

MODEL NO. : TM104SBH04ISSUED DATE: 2010-9-7VERSION : Ver 1.0☒ Preliminary Specification☐ Final Product Specification

Customer : _____

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

SHANGHAI TIANMA Confirmed :

| Prepared by | Checked by | Approved by |
|-------------|------------|-------------|
| | | |

This technical specification is subjected to change without notice

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



Table of Contents

| | |
|---|----|
| Table of Contents | 2 |
| 1 General Specifications | 4 |
| 2 INPUT TERMINALS PIN ASSIGNMENT | 4 |
| 3 ABSOLUTE MAXIMUM RATINGS | 8 |
| 4 ELECTRICAL CHARACTERISTICS | 9 |
| 5 INTERFACE TIMING | 12 |
| 6 Optical Characteristics | 15 |
| 7 Environmental / Reliability Tests | 19 |
| 8 Mechanical Drawing | 20 |
| 9 Packaging Drawing | 22 |
| 10 Precautions for Use of LCD Modules | 23 |



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



1 General Specifications

| Feature | | Spec |
|----------------------------|---------------------------------|------------------------|
| Display Spec. | Size | 10.4 inch |
| | Resolution | 800(RGB) x 600 |
| | Interface | LVDS 8-bit/6-bit |
| | Color Depth | 16.7M/262K |
| | Technology Type | a-Si |
| | Pixel Pitch (mm) | 0.264x0.264 |
| | 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) | 243.00x179.40x10 |
| | Active Area(mm) | 211.20x158.40 |
| | With /Without TSP | With TSP |
| | Weight (g) | TBD |

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: $\pm 5\%$

2 INPUT TERMINALS PIN ASSIGNMENT

2.1 TFT LCD Panel

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



CN1 Connector type: 107A20-0021RA-G3-R

| No | Symbol | I/O | Description | Comment |
|----|----------|-----|---|---------|
| 1 | VDD | P | Power Supply | |
| 2 | VDD | P | Power Supply | |
| 3 | GND | P | Ground | |
| 4 | DPS | I | Reverse Scan Function [H: Enable; L/NC: Disable] | Note3 |
| 5 | RxIN0- | I | LVDS receiver signal channel 0. LVDS Differential | Note2 |
| 6 | RxIN0+ | I | Data Input (R0, R1, R2, R3, R4, R5, G0) | |
| 7 | GND | P | Ground | |
| 8 | RxIN1- | I | LVDS receiver signal channel 1. LVDS Differential | Note2 |
| 9 | RxIN1+ | I | Data Input (G1, G2, G3, G4, G5, B0, B1) | |
| 10 | GND | P | Ground | |
| 11 | RxIN2- | I | LVDS receiver signal channel 2 | Note2 |
| 12 | RxIN2+ | I | LVDS Differential Data Input (B2, B3, B4, B5, DE) | |
| 13 | GND | P | Ground | |
| 14 | RxCLKIN- | I | LVDS receiver signal clock | Note2 |
| 15 | RxCLKIN+ | I | | |
| 16 | GND | P | Ground | |
| 17 | RxIN3- | I | LVDS receiver signal channel 3, NC for 6-bit LVDS Input. LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV) for 8-bit LVDS input. | Note2 |
| 18 | RxIN3+ | I | | |
| 19 | AGMode | I | Aging Mode setting [H: Aging Mode; L/NC: Normal] | |
| 20 | SEL68 | P | 6-bit/8-bit LVDS data input selection [H: 8-bit L/NC: 6-bit] | Note2 |

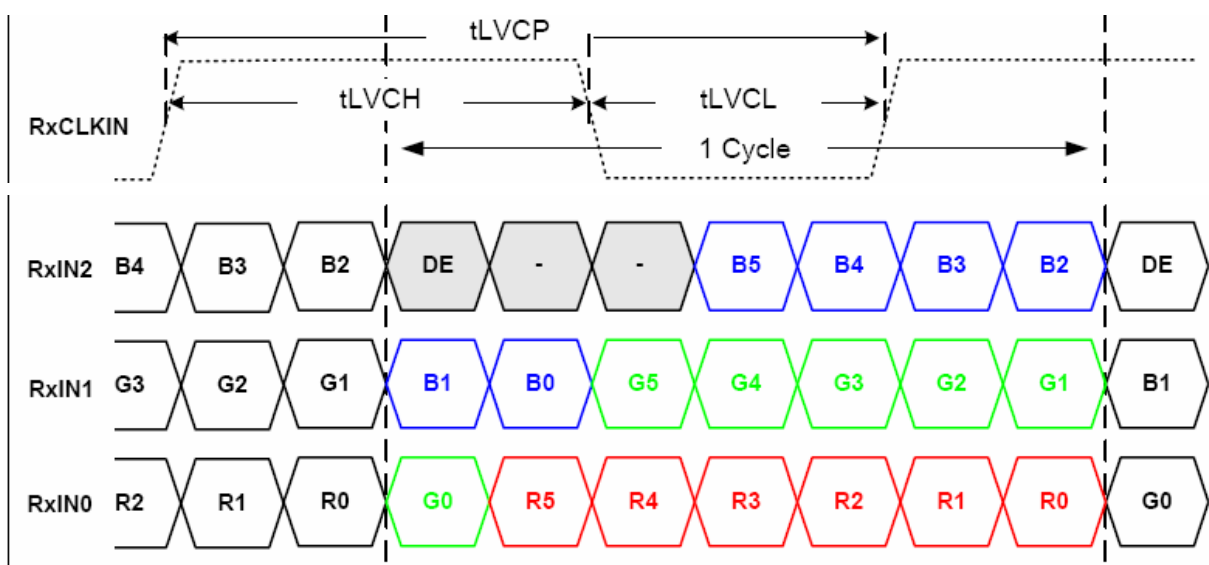
P: Power/GND; I: input pin;

Table 2.1 input terminal pin assignment

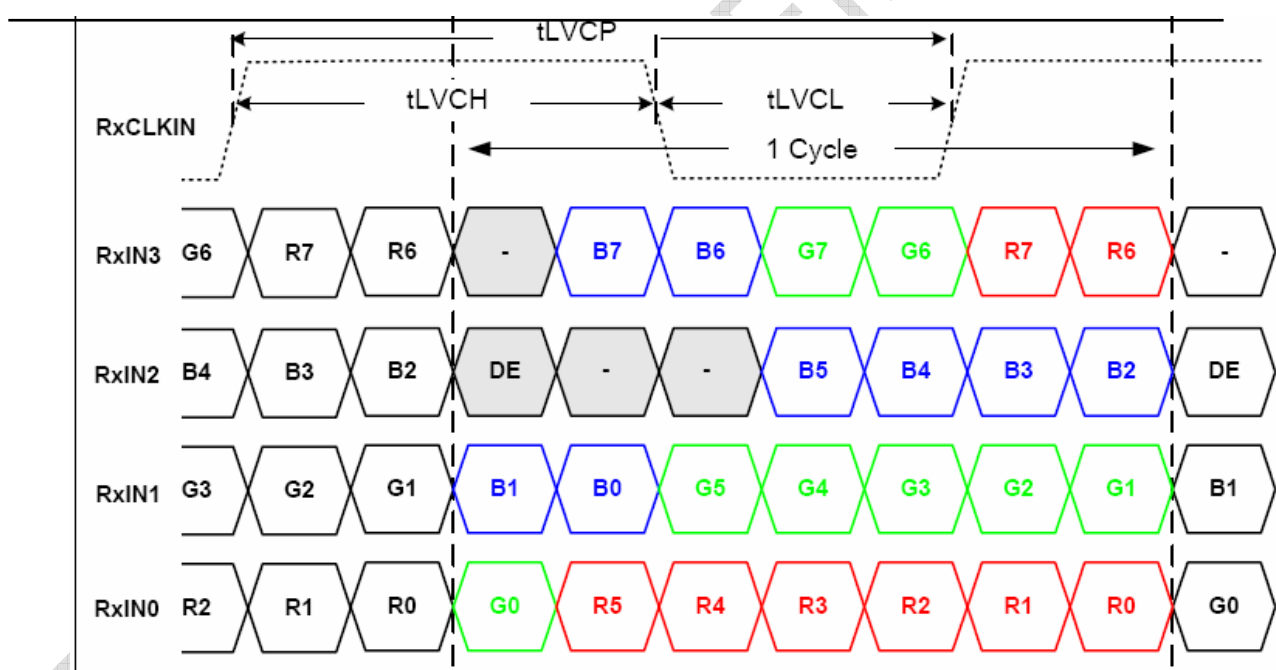
Note1 : CN1 Match Connector type: DF19G-20S-1C or compatible



Note2: LVDS 6-bit data mapping when SEL68=L/NC as follows:



LVDS 8-bit data mapping when SEL68=H as follows:



Note3 : DPS: Scan direction setting

| DPS | Horizontal Scan direction | Vertical Scan direction |
|--------|---------------------------|-------------------------|
| High | Right to left | Down to up |
| Low/NC | Left to right | Up to down |



2.2 CN2(Backlight Connector)

Connector type: 3808K-F05N-03R (ENTERY)

| No | Symbol | I/O | Description | Remark |
|----|---------|-----|--|--------|
| 1 | VCC | P | Power for LED driving circuit. 12.0V input. | |
| 2 | PGND | P | Ground for LED driving circuit. 0V input. | |
| 3 | EN | I | Backlight enable setting. High: enabled; Low: disable. | |
| 4 | Dimming | I | PWM signal for adjusting luminance of backlight. | |
| 5 | NC | - | No connection | |

Match connector: H208K-P05N-02B (ENTERY)

2.3 CN3(TSP interface)

| No | Symbol | I/O | Description | Remark |
|----|--------|-----|-------------|--------|
| 1 | Y2 | I | ITO film | |
| 2 | X2 | I | ITO glass | |
| 3 | Y1 | I | ITO film | |
| 4 | X1 | I | ITO glass | |

CN3(TSP FPC) Match Connector: SFW4R-1STAE1 LF(for reference);



3 ABSOLUTE MAXIMUM RATINGS

GND=0V, Ta = 25°C

| Item | Symbol | Min | Max | Unit | Remark |
|-------------------------------|------------------|------|------|------|--------|
| Power Voltage | VDD | -0.3 | 5.0 | V | |
| Power for LED driving circuit | VCC | -0.3 | 13.5 | V | |
| Input voltage | V _{IN} | -0.3 | 5.0 | V | Note1 |
| Input voltage for backlight | V _t | -0.5 | 7.0 | V | Note2 |
| Operating Temperature | T _{OPR} | -20 | 70 | °C | |
| Storage Temperature | T _{STG} | -30 | 80 | °C | |

Note1 : V_{IN} represents RxIN0±, RxIN1±, RxIN2±, RxIN3±, RxCLKIN±, DPS, AGMode, SEL68.

Note2 : V_t represents EN and Dimming.

Table 3.1 Absolute maximum rating



4 ELECTRICAL CHARACTERISTICS

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|--|--------------|--------------|------|--------------------|------|-------------------|
| Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| LVDS Differential input high threshold | V_{TH} | - | - | +100 | mV | $V_{CMLVDS}=1.2V$ |
| LVDS Differential input low threshold | V_{TL} | -100 | - | - | mV | $V_{CMLVDS}=1.2V$ |
| Differential input voltage | $ V_{ID} $ | 0.1 | - | 0.6 | V | |
| LVDS input common mode voltage | V_{CMLVDS} | $ V_{ID} /2$ | - | $1.4-(V_{ID} /2)$ | V | |
| Common Electrode Driving Signal | VCOM | - | 4.30 | - | V | Note1 |
| Sync Frequency | FVD | - | 60 | 70 | Hz | |
| VDD Power Consumption | I_{VDD} | - | 340 | 380 | mA | Note2 |

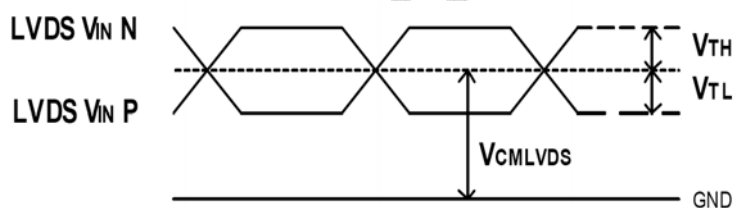


Figure 4.1.1 LVDS DC timing diagram

Note1 : For different LCM, the value may have a bit of difference.

Note2 : To test the current dissipation, use “all Black Pattern” test pattern.



4.2 Driving Backlight

Ta=25℃

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-------------------------------|------------------|-------|---------|------|------|---------------------|
| Power for LED driving circuit | VCC | 10.8 | 12.0 | 12.6 | V | |
| Current of Backlight Power | I _{VCC} | - | 0.32 | - | A | 100% PWM Duty |
| Backlight Power Consumption | W _{BL} | - | 3.84 | - | W | 100% PWM Duty |
| Dimming Frequency | F _{PWM} | 200 | - | 20K | Hz | |
| Dimming duty cycle | - | 0 | - | 100% | - | |
| High Level Input Voltage | V _{IH} | 2 | - | - | V | For Dimming, EN pin |
| Low Level Input Voltage | V _{IL} | - | - | 0.8 | V | For Dimming, EN pin |
| LED Life Time | - | 25000 | (50000) | - | hrs | Note 1 |

Note1 : Optical performance should be evaluated at Ta=25℃ 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.

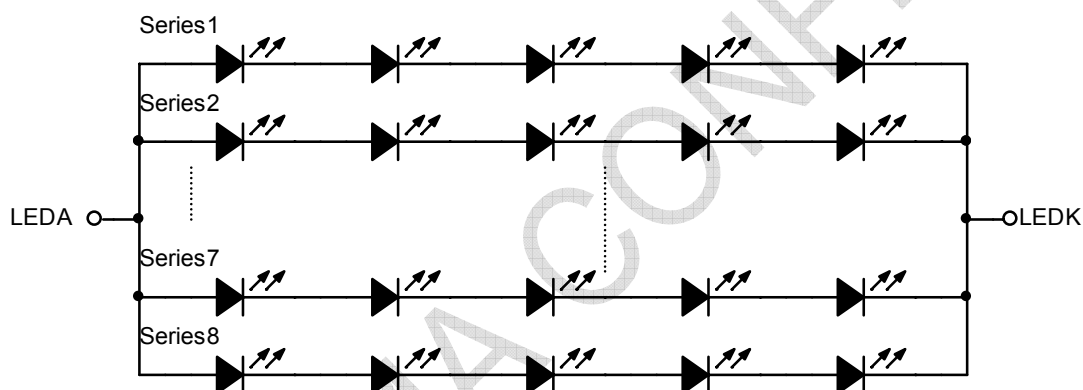
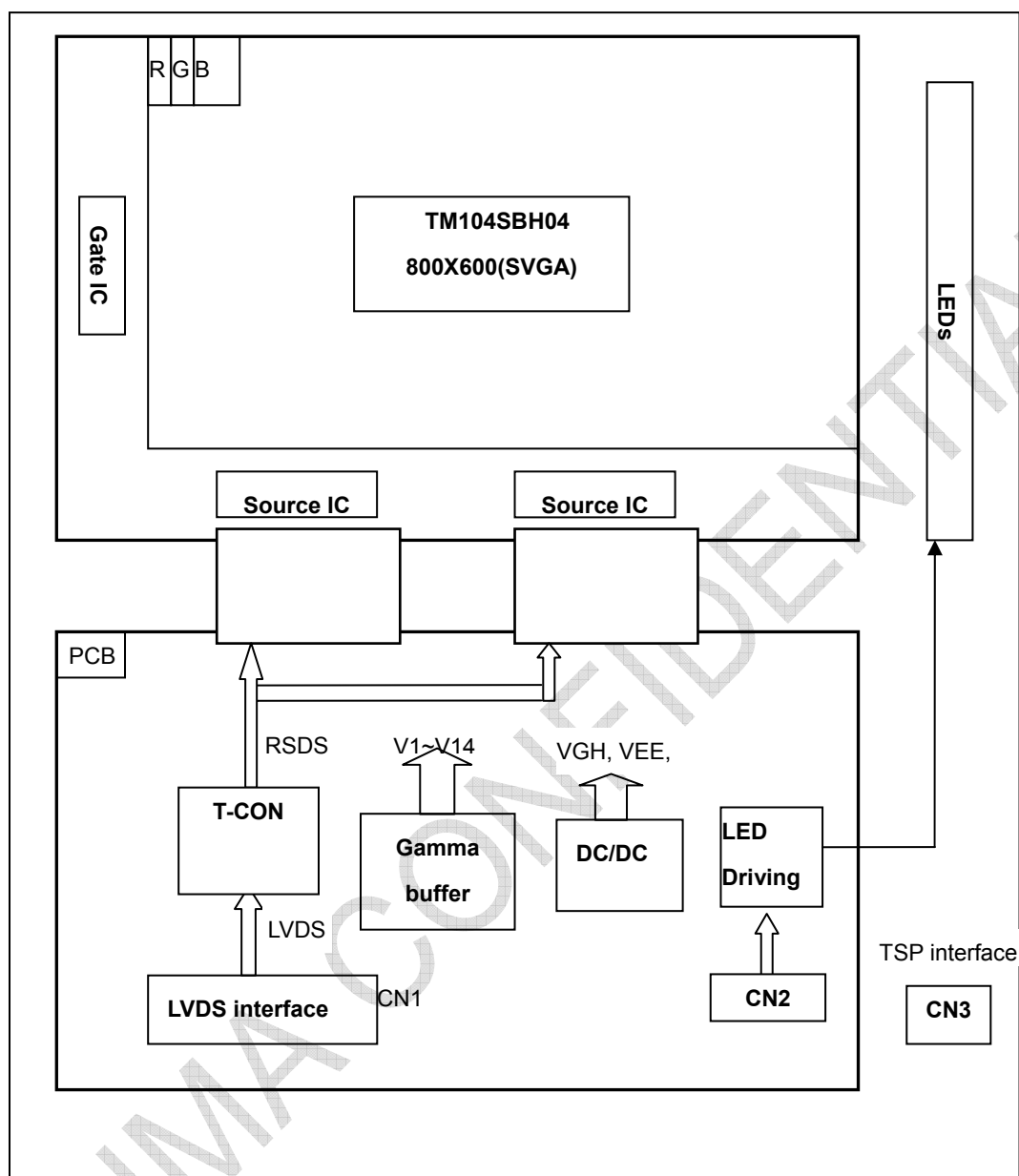


Figure 4.2 LED connection of backlight



4.3 Block Diagram





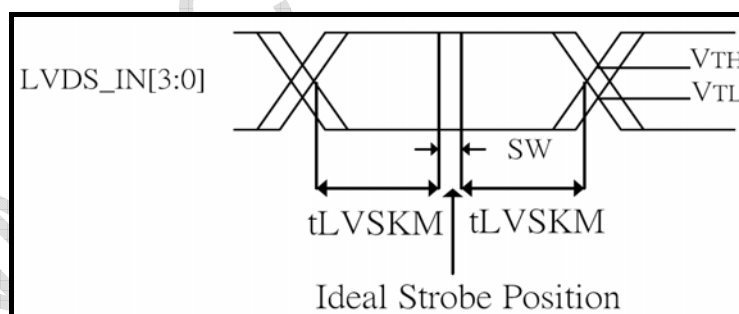
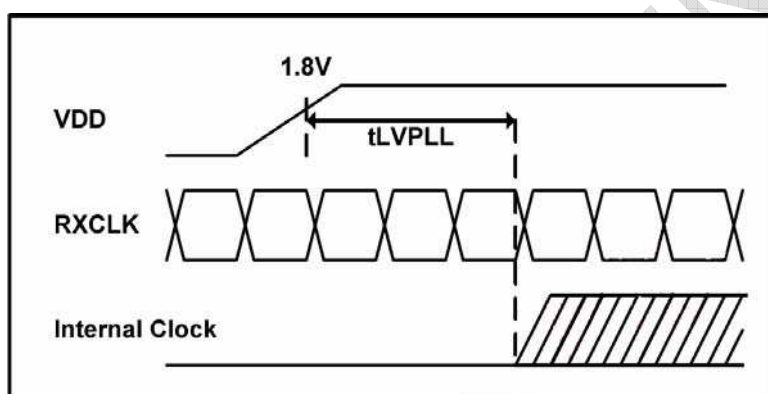
5 INTERFACE TIMING

5.1 Timing Parameter

Ta=25°C

| Item | Symbol | Min | Typ | Max | Unit | Condition |
|-------------------|--------|------|-------|-------|------|-----------|
| Clock period | tLVCP | 20.0 | 25 | 31.25 | ns | |
| Clock high time | tLVCH | - | 14.29 | - | ns | |
| Clock low time | tLVCL | - | 10.71 | - | ns | |
| PLL wake-up time | tLVPLL | - | - | 1 | ms | |
| Input skew margin | tLVSKM | 400 | - | - | ps | f=85MHz |

Table 5.1 timing parameter



SW: Setup and Hold time

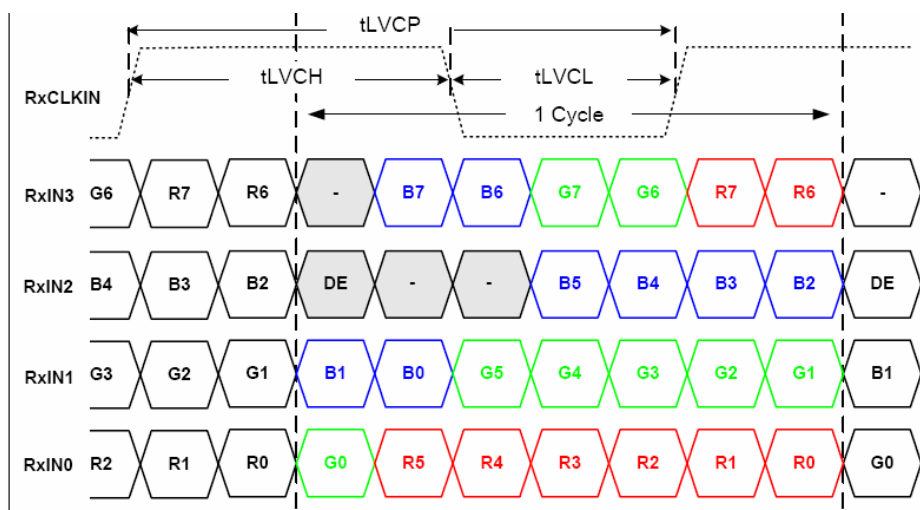


Figure 5.1 Input signal data timing

5.2 Power On/Off Sequence

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---------------------------------|--------|-----|-----|-----|------|--------|
| VDD 3.0V 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 | |

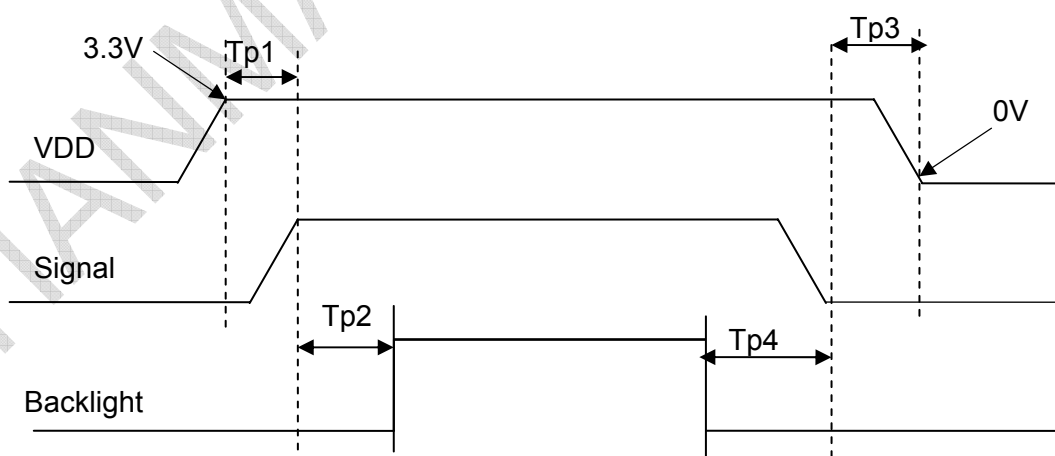


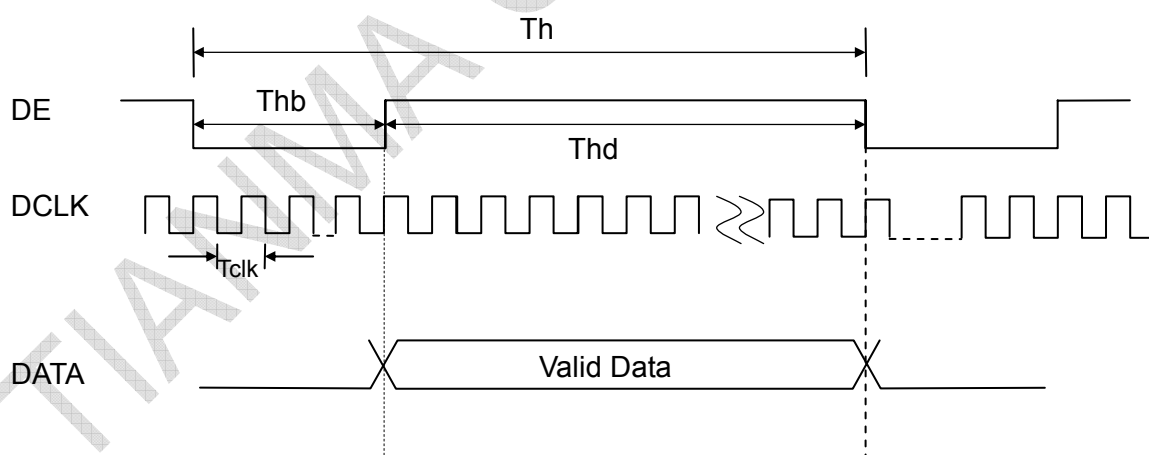
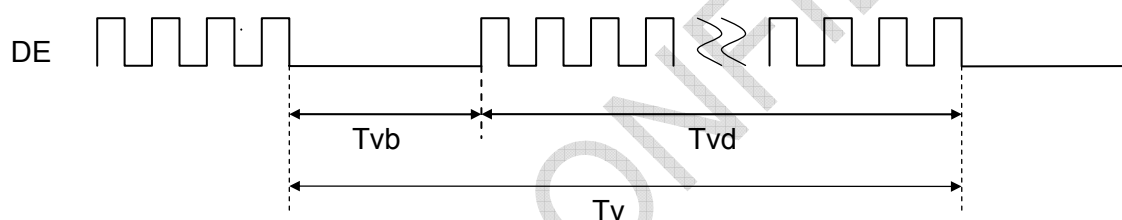
Figure 5.2 Interface power on/off sequence



5.3 Recommended Input Timing of LVDS transmitter

| Item | Parameter | Symbol | Min. | Typ. | Max. | Unit | Remarks |
|--------------------|---------------------|--------|------|------|------|------|---------|
| Dclk frequency | | 1/Tclk | 32 | 40 | 50 | MHz | |
| Horizontal section | Horizontal total | Th | 866 | 1056 | 1064 | Tclk | |
| | Horizontal blanking | Thb | 66 | 256 | 264 | Tclk | |
| | Valid Data Width | Thd | 800 | 800 | 800 | Tclk | |
| Vertical section | Frame rate | - | - | 60 | 70 | Hz | |
| | Vertical total | Tv | 604 | 628 | 800 | Th | |
| | Vertical blanking | Tvb | 4 | 28 | 200 | Th | |
| | Valid Data Width | Tvd | 600 | 600 | 600 | Th | |

Note: DE signal is necessary.





6 Optical Characteristics

| Item | | Symbol | Condition | Min | Typ. | Max. | Unit | Remark |
|----------------|-------|--------|-----------|--------|--------|--------|--------|---------|
| View Angles | | θT | CR≧10 | 60 | 70 | - | Degree | Note 2 |
| | | θB | | 50 | 60 | - | | |
| | | θL | | 60 | 70 | - | | |
| | | θR | | 60 | 70 | - | | |
| Contrast Ratio | | CR | θ=0° | 400 | 500 | | - | Note1,3 |
| Response Time | | Ton | 25℃ | - | 25 | 40 | ms | Note1,4 |
| | | Toff | | | | | | |
| Chromaticity | White | x | - | 0.2995 | 0.3005 | 0.3017 | - | Note1,5 |
| | | y | | 0.3372 | 0.3381 | 0.3390 | | |
| | RED | x | | 0.6128 | 0.6136 | 0.6152 | | |
| | | y | | 0.3537 | 0.3538 | 0.3538 | | |
| | GREEN | x | | 0.3107 | 0.3114 | 0.3123 | | |
| | | y | | 0.5322 | 0.5335 | 0.5349 | | |
| | BLUE | x | | 0.1313 | 0.1316 | 0.1321 | | |
| | | y | | 0.1406 | 0.1415 | 0.1420 | | |
| Uniformity | | U | - | - | 80 | - | % | Note1,6 |
| NTSC | | - | - | - | 47 | - | % | Note 5 |
| Luminance | | L | - | 220 | 260 | - | cd/m2 | Note1,7 |

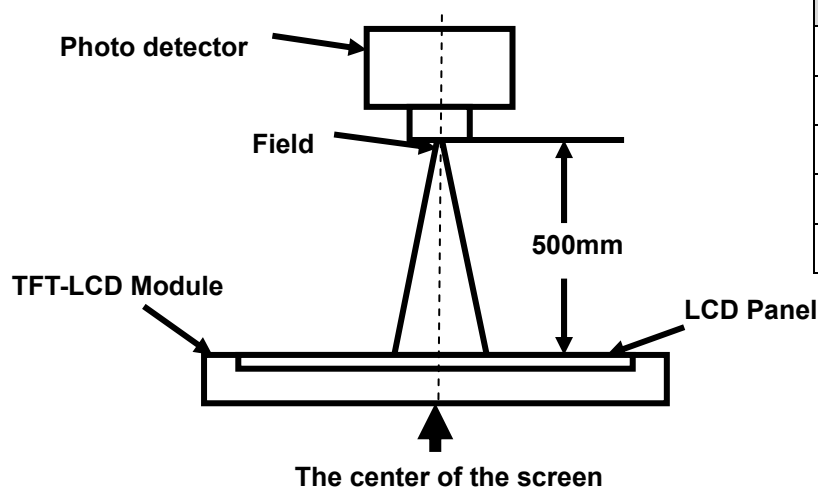
Test Conditions:

1. $VDD=3.3V$, $I_L=20mA$ (Backlight current), 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.



| 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).

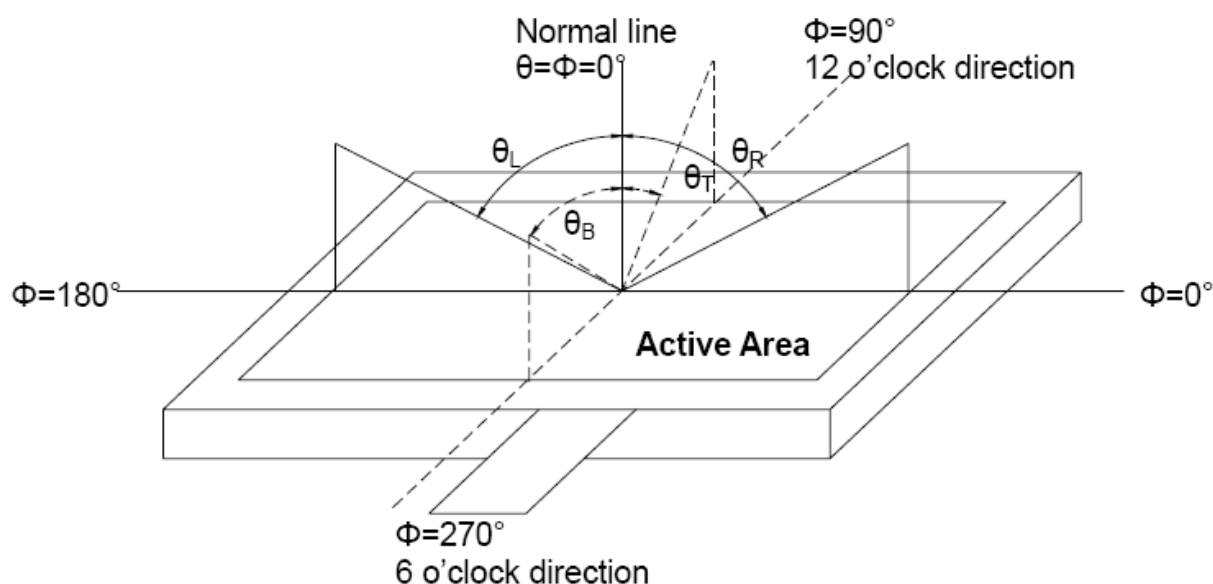


Fig. 1 Definition of viewing angle



Note 3 : Definition of contrast ratio

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

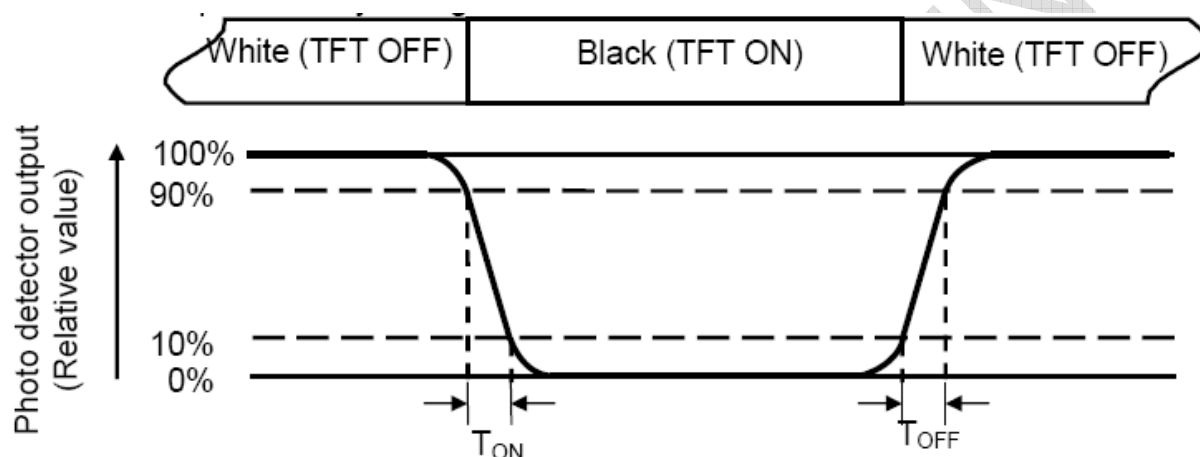
"White state ":The state is that the LCD is driven by V_{white} .

"Black state": The state is that the LCD is 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

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



each measuring area.

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

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

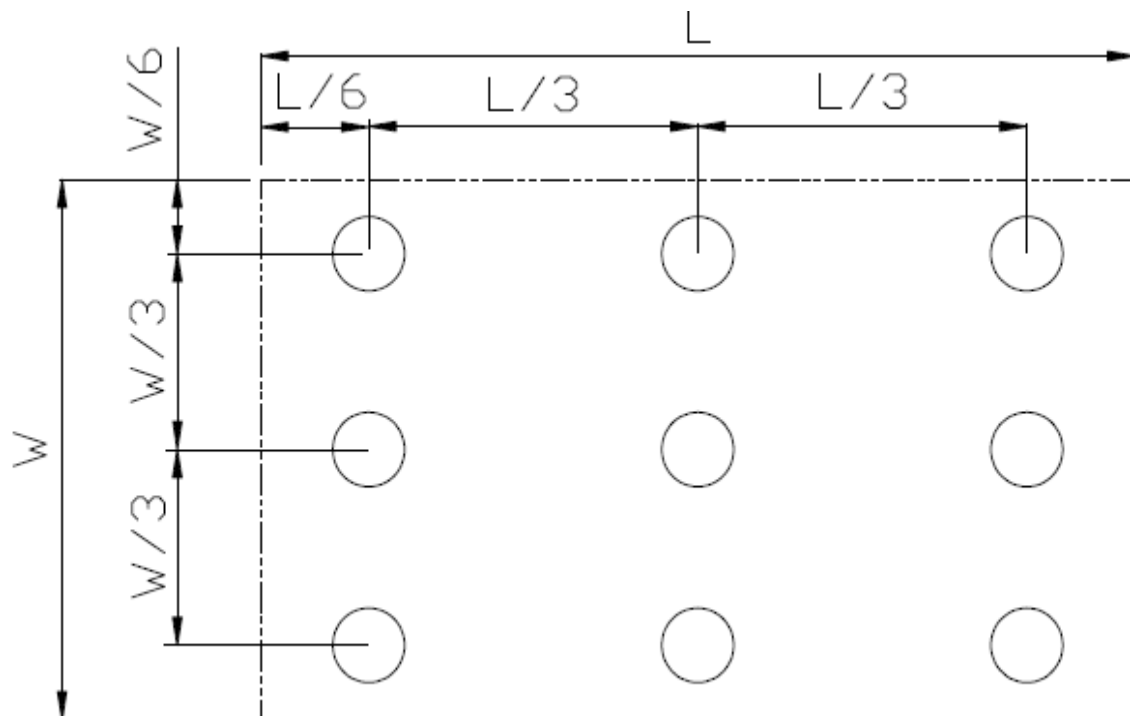


Fig. 2 Definition of uniformity

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

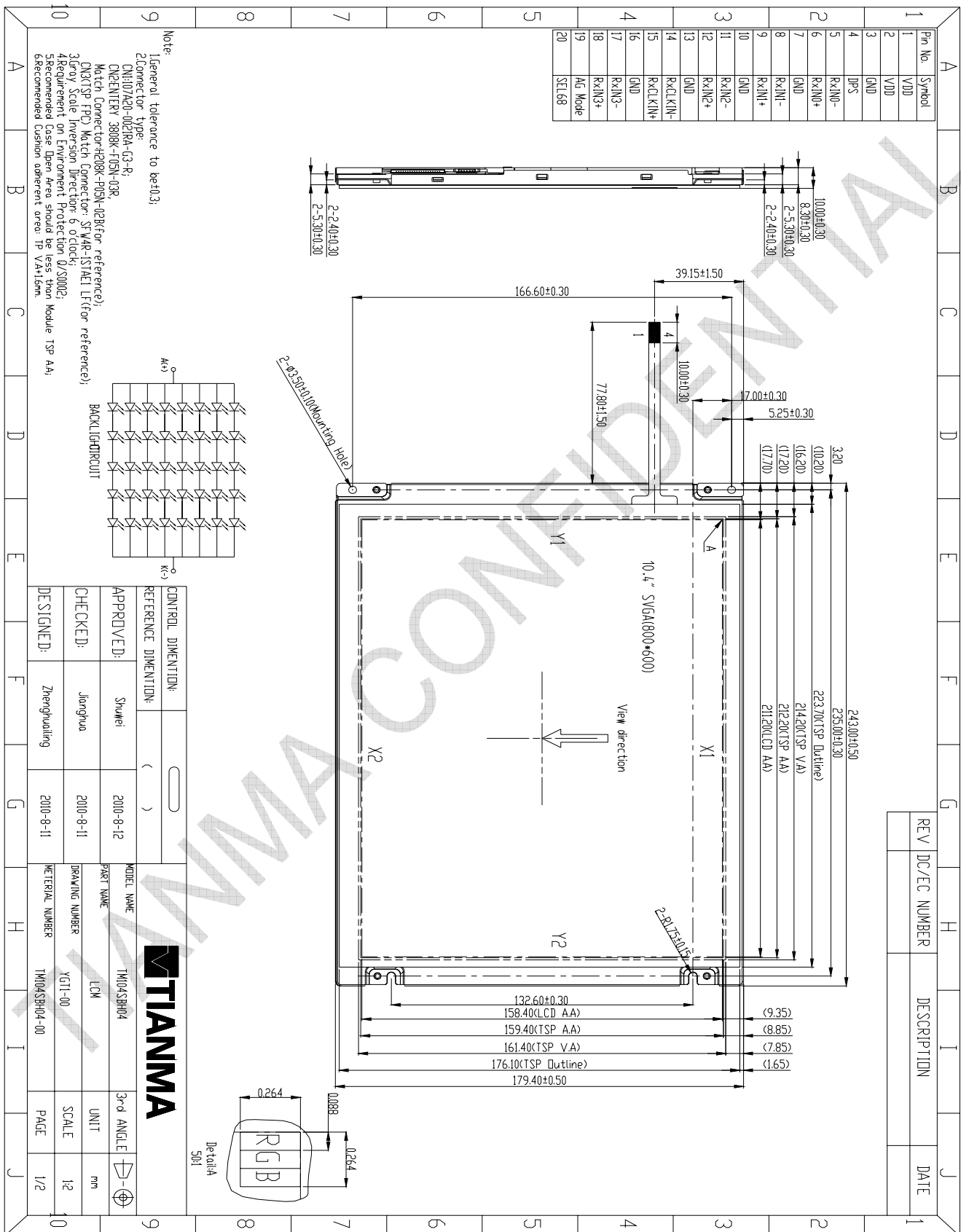
| No | Test Item | Condition | Remark |
|----|--|---|--|
| 1 | High Temperature Operation | Ts=+70℃, 240hrs | Note1 IEC60068-2-1,GB2423.2 |
| 2 | Low Temperature Operation | Ta=-20℃, 240hrs | IEC60068-2-1 GB2423.1 |
| 3 | High Temperature Storage (non-operation) | Ta=+80℃, 240hrs | IEC60068-2-1 GB2423.2 |
| 4 | Low Temperature Storage (non-operation) | Ta=-30℃, 240hrs | IEC60068-2-1 GB2423.1 |
| 5 | High Temperature & High Humidity Operation | Ta = +60℃, 90% RH max,240 hours | Note2 IEC60068-2-78 GB/T2423.3 |
| 6 | Thermal Shock (non-operation) | -30℃ 30 min~+80℃ 30 min, Change time:5min, 30 Cycles | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22 |
| 7 | Electro Static Discharge (operation) | C=150pF,R=330Ω, Air:±15Kv, Contact:±8Kv, 10times/terminal | IEC61000-4-2 GB/T17626.2 |
| 8 | Vibration (non-operation) | Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of x.y.z (6 hours for total) | IEC60068-2-6 GB/T2423.10 |
| 9 | Shock (non-operation) | 80G 6ms, ±X,±Y,±Z 3 times for each direction | IEC60068-2-27 GB/T2423.5 |
| 10 | Package Drop Test | Height:80 cm,1 corner, 3 edges, 6 surfaces | IEC60068-2-32 GB/T2423.8 |
| 11 | Package Vibration Test | Random Vibration: 0.015GxG/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 GB/T2423.11 |

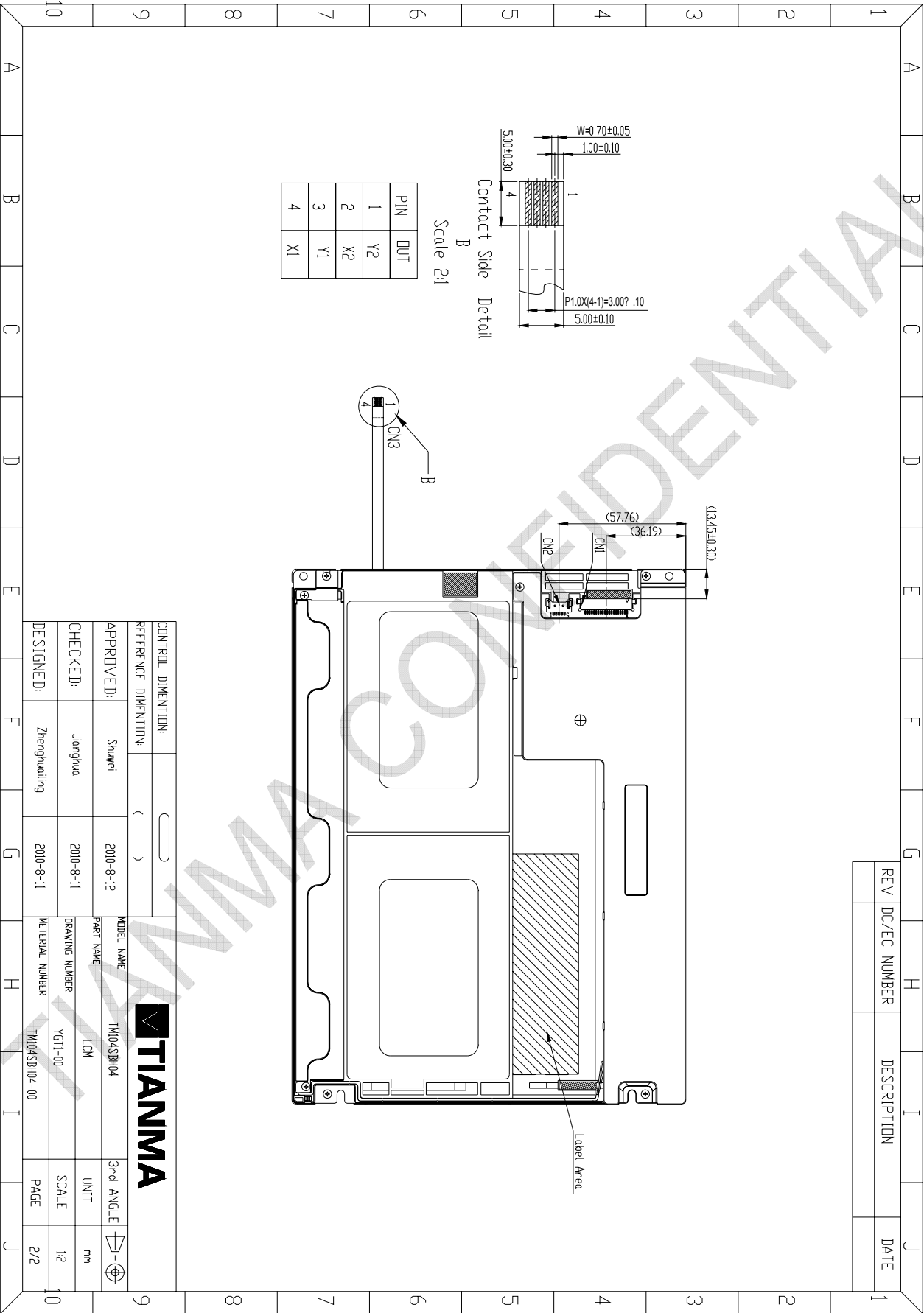
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.



8 Mechanical Drawing

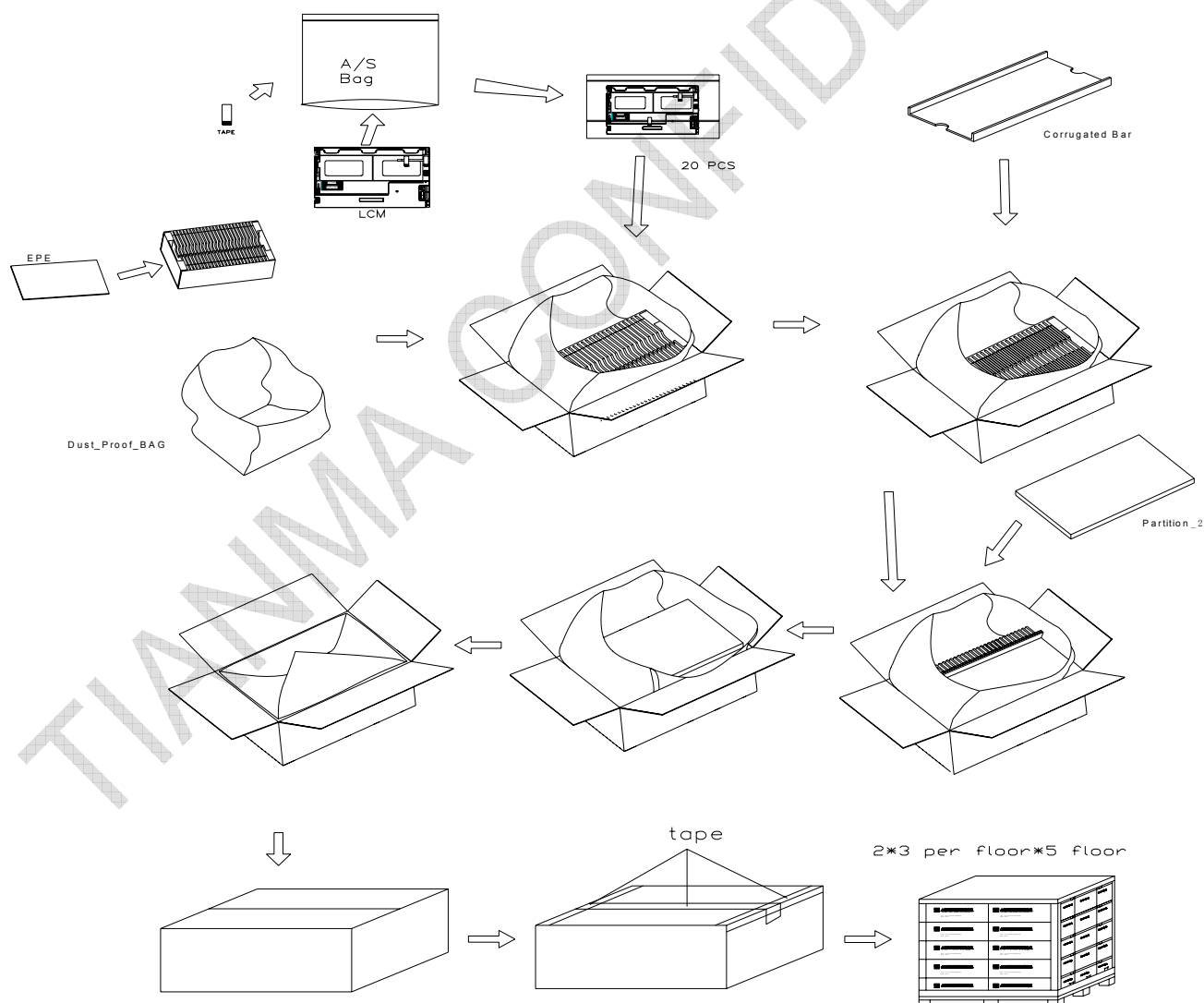






9 Packaging Drawing

| N o | Item | Model (Material) | Dimen- sions(mm) | Unit Weight(Kg) | Quantity | Remark |
|--------|-----------------|------------------|---------------------|-----------------|----------|--------|
| 1 | LCM module | TM104SBH04 | 243x179.4x10 | TBD | 20 | |
| 2 | Partition_1 | Corrugated paper | 513x333x217 | TBD | 1 | |
| 3 | Anti-static Bag | PE | 265x255x0.05 | 0.0054 | 20 | |
| 4 | Dust-Proof Bag | PE | 700x530 | TBD | 1 | |
| 5 | Partition_2 | Corrugated Paper | 505x332 | 0.1 | 1 | |
| 6 | Corrugated Bar | Corrugated paper | 413x285 | TBD | 1 | |
| 7 | Carton | Corrugated paper | 530x350x250 | 1.12 | 1 | |
| 8 | Total weight | TBD | | | | |





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.
- a. Be sure to ground the body when handling the LCD Modules.
 - b. Tools required for assembly, such as soldering irons, must be properly ground.
 - c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - d. 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

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