

# **CHIMEI INNOLUX DISPLAY CORPORATION**

## **LCD MODULE**

# **SPECIFICATION**

**Customer:** \_\_\_\_\_  
**Model Name:** AT050TN43 V.1  
**SPEC NO.:** A050-43-TT-11  
**Date:** 2010/05/11  
**Version:** 01

☒ **Preliminary Specification**  
☐ **Final Specification**

**For Customer's Acceptance**

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

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## Record of Revision

| Version     | Revise Date | Page | Content          |
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| Pre-spec.01 | 2010/05/11  |      | Initial Release. |

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## 1. General Specifications

| No. | Item                        | Specification                  | Remark |
|-----|-----------------------------|--------------------------------|--------|
| 1   | LCD size                    | 5.0 inch(Diagonal)             |        |
| 2   | Driver element              | a-Si TFT active matrix         |        |
| 3   | Resolution                  | 800 × 3(RGB) × 480             |        |
| 4   | Display mode                | Normally White, Transmissive   |        |
| 5   | Dot pitch                   | 0.045(W) × 0.135(H) mm         |        |
| 6   | Active area                 | 108.0(W) × 64.8(H) mm          |        |
| 7   | Module size                 | 120.7(W) × 76.3(H) × 3.1(D) mm |        |
| 8   | Surface treatment           | Anti-Glare                     |        |
| 9   | Color arrangement           | RGB-stripe                     |        |
| 10  | Interface                   | Digital                        |        |
| 11  | Backlight Power consumption | TBDW(Typ.)                     |        |
| 12  | Panel Power consumption     | TBD mW(Typ.)                   |        |
| 13  | Weight                      | TBD                            |        |

## 2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH19SC-40S-0.5SH manufactured by HIROSE.

| Pin No. | Symbol            | I/O | Function                        | Remark |
|---------|-------------------|-----|---------------------------------|--------|
| 1       | V <sub>LED-</sub> | P   | Power for LED backlight cathode |        |
| 2       | V <sub>LED+</sub> | P   | Power for LED backlight anode   |        |
| 3       | GND               | P   | Power ground                    |        |
| 4       | V <sub>DD</sub>   | P   | Power voltage                   |        |
| 5       | R0                | I   | Red data (LSB)                  |        |
| 6       | R1                | I   | Red data                        |        |
| 7       | R2                | I   | Red data                        |        |
| 8       | R3                | I   | Red data                        |        |
| 9       | R4                | I   | Red data                        |        |
| 10      | R5                | I   | Red data                        |        |
| 11      | R6                | I   | Red data                        |        |
| 12      | R7                | I   | Red data (MSB)                  |        |
| 13      | G0                | I   | Green data (LSB)                |        |
| 14      | G1                | I   | Green data                      |        |
| 15      | G2                | I   | Green data                      |        |
| 16      | G3                | I   | Green data                      |        |
| 17      | G4                | I   | Green data                      |        |
| 18      | G5                | I   | Green data                      |        |
| 19      | G6                | I   | Green data                      |        |
| 20      | G7                | I   | Green data (MSB)                |        |

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|    |      |   |                 |  |
|----|------|---|-----------------|--|
| 21 | B0   | I | Blue data (LSB) |  |
| 22 | B1   | I | Blue data       |  |
| 23 | B2   | I | Blue data       |  |
| 24 | B3   | I | Blue data       |  |
| 25 | B4   | I | Blue data       |  |
| 26 | B5   | I | Blue data       |  |
| 27 | B6   | I | Blue data       |  |
| 28 | B7   | I | Blue data (MSB) |  |
| 29 | GND  | P | Power ground    |  |
| 30 | CLK  | I | Pixel clock     |  |
| 31 | DISP | I | Display on/off  |  |
| 32 | NC   | - | No connection   |  |
| 33 | NC   | - | No connection   |  |
| 34 | DE   | I | Data Enable     |  |
| 35 | NC   | - | No Connector    |  |
| 36 | GND  | P | Power ground    |  |
| 37 | NC   | - | No Connector    |  |
| 38 | NC   | - | No Connector    |  |
| 39 | NC   | - | No Connector    |  |
| 40 | NC   | - | No Connector    |  |

I: input, O: output, P: Power

### 3. Operation Specifications

#### 3.1. Absolute Maximum Ratings

(Note 1)

| Item                  | Symbol      | Values |      | Unit | Remark             |
|-----------------------|-------------|--------|------|------|--------------------|
|                       |             | Min.   | Max. |      |                    |
| Power voltage         | $V_{DD}$    | -0.5   | 5.0  | V    |                    |
| Input signal voltage  | Logic input | -0.5   | 5.0  | V    |                    |
| Operation temperature | $T_{OP}$    | -20    | 70   | °C   | Note 3, 4          |
| Storage temperature   | $T_{ST}$    | -30    | 80   | °C   | Note 3, 4          |
| LED Reverse Voltage   | $V_R$       | -      | TBD  | V    | Each LED<br>Note 2 |
| LED Forward Current   | $I_F$       | -      | TBD  | mA   | Each LED           |

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

Note 2:  $V_R$  Conditions: Zener Diode 20mA



### 3.2. Typical operation conditions

| Item                     | Symbol   | Values       |      |              | Unit | Remark          |
|--------------------------|----------|--------------|------|--------------|------|-----------------|
|                          |          | Min.         | Typ. | Max.         |      |                 |
| Power voltage            | $V_{DD}$ | 3.1          | 3.3  | 3.5          | V    |                 |
| Current for Driver       | $I_{DD}$ | -            | TBD  | TBD          | mA   | $V_{DD} = 3.3V$ |
| Input logic high voltage | $V_{IH}$ | $0.7 V_{DD}$ | -    | $V_{DD}$     | V    | Note 1          |
| Input logic low voltage  | $V_{IL}$ | GND          | -    | $0.3 V_{DD}$ | V    |                 |

Note1: CLK, DE, R0~ R7, G0~ G7, B0~ B7.

### 3.3 Backlight Driving Conditions

| Item                      | Symbol | Values |      |      | Unit | Remark |
|---------------------------|--------|--------|------|------|------|--------|
|                           |        | Min.   | Typ. | Max. |      |        |
| Voltage for LED Backlight | $V_L$  | 19.6   | 21.7 | 23.8 | V    | Note 1 |
| Current for LED Backlight | $I_L$  | 36     | 40   | 44   | mA   |        |
| LED life time             | -      | 20,000 | -    | -    | Hr   | Note 2 |

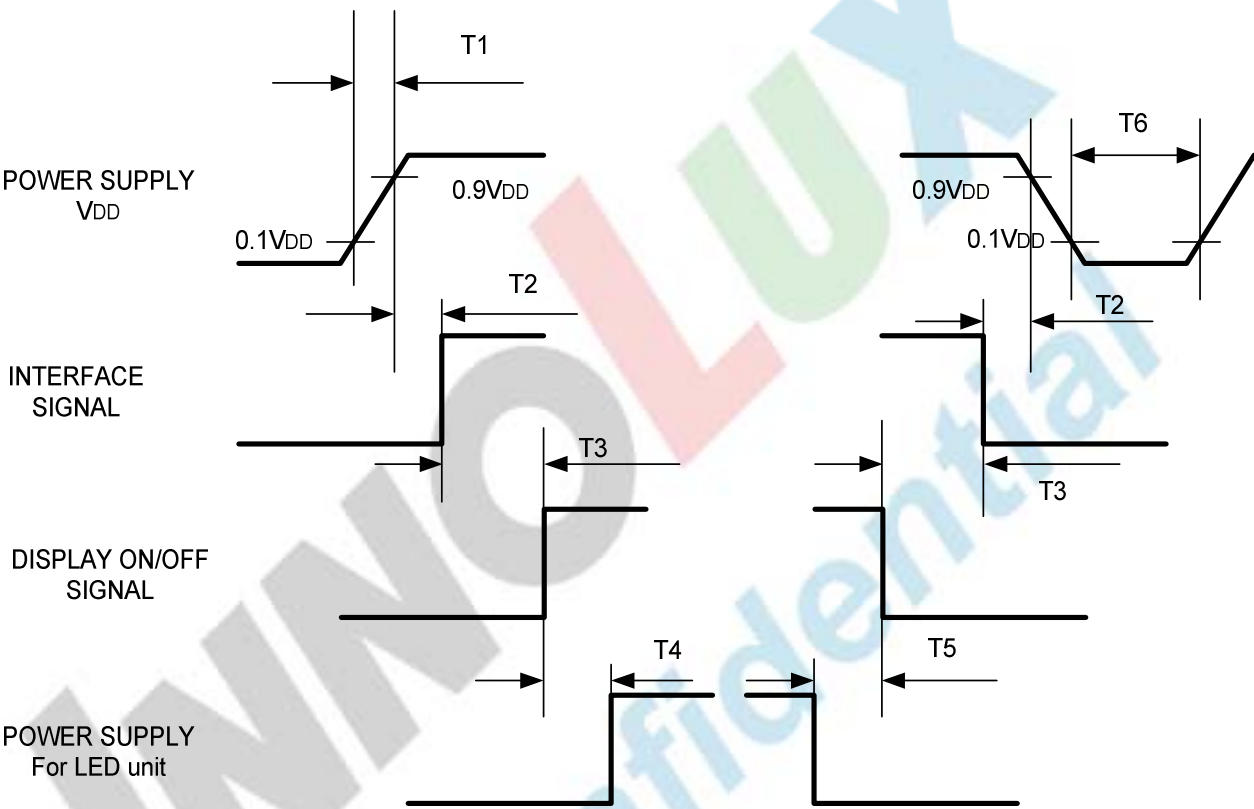
Note 1: The LED Supply Voltage is defined by the number of LED at  $T_a=25^{\circ}\text{C}$  and  $I_L=40\text{mA}$ .

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^{\circ}\text{C}$  and  $I_L=40\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 40 mA.



3.4.Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



| Symbol | Specification                      | Symbol | Specification              |
|--------|------------------------------------|--------|----------------------------|
| T1     | $0 \leq T1 \leq 10 \text{ msec}$   | T4     | $200 \text{ msec} \leq T4$ |
| T2     | $16 \leq T2 \leq 100 \text{ msec}$ | T5     | $100 \text{ msec} \leq T5$ |
| T3     | $0 \leq T3 \leq 200 \text{ msec}$  | T6     | $16 \text{ msec} \leq T6$  |

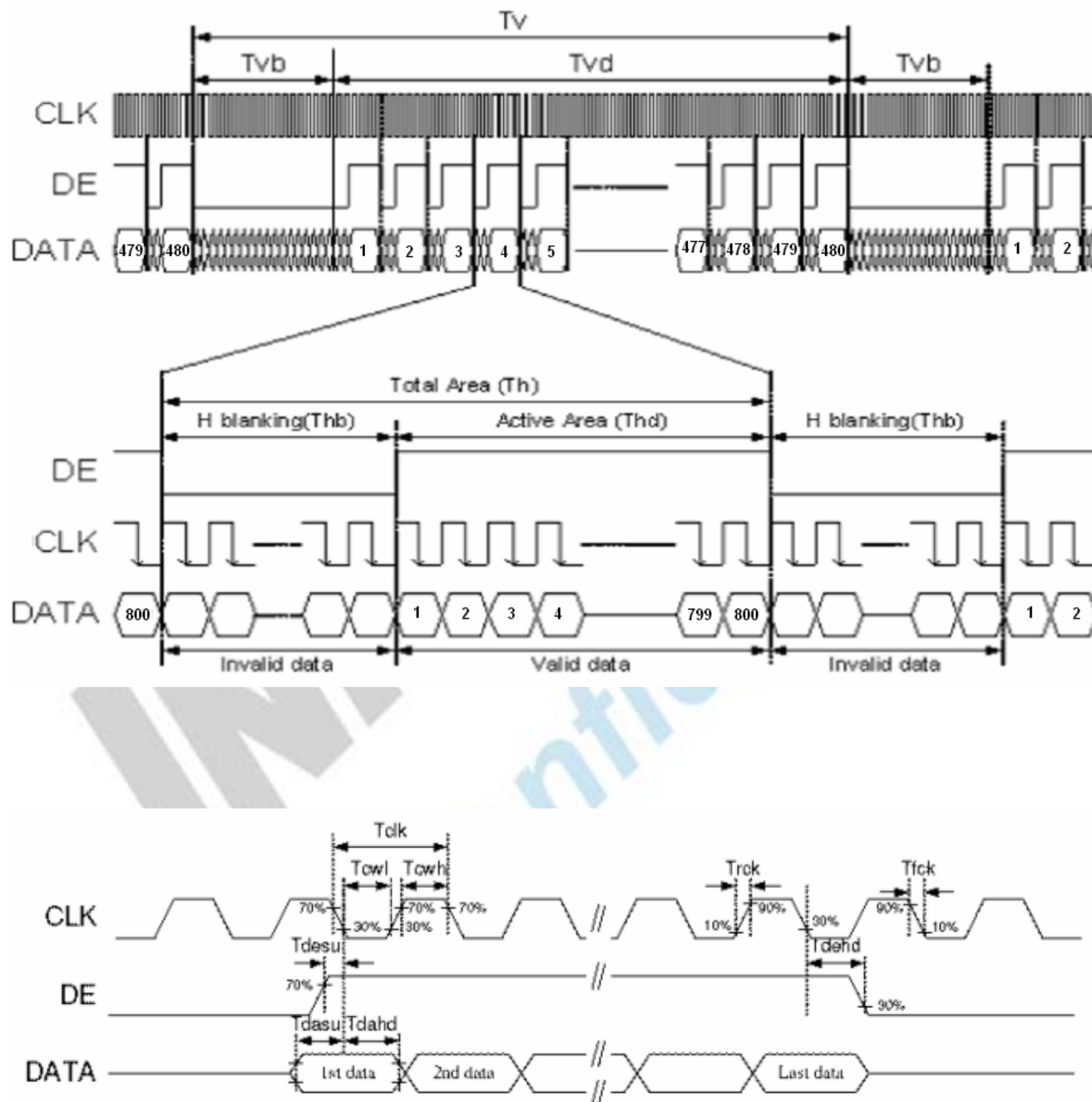
### 3.5. Timing Characteristics

#### 3.5.1. Timing Conditions

Parallel DE mode RGB input timing table

| Parameter                 | Symbol            | Value |      |      | Unit |
|---------------------------|-------------------|-------|------|------|------|
|                           |                   | Min.  | Typ. | Max. |      |
| CLK frequency             | fclk              | 26.4  | 33.3 | 46.8 | MHz  |
| DEV period time           | Tv                | 510   | 525  | 650  | H    |
| DEV display area          | Tvd               | 480   |      |      | H    |
| DEV blanking              | Tvb               | 30    | 45   | 170  | H    |
| DEH period time           | Th                | 862   | 1056 | 1200 | CLK  |
| DEH display area          | Thd               | 800   |      |      | CLK  |
| DEH blanking              | Thb               | 62    | 256  | 400  | CLK  |
| CLK cycle time            | Tclk              | 21.3  | 30   | 37.8 | ns   |
| Clock width of high level | Tcwh              | 40    | 50   | 60   | %    |
| Clock width of low level  | Tcwl              | 40    | 50   | 60   | %    |
| Clock rising time         | t <sub>rck</sub>  | 8     | -    | -    | ns   |
| Clock falling time        | t <sub>fcck</sub> | 8     | -    | -    | ns   |
| Data Setup Time           | t <sub>dasu</sub> | 8     | -    | -    | ns   |
| Data Hold Time            | t <sub>dahd</sub> | 8     | -    | -    | ns   |
| DE Setup Time             | t <sub>desu</sub> | 8     | -    | -    | ns   |
| DE Hold Time              | t <sub>dehd</sub> | 8     | -    | -    | ns   |

### 3.5.2. Timing Diagram



## 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)    | 60     | 70   | -    | degree            | Note 1           |
|                           | $\theta_R$ | $\Phi=0^\circ$ (3 o'clock)      | 60     | 70   | -    |                   |                  |
|                           | $\theta_T$ | $\Phi=90^\circ$ (12 o'clock)    | 40     | 50   | -    |                   |                  |
|                           | $\theta_B$ | $\Phi=270^\circ$ (6 o'clock)    | 60     | 70   | -    |                   |                  |
| Response time             | $T_{ON}$   | Normal<br>$\theta=\Phi=0^\circ$ | -      | 10   | 20   | msec              | Note 3           |
|                           | $T_{OFF}$  |                                 | -      | 15   | 30   | msec              | Note 3           |
| Contrast ratio            | CR         |                                 | 400    | 500  | -    | -                 | 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          |                                 | 280    | 350  | -    | cd/m <sup>2</sup> | Note 6           |
| Luminance uniformity      | $Y_U$      |                                 | 70     | 75   | -    | %                 | Note 7           |

Test Conditions:

1.  $V_{DD}=3.3V$ ,  $I_L=40mA$  (Backlight current), the ambient temperature is  $25^\circ C$ .
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

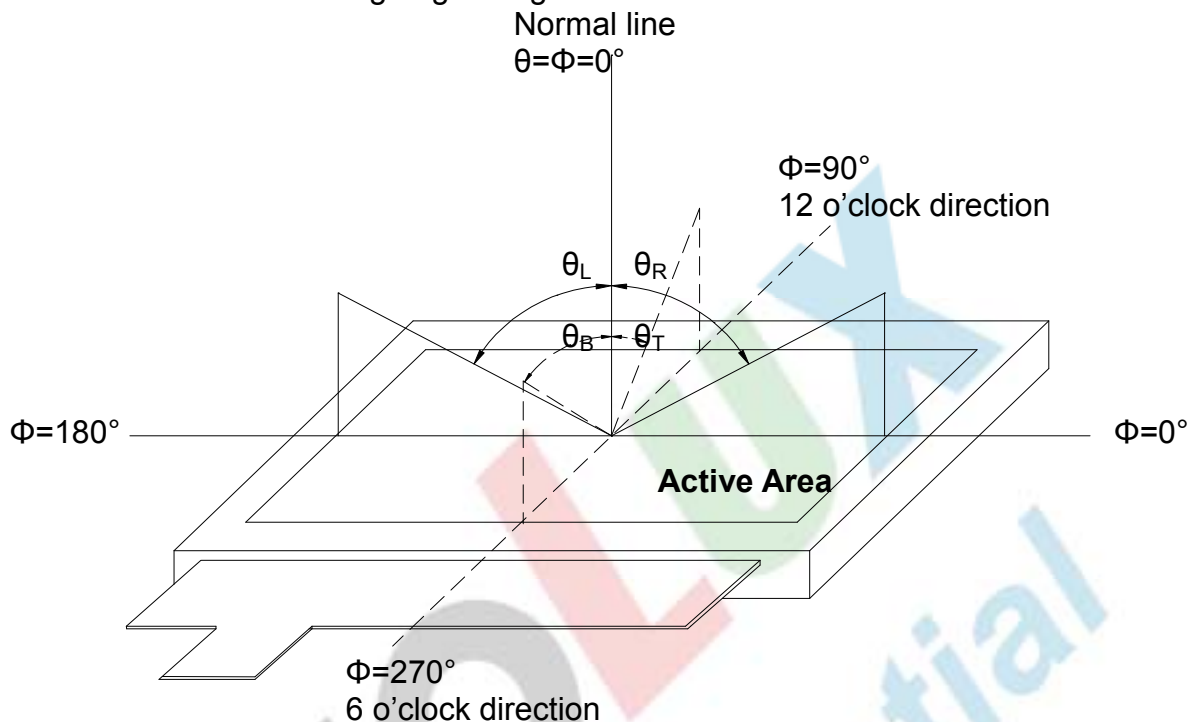
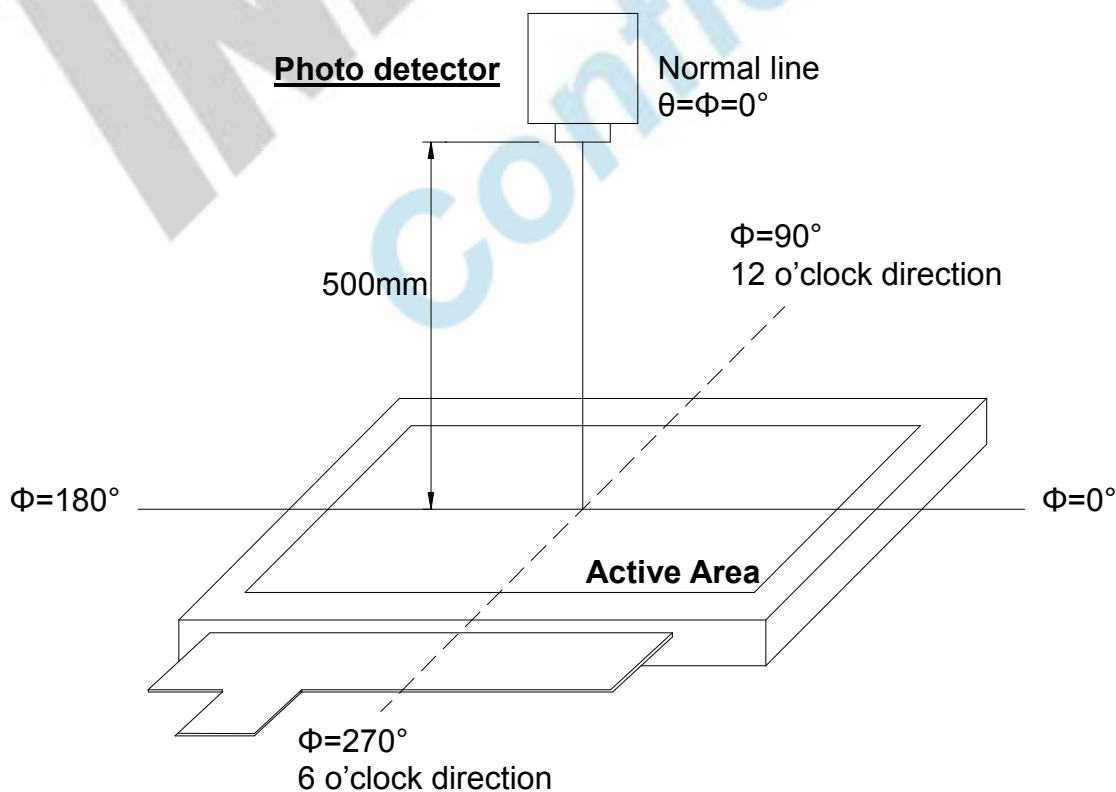


Fig. 4-1 Definition of viewing angle

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:  $1^\circ$  /Height: 500mm.)



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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%.

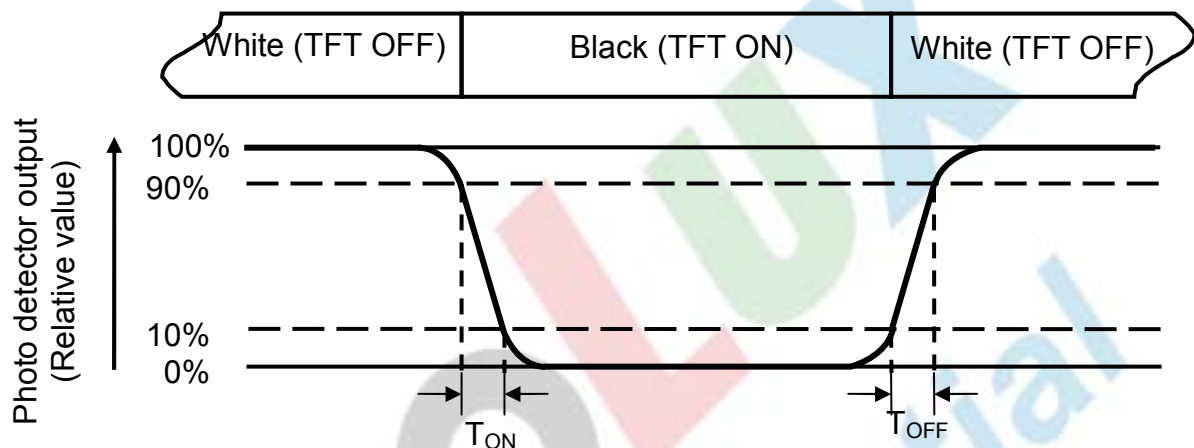


Fig. 4-3 Definition of response time

## 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  $I_L=40\text{mA}$ .

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.

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

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

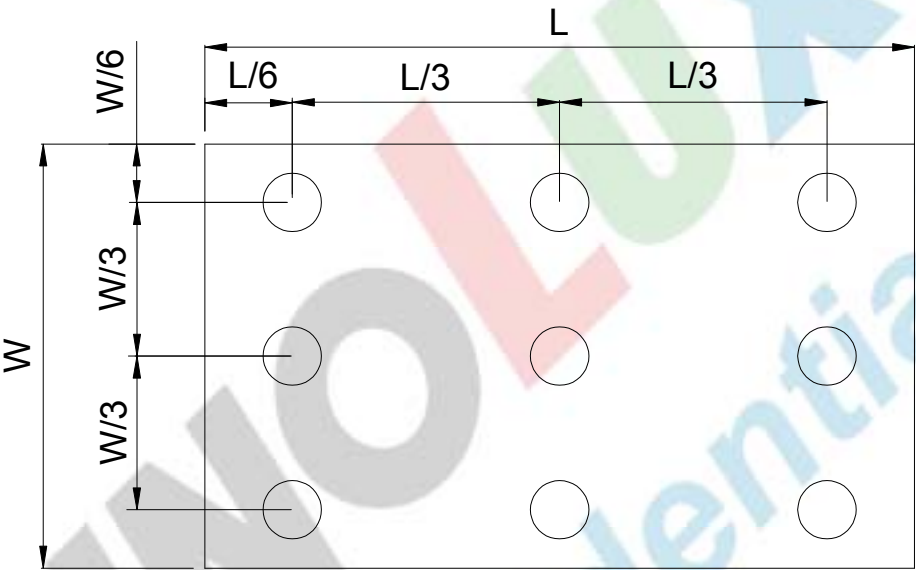


Fig. 4-4 Definition of measuring points

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



## 5. Reliability Test Items

(Note3)

| Item                                     | Test Conditions                                                                                                                                | Remark        |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| High Temperature Storage                 | Ta = 80℃ 240 hrs                                                                                                                               | Note 1,Note 4 |
| Low Temperature Storage                  | Ta = -30℃ 240hrs                                                                                                                               | Note 1,Note 4 |
| High Temperature Operation               | Ts = 70℃ 240hrs                                                                                                                                | Note 2,Note 4 |
| Low Temperature Operation                | Ta = -20℃ 240hrs                                                                                                                               | Note 1,Note 4 |
| Operate at High Temperature and Humidity | +60℃, 90% RH 240 hrs                                                                                                                           | Note 4        |
| Thermal Shock                            | -30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature                                    | Note 4        |
| Vibration Test                           | Frequency range:10~55Hz<br>Stroke:1.5mm<br>Sweep:10Hz~55Hz~10Hz<br>2 hours for each direction of X. Y. Z.<br>(6 hours for total)               |               |
| Mechanical Shock                         | 100G 6ms,±X, ±Y, ±Z 3 times for each direction                                                                                                 |               |
| Package Vibration Test                   | Random Vibration :<br>0.015G*G/Hz from 5-200HZ,<br>-6dB/Octave from 200-500HZ<br>2 hours for each direction of X. Y. Z.<br>(6 hours for total) |               |
| Package Drop Test                        | Height:60 cm<br>1 corner, 3 edges, 6 surfaces                                                                                                  |               |
| Electro Static Discharge                 | ± 2KV, Human Body Mode,<br>100pF/1500Ω                                                                                                         |               |

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 4: Before cosmetic and function tests, the product must have enough recovery time, at least 2 hours at room temperature.

## 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

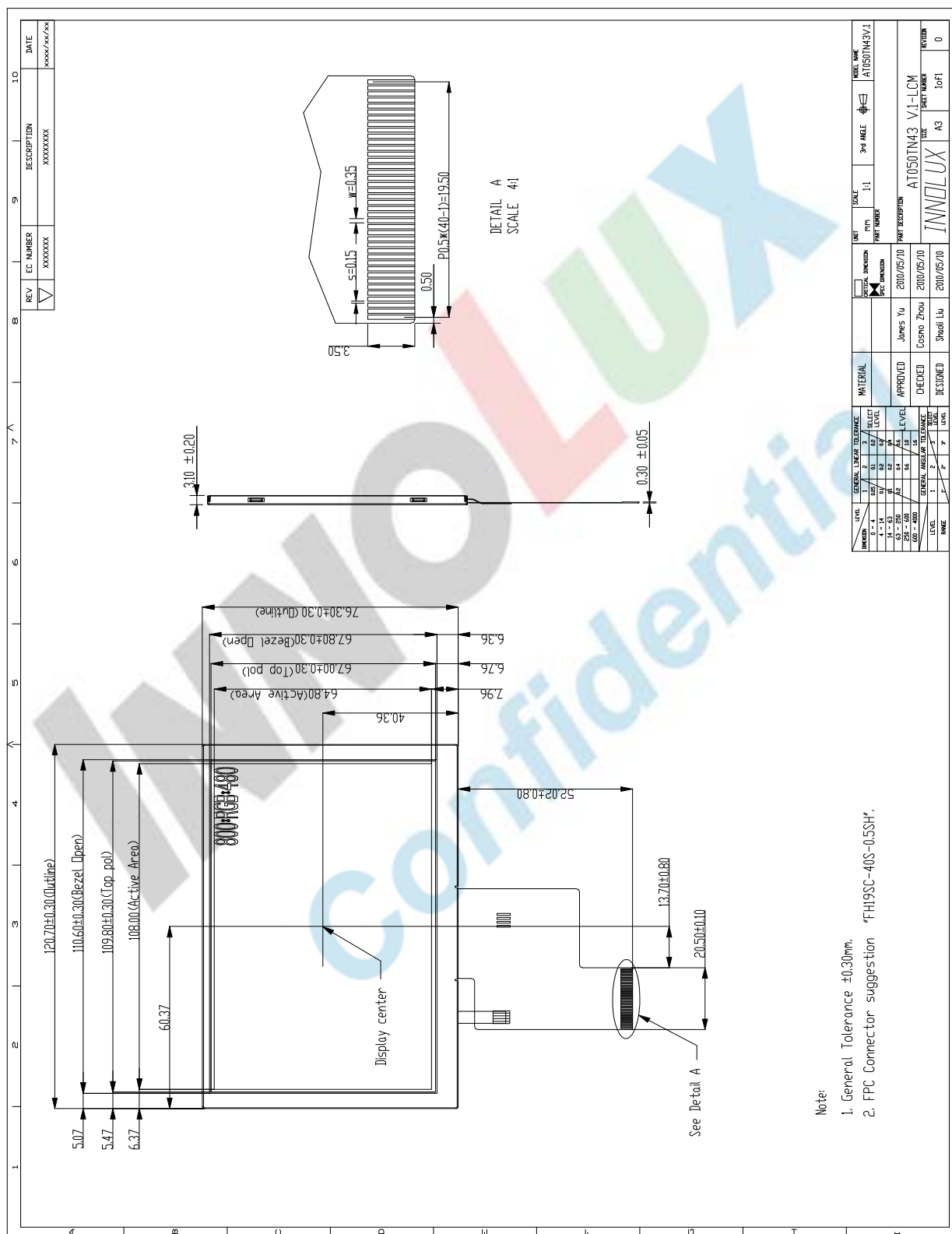
1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

### 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.



1. General Tolerance  $\pm 0.30\text{mm}$ .
2. FPC Connector suggestion "FH19SC-40S-0.5SH".

## 8. Package Drawing

### 8.1 Packaging Material Table

| No | Item             | Model (Material)    | Dimensions(mm)    | Unit Weight (Kg) | Quantity (pcs) | Remark |
|----|------------------|---------------------|-------------------|------------------|----------------|--------|
| 1  | LCM module       | AT050TN43 V.1       | 120.7× 76.3 × 3.1 | TBD              | 100            |        |
| 2  | Corrugated Bar   | B Corrugated Paper  | 510 × 178         | 0.047            | 4              |        |
| 3  | Corrugated Board | B Corrugated Paper  | 512 × 349         | 0.074            | 3              |        |
| 4  | Partition        | BC Corrugated Paper | 512 × 349 × 112   | 0.073            | 2              |        |
| 5  | Dust-Proof Bag   | PE                  | 700 × 530         | 0.060            | 1              |        |
| 6  | A/S Bag          | PE                  | 145 ×145          | 0.001            | 100            |        |
| 7  | Carton           | Corrugated Paper    | 530 × 355 × 255   | 1.100            | 1              |        |
| 8  | Total weight     | TBD                 |                   |                  |                |        |

### 8.2 Packaging Quantity

|                                   |                                      |
|-----------------------------------|--------------------------------------|
| (1) LCM quantity per Partition:   | 2 row x 25 pcs = 50pcs               |
| (2) Total LCM quantity in Carton: | 2 layer x 50 pcs/Partition = 100 pcs |

