

MODEL NO. : TM070SDH02ISSUED DATE: 2008-11-12VERSION : Ver 1.0

- ☒ Preliminary Specification
☐ Final Product Specification

Customer : _____

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

SHANGHAI TIANMA Confirmed :

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| | | |

This technical specification is subjected to change without notice



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[illegible]



1 General Specifications

Matching connector (BE P-TWD) P/N: AF 730L-A2G1T

| Feature | | Spec |
|----------------------------|---------------------------------|------------------------|
| Display Spec | Size | 7 inch |
| | Resolution | 800(RGB) X 600 |
| | Interface | Digital 18 bits |
| | Color Depth | 262k |
| | Technology Type | a-Si |
| | Pixel Pitch (mm) | 0.176 X 0.176 |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Display Mode | TM with Normally White |
| | Surface Treatment(Up Polarizer) | Anti-Glare(3H) |
| | Viewing Direction | 12 o'clock |
| | Gray Scale Inversion Direction | 6 o'clock |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 155.50 X 118.70 X 5.70 |
| | Active Area(mm) | 141.00 X 105.75 |
| | With /Without TSP | Without TSP |
| | Weight (g) | TBD |
| | LED Numbers | 18 LEDs |

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: ROHS

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



2 Input/Output Terminals

| No | Symbol | I/O | Description | Comment |
|----|--------|-----|--|---------|
| 1 | POL | I | Polarity selection | |
| 2 | STVD | I/O | Vertical start pulse input when U/D= H | Note 1 |
| 3 | OEV | I | Output enable | |
| 4 | CKV | I | Vertical clock | |
| 5 | STVU | I/O | Vertical start pulse input when U/D= L | Note 1 |
| 6 | GND | P | Power ground | |
| 7 | EDGSL | I | Select rising edge or falling edge | |
| 8 | VCC | P | Power supply for digital circuit | |
| 9 | V9 | I | Gamma voltage level 9 | |
| 10 | VGL | P | Gate OFF voltage | |
| 11 | V2 | I | Gamma voltage level 2 | |
| 12 | VGH | P | Gate ON voltage | |
| 13 | V6 | I | Gamma voltage level 6 | |
| 14 | U/D | I | Up/down selection | |
| 15 | VCOM | I | Common voltage | |
| 16 | GND | P | Power ground | |
| 17 | AVDD | P | Power supply for analog circuit | |
| 18 | V14 | I | Gamma voltage level 14 | |
| 19 | V11 | I | Gamma voltage level 11 | |
| 20 | V8 | I | Gamma voltage level 8 | |
| 21 | V5 | I | Gamma voltage level 5 | |
| 22 | V3 | I | Gamma voltage level 3 | |
| 23 | GND | P | Power ground | |
| 24 | R5 | I | Red data(MSB) | |
| 25 | R4 | I | Red data | |
| 26 | R3 | I | Red data | |
| 27 | R2 | I | Red data | |
| 28 | R1 | I | Red data | |
| 29 | R0 | I | Red data(LSB) | |
| 30 | GND | P | Power ground | |
| 31 | GND | P | Power ground | |
| 32 | G5 | I | Green data(MSB) | |
| 33 | G4 | I | Green data | |
| 34 | G3 | I | Green data | |
| 35 | G2 | I | Green data | |
| 36 | G1 | I | Green data | |
| 37 | G0 | I | Green data(LSB) | |
| 38 | STHL | I/O | Horizontal start pulse input when R/L = L | Note 1 |
| 39 | REV | I | Control signal are inverted or not | |
| 40 | GND | P | Power ground | |
| 41 | DCLK | I | Sample clock | |
| 42 | VCC | P | Power supply for digital circuit | |
| 43 | STHR | I/O | Horizontal start pulse input when R/L= H | Note 1 |
| 44 | LD | I | Latches the polarity of outputs and switches the new data to outputs | |
| 45 | B5 | I | Blue data (MSB) | |

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| | | | | |
|----|------|---|---------------------------------|--|
| 46 | B4 | I | Blue data | |
| 47 | B3 | I | Blue data | |
| 48 | B2 | I | Blue data | |
| 49 | B1 | I | Blue data | |
| 50 | B0 | I | Blue data (LSB) | |
| 51 | R/L | I | Right/ left selection | |
| 52 | V1 | I | Gamma voltage level 1 | |
| 53 | V4 | I | Gamma voltage level 4 | |
| 54 | V7 | I | Gamma voltage level 7 | |
| 55 | V10 | I | Gamma voltage level 10 | |
| 56 | V12 | I | Gamma voltage level 12 | |
| 57 | V13 | I | Gamma voltage level 13 | |
| 58 | AVDD | P | Power supply for analog circuit | |
| 59 | GND | P | Power ground | |
| 60 | VCOM | I | Common voltage | |

Note 1:

| Setting | | In/Out State for Start Pulse | | | | Scanning Direction |
|---------|-----|------------------------------|------|------|------|---------------------------|
| U/D | R/L | STVD | STVU | STHR | STHL | |
| GND | VCC | O | I | I | O | UP to down, left to right |
| VCC | GND | I | O | O | I | Down to up, right to left |
| GND | GND | O | I | O | I | UP to down, right to left |
| VCC | VCC | I | O | I | O | Down to up, left to right |

Note 2: I/O definition:

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



3 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | Min | Max | Unit | Remark |
|--------------------------------|------------------|----------|----------|------|--------|
| Logic Supply Voltage | VCC | -0.3 | 5.0 | V | |
| Analog Supply Voltage | AVDD | -0.3 | 15 | V | |
| Positive power for scan driver | VGH | -0.3 | 42.0 | V | |
| Negative power for scan driver | VGL | -20 | 0.3 | V | |
| Voltage range of VGH- VGL | VGH- VGL | -0.3 | 40.0 | V | |
| Gamma voltage | V1~V7 | 0.4 AVDD | AVDD+0.3 | V | Note 1 |
| | V8~V14 | -0.3 | 0.6 AVDD | V | Note 1 |
| Operating Temperature | T _{OPR} | -20 | 70 | °C | |
| Storage Temperature | T _{STG} | -30 | 80 | °C | |

Note 1: $AVDD-0.1 \geq V1 \geq V2 \geq V3 \geq V4 \geq V5 \geq V6 \geq V7 \geq V8 \geq V9 \geq V10 \geq V11 \geq V12 \geq V13 \geq V14 \geq GND+0.1$



4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

| Item | | Symbol | Min | Typ | Max | Unit | Remark |
|--------------------------------|------------|-------------------|---------|--------|---------|------|---|
| Logic Supply Voltage | | VCC | 3.0 | 3.3 | 3.6 | V | |
| Analog Supply Voltage | | AVDD | - | 10.0 | - | V | |
| Positive power for scan driver | | VGH | 14.5 | 15 | 15.5 | | |
| Negative power for scan driver | | VGL | -10.5 | -10 | -9.5 | | |
| VCOM | | VCOM | - | 4.05 | - | V | |
| Input Signal Voltage | Low Level | V _{IL} | 0 | - | 0.2xVCC | V | R0~5,G0~5,B0~5,POL, STVD,OEV,CKV,STVU, EDGSL,U/D,STHL,REV, DCLK,STHR,LD,R/L |
| | High Level | V _{IH} | 0.8xVCC | - | VCC | V | |
| Output Signal Voltage | Low Level | V _{OL} | 0 | - | 0.2xVCC | V | STVD,STVU,STHL,STHR |
| | High Level | V _{OH} | 0.8xVCC | - | VCC | V | |
| (Panel+LSI) Power Consumption | | I _{GH} | - | 0.217 | - | mA | |
| | | I _{GL} | - | 0.542 | - | mA | |
| | | I _{CC} | - | 3.577 | - | mA | |
| | | I _{AVDD} | - | 35.788 | - | mA | |

Note: It is important that VCC & VGL should be applied before VGH.

4.2 Gamma Correction Voltage

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|---|--------|-----|-------|-----|------|--------|
| Gamma Correction reference Voltage V1~V14 | V1 | - | 9.800 | - | V | |
| | V2 | - | 9.704 | - | V | |
| | V3 | - | 7.866 | - | V | |
| | V4 | - | 7.365 | - | V | |
| | V5 | - | 6.980 | - | V | |
| | V6 | - | 6.287 | - | V | |
| | V7 | - | 5.450 | - | V | |
| | V8 | - | 4.550 | - | V | |
| | V9 | - | 3.713 | - | V | |
| | V10 | - | 3.020 | - | V | |
| | V11 | - | 2.635 | - | V | |
| | V12 | - | 2.134 | - | V | |
| | V13 | - | 0.296 | - | V | |
| | V14 | - | 0.200 | - | V | |

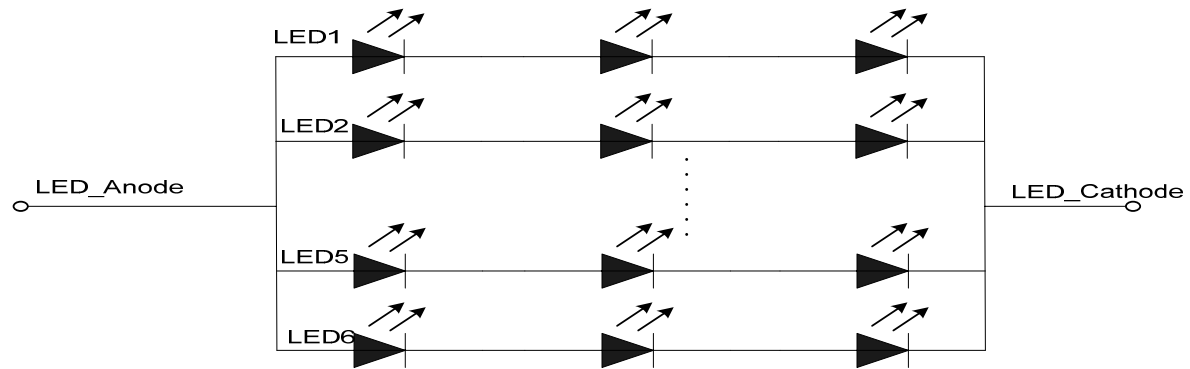


4.3 Driving Backlight

Ta=25°C

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-----------------------------|----------|-----|------|-----|------|--------|
| Forward Current | I_F | - | 20 | - | mA | Note 1 |
| Forward Current Voltage | V_F | - | 9.6 | - | V | Note 1 |
| Backlight Power Consumption | W_{BL} | - | 1152 | - | mW | Note 1 |

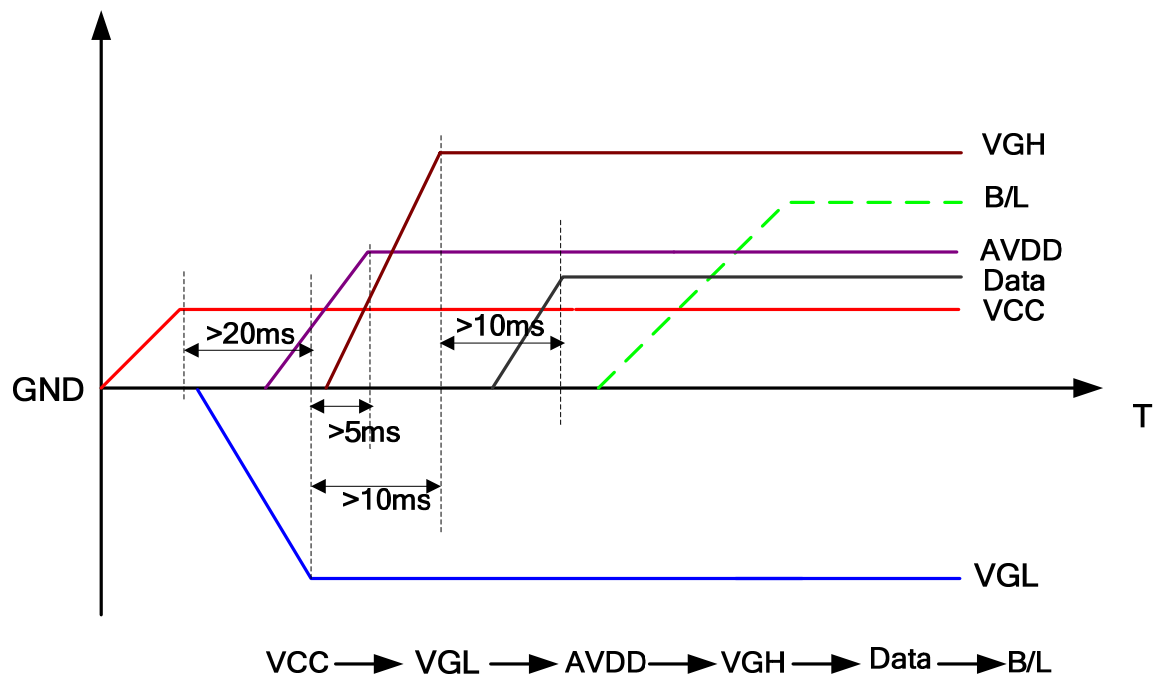
Note 1 : The LED driving condition is defined for all LED module (3 LED Serial, 6LED Parallel).



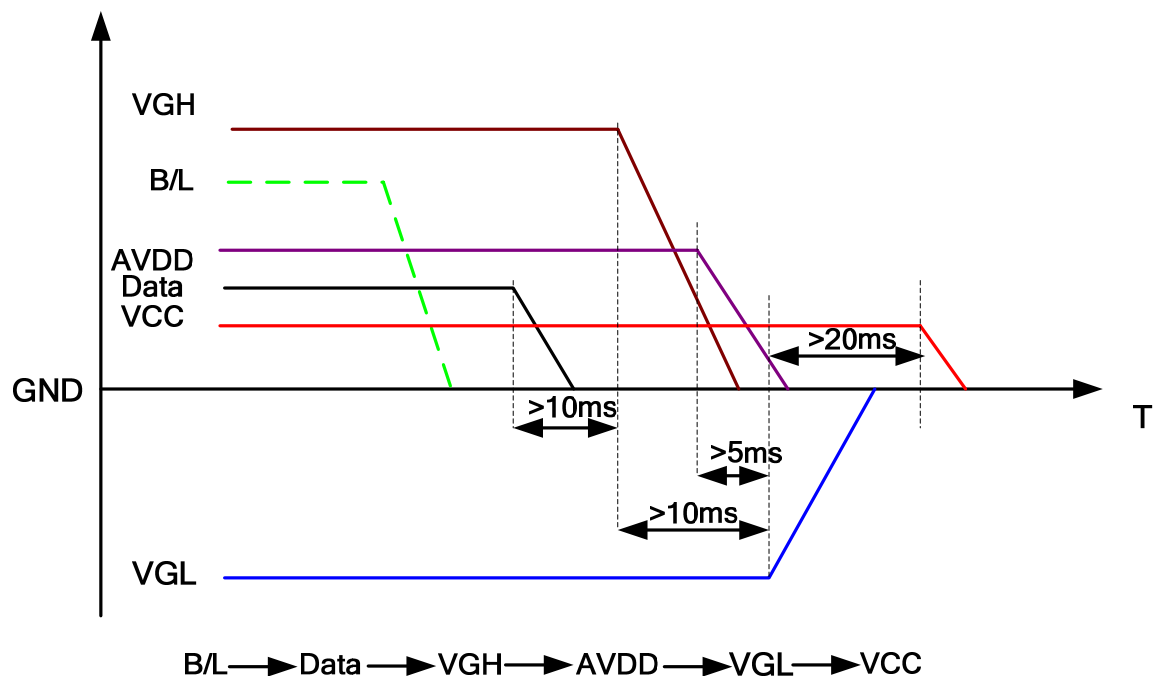


4.4 Power Sequence

4.4.1 Power on

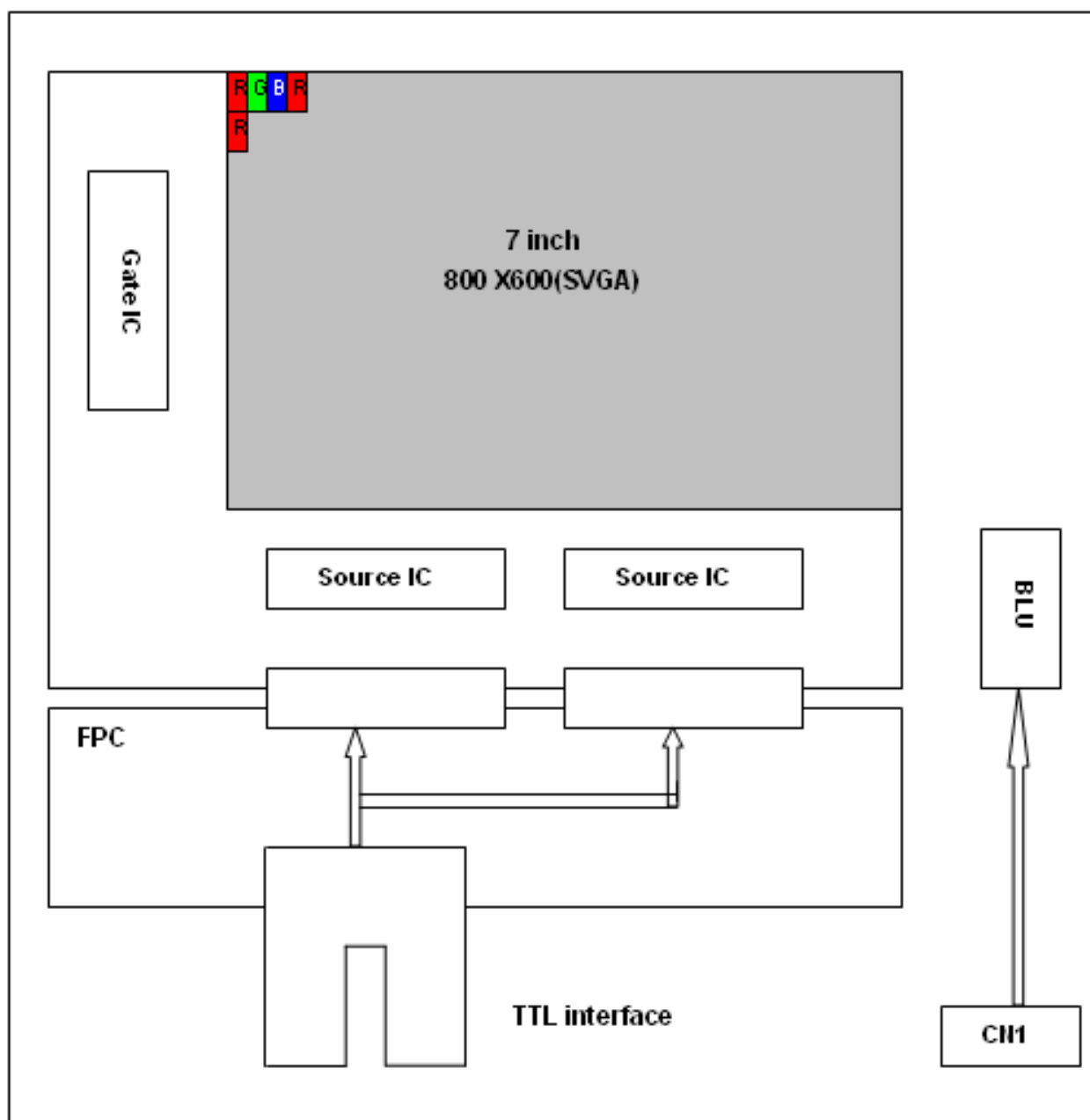


4.4.2 Power off





4.5 Block diagram





5 Timing Chart

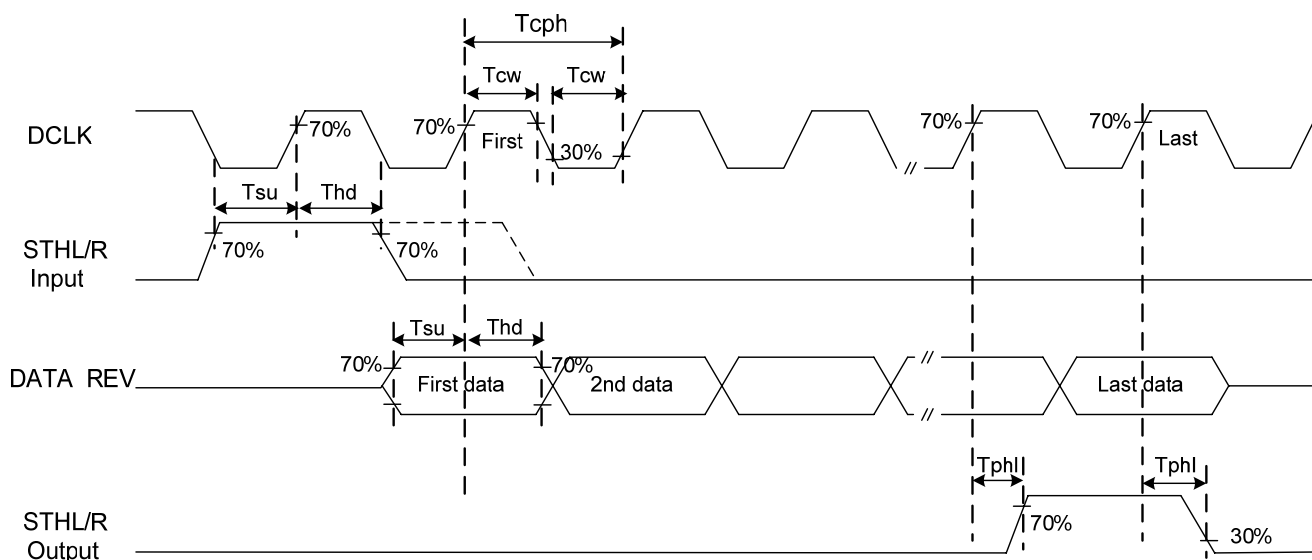
5.1.1. Clock and data input timing diagram1 (VCC=3.3V, AVDD=10.0V, GND=AGND=0V, Ta=25°C)

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|---------------------------------|--------|-----|------|------|------|------------|
| DCLK frequency | Fclk | - | 50 | 55 | MHz | EDGSL=0 |
| | | - | 25 | 27.5 | MHz | EDGSL=1 |
| DCLK cycle | Tcph | 18 | 20 | - | ns | EDGSL=0 |
| | | 36 | 40 | - | ns | EDGSL=1 |
| DCLK pulse width | Tcw | 40% | - | 60% | Tcph | |
| Data set-up time | Tsu | 4 | - | - | ns | |
| Data hold time | Thd | 2 | - | - | ns | |
| Time that the last data to LD | Tld | 1 | - | - | Tcph | |
| Pulse width of LD | Twld | 2 | - | - | Tcph | |
| Time that LD to STHL/R | Tlds | 5 | - | - | Tcph | |
| POL set-up time | Tpsu | 6 | - | - | ns | POL to LD |
| POL hold time | Tphd | 6 | - | - | ns | POL to LD |
| Horizontal display timing range | Tdh | - | 800 | - | Tcph | |
| Horizontal timing range | Th | - | 1056 | - | Tcph | |
| CKV pulse width | Pwclk | 500 | - | - | ns | High & Low |
| OEV pulse width | Twcl | 1 | - | - | us | |
| STVD/U set-up time | Tgsu | 200 | - | - | ns | |
| STVD/U hold time | Tghd | 300 | - | - | ns | |
| Horizontal lines per field | Tv | 628 | 635 | 650 | Tdh | |
| Vertical display timing range | Tvd | - | 600 | - | Tdh | |

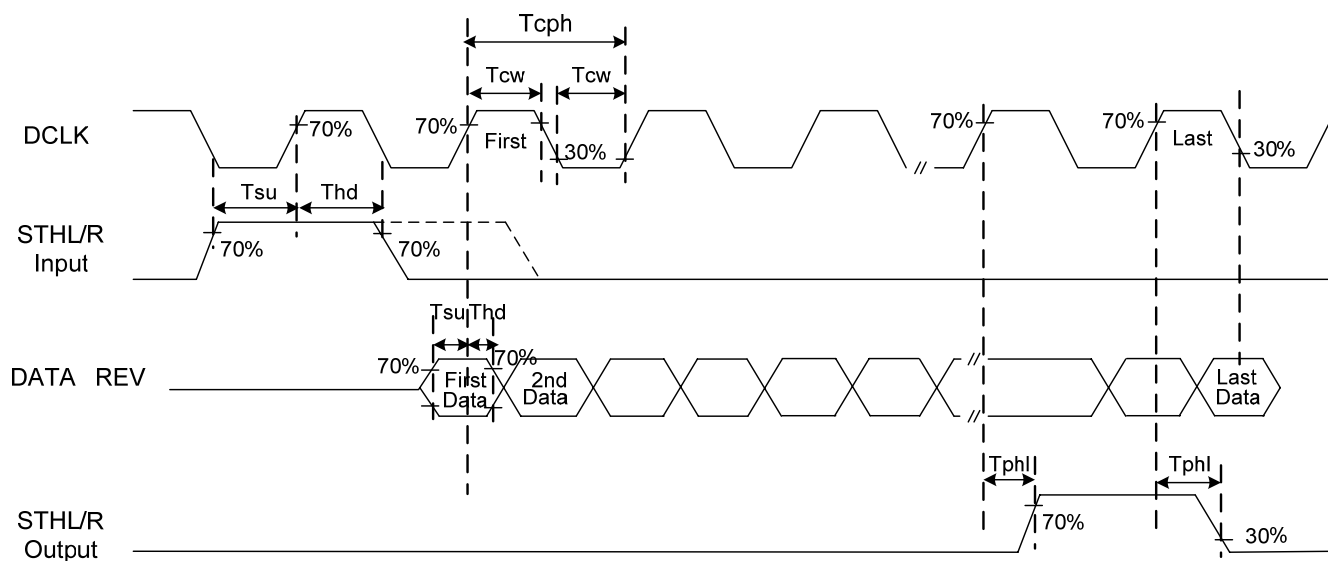


5.1.2. Clock and data input timing diagram1 (VCC=3.3V,AVDD=10.0V, GND=AGND=0V,Ta=25℃)

<< EDGSL="0" >>

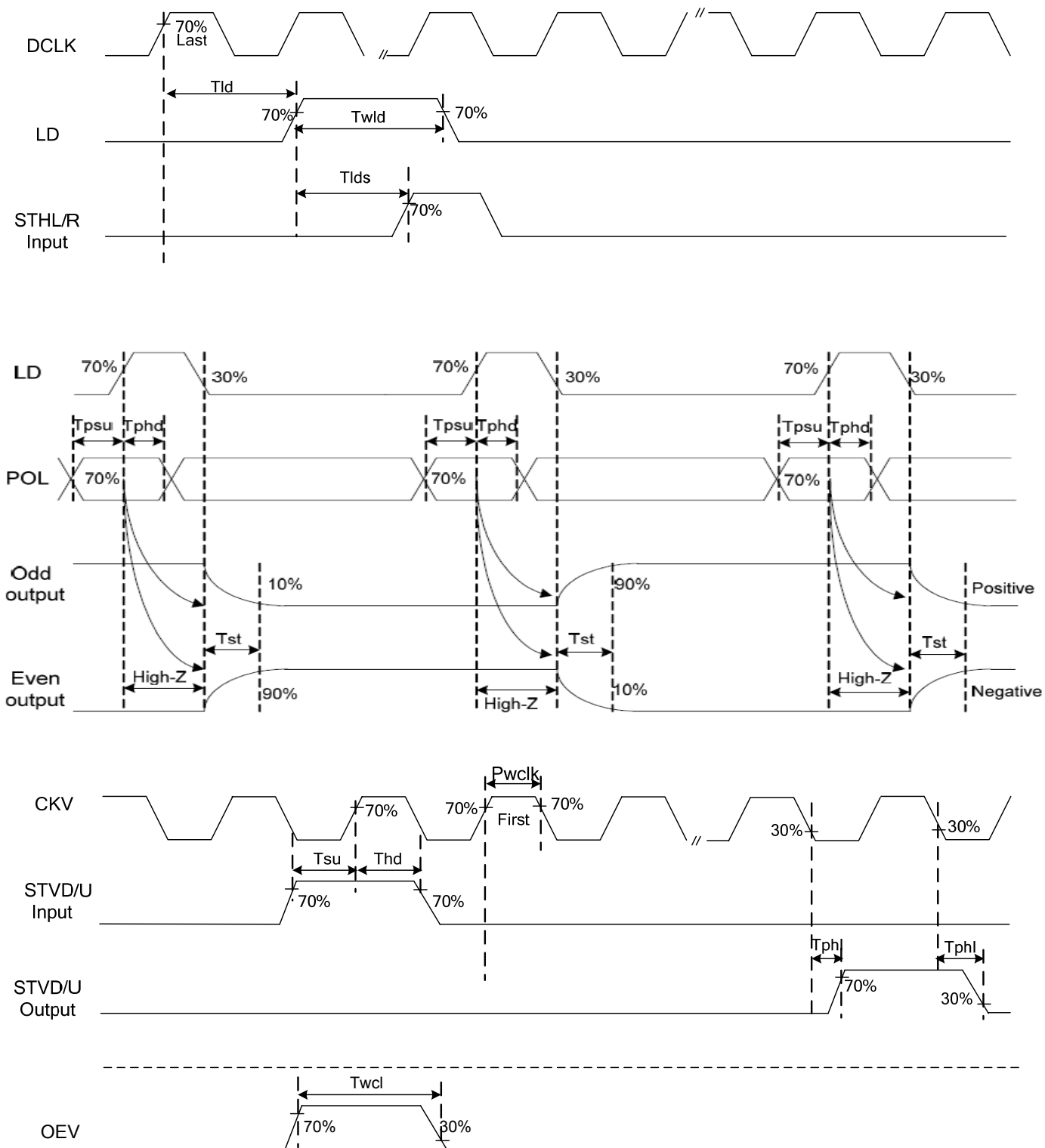


<< EDGSL="1" >>





5.1.3. Clock and data input timing diagram2





6 Optical Characteristics

6.1 Optical Specification

Ta=25°C

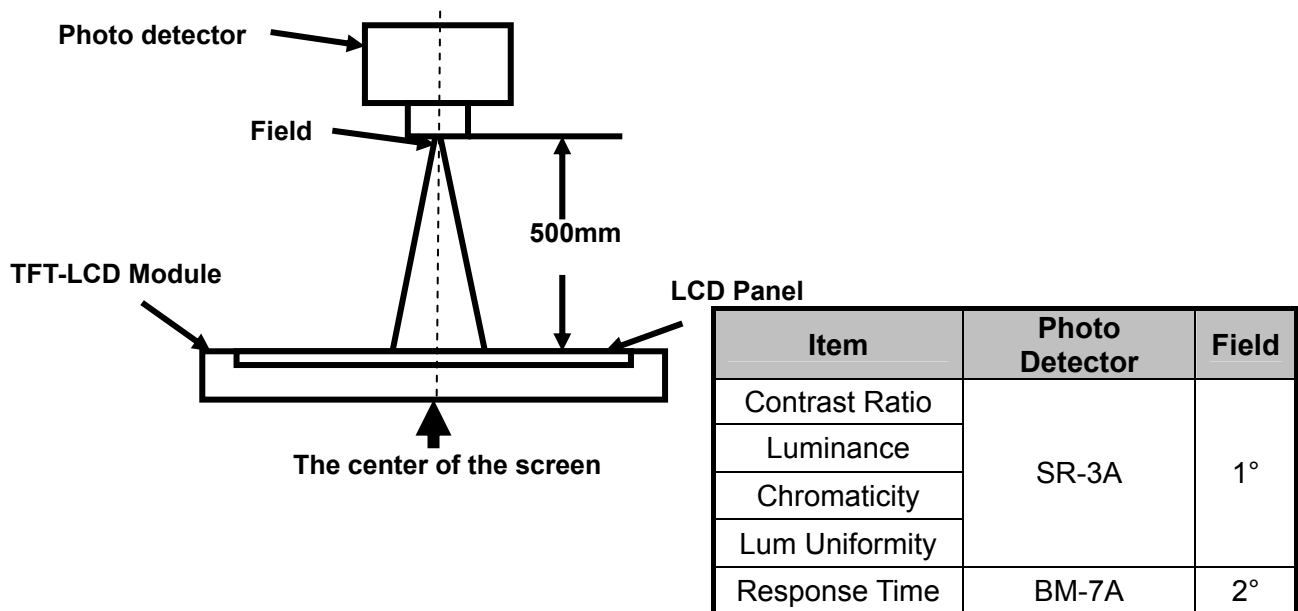
| Item | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|----------------|-------|------------------|-----------------|-------|-------|-------|-------------------|----------|
| View Angles | | θT | CR≧10 | 35 | 45 | - | Degree | Note2,3 |
| | | θB | | 55 | 65 | - | | |
| | | θL | | 55 | 65 | | | |
| | | θR | | 55 | 65 | - | | |
| Contrast Ratio | | CR | θ=0° | 250 | 400 | - | | Note 3 |
| Response Time | | T _{ON} | 25℃ | - | 25 | 50 | ms | Note 4 |
| | | T _{OFF} | | | | | | |
| Chromaticity | White | x | Backlight is on | 0.260 | 0.310 | 0.340 | | Note 1,5 |
| | | y | | 0.287 | 0.337 | 0.387 | | |
| | Red | x | | 0.536 | 0.568 | 0.636 | | |
| | | y | | 0.297 | 0.347 | 0.397 | | |
| | Green | x | | 0.286 | 0.336 | 0.386 | | |
| | | y | | 0.524 | 0.574 | 0.624 | | |
| | Blue | x | | 0.090 | 0.140 | 0.190 | | |
| | | y | | 0.074 | 0.124 | 0.174 | | |
| Uniformity | | U | | 70 | 80 | - | % | Note 6 |
| NTSC | | - | | 45 | 50 | - | % | Note 5 |
| Luminance | | L | | 160 | 200 | - | cd/m ² | Note 7 |

Test Conditions:

1. The ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

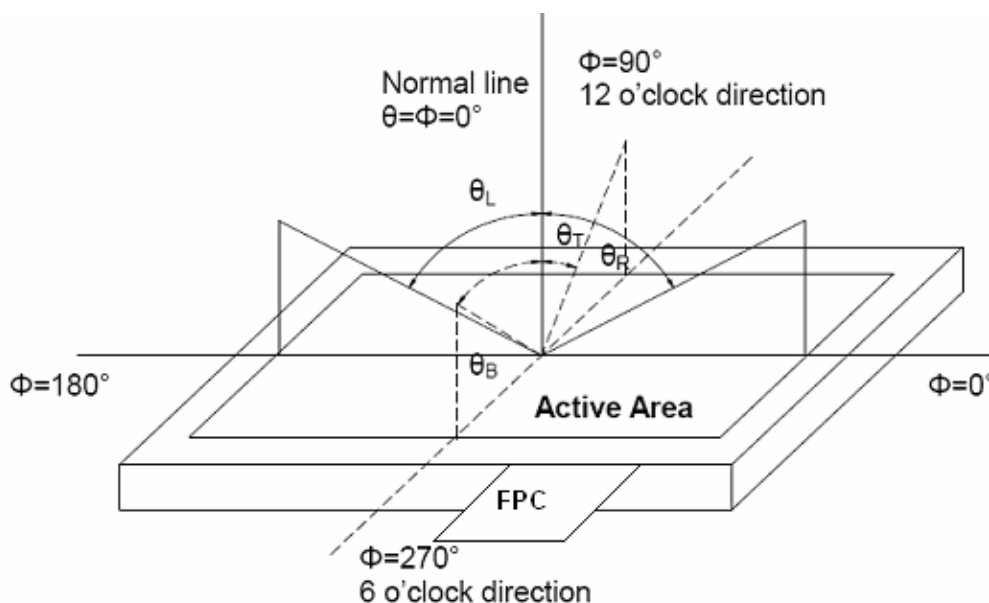
**Note 1: Definition of optical measurement system.**

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 by CONOSCOPE(ergo-80).

Fig. 6.1 Definition of viewing angle





Note 3: Definition of contrast ratio

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

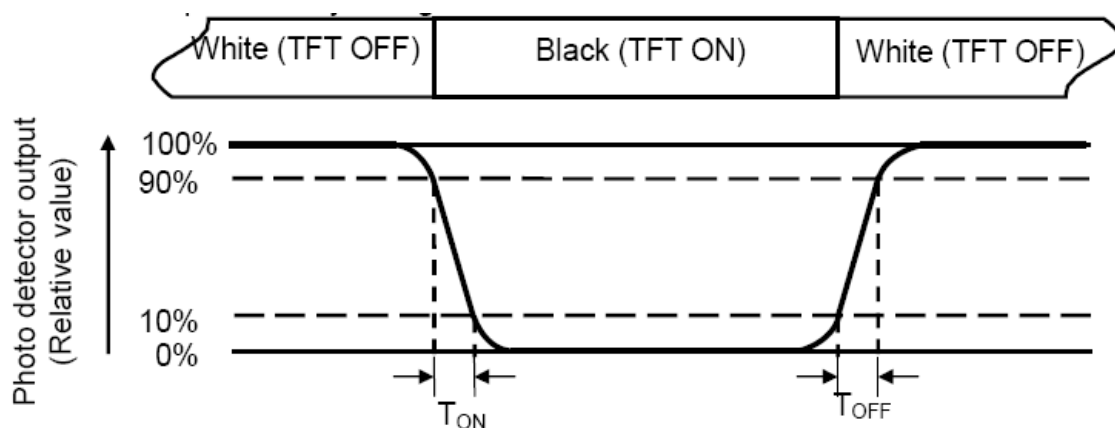
"White state": The state is that the LCD should driven by V_{white} .

"Black state": The state is that the LCD should driven by V_{black} .

V_{white} : To be determined V_{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

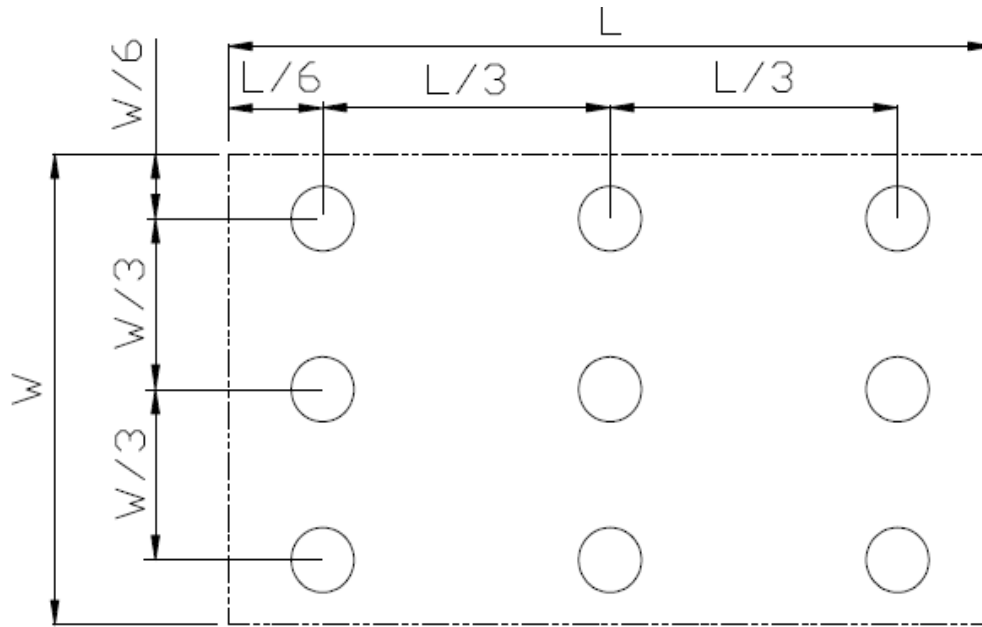


Fig. 6.2 Definition of uniformity

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 Tests

| No | Test Item | Condition | Remark |
|----|--|---|---|
| 1 | High Temperature Operation | Ts=+70℃, 240hrs | Note1 IEC60068-2-2,GB2423.2—89 |
| 2 | Low Temperature Operation | Ta=-20℃, 240hrs | IEC60068-2-1 GB2423.1—89 |
| 3 | High Temperature Storage (non-operation) | Ta=+80℃, 240hrs | IEC60068-2-2, GB2423.2—89 |
| 4 | Low Temperature Storage (non-operation) | Ta=-30℃, 240hrs | IEC60068-2-1 GB2423.1—89 |
| 5 | High Temperature & High Humidity Operation | Ta = +60℃,90% RH max,240 hours | Note2 IEC60068-2-3, GB/T2423.3—2006 |
| 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—87 |
| 7 | Electro Static Discharge (operation) | ± 2KV,Human Body Mode, 100pF/1500 Ω | IEC61000-4-2 GB/T17626.2—1998 |
| 8 | Vibration (non-operation) | Sine Wave Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.(6 hours for total) | IEC60068-2-6 GB/T2423.10—1995 |
| 9 | Shock (non-operation) | 100G 6ms, ±X,±Y,±Z 3times for each direction | IEC60068-2-27 GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:80 cm,1 corner, 3 edges, 6 surfaces | IEC60068-2-32 GB/2423.8—1995 |
| 11 | Package Vibration Test | Random Vibration: 0.015G*G/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total) | IEC60068-2-34 |

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

Note2: Ta is the ambient temperature of samples.







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
- 10.1.6. Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 10.1.7. Do not attempt to disassemble the LCD Module.
- 10.1.8. If the logic circuit power is off, do not apply the input signals.
- 10.1.9. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- 10.2 Be sure to ground the body when handling the LCD Modules.
- 10.3 Tools required for assembly, such as soldering irons, must be properly ground.
- 10.4 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
- 10.5 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.
- 10.6 Storage precautions
 - 10.6.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
 - 10.6.2. 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:
- 10.7 Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%
 - 10.7.1. The LCD modules should be stored in the room without acid, alkali and harmful gas.
 - 10.7.2. Transportation Precautions
- 10.8 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.