
LCD MODULE SPECIFICATION

Customer: _____
Model Name: MD101IA01D-30E
Date: 2014/03/18
Version: 01

☐ Preliminary Specification
☒ Final Specification

For Customer's Acceptance

| Approved by | Comment |
|-------------|---------|
| | |

Record of Revision

| Version | Revise Date | Page | Content |
|---------------|-------------|------|-----------------|
| FINAL-Spec.01 | 2014/03/18 | | Initial Release |

Contents

| | |
|---|----|
| 1. General Specifications | 1 |
| 2. Pin Assignment | 2 |
| 3. Operation Specifications | 4 |
| 3.1. Absolute Maximum Ratings | 4 |
| 3.2. Typical Operation Conditions | 6 |
| 3.3. Power Sequence | 7 |
| 3.4. LVDS Signal Timing Characteristics | 8 |
| 3.4.1. AC Electrical Characteristics | 8 |
| 3.4.2. Timing Table | 9 |
| 3.4.3. LVDS Data Input Format | 10 |
| 4. Optical Specifications | 11 |
| 5. Reliability Test Items | 15 |
| 6. General Precautions | 16 |
| 6.1. Safety | 16 |
| 6.2. Handling | 16 |
| 6.3. Static Electricity | 16 |
| 6.4. Storage | 16 |
| 6.5. Cleaning | 16 |
| 7. Mechanical Drawing | 17 |
| 8. Package Drawing | 18 |
| 8.1. Packaging Material Table | 18 |
| 8.2. Packaging Quantity | 18 |
| 8.3. Packaging Drawing | 18 |

1. General Specifications

| No. | Item | Specification | Remark |
|-----|-----------------------------|-----------------------------------|--------|
| 1 | LCD size | 10.1 inch(Diagonal) | |
| 2 | Driver element | a-Si TFT active matrix | |
| 3 | Resolution | 1280 × 3(RGB) × 800 | |
| 4 | Display mode | Normally Black, Transmissive | |
| 5 | Dot pitch | 0.0565(W) × 0.1695(H) mm | |
| 6 | Active area | 216.96(W) × 135.60(H) mm | |
| 7 | Module size | 229.46(W) × 149.1(H) × 2.48(D) mm | Note 1 |
| 8 | Surface treatment | HC | |
| 9 | Color arrangement | RGB-stripe | |
| 10 | Interface | Digital | |
| 11 | Backlight power consumption | 1.86 W | |
| 12 | Panel power consumption | 1W | Note 2 |
| 13 | Weight | 170g(typ.) | |

Note 1: Refer to Mechanical Drawing.

Note 2: Including T-con Board power consumption

2. Pin Assignment

A 40pin connector is used for the module electronics interface. The recommended model is F62240-H1210A manufactured by Vigorconn.

| Pin No. | Symbol | I/O | Function | Remark |
|---------|--------|-----|--------------------------------|---------------------------|
| 1 | VCOM | P | Common Voltage | |
| 2 | VDD | P | Power Supply | |
| 3 | VDD | P | Power Supply | |
| 4 | NC | --- | No connection | |
| 5 | NC | --- | No connection | |
| 6 | NC | --- | No connection | |
| 7 | GND | P | Ground | |
| 8 | Rxin0- | I | -LVDS Differential Data Input | R0-R5, G0 |
| 9 | Rxin0+ | I | +LVDS Differential Data Input | |
| 10 | GND | P | Ground | |
| 11 | Rxin1- | I | -LVDS Differential Data Input | G1~G5, B0,B1 |
| 12 | Rxin1+ | I | +LVDS Differential Data Input | |
| 13 | GND | P | Ground | |
| 14 | Rxin2- | I | -LVDS Differential Data Input | B2-B5,HS,VS, DE |
| 15 | Rxin2+ | I | +LVDS Differential Data Input | |
| 16 | GND | P | Ground | |
| 17 | RxCLK- | I | -LVDS Differential Clock Input | LVDS CLK |
| 18 | RxCLK+ | I | +LVDS Differential Clock Input | |
| 19 | GND | P | Ground | |
| 20 | Rxin3- | I | -LVDS Differential Data Input | R6, R7, G6, G7, B6, B7 |
| 21 | Rxin3+ | I | +LVDS Differential Data Input | |
| 22 | GND | P | Ground | |
| 23 | NC | --- | No connection | |
| 24 | NC | --- | No connection | |
| 25 | GND | P | Ground | |
| 26 | NC | --- | No connection | |

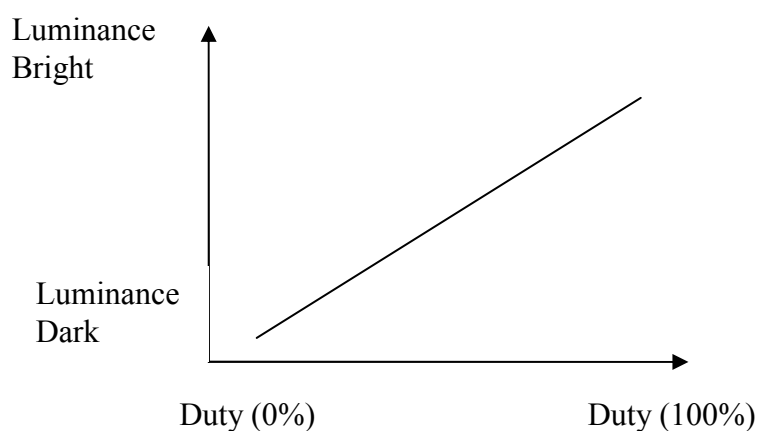
| | | | | |
|----|---------|-----|---|-------|
| 27 | LED_PWM | O | CABC controller signal output for backlight | Note2 |
| 28 | NC | --- | No connection | |
| 29 | AVDD | P | Power for Analog Circuit | |
| 30 | GND | P | Ground | |
| 31 | LED- | P | LED Cathode | |
| 32 | LED- | P | LED Cathode | |
| 33 | NC | --- | No connection | |
| 34 | NC | --- | No connection | |
| 35 | VGL | P | Gate OFF Voltage | |
| 36 | NC | --- | No connection | |
| 37 | CABC_EN | I | CABC Enable Input | Note1 |
| 38 | VGH | P | Gate ON Voltage | |
| 39 | LED+ | P | LED Anode | |
| 40 | LED+ | P | LED Anode | |

I: input, O: output, P: Power

Note1: The setting of CABC function are as follows.

| Pin | Enable | Disable |
|---------|--------------|---------------------|
| CABC_EN | High Voltage | Low Voltage or open |

Note2: LED_PWM is used to adjust backlight brightness.



3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

| Item | Symbol | Values | | Unit | Remark |
|-----------------------|----------------------------------|--------|------|------|----------|
| | | Min. | Max. | | |
| Power voltage | VDD | -0.3 | 3.9 | V | |
| | AVDD | -0.3 | 14 | V | |
| | V _{GH} | -0.3 | 42.0 | V | |
| | V _{GL} | -19 | 0.3 | V | |
| | V _{GH} -V _{GL} | 12 | 40.0 | V | |
| Operation Temperature | T _{OP} | 0 | 50 | °C | |
| Storage Temperature | T _{ST} | -20 | 60 | °C | |
| LED Reverse Voltage | V _R | | 5 | V | Each LED |
| LED Forward Current | I _F | | 35 | 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.

3.1.1. Backlight Driving Conditions

| Item | Symbol | Values | | | Unit | Remark |
|---------------------------|--------|--------|--------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Voltage for LED backlight | V_L | 8.7 | 9.3 | 9.9 | V | Note 1 |
| Current for LED backlight | I_L | 170 | 200 | 250 | mA | |
| LED life time | - | 15000 | 20,000 | - | Hr | Note 2 |

Note 1: The LED Supply Voltage is defined by the number of LED at $T_a=25^{\circ}\text{C}$ and $I_L=200\text{mA}$.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=200\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 200mA.

3.2. Typical Operation Conditions

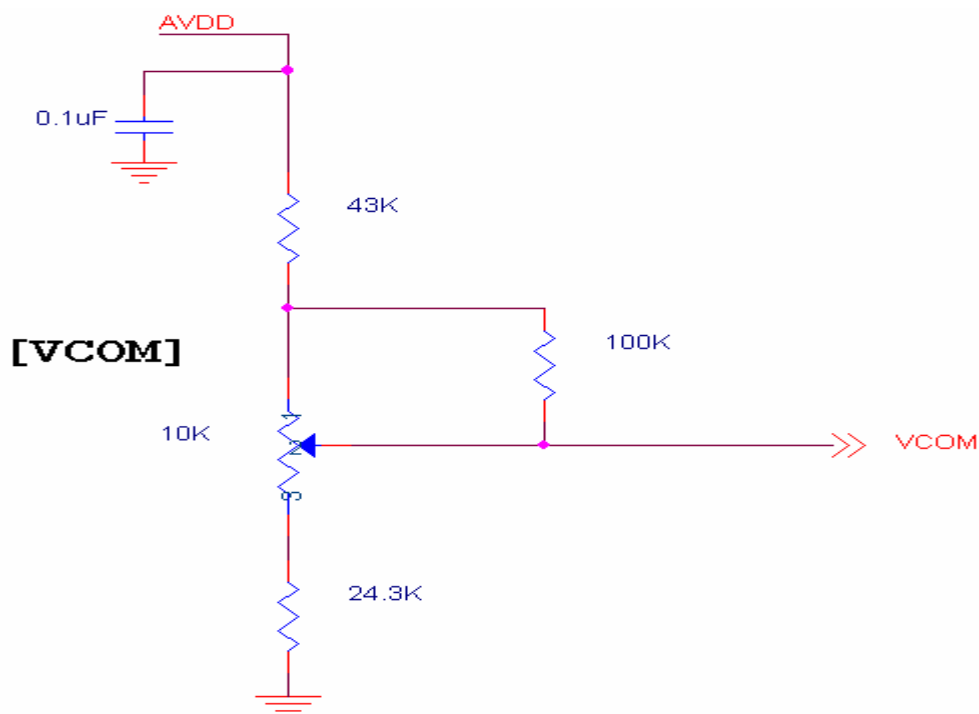
(Note 1)

| Item | Symbol | Values | | | Unit | Remark |
|--------------------------|-----------------|---------|------|----------------------|------|--------|
| | | Min. | Typ. | Max. | | |
| Power voltage | VDD | 2.3 | 2.5 | 2.7 | V | Note 2 |
| | AVDD | 8.0 | 8.2 | 8.4 | V | |
| | V _{GH} | 21.7 | 22 | 22.3 | V | |
| | V _{GL} | -7.3 | -7 | -6.7 | V | |
| Input signal voltage | VCOM | 3.0 | 3.3 | 3.6 | V | Note 4 |
| Input logic high voltage | V _{IH} | 0.8 VDD | - | VDD | V | Note 3 |
| Input logic low voltage | V _{IL} | 0 | - | 0.2 DV _{DD} | V | |

Note 1: Be sure to apply VDD and V_{GL} to the LCD first, and then apply V_{GH}.

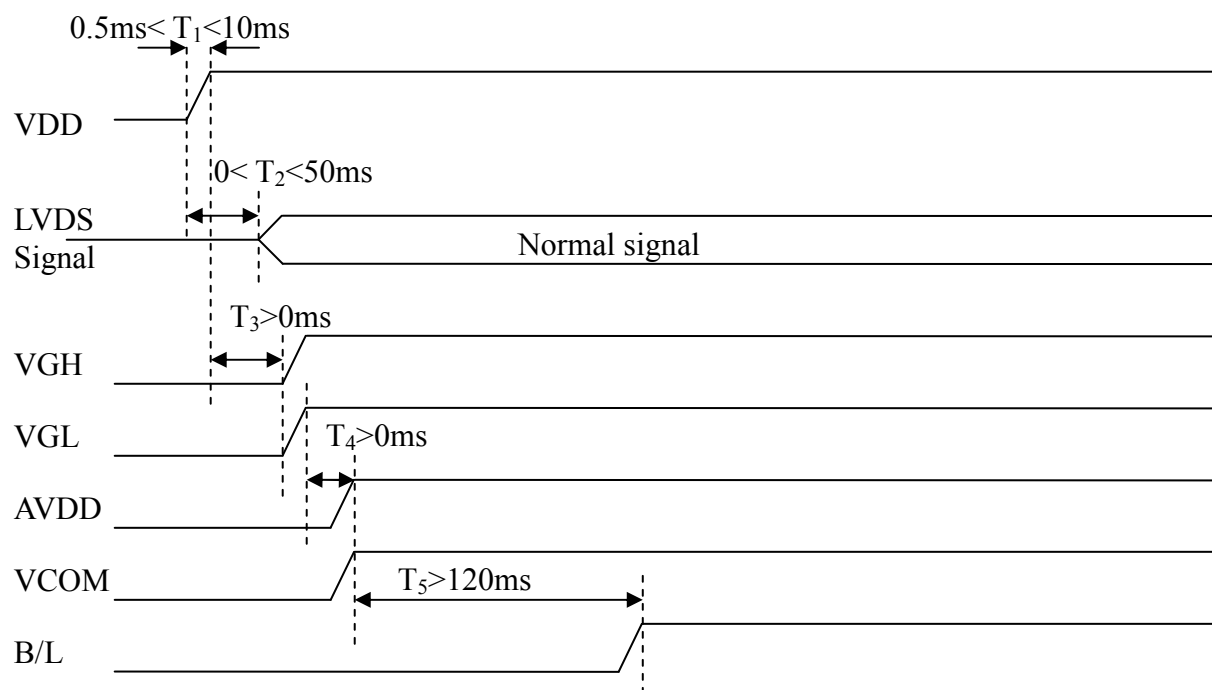
Note 2: VDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 4: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR.

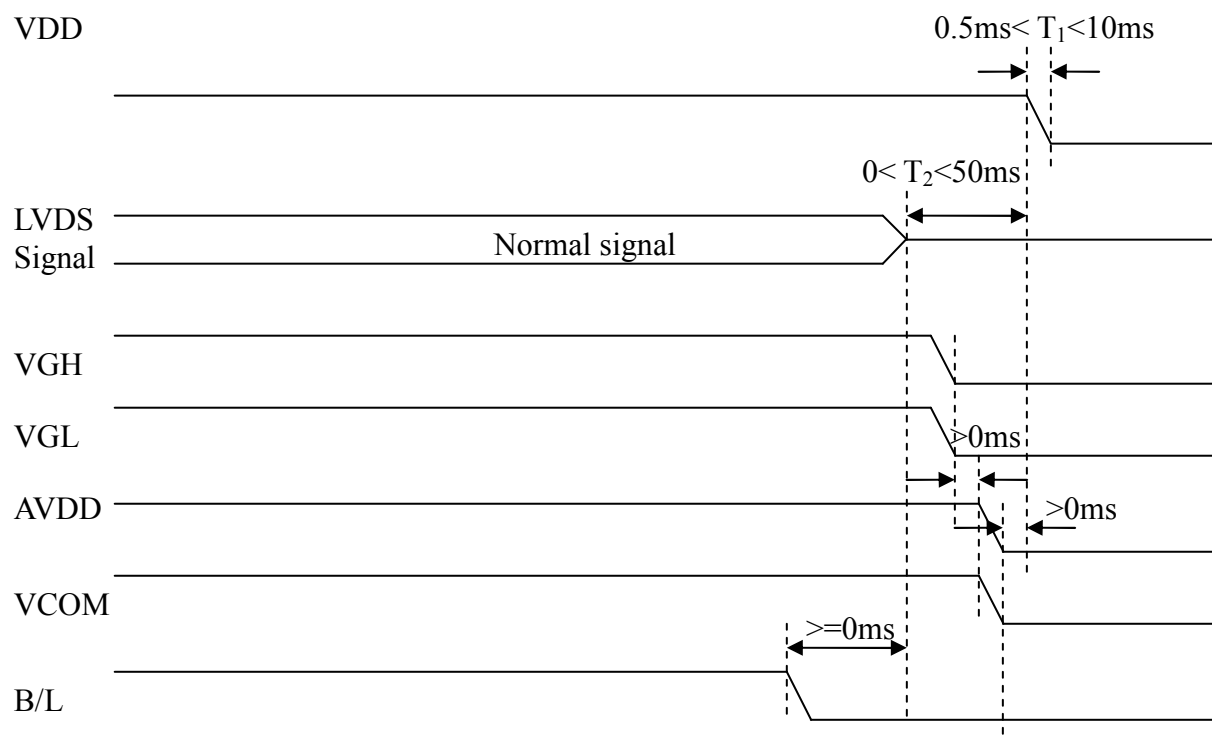


3.3. Power Sequence

a. Power on:



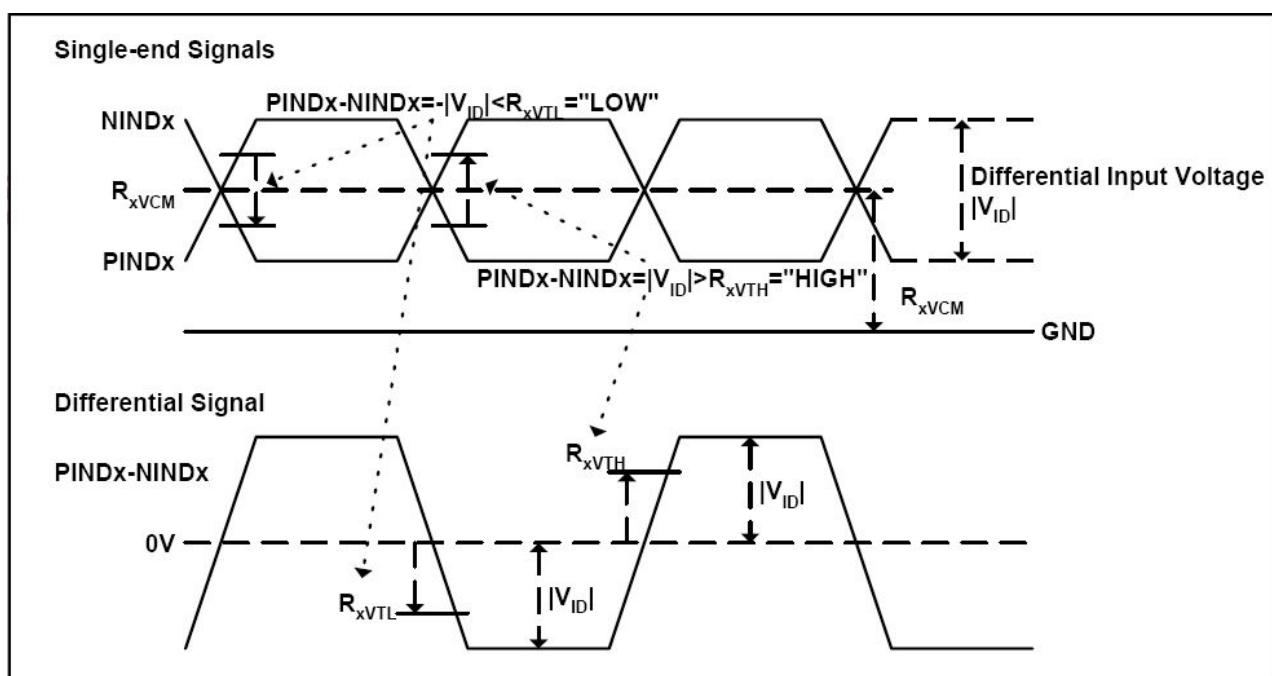
b. Power off:



3.4. LVDS Signal Timing Characteristics

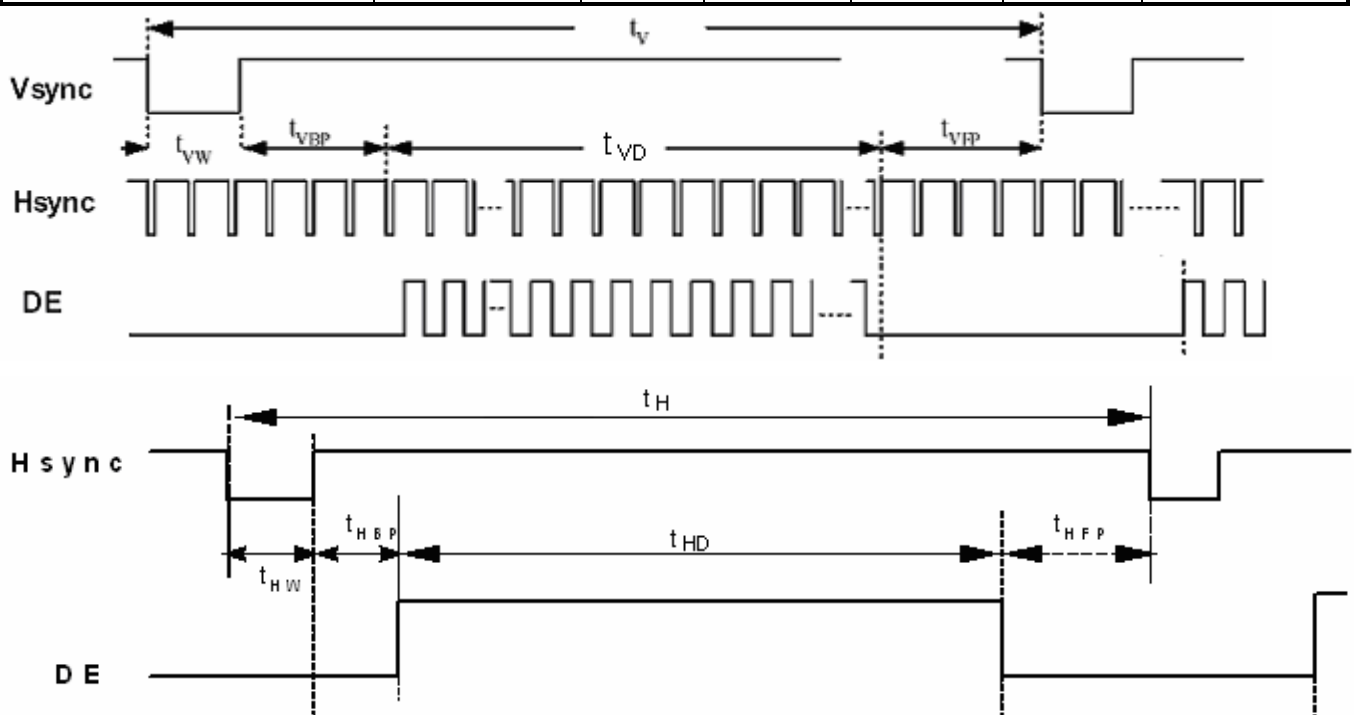
3.4.1. AC Electrical Characteristics

| Parameter | Symbol | Values | | | Unit | Remark |
|--|------------|--------|------|------|------|-----------------|
| | | Min. | Typ. | Max. | | |
| LVDS Differential input high Threshold voltage | R_{xVTH} | - | - | +100 | mV | $R_{xVCM}=1.2V$ |
| LVDS Differential input low Threshold voltage | R_{xVTL} | -100 | - | - | mV | |
| LVDS Differential input common mode voltage | R_{xVCM} | 0.7 | - | 1.6 | V | |
| LVDS Differential voltage | $ V_{ID} $ | 100 | - | 600 | mV | |

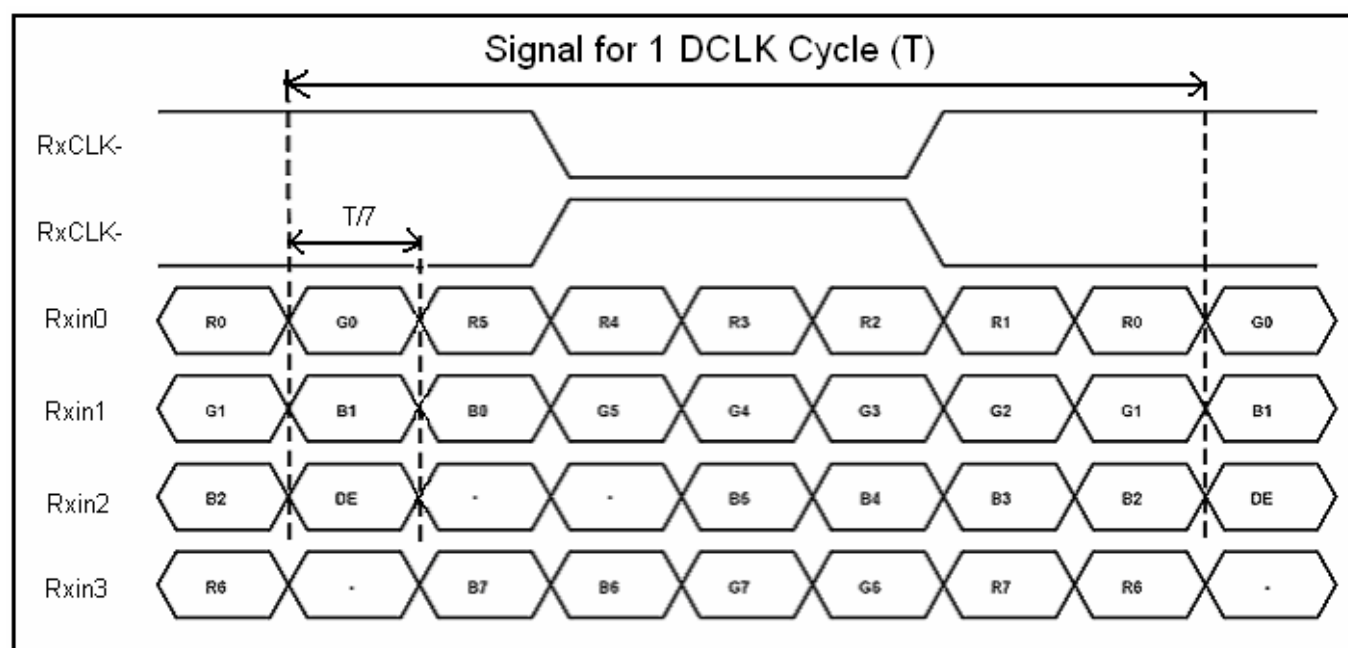


3.4.2. Timing Table

| Item | Symbol | Values | | | Unit | Remark |
|--------------------------------------|---|--------|------|--------|----------------|------------------|
| | | Min. | Typ. | Max. | | |
| Clock Frequency | 1/Tc | (68.9) | 71.1 | (73.4) | MHz | Frame rate =60Hz |
| Horizontal display area | t _{HD} | 1280 | | | Tc | |
| HS period time | t _H | (1410) | 1440 | (1470) | Tc | |
| HS Width +Back Porch +Front Porch | t _{HW} + t _{HBP} +t _{HFP} | (60) | 160 | (190) | Tc | |
| Vertical display area | t _{VD} | 800 | | | t _H | |
| VS period time | t _v | (815) | 823 | (833) | t _H | |
| VS Width +Back Porch +Front Porch | t _{VW} + t _{VBP} +t _{VFP} | (15) | 23 | (33) | t _H | |



3.4.3. LVDS Data Input Format



4. Optical Specifications

| Item | Symbol | Condition | Values | | | Unit | Remark |
|---------------------------|------------|---------------------------------|--------|------|------|-------------------|------------------|
| | | | Min. | Typ. | Max. | | |
| Viewing angle (CR≥ 10) | θ_L | $\Phi=180^\circ$ (9 o'clock) | 75 | 85 | - | degree | Note 1 |
| | θ_R | $\Phi=0^\circ$ (3 o'clock) | 75 | 85 | - | | |
| | θ_T | $\Phi=90^\circ$ (12 o'clock) | 75 | 85 | - | | |
| | θ_B | $\Phi=270^\circ$ (6 o'clock) | 75 | 85 | - | | |
| Response time | T_{ON} | Normal $\theta=\Phi=0^\circ$ | - | 10 | 20 | msec | Note 3 |
| | T_{OFF} | | - | 15 | 30 | msec | Note 3 |
| Contrast ratio | CR | | 600 | 800 | - | - | Note 4 |
| Color chromaticity | W_X | | 0.26 | 0.31 | 0.34 | - | Note 2 Note 5 |
| | W_Y | | 0.27 | 0.33 | 0.35 | - | Note 6 |
| Luminance | L | | 300 | 350 | - | cd/m ² | 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 $25^\circ C$..
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

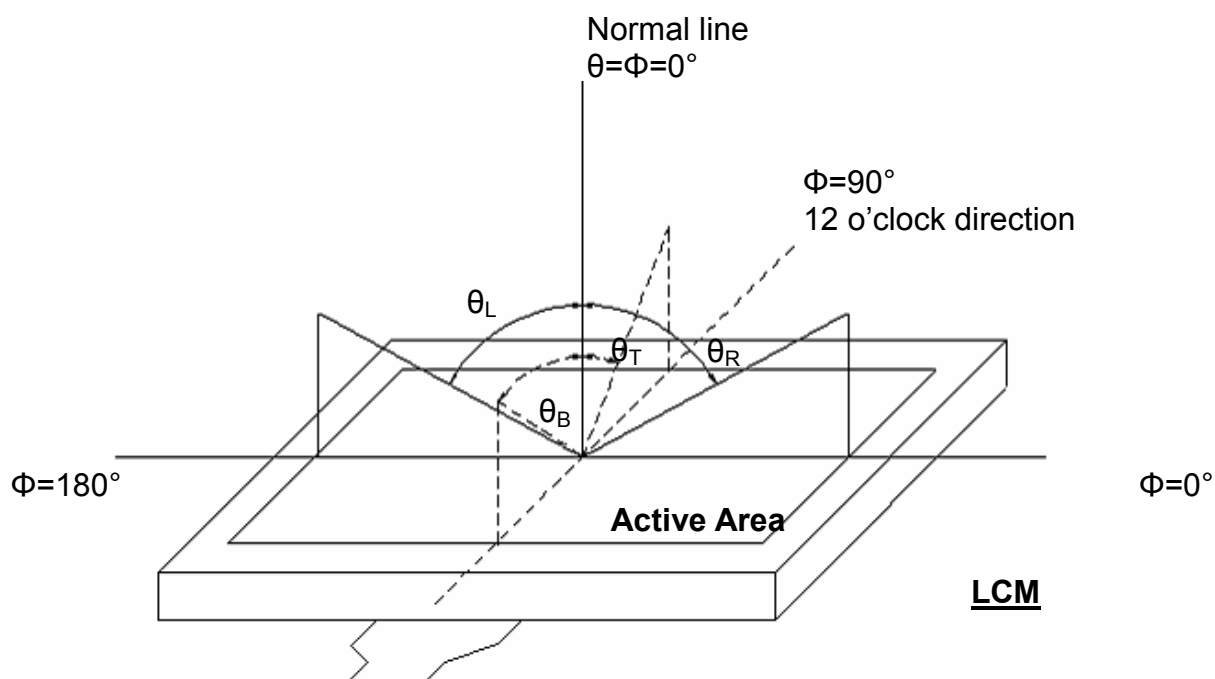


Fig. 4-1 Definition of viewing angle

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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

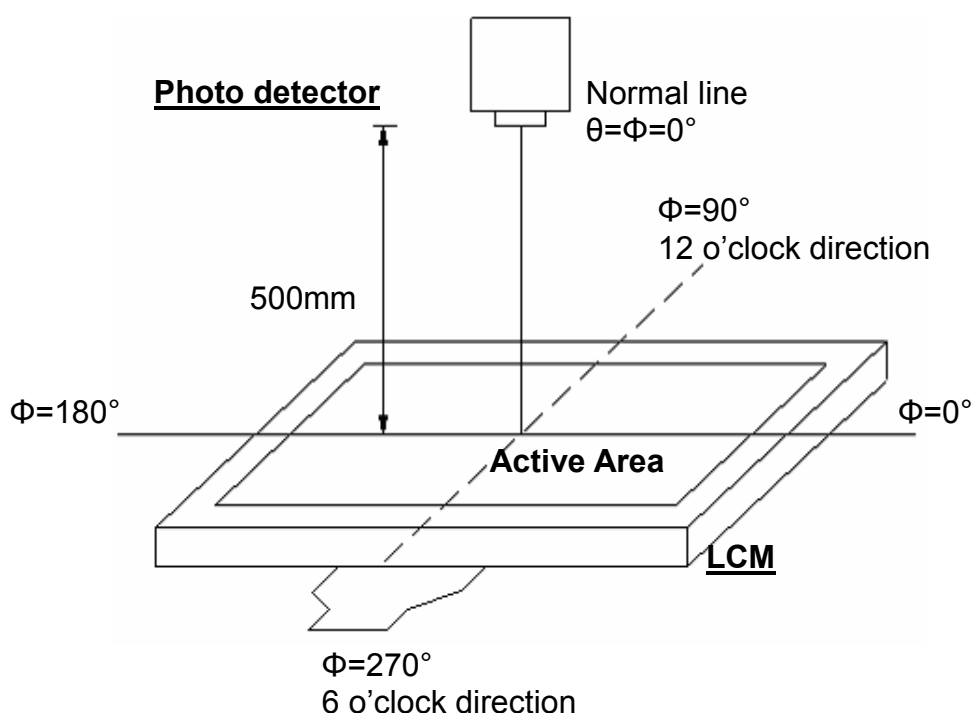


Fig. 4-2 Optical measurement system setup

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%.

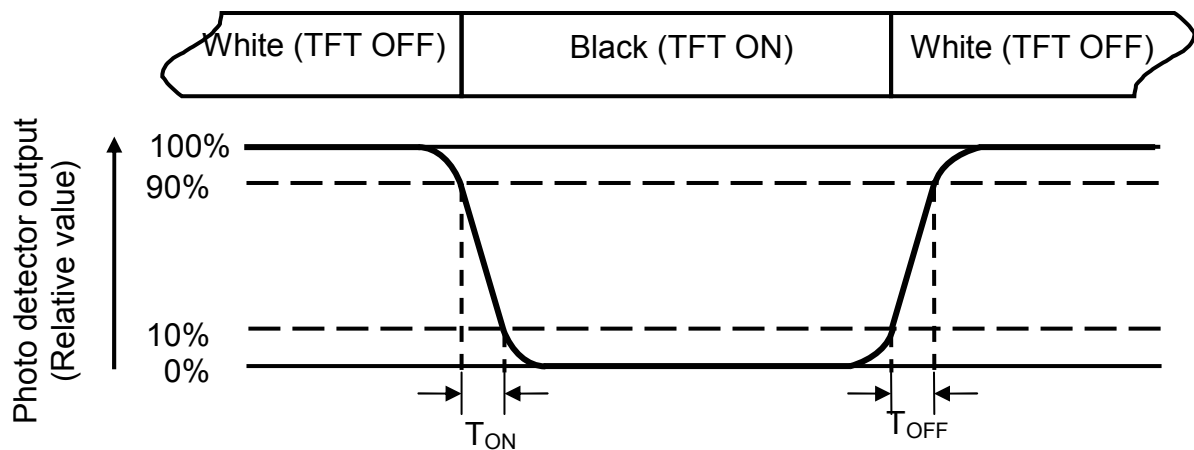


Fig. 4-3 Definition of response time

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)

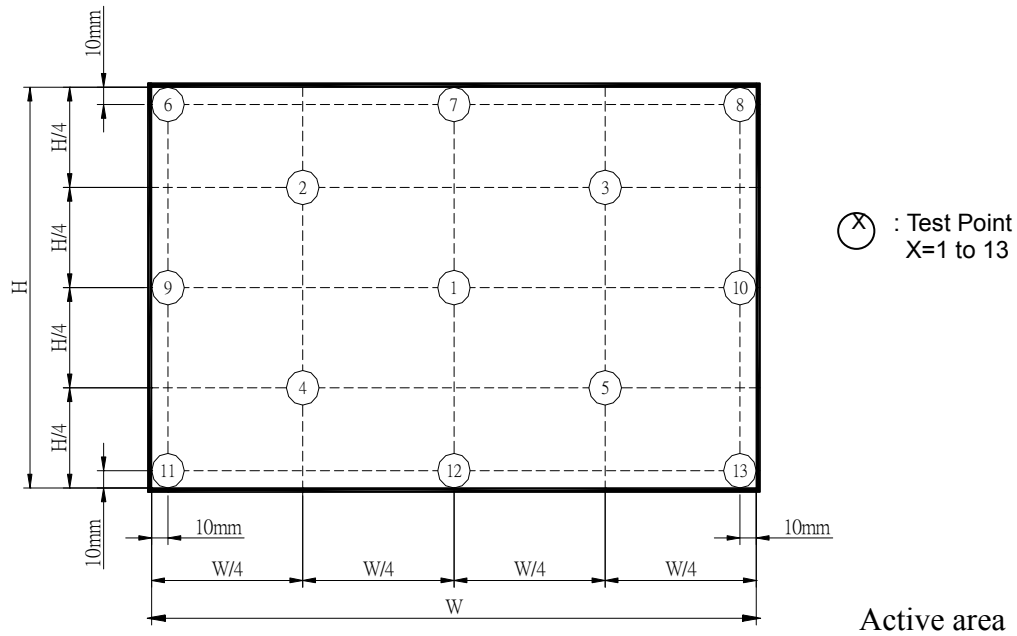
Color coordinates measured at center point of LCD.

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

Note 7: Definition of Luminance Uniformity

Measure the luminance of gray level 63 at 9 points

$$\delta W_{9p} = \left\{ \frac{\text{Minimum } [L(1) + L(6) + L(7) + L(8) + L(9) + L(10) + L(11) + L(12) + L(13)]}{\text{Maximum } [L(1) + L(6) + L(7) + L(8) + L(9) + L(10) + L(11) + L(12) + L(13)]} \right\} * 100\%$$



5. Reliability Test Items

(Note3)

| Item | Test Conditions | Remark |
|--|--|----------------|
| High Temperature Storage | Ta = 60℃ 120hrs | Note 1, Note 4 |
| Low Temperature Storage | Ta = -20℃ 120hrs | Note 1, Note 4 |
| High Temperature Operation | Ts = 50℃ 120hrs | Note 2, Note 4 |
| Low Temperature Operation | Ta = 0℃ 120hrs | Note 1, Note 4 |
| Operate at High Temperature and Humidity | +40℃, 90%RH 120hrs | Note 4 |
| Thermal Shock | -20℃/30 min ~ +60℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature. | Note 4 |
| 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) | |
| Mechanical Shock | 100G 6ms,±X, ±Y, ±Z 3 times for each direction | |
| Package Vibration Test | Random Vibration : ISTA-3A 1Hz~200Hz,Grms=0.53 Half hours for direction of Z. | |
| Package Drop Test | Height:60 cm 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.

6. General Precautions

6.1. 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.

6.2. 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.

6.3. Static Electricity

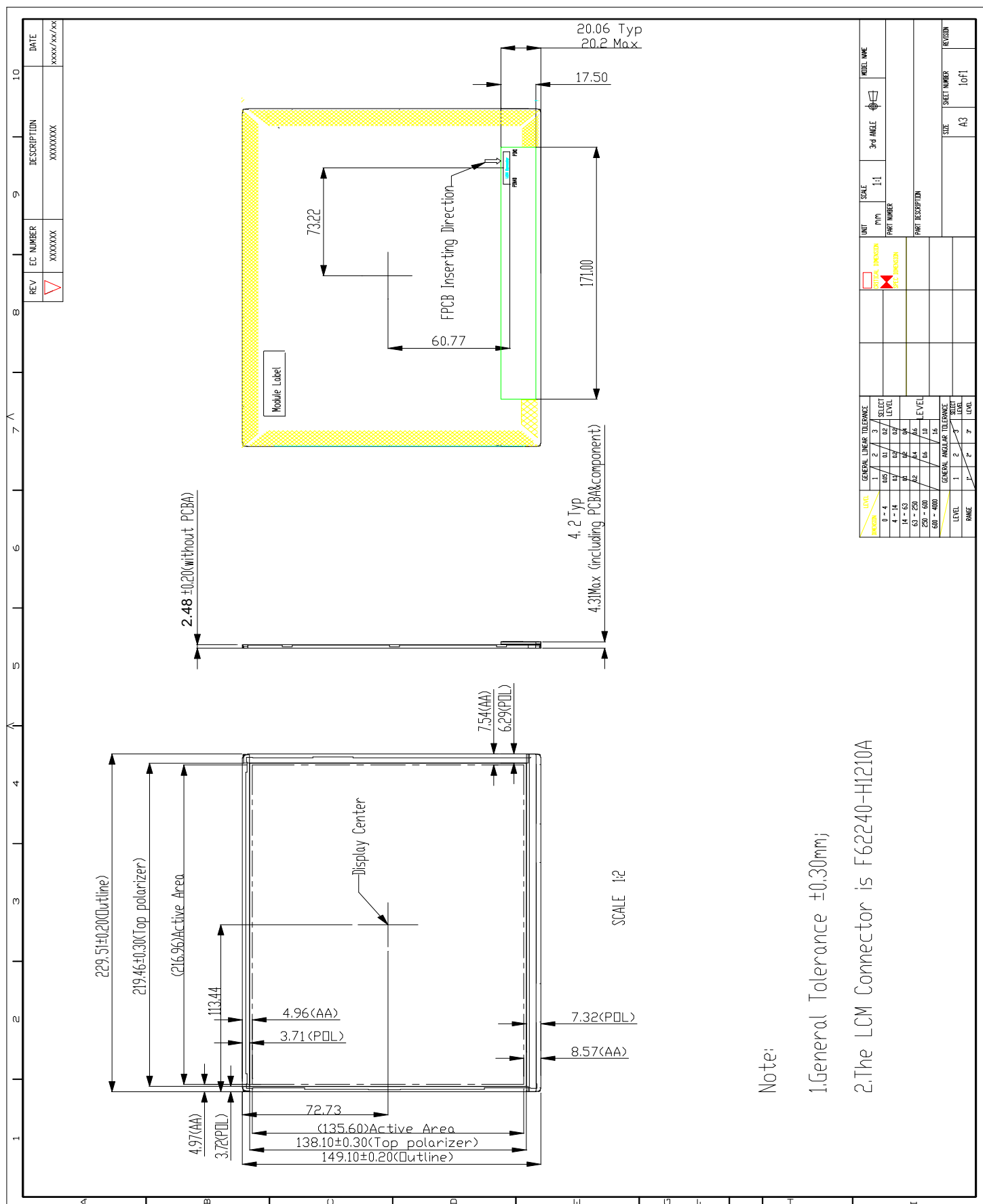
1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

6.4. Storage

1. Store the module in a dark room where must keep at $25\pm10^{\circ}\text{C}$ 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.

6.5. 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. Package Drawing

8.1. Packaging Material Table

TBD

8.2. Packaging Quantity

TBD

8.3. Packaging Drawing

TBD
