HIGHNESS™

*One of a kind*

# HM070WV101HT
# 7.0" Color TFT-LCD

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HIGHNESS MICROELECTRONICS LTD.
URL: www.highnessmicro.com, Email: sales@highnessmicro.com

# 1. General Specifications

| No. | Item | Specification | Remark |
|---|---|---|---|
| 1 | LCD size | 7.0 inch(Diagonal) | |
| 2 | Driver element | a-Si TFT active matrix | |
| 3 | Resolution | 800 × 3(RGB) × 480 | |
| 4 | Display mode | Normally White, Transmissive | |
| 5 | Dot pitch | 0.0642(W) × 0.1790(H) mm | |
| 6 | Active area | 154.08(W) × 85.92(H) mm | |
| 7 | Module size | 164.9(W) ×100.0(H) ×5.7(D) mm | Note 1 |
| 8 | Surface treatment | Anti-Glare | |
| 9 | Color arrangement | RGB-stripe | |
| 10 | Interface | Digital | |
| 11 | Backlight power consumption | TBD | |
| 12 | Panel power consumption | TBD | |
| 13 | Weight | TBD | |
| 14 | Touch Screen Type | Projected Capacitive Touch | |
| 15 | Touch Controller | USB | |

Note 1: Refer to Mechanical Drawing.

# 2. PinAssignment

## 2.1 TFT LCD Module Driving Section

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 1 | $V_{LED+}$ | P | Power for LED backlight (Anode) | |
| 2 | $V_{LED+}$ | P | Power for LED backlight (Anode) | |
| 3 | $V_{LED-}$ | P | Power for LED backlight (Cathode) | |
| 4 | $V_{LED-}$ | P | Power for LED backlight (Cathode) | |
| 5 | GND | P | Power ground | |
| 6 | $V_{COM}$ | I | Common voltage | |
| 7 | $DV_{DD}$ | P | Power for Digital Circuit | |
| 8 | MODE | I | DE/SYNC mode select | Note 1 |
| 9 | DE | I | Data Input Enable | |
| 10 | VS | I | Vertical Sync Input | |
| 11 | HS | I | Horizontal Sync Input | |
| 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 | Note 2 |
| 19 | B0 | I | Blue data(LSB) | Note 2 |
| 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 | Note 2 |
| 27 | G0 | I | Green data(LSB) | Note 2 |
| 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 | Note 2 |
| 35 | R0 | I | Red data(LSB) | Note 2 |
| 36 | GND | P | Power Ground | |
| 37 | DCLK | I | Sample clock | Note 3 |
| 38 | GND | P | Power Ground | |
| 39 | L/R | I | Left / right selection | Note 4,5 |
| 40 | U/D | I | Up/down selection | Note 4,5 |
| 41 | $V_{GH}$ | P | Gate ON Voltage | |
| 42 | $V_{GL}$ | P | Gate OFF Voltage | |
| 43 | $AV_{DD}$ | P | Power for Analog Circuit | |
| 44 | RESET | I | Global reset pin. | Note 6 |
| 45 | NC | - | No connection | |
| 46 | $V_{COM}$ | I | Common Voltage | |
| 47 | DITHB | I | Dithering function | Note 7 |
| 48 | GND | P | Power Ground | |
| 49 | NC | - | No connection | |
| 50 | NC | - | No connection | |

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.
When select DE mode, MODE=”1”, VS and HS must pull high.
When select SYNC mode, MODE= ”0”, DE must be grounded.

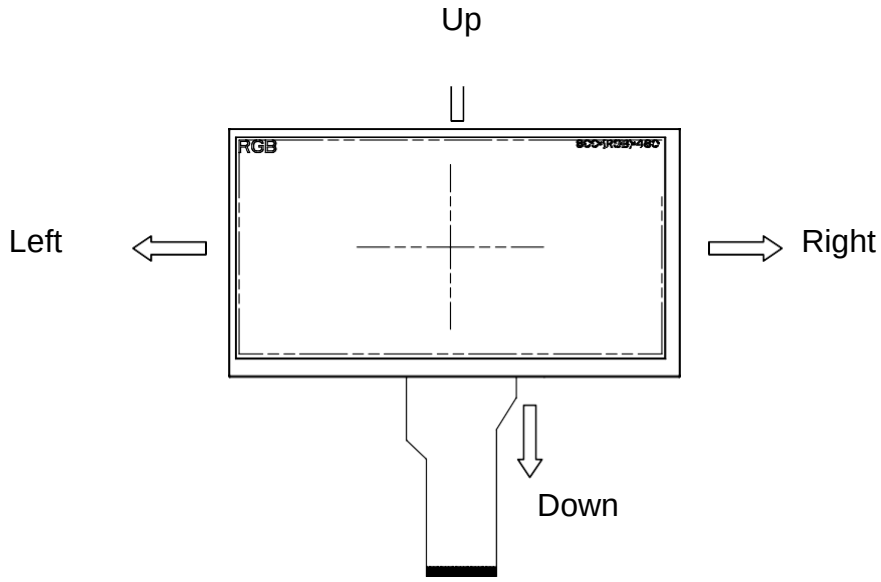
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

| Setting of scan control input | | Scanning direction |
|---|---|---|
| U/D | L/R | |
| GND | $DV_{DD}$ | Up to down, left to right |
| $DV_{DD}$ | GND | Down to up, right to left |
| GND | GND | Up to down, right to left |
| $DV_{DD}$ | $DV_{DD}$ | Down to up, left to right |

Note 5: Definition of scanning direction.
Refer to the figure as below:




Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB=”1”,Disable internal dithering function,
When DITHB=”0”,Enable internal dithering function,

# 3. Operation Specifications

## 3.1. Absolute Maximum Ratings

(Note 1)

| Item | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power voltage | $DV_{DD}$ | -0.3 | 5.0 | V | |
| | $AV_{DD}$ | 6.5 | 13.5 | V | |
| | $V_{GH}$ | -0.3 | 40.0 | V | |
| | $V_{GL}$ | -20.0 | 0.3 | V | |
| | $V_{GH}$-$V_{GL}$ | - | 40.0 | V | |
| Operation Temperature | $T_{OP}$ | -20 | 70 | ℃ | |
| Storage Temperature | $T_{ST}$ | -30 | 80 | ℃ | |
| LED Reverse Voltage | $V_R$ | - | 1.2 | V | Each LED Note 2 |
| LED Forward Current | $I_F$ | - | 25 | mA | Each LED |

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2: $V_R$ Conditions: Zener Diode 20mA

### 3.1.1. Typical Operation Conditions

( Note 1)

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power voltage | $DV_{DD}$ | 3.0 | 3.3 | 3.6 | V | Note 2 |
| | $AV_{DD}$ | (10.2) | (10.4) | (10.6) | V | |
| | $V_{GH}$ | (15.3) | (16.0) | (16.7) | V | |
| | $V_{GL}$ | (-7.7) | (-7.0) | (-6.3) | V | |
| Input signal voltage | $V_{COM}$ | 2.6 | 3.6 | 4.6 | V | |
| Input logic high voltage | $V_{IH}$ | 0.7 $DV_{DD}$ | - | $DV_{DD}$ | V | Note 3 |
| Input logic low voltage | $V_{IL}$ | 0 | - | 0.3 $DV_{DD}$ | V | |

Note 1: Be sure to apply $DV_{DD}$ and $V_{GL}$ to the LCD first, and then apply $V_{GH}$.
Note 2: $DV_{DD}$ setting should match the signals output voltage (refer to Note 3) of customer's system board.
Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

### 3.1.2. Current Consumption

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Current for Driver | $I_{GH}$ | - | 0.2 | 1.0 | mA | $V_{GH}$ =17.0V |
| | $I_{GL}$ | - | 0.2 | 1.0 | mA | $V_{GL}$ = -5.0V |
| | $IDV_{DD}$ | - | 4.0 | 10 | mA | $DV_{DD}$ =3.3V |
| | $IAV_{DD}$ | - | 20 | 50 | mA | $AV_{DD}$ =10.4V |

### 3.1.3. Backlight Driving Conditions

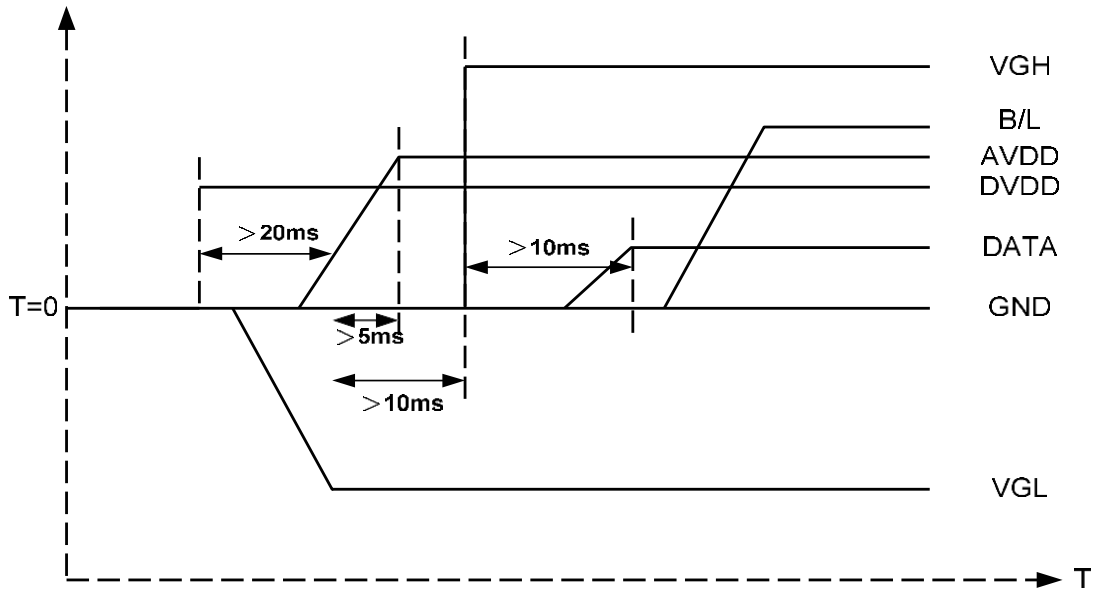
| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Voltage for LED backlight | $V_L$ | (9.3) | (9.9) | (10.5) | V | Note 1 |
| Current for LED backlight | $I_L$ | (180) | (200) | (220) | mA | |
| LED life time | - | 20,000 | - | - | Hr | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and $I_L$ =200mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and $I_L$ =200mA. The LED lifetime could be decreased if operating $I_L$ is lager than 200mA.

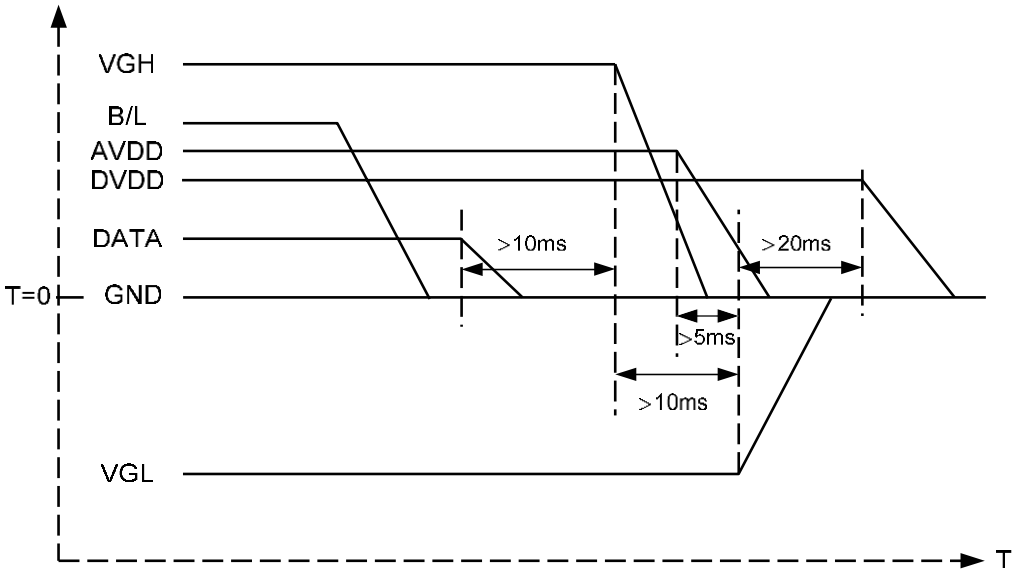
## 3.2. Power Sequence

a. Power on:




$DV_{DD}$→VGL→VGH→Data→B/L

b. Power off:




B/L→Data→VGH→VGL→$DV_{DD}$

Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS,VS,DE.

## 3.3. Timing Characteristics

### 3.3.1. AC Electrical Characteristics

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| HS setup time | $T_{hst}$ | 8 | - | - | ns | |
| HS hold time | $T_{hhd}$ | 8 | - | - | ns | |
| VS setup time | $T_{vst}$ | 8 | - | - | ns | |
| VS hold time | $T_{vhd}$ | 8 | - | - | ns | |
| Data setup time | $T_{dsu}$ | 8 | - | - | ns | |
| Data hole time | $T_{dhd}$ | 8 | - | - | ns | |
| DE setup time | $T_{esu}$ | 8 | - | - | ns | |
| DE hole time | $T_{ehd}$ | 8 | - | - | ns | |
| $DV_{DD}$ Power On Slew rate | $T_{POR}$ | - | - | 20 | ms | From 0 to 90% $DV_{DD}$ |
| RESET pulse width | $T_{Rst}$ | 1 | - | - | ms | |
| DCLK cycle time | $T_{coh}$ | 20 | - | - | ns | |
| DCLK pulse duty | $T_{cwh}$ | 40 | 50 | 60 | % | |

### 3.3.2. Data Input Format

Figure 3. 1 Horizontal input timing diagram.

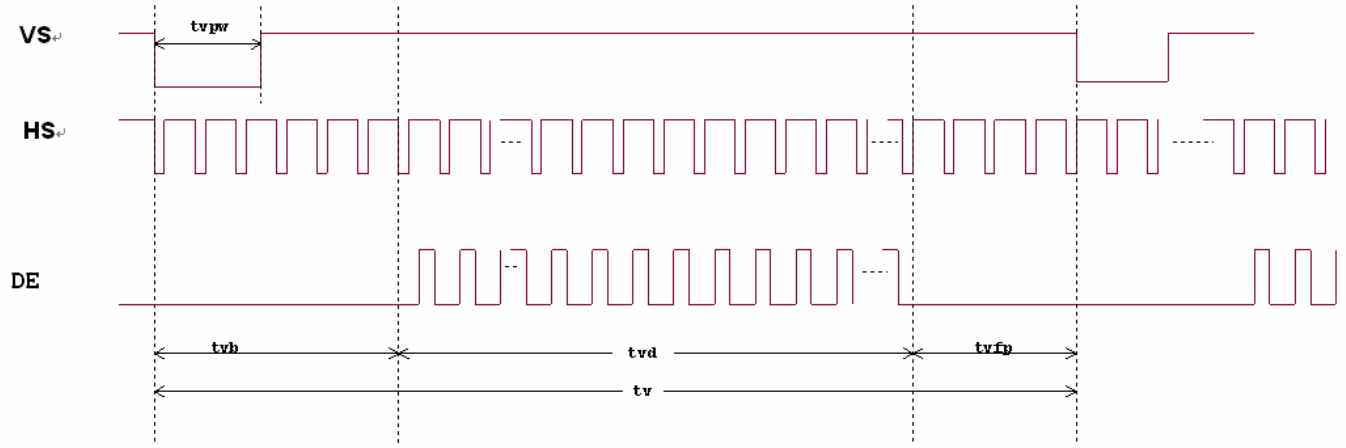



Figure 3. 2 Vertical input timing diagram.

### 3.3.3. Timing

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Horizontal Display Area | thd | - | 800 | - | DCLK | |
| DCLK Frequency | fclk | 26.4 | 33.3 | 46.8 | MHz | |
| One Horizontal Line | th | 862 | 1056 | 1200 | DCLK | |
| HS pulse width | thpw | 1 | - | 40 | DCLK | |
| HS Blanking | thb | 46 | 46 | 46 | DCLK | |
| HS Front Porch | thfp | 16 | 210 | 354 | DCLK | |

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Vertical Display Area | tvd | - | 480 | - | TH | |
| VS period time | tv | 510 | 525 | 650 | TH | |
| VS pulse width | tvpw | 1 | - | 20 | TH | |
| VS Blanking | tvb | 23 | 23 | 23 | TH | |
| VS Front Porch | tvfp | 7 | 22 | 147 | TH | |

# 4. Optical Specifications

| Item | Symbol | Condition | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Viewing angle (CR≥ 10) | $\theta_L$ | Φ=180°(9 o'clock) | 60 | 70 | - | degree | Note 1 |
| | $\theta_R$ | Φ=0°(3 o'clock) | 60 | 70 | - | | |
| | $\theta_T$ | Φ=90°(12 o'clock) | 40 | 50 | - | | |
| | $\theta_B$ | Φ=270°(6 o'clock) | 60 | 70 | - | | |
| Response time | $T_{ON}$ | Normal θ=Φ=0° | - | 10 | 20 | msec | Note 3 |
| | $T_{OFF}$ | | - | 15 | 30 | msec | Note 3 |
| Contrast ratio | CR | | 400 | 500 | - | - | Note 4 |
| Color chromaticity | $W_X$ | | 0.26 | 0.31 | 0.36 | - | Note 2 Note 5 Note 6 |
| | $W_Y$ | | 0.28 | 0.33 | 0.38 | - | |
| Luminance | L | | 250 | 300 | - | cd/m2 | Note 6 |
| Luminance uniformity | $Y_U$ | | 70 | 75 | - | % | Note 7 |

Test Conditions:

1. $DV_{DD}$=3.3V, $I_L$=200mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

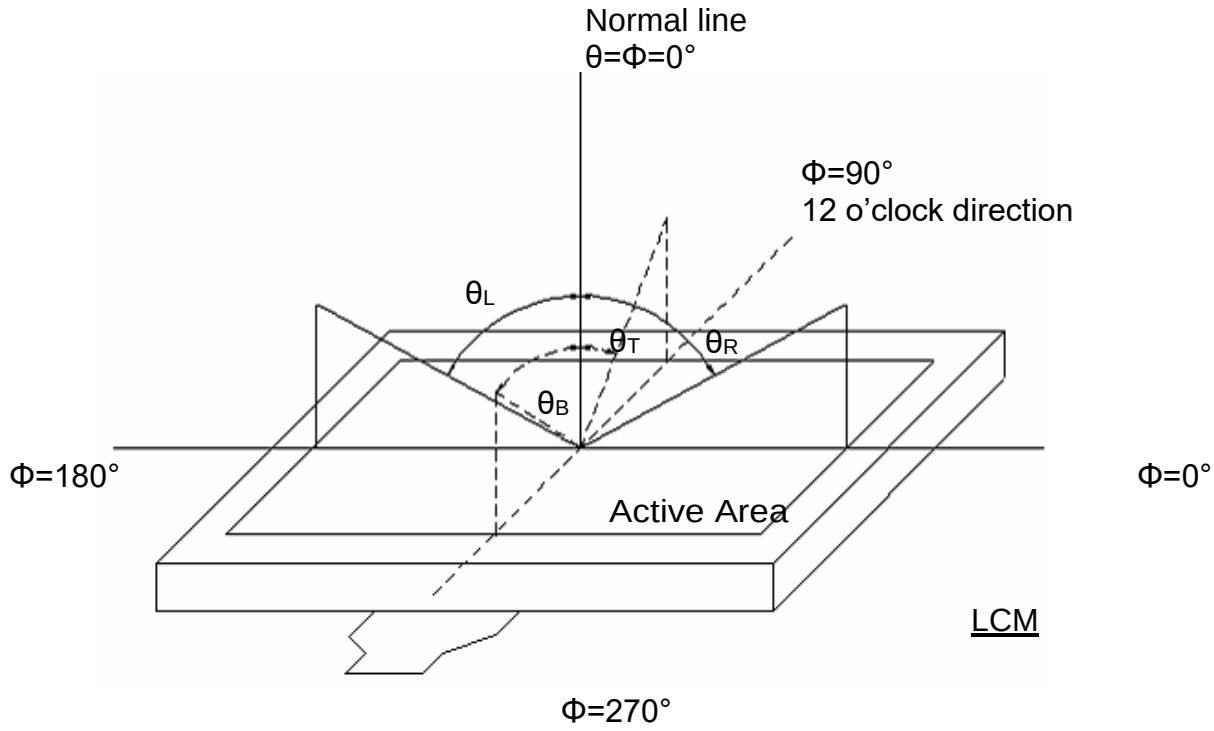



Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

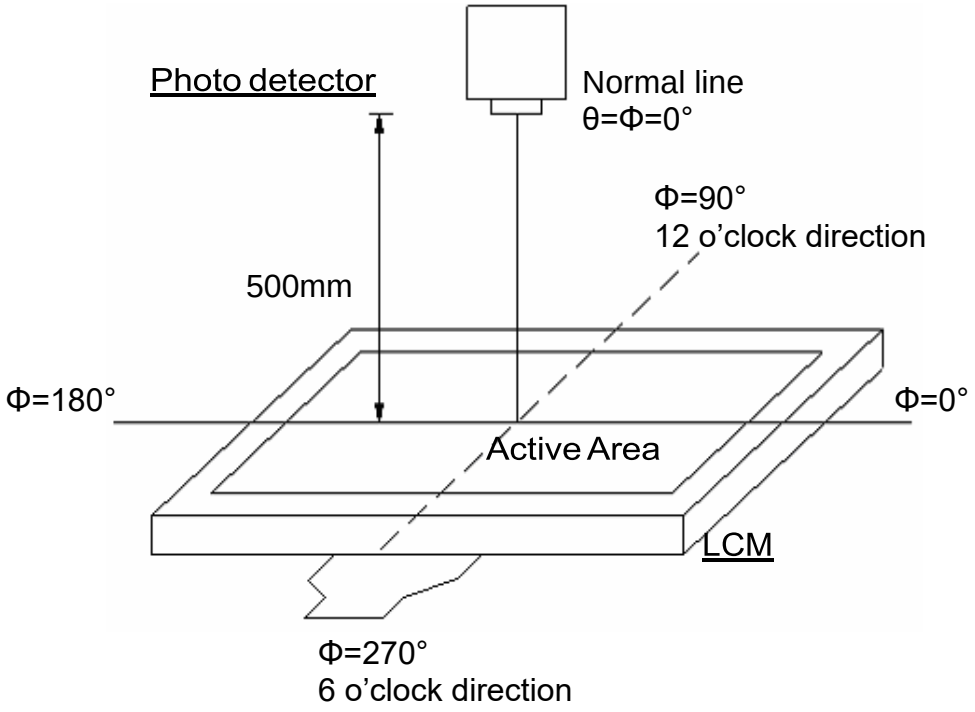



Fig. 4-2 Optical measurement system setup

Note 3: 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%.

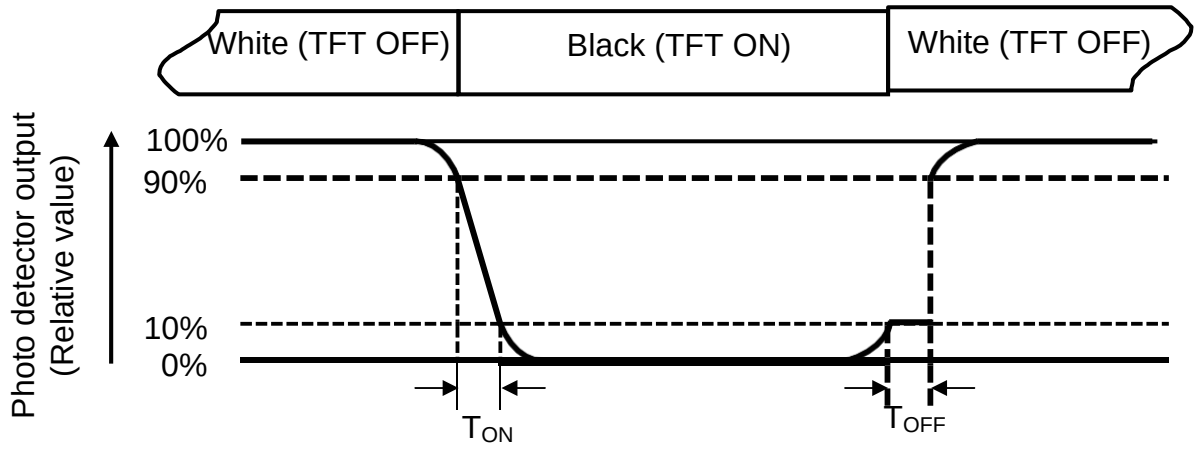



Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L$=200mA .

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (Yu) $\frac{B_{max}}{B_{min}}$

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

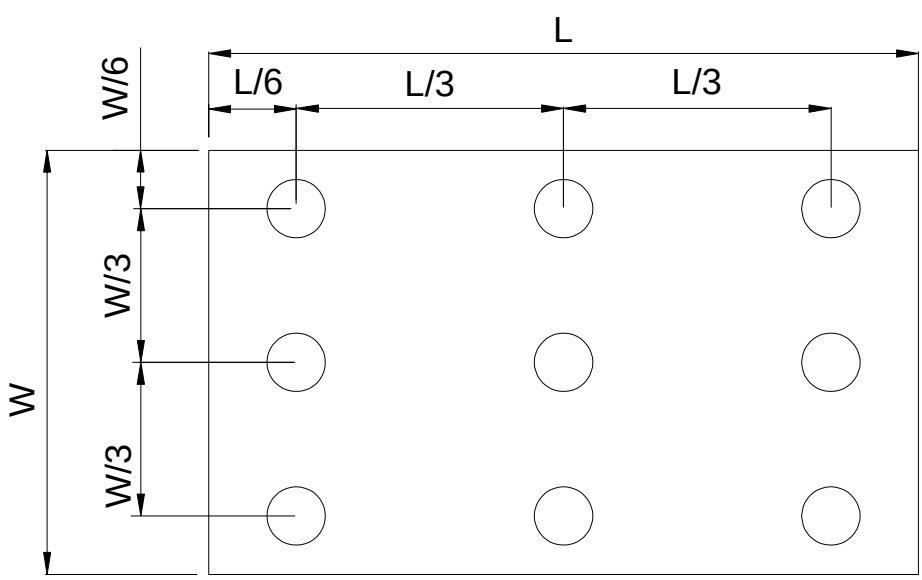



Fig. 4-4 Definition of measuring points

$B_{max}$: The measured maximum luminance of all measurement position.

$B_{min}$: The measured minimum luminance of all measurement position.

# 5. TOUCH SCREENSPECIFICATION

### 5.1 Overview

This is a Projected Capacitive Touch Panel module with multi touch technology function.

### 5.2 Specification:

| Items | Specification |
|---|---|
| Screen Diagonal (inch) | As per drawing |
| Structure | Glass / Glass |
| Touch Controller | Chip on Film (COF) type |
| Out Line Dimension (mm) | As per drawing |
| Active area | As per drawing |
| Viewing area | As per drawing |
| Total Thickness | As per drawing |

### 5.3 Characteristics of Touch Screen:

#### 5.3.1 Product Characteristics

| Items | Specification |
|---|---|
| Operation Conditions | -20°C~+70°C at Min 10% to Max 90%RH |
| Storage Conditions | -35°C~+80°C at Min 10% to Max 90%RH |
| Electrostatic Discharge (non operation) | 25ppi (Min) |

#### 5.3.2 Optical Property:

| Items | Specification |
|---|---|
| Transmittance (T%) | >85% |
| Haze | 3% |

**Note: Light source C-light (Measure point: Center of panel)**

#### 5.3.3 Electrical Characteristics:

| Interface to Host/Master | Specification |
|---|---|
| Interface | USB 2.0 |
| Supply Voltage | 5V DC |
| Support Points | Multi-finger |

### 5.4 Touch Screen PIN:

| Pin | Specification |
|---|---|
| 1 | GND |
| 2 | D+ |
| 3 | D- |
| 4 | VDD 5V |

# 6. Reliability Test Items

(Note3)

| Item | Test Conditions | Remark |
|---|---|---|
| High Temperature Storage | Ta = 80℃ 240hrs | Note 1，Note 4 |
| Low Temperature Storage | Ta = -30℃ 240hrs | Note 1，Note 4 |
| High Temperature Operation | Ts = 70℃ 240hrs | Note 2，Note 4 |
| Low Temperature Operation | Ta = -20℃ 240hrs | Note 1，Note 4 |
| Operate at High Temperature and Humidity | +60℃, 90%RH 240hrs | Note 4 |
| Thermal Shock | -30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature. | Note 4 |
| Vibration Test | Frequency range:10~55Hz<br>Stroke:1.5mm<br>Sweep:10Hz~55Hz~10Hz<br>2 hours for each direction of X. Y. Z.<br>(6 hours for total) | |
| Mechanical Shock | 100G 6ms,±X, ±Y, ±Z 3 times for each direction | |
| Package Vibration Test | Random Vibration :<br>0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ<br>2 hours for each direction of X. Y. Z.<br>(6 hours for total) | |
| Package Drop Test | Height:60 cm<br>1 corner, 3 edges, 6 surfaces | |
| Electro Static Discharge | ± 2KV, Human Body Mode, 100pF/1500Ω | |

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

# 7. General Precautions

## Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

## Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

## Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

## Storage

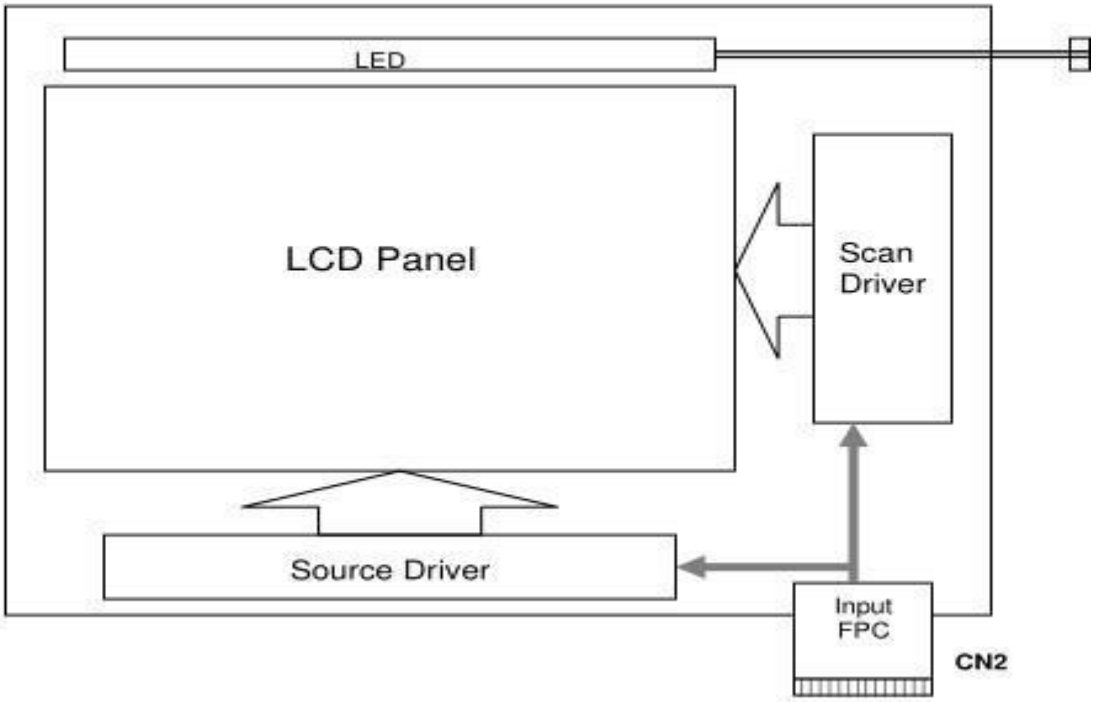
1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

## Cleaning

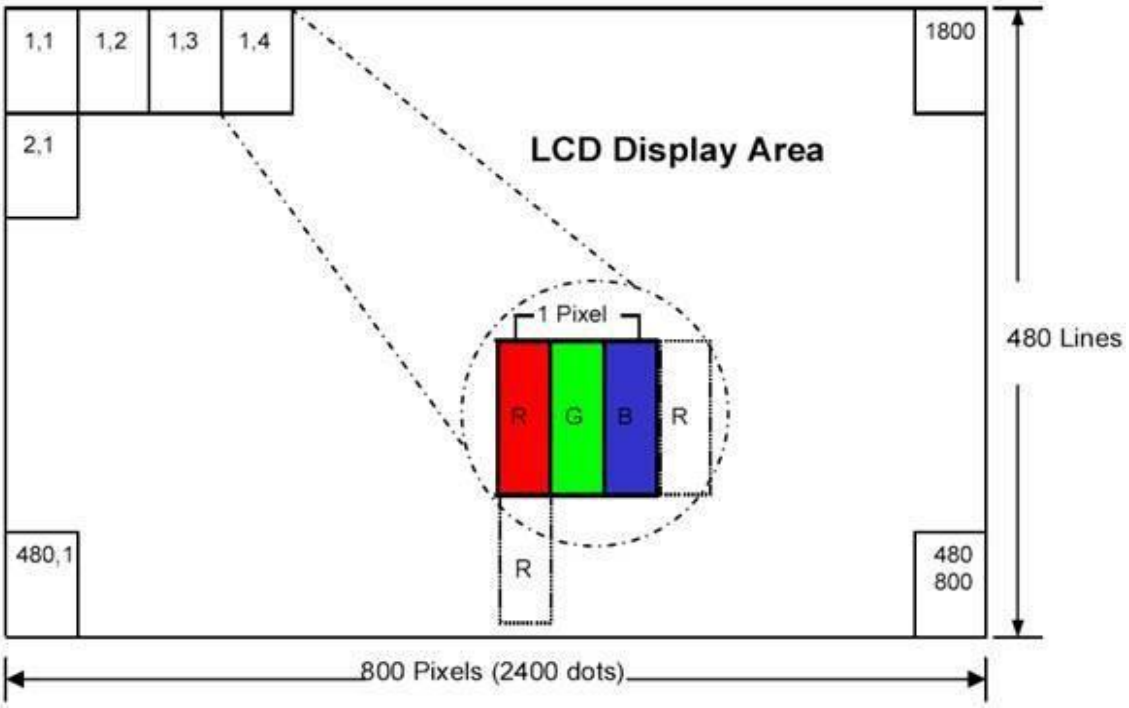
1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

# 8.0 BLOCK DIAGRAM

### 8.1 TFT LCD Module




**Pixel Format**



# 9.0 Mechanical Drawing

(To be advised)

# 10.0 Precaution

10.1 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.
10.1.1 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
10.1.2 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands.(Polarizer film, surface of LCD panel is easy to be flawed.)
10.1.3 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module, If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
10.1.4 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
10.1.5 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
10.1.6 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
10.2 Disassembling or Modification
Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. Century does not warrant the module, if customers disassemble or modify the module.
10.2.1 Breakage of LCD Panel
10.2.2 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
10.2.3 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
12.2.4. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
10.2.5. Handle carefully with chips of glass that may cause injury, when the glass is broken.
10.2.6 Absolute Maximum Ratings and Power Protection Circuit
10.2.7. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
10.2.8. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
10.2.9. It's recommended to employ protection circuit for power supply.
10.3 Operation
10.3.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
10.3.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for
incoming inspection or assembly.
10.3.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
10.3.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time,
they may causes deformation or color fading.

10.3.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other
adequate solvent.
10.4 Static Electricity
10.4.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
10.4.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge.
Please be careful with electrostatic discharge.
10.4.3 Persons who handle the module should be grounded through adequate methods.
10.5 Disposal
When disposing LCD module, obey the local environmental regulations.
10.6 Others
10.6.1 A strong incident light into LCD panel might cause display characteristics' changing inferior because of Polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land Strong UV rays.
10.6.2 Please pay attention to a panel side of LCD module not to contact with other materials in pressing it alone.
10.6.3 For the packaging box, please pay attention to the followings:
10.6.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching
during transportation. Please do not open except picking LCDs up from the box.
10.6.3.2 Please do not pile them up more than 6 boxes (They are not designed so) And please do not turn over.
10.6.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
10.6.3.4 Packing box and inner case for LCDs are made of cardboard, So please pay attention not to get them Wet (Such like keeping them in high humidity or wet place can occur getting them wet.)