# B3 EV080X0M-A40 Product Specification Rev.P0

| | |
|---|---|
| BUYER | |
| SUPPLIER | HEFEI BOE Optoelectronics Technology CO., LTD |
| FG-Code | EV080X0M-A40-3130 |

| ITEM | BUYER SIGNATURE | DATE |
|---|---|---|
| | | |
| | | |
| | | |

| ITEM | SUPPLIER SIGNATURE | DATE |
|---|---|---|
| Prepared | 张晓磊 | |
| Reviewed | 王盛 王贺陶 | |
| Approved | 李乘揆 布占场 | |

# REVISION HISTORY

(√ )preliminary specification

( )Final specification

| REV. | ECN No. | DESCRIPTION OF CHANGES | DATE | PREPARED |
|---|---|---|---|---|
| P0 | | Initial Release | 2021-06-15 | 张晓磊 |
| | | | | |
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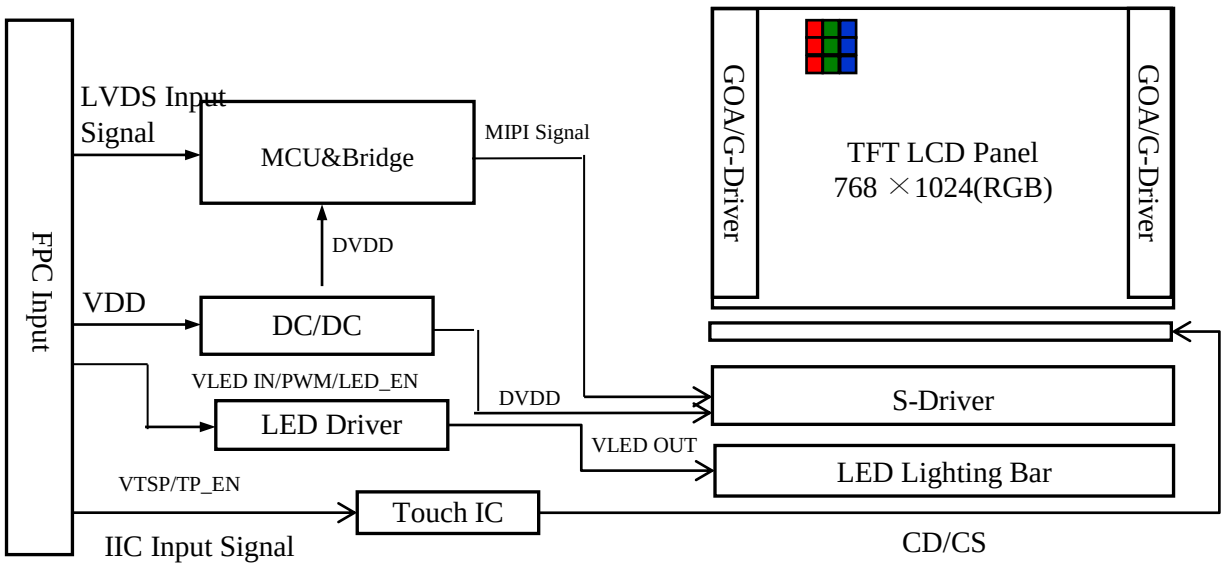
| | | | | |

# Contents

# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

EV080X0M-A40 is a color active matrix TFT LCD module using amorphous silicon TFT ‘s (Thin Film Transistors) as an active switching devices. This module has a 8 inch diagonally measured active area with XGA resolutions (768 horizontal by 1024 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD module Touch Structure is GG.




## 1.2 Features

- 0.4T Glass (Single)
- Reverse Type
- 8bits LVDS data input
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS compliant

### 1.3 Application

- Defibrillator (除颤仪)

### 1.4 General Specification

The followings are general specifications at the EV080X0M-A40

**<Table 1-1. LCD Module Specifications>**

| Parameter | Specification | Unit | Remarks |
|---|---|---|---|
| Active Area | 121.8816*162.5088 | mm | |
| Number Of Pixels | 768*1024 | pixels | |
| Pixel Pitch | 0.1587*0.1587 | mm | |
| Pixel Arrangement | 2domain，Z-Inversion | | |
| Display Mode | HADS | | |
| Display Colors | 16.7M | colors | |
| Surface Treatment | AG+AF | | |
| Contrast Ratio | Typ. 1500 Min.1000 | | |
| Viewing Angle(CR>10) | 85/85/85/85 Typ. | deg. | |
| Response Time | 35ms Max. | ms | |
| Color Gamut | Min.67% Typ.70.8% | | |
| Brightness | Typ. 300nit Min. 250nit | cd/m2 | |
| Brightness Uniformity | 80% Typ. 75% Min. | | |
| Power Consumption | TBD | watt | |
| Outline Dimension | 130.882×175.304(LCM),<br>158.2×192(TLCM) | mm | Pre Spec |
| Weight | 140±5(LCM),350±10g(TLCM) | gram | Pre Spec |
| Display Orientation | Portrait Only | | |

### 1.5 Touch General Specification

The followings are touch general specifications at the model EV080X0M-A40. (listed in Table 1-2)

**<Table 1-2. General Specifications>**

| Parameter | Specification | Unit | Remarks |
|---|---|---|---|
| Type of Touch Sensor | OGS | | |
| Touch Structure | GG | | |
| Panel Size | 8 | | |
| TP Active Area | 163.51*122.88 | mm | |
| Surface treatment | AG+AF | | |
| Surface Hardness | 7 | H | |
| Interface | IIC | | |
| Report Rate | ≥85HZ | | |
| Multi-Touch Point | Above 2 points | | |
| Input method | 医用橡胶手套0.7mm(约6层手套)，棉手套(2mm) | | |
| Touch panel sensor IC | Atmel MXT1066TD | | |
| Channel | 35TX*26RX | | |
| Support OS | Linux | | |
| TP Power Consumption | - | | |

## 2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

**< Table 2. Absolute Maximum Ratings>**

| Parameter | | Symbol | Min. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Power Supply | LCD Module | VDD | 0 | 3.6 | V | Ta = 25 ℃ |
| | BLU | $V_{LED}$ | - | 18 | V | |
| Operating Temperature | | $T_{OP}$ | -10 | +60 | ℃ | Note 1 |
| Storage Temperature | | $T_{ST}$ | -30 | +70 | ℃ | |

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.

# 3.0 ELECTRICAL SPECIFICATIONS

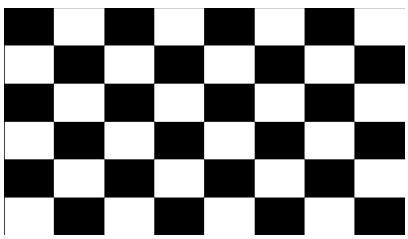
## 3.1.1 TFT LCD Module

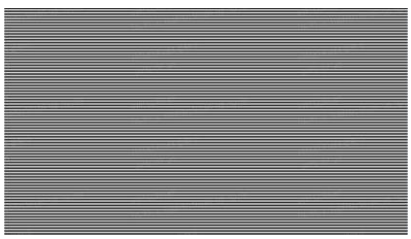
[Ta =25±2 ℃]

**< Table 3-1. LCD Module Electrical specifications >**

| Parameter | Symbol | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power Supply Voltage | VDD | 3.0 | 3.3 | 3.3 | V | Note 1 |
| Power Supply Current | IDD | - | TBD | TBD | mA | |
| BLU Supply Voltage | $V_{LED}$ | - | 12 | 13.2 | V | |
| BLU Supply Current | $I_{LED}$ | - | TBD | - | mA | |
| Power Consumption | $P_D$ | TBD | TBD | TBD | W | Note 1 |
| | $P_{LED}$ | - | - | TBD | W | |
| | $P_{total}$ | - | - | TBD | W | |
| Rush current | IRUSH | - | - | TBD | A | Note 2 |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=3.3V, Frame rate $f_V$=60Hz and Clock frequency = 52MHz. Test Pattern of power supply current
a) Typ : Mosaic 8 x 6 Pattern(L0/L255) b) Max : H 1 Line





2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

### 3.1.2 Electrical Specifications for Touch Part

< Table 3-2. Electrical specifications >

| Parameter | | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| Power Supply Voltage | | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | Note 1 |
| Permissible Input Ripple Voltage | | $V_{RF}$ | - | - | 100 | mV | At $V_{DD}$ = 3.3V |
| Power Supply Current | | $I_{DD}$ | - | - | 61 | mA | |
| Power Consumption | Active Mode | $P_T$ | - | - | 0.2 | W | Note1 |
| | Idle Mode | | - | - | 0.1 | W | Note2 |
| TP_EN | High Level | | 0.8* VDDIO | - | - | V | @VDDIO |
| | Low Level | | - | - | 0.15* VDDIO | V | |

Notes :
1. The supply voltage is measured and specified at the interface connector of TLCM
   The current draw and power consumption specified is for 3.3V at 25℃ when touch function is active;
2. The supply voltage is measured and specified at the interface connector of TLCM
   The current draw and power consumption specified is for 3.3V at 25℃ when touch function is Idle;

### 3.2 Back-Light Unit

**Table 4. LED Bar Electrical Specifications >** [Ta =25±2 ℃]

| Parameter | | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| LED Forward Voltage | | $V_F$ | - | - | 3.0 | V | |
| LED Forward Current | | $I_F$ | - | 20 | - | mA | - |
| LED Power Input Voltage | | $V_{LED}$ | - | - | 24 | V | |
| LED Power Input Current | | $I_{LED}$ | - | 150 | - | mA | |
| LED Power Supply for LED driver Inrush | | $I_{RUSH}$ | - | - | TBD | A | |
| EN Control Level | Backlight on | | 1.9 | - | - | V | |
| | Backlight off | | - | - | 0.8 | V | |
| PWM Control Level | PWM High Level | | 1.9 | - | - | V | |
| | PWM Low Level | | - | - | 0.8 | V | |
| PWM Control Frequency | | $F_{PWM}$ | 100 | - | 30K | Hz | |
| Duty Ratio | | - | 1 | - | 100 | % | Note1 |
| LED Quantity | | QLED | - | 24 | - | EA | |
| LED Life Time | | TLED | 15000 | - | - | Hrs | Note 2/3 |

Notes: 1. Power supply voltage 12V for LED driver.

Calculator value for reference $V_F$*$I_F$* 24/driver efficiency=PLED

2. The life time of LED, 15000Hrs, is determined as the time at which luminance of the LED is 50% compared to that of initial value at the typical LED current on condition of continuous operating at 25 ± 2°C.

3. Only under the above operating conditions could the life time of LED be guaranteed.

### 3.3 INPUT TERMINAL PIN ASSIGNMENT

### 3.3.1 Pin assignment for LCD module

FPC single Interface：40PIN。（Molex5051104091）

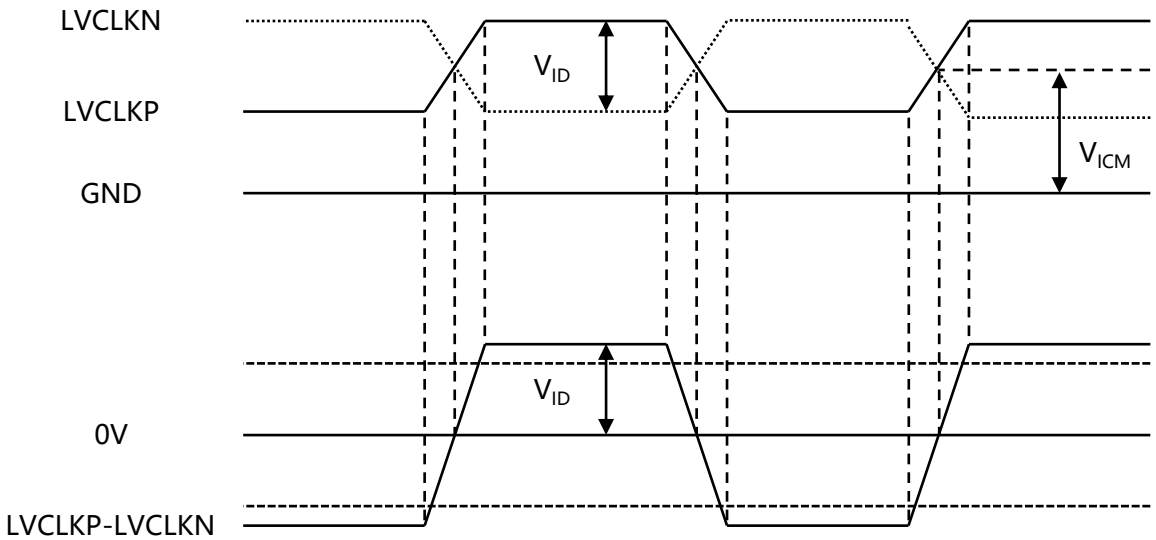
**< Table5-1. Pin Assignment for LCD Module Connector >**

| Pin No | Symbol | Description | Pin No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | NC | 与40pin短接 | 21 | GND | Ground |
| 2 | VDD | VDD（3.3V±0.3V） | 22 | NC | I2C for BOE use only |
| 3 | VDD | VDD（3.3V±0.3V） | 23 | NC | I2C for BOE use only |
| 4 | NC | BOE use only | 24 | PWM | PWM single for backlight dimming |
| 5 | NC | BOE use only | 25 | EN | ON/OFF Control single for backlight |
| 6 | GND | Ground | 26 | GND | Ground |
| 7 | RXIN0- | -LVDS differential data input | 27 | VPP | Power for backlight |
| 8 | RXIN0+ | +LVDS differential data input | 28 | VPP | |
| 9 | GND | Ground | 29 | GND | Ground |
| 10 | RXIN1- | -LVDS differential data input | 30 | NC | BOE use only |
| 11 | RXIN1+ | +LVDS differential data input | 31 | VDD | Power for touch |
| 12 | GND | Ground | 32 | NC | BOE use only |
| 13 | RXIN2- | -LVDS differential data input | 33 | SCL | SCL for touch |
| 14 | RXIN2+ | +LVDS differential data input | 34 | SDA | SDA for touch |
| 15 | GND | Ground | 35 | GND | Ground |
| 16 | RXCLK- | -LVDS differential clock input | 36 | CHG | State change interrupt for touch |
| 17 | RXCLK+ | +LVDS differential clock input | 37 | RESET | Reset for touch |
| 18 | GND | Ground | 38 | NC | 客户端ID识别预留 |
| 19 | RXIN3- | -LVDS differential data input | 39 | NC | 客户端ID识别预留 |
| 20 | RXIN3+ | +LVDS differential data input | 40 | NC | 与1pin短接 |

### 3.4 DC Specification

**< Table7. DC Specification >**

| **LVDS DC specifications** | | | | | | |
|---|---|---|---|---|---|---|
| Differential input high threshold | $V_{TH}$ | - | - | +100 | mV | $V_{ICM}$=1.2V |
| Differential input low threshold | $V_{TL}$ | -100 | - | - | mV | |
| LVDS common mode voltage | $V_{ICM}$ | | 1.2 | | V | |
| LVDS swing voltage | $V_{ID}$ | ±100 | ±350 | ±600 | mV | |

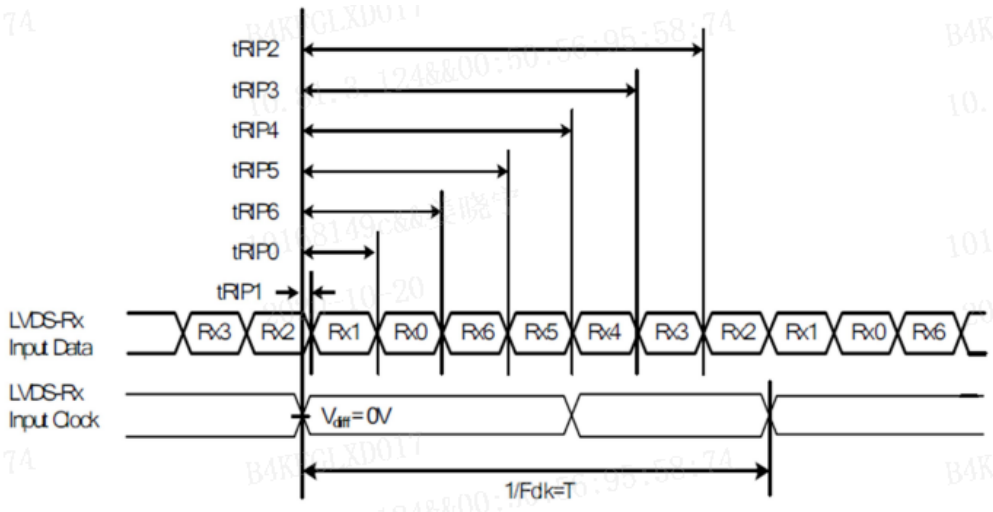



< LVDS $V_{ID}$ and $V_{ICM}$ definition>

## 3.5 AC Specification

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **fCLKIN** | Input clock frequency | 40 | | 100 | MHz |
| **tRCP** | CLKORP1 Period | 10 | | 25 | ns |
| **tRCH** | CLKORP1 High time | 0.45T | 0.5T | 0.55T | TCK |
| **tRCL** | CLKORP1 Low time | 0.45T | 0.5T | 0.55T | TCK |
| **tRMG** | Receiver Data Input Margin<br>FCLKIN = 100MHz<br>FCLKIN = 85MHZ<br>FCLKIN = 65MHZ | <br>-0.30<br>-0.45<br>-0.60 | | <br>0.30<br>0.45<br>0.60 | ns |
| **tRIP 1** | Input data Position1 | -\|tRMG\| | 0.0 | +\|tRMG\| | Clock |
| **tRIP 0** | Input data Position0 | T/7-\|tRMG\| | T/7 | T/7+\|tRMG\| | Clock |
| **tRIP 2** | Input data Position2 | 6T/7-\|tRMG\| | 6T/7 | 6T/7+\|tRMG\| | Clock |
| **tRIP 3** | Input data Position3 | 5T/7-\|tRMG\| | 5T/7 | 5T/7+\|tRMG\| | Clock |
| **tRIP 4** | Input data Position4 | 4T/7-\|tRMG\| | 4T/7 | 4T/7+\|tRMG\| | Clock |
| **tRIP 5** | Input data Position5 | 3T/7-\|tRMG\| | 3T/7 | 3T/7+\|tRMG\| | Clock |
| **tRIP 6** | Input data Position6 | 2T/7-\|tRMG\| | 2T/7 | 2T/7+\|tRMG\| | Clock |
| **tRPLL** | Phase Locked Loop set time | | | 300 | us |

LVDS Receiver AC Electrical Characteristics

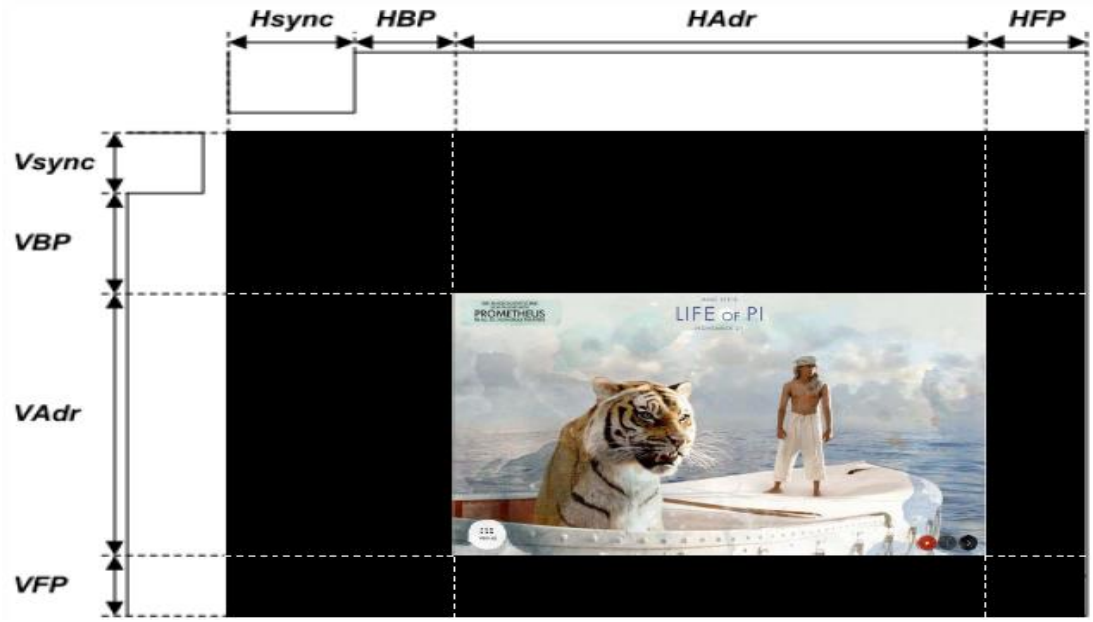



LVDS RX data Margin

### 3.6 Interface timing Parameter

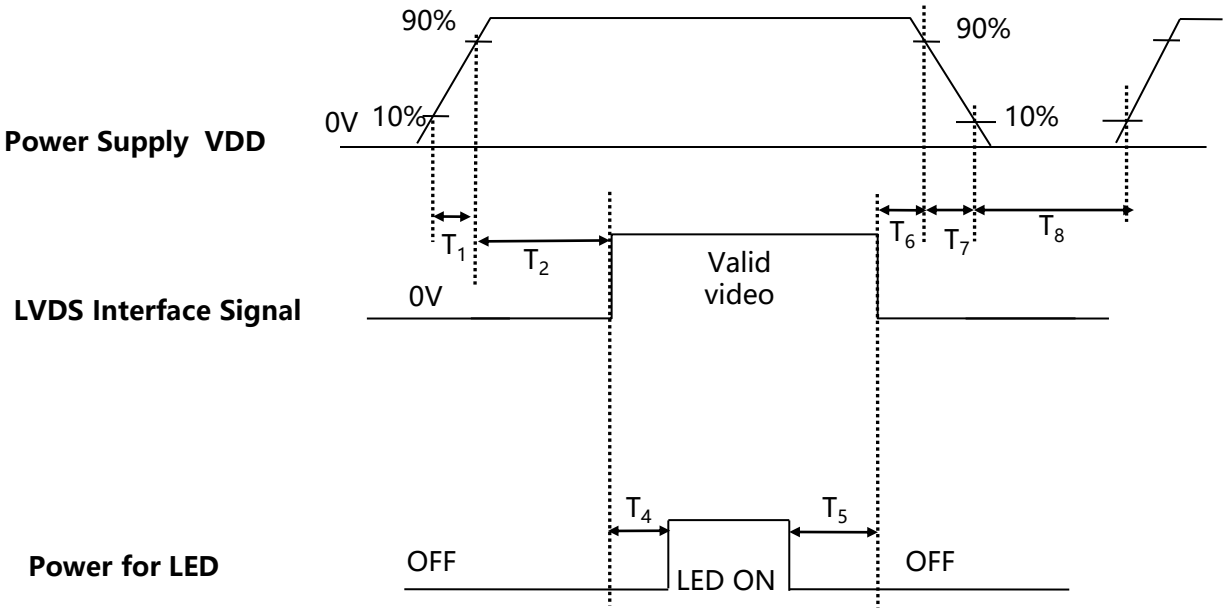
**< Table9. Timing Parameter >**

| Item | | | Symbol | min | typ | max | UNIT |
|---|---|---|---|---|---|---|---|
| LCD | Frame Rate | | - | - | 60 | - | Hz |
| | Pixels Rate | | - | - | 52.016 | - | MHz |
| Timing | Horizontal | Total time | tHP | - | 832 | - | $t_{CLK}$ |
| | | Active time | tHadr | 768 | | | $t_{CLK}$ |
| | Vertical | Total time | tvp | - | 1044 | - | $t_H$ |
| | | Active time | tVadr | 1024 | | | $t_H$ |
| Port | | | | - | 1 | - | Port |



### 3.7 Power Sequence

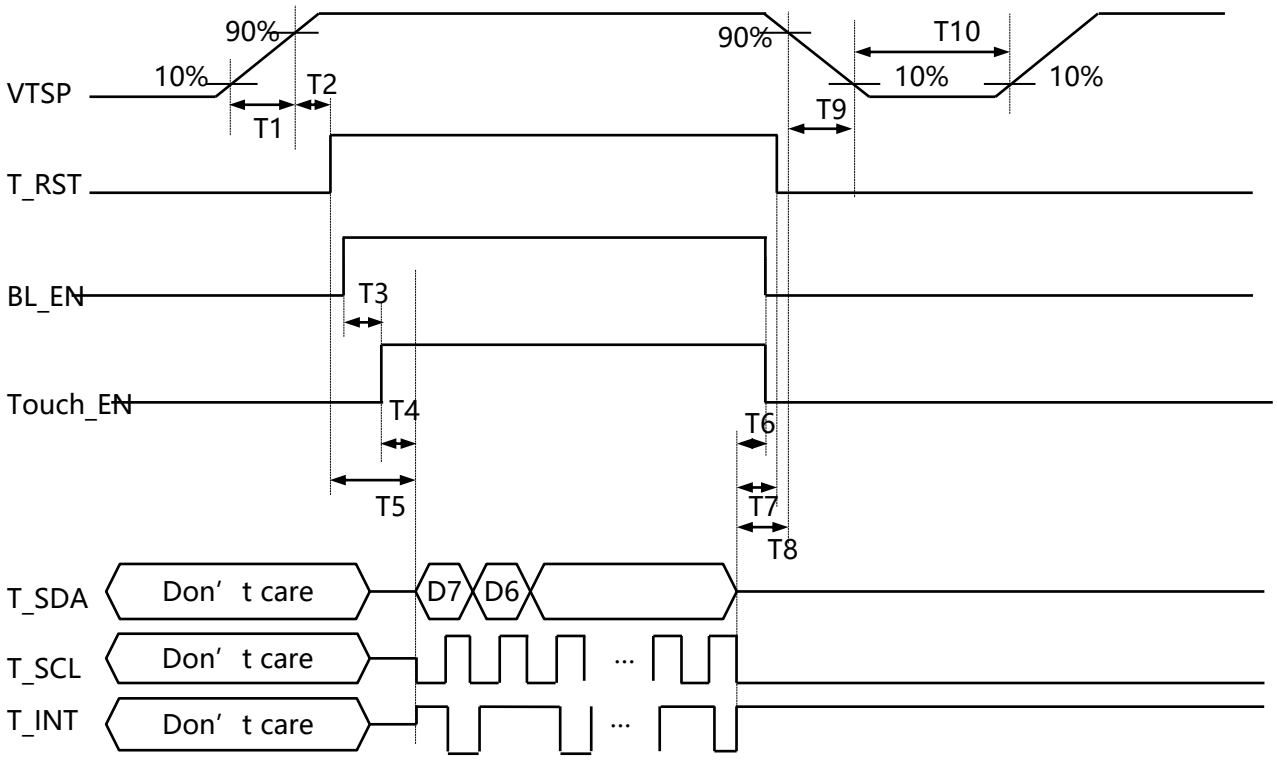
[Ta =25±2 ℃]




**< Table10. Sequence Table >**

| Parameter | Value | | | Units |
|---|---|---|---|---|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | (ms) |
| T2 | 0 | - | 500 | (ms) |
| T4 | 1500 | - | - | (ms) |
| T5 | 500 | - | - | (ms) |
| T6 | 100 | - | - | (ms) |
| T7 | 0 | - | 200 | (ms) |
| T8 | 2000 | - | - | (ms) |

To prevent a latch-up or DC operation of the TLCM module, the power on/off sequence of Touch shall be as shown in below




**< Table10-2.** Touch Power Sequence **Table >**

| Parameter | Values | | | Units |
|---|---|---|---|---|
| | Min | Typ | Max | |
| T1 | | | | |
| T2 | | | | |
| T3 | | | | |
| T4 | | | | |
| T5 | | | | |
| T6 | | | | |
| T7 | | | | |
| T8 | | | | |
| T9 | | | | |
| T10 | | | | |

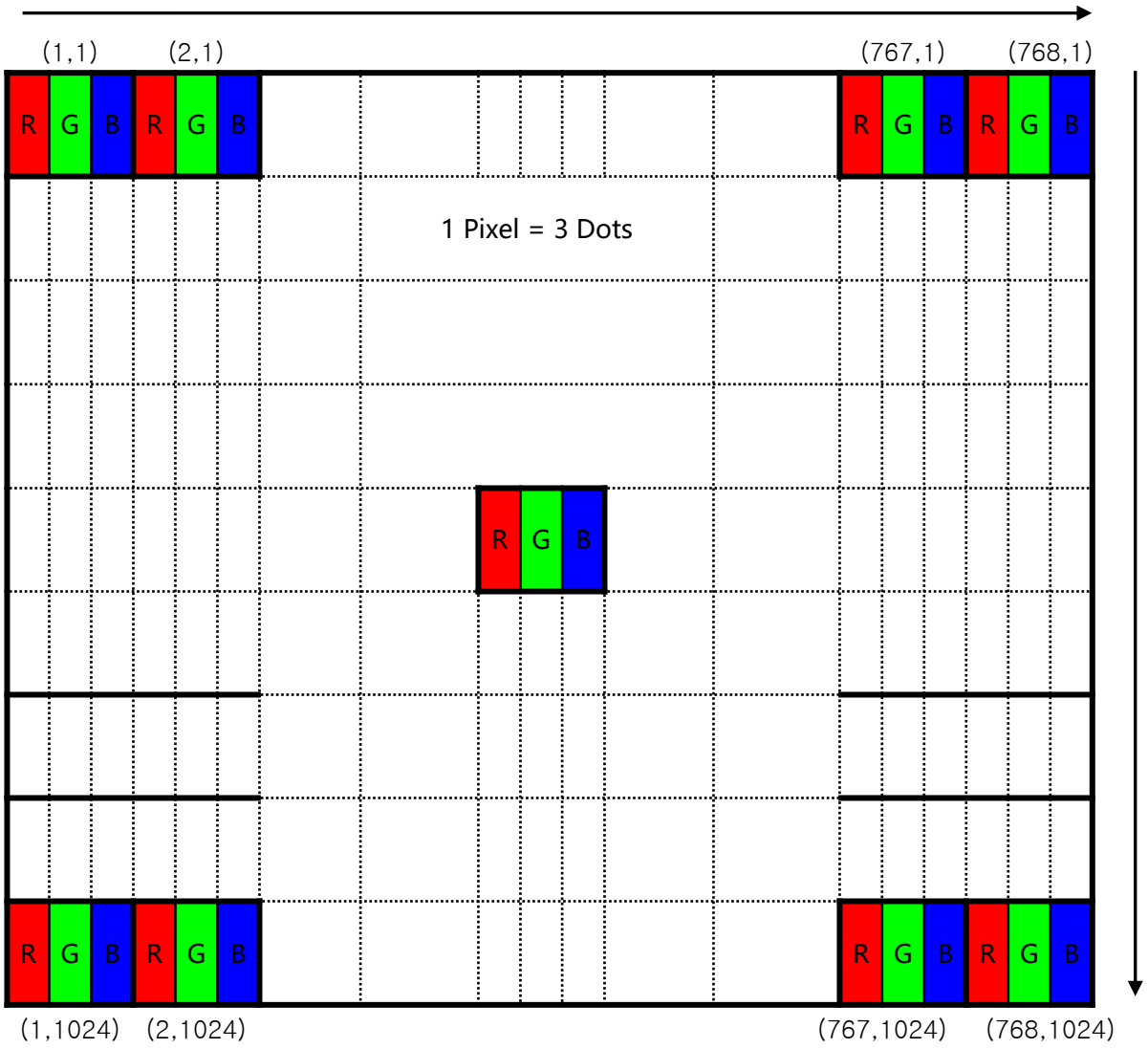
Notes:
1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

### 3.8 Input Color Data Mapping

**< Table11. Input Signal and Display Color Table >**

| Color & Gray Scale | | Input Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red Data | | | | | | | | Green Data | | | | | | | | Blue Data | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale of Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of Green | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale of Blue | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale of White | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

### 3.9 Input Color Data Mapping




Display Position of Input Data (V-H)

# 4.0 OPTICAL SPECIFICATIONS

## 4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance met er system (Gonio meter system and TOPCON BM-5) and test unit shall be located at an approximate dista nce 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ =0 (=θ3 ) as the 3 o′ clock direction (the "right" ), θØ=90 (= θ12 ) as the 12 O′ clock direction ( "upward" ), θØ=180 (= θ9 ) as the 9 O′ clock direction ( "left" ) and θØ=27 0(= θ6 ) as the 6 O′ clock direction ( "bottom" ). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed.

## 4.2 Optical Specifications

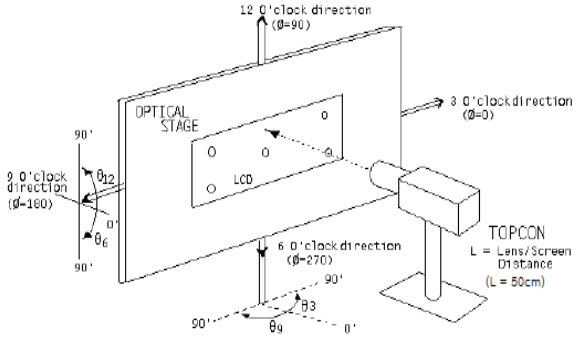
**< Table11. Optical Table >**

| Item | Symbol | Condition | Min | Typ. | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| **luminance** | Bp | θ=0° | 250 | 300 | -- | cd/m2 | Note 1 |
| **Brightness Uniformity** | △Bp | | 75 | 80 | -- | % | Note 2 |
| **Viewing Angle** | θL | Cr≥10 | 80 | 85 | -- | deg | Note 3 |
| | $\theta_R$ | | 80 | 85 | -- | | |
| | $\psi_T$ | | 80 | 85 | -- | | |
| | $\psi_B$ | | 80 | 85 | -- | | |
| **Contrast Ratio** | Cr | θ=0° FF=0° | 1000 | 1500 | | - | Note 4 |
| **Response Time** | Tr+Tf | | - | 30 | 35 | ms | Note 5 |
| **Color Coordinate of CIE1931** | Rx | θ=0° | 0.636 | 0.639 | 0.642 | - | Note 6 |
| | Ry | | 0.337 | 0.340 | 0.343 | | |
| | Gx | | 0.302 | 0.305 | 0.308 | | |
| | Gy | | 0.610 | 0.613 | 0.616 | | |
| | Bx | | 0.145 | 0.148 | 0.151 | | |
| | By | | 0.060 | 0.063 | 0.066 | | |
| | Wx | | 0.289 | 0.292 | 0.295 | | |
| | Wy | | 0.326 | 0.329 | 0.332 | | |
| **NTSC Ratio** | NTSC | CIE1931 | 67 | 78.0 | -- | % | Note 7 |
| **Polarization Direction of Front Polarizer** | PdF | | -- | 0° | -- | deg | Note 8 |
| **Polarization Direction of Rear Polarizer** | PdR | | -- | 90° | -- | Deg | |
| **Gray inversion angle** | | | -- | ADS无 | -- | | Note 9 |
| **Gamma Scale** | | | 2.0 | 2.2 | 2.4 | | |

**Note1:Luminance measurement**

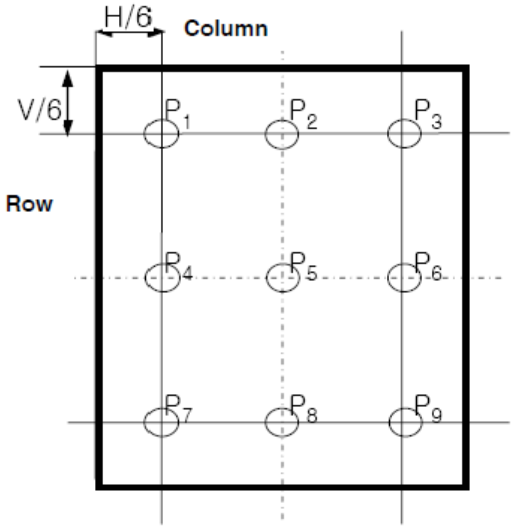
The test condition is at ILED=100mA and measured on the surface of LCD module at 25℃.

- The data are measured after LEDs are lighted on for more than 5 minutes and LCM displays are fully white. The brightness is the center of the LCD. Measurement equipment CS2000 or similar equipments (Field of view:1deg,Distance:50cm)
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.
- Measured value at the center point of LCD panel must be after more than 5 minutes while backlight turning on.

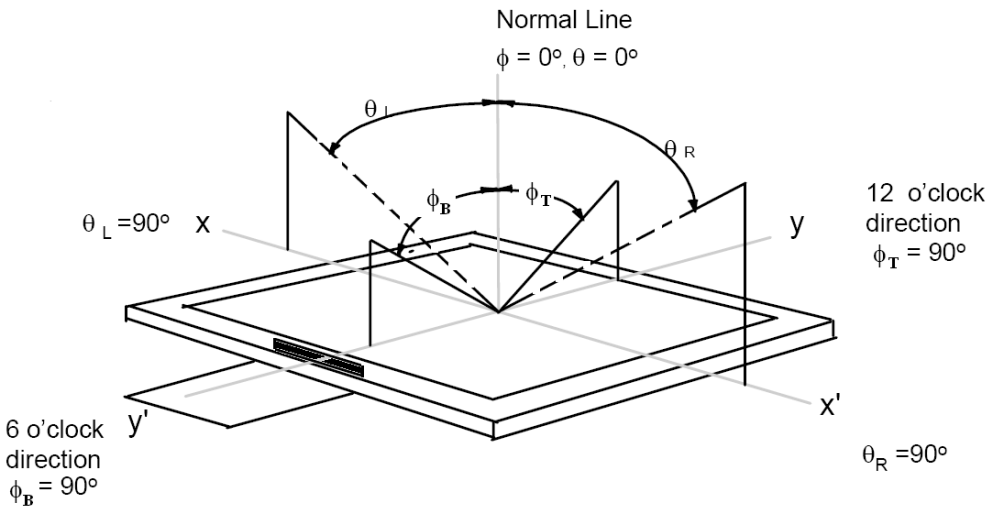



**Note2:Uniformity**

- The test condition is at ILED=100mA and measured on the surface of LCD module at 25℃.
- Measurement equipment:CS2000 or similar equipments
- The luminance uniformity is calculated by using following formula:
- △Bp = Bp (Min.) / Bp (Max.)×100 (%)
- Bp (Max.) = Maximum brightness in 9 measured spots
- Bp (Min.) = Minimum brightness in 9 measured spots.



**Note 3**:**The definition of Viewing Angle**
Refer to the graph below marked by $\theta$ and $\Phi$.

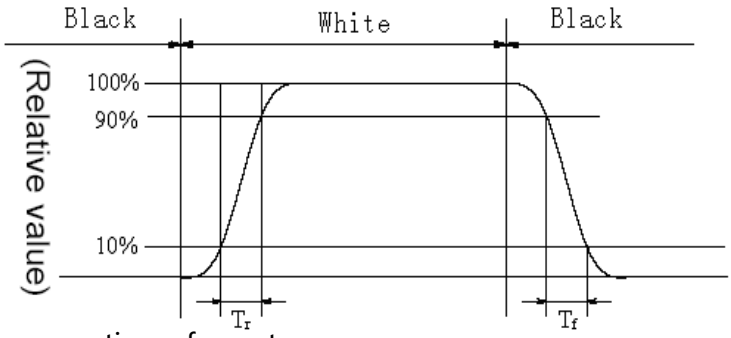



**Note4**:**ThedefinitionofContrastRatio** (Test LCM using CS2000 or similar equipments):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

**Note5**:**Definitionof Response time.**(Test LCD using DMS501 or similar equipments):
The output sign also photo detector are measured when the input sign also are changed from "black " to "white" (Voltage falling time)and from "white" to "black" (Voltage rising time), respectively . The response time is defined as the time interval between the 10% and 90% of amplitudes . Refer to fi gures below.




| | L0 | L1 | L2 | L3 | L4 | L5 | L6 | L7 |
|---|---|---|---|---|---|---|---|---|
| L0 | ■ | | | | | | | |
| L1 | | ■ | | | | | | |
| L2 | | | ■ | | | | | |
| L3 | | | | ■ | | | | |
| L4 | | | | | ■ | | | |
| L5 | | | | | | ■ | | |
| L6 | | | | | | | ■ | |
| L7 | | | | | | | | ■ |

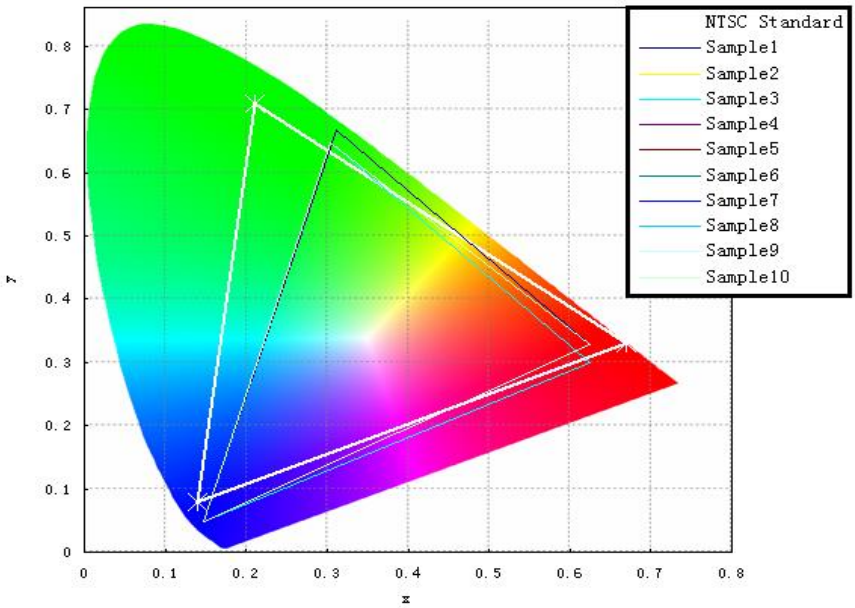
Response time of gray to gray:
Measurement equipment: DMS501 or similar equipments.
Test method: we define 8 grays L0-L7,the grays of L0-L7 were defined as:0,36,73, 109, 146, 182, 219, 25 5. Theoutputsignalsofphotodetectoraremeasuredwhentheinputsignalsarechanged from "Lx" to "Ly" , x, y= [0, 7]. The response time is defined as the time interval between the 10% and 90% of amplitudes. The result of the test can be noted as below:

**Note 6: Color Coordinates of CIE 1931**

The test condition is at ILED=100mA and measured on the surface of LCD module at 25℃.
Measurement equipment: CS2000 or similar equipments
The Color Coordinate (CIE 1931) is the measurement of the center of the display shown in below figure.

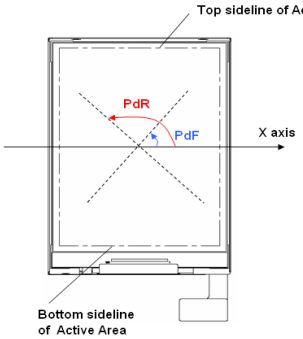
**Note 7: Definition of Color of CIE Coordinate and NTSC Ratio.**

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$



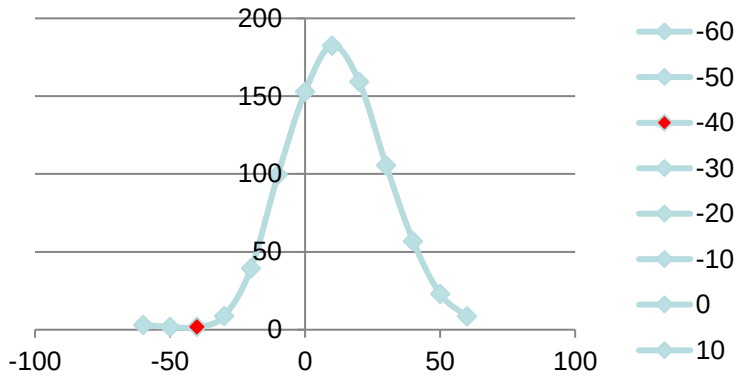

**Note 8: Polarization Direction Definition**

- Viewing direction is normal user viewing direction which is vertical to the display surface
- The polarizer which is closer to viewer is defined as Front Polarizer
- The polarizer which is on the rear side of viewer is defined as Rear Polarizer
- The X axis is defined as parallel line to top & bottom sidelines of the Active Area
- PdF which is marked in blue arrow is polarization degree of Front polarizer
- PdB which is marked in red arrow is polarization degree of Back polarizer
- The polarization degree parameter must be indicated in range of 0deg to 180deg according to above definition



**Note 9**: **Definition of gray inversion angle**

- Refer to the graph of note 9.
- Using luminance test method.
- Test pattern : 128 gray
- If the viewing direction is 12 o' clock ,then test the luminance while θ=-60°,θ=-50°, θ=-40°, θ=-30°, θ=-20°, θ=-10°, θ=0°, θ=10°, θ=20°, θ=30°, θ=40°, θ=-50°, θ=60°. The luminance test as figure below:



## 5.0 RELIABLITY TEST

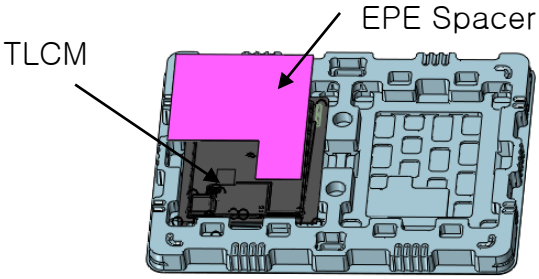
The Reliability test items and its conditions are shown in below.

**<Table 12. Reliability Test Parameters >**

| No | Test Items | Conditions |
|---|---|---|
| 1 | High temperature & high humidity (storage test) | 60℃，90%RH，240hr |
| 2 | High temperature storage test | 70℃，240hr |
| 3 | Low temperature storage test | -30℃，240hr |
| 4 | High temperature & high humidity (operation test) | 60℃，90%RH，240hr |
| 5 | Low temperature operation test | -10℃，240hr |
| 6 | High temperature operation test | 60℃，240hr |
| 7 | Thermal Shock Test | -20℃~60℃，1hr/cycle，100cycle |
| 8 | PCT | 121℃，100%RH，2atm，12hr |
| 9 | ESD | 150pF，330Ω，±8kV(Contact)，±15kV（Air） |
| 10 | Image Sticking | 6*8chess to Gray 128：2hr+1min image need disappear |
| 11 | Packing VIB | 1.47G，1-200hz，X，Y，±Z，30min/Axis |
| 12 | Packing Drop | Height：Xcm，1角3边6面<br>注：X根据整箱重量而定，＞10Kg取60cm，≤10Kg取80cm |
| 13 | VIB | 1.5G，10-500Hz，Sine，方向 +X +Y +Z Sweep 60min |
| 14 | Shock | 220G，2ms，half sine，方向±X ±Y ±Z，每个方向各冲击1次 |
| 15 | Water Immunity | 滴水不报点，擦拭后正常触控；表面水雾可正常操作；少许雨水可湿手操作；水平状态少量积水可操作； |
| 16 | Touch method | 医用橡胶手套0.7mm（约6层手套），棉手套（2mm）可操作 |

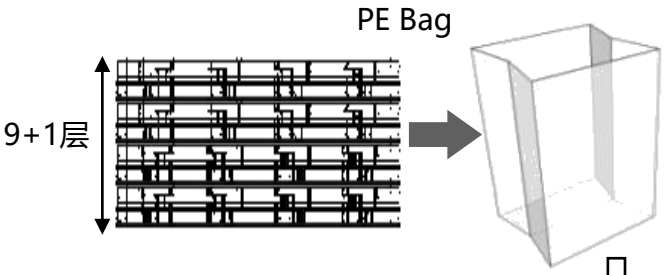
## 6.1 PACKING INFORMATION(产品形态：TLCM )

**Packing process:**



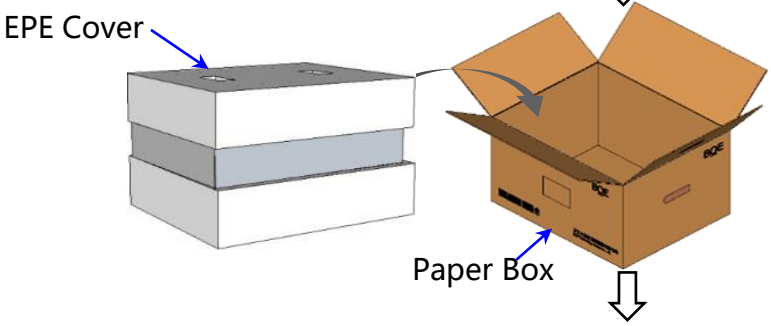

-.Place 1 pcs of TLCM (TP facing down) in each hole of tray, and then place 1 pcs of EPE spacer on the product (the gap position of spacer avoids the protruding part of TLCM).
Total:2 EPE Spacer / Tray ; 2 TLCM/Tray

⇩



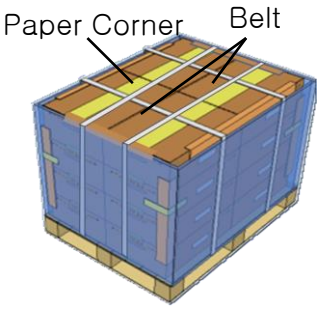

-.Stack 9 pcs tray, top 1 pcs empty tray, and then put it into PE bag

⇩




-.Place 1pcs EPE cover in inner box, place the stacked 10 pcs tray horizontally in box, and then place 1pcs EPE cover
Total:18 TLCM/ Paper Box

⇩



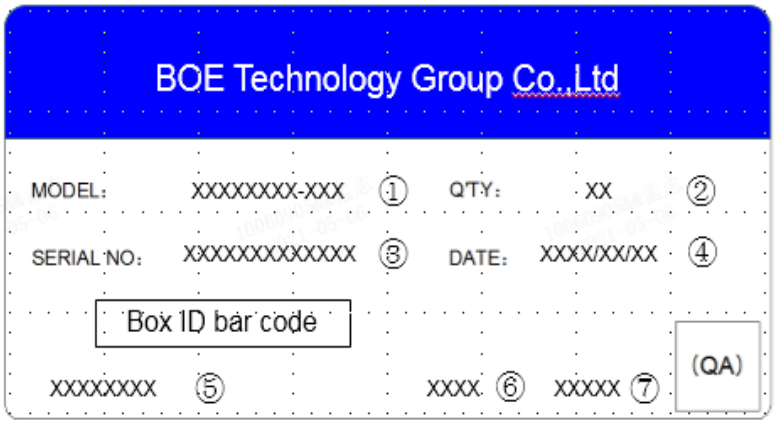

-.Each pallet is stacked in 2 rows and 3 columns, with a total of 4 layers of box, 8 EA paper corner protection, wrapping film (≥ 3 layers), packing belt "well" shape shooting
Total: 432 TLCM/24 Paper BOX/Pallet

## 6.2 BOX LABEL (产品形态：TLCM )

**Serial number marked part needs to print, As follows**

1. FG-CODE( 前12位)
2. Product Quantity
3. Box ID
4. Packing Date
5. Customer Part No.--Empty
6. the last four numbers FG-Code
7. Vendor Code --- Empty

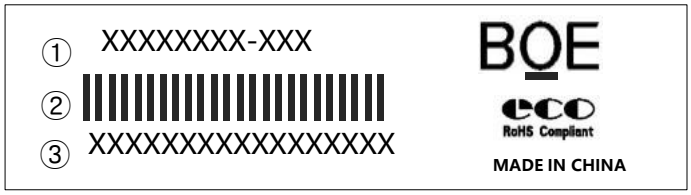
Total Size:110×55mm




- Box Label Naming Rule

| Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | S | L | S | 5 | 1 | 2 | 3 | D | 0 | 0 | 0 | 6 | 8 |
| Description | Products/GBN | | Grade | Line | Year | | Month | Revision Code | Serial Number | | | | |

## 6.3 Product Label




**Serial number marked part needs to print, As follows**

1. FG-CODE( 前12位)
2. Product ID barcode
3. Product ID

Total Size:48×12mm

- Product Label Naming Rule

| Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | S | L | S | 5 | 1 | 2 | 3 | 5 | 9 | 4 | 2 | 0 | 0 | 0 | 1 | D | B |
| Description | Model Code/GBN | | Grade | Line | Year | | Month | Model Extension Code (Last 4 Digits Of FG-Code) | | | | Serial Number:00001~ZZZZZZ | | | | | |

## 8.0 Handling & Cautions

Please pay attention to the followings when you use this TFT LCD Module.

## 8.1 Mounting Precautions

- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- You must mount a module using specified mounting holes (Details refer to the drawings).
- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress)is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- Do not apply mechanical stress or static pressure on module; Abnormal display cause by pressing some parts of module during assembly process , do not belong to product failure, the press should be agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on module , and avoid impact, vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Protection film for polarizer on the module should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact the module surface.
- You should adopt radiation structure to satisfy the temperature specification.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
  Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)

- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane & alcohol is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene , because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- This module has its circuitry PCB' s on the rear side and Driver IC, should be handled carefully in order not to be stressed.
- Avoid impose stress on PCB and Driver IC during assembly process ,Do not drawing, bending, COF package & wire.
- Do not disassemble the module.

## 8.2 Operating Precautions

- Do not connector or disconnect the cable to/from the Module at the "Power On" Condition.
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the module would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- Do not allow to adjust the adjustable resistance or switch.
- The electrochemical reaction caused by DC voltage will lead to LCD module degradation, so DC drive should be avoided.
- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipment to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

- The cables should be as short as possible between System Board and PCB interface.
- Connectors are precision devices to transmit electrical signals, and operators should plug in parallel.
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- Long side LED Bar design is recommended when using E-LED type Back Light.

- For long-term lighting products, it is recommended to shut down periodically.
- If the product is used for a long time under the condition of 7*24 hr, it is strongly recommended to contact BOE for filed application engineering advice.
- Long time and large angle forward use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice.

## 8.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc.
- Do not close to static electricity to avoid product damage.
- Do not touch interface pin directly.

## 8.4 Precautions for Strong Light Exposure

- Do not leave the module operation or storage in Strong light . Strong light exposure causes degradation of polarizer and color filter.

## 8.5 Precautions for Storage

A. Atmosphere Requirement

| ITEM | UNIT | MIN | MAX |
|---|---|---|---|
| Storage Temperature | (℃) | 5 | 40 |
| Storage Humidity | (%rH) | 40 | 75 |
| Storage Life | 6 months | | |
| Storage Condition | • The storage room should be equipped with a dark and good ventilation facility.<br>• Prevent products from being exposed to the direct sunlight, moisture and water.<br>• The product need to keep away from organic solvent and corrosive gas.<br>• Be careful for condensation at sudden temperature change.<br>• Storage condition is guaranteed under packing conditions. | | |

B. Package Requirement

- The product should be placed in a sealed polythene bag.
- Product Should be placed on the pallet, Which is away from the floor, Be cautions not to pile the product up.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
- As the original protective film, do not use the adhesive protective film to avoid change of Pol color and characteristic.

## 8.6 Precautions for protection film

- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- People who peeled off the protection film should wear anti-static strap and grounded well.

## 8.7 Appropriate Condition for Commercial Display

-Generally large-sized LCD modules are designed for consumer applications . Accordingly, long-term display like in Commercial Display application, can cause uneven display including image sticking. To optimize module's lifetime and function, several operating usages are required.

1. Normal operating condition
   - Temperature: 20±15℃
   - Operating Ambient Humidity : 55±20%
   - Display pattern: dynamic pattern (Real display)
   - Well-ventilated place is recommended to set up Commercial Display system
2. Special operating condition

   a. Ambient condition

   - Well-ventilated place is recommended to set up Commercial Display system.

   b. Power and screen save

   - Periodical power-off or screen save is needed after long-term display.

   c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD module may turn black screen. The above phenomenon cannot explain the failure of the display. When the temperature returns to the normal operating temperature, the LCD module will return to normal display.

   d. When expose to drastic fluctuation of temperature (hot to cold or cold to hot） ,the LCD module may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD module ‘s surface which may affect the operation of the polarizer and LCD module .

   e. Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.

   f. Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions such as high temperature, high humidity, high altitude, special display images, running time, long time operation, outdoor operation, etc. It is strongly recommended to contact BOE for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

3. Operating usages to protect against image sticking due to long-term static display.
   a. Suitable operating time: under 20 hours a day.
   b. Static information display recommended to use with moving image.
   - Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.
   c. Background and character (image) color change
   - Use different colors for background and character, respectively.
   - Change colors themselves periodically.
   d. Avoid combination of background and character with large different luminance.
   1) Abnormal condition just means conditions except normal condition.
   2) Black image or moving image is strongly recommended as a screen save
4. Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.

## 8.8 Other Precautions

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

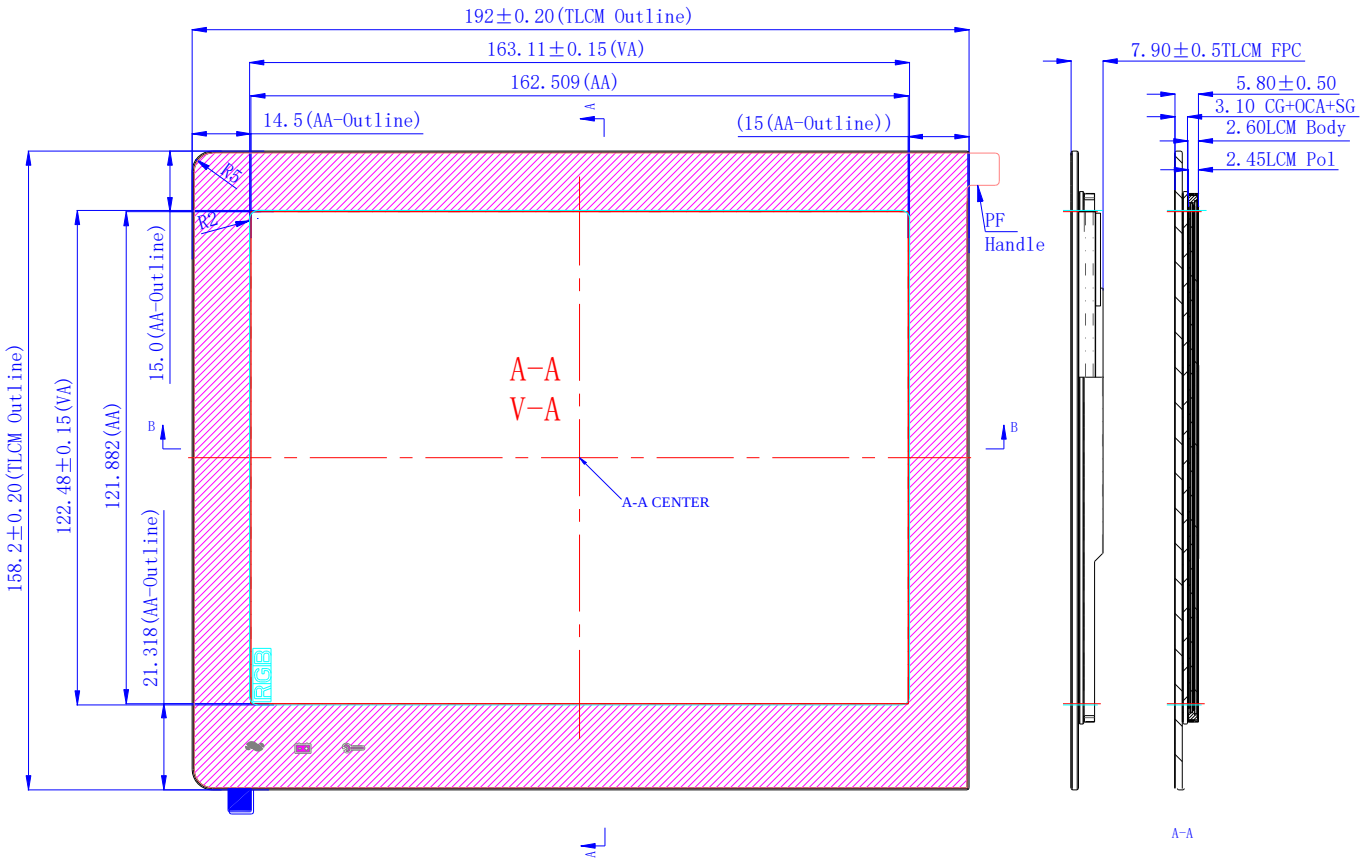
B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

# 9.0 APPENDIX

## Mechanical Drawing

Drawing Attachment: Landscape Front View



**Mechanical Drawing**

Drawing Attachment: Landscape Back View