# LCD MODULE
# SPECIFICATION

**Customer:**

**Model Name:** HC050IG40029-D58V.C

**Date:** 2022.08.31

**Version:** 03

■**Preliminary Specification**

☐**Final Specification**

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

| Approved by | Reviewed by | Prepared by |
|---|---|---|
|  |  |  |

# Record of Revision

| Version | Revise Date | Page | Content |
|---|---|---|---|
| Pre-Spec.01 | 2022.01.20 | All | Initial Release |
| Pre-Spec.02 | 2022.06.27 | 2 | Update the PIN |
| Pre-Spec.03 | 2022.08.31 | 2 | Update the PIN |

# 1. General Specifications

| No. | Item | Specification | Remark |
|---|---|---|---|
| 1 | LCD size | 5.0 inch(Diagonal) | |
| 2 | Driver element | a-Si TFT active matrix | |
| 3 | Resolution | 800× 3(RGB) × 480 | |
| 4 | Display mode | Normally Black, IPS | |
| 5 | Dot pitch | 0.135(W) ×0.135(H) mm | |
| 6 | Active area | 108(W) ×64.8 (H) mm | |
| 7 | Module size | 130.70(W) ×85.80(H) ×4.68(D)    mm | Note 1 |
| 8 | TP Surface treatment | 6H | |
| 9 | Color arrangement | RGB-stripe | |
| 10 | LCM Interface | Digital | |
| 11 | TOUCH Interface | USB | |
| 12 | Panel power consumption | TBD | |
| 13 | Weight | TBD | |

Note 1: Refer to Mechanical Drawing.

# 2. Pin Assignment

LCM

| Pin No. | Symbol | I/O | Function | | Remark |
|---------|--------|-----|----------|---|--------|
| 1 | VDD | P | Power Voltage for digital circuit (VDD5V) | | |
| 2 | VDD | P | Power Voltage for digital circuit(VDD5V) | | |
| 3 | VDD | P | Power Voltage for digital circuit(VDD5V) | | |
| 4 | LVDS EN | I | LVDS VCC Power EN(Active High) | | |
| 5 | GND | P | Ground | | |
| 6 | GND | P | Ground | | |
| 7 | RXIN0- | I | -LVDS0 differential data input | | |
| 8 | RXIN0+ | I | +LVDS0 differential data input | | |
| 9 | RXIN1- | I | -LVDS0 differential data input | | |
| 10 | RXIN1+ | I | +LVDS0 differential data input | | |
| 11 | RXIN2- | I | -LVDS0 differential data input | | |
| 12 | RXIN2- | I | +LVDS0 differential data input | | |
| 13 | GND | P | Ground | | |
| 14 | GND | P | Ground | | |
| 15 | RXCLKIIN- | I | -LVDS0 differential clock input | | |
| 16 | RXCLKIN+ | I | +LVDS0 differential clock input | | |
| 17 | RXIN3- | I | -LVDS0 differential data input | | |
| 18 | RXIN3+ | I | +LVDS0 differential data input | | |
| 19 | LED EN PWM | I | Backlight Power EN(Active High) and PWM | | |
| 20 | NC | I | No Connect | | |

# 3. Operation Specifications

## 3.1. Absolute Maximum Ratings

(Note 1)

| Item | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Supply voltage | $V_{DD}$ | -0.3 | 5.5 | V | |
| Operation Temperature | $T_{OP}$ | -20 | 70 | ℃ | |
| Storage Temperature | $T_{ST}$ | -20 | 70 | ℃ | |
| LED Reverse Voltage | VR | - | 5 | V | Each LED Note 2 |
| LED Forward Current | IF | - | 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

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ | Max. | | |
| Power voltage | $V_{DD}$ | 3.5 | 5.0 | 5.5 | V | Note 2 |
| Current for Driver | $IV_{DD}$ | - | 17 | 25 | mA | |
| Input logic high voltage | $V_{IH}$ | $0.8 V_{DD}$ | - | $V_{DD}$ | V | Note 3 |
| Input logic low voltage | $V_{IL}$ | 0 | - | $0.2 V_{DD}$ | V | |

### 3.1.2. Backlight Driving Conditions

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Voltage for LED backlight | $V_L$ | 16 | 18 | 18.6 | V | Note 1 |
| Current for LED backlight | $I_L$ | -- | 40 | -- | 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
$I_L$ =40mA.
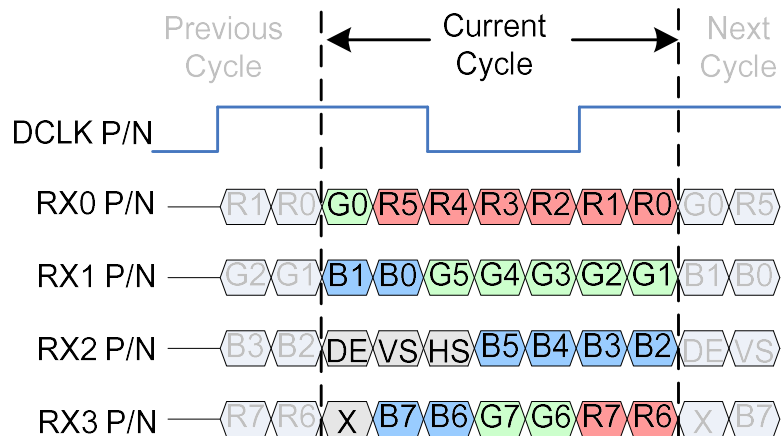
Note 2: The "LED life time" is defined as the module brightness decrease to 50% original
brightness at Ta=25℃ and $I_L$ =40mA. The LED lifetime could be decreased if operating $I_L$ is lager than 40mA.
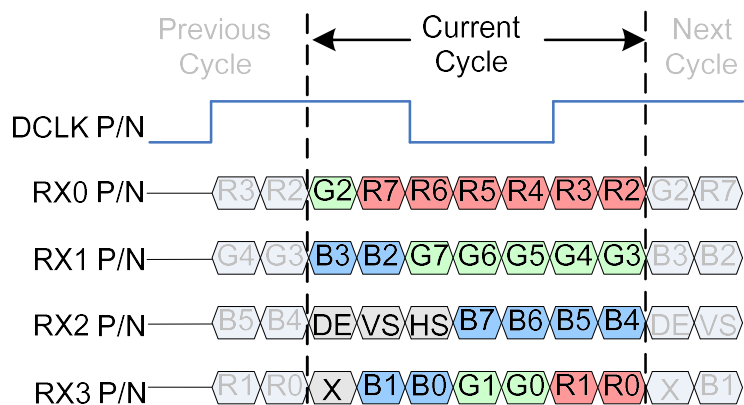
## CIRCUIT DIAGRAM(6✳2 LED)
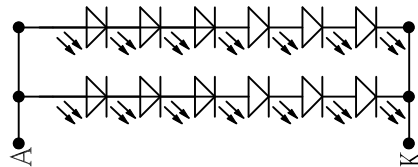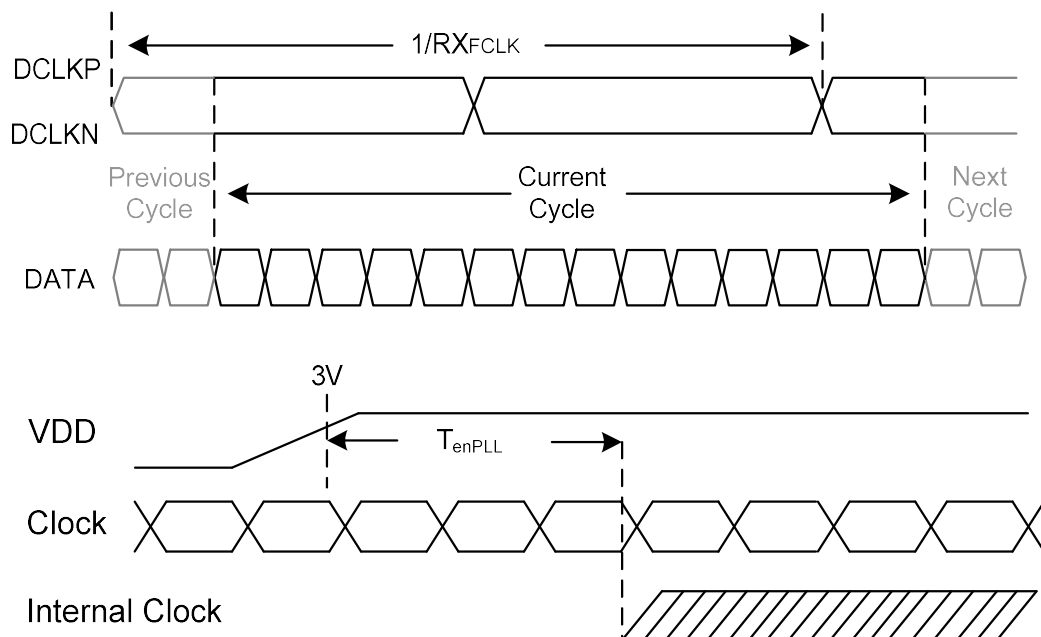
# 3.2. Timing Characteristics
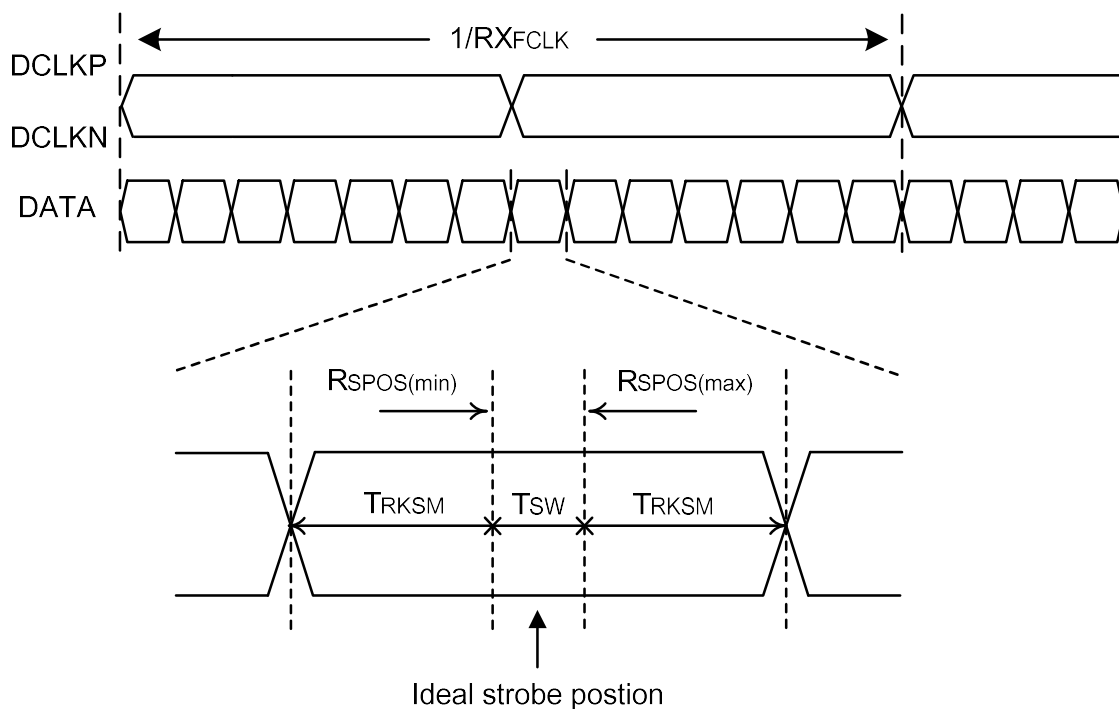
## 4 Lane VESA Data Format Color Bit Map



## 4 Lane JEIDA Data Format Color Bit Map



### 3.2.1 LVDS Input Timing Table

DCLKP

DCLKN

DATA

1/RX$_{FCLK}$

R$_{SPOS(min)}$    R$_{SPOS(max)}$

T$_{RKSM}$    T$_{SW}$    T$_{RKSM}$

Ideal strobe postion

R$_{RKSM}$ : Receiver strobe margin
R$_{SPOS}$ : Receiver strobe position
T$_{SW}$ : Strobe width (internal DATA sampling window)

LVDS Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Clock Frequency | RX$_{FCLK}$ | 23 | 25 | 27 | MHz | |
| Input Data Skew Margin | T$_{RSKM}$ | 400 | - | - | ps | |
| Clock High Time | T$_{LVCH}$ | 4/(7 x RX$_{FCLK}$) | | | ns | |
| Clock Low Time | T$_{LVCL}$ | 3/(7 x RX$_{FCLK}$) | | | ns | |
| PLL Wake-up Time | T$_{enPLL}$ | - | - | 150 | us | |
| LVDS Spread Spectrum Clocking (SSC) Tolerance of LVDS Receiver | | | | | | |
| Modulation Frequency | SSC$_{MF}$ | - | - | 100 | KHz | |
| Modulation Rate | SSC$_{MR}$ | - | - | +/-3 | % | |

*Note. The maximum RXFCLK Frequency is 27MHz. If the case needs faster RXFCLK, please contact Sitronix first.*

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Horizontal display area | thd | | 800 | | DCLK |
| DCLK frequency | Fclk | – | 33 | 50 | MHZ |
| 1 Horizontal   line | th | | 1056 | | DCLK |
| HSYNC pulse width | thpw | 1 | | 40 | |
| HSYNC Back Porch (blanking) | thb | – | 46 | – | |
| HSYNC front porch | thfp | 16 | 210 | 354 | |
| Vertical display area | tvd | | 480 | | H |
| VSD period time | tv | 510 | 525 | 650 | |
| VSD pulse width | tvpw | 1 | – | 20 | |
| VSD Back Porch (blanking) | tvb | – | 23 | – | |
| VSD front porch | tvfp | 7 | 22 | 147 | |

# 4. Optical Specifications

| Item | Symbol | Condition | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Viewing angle (CR≥ 10) | $\theta_L$ | Φ=180°(9 o'clock) | - | 80 | - | degree | Note 1 |
| | $\theta_R$ | Φ=0°(3 o'clock) | - | 80 | - | | |
| | $\theta_T$ | Φ=90°(12 o'clock) | - | 80 | - | | |
| | $\theta_B$ | Φ=270°(6 o'clock) | - | 80 | - | | |
| Response time | $T_{ON}$ | Normal θ=Φ=0° | - | 10 | 20 | msec | Note 3 |
| | $T_{OFF}$ | | - | 10 | 20 | msec | Note 3 |
| Contrast ratio | CR | | 800 | 1000 | - | - | Note 4 |
| Color chromaticity | $W_X$ | | 0.26 | 0.32 | 0.36 | - | Note 2 Note 5 Note 6 |
| | $W_Y$ | | 0.28 | 0.34 | 0.38 | - | |
| Luminance with CTP | | | | 300 | | cd/m2 | |

Test Conditions:
1. $V_{DD}$=3.3V, $I_L$=40mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

Normal line
θ=Φ=0°

Φ=90°
12 o'clock direction

$\theta_L$   $\theta_T$

$\theta_B$   $\theta_R$

Φ=180°                                                           Φ=0°
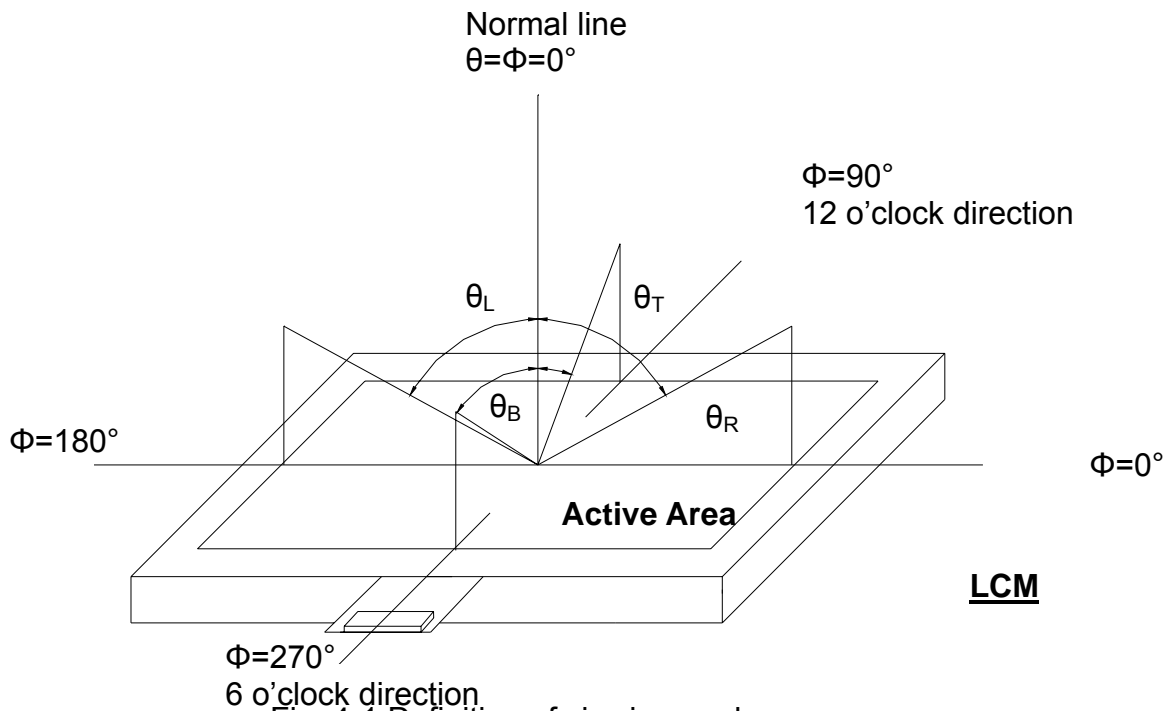
Active Area

LCM

Φ=270°
6 o'clock direction

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.)

Photo detector

Normal line
θ=Φ=0°

Φ=90°
12 o'clock direction

500mm

Active Area

Φ=180°                                                           Φ=0°
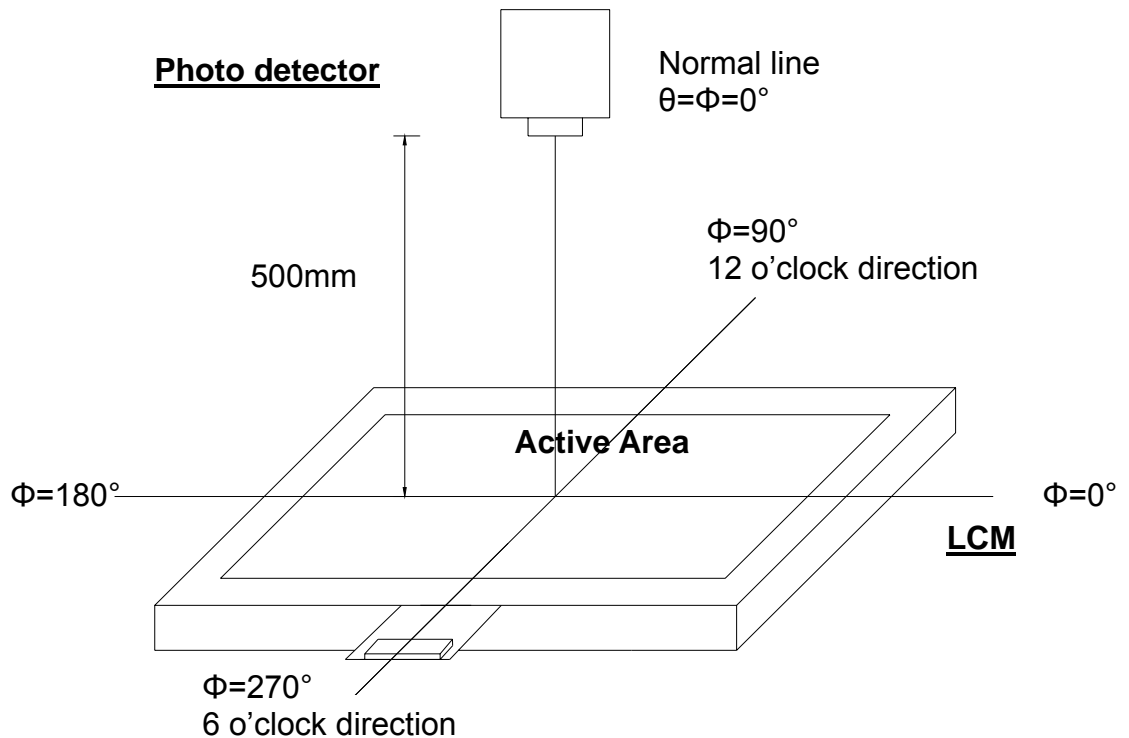
LCM

Φ=270°
6 o'clock direction

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%.
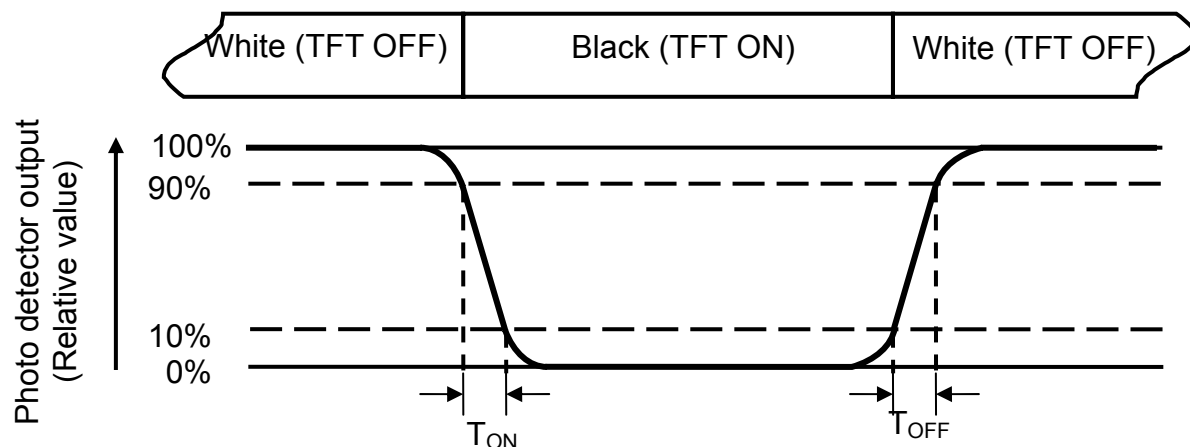


Fig. 4-3 Definition of response time

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 $I_L$=40mA .

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.

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

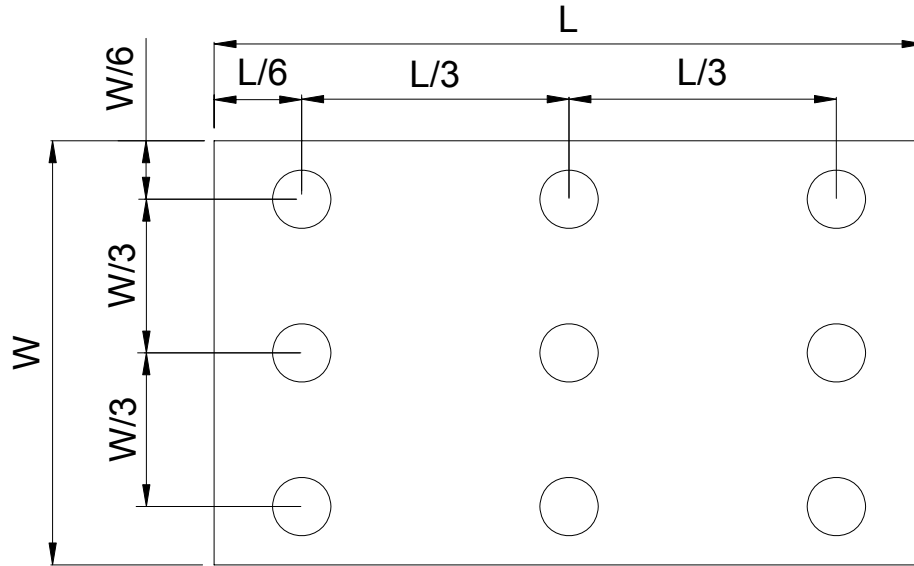L-------Active area length     W----- Active area width



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. Reliability Test Items

| Item | Test Conditions | Remark |
|---|---|---|
| High Temperature Storage | Ta = 70℃                    240hrs | Note 1，Note 4 |
| Low Temperature Storage | Ta = -20 ℃                   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 | -10℃/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<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.

# 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±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.

## 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.

# 7.Mechanical Drawings

**Front**

85.80±0.1 CTP OD
75.80±0.2 LCM OD
3.11
10.00 | 65.80 CTP AA
10.50 | 64.80 LCM AA
5.00
10.85
11.35

BLACK INK

5.0 IPS
800*RGB*480
View Direction:All

120.70±0.2 LCM OD
109.00 CTP VA
108.00 LCM AA
130.70±0.1 CTP OD

IC
USB

R5.00

**Side**

0.70 COVER
0.20 OCA
0.70 SENSOR
0.20 OCA
2.90±0.2 LCM
LCM+CTP=4.68±0.2

**Back**

USB
IC

Tape A USB
USB CABLE 500mm
2*15PIN/PIN2.0mm
LVDS CABLE 300mm

NOTES:
1.Display size:5.0"IPS 800*480
2.Viewing direction:Full View
3.Display mode:Transmissive/Normal black/Anti-glare
4.Operation temperature:-20°C~+70°C
5.Storage temperature:-20°C~+70°C
6.Unspecification tolerance are ±0.2mm

| CTP | |
|---|---|
| PIN | Definition |
| 1 | VCC |
| 2 | DATE- |
| 3 | DATE+ |
| 4 | GND |

| LCM | |
|---|---|
| PIN | Assignment |
| 1 | VDD 5V |
| 2 | VDD 5V |
| 3 | VDD 5V |
| 4 | LVDS EN |
| 5 | GND |
| 6 | GND |
| 7 | LVDS0_D0N |
| 8 | LVDS0_D0P |
| 9 | LVDS0_D1N |
| 10 | LVDS0_D1P |
| 11 | LVDS0_D2N |
| 12 | LVDS0_D2P |
| 13 | GND |
| 14 | GND |
| 15 | LVDS0_CLK0N |
| 16 | LVDS0_CLK0N |
| 17 | LVDS0_D3N |
| 18 | LVDS0_D3P |
| 19 | GND |
| 20 | LED EN PWM |

| VERSION | DATE | | REV | DESCRIPTIONS | DATE |
|---|---|---|---|---|---|
| NO. | UNIT: mm | | 01 | NEW | 2022.01.20 |
| SCALE 1:1 | | | | | |
| APPROVED William | CHECKED Bombi | DRAWN Zane | | | |

TITLE:

FILE NAME:HC050IG40029-D58V.C