SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LTBLDT701G6CS_

SPEC. NO.: LM701-6B-Δ

CUSTOMER

APPROVED BY

DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
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EDITED ON: May.19.2007

<table>
<thead>
<tr>
<th>Q.C. DEPT.</th>
<th>DESIGN MANAGER</th>
<th>DESIGN CHECK</th>
<th>DESIGNER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>C.Y.CHAN</td>
</tr>
<tr>
<td>DATE</td>
<td>REVISED NO.</td>
<td>REF. PAGE</td>
<td>SUMMARY</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>-----------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>12.22.05'</td>
<td>0</td>
<td>23/23</td>
<td>First Issue</td>
</tr>
<tr>
<td>11.07.07'</td>
<td>1</td>
<td>—</td>
<td>Modified Capacitor Type ( AL → Ceramic )</td>
</tr>
<tr>
<td>15.19.08'</td>
<td>2</td>
<td>9/23</td>
<td>CCFL connector : M63M83-04 (MITSUMI) or compatible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23/23</td>
<td>Modified Drawing</td>
</tr>
</tbody>
</table>
# 1. MECHANICAL DATA

<table>
<thead>
<tr>
<th>NO</th>
<th>ITEM</th>
<th>CONTENTS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Product No.</td>
<td>LTBLDT701G6CS_</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>Module Size</td>
<td>205.5 (W) x 141.0 (H) x 7.0 max (D)</td>
<td>mm</td>
</tr>
<tr>
<td>3</td>
<td>Dot Size</td>
<td>0.21 (W) x 0.21 (H)</td>
<td>mm</td>
</tr>
<tr>
<td>4</td>
<td>Dot Pitch</td>
<td>0.23 (W) x 0.23 (H)</td>
<td>mm</td>
</tr>
<tr>
<td>5</td>
<td>Number of Dots</td>
<td>640 (W) x 480 (H)</td>
<td>Dot</td>
</tr>
<tr>
<td>6</td>
<td>Duty</td>
<td>1/240</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>LCD Display Mode</td>
<td>FSTN, Normally Black / Negative Image</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>Rear Polarizer</td>
<td>Transmissive Type</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
<td>Viewing Direction</td>
<td>6 O'clock</td>
<td>–</td>
</tr>
<tr>
<td>10</td>
<td>Backlight</td>
<td>CCFL</td>
<td>–</td>
</tr>
<tr>
<td>11</td>
<td>Controller</td>
<td>Excluded</td>
<td>–</td>
</tr>
<tr>
<td>12</td>
<td>DC/DC Converter</td>
<td>Excluded</td>
<td>–</td>
</tr>
<tr>
<td>13</td>
<td>Touch Panel</td>
<td>Excluded</td>
<td>–</td>
</tr>
<tr>
<td>14</td>
<td>Weight</td>
<td>310 (Approx.)</td>
<td>g</td>
</tr>
</tbody>
</table>

**Note:**

- Backlight: B : CCFL Backlight
- Reflective/Transmissive: T : Transmissive

**Option:**

- 6 : Module Version Number
- C : Polarizer with Anti-Glare
- S : RoHS Compliance
- T : Testing Sample

**Mode/View Angle:**

- G : Normally Black, 6 O’clock

**RoHS Compliance.**

Nan Ya guarantees that this project doesn’t include any materials (6 materials) or includes less than specified quantities which are regulated by RoHS Compliance.
2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SYMBOL</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply for Logic</td>
<td>VDD–VSS</td>
<td>−0.3</td>
<td>6.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>VEE–VSS</td>
<td>0</td>
<td>27</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Static Electricity</td>
<td></td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>Note 1</td>
</tr>
</tbody>
</table>

Note 1  LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>NORMAL TEMP.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OPERATING</td>
</tr>
<tr>
<td></td>
<td>MIN.</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>0</td>
</tr>
<tr>
<td>Humidity (Without Condensation)</td>
<td>Note 2,4</td>
</tr>
</tbody>
</table>

Note 2  Ta ≤ 50°C : 80%RH max

Note 3  Please refer to item of reliability test

Note 4  Background color will change slightly depending on ambient temperature. That phenomenon is reversible.
# 3. ELECTRICAL CHARACTERISTICS

## 3–1. ELECTRICAL CHARACTERISTICS OF LCD

<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>Power Supply for Logic</td>
<td>VDD–VSS</td>
<td>–</td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.75</td>
<td>5.0</td>
<td>5.25</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>VIL</td>
<td>L level</td>
<td>VSS</td>
<td>0.2VDD</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>VIH</td>
<td>H level</td>
<td>0.8VDD</td>
<td>VDD</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>LCM Recommend LCD Module Driving Voltage</td>
<td>VEE–VSS</td>
<td>VDD=5.0V</td>
<td>0°C</td>
<td>22.9</td>
<td>23.3</td>
<td>23.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25°C</td>
<td>21.9</td>
<td>22.3</td>
<td>22.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50°C</td>
<td>21.0</td>
<td>21.4</td>
<td>21.8</td>
</tr>
<tr>
<td>Power Supply Current for LCM</td>
<td>IDD</td>
<td>VDD=5.0V</td>
<td>–</td>
<td>3.0</td>
<td>6.0</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>IEE</td>
<td>VEE–VSS=22.3V</td>
<td>–</td>
<td>15</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FLM=70Hz</td>
<td>PATTERN :</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| LCM | Surface Luminance | Ls | Vin=10.1V | I_L =5mA | PATTERN: (Dots All On) | 70.0 | 85.5 | – | cd/m² |
| | | | | | PATTERN: (Dots All Off) | – | 13.3 | 20.0 | |

**REV/DATE**: R0/12.22.04

**BY**: T.M. Chen
3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT

<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>Lamp Voltage</td>
<td>V_L</td>
<td>–</td>
<td>295</td>
<td>–</td>
<td>Vrms</td>
<td>–</td>
</tr>
<tr>
<td>Lamp current</td>
<td>I_L</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>mArms</td>
<td>–</td>
</tr>
<tr>
<td>Lamp power consumption</td>
<td>P_L</td>
<td>–</td>
<td>1.48</td>
<td>–</td>
<td>W</td>
<td>(*)1</td>
</tr>
<tr>
<td>Starting voltage</td>
<td>V_S</td>
<td>–</td>
<td>–</td>
<td>430</td>
<td>Vrms</td>
<td>Ta=25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–</td>
<td>–</td>
<td>500</td>
<td>Vrms</td>
<td>Ta=0°C</td>
</tr>
<tr>
<td>Lamp life time</td>
<td>L_L</td>
<td>–</td>
<td>20000</td>
<td>–</td>
<td>hrs</td>
<td>at I_L = 5 mArms Ta=25°C (*)2</td>
</tr>
</tbody>
</table>

(*)1 Power consumption excluded inverter loss.

(*)2 Lamp life time is defined as follows: The final brightness is at 50% of original brightness.
3–3. ELECTRICAL CHARACTERISTICS OF RECOMMENDED INVERTER
TDK CXA–L10L

3–3–1 GENERAL SPECIFICATIONS
OPERATION TEMPERATURE : –10°C~60°C
STORAGE TEMPERATURE : –20°C~85°C
DIMENSION : 44.0(L)mm x 21.0(W)mm x MAX 18.0(H)mm

3–3–2 PIN ASSIGNMENTS

<table>
<thead>
<tr>
<th>NO.</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VIN</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NO.</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>OUT1</td>
</tr>
<tr>
<td>4</td>
<td>OUT2</td>
</tr>
<tr>
<td>5</td>
<td>OUT GND</td>
</tr>
</tbody>
</table>

3–3–3 RELATIONSHIP BETWEEN VIN & TUBE CURRENT

<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>Input Voltage</td>
<td>VIN</td>
<td>–</td>
<td>10.1</td>
<td>–</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Tube Current</td>
<td>I_L</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>mA</td>
<td></td>
</tr>
</tbody>
</table>
4. OPTICAL CHARACTERISTICS

AT Vop

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Cr (Contrast Ratio)</th>
<th>(\theta) (Viewing Angle)</th>
<th>(\phi) (Viewing Angle)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0°C</td>
<td>25°C</td>
<td>50°C</td>
</tr>
<tr>
<td>MIN.</td>
<td>TYP.</td>
<td>MIN.</td>
<td>TYP.</td>
</tr>
<tr>
<td>T G</td>
<td>5.5</td>
<td>8.0</td>
<td>7.0</td>
</tr>
<tr>
<td>NOTE</td>
<td>NOTE 6</td>
<td>NOTE 5</td>
<td></td>
</tr>
</tbody>
</table>

* Under Cr > 2 Condition

NOTE:

T: TRANSMISSIVE
G: NORMALLY BLACK, 6 O’clock

AT \(\phi=0^\circ\) \(\theta=0^\circ\)

<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>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Time (rise)</td>
<td>Tr</td>
<td>0(\tau)</td>
<td>440</td>
<td>550</td>
<td>820</td>
<td>ms</td>
<td>NOTE 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25(\tau)</td>
<td>180</td>
<td>234</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50(\tau)</td>
<td>90</td>
<td>110</td>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time (fall)</td>
<td>Tr</td>
<td>0(\tau)</td>
<td>200</td>
<td>250</td>
<td>375</td>
<td>ms</td>
<td>NOTE 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25(\tau)</td>
<td>90</td>
<td>110</td>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50(\tau)</td>
<td>75</td>
<td>95</td>
<td>140</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(NOTE 1)

Definition of Operation Voltage (Vop)

(positive type)

100%

Brightness

CmMax

Vop

Applying Voltage

NON-SELECTED WAVE

SELECTED WAVE

(negative type)

100%

Brightness

CmMax

Vop

Applying Voltage

NON-SELECTED WAVE

SELECTED WAVE

*Conditions

Viewing Angle : 0
Frame Frequency : 70Hzs
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time (Tr, Tt)

(positive type)

100%

Brightness

NON-SELECTED CONDITION

SELECTED CONDITION

NON-SELECTED CONDITION

Tr

Rise time

Tt

Fall time

(negative type)

100%

Brightness

NON-SELECTED CONDITION

SELECTED CONDITION

NON-SELECTED CONDITION

Tr

Rise time

Tt

Fall time

*Conditions

Operating Voltage : Vop
Viewing Angle (θ,φ) : (0,0)
Frame Frequency : 70Hzs
Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

TUNGSTEN LAMP

BRIGHTNESS

(Reflectance)

SPOT METER

(const.)

TRANSMITTANCE

TEMP.

CHAMBER

25°

0°

180°

Sample Stage

TUNGSTEN LAMP

Multiplex Driving (1/N duty 1/a bias)

(1/2a)Vop

(1/2a)Vop

(1/a)Vop

(1/a)Vop

(1/(1/N))

NON-SELECTED WAVE

SELECTED WAVE

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

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(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop

(1/a)Vop
(NOTE 4)
Definition of Viewing Direction

12:00
3:00
6:00
9:00

(NOTE 5)
Definition of Viewing Angle

R-L Direction
F-R Direction
Φ

*For this Product
The viewing direction is 6 o'clock
So Φ1 > Φ2

(Φ = Φ1 + Φ2)

*Conditions
Operating Voltage: Vop
Frame Frequency: 70Hz
Applying Waveform: 1/N duty 1/a bias
Contrast Ratio: larger than 2

(NOTE 6)
Definition of Contrast Ratio (Cr)

Selected Wave
Non-Selected Wave

(positive type) Contrast Ratio: Cr = A/B

(negative type)

*Conditions
Viewing Angle: 0
Frame Frequency: 70Hz
Applying Waveform: 1/N duty 1/a bias
5. BLOCK DIAGRAM

M Signal Generator

SEG Drivers (Upper)

640 X 480 LCD PANEL

SEG Drivers (Lower)

COM Drivers

 Bias Circuit Generator

CCFL Back-Light

1 FLM
2 CL1
3 CL2
4 DISP
5 VDD
6 VSS
7 VEE
8 UDO
9 UD3
10 LD0
11 LD3
12
13

1 HV
2 NC
3 NC
4 GND
# 6. INTERNAL PIN CONNECTION

## LCD

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Level</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FLM</td>
<td>H/L</td>
<td>SCAN START-UP SIGNAL</td>
</tr>
<tr>
<td>2</td>
<td>CL1</td>
<td>H→L</td>
<td>DATA LATCH PULSE</td>
</tr>
<tr>
<td>3</td>
<td>CL2</td>
<td>H→L</td>
<td>DATA SHIFT PULSE</td>
</tr>
<tr>
<td>4</td>
<td>DISP</td>
<td>H/L</td>
<td>DISPLAY OFF (&quot;H&quot;=ON,&quot;L&quot;=OFF)</td>
</tr>
<tr>
<td>5</td>
<td>VDD</td>
<td>-</td>
<td>POWER SUPPLY FOR LOGIC (+3.3V/+5V)</td>
</tr>
<tr>
<td>6</td>
<td>VSS</td>
<td>-</td>
<td>SIGNAL GROUND (GND)</td>
</tr>
<tr>
<td>7</td>
<td>VEE</td>
<td>-</td>
<td>POWER SUPPLY FOR LCD (+V)</td>
</tr>
<tr>
<td>8</td>
<td>UDO</td>
<td>H/L</td>
<td>DISPLAY DATA (UPPER HALF)</td>
</tr>
<tr>
<td>9</td>
<td>UD1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>UD2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>UD3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>LD0</td>
<td>H/L</td>
<td>DISPLAY DATA (LOWER HALF)</td>
</tr>
<tr>
<td>13</td>
<td>LD1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>LD2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>LD3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## CCFL

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Level</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HV</td>
<td>-</td>
<td>HIGH VOLTAGE LINE (INVERTER)</td>
</tr>
<tr>
<td>2~3</td>
<td>NC</td>
<td>-</td>
<td>NON CONNECTION</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>-</td>
<td>GROUND LINE (INVERTER)</td>
</tr>
</tbody>
</table>

LCD  
Used connector: MOLEX 53261-1571  
Mating connector: MOLEX 51021-1500(HOUSING) x 1 +  
MOLEX 50058-8000(TERMINAL) x 15 or Compatible

CCFL  
Used connector: M63M83-04 (MITSUMI) or compatible  
Mating connector: M60-04-30-114P (MITSUMI)  
M60-04-30-134P (MITSUMI)  
M61M73-04 (MITSUMI)

REV/DATE  
R0/  
12.22.04'  
R2/  
05.19.08'  
BY  
T.M. Chen
7. POWER SUPPLY

VDD
+3.3~5V

VSS
+15V
+27V

VEE

CCFL Back-Light

RECOMMENDED INVERTER: CXA-L10L (TDK)
8. TIMING CHARACTERISTICS

8–1. INTERFACE TIMING

@VDD=2.5~5.5V

<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>Shift Clock Period</td>
<td>tcp</td>
<td>152</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>&quot;CL2&quot; PULSE WIDTH</td>
<td>tw</td>
<td>65</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>CLOCK RISE, FALL TIME</td>
<td>tr, tf</td>
<td>–</td>
<td>–</td>
<td>50</td>
<td>ns</td>
</tr>
<tr>
<td>DATA SETUP TIME</td>
<td>tdsu</td>
<td>50</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>DATA HOLD TIME</td>
<td>tdhd</td>
<td>40</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>&quot;CL2&quot;→ &quot;CL1&quot; FALL TIME</td>
<td>tlsu</td>
<td>65</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>&quot;CL1&quot;→ &quot;CL2&quot; FALL TIME</td>
<td>tlc</td>
<td>65</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>&quot;FLM&quot; SETUP TIME</td>
<td>tsetup</td>
<td>100</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>&quot;FLM&quot; HOLD TIME</td>
<td>thold</td>
<td>100</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
<tr>
<td>&quot;CL1&quot; PULSE WIDTH</td>
<td>twc</td>
<td>65</td>
<td>–</td>
<td>–</td>
<td>ns</td>
</tr>
</tbody>
</table>
8–2. POWER ON/OFF TIMING

The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.
8–3. DISPLAY PATTERN

SEGMENT

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>640</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>1.640</td>
</tr>
<tr>
<td>2.1</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UPPER

COMMON

<table>
<thead>
<tr>
<th>240</th>
<th>240.640</th>
</tr>
</thead>
<tbody>
<tr>
<td>241</td>
<td>241.640</td>
</tr>
</tbody>
</table>

LOWER

480

| 480.1 | 480.640 |

NOTE: 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT

SEGMENT

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>637</th>
<th>638</th>
<th>639</th>
<th>640</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD3</td>
<td>UD2</td>
<td>UD1</td>
<td>UD0</td>
<td>UD3</td>
<td>UD2</td>
<td>UD1</td>
<td>UD0</td>
<td>UD3</td>
<td>UD2</td>
<td>UD1</td>
<td>UD0</td>
</tr>
<tr>
<td>UD3</td>
<td>UD2</td>
<td>UD1</td>
<td>UD0</td>
<td>UD3</td>
<td>UD2</td>
<td>UD1</td>
<td>UD0</td>
<td>UD3</td>
<td>UD2</td>
<td>UD1</td>
<td>UD0</td>
</tr>
</tbody>
</table>

UPPER

COMMON

<table>
<thead>
<tr>
<th>240</th>
<th>UD3</th>
<th>UD2</th>
<th>UD1</th>
<th>UD0</th>
<th>UD3</th>
<th>UD2</th>
<th>UD1</th>
<th>UD0</th>
</tr>
</thead>
<tbody>
<tr>
<td>241</td>
<td>LD3</td>
<td>LD2</td>
<td>LD1</td>
<td>LD0</td>
<td>LD3</td>
<td>LD2</td>
<td>LD1</td>
<td>LD0</td>
</tr>
</tbody>
</table>

LOWER

480

| LD3 | LD2 | LD1 | LD0 | LD3 | LD2 | LD1 | LD0 |
# 9. RELIABILITY TEST

## NORMAL TEMPERATURE RELIABILITY TEST

<table>
<thead>
<tr>
<th>NO</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>STANDARD</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Temp. Storage</td>
<td>70°C</td>
<td>120Hrs</td>
<td>Appearance without defect</td>
</tr>
<tr>
<td>2</td>
<td>Low Temp. Storage</td>
<td>−20°C</td>
<td>120Hrs</td>
<td>Appearance without defect</td>
</tr>
<tr>
<td>3</td>
<td>High Temp. &amp; High Humi.</td>
<td>50°C</td>
<td>120Hrs</td>
<td>Appearance without defect</td>
</tr>
<tr>
<td></td>
<td>Storage</td>
<td>90%RH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>High Temp. Operating Display</td>
<td>50°C</td>
<td>120Hrs</td>
<td>Appearance without defect</td>
</tr>
<tr>
<td>5</td>
<td>Low Temp. Operating Display</td>
<td>0°C</td>
<td>120Hrs</td>
<td>Appearance without defect</td>
</tr>
<tr>
<td>6</td>
<td>Thermal Shock</td>
<td>−20°C, 30min</td>
<td>70°C, 30min</td>
<td>Appearance without defect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1cycle)</td>
<td></td>
<td>10 cycles</td>
</tr>
</tbody>
</table>
Inspection Provision

1. Purpose
   The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

2. Applicable Scope
   The NAN YA inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3. Technical Terms
   3-1 NAN YA Technical Terms

![Diagram of LCD components]

4. Outgoing Inspection Provision

4-1 Inspection Method
   MIL-STD-105E Level II Regular inspection

4-2 Inspection Standard

<table>
<thead>
<tr>
<th>Item</th>
<th>AQL(%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Defect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opens</td>
<td>0.4</td>
<td>faults which substantially lower the practicality and the initial purpose difficult to achieve.</td>
</tr>
<tr>
<td>Shorts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erroneous operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solder appearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cracks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display surface cracks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Defect</td>
<td>Dimensions</td>
<td>External from Dimensions</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Inside the glass</td>
<td>Black spots</td>
<td></td>
</tr>
<tr>
<td>Polarizing plate</td>
<td>Scratches, foreign Matter, air bubbles, and peeling</td>
<td></td>
</tr>
<tr>
<td>Dots</td>
<td>Pinhole, deformation</td>
<td></td>
</tr>
<tr>
<td>Color tone</td>
<td>Color unevenness</td>
<td></td>
</tr>
<tr>
<td>Solder appearance</td>
<td>Cold solder</td>
<td>Solder projections</td>
</tr>
</tbody>
</table>

4-3 Inspection Provisions

*Viewing Area Definition

Fig. 1

![Diagram]

A : Zone Viewing Area  
B : Zone Glass Plate Out Line

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring. The distance between luminous source (daylight fluorescent lamp and cool white fluorescent lamp) and a sample to be 30cm to 50cm.
*Test and measurement are performed under the following conditions, unless otherwise specified.

Otherwise specified.

- Temperature: 20± 15°C
- Humidity: 65± 20% R.H.
- Pressure: 860~1060 hPa (mbar)

In case of doubtful judgment, it is performed under the following conditions.

- Temperature: 20± 15°C
- Humidity: 65± 20% R.H.
- Pressure: 860~1060 hPa (mbar)

5. Specification for quality check
5-1 Electrical characteristics

<table>
<thead>
<tr>
<th>NO.</th>
<th>Item</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Non operational</td>
<td>Fail</td>
</tr>
<tr>
<td>2.</td>
<td>Miss operating</td>
<td>Fail</td>
</tr>
<tr>
<td>3.</td>
<td>Missing dot</td>
<td>Fail</td>
</tr>
<tr>
<td>4.</td>
<td>Contrast irregular</td>
<td>Fail</td>
</tr>
<tr>
<td>5.</td>
<td>Response time</td>
<td>Within Specified value</td>
</tr>
<tr>
<td>6.</td>
<td>Backlight turn on / off</td>
<td>Within Specified value</td>
</tr>
</tbody>
</table>
5–2 External Appearance Defect

<table>
<thead>
<tr>
<th>NO.</th>
<th>Item</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td>
<td>(1)–1–Spots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average Diameter(mm):D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D≤0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1&lt;D≤0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2&lt;D≤0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3&lt;D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of total pieces is set to within 5 pieces.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note that when there are 2 pieces or more, they are not to be concentrated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set as: Average diameter = (Long diameter + Short diameter)/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1)–2–Blurred Spots (At lighting condition)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average Diameter(mm):D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D≤0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.3&lt;D≤0.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75&lt;D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of total pieces is set to within 5 pieces.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note that when there are 2 pieces or more, they are not to be concentrated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set as: Average diameter = (Long diameter + Short diameter)/2</td>
</tr>
</tbody>
</table>
1. Line

(1)–1 Lines (At non lighting condition)

<table>
<thead>
<tr>
<th>Width (mm): W</th>
<th>Length (mm): L</th>
<th>Number of pieces permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>W ≤ 0.03</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>0.03 &lt; W ≤ 0.08</td>
<td>L ≤ 4</td>
<td>2</td>
</tr>
<tr>
<td>0.08 &lt; W ≤ 0.1</td>
<td>L ≤ 1</td>
<td>1</td>
</tr>
</tbody>
</table>

Object exceeding 0.1 mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.

(1)–2 Lins (At lighting condition)

<table>
<thead>
<tr>
<th>Width (mm): W</th>
<th>Length (mm): L</th>
<th>Number of pieces permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>W ≤ 0.03</td>
<td>Ignore</td>
<td>Ignore</td>
</tr>
<tr>
<td>0.03 &lt; W ≤ 0.08</td>
<td>L ≤ 3</td>
<td>6</td>
</tr>
<tr>
<td>0.08 &lt; W</td>
<td>3 &lt; L</td>
<td>None</td>
</tr>
</tbody>
</table>

Object exceeding 0.1 mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.

2. Scratches (Glass, reflection plates, and polarizing plates)

In accordance with black spots.
(At non lighting condition)

3. Color irregular

Not remarkable color irregular.
4. Air bubbles polarizing plates, and reflection plates

<table>
<thead>
<tr>
<th>Average Diameter (mm):D</th>
<th>Number of pieces permitted</th>
<th>Average diameter = (Long diameter + Short diameter)/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D ≤ 0.3</td>
<td>Ignore</td>
<td></td>
</tr>
<tr>
<td>0.3 &lt; D</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Note that when there are 4 pieces or more, they are not to be concentrated.

5. Cracks

(1) General crack

a ≤ 5  
b ≤ 2  
c ≤ t

Where, a and b are ignored when less than or equal 0.5. The numbers of pieces are set at up to 5 pieces.

(2) Corner crack

a ≤ 2.5  
b ≤ 2.5  
c ≤ t  
a + b ≤ 4

(3) Seal portion crack

The seal width × 1/3  
b ≤ t × 2/3  
c ≤ 5

The numbers of pieces are set at up to 5 pieces.

(4) ITO Pin crack

a ≤ 5  
b ≤ 1/3 pin length  
c ≤ t

(5) Progressive cracks

All taken to be unacceptable.
6. Outer dimensions
   Should be within the tolerance.

7. Newton ring (touch panel)
   Orbicular of interference fringes is not allowed in the optimum contrast within the active area under viewing angle.

8. Soldering
   Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mounting position, etc.

5–3 Dot Appearance Defect

<table>
<thead>
<tr>
<th>NO.</th>
<th>Item</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Plinhole</td>
<td>Dot display a and b are each $\leq 0.2\text{mm}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The overall total is taken be with in 10 units.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note that they are not to be concentrated.</td>
</tr>
<tr>
<td>2.</td>
<td>Missing</td>
<td>Dot display a and b are each $\leq 0.2\text{mm}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The overall total is taken to be with in 10 units.</td>
</tr>
<tr>
<td>3.</td>
<td>Thick and thin display</td>
<td>Taken to be within $\pm 1.5%$ of display character width(a) and height(b).</td>
</tr>
</tbody>
</table>
• SAFETY
  1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
  2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

• HANDLING
  1. Avoid static electricity which can damage the CMOS LSI.
  2. Do not remove the panel or frame from the module.
  3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
  5. Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

• STORAGE
  1. Store the panel or module in a dark place where the temperature is 25°C±5°C and the humidity is below 65% RH.
  2. Do not place the module near organics solvents or corrosive gases.
  3. Do not crush, shake, or jolt the module.

• TERMS OF WARRANT
  1. Acceptance inspection period
     The period is within one month after the arrival of contracted commodity at the buyer’s factory site.
  2. Applicable warrant period
     The period is within twelve months since the date of shipping out under normal using and storage conditions.
THE NOTES OF LCM USING

LCM is easy to damage.
Please follow the notes as bellows, and be careful of handling!

Correct handling

As above picture, please handle with glove by LCM edges and full EOS/ESD protection.

Incorrect handling

Please don’t touch IC directly.
Please don’t put one on another LCM.

Please don’t hold the surface of LCM.
Please don’t stretch interface of output.
THE NOTES OF LCD USING

LCD is easy damage.
Please follow notes as bellows, and be careful of handling!

Correct handling

As above picture, please handle with glove by LCD edges and full EOS/ESD protection.

Incorrect handling

Please don’t put one on another LCD.

Please don’t hold the surface of LCD.

Please don’t operate with sharp stick such as sharp pencil.

Please don’t touch ITO glass without anti-static gloves.
THE NOTES OF TOUCH PANEL USING

Touch Panel is easy to damage.
Please follow the notes as bellow, and be careful of handling!

Correct handling

As above picture, please handle with glove by Touch Panel edges and full EOS/ESD protection.

Incorrect handling

Please don’t operate with sharp stick such as sharp pencil.
Please keep with film surface in upper side.

Please don’t hold the surface of TTP.
Please don’t hold FPC, stretch FPC, or twist FPC.