

# **CHIMEI INNOLUX DISPLAY CORPORATION**

## **LCD MODULE**

# **SPECIFICATION**

**Customer:** \_\_\_\_\_  
**Model Name:** AT070TNA2 V.1  
**SPEC NO.:** A070-A2-TT-11  
**Date:** 2010/08/30  
**Version:** 01

- Preliminary Specification  
 Final Specification

For Customer's Acceptance

| Approved by | Comment |
|-------------|---------|
|             |         |

| Approved by                        | Reviewed by  | Prepared by                        |
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### Record of Revision

| Version     | Revise Date | Page | Content          |
|-------------|-------------|------|------------------|
| Pre-Spec.01 | 2010/08/30  |      | Initial Release. |

CHIMEI INNOLUX  
General

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## Contents

|  |    |
|--|----|
| 1. General Specifications .....                  | 1  |
| 2. Pin Assignment .....                          | 2  |
| 3. Operation Specifications .....                | 5  |
| 3.1. Absolute Maximum Ratings .....              | 5  |
| 3.1.1. Typical Operation Conditions .....        | 6  |
| 3.1.2. Current Consumption .....                 | 7  |
| 3.1.3. Backlight Driving Conditions .....        | 7  |
| 3.2. Power Sequence .....                        | 8  |
| 3.3. Timing Characteristics .....                | 9  |
| 3.3.1. AC Electrical Characteristics .....       | 9  |
| 3.3.2. Input Clock and Data Timing Diagram ..... | 9  |
| 3.3.3. DC Electrical Characteristics .....       | 10 |
| 3.3.4. Timing .....                              | 11 |
| 3.3.5. Data Input Format .....                   | 12 |
| 4. Optical Specifications .....                  | 13 |
| 5. Reliability Test Items .....                  | 17 |
| 6. General Precautions .....                     | 18 |
| 6.1. Safety .....                                | 18 |
| 6.2. Handling .....                              | 18 |
| 6.3. Static Electricity .....                    | 18 |
| 6.4. Storage .....                               | 18 |
| 6.5. Cleaning .....                              | 18 |
| 7. Mechanical Drawing .....                      | 19 |
| 8. Package Drawing .....                         | 20 |
| 8.1. Packaging Material Table .....              | 20 |
| 8.2. Packaging Quantity .....                    | 20 |
| 8.3. Packaging Drawing .....                     | 21 |

# 1. General Specifications

| No. | Item                           | Specification                      | Remark |
|-----|--------------------------------|------------------------------------|--------|
| 1   | LCD size                       | 7.0 inch(Diagonal)                 |        |
| 2   | Driver element                 | a-Si TFT active matrix             |        |
| 3   | Resolution                     | 1024 × 3(RGB) × 600                |        |
| 4   | Display mode                   | Normally White, Transmissive       |        |
| 5   | Dot pitch                      | 0.05(W) × 0.15(H) mm               |        |
| 6   | Active area                    | 153.6(W) × 90.0(H) mm              |        |
| 7   | Module size                    | 165.75 (W) × 105.39(H) × 3.4(D) mm | Note 1 |
| 8   | Surface treatment              | Anti-Glare                         |        |
| 9   | Color arrangement              | RGB-stripe                         |        |
| 10  | Interface                      | Digital                            |        |
| 11  | View direction(Gray Inversion) | 6 O'Clock                          |        |
| 12  | Backlight power consumption    | 1.2W (Typ.)                        |        |
| 13  | Panel power consumption        | 0.45W (Typ.)                       |        |
| 14  | Weight                         | TBD (Typ.)                         |        |

Note 1: Refer to Mechanical Drawing.

## 2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

| Pin No. | Symbol   | I/O | Function  | Remark |
|---------|----------|-----|---|--------|
| 1       | VCOM     | P   | Common Voltage  |        |
| 2       | VDD      | P   | Power Voltage for digital circuit   |        |
| 3       | VDD      | P   | Power Voltage for digital circuit   |        |
| 4       | NC       | --- | No connection   |        |
| 5       | Reset    | I   | Global reset pin  |        |
| 6       | STBYB    | I   | Standby mode, Normally pulled high<br>STBYB = "1", normal operation<br>STBYB = "0", timing controller, source driver will turn off, all output are High-Z |        |
| 7       | GND      | P   | Ground  |        |
| 8       | RXIN0-   | I   | - LVDS differential data input  |        |
| 9       | RXIN0+   | I   | + LVDS differential data input  |        |
| 10      | GND      | P   | Ground  |        |
| 11      | RXIN1-   | I   | - LVDS differential data input  |        |
| 12      | RXIN1+   | I   | + LVDS differential data input  |        |
| 13      | GND      | P   | Ground  |        |
| 14      | RXIN2-   | I   | - LVDS differential data input  |        |
| 15      | RXIN2+   | I   | + LVDS differential data input  |        |
| 16      | GND      | P   | Ground  |        |
| 17      | RXCLKIN- | I   | - LVDS differential clock input   |        |
| 18      | RXCLKIN+ | I   | + LVDS differential clock input   |        |
| 19      | GND      | P   | Ground  |        |
| 20      | RXIN3-   | I   | - LVDS differential data input  |        |
| 21      | RXIN3+   | I   | + LVDS differential data input  |        |
| 22      | GND      | P   | Ground  |        |
| 23      | NC       | --- | No connection   |        |
| 24      | NC       | --- | No connection   |        |
| 25      | GND      | P   | Ground  |        |

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|    |         |     |   |       |
|----|---------|-----|---|-------|
| 26 | NC      | --- | No connection                           |       |
| 27 | DIMO    | O   | Backlight CABC controller signal output |       |
| 28 | SELB    | I   | 6bit/8bit mode select                   | Note1 |
| 29 | AVDD    | P   | Power for Analog Circuit                |       |
| 30 | GND     | P   | Ground                                  |       |
| 31 | LED-    | P   | LED Cathode                             |       |
| 32 | LED-    | P   | LED Cathode                             |       |
| 33 | L/R     | I   | Horizontal inversion                    | Note3 |
| 34 | U/D     | I   | Vertical inversion                      | Note3 |
| 35 | VGL     | P   | Gate OFF Voltage                        |       |
| 36 | CABCEN1 | I   | CABC H/W enable                         | Note2 |
| 37 | CABCEN0 | I   | CABC H/W enable                         | Note2 |
| 38 | VGH     | P   | Gate ON Voltage                         |       |
| 39 | LED+    | P   | LED Anode                               |       |
| 40 | LED+    | P   | LED Anode                               |       |

I: input, O: output, P: Power

Note1: If LVDS input data is 6 bits ,SELB must be set to High;

If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC\_EN="00", CABC OFF.

When CABC\_EN="01", user interface image.

When CABC\_EN="10", still picture.

When CABC\_EN="11", moving image.

When CABC off, don't connect DIMO, else connect it to backlight.

Note3: When L/R="0", set right to left scan dirction.

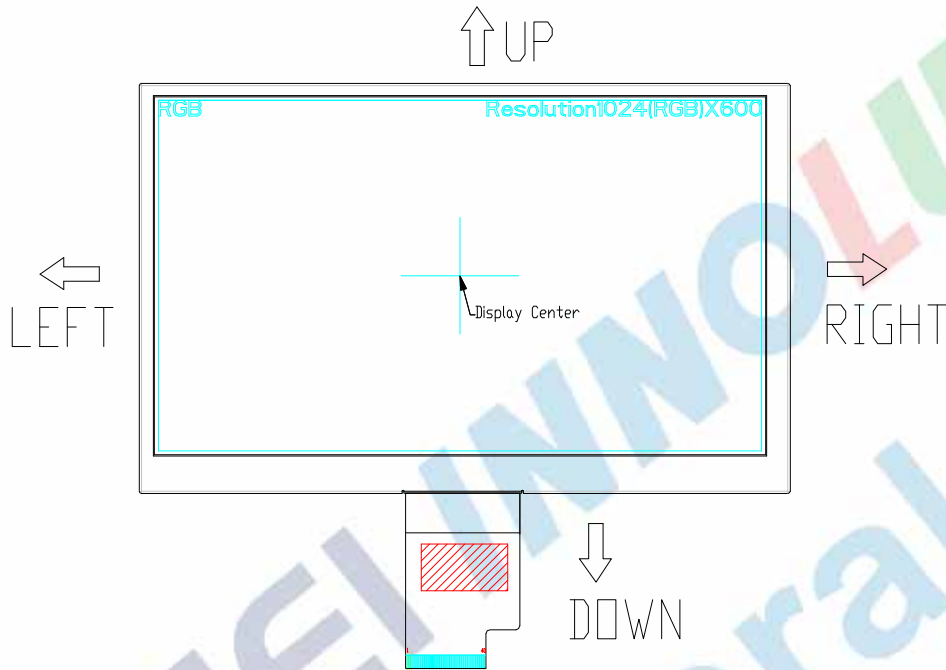
When L/R="1", set left to right scan dirction.

When U/D="0", set top to bottom scan dirction.

When U/D="1", set bottom to top scan dirction.



Note: Definition of scanning direction.  
Refer to the figure as below:



### 3. Operation Specifications

#### 3.1. Absolute Maximum Ratings

(Note 1)

| Item                  | Symbol          | Values |      | Unit | Remark   |
|-----------------------|-----------------|--------|------|------|----------|
|                       |                 | Min.   | Max. |      |          |
| Power voltage         | $DV_{DD}$       | -0.3   | 5.0  | V    |          |
|                       | $AV_{DD}$       | 6.5    | 13.5 | V    |          |
|                       | $V_{GH}$        | -0.3   | 42.0 | V    |          |
|                       | $V_{GL}$        | -20.0  | 0.3  | V    |          |
|                       | $V_{GH}-V_{GL}$ | -      | 40.0 | V    |          |
| Operation Temperature | $T_{OP}$        | -20    | 60   | °C   |          |
| Storage Temperature   | $T_{ST}$        | -30    | 70   | °C   |          |
| LED Reverse Voltage   | $V_R$           | -      | 5    | V    | Each LED |
| LED Forward Current   | $I_F$           | -      | 35   | mA   | Each LED |

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.



3.1.1. Typical Operation Conditions

( Note 1)

| Item                     | Symbol           | Values               |      |                      | Unit | Remark |
|--------------------------|------------------|----------------------|------|----------------------|------|--------|
|                          |                  | Min.                 | Typ. | Max.                 |      |        |
| Power voltage            | DV <sub>DD</sub> | 3.0                  | 3.3  | 3.6                  | V    | Note 2 |
|                          | AV <sub>DD</sub> | 10.8                 | 11   | 11.2                 | V    |        |
|                          | V <sub>GH</sub>  | 19.7                 | 20   | 20.3                 | V    |        |
|                          | V <sub>GL</sub>  | -6.5                 | -6.8 | -7.1                 | V    |        |
| Input signal voltage     | V <sub>COM</sub> | 3.6                  | 3.8  | 4.0                  | V    |        |
| Input logic high voltage | V <sub>IH</sub>  | 0.7 DV <sub>DD</sub> | -    | DV <sub>DD</sub>     | V    | Note 3 |
| Input logic low voltage  | V <sub>IL</sub>  | 0                    | -    | 0.3 DV <sub>DD</sub> | V    |        |

Note 1: Be sure to apply DV<sub>DD</sub> and V<sub>GL</sub> to the LCD first, and then apply V<sub>GH</sub>.

Note 2: DV<sub>DD</sub> setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: LVDS, Reset.

**3.1.2. Current Consumption**

| Item               | Symbol        | Values |      |      | Unit | Remark           |
|--------------------|---------------|--------|------|------|------|------------------|
|                    |               | Min.   | Typ. | Max. |      |                  |
| Current for Driver | $I_{GH}$      | -      | 0.2  | 1.0  | mA   | $V_{GH} = 20V$   |
|                    | $I_{GL}$      | -      | 0.2  | 1.0  | mA   | $V_{GL} = -6.8V$ |
|                    | $IDV_{DD}$    | -      | 50   | 60   | mA   | $DV_{DD} = 3.3V$ |
|                    | $I_{AV_{DD}}$ | -      | 25   | 30   | mA   | $AV_{DD} = 11V$  |

**3.1.3. Backlight Driving Conditions**

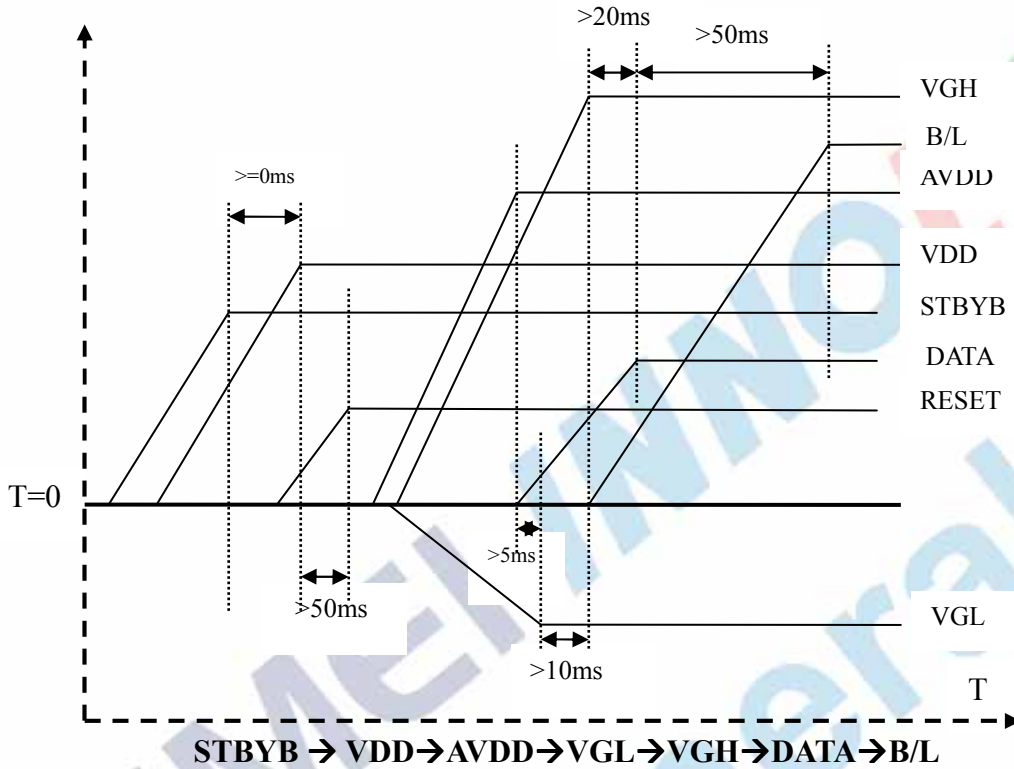
| Item                      | Symbol | Values |        |      | Unit | Remark |
|---------------------------|--------|--------|--------|------|------|--------|
|                           |        | Min.   | Typ.   | Max. |      |        |
| Voltage for LED backlight | $V_L$  | --     | 9.3    | 10.2 | V    | Note 1 |
| Current for LED backlight | $I_L$  | --     | 120    | 130  | mA   |        |
| LED life time             | -      | -      | 20,000 | -    | Hr   | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at  $T_a=25^{\circ}C$  and  $I_L = 120mA$ .

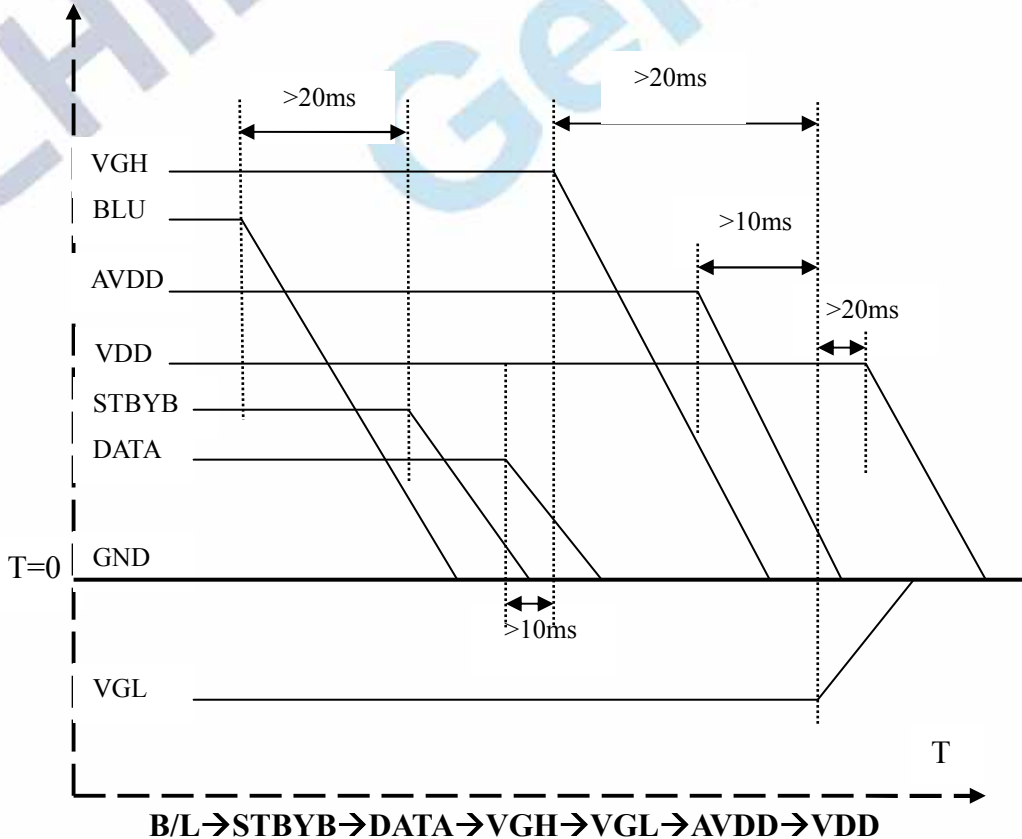
Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^{\circ}C$  and  $I_L = 120mA$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 120mA.

### 3.2. Power Sequence

#### a. Power on:



#### b. Power off:

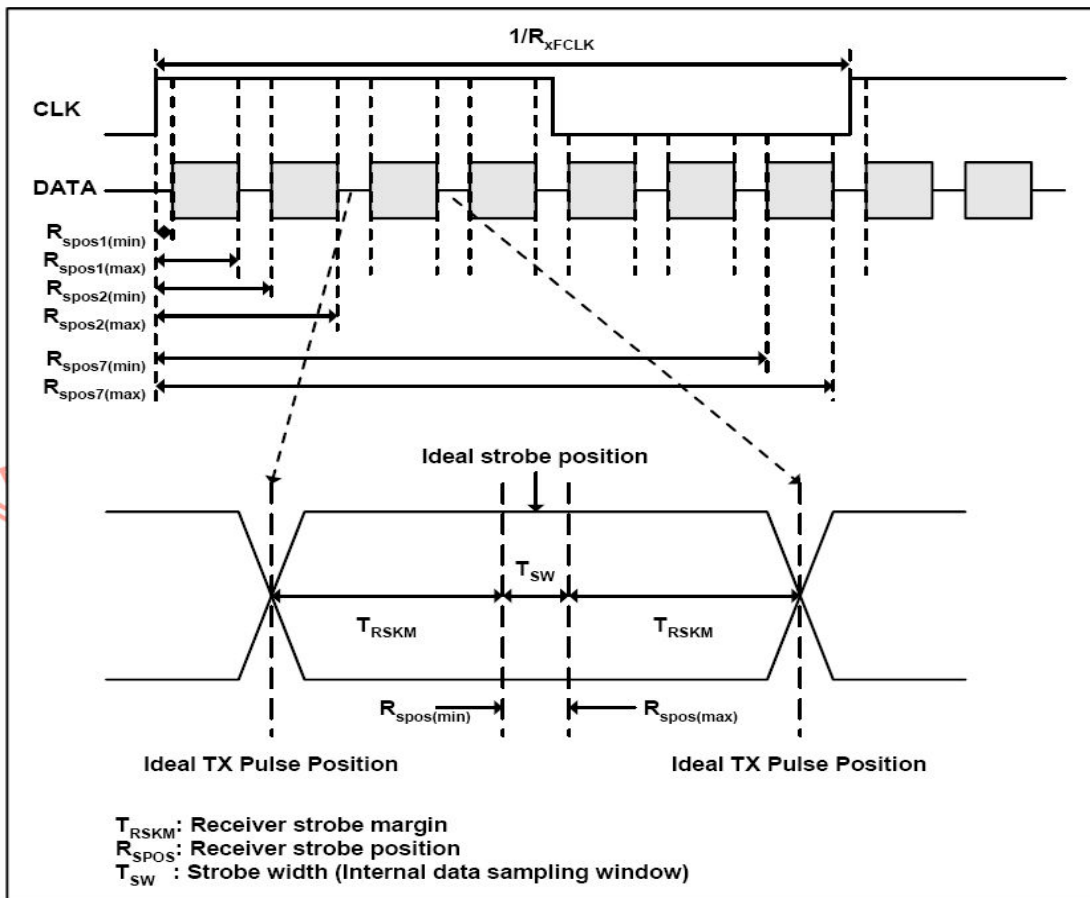
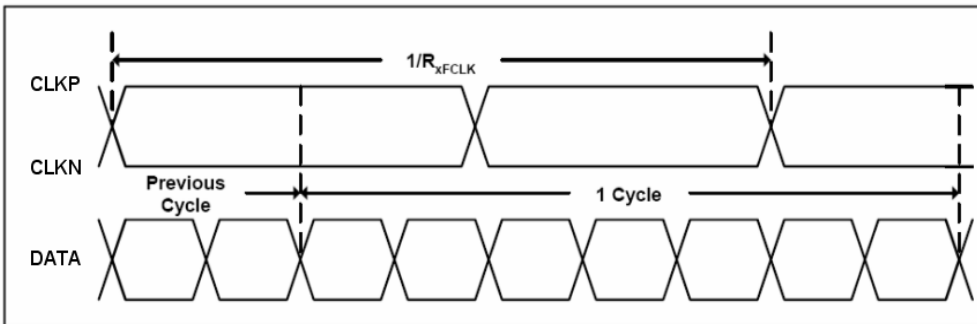


### 3.3. Timing Characteristics

#### 3.3.1. AC Electrical Characteristics

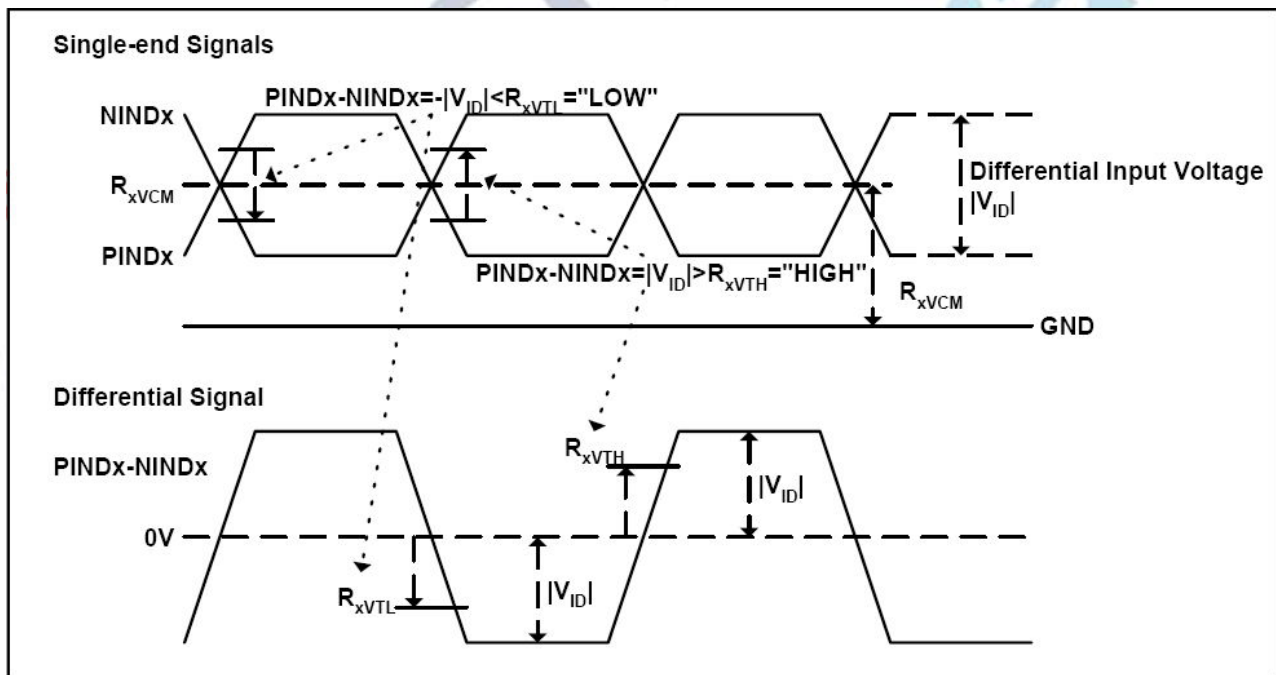
| Parameter              | Symbol      | Values |                     |      | Unit | Remark |
|------------------------|-------------|--------|---------------------|------|------|--------|
|                        |             | Min.   | Typ.                | Max. |      |        |
| Clock frequency        | $R_{XFCLK}$ | 40.8   | 51.2                | 71   | MHz  |        |
| Input data skew margin | $T_{RSKM}$  | 500    | -                   | -    | ps   |        |
| Clock high time        | $T_{LVCH}$  | -      | $4/(7 * R_{XFCLK})$ | -    | ns   |        |
| Clock low time         | $T_{LVCL}$  | -      | $3/(7 * R_{XFCLK})$ | -    | ns   |        |

#### 3.3.2. Input Clock and Data Timing Diagram



3.3.3. DC Electrical Characteristics

| Parameter                                 | Symbol         | Values       |      |                  | Unit    | Remark          |
|---|----------------|--------------|------|------------------|---------|-----------------|
|   |                | Min.         | Typ. | Max.             |         |                 |
| Differential input high Threshold voltage | $R_{xVTH}$     | -            | -    | +0.1             | V       | $R_{xVCM}=1.2V$ |
| Differential input low Threshold voltage  | $R_{xVTL}$     | -0.1         | -    | -                | V       |                 |
| Input voltage range (singled-end)         | $R_{xVIN}$     | 0            | -    | 2.4              | V       |                 |
| Differential input common mode voltage    | $R_{xVCM}$     | $ V_{ID} /2$ | -    | $2.4- V_{ID} /2$ | V       |                 |
| Differential voltage                      | $ V_{ID} $     | 0.2          | -    | 0.6              | V       |                 |
| Differential input leakage current        | $R_{V_{xIIZ}}$ | -10          | -    | +10              | $\mu A$ |                 |



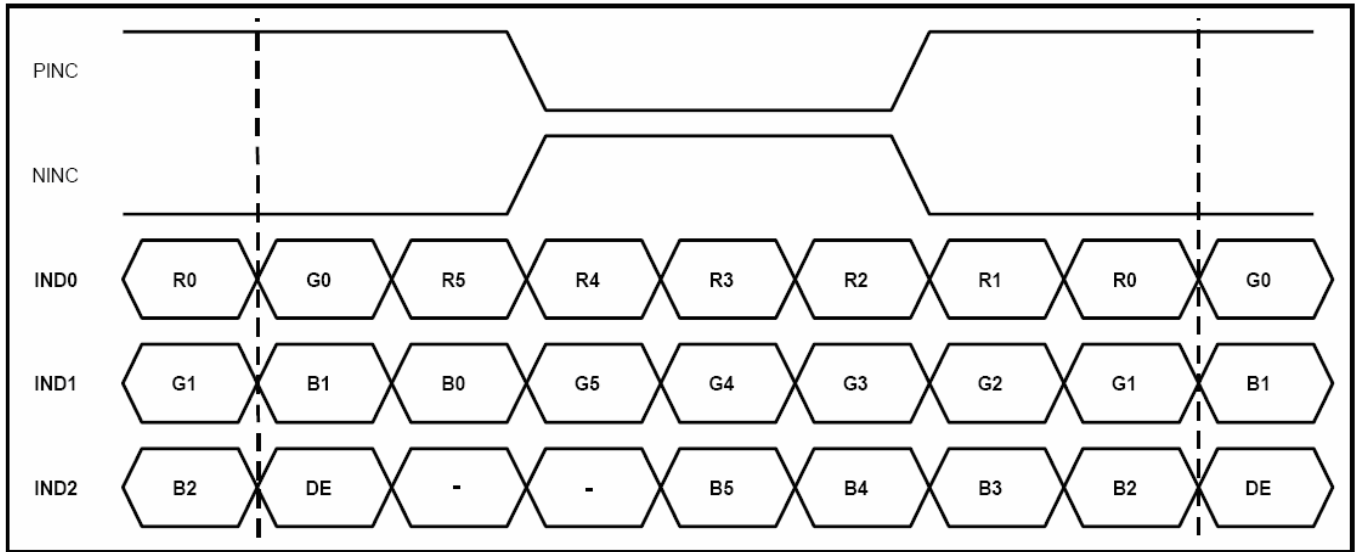
3.3.4. Timing

| Item                    | Symbol | Values |      |      | Unit | Remark           |
|-------------------------|--------|--------|------|------|------|------------------|
|                         |        | Min.   | Typ. | Max. |      |                  |
| Clock Frequency         | fclk   | 40.8   | 51.2 | 67.2 | MHz  | Frame rate =60Hz |
| Horizontal display area | thd    | 1024   |      |      | DCLK |                  |
| HS period time          | th     | 1114   | 1344 | 1400 | DCLK |                  |
| HS Blanking             | thb    | 90     | 320  | 376  | DCLK |                  |
| Vertical display area   | tvd    | 600    |      |      | H    |                  |
| VS period time          | tv     | 610    | 635  | 800  | H    |                  |
| VS Blanking             | thb    | 10     | 35   | 200  | H    |                  |

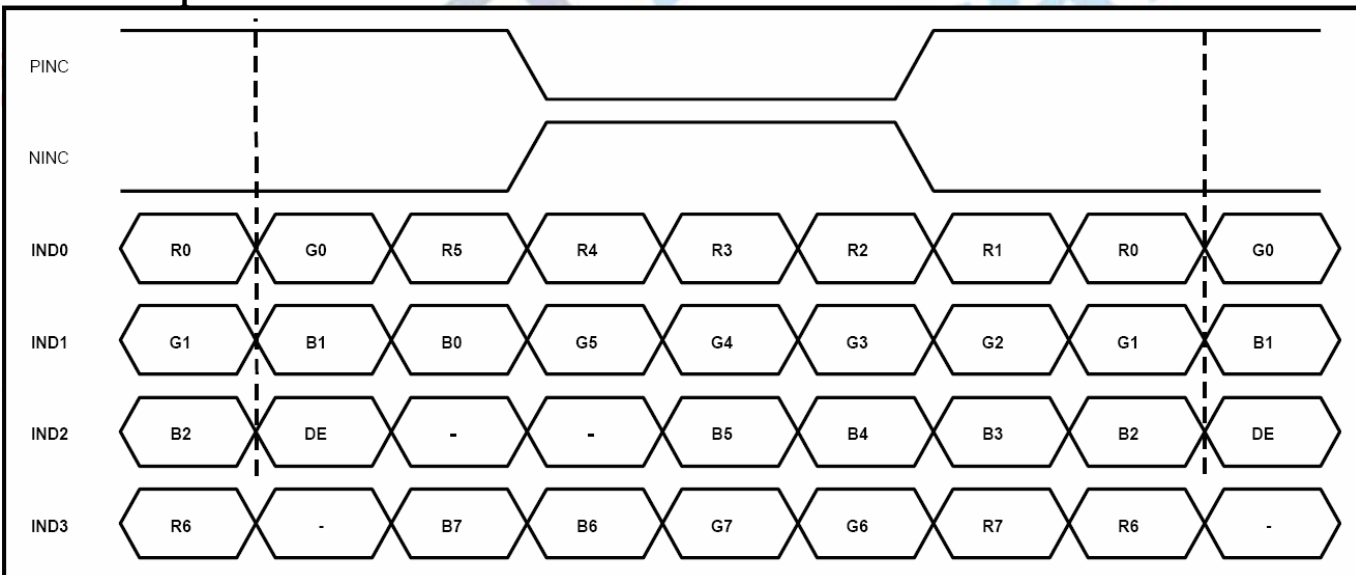


**3.3.5. Data Input Format**

**6bit LVDS input**



**8bit LVDS input**



Note: Support DE timing mode only, SYNC mode not supported.

## 4. Optical Specifications

| Item                      | Symbol     | Condition                       | Values |      |      | Unit              | Remark           |
|---------------------------|------------|---------------------------------|--------|------|------|-------------------|------------------|
|                           |            |                                 | Min.   | Typ. | Max. |                   |                  |
| Viewing angle<br>(CR≥ 10) | $\theta_L$ | $\Phi=180^\circ$ (9 o'clock)    | -      | 75   | -    | degree            | Note 1           |
|                           | $\theta_R$ | $\Phi=0^\circ$ (3 o'clock)      | -      | 75   | -    |                   |                  |
|                           | $\theta_T$ | $\Phi=90^\circ$ (12 o'clock)    | -      | 70   | -    |                   |                  |
|                           | $\theta_B$ | $\Phi=270^\circ$ (6 o'clock)    | -      | 75   | -    |                   |                  |
| Response time             | $T_{ON}$   | Normal<br>$\theta=\Phi=0^\circ$ | -      | 10   | 20   | msec              | Note 3           |
|                           | $T_{OFF}$  |                                 | -      | 10   | 20   | msec              | Note 3           |
| Contrast ratio            | CR         |                                 | 500    | 700  | -    | -                 | Note 4           |
| Color chromaticity        | $W_X$      |                                 | 0.26   | 0.31 | 0.36 | -                 | Note 2<br>Note 5 |
|                           | $W_Y$      |                                 | 0.28   | 0.33 | 0.38 | -                 | Note 6           |
| Luminance                 | L          |                                 | 200    | 250  | -    | cd/m <sup>2</sup> | Note 6           |
| Luminance uniformity      | $Y_U$      |                                 | 70     | 75   | -    | %                 | Note 7           |

Test Conditions:

1.  $DV_{DD}=3.3V$ ,  $I_L=120mA$  (Backlight current), the ambient temperature is  $25^\circ C$ .
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

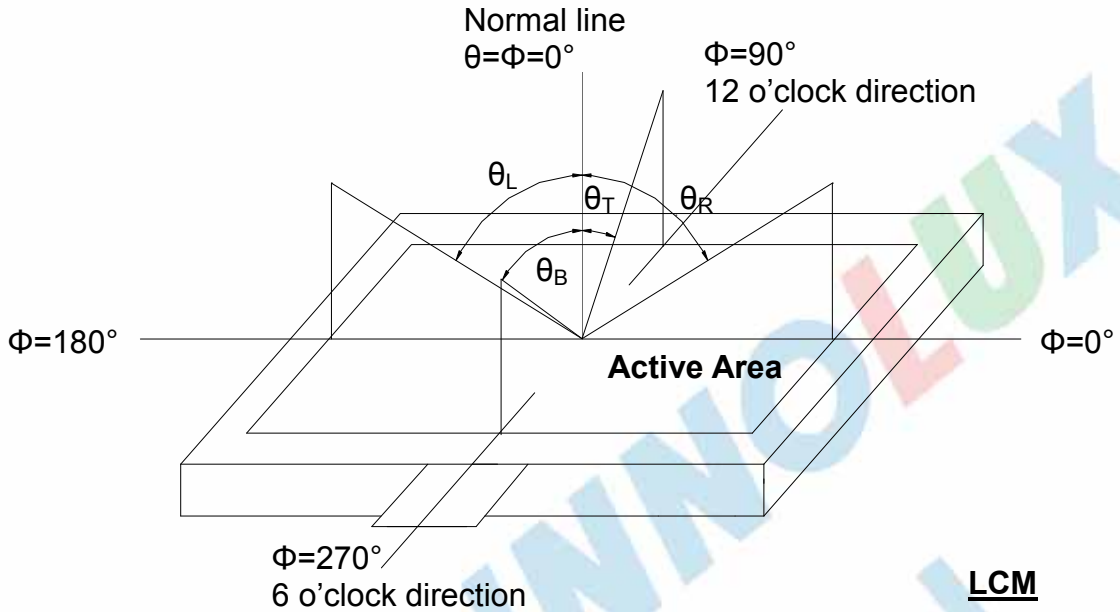


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

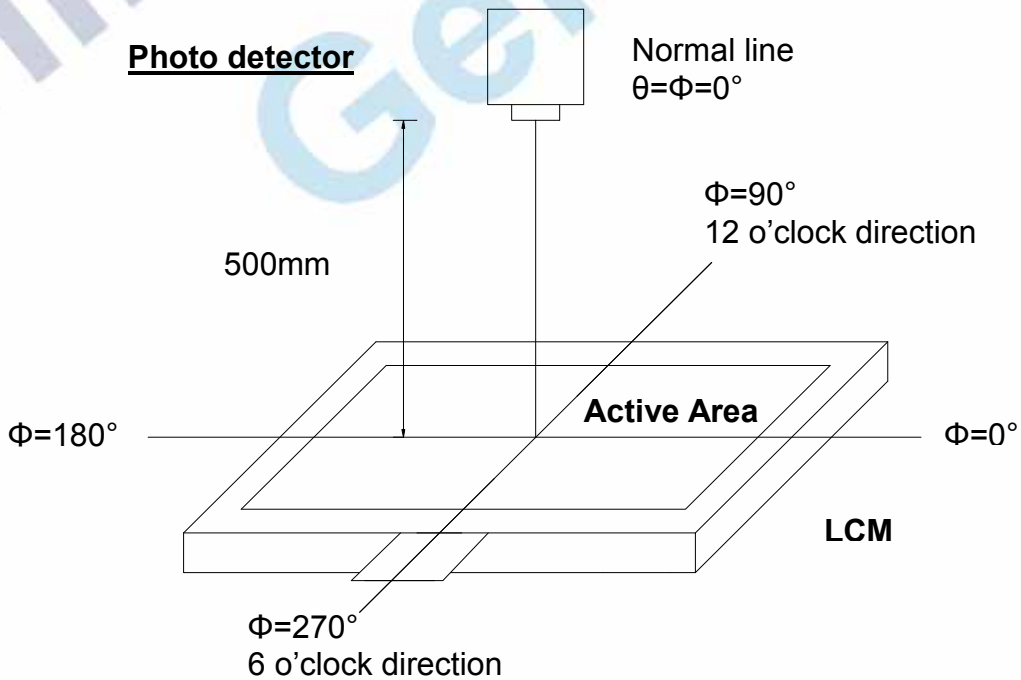


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.

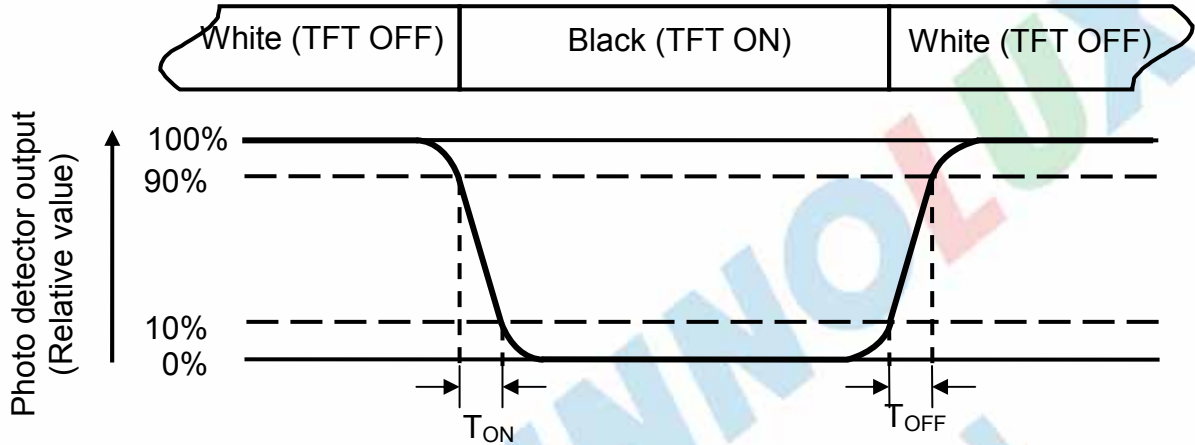


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is  $I_L=120\text{mA}$ .

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length      W----- Active area width

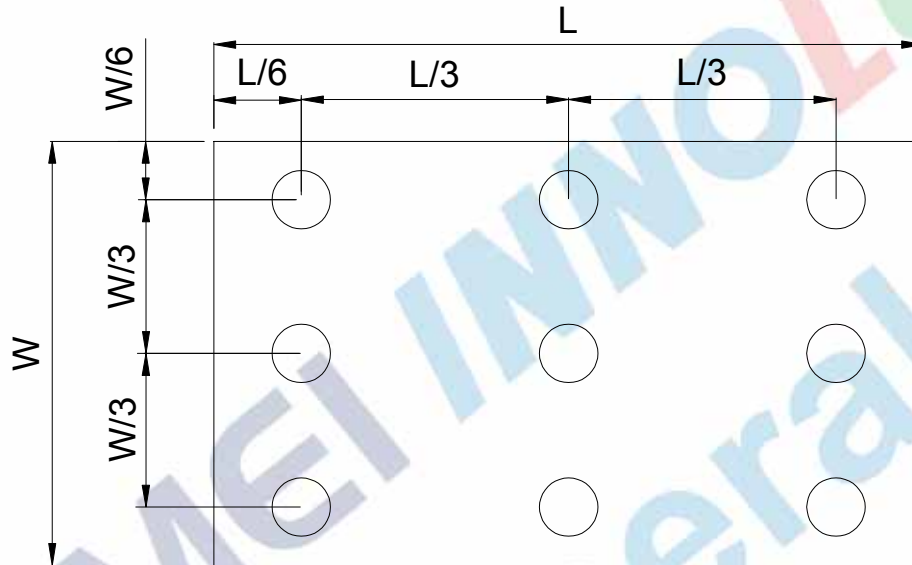


Fig. 4-4 Definition of measuring points

**B<sub>max</sub>**: The measured maximum luminance of all measurement position.

**B<sub>min</sub>**: The measured minimum luminance of all measurement position.







## 6. General Precautions

### 6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

### 6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

### 6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

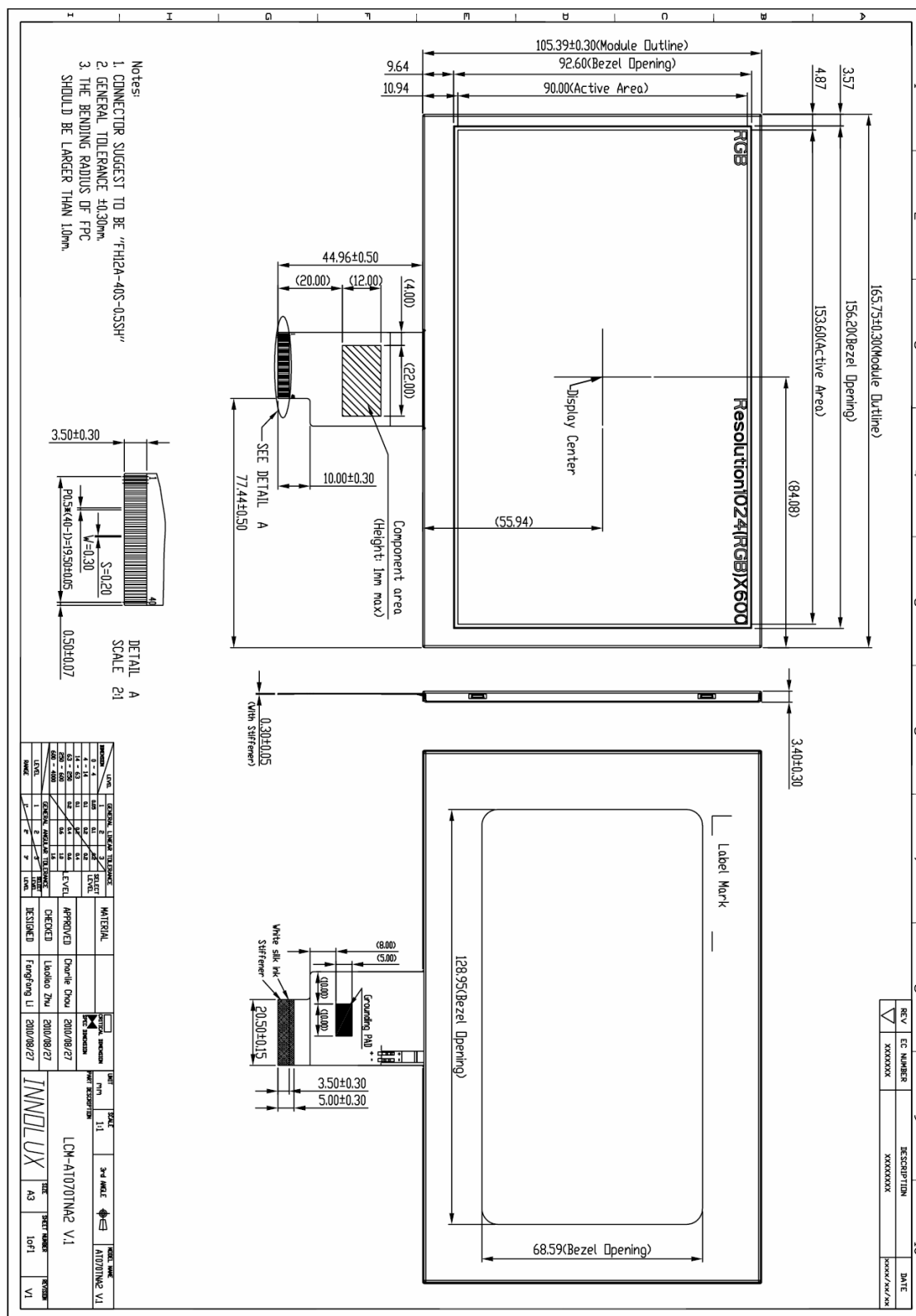
### 6.4. Storage

1. Store the module in a dark room where must keep at  $25\pm 10^{\circ}\text{C}$  and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

### 6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

# 7. Mechanical Drawing



## 8. Package Drawing

### 8.1. Packaging Material Table

| No. | Item             | Model (Material)    | Dimensions(mm)        | Unit Weight (kg) | Quantity | Remark |
|-----|------------------|---------------------|-----------------------|------------------|----------|--------|
| 1   | LCM Module       | AT070TNA2 V.1       | 165.75 × 105.39 × 3.4 | TBD              | 50       |        |
| 2   | Partition        | BC Corrugated paper | 512 × 349 × 226       | 1.466            | 1set     |        |
| 3   | Corrugated Paper | B Corrugated paper  | 510 × 350             | 0.071            | 4pcs     |        |
| 4   | Corrugated Bar   | B Corrugated paper  | 512 × 11 × 3          | 0.046            | 4pcs     |        |
| 5   | Dust-Proof Bag   | PE                  | 700 × 530             | 0.048            | 1pcs     |        |
| 6   | A/S Bag          | PE                  | 180 × 133 × 0.2       | 0.002            | 50pcs    |        |
| 7   | Carton           | Corrugated paper    | 530 × 355 × 255       | 1.100            | 1 pcs    |        |
| 8   | Total weight     | TBD                 |                       |                  |          |        |

### 8.2. Packaging Quantity

Total LCM quantity in Carton: no. of Partition      2 Rows × quantity per Row 25      = 50

### 8.3. Packaging Drawing

