

# 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



**MODEL NO :** ET070WS01-X**MODEL VERSION:** 01**SPEC VERSION :** 1.0**ISSUED DATE:** 2018-02-11☒ **Preliminary Specification**☐ **Final Product Specification****Customer :** \_\_\_\_\_

| Approved by | Notes |
|-------------|-------|
|             |       |

## Table of Contents

|                                             |    |
|---------------------------------------------|----|
| Record of Revision.....                     | 3  |
| 1 General Specifications .....              | 4  |
| 2 Input/Output Terminals .....              | 5  |
| 3 Absolute Maximum Ratings .....            | 6  |
| 4 Electrical Characteristics.....           | 7  |
| 5 Timing Chart.....                         | 9  |
| 6 Optical Characteristics .....             | 14 |
| 7 Environmental / Reliability Test .....    | 17 |
| 9 Packing Drawing .....                     | 19 |
| 10 Precautions for Use of LCD Modules ..... | 19 |

## Record of Revision

[illegible]

## 1 General Specifications

| Feature                           |                      | Spec                         |
|-----------------------------------|----------------------|------------------------------|
| <b>Display Spec.</b>              | Size                 | 7 inch                       |
|                                   | Resolution           | 1024*3(RGB)*600              |
|                                   | Technology Type      | a-Si                         |
|                                   | Pixel Configuration  | RGB Vertical Stripe          |
|                                   | Pixel pitch(mm)      | 0.15(H)×0.14(V)              |
|                                   | Display Mode         | Transmissive/ Normally Black |
|                                   | Viewing Direction    | ALLL                         |
| <b>Mechanical Characteristics</b> | LCM (W x H x D) (mm) | 163.8(W)×97(H)×2.75(D)       |
|                                   | Active Area(mm)      | 154.2144(H)x 85.92(V)        |
|                                   | With /Without TSP    | Without TSP                  |
|                                   | Weight (g)           | TBD                          |
| <b>Electrical Characteristics</b> | Interface            | MIPI 4Lane                   |
|                                   | Color Depth          | 16.7M                        |

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%

## 2 Input/Output Terminals

| LCM Pin | Symbol    | I/O | Description                                   |
|---------|-----------|-----|-----------------------------------------------|
| 1-2     | LED+      | P   | LED+ Anode                                    |
| 3       | LCD_VGH   | P   | Gate ON Voltage                               |
| 4       | LCD_VGL   | P   | Gate OFF Voltage                              |
| 5       | UPDN      | I   | Gate up or down scan control                  |
| 6       | SHLR      | I   | Source right or left sequence control         |
| 7-8     | LED-      | P   | LED- Cathode                                  |
| 9       | AVDD      | P   | Power for Analog Circuit                      |
| 10      | GND       | P   | Power Ground                                  |
| 11      | MIPI_TDP3 | I   | MIPI data input                               |
| 12      | MIPI_TDN3 | I   | MIPI data input                               |
| 13      | GND       | P   | Power Ground                                  |
| 14      | MIPI_TDP2 | I   | MIPI data input                               |
| 15      | MIPI_TDN2 | I   | MIPI data input                               |
| 16      | GND       | P   | Power Ground                                  |
| 17      | MIPI_TDP  | I   | MIPI clock input                              |
| 18      | MIPI_TDN  | I   | MIPI clock input                              |
| 19      | GND       | P   | Power Ground                                  |
| 20      | MIPI_TDP1 | I   | MIPI data input                               |
| 21      | MIPI_TDN1 | I   | MIPI data input                               |
| 22      | GND       | P   | Power Ground                                  |
| 23      | MIPI_TDP0 | I   | MIPI data input                               |
| 24      | MIPI_TDN0 | I   | MIPI data input                               |
| 25      | GND       | P   | Power Ground                                  |
| 26      | STBYB     | I   | Standby mode, Normally pulled high            |
| 27      | RESET     | I   | Global reset pin                              |
| 28-29   | VDD       | P   | Power supply for digital circuits +1.8V input |
| 30      | VCOM      | P   | Common voltage                                |

### 3 Absolute Maximum Ratings

| Parameter of absolute maximum ratings 参数 | Symbol 符号 | Min 最小值 | Max 最大值       | Unit 单位          |
|------------------------------------------|-----------|---------|---------------|------------------|
| Power supply voltage1                    | VDD       | -0.3    | 5             | V                |
| Power supply voltage2                    | AVDD      | -0.5    | 13.5          | V                |
| Power supply voltage3                    | VGH       | -0.3    | 20            | V                |
| Power supply voltage4                    | VGL       | -11     | 0             | V                |
| Power supply voltage5                    | VCOM      | -0.3    | 4.8           | V                |
| Backlight forward current                | ILED      | -0.001  | 30            | mA(For each led) |
| Reverse Voltage                          | VR        | -       | 5             | V                |
| Operating temperature                    | Top       | -20     | 70            | °C               |
| Storage temperature                      | Tst       | -30     | 80            | °C               |
| Humidity                                 | RH        | -       | 90%(Max)/60°C | RH               |

## 4 Electrical Characteristics

### 4.1 Driving TFT LCD Panel

| Item                  | Symbol  | Values |      |      | Unit | Remarks |
|-----------------------|---------|--------|------|------|------|---------|
|                       |         | Min.   | Typ. | Max. |      |         |
| Power Voltage Supply1 | VDD     | 1.6    | 1.8  | 2.2  | V    | -       |
| Power Voltage Supply2 | AVDD    | 3.5    | 9.6  | 13.5 | V    |         |
| Power Voltage Supply3 | LCD_VGH | 7      | 18   | 22   | V    |         |
| Power Voltage Supply4 | LCD_VGL | -7     | -6   | -5   | V    |         |
| Power Voltage Supply5 | VCOM    | 2.7    | -    | 3.4  | V    |         |

## 4.2 Backlight Unit

The backlight system is an edge-lighting type with 18 LEDs. The characteristics of the LED are shown in the following tables.

| Item                      | Symbol | MIN   | TYP | MAX | Unit | Remark  |
|---------------------------|--------|-------|-----|-----|------|---------|
| Backlight forward voltage | $V_F$  | -     | 9.6 | -   | V    | 18 LEDs |
| Backlight forward current | $I_F$  | --    | 120 | --  | mA   |         |
| LED life time             | --     | 20000 | --  | --  | Hrs  |         |

Note 1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  $T_a=25\pm3\text{ }^{\circ}\text{C}$ , typical IL value indicated in the above table and the  $f_L=50\text{k Hz}$  until the brightness becomes less than 50%.

## 5 Timing Chart

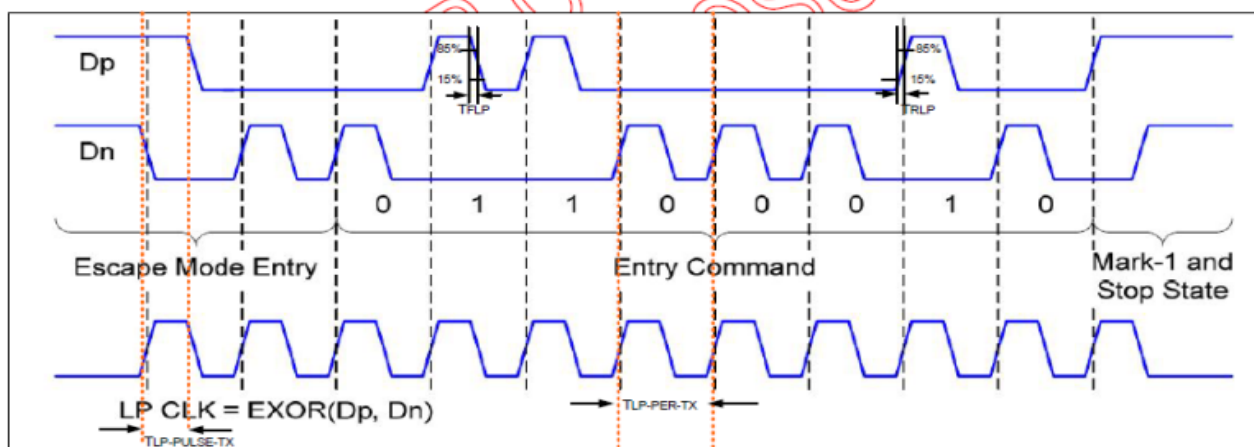
### 5.1 MIPI DC CHARACTERISTICS

(VDD=VDD\_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND\_IF=0V, TA=-20°C to 85°C)

| Parameter                                     | Symbol    | Min. | Typ. | Max. | Unit |
|-----------------------------------------------|-----------|------|------|------|------|
| MIPI Characteristics for High Speed Receiver  |           |      |      |      |      |
| Single-ended input low voltage                | VILHS     | -40  | -    | -    | mV   |
| Single-ended input high voltage               | VIHHS     | -    | -    | 460  | mV   |
| Common-mode voltage                           | VCDRXDC   | 70   | -    | 330  | mV   |
| Differential input impedance                  | ZID       |      | 100  |      | ohm  |
| HS transmit differential voltage(VOD=VDP-VDN) | VOD       | 140  | 200  | 250  | mV   |
| MIPI Characteristics for Low Power Mode       |           |      |      |      |      |
| Pad signal voltage range                      | Vi        | -50  | -    | 1350 | mV   |
| Ground shift                                  | VGNDSH    | -50  | -    | 50   | mV   |
| Logic 0 input threshold                       | VIL       | 0    | -    | 550  | mV   |
| Logic 1 input threshold                       | VIH       | 880  | -    | 1350 | mV   |
| Input hysteresis                              | VHYST     | 25   | -    | -    | mV   |
| Output low level                              | VOL       | -50  | -    | 50   | mV   |
| Output high level                             | VOH       | 1.1  | 1.2  | 1.3  | V    |
| Output impedance of Low Power Transmitter     | ZOLP      | 80   | 100  | 125  | ohm  |
| Logic 0 contention threshold                  | VILCD,MAX | -    | -    | 200  | mV   |
| Logic 0 contention threshold                  | VIHCD,MIN | 450  | -    | -    | mV   |

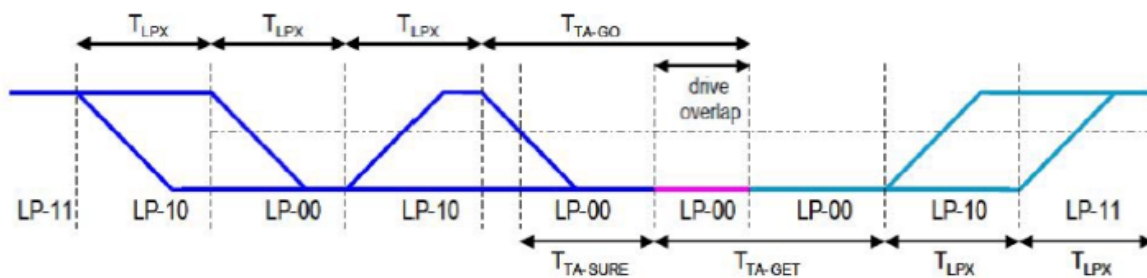
## 5.2 MIPI AC CHARACTERISTICS

| Parameter                            | Symbol                     | Min | Typ | Max | Units | Notes |
|--------------------------------------|----------------------------|-----|-----|-----|-------|-------|
| 15%~85% rising time and falling time | $T_{RLP} / T_{FLP}$        | -   | -   | 25  | ns    | -     |
| 30%~85% rising time and falling time | $T_{REOT}$                 | -   | -   | 35  | ns    | -     |
| Pulse width of LP exclusive-OR clock | $T_{LP-PULSE-TX}$          | 40  | -   | -   | ns    | -     |
|                                      |                            |     |     |     | ns    | -     |
| Period of the LP EXOR clock          | $T_{LP-PER-TX}$            | 90  | -   | -   | mV/ns | -     |
| Slew Rate @CLOAD =0pF                | $\delta V / \delta t_{SR}$ | 30  | -   | 500 | mV/ns | -     |
| Slew Rate @CLOAD =5pF                |                            | 30  | -   | 200 | mV/ns | -     |
| Slew Rate @CLOAD =20pF               |                            | 30  | -   | 150 | mV/ns | -     |
| Slew Rate @CLOAD =70pF               |                            | 30  | -   | 100 | mV/ns | -     |
| Load Capacitance                     | $T_{RLP}$                  | -   | -   | 70  | pF    | -     |



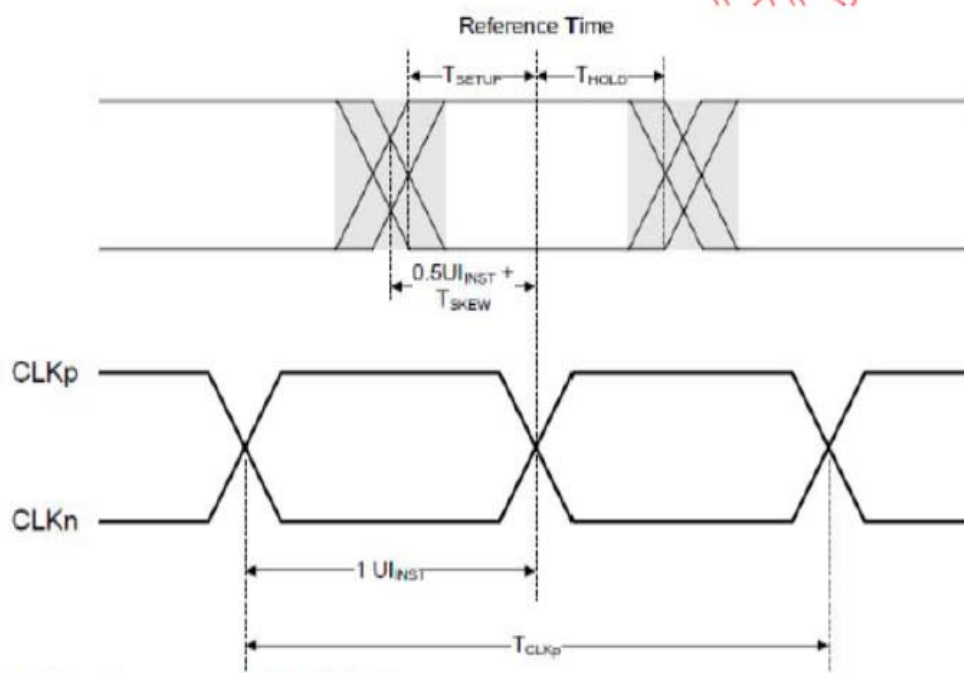
Turnaround Procedure Operation Timing Parameters

| Parameter                                                                    | Symbol          | Min       | Typ        | Max        | Units |
|------------------------------------------------------------------------------|-----------------|-----------|------------|------------|-------|
| Length of any Low-Power state period: Master side                            | $T_{LPX}$       | 50        | -          | 75         | ns    |
| Length of any Low-Power state period: Slave side                             | $T_{LPX}$       | 50        | 55.56      | 58.34      | ns    |
| Ratio of $T_{LPX}$ (Master)/ $T_{LPX}$ (Slave) between Master and Slave side | Ratio $T_{LPX}$ | 2/3       | -          | 3/2        |       |
| Time-out before new TX side start driving                                    | $T_{TA-Sure}$   | $T_{LPX}$ | -          | $2T_{LPX}$ | ns    |
| Time to drive LP-00 by new TX                                                | $T_{TA-GET}$    | -         | $5T_{LPX}$ | -          | ns    |
| Time to drive LP-00 after Turnaround Request                                 | $T_{TA-GO}$     | -         | $4T_{LPX}$ | -          | ns    |



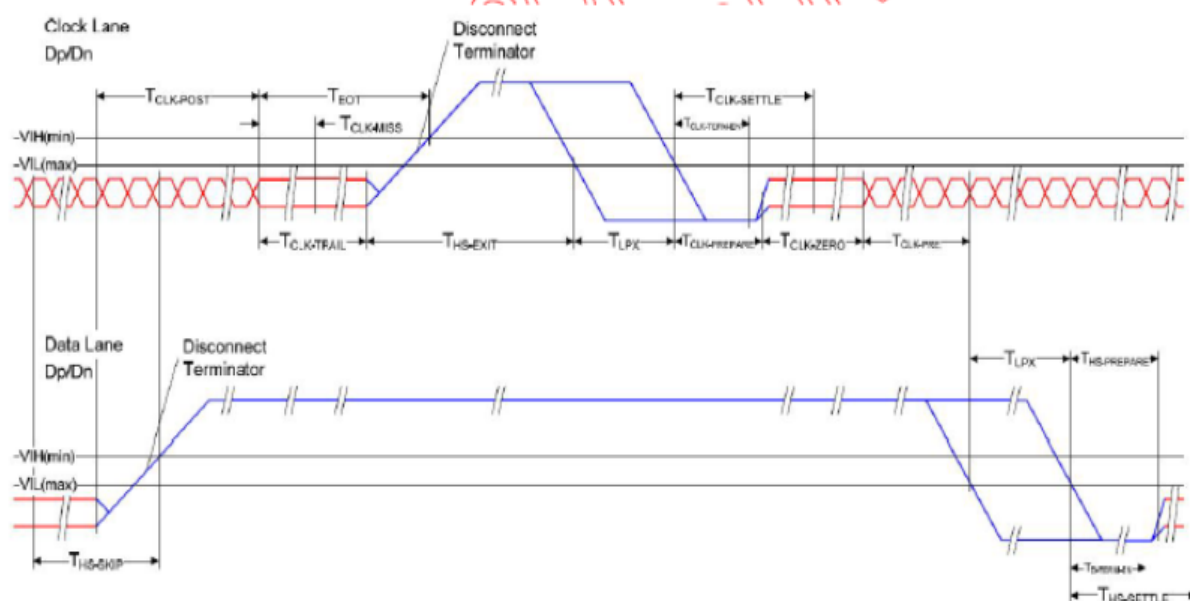
## High speed transmission

| Parameter                                      | Symbol          | Min   | Typ | Max  | Units      |
|------------------------------------------------|-----------------|-------|-----|------|------------|
| UI instantaneous                               | $U_{INST}$      | 2     | -   | 12.5 | ns         |
| Data to Clock Skew(measured at transmitter)    | $T_{SKEW(TX)}$  | -0.15 | -   | 0.15 | $U_{INST}$ |
| Data to Clock Setup time(measured at receiver) | $T_{SETUP(RX)}$ | 0.15  | -   | -    | $U_{INST}$ |
| Data to Clock Hold time(measured at receiver)  | $T_{HOLD(RX)}$  | 0.15  | -   | -    | $U_{INST}$ |
| 20%~80% rise time and fall time                | $T_R, T_F$      | 150   | -   | -    | ps         |
|                                                |                 | -     | -   | 0.3  | $U_{INST}$ |



## High Speed Clock Transmission

| Parameter                                                                                                                 | Symbol                   | Min     | Typ | Max | Units |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------|---------|-----|-----|-------|
| Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode | TCLK-POST                | 60+52UI | -   | -   | ns    |
| Detection time that the clock has stopped toggling                                                                        | TCLK-MISS                | -       | -   | 60  | ns    |
| Time to drive LP-00 to prepare for HS clock transmission                                                                  | TCLK-PREPARE             | 38      | -   | 95  | ns    |
| Minimum lead HS-0 drive period before starting clock                                                                      | TCLK-PREPARE + TCLK-ZERO | 300     | -   | -   | ns    |
| Time to enable Clock Lane receiver line termination measured from when Dn cross $V_{IL,MAX}$                              | THS-TERM-EN              | -       | -   | 38  | ns    |
| Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode    | TCLK-PRE                 | 8       | -   | -   | UI    |
| Time to drive HS differential state after last payload clock bit of a HS transmission burst                               | TCLK-TRAIL               | 60      | -   | -   | ns    |



### 5.3 Resolution

DE mode

| Parameter                       | Symbol   | Value |      |      | Unit |
|---------------------------------|----------|-------|------|------|------|
|                                 |          | Min.  | Typ. | Max. |      |
| DCLK frequency @Frame rate=60hz | fclk     | 40.8  | 51.2 | 67.2 | Mhz  |
| Horizontal display area         | thd      | 1024  |      |      | DCLK |
| HSYNC period time               | th       | 1114  | 1344 | 1400 | DCLK |
| HSYNC blanking                  | thb+thfp | 90    | 320  | 376  | DCLK |
| Vertical display area           | Tvd      | 600   |      |      | H    |
| VSYNC period time               | Tv       | 610   | 635  | 800  | H    |
| VSYNC blanking                  | Tvb+Tvfp | 10    | 35   | 200  | H    |

HV mode

Horizontal input timing

| Parameter                       |      | Symbol | Value |      |      | Unit |
|---------------------------------|------|--------|-------|------|------|------|
| Horizontal display area         |      | thd    | 1024  |      |      | DCLK |
| DCLK frequency@ Frame rate=60hz |      | fclk   | Min.  | Typ. | Max. | Mhz  |
|                                 |      |        | 44.9  | 51.2 | 63   |      |
| 1 Horizontal Line               |      | th     | 1200  | 1344 | 1400 | DCLK |
| HSYNC pulse width               | Min. | thpw   | 1     |      |      |      |
|                                 | Typ. |        | —     |      |      |      |
|                                 | Max. |        | 140   |      |      |      |
| HSYNC blanking                  |      | thb    | 160   | 160  | 160  |      |
| HSYNC front porch               |      | thfp   | 16    | 160  | 216  |      |

HV mode

Vertical input timing

| Parameter             | Symbol | Value |      |      | Unit |
|-----------------------|--------|-------|------|------|------|
|                       |        | Min.  | Typ. | Max. |      |
| Vertical display area | tvd    | 600   |      |      | H    |
| VSYNC period time     | tv     | 624   | 635  | 750  | H    |
| VSYNC pulse width     | tpw    | 1     | —    | 20   | H    |
| VSYNC back porch      | tvb    | 23    | 23   | 23   | H    |
| VSYNC front porch     | tvfp   | 1     | 12   | 127  | H    |

## 6 Optical Characteristics

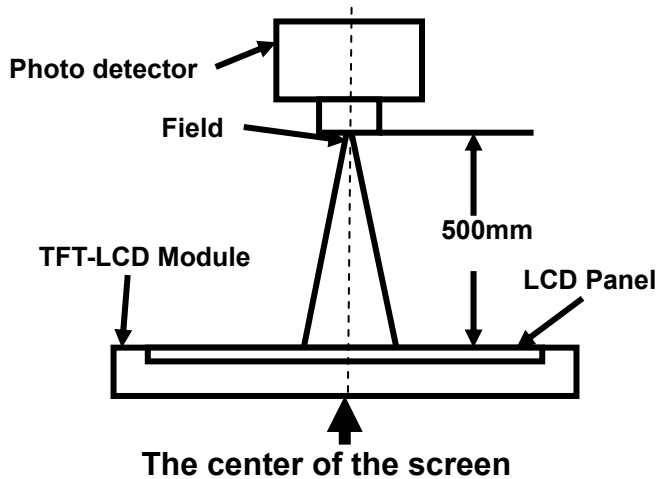
| Item           |       | Symbol           | Condition       | Mi   | Typ  | Max  | Unit              | Remark   |
|----------------|-------|------------------|-----------------|------|------|------|-------------------|----------|
| View Angles    |       | θT               | CR≧10           |      | 80   |      | Degree            | Note2,3  |
|                |       | θB               |                 |      | 80   |      |                   |          |
|                |       | θL               |                 |      | 80   |      |                   |          |
|                |       | θR               |                 |      | 80   |      |                   |          |
| Contrast Ratio |       | CR               | θ=0°            |      | 600  | -    |                   | Note 3   |
| Response Time  |       | T <sub>ON</sub>  | 25℃             | -    | 25   | 30   | ms                | Note 4   |
|                |       | T <sub>OFF</sub> |                 |      |      |      |                   |          |
| Chromaticity   | White | x                | Backlight is on | 0.26 | 0.29 | 0.32 |                   | Note 1,5 |
|                |       | y                |                 | 0.31 | 0.34 | 0.37 |                   |          |
|                | Red   | x                |                 |      |      |      |                   | Note 1,5 |
|                |       | y                |                 |      |      |      |                   |          |
|                | Green | x                |                 |      |      |      |                   | Note 1,5 |
|                |       | y                |                 |      |      |      |                   |          |
|                | Blue  | x                |                 |      |      |      |                   | Note 1,5 |
|                |       | y                |                 |      |      |      |                   |          |
| Uniformity     |       | U                |                 | 80   | 85   | --   | %                 | Note 6   |
| Luminance      |       | L                |                 | 200  | 250  | -    | cd/m <sup>2</sup> | Note 7   |

Test Conditions:

1.  $I_F = 20$  mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

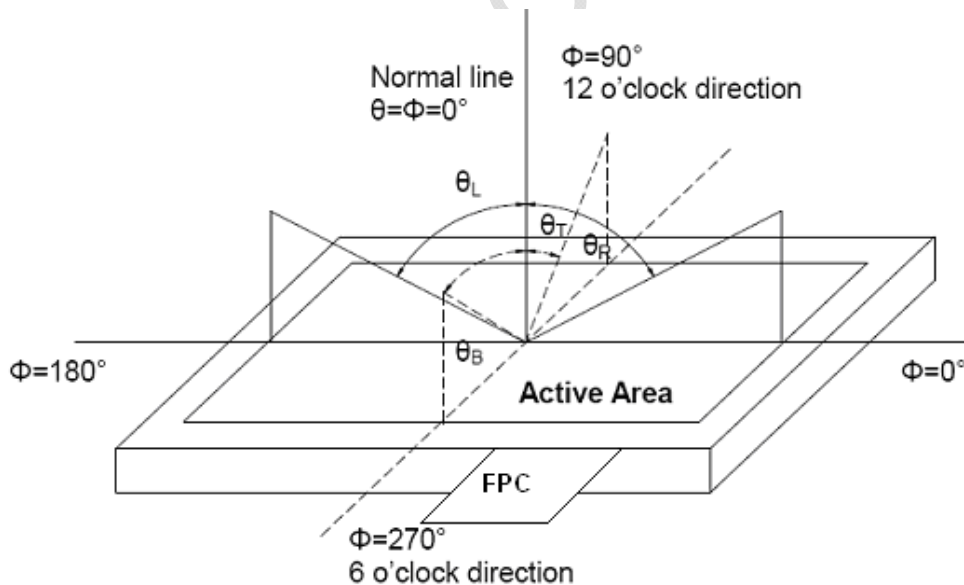
Note 1: Definition of optical measurement system.

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.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD.



Note 3: Definition of contrast ratio

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

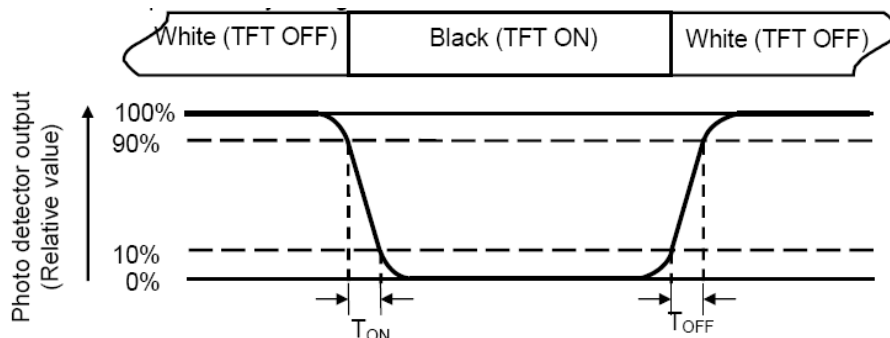
"White state ": The state is that the LCD should drive by  $V_{\text{white}}$ .

"Black state": The state is that the LCD should drive by  $V_{\text{black}}$ .

$V_{\text{white}}$ : To be determined     $V_{\text{black}}$ : 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)**

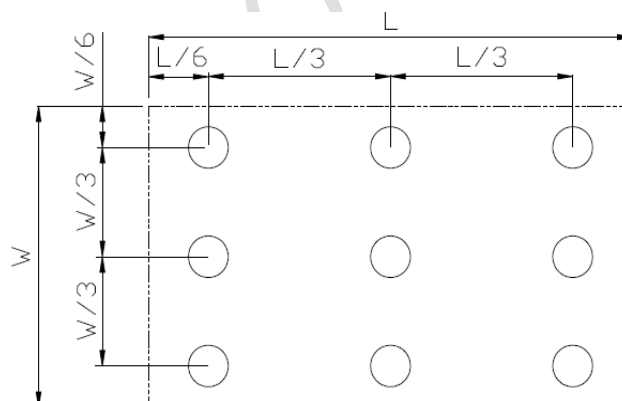
Color coordinates measured at center point of LCD.

**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.

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

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



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

$L_{\min}$ : 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               | 50°C / 120Hours                                                                     | IEC60068-2-1:2007<br>GB2423.2-2008                                                                  |
| 2  | Low Temperature Operation                | 0°C / 120Hours                                                                      | IEC60068-2-1:2007<br>GB2423.1-2008                                                                  |
| 3  | High Temperature Storage                 | 60°C / 120Hours                                                                     | IEC60068-2-1:2007<br>GB2423.2-2008                                                                  |
| 4  | Low Temperature Storage                  | -10°C / 120Hours                                                                    | IEC60068-2-1:2007<br>GB2423.1-2008                                                                  |
| 5  | Storage at High Temperature and Humidity | 40°C x 90%RH / 120Hours                                                             | IEC60068-2-78 :2001<br>GB/T2423.3—2006                                                              |
| 6  | Thermal Shock (non-operation)            | 0°C $\leftrightarrow$ 50°C x 10cycles<br>(30min) (5min) (30min)                     | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14:1984,G<br>B2423.22-2002 |
| 7  | ESD                                      | Contact: $\pm$ 4KV<br>Air: $\pm$ 8KV<br>150PF/330 $\Omega$ ,5Points/panel,5times    | IEC61000-4-2:2001<br>GB/T17626.2-2006                                                               |
| 8  | Vibration Test                           | Frequency: 10Hz~55Hz~10Hz<br>Amplitude:1.5mm, 2 hours for each direction of X, Y, Z | IEC60068-2-6:1982<br>GB/T2423.10—1995                                                               |
| 10 | Package Drop Test                        | Drop to the ground from 1m height,<br>1 corner, 3 edges, 6 surfaces.                | IEC60068-2-32:1990<br>GB/T2423.8—1995                                                               |

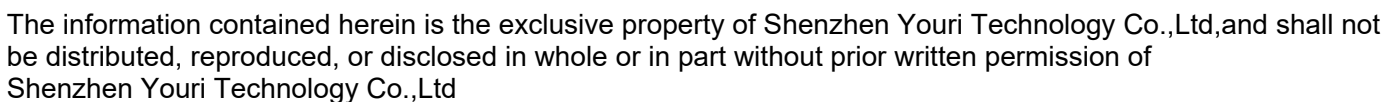
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: 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.

## 8. Outline Dimension



## 9 Packing Drawing

TBD

## 10 Precautions for Use of LCD Modules

### a) Handling Precautions

- i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- ii. 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.
- iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- v. 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
- vi. Do not attempt to disassemble the LCD Module.
  - vii. If the logic circuit power is off, do not apply the input signals.
  - viii. 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.

**b) Storage precautions**

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

- ii. 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%

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

**c) Transportation Precautions**

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