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Datasheet

Tianma

P1210XGF1MB00

TI-01-019

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1. Summary

1.1 General Description

This is a 12.1 inch a-Si TFT-LCD module with normal- black SFT technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle (Super Fine TFT (SFT));
- LCM Interface: 1port LVDS 8bit / 6bit;
- High NTSC

- 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 |
|-----------------------------------|---------------------------------|------------------------------|
| Display Spec. | Size | 12.1 inch |
| | Resolution | 1024(RGB) x 768 |
| | Technology Type | SFT |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Pixel Pitch (mm) | 0.240 (H) × 0.240 (V) |
| | Display Mode | Transmissive, Normally Black |
| | Surface Treatment(Up Polarizer) | HC |
| | Viewing Direction | All direction |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 260.5 x 203 x 9.5 |
| | Active Area(mm) | 245.76 x 184.32 |
| | With /Without TSP | Without Touch Screen |
| | LCM connector type(CN1) | FI-SEB20P-HFE |
| | Backlight connector type(CN2) | SM10B-SHLS-TF(LF)(SN) |
| | Weight (g) | 556g |
| Electrical Characteristics | Interface | 1port LVDS 8bit / 6bit |
| | Color Depth | 16.7M&262K |

Table 2 General TFT Specifications

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: +/- 5%

3. Input / Output Terminals

3.1 CN1 Pin assignment (CN1)

Matching connector: FI-SEB20P-HFE(JAE) or equivalent

| Pin No. | Symbol | Signal | Input data signal: 8-bit | | Input data signal: 6-bit | Remarks | |
|---------|--------|-----------------------------------|--|-------------------|--------------------------|---------|--------------------|
| | | | MAP A | MAP B | | | |
| 1 | A | D3+ | Pixel data | R0-R1,G0-G1,B0-B1 | R6-R7,G6-G7,B6-B7 | - | |
| | B | GND | Ground | - | | Ground | |
| 2 | A | D3- | Pixel data | R0-R1,G0-G1,B0-B1 | R6-R7,G6-G7,B6-B7 | - | |
| | B | GND | Ground | - | | Ground | |
| 3 | DPS | Selection of scan direction | High: Normal scan Low: Reverse scan | | | | Default H Note2 |
| 4 | FRC | Selection of the number of colors | High | | Low | | Default H |
| 5 | GND | Ground | Ground | | | | |
| 6 | CLK+ | Pixel clock | Pixel clock | | | | |
| 7 | CLK- | | | | | | |
| 8 | GND | Ground | Ground | | | | |
| 9 | D2+ | Pixel data | B4-B7,DE | B2-B5,DE | | | |
| 10 | D2- | | | | | | |
| 11 | GND | Ground | Ground | | | | |
| 12 | D1+ | Pixel data | G3-G7,B2-B3 | G1-G5,B0-B1 | | | |
| 13 | D1- | | | | | | |
| 14 | GND | Ground | Ground | | | | |
| 15 | D0+ | Pixel data | R2-R7,G2 | R0-R5,G0 | | | |
| 16 | D0- | | | | | | |
| 17 | GND | Ground | Ground | | | | |
| 18 | MSL | Selection of LVDS input map | Low | High | | | Default H |
| 19 | VCC | Power supply | Power supply | | | | |
| 20 | VCC | | | | | | |

Note1: All of the GND Pins should be connected to the system ground.

Note2: Scanning direction please refer to below picture:

The following figures are seen from a front view.

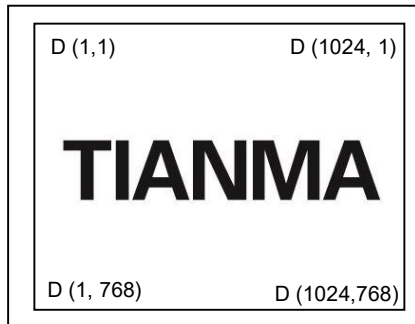


Figure1. Normal scan (DPS: High)

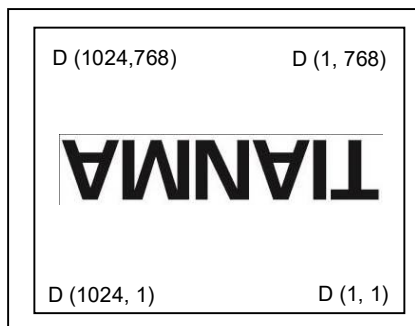


Figure3.1. Reverse scan (DPS: Low)

3.2 CN2 Pin assignment (CN2)

Matching connector: SM10B-SHLS-TF(LF)(SN)(JST)

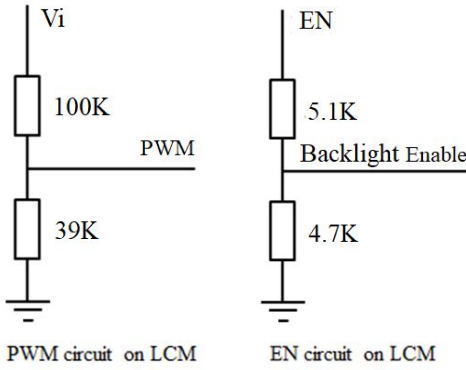
| No | Symbol | I/O | Description | Remarks |
|----|------------------|-----|-------------------------|-------------------|
| 1 | VI | P | Converter input voltage | |
| 2 | VI | P | Converter input voltage | |
| 3 | VI | P | Converter input voltage | |
| 4 | VI | P | Converter input voltage | |
| 5 | V _{GND} | P | Converter ground | |
| 6 | V _{GND} | P | Converter ground | |
| 7 | V _{GND} | P | Converter ground | |
| 8 | V _{GND} | P | Converter ground | |
| 9 | EN | I | Enable pin | Default L(Note 1) |
| 10 | PWM | I | Backlight Adjust | Default H(Note2) |

Table 3.2 Pin Assignment for backlight

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

Note2: The circuit diagram of PWM on LCM is as follows:

Note3: The circuit diagram of EN on LCM is as follows:



4. Absolute Maximum Ratings

4.1 Driving TFT LCD panel

GND=0V, Ta = 25°C

| Parameter | | Symbol | Rating | Unit | Remarks | |
|----------------------------|-----------------------------------|------------|---------------|------------------|------------------|---|
| Power supply voltage | LCD panel signal processing board | VCC | -0.3 to +5.0 | V | Ta= 25°C | |
| | LED driver | Vi | 9V to 28V | | | |
| Input voltage for signals | Logic Input Voltage | Low level | VIL | 0 to 0.3VCC | | V |
| | | High level | VH | 0.7VCC to VCC | | |
| | LED driver | PWM | 0 to 5 | V | | |
| | | EN | 0 to 15 | | | |
| Storage temperature | | Tst | -40 to +90 | °C | - | |
| Operating temperature | Front surface | TopF | -30 to +80 | °C | Note1 | |
| | Rear surface | TopR | -30 to +80 | °C | Note2 | |
| Relative humidity Note4 | | RH | ≤ 95 | % | Ta ≤ 40°C | |
| | | | ≤ 85 | % | 40°C < Ta ≤ 50°C | |
| | | | ≤ 55 | % | 50°C < Ta ≤ 60°C | |
| | | | ≤ 36 | % | 60 < Ta ≤ 70°C | |
| | | | ≤ 24 | % | 70 < Ta ≤ 80°C | |
| Absolute humidity Note3 | | AH | ≤ 70 Note4 | g/m ³ | Ta = 80°C | |

Table 4.1 Absolute Maximum Ratings

Note1: Measured at LCD panel surface (including self-heat)

Note2: Measured at LCD module's rear shield surface (including self-heat)

Note3: No condensation

Note4: Water amount at Ta= 80°C and RH= 24%

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

GND=0V, Ta = 25°C

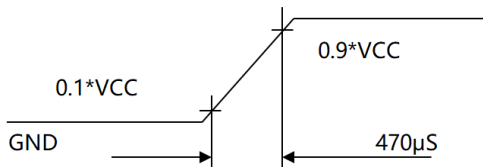
| Parameter | Symbol | min. | typ. | max. | Unit | Remarks |
|--|--------|------|--------|---------------|--------|----------------------|
| Power supply voltage | VCC | 3.2 | 3.3 | 3.4 | V | - |
| Power supply current | ICC | - | 135 | 202 | mA | at VCC=3.3V Note1 |
| Permissible ripple voltage | VRPC | - | - | 100 | mVp-p | for VCC |
| Differential Input common Mode voltage | RXVCM | 1 | 1.2 | 1.4 | V | |
| Differential input voltage | VID | 0.1 | - | (1.5-RxVCM)*2 | mV | |
| Inrush current | Irush | - | - | 1 | A | Note2 |
| Input voltage for DPS,FRC and MSL signal | High | VFH1 | 0.7VCC | - | VCC | CMOS level |
| | Low | VFL1 | 0 | - | 0.3VCC | |

Table 5.1 Operating Voltages

Note1: Typical picture is White

Note2: Inrush current should be tested under LCD_VDD rising time 470us.

VCC rising time is 470 μS



5.2 DC Characteristics for Backlight Driving

| Parameter | | Symbol | min. | typ. | max. | Unit | Remarks |
|-------------------------------|------|------------|------|-------|------|---------|--------------|
| Power supply voltage | | V_i | 11.2 | 12.0 | 12.8 | V | Note1 |
| Power supply current Note2 | | I_i | - | 490 | 612 | mA | Note4 |
| Permissible ripple voltage | | VRPD | - | - | 200 | mVp-p | for VDD |
| Input voltage for PWM signal | High | VDFH1 | 1.2 | - | 4.5 | V | - |
| | Low | VDFL1 | 0 | - | 0.35 | V | |
| Input voltage for EN signal | High | VDFH2 | 6 | 12 | 14 | V | - |
| | Low | VDFL2 | 0 | - | 3 | V | |
| PWM frequency | | f_{PWM} | 200 | - | 10K | Hz | Note5, Note6 |
| PWM duty ratio | | DR_{PWM} | 5% | - | 100 | % | Note7 |
| PWM pulse width | | t_{PWH} | 10 | - | - | μs | |
| LED Life Time | | LT | - | 50000 | - | Hrs | Note8 |

Note1: When designing of the power supply, take the measures for the prevention of surge voltage.

Note2: The power supply lines (V_i and GND) may have ripple voltage during luminance control of LED. There is the possibility that the ripple voltage produces acoustic noise and signal wave noise in audio circuit and so on. Put a capacitor between the power supply lines (V_i and GND) to reduce the noise if necessary.

Note3: This value excludes peak current such as overshoot current.

Note4: At the maximum luminance control

Note5: A recommended f_{PWM} value is as follows.

$$f_{PWM} = \frac{2n-1}{4} \times fv$$

(n = integer, fv = frame frequency of LCD module)

Note6: Depending on the frequency used, some noise may appear on the screen, please conduct a thorough evaluation.

Note7: The recommended PWM frequency is 200Hz to 10kHz, but the LED current cannot be 100% proportional to duty cycle, especially for high frequency and low duty ratio.

While the EN signal is high, do not set the t_{PWH} (PWM pulse width) is less than $0.1\mu s$. It may cause abnormal working of the backlight. In this case, turn the backlight off and then on again by EN signal.

Note8: Optical performance should be evaluated at $T_a=25^\circ C$ Only.

If LED is driven by high current, high ambient temperature & humidity condition.

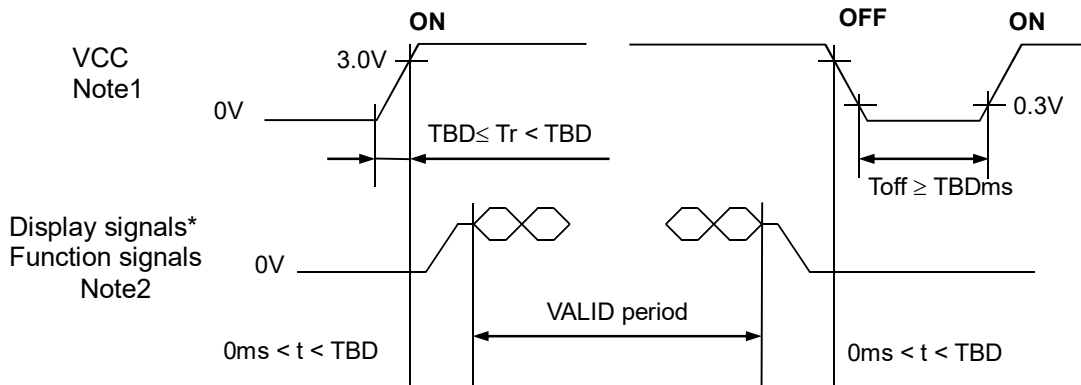
The life time of LED will be reduced.

Operating life means brightness goes down to 50% of initial brightness.

Typical operating life time is estimated data.

5.3 Recommended LCD Power ON/OFF Sequence

5.3.1 LCD power ON/OFF sequence



* These signals should be measured at the terminal of 100Ω resistance.

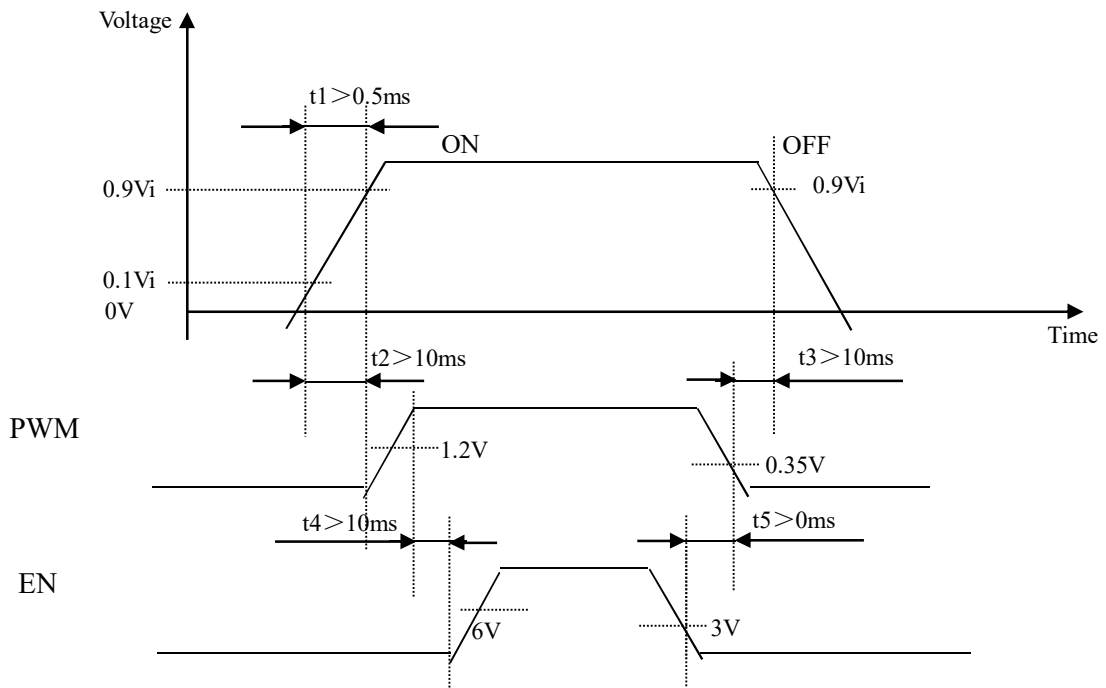
Figure 5.3.1 Power on sequence

Note1: If there is a voltage variation (voltage drop) at the rising edge of VCC below 3.0V, there is a possibility that a product does not work due to a protection circuit.

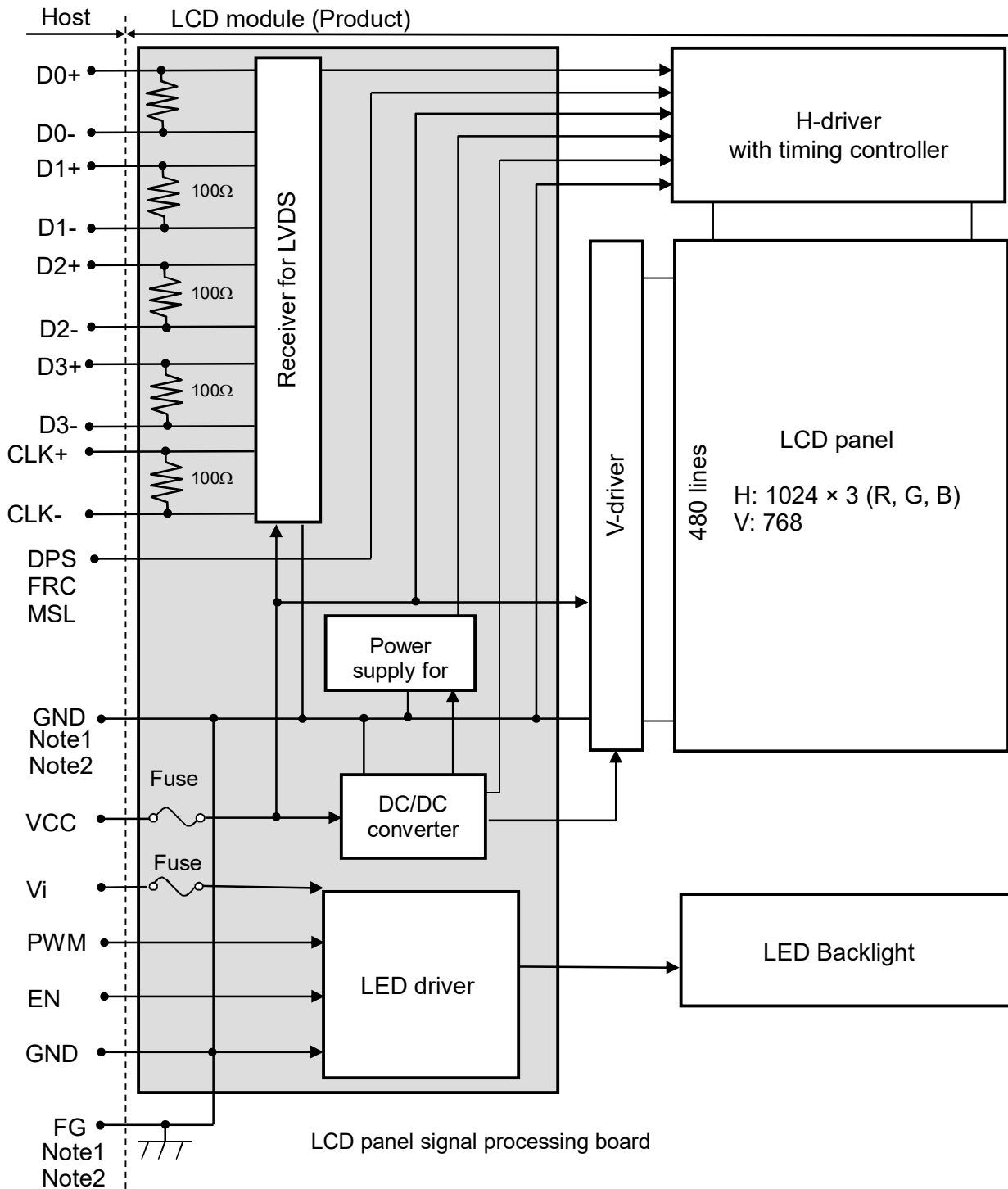
Note2: Display signals (D0+/-, D1+/-, D2+/- and CLK+/-) and function signals (DPS) must be set to Low or High-impedance, except the VALID period (See above sequence diagram), in order to avoid the circuitry damage.

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, VCC also must be shut do

5.3.2 LED Driver



5.4 LCD Module Block Diagram



Note1: GND (Signal ground) is connected to FG (Frame ground) in the LCD module
 Note2: GND and FG must be connected to customer equipment's ground, and it is recommended that these grounds to be connected together in customer equipment.

6. Timing Characteristics

6.1 Timing Characteristics

| Parameter | | Symbol | min. | typ. | max. | Unit | Remarks | |
|-----------|----------------------|----------------|-------|-------|--------|------|-----------------|-------------------|
| CLK | Frequency | 1/tc | 50.34 | 50.66 | 65.34 | MHz | 19.739ns (typ.) | |
| DE | Horizontal | Cycle | th | - | 21.477 | - | μs | 46.561 kHz (typ.) |
| | | | | 1084 | 1,088 | 1214 | CLK | |
| | Vertical (One frame) | Display period | thd | 1024 | | | CLK | - |
| | | Cycle | tv | - | 16.666 | - | ms | 60.0Hz (typ.) |
| | | | 774 | 776 | 897 | H | | |
| | Display period | tvd | 768 | | | H | - | |

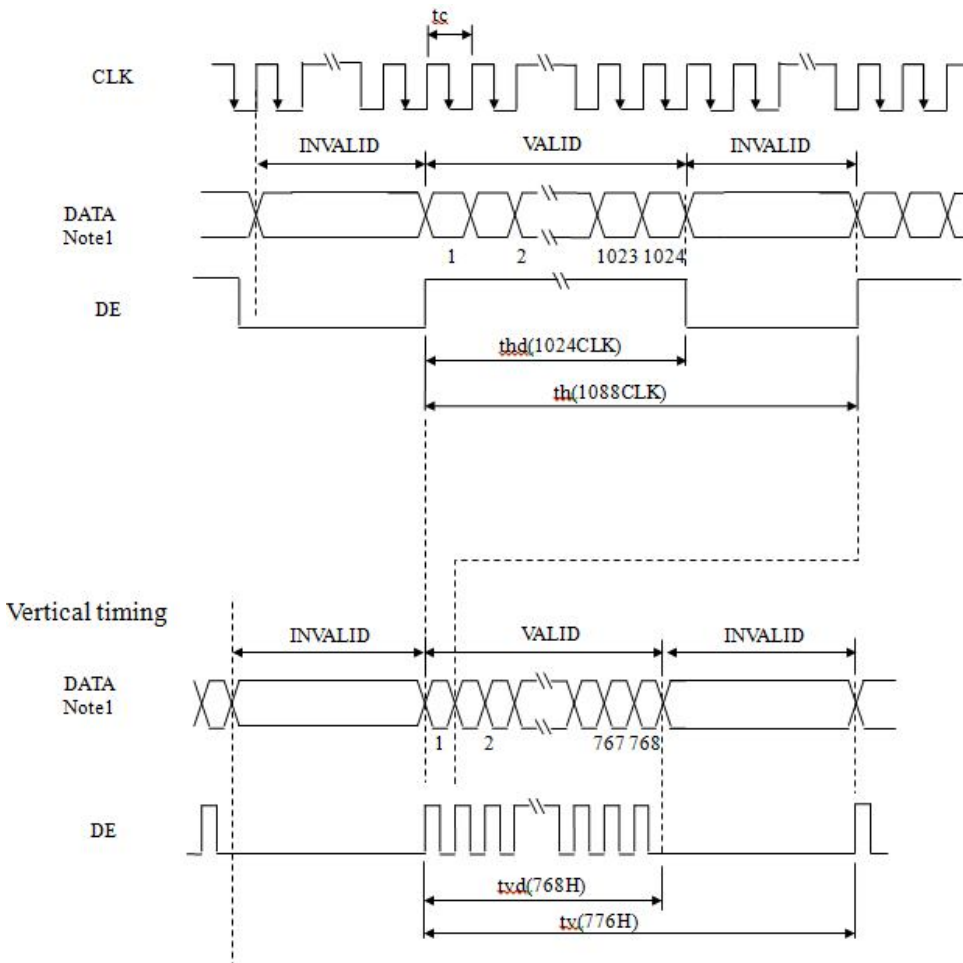
Note1: Definition of parameters is as follows:

$$t_c = 1\text{CLK}, t_h = 1\text{H}$$

Note2: See the data sheet of LVDS transmitter.

Note3: Vertical cycle (tv) should be specified in integral multiple of Horizontal cycle (th)

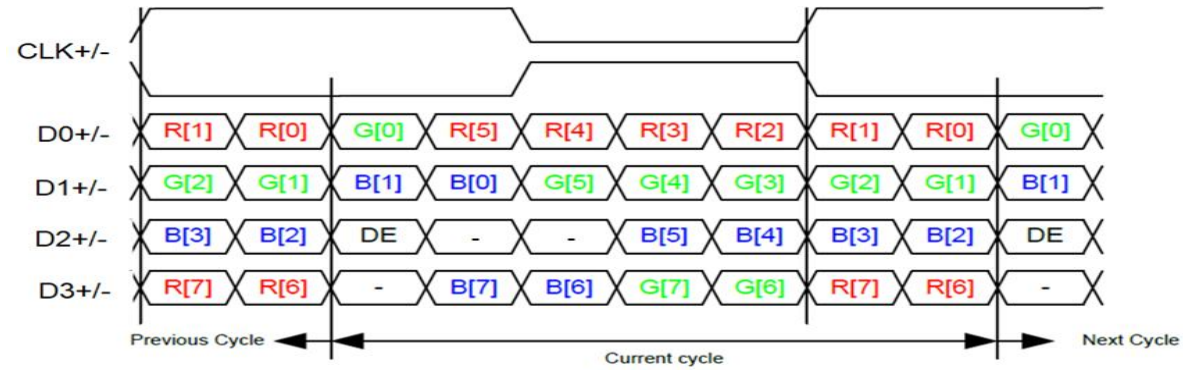
6.2 Input signal timing chart



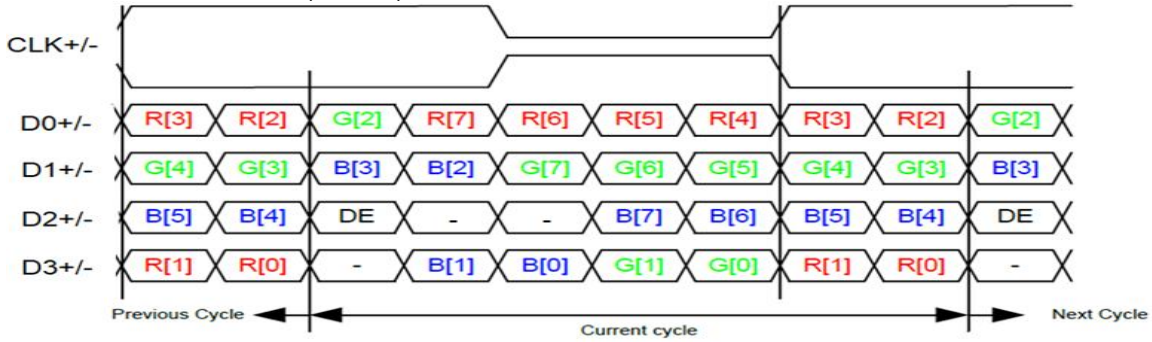
Note1: DATA = R0-R7, G0-G7, B0-B7

6.3 LVDS data input format

Input data signal: 8-bit



VESA (MAP B) format

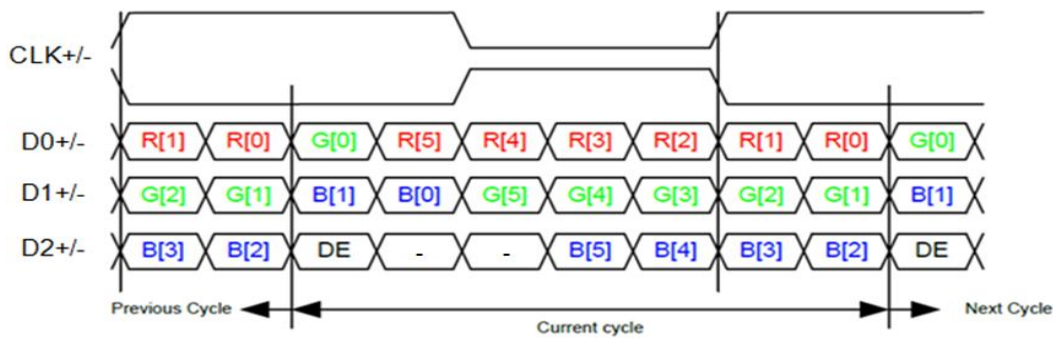


JEIDA (MAP A) format

Note1: LSB (Least Significant Bit) – R0, G0, B0, MSB (Most Significant Bit) – R7, G7, B7

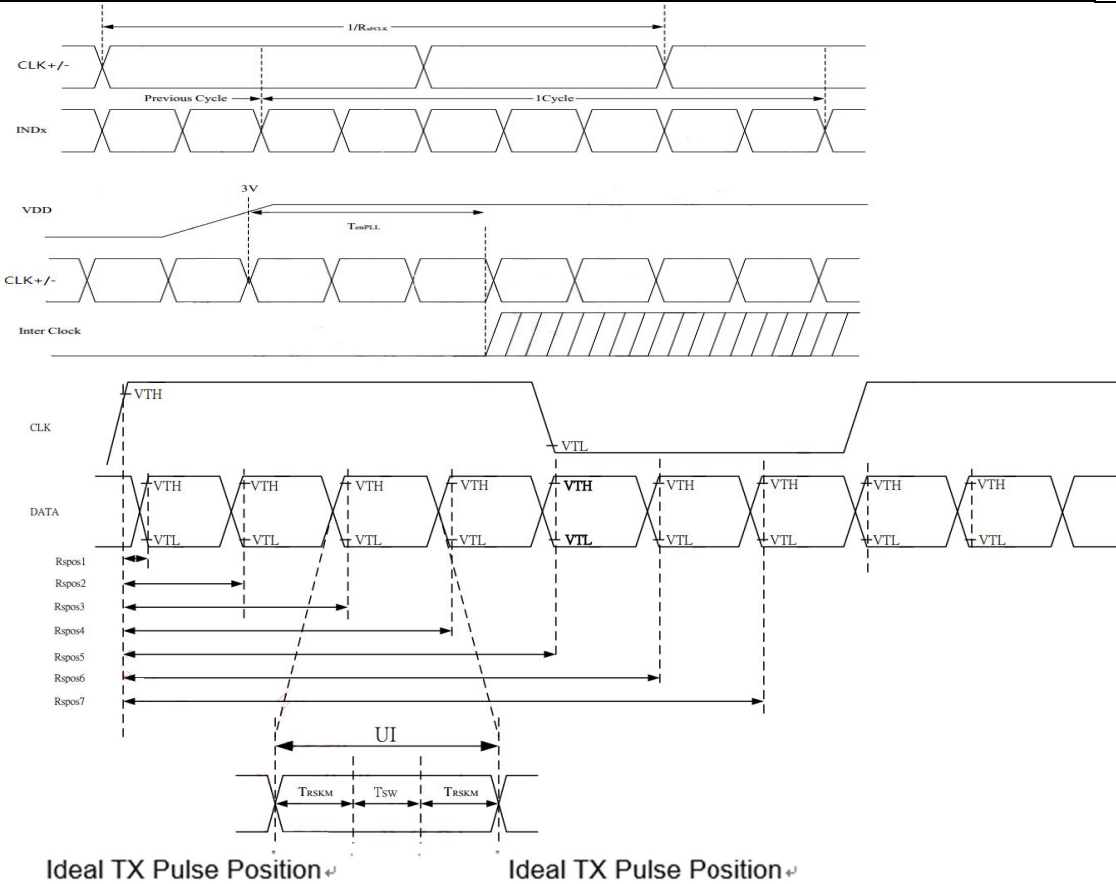
Note2: Twist pair wires with 100Ω (Characteristic impedance) should be used between LCD panel signal processing board and LVDS transmitter.

Input data signal: 6-bit



6.4 LVDS RX AC SPEC

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|------------------------|--------|------|--------------|------|------|--|
| Clock frequency | RXFCLK | 10 | - | 110 | MHz | |
| 1 data bit time | UI | 1/7 | 1/RXFCLK | | | |
| Position 1 | Rspos1 | -0.2 | 0 | 0.2 | UI | |
| Position 2 | Rspos2 | 0.8 | 1 | 1.2 | UI | |
| Position 3 | Rspos3 | 1.8 | 2 | 2.2 | UI | |
| Position 4 | Rspos4 | 2.8 | 3 | 3.2 | UI | |
| Position 5 | Rspos5 | 8 | 4 | 4.2 | UI | |
| Position 6 | Rspos6 | 4.8 | 5 | 5.2 | UI | |
| Position 7 | Rspos7 | 5.8 | 6 | 6.2 | UI | |
| Input data skew margin | TRSKM | - | - | 0.2 | UI | VID =100mV RXVCM=1.2V RXFCLK=75MHz |
| Clock high time | TLVCH | - | 4/(7*RXFCLK) | - | ns | |
| Clock low time | TLVCL | - | 3/(7*RXFCLK) | - | ns | |
| PLL wake-up time | TenPLL | - | - | 150 | us | |



TRSKM: Receiver strobe margin
 Tsw: Strobe width (internal data sampling window)
 $V_{TH} = R_{xvcm} + |VID|/2$, $V_{TL} = R_{xvcm} - |VID|/2$

7. Optical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark | |
|----------------|------------|------------------|-----|-------|-------|-------------------|----------------|----------------|
| View Angles | θT | CR \square 10 | 70 | 88 | - | Degree | Note 2 | |
| | θB | | 70 | 88 | - | | | |
| | θL | | 70 | 88 | - | | | |
| | θR | | 70 | 88 | - | | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 800 | 1000 | - | - | Note1 Note3 | |
| Response Time | T_{ON} | 25°C | - | 25 | 35 | ms | Note1 | |
| | T_{OFF} | | | | | | Note4 | |
| Chromaticity | White | Backlight is on | x | 0.253 | 0.303 | 0.353 | - | Note5 Note1 |
| | | | y | 0.287 | 0.337 | 0.387 | | |
| | Red | | x | 0.589 | 0.639 | 0.689 | | |
| | | | y | 0.286 | 0.336 | 0.386 | | |
| | Green | | x | 0.238 | 0.288 | 0.338 | | |
| | | | y | 0.568 | 0.618 | 0.668 | | |
| | Blue | | x | 0.099 | 0.149 | 0.199 | | |
| | | | y | 0.017 | 0.067 | 0.117 | | |
| Uniformity | U | - | 75 | 80 | - | % | Note1 Note6 | |
| NTSC | - | - | 65 | 72 | - | % | Note 5 | |
| Luminance | L | - | 350 | 500 | - | cd/m ² | Note1 | |

Table 7.1 Optical Parameters

Test Conditions:

1. The ambient temperature is $25\pm 2^\circ\text{C}$. humidity is $65\pm 7\%$
2. The test systems refer to Note 1 and Note 2.

stable forward current should be input, the ambient temperature is 25°C

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.

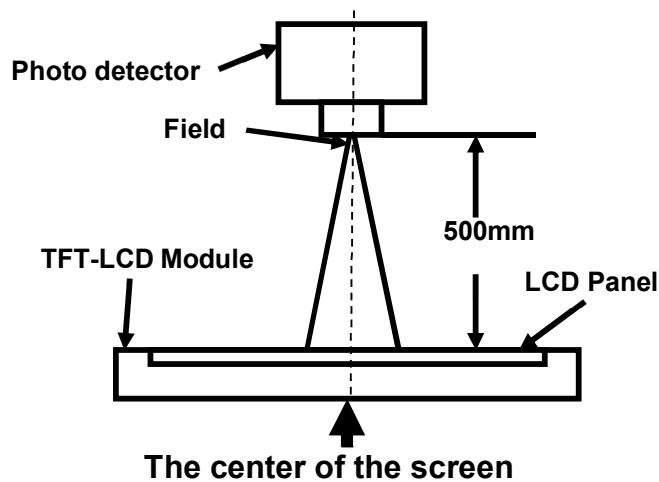


Fig1. Measurement Set Up

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

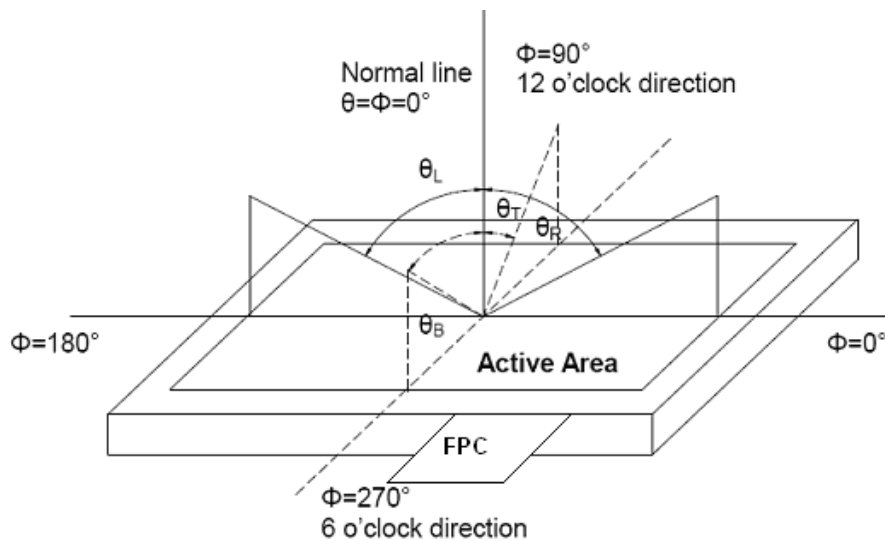


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

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

“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

The luminance of white and black should be measured at perpendicular direction.

Note4: 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_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%.

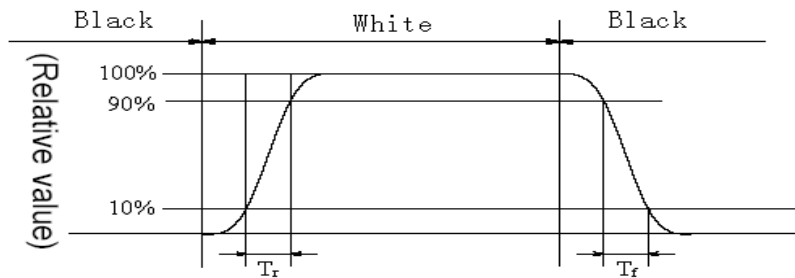


Fig4. Response Time Testing(SFT)

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.

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

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

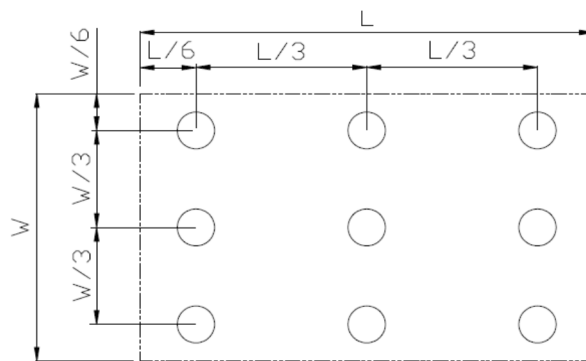


Fig5. Luminance Uniformity Measurement Locations (9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

| No | Test Item | Condition | Remark |
|----|--|--|---|
| 1 | High Temperature Operation | Ta = +80℃, 240 hours | IEC60068-2-1 GB2423.2 |
| 2 | Low Temperature Operation | Ta = -30℃, 240 hours | IEC60068-2-1 GB2423.1 |
| 3 | High Temperature Storage | Ta = +90℃, 240 hours | IEC60068-2-1 GB2423.2 |
| 4 | Low Temperature Storage | Ta = -40℃, 240 hours | IEC60068-2-1 GB2423.1 |
| 5 | High Temperature & High Humidity Operation | Ta = +60℃, 90% RH max, 240 hours | IEC60068-2-78 GB/T2423.3 |
| 6 | Thermal Shock (non-operation) | -30℃ 30 min~+80℃30 min, Change time:5min, 100 Cycle | Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22 |
| 7 | ESD | C=150pF, R=330Ω, 9point/panel Air: ±15Kv, 5 times Contact: ±8Kv, 5times (Environment: 15℃~35℃, 30%~60%.86Kpa~106Kpa) Level C is acceptable. | IEC61000-4-2 GB/T17626.2 |
| 8 | Vibration Test (Non Op) | 5~100HZ, 19.60m/s ² 1min/cycle 120times Per X/Y/Z | IEC60068-2-6 GB/T17626.6 |
| 9 | Mechanical Shock (Non Op) | 539m/s ² , 11ms 5times ±X, ±Y, ±Z | IEC60068-2-27 GB/T2423.5 |

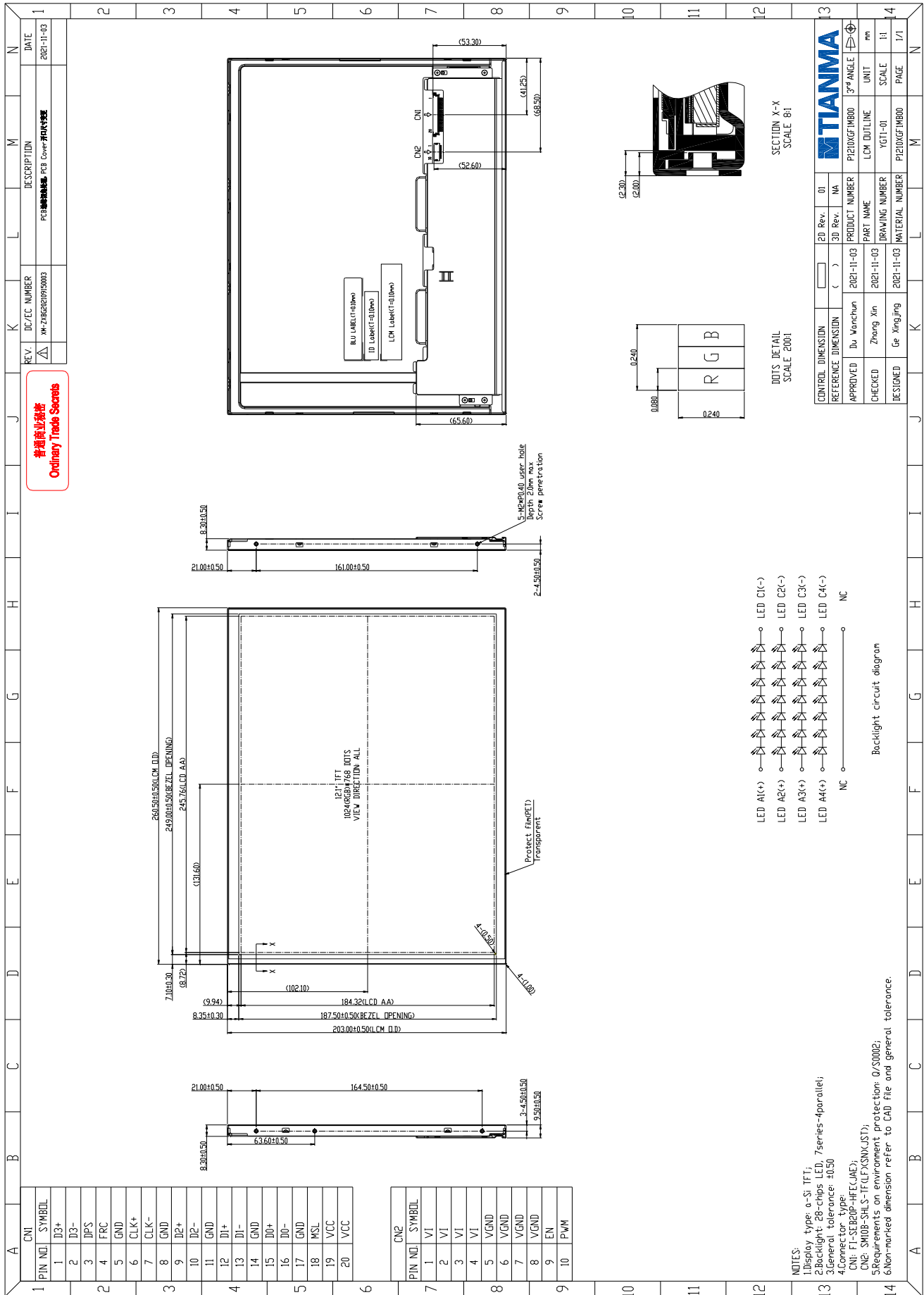
Table 8.1 RA test condition

Note1: Ta 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.

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.

9. Mechanical Drawing



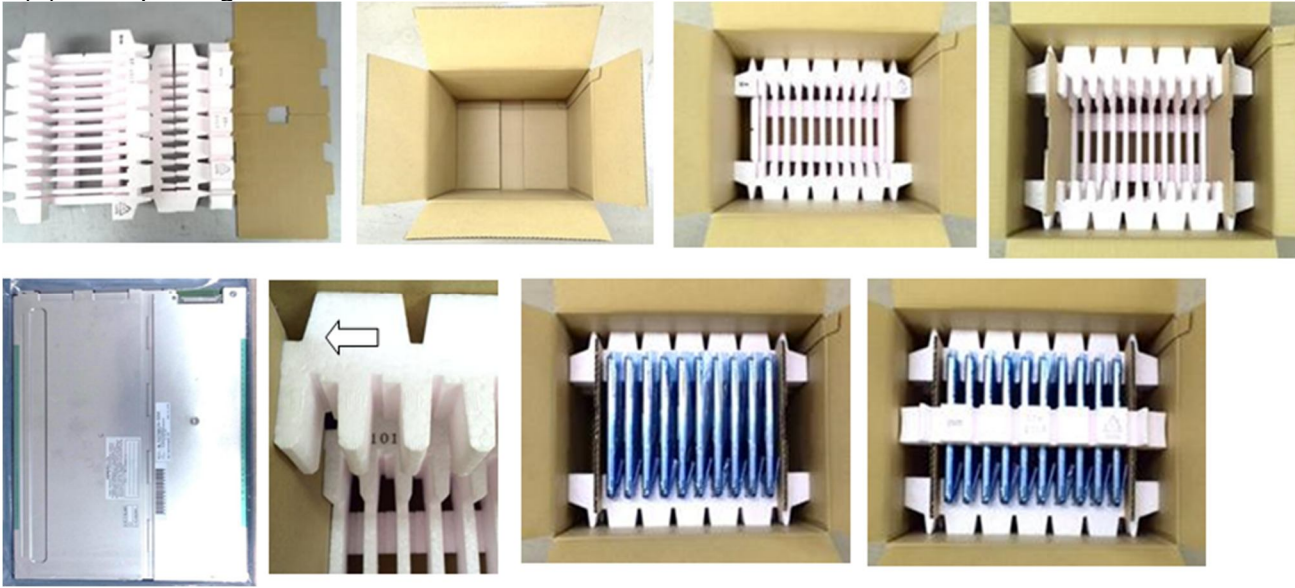
10. Packing Instruction

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark |
|----|-----------------|------------------|----------------|-----------------|----------|--------|
| 1 | LCM module | P1210XGF1MB00 | 260.5×203×9.5 | 0.55 | 10 | |
| 2 | Partition board | Corrugated paper | 271×215 | 0.032 | 2 | |
| 3 | Anti-static Bag | LD-PE | 435×325×0.05 | 0.015 | 10 | |
| 4 | EPP-Bottom | EPP | 430×390×140 | 0.116 | 1 | |
| 5 | EPP-Top | EPP | 430×90×40 | 0.017 | 1 | |
| 6 | Carton | Corrugated paper | 433×395×310 | 1.068 | 1 | |
| 7 | Total weight | 6.92 Kg±5 % | | | | |

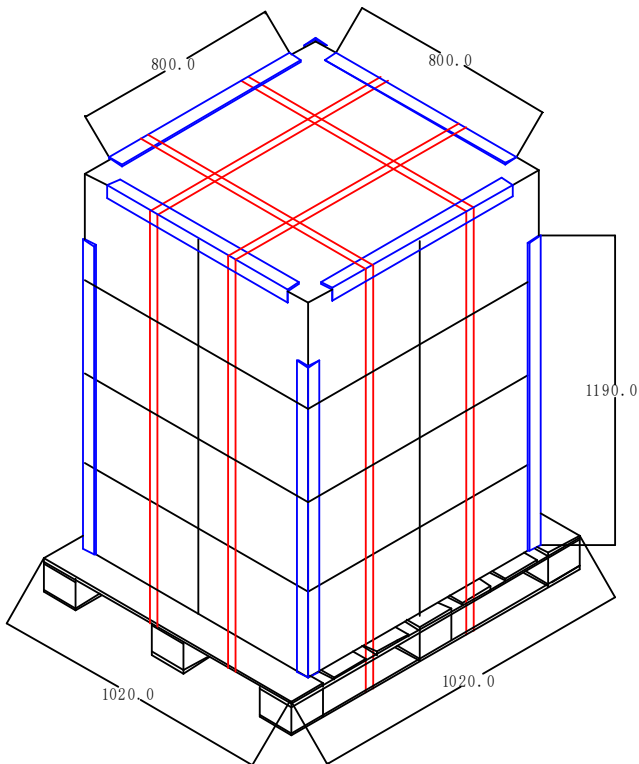
(1) single piece package:



(2) Inner package



Stock method (2*2*4)



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 alcoholSolvents 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/ humidity 30% ~ 75%.
- (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

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