深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

# LMT080DIEFWU-NNA

LCD Module User Manual

| Prepared by: | Checked by: | Approved by: |
|---|---|---|
| **Linli** | | |
| Date: 2017-08-17 | Date: | Date: |

| Rev. | Descriptions | Release Date |
|---|---|---|
| 0.1 | Preliminary release | 2012-04-28 |
| 0.2 | Update TFT parameters | 2012-05-03 |
| 0.3 | Typing correction | 2016-4-5 |
| 0.4 | Update TFT parameters | 2017-08-17 |
| 0.5 | Update section 1 | 2018-10-18 |

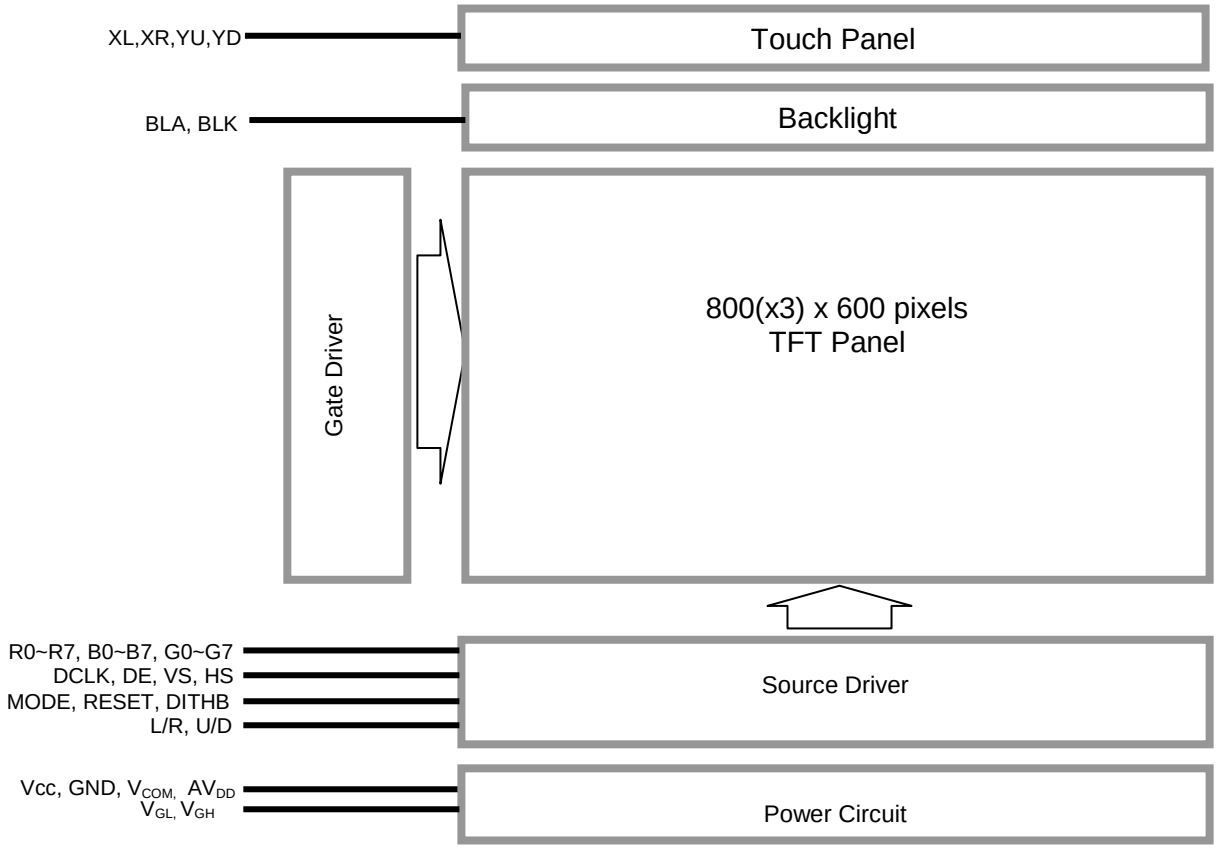
# Table of Content

# 1. General Specification

| | |
|---|---|
| Signal Interface : | Digital 24-bits RGB |
| Display Technology : | a-Si TFT active matrix |
| Display Mode : | Transmissive / Normal White |
| Screen Size(Diagonal) : | 8.0” |
| Outline Dimension : | 183.0 x 141.0 x 7.1 (mm)<br>(see attached drawing for details) |
| Active Area : | 162.0 x 121.5 (mm) |
| Number of dots : | 800 x 3 (RGB) x 600 |
| Pixel Pitch : | 0.2025 x 0.2025 (mm) |
| Pixel Configuration : | RGB Stripe |
| Backlight : | LEDs |
| Touch Panel type: | 4 wire Resistive |
| Surface Treatment : | Anti-Glare Treatment |
| Viewing Direction : | 6 o’clock(Gray scale Invesion)（*1）<br>12 o’clock (*2) |
| Operating Temperature : | -20 ~ +70°C |
| Storage Temperature : | -30 ~ +80°C |

Note:
*1. For saturated color display content (eg. pure-red, pure-green, pure-blue or pure-colors -combinations).
*2. For “color scales” display content.
*3. Color tone may slightly change by temperature and driving condition.

# 2. Block Diagram



# 3. Terminal Function

## 3.1 K1 TFT Input Terminal

| Pin No. | Pin Name | I/O | Descriptions |
|---|---|---|---|
| 1 | NC | - | No Connection |
| : | | | |
| 4 | | | |
| 5 | GND | Power | Power GND (0V) |
| 6 | $V_{COM}$ | Input | Common voltage |
| 7 | Vcc | Power | Power for Digital Circuit |
| 8 | MODE | Input | DE/SYNC mode select (*1) |
| 9 | DE | Input | Data input enable |
| 10 | VS | Input | Vertical Sync Input |
| 11 | HS | Input | Horizontal Sync Input |
| 12 | B7 | Input | 8bit Data for Blue |
| : | : | | |
| 19 | B0 | | |
| 20 | G7 | Input | 8bit Data for Green |
| : | : | | |
| 27 | G0 | | |
| 28 | R7 | Input | 8bit Data for Red |
| : | : | | |
| 35 | R0 | | |
| 36 | GND | Power | Power GND (0V) |
| 37 | DCLK | Input | Sample clock(*2) |
| 38 | GND | Power | Power GND (0V) |
| 39 | L/R | Input | Left / right selection (*3) |
| 40 | U/D | Input | Up/down selection (*3) |
| 41 | $V_{GH}$ | Power | Gate ON Voltage |
| 42 | $V_{GL}$ | Power | Gate OFF Voltage |
| 43 | $AV_{DD}$ | Power | Power for Analog Circuit |
| 44 | RESET | Input | Global reset pin (*4) |
| 45 | NC | - | No connection |
| 46 | $V_{COM}$ | Input | Common Voltage |
| 47 | DITHB | Input | Dithering function (*5)<br>DITHB=0,Disable internal dithering function.<br>DITHB=1,Enable internal dithering function |
| 48 | GND | Power | Power GND (0V) |
| 49 | NC | - | No connection |
| 50 | NC | | |

Note:

* 1: When select DE mode, MODE="1".
  When select SYNC mode, MODE= "0".
* 2: Data shall be latched at the falling edge of DCLK.
* 3: Selection of scanning mode

| Setting of scan control input | | Scanning direction |
|---|---|---|
| U/D | L/R | |
| 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 |

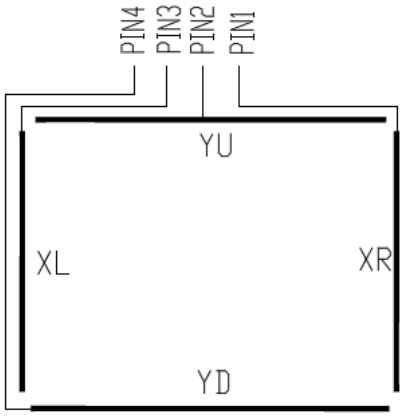
*4: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.
*5: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function. For 18bit RGB interface, connect two LSB bits of all the R/G/B data buses to GND.
When DITHB="0", Enable internal dithering function, For TTL 24 bits parallel RGB image data input.

### 3.2 K2 (Backlight connector)

| Pin No. | Pin Name | IO | Descriptions | Wire Color |
|---|---|---|---|---|
| 1 | BLA | Power | LED driving anode (high voltage) | Red |
| 2 | BLK | Power | LED driving cathode (low voltage) | White |

### 3.3 Touch Panel Terminal Functions

| Pin No. | Pin Name | I/O | Descriptions |
|---|---|---|---|
| 1 | XR | Passive | Right Side sense Terminal |
| 2 | YU | Passive | Up Side sense Terminal |
| 3 | XL | Passive | Left Side sense Terminal |
| 4 | YD | Passive | Down Side sense Terminal |




## 4. Absolute Maximum Ratings

AGND= GND=0V, Ta = 25℃

| Items | Symbol | Min. | Max. | Unit | Condition |
|---|---|---|---|---|---|
| Power voltage | Vcc | -0.5 | 3.96 | V | |
| | $AV_{DD}$ | -0.5 | 14.85 | V | |
| | $V_{GH}$ | -0.3 | +42 | V | |
| | $V_{GL}$ | $V_{GH}$ -42 | +0.3 | V | |
| Operating Temperature | $T_{OP}$ | -20 | 70 | °C | No Condensation |
| Storage Temperature | $T_{ST}$ | -30 | 80 | °C | No Condensation |

Note:
*1. This rating applies to all parts of the module. And should not be exceeded.
*2. The operating temperature only guarantees operation of the circuit. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature, $T_{OP}$=25.
*3. Ambient temperature when the backlight is lit (reference value)
*4. Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

# 5. Electrical Characteristics

## 5.1 DC Characteristics

$T_{OP}$ =25°C

| Items | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Power voltage | Vcc | 2.8 | 3.3 | 3.6 | V | *2 |
| | $AV_{DD}$ | 12.4 | 12.6 | 12.8 | V | |
| | $V_{GH}$ | 20．0 | 22.0 | 24.0 | V | |
| | $V_{GL}$ | -7.4 | -6.9 | -6.4 | V | |
| Input signal voltage | $V_{COM}$ | 4.05 | 4.1 | 4.15 | V | |
| Input logic high voltage | $V_{IH}$ | 0.7Vcc | - | Vcc | V | *3 |
| Input logic low voltage | $V_{IL}$ | 0 | - | 0.3Vcc | V | |

Note:

*1.Be sure to apply VCC and VGL to the LCD first, and then apply VGH.

*2: VCC setting should match the signals output voltage (refer to Note 3) of customer's system board.

*3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

## 5.2 Current Consumption

| Items | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Current for Driver | $I_{GH}$ | - | 0.28 | 0.4 | mA | $V_{GH}$ = 22.0V |
| | $I_{GL}$ | - | 0.29 | 0.4 | mA | $V_{GL}$ = -6.9V |
| | $I_{CC}$ | - | 3.39 | 10 | mA | $V_{DD}$=3.3V |
| | $I_{AV_{DD}}$ | - | 17.8 | 28 | mA | $AV_{DD}$=12.6V |

## 5.3 LED Backlight Circuit Characteristics

Top=25℃

| Items | Symbol | MIN. | TYP. | MAX. | Unit | Note |
|---|---|---|---|---|---|---|
| Forward Voltage | $Vf_{BLA}$ | 9.0 | 9.6 | 10.3 | V | If=180mA |
| Forward Current | $If_{BLA}$ | - | 180.0 | 225.0 | mA | |
| Backlight Life Time | - | 20,000 | 25,000 | - | hr | If=180mA |

Cautions:

Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.

## 5.4 Touch Panel Characteristics

$T_{OP}$ =25°C

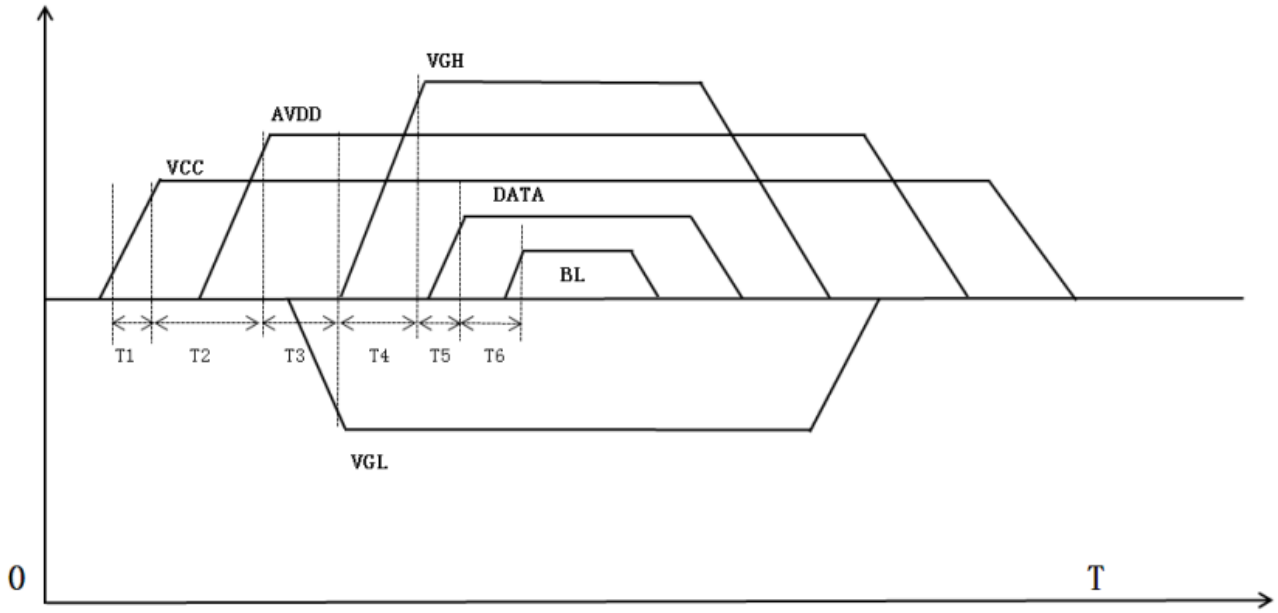
| Items | Symbol | Min. | Typ. | Max. | Unit | Applicable Pin |
|---|---|---|---|---|---|---|
| Operating Force | Fop | 100 | - | 160 | g | - |
| Operating Voltage | Vop | - | 5 | - | V | - |
| Life Time | TL | - | 1,000,000 | - | times | - |

Cautions:

Exceeding the recommended Condition could cause substantial damage to the touch panel and shorten its life time.

### 5.5 Power on/off Sequence

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| VCC 3.3V rising time | T1 | 0 | - | 20 | ms | |
| VCC to AVDD on time | T2 | 16.7 | - | - | ms | |
| AVDD to VGL on time | T3 | 0 | - | - | ms | |
| VGL to VGH on time | T4 | 0 | - | - | ms | |
| VGH to DATA on time | T5 | 0 | - | - | ms | |
| DATA to BL on time | T6 | 0 | - | - | ms | |




Note:
*1. Power on sequence: VCC➔AVDD➔VGL➔VGH➔DATA ON➔BACKLIGHT ON
*2. Power off sequence: BACKLIGHT OFF➔DATA OFF➔VGH➔VGL➔AVDD➔VCC
*3. When VCC turned on, the rising time T1 should less than 20ms.
*4. AVDD stable to VCC stable time T2 should better longer than 1 frame time.
*5. The power off sequence can be set according to power on settings.

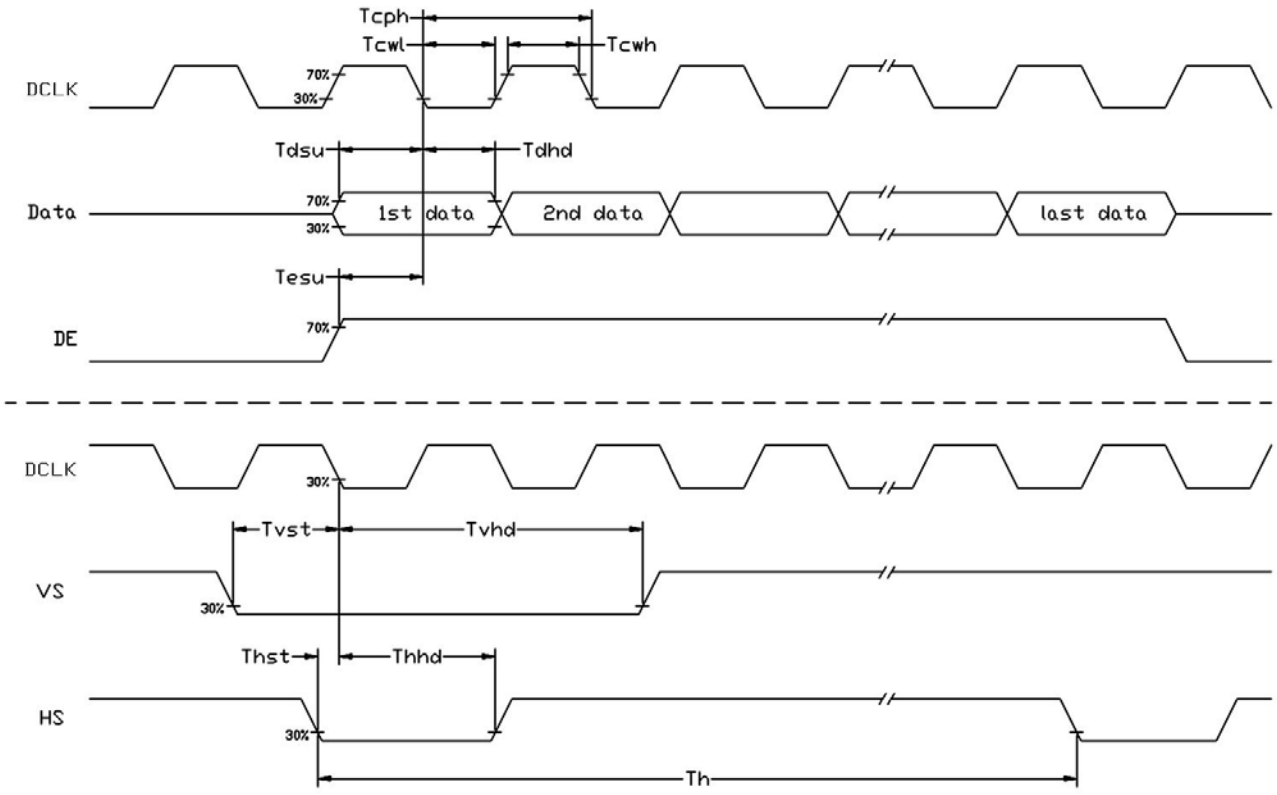
# 6. AC Characteristics

## 6.1 Timing Characteristics

VCC=3.3V,AVDD=12.6V,AGND=GND=0V,Ta=25°C

| Item | Symbol | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|
| VDD Power On Slew rate | $T_{POR}$ | - | - | 20 | ms | From 0V to 90% VDD |
| GRB pulse width | $T_{GRB}$ | 50 | - | - | us | DCLK=65MHz |
| DCLK Cycle Time | Tcph | 14 | - | - | ns | |
| DCLK Pulse Width | Tcw | 40 | 50 | 60 | % | |
| VSD Setup Time | Tvst | 5 | - | - | ns | |
| VSD Hold Time | Tvhd | 5 | - | - | ns | |
| HSD Setup Time | Thst | 5 | - | - | ns | |
| HSD Hold Time | Thhd | 5 | - | - | ns | |
| Data Setup Time | Tdsu | 5 | - | - | ns | Data to DCLK |
| Data Hold Time | Tdhd | 5 | - | - | ns | Data to DCLK |
| DE Setup Time | Tesu | 5 | - | - | ns | |
| DE Hold Time | Tehd | 5 | - | - | ns | |

## 6.2 Input Clock and Data Timing Diagram



### 6.3 Recommended Timing Setting Of TCON

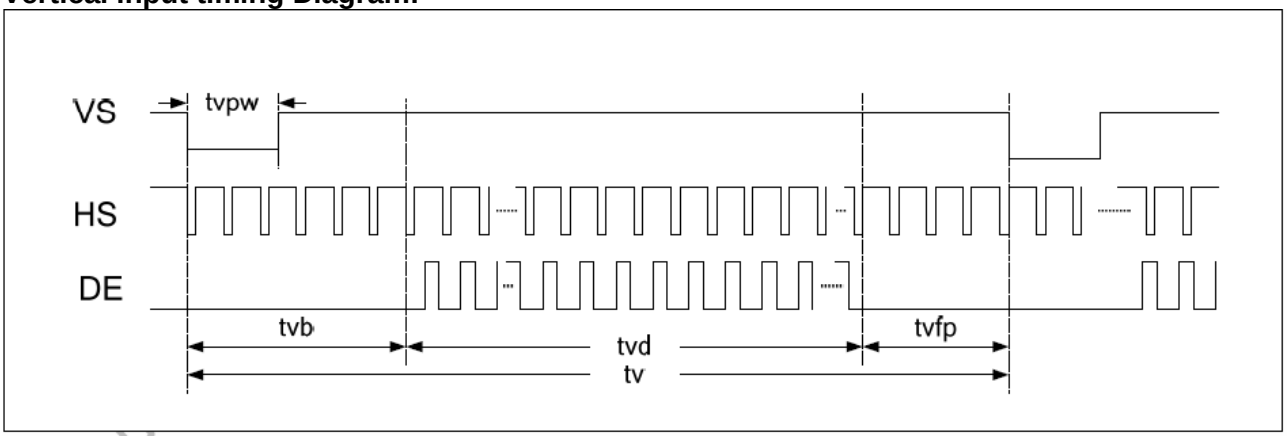
**TCON (Embedded In Source IC) Input Timing (DCLK, HSD, VSD, DE)**

VCC=3.3V, AVDD=12.5V, AGND=GND=0V, Ta=25℃

| Item | Symbol | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|
| DCLK | Fclk | 34.5 | 39.6 | 50.4 | MHZ | |
| | tclk | - | 25.3 | - | ns | |
| HSD | th | 900 | 1000 | 1200 | tclk | |
| | thd | - | 800 | - | tclk | |
| | thpw | 1 | - | 40 | tclk | |
| | thb | - | 88 | - | tclk | |
| | thfp | 12 | 112 | 312 | tclk | |
| VSD | tv | 640 | 660 | 700 | th | |
| | tvd | - | 600 | - | th | |
| | tvpw | 1 | - | 20 | th | |
| | tvb | - | 39 | - | th | |
| | tvfp | 1 | 21 | 61 | th | |

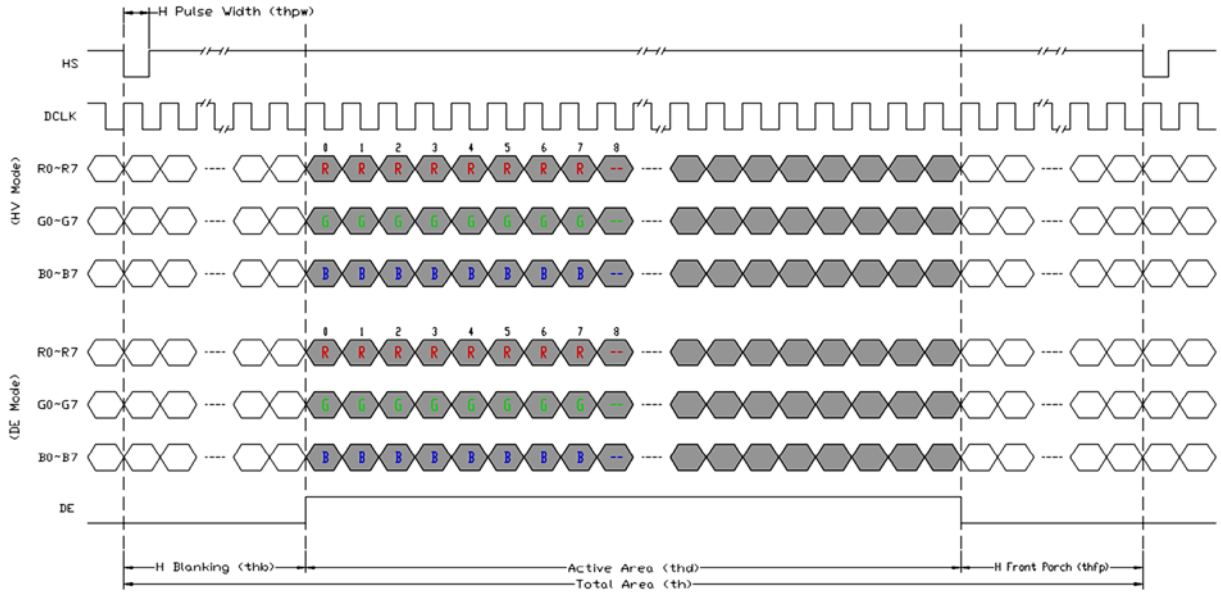
Note: DE timing refer to HSD, VSD input timing.

**Vertical input timing Diagram:**




Vertical input timing Diagram

### 6.4 Horizontal input timing Diagram




Horizontal input timing diagram

## 7. Optical Characteristics

Test Conditions:

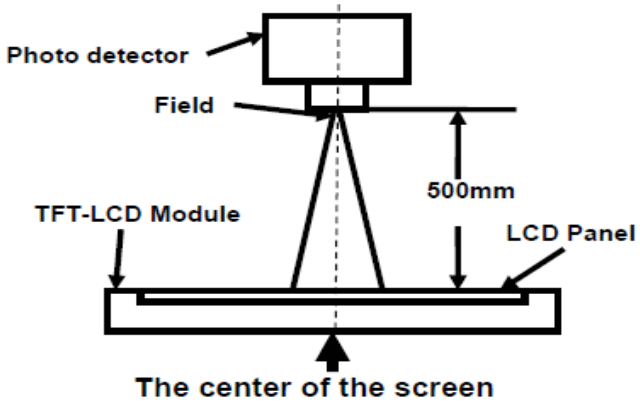
1. $I_F$= 20mA, $V_F$=9.6V, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

| Item | | Symbol | Condition | MIN. | TYP. | MAX. | UNIT | Note. |
|---|---|---|---|---|---|---|---|---|
| Viewing angle (CR≥10) | | $\theta_L$ | 9 o'clock | 60 | 70 | - | degree | Note 2 |
| | | $\theta_R$ | 3 o'clock | 60 | 70 | - | | |
| | | $\theta_T$ | 12 o'clock | 40 | 50 | - | | |
| | | $\theta_B$ | 6 o'clock | 60 | 70 | - | | |
| Response Time | | $T_f$ | 25℃ | - | 25 | 30 | msec | Note 1 Note 4 |
| | | $T_r$ | | | | | msec | |
| Contrast ratio | | CR | θ=0° | 400 | 500 | - | - | Note 1,3 |
| Color chromaticlty | White | X | Backlight is on | 0.260 | 0.310 | 0.360 | | Note 1 Note 5 |
| | | Y | | 0.280 | 0.330 | 0.380 | | |
| | Red | X | | 0.541 | 0.591 | 0.641 | | |
| | | Y | | 0.300 | 0.350 | 0.400 | | |
| | Green | X | | 0.299 | 0.349 | 0.399 | | |
| | | Y | | 0.520 | 0.570 | 0.620 | | |
| | Blue | X | | 0.101 | 0.151 | 0.201 | | |
| | | Y | | 0.047 | 0.097 | 0.147 | | |
| Luminance | | L | | - | 200 | - | cd/m$^2$ | Note 1,6 |
| Luminance uniformity | | $Y_U$ | | 70 | 75 | - | % | Note 1,7 |

Note

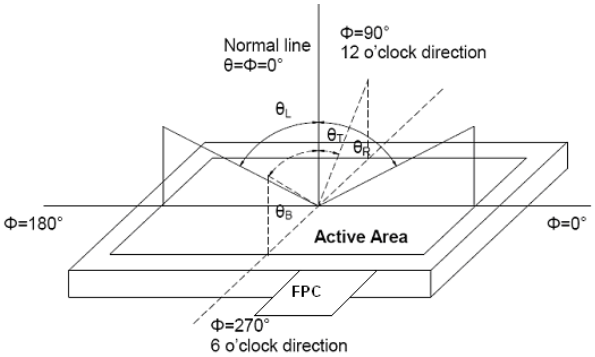
*1: Definition of optical measurement system.

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 | - |

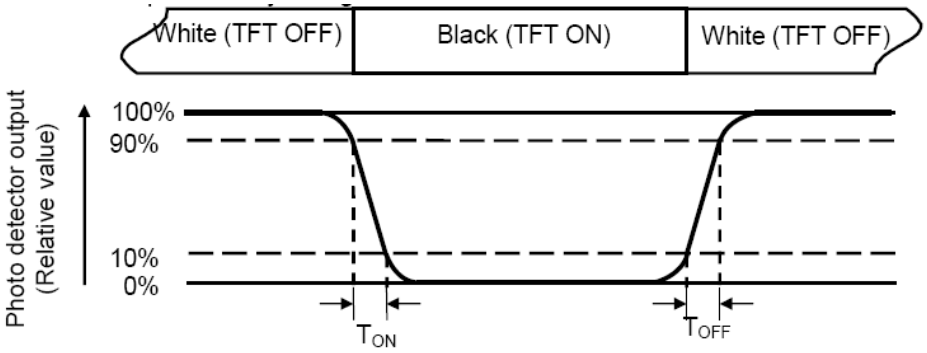
*2: Definition of viewing angle range



*3: Definition of contrast ratio

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

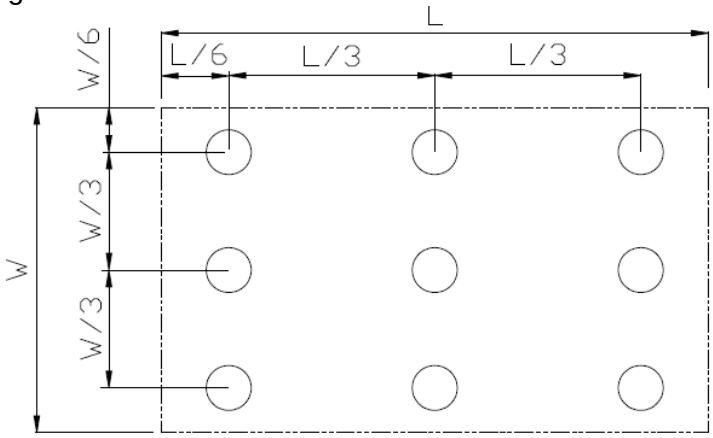
* 4: Definition of Response time
The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ($T_{ON}$) is the time between photo detector output intensity changed from 90% to 10%. And fall time ($T_{OFF}$) is the time between photo detector output intensity changed from 10% to 90%.




* 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

* 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) = Lmin/ Lmax
L-------Active area length W----- Active area width




Lmax: The measured Maximum luminance of all measurement position.
Lmin: The measured Minimum luminance of all measurement position.

* 7: Definition of Luminance:
Measure the luminance of white state at center point.

# 8. Precautions of using LCD Modules

**Mounting**

- Mounting must use holes arranged in four corners or four sides.
- The mounting structure so provide even force on to LCD module. Uneven force (ex. Twisted stress) should not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- It is suggested to attach a transparent protective plate to the surface in order to protect the polarizer. It should have sufficient strength in order to the resist external force.
- The housing should adopt radiation structure to satisfy the temperature specification.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. Never rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer

**Operating**

- The spike noise causes the mis-operation of circuits. It should be within the ±200mV level (Over and under shoot voltage)
- Response time depends on the temperature.(In lower temperature, it becomes longer.)
- Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- When fixed patterns are displayed for a long time, remnant image is likely to occur.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference

**Electrostatic Discharge Control**

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

**Strong Light Exposure**

Strong light exposure causes degradation of polarizer and color filter.

**Storage**

When storing modules as spares for a long time, the following precautions are necessary.

- Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

**Protection Film**

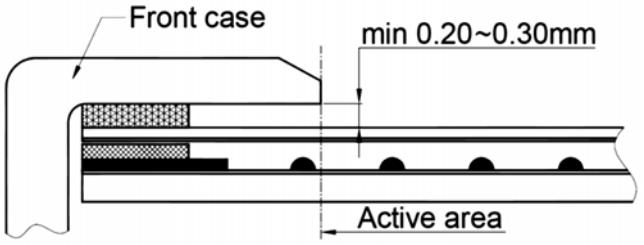
- When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt tore main on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.
- When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

**Transportation**

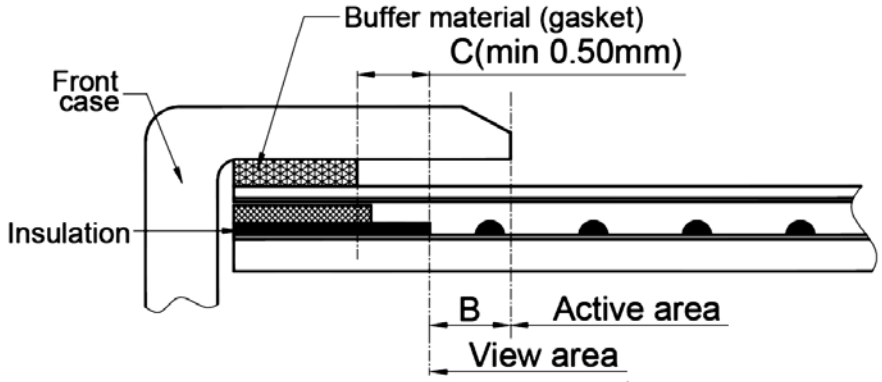
The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

## 附录：Touch panel Design Precautions

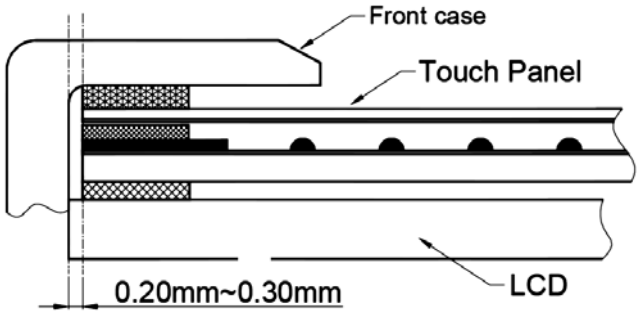
1. It should prevent front case touching the touch panel Active Area (A.A.) to prevent abnormal touch.
   It should left gab (e.g. 0.2~0.3mm) in between.




2. Outer case design should take care about the area outside the A.A.
   Those areas contain circuit wires which is having different thickness. Touching those areas could deform the ITO film. As a result case the ITO cold be damaged and shorten its lifetime.
   It is suggested to protect those areas with gasket (between the front case and the touch panel).
   The suggested figures are B≥0.50mm; C≥0.50mm。




3. The front case side wall should keep space (e.g. 0.2 ~ 0.3mm) from the touch panel.




4. In general design,
   touch panel V.A. should be bigger than the LCD V.A.
   and touch panel A.A. should be bigger than the LCD A.A.