

**MODEL NO. :** TM097TDH02**ISSUED DATE:** 2011-9-7**VERSION :** Ver. 2.0

☒ **Preliminary Specification**  
☐ **Final Product Specification**

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

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

**SHANGHAI AVIC Confirmed :**

| Prepared by             | Checked by             | Approved by             |
|-------------------------|------------------------|-------------------------|
| Stephen Sun<br>2011/9/7 | Hyman Chen<br>2011/9/7 | Anfernee Du<br>2011/9/7 |

This technical specification is subjected to change without notice

The information contained herein is the exclusive property of SHANGHAI AVIC OPTOELECTRONICS Corporation, and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of SHANGHAI AVIC OPTOELECTRONICS Corporation.



## Table of Contents

|                                            |    |
|--------------------------------------------|----|
| Table of Contents.....                     | 2  |
| 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.....                        | 10 |
| 6 Optical Characteristics.....             | 15 |
| 7 Environmental / Reliability Test.....    | 18 |
| 8 Mechanical Drawing.....                  | 19 |
| 9 Packing drawing.....                     | 20 |
| 10 Precautions for Use of LCD Modules..... | 21 |



## Record of Revision

[illegible]

The information contained herein is the exclusive property of SHANGHAI AVIC OPTOELECTRONICS Corporation, and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of SHANGHAI AVIC OPTOELECTRONICS Corporation.



## 1 General Specifications

| Feature                    |                                 | Spec                         |
|----------------------------|---------------------------------|------------------------------|
| Display Spec               | Size                            | 9.7 inch                     |
|                            | Resolution                      | 1024 (RGB) x 768             |
|                            | Interface                       | LVDS 6-bit                   |
|                            | Color Depth                     | 262K                         |
|                            | Technology Type                 | a-Si                         |
|                            | Pixel Pitch (mm)                | 0.192 (H) x 0.192 (V)        |
|                            | Pixel Configuration             | R.G.B. Vertical Stripe       |
|                            | Display Mode                    | TM with Normally White       |
|                            | Surface Treatment(Up Polarizer) | Anti Glare(3H)               |
|                            | Viewing Direction               | 3 o'clock                    |
|                            | Gray Scale Inversion Direction  | 9 o'clock                    |
| Mechanical Characteristics | LCM (W x H x D) (mm)            | 210.20 (W) x166.30(H)x3.5(D) |
|                            | Active Area(mm)                 | 196.61 (W) x 147.46 (H)      |
|                            | With /Without TSP               | Without TSP                  |
|                            | Weight (g)                      | TBD                          |
|                            | LED Numbers                     | 36 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

### 2.1 CN1 of FPC

| Pin No. | Symbol              | I/O | Function                              | Remarks |
|---------|---------------------|-----|---------------------------------------|---------|
| 1       | GND                 | P   | Ground                                | -       |
| 2       | VCC                 | P   | Power supply 3.3V                     | -       |
| 3       | VCC                 | P   | Power supply 3.3V                     | -       |
| 4       | V EEDID             | P   | DDC 3.3V                              | -       |
| 5       | GSP                 | -   | GSP                                   | -       |
| 6       | Clk EEDID           | I   | DDC clock                             | -       |
| 7       | Data EEDID          | I   | DDC data                              | -       |
| 8       | R <sub>IN</sub> 0-  | I   | Negative LVDS differential data input | -       |
| 9       | R <sub>IN</sub> 0+  | I   | Positive LVDS differential data input | -       |
| 10      | GND                 | P   | Ground                                | -       |
| 11      | R <sub>IN</sub> 1-  | I   | Negative LVDS differential data input | -       |
| 12      | R <sub>IN</sub> 1+  | I   | Positive LVDS differential data input | -       |
| 13      | GND                 | P   | Ground                                | -       |
| 14      | R <sub>IN</sub> 2-  | I   | Negative LVDS differential data input | -       |
| 15      | R <sub>IN</sub> 2+  | I   | Positive LVDS differential data input | -       |
| 16      | GND                 | P   | Ground                                | -       |
| 17      | Clk <sub>IN</sub> - | I   | Negative LVDS differential data input | -       |
| 18      | Clk <sub>IN</sub> + | I   | Positive LVDS differential data input | -       |
| 19      | GND                 | P   | Ground                                | -       |
| 20      | NC                  | -   | No connection                         | -       |
| 21      | Vdc                 | P   | LED Anode (positive)                  | -       |
| 22      | Vdc                 | P   | LED Anode (positive)                  | -       |
| 23      | NC                  | -   | No connection                         | -       |
| 24      | Vdc 1               | P   | LED Cathode (Negative)                | -       |
| 25      | Vdc 2               | P   | LED Cathode (Negative)                | -       |
| 26      | Vdc 3               | P   | LED Cathode (Negative)                | -       |
| 27      | Vdc 4               | P   | LED Cathode (Negative)                | -       |
| 28      | Vdc 5               | P   | LED Cathode (Negative)                | -       |
| 29      | Vdc 6               | P   | LED Cathode (Negative)                | -       |
| 30      | NC                  | -   | No connection                         | -       |

Note: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No Connection



### 3 Absolute Maximum Ratings

AGND= GND=0V, Ta = 25°C

| Item                  | Symbol           | Min  | Max | Unit | Remark |
|-----------------------|------------------|------|-----|------|--------|
| Power Voltage         | VCC              | -0.5 | 5.0 | V    |        |
| Operating Temperature | T <sub>OPR</sub> | -20  | 70  | °C   |        |
| Storage Temperature   | T <sub>STG</sub> | -30  | 80  | °C   |        |



## 4 Electrical Characteristics

### 4.1 Recommended Operating Condition

AGND=GND=0V, Ta = 25°C

| Item                   | Symbol | Min | Typ | Max | Unit | Remark |
|------------------------|--------|-----|-----|-----|------|--------|
| Digital Supply Voltage | VCC    | 3.0 | 3.3 | 3.6 | V    |        |

Note: The value is for design stage only.

AVICCONFIDENTIAL



## 4.2 Recommended Driving Condition for Backlight

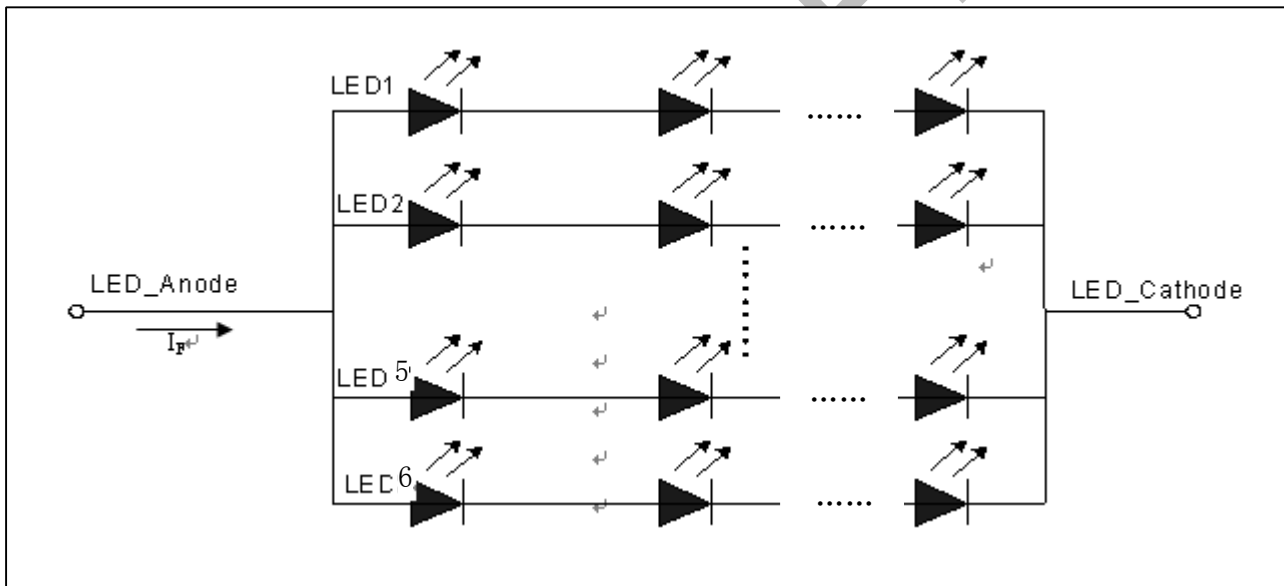
Ta=25°C

| Item                | Symbol | Min | Typ   | Max | Unit | Remark                                       |
|---------------------|--------|-----|-------|-----|------|----------------------------------------------|
| Forward Current     | $I_F$  |     | 120   |     | mA   | 36 LEDs<br>(6 LED Serial, 6<br>LED Parallel) |
| Forward Voltage     | $V_F$  |     | 19.2  |     | V    |                                              |
| Operating Life Time | -      |     | 30000 | -   | Hrs  |                                              |

Note1: For each LED:  $I_F (1/6) = 20\text{mA}$ ,  $V_F (1/6) = 3.2\text{V}$ .

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

Note3:  $I_F$  is defined for one channel LED. Optical performance should be evaluated at Ta=25°C only. 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.



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



**4.3 Power Consumption**

AGND=GND=0V, Ta = 25°C

| Item                 | Symbol            | Condition | Min | Typ   | Max | Unit | Remark |
|----------------------|-------------------|-----------|-----|-------|-----|------|--------|
| Power Supply Current | I <sub>DVDD</sub> | VCC=3.3V  | -   | 271   | -   | mA   |        |
| Power Consumption    | Panel&Gamma       |           | -   | 894.3 | -   | mW   |        |
|                      | Backlight         |           | -   | 2.304 | -   | W    |        |
|                      | Total             |           | -   | 3.198 | -   | W    |        |

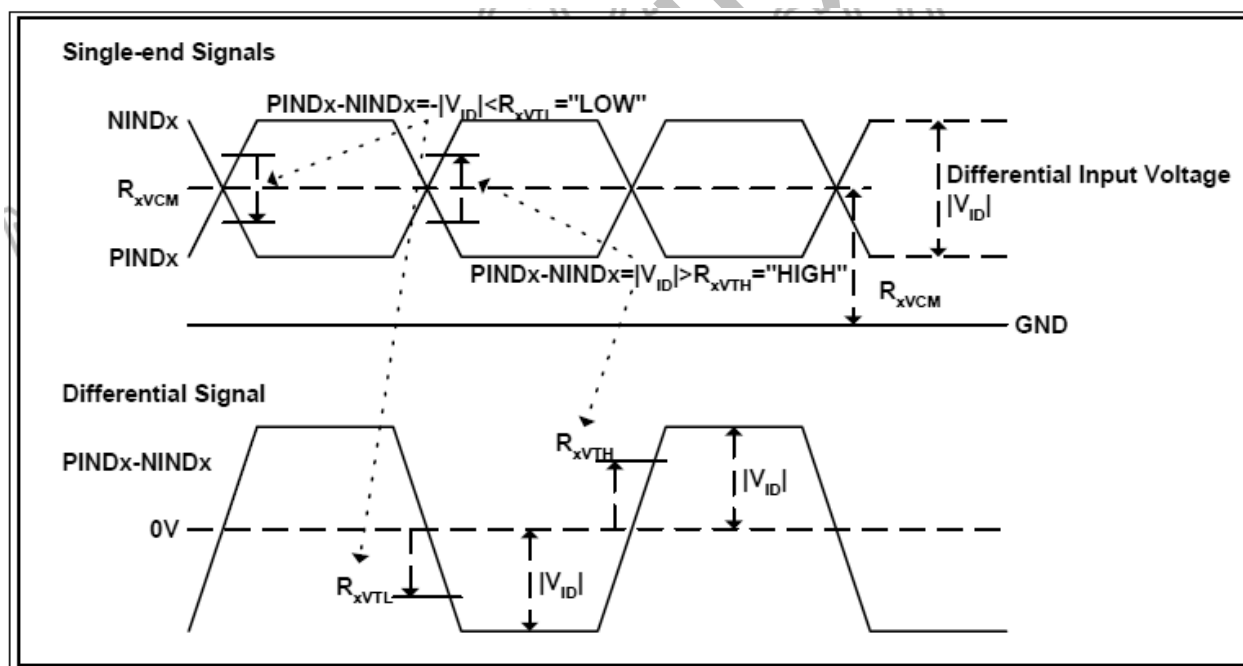


## 5 Timing Chart

### 5.1 TFT-LCD Input Timing

#### DC specification

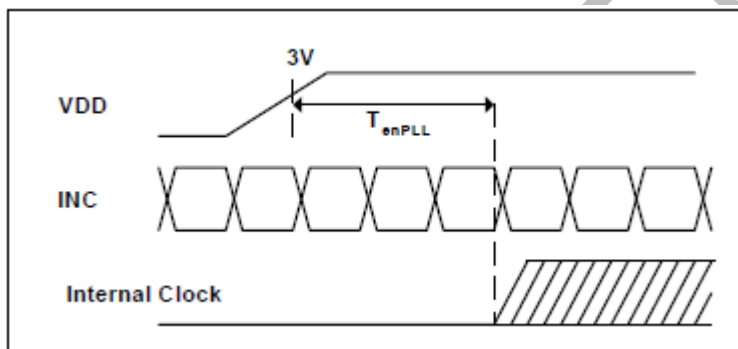
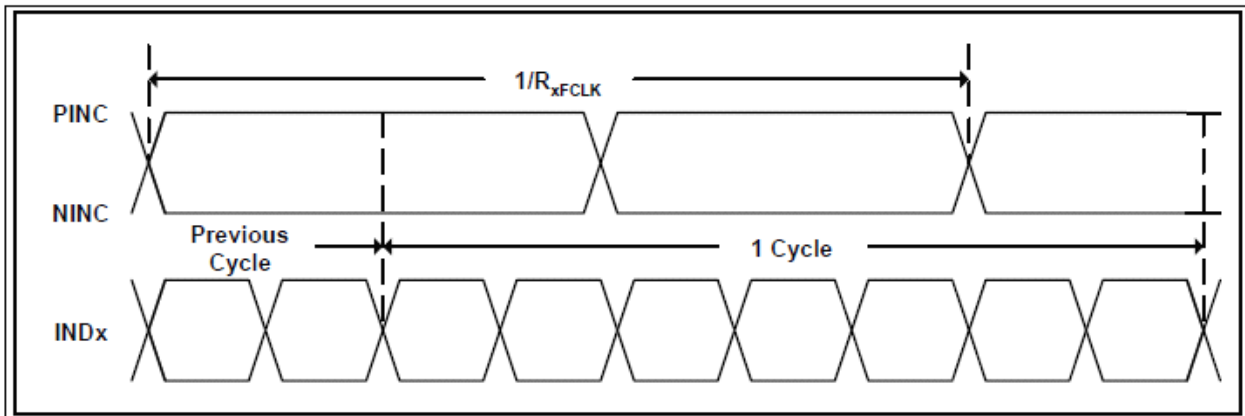
| Parameter                                 | Symbol       | Min.         | Typ. | Max.               | Unit    | Condition                         |
|-------------------------------------------|--------------|--------------|------|--------------------|---------|-----------------------------------|
| 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       |                                   |
| Differential input leakage current        | $RV_{xliz}$  | -10          |      | +10                | $\mu A$ |                                   |
| LVDS Digital Operating Current            | $I_{ddlvds}$ | -            | 40   | 50                 | mA      | Fclk=65 MHz, VDD=3.3V             |
| LVDS Digital Stand-by Current             | $I_{stlvds}$ | -            | 10   | 50                 | $\mu A$ | Clock & all Functions are stopped |

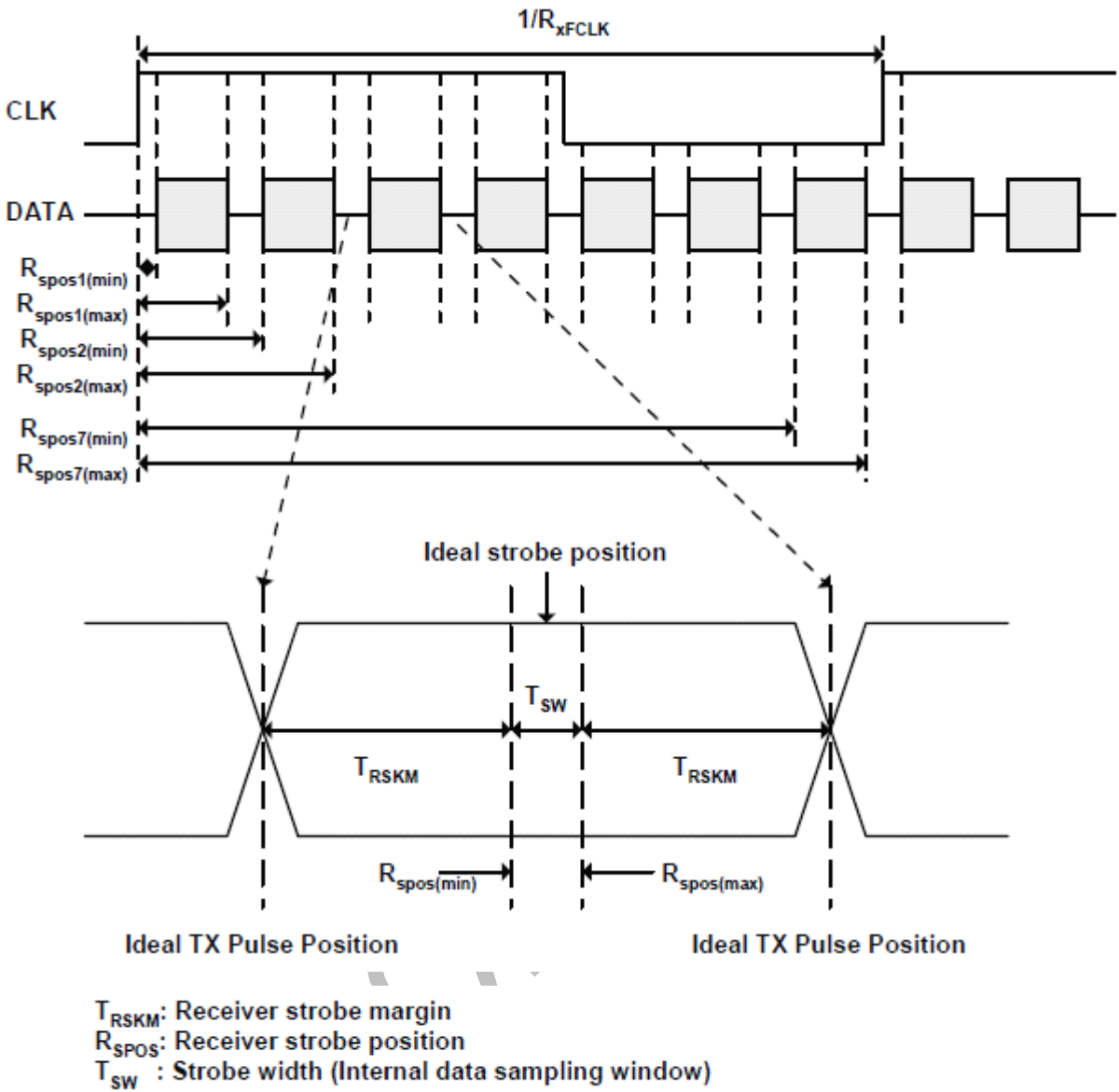




## AC specification

| Parameter              | Symbol      | Min. | Typ.               | Max. | Unit | Condition                                                      |
|------------------------|-------------|------|--------------------|------|------|----------------------------------------------------------------|
| Clock frequency        | $R_{xCLK}$  | 20   |                    | 71   | MHz  |                                                                |
| Input data skew margin | $T_{RSKM}$  | 500  |                    |      | pS   | $ V_{ID}  = 400mV$<br>$R_{xVCM} = 1.2V$<br>$R_{xCLK} = 71 MHz$ |
| Clock high time        | $T_{LVCH}$  |      | $4/(7 * R_{xCLK})$ |      | ns   |                                                                |
| Clock low time         | $T_{LVCL}$  |      | $3/(7 * R_{xCLK})$ |      | ns   |                                                                |
| PLL wake-up time       | $T_{enPLL}$ |      |                    | 150  | uS   |                                                                |





| SSC tolerance of LVDS receiver |                      |                                     |      |      |         |       |
|--------------------------------|----------------------|-------------------------------------|------|------|---------|-------|
| Symbol                         | parameter            | condition                           | Min. | Typ. | Max.    | Units |
| SSCMF                          | Modulation Frequency |                                     | 23   |      | 93      | KHz   |
| SSCMR                          | Modulation Rate      | LVDS clock = 71MHz<br>center spread |      |      | $\pm 3$ | %     |

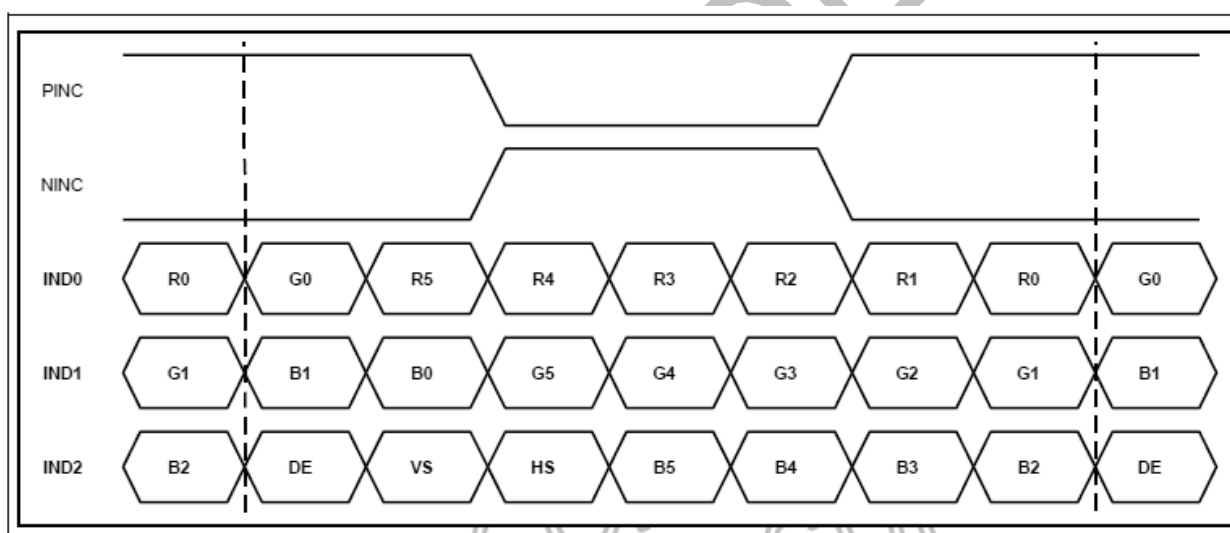


## 5.2 Timing Setting Of Signal

### Input Timing Of Connector

| Parameter | Symbol    | Min  | Typ  | Max  | Unit | Remark |
|-----------|-----------|------|------|------|------|--------|
| DCLK      | fclk      | 52   | 65   | 71   | MHZ  |        |
| Hsync     | thd       | 1024 |      |      | tclk |        |
|           | th        | 1114 | 1344 | 1400 | tclk |        |
|           | thb+thfp  | 90   | 320  | 376  | tclk |        |
| Vsync     | tvd       | 768  |      |      | thp  |        |
|           | tv        | 778  | 806  | 845  | thp  |        |
|           | tvbp+tvfp | 10   | 38   | 77   | thp  |        |

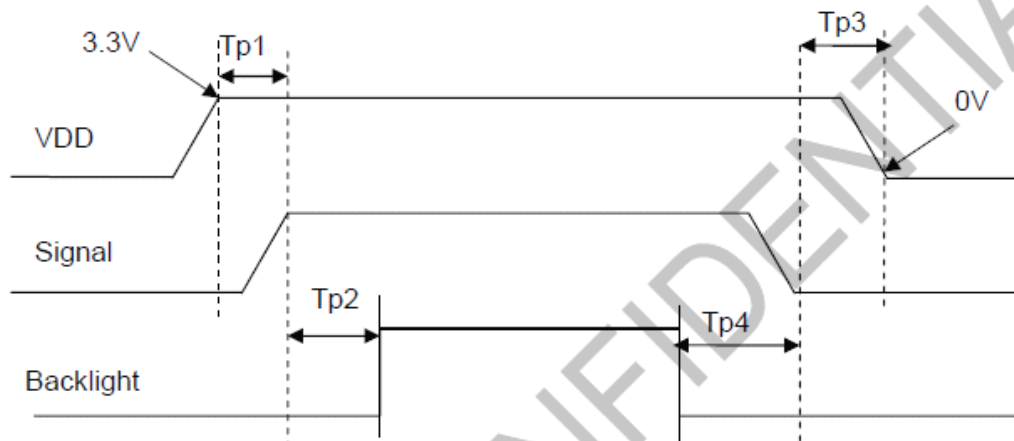
### Date input:





### 5.3 POWER ON/OFF SEQUENCE

| Item                            | Symbol | Min | Typ | Max | Unit | Remark |
|---------------------------------|--------|-----|-----|-----|------|--------|
| VDD to signal starting          | Tp1    | 5   | -   | 50  | ms   |        |
| Signal starting to backlight on | Tp2    | 150 | -   | -   | ms   |        |
| Signal off to VDD 3.0V          | Tp3    | 5   | -   | 50  | ms   |        |
| Backlight off to signal off     | Tp4    | 150 | -   | -   | ms   |        |





## 6 Optical Characteristics

Ta=25℃

| Item           |       | Symbol           | Condition       | Min   | Typ   | Max   | Unit              | Remark         |
|----------------|-------|------------------|-----------------|-------|-------|-------|-------------------|----------------|
| View Angles    |       | θT               | CR≥10           | 60    | 70    | -     | Degree            | Note 2         |
|                |       | θB               |                 | 60    | 70    | -     |                   |                |
|                |       | θL               |                 | 60    | 70    | -     |                   |                |
|                |       | θR               |                 | 50    | 60    | -     |                   |                |
| Contrast Ratio |       | CR               | θ=0°            | 400   | 500   | -     |                   | Note1<br>Note3 |
| Response Time  |       | T <sub>ON</sub>  | 25℃             | -     | 20    | 25    | ms                | Note1<br>Note4 |
|                |       | T <sub>OFF</sub> |                 |       |       |       |                   |                |
| Chromaticity   | White | x                | Backlight is on | 0.261 | 0.311 | 0.361 |                   | Note1<br>Note5 |
|                |       | y                |                 | 0.266 | 0.316 | 0.366 |                   |                |
|                | Red   | x                |                 | 0.533 | 0.583 | 0.633 |                   |                |
|                |       | y                |                 | 0.296 | 0.346 | 0.396 |                   |                |
|                | Green | x                |                 | 0.298 | 0.348 | 0.398 |                   |                |
|                |       | y                |                 | 0.518 | 0.568 | 0.618 |                   |                |
|                | Blue  | x                |                 | 0.101 | 0.151 | 0.201 |                   |                |
|                |       | y                |                 | 0.039 | 0.089 | 0.139 |                   |                |
| Uniformity     |       | U                |                 |       | 75    | --    | %                 | Note1<br>Note6 |
| NTSC           |       |                  |                 | 45    | 50    | -     | %                 | Note 5         |
| Luminance      |       | L                |                 |       | 350   | -     | cd/m <sup>2</sup> | Note1<br>Note7 |

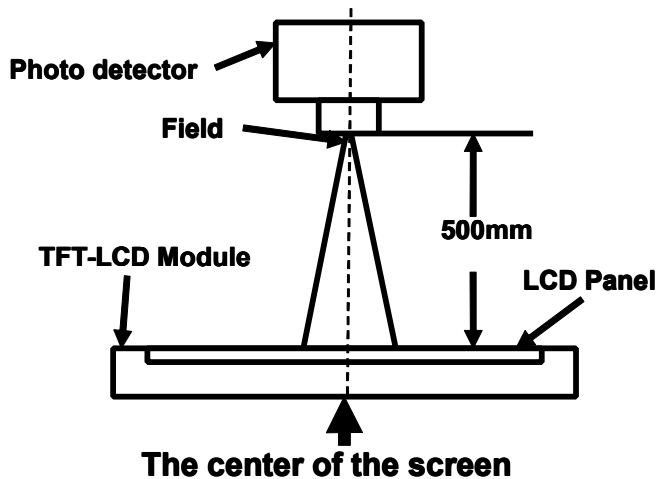
Test Conditions:

1.  $I_F = 120 \text{ mA}$ ,  $V_F = 19.2 \text{ V}$  and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

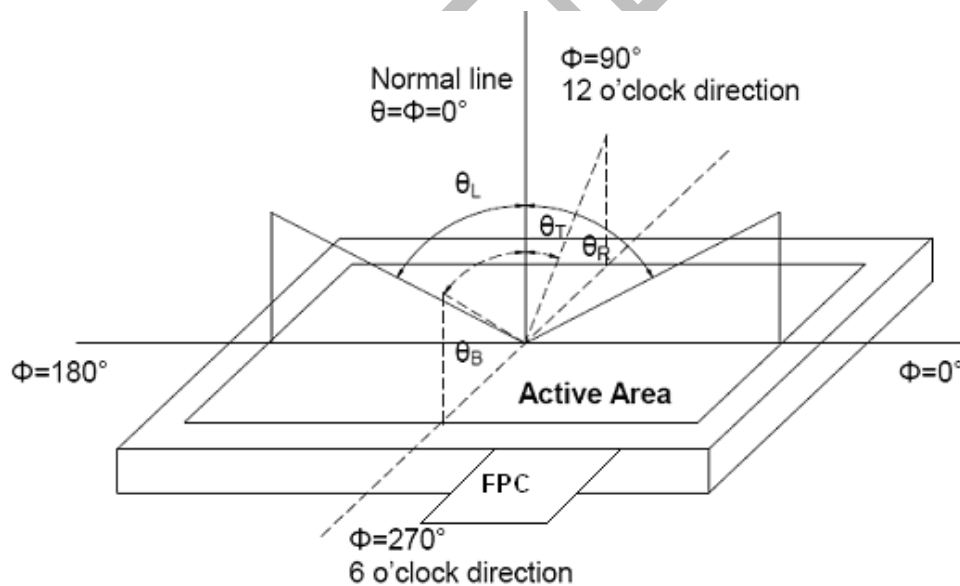
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| Item           | Photo detector | Field |
|----------------|----------------|-------|
| Contrast Ratio | BM-5A          | 1°    |
| Luminance      |                |       |
| Lum Uniformity |                |       |
| Chromaticity   | SR-3A          | -     |
| Response Time  | TRD100         |       |

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.

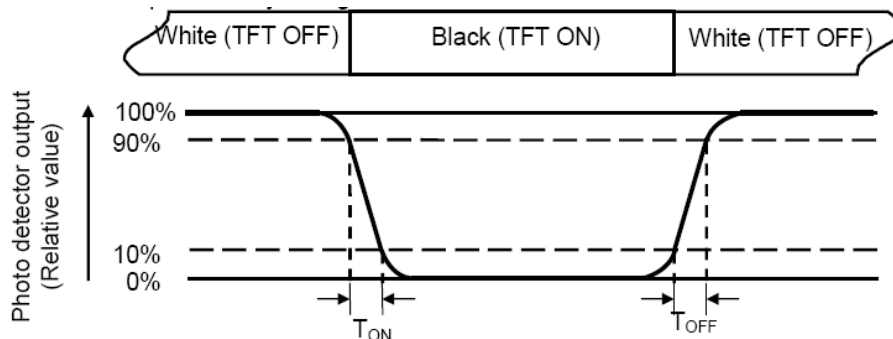
Vwhite: To be determined      Vblack: To be determined.





## 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)

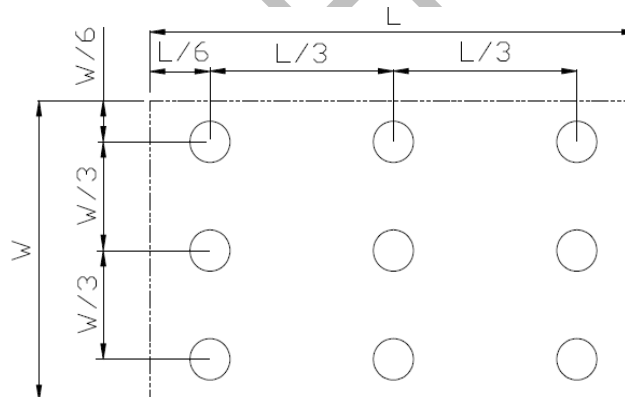
Color coordinates measured at center point of LCD.

## 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.

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

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               | Ts = +50℃, 96 hours                                                                                                               | IEC60068-2-1:2007<br>GB2423.2-2008                                                                   |
| 2  | Low Temperature Operation                | Ta = 0℃, 96 hours                                                                                                                 | IEC60068-2-1:2007<br>GB2423.1-2008                                                                   |
| 3  | High Temperature Storage                 | Ta = +60℃, 96 hours                                                                                                               | IEC60068-2-1:2007<br>GB2423.2-2008                                                                   |
| 4  | Low Temperature Storage                  | Ta = -20℃, 96 hours                                                                                                               | IEC60068-2-1:2007<br>GB2423.1-2008                                                                   |
| 5  | Storage at High Temperature and Humidity | Ta = +60℃, 90% RH max, 96 hours                                                                                                   | IEC60068-2-78 :2001<br>GB/T2423.3—2006                                                               |
| 6  | Thermal Shock (non-operation)            | -20℃ 30 min~+60℃ 30 min,<br>Change time:5min, 20 Cycle                                                                            | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14:1984, G<br>B2423.22-2002 |
| 7  | ESD                                      | C=150pF,R=330Ω, 5point/panel<br>Air:±8Kv, 5times;<br>Contact:±4Kv, 5times<br>(Environment: 15℃~35℃,<br>30%~60%.86Kpa~106Kpa)      | IEC61000-4-2:2001<br>GB/T17626.2-2006                                                                |
| 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) | IEC60068-2-6:1982<br>GB/T2423.10—1995                                                                |
| 9  | Mechanical Shock (Non Op)                | Half Sine Wave<br>60G 6ms, ±X, ±Y, ±Z<br>3times for each direction                                                                | IEC60068-2-27:1987<br>GB/T2423.5—1995                                                                |
| 10 | Package Drop Test                        | Height: 80cm,<br>1corner, 3edges, 6surfaces                                                                                       | IEC60068-2-32:1990<br>GB/T2423.8—1995                                                                |

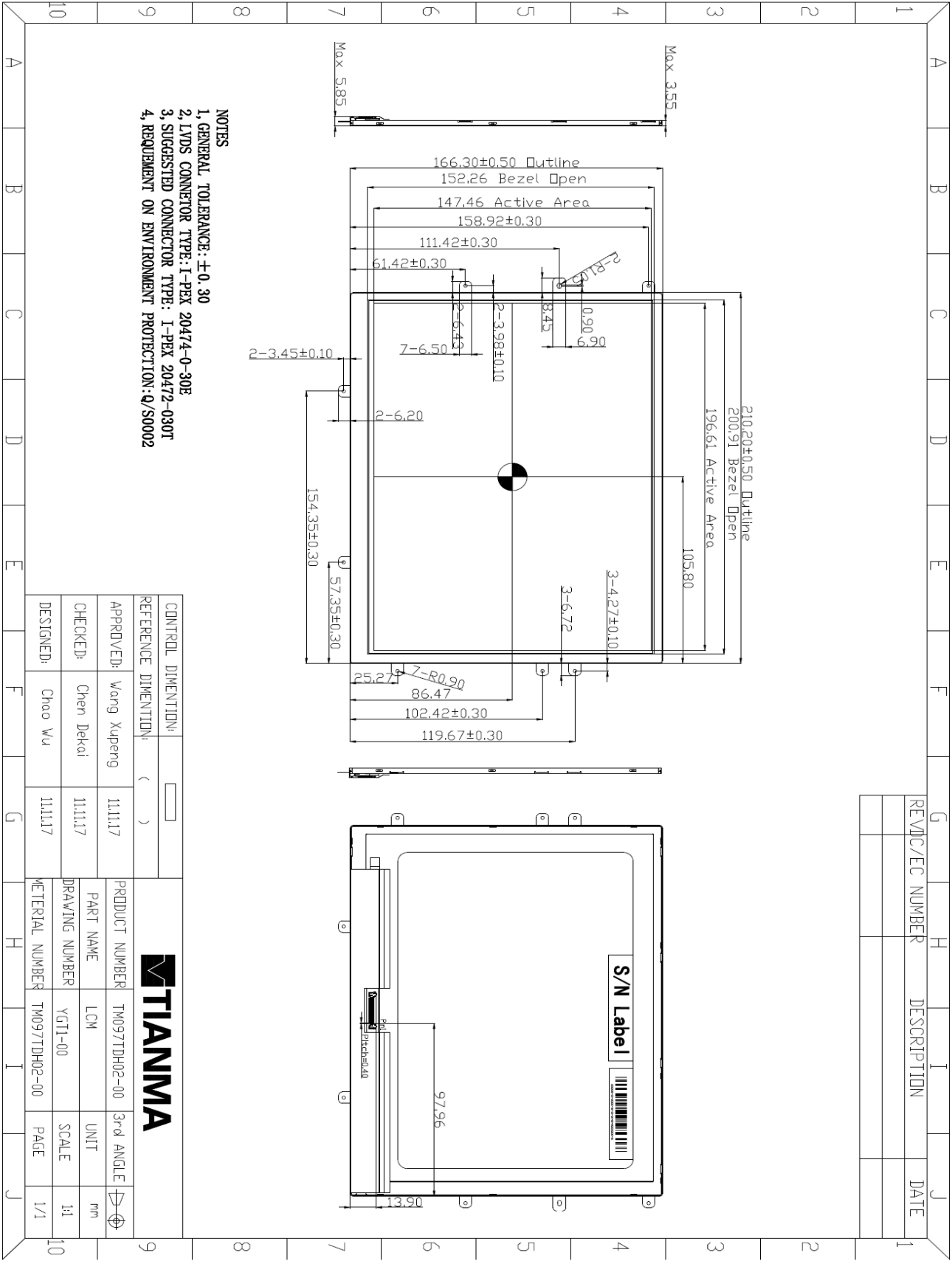
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.

Note3: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.



8 Mechanical Drawing

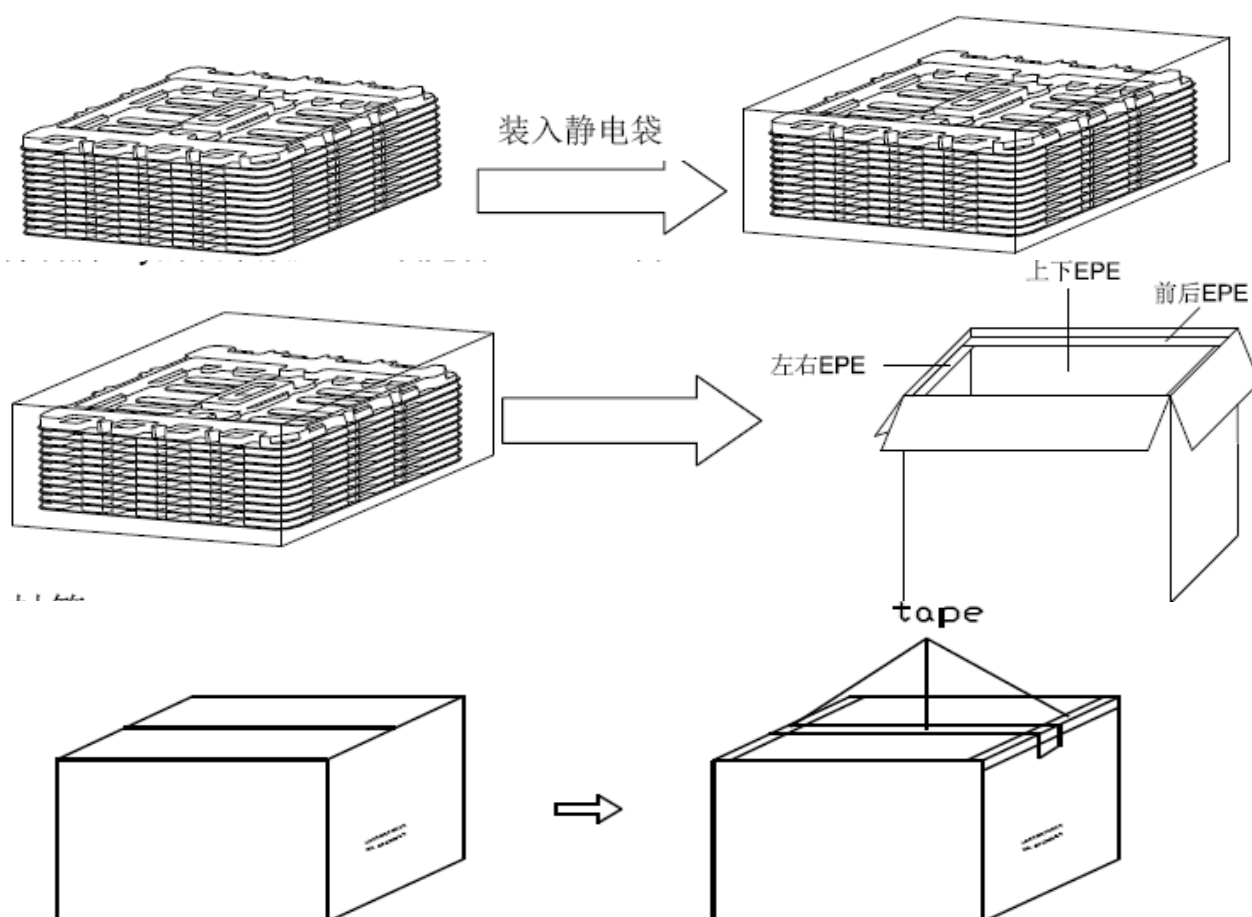


The information contained herein is the exclusive property of SHANGHAI AVIC OPTOELECTRONICS Corporation, and shall not be distributed, reproduced, or disclosed in whole or in part without prior written permission of SHANGHAI AVIC OPTOELECTRONICS Corporation.



## 9 Packing drawing

| No | Item           | Model (Material) | Dimensions(mm)   | Unit Weight(Kg) | Quantity | Remark |
|----|----------------|------------------|------------------|-----------------|----------|--------|
| 1  | LCM module     | TM097TDH02       | 210.2X166.3X3.66 |                 | 60       |        |
| 2  | Tray           | PET              | 519 X437 X20     | 0.295           | 16       |        |
| 3  | Dust-Proof Bag | PE               | 830 X 525 X 0.09 | 0.05            | 1        |        |
| 4  | EPE Spacer     | EPE              | 544 X426 X15     | 0.2             | 2        |        |
| 5  | EPE Spacer     | EPE              | 462 X246 X15     | 0.1             | 2        |        |
| 6  | EPE Spacer     | EPE              | 514 X246 X15     | 0.1             | 2        |        |
| 7  | EPE Spacer     | EPE              | 451 X368 X1      | 0.02            | 15       |        |
| 8  | Carton         | Corrugated paper | 565 X 483 X 312  | 1.4             | 1        |        |
| 9  | Total weight   | 22.9kg±5%        |                  |                 |          |        |





## 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℃ ~ 40℃      Relatively humidity: ≤80%

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

### 10.3 Transportation Precautions

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.