



**SPECIFICATION  
FOR  
LCD Module  
KD050C-1A-TP**

|                  |                     |
|------------------|---------------------|
| <b>MODULE:</b>   | <b>KD050C-1A-TP</b> |
| <b>CUSTOMER:</b> |                     |

|            |                    |                   |
|------------|--------------------|-------------------|
| <b>REV</b> | <b>DESCRIPTION</b> | <b>DATE</b>       |
| <b>1.0</b> | <b>FIRST ISSUE</b> | <b>2015.07.31</b> |
|            |                    |                   |

|                    |                |             |
|--------------------|----------------|-------------|
| <b>STARTEK</b>     | <b>INITIAL</b> | <b>DATE</b> |
| <b>PREPARED BY</b> |                |             |
| <b>CHECKED BY</b>  |                |             |
| <b>APPROVED BY</b> |                |             |

|                    |                |             |
|--------------------|----------------|-------------|
| <b>CUSTOMER</b>    | <b>INITIAL</b> | <b>DATE</b> |
| <b>APPROVED BY</b> |                |             |



## Revision History

[illegible]

|          |              |     |      |              |
|----------|--------------|-----|------|--------------|
| Part. No | KD050C-1A-TP | REV | V1.0 | Page 2 of 25 |
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## General Description

### \* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 5.0TFT-LCD contains 800x480 pixels, and can display up to 65K/262K/16.7M colors.

### \* Features

- Low Input Voltage: 3.3V(TYP)
- Display Colors of TFT LCD: 65K/262K/16.7M colors
- Interface: 16/18/24 bit RGB

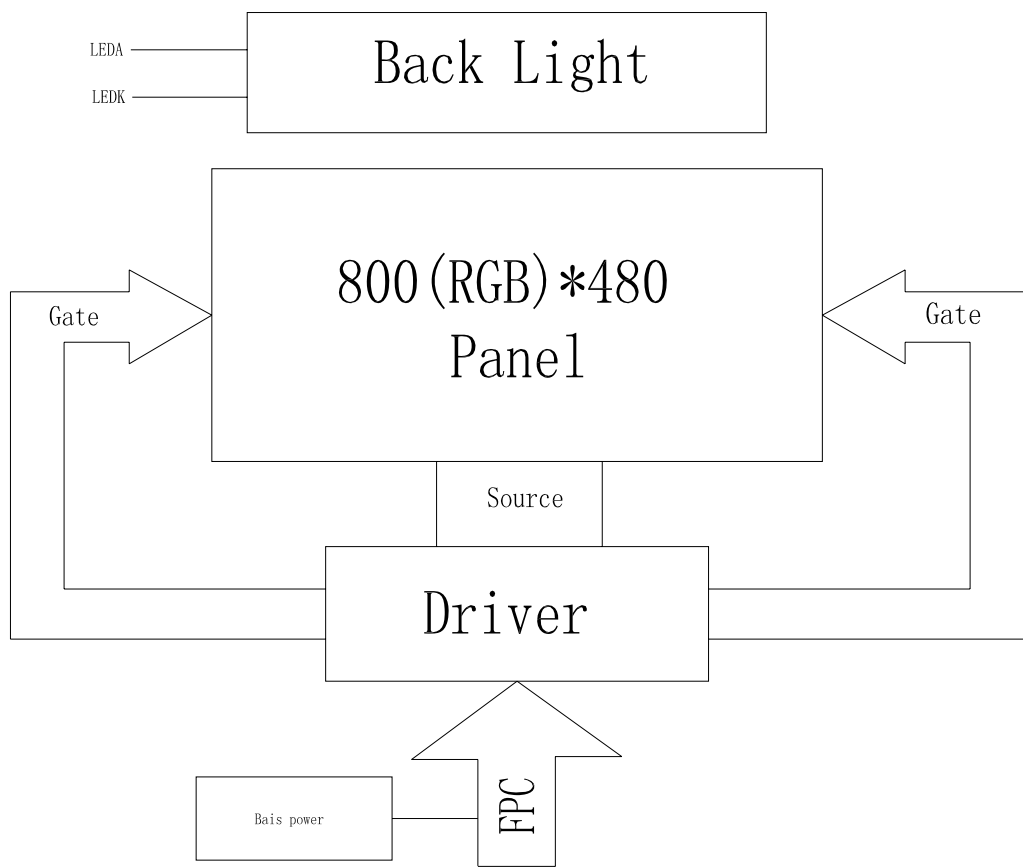
| eral Information Items | Specification                | Unit    | Note |
|------------------------|------------------------------|---------|------|
|                        | Main Panel                   |         |      |
| Display area(AA)       | 108.00(H)*64.80(V) (5.0inch) | mm      | -    |
| Driver element         | TFT active matrix            | -       | -    |
| Display colors         | 65K/262K/16.7M               | colors  | -    |
| Number of pixels       | 800(RGB)*480                 | dots    | -    |
| Pixel arrangement      | RGB vertical stripe          | -       | -    |
| Pixel pitch            | 0.108(H)*0.108(V)            | mm      | -    |
| Viewing angle          | 12:00                        | o'clock | -    |
| Controller IC          | ILI5960/ILI6122              | -       | -    |
| Display mode           | Transmissive/ Normally White | -       | -    |
| Operating temperature  | -20~+70                      | ℃       | -    |
| Storage temperature    | -30~+80                      | ℃       | -    |

### \* Mechanical Information

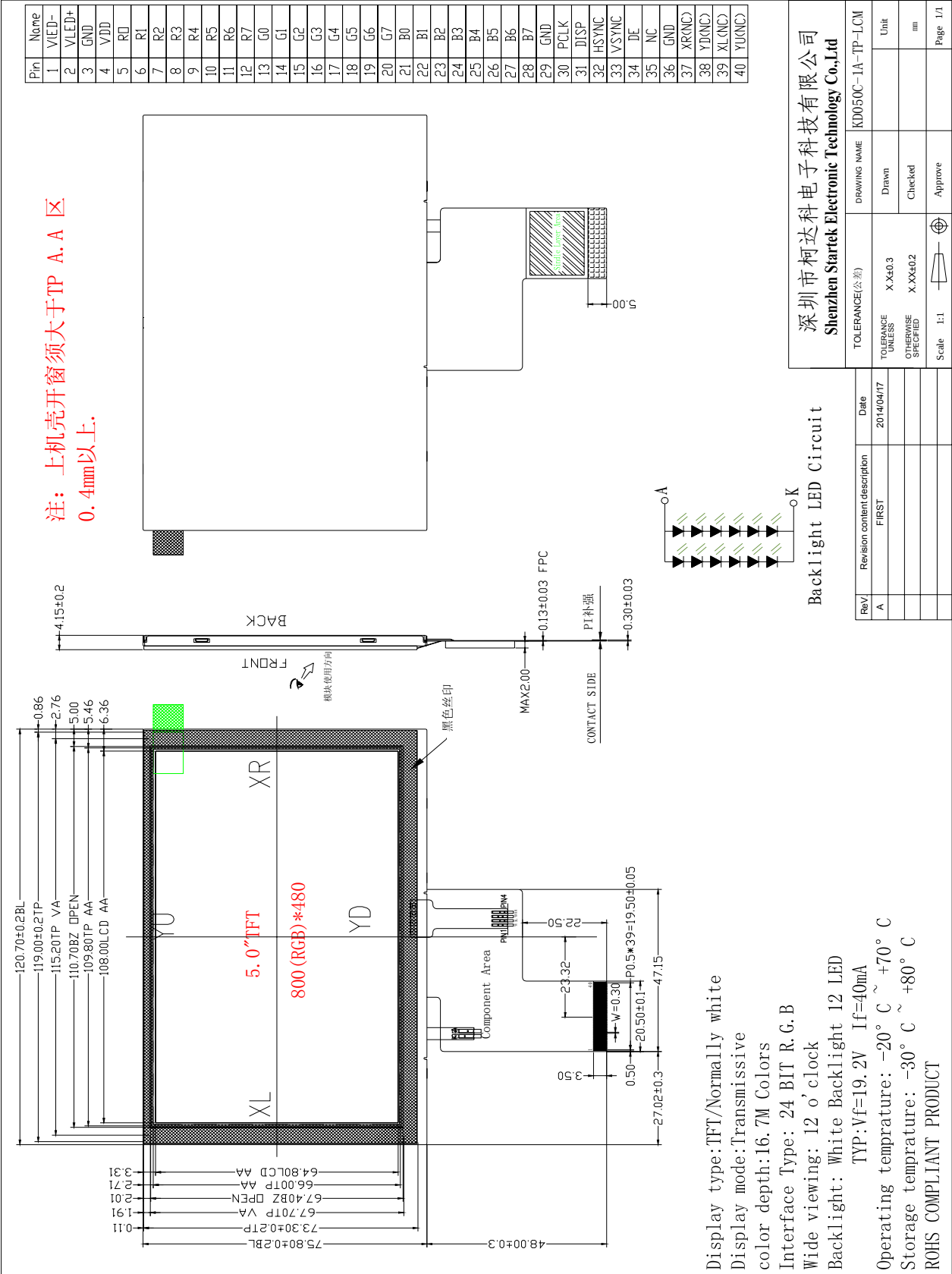
| Item        |               | Min. | Typ.   | Max. | Unit | Note |
|-------------|---------------|------|--------|------|------|------|
| Module size | Horizontal(H) |      | 120.70 |      | mm   | -    |
|             | Vertical(V)   |      | 75.80  |      | mm   | -    |
|             | Depth(D)      |      | 4.15   |      | mm   | -    |
| Weight      |               |      | TBD    |      | g    | -    |



1. Block Diagram



2. Outline dimension



### 3. Input terminal Pin Assignment

| NO. | SYMBOL | DISCRIPTION              | I/O |
|-----|--------|--------------------------|-----|
| 1   | VLED-  | Cathode pin OF backlight | P   |
| 2   | VLED+  | Anode pin of backlight   | P   |
| 3   | GND    | Ground.                  | P   |
| 4   | VDD    | Supply voltage(3.3V).    | P   |
| 5   | R0     | Red data input.          | I/O |
| 6   | R1     | Red data input.          | I/O |
| 7   | R2     | Red data input.          | I/O |
| 8   | R3     | Red data input.          | I/O |
| 9   | R4     | Red data input.          | I/O |
| 10  | R5     | Red data input.          | I/O |
| 11  | R6     | Red data input.          | I/O |
| 12  | R8     | Red data input.          | I/O |
| 13  | G0     | Green data input.        | I/O |
| 14  | G1     | Green data input.        | I/O |
| 15  | G2     | Green data input.        | I/O |
| 16  | G3     | Green data input.        | I/O |
| 17  | G4     | Green data input.        | I/O |
| 18  | G5     | Green data input.        | I/O |
| 19  | G6     | Green data input.        | I/O |
| 20  | G7     | Green data input.        | I/O |
| 21  | B0     | Blue data input.         | I/O |
| 22  | B1     | Blue data input.         | I/O |
| 23  | B2     | Blue data input.         | I/O |
| 24  | B3     | Blue data input.         | I/O |
| 25  | B4     | Blue data input.         | I/O |
| 26  | B5     | Blue data input.         | I/O |



|    |        |                                                                                                                                        |     |
|----|--------|----------------------------------------------------------------------------------------------------------------------------------------|-----|
| 27 | B6     | Blue data input.                                                                                                                       | I/O |
| 28 | B7     | Blue data input.                                                                                                                       | I/O |
| 29 | GND    | Ground.                                                                                                                                | P   |
| 30 | PCLK   | Dot clock signal for RGB interface operation<br>Fix this pin at VCI or GND when not in use.                                            | I   |
| 31 | DISP   | Standby setting for testing, it should be connected to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode. | I   |
| 32 | HSYNC  | Line synchronizing signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use                                   | I   |
| 33 | VSYNC  | Frame synchronizing signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                 | I   |
| 34 | DE     | Data enable signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                         | I   |
| 35 | NC     | NC                                                                                                                                     |     |
| 36 | GND    | Ground.                                                                                                                                | P   |
| 37 | XR(NC) | Touch panel Right Glass Terminal                                                                                                       | A/D |
| 38 | YD(NC) | Touch panel Bottom Film Terminal                                                                                                       | A/D |
| 39 | XL(NC) | Touch panel LIFT Glass Terminal                                                                                                        | A/D |
| 40 | YU(NC) | Touch panel Top Film Terminal                                                                                                          | A/D |

## 4. LCD Optical Characteristics

### 4.1 Optical specification

| Item                              |         | Symbol         | Condition                      | Min.  | Typ.  | Max.  | Unit. | Note |
|-----------------------------------|---------|----------------|--------------------------------|-------|-------|-------|-------|------|
| Transmittance<br>(with Polarizer) |         | T(%)           | --                             | --    | 5     | --    |       |      |
| Contrast Ratio                    |         | CR             | Θ=0<br>Normal viewing<br>angle | 600   | 800   |       |       |      |
| Response<br>time                  | Rising  | T <sub>R</sub> |                                | --    | 5     | 10    | msec  |      |
|                                   | Falling | T <sub>F</sub> |                                | --    | 15    | 25    |       |      |
| Color gamut                       |         | S(%)           |                                | --    | 60    | --    | %     |      |
| Color Filter<br>Chromaticity      | White   | W <sub>X</sub> |                                | 0.285 | 0.305 | 0.325 |       |      |
|                                   |         | W <sub>Y</sub> |                                | 0.314 | 0.334 | 0.354 |       |      |
|                                   | Red     | R <sub>X</sub> |                                | 0.588 | 0.608 | 0.628 |       |      |
|                                   |         | R <sub>Y</sub> |                                | 0.296 | 0.316 | 0.336 |       |      |
|                                   | Green   | G <sub>X</sub> |                                | 0.285 | 0.305 | 0.325 |       |      |
|                                   |         | G <sub>Y</sub> |                                | 0.536 | 0.556 | 0.576 |       |      |
|                                   | Blue    | B <sub>X</sub> |                                | 0.115 | 0.135 | 0.155 |       |      |
|                                   |         | B <sub>Y</sub> |                                | 0.117 | 0.137 | 0.157 |       |      |
| Viewing angle                     | Hor.    | Θ <sub>L</sub> | CR>10                          | --    | 60    | --    |       |      |
|                                   |         | Θ <sub>R</sub> |                                | --    | 60    | --    |       |      |
|                                   | Ver.    | Θ <sub>U</sub> |                                | --    | 50    | --    |       |      |
|                                   |         | Θ <sub>D</sub> |                                | --    | 70    | --    |       |      |
| Option View Direction             |         | 12 O'clock     |                                |       |       |       |       |      |

### 4.2 Measuring Condition

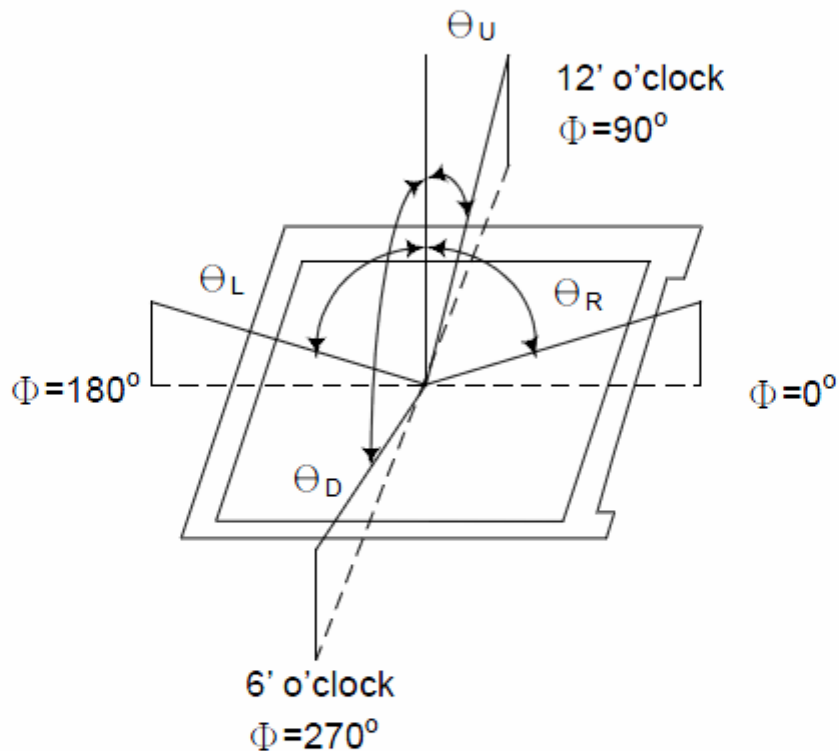
- Measuring surrounding: dark room
- Ambient temperature:  $25\pm 2^\circ\text{C}$
- 15min. warm-up time.



#### 4.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

Note (1) Definition of Viewing Angle:

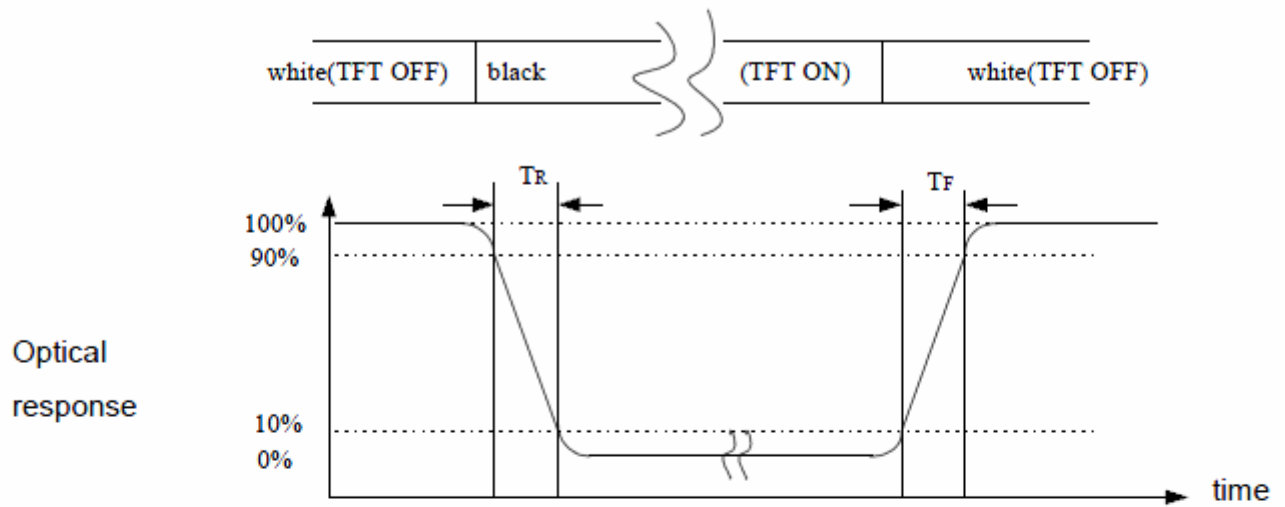


Note (2) Definition of Contrast Ratio (CR) :  
measured at the center point of panel

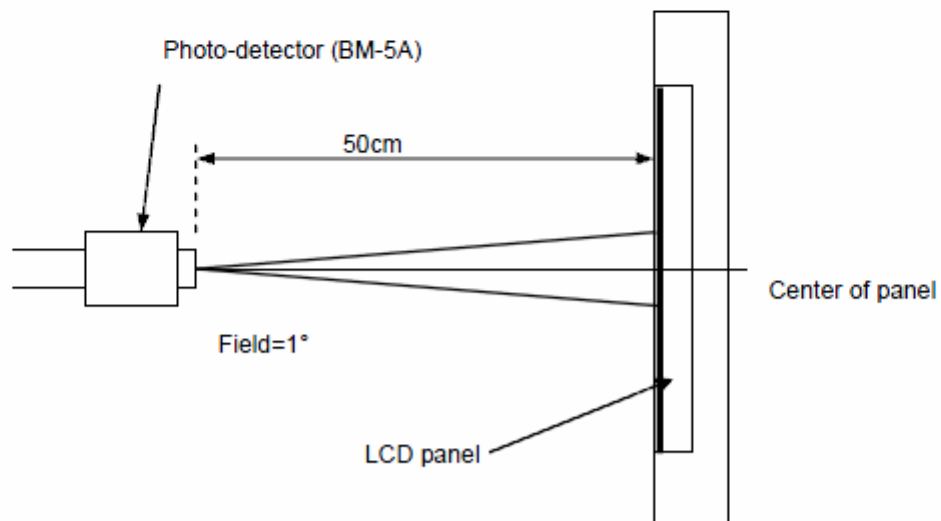
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



Note (3) Definition of Response Time : Sum of  $T_R$  and  $T_F$



Note (4) Definition of optical measurement setup



## 5. Electrical Characteristics

### 5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

| Characteristics                  | Symbol          | Min. | Max.    | Unit |
|----------------------------------|-----------------|------|---------|------|
| Digital Supply Voltage           | VDD             | -0.5 | 5.0     | V    |
| Digital interface supply Voltage | VDDIO           | -0.5 | VDD+0.3 | V    |
| Operating temperature            | T <sub>OP</sub> | -20  | +70     | °C   |
| Storage temperature              | T <sub>ST</sub> | -30  | +80     | °C   |

### 5.2 DC Electrical Characteristics

| Characteristics                  | Symbol | Min.     | Typ. | Max.     | Unit | Note |
|----------------------------------|--------|----------|------|----------|------|------|
| Digital Supply Voltage           | VDD    | 3.0      | 3.3  | 4.2      | V    |      |
| Digital interface supply Voltage | VDDIO  | 3.0      | 3.3  | 4.2      | V    |      |
| Normal mode Current consumption  | IDD    | --       | 200  | --       | mA   |      |
| Level input voltage              | VIH    | 0.7VDDIO |      | VDDIO    | V    |      |
|                                  | VIL    | GND      |      | 0.3VDDIO | V    |      |
| Level output voltage             | VOH    | 0.8VDDIO |      | VDDIO    | V    |      |
|                                  | VOL    | GND      |      | 0.2VDDIO | V    |      |

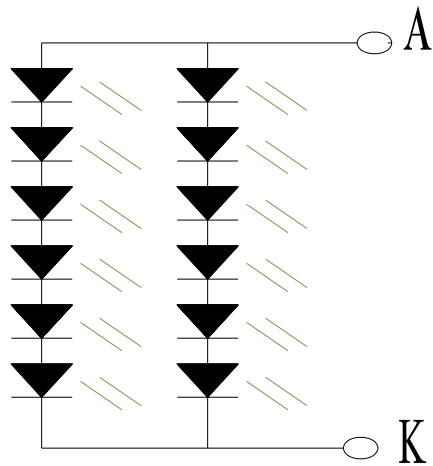
### 5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 12chips White LED

| Item            | Symbol         | Min.  | Typ. | Max. | Unit              | Note    |
|-----------------|----------------|-------|------|------|-------------------|---------|
| Forward Current | I <sub>F</sub> | 30    | 40   | --   | mA                |         |
| Forward Voltage | V <sub>F</sub> | --    | 19.2 | --   | V                 |         |
| LCM Luminance   | L <sub>V</sub> | 320   | --   | --   | cd/m <sup>2</sup> | IF=40mA |
| LED life time   | Hr             | 50000 |      |      | Hour              | Note1,2 |
| Uniformity      | AVg            | 80    | --   | --   | %                 |         |

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.



B a c k l i g h t   L E D   C i r c u i t

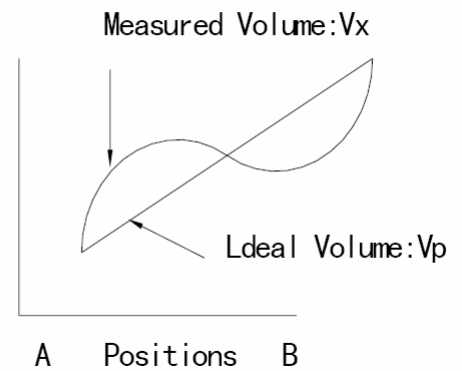
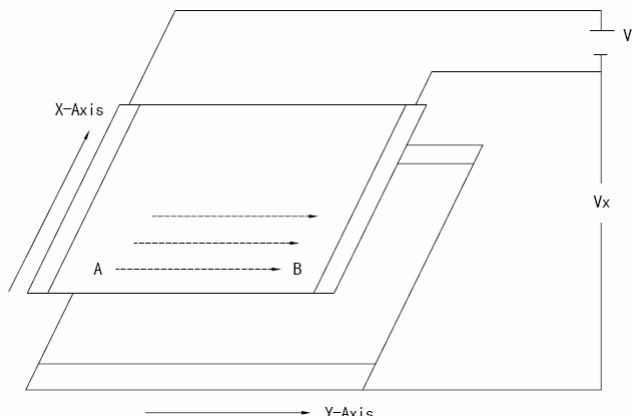
## 6. TP Feature

### 6.1 Conditions of use and storage

| Item                             | Value(condition)                                 | Note                  |
|----------------------------------|--------------------------------------------------|-----------------------|
| Temperature range upon operation | Humidity: 20%~90% non dew, condensation -20℃~70℃ | In a simple substance |
| Temperature range upon storage   | Humidity: 20%~90% non dew, condensation -30℃~80℃ | In a simple substance |

### 6.2 Electrical property

| Item                         | Value                             | Note                                                                             |
|------------------------------|-----------------------------------|----------------------------------------------------------------------------------|
| Maximum voltage              | DC5V                              |                                                                                  |
| Resistance between terminals | X direction[Film side]:200-600Ω   |                                                                                  |
|                              | Y direction [Glass side]:300-900Ω |                                                                                  |
| Insulation resistance        | DC 25V 20MΩor above               | Connect X + ~X- and Y+ ~Y-, apply 25VDC Between X and Y for perform measurements |
| Chattering                   | 10 msec or below                  |                                                                                  |
| Rating                       | Voltage is DC 5V                  |                                                                                  |



### 6.3 Mechanical property

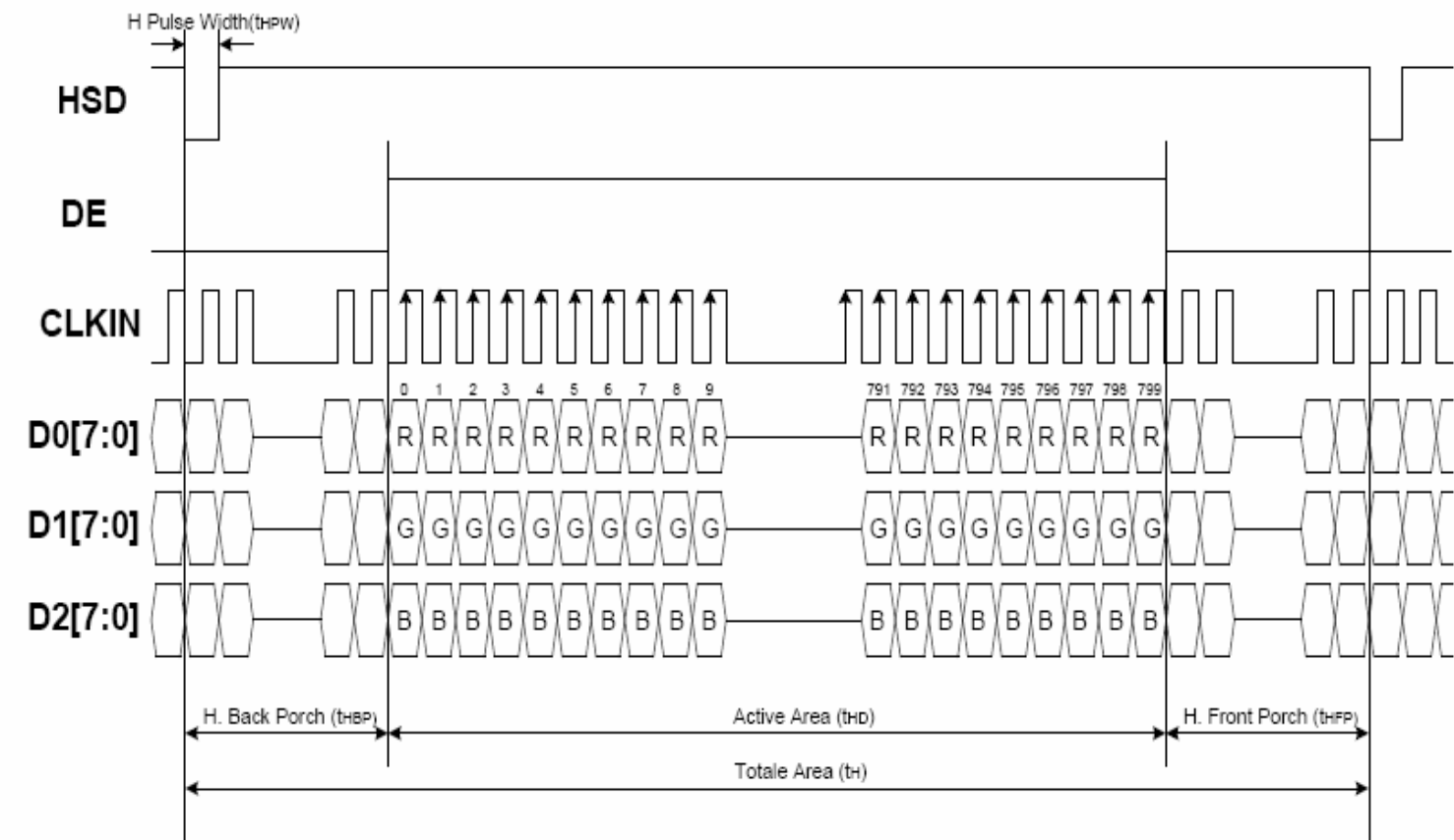
| Item                | Performance                        |                  | Note                                                                                                                                                                                                |
|---------------------|------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input method        | Used of an exclusive pen or finger |                  |                                                                                                                                                                                                     |
| Load upon operation | Exclusive pen                      | 60-100g or below | Operation and measurement with a pen must be carried out under the following tip condition s: Stylus pen material : POM(ployacetal) .<br>Tip : Diameter 3.0mm, SR 0.8 mm                            |
|                     | Finger                             | 60-100g or below | Operations and measurement methods simulat ed for a finger must be carried out under the following tip conditions.<br>Material :Silicon rubber (Hardness : 30°Hs) Tip : Diameter 12.0 mm, SR 12.5mm |
| Surface hardness    | Pencil hardness : 3H or above      |                  | It complies with the way of test method JIS K5400.                                                                                                                                                  |

### 6.4 Optical property

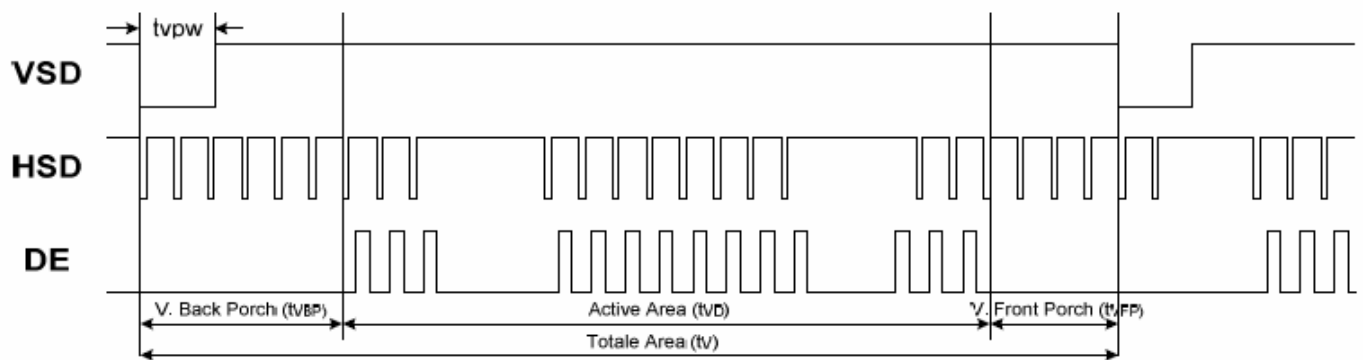
| Item                      | Performance                            | Note      |
|---------------------------|----------------------------------------|-----------|
| Total light transmittance | 80% or above                           | JIS K7105 |
| Haze                      | 5% or below                            | JIS K7136 |
| Film specification        | Polished type with hard coated surface |           |

## 7. AC Characteristic

### 7.1. Display Timing characteristics



| Horizontal Input Timing  |      |                  |       |      |       |       |
|--------------------------|------|------------------|-------|------|-------|-------|
| Parameter                |      | Symbol           | Value |      |       | Unit  |
|                          |      |                  | Min.  | Typ. | Max.  |       |
| Horizontal display area  |      | t <sub>HD</sub>  | --    | 800  | --    | CLKIN |
| CLKIN frequency          |      | f <sub>CLK</sub> | --    | 33.3 | 50    | MHz   |
| 1 Horizontal line period |      | t <sub>H</sub>   | 862   | 1056 | 1200  | CLKIN |
| HSD pulse width          | Min. | t <sub>HPW</sub> | --    | 1    | --    | CLKIN |
|                          | Typ. |                  | --    | --   | CLKIN |       |
|                          | Max. |                  | --    | 40   | --    | CLKIN |
| HSD back porch           | SYNC | t <sub>HBP</sub> | 46    | 46   | 46    | CLKIN |
| HSD front porch          | SYNC | t <sub>HFP</sub> | 16    | 210  | 354   | CLKIN |



| Vertical Input Timing |           |       |      |      |      |
|-----------------------|-----------|-------|------|------|------|
| Parameter             | Symbol    | Value |      |      | Unit |
|                       |           | Min.  | Typ. | Max. |      |
| Vertical display area | $t_{vD}$  | --    | 480  | --   | HSD  |
| VSD period time       | $t_v$     | 510   | 525  | 650  | HSD  |
| VSD pulse width       | $t_{vpw}$ | 1     | --   | 20   | HSD  |
| VSD back porch        | $t_{vBP}$ | 23    | 23   | 23   | HSD  |
| VSD front porch       | $t_{vFP}$ | 7     | 22   | 147  | HSD  |

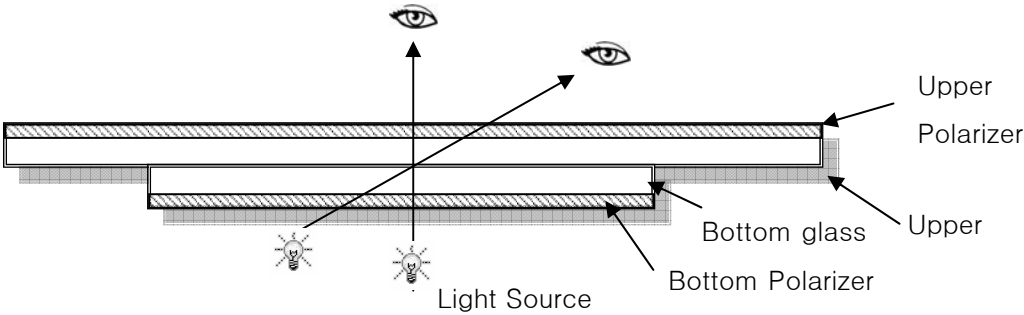
8. LCD Module Out-Going Quality Level

8.1 VISUAL & FUNCTION INSPECTION STANDARD

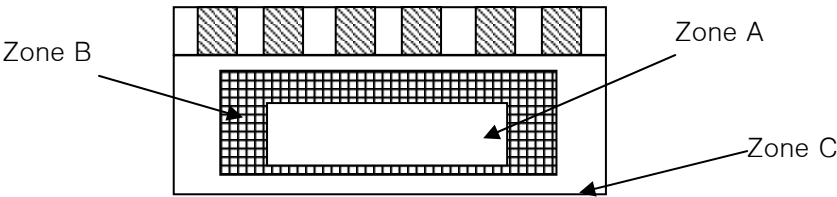
8.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

- Temperature : 25±5℃
- Humidity : 65%±10%RH
- Viewing Angle : Normal viewing Angle.
- Illumination: Single fluorescent lamp (300 to 700Lux)
- Viewing distance:30–50cm



8.1.2 Definition



- Zone A : Effective Viewing Area(Character or Digit can be seen)
- Zone B : Viewing Area except Zone A
- Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

### 8.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

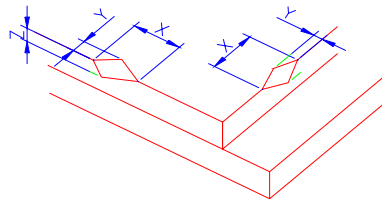
AQL:

| Major defect | Minor defect |
|--------------|--------------|
| 0.65         | 1.5          |

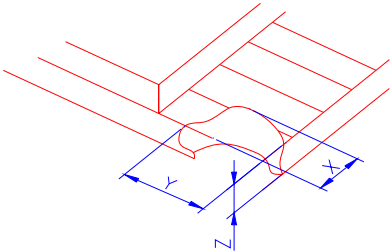
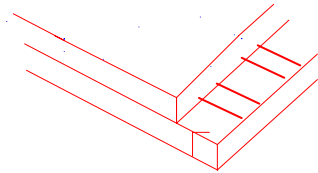
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

| No | Items to be inspected | Criteria                                                                                                                              | Classification of defects |
|----|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 1  | Functional defects    | 1) No display, Open or miss line<br>2) Display abnormally, Short<br>3) Backlight no lighting, abnormal lighting.<br>4) TP no function | Major                     |
| 2  | Missing               | Missing component                                                                                                                     |                           |
| 3  | Outline dimension     | Overall outline dimension beyond the drawing is not allowed                                                                           |                           |
| 4  | Color tone            | Color unevenness, refer to limited sample                                                                                             | Minor                     |
| 5  | Soldering appearance  | Good soldering , Peeling off is not allowed.                                                                                          |                           |
| 6  | LCD/Polarizer/TP      | Black/White spot/line, scratch, crack, etc.                                                                                           |                           |

### 8.1.4 Criteria (Visual)

| Number                         | Items                          | Criteria(mm)                                                                                                                                                                                                                  |   |   |   |        |                                |    |
|--------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------|--------------------------------|----|
| 1.0 LCD Crack/Broken           | (1) The edge of LCD broken     |  <table> <tr> <td>X</td><td>Y</td><td>Z</td></tr> <tr> <td>≤3.0mm</td><td>&lt;Inner border line of the seal</td><td>≤T</td></tr> </table> | X | Y | Z | ≤3.0mm | <Inner border line of the seal | ≤T |
| X                              | Y                              | Z                                                                                                                                                                                                                             |   |   |   |        |                                |    |
| ≤3.0mm                         | <Inner border line of the seal | ≤T                                                                                                                                                                                                                            |   |   |   |        |                                |    |
| NOTE:<br>X: Length<br>Y: Width |                                |                                                                                                                                                                                                                               |   |   |   |        |                                |    |



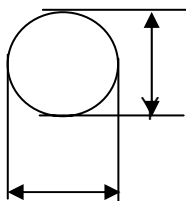
|                                                    |                                                                                                                 |                                                                                                                                                                                                                                 |   |   |   |        |    |    |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------|----|----|
| Z: Height<br>L: Length of ITO,<br>T: Height of LCD | (2)LCD corner broken                                                                                            |  <table border="1" data-bbox="922 546 1332 647"><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table> | X | Y | Z | ≤3.0mm | ≤L | ≤T |
|                                                    | X                                                                                                               | Y                                                                                                                                                                                                                               | Z |   |   |        |    |    |
| ≤3.0mm                                             | ≤L                                                                                                              | ≤T                                                                                                                                                                                                                              |   |   |   |        |    |    |
| (3) LCD crack                                      |  <p>Crack<br/>Not allowed</p> |                                                                                                                                                                                                                                 |   |   |   |        |    |    |

| Number   | Items        | Criteria (mm) |      |               |
|----------|--------------|---------------|------|---------------|
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2.0

Spot defect



X

$$\Phi = (X+Y)/2$$

① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)

| Zone<br>Size (mm)       | Acceptable Qty                   |   |        |
|-------------------------|----------------------------------|---|--------|
|                         | A                                | B | C      |
| $\Phi \leq 0.10$        | Ignore                           |   | Ignore |
| $0.15 < \Phi \leq 0.2$  | 3( distance $\geq 10\text{mm}$ ) |   |        |
| $0.25 < \Phi \leq 0.35$ | 2                                |   |        |
| $0.4 < \Phi$            | 0                                |   |        |

② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)

| Zone<br>Size (mm)       | Acceptable Qty                   |   |        |
|-------------------------|----------------------------------|---|--------|
|                         | A                                | B | C      |
| $\Phi \leq 0.1$         | Ignore                           |   | Ignore |
| $0.1 < \Phi \leq 0.25$  | 3( distance $\geq 10\text{mm}$ ) |   |        |
| $0.25 < \Phi \leq 0.35$ | 2                                |   |        |
| $\Phi > 0.4$            | 0                                |   |        |

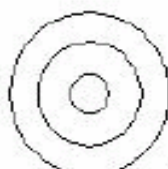
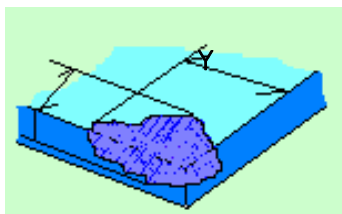
③ Polarizer accidented spot

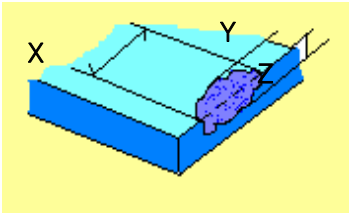
| Zone<br>Size (mm)     | Acceptable Qty                   |   |        |
|-----------------------|----------------------------------|---|--------|
|                       | A                                | B | C      |
| $\phi \leq 0.2$       | Ignore                           |   | Ignore |
| $0.2 < \phi \leq 0.5$ | 2( distance $\geq 10\text{mm}$ ) |   |        |
| $\phi > 0.5$          | 0                                |   |        |

Line defect  
(LCD/TP  
/Polarizer  
black/white  
line,  
scratch,  
stain)

| Width(mm)            | Length(mm)            | Acceptable Qty |   |        |
|----------------------|-----------------------|----------------|---|--------|
|                      |                       | A              | B | C      |
| $\phi \leq 0.03$     | Ignore                | Ignore         |   | Ignore |
| $0.03 < W \leq 0.05$ | $L \leq 3.0$          | $N \leq 2$     |   |        |
| $0.05 < W \leq 0.08$ | $L \leq 2.0$          | $N \leq 2$     |   |        |
| $0.08 < W$           | Define as spot defect |                |   |        |



|                        |                                                                              |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
|------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---|------------|----------------|---------|-------------------|---|---|---|-------|--------|--|--|------------|---|--|--|-------------|---|--|--|-------|---|--|--|
| 3.0                    | SMT                                                                          | According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| 4.0                    | TP<br>Related                                                                | TP bubble/<br>accidented<br>spot                                                                                                                                                                                                                                                                                                      | <table><tr><td rowspan="2">Size Φ(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>Φ≤0.1</td><td colspan="3">Ignore</td></tr><tr><td>0.2&lt;Φ≤0.25</td><td colspan="3">3</td></tr><tr><td>0.25&lt;Φ≤0.35</td><td colspan="3">2</td></tr><tr><td>0.4&lt;Φ</td><td colspan="3">0</td></tr></table> |                |   | Size Φ(mm) | Acceptable Qty |         |                   | A | B | C | Φ≤0.1 | Ignore |  |  | 0.2<Φ≤0.25 | 3 |  |  | 0.25<Φ≤0.35 | 2 |  |  | 0.4<Φ | 0 |  |  |
|                        |                                                                              |                                                                                                                                                                                                                                                                                                                                       | Size Φ(mm)                                                                                                                                                                                                                                                                                                                                     | Acceptable Qty |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
|                        |                                                                              |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                | A              | B | C          |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
|                        |                                                                              |                                                                                                                                                                                                                                                                                                                                       | Φ≤0.1                                                                                                                                                                                                                                                                                                                                          | Ignore         |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
|                        |                                                                              |                                                                                                                                                                                                                                                                                                                                       | 0.2<Φ≤0.25                                                                                                                                                                                                                                                                                                                                     | 3              |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| 0.25<Φ≤0.35            | 2                                                                            |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| 0.4<Φ                  | 0                                                                            |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| Assembly<br>deflection | beyond the edge of backlight ≤0.15mm                                         |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| Newton<br>Ring         | Newton Ring area>1/3 TP area<br>NG<br><br>Newton Ring area≤1/3 TP<br>area OK | <div><p>1 规律性</p></div> <div><p>2 非规律性</p></div> <div><p>似牛顿环</p></div> |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
|                        |                                                                              | <div><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤3.0mm</td><td>Y≤3.0mm</td><td>Z&lt;LCD<br/>thicknes</td></tr></table><p>*<br/>Circuitry broken is not</p></div> <div></div>                                                         |                                                                                                                                                                                                                                                                                                                                                | X              | Y | Z          | X≤3.0mm        | Y≤3.0mm | Z<LCD<br>thicknes |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| X                      | Y                                                                            | Z                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |
| X≤3.0mm                | Y≤3.0mm                                                                      | Z<LCD<br>thicknes                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                |                |   |            |                |         |                   |   |   |   |       |        |  |  |            |   |  |  |             |   |  |  |       |   |  |  |

|  |  |                |                                    |         |                                                                                     |
|--|--|----------------|------------------------------------|---------|-------------------------------------------------------------------------------------|
|  |  |                | allowed.                           |         |                                                                                     |
|  |  | TP edge broken | X                                  | Y       | Z                                                                                   |
|  |  | X : length     | X≤6.0mm                            | Y≤2.0mm | Z<LCD thicknes                                                                      |
|  |  | Y : width      |                                    |         |                                                                                     |
|  |  | Z : height     |                                    |         |                                                                                     |
|  |  |                | * Circuitry broken is not allowed. |         |                                                                                     |
|  |  |                |                                    |         |  |

Criteria ( functional items)

| Number | Items                 | Criteria (mm) |
|--------|-----------------------|---------------|
| 1      | No display            | Not allowed   |
| 2      | Missing segment       | Not allowed   |
| 3      | Short                 | Not allowed   |
| 4      | Backlight no lighting | Not allowed   |
| 5      | TP no function        | Not allowed   |

## 9. Reliability Test Result

### 9.1 Condition

| Item                                 | Condition                                                                                                                                                                                                                                                                                               | Sample Size | Test Result | Note |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------|
| Low Temperature Operating Life test  | -20℃, 96HR                                                                                                                                                                                                                                                                                              | 3ea         | pass        | -    |
| Thermal Humidity Operating Life test | 60℃, 90%RH, 96HR                                                                                                                                                                                                                                                                                        | 3ea         | pass        | -    |
| Temperature Cycle ON/OFF test        | -20℃ ↔ 70℃, ON/OFF, 20CYC                                                                                                                                                                                                                                                                               | 3ea         | pass        | (1)  |
| High Temperature Storage test        | 80℃, 96HR                                                                                                                                                                                                                                                                                               | 3ea         | pass        | -    |
| Low Temperature Storage test         | - 30℃, 96HR                                                                                                                                                                                                                                                                                             | 3ea         | pass        | -    |
| ESD test                             | 150pF, 330Ω, ±4KV(Contact)/± 6KV(Air), 5 points/panel, 10 times/point                                                                                                                                                                                                                                   | 3ea         | pass        |      |
| Thermal Shock Resistance             | The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours | 3ea         | pass        |      |
| Box Drop Test                        | 1 Corner 3 Edges 6 faces, 66 <sub>cm</sub> (MEDIUM BOX)                                                                                                                                                                                                                                                 | 1box        | pass        | -    |

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds

## 10. Cautions and Handling Precautions

### 10.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

### 10.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

|          |              |     |      |               |
|----------|--------------|-----|------|---------------|
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## 11.Packing

-----TBD-----

|          |              |     |      |               |
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