To: _____________________________

Specification of FUJITSU TFT-LCD module

FLC43XWC6V-02

<table>
<thead>
<tr>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>By:</td>
</tr>
</tbody>
</table>

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter “High Safety Required Use”), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer’s product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, Fujitsu shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

Specification No.: Tech Bes LCD-00087

Issue Date: Nov. 7, 2001

Issued by:  
T. Naka  
Director  
LCD Design Dep.  
LCD Technology Div.  
LCD Group  

FUJITSU LIMITED
## REVISION HISTORY

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Prepared</th>
<th>Checked</th>
<th>Approved</th>
<th>Summary</th>
</tr>
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<tr>
<td>01A</td>
<td>Nov. 7, 2001</td>
<td>H.Takahashi</td>
<td>T.Minemura</td>
<td>T.Naka</td>
<td>1st issue</td>
</tr>
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Tech Bes LCD-00087

FUJITSU LIMITED
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1. APPLICATIONS
This specification is applied to the 17.0 in. XGA-WIDE supported TFT-LCD module.

2. PRODUCT NAME AND MODEL NUMBER

2-1. Product Name : LCD Module
2-2. Model Name : FLC43XWC6V-02

3. OVERVIEW
This LCD module has a TFT active matrix type liquid crystal panel 1280×768 pixels, and
diagonal size of 43cm (17.0-inch). This module supports 1280×768 XGA-WIDE mode
(Non-interlace).
This LCD has a digital RGB interface and can display 262,144 colors.
Timing control signal is “Data enable signal : ENAB” only. (Data enable mode)
Even and odd data are transmitted at the same timing in the interface, so data lines are 36.
(R, G, B each 6 bit ×2) The signal level of this interface is +3.3V CMOS level or 5V TTL level.
The power supply of this LCD module is +5v DC single.

4. CONFIGURATION
This LCD module consists of a LCD panel, LCD driving circuit, control circuit, interface
circuit and backlight unit.
The LCD panel is active matrix TFT type and Fujitsu’s unique MVA (Multi-domain Vertical
Alignment) liquid crystal technology is adopted in it. The LCD driving circuit is integrated in
IC chips, which are bonded on plastic wiring film (hereinafter TAB driver-IC), and the output
terminals of the IC chips are connected to the LCD panel. The control circuit and the interface
circuit are mounted on three kinds of printed circuit board (hereinafter PCB) and the input of
the TAB driver-ICs are connected to the PCBs.
With such circuit construction, the image data received by the interface circuit is forwarded to
the control circuit and the control circuit modulates the image data to LCD driving signals.
The TAB driver ICs buffer the LCD driving signals and output driving voltages to the LCD
panel.
These LCD parts such as the LCD panel, the TAB-ICs and the PCBs are assembled together
with the backlight module in a plastic case and a metal frame.
Fig.4-1 shows a block diagram of this LCD module.
5. MECHANICAL SPECIFICATIONS

Table 5-1 shows the mechanical specifications of this LCD module.

Table 5-1. Mechanical Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
<th>Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>413.8×263.5×19.4(TYP.) (Excluding I/F Connector and fixing parts)</td>
<td>mm</td>
<td>Edge type backlight is used. (φ2.6 CCFL×4)</td>
</tr>
<tr>
<td>Display Resolution</td>
<td>(1280×3) ×768</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Display Dot Area</td>
<td>369.6×221.76</td>
<td>mm</td>
<td>Outward Appearance is shown at page 30 and 31.</td>
</tr>
<tr>
<td>Dot Pitch</td>
<td>(0.09625×3) ×0.28875</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Aspect Ratio</td>
<td>1 : 1</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2,000 max</td>
<td>g</td>
<td></td>
</tr>
<tr>
<td>FG-SG</td>
<td>Short circuit</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>
6. ABSOLUTE MAXIMUM RATINGS
Table 6-1 shows the absolute maximum rating of this LCD module.

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>VCC</td>
<td>Ta=25ºC</td>
<td>-0.3</td>
<td>—</td>
<td>6.0</td>
<td>V</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>VIN</td>
<td>Ta=25ºC</td>
<td>-0.3</td>
<td>—</td>
<td>Vcc+0.3</td>
<td>V</td>
</tr>
</tbody>
</table>

7. RECOMMENDED OPERATING CONDITIONS
Table 7-1 shows the recommended operating conditions of this LCD module.

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage (Logic)</td>
<td>VCC</td>
<td>4.75</td>
<td>5.0</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td>Ripple Voltage</td>
<td>VCC</td>
<td>Vrp</td>
<td>—</td>
<td>—</td>
<td>100</td>
</tr>
</tbody>
</table>
# 8. ELECTRICAL SPECIFICATIONS

Table 8-1 shows the electrical specifications of this LCD module.

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current</td>
<td>Icc</td>
<td>Vcc=+5.0±0.25V</td>
<td>—</td>
<td>380</td>
<td>800</td>
<td>mA</td>
<td>*1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vss=0V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DCLK=32.505MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;H&quot; Level Logic Input Voltage</td>
<td>Vih</td>
<td>—</td>
<td>2.3</td>
<td>—</td>
<td>Vcc</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>&quot;L&quot; Level Logic Input Voltage</td>
<td>Vil</td>
<td>Vss</td>
<td>—</td>
<td>0.9</td>
<td>—</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply Rush Current</td>
<td>Iscc</td>
<td>—</td>
<td>5.5</td>
<td>7</td>
<td>A</td>
<td>A</td>
<td>*2</td>
</tr>
<tr>
<td>Supply Rush Current Duration (1A excess)</td>
<td>Tscw</td>
<td>—</td>
<td>0.4</td>
<td>0.15</td>
<td>ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCFL Turn on Voltage</td>
<td>Vs</td>
<td>f&lt;sub&gt;s&lt;/sub&gt;=50kHz, Ta=25ºC</td>
<td>—</td>
<td>1230</td>
<td>1600</td>
<td>Vrms</td>
<td>*4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f&lt;sub&gt;s&lt;/sub&gt;=50kHz, Ta=0ºC</td>
<td>—</td>
<td>—</td>
<td>1600</td>
<td>Vrms</td>
<td>*4</td>
</tr>
<tr>
<td>Lighting Voltage</td>
<td>Vl</td>
<td>f&lt;sub&gt;L&lt;/sub&gt;=50kHz, I&lt;sub&gt;L&lt;/sub&gt;=10.5mA</td>
<td>590</td>
<td>630</td>
<td>670</td>
<td>Vrms</td>
<td>*4</td>
</tr>
<tr>
<td>Lighting Frequency</td>
<td>f&lt;sub&gt;L&lt;/sub&gt;</td>
<td>V&lt;sub&gt;L&lt;/sub&gt;=580Vrms</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>kHz</td>
<td></td>
</tr>
<tr>
<td>Tube Current</td>
<td>I&lt;sub&gt;L&lt;/sub&gt;</td>
<td>f&lt;sub&gt;L&lt;/sub&gt;=50kHz, V&lt;sub&gt;L&lt;/sub&gt;=580Vrms</td>
<td>9.5</td>
<td>10.5</td>
<td>11.0</td>
<td>mA</td>
<td>*4</td>
</tr>
</tbody>
</table>

(*1) Typical current value is measured when color bar pattern is displayed at Vcc=5.0V. Maximum current value is measured when 55/63 and 63/63 gray scale pattern every 2 pixel is displayed at Vcc=4.75V. Without rush current.

(*2) These items prescribe the rush current for starting internal DC/DC. Charging current to capacitors of Vcc is not prescribed.

(*3) Backlight specifications are valid when using a suitable inverter such as the "FLCV-15" of Fujitsu Limited.

(*4) Tube current (I<sub>L</sub>) shows the value of the current that is consumed at one lamp. This LCD module has 4 lamps. Each 2 lamps are placed at upper and lower side of the display. 2 lamps are connected in parallel. Each low voltage terminals are bound into 1 line cable, which connected to the backlight connector.
Note 1) Measurement Circuit
Based on Fig.8-1.

![Diagram of Measurement Circuit]

Note 2) Equivalent Circuit
Based on Fig.8-2 (a), (b).

Input signals
- DCLK
- ENAB
  - RO0~5, RE0~5
  - GO0~5, GE0~5
  - BO0~5, BE0~5

![Diagram of Equivalent Circuit of Logic Signal Input]

![Diagram of Equivalent Circuit of Power Supply]

 Fus e ................ KAB2402202NA (Matsuo Electric CO., LTD.)
 EMI Filter ........ SGM20C1E332-2A (Sumitomo Metals)
9. **OPTICAL SPECIFICATIONS**

Table 9-1 shows the optical specifications of this LCD module.

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>Specifications</th>
<th>Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal</td>
<td>$\theta_{LR}$</td>
<td>$\theta_{UD}=0^\circ$</td>
<td>80 — —</td>
<td>deg</td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td>$\theta_{UD}$</td>
<td>$\theta_{LR}=0^\circ$</td>
<td>80 — —</td>
<td>deg</td>
<td></td>
</tr>
<tr>
<td>Contrast Ratio</td>
<td>CR</td>
<td>$\theta_{LR,UD}=0^\circ$</td>
<td>210 400 — —</td>
<td></td>
<td>White/Black</td>
</tr>
<tr>
<td>Response Time (ON) (B→W)</td>
<td>$t_{on}$</td>
<td>$\theta_{LR, UD}=0^\circ$</td>
<td>Ta=25°C — 15 30</td>
<td>ms</td>
<td>(1)(2)(4)(5)</td>
</tr>
<tr>
<td>Response Time (OFF) (W→B)</td>
<td>$t_{off}$</td>
<td>$\theta_{LR, UD}=0^\circ$</td>
<td>Ta=25°C — 10 25</td>
<td>ms</td>
<td>(1)(2)(4)(5)</td>
</tr>
<tr>
<td>Brightness</td>
<td>I</td>
<td>$\theta_{LR,UD}=0^\circ$</td>
<td>340 400 — —</td>
<td>cd/m²</td>
<td>White*1</td>
</tr>
<tr>
<td>Brightness Uniformity</td>
<td>$\Delta I$</td>
<td>$V_{CC}=5V$, $I_L=10.5mA$ (at maximum brightness)</td>
<td>70 — —</td>
<td>%</td>
<td>(1)(5)(7)</td>
</tr>
<tr>
<td>Chromaticity</td>
<td>W</td>
<td>X</td>
<td>0.266 0.296 0.326 —</td>
<td></td>
<td>(1)(5)</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>Y</td>
<td>0.276 0.306 0.336 —</td>
<td></td>
<td>(1)(5)</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>Red (0.640, 0.348)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>Green (0.288, 0.587)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>White (0.147, 0.142)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| LCD Panel Type               |        | TFT Color       |                |      |                |
| Display Mode                 |        | Normally Black VA |                |      |                |
| Wide Viewing Angle Technology|        | MVA             |                |      |                |
| Optimum Viewing Angle        |        | — (symmetry)    |                |      | (6)            |
| Display Color                |        | 262,144         | (6-bit color)  |      |                |
| Color of non-display area    |        | Black           |                |      |                |
| Surface Treatment            |        | Anti-glare (Haze value: 25%, 3H) | |    |                |

(*1) Specified value is measured in 20~30 minutes after lighting on (LCD module single).

A required value may not be achieved on condition that LCD module is built in the cabinet because of its radiation.

(Note1) • CS-1000 (MINOLTA Co., Ltd.) , BM-5A(Topcon) or equivalent luminance colorimeter should be used for the measurement.

Field=2", L=500mm

• The specified value of viewing angle, contrast, brightness, brightness uniformity and chromaticity are under the dark room condition (1lux or less).

(Note2) • Optical specifications are valid when using a suitable inverter such as the “FLCV-15” of Fujitsu Limited.
Note 1) Definition of Viewing Angle (1)
Based on Fig.9-2.

\[ \theta_U = 0^\circ, \theta_D = 0^\circ, \theta_L = 0^\circ, \theta_R = 0^\circ \]

Fig.9-2. Definition of Viewing Angle (1)

Note 2) Definition of Viewing Angle (2)
Based on Fig.9-3.

Fig.9-3. Definition of Viewing Angle (2)

Note 3) Definition of Contrast Ratio (CR)
Determined by Formula (1) based on Fig.9-4. Voltage-Brightness Characteristics.

\[ \frac{L_W}{L_B} = \frac{L_B}{L_W} \] (1)

Fig.9-4. Voltage-Brightness Characteristics
Note 4) Definition of Response Time
Based on Fig. 9-5.

Drive signal of LCD panel

ON

OFF

Non-select status

Select status

Non-select status

Relative

Brightness

100%

90%

White

10%

Black

ON Response Time

OFF Response Time

\( t_{on} \)

\( t_{off} \)

Fig. 9-5. Definition of Response Time

Note 5) Contrast Ratio and Response Measurement System
Based on Fig. 9-6.

Drive and Measurement System

Brightness Meter or Luminance Colorimeter
(with luminosity correction function)

Fig. 9-6. Contrast Ratio and Response Time Measurement System
Note 6) Definition of Optimum Viewing Angle
Based on Fig.9-7.

![Graph showing the contrast ratio with viewing angle θ.

6 o'clock ← Viewing Angle θ → 12 o'clock

Fig.9-7. Definition of Viewing Angle

Note 7) Definition of Brightness Uniformity
Brightness uniformity is defined by the following formula.

Brightness (I1~I9) are measured at the following 9 points (1 ~ 9) on the display area shown in Fig.9-8.

\[
\text{Brightness Uniformity (ΔL)} = \frac{|\text{Min. In}|}{|\text{Max. In}|} \times 100 \%
\]

Note) Each measurement point (1 ~ 9) defines the center spot of Brightness Meter view. The tolerance of measurement position is ±5mm.

Fig.9-8. Measurement Points
## 10. INTERFACE SPECIFICATIONS

### 10-1. Signal descriptions

Table 10-1 shows the description and configuration of Interface signals (CN1).

**Table 10-1. Interface signals (CN1)**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>I/O</th>
<th>Function</th>
<th>Pin No.</th>
<th>Symbol</th>
<th>I/O</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
<td>31</td>
<td>GO1</td>
<td>I</td>
<td>Green odd data 1</td>
</tr>
<tr>
<td>2</td>
<td>RE0</td>
<td>I</td>
<td>Red even data 0</td>
<td>32</td>
<td>GO2</td>
<td>I</td>
<td>Green odd data 2</td>
</tr>
<tr>
<td>3</td>
<td>RE1</td>
<td>I</td>
<td>Red even data 1</td>
<td>33</td>
<td>GO3</td>
<td>I</td>
<td>Green odd data 3</td>
</tr>
<tr>
<td>4</td>
<td>RE2</td>
<td>I</td>
<td>Red even data 2</td>
<td>34</td>
<td>GO4</td>
<td>I</td>
<td>Green odd data 4</td>
</tr>
<tr>
<td>5</td>
<td>RE3</td>
<td>I</td>
<td>Red even data 3</td>
<td>35</td>
<td>GO5</td>
<td>I</td>
<td>Green odd data 5</td>
</tr>
<tr>
<td>6</td>
<td>RE4</td>
<td>I</td>
<td>Red even data 4</td>
<td>36</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>RE5</td>
<td>I</td>
<td>Red even data 5</td>
<td>37</td>
<td>BO0</td>
<td>I</td>
<td>Blue odd data 0</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
<td>38</td>
<td>BO1</td>
<td>I</td>
<td>Blue odd data 1</td>
</tr>
<tr>
<td>9</td>
<td>GE0</td>
<td>I</td>
<td>Green even data 0</td>
<td>39</td>
<td>BO2</td>
<td>I</td>
<td>Blue odd data 2</td>
</tr>
<tr>
<td>10</td>
<td>GE1</td>
<td>I</td>
<td>Green even data 1</td>
<td>40</td>
<td>BO3</td>
<td>I</td>
<td>Blue odd data 3</td>
</tr>
<tr>
<td>11</td>
<td>GE2</td>
<td>I</td>
<td>Green even data 2</td>
<td>41</td>
<td>BO4</td>
<td>I</td>
<td>Blue odd data 4</td>
</tr>
<tr>
<td>12</td>
<td>GE3</td>
<td>I</td>
<td>Green even data 3</td>
<td>42</td>
<td>BO5</td>
<td>I</td>
<td>Blue odd data 5</td>
</tr>
<tr>
<td>13</td>
<td>GE4</td>
<td>I</td>
<td>Green even data 4</td>
<td>43</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>14</td>
<td>GE5</td>
<td>I</td>
<td>Green even data 5</td>
<td>44</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>15</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
<td>45</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>16</td>
<td>BE0</td>
<td>I</td>
<td>Blue even data 0</td>
<td>46</td>
<td>ENAB</td>
<td>I</td>
<td>Data enable signal</td>
</tr>
<tr>
<td>17</td>
<td>BE1</td>
<td>I</td>
<td>Blue even data 1</td>
<td>47</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>18</td>
<td>BE2</td>
<td>I</td>
<td>Blue even data 2</td>
<td>48</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>19</td>
<td>BE3</td>
<td>I</td>
<td>Blue even data 3</td>
<td>49</td>
<td>DCLK</td>
<td>I</td>
<td>Dot clock signal</td>
</tr>
<tr>
<td>20</td>
<td>BE4</td>
<td>I</td>
<td>Blue even data 4</td>
<td>50</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>21</td>
<td>BE5</td>
<td>I</td>
<td>Blue even data 5</td>
<td>51</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>22</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
<td>52</td>
<td>SS</td>
<td>—</td>
<td>SS function ON/OFF (*1)</td>
</tr>
<tr>
<td>23</td>
<td>RO0</td>
<td>I</td>
<td>Red odd data 0</td>
<td>53</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>24</td>
<td>RO1</td>
<td>I</td>
<td>Red odd data 1</td>
<td>54</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>25</td>
<td>RO2</td>
<td>I</td>
<td>Red odd data 2</td>
<td>55</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>26</td>
<td>RO3</td>
<td>I</td>
<td>Red odd data 3</td>
<td>56</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
</tr>
<tr>
<td>27</td>
<td>RO4</td>
<td>I</td>
<td>Red odd data 4</td>
<td>57</td>
<td>VDD</td>
<td>—</td>
<td>+5V Power supply</td>
</tr>
<tr>
<td>28</td>
<td>RO5</td>
<td>I</td>
<td>Red odd data 5</td>
<td>58</td>
<td>VDD</td>
<td>—</td>
<td>+5V Power supply</td>
</tr>
<tr>
<td>29</td>
<td>GND</td>
<td>—</td>
<td>Ground</td>
<td>59</td>
<td>VDD</td>
<td>—</td>
<td>+5V Power supply</td>
</tr>
<tr>
<td>30</td>
<td>G00</td>
<td>I</td>
<td>Green odd data 0</td>
<td>60</td>
<td>VDD</td>
<td>—</td>
<td>+5V Power supply</td>
</tr>
</tbody>
</table>

(*1) SS (Spread Spectrum): SS function is ON when signal level is high or N.C. (generally set up N.C.)

SS function is OFF when signal level is low.

---

**Upper side**

**Interface connector**

LCD Module  
Rear side

**Connectors:**
- 52760-0600 (Molex)
- 53475-0600 (Molex)

**User’s connector:** 53475-0600 (Molex)

---

**Lower side**
10-2. Color Data Assignment

Table 10-2 shows the color data assignment.

### Table 10-2. Color Data Assignment

<table>
<thead>
<tr>
<th>Color</th>
<th>R Input data</th>
<th>G Input data</th>
<th>B Input data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odd</td>
<td>Even</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R05 R04 R03 R02 R01 R00</td>
<td>G05 G04 G03 G02 G01 R00</td>
<td>B05 B04 B03 B02 B01 B00</td>
</tr>
<tr>
<td><strong>Odd</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Red</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>Blue</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>Green</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Magenta</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>Yellow</td>
<td>1 1 1 1 1 1</td>
<td>1 1 1 1 1 1</td>
<td>1 1 1 1 1 1</td>
</tr>
<tr>
<td>White</td>
<td>1 1 1 1 1 1</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td><strong>Even</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Brighter 61</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Brighter 62</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Red 63</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Black</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Brighter 61</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 0 1</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Brighter 62</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Green 63</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 1</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td><strong>Blue</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
</tr>
<tr>
<td>Brighter 61</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 0</td>
</tr>
<tr>
<td>Brighter 62</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 0</td>
</tr>
<tr>
<td>Blue 63</td>
<td>0 0 0 0 0 0</td>
<td>0 0 0 0 0 0</td>
<td>1 1 1 1 1 1</td>
</tr>
</tbody>
</table>

Note.1) Definition of gray scale: Color (n) ---“n” indicates gray scale level.

The gray scale is brighter as the number is larger.

Note.2) Data: 1: High, 0: Low

Note.3) Color data consist of 36 bits, namely, 6-bit odd and even data for each red, green and blue. Optional data can be set to red, green and blue independently. Therefore, the module is able to display 262,144 colors.
10-3. Input Signal Timing

Table 10-3 and Fig.10-3 shows the input signal timing.

Table 10-3. Timing Characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCLK signal (Clock)</td>
<td>Period</td>
<td>Tc</td>
<td>30.764</td>
<td>30.764</td>
<td>40.000</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>fc</td>
<td>25.000</td>
<td>32.505</td>
<td>32.505</td>
<td>MHz</td>
</tr>
<tr>
<td>Duty</td>
<td>Tch/Tc</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>%</td>
<td>*1</td>
</tr>
<tr>
<td>High time</td>
<td>TclkH</td>
<td>5.0</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Low time</td>
<td>TclkL</td>
<td>5.0</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Rise time</td>
<td>TclkR</td>
<td>—</td>
<td>—</td>
<td>5.0</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>TclkF</td>
<td>—</td>
<td>—</td>
<td>5.0</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>DCLK-Data Timing</td>
<td>Setup time</td>
<td>Tset</td>
<td>4.5</td>
<td>—</td>
<td>—</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Hold time</td>
<td>Thold</td>
<td>6.5</td>
<td>—</td>
<td>—</td>
<td>ns</td>
</tr>
<tr>
<td>Horizontal</td>
<td>Period</td>
<td>Th</td>
<td>672</td>
<td>672</td>
<td>1566</td>
<td>DCLK fh=1/Th</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>fh</td>
<td>46.6</td>
<td>48.3</td>
<td>48.3</td>
<td>kHz</td>
</tr>
<tr>
<td></td>
<td>Display period</td>
<td>Thd</td>
<td>640</td>
<td>640</td>
<td>640</td>
<td>DCLK *2,3</td>
</tr>
<tr>
<td>Vertical</td>
<td>Period</td>
<td>Tv</td>
<td>776</td>
<td>806</td>
<td>806</td>
<td>Th 16.67ms</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>fv</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>Hz</td>
</tr>
<tr>
<td></td>
<td>Display period</td>
<td>Tvd</td>
<td>768</td>
<td>768</td>
<td>768</td>
<td>Th *2,3</td>
</tr>
<tr>
<td>Data-ENAB timing</td>
<td>Tdn</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>DCLK *4</td>
<td></td>
</tr>
</tbody>
</table>

*1) DCLK signal input must be valid while power supply is applied.

*2) Display position is specified by the ENAB signal.
   - Horizontal display position is specified by the rise of ENAB signal. The data of a horizontal line, which is latched by the falling edge of 1st DCLK right after the rise of ENAB, is displayed on the left edge of the screen.
   - Vertical display position is specified by the rise of ENAB after a “Low” level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise of ENAB is displayed at the top line of screen.

*3) If a period of ENAB “High” is less than 640 DCLK or less than 768 lines, the rest of the screen displays black.

*4) The display position does not fit to the screen if the ENAB period and the effective data period do not synchronize with each other.
Fig. 10-3. Input Signal Timing Chart

**DCLK**

**ENAB**

**RO5-0, RE5-0**

**GO5-0, GE5-0**

**BO5-0, BE5-0**
10-4. Correspondence between Data and Display Position

Fig. 10-3 shows the Correspondence between Data and Display Position.

<table>
<thead>
<tr>
<th>RO</th>
<th>GO</th>
<th>BO</th>
<th>RE</th>
<th>GE</th>
<th>BE</th>
<th>RO</th>
<th>GO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>0001</td>
<td>0001</td>
<td>0002</td>
<td>0002</td>
<td>0003</td>
<td>0003</td>
<td></td>
</tr>
</tbody>
</table>

**C001**  
RO 0001  
GO 0001  
BO 0001  
RE 0002  
GE 0002  
BE 0003  
RO 0003  
GO 0003

<table>
<thead>
<tr>
<th>GE</th>
<th>BE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1280</td>
<td>1280</td>
</tr>
</tbody>
</table>

**S0001 S0002 S0003 S0004 S0005 S0006 S0007 S0008 S0009 S3071 S3072**

---

10-5. Power Supply Sequence

The sequence of input signals and On/Off of the power supply of this LCD module should be in the specification shown in Fig. 10-4 to prevent latch-up of the driver ICs and DC driving of the LCD panel.

**Fig. 10-4. Correspondence Data and Display Position**

**Fig. 10-5. Power Supply Sequence**
11. BACKLIGHT SPECIFICATIONS

11-1. Pin Configuration for Backlight

Table 11-1(a) and 11-1(b) shows the description and pin assignment of the connectors (CN-A and B) for the Backlight of this LCD module.

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Signal</th>
<th>Function</th>
<th>Pin No</th>
<th>Signal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vl.1</td>
<td>Power supply for CCFL 1</td>
<td>1</td>
<td>Vl.3</td>
<td>Power supply for CCFL 3</td>
</tr>
<tr>
<td>2</td>
<td>Vl.2</td>
<td>Power supply for CCFL 2</td>
<td>2</td>
<td>Vl.4</td>
<td>Power supply for CCFL 4</td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td>——</td>
<td>3</td>
<td>NC</td>
<td>——</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground (for Vl.1, 2)</td>
<td>4</td>
<td>GND</td>
<td>Ground (for Vl.3, 4)</td>
</tr>
</tbody>
</table>

Cable color (CN-A and B) : White at GND, Pink at Vl.1,2,3 and 4

Connector : Housing : BHR-04VS-1
Contact : SBH-001T-P0.5
User’s Connector : Post with base : SM04(4.0)B-BHS-1-TB
Supplier : Japan Solderless Terminal Trading Company LTD. (J.S.T.)

11-2. CCFL

Supplier : SANKEN ELECTRIC CO., LTD Part No. SD26E3850E8350B3113000

11-3. Life

The life of the backlight is a minimum of 25,000 hours at the following conditions.

(1) Working conditions
   ① Ambient temperature : 25±5°C
   ② Tube current(I_t) : (10.5mA or less)

(2) Definition of life
   ① Brightness becomes 50% or below 50% of the minimum brightness value shown in Table 9-1.
   ② The lamp cannot be lit by the breakdown voltage of 1600Vvms.
   ③ Lamp is flashing.

11-4. Lamp Assembly set (for replacement)

Lamp Assembly set (with charge) is prepared for maintenance.
This set consists of an upper lamp assembly and a lower lamp assembly.
Type number : FLCL-21
12. APPEARANCE SPECIFICATIONS

12-1. Zone

- Inside display dot area (369.6×221.8mm)
- Display dot area means active area.
- One pixel consists of 3 dots (red, green and blue).
- Foreign particle and scratch unharmed to display image, such as the foreign particle under polarizer film but outside of the display area and scratch on metal bezel, backlight module or polarizer film out of the display area, etc., are not counted.

12-2. Bright spots

(1) Bright spots by the defect of TFT.
   - Visible under bias of 2% ND filter ......................... High bright spot R·G
   - Visible under 5% but invisible under 2% ND filter .... Low bright spot R·G·B
   - Invisible under bias of 5% ND filter ....................... Not counted

(2) Bright spots by the light passing through tears, breaks, etc in color filter.
   - Exceed size of a half dot ....................................... High bright spot
   - A half dot or less ....................................................... Not counted

(3) Bright spots by the light passing through tears, breaks, etc in chromium mask.
   - Exceed 50µm .......................................................... High bright spot
   - 50µm or less ............................................................ Not counted

12-3. Test condition

- Inspector must observe the LCD screen from the normal direction under the illumination by a single 20W fluorescent lamp. The distance between the LCD screen and the inspector should be a height of 50cm above the worktable. The vertical illuminance is 300 to 600lux (reference value).
- Bright spot should be counted under entire black screen.
- Dark spot should be counted under entire white screen.
- Frame frequency should be 60Hz.

12-4. Specifications

Table 12-4 shows the appearance standard.

(Note1) Please do not mistake a single bright spot for a bright spot connection due to Cs(supplemental capacitance) line at the center of each dot.
(Note2) If a pixel is dark partially, it connects into the number of dark spots in accordance with following rule.
   - (a) S<1/3 : Not count. Only one of 4 dark connection is allowed.
   - (b) 1/3≤S<2/3 : Considered as 0.5 dot.
   - (C) 2/3≤S : Considered as 1 dot.
   - (S=Dark spot size/dot size)
Table 12-4. Appearance specifications

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Judgment method and standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bright spot (high and Low)</td>
<td>≤10 dots</td>
</tr>
<tr>
<td>2</td>
<td>Bright spot connection (high and low)</td>
<td>≤2 pair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 dot connection in horizontal)</td>
</tr>
<tr>
<td>3</td>
<td>Total of bright spot</td>
<td>≤7 dots</td>
</tr>
<tr>
<td>4</td>
<td>Dark spot</td>
<td>≤12 dots</td>
</tr>
<tr>
<td>5</td>
<td>Dark spot connection</td>
<td>≤5 pairs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 dot connection in horizontal)</td>
</tr>
<tr>
<td>6</td>
<td>Total of dark spot</td>
<td>≤12 dots</td>
</tr>
<tr>
<td>7</td>
<td>Total of dot defect (bright and dark)</td>
<td>≤12 dots</td>
</tr>
<tr>
<td>8</td>
<td>Distance of bright spot</td>
<td>high-high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥10mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>others</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥3mm</td>
</tr>
<tr>
<td>9</td>
<td>Distance of dark spot</td>
<td>≥3mm</td>
</tr>
<tr>
<td>10</td>
<td>Scratch on polarizer, line shape</td>
<td>0.3&lt;W&lt;0.5, L&lt;0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5&lt;W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W&lt;0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignore</td>
</tr>
<tr>
<td>11</td>
<td>Dent on polarizer, dot shape</td>
<td>D&lt;0.5</td>
</tr>
<tr>
<td>12</td>
<td>Nick on polarizer, line shape</td>
<td>L&lt;10.0</td>
</tr>
<tr>
<td>13</td>
<td>Black spot (Foreign circular matter)</td>
<td>D&lt;0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6&lt;D&lt;0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5&lt;D&lt;1.0</td>
</tr>
<tr>
<td></td>
<td>White spot (Foreign circular matter)</td>
<td>D&lt;0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8&lt;D&lt;1.0</td>
</tr>
<tr>
<td>14</td>
<td>Lints, black line</td>
<td>W&lt;0.1, L&lt;3.0</td>
</tr>
<tr>
<td></td>
<td>Lints, white spot</td>
<td>W&lt;0.05, 0.1&lt;L&lt;0.5</td>
</tr>
</tbody>
</table>

D: Average diameter [mm], W: Width [mm], L: Length [mm], S=(bright spot size)/(dot size)
13. ENVIRONMENTAL SPECIFICATIONS

Table 13-1 shows the environmental specifications.

<table>
<thead>
<tr>
<th>Item</th>
<th>Condition</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Operation</td>
<td>0~60°C (Note1)</td>
</tr>
<tr>
<td></td>
<td>Storage</td>
<td>-20~60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>Operation</td>
<td>20~85%RH</td>
</tr>
<tr>
<td></td>
<td>Storage</td>
<td>5~85%RH</td>
</tr>
<tr>
<td>Vibration</td>
<td>Non-operation</td>
<td>10~500Hz, 1 cycle/20 minute, 2G, 1.5mm max, 2hour each X, Y and Z directions</td>
</tr>
<tr>
<td>Shock</td>
<td>Non-operation</td>
<td>30G, 6ms, 1time each ±X, ±Y and ±Z directions.</td>
</tr>
</tbody>
</table>

Note1: Temperature on surface of LCD panel should be under 60°C.
Note2: Table 13-2 and Fig. 13-1 show the shock resistance standard when module is packaged.

Table 13-2. Shock Resistance Standard when Module is Packaged

<table>
<thead>
<tr>
<th>Dropping location</th>
<th>Dropping height</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ~ J</td>
<td>60cm</td>
<td>1 time</td>
</tr>
</tbody>
</table>

Fig.13-1. Direction to apply shock to package
14. INDICATIONS
This module has the following indications.

(1) Product name : LCD unit
(2) Model number : FLC43XWC6V-02
(3) Product drawing number : NA19020-C553
(4) Manufacturing number

<table>
<thead>
<tr>
<th>Serial number (To be reset every month on 1st.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last digit of manufacturing year.</td>
</tr>
</tbody>
</table>

(5) Version number : 01A (Example)
- 1st 2 digits “01” means operational version.
- 3rd alphabet means functional version.

(6) Country of origin : MADE IN JAPAN

(7) Company name : FUJITSU LIMITED

(8) Disposal method of cold-cathode tubes. (See Fig.14-1)

(9) Caution when changing cold-cathode tubes. (See Fig. 14-2)

15. PACKAGING
Separately specified in packaging specifications.

15-1. Packaging specifications
(1) 5 LCD modules / 1 package.
(2) Weight: approximately 13kg / 1 package.
(3) Outline dimensions : 348mm(W) × 328(D) × 490mm(H)

15-2. Packaging method
Fig.15-2 (a),(b),(c),(d) show the packing method.
Fig. 15-2(a) Packaging Method
Label(example)

- Taping
  - Upper: H or I method
  - Bottom: H method
- Upper and bottom holders should be anti-electrostatic type.

Fig. 15-2(b) Packaging Method

[Diagram of packaging method with dimensions and components labeled]
Up and Down : 3 times wrap
Middle : 2 times wrap

Note:1) 4 boxes x 3 layers (maximum 12 boxes) : by ship
4 boxes x 2 layers (maximum 8 boxes) : by airplane

Note:2) This drawing shows marine transportation specification.

Fig. 15-2 (C) Packaging Method
Note 1) The carton (A) should be placed in the middle of the container (B) with enough cushioning materials.

Figure 15-2(d) Packaging Method
16. WARRANTY
The warranty period is one year after manufacturing. Products which fail during this period are repaired or replaced without charge, unless the failure is caused by user.

17. PRECAUTIONS
Adhere to the following precautions to properly use this LCD module.

(1) Fail safe design
   LCD module has an inherent chance of failure. Customers must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

(2) Handling of LCD panel
   ① Do not apply any strong mechanical shock to the LCD panel.
      Since the LCD panel is made of glass, excessive shock may damage the panel or cause a malfunction.
   ② Do not press hard on the LCD panel surface.
      In the LCD panel, the gap between two glass plates is kept precisely and uniformly to maintain display's characteristics and reliability. If this panel is pressed hard, the following troubles occurs.
      (a) Ununiformity of color
         (b) Orientation of liquid crystal becomes disordered
      Problem (a) returns to normal after a while. Problem (b) returns to normal if power is shut off once then turned on again.
      However these operations should be avoided to insure reliability.
   ③ Do not scratch the polarizer film on the LCD panel surface.
      • Do not press or rub the display surface with a hard tool, pincer, etc.
      • For handling, use cotton or conductive gloves so that the display surface is not stained.
      • For If the display surface is stained by dust or dirt, clean it as follows with a soft cloth (deer skin, etc.)
         [Dust] Wipe off with a soft cloth. (do not rub.)
         [Dirt] Wipe off lightly with a soft cloth after soaking in the clear water and squeezing hard out of water drops. Only if the dirt is hardly wiped off, use isopropyl alcohol or ethanol.
         Be careful not to splash the water or the solvent and water penetrated between the polarizer and the LCD panel.
         Do not use solvents such as ketone (acetone, etc.) and aromatics (xylene, toluene, etc.)
      • If saliva or water drops are left for long time, it may deform partial deformation or discolored. Wipe off immediately in the same way as for dirt.
      • Do not allow oil to adhere to the module, since the cleaning of oil is difficult.
   ④ Do not place or contact objects on the display surface for a long period of time.
      That's because this may make some parts of the LCD module distorted and the display quality may decline.
(3) Handling of LCD module

1. Do not pull the cold-cathode tube cable strongly.
   If the cable is pulled with the loaf of 2kg or more, the cable may be damaged or reliability may decrease.

2. Assemble the module into user’s system in a dust free environment.
   If conductive foreign matter adheres to the module, failures may occur.

3. Take anti-static measures for assembling the module.
   Since the LCD module contains CMOS ICs, the following considerations are necessary.
   • For assembling the module, operator should be grounded and wear cotton or conductive gloves.
   • Floor of work area and work table to assemble the LCD module should be covered with electrostatic shielding in order to discharge static electricity via an earth wire.
   • If necessary, ground operation tools (soldering iron, radio pliers, pincet, etc.).
   • Do not take the module out of the conductive bag until the time when the module is assembled.
   • Assemble the module under low humidity (50%RH or less).

4. Do not pull the connecting cable on the rear face of the LCD module strongly.

5. Do not disassemble or remodel the LCD module.
   If this LCD module is disassembled or remodeled, it may have some trouble, or the display quality and reliability may not be assured.

(4) Precautions for operating the LCD module

1. Adhere to the specified power supply sequence.
   If not followed, the CMOS IC may cause a latch-up, or the DC voltage may be applied the liquid crystal, and a failure or serious deterioration in display quality may occur.

2. Do not operate the LCD module when condensation is present.
   If the LCD module is operated when condensation is on the terminals of the LCD panel, the terminals cause electrochemical reaction, and may reach disconnection. Condensation easily occurs especially when the module is moved from a cold environment to a warm environment.

3. Trouble that occurs when the LCD module is used at not recommended temperature.
   • Operation at high temperature (>50ºC) : Display colors shift to blue.
   • Storage at high temperature (>60ºC) : The polarizer film deteriorates and contrast decreases.
   • Operation at low temperature (<0ºC) : The response speed decreases considerably.
   • Storage at low temperature (<-20ºC) : The liquid crystal may solidify and become damaged.

4. Always input the control signals at the correct timing.
   If control signals (DCLK, or ENAB) are not input, or if the timing is out of the specified timing, DC voltage may be applied to the liquid crystal and, as a result, cause image sticking or deterioration of contrast.
(5) Precautions on designing module mounting

1. Do not press the display surface and bottom face of the LCD module.
   Display quality or reliability may be deteriorated if the installation of the LCD module is inappropriate and, as a result, excessive pressure is applied to the surface of LCD screen. Brightness uniformity or the reliability of CCFL may decrease if the pressure is applied to the backlight module.

2. Consider the module mounting design, so that twisting and bending do not occur to the LCD module.
   Excessive twisting and bending may damage display quality and reliability.

3. The power cable length between the LCD module and inverter should not be extended.
   Otherwise the backlight may not light or flickering may occur.

4. Do not make the power cable of the backlight clung to a metal plate, etc.
   Backlight frequency current for backlight driving may leak to the metal and desired brightness may not be assured.

5. When Mounting LCD module with M4 screw (x4) should be screw up under 5.75kgf·cm torque.

(6) Storage method

1. Do not store the LCD module in an atmosphere of organic solvent or corrosive gas.
   In an organic solvent atmosphere, the polarizer film discolors and display quality deteriorates.
   In a corrosive gas environment, various problems may occur.

2. Store the LCD module in a Fujitsu package.
   At storing, Fujitsu packages can be stacked up to 4 boxes.
   The LCD module is in an anti-static bag. Keep the module in that status.

3. It is recommended that the storage environment should be humidity controlled, cool and dark.
   Recommended storage environment
   • Place : Dark (avoid direct sunlight)
   • Temperature : 10~35°C
   • Humidity : 50~60%RH
   Note) If the module is left in an environment of 60°C or more for a long period of time, optical characteristics may deteriorate.

(7) Storage method

1. If the LCD panel is damaged, do not inhale or allow the liquid crystal to enter the mouth
   If the liquid crystal contacts the body or cloths, wash it off with soap immediately. Follow precautions for regular electronic components.

2. Solder flux on the printed circuit board is harmless to the quality and reliability of LCD module.
   Fujitsu is practicing non-wash technology on module assembly process.
18. PRECAUTIONS FOR USE

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter “High Safety Required Use”), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer’s product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, Fujitsu shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

19. MISCELLANEOUS

Specifications of the TFT-LCD panel and other components used in the LCD module are subject to change. Both parties shall discuss together before change. If any doubt is raised in the content of the specifications, both parties shall discuss and make best effort for the agreement.