



**SPECIFICATION  
FOR  
LCD Module  
KD28C-1A**

|                  |                  |
|------------------|------------------|
| <b>MODULE:</b>   | <b>KD028C-1A</b> |
| <b>CUSTOMER:</b> |                  |

|            |                    |                   |
|------------|--------------------|-------------------|
| <b>REV</b> | <b>DESCRIPTION</b> | <b>DATE</b>       |
| <b>1.0</b> | <b>FIRST ISSUE</b> | <b>2012.03.20</b> |
|            |                    |                   |

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

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



## Revision History

[illegible]

|          |           |     |      |              |
|----------|-----------|-----|------|--------------|
| Part. No | KD028C-1A | REV | V1.0 | Page 2 of 28 |
|----------|-----------|-----|------|--------------|



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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 2.8'TFT-LCD contains 240x320 pixels, and can display up to 65K colors.

### \* Features

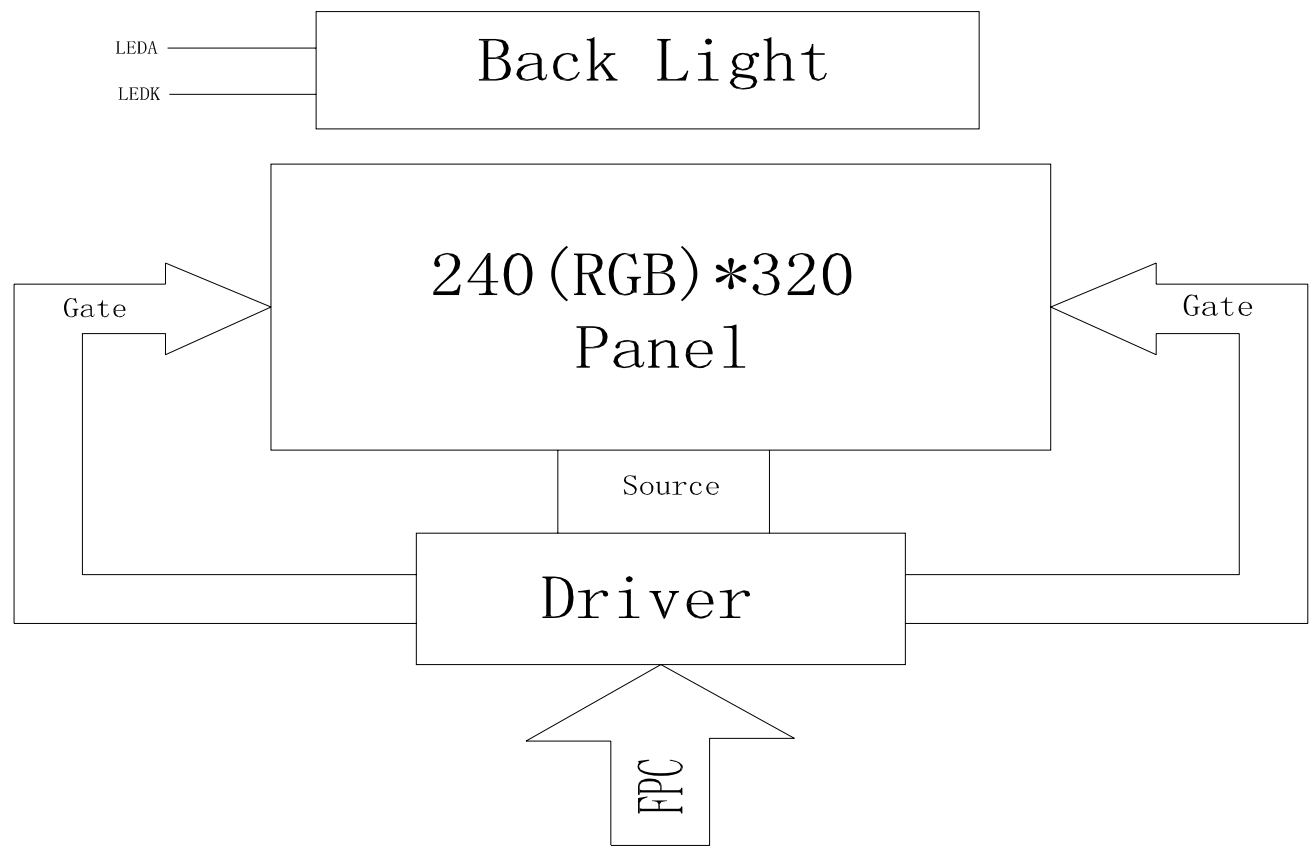
- Low Input Voltage: 3.3V(TYP)
- Display Colors of TFT LCD: 65Kcolors
- RGB Interface: 8BIT/16BIT MCU

| General Information Items | Specification                | Unit    | Note |
|---------------------------|------------------------------|---------|------|
|                           | Main Panel                   |         |      |
| Display area(AA)          | 43.20(H)*57.60(V) (2.8inch)  | mm      | -    |
| Driver element            | TFT active matrix            | -       | -    |
| Display colors            | 65K                          | colors  | -    |
| Number of pixels          | 240(RGB)*320                 | dots    | -    |
| Pixel arrangement         | RGB vertical stripe          | -       | -    |
| Pixel pitch               | 0.153(H)*0.153(V)            | mm      | -    |
| Viewing angle             | 12:00                        | o'clock | -    |
| Controller IC             | ILI9341V                     | -       | -    |
| Display mode              | Transmissive/ Normally White | -       | -    |
| Operating temperature     | -20~+70                      | °C      | -    |
| Storage temperature       | -30~+80                      | °C      | -    |

### \* Mechanical Information

| Item        |               | Min. | Typ.  | Max. | Unit | Note |
|-------------|---------------|------|-------|------|------|------|
| Module size | Horizontal(H) |      | 50.50 |      | mm   | -    |
|             | Vertical(V)   |      | 69.75 |      | mm   | -    |
|             | Depth(D)      |      | 2.9   |      | mm   | -    |
| Weight      |               |      | TBD   |      | g    | -    |

1. Block Diagram

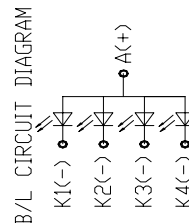




注：机壳开窗须小于LCD0.3MM以上，  
LCD V.A为上镜片建议开窗区。



NOTE:  
1. If not use PINS, fix to the GND , VCC or NC.



NOTES:

1. DISPLAY TYPE: 2.8", TFT-LCD, 65K COLORS
2. DISPLAY MODE: T/N NORMALLY WHITE
3. VIEWING DIRECTION: 12:00
4. DRIVER IC: ILI9341V (COG)
5. VCI: 3.3V(TYP)
6. OPERATING TEMP: -20°C TO 70°C
7. STORAGE TEMP: -30°C TO 80°C
7. BACK LIGHT: LED WHITE, 4 LED, 60mA, 3.2±0.3V
8. RoHS COMPLIANT.

|                |                              |            |                                      |  |                |
|----------------|------------------------------|------------|--------------------------------------|--|----------------|
| 深圳市柯达科电子科技有限公司 |                              |            | SHENZHEN STARTEK ELECTRONICS CO.,LTD |  |                |
| Rev            | Revision content description | Date       | DRAWING NAME                         |  | K0028C-1A-1 CM |
|                |                              |            | PARTS NO.                            |  | 99028001A      |
| A              | FIRST                        | 2013/04/03 | TOLERANCE (公称)                       |  |                |
|                |                              |            | TOLERANCE UNLESS                     |  | Unit           |
|                |                              |            | OTHERWISE SPECIFIED                  |  | mm             |
|                |                              |            | Scale 1:1                            |  | Page 1/1       |

|          |           |     |      |              |
|----------|-----------|-----|------|--------------|
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|----------|-----------|-----|------|--------------|



## 3. Input terminal Pin Assignment

| NO.   | SYMBOL    | DISCRIPTION                                                                                                    | I/O |
|-------|-----------|----------------------------------------------------------------------------------------------------------------|-----|
| 1     | NC        | NC                                                                                                             |     |
| 2     | NC        | NC                                                                                                             |     |
| 3     | NC        | NC                                                                                                             |     |
| 4     | IM0       | MPU Parallel interface mode set.<br>H: 8bit,DB17-DB10 used.<br>L: 16bit,DB17-DB10,DB8-DB1                      | I   |
| 5     | CS        | Chip select input pin ("Low" enable).<br>fix this pin at VCI or GND when not in use.                           | I   |
| 6     | RS        | Display data / Command selection .<br>D/CX='1': Display data.<br>D/CX='0': Command data.                       | I   |
| 7     | WR        | Write enable in parallel interface. use.                                                                       | I   |
| 8     | RD        | Serves as a read signal and MCU read data<br>at the rising edge.<br>fix this pin at VCI or GND when not in use | I   |
| 9     | RESET     | Reset pin. Setting either pin low initializes the<br>LSI. Must be resetafter power is supplied.                | I   |
| 10    | NC        | NC                                                                                                             |     |
| 11    | NC        | NC                                                                                                             |     |
| 12-19 | DB17-DB10 | 8/16-bit parallel bi-directional data bus for<br>MCU interface mode.<br>Fix to GND level when not in use.      | I/O |
| 20    | NC        | NC                                                                                                             |     |
| 21-28 | DB8-DB1   | 8/16-bit parallel bi-directional data bus for<br>MCU interface mode.<br>Fix to GND level when not in use.      | I/O |
| 29    | NC        | NC                                                                                                             |     |
| 30    | NC        | NC                                                                                                             |     |
| 31    | NC        | NC                                                                                                             |     |
| 32    | NC        | NC                                                                                                             |     |



|    |        |                                   |     |
|----|--------|-----------------------------------|-----|
| 33 | NC     | NC                                |     |
| 34 | LEDA   | Anode pin of backlight.           | P   |
| 35 | LEDK1  | Cathode pin OF backlight.         | P   |
| 36 | LEDK2  | Cathode pin OF backlight.         | P   |
| 37 | LEDK3  | Cathode pin OF backlight.         | P   |
| 38 | LEDK4  | Cathode pin OF backlight.         | P   |
| 39 | X+(XR) | Touch panel Right Glass Terminal. | A/D |
| 40 | Y+(YU) | Touch panel Top Film Terminal.    | A/D |
| 41 | X-(XL) | Touch panel LIFT Glass Terminal.  | A/D |
| 42 | Y-(YD) | Touch panel Bottom Film Terminal. | A/D |
| 43 | GND    | Ground.                           | P   |
| 44 | GND    | Ground.                           | P   |
| 45 | VCC    | Supply voltage(3.3V).             | P   |



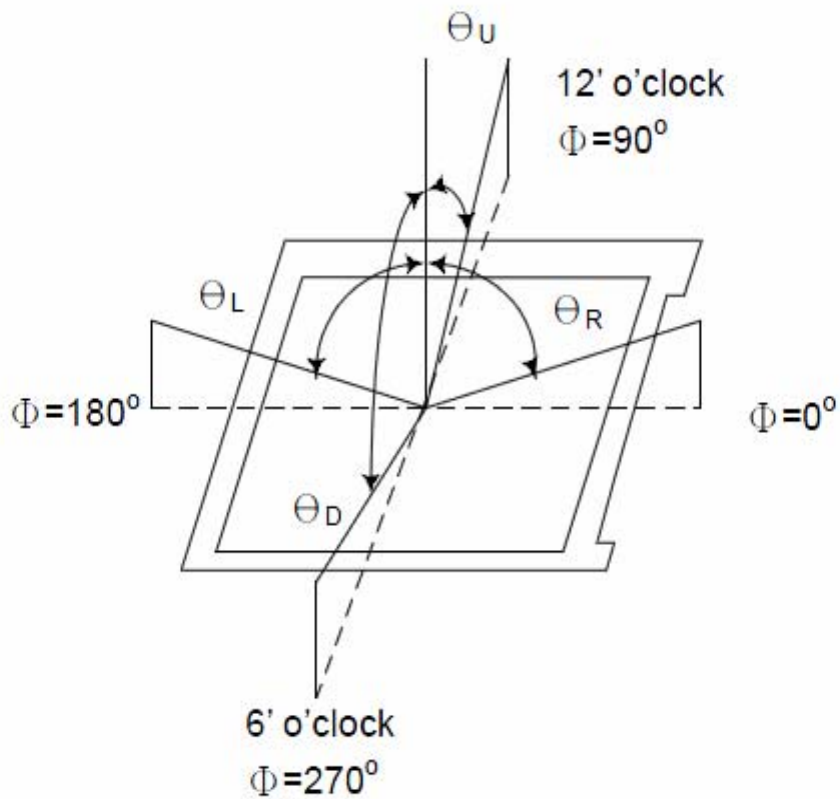
#### 4. LCD Optical Characteristics

##### 4.1 Optical specification

| Item                                 |         | Symbol         | Condition                                              | Min.  | Typ.  | Max.  | Unit | Note                            |
|--------------------------------------|---------|----------------|--------------------------------------------------------|-------|-------|-------|------|---------------------------------|
| Transmittance<br>(without Polarizer) |         | T(%)           | —                                                      | —     | 17.3  | —     | —    |                                 |
| Contrast Ratio                       |         | CR             | $\Theta=0$<br><br>Normal<br>viewing<br>angle<br>—<br>— | 400   | 500   | —     | —    | (1)(2)                          |
| Response<br>time                     | Rising  | T <sub>R</sub> |                                                        | —     | 4     | 8     | msec | (1)(3)                          |
|                                      | Falling | T <sub>F</sub> |                                                        | —     | 12    | 24    |      |                                 |
| Color gamut                          |         | S(%)           |                                                        |       | 60    |       | %    |                                 |
| Color<br>chromaticity<br>(CIE1931)   | White   | W <sub>x</sub> |                                                        | 0.283 | 0.303 | 0.323 |      | (1)(4)<br>CF glass<br>(C-light) |
|                                      |         | W <sub>y</sub> |                                                        | 0.305 | 0.325 | 0.345 |      |                                 |
|                                      | Red     | R <sub>x</sub> |                                                        | 0.606 | 0.626 | 0.646 |      |                                 |
|                                      |         | R <sub>y</sub> |                                                        | 0.314 | 0.334 | 0.354 |      |                                 |
|                                      | Green   | G <sub>x</sub> |                                                        | 0.257 | 0.277 | 0.297 |      |                                 |
|                                      |         | G <sub>y</sub> |                                                        | 0.529 | 0.549 | 0.569 |      |                                 |
|                                      | Blue    | B <sub>x</sub> |                                                        | 0.122 | 0.142 | 0.162 |      |                                 |
|                                      |         | B <sub>y</sub> |                                                        | 0.102 | 0.122 | 0.142 |      |                                 |
| Viewing angle                        | Hor.    | $\Theta_L$     | CR>10                                                  | 35    | 45    | —     |      |                                 |
|                                      |         | $\Theta_R$     |                                                        | 35    | 45    | —     |      |                                 |
|                                      | Ver.    | $\Theta_U$     |                                                        | 40    | 50    | —     |      |                                 |
|                                      |         | $\Theta_D$     |                                                        | 10    | 20    | —     |      |                                 |
| Optima View Direction                |         | 12 O'clock     |                                                        |       |       |       |      | (5)                             |



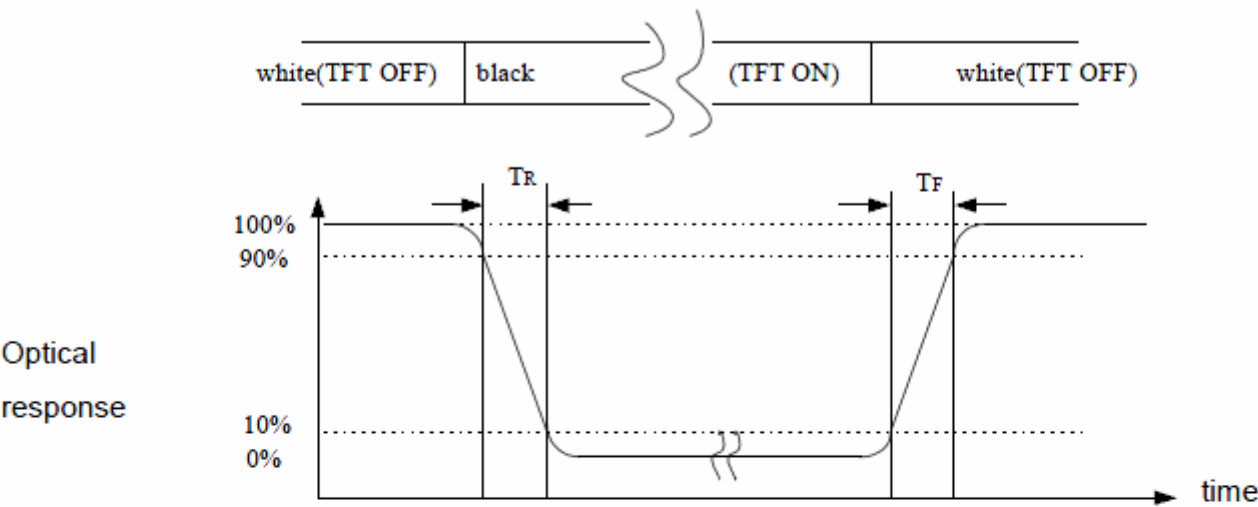
**Note (1)** Definition of Viewing Angle :



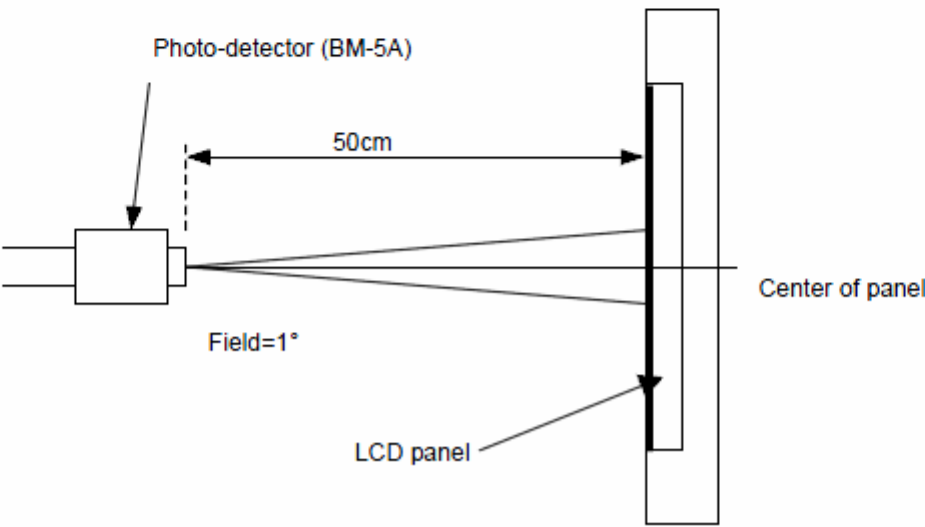
**Note (2)** Definition of Contrast Ratio(CR) :  
measured at the center point of panel

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

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

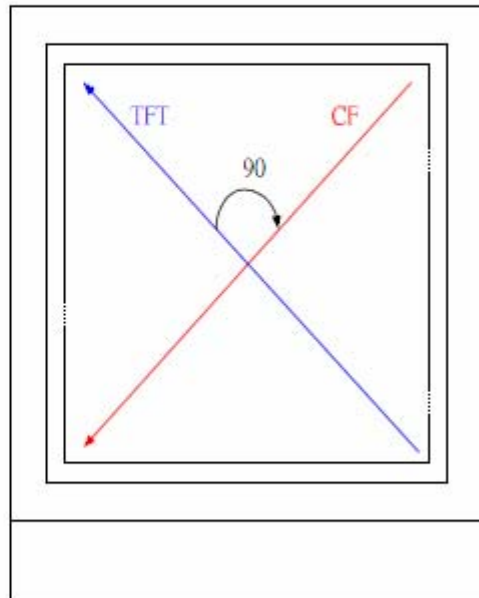


**Note (4)** Definition of optical measurement setup





**Note (5)** Rubbing Direction (The different Rubbing Direction will cause the different view direction.



TFT Face up

## 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   |

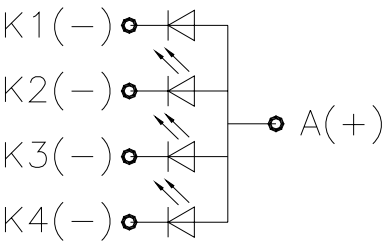
### 5.2 DC Electrical Characteristics

| 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

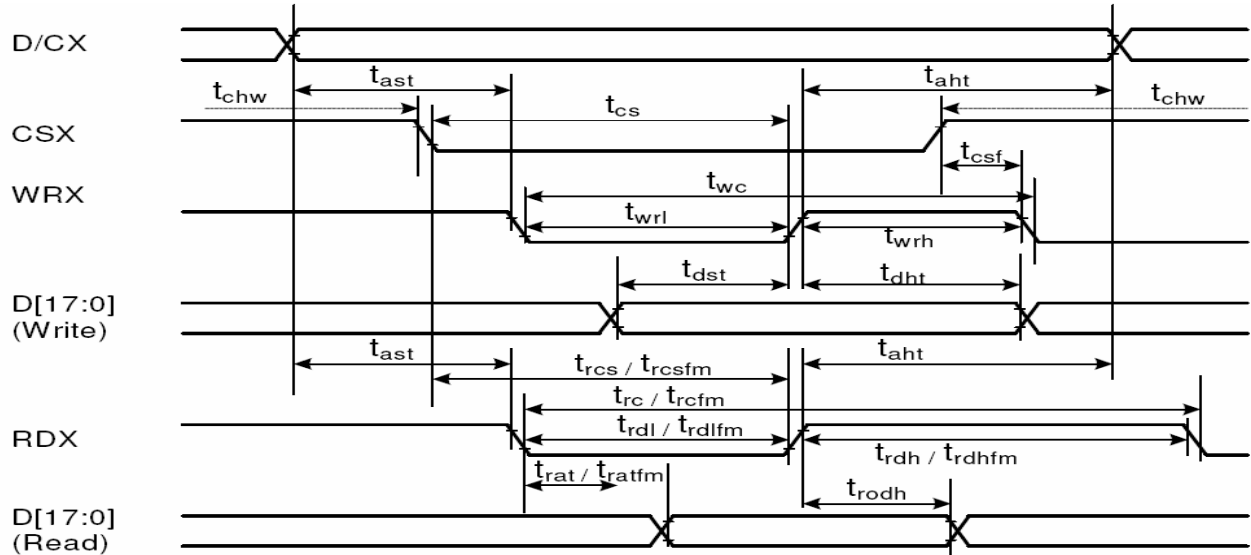
| Item            | Symbol | Min. | Typ. | Max. | Unit  | Note    |
|-----------------|--------|------|------|------|-------|---------|
| Forward Current | $I_F$  | 60   | 80   | --   | mA    |         |
| Forward Voltage | $V_F$  | --   | 3.2  | --   | V     |         |
| LCM Luminance   | $L_v$  | 250  | --   | --   | cd/m2 | IF=80mA |
| Uniformity      | AVg    | 80   | --   | --   | %     |         |



BLU CIRCUIT DIAGRAM

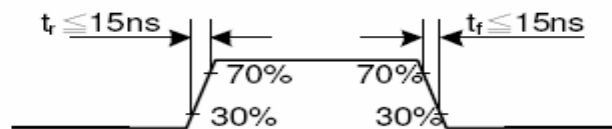
## 6. AC Characteristic

### 6.1. Display Parallel Interface Timing Characteristics (8080-II system)



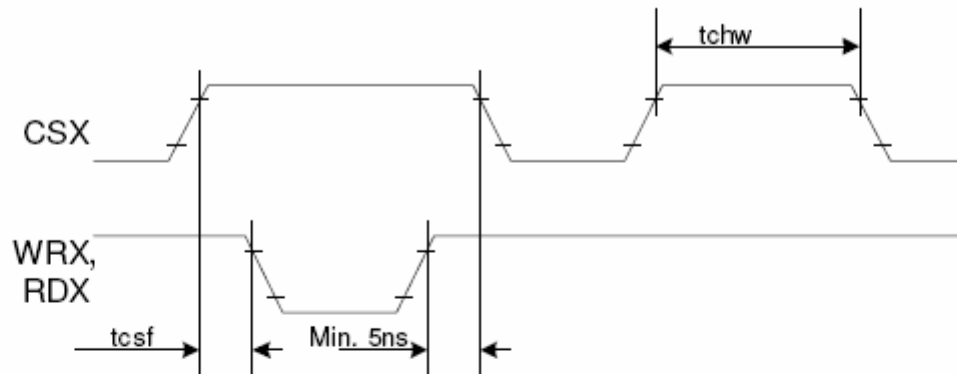
| Signal                                               | Symbol | Parameter                          | min | max | Unit | Description                               |
|------------------------------------------------------|--------|------------------------------------|-----|-----|------|-------------------------------------------|
| DCX                                                  | tast   | Address setup time                 | 0   | -   | ns   |                                           |
|                                                      | taht   | Address hold time (Write/Read)     | 0   | -   | ns   |                                           |
| CSX                                                  | tchw   | CSX "H" pulse width                | 0   | -   | ns   |                                           |
|                                                      | tcs    | Chip Select setup time (Write)     | 15  | -   | ns   |                                           |
|                                                      | trcs   | Chip Select setup time (Read ID)   | 45  | -   | ns   |                                           |
|                                                      | trcsfm | Chip Select setup time (Read FM)   | 355 | -   | ns   |                                           |
|                                                      | tcsf   | Chip Select Wait time (Write/Read) | 10  | -   | ns   |                                           |
| WRX                                                  | twc    | Write cycle                        | 66  | -   | ns   |                                           |
|                                                      | twrh   | Write Control pulse H duration     | 15  | -   | ns   |                                           |
|                                                      | twrl   | Write Control pulse L duration     | 15  | -   | ns   |                                           |
| RDX (FM)                                             | trcfm  | Read Cycle (FM)                    | 450 | -   | ns   |                                           |
|                                                      | trdhfm | Read Control H duration (FM)       | 90  | -   | ns   |                                           |
|                                                      | trdlfm | Read Control L duration (FM)       | 355 | -   | ns   |                                           |
| RDX (ID)                                             | trc    | Read cycle (ID)                    | 160 | -   | ns   |                                           |
|                                                      | trdh   | Read Control pulse H duration      | 90  | -   | ns   |                                           |
|                                                      | trdl   | Read Control pulse L duration      | 45  | -   | ns   |                                           |
| D[17:0],<br>D[17:10]&D[8:1],<br>D[17:10],<br>D[17:9] | tdst   | Write data setup time              | 10  | -   | ns   | For maximum CL=30pF<br>For minimum CL=8pF |
|                                                      | tdht   | Write data hold time               | 10  | -   | ns   |                                           |
|                                                      | trat   | Read access time                   | -   | 40  | ns   |                                           |
|                                                      | tratfm | Read access time                   | -   | 340 | ns   |                                           |
|                                                      | trod   | Read output disable time           | 20  | 80  | ns   |                                           |

Note:  $T_a = -30$  to  $70$  °C,  $V_{DDI}=1.65V$  to  $3.3V$ ,  $V_{CI}=2.5V$  to  $3.3V$ ,  $V_{SS}=0V$ .



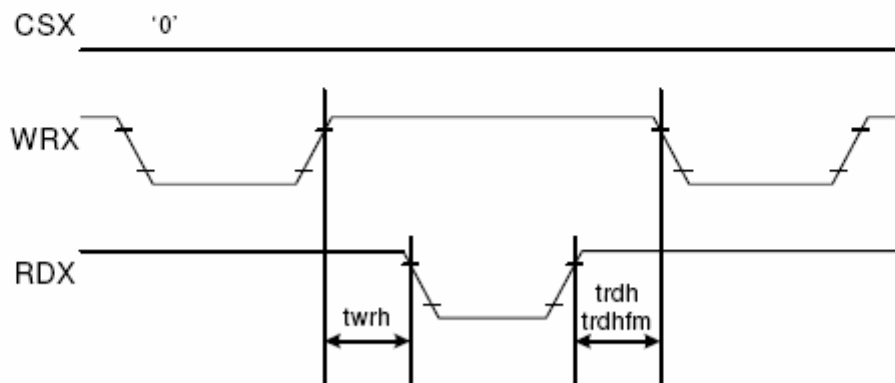


CSX timings :



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

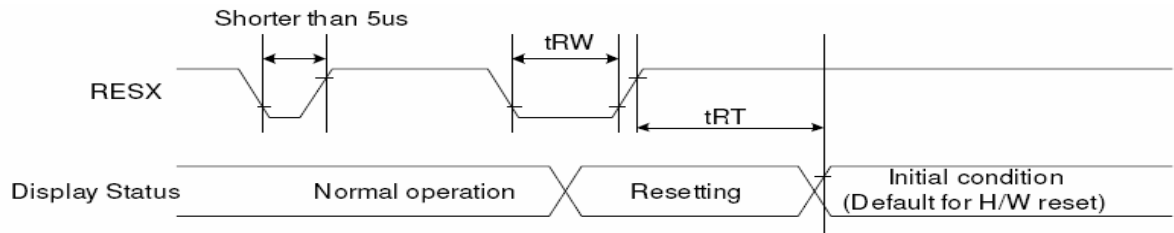
Write to read or read to write timings:



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.



## 6.2 Reset Timing Characteristics



| Signal | Symbol | Parameter            | Min | Max                 | Unit |
|--------|--------|----------------------|-----|---------------------|------|
| RESX   | tRW    | Reset pulse duration | 10  |                     | uS   |
|        | tRT    | Reset cancel         |     | 5<br>(note 1,5)     | mS   |
|        |        |                      |     | 120<br>(note 1,6,7) | mS   |

| Signal | Symbol | Parameter            | Min | Max                 | Unit |
|--------|--------|----------------------|-----|---------------------|------|
| RESX   | tRW    | Reset pulse duration | 10  |                     | uS   |
|        | tRT    | Reset cancel         |     | 5<br>(note 1,5)     | mS   |
|        |        |                      |     | 120<br>(note 1,6,7) | mS   |

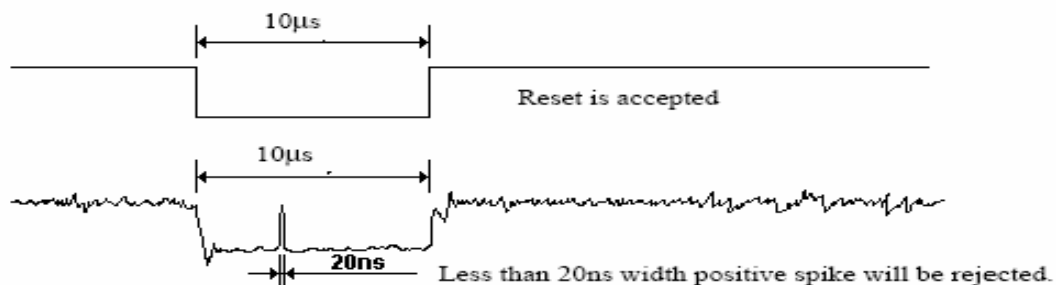
**Note 1:** The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

**Note 2:** Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

| RESX Pulse           | Action         |
|----------------------|----------------|
| Shorter than 5us     | Reset Rejected |
| Longer than 10us     | Reset          |
| Between 5us and 10us | Reset starts   |

**Note 3:** During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

**Note 4:** Spike Rejection also applies during a valid reset pulse as shown below:



**Note 5:** When Reset applied during Sleep In Mode.

**Note 6:** When Reset applied during Sleep Out Mode.

**Note 7:** It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

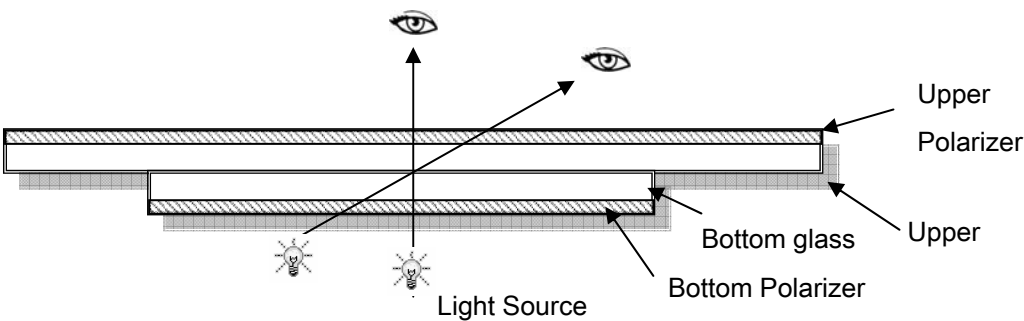
## 7. LCD Module Out-Going Quality Level

### 7.1 VISUAL & FUNCTION INSPECTION STANDARD

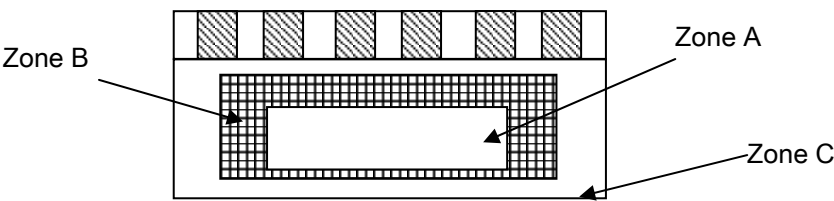
#### 7.1.1 Inspection conditions

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:

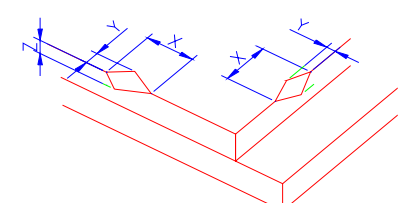
| Major defect | Minor defect |
|--------------|--------------|
| 0.65         | 1.5          |

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

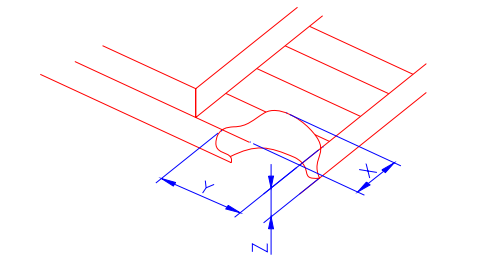
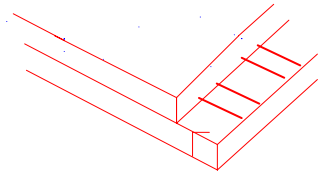
| No | Items to be inspected | Criteria                                                                                                                              | Classification of defects |
|----|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 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.                                                                                           |                           |

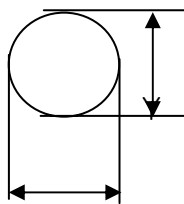
7

### 7.1.4 Criteria (Visual)

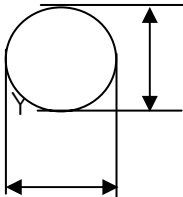
| Number                         | Items                             | Criteria(mm)                                                                                                                                                                                                                      |   |   |   |        |                                   |    |
|--------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------|-----------------------------------|----|
| 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 1332 647"><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table> | X | Y | Z | ≤3.0mm | ≤L | ≤T |
|                                                    | X                                                                                                               | Y                                                                                                                                                                                                                               | Z |   |   |        |    |    |
| ≤3.0mm                                             | ≤L                                                                                                              | ≤T                                                                                                                                                                                                                              |   |   |   |        |    |    |
| (3) LCD crack                                      |  <p>Crack<br/>Not allowed</p> |                                                                                                                                                                                                                                 |   |   |   |        |    |    |

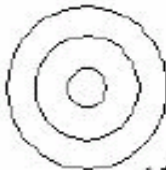
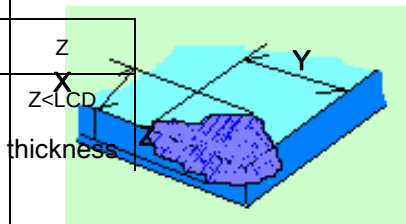
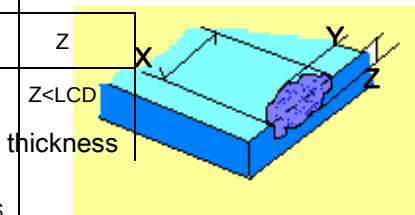
| Number                               | Items                                                                                                                                                 | Criteria (mm)                                                                     |   |                   |   |                |   |  |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---|-------------------|---|----------------|---|--|
| 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) |   |                   |   |                |   |  |
|                                      |                                                                                                                                                       | <div>Zone</div> <div>Size (mm)</div>                                              |   | 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)                    |   |                   |   |                |   |  |
|                                      |                                                                                                                                                       | <div>Zone</div> <div>Size (mm)</div>                                              |   | 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          |                                                                                                                                                       |                                                                                   |   |                   |   |                |   |  |
| <div>Zone</div> <div>Size (mm)</div> |                                                                                                                                                       | Acceptable Qty                                                                    |   |                   |   |                |   |  |
|                                      |                                                                                                                                                       | A                                                                                 | B | C                 |   |                |   |  |
| Φ≤0.2                                |                                                                                                                                                       | Ignore                                                                            |   | Ignore            |   |                |   |  |
| 0.2<Φ≤0.5                            |                                                                                                                                                       | 2( distance≥10mm)                                                                 |   |                   |   |                |   |  |
| Φ>0.5                                |                                                                                                                                                       | 0                                                                                 |   |                   |   |                |   |  |
|                                      | Line defect<br>(LCD/TP /Polarizer black/white line, scratch, stain)                                                                                   | 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>Y<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 | Size $\Phi$ (mm)       |                                                   |  | Acceptable Qty |        |   |
|  |  |                                  |                        | A                                                 |  | B              |        | C |
|  |  |                                  | $\Phi \leq 0.1$        | Ignore                                            |  |                | 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></tr><tr><td>X≤3.0mm</td><td>Y≤3.0mm</td></tr></table> <p>*<br/>Circuitry broken is not allowed.</p> | X  | Y            | X≤3.0mm                                                                                      | Y≤3.0mm |  |  |  |
| X       | Y             |                                                              |                                                                                                                                     |    |              |                                                                                              |         |  |  |                                                                                      |
| X≤3.0mm | Y≤3.0mm       |                                                              |                                                                                                                                     |    |              |                                                                                              |         |  |  |                                                                                      |
|         |               | TP edge<br>broken<br>X : length<br>Y : width<br>Z : height   | <table><tr><td>X</td><td>Y</td></tr><tr><td>X≤6.0mm</td><td>Y≤2.0mm</td></tr></table> <p>* Circuitry broken is not allowed.</p>     | X  | Y            | X≤6.0mm                                                                                      | Y≤2.0mm |  |  |  |
| X       | Y             |                                                              |                                                                                                                                     |    |              |                                                                                              |         |  |  |                                                                                      |
| X≤6.0mm | Y≤2.0mm       |                                                              |                                                                                                                                     |    |              |                                                                                              |         |  |  |                                                                                      |





## 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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