# PMOLED SPECIFICATION

<table>
<thead>
<tr>
<th>Part Number</th>
<th>USMP-P19603</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>1.1&quot;</td>
</tr>
<tr>
<td>Resolution</td>
<td>96 x 64</td>
</tr>
<tr>
<td>Color</td>
<td>Yellow</td>
</tr>
<tr>
<td>Panel Size</td>
<td>29 (W) x 21 (H)</td>
</tr>
<tr>
<td>Active Area</td>
<td>23.49 (W) x 15.65 (H)</td>
</tr>
<tr>
<td>IC</td>
<td>SSD1325T2R1</td>
</tr>
<tr>
<td>Interface</td>
<td>Parallel, SPI</td>
</tr>
</tbody>
</table>

FOR ADDITIONAL INFORMATION PLEASE CONTACT: engineering@usmicroproducts.com
## REVISION RECORD

<table>
<thead>
<tr>
<th>REV.</th>
<th>REVISION DESCRIPTION</th>
<th>REV. DATE</th>
<th>REMARK</th>
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<tbody>
<tr>
<td>X01</td>
<td>INITIAL RELEASE</td>
<td>2009. 05. 27</td>
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| X02  | ■ Add the operating conditions for different luminance  
     | ■ Add the panel electrical specifications  
     | ■ Add the application circuit | 2009. 06. 22 | Page 6, 7, 8 & 17 |
|      |                      |            |                        |
| X03  | ■ Remove holder      | 2012. 08. 09 | Page 4, 5, 6, 8 & 19   |
|      | ■ Change white color recipe |        |                        |
| X04  | ■ Modify driving voltage (13→14.5V)  
     | ■ Modify panel electrical specifications | 2012. 11. 20 | Page 6, 7 & 8     |
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<td>21</td>
</tr>
</tbody>
</table>
1. SCOPE
This specification is to define the general provisions and quality requirements that apply to the supply of display cells manufactured by US Micro Products. This document, together with the Module Ass'y Drawing, is the highest-level specification for this product.

2. WARRANTY
US Micro Products warrants that the products delivered pursuant to this specification (or order) will conform to the agreed specifications for twelve (12) months from the shipping date ("Warranty Period"). US Micro Products is obligated to repair or replace the products which are found to be defective or inconsistent with the specifications during the Warranty Period without charge, on condition that the products are stored or used as the conditions specified in the specifications. Nevertheless, US Micro Products is not obligated to repair or replace the products without charge if the defects or inconsistency are caused by the force majeure or the reckless behaviors of the customer. After the Warranty Period, all repairs or replacements of the products are subject to charge.

3. FEATURES
- Small molecular organic light emitting diode.
- Color : White.
- Panel matrix : 96*64.
- Driver IC : SSD1325.
- Excellent quick response time.
- Extremely thin thickness for best mechanism design : 1.61mm.
- Wide viewing angle : 160°.
- 8-bit 8080-series parallel interface, serial peripheral interface.
- Wide range of operating temperature : -40 to 70 °C.
- Anti-glare polarizer.
### 4. MECHANICAL DATA

<table>
<thead>
<tr>
<th>NO</th>
<th>ITEM</th>
<th>SPECIFICATION</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dot Matrix</td>
<td>96 (W) x 64 (H)</td>
<td>dot</td>
</tr>
<tr>
<td>2</td>
<td>Dot Size</td>
<td>0.215 (W) x 0.215 (H)</td>
<td>mm²</td>
</tr>
<tr>
<td>3</td>
<td>Dot Pitch</td>
<td>0.245 (W) x 0.245 (H)</td>
<td>mm²</td>
</tr>
<tr>
<td>4</td>
<td>Aperture Rate</td>
<td>77</td>
<td>%</td>
</tr>
<tr>
<td>5</td>
<td>Active Area</td>
<td>23.49 (W) x 15.65 (H)</td>
<td>mm²</td>
</tr>
<tr>
<td>6</td>
<td>Panel Size</td>
<td>29 (W) x 21 (H)</td>
<td>mm²</td>
</tr>
<tr>
<td>7*</td>
<td>Panel Thickness</td>
<td>1.42 ± 0.1</td>
<td>mm</td>
</tr>
<tr>
<td>8</td>
<td>Module Size</td>
<td>29 (W) x 66.2 (H) x 2.41 (D)</td>
<td>mm³</td>
</tr>
<tr>
<td>9</td>
<td>Diagonal A/A size</td>
<td>1.1</td>
<td>inch</td>
</tr>
<tr>
<td>10</td>
<td>Module Weight</td>
<td>TBD</td>
<td>gram</td>
</tr>
</tbody>
</table>

* Panel thickness includes substrate glass, cover glass and UV glue thickness.
## 5. MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
<th>Condition</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage (V_{DD})</td>
<td>-0.3</td>
<td>3.5</td>
<td>V</td>
<td>Ta = 25°C</td>
<td>IC maximum rating</td>
</tr>
<tr>
<td>Supply Voltage (V_{cc})</td>
<td>8</td>
<td>16</td>
<td>V</td>
<td>Ta = 25°C</td>
<td>IC maximum rating</td>
</tr>
<tr>
<td>Operating Temp.</td>
<td>-40</td>
<td>70</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage Temp</td>
<td>-40</td>
<td>85</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>-</td>
<td>85</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Time</td>
<td>30,000</td>
<td>-</td>
<td>Hrs</td>
<td>100 cd/m², 50% checkerboard</td>
<td>Note (1)</td>
</tr>
<tr>
<td>Life Time</td>
<td>37,000</td>
<td>-</td>
<td>Hrs</td>
<td>80 cd/m², 50% checkerboard</td>
<td>Note (2)</td>
</tr>
<tr>
<td>Life Time</td>
<td>50,000</td>
<td>-</td>
<td>Hrs</td>
<td>60 cd/m², 50% checkerboard</td>
<td>Note (3)</td>
</tr>
</tbody>
</table>

Note:
(A) Under V_{cc} = 14.5V, Ta = 25°C, 50% RH.
(B) Life time is defined as the amount of time when the luminance has decayed to less than 50% of the initial measured luminance.

1. Setting of 100 cd/m²:
   - Contrast setting : 0x33
   - Frame rate : 105Hz
   - Duty setting : 1/64

2. Setting of 80 cd/m²:
   - Contrast setting : 0x2a
   - Frame rate : 105Hz
   - Duty setting : 1/64

3. Setting of 60 cd/m²:
   - Contrast setting : 0x21
   - Frame rate : 105Hz
   - Duty setting : 1/64
6. ELECTRICAL CHARACTERISTICS

6.1 D.C ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETERS</th>
<th>TEST CONDITION</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
<td>Analog power supply (for OLED panel)</td>
<td>$Ta=-20^\circ C$ to $+70^\circ C$</td>
<td>14</td>
<td>14.5</td>
<td>15</td>
<td>V</td>
</tr>
<tr>
<td>$V_{DD}$</td>
<td>Digital power supply</td>
<td>$Ta=-20^\circ C$ to $+70^\circ C$</td>
<td>2.4</td>
<td>2.8</td>
<td>3.5</td>
<td>V</td>
</tr>
<tr>
<td>$I_{DD}$</td>
<td>Operating current for $V_{DD}$</td>
<td>$V_{DD}=2.7V$, $V_{CC}=12V$, $IREF=10\mu A$</td>
<td>Contrast=7F</td>
<td>-</td>
<td>-</td>
<td>650 uA</td>
</tr>
<tr>
<td>$I_{CC}$</td>
<td>Operating current for $V_{CC}$</td>
<td>$V_{DD}=2.7V$, $V_{CC}=12V$, $IREF=10\mu A$</td>
<td>Contrast=7F</td>
<td>-</td>
<td>700</td>
<td>- uA</td>
</tr>
<tr>
<td>$V_{IH}$</td>
<td>Hi logic input level</td>
<td>$0.8^* V_{DD}$</td>
<td>-</td>
<td>$V_{DD}$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{IL}$</td>
<td>Low logic input level</td>
<td>0</td>
<td>-</td>
<td>$0.2^* V_{DD}$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{OH}$</td>
<td>Hi logic output level</td>
<td>$0.9^* V_{DD}$</td>
<td>-</td>
<td>$V_{DD}$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{OL}$</td>
<td>Low logic output level</td>
<td>0</td>
<td>-</td>
<td>$0.1^* V_{DD}$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$I_{SEG}$</td>
<td>Segment on output current</td>
<td>$V_{DD}=2.7V$, $V_{CC}=12V$, $IREF=10\mu A$, Display on.</td>
<td>Contrast=7F</td>
<td>270</td>
<td>300</td>
<td>370 uA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contrast=5F</td>
<td>-</td>
<td>225</td>
<td>- uA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contrast=3F</td>
<td>-</td>
<td>150</td>
<td>- uA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contrast=1F</td>
<td>-</td>
<td>75</td>
<td>- uA</td>
</tr>
</tbody>
</table>
### 6.2 ELECTRO-OPTICAL CHARACTERISTICS

#### PANEL ELECTRICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MIN</th>
<th>TYP.</th>
<th>MAX</th>
<th>UNITS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal mode current</td>
<td>16</td>
<td>18</td>
<td>mA</td>
<td>All pixels on (1)</td>
<td></td>
</tr>
<tr>
<td>Standby mode current</td>
<td>1</td>
<td>2</td>
<td>mA</td>
<td>Standby mode 10% pixels on (2)</td>
<td></td>
</tr>
<tr>
<td>Normal mode power consumption</td>
<td>232</td>
<td>261</td>
<td>mW</td>
<td>All pixels on (1)</td>
<td></td>
</tr>
<tr>
<td>Standby mode power consumption</td>
<td>14.5</td>
<td>29</td>
<td>mW</td>
<td>Standby mode 10% pixels on (2)</td>
<td></td>
</tr>
<tr>
<td>Normal Luminance</td>
<td>60</td>
<td>80</td>
<td>cd/m²</td>
<td>Display Average</td>
<td></td>
</tr>
<tr>
<td>Standby Luminance</td>
<td>10</td>
<td></td>
<td>cd/m²</td>
<td>Display Average</td>
<td></td>
</tr>
<tr>
<td>CIEx (White)</td>
<td>0.27</td>
<td>0.31</td>
<td>0.35</td>
<td>x, y (CIE 1931)</td>
<td></td>
</tr>
<tr>
<td>CIEy (White)</td>
<td>0.31</td>
<td>0.35</td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dark Room Contrast</td>
<td>2000:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viewing Angle</td>
<td>160</td>
<td></td>
<td>degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td>10</td>
<td></td>
<td>µs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Normal mode condition:
- Driving Voltage : 14.5V
- Contrast setting : 0x2a
- Frame rate : 105Hz
- Duty setting : 1/64

(2) Standby mode condition:
- Driving Voltage : 14.5V
- Contrast setting : 0x06
- Frame rate : 105Hz
- Duty setting : 1/64
7. INTERFACE

7.1 FUNCTION BLOCK DIAGRAM

7.2 PANEL LAYOUT DIAGRAM
### 7.3 PIN ASSIGNMENTS

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>No connection.</td>
</tr>
<tr>
<td>2</td>
<td>VCC</td>
<td>Positive OLED high voltage power supply</td>
</tr>
<tr>
<td>3</td>
<td>VCOMH</td>
<td>The COM voltage reference pin, this pin should be connected to ground through a capacitor.</td>
</tr>
<tr>
<td>4</td>
<td>IREF</td>
<td>The current reference input pin, this pin should be connected to ground through a resistor.</td>
</tr>
<tr>
<td>5</td>
<td>D7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>D6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>D5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>D4</td>
<td>8-bit data bus</td>
</tr>
<tr>
<td>9</td>
<td>D3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>D2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>D1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>D0</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>E(RD#)</td>
<td>Data read operation is initiated when it’s pull low.</td>
</tr>
<tr>
<td>14</td>
<td>R/W#</td>
<td>Data write operation is initiated when it’s pull low.</td>
</tr>
<tr>
<td>15</td>
<td>D/C#</td>
<td>Data/Command control. Pull high for write/read display data. Pull low for write command or read status.</td>
</tr>
<tr>
<td>16</td>
<td>RES#</td>
<td>Hardware reset signal</td>
</tr>
<tr>
<td>17</td>
<td>CS#</td>
<td>The driver IC will be selected when CS pin is active low.</td>
</tr>
<tr>
<td>18</td>
<td>NC</td>
<td>No connection.</td>
</tr>
<tr>
<td>19</td>
<td>BS2</td>
<td>Interface select pin</td>
</tr>
<tr>
<td>20</td>
<td>BS1</td>
<td>Interface select pin</td>
</tr>
<tr>
<td>21</td>
<td>VDD</td>
<td>Voltage power supply for logic</td>
</tr>
<tr>
<td>22</td>
<td>NC</td>
<td>No connection.</td>
</tr>
<tr>
<td>23</td>
<td>NC</td>
<td>No connection.</td>
</tr>
<tr>
<td>24</td>
<td>VBREF</td>
<td>This is an internal voltage reference pin. It should be kept NC and left open.</td>
</tr>
<tr>
<td>25</td>
<td>RESE</td>
<td>This is a reserved pin. It should be kept NC.</td>
</tr>
<tr>
<td>26</td>
<td>FB</td>
<td>This is a reserved pin. It should be kept NC.</td>
</tr>
<tr>
<td>27</td>
<td>VDDDB</td>
<td>This is a reserved pin. Voltage source input for logic circuit.</td>
</tr>
<tr>
<td>28</td>
<td>GDR</td>
<td>This is a reserved pin. It should be kept NC.</td>
</tr>
<tr>
<td>29</td>
<td>VSS</td>
<td>This is a ground pin.</td>
</tr>
<tr>
<td>30</td>
<td>VSL</td>
<td>This pin is the output pin for the voltage output low level for SEG signals. This pin can be kept NC or connected with a capacitor to VSS for stability.</td>
</tr>
</tbody>
</table>
7.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP

The GDDRAM is a bit mapped static RAM holding the bit pattern to be displayed. The size of the RAM is 128x80x4 bits. For mechanical flexibility, re-mapping on both Segment and Common outputs can be selected by software. (Refer to Table 3–7 for GDDRAM address map description)

Table 3– GDDRAM address map showing Horizontal Address Increment A[2]=0, Column Address Re-map A[0]=0, Nibble Re-map A[1]=0, COM Re-map A[4]=0, and Display Start Line=00H (Data byte sequence: D0, D1, … , D5118, D5119)

Table 4– GDDRAM address map showing Vertical Address Increment A[2]=1, Column Address Re-map A[0]=0, Nibble Re-map A[1]=0, COM Re-map A[4]=0, and Display Start Line=00H (Data byte sequence: D0, D1, … , D5118, D5119)
Table 5–GDDRAM address map showing Horizontal Address Increment A[2]=0, Column Address Re-map A[0]=1, Nibble Re-map A[1]=1, COM Re-map A[4]=0, and Display Start Line=00H (Data byte sequence: D0, D1, … , D5118, D5119)


Table 7–GDDRAM address map showing Horizontal Address Increment A[2]=0, Column Address Re-map A[0]=0, Nibble Re-map A[1]=0, COM Re-map A[4]=0, Display Start Line=00H (Data byte sequence: D0, D1, … , D4834, D4835), Column Start Address=01H, Column End Address=3EH, Row Start Address=01H and Row End Address=4EH
### 7.5 INTERFACE TIMING CHART

8080-Series MPU Parallel Interface Timing Characteristics

\( (V_{DD} - V_{SS} = 2.4 \text{ to } 3.5V, T_a = 25^{\circ}C) \)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_{AS} )</td>
<td>Address Setup Time</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{AH} )</td>
<td>Address Hold Time</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{DSW} )</td>
<td>Write Data Setup Time</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{DHW} )</td>
<td>Write Data Hold Time</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{DHR} )</td>
<td>Read Data Hold Time</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{OH} )</td>
<td>Output Disable Time</td>
<td>-</td>
<td>-</td>
<td>70</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{ACC} )</td>
<td>Access Time</td>
<td>-</td>
<td>-</td>
<td>140</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{DLW} )</td>
<td>Read Low Time</td>
<td>120</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{DH} )</td>
<td>Read High Time</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{DHW} )</td>
<td>Write High Time</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_r )</td>
<td>Rise Time</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>( t_f )</td>
<td>Fall Time</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{CS} )</td>
<td>Chip select setup time</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{CSH} )</td>
<td>Chip select hold time to read signal</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{CSR} )</td>
<td>Chip select hold time</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

#### 8080-series parallel interface characteristics (Form 1)

- **Write cycle (Form 1)**
- **Read cycle (Form 1)**

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8080-series parallel interface characteristics (Form2)

Write cycle (Form 2)

Read cycle (Form 2)
### Serial Interface Timing Characteristics

\((V_{DD} - V_{SS} = 2.4\text{ to } 3.5\text{V}, T_A = 25^\circ\text{C})\)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_{\text{cycle}})</td>
<td>Clock Cycle Time</td>
<td>250</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{AS}})</td>
<td>Address Setup Time</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{AH}})</td>
<td>Address Hold Time</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{CSS}})</td>
<td>Chip Select Setup Time</td>
<td>120</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{CSH}})</td>
<td>Chip Select Hold Time</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{DSW}})</td>
<td>Write Data Setup Time</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{DHW}})</td>
<td>Write Data Hold Time</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{CLKL}})</td>
<td>Clock Low Time</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_{\text{CLKH}})</td>
<td>Clock High Time</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>(t_r)</td>
<td>Rise Time</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>(t_f)</td>
<td>Fall Time</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>ns</td>
</tr>
</tbody>
</table>

### Serial Interface Characteristics

![Serial Interface Timing Diagram](image-url)
8. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

8.1 POWER ON / OFF SEQUENCE

1. Power ON VDD.
2. After VDD become stable, set RES# pin LOW (logic low) for at least 3us(t₁) and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 3us(t₂). Then Power ON VCC.\(^{(1)}\)
4. After VCC become stable, send command AFh for display ON. SEG/COM will be ON after 100ms(tAF).

**Power OFF sequence:**

1. Send command AEh for display OFF.
2. Wait until panel discharges completely.
3. Power OFF VCC.\(^{(1),(2)}\)
4. Wait for tOFF. Power OFF VDD. (where Minimum tOFF=80ms, Typical tOFF=100ms)

**Note:**

(1) Since an ESD protection circuit is connected between VDD and VCC, VCC becomes lower than VDD whenever VDD is ON and VCC is OFF as shown in the dotted line of VCC in above figures.

(2) VCC should be kept float (disable) when it is OFF.

(3) Power Pins (VDD, VCC) can never be pulled to ground under any circumstance.

(4) The register values are reset after t₁.

(5) VDD should not be Power OFF before VCC Power OFF.
8.2 APPLICATION CIRCUIT

Recommend components:
C1: 2.2uF/25V (0805)
C2: 0.1uF/16V (0603)
C3: 4.7uF/35V (Tantalum type), or VISHAY (572D475X0025A2T)
R1: 1M ohm/1% (0603)

Notes: This circuit is for 8080 interface.

8.3 COMMAND TABLE

Refer to SSD1325 IC Spec.
9. RELIABILITY TEST CONDITIONS

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Specification</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High temp. (Non-operation)</td>
<td>85°C, 240hrs</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>High temp. (Operation)</td>
<td>70°C, 120hrs</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Low temp. (Operation)</td>
<td>-40°C, 120hrs</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>High temp. / High humidity (Op.)</td>
<td>65°C, 90%RH, 120hrs</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Thermal shock (Non-operation)</td>
<td>-40°C ~ 85°C (~40°C / 30min; transit / 3min; 85°C / 30min; transit / 3min) 1 cycle: 66min, 100 cycles</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Vibration</td>
<td>Frequency: 5~50Hz, 0.5G Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X, Y, Z</td>
<td>1 Carton</td>
</tr>
<tr>
<td>7</td>
<td>Drop</td>
<td>Height: 120cm Sequence: 1 angle, 3 edges and 6 faces Cycles: 1</td>
<td>1 Carton</td>
</tr>
<tr>
<td>8</td>
<td>ESD (Non-operation)</td>
<td>Air discharge model, ±8kV, 10 times</td>
<td>5</td>
</tr>
</tbody>
</table>

**Test and measurement conditions**

1. All measurements shall not be started until the specimens attain to temperature stability.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for item 1, 4 & 5.

**Evaluation criteria**

1. The function test is OK.
2. No observable defects.
3. Luminance: > 50% of initial value.
4. Current consumption: within ± 50% of initial value.
11. PACKING SPECIFICATION
12. APPENDIXES

APPENDIX 1: DEFINITIONS

A. DEFINITION OF CHROMATICITY COORDINATE

The chromaticity coordinate is defined as the coordinate value on the CIE 1931 color chart for R, G, B, W.

B. DEFINITION OF CONTRAST RATIO

The contrast ratio is defined as the following formula:

\[
\text{Contrast Ratio} = \frac{\text{Luminance of all pixels on measurement}}{\text{Luminance of all pixels off measurement}}
\]

C. DEFINITION OF RESPONSE TIME

The definition of turn-on response time \(T_r\) is the time interval between a pixel reaching 10% of steady state luminance and 90% of steady state luminance. The definition of turn-off response time \(T_f\) is the time interval between a pixel reaching 90% of steady state luminance and 10% of steady state luminance. It is shown in Figure 2.

![Figure 2: Response time](image-url)
D. DEFINITION OF VIEWING ANGLE

The viewing angle is defined as Figure 3. Horizontal and vertical (H & V) angles are determined for viewing directions where luminance varies by 50% of the perpendicular value.

Figure 3: Viewing Angle
APPENDIX 2: MEASUREMENT APPARATUS

A. LUMINANCE/COLOR COORDINATE

PHOTO RESEARCH PR-705, MINOLTA CS-100

B. CONTRAST / RESPONSE TIME / VIEW ANGLE

WESTAR CORPORATION FPM-510
C. ESD ON AIR DISCHARGE MODE

V

EUT

R 330 ohms

DISCHARGE TIP

C 150pF

RETURN

GROUND PLANE
APPENDIX 3: PRECAUTIONS

A. RESIDUE IMAGE
Because the pixels are lighted in different time, the luminance of active pixels may reduce or differ from inactive pixels. Therefore, the residue image will occur. To avoid the residue image, every pixel needs to be lighted up uniformly.