

# Datasheet

## InnoLux

S270DR1-A01 RevB1

CH-01-093

**FORTEC**  
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- ☐ Tentative Specification  
☒ Preliminary Specification  
☐ Approval Specification

MODEL NO.: S270DR1  
SUFFIX: A01

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| Revision :B1                                                                 |           |
| Customer :                                                                   |           |
| APPROVED BY                                                                  | SIGNATURE |
| <br>                                                                         |           |
| Name / Title _____                                                           |           |
| Note _____                                                                   |           |
| <br>                                                                         |           |
| Please return 1 copy for your confirmation with your signature and comments. |           |

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## REVISION HISTORY

| Version  | Date        | Page(New) | Section | Description                                            |
|----------|-------------|-----------|---------|--------------------------------------------------------|
| Ver. 0.0 | Oct.24,2024 | All       | All     | Tentative Specification was first issued.              |
| Ver. 1.0 | Jun.23,2025 | All       | All     | Preliminary Specification was first issued.            |
| Ver.1.1  | Jul.08.2025 | 5         | 1.2     | High color saturation DCI-P3 95%/NTSC 85%              |
|          |             | 28        | 5.2     | Update “Color Chromaticity”                            |
| Ver.1.2  | Jul.14,2025 | 5         | 1.2     | Viewing Angle : 178(H)/178(V) (CR ≥ 10) AAS Technology |

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

S270DR1-A01 is a 27" TFT Liquid Crystal Display PID module with LED Backlight unit and 51-pins-4 lane-eDP interface. This module supports 3840 x 2160 Full HDTV format and can display 1.07B colors (8-bit+FRC). The converter module for backlight is built-in.

### 1.2 FEATURES

- High brightness 700 nits
- High contrast ratio 1000:1
- Fast response time Gray to gray average 14 ms
- High color saturation DCI-P3 95%/NTSC 85%
- Half HDTV (3840 x 2160 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- eDP interface
- Optimized response time for 50Hz/60Hz frame rate
- Ultra wide viewing angle : AAS technology
- Viewing Angle : 178(H)/178(V) (CR ≥ 10) AAS Technology
- RoHS compliance
- T-con input frame rate: 50Hz/60Hz, output frame rate: 50Hz/60Hz

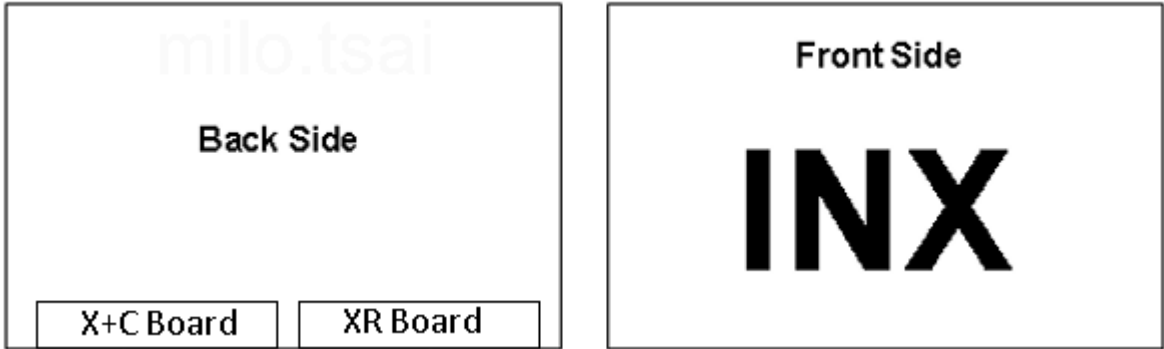
### 1.3 GENERAL SPECIFICATIONS

| Item                   | Specification                              | Unit  | Note |
|------------------------|--------------------------------------------|-------|------|
| Active Area            | 596.736 (H) x 335.664 (V) (27" diagonal)   | mm    | (1)  |
| Bezel Opening Area     | 601.9 (H) x 340.3 (V)                      | mm    |      |
| Driver Element         | a-si TFT active matrix                     | -     | -    |
| Pixel Number           | 3840 x R.G.B. x 2160                       | pixel | -    |
| Pixel Pitch            | 0.1554 (H) x 0.1554 (V)                    | mm    | -    |
| Pixel Arrangement      | RGB vertical stripe                        | -     | -    |
| Display Colors         | 1.07B(8bit+FRC)                            | color | -    |
| Display Operation Mode | Transmissive mode / Normally black         | -     | -    |
| Surface Treatment      | Anti-Glare coating(Haze 25%) , Hardness 3H | -     | (2)  |
| Rotation Function      | Unachievable                               |       | (3)  |
| Display Orientation    | Signal input with "INX"                    |       | (3)  |

Note (1) Please refer to the attached drawings in chapter 9 for more information about the front and back outlines.

Note (2) The spec. of the surface treatment is temporarily for this phase. INX reserves the rights to change this feature.

Note (3)



1.4 MECHANICAL SPECIFICATIONS

| Item                                                     |       | Min.  | Typ.  | Max.  | Unit | Note |
|----------------------------------------------------------|-------|-------|-------|-------|------|------|
| Horizontal (H)<br>Vertical (V)<br>Depth (D)<br>Depth (D) | 615.7 | 616.7 | 617.7 | 617.7 | mm   | (1)  |
|                                                          | 359.3 | 360.3 | 361.3 | 361.3 | mm   | (1)  |
|                                                          | 14.06 | 15.06 | 16.06 | 16    | mm   | (2)  |
|                                                          | 21.4  | 22.4  | 23.4  | 23.4  | mm   | (3)  |
| Weight                                                   |       | 2200  | 2320  | 2440  | g    |      |

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

Note (2) Module Depth is between bezel to T-CON cover.

Note (3) Module Depth is between bezel to Converter cover

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item                          | Symbol          | Value |      | Unit | Note    |
|-------------------------------|-----------------|-------|------|------|---------|
|                               |                 | Min.  | Max. |      |         |
| Storage Temperature           | T <sub>ST</sub> | -20   | +60  | °C   | (1),(2) |
| Operating Ambient Temperature | T <sub>OP</sub> | -20   | +60  | °C   | (1),(2) |
| Panel Surface Temperature     | T <sub>PS</sub> | -     | +70  | °C   | (3),(4) |

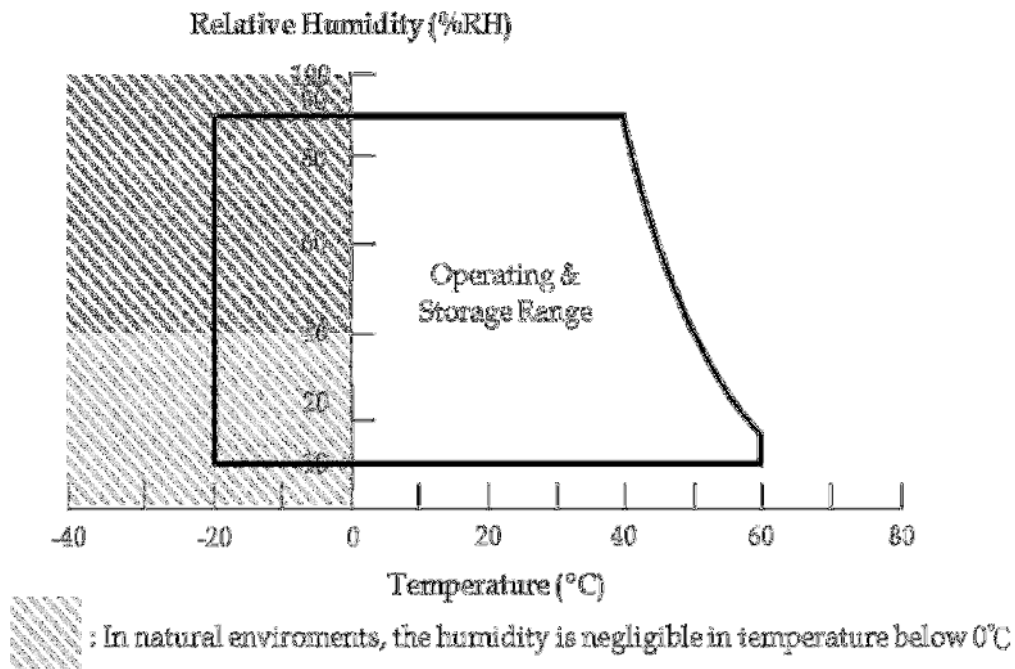
Note (1) Temperature and relative humidity range is shown in the figure below.

- (a) 90 %RH Max. ( $T_a \leq 40^\circ\text{C}$ ).
- (b) Wet-bulb temperature should be  $39^\circ\text{C}$  Max.
- (c) No condensation.

Note (2) The specified temperature range is determined by the design of the product set. When integrated with the customer's system, it is imperative to control environmental conditions within this prescribed range; otherwise, the operational capability of the product cannot be guaranteed.

Note (3) Surface temperature is measured at  $60^\circ\text{C}$  dry condition.

Note (4) Thermal management should be considered in final product design to prevent the surface temperature of display area from being over  $70^\circ\text{C}$ . The range of operating temperature may degrade in case of improper thermal management in final product design.





## 2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

| ITEM                | UNIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | MIN | TYP | MAX |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|
| Storage Temperature | °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0   | 25  | 35  |
| Storage Humidity    | %RH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 35  | 50  | 75  |
| Storage Life        | 18 months                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |     |     |
| Storage Condition   | (1) The storage room should be equipped in indoor and good ventilation facility.<br>(2) Prevent products from being exposed to the direct sunlight, moisture and water.<br>(3) The product need to keep away from organic solvent and corrosive gas.<br>(4) Be careful for condensation at sudden temperature change.<br>(5) Storage life is guaranteed under packing conditions:<br>(a) The product should be placed in a sealed moisture-proof.<br>(b) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped. |     |     |     |

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 TFT LCD MODULE

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

### 2.3.2 BACKLIGHT CONVERTER UNIT

| Item                    | Symbol | Value |      | Unit | Note     |
|-------------------------|--------|-------|------|------|----------|
|                         |        | Min.  | Max. |      |          |
| Light Bar Voltage       | VW     | —     | 76.3 | VRMS |          |
| Converter Input Voltage | VBL    | 21.6  | 26.4 | V    | (1)      |
| Control Signal Level    | —      | -0.3  | 6    | V    | (1), (3) |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals include On/Off Control and External PWM Control.

### 3. BACKLIGHT CONVERTER UNIT

#### 3.1 CONVERTER CHARACTERISTICS

| Parameter               | Symbol          | Value  |        |        | Unit              | Note                                       |
|-------------------------|-----------------|--------|--------|--------|-------------------|--------------------------------------------|
|                         |                 | Min.   | Typ.   | Max.   |                   |                                            |
| Power Consumption       | P <sub>BL</sub> | -      | (44)   | (52)   | W                 | (1), (2)                                   |
| Converter Input Voltage | V <sub>BL</sub> | (22.8) | (24.0) | (25.2) | VDC               |                                            |
| Converter Input Current | I <sub>BL</sub> | -      | (1.8)  | (2.2)  | A                 | Non Dimming                                |
| Input Inrush Current    | I <sub>R</sub>  | -      | -      | (TBD)  | A <sub>peak</sub> | V <sub>BL</sub> =22.8V <sub>r</sub><br>(3) |
| Dimming Frequency       | FB              | 150    | -      | 170    | Hz                |                                            |
| Dimming Duty Ratio      | DDR             | 5      | -      | 100    | %                 | (4)                                        |
| Life Time               | -               | 50,000 | -      | -      | Hrs               | (5)                                        |

Note (1) The power supply capacity should be higher than the total converter power consumption P<sub>BL</sub>. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when converter dimming.

Note (2) The measurement condition of Max. value is based on 27" backlight unit under input voltage 24V.

Note (3) For input inrush current measure, the V<sub>BL</sub> rising time from 10% to 90% is about 20ms.

Note (4) EPWM signal have to input available duty range. 5% minimum duty ratio is only valid for electrical operation.

Note (5) The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value,

Operating condition: Continuous operating at Ta = 25±2°C

Note (6) Below diagram is only for power supply design reference.

(圖)TBD

## 3.2 CONVERTER INTERFACE CHARACTERISTICS

| Parameter                    |     | Symbol           | Test Condition | Value |      |      | Unit | Note                    |     |
|------------------------------|-----|------------------|----------------|-------|------|------|------|-------------------------|-----|
|                              |     |                  |                | Min.  | Typ. | Max. |      |                         |     |
| On/Off Control Voltage       | ON  | VBLON            | —              | 2.0   | —    | 5.0  | V    |                         |     |
|                              | OFF |                  | —              | 0     | —    | 0.8  | V    |                         |     |
| External PWM Control Voltage | HI  | VEPWM            | —              | 2.0   | —    | 5.0  | V    | Duty on                 | (5) |
|                              | LO  |                  | —              | 0     | —    | 0.8  | V    | Duty off                |     |
| Error Signal                 |     | ERR              | —              | —     | —    | —    | —    | Abnormal: Open          |     |
| VBL Rising Time              |     | Tr1              | —              | 20    | —    | —    | ms   | 10%-90% V <sub>BL</sub> |     |
| Control Signal Rising Time   |     | Tr               | —              | —     | —    | 100  | ms   |                         |     |
| Control Signal Falling Time  |     | Tf               | —              | —     | —    | 100  | ms   |                         |     |
| PWM Signal Rising Time       |     | TPWMR            | —              | —     | —    | 50   | us   |                         |     |
| PWM Signal Falling Time      |     | TPWMF            | —              | —     | —    | 50   | us   |                         |     |
| Input Impedance              |     | Rin              | —              | 1     | —    | —    | MΩ   |                         |     |
| PWM Delay Time               |     | TPWM             | —              | 100   | —    | —    | ms   |                         |     |
| BLON Delay Time              |     | T <sub>on</sub>  | —              | 300   | —    | —    | ms   |                         |     |
|                              |     | T <sub>on1</sub> | —              | 300   | —    | —    | ms   |                         |     |
| BLON Off Time                |     | Toff             | —              | 300   | —    | —    | ms   |                         |     |

Note (1) The Dimming signal should be valid before backlight turns on by BLON signal. It is inhibited to change the external PWM signal during backlight turn on period.

Note (2) The power sequence and control signal timing are shown in the Fig.1. For a certain reason, the converter has a possibility to be damaged with wrong power sequence and control signal timing.

Note (3) While system is turned ON or OFF, the power sequences must follow as below descriptions:

Turn ON sequence: VBL → PWM signal → BLON

Turn OFF sequence: BLOFF → PWM signal → VBL

Note (4) When converter protective function is triggered, ERR will output open collector status. (Fig.2)

Note (5) The EPWM interface that inserts a pull up resistor to 5V in Max Duty (100%), please refers to Fig.3.

Note (6) EPWM signal have to input available frequency range.

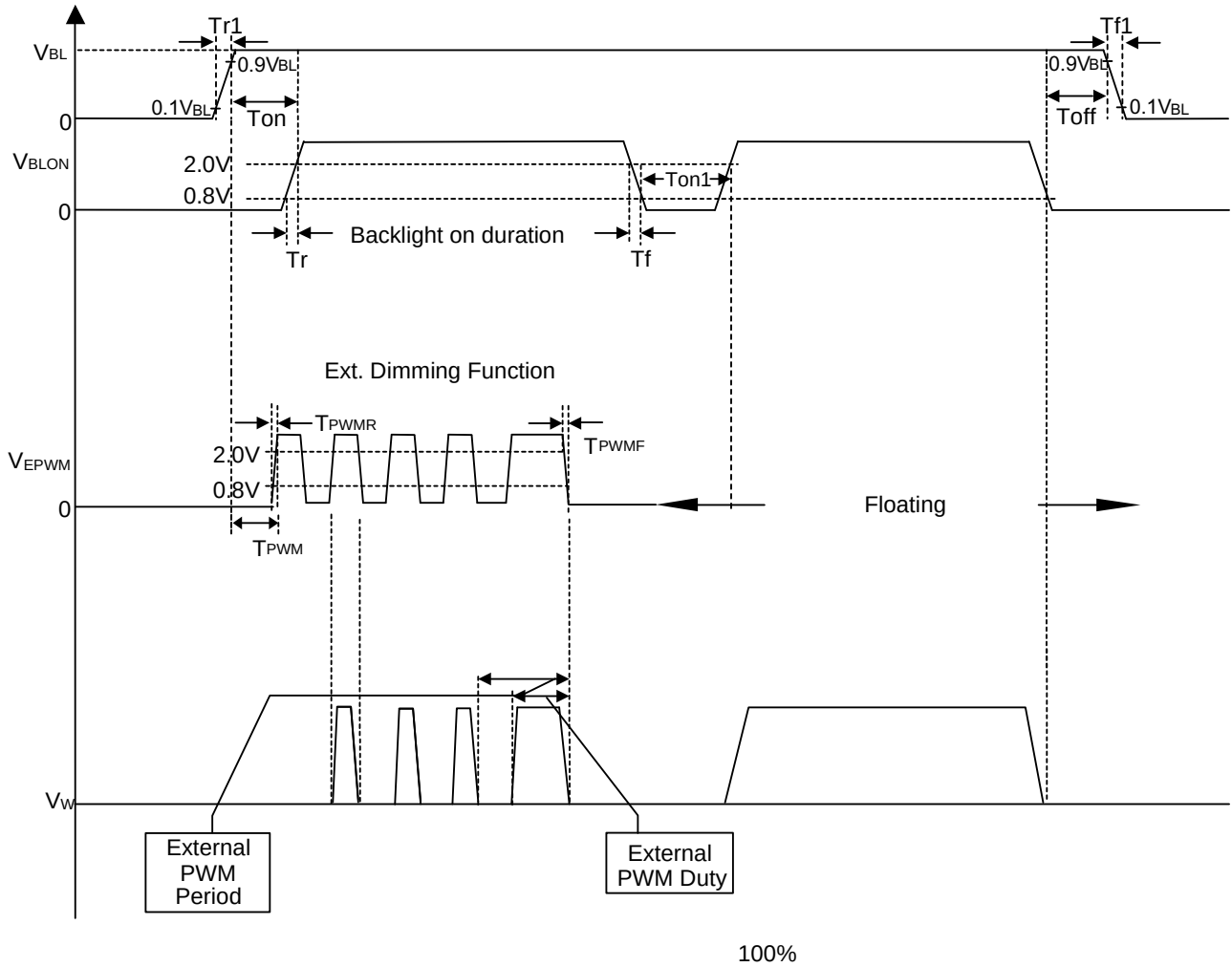


Fig. 1

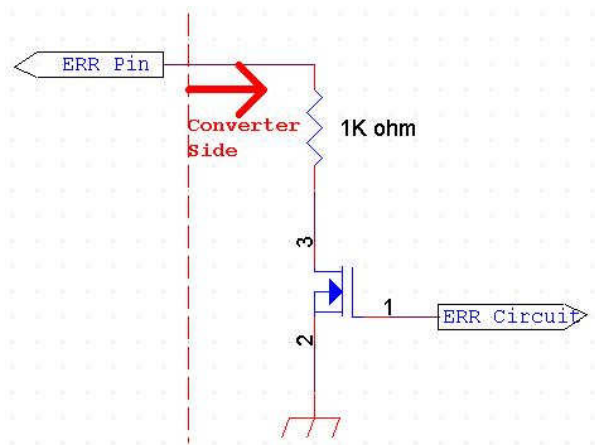


Fig. 2

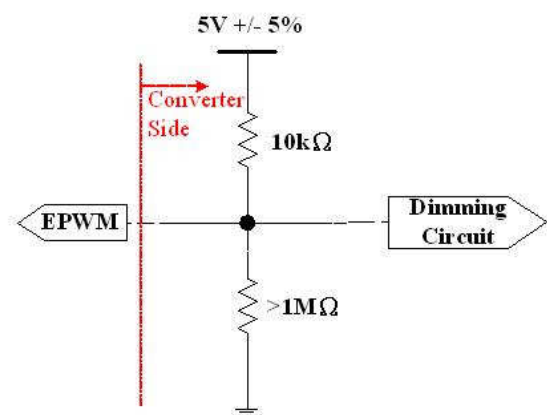


Fig. 3

## 3.3 BACKLIGHT UNIT

### 3.3.1 LIGHT BAR UNIT

[1] Connector ( wire type)

| Item             | Description                                     |
|------------------|-------------------------------------------------|
| Type part number | Cvilux CI1406M1VL0-N-NH<br>ACES 50429-0060N-001 |

The pin configuration for the housing and lead wire is shown in the table below.

CNL01 Connector Pin Assignment:

CNL01

| Pin No | Symbol | Feature                |
|--------|--------|------------------------|
| 1      | VLED+  | Positive of LED String |
| 2      | VLED+  |                        |
| 3      | N1     | Negative of LED String |
| 4      | N2     |                        |
| 5      | N3     |                        |
| 6      | N4     |                        |

### 3.3.2 CONVERTER UNIT

Connector (wire type)

| Item                       | Description                              |
|----------------------------|------------------------------------------|
| Type part number           | Cvilux CI0114M1HR0-LA<br>FCN JH2-D4-143N |
| Mating housing part number | Cvilux_CI0114S0000 or compatible         |

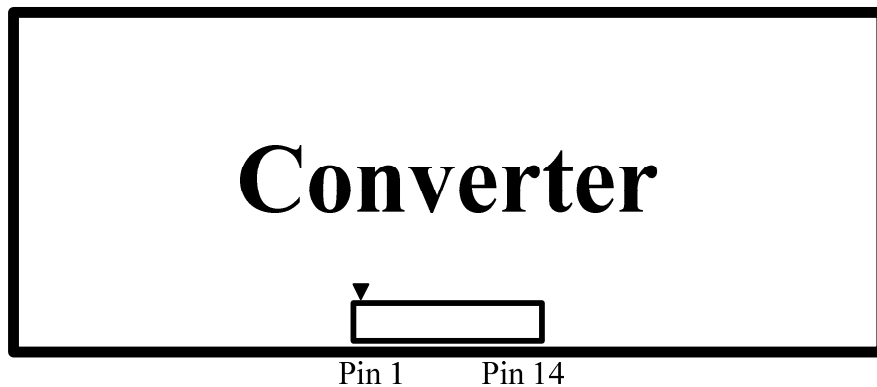
CNV04 Connector Pin Assignment:

| Pin No. | Symbol | Feature |
|---------|--------|---------|
| 1       | VBL    | +24V    |
| 2       |        |         |
| 3       |        |         |
| 4       |        |         |
| 5       |        |         |
| 6       | GND    | GND     |
| 7       |        |         |
| 8       |        |         |
| 9       |        |         |
| 10      |        |         |

|    |       |                                          |
|----|-------|------------------------------------------|
| 11 | ERR   | Normal (GND) ; Abnormal (Open collector) |
| 12 | BLON  | BL ON/OFF                                |
| 13 | NC    | NC                                       |
| 14 | E_PWM | External PWM Control                     |

Note (1) If Pin14 is open, E\_PWM is 100% duty.

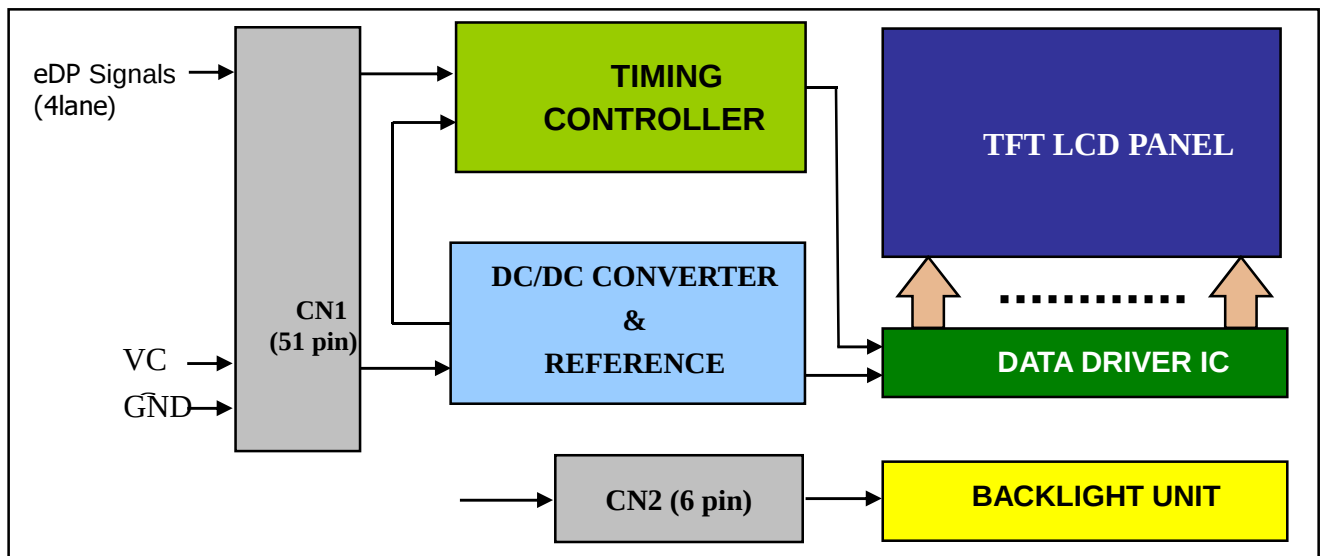
Note (2) Input connector pin order defined as follows



**Input Connector**

## 4. ELECTRICAL SPECIFICATIONS

### 4.1 FUNCTION BLOCK DIAGRAM



## 4.2 INTERFACE CONNECTIONS

PIN ASSIGNMENT(CN1 : eDP 51pins)

| 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   | N.C. | No Connection                          | (1)  |
| 8   | N.C. | No Connection                          | (1)  |
| 9   | N.C. | No Connection                          | (1)  |
| 10  | N.C. | No Connection                          | (1)  |
| 11  | N.C. | No Connection                          | (1)  |
| 12  | GND. | Ground                                 |      |
| 13  | N.C. | No Connection                          | (1)  |
| 14  | N.C. | No Connection                          | (1)  |
| 15  | N.C. | No Connection                          | (1)  |
| 16  | GND. | Ground                                 |      |
| 17  | GND. | Ground                                 |      |
| 18  | RX0P | True Signal for Main Link 0            | (4)  |
| 19  | RX0N | Component Signal for Main Link 0       | (4)  |
| 20  | GND. | Ground                                 |      |
| 21  | RX1P | True Signal for Main Link 1            | (4)  |
| 22  | RX1N | Component Signal for Main Link 1       | (4)  |
| 23  | GND. | Ground                                 |      |
| 24  | RX2P | True Signal for Main Link 2            | (4)  |
| 25  | RX2N | Component Signal for Main Link 2       | (4)  |
| 26  | GND. | Ground                                 |      |
| 27  | RX3P | True Signal for Main Link 3            | (4)  |
| 28  | RX3N | Component Signal for Main Link 3       | (4)  |
| 29  | GND. | Ground                                 |      |
| 30  | AUXN | Component Signal for Auxiliary Channel |      |
| 31  | AUXP | True Signal for Auxiliary Channel      |      |
| 32  | GND. | Ground                                 |      |
| 33  | HPD  | Hot Plug Detect Signal                 |      |
| 34  | GND. | Ground                                 |      |
| 35  | N.C. | No Connection                          | (1)  |
| 36  | GND. | Ground                                 |      |
| 37  | N.C. | No Connection                          | (1)  |
| 38  | N.C. | No Connection                          | (1)  |



|    |      |               |     |
|----|------|---------------|-----|
| 39 | GND. | Ground        |     |
| 40 | N.C. | No Connection | (1) |
| 41 | N.C. | No Connection | (1) |
| 42 | GND. | Ground        |     |
| 43 | N.C. | No Connection | (1) |
| 44 | N.C. | No Connection | (1) |
| 45 | GND. | Ground        |     |
| 46 | N.C. | No Connection | (1) |
| 47 | N.C. | No Connection | (1) |
| 48 | GND. | Ground        |     |
| 49 | N.C. | No Connection | (1) |
| 50 | N.C. | No Connection | (1) |
| 51 | GND. | Ground        |     |

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

### Connector Information

Note (1) Reserved for internal use. Please leave it open.

Note (2) Connector Part No.:

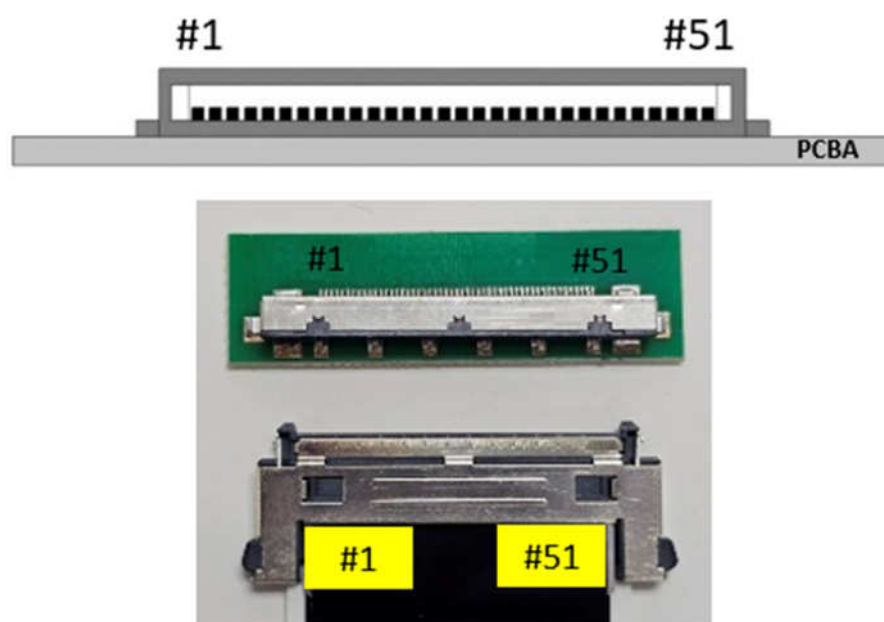
| Item             | Description        |
|------------------|--------------------|
| Type Part Number | P-Two 187059-51221 |
|                  | FCN WF23-402-5133  |

Note (3) User's connector Part No:

| Item                                | Description                               |
|-------------------------------------|-------------------------------------------|
| Mating Wire Cable Connector Part No | JAE FI-RE5HL                              |
|                                     | P-Two LVDS 28 type_187120-51001-3         |
|                                     | Hamburg FCC-W50-510001-000C or compatible |

Note (4) eDP 4 Lane Main Link.

Note (5) The direction of pin assignment is shown as below



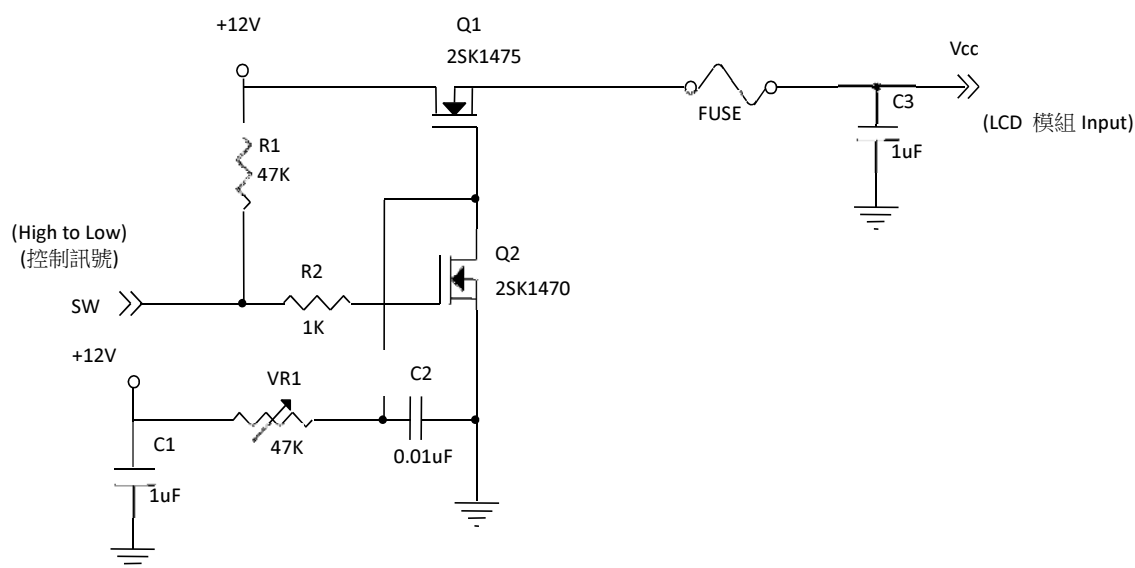
## 4.3 ELECTRICAL CHARACTERISTICS

### 4.3.1 LCD ELETRONICS SPECIFICATION

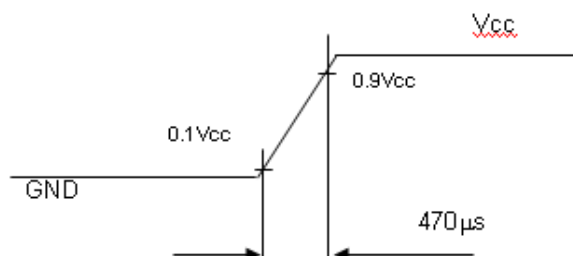
| Parameter            |                              | Symbol            | Value |         |         | Unit | Note |
|----------------------|------------------------------|-------------------|-------|---------|---------|------|------|
|                      |                              |                   | Min.  | Typ.    | Max.    |      |      |
| Power Supply Voltage |                              | V <sub>CC</sub>   | 10.8  | 12      | 13.2    | V    | -    |
| Ripple Voltage       |                              | V <sub>RP</sub>   | -     | -       | 500     | mV   | (5)  |
| Rush Current         |                              | I <sub>RUSH</sub> | -     | -       | 5       | A    | (2)  |
| Power Supply Current | White                        | I <sub>CC</sub>   | -     | (0.46)  | (0.5)   | A    | (3)a |
|                      | Black                        |                   | -     | (0.41)  | (0.44)  | A    | (3)b |
|                      | Max Power Pattern            |                   | -     | (0.9)   | (0.98)  | A    | (3)c |
| Power Consumption    | Typ. FR                      | PLCD              | -     | (10.8)  | (11.76) | Watt | (4)  |
|                      | Max. FR                      |                   | -     | (11.28) | (12.24) | Watt |      |
| 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  $T_a = 25 \pm 2^\circ\text{C}$ .

Note (2) Measurement Conditions:



**V<sub>CC</sub> rising time is 470μs**



Note (3) 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



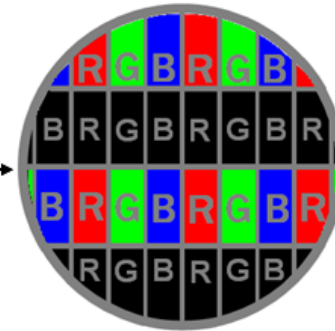
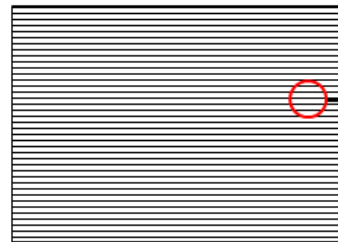
Active Area

b. Black Pattern



Active Area

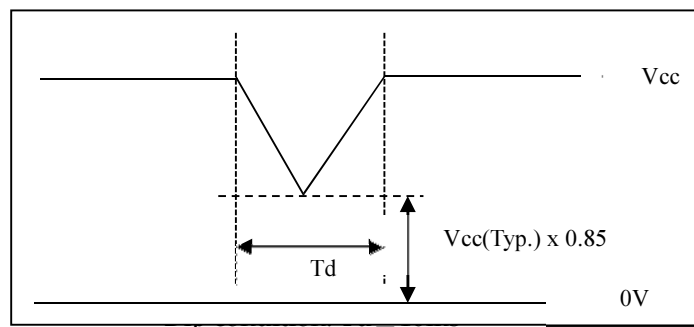
c. Horizontal Pattern



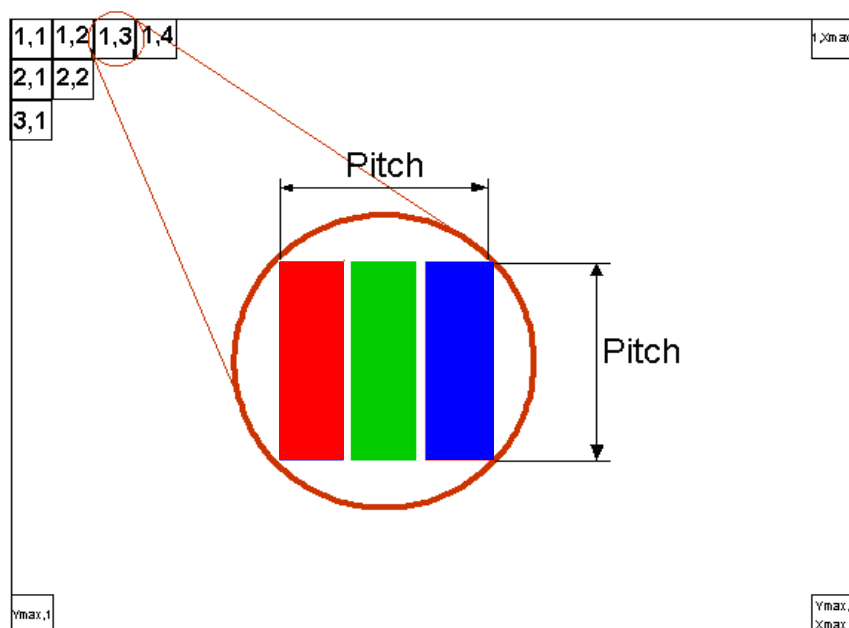
Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5)  $V_{cc} = \text{Typ.}$ ,  $F_r = \text{Max.}$ , Test pattern: White pattern

#### 4.3.2 VCC POWER DIP CONDITION



#### 4.4 eDP INPUT DATA MAPPING TABLE



#### 4 Lane eDP

| Lane   | Data Stream                 |
|--------|-----------------------------|
| Lane 0 | 1, 5, 9, ....., 3833, 3837  |
| Lane 1 | 2, 6, 10, ....., 3834, 3838 |
| Lane 2 | 3, 7, 11, ....., 3835, 3839 |
| Lane 3 | 4, 8, 12, ....., 3836, 3840 |

#### 4 lane 10 bits input Data format

| Lane 0            | Lane 1            | Lane 2            | Lane 3            |
|-------------------|-------------------|-------------------|-------------------|
| R1-9:2            | R2-9:2            | R3-9:2            | R4-9:2            |
| R1-1:0   G1-9:4   | R2-1:0   G2-9:4   | R3-1:0   G3-9:4   | R4-1:0   G4-9:4   |
| G1-3:0   B1-9:6   | G2-3:0   B2-9:6   | G3-3:0   B3-9:6   | G4-3:0   B4-9:6   |
| B1-5:0   R5-9:8   | B2-5:0   R6-9:8   | B3-5:0   R7-9:8   | B4-5:0   R8-9:8   |
| R5-7:0            | R6-7:0            | R7-7:0            | R8-7:0            |
| G5-9:2            | G6-9:2            | G7-9:2            | G8-9:2            |
| G5-1:0   B5-9:4   | G6-1:0   B6-9:4   | G7-1:0   B7-9:4   | G8-1:0   B8-9:4   |
| B5-3:0   R9-9:6   | B6-3:0   R10-9:6  | B7-3:0   R11-9:6  | B8-3:0   R12-9:6  |
| R9-5:0   G9-9:8   | R10-5:0   G10-9:8 | R11-5:0   G11-9:8 | R12-5:0   G12-9:8 |
| G9-7:0            | G10-7:0           | G11-7:0           | G12-7:0           |
| B9-9:2            | B10-9:2           | B11-9:2           | B12-9:2           |
| B9-1:0   R13-9:4  | B10-1:0   R14-9:4 | B11-1:0   R15-9:4 | B12-1:0   R16-9:4 |
| R13-3:0   G13-9:6 | R14-3:0   G14-9:6 | R15-3:0   G15-9:6 | R16-3:0   G16-9:6 |
| G13-5:0   B13-9:8 | G14-5:0   B14-9:8 | G15-5:0   B15-9:8 | G16-5:0   B16-9:8 |
| B13-7:0           | B14-7:0           | B15-7:0           | B16-7:0           |

#### 4.4.1 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 |   |  |  |
|                     | 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 |   |  |  |
|                     | Green           | 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 |   |  |  |
|                     | Blue            | 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 |   |  |  |
|                     | Magenta         | 1           | 1  | 1  | 1  | 1  | 1  | 1  |    | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1 | 1 |  |  |
|                     | Yellow          | 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 | 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 |   |  |  |
|                     | Red(1)          | 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  | 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  | 0  | 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  | 0  | 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 |   |  |  |
|                     | Green(1)        | 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  | 1  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | :               | :           | :  | :  | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  | : |   |  |  |
|                     | :               | :           | :  | :  | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  | : |   |  |  |
|                     | Green(1021)     | 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  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Green(1023)     | 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 |   |  |  |
|                     | 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  | 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  | 1  | 0 |   |  |  |
|                     | :               | :           | :  | :  | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  | : |   |  |  |
|                     | :               | :           | :  | :  | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  | : |   |  |  |
|                     | Blue(1021)      | 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  | 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  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1 |   |  |  |

#### 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                    |
|-------------------------|----------------|--------|--------|--------|------|------|-------------------------|
| eDP                     | Frequency      | Fc     | 518.28 | 533.28 | 552  | MHz  | (3)                     |
| Vertical Display Term   | Frame Rate     | Fr     | 39     | 60     | 62   | Hz   | -                       |
|                         | Total          | Tv     | 2219   | 2222   | 3545 | Th   | $T_v = T_{vd} + T_{vb}$ |
|                         | Active Display | Tvd    | 2160   | 2160   | 2160 | Th   | -                       |
|                         | Blank          | Tvb    | 59     | 62     | 1385 | Th   | -                       |
| Horizontal Display Term | Frequency      | Fh     | 95     | 133    | 139  | KHz  | -                       |
|                         | Total          | Th     | 3968   | 4000   | 5440 | Tc   | $T_h = T_{hd} + T_{hb}$ |
|                         | Active Display | Thd    | 3840   | 3840   | 3840 | Tc   | -                       |
|                         | Blank          | Thb    | 128    | 160    | 1600 | Tc   | -                       |

Note(1) In Free-sync mode, only guaranteed no functional failure, but don't guaranteed its quality of the optical and cosmetic performance.

Note(2) The optimal Vertical Frame Rate is 59~62Hz for best picture quality

Note(3) Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

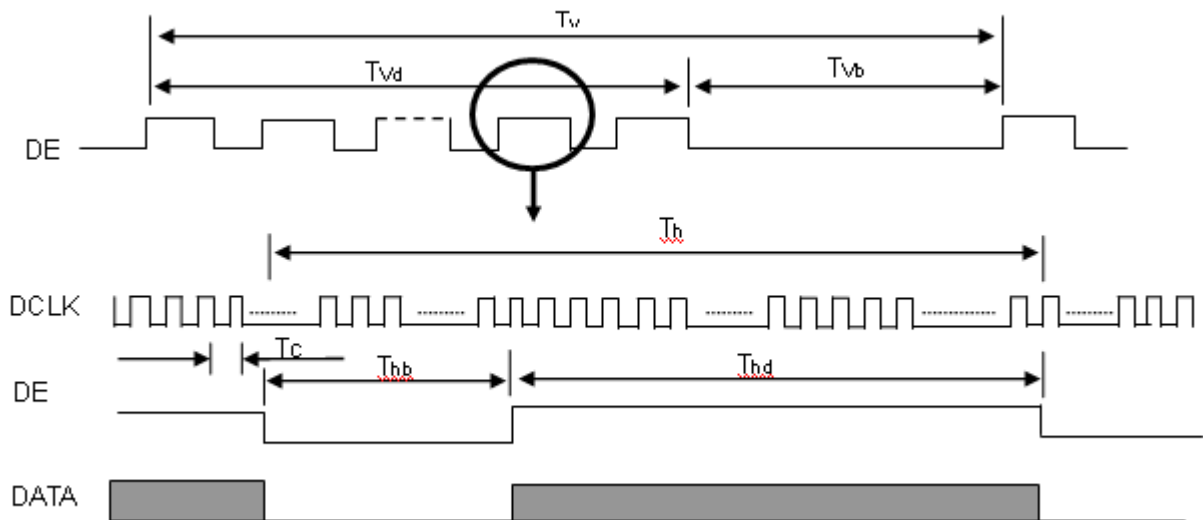
$$F_c = F_r \times T_v \times T_h,$$

$$F_h(\text{min.}) = F_c(\text{min.}) / T_h(\text{min.}), F_h(\text{typ.}) = F_c(\text{typ.}) / T_h(\text{typ.}), F_h(\text{max.}) = F_c(\text{max.}) / T_h(\text{min.})$$

Please make sure the range of pixel clock has follow the below equation and  $F_c$ ,  $F_r$ ,  $T_v$ ,  $T_h$ ,  $F_h$  not allowed to get beyond the min or max spec.

Max.  $F_c$  is including spread spectrum.

#### INPUT SIGNAL TIMING DIAGRAM

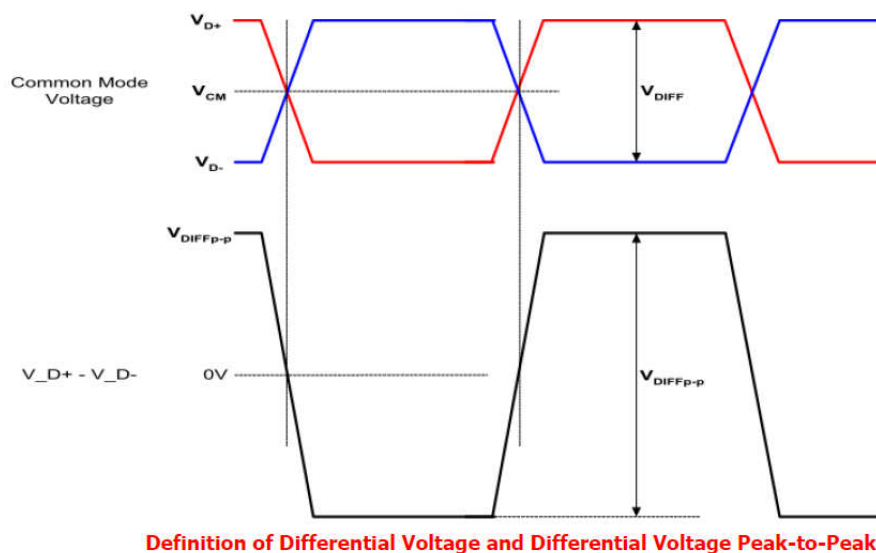


#### 4.6 eDP SIGNAL SPECIFICATIONS

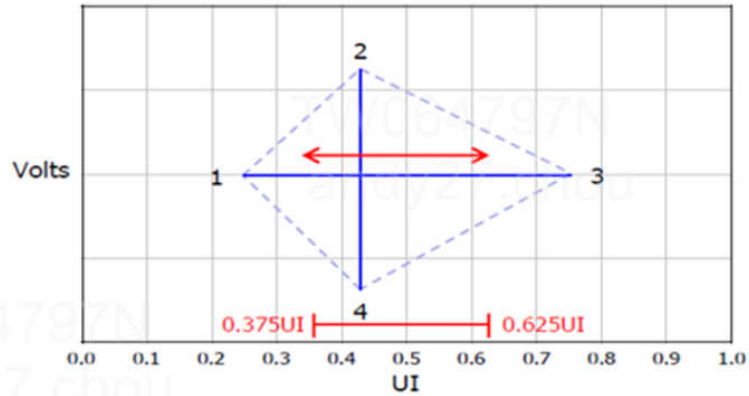
##### 4.6.1 eDP MAIN LINK SIGNAL

| Parameter                                         | Symbol      | Min              | Typ | Max         | Unit | Notes |
|---------------------------------------------------|-------------|------------------|-----|-------------|------|-------|
| Frequency for high bit rate (HBR2)                | fHBR2       | 5.37138          | 5.4 | 5.40162     | Gbps |       |
| Spread spectrum clock (Down Spreading)            | -           | 0                | -   | 0.5         | %    | (6)   |
| SSC modulation frequency                          | fssc        | 30               | -   | 33          | kHz  | (6)   |
| Differential peak to peak voltage at RX connector | VDIFFp-p    | 120              | -   | 1320        | mV   | (1)   |
| Rx input DC common mode voltage                   | VCM         | 0                | -   | 2           | V    | (1)   |
| Differential termination resistance               | VRX-TERM    | 80               | 100 | 120         | ohm  |       |
| Rx intra-pair skew at HBR2                        | tTOSK_Intra | -                | -   | 50          | ps   | (3)   |
| Rx inter-pair skew at HBR2                        | tTOSK_Inter | -<br>(4UI+500ps) | -   | (4UI+500ps) | ps   | (4)   |
| Main Link AC Coupling Capacitor                   | C_ML_Source | 75               | -   | 200         | nF   | (5)   |

Note(1) Definition of Differential Voltage

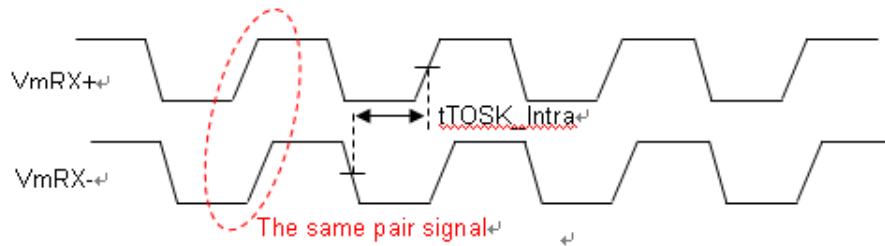


Note(2) Main Link EYE Diagram

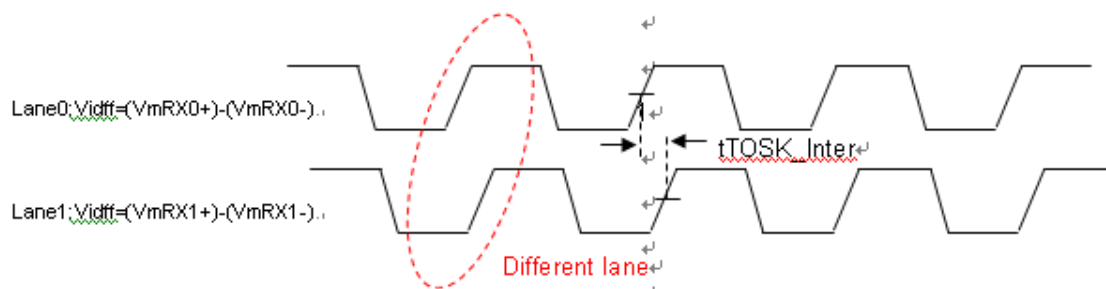


| HBR2 @TP3_EQ |                                                                    |            |
|--------------|--------------------------------------------------------------------|------------|
| Point        | Time(UI)                                                           | Voltage(V) |
| 1            | Any UI locattion(x),where the Eye width is open from x to x+0.38UI | 0.000      |
| 2            | Any passing UI location between 0.375 and 0.625UI                  | 0.045      |
| 3            | Point 1+ 0.38UI                                                    | 0.000      |
| 4            | Same as Point 2                                                    | -0.045     |

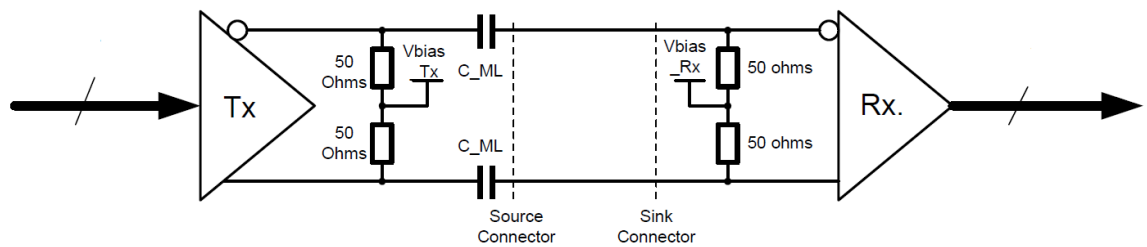
Note(3) eDP Intra-pair skew



Note(4) eDP Inter-pair skew

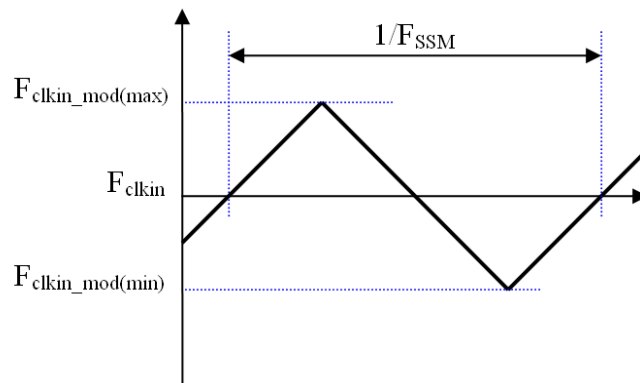


Note(5) Recommended Main Link Channel topology is as below and the Main Link AC Coupling Capacitor ( $C_{ML\_Source}$ ) should be placed on the source device





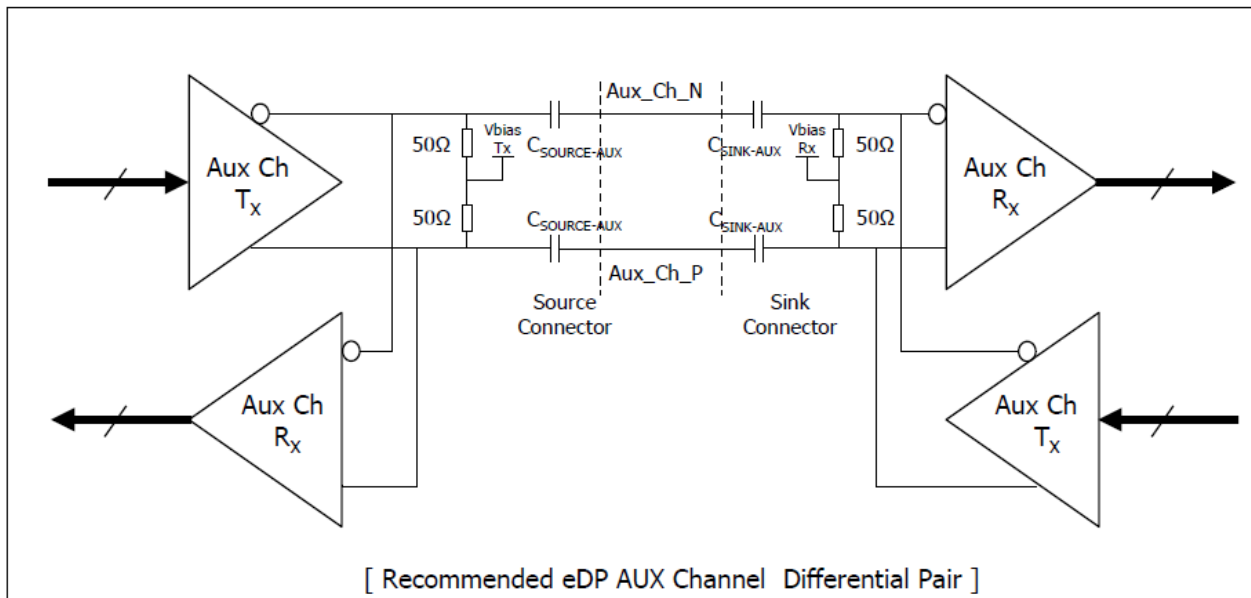
Note(6) The SSCG (Spread spectrum clock generator) is defined as below figures.



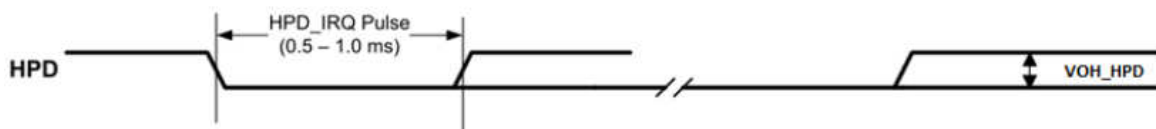
#### 4.6.2 eDP AUX CHANNEL SIGNAL

| Parameter                                     | Symbol       | Min  | Typ | Max  | Unit | Notes |
|-----------------------------------------------|--------------|------|-----|------|------|-------|
| AUX Unit Interval                             | UI           | 0.4  | -   | 0.6  | us   |       |
| AUX Jitter at Tx IC Pins                      | T jitter     | -    | -   | 0.04 | UI   |       |
| AUX Jitter at Rx IC Pins                      | T jitter     | -    | -   | 0.05 | UI   |       |
| AUX Peak-to-peak voltage at Connector Rx Pins | VAUX-DIFFp-p | 0.27 | -   | 1.36 | V    |       |
| AUX Peak-to-peak voltage at Connector Tx Pins | VAUX-DIFFp-p | 0.29 | 0.4 | 1.38 | V    |       |
| AUX Differential termination resistance       | AUX_dtr      | 80   | 100 | 120  | ohm  | (1)   |
| AUX DC common mode voltage                    | VAUX_CM      | 0    | -   | 1.2  | V    |       |
| AUX AC Coupling Capacitor                     | C_Source_Aux | 75   | -   | 200  | nF   | (1)   |

Notes(1) Recommended eDP AUX Channel topology is as below and the AUX AC Coupling Capacitor (C\_Source\_Aux) should be placed on the source device.



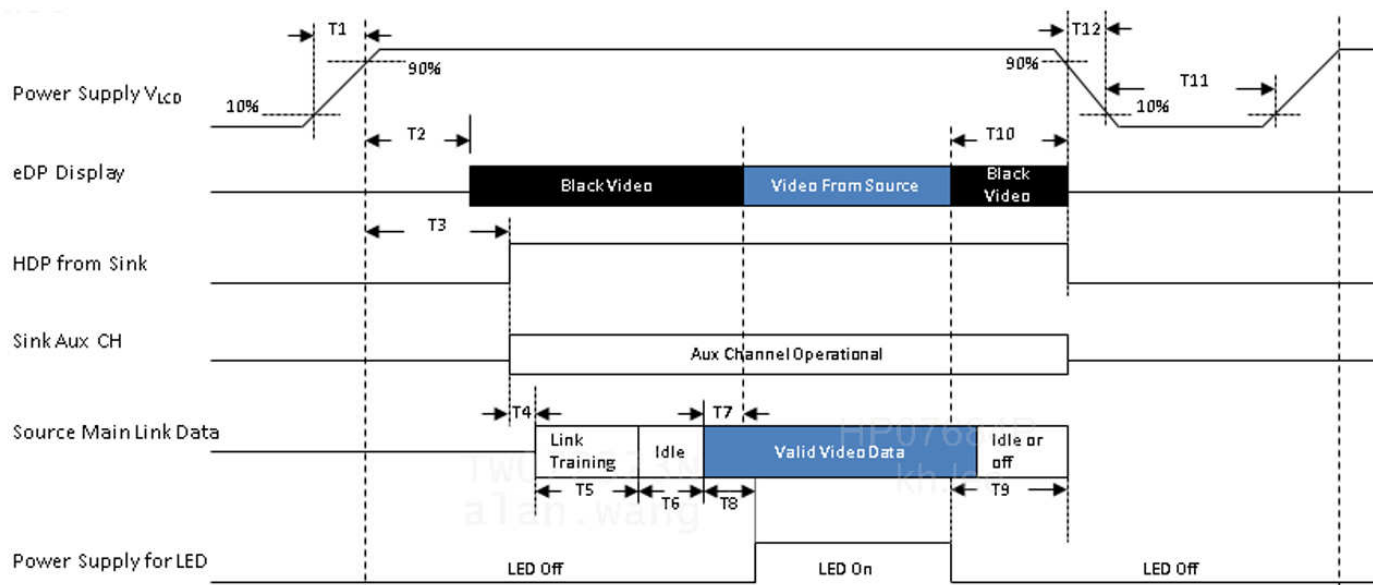
#### 4.6.3 eDP HPD SIGNAL



| Parameter           | Symbol   | Min   | Typ | Max   | Unit |
|---------------------|----------|-------|-----|-------|------|
| HPD Voltage         | VOH_HPDP | 3.135 | -   | 3.465 | V    |
| HPD_IRQ Pulse Width | HPD_IRQ  | 0.5   | -   | 1     | ms   |

#### 4.7 POWER ON/OFF SEQUENCE

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



Timing Specifications:

| Timing | Required By | Min  | Max | Units | Notes |
|--------|-------------|------|-----|-------|-------|
| T1     | Source      | 0.5  | 10  | ms    |       |
| T2     | Sink        | 10   | 200 | ms    |       |
| T3     | Sink        | 15   | 200 | ms    |       |
| T4     | Source      | 0    | -   | ms    | (7)   |
| T5     | Source      | 0    | -   | ms    | (7)   |
| T6     | Source      | 0    | 100 | ms    |       |
| T7     | Sink        | 0    | 50  | ms    |       |
| T8     | Source      | 200  | -   | ms    |       |
| T9     | Source      | 200  | -   | ms    | (8)   |
| T10    | Source      | 0    | 500 | ms    |       |
| T11    | Source      | 1000 | -   | ms    |       |
| T12    | Source      | 10   | 100 | ms    |       |

Note (1) The supply voltage of the external system for the module input should follow the definition of  $V_{CC}$ .

Note (2) Please insert a display black pattern during all T9. When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen and it will be no reliability concern (T9 < 200ms).

Note (3) In case of  $V_{CC}$  is in off level, please keep the level of input signals on the low or high impedance.

If T2 < 0, that maybe cause electrical overstress failure.

Note (4) T11 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)  $V_{CC}$  must decay smoothly when power-off.

Note (7) Link training duration is dependent on the customer's system.

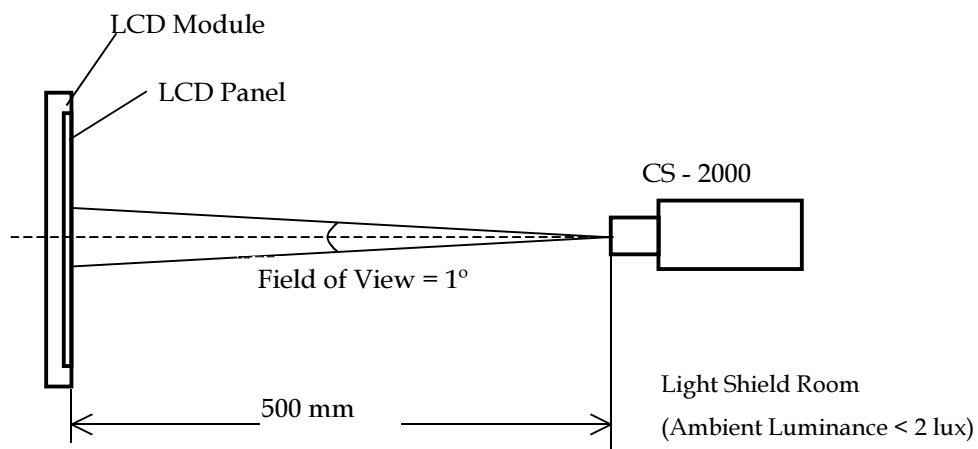
Note (8) LED power must be turned of while video data signal is valid.

## 5. OPTICAL CHARACTERISTICS

### 5.1 TEST CONDITIONS

| Item                | Symbol                                                        | Value  | Unit |
|---------------------|---------------------------------------------------------------|--------|------|
| Ambient Temperature | Ta                                                            | 25±2   | °C   |
| Ambient Humidity    | Ha                                                            | 50±10  | %RH  |
| Supply Voltage      | VCC                                                           | 12±1.2 | V    |
| Input Signal        | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |        |      |
| Vertical Frame Rate | Fr                                                            | 60     | Hz   |

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.



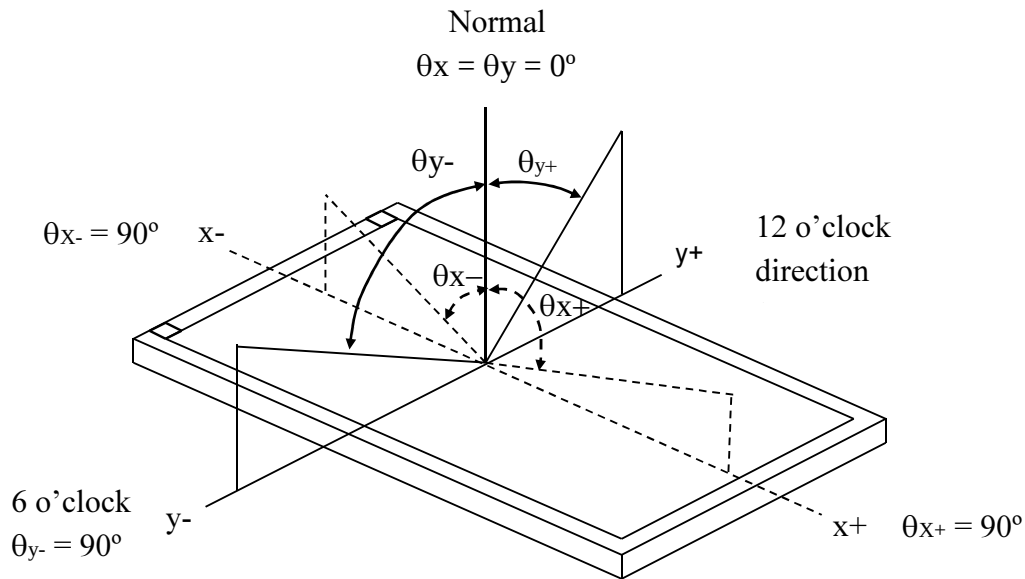
## 5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 6.2. The following items should be measured under the test conditions described in 6.1 and stable environment shown in 6.1.

| Item                      |                              | Symbol           | Condition                                                                    | Min.          | Typ.  | Max.          | Unit              | Note |   |
|---------------------------|------------------------------|------------------|------------------------------------------------------------------------------|---------------|-------|---------------|-------------------|------|---|
| Contrast Ratio            |                              | CR               | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>Viewing angle at<br>normal direction | 700           | 1000  | -             | -                 | (2)  |   |
| Response Time             |                              | Gray to gray     |                                                                              | -             | 14    | -             | ms                | (3)  |   |
| Center Luminance of White |                              | L <sub>C</sub>   |                                                                              | 560           | 700   | -             | cd/m <sup>2</sup> | (4)  |   |
| White Variation           |                              | δW               |                                                                              |               |       | 1.3           | -                 | (6)  |   |
| Cross Talk                |                              | CT               |                                                                              | -             |       | 4             | %                 | (5)  |   |
| Color<br>Chromaticity     | Red                          | R <sub>x</sub>   |                                                                              | Typ.-<br>0.03 | 0.675 | Typ.+<br>0.03 | -                 | -    |   |
|                           |                              | R <sub>y</sub>   |                                                                              |               | 0.319 |               | -                 |      |   |
|                           | Green                        | G <sub>x</sub>   |                                                                              |               | 0.278 |               | -                 |      |   |
|                           |                              | G <sub>y</sub>   |                                                                              |               | 0.628 |               | -                 |      |   |
|                           | Blue                         | B <sub>x</sub>   |                                                                              |               | 0.144 |               | -                 |      |   |
|                           |                              | B <sub>y</sub>   |                                                                              |               | 0.054 |               | -                 |      |   |
|                           | White                        | W <sub>x</sub>   |                                                                              |               | 0.313 |               | -                 |      |   |
|                           |                              | W <sub>y</sub>   |                                                                              |               | 0.329 |               | -                 |      |   |
|                           | Correlated color temperature |                  |                                                                              |               | -     |               | 7000              |      | - |
|                           | Color Gamut                  | C.G.             | -                                                                            |               | 95    |               | -                 |      | % |
|                           |                              | -                | 85                                                                           | -             | %     | NTSC          |                   |      |   |
| Viewing<br>Angle          | Horizontal                   | θ <sub>x</sub> + | CR≥10                                                                        | 80            | 89    | -             | Deg.              | (1)  |   |
|                           |                              | θ <sub>x</sub> - |                                                                              | 80            | 89    | -             |                   |      |   |
|                           | Vertical                     | θ <sub>y</sub> + |                                                                              | 80            | 89    | -             |                   |      |   |
|                           |                              | θ <sub>y</sub> - |                                                                              | 80            | 89    | -             |                   |      |   |

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

Viewing angles are measured by Autronic Conoscope Cono-80 (or Eldim EZ-Contrast 160R).



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

The contrast ratio can be calculated by the following expression.

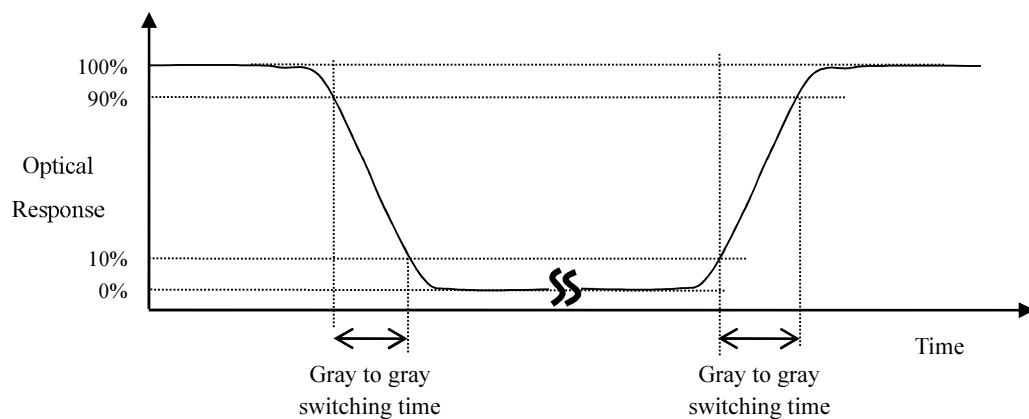
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (X), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (3) Definition of Gray-to-Gray Switching Time :



The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255.

Gray to gray average time means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255 to each other.

Note (4) Definition of Luminance of White ( $L_C$ ,  $L_{AVE}$ ) :

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L(5)$ , where  $L(X)$  is corresponding to the luminance of the point X at the figure in Note (6).

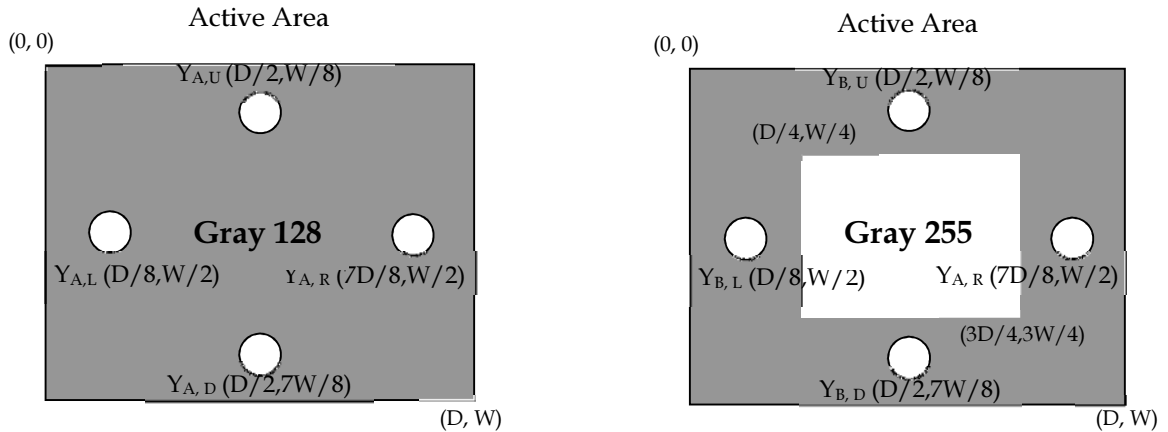
Note (5) Definition of Cross Talk (CT) :

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where:

$Y_A$  = Luminance of measured location without gray level 255 pattern (cd/m<sup>2</sup>)

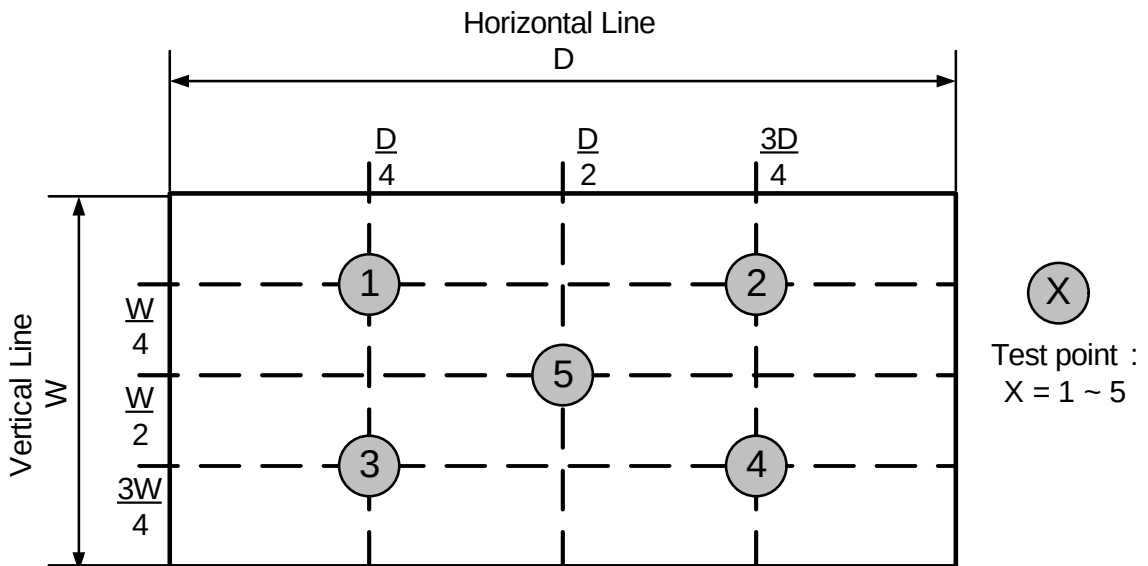
$Y_B$  = Luminance of measured location with gray level 255 pattern (cd/m<sup>2</sup>)



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

Measure the luminance of gray level 255 at 5 points

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



## 6. PRECAUTIONS

### 6.1 ASSEMBLY AND HANDLING PRECAUTIONS

- [1] Do not apply rough force such as bending or twisting to the module during assembly.
- [2] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- [3] Bezel of Set can not press or touch the panel surface. It will make light leakage or scrape.
- [4] It should be attached to the system firmly using all mounting holes.
- [5] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer, do not press or scratch the surface harder than a HB pencil lead.
- [6] Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- [7] Protection film for polarizer on the module should be slowly peeled off just before use so that the electrostatic charge can be minimized.
- [8] Do not disassemble the module.
- [9] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- [10] Do not plug in or pull out the I/F connector while the module is in operation, pins of I/F connector should not be touched directly with bare hands. Do not adjust the variable resistor located on the module.
- [11] When storing modules as spares for a long time, the following precaution is necessary.
  - [11.1] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 at °C normal humidity (under 70%) without condensation.
  - [11.2] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [12] Use a soft dry cloth without chemicals and Ethyl Alcohol for cleaning, because the surface of polarizer is very soft and easily scratched. Do not use Ketone type materials (ex. Acetone), Toluene, Ethyl acid or Methyl chloride, these chemical solvent might permanently damage the polarizer due to chemical action.
- [13] Moisture can easily penetrate into LCD module and may cause the damage during operation.



## 6.2 SAFETY PRECAUTIONS

To optimize PID module's lifetime and functions, operating conditions should be followed as below

### [1] Normal operating condition

[1.1] Well-ventilated place is suggested to set up PID module and system.

[1.2] Display pattern : regular switched patterns or moving pictures.

### [2] Operation usage to protect against image sticking due to long-term static display.

[2.1] Liquid Crystal refresh time is required. Cycling display between 5 minutes' information (static) display and 10 seconds' moving image.

[2.2] Periodical display contents should be changed from static image to moving picture.

[2.2.1] Different background and image colors changed respectively, and changed colors periodically.

[2.2.2] Background and image with large different luminance displayed at the same time should be avoided.

[2.2.3] Periodical power-off the system for a while or screen saver is needed after long-term static display.

[2.2.4] Moving picture or black pattern is strongly recommended for screen saver.

[3] The startup voltage of a Backlight may cause an electrical shock while assembling with the converter. Do not disassemble the module or insert anything into the Backlight unit.

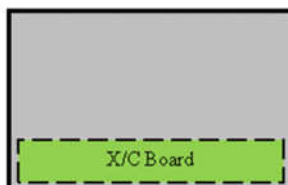
[4] Do not connect or disconnect the module in the "Power On" condition.

[5] Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature...) Otherwise the module may be damaged.

[6] 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.

[7] Module should be turned clockwise (regular front view perspective) when used in portrait mode.

Landscape (Front view)



Portrait (Front view)



[8] Product reliability and functions are only guaranteed when the product is used under right operation usages.

If product will be used in extreme conditions, especially combining severe conditions such as high temperature/humidity, display stationary patterns, or long operation time etc..., it is strongly recommended to contact INX for field application engineering advice. Otherwise, the panel may be damaged and its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and full outdoor display.

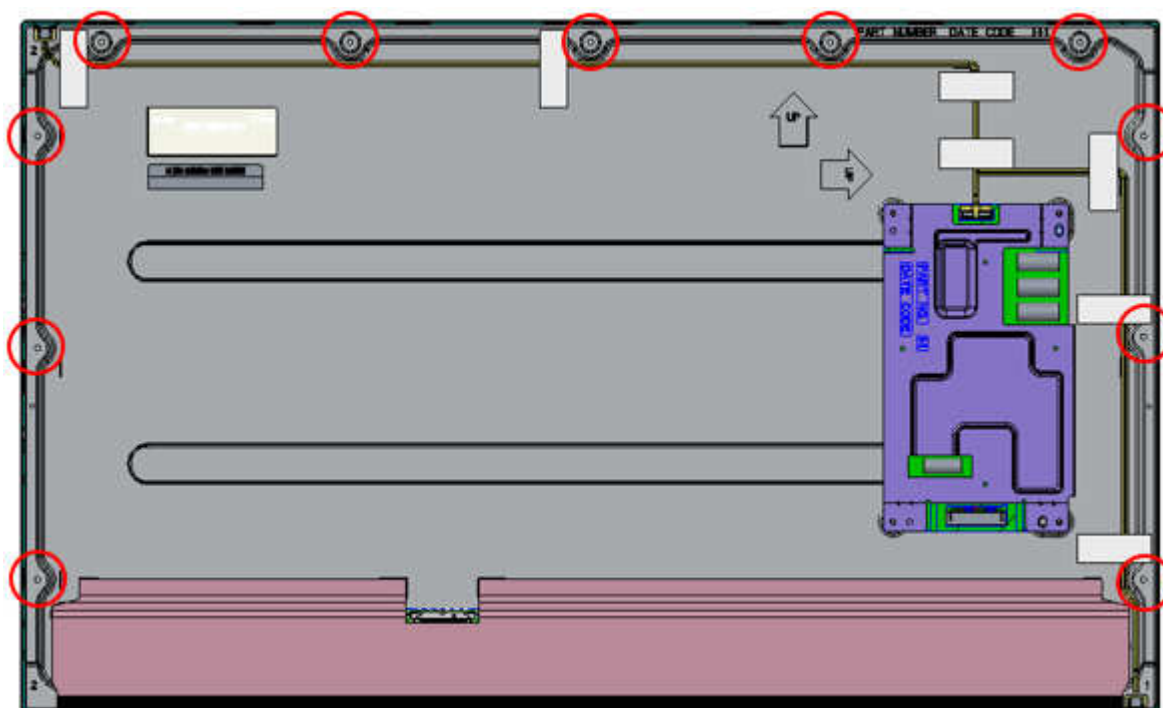
[9] LCD system is required to place in well-ventilated environment. Adapting active cooling system is highly recommended.

### 6.3 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

[1] Strong light exposure causes degradation of polarizer and color filter. Since the product design is not protected by an ultra-violet ray filter, the deterioration of the polarizer due to sun exposure or water drenching is not guarantee. It is necessary to set up cover-glass with ultraviolet resistance to protect panel from radiation of ambient environment.

### 6.4 DUST RESIST

- [1] INX module dust test is conducted with marked holes (see Figure below, marked with red circle) sealed.
- [2] Module users should design set with these holes used/sealed (if not used) or covered by set mechanism to prevent dust from entering. The INX testing procedure cannot replicate all different real world scenarios, module users should apply set dust resistance solution to meet user's requirement.



### 6.5 SAFETY STANDARDS

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

| Regulatory                                                      | Item | Standard                                         |
|-----------------------------------------------------------------|------|--------------------------------------------------|
| Audio/video, Information and Communication Technology Equipment | UL   | UL 62368-1, 3rd Ed, 2021-10-22                   |
|                                                                 | cUL  | CAN/CSA C22.2 No. 62368-1:19, 3rd Ed, 2021-10-22 |
|                                                                 | CB   | IEC 62368-1:2018<br>EN IEC 62368-1:2020+A11:2020 |

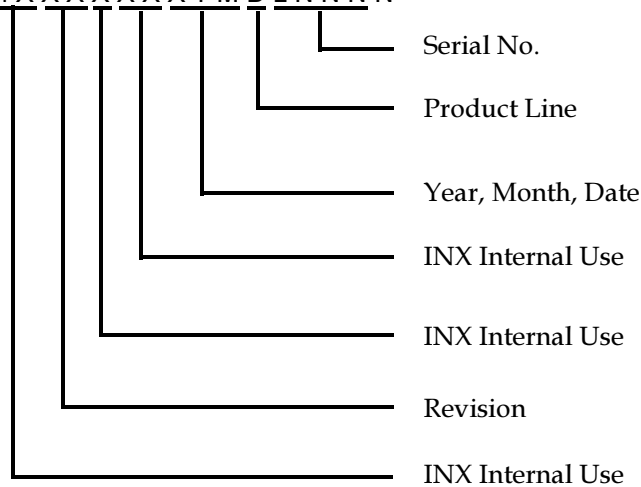
## 7. DEFINITION OF LABELS

### 7.1 MODULE LABEL

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



- (a) Model Name: S270DR1-A01
- (b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2... etc.
- (c) Serial ID: XXXXXYMDLNNNN



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 0~9, for 2020~2029  
Month: 1~9, A~C, for Jan. ~ Dec.  
Day: 1~9, A~Y, for 1<sup>st</sup> to 31<sup>st</sup>, exclude I, O, and U.
- (b) Revision Code: Cover all the change
- (c) Serial No.: Manufacturing sequence of product
- (d) Product Line: 1 → Line1, 2 → Line 2, ...etc.

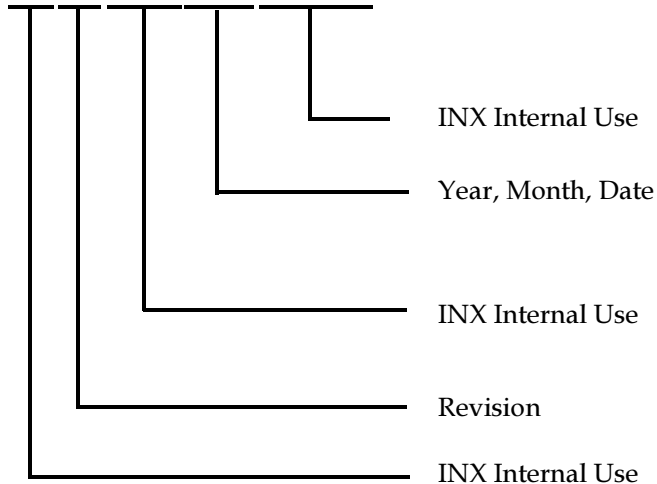
## 7.2 CARTON LABEL

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

|                                            |                  |
|--------------------------------------------|------------------|
| PO. NO. _____                              |                  |
| Part ID. _____                             |                  |
| Model Name <u>S270DR1-A01</u> Rev.XX _____ |                  |
| Carton ID. _____                           | Quantities _____ |
| XXXXXXXXXXXXXXXX                           |                  |
| Made In Taiwan (Made In China)             |                  |
| RoHS                                       |                  |

Model Name: S270DR1-A01

Carton ID: X X X X X X Y M D X X X X



Serial ID includes the information as below :

Manufactured Date:

Year: 2010=0, 2011=1, 2012=2...etc.

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

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

Revision Code: Cover all the change

## 8. PACKAGING

### 8.1 PACKAGING SPECIFICATIONS

- (1) 12 LCD TV MODULES / 1 BOX
- (2) BOX DIMENSIONS : 735(L) X 565(W) X 450(H)
- (3) WEIGHT: APPROXIMATELY 33 KG (12 MODULES PER BOX)

### 8.2 PACKAGING METHOD

Packaging method is shown in following Figures 9-1 and 9-2

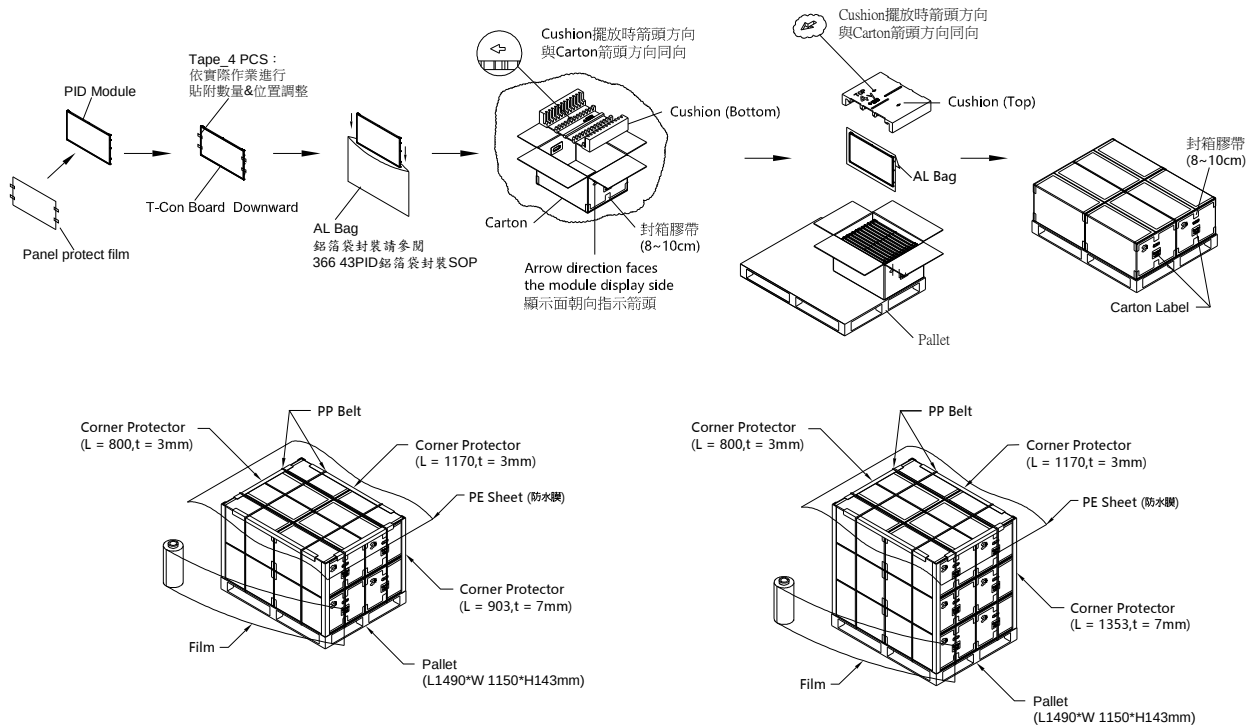
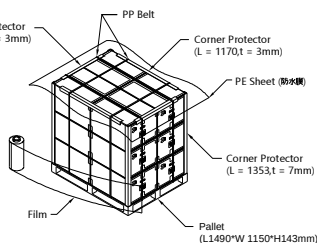
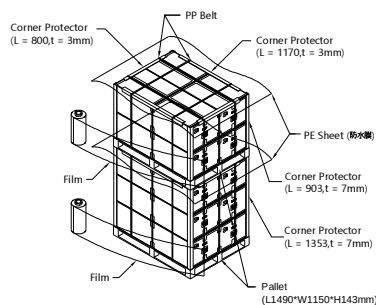


Figure 9-1 packaging method

Air Transportation  
單棧堆疊(3 Layers)



Sea / Land Transportation  
(40ft HQ)  
上,下棧堆疊(3+2 Layers)



Sea / Land Transportation  
(40ft Container)  
上,下棧堆疊(2+2 Layers)

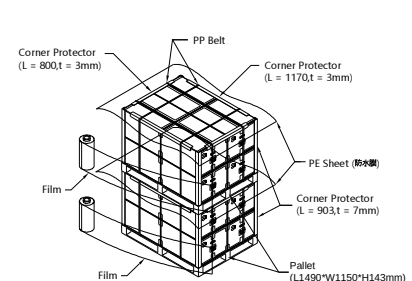


Figure. 9-2 packaging method

### 8.3 UN-PACKAGING METHOD

Un-packaging method is shown in following Figure.9-3.

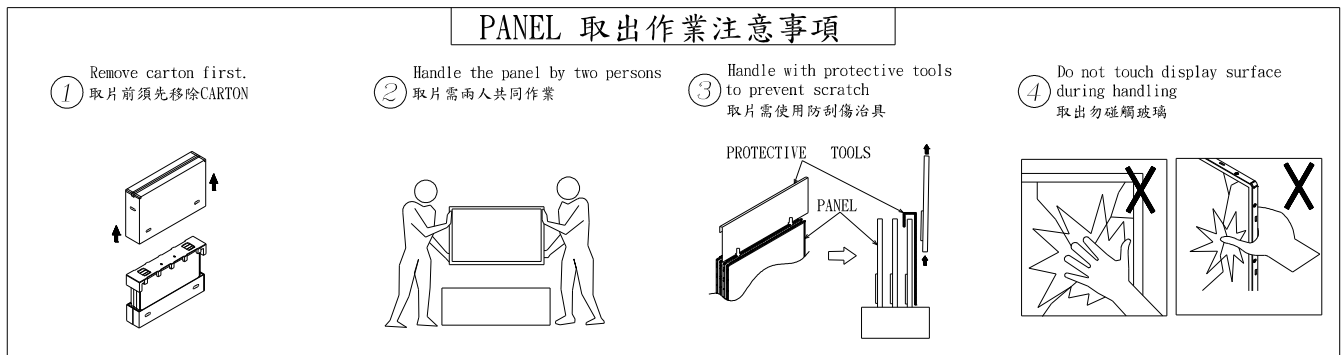
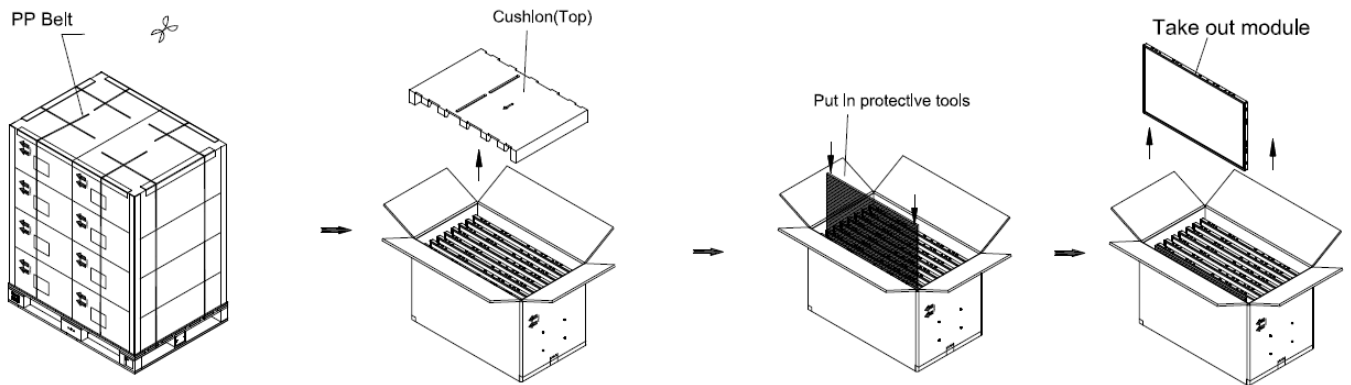
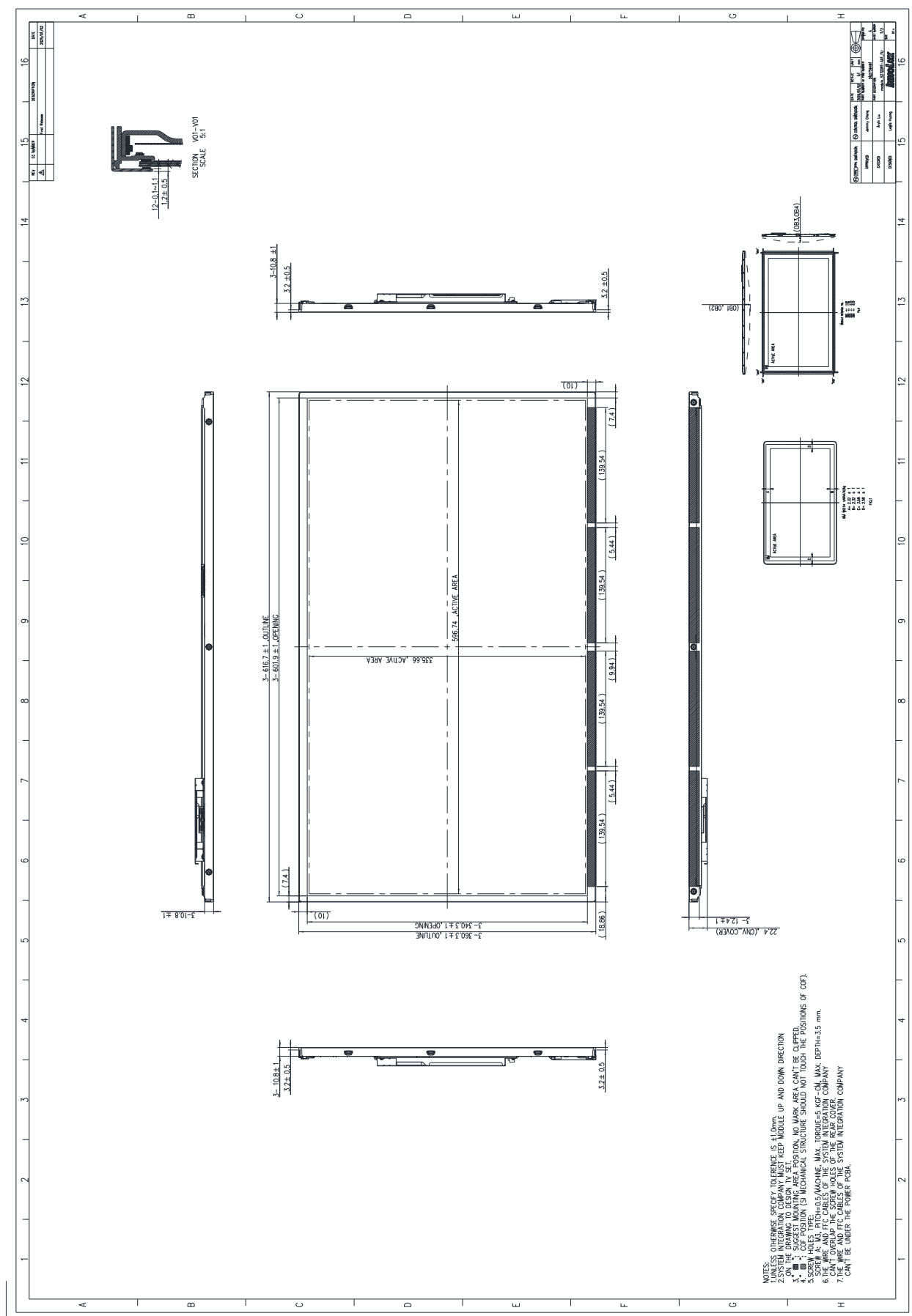
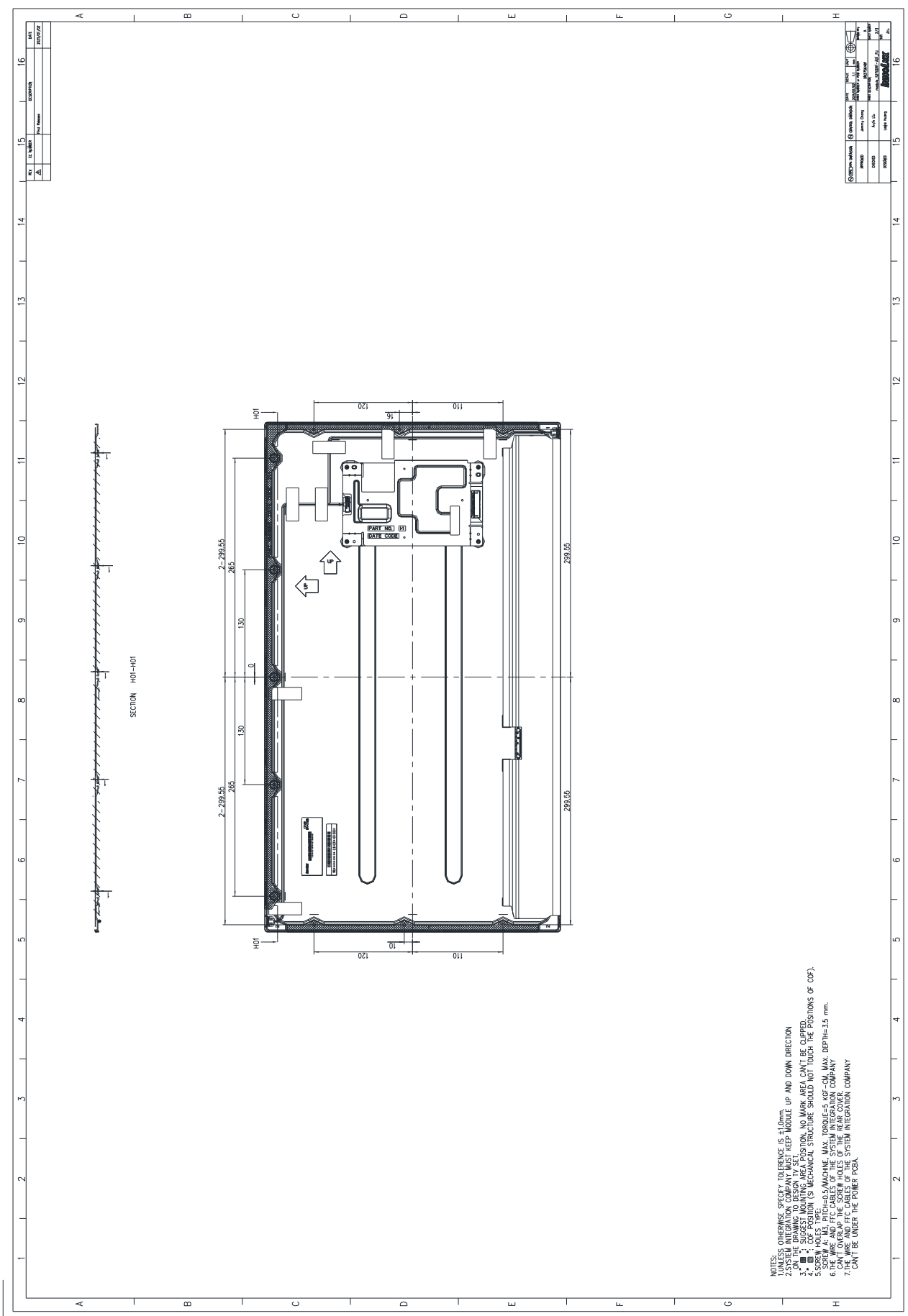


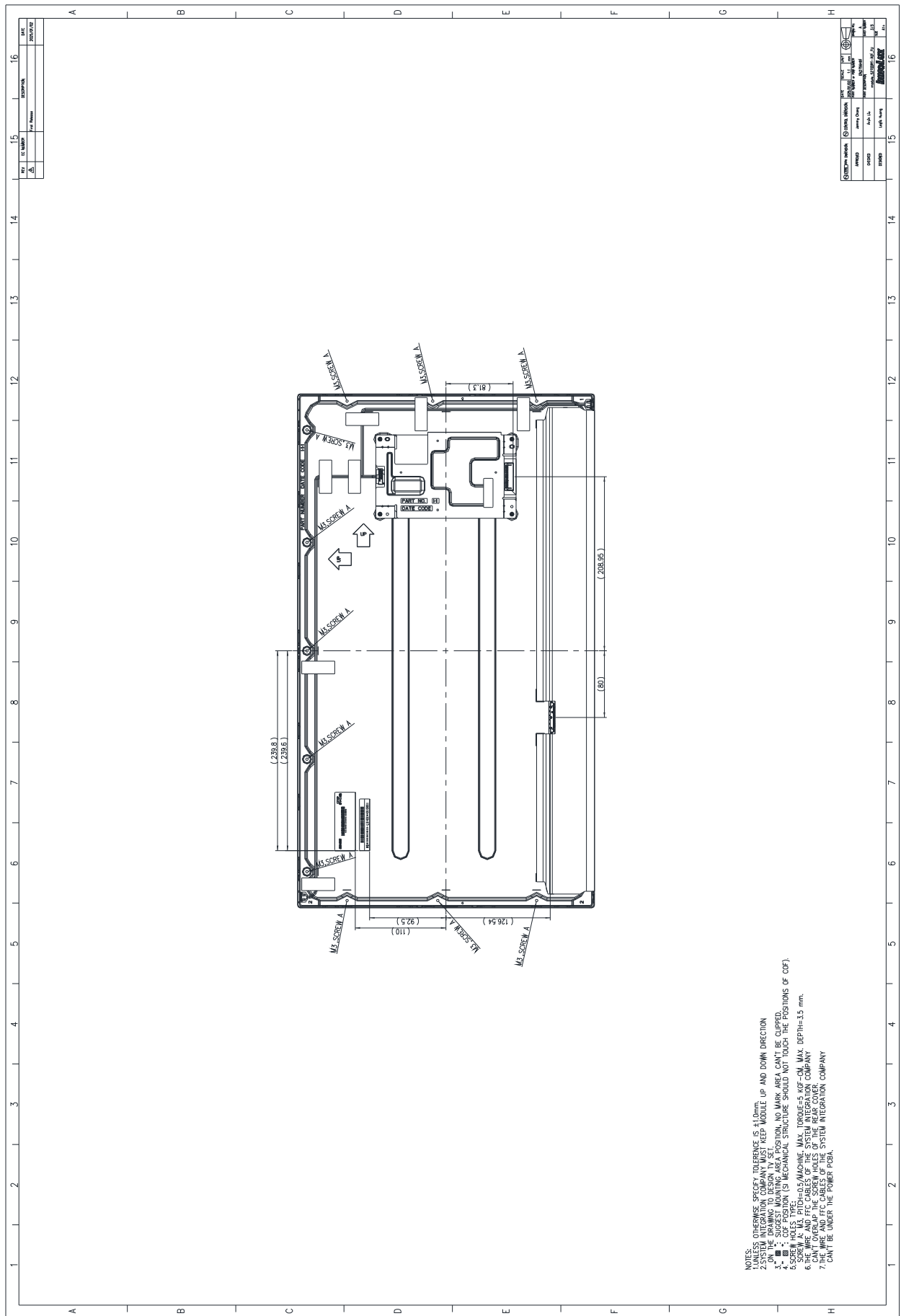
Figure. 9-3 un-packaging method

## 9. MECHANICAL CHARACTERISTIC









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