

# **INNOLUX DISPLAY CORPORATION**

## **LCD FOG**

# **SPECIFICATION**

**Customer:** \_\_\_\_\_

**Model Name:** EE101IA-01D

**Date:** 2020/09/17

**Version:** 11

☐ **Preliminary Specification**

☒ **Final Specification**

**For Customer's Acceptance**

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

| Approved by | Reviewed by | Prepared by |
|-------------|-------------|-------------|
|             |             |             |

## Record of Revision

| Version     | Revise Date | Page  | Content                                                          |
|-------------|-------------|-------|------------------------------------------------------------------|
| Pre-Spec.01 | 2012/11/13  | All   | Initial Release                                                  |
| Fin-Spec.01 | 2013/05/20  | 1     | Update Panel power consumption& Weight                           |
|             |             | 5     | Update Vcom from 3.3 to 3.0                                      |
|             |             | 6     | Add 3.3 Current Consumption                                      |
|             |             | 7     | Update Power sequence                                            |
|             |             | 8     | Update LVDS Differential voltage min. values from 200 to 100 mV  |
|             |             | 11    | Update Panel transmission& Test Conditions 1                     |
|             |             | 16    | Modify Mechanical Drawing                                        |
|             |             | 17~18 | Modify Package Drawing                                           |
| Fin-Spec.02 | 2014/01/24  | 2     | Modify connect type                                              |
|             |             | 6     | Modify unit of I <sub>GH</sub> and I <sub>GL</sub> from mA to uA |
|             |             | 7     | Modify power sequence                                            |
|             |             | 11    | Modify panel transmission typ. values from 3.4% to 5.4%          |
| Fin-Spec.03 | 2014/08/18  | 1     | Panel size update                                                |
| Fin-Spec.04 | 2014/12/29  | 16    | Modify Mechanical Drawing                                        |
| Fin-Spec.05 | 2016/11/29  | 1     | Update General Specifications                                    |
|             |             | 6     | Update Current Consumption                                       |
|             |             | 6~7   | Update Power Sequence                                            |
|             |             | 13    | Update Reliability Test Items                                    |
| Fin-Spec.06 | 2018/07/12  | 2-3   | Modify Pin Assignment                                            |
|             |             | 4     | Modify Operation Specifications                                  |
|             |             | 7-8   | Modify Power Sequence                                            |
|             |             | 9     | Modify Timing Table                                              |
|             |             | 11    | Modify Optical Specifications                                    |
|             |             | 14    | Modify Reliability Test Items                                    |
|             |             | 16    | Modify Mechanical Drawing                                        |
|             |             | 17-18 | Modify Packaging Drawing                                         |
| Fin-Spec.07 | 2018/08/13  | 3     | Modify Pin Assignment Description                                |
| Fin-Spec.08 | 2018/11/08  | 16    | Modify Mechanical Drawing                                        |
| Fin-Spec.09 | 2019/06/20  | 16    | Modify Mechanical Drawing                                        |
| Fin-Spec.10 | 2020/08/14  | 16    | Modify Mechanical Drawing                                        |
| Fin-Spec.10 | 2020/09/17  | 16    | Modify Mechanical Drawing                                        |

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# 1. General Specifications

| No. | Item                           | Specification                      | Remark |
|-----|--------------------------------|------------------------------------|--------|
| 1   | LCD size                       | 10.1 inch(Diagonal)                |        |
| 2   | Driver element                 | a-Si TFT active matrix             |        |
| 3   | Resolution                     | 1280 × 3(RGB) × 800                |        |
| 4   | Display mode                   | Normally Black, Transmissive       |        |
| 5   | Dot pitch                      | 0.0565(W) × 0.1695(H) mm           |        |
| 6   | Active area                    | 216.96(W) × 135.60(H) mm           |        |
| 7   | Panel size                     | 223.95(W) × 144.24(H) × 1.07(D) mm | Note 1 |
| 8   | Surface treatment              | HC                                 |        |
| 9   | Color arrangement              | RGB-stripe                         |        |
| 10  | Interface                      | LVDS                               |        |
| 11  | View direction(Gray Inversion) | free                               |        |
| 12  | Panel power consumption        | 0.7W (Typ)                         | Note 2 |
| 13  | Weight                         | 80g(Typ)                           |        |
| 14  | inversion                      | 1+2line                            |        |
| 15  | IC                             | HX8288*4&HX8695*1                  |        |

Note 1: Refer to Mechanical Drawing.

Note 2: Including T-con Board power consumption

## 2. Pin Assignment

A 40pin connector is used for the module electronics interface. This model used 196479-40041-3 manufactured by P2 connector

| Pin No. | Symbol | I/O | Function                       | Remark                    |
|---------|--------|-----|--------------------------------|---------------------------|
| 1       | VCOM   | P   | Common Voltage                 |                           |
| 2       | VDD    | P   | Power Supply                   |                           |
| 3       | VDD    | P   | Power Supply                   |                           |
| 4       | NC     | --- | No connection                  |                           |
| 5       | NC     | --- | No connection                  |                           |
| 6       | NC     | --- | No connection                  |                           |
| 7       | GND    | P   | Ground                         |                           |
| 8       | Rxin0- | I   | -LVDS Differential Data Input  | R0-R5, G0                 |
| 9       | Rxin0+ | I   | +LVDS Differential Data Input  |                           |
| 10      | GND    | P   | Ground                         |                           |
| 11      | Rxin1- | I   | -LVDS Differential Data Input  | G1~G5, B0,B1              |
| 12      | Rxin1+ | I   | +LVDS Differential Data Input  |                           |
| 13      | GND    | P   | Ground                         |                           |
| 14      | Rxin2- | I   | -LVDS Differential Data Input  | B2-B5,HS,VS,<br>DE        |
| 15      | Rxin2+ | I   | +LVDS Differential Data Input  |                           |
| 16      | GND    | P   | Ground                         |                           |
| 17      | RxCLK- | I   | -LVDS Differential Clock Input | LVDS CLK                  |
| 18      | RxCLK+ | I   | +LVDS Differential Clock Input |                           |
| 19      | GND    | P   | Ground                         |                           |
| 20      | Rxin3- | I   | -LVDS Differential Data Input  | R6, R7, G6, G7,<br>B6, B7 |
| 21      | Rxin3+ | I   | +LVDS Differential Data Input  |                           |
| 22      | GND    | P   | Ground                         |                           |
| 23      | NC     | --- | No connection                  |                           |
| 24      | NC     | --- | No connection                  |                           |
| 25      | GND    | P   | Ground                         |                           |
| 26      | NC     | --- | No connection                  |                           |

|    |      |     |                          |  |
|----|------|-----|--------------------------|--|
| 27 | NC   | --- | No connection            |  |
| 28 | NC   | --- | No connection            |  |
| 29 | AVDD | P   | Power for Analog Circuit |  |
| 30 | GND  | P   | Ground                   |  |
| 31 | LED- | P   | LED Cathode              |  |
| 32 | LED- | P   | LED Cathode              |  |
| 33 | NC   | --- | No connection            |  |
| 34 | NC   | --- | No connection            |  |
| 35 | VGL  | P   | Gate OFF Voltage         |  |
| 36 | NC   | --- | No connection            |  |
| 37 | NC   | --- | No connection            |  |
| 38 | VGH  | P   | Gate ON Voltage          |  |
| 39 | LED+ | P   | LED Anode                |  |
| 40 | LED+ | P   | LED Anode                |  |

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         | VDD                              | -0.3   | 3.9  | V    |        |
|                       | AVDD                             | -0.3   | 14   | V    |        |
|                       | V <sub>GH</sub>                  | -0.3   | 42.0 | V    |        |
|                       | V <sub>GL</sub>                  | -19    | 0.3  | V    |        |
|                       | V <sub>GH</sub> -V <sub>GL</sub> | 12     | 40.0 | V    |        |
| Operation Temperature | T <sub>OP</sub>                  | -20    | 70   | °C   |        |
| Storage Temperature   | T <sub>ST</sub>                  | -30    | 80   | °C   |        |

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.

## 3.2. Typical Operation Conditions

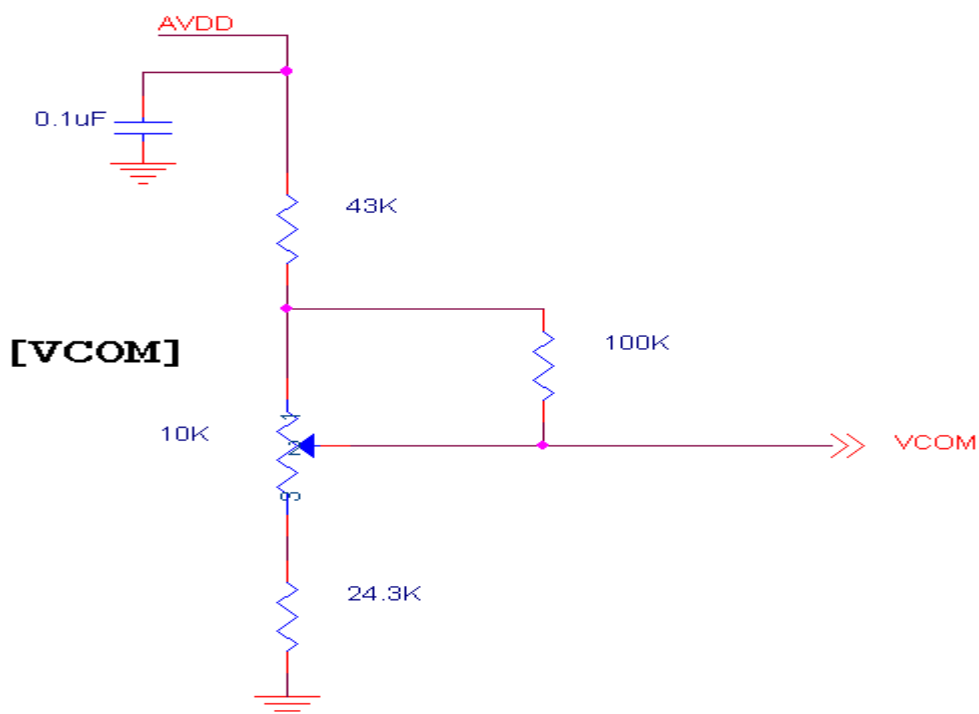
( Note 1)

| Item                     | Symbol          | Values  |      |                      | Unit | Remark |
|--------------------------|-----------------|---------|------|----------------------|------|--------|
|                          |                 | Min.    | Typ. | Max.                 |      |        |
| Power voltage            | VDD             | 2.3     | 2.5  | 2.7                  | V    | Note 2 |
|                          | AVDD            | 8.0     | 8.2  | 8.4                  | V    |        |
|                          | V <sub>GH</sub> | 21.7    | 22   | 22.3                 | V    |        |
|                          | V <sub>GL</sub> | -7.3    | -7   | -6.7                 | V    |        |
| Input signal voltage     | VCOM            | 2.7     | 3.0  | 3.3                  | V    | Note 4 |
| Input logic high voltage | V <sub>IH</sub> | 0.8 VDD | -    | 3.6                  | V    | Note 3 |
| Input logic low voltage  | V <sub>IL</sub> | 0       | -    | 0.2 DV <sub>DD</sub> | V    |        |

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

Note 2: VDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 4: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR.



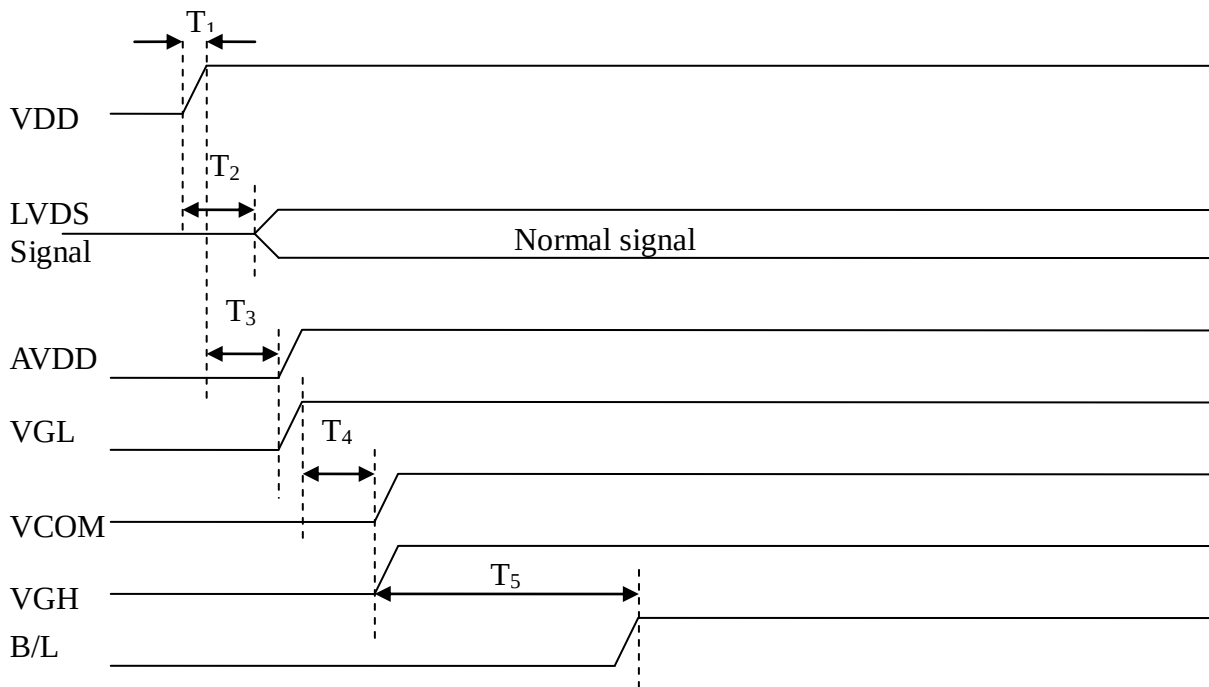


### 3.3. Current Consumption

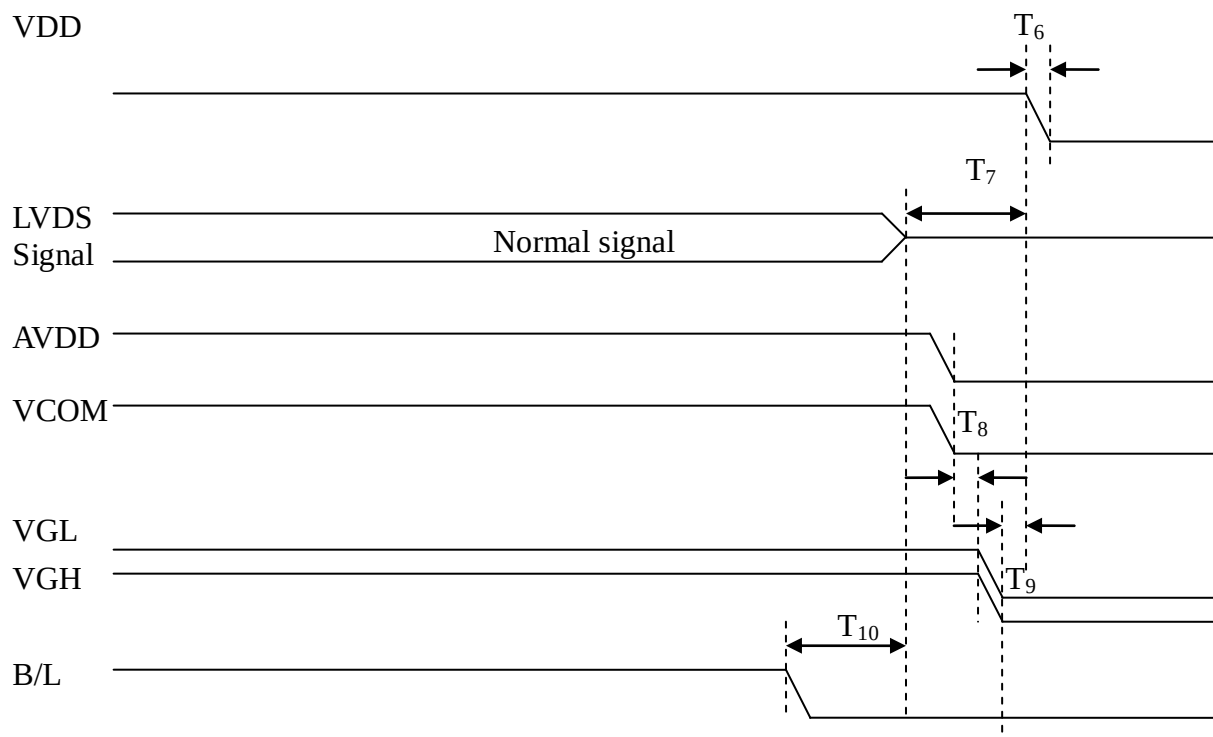
| Item               | Symbol        | Values |      |      | Unit | Remark           |
|--------------------|---------------|--------|------|------|------|------------------|
|                    |               | Min.   | Typ. | Max. |      |                  |
| Current for Driver | $I_{GH}$      | 300    | 705  | 1000 | uA   | $V_{GH} = 22V$   |
|                    | $I_{GL}$      | 300    | 705  | 1000 | uA   | $V_{GL} = -7V$   |
|                    | $I_{V_{DD}}$  | 50     | 95   | 120  | mA   | $V_{DD} = 2.5V$  |
|                    | $I_{AV_{DD}}$ | 8      | 45   | 70   | mA   | $AV_{DD} = 8.2V$ |

### 3.4. Power Sequence

#### a. Power on:



| Symbol | Value |      |      | Unit<br>Min. |
|--------|-------|------|------|--------------|
|        | Min.  | Typ. | Max. |              |
| T1     | 0.5   | 2    | 10   | ms           |
| T2     | 0     | 5    | 50   | ms           |
| T3     | 0     | 5    | 50   | ms           |
| T4     | 0     | 6    | 100  | ms           |
| T5     | 120   | 130  | 200  | ms           |

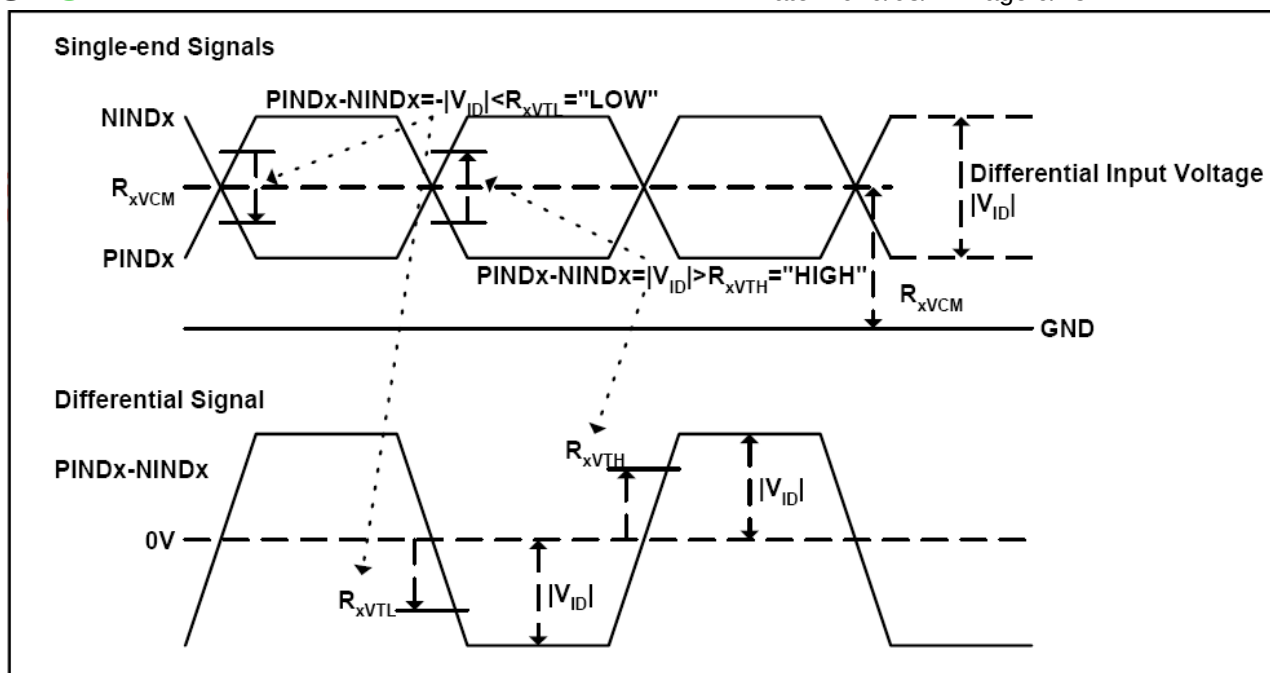
**b. Power off:**


| Symbol | Value |      |      | Unit<br>Min. |
|--------|-------|------|------|--------------|
|        | Min.  | Typ. | Max. |              |
| T6     | 0.5   | 2    | 10   | ms           |
| T7     | 0     | 7    | 50   | ms           |
| T8     | 0     | 5    | 10   | ms           |
| T9     | 0     | 1    | 10   | ms           |
| T10    | 0     | 2    | 100  | ms           |

### 3.5. LVDS Signal Timing Characteristics

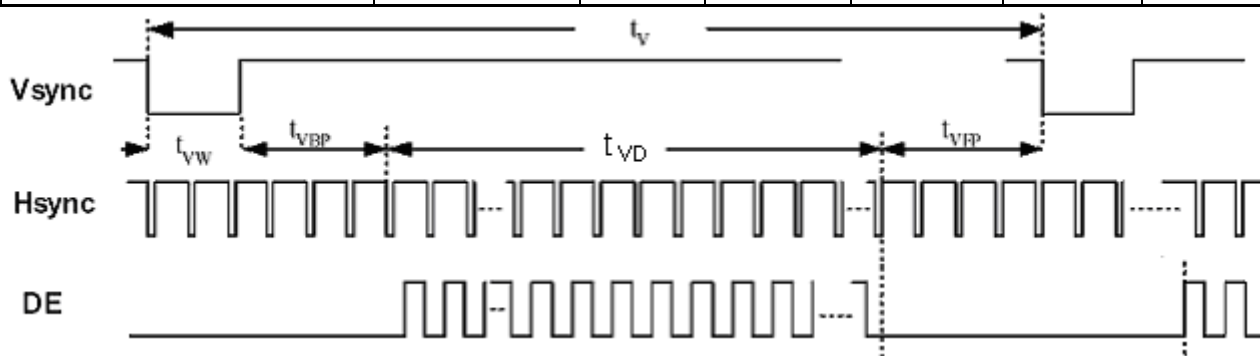
#### 3.5.1. AC Electrical Characteristics

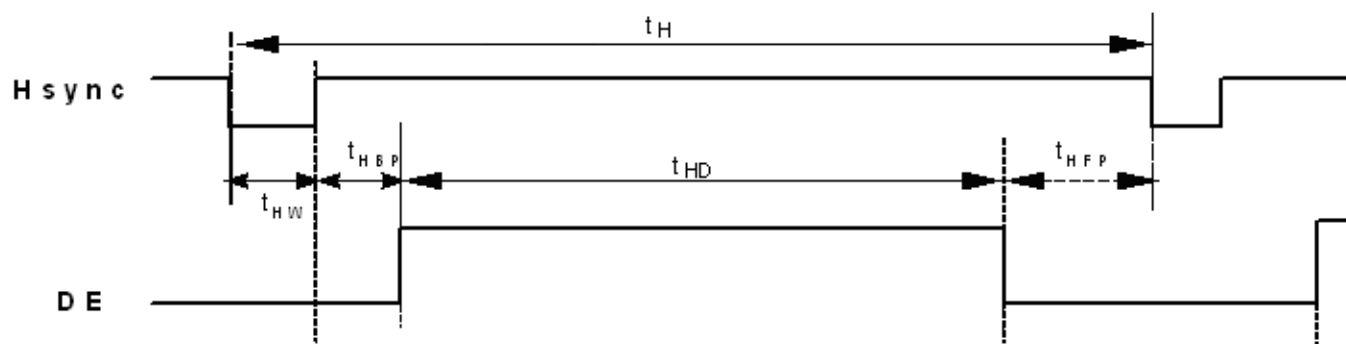
| Parameter                                      | Symbol     | Values |      |      | Unit | Remark          |
|------------------------------------------------|------------|--------|------|------|------|-----------------|
|                                                |            | Min.   | Typ. | Max. |      |                 |
| LVDS Differential input high Threshold voltage | $R_{xVTH}$ | -      | -    | +100 | mV   | $R_{xVCM}=1.2V$ |
| LVDS Differential input low Threshold voltage  | $R_{xVTL}$ | -100   | -    | -    | mV   |                 |
| LVDS Differential input common mode voltage    | $R_{xVCM}$ | 0.7    | -    | 1.6  | V    |                 |
| LVDS Differential voltage                      | $ V_{ID} $ | 200    | -    | 600  | mV   |                 |



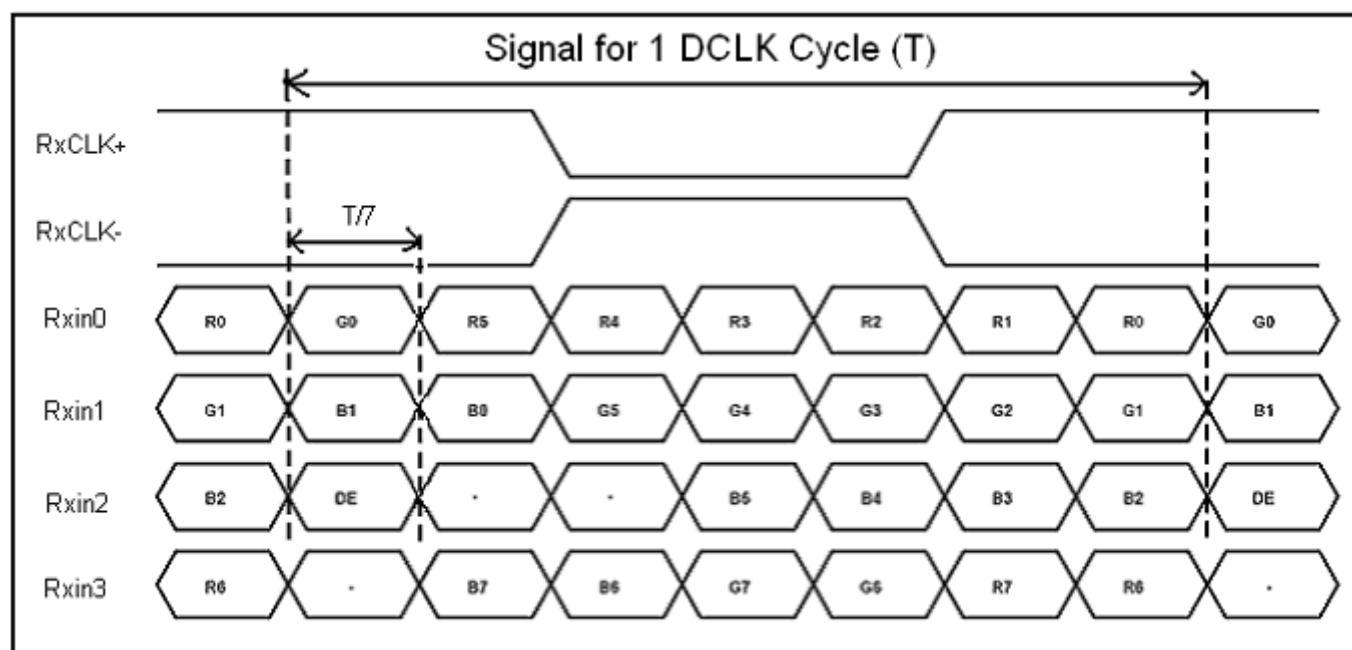
### 3.5.2. Timing Table

| Item                              | Symbol                                               | Values |      |      | Unit           | Remark           |
|-----------------------------------|------------------------------------------------------|--------|------|------|----------------|------------------|
|                                   |                                                      | Min.   | Typ. | Max. |                |                  |
| Clock Frequency                   | 1/Tc                                                 | 68.9   | 71.1 | 73.4 | MHz            | Frame rate =60Hz |
| Horizontal display area           | t <sub>HD</sub>                                      | 1280   |      |      |                |                  |
| HS period time                    | t <sub>H</sub>                                       | 1410   | 1440 | 1470 | Tc             |                  |
| HS Width +Back Porch +Front Porch | t <sub>HW</sub> + t <sub>HBP</sub> +t <sub>HFP</sub> | 60     | 160  | 190  | Tc             |                  |
| Vertical display area             | t <sub>VD</sub>                                      | 800    |      |      |                |                  |
| VS period time                    | t <sub>v</sub>                                       | 815    | 823  | 833  | t <sub>H</sub> |                  |
| VS Width +Back Porch +Front Porch | t <sub>VW</sub> + t <sub>VBP</sub> +t <sub>VFP</sub> | 15     | 23   | 33   | t <sub>H</sub> |                  |





### 3.5.3. LVDS Data Input Format



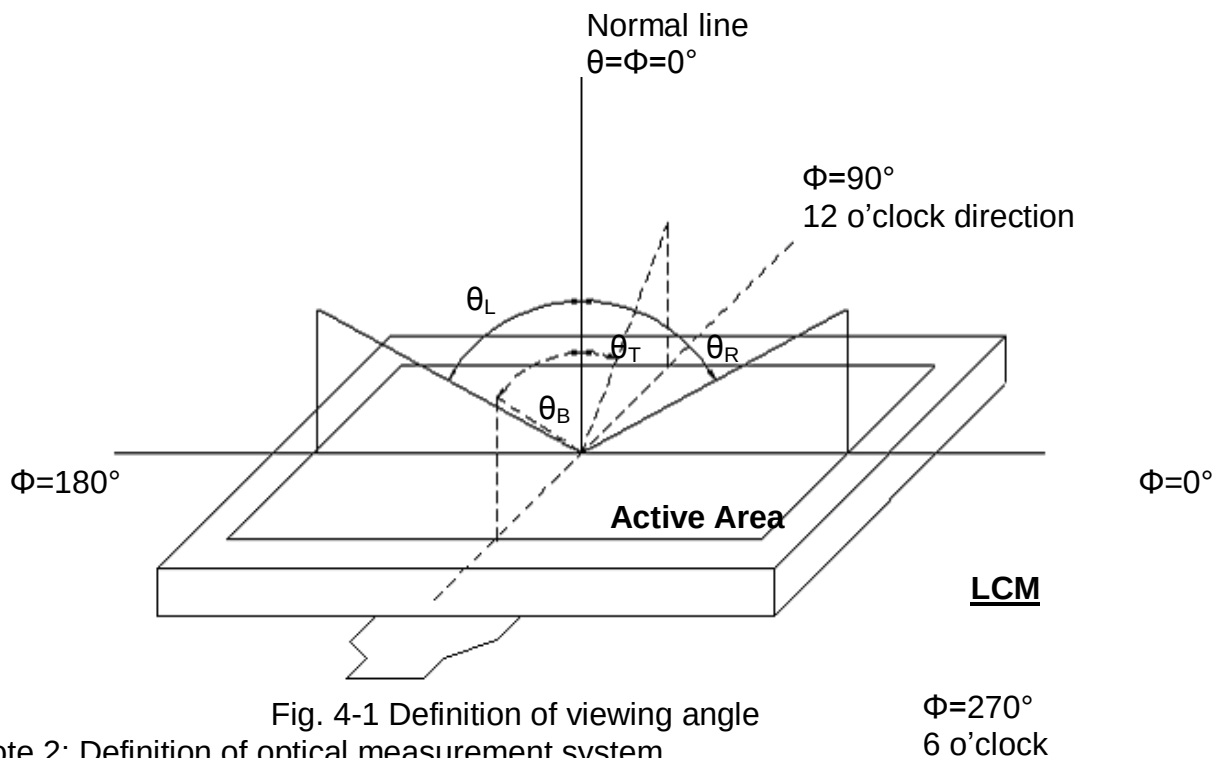
## 4. Optical Specifications

| Item                      | Symbol     | Condition                       | Values |      |      | Unit   | Remark                     |
|---------------------------|------------|---------------------------------|--------|------|------|--------|----------------------------|
|                           |            |                                 | Min.   | Typ. | Max. |        |                            |
| Viewing angle<br>(CR≥ 10) | $\theta_L$ | $\Phi=180^\circ$ (9 o'clock)    | 75     | 85   | -    | degree | Note 1                     |
|                           | $\theta_R$ | $\Phi=0^\circ$ (3 o'clock)      | 75     | 85   | -    |        |                            |
|                           | $\theta_T$ | $\Phi=90^\circ$ (12 o'clock)    | 75     | 85   | -    |        |                            |
|                           | $\theta_B$ | $\Phi=270^\circ$ (6 o'clock)    | 75     | 85   | -    |        |                            |
| 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         |                                 | 600    | 800  | -    | -      | Note 4                     |
| Color chromaticity        | $W_X$      |                                 | 0.27   | 0.31 | 0.35 | -      | Note 2<br>Note 5<br>Note 6 |
|                           | $W_Y$      |                                 | 0.28   | 0.32 | 0.36 | -      |                            |
| Panel transmission        | %          |                                 | 4.8%   | 5.4% |      | -      |                            |

### Test Conditions:

1. VDD=2.5V,, the ambient temperature is 25°C ..
2. The test systems refer to Note 2.
3. The optical specifaitions are measured base on Innolux LCM

Note 1: Definition of viewing angle range



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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view:  $1^\circ$  /Height: 500mm.)

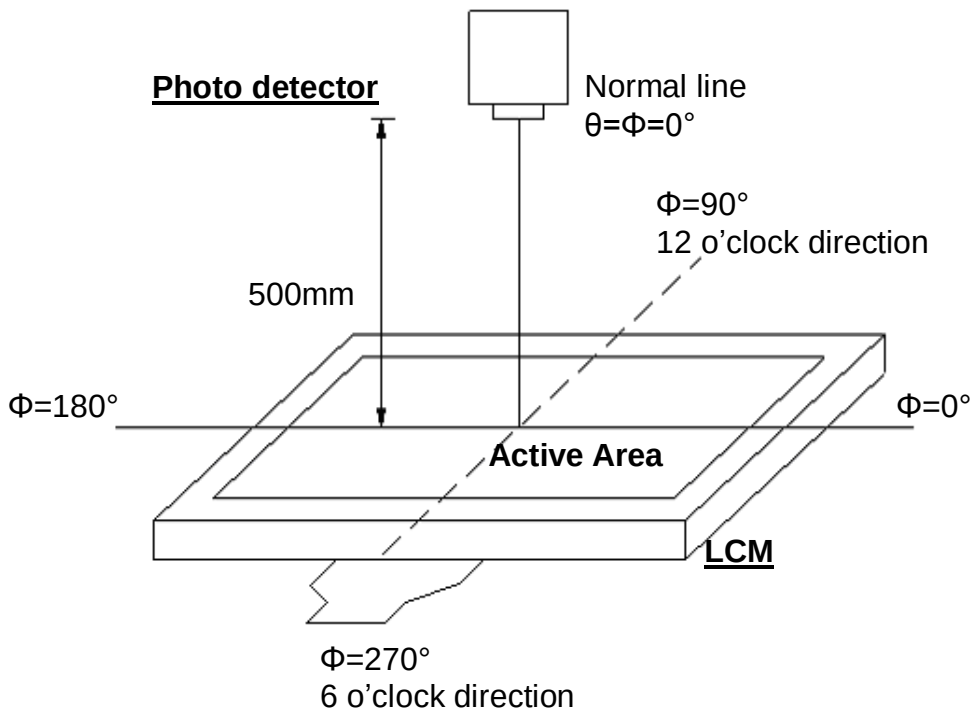


Fig. 4-2 Optical measurement system setup

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%.

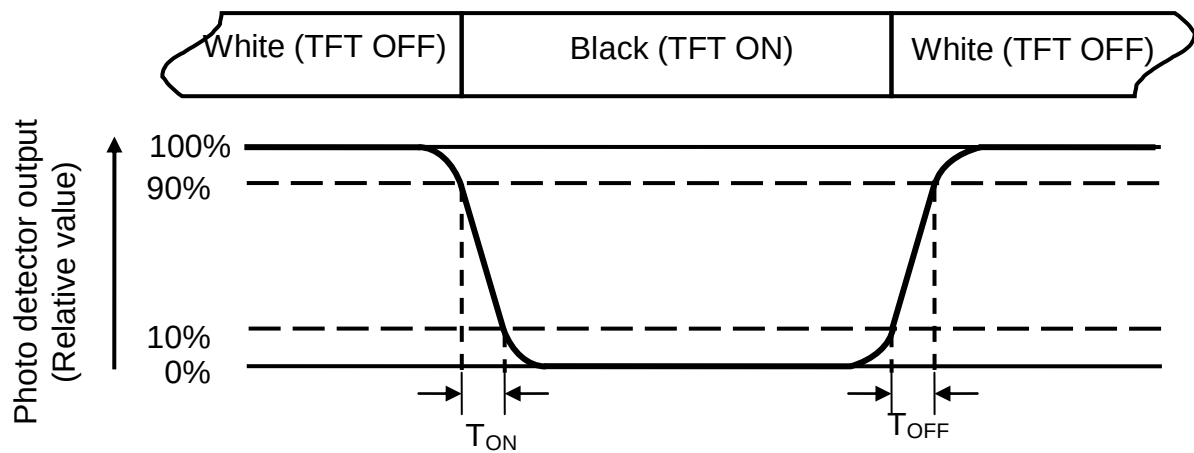


Fig. 4-3 Definition of response time

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.



## 5. Reliability Test Items

| Item                                     | Test Conditions                                                                                             |        | Remark         |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------|----------------|
| High Temperature Storage                 | Ta = 80℃                                                                                                    | 120hrs | Note 1, Note 2 |
| Low Temperature Storage                  | Ta = -30℃                                                                                                   | 120hrs | Note 1, Note 2 |
| High Temperature Operation               | Ts = 70℃                                                                                                    | 120hrs | Note 1, Note 2 |
| Low Temperature Operation                | Ta = -20℃                                                                                                   | 120hrs | Note 1, Note 2 |
| Operate at High Temperature and Humidity | +40℃, 90%RH                                                                                                 | 120hrs | Note 1, Note 2 |
| Thermal Shock                            | -0℃/30 min ~ +50℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature. |        | Note 1, Note 2 |
| Package Vibration Test                   | Random Vibration :<br>ISTA-3A 1Hz~200Hz, Grms=0.53<br>Half hours for direction of Z.                        |        | Note 1         |
| Package Drop Test                        | Height: 60 cm<br>1 corner, 3 edges, 6 surfaces                                                              |        | Note 1         |
| Electro Static Discharge                 | ± 2KV, Human Body Mode, 100pF/1500Ω                                                                         |        | Note 1         |

Note 1: After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 2: Before cosmetic and function test, 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.

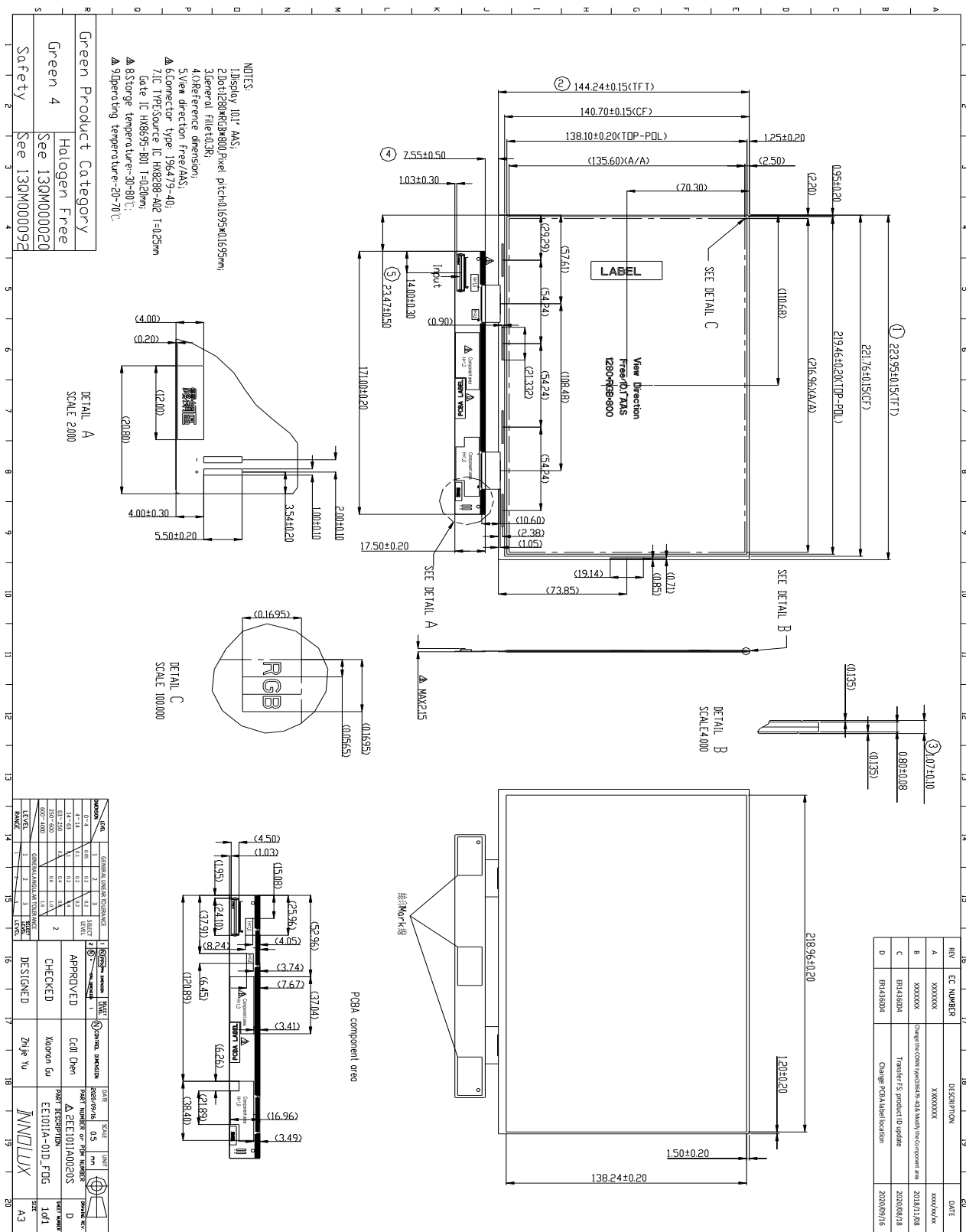
### 6.4.Storage

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 cloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

# 7.Mechanical Drawing



## 8.Package Drawing

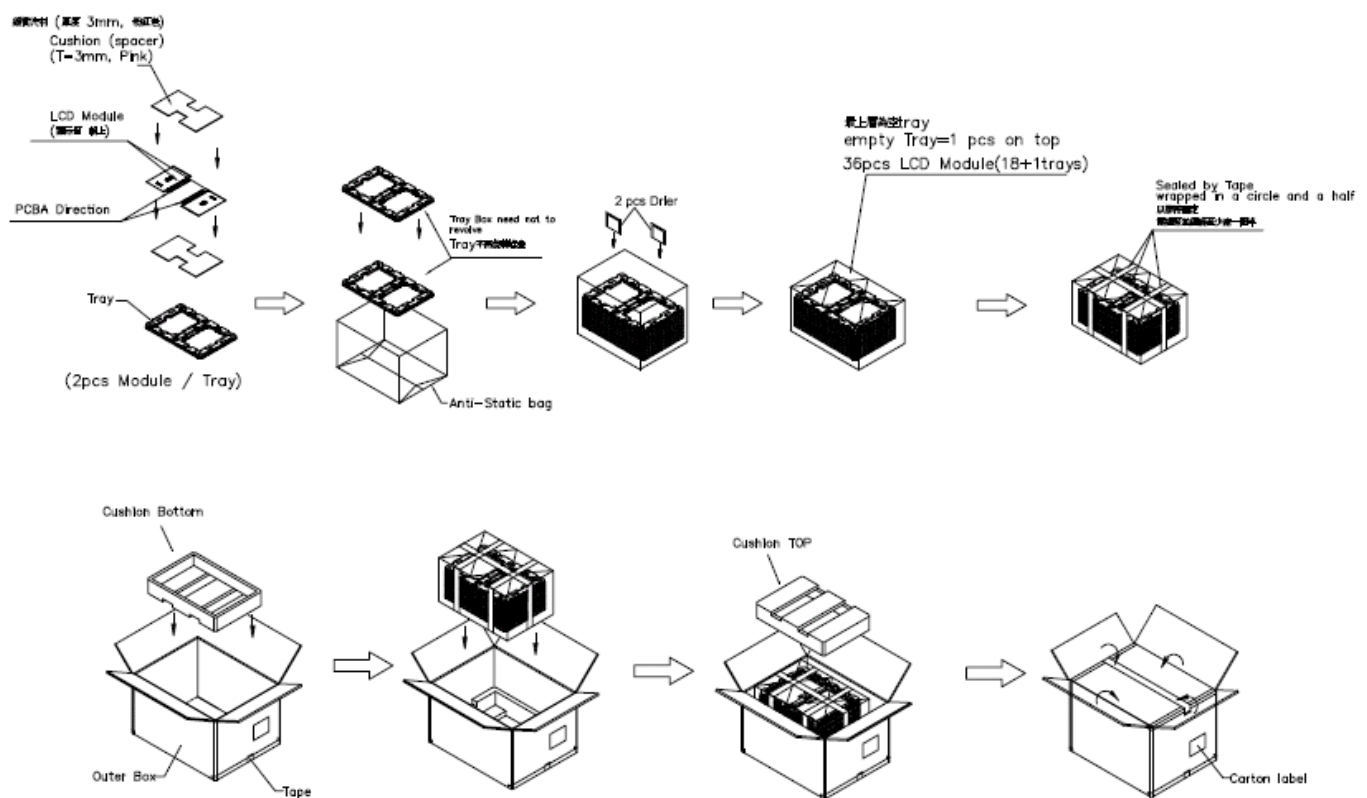
### 8.1. Packaging Material Table

| No. | Item           | Model (Material) | Dimensions(mm)      | Unit Weight (kg) | Quantity | Remark |
|-----|----------------|------------------|---------------------|------------------|----------|--------|
| 1   | Panel Assembly | EE101IA-01D      | 223.95 x168.34x1.07 | 0.08             | 36       |        |
| 2   | EPE spacer     | EPE              | 369 x 221 x 3.2     | 0.006            | 36       |        |
| 3   | Dust-Proof Bag | PE               | 700 x 530           | 0.058            | 1        |        |
| 4   | Tray           | PET              | 472 x 310 x 16      | 0.196            | 19       |        |
| 5   | Cushion        | EPE              | 518x 356 x 90       | 0.140            | 2        |        |
| 6   | Drier          | SILICA GEL       | 100 x 75            | 0.032            | 2        |        |
| 7   | Carton         | Corrugated Paper | 530 x 367 x 260     | 0.95             | 1        |        |
| 8   | Total weight   | 8.17 Kg $\pm$ 5% |                     |                  |          |        |

### 8.2. Packaging Quantity

|                                   |                                  |
|-----------------------------------|----------------------------------|
| (1) FOG quantity per PET-Tray:    | 2pcs                             |
| (2) Total FOG quantity in Carton: | 18 layer x 2pcs/PET-Tray = 36pcs |

### 8.3. Packaging Drawing



- (1) Box Dimensions : 530(L)\*367(W)\*260(H)  
(2) 36 Panel/Carton