

# AVNET EMBEDDED SPECIFICATION.

**Datasheet**  
CMO G070Y2-L01

## TFT LCD Preliminary Specification

**MODEL NO.: G070Y2-L01**

Customer: \_\_\_\_\_

Approved by: \_\_\_\_\_

Note:

| Liquid Crystal Display Division |                   |
|---------------------------------|-------------------|
| QRA Division.                   | OA Head Division. |
| Approval                        | Approval          |
|                                 |                   |

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**REVISION HISTORY**

| Version | Date         | Section | Description                                            |
|---------|--------------|---------|--------------------------------------------------------|
| Ver 1.0 | Jul. 24, '09 | All     | G070Y2-L01 Preliminary specification was first issued. |

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

G070Y2-L01 is a 7inch TFT Liquid Crystal Display module with a LED backlight unit and a-20pin 6/8bit LVDS interface controller board and controller board with LED converter. This module supports 800 (R.G.B) x 480 WVGA mode which main application is the automotive display and industrial field.

### 1.2 FEATURES

- Wide viewing angle.
- Fast response time
- Wide operating temperature
- Reversible scan function
- 6/8 bit convertible
- High Color gamut ( NTSC : 72% )

### 1.3 APPLICATION

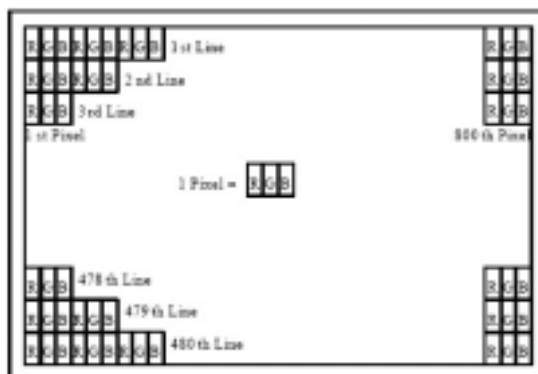
- Automotive Display
- Industry Application

### 1.4 GENERAL SPECIFICATIONS

| Item                     | Specification                   | Unit  | Note |
|--------------------------|---------------------------------|-------|------|
| Diagonal Size            | 7                               | inch  |      |
| Active Area              | 152.4x91.44                     | mm    | (1)  |
| Bezel Opening Area       | 154.6x93.64                     | mm    |      |
| Driver Element           | a-si TFT active matrix          | -     | -    |
| Pixel Number             | 800 x R.G.B. x 480              | pixel | -    |
| Pixel Pitch              | 0.1905 x 0.1905                 | mm    | -    |
| Pixel Arrangement        | RGB vertical stripe             | -     | (2)  |
| Display Colors           | 262k or 16.2M                   | color | -    |
| Display Mode             | Normal White                    | -     | -    |
| Surface Treatment        | Anti-glare, Hard Coating ( 3H ) | -     | -    |
| Module Power Consumption | 4.86                            | W     | Typ. |

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

Note (2)



### 1.5 MECHANICAL SPECIFICATIONS

| Item        |                | Min.    | Typ.   | Max.    | Unit    | Note |
|-------------|----------------|---------|--------|---------|---------|------|
| Module Size | Horizontal (H) | (164.5) | (165)  | (165.5) | mm      | (1)  |
|             | Vertical (V)   | (103.5) | (104)  | (104.5) | mm      |      |
|             | Depth (D)      | (9.13)  | (9.63) | (10.13) | mm      |      |
| Weight      |                | ---     | ---    | (148.6) | (168.6) | g    |

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

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

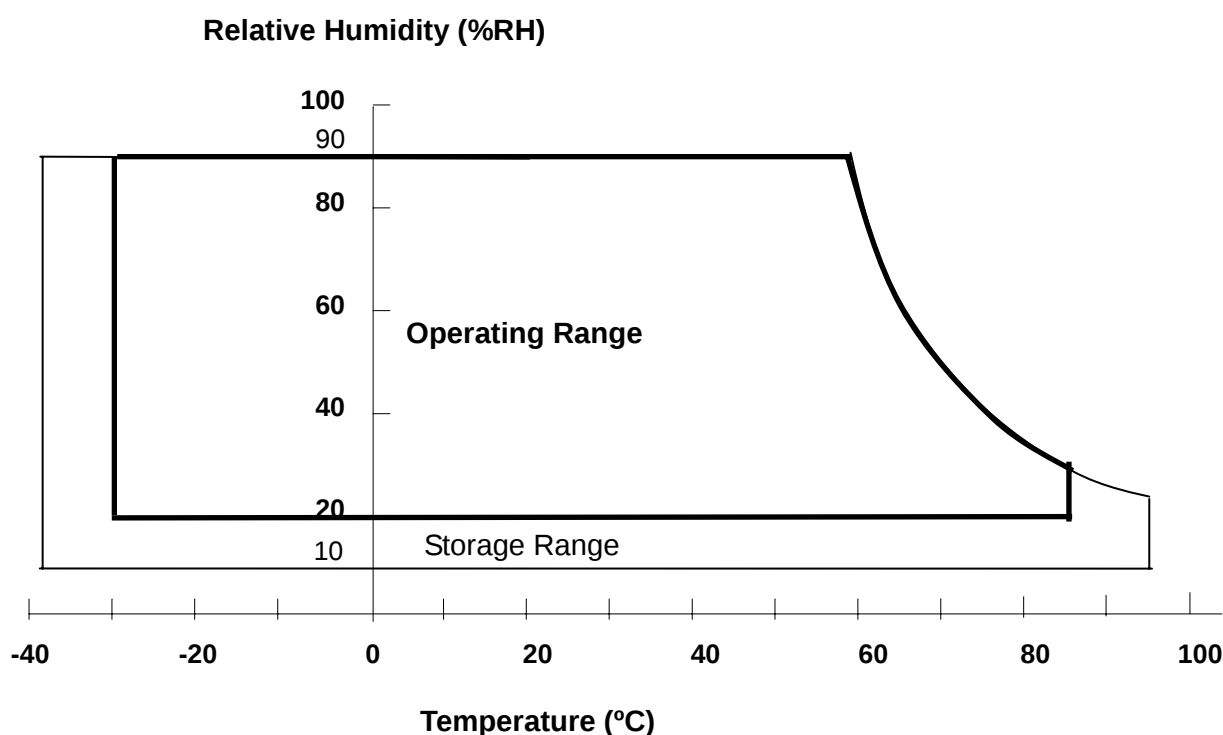
| Item                          | Symbol          | Value |      | Unit | Note |
|-------------------------------|-----------------|-------|------|------|------|
|                               |                 | Min.  | Max. |      |      |
| Operating Ambient Temperature | T <sub>OP</sub> | -30   | +85  | °C   |      |
| Storage Temperature           | T <sub>ST</sub> | -40   | +95  | °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. (Ta > 40 °C).

(4) No condensation.



## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

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

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

### 2.2.2 LED CONVERTER

| Item              | Symbol         | Value |       | Unit | Note      |
|-------------------|----------------|-------|-------|------|-----------|
|                   |                | Min.  | Max.  |      |           |
| Converter Voltage | V <sub>i</sub> | -0.3  | 18    | V    | (1) , (2) |
| Enable Voltage    | EN             | ---   | (4)   | V    |           |
| Backlight Adjust  | ADJ            | ---   | (3.3) | 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 LED converter (Refer to 3.2 for further information).

### 3. ELECTRICAL CHARACTERISTICS

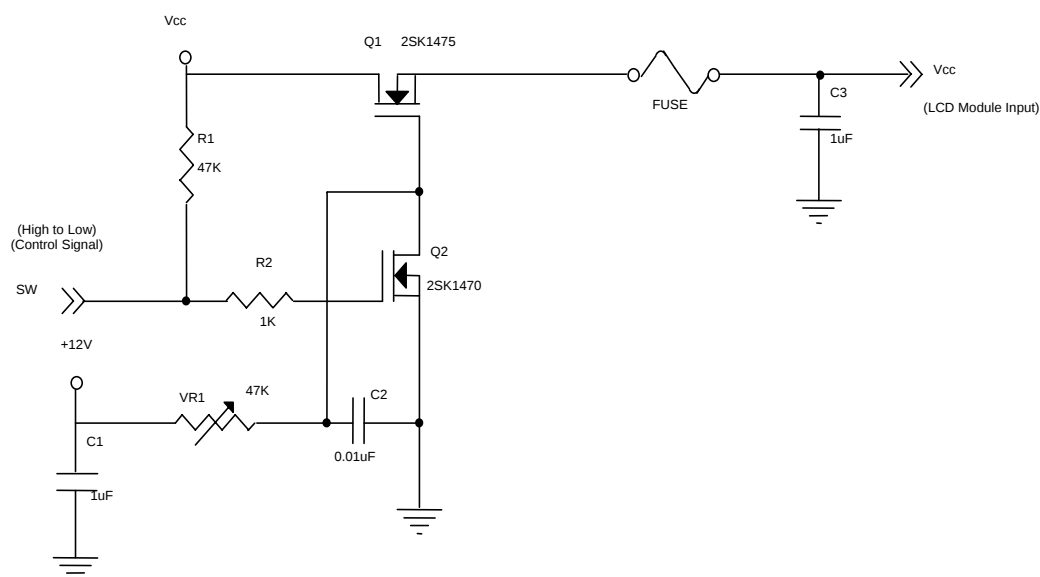
#### 3.1 RECOMMENDED OPERATION CONDITION

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

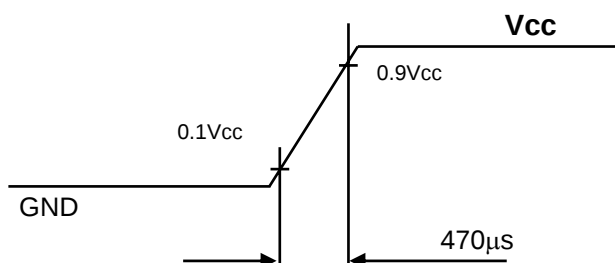
| Parameter                              | Symbol                | Value  |       |        | Unit | Note |
|----------------------------------------|-----------------------|--------|-------|--------|------|------|
|                                        |                       | Min.   | Typ.  | Max.   |      |      |
| Power Supply Voltage                   | V <sub>CC</sub>       | (3.0)  | (3.3) | (3.6)  | V    | (1)  |
| Rush Current                           | I <sub>RUSH</sub>     |        |       | (1.5)  | A    | (2)  |
| Power Supply Current                   | White                 |        | (140) |        | mA   | (3)a |
|                                        | Black                 |        | (170) |        | mA   | (3)b |
| LVDS Differential Input High Threshold | V <sub>TH(LVDS)</sub> |        |       | (+100) | mV   | -    |
| LVDS Differential Input Low Threshold  | V <sub>TL(LVDS)</sub> | (-100) |       |        | mV   | -    |
| LVDS Common Mode Voltage               | V <sub>CM</sub>       |        | (1.2) |        | V    | -    |

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

Note (2) Measurement Conditions:



**Vcc rising time is 470μs**



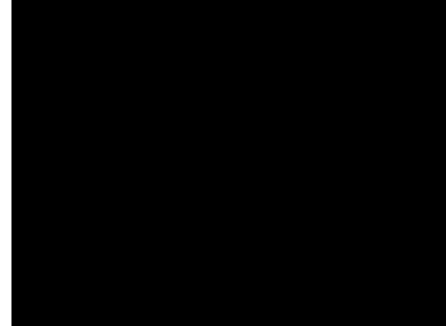
Note (3) The specified power supply current is under the conditions at  $V_{CC} = 3.3V$ ,  $T_a = 25 \pm 2^\circ C$ ,  $f_v = 60$  Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern



Active Area

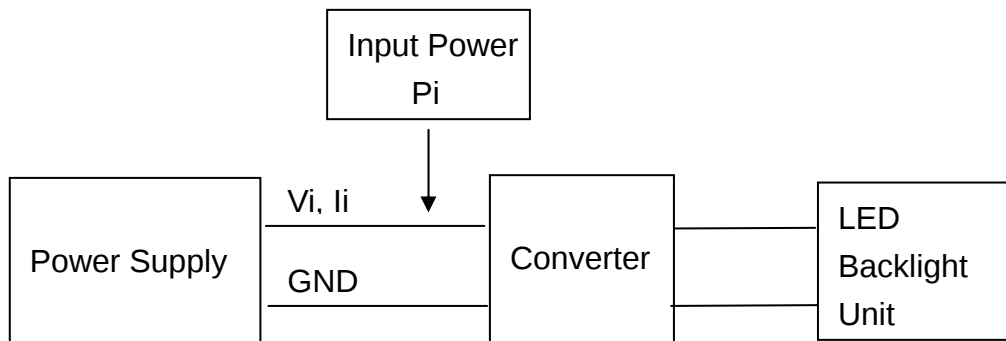
### 3.2 BACKLIGHT UNIT

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

| 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 |                | $I_i$     | ---    | (0.36) | ---    | A    | @ $V_i = 12\text{V}$<br>(Duty 100%) |
| Converter Power Consumption    |                | $P_{LED}$ | ---    | (4.32) | ---    | W    | @ $V_i = 12\text{V}$<br>(Duty 100%) |
| EN Control Level               | Backlight on   |           | (2.0)  | ---    | (3.3)  | V    |                                     |
|                                | Backlight off  |           | (0)    | ---    | (0.8)  | V    |                                     |
| PWM Control Level              | PWM High Level |           | (2.0)  | ---    | (3.3)  | V    |                                     |
|                                | PWM Low Level  |           | (0)    | ---    | (0.15) | V    |                                     |
| PWM Control Duty Ratio         |                |           | (20)   |        | (100)  | %    |                                     |
| PWM Control Frequency          |                | $f_{PWM}$ | (190)  | (200)  | (210)  | Hz   |                                     |
| LED Life Time                  |                | $L_L$     | 50,000 |        |        | Hrs  | (2)                                 |

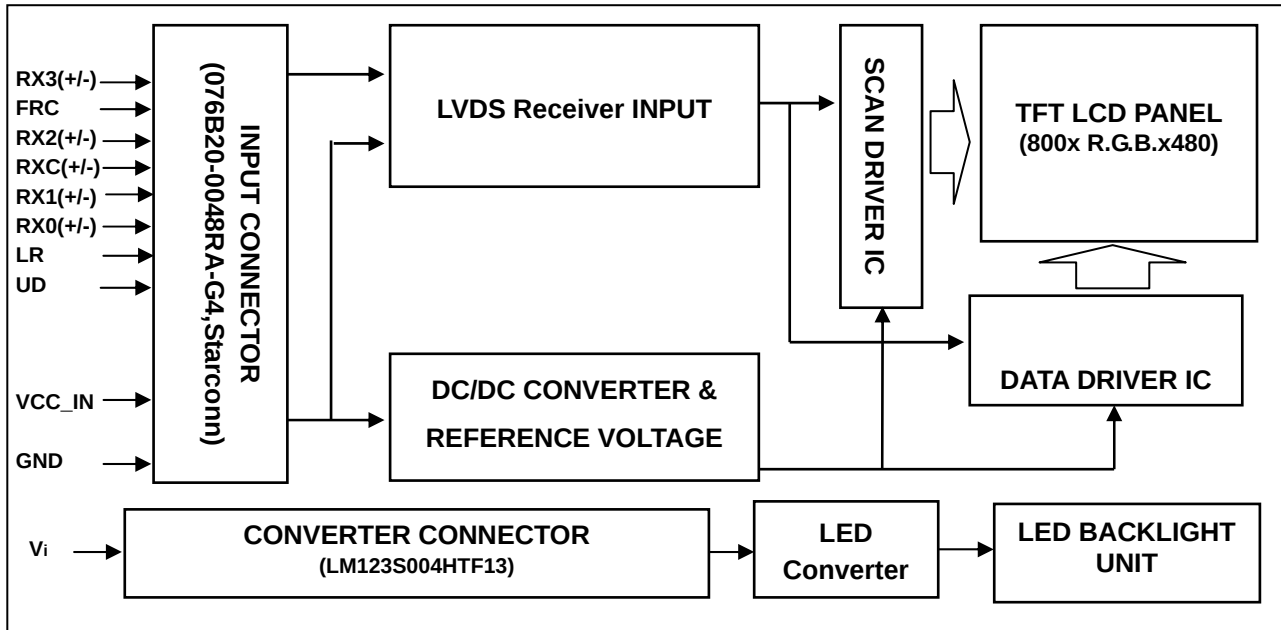
Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at  $T_a = 25 \pm 2$  and  $I_{LED} = 80\text{mA}_{DC}$  (LED forward current) until the brightness becomes 50% of its original value.



#### 4. BLOCK DIAGRAM

##### 4.1 TFT LCD MODULE



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 LVDS I/O PIN ASSIGNMENT

| Pin | Name   | I/O | Description                                                                                                                                                                 |
|-----|--------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | RX3+   | I   | LVDS differential data input Pair 3.                                                                                                                                        |
| 2   | RX3-   | I   |                                                                                                                                                                             |
| 3   | NC     | I   | No Connected                                                                                                                                                                |
| 4   | FRC    | I   | Dithering control setting<br>When FRC=H, the width of data input 8 bits<br>When FRC=L, the width of data input 6 bits and set Dx0 and Dx1 to logical low (Default pull low) |
| 5   | GND    | I   | Ground                                                                                                                                                                      |
| 6   | RXC+   | I   | LVDS differential Clock input Pair                                                                                                                                          |
| 7   | RXC-   | I   |                                                                                                                                                                             |
| 8   | GND    | I   | Ground                                                                                                                                                                      |
| 9   | RX2+   | I   | LVDS differential data input Pair 2                                                                                                                                         |
| 10  | RX2-   | I   |                                                                                                                                                                             |
| 11  | GND    | I   | Ground                                                                                                                                                                      |
| 12  | RX1+   | I   | LVDS differential data input Pair 1                                                                                                                                         |
| 13  | RX1-   | I   |                                                                                                                                                                             |
| 14  | GND    | I   | Ground                                                                                                                                                                      |
| 15  | RX0+   | I   | LVDS differential data input Pair 0                                                                                                                                         |
| 16  | RX0-   | I   |                                                                                                                                                                             |
| 17  | LR     | I   | Shift direction of Source Driver IC internal shift register is controlled by this pin as show below:<br>LR=H SO1→ .....SO1200 (Default pull high)<br>LR=L SO1200→ .....SO1  |
| 18  | UD     | I   | Gate Driver Up/down scan setting<br>When UD=H, reverse scan<br>When UD=L, normal scan (Default pull low)                                                                    |
| 19  | VCC_IN | I   | Digital power supply (+3.3V)                                                                                                                                                |
| 20  | VCC_IN | I   | Digital power supply (+3.3V)                                                                                                                                                |

Note (1) User's connector Part No.: 076B20-0048RA-G4, Starconn or equivalent

### 5.2 BACKLIGHT (Converter connector pin)

| No | Symbol           | I/O | Description             |
|----|------------------|-----|-------------------------|
| 1  | Vi               | I   | Converter input voltage |
| 2  | ADJ              | I   | Backlight Adjust        |
| 3  | EN               | I   | Enable pin              |
| 4  | V <sub>GND</sub> |     | Converter ground        |

Note (1) User's connector Part No: LM123S004HTF13,4 PIN, UNE

### 5.3 SCANNING DIRECTION

The following figures show the image seen from the front view. The arrow indicates the direction of scan.

**Fig.1 Normal Scan**



**Fig.2 Reverse Scan**



**Fig.3 Reverse Scan**



**Fig.4 Reverse Scan**



Fig. 1 Normal scan ( pin 17, LR = High ; pin 18, UD = Low )

Fig. 2 Reverse scan ( pin 17, LR = Low ; pin 18, UD = Low )

Fig. 3 Reverse scan ( pin 17, LR = High ; pin 18, UD = High )

Fig. 4 Reverse scan ( pin 17, LR = Low ; pin 18, UD = High )

#### 5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-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. ( 0: Low Level Voltage, 1: High Level Voltage)

| Color               |                 | Data Signal |    |    |    |    |    |       |    |    |    |    |    |      |    |    |    |    |    |
|---------------------|-----------------|-------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|----|
|                     |                 | Red         |    |    |    |    |    | Green |    |    |    |    |    | Blue |    |    |    |    |    |
|                     |                 | R5          | R4 | R3 | R2 | R1 | R0 | G5    | G4 | G3 | G2 | G1 | G0 | 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  |
|                     | Red             | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green           | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue            | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan            | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Magenta         | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow          | 1           | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 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  |
| 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  |
|                     | Red(1)          | 0           | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(2)          | 0           | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | Red(61)         | 1           | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(62)         | 1           | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(63)         | 1           | 1  | 1  | 1  | 1  | 1  | 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  |
|                     | Green(1)        | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(2)        | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | Green(61)       | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(62)       | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(63)       | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 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  |
|                     | Blue(1)         | 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  | 1  | 0  |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | Blue(61)        | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 0  | 1  |
|                     | Blue(62)        | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 0  |
|                     | Blue(63)        | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |

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.

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

| 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  | 1  | 0  | 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  |    |

## 6. INTERFACE TIMING

### 6.1 Timing CHARACTERISTICS

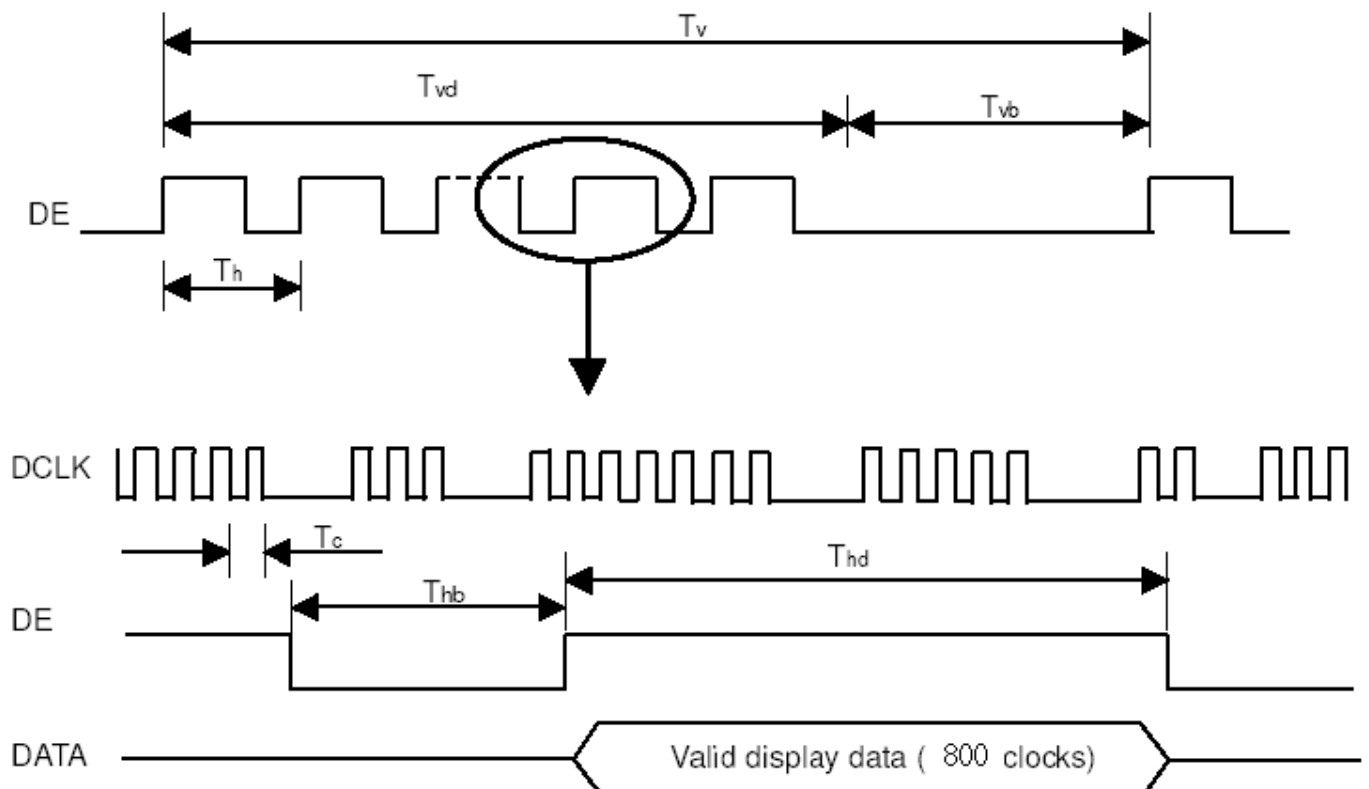
The input signal timing specifications are shown as the following table and timing diagram

| Parameter          |          | Symbol        | Value  |         |        | Unit        | Note                    |
|--------------------|----------|---------------|--------|---------|--------|-------------|-------------------------|
|                    |          |               | Min.   | Typ.    | Max.   |             |                         |
| Vertical Display   | Period   | $T_v$         | (490)  | (508)   | (580)  | $T_h$       | $T_v = T_{vd} + T_{vb}$ |
|                    | Active   | $T_{vd}$      | -      | (480)   | -      | $T_h$       | -                       |
|                    | Blanking | $T_{vb}$      | (10)   | (28)    | (100)  | $T_h$       | -                       |
| Horizontal Display | Period   | $T_h$         | (1000) | (1056)  | (1200) | $T_{clock}$ | $T_h = T_{hd} + T_{hb}$ |
|                    | Active   | $T_{hd}$      | -      | (800)   | -      | $T_{clock}$ | -                       |
|                    | Blanking | $T_{hb}$      | (200)  | (256)   | (400)  | $T_{clock}$ | -                       |
| Clock Frequency    |          | $1/T_{clock}$ | (27)   | (32.18) | (37)   | MHz         | -                       |

Note (1) Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

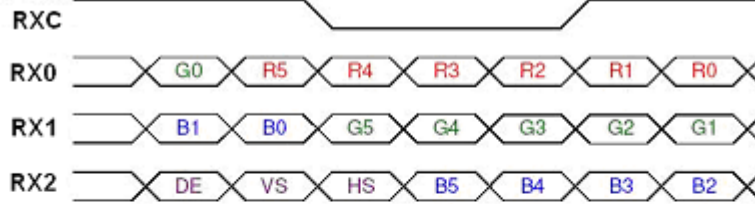
(2) Frame rate is 60Hz

#### INPUT SIGNAL TIMING DIAGRAM

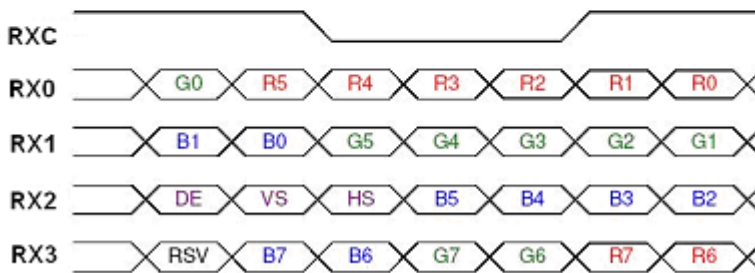


## 6.2 LVDS Input Data Format

**FRC = "Low" or "NC" for 6 bits LVDS Input**



**FRC = "High" for 8 bits LVDS Input**



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

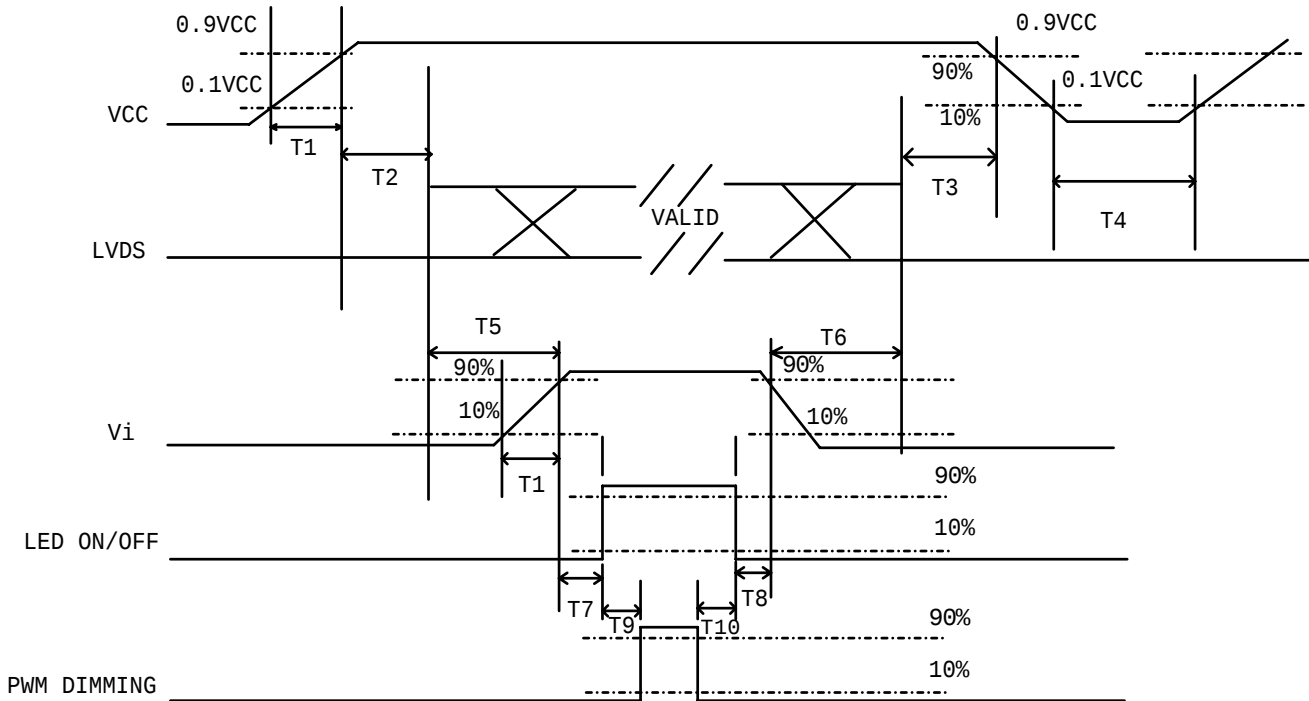
Note (2) Please follow PSWG

| Signal Name                                  | Description                                                                                                                       | Remark                                                                                      |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| R7<br>R6<br>R5<br>R4<br>R3<br>R2<br>R1<br>R0 | Red Data 7 (MSB)<br>Red Data 6<br>Red Data 5<br>Red Data 4<br>Red Data 3<br>Red Data 2<br>Red Data 1<br>Red Data 0 (LSB)          | Red-pixel Data<br>Each red pixel's brightness data consists of these 8 bits pixel data.     |
| G7<br>G6<br>G5<br>G4<br>G3<br>G2<br>G1<br>G0 | Green Data 7 (MSB)<br>GreenData 6<br>GreenData 5<br>GreenData 4<br>GreenData 3<br>GreenData 2<br>GreenData 1<br>GreenData 0 (LSB) | Green-pixel Data<br>Each green pixel's brightness data consists of these 8 bits pixel data. |
| B7<br>B6<br>B5<br>B4<br>B3<br>B2<br>B1<br>B0 | Blue Data 7 (MSB)<br>Blue Data 6<br>Blue Data 5<br>Blue Data 4<br>Blue Data 3<br>Blue Data 2<br>Blue Data 1<br>Blue Data 0 (LSB)  | Blue-pixel Data<br>Each blue pixel's brightness data consists of these 8 bits pixel data.   |
| RXCLKIN+<br>RXCLKIN-                         | LVDS Clock Input                                                                                                                  |                                                                                             |
| DE                                           | Display Enable                                                                                                                    |                                                                                             |
| VS                                           | Vertical Sync                                                                                                                     |                                                                                             |
| HS                                           | Horizontal Sync                                                                                                                   |                                                                                             |

Note (3) Output signals from any system shall be low or Hi-Z state when VCC is off.

### 6.3 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        | 10    | -   | -   | ms    |
| T8        | 10    | -   | -   | ms    |
| T9        | 10    | -   | -   | ms    |
| T10       | 0     | -   | -   | ms    |

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item                | Symbol                                                        | Value   | Unit |
|---------------------|---------------------------------------------------------------|---------|------|
| Ambient Temperature | Ta                                                            | 25±2    | °C   |
| 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" |         |      |
| Current             | I <sub>f</sub>                                                | (80±10) | mA   |
| Converter Duty      |                                                               | 100     | %    |

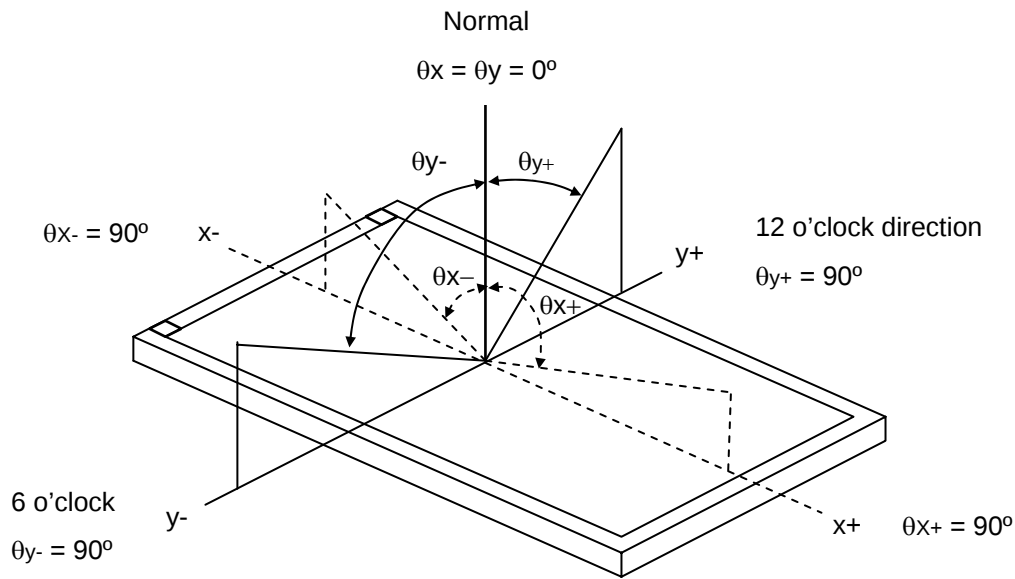
Note (1) I<sub>f</sub> means the forward current of each channel

### 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

| Item               |                           | Symbol           | Condition                                                    | Min.       | Typ.           | Max.       | Unit     | Note     |
|--------------------|---------------------------|------------------|--------------------------------------------------------------|------------|----------------|------------|----------|----------|
| Color Chromaticity | Red                       | R <sub>x</sub>   | $\theta_x=0^\circ, \theta_y=0^\circ$<br>Viewing Normal Angle | Typ – 0.03 | (0.645)        | Typ + 0.03 |          | (1), (6) |
|                    |                           | R <sub>y</sub>   |                                                              |            | (0.341)        |            |          |          |
|                    | Green                     | G <sub>x</sub>   |                                                              |            | (0.312)        |            |          |          |
|                    |                           | G <sub>y</sub>   |                                                              |            | (0.625)        |            |          |          |
|                    | Blue                      | B <sub>x</sub>   |                                                              |            | (0.153)        |            |          |          |
|                    |                           | B <sub>y</sub>   |                                                              |            | (0.053)        |            |          |          |
|                    | White                     | W <sub>x</sub>   |                                                              |            | (0.313)        |            |          |          |
|                    |                           | W <sub>y</sub>   |                                                              |            | (0.329)        |            |          |          |
|                    | Center Luminance of White |                  |                                                              |            | L <sub>C</sub> |            |          |          |
| Contrast Ratio     |                           | CR               | (500)                                                        | (600)      |                | -          | (2), (6) |          |
| Response Time      |                           | T <sub>R</sub>   |                                                              | (5)        | (10)           | Ms         | (3)      |          |
|                    |                           | T <sub>F</sub>   |                                                              | (11)       | (16)           | Ms         |          |          |
| White Variation    |                           | δW               |                                                              |            | (1.25)         | (1.4)      | -        | (5), (6) |
| Viewing Angle      | Horizontal                | θ <sub>x</sub> + | CR 10                                                        | (60)       | (70)           |            | Deg.     | (1), (6) |
|                    |                           | θ <sub>x</sub> - |                                                              | (60)       | (70)           |            |          |          |
|                    | Vertical                  | θ <sub>y</sub> + |                                                              | (50)       | (60)           |            |          |          |
|                    |                           | θ <sub>y</sub> - |                                                              | (50)       | (60)           |            |          |          |

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.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

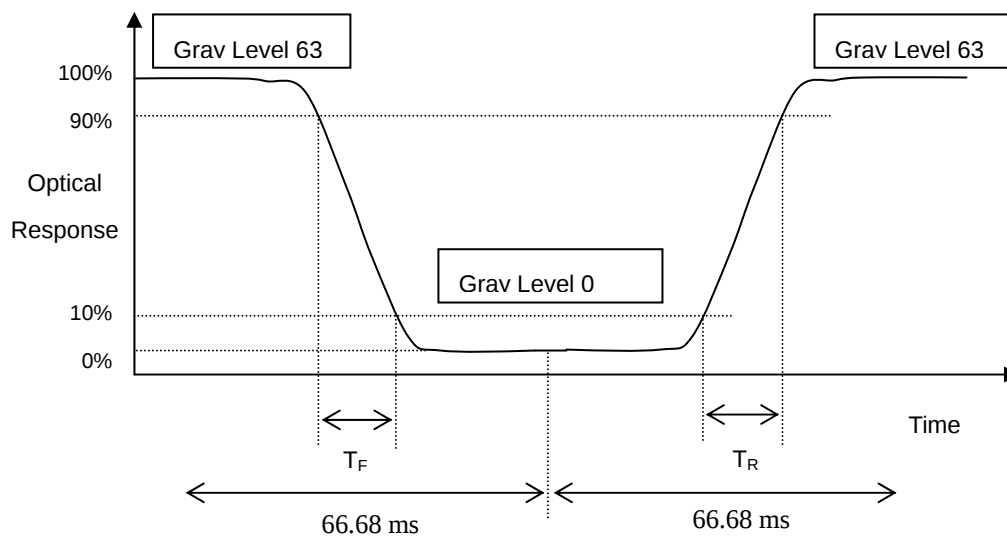
L63: Luminance of gray level 63

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 (5).

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



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

Measure the luminance of gray level 63 at center point

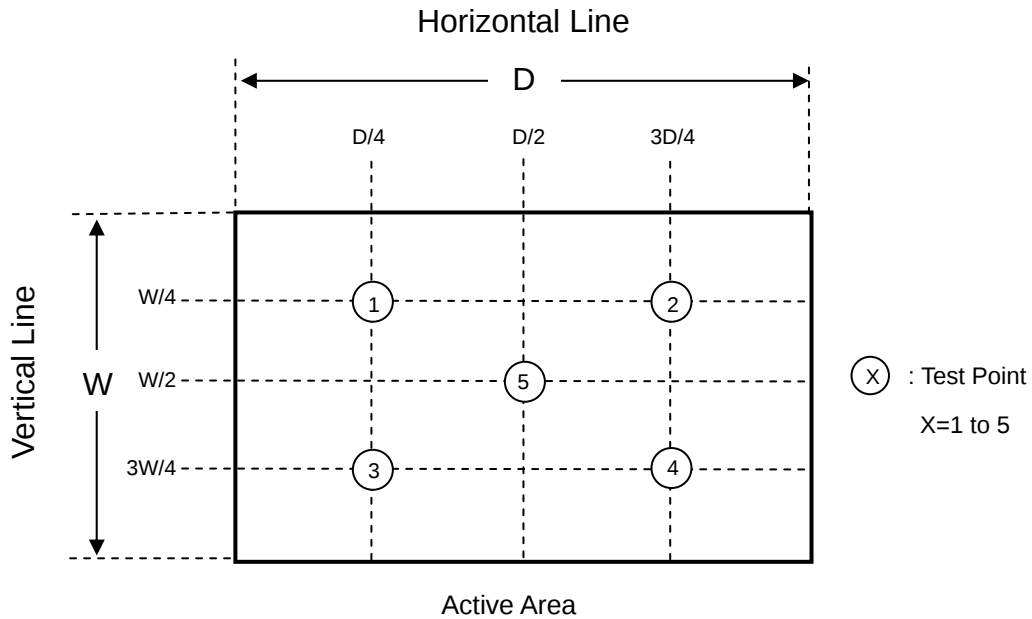
$$L_C = L(5)$$

$L(x)$  is corresponding to the luminance of the point X at Figure in Note (5).

Note (5) Definition of White Variation ( $\delta W$ ):

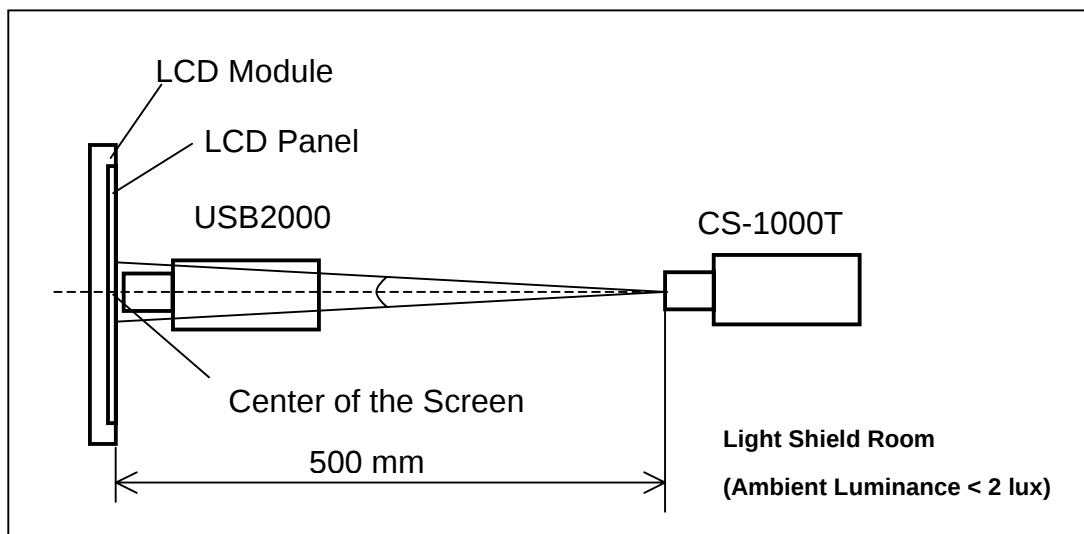
Measure the luminance of gray level 63 at 5 points

$$\delta W = \text{Maximum} [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum} [L(1), L(2), L(3), L(4), L(5)]$$



Note (6) 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.



## 8. RELIABILITY TEST

### 8.1 RELIABILITY TEST CRITERIA

| No. | Test Item                                  | Test Condition                                                       | Note    |
|-----|--------------------------------------------|----------------------------------------------------------------------|---------|
| 1   | High Temperature Storage                   | 95 , 240 hours                                                       | (1) (2) |
| 2   | Low Temperature Storage                    | -40 , 240 hours                                                      |         |
| 3   | Thermal Shock Storage                      | {{(-40 , 0.5 hour) (85 , 0.5 hour)}}, 100 cycles                     |         |
| 4   | High Temperature Operating                 | 85 , 240 hours                                                       |         |
| 5   | Low Temperature Operating                  | -30 , 240 hours                                                      |         |
| 6   | High Temperature & High Humidity Operating | 60 , 90% RH, 240hours                                                |         |
| 7   | Shock (Non-Operating)                      | 100G, 6ms, half sine wave, 3 times for $\pm X$ , $\pm Y$ , $\pm Z$ . | (3)     |
| 8   | Vibration (Non-Operating)                  | 3G, 10 ~ 200 Hz, 10min/cycle, 3 cycles each X, Y, Z                  | (3)     |

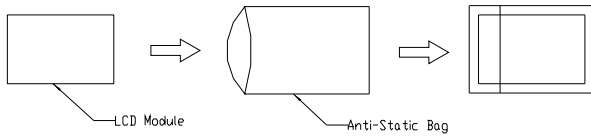
Note (1) There should be no condensation on the surface of panel during test.

Note (2) The temperature of panel display surface area should be 95 Max.

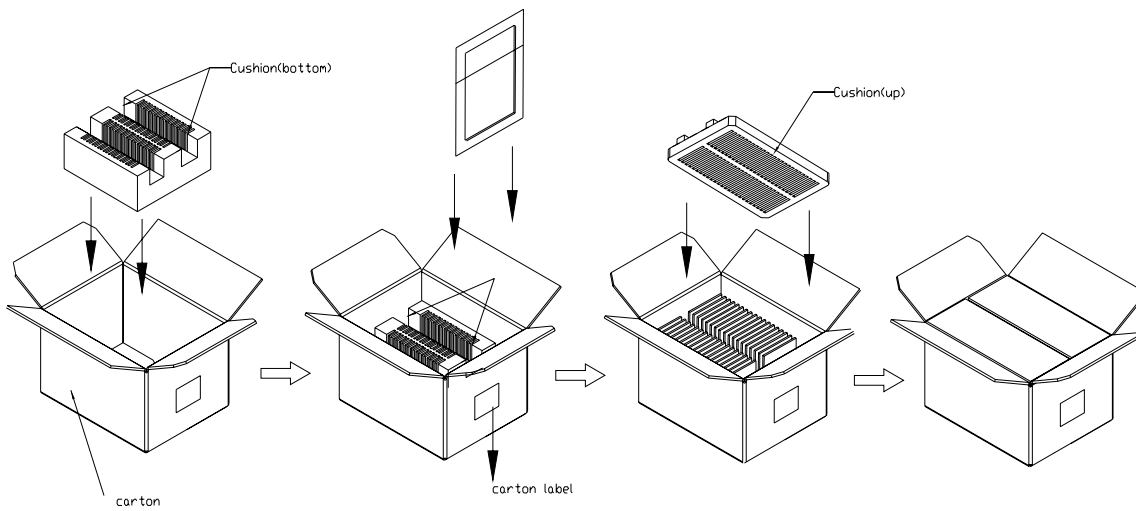
Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

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

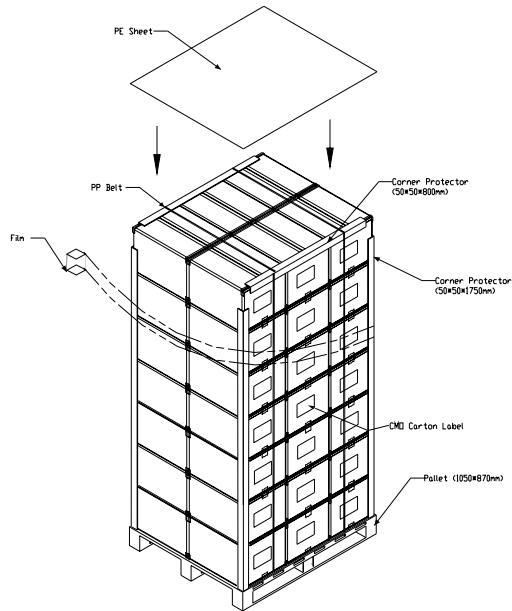
## 9. PACKAGING



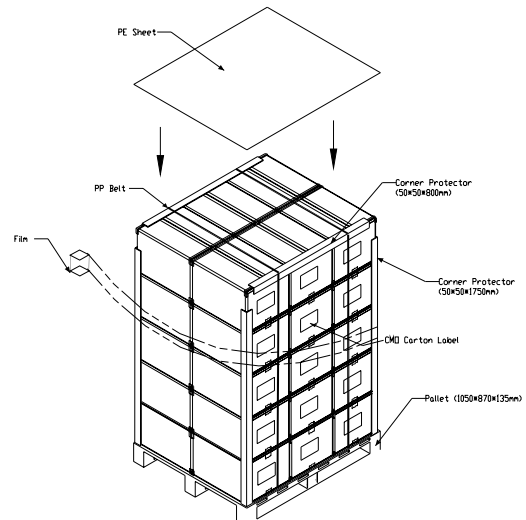
- (1) 34pcs Modules/1 box
- (2) Carton dimensions : 465(L)x362(W)x314(H)mm
- (3) Weight : approximately 14.3kg(34 Module per box).



Sea and Land Transportation



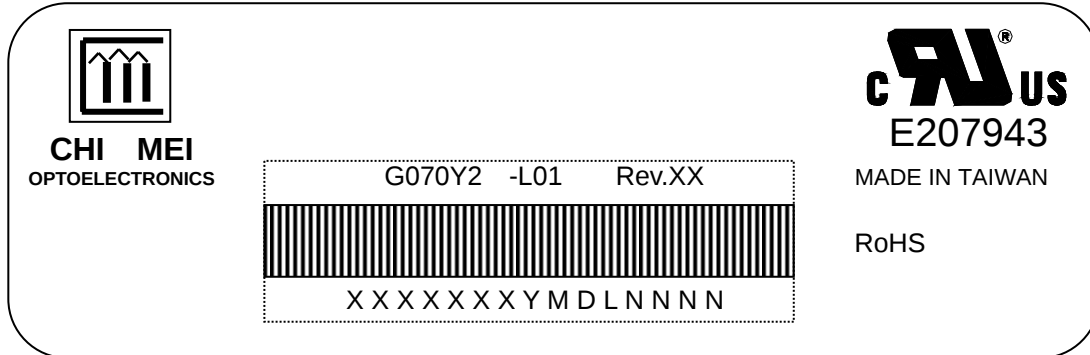
Air Transportation



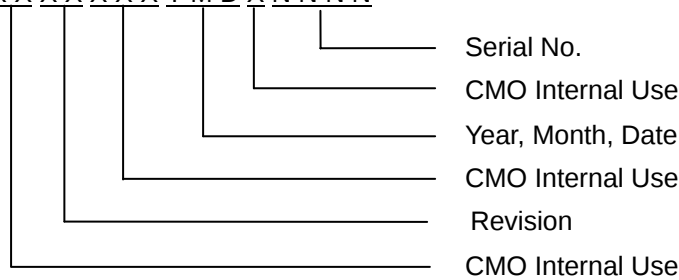
## 10. DEFINITION OF LABELS

### 10.1 CMO MODULE LABEL

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



- (a) Model Name: G070Y2 -L01
- (b) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.
- (c) Serial ID: XXXXXXXXYMDXNNNN



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 1~9, for 2001~2009  
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  
Serial No.: Manufacturing sequence of product

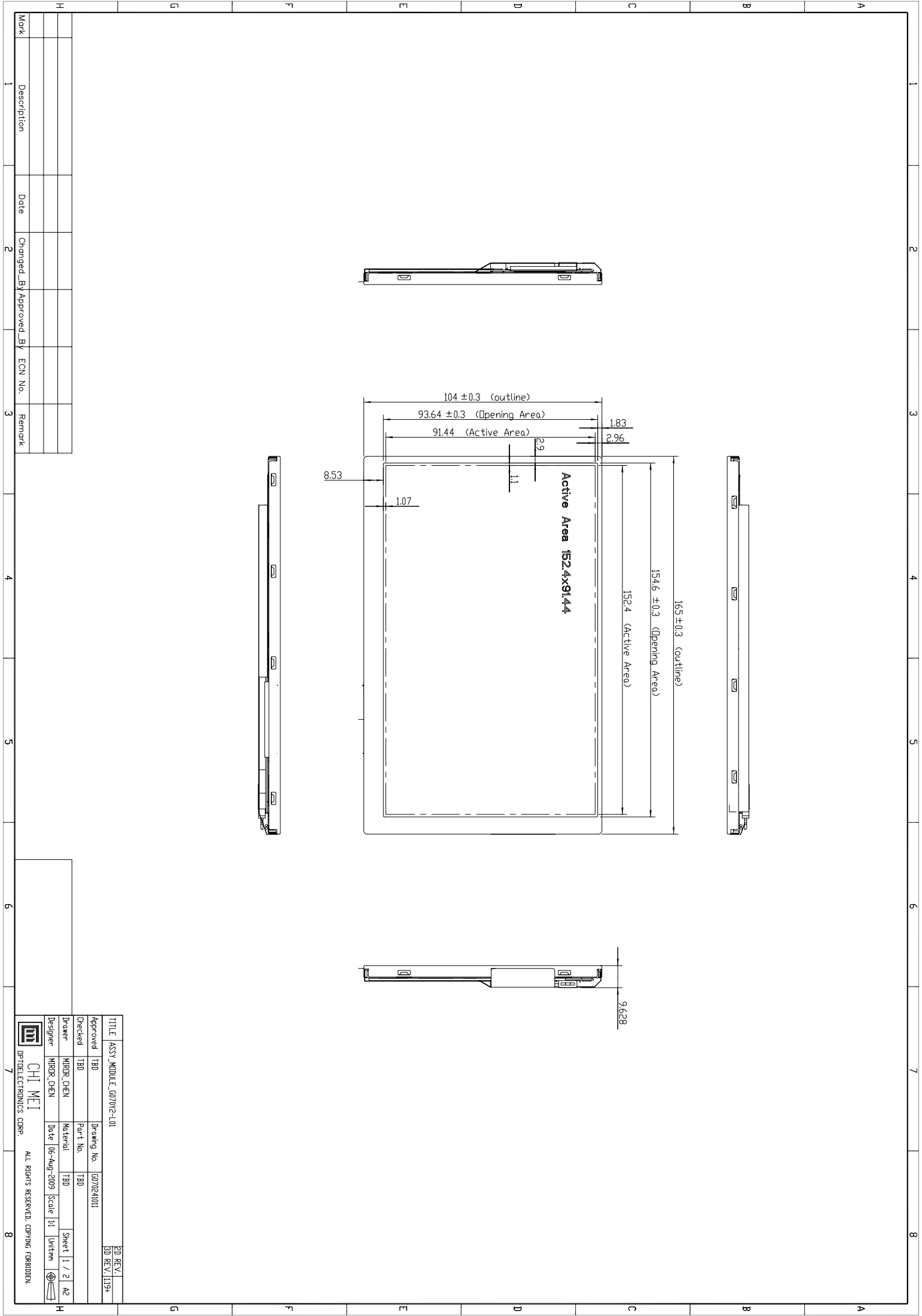
## 11. PRECAUTIONS

### 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, and the starting voltage of CCFL will be higher than room temperature.
- (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 to prevent electrical shock.
- (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.



|      |             |      |            |             |         |        |
|------|-------------|------|------------|-------------|---------|--------|
| Work | Description | Date | Changed By | Approved By | ECN No. | Remark |
| 1    |             |      |            |             |         |        |
| 2    |             |      |            |             |         |        |
| 3    |             |      |            |             |         |        |
| 4    |             |      |            |             |         |        |
| 5    |             |      |            |             |         |        |
| 6    |             |      |            |             |         |        |
| 7    |             |      |            |             |         |        |
| 8    |             |      |            |             |         |        |

|          |  |                        |             |         |             |
|----------|--|------------------------|-------------|---------|-------------|
| TITLE    |  | ASSY MODULE_60702-1.01 |             | 2D REV. |             |
| Approved |  | TBD                    | Drawing No. |         | 6070241011  |
| Checked  |  | TBD                    | Part No.    |         | TBD         |
| Designer |  | MIROR CHEN             | Date        |         | 06-Aug-2009 |
| Scale    |  | 1:1                    | Sheet       |         | 1 / 2       |
| Unit     |  | mm                     | A2          |         |             |

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