

**SPECIFICATION  
FOR  
LCD Module  
KD035C-4 V2-TP**

|                  |                       |
|------------------|-----------------------|
| <b>MODULE:</b>   | <b>KD035C-4 V2-TP</b> |
| <b>CUSTOMER:</b> |                       |

|            |                    |                   |
|------------|--------------------|-------------------|
| <b>REV</b> | <b>DESCRIPTION</b> | <b>DATE</b>       |
| <b>1.0</b> | <b>FIRST ISSUE</b> | <b>2012.06.06</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]

|          |                |     |      |              |
|----------|----------------|-----|------|--------------|
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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 3.5TFT-LCD contains 320x480 pixels, and can display up to 65K/262K colors.

### \* Features

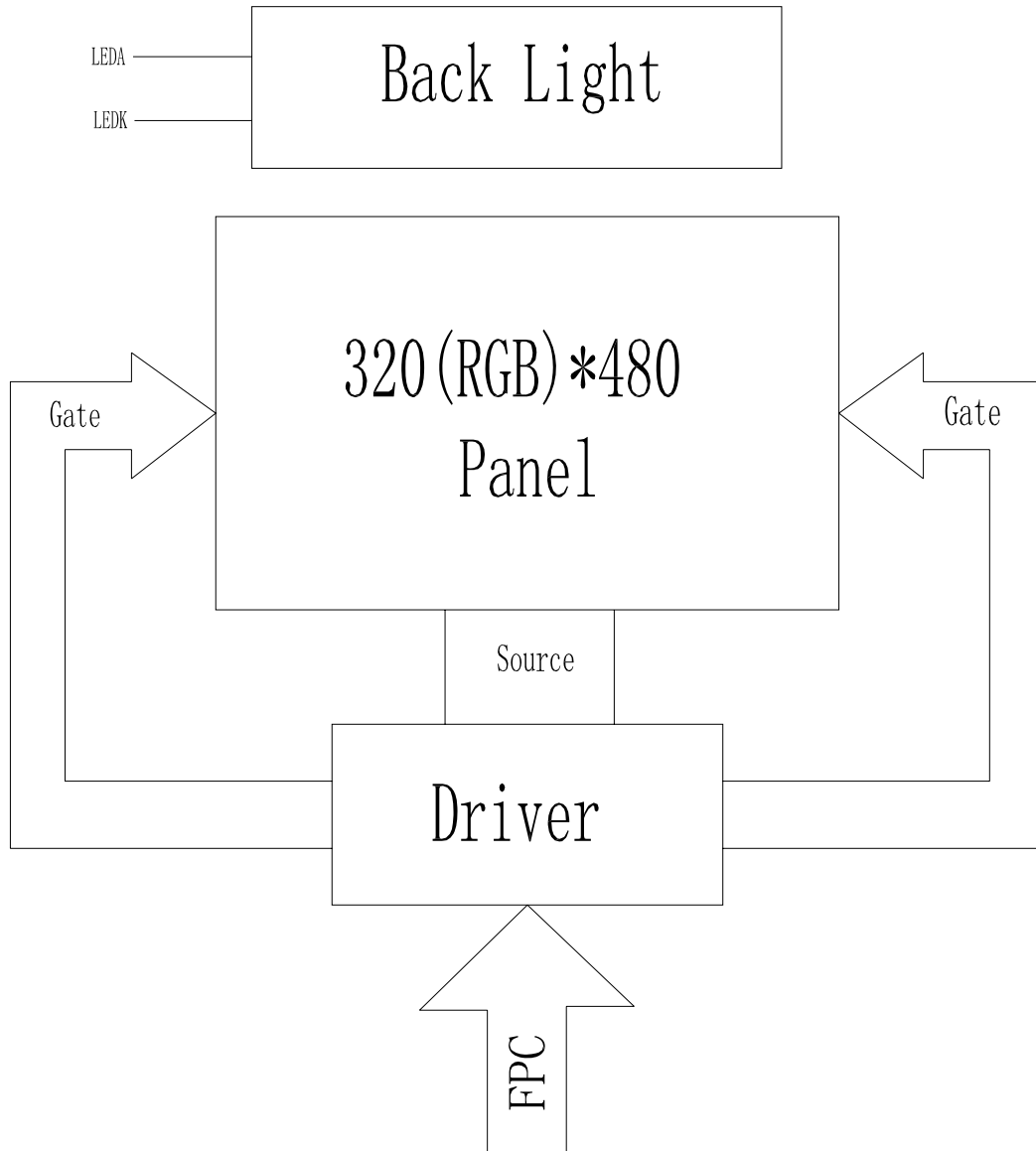
- Low Input Voltage: 3.3V(TYP)
- Display Colors of TFT LCD: 65K/262K colors
- RGB Interface: 8BIT/9BIT/16BIT/18BIT MCU, 3SPI/4SPI+16BIT/18BIT RGB

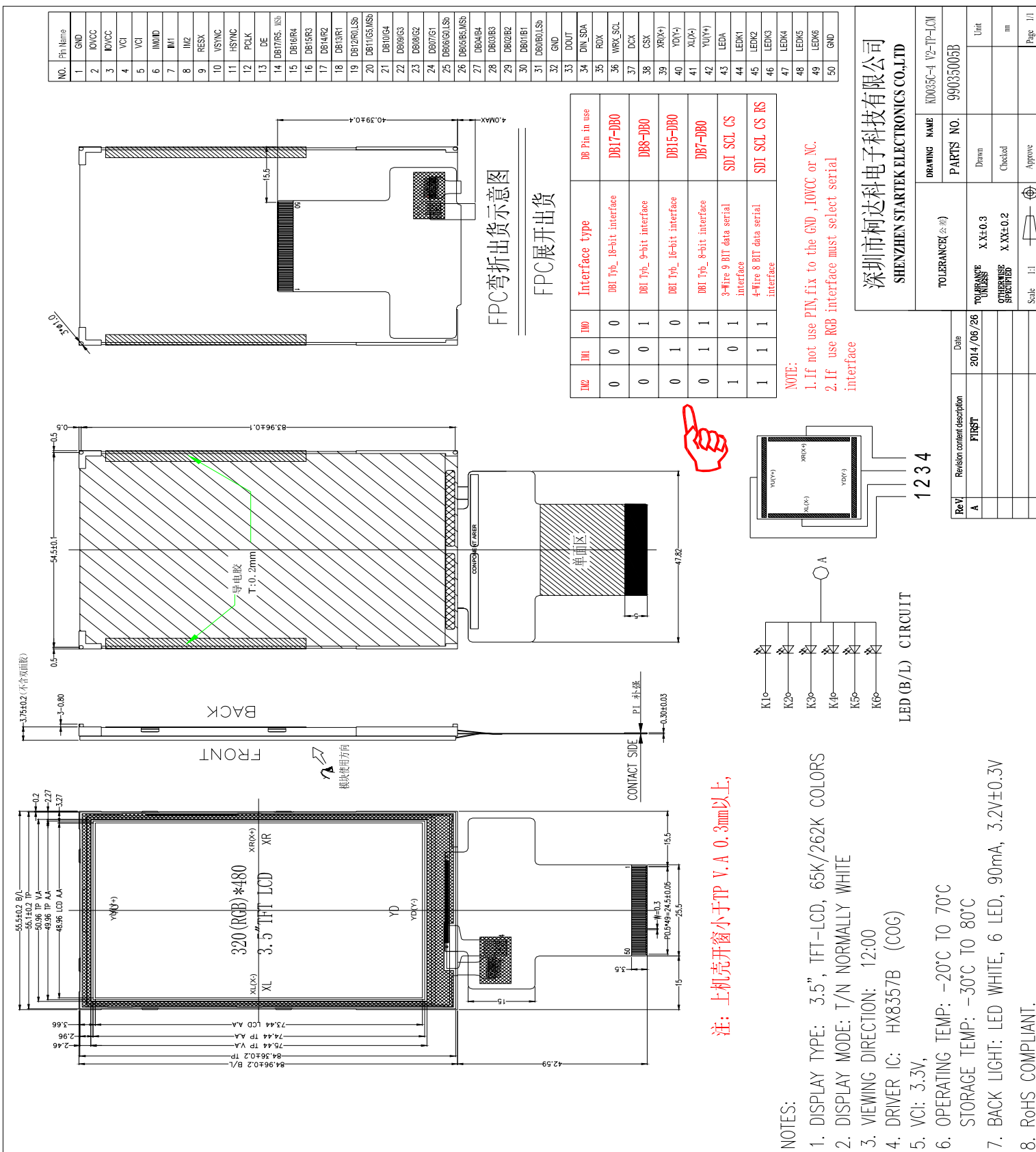
| eral Information Items | Specification                | Unit    | Note |
|------------------------|------------------------------|---------|------|
|                        | Main Panel                   |         |      |
| Display area(AA)       | 48.96(H)*73.44(V) (3.5inch)  | mm      | -    |
| Driver element         | TFT active matrix            | -       | -    |
| Display colors         | 65K/262K                     | colors  | -    |
| Number of pixels       | 320(RGB)*480                 | dots    | -    |
| Pixel arrangement      | RGB vertical stripe          | -       | -    |
| Pixel pitch            | 0.153(H)*0.153(V)            | mm      | -    |
| Viewing angle          | 6:00                         | o'clock | -    |
| Controller IC          | ILI9488                      | -       | -    |
| 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) |      | 55.50 |      | mm   | -    |
|             | Vertical(V)   |      | 84.96 |      | mm   | -    |
|             | Depth(D)      |      | 2.7   |      | mm   | -    |
| Weight      |               |      | TBD   |      | g    | -    |

# 1. Block Diagram





|          |                |     |      |              |
|----------|----------------|-----|------|--------------|
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### 3. Input terminal Pin Assignment

| NO.   | SYMBOL   | DISCRIPTION                                                                                                                               | I/O |
|-------|----------|-------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1     | GND      | Ground.                                                                                                                                   | P   |
| 2     | IOVCC    | Supply voltage(1.8–3.3V)                                                                                                                  | P   |
| 3     | IOVCC    | Supply voltage(1.8–3.3V)                                                                                                                  | P   |
| 4     | VCI      | Supply voltage(3.3V).                                                                                                                     | P   |
| 5     | VCI      | Supply voltage(3.3V).                                                                                                                     | P   |
| 6     | IM0/ID   | MPU Parallel interface bus and serial interface select If use RGB Interface must select serial interface.<br>Fix this pin at VCI and GND. | I   |
| 7     | IM1      |                                                                                                                                           | I   |
| 8     | IM2      |                                                                                                                                           | I   |
| 9     | RESX     | This signal will reset the device and must be applied to properly initialize the chip.                                                    | I   |
| 10    | VSYNC    | Frame synchronizing signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                    | I   |
| 11    | HSYNC    | Line synchronizing signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use                                      | I   |
| 12    | PCLK     | Dot clock signal for RGB interface operation<br>Fix this pin at VCI or GND when not in use.                                               | I   |
| 13    | DE       | Data enable signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                            | I   |
| 14–31 | DB17–DB0 | 18–bit parallel bi–directional data bus for MCU system and RGB interface mode .<br>Fix to GND level when not in use                       | I   |
| 32    | GND      | Ground.                                                                                                                                   | I   |
| 33    | DOUT     | Serial data output pin in serial bus system interface.<br>If not used, please open this pin.                                              | O   |
| 34    | DIN_SDA  | Serial input signal.<br>The data is applied on the rising edge of the SCL signal.                                                         | I   |



|    |         |                                                                                                              |     |
|----|---------|--------------------------------------------------------------------------------------------------------------|-----|
|    |         | If not used, fix this pin at VCI or GND.                                                                     |     |
| 35 | RDX     | Serves as a read signal and MCU read data at the rising edge.<br>fix this pin at VCI or GND when not in use. | I   |
| 36 | WRX_SCL | The data is applied on the rising edge of the SCL signal.<br>fix this pin at VCI or GND when not in use.     | I   |
| 37 | DCX     | <b>Display data/ command selection pin</b>                                                                   | I   |
| 38 | CSX     | Chip select input pin ("Low" enable).<br>fix this pin at VCI or GND when not in use.                         | I   |
| 39 | XR(NC)  | Touch panel Right Glass Terminal                                                                             | A/D |
| 40 | YD(NC)  | Touch panel Bottom Film Terminal                                                                             | A/D |
| 41 | XL(NC)  | Touch panel LIFT Glass Terminal                                                                              | A/D |
| 42 | YU(NC)  | Touch panel Top Film Terminal                                                                                | A/D |
| 43 | LEDA    | Anode pin of backlight                                                                                       | P   |
| 44 | LEDK1   | Cathode pin OF backlight                                                                                     | P   |
| 45 | LEDK2   | Cathode pin OF backlight                                                                                     | P   |
| 46 | LEDK3   | Cathode pin OF backlight                                                                                     | P   |
| 47 | LEDK4   | Cathode pin OF backlight                                                                                     | P   |
| 48 | LEDK5   | Cathode pin OF backlight                                                                                     | P   |
| 49 | LEDK6   | Cathode pin OF backlight                                                                                     | P   |
| 50 | GND     | Ground.                                                                                                      | P   |

## 4. LCD Optical Characteristics

### 4.1 Optical specification

| C. Optical specifications                                                          |        |                    |               |       |       |      |            |
|------------------------------------------------------------------------------------|--------|--------------------|---------------|-------|-------|------|------------|
| Item                                                                               | Symbol | Condition          | Specification |       |       | Unit | Remark     |
|                                                                                    |        |                    | Min.          | Typ.  | Max.  |      |            |
| Response time (By Quick)                                                           | Tr+Tf  | $\theta = 0^\circ$ | -             | 20    | 40    | ms   | Note 5     |
| Contrast ratio                                                                     | CR     | $\theta = 0^\circ$ | -             | 500   | -     |      | Note 2,6   |
| Viewing angle                                                                      | Top    | $CR \geq 10$       | -             | 60    | -     | deg. | Note 2,6,7 |
|                                                                                    | Bottom | $CR \geq 10$       | -             | 60    | -     |      |            |
|                                                                                    | Left   | $CR \geq 10$       | -             | 70    | -     |      |            |
|                                                                                    | Right  | $CR \geq 10$       | -             | 70    | -     |      |            |
| Color chromaticity<br>( CF only with ITO,<br>light source is C<br>light, CIE 1931) | Wx     | $\theta = 0^\circ$ | 0.292         | 0.307 | 0.322 |      | Note 3     |
|                                                                                    | Wy     |                    | 0.312         | 0.327 | 0.342 |      |            |
|                                                                                    | Rx     |                    | 0.609         | 0.624 | 0.639 |      |            |
|                                                                                    | Ry     |                    | 0.316         | 0.331 | 0.346 |      |            |
|                                                                                    | Gx     |                    | 0.281         | 0.296 | 0.311 |      |            |
|                                                                                    | Gy     |                    | 0.562         | 0.577 | 0.592 |      |            |
|                                                                                    | Bx     |                    | 0.128         | 0.143 | 0.158 |      |            |
|                                                                                    | By     |                    | 0.094         | 0.109 | 0.124 |      |            |
| NTSC                                                                               |        |                    | 57%           | 60%   | -     |      | Note 3     |
| Cross talk                                                                         | Ct     |                    | -             | -     | 2%    |      | Note 9     |
| Transmittance                                                                      | Trans  |                    | -             | 5.50% | -     |      | Note 4     |

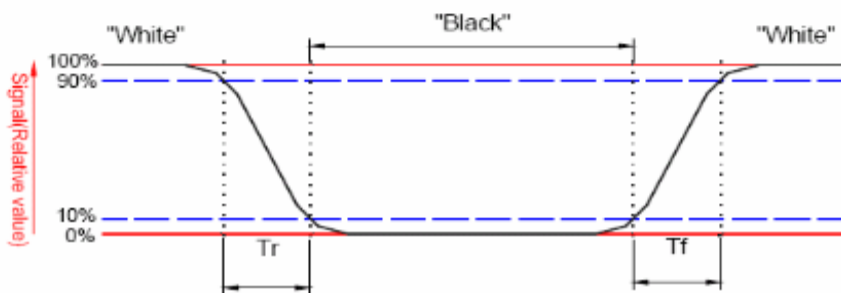
Note 1: Ambient temperature = 25°C.

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is  $\pm 10\%$ .

Note 5: Definition of response time:  
The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.



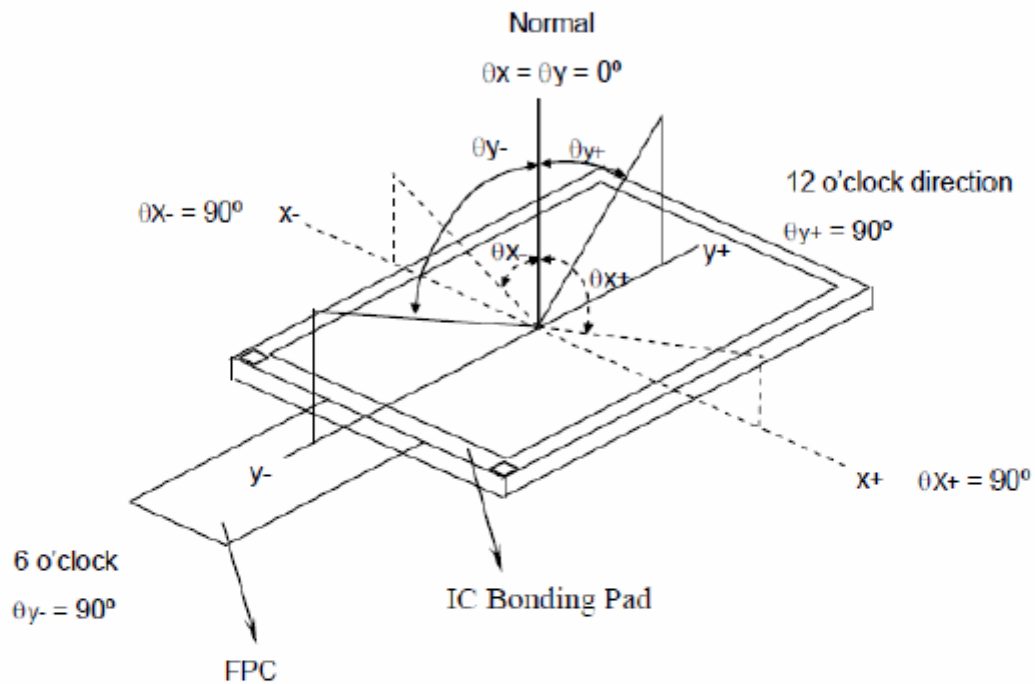


Note 6: Definition of contrast ratio:

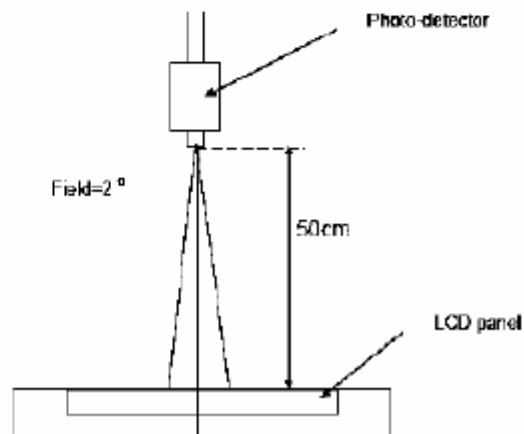
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 7: Definition of viewing angle

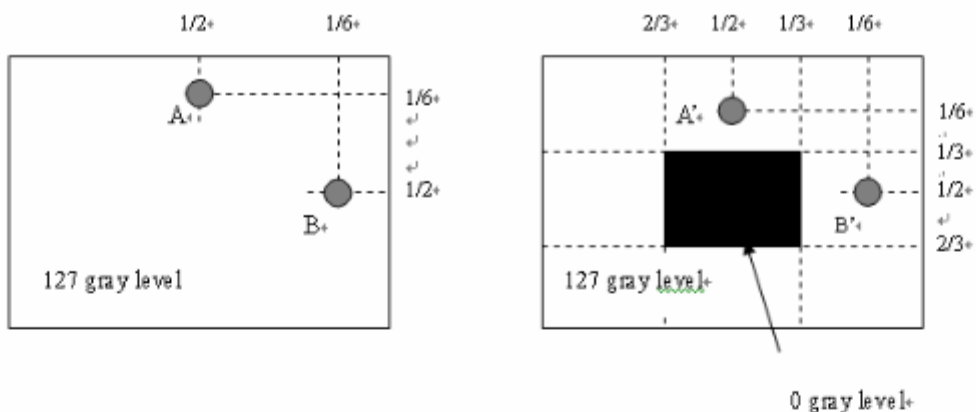


Note 8: Optical characteristic measurement setup.





Note 9:



$|LA - LA'| / LA \times 100\% = 2\% \text{ max.}$ , LA and LA' are brightness at location A and A'  
 $|LB - LB'| / LB \times 100\% = 2\% \text{ max.}$ , LB and LB' are brightness at location B and B'

## 5. Electrical Characteristics

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

| Characteristics                  | Symbol          | Min. | Max. | Unit |
|----------------------------------|-----------------|------|------|------|
| Digital Supply Voltage           | VDD             | -0.3 | 4.6  | V    |
| Digital interface supply Voltage | VDDIO           | -0.3 | 4.6  | V    |
| Operating temperature            | T <sub>OP</sub> | -20  | +70  | °C   |
| Storage temperature              | T <sub>ST</sub> | -30  | +80  | °C   |

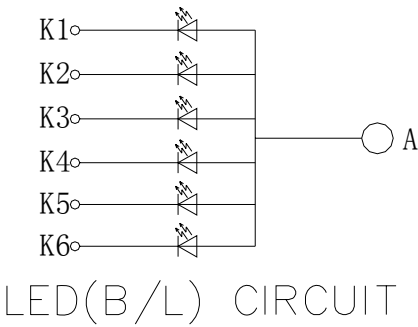
### 5.2 DC Electrical Characteristics

| Characteristics                  | Symbol          | Min.                 | Typ. | Max.                 | Unit | Note |
|----------------------------------|-----------------|----------------------|------|----------------------|------|------|
| Digital Supply Voltage           | VDD             | 2.4                  | 3.3  | 4.2                  | V    |      |
| Digital interface supply Voltage | VDDIO           | 1.65                 | 3.3  | 4.2                  | V    |      |
| Normal mode Current consumption  | IDD             | --                   | 10   | --                   | mA   |      |
| Level input voltage              | V <sub>IH</sub> | 0.7V <sub>DDIO</sub> |      | VDDIO                | V    |      |
|                                  | V <sub>IL</sub> | GND                  |      | 0.3V <sub>DDIO</sub> | V    |      |
| Level output voltage             | V <sub>OH</sub> | 0.8VDDIO             |      | VDDIO                | V    |      |
|                                  | V <sub>OL</sub> | GND                  |      | 0.2VDDIO             | V    |      |

### 5.3 LED Backlight Characteristics

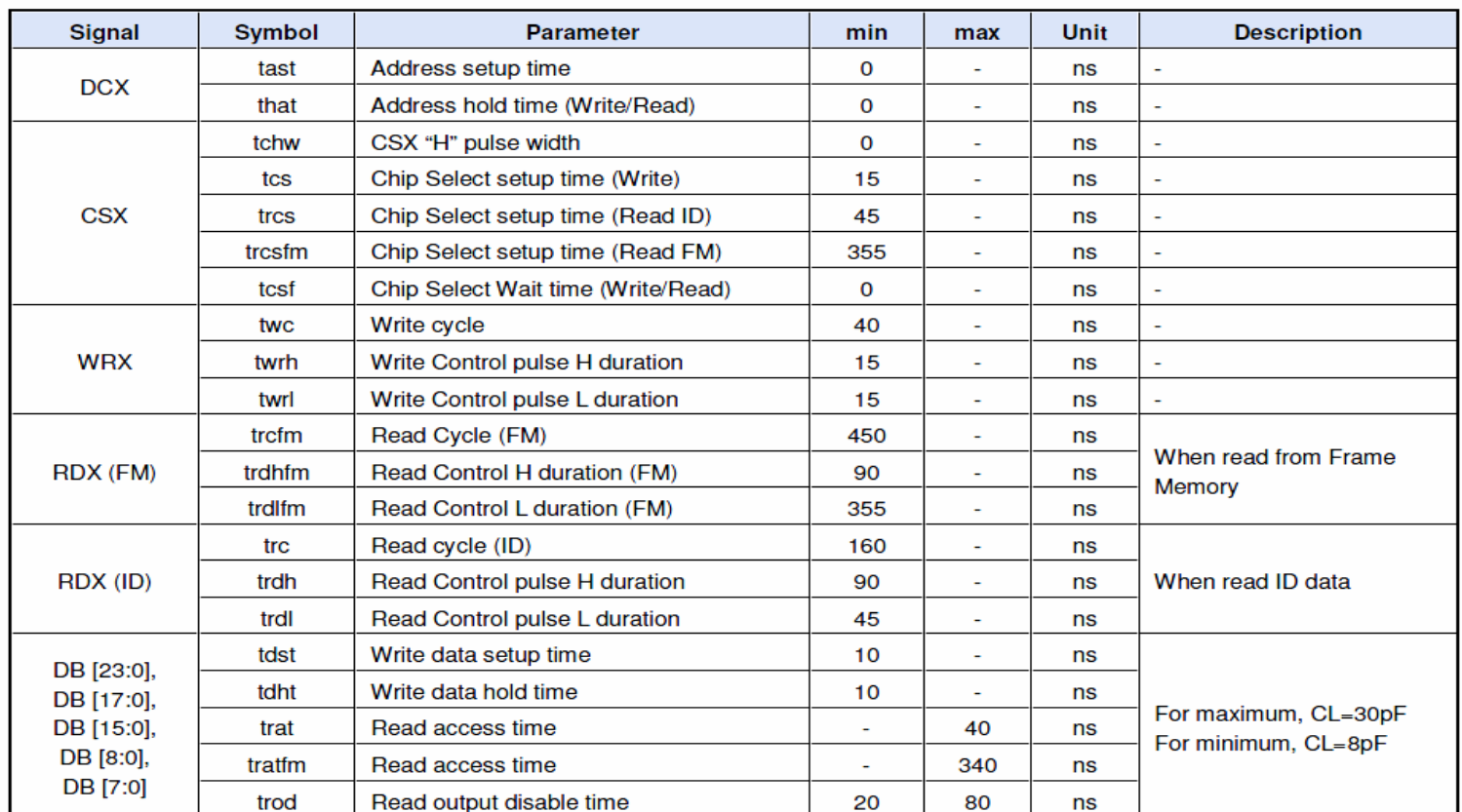
The back-light system is edge-lighting type with 4chips White LED

| Item            | Symbol         | Min. | Typ. | Max. | Unit  | Note     |
|-----------------|----------------|------|------|------|-------|----------|
| Forward Current | I <sub>F</sub> | 90   | 120  | --   | mA    |          |
| Forward Voltage | V <sub>F</sub> | 2.9  | 3.2  | 3.4  | V     |          |
| LCM Luminance   | L <sub>V</sub> | 250  | --   | --   | cd/m2 | IF=120mA |
| Uniformity      | AVg            | 80   | --   | --   | %     |          |

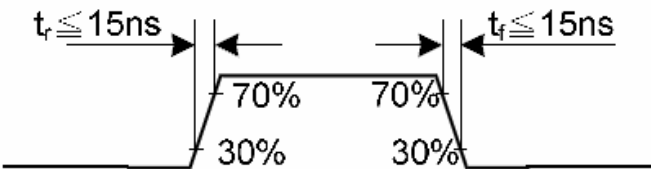




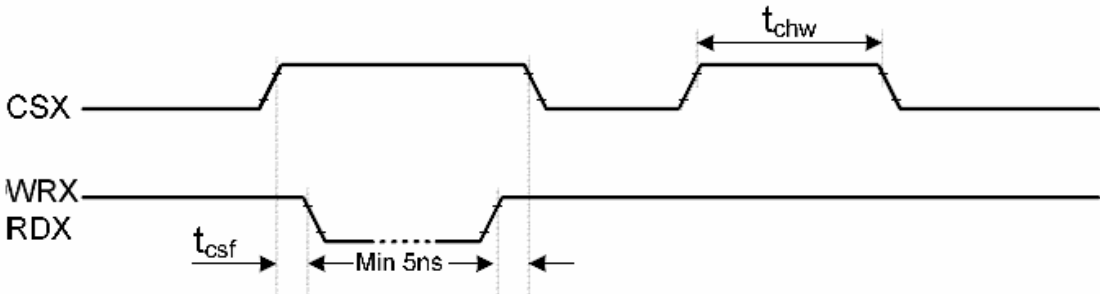
### 6.1. Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080- system)



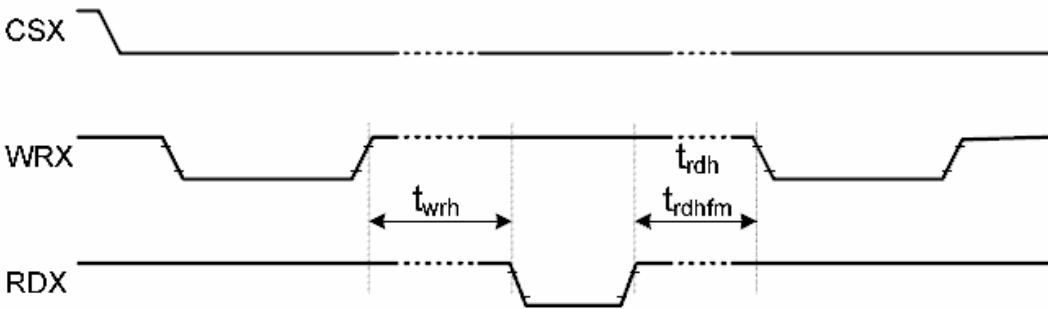
- Notes:**
1. Ta = -30 to 70 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V
  2. Logic high and low levels are specified as 30% and 70% of IOVCC for input signals.
  3. Input signal rising time and falling time:



4. The CSX timing:

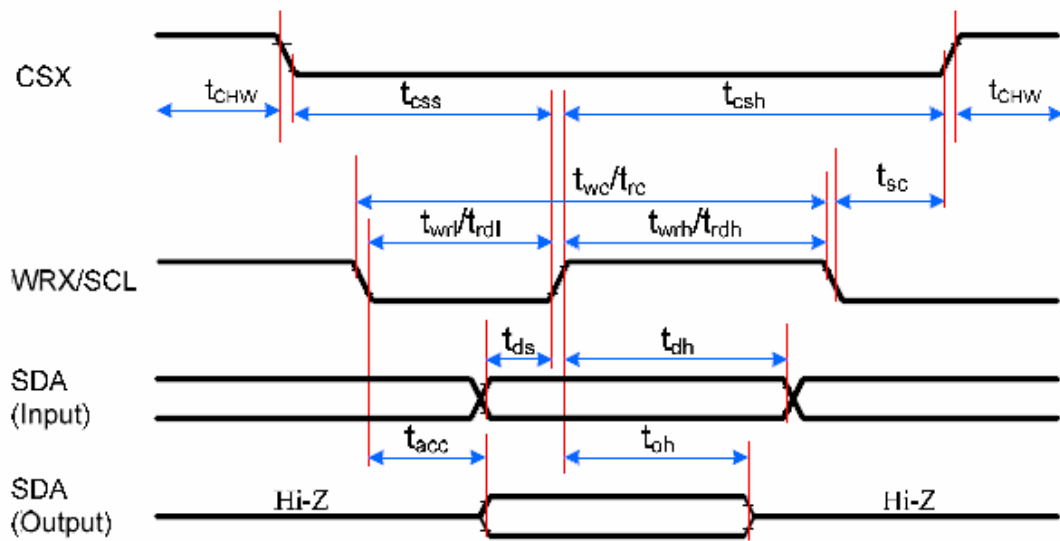


5. The Write to Read or the Read to Write timing:



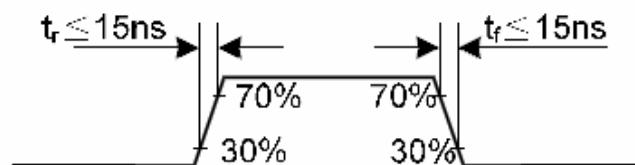


## 6.2 Display Serial Interface Timing Characteristics (3-line SPI system)

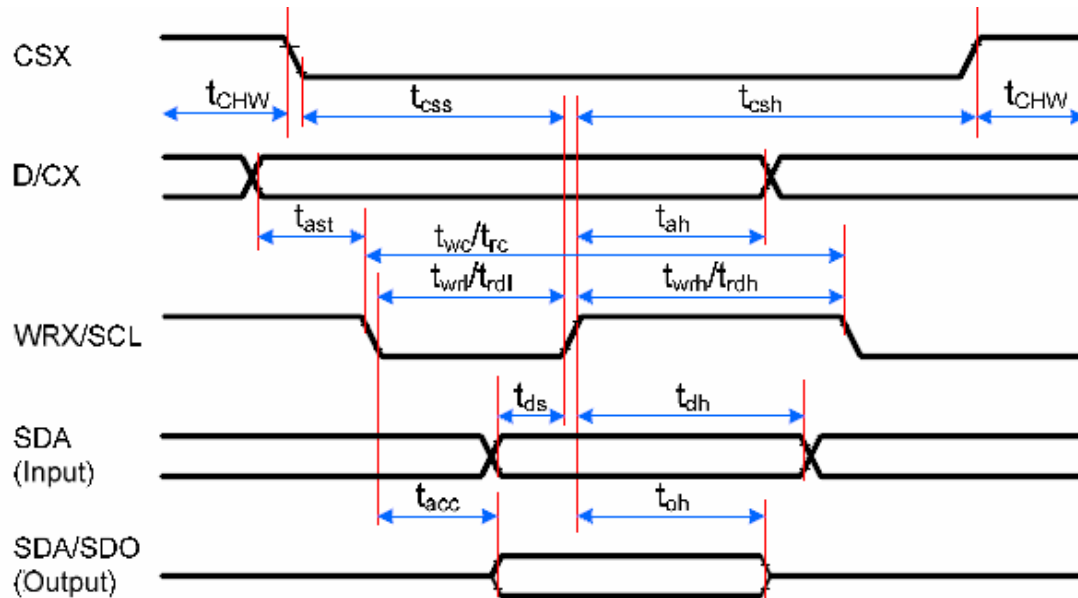


| Signal           | Symbol | Parameter                    | min | max | Unit | Description         |
|------------------|--------|------------------------------|-----|-----|------|---------------------|
| CSX              | tsc    | SCL-CSX                      | 15  | -   | ns   |                     |
|                  | tchwh  | CSX H Pulse Width            | 40  | -   | ns   |                     |
|                  | tcss   | Chip select time (Write)     | 60  | -   | ns   |                     |
|                  | tcsh   | Chip select hold time (Read) | 65  | -   | ns   |                     |
| SCL              | twc    | Serial Clock Cycle (Write)   | 66  | -   | ns   |                     |
|                  | twrh   | SCL H Pulse Width (Write)    | 15  | -   | ns   |                     |
|                  | twrl   | SCL L Pulse Width (Write)    | 15  | -   | ns   |                     |
|                  | trc    | Serial Clock Cycle (Read)    | 150 | -   | ns   |                     |
|                  | trdh   | SCL H Pulse Width (Read)     | 60  | -   | ns   |                     |
|                  | trdl   | SCL L Pulse Width (Read)     | 60  | -   | ns   |                     |
| SDA (Input)      | tds    | Data setup time (Write)      | 10  | -   | ns   |                     |
|                  | tdh    | Data hold time (Write)       | 10  | -   | ns   |                     |
| SDA/SDO (Output) | tacc   | Access time (Read)           | 10  | 50  | ns   | For maximum CL=30pF |
|                  | toh    | Output disable time (Read)   | 15  | 50  | ns   | For minimum CL=8pF  |

**Note:**  $T_a = -30$  to  $70$  °C,  $I_{OVCC} = 1.65V$  to  $3.6V$ ,  $V_{CI} = 2.5V$  to  $3.6V$ ,  $AGND = DGND = 0V$ ,  $T = 10 \pm 0.5ns$



### 6.3 Display Serial Interface Timing Characteristics (4-line SPI system)



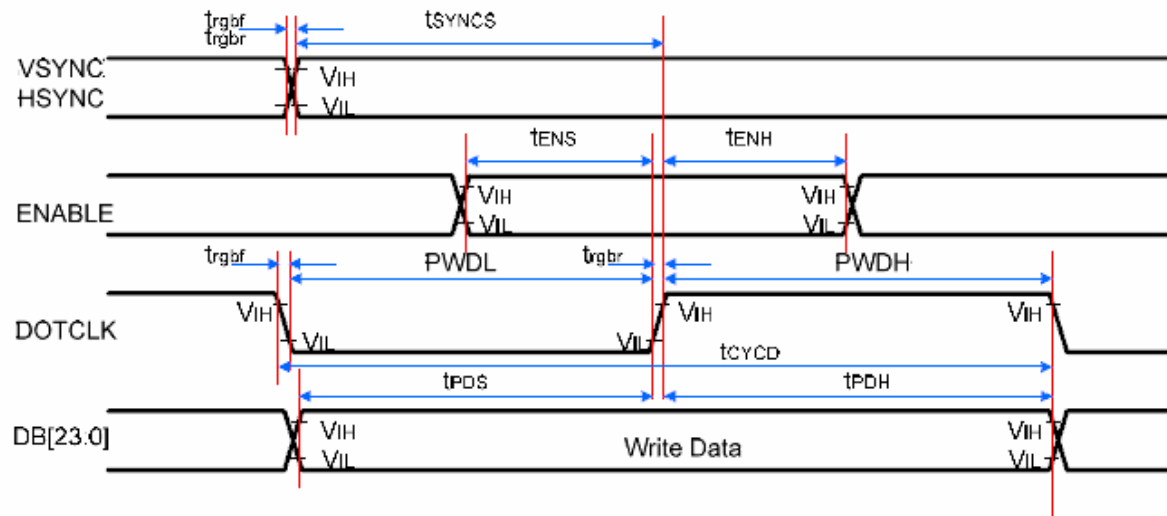
| Signal           | Symbol    | Parameter                    | min | max | Unit | Description            |
|------------------|-----------|------------------------------|-----|-----|------|------------------------|
| CSX              | $t_{css}$ | Chip select time (Write)     | 15  | -   | ns   |                        |
|                  | $t_{csh}$ | Chip select hold time (Read) | 15  | -   | ns   |                        |
|                  | $t_{CHW}$ | CS H pulse width             | 40  | -   | ns   |                        |
| SCL              | $t_{wc}$  | Serial clock cycle (Write)   | 50  | -   | ns   |                        |
|                  | $t_{wrh}$ | SCL H pulse width (Write)    | 10  | -   | ns   |                        |
|                  | $t_{wrl}$ | SCL L pulse width (Write)    | 10  | -   | ns   |                        |
|                  | $t_{rc}$  | Serial clock cycle (Read)    | 150 | -   | ns   |                        |
|                  | $t_{rdh}$ | SCL H pulse width (Read)     | 60  | -   | ns   |                        |
|                  | $t_{rdl}$ | SCL L pulse width (Read)     | 60  | -   | ns   |                        |
| D/CX             | $t_{as}$  | D/CX setup time              | 10  | -   | ns   |                        |
|                  | $t_{ah}$  | D/CX hold time (Write/Read)  | 10  | -   | ns   |                        |
| SDA (Input)      | $t_{ds}$  | Data setup time (Write)      | 10  | -   | ns   |                        |
|                  | $t_{dh}$  | Data hold time (Write)       | 10  | -   | ns   |                        |
| SDA/SDO (Output) | $t_{acc}$ | Access time (Read)           | 10  | 50  | ns   | For maximum $C_L=30pF$ |
|                  | $t_{od}$  | Output disable time (Read)   | 15  | 50  | ns   | For minimum $C_L=8pF$  |

#### Notes:

1.  $T_a = -30$  to  $70\text{ }^{\circ}\text{C}$ ,  $I_{OVCC} = 1.65\text{V}$  to  $3.3\text{V}$ ,  $V_{CI} = 2.5\text{V}$  to  $3.3\text{V}$ ,  $AGND = DGND = 0\text{V}$ ,  $T = 10 \pm 0.5\text{ns}$ .
2. Does not include signal rising and falling times.

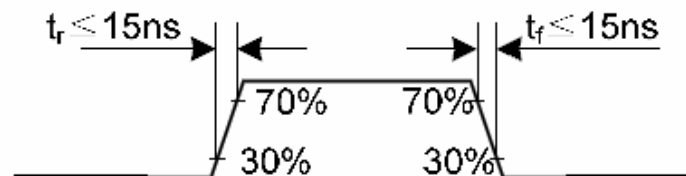


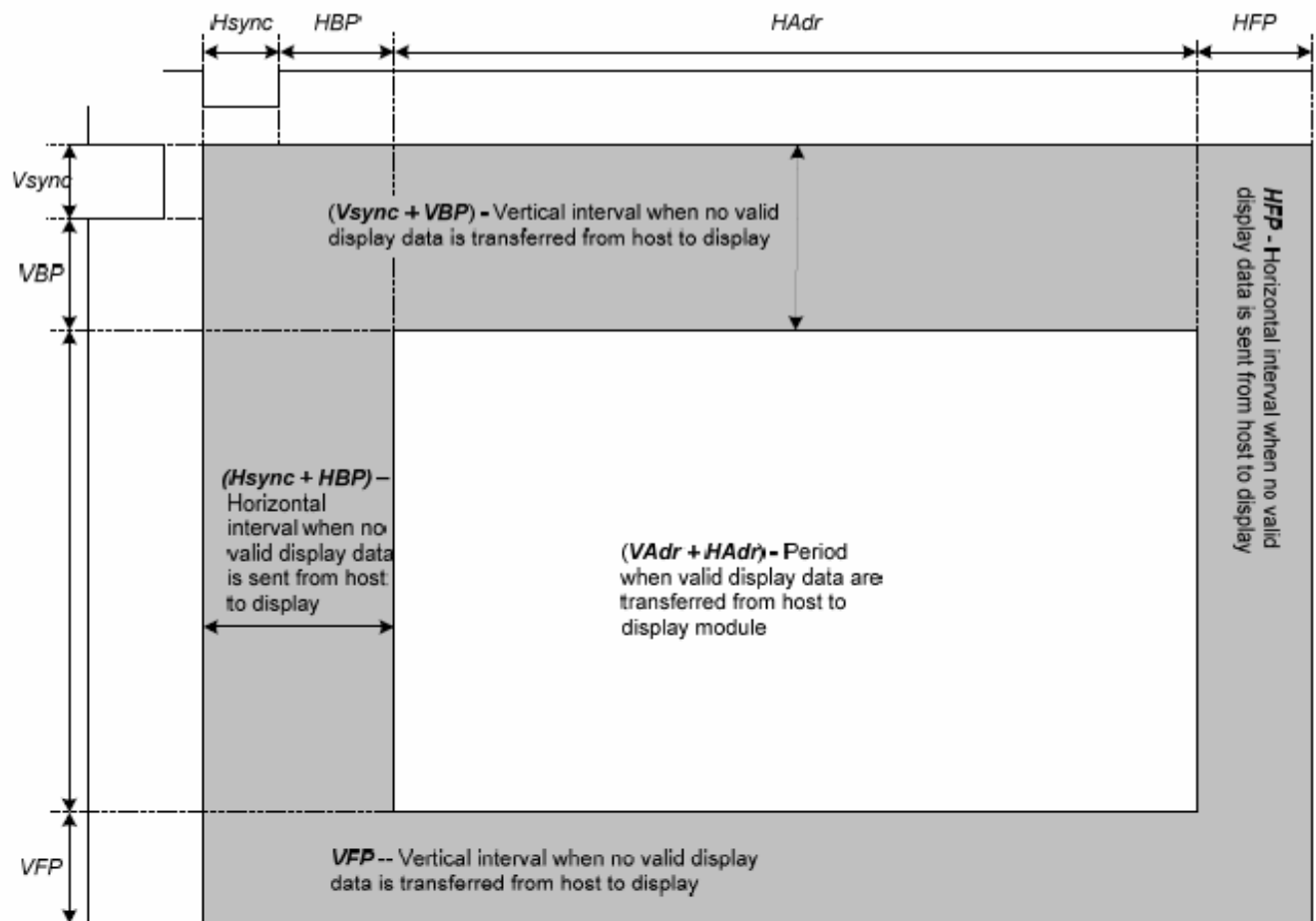
## 6.4 Parallel RGB Interface Timing Characteristics



| Signal          | Symbol                               | Parameter                           | min | max | Unit | Description                              |
|-----------------|--------------------------------------|-------------------------------------|-----|-----|------|------------------------------------------|
| VSYNC/<br>HSYNC | $t_{SYNCS}$                          | VSYNC/HSYNC setup time              | 15  | -   | ns   | 16-/18-/24-bit bus<br>RGB interface mode |
|                 | $t_{SYNCH}$                          | VSYNC/HSYNC hold time               | 15  | -   | ns   |                                          |
| ENABLE          | $t_{ENS}$                            | ENABLE setup time                   | 15  | -   | ns   |                                          |
|                 | $t_{ENH}$                            | ENABLE hold time                    | 15  | -   | ns   |                                          |
| DB [23:0]       | $t_{POS}$                            | Data setup time                     | 15  | -   | ns   |                                          |
|                 | $t_{PDH}$                            | Data hold time                      | 15  | -   | ns   |                                          |
| DOTCLK          | $PWDH$                               | DOTCLK high-level period            | 20  | -   | ns   |                                          |
|                 | $PWDL$                               | DOTCLK low-level period             | 20  | -   | ns   |                                          |
|                 | $t_{CYCD}$                           | DOTCLK cycle time                   | 50  | -   | ns   |                                          |
|                 | $t_{rgb\uparrow}, t_{rgb\downarrow}$ | DOTCLK, HSYNC, VSYNC rise/fall time | -   | 15  | ns   |                                          |

Note:  $T_a = -30$  to  $70^\circ\text{C}$ ,  $IOVCC = 1.65\text{V}$  to  $3.3\text{V}$ ,  $VCI = 2.5\text{V}$  to  $3.3\text{V}$ ,  $AGND = DGND = 0\text{V}$





| Parameters                 | Symbols             | Min. | Typ. | Max. | Units |
|----------------------------|---------------------|------|------|------|-------|
| PCLK Cycle                 | PCLK <sub>CYC</sub> | 100  | 80   | 66.6 | ns    |
| Horizontal Synchronization | Hsync               | 3    | 3    | -    | PCLK  |
| Horizontal Back Porch      | HBP                 | 3    | 3    | -    | PCLK  |
| Horizontal Address         | HAdr                | -    | 320  | -    | PCLK  |
| Horizontal Front Porch     | HFP                 | 3    | 3    | -    | PCLK  |
| Vertical Synchronization   | Vsync               | 2    | 2    | -    | Line  |
| Vertical Back Porch        | VBP                 | 2    | 2    | -    | Line  |
| Vertical Address           | VAdr                | -    | 480  | -    | Line  |
| Vertical Front Porch       | VFP                 | 2    | 2    | -    | Line  |
| Vertical Frequency(*)      |                     | 50   | 60   | 80   | Hz    |
| Horizontal Frequency(*)    |                     | -    | 33   | -    | KHz   |
| PCLK Frequency(*)          |                     | 10   | 12.5 | 15   | MHz   |

## Notes:

1. Vertical period (one frame) shall be equal to the sum of Vsync + VBP + VAdr + VFP.
2. Horizontal period (one line) shall be equal to the sum of Hsync + HBP + HAdr + HFP.
3. Control signals PCLK and Hsync shall be transmitted as specified at all times while valid pixels are transferred between the host processor and the display module.

6.5 Reset Timing Characteristics

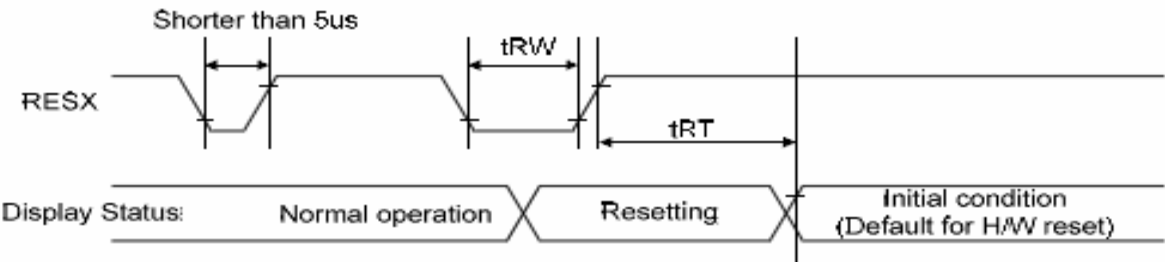


Table 39: Reset Timing

| Signal | Symbol   | Parameter            | Min | Max              | Unit    |
|--------|----------|----------------------|-----|------------------|---------|
| RESX   | $t_{RW}$ | Reset pulse duration | 10  |                  | $\mu S$ |
|        | $t_{RT}$ | Reset cancel         |     | 5 (note 1,5)     | mS      |
|        |          |                      |     | 120 (note 1,6,7) | mS      |

Notes:

- The reset cancel also includes the required time for loading ID bytes, VCOM setting and other settings from the EEPROM to registers. After a rising edge of RESX, this loading is done within 5 ms after the H/W reset cancel ( $t_{RT}$ ).
- According to the Table 40, a spike due to an electrostatic discharge on the RESX line does not cause irregular system reset.

Table 40: Reset Description

| RESX Pulse          | Action         |
|---------------------|----------------|
| Shorter than 5us    | Reset Rejected |
| Longer than 9us     | Reset          |
| Between 5us and 9us | Reset starts   |

- During the Reset period, the display will be blanked (When Reset starts in the Sleep Out mode, the display will enter the blanking sequence in at least 120 ms. The display remains the blank state in the Sleep In mode.) and then return to the default condition for the Hardware Reset.
- Spike Rejection can also be applied during a valid reset pulse, as shown below:

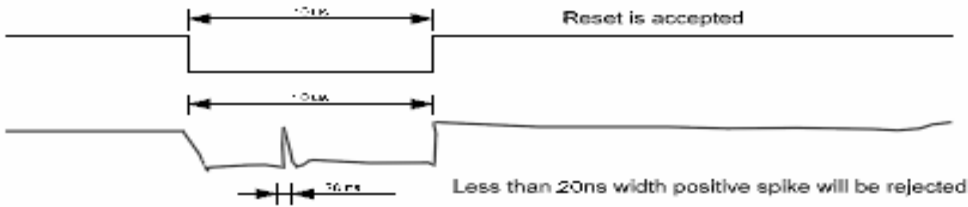


Figure 137: Positive Noise Pulse during Reset Low

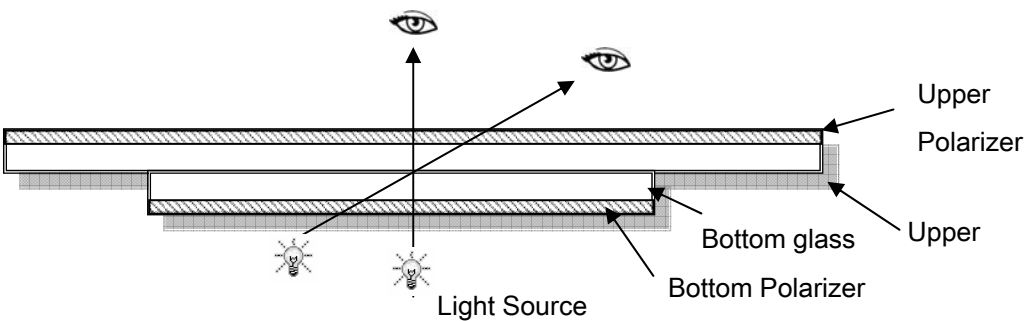
## 7. LCD Module Out-Going Quality Level

### 7.1 VISUAL & FUNCTION INSPECTION STANDARD

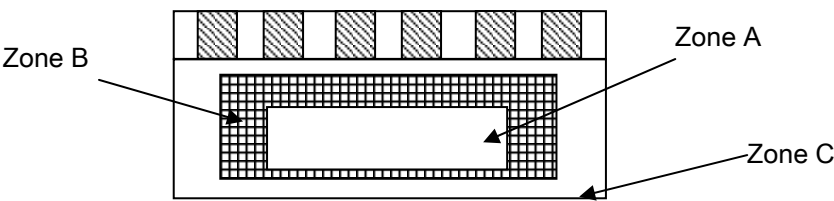
#### 7.1.1 Inspection conditions

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



#### 7.1.2 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.

### 7.1.3 Sampling Plan

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

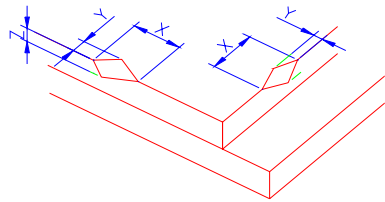
AQL:

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

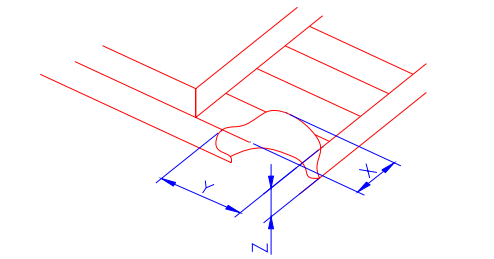
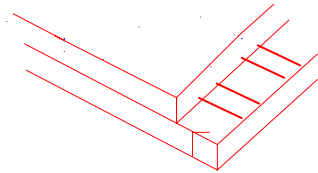
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

| 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.                                                                                           |                           |

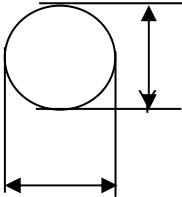
### 7.1.4 Criteria (Visual)

| Number                         | Items                             | Criteria(mm)                                                                                                                                                                                                                      |   |   |   |        |                                   |    |
|--------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------|-----------------------------------|----|
| 1.0 LCD<br>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<br/>line of the seal</td><td>≤T</td></tr> </table> | X | Y | Z | ≤3.0mm | <Inner border<br>line of the seal | ≤T |
| X                              | Y                                 | Z                                                                                                                                                                                                                                 |   |   |   |        |                                   |    |
| ≤3.0mm                         | <Inner border<br>line of the seal | ≤T                                                                                                                                                                                                                                |   |   |   |        |                                   |    |
| NOTE:<br>X: Length<br>Y: Width |                                   |                                                                                                                                                                                                                                   |   |   |   |        |                                   |    |

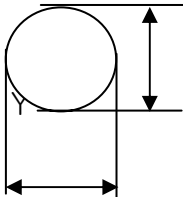


|                                                    |                                                                                                                 |                                                                                                                                                                                                                                 |   |   |   |        |    |    |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------|----|----|
| Z: Height<br>L: Length of ITO,<br>T: Height of LCD | (2)LCD corner broken                                                                                            |  <table border="1" data-bbox="920 544 1331 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> |                                                                                                                                                                                                                                 |   |   |   |        |    |    |



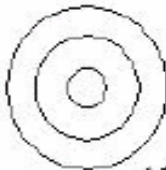
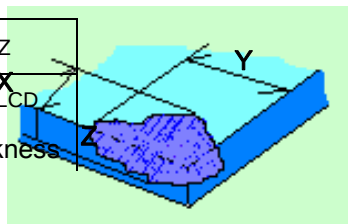
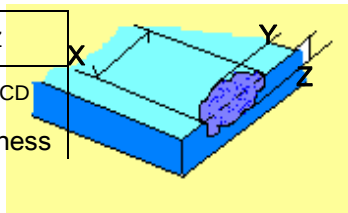
| Number                                                                                                                                                                                                                                                                                                                                     | Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Criteria (mm)                                                                                                                                                                                                                                                                                                                                                                                      |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|--------|---|---|-------|--------|--------|--------|-----------|-------------------|-------------|-------------------|-------|------------|---|-------------|-------|-----|--|--------|-----------------------|--|--|--|
| 2.0                                                                                                                                                                                                                                                                                                                                        | <div>Spot defect</div> <div></div> <div>X</div> <div>Φ=(X+Y)/2</div>                                                                                                                                                                                                                                                                                                                         | ① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)                                                                                                                                                                                                                                                                                                                  |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.10</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>0.10&lt;Φ≤0.15</td><td colspan="2">3( distance≥10mm)</td></tr><tr><td>0.15&lt;Φ≤0.2</td><td colspan="2">1</td></tr><tr><td>0.2&lt;Φ</td><td colspan="2">0</td></tr></table> | Zone<br>Size (mm) | Acceptable Qty |        |   | A | B     | C      | Φ≤0.10 | Ignore |           | Ignore            | 0.10<Φ≤0.15 | 3( distance≥10mm) |       | 0.15<Φ≤0.2 | 1 |             | 0.2<Φ | 0   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Zone<br>Size (mm)                                                                                                                                                                                                                                                                                                                                                                                  |                   | Acceptable Qty |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                    | A                 | B              | C      |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Φ≤0.10                                                                                                                                                                                                                                                                                                                                                                                             | Ignore            |                | Ignore |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.10<Φ≤0.15                                                                                                                                                                                                                                                                                                                                                                                        | 3( distance≥10mm) |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.15<Φ≤0.2                                                                                                                                                                                                                                                                                                                                                                                         | 1                 |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.2<Φ                                                                                                                                                                                                                                                                                                                                                                                              | 0                 |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ②Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot)                                                                                                                                                                                                                                                                                                                                     |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>0.1&lt;Φ≤0.2</td><td colspan="2">2( distance≥10mm)</td></tr><tr><td>0.2&lt;Φ≤0.3</td><td colspan="2">1</td></tr><tr><td>Φ&gt;0.3</td><td colspan="2">0</td></tr></table>     | Zone<br>Size (mm) | Acceptable Qty |        |   | A | B     | C      | Φ≤0.1  | Ignore |           | Ignore            | 0.1<Φ≤0.2   | 2( distance≥10mm) |       | 0.2<Φ≤0.3  | 1 |             | Φ>0.3 | 0   |  |        |                       |  |  |  |
| Zone<br>Size (mm)                                                                                                                                                                                                                                                                                                                          | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | B                                                                                                                                                                                                                                                                                                                                                                                                  | C                 |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| Φ≤0.1                                                                                                                                                                                                                                                                                                                                      | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                    | Ignore            |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| 0.1<Φ≤0.2                                                                                                                                                                                                                                                                                                                                  | 2( distance≥10mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| 0.2<Φ≤0.3                                                                                                                                                                                                                                                                                                                                  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| Φ>0.3                                                                                                                                                                                                                                                                                                                                      | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| ③ Polarizer accidented spot                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>0.2&lt;Φ≤0.5</td><td colspan="2">2( distance≥10mm)</td></tr><tr><td>Φ&gt;0.5</td><td colspan="2">0</td></tr></table> | Zone<br>Size (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                     |                   |                | A      | B | C | Φ≤0.2 | Ignore |        | Ignore | 0.2<Φ≤0.5 | 2( distance≥10mm) |             | Φ>0.5             | 0     |            |   |             |       |     |  |        |                       |  |  |  |
| Zone<br>Size (mm)                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                     |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | B                                                                                                                                                                                                                                                                                                                                                                                                  | C                 |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| Φ≤0.2                                                                                                                                                                                                                                                                                                                                      | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                    | Ignore            |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| 0.2<Φ≤0.5                                                                                                                                                                                                                                                                                                                                  | 2( distance≥10mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| Φ>0.5                                                                                                                                                                                                                                                                                                                                      | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| Line defect (LCD/TP /Polarizer black/white line, scratch, stain)                                                                                                                                                                                                                                                                           | <table><tr><th rowspan="2">Width(mm)</th><th rowspan="2">Length(mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.03</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>0.03&lt;W≤0.05</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr><tr><td>0.05&lt;W≤0.08</td><td>L≤2.0</td><td colspan="2">N≤2</td></tr><tr><td>0.08&lt;W</td><td colspan="4">Define as spot defect</td></tr></table> | Width(mm)                                                                                                                                                                                                                                                                                                                                                                                          | Length(mm)        | Acceptable Qty |        |   | A | B     | C      | Φ≤0.03 | Ignore | Ignore    |                   | Ignore      | 0.03<W≤0.05       | L≤3.0 | N≤2        |   | 0.05<W≤0.08 | L≤2.0 | N≤2 |  | 0.08<W | Define as spot defect |  |  |  |
| Width(mm)                                                                                                                                                                                                                                                                                                                                  | Length(mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                    |                   | Acceptable Qty |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | A                                                                                                                                                                                                                                                                                                                                                                                                  | B                 | C              |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| Φ≤0.03                                                                                                                                                                                                                                                                                                                                     | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Ignore                                                                                                                                                                                                                                                                                                                                                                                             |                   | Ignore         |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| 0.03<W≤0.05                                                                                                                                                                                                                                                                                                                                | L≤3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | N≤2                                                                                                                                                                                                                                                                                                                                                                                                |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| 0.05<W≤0.08                                                                                                                                                                                                                                                                                                                                | L≤2.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | N≤2                                                                                                                                                                                                                                                                                                                                                                                                |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
| 0.08<W                                                                                                                                                                                                                                                                                                                                     | Define as spot defect                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                |        |   |   |       |        |        |        |           |                   |             |                   |       |            |   |             |       |     |  |        |                       |  |  |  |



| Items                                                                                                                   | Criteria (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|--|--|---|---|---|----------------|--------|--|--------|---------------------|---------------------------------|--|--------------------|---|--|------------|---|--|-------------------|----------------|--|--|---|---|---|---------------|--------|--|--------|-------------------|---------------------------------|--|-------------------|---|--|------------|---|--|-------------------|----------------|--|--|---|---|---|---------------|--------|--|--------|-------------------|---------------------------------|--|------------|---|--|
| Spot defect<br><br>X<br>$\Phi=(X+Y)/2$ | <p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi\leq0.10</math></td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td><math>0.10&lt;\Phi\leq0.15</math></td><td colspan="2">3( distance<math>\geq10\text{mm}</math>)</td></tr><tr><td><math>0.15&lt;\Phi\leq0.2</math></td><td colspan="2">1</td></tr><tr><td><math>0.2&lt;\Phi</math></td><td colspan="2">0</td></tr></table> <p>②Dim spot (LCD/TP/Polarizer dim dot, light leakage、dark spot)</p> <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi\leq0.1</math></td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td><math>0.1&lt;\Phi\leq0.2</math></td><td colspan="2">2( distance<math>\geq10\text{mm}</math>)</td></tr><tr><td><math>0.2&lt;\Phi\leq0.3</math></td><td colspan="2">1</td></tr><tr><td><math>\Phi&gt;0.3</math></td><td colspan="2">0</td></tr></table> <p>③ Polarizer accidented spot</p> <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi\leq0.2</math></td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td><math>0.2&lt;\Phi\leq0.5</math></td><td colspan="2">2( distance<math>\geq10\text{mm}</math>)</td></tr><tr><td><math>\Phi&gt;0.5</math></td><td colspan="2">0</td></tr></table> | Zone<br>Size (mm) | Acceptable Qty |  |  | A | B | C | $\Phi\leq0.10$ | Ignore |  | Ignore | $0.10<\Phi\leq0.15$ | 3( distance $\geq10\text{mm}$ ) |  | $0.15<\Phi\leq0.2$ | 1 |  | $0.2<\Phi$ | 0 |  | Zone<br>Size (mm) | Acceptable Qty |  |  | A | B | C | $\Phi\leq0.1$ | Ignore |  | Ignore | $0.1<\Phi\leq0.2$ | 2( distance $\geq10\text{mm}$ ) |  | $0.2<\Phi\leq0.3$ | 1 |  | $\Phi>0.3$ | 0 |  | Zone<br>Size (mm) | Acceptable Qty |  |  | A | B | C | $\Phi\leq0.2$ | Ignore |  | Ignore | $0.2<\Phi\leq0.5$ | 2( distance $\geq10\text{mm}$ ) |  | $\Phi>0.5$ | 0 |  |
| Zone<br>Size (mm)                                                                                                       | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
|                                                                                                                         | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | B                 | C              |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $\Phi\leq0.10$                                                                                                          | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   | Ignore         |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $0.10<\Phi\leq0.15$                                                                                                     | 3( distance $\geq10\text{mm}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $0.15<\Phi\leq0.2$                                                                                                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $0.2<\Phi$                                                                                                              | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| Zone<br>Size (mm)                                                                                                       | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
|                                                                                                                         | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | B                 | C              |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $\Phi\leq0.1$                                                                                                           | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   | Ignore         |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $0.1<\Phi\leq0.2$                                                                                                       | 2( distance $\geq10\text{mm}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $0.2<\Phi\leq0.3$                                                                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $\Phi>0.3$                                                                                                              | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| Zone<br>Size (mm)                                                                                                       | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
|                                                                                                                         | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | B                 | C              |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $\Phi\leq0.2$                                                                                                           | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   | Ignore         |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $0.2<\Phi\leq0.5$                                                                                                       | 2( distance $\geq10\text{mm}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |
| $\Phi>0.5$                                                                                                              | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                |  |  |   |   |   |                |        |  |        |                     |                                 |  |                    |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |                   |   |  |            |   |  |                   |                |  |  |   |   |   |               |        |  |        |                   |                                 |  |            |   |  |

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------|---|--------|------|----------------|--|--|-----------|---|---|---|-----------------|--------|--|--------|-----------------------|---------------------------------|--|-----------------------|---|--|--------------|---|--|
| Line defect<br>(LCD/TP<br>/Polarizer<br>black/white<br>line,<br>scratch,<br>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 |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| Polarizer<br>Bubble                                                                | <table><tr><td>Zone</td><td colspan="3">Acceptable Qty</td></tr><tr><td>Size (mm)</td><td>A</td><td>B</td><td>C</td></tr><tr><td><math>\Phi \leq 0.2</math></td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.4</math></td><td colspan="2">2(distance <math>\geq 10\text{mm}</math>)</td></tr><tr><td><math>0.4 &lt; \Phi \leq 0.6</math></td><td colspan="2">1</td></tr><tr><td><math>0.6 &lt; \Phi</math></td><td colspan="2">0</td></tr></table> |                       |                |   |        | Zone | Acceptable Qty |  |  | Size (mm) | A | B | C | $\Phi \leq 0.2$ | Ignore |  | Ignore | $0.2 < \Phi \leq 0.4$ | 2(distance $\geq 10\text{mm}$ ) |  | $0.4 < \Phi \leq 0.6$ | 1 |  | $0.6 < \Phi$ | 0 |  |
| Zone                                                                               | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| Size (mm)                                                                          | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | B                     | C              |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| $\Phi \leq 0.2$                                                                    | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       | Ignore         |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| $0.2 < \Phi \leq 0.4$                                                              | 2(distance $\geq 10\text{mm}$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| $0.4 < \Phi \leq 0.6$                                                              | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| $0.6 < \Phi$                                                                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |
| SMT                                                                                | According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.                                                                                                                                                                                                                                                                                                                                                                         |                       |                |   |        |      |                |  |  |           |   |   |   |                 |        |  |        |                       |                                 |  |                       |   |  |              |   |  |

|                       |                | TP bubble/<br>accidented<br>spot | <table><tr><th rowspan="2">Size <math>\Phi</math>(mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi \leq 0.1</math></td><td colspan="3">Ignore</td></tr><tr><td><math>0.1 &lt; \Phi \leq 0.2</math></td><td colspan="3">2</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.3</math></td><td colspan="3">1</td></tr><tr><td><math>0.3 &lt; \Phi</math></td><td colspan="3">0</td></tr></table> | Size $\Phi$ (mm) | Acceptable Qty |  |  | A | B | C | $\Phi \leq 0.1$ | Ignore |  |  | $0.1 < \Phi \leq 0.2$ | 2 |  |  | $0.2 < \Phi \leq 0.3$ | 1 |  |  | $0.3 < \Phi$ | 0 |  |  |
|-----------------------|----------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|--|--|---|---|---|-----------------|--------|--|--|-----------------------|---|--|--|-----------------------|---|--|--|--------------|---|--|--|
| Size $\Phi$ (mm)      | Acceptable Qty |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
|                       | A              | B                                | C                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $\Phi \leq 0.1$       | Ignore         |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $0.1 < \Phi \leq 0.2$ | 2              |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $0.2 < \Phi \leq 0.3$ | 1              |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $0.3 < \Phi$          | 0              |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
|                       |                | Assembly<br>deflection           | beyond the edge of backlight $\leq 0.15\text{mm}$                                                                                                                                                                                                                                                                                                                                                                                                |                  |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |

|         |               |                                                              |                                                                                                                                                                              |    |              |                                                                                              |         |         |                    |  |                                                                                      |
|---------|---------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------|----------------------------------------------------------------------------------------------|---------|---------|--------------------|--|--------------------------------------------------------------------------------------|
| 5.0     | TP<br>Related | Newton<br>Ring                                               | Newton<br>area>1/3<br>NG                                                                                                                                                     | TP | Ring<br>area | <br>1.规律性  |         |         |                    |  |                                                                                      |
|         |               | Newton<br>Ring                                               | Newton<br>area≤1/3<br>OK                                                                                                                                                     | TP | Ring<br>area | <br>2.非规律性 |         |         |                    |  |                                                                                      |
|         |               |                                                              |                                                                                                                                                                              |    |              | <br>似牛顿环   |         |         |                    |  |                                                                                      |
|         |               | TP corner<br>broken<br>X : length<br>Y : width<br>Z : height | <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/>thickness</td></tr></table> <p>*<br/>Circuitry broken is not allowed.</p> | X  | Y            | Z                                                                                            | X≤3.0mm | Y≤3.0mm | Z<LCD<br>thickness |  |  |
| X       | Y             | Z                                                            |                                                                                                                                                                              |    |              |                                                                                              |         |         |                    |  |                                                                                      |
| X≤3.0mm | Y≤3.0mm       | Z<LCD<br>thickness                                           |                                                                                                                                                                              |    |              |                                                                                              |         |         |                    |  |                                                                                      |
|         |               | TP edge<br>broken<br>X : length<br>Y : width<br>Z : height   | <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤6.0mm</td><td>Y≤2.0mm</td><td>Z&lt;LCD<br/>thickness</td></tr></table> <p>* Circuitry broken is not allowed.</p>     | X  | Y            | Z                                                                                            | X≤6.0mm | Y≤2.0mm | Z<LCD<br>thickness |  |  |
| X       | Y             | Z                                                            |                                                                                                                                                                              |    |              |                                                                                              |         |         |                    |  |                                                                                      |
| X≤6.0mm | Y≤2.0mm       | Z<LCD<br>thickness                                           |                                                                                                                                                                              |    |              |                                                                                              |         |         |                    |  |                                                                                      |



## 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   |

## 8. Reliability Test Result

### 8.1 Condition

| Item                                 | Condition                                                                                                                                                                                                                                                                                               | Sample Size | Test Result | Note |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------|
| Low Temperature Operating Life test  | -20℃, 96HR                                                                                                                                                                                                                                                                                              | 3ea         | pass        | -    |
| Thermal Humidity Operating Life test | 70℃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        | -    |
| 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, 66cm(MEDIUM BOX)                                                                                                                                                                                                                                                              | 1box        | pass        | -    |

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

## 9. Cautions and Handling Precautions

### 9.1 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

### 9.2 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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## 10.Packing

----TBD-----

|          |                |     |      |               |
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