Customer : OPTREX STANDARD
Customer's Product No : ---------

OPTREX CORPORATION

Approved: Yasuo Kawasaki
QUALITY ASSURANCE DIVISION

Checked: Noboru Wada
Module Design G.

Prepared: Takashi Yuchi
Project Management Div.

APPROVED

By

Signature :
Date :

Please return this specification within two months with your signature.
If not returned within two months, specification will be considered
as having been accepted.
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Revision History

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Page</th>
<th>Comment</th>
</tr>
</thead>
</table>
| 1    | Nov 28, 2008 | 4    | 4. Dimensinal Outline  
Revise of Dimensinal Outline Rev.A → Rev.B |
|      |            | 6    | 6. I/O Terminal  
Changed the code of Connector  
08-6210-033(ELCO) → 08-6260-033-340-829+ |
1. Application

This specification applies to 5.7" color TFT-LCD module 「With touch panel」
(T-55265GD057J-LW-ACN).

2. General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Conditions</th>
<th>Temperature Range</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dot Pixels</td>
<td>320 × 3 [R.G.B] (W) × 240 (H) dots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dot Size</td>
<td>0.12 × 3 [R.G.B] (W) × 0.36 (H) mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pixel Arrangement</td>
<td>RGB-Stripe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color Depth</td>
<td>262,144 colors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viewing Area</td>
<td>117.88 (W) × 88.24 (H) mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outline Dimensions</td>
<td>144.0 (W) × 104.6* (H) × 15.1max. (D) mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Without LED Cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>306g max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCD Type</td>
<td>ATS-25837</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(TFT / Normally white-mode / Transmissive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viewing Angle</td>
<td>6:00 (Angle of Least Color Inversion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>18-bit RGB interface(6-bit / color)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backlight</td>
<td>LED Backlight / White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touch Panel</td>
<td>Resistive Type (4-wire)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RoHS regulation</td>
<td>To our best knowledge, this product satisfies material requirement of RoHS regulation. Our company is doing the best efforts to obtain the equivalent certificate from our suppliers.</td>
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3. Operating Conditions

<table>
<thead>
<tr>
<th>Item</th>
<th>Conditions</th>
<th>Temperature Range</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature Range</td>
<td>Display Surface</td>
<td>−20～70°C</td>
<td>Note1</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Display Surface</td>
<td>−30～80°C</td>
<td></td>
</tr>
</tbody>
</table>

*Note1:* Operating temperature range defines the operation only and the contrast, response time and other display optical characteristics are set at Ta=+25°C.
4. Dimensional Outline
6. I/O Terminal

6.1. CN1 Pin Assignment (INTERFACE SIGNAL)

- Used connector 08-6260-033-340-829+
- Corresponding FPC: P0.5, 33pin, t=0.3mm

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Functional Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Power Supply (0V, GND)</td>
</tr>
<tr>
<td>2</td>
<td>CK</td>
<td>Clock Signal</td>
</tr>
<tr>
<td>3</td>
<td>HSYNC</td>
<td>Horizontal Sync Input</td>
</tr>
<tr>
<td>4</td>
<td>VSYNC</td>
<td>Vertical Sync Input</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Power Supply (0V, GND)</td>
</tr>
<tr>
<td>6</td>
<td>R0</td>
<td>Red Data Signal</td>
</tr>
<tr>
<td>7</td>
<td>R1</td>
<td>Red Data Signal</td>
</tr>
<tr>
<td>8</td>
<td>R2</td>
<td>Red Data Signal</td>
</tr>
<tr>
<td>9</td>
<td>R3</td>
<td>Red Data Signal</td>
</tr>
<tr>
<td>10</td>
<td>R4</td>
<td>Red Data Signal</td>
</tr>
<tr>
<td>11</td>
<td>R5</td>
<td>Red Data Signal</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td>Power Supply (0V, GND)</td>
</tr>
<tr>
<td>13</td>
<td>G0</td>
<td>Green Data Signal</td>
</tr>
<tr>
<td>14</td>
<td>G1</td>
<td>Green Data Signal</td>
</tr>
<tr>
<td>15</td>
<td>G2</td>
<td>Green Data Signal</td>
</tr>
<tr>
<td>16</td>
<td>G3</td>
<td>Green Data Signal</td>
</tr>
<tr>
<td>17</td>
<td>G4</td>
<td>Green Data Signal</td>
</tr>
<tr>
<td>18</td>
<td>G5</td>
<td>Green Data Signal</td>
</tr>
<tr>
<td>19</td>
<td>GND</td>
<td>Power Supply (0V, GND)</td>
</tr>
<tr>
<td>20</td>
<td>B0</td>
<td>Blue Data Signal</td>
</tr>
<tr>
<td>21</td>
<td>B1</td>
<td>Blue Data Signal</td>
</tr>
<tr>
<td>22</td>
<td>B2</td>
<td>Blue Data Signal</td>
</tr>
<tr>
<td>23</td>
<td>B3</td>
<td>Blue Data Signal</td>
</tr>
<tr>
<td>24</td>
<td>B4</td>
<td>Blue Data Signal</td>
</tr>
<tr>
<td>25</td>
<td>B5</td>
<td>Blue Data Signal</td>
</tr>
<tr>
<td>26</td>
<td>GND</td>
<td>Power Supply (0V, GND)</td>
</tr>
<tr>
<td>27</td>
<td>ENAB</td>
<td>Input Data Enable Control</td>
</tr>
<tr>
<td>28</td>
<td>VCC(3.3V)</td>
<td>Power Supply for Logic</td>
</tr>
<tr>
<td>29</td>
<td>VCC(3.3V)</td>
<td>Power Supply for Logic</td>
</tr>
<tr>
<td>30</td>
<td>R/L</td>
<td>Control the shift direction of device internal shift resister</td>
</tr>
<tr>
<td>31</td>
<td>U/D</td>
<td>Set the Up/Down scan direction</td>
</tr>
<tr>
<td>32</td>
<td>NC</td>
<td>Non Connection</td>
</tr>
<tr>
<td>33</td>
<td>GND</td>
<td>Power Supply (0V, GND)</td>
</tr>
</tbody>
</table>
6.2. CN2 Pin Assignment (Backlight)

Used connector: SHLP-06V-S-B(JST)
Corresponding connector: SM06B-SHLS-TF(JST)

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Functional Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Anode 1</td>
<td>LED Anode Terminal</td>
</tr>
<tr>
<td>2</td>
<td>Anode 2</td>
<td>LED Anode Terminal</td>
</tr>
<tr>
<td>3</td>
<td>Anode 3</td>
<td>LED Anode Terminal</td>
</tr>
<tr>
<td>4</td>
<td>Cathode 1</td>
<td>LED Cathode Terminal</td>
</tr>
<tr>
<td>5</td>
<td>Cathode 2</td>
<td>LED Cathode Terminal</td>
</tr>
<tr>
<td>6</td>
<td>Cathode 3</td>
<td>LED Cathode Terminal</td>
</tr>
</tbody>
</table>

6.3. CN3 Pin Assignment (Touch Panel)

Used FPC: P1.0mm, 4Pin, T=0.3mm
Corresponding connector: 6227 Series(ELCO)

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Functional Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>XR</td>
<td>X right side</td>
</tr>
<tr>
<td>2</td>
<td>YU</td>
<td>Y 120° clock side</td>
</tr>
<tr>
<td>3</td>
<td>XL</td>
<td>X left side</td>
</tr>
<tr>
<td>4</td>
<td>YD</td>
<td>Y 60° clock side</td>
</tr>
</tbody>
</table>
7. **Electrical Specifications**

### 7.1. Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage for LCD</td>
<td>VCC</td>
<td>-</td>
<td>-0.3</td>
<td>+7.0</td>
<td>V</td>
</tr>
</tbody>
</table>

Ta=-20~70°C, VSS=0V

### 7.2. DC Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage for LCD</td>
<td>VCC</td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>High Level Input Voltage</td>
<td>V_H</td>
<td>0.7VCC</td>
<td>-</td>
<td>VCC</td>
<td>V</td>
</tr>
<tr>
<td>Low Level Input Voltage</td>
<td>V_L</td>
<td>0</td>
<td>-</td>
<td>0.3VCC</td>
<td>V</td>
</tr>
<tr>
<td>Power Supply Current for LCD</td>
<td>ICC</td>
<td>-</td>
<td>100</td>
<td>150</td>
<td>mA</td>
</tr>
</tbody>
</table>

Ta=-20~70°C, VSS=0V

A) Typical current condition

- All black pattern with frame 240 line mode.
- VCC=+3.3V, f_w=15.7kHz, f_v=60Hz, f_{clx}=6.4MHz
### 7.3. AC Characteristics

#### 7.3.1. Digital Parallel RGB Interface Timing

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CK Frequency</td>
<td>1/toscc</td>
<td>-</td>
<td>6.4</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>CK Period</td>
<td>tosc</td>
<td>-</td>
<td>156</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CK High Pulse Width Time</td>
<td>toscH</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CK Low Pulse Width Time</td>
<td>toscL</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CK Pulse Duty ratio</td>
<td>toscH/toscc</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td>Data Setup time</td>
<td>tds</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Data Hold time</td>
<td>tdh</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>HSYNC (Horizontal Sync.) Signal Cycle</td>
<td>TH</td>
<td>-</td>
<td>62.8</td>
<td>-</td>
<td>μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>408</td>
<td>450</td>
<td>clk</td>
</tr>
<tr>
<td>HSYNC Pulse Width</td>
<td>THs</td>
<td>5</td>
<td>30</td>
<td>-</td>
<td>clk</td>
</tr>
<tr>
<td>Horizontal Display Term</td>
<td>THd</td>
<td>-</td>
<td>320</td>
<td>-</td>
<td>clk</td>
</tr>
<tr>
<td>ENAB Setup Time</td>
<td>tens</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>ENAB Hold Time</td>
<td>tenh</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>VSYNC (Vertical Sync.) Signal Cycle</td>
<td>TV</td>
<td>-</td>
<td>262</td>
<td>350</td>
<td>Line</td>
</tr>
<tr>
<td>VSYNC Pulse Width</td>
<td>TVs</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>Line</td>
</tr>
<tr>
<td>Vertical Display Term</td>
<td>TVd</td>
<td>-</td>
<td>240</td>
<td>-</td>
<td>Line</td>
</tr>
<tr>
<td>Vertical Display Start</td>
<td>TVds</td>
<td>-</td>
<td>18</td>
<td>-</td>
<td>Line</td>
</tr>
<tr>
<td>HSYNC-ENAB Phase Difference</td>
<td>THE</td>
<td>-</td>
<td>68</td>
<td>-</td>
<td>clk</td>
</tr>
<tr>
<td>HSYNC-CK Phase Difference</td>
<td>THC</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>HSYNC-VSYNC Phase Difference</td>
<td>THV</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>clk</td>
</tr>
</tbody>
</table>
7.3.2. Input Signal Timing

Data latched on rising edge of CK.

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7.4. Pixel Alignment

[Diagram showing pixel alignment with labels B, G, R]
### 7.5. Color Data Assignment

<table>
<thead>
<tr>
<th>COLOR</th>
<th>INPUT DATA</th>
<th>R DATA</th>
<th>G DATA</th>
<th>B DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MSB</td>
<td>LSB</td>
<td>MSB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R5</td>
<td>R4</td>
<td>R3</td>
</tr>
<tr>
<td>BLACK</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RED (63)</td>
<td>1 1 1 1 1 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GREEN (63)</td>
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<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BLUE (63)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CYAN</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MAGENTA</td>
<td>1 1 1 1 1 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>YELLOW</td>
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<td>1</td>
</tr>
<tr>
<td>WHITE</td>
<td>1 1 1 1 1 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

#### BASIC COLOR

<table>
<thead>
<tr>
<th>RED</th>
<th></th>
<th>R DATA</th>
<th>G DATA</th>
<th>B DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MSB</td>
<td>LSB</td>
<td>MSB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R5</td>
<td>R4</td>
<td>R3</td>
</tr>
<tr>
<td>RED (0)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RED (1)</td>
<td>0 0 0 0 1 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RED (2)</td>
<td>0 0 0 1 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RED (62)</td>
<td>1 1 1 1 1 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RED (63)</td>
<td>1 1 1 1 1 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### GREEN

<table>
<thead>
<tr>
<th>GREEN</th>
<th></th>
<th>R DATA</th>
<th>G DATA</th>
<th>B DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MSB</td>
<td>LSB</td>
<td>MSB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R5</td>
<td>R4</td>
<td>R3</td>
</tr>
<tr>
<td>GREEN (0)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GREEN (1)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GREEN (2)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>GREEN (62)</td>
<td>0 0 0 0 0 0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GREEN (63)</td>
<td>0 0 0 0 0 0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

#### BLUE

<table>
<thead>
<tr>
<th>BLUE</th>
<th></th>
<th>R DATA</th>
<th>G DATA</th>
<th>B DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MSB</td>
<td>LSB</td>
<td>MSB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R5</td>
<td>R4</td>
<td>R3</td>
</tr>
<tr>
<td>BLUE (0)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BLUE (1)</td>
<td>0 0 0 0 0 0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>BLUE (2)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BLUE (62)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BLUE (63)</td>
<td>0 0 0 0 0 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

[Note]

1) Definition of gray scale
   Color (n) --- n indicates gray scale level.
   Higher n means brighter level.

2) Data: 1: High, 0: Low

Relation of IC and LCD Module Data Bus

<table>
<thead>
<tr>
<th>LCD Module</th>
<th>RGB5</th>
<th>RGB4</th>
<th>RGB3</th>
<th>RGB2</th>
<th>RGB1</th>
<th>RGB0</th>
<th>*</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC</td>
<td>RGB7</td>
<td>RGB6</td>
<td>RGB5</td>
<td>RGB4</td>
<td>RGB3</td>
<td>RGB2</td>
<td>RGB1</td>
<td>RGB0</td>
</tr>
</tbody>
</table>

*Connected to “L” in the LCD Module
7.6 Inverted Scan Capability

This module has the capability of inverting scan direction by signaling from controller. Note that scan direction cannot be changed during operation.

The following drawing shows the relationship between the viewing direction and the scan direction.

Normal scan (U/D:H  R/L:L)

Reverse scan (U/D:L  R/L:H)
7.7. Lighting Specifications

7.7.1. Absolute Maximum Ratings

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
\text{Parameter} & \text{Symbol} & \text{Conditions} & \text{Min.} & \text{Typ.} & \text{Max.} & \text{Units} \\
\hline
\text{Forward Current} & I_F & \text{Note 1, 2} & - & - & 90 & \text{mA} \\
\text{Reverse Voltage} & V_R & \text{Note 1} & - & - & 20 & \text{V} \\
\text{LED Power Dissipation} & P_D & \text{Note 1} & - & - & 1.6 & \text{W} \\
\hline
\end{array}
\]

Note 1: This value is for each 1 line.
Note 2: Refer to the forward current derating curve.

7.7.2. Operating Characteristics

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\text{Parameter} & \text{Symbol} & \text{Conditions} & \text{Min.} & \text{Typ.} & \text{Max.} & \text{Units} \\
\hline
\text{Forward Voltage} & V_F & I_F=60\text{mA} / 1 \text{ line} & - & (13.2) & - & \text{V} \\
\hline
\end{array}
\]
7.8. Touch Panel Specifications

7.8.1. Touch Panel Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Voltage</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Resistor between</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XL-XR</td>
<td>350</td>
<td>-</td>
<td>950</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>YU-YD</td>
<td>200</td>
<td>-</td>
<td>550</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>Line Linearity</td>
<td>-</td>
<td>-</td>
<td>±1.5</td>
<td>%</td>
<td>Initial Value</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>MΩ</td>
<td>At DC25V</td>
</tr>
<tr>
<td>Operation Force</td>
<td>20</td>
<td>-</td>
<td>120</td>
<td>g</td>
<td>Initial Value</td>
</tr>
</tbody>
</table>
8. **Optical Specifications**

8.1. **Optical Characteristics**

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Standard Value</th>
<th>Unit</th>
<th>Method of Measure</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightness</td>
<td>B</td>
<td>$0^\circ$ $0^\circ$</td>
<td>280 $\theta$ 400 $\phi$ 400</td>
<td>$C$</td>
<td>Min. Typ. Max.</td>
<td>cd/m$^2$</td>
</tr>
<tr>
<td>Contrast</td>
<td>CR</td>
<td>Best Viewing</td>
<td>210 $\theta$ 350 $\phi$ 350</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

| Color Coordinates | Red  | Rx  | $0^\circ$ $0^\circ$ | - | 0.6209 | - |
|                   |      | Ry  | $0^\circ$ $0^\circ$ | - | 0.3652 | - |
|                   | Green| Gx  | $0^\circ$ $0^\circ$ | - | 0.3319 | - |
|                   |      | Gy  | $0^\circ$ $0^\circ$ | - | 0.5657 | - |
|                   | Blue | Bx  | $0^\circ$ $0^\circ$ | - | 0.1401 | - |
|                   |      | By  | $0^\circ$ $0^\circ$ | - | 0.0863 | - |
|                   | White| Wx  | $0^\circ$ $0^\circ$ | - | 0.2919 | - |
|                   |      | Wy  | $0^\circ$ $0^\circ$ | - | 0.3040 | - |

| Brightness Uniformity | - | $0^\circ$ $0^\circ$ | 70 | 75 | - | % |

| Vertical Viewing Angle | Up  | $\theta_u$ | - | $0^\circ$ $\geq 5$ | - | 70 | Degree |
|                       | Down| $\theta_d$ | - | $0^\circ$ $\geq 5$ | - | 70 | Degree |
|                       | Left| $\phi_l$  | - | $0^\circ$ $\geq 5$ | - | 70 | Degree |
|                       | Right| $\phi_r$ | - | $0^\circ$ $\geq 5$ | - | 70 | Degree |

| Response Time         | Rise| $\tau_r$ | $0^\circ$ $0^\circ$ | - | 21 | - | ms |
|                       | Decay| $\tau_d$ | $0^\circ$ $0^\circ$ | - | 10 | - | ms |

**Note 1:** Under the condition of maximum brightness.

- **Conditions for Measuring**
  - Environment: Dark room with no light or close to no light.
  - Temperature: 25±5°C
  - Humidity: 40–70%RH
  - Driving voltage is set for optimal contrast to measure center of display.
  - LED Backlight driving condition: IF=60mA/1Line

- **Optimal viewing angle**
  (The angle of Least Color Inversion)
8.2. Definition of Viewing Angle and Optimum Viewing Area

*Point ● shows the point where contrast ratio is measured. ϑ = 0°, φ = -∞
*Driving condition: 60Hz

![Diagram showing viewing angles and contrast ratio]

*Area shows typ. CR ≥ 5
*Area shows typ. CR ≥ 20
◆ Method of Brightness Measurement (Fig.1)

(1) Measuring Device
   TOPCON: BM-5

(2) Measuring Point
   Center of Display: $\theta=0^\circ$, $\phi=0^\circ$
   On condition $\theta$: A vertical angle from measuring direction to perpendicular.
   $\phi$: A horizontal angle from measuring direction to perpendicular.

![Diagram of Measuring Device and Display]

Distance: 500mm

(X, Y)= (160, 120)

Fig. 1

(3) Method of Measuring
   Apply signal voltage (displayed in white) to maximize brightness and measure brightness $B$ (cd/m²).
   The distance between BM-5's front lens to surface panel is 500mm.
   Measured after backlight has been lit for more than 30 minutes.

◆ Method of Contrast Measurement (Fig.1)

(1) Measuring Device
   TOPCON: BM-5, Measuring Field: $1^\circ$

(2) Measuring Point
   Center of display: same as Method of Brightness Measurement

(3) Method of Measuring
   • Set LCD module to $\theta=0^\circ$, $\phi=0^\circ$.
   • Change signal voltage to measure maximum brightness $Y_1$ and minimum brightness $Y_2$.
   • Contrast is derived from $CR=Y_1/Y_2$. 
Definition of Brightness Uniformity (Fig. 2)
Definition is calculated from the four points (S1-S9) on the diagram below.

Standard Value of Brightness Uniformity [%] = \frac{\text{Minimum Value of S1-S9}}{\text{Maximum Value of S1-S9}} \times 100

Fig. 2
◆ Method of Viewing Angle Measurement (Fig. 3)

(1) Measuring Device
ELDIM: EZ CONTRAST

(2) Measuring Point
Center of display: Same as Method of Brightness Measurement

(3) Angle of Measuring
θ: An angle vertical to perpendicular line from the viewing direction.
ϕ: An angle horizontal to perpendicular from the viewing direction.

![Image of a rotation table with LCD and angles θ and ϕ]

Temperature

---

(4) Method of Measuring
Set the module on the rotation table and measure a vertical axis direction in the state that
fixed ϕ = 0 degrees horizontal axis direction to θ = 90 degrees.
(Viewing angle is measured automatically by EZ CONTRAST)
Measuring Response Time (Fig. 4)

1. Measuring Device
   - TOPCON BM-5, Measuring Field: 1°
   - Tektronix Digital Oscilloscope

2. Measuring Point
   - Center of display, same as Method of Brightness Measurement

3. Method of Measuring
   - Set LCD panel to $\theta = 0^\circ$, and $\phi = 0^\circ$.
   - Input white $\rightarrow$ black $\rightarrow$ white to display by switching signal voltage.
   - If the luminance is 0% and 100% immediately before the change of signal voltage, then $\tau_r$ is optical response time during the change from 90% to 10% immediately after rise of signal voltage, and $\tau_d$ is optical response time during the change from 10% to 90% immediately after decay of signal voltage.

![Diagram showing brightness transition with $\tau_r$ and $\tau_d$](image)

**Fig. 4**
9. Test

No abnormal function and appearance are found after the following tests.

Conditions: Unless otherwise specified, tests will be conducted under the following conditions.
Temperature: 20±5°C
Humidity: 65±5%RH
Tests will not be conducted under functioning state.

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Temperature Operating</td>
<td>70°C±2°C, 96hrs (operation state)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Low Temperature Operating</td>
<td>-20°C±2°C, 96hrs (operation state)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>High Temperature Storage</td>
<td>80°C±2°C, 96hrs</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Low Temperature Storage</td>
<td>-30°C±2°C, 96hrs</td>
<td>1,2</td>
</tr>
<tr>
<td>5</td>
<td>Damp Proof Test</td>
<td>40°C±2°C, 90%RH, 96hrs</td>
<td>1,2</td>
</tr>
<tr>
<td>6</td>
<td>Vibration Test</td>
<td>Total fixed amplitude: 1.5mm</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vibration Frequency: 10~55Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>One cycle 60 seconds to 3 directions of X, Y, Z each 15 minutes</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Shock Test</td>
<td>To be measured after dropping from 60cm high the concrete surface in packing state.</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: No dew condensation to be observed.
Note 2: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
Note 3: Vibration test will be conducted to the product itself without putting it in a container.
10. Appearance Standards

10.1. Inspection conditions

The LCD shall be inspected under the white fluorescent light.
Appearance Inspection: Illuminance > 500 [lx]
Operating Inspection: Illuminance < 250 [lx]
The distance between the eyes and the sample shall be more than 30 cm.
All directions for inspecting the sample should be within 45° against perpendicular line.

10.2. Definition of applicable Zones

A Zone: Active display area
B Zone = (Viewing Area) – (Active Area)
C Zone: Rest parts
## 10.3 Standards (Only the display part)

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Zone</td>
</tr>
<tr>
<td>1</td>
<td>Polarizer Scratches</td>
<td>X(mm), Y(mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L ≤ 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L &gt; 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X: Length, Y: Width</td>
</tr>
<tr>
<td>2</td>
<td>DENT</td>
<td>Dimension (mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.30 &lt; D ≤ 0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.50 &lt; D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: Average Diameter = (long+short)/2</td>
</tr>
<tr>
<td>3</td>
<td>BLACK SPOT</td>
<td>Dimension (mm)</td>
</tr>
<tr>
<td></td>
<td>WHITE SPOT</td>
<td>0.30 &lt; D ≤ 0.50</td>
</tr>
<tr>
<td></td>
<td>BUBBLE</td>
<td>0.50 &lt; D</td>
</tr>
<tr>
<td>4</td>
<td>LINT</td>
<td>X(mm), Y(mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L ≤ 3.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L &gt; 3.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X: Length, Y: Width</td>
</tr>
</tbody>
</table>

* : Disregard
<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) Bright Dot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Dark Dot</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>TWO Adjacent Dot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Three or More</td>
<td>NOT ALLOWED</td>
</tr>
<tr>
<td></td>
<td>Adjacent Dot</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>Distance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone</th>
<th>Acceptable Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>C</td>
</tr>
</tbody>
</table>

**Notes:**

1. Bright Dot is defined as follows:
   - Visible through 5% transmission ND filter under the condition that black image (color 0) is on the display.

2. Dark Dot is defined as follows:
   - Recognizable darker than around under the condition that each R(63), G(63), B(63) image is on the display.

3. Definition of adjacent...
## 10.4 Standards on Touch panel

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Criteria</th>
<th>Judgment</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dot type foreign material, Dent</td>
<td>Dimension (mm)</td>
<td>D ≤ 0.15</td>
<td>Disregard D(mm): average diameter=(Long dia.+ short dia.)/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15&lt;D&lt;0.25</td>
<td>Distance from any other foreign object</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;20mm : Ignore &lt;20mm : are allowed 2pcs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D &gt; 0.25</td>
<td>Nothing</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Linear foreign material, Linear scratch</td>
<td>Dimension (mm)</td>
<td>W&lt;0.025</td>
<td>Disregard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.025&lt;W&lt;0.035 L ≤ 2.5</td>
<td>Distance from any other foreign object</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;20mm : Ignore &lt;20mm : are allowed 2pcs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.035&lt;W&lt;0.05 L ≤ 1.5</td>
<td>Are allowed 2pcs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>W&gt;0.05mm L&lt;5mm</td>
<td>Nothing</td>
<td></td>
</tr>
</tbody>
</table>

**Corner**

1) X ≤ 3.0mm, Y ≤ 3.0mm, Z ≤ Glass thickness : Ignore
2) the chipping on the terminal : Not allowable
3) the chipping on the Circuit : Not allowable

**Without corner**

1) X<4.0mm, Y<2.0mm, Z<Glass thickness : Ignore
2) the chipping on the terminal : Not allowable
3) the chipping on the Circuit : Not allowable
<table>
<thead>
<tr>
<th></th>
<th>Scratch</th>
<th>Dimension (mm)</th>
<th>Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td><strong>W&lt;0.03, L≤10</strong></td>
<td>Ignore</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>0.03&lt;W&lt;0.05, L≤10</strong></td>
<td>Distance from any other scratch object &gt;20mm: Ignore &lt;20mm: 1pcs is allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>0.03&lt;W&lt;0.05, L&gt;10</strong></td>
<td>Nothing</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>W&gt;0.05</strong></td>
<td>Nothing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fish eye on film, Dent on film and Air bubble</th>
<th>Dimension (mm)</th>
<th>Judgment</th>
<th>D(mm): average diameter=(Long dia.+ short dia.)/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td><strong>D≤0.2</strong></td>
<td>Disregard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>0.2&lt;D≤0.4</strong></td>
<td>Are allowed 5pcs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>0.4&lt;D≤0.5</strong></td>
<td>Are allowed 2pcs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>D&gt;0.5</strong></td>
<td>Nothing</td>
<td></td>
</tr>
</tbody>
</table>

6. **Newton's ring**

Visual inspection shall be done at a distance of 0.3 m between eyes and a product with an angles of 60° ± 10° to the surface of the product under a ceiling fluorescent light (40W, natural color).

1. **Regular**
   A) When Newton ring dimension is more than 1/3 of sample dimension; it is regarded as a defect.
   B) When Newton ring dimension that is less than 1/3 of sample dimension and is not affect font effect and line distortion under a ceiling fluorescent light, it is acceptable.

2. **Irregular**
   A) Newton ring dimension is more than 1/2 without lighting; it is regarded as a defect.
   B) As long as Newton ring affects font effect and line distortion under a ceiling fluorescent light, it is regarded as a defect.
   C) When Newton ring dimension is less than 1/2 of sample dimension and is not affect font effect and line distortion under a ceiling fluorescent light, it is acceptable.

7. **Miss matching of film and plastic board.**

All round of film is inside of plastic board.
11. Code System of Production Lot

The production lot of module is specified as follows.

- Factory Control Number (0~99)
- Date of the week (A~G)
- Factory Number (0~9)
- Factory Code (Alphabet)
- Production Week (1~5)
- Production Month (1~9, X, Y, Z)
- Production Year (Lower 2 digits)

12. Type Number

The type number of module is specified as follows.

355265AC

13. Applying Precautions

Please contact us when questions and/or new problems not specified in this Specifications arise.
14. Precautions Relating Product Handling

The following precautions will guide you in handling our product correctly.

1) Liquid crystal display devices
   1. The liquid crystal display panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care. The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.

2) Care of the liquid crystal display module against static electricity discharge.
   1. When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect worktables against the hazards of electrical shock.
   2. Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
   3. Slowly and carefully remove the protective film from the LCD module; since this operation can generate static electricity.

3) When the LCD module must be stored for long periods of time:
   1. Protect the modules from high temperature and humidity.
      Conditions: Temperature: 0°C~40°C
                  Humidity: Less than 60%RH
                  No dew condensation to be observed.
   2. Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.
   3. Protect the modules from excessive external forces.

4) Use the module with a power supply that is equipped with an overcurrent protector circuit, since the module is not provided with this protective feature.

5) Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

6) Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

7) For models which use CFL:
   1. High voltage of 1000V or greater is applied to the CFL cable connector area. Care should be taken not to touch connection areas to avoid burns.
   2. Protect CFL cables from rubbing against the unit and thus causing the wire jacket to become worn.
   3. The use of CFLs for extended periods of time at low temperatures will significantly shorten their service life.
   4. After storing the product (or LCD) under low temperature and/or in dark atmosphere for a long period of time, CCFL may take longer time to reach its specified brightness.

8) For models which use touch panels:
   1. Do not stack up modules since they can be damaged by components on neighboring modules.
   2. Do not place heavy objects on top of the product. This could cause glass breakage.
9) For models which use COG, TAB, or COF:
   1. The mechanical strength of the product is low since the IC chip faces out unprotected from the rear. Be sure to protect the rear of the IC chip from external forces.
   2. Given the fact that the rear of the IC chip is left exposed, in order to protect the unit from electrical damage, avoid installation configurations in which the rear of the IC chip runs the risk of making any electrical contact.

10) Models which use flexible cable, heat seal, or TAB:
   1. In order to maintain reliability, do not touch or hold by the connector area.
   2. Avoid any bending, pulling, or other excessive force, which can result in broken connections.

11) In case of buffer material such as cushion / gasket is assembled into LCD module, it may have an adverse effect on connecting parts (LCD panel-TCP / HEAT SEAL / FPC / etc., PCB-TCP / HEAT SEAL / FPC etc., TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC, etc.,) depending on its materials. Please check and evaluate these materials carefully before use.

12) In case of acrylic plate is attached to front side of LCD panel, cloudiness (very small cracks) can occur on acrylic plate, being influenced by some components generated from polarizer film. Please check and evaluate those acrylic materials carefully before use.

13) Flickering due to optical interference may occur by combination of a) LCD driving frame frequency decided by either internal oscillator in driver IC or external clock input by the customer and b) lighting frequency of either backlight or other light sources. Please evaluate enough at the environment of actual use, and decide the driving condition that does not cause flickering.
15. **Warranty**

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1. We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.

2. We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.

3. We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.

4. When the product is in CFL models, CFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.

5. We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.

6. Optrex will not be held responsible for any quality issue(s) after two years and beyond from its production date indicated on the lot number (please refer to “Code System of Production Lot” indicated earlier in this specification).