# PRODUCT SPECIFICATION

**CDTECH Model:** **S123IWU12EP-FC20**

**CUSTOMER Model:** -

**Description:** **12.3” TFT-LCD Module with CTP**

**Version:** **1.0**

| CDTECH | PREPARED BY | CHECKED BY | APPROVED BY |
|---|---|---|---|
| SIGNATURE | | | |
| DATE | 2023.3.31 | 2023.3.31 | 2023.3.31 |

| CUSTOMER APPROVAL | SIGNATURE | DATE |
|---|---|---|
| | | |

## Record of Revisions

| Version | Revise Date | Description | Page |
|---|---|---|---|
| 1.0 | 2023-3-31 | First Release | - |
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# 1. General Specifications

## 1.1 LCM General Information

| Item | Specification | Unit |
|---|---|---|
| LCD Size | 12.3 | inch |
| Number of Pixels | 1920 (H) RGB x 720 (V) | pixels |
| Display Mode | Normally Black | - |
| Viewing Direction | Free | o' clock |
| Interface | LVDS | - |
| Display Colors | 16.7M | colors |
| Outline Dimension | 320.33 (H) x 141.13 (V) x 7.80 (D) | mm |
| Active Area | 292.03 (H) x 109.51 (V) | mm |
| Pixel Pitch | 0.1520 (H) x 0.1520 (V) | mm |
| Driver IC | - | - |
| Operation Temperature | -30~85 | ℃ |
| Storage Temperature | -30~85 | ℃ |

## 1.2 Touch Panel Information

| Item | Specification |
|---|---|
| Touch Structure | G+G |
| Bonding Type with LCM | OCA Optical Bonding |
| Driver IC | GT9110 |
| Interface | I²C |
| Touch Count Max | 5 Points |
| Surface treatment | - |
| Surface hardness | 6H |
| I2C slave address | 0x28 |
| Origin of coordinate | Top Left Corner |

Note1:Requirements on environmental protection RoHS compliant.

# 2. Absolute Maximum Ratings

| Item | Symbol | MIN. | MAX. | Unit | Note |
|---|---|---|---|---|---|
| Analog Supply voltage | VDD | -0.3 | 5.0 | V | Note 1 |

Note 1:Permanent damage may occur to the LCD module if beyond this specification.
Functional operation should be restricted to the conditions described under normal operating conditions.

# 3. Elecrical Characteristics

## 3.1 Recommended Operating Condition for TFT LCD

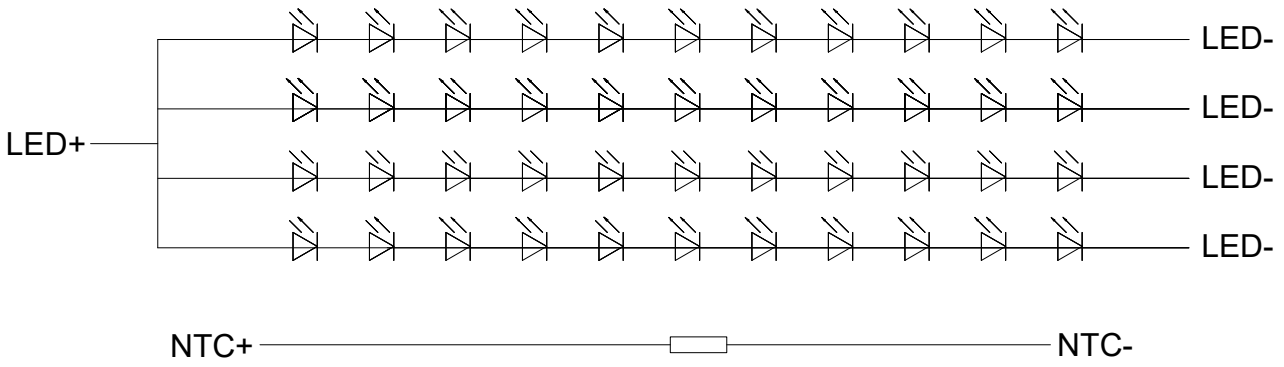
| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Analog Supply voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| Analog supply current | $I_{VDD}$ | - | TBD | - | mA | VDD=3.3V |
| Logic input voltage | VIH | 0.7*VDD | - | VDD | V | |
| | VIL | GND | - | 0.3*VDD | V | |

## 3.2 Recommended Driving Condition for Backlight

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Driving Current | $I_F$ | - | 360 | - | mA | |
| Driving Voltage | $V_F$ | 29.7 | - | 36.3 | V | |
| Power consumption | $W_{BL}$ | 10.692 | - | 13.068 | W | |
| LED Life-Time | N/A | - | 50,000 | - | Hours | Ta=25℃<br>Note 1 |

Note 1:LED lifetime is defined as the module brightness decay 50% of original brightness at Ta=25 degree, typical current.

Note 2:LED circuit :




### 3.3 Touch Panel

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Power Supply voltage | VDD | - | 3.3 | - | V | |
| Analog supply current | $I_{VDD}$ | - | TBD | - | mA | VDD=3.3V |
| Input high-level voltage | VIH | 0.7*VDD | - | VDD | V | |
| Input low -level voltage | VIL | GND | - | 0.3*VDD | V | |

# 4. Interface Pin Assignment

## 4.1 LCM Pin Assignment

Recommended connector：FH12-50S-0.5SH(55)　manufactured by HIROSE

| No. | Symbol | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | BIST | LCD Panel Self Test Enable, When it is not used, connecting to GND is recommended, don't floating |
| 3 | VCC | Power supply |
| 4 | VCC | Power supply |
| 5 | GND | Ground |
| 6 | GND | Ground |
| 7 | OTP | Serial interface OTP power (NOTE1) |
| 8 | NC | No connection |
| 9 | GND | Ground |
| 10 | ORXIN0- | Negative LVDS differential data input(Odd data) |
| 11 | ORXIN0+ | Positive LVDS differential data input(Odd data) |
| 12 | ORXIN1- | Negative LVDS differential data input(Odd data) |
| 13 | ORXIN1+ | Positive LVDS differential data input(Odd data) |
| 14 | ORXIN2- | Negative LVDS differential data input(Odd data) |
| 15 | ORXIN2+ | Positive LVDS differential data input(Odd data) |
| 16 | ORXCLKIN- | Negative LVDS differential data input(Odd clock) |
| 17 | ORXCLKIN+ | Positive LVDS differential data input(Odd clock) |
| 18 | ORXIN3- | Negative LVDS differential data input(Odd data) |
| 19 | ORXIN3+ | Positive LVDS differential data input(Odd data) |
| 20 | ERXIN0- | Negative LVDS differential data input(Even data) |
| 21 | ERXIN0+ | Positive LVDS differential data input(Even data) |
| 22 | ERXIN1- | Negative LVDS differential data input(Even data) |
| 23 | ERXIN1+ | Positive LVDS differential data input(Even data) |
| 24 | ERXIN2- | Negative LVDS differential data input(Even data) |
| 25 | ERXIN2+ | Positive LVDS differential data input(Even data) |
| 26 | ERXCLKIN- | Negative LVDS differential data input(Even clock) |
| 27 | ERXCLKIN+ | Positive LVDS differential data input(Even clock) |
| 28 | ERXIN3- | Negative LVDS differential data input(Even data) |
| 29 | ERXIN3+ | Positive LVDS differential data input(Even data) |
| 30 | GND | Ground |
| 31 | FAULT | FAULT signal output(normal=H,abnormal=L) |
| 32 | RESET | Global reset pin |
| 33 | STBYB | Standby mode |
| 34 | CSB | Serial interface chip enable (NOTE1) |

| | | | |
|---|---|---|---|
| 35 | SCL | Serial interface clock input | (NOTE1) |
| 36 | SDAI | Serial interface data input | (NOTE1) |
| 37 | SDAO | Serial interface data output | (NOTE1) |
| 38 | GND | Ground | |
| 39 | GND | Ground | |
| 40 | NC | No connection | |
| 41 | LEDA | Power for LED backlight (Anode) | |
| 42 | LEDA | Power for LED backlight (Anode) | |
| 43 | LEDA | Power for LED backlight (Anode) | |
| 44 | NC | No connection | |
| 45 | LEDK | Power for LED backlight (Cathode) | |
| 46 | LEDK | Power for LED backlight (Cathode) | |
| 47 | LEDK | Power for LED backlight (Cathode) | |
| 48 | LEDK | Power for LED backlight (Cathode) | |
| 49 | NTC_A | NTC_Anode | |
| 50 | NTC_K | NTC_Cathode | |

Note1：Pin 7, 34 - 37 only for IVO use

### 4.2 Touch FPC Pin Assignment

| No. | Symbol | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | DP+ | Data+ Input |
| 3 | DP- | Data- Input |
| 4 | VDD | Power supply |

# 5. Interface Characteristics

## 5.1 Signal Electrical Characteristics for LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644 ) standard.

**Table 5 LVDS Receiver Electrical Characteristics**

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Differential Input High Threshold | Vth | +150 | - | - | mV | $V_{CM}$=+1.2V |
| Differential Input Low Threshold | Vtl | - | - | -150 | mV | - |
| Magnitude Differential Input | $\|V_{ID}\|$ | 150 | - | 600 | mV | - |
| LVDS Input Voltage | $V_{INLV}$ | 0.7 | - | 1.7 | V | - |
| Common Mode Voltage | $V_{CM}$ | 1.0 | 1.2 | 1.7-\|VID\|/2 | V | - |

Note (1) Input signals shall be low or Hi- resistance state when VCC is off.
Note (2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

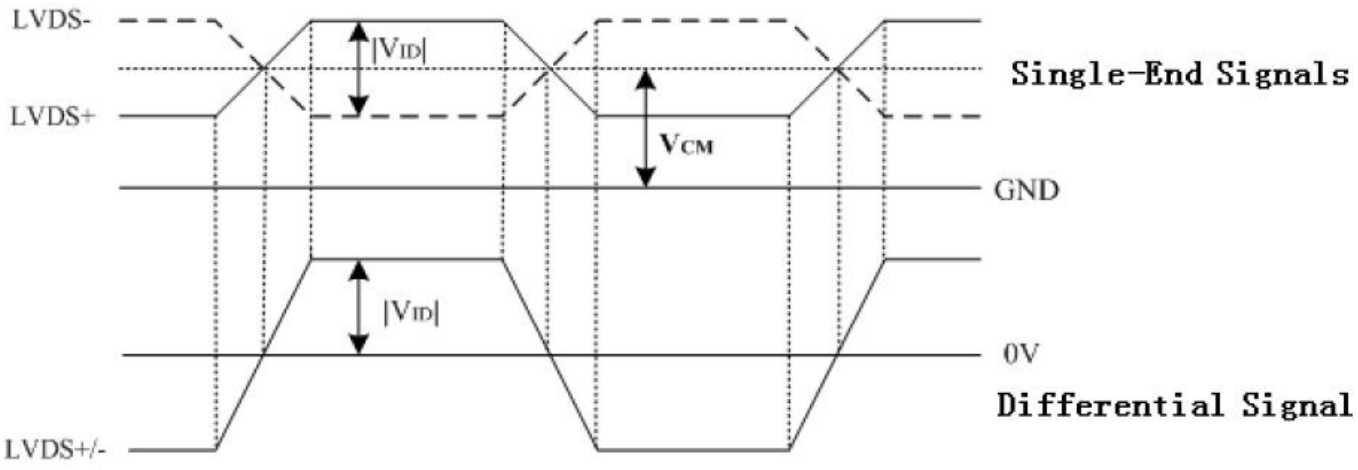



**Figure 8 Voltage Definitions**

**Table 6 LVDS mode AC electrical characterisitics**

| Parameter | Symbol | Spec | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Clock frequency(1-port) | Flvcyc | 40.8 | - | 48.2 | MHz |
| Clock period(1-port) | Tlvcyc | 20.7 | - | - | ns |
| 1 data bit time | UI | - | 1/7 | - | Tlvcyc |
| Clock high time | TLVHW | - | 4 | - | UI |
| Clock low time | TLVLW | - | 3 | - | UI |
| Position1 | Tpos1 | -0.2 | 0 | 0.2 | UI |
| Position0 | Tpos0 | 0.8 | 1 | 1.2 | UI |
| Position6 | Tpos6 | 1.8 | 2 | 2.2 | UI |
| Position5 | Tpos5 | 2.8 | 3 | 3.2 | UI |
| Position4 | Tpos4 | 3.8 | 4 | 4.2 | UI |
| Position3 | Tpos3 | 4.8 | 5 | 5.2 | UI |
| Position2 | Tpos2 | 5.8 | 6 | 6.2 | UI |
| Input eye width | TEYEW | 0.6 | - | - | UI |
| Input eye border | TEX | - | - | 0.2 | UI |
| LVDS clock to clock skew | TSKEW_EO | -1 | - | 1 | UI |

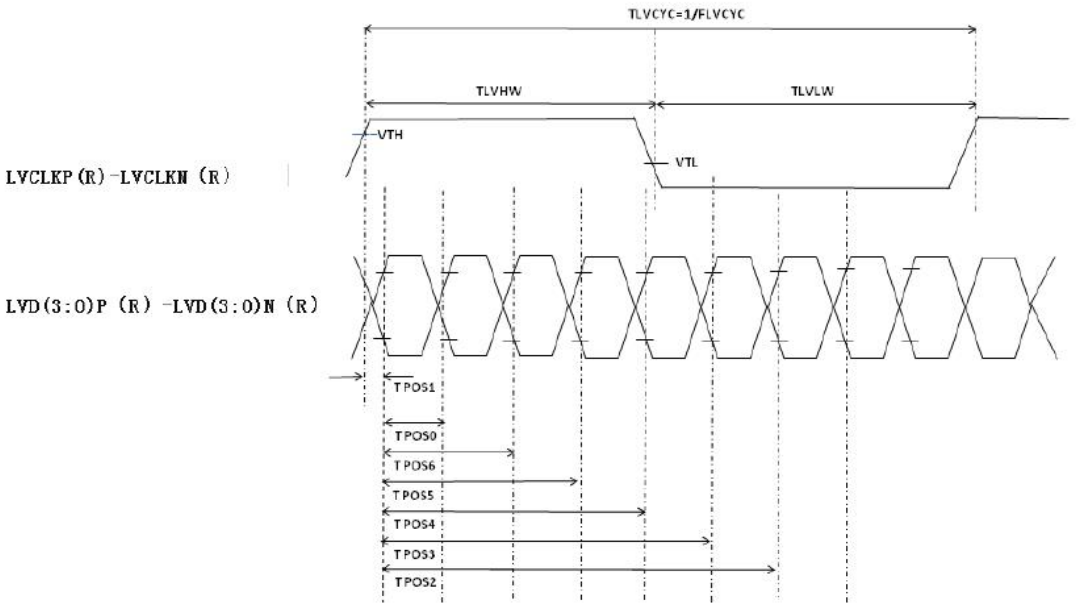



**Figure 9 LVDS input timing**

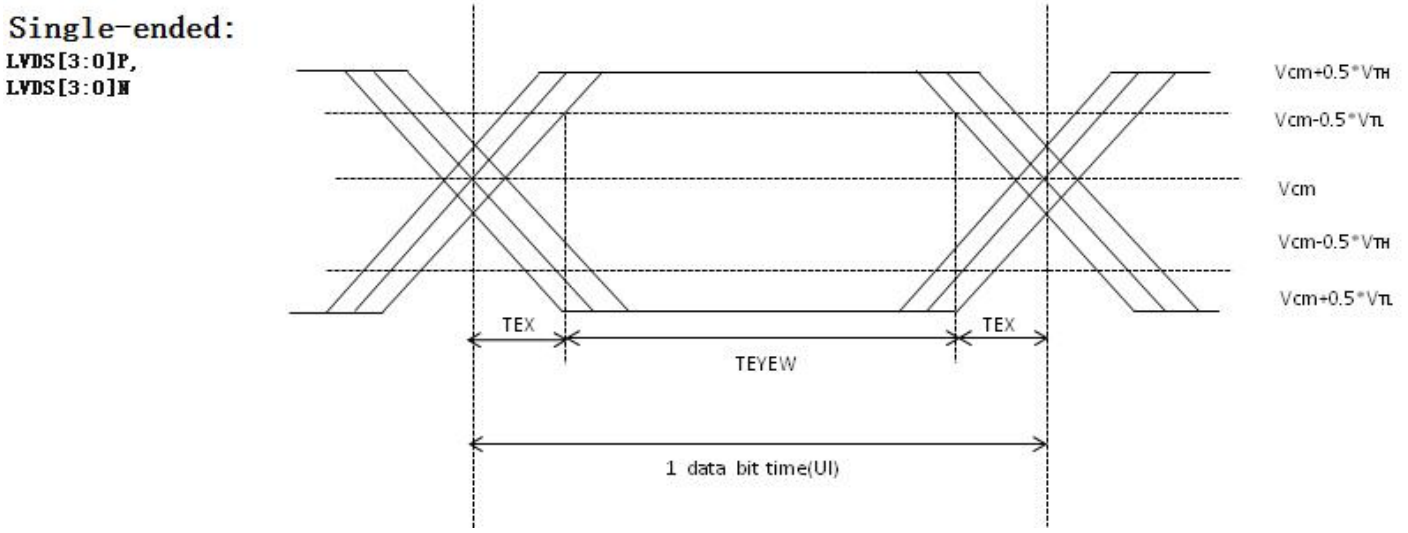



**Figure 10 LVDS input eye diagram**

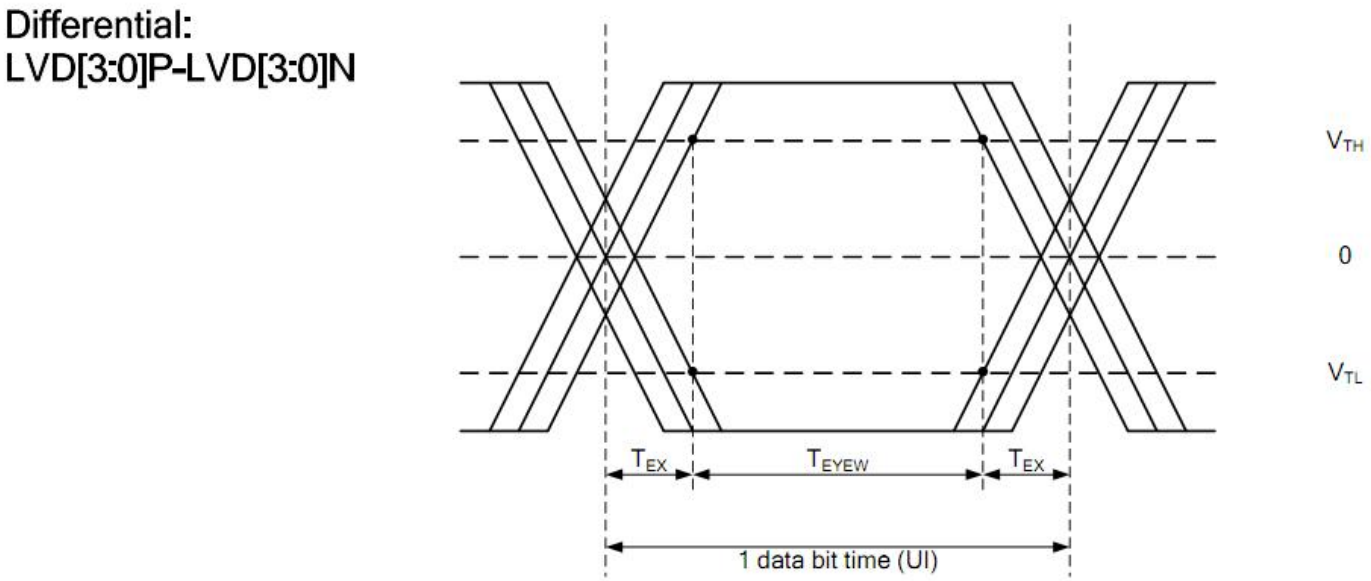



**Figure 11 LVDS input eye diagram**

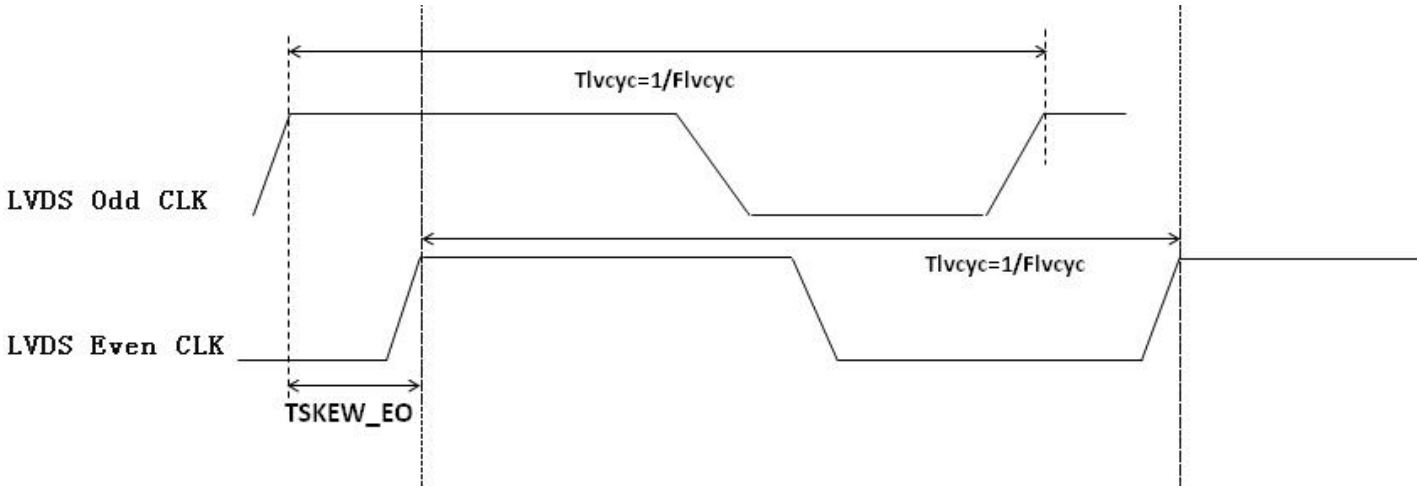



**Figure 12 LVDS clock to clock skew**

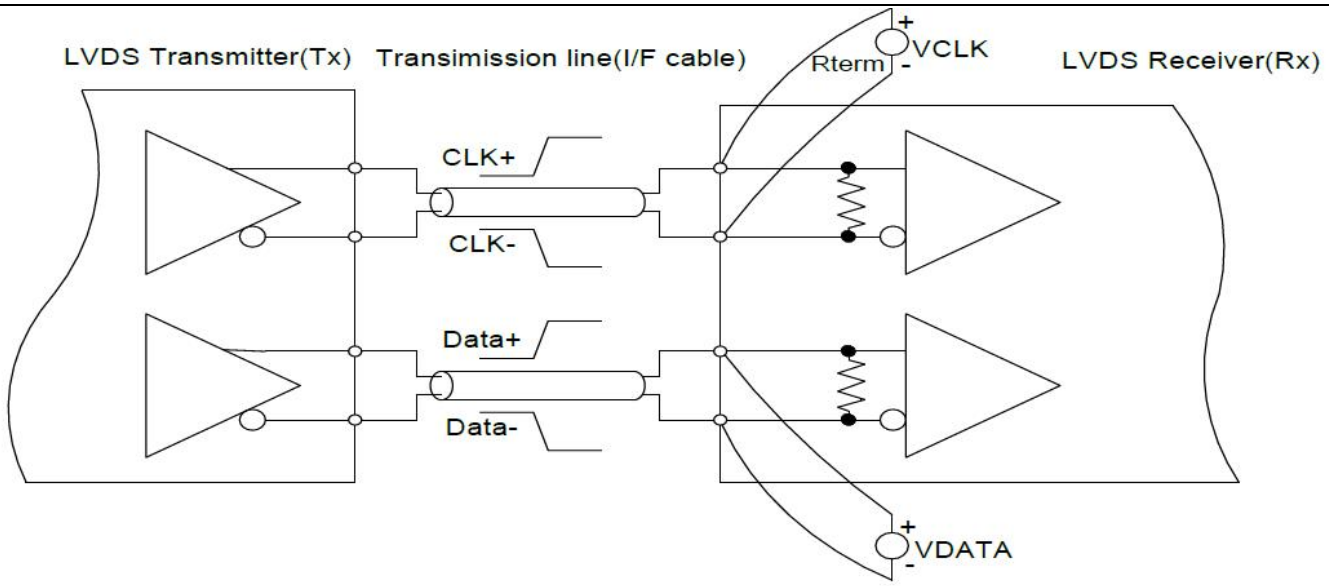



**Figure 13 Measurement System**

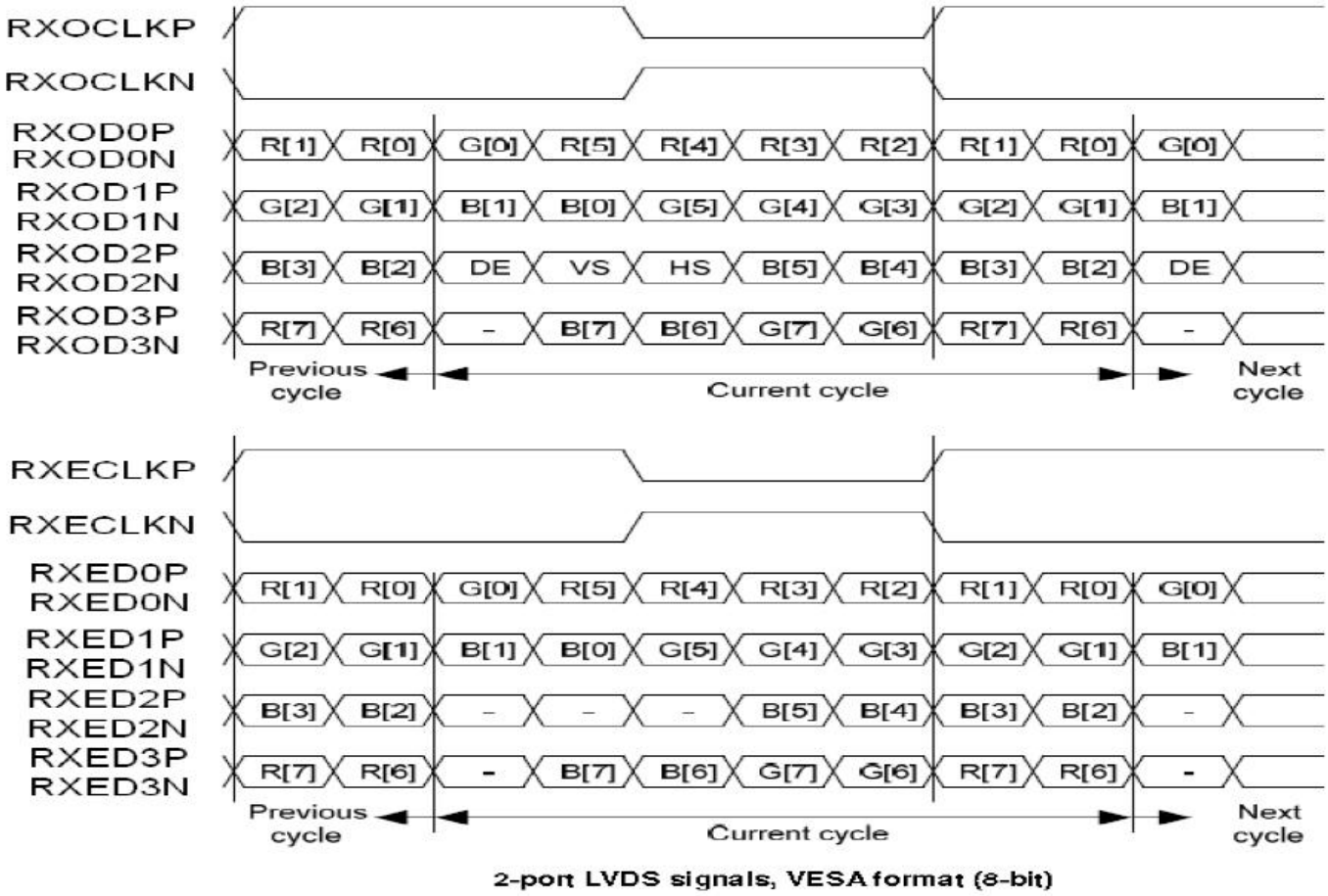



**Figure 14 Data Mapping**

## 5.2 Interface Timings

**Table 7 Interface Timings**

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| LVDS Clock Frequency | Fclk | 81.6 | 89.0 | 96.5 | MHz |
| H Total Time | HT | 1,975 | 2030 | 2880 | Clocks |
| H Active Time | HA | | 1920 | | Clocks |
| V Total Time | VT | 728 | 731 | 1080 | Lines |
| V Active Time | VA | | 720 | | Lines |
| Frame Rate | FV | 55 | 60 | 65 | Hz |

Note1:This module actually uses 2-port.
Note2: HT * VT *Frame Frequency≤48.25MHz（1-port）.
Note3: All reliabilities are specified for timing specification based on refresh rate of 60Hz.
DE Only Mode

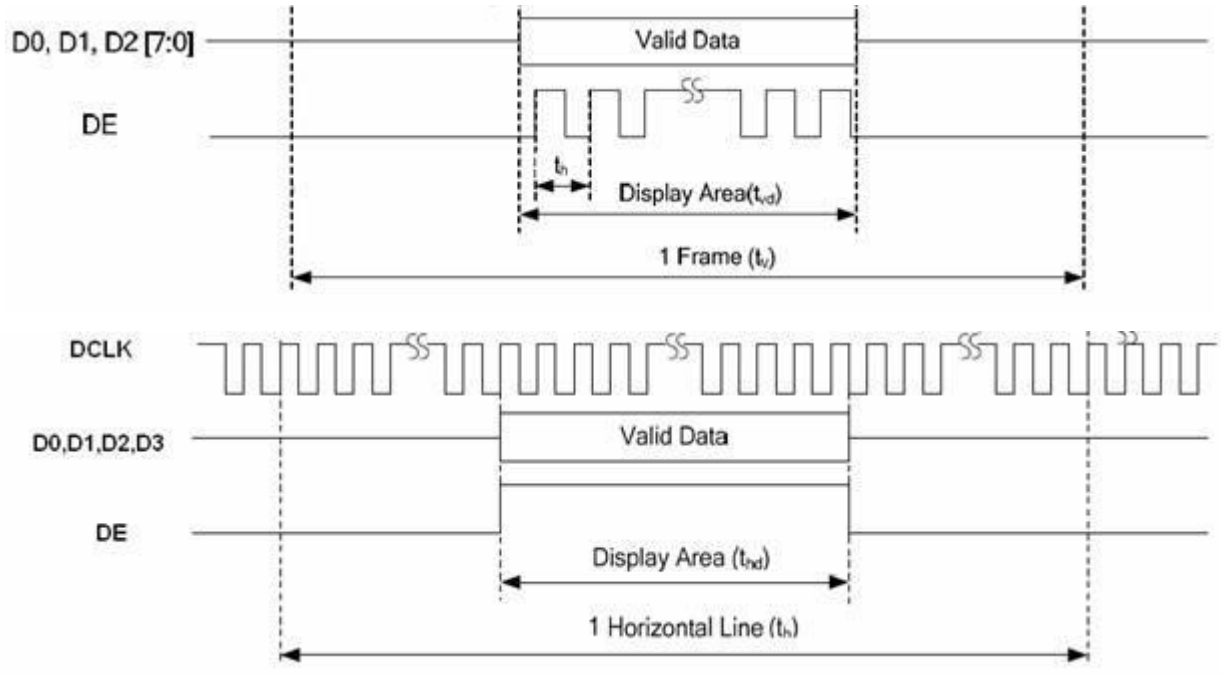



**Figure 16 Timing Diagram**

## 5.3 Power ON/OFF Sequence

1.Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VCC voltage is off.

2. When system first start up, should keep the VCC high time longer than 200ms, otherwise may cause image sticking when VCC drop off.

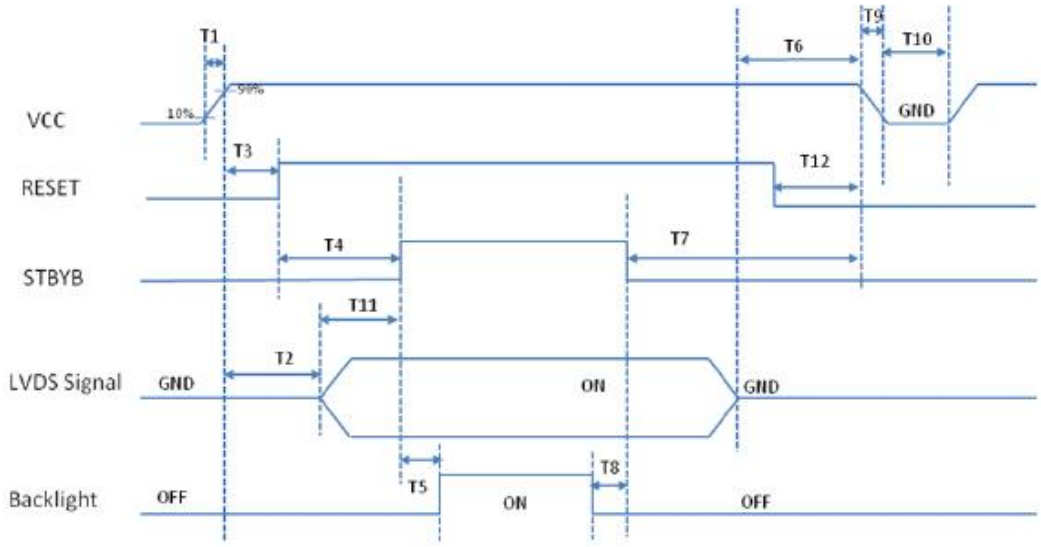



**Figure 19 Power Sequence**

**Table 9 Power Sequencing Requirements**

| Parameter | Symbol | Unit | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| VCC Rising Time | T1 | ms | 0.5 | - | 10 |
| VCC to LVDS | T2 | ms | 0 | - | 50 |
| VCC to RSTB | T3 | us | 10 | - | - |
| RSTB to STBYB pull H | T4 | ms | 36 | - | - |
| STBYB pull H to BL power On | T5 | ms | 200 | - | - |
| BL power off to STBYB pull L | T8 | ms | 200 | - | - |
| STBYB pull L to VCC Power off | T7 | ms | 50 | 67 | 83 |
| LVDS Disable to VCC Power off | T6 | ms | 0 | 26 | 50 |
| VCC Fall Time | T9 | ms | 0.5 | - | 30 |
| VCC Power off | T10 | s | 0.5 | 14.2 | - |
| LVDS Enable to STBYB pull high | T11 | ms | 0 | 10 | - |
| RSTB pull high to BIST pull high | T12 | ms | 10 | - | - |

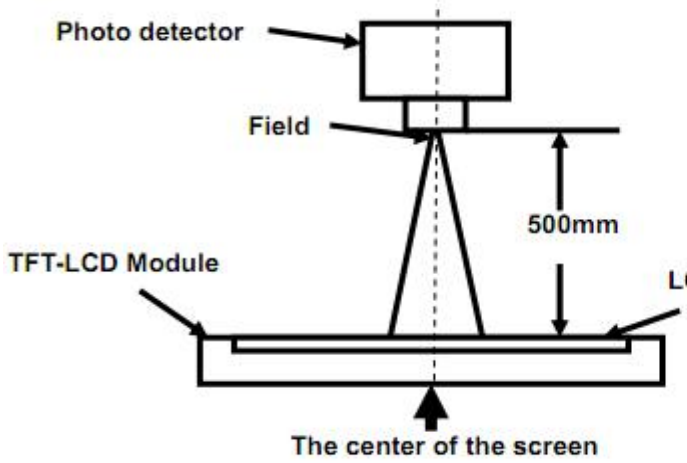
Note: IVO recommend T6, T7, T10, T11 to setting Typical value. There will be unknown risks if not.

# 6. Optical Specifications

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Viewing Angle (CR≥10) B/L ON | $\theta_T$ | Φ=90°(12 o'clock) | 80 | 85 | - | deg | Note2 |
| | $\theta_B$ | Φ=270°(6 o'clock) | 80 | 85 | - | deg | Note2 |
| | $\theta_L$ | Φ=180°(9 o'clock) | 80 | 85 | - | deg | Note2 |
| | $\theta_R$ | Φ=0°(3 o'clock) | 80 | 85 | - | deg | Note2 |
| Response Time | $T_{ON}$ | Normal θ=Φ=0° | - | 12 | 17 | msec | Note4 |
| | $T_{OFF}$ | | - | 12 | 17 | msec | Note4 |
| Contrast Ratio | CR | | 800 | 1000 | - | - | Note1 Note3 |
| Color Chromaticity | $W_X$ | | 0.250 | 0.300 | 0.35 | - | Note1 Note5 |
| | $W_Y$ | | 0.27 | 0.320 | 0.37 | - | Note1 Note5 |
| Luminance | L | | 700 | 800 | - | cd/m² | Note1 Note7 |
| Luminance Uniformity | $Y_U$ | | 70 | 80 | - | % | Note1 Note6 |
| NTSC | - | | - | 75 | - | % | - |

Note 1:Definition of optical measurement system

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.




| Item | Photo detector | Field |
|---|---|---|
| Contrast Ratio | SR-3A | 1° |
| Luminance | | |
| Chromaticity | | |
| Lum Uniformity | | |
| Response Time | BM-7A | 2° |

Note 2:Definition of viewing angle range and measurement system
Viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

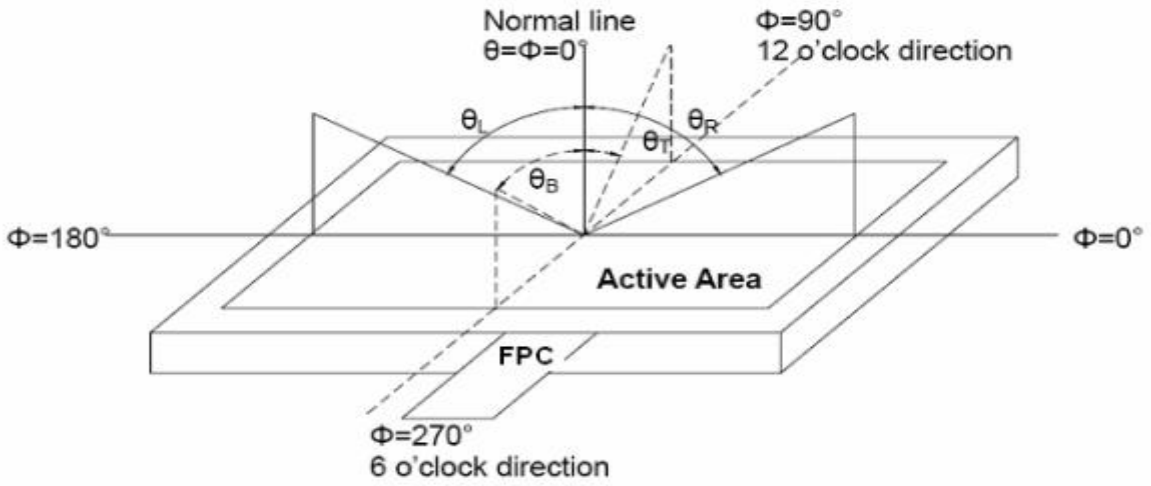


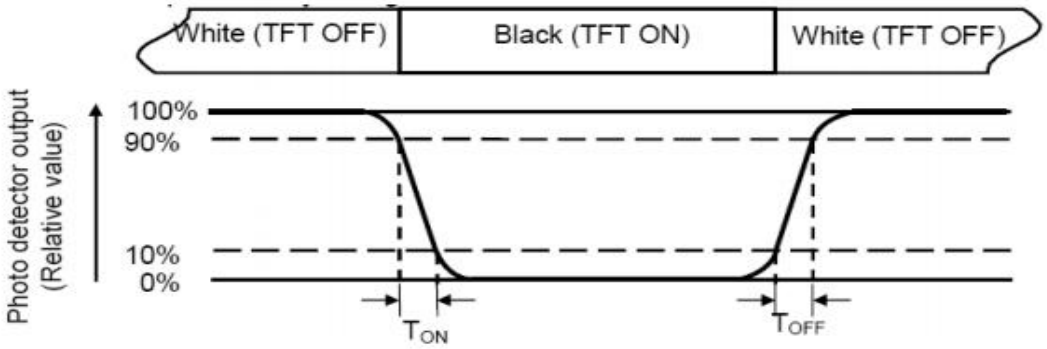

Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black”state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.




Note 5:Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6:Definition of Luminance Uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

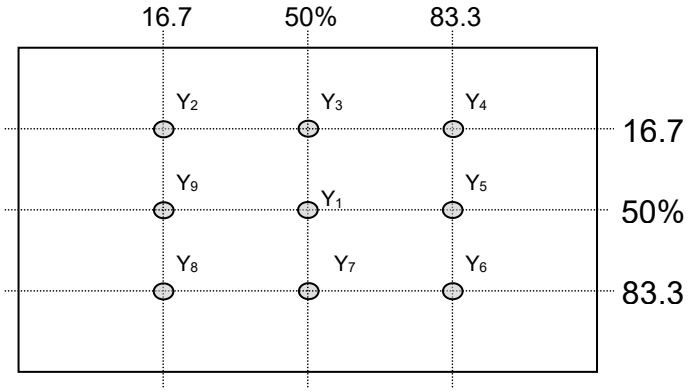



Fig. 2 Definition of points

Note 7:Definition of Luminance (Refer Fig. 2)

Surface luminance is the luminance with all pixels displaying white.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ......,Pn).

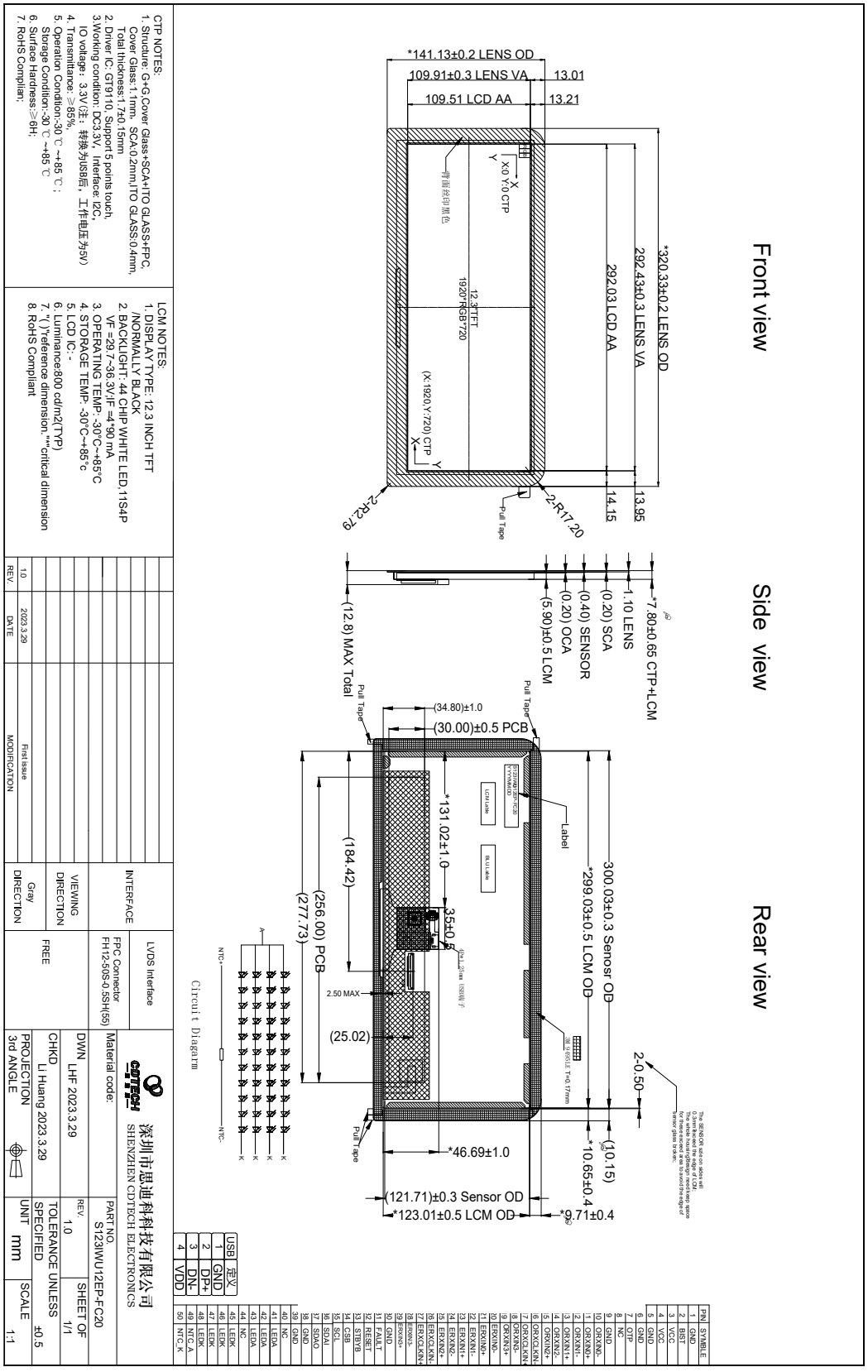
# 7. Reliability Test Items

| Test Item | Test Conditions | |
|---|---|---|
| High Temperature Storage | Ta= +85℃ | 96hrs |
| Low Temperature Storage | Ta= -30℃ | 96hrs |
| High Temperature Operation | Ta= +85℃ | 96hrs |
| Low Temperature Operation | Ta= -30℃ | 96hrs |
| High Temperature and Humidity Storage | Ta= +60℃, 90% RH | 96hrs |
| Thermal Shock (Non-operation) | -30℃/30 min ~ +85℃/30 min for 20 cycles<br>Start with cold temperature<br>end with high temperature | |
| Electro Static Discharge | Contact = ± 4 kV, class B<br>Air = ± 8 kV, class B<br>R=330Ω,C=150pF | |
| Vibration | Sweep: 10Hz~55Hz~10Hz<br>Stroke: 1.5mm<br>2 hrs for each direction of X .Y. Z. | |
| Mechanical Shock | 60G 6ms,±X,±Y,±Z<br>3 times for each direction | |
| Package Drop Test | Height: 60 cm<br>1 corner, 3 edges, 6 surfaces | |

Notes: The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:

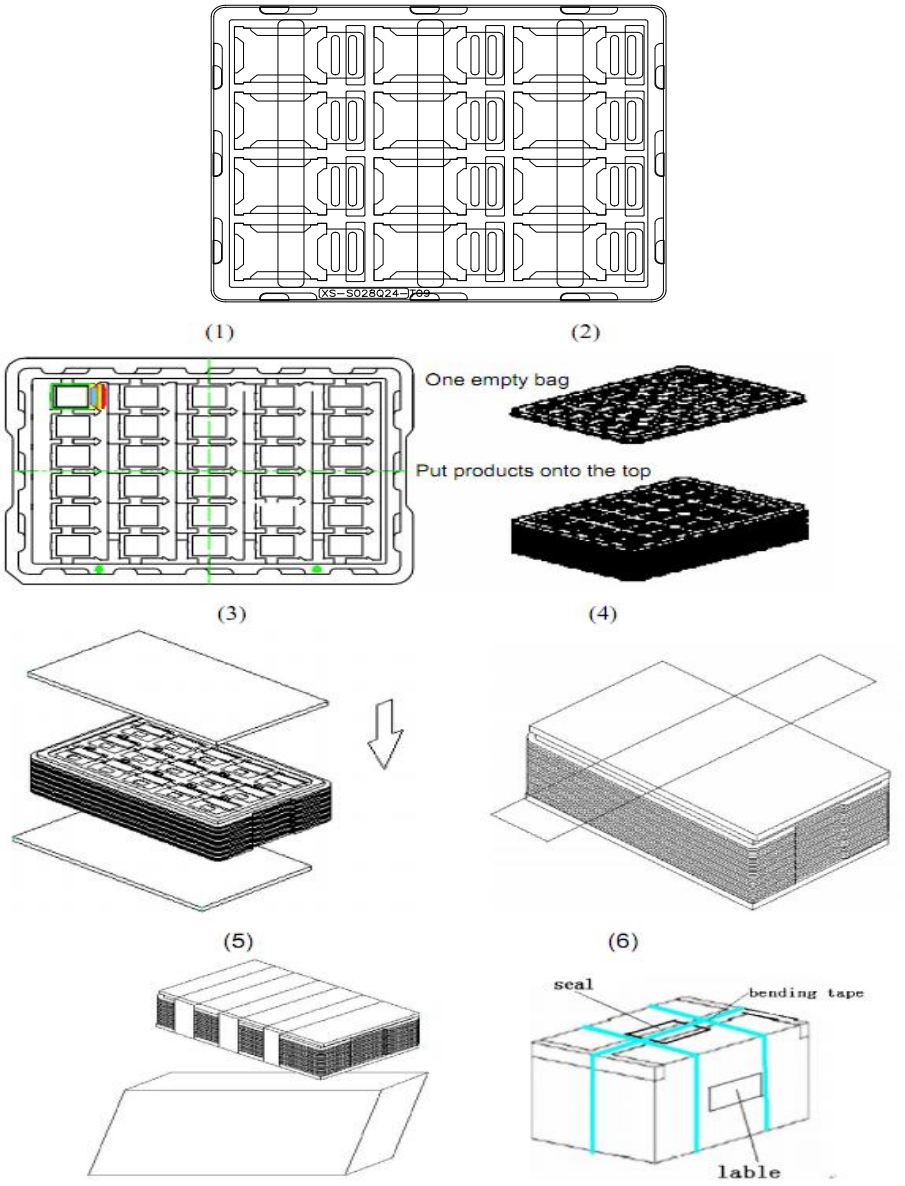
1). Air bubble in the LCD
2). Seal leak or Glass crack
3). Non display or abnormal display
4). Brightness reduction >50%

# 8. Mechanical Drawing



# 9. Packing

**Packing Method**




Steps:

1. Put module into tray cavity
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above
4. Fix the cardboard to the tray stack with adhesive tape
5. Put the tray stack into carton
6. Carton sealing with adhesive tape

# 10. Precautions for Use of LCD modules

## 10.1 Handling Precautions

10.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

10.1.6. Do not attempt to disassemble the LCD Module.

10.1.7. If the logic circuit power is off, do not apply the input signals.

10.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1. Be sure to ground the body when handling the LCD Modules.

10.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

## 10.2 Storage Precautions

10.2.1.When storing the LCD modules,avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2.The LCD modules should be stored under the storage temperature range if the LCD modules will be stored for a long time,the recommend condition is :

Temperature : 0℃ ~40℃ Relatively humidity: ≤80%

10.2.3.The LCD modules should be stored in the room without acid, alkali and harmful gas.

## 10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.