

**MODEL NO :** TM084SDHG01

**MODEL VERSION:** 01

**SPEC VERSION :** 2.3

**ISSUED DATE:** 2015-11-25

- ☐ Preliminary Specification
- ☒ Final Product Specification

**Customer :** \_\_\_\_\_

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

**TIANMA Confirmed :**

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This technical specification is subjected to change without prior notice.

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## Record of Revision

[illegible]

# 1 General Specifications

| Feature                           |                                | Spec                    |
|-----------------------------------|--------------------------------|-------------------------|
| <b>Display Spec.</b>              | Size                           | 8.4 inch                |
|                                   | Resolution                     | 800(RGB) x 600          |
|                                   | Technology Type                | a-Si TFT                |
|                                   | Pixel Configuration            | R.G.B. Vertical Stripe  |
|                                   | Pixel pitch(mm)                | 0.213×0.213             |
|                                   | Display Mode                   | TM,NW                   |
|                                   | Surface Treatment              | Anti Glare              |
|                                   | Viewing Direction              | 12 o'clock              |
|                                   | Gray Scale Inversion Direction | 6 o'clock               |
| <b>Mechanical Characteristics</b> | LCM (W x H x D) (mm)           | 203x 142.5 x 5.7        |
|                                   | Active Area(mm)                | 170.4 (W) X127.8(H)     |
|                                   | With /Without TSP              | Without TSP             |
|                                   | Matching Connection Type(CN1)  | DF19-20S-1C(HRS)        |
|                                   | Matching Connection Type(CN2)  | H208K-P04N-02B (Entery) |
|                                   | LED Numbers                    | 21 LEDS                 |
|                                   | Weight (g)                     | 185.1                   |
| <b>Electrical Characteristics</b> | Interface                      | LVDS 6/8 bit            |
|                                   | Color Depth                    | 16.7M                   |
|                                   | Driver IC                      | NT51008B*2+NT52002*1    |

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

### 2.1 CN1 pin assignment

Matching Connector: DF19-20S-1C(HRS)

| Pin | Symbol   | I/O | Description                                                 | Remark |
|-----|----------|-----|-------------------------------------------------------------|--------|
| 1   | VDD      | P   | Power supply                                                |        |
| 2   | VDD      | P   | Power supply                                                |        |
| 3   | UD       | I   | Vertical Reverse Scan Control                               | Note1  |
| 4   | LR       | I   | Horizontal Reverse Scan Control                             | Note1  |
| 5   | RxIN1-   | I   | Negative data 1 for LVDS signal input                       |        |
| 6   | RxIN1+   | I   | Positive data 1 for LVDS signal input                       |        |
| 7   | GND      | P   | Ground                                                      |        |
| 8   | RxIN2-   | I   | Negative data 2 for LVDS signal input                       |        |
| 9   | RxIN2+   | I   | Positive data 2 for LVDS signal input                       |        |
| 10  | GND      | P   | Ground                                                      |        |
| 11  | RxIN3-   | I   | Negative data 3 for LVDS signal input                       |        |
| 12  | RxIN3+   | I   | Positive data 3 for LVDS signal input                       |        |
| 13  | GND      | P   | Ground                                                      |        |
| 14  | RxCLKIN- | I   | negative clock for LVDS signal input                        |        |
| 15  | RxCLKIN+ | I   | Positive clock for LVDS signal input                        |        |
| 16  | GND      | P   | Ground                                                      |        |
| 17  | SEL68    | I   | LVDS 6/8 bit selection control<br>Hight:8bit;Low or NC:6bit |        |
| 18  | NC       | I   | No connection                                               |        |
| 19  | RxIN4-   | I   | Negative data 4 for LVDS signal input                       |        |
| 20  | RxIN4+   | I   | Positive data 4 for LVDS signal input                       |        |

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

**Table 2.1 terminal pin assignments**

**Note1: Scanning direction description**

| Scan control input |      | Scanning direction        |
|--------------------|------|---------------------------|
| UD                 | LR   |                           |
| HIGH               | HIGH | Down to up, left to right |
| LOW                | LOW  | Up to down, right to left |
| HIGH               | LOW  | Down to up, right to left |
| LOW                | HIGH | Up to down, left to right |

**2.2 CN2 pin assignment (Backlight interface)**

Matching Connector type: H208K-P04N-02B (Entery)

| Pin | Symbol  | I/O | Description                                           | Remark |
|-----|---------|-----|-------------------------------------------------------|--------|
| 1   | VBL     | P   | Backlight Power supply , 12V input                    |        |
| 2   | PGND    | P   | Ground                                                |        |
| 3   | BL_EN   | I   | Enable : 3.3V for backlight on ; 0V for backlight off |        |
| 4   | Dimming | I   | Adjust the luminance of LED's                         |        |

### 3 Absolute Maximum Ratings

GND=0V, Ta = 25 °C

| Item                         | Symbol          | MIN  | MAX | Unit             | Remark           |
|------------------------------|-----------------|------|-----|------------------|------------------|
| Power Voltage                | VDD             | -0.5 | 5.0 | V                |                  |
|                              | VBL             | -0.3 | 24  | V                |                  |
| Input voltage                | V <sub>IN</sub> | -0.5 | 5.0 | V                | Note1            |
| Operating Temperature        | Top             | -20  | 70  | °C               |                  |
| Storage Temperature          | Tst             | -30  | 80  | °C               |                  |
| Relative Humidity<br>(Note2) | RH              | --   | ≤95 | %                | Ta≤40°C          |
|                              |                 | --   | ≤85 | %                | 40°C < Ta ≤ 50°C |
|                              |                 | --   | ≤55 | %                | 50°C < Ta ≤ 60°C |
|                              |                 | --   | ≤36 | %                | 60°C < Ta ≤ 70°C |
|                              |                 | --   | ≤24 | %                | 70°C < Ta ≤ 80°C |
| Absolute Humidity            | AH              | --   | ≤70 | g/m <sup>3</sup> | Ta > 70°C        |

**Table 3 Absolute Maximum Ratings**

Note1: Input voltage include RxIN, RxCLK , SEL68, UD, LR ,EN ,Dimming.

Note2: Ta means the ambient temperature.

It is necessary to limit the relative humidity to the specified temperature range.

Condensation on the module is not allowed.

## 4 Electrical Characteristics

### 4.1 Recommended Operating Condition

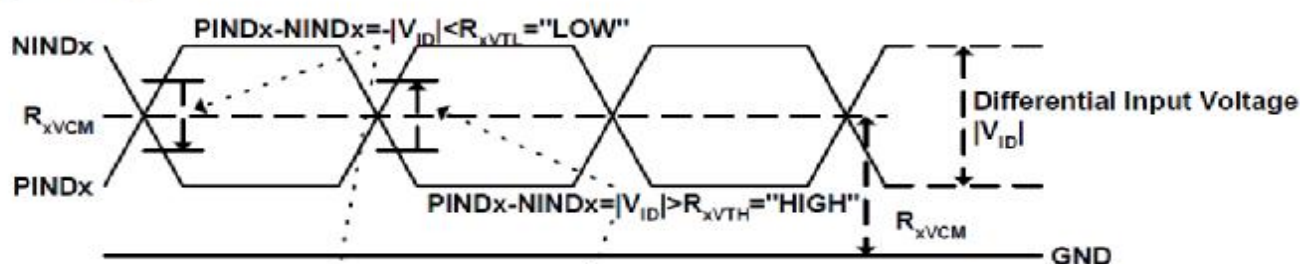
VCC=3.3V, GND=0V, Ta = 25℃

| Item                                      | Symbol     | Min          | Typ  | Max              | Unit | Remark          |
|-------------------------------------------|------------|--------------|------|------------------|------|-----------------|
| POWER Supply Voltage                      | VDD        | 3.00         | 3.30 | 3.60             | V    |                 |
| Differential input high threshold voltage | $R_{xVTH}$ |              |      | +0.1             | V    | $R_{xVCM}=1.2V$ |
| Differential input low threshold voltage  | $R_{xVTL}$ | -0.1         |      |                  | V    |                 |
| Input voltage range (singled-end)         | $R_{xVIN}$ | 0            |      | 2.4              | V    |                 |
| Differential input common mode voltage    | $R_{xVCM}$ | $ V_{ID} /2$ |      | $2.4- V_{ID} /2$ | V    |                 |
| Differential input voltage                | $ V_{ID} $ | 0.2          |      | 0.6              | V    |                 |
| Current of VDD Power supply               | IVDD       | -            | 230  | 350              | mA   | Note1           |
| Power consumption of VDD                  | WVDD       | -            | 759  | -                | mW   |                 |
| Inrush current of VDD                     | Irush      | -            | 0.88 | 1.2              | A    |                 |

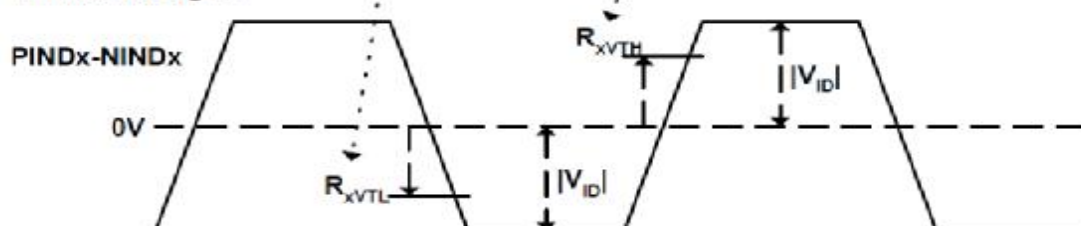
Table 4.1 LCD module electrical characteristics

Note1: To test the current dissipation, use “all Black Pattern”.

#### Single-end Signals



#### Differential Signal



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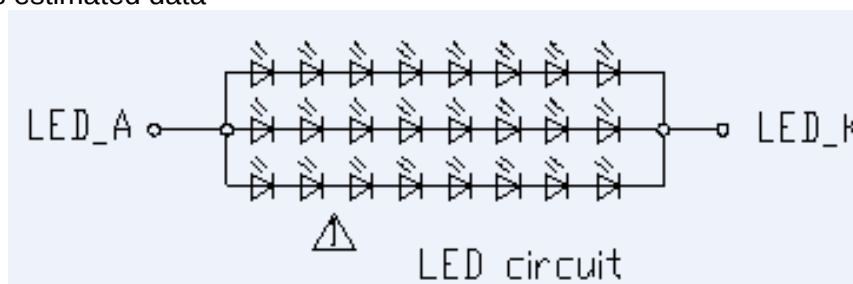
## 4.2 Backlight Unit Driving Condition

LEDGND=GND=0V, Ta = 25℃

| Item                          | Symbol               | Min  | Typ     | Max  | Unit | Remark |
|-------------------------------|----------------------|------|---------|------|------|--------|
| Voltage of LED driver circuit | VBL                  | 11.5 | 12      | 12.5 | V    |        |
| Current of LED driver circuit | IBL                  | -    | 165     | 240  | mA   |        |
| Power Consumption             | W <sub>BL</sub>      | -    | 1980    | -    | mW   |        |
| Dimming Signal frequency      | F <sub>dimming</sub> | 0.1  |         | 100  | KHz  |        |
| Dimming Signal duty           | 100Hz~10KHz          | -    | 0       | -    | 100  | %      |
|                               | 10KHz~100KHz         | -    | 10      | -    | 100  | %      |
| LED Life time                 | -                    | --   | (50000) | --   | H    |        |

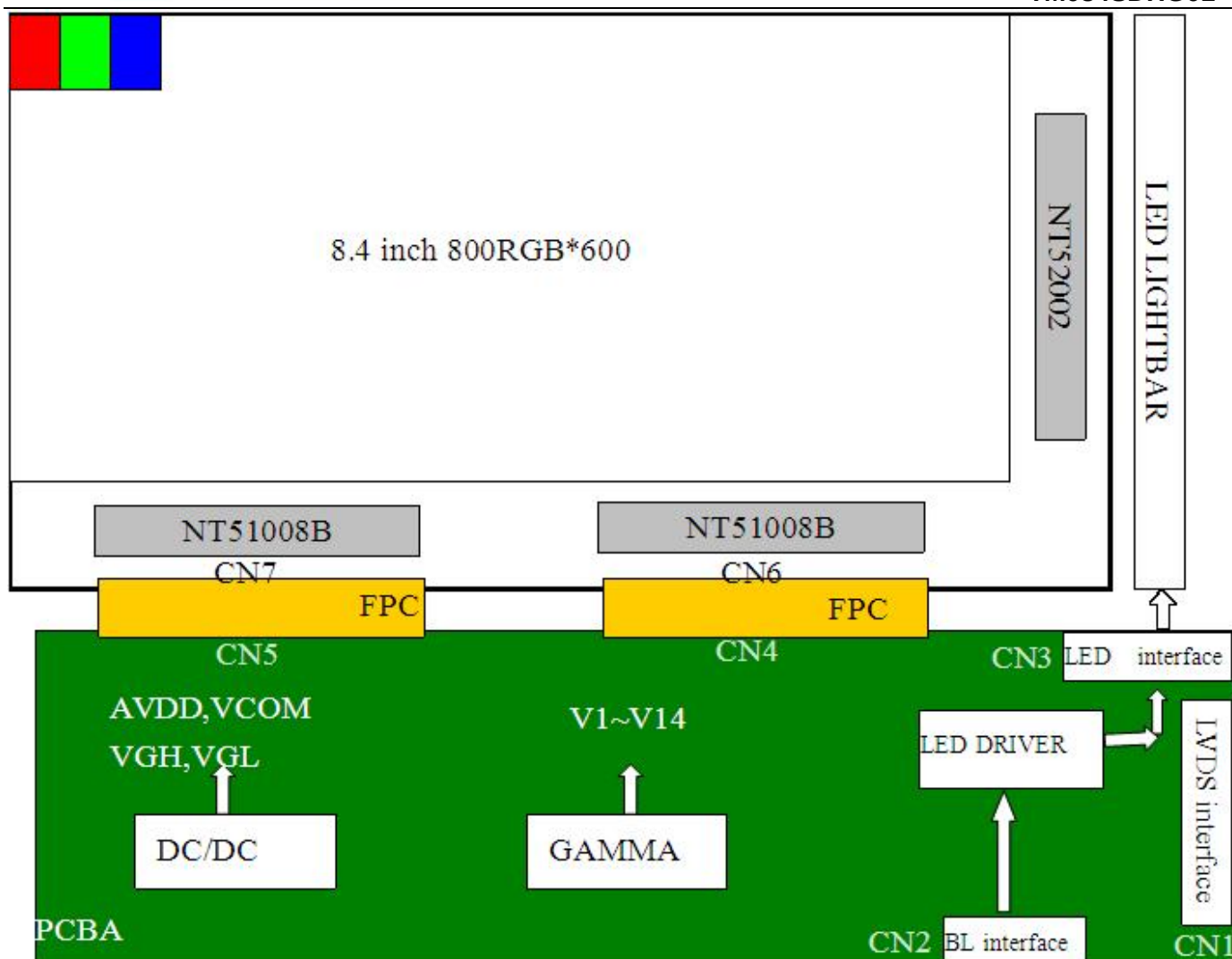
**Table 4.2 LED backlight characteristics**

Note 1: 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% initial brightness. Typical operating life time is estimated data



**Figure4.1 LED connection of backlight**

## 4.3 BLOCK DIAGRAM



## 5 Timing Chart

### 5.1 TFT-LCD Input Timing

VCC=3.3V, GND=0V, Ta=25°C

| Parameter | Symbol | Min  | Typ  | Max  | Unit | Remark      |
|-----------|--------|------|------|------|------|-------------|
| DCLK      | Fclk   | 34.5 | 39.6 | 49.5 | MHz  | Tclk=1/Fclk |
|           | Tclk   | 20.2 | 25.3 | 30.7 | ns   |             |
| HSYNC     | TH     | 900  | 1000 | 1200 | Tclk |             |
|           | THD    | -    | 800  | -    | Tclk |             |
|           | Thwh   | 1    | -    | 40   | Tclk |             |
|           | Thbp   | -    | 88   | -    | Tclk |             |
|           | Thfp   | 12   | 112  | 312  | Tclk |             |
| VSYNC     | TV     | 640  | 660  | 700  | TH   |             |
|           | TVD    | -    | 480  | -    | TH   |             |
|           | Tvwh   | 1    | -    | 20   | TH   |             |
|           | Tvbp   | -    | 39   | -    | TH   |             |
|           | Tvfp   | 1    | 21   | 61   | TH   |             |

**Table 5.1 TCON input timing(HV mode)**

### 5.2 Recommended Timing Setting Of TCON

**TCON (Embedded In Source IC) Input timing at DE mode**

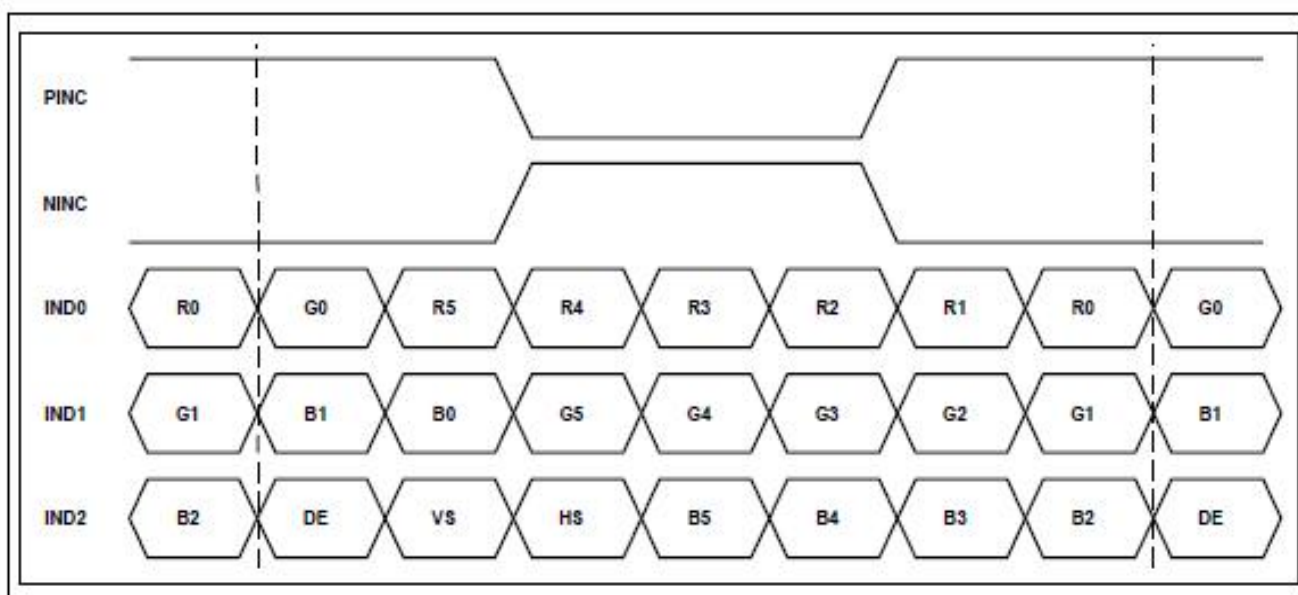
VCC=3.3V, GND=0V, Ta=25°C

|                    | Parameter           | Symb<br>ol | Min. | Typ. | Max. | Unit | Remark      |
|--------------------|---------------------|------------|------|------|------|------|-------------|
| Dclk frequency     |                     | Fclk       | 33   | 39.6 | 49.5 | MHz  | Tclk=1/Fclk |
| Horizontal section | Horizontal total    | TH         | 890  | 1000 | 1300 | Tclk |             |
|                    | Horizontal blanking | THC        | 90   | 200  | 500  | Tclk |             |
|                    | Valid Data Width    | THD        | -    | 800  | -    | Tclk |             |
| Vertical section   | Frame rate          | -          | -    | 60   | -    | Hz   |             |
|                    | Vertical total      | TV         | 610  | 660  | 800  | TH   |             |
|                    | Vertical blanking   | TVC        | 10   | 60   | 200  | TH   |             |
|                    | Valid Data Width    | TVD        | -    | 600  | -    | TH   |             |

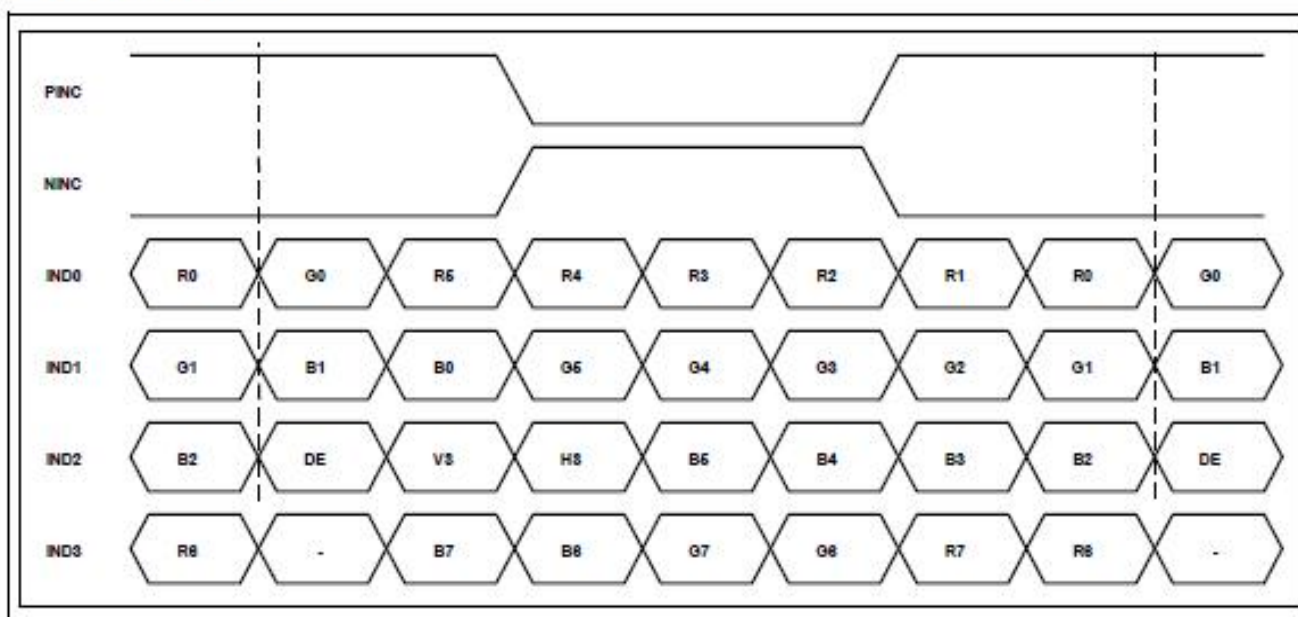
**Table 5.2 TCON input timing (DE mode)**

### 5.3 LVDS Input Data Format

#### 6bit LVDS input



#### 8-bit LVDS input



**Figure5.1 LVDS input data mapping**

## 5.4 Input signal AC timing

| Parameter       | Symbol      | Min. | Typ.                | Max. | Unit | Remark |
|-----------------|-------------|------|---------------------|------|------|--------|
| Clock frequency | $R_{xFCLK}$ | 33   | 39.6                | 49.5 | MHz  |        |
| Clock high time | $T_{LVCH}$  |      | $4/(7^* R_{xFCLK})$ |      | nS   |        |
| Clock low time  | $T_{LVCL}$  |      | $3/(7^* R_{xFCLK})$ |      | nS   |        |

Table 5.3 LVDS clock Input timing

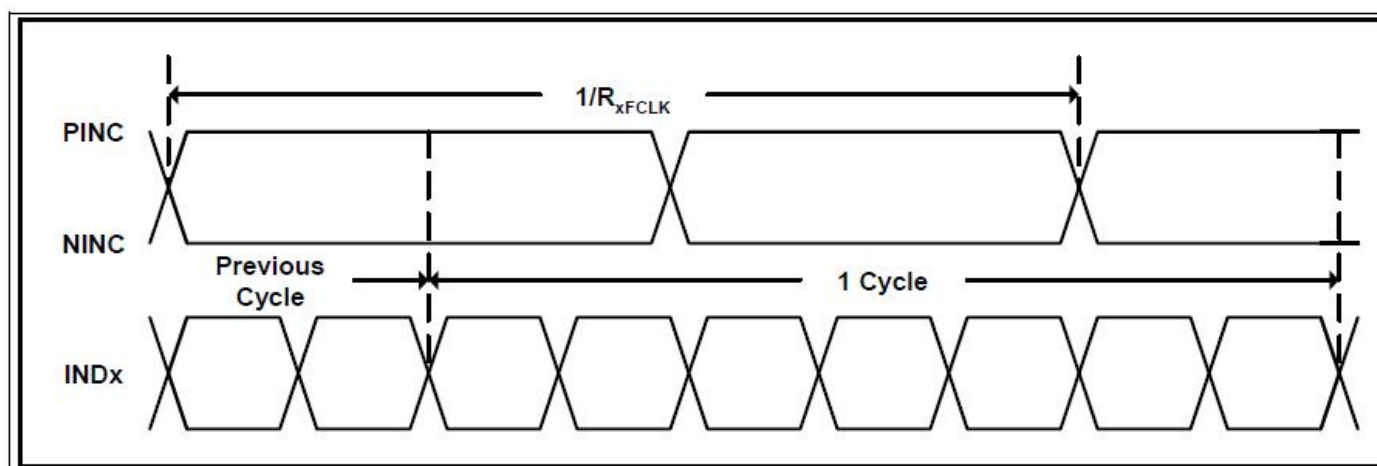


Figure5.2 Input signal AC timing

## 5.5 POWER ON/OFF SEQUENCE

| Item                            | Symbol | Min | Typ | Max | Unit | Remark |
|---------------------------------|--------|-----|-----|-----|------|--------|
| VDD 3.3V to signal starting     | Tp1    | 5   | -   | 50  | ms   |        |
| VDD rising time                 | Tr     | 0.1 | -   | 5   | ms   |        |
| Signal starting to backlight on | Tp2    | 150 | -   | -   | ms   |        |
| Signal off to VDD 0V            | Tp3    | 5   | -   | 50  | ms   |        |
| Backlight off to signal off     | Tp4    | 150 | -   | -   | ms   |        |

Table 5.4 POWER ON/OFF SEQUENCE

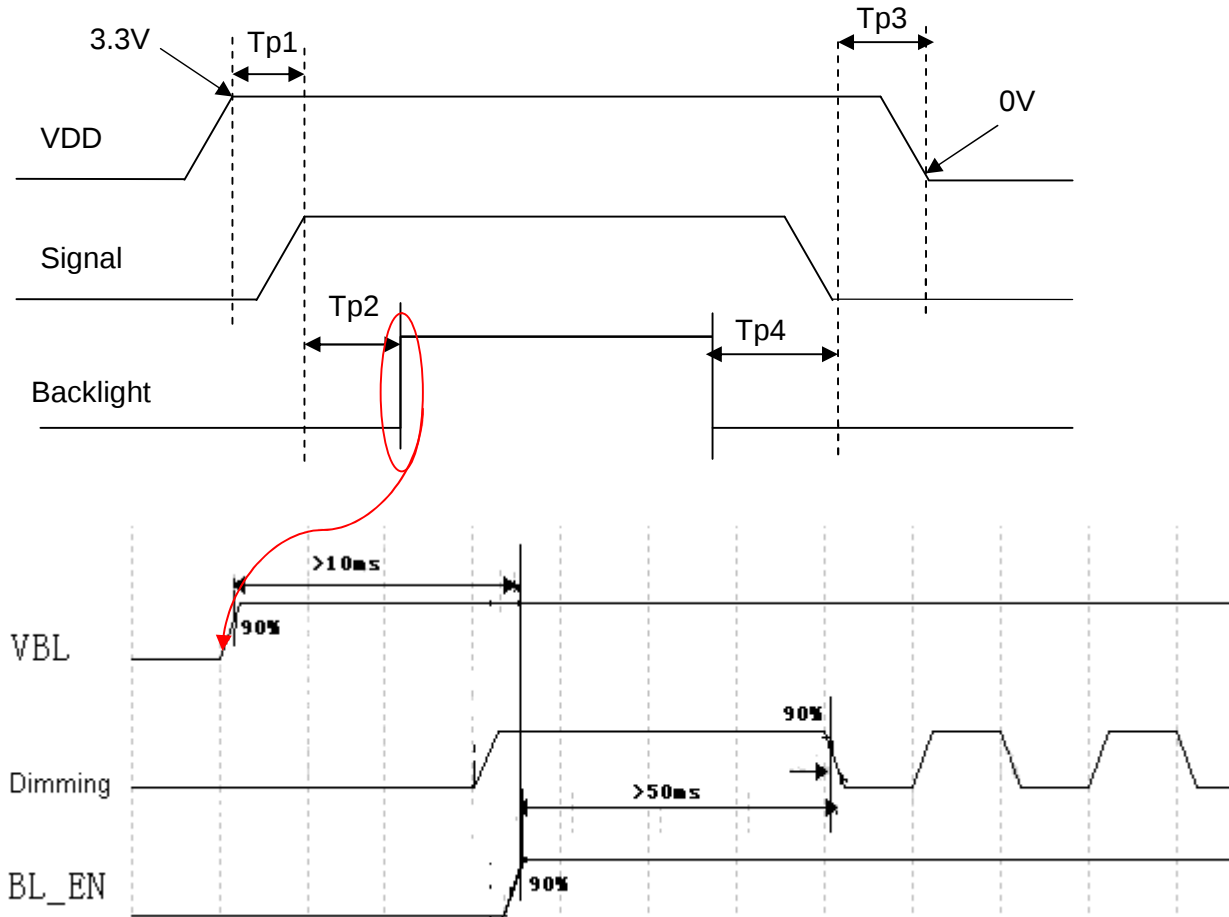


Figure5.3 Interface power on/off sequence

## 6 Optical Characteristics

Ta=25 °C

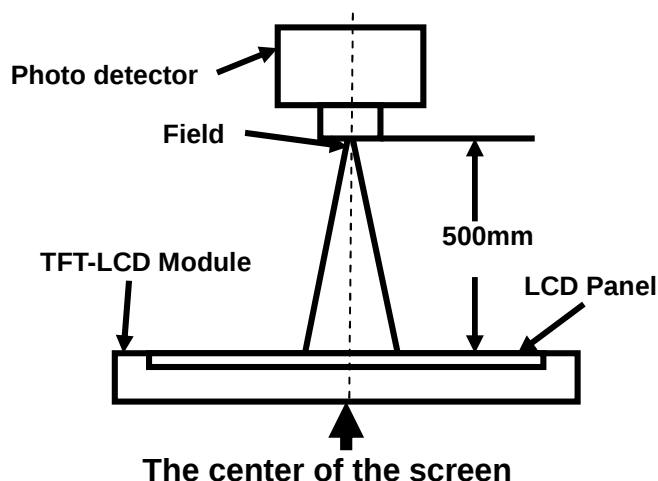
| Item                   |       | Symbol           | Condition       | Min   | Typ   | Max   | Unit              | Remark         |
|------------------------|-------|------------------|-----------------|-------|-------|-------|-------------------|----------------|
| View Angles            |       | θT               | CR≧10           | 50    | 60    | -     | Degree            | Note 2         |
|                        |       | θB               |                 | 60    | 70    | -     |                   |                |
|                        |       | θL               |                 | 60    | 70    | -     |                   |                |
|                        |       | θR               |                 | 60    | 70    | -     |                   |                |
| Contrast Ratio         |       | CR               | θ=0°            | 400   | 500   | -     |                   | Note1<br>Note3 |
| Response Time          |       | T <sub>ON</sub>  | 25℃             | -     | 20    | 30    | ms                | Note1<br>Note4 |
|                        |       | T <sub>OFF</sub> |                 |       |       |       |                   |                |
| Chromaticity           | White | x                | Backlight is on | 0.25  | 0.300 | 0.35  |                   | Note1<br>Note5 |
|                        |       | y                |                 | 0.281 | 0.331 | 0.381 |                   |                |
|                        | Red   | x                |                 | 0.546 | 0.596 | 0.646 |                   |                |
|                        |       | y                |                 | 0.281 | 0.331 | 0.381 |                   |                |
|                        | Green | x                |                 | 0.296 | 0.346 | 0.396 |                   |                |
|                        |       | y                |                 | 0.539 | 0.589 | 0.639 |                   |                |
|                        | Blue  | x                |                 | 0.103 | 0.153 | 0.203 |                   |                |
|                        |       | y                |                 | 0.054 | 0.104 | 0.154 |                   |                |
| Uniformity             |       | U                |                 | 70    | 75    | -     | %                 | Note1<br>Note6 |
| NTSC                   |       |                  |                 | 45    | 50    | -     | %                 | Note 5         |
| Luminance (Without TP) |       | L                |                 | 280   | 350   | -     | cd/m <sup>2</sup> | Note1<br>Note7 |

Test Conditions:

1.  $I_F=160\text{ mA}$ ,  $V_F=9.6\text{ V}$  and 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.

Note 1: Definition of optical measurement system.

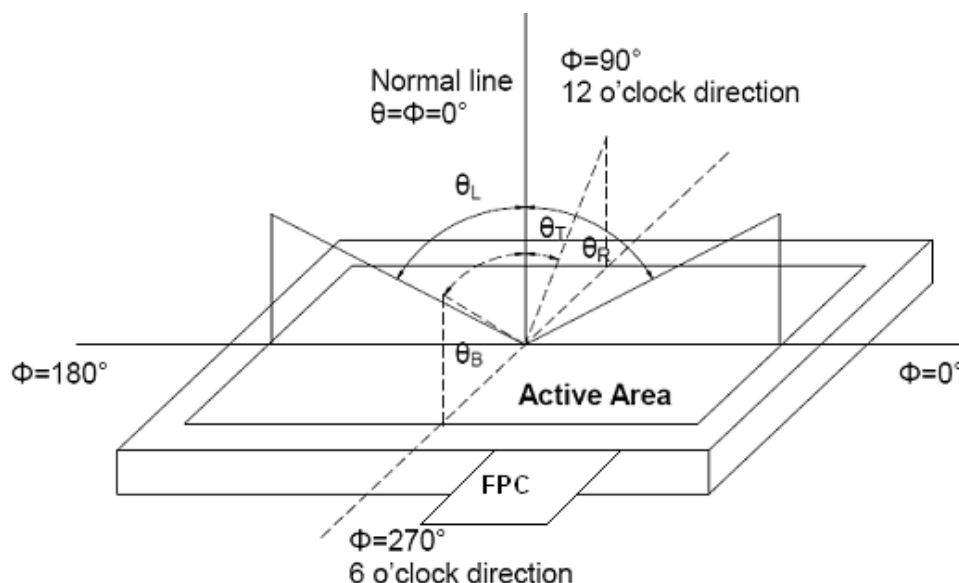
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| 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).



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.

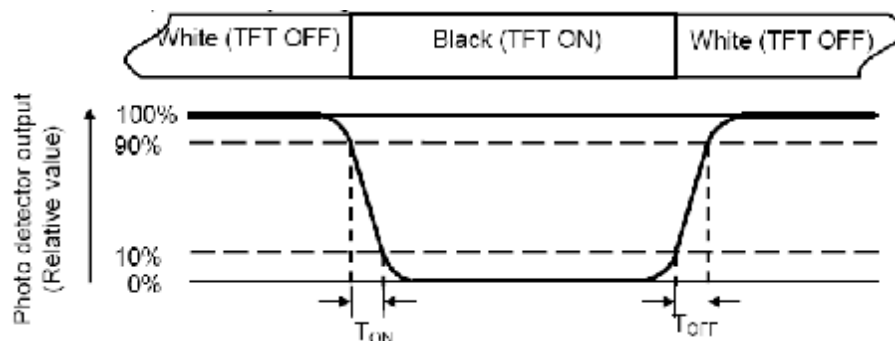
“Black state”: The state is that the LCD should drive by Vblack.

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V<sub>white</sub>: To be determined    V<sub>black</sub>: 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<sub>ON</sub>) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T<sub>OFF</sub>) is the time between photo detector output intensity changed from 10% to 90%.



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

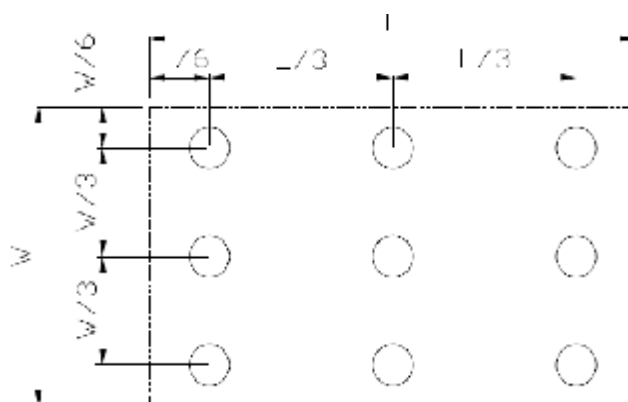
Color coordinates measured at center point of LCD.

#### 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<sub>max</sub>: The measured Maximum luminance of all measurement position.

L<sub>min</sub>: The measured Minimum luminance of all measurement position.

#### Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

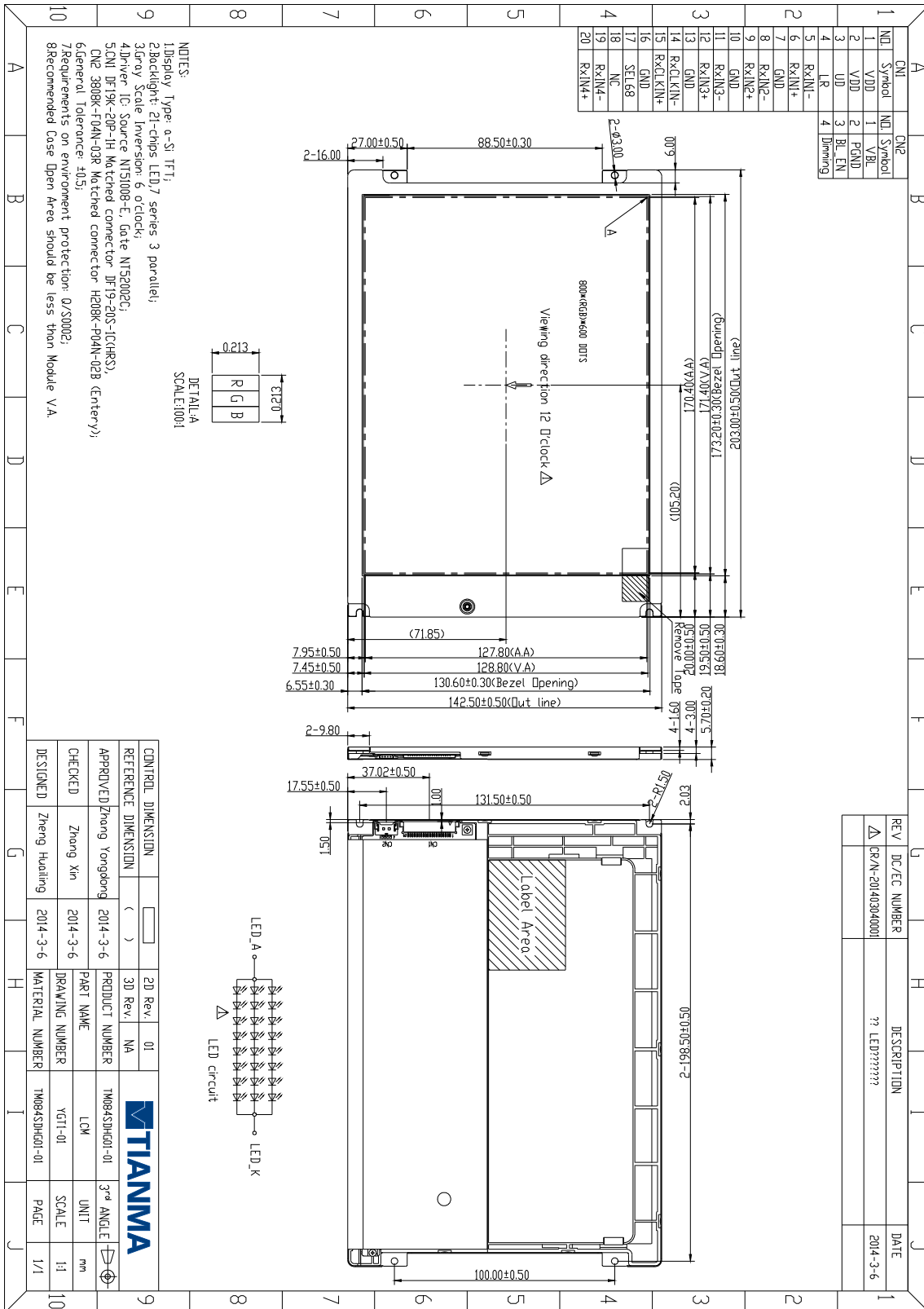
## 7 Environmental / Reliability Test

| No | Test Item                                | Condition                                                                                                                              | Remarks                                                                                |
|----|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1  | High Temperature Operation               | Ts = +70℃, 240 hours                                                                                                                   | IEC60068-2-1<br>GB2423.2                                                               |
| 2  | Low Temperature Operation                | Ta = -20℃, 240 hours                                                                                                                   | IEC60068-2-1<br>GB2423.1                                                               |
| 3  | High Temperature Storage                 | Ta = +80℃, 240 hours                                                                                                                   | IEC60068-2-1<br>GB2423.2                                                               |
| 4  | Low Temperature Storage                  | Ta = -30℃, 240 hours                                                                                                                   | IEC60068-2-1<br>GB2423.1                                                               |
| 5  | Storage at High Temperature and Humidity | Ta = +60℃, 90% RH max, 240 hours                                                                                                       | IEC60068-2-78<br>GB/T2423.3                                                            |
| 6  | Thermal Shock (non-operation)            | -30℃ 30 min ~ +80℃ 30 min,<br>Change time: 5 min, 100 Cycle                                                                            | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14, GB2423.22 |
| 7  | ESD                                      | C=150pF, R=330Ω, 5 point/panel<br>Air: ±8Kv, 5 times;<br>Contact: ±4Kv, 5 times<br>(Environment: 15℃~35℃,<br>30%~60% RH, 86Kpa~106Kpa) | IEC61000-4-2<br>GB/T17626.2                                                            |
| 8  | Vibration Test                           | Frequency range: 10~55Hz<br>Stroke: 1.5mm<br>Sweep: 10Hz~55Hz~10Hz<br>2 hours for each direction of X.Y.Z.<br>(6 hours for total)      | IEC60068-2-6<br>GB/T2423.10                                                            |
| 9  | Mechanical Shock (Non Op)                | Half Sine Wave<br>100G 6ms, ±X, ±Y, ±Z<br>3 times for each direction                                                                   | IEC60068-2-27<br>GB/T2423.5                                                            |
| 10 | Package Drop Test                        | Height: 60cm,<br>1 corner, 3 edges, 6 surfaces                                                                                         | IEC60068-2-32<br>GB/T2423.8                                                            |

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

Note2: Ta is the ambient temperature of samples.

# 8 Mechanical Drawing



**9 Packing drawing**

| No | Item            | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark      |
|----|-----------------|------------------|----------------|-----------------|----------|-------------|
| 1  | LCM module      | TM084SDHG01-01   | 203X142.5X5.7  | 0.1851          | 36       |             |
| 2  | Partition_1     | Corrugated paper | 527X348X217    | 1.571           | 1        |             |
| 3  | Anti-static Bag | PE               | 161X253X0.05   | 0.001           | 36       | Anti-static |
| 4  | Dust-Proof Bag  | PE               | 700X545        | 0.06            | 1        |             |
| 5  | Partition_2     | Corrugated Paper | 505X332X4.0    | 0.092           | 2        |             |
| 6  | Corrugated Bar  | Corrugated paper | 348X173        | 0.057           | 4        |             |
| 7  | Carton          | Corrugated paper | 544X365X250    | 0.76            | 1        |             |
| 9  | Total weight    | 9.5kg $\pm$ 10%  |                |                 |          |             |

## **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
- Ketone
- 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°C ~ 40°C      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**

10.3.1 The LCD modules should be no falling and violent shocking during transportation, and also

should avoid excessive press, water, damp and sunshine.