

SPECIFICATION

[] Preliminary Specification
 [] Final Specification

Description **5.7" 320xRGBx240 TFT-LCD Module**
Part Number **P0567VQF1ME00**

| | | | |
|--------------------|--------------------|--|--------------------|
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* This cover page is for your Comments and Signatures back to TIANMA.

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1. Summary

1.1 General Description

This is a 5.7 inch a-Si TFT-LCD module with Normal-Black technology. It is composed of a TFT-LCD panel, a driver circuit, FPC, and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle (SFT, Normally black)
- Wide view angle(85/85/85/85)
- Interface(RGB888)
- Surface treatment(AG)
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

2. General Specifications

| | Feature | Spec | Unit |
|-----------------------------------|---------------------|---------------------------------|-------------------|
| Display Spec | Size | 5.7 inches | |
| | Resolution | 320(RGB)x240 | |
| | Pixel Pitch | 0.36x0.36 | mm |
| | TFT Active Area | 115.20x86.40 | mm |
| | Technology Type | a-Si | |
| | Pixel Configuration | R.G.B Vertical Stripe | |
| | Display Mode | SFT, Normally Black | |
| | Surface Treatment | Anti-Glare | |
| | Viewing Direction | all | |
| Mechanical Characteristics | LCM (W x H x D) | 144.00x104.60x5.10(without FPC) | mm |
| | Weight | TBD | g |
| Optical Characteristics | Luminance | 500 | cd/m ² |
| | Contrast Ratio | 1000:1 | |
| | NTSC | 65 | % |
| | Viewing Angle | 85/85/85/85 | degree |
| Electrical Characteristics | Interface | RGB 24bits | |
| | Color Depth | 16.7M | color |
| | Power Consumption | LCD: TBD Backlight: TBD | mW |

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

| Connector Information | |
|-----------------------|--|
| Matching connector | FH12A-50S-0.5SH (HIROSE) or equivalent |

Table 3.1.1 Connector information

| PIN | Symbol | I/O | Description | Remark |
|-----|--------|-----|--|--------|
| 1 | LED+ | P | LED Anode | |
| 2 | LED+ | P | LED Anode | |
| 3 | LED- | P | LED cathode | |
| 4 | LED- | P | LED cathode | |
| 5 | GND | P | Ground | |
| 6 | NC | N | No connection | |
| 7 | VCC | P | Power supply(+3.3V) | |
| 8 | NC | N | No connection | |
| 9 | DE | I | Data enable, active high | |
| 10 | VS | I | Vertical SYNC signal input, active low. | |
| 11 | HS | I | Horizontal SYNC signal input, active low | |
| 12 | GND | P | Ground | |
| 13 | B7 | I | Blue data Input(MSB) | |
| 14 | B6 | I | Blue data Input | |
| 15 | B5 | I | Blue data Input | |
| 16 | B4 | I | Blue data Input | |
| 17 | B3 | I | Blue data Input | |
| 18 | B2 | I | Blue data Input | |
| 19 | B1 | I | Blue data Input | |
| 20 | B0 | I | Blue data Input(LSB) | |
| 21 | G7 | I | Green data Input(MSB) | |
| 22 | G6 | I | Green data Input | |
| 23 | G5 | I | Green data Input | |
| 24 | G4 | I | Green data Input | |
| 25 | G3 | I | Green data Input | |
| 26 | G2 | I | Green data Input | |
| 27 | G1 | I | Green data Input | |
| 28 | G0 | I | Green data Input(LSB) | |
| 29 | R7 | I | Red data Input(MSB) | |
| 30 | R6 | I | Red data Input | |
| 31 | R5 | I | Red data Input | |
| 32 | R4 | I | Red data Input | |
| 33 | R3 | I | Red data Input | |
| 34 | R2 | I | Red data Input | |
| 35 | R1 | I | Red data Input | |
| 36 | R0 | I | Red data Input(LSB) | |
| 37 | GND | P | Ground | |
| 38 | DCLK | I | Clock input(latch data at falling edge) | |
| 39 | GND | P | Ground | |
| 40 | L/R | I | Left/right scan control signal. | |
| 41 | U/D | I | Up/down scan control signal. | |

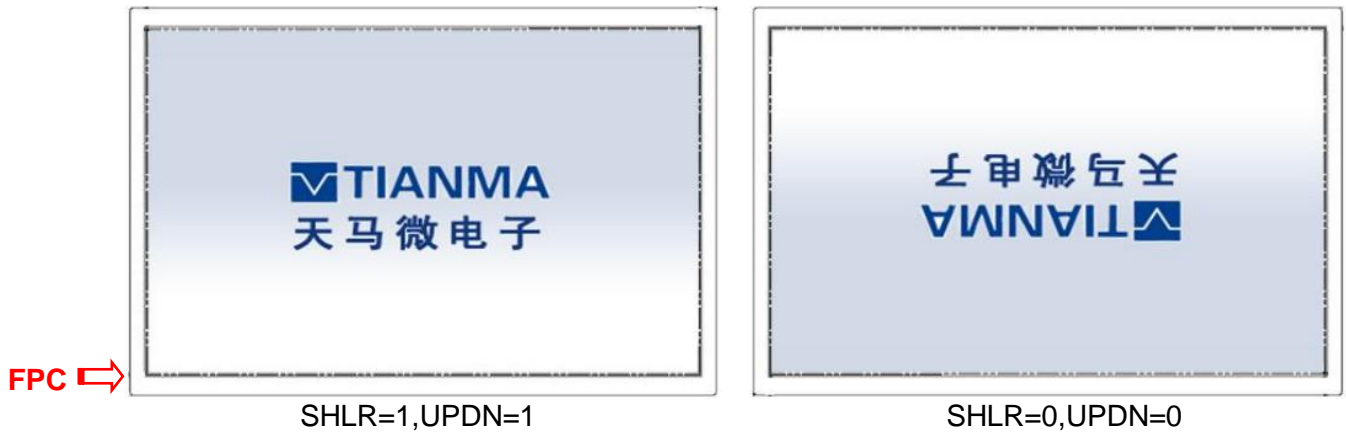
| | | | |
|----|-------|---|--|
| 42 | NC | - | No connection (For internal use, leave it open.) |
| 43 | VCC | P | Power supply(+3.3V) |
| 44 | NC | N | No connection (For internal use, leave it open.) |
| 45 | RESET | I | Reset signal, active low. |
| 46 | NC | N | No connection (For internal use, leave it open.) |
| 47 | NC | N | No connection (For internal use, leave it open.) |
| 48 | NC | N | No connection (For internal use, leave it open.) |
| 49 | GND | P | Ground |
| 50 | NC | N | No connection |

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note3: Scan direction is shown as below(FPC at down side):



4. Absolute Maximum Ratings

| Item | Symbol | MIN | MAX | Unit | Remark |
|----------------------------|--------|------|-----|------------------|----------------|
| Power Voltage | VCC | -0.3 | 6.0 | V | Note1 |
| Input voltage | VIN | -0.3 | 6.0 | V | |
| Operating Temperature | Top | -20 | 70 | °C | |
| Storage Temperature | Tst | -30 | 80 | °C | |
| Relative Humidity 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 ³ | Ta>70°C |

Table 4.1 Absolute Maximum Ratings

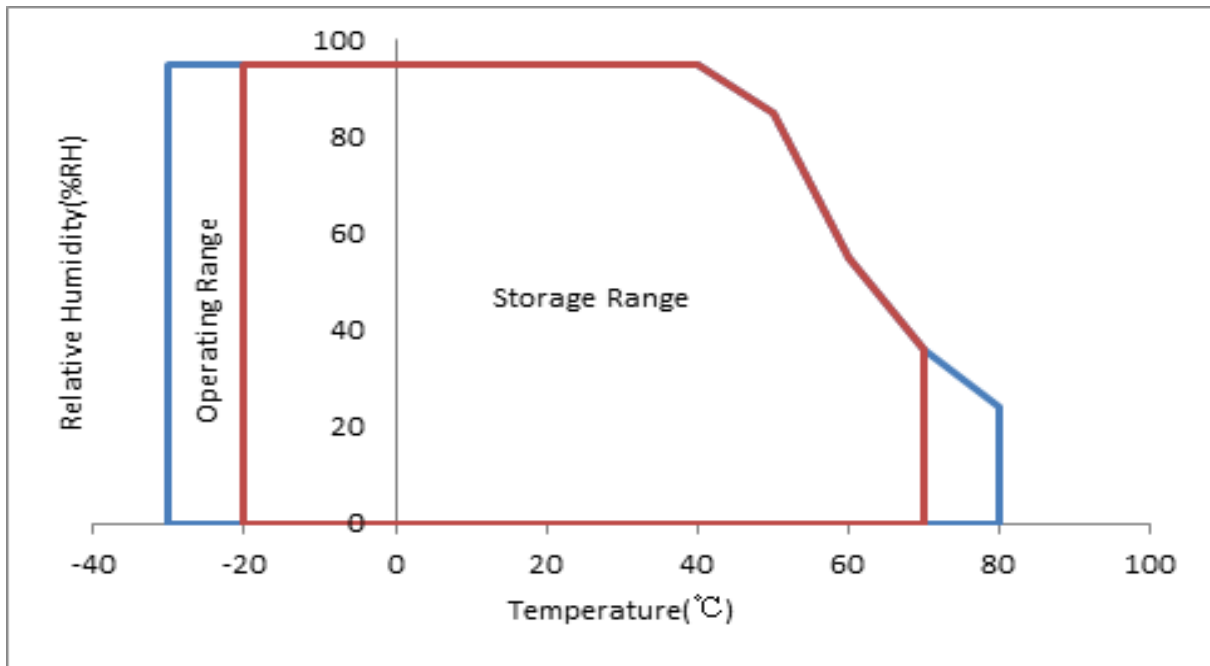


Table 4.2 Absolute Maximum Ratings chart

Note1: Input voltage include all input data(R[0:7],G[0:7],B[0:7],DCLK,DE,HS,VS,RESET,L/R,U/D).

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.

Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|----------------------|------------|-----|---------|-----|---------|----------------|
| Supply Voltage | VCC | 3.2 | 3.3 | 3.4 | V | without ripple |
| Input Signal Voltage | Low Level | VIL | 0 | -- | 0.3×VCC | V |
| | High Level | VIH | 0.7×VCC | -- | VCC | V |
| VDD current | 60Hz | I | -- | TBD | -- | mA |
| Power Consumption | | P | -- | TBD | -- | |
| | | | | | | White pattern |

Table 5.1.1 Operating Voltages

Note1: Input voltage include R[0:7],G[0:7],B[0:7],DCLK,DE,HS,VS,RESET,L/R,U/D.

5.2 DC Characteristics for Backlight Driving

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------------------|--------|-------|-------|-----|------|--------|
| Forward Current | IF | -- | 60 | -- | mA | |
| Forward Current Voltage | VF | -- | 18 | -- | V | |
| Backlight Power Consumption | WBL | -- | 1080 | -- | mW | |
| LED life time | -- | 30000 | 50000 | -- | Hrs | |

Table 5.2.1 LED Backlight Characteristics

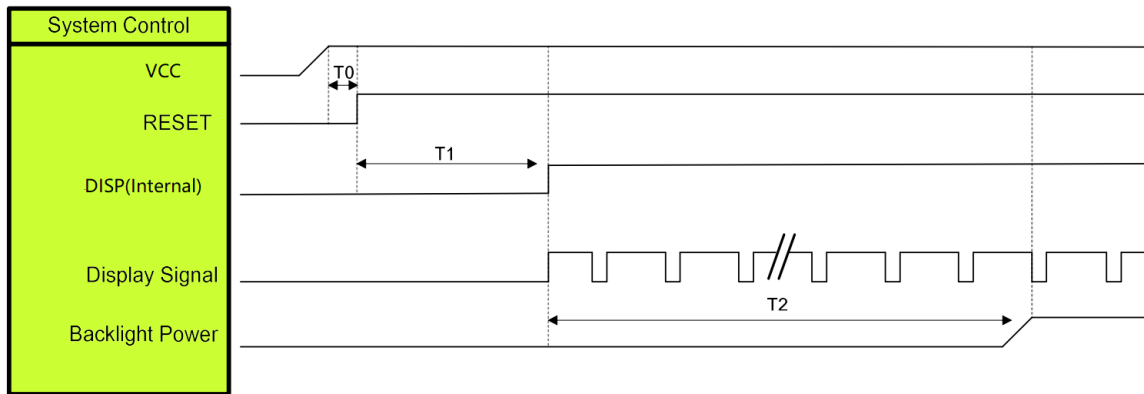
Note1: I_F is defined for total channel.

Note2: Optical performance should be evaluated at $T_a=25^\circ\text{C}$ only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data.

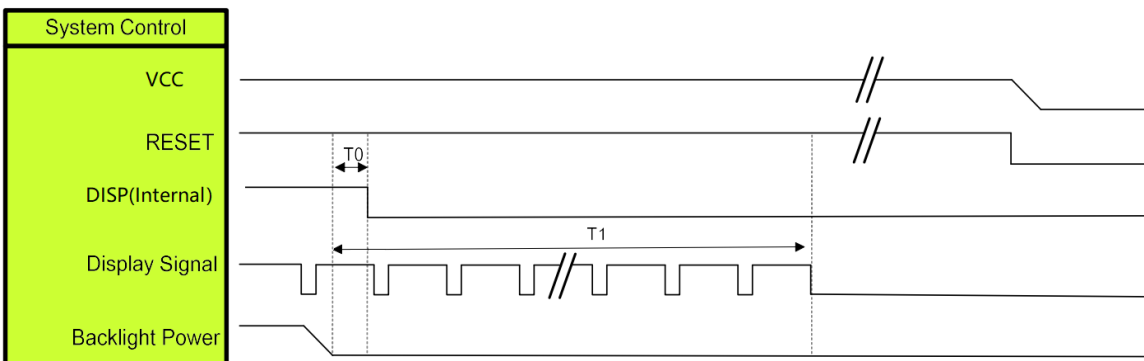
5.3 Recommended Power ON/OFF Sequence



| Symbol | Description | Min. Time | Unit |
|--------|---|-----------|------|
| T0 | System power stability to GRB RESET signal | 0 | ms |
| T1 | GRB RESET= "High" to DISP="High" | 10 | ms |
| T2 | Display Signal output to Backlight Power on | 250 | ms |

Note1: Display signal: R[0:7],G[0:7],B[0:7],DCLK,DE,HS,VS.

Figure 5.3.1 Power on sequence



| Symbol | Description | Min. Time | Unit |
|--------|--|-----------|------|
| T0 | Backlight Power off to DISP="Low" | 5 | ms |
| T1 | DISP="Low" to IC internal voltage discharge complete | 80 | ms |

Figure 5.3.2 Power on/off sequence

Note1: Display signal: R[0:7],G[0:7],B[0:7],DCLK,DE,HS,VS.

5.4 LCD Module Block Diagram

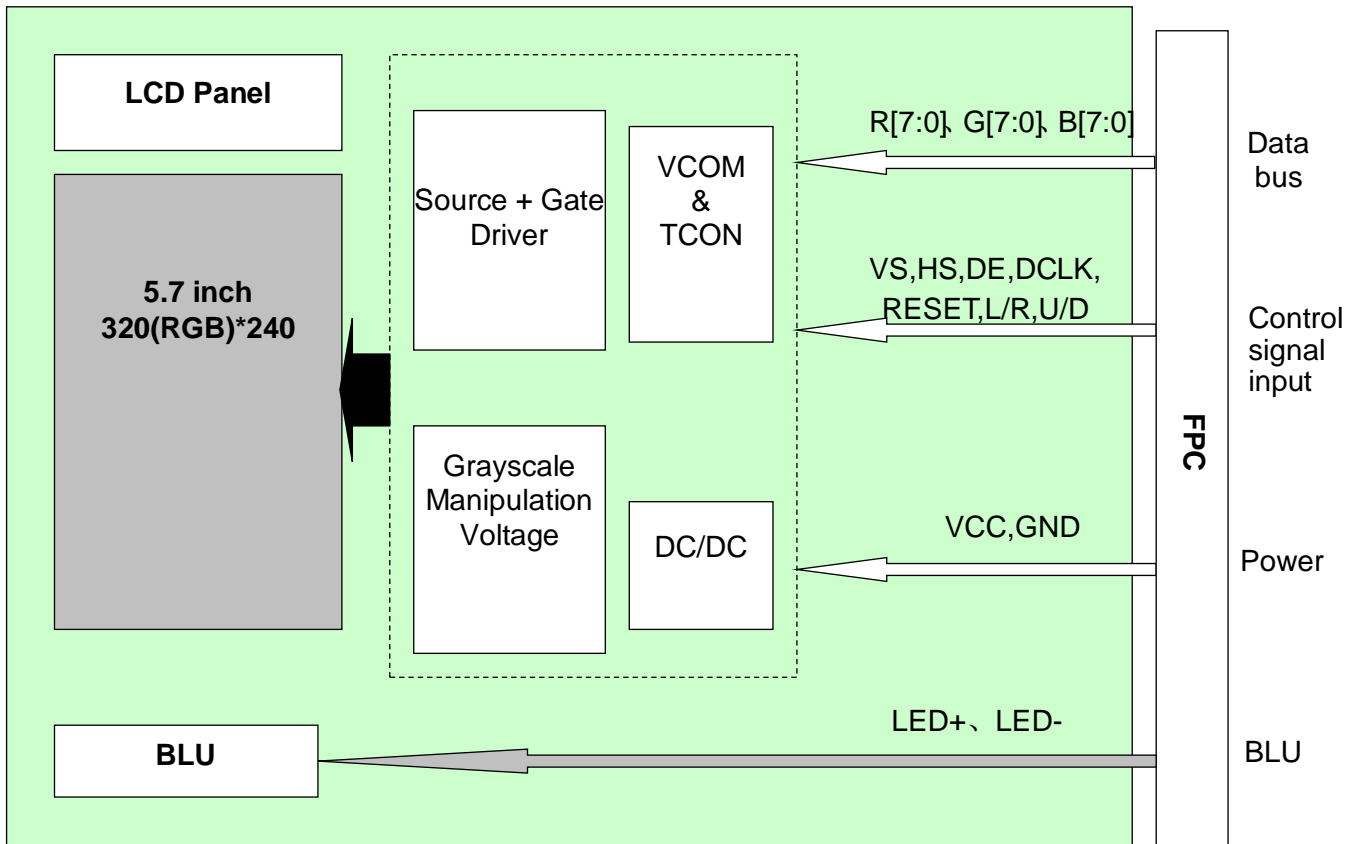


Figure 5.4 LCD Module Block Diagram

6. Timing Characteristics

6.1 AC characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|-----------------|------------|-----|-----|-----|------|--------|
| DCLK Pulse Duty | T_{clk} | 40 | 50 | 60 | % | |
| HS Width | T_{hw} | 2 | | | DCLK | |
| VS Setup Time | T_{vst} | 12 | - | - | ns | |
| VS Hold Time | T_{vhd} | 12 | - | - | ns | |
| HS Setup Time | T_{hst} | 12 | - | - | ns | |
| HS Hold Time | T_{hhd} | 12 | - | - | ns | |
| Data Setup Time | T_{dsu} | 12 | - | - | ns | |
| Data Hold Time | T_{dhd} | 12 | - | - | ns | |
| DE Setup Time | T_{dest} | 12 | - | - | ns | |
| DE Hold Time | T_{dehd} | 12 | - | - | ns | |

Table 6.1 Input Setup Timing Parameters Requirement

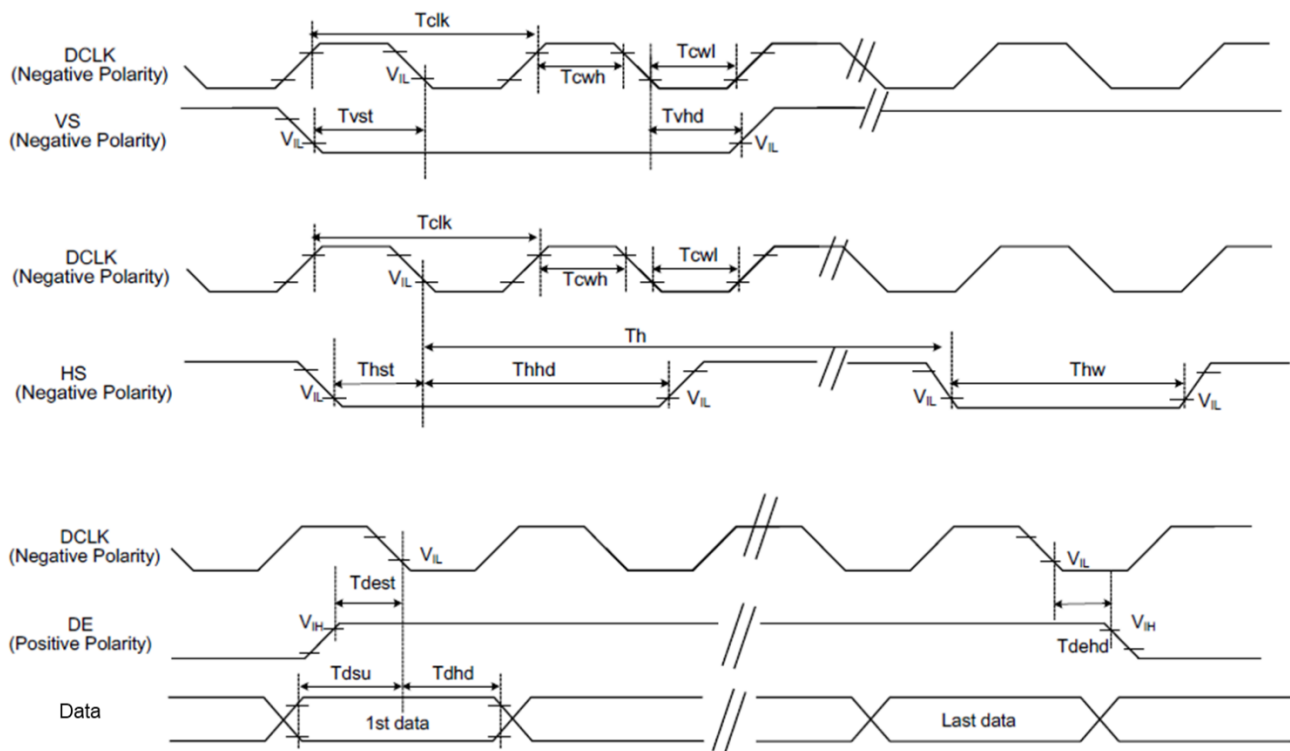


Figure 6.1 Clock and Data Input Timing Diagram

6.2 Data Input Timing Parameter Setting

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|-------------------|--------|-----|-----|-----|-------|--------|
| DCLK frequency | Fclk | 5 | 6 | 8 | MHz | |
| DCLK Period | Tclk | 125 | 167 | 200 | ns | |
| HS Period Time | Th | 325 | 371 | 438 | DCLK | |
| HS Display Period | Thdisp | 320 | 320 | 320 | DCLK | |
| HS Back Porch | Thbp | 3 | 43 | 43 | DCLK | |
| HS Front Porch | Thfp | 2 | 8 | 75 | DCLK | |
| HS Pulse Width | Thw | 2 | 4 | 43 | DCLK | |
| VS Period Time | Tv | 244 | 260 | 289 | HSYNC | |
| VS Display Period | Tvdisp | 240 | 240 | 240 | HSYNC | |
| VS Back Porch | Tvbp | 2 | 12 | 12 | HSYNC | |
| VS Front Porch | Tvfp | 2 | 8 | 37 | HSYNC | |
| VS Pulse Width | Tvw | 2 | 4 | 12 | HSYNC | |
| Frame Rate | F | -- | 60 | -- | Hz | |

Table 6.2 Data Input Timing Parameters

6.3 Timing Diagram

| RGB Mode Selection Table | DCLK | HSYNC | VSYNC | DE |
|--------------------------|-------|-------|-------|-------|
| SYNC – DE Mode | Input | Input | Input | Input |
| SYNC Mode | Input | Input | Input | GND |
| DE Mode | Input | GND | GND | Input |

6.3.1 Parallel RGB SYNC Mode

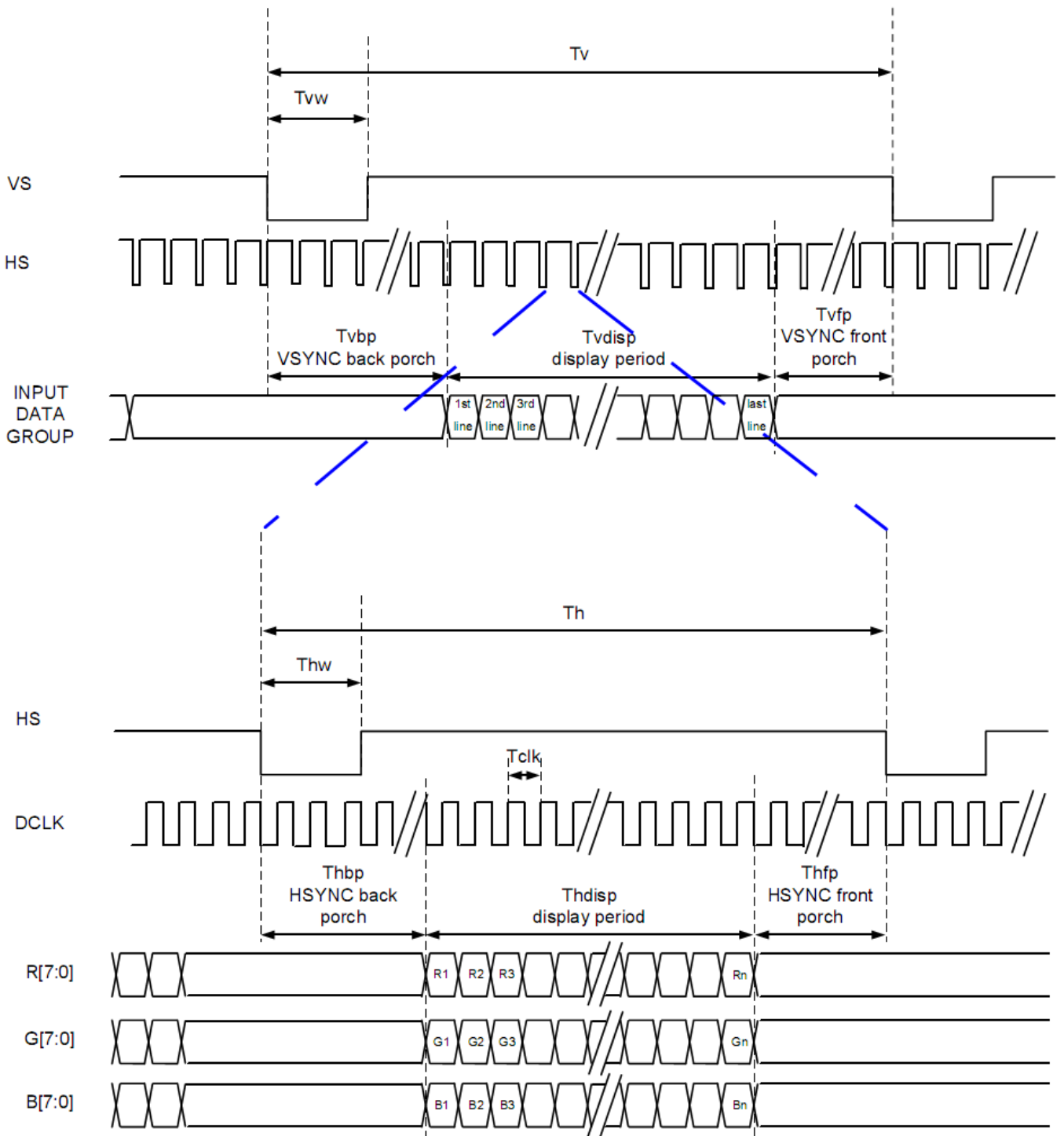


Figure 6.3.1 SYNC Mode

6.3.2 Parallel RGB SYNC-DE Mode

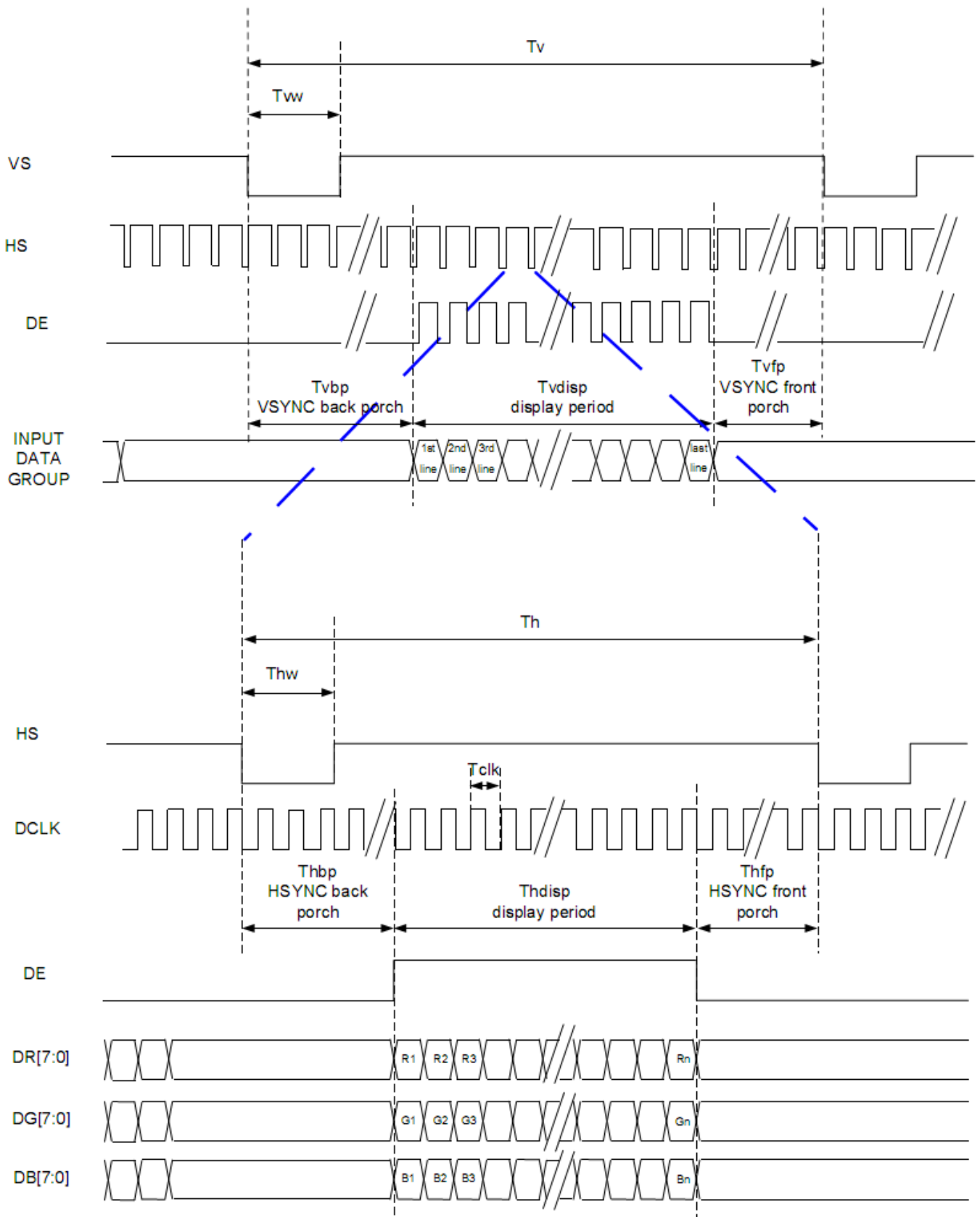


Figure 6.3.2 SYNC-DE Mode

6.3.3 Parallel RGB DE Mode

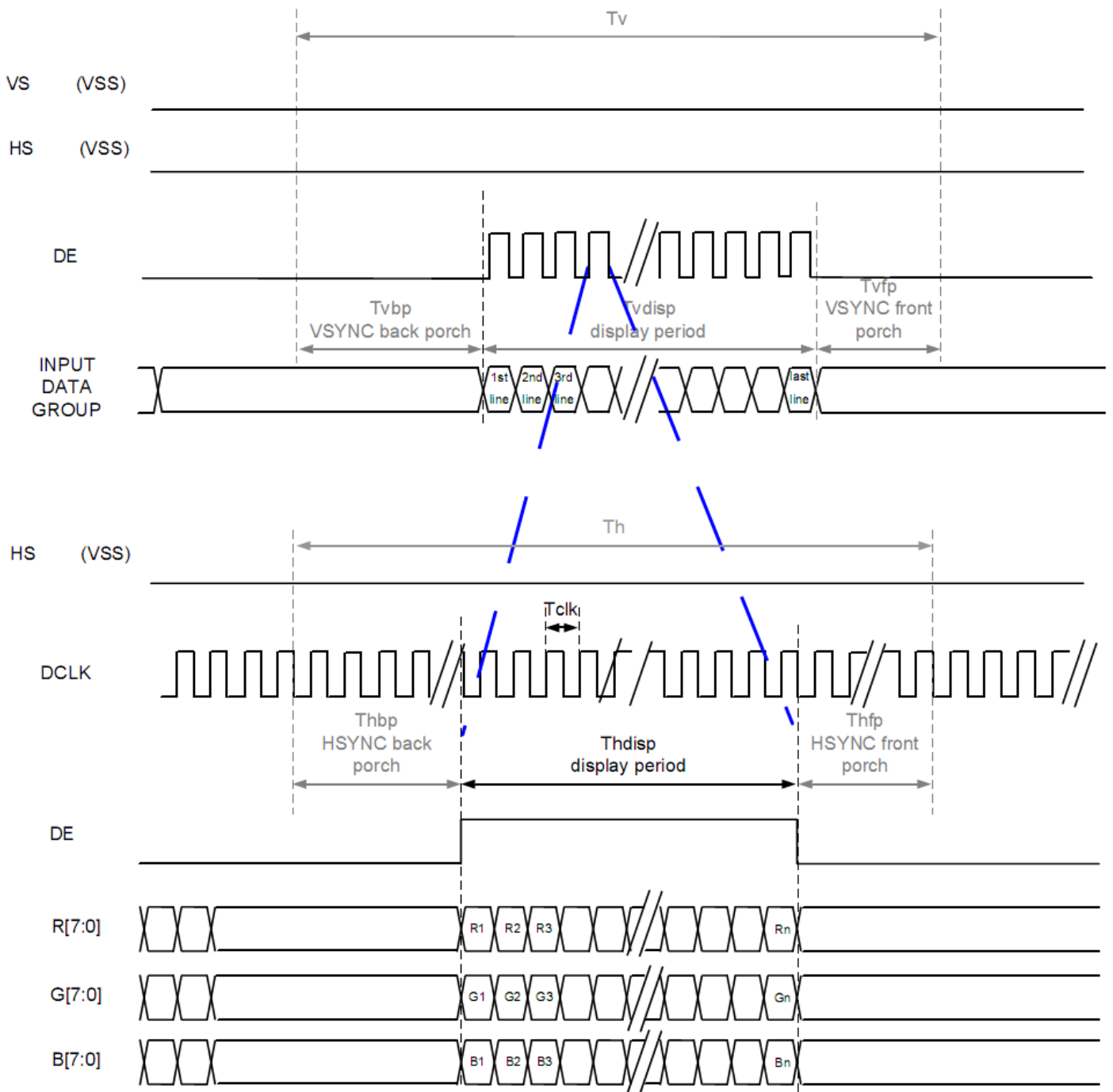


Figure 6.3.2 DE Mode

7. Optical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark | | |
|--------------------------|------------|------------------|-----|------|-------|-------------------|----------------|---|-------|
| View Angles | θT | $CR \geq 10$ | 80 | 85 | - | Degree | Note 2 | | |
| | θB | | 80 | 85 | - | | | | |
| | θL | | 80 | 85 | - | | | | |
| | θR | | 80 | 85 | - | | | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 700 | 1000 | - | | Note1 Note3 | | |
| Response Time | T_{ON} | 25°C | - | 35 | 45 | ms | Note1 Note4 | | |
| | T_{OFF} | | | | | | | | |
| Chromaticity | White | Backlight is on | | | 0.313 | | Note1 Note5 | | |
| | | | | | | | | y | 0.329 |
| | Red | | | | | | | x | TBD |
| | | | | | | | | y | TBD |
| | Green | | | | | | | x | TBD |
| | | | | | | | | y | TBD |
| | Blue | | | | | | | x | TBD |
| | | | | | | | | y | TBD |
| Uniformity | U | | 75 | 80 | - | % | Note1 Note6 | | |
| NTSC | N | | 60 | 65 | - | % | Note 5 | | |
| Luminance (Without TP) | L | | 400 | 500 | - | cd/m ² | Note1 Note7 | | |

Table 7.1 Optical Parameters

Test Conditions:

1. $I_F= 180$ mA, and the ambient temperature is 25°C.
2. The test systems refer to Note1 and Note2.

Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

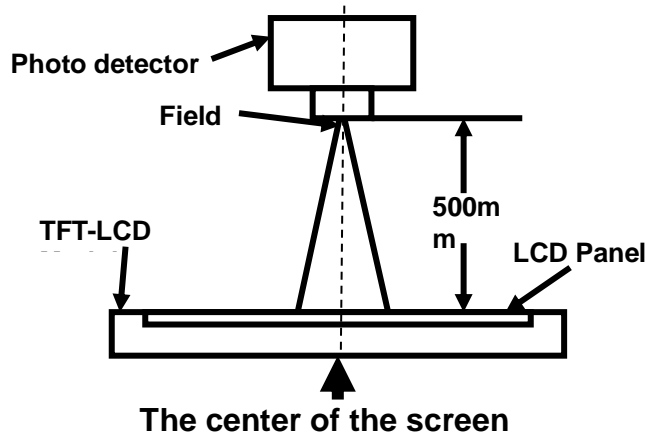


Fig1. Measurement Set Up

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD .

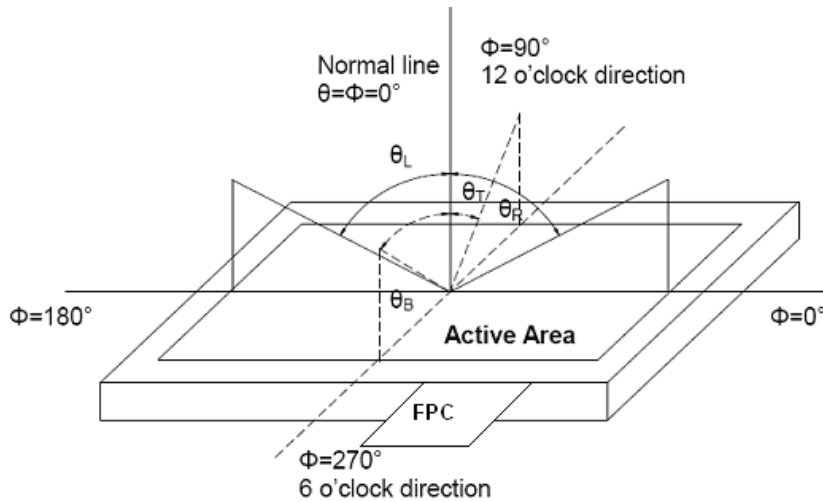


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

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

Note4: Definition of Response time

For SFT LCM, the response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_r) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.

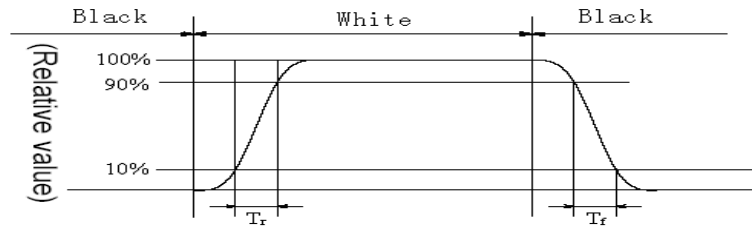


Fig3. Response Time Testing(SFT)

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = \text{Lmin} / \text{Lmax}$$

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

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

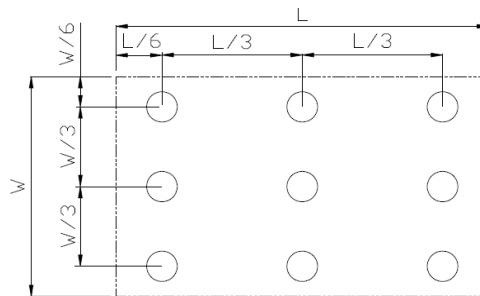


Fig4. Luminance Uniformity Measurement Locations(9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

| No | Test Item | Condition | Remarks |
|----|---|---|---|
| 1 | High Temperature Operation | +70°C , 240H | IEC60068-2-1:2007 GB2423.2-2008 |
| 2 | Low Temperature Operation | -20°C , 240H | IEC60068-2-1:2007 GB2423.1-2008 |
| 3 | High Temperature Storage | +80°C , 240H | IEC60068-2-1:2007 GB2423.2-2008 |
| 4 | Low Temperature Storage | -30°C , 240H | IEC60068-2-1:2007 GB2423.1-2008 |
| 5 | Storage at High Temperature and Humidity(non-operation) | +60°C , 90%RH , 240H | IEC60068-2-78 :2001 GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -30°C , 30min~80°C , 30min , change time : 5min , 100cycle | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002 |
| 7 | ESD | C=150pF , R=330Ω , 5point/panel Air : ±15kv , 5times ; Contact : ±8kv , 5times ; (Environment : 15°C~35°C , 30%~60% , 86Kpa~106Kpa) | IEC61000-4-2:2001 GB/T17626.2-2006 |
| 8 | Vibration Test (non-operation) | Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) | GB/T 2423.10-2008 ; GB/T 2423.56-2006 |
| 9 | Shock Test | Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction | GB/T 2423.5-1995 |
| 10 | Package Vibration | 5-20-200HZ , PSD : 0.01-0.01-0.001 Total:0.781g ² /HZ, x/y/z 30min) | GB/T 4857.5-1992 |
| 11 | Package Drop Test | Height: 60 cm,1 corner, 3edges, 6 surfaces | IEC60068-2-32:1990 GB/T2423.8—1995 |

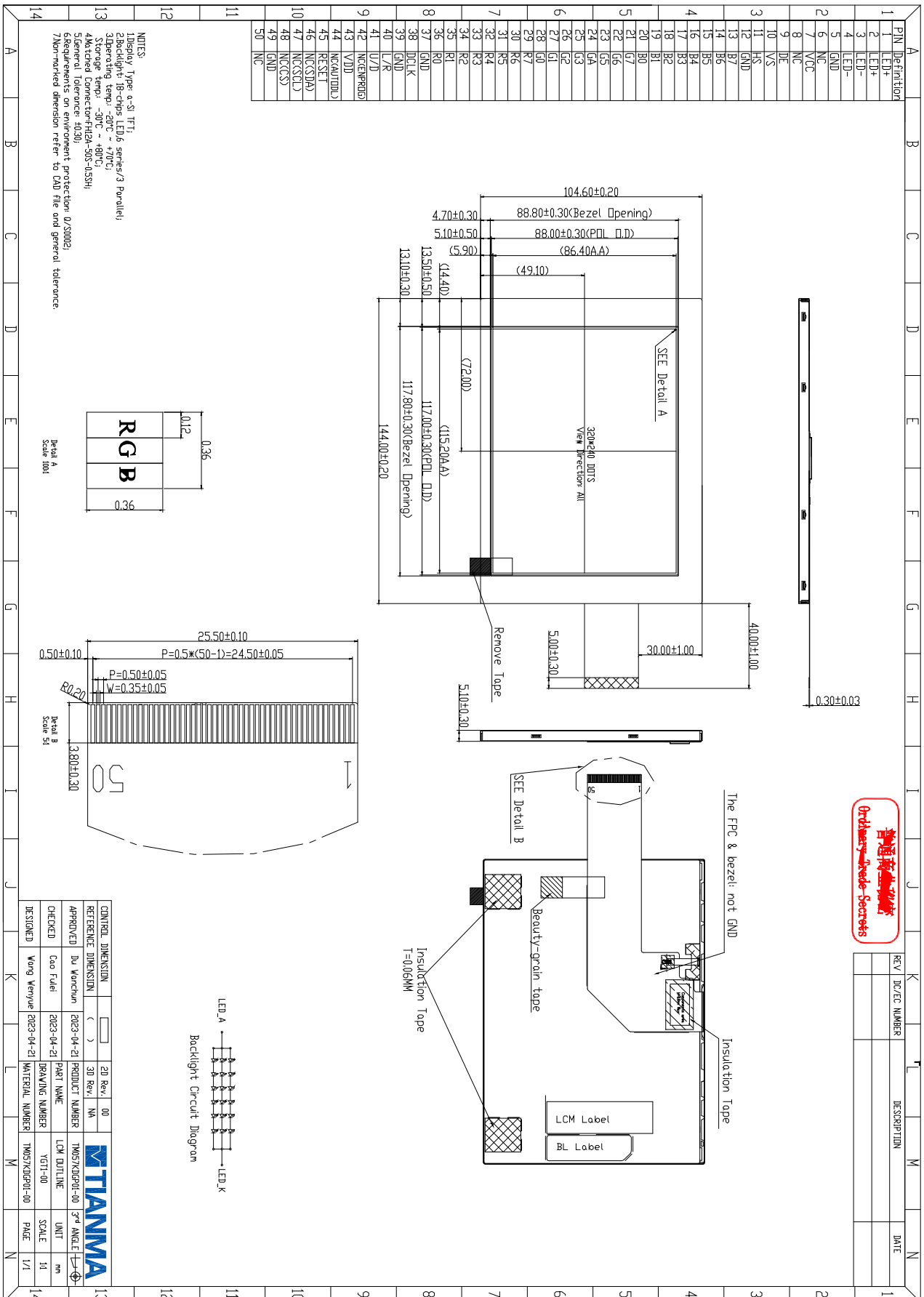
Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

9. Mechanical Drawing



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10. Packing Instruction

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark |
|----|----------------|------------------|--------------------|-----------------|----------|--------|
| 1 | LCM | P0567VQF1ME00 | 144.00x104.60x5.10 | TBD | TBD | |
| 2 | Tray | | | | | |
| 3 | Dust-Proof Bag | | | | | |
| 4 | Box | | | | | |
| 5 | Carton | | | | | |
| 6 | Plastic Board | | | | | |
| 7 | Total weight | TBD | | | | |

Note1:

11. Precautions for Use of LCD Modules

11.1 Handling Precautions

- (1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
- (2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcoholSolvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- (6) Do not disassemble the LCD Module.
- (7) If powered off, do not apply the input signals.
- (8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
- (9) Be sure to ground your body when handling the LCD Modules.
- (10) Tools used for assembly, must be properly grounded.
- (11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
- (12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

11.2 Storage precautions

- (1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is:
Temperature: 0 ~ 35 °C at normal humidity.
- (3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

11.5 Safety Precautions

- (1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
- (2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- (3) LED driver should be designed to limit or stop its function when over current is detected on the LED.