b>Driving strength of phase B</b> | 000: period 1<br>001: period 2<br>010: period 3<br>011: period 4<br>100: period 5<br>101: period 6<br>110: period 7<br>111: period 8 (default) | 5-3 |  | 000: Strength 1<br>001: Strength 2<br>010: Strength 3 (default)<br>011: Strength 4<br>100: Strength 5<br>101: Strength 6<br>110: Strength 7<br>111: Strength 8 | 7-6 | <b>Soft start period of phase B</b> | 00: 10mS (default)<br>01: 20mS<br>10: 30mS<br>11: 40mS | Bit | Name | Description |
|-------------|---|--|--|--|-----|------|-------------|-----|------------------------------------|--|-----|--|--|-----|-------------------------------------|--|-----|------|-------------|-----|------------------------------------|--|-----|--|--|-----|-------------------------------------|--|-----|------|-------------|
| Bit         | Name  | Description  |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| 2-0         | <b>Driving strength of phase A</b>  | 000: period 1<br>001: period 2<br>010: period 3<br>011: period 4<br>100: period 5<br>101: period 6<br>110: period 7<br>111: period 8 (default)                 |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| 5-3         |   | 000: Strength 1<br>001: Strength 2<br>010: Strength 3 (default)<br>011: Strength 4<br>100: Strength 5<br>101: Strength 6<br>110: Strength 7<br>111: Strength 8 |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| 7-6         | <b>Soft start period of phase A</b>   | 00: 10mS (default)<br>01: 20mS<br>10: 30mS<br>11: 40mS   |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| Bit         | Name  | Description  |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| 2-0         | <b>Driving strength of phase B</b>  | 000: period 1<br>001: period 2<br>010: period 3<br>011: period 4<br>100: period 5<br>101: period 6<br>110: period 7<br>111: period 8 (default)                 |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| 5-3         |   | 000: Strength 1<br>001: Strength 2<br>010: Strength 3 (default)<br>011: Strength 4<br>100: Strength 5<br>101: Strength 6<br>110: Strength 7<br>111: Strength 8 |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| 7-6         | <b>Soft start period of phase B</b>   | 00: 10mS (default)<br>01: 20mS<br>10: 30mS<br>11: 40mS   |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |
| Bit         | Name  | Description  |  |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |     |                                    |  |     |  |  |     |                                     |  |     |      |             |

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| File Name  | Specification For HINK 2.13" EPD                  |  |  | Module Number | LCMEN2R13EFC1 |  |  |
|--|---|--|--|---------------|---------------|--|--|
| Version  | A0  |  |  | Page Number   | 16 of 44      |  |  |
|  | 2-0   | <b>Minimum OFF time setting of GDR in phase C</b>                                      | 000: period 1<br>001: period 2<br>010: period 3<br>011: period 4<br>100: period 5<br>101: period 6<br>110: period 7<br>111: period 8 (default)                 |               |               |  |  |
|  | 5-3   | <b>Driving strength of phase C</b>   | 000: Strength 1<br>001: Strength 2<br>010: Strength 3 (default)<br>011: Strength 4<br>100: Strength 5<br>101: Strength 6<br>110: Strength 7<br>111: Strength 8 |               |               |  |  |
| 4th Parameter:   |   |  |  |               |               |  |  |
| This parameter is a check code. The command would be excited if check code = 0xA5, and the 5th Parameter would be available. |   |  |  |               |               |  |  |
| 5th Parameter:   |   |  |  |               |               |  |  |
| Bit  | Name  | Description  |  |               |               |  |  |
| 1-0  | <b>Minimum OFF time setting of GDR in phase B</b> | 00: period sel 1 (default)<br>01: period sel 2<br>10: period sel 3<br>11: period sel 4 |  |               |               |  |  |
| 3-2  | <b>Driving strength of phase B</b>                | 00: Strength sel 1<br>01: Strength sel 2<br>10: Strength sel 3<br>11: Strength sel 4   |  |               |               |  |  |
| 5-4  | <b>Minimum OFF time setting of GDR in phase C</b> | 00: period sel 1 (default)<br>01: period sel 2<br>10: period sel 3<br>11: period sel 4 |  |               |               |  |  |
| 7-6  | <b>Driving strength of phase C</b>                | 00: Strength sel 1<br>01: Strength sel 2<br>10: Strength sel 3<br>11: Strength sel 4   |  |               |               |  |  |
| Restriction  |   |  |  |               |               |  |  |

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|           |                                  |  |  |  |  |  |  |  |               |               |
|-----------|----------------------------------|--|--|--|--|--|--|--|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number   | 17 of 44      |

## 8) R07H (DSLP): Deep Sleep Command

| 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  |
| 1 <sup>st</sup> 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:<br>After this command is transmitted, the chip would enter the deep-sleep mode to save power.<br>The deep sleep mode would return to standby by hardware reset.<br>The only one parameter is a check code, the command would be excited if check code = 0xA5. |
| Restriction | This command only active when BUSY_N = “1”.  |

## 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | KPixel1     | KPixel2     | KPixel3     | KPixel4     | KPixel5     | KPixel6     | KPixel7     | KPixel8   | 00h  |
| 2 <sup>nd</sup> Parameter | W   | 1    |             |             |             |             |             |             |             |           | 00h  |
| ...                       | W   | 1    |             |             |             |             |             |             |             |           | 00h  |
| M <sup>th</sup> 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:<br>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.<br>In B/W mode, this command writes “OLD” data to SRAM.<br>In B/W/Red mode, this command writes “B/W” data to SRAM.<br>In Program mode, this command writes “OTP” data to SRAM for programming. |
| Restriction |   |

## 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  |
| 1 <sup>st</sup> Parameter | R   | 1    | Data_flag | -  | -  | -  | -  | -  | -  | -  | 00h  |

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

| Description | -The command defines as :<br>■ While finished the data transmitting, user must send this command to driver and read Data_flag information.<br>1st Parameter:  |   |      |             |   |   |   |
|-------------|---|---|------|-------------|---|---|---|
|             | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>-</td> <td>0: Driver didn’t receive all the data.<br/>1: Driver has already received all of the one frame data.</td> </tr> </tbody> </table> | Bit   | Name | Description | 7 | - | 0: Driver didn’t receive all the data.<br>1: Driver has already received all of the one frame data. |
| Bit         | Name  | Description   |      |             |   |   |   |
| 7           | -   | 0: Driver didn’t receive all the data.<br>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”.  |   |      |             |   |   |   |

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|           |                                  |  |  |  |  |  |  |  |               |               |
|-----------|----------------------------------|--|--|--|--|--|--|--|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number   | 18 of 44      |

## 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 :<br>■ While users send this command, driver will refresh display (data/VCOM) base on SRAM data and LUT.<br>After display refresh command, BUSY_N signal will become “0”. |
| Restriction | This command only actives when BUSY_N = “1”.  |

## 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | KPixel1     | KPixel2     | KPixel3     | KPixel4     | KPixel5     | KPixel6     | KPixel7     | KPixel8   | 00h  |
| 2 <sup>nd</sup> Parameter | W   | 1    |             |             |             |             |             |             |             |           | 00h  |
| ...                       | W   | 1    |             |             |             |             |             |             |             |           | 00h  |
| M <sup>th</sup> 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:<br>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.<br>In B/W mode, this command writes “NEW” data to SRAM.<br>In B/W/Red mode, this command writes “RED” data to SRAM. |
| Restriction |   |

## 13) R17H (AUTO): Auto Sequence

| R17H          | Bit |      |    |    |    |    |    |    |    |    |      |
|---------------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para     | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| Auto Sequence | W   | 0    | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 17H  |

|             |  |
|-------------|--|
| Description | 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.<br>AUTO (0x17) + Code(0xA5) = (PON→DRF→POF)<br>AUTO (0x17) + Code(0xA7) = (PON→DRF→POF→DSLP) |
| Restriction | This command only actives when BUSY_N = “1”.   |

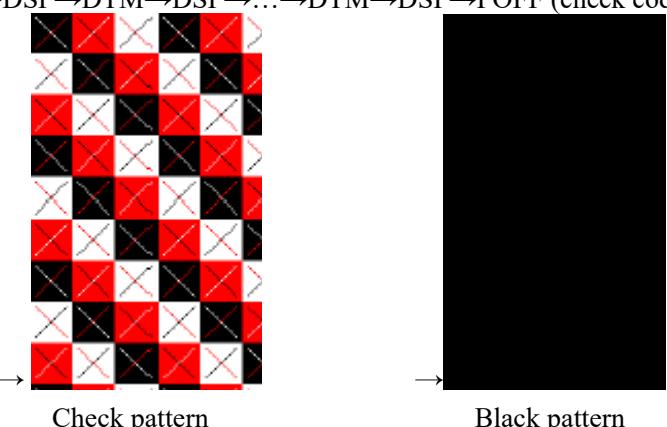
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|           |                                  |  |  |  |  |  |  |               |               |  |
|-----------|----------------------------------|--|--|--|--|--|--|---------------|---------------|--|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |  |
| Version   | A0                               |  |  |  |  |  |  | Page Number   | 19 of 44      |  |

## 14) R18H (BIST): BIST mode Command

| R07H                      | Bit |      |    |    |    |    |    |    |    |    |      |
|---------------------------|-----|------|----|----|----|----|----|----|----|----|------|
| Inst/Para                 | R/W | D/CX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Code |
| BIST                      | W   | 0    | 0  | 0  | 0  | 1  | 1  | 0  | 0  | 0  | 18H  |
| 1 <sup>st</sup> Parameter | W   | 1    | 1  | 0  | 1  | 0  | 0  | 1  | 0  | 1  | A5h  |
| 2 <sup>nd</sup> 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:<br/>This command use only BWR mode.</p> <ul style="list-style-type: none"> <li>● 1st Parameter: (BIST once)<br/>This parameter is a check code.<br/>After this parameter is transmitted, the chip would enter the BIST mode, and display build-in pattern which could be decided by user in R19H (BIST_PS) command.<br/>The command would be excited if check code = 0xA5.<br/>While finished the BIST flow, the check code will be clear to 0x00.</li> </ul> <p>The flow as below:<br/>PON→DTM→DSP→POFF</p>  <p>BIST pattern</p> <ul style="list-style-type: none"> <li>● 2nd Parameter: (BIST auto run)<br/>This parameter is a check code.<br/>After this parameter is transmitted, the chip would enter the BIST mode, and display build-in pattern auto run.<br/>The command would be excited if check code = 0xA5.<br/>The BIST auto run flow will be stop when the check code =0x00.</li> </ul> <p>The flow as below:<br/>PON→DTM→DSP→DTM→DSP→...→DTM→DSP→POFF (check code =0x00 )</p>  <p>Check pattern                                      Black pattern</p> |
|-------------|---|

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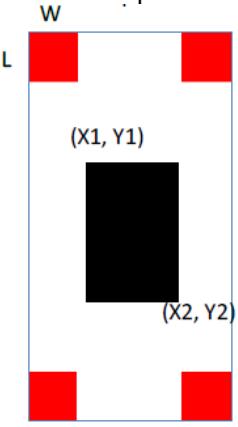
|           |                                  |  |               |               |
|-----------|----------------------------------|--|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  | Page Number   | 20 of 44      |
|           |                                  | <p>White pattern</p> <p>Red pattern</p> <p>(X1, Y1)</p> <p>(X2, Y2)</p> <p>L</p> <p>W</p> <p>Check pattern 2<br/>• BIST pattern (repeat)</p> |               |               |

## 15) R19H (BIST PS): Pattern Selection in BIST

| R19H                      | Bit |      |         |    |    |    |    |              |    |    |      |
|---------------------------|-----|------|---------|----|----|----|----|--------------|----|----|------|
| Inst/Para                 | R/W | D/CX | D7      | D6 | D5 | D4 | D3 | D2           | D1 | D0 | Code |
| Auto Sequence             | W   | 0    | 0       | 0  | 0  | 1  | 1  | 0            | 0  | 1  | 19H  |
| 1 <sup>st</sup> Parameter | W   | 1    | -       | -  | -  | -  | -  | BSIT_PS[2:0] |    |    | 00h  |
| 2 <sup>nd</sup> Parameter | W   | 1    | W [7:3] |    |    |    |    | -            |    |    |      |
| 3 <sup>rd</sup> Parameter | W   | 1    | L[7:0]  |    |    |    |    |              |    |    |      |
| 4 <sup>th</sup> Parameter | W   | 1    | X1[7:3] |    |    |    |    | 0            | 0  | 0  | 00h  |
| 5 <sup>th</sup> Parameter | W   | 1    | Y1[7:0] |    |    |    |    |              |    |    |      |
| 6 <sup>th</sup> Parameter | W   | 1    | X2[7:3] |    |    |    |    | 1            | 1  | 1  | 00h  |
| 7 <sup>th</sup> Parameter | W   | 1    | Y2[7:0] |    |    |    |    |              |    |    |      |

|             |   |
|-------------|---|
| Description | The command can decide which BIST pattern you would like to show.<br>1st Parameter<br>000: check pattern<br>001: Black pattern<br>010: White pattern<br>011: Red pattern<br>100: check pattern 2<br>Note: R19 should be determined before R18.<br>2nd ~7th Parameter : check pattern 2 setting<br>W[7:3]: Red block width |
|-------------|---|

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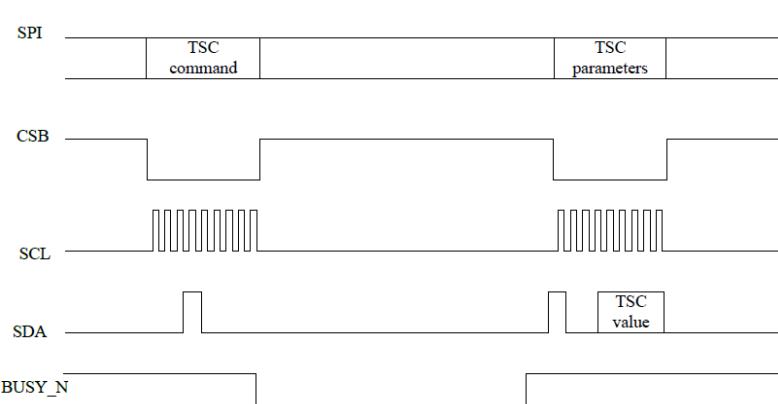
|             |  |               |               |
|-------------|--|---------------|---------------|
| File Name   | Specification For HINK 2.13" EPD   | Module Number | LCMEN2R13EFC1 |
| Version     | A0   | Page Number   | 21 of 44      |
|             | <p>L[7:0]: Red block Length<br/>     X1[7:3]: Black block X star point<br/>     Y1[7:0]: Black block Y star point<br/>     X2[7:3]: Black block X end point<br/>     Y2[7:0]: Black block Y end point</p>  <p>Note:<br/>     1. <math>W &gt; H/2 \rightarrow W = W/4</math><br/>     2. <math>L &gt; V/2 \rightarrow L = V/4</math><br/>     3. <math>X2 &gt; X1</math><br/>     4. <math>Y2 &gt; Y1</math></p> |               |               |
| Restriction | This command only actives when BUSY_N = "1".   |               |               |

## 16) 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  |
| 1 <sup>st</sup> 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] | -    |
| 2 <sup>nd</sup> Parameter | R   | 1    | D2/TS[1]  | D1/TS[0] | D0       | -        | -        | -        | -        | -        | -    |

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

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| File Name       | Specification For HINK 2.13" EPD  | Module Number   | LCMEN2R13EFC1 |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
|-----------------|---|-----------------|---------------|-----------------|-------|-----------------|-------|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|---|----------|----|----------|-----|----------|----|----------|----|----------|-----|----------|----|----------|----|----------|-----|----------|----|----------|----|----------|-----|----------|----|----------|----|----------|-----|----------|----|----------|----|----------|-----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|---------|--------|----|----|----|-------|----|------|----|-------|
| Version         | A0  | Page Number     | 22 of 44      |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| Description     | <p>-The command define as follows:<br/> This command indicates the temperature value.<br/> If R41H(TSE) bit7 set to 0, this command reads internal temperature sensor value.<br/> If R41H(TSE) bit7 set to 1, this command reads external (LM75) temperature sensor value.</p>    |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
|                 | <table border="1"> <thead> <tr> <th>TS[9:2]/D[10:3]</th> <th>T(°C)</th> <th>TS[9:2]/D[10:3]</th> <th>T(°C)</th> <th>TS[9:2]/D[10:3]</th> <th>T(°C)</th> </tr> </thead> <tbody> <tr><td>11100111</td><td>-25</td><td>00000000</td><td>0</td><td>00011001</td><td>25</td></tr> <tr><td>11101000</td><td>-24</td><td>00000001</td><td>1</td><td>00011010</td><td>26</td></tr> <tr><td>11101001</td><td>-23</td><td>00000010</td><td>2</td><td>00011011</td><td>27</td></tr> <tr><td>11101010</td><td>-22</td><td>00000011</td><td>3</td><td>00011100</td><td>28</td></tr> <tr><td>11101011</td><td>-21</td><td>00000100</td><td>4</td><td>00011101</td><td>29</td></tr> <tr><td>11101100</td><td>-20</td><td>00000101</td><td>5</td><td>00011110</td><td>30</td></tr> <tr><td>11101101</td><td>-19</td><td>00000110</td><td>6</td><td>00011111</td><td>31</td></tr> <tr><td>11101110</td><td>-18</td><td>00000111</td><td>7</td><td>00100000</td><td>32</td></tr> <tr><td>11101111</td><td>-17</td><td>00001000</td><td>8</td><td>00100001</td><td>33</td></tr> <tr><td>11110000</td><td>-16</td><td>00001001</td><td>9</td><td>00100010</td><td>34</td></tr> <tr><td>11110001</td><td>-15</td><td>00001010</td><td>10</td><td>00100011</td><td>35</td></tr> <tr><td>11110010</td><td>-14</td><td>00001011</td><td>11</td><td>00100100</td><td>36</td></tr> <tr><td>11110011</td><td>-13</td><td>00001100</td><td>12</td><td>00100101</td><td>37</td></tr> <tr><td>11110100</td><td>-12</td><td>00001101</td><td>13</td><td>00100110</td><td>38</td></tr> <tr><td>11110101</td><td>-11</td><td>00001110</td><td>14</td><td>00100111</td><td>39</td></tr> <tr><td>11110110</td><td>-10</td><td>00001111</td><td>15</td><td>00101000</td><td>40</td></tr> <tr><td>11110111</td><td>-9</td><td>00010000</td><td>16</td><td>00101001</td><td>41</td></tr> <tr><td>11111000</td><td>-8</td><td>00010001</td><td>17</td><td>00101010</td><td>42</td></tr> <tr><td>11111001</td><td>-7</td><td>00010010</td><td>18</td><td>00101011</td><td>43</td></tr> <tr><td>11111010</td><td>-6</td><td>00010011</td><td>19</td><td>00101100</td><td>44</td></tr> <tr><td>11111011</td><td>-5</td><td>00010100</td><td>20</td><td>00101101</td><td>45</td></tr> <tr><td>11111100</td><td>-4</td><td>00010101</td><td>21</td><td>00101110</td><td>46</td></tr> <tr><td>11111101</td><td>-3</td><td>00010110</td><td>22</td><td>00101111</td><td>47</td></tr> <tr><td>11111110</td><td>-2</td><td>00010111</td><td>23</td><td>00110000</td><td>48</td></tr> <tr><td>11111111</td><td>-1</td><td>00011000</td><td>24</td><td>00110001</td><td>49</td></tr> </tbody> </table><br><table border="1"> <thead> <tr> <th>TS[1:0]</th> <th>T(° C)</th> </tr> </thead> <tbody> <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> </tbody> </table> | 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 | TS[1:0] | T(° C) | 00 | +0 | 01 | +0.25 | 10 | +0.5 | 11 | +0.75 |
| 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    |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| TS[1:0]         | T(° C)  |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| 00              | +0  |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| 01              | +0.25   |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| 10              | +0.5  |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| 11              | +0.75   |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |
| Restriction     | This command only actives when BUSY_N = "1".  |                 |               |                 |       |                 |       |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |   |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |     |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |          |    |         |        |    |    |    |       |    |      |    |       |

## 17) R41H (TSE): Temperature Sensor Calibration Register

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|                           |                                  |      |     |    |       |       |       |       |               |               |      |
|---------------------------|----------------------------------|------|-----|----|-------|-------|-------|-------|---------------|---------------|------|
| File Name                 | Specification For HINK 2.13" EPD |      |     |    |       |       |       |       | Module Number | LCMEN2R13EFC1 |      |
| Version                   | A0                               |      |     |    |       |       |       |       | Page Number   | 23 of 44      |      |
| 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  |
| 1 <sup>st</sup> Parameter | W                                | 1    | TSE | -  | TO[5] | TO[4] | TO[3] | TO[2] | TO[1]         | TO[0]         | 00h  |

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

|             |   |   |
|-------------|---|---|
| Description | <p>-The command defines as:<br/>         This command indicates the driver IC temperature sensor enable and calibration function.<br/>         Reserve one temperature offset TO[3:0] for calibration<br/>         1. TO[3]: mean ‘+’ or ‘-‘ , while 0 is ‘+’ ; 1 is ‘-‘<br/>         2. TO[2:0]: mean temperature offset value</p> |   |
|             | Bit   | Description   |
|             | 3-0   | <p>Temperature level:<br/>         0000: +0°C (default)<br/>         0001: +1°C<br/>         0010: +2°C<br/>         0011: +3°C<br/>         0100: +4°C<br/>         0101: +5°C<br/>         0110: +6°C<br/>         0111: +7°C<br/>         1000: -8°C<br/>         1001: -7°C<br/>         1010: -6°C<br/>         1011: -5°C<br/>         1100: -4°C<br/>         1101: -3°C<br/>         1110: -2°C<br/>         1111: -1°C</p> |
|             | 5-4   | <p>00: +0.0°C (default)<br/>         01: +0.25°C<br/>         10: +0.5°C<br/>         11: +0.75°C</p>   |
|             | 7   | <p>Internal temperature sensor enable<br/>         0: Internal temperature sensor enable.(default)<br/>         1: Internal temperature sensor disable, using external temperature sensor.</p>  |
| Restriction | This command only actives after R04H(PON) or R05H(PMES)   |   |

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|           |                                  |  |  |  |  |  |  |               |               |  |
|-----------|----------------------------------|--|--|--|--|--|--|---------------|---------------|--|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |  |
| Version   | A0                               |  |  |  |  |  |  | Page Number   | 24 of 44      |  |

## 18) 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | WATTR[7] | WATTR[6] | WATTR[5] | WATTR[4] | WATTR[3] | WATTR[2] | WATTR[1] | WATTR[0] | 00h  |
| 2 <sup>nd</sup> Parameter | W   | 1    | WMSB[7]  | WMSB[6]  | WMSB[5]  | WMSB[4]  | WMSB[3]  | WMSB[2]  | WMSB[1]  | WMSB[0]  | 00h  |
| 3 <sup>rd</sup> 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 | <p>-The command defines as:<br/>This command writes the temperature.</p> <p>1st Parameter:</p> <table border="1"> <tr> <td>Bit</td><td>temperature</td></tr> <tr> <td>2-0</td><td>Pointer setting</td></tr> <tr> <td>5-3</td><td>User-defined address bits (A2, A1, A0)</td></tr> <tr> <td>7-6</td><td>I2C Write Byte Number<br/>00: 1 byte (head byte only)<br/>01: 2 bytes (head byte + pointer)<br/>10: 3 bytes (head byte + pointer + 1st parameter)<br/>11: 4 bytes (head byte + pointer + 1st parameter + 2nd parameter)</td></tr> </table> <p>2nd Parameter:</p> <table border="1"> <tr> <td>Bit</td><td>temperature</td></tr> <tr> <td>7-0</td><td>MSByte of write-data to external temperature sensor</td></tr> </table> <p>3rd Parameter:</p> <table border="1"> <tr> <td>Bit</td><td>temperature</td></tr> <tr> <td>7-0</td><td>LSByte of write-data to external temperature sensor</td></tr> </table> |  |  |  |  |  |  |  |  |  |  |  | Bit | temperature | 2-0 | Pointer setting | 5-3 | User-defined address bits (A2, A1, A0) | 7-6 | I2C Write Byte Number<br>00: 1 byte (head byte only)<br>01: 2 bytes (head byte + pointer)<br>10: 3 bytes (head byte + pointer + 1st parameter)<br>11: 4 bytes (head byte + pointer + 1st parameter + 2nd parameter) | Bit | temperature | 7-0 | MSByte of write-data to external temperature sensor | Bit | temperature | 7-0 | LSByte of write-data to external temperature sensor |
| Bit         | temperature   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| 2-0         | Pointer setting   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| 5-3         | User-defined address bits (A2, A1, A0)  |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| 7-6         | I2C Write Byte Number<br>00: 1 byte (head byte only)<br>01: 2 bytes (head byte + pointer)<br>10: 3 bytes (head byte + pointer + 1st parameter)<br>11: 4 bytes (head byte + pointer + 1st parameter + 2nd parameter)   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| Bit         | temperature   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| 7-0         | MSByte of write-data to external temperature sensor   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| Bit         | temperature   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| 7-0         | LSByte of write-data to external temperature sensor   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |
| Restriction | This command only actives after R04H(PON) or R05H(PMES)   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |                 |     |  |     |   |     |             |     |   |     |             |     |   |

## 19) 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       | 1       | 1       | 43H  |
| 1 <sup>st</sup> Parameter | R   | 1    | RMSB[7] | RMSB[6] | RMSB[5] | RMSB[4] | RMSB[3] | RMSB[2] | RMSB[1] | RMSB[0] | -    |
| 2 <sup>nd</sup> 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 | <p>-The command defines as:<br/>This command reads the temperature sensed by the temperature sensor.</p> <p>1st Parameter:</p> <table border="1"> <tr> <td>Bit</td><td>temperature</td></tr> <tr> <td>7-0</td><td>MSByte of read-data from external temperature sensor</td></tr> </table> <p>2nd Parameter:</p> <table border="1"> <tr> <td>Bit</td><td>temperature</td></tr> <tr> <td>7-0</td><td>LSByte of write-data from external temperature sensor</td></tr> </table> |  |  |  |  |  |  |  |  |  |  |  | Bit | temperature | 7-0 | MSByte of read-data from external temperature sensor | Bit | temperature | 7-0 | LSByte of write-data from external temperature sensor |
| Bit         | temperature   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |  |     |             |     |   |
| 7-0         | MSByte of read-data from external temperature sensor  |  |  |  |  |  |  |  |  |  |  |  |     |             |     |  |     |             |     |   |
| Bit         | temperature   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |  |     |             |     |   |
| 7-0         | LSByte of write-data from external temperature sensor   |  |  |  |  |  |  |  |  |  |  |  |     |             |     |  |     |             |     |   |

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|             |   |  |             |  |               |                |  |
|-------------|---|--|-------------|--|---------------|----------------|--|
| File Name   | Specification For HINK 2.13" EPD                        |  |             |  | Module Number | LCMEN2R13EFC1  |  |
| Version     | A0  |  |             |  | Page Number   | 25 of 44       |  |
|             | SPI   |  | TSR command |  |               | TSR parameters |  |
|             | CSB   |  |             |  |               |                |  |
|             | SCL   |  |             |  |               |                |  |
|             | SDA   |  |             |  |               | TSR value      |  |
|             | BUSY_N  |  |             |  |               |                |  |
| Restriction | This command only actives after R04H(PON) or R05H(PMES) |  |             |  |               |                |  |

## 20)R50H (CDI): VCOM and DATA interval setting Register

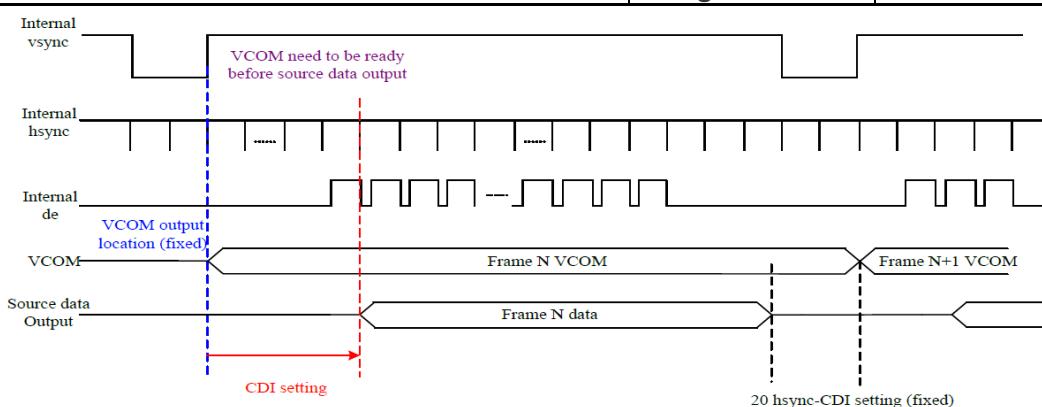
| R50H                      | Bit |      |        |        |        |        |        |        |        |        |      |
|---------------------------|-----|------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| Inst/Para                 | R/W | D/CX | D7     | D6     | D5     | D4     | D3     | D2     | D1     | D0     | Code |
| CDI                       | W   | 0    | 0      | 1      | 0      | 1      | 0      | 0      | 0      | 0      | 50H  |
| 1 <sup>st</sup> 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 | <p>-The command defines as:</p> <p>1st Parameter:</p> <p>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).</p> <p>2nd Parameter:</p> <table border="1"> <thead> <tr> <th>Bit</th><th></th></tr> </thead> <tbody> <tr> <td>3-0</td><td>Vcom and data interval<br/>0000: 17 hsync<br/>0001:16 hsync<br/>0010:15 hsync<br/>0011:14 hsync<br/>0100:13 hsync<br/>0101:12 hsync<br/>0110:11 hsync<br/>0111:10 hsync<br/>1000:9 hsync<br/>1001:8 hsync<br/>1010:7 hsync<br/>1011:6 hsync<br/>1100:5 hsync<br/>1101:4 hsync<br/>1110:3 hsync<br/>1111:2 hsync</td></tr> </tbody> </table> | Bit |  | 3-0 | Vcom and data interval<br>0000: 17 hsync<br>0001:16 hsync<br>0010:15 hsync<br>0011:14 hsync<br>0100:13 hsync<br>0101:12 hsync<br>0110:11 hsync<br>0111:10 hsync<br>1000:9 hsync<br>1001:8 hsync<br>1010:7 hsync<br>1011:6 hsync<br>1100:5 hsync<br>1101:4 hsync<br>1110:3 hsync<br>1111:2 hsync |
|-------------|---|-----|--|-----|---|
| Bit         |   |     |  |     |   |
| 3-0         | Vcom and data interval<br>0000: 17 hsync<br>0001:16 hsync<br>0010:15 hsync<br>0011:14 hsync<br>0100:13 hsync<br>0101:12 hsync<br>0110:11 hsync<br>0111:10 hsync<br>1000:9 hsync<br>1001:8 hsync<br>1010:7 hsync<br>1011:6 hsync<br>1100:5 hsync<br>1101:4 hsync<br>1110:3 hsync<br>1111:2 hsync   |     |  |     |   |

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|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 26 of 44      |



VBD[1:0]: Border data selection.

B/W/Red mode(BWR=0)

| Bit 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 (default) |

B/W mode(BWR=1)

| Bit 4      | Bit7-6   | Description        |
|------------|----------|--------------------|
| DDX[0]     | VBD[1:0] | LUT                |
| 0          | 00       | Floating           |
|            | 01       | LUTBW (1->0)       |
|            | 10       | LUTWB (0->1)       |
|            | 11       | Floating           |
| 1(default) | 00       | Floating           |
|            | 01       | LUTWB (0->1)       |
|            | 10       | LUTBW (1->0)       |
|            | 11       | Floating (default) |

Border output voltage level: The level selection is based on mapping LUT data.

Level Selection:

00b: VCOM

01b: VSH

10b: VSL

11b: VSHR

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

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| File Name   | Specification For HINK 2.13" EPD                        |             | Module Number | LCMEN2R13EFC1 |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|---|---|-------------|---------------|---------------|-------------|--|----------|----------------|-----|----|----|-------------|----|-------------|----|-------------|-------------|-------------|-------------|----|-------------|----|-------------|----|-------------|----|-------------|----|----|------|----|------|----|------|----|------|----|----|------|----|------|----|------|----|------|
| Version   | A0  |             | Page Number   | 27 of 44      |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| B/W/Red mode(BWR=0)<br>DDX[1] is for RED data<br>DDX[0] is for B/W data   |   |             |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| <table border="1"> <thead> <tr> <th>Bit 5-4</th> <th>Description</th> <th></th> </tr> </thead> <tbody> <tr> <td>DDX[1:0]</td> <td>Data (Red/B/W)</td> <td>LUT</td> </tr> <tr> <td rowspan="4">00</td> <td>00</td> <td>LUTW</td> </tr> <tr> <td>01</td> <td>LUTB</td> </tr> <tr> <td>10</td> <td>LUTR</td> </tr> <tr> <td>11</td> <td>LUTR</td> </tr> <tr> <td rowspan="4">01(default)</td> <td>00</td> <td>LUTB</td> </tr> <tr> <td>01</td> <td>LUT2</td> </tr> <tr> <td>10</td> <td>LUTR</td> </tr> <tr> <td>11</td> <td>LUTR</td> </tr> <tr> <td rowspan="4">10</td> <td>00</td> <td>LUTR</td> </tr> <tr> <td>01</td> <td>LUTR</td> </tr> <tr> <td>10</td> <td>LUTW</td> </tr> <tr> <td>11</td> <td>LUTB</td> </tr> <tr> <td rowspan="4">11</td> <td>00</td> <td>LUTR</td> </tr> <tr> <td>01</td> <td>LUTR</td> </tr> <tr> <td>10</td> <td>LUTB</td> </tr> <tr> <td>11</td> <td>LUTW</td> </tr> </tbody> </table> |   |             |               | 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 | LUT2        | 10 | LUTR        | 11 | LUTR        | 10 | 00 | LUTR | 01 | LUTR | 10 | LUTW | 11 | LUTB | 11 | 00 | LUTR | 01 | LUTR | 10 | LUTB | 11 | LUTW |
| 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  | LUT2        |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 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)<br>DDX[1]=0 is for BW mode with NEW/OLD  |   |             |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
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| Bit 5-4   | Description   |             |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| DDX[1:0]  | Data (B/W)  | LUT         |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| 00  | 00  | LUTWW0->0)  |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 01  | LUTBW(1->0) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 10  | LUTWB(0->1) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 11  | LUTBB(1->1) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| 01(default)   | 00  | LUTBB(0->0) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 01  | LUTWB(1->0) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 10  | LUTBW(0->1) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 11  | LUTWW(1->1) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| DDX[1]=1 is for BW mode without NEW/OLD   |   |             |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| <table border="1"> <thead> <tr> <th>Bit 5-4</th> <th>Description</th> <th></th> </tr> </thead> <tbody> <tr> <td>DDX[1:0]</td> <td>Data (B/W)</td> <td>LUT</td> </tr> <tr> <td rowspan="2">10</td> <td>0</td> <td>LUTBW(1-&gt;0)</td> </tr> <tr> <td>1</td> <td>LUTWB(0-&gt;1)</td> </tr> <tr> <td rowspan="2">11</td> <td>0</td> <td>LUTWB(0-&gt;0)</td> </tr> <tr> <td>1</td> <td>LUTBW(1-&gt;0)</td> </tr> </tbody> </table>  |   |             |               | Bit 5-4       | Description |  | DDX[1:0] | Data (B/W)     | LUT | 10 | 0  | LUTBW(1->0) | 1  | LUTWB(0->1) | 11 | 0           | LUTWB(0->0) | 1           | LUTBW(1->0) |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| Bit 5-4   | Description   |             |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| DDX[1:0]  | Data (B/W)  | LUT         |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| 10  | 0   | LUTBW(1->0) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 1   | LUTWB(0->1) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| 11  | 0   | LUTWB(0->0) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
|   | 1   | LUTBW(1->0) |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |
| Restriction   | This command only actives after R04H(PON) or R05H(PMES) |             |               |               |             |  |          |                |     |    |    |             |    |             |    |             |             |             |             |    |             |    |             |    |             |    |             |    |    |      |    |      |    |      |    |      |    |    |      |    |      |    |      |    |      |

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|-----------|----------------------------------|--|--|--|--|--|--|--|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number   | 28 of 44      |

## 21) 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  |
| 1 <sup>st</sup> Parameter | R   | 1    | GHD | SHD | SLD | SHRD - | -  | -  | -  | LPD | -    |

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

| Description | <p>-The command defines as:<br/>This command indicates the input power condition. Host can read this data to understand the battery’s condition.<br/>When LPD=“1”, system input power is normal.<br/>When LPD=“0”, system input power is lower (VDD&lt;2.5v, which could be select in RE4H (LVSEL)).</p> <p>1st Parameter:</p> <table border="1"> <thead> <tr> <th>Bit</th><th>Name</th><th>Description</th></tr> </thead> <tbody> <tr> <td>0</td><td>LPD</td><td>0: Low power input<br/>1: Normal status</td></tr> <tr> <td>4</td><td>SHRD</td><td>0: Detect voltage &lt; 90%VSHR<br/>1: Normal status</td></tr> <tr> <td>5</td><td>SLD</td><td>0: Detect voltage &lt; 95%VSL<br/>1: Normal status</td></tr> <tr> <td>6</td><td>SHD</td><td>0: Detect voltage &lt; 95%VSH<br/>1: Normal status</td></tr> <tr> <td>7</td><td>GHD</td><td>0: Detect voltage &lt; 95%VGH<br/>1: Normal status</td></tr> </tbody> </table> | Bit   | Name | Description | 0 | LPD | 0: Low power input<br>1: Normal status | 4 | SHRD | 0: Detect voltage < 90%VSHR<br>1: Normal status | 5 | SLD | 0: Detect voltage < 95%VSL<br>1: Normal status | 6 | SHD | 0: Detect voltage < 95%VSH<br>1: Normal status | 7 | GHD | 0: Detect voltage < 95%VGH<br>1: Normal status |
|-------------|---|---|------|-------------|---|-----|--|---|------|---|---|-----|--|---|-----|--|---|-----|--|
| Bit         | Name  | Description                                     |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |
| 0           | LPD   | 0: Low power input<br>1: Normal status          |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |
| 4           | SHRD  | 0: Detect voltage < 90%VSHR<br>1: Normal status |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |
| 5           | SLD   | 0: Detect voltage < 95%VSL<br>1: Normal status  |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |
| 6           | SHD   | 0: Detect voltage < 95%VSH<br>1: Normal status  |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |
| 7           | GHD   | 0: Detect voltage < 95%VGH<br>1: Normal status  |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |
| Restriction | <ul style="list-style-type: none"> <li>- This command only actives when BUSY_N = “1”.</li> <li>- This command only actives after R04H(PON) /R05H(PMES)</li> </ul>   |   |      |             |   |     |  |   |      |   |   |     |  |   |     |  |   |     |  |

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| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number   | 29 of 44      |

## 22)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  |
| 1 <sup>st</sup> Parameter | W   | 1    | S2G[3] | S2G[2] | S2G[1]- | S2G[0] | G2S[3] | G2S[2] | G2S[1] | G2S[0] | 22h  |

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

| Description       | <ul style="list-style-type: none"> <li>- The command define Non-overlap period of gate and source as below:</li> </ul> <p>1st Parameter:</p> <table border="1"> <thead> <tr> <th>Bit</th><th>Period</th></tr> </thead> <tbody> <tr> <td>S2G[3:0]/G2S[3:0]</td><td>           0000: 4 clock<br/>           0001: 8 clock<br/>           0010: 12 clock (default)<br/>           0011: 16 clock<br/>           0100: 20 clock<br/>           0101: 24 clock<br/>           0110: 28 clock<br/>           0111: 32 clock<br/>           1000: 36 clock<br/>           1001: 40 clock<br/>           1010: 44 clock<br/>           1011: 48 clock<br/>           1100: 52 clock<br/>           1101: 56 clock<br/>           1110: 60 clock<br/>           1111: 64 clock         </td></tr> </tbody> </table> | Bit | Period | S2G[3:0]/G2S[3:0] | 0000: 4 clock<br>0001: 8 clock<br>0010: 12 clock (default)<br>0011: 16 clock<br>0100: 20 clock<br>0101: 24 clock<br>0110: 28 clock<br>0111: 32 clock<br>1000: 36 clock<br>1001: 40 clock<br>1010: 44 clock<br>1011: 48 clock<br>1100: 52 clock<br>1101: 56 clock<br>1110: 60 clock<br>1111: 64 clock |
|-------------------|--|-----|--------|-------------------|--|
| Bit               | Period   |     |        |                   |  |
| S2G[3:0]/G2S[3:0] | 0000: 4 clock<br>0001: 8 clock<br>0010: 12 clock (default)<br>0011: 16 clock<br>0100: 20 clock<br>0101: 24 clock<br>0110: 28 clock<br>0111: 32 clock<br>1000: 36 clock<br>1001: 40 clock<br>1010: 44 clock<br>1011: 48 clock<br>1100: 52 clock<br>1101: 56 clock<br>1110: 60 clock<br>1111: 64 clock   |     |        |                   |  |
|                   | <p>Period=650ns</p>  |     |        |                   |  |
| Restriction       |  |     |        |                   |  |

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|-----------|----------------------------------|--|--|--|--|--|--|--|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number   | 30 of 44      |

## 23) 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  |
| 1 <sup>st</sup> Parameter | W   | 1    | HRES[7] | HRES[6] | HRES[5] | HRES[4] | HRES[3] | -       | -       | -       | 00h  |
| 2 <sup>nd</sup> Parameter | W   | 1    |         |         |         |         |         |         |         | VRES[8] | 00h  |
| 3 <sup>rd</sup> 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 | -The command define as follows:<br>When using register:<br>Horizontal display resolution(source) = HRES<br>Vertical display resolution(gate) = VRES<br>Channel disable calculation:<br>GD : First G active = G0; LAST active GD= first active +VRES[7:0] -1<br>SD : First active channel: =S0 ; LAST active SD= first active +HRES[7:3]*8-1<br>EX :128X240<br>GD: First G active = G0<br>LAST active GD= 0+240-1= 239; (G239)<br>SD : First active channel: =S0<br>LAST active SD=0+16*8-1=127; (S127) |
| Restriction |  |

## 24) R65H (GSST): Gate/Source Start Setting Register

| R65H                      | Bit |      |            |            |            |            |            |            |            |            |      |
|---------------------------|-----|------|------------|------------|------------|------------|------------|------------|------------|------------|------|
| Inst/Para                 | R/W | D/CX | D7         | D6         | D5         | D4         | D3         | D2         | D1         | D0         | Code |
| GSST                      | W   | 0    | 0          | 1          | 1          | 0          | 0          | 1          | 0          | 1          | 65H  |
| 1 <sup>st</sup> Parameter | W   | 1    | S_start[7] | S_start[6] | S_start[5] | S_start[4] | S_start[3] | --         | --         | --         | 00h  |
| 2 <sup>nd</sup> Parameter | W   | 1    |            |            |            | gscan      |            |            |            | G_start[8] | 00h  |
| 3 <sup>rd</sup> 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:<br>1.S_Start [7:3] describe which source output line is the first date line<br>2.G_Start[7:0] describe which gate line is the first scan line<br>3. gscan :Gate scan select<br>0: Normal scan<br>1: Cascade type 2 scan |
| Restriction | S_Start should be the multiple of 8   |

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|           |                                  |  |  |  |  |  |  |  |               |               |
|-----------|----------------------------------|--|--|--|--|--|--|--|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD |  |  |  |  |  |  |  | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               |  |  |  |  |  |  |  | Page Number   | 31 of 44      |

## 25) RE3H (PWS): Power Saving Register

| RE3H                      | Bit |      |             |    |    |    |           |    |    |    |      |
|---------------------------|-----|------|-------------|----|----|----|-----------|----|----|----|------|
| Inst/Para                 | R/W | D/CX | D7          | D6 | D5 | D4 | D3        | D2 | D1 | D0 | Code |
| PWS                       | W   | 0    | 1           | 1  | 1  | 0  | 0         | 0  | 1  | 1  | E3H  |
| 1 <sup>st</sup> Parameter | W   | 1    | VCOM_W[3:0] |    |    |    | SD_W[3:0] |    |    |    | 00h  |

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

|             |  |
|-------------|--|
| Description | <ul style="list-style-type: none"> <li>- 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.</li> </ul> <p>VCOM_W: VCOM power saving width (unit = line period)</p> <p>SD_W: Source power saving width (unit = 660nS)</p> |
| Restriction |  |

|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 32 of 44      |

## 8 . HOST INTERFACES

### 8.1 “3-Wire” Serial Port Interface

E0213A285 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.

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”.

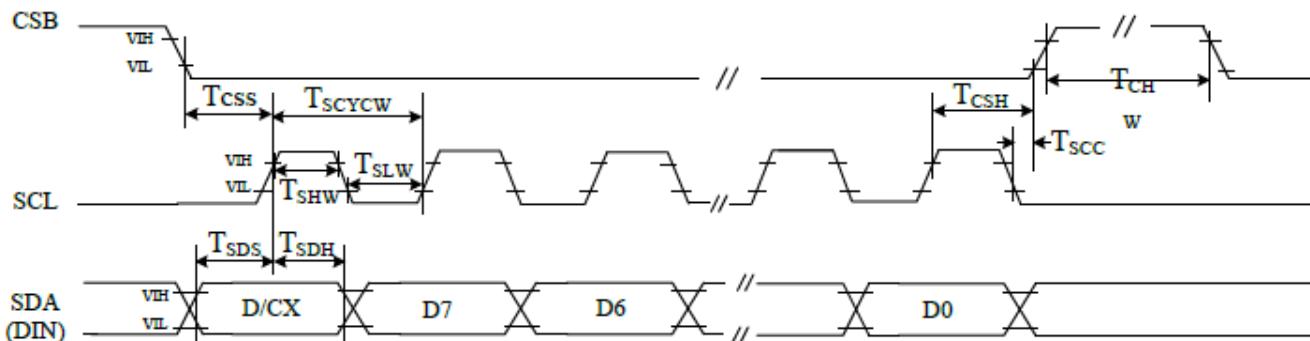


Figure 8-1 3 pin serial interface characteristics (write mode)

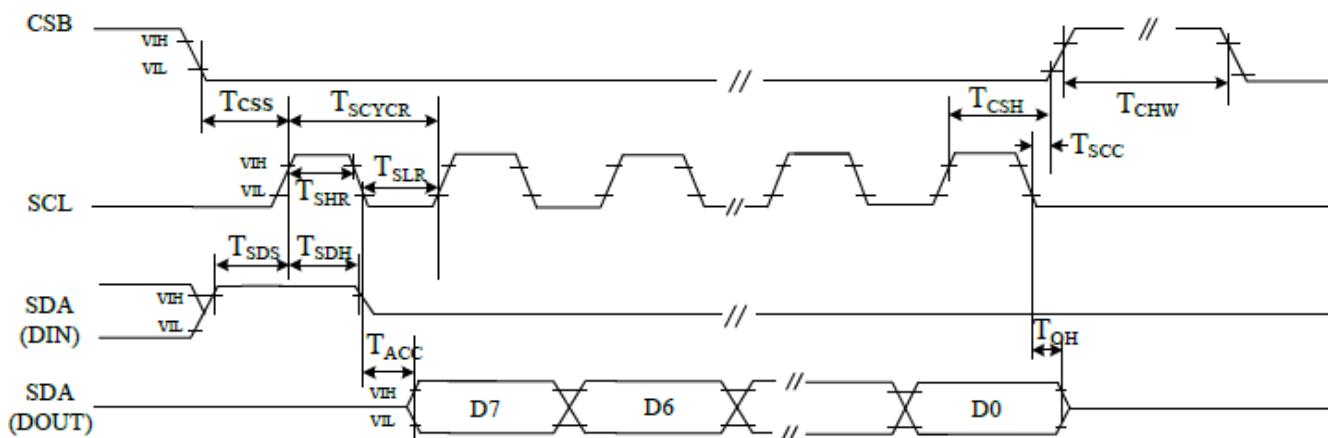
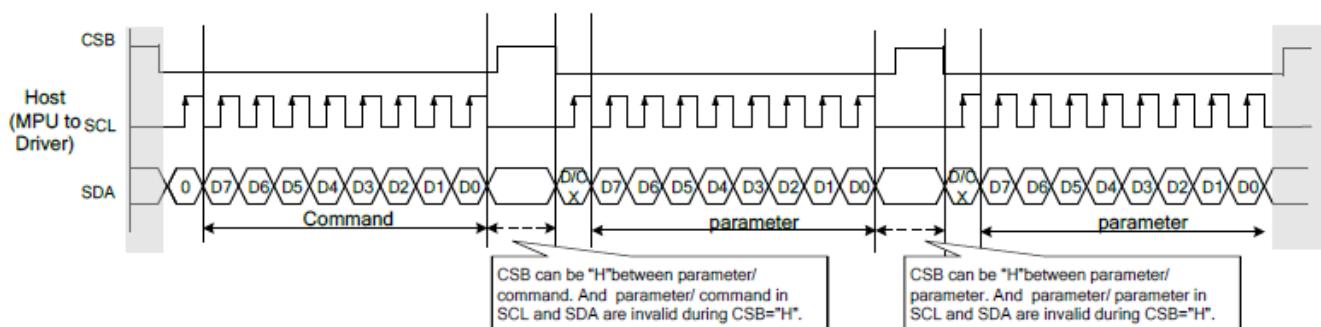


Figure 8-2 3 pin serial interface characteristics (read mode)



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|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 33 of 44      |

## 8.1 “4-Wire” Serial Port Interface

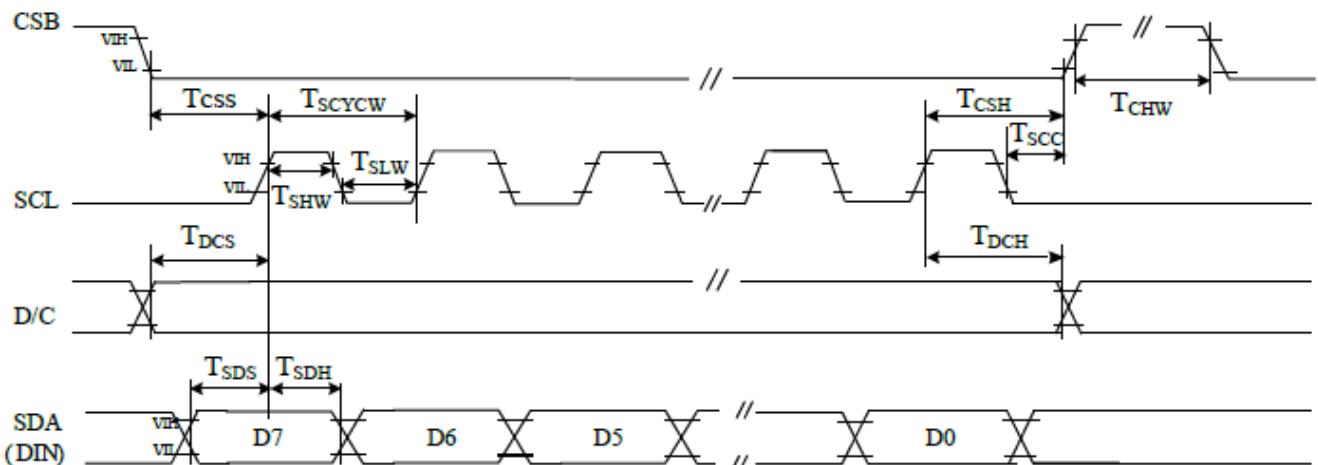


Figure 8-3 4 pin serial interface characteristics (write mode)

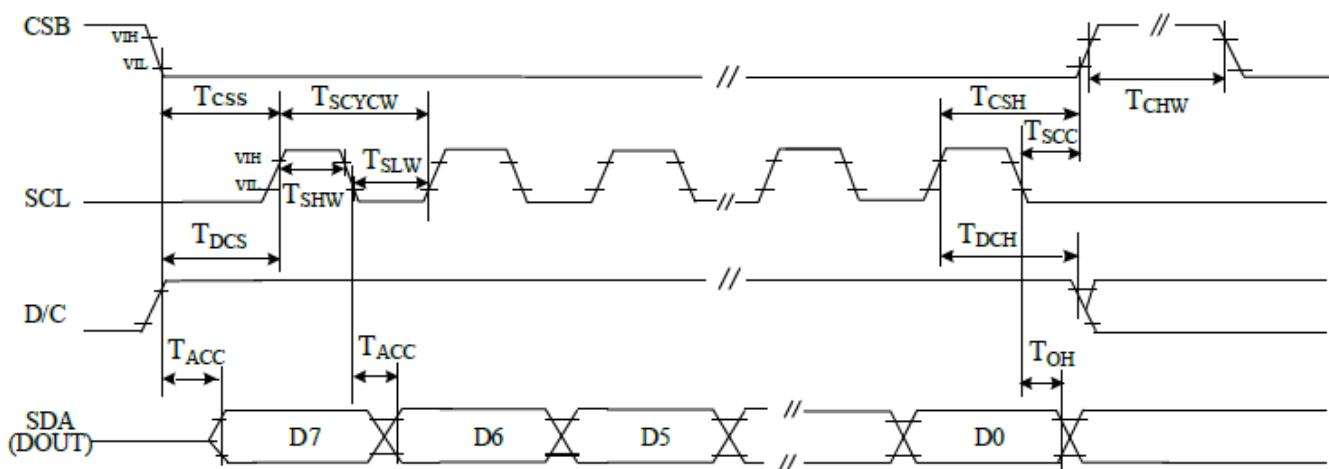
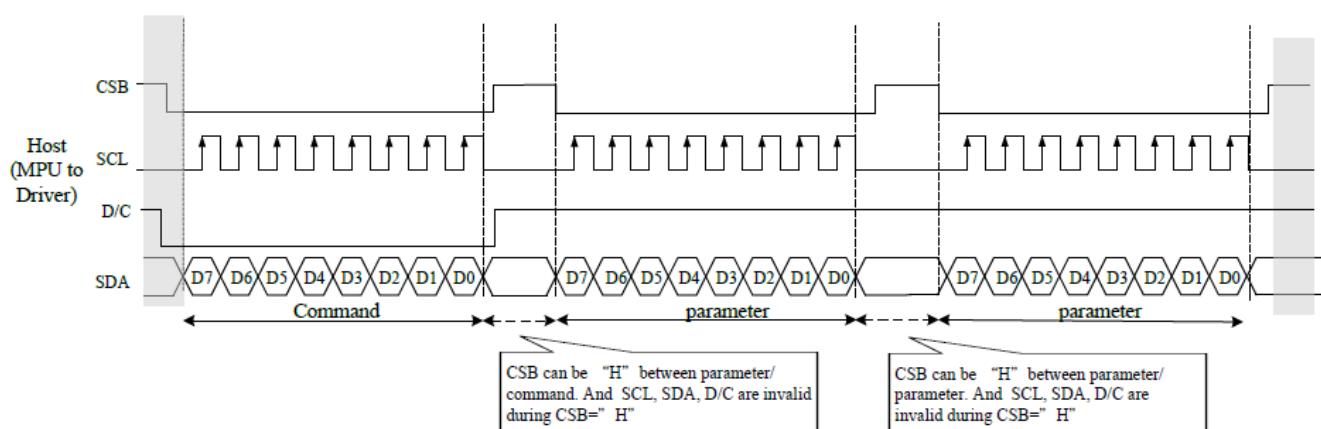


Figure 8-4 4 pin serial interface characteristics (read mode)



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|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 34 of 44      |

## 9. Power ON/OFF Sequence

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

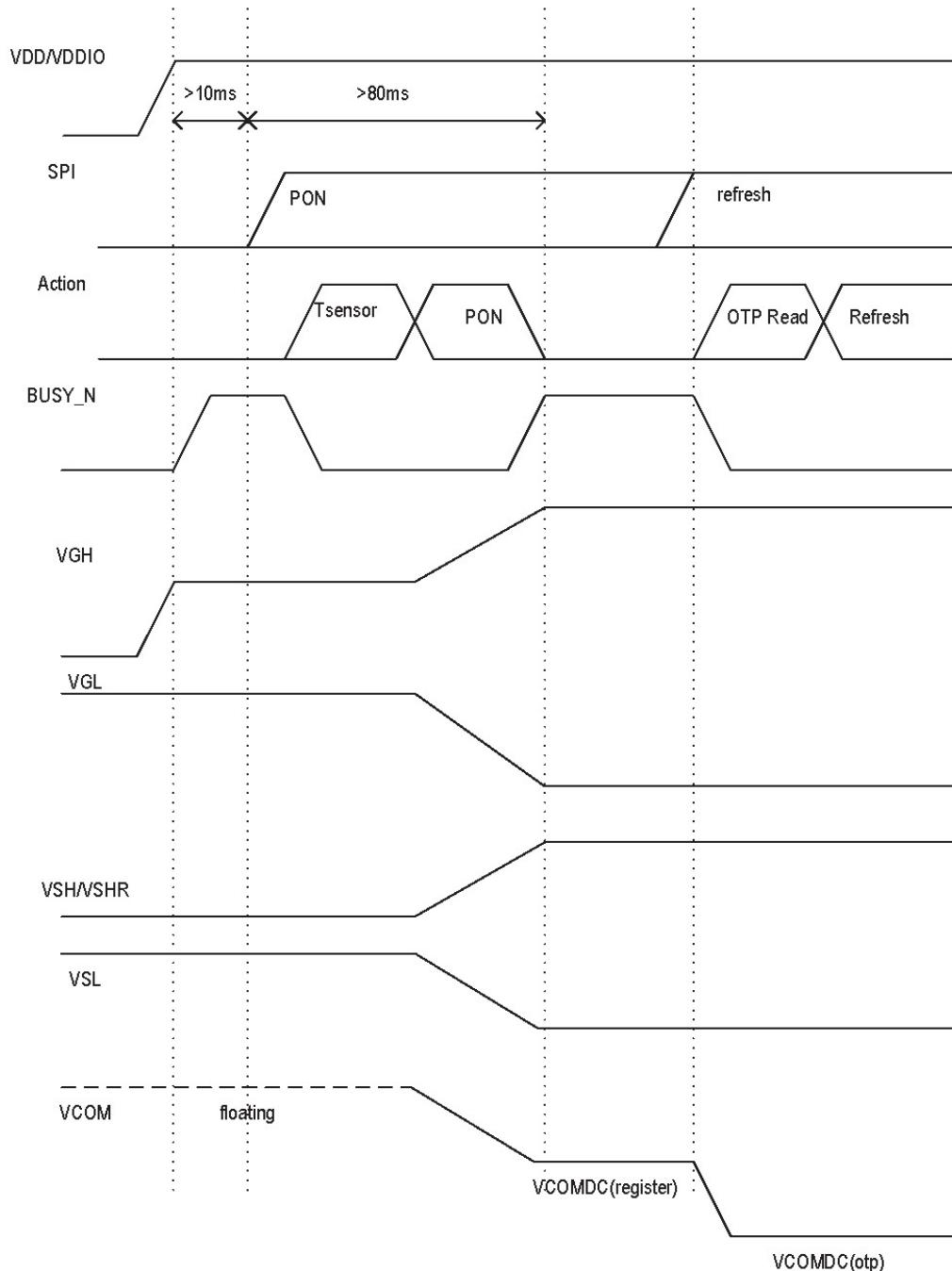


Figure 9-1: Power on sequence

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|           |   |               |               |
|-----------|---|---------------|---------------|
| File Name | Specification For HINK 2.13 <sup>WISEVAST</sup> EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0  | Page Number   | 35 of 44      |

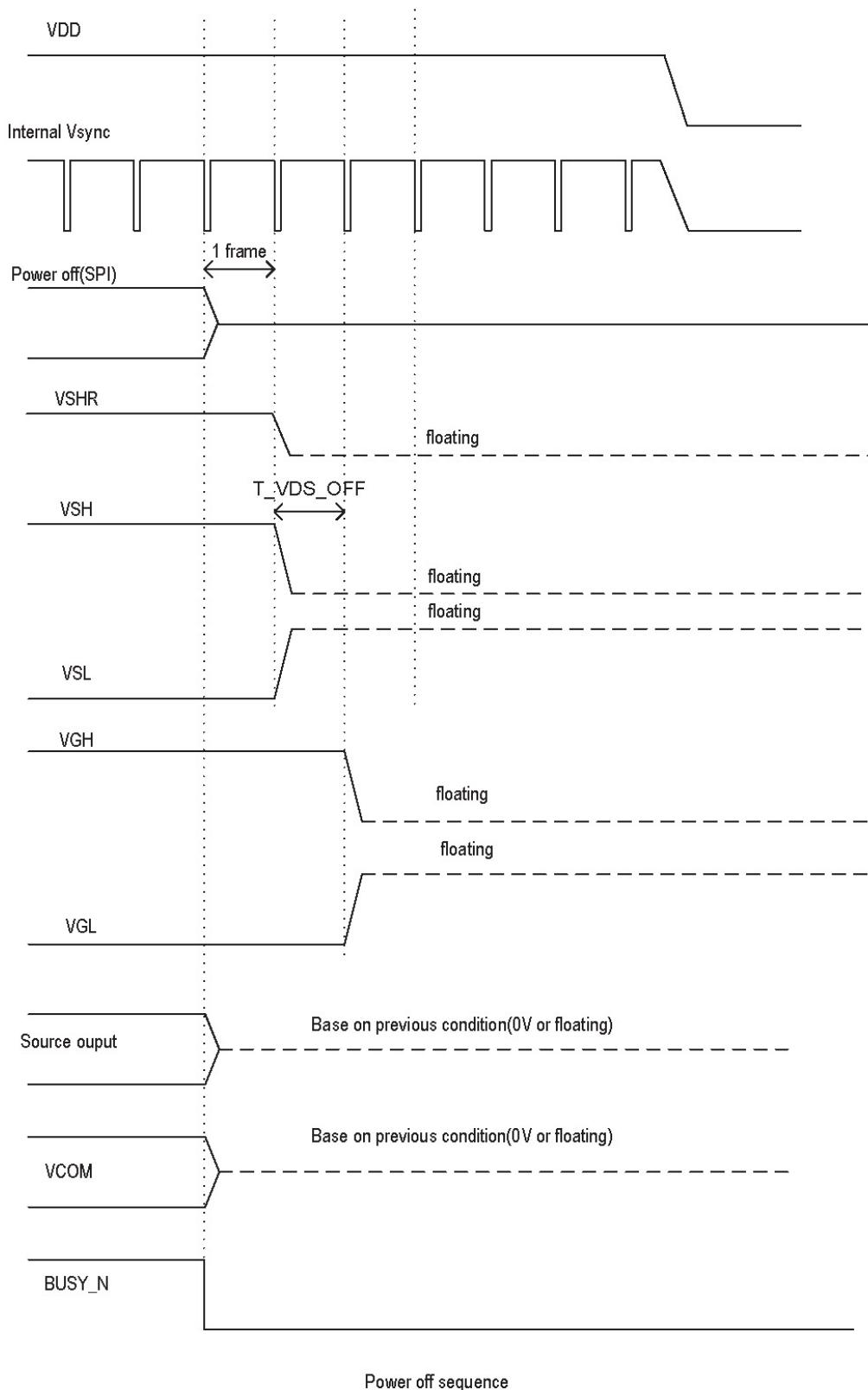


Figure 9-2: Power off sequence

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|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
| Version   | A0                               | Page Number   | 36 of 44      |

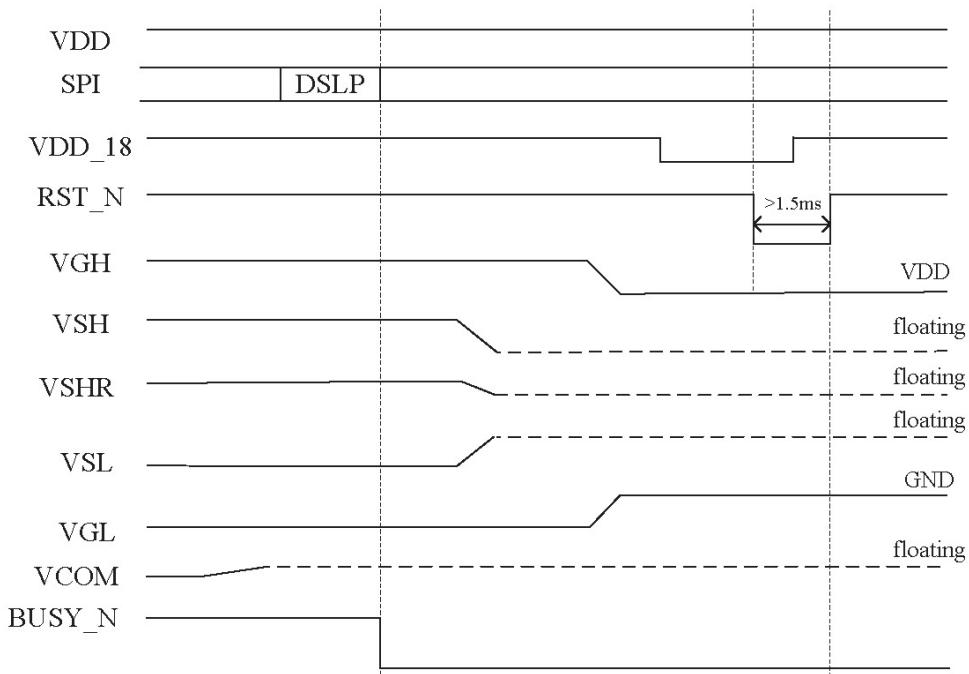


Figure 9-3: DS LP sequence

## 10. Reference Circuit

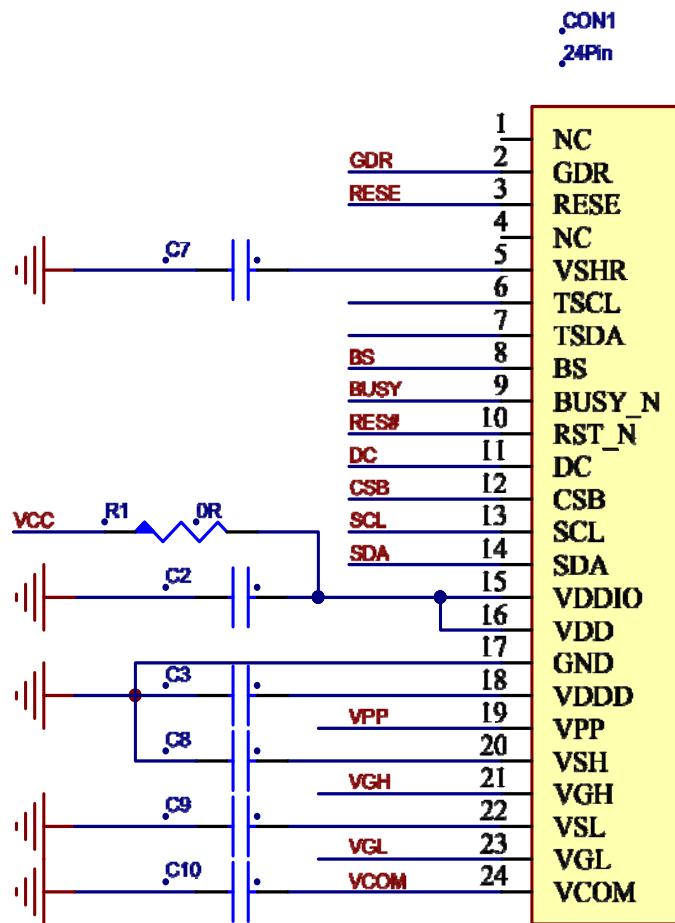


Figure 10-1

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|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
| File Name | Specification For HINK 2.13" EPD | Module Number | LCMEN2R13EFC1 |
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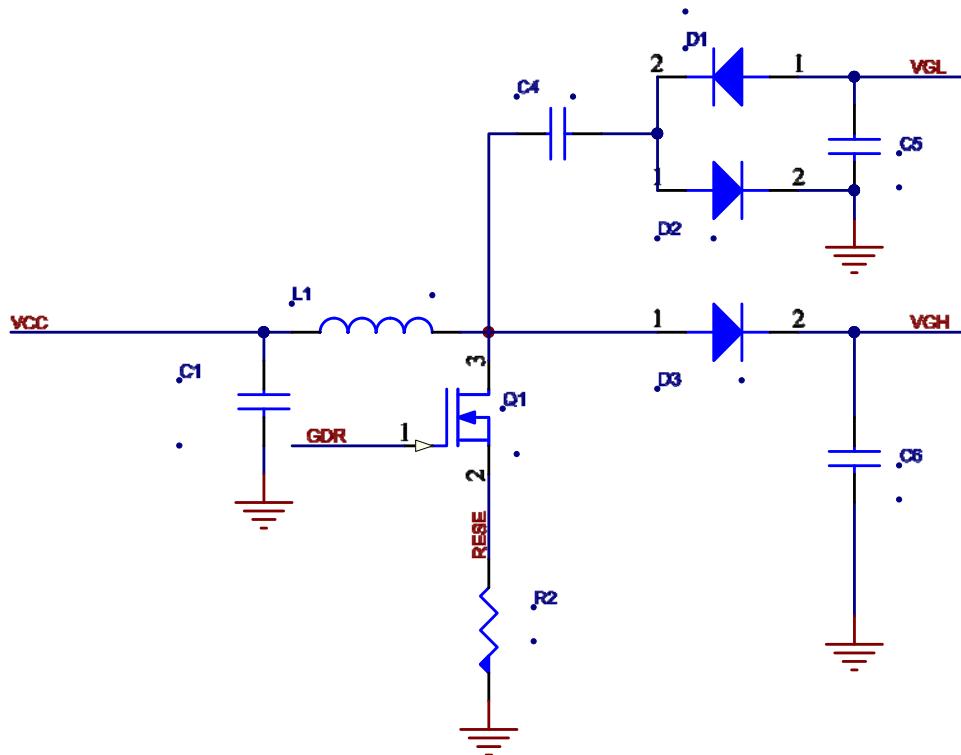


Figure 10-2

| Part Name | Value /requirement/Reference Part   |
|-----------|---|
| C1—C3     | 1uF/0603;X5R;Voltage Rating: 25V  |
| C4-C9     | 1uF/0603;X5R;Voltage Rating: 50V  |
| C10       | 0.47uF/0603; X5R;Voltage Rating: 25V  |
| D1—D3     | MBR0530<br>1) Reverse DC voltage $\geq 30V$<br>2) Forward current $\geq 500mA$<br>3)Forward voltage $\leq 430mV$  |
| R2        | 2.2 $\Omega$ /0603: 1% variation  |
| Q1        | NMOS:Si1308EDL、 Si1304BDL<br>1) Drain-Source breakdown voltage $\geq 30V$<br>2) $V_{gs} (th) = 0.9$ (Typ) , 1.3V (Max)<br>3) $R_{ds\ on} \leq 2.1 \Omega$ @ $V_{gs}=2.5V$ |
| L1        | 47UH/NRH3010T470MN<br>$I_o = 500$ (Max)   |
| CON24Pin  | 0.5mm ZIF Socket 24Pins,0.5mm pitch   |

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## 11. ABSOLUTE MAXIMUM RATINGS

Table 11-1: Maximum Ratings

| Symbol           | Parameter                        | Rating       | Unit | Humidity | Unit | Note                          |
|------------------|----------------------------------|--------------|------|----------|------|-------------------------------|
| V <sub>DD</sub>  | Logic supply voltage             | -0.3 to +6.0 | V    | -        | -    |                               |
| T <sub>OPR</sub> | Operation temperature range      | 0 to 50      | °C   | 35 to70  | %    | Note 11-1                     |
| T <sub>ttg</sub> | Transportation temperature range | -25 to 60    | °C   | -        | %    | Note11-2                      |
| T <sub>stg</sub> | Storage condition                | 0 to 40      | °C   | 35 to70  | %    | Maximum storage time: 5 years |

Note 11-1: Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics chapter.

Note11-2: T<sub>ttg</sub> is the transportation condition, the transport time is within 10 days for -25°C~0°C or 50°C~60°C

## 12. DC CHARACTERISTICS

The following specifications apply for: VSS=0V, VDD=3.3V, T<sub>OPR</sub>=25°C.

Table 12-1: DC Characteristics

| Symbol  | Parameter                     | Condition          | Min.    | Typ. | Max.    | Unit |
|---------|-------------------------------|--------------------|---------|------|---------|------|
| VDD     | Digital/Analog supply voltage | -                  | 2.5     | 3.3  | 3.6     | V    |
| VIH     | High level input voltage      | Digital input pins | 0.7xVIO | -    | VIO     | V    |
| VIL     | Low level input voltage       | Digital input pins | GND     | -    | 0.3xVDD | V    |
| VOH     | High level output voltage     | IOH = 400uA        | VIO-0.4 | -    | -       | V    |
| VOL     | Low level output voltage      | IOL = -400uA       | GND     | -    | GND+0.4 | V    |
| Iupdate | Module operating current      | -                  | -       | 3    | -       | mA   |
| Isleep  | Deep sleep mode               | VDD=3.3V           | -       | -    | 0.3     | uA   |

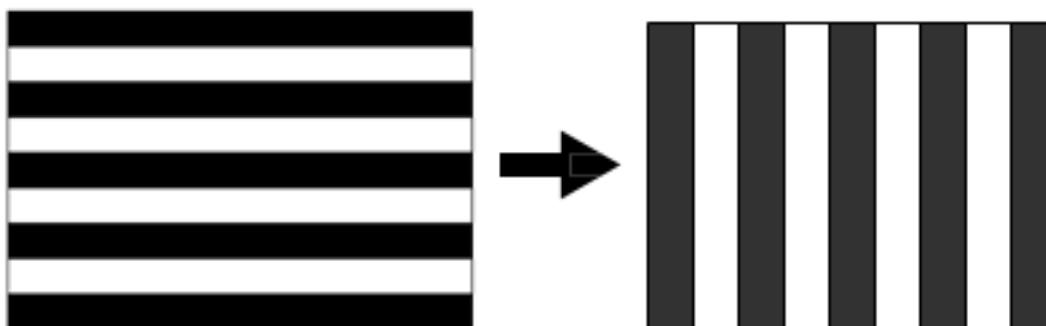
- The Typical power consumption is measured using associated 25°C waveform with following pattern transition: from horizontal scan pattern to vertical scan pattern. (Note 12-1)

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

- Vcom value will be OTP before in factory or present on the label sticker.

Note 12-1

The Typical power consumption

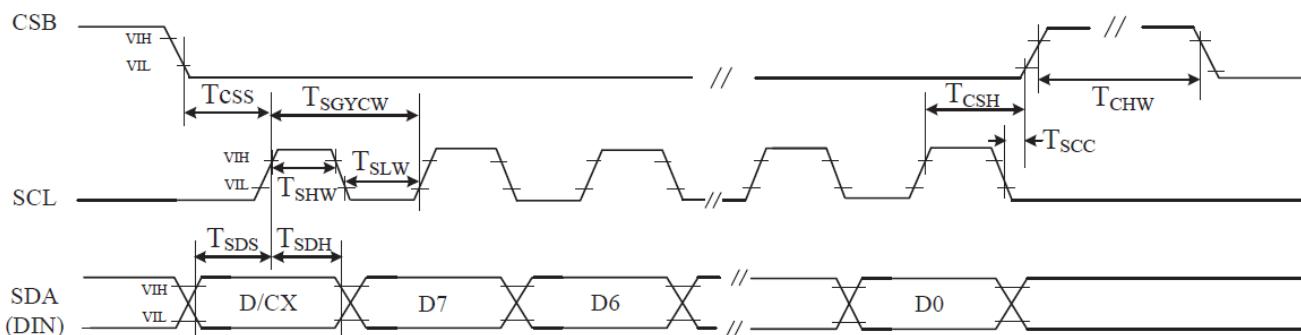


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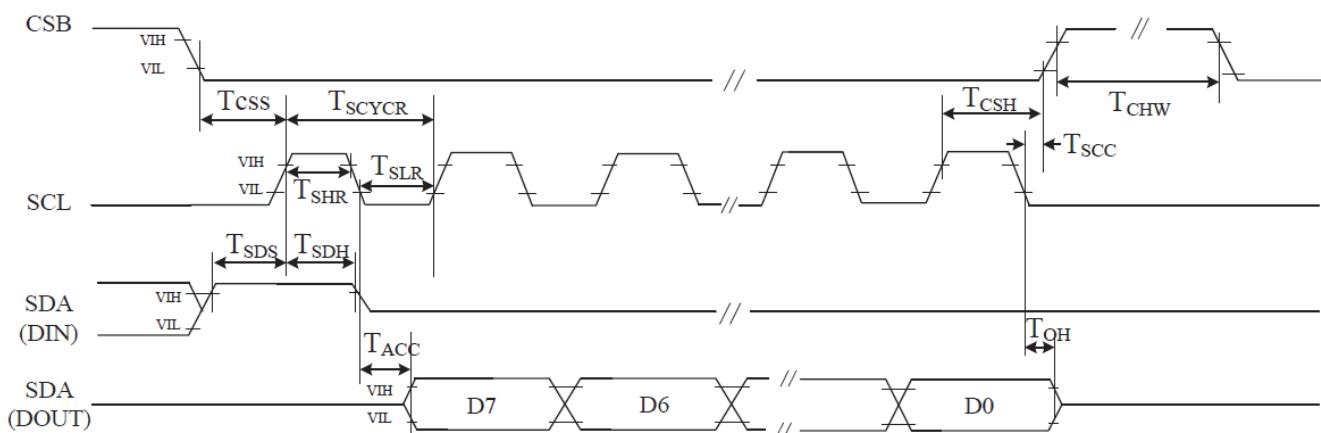
|           |                                  |               |               |
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## 13. AC CHARACTERISTICS

| Parameter              | Symbol | Min. | Typ. | Max. | Unit | Condition                   |
|------------------------|--------|------|------|------|------|-----------------------------|
| CSB                    | TCSS   | 60   |      |      | ns   | Chip select setup time      |
|                        | TCSH   | 65   |      |      | ns   | Chip select hold time       |
|                        | TSCC   | 20   |      |      | ns   | Chip select CSB setup time  |
|                        | TCHW   | 40   |      |      | ns   | Chip select setup time      |
| SCL                    | TSCYCW | 100  |      |      | ns   | Serial clock cycle (Write)  |
|                        | TSHW   | 35   |      |      | ns   | SCL "H" pulse width (Write) |
|                        | TSLW   | 35   |      |      | ns   | SCL "L" pulse width (Write) |
|                        | TSCYCR | 150  |      |      | ns   | Serial clock cycle (Read)   |
|                        | TSHR   | 60   |      |      | ns   | SCL "H" pulse width (Read)  |
|                        | TSRL   | 60   |      |      | ns   | SCL "L" pulse width (Read)  |
| SDA<br>(DIN)<br>(DOUT) | TSDS   | 30   |      |      | ns   | Data setup time             |
|                        | TSDH   | 30   |      |      | ns   | Data hold time              |
|                        | TACC   |      |      | 50   | ns   | Access time                 |
|                        | TOH    | 15   |      |      | ns   | Output disable time         |
| D/C                    | TDCS   | 20   |      |      | ns   | DC setup time               |
|                        | TDCH   | 20   |      |      | ns   | DC hold time                |



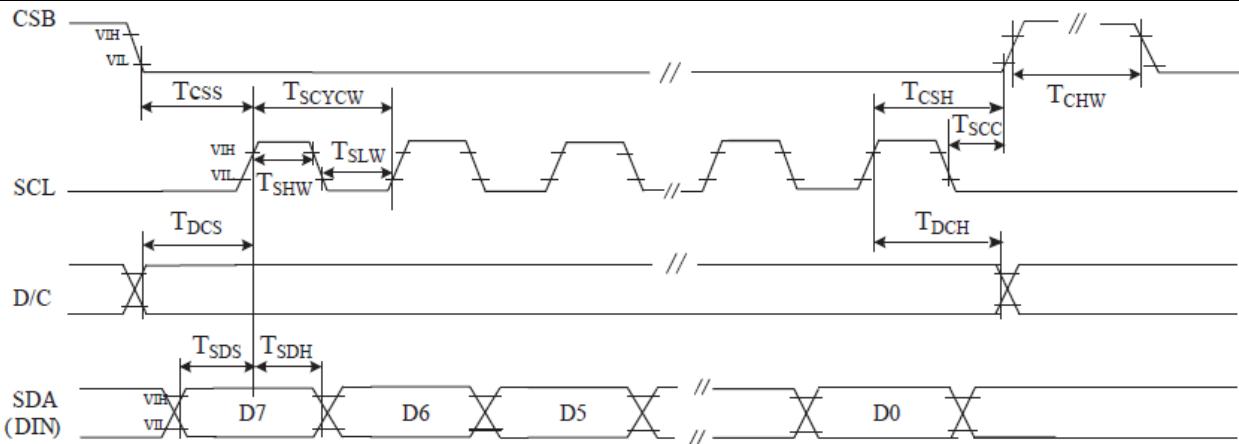
3 pin serial interface characteristics (write mode)



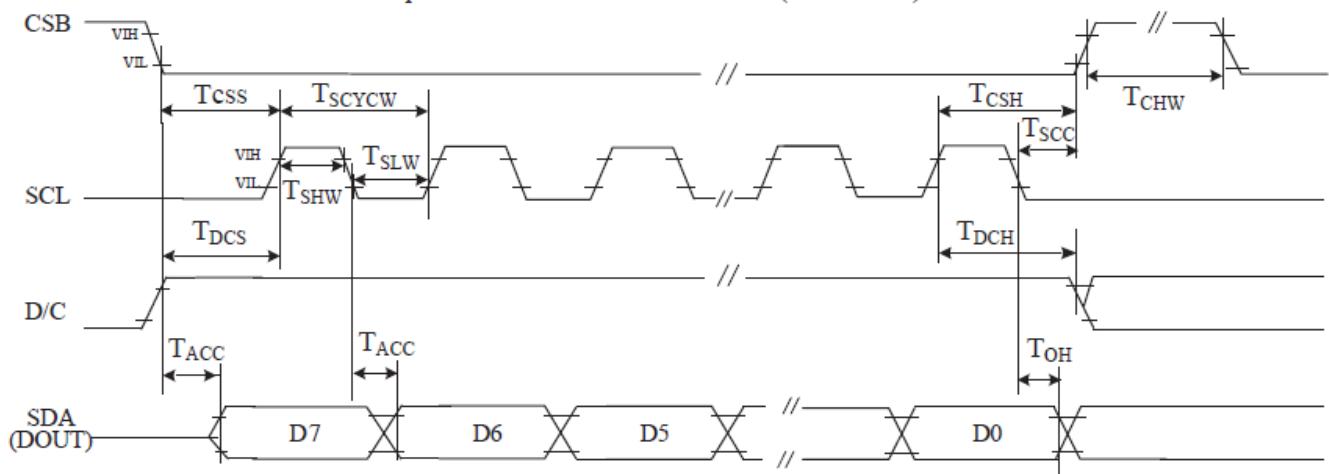
3 pin serial interface characteristics (read mode)

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4 pin serial interface characteristics(write mode)



4 pin serial interface characteristics(read mode)

Figure 13-1: SPI interface interface timing

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## 14. Power Consumption

| Parameter                             | Symbol | Conditions | TYP | Max | Unit | Remark |
|---------------------------------------|--------|------------|-----|-----|------|--------|
| Panel power consumption during update | -      | 25°C       | -   | 20  | mAs  | -      |
| Deep sleep mode                       | -      | 25°C       | -   | 3   | uA   | -      |

mAs=update average current× update time

## 15 . Optical characteristics

### 15. 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±2°C , VDD=3.3V

| SYMBOL | PARAMETER            | CONDITIONS                 | MIN | TYP.                       | MAX | UNIT | Note      |
|--------|----------------------|----------------------------|-----|----------------------------|-----|------|-----------|
| R      | Reflectance          | White                      | 30  | 35                         | -   | %    | Note 15-1 |
| Gn     | 2Grey Level          | -                          | -   | KS+(WS-KS)×n(m-1)          | -   | L*   | -         |
| CR     | Contrast Ratio       | -                          | -   | 10                         | -   | -    | -         |
| KS     | Black State L* value | -                          | -   | 18                         | -   | -    | Note 15-1 |
|        | Black State a* value | -                          | -   | 0.2                        | -   | -    | Note 15-1 |
| WS     | White State L* value | -                          | -   | 67                         | -   | -    | Note 15-1 |
| Panel  | Image Update         | Storage and transportation | -   | Update the white screen    | -   | -    | -         |
|        | Update Time          | Operation                  | -   | Suggest Updated once a day | -   | -    | -         |

WS : White state, KS : Black State,

Note 15-1 : Luminance meter : i - One Pro Spectrophotometer

Note 15-2: We guarantee display quality from 0°C~30°C generally, If operation ambient temperature from 0°C~50°C,will offer special waveform by Xingtai.

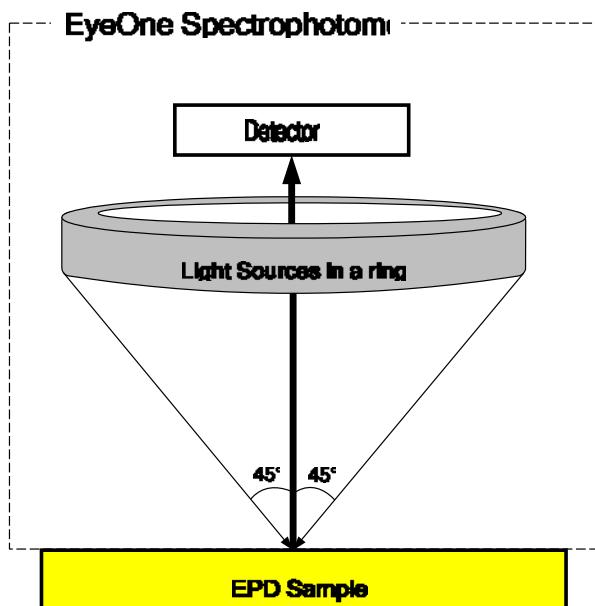
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## 15.2 Definition of contrast ratio

The contrast ratio (CR) is the ratio between the reflectance in a full white area (R<sub>l</sub>) and the reflectance in a dark area (R<sub>d</sub>):

$$CR = R_l/R_d$$

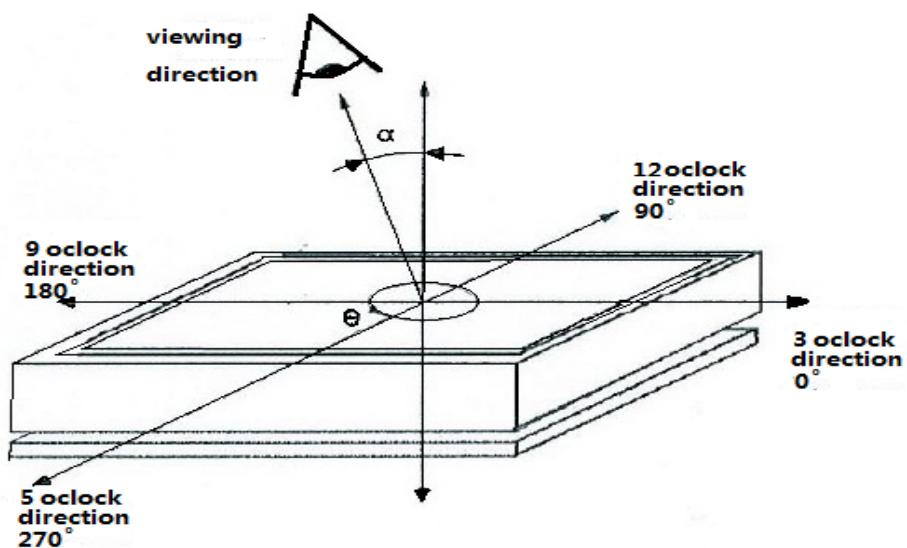


## 15.3 Reflection Ratio

The reflection ratio is expressed as:

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

L<sub>center</sub> is the luminance measured at center in a white area (R=G=B=1). L<sub>white board</sub> 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.



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## 16. HANDLING, SAFETY AND ENVIRONMENTAL REQUIREMENTS

### WARNING

The display module should be kept flat or fixed to a rigid, curved support with limited bending along the long axis. It should not be used for continual flexing and bending. Handle with care. Should the display break do not touch any material that leaks out. In case of contact with the leaked material then 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.

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## Data sheet status

|                       |   |
|-----------------------|---|
| 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.

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## 17 . Reliability test

### 17.1 Reliability Test Items

|    | TEST                                      | CONDITION   | REMARK                   |
|----|---|---|--------------------------|
| 1  | High-Temperature Operation                | T=40°C , RH=35%RH, For 240Hr  |                          |
| 2  | Low-Temperature Operation                 | T = 0°C for 240 hrs   |                          |
| 3  | High-Temperature Storage                  | T=60°C RH=35%RH For 240Hr   | Test in white pattern    |
| 4  | Low-Temperature Storage                   | T = -25°C for 240 hrs   | Test in white pattern    |
| 5  | High Temperature, High-Humidity Operation | T=40°C, RH=90%RH, For 168Hr   |                          |
| 6  | High Temperature, High-Humidity Storage   | T=60°C, RH=80%RH, For 240Hr   | Test in white pattern    |
| 7  | Temperature Cycle                         | -25°C(30min)~70°C(30min), 100 Cycle   | Test in white pattern    |
| 8  | Package Vibration                         | 1.04G, Frequency : 20~200Hz<br>Direction : X,Y,Z<br>Duration: 30 minutes in each direction                    | Full packed for shipment |
| 9  | Package Drop Impact                       | Drop from height of 100 cm on Concrete surface<br>Drop sequence:1 corner, 3edges, 6face<br>One drop for each. | Full packed for shipment |
| 10 | UV exposure Resistance                    | 765 W/m² for 168hrs, 40°C   |                          |
| 11 | Electrostatic discharge                   | Machine model:<br>+/-250V, 0Ω, 200pF  |                          |

Actual EMC level to be measured on customer application.

Note1: Stay white pattern for storage and non-operation test.

Note2: Operation is black/white pattern , hold time is 150S.

Note3: The function ,appearance should meet the requirements of the test before and after the test.

Note4: Keep testing after 2 hours placing at 20°C-25°C.

### 17.2 Product life time

The EPD Module is designed for a 5-year life-time with 25 °C/50%RH operation assumption. Reliability estimation testing with accelerated life-time theory would be demonstrated to provide confidence of EPD lifetime.

### 17.3 Product warranty

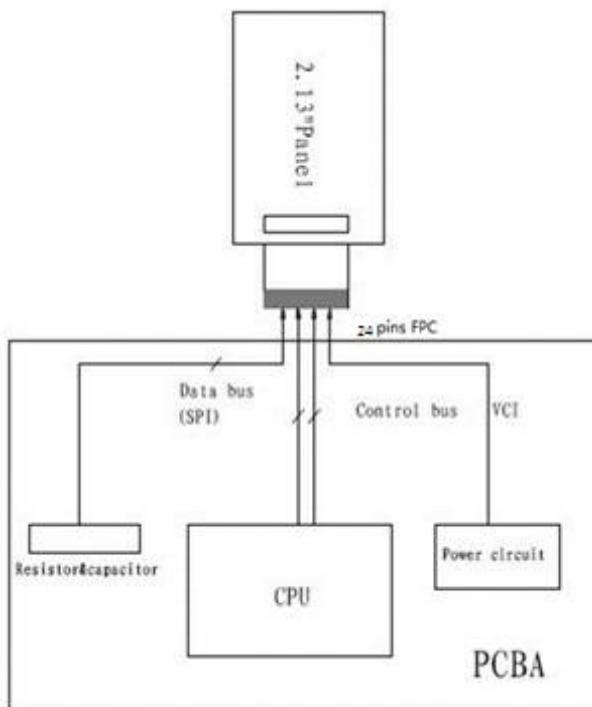
Warranty conditions have to be negotiated between Xingtai and individual customers.

Xingtai provides 12+1(one month delivery time) months warranty for all products which are purchased from Xingtai.

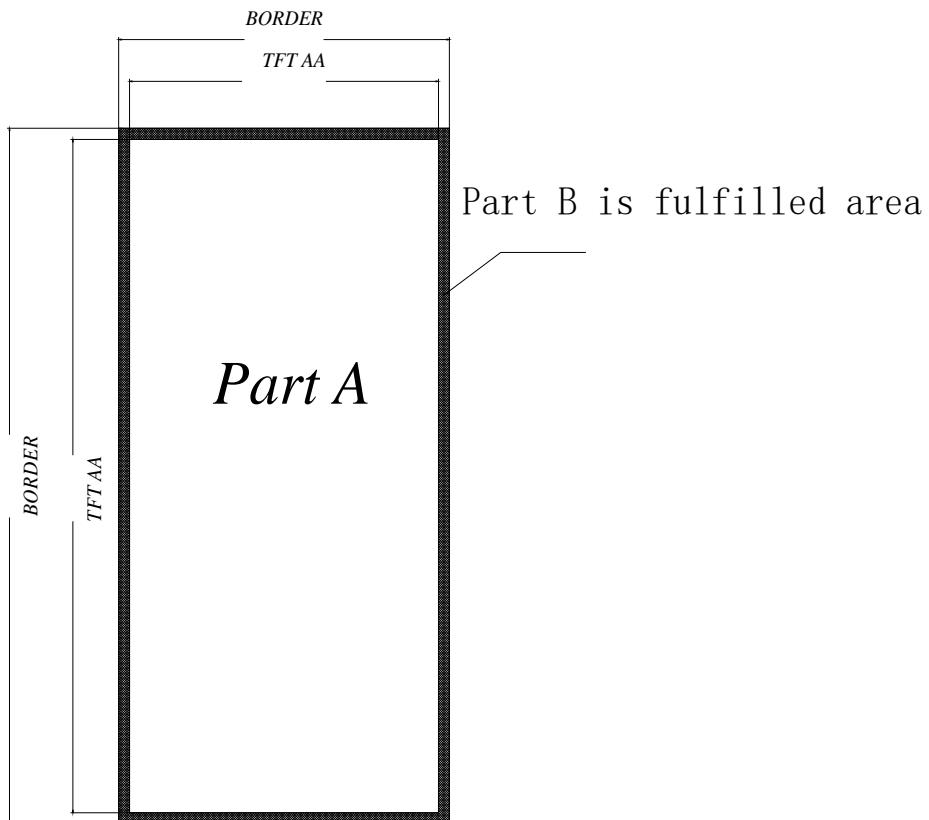
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## 18. Block Diagram



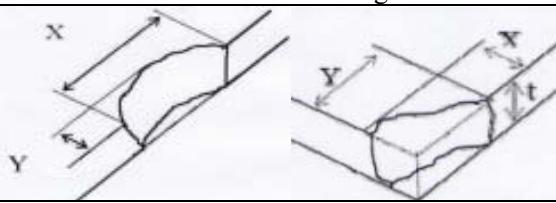
## 19. PartA/PartB specification



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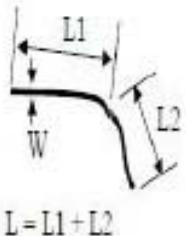
|           |                                  |               |               |
|-----------|----------------------------------|---------------|---------------|
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## 20. Point and line standard

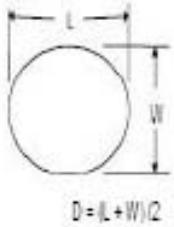
| Shipment Inspection Standard                    |  |   |             |             |        |             |  |  |  |  |  |  |  |
|---|--|---|-------------|-------------|--------|-------------|--|--|--|--|--|--|--|
| Equipment: Electrical test fixture, Point gauge |  |   |             |             |        |             |  |  |  |  |  |  |  |
| Outline dimension                               | 29.2(H)×59.2(V)×0.9(D)   | Unit: mm  | Part-A      | Active area | Part-B | Border area |  |  |  |  |  |  |  |
| Environment                                     | Temperature  | Humidity  | Illuminance | Distance    | Time   | Angle       |  |  |  |  |  |  |  |
|   | 19°C~25°C  | 55%±5%RH  | 800~1300Lux | 300mm       | 35Sec  |             |  |  |  |  |  |  |  |
| Defect type                                     | Inspection method  | Standard  |             | Part-A      | Part-B |             |  |  |  |  |  |  |  |
| Spot  | Electric Display   | D≤0.25mm  | Ignore      | Ignore      | Ignore |             |  |  |  |  |  |  |  |
|   |  | 0.25mm<D≤0.4mm  | N≤4         | Not Allow   | Ignore |             |  |  |  |  |  |  |  |
|   |  | D>0.4mm   | Not Allow   | Ignore      | Ignore |             |  |  |  |  |  |  |  |
| Display unwork                                  | Electric Display   | Not Allow   | Not Allow   | Not Allow   | Ignore |             |  |  |  |  |  |  |  |
| Display error                                   | Electric Display   | Not Allow   | Not Allow   | Not Allow   | Ignore |             |  |  |  |  |  |  |  |
| Scratch or line defect(include dirt)            | Visual/Film card   | L≤2mm,W≤0.2mm   | Ignore      | Ignore      | Ignore |             |  |  |  |  |  |  |  |
|   |  | 2.0mm<L≤5.0mm,0.2<W≤0.3mm,  | N≤2         | Not Allow   | Ignore |             |  |  |  |  |  |  |  |
|   |  | L>5mm,W>0.3mm   | Not Allow   | Ignore      | Ignore |             |  |  |  |  |  |  |  |
| PS Bubble                                       | Visual/Film card   | D≤0.2mm   | Ignore      | Ignore      | Ignore |             |  |  |  |  |  |  |  |
|   |  | 0.2mm≤D≤0.35mm  | N≤4         | Not Allow   | Ignore |             |  |  |  |  |  |  |  |
|   |  | D>0.35 mm   | Not Allow   | Ignore      | Ignore |             |  |  |  |  |  |  |  |
| Side Fragment                                   | Visual/Film card   | X≤6mm,Y≤0.4mm, Do not affect the electrode circuit (Edge chipping)<br>X≤1mm,Y≤1mm, Do not affect the electrode circuit( (Corner chipping)<br>Ignore |             |             |        |             |  |  |  |  |  |  |  |
|   |  |   |             |             |        |             |  |  |  |  |  |  |  |
| Remark  | 1. Appearance defect should not cause electrical defects;            |   |             |             |        |             |  |  |  |  |  |  |  |
|   | 2. Appearance defects should not cause dimensional accuracy problems |   |             |             |        |             |  |  |  |  |  |  |  |
|   | L=long W=wide D=point size N=Defects NO                              |   |             |             |        |             |  |  |  |  |  |  |  |

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Line Defect



Spot Defect

L=long      W=wide    D=point size

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## 21. Barcode

### 21.1 label appearance



ABBBBBBBCC  
DDDEEFGGG

### 21.2 QR scanned information (Total 28 code number+ 2 blank spaces)

A BBBBBBBB CC  DDD EEE F GGG  H III JJ KK  
①    ②        ③    ④    ⑤ ⑥ ⑦        ⑧ ⑨ ⑩ ⑪

- ① A——The factory code
- ② BBBBBBBB——Module name of EPD
- ③ CC——Production line
- ④ DDD——Date of production
- ⑤ EEE——Production lot
- ⑥ F——Separator
- ⑦ GGG——FPL Lot
- ⑧ H——Product status
- ⑨ III——TFT、PS、EC.
- ⑩ JJ——IC
- ⑪ KK——Serial NO.
- blank spaces

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## 22. Packing

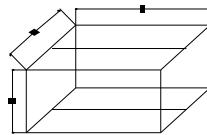
### Packing Spec

Sheet No:

| WISEVAST | Part No | LCMEN2R13EFC1 | DATE | 2021. 3. 23 | VER |  | Page | A0 |
|----------|---------|---------------|------|-------------|-----|--|------|----|
|----------|---------|---------------|------|-------------|-----|--|------|----|

一, Package Type: Box

|             |                       |
|-------------|-----------------------|
| Box No      | Holitech shipment box |
| Box size    | 515*322*170           |
| Containment | 450 PCS               |



PRODUCT DRAWING



二, Inside package type: Plastic

Trayunit: mm

|                       |               |        |
|-----------------------|---------------|--------|
| Plastic Tray          | 465*280*15    | 13 pcs |
| Anti-static foil bags | 700*530*0.1   | 1 pcs  |
| EPE (inside)          | 405.5*250.4*2 | 12 pcs |
| EPE(Up-Down)          | 485*145*10    | 2 pcs  |
| EPE (Left-Right)      | 285*480*10    | 2 pcs  |
| EPE (Front-back)      | 310*145*10    | 2 pcs  |
| Chip board            | 500*306*5     | 2 pcs  |
| Quantity/tray         | 15 pcs        |        |
| Tray number/sheet     | 15+1 Sheets   |        |
| Box                   | 1             |        |



Step 1:

Material: Tray, EPE  
Put the product in to the tray and keep the display side up. Then put anti-static EPE in to each holes.

Step 2,

1), Must keep the angle 180 degree placed between the neighboring Plastic trays.

2), There are 15 layers product, total  $30*15=450$  pcs.

3), An empty Plastic tray intersects put on the top of the plastic trays.

Step 3,

1), In each case, put 2 bags of desiccant. then seal the trays with adhesive tapes.

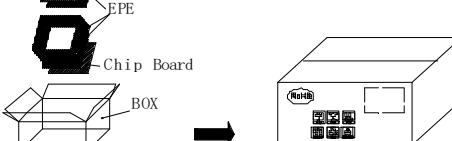


Step 3,

- 1), In each case, put 2 bags of desiccant. then seal the trays with adhesive tapes.
- 2), Put the trays into foil bags.
- 3), heat seal the foil bags.



- 1), In each case, put 2 bags of desiccant. then seal the trays with adhesive tapes.
- 2), Put the trays into foil bags.
- 3), heat seal the foil bags.



Step 4,

- 1), First put a chip board on the bottom of the box, then placed the down EPE, the left - right and front - back EPE.
- 2), Placed the sealed products into the box.
- 3), The last placed the up EPE on the top of the trays, and place a chip board on it.

Step 5,

- 1), Seal the box with adhesive tapes .

- 2), Paste the lable onto the exterior box, and the lable can't cover the safety , transfer and RoSH sign.

|        |             |         |             |         |             |
|--------|-------------|---------|-------------|---------|-------------|
| Design | X. Z. P     | Approve | Daisy       | Confirm | H.Z.P       |
| Date   | 2021. 3. 23 | Date    | 2021. 3. 23 | Date    | 2021. 3. 23 |