

**SPECIFICATION  
OF  
LCD MODULE**

**MODULE NO.: HL035T15-01**

**Customer Approval:**

☐ **Accept**

☐ **Reject**

|             | SIGNATURE | DATE |
|-------------|-----------|------|
| PREPARED BY |           |      |
| CHECKED BY  |           |      |
| APPROVED BY |           |      |

## DOCUMENT REVISION HISTORY

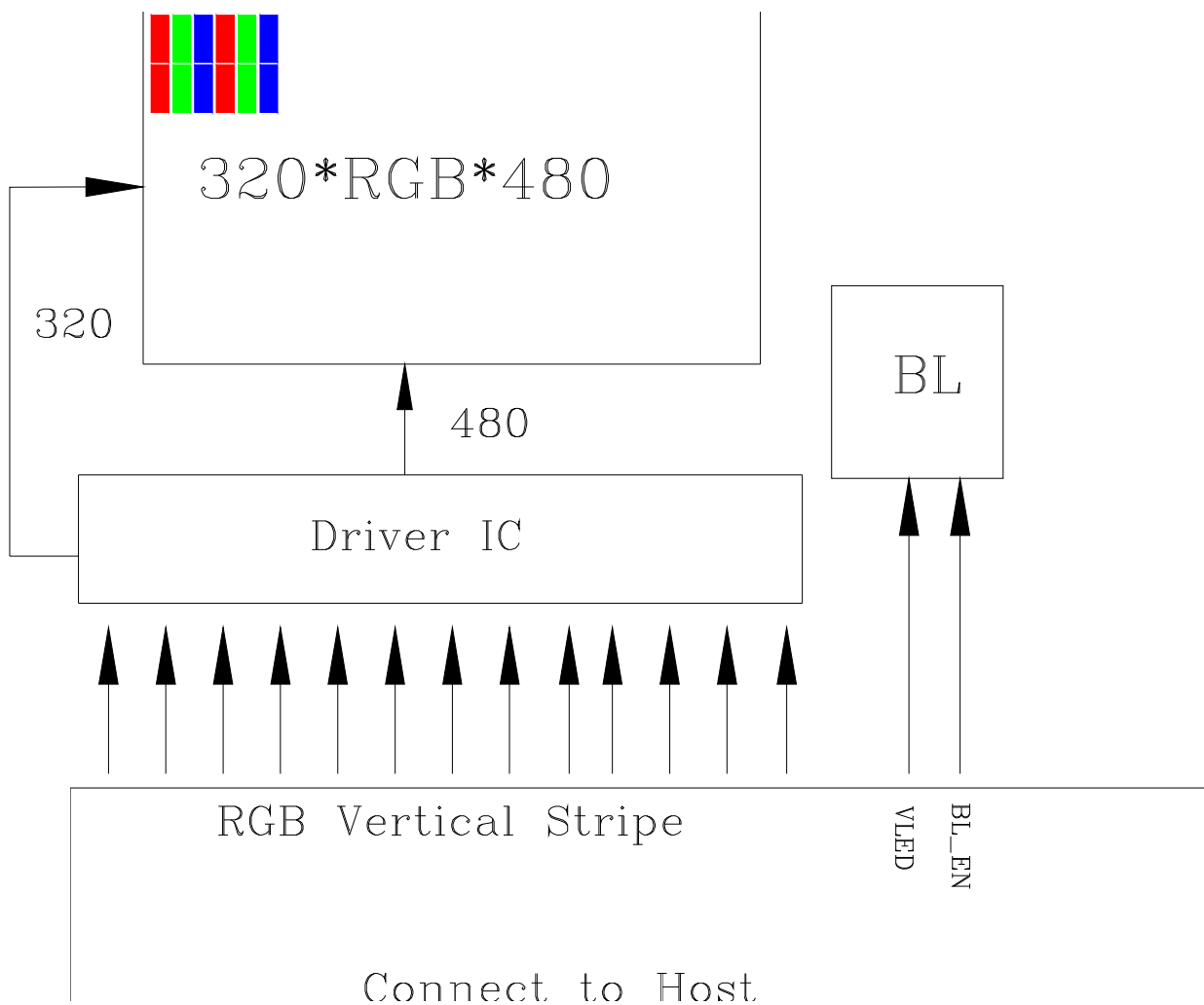
| Sample Version | Doc. Version | DATE       | DESCRIPTION    | CHECKED BY |
|----------------|--------------|------------|----------------|------------|
| 0001           | A0           | 2021-06-22 | First Release. |            |

## 1. MECHANICAL SPECIFICATIONS:

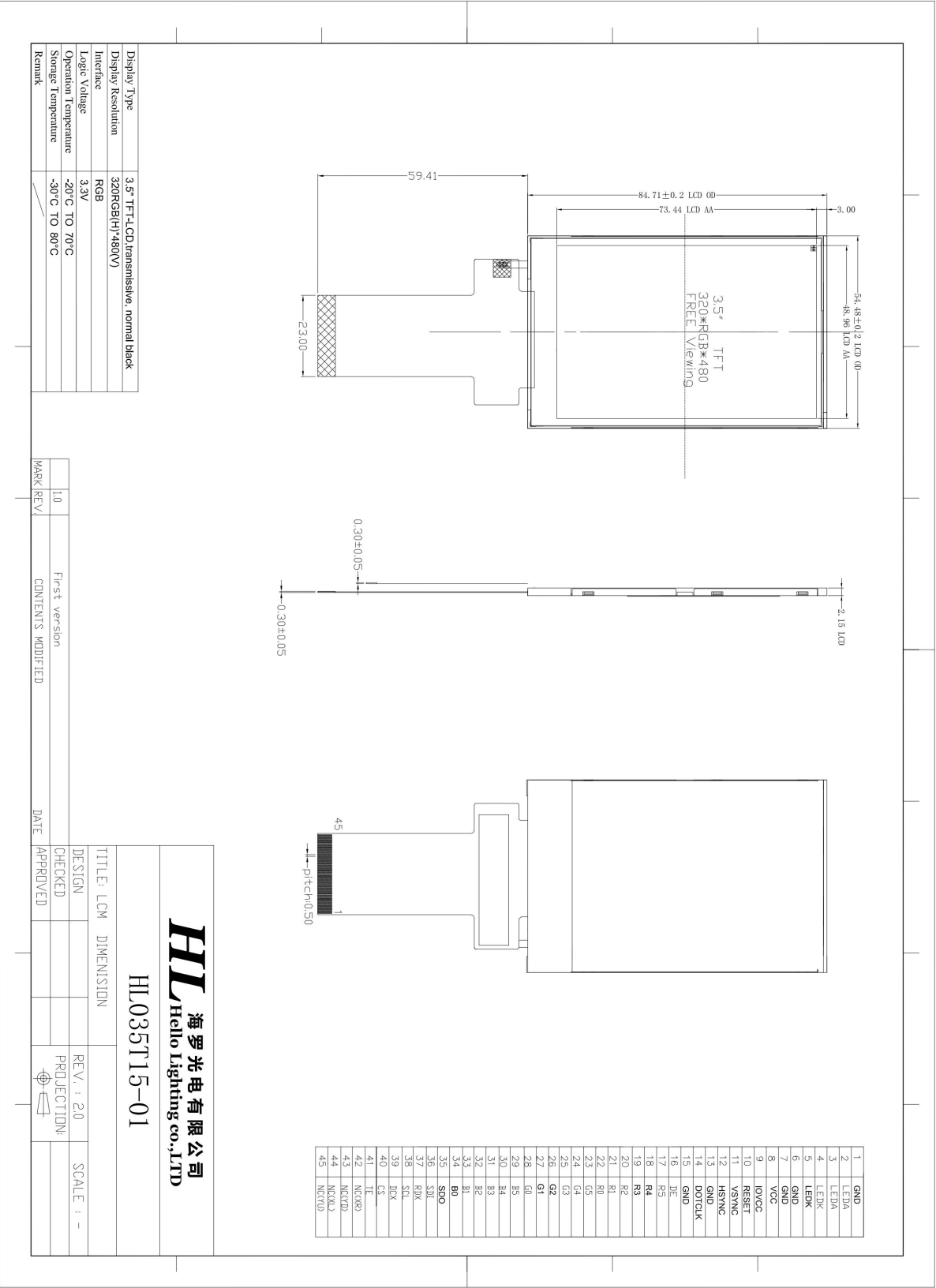
| ITEM               | SPECIFICATION               | UNIT |
|--------------------|-----------------------------|------|
| OUTLINE DIMENSIONS | 54.48 (W) X84.71(H) X2.4(T) | mm   |
| DISPLAY SIZE       | 3.5                         | inch |
| DOT PITCH          | \                           | mm   |
| NUMBER OF DOTS     | 320* (RGB) *480             | -    |
| DRIVER IC          | HX8357C or equ              | -    |
| LCD TYPE           | TFT(262K) TRANSMISSIVE      | -    |
| BACKLIGHT TYPE     | LED White                   | -    |
| VIEWING DIRECTION  | FREE                        | -    |

**\*See attached drawing for details.**

**2.BLOCK DIAGRAM:**



3.DIMENSIONAL



#### **4. PIN DESCRIPTION:**

| NO. | PIN NAME | I/O | Description                                                                                                                                   |
|-----|----------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | GND      | P   | Power ground                                                                                                                                  |
| 2   | LED A    | P   | Led anode                                                                                                                                     |
| 3   | LED A    | P   | Led anode                                                                                                                                     |
| 4   | LED K    | P   | Led cathod                                                                                                                                    |
| 5   | LED K    | P   | Led cathod                                                                                                                                    |
| 6   | GND      | P   | Power ground                                                                                                                                  |
| 7   | GND      | P   | Power ground                                                                                                                                  |
| 8   | VCC      | P   | Power supply for core                                                                                                                         |
| 9   | IOVCC    | P   | Power supply for IO                                                                                                                           |
| 10  | RESET    | I   | Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied.                                                 |
| 11  | VSYNC    | I   | Vertical Sync signal                                                                                                                          |
| 12  | HSYNC    | I   | Horizontal Sync signal                                                                                                                        |
| 13  | GND      | P   | The unused pins let to open or connected to VSSD.                                                                                             |
| 14  | DOTCLK   | I   | Pixel clock signal                                                                                                                            |
| 15  | GND      | P   | Power ground                                                                                                                                  |
| 16  | DE       | I   | Data enable                                                                                                                                   |
| 17  | R5       | I   | Red data bus                                                                                                                                  |
| 18  | R4       | I   |                                                                                                                                               |
| 19  | R3       | I   |                                                                                                                                               |
| 20  | R2       | I   |                                                                                                                                               |
| 21  | R1       | I   |                                                                                                                                               |
| 22  | R0       | I   |                                                                                                                                               |
| 23  | G5       | I   | Green data bus                                                                                                                                |
| 24  | G4       | I   |                                                                                                                                               |
| 25  | G3       | I   |                                                                                                                                               |
| 26  | G2       | I   |                                                                                                                                               |
| 27  | G1       | I   |                                                                                                                                               |
| 28  | G0       | I   |                                                                                                                                               |
| 29  | B5       | I   | Blue data bus                                                                                                                                 |
| 30  | B4       | I   |                                                                                                                                               |
| 31  | B3       | I   |                                                                                                                                               |
| 32  | B2       | I   |                                                                                                                                               |
| 33  | B1       | I   |                                                                                                                                               |
| 34  | B0       | I   |                                                                                                                                               |
| 35  | SDO      | O   | Serial data output pin in serial bus system interface.                                                                                        |
| 36  | SDI      | I   | Serial data input pin in serial bus system interface.                                                                                         |
| 37  | RDX      | I   | Serves as a read signal and read data at the low level.<br>If not used, please fix this pin at IOVCC or GND level                             |
| 38  | WR/SCL   | I   | Serves as a write signal and write data at the low level.<br>or servers as SCL (Serial Clock)<br>Fix it to IOVCC or VSSD level when not used. |
| 39  | DCX      | I   | Data / Command Selection pin<br>If not used, please fix this pin at IOVCC or GND level.                                                       |
| 40  | CS       | P   | Chip select signal.<br>Low: chip can be accessed;                                                                                             |

|    |        |   |                                                                  |
|----|--------|---|------------------------------------------------------------------|
|    |        |   | High: chip cannot be accessed.<br>Fix it to IOVCC when not used. |
| 41 | TE     | P | Tear effect output                                               |
| 42 | NC(XR) | - | No connection                                                    |
| 43 | NC(YD) | - | No connection                                                    |
| 44 | NC(XL) | - | No connection                                                    |
| 45 | NC(YU) | - | No connection                                                    |

## 5. MAXIMUM ABSOLTE LIMIT:

| Item                           | Symbol    | Value        | Unit |
|--------------------------------|-----------|--------------|------|
| Power supply voltage for logic | $V_{DD}$  | -0.3~3.3     | V    |
| Input voltage                  | $V_{in}$  | $V_{DD}+0.3$ | V    |
| Operating temperature          | $T_{opr}$ | -20 to 70    | °C   |
| Storage temperature            | $T_{stg}$ | -30 to 80    | °C   |

**Note:** Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken.

They do not assure operations.

Note2: Background color changes slightly depending on ambient temperature. This Phenomenon is reversible.

$T_a \leq 60^{\circ}\text{C}$ : 75%RH max

$T_a > 60^{\circ}\text{C}$ : absolute humidity must be lower than the humidity of 75%RH at  $60^{\circ}\text{C}$

Note3:  $T_a$  at  $-20^{\circ}\text{C}$  will be <48hrs, at  $70^{\circ}\text{C}$  will be <120hrs

## 6.ELECTRICAL CHARACTERISTICS

### 6-1 DC Characteristics ( $V_{DD}=3.3\text{V}$ , $T_a=25^{\circ}\text{C}$ )

| Item             | Symbol   | Min | Type | Max | Unit | Test condition                                  |
|------------------|----------|-----|------|-----|------|-------------------------------------------------|
| Voltage for IO   | IOVCC    | 1.8 | 3.3  | 3.6 | V    | -                                               |
| Voltage for CORE | VCC      | 2.8 | 3.3  | 3.6 | V    |                                                 |
| Supply current   | $I_{DD}$ | -   | TBD  | -   | mA   | $V_{DD}=3.3\text{V}$ , $T_a=25^{\circ}\text{C}$ |

Note: Voltage greater than above may damage the module.

All voltages are specified relative to  $V_{SS}=0\text{V}$ .

## 6-2 Backlight Electrical-optical Characteristics

### 1. Stander Lamp Styles(Edge Lighting Type):

The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption:

2. The Main Advantages of the LED Backlight are as following:

2.1 The brightness of the backlight can simply be adjusted by a resistor or a potentiometer.

### 3. Data About LED Backlight:

[illegible]

## **7.AC TIMING**

**Please refer to IC datasheet**

## **8. OPTICAL CHARACTERISTICS:**

Driving the backlight

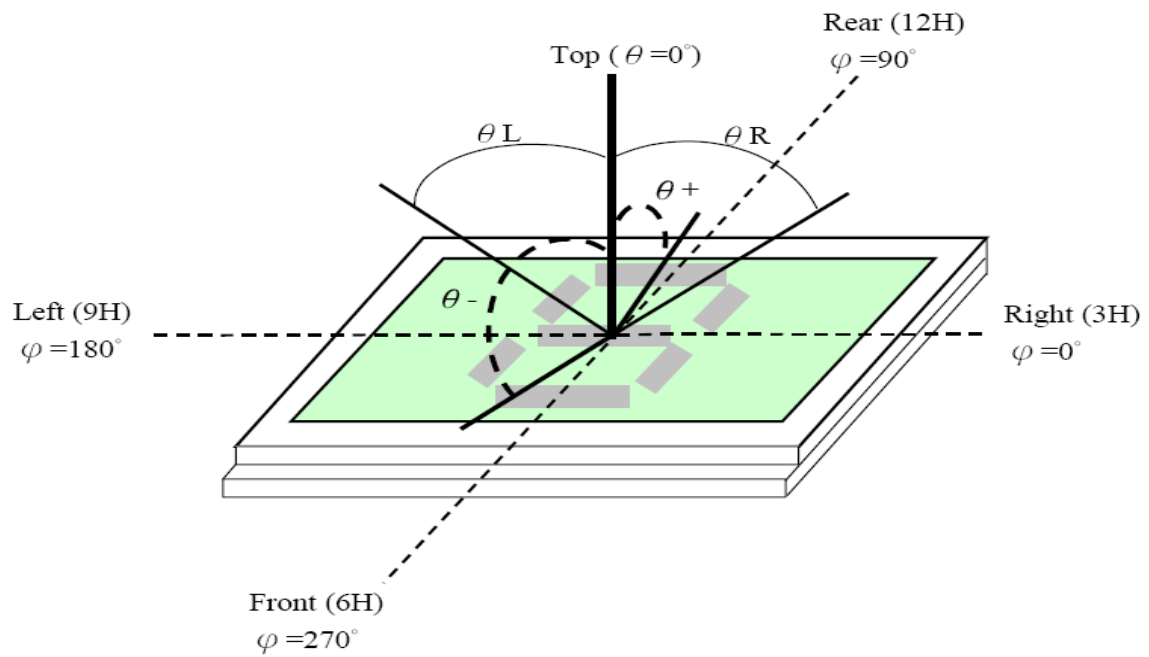
| No. | ITEM             |       | Symbol     | Conditions                                 | Specification |       |       | Unit  | Note   |
|-----|------------------|-------|------------|--------------------------------------------|---------------|-------|-------|-------|--------|
|     |                  |       |            |                                            | Min           | Typ   | Max   |       |        |
| 1   | Response Time    |       | Tr+Tf      | 25℃                                        | -             | -     | 25    | Ms    | (1)(2) |
| 2   | Contrast Rate    |       | Cr         | $\theta=0$ ,<br>Normal<br>viewing<br>angle | -             | 700   | -     | -     | (1)(3) |
| 3   | Viewing<br>Angle | Hor.  | $\theta_L$ | CR>10                                      | -             | 80    | -     | Deg   | -      |
|     |                  |       | $\theta_R$ |                                            | -             | 80    | -     |       |        |
|     |                  | Ver.  | $\Theta+$  |                                            | -             | 80    | -     |       |        |
|     |                  |       | $\Theta-$  |                                            | -             | 80    | -     |       |        |
|     |                  |       |            |                                            | -             | 80    | -     |       |        |
| 4   | Chromaticiry     | White | x          | Brightness<br>is ON                        | 0.293         | 0.313 | 0.333 |       |        |
|     |                  |       | y          |                                            | 0.319         | 0.339 | 0.359 |       |        |
|     |                  | Red   | x          |                                            | 0.620         | 0.640 | 0.660 |       |        |
|     |                  |       | y          |                                            | 0.326         | 0.346 | 0.366 |       |        |
|     |                  | Green | x          |                                            | 0.282         | 0.302 | 0.322 |       |        |
|     |                  |       | y          |                                            | 0.552         | 0.572 | 0.592 |       |        |
|     |                  | Blue  | x          |                                            | 0.115         | 0.135 | 0.155 |       |        |
|     |                  |       | y          |                                            | 0.103         | 0.125 | 0.145 |       |        |
|     |                  |       |            |                                            |               |       |       |       |        |
| 5   | luminance        |       | L          |                                            | -             | 350   |       | cd/m2 |        |
| 6   | Uniformity       |       | U          |                                            | 75            | 80    |       | %     |        |

Measure Conditions:

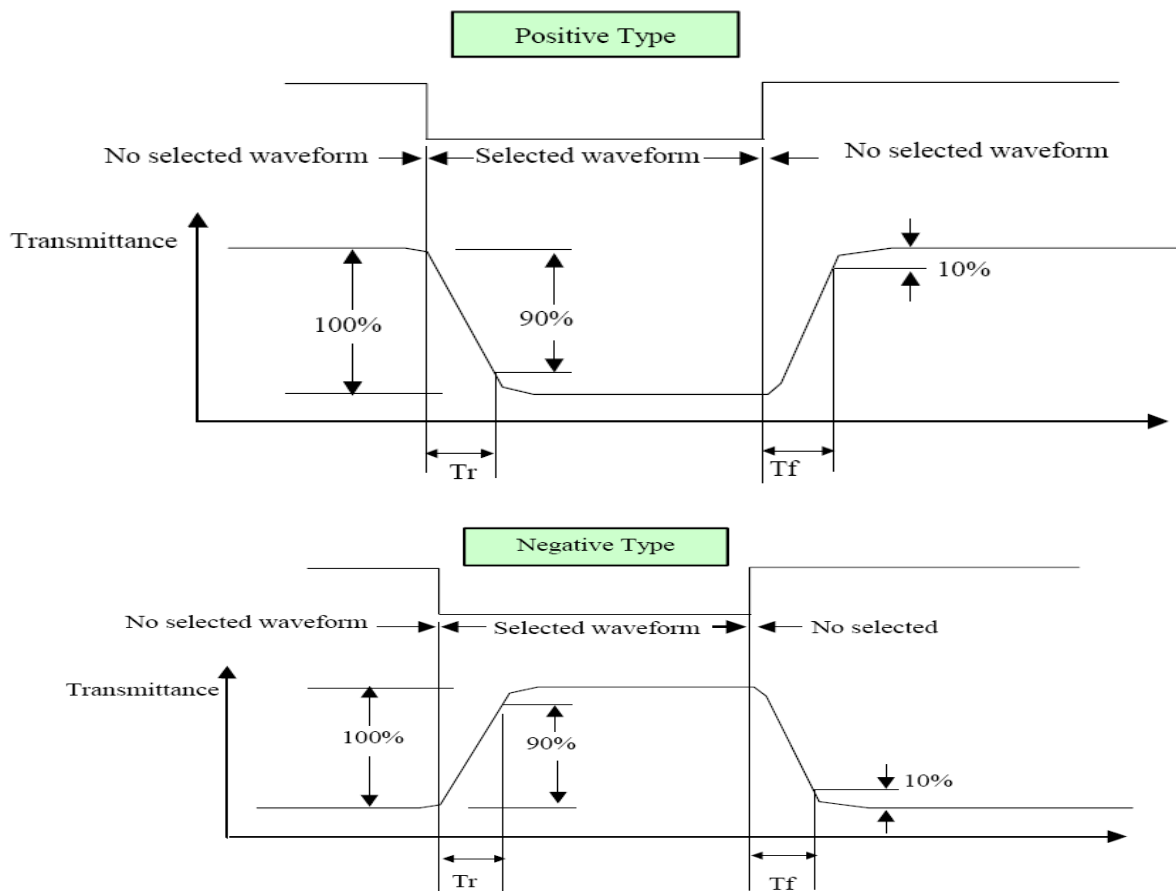
1. Measure surrounding : dark room;
2. Ambient temperature: 25±2℃;
3. 30min.warm-up time.

### **Note Definition:**

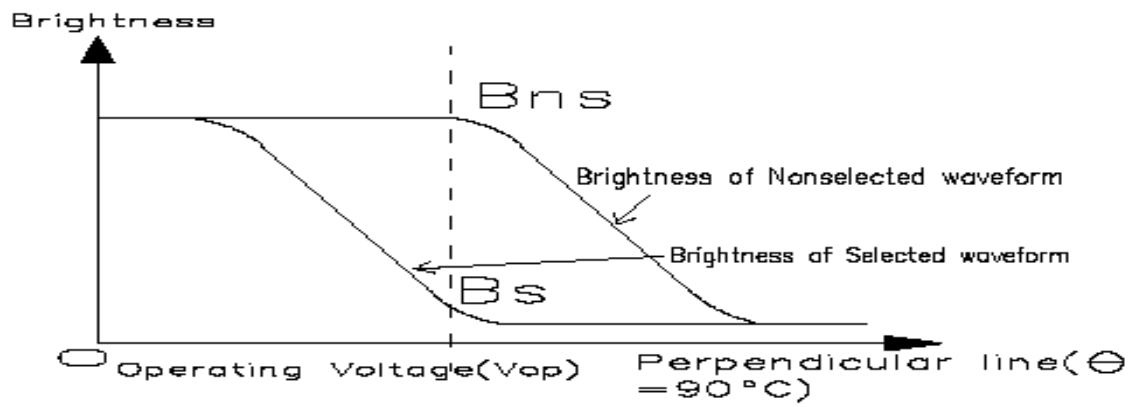
**Note(1)Viewing angle range:**



**Note(2) Response Time:**



**Note(3) Contrast Ratio Definition:**

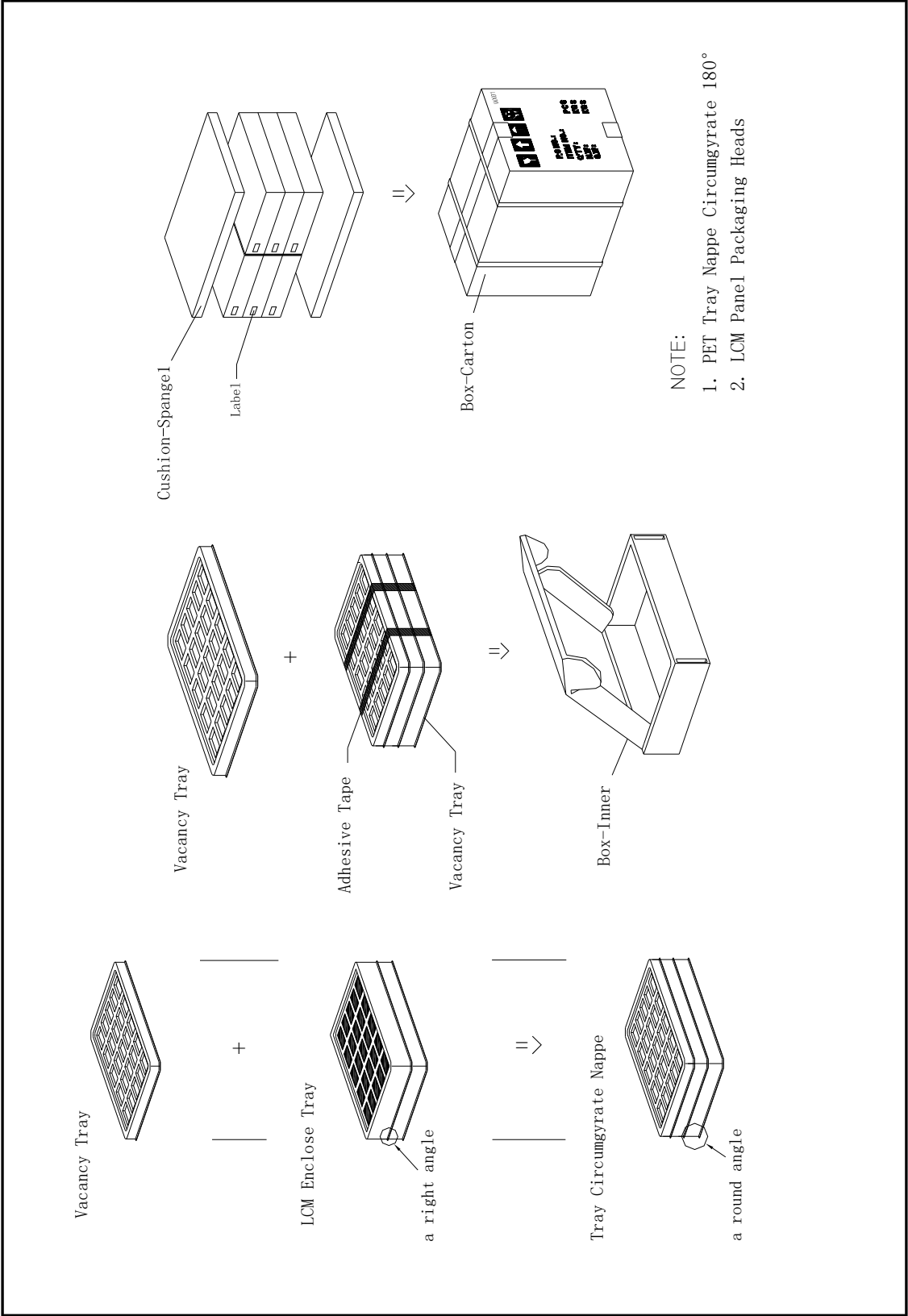


Luminance with all pixel white

Contrast Ratio (Cr)= \_\_\_\_\_

Luminance with all pixel black

9.PACKAGE.



## **10. STANDARD SPECIFICATION FOR RELIABILITY:**

| Item                         | Condition                               |       | Time (hrs) | Assessment                                         |
|------------------------------|-----------------------------------------|-------|------------|----------------------------------------------------|
| High temp. Storage           | 80°C                                    |       | 120        | No abnormalities<br>in functions<br>and appearance |
| High temp. Operating         | 70°C                                    |       | 120        |                                                    |
| Low temp. Storage            | -30°C                                   |       | 120        |                                                    |
| Low temp. Operating          | -20°C                                   |       | 120        |                                                    |
| Humidity                     | 40°C/ 90%RH                             |       | 120        |                                                    |
| Thermal Shock Temp.<br>Cycle | -20°C ← →70°C<br>(0.5hour ← → 0.5 hour) |       | 10cycles   |                                                    |
| ESD Testing                  | HBM:                                    | ±8KV  |            | 330Ω/150PF                                         |
|                              | MM:                                     | ±200V |            | 200PF/0Ω                                           |

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature ( $25\pm10^{\circ}\text{C}$ ), normal humidity ( $45\pm20\%$  RH), and in area not exposed to direct sun light. (Life time of backlight, please refer to Data about backlight.)

### **Testing Conditions and Inspection Criteria:**

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in up Table, Standard specifications for Reliability have been executed in order to ensure stability.

| Item                | Test Model             | In section Criteria                                                                                                |
|---------------------|------------------------|--------------------------------------------------------------------------------------------------------------------|
| Current Consumption | Refer To Specification | The current consumption should conform to the product specification.                                               |
| Contrast            | Refer To Specification | After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests. |
| Appearance          | Visual inspection      | Defect free.                                                                                                       |

## **11.SPECIFICATION OF QUALITY ASSURANCE:**

### **11.1 Purpose**

This standard for Quality Assurance should affirm the quality of LCD Module products to supply.

### **11.2 Standard for Quality Test**

#### **a. Inspection:**

Before delivering, the supplier should take the following tests, and affirm the quality of product.

#### **b. Electro-Optical Characteristics:**

According to the individual specification to test the product.

#### **c. Test of Appearance Characteristics:**

According to the individual specification to test the product.

#### **d. Test of Reliability Characteristics:**

According to the definition of reliability on the specification for testing products.

#### **e. Delivery Test:**

Before delivering, the supplier should take the delivery test.

(i) Test method: According to MIL-STD105E.General Inspection Level II take a single time.

(ii) The defects classify of AQL as following:

Major defect: AQL = 0.65

Minor defect: AQL = 2.5

Total defects: AQL = 2.5

### **11.3. Nonconforming Analysis & Deal With Manners**

#### **a. Nonconforming Analysis:**

(i) Purchaser should supply the detail data of non- conforming sample and the non- conforming.

(ii) After accepting the detail data from purchaser, the analysis of nonconforming should be finished in two weeks.

(iii) If supplier can not finish analysis on time, must announce purchaser before two weeks.

#### **b. Disposition of nonconforming:**

(i) If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

(ii) Both supplier and customer should analyze the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

### **11.4. Agreement items**

Both sides should discuss together when the following problems happen.

a. There is any problem of standard of quality assurance, and both sides think that it must be modified.

b. There is any argument item which does not record in the standard of quality assurance.

c. Any other special problem.

### **11.5 Standard of The Product Appearance Test**

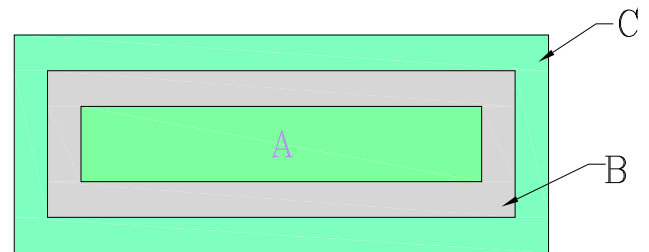
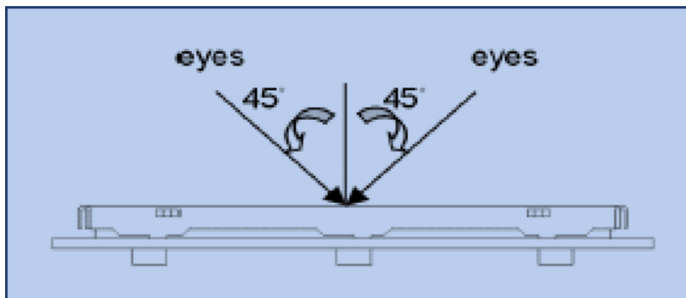
a. Manner of appearance test: This specification should be applied for both light on and off situation.

(i) The test must be under  $20W \times 2$  or  $40W$  fluorescent light, and the distance of view must be at  $30 \pm 5cm$ .

(ii) When test the model of transmissive product must add the reflective plate.

(iii)The test direction is base on about around  $10^\circ$  of vertical line (Left graph)

(iii)Temperature:  $25\pm 5^\circ\text{C}$  Humidity:  $65\pm 10\%\text{RH}$



(iv) Definition of area (Right graph)

A. Area: Viewing area. B. Area: Out of viewing area.(Outside viewing area)

b. Basic principle:

(i) It will accord to the AQL when the standard can not be described.

(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

(iii) Must add new item on time when it is necessary.

c. Standard of inspection: (Unit: mm)

Allowable limits defined in follow Dot defect Table should be met for each white, black , R, G, B raster. The limits apply to the entire area. Missing white in 60% or more of typical (one color, R or G or B) pixel aperture is defined as a bright defect, less than 60% is acceptable .Black spot in 60% or more of typical pixel aperture is defined as a dark defect, less than 60% is acceptable.

Dot defect table:

| Item |                        | White dot defect                                                                                                                       | Black dot defect | Total |
|------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------|-------|
| 1    | Defect counts          | 3                                                                                                                                      | 3                | 3     |
| 2    | Combined defect Counts | No combined dot defect allowed. Two Single dot defect that within 5mm during each dot defect should be counted as combined dot defect. |                  |       |

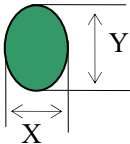
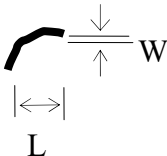
## 11.6 Inspection specification

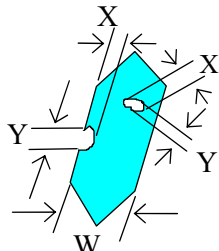
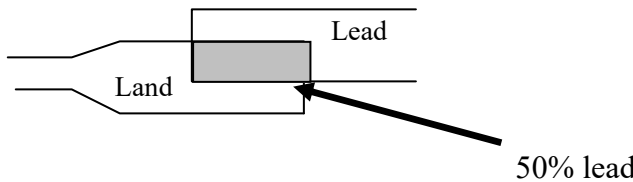
AQL inspection standard

Sampling method: MIL-STD-105E, Level II, single sampling

| Classify | Item          |                              | Note | AQL  |  |
|----------|---------------|------------------------------|------|------|--|
| Major    | Display state | Short or open circuit        | 1    | 0.65 |  |
|          |               | Contrast defect (dim, ghost) |      |      |  |
|          |               | LC leakage                   |      |      |  |
|          |               | Flickering                   |      |      |  |
|          |               | No display                   |      |      |  |
|          |               | Wrong viewing direction      | 2    |      |  |
|          |               | Wrong Back-light             | 7    |      |  |
|          | Non-display   | Flat cable or pin reverse    | 9    |      |  |
|          |               | Wrong or missing component   | 10   |      |  |
| Minor    | Display state | Background color deviation   | 2    | 2.5  |  |
|          |               | Black spot and dust          | 3    |      |  |
|          |               | Line defect                  | 4    |      |  |
|          |               | Scratch                      |      |      |  |
|          |               | Rainbow                      | 5    |      |  |
|          |               | Pin hole                     | 6    |      |  |
|          | Polarizer     | Bubble and foreign material  | 3    |      |  |
|          |               | Scratch                      | 4    |      |  |
|          | PCB,FPC       | Scratch                      | 4    |      |  |
|          | Soldering     | Poor connection              | 8    |      |  |
|          | Wire          | Poor connection              | 9    |      |  |
|          | LCD           | CHIP OUT                     | 11   |      |  |

**Note on defect classification:**

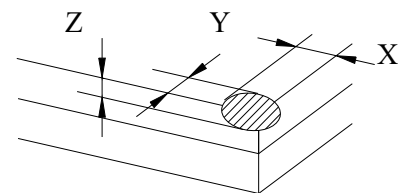
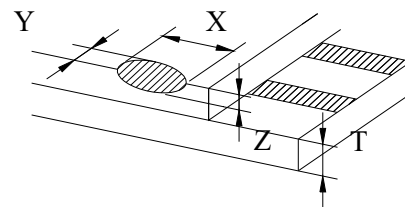
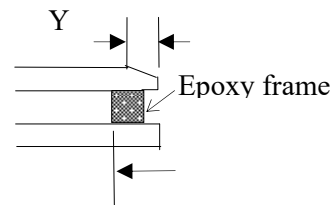
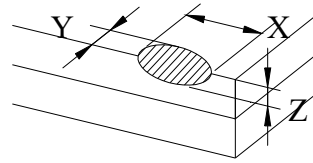
| No.                     | Item                                                                                                                                                                                               | Criterion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------|-----------------|---|------------------|-----------|-------------------------|----------------|-------------------------|--------------|---------------|---|--------------|---------------|--------------|-----------|---|-----|------------|-------------------------|
| 1                       | Short or open circuit                                                                                                                                                                              | Not allow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|                         | LC leakage                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|                         | Flickering                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|                         | No display                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|                         | Wrong viewing direction                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|                         | Wrong Back-light                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| 2                       | Contrast defect                                                                                                                                                                                    | Refer to approval sample                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
|                         | Background color deviation                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| 3                       | Point defect,<br>Black spot, dust<br>(incl. Polarizer) ex.:<br>dirt under polarizer,<br>Pinhole of<br>reflector ,glass<br>scratch, dirt under<br>glass,scratch on<br>polarizer<br>$\phi = (X+Y)/2$ | <div></div> <table><tr><td>Point</td><td>Acceptable Qty.</td></tr><tr><td>Size</td><td></td></tr><tr><td><math>\phi \leq 0.20</math></td><td>Disregard</td></tr><tr><td><math>0.20 &lt; \phi \leq 0.25</math></td><td>3</td></tr><tr><td><math>0.25 &lt; \phi \leq 0.30</math></td><td>2</td></tr><tr><td><math>\phi &gt; 0.30</math></td><td>0</td></tr></table> <div>Unit: mm</div>                                                                                                                                                                                    | Point | Acceptable Qty. | Size            |   | $\phi \leq 0.20$ | Disregard | $0.20 < \phi \leq 0.25$ | 3              | $0.25 < \phi \leq 0.30$ | 2            | $\phi > 0.30$ | 0 |              |               |              |           |   |     |            |                         |
|                         | Point                                                                                                                                                                                              | Acceptable Qty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| Size                    |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $\phi \leq 0.20$        | Disregard                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $0.20 < \phi \leq 0.25$ | 3                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $0.25 < \phi \leq 0.30$ | 2                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $\phi > 0.30$           | 0                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| 4                       | Line defect                                                                                                                                                                                        | <div></div> <table><tr><td></td><td>Line</td><td>Acceptable Qty.</td></tr><tr><td>L</td><td>W</td><td></td></tr><tr><td>---</td><td><math>0.015 \geq W</math></td><td>Disregard</td></tr><tr><td><math>3.0 \geq L</math></td><td><math>0.03 \geq W</math></td><td rowspan="2">2</td></tr><tr><td><math>2.0 \geq L</math></td><td><math>0.05 \geq W</math></td></tr><tr><td><math>1.0 \geq L</math></td><td><math>0.1 &gt; W</math></td><td>1</td></tr><tr><td>---</td><td><math>0.05 &lt; W</math></td><td>Applied as point defect</td></tr></table> <div>Unit: mm</div> |       | Line            | Acceptable Qty. | L | W                |           | ---                     | $0.015 \geq W$ | Disregard               | $3.0 \geq L$ | $0.03 \geq W$ | 2 | $2.0 \geq L$ | $0.05 \geq W$ | $1.0 \geq L$ | $0.1 > W$ | 1 | --- | $0.05 < W$ | Applied as point defect |
|                         | Line                                                                                                                                                                                               | Acceptable Qty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| L                       | W                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| ---                     | $0.015 \geq W$                                                                                                                                                                                     | Disregard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $3.0 \geq L$            | $0.03 \geq W$                                                                                                                                                                                      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $2.0 \geq L$            | $0.05 \geq W$                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| $1.0 \geq L$            | $0.1 > W$                                                                                                                                                                                          | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| ---                     | $0.05 < W$                                                                                                                                                                                         | Applied as point defect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |
| 5                       | Rainbow                                                                                                                                                                                            | Not more than two color changes across the viewing area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |                 |                 |   |                  |           |                         |                |                         |              |               |   |              |               |              |           |   |     |            |                         |

| No.                     | Item                                                                                             | Criterion                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |                |                  |           |                         |   |               |   |
|-------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------|------------------|-----------|-------------------------|---|---------------|---|
| 6                       | <p><b>Segment pattern</b></p> <p><b>W = Segment width</b></p> <p><math>\phi = (X+Y)/2</math></p> | <p><b>(1) Pin hole</b></p> <p><math>\phi &lt; 0.10\text{mm}</math> is acceptable.</p> <div></div> <table><tr><th>Point Size</th><th>Acceptable Qty</th></tr><tr><td><math>\phi \leq 1/4W</math></td><td>Disregard</td></tr><tr><td><math>1/4W &lt; \phi \leq 1/2W</math></td><td>1</td></tr><tr><td><math>\phi &gt; 1/2W</math></td><td>0</td></tr></table> <p>Unit: mm</p> | Point Size | Acceptable Qty | $\phi \leq 1/4W$ | Disregard | $1/4W < \phi \leq 1/2W$ | 1 | $\phi > 1/2W$ | 0 |
| Point Size              | Acceptable Qty                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                |                  |           |                         |   |               |   |
| $\phi \leq 1/4W$        | Disregard                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                |                  |           |                         |   |               |   |
| $1/4W < \phi \leq 1/2W$ | 1                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                |                  |           |                         |   |               |   |
| $\phi > 1/2W$           | 0                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                |                  |           |                         |   |               |   |
| 7                       | <b>Back-light</b>                                                                                | <p>(1) The color of backlight should correspond its specification.</p> <p>(2) Not allow flickering</p>                                                                                                                                                                                                                                                                                                                                                       |            |                |                  |           |                         |   |               |   |
| 8                       | <b>Soldering</b>                                                                                 | <p>(1) Not allow heavy dirty and solder ball on PCB or FPC.<br/>(The size of dirty refer to point and dust defect)</p> <p>(2) Over 50% of lead should be soldered on Land.</p> <div></div>                                                                                                                                                                               |            |                |                  |           |                         |   |               |   |
| 9                       | <b>Wire</b>                                                                                      | <p>(1) Copper wire should not be rusted</p> <p>(2) Not allow crack on copper wire connection.</p> <p>(3) Not allow reversing the position of the flat cable.</p> <p>(4) Not allow exposed copper wire inside the flat cable.</p>                                                                                                                                                                                                                             |            |                |                  |           |                         |   |               |   |
| 10                      | <b>PCB,FPC</b>                                                                                   | <p>(1) Not allow screw rust or damage.</p> <p>(2) Not allow missing or wrong putting of component.</p>                                                                                                                                                                                                                                                                                                                                                       |            |                |                  |           |                         |   |               |   |

11

LCD

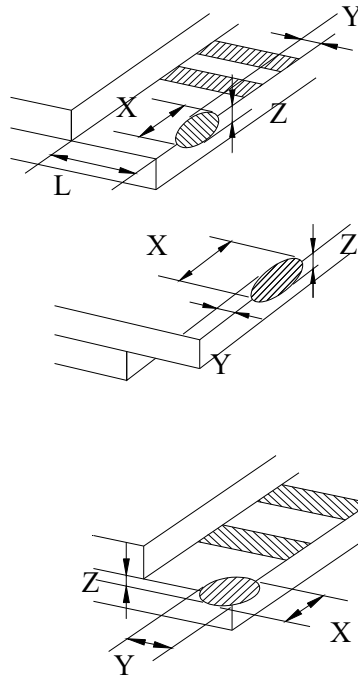
### 2.1.1 chip on the surface



Note: A: LCD Length

| X           | Y                                      | Z           |
|-------------|----------------------------------------|-------------|
| $>1/8A$     | $\leq 0.3\text{mm}$                    | $\leq 1/2T$ |
| $\leq 1/8A$ | Not enter into epoxy frame             | $\leq T$    |
|             | Not enter into the inner edge of epoxy | $\leq 1/2T$ |

### 2.1.2 Chip on the terminal

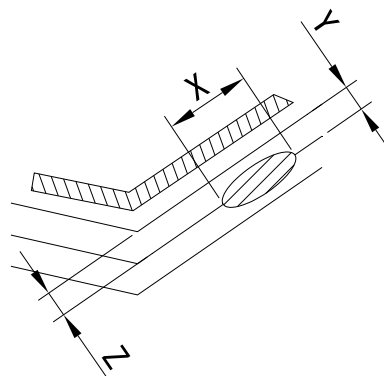


| X                                       | Y                   | Z           |
|-----------------------------------------|---------------------|-------------|
| $> 1/8A$                                | $\leq 0.3\text{mm}$ | $\leq 1/2T$ |
| $\leq 1/8A$                             | $\leq 1/2L$         | $\leq T$    |
| $\leq 1/8A \text{ \& } \leq 1\text{mm}$ | $\leq L$            | $\leq T$    |
| $\leq 1/8A \text{ \& } \leq 2\text{mm}$ | $\leq L$            | $\leq 1/2T$ |

Note: A: LCD Length.

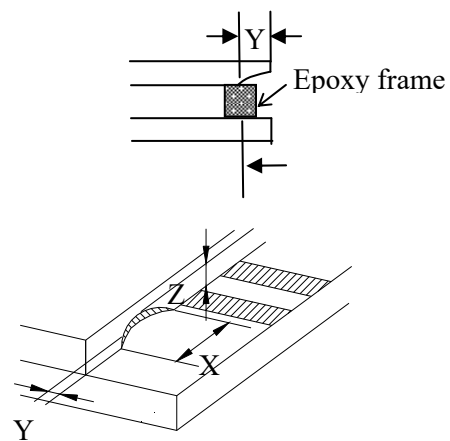
the distance between crack and contact pad must be greater than the width of 1<sup>st</sup> contact pad.

### 2.1.3 Chip out on between side



11

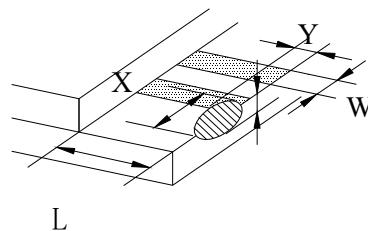
LCD



| X           | Y                              | Z             |
|-------------|--------------------------------|---------------|
| $\leq 1/8A$ | Not enter into epoxy frame     | $Z \leq 2T$   |
|             | Not enter into 1/2 epoxy frame | $Z \leq 1/2T$ |

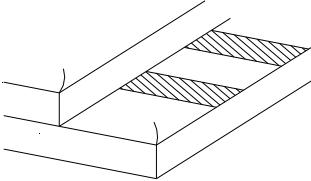
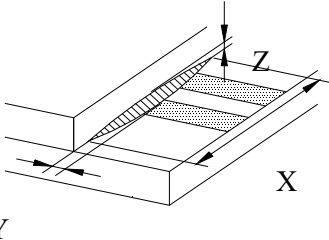
Note: A : LCD Length

#### 2.1.4 including corner chip and side chip



Note: A:LCD Length

| X           | Y           | Z           |
|-------------|-------------|-------------|
| $>1/8A$     | $\leq 1/6L$ | $\leq 1/2T$ |
| $\leq 1/8A$ | $\leq 1/3L$ |             |
| $\leq 1/4W$ | $\leq 2/3L$ |             |

| 11                                                               | LCD                     | <p><b>2.2 Chip out</b></p>  <ol style="list-style-type: none"> <li>1) Chip out is that crackles extend to inner edge.</li> <li>2) Crackles round epoxy frame will be rejected.</li> <li>3) Chip out on the terminal will be rejected: <math>Z=T</math> length <math>&gt;1\text{mm}</math> or <math>Z&lt;T</math> length <math>&gt;2\text{mm}</math></li> <li>4) The chip out at ITO will be rejected.</li> </ol> <p><b>2.3 Poor cutting</b></p>  <table border="1" data-bbox="676 943 1158 1189"> <thead> <tr> <th>X</th><th>Y</th><th>Z</th></tr> </thead> <tbody> <tr> <td><math>&gt;1/8</math><br/>A</td><td><math>\leq 0.3</math></td><td><math>\leq 1/2T</math></td></tr> <tr> <td><math>\leq 1/8</math><br/>A</td><td>According<br/>to drawing</td><td><math>1/2T \leq Z \leq T</math></td></tr> </tbody> </table> <p><b>Note :</b> A: LCD Length.</p> | X | Y | Z | $>1/8$<br>A | $\leq 0.3$ | $\leq 1/2T$ | $\leq 1/8$<br>A | According<br>to drawing | $1/2T \leq Z \leq T$ |
|------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|-------------|------------|-------------|-----------------|-------------------------|----------------------|
| X                                                                | Y                       | Z                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |   |   |             |            |             |                 |                         |                      |
| $>1/8$<br>A                                                      | $\leq 0.3$              | $\leq 1/2T$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |   |   |             |            |             |                 |                         |                      |
| $\leq 1/8$<br>A                                                  | According<br>to drawing | $1/2T \leq Z \leq T$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |   |   |             |            |             |                 |                         |                      |
| 12                                                               | SMT                     | <p>According to the &lt;Acceptable of electronic assemblies&gt; IPC-A-610C class 2 stander. Component missing or function defect are Major defect ,the others are Minor defect.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |   |   |   |             |            |             |                 |                         |                      |
| <p><b>Any one out of the specification will be rejected.</b></p> |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   |   |   |             |            |             |                 |                         |                      |

## **12. GENERAL PRECAUTIONS**

### **(1) Mounting Method**

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD Modules.

### **(2) Caution of LCD handling & cleaning**

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent:

- Water
- Ketone
- Aromatics

### **(3) Caution against static charge**

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

### **(4) Packaging**

Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.

- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

### **(5) Caution for operation**

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD's which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- As light dew depositing on terminals is a cause for electro-chemical reaction resulting in

terminal open circuit.

Usage under the relative condition of 40°C, 50%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance, for years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is.

Keeping temperature in the specified storage temperature range.

- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol which should be burned up later.
- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.