

# INDUSTRIAL STRENGTH... Start Your Application From YOURITECH

Integration support

Obsolescence Management

PCAP

Embedded Systems

Human Machine Interface

Touch Solutions

Software

Quality Management

Open Frame Monitors

LCD Controller

Research & Development

Firmware

EMC tests

on-site service

Optical Bonding

In-house Manufacturing

Cover glass

System solutions

OEM Solutions

Custom Display

Production  
Custom designs  
Installation

Mechanical design



# SPECIFICATION

☐ Preliminary Specification  
☒ Final Specification

**Description**                      **15.0" 1024xRGBx768 TFT-LCD Module**  
**Part Number**                    **P1500XGF2MB10**

|            |       |                                                         |           |
|------------|-------|---------------------------------------------------------|-----------|
| Customer   |       | Product Dept, PDBU<br>Tianma Microelectronics Co., Ltd. |           |
| Signatures | Date  | Approved By                                             | Date      |
| <hr/>      | <hr/> | Kim Minhong                                             | 2025/5/20 |
| <hr/>      | <hr/> | Reviewed By                                             |           |
|            |       | Deng Longping                                           | 2025/5/20 |
|            |       | Prepared By                                             |           |
|            |       | Chen Siyuan                                             | 2025/5/20 |
| Comments:  |       |                                                         |           |

\* This cover page is for your Comments and Signatures back to TIANMA.

## REVISION HISTORY

| Rev | Date       | Page | Revision Items                                                                                                                            | Editor      |
|-----|------------|------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1.0 | 2024/6/17  | -    | Preliminary Spec Issued                                                                                                                   | Chen Siyuan |
| 1.1 | 2024/10/11 | 4    | Delete min data and add PWM 100% in the remark table of “5.2 DC Characteristics for Backlight Driving”.                                   | Chen Siyuan |
| 1.2 | 2025/1/14  | 1    | Adding power consumption data and weight information                                                                                      | Chen Siyuan |
|     |            | 4    | Adding TBD information to 5.1 and 5.2 items                                                                                               |             |
|     |            | 16   | Updating the packaging information                                                                                                        |             |
| 1.3 | 2025/3/6   | 15   | Optimizing 2D drawing (Zooming Pinout Number, which can be more clearly seen by customer)                                                 | Chen Siyuan |
| 2.0 | 2025/5/20  | -    | Final Specification Issued                                                                                                                | Chen Siyuan |
|     |            | 1    | Updating BLU Power Consumption in “2”                                                                                                     |             |
|     |            | 3    | Updating “Back Light Input voltage-VIN” (0→“-0.3”) in “4”                                                                                 |             |
|     |            | 4    | Updating Note in 5.1 (Delete previous Note1 and Converse previous Note2 to Note1)                                                         |             |
|     |            | 4    | Updating BLU Power Consumption in “5.2”                                                                                                   |             |
|     |            | 6    | Updating “Note” (Delete previous Note3~5 and add new Note 3~6)                                                                            |             |
|     |            | 11   | Updating “Uniformity” in “7”, and Confirming the “Luminance” in “7”                                                                       |             |
| 2.1 | 2025/6/3   | 4    | Correcting “Inrush Value” in “5.2 DC Characteristics for Backlight Driving”: From 1.5A to 2.0A.<br>Based on TIANMA current testing value. | Chen Siyuan |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |
|     |            |      |                                                                                                                                           |             |

# CONTENTS

|                                                    |           |
|----------------------------------------------------|-----------|
| <b>1. SUMMARY.....</b>                             | <b>1</b>  |
| 1.1 General Description.....                       | 1         |
| 1.2 Features.....                                  | 1         |
| <b>2. GENERAL SPECIFICATIONS.....</b>              | <b>1</b>  |
| <b>3. INPUT / OUTPUT TERMINALS.....</b>            | <b>2</b>  |
| 3.1 CN1 Pin assignment (LCD Interface) .....       | 2         |
| 3.2 CN2 Pin assignment (Back Light).....           | 3         |
| <b>4. ABSOLUTE MAXIMUM RATINGS .....</b>           | <b>3</b>  |
| <b>5. ELECTRICAL CHARACTERISTICS .....</b>         | <b>4</b>  |
| 5.1 DC Characteristics for Panel Driving.....      | 4         |
| 5.2 DC Characteristics for Backlight Driving.....  | 4         |
| 5.3 Recommended Power ON/OFF Sequence.....         | 6         |
| 5.4 LCD Module Block Diagram .....                 | 7         |
| 5.5 LVDS DC electrical characteristics .....       | 8         |
| 5.6 LVDS AC electrical characteristics.....        | 9         |
| <b>6. TIMING CHARACTERISTICS .....</b>             | <b>10</b> |
| <b>7. OPTICAL CHARACTERISTICS .....</b>            | <b>11</b> |
| <b>8. RELIABILITY TEST.....</b>                    | <b>14</b> |
| <b>9. MECHANICAL DRAWING .....</b>                 | <b>15</b> |
| <b>10. PACKING INSTRUCTION.....</b>                | <b>16</b> |
| <b>11. PRECAUTIONS FOR USE OF LCD MODULES.....</b> | <b>19</b> |
| 11.1 Handling Precautions.....                     | 19        |
| 11.2 Storage precautions.....                      | 19        |
| 11.3 Transportation Precautions .....              | 19        |
| 11.4 Screen saver Precautions.....                 | 19        |
| 11.5 Safety Precautions .....                      | 19        |

## 1. Summary

### 1.1 General Description

This is a 15.0 inch a-Si TFT-LCD module with Normal- Black technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, and an LED backlight unit.

### 1.2 Features

- Ultra-wide viewing angle
- Interface: LVDS
- LED driver integrated
- Surface treatment: AG
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: E333987)
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

## 2. General Specifications

| Feature                    |                     | Spec                           | Unit              |
|----------------------------|---------------------|--------------------------------|-------------------|
| Display Spec               | Size                | 15.0 inches                    |                   |
|                            | Resolution          | 1024(RGB)*768                  |                   |
|                            | Pixel Pitch         | 0.297*0.297                    | mm                |
|                            | TFT Active Area     | 304.128*228.096                | mm                |
|                            | Technology Type     | a-Si                           |                   |
|                            | Pixel Configuration | R.G.B Vertical Stripe          |                   |
|                            | Display Mode        | SFT, Normally Black            |                   |
|                            | Surface Treatment   | Anti-Glare                     |                   |
|                            | Viewing Direction   | ALL                            |                   |
| Mechanical Characteristics | LCM (W x H x D)     | 326.5*253.5*9.0 (typ.)         | mm                |
|                            | Weight              | 875                            | g                 |
| Optical Characteristics    | Luminance           | 500 (typ.)                     | cd/m <sup>2</sup> |
|                            | Contrast Ratio      | 1200:1 (typ.)                  |                   |
|                            | NTSC                | 60 (typ.)                      | %                 |
|                            | Viewing Angle       | 88/88/88/88 (typ.)             | degree            |
| Electrical Characteristics | Interface           | LVDS                           |                   |
|                            | Color Depth         | 16.7 Million                   | color             |
|                            | Power Consumption   | LCD: 914.1;<br>Backlight: 6960 | mW                |

Table 2.1 General TFT Specifications

### 3. Input / Output Terminals

#### 3.1 CN1 Pin assignment (LCD Interface)

| Connector Information |                                 |
|-----------------------|---------------------------------|
| LCD Module connector  | MSB240420HE                     |
| Matching connector    | Housing:P240420、Terminal:2404PS |

Table 3.1.1 Connector information

| No | Symbol | I/O | Description                     | Comment |
|----|--------|-----|---------------------------------|---------|
| 1  | VDD    | P   | Power Supply, 3.3V (typical)    |         |
| 2  | VDD    | P   | Power Supply, 3.3V (typical)    |         |
| 3  | NC     | N   | No Connect                      |         |
| 4  | NC     | N   | No Connect                      |         |
| 5  | Rin1-  | I   | - LVDS differential data input  |         |
| 6  | Rin1+  | I   | + LVDS differential data input  |         |
| 7  | VSS    | P   | Ground                          |         |
| 8  | Rin2-  | I   | - LVDS differential data input  |         |
| 9  | Rin2+  | I   | + LVDS differential data input  |         |
| 10 | VSS    | P   | Ground                          |         |
| 11 | Rin3-  | I   | - LVDS differential data input  |         |
| 12 | Rin3+  | I   | + LVDS differential data input  |         |
| 13 | VSS    | P   | Ground                          |         |
| 14 | ClkIN- | I   | - LVDS differential clock input |         |
| 15 | ClkIN+ | I   | + LVDS differential clock input |         |
| 16 | GND    | P   | Ground                          |         |
| 17 | Rin4-  | I   | - LVDS differential data input  |         |
| 18 | Rin4+  | I   | + LVDS differential data input  |         |
| 19 | VSS    | P   | Ground                          |         |
| 20 | VSS    | P   | Ground                          |         |

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note3: Scanning Direction.

PCB side →



Note4: VSS and GND should be connect to same ground.

### 3.2 CN2 Pin assignment (Back Light)

| Connector Information |                                 |
|-----------------------|---------------------------------|
| LCD Module connector  | MSB24038P5                      |
| Matching connector    | Housing:P24038、Terminal:24038PS |

Table 3.2.1 Connector information

| No | Symbol  | I/O | Description                                  | Wire Color |
|----|---------|-----|----------------------------------------------|------------|
| 1  | VCC     | P   | Power Supply, 12V (typical)                  |            |
| 2  | GND     | P   | Ground                                       |            |
| 3  | Enable  | I   | Backlight on/off control signal(1:on, 0:off) |            |
| 4  | Dimming | I   | Dimming control signal                       |            |
| 5  | NC      | N   | No Connect                                   |            |

Table 3.2.2 Pin Assignment for Back Light Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

## 4. Absolute Maximum Ratings

| Item                       | Symbol | MIN  | MAX | Unit | Remark         |
|----------------------------|--------|------|-----|------|----------------|
| Power Voltage              | VDD    | -0.3 | 3.6 | V    |                |
| Back Light Power voltage   | VCC    | -0.3 | 27  | V    |                |
| Back Light Input voltage   | VIN    | -0.3 | 5.5 | V    | Note1          |
| Operating Temperature      | Top    | -20  | 70  | °C   |                |
| Storage Temperature        | Tst    | -30  | 80  | °C   |                |
| Relative Humidity<br>Note2 | RH     | --   | ≤95 | %    | Ta≤40°C        |
|                            |        | --   | ≤85 | %    | 40°C < Ta≤50°C |
|                            |        | --   | ≤55 | %    | 50°C < Ta≤60°C |
|                            |        | --   | ≤36 | %    | 60°C < Ta≤70°C |
|                            |        | --   | ≤24 | %    | 70°C < Ta≤80°C |
| Absolute Humidity          | AH     | --   | ≤70 | g/m³ | Ta>70°C        |

Table 4.1 Absolute Maximum Ratings

Note1: Back Light Input voltage include Enable, Dimming..

Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.

Note3: 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

## 5. Electrical Characteristics

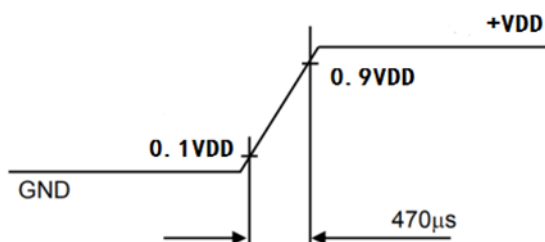
### 5.1 DC Characteristics for Panel Driving

| Item                 | Symbol     | MIN   | TYP     | MAX     | Unit | Remark         |
|----------------------|------------|-------|---------|---------|------|----------------|
| Supply Voltage       | VDD        | 3.0   | 3.3     | 3.6     | V    | Include ripple |
| Input Signal Voltage | Low Level  | VIL   | VSS     | 0.3×VDD | V    |                |
|                      | High Level | VIH   | 0.7×VDD | VDD     | V    |                |
| VDD Current          | 60Hz       | IDD   | --      | 277     | mA   | White pattern  |
| Power Consumption    | 60Hz       | PDD   | --      | 914.1   | mW   |                |
| Inrush current       |            | Irush | --      | 1.5     | A    | Note2          |

Table 5.1.1 Operating Voltages

Note1: To test the current dissipation, using the “white pattern” shown

VDD rising time is 470μs



### 5.2 DC Characteristics for Backlight Driving

| Item                            |            | Symbol | MIN  | TYP   | MAX   | Unit | Remark           |
|---------------------------------|------------|--------|------|-------|-------|------|------------------|
| Backlight Driving Input Voltage |            | VCC    | 10.8 | 12    | 13.2  | V    |                  |
| VCC Current                     |            | Icc    | --   | 580   | 870   | mA   | 100% Dimming     |
| Backlight Power Consumption     |            | P      | --   | 6960  | 10440 | mW   | 100% Dimming     |
| PWM frequency                   |            | F      | 200  | --    | 10K   | Hz   |                  |
| PWM duty                        |            | D      | 5    | --    | 100   | %    |                  |
| Enable, DimmingI                | High level | --     | 2    | -     | 5.5   | V    | Enable, DimmingI |
|                                 | Low level  | --     | -    | -     | 0.8   | V    |                  |
| LED Forward Current             |            | If     | -    | 80    | -     | mA   |                  |
| LED life time                   |            | --     | --   | 50000 | -     | Hrs  | PWM 100%         |
| Inrush current                  |            | Irush  | --   | --    | 2.0   | A    | Note5            |

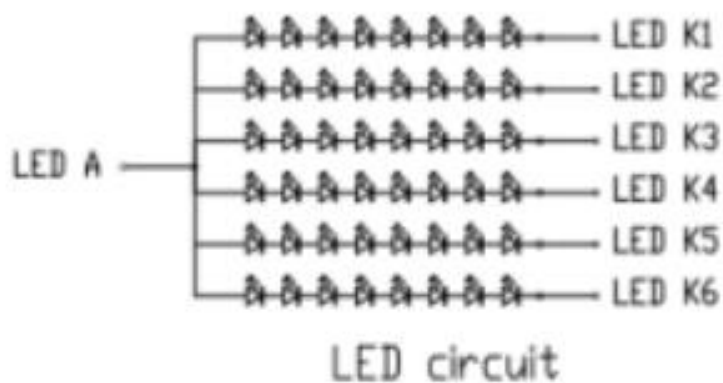
Table 5.2.1 LED Backlight Characteristics

Note1:  $I_F$  is defined for each channel.

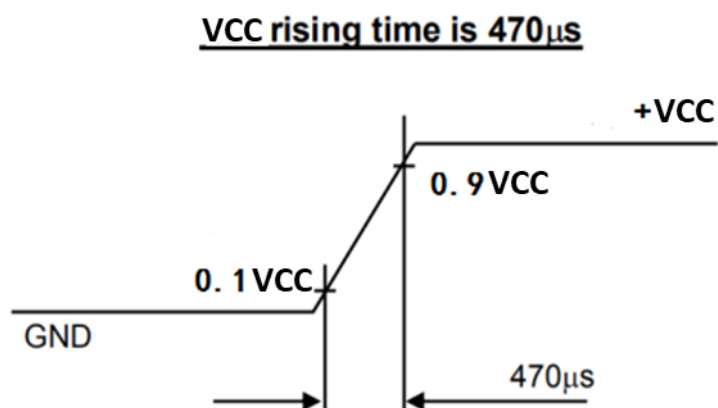
Note2: Optical performance should be evaluated at  $T_a=25^{\circ}\text{C}$  only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition, The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.



Note5: To test the current dissipation, using the “white pattern” shown



### 5.3 Recommended Power ON/OFF Sequence

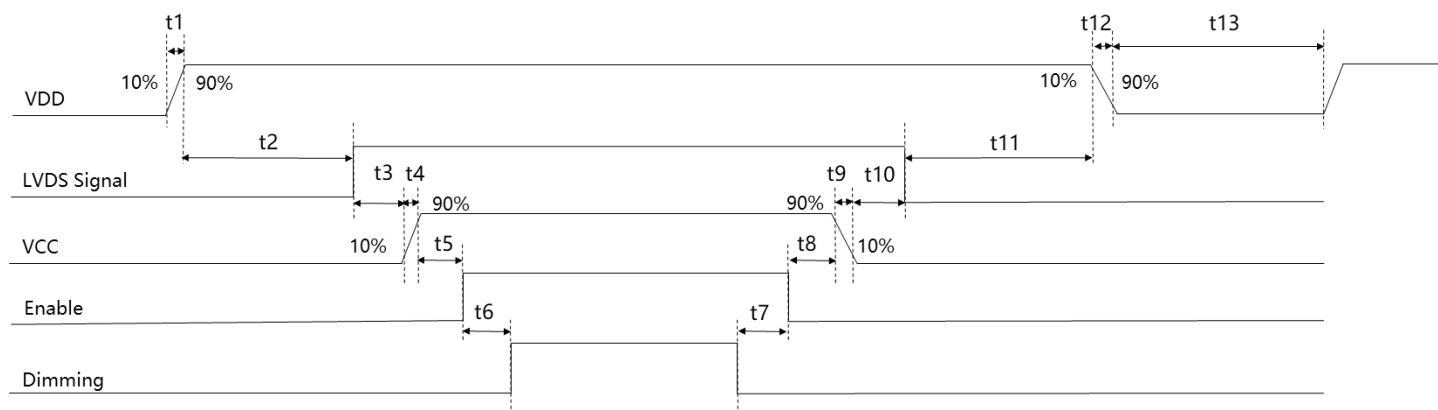


Figure 5.3.1 Power on/off sequence

| Symbol | Min  | Typ | Max | Unit | Remark |
|--------|------|-----|-----|------|--------|
| t1     | 0.5  | -   | 10  | ms   |        |
| t2     | 100  | -   | -   | ms   |        |
| t3     | 200  | -   | -   | ms   |        |
| t4     | 1    | -   | -   | ms   | Note 1 |
| t5     | 2    | -   | -   | ms   |        |
| t6     | 2    | -   | -   | ms   |        |
| t7     | 2    | -   | -   | ms   |        |
| t8     | 2    | -   | -   | ms   |        |
| t9     | 1    | -   | -   | ms   |        |
| t10    | 200  | -   | -   | ms   |        |
| t11    | 200  | -   | -   | ms   |        |
| t12    | -    | -   | 200 | ms   |        |
| t13    | 1000 | -   | -   | ms   |        |

Table 5.3.1 Power on/off sequence

Note1: The low level of these signals and analog powers are GND level.

Note2: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.

Note3: Keep Enable low level until the display has stabilized.

Note4: If there is a voltage variation ( voltage drop) at the rising edge of VDD below 3.0V, there is a possibility that a product does not work due to a protection circuit.

Note5: Display signals (Rin1-/+, Rin2-/+, Rin3-/+, Rin4-/+, and ClkIN-/+) must be set to Low or High impedance , except the VALID period (See above sequence diagram), in order to avoid the circuitry damage. If some of display and function signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If a customer stops the display and function signals, VDD also must be shut down.

Note6: In order to avoid unstable data display, the backlight is recommended to turn on within the VALID period of display. Recommended value:  $t3 \geq 200$  ms.

## 5.4 LCD Module Block Diagram

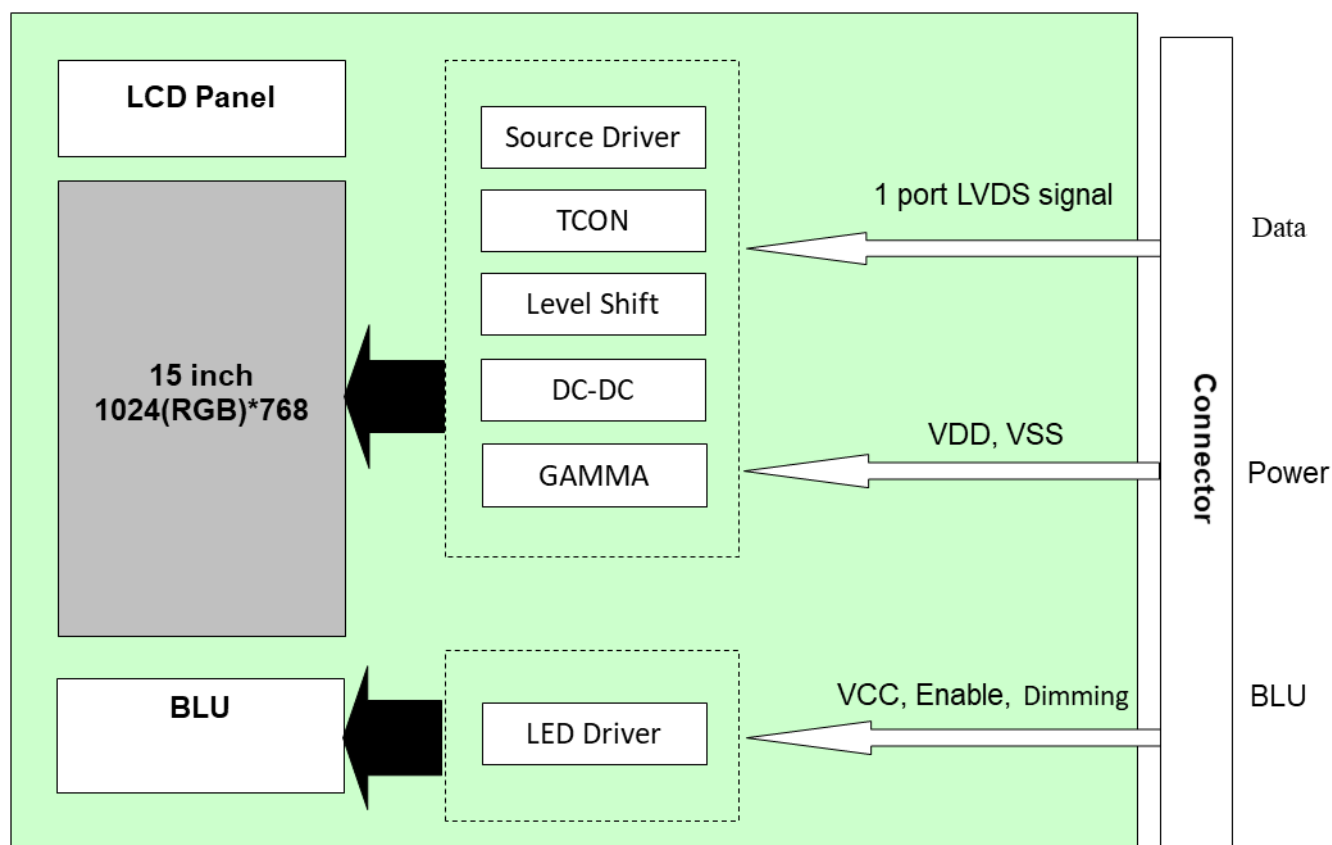


Figure 5.4.1 LCD Module Block Diagram

## 5.5 LVDS DC electrical characteristics

| Parameter                                 | Symbol     | Min  | Typ | Max              | Unit | Condition       |
|-------------------------------------------|------------|------|-----|------------------|------|-----------------|
| 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 (signaled-end)        | $R_{xVIN}$ | 0    | -   | 2.4              | V    |                 |
| Differential Input common Mode voltage    | $R_{xVCM}$ | 1.0  | 1.2 | $2.4- V_{ID} /2$ | V    |                 |
| Differential Input voltage                | $ V_{ID} $ | 0.1  | -   | 0.6              | V    |                 |

Table 5.5.1 LVDS DC Characteristics

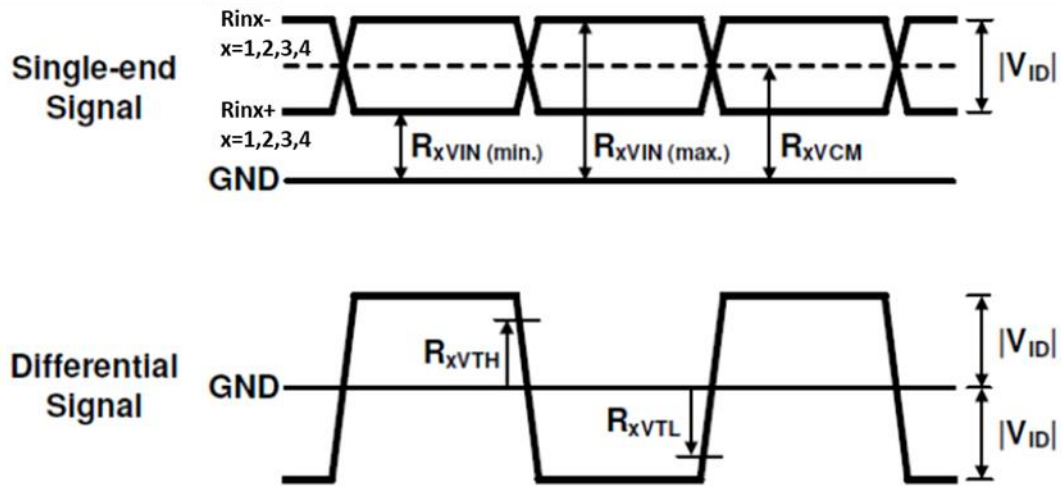


Figure 5.5.1 LVDS DC Characteristics

Note:

$|(R_{inx+})-(R_{inx-})| < R_{xVTL}$  = "LOW"  
 $|(R_{inx+})-(R_{inx-})| > R_{xVTH}$  = "HIGH"  
 $|V_{ID}| = |(R_{inx+})-(R_{inx-})|$   
 $V_{CM} = |(R_{inx+})-(R_{inx-})|/2$

## 5.6 LVDS AC electrical characteristics

| Parameter                   | Symbol      | Min        | Typ  | Max        | Unit | Remark                                    |
|-----------------------------|-------------|------------|------|------------|------|-------------------------------------------|
| Clock frequency             | RxFCLK      | 54.8       | -    | 88.1       | MHz  |                                           |
| Input data Position0        | tRIP1       | - tRMG     | 0.0  | tRMG       | ns   |                                           |
| Input data Position1        | tRIP0       | T/7- tRMG  | T/7  | T/7+ tRMG  | ns   |                                           |
| Input data Position2        | tRIP6       | 2T/7- tRMG | 2T/7 | 2T/7+ tRMG | ns   |                                           |
| Input data Position3        | tRIP5       | 3T/7- tRMG | 3T/7 | 3T/7+ tRMG | ns   |                                           |
| Input data Position4        | tRIP4       | 4T/7- tRMG | 4T/7 | 4T/7+ tRMG | ns   |                                           |
| Input data Position5        | tRIP3       | 5T/7- tRMG | 5T/7 | 5T/7+ tRMG | ns   |                                           |
| Input data Position6        | tRIP2       | 6T/7- tRMG | 6T/7 | 6T/7+ tRMG | ns   |                                           |
| Input data skew margin      | TRSKM       | -400       | -    | +400       | ps   | RxCLK = 85MHz<br>RxVTH – RxVTL<br>=200 mV |
| Input spread spectrum ratio | SSR         | -          | -    | +/-3       | %    |                                           |
| Input modulation frequency  | FM          | -          | -    | 300k       | Hz   |                                           |
| Jitter tolerance            | Tjitter_tol |            |      | 200        | ps   |                                           |

Table 5.6.1 LVDS AC Characteristics

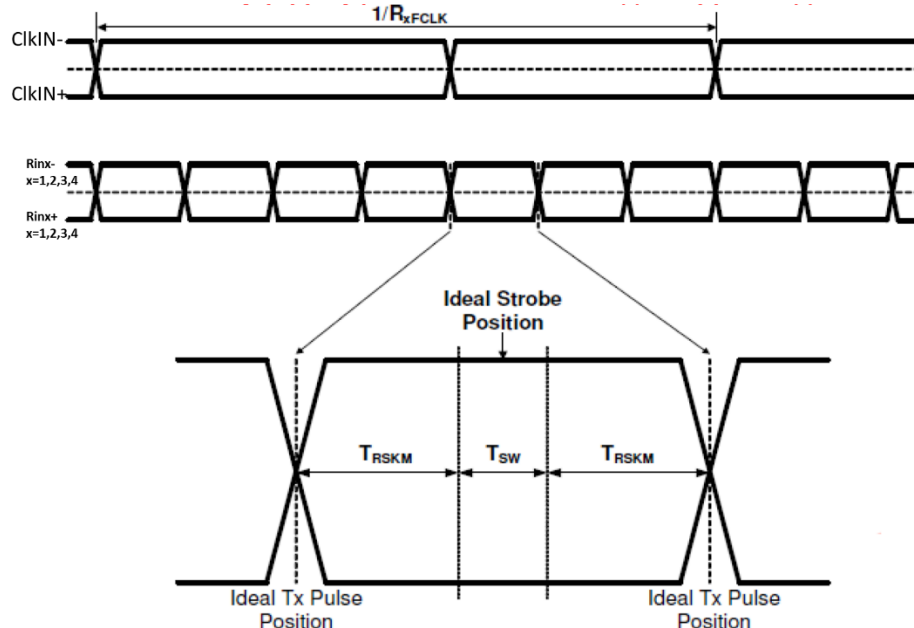


Figure 5.6.1 LVDS AC Characteristics

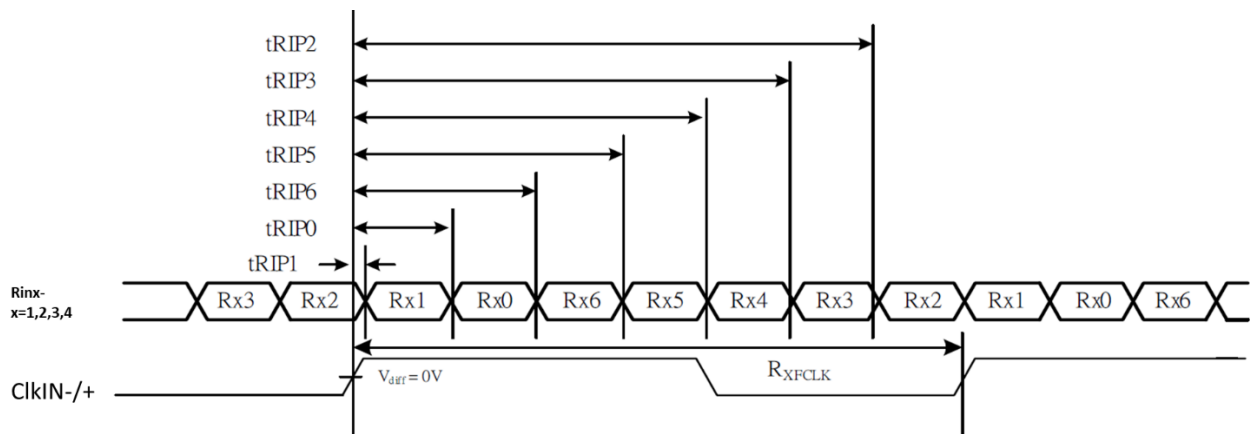


Figure 5.6.2 LVDS AC Characteristics

## 6. Timing Characteristics

### 6.1. LVDS signal timing characteristics

| Parameter          |                     | Symbol | Min. | Typ. | Max. | Unit | Remark      |
|--------------------|---------------------|--------|------|------|------|------|-------------|
| DCLK frequency     |                     | Fclk   | 54.8 | 57.6 | 88.1 | MHz  | Tclk=1/Fclk |
| Horizontal section | Horizontal total    | Th     | 1150 | 1200 | 1300 | Tclk |             |
|                    | Horizontal blanking | Thb    | 126  | 176  | 276  | Tclk |             |
|                    | Valid Data Width    | Thd    | 1024 |      |      | Tclk |             |
| Vertical section   | Vertical total      | Tv     | 794  | 800  | 1129 | TH   |             |
|                    | Vertical blanking   | Tvb    | 26   | 32   | 361  | TH   |             |
|                    | Valid Data Width    | Tvd    | 768  |      |      | TH   |             |
| Frame Rate         |                     | FR     | 60   |      |      | Hz   |             |

Table 6.1.1 Input Timing Parameters

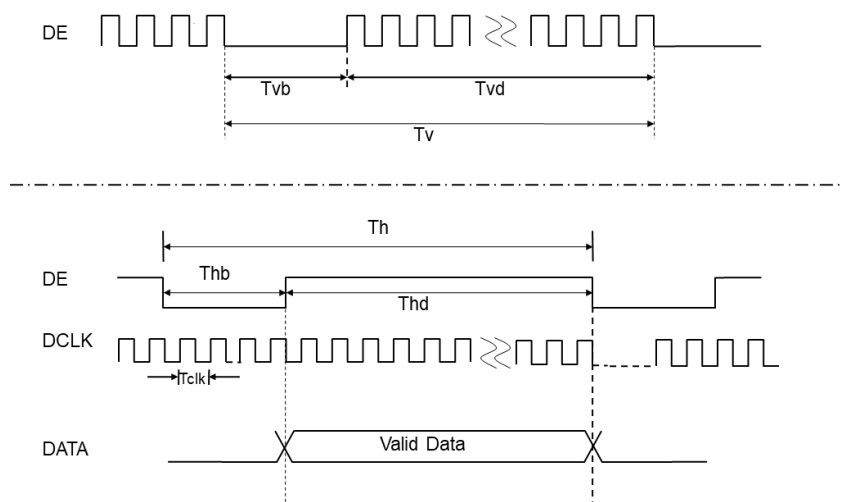


Figure 6.1.1 Clock and Data Input Timing Diagram

### 6.2. LVDS data mapping

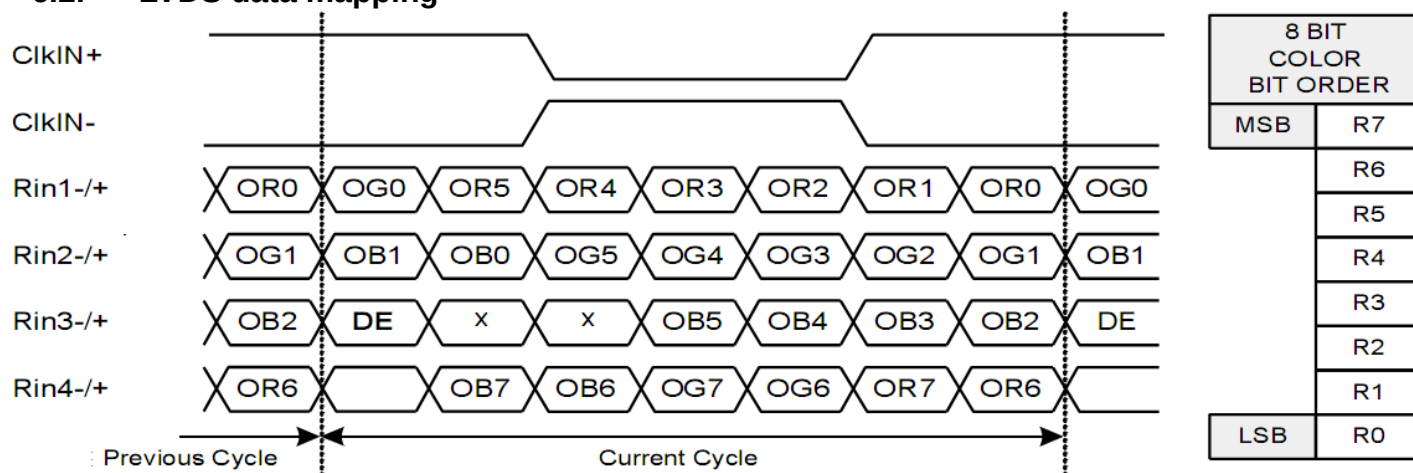


Figure 6.2.1 LVDS data mapping (VESA standard)

## 7. Optical Characteristics

| Item           |       | Symbol           | Condition       | Min   | Typ   | Max   | Unit              | Remark   |
|----------------|-------|------------------|-----------------|-------|-------|-------|-------------------|----------|
| View Angles    |       | θT               | CR≧10           | 80    | 88    | -     | degree            | Note2,3  |
|                |       | θB               |                 | 80    | 88    | -     |                   |          |
|                |       | θL               |                 | 80    | 88    | -     |                   |          |
|                |       | θR               |                 | 80    | 88    | -     |                   |          |
| Contrast Ratio |       | CR               | θ=0°            | 800   | 1200  | -     |                   | Note 3   |
| Response Time  |       | T <sub>ON</sub>  | 25℃             | -     | 30    | 35    | ms                | Note 4   |
|                |       | T <sub>OFF</sub> |                 |       |       |       |                   |          |
| Chromaticity   | White | x                | Backlight is on | 0.256 | 0.306 | 0.356 |                   | Note 1,5 |
|                |       | y                |                 | 0.272 | 0.322 | 0.372 |                   |          |
|                | Red   | x                |                 | 0.579 | 0.629 | 0.679 |                   | Note 1,5 |
|                |       | y                |                 | 0.281 | 0.331 | 0.381 |                   |          |
|                | Green | x                |                 | 0.280 | 0.330 | 0.380 |                   | Note 1,5 |
|                |       | y                |                 | 0.528 | 0.578 | 0.628 |                   |          |
|                | Blue  | x                |                 | 0.102 | 0.152 | 0.202 |                   | Note 1,5 |
|                |       | y                |                 | 0.010 | 0.060 | 0.110 |                   |          |
| Uniformity     |       | U                |                 | 75    | 80    |       | %                 | Note 6   |
| NTSC           |       | -                |                 | 55    | 60    |       | %                 | Note 5   |
| Luminance      |       | L                |                 | 400   | 500   | -     | cd/m <sup>2</sup> | Note 7   |

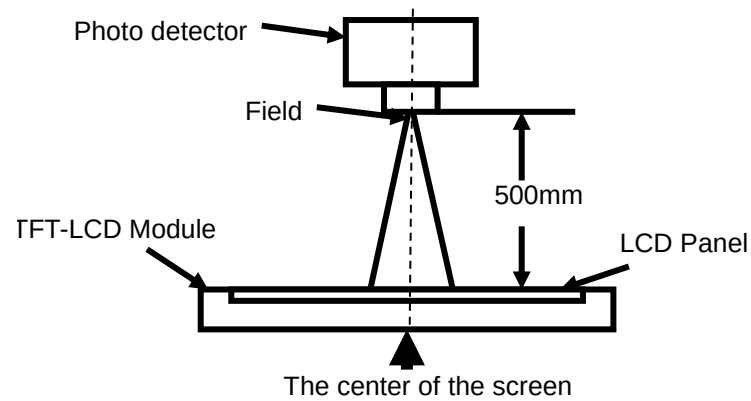
Table 7.1 Optical Parameters

Test Conditions:

1.  $I_F = XX$  mA, and the ambient temperature is 25°C.
2. The test systems refer to Note1 and Note2.

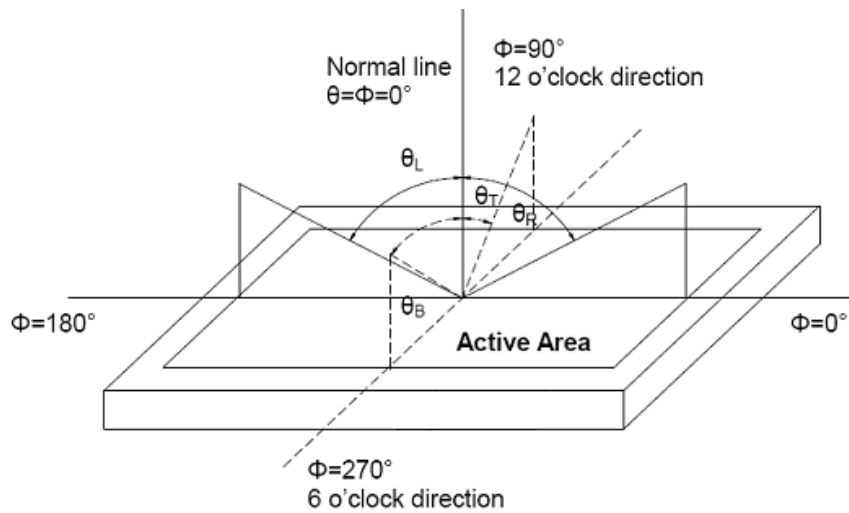
Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.



**Fig1. Measurement Set Up**

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD .



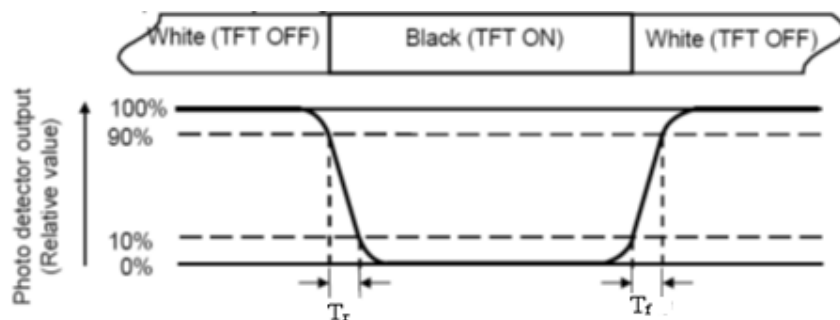
**Fig2. Measurement viewing angle**

Note3: Definition of contrast ratio

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

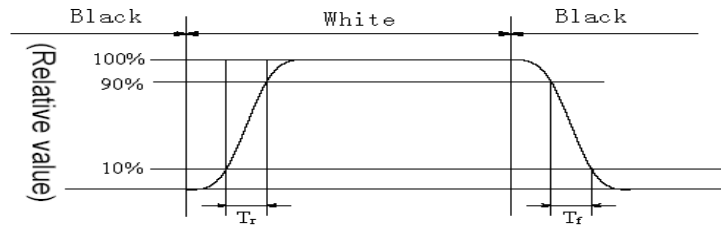
Note4: Definition of Response time

For TN LCM, the response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ( $T_r$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_f$ ) is the time between photo detector output intensity changed from 10% to 90%.



**Fig3. Response Time Testing(TN)**

For SFT LCM, the response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ( $T_r$ ) is the time between photo detector output intensity changed from 10% to 90%. And fall time ( $T_f$ ) is the time between photo detector output intensity changed from 90% to 10%.



**Fig4. Response Time Testing(SFT)**

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

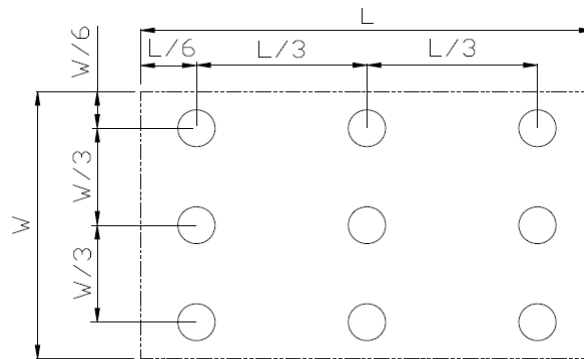
Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity ( $U$ ) =  $L_{min} / L_{max}$

$L_{max}$ : The measured Maximum luminance of all measurement position.

$L_{min}$ : The measured Minimum luminance of all measurement position.

$L$ -----Active area length;  $W$ ----- Active area width



**Fig5. Luminance Uniformity Measurement Locations(9 points)**

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

## 8. Reliability Test

| No | Test Item                                               | Condition                                                                                                                                      | Remarks                                                                                         |
|----|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1  | High Temperature Operation                              | +70℃ , 240H                                                                                                                                    | IEC60068-2-1:2007<br>GB2423.2-2008                                                              |
| 2  | Low Temperature Operation                               | -20℃ , 240H                                                                                                                                    | IEC60068-2-1:2007<br>GB2423.1-2008                                                              |
| 3  | High Temperature Storage                                | +80℃ , 240H                                                                                                                                    | IEC60068-2-1:2007<br>GB2423.2-2008                                                              |
| 4  | Low Temperature Storage                                 | -30℃ , 240H                                                                                                                                    | IEC60068-2-1:2007<br>GB2423.1-2008                                                              |
| 5  | Storage at High Temperature and Humidity(non-operation) | +60℃ , 90%RH , 240H                                                                                                                            | IEC60068-2-78 :2001<br>GB/T2423.3—2006                                                          |
| 6  | Thermal Shock (non-operation)                           | -30℃ , 30min~80℃ , 30min , change time : 5min , 100cycle                                                                                       | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14:1984,GB2423.22-2002 |
| 7  | ESD                                                     | C=150pF , R=330Ω , 5point/panel<br>Air : ±8kv , 5times ;<br>Contact : ±4kv , 5times ;<br>( Environment : 15℃~35℃ ,<br>30%~60% , 86Kpa~106Kpa ) | IEC61000-4-2:2001<br>GB/T17626.2-2006                                                           |
| 8  | Package Vibration                                       | 5-20-200HZ , PSD : 0.01-0.01-0.001<br>Total:0.781g <sup>2</sup> /HZ,x/y/z 30min )                                                              | GB/T 4857.23-2012                                                                               |
| 9  | Package Drop Test                                       | Height: X cm,1 corner, 3edges, 6 surfaces<br>Note : X > 10Kg:60cm ; ≤10Kg:80cm                                                                 | IEC60068-2-32:1990<br>GB/T2423.8—1995                                                           |

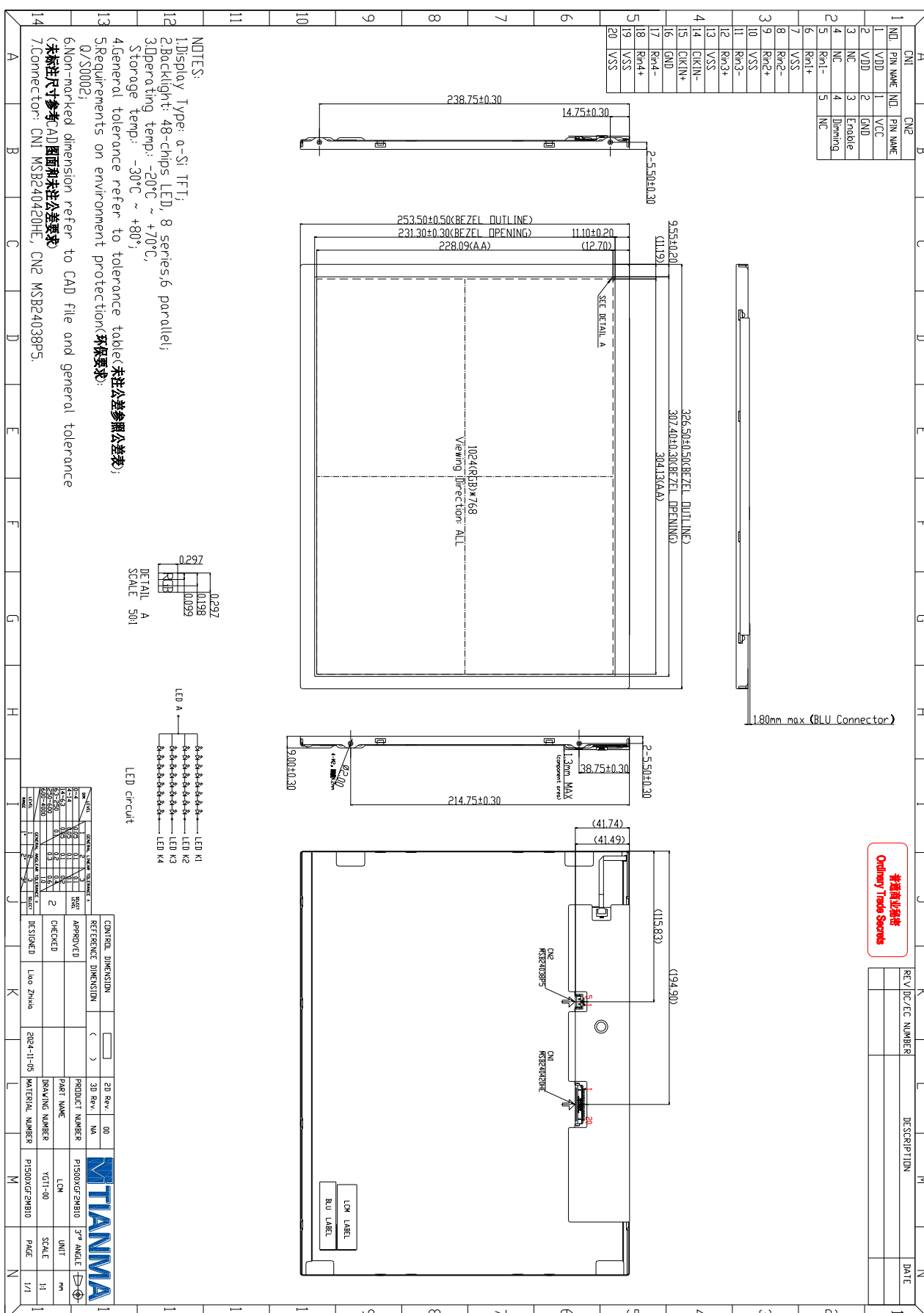
**Table 8.1 RA test condition**

Note1: Temperature is the ambient temperature of sample

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

## 9. Mechanical Drawing

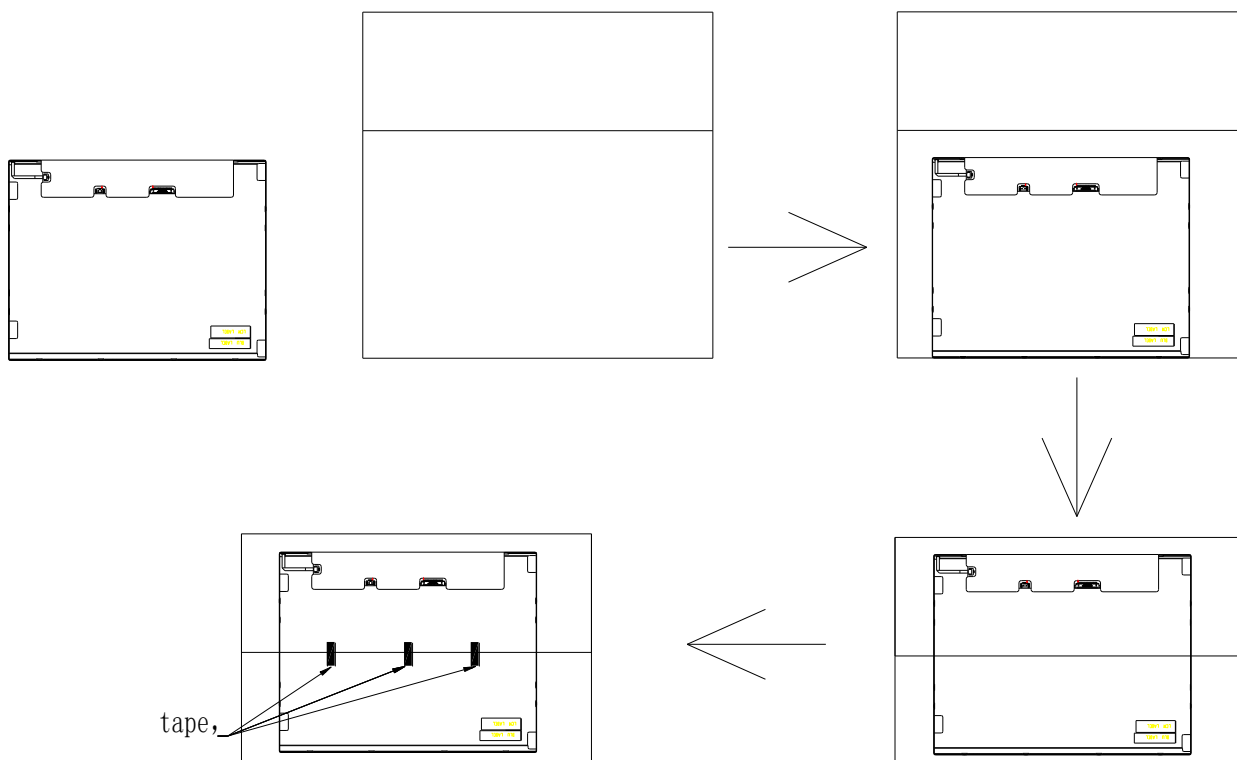


## 10. Packing Instruction

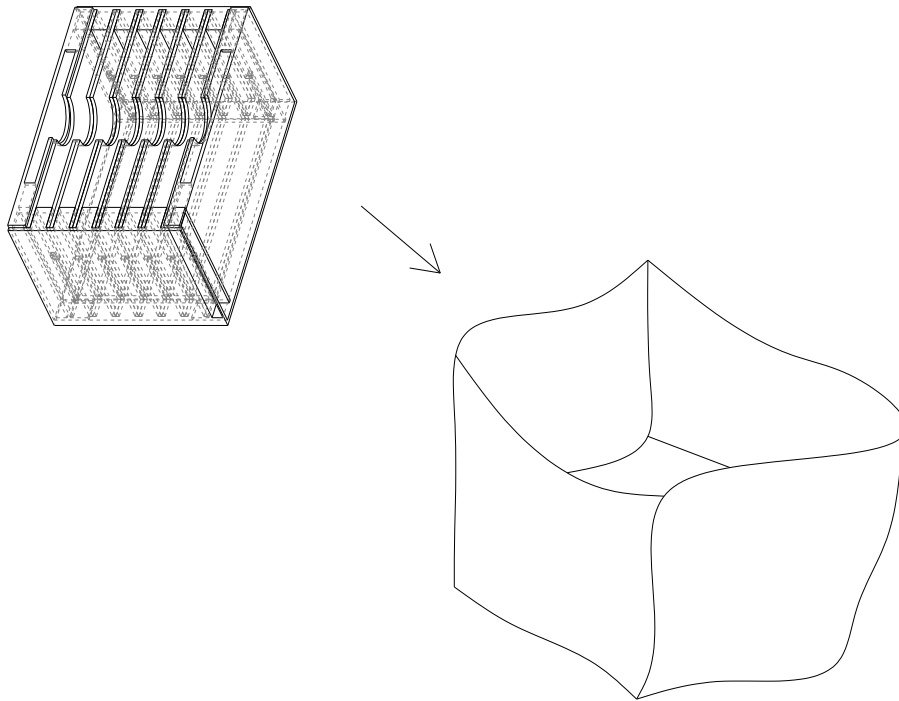
| No | Item           | Model (Material) | Dimensions(mm)  | Unit Weight(Kg) | Quantity | Remark |
|----|----------------|------------------|-----------------|-----------------|----------|--------|
| 1  | LCM module     | P1500XGF2MB10    | 326.5×253.5×9.0 | 0.875           | 12       |        |
| 2  | Paper card     | Corrugated Paper | 544×348×285     | 1.650           | 1        |        |
| 3  | Dust-proof Bag | PE               | 700×545×0.05    | 0.021           | 1        |        |
| 4  | Carton         | Corrugated Paper | 544×273.5×312.5 | 0.75            | 1        |        |
| 5  | Paper board    | Corrugated Paper | 527×348×6       | 0.1             | 1        |        |
| 6  | Label          | Label            | 100×52          | 0.001           | 1        |        |
| 7  | Tape           | Tape             | 10×30           | 0.001           | 36       |        |
| 8  | ESD bubble bag | PE               | 350×350×6       | 0.18            | 12       |        |
| 9  | Total weight   | 3.578kg          |                 |                 |          |        |

### Drawing notes:

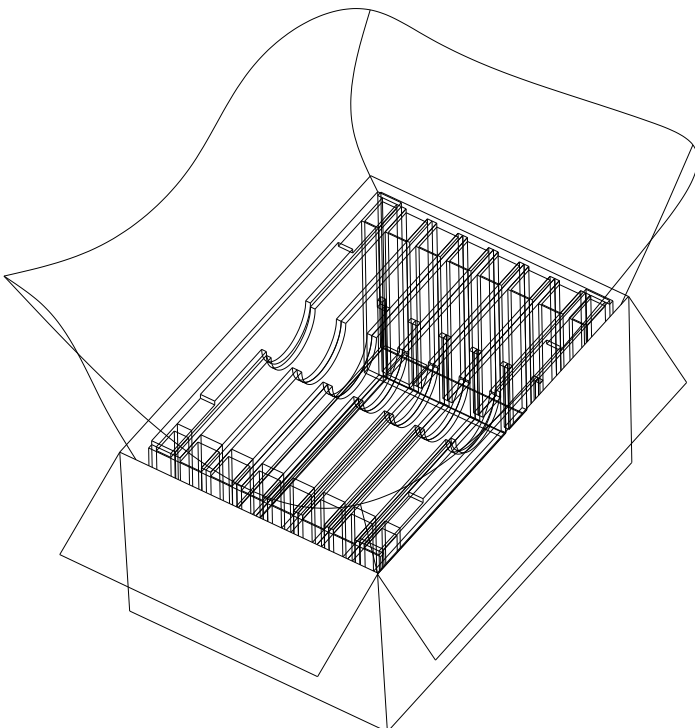
1、The protruding part of the casing of the module is placed on the open side of the bubble bag, put into the bubble bag, folded and attached with masking tape.



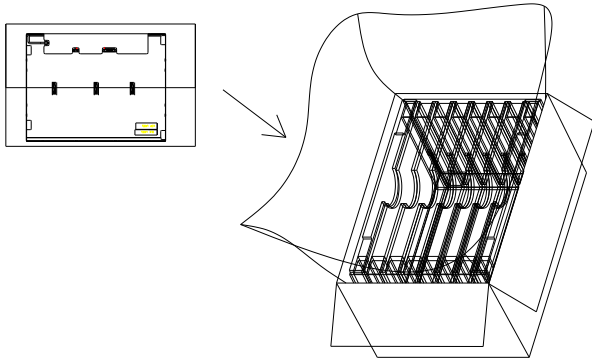
**2、Place the paper card in a dust bag**



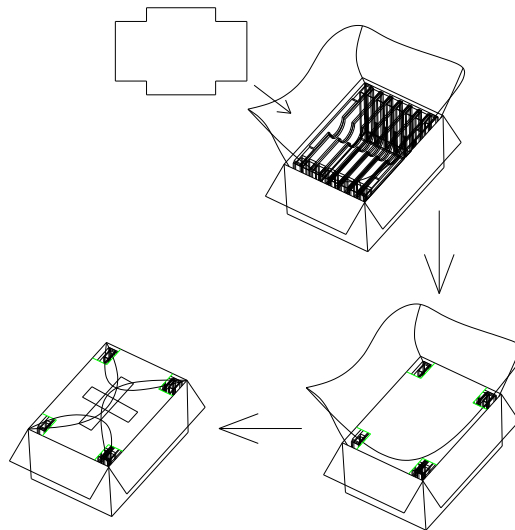
**3、Put the combination of the paper card and dust bag in Step 2 into the cardboard box**



4、Put the modules into cartons, and each carton is loaded with 12 modules,



5、Put the cardboard into the carton, cover it on the paper card, and fold the excess part of the dust bag over, and fixed with tape



6、Seal the box with tape and attach a label



## 11. Precautions for Use of LCD Modules

### 11.1 Handling Precautions

- (1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
- (2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
  - Isopropyl alcohol
  - Ethyl alcohol
 Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
  - Water
  - Ketone
  - Aromatic solvents
- (6) Do not disassemble the LCD Module.
- (7) If powered off, do not apply the input signals.
- (8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
- (9) Be sure to ground your body when handling the LCD Modules.
- (10) Tools used for assembly, must be properly grounded.
- (11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
- (12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

### 11.2 Storage precautions

- (1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 °C at normal humidity.
- (3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

### 11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

### 11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

### 11.5 Safety Precautions

- (1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
- (2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- (3) LED driver should be designed to limit or stop its function when over current is detected on the LED.

Our company network supports you worldwide with offices in Germany, Austria, Switzerland, Benelux, Egypt, the UK and the USA. For more information please contact:

## FORTEC

GROUP

**FORTEC Elektronik AG** | Augsburger Straße 2b | 82110 Germering  
+49 89 894450-0  
[info@fortecag.de](mailto:info@fortecag.de) | [www.fortecag.de](http://www.fortecag.de)

---

## FORTEC

INTEGRATED

**FORTEC Integrated GmbH** | Augsburger Straße 2b | 82110 Germering  
+49 89 894363-0  
[info@fortec-integrated.de](mailto:info@fortec-integrated.de) | [www.fortec-integrated.de](http://www.fortec-integrated.de)

## FORTEC

POWER

**FORTEC Power GmbH** | Lise-Meitner-Straße 3 | 64560 Riedstadt  
+49 6158 8285-0  
[weborder@fortec-power.de](mailto:weborder@fortec-power.de) | [www.fortec-power.de](http://www.fortec-power.de)

## FORTEC

UNITED KINGDOM

**FORTEC Technology UK Ltd.** | Osprey House | 1 Osprey Court  
Hinchingbrooke Business Park | Huntingdon | Cambridgeshire | PE29 6FN  
+44 1480 411600 | [info@fortec.uk](mailto:info@fortec.uk) | [www.fortec.uk](http://www.fortec.uk)

## FORTEC

UNITED STATES

**FORTEC United States, Corp.** | 87 Raynor Avenue Unit 1 | Ronkonkoma  
NY | 11779 | +1 631 5804360  
[info@fortec.us](mailto:info@fortec.us) | [www.fortec.us](http://www.fortec.us)

## FORTEC

CZECH REPUBLIC

**FORTEC Czech Republic s.r.o.** | Přátelství 275 | 330 02 Dýšina  
+49 89 894363-0  
[info@fortec.cz](mailto:info@fortec.cz) | [www.fortec.cz](http://www.fortec.cz)

## FORTEC

SWITZERLAND

**FORTEC Switzerland AG** | Bahnhofstraße 3 | 5436 Würenlos  
+41 44 7446111  
[info@fortec.ch](mailto:info@fortec.ch) | [www.fortec.ch](http://www.fortec.ch)

## FORTEC

EGYPT

**FORTEC Electronic Design and Solution Egypt SMLC** | Linx Business Park  
Unit B318 | Smart Village | Giza Governorate  
+20 120 1146222 | [info@fortec.eg](mailto:info@fortec.eg) | [www.fortec.eg](http://www.fortec.eg)

## FORTEC

BENELUX

**FORTEC Benelux B.V.** | Everdenberg 79 | 4902 TT Oosterhout  
+31 162 515458  
[info@fortec-benelux.com](mailto:info@fortec-benelux.com) | [www.fortec-benelux.com](http://www.fortec-benelux.com)