上海冠显光电科技有限公司
Shanghai Top Display Optoelectronics Co., LTD

# LCD MODULE SPECIFICATION

**Customer:** _____

**Module No.:** TL043WVV01CT-B1884A

**Date:** 2025-01-25

**Version:** 0.1

■ **Pre-Specification for parameter checking**
□ **Final-Specification for sample approval**

**For Customer's Acceptance:**

| Approved by | Comment |
|---|---|
| | |

| Approved by | Checked by | Prepared by |
|---|---|---|
| Kanglin.Zhong | Xianren.Zhou | Zaiping.Yang |

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# Record of Revision

| Rev. | Date | Description | Editor |
|---|---|---|---|
| 0.1 | 2025-01-14 | First release | Zaiping.Yang |
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# 1 General Specifications

| No. | Item | Specification | Remark |
|---|---|---|---|
| 1 | LCD Size | 4.3 inch (Diagonal) | |
| 2 | Driver Element | a-Si TFT active matrix | |
| 3 | Resolution | 480 (RGB) ×800 | |
| 4 | Display Mode | Normally Black, Transmissive | |
| 5 | Pixel Pitch | 0.117 (H) × 0.117 (V) | |
| 6 | Display Colors | 262K | |
| 7 | Surface Treatment | / | |
| 8 | Color Arrangement | RGB-Stripe | |
| 9 | Interface | 3W SPI+RGB18bit | |
| 10 | Viewing Direction | All | |
| 11 | Gray Scale Inversion Direction | / | Note 1 |
| 12 | Outline Dimension (mm) | 68.26 (W) × 109.47(H) × 2.94 (T) | |
| 13 | Active Area (mm) | 56.16 (W) × 93.60 (H) | |
| 14 | Touch Screen | With Incell CTP | |
| 15 | Display Driver IC | ST7102 (integrated “In-Cell” touch screen controller) | |
| 16 | Touch Driver IC | ST7102 | |

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180°shift.

Note 2: RoHS compliant.

# 2 Pin Assignment

## 2.1 LCD Pin assignment

Match connector: XF2M-4015-1A（OMRON）or equivalent.

| PIN | Symbol | I/O | Description | Remark |
|---|---|---|---|---|
| 1 | LED A | P | LED ANODE | |
| 2 | LED K1 | P | LED1 CATHODE | |
| 3 | LED K2 | P | LED2 CATHODE | |
| 4 | GND | P | Ground | |
| 5 | VCI | P | Power supply | |
| 6 | RESET | I | Reset Signal ,Active Low | |
| 7 | NC | - | NC | |
| 8 | SDO | O | SPI output Data signal ,If not used, please floating | |
| 9 | SDA | I | SPI Input Data signal | |
| 10 | SCK | I | SPI Clock signal | |
| 11 | CS | I | SPI Chip select signal | |
| 12 | PCLK | I | RGB dot clock signal | |
| 13 | DE | I | RGB data enable signal | |
| 14 | VSYNC | I | RGB frame synchronizing signal | |
| 15 | HSYNC | I | RGB line synchronizing signal | |
| 16~33 | DB0~DB17 | I | RGB data signal:<br>DB0:BlUE LSB--DB5:BIUE MSB;<br>DB6:GREEN LSB--DB11:GREEN,MSB;<br>DB12:RED LSB--DB17:RED MSB. | |
| 34 | GND | P | Ground | |
| 35 | TP_INT | O | In-Cell Touch Interrupt(3.3V H Level) | |
| 36 | TP_SDA | I/O | In-Cell Touch IIC Data signal(3.3V H Level) | |
| 37 | TP_SCL | I | In-Cell Touch IIC Clock signal(3.3V H Level) | |
| 38 | TP_RESET | I | In-Cell Touch Reset Signal(3.3V H Level) | |
| 39 | TP_VCI（NC） | - | No connector. | |
| 40 | GND | P | Ground | |

I---Input, O---Output, P--- Power/Ground

# 3 Absolute Maximum Ratings

Ta = 25℃

| Item | Symbol | Min. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| Power Voltage | VCI | -0.30 | +3.6 | V | |
| Operating Temperature | Top | -20.0 | 70.0 | ℃ | |
| Storage Temperature | $T_{st}$ | -30.0 | 80.0 | ℃ | |
| Operating and Storage Humidity | $H_{stg}$ | 10% | 90% | %(RH) | |

# 4. Electrical Characteristics

## 4.1 Recommended Operating Condition

VCI =3.3V， GND=0V， Ta = 25℃

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Analog supply Voltage | | VCI | 2.8 | 3.2 | 3.3 | V | |
| Input Signal Voltage | Low Level | $V_{IL}$ | 0 | - | 0.3 x VCI | V | |
| | High Level | $V_{IH}$ | 0.7 x VCI | - | VCI | V | |
| Current of analog supply voltage | | $I_{VCI}$ | - | 50 | - | mA | VCI =3.3V, color bar pattern |

## 4.2 Backlight Unit Driving Condition

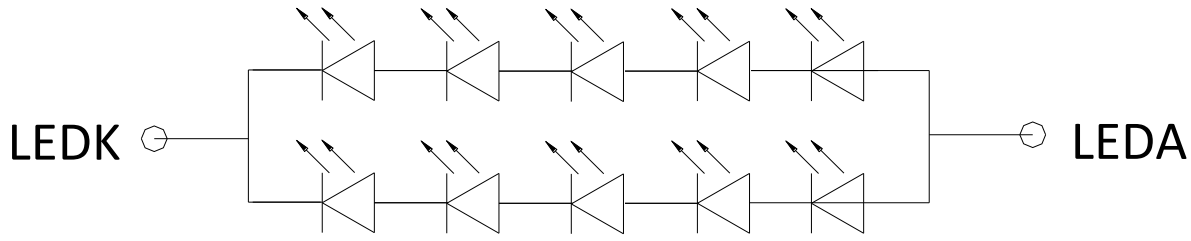
| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Forward Current | $I_F$ | - | 40 | 50 | mA | 10LEDs (5 LED Serial, 2 LED Parallel) |
| Forward Current Voltage | $V_F$ | - | 15.0 | 16.0 | V | |
| Backlight Power Consumption | $W_{BL}$ | - | 600 | 800 | mW | |
| Operating Life Time | -- | 30000 | -- | -- | hrs | Note 2, Note 3 |

Note1: The LED driving condition is defined for each module (5 LED Serial, 2 LED Parallel).

Note2: When LCM is operated, the stable forward current should be inputted. And forward voltage is for reference only.

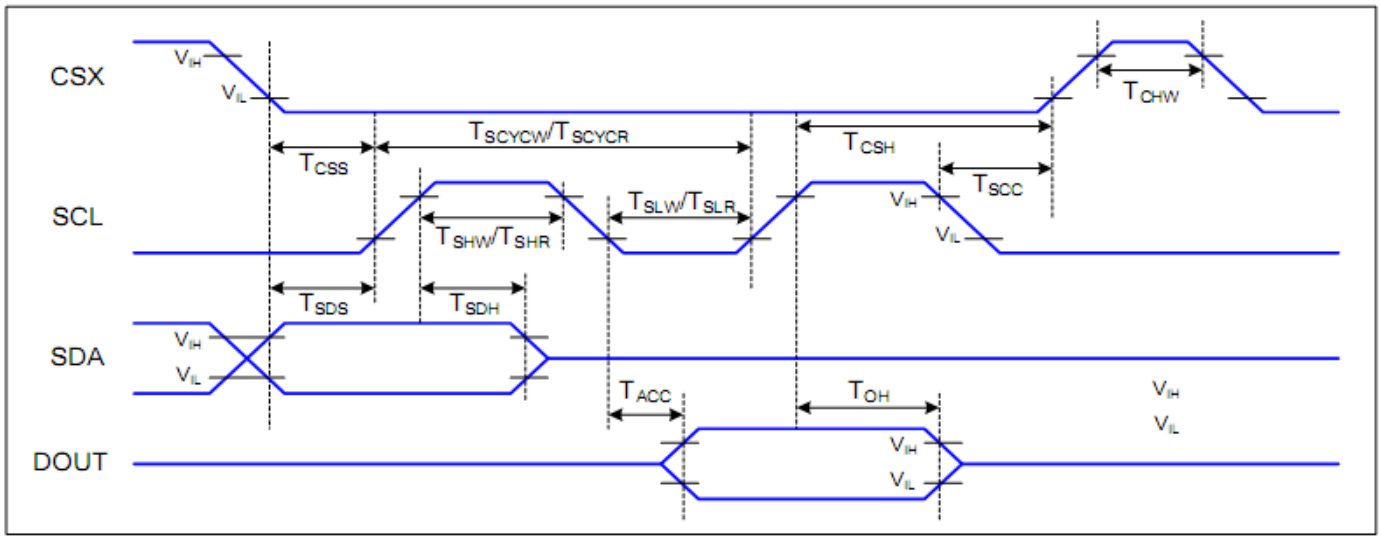
Note3: Optical performance should be evaluated at Ta=25℃ When LED is driven at high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.



# 5 Timing Chart

## 5.1 Serial Interface Characteristics (3-line serial):




**3-line serial Interface Timing Characteristics**

*VDD=2.8, AGND=DGND=0V, Ta=25℃*

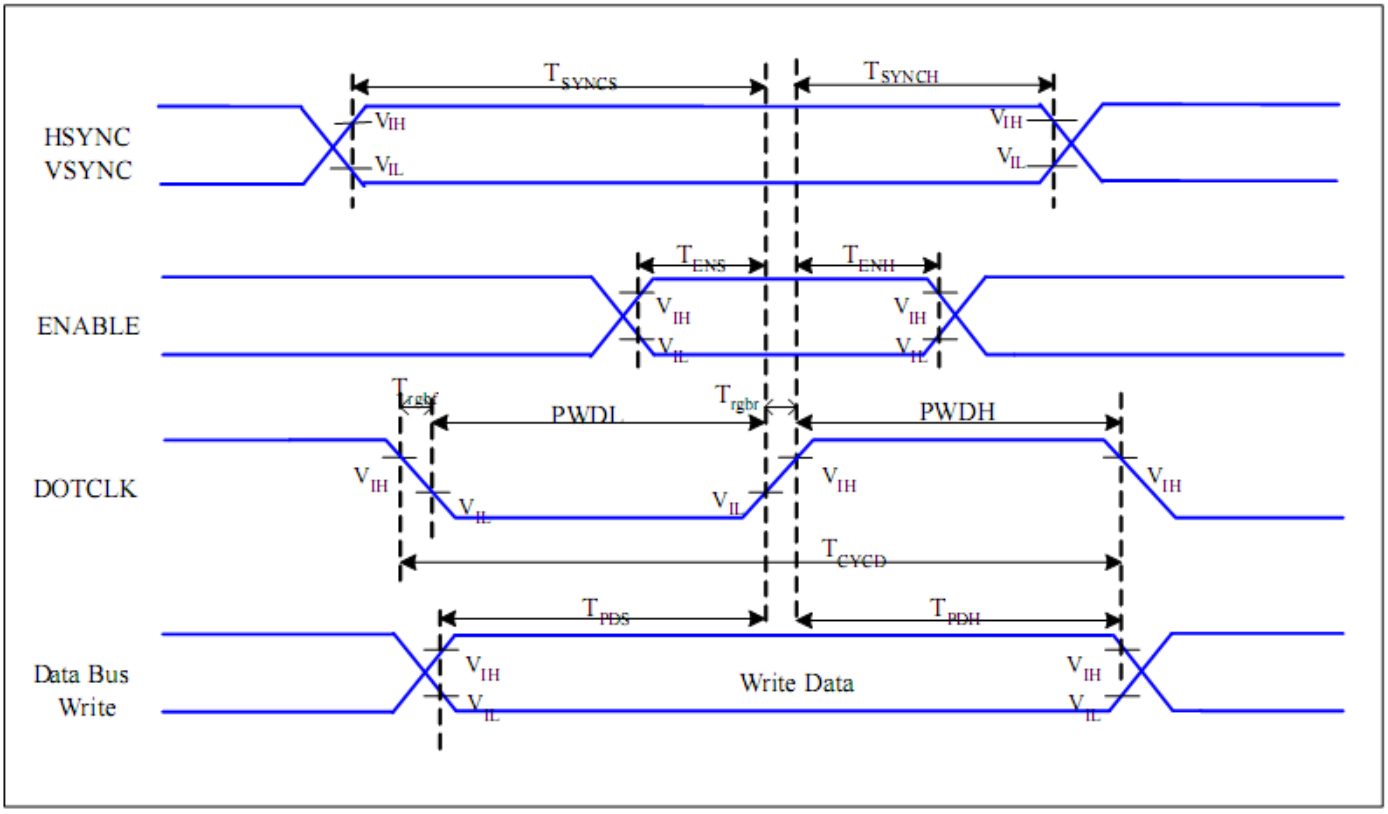
| Signal | Symbol | Parameter | Min | Max | Unit | Description |
|---|---|---|---|---|---|---|
| CSX | $T_{CSS}$ | Chip select setup time (write) | 15 | | ns | |
| | $T_{CSH}$ | Chip select hold time (write) | 15 | | ns | |
| | $T_{CSS}$ | Chip select setup time (read) | 60 | | ns | |
| | $T_{SCC}$ | Chip select hold time (read) | 60 | | ns | |
| | $T_{CHW}$ | Chip select "H" pulse width | 40 | | ns | |
| SCL | $T_{SCYCW}$ | Serial clock cycle (Write) | 66 | | ns | |
| | $T_{SHW}$ | SCL "H" pulse width (Write) | 15 | | ns | |
| | $T_{SLW}$ | SCL "L" pulse width (Write) | 15 | | ns | |
| | $T_{SCYCR}$ | Serial clock cycle (Read) | 150 | | ns | |
| | $T_{SHR}$ | SCL "H" pulse width (Read) | 60 | | ns | |
| | $T_{SLR}$ | SCL "L" pulse width (Read) | 60 | | ns | |
| SDA (DIN) | $T_{SDS}$ | Data setup time | 10 | | ns | |
| | $T_{SDH}$ | Data hold time | 10 | | ns | |

**3-line serial Interface Characteristics**

*Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.*

## 5.2 RGB Interface Characteristics :

### 5.2.1 TFT-LCD Input Clock and Data timing Diagram:




*VDD=2.8, AGND=DGND=0V, Ta=25 ℃*

| Signal | Symbol | Parameter | MIN | MAX | Unit | Description |
|---|---|---|---|---|---|---|
| HSYNC, VSYNC | TSYNCS | VSYNC, HSYNC Setup Time | 5 | - | ns | |
| ENABLE | TENS | Enable Setup Time | 5 | - | ns | |
| | TENH | Enable Hold Time | 5 | - | ns | |
| DOTCLK | PWDH | DOTCLK High-level Pulse Width | 15 | - | ns | |
| | PWDL | DOTCLK Low-level Pulse Width | 15 | - | ns | |
| | TCYCD | DOTCLK Cycle Time | 33 | - | ns | |
| | Trghr, Trghf | DOTCLK Rise/Fall time | - | 15 | ns | |
| DB | TPDS | PD Data Setup Time | 5 | - | ns | |
| | TPDH | PD Data Hold Time | 5 | - | ns | |

**18Bits RGB Interface Timing Characteristics**

## 5.3 Recommended Timing Setting of TCON

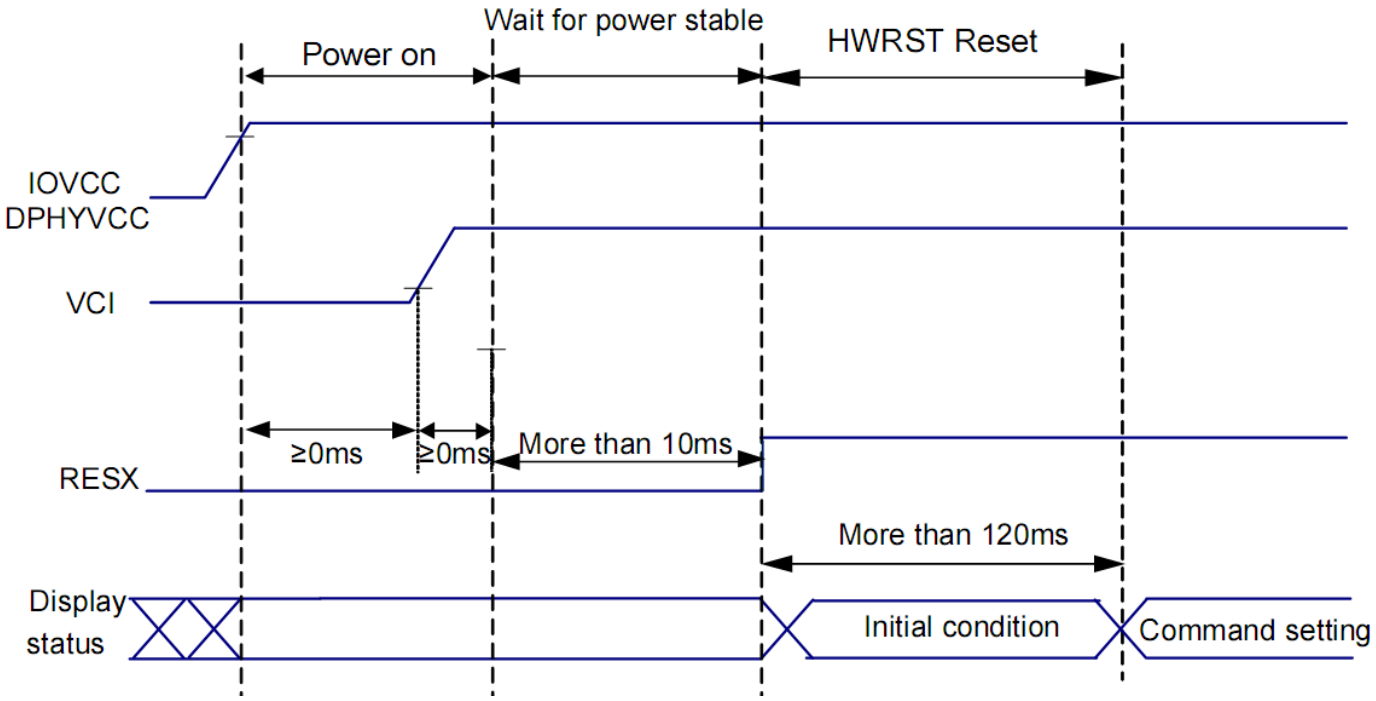
TCON (Embedded in Source IC) Input Timing (DCLK, HS, VS, DE)

VCI =2.8V, GND=0V, Ta=25℃

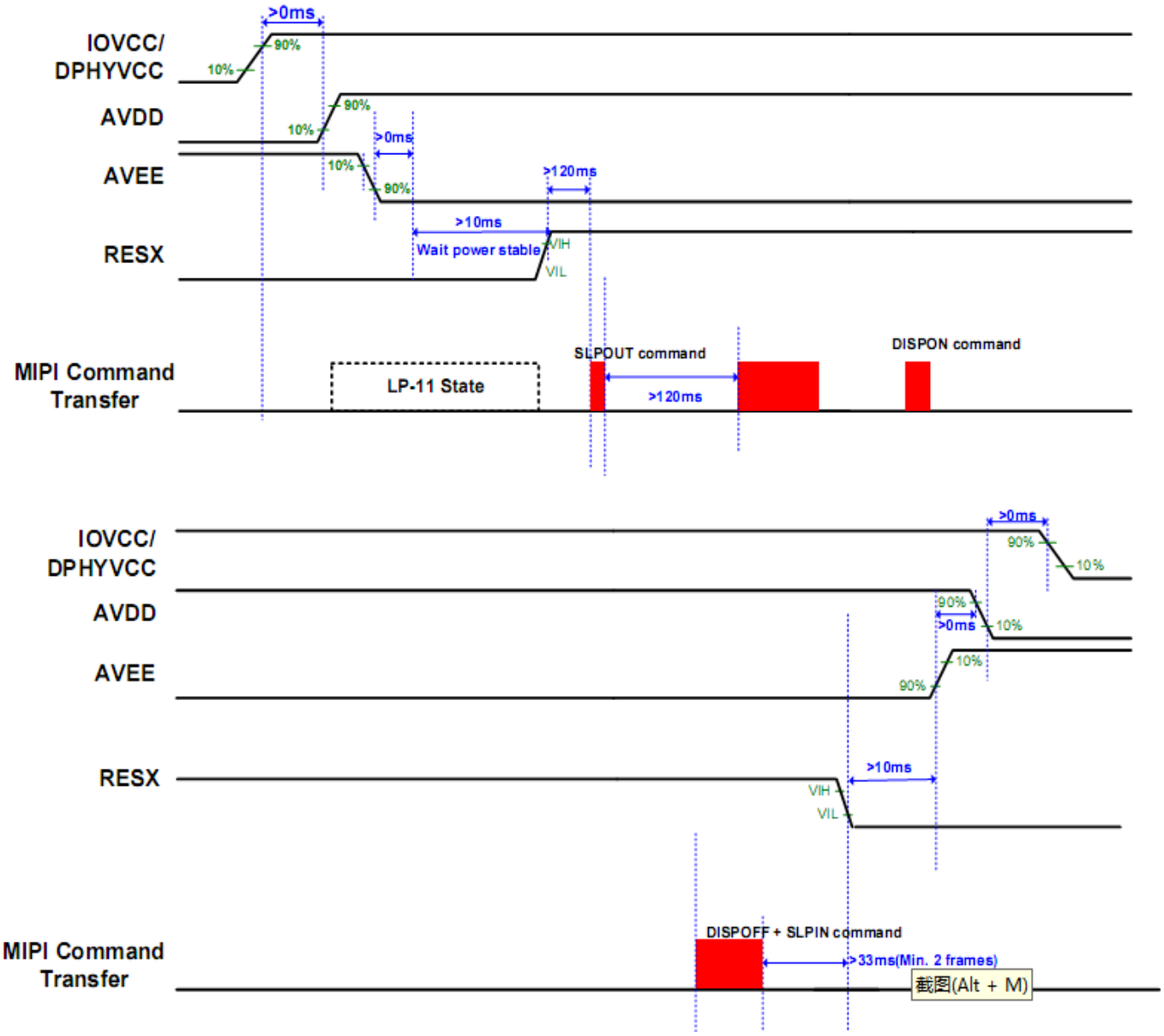
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| DCLK | Fclk | -- | 46 | -- | MHz | |
| | tclk | -- | 34.482 | -- | ns | |
| HSD | hdisp | -- | 480 | -- | tclk | |
| | hpw | -- | 20 | -- | tclk | |
| | hbp | -- | 200 | -- | tclk | |
| | hfp | -- | 200 | -- | tclk | |
| VSD | vdisp | -- | 800 | -- | th | |
| | vs | -- | 10 | -- | th | |
| | vbp | -- | 20 | -- | th | |
| | vfp | -- | 20 | -- | th | |

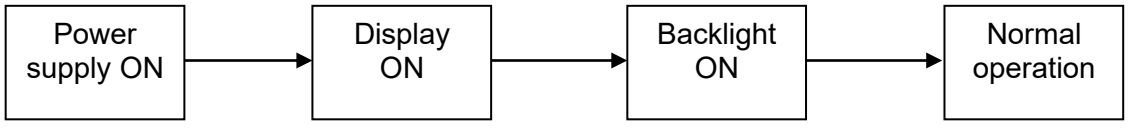
Note: For reference only, it needs to be adjusted according to the actual display effect

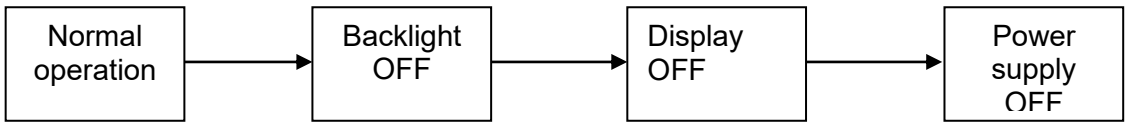
## 5.4 Reset input timing



## 5.5 POWER ON/ OFF SEQUENCE



## 6 Optical Characteristics

Ta=25℃

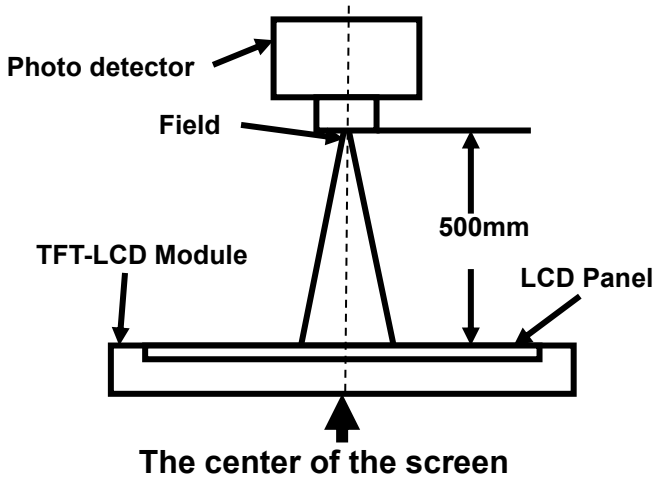
| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| View Angles | | θT | CR≧10 | 75 | 85 | - | Degree | Note 2 |
| | | θB | | 75 | 85 | - | | |
| | | θL | | 75 | 85 | - | | |
| | | θR | | 75 | 85 | - | | |
| Contrast Ratio | | CR | θ=0° | 1000 | 1500 | - | | Note1 Note3 |
| Response Time | | $T_{ON}$ | 25℃ | - | 25 | 35 | ms | Note1 Note4 |
| | | $T_{OFF}$ | | | | | | |
| Chromaticity | White | x | Backlight is on | Typ-0.03 | 0.292 | Typ+0.03 | | Note1 Note5 |
| | | y | | | 0.325 | | | |
| | Red | x | | | 0.656 | | | |
| | | y | | | 0.339 | | | |
| | Green | x | | | 0.286 | | | |
| | | y | | | 0.611 | | | |
| | Blue | x | | | 0.138 | | | |
| | | y | | | 0.098 | | | |
| Uniformity | | U | | - | 85 | - | % | Note1 Note6 |
| NTSC | | | | 65 | 70 | - | % | Note 5 |
| Luminance | | L | | - | 350 | - | $cd/m^2$ | Note1 Note7 |

Test Conditions:

1. $I_F$= 40 mA, $V_F$=15.0V and the ambient temperature is 25±2℃.humidity is 65±7%
2. The test systems refer to Note 1 and Note 2.

## Note 1: Definition of optical measurement system.

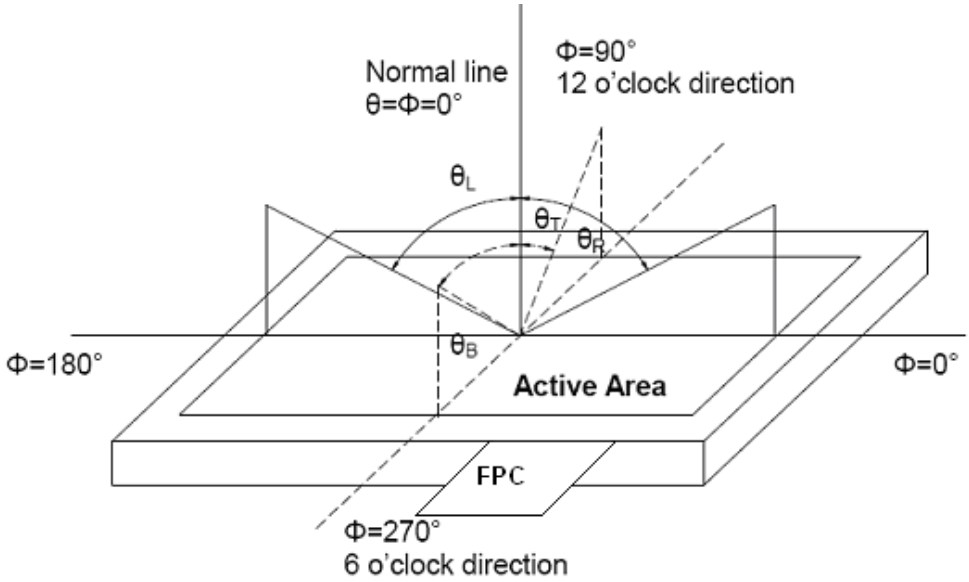
Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.




| Item | Photo detector | Field |
|---|---|---|
| Contrast Ratio | BM-7A or similar equipment | 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)。




## Note 3: Definition of contrast ratio

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

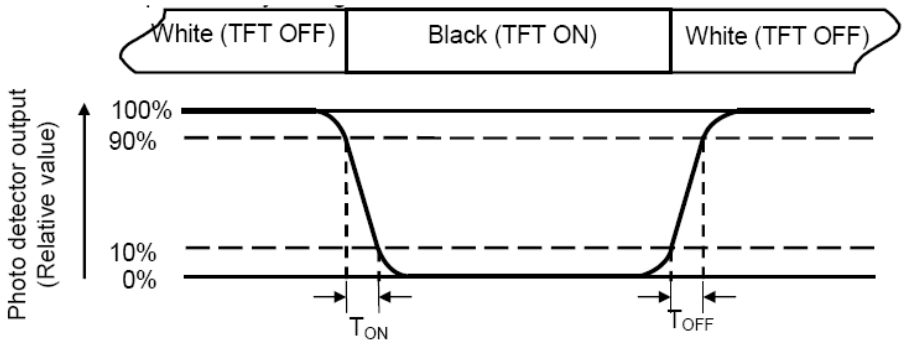
"White state ": The state is that the LCD should drive by Vwhite.

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

Vwhite: To be determined  Vblack: To be determined.

## 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 ($T_{ON}$) is the time between photo detector output intensity changed from 90% to 10%. And fall time ($T_{OFF}$) is the time between photo detector output intensity changed from 10% to 90%.




## Note 5: Definition of color chromaticity (CIE1931)

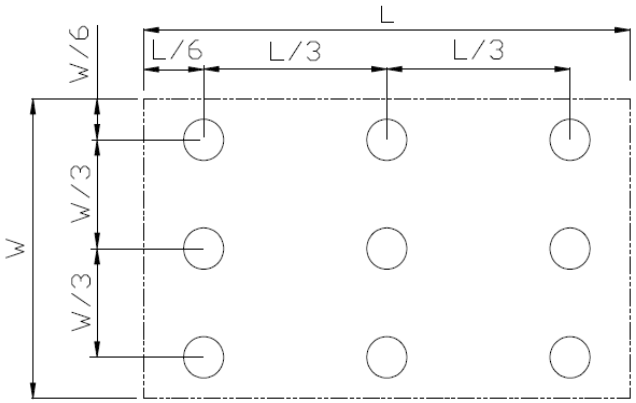
Color coordinates measured at center point of LCD.

## Note 6: Definition of luminance uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

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




Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

## Note 7: Definition of luminance:

Measure the luminance of white state at center point.

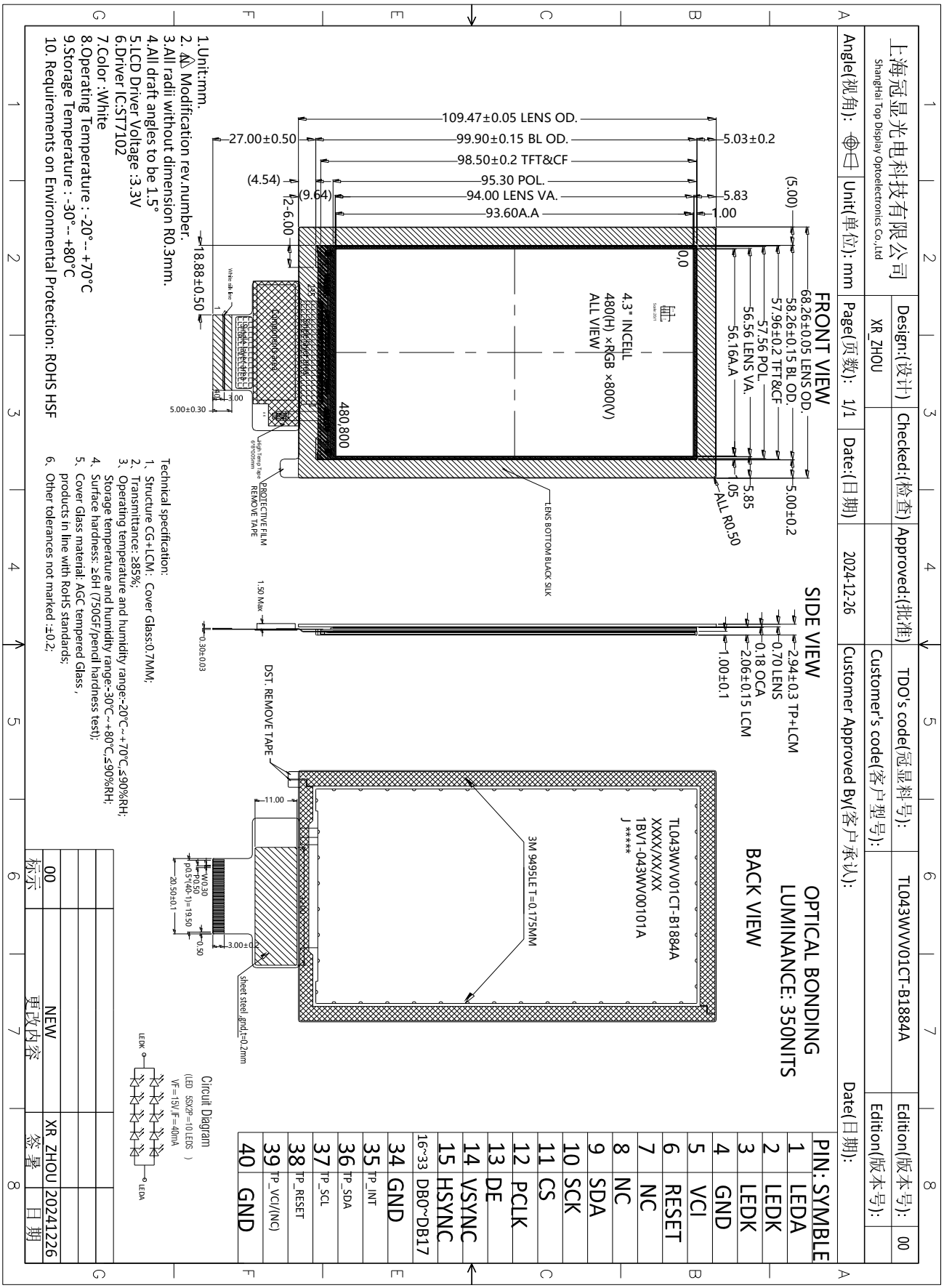
# 7 Environmental / Reliability Test

| No | Test Item | Condition | Remarks |
|---|---|---|---|
| 1 | High Temperature Operation | Ts = +70℃, 240 hours | No abnormalities in functions |
| 2 | Low Temperature Operation | Ta = -20℃, 240 hours | No abnormalities in functions |
| 3 | High Temperature Storage | Ta = +80℃, 240 hours | No abnormalities in functions |
| 4 | Low Temperature Storage | Ta = -30℃, 240 hours | No abnormalities in functions |
| 5 | Storage at High Temperature and Humidity | Ta = +60℃, 90% RH max,240hours | No abnormalities in functions |
| 6 | Thermal Shock (non-operating) | -30℃ 30 min~ +70℃ 30 min, Change time: 0.5 hour ← 5 min → 0.5 hour.10 Cycle | Start with cold temperature, End with high temperature, |
| 7 | ESD | C=150pF, R=330Ω,5point/panel Air: ±8Kv, 5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa) | No abnormalities in functions |

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.

# 8 Mechanical Drawing



# 9 Precautions for Use of LCD Modules

## Handling Precautions

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

9.1.2 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.

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

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

9.1.5 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
- Ketone
- Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

9.1.8.4 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.

## Storage Precautions

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

9.2.2 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%

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

## Transportation Precautions

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