



MODEL NO. : TM070RBH10-20

ISSUED DATE: 2011-11-15

VERSION : Ver 2.0

- Preliminary Specification
- Final Product Specification

Customer : _____

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

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| | | |

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1 General Specifications

| Feature | | Spec |
|-----------------------------------|--------------------------------|------------------------|
| Display Spec. | Size | 7.0 inch |
| | Resolution | 800(RGB) x 480 |
| | Interface | RGB 24 bits with TCON |
| | Color Depth | 16M |
| | Technology Type | a-Si TFT |
| | Pixel Pitch (mm) | 0.1926 (H) x 0.179(V) |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Display Mode | TM,NW |
| | Surface Treatment | Anti Glare |
| | Viewing Direction | 12 o'clock |
| | Gray Scale Inversion Direction | 6 o'clock |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 164.9x 100 x 6.8 |
| | Active Area(mm) | 154.08 (W) x 85.92 (H) |
| | With /Without TSP | With TSP |
| | Weight (g) | 195.09 |
| | LED Numbers | 24 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 | Symbol | I/O | Description | Remark |
|-----|--------|-----|---|--------|
| 1 | VLED+ | P | Led anode | |
| 2 | VLED+ | P | Led anode | |
| 3 | VLED- | P | Led cathode | |
| 4 | VLED- | P | Led cathode | |
| 5 | GND | P | Ground | |
| 6 | VCOM | P | Common voltage input | |
| 7 | VCC | P | Digital power supply | |
| 8 | MODE | I | DE/SYNC mode select. H:DE mode, L:SYNC mode | |
| 9 | DE | I | Data enable signal, active high to enable data,if not use,please pull low | |
| 10 | VSYNC | I | Vertical sync input, negative polarity,if not use,please pull high | |
| 11 | HSYNC | I | Horizontal sync input, negative polarity, if not use,please pull high | |
| 12 | B7 | I | Blue data (MSB) | |
| 13 | B6 | I | Blue data | |
| 14 | B5 | I | Blue data | |
| 15 | B4 | I | Blue data | |
| 16 | B3 | I | Blue data | |
| 17 | B2 | I | Blue data | |
| 18 | B1 | I | Blue data | |
| 19 | B0 | I | Blue data (LSB) | |
| 20 | G7 | I | Green data (MSB) | |
| 21 | G6 | I | Green data | |
| 22 | G5 | I | Green data | |
| 23 | G4 | I | Green data | |
| 24 | G3 | I | Green data | |
| 25 | G2 | I | Green data | |
| 26 | G1 | I | Green data | |
| 27 | G0 | I | Green data (LSB) | |
| 28 | R7 | I | Red data (MSB) | |
| 29 | R6 | I | Red data | |
| 30 | R5 | I | Red data | |
| 31 | R4 | I | Red data | |
| 32 | R3 | I | Red data | |
| 33 | R2 | I | Red data | |
| 34 | R1 | I | Red data | |
| 35 | R0 | I | Red data (LSB) | |
| 36 | GND | P | Ground | |
| 37 | DCLK | I | Clock for input data | |
| 38 | GND | P | Ground | |
| 39 | LR | I | Source left or right sequence control | |
| 40 | UD | I | Gate up or down scan control | |

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| | | | |
|----|-------|----|--|
| 41 | VGH | P | Positive power of TFT |
| 42 | VGL | P | Negative power of TFT |
| 43 | AVDD | P | Analog power supply |
| 44 | RESET | I | Global reset pin |
| 45 | NC | NC | |
| 46 | VCOM | P | Common voltage input |
| 47 | DITHB | I | Dithering setting. H: 6bit resolution, L: 8bit resolution |
| 48 | GND | P | Ground |
| 49 | NC | NC | |
| 50 | NC | NC | |

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

Table 2.1 terminal pin assignments

2.2 CN2 of TSP

| PIN | Symbol | I/O | Description | Remark |
|-----|--------|-----|-------------------|--------|
| 1 | XL | O | X+ channel output | |
| 2 | YD | O | Y+ channel output | |
| 3 | XR | O | X- channel output | |
| 4 | YU | O | Y- channel output | |

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

Table 2.2 terminal pin assignments

2.3 U/D R/L Function Description

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



3 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | MIN | MAX | Unit | Remark |
|-----------------------|-----------------|--------|-------|------|--------|
| Power Voltage | VCC | -0.50 | 5.00 | V | |
| | AVDD | -0.50 | 13.50 | V | |
| | VGH | -0.30 | 42.00 | V | |
| | VGL | -20.00 | 0.30 | V | |
| | VGH-VGL | -0.30 | 40.00 | V | |
| Operating Temperature | T _{op} | -20.0 | 70.0 | °C | |
| Storage Temperature | T _{st} | -30.0 | 80.0 | °C | |

Table 3.1 absolute maximum rating

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4 Electrical Characteristics

4.1 Recommended Operating Condition

VCC=3.3V, GND=0V, Ta = 25°C

| Item | Symbol | MIN | TYP | MAX | Unit | Remark | |
|-----------------------------------|-------------------|-----------------|---------|-------|---------|---------------------------|--|
| Digital supply Voltage | VCC | 3.00 | 3.30 | 3.60 | V | | |
| Analog supply Voltage | AVDD | 9.88 | 10.40 | 10.92 | V | | |
| Gate on voltage | VGH | 14.40 | 16.00 | 17.60 | V | | |
| Gate off voltage | VGL | -7.70 | -7.00 | -6.30 | V | | |
| Common Electrode Driving Signal | VCOM | 3.68 | 3.70 | 3.72 | V | | |
| Input Signal Voltage | Low Level | V _{IL} | 0 | - | 0.3xVCC | V | R0~R7, G0~G7, 0~B7, DE, DCLK, HSYNC, VSYNC, MODE, RESET, LR, UD, DITHB |
| | High Level | V _{IH} | 0.7xVCC | - | VCC | V | |
| Current of digital supply voltage | I _{VCC} | - | - | 10 | mA | VCC=3.3V,colorbar pattern | |
| Current of analog supply voltage | I _{AVDD} | - | - | 30 | mA | | |
| Current of Gate on voltage | I _{VGH} | - | - | 0.3 | mA | VGH=16.00V | |
| Current of Gate off voltage | I _{VGL} | - | - | 0.3 | mA | VGL=-7.0V | |

Table 4.1 LCD module electrical characteristics

Note 1: the value is for design stage only.



4.2 Backlight Unit Driving Condition

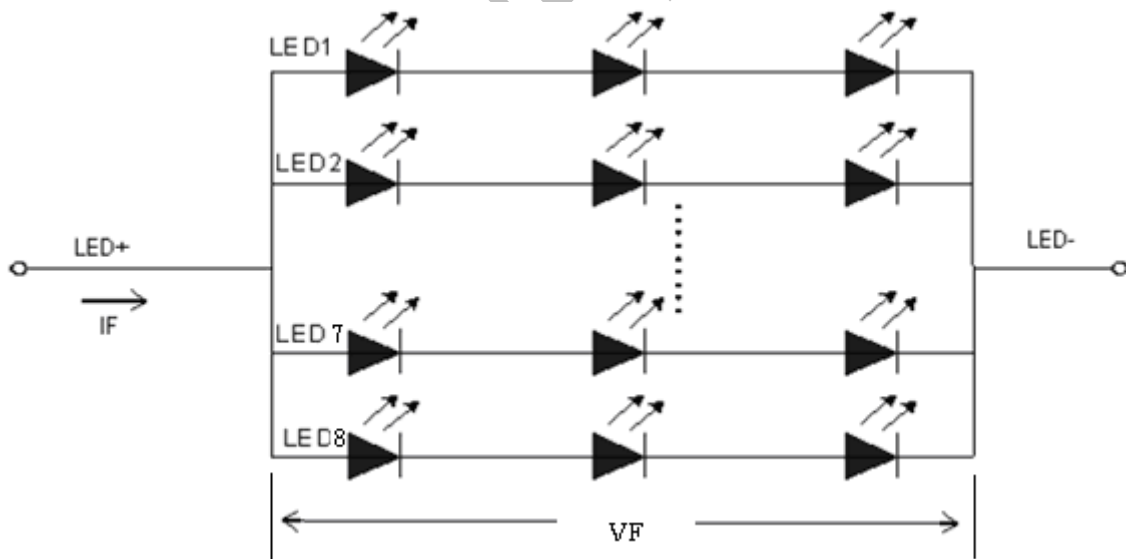
| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------------------|----------|-------|---------|------|------|---|
| Forward Current | I_F | - | 160.0 | 200 | mA | 24 LEDs (3 LED Serial, 8 LED Parallel) |
| Forward Current Voltage | V_F | - | 9.6 | 10.8 | V | |
| Backlight Power Consumption | W_{BL} | - | 1536 | - | mW | |
| Life Time | ----- | 10000 | (20000) | | hrs | |

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 8 LED Parallel).For each LED: $I_F (1/8) = 20mA$, $V_F (1/3) = 3.2V$.

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

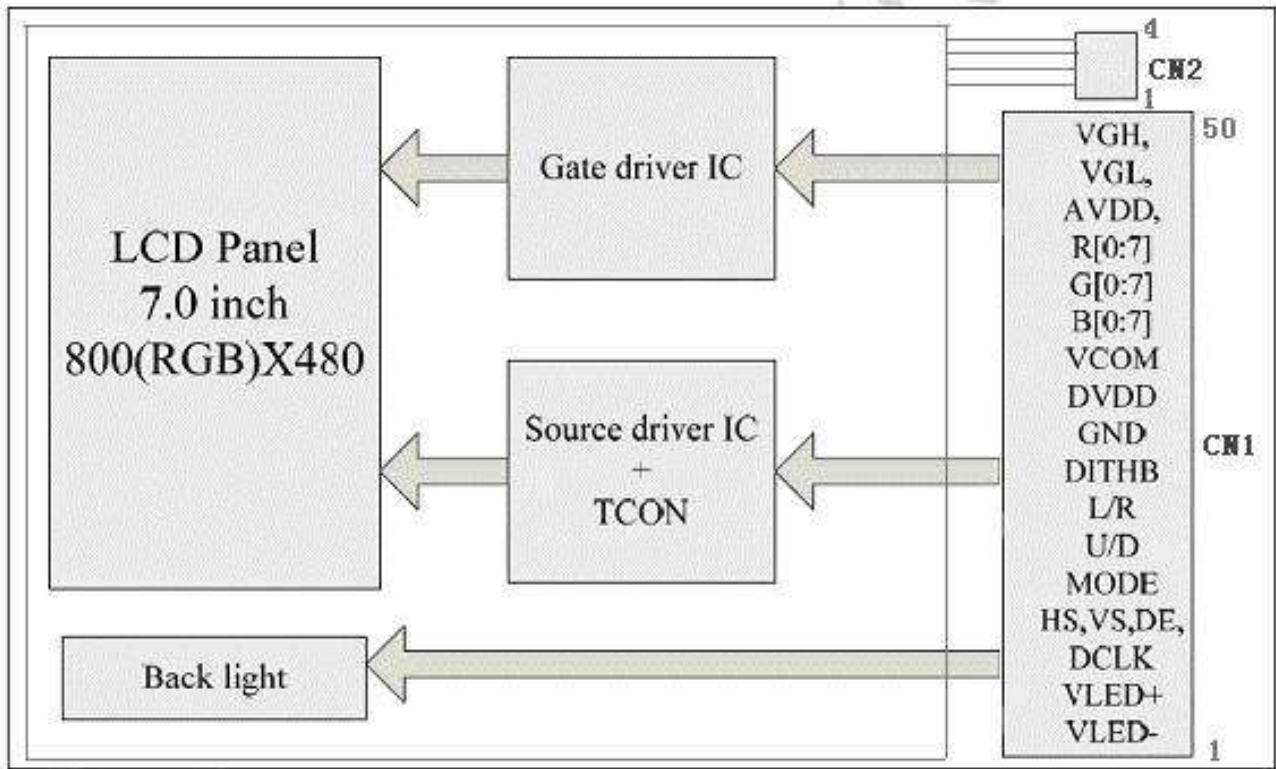
Note3: I_F is defined for one channel LED.Optical performance should be evaluated at $T_a=25^\circ C$ only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

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





4.3 BLOCK DIAGRAM



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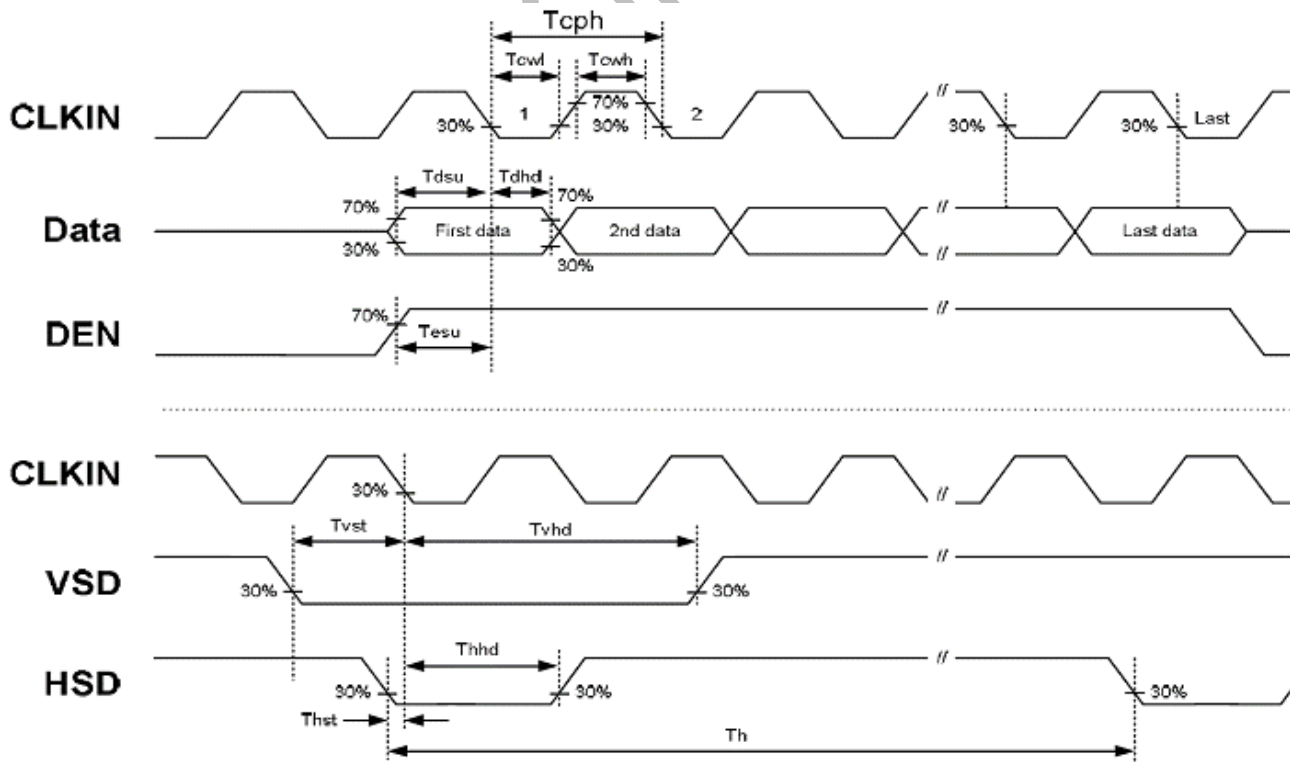
5 Timing Chart

5.1 TFT-LCD Input Timing

VCC=3.3V, GND=0V, Ta=25°C

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|------------------|-----------|-------|-------|-------|-----------|--------------|
| DCLK frequency | F_{clk} | 24.36 | 29.23 | 36.54 | MHz | |
| DCLK cycle time | T_{cph} | 41.05 | 34.21 | 27.37 | ns | |
| DCLK pulse width | T_{cw} | 40% | 50% | 60% | T_{cph} | |
| VS setup time | T_{vst} | 10 | | | ns | |
| VS hold time | T_{vhd} | 10 | - | - | ns | |
| HS setup time | T_{hst} | 10 | | | ns | |
| HS hold time | T_{hhd} | 10 | - | - | ns | |
| Data setup time | T_{dsu} | 10 | | | ns | Data to DCLK |
| Data hold time | T_{dhd} | 10 | - | - | ns | Data to DCLK |
| DE setup time | T_{esu} | 10 | - | - | ns | |
| DE hold time | T_{ehd} | 10 | - | - | ns | |

Input Clock and Data timing Diagram:



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5.2 Recommended Timing Setting Of TCON

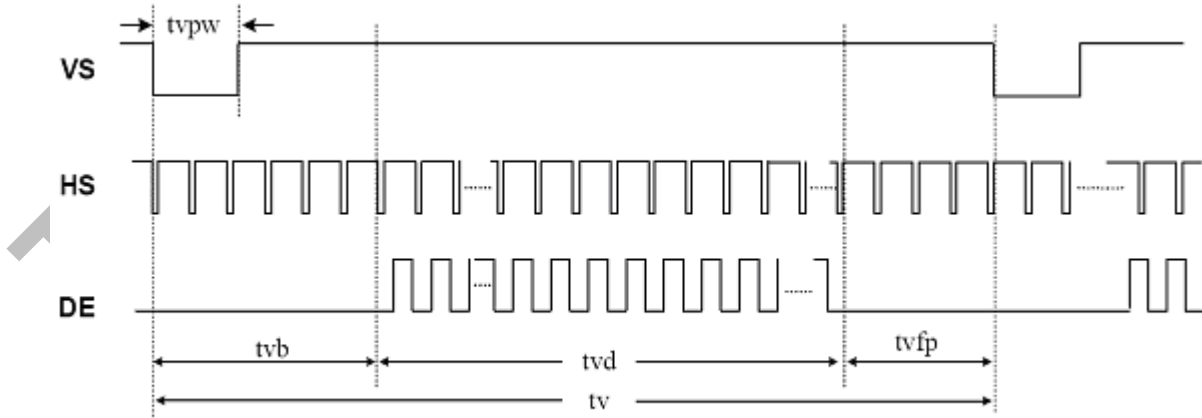
TCON (Embedded In Source IC) Input Timing (DCLK, HS, VS, DE)

VCC=3.3V, GND=0V, Ta=25°C

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|-----------|--------|-----|------|------|------|--------|
| DCLK | Fclk | 28 | 30 | 40 | MHZ | |
| | tclk | 20 | 33.3 | 36 | ns | |
| HSD | th | 862 | 1056 | 1200 | tclk | |
| | thd | 800 | 800 | 800 | tclk | |
| | thpw | 1 | - | 40 | tclk | |
| | thb | 46 | 46 | 46 | tclk | |
| | thfp | 16 | 210 | 354 | tclk | |
| VSD | tv | 510 | 525 | 650 | th | |
| | tvd | 480 | 480 | 480 | th | |
| | tvpw | 1 | 3 | 20 | th | |
| | tvb | 23 | 23 | 23 | th | |
| | tvfp | 7 | 22 | 147 | th | |

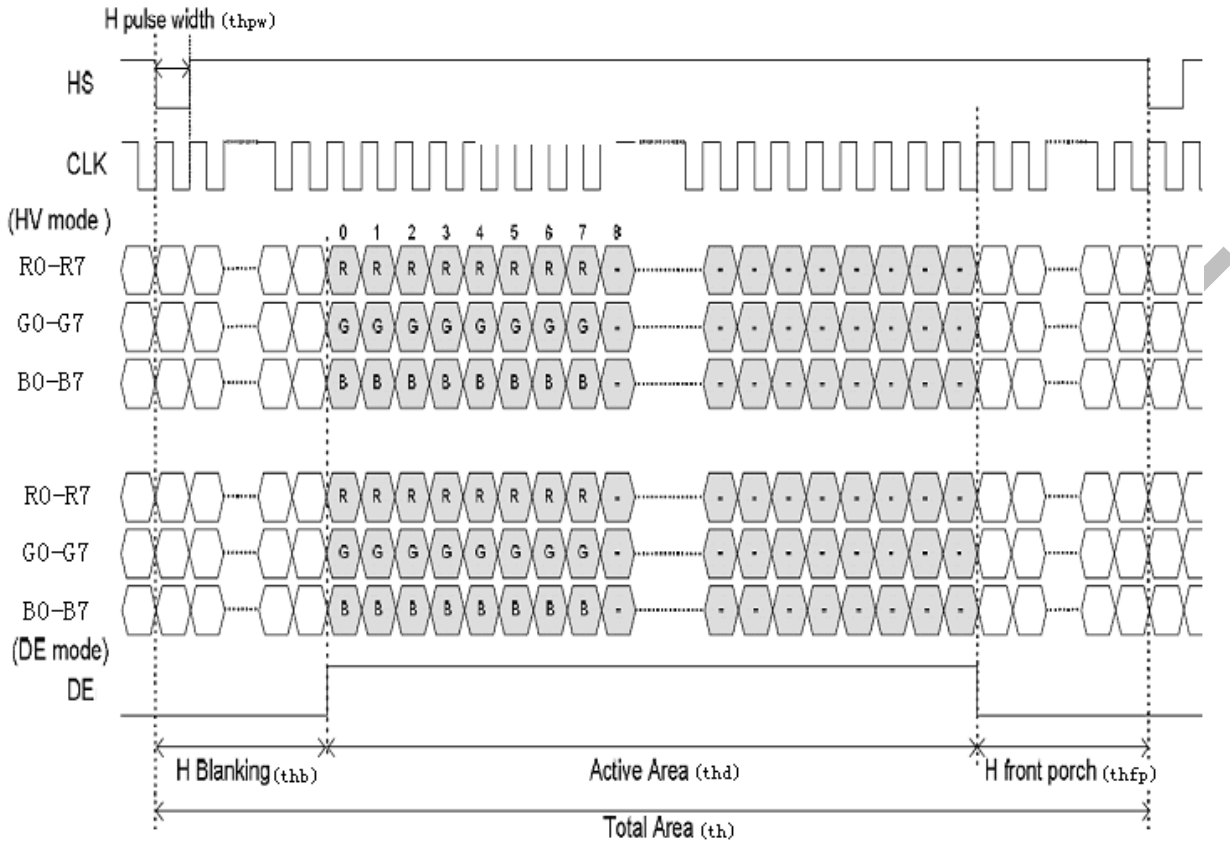
Note 1: DE timing refer to HS, VS input timing.

TCON Vertical Input Timing Diagram HV

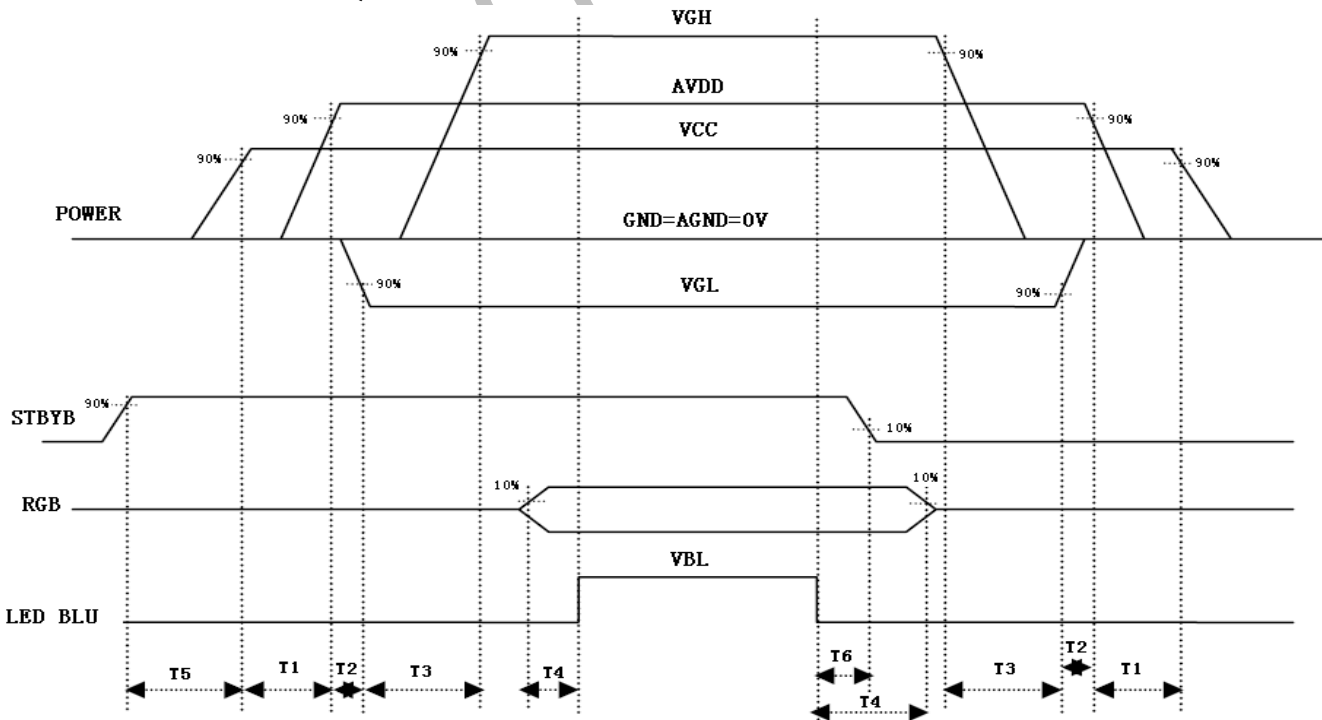




TCON Horizontal Input Timing Diagram



5.3 POWER ON/OFF SEQUENCE



Note: T1≥20ms, T2≥20ms, T3≥5ms, T4≥100ms, T5≥5ms, T6≥5ms.

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6. Touch Screen Panel Specifications

6.1 Electrical Characteristics

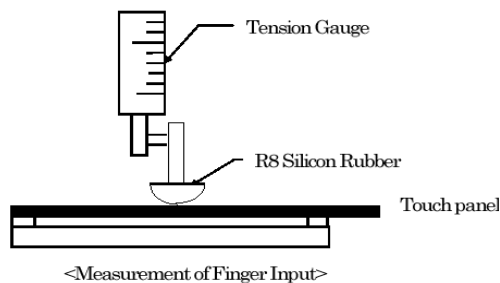
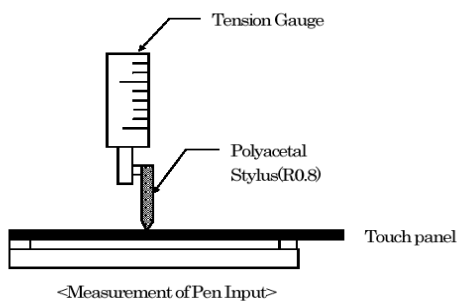
| Item | Min. | Typ. | Max. | Unit | |
|------------------------------|---------|------|------|------------|--------------------|
| Linearity | --- | --- | 1.5% | --- | Each axis: X and Y |
| Operating Voltage | --- | 5.0 | 7.0 | V | DC |
| Resistance | X axis: | 440 | --- | 1100 | Ω |
| | Y axis: | 70 | --- | 420 | Ω |
| Chattering Time | --- | --- | 10.0 | ms | |
| Insulation Resistance | 20 | --- | --- | M Ω | @DC25V |

6.2 Touch Panel Mechanical & Reliability Characteristics

| Item | Value | | | Unit | Remark |
|-------------------------------|--------------|-----|-----|------------|-----------|
| | Min | Typ | Max | | |
| Activation | 80 | - | 160 | gf | Note 1 |
| Durability-surface scratching | Write 100000 | - | - | characters | Note 2 |
| Durability-surface pitting | 1000000 | - | - | touches | Note 3 |
| Surface hardness | 3 | | | H | JIS K5400 |

Note1:

1. Input DC 5V on X direction , Drop off Polyacetal Stylus(R0.8),until output voltage stabilize ,then get the activation force;
2. R8 Silicon rubber for finger Activation force test;
3. Test point: 9 points.



Note2:

- End shape: R0.8mm(Stylus)
- Load force: 150gf
- Writing speed: 60 mm/sec
- Material of Pen: Polyacetal resin
- Sliding length: 10~100 mm

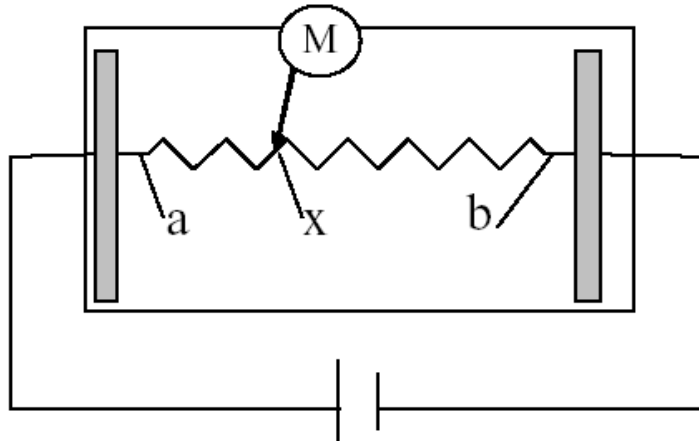
Note3:

- End shape: R8mm, Material of Pen: Silicon rubber
- Hardness: 60°
- Load force: 150gf
- Frequency: 2 Hz

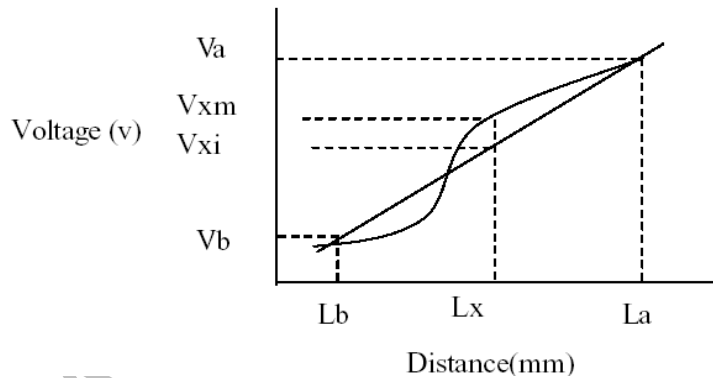


6.2 Electrical Characteristic

Linearity Definition

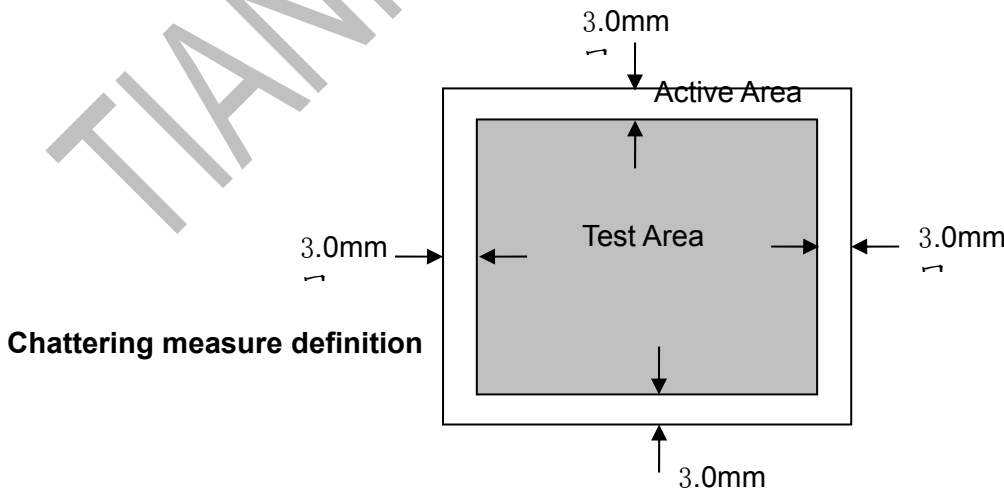


- Va: maximum voltage in the active area of touch panel
- Vb: minimum voltage in the active area of touch panel
- X: random measuring point
- Vxm: actual voltage of Lx point
- Vxi: theoretical voltage of Lx point



$$\text{Linearity} = \frac{|Vxi - Vxm|}{(Va - Vb)} * 100\%$$

Note: Test area is as follows and operation force is 150gf(single layer ITO Film), polyacetal stylus: R0.8mm.



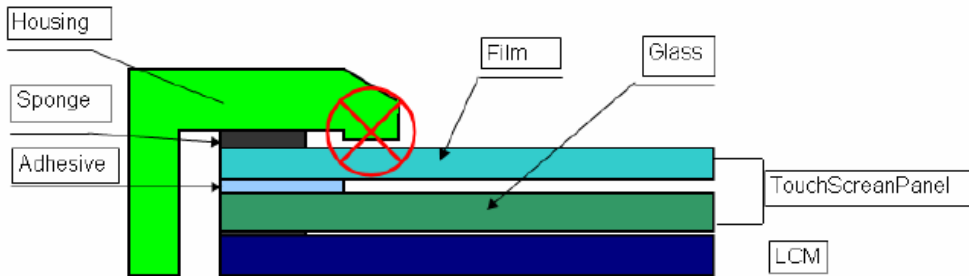
Chattering measure definition



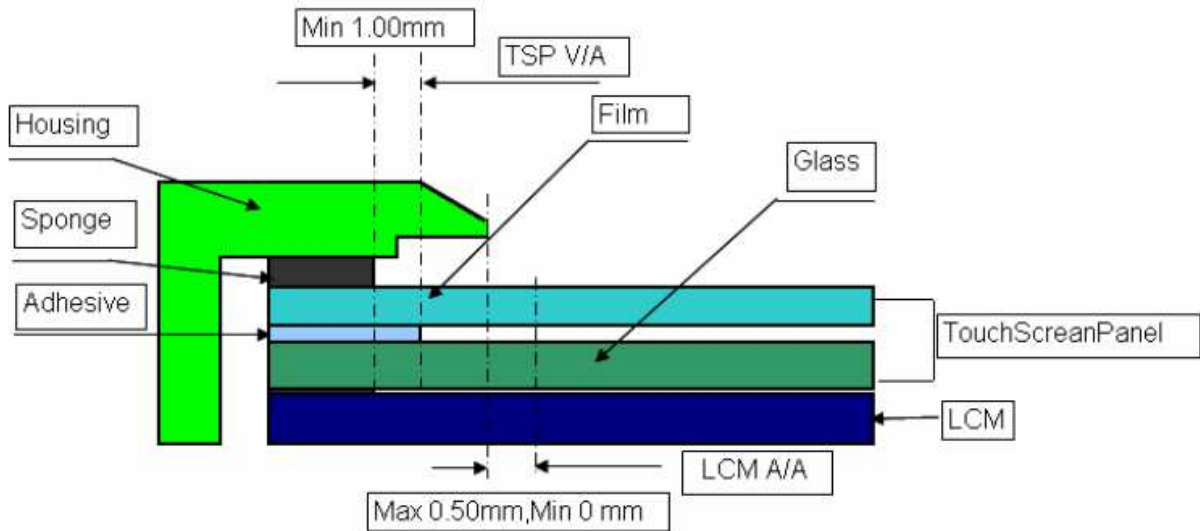
6.3.Housing design guide

Housing design follow as below

1. Avoid the design that housing overlap and press on the active area of the LCM
2. Give enough gap(Over 0.5mm at compressed) between the housing and TSP to Protect wrong operating.



3. Use a buffer material(Gasket) between the TSP and housing to protect damage and wrong operating
4. Avoid the design that buffer material overlap and press on the inside of TSP view area.



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7. Optical Characteristics

Ta=25°C

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|---------------------|------------|------------------|-------|-------|-------|-------------------|----------------|
| View Angles | θT | $CR \geq 10$ | (40) | 50 | - | Degree | Note 2 |
| | θB | | (60) | 70 | - | | |
| | θL | | (60) | 70 | - | | |
| | θR | | (60) | 70 | - | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | (400) | 500 | - | | Note1 Note3 |
| Response Time | T_{ON} | 25°C | - | 25 | - | ms | Note1 Note4 |
| | T_{OFF} | | | | | | |
| Chromaticity | White | Backlight is on | x | 0.267 | 0.317 | 0.367 | Note1 Note5 |
| | | | y | 0.284 | 0.334 | 0.384 | |
| | Red | | x | 0.567 | 0.617 | 0.667 | |
| | | | y | 0.305 | 0.355 | 0.405 | |
| | Green | | x | 0.289 | 0.339 | 0.389 | |
| | | | y | 0.483 | 0.533 | 0.583 | |
| | Blue | | x | 0.092 | 0.142 | 0.192 | |
| | | | y | 0.049 | 0.099 | 0.149 | |
| Uniformity | U | | - | 75 | - | % | Note1 Note6 |
| NTSC | | | - | 49.2 | - | % | Note 5 |
| Luminance (With TP) | L | | 250 | 280 | - | cd/m ² | Note1 Note7 |

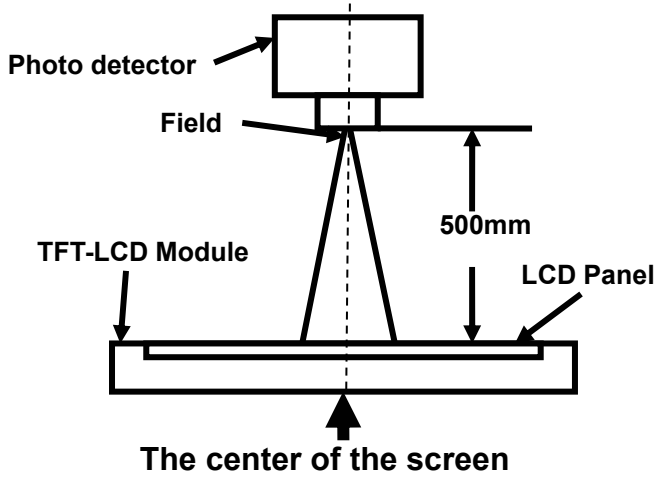
Test Conditions:

1. $I_F=20\text{ mA}$, $V_F=9.6\text{ V}$ and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

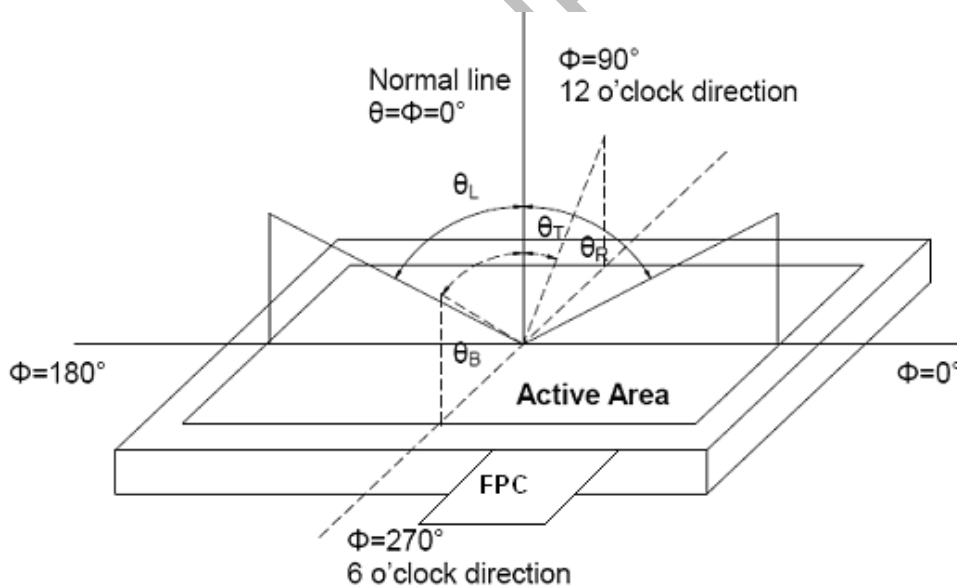
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| Item | Photo detector | Field |
|----------------|----------------|-------|
| Contrast Ratio | SR-3A | 1° |
| Luminance | | |
| Chromaticity | | |
| Lum Uniformity | BM-7A | 2° |
| Response Time | | |

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 V_{white} .

“Black state”: The state is that the LCD should drive by V_{black} .

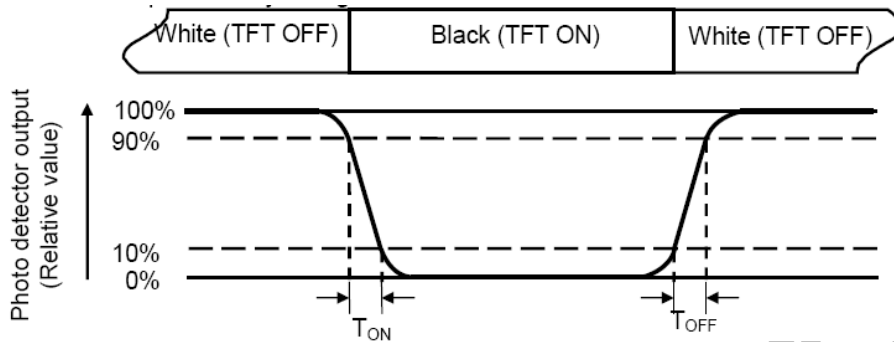
V_{white} : To be determined V_{black} : To be determined.

Note 4: Definition of Response time

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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)

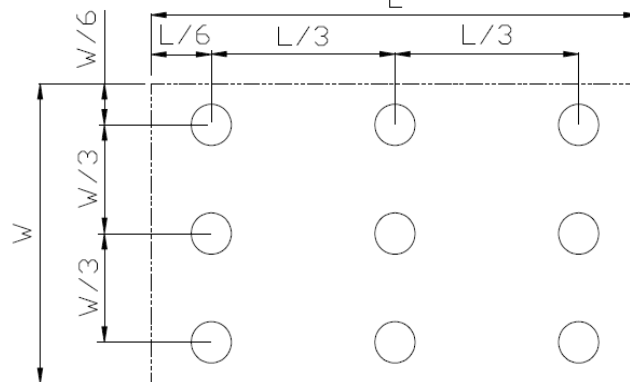
Color coordinates measured at center point of LCD.

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.

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.

**8.Environmental / Reliability Test**

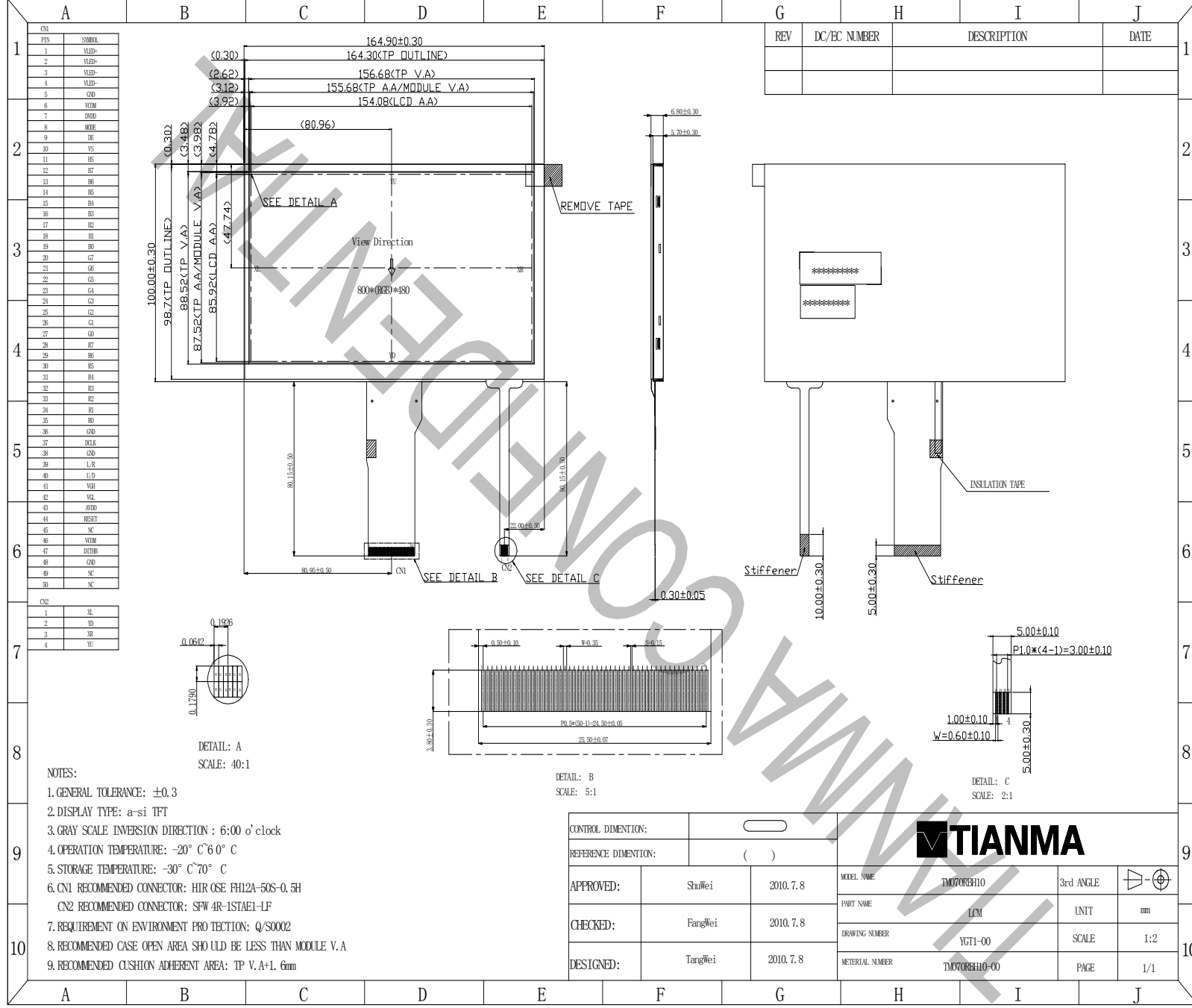
| No | Test Item | Condition | Remarks |
|----|--|--|---|
| 1 | High Temperature Operation | Ts = +70°C, 240 hours | IEC60068-2-1:2007 GB2423.2-2008 |
| 2 | Low Temperature Operation | Ta = -20°C, 240 hours | IEC60068-2-1:2007 GB2423.1-2008 |
| 3 | High Temperature Storage | Ta = +80°C, 240 hours | IEC60068-2-1:2007 GB2423.2-2008 |
| 4 | Low Temperature Storage | Ta = -30°C, 240 hours | IEC60068-2-1:2007 GB2423.1-2008 |
| 5 | Storage at High Temperature and Humidity | Ta = +60°C, 90% RH max,240hours | IEC60068-2-78 :2001 GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -30°C 30 min~+80°C 30 min, Change time:5min, 100 Cycle | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002 |
| 7 | ESD | C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15°C~35°C, 30%~60%.86Kpa~106Kpa) | IEC61000-4-2:2001 GB/T17626.2-2006 |
| 8 | Vibration Test | Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) | IEC60068-2-6:1982 GB/T2423.10—1995 |
| 9 | Mechanical Shock (Non Op) | Half Sine Wave 100G 6ms, ±X,±Y,±Z 3times for each direction | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:60cm, 1corner,3edges,6surfaces | IEC60068-2-32:1990 GB/T2423.8—1995 |

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

Note2: Ta is the ambient temperature of samples.



9.Mechanical Drawing

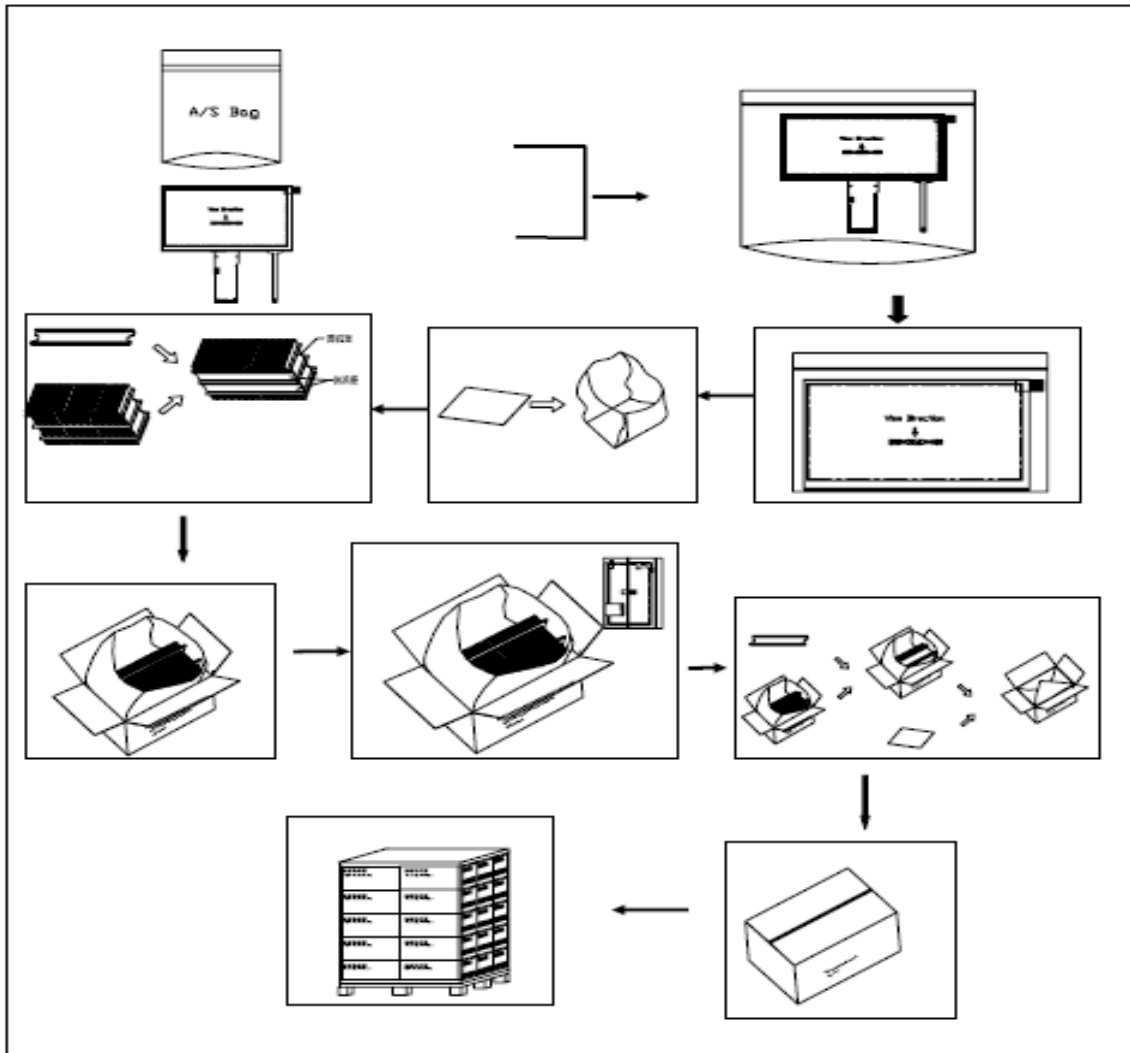


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10.Packing drawing

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark | |
|----|-----------------|------------------|--------------------|-----------------|----------|-------------|--|
| 1 | LCM module | TM070RBH10 | 164.90x100.00x6.80 | 0.195 | 50 | | |
| 2 | Partition_1 | Corrugated Paper | 513x333x215 | 2.0 | 1 | | |
| 3. | Anti-Static Bag | PE | 200x175x0.05 | 0.01 | 50 | Anti-static | |
| 4 | Dust-Proof Bag | PE | 700x545 | 0.0600 | 1 | | |
| 5 | Partition_2 | Corrugated Paper | 505x332 | 0.1 | 2 | | |
| 6 | Corrugated Bar | Corrugated Paper | 513x148 | 0.06 | 4 | | |
| 7 | Beauty-grain | Tape | 30x10 | 0.001 | 50 | | |
| 8 | Dessicant | Dessicant | 45x35 | 0.002 | 8 | | |
| 9 | Carton | Corrugated Paper | 530x350x250 | 1.1000 | 1 | | |
| 10 | Total weight | 13.9±5% | | | | | |



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11. Precautions for Use of LCD Modules

Handling Precautions

11.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2 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.

11.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5 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

11.1.6 Do not attempt to disassemble the LCD Module.

11.1.7 If the logic circuit power is off, do not apply the input signals.

11.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1 Be sure to ground the body when handling the LCD Modules.

11.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4 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.

Storage precautions

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

11.2.2 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%

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

Transportation Precautions

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