

Doc. Number :

- ☐ Tentative Specification  
☐ Preliminary Specification  
☒ Approval Specification

**MODEL NO.: M280DGJ**  
**SUFFIX: L30**

**Customer: ALL**

**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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|                                                     |           |
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## REVISION HISTORY

| Version | Date        | Page       | Description                                                               |
|---------|-------------|------------|---------------------------------------------------------------------------|
| 3.0     | 10.17, 2013 | All        | Approval Spec Ver.3.0 was first issued.                                   |
| 3.1     | 11.23.2013  | 5          | 1.2 Total power consumption<br>Cell 11.664 →14.256w Total 34.344→36.936 w |
| 3.2     | 04.30.2014  | Appendixes | Drawing add Back cover add emboss                                         |
|         | 05.22.2014  | 5          | 1.2 Display Colors_ add the description_ 8 bits.+ High FRC                |
|         | 06.25.2014  | 5          | Screen Size 27.9" real diagonal                                           |
| 3.3     | 09,23,2014  | 6          | 3.1 ABSOLUTE RATINGS OF ENVIRONMENT<br>刪除(Ta <40 oC).                     |
|         |             | 10         | BGR > RGB                                                                 |
|         |             | 11         | Power Supply Current                                                      |
|         |             | 18         | Not 2, Not3                                                               |
|         |             | 20         | 4.8 POWER ON/OFF SEQUENCE                                                 |
|         |             | 31         | 10.2 STORAGE PRECAUTIONS (1)relative humidity of less than<br>70%--→90%   |
|         |             |            |                                                                           |
|         |             |            |                                                                           |
|         |             |            |                                                                           |
|         |             |            |                                                                           |
|         |             |            |                                                                           |
|         |             |            |                                                                           |

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

M280DGJ-L30 is a 28.0" TFT Liquid Crystal Display module with WLED Backlight unit and 51 pins 8 lane – V by 1 interface. This module supports 3840 x 2160 UHD(Ultra High Definition) mode and can display up to 1.073G colors. The converter module for Backlight is not built in.

### 1.2 GENERAL SPECIFICATIONS

| Item                         | Specification                                                     | Unit  | Note |
|------------------------------|-------------------------------------------------------------------|-------|------|
| Screen Size                  | 27.9" real diagonal                                               | mm    |      |
| Driver Element               | a-si TFT active matrix                                            | -     | -    |
| Pixel Number                 | 3840 x R.G.B. x 2160                                              | pixel | -    |
| Pixel Pitch                  | 0.16 (H) x 0.16 (V)                                               | mm    | -    |
| Pixel Arrangement            | RGB vertical stripe                                               | -     | -    |
| Display Colors               | 1.073G (8 bits.+ High FRC)                                        | color | -    |
| Transmissive Mode            | Normally White                                                    | -     | -    |
| Surface Treatment            | AG type, 3H hard coating, Haze 25                                 | -     | -    |
| Color Gamut                  | 72% of NTSC(Typ.)                                                 | -     | -    |
| RoHS, Halogen Free & TCO 6.0 | RoHS, Halogen Free TCO 6.0 compliance                             |       |      |
| Luminance, White             | 300                                                               | Cd/m2 |      |
| Power Consumption            | Total (36.936) W(Typ.) @ cell (14.256) W(Typ.), BL (22.68)W(Typ.) |       | (1)  |

Note (1) The specified power consumption : Total= cell (reference 4.3.1)+BL (reference 4.3.3)

## 2. MECHANICAL SPECIFICATIONS

| Item        | Min.           | Typ.   | Max.   | Unit   | Note |
|-------------|----------------|--------|--------|--------|------|
| Module Size | Horizontal (H) | 647.90 | 648.90 | 649.90 | mm   |
|             | Vertical (V)   | 368.30 | 369.30 | 370.30 | mm   |
|             | Thickness (T)  | 18.85  | 19.85  | 20.85  | mm   |
| Bezel Area  | Horizontal     | 625.93 | 626.93 | 627.93 | mm   |
|             | Vertical       | 346.28 | 347.28 | 348.28 | mm   |
| Active Area | Horizontal     | -      | 620.93 | -      | mm   |
|             | Vertical       | -      | 341.28 | -      | mm   |
| Weight      | -              | 2910   | 3055   | g      |      |

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

### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item                          | Symbol | Value |      | Unit | Note     |
|-------------------------------|--------|-------|------|------|----------|
|                               |        | Min.  | Max. |      |          |
| Storage Temperature           | TST    | -20   | 60   | °C   | (1)      |
| Operating Ambient Temperature | TOP    | 0     | 50   | °C   | (1), (2) |

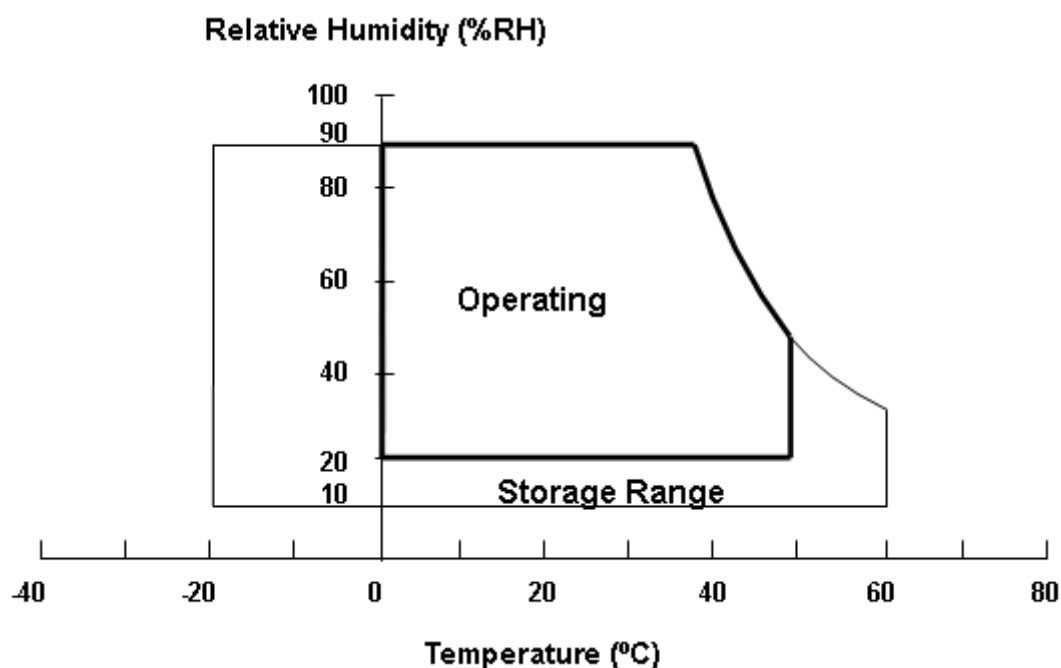
Note (1)

(a) 90 %RH Max.

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

(c) No condensation.

Note (2) The temperature of panel surface should be 0 oC min. and 60 oC max.



## 3.2 ELECTRICAL ABSOLUTE RATINGS

### 3.2.1 TFT LCD MODULE

| Item                 | Symbol | Value |       | Unit | Note |
|----------------------|--------|-------|-------|------|------|
|                      |        | Min.  | Max.  |      |      |
| Power Supply Voltage | VCCS   | -0.3  | 13.5. | V    | (1)  |
| Logic Input Voltage  | VIN    | -0.3  | 3.6   | V    |      |

### 3.2.2 BACKLIGHT UNIT

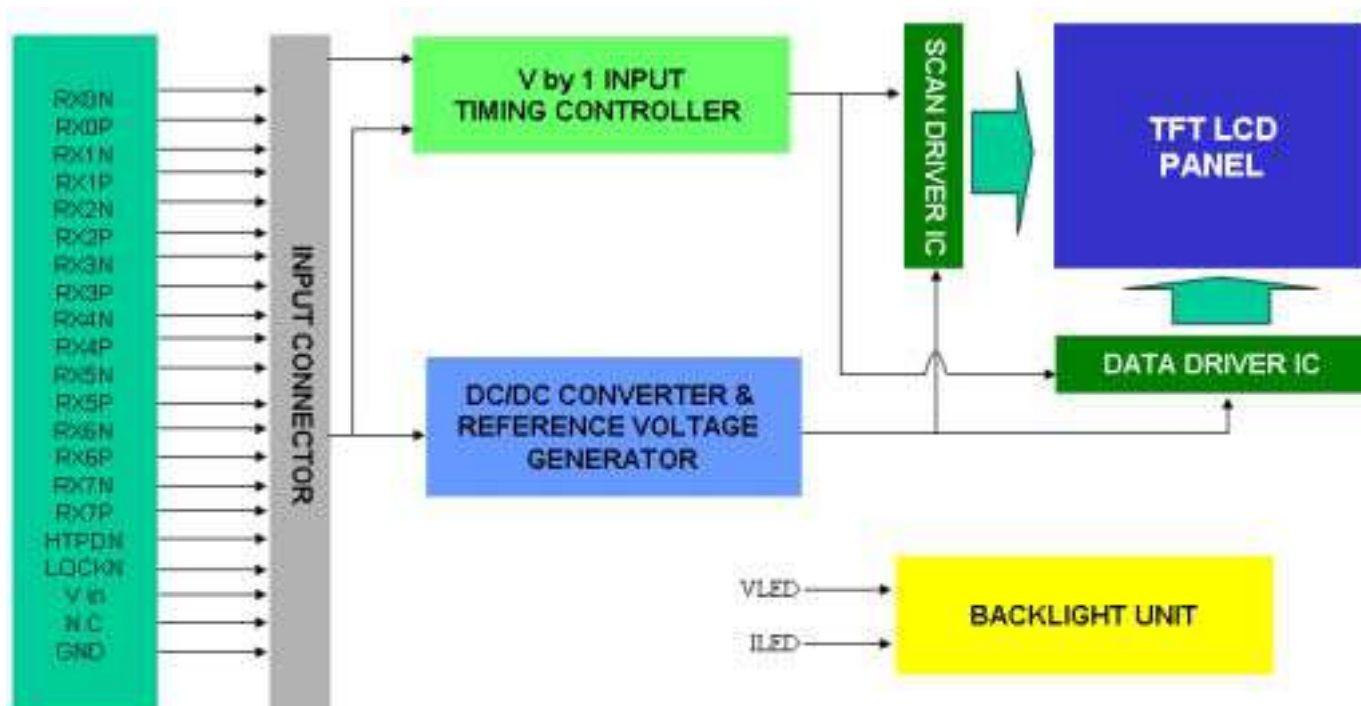
| Item                              | Symbol | Value |     |      | Unit | Note                  |
|-----------------------------------|--------|-------|-----|------|------|-----------------------|
|                                   |        | Min.  | Typ | Max. |      |                       |
| LED Forward Current Per Input Pin | IF     | 141   | 150 | 159  | mA   | (1), (2)<br>Duty=100% |

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  $T_a=25\pm2\text{ }^{\circ}\text{C}$  (Refer to 4.3.2 and 4.3.3 for further information).

## 4. ELECTRICAL SPECIFICATIONS

### 4.1 FUNCTION BLOCK DIAGRAM



### 4.2. INTERFACE CONNECTIONS

#### PIN ASSIGNMENT

| Pin | Name | Description                     | Note |
|-----|------|---------------------------------|------|
| 1   | Vin  | Power input (+12V)              |      |
| 2   | Vin  | Power input (+12V)              |      |
| 3   | Vin  | Power input (+12V)              |      |
| 4   | Vin  | Power input (+12V)              |      |
| 5   | Vin  | Power input (+12V)              |      |
| 6   | Vin  | Power input (+12V)              |      |
| 7   | Vin  | Power input (+12V)              |      |
| 8   | Vin  | Power input (+12V)              |      |
| 9   | N.C. | No Connection                   | (2)  |
| 10  | GND  | Ground                          |      |
| 11  | GND  | Ground                          |      |
| 12  | GND. | Ground                          |      |
| 13  | GND. | Ground                          |      |
| 14  | GND. | Ground                          |      |
| 15  | N.C. | No Connection                   | (2)  |
| 16  | N.C. | No Connection                   | (2)  |
| 17  | N.C. | No Connection                   | (2)  |
| 18  | N.C  | For internal use, no connection |      |
| 19  | N.C  | For internal use, no connection |      |
| 20  | N.C. | No Connection                   | (2)  |
| 21  | N.C. | No Connection                   | (2)  |
| 22  | N.C. | No Connection                   | (2)  |
| 23  | N.C. | No Connection                   | (2)  |



| Pin | Name  | Description                                                                    | Note |
|-----|-------|--------------------------------------------------------------------------------|------|
| 24  | N.C.  | No Connection                                                                  | (2)  |
| 25  | HTPDN | Hot plug detect output, Open drain.                                            |      |
| 26  | LOCKN | Lock detect output, Open drain.                                                |      |
| 27  | GND   | Ground                                                                         |      |
| 28  | RX0N  | 1 <sup>st</sup> Pixel Negative VbyOne differential data input in area A. Lan 0 | (1)  |
| 29  | RX0P  | 1 <sup>st</sup> Pixel Positive VbyOne differential data input in area A. Lan 0 |      |
| 30  | GND   | Ground                                                                         |      |
| 31  | RX1N  | 2 <sup>nd</sup> Pixel Negative VbyOne differential data input in area A. Lan 1 | (1)  |
| 32  | RX1P  | 2 <sup>nd</sup> Pixel Positive VbyOne differential data input in area A. Lan 1 |      |
| 33  | GND   | Ground                                                                         |      |
| 34  | RX2N  | 3 <sup>rd</sup> Pixel Negative VbyOne differential data input in area A. Lan 2 | (1)  |
| 35  | RX2P  | 3 <sup>rd</sup> Pixel Positive VbyOne differential data input in area A. Lan 2 |      |
| 36  | GND   | Ground                                                                         |      |
| 37  | RX3N  | 4 <sup>th</sup> Pixel Negative VbyOne differential data input in area A. Lan 3 | (1)  |
| 38  | RX3P  | 4 <sup>th</sup> Pixel Positive VbyOne differential data input in area A. Lan 3 |      |
| 39  | GND   | Ground                                                                         |      |
| 40  | RX4N  | 5 <sup>th</sup> Pixel Negative VbyOne differential data input in area A. Lan 4 | (1)  |
| 41  | RX4P  | 5 <sup>th</sup> Pixel Positive VbyOne differential data input in area A. Lan 4 |      |
| 42  | GND   | Ground                                                                         |      |
| 43  | RX5N  | 6 <sup>th</sup> Pixel Negative VbyOne differential data input in area A. Lan 5 | (1)  |
| 44  | RX5P  | 6 <sup>th</sup> Pixel Positive VbyOne differential data input in area A. Lan 5 |      |
| 45  | GND   | Ground                                                                         |      |
| 46  | RX6N  | 7 <sup>th</sup> Pixel Negative VbyOne differential data input in area A. Lan 6 | (1)  |
| 47  | RX6P  | 7 <sup>th</sup> Pixel Positive VbyOne differential data input in area A. Lan 6 |      |
| 48  | GND   | Ground                                                                         |      |
| 49  | RX7N  | 8 <sup>th</sup> Pixel Negative VbyOne differential data input in area A. Lan 7 | (1)  |
| 50  | RX7P  | 8 <sup>th</sup> Pixel Positive VbyOne differential data input in area A. Lan 7 |      |
| 51  | GND   | Ground                                                                         |      |

## Connector Information

| Item                              | Description                               |
|-----------------------------------|-------------------------------------------|
| Manufacturer                      | FCN/ P-TWO                                |
| Type part number                  | FCN: WF23-402-5133<br>P-TWO: 187059-51221 |
| User's Mating housing part number | JAE: FI-RE51HL                            |

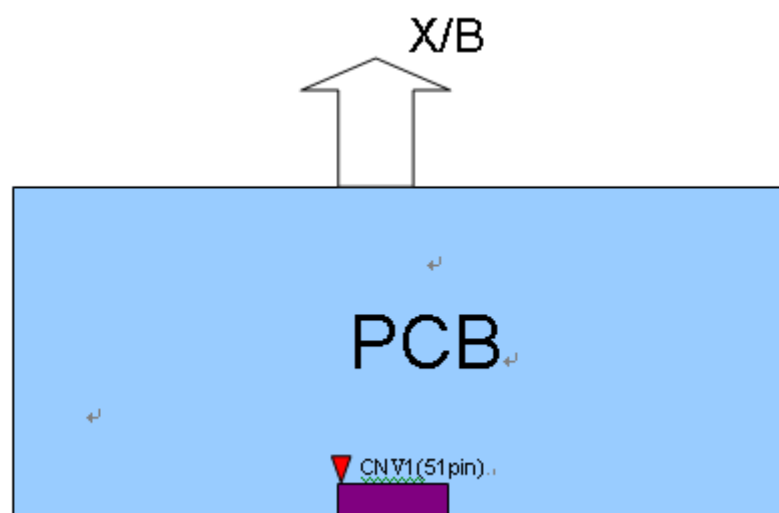
\*Notice: There would be compatible issues if not using the indicated connectors in the matching list.

Note (1) V-by-One® HS Data Mapping

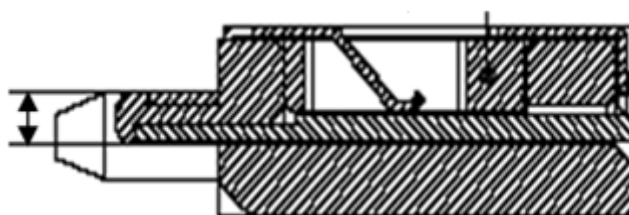
| Lan   | Data Stream                  |
|-------|------------------------------|
| Lan 0 | 1, 9, 17, ....., 3825, 3833  |
| Lan 1 | 2, 10, 18, ....., 3826, 3834 |
| Lan 2 | 3, 11, 19, ....., 3827, 3835 |
| Lan 3 | 4, 12, 20, ....., 3828, 3836 |
| Lan 4 | 5, 13, 21, ....., 3829, 3837 |
| Lan 5 | 6, 14, 22, ....., 3830, 3838 |
| Lan 6 | 7, 15, 23, ....., 3831, 3839 |
| Lan 7 | 8, 16, 24, ....., 3832, 3840 |

Note (2) Reserved for internal use. Please leave it open.

Note (3) VbyOne HS connector pin order defined as following:

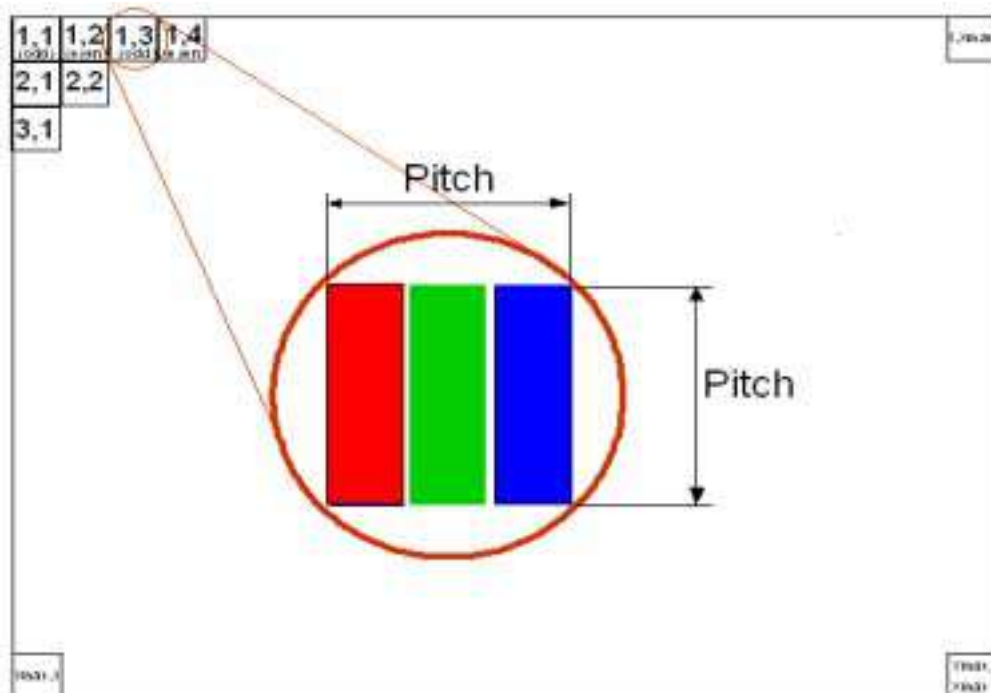


Note (4) V-by-One connector mating dimension range request is 0.93mm~1.0mm as below:



Note (5) The first pixel is odd.

Note (6) Input signal of even and odd clock should be the same timing



## 4.3 ELECTRICAL CHARACTERISTICS

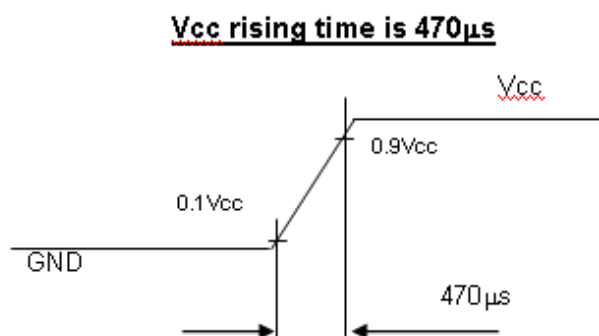
### 4.3.1 LCD ELETRONICS SPECIFICATION

| Parameter            |                                           | Symbol            | Value |        |        | Unit | Note |
|----------------------|-------------------------------------------|-------------------|-------|--------|--------|------|------|
|                      |                                           |                   | Min.  | Typ.   | Max.   |      |      |
| Power Supply Voltage |                                           | V <sub>CC</sub>   | 10.8  | 12     | 13.2   | V    | (2)  |
| Ripple Voltage       |                                           | V <sub>RP</sub>   | -     | -      | 300    | mV   | -    |
| Rush Current         |                                           | I <sub>RUSH</sub> | -     | 2      | 2.6    | A    | (3)  |
| Power Supply Current | White                                     | P <sub>T</sub>    | -     | 0.6    | 0.728  | A    | (4)a |
|                      | Black                                     |                   | -     | 0.588  | 0.702  | A    | (4)b |
|                      | Horizontal Stripe                         |                   | -     | 1.296  | 1.573  | A    | (4)c |
| Power Consumption    |                                           | PLCD              | -     | 15.552 | 18.876 | Watt | (5)  |
| V-by-One interface   | Differential Input High Threshold Voltage | VLV <sub>TH</sub> | -     | -      | 50     | mV   | (6)  |
|                      | Differential Input Low Threshold Voltage  | VLV <sub>TL</sub> | -50   | -      | -      | mV   |      |
|                      | Differential Input Resistor               | RRIN              | 80    | 100    | 120    | ohm  |      |
| CMOS interface       | Input High Threshold voltage              | V <sub>IH</sub>   | 2.7   |        | 3.3    | V    |      |
|                      | Input Low threshold voltage               | V <sub>IL</sub>   | 0     |        | 0.7    | V    |      |

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

Note (2) The module should be always operated within the above ranges. The ripple voltage should be controlled under 10 % of V<sub>CC</sub> (Typ.)

Note (3) Measurement Conditions:



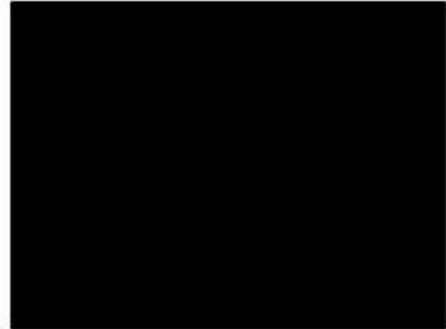
Note (4) The specified power supply current is under the conditions at  $V_{cc} = 12\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $F_r = 60\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. White Pattern



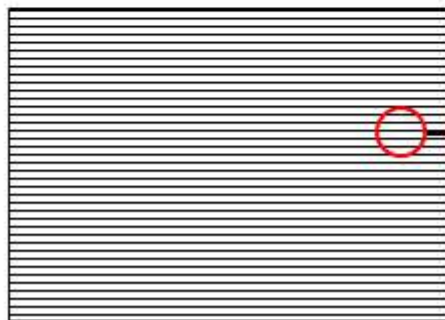
Active Area

b. Black Pattern



Active Area

c. Horizontal Pattern



Note (5) The power consumption is specified at the pattern with the maximum current.

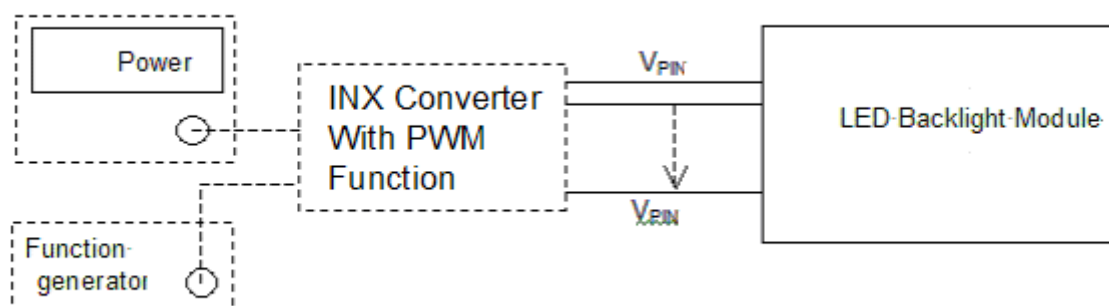
## 4.3.2 BACKLIGHT UNIT

| Parameter                                 | Symbol | Value |       |       | Unit | Note                             |
|-------------------------------------------|--------|-------|-------|-------|------|----------------------------------|
|                                           |        | Min.  | Typ.  | Max.  |      |                                  |
| LED Light Bar Input Voltage Per Input Pin | VPIN   | -     | 37.8  | 40.2  | V    | (1),<br>Duty=100%,<br>IPIN=150mA |
| LED Light Bar Current Per Input Pin       | IPIN   | 141   | 150   | 159   | mA   | (1), (2)<br>Duty=100%            |
| LED Life Time                             | LLED   | 30000 |       |       | Hrs  | (3)                              |
| Power Consumption                         | PBL    | -     | 22.68 | 24.12 | W    | (1)<br>Duty=100%,<br>IPIN=150mA  |

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

Note (2)  $PBL = IPIN \times VPIN \times (4) \text{ input pins}$ .

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at  $T_a = 25 \pm 2^\circ\text{C}$  and  $I = (150)\text{mA}$  (per chip) until the brightness becomes  $\leq 50\%$  of its original value.



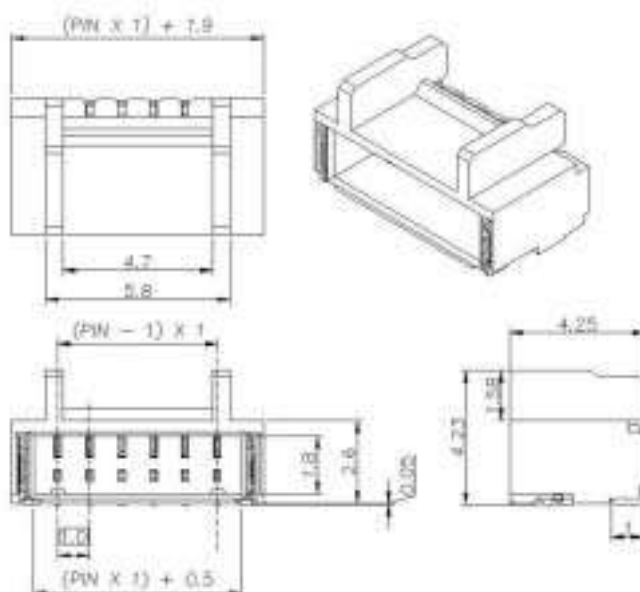
## 4.3.3 LIGHTBAR Connector Pin Assignment:

(1) Connector Information:

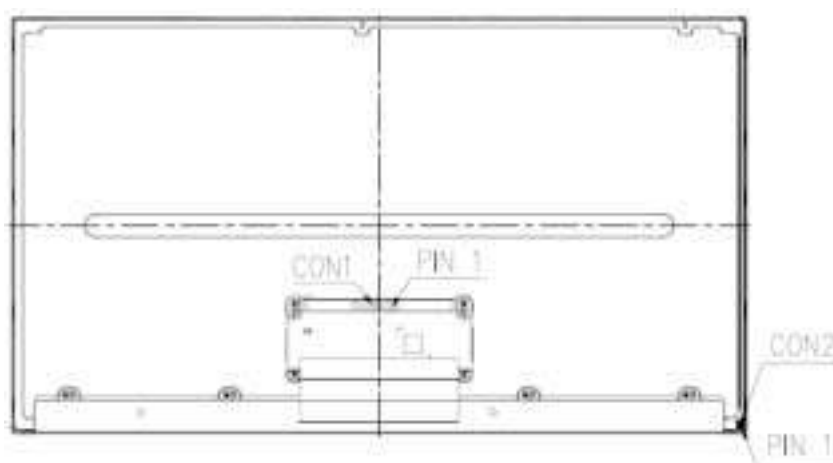
| Item                       | Description                                     |
|----------------------------|-------------------------------------------------|
| Manufacturer               | FCN/ CviLux                                     |
| Type part number           | WM13-406-063N(FCN)<br>/ CI1406M1HRK-NH(CviLux)  |
| Mating housing part number | WF1300106-B (FCN)<br>/ CI1406SL000-NH (CviLux). |

\*Notice: There would be compatible issues if not using the indicated connectors in the matching list.

(2) LB Connector drawing:



| Pin number | Description            |
|------------|------------------------|
| 1          | Cathode of LED string1 |
| 2          | Cathode of LED string2 |
| 3          | VLED                   |
| 4          | VLED                   |
| 5          | Cathode of LED string3 |
| 6          | Cathode of LED string4 |



## 4.4 V by One INPUT SIGNAL SPECIFICATIONS

### 4.4.1 V by One DATA MAPPING TABLE

| Lan   | Data Stream                  |
|-------|------------------------------|
| Lan 0 | 1, 9, 17, ....., 3825, 3833  |
| Lan 1 | 2, 10, 18, ....., 3826, 3834 |
| Lan 2 | 3, 11, 19, ....., 3827, 3835 |
| Lan 3 | 4, 12, 20, ....., 3828, 3836 |
| Lan 4 | 5, 13, 21, ....., 3829, 3837 |
| Lan 5 | 6, 14, 22, ....., 3830, 3838 |
| Lan 6 | 7, 15, 23, ....., 3831, 3839 |
| Lan 7 | 8, 16, 24, ....., 3832, 3840 |



## 4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-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 |    |    |    |    |    |    |    |    |    |
|                     |                 | R9          | R8 | G7 | G6 | R5 | R4 | R3 | R2 | R1 | R0 | G9    | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B9   | B8 | 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  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red             | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 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  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 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  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 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  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 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  | 1  | 1  | 1  | 1  | 0    | 0  | 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  | 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  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red(1)          | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red(2)          | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | Red(1021)       | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red(1022)       | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red(1023)       | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 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  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green(1)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green(2)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | Green(1021)     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green(1022)     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |    |
|                     | Green(1023)     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 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  | 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  | 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  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  |    |
|                     | Blue(1021)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                     | Blue(1022)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  |
|                     | Blue(1023)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 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.

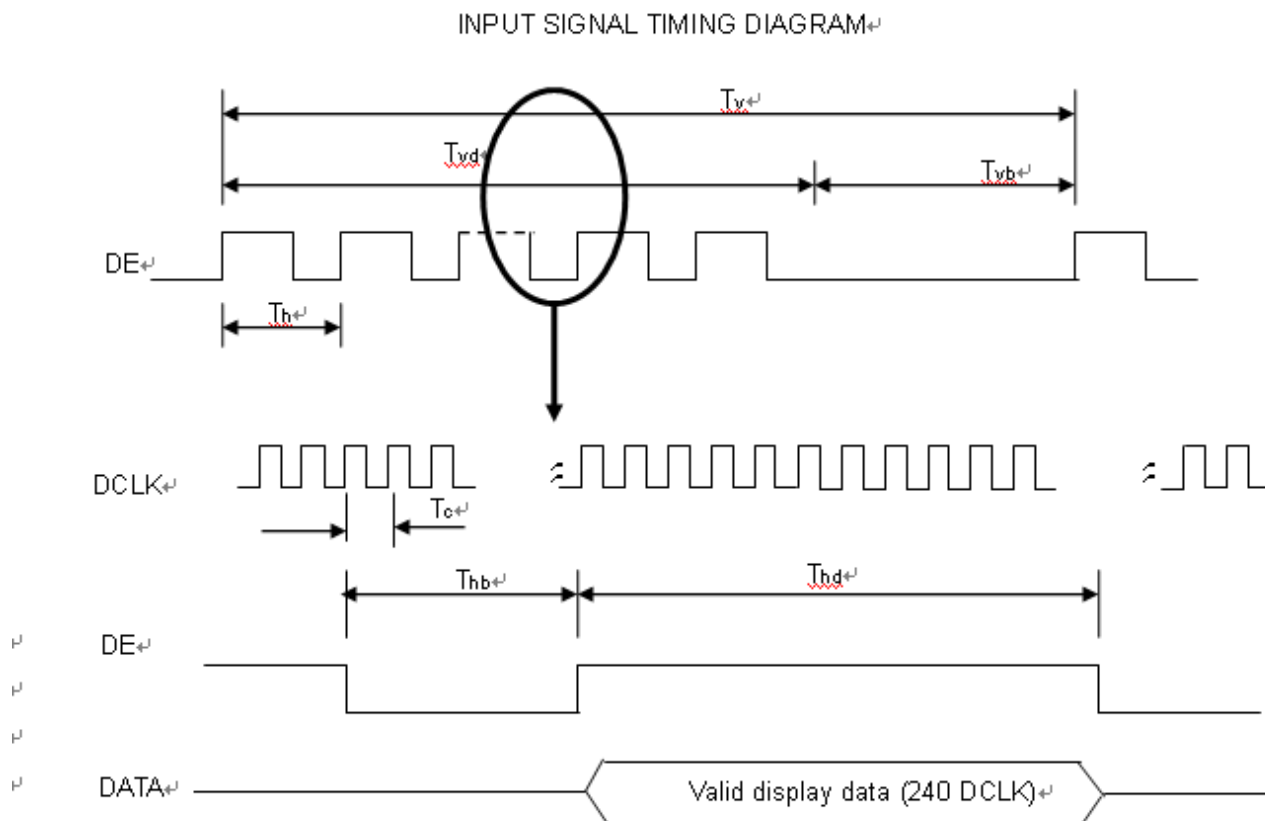
| Signal                  | Item                                 | Symbol           | Min.                     | Typ.  | Max.                     | Unit | Note       |
|-------------------------|--------------------------------------|------------------|--------------------------|-------|--------------------------|------|------------|
| V by One                | Frequency                            | Fc               | 70                       | 74.25 | 80                       | MHz  | (1)        |
|                         | Intra-Pair skew                      |                  | -0.3                     | -     | 0.3                      | UI   | (2)        |
|                         | Inter-Pair skew                      |                  | -5                       | -     | 5                        | UI   | (3)        |
|                         | Spread spectrum modulation range     | Fclkin_mod       | F <sub>clkin</sub> -0.5% | -     | F <sub>clkin</sub> +0.5% | MHz  | (4)        |
|                         | Spread spectrum modulation frequency | F <sub>SSM</sub> | -                        | -     | 30                       | KHz  |            |
| Vertical Display Term   | Frame Rate                           | Fr               | 57.5                     | 60    | 62.5                     | Hz   | (5)(6)     |
|                         | Total                                | Tv               | 2200                     | 2250  | 2790                     | Th   | Tv=Tvd+Tvb |
|                         | Active Display                       | Tvd              | 2160                     | 2160  | 2160                     | Th   | -          |
|                         | Blank                                | Tvb              | 40                       | 90    | 630                      | Th   | -          |
| Horizontal Display Term | Total                                | Th               | 530                      | 550   | 570                      | Tc   | Th=Thd+Thb |
|                         | Active Display                       | Thd              | 480                      | 480   | 480                      | Tc   | -          |
|                         | Blank                                | Thb              | 50                       | 70    | 90                       | Tc   | -          |

Note (1) Please make sure the range of pixel clock has follow the below equation:

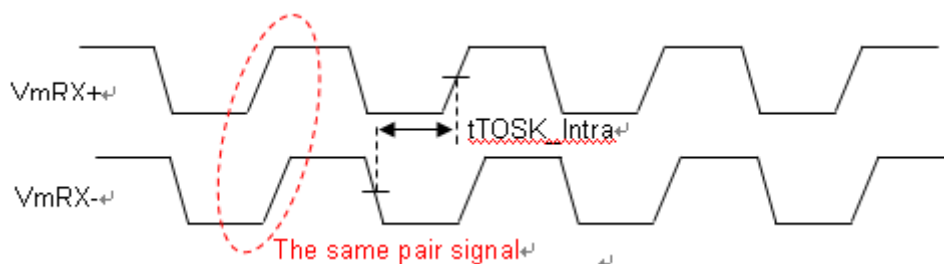
$$F_{clkin(max)} \geq Fr \times Tv \times Th$$

$$Fr \times Tv \times Th \geq F_{clkin(min)}$$

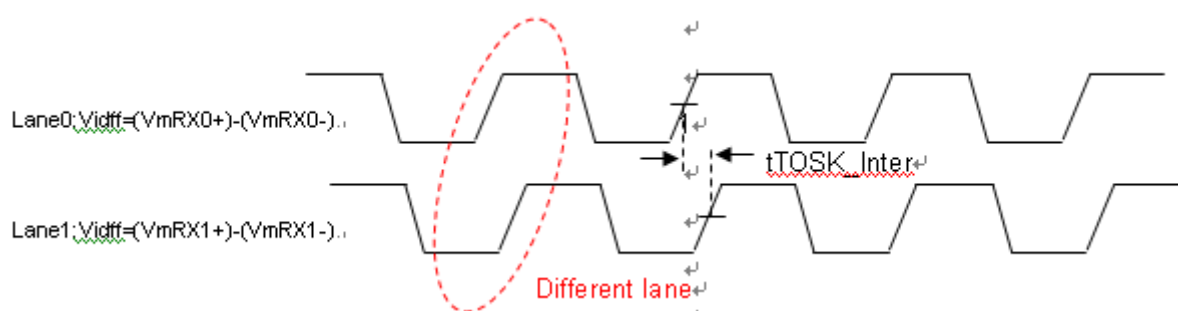
### INPUT SIGNAL TIMING DIAGRAM



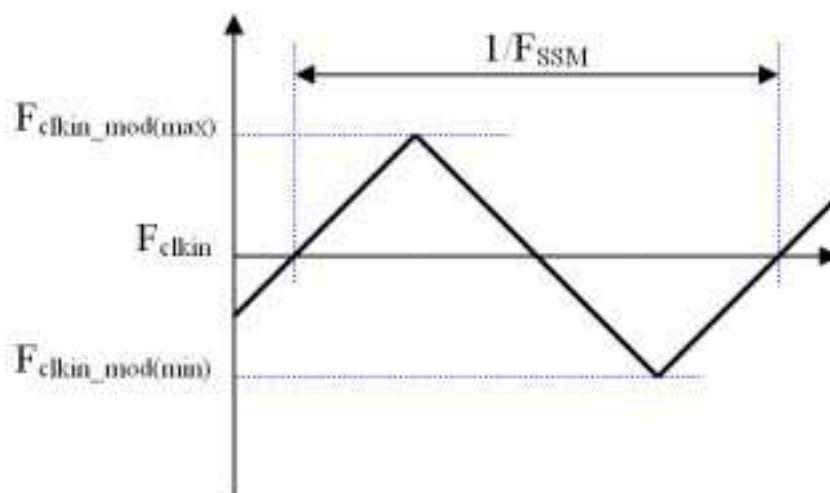
Note (2) V-by-One HS Intra-pair skew



Note (3) V-by-One HS Inter-pair skew

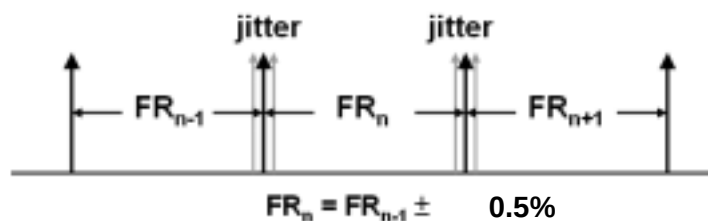


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The frame-to-frame jitter of the input frame rate is defined as the above figures.  $FR_n = FR_{n-1} \pm 0.5\%$ .

Note (6) The setup of the frame rate jitter  $> 0.5\%$  may result in the cosmetic LED backlight symptom and the electric function is affected.



#### 4.6 V by One Input Signal Timing Diagram

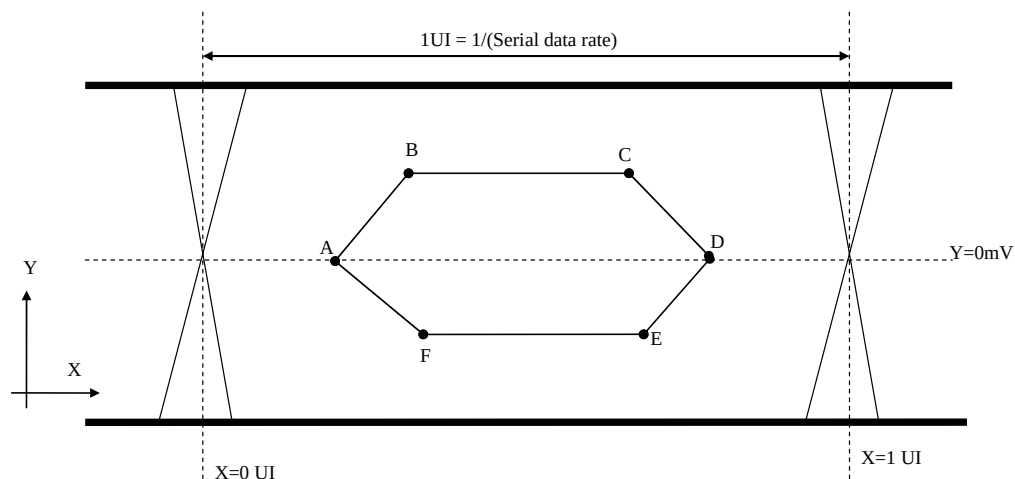


Table 1 Eye Mask Specification

|   | X [UI] | Y [mV] | Note |
|---|--------|--------|------|
| A | 0.25   | 0      | (1)  |
| B | 0.3    | 50     | (1)  |
| C | 0.7    | 50     | (1)  |
| D | 0.75   | 0      | (1)  |
| E | 0.7    | -50    | (1)  |
| F | 0.3    | -50    | (1)  |

Note (1) Input levels of V-by-One HS signals are comes from "V-by-One HS Stander Ver.1.4"

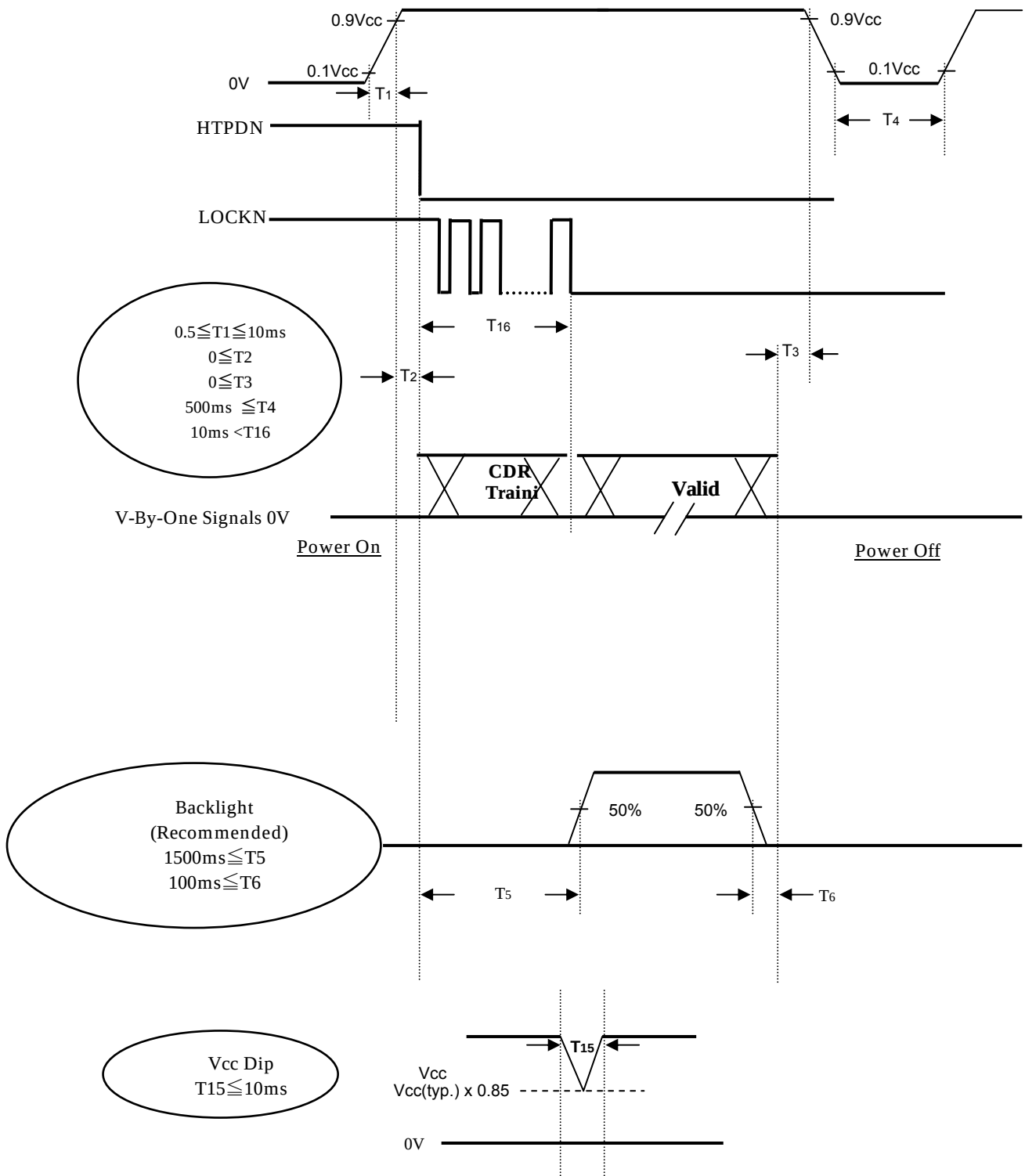
## 4.7 Byte Length and Color mapping of V-by-One HS

| Packer input & Unpacker output |       | 30bpp RGB (10bit) |
|--------------------------------|-------|-------------------|
| Byte 0                         | D[0]  | R[2]              |
|                                | D[1]  | R[3]              |
|                                | D[2]  | R[4]              |
|                                | D[3]  | R[5]              |
|                                | D[4]  | R[6]              |
|                                | D[5]  | R[7]              |
|                                | D[6]  | R[8]              |
|                                | D[7]  | R[9]              |
| Byte 1                         | D[8]  | G[2]              |
|                                | D[9]  | G[3]              |
|                                | D[10] | G[4]              |
|                                | D[11] | G[5]              |
|                                | D[12] | G[6]              |
|                                | D[13] | G[7]              |
|                                | D[14] | G[8]              |
|                                | D[15] | G[9]              |
| Byte 2                         | D[16] | B[2]              |
|                                | D[17] | B[3]              |
|                                | D[18] | B[4]              |
|                                | D[19] | B[5]              |
|                                | D[20] | B[6]              |
|                                | D[21] | B[7]              |
|                                | D[22] | B[8]              |
|                                | D[23] | B[9]              |
| Byte 3                         | D[24] | X                 |
|                                | D[25] | X                 |
|                                | D[26] | B[0]              |
|                                | D[27] | B[1]              |
|                                | D[28] | G[0]              |
|                                | D[29] | G[1]              |
|                                | D[30] | R[0]              |
|                                | D[31] | R[1]              |

#### 4.8 POWER ON/OFF SEQUENCE

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

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



Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the LED voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen..

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If  $T_2 < 0$ , that maybe cause electrical overstress failure.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period..

Note (5) Interface signal shall not be kept at high impedance when the power is on

Note (6) Vcc must decay smoothly when power-off

## 5. OPTICAL CHARACTERISTICS

### 5.1 TEST CONDITIONS

| Item                                      | Symbol                                                        | Value   | Unit |
|-------------------------------------------|---------------------------------------------------------------|---------|------|
| Ambient Temperature                       | Ta                                                            | 25±2    | oC   |
| Ambient Humidity                          | Ha                                                            | 50±10   | %RH  |
| Supply Voltage                            | VCC                                                           | 12±0.12 | V    |
| Input Signal                              | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |         |      |
| LED Light Bar Input Current Per Input Pin | IPIN                                                          | 150     | mA   |
| PWM Duty Ratio                            | D                                                             | 100     | %    |
| LED Light Bar Test Converter              | (INX 27 - D089583)                                            |         |      |

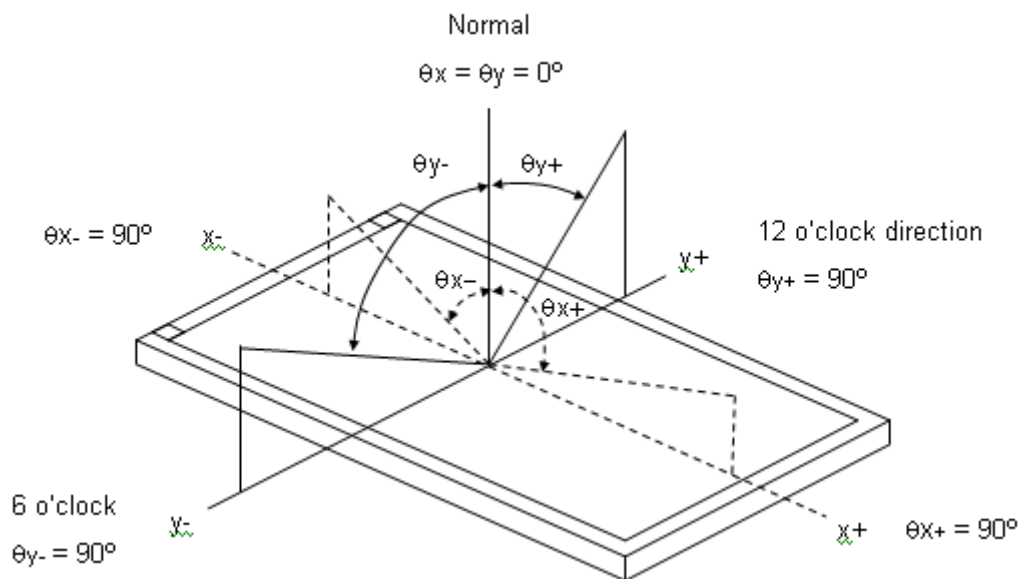
### 5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. 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                          | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>CS-2000<br>R=G=B=255<br>Gray scale | Typ – 0.03 | 0.633          | Typ + 0.03 | -        | (1), (5) |
|                               |                                              | Ry                          |                                                                            |            | 0.340          |            |          |          |
|                               | Green                                        | Gx                          |                                                                            |            | 0.311          |            |          |          |
|                               |                                              | Gy                          |                                                                            |            | 0.633          |            |          |          |
|                               | Blue                                         | Bx                          |                                                                            |            | 0.158          |            |          |          |
|                               |                                              | By                          |                                                                            |            | 0.061          |            |          |          |
|                               | White                                        | Wx                          |                                                                            |            | 0.313          |            |          |          |
|                               |                                              | Wy                          |                                                                            |            | 0.329          |            |          |          |
|                               | Center Luminance of White (Center of Screen) |                             |                                                                            |            | L <sub>C</sub> |            |          |          |
| Contrast Ratio                |                                              | CR                          | 700                                                                        | 1000       | -              | -          | (2), (5) |          |
| Response Time                 |                                              | T <sub>R</sub>              | $\theta_x=0^\circ, \theta_Y=0^\circ$                                       | -          | 1.5            | 2.5        | ms       | (3)      |
|                               |                                              | T <sub>F</sub>              |                                                                            | -          | 3.5            | 5.5        |          |          |
| White Variation               |                                              | W                           | $\theta_x=0^\circ, \theta_Y=0^\circ$                                       | --         | -              | 1.42       | --       | (5), (6) |
| Viewing Angle                 | Horizontal                                   | $\theta_{x-} + \theta_{x+}$ | CR ≥ 10                                                                    | 150        | 170            | -          | Deg.     | (1), (5) |
|                               | Vertical                                     | $\theta_{y-} + \theta_{y+}$ |                                                                            | 140        | 160            | -          |          |          |



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.

Contrast Ratio (CR) =  $L_{255} / L_0$

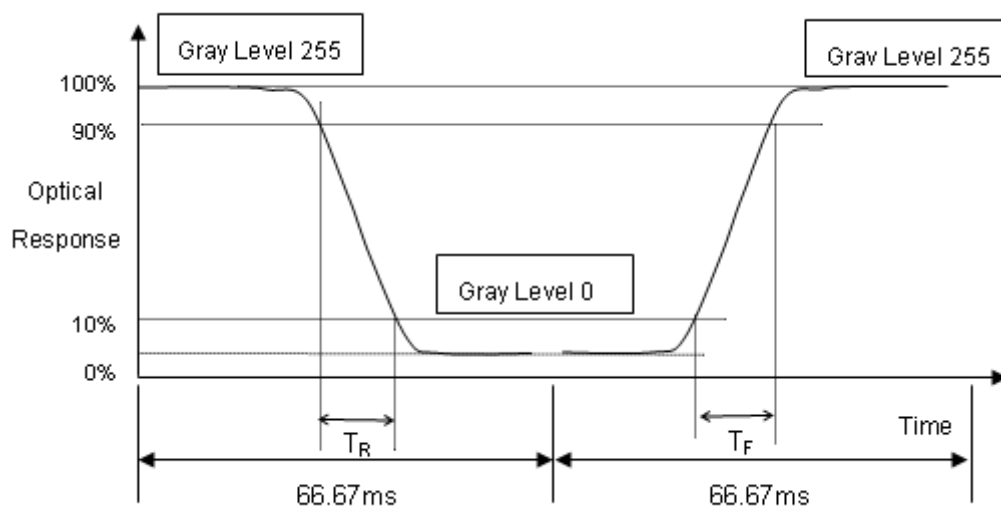
$L_{255}$ : Luminance of gray level 255

$L_0$ : 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 ( $L_c$ ):

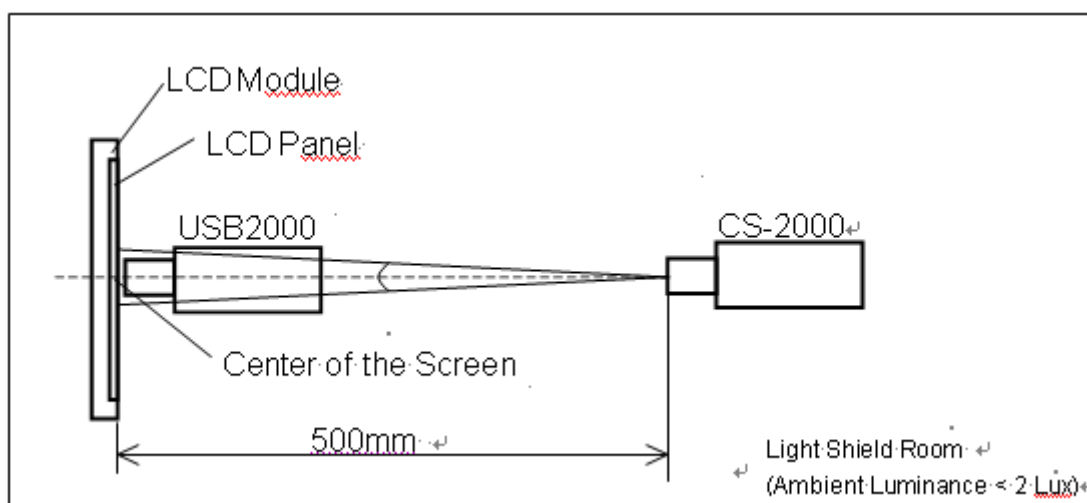
Measure the luminance of gray level 255 at center point

$$L_c = L(5)$$

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

Note (5) Measurement Setup:

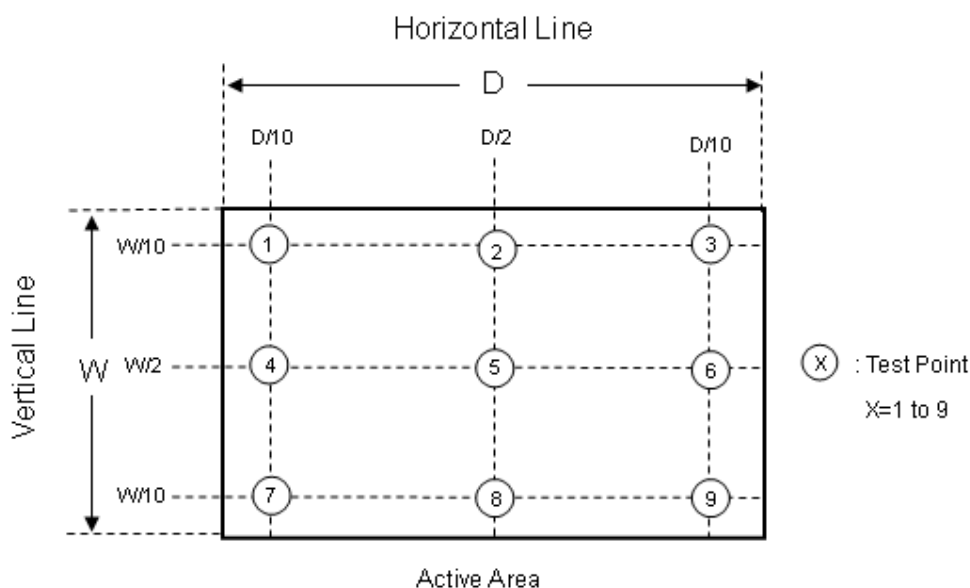
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



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

Measure the luminance of gray level 255 at 9 points

$$\delta W = \text{Maximum } [L(1) \sim L(9)] / \text{Minimum } [L(1) \sim L(9)]$$



## 6. RELIABILITY TEST ITEM

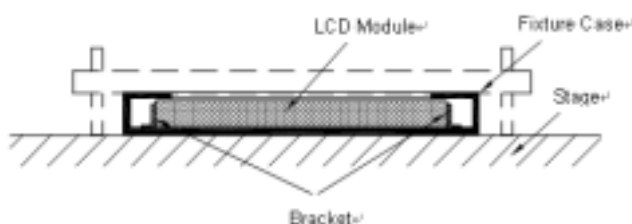
| Items                            | Required Condition                                                                                                | Note |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------|------|
| Temperature Humidity Bias (THB)  | Ta= 50°C , 80%RH, 240hours                                                                                        |      |
| High Temperature Operation (HTO) | Ta= 50°C , 240hours                                                                                               |      |
| Low Temperature Operation (LTO)  | Ta= 0°C , 240hours                                                                                                |      |
| High Temperature Storage (HTS)   | Ta= 60°C , 240hours                                                                                               |      |
| Low Temperature Storage (LTS)    | Ta= -20°C , 240hours                                                                                              |      |
| Vibration Test (Non-operation)   | Acceleration: 1.5 G<br>Wave: sine<br>Frequency: 10 - 300 Hz<br>Sweep: 30 Minutes each Axis (X, Y, Z)              |      |
| Shock Test (Non-operation)       | Acceleration: 50 G<br>Wave: Half-sine<br>Active Time: 11 ms<br>Direction : ± X, ± Y, ± Z.(one time for each Axis) |      |
| Thermal Shock Test (TST)         | -20°C/30min , 60°C / 30min , 100 cycles                                                                           |      |
| On/Off Test                      | 25°C ,On/10sec , Off /10sec , 30,000 cycles                                                                       |      |
| ESD (Electro Static Discharge)   | Contact Discharge: ± 8KV, 150pF(330Ω)                                                                             |      |
|                                  | Air Discharge: ± 15KV, 150pF(330Ω)                                                                                |      |
| Altitude Test                    | Operation:10,000 ft / 24hours<br>Non-Operation:30,000 ft / 24hours                                                |      |

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hour

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.

The fixing condition is shown as below:



## 7. Mechanical Strength Characteristics

### 7.1 Mechanical Strength Specifications

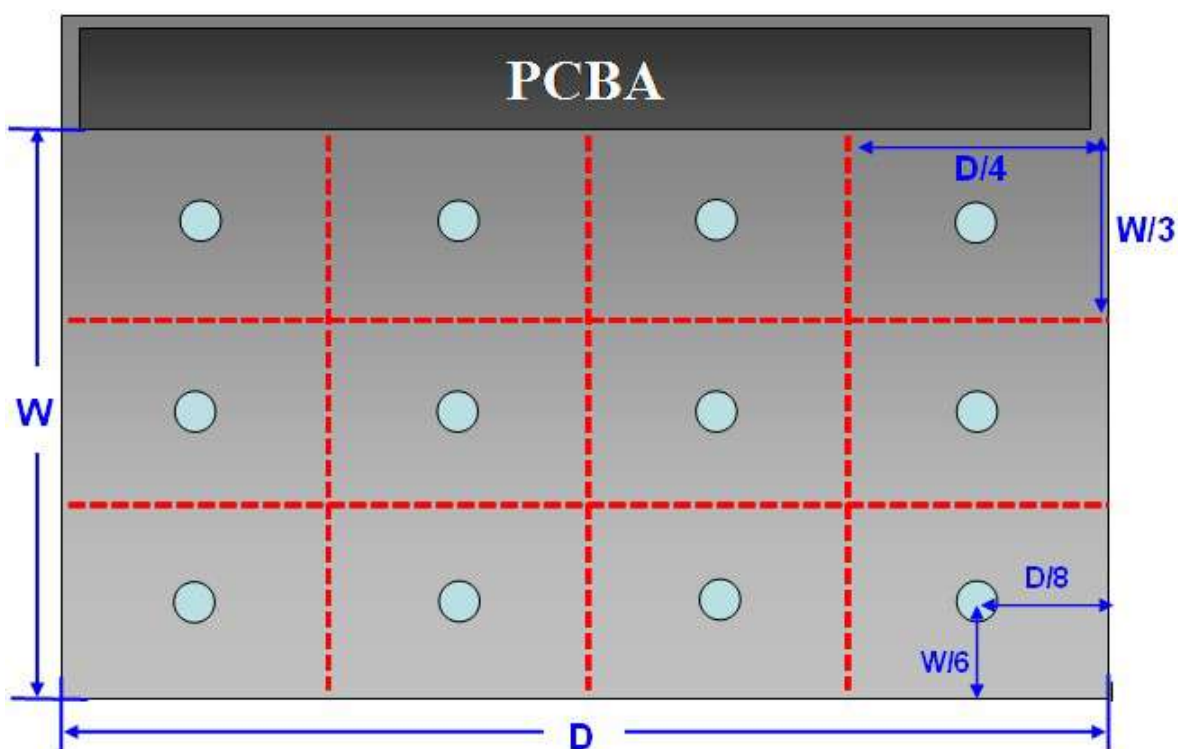
| Item                | Condition                      | Min | Unit | Note |
|---------------------|--------------------------------|-----|------|------|
| Mechanical Strength | 128 <sup>th</sup> Gray Pattern | 0.6 | Kgf  |      |

### 7.2 Test Conditions

| Items                       | Description                                                                                                                                                                    |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Condition              | 1. Ambient Illumination : 10~15 lux<br>2. Test Pattern : 128 Gray<br>3. Distance of the judgment : 30cm from the surface of module<br>4. Viewing angle of the judgment : Front |
| Gage Information            | 1. Push pull guage<br>a. Model name : HF-50, maker : ALGOL<br>b. Shape of gage tip<br>- Diameter : 2mm<br>- Thickness : 2mm                                                    |
| Definition of Minimum force | To measure minimum force when operator detects any white spot and light leakage that have occurred while operator presses on back side of module with push pull gage.          |

### 7.3 Definition of Test Points

Measure the minimum force of test points at 128th Gray pattern. The test points at back side of module area is showing as below (except PCBA).



## 8. PACKING

### 8.1 PACKING SPECIFICATIONS

- (1) 9 LCD modules / 1 Box
- (2) Box dimensions: 713(L) X 429(W) X 453(H) mm
- (3) Weight: approximately: (34) Kg ( 9 modules per box)

### 8.2 PACKING METHOD

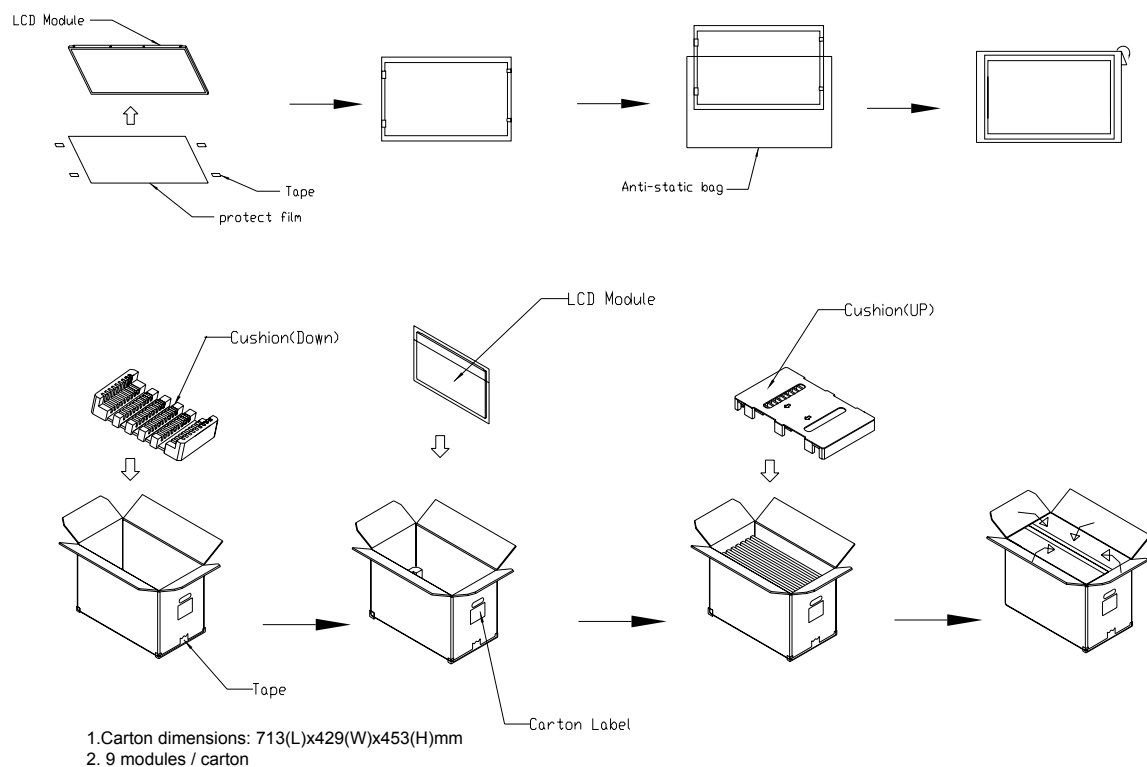
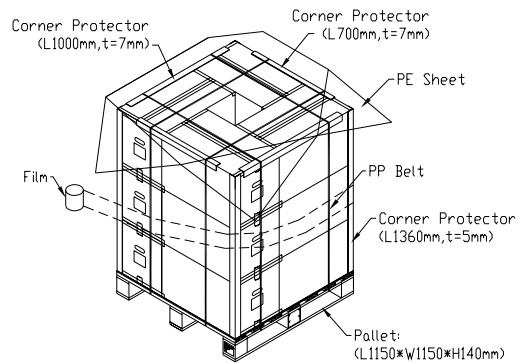


Figure. 8-1 Packing method

## 8.3 PALLET

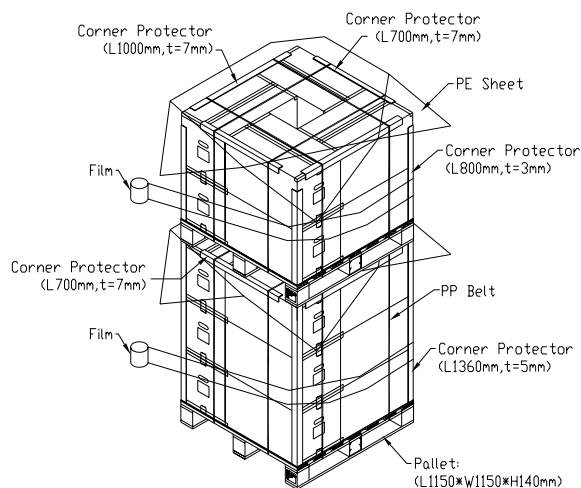
For ocean shipping

### Air Transportation



For air transport

### Sea / Land Transportation (40ft HQ Container)



### Sea / Land Transportation (40ft Container)

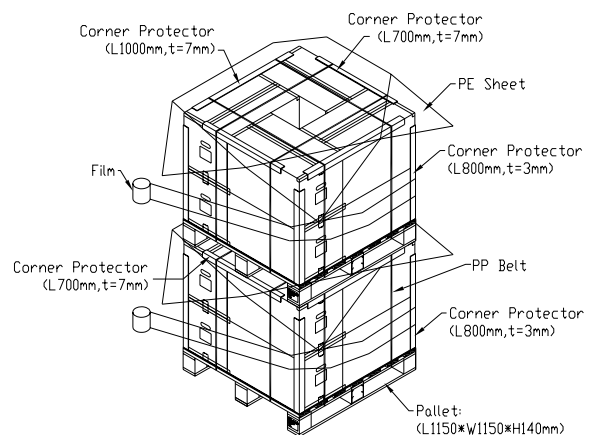


Figure. 8-2 Packing method

## 8.4 UN-PACKING METHOD

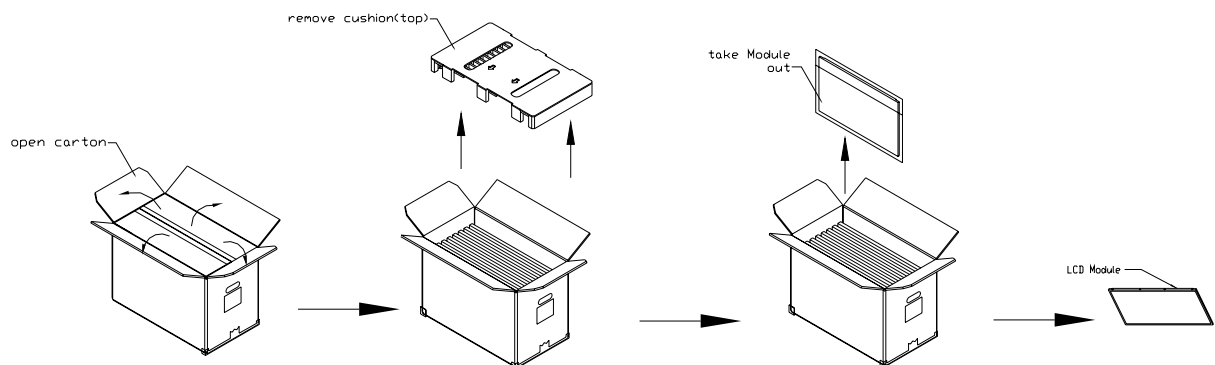
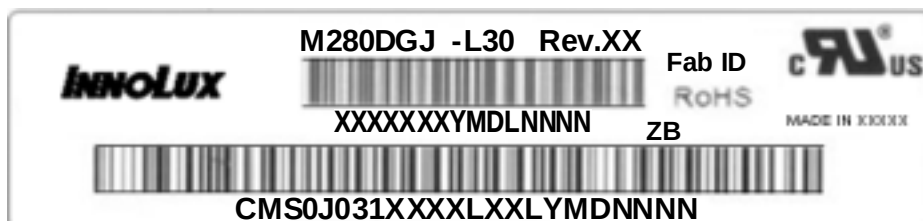


Figure. 8-3 UN-Packing method

## 9. INX MODULE LABEL

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



(a) Model Name: M280DGJ-L30

(b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

(c) InnoLux barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

| Code | Meaning              | Description                                                                                                                                                               |
|------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| XX   | InnoLux internal use | -                                                                                                                                                                         |
| XX   | Revision             | Cover all the change                                                                                                                                                      |
| X    | InnoLux internal use | -                                                                                                                                                                         |
| XX   | InnoLux internal use | -                                                                                                                                                                         |
| YMD  | Year, month, day     | Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2...<br>Month: 1~12=1, 2, 3, ~, 9, A, B, C<br>Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U. |
| L    | Product line #       | Line 1=1, Line 2=2, Line 3=3, ...                                                                                                                                         |
| NNNN | Serial number        | Manufacturing sequence of product                                                                                                                                         |

(d) Customer's barcode definition:

Serial ID: CM-S0J03-X-X-X-XX-L-XX-L-YMD-NNNN

| Code  | Meaning               | Description                                                                                                                                                                                                                                     |
|-------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CM    | Supplier code         | INX=CM                                                                                                                                                                                                                                          |
| S0J03 | Model number          | M280DGJ-L30= S0J03                                                                                                                                                                                                                              |
| X     | Revision code         | Non ZBD: 1,2,~,8,9 / ZBD: A~Z                                                                                                                                                                                                                   |
| X     | Source driver IC code | Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C, OKI=D, Philips=E, Renesas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M, ILITEK=Q, Fiti=Y, None IC =Z |
| X     | Gate driver IC code   |                                                                                                                                                                                                                                                 |
| XX    | Cell location         | Tainan Taiwan=TN, Ningbo China=CN, Hsinchu Taiwan=SC                                                                                                                                                                                            |
| L     | Cell line #           | 1,2,~,9,A,B,~,Y,Z                                                                                                                                                                                                                               |
| XX    | Module location       | Tainan, Taiwan=TN, Ningbo China=NP, Shenzhen China=SH, Nanhai China=NH                                                                                                                                                                          |
| L     | Module line #         | 1,2,~,9,A,B,~,Y,Z                                                                                                                                                                                                                               |
| YMD   | Year, month, day      | Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2...<br>Month: 1~12=1, 2, 3, ~, 9, A, B, C<br>Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V                                                                                             |
| NNNN  | Serial number         | By LCD supplier                                                                                                                                                                                                                                 |



(e) FAB ID(UL Factory ID):

| Region | Factory ID |
|--------|------------|
| TWINX  | GEMN       |
| NBCMI  | LEOO       |
| NBCMI  | VIRO       |
| NBCME  | CANO       |
| NHCM1  | CAPG       |

## 10. PRECAUTIONS

### 10.1 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.

### 10.2 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°C to 35°C and relative humidity of less than 90%
- (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

## 10.3 OPERATION PRECAUTIONS

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

Normal condition is defined as below :

Temperature :  $20 \pm 15^{\circ}\text{C}$

Humidity:  $65 \pm 20\%$

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 INX for application engineering advice . Otherwise , Its reliability and function may not be guaranteed.

## 10.4 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.

## 10.5 SAFETY STANDARDS

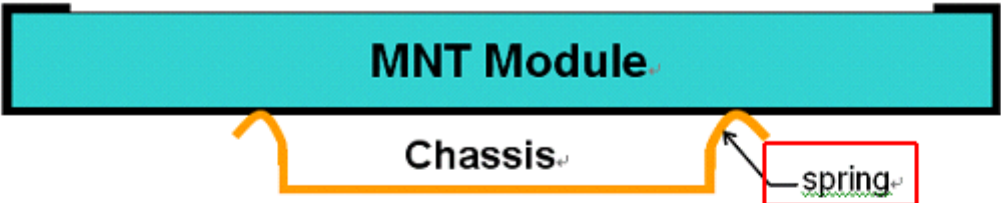
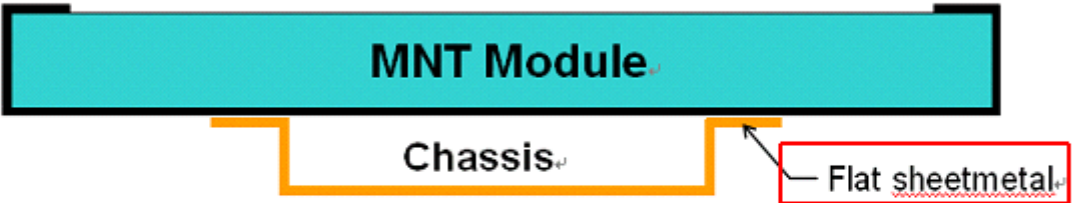
The LCD module should be certified with safety regulations as follows:

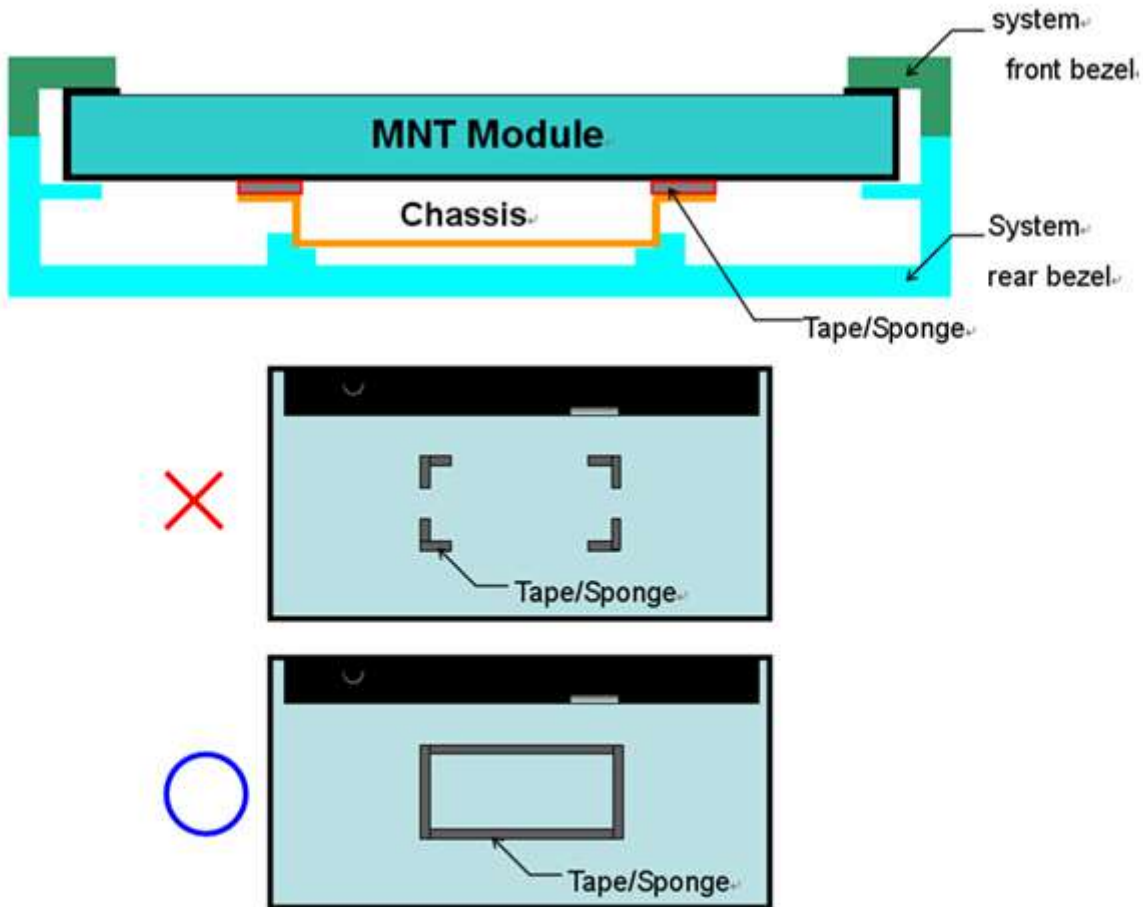
| Requirement | Standard                                   | remark |
|-------------|--------------------------------------------|--------|
| UL          | UL60950-1:2006 or Ed.2:2007                |        |
| cUL/CSA     | CAN/CSA C22.2 No.60950-1-03 or 60950-1-07  |        |
| CB          | IEC60950-1:2005 / EN60950-1:2006+ A11:2009 |        |

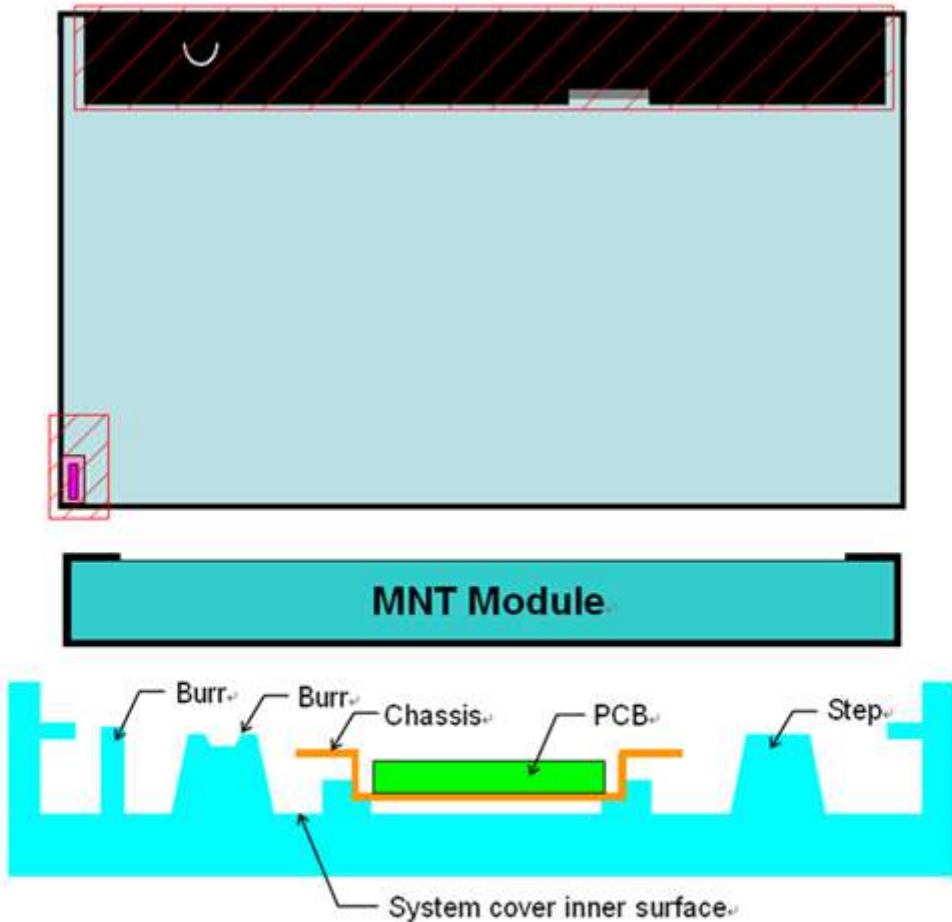
## 10.6 OTHER

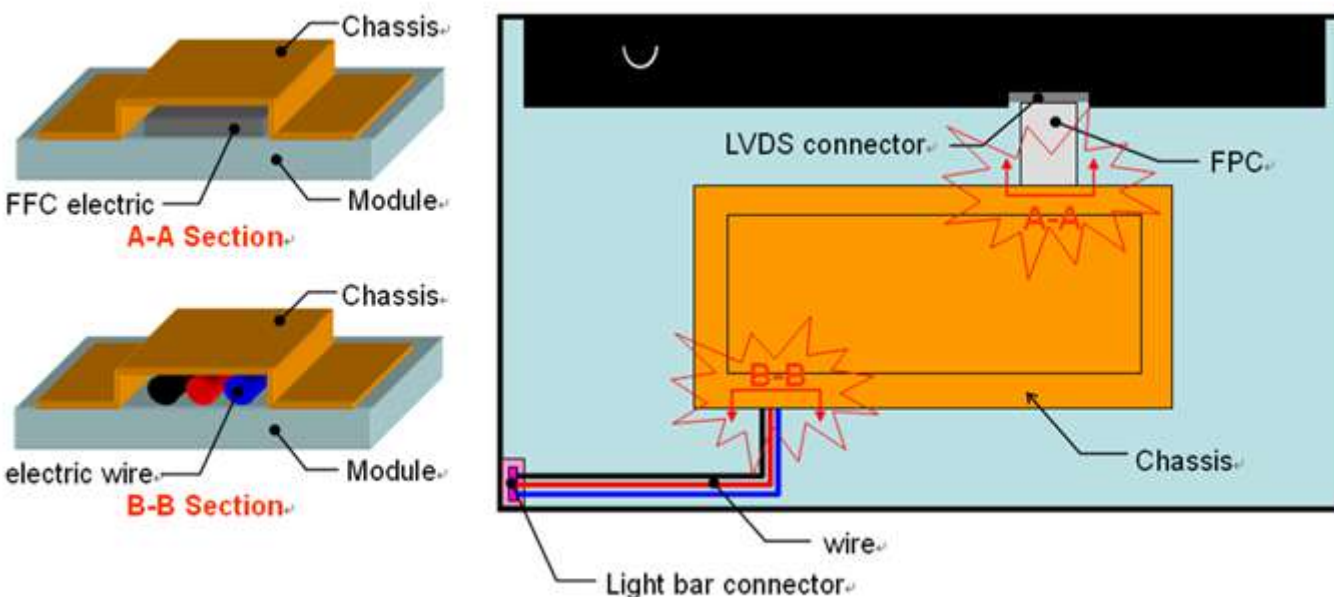
When fixed patterns are displayed for a long time, remnant image is likely to occur.

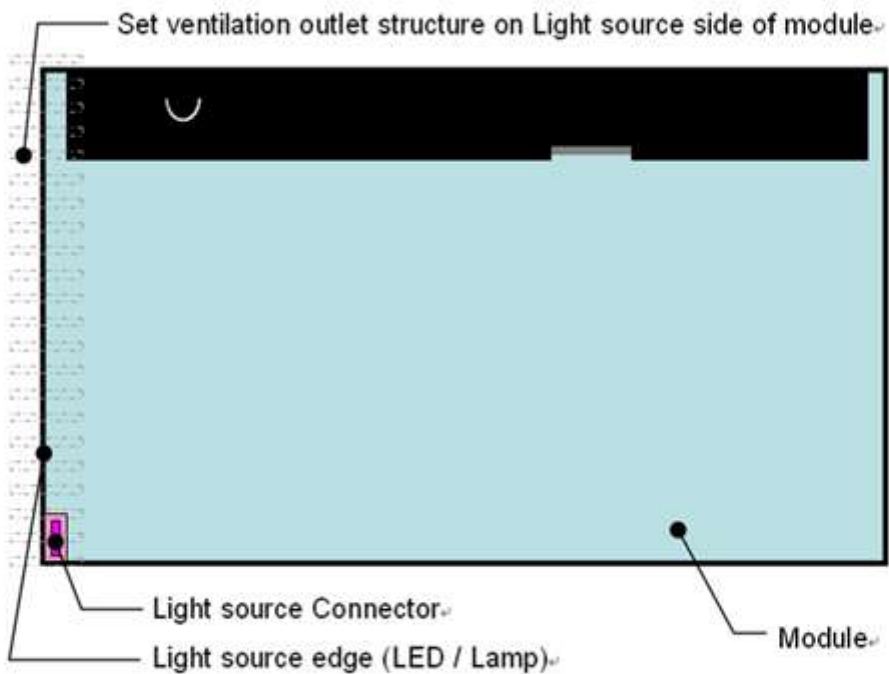
Appendix 1. SYSTEM COVER DESIGN NOTICE

| 1.                                                                                | Set Chassis and MNT Module touching Mode                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <br><br>                                                                                                                    |
| Definition                                                                        | <p>a) To prevent from abnormal display &amp; white spot after Mechanical test, it is not recommended to used <u>spring</u> type chassis.</p> <p>b) We suggest the contact mode between Chassis and Module rear cover is Tape/Sponge, second is <u>Flat sheetmetal</u> type chassis (Don't interference from flat <u>sheetmetal</u> of chassis to rear cover of <u>Module</u>).</p> |

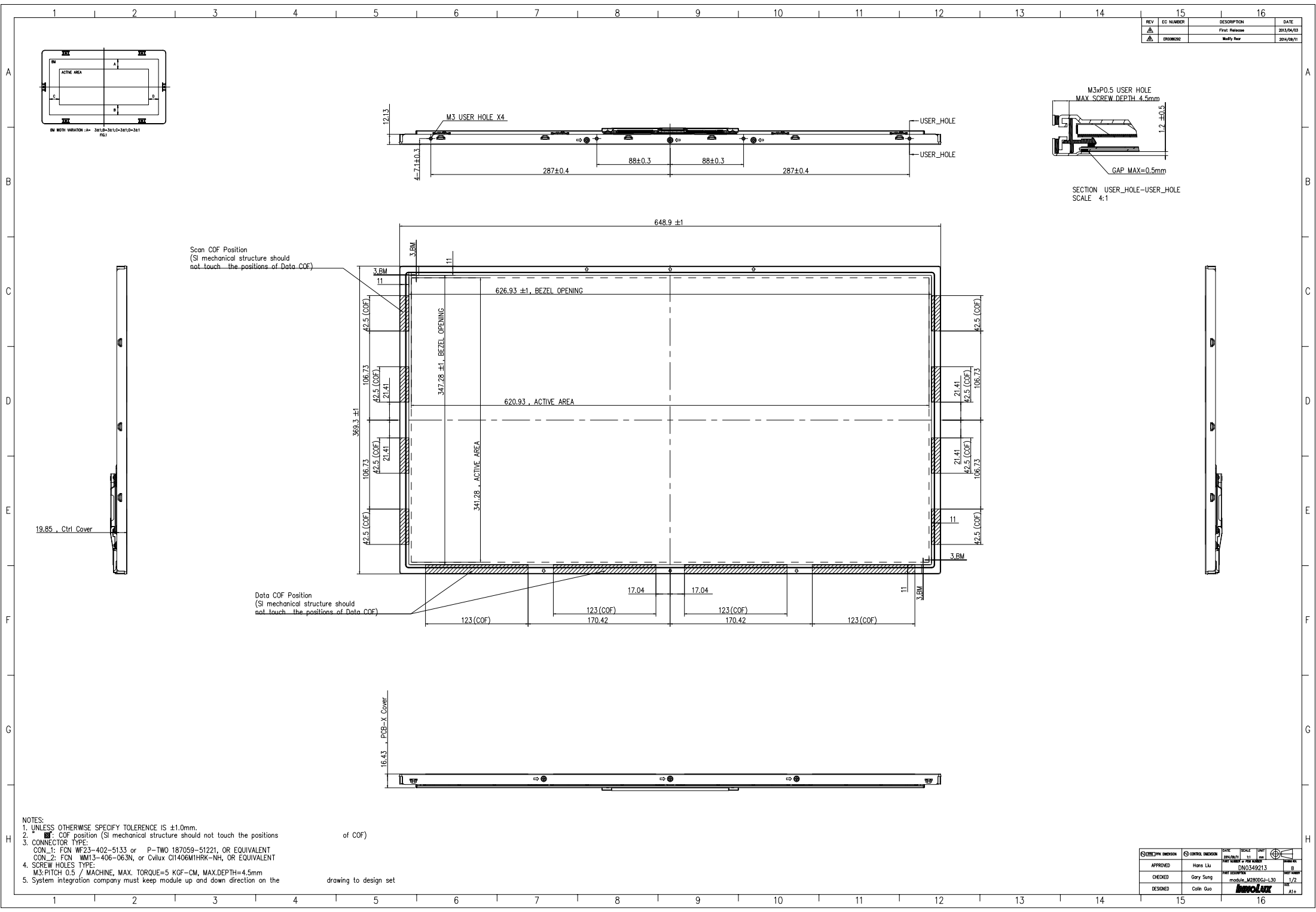
|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2          | Tape/sponge design on system inner surface                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|            |  <p>The diagram illustrates the correct and incorrect placement of Tape/Sponge on the system inner surface. The top part shows a cross-section of the MNT Module, Chassis, and System with front and rear bezels. The middle part shows an incorrect placement of Tape/Sponge at four points, marked with a red X. The bottom part shows a correct placement of Tape/Sponge as a continuous strip, marked with a blue circle.</p> |
| Definition | <p>a) To prevent from abnormal display &amp; white spot after Mechanical test, We suggest using Tape/Sponge as medium between chassis and Module rear cover could reduce the occurrence of white spot.</p> <p>b) When using the Tape/Sponge, suggest it be lay over between set chassis and module rear cover. it is not recommended to add tape/sponge in separate location. Since each tape/sponge may act as pressure concentration location.</p>                                                                 |

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3                                                                                   | System inner surface examination                                                                                                                                                                                                                                                                                                                                                              |
|  |                                                                                                                                                                                                                                                                                                                                                                                               |
| Definition                                                                          | <p>a). Burr at logo edge, step, protrusion or PCB board will easily cause white spot.</p> <p>b). Keeping flat surface underneath module is recommended.</p> <p>c). The area (  ) on Module PCBA and Light bar connector should keep at least 1mm gap to any structure with System cover inner surface.</p> |

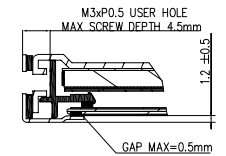
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The overlapping part on System's Chassis and electric wire needs gap structure.                                                                                                   |
|  <p>The diagram illustrates the required gap structure for overlapping parts on the system's chassis and electric wires. It includes two cross-sectional views, A-A and B-B, and a top-down view. A-A Section shows a chassis with a gap for the FFC electric. B-B Section shows a chassis with a gap for the electric wire. The top-down view shows the LVDS connector, FPC, chassis, wire, and light bar connector.</p> |                                                                                                                                                                                   |
| Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The overlapping part on System's Chassis and electric wire (FPC、FFC and wire) needs gap structure to avoid display of white spot by pressing overlapping part cause interference. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                               | System cover's ventilation outlet structure                                                                                                                  |
|  <p>The diagram shows the system cover's ventilation outlet structure. It includes a top-down view of the system cover with a ventilation outlet structure on the light source side of the module. Labels include: Set ventilation outlet structure on Light source side of module, Light source Connector, Light source edge (LED / Lamp), and Module.</p> |                                                                                                                                                              |
| Definition                                                                                                                                                                                                                                                                                                                                                                                                                                      | To prevent from abnormal display of light leakage, We suggest to set ventilation outlet structure on side of Module Light bar in system cover inner surface. |

## Appendix 2. OUTLINE DRAWING



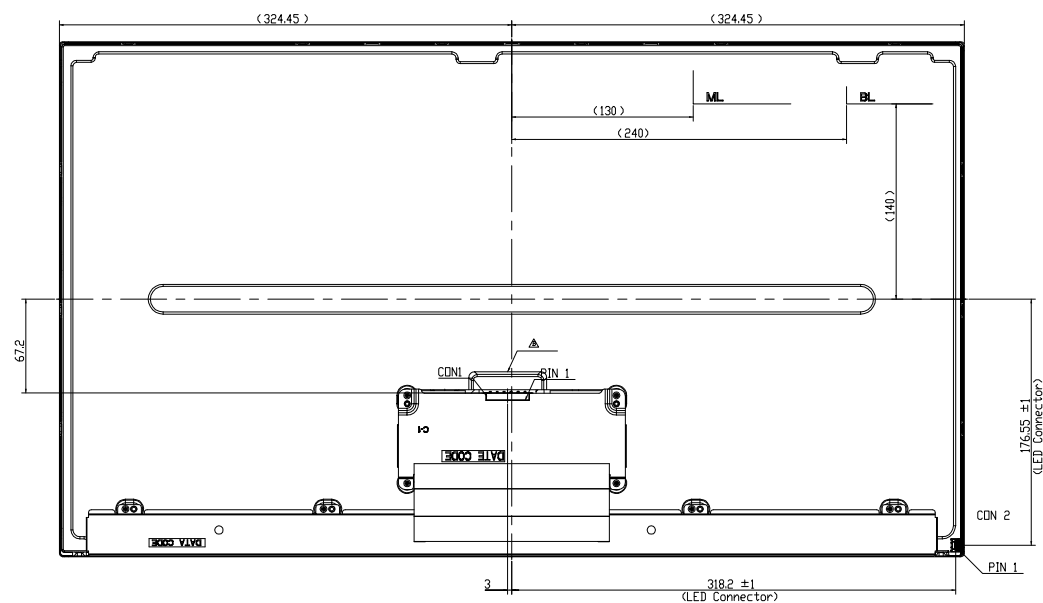
| REV | EC NUMBER | DESCRIPTION   | DATE       |
|-----|-----------|---------------|------------|
| 1   |           | First Release | 2015/04/03 |
| 2   | 150506202 | Modify New    | 2016/06/11 |



SECTION USER\_HOLE-USER\_HOLE  
SCALE 4:1

| DESIGNED BY | DESIGNED  | DATE       | SCALE | UNIT | REVISION |
|-------------|-----------|------------|-------|------|----------|
| APPROVED    | Hans Liu  | 2016/06/11 | 1:1   | mm   | 1        |
| CHECKED     | Gary Sung | 2016/06/11 | 1:1   | mm   | 2        |
| DESIGNED    | Colin Guo | 2016/06/11 | 1:1   | mm   | 3        |

| 15                                                                                |           | 16            |            |
|-----------------------------------------------------------------------------------|-----------|---------------|------------|
| REV                                                                               | EC NUMBER | DESCRIPTION   | DATE       |
|  |           | First Release | 2013/04/02 |
|  | CR00629C  | Modify Reur   | 2014/09/11 |



NOTES:

1. UNLESS OTHERWISE SPECIFY TOLERANCE IS  $\pm 1.0\text{mm}$ .

2. CONNECTOR TYPE:

CON\_1: FCN WF23-400-513C or P-TWO 187059-51221, OR EQUIVALENT

CON\_2: FCN WM13-406-063N, or Civilux CI1406M1HRK-NH, OR EQUIVALENT

3. SCREW HOLES TYPE:

M3/PITCH 0.5 / MACHINE, MAX. TORQUE=5 KGF-CM, MAX.DEPH=4.5mm

4. "  : SUGGESTED MOUNTING AREA POSITION, NO MARK AREA CAN'T BE CLIPPED

5. The wire and FFC cables of the system integration company can't overlap the screw holes of the rearcover

| DIMENSIONAL TOLERANCE |      |       |        |         |         |          |       | <br>SURFACE TEXTURE |            | <br>GEOMETRIC TOLERANCE |            |
|-----------------------|------|-------|--------|---------|---------|----------|-------|---------------------|------------|-------------------------|------------|
| RANGE(mm)             | 0-6  | 6-30  | 30-150 | 150-300 | 300-600 | 600-1000 | >1000 | APPROVED            | Hans Liu   | DATE                    | 2023.09.13 |
| TOL. ±                | ±0.1 | ±0.15 | ±0.2   | ±0.25   | ±0.3    | ±0.4     | ±0.5  | CHECKED             | Gavin Sung | DATE                    | 2023.09.13 |
|                       |      |       |        |         |         |          |       | DESIGNED            | Colin Guo  | DATE                    | 2023.09.13 |