SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LCBFBTB61M73S

SPEC. NO: LMB61-73A-Δ

<table>
<thead>
<tr>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
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<table>
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<th>APPROVED BY</th>
</tr>
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<table>
<thead>
<tr>
<th>DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
NAN YA PLASTICS CORPORATION
201, TUNG HWA N. ROAD, TAIPEI
TEL: 886-2-2712211 EXT. 5993~5995
FAX: 886-2-27178253
E-mail: lcdsales@npc.com.tw

EDITED ON: Jan. 02. 2006

<table>
<thead>
<tr>
<th>Q.C. DEPT.</th>
<th>DESIGN MANAGER</th>
<th>DESIGN CHECK</th>
<th>DESIGNER</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>W.R. HSU</td>
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</tbody>
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<table>
<thead>
<tr>
<th>DATE</th>
<th>REVISED NO.</th>
<th>REF. PAGE</th>
<th>SUMMARY</th>
<th>DESIGN</th>
<th>CHECK</th>
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<tr>
<td>01.02.06’</td>
<td>0</td>
<td>1~27/27</td>
<td>First Issue</td>
<td>W.R.HSU</td>
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## 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>LCBFBTB61M73S</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>Module Size</td>
<td>154.6 (W) x 114.8 (H) x 10.5 (D)</td>
<td>mm</td>
</tr>
<tr>
<td>3</td>
<td>Dot Size</td>
<td>0.10 (W) x 0.34 (H)</td>
<td>mm</td>
</tr>
<tr>
<td>4</td>
<td>Dot Pitch</td>
<td>0.12 (W) x 0.36 (H)</td>
<td>mm</td>
</tr>
<tr>
<td>5</td>
<td>Number of Dots</td>
<td>320 x RGB (W) x 240 (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, Color STN Module</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>Rear Polarizer</td>
<td>Color Transmissive Type</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
<td>Viewing Direction</td>
<td>6</td>
<td>O’clock</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>Included</td>
<td>–</td>
</tr>
<tr>
<td>13</td>
<td>Touch Panel</td>
<td>Included</td>
<td>–</td>
</tr>
<tr>
<td>14</td>
<td>Weight</td>
<td>230 (Approx.)</td>
<td>g</td>
</tr>
</tbody>
</table>

**Note:**

- **LCBFBTB61M73S**
- Option:
  - 73: Module Version Number
  - S: RoHS Compliance
- Mode/View Angle:
  - M: Color STN Module, 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>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>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>VI</td>
<td>−0.3</td>
<td>VDD</td>
<td>V</td>
</tr>
<tr>
<td>Contrast Adjust Voltage</td>
<td>VCON–VSS</td>
<td>1.5</td>
<td>2.5</td>
<td>V</td>
</tr>
<tr>
<td>Static Electricity</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 LCM

<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>Logic Circuit Power Supply</td>
<td>VDD–VSS</td>
<td>Ta= 25℃</td>
<td>4.5</td>
<td>5.0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>VIH</td>
<td>H level</td>
<td>0.8VDD</td>
<td>–</td>
<td>VDD</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>VIL</td>
<td>L level</td>
<td>0</td>
<td>–</td>
<td>0.2VDD</td>
<td>V</td>
</tr>
<tr>
<td>Contrast Adjust Voltage</td>
<td>VCON–VSS</td>
<td>Duty=1/240 Bias=1/13 VDD=3.3/5.0V</td>
<td>0℃</td>
<td>1.5</td>
<td>1.8</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50℃</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Current for Logic</td>
<td>IDD</td>
<td>VDD–VSS = 3.3V VCON–VSS = 1.8V Ta= 25℃</td>
<td>PATTERN:</td>
<td>–</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>IDD</td>
<td>VDD–VSS = 5.0V VCON–VSS = 1.8V Ta= 25℃</td>
<td>PATTERN:</td>
<td>–</td>
<td>80</td>
<td>120</td>
</tr>
<tr>
<td>LCM</td>
<td>Surface Luminance</td>
<td>L</td>
<td>PATTERN: (Dots All On of White Color)</td>
<td>70</td>
<td>110</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PATTERN: (Dots All Off)</td>
<td>–</td>
<td>7</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Recommended Frame Frequency for Optimum Contrast</td>
<td>FLM</td>
<td>–</td>
<td>115</td>
<td>120</td>
<td>125</td>
<td>Hz</td>
</tr>
</tbody>
</table>
### 3-2. ELECTRICAL CHARACTERISTICS OF BACKLIGHT

**Used Lamp Rating**

<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>VL</td>
<td>–</td>
<td>479</td>
<td>–</td>
<td>Vrms</td>
<td>–</td>
</tr>
<tr>
<td>Lamp current</td>
<td>IL</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>mA</td>
<td>–</td>
</tr>
<tr>
<td>Lamp power consumption</td>
<td>PL</td>
<td>–</td>
<td>2.4</td>
<td>–</td>
<td>W</td>
<td>(*1)</td>
</tr>
<tr>
<td>Starting voltage</td>
<td>Vs</td>
<td>–</td>
<td>–</td>
<td>730</td>
<td>Vrms</td>
<td>Ta=25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–</td>
<td>–</td>
<td>1010</td>
<td>Vrms</td>
<td>Ta=0°C</td>
</tr>
<tr>
<td>Lamp life time</td>
<td>LL</td>
<td>40000</td>
<td>–</td>
<td>–</td>
<td>hrs</td>
<td>at IL = 5 mA, 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 TAD250

3–3–1 GENERAL SPECIFICATIONS
OPERATION TEMPERATURE: 00°C~50°C
STORAGE TEMPERATURE: −20°C~80°C
DIMENSION: 95.0(L)mm x 19.5(W)mm x MAX 8.8(H)mm

3–3–2 PIN ASSIGNMENTS

**INPUT (CP1) CONNECTOR:**
MOLEX 53261–0590

<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>
<tr>
<td>3</td>
<td>Vrmt ON/OFF CONTROL</td>
</tr>
<tr>
<td>4</td>
<td>Vctrl</td>
</tr>
<tr>
<td>5</td>
<td>N.C</td>
</tr>
</tbody>
</table>

**OUTPUT (CP2) CONNECTOR:**
MITSUMI M60–04–30–134P

<table>
<thead>
<tr>
<th>NO.</th>
<th>FUNCTION</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>RTN</td>
</tr>
<tr>
<td>2</td>
<td>N.C</td>
</tr>
<tr>
<td>3</td>
<td>N.C</td>
</tr>
<tr>
<td>4</td>
<td>HV</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>10</td>
<td>12</td>
<td>15</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Control Terminal Input Voltage</td>
<td>Vrmt</td>
<td>3.5</td>
<td>5</td>
<td>10</td>
<td>V</td>
<td>ON State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>−0.5</td>
<td>0</td>
<td>0.4</td>
<td>V</td>
<td>OFF State</td>
</tr>
<tr>
<td>Tube Current Control Voltage</td>
<td>Vctrl</td>
<td>−</td>
<td>1.2</td>
<td>−</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Tube Current</td>
<td>IL</td>
<td>−</td>
<td>5</td>
<td>−</td>
<td>mA</td>
<td></td>
</tr>
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</table>
3-4. CHARACTERISTICS OF TOUCH PANEL

<table>
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<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>Applied Rating Voltage</td>
<td>$V_R$</td>
<td></td>
<td>$-$</td>
<td>$-$</td>
<td>7.0</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>$T_{OPR}$</td>
<td>20%~85% R.H. Max. Avoid Dew Condensation at Any Time</td>
<td>$-5$</td>
<td>$-$</td>
<td>60</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{STO}$</td>
<td></td>
<td>$-30$</td>
<td>$-$</td>
<td>70</td>
<td>°C</td>
</tr>
<tr>
<td>Resistance of Terminal Electrodes</td>
<td>$R_{ELE}$</td>
<td>X Electrode</td>
<td>300</td>
<td>$-$</td>
<td>900</td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y Electrode</td>
<td>200</td>
<td>$-$</td>
<td>600</td>
<td>Ω</td>
</tr>
<tr>
<td>Linearity</td>
<td>$L$</td>
<td></td>
<td>$-$</td>
<td>$-$</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>$R_{OFF}$</td>
<td>$V_{DC}=25V$</td>
<td>10</td>
<td>$-$</td>
<td>$-$</td>
<td>MΩ</td>
</tr>
<tr>
<td>Transparency</td>
<td>$T$</td>
<td>According to JIS-K7015</td>
<td>$-$</td>
<td>80</td>
<td>$-$</td>
<td>%</td>
</tr>
<tr>
<td>Surface Hardness</td>
<td>$S_H$</td>
<td>According to JIS-K5400</td>
<td>3</td>
<td>$-$</td>
<td>$-$</td>
<td>H</td>
</tr>
</tbody>
</table>

Test condition: Touch panel is placed horizontally in a vessel and no power is supplied to T/P. Normal state is temperature: 25±10°C, relative humidity: 60±25%
### 4. OPTICAL CHARACTERISTICS

#### 4-1. Optical Char. of Normal Temp. Mode

<table>
<thead>
<tr>
<th>ITEM</th>
<th>At Vᵦ</th>
<th>Cr (Contrast Ratio)</th>
<th>θ (Viewing Angle)</th>
<th>Θ (Viewing Angle)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0°C</td>
<td>25°C</td>
<td>50°C</td>
<td>25°C</td>
</tr>
<tr>
<td>MODE</td>
<td>MIN.</td>
<td>TYP.</td>
<td>MIN.</td>
<td>TYP.</td>
</tr>
<tr>
<td>T</td>
<td>14</td>
<td>17</td>
<td>25</td>
<td>3.5</td>
</tr>
<tr>
<td>M</td>
<td>20</td>
<td>14</td>
<td>25</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**NOTE:**
- T: Transmissive
- M: Color STN Module, 6 O’clock

**At θ = 0°, θ = 0°**

<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°C</td>
<td>640</td>
<td>800</td>
<td>1200</td>
<td>ms</td>
<td>NOTE 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25°C</td>
<td>240</td>
<td>300</td>
<td>450</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50°C</td>
<td>80</td>
<td>100</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time (fall)</td>
<td>Tf</td>
<td>0°C</td>
<td>360</td>
<td>450</td>
<td>670</td>
<td>ms</td>
<td>NOTE 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25°C</td>
<td>80</td>
<td>100</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50°C</td>
<td>48</td>
<td>60</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4–2. Color of CIE Coordinate

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SYMBOL</th>
<th>CONDITION</th>
<th>VALUE</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>x</td>
<td>θ=0°, θ=0°</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>y</td>
<td></td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>x</td>
<td>θ=0°, θ=0°</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>y</td>
<td></td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>x</td>
<td>θ=0°, θ=0°</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>y</td>
<td></td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>x</td>
<td>θ=0°, θ=0°</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>y</td>
<td></td>
<td>0.32</td>
<td></td>
</tr>
</tbody>
</table>

Note: Measuring at position 3 on Fig.1
CIE chromaticity diagram

Ta = 25°C

Tolerance: ±0.05

---

**Fig.1**

![CIE chromaticity diagram](image_url)
(NOTE 1)
Definition of Operation Voltage($V_{op}$)

![Graph showing the definition of Operation Voltage](image)

(positive type)

*Conditions
- Viewing Angle: 0
- Frame Frequency: 120Hz
- Applying Waveform: $1/N$ duty 1/a bias

(negative type)

(Note 2)
Definition of Response Time($Tr, Tf$)

![Graph showing the definition of Response Time](image)

(positive type)

*Conditions
- Operating Voltage: $V_{op}$
- Viewing Angle ($\theta, \phi$): (0,0)
- Frame Frequency: 120Hz
- Applying Waveform: $1/N$ duty 1/a bias

(Note 3)
Description of Measuring Equipment and Driving Waveforms

![Diagram of measuring equipment and driving waveforms](image)
(NOTE 4)
Definition of Viewing Direction

(NOTE 5)
Definition of Viewing Angle

(NOTE 6)
Definition of Contrast Ratio (Cr)

*For This Product
The Viewing Direction is 6 O’clock
So \( \theta_1 > \theta_2 \)

\[ \theta = \theta_1 + \theta_2 \]

*Conditions
- Operating Voltage: \( V_{op} \)
- Frame Frequency: 120Hz
- Applying Waveform: 1/N duty 1/a bias
- Contrast Ratio: larger than 2

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

(negative type)

*Conditions
- Viewing Angle: 0
- Frame Frequency: 120Hz
- Applying Waveform: 1/N duty 1/a bias
5. BLOCK DIAGRAM

LCD

1 FRM -> ROW Driver x 2

2 LOAD
4 DISP

3 CP

8~15
D7~DO

LOAD

M Circuit

240 -> 320 X R.G.B. X 240 dots

960

Column Driver x 4

7 VCON

DC/DC Circuit (Included Temp. Compensation)

Bias Circuit

To LSI

6 VSS

5 VDD

To LSI Logic

CCFL

1 HV -> CCFL Backlight

2 NC

3 GND

REV/DATE: RO/01.02.06
BY: W.R.HSU
# 6. INTERNAL PIN CONNECTION

## LCD

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Function</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FRM</td>
<td>Synchronous signal for driving scanning line</td>
<td>H</td>
</tr>
<tr>
<td>2</td>
<td>LOAD</td>
<td>Data signal latch clock</td>
<td>H → L</td>
</tr>
<tr>
<td>3</td>
<td>CP</td>
<td>Data signal shift clock</td>
<td>H → L</td>
</tr>
<tr>
<td>4</td>
<td>DISP</td>
<td>Display control signal</td>
<td>H(ON), L(OFF)</td>
</tr>
<tr>
<td>5</td>
<td>VDD</td>
<td>Power supply for logic</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>VSS</td>
<td>GND</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>VCON</td>
<td>Power supply for LCD</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>D7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>D6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>D5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>D4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>D3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>D2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>D1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>D0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CN1 : 53261–1571 (Molex)
Recommended Matching Connector : 51021–1500(Molex) or Compatible

## CCFL

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Function</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HV</td>
<td>Power supply for CFL</td>
<td>AC</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Display data</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Ground line (from inverter)</td>
<td>–</td>
</tr>
</tbody>
</table>

CN2 : BHR-03VS-1 (JST)
Recommended Matching Connector : SM02–(8.0)B–BHS–1(JST) or Compatible

## TOUCH SCREEN

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Level</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DOWN</td>
<td>–</td>
<td>Down Direction</td>
</tr>
<tr>
<td>2</td>
<td>LEFT</td>
<td>–</td>
<td>Left Direction</td>
</tr>
<tr>
<td>3</td>
<td>UP</td>
<td>–</td>
<td>Up Direction</td>
</tr>
<tr>
<td>4</td>
<td>RIGHT</td>
<td>–</td>
<td>Right Direction</td>
</tr>
</tbody>
</table>

TOUCH SCREEN CABLE :
N4, Pitch 1.0mm (Thickness = 0.3 mm)
7. POWER SUPPLY

LCM

VDD

PCB

VSS

VCON

1.5V~2.5V (TYP.1.8V)

+3.3v/+5v
POWER SUPPLY (LOGIC)

5mA

HV

CCFL
Backlight

GND

(CP2)

4

3

2

(CP1)

1

(CDK TAD250)

1

2

3

4

5

Vin=12V

GND=0V

Vrm=5V

Vctrl=1.2V
(Recommended Value)
8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOCK PULSE CYCLE TIME</td>
<td>twck</td>
<td>66/40</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CLOCK PULSE HIGH LEVEL WIDTH</td>
<td>twckh</td>
<td>23/12</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CLOCK PULSE LOW LEVEL WIDTH</td>
<td>twckl</td>
<td>23/14</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>LATCH PULSE HIGH LEVEL WIDTH</td>
<td>twlph</td>
<td>30/15</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CP→LOAD RISE TIME</td>
<td>tld</td>
<td>10/5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CP→LOAD FALL TIME</td>
<td>tsl</td>
<td>30/25</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>LOAD→CP RISE TIME</td>
<td>tls</td>
<td>30/25</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>LOAD→CP FALL TIME</td>
<td>tlu</td>
<td>30/25</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CLOCK PULSE RISE/FALL TIME</td>
<td>tr, tr</td>
<td>-</td>
<td>50</td>
<td>ns</td>
</tr>
<tr>
<td>DATA SETUP TIME</td>
<td>tds</td>
<td>10/5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>DATA HOLD TIME</td>
<td>tdh</td>
<td>25/15</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>DISP LOW LEVEL WIDTH</td>
<td>twdl</td>
<td>1.2</td>
<td>-</td>
<td>μs</td>
</tr>
<tr>
<td>DISP CANCELLATION TIME</td>
<td>tsd</td>
<td>100</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>FRM SETUP TIME</td>
<td>tsu</td>
<td>30</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>FRM HOLD TIME</td>
<td>th</td>
<td>50</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

VDD = 3.3/5.0V ± 10%

---

**Diagram**

- **LOAD**
- **CP**
- **D7~D0**
- **DISP**
- **FRM**

---

**REV/DATE**

- **R0/01.02.06**

**BY**

- W.R.HSU
8-2. TIMING CHART

CP

D7 G318
D6 B318
D5 R319
D4 G319
D3 B319
D2 R320
D1 G320
D0 B320

R1
R4
R7
R2
R5
R8
R3
R6

B3
B6
B9
B4
B7
B10
B5
B8

G6
G9
G12
G7
G10
G13
G8
G11

R11
R14
R17
R10
R13
R16
R19
R12

G14
G17
G20
G15
G18
G21
G16
G19

R19
R20
R21
R20
R21
R20
R21
R20

G318
G319
G320
G320
G319
G319
G319
G319

FRM

CP(320X3)/B Pulse

LOAD (Reduction)

FRM (Reduction)

Y1

Y2

Y240

Y1

REV/DATE RO 01.02.06

BY W.R.HSU
8–3. POWER ON/OFF TIMING

The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.
### Display Pattern

<table>
<thead>
<tr>
<th>X1</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
<th></th>
<th>Y318</th>
<th></th>
<th>Y319</th>
<th></th>
<th>Y320</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X2</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
<th></th>
<th>Y318</th>
<th></th>
<th>Y319</th>
<th></th>
<th>Y320</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X239</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
<th></th>
<th>Y318</th>
<th></th>
<th>Y319</th>
<th></th>
<th>Y320</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X240</th>
<th>Y1</th>
<th>Y2</th>
<th>Y3</th>
<th></th>
<th>Y318</th>
<th></th>
<th>Y319</th>
<th></th>
<th>Y320</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
<tr>
<td></td>
<td>R1</td>
<td>G1</td>
<td>B1</td>
<td>D7</td>
<td>D6</td>
<td>D5</td>
<td>R2</td>
<td>D4</td>
<td>G2</td>
<td>D3</td>
</tr>
</tbody>
</table>

Rev/Date: R0/01.02.06
By: W.R. HSU
# 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. Storage</td>
<td>50°C/90%RH</td>
<td>120Hrs</td>
<td>Appearance without defect</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 to 70°C, 30min (1 cycle)</td>
<td>Appearance without defect</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 component parts]

4. Outgoing Inspection

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

4-2 Inspection Standard

<table>
<thead>
<tr>
<th>Major Defect</th>
<th>Item</th>
<th>AQL(%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dots</td>
<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></td>
<td>Shorts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erroneous operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solder appearance</td>
<td>Shorts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cracks</td>
<td>Display surface cracks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touch Panel contact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Defect</td>
<td>Touch Panel linearity</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>External from Dimensions</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Inside the glass</td>
<td>Black spots</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Polarizing plate</td>
<td>Scratches, foreign Matter, air bubbles, and peeling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dots</td>
<td>Pinhole, deformation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color tone</td>
<td>Color unevenness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solder appearance</td>
<td>Cold solder</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solder projections</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4–3 Inspection Provisions

*Viewing Area Definition

Fig. 1

A : Zone Viewing Area
B : Zone Glass Plate Outline

*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 sample to be 30cm to 50cm.
*Test and measurement are performed under the following conditions, unless otherwise specified.

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

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

- Temperature: 20±2°C
- Humidity: 65±5%R.H.
- Pressure: 860~1060hPa(mmbar)

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>Touch Panel contact resistance</td>
<td>Within Specified value</td>
</tr>
<tr>
<td>7</td>
<td>Touch Panel input load</td>
<td>Within Specified value</td>
</tr>
<tr>
<td>8</td>
<td>Touch Panel linearity</td>
<td>Within Specified value</td>
</tr>
<tr>
<td>9</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 ≤ 0.2</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 ≤ 0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.4 &lt; D</td>
</tr>
</tbody>
</table>

Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2

(1)-2-Blurred Spots (At lighting condition)

<table>
<thead>
<tr>
<th>Average Diameter(mm): D</th>
<th>Number of pieces permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>D ≤ 0.3</td>
<td>Ignore</td>
</tr>
<tr>
<td>0.3 &lt; D ≤ 0.75</td>
<td>5</td>
</tr>
<tr>
<td>0.75 &lt; D</td>
<td>0</td>
</tr>
</tbody>
</table>

Number of total pieces is set to within 5 pieces.

Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2
### 1 Line

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

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

### 3 Scratches (Glass, reflection plates, and polarizing plates)

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

### Color irregular

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

<table>
<thead>
<tr>
<th>Diameter (mm): D</th>
<th>Average Diameter</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>0</td>
<td></td>
</tr>
<tr>
<td>0.3 &lt; D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### Cracks

1. **General crack**
   - $a \leq 5$
   - $b \leq 2$
   - $c \leq 1$
   Where, $a$ and $b$ are ignored when less than or equal to 0.5
   The numbers of pieces are set at up to 5 pieces.

2. **Corner crack**
   - $a \leq 2.5$
   - $b \leq 2.5$
   - $c \leq 1$
   - $a + b \leq 4$

3. **Seal portion crack**
   - $a \leq \text{the seal width} \times 1/3$
   - $b \leq \text{the seal width} \times 2/3$
   - $c \leq 5$
   The numbers of pieces are set at up to 5 pieces.

4. **ITO Pin crack**
   - $a \leq 5$
   - $b \leq 1/3 \text{ pin length}$
   - $c \leq 1$

5. **Progressive cracks**
   - All taken to be unacceptable.
<table>
<thead>
<tr>
<th>NO.</th>
<th>Item</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Outer dimensions</td>
<td>Should be within the tolerance.</td>
</tr>
<tr>
<td>7</td>
<td>Newton ring(touch panel)</td>
<td>Orbicular of interference fringes is not allowed in the optimum contrast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>within the active area under viewing angle.</td>
</tr>
<tr>
<td>8</td>
<td>Soldering</td>
<td>Should be no defective soldering such as shorting, loose terminal cold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>solder, peeling of printed circuit board pattern, improper mounting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>position, etc.</td>
</tr>
</tbody>
</table>

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>Pinhole</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 within 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 within 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>
NOTICE:

- 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 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 bellows, 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.