



PHOENIX DISPLAY INTERNATIONAL, INC.

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SPECIFICATION FOR LCD MODULE

| | |
|--------------------|-----------------------|
| CUSTOMER | |
| PART NUMBER | PDI104SVTM-01 |
| DESCRIPTION | 10.4" 800 (RGB) x 600 |
| VERSION | V1.0 |
| ISSUE DATE | 10-Jul-17 |

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1 General Specifications

| | Feature | Spec |
|-----------------------------------|---------------------------------|------------------------|
| Display Spec. | Size | 10.4 inch |
| | Resolution | 800(RGB) x 600 |
| | Interface | LVDS 6 bits |
| | Color Depth | 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) | 236.00x176.90x5.60 |
| | Active Area(mm) | 211.20x158.40 |
| | With /Without TSP | Without TSP |
| | Weight (g) | 288 |

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 TFT LCD Panel

Matching connector of Hirose DF19K-20P-1H (56)

| No | Symbol | I/O | Description | Comment |
|----|--------|-----|---|---------|
| 1 | VDD | P | Power Supply | |
| 2 | VDD | P | Power Supply | |
| 3 | GND | P | Ground | |
| 4 | GND | P | Ground | |
| 5 | IN0- | I | LVDS receiver negative signal channel 0 | |
| 6 | IN0+ | I | LVDS receiver positive signal channel 0 | |
| 7 | GND | P | Ground | |
| 8 | IN1- | I | LVDS receiver negative signal channel 1 | |
| 9 | IN1+ | I | LVDS receiver positive signal channel 1 | |
| 10 | GND | P | Ground | |
| 11 | IN2- | I | LVDS receiver negative signal channel 2 | |
| 12 | IN2+ | I | LVDS receiver positive signal channel 2 | |
| 13 | GND | P | Ground | |
| 14 | CLK- | I | LVDS receiver negative signal clock | |
| 15 | CLK+ | I | LVDS receiver positive signal clock | |
| 16 | GND | P | Ground | |
| 17 | NC | - | No connection | |
| 18 | NC | - | No connection | |
| 19 | GND | P | Ground | |
| 20 | GND | P | Ground | |

Note: I/O definition:

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

2.2 CN2(BackLight Connector)

| No | Symbol | I/O | Description | Wire Color |
|----|--------|-----|-----------------------------------|------------|
| 1 | LEDA | P | LED driving anode (high voltage) | Red |
| 2 | LEDK | P | LED driving cathode (low voltage) | White |

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25°C

| Item | Symbol | Min | Max | Unit | Remark |
|-----------------------|------------------|------|-----|------|--------|
| Power Voltage | VDD | -0.3 | 5.0 | V | |
| Input voltage | V _{IN} | -0.3 | 5.0 | V | Note1 |
| Operating Temperature | T _{OPR} | -20 | 70 | °C | |
| Storage Temperature | T _{STG} | -30 | 80 | °C | |

Note1: V_{IN} represent IN0±, IN1±, IN2±, CLK±

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|--|---------------------|---------------------|------|----------------------------|------|---------------------------|
| 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 | |
| Input current | I _{IN} | -10 | - | 10 | μA | |
| Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| Common Electrode Driving Signal | VCOM | - | 4.36 | - | V | Note1 |
| Sync Frequency | FVD | - | 60 | 70 | Hz | |
| VDD Power Consumption | I _{DD} | - | 260 | 380 | mA | Note2 |

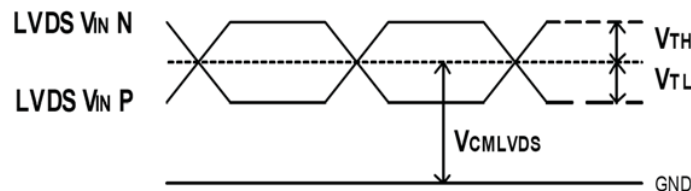


Figure 4.1.1 LVDS DC timing diagram

Note1: The value may be different for different LCM.

Note2: To test the current dissipation, using the “color bar” testing pattern shown as below:

1. White
2. Yellow
3. Cyan
4. Green
5. Magenta
6. Red
7. Blue
8. Black

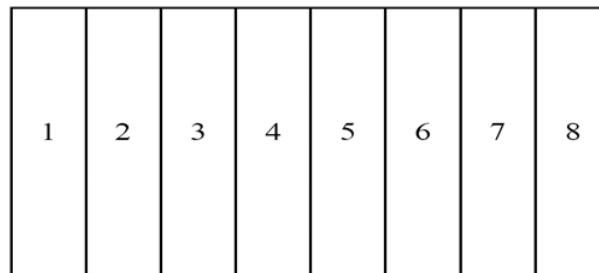


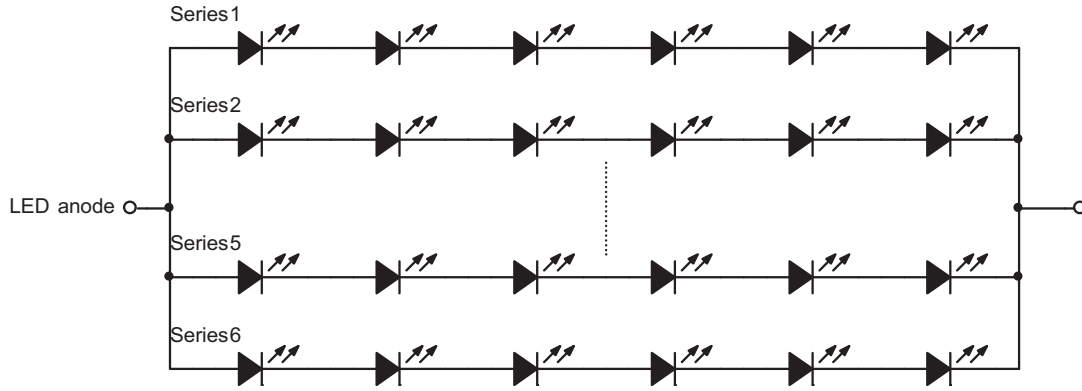
Figure 4.1.2 Current dissipation testing pattern

4.2 Driving Backlight

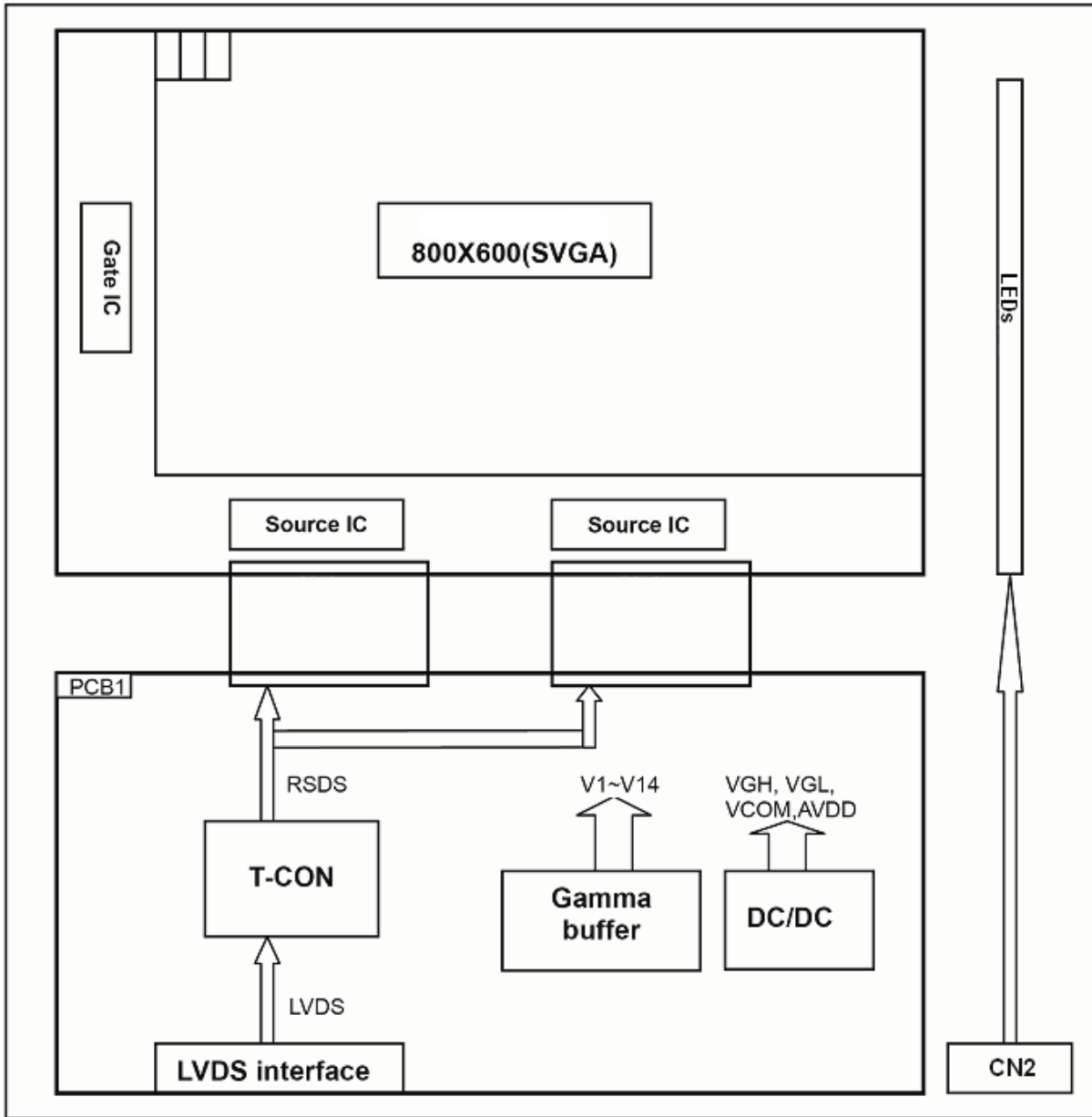
Ta=25°C

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-----------------------------|--------|-----|-------|-----|------|--------|
| Forward Current | I_F | - | 120.0 | - | mA | Note 1 |
| Forward Current Voltage | V_F | - | 19.2 | - | V | Note 1 |
| Backlight Power Consumption | WBL | - | 2304 | - | mW | Note 1 |

Note 1: The figure below shows the connection of backlight LED.



4.3 Block Diagram

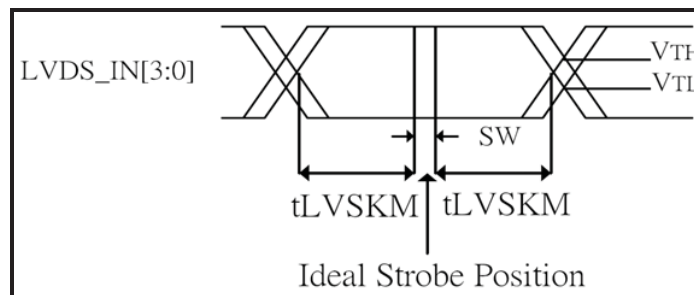
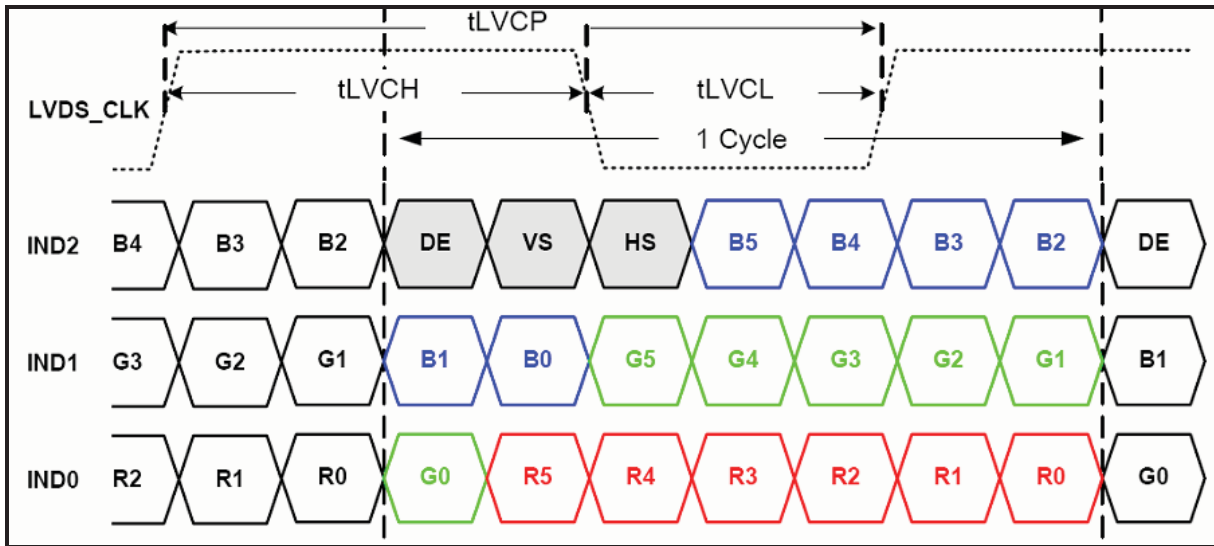
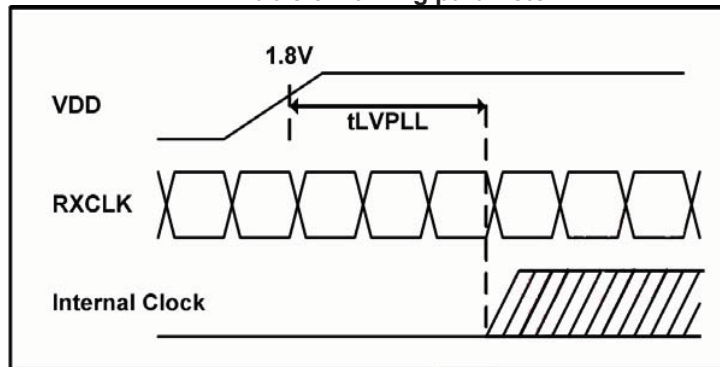


5 Timing Chart

5.1 Timing Parameter

| 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



5.2 Power On/Off Sequence

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---------------------------------|--------|-----|-----|-----|------|--------|
| VDD 3.0V to signal starting | Tp1 | 0 | - | 50 | ms | |
| Signal starting to backlight on | Tp2 | 150 | - | - | ms | |
| Signal off to VDD 3.0V | Tp3 | 0 | - | 50 | ms | |
| Backlight off to signal off | Tp4 | 150 | - | - | ms | |

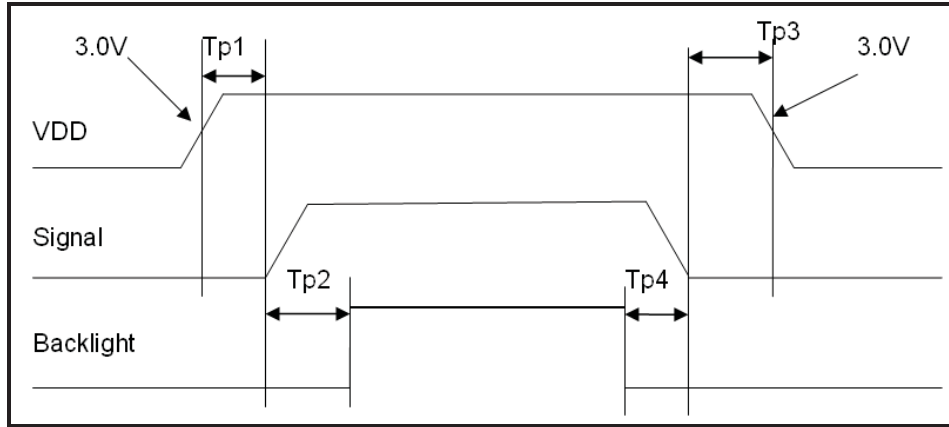


Figure 5.2 Interface power on/off sequenc

6 Optical Characteristics

6.1 Optical Specification

Ta=25°C

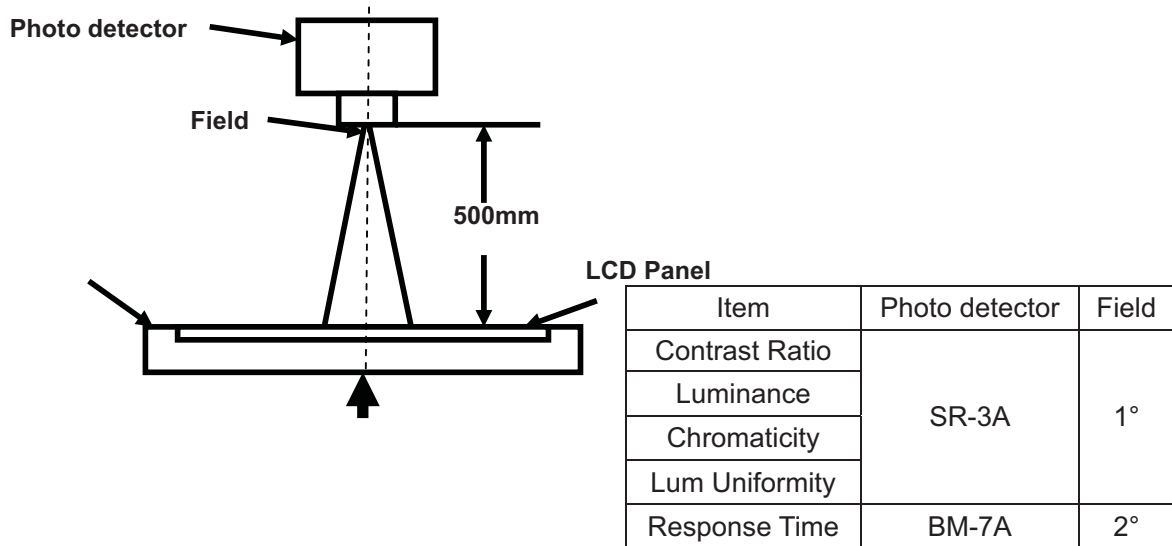
| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark | |
|----------------|------------------|------------------|-----|-------|-------|-------------------|----------------|----------------|
| View Angles | θT | $CR \geq 10$ | 35 | 45 | - | Degree | Note 2 | |
| | θB | | 55 | 65 | - | | | |
| | θL | | 55 | 65 | - | | | |
| | θR | | 55 | 65 | - | | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 300 | 400 | - | - | Note1 Note3 | |
| Response Time | T _{ON} | 25°C | - | 10 | 15 | ms | Note1 Note4 | |
| | T _{OFF} | | - | 15 | 25 | | | |
| Chromaticity | White | Backlight is on | x | 0.259 | 0.309 | 0.359 | - | Note5 Note1 |
| | | | y | 0.284 | 0.334 | 0.384 | | |
| | Red | | x | 0.550 | 0.600 | 0.650 | | |
| | | | y | 0.296 | 0.346 | 0.396 | | |
| | Green | | x | 0.283 | 0.333 | 0.383 | | |
| | | | y | 0.516 | 0.566 | 0.616 | | |
| | Blue | | x | 0.092 | 0.142 | 0.192 | | |
| | | | y | 0.065 | 0.115 | 0.165 | | |
| Uniformity | U | - | 70 | 80 | - | % | Note1 Note6 | |
| NTSC | - | - | - | 50 | - | % | Note 5 | |
| Luminance | L | | 350 | 400 | - | cd/m ² | Note1 Note7 | |

Test Conditions:

1. The ambient temperature is 25±2°C .humidity is 65±7%
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

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



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).

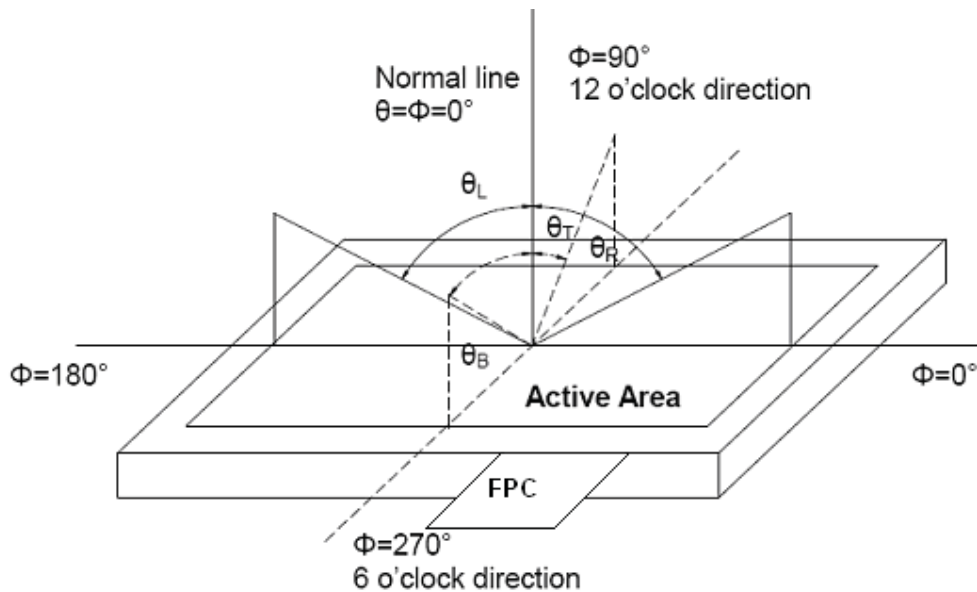


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

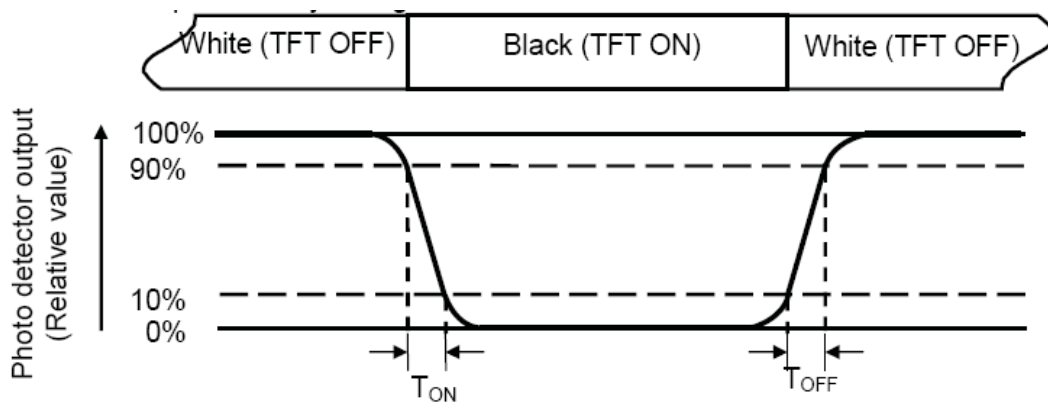
“White state “:The state is that the LCD should driven by V_{white} .

“Black state”: The state is that the LCD should 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%.

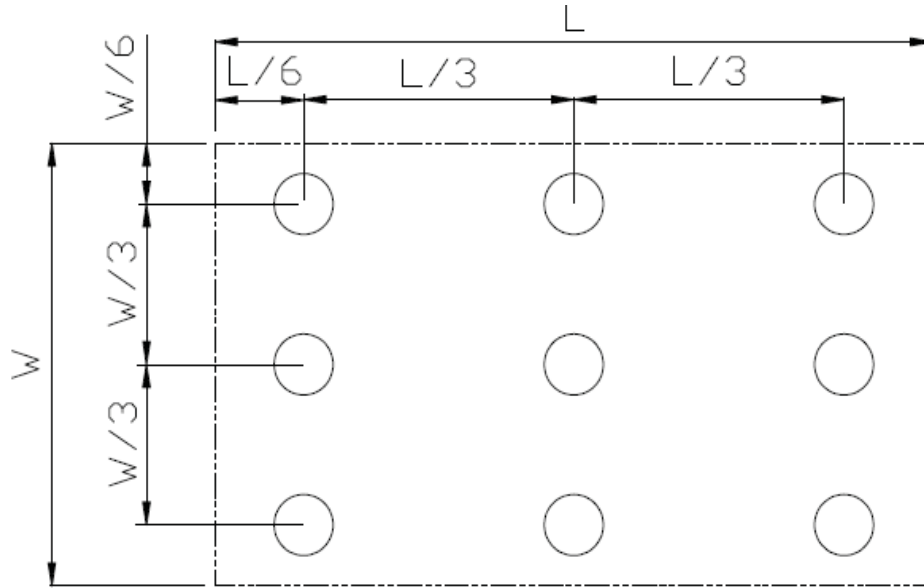


Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

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

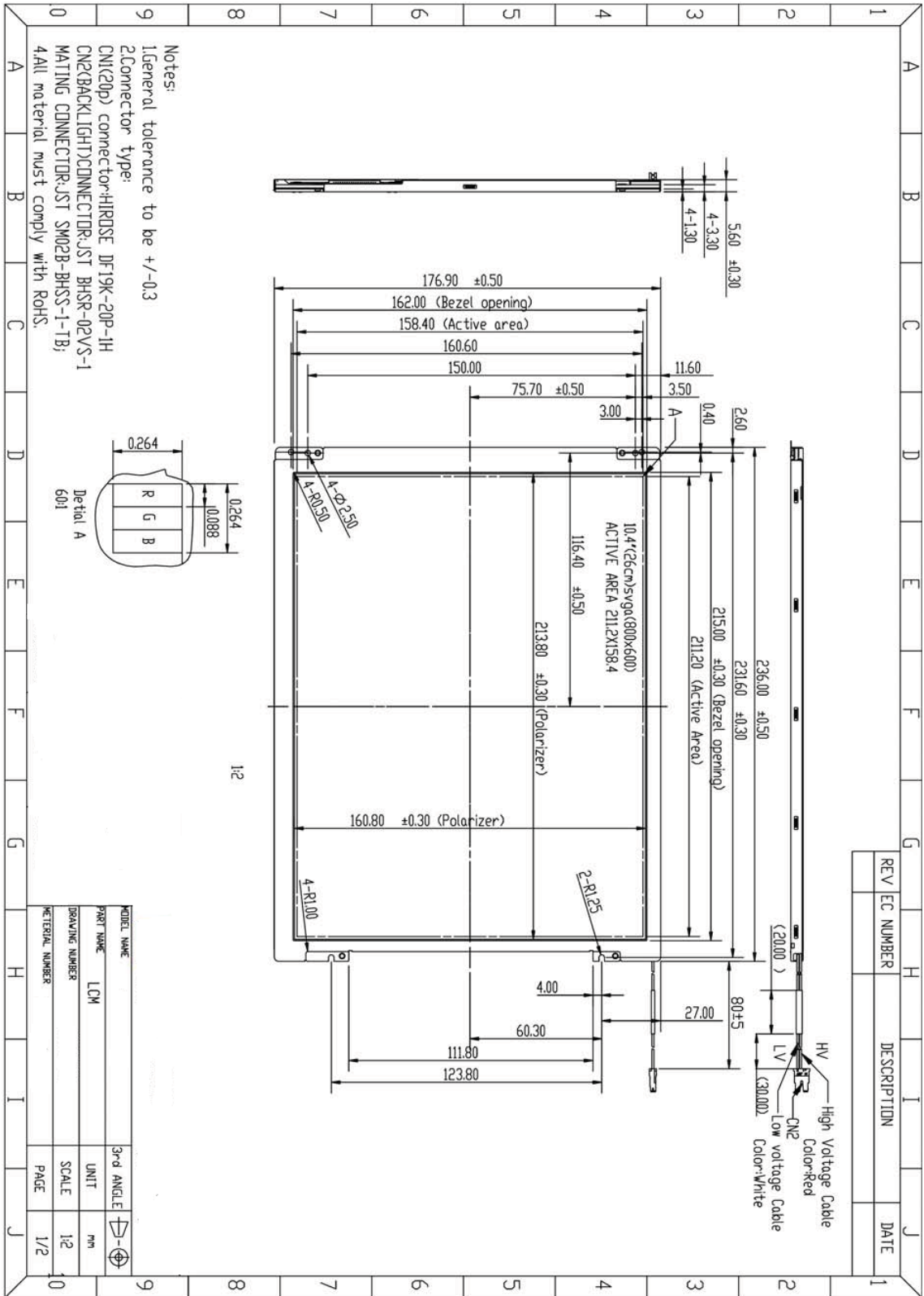
L-----Active area length W----- Active area width

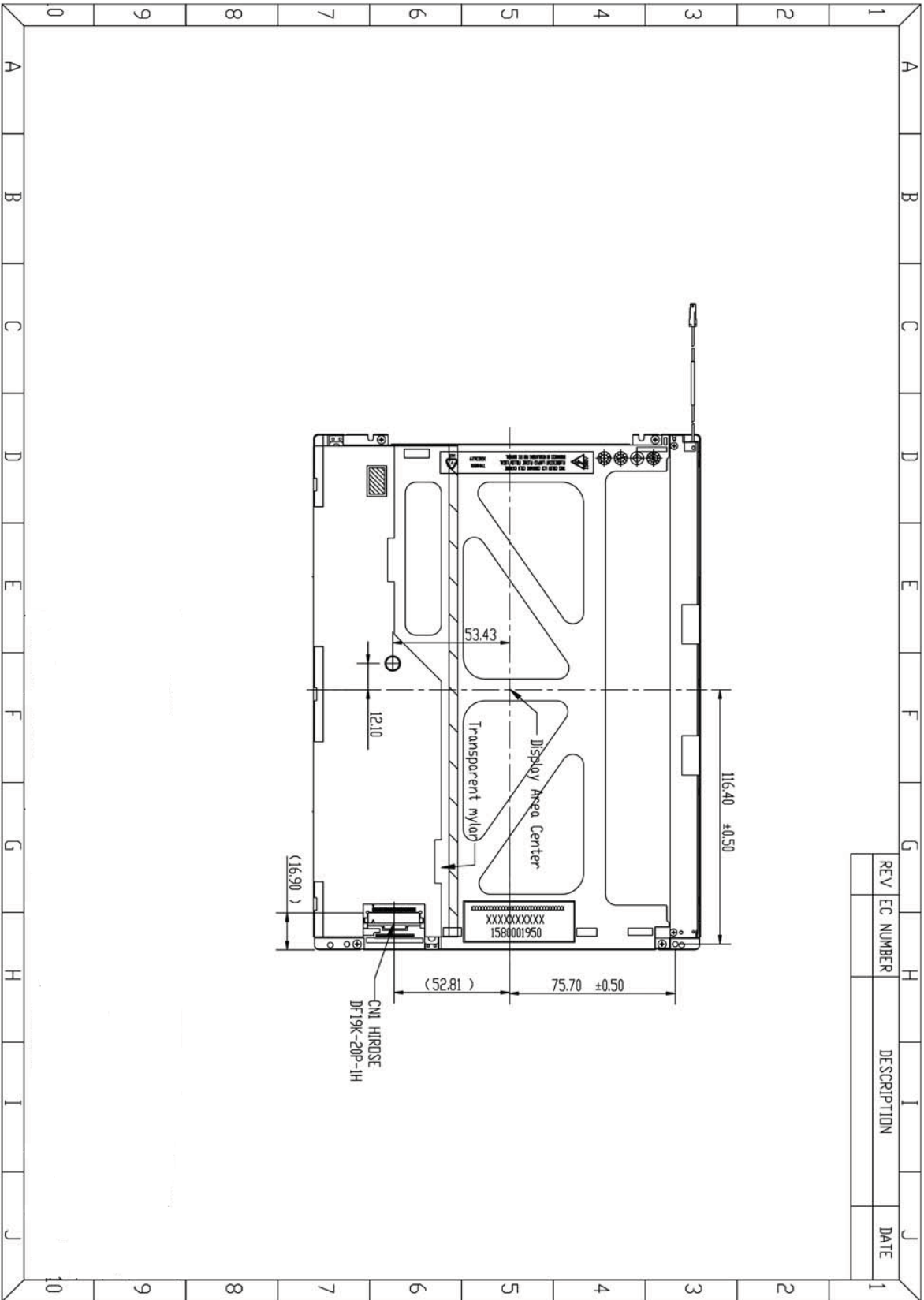


7 Environmental / Reliability Test

| No | Test Item | Condition | Remark |
|----|--|--|--|
| 1 | High Temperature Operation | Ts=+70°C, 240hrs | Note1 IEC60068-2-2,GB2423.2—89 |
| 2 | Low Temperature Operation | Ta=-20°C, 240hrs | IEC60068-2-1 GB2423.1—89 |
| 3 | High Temperature Storage (non-operation) | Ta=+80°C, 240hrs | IEC60068-2-2, GB2423.2—89 |
| 4 | Low Temperature Storage (non-operation) | Ta=-30°C, 240hrs | IEC60068-2-1 GB2423.1—89 |
| 5 | High Temperature & High Humidity Operation | Ta = +60°C, 90% RH max,240 hours | Note2 IEC60068-2-3, GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -20°C 30 min~+70°C 30 min, Change time:5min, 100 Cycles | Start with cold temperature, end with high temperature IEC60068-2-14,GB2423.22—87 |
| 7 | Electro Static Discharge (operation) | C=150pF,R=330Ω, Air:±15Kv, Contact:±8Kv, 10times/terminal | IEC61000-4-2 GB/T17626.2—1998 |
| 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—1995 |
| 9 | Shock (non-operation) | 80G 6ms, ±X,±Y,±Z 3 times for each direction | IEC60068-2-27 GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:80 cm,1 corner, 3 edges, 6 surfaces | IEC60068-2-32 GB/2423.8—1995 |
| 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 |

8 Mechanical Drawing





| REV | EC NUMBER | DESCRIPTION | DATE |
|-----|-----------|-------------|------|
| 1 | | | |

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 alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 10.1.6 Do not attempt to disassemble the LCD Module.
- 10.1.7 If the logic circuit power is off, do not apply the input signals.
- 10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 10.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage Precautions

- 10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:
Temperature : 0°C ~ 40°C Relatively humidity: ≤80%
- 10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

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