A Brighter Solution

# AMP DISPLAY INC.

## SPECIFICATIONS

## 5.7-in COLOR TFT MODULE W/ TOUCH

| | |
|---|---|
| CUSTOMER: | |
| CUSTOMER PART NO. | |
| AMP DISPLAY PART NO. | A M - 3 2 0 2 4 0 N T M C W - T 3 0 H - ( R ) |
| APPROVED BY: | |
| DATE: | |

☐ APPROVED FOR SPECIFICATIONS

☐ APPROVED FOR SPECIFICATION AND PROTOTYPES

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# RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---|---|---|---|
| 2006/11/23 | - | New Release | Kokai |
| 2007/7/18 | 9 | Modify LCD Viewing Angle | Edward |

# 1 Features

5.7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 5.7" TFT-LCD panel, a driver circuit, a touch panel, and backlight unit.

(1) Construction: 5.7" a-Si color TFT-LCD, White CCFL Backlight, Touch panel, and PCB.
(2) Resolution (pixel): 320(R.G.B) X240
(3) Number of the Colors : 262K colors ( R , G , B 6 bit digital each)
(4) LCD type : Transmissive Color TFT LCD ( normally White)
(5) Interface: 40 pin
(6) Power Supply Voltage: 3.3V single power input. Built-in power supply circuit.
(7) Viewing Direction: 6 O'clock ( The direction it's hard to be discolored )
(8) DE only mode timing support.

# 2 Physical specifications

| Item | Specifications | Unit | |
|---|---|---|---|
| Display resolution(dot) | 960 (W) x 240(H) | mm | |
| Active area | 115.2 (W) x 86.4 (H) | mm | |
| Screen size | 5.7(Diagonal) | mm | |
| Pixel size | 120 (W) x 360 (H) | um | |
| Color configuration | R.G.B stripe | | |
| Overall dimension | 131.0(W)x102.2(H)x12.4(D) | mm | |
| Weight | T.B.D | mg | |
| Backlight unit | CCFL | | |

# 3 Electrical specification

## 3.1 Absolute max. ratings

### 3.1.1 Electrical Absolute max. ratings

| Item | Symbol | Condition | Min. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Power voltage | VDD | VSS=0 | -0.3 | 6.0 | V | |
| Input voltege | $V_{in}$ | | -0.3 | VDD+0.3 | V | Note 1 |

Note1: DEN, DCLK, R0~R5, G0~G5, B0~B5

### 3.1.2 Environmental Absolute max. ratings

| Item | OPERATING | | STORAGE | | Remark |
|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | |
| Temperature | -20 | 70 | -30 | 80 | Note2,3,4,5,6,7,8 |
| Humidity | Note1 | | Note1 | | |
| Corrosive Gas | Not Acceptable | | Not Acceptable | | |

Note1 : Ta <= 40℃ : 85% RH max

Ta > 40℃ : Absolute humidity must be lower than the humidity of 85%RH at 40℃

Note2 : For storage condition Ta at -30℃ < 48h , at 80℃ < 100h

For operating condition Ta at -20℃ < 100h

Note3 : Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note4 : The response time will be slower at low temperature.

Note5 : Only operation is guarantied at operating temperature. Contrast , response time, another display quality are evaluated at +25℃

Note6 : When LCM is operated over 60℃ ambient temperature, the $I_L$ of the CCFL back-light should be adjusted to 3mA max

Note7 : This is panel surface temperature, not ambient temperature.

Note8 : When LCM be operated less than 0℃ , the life time of the CCFL back-light will be reduced. The rise time of the CCFL ON will be longer when the ambient temperature below 0℃ and confirm the characteristics of inverter is nessary.

### 3.1.3 CCFL back-light Unit Absolute max. ratings

| Item | Symbol | Min | Max | Unit | Remark |
|---|---|---|---|---|---|
| Lamp Current | IL | - | 7.0 | mArms | Note 1 |
| Lamp Voltage | VL | - | 2000 | Vrms | Note 2 |

Note1 : Please put your meter at GND cable to measurement.

Note2 : Apply to the connector of the back-light unit.

## 3.2 Electrical characteristics

### 3.2.1 DC Electrical characteristic of the LCD

Typical operting conditions (VSS=0V)

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Power supply | | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input Voltage for logic | H Level | $V_{IH}$ | 0.7 VDD | - | VDD | V | Note 1 |
| | L Level | $V_{IL}$ | 0 | - | 0.3 VDD | V | |
| Power Supply current | | IDD | | 45 | 55 | mA | Note 2 |

Note1: DEN, DCLK, R0~R5, G0~G5, B0~B5

Note2: fv =60Hz , Ta=25℃ , Display pattern : All Black

### 3.2.2 Electrical characteristic of Back-light

| Paramenter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Lamp voltage | $V_L$ | - | 650 | - | Vrms | |
| Lamp current | $I_L$ | 2.5 | 6.0 | 6.5 | mArms | Note7,8 |
| Frequency | $F_L$ | | 55 | | KHz | Note 4 |
| Lamp starting voltage | Vs | - | - | 1300 | Vrms | Note1,5 |
| | | - | - | 1450 | Vrms | Note2,5 |
| | | - | - | 1600 | Vrms | Note3,5 |
| Lamp life time | | - | 30,000 | - | Hr | Note 6 |

( )For reference only. These data should be update according the prototype.

Note 1:Ta=25℃

Note 2:Ta=0℃

Note 3:Ta=-20℃

Note 4:The lamp frequency should be selected as different as possible from display horizontal synchronous signal to avoid interference.

Note 5: For starting the backlight unit, the output voltage of DC/AC's transformer Should be larger than the maximum lamp starting voltage.

Note 6:The " Lamp life time" is defined as the module brightness decrease to 50% Original brightness at Ta=25℃, $I_L$=6mA.

Note 7: Measurement of IL is provided for GND side of the CFL.

Note 8: When $I_L$ is over 6.0mA,it may cause uneven contrast near CFL location, due to heat dispersion from CFL.

### 3.3 AC Timing characteristic of the LCD

**a. Timing condition**

| Signal | Parameter | | Symbol | Min. | Typ. | Max. | Unit. | Remark |
|---|---|---|---|---|---|---|---|---|
| DCLK | DCLK period | | TOSC | - | 156 | - | ns | |
| | Frequency | | FOSC | - | 6.4 | - | MHz | |
| | DCLK High plus width | | TCH | - | 78 | - | ns | |
| | DCLK Low plus width | | TCL | - | 78 | - | ns | |
| RGB DATA | Data setup time | | TSU | 12 | - | - | ns | |
| | Data hold time | | THD | 12 | - | - | ns | |
| Hsync | Hsync period | | TH | - | 408 | - | TOSC | |
| | Hsync pulse width | | THS | 5 | 30 | - | TOSC | |
| | Back-Parch | | THB | | 38 | | TOSC | |
| | Front-Parch | | THF | | 20 | | TOSC | |
| | Hsync rising time | | TCr | - | - | 700 | ns | |
| | Hsync falling time | | TCf | - | - | 300 | ns | |
| Vsync | Vsync period | NTSC | | - | 262.5 | - | TH | |
| | | PAL | | - | 312.5 | - | TH | |
| | Vsync pulse width | | TVS | 1 | 3 | 5 | TH | |
| | Back-Porch | NTSC | TVB | | 15 | | TH | |
| | | PAL | | | 23 | | TH | |
| | Display Period | | TVD | | 240 | | TH | |
| | Front Porch | NTSC | TVF | | 4.5 | | TH | |
| | | PAL | | | 46.5 | | TH | |
| | Vsync rising time | | TVr | - | - | 700 | ns | |
| | Vsync falling time | | TVf | - | - | 1.5 | μs | |
| | Vsync falling to Hsync rising time for odd field | | THVO | 1 | - | - | TOSC | |
| | Vsync falling to Hsync falling time for even field | | THVE | 1 | - | - | TOSC | |
| DEN | Vsync-DEN time | NTSC | TVSE | - | 18 | - | TH | |
| | | PAL | TVSE | - | 26 | - | TH | |
| | Hsync-DEN time | | THE | 36 | 68 | 88 | TOSC | |
| | DEN plus width | | TEP | - | 320 | - | TOSC | |

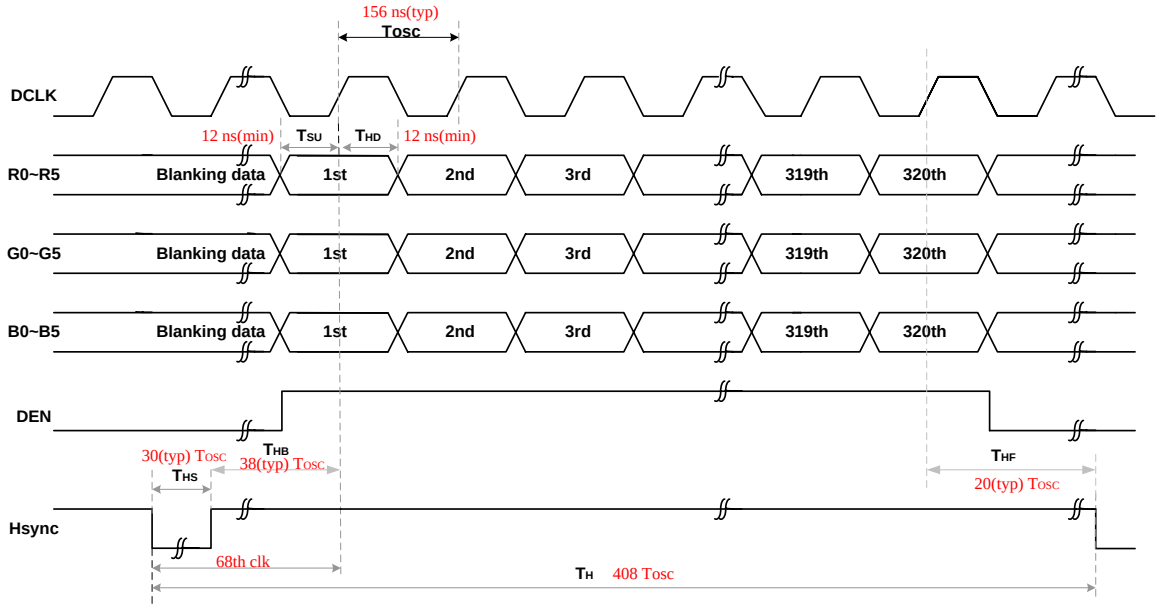
Note 1: DEN is definition of above timing for Hsync and Vsync.

Note 2: No metter when Hsync and Vsync is inputted, the LCM can be drove only DEN Signal. DEN should be set to low level when it is not input.

Note 3: The Dummy Enable is needed in the end of frame. Please set the LCD controller timing to 241 lines.

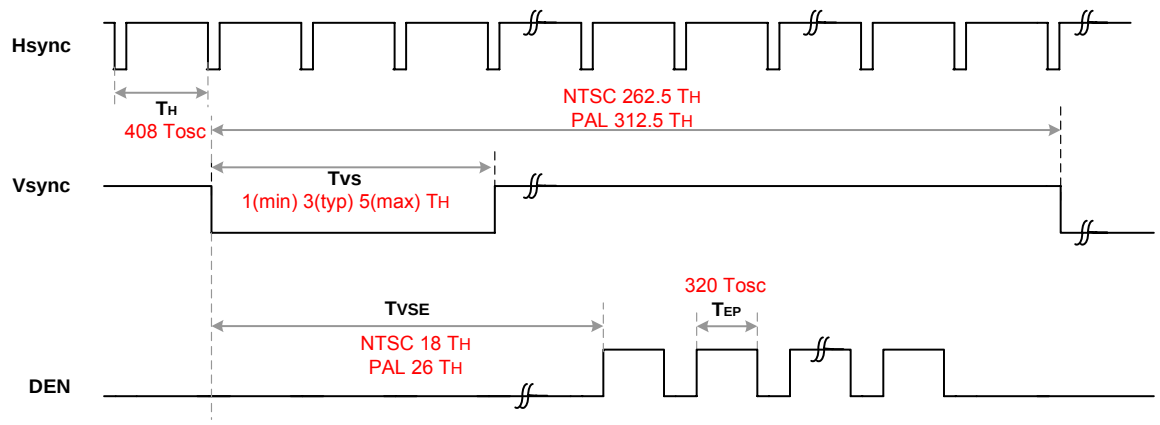
- Horizontal display timing

Note: Data is latched rising edge trigger of CLK.

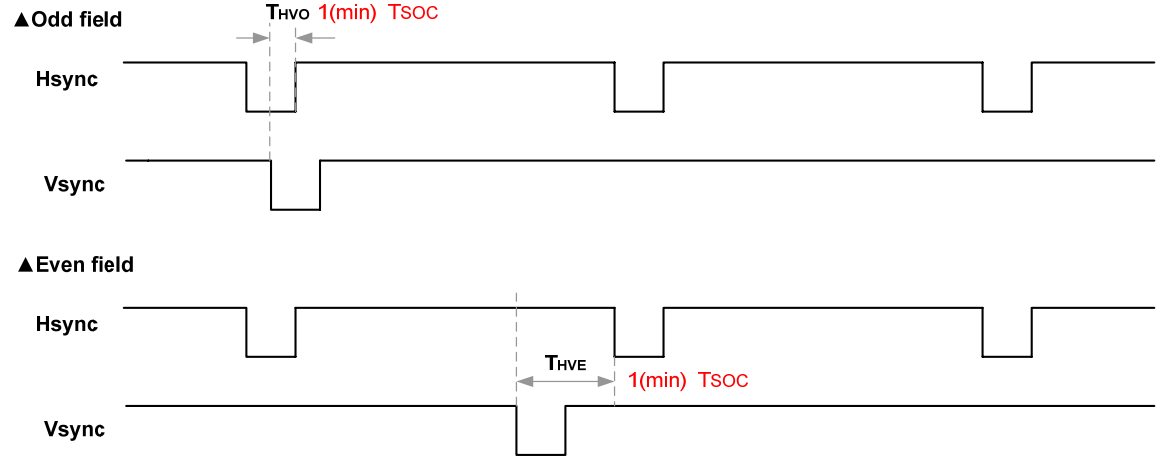


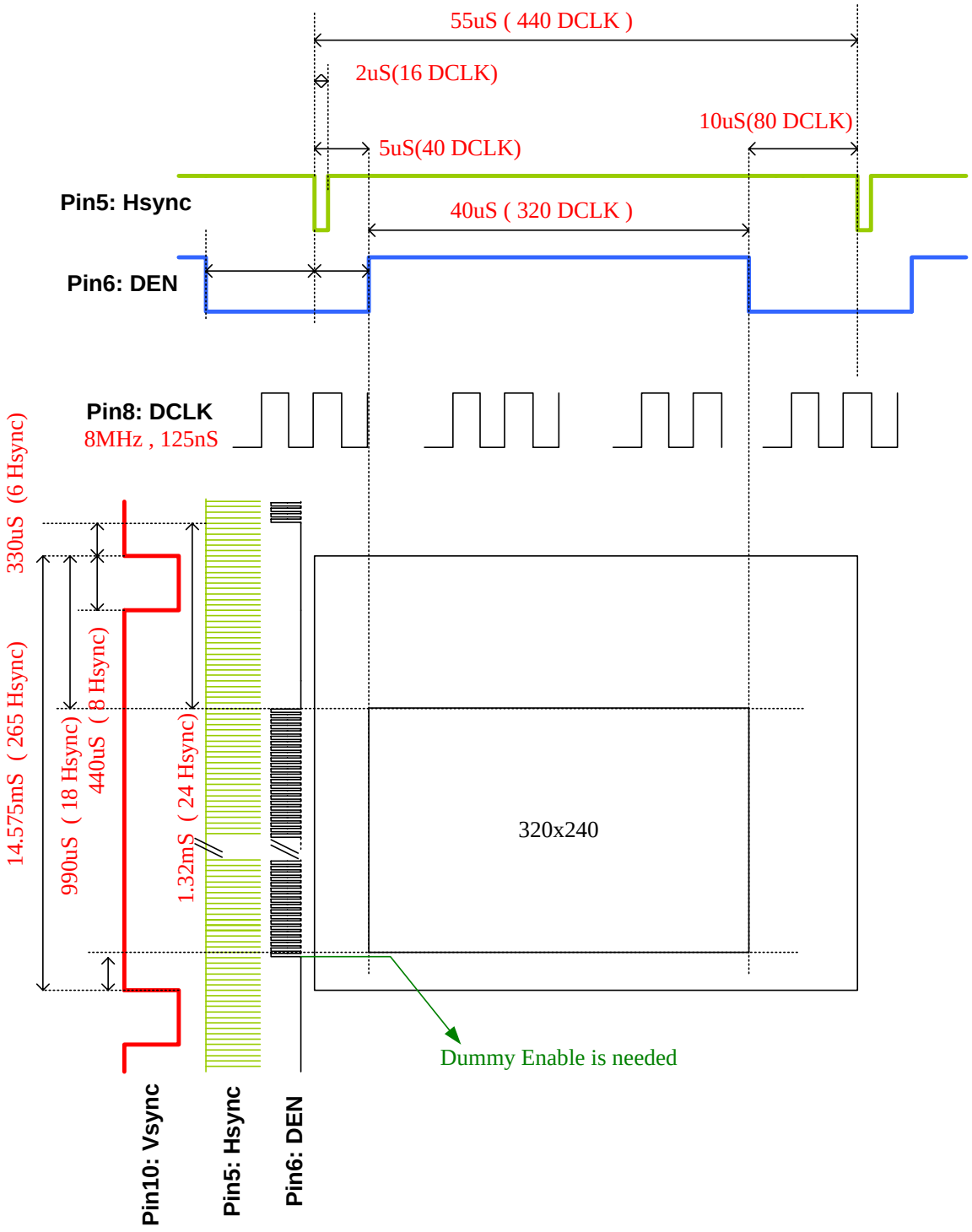

If DEN is fixed to low, the SYNC mode is used. Otherwise DE mode is used.
When SYNC mode is used, 1st data start from 68th CLK after Hsync falling

- Vertical display timing




- Hsync and Vsync timing




55uS ( 440 DCLK )
2uS(16 DCLK)
10uS(80 DCLK)
5uS(40 DCLK)
Pin5: Hsync
40uS ( 320 DCLK )
Pin6: DEN
Pin8: DCLK
8MHz , 125nS
330uS (6 Hsync)
14.575mS ( 265 Hsync)
990uS ( 18 Hsync)
440uS ( 8 Hsync)
1.32mS ( 24 Hsync)
320x240
Dummy Enable is needed
Pin10: Vsync
Pin5: Hsync
Pin6: DEN

# 4 Optical specification

## 4.1 Optical characteristic of the LCD

| Item | | Symbol | Conditon | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Response Time | Rise<br>Fall | $T_r$<br>$T_f$ | Θ=0° | -<br>- | 15<br>35 | 30<br>50 | ms<br>ms | Note 1,2,3,5 |
| Contrast ratio | | CR | At optimized viewing angle | 247 | 270 | - | | Note 1,2,4,5 |
| Viewing Angle | Top<br>Bottom<br>Left<br>Right | | CR≧10 | 55<br>45<br>55<br>55 | 60<br>50<br>60<br>60 | -<br>-<br>-<br>- | deg. | Note1,2, 5,6 |
| Brightness | | $Y_L$ | $I_L$=6mA,25℃ | 240 | 262 | - | cd/m² | Note 7 |
| Red chromaticity | | $X_R$ | Θ=0°<br>Θ=0° | 0.610 | 0.640 | 0.670 | | Note 7<br>For reference only. These data should be update according the prototype. |
| | | $Y_R$ | | 0.314 | 0.344 | 0.374 | | |
| Green chromaticity | | $X_G$ | | 0.268 | 0.298 | 0.328 | | |
| | | $Y_G$ | | 0.553 | 0.583 | 0.613 | | |
| Blue chromaticity | | $X_B$ | | 0.102 | 0.132 | 0.162 | | |
| | | $Y_B$ | | 0.107 | 0.137 | 0.167 | | |
| White chromaticity | | $X_W$ | | 0.282 | 0.312 | 0.342 | | |
| | | $Y_W$ | | 0.299 | 0.329 | 0.359 | | |

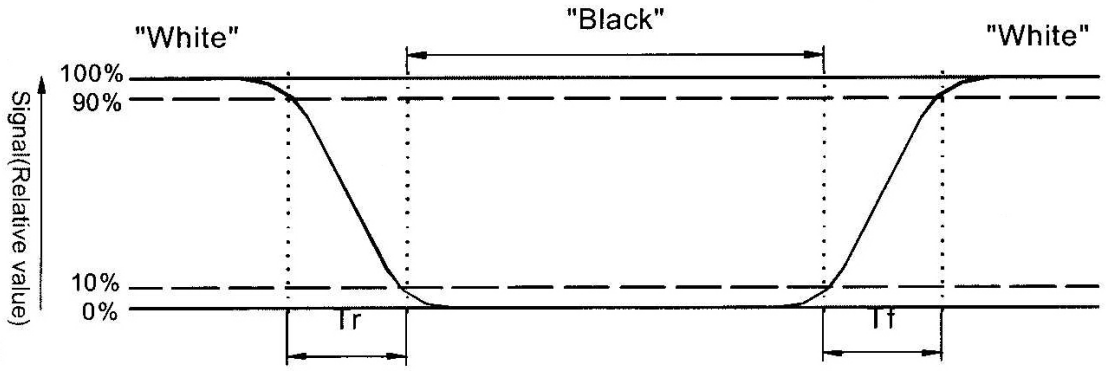
( )For reference only. These data should be update according the prototype.

Note 1:Ambient temperature=25℃,and lamp current $I_L$=6 mArms.To be measured in the dark room.

Note 2:To be measured on the center area of panel with a viewing cone of 1°by Topcon luminance meter BM-7,after 10 minutes operation.

Note 3.Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black“ to “white”(falling time) and from”white” to “black” (rising time),respectively.The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



Note 4.Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note 5:White $V_i=V_{i50}$ +1.5V

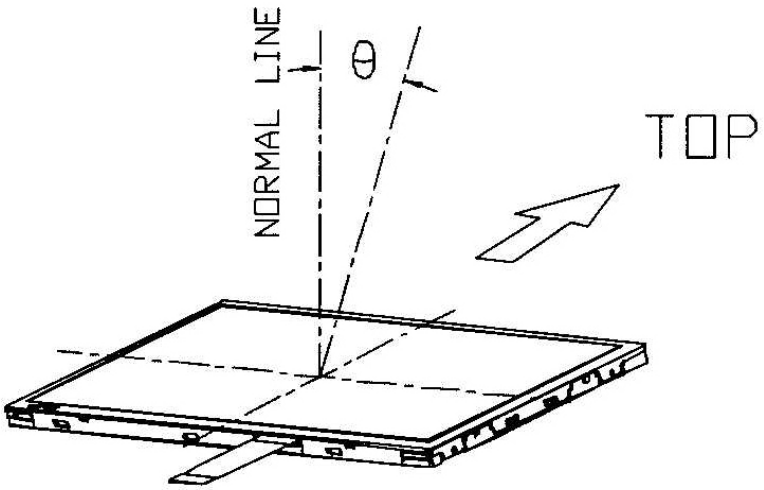
Black $V_i=V_{i50}$ +2.0V

"±"means that the analog input signal swings in phase with $V_{COM}$ signal.

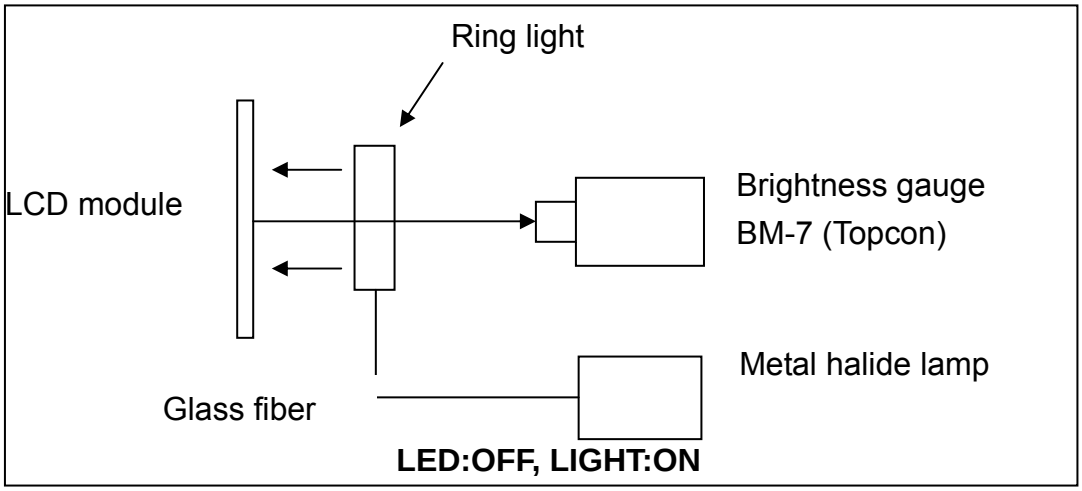
"$\frac{-}{+}$ " means that the analog input signal swings out of phase with $V_{COM}$ signal.

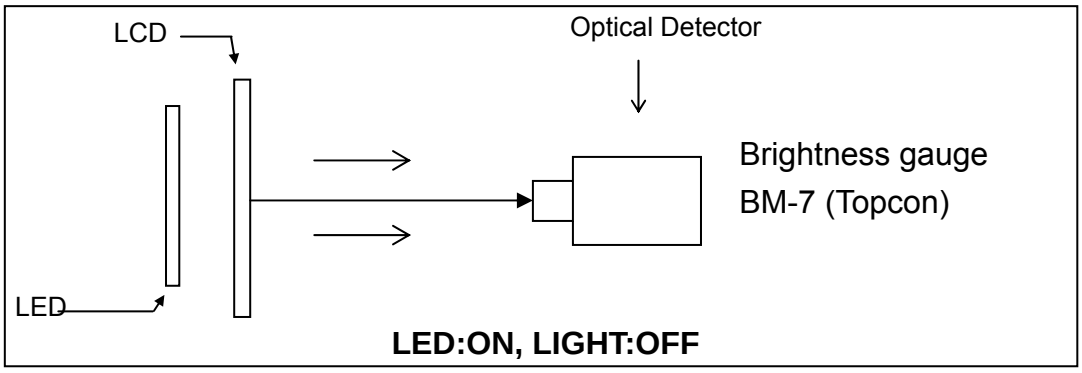
$V_{i50}$ : The analog input voltage when transmission is 50%.The 100% Transmission is defined as the transmission of LCD panel when all the Input terminals of module are electrically opened.

Note 6.Definition of viewing angle,Refer to figure as below.



Note 7.Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



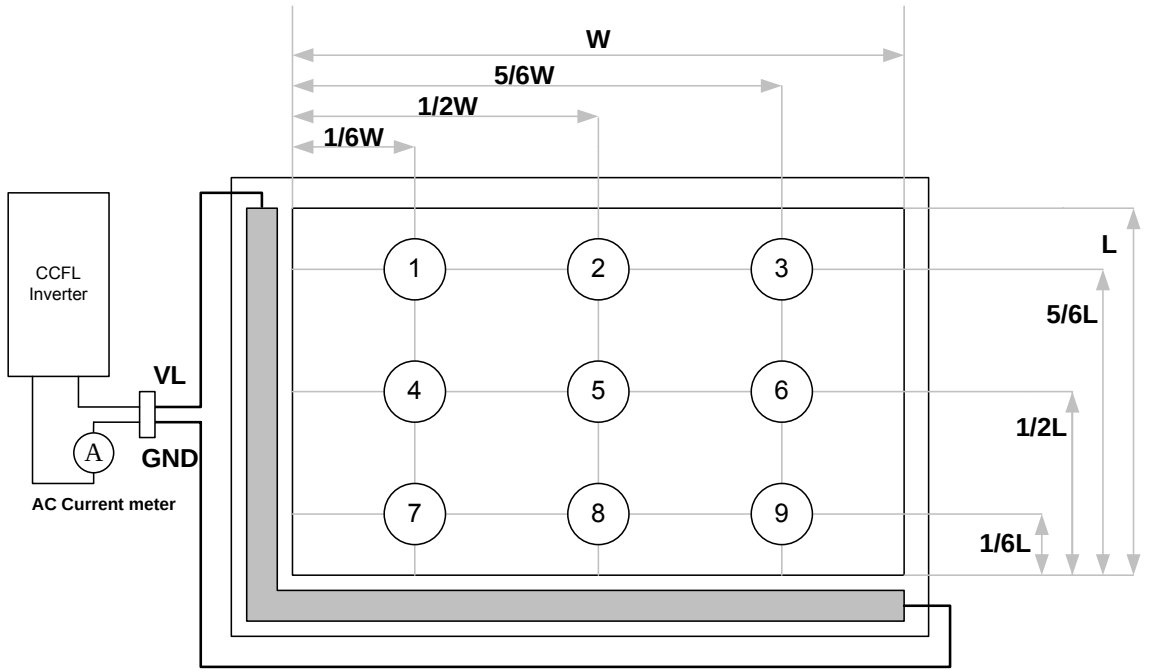
### 4.2 Optical characteristic of the Back-light

| ITEM | MIN | TYP | MAX | UNIT | NOTE |
|---|---|---|---|---|---|
| Bare Brightness | 4000 | 4500 | | Cd/m2 | IL=6.0 mA (Note 1) |
| Rise Time | - | 3 | - | Minute | IL=6.0 mA Brightness 80% |
| Brightness Uniformity | 80 | - | - | % | (Note 1,2,3) |

( )For reference only. These data should be update according the prototype.

Note1 : Measurement after 10 minutes from CFL operating.

Note2 : Measurement of the following 9 places on the display.




Note3: The Uniformity definition

(Min Brightness / Max Brightness) x 100%

## 4.3 Touch Panel Electrical Specification

| Parameter | Condition | Standard Value |
|---|---|---|
| Terminal Resistance | X Axis | 400 ~ 900 Ω |
| | Y Axis | 200 ~ 500 Ω |
| Insulating Resistance | DC 25 V | More than 10MΩ |
| Linearity | -- | ±1.5 % |
| Notes life by Pen | Note a | 100,000 times(min) |
| Input life by finger | Note b | 1,000,000 times (min) |

**Note A .**

Notes area for pen notes life test is 10 x 9 mm.

Size of word is 7.5 x 6.72

Shape of pen end : R0.8

Load : 250 g

**Note B**

By Silicon rubber tapping at same point

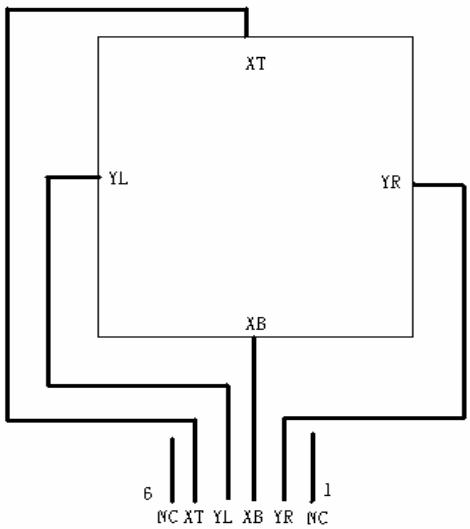
Shape of rubber end : R8

Load : 200g

Frequency : 5 Hz

**Interface**

| No. | Symbol | Function |
|---|---|---|
| 1 | NC | No connection |
| 2 | YR | Touch Panel Right Signal |
| 3 | XB | Touch Panel Bottom Signal |
| 4 | YL | Touch Panel Left Signal |
| 5 | XT | Touch Panel Top Signal |
| 6 | NC | No connection |




# 5 Interface specifications

## 5.1 Driving signals for the TFT panel

JAE:FA5B040HF1R3000 (Suitable FPC :t=0.3+/-0.03mm , 0.5+/-0.03mm pitch)

| Pin no | Symbol | I/O | Description | Remark |
|---|---|---|---|---|
| 1~4 | VDD | | Power supply for the logic (3.3V) | |
| 5 | NC | I | No connection<br>Can be OPEN fixed to VDD or GND. | |
| 6 | DEN | I | Input data enable control | |
| 7 | VSS | | GND | |
| 8 | DCLK | I | Clock signal. Latching data at the rising edge. | |
| 9 | VSS | | GND | |
| 10 | NC | I | No connection<br>Can be OPEN fixed to VDD or GND. | |
| 11 | VSS | | GND | |
| 12 | B5 | I | Blue data | |
| 13 | B4 | I | | |
| 14 | B3 | I | | |
| 15 | VSS | | GND | |
| 16 | B2 | I | Blue data | |
| 17 | B1 | I | | |
| 18 | B0 | I | | |
| 19 | VSS | | GND | |
| 20 | G5 | I | Green data | |
| 21 | G4 | I | | |
| 22 | G3 | I | | |
| 23 | VSS | | GND | |
| 24 | G2 | I | Green data | |
| 25 | G1 | I | | |
| 26 | G0 | I | | |
| 27 | VSS | | GND | |
| 28 | R5 | I | Red data | |
| 29 | R4 | I | | |
| 30 | R3 | I | | |

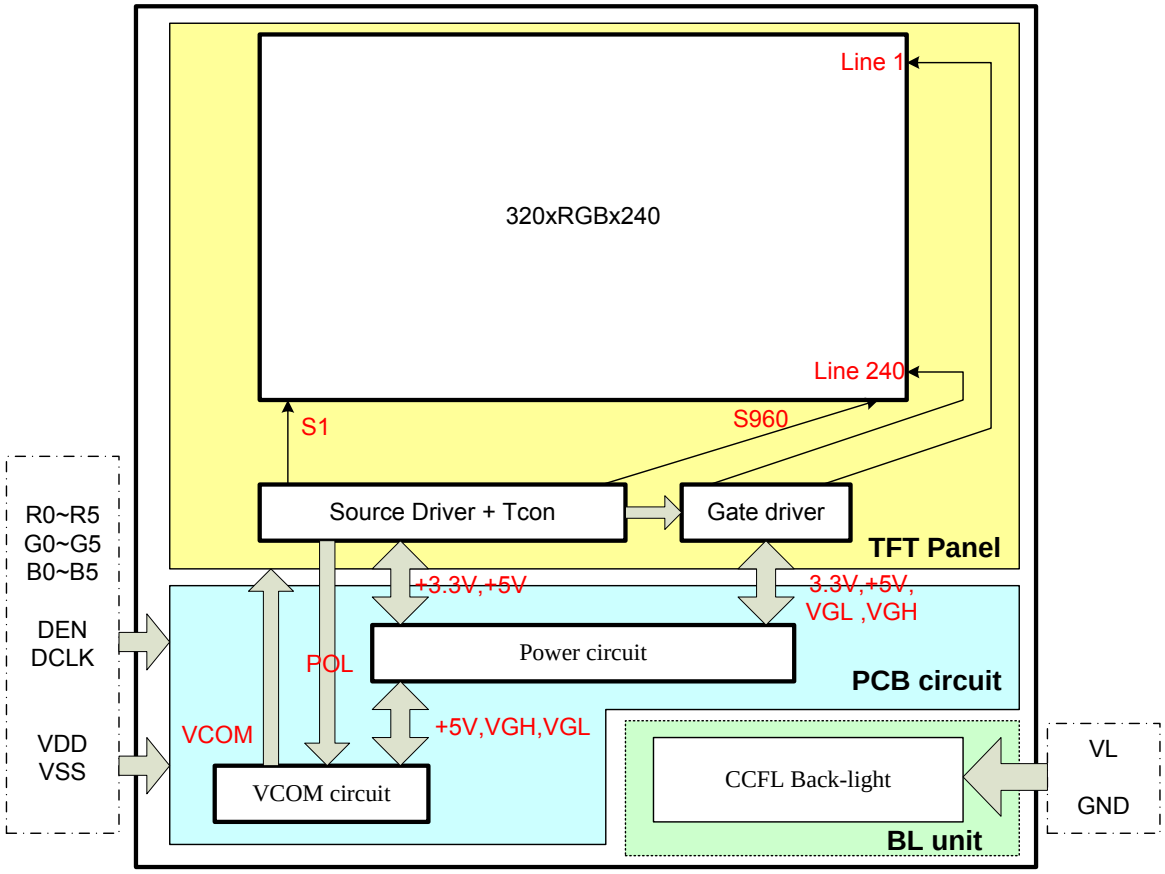
| | | | | |
|---|---|---|---|---|
| 31 | VSS | | GND | |
| 32 | R2 | I | Red data | |
| 33 | R1 | I | | |
| 34 | R0 | I | | |
| 35 | NC | | No connection | |
| 36 | VSS | | GND | |
| 37 | XT | | Touch Panel Top Signal | |
| 38 | YL | | Touch Panel Left Signal | |
| 39 | XB | | Touch Panel Bottom Signal | |
| 40 | YR | | Touch Panel Right Signal | |

### 5.2 Driving signals for the CCFL back-light

JST Housing: BHR-03VS-1

| Pin no | Symbol | Level | Description | Remark |
|---|---|---|---|---|
| 1 | VL | - | Power supply for CFL | |
| 2 | NC | - | No connection | |
| 3 | GND | - | GND for CFL (OV) | |

## 6 BLOCK DIAGRAM



# 7 DISPLAYED COLOR AND INPUT DATA

| | Color & Gray Scale | DATA SIGNAL | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Color | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(0) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(0) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(62) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(61) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(31) | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(1) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(0) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(31) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(0) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(61) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(31) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

# 8 QUALITY AND RELIABILITY

## 8.1 TEST CONDITIONS

Tests should be conducted under the following conditions :
Ambient temperature : 25 ± 5°C
Humidity : 60 ± 25% RH.

## 8.2 SAMPLING PLAN

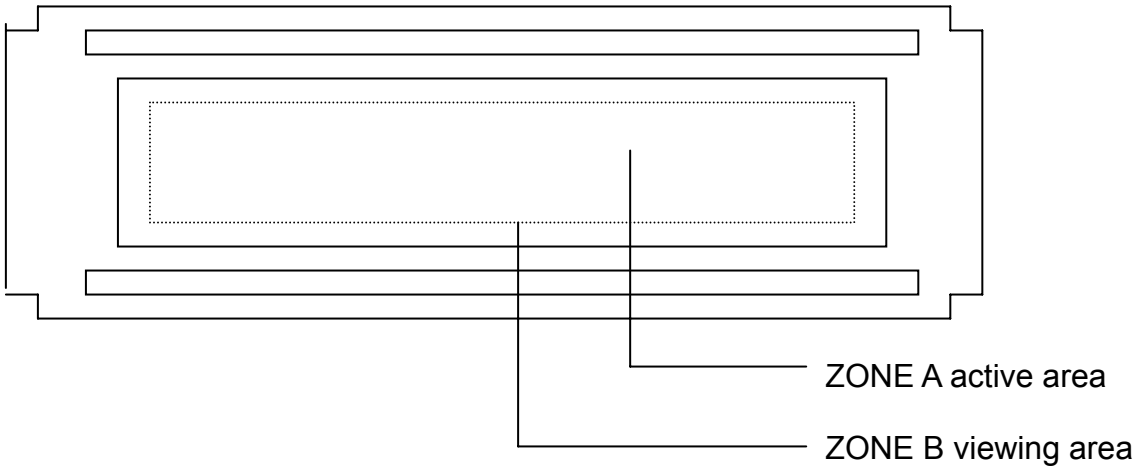
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

## 8.3 ACCEPTABLE QUALITY LEVEL

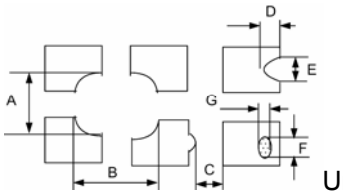
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

## 8.4 APPEARANCE

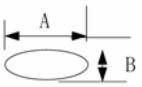
An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under flourescent light. The inspection area of LCD panel shall be within the range of following limits.



## 8.5 INSPECTION QUALITY CRITERIA

<table>
<tr><th>No.</th><th>Item</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>1</td><td>Non display</td><td>No non display is allowed</td><td>Major</td></tr>
<tr><td>2</td><td>Irregular operation</td><td>No irregular operation is allowed</td><td>Major</td></tr>
<tr><td>3</td><td>Short</td><td>No short are allowed</td><td>Major</td></tr>
<tr><td>4</td><td>Open</td><td>Any segments or common patterns that don’t activate are rejectable.</td><td>Major</td></tr>
<tr><td>5</td><td>Black/White spot (I)</td><td><table><tr><th>Size D (mm)</th><th>Acceptable number</th></tr><tr><td>D ≤ 0.15</td><td>Ignore</td></tr><tr><td>0.15 < D ≤ 0.20</td><td>3</td></tr><tr><td>0.20 < D ≤ 0.30</td><td>2</td></tr><tr><td>0.30 < D</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>6</td><td>Black/White line (I)</td><td><table><tr><th>Length(mm)</th><th></th><th>Acceptable number</th></tr><tr><td>10 < L</td><td>0.03 < W ≤ 0.04</td><td>5</td></tr><tr><td>5.0 < L ≤10</td><td>0.04 < W ≤ 0.06</td><td>3</td></tr><tr><td>1.0 < L ≤ 5.0</td><td>0.06 < W ≤ 0.07</td><td>2</td></tr><tr><td>L ≤ 1.0</td><td>0.07 < W ≤ 0.09</td><td>1</td></tr></table></td><td>Minor</td></tr>
<tr><td>7</td><td>Black/White sport (II)</td><td><table><tr><th>Size D (mm)</th><th>Acceptable number</th></tr><tr><td>D ≤ 0.30</td><td>Ignore</td></tr><tr><td>0.30 < D ≤ 0.50</td><td>5</td></tr><tr><td>0.50 < D ≤ 1.20</td><td>3</td></tr><tr><td>1.20 < D</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>8</td><td>Black/White line (II)</td><td><table><tr><th>Length (mm)</th><th>Width (mm)</th><th>Acceptable number</th></tr><tr><td>20 < L</td><td>0.05 < W ≤ 0.07</td><td>5</td></tr><tr><td>10 < L ≤ 20</td><td>0.07 < W ≤ 0.09</td><td>3</td></tr><tr><td>5.0 < L ≤ 10</td><td>0.09 < W ≤ 0.10</td><td>2</td></tr><tr><td>L ≤ 5.0</td><td>0.10 < W ≤ 0.15</td><td>1</td></tr></table></td><td>Minor</td></tr>
<tr><td>9</td><td>Back Light</td><td>1. No Lighting is rejectable<br>2. Flickering and abnormal lighting are rejectable</td><td>Major</td></tr>
<tr><td>10</td><td>Display pattern</td><td> 

Unit:mm
<table><tr><td>$\frac{A+B}{2} \le 0.30$</td><td>0 < C</td><td>$\frac{D+E}{2} \le 0.25$</td><td>$\frac{F+G}{2} \le 0.25$</td></tr></table>
Note: 1. Acceptable up to 3 damages<br>2. NG if there’re to two or more pinholes per dot</td><td>Minor</td></tr>
</table>

<table>
<tr><td>11</td><td>Blemish & Foreign matters<br><br>Size:<br>$D = \frac{A+B}{2}$</td><td><table><tr><th>Size D (mm)</th><th>Acceptable number</th></tr><tr><td>D ≤ 0.15</td><td>Ignore</td></tr><tr><td>0.15 < D ≤ 0.20</td><td>3</td></tr><tr><td>0.20 < D ≤ 0.30</td><td>2</td></tr><tr><td>0.30 < D</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>12</td><td>Scratch on Polarizer<br><br>  </td><td><table><tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr><tr><td>W≤0.03</td><td>Ignore</td><td>Ignore</td></tr><tr><td>0.03<W≤0.05</td><td>L ≤ 2.0</td><td>Ignore</td></tr><tr><td></td><td>L > 2.0</td><td>1</td></tr><tr><td>0.05<W≤0.08</td><td>L > 1.0</td><td>1</td></tr><tr><td></td><td>L ≤ 1.0</td><td>Ignore</td></tr><tr><td>0.08<W</td><td>Note (1)</td><td>Note(1)</td></tr></table>Note(1) Regard as a blemish</td><td>Minor</td></tr>
<tr><td>13</td><td>Bubble in polarizer</td><td><table><tr><th>Size D (mm)</th><th>Acceptable number</th></tr><tr><td>D ≤ 0.20</td><td>Ignore</td></tr><tr><td>0.20 < D ≤ 0.50</td><td>3</td></tr><tr><td>0.50 < D ≤ 0.80</td><td>2</td></tr><tr><td>0.80 < D</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>14</td><td>Stains on LCD panel surface</td><td>Stains that cannot be removed even when wiped lightly with a soft cloth or similar cleaning too are rejectable.</td><td>Minor</td></tr>
<tr><td>15</td><td>Rust in Bezel</td><td>Rust which is visible in the bezel is rejectable.</td><td>Minor</td></tr>
<tr><td>16</td><td>Defect of land surface contact (poor soldering)</td><td>Evident crevices which is visible are rejectable.</td><td>Minor</td></tr>
<tr><td>17</td><td>Parts mounting</td><td>1. Failure to mount parts<br>2. Parts not in the specifications are mounted<br>3. Polarity, for example, is reversed</td><td>Major<br>Major<br>Major</td></tr>
<tr><td>18</td><td>Parts alignment</td><td>1. LSI, IC lead width is more than 50% beyond pad outline.<br>2. Chip component is off center and more than 50% of the leads is off the pad outline.</td><td>Minor<br><br>Minor</td></tr>
<tr><td>19</td><td>Conductive foreign matter (Solder ball, Solder chips)</td><td>1. 0.45<φ ,N≧1<br>2. 0.30<φ≤0.45 ,N≧1<br>φ:Average diameter of solder ball (unit: mm)<br>3. 0.50<L ,N≧1<br>L: Average length of solder chip (unit: mm)</td><td>Major<br>Minor<br><br>Minor</td></tr>
<tr><td>20</td><td>Faulty PCB correction</td><td>1. Due to PCB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair; 2 or more places are corrected per PCB.<br>2. Short circuited part is cut, and no resist coating has been performed.</td><td>Minor<br><br>Minor</td></tr>
</table>

<table>
<tr>
<td>21</td>
<td>Defect Dot</td>
<td>The TFT panel may have bright dot or Dark dot.<br>The acceptable number defection:
<table>
<tr><th>Bright dot</th><th>Dark dot</th><th>Total dot</th><th>Distance between Dark-- dark</th></tr>
<tr><td>2</td><td>3</td><td>4</td><td>L≧5 mm</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
</table>

## 9 Reliability test items (Note2):

| No. | Test items | Conditions | Remark |
|---|---|---|---|
| 1 | High temperature storage | Ta=80℃ 240Hrs | |
| 2 | Low temperature storage | Ta=-30℃ 240Hrs | |
| 3 | High temperature operation | Ta=70℃ 240Hrs | |
| 4 | Low temperature operation | Ta=-20℃ 240Hrs | |
| 5 | High temperature and high humidity | Ta=40℃,85% RH 240Hrs | Operation |
| 6 | Heat shock | -30℃~80℃/200 cycles 1Hrs/cycle | Non-operation |
| 7 | Electrostatic discharge | ±200V,200Pf(0Ω),once for each terminal | Non-operation |
| 8 | Vibration | Frequency range :8~33.3Hz<br>Stoke :1.3mm<br>Sweep :2.9G,33.3~400Hz<br>Cycle :15 minutes<br>2 hours for each direction of X,Z<br>4 hours for Y direction | JIS C7021, A-10 Condition A |
| 9 | Mechanical shock | 100G, 6ms,±X, ±Y,±Z<br>3 times for each direction | JIS C7021, A-7 Condition C |
| 10 | Vibration (With carton) | Random vibration:<br>$0.015G^2$/Hz from 5~200Hz<br>-6dB/octave from 200~500Hz | IEC 68~34 |
| 11 | Drop (with carton) | Height:60cm<br>1 corner,3 edges,6 surfaces | JIS Z0202 |

# 10 USE PRECAUTIONS

## 10.1 Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

## 10.2 Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

## 10.3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.

3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

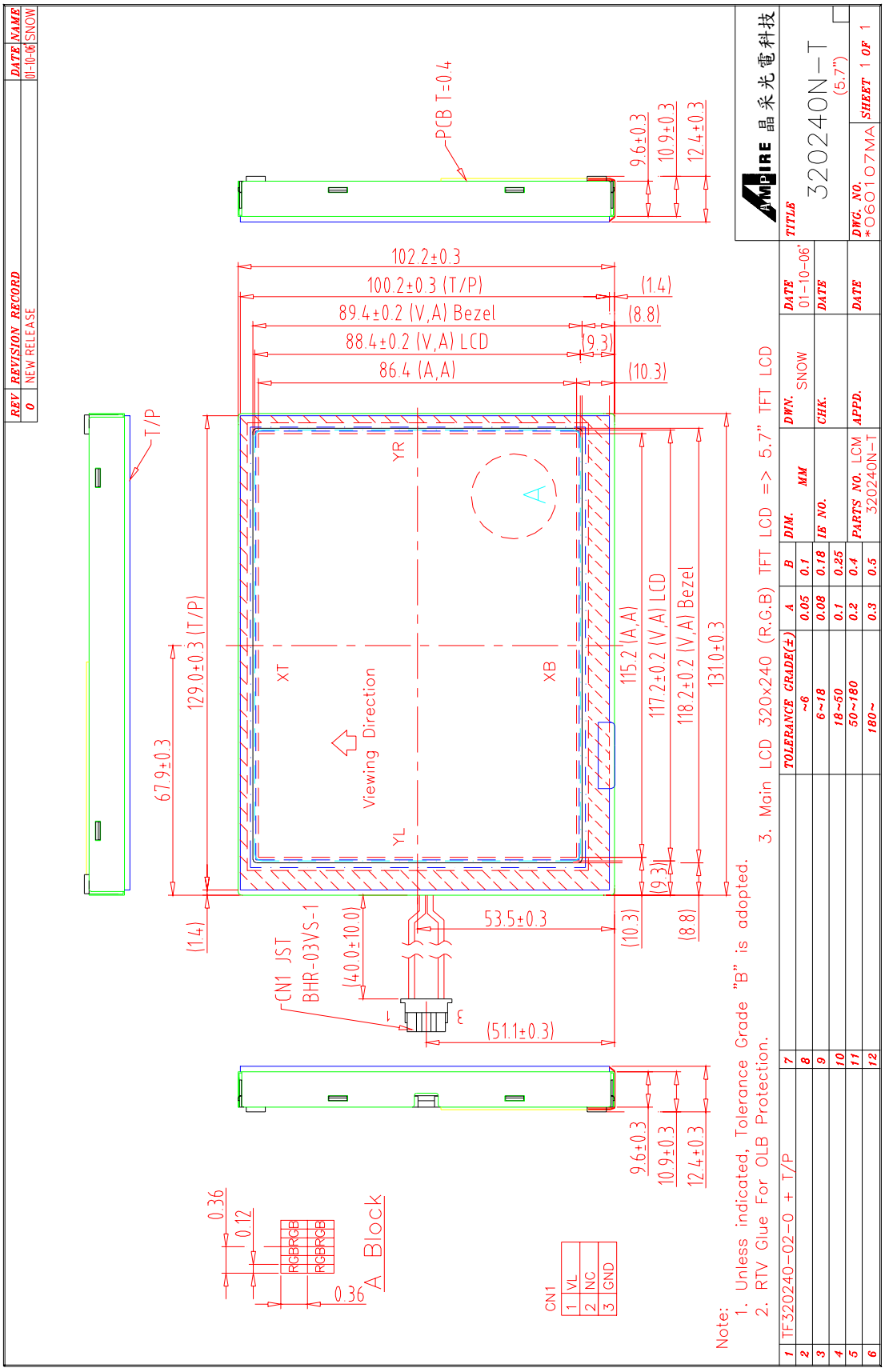
### 10.4 Operating precautions

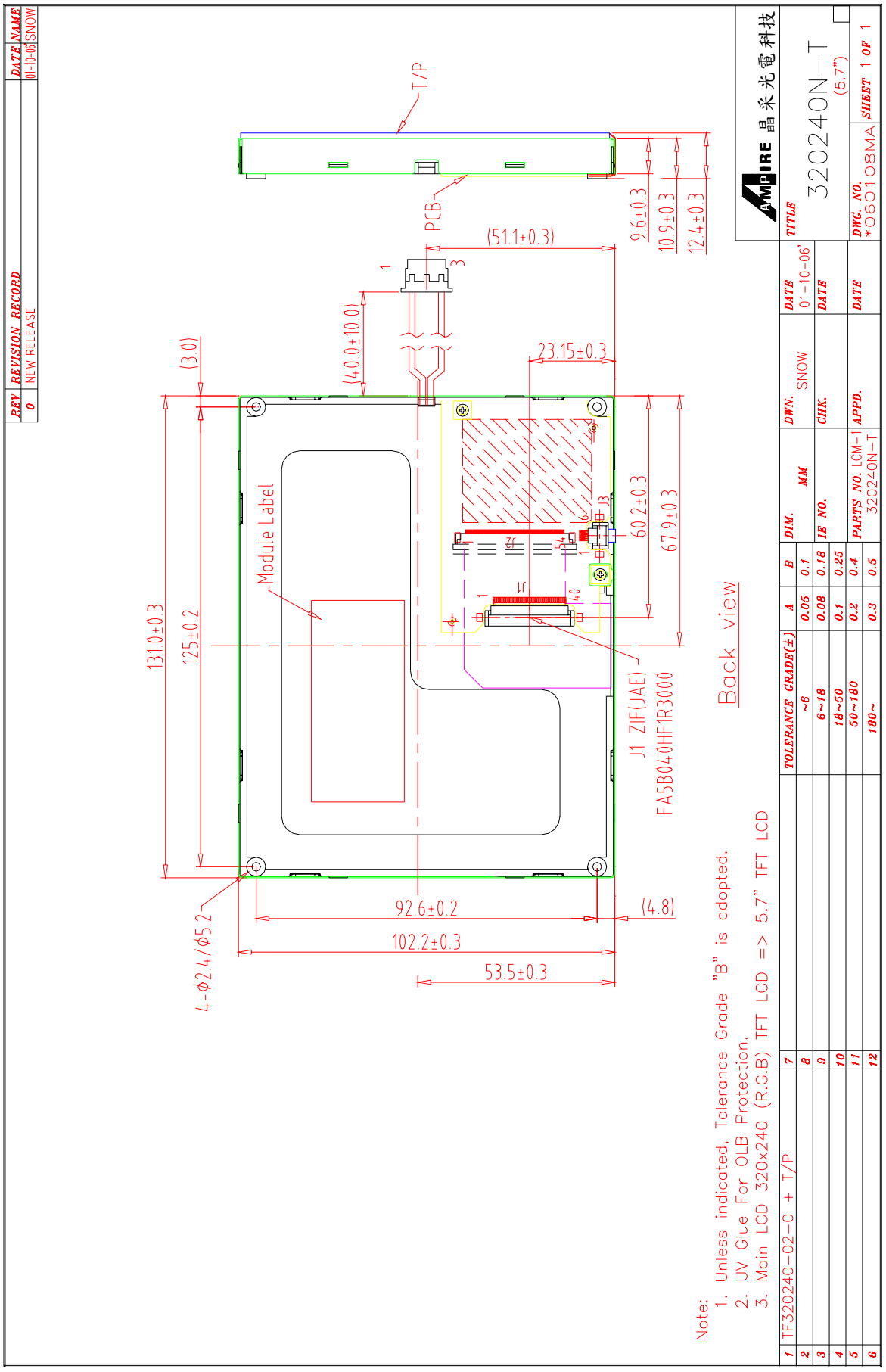
1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

### 10.5 Other

1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.

# 11 OUTLINE DIMENSION




T/P
PCB
(51.1±0.3)
9.6±0.3
10.9±0.3
12.4±0.3
(40.0±10.0)
23.15±0.3
(3.0)
Module Label
131.0±0.3
125±0.2
60.2±0.3
67.9±0.3
J1 ZIF(JAE)
FA5B040HF1R3000
Back view
92.6±0.2
(4.8)
102.2±0.3
53.5±0.3
4-Φ2.4/Φ5.2
Note:
1. Unless indicated, Tolerance Grade "B" is adopted.
2. UV Glue For OLB Protection.
3. Main LCD 320x240 (R.G.B) TFT LCD => 5.7" TFT LCD
REV REVISION RECORD
0 NEW RELEASE
DATE NAME
01-10-06 SNOW
TITLE 320240N-T (5.7")
DWG. NO. *060108MA
SHEET 1 OF 1
DWN. SNOW
CHK.
APPD.
DATE 01-10-06'
PARTS NO. LCM-1 320240N-T
IE NO.
DIM. MM
TOLERANCE GRADE(±)
~6 0.05 0.1
6~18 0.08 0.18
18~50 0.1 0.25
50~180 0.2 0.4
180~ 0.3 0.5
1 TFT320240-02-0 + T/P