**Doc. Number :**

☐ Tentative Target Specification
☐ Preliminary Specification
■ Approval Specification

# MODEL NO.: G070ACE
# SUFFIX: L01

**Customer:**

**APPROVED BY** **SIGNATURE**

**Name / Title**
Note

Please return 1 copy for your confirmation with your signature and comments.

| Approved By | Checked By | Prepared By |
|---|---|---|
| 陳立錚 | 林秋森 | 阮志昌 |

# CONTENTS

# REVISION HISTORY

| Version | Date | Page | Description |
|---|---|---|---|
| 2.0 | Sep.6, 2019 | All | Spec Ver. 2.0 was first issued. |
| 2.1 | Apr.30, 2020 | 24 | Modify 2D drawing. |
| | Jun.15, 2020 | 21 | Add UL code on module label. |
| 2.2 | Mar.5, 2021 | AII | Approval Specification was first issued |
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# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

G070ACE-L01 is a 7” TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 1ch-LVDS interface. This module supports 800xRGBx480 AAS mode and can display 262k or 16.7M colors.

## 1.2 GENERAL SPECIFICATIONS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Screen Size | 7” real diagonal | | |
| Driver Element | a-si TFT active matrix | - | - |
| Pixel Number | 800 x R.G.B. x 480 | pixel | - |
| Pixel Pitch | 0.1905 (H) x 0.1905 (V) | mm | - |
| Pixel Arrangement | RGB stripe | - | - |
| Display Colors | 16.7M / 262K | color | - |
| Transmissive Mode | Normally Black | - | - |
| Surface Treatment | AG type, 3H hard coating, | - | - |
| Luminance, White | 500(Typ.) | Cd/m2 | |
| Color Gamut | 70 % of NTSC(Typ.) | - | - |
| Power Consumption | Total 2.48 W (Typ) @ cell 0.48 W (Typ), BL 2.0 W (Typ) | | |

# 2. MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal (H) | 169.5 | 170 | 170.5 | mm | (1) (2) |
| | Vertical (V) | 109.5 | 110 | 110.5 | mm | |
| | Thickness (T) | 5.5 | 6 | 6.5 | mm | |
| Bezel Area | Horizontal | 154.1 | 154.40 | 154.7 | mm | |
| | Vertical | 93.14 | 93.44 | 93.74 | mm | |
| Active Area | Horizontal | - | 152.4 | - | mm | |
| | Vertical | - | 91.44 | - | mm | |
| Weight | | 173.66 | 182.8 | 191.94 | g | |

Note (1) Module Outline Size without User hold. (Based on 2D Drawing)

(2) Module Thickness Size without PCBA/Connector. (Based on 2D Drawing)

## 3. ABSOLUTE MAXIMUM RATINGS

### 3.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | Tst | -40 | 90 | ℃ | (1), (2) |
| Operating Ambient Temperature | Top | -30 | 85 | ℃ | (1), (2) |

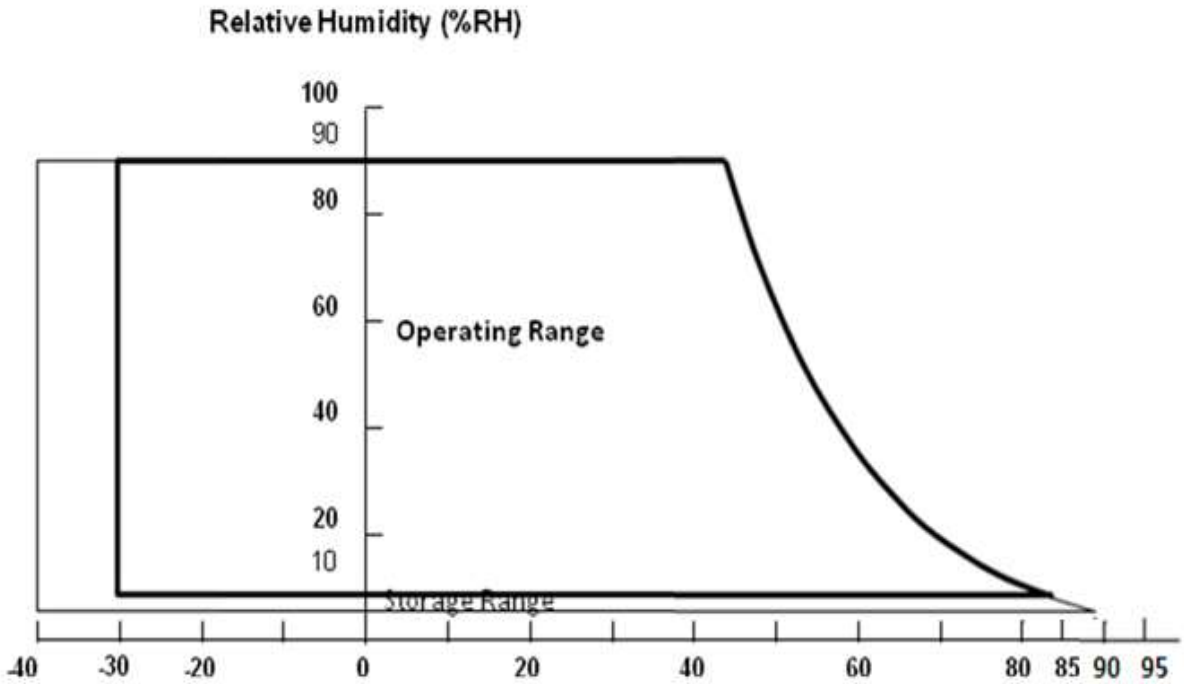
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The absolute maximum rating values of this product are not allowed to be exceeded at any times. The module should not be used over the absolute maximum rating value. It will cause permanently unrecoverable function fail in such an condition



## 3.2 ELECTRICAL ABSOLUTE RATINGS

### 3.2.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | Vcc | -0.3 | 3.6 | V | (1) |
| Logic Input Voltage | $V_{IN}$ | -0.3 | 3.6 | V | |

### 3.2.2 BACKLIGHT CONVERTER

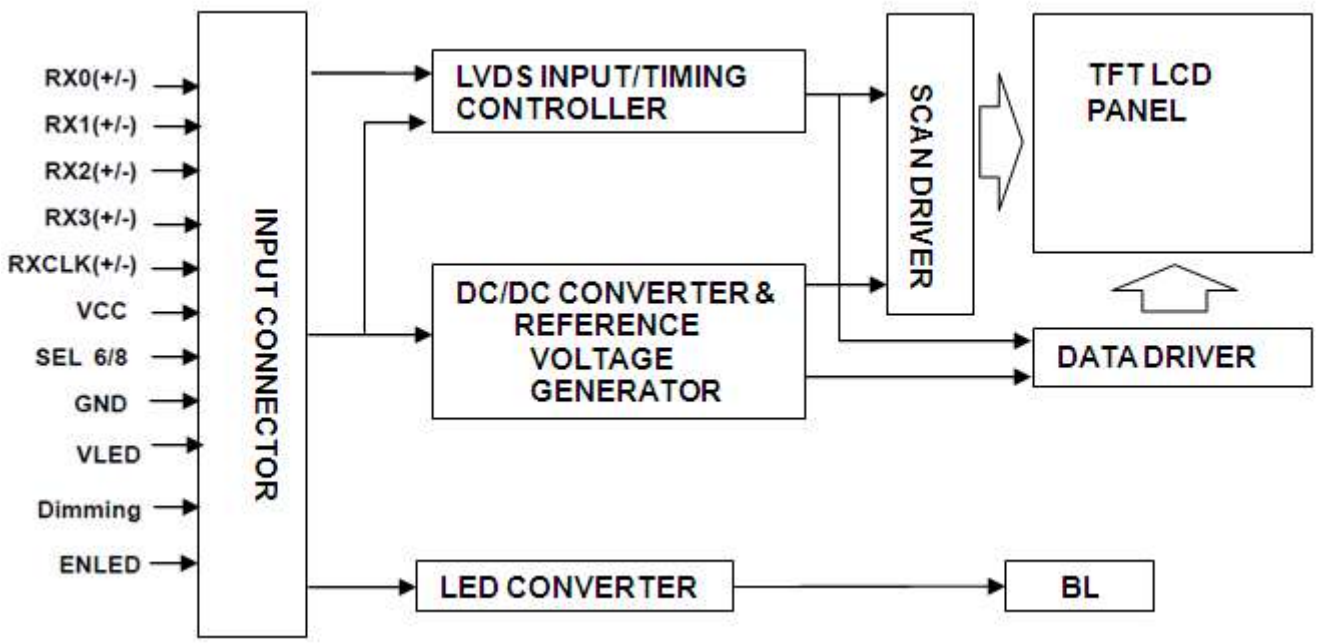
| Item | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ | Max. | | |
| Converter Voltage | LED_$V_{in}$ | 0 | 12.0 | 18.0 | V | (1), (2) Duty=100% |
| Enable Voltage | LED_EN | 0 | 3.3 / 5 | 7 | V | |
| Backlight Adjust | LED_PWM | 0 | 3.3 / 5 | 7 | V | (1), (2) Pulse Width≦10msec. and Duty≦10% |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 ℃

## 4. ELECTRICAL SPECIFICATIONS

### 4.1 FUNCTION BLOCK DIAGRAM



## 4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

| Pin No. | Symbol | Description | Note |
|---|---|---|---|
| 1 | 12V | LED power | - |
| 2 | 12V | LED power | - |
| 3 | 12V | LED power | - |
| 4 | 12V | LED power | - |
| 5 | ENLED | Enable pin | - |
| 6 | Dimming | Backlight Adjust | - |
| 7 | NC | No Conncetion (Reserve for INX test) | (3) |
| 8 | NC | No Conncetion (Reserve for INX test) | (3) |
| 9 | VCC | Power supply: +3.3V | - |
| 10 | VCC | Power supply: +3.3V | - |
| 11 | GND | Ground | - |
| 12 | GND | Ground | - |
| 13 | RX0- | Negative transmission data of pixel 0 | - |
| 14 | RX0+ | Positive transmission data of pixel 0 | - |
| 15 | GND | Ground | - |
| 16 | RX1- | Negative transmission data of pixel 1 | - |
| 17 | RX1+ | Positive transmission data of pixel 1 | - |
| 18 | GND | Ground | - |
| 19 | RX2- | Negative transmission data of pixel 2 | - |
| 20 | RX2+ | Positive transmission data of pixel 2 | - |
| 21 | GND | Ground | - |
| 22 | RXCLK- | Negative of clock | - |
| 23 | RXCLK+ | Positive of clock | - |
| 24 | GND | Ground | - |
| 25 | RX3- | Negative transmission data of pixel 3 | - |
| 26 | RX3+ | Positive transmission data of pixel 3 | - |
| 27 | GND | Ground | - |
| 28 | SEL6/8 | LVDS 6/8 bit select function control,<br>Low → 6 bit Input Mode<br>High or NC → 8bit Input Mode | (2) |
| 29 | GND | Ground | - |
| 30 | GND | Ground | - |

Note (1) Connector Part No.: Starconn 093G30-B0001A-G4.or P-TWO 187114-30091

Note (2) User's connector Part No:

Mating Wire Cable Connector Part No. :FI-X30H (JAE) or FI-X30HL (JAE)

Note (3) "Low" stands for 0V. "High" stands for 3.3V

Note (4) Pin7, Pin8 input signals should be set to no connection or ground, this module

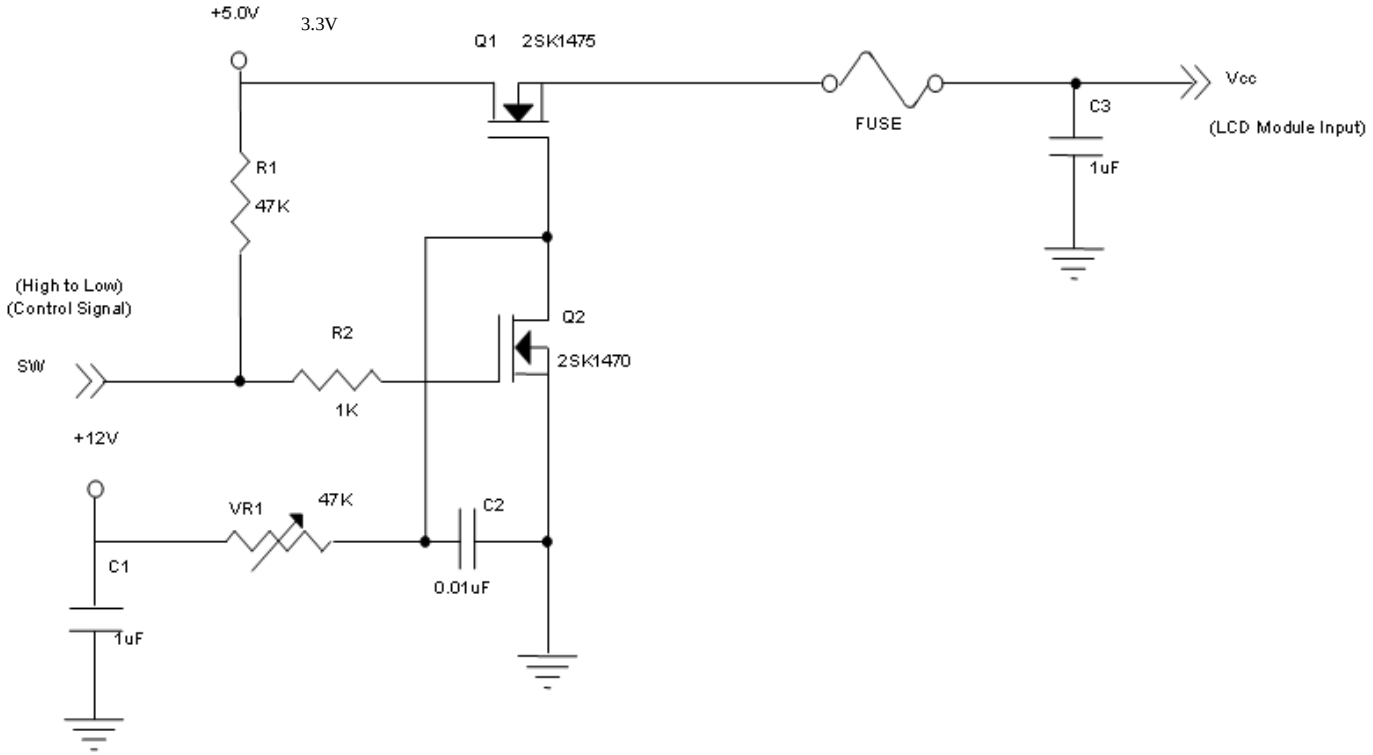
## 4.3 ELECTRICAL CHARACTERISTICS

### 4.3.1 LCD ELETRONICS SPECIFICATION

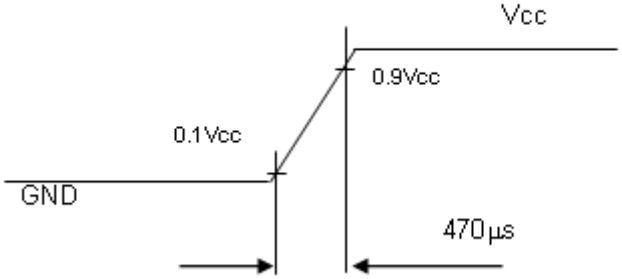
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | Vcc | 3.0 | 3.3 | 3.6 | V | - |
| Ripple Voltage | | $V_{RP}$ | - | - | 100 | mVp-p | - |
| Rush Current | | $I_{RUSH}$ | - | - | 2 | A | (2) |
| Power Supply Current | White | - | - | 135 | 200 | mA | (3)a |
| | Black | - | - | 85 | 135 | mA | (3)b |
| | Vertical Stripe | - | - | 145 | 220 | mA | (3)c |
| Power Consumption | | PLCD | - | 0.48 | 0.73 | W | |
| LVDS differential input voltage | | Vid | 200 | - | 600 | mV | |
| LVDS common input voltage | | Vic | 1.0 | 1.2 | 1.4 | V | |
| LVDS terminating resistor | | $R_T$ | - | 100 | - | ohm | |

Note (1) The ambient temperature is Ta = 25 ± 2 ℃.

Note (2) Measurement Conditions:

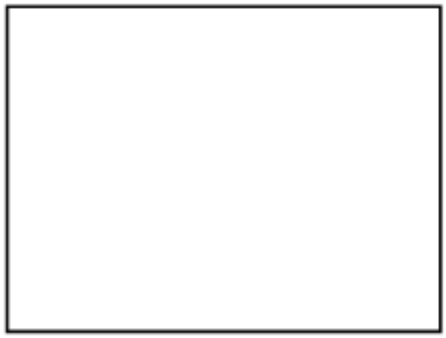



**Vcc rising time is 470μs**



Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ℃, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

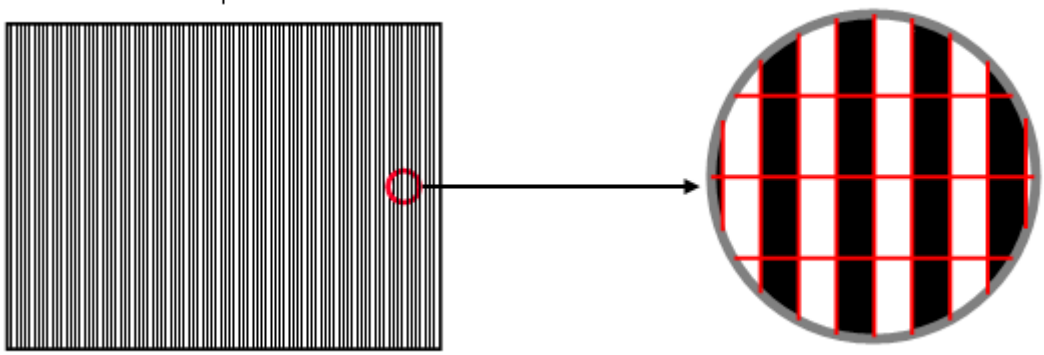


Active Area

b. Black Pattern

Active Area

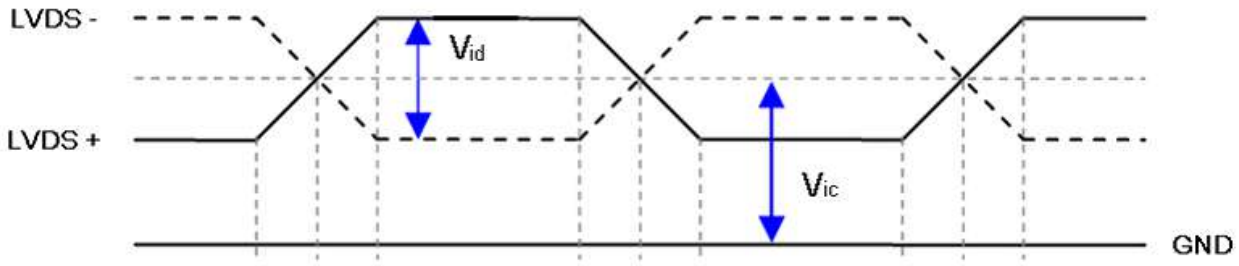
c. Vertical Stripe Pattern



Active Area

Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) VID waveform condition

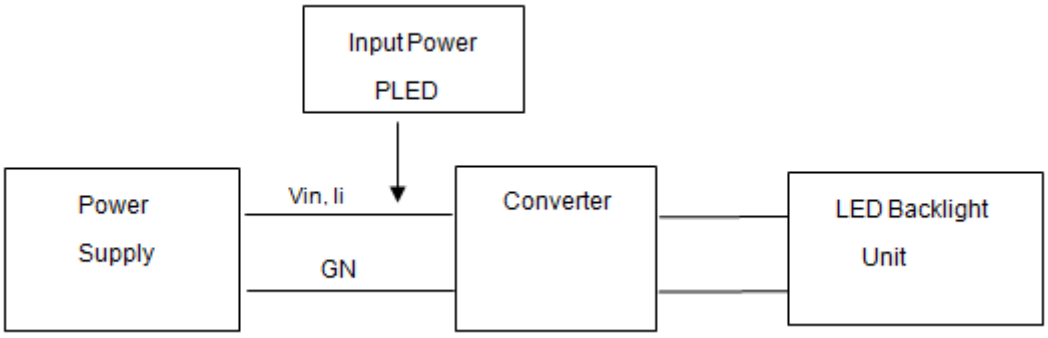


### 4.3.2 BACKLIGHT UNIT

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Converter Power Supply Voltage | | LED_Vin | 10.8 | 12.0 | 13.2 | V | |
| Converter Power Supply Current | | Ii | 0.1 | 0.17 | 0.2 | A | @LED_Vin= 12V Duty=100% |
| Converter Input Rush Current | | Iirsh | | 4.3 | | A | @LED_Vin rising = 1mS |
| Power Consumption | | $P_{LED}$ | | 2.0 | 2.3 | W | @ LED_Vin = 12V Duty=100% |
| EN Control Level | Backlight on | LED_EN | 2.0 | 3.3 | 5.0 | V | |
| | Backlight off | | 0 | - | 0.15 | | |
| PWM Control Level | PWM High Level | LED_PWM | 2.0 | -- | 5.0 | V | |
| | PWM Low Level | | 0 | -- | 0.15 | | |
| PWM Control Duty Ratio | | | 5 | -- | 100 | % | |
| PWM Control Frequency | | $f_{PWM}$ | 190 | 200 | 300 | Hz | |
| LED Life Time | | $L_L$ | 50,000 | | | Hrs | (2) |

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note (2) The lifetime of LED is estimated data and defined as the time when it continues to operate under the conditions at Ta = 25±2℃ and Duty 100% until the brightness becomes ≦ 50% of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.



## 4.4 LVDS INPUT SIGNAL SPECIFICATIONS

### 4.4.1 LVDS DATA MAPPING TABLE

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

## 4.5 DISPLAY TIMING SPECIFICATIONS

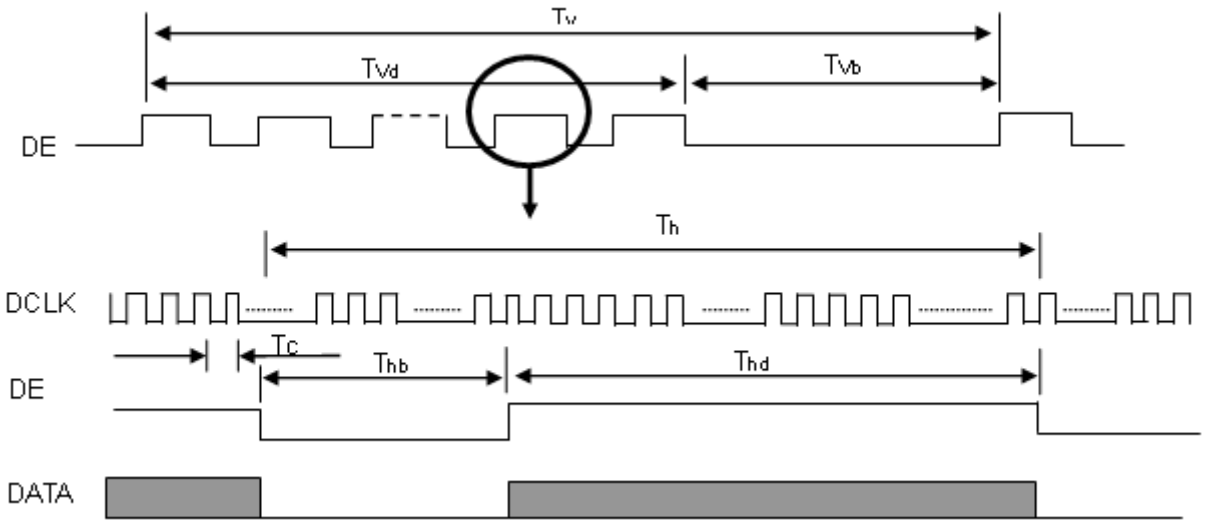
The input signal timing specifications are shown as the following table and timing diagram.

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Clock | Frequency | Fc | 25.2 | 25.4 | 35.7 | MHz | - |
| | Period | Tc | | 39.37 | | ns | |
| | Input cycle to cycle jitter | $T_{rcl}$ | -0.02*Tc | - | 0.02*Tc | ns | (3) |
| | Input clock to data skew | TLVCCS | -0.02*Tc | - | 0.02*Tc | ns | (4) |
| | Spread spectrum modulation range | Fclkin_mod | FC*98% | - | FC*102% | MHz | (5) |
| | Spread spectrum modulation frequency | $F_{SSM}$ | 23 | - | 93 | KHz | |
| Vertical Display Term | Frame Rate | Fr | - | 60 | - | Hz | - |
| | Total | Tv | 488 | 490 | 611 | Th | Tv=Tvd+Tvb |
| | Active Display | Tvd | 480 | 480 | 480 | Th | - |
| | Blank | Tvb | 8 | 10 | 131 | Th | - |
| Horizontal Display Term | Total | Th | 860 | 864 | 974 | Tc | Th=Thd+Thb |
| | Active Display | Thd | 800 | 800 | 800 | Tc | - |
| | Blank | Thb | 60 | 64 | 174 | Tc | - |

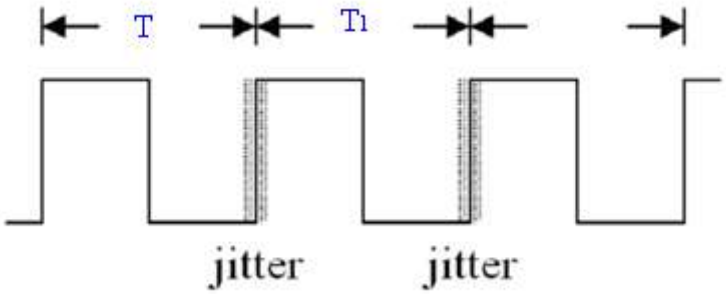
Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

Note (2) The Tv(Tvd+Tvb) must be integer, otherwise, this module would operate abnormally.

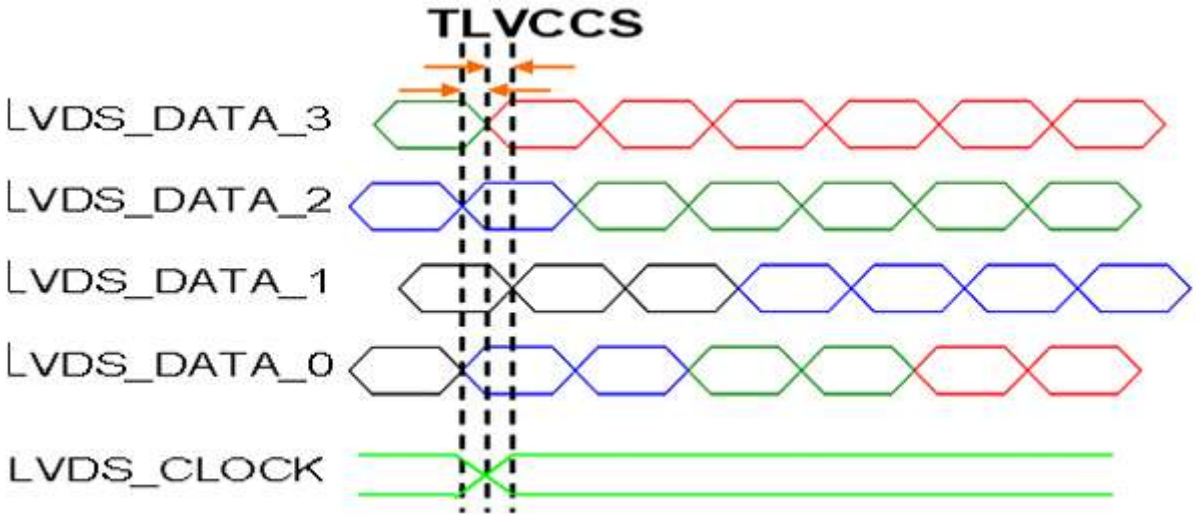
INPUT SIGNAL TIMING DIAGRAM



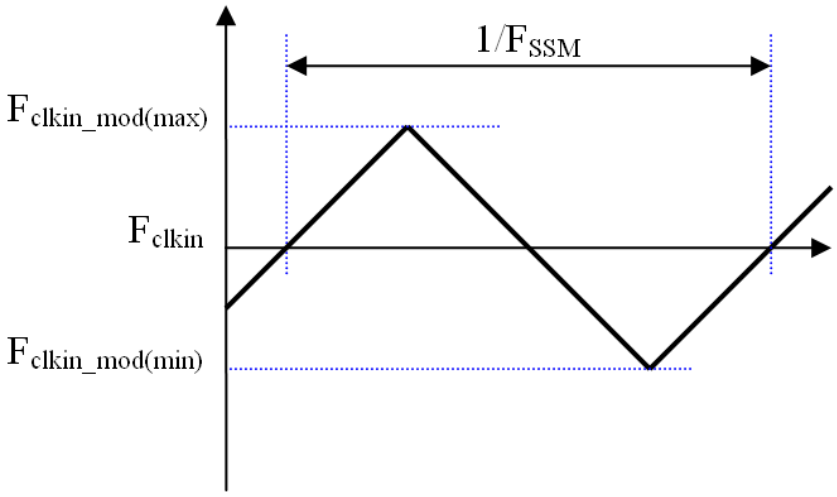
Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I $T_1$ – TI




Note (4) Input Clock to data skew is defined as below figures.

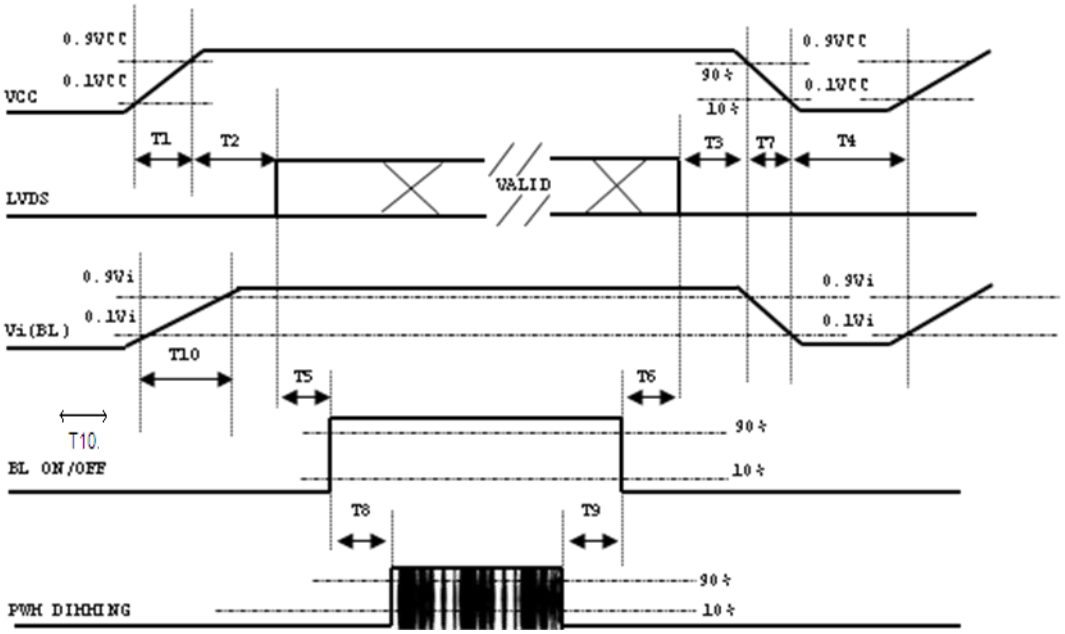



Note (5) The SSCG (Spread spectrum clock generator) is defined as below figures.



## 4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.




Timing Specifications:

| Parameter | Value | | | Units |
|---|---|---|---|---|
| | Min | Typ | Max | |
| T1 | 0.5 | - | 10 | ms |
| T2 | 0 | - | 50 | ms |
| T3 | 0 | - | 50 | ms |
| T4 | 500 | - | - | ms |
| T5 | 450 | - | - | ms |
| T6 | 200 | - | - | ms |
| T7 | 10 | - | 100 | ms |
| T8 | 10 | - | - | ms |
| T9 | 10 | - | - | ms |
| T10 | 20 | | 50 | |

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

# 5. OPTICAL CHARACTERISTICS

## 5.1 TEST CONDITIONS

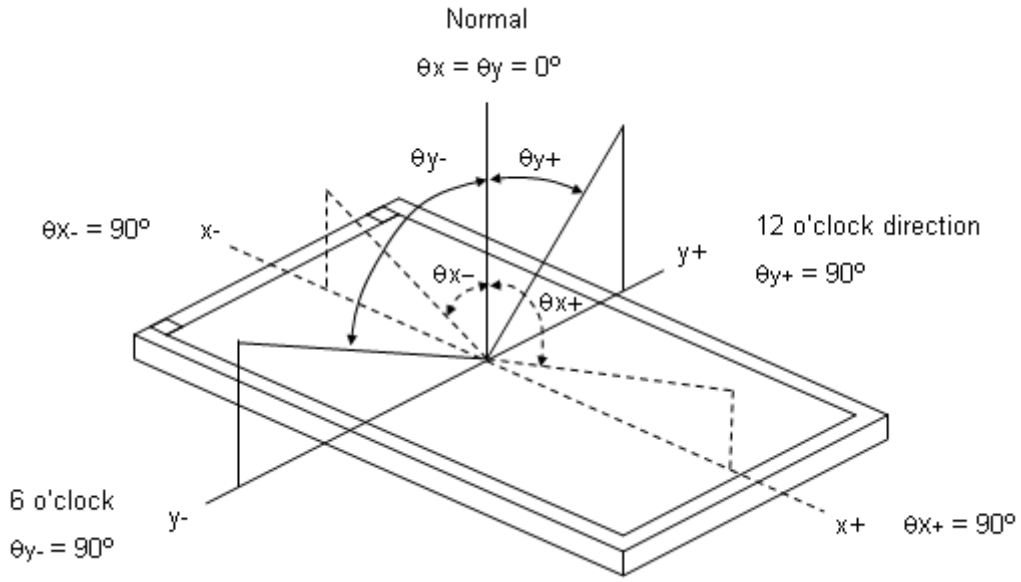
| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | ℃ |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | According to typical value in "ELECTRICAL CHARACTERISTICS" | | |
| Input Signal | | | |
| LED Light Bar Input Current Per Input Pin | | | |

## 5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2 and all items are measured at the center point of screen except white variation. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Color Chromaticity (CIE 1931) | Red | Rx | $\theta_x$=0°, $\theta_Y$ =0° CS-2000 R=G=B=255 Gray scale | Typ – 0.05 | 0.625 | Typ + 0.05 | - | (1), (5) |
| | | Ry | | | 0.303 | | | |
| | Green | Gx | | | 0.307 | | | |
| | | Gy | | | 0.630 | | | |
| | Blue | Bx | | | 0.150 | | | |
| | | By | | | 0.050 | | | |
| | White | Wx | | | 0.313 | | | |
| | | Wy | | | 0.315 | | | |
| Center Luminance of White | | $L_C$ | | 400 | 500 | - | cd/m$^2$ | (4), (5) |
| Contrast Ratio | | CR | | 600 | 800 | - | - | (2), (5) |
| Response Time | | $T_R$ | $\theta_x$=0°, $\theta_Y$ =0° | - | 13 | - | ms | (3) |
| | | $T_F$ | | - | 12 | - | | |
| White Variation | | W | $\theta_x$=0°, $\theta_Y$ =0° | 70 | - | - | % | (5), (6) |
| Viewing Angle | Horizontal | $\theta_x$+ | CR ≧ 10 | 80 | 89 | --- | Deg. | (1), (5) |
| | | $\theta_x$- | | 80 | 89 | | | |
| | Vertical | $\theta_Y$+ | | 80 | 89 | | | |
| | | $\theta_Y$- | | 80 | 89 | --- | | |

Note (1) Definition of Viewing Angle (θx, θy):




Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

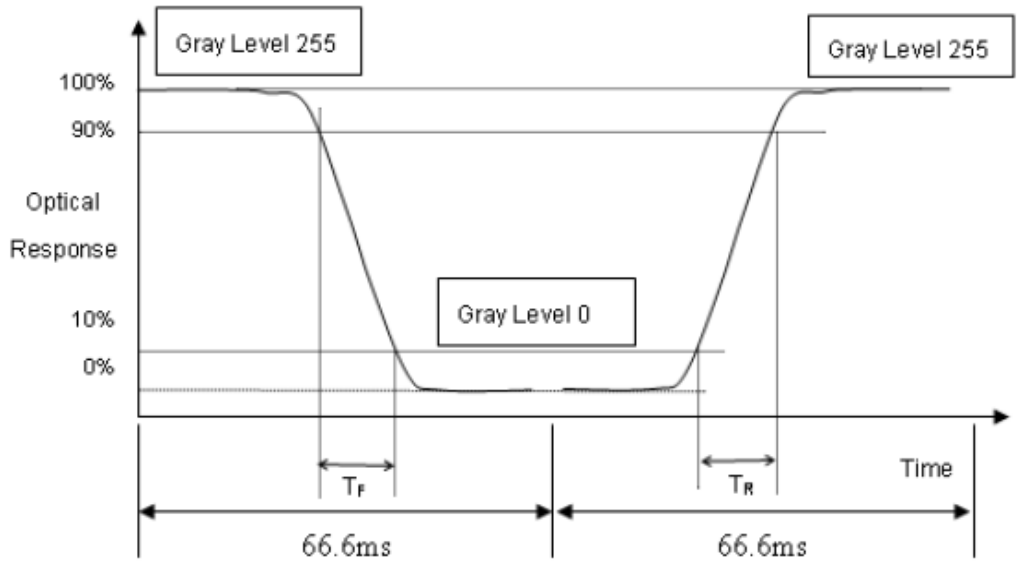
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time ($T_R$, $T_F$):



Note (4) Definition of Luminance of White ($L_C$):

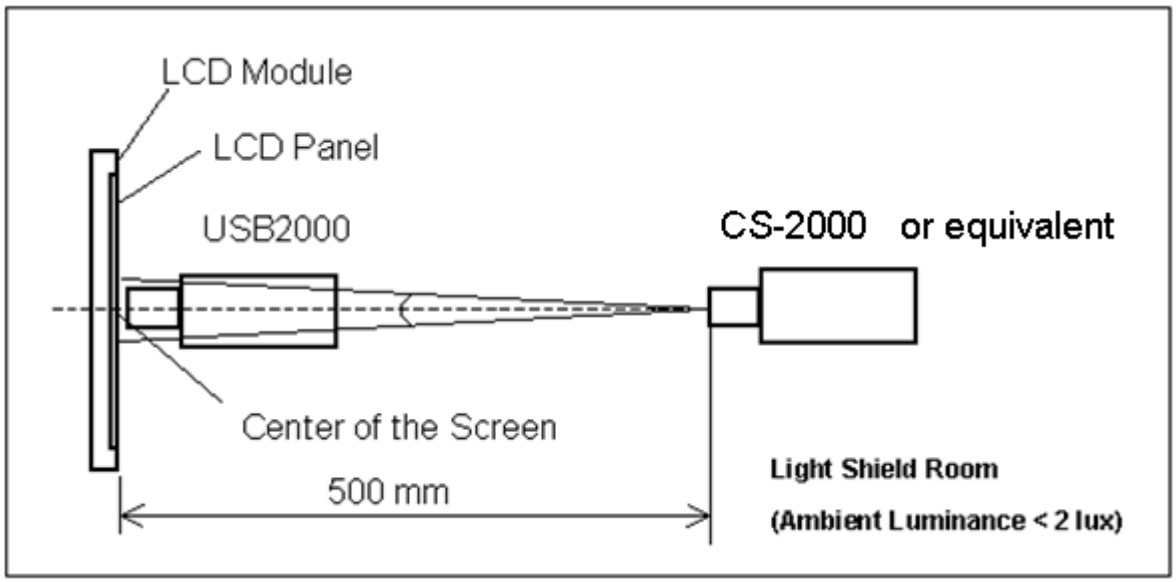
Measure the luminance of gray level 255 at center point

$L_C$ = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

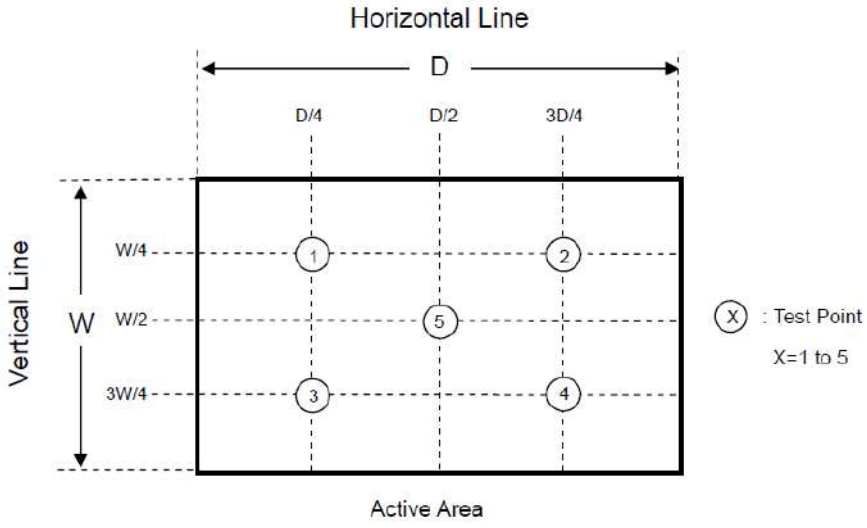
The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.




Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = ( Minimum [L (1) ~ L (5)] / Maximum [L (1) ~ L (5)] ) *100%



## 6. RELIABILITY TEST ITEM

| Test Item | Test Condition | Note |
|---|---|---|
| High Temperature Storage Test | 90ºC, 240 hours | (1)(2)<br>(4)(5) |
| Low Temperature Storage Test | -40ºC, 240 hours | |
| Thermal Shock Storage Test | -30ºC, 0.5hour←→80℃, 0.5hour; 1hour/cycle,100cycles | |
| High Temperature Operation Test | 85ºC, 240 hours | |
| Low Temperature Operation Test | -30ºC, 240 hours | |
| High Temperature & High Humidity Operation Test | 60ºC, 90%RH, 240hours | (1)(2)<br>(4)(6) |
| Shock (Non-Operating) | 50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z. | (2)(3) |
| Vibration (Non-Operating) | 1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z | (2)(3) |

Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 85 ºC Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic specification is judged before reliability test.

Note (5) Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note (6) Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

# 7. PACKING

## 7.1 PACKING SPECIFICATIONS

(1) 38 pcs LCD modules / 1 Box

(2) Box dimensions: 445 (L) X 370 (W) X 275 (H) mm

(3) Weight: approximately 8.3Kg (38modules per box)

## 7.2 PACKING METHOD

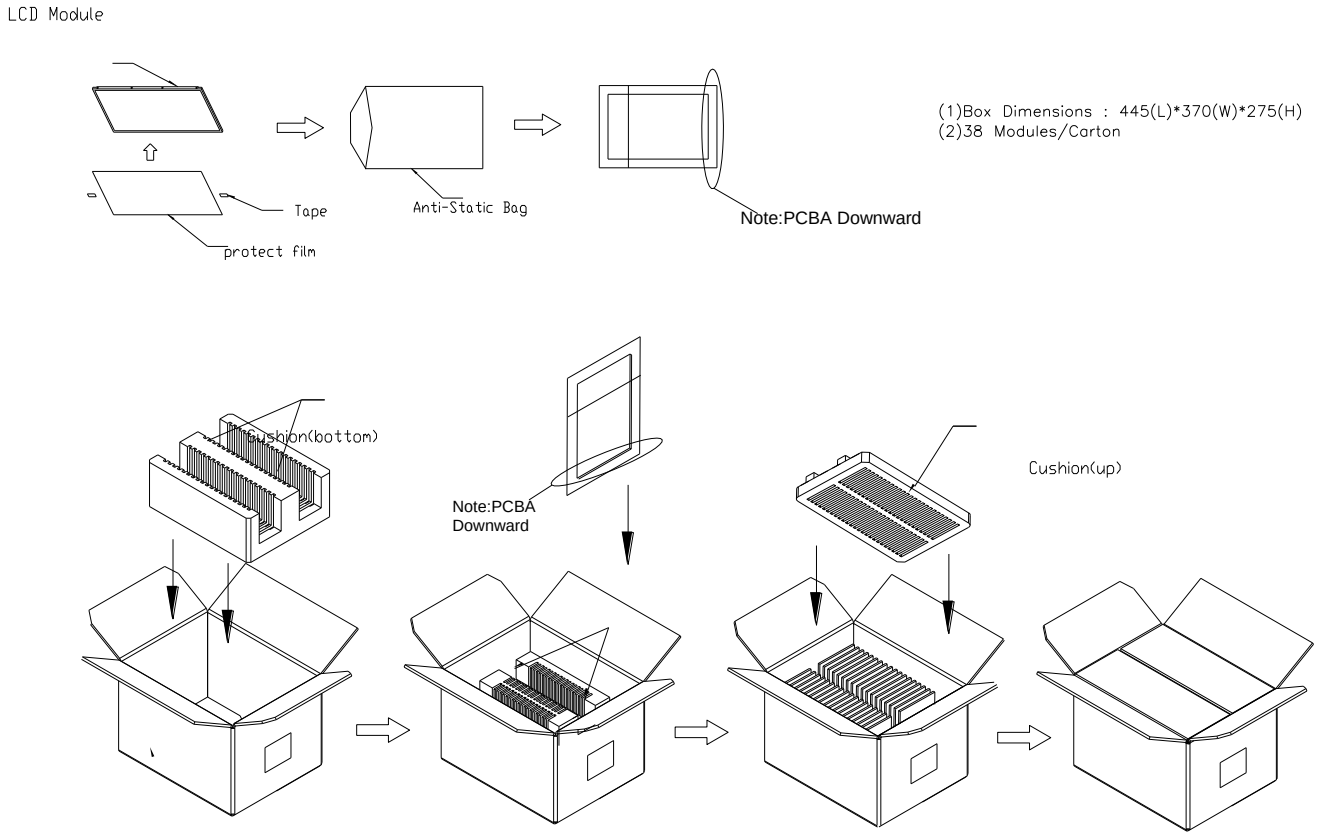



**Figure. 7-1 Packing method**

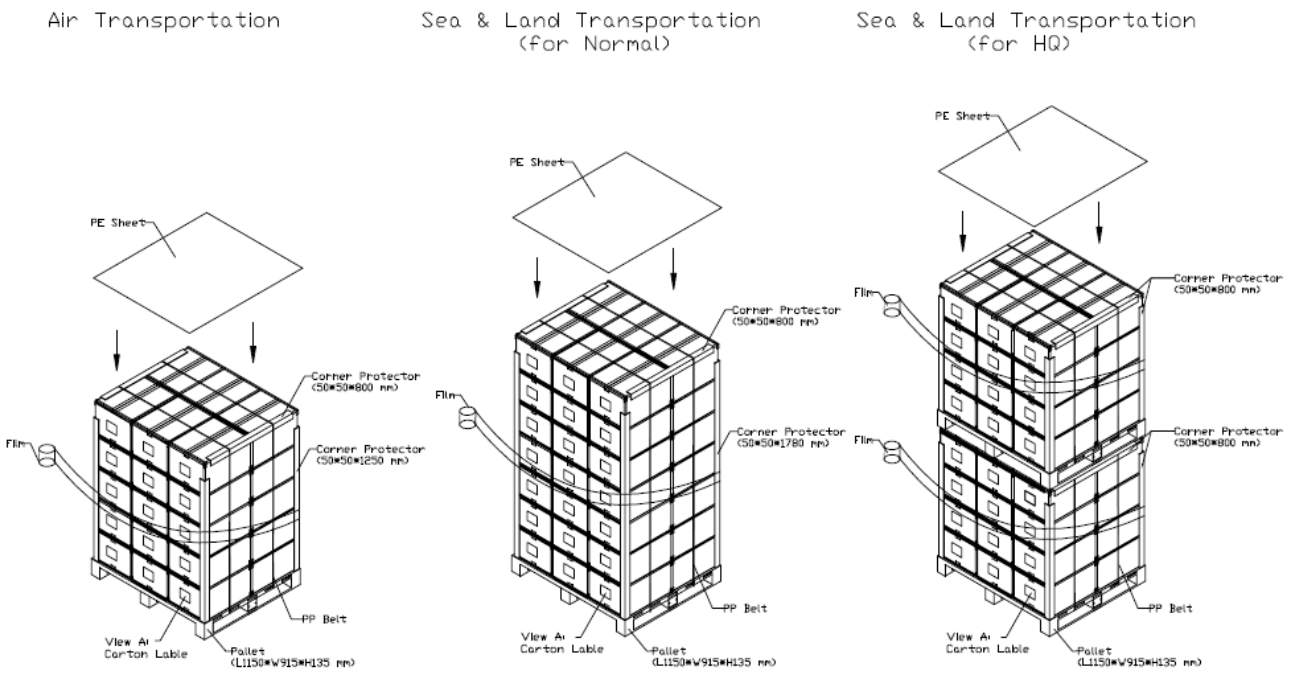



**Figure. 7-2 Packing method**

## 7.3 UN-PACKING METHOD

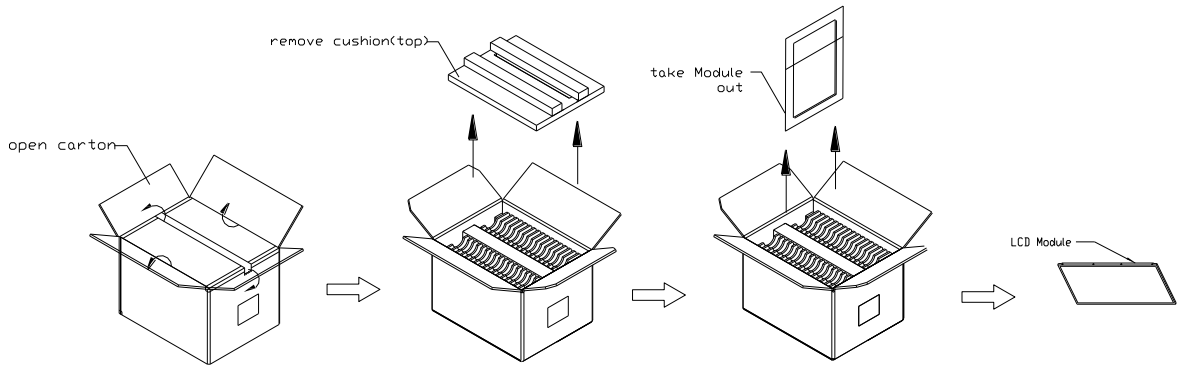
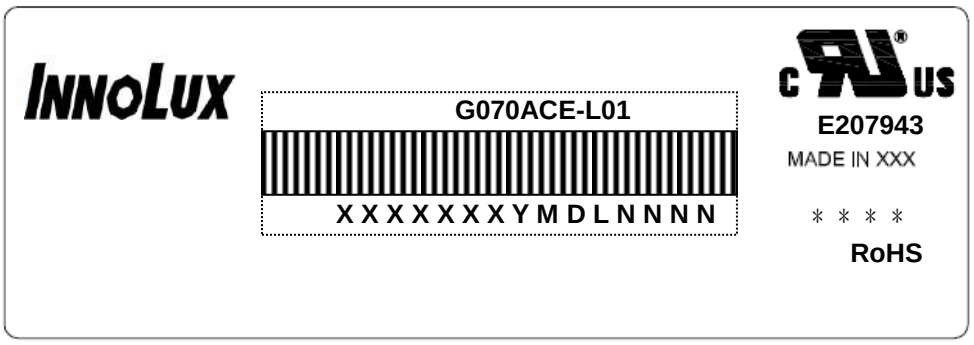



**Figure. 7-3 UN-Packing method**

# 8. MODULE LABEL

## 8.1 INX MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

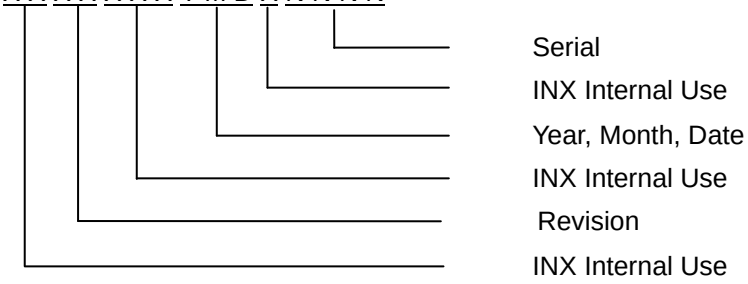



(a) Model Name: G070ACE-L01

(b) Revision: Rev. XX, for example: A1, B1, C1, C2 …etc.

(c) ＊ ＊ ＊ ＊ : Factory ID

(d) Serial ID: X X X X X X X Y M D X N N N N




Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2011~2019

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

# 9. PRECAUTIONS

## 9.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10)When ambient temperature is lower than 10℃ may reduce the display quality. For example, the response time will become slowly.

## 9.2 STORAGE PRECAUTIONS

(1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0℃ to 35℃ and relative humidity of less than 70%

(2) Do not store the TFT – LCD module in direct sunlight

(3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

## 9.3 OPERATION PRECAUTIONS

(1) The LCD product should be operated under normal condition.

Normal condition is defined as below :

Temperature : 20±15℃

Humidity: 65±20%

Display pattern : continually changing pattern(Not stationary)

(2) If the product will be used in extreme conditions such as high temperature,high humidity,high altitude ,display pattern or operation time etc…It is strongly recommended to contact CMI for application engineering advice . Otherwise , Its reliability and function may not be guaranteed.

## 9.4 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the module's end of life, it is not harmful in case of normal operation and storage.

## 9.5 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

(1) UL60950-1 or updated standard.

(2) IEC60950-1 or updated standard.

## 9.6 OTHER

When fixed patterns are displayed for a long time, remnant image is likely to occur

## Appendix. OUTLINE DRAWING