# Model Name: P495IVN02.0

## Issue Date: 2025/05/20

## ( )Preliminary Specifications
## (＊)Final Specifications

| Customer Signature | Date | AUO Display Plus | Date |
|---|---|---|---|
| Approved By<br><br>_____ | | Approval By PM Director<br>CT Wu<br>_____ | |
| Note | | Reviewed By RD Director<br>Lamy Chen<br>_____<br>Reviewed By Project Leader<br>Horis Wang | |
| | | Prepared By PM<br>KimKuo<br>_____ | |



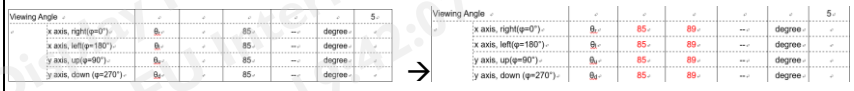
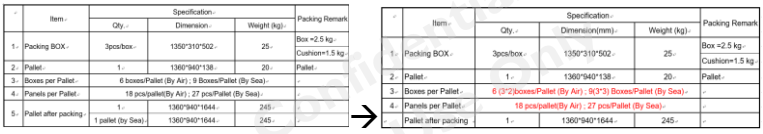
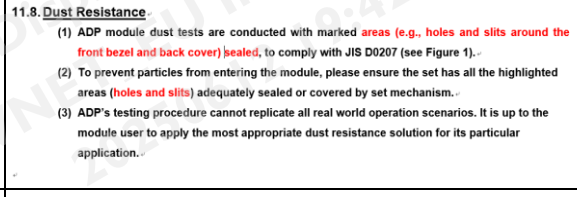
# Contents





# Record of Revision

| Version | Date | Page | Description |
|---|---|---|---|
| 0.0 | 2021/06/18 | All | First version release |
| 1.0 | 2021/12/10 | 6 | Operation / storage condition diagram |
| 1.0 | 2021/12/10 | 7 | Rx,Ry modify and Viewing Angle typ 85˚ |
| 1.0 | 2021/12/10 | 14 | input color data 10bit → 8bit |
| 1.0 | 2021/12/10 | 20 | BL input current & inrush current & power |
| 1.0 | 2021/12/10 | 26/27 | Mechanical Front View/ Back View |
| 1.1 | 2022/05/18 | 4 | Modify second paragraph description of general description part. |
| 1.1 | 2022/05/18 | 4-5 | New add the spec of sunglasses readability in general information table and Note 3. |
| 1.1 | 2022/05/18 | 7 | Delete gamma spec. |
| 1.1 | 2022/05/18 | 7 | Correct the min. and typ. Value of view angle.  |
| 1.1 | 2022/05/18 | 28 | Add the reliaiblity item in red color for the upgraded operation temperature.  |
| 1.1 | 2022/05/18 | 32 | Modify the 10.3 Pallet and Shipment Information as below in red.  |
| 1.1 | 2022/05/18 | 34 | Correct operation temp. from 0-50℃ to -20-60℃. |
| 1.1 | 2022/05/18 | 35 | Update the description of 11.8. Dust Resistance.  |
| 1.2 | 2022/05/26 | 23 | Add Note5 PDIM. |
| 1.3 | 2022/07/15 | 7 | Remove PST note 3 |
| 1.4 | 2023/03/28 | 30 | Label Update |
| 1.5 | 2023/04/20 | 28 | Update RA condition |
| 1.6 | 2024/5/9 | 4 | Pixel Arrangement: add BGR |
| 1.7 | 2025/5/20 | 4,5 | Revise LED MTTF to MTBF:100Khours, and Note 4 description |
| | | 28 | Add MTBF test items in Chapter 8 Reliability Test Items |

# 1. General Description

This specification applies to the 49.5 inch Color TFT-LCD Module P495IVN02.0. This LCD module has a TFT active matrix type liquid crystal panel 1920x540 pixels, and diagonal size of 49.5 inch. This module supports 1920x540 mode. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot.

P495IVN02.0 has been designed to apply the 8-bit 2 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth are very important. Special materials applied into this model are:

1. Liquid crystal: Advanced wide temperature LC(-40℃~110℃)
2. Polarizer: Wide temperature polarizer (95℃)

*** General Information**

| Items | Specification | Unit | Note |
|---|---|---|---|
| Active Screen Size | 49.5 | inch | |
| Display Area | 1209.6(H) x 340.2(V) | mm | |
| Outline Dimension | 1237.4(H) x 368(V) x 25.1(D) | mm | D: front bezel to D/B cover |
| Driver Element | a-Si TFT active matrix | | |
| Display Colors | 8 bit(16.7 million) | Colors | |
| Number of Pixels | 1920 x 540 | Pixel | |
| Pixel Pitch | 0.63 (H) x 0.63 (W) | mm | |
| Pixel Arrangement | RGB&BGR vertical stripe | | |
| Display Operation Mode | Normally Black | | |
| Surface Treatment | Anti-Glare, 3H | | Haze = 28% |
| Rotate Function | Unachievable | | Note 1 |
| Display Orientation | Portrait/Landscape Enabled | | Note 2 |
| Sunglasses Readability | Landscape Mode | | Note 3 |
| Operating Time | 24/7 | | See Chapter 11.3 for details |
| Frame Rate | 60 | Hz | See Chapter 5.1 for details |
| MTBF | 100K | hours | See Chapter 8 for details Note 4 |



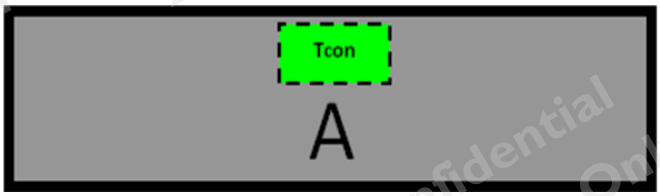
**Note 1:** Rotate Function refers to LCD display could be able to rotate. This function does not work in this model.

**Note 2:**

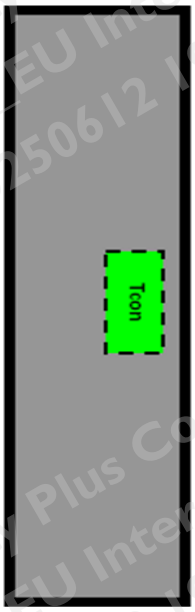
(1) Landscape Mode: The default placement is T-Con Side on the upside and the image is shown upright via viewing from the front.

(2) Portrait Mode: The default placement is that T-Con side has to be placed on the right side via viewing from the front.

**Landscape (Front view)**




**Portrait (Front view)**

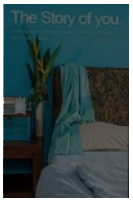



**Note 3:**

The image can be seen via polarized sunglasses while this panel is placed in landscape mode.

Display Orientation:

Landscape




Portrait

Polarized Sunglasses

**Note 4:**

MTBF is a reference index, it is not representative of warranty. Thermal acceleration factor based on Arrhenius model with eV = 0.6 @ Ambient temp 25C/50

# 2. Absolute Maximum Ratings

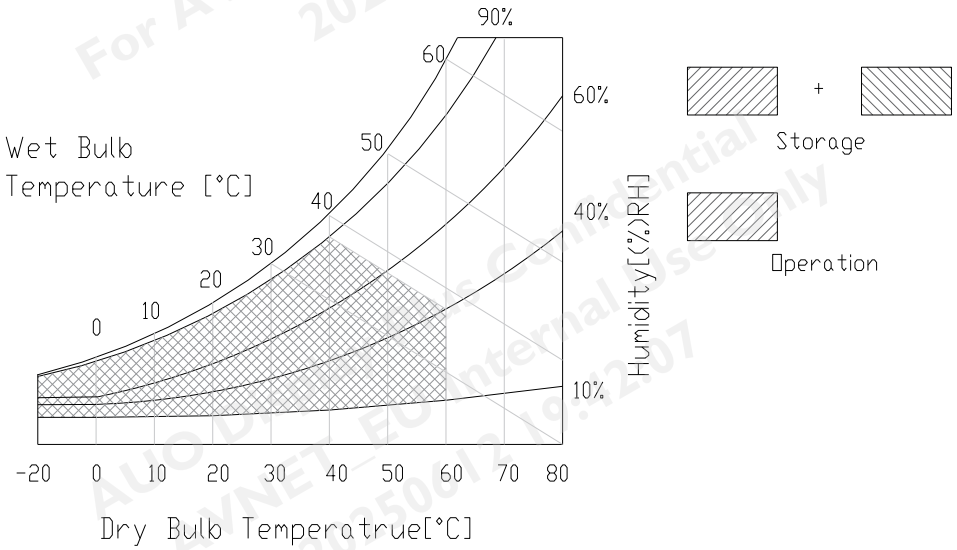
The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Logic/LCD Drive Voltage | $V_{DD}$ | -0.3 | 14 | [Volt] | Note 1 |
| Input Voltage of Signal | Vin | -0.3 | 4 | [Volt] | Note 1 |
| Operating Temperature | TOP | -20 | 60 | [°C] | Note 2 |
| Operating Humidity | HOP | 10 | 90 | [%RH] | Note 2 |
| Storage Temperature | TST | -20 | +60 | [°C] | Note 2 |
| Storage Humidity | HST | 10 | 90 | [%RH] | Note 2 |
| Panel Surface Temperature | PST | | 65 | [°C] | |

**Note 1:** Duration:50 msec.

**Note 2:** Maximum Wet-Bulb should be 39℃and No condensation.

The relative humidity must not exceed 90% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃



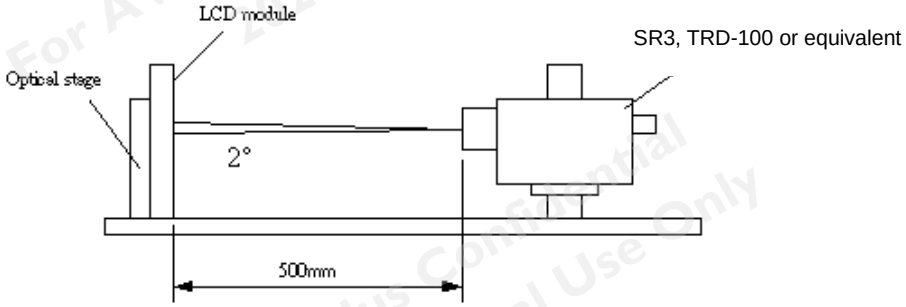


# 3. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 45 minutes in a dark environment at 25°C. The values specified are at an approximate distance 500 mm from the LCD surface at a viewing angle of φ and θ equal to 0°.

**Fig.1 presents additional information concerning the measurement equipment and method.**




| Parameter | | Symbol | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max | | |
| Contrast Ratio | | CR | 3200 | 4000 | -- | | 1 |
| Surface Luminance (White) | | $L_{WH}$ | 2000 | 2500 | -- | cd/m$^2$ | 2 |
| Luminance Variation | | $\delta_{WHITE(9P)}$ | -- | -- | 1.33 | | 3 |
| Response Time (G to G) | | $T_Y$ | -- | 8 | 16 | ms | 4 |
| Color Gamut | | sRGB | | 72 | | % | |
| Color Coordinates | | | | | | | |
| | Red | $R_X$ | Typ.-0.03 | 0.609 | Typ.+0.03 | | |
| | | $R_Y$ | | 0.328 | | | |
| | Green | $G_X$ | | 0.341 | | | |
| | | $G_Y$ | | 0.568 | | | |
| | Blue | $B_X$ | | 0.166 | | | |
| | | $B_Y$ | | 0.115 | | | |
| | White | $W_X$ | | 0.313 | | | |
| | | $W_Y$ | | 0.329 | | | |
| Viewing Angle | | | | | | | 5 |
| | x axis, right(φ=0°) | $\theta_r$ | 85 | 89 | -- | degree | |
| | x axis, left(φ=180°) | $\theta_l$ | 85 | 89 | -- | degree | |
| | y axis, up(φ=90°) | $\theta_u$ | 85 | 89 | -- | degree | |
| | y axis, down (φ=270°) | $\theta_d$ | 85 | 89 | -- | degree | |



**Note:**

1. Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance of } L_{on5}}{\text{Surface Luminance of } L_{off5}}$$

2. Surface luminance is luminance value at point 5 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see FIG 2. LED current $I_F$ = typical value (without driver board), LED input VDDB =24V, $I_{DDB}$. = Typical value (with driver board), $L_{WH}$=Lon5 where Lon5 is the luminance with all pixels displaying white at center 5 location.
3. The variation in surface luminance, δWHITE is defined (center of Screen) as:

   $\delta_{WHITE(9P)}$= Maximum($L_{on1}$, $L_{on2}$,…,$L_{on9}$)/ Minimum($L_{on1}$, $L_{on2}$,…$L_{on9}$)
4. Response time $T_\gamma$ is the average time required for display transition by switching the input signal for five luminance ratio (0%,25%,50%,75%,100% brightness matrix) and is based on Frame rate = 60Hz to optimize.

| Measured Response Time | | Target | | | | |
|---|---|---|---|---|---|---|
| | | **0%** | **25%** | **50%** | **75%** | **100%** |
| **Start** | **0%** | | 0% to 25% | 0% to 50% | 0% to 75% | 0% to 100% |
| | **25%** | 25% to 0% | | 25% to 50% | 25% to 75% | 25% to 100% |
| | **50%** | 50% to 0% | 50% to 25% | | 50% to 75% | 50% to 100% |
| | **75%** | 75% to 0% | 75% to 25% | 75% to 50% | | 75% to 100% |
| | **100%** | 100% to 0% | 100% to 25% | 100% to 50% | 100% to 75% | |

$T_\gamma$ is determined by 10% to 90% brightness difference of rising or falling period. (As illustrated)

The response time is defined as the following figure and shall be measured by switching the input signal for “any level of gray(bright) “ and “any level of gray(dark)”.

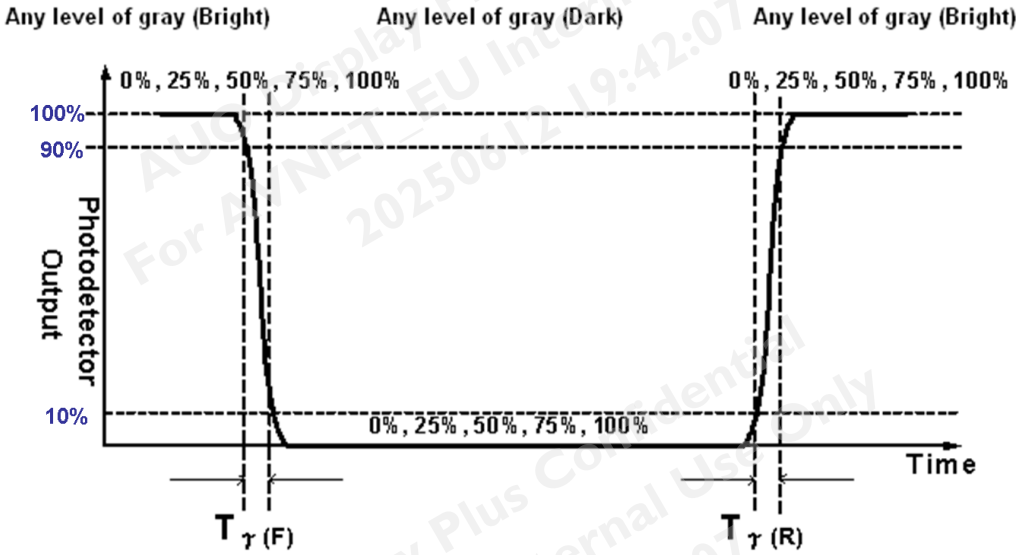
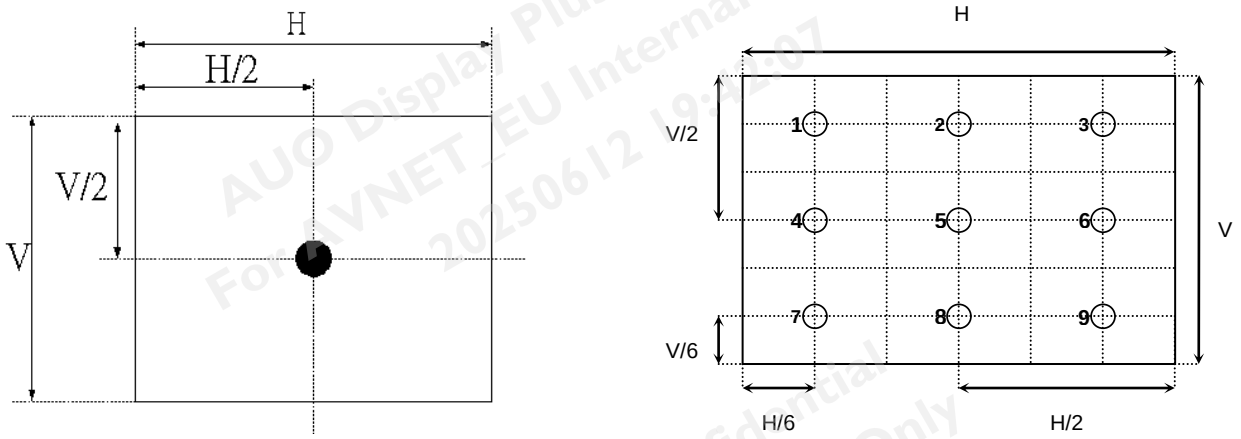
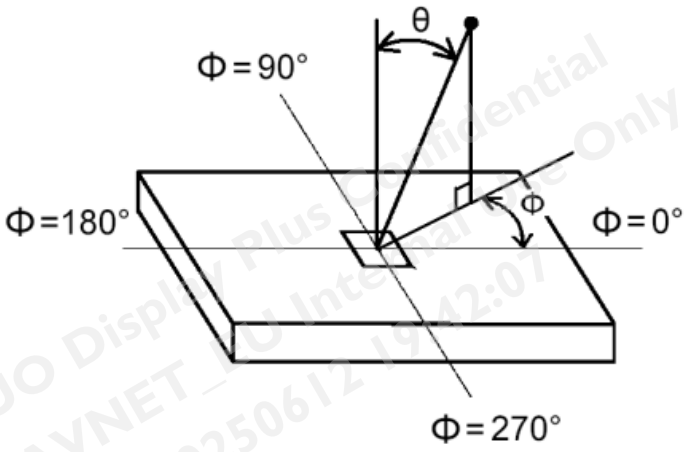


**FIG. 2 Luminance**




5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG3.

**FIG.3 Viewing Angle**





# 4. Interface Specification

## 4.1 Input power

The P495IVN02.0 module requires power inputs which are employed to power the LCD electronics and to drive the TFT array and liquid crystal.

| Item | | Symbol | Min. | Typ. | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Power Supply Input Voltage | | $V_{DD}$ | 10.8 | 12 | 13.2 | V | 1 |
| Power Supply Input Current | Black pattern | $I_{DD}$ | - | 0.34 | 0.41 | A | 2 |
| | White pattern | | - | 0.35 | 0.42 | A | |
| | H-strip pattern | | - | 0.41 | 0.49 | A | |
| Power Consumption | Black pattern | $P_C$ | - | 4.08 | 4.90 | Watt | |
| | White pattern | | - | 4.20 | 5.04 | Watt | |
| | H-strip pattern | | - | 4.92 | 5.90 | Watt | |
| Inrush Current | | $I_{RUSH}$ | -- | -- | 2.86 | A | 3 |

**Note1.** The ripple voltage should be fewer than 5% of VDD.

**Note2.** Test Condition:

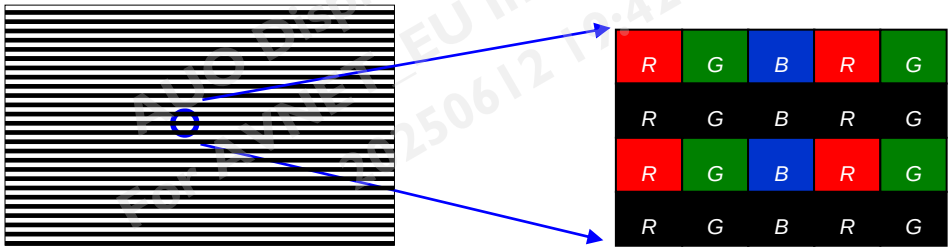
(1) $V_{DD}$ = 12.0V, (2) Fv = 60Hz, (3) Fclk= 74.25MHz, (4) Temperature = 25 ℃

(5) Power dissipation check pattern. (Only for power design)

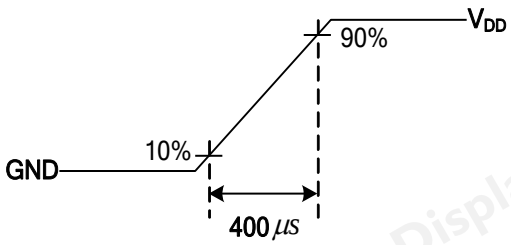
a. Black pattern

b. White pattern

c. H-Strip pattern




**Note3.** Measurement condition : Rising time = 400us



## 4.2 Input Connection

■ LCD connector:

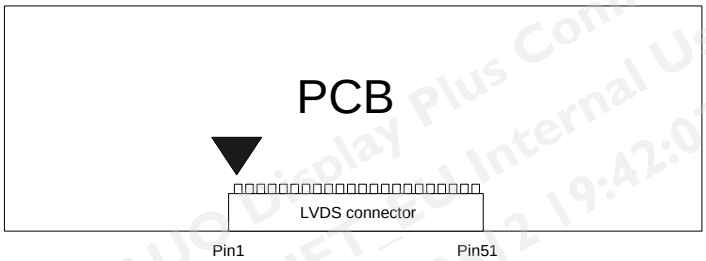
P-Two 187059-51221-1 / Starconn 115E51-0000RA-M3-R / JAE SJ11346-FI-RTE51SZ-HF

| PIN | Symbol | Description | Note | PIN | Symbol | Description | Note |
|---|---|---|---|---|---|---|---|
| 1 | N.C. | No connection | 1&2 | 26 | N.C. | No connection | 2 |
| 2 | N.C. | No connection | 2 | 27 | N.C. | No connection | 2 |
| 3 | N.C. | No connection | 2 | 28 | CH2_0- | LVDS Channel 2, Signal 0- | |
| 4 | N.C. | No connection | 2 | 29 | CH2_0+ | LVDS Channel 2, Signal 0+ | |
| 5 | N.C. | No connection | 2 | 30 | CH2_1- | LVDS Channel 2, Signal 1- | |
| 6 | N.C. | No connection | 2 | 31 | CH2_1+ | LVDS Channel 2, Signal 1+ | |
| 7 | LVDS_SEL | Open/ Low (GND) for NS<br>High (3.3V) for JEIDA | 3&4 | 32 | CH2_2- | LVDS Channel 2, Signal 2- | |
| 8 | N.C. | No connection | 2 | 33 | CH2_2+ | LVDS Channel 2, Signal 2+ | |
| 9 | N.C. | No connection | 2 | 34 | GND | Ground | |
| 10 | N.C. | No connection | 2 | 35 | CH2_CLK- | LVDS Channel 2, Clock - | |
| 11 | GND | Ground | | 36 | CH2_CLK+ | LVDS Channel 2, Clock + | |
| 12 | CH1_0- | LVDS Channel 1, Signal 0- | | 37 | GND | Ground | |
| 13 | CH1_0+ | LVDS Channel 1, Signal 0+ | | 38 | CH2_3- | LVDS Channel 2, Signal 3- | |
| 14 | CH1_1- | LVDS Channel 1, Signal 1- | | 39 | CH2_3+ | LVDS Channel 2, Signal 3+ | |
| 15 | CH1_1+ | LVDS Channel 1, Signal 1+ | | 40 | N.C. | No connection | 2 |
| 16 | CH1_2- | LVDS Channel 1, Signal 2- | | 41 | N.C. | No connection | 2 |
| 17 | CH1_2+ | LVDS Channel 1, Signal 2+ | | 42 | N.C. | No connection | 2 |
| 18 | GND | Ground | | 43 | N.C. | No connection | 2 |
| 19 | CH1_CLK- | LVDS Channel 1, Clock - | | 44 | GND | Ground | |
| 20 | CH1_CLK+ | LVDS Channel 1, Clock + | | 45 | GND | Ground | |
| 21 | GND | Ground | | 46 | GND | Ground | |
| 22 | CH1_3- | LVDS Channel 1, Signal 3- | | 47 | N.C. | No connection | 2 |
| 23 | CH1_3+ | LVDS Channel 1, Signal 3+ | | 48 | $V_{DD}$ | Power Supply Input Voltage | |
| 24 | N.C. | No connection | 2 | 49 | $V_{DD}$ | Power Supply Input Voltage | |
| 25 | N.C. | No connection | 2 | 50 | $V_{DD}$ | Power Supply Input Voltage | |
| | | | | 51 | $V_{DD}$ | Power Supply Input Voltage | |



**Note1. Pin number start from the left side as the following figure.**




**Note2. Please leave this pin unoccupied. It cannot be connected with any signal (Low/GND/High).**

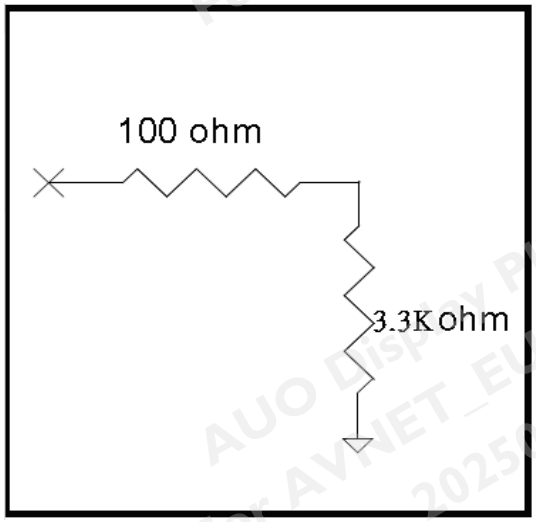
**Note3. Input control signal threshold voltage definition**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input High Threshold Voltage | VIH | 2.7 | - | 3.6 | V |
| Input Low Threshold Voltage | VIL | 0 | - | 0.6 | V |

**Note4. LVDS data format selection**

| LVDS_SEL | Mode |
|---|---|
| L or OPEN | NS |
| H | Jeida |

**Input equivalent impedance of LVDE_SEL pin**

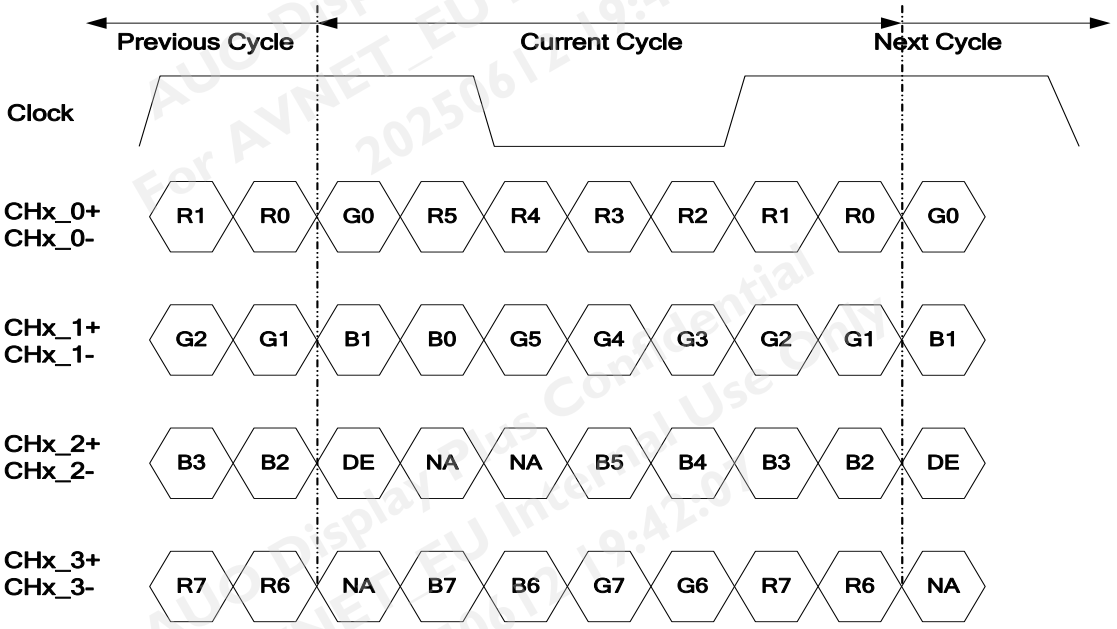


## 4.3 Input Data Format

### 4.3.1 LVDS color data mapping

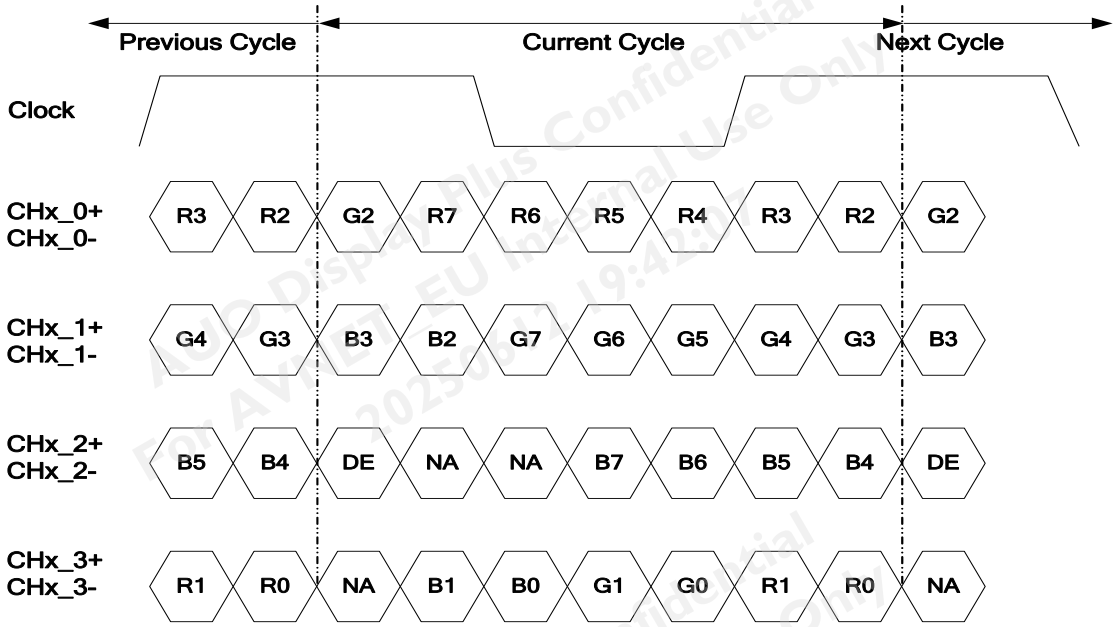
**LVDS Option for 8bit**

- **LVDS Option NS**




Note: x = 1, 2, 3, 4…

- **LVDS Option JEIDA**




Note: x = 1, 2, 3, 4…

### 4.3.2 Color Input Data Reference

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

**COLOR DATA REFERENCE**

| Color | | Input Color Data | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RED | | | | | | | | GREEN | | | | | | | | BLUE | | | | | | | |
| | | MSB | | | | | | | LSB | MSB | | | | | | | LSB | MSB | | | | | | | LSB |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Color | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| R | RED(000) | 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(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ---- | | | | | | | | | | | | | | | | | | | | | | | | |
| | RED(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| G | GREEN(000) | 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(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ---- | | | | | | | | | | | | | | | | | | | | | | | | |
| | GREEN(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B | BLUE(000) | 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(001) | 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(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | BLUE(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

# 5. Signal Timing Specification

This is the signal timing required at the input of the user connector. All of the interface signal timing should be satisfied with the following specifications for its proper operation.

## 5.1 Input Timing

### 5.1.1. Timing table

**Timing Table (DE only Mode)**

| Signal | Item | Symbol | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Vertical Section | Period | Tv | 1120 | 1125 | 1480 | Th |
| | Active | Tdisp (v) | | 1080 | | |
| | Blanking | Tblk (v) | 40 | 45 | 400 | Th |
| Horizontal Section | Period | Th | 1030 | 1100 | 1325 | Tclk |
| | Active | Tdisp (h) | | 960 | | |
| | Blanking | Tblk (h) | 70 | 140 | 365 | Tclk |
| Clock | Frequency | Fclk=1/Tclk | 53 | 74.25 | 82 | MHz |
| Vertical Frequency | Frequency | Fv | 47 | 60 | 63 | Hz |
| Horizontal Frequency | Frequency | Fh | 60 | 67.5 | 73 | KHz |

**Notes:**

(1) Display position is specific by the rise of DE signal only.
Horizontal display position is specified by the rising edge of 1st DCLK after the rise of 1st DE, is displayed on the left edge of the screen.

(2) Vertical display position is specified by the rise of DE after a “Low” level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise of 1st DE is displayed at the top line of screen.

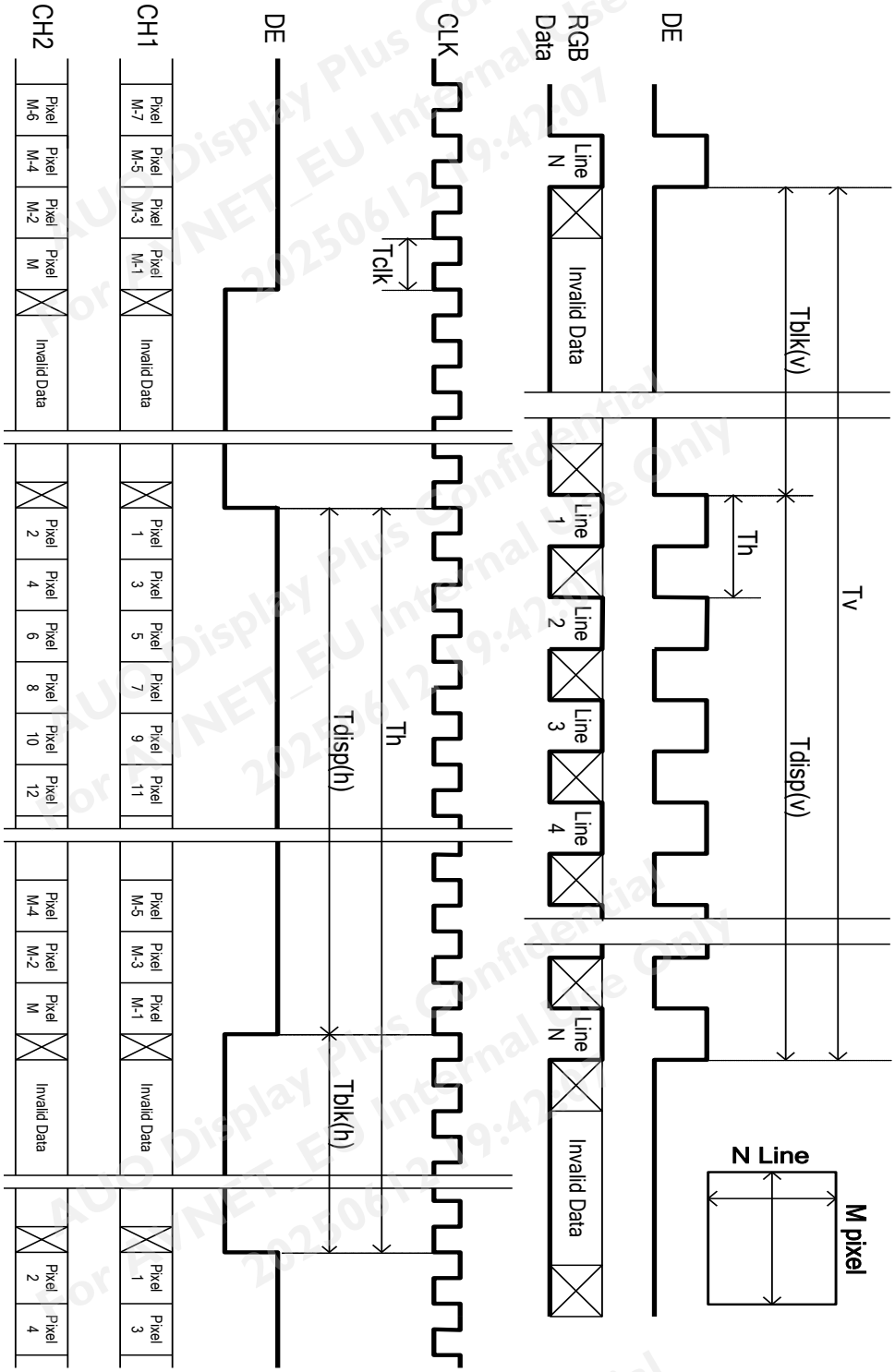
(3) If a period of DE “High” is less than 1920 DCLK or less than 1080 lines, the rest of the screen displays black.

(4) The display position does not fit to the screen if a period of DE “High” and the effective data period do not synchronize with each other.



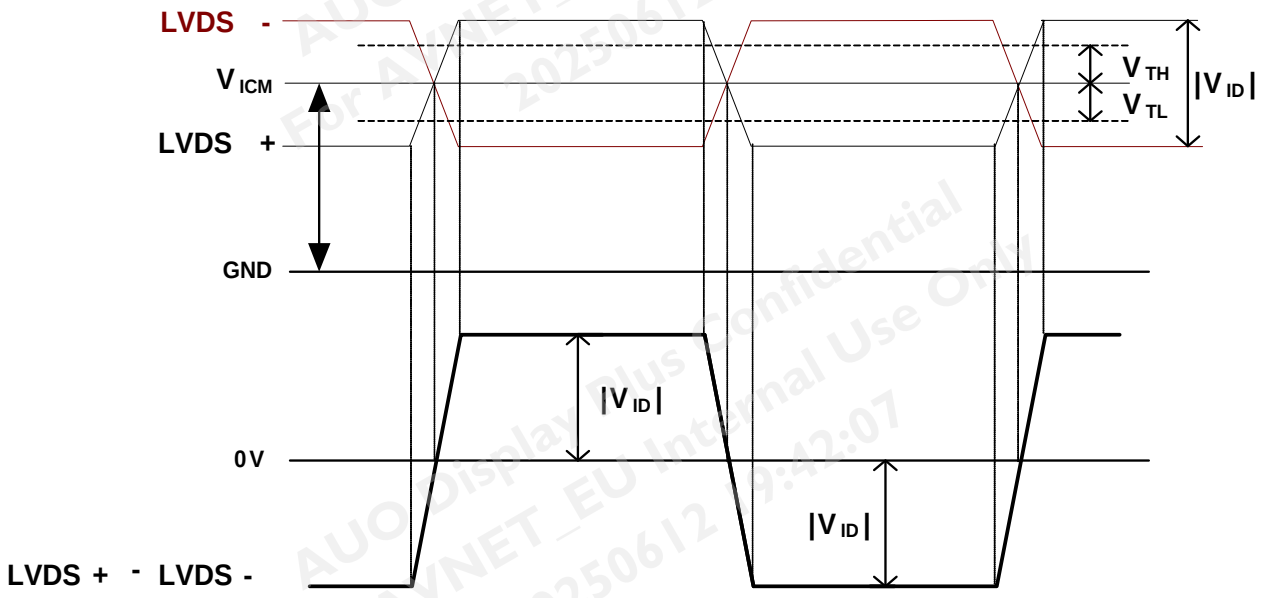
### 5.1.2. Signal Timing Waveform



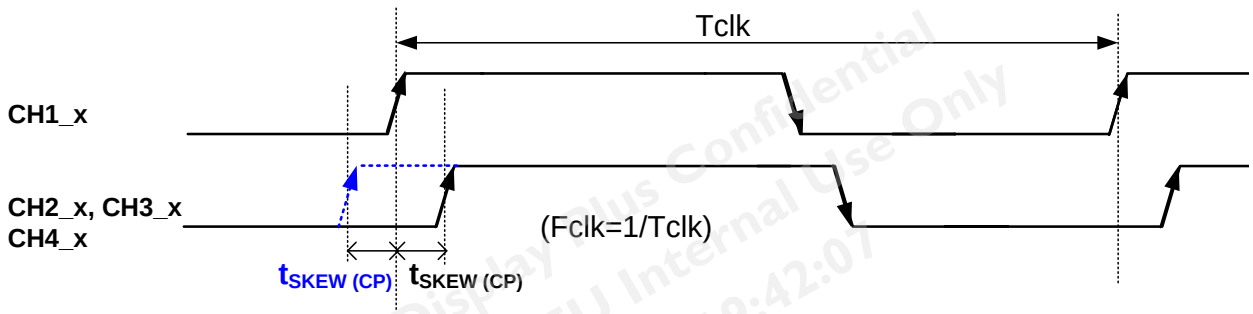
## 5.2 Input interface characteristics

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max | | |
| LVDS Interface | Input Differential Voltage | $\|V_{ID}\|$ | 200 | 400 | 600 | $mV_{DC}$ | 1 |
| | Differential Input High Threshold Voltage | $V_{TH}$ | +100 | -- | +300 | $mV_{DC}$ | 1 |
| | Differential Input Low Threshold Voltage | $V_{TL}$ | -300 | -- | -100 | $mV_{DC}$ | 1 |
| | Input Common Mode Voltage | $V_{ICM}$ | 1.1 | 1.25 | 1.4 | $V_{DC}$ | 1 |
| | Input Channel Pair Skew Margin | $t_{SKEW\ (CP)}$ | -500 | -- | +500 | ps | 2 |
| | Receiver Clock : Spread Spectrum Modulation range | Fclk_ss | Fclk -3% | -- | Fclk +3% | MHz | 3 |
| | Receiver Clock : Spread Spectrum Modulation frequency | Fss | 30 | -- | 200 | KHz | 3 |
| | Receiver Data Input Margin<br>Fclk = 85 MHz<br>Fclk = 65 MHz | tRMG | <br>-0.4<br>-0.5 | <br>--<br>-- | <br>0.4<br>0.5 | ns | 8 |

**Note1. VICM = 1.25V**

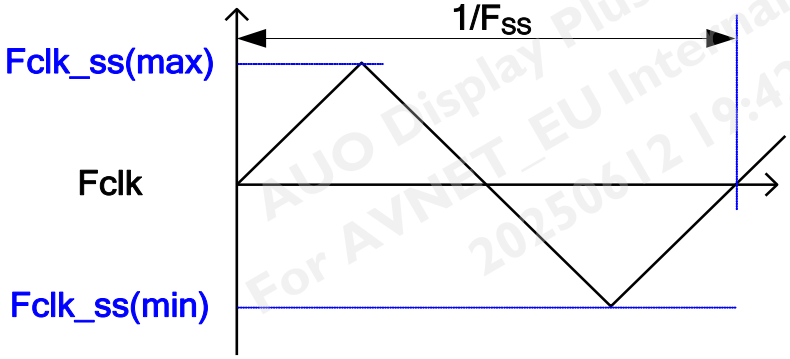



**Note2. Input Channel Pair Skew Margin**



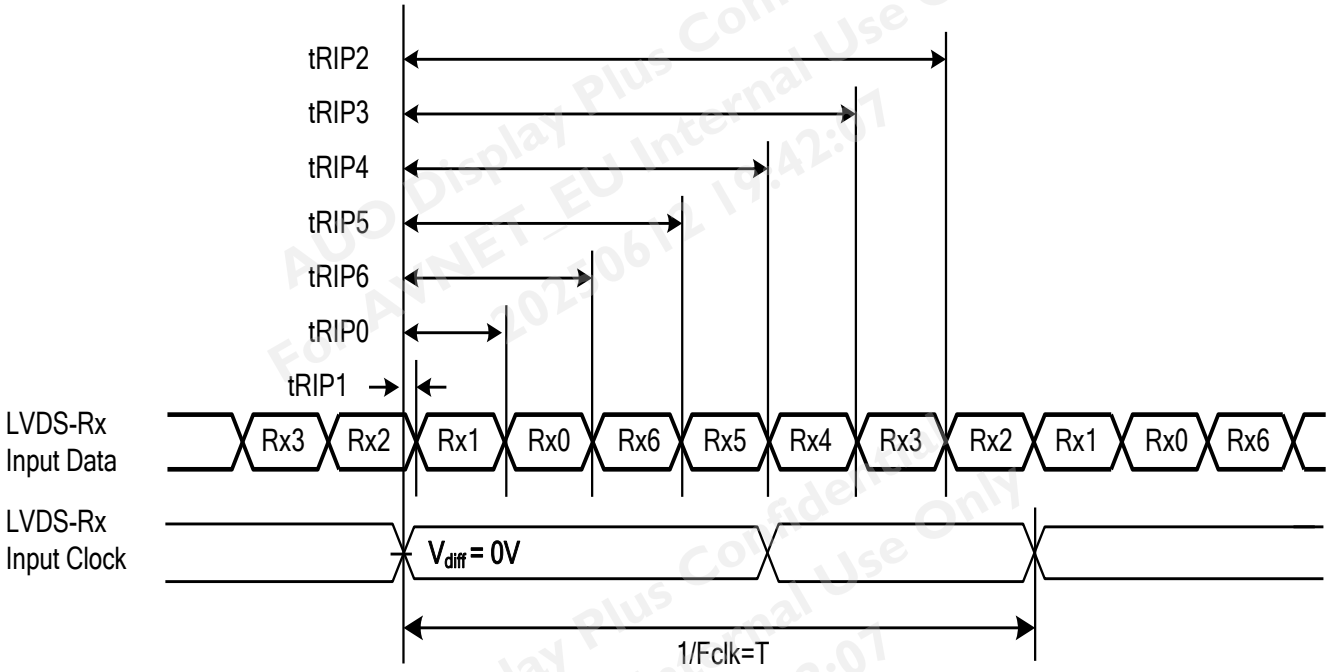

 

**Note3. LVDS Receiver Clock SSCG (Spread spectrum clock generator) is defined as below figures.**

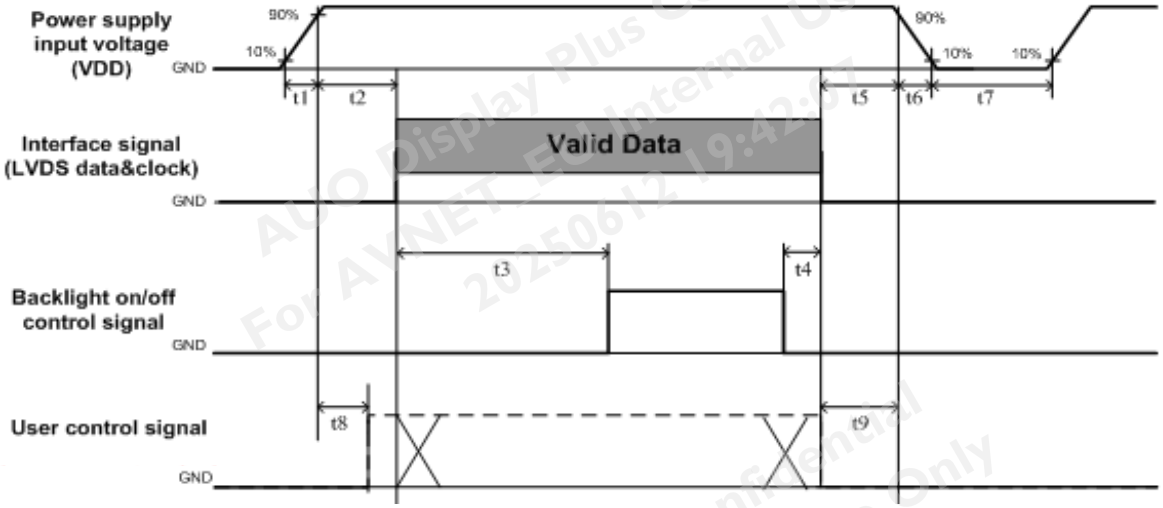



**Note4. Receiver Data Input Margin**

| Parameter | Symbol | Rating | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min | Type | Max | | |
| Input Clock Frequency | Fclk | Fclk (min) | -- | Fclk (max) | MHz | **T=1/Fclk** |
| Input Data Position0 | tRIP1 | -\|tRMG\| | 0 | \|tRMG\| | ns | |
| Input Data Position1 | tRIP0 | T/7-\|tRMG\| | T/7 | T/7+\|tRMG\| | ns | |
| Input Data Position2 | tRIP6 | 2T/7-\|tRMG\| | 2T/7 | 2T/7+\|tRMG\| | ns | |
| Input Data Position3 | tRIP5 | 3T/7-\|tRMG\| | 3T/7 | 3T/7+\|tRMG\| | ns | |
| Input Data Position4 | tRIP4 | 4T/7-\|tRMG\| | 4T/7 | 4T/7+\|tRMG\| | ns | |
| Input Data Position5 | tRIP3 | 5T/7-\|tRMG\| | 5T/7 | 5T/7+\|tRMG\| | ns | |
| Input Data Position6 | tRIP2 | 6T/7-\|tRMG\| | 6T/7 | 6T/7+\|tRMG\| | ns | |



## 5.3 Power Sequence for LCD




| Parameter | Values | | | Unit |
|---|---|---|---|---|
| | Min. | Type. | Max. | |
| t1 | 0.4 | --- | 30 | ms |
| t2 | 40 | --- | --- | ms |
| t3 | 640 | --- | --- | ms |
| t4 | 0*1 | --- | --- | ms |
| t5 | 0 | --- | --- | ms |
| t6 | --- | --- | ---*2 | ms |
| t7 | 1000 | --- | --- | ms |
| t8 | 20*3 | --- | 50 | ms |
| t9 | 0 | --- | --- | ms |

**Note:**

(1) t4=0 : concern for residual pattern before BLU turn off.

(2) t6 : voltage of VDD must decay smoothly after power-off. (Customer system decide this value)

(3) When User control signal is N.C. (no connection), opened in Transmitted end, t8 timing spec can be negligible.



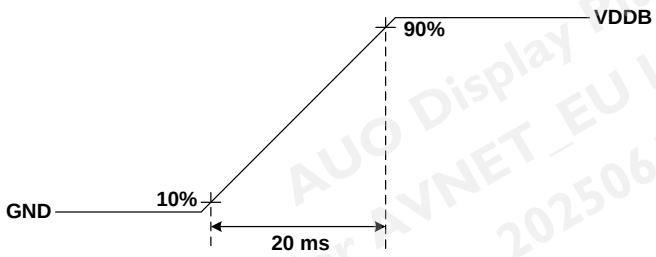
# 6. Backlight Specification

## 6.1 Electrical specification

| | Item | Symbol | | Condition | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Power Supply Input Voltage | VDDB | | - | 22.8 | 24 | 25.2 | V | - |
| 2 | Power Supply Input Current | $I_{DDB}$ | | VDDB=24V | | 4.47 | 5.36 | A | 1 |
| 3 | Power Consumption | $P_{DDB}$ | | VDDB=24V | | 107.3 | 135.1 | Watt | 1 |
| 4 | Inrush Current | $I_{RUSH}$ | | VDDB=24V | | | 16.32 | A | 2 |
| 5 | Control signal voltage | $V_{Signal}$ | Hi | VDDB=24V | 2 | - | 5.5 | V | - |
| | | | Low | | 0 | - | 0.8 | | 3 |
| 6 | Control signal current | $I_{Signal}$ | | VDDB=24V | - | - | 1.5 | mA | - |
| 7 | External PWM Duty ratio (input duty ratio) | D_EPWM | | VDDB=24V | 0 | - | 100 | % | 4 |
| 8 | External PWM Frequency | F_EPWM | | VDDB=24V | 120 | - | 960 | Hz | 4 |
| 9 | DET status signal | DET | HI | VDDB=24V | Open Collector | | | V | 5 |
| | | | Lo | | 0 | - | 0.8 | V | 5 |
| 10 | Input Impedance | Rin | | VDDB=24V | 300 | | | Kohm | - |
| 11 | LED MTTF | LED_MTTF | | - | 50,000 | - | - | Hr | 6, 7 |

**Note 1:** Dimming ratio= 100%,（Ta=25±5℃, Turn on for 45minutes）

**Note 2:** MAX input current while DB turn on, measurement condition VDDB rising time=20ms(VDDB: 10%~90%)




**Note 3:** When BLU off ( VDDB = 24V , VBLON = 0V) , IDDB (max) = 0.1A.

**Note 4:** Less than 5% dimming control is functional well and no backlight shutdown happened.

**Note 5:** Normal: 0~0.8V ; Abnormal : Open collector.

**Note 6:** The LED MTTF is defined as the time which luminance of LED is 50% compared to its original value.

[Operating condition: Continuous operating at Ta = 25±2℃, for single LED only]

**Note 7:** MTTF is a reference index, it is not representative of warranty.



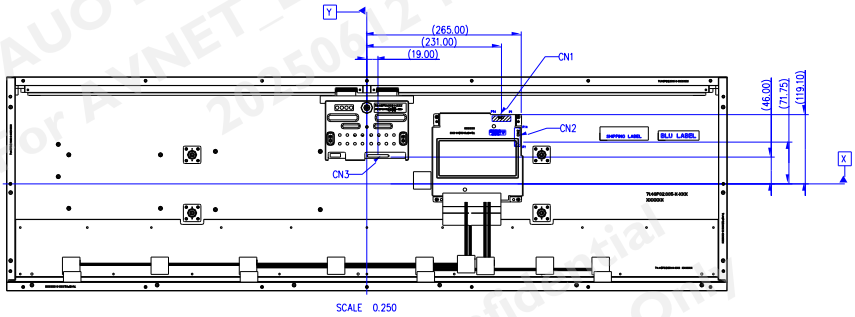
 

## 6.2 Input Pin Assignment

The P495IVN02.0 module requires 1 power input (14-pin).

CN1 & CN2 (BLU Driver Board)

CN3 (TCON Board)




■ LED DB connector (CN1): No connection (for AUO internal use only)

| Pin | Symbol | Description | Note |
|---|---|---|---|
| 1 | NC | No connection | 4 |
| 2 | NC | No connection | 4 |
| 3 | NC | No connection | 4 |
| 4 | NC | No connection | 4 |
| 5 | NC | No connection | 4 |
| 6 | NC | No connection | 4 |
| 7 | NC | No connection | 4 |
| 8 | NC | No connection | 4 |
| 9 | NC | No connection | 4 |
| 10 | NC | No connection | 4 |
| 11 | NC | No connection | 4 |
| 12 | NC | No connection | 4 |
| 13 | NC | No connection | 4 |
| 14 | NC | No connection | 4 |



■ LED DB connector (CN2): CI0114M1HRL-NH(CviLux) or equivalent

| Pin | Symbol | Description | Note |
|---|---|---|---|
| 1 | VDDB | Power Supply Input Voltage | |
| 2 | VDDB | Power Supply Input Voltage | |
| 3 | VDDB | Power Supply Input Voltage | |
| 4 | VDDB | Power Supply Input Voltage | |
| 5 | VDDB | Power Supply Input Voltage | |
| 6 | GND | Ground | |
| 7 | GND | Ground | |
| 8 | GND | Ground | |
| 9 | GND | Ground | |
| 10 | GND | Ground | |
| 11 | DET | BLU status detection: | 1 |
| 12 | VBLON | BLU On-Off control: | 2,3 |
| 13 | NC | NC | 4 |
| 14 | PDIM | External PWM | 2,5 |

**Note1. DET status**

| DET | BLU status |
|---|---|
| 0 ~ 0.8V | Normal |
| Open collector | Abnormal |

Recommend pull high R > 10K ohm, pull high voltage VDD = 3.3V

**Note2. input control signal threshold voltage definition**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input High Threshold Voltage | VIH | 2 | - | 5.5 | V |
| Input Low Threshold Voltage | VIL | 0 | - | 0.8 | V |

**Note3. VBLON**

Mode selection

| VBLON | Note |
|---|---|
| H or OPEN | BL On |
| L | BL Off |

**Note4. Please leave this pin unoccupied. It cannot be connected by any signal (Low/GND/High).**



**Note5. PDIM**

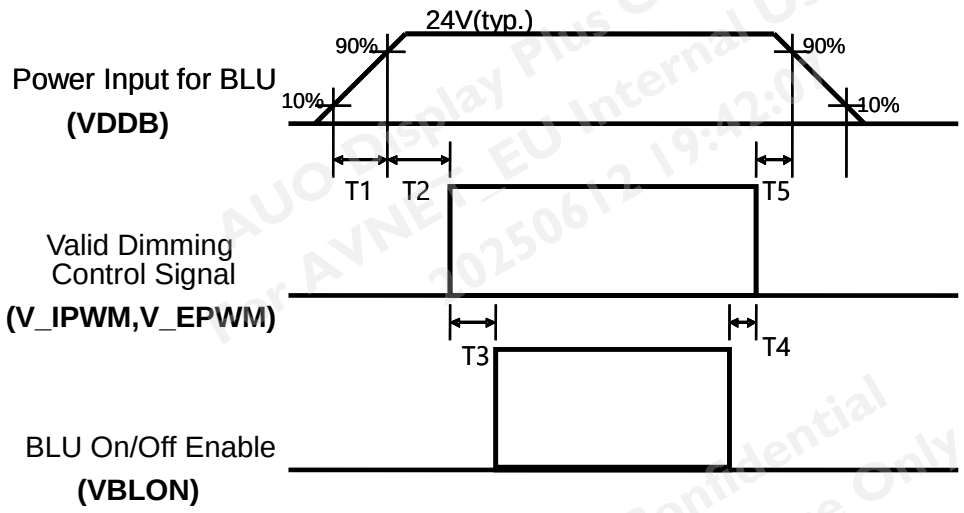
PWM Dimming range:

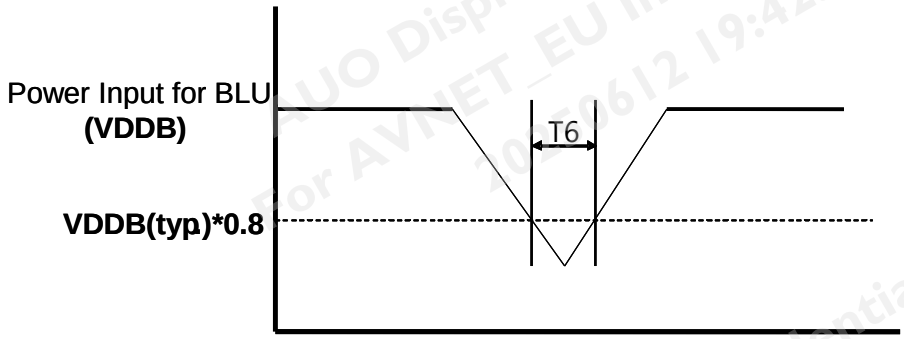

Suggest Dimming PWM signal synchronize and frequency multiplication with cell frame rate



## 6.3 Power Sequence for Backlight




**Dip condition**

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| T1 | 20 | - | - | ms |
| T2 | 250 | - | - | ms |
| T3 | 200 | | | ms |
| T4 | 0 | - | - | ms |
| T5 | 0 | - | - | ms |
| T6 | | - | 1000 | ms*1 |

**Note1.** T6 describes VDDB dip condition and VDDB couldn't lower than 10% VDDB.



# 7. Mechanical Characteristics

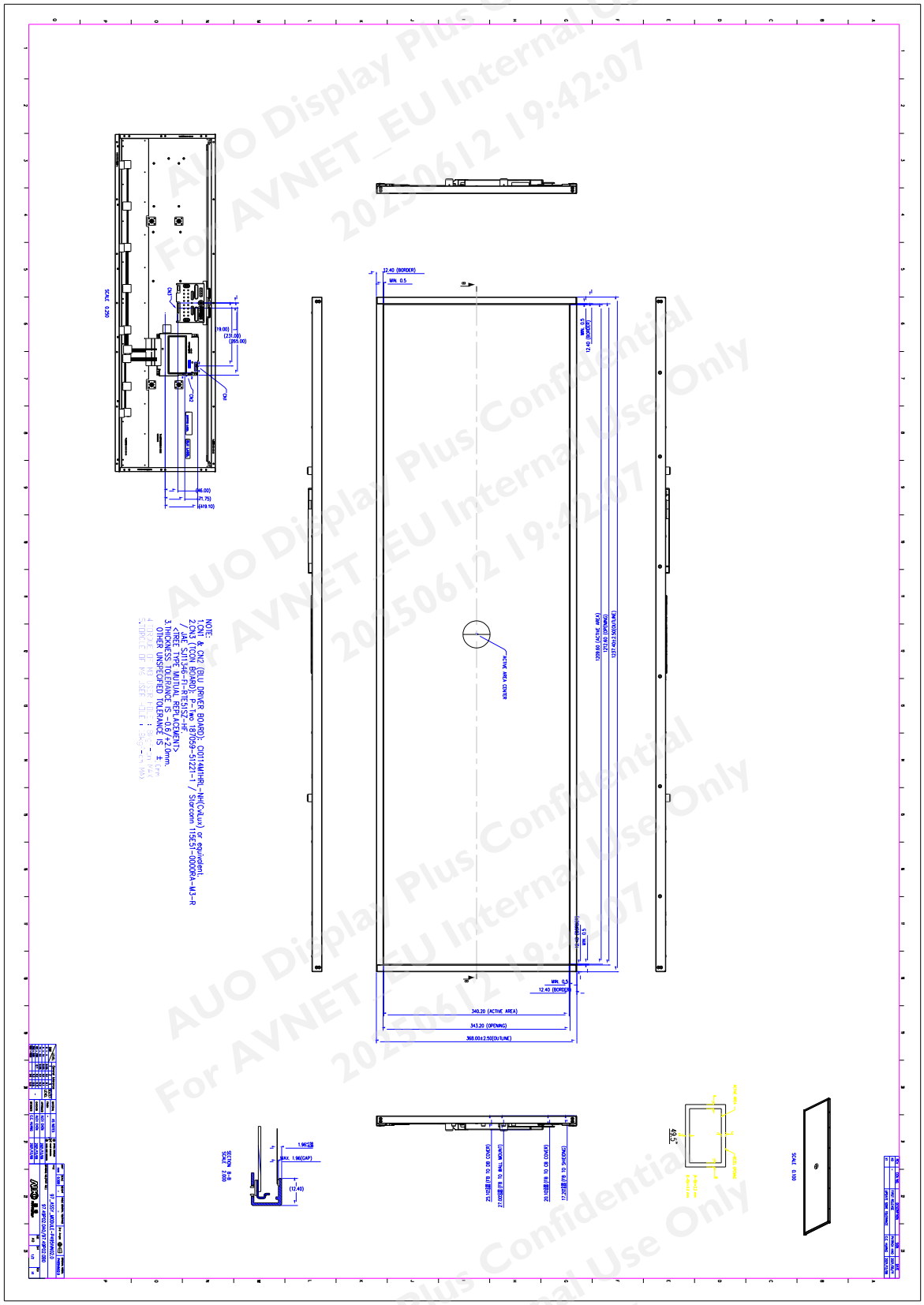
The contents provide general mechanical characteristics for the model P495IVN02.0. In addition the figures in the next page are detailed mechanical drawing of the LCD.

| Item | | Dimension | Unit | Note |
|---|---|---|---|---|
| Outline Dimension | Horizontal | 1237.4 | mm | |
| | Vertical | 368 | mm | |
| | Depth (Dmin) | 10.7 | mm | Front bezel to rear |
| | Depth (Dmax) | 25.1 | mm | Front Bezel to DB Cover |
| | Bezel opening | 1212.6(H) x 343.2(V) | mm | |
| | Bezel Width | 12.4/12.4/12.4/12.4 | mm | U/D/L/R |
| | Display Area | 1209.6(H) x 340.2(V) | mm | |
| Weight | 6.4 | | Kg | |



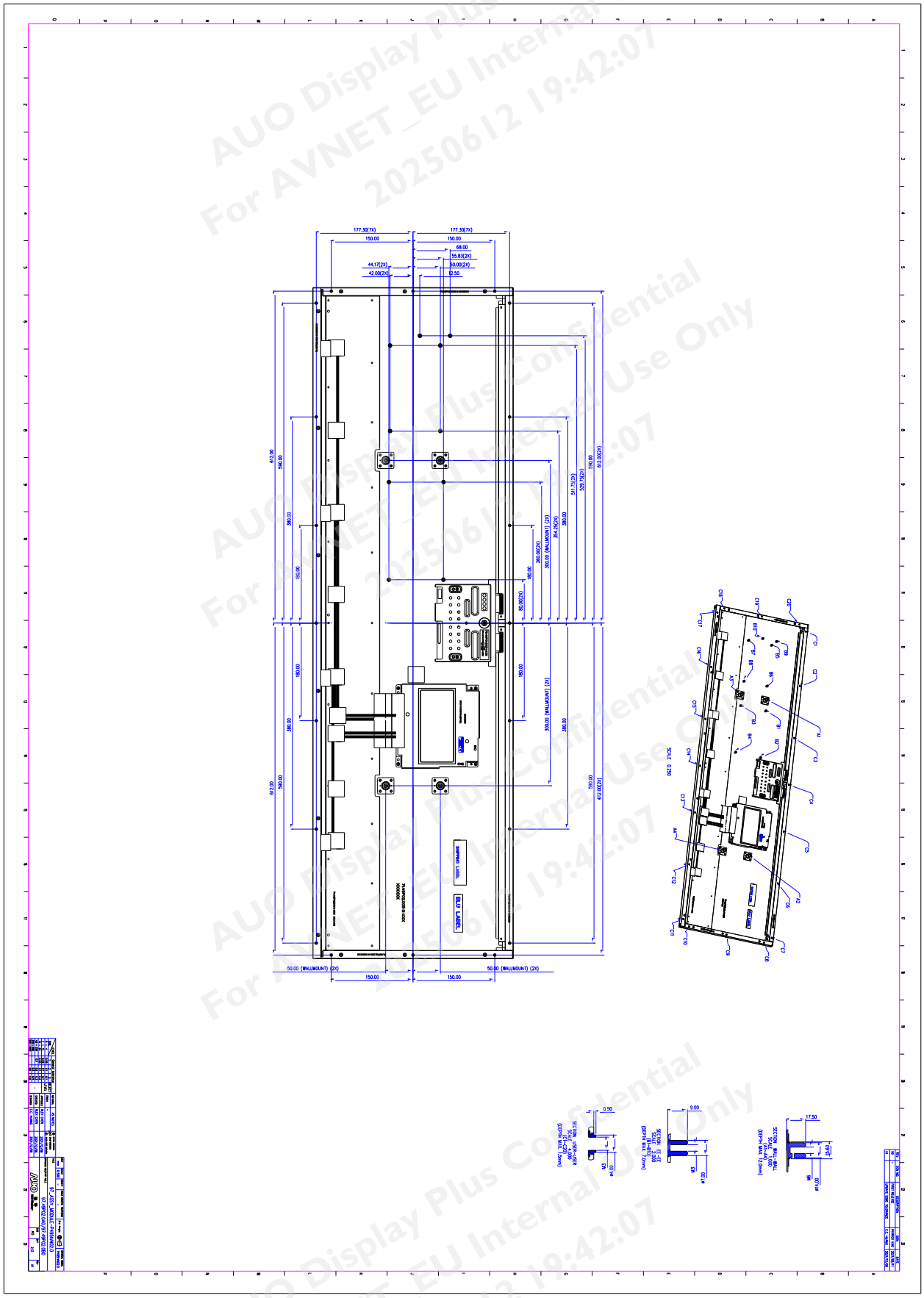
# Front View





# Back View



# 8. Reliability Test Items

| | Test Item | Q'ty | Condition |
|---|---|---|---|
| 1 | High temperature storage test | 3 | 60℃, 500hrs |
| 2 | Low temperature storage test | 3 | -20℃, 500hrs |
| 3 | High temperature operation test | 3 | 60℃, 500hrs |
| 4 | Low temperature operation test | 3 | -20℃, 500hrs |
| 5 | High temperature and High humidity operation (THB) | 3 | 60℃, 75%, 500hrs |
| 6 | Vibration test (With carton) | 1( PKG) | Random wave (1.04Grms 2~200Hz)<br>Duration : X,Y,Z 20min per axes |
| 7 | Drop test (With carton) | 1( PKG) | Height: 45.7 cm<br>Direction: 1-corner、3-edges、6-flats<br>(ASTMD4169-I) |
| 8 | Vibration | 3 | Time: 5hr(each Axis)<br>Total time: 15hrs<br>Orientation:<br>a) Vertical: 4.25m/s$^2$<br>b) Transverse:2.09m/s$^2$<br>c) Longitudinal: 2.83m/s$^2$ |
| 9 | MTBF | 12 | 50°C/80%, 1300hrs, 90% confidence level |



# 9. International Standard

## 9.1 Safety

(1) UL 62368-1：Audio/video, information and communication technology equipment – Part 1: Safety requirements

(2) IEC 62368-1：Audio/video, information and communication technology equipment –Part 1: Safety requirements

(3) EN 62368-1：Audio/video, information and communication technology equipment –Part 1: Safety requirements

## 9.2 EMC

(1) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz. “American National standards Institute(ANSI), 1992

(2) C.I.S.P.R “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” International Special committee on Radio Interference.

(3) EN 55022 “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” European Committee for Electrotechnical Standardization. (CENELEC), 1998

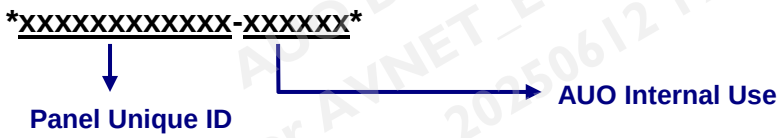


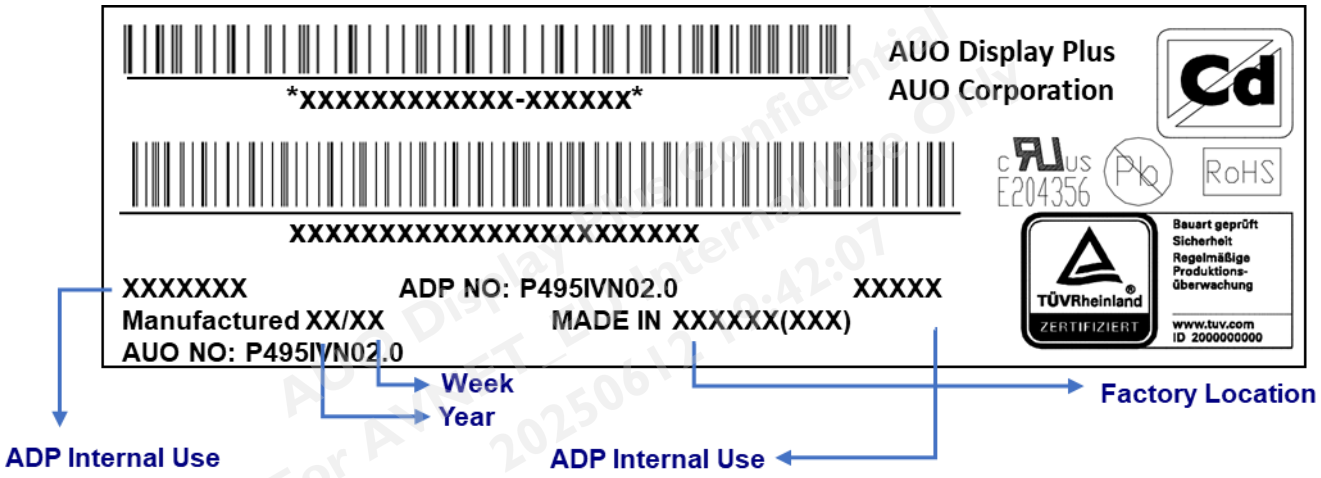
 

# 10. Packing

## 10.1 Definition of Label

### A. Panel Label:



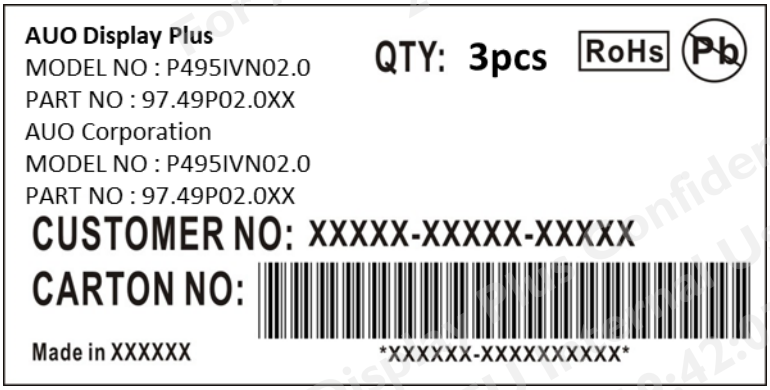

**Green mark description**

(1) For Pb Free Product, AUO will add Pb for identification.

(2) For RoHs compatible products, AUO will add RoHS for identification.

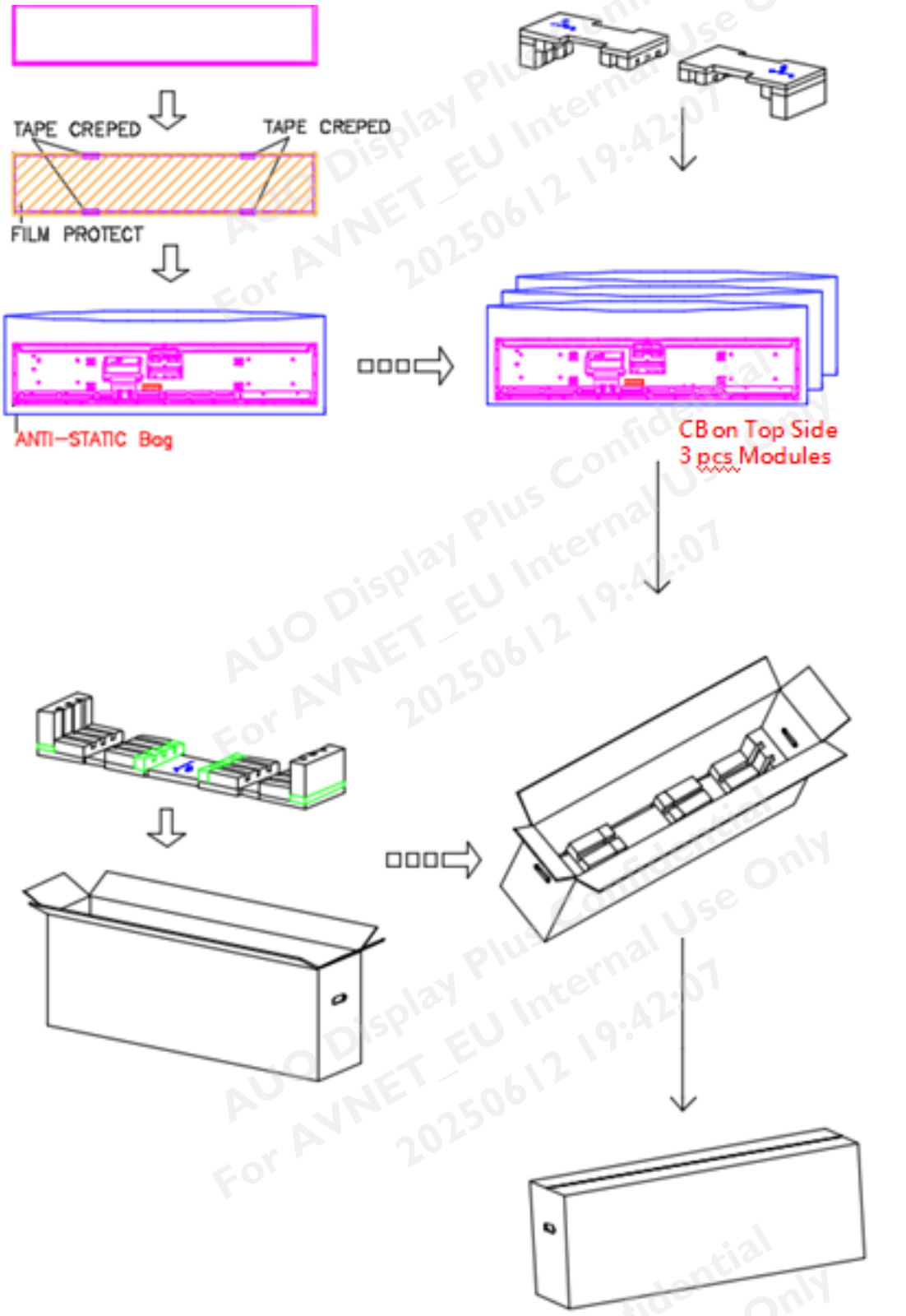
Note: The green Mark will be present only when the green documents have been ready by AUO internal green team. (definition of green design follows the AUO green design checklist.)

### B. Carton Label:



## 10.2 Packing Methods

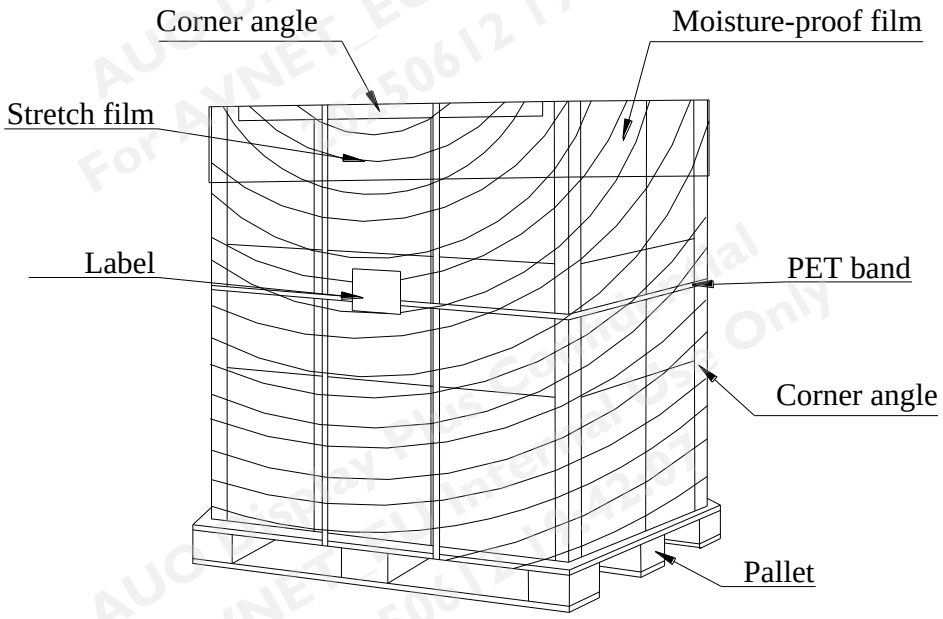




## 10.3 Pallet and Shipment Information

| | Item | Specification | | | Packing Remark |
|---|---|---|---|---|---|
| | | Qty. | Dimension | Weight (kg) | |
| 1 | Packing BOX | 3pcs/box | 1350*310*502 | 25 | Box =2.5 kg<br>Cushion=1.5 kg |
| 2 | Pallet | 1 | 1360*940*138 | 20 | Pallet |
| 3 | Boxes per Pallet | 6 (3*2)boxes/Pallet (By Air) ; 9(3*3) Boxes/Pallet (By Sea) | | | |
| 4 | Panels per Pallet | 18 pcs/pallet(By Air) ; 27 pcs/Pallet (By Sea) | | | |
| 5 | Pallet after packing | 1 | 1360*940*1644 | 245 | |
| | | 1 pallet (by Sea) | 1360*940*1644 | 245 | |





# 11. Precautions

Please pay attention to the followings when you use this TFT LCD module.

## 11.1. Mounting Precautions

(1) You must mount a module using holes arranged in four corners or four sides.

(2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.

(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(4) You should adopt radiation structure to satisfy the temperature specification.

(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter cause circuit broken by electro-chemical reaction.

(6) Do not touch, push or rub the exposed polarizer with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)

(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizer. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(9) Do not open the case because inside circuits do not have sufficient strength.

## 11.2. Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V=±200mV(Over and under shoot voltage)

(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)

(3) Brightness depends on the temperature. (In lower temperature, it may become lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.

(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

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

(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic

interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interface.

(7) The conductive material and signal cables are kept away from LED driver inductor to prevent abnormal display, sound noise and temperature rising.

## 11.3. Operating Condition for Public Information Display

The device listed in the product specification is designed and manufactured for PID (Public Information Display) application. To optimize module's lifetime and function, below operating usages are required.

(1) Normal operating condition
   A. Operating temperature: -20~60℃
   B. Operating humidity: 10~90%
   C. Display pattern: dynamic pattern (Real display).
      Note) Long-term static display would cause image sticking.

(2) Operation usage to protect against image sticking due to long-term static display.
   A. Suitable operating time: under 24 hours a day
   B. Liquid Crystal refresh time is required. Cycling display between 5 minutes' information (static) display and 10 seconds' moving image.
   C. Periodically change background and character (image) color.
   D. Avoid combination of background and character with large different luminance.

(3) Periodically adopt one of the following actions after long time display.
   A. Running the screen saver (motion picture or black pattern)
   B. Power off the system for a while

(4) LCD system is required to place in well-ventilated environment. Adapting active cooling system is highly recommended.

(5) Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions, such as high temperature/ humidity, display stationary patterns, or long operation time etc…, it is strongly recommended to contact ADP for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

## 11.4. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

## 11.5. Precautions for Strong Light Exposure

(1) **Strong light exposure causes degradation of polarizer and color filter.**

(2) **To keep display function well as a digital signage application, especially the component of TFT is very sensitive to sunlight, it is necessary to set up blocking device protecting panel from radiation of ambient environment.**

## 11.6. Storage

**When storing modules as spares for a long time, the following precautions are necessary.**

**(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃and 35℃at normal humidity.**

**(2) 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.**

**(3) Storage condition is guaranteed under packing conditions.**

**(4) The phase transition of Liquid Crystal in the condition of the low or high storage temperature will be recovered when the LCD module returns to the normal condition.**

## 11.7. Handling Precautions for Protection Film

**(1) The protection film is attached to the bezel with a small masking tape. When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.**

**(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.**

**(3) You can remove the glue easily. When the glue remains on the bezel or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.**

## 11.8. Dust Resistance

**(1) ADP module dust tests are conducted with marked areas (e.g., holes and slits around the front bezel and back cover) sealed, to comply with JIS D0207 (see Figure 1).**

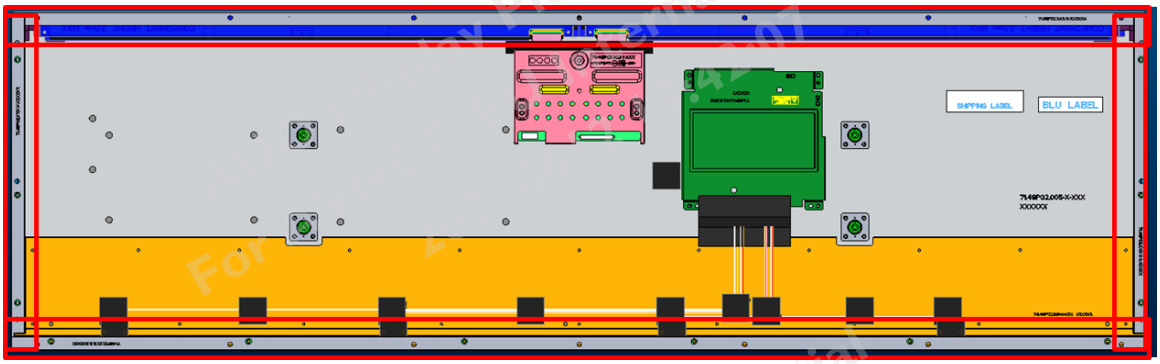
**(2) To prevent particles from entering the module, please ensure the set has all the highlighted areas (holes and slits) adequately sealed or covered by set mechanism.**

**(3) ADP's testing procedure cannot replicate all real world operation scenarios. It is up to the module user to apply the most appropriate dust resistance solution for its particular application.**



**Figure 1 (red mark)**



# 12. Appendix: Content Format

- FHD (1920 x 1080) / LVDS interface