

**Doc. Number :**

- ☐ Tentative Specification  
☐ Preliminary Specification  
☒ Approval Specification

**MODEL NO.: G101ICE**  
**SUFFIX: L01**

**Customer:****APPROVED BY****SIGNATURE****Name / Title**

Note

Product Version : C2

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

| Approved By    | Checked By | Prepared By |
|----------------|------------|-------------|
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**REVISION HISTORY**

| Version  | Date          | Page | Description                              |
|----------|---------------|------|------------------------------------------|
| Ver. 1.0 | 18 Jun., 2015 | All  | Approval Specification was first issued. |
| Ver. 1.1 | 16 Sep., 2015 | 1.5  | Bezel area dimension modified            |
| Ver. 3.0 | 16 Jun., 2019 | All  | Change Revision from C1 to C2            |
| Ver. 3.1 | 7 Jun., 2022  | 6.1  | Vertical Total Time Max. from 829 to 840 |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |
|          |               |      |                                          |



## PRODUCT SPECIFICATION

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

G101ICE-L01 is a 10.1" TFT Liquid Crystal Display module with LED Backlight units and 40 pins LVDS interface. This module supports 1280 x 800 WXGA mode and can display 16.2M/ 262k colors. The LED driving device for Backlight is built in PCBA.

### 1.2 FEATURES

- WXGA (1280 x 800 pixels) resolution
- DE (Data Enable) only mode
- LVDS Interface with 1pixel/clock
- Wide operating temperature.
- RoHS compliance

### 1.3 APPLICATION

- TFT LCD Monitor
- Factory Application
- Amusement

### 1.4 GENERAL SPECIFICATIONS

| Item                     | Specification                            | Unit  | Note    |
|--------------------------|------------------------------------------|-------|---------|
| Active Area              | 216.96 (H) x 135.60 (V) (10.1" diagonal) | mm    | (1)     |
| Bezel Opening Area       | 218.96 (H) x 137.6 (V)                   | mm    |         |
| Driver Element           | a-Si TFT active matrix                   | -     | -       |
| Pixel Number             | 1280 x R.G.B x 800                       | pixel | -       |
| Pixel Pitch              | 0.1695 (H) x 0.1695 (V)                  | mm    | -       |
| Pixel Arrangement        | RGB vertical Stripe                      | -     | -       |
| Display Colors           | 16,194,277 / 262,144                     | color | -       |
| Display Mode             | Normally Black                           | -     | -       |
| Surface Treatment        | Hard Coating (3H), Anti-Glare            | -     | -       |
| Module Power Consumption | 6.18                                     | W     | Typical |

## 1.5 MECHANICAL SPECIFICATIONS

| Item        |               | Min.   | Typ.   | Max.   | Unit | Note   |
|-------------|---------------|--------|--------|--------|------|--------|
| Module Size | Horizontal(H) | 230.2  | 230.7  | 231.2  | mm   | (1)    |
|             | Vertical(V)   | 152.05 | 152.55 | 153.05 | mm   |        |
|             | Depth(D)      | 6.0    | 6.5    | 7.0    | mm   | (1)(2) |
| Bezel Area  | Horizontal    | 218.66 | 218.96 | 219.26 | mm   |        |
|             | Vertical      | 137.3  | 137.6  | 137.9  | mm   |        |
| Active Area | Horizontal    | -      | 216.96 | -      | mm   |        |
|             | Vertical      | -      | 135.6  | -      | mm   |        |
| Weight      |               | -      | 360    | 375    | g    |        |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) The depth is without connector.



## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

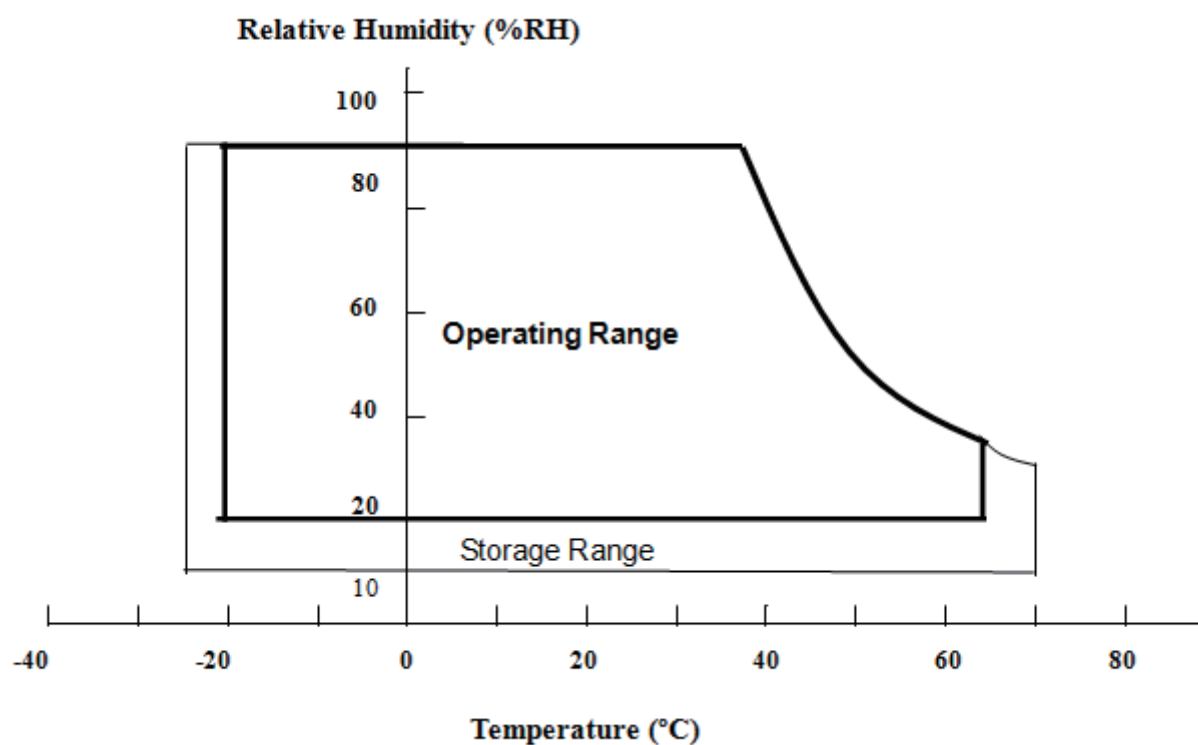
| Item                          | Symbol          | Value |      | Unit | Note |
|-------------------------------|-----------------|-------|------|------|------|
|                               |                 | Min.  | Max. |      |      |
| Operating Ambient Temperature | T <sub>OP</sub> | -20   | +65  | °C   |      |
| Storage Temperature           | T <sub>ST</sub> | -25   | +70  | °C   |      |

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

(2) 90 %RH Max. (Ta < 40°C).

(3) Wet-bulb temperature should be 39°C Max.

(4) No condensation.



## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item                 | Symbol | Value |      | Unit | Note |
|----------------------|--------|-------|------|------|------|
|                      |        | Min.  | Max. |      |      |
| Power Supply Voltage | VCC    | -0.3  | 4    | V    | (1)  |

### 2.2.2 BACKLIGHT UNIT

| Item              | Symbol         | Value |      | Unit | Note     |
|-------------------|----------------|-------|------|------|----------|
|                   |                | Min.  | Max. |      |          |
| Converter Voltage | V <sub>i</sub> | -0.3  | 18   | V    | (1), (2) |
| Enable Voltage    | EN             | ---   | 5.5  | V    |          |
| Backlight Adjust  | ADJ            | ---   | 5.5  | V    |          |

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 lamp (Refer to 3.2 for further information).

## 3. ELECTRICAL SPECIFICATIONS

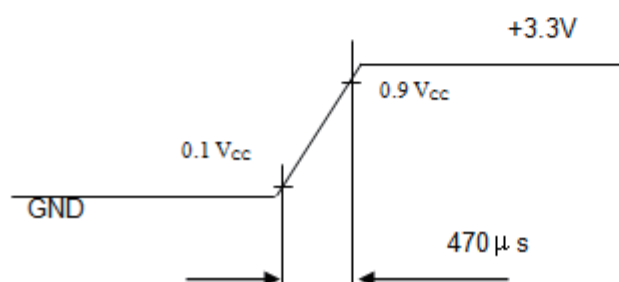
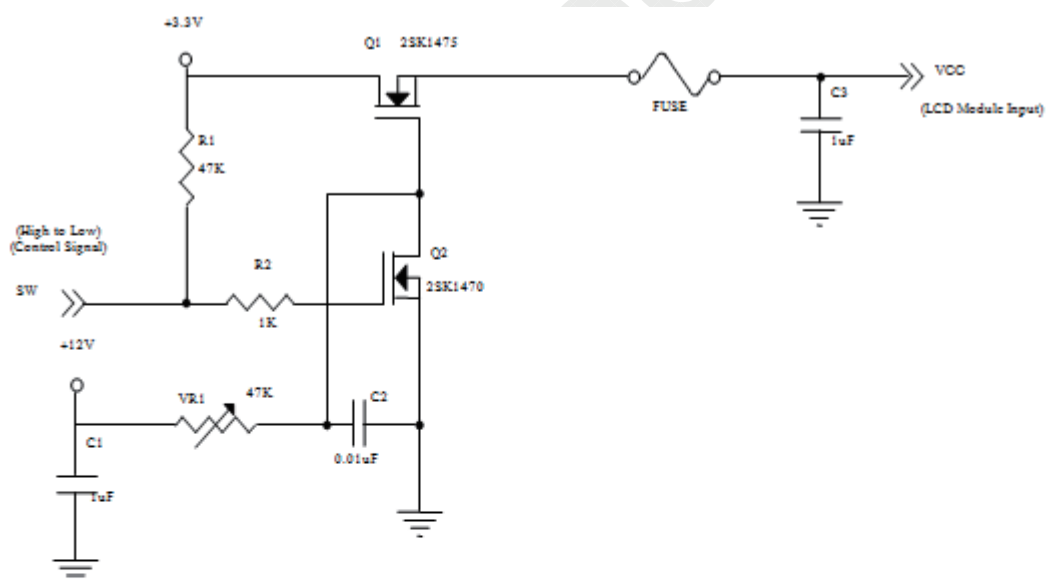
### 3.1 TFT LCD MODULE

 $T_a = 25 \pm 2^\circ\text{C}$ 

| Parameter                                              | Symbol     | Value |      |      | Unit  | Note |
|--------------------------------------------------------|------------|-------|------|------|-------|------|
|                                                        |            | Min.  | Typ. | Max. |       |      |
| Power Supply Voltage                                   | $V_{CC}$   | 3.0   | 3.3  | 3.6  | V     | -    |
| Ripple Voltage                                         | $V_{RP}$   | -     | -    | 100  | mVp-p |      |
| Rush Current                                           | $I_{RUSH}$ | -     | -    | 1.5  | A     | (2)  |
| Power Supply Current                                   | White      | -     | 265  | 320  | mA    | (3)a |
|                                                        | Black      | -     | 210  | 260  | mA    | (3)b |
| LVDS differential input voltage                        | $V_{id}$   | 200   | -    | 600  | mV    |      |
| LVDS common input voltage                              | $V_{ic}$   | 1.0   | 1.2  | 1.4  | V     |      |
| Differential Input Voltage for LVDS Receiver Threshold | "H" Level  |       |      | 100  | mV    | -    |
|                                                        | "L" Level  | -100  |      |      | mV    | -    |
| Terminating Resistor                                   | $R_T$      | -     | 100  |      | Ohm   | -    |

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



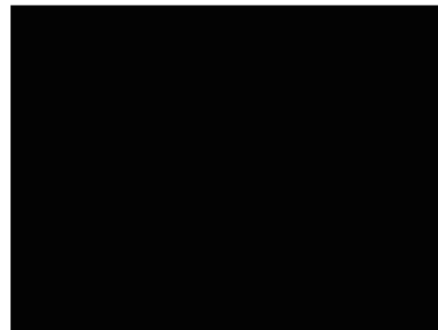
Note (3) The specified power supply current is under the conditions at  $V_{DD} = 3.3V$ ,  $T_a = 25 \pm 2^\circ C$ , DC Current and  $f_v = 60$  Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern



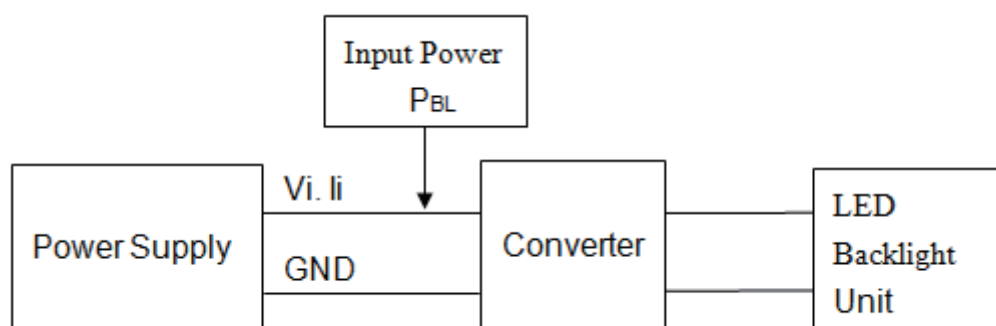
Active Area

## 3.2 BACKLIGHT UNIT

 $T_a = 25 \pm 2^\circ C$ 

| Parameter                      |                | Symbol    | Value  |      |      | Unit | Note                         |
|--------------------------------|----------------|-----------|--------|------|------|------|------------------------------|
|                                |                |           | Min.   | Typ. | Max. |      |                              |
| Converter Power Supply Voltage |                | $V_i$     | 10.8   | 12.0 | 13.2 | V    |                              |
| Converter Power Supply Current |                | $I_i$     | -      | 0.45 | 0.50 | A    | @ $V_i = 12V$<br>(Duty 100%) |
| Backlight Power Consumption    |                | $P_{BL}$  | -      | 5.3  | 5.8  | W    | @ $V_i = 12V$<br>(Duty 100%) |
| EN Control Level               | Backlight on   | -         | 2.5    | 3.3  | 5.0  | V    |                              |
|                                | Backlight off  |           | 0      | ---  | 0.8  | V    |                              |
| PWM Control Level              | PWM High Level | -         | 2.5    | 3.3  | 5.0  | V    |                              |
|                                | PWM Low Level  |           | 0      | -    | 0.15 | V    |                              |
| PWM Control Duty Ratio         |                | -         | 1      | -    | 100  | %    | @200Hz                       |
| PWM Control Frequency          |                | $f_{PWM}$ | 190    | 200  | 20k  | Hz   | (2)                          |
| LED Life Time                  |                | $L_L$     | 50,000 | -    | -    | Hrs  | (3)                          |

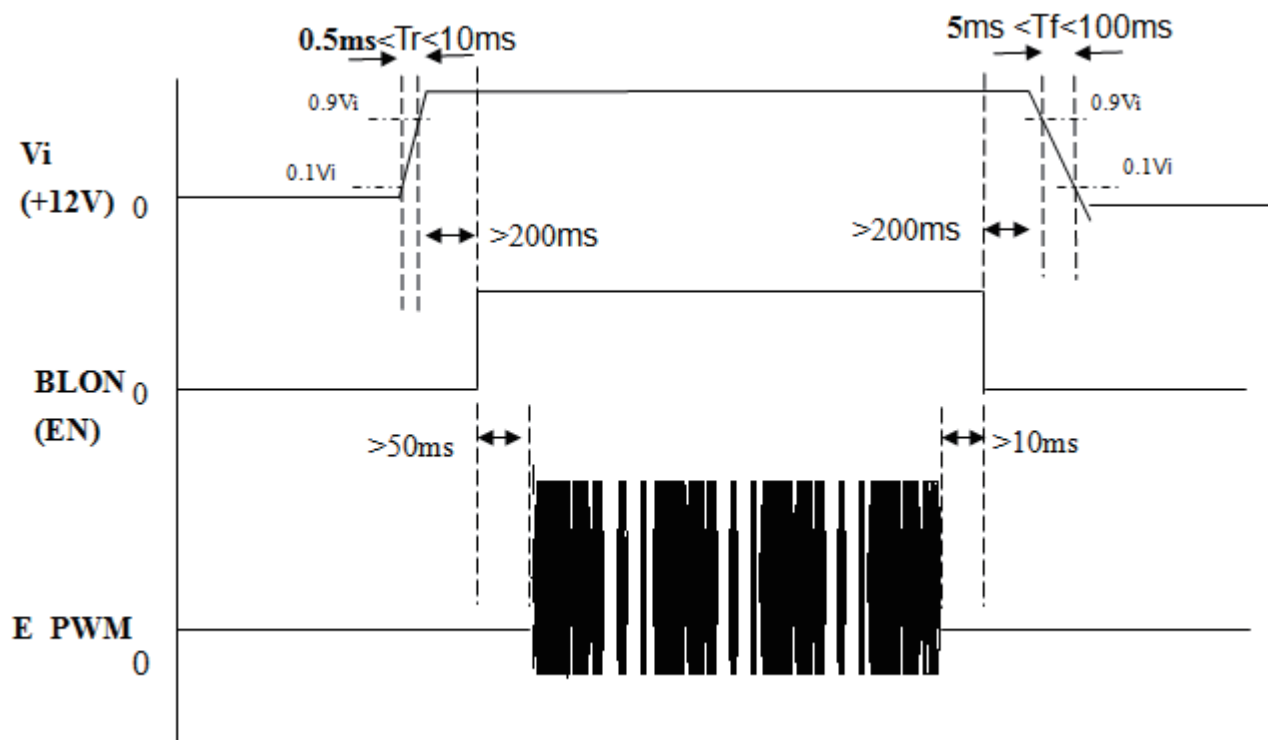
Note (1) LED current is measured by utilizing a high frequency current meter as shown below:



Note (2) At 200 Hz PWM control frequency, duty ratio range is restricted from 1% to 100%

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at  $T_a = 25 \pm 2^\circ C$  and Duty 100% until the brightness becomes  $\leq 50\%$  of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.

Power sequence and control signal timing are shown in the following figure



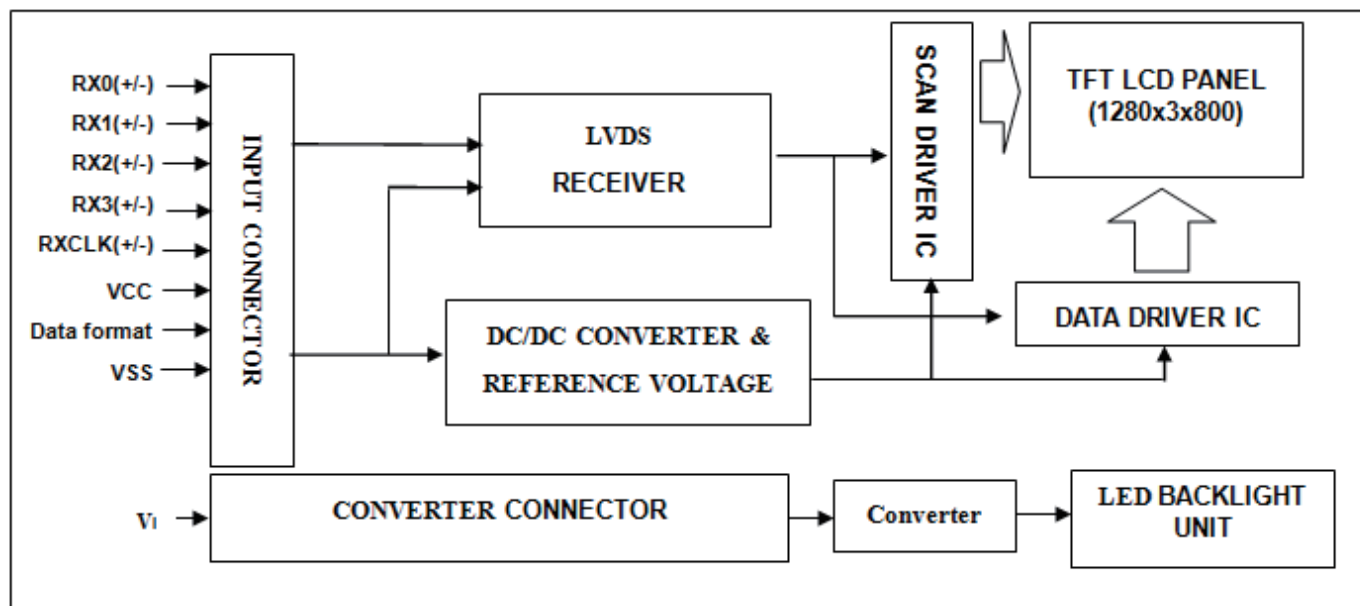
Note : While system is turned ON or OFF, the power sequences must follow as below descriptions

Turn ON sequence: Vi(+12V) → BLON → E\_PWM signal

Turn OFF sequence: E\_PWM signal → BLON → Vi(+12V)

## 4. BLOCK DIAGRAM

### 4.1 TFT LCD MODULE





## 5. INPUT TERMINAL PIN ASSIGNMENT

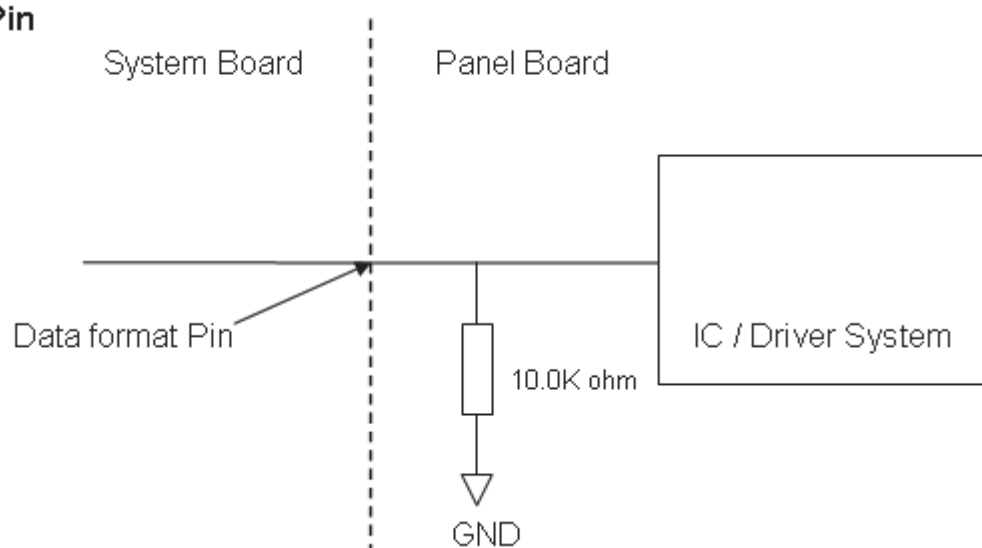
### 5.1 TFT LCD MODULE

| Pin No. | Symbol      | Function                                         | Polarity | Note             |
|---------|-------------|--------------------------------------------------|----------|------------------|
| 1       | VCCS        | Power Supply +3.3V(typical)                      |          |                  |
| 2       | VCCS        | Power Supply +3.3V(typical)                      |          |                  |
| 3       | VCCS        | Power Supply +3.3V(typical)                      |          |                  |
| 4       | Data format | L or NC : 8bit Input Mode<br>H : 6bit Input Mode |          | Note (2),Note(3) |
| 5       | NC          | No Connction (Reserve for INX test)              |          |                  |
| 6       | NC          | No Connction (Reserve for INX test)              |          |                  |
| 7       | NC          | No Connction (Reserve for INX test)              |          |                  |
| 8       | Rxin0-      | LVDS Differential Data Input                     | Negative |                  |
| 9       | Rxin0+      | LVDS Differential Data Input                     | Positive |                  |
| 10      | VSS         | Ground                                           |          |                  |
| 11      | Rxin1-      | LVDS Differential Data Input                     | Negative |                  |
| 12      | Rxin1+      | LVDS Differential Data Input                     | Positive |                  |
| 13      | VSS         | Ground                                           |          |                  |
| 14      | Rxin2-      | LVDS Differential Data Input                     | Negative |                  |
| 15      | Rxin2+      | LVDS Differential Data Input                     | Positive |                  |
| 16      | VSS         | Ground                                           |          |                  |
| 17      | RxCLK-      | LVDS Differential Clock Input                    | Negative |                  |
| 18      | RxCLK+      | LVDS Differential Clock Input                    | Positive |                  |
| 19      | VSS         | Ground                                           |          |                  |
| 20      | Rxin3-      | LVDS Differential Data Input                     | Negative |                  |
| 21      | Rxin3+      | LVDS Differential Data Input                     | Positive |                  |
| 22      | VSS         | Ground                                           |          |                  |
| 23      | NC          | No Connction (Reserve)                           |          |                  |
| 24      | NC          | No Connction (Reserve)                           |          |                  |
| 25      | VSS         | Ground                                           |          |                  |
| 26      | VSS         | Ground                                           |          |                  |
| 27      | LED_PWM     | PWM Control Signal od LED Converter              |          |                  |
| 28      | LED_EN      | Enable Control Signal od LED Converter           |          |                  |
| 29      | LED_GND     | LED Ground                                       |          |                  |
| 30      | LED_GND     | LED Ground                                       |          |                  |
| 31      | LED_GND     | LED Ground                                       |          |                  |
| 32      | LED_GND     | LED Ground                                       |          |                  |
| 33      | LED_GND     | LED Ground                                       |          |                  |
| 34      | NC          | No Connction (Reserve)                           |          |                  |
| 35      | NC          | No Connction (Reserve)                           |          |                  |
| 36      | LED_VCCS    | LED Power Supply                                 |          |                  |
| 37      | LED_VCCS    | LED Power Supply                                 |          |                  |
| 38      | LED_VCCS    | LED Power Supply                                 |          |                  |
| 39      | LED_VCCS    | LED Power Supply                                 |          |                  |
| 40      | LED_VCCS    | LED Power Supply                                 |          |                  |

Note (1) Connector Part No.: I-PEX 20455-040E-12 or Tyco\_5-2069716-3.

Note (2) "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connection".

Note (3) Interface optional pin has internal scheme as following diagram, Customer should keep the interface voltage level requirement which including panel board loading as below.

**Data format Pin**



## 5.2 COLOR DATA INPUT ASSIGNMENT

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 | R7    | R6 | G5 | G4 | G3 | G2 | G1 | G0 | R7   | R6 | 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  | 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(252)       | 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(252)       | 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(252)            | 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(252)     | 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(252)     | 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(252)          | 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(252)      | 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(252)      | 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(252)           | 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

## 6. INTERFACE TIMING

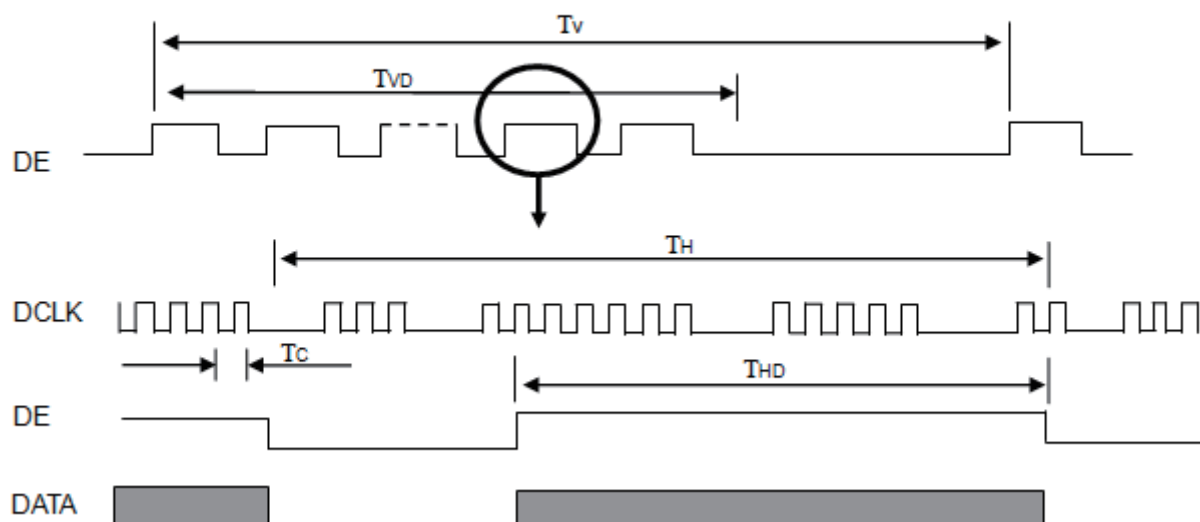
### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

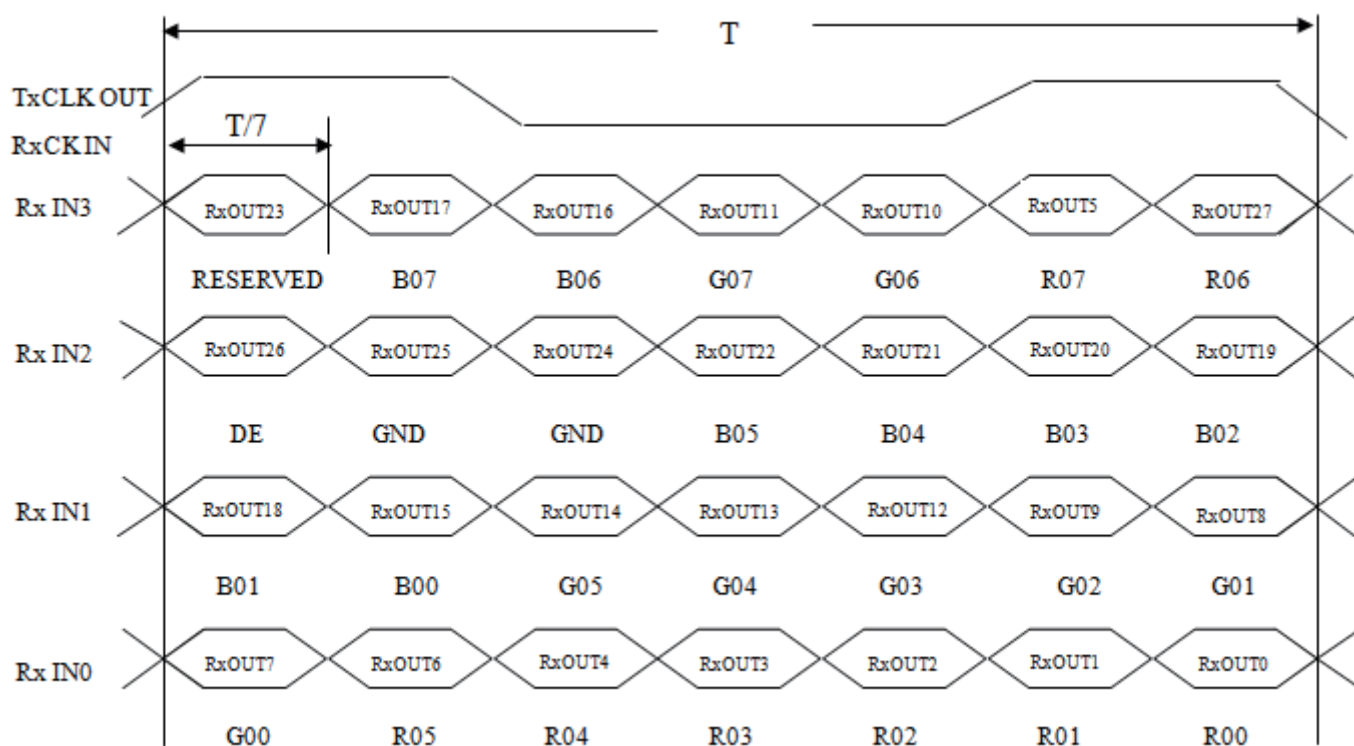
| Signal | Item                    | Symbol   | Min.  | Typ. | Max. | Unit  | Note |
|--------|-------------------------|----------|-------|------|------|-------|------|
| DCLK   | Pixel Clock             | $1/T_C$  | 60.40 | 71.1 | 74.7 | MHz   | -    |
| DE     | Vertical Total Time     | $T_V$    | 810   | 823  | 840  | $T_H$ | -    |
|        | Vertical Address Time   | $T_{VD}$ | 800   | 800  | 800  | $T_H$ | -    |
|        | Horizontal Total Time   | $T_H$    | 1362  | 1440 | 1480 | $T_C$ | -    |
|        | Horizontal Address Time | $T_{HD}$ | 1280  | 1280 | 1280 | $T_C$ | -    |

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

#### INPUT SIGNAL TIMING DIAGRAM

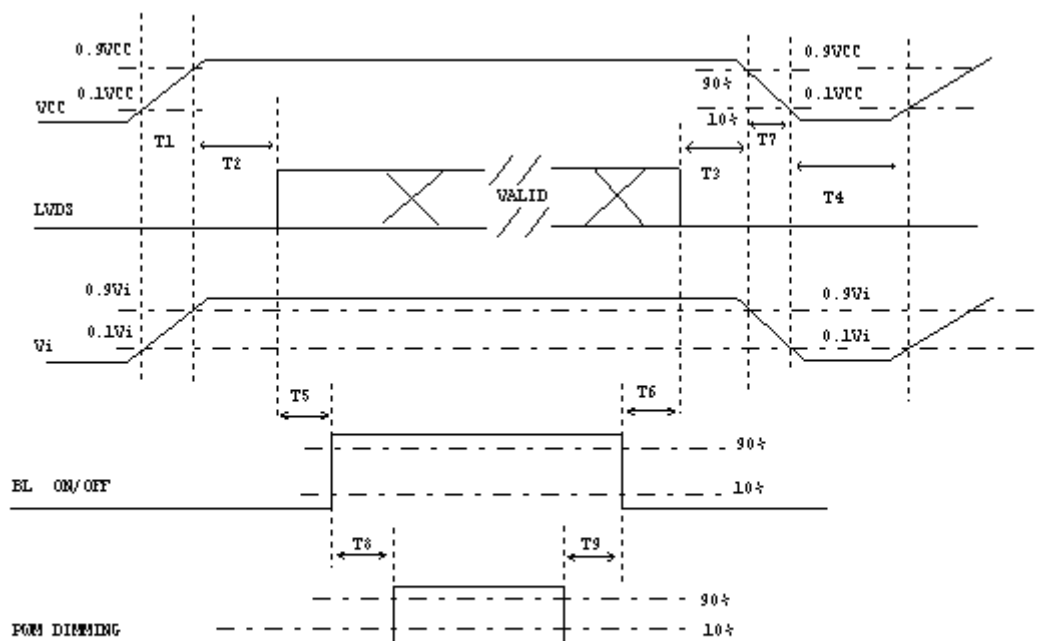


## TIMING DIAGRAM of LVDS



## 6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.



### Power ON/OFF sequence

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.

| Parameter | Value |     |     | Units |
|-----------|-------|-----|-----|-------|
|           | Min   | Typ | Max |       |
| T1        | 0.5   | -   | 10  | ms    |
| T2        | 0     | -   | 50  | ms    |
| T3        | 0     | -   | 50  | ms    |
| T4        | 500   | -   | -   | ms    |
| T5        | 200   | -   | -   | ms    |
| T6        | 200   | -   | -   | ms    |
| T7        | 5     | -   | 300 | ms    |
| T8        | 10    | -   | -   | ms    |
| T9        | 10    | -   | -   | ms    |

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITION

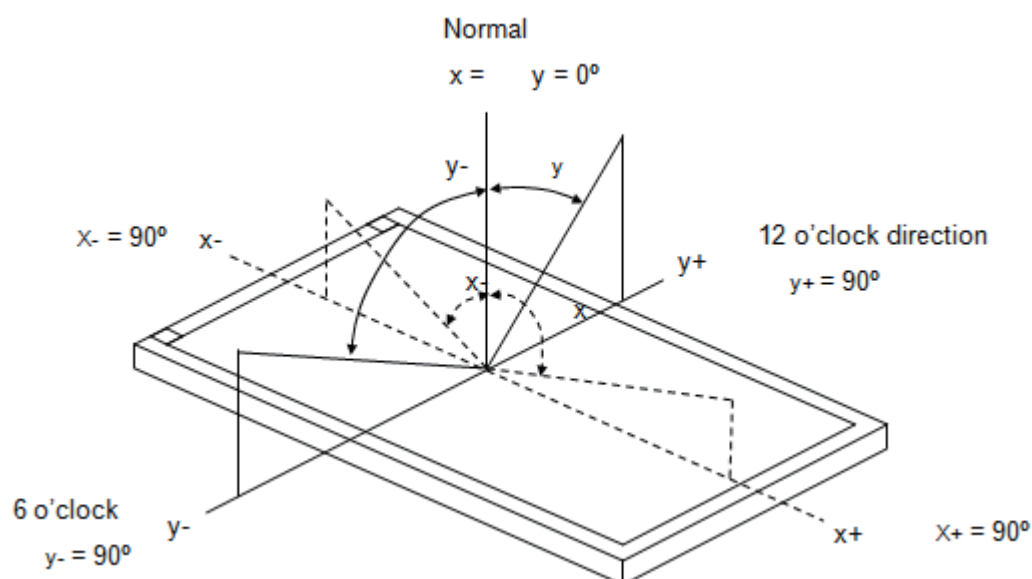
| Item                | Symbol                                                        | Value | Unit |
|---------------------|---------------------------------------------------------------|-------|------|
| Ambient Temperature | Ta                                                            | 25±2  | ℃    |
| Ambient Humidity    | Ha                                                            | 50±10 | %RH  |
| Supply Voltage      | V <sub>CC</sub>                                               | 3.3   | V    |
| Input Signal        | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |       |      |
| Converter Voltage   | V <sub>i</sub>                                                | 12    | V    |
| Converter Duty      |                                                               | 100%  |      |

### 7.2 OPTICAL SPECIFICATION

The relative measurement methods of optical characteristics are shown in 7.2 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 7.1 and stable environment shown in Note (5).

| Item                      |            | Symbol          | Condition                                        | Min.          | Typ.  | Max.              | Unit     | Note     |
|---------------------------|------------|-----------------|--------------------------------------------------|---------------|-------|-------------------|----------|----------|
| Color Chromaticity        | Red        | R <sub>x</sub>  | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>CS-1000T | Typ -<br>0.05 | 0.592 | Typ+<br>0.05      | -        | (1), (5) |
|                           |            | R <sub>y</sub>  |                                                  |               | 0.340 |                   |          |          |
|                           | Green      | G <sub>x</sub>  |                                                  |               | 0.316 |                   |          |          |
|                           |            | G <sub>y</sub>  |                                                  |               | 0.591 |                   |          |          |
|                           | Blue       | B <sub>x</sub>  |                                                  |               | 0.154 |                   |          |          |
|                           |            | B <sub>y</sub>  |                                                  |               | 0.123 |                   |          |          |
|                           | White      | W <sub>x</sub>  |                                                  |               | 0.313 |                   |          |          |
|                           |            | W <sub>y</sub>  |                                                  |               | 0.329 |                   |          |          |
| Center Luminance of White |            | L <sub>C</sub>  | 400                                              | 500           |       | cd/m <sup>2</sup> | (4), (5) |          |
| Contrast Ratio            |            | CR              | 600                                              | 800           |       | -                 | (2), (5) |          |
| Response Time             |            | T <sub>R</sub>  | $\theta_x=0^\circ, \theta_Y=0^\circ$             | -             | 14    | 17                | ms       | (3)      |
|                           |            | T <sub>F</sub>  |                                                  | -             | 11    | 14                |          |          |
| White Variation           |            | δW              | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>USB2000  | 70            | -     | -                 | %        | (5), (6) |
| Viewing Angle             | Horizontal | θ <sub>x+</sub> | CR ≥ 10<br>USB2000                               | 80            | 85    | -                 | Deg.     | (1), (5) |
|                           |            | θ <sub>x-</sub> |                                                  | 80            | 85    | -                 |          |          |
|                           | Vertical   | θ <sub>y+</sub> |                                                  | 80            | 85    | -                 |          |          |
|                           |            | θ <sub>y-</sub> |                                                  | 80            | 85    | -                 |          |          |

Note (1) Definition of Viewing Angle ( $\theta_x$ ,  $\theta_y$ ):



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

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{252} / L_0$$

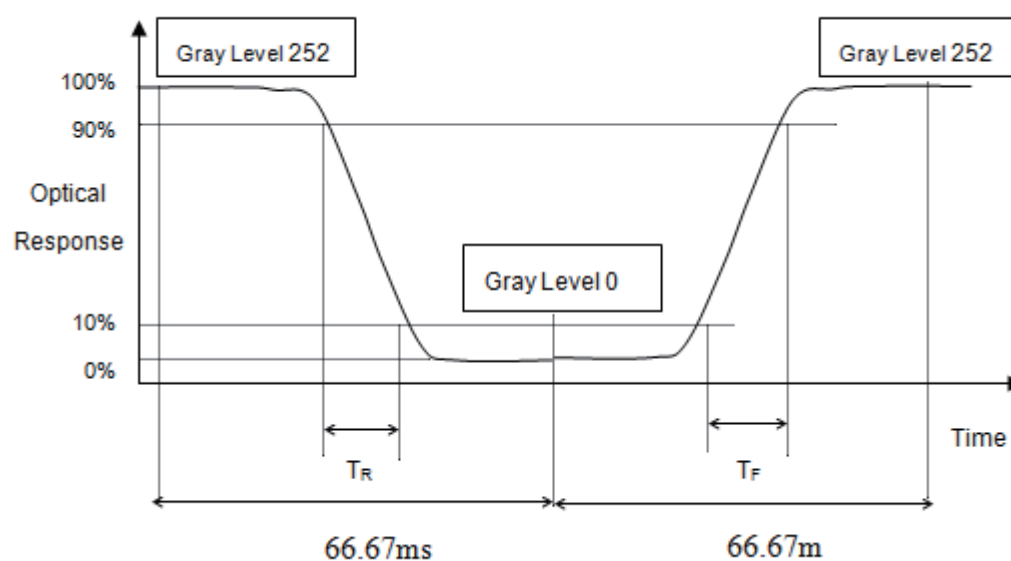
L252: Luminance of gray level 252

L0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

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 ( $L_c$ ):

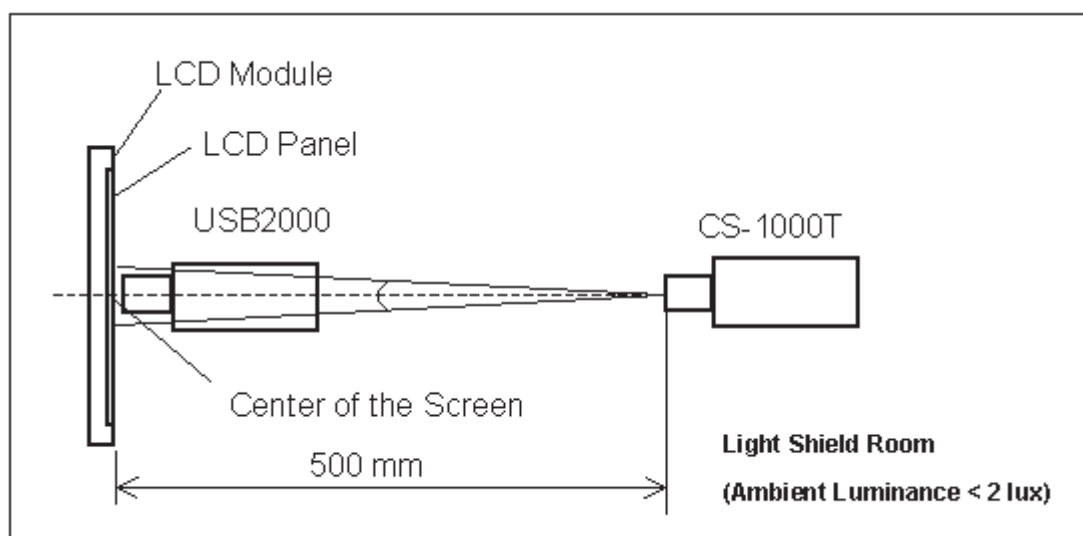
Measure the luminance of gray level 252 at center point

$$L_c = L(5)$$

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

Note (5) Measurement Setup:

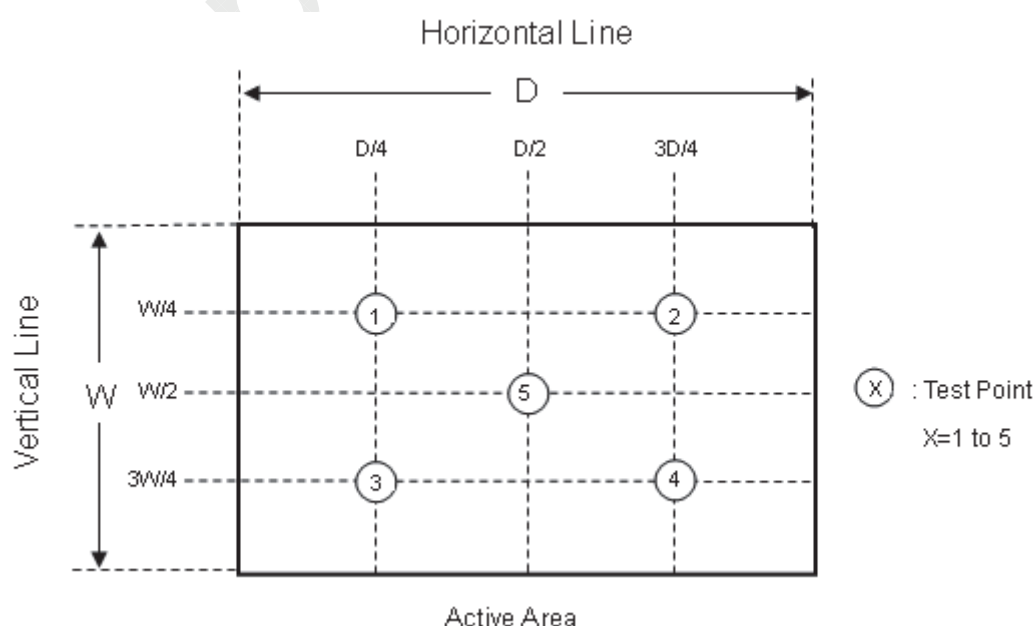
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 252 at 5 points

$$W_{5p} = \{ \text{Minimum} [L(1) \sim L(5)] / \text{Maximum} [L(1) \sim L(5)] \} * 100\%$$



## 8. RELIABILITY TEST CRITERIA

| Test Item                                       | Test Condition                                                                                           | Note            |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------|
| High Temperature Storage Test                   | 70°C, 240 hours                                                                                          | (1), (2)<br>(4) |
| Low Temperature Storage Test                    | -25°C, 240 hours                                                                                         |                 |
| Thermal Shock Storage Test                      | -25°C, 0.5 hour ↔ 70°C, 0.5 hour; 100cycles, 1 hour/cycle)                                               |                 |
| High Temperature Operation Test                 | 65°C, 240 hours                                                                                          |                 |
| Low Temperature Operation Test                  | -20°C, 240 hours                                                                                         |                 |
| High Temperature & High Humidity Operation Test | 60°C, RH 90%, 240 hours                                                                                  | (1), (3)        |
| ESD Test (Operation)                            | 150pF, 330Ω, 1 sec/cycle<br>Condition 1 : panel contact, ±8 KV<br>Condition 2 : panel non-contact ±15 KV |                 |
| Shock (Non-Operating)                           | 50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z direction                                            |                 |
| Vibration (Non-Operating)                       | 1.5G, 10 ~ 300 Hz sine wave, 10 min/cycle, 3 cycles each X, Y, Z direction                               |                 |

Note (1) No display malfunction.

Note (2) Judgment should be tested after storage at room temperature for more than two hour. All the cosmetic specification is judged before reliability test.

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) Temperature of panel display surface area should be 75°C Max.

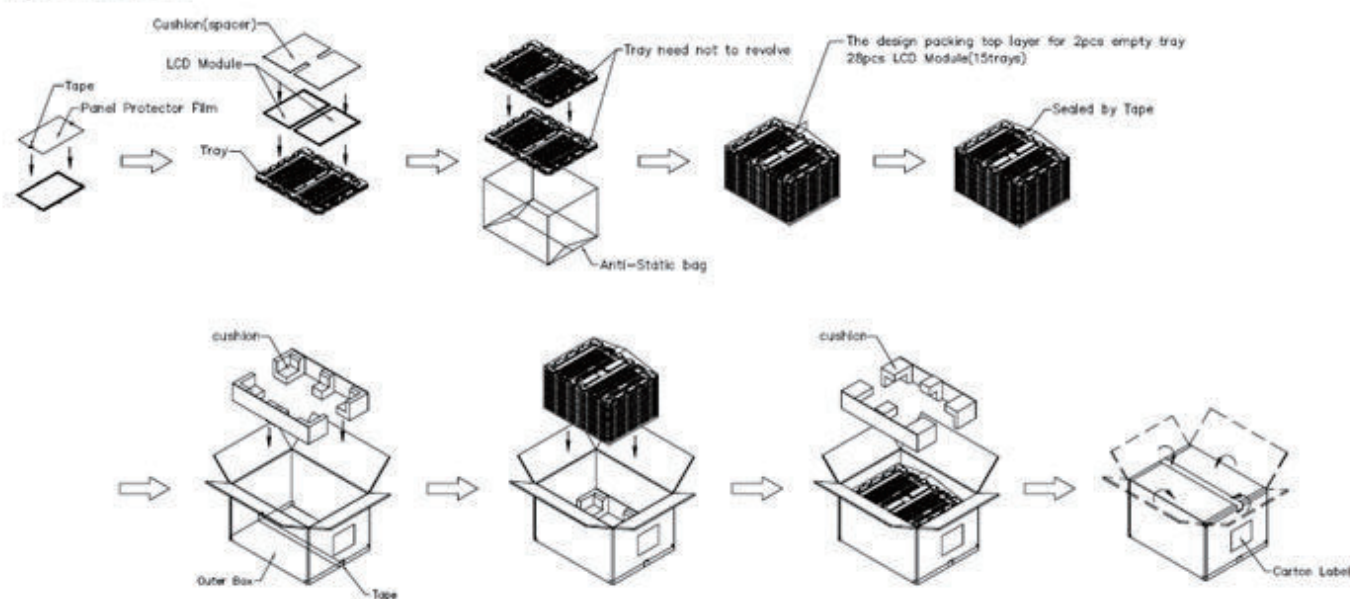
## 9. PACKING

### 9.1 PCAKING SPECIFICATIONS

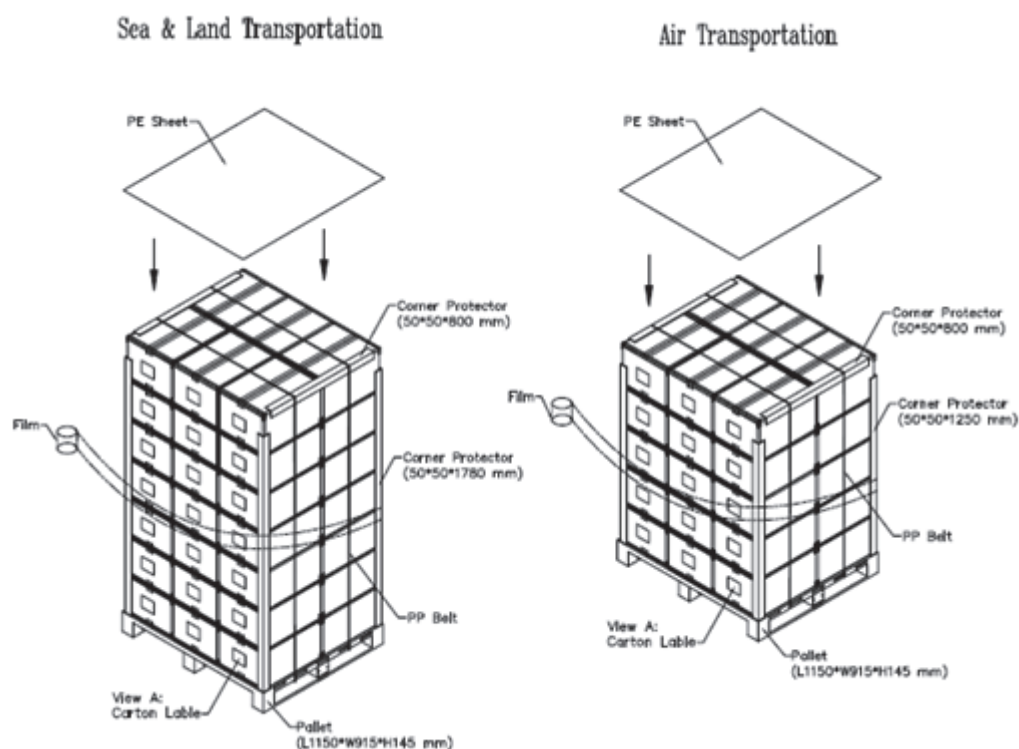
- (1) 28pcs LCD modules / 1 Box
- (2) Box dimensions: 435(L) X 350 (W) X 275 (H) mm
- (3) Weight: approximately 12.02Kg (28 modules per box)

### 9.2 PACKING METHOD

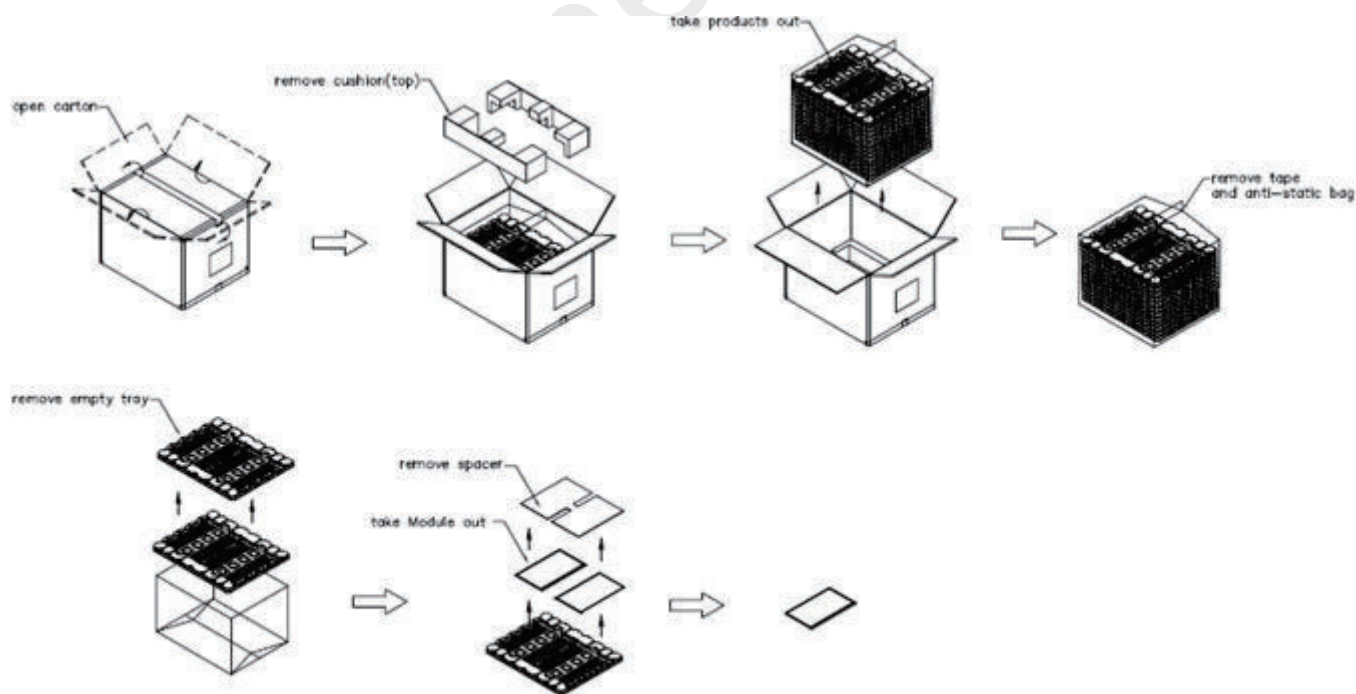
- (1) Box Dimensions : 435(L)\*350(W)\*275(H)
- (2) 28 Modules/Carton



**Figure. 9-1 Packing method**

**Figure. 9-2 Packing method**

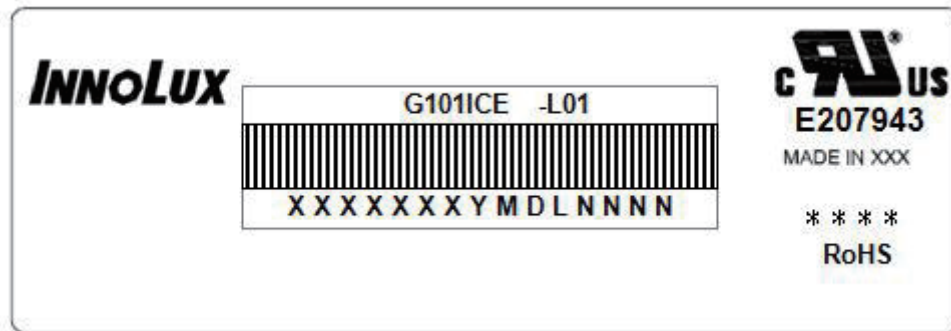
### 9.3 UN-PACKING METHOD

**Figure. 9-3 UN-Packing method**

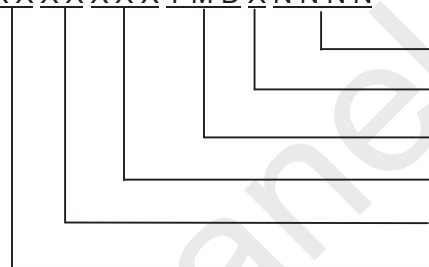
## 10. DEFINITION OF LABEL

### 10.1 INX MODULE LABEL

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



- (a) Model Name: G101ICE -L01
- (b) Revision: Rev. XX, for example: A1, B1, C1, C2 ...etc.
- (c) \* \* \* \* : Factory ID
- (d) Serial ID: XXXXXXYMDXNNNN



Serial  
 INX Internal Use  
 Year, Month, Date  
 INX Internal Use  
 Revision  
 INX Internal Use

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 1<sup>st</sup> to 31<sup>st</sup>, exclude I , O and U
- (b) Revision Code: cover all the change
- (c) Serial No.: Manufacturing sequence of product

## 11. PRECAUTIONS

### 11.1 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°C may reduce the display quality. For example, the response time will become slowly.
- (11) Do not keep same pattern in a long period of time. It may cause image sticking on LCD.

### 11.2 SAFETY PRECAUTIONS

- (1) Do not disassemble the module or insert anything into the Backlight unit.
- (2) 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.
- (3) After the module's end of life, it is not harmful in case of normal operation and storage.



## PRODUCT SPECIFICATION

## 12. MECHANICAL CHARACTERISTICS

