1.54 inch E-paper Display Series

GDEY0154D67

Dalian Good Display Co., Ltd.
# Product Specifications

<table>
<thead>
<tr>
<th>Customer</th>
<th>Standard</th>
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</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>1.54” E-PAPER DISPLAY</td>
</tr>
<tr>
<td><strong>Model Name</strong></td>
<td>GDEY0154D67</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>2020/11/23</td>
</tr>
<tr>
<td><strong>Revision</strong></td>
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</table>

## Design Engineering

<table>
<thead>
<tr>
<th>Design Engineering</th>
<th>Approval</th>
<th>Check</th>
<th>Design</th>
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<td><img src="check.png" alt="Check" /></td>
<td><img src="design.png" alt="Design" /></td>
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</tbody>
</table>

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Email: info@good-display.com

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# REVISION HISTORY

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Item</th>
<th>Page</th>
<th>Remark</th>
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<tr>
<td>1.0</td>
<td>NOV.23.2020</td>
<td>New Creation</td>
<td>ALL</td>
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1. Over View

GDEY0154D67 is a TFT active matrix electrophoretic display, with interface and a reference system design. The 1.54” active area contains 200×200 pixels, and has 1-bit black/white 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

- High contrast
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Landscape, portrait mode
- Antiglare hard-coated front-surface
- Low current 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
- Available in COG package IC thickness 300um

3. Mechanical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specifications</th>
<th>Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen Size</td>
<td>1.54</td>
<td>Inch</td>
<td></td>
</tr>
<tr>
<td>Display Resolution</td>
<td>200(H)×200(V)</td>
<td>Pixel</td>
<td>Dpi:184</td>
</tr>
<tr>
<td>Active Area</td>
<td>27.0(H)×27.0(V)</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Pixel Pitch</td>
<td>0.14×0.14</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Pixel Configuration</td>
<td>Square</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outline Dimension</td>
<td>31.80(H)×37.32(V) ×1.0(D)</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2.18±0.5</td>
<td>g</td>
<td></td>
</tr>
</tbody>
</table>
4. Mechanical Drawing of EPD module
### 5. Input /Output Pin Assignment

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>I/O</th>
<th>Description</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>O</td>
<td>Do not connect with other NC pins</td>
<td>Keep Open</td>
</tr>
<tr>
<td>2</td>
<td>GDR</td>
<td>I</td>
<td>N-Channel MOSFET Gate Drive Control</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RESE</td>
<td>O</td>
<td>Current Sense Input for the Control Loop</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>O</td>
<td>Do not connect with other NC pins</td>
<td>Keep Open</td>
</tr>
<tr>
<td>5</td>
<td>VSH2</td>
<td>C</td>
<td>Positive Source driving voltage (Red)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>TSCL</td>
<td>O</td>
<td>I²C Interface to digital temperature sensor Clock pin</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TSDA</td>
<td>I/O</td>
<td>I²C Interface to digital temperature sensor Data pin</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>BS1</td>
<td>I</td>
<td>Bus Interface selection pin</td>
<td>Note 5-5</td>
</tr>
<tr>
<td>9</td>
<td>BUSY</td>
<td>O</td>
<td>Busy state output pin</td>
<td>Note 5-4</td>
</tr>
<tr>
<td>10</td>
<td>RES#</td>
<td>I</td>
<td>Reset signal input. Active Low.</td>
<td>Note 5-3</td>
</tr>
<tr>
<td>11</td>
<td>D/C#</td>
<td>I</td>
<td>Data /Command control pin</td>
<td>Note 5-2</td>
</tr>
<tr>
<td>12</td>
<td>CS#</td>
<td>I</td>
<td>Chip select input pin</td>
<td>Note 5-1</td>
</tr>
<tr>
<td>13</td>
<td>SCL</td>
<td>I</td>
<td>Serial Clock pin (SPI)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>SDA</td>
<td>I</td>
<td>Serial Data pin (SPI)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>VDDIO</td>
<td>P</td>
<td>Power Supply for interface logic pins It should be connected with VCI</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>VCI</td>
<td>P</td>
<td>Power Supply for the chip</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>VSS</td>
<td>P</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>VDD</td>
<td>C</td>
<td>Core logic power pin VDD can be regulated internally from VCI. A capacitor should be connected between VDD and VSS</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>VPP</td>
<td>P</td>
<td>FOR TEST</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>VSH1</td>
<td>C</td>
<td>Positive Source driving voltage</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>VGH</td>
<td>C</td>
<td>Power Supply pin for Positive Gate driving voltage and VSH1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>VSL</td>
<td>C</td>
<td>Negative Source driving voltage</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>VGL</td>
<td>C</td>
<td>Power Supply pin for Negative Gate driving voltage VCOM and VSL</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>VCOM</td>
<td>C</td>
<td>VCOM driving voltage</td>
<td></td>
</tr>
</tbody>
</table>
**Note 5-1:** This pin (CS#) is the chip select input connecting to the MCU. The chip is enabled for MCU communication only when CS# is pulled Low.

**Note 5-2:** This pin (D/C#) is Data/Command control pin connecting to the MCU. When the pin is pulled High, the data will be interpreted as data. When the pin is pulled Low, the data will be interpreted as command.

**Note 5-3:** This pin (RES#) is reset signal input. The Reset is active low.

**Note 5-4:** This pin (BUSY) is Busy state output pin. When Busy is Low, the operation of chip should not be interrupted and any commands should not be issued to the module. The driver IC will put Busy pin Low when the driver IC is working such as:
- Outputting display waveform; or
- Communicating with digital temperature sensor

**Note 5-5:** This pin (BS1) is for 3-line SPI or 4-line SPI selection. When it is "Low", 4-line SPI is selected. When it is "High", 3-line SPI (9 bits SPI) is selected. Please refer to below Table.

<table>
<thead>
<tr>
<th>BS1 State</th>
<th>MCU Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>4-lines serial peripheral interface(SPI) - 8 bits SPI</td>
</tr>
<tr>
<td>H</td>
<td>3-lines serial peripheral interface(SPI) - 9 bits SPI</td>
</tr>
</tbody>
</table>
### 6. Command Table

<table>
<thead>
<tr>
<th>Command Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R/# D/# Hex D7 D6 D5 D4 D3 D2 D1 D0</td>
<td>Command</td>
</tr>
<tr>
<td>0 0 01 0 0 0 0 0 0 1</td>
<td>Driver Output control</td>
</tr>
<tr>
<td>0 1 A7 A6 A5 A4 A3 A2 A1 A0</td>
<td></td>
</tr>
<tr>
<td>0 1 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>0 1 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
</tbody>
</table>

**GDEY0154D67**

- Gate setting
  - A8= C7h [POR], 200 MUX
  - MUX Gate lines setting as (A8+1).
  - B2= 000 [POR]
  - Gate scanning sequence and direction

- B[2]: GD
  - Selects the 1st output Gate
  - GD=0 [POR]
  - G0 is the 1st gate output channel, gate output sequence is G0, G1, G2, G3,...
  - GD=1
  - G1 is the 1st gate output channel, gate output sequence is G1, G0, G3, G2, ...

- B[1]: SM
  - Change scanning order of gate driver.
  - SM=0 [POR]
  - G0, G1, G2, G3...199 (left and right gate interlaced)
  - SM=1
  - G0, G2, G4 ...G198, G1, G3, ...G199

- B[0]: TB
  - TB = 0 [POR], scan from G0 to G199
  - TB = 1, scan from G199 to G0.

<table>
<thead>
<tr>
<th>Command Table</th>
<th>Set Gate driving voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>R/# D/# Hex D7 D6 D5 D4 D3 D2 D1 D0</td>
<td>VGH setting from 10V to 20V</td>
</tr>
<tr>
<td>0 0 03 0 0 0 0 0 0 1 1</td>
<td></td>
</tr>
<tr>
<td>0 1 0 0 0</td>
<td>VGH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A8</th>
<th>VGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>00h</td>
<td>20</td>
</tr>
<tr>
<td>03h</td>
<td>10</td>
</tr>
<tr>
<td>04h</td>
<td>10.5</td>
</tr>
<tr>
<td>05h</td>
<td>11</td>
</tr>
<tr>
<td>06h</td>
<td>11.5</td>
</tr>
<tr>
<td>07h</td>
<td>12</td>
</tr>
<tr>
<td>08h</td>
<td>12.5</td>
</tr>
<tr>
<td>09h</td>
<td>13</td>
</tr>
<tr>
<td>0Ah</td>
<td>13.5</td>
</tr>
<tr>
<td>0Bh</td>
<td>14</td>
</tr>
<tr>
<td>0Ch</td>
<td>14.5</td>
</tr>
</tbody>
</table>

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1.54 inch Series
# Command Table

<table>
<thead>
<tr>
<th>RWB</th>
<th>D/C</th>
<th>Hex</th>
<th>D7</th>
<th>D6</th>
<th>D5</th>
<th>D4</th>
<th>D3</th>
<th>D2</th>
<th>D1</th>
<th>D0</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>04</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Source Driving voltage Control</td>
<td>Set Source driving voltage A[7:0] = 41h [POR], VSH1 at 15V B[7:0] = A8h [POR], VSH2 at 5V C[7:0] = 32h [POR], VSL at -15V Rem: VSH1=VSH2</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A[7:0] = 1, VSH1/VSH2 voltage setting from 2.4V to 8.8V</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B[7:0] = 0, VSH1/VSH2 voltage setting from 9V to 17V</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C[7:0] = 0, VSL setting from -5V to -17V</td>
<td></td>
</tr>
</tbody>
</table>

### Initial Code Setting OTP Program

The command required CLKEN=1. Refer to Register 0x22 for detail. BUSY pad will output high during operation.

### Write Register for Initial Code Setting

Details refer to Application Notes of Initial Code Setting

### Read Register for Initial Code Setting
<table>
<thead>
<tr>
<th>Command Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R/W</td>
<td>D/C</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Bit Description of each byte:
- A6 6, B6 4, C6 2, D6 0

<table>
<thead>
<tr>
<th>BI[6:4]</th>
<th>Driving Strength Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>1(Weakest)</td>
</tr>
<tr>
<td>001</td>
<td>2</td>
</tr>
<tr>
<td>010</td>
<td>3</td>
</tr>
<tr>
<td>011</td>
<td>4</td>
</tr>
<tr>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>101</td>
<td>6</td>
</tr>
<tr>
<td>110</td>
<td>7</td>
</tr>
<tr>
<td>111</td>
<td>8(Strongest)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BI[3:0]</th>
<th>Min Off Time Setting of GDR [Time unit]</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>NA</td>
</tr>
<tr>
<td>011</td>
<td>2.6</td>
</tr>
<tr>
<td>010</td>
<td>3.2</td>
</tr>
<tr>
<td>011</td>
<td>3.9</td>
</tr>
<tr>
<td>100</td>
<td>4.8</td>
</tr>
<tr>
<td>101</td>
<td>5.4</td>
</tr>
<tr>
<td>101</td>
<td>6.3</td>
</tr>
<tr>
<td>110</td>
<td>7.3</td>
</tr>
<tr>
<td>111</td>
<td>8.4</td>
</tr>
<tr>
<td>111</td>
<td>9.8</td>
</tr>
<tr>
<td>111</td>
<td>11.5</td>
</tr>
<tr>
<td>111</td>
<td>13.8</td>
</tr>
<tr>
<td>111</td>
<td>16.5</td>
</tr>
</tbody>
</table>

D[5:0]: duration setting of phase
D[5:4]: duration setting of phase 3
D[3:2]: duration setting of phase 2
D[1:0]: duration setting of phase 1

<table>
<thead>
<tr>
<th>BI[1:0]</th>
<th>Duration of Phase [Approximation]</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>10ms</td>
</tr>
<tr>
<td>01</td>
<td>20ms</td>
</tr>
<tr>
<td>10</td>
<td>30ms</td>
</tr>
<tr>
<td>11</td>
<td>40ms</td>
</tr>
</tbody>
</table>

Deep Sleep mode:

<table>
<thead>
<tr>
<th>Deep Sleep mode Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>A[1:0] : Description</td>
</tr>
<tr>
<td>00 : Normal Mode [POR]</td>
</tr>
<tr>
<td>01 : Enter Deep Sleep Mode 1</td>
</tr>
<tr>
<td>11 : Enter Deep Sleep Mode 2</td>
</tr>
</tbody>
</table>

After this command initiated, the chip will enter Deep Sleep Mode, BUSY pad will keep output high.

Remark:
To Exit Deep Sleep mode, User required to send HWRESET to the driver.
<table>
<thead>
<tr>
<th>Command Table</th>
<th>R/W</th>
<th>DI/Clk</th>
<th>Hex</th>
<th>D7</th>
<th>D6</th>
<th>D5</th>
<th>D4</th>
<th>D3</th>
<th>D2</th>
<th>D1</th>
<th>D0</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>HV Ready Detection</td>
<td>HV ready detection A[7:0] = 00h [POR] The command required CLKEN=1 and ANALOGEN=1. Refer to Register 0x22 for detail. After this command initiated, HV Ready detection starts. BUSY pad will output high during detection. The detection result can be read from the Status Bit Read (Command 0x2F). A[6:4]=n for cool down duration: 10ms x (n+1) A[2:0]=m for number of Cool Down Loop to detect. The max HV ready duration is 10ms x (n+1) x (m) HV ready detection will be trigger after each cool down time. The detection will be completed when HV is ready. For 1 shot HV ready detection, A[7:0] can be set as 00h.</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>VCI Detection</td>
<td>VCI Detection A[2:0] = 100 [POR], Detect level at 2.3V A[2:0] : VCI level Detect</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>VCI Detection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>Temperature Sensor Control</td>
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<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Temperature Sensor Control (Write to temperature register)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Temperature Sensor Control (Read from temperature register)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>SW RESET</td>
<td></td>
</tr>
</tbody>
</table>

The command required CLKEN=1 and ANALOGEN=1 Refer to Register 0x22 for detail. After this command initiated, VCI detection starts. BUSY pad will output high during detection. The detection result can be read from the Status Bit Read (Command 0x2F).
### Command Table

<table>
<thead>
<tr>
<th>RW#</th>
<th>D/C#</th>
<th>Hex</th>
<th>D7</th>
<th>D6</th>
<th>D5</th>
<th>D4</th>
<th>D3</th>
<th>D2</th>
<th>D1</th>
<th>D0</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1C</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Temperature Sensor Control (Write Command to External temperature sensor)</td>
<td>Write Command to External temperature sensor. A[7:0] = 00h [POR], B[7:0] = 00h [POR], C[7:0] = 00h [POR]. A[7:6] Select no of byte to be sent 0 Address + pointer 01 Address + pointer + 1st parameter 10 Address + pointer + 1st parameter + 2nd pointer 11 Address A[5:0] - Pointer Setting B[7:0] - 1st parameter C[7:0] - 2nd parameter The command required CLKEN=1. Refer to Register 0x22 for detail. After this command initiated, Write Command to external temperature sensor starts. BUSY pad will output high during operation.</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Master Activation</td>
<td>Activate Display Update Sequence The Display Update Sequence Option is located at R22h. BUSY pad will output high during operation. User should not interrupt this operation to avoid corruption of panel images.</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Display Update Control</td>
<td>RAM content option for Display Update A[7:0] = 00h [POR] B[7:0] = 00h [POR] A[7:4] Red RAM option 0000 Normal 0100 Bypass RAM content as 0 1000 Inverse RAM content A[3:0] BW RAM option 0000 Normal 0100 Bypass RAM content as 0 1000 Inverse RAM content</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Data Entry mode setting</td>
<td>Define data entry sequence A[2:0] = 011 [POR] A[1:0] = ID[1:0] Address automatic increment / decrement setting The setting of incrementing or decrementing of the address counter can be made independently in each upper and lower bit of the address. 00 - Y decrement, X decrement, 01 - Y decrement, X increment, 10 - Y increment, X decrement, 11 - Y increment, X increment [POR] A[2] = AM Set the direction in which the address counter is updated automatically after data are written to the RAM. AM= 0, the address counter is updated in the X direction. [POR] AM = 1, the address counter is updated in the Y direction.</td>
<td></td>
</tr>
<tr>
<td>Command Table</td>
<td>Command</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>R/W 0 D/C# 22</td>
<td>0 1 A7 A6 A5 A4 A3 A2 A1 A0</td>
<td>Display Update Control 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Operating sequence**

<table>
<thead>
<tr>
<th>Parameter (in Hex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable clock signal</td>
</tr>
<tr>
<td>Disable clock signal</td>
</tr>
<tr>
<td>Enable clock signal → Enable Analog</td>
</tr>
<tr>
<td>Disable Analog → Disable clock signal</td>
</tr>
<tr>
<td>Enable clock signal → Load LUT with DISPLAY Mode 1 → Disable clock signal</td>
</tr>
<tr>
<td>Enable clock signal → Load LUT with DISPLAY Mode 2 → Disable clock signal</td>
</tr>
<tr>
<td>Enable clock signal → Load temperature value → Load LUT with DISPLAY Mode 1 → Disable clock signal</td>
</tr>
<tr>
<td>Enable clock signal → Load temperature value → Load LUT with DISPLAY Mode 2 → Disable clock signal</td>
</tr>
<tr>
<td>Enable clock signal → Enable Analog → Display with DISPLAY Mode 1 → Disable Analog → Disable OSC</td>
</tr>
<tr>
<td>Enable clock signal → Enable Analog → Display with DISPLAY Mode 2 → Disable Analog → Disable OSC</td>
</tr>
<tr>
<td>Enable clock signal → Enable Analog → Load temperature value → DISPLAY with DISPLAY Mode 1 → Disable Analog → Disable OSC</td>
</tr>
<tr>
<td>Enable clock signal → Enable Analog → Load temperature value → DISPLAY with DISPLAY Mode 2 → Disable Analog → Disable OSC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command (R/W 0 D/C# 24)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 24 0 0 1 0 0 1 0 0</td>
<td>Write RAM (Black White) * RAM 0x24</td>
</tr>
</tbody>
</table>

After this command, data entries will be written into the BW RAM until another command is written. Address pointers will advance accordingly.

For Write pixel:
Content of Write RAM(BW) = 1
For Black pixel:
Content of Write RAM(BW) = 0
<table>
<thead>
<tr>
<th>Command Table</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 26 0 0 1 0 0 1 1 0</td>
<td>Write RAM (RED) / RAM 0x26</td>
<td>After this command, data entries will be written into the RED RAM until another command is written. Address pointers will advance accordingly. For Red pixel: Content of Write RAM(RED) = 1 For non-Red pixel [Black or White]: Content of Write RAM(RED) = 0</td>
</tr>
<tr>
<td>0 0 27 0 0 1 0 0 1 1 1</td>
<td>Read RAM</td>
<td>After this command, data read on the MCU bus will fetch data from RAM. According to parameter of Register 41h to select reading RAM0x24/ RAM0x26, until another command is written. Address pointers will advance accordingly. The 1st byte of data read is dummy data.</td>
</tr>
<tr>
<td>0 0 28 0 0 1 0 1 0 0 0</td>
<td>VCOM Sense</td>
<td>Enter VCOM sensing conditions and hold for duration defined in 29h before reading VCOM value. The sensed VCOM voltage is stored in register. The command required CLKEN=1 and ANALOGEN=1 Refer to Register 0x22 for detail. BUSY pad will output high during operation.</td>
</tr>
<tr>
<td>0 0 29 0 0 1 0 1 0 0 1</td>
<td>VCOM Sense Duration</td>
<td>Stabling time between entering VCOM sensing mode and reading acquired. A[3:0] = 9h, duration = 10s. VCOM sense duration = (A[3:0]+1) sec</td>
</tr>
<tr>
<td>0 0 2A 0 0 1 0 1 0 1 0</td>
<td>Program VCOM OTP</td>
<td>Program VCOM register into OTP The command required CLKEN=1. Refer to Register 0x22 for detail. BUSY pad will output high during operation.</td>
</tr>
<tr>
<td>0 0 2B 0 0 1 0 1 0 1 1</td>
<td>Write Register for VCOM Control</td>
<td>This command is used to reduce glitch when ACVCOM toggle. Two data bytes D0th and D0sh should be set for this command.</td>
</tr>
</tbody>
</table>
### Command Table

<table>
<thead>
<tr>
<th>RW/D/C#</th>
<th>D7</th>
<th>D6</th>
<th>D5</th>
<th>D4</th>
<th>D3</th>
<th>D2</th>
<th>D1</th>
<th>D0</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>2C</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Write VCOM register from MCU interface A[7:0] = 00h [POR]</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A[7:0] VCOM</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>08h -0.2</td>
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</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0Ch -0.3</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10h -0.4</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14h -0.5</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18h -0.6</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1Ch -0.7</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20h -0.8</td>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24h -0.9</td>
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<tr>
<td>0</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>28h -1</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2Ch -1.1</td>
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</tr>
<tr>
<td>0</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30h -1.2</td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td></td>
<td></td>
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<td>34h -1.3</td>
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<td>38h -1.4</td>
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<td></td>
<td></td>
<td></td>
<td>3Ch -1.5</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40h -1.6</td>
<td>Other NA</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>2D</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>OTP Register</td>
<td>Read Register for Display Option</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A[7:0] VCOM OTP Selection</td>
<td>(Command 0x37, Byte A)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B[7:0] VCOM Register</td>
<td>(Command 0x2C)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>C[7:0]–G[7:0]: Display Mode</td>
<td>(Command 0x37, Byte B to Byte F) [5 bytes]</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H[7:0]–K[7:0]: Waveform Version</td>
<td>(Command 0x37, Byte G to Byte J) [4 bytes]</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>2E</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>User ID Read</td>
<td>Read 10 Byte User ID stored in OTP: A[7:0]–J[7:0]: UserID (R36, Byte A and Byte J) [10 bytes]</td>
</tr>
<tr>
<td>Command Table</td>
<td>Command</td>
<td>Description</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
| 0 0 2F 0 0 1 0 1 1 1 | Status Bit Read | Read IC status Bit [POR 0x01]  A[5]: HV Ready Detection flag [POR=0]  0: Ready  1: Not Ready  A[4]: VCI Detection flag [POR=0]  0: Normal  1: VCI lower than the Detect level  A[3]: [POR=0]  A[2]: Busy flag [POR=0]  0: Normal  1: BUSY  A[1:0]: Chip ID [POR=01]  
Remark:  A[5] and A[4] status are not valid after RESET, they need to be initiated by command 0x14 and command 0x15 respectively. |
<p>| 0 0 30 0 0 1 1 0 0 0 | Program WS OTP | Program OTP of Waveform Setting  The contents should be written into RAM before sending this command.  The command required CLKEN=1.  Refer to Register 0x22 for detail.  BUSY pad will output high during operation. |
| 0 0 31 0 0 1 1 0 0 1 | Load WS OTP | Load OTP of Waveform Setting  The command required CLKEN=1.  Refer to Register 0x22 for detail.  BUSY pad will output high during operation. |
| 0 0 32 0 0 1 1 0 0 1 | Write LUT register | Write LUT register from MCU interface [153 bytes], which contains the content of VS[nx-LUTm], TF[nx], RP[n], SR[nXY], and FR[n]  Refer to Session 6.7 WAVEFORM SETTING |
| 0 0 34 0 0 1 1 0 1 | CRC calculation | CRC calculation command  For details, please refer to SSD1681 application note.  BUSY pad will output high during operation. |
| 0 0 35 0 0 1 1 0 1 0 1 | CRC Status Read | CRC Status Read  A[15:0] is the CRC read out value |
| 1 1 A_15 A_14 A_13 A_12 A_11 A_10 A_9 A_8 A_7 A_6 A_5 A_4 A_3 A_2 A_1 A_0 | | |</p>
<table>
<thead>
<tr>
<th>Command Table</th>
<th>R/W# D/C# Hex</th>
<th>D7 D6 D5 D4 D3 D2 D1 D0</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 36 0</td>
<td>0 1 1 0 1 1 0</td>
<td>Program OTP selection</td>
<td>Program OTP Selection according to the OTP Selection Control [R37h and R38h]. The command required CLKEN=1. Refer to Register 0x22 for detail. BUSY pad will output high during operation.</td>
<td></td>
</tr>
<tr>
<td>0 0 37 0</td>
<td>0 1 1 0 1 1 1</td>
<td>Write Register for Display Option</td>
<td>Write Register for Display Option 0: Default [POR] 1: Spare</td>
<td></td>
</tr>
<tr>
<td>0 1 A7</td>
<td>0 0 0 0 0 0 0</td>
<td>Display Mode for WS[7:0]</td>
<td>B[7:0]</td>
<td></td>
</tr>
<tr>
<td>0 1 B7</td>
<td>0 0 0 0 0 0 0</td>
<td>Display Mode for WS[15:8]</td>
<td>C[7:0]</td>
<td></td>
</tr>
<tr>
<td>0 1 C7</td>
<td>0 0 0 0 0 0 0</td>
<td>Display Mode for WS[23:16]</td>
<td>D[7:0]</td>
<td></td>
</tr>
<tr>
<td>0 1 D7</td>
<td>0 0 0 0 0 0 0</td>
<td>Display Mode for WS[31:24]</td>
<td>E[7:0]</td>
<td></td>
</tr>
<tr>
<td>0 1 E7</td>
<td>0 0 0 0 0 0 0</td>
<td>Display Mode for WS[35:32]</td>
<td>F[0:3]</td>
<td></td>
</tr>
<tr>
<td>0 1 F7</td>
<td>0 0 0 0 0 0 0</td>
<td>PingPong for Display Mode 2</td>
<td>G(7:0)–J(7:0) module ID /waveform version. Remarks: 1) A[7:0]–J[7:0] can be stored in OTP 2) RAM Ping-Pong function is not support for Display Mode 1</td>
<td></td>
</tr>
<tr>
<td>0 1 G7</td>
<td>0 0 0 0 0 0 0</td>
<td>RAM Ping-Pong can be stored in Display Mode 1</td>
<td>H(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 H7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>I(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 I7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>J(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 0 38 0</td>
<td>0 1 1 1 1 0 0</td>
<td>Write Register for User ID</td>
<td>Write Register for User ID 0: Default [POR] 1: User ID [10 bytes]</td>
<td></td>
</tr>
<tr>
<td>0 1 A7</td>
<td>0 0 0 0 0 0 0</td>
<td>A[7:0]–J[7:0]: UserID [10 bytes] Remarks: A[7:0]–J[7:0] can be stored in OTP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 1 B7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>C(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 C7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>D(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 D7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>E(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 E7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>F(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 F7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>G(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 G7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>H(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 H7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>I(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 1 I7</td>
<td>0 0 0 0 0 0 0</td>
<td></td>
<td>J(7:0)</td>
<td></td>
</tr>
<tr>
<td>0 0 39 0</td>
<td>0 1 1 1 1 0 1</td>
<td>OTP program mode</td>
<td>OTP program mode 0: Normal Mode [POR] 1: Internal generated OTP programming voltage Remarks: User is required to EXACTLY follow the reference code sequences</td>
<td></td>
</tr>
<tr>
<td>0 1 A7</td>
<td>0 0 0 0 0 0 0</td>
<td>A[1:0] = 00: Normal Mode [POR] A[1:0] = 11: Internal generated OTP programming voltage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.good-display.com 19 37 1.54 inch Series
<table>
<thead>
<tr>
<th>Command Table</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Border Waveform Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 0 3C 0 0 1 1 1 1 0 0</td>
<td>A7</td>
<td>A6 A5 A4 A3 A2 A1 A0</td>
</tr>
<tr>
<td>0 1</td>
<td>Select border waveform for VBD</td>
<td></td>
</tr>
<tr>
<td>07:0 = 0C [POR], set VBD as HIZ.</td>
<td>A7</td>
<td>Select VBD as</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Fix Level, Defined in A[5:4]</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>VCOM</td>
</tr>
<tr>
<td></td>
<td>11 [POR]</td>
<td>HIZ</td>
</tr>
<tr>
<td></td>
<td>A5</td>
<td>VBD level</td>
</tr>
<tr>
<td></td>
<td>00</td>
<td>VSS</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>VSH1</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>VSL</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>VSH2</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>GS Transition control</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Follow LUT</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Follow LUT</td>
</tr>
<tr>
<td></td>
<td>(Output VCOM @ RED)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>A[1:0] GS Transition setting for VBD</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A1</td>
<td>VBD Transition</td>
</tr>
<tr>
<td></td>
<td>00</td>
<td>LUT0</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>LUT1</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>LUT2</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>LUT3</td>
</tr>
<tr>
<td>0 0 3F 0 0 1 1 1 1 1 1</td>
<td>End Option (EOPT)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>Option for LUT end</td>
<td></td>
</tr>
<tr>
<td>07:0 = 02h [POR]</td>
<td>22h</td>
<td>Normal.</td>
</tr>
<tr>
<td></td>
<td>07h</td>
<td>Source output level keep previous output before power off</td>
</tr>
<tr>
<td>0 0 41 0 0 1 0 0 0 0 0</td>
<td>Read RAM Option</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>Read RAM Option</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Read RAM corresponding to RAM0x26</td>
</tr>
<tr>
<td>0 0 44 0 0 1 0 0 0 0 0</td>
<td>Set RAM X - address</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>Specify the start/endpoint positions of the window address in the X direction by an address unit for RAM</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>A5: XSA[5:0], XStart, POR = 00h</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B5: XEA[5:0], XEnd, POR = 15h</td>
<td></td>
</tr>
<tr>
<td>0 1 0 0 B5 B4 B3 B2 B1 B0</td>
<td>Start / End position</td>
<td></td>
</tr>
<tr>
<td>0 0 45 0 0 1 0 0 0 0 0</td>
<td>Set RAM Y - address</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>Specify the start/endpoint positions of the window address in the Y direction by an address unit for RAM</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>A5: YSA[5:0], YStart, POR = 00h</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B5: YEA[5:0], YEnd, POR = 127h</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>Start / End position</td>
<td></td>
</tr>
<tr>
<td>0 1 B7 B6 B5 B4 B3 B2 B1 B0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command Table</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>R/W</td>
<td>D/C#</td>
<td>Hex</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>46</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>A7</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>4F</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>A7</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>7F</td>
</tr>
</tbody>
</table>
### 7. Electrical Characteristics

#### 7-1. Absolute maximum rating

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic supply voltage</td>
<td>VCI</td>
<td>-0.5 to +4.0</td>
<td>V</td>
</tr>
<tr>
<td>Logic Input voltage</td>
<td>VIN</td>
<td>-0.5 to VCI +0.5</td>
<td>V</td>
</tr>
<tr>
<td>Logic Output voltage</td>
<td>VOUT</td>
<td>-0.5 to VCI +0.5</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temp range</td>
<td>TOPR</td>
<td>0 to +50</td>
<td>ºC</td>
</tr>
<tr>
<td>Storage Temp range</td>
<td>TSTG</td>
<td>-25 to +70</td>
<td>ºC</td>
</tr>
<tr>
<td>Optimal Storage Temp</td>
<td>TSTGo</td>
<td>23±2</td>
<td>ºC</td>
</tr>
<tr>
<td>Optimal Storage Humidity</td>
<td>HSTGo</td>
<td>55±10</td>
<td>%RH</td>
</tr>
</tbody>
</table>

#### 7-2. Panel DC Characteristics

The following specifications apply for: VSS=0V, VCI=3.0V, TOPR =23ºC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Applicable pin</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single ground</td>
<td>VSS</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Logic supply voltage</td>
<td>VCI</td>
<td>VCI</td>
<td>2.2</td>
<td>3.0</td>
<td>3.7</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Core logic voltage</td>
<td>VDD</td>
<td>VDD</td>
<td>1.7</td>
<td>1.8</td>
<td>1.9</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>High level input voltage</td>
<td>VIH</td>
<td>-</td>
<td>0.8 VCI</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Low level input voltage</td>
<td>VIL</td>
<td>-</td>
<td>-</td>
<td>0.2</td>
<td>VCI</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>High level output voltage</td>
<td>VOH</td>
<td>IOH = -100µA</td>
<td>-</td>
<td>0.9</td>
<td>VCI</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Low level output voltage</td>
<td>VOL</td>
<td>IOI = 100µA</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>VCI</td>
<td>V</td>
</tr>
<tr>
<td>Typical power</td>
<td>P_TYP</td>
<td>VCI=3.0V</td>
<td>-</td>
<td>4.5</td>
<td>-</td>
<td>-</td>
<td>mW</td>
</tr>
<tr>
<td>Deep sleep mode</td>
<td>P_STP</td>
<td>VCI=3.0V</td>
<td>-</td>
<td>0.003</td>
<td>-</td>
<td>-</td>
<td>mW</td>
</tr>
<tr>
<td>Typical operating current</td>
<td>Iopr _VCI</td>
<td>VCI=3.0V</td>
<td>-</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>Full update time</td>
<td>-</td>
<td>25 ºC</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>sec</td>
</tr>
<tr>
<td>Fast update time</td>
<td>-</td>
<td>25 ºC</td>
<td>-</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
<td>sec</td>
</tr>
<tr>
<td>Partial update time</td>
<td>-</td>
<td>25 ºC</td>
<td>-</td>
<td>0.26</td>
<td>-</td>
<td>-</td>
<td>sec</td>
</tr>
<tr>
<td>Sleep mode current</td>
<td>Islp _VCI</td>
<td>DC/DC off</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>uA</td>
</tr>
<tr>
<td>Deep sleep mode current</td>
<td>Idslp _VCI</td>
<td>DC/DC off</td>
<td>-</td>
<td>1</td>
<td>5</td>
<td>-</td>
<td>uA</td>
</tr>
</tbody>
</table>

Notes:

1) Refresh time: the time it takes for the whole process from the screen change to the screen stabilization.

2) The difference between different refresh methods:

Full refresh: The screen will flicker several times during the refresh process;
The Typical power consumption is measured with following pattern transition: from horizontal 2 gray scale pattern to vertical 2 gray scale pattern. (Note 7-1) The standby power is the consumed power when the panel controller is in standby mode. The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by GOOD DISPLAY. Vcom is recommended to be set in the range of assigned value ± 0.1V.

Note 7-1 The Typical power consumption

7-3. Panel AC Characteristics
7-3-1. MCU Interface
7-3-1-1. MCU Interface selection
The module can support 3-wire/4-wire serial peripheral. MCU interface is pin selectable by BS1 shown in Table 7-1.

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>MCU interface</th>
<th>BS1</th>
<th>RES#</th>
<th>CS#</th>
<th>D/C#</th>
<th>SCL</th>
<th>SDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-wire serial peripheral</td>
<td>L</td>
<td>RES#</td>
<td>CS#</td>
<td>DC#</td>
<td>SCL</td>
<td>SDA</td>
<td></td>
</tr>
<tr>
<td>interface (SPI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-wire serial peripheral</td>
<td>H</td>
<td>RES#</td>
<td>CS#</td>
<td>L</td>
<td>SCL</td>
<td>SDA</td>
<td></td>
</tr>
<tr>
<td>interface (SPI) – 9 bits SPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7-1: Interface pins assignment under different MCU interface

Note: (1) L is connected to VSS and H is connected to VDDIO

7-3-1-2. MCU Serial Interface (4-wire SPI)
The 4-wire SPI consists of serial clock SCL, serial data SDA, D/C# and CS#. The control pins status in 4-wire SPI in writing command/data is shown in Table 6-2 and the write procedure 4-wire SPI is shown in Table 7-2.

<table>
<thead>
<tr>
<th>Function</th>
<th>SCL pin</th>
<th>SDA pin</th>
<th>D/C# pin</th>
<th>CS# pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write command</td>
<td>↑</td>
<td>Command bit</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Write data</td>
<td>↑</td>
<td>Data bit</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>

Table 7-2: Control pins status of 4-wire SPI

Fast Refresh: The screen will flash once during the refresh process;
Partial refresh: The screen does not flicker during the refresh process.

Note: During the fast refresh or partial refresh of the electronic paper, it is recommended to add a full-screen refresh after 5 consecutive operations to reduce the accumulation of afterimages on the screen.
Note:
(1) L is connected to VSS and H is connected to VDDIO
(2) ↑ stands for rising edge of signal
(3) SDA (Write Mode) is shifted into an 8-bit shift register on every rising edge of SCL in the order of D7, D6, ... D0. The level of D/C# should be kept over the whole byte. The data byte in the shift register is written to the Graphic Display Data RAM (RAM)/Data Byte register or command Byte register according to D/C# pin.

![Figure 7-1: Write procedure in 4-wire SPI mode](image)

In the read operation (Command 0x1B, 0x27, 0x2D, 0x2E, 0x2F, 0x35). After CS# is pulled low, the first byte sent is command byte, D/C# is pulled low. After command byte sent, the following byte(s) read are data byte(s), so D/C# bit is then pulled high. An 8-bit data will be shifted out on every clock falling edge. The serial data SDA bit shifting sequence is D7, D6, to D0 bit. Figure 6-2 shows the read procedure in 4-wire SPI.

![Figure 7-2: Read procedure in 4-wire SPI mode](image)
7-3-1-3. MCU Serial Peripheral Interface (3-wire SPI)

The 3-wire SPI consists of serial clock SCL, serial data SDA and CS#. The operation is similar to 4-wire SPI while D/C# pin is not used and it must be tied to LOW. The control pins status in 3-wire SPI is shown in Table 7-3.

In the write operation, a 9-bit data will be shifted into the shift register on every clock rising edge. The bit shifting sequence is D/C# bit, D7 bit, D6 bit to D0 bit. The first bit is D/C# bit which determines the following byte is command or data. When D/C# bit is 0, the following byte is command. When D/C# bit is 1, the following byte is data. Table 6-3 shows the write procedure in 3-wire SPI.

<table>
<thead>
<tr>
<th>Function</th>
<th>SCL pin</th>
<th>SDA pin</th>
<th>D/C# pin</th>
<th>CS# pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write command</td>
<td>↑</td>
<td>Command bit</td>
<td>Tie LOW</td>
<td>L</td>
</tr>
<tr>
<td>Write data</td>
<td>↑</td>
<td>Data bit</td>
<td>Tie LOW</td>
<td>L</td>
</tr>
</tbody>
</table>

Table 7-3 : Control pins status of 3-wire SPI

Note:
(1) L is connected to VSS and H is connected to VDDIO
(2) ↑ stands for rising edge of signal

Figure 7-3 : Write procedure in 3-wire SPI
In the read operation (Register 0x1B, 0x27, 0x2D, 0x2E, 0x2F, 0x35). SDA data are transferred in the unit of 9 bits. After CS# pull low, the first byte is command byte, the D/C# bit is as 0 and following with the register byte. After command byte send, the following byte(s) are data byte(s), with D/C# bit is 1. After D/C# bit sending from MCU, an 8-bit data will be shifted out on every clock falling edge. The serial data SDA bit shifting sequence is D7, D6, to D0 bit. Figure 7-4 shows the read procedure in 3-wire SPI.

**Figure 7-4:** Read procedure in 3-wire SPI mode

### 7-3-2. Serial Peripheral Interface

#### Write mode

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter (Write Mode)</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_{SCL}$</td>
<td>SCL frequency (Write Mode)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20 MHz</td>
</tr>
<tr>
<td>$t_{CSU}$</td>
<td>Time CS# has to be low before the first rising edge of SCLK</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{CSLD}$</td>
<td>Time CS# has to remain low after the last falling edge of SCLK</td>
<td>65</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{CSHIGH}$</td>
<td>Time CS# has to remain high between two transfers</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{CSLOW}$</td>
<td>Part of the clock period where SCL has to remain high</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$t_{SPIU}$</td>
<td>Part of the clock period where SCL has to remain low</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$t_{SIU}$</td>
<td>Time SI (SDA Write Mode) has to be stable before the next rising edge of SCL</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{SIUL}$</td>
<td>Time SI (SDA Write Mode) has to remain stable after the rising edge of SCL</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

#### Read mode

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter (Read Mode)</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_{SCL}$</td>
<td>SCL frequency (Read Mode)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.5 MHz</td>
</tr>
<tr>
<td>$t_{CSU}$</td>
<td>Time CS# has to be low before the first rising edge of SCLK</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{CSLD}$</td>
<td>Time CS# has to remain low after the last falling edge of SCLK</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{CSHIGH}$</td>
<td>Time CS# has to remain high between two transfers</td>
<td>250</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{CSLOW}$</td>
<td>Part of the clock period where SCL has to remain high</td>
<td>180</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{SIU}$</td>
<td>Part of the clock period where SCL has to remain low</td>
<td>180</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{SOI}$</td>
<td>Time SO (SDA Read Mode) will be stable before the next rising edge of SCL</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{SOUL}$</td>
<td>Time SO (SDA Read Mode) will remain stable after the falling edge of SCL</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note: All timings are based on 20% to 80% of VDDIO-VSS
Table 7-4: Serial Peripheral Interface Timing Characteristics

![SPI timing diagram](image)

Figure 7-5: SPI timing diagram
8. Operation Flow and Code Sequence

8-1. General operation flow to drive display panel

START

1. Power On
- Supply VCI
- Wait 10ms

2. Set Initial Configuration
- Define SPI interface to communicate with MCU
- HW Reset
- SW Reset by Command 0x12
- Wait 10ms

3. Send Initialization Code
- Set gate driver output by Command 0x01
- Set display RAM size by Command 0x11, 0x44, 0x45
- Set panel border by Command 0x3C

4. Load Waveform LUT
- Sense temperature by int/ext TS by Command 0x18
- Load waveform LUT from OTP by Command 0x22, 0x20 or by MCU
- Wait BUSY Low

5. Write Image and Drive Display Panel
- Write image data in RAM by Command 0x4E, 0x4F, 0x24, 0x26
- Set softstart setting by Command 0x0C
- Drive display panel by Command 0x22, 0x20
- Wait BUSY Low

6. Power Off
- Deep sleep by Command 0x10
- Power OFF

END
9. Optical Specifications

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>White Reflectivity</td>
<td>White</td>
<td>30</td>
<td>35</td>
<td>-</td>
<td>%</td>
<td>9-1</td>
</tr>
<tr>
<td>CR</td>
<td>Contrast Ratio</td>
<td>Indoor</td>
<td>8:1</td>
<td>-</td>
<td>-</td>
<td></td>
<td>9-2</td>
</tr>
<tr>
<td>GN</td>
<td>2Grey Level</td>
<td>-</td>
<td>DS+(WS-DS)*n(m-1)</td>
<td>9-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T up</td>
<td>Image update time</td>
<td>at 25 °C</td>
<td>3</td>
<td>-</td>
<td>sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life</td>
<td>Topr</td>
<td>1000000times or 5years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
9-1. Luminance meter: Eye-One Pro Spectrophotometer.
9-2. CR=Surface Reflectance with all white pixel/Surface Reflectance with all black pixels.
9-3. WS: White state, DS: Dark state

10. Handling, Safety and Environment Requirements

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

CAUTION
The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronic components. Disassembling the display module can cause permanent damage and invalidate the warranty agreements.

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.

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 dose not form part of the specification.

Product Environmental certification
RoHS
## 11. Reliability test

<table>
<thead>
<tr>
<th>TEST</th>
<th>CONDITION</th>
<th>METHOD</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High-Temperature Operation</td>
<td>$T = 50^\circ C, RH = 35%$ for 240 hrs</td>
<td>When the experimental cycle finished, the EPD samples will be taken out from the high temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard IEC 60 068-2-2Bp.</td>
<td>When experiment finished, the EPD must meet electrical performance standards.</td>
</tr>
<tr>
<td>2. Low-Temperature Operation</td>
<td>$T = 0^\circ C$ for 240 hrs</td>
<td>When the experimental cycle finished, the EPD samples will be taken out from the low temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard IEC 60 068-2-2Ab.</td>
<td>When experiment finished, the EPD must meet electrical performance standards.</td>
</tr>
<tr>
<td>3. High-Temperature Storage</td>
<td>$T = +70^\circ C$, RH = 35% for 240 hrs Test in white pattern</td>
<td>When the experimental cycle finished, the EPD samples will be taken out from the high temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard IEC 60 068-2-2Ab.</td>
<td>When experiment finished, the EPD must meet electrical performance standards.</td>
</tr>
<tr>
<td>4. Low-Temperature Storage</td>
<td>$T = -25^\circ C$ for 240 hrs Test in white pattern</td>
<td>When the experimental cycle finished, the EPD samples will be taken out from the low temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard IEC 60 068-2-2Ab.</td>
<td>When experiment finished, the EPD must meet electrical performance standards.</td>
</tr>
<tr>
<td>5. High Temperature, High-Humidity Operation</td>
<td>$T = +40^\circ C$, RH = 80% for 240 hrs</td>
<td>When the experimental cycle finished, the EPD samples will be taken out from the environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard IEC 60 068-2-3CA.</td>
<td>When experiment finished, the EPD must meet electrical performance standards.</td>
</tr>
<tr>
<td>6. High Temperature, High-Humidity Storage</td>
<td>$T = +50^\circ C$, RH = 80% for 240 hrs Test in white pattern</td>
<td>When the experimental cycle finished, the EPD samples will be taken out from the environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard IEC 60 068-2-3CA.</td>
<td>When experiment finished, the EPD must meet electrical performance standards.</td>
</tr>
<tr>
<td>No.</td>
<td>Test Item</td>
<td>Detailed Description</td>
<td>Notes</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Temperature Cycle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|     | [-25°C 30mins] → [Temperature rise 30mins] → [+70°C, RH=35% 30mins] → [Temperature drop 30mins], 1 cycle=2hrs, 50 cycles Test in white pattern | 1. Samples are put in the Temp & Humid. Environmental Chamber. Temperature cycle starts with -25°C, storage period 30 minutes. After 30 minutes, it needs 30min to let temperature rise to 60°C. After 30min, temperature will be adjusted to 60°C, RH=35% and storage period is 30 minutes. After 30 minutes, it needs 30min to let temperature rise to -25°C. One temperature cycle (2hrs) is complete.  
2. Temperature cycle repeats 50 times.  
3. When 50 cycles finished, the samples will be taken out from experiment chamber and set aside a few minutes. As EPDs return to room temperature, tests will observe the appearance, and test electrical and optical performance based on standard# IEC 60 068-2-14NB. |
| 8   | UV exposure Resistance  | 765 W/m² for 168 hrs, 40°C                                                                                                                          | Standard# IEC 60 068-2-5 Sa                                                                                                                                 |
| 9   | Electrostatic discharge | Machine Model: +/-250V, 0Ω, 200PF                                                                                                                     | Standard# IEC61000-4-2                                                                                                                                 |
| 10  | Package Vibration       | 1.04G,Frequency : 10~500Hz Direction : X, Y, Z Duration: 1 hours in each direction                                                                | Full packed for shipment                                                                                                                                 |
| 11  | Package Drop Impact     | Drop from height of 122 cm on Concrete surface Drop sequence: 1 corner, 3 edges, 6 face One drop for each.                                                | Full packed for shipment                                                                                                                                 |

Actual EMC level to be measured on customer application.  
Note: (1) The protective film must be removed before temperature test. 
(2) There’s temperature vs display quality limitation in our display module, we guarantee 1 pixel display quality from 5°C ~ 30°C, and 2 pixel display quality for 0°C~ 5°C & 30°C ~ 40°C.  
(3) In order to make sure the display module can provide the best display quality, the update should be made after putting the display module in stable temperature environment for 4 hours at 25°C.
12. Block Diagram
13. Reference Circuit
14. Matched Development Kit

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

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

More details about the Development Kit, please click to the following link: https://www.good-display.com/product/53/
15. Point and line standard

Shipment Inspecion Standard

Part-A: Active area  Part-B: Border area

Equipment: Electrical test fixture, Point gauge

Outline dimension:
31.8(H) × 37.32(V) × 0.98(D)  Unit: mm

<table>
<thead>
<tr>
<th>Environment</th>
<th>Temperature</th>
<th>Humidity</th>
<th>Illuminance</th>
<th>Distance</th>
<th>Time</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23 ± 2°C</td>
<td>55 ± 5%RH</td>
<td>1200~1500Lux</td>
<td>300 mm</td>
<td>35 Sec</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Causes</th>
<th>Spot size</th>
<th>Part-A</th>
<th>Part-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot</td>
<td>B/W spot in glass or protection sheet, foreign mat. Pin hole</td>
<td>D ≤ 0.15mm</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15mm &lt; D ≤ 0.25mm</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.25mm &lt; D</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Scratch or line defect</td>
<td>Scratch on glass or Scratch on FPL or Particle is Protection sheet.</td>
<td>Length</td>
<td>Width</td>
<td>Part-A</td>
</tr>
<tr>
<td></td>
<td>L ≤ 1.0mm</td>
<td>W ≤ 0.1mm</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td></td>
<td>1.0 mm &lt; L ≤ 2.5mm</td>
<td>0.1 mm &lt; W ≤ 0.2mm</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5 mm &lt; L</td>
<td>0.2mm &lt; W</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Air bubble</td>
<td>Air bubble</td>
<td>D1, D2 ≤ 0.15 mm</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15 mm &lt; D1,D2 ≤ 0.2mm</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2mm &lt; D1, D2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Side Fragment</td>
<td>N</td>
<td>Y ≤ 0.5mm &amp; display is ok, Ignore</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remarks: Spot define: That only can be seen under WS or DS defects.

Any defect which is visible under gray pattern or transition process but invisible under black and white is disregarded.

Here is definition of the “Spot” and “Scratch or line defect”.

Spot: W > 1/4L  Scratch or line defect: W ≤ 1/4L

Definition for L/W and D (major axis)

FPC bonding area pad doesn’t allowed visual inspection.

Note: AQL = 0.4
16. Packing

PACKLING ORDER:

1) Putting 35 pcs Modules on each PET tray. And cover a dedicated EPE film.

2) Putting 12 pcs PET trays together with 1 empty tray on the top of PET tray. Insert in the ESD bag, add desiccant in the ESD bag.

3) the tray together with adhesive tape

4) Putting into one outcarton

5) Packing finished

Note: 35 pcs in a tray, 12 trays in a inner carton, 1 inner cartons in a out carton, so 35x12x1=420pcs/Outcarton

Dimension (Out carton): 394*344*255mm
17. Precautions

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