# *CHIMEI INNOLUX* DISPLAY CORPORATION

## LCD MODULE

# SPECIFICATION

**Customer:** __Lenovo__

**Model Name:** __HJ070IA-01I__

**Date:** __2013/05/21__

**Version:** __02__

■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 | 2012/11/18 | | Initial Release. |
| Final-Spec.01 | 2013/04/09 | 1 | Update    Panel power consumption to 2.4W (Max.) |
| | 2013/04/15 | 17 | Update    Mechanical Drawing. |
| | 2013/04/17 | 15 | Update ESD specfication |
| | 2013/05/21 | 17 | Update    Mechanical Drawing. |

# CHIMEI INNOLUX

## Contents

# CHIMEI INNOLUX

## 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 $\times$ 3(RGB) $\times$ 600 | |
| 4 | Display mode | Normally Black, Transmissive | |
| 5 | Dot pitch | 0.05(W) $\times$ 0.15(H) mm | |
| 6 | Active area | 153.6(W) $\times$ 90.0(H) mm | |
| 7 | Module size | 164.1 (W) $\times$102.6(H) $\times$2.8 (max) | Note 1 |
| 8 | Surface treatment | Glare | |
| 9 | Color arrangement | RGB-stripe | |
| 10 | Interface | LVDS | |
| 11 | Backlight power consumption | 1.8W | |
| 12 | Panel power consumption | 2.4W (Max.) | |
| 13 | Weight | 93g (Max.) | |

Note 1: Refer to Mechanical Drawing.

# CHIMEI INNOLUX

## 2. Pin Assignment

A 30pin connector is used for the module electronics interface. The recommended model is "FF12-31A-R11B".

| Pin No. | Symbol | I/O | Function | Remark |
|---------|--------|-----|----------|--------|
| 1 | VDDIN | I | | |
| 2 | VDDIN | I | | |
| 3 | VDDIN | I | | |
| 4 | VDDIN | I | Power supply VDDIN=3.7V(Typ) | |
| 5 | VDDIN | I | | |
| 6 | VDDIN | I | | |
| 7 | VDDIN | I | | |
| 8 | NC | - | Non connection | |
| 9 | NC | - | Non connection | |
| 10 | LDO EN | P | LDO enable for driver ic(H=1.8V) | |
| 11 | GND | P | GROUND | |
| 12 | GND | P | GROUND | |
| 13 | RIN0- | I/O | LVDS Negative data signal | |
| 14 | RIN0+ | I/O | LVDS Positive data signal | |
| 15 | GND | P | GROUND | |
| 16 | RIN1- | I/O | LVDS Negative data signal | |
| 17 | RIN1+ | I/O | LVDS Positive data signal | |
| 18 | GND | P | GROUND | |
| 19 | RIN2- | I/O | LVDS Negative data signal | |
| 20 | RIN2+ | I/O | LVDS Positive data signal | |
| 21 | GND | P | GROUND | |
| 22 | LVDS CLK- | I/O | LVDS Negative CLK signal | |
| 23 | LVDS CLK+ | I/O | LVDS Positive CLK signal | |
| 24 | GND | P | GROUND | |
| 25 | RIN3- | I/O | LVDS Negative data signal | |
| 26 | RIN3+ | I/O | LVDS Positive data signal | |

| 27 | GND | P | GROUND | |
|----|-----|---|--------|--|
| 28 | BL-PWM | P | LCM backlight control(H=1.8V) | |
| 29 | GND | P | GROUND | |
| 30 | LCM ID | P | Pull low by resistor in LCM(H=2.8V) | |
| 31 | GND | P | GROUND | |

I: input, O: output, P: Power

# CHIMEI INNOLUX

# 3. Operation Specifications

## 3.1. Absolute Maximum Ratings

(Note 1)

| Item | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power voltage | VDDIN | -0.3 | 5.0 | V | GND=0V, TA=25℃ |
| Operation Temperature | $T_{OP}$ | -20 | 60 | ℃ | |
| Storage Temperature | $T_{ST}$ | -30 | 70 | ℃ | |
| 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.

## 3.2. Typical Operation Conditions

(GND=0V)

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power voltage | VDDIN | 3.3 | 3.7 | 4.2 | V | |
| Current for Driver | $I_{VDDIN}$ | - | | TBD | mA | VDDIN=3.7 V |
| Input logic high voltage | $V_{IH}$ | 0.7 VCC | - | VCC | V | VCC=3.3V |
| Input logic low voltage | $V_{IL}$ | 0 | - | 0.3 VCC | V | |

### 3.3. Backlight Driving Conditions

| Item | Symbol | Values | | | Unit | Remark |
| --- | --- | --- | --- | --- | --- | --- |
| | | Min. | Typ. | Max. | | |
| Voltage for LED backlight | $V_L$ | 11.6 | (12) | 14.0 | V | Note 1 |
| Current for LED backlight | $I_L$ | / | (100) | / | mA | |
| LED life time | - | - | 20,000 | - | Hr | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and $I_L$ =100mA.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and $I_L$ =100mA. The LED lifetime could be decreased if operating $I_L$ is lager than 100mA.
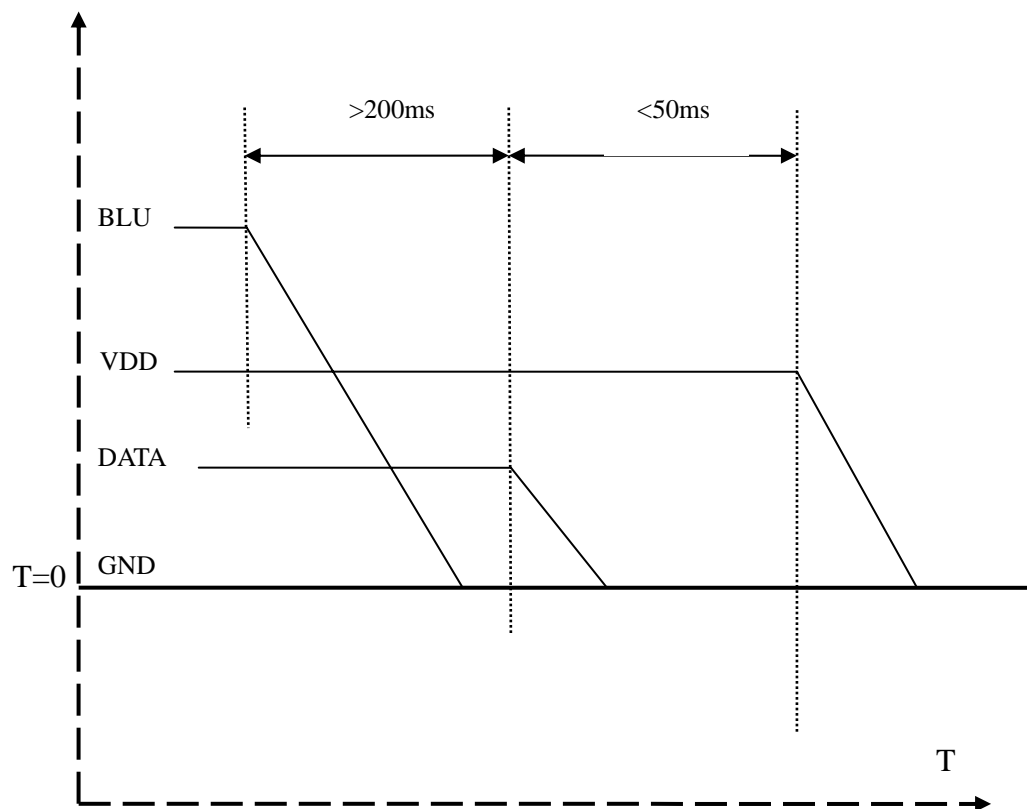
The schematic circuit of Backlight is as follow:

# CHIMEI INNOLUX
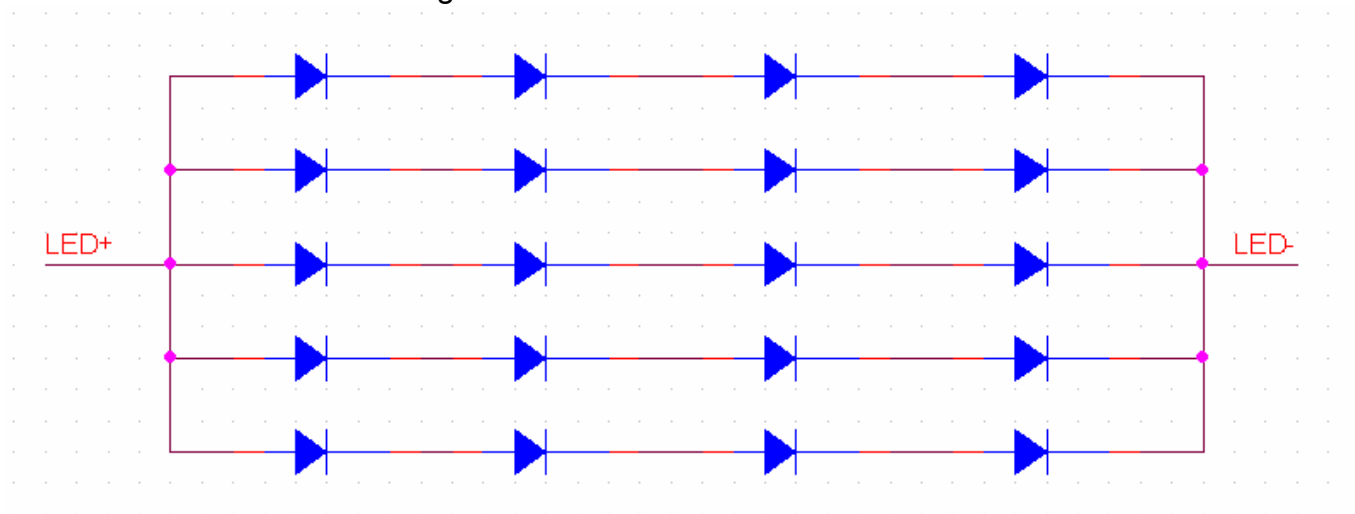
## 3.4. Power Sequence

**a. Power on:**
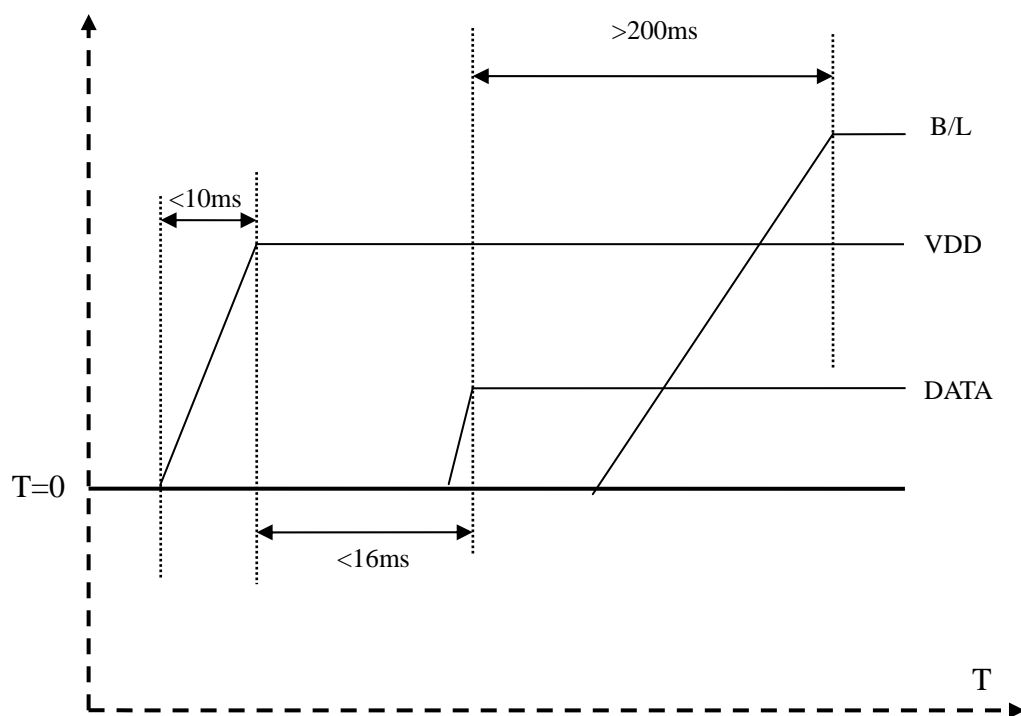


VDD→ DATA→B/L

**b. Power off:**



B/L→ DATA →VDD

## 3.5.    LVDS Signal Timing Characteristics

### 3.5.1.    AC Electrical Characteristics

| Parameter | Symbol | Values | | | Unit | Remark |
|-----------|--------|--------|--|--|------|--------|
| | | Min. | Typ. | Max. | | |
| Clock frequency | $R_{xFCLK}$ | 20 | - | 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 | |



$T_{RSKM}$: Receiver strobe margin
$R_{SPOS}$: Receiver strobe position
$T_{SW}$ : Strobe width (Internal data sampling window)
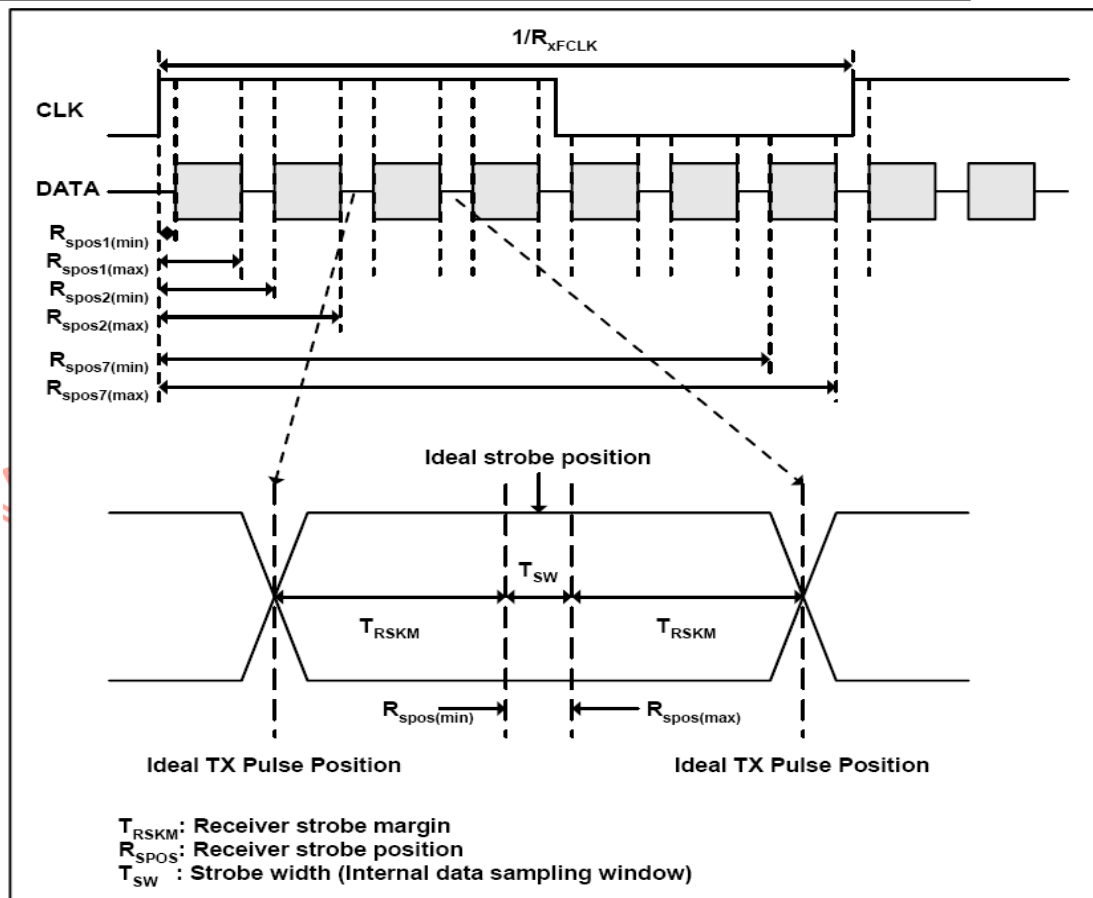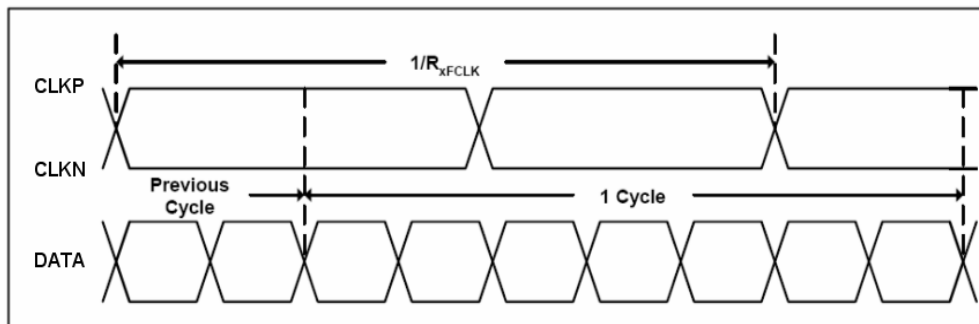
### 3.5.2. DC Electrical Characteristics

| 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 | $RV_{xliz}$ | -10 | - | +10 | uA | |
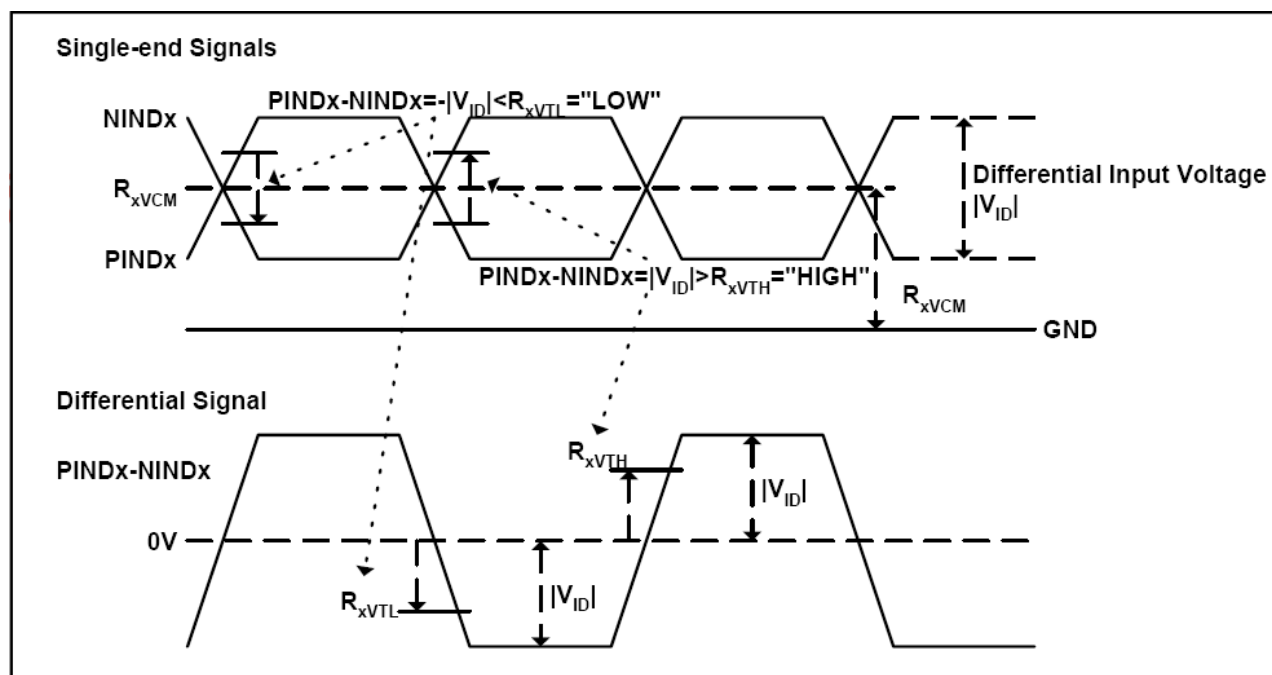
### 3.5.3. Timing Table

| Item | Symbol | Values | | | Unit | Remark |
|------|--------|--------|--------|--------|------|--------|
|      |        | Min. | Typ. | Max. |      |        |
| Clock Frequency | fclk | 44.9 | 51.2 | 63 | MHz | |
| Horizontal display area | thd | 1024 | | | DCLK | |
| HS period time | th | 1200 | 1344 | 1400 | DCLK | |
| HS Pulse Width | thw | 1 | - | 140 | DCLK | |
| HS Width +Back Porch | Thw+ thbp | 160 | 160 | 160 | DCLK | |
| HS front porch | thfp | 16 | 160 | 216 | DCLK | |
| Vertical display area | tvd | 600 | | | H | |
| VS period time | tv | 624 | 635 | 750 | H | |
| VS Pulse Width | tvw | 1 | - | 20 | H | |
| VS Width +Back Porch | Tvw+ tvbp | 23 | 23 | 23 | H | |
| VS front porch | tvfp | 1 | 12 | 127 | H | |
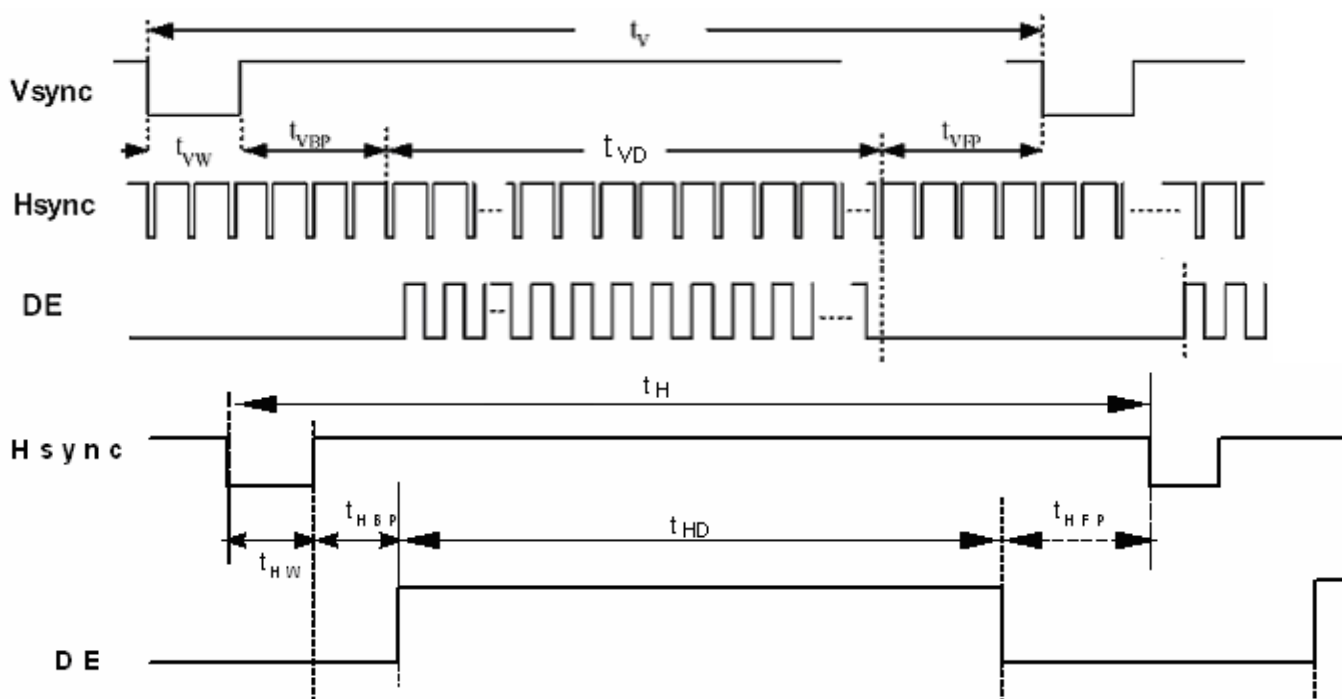
### 3.5.4.    Data Input Format

**8bit LVDS input**
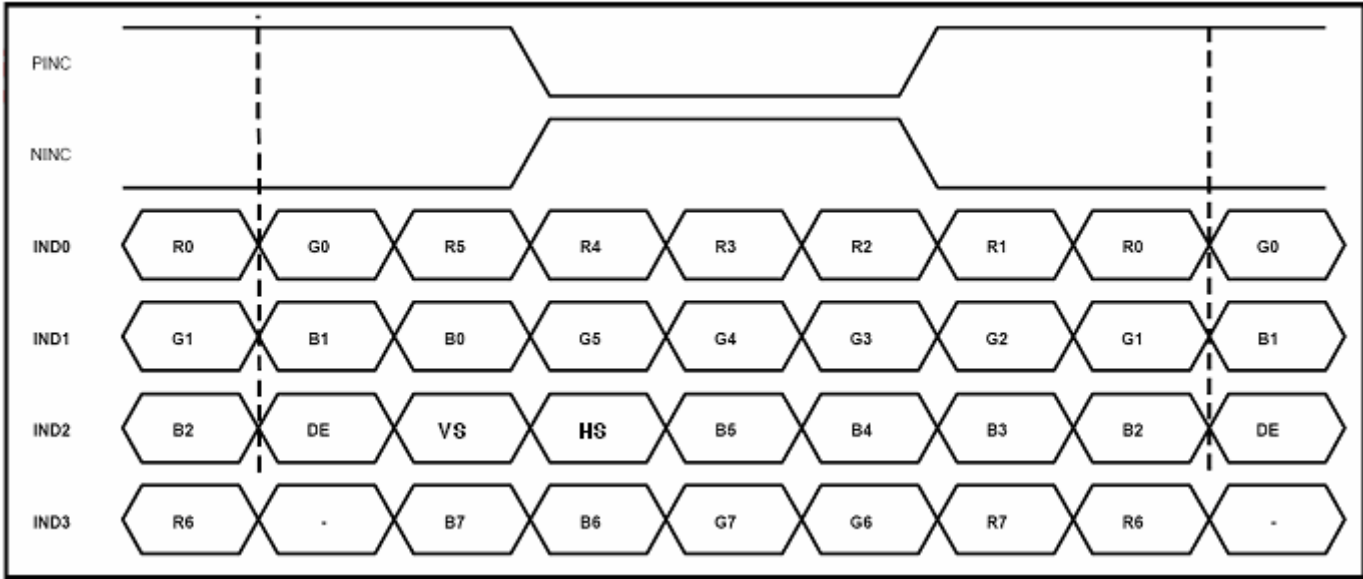
# 4. Optical Specifications

| Item | Symbol | Condition | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Viewing angle (CR≥ 10) | $\theta_L$ | Φ=180°(9 o'clock) | 75 | 85 | - | degree | Note 1 |
| | $\theta_R$ | Φ=0°(3 o'clock) | 75 | 85 | - | | |
| | $\theta_T$ | Φ=90°(12 o'clock) | 75 | 85 | - | | |
| | $\theta_B$ | Φ=270°(6 o'clock) | 75 | 85 | - | | |
| Response time | $T_{ON}$ | | - | 30 | - | msec | Note 3 |
| | $T_{OFF}$ | | | | | msec | Note 3 |
| Contrast ratio | CR | | - | 700 | - | - | Note 4 |
| Color chromaticity | $W_X$ | Normal θ=Φ=0° | 0.28 | 0.31 | 0.34 | - | Note 2 Note 5 Note 6 |
| | $W_Y$ | | 0.30 | 0.33 | 0.36 | - | |
| | $R_X$ | | 0.59 | 0.62 | 0.65 | | |
| | $R_Y$ | | 0.31 | 0.34 | 0.37 | | |
| | $G_X$ | | 0.28 | 0.31 | 0.34 | | |
| | $G_Y$ | | 0.5 | 0.53 | 0.56 | | |
| | $B_X$ | | 0.11 | 0.14 | 0.17 | | |
| | $B_Y$ | | 0.1 | 0.13 | 0.16 | | |
| Luminance | L | | 300 | 350 | - | cd/m² | Note 6 |
| Luminance uniformity | $Y_U$ | | 70 | 80 | - | % | Note 7 |
| NTSC | | | | 50 | | % | |

Test Conditions:
1. $DV_{DD}$=3.1V, $I_L$=100mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

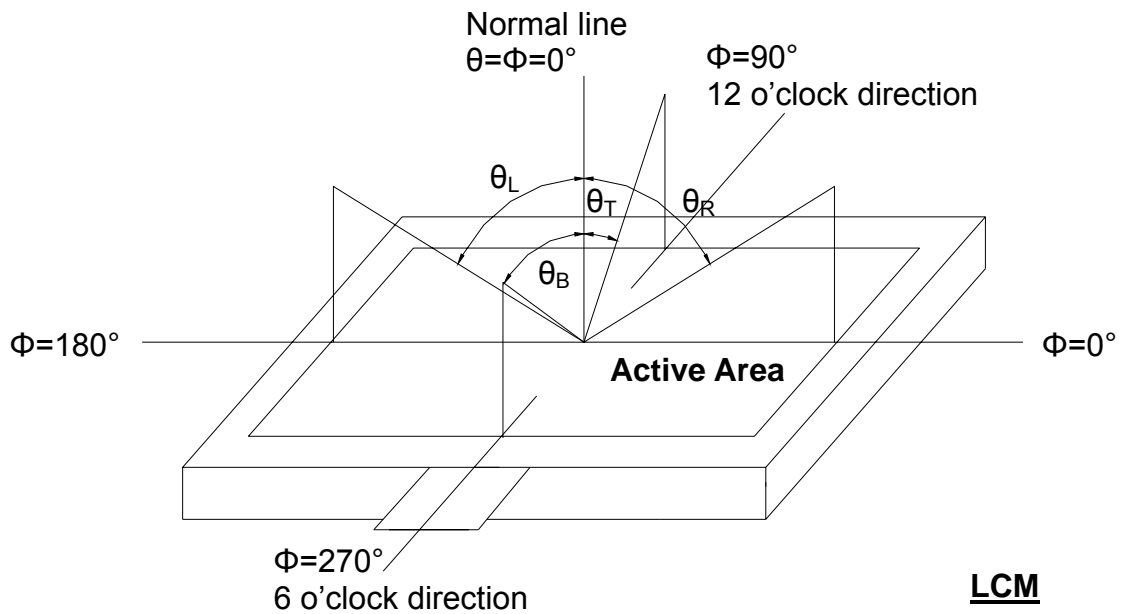Note 1: Definition of viewing angle range



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.)
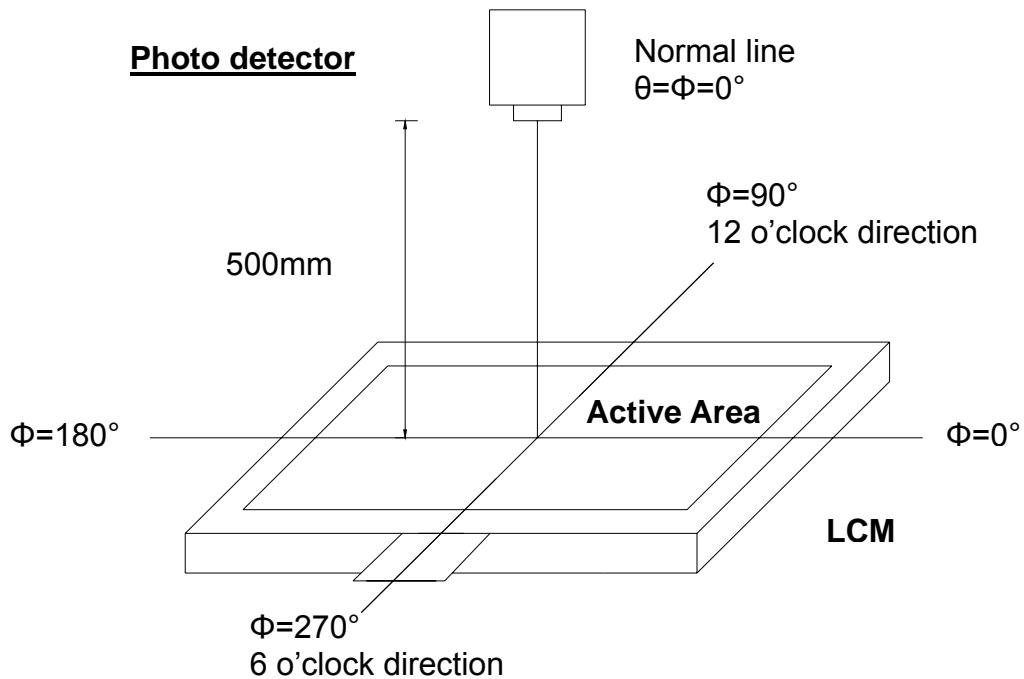


Fig. 4-2 Optical measurement system setup

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%.
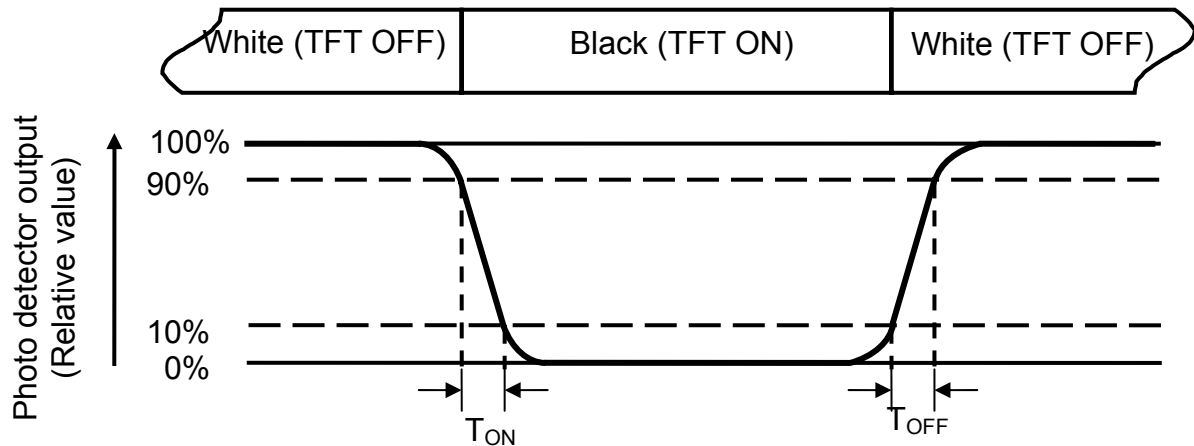
| White (TFT OFF) | Black (TFT ON) | White (TFT OFF) |



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: Definition of luminance:

Measured at the Brightness(Average 5 points = 1,2,3,4,5) of the panel when LCD panel is driven at "white" state. The LED driving condition is $I_L$=80mA .



H,V : ACTIVE AREA
A : H/4 mm
B : V/4 mm
POINTS: 13 POINTS
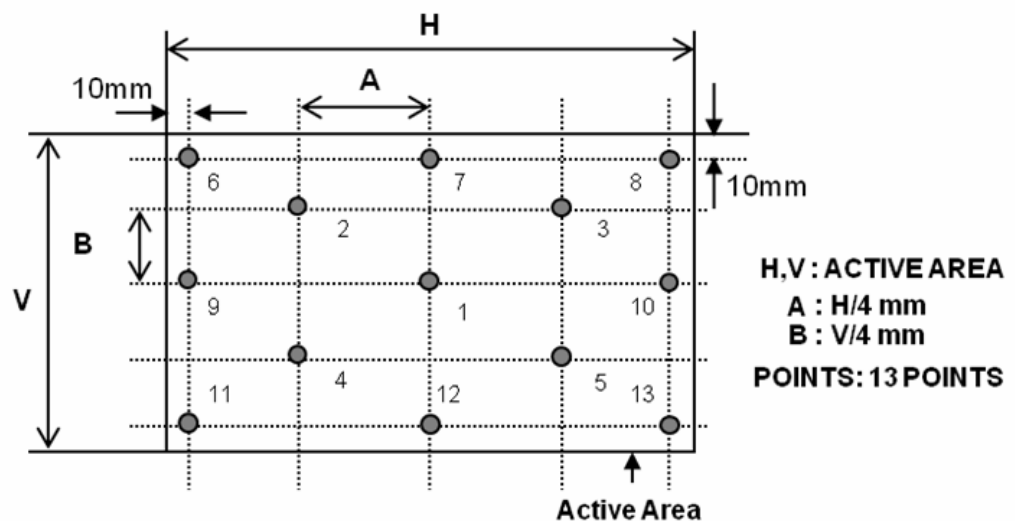
Note 7: Definition of Luminance Uniformity

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.

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

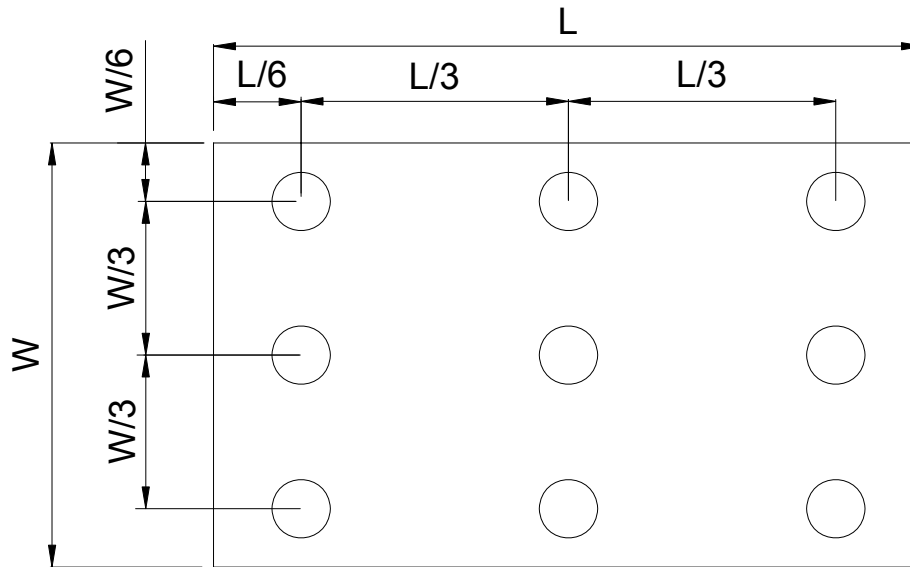L-------Active area length        W----- Active area width



Fig. 4-4 Definition of measuring points

$B_{max}$: The measured maximum luminance of all measurement position.
$B_{min}$: The measured minimum luminance of all measurement position.

# CHIMEI INNOLUX

# 5. Reliability Test Items

(Note3)

| Item | Test Conditions | Remark |
|---|---|---|
| High Temperature Storage | Ta = 70℃    240hrs | Note 1，Note 4 |
| Low Temperature Storage | Ta = -30℃    240hrs | Note 1，Note 4 |
| High Temperature Operation | Ts = 60℃      40hrs | Note 2，Note 4 |
| Low Temperature Operation | Ta = -20℃    240hrs | Note 1，Note 4 |
| Operate at High Temperature and Humidity | +40℃, 90%RH 240hrs | Note 4 |
| Thermal Shock | -20℃/30 min ~ +60℃/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>ISTA-3A 1Hz~200Hz,Grms=0.53<br>Half hours for direction of Z. | |
| Package Drop Test | Height:60 cm<br>1 corner, 3 edges, 6 surfaces | |
| Electro Static Discharge | C=150pF,R=330Ω,8point/Panel<br>Test with Lenovo system<br>Contact:± 8KV, 5times, Human Body Mode，level:C<br>Air     : ± 15KV, 5times, Human Body Mode，level:C<br>(Environment :15℃~35℃, 30%~60%) | |

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 don't guarantee all of the cosmetic specification.
Note 4: 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.
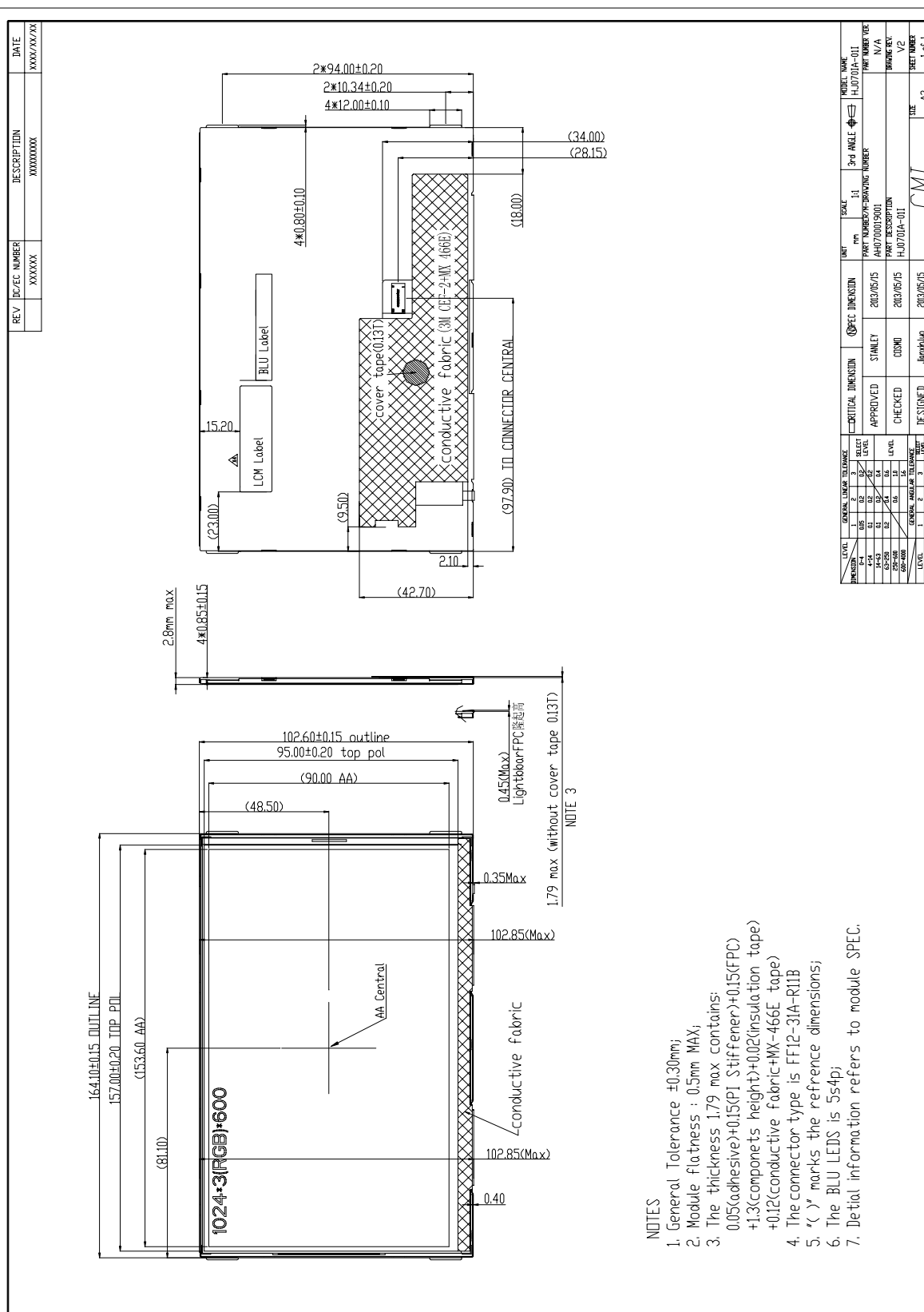2. Do not apply voltage which exceeds the absolute maximum rating value.

## 6.4.  Storage

1. Store the module in a dark room where must keep at 25±10℃ 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.

# CHIMEI INNOLUX

# 7. Mechanical Drawing



NOTES
1. General Tolerance ±0.30mm;
2. Module flatness : 0.5mm MAX;
3. The thickness 1.79 max contains:
   0.05(adhesive)+0.15(PI Stiffener)+0.15(FPC)
   +1.3(componets height)+0.02(insulation tape)
   +0.12(conductive fabric+MX-466E tape)
4. The connector type is FF12-31A-R11B
5. "( )" marks the refrence dimensions;
6. The BLU LEDS is 5s4pj
7. Detial information refers to module SPEC.

# CHIMEI INNOLUX

# 8. Package Drawing

## 8.1. Package Material Table

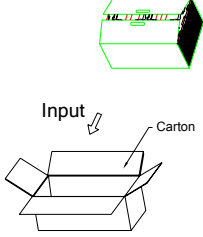| No. | Item | Model (Material) | Dimensions(mm) | Unit Weight (kg) | Quantity | Remark |
|---|---|---|---|---|---|---|
| 1 | LCM Module | HJ070IA-01I | 164.1 X102.6X 2.8 | 6.8 | 80pcs | |
| 2 | Partition | BC Corrugated paper | 512 X 349 X 226 | 1.25 | 1set | |
| 3 | PET Tray | PET | 511 X 342X16 | 4.41 | 21pcs | |
| 4 | Dust-Proof Bag | PE | 700 X 530 | 0.060 | 1pcs | |
| 5 | Carton | Corrugated paper | 530 X 355 X 255 | 1.100 | 1pcs | |
| 6 | Total weight | 13.62 Kg±5% | | | | |
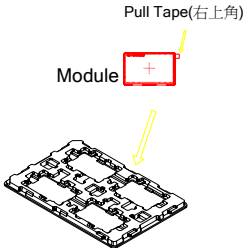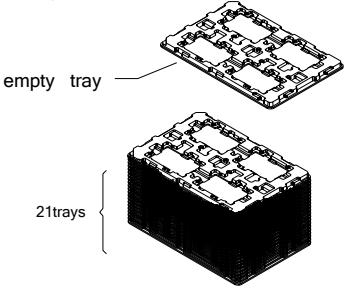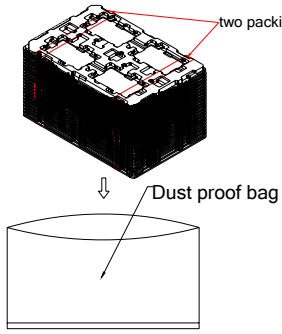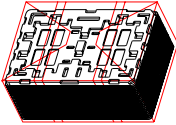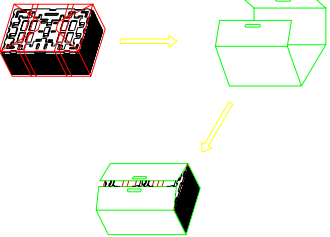
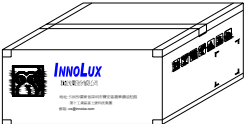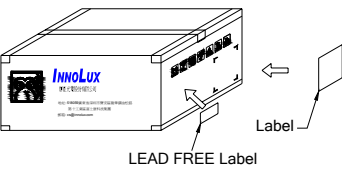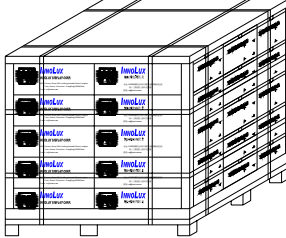## 8.2. Package Quantity

Total LCM quantity in Carton:   4pcs/Tray X   20 Trays/Carton   = 80pcs

# CHIMEI INNOLUX
## 8.3. Package Drawing

| | | |
|---|---|---|
| **Step A.**<br><br>Pull Tape(右上角)<br><br>Module<br><br>NOTES:<br>Put products into the trays.<br>The top surface of product face to us.<br>There are 4 pcs modules in one tray. | **Step B.**<br><br>empty tray<br><br>21trays<br><br>Notes:<br>There are total 80modules in 21 trays.<br>Every second tray turn 180 degrees to stack up.<br>The top tray is empty. | **Step C.**<br><br>two packing tapes<br><br>Dust proof bag<br><br>1.Wind around two packing-tape as above picture<br>2.Put trays into Dust-Proof Bag. |
| **Step D.**<br><br>1.Seal the Dust-Proof Bag.<br>2.Wind around two packing-tape as above picture | **Step E.**<br><br>Partition<br><br>Put it into the Partition | **Step F.**<br><br>Input<br><br>Carton<br><br>Put it into the Carton. |
| **Step G.**<br><br>INNOLUX<br><br>Seal the Carton. | **Step H.**<br><br>INNOLUX<br><br>LEAD FREE Label<br><br>Label<br><br>Paste the label on Caton | **Step I.**<br><br>INNOLUX<br><br>Put the 30 loaded packages on a pallet.<br>There are 6 packages on a storey, 5 stores on a pallet. |