

Doc. Number :

- ☐ Tentative Specification  
☐ Preliminary Specification  
☒ Approval Specification

**MODEL NO.: M215HJJ**  
**SUFFIX: L30**

**Customer: Common Model**

**APPROVED BY                      SIGNATURE**

**Name / Title** \_\_\_\_\_

**Note**

**Product version** C1

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

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## CONTENTS

|                                                     |           |
|-----------------------------------------------------|-----------|
| <b>1. GENERAL DESCRIPTION .....</b>                 | <b>5</b>  |
| 1.1 OVERVIEW .....                                  | 5         |
| 1.2 GENERAL SPECIFICATIONS .....                    | 5         |
| <b>2. MECHANICAL SPECIFICATIONS .....</b>           | <b>5</b>  |
| <b>3. ABSOLUTE MAXIMUM RATINGS .....</b>            | <b>5</b>  |
| 3.1 ABSOLUTE RATINGS OF ENVIRONMENT .....           | 5         |
| 3.2 ELECTRICAL ABSOLUTE RATINGS .....               | 6         |
| 3.2.1 TFT LCD MODULE .....                          | 6         |
| 3.2.2 BACKLIGHT UNIT .....                          | 6         |
| <b>4. ELECTRICAL SPECIFICATIONS .....</b>           | <b>7</b>  |
| 4.1 FUNCTION BLOCK DIAGRAM .....                    | 7         |
| 4.2. INTERFACE CONNECTIONS .....                    | 8         |
| 4.3 ELECTRICAL CHARACTERISTICS .....                | 10        |
| 4.3.1 LCD ELETRONICS SPECIFICATION .....            | 10        |
| 4.3.2 Vcc Power Dip Condition .....                 | 12        |
| 4.3.3 BACKLIGHT UNIT .....                          | 12        |
| 4.3.4 LIGHTBAR Connector Pin Assignment .....       | 13        |
| 4.4 LVDS INPUT SIGNAL SPECIFICATIONS .....          | 14        |
| 4.4.1 LVDS DATA MAPPING TABLE .....                 | 14        |
| 4.4.2 COLOR DATA INPUT ASSIGNMENT .....             | 15        |
| 4.5 DISPLAY TIMING SPECIFICATIONS .....             | 16        |
| 4.6 POWER ON/OFF SEQUENCE .....                     | 18        |
| <b>5. OPTICAL CHARACTERISTICS .....</b>             | <b>19</b> |
| 5.1 TEST CONDITIONS .....                           | 19        |
| 5.2 OPTICAL SPECIFICATIONS .....                    | 19        |
| <b>6. RELIABILITY TEST ITEM .....</b>               | <b>23</b> |
| <b>7. Mechanical Strength Characteristics .....</b> | <b>24</b> |
| 7.1 Mechanical Strength Specifications .....        | 24        |
| 7.2 Test Conditions .....                           | 24        |
| 7.3 Definition of Test Points .....                 | 24        |
| <b>8. PACKING .....</b>                             | <b>25</b> |
| 8.1 PACKING SPECIFICATIONS .....                    | 25        |
| 8.2 PACKING METHOD .....                            | 25        |
| 8.3 PALLET .....                                    | 26        |
| 8.4 UN-PACKING METHOD .....                         | 27        |



|                                                     |           |
|-----------------------------------------------------|-----------|
| <b>9. INX MODULE LABEL</b> .....                    | <b>28</b> |
| <b>10. PRECAUTIONS</b> .....                        | <b>29</b> |
| 10.1 ASSEMBLY AND HANDLING PRECAUTIONS .....        | 29        |
| 10.2 STORAGE PRECAUTIONS .....                      | 29        |
| 10.3 OPERATION PRECAUTIONS .....                    | 29        |
| 10.4 SAFETY PRECAUTIONS .....                       | 30        |
| 10.5 SAFETY STANDARDS .....                         | 30        |
| 10.6 OTHER .....                                    | 30        |
| <b>Appendix 1. SYSTEM COVER DESIGN NOTICE</b> ..... | <b>31</b> |
| <b>Appendix 2. OUTLINE DRAWING</b> .....            | <b>35</b> |



## REVISION HISTORY

| Version | Date       | Page | Description                              |
|---------|------------|------|------------------------------------------|
| 2.0     | 2014.09.26 | All  | Approval Specification was first issued. |
|         |            |      |                                          |
|         |            |      |                                          |
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|         |            |      |                                          |



## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

M215HJJ-L30 is a 21.5" TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1920 x 1080 Full HD mode and can display up to 16.7M colors. The converter module for Backlight is not built in.

### 1.2 GENERAL SPECIFICATIONS

| Item              | Specification                              | Unit  | Note |
|-------------------|--------------------------------------------|-------|------|
| Screen Size       | 21.5" real diagonal                        |       |      |
| Driver Element    | a-si TFT active matrix                     | -     | -    |
| Pixel Number      | 1920 x R.G.B. x 1080                       | pixel | -    |
| Pixel Pitch       | 0.24795 (H) x 0.24795 (V)                  | mm    | -    |
| Pixel Arrangement | RGB vertical stripe                        | -     | -    |
| Display Colors    | 16.7M                                      | color | -    |
| Transmissive Mode | Normally black                             | -     | -    |
| Surface Treatment | SR16 type,3H hard coating, Haze 25         | -     | -    |
| Luminance, White  | 250                                        | Cd/m2 |      |
| Color Gamut       | 72% of NTSC(Typ.)                          | -     | -    |
| TCO               | TCO 6.0 compliance                         |       |      |
| Power Consumption | Total 17.888 W@ cell 5.6 W, BL 12.288 (W), |       | (1)  |

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

## 2. MECHANICAL SPECIFICATIONS

| Item        | Min.           | Typ.   | Max.    | Unit   | Note      |
|-------------|----------------|--------|---------|--------|-----------|
| Module Size | Horizontal (H) | 495.1  | 495.6   | 496.1  | mm<br>(1) |
|             | Vertical (V)   | 291.7  | 292.2   | 292.7  |           |
|             | Thickness (T)  | -      | 11.0    | 11.5   |           |
| Bezel Area  | Horizontal     | 479.34 | 479.84  | 480.34 | mm        |
|             | Vertical       | 270.8  | 271.3   | 271.8  | mm        |
| Active Area | Horizontal     |        | 476.064 | -      | mm        |
|             | Vertical       |        | 267.786 | -      | mm        |
| Weight      | -              | 1910   | 2100    | g      |           |

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

## 3. ABSOLUTE MAXIMUM RATINGS

### 3.1 ABSOLUTE RATINGS OF ENVIRONMENT

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

Note (1)

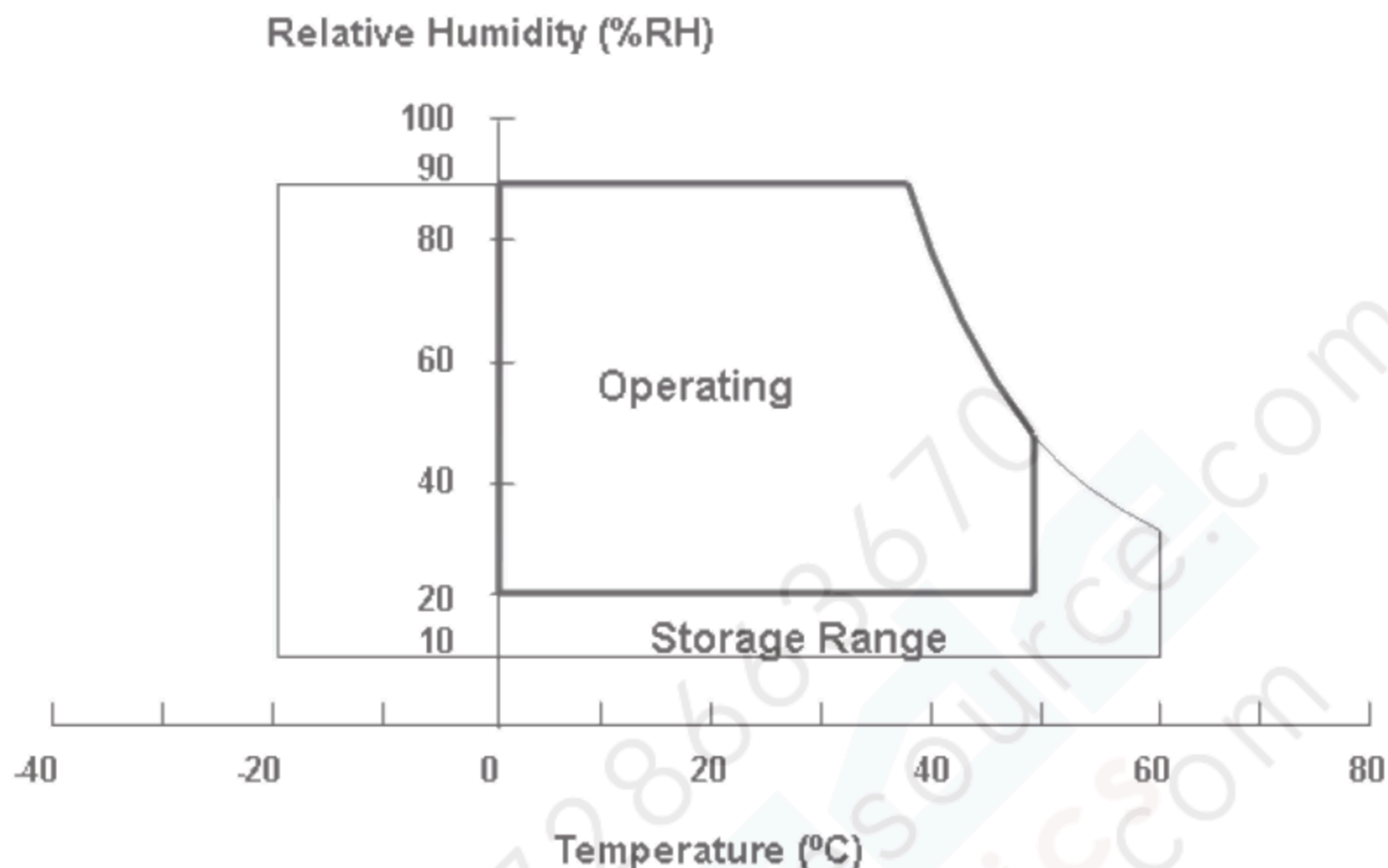
(a) 90 %RH Max..

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

(c) No condensation.



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



## 3.2 ELECTRICAL ABSOLUTE RATINGS

### 3.2.1 TFT LCD MODULE

| Item                 | Symbol          | Value |      | Unit | Note |
|----------------------|-----------------|-------|------|------|------|
|                      |                 | Min.  | Max. |      |      |
| Power Supply Voltage | VCCS            | -0.3  | 6.0  | V    | (1)  |
| Logic Input Voltage  | V <sub>IN</sub> | -0.3  | 3.6  | V    |      |

### 3.2.2 BACKLIGHT UNIT

| Item                                    | Symbol         | Value |     |      | Unit | Note                                                |
|-----------------------------------------|----------------|-------|-----|------|------|-----------------------------------------------------|
|                                         |                | Min.  | Typ | Max. |      |                                                     |
| LED Forward Current Per Input Pin       | I <sub>F</sub> | --    | 80  | 85   | mA   | (1), (2)<br>Duty=100%                               |
| LED Pulse Forward Current Per Input Pin | I <sub>P</sub> | --    | --  | 500  | mA   | (1), (2)<br>Pulse Width ≤ 10msec.<br>and Duty ≤ 25% |

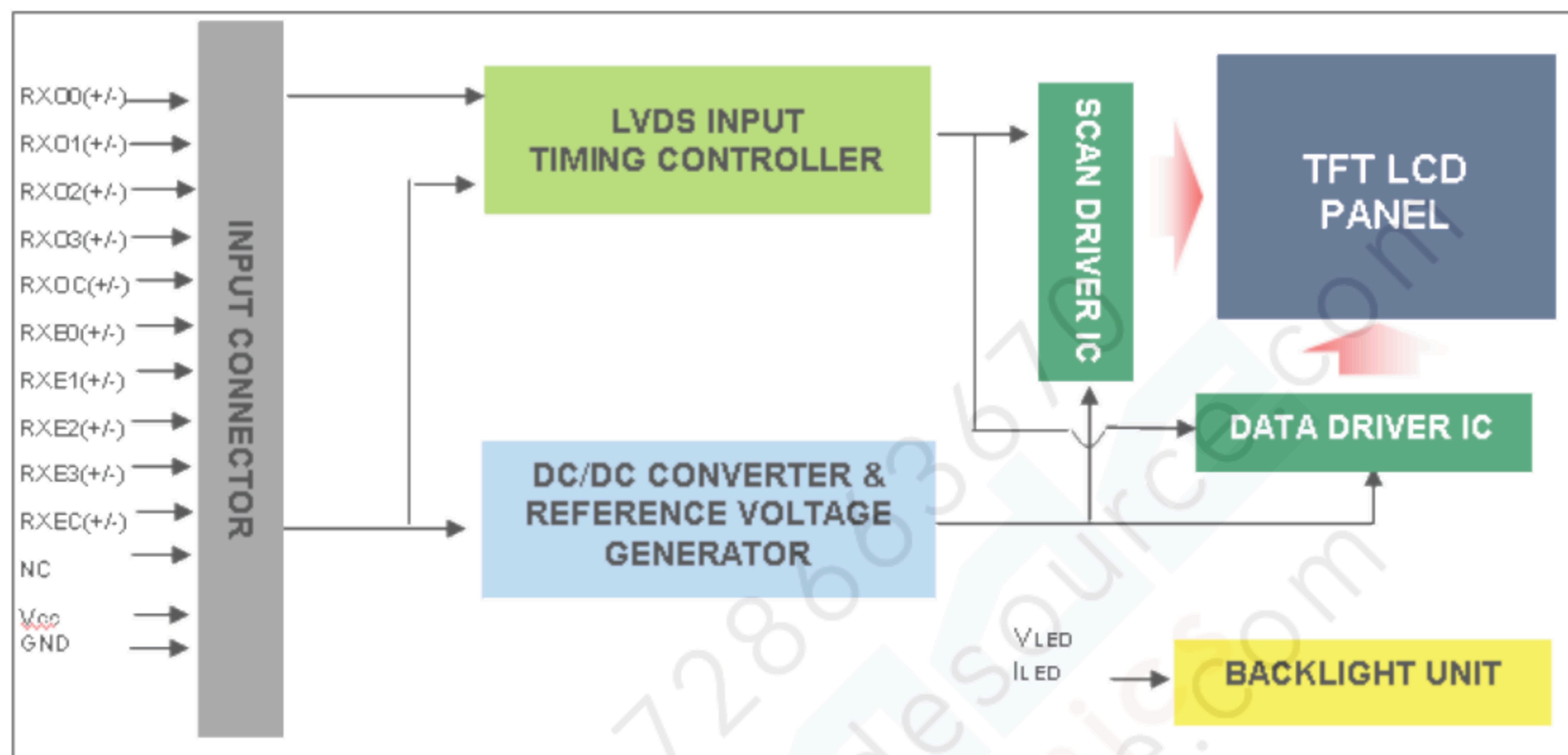
Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 °C (Refer to 4.3.3 and 4.3.4 for further information).



## 4. ELECTRICAL SPECIFICATIONS

### 4.1 FUNCTION BLOCK DIAGRAM





## 4.2. INTERFACE CONNECTIONS

### PIN ASSIGNMENT

| Pin | Name  | Description                                              |
|-----|-------|----------------------------------------------------------|
| 1   | RXO0- | Negative LVDS differential data input. Channel O0 (odd)  |
| 2   | RXO0+ | Positive LVDS differential data input. Channel O0 (odd)  |
| 3   | RXO1- | Negative LVDS differential data input. Channel O1 (odd)  |
| 4   | RXO1+ | Positive LVDS differential data input. Channel O1 (odd)  |
| 5   | RXO2- | Negative LVDS differential data input. Channel O2 (odd)  |
| 6   | RXO2+ | Positive LVDS differential data input. Channel O2 (odd)  |
| 7   | GND   | Ground                                                   |
| 8   | RXOC- | Negative LVDS differential clock input. (odd)            |
| 9   | RXOC+ | Positive LVDS differential clock input. (odd)            |
| 10  | RXO3- | Negative LVDS differential data input. Channel O3(odd)   |
| 11  | RXO3+ | Positive LVDS differential data input. Channel O3 (odd)  |
| 12  | RXE0- | Negative LVDS differential data input. Channel E0 (even) |
| 13  | RXE0+ | Positive LVDS differential data input. Channel E0 (even) |
| 14  | GND   | Ground                                                   |
| 15  | RXE1- | Negative LVDS differential data input. Channel E1 (even) |
| 16  | RXE1+ | Positive LVDS differential data input. Channel E1 (even) |
| 17  | GND   | Ground                                                   |
| 18  | RXE2- | Negative LVDS differential data input. Channel E2 (even) |
| 19  | RXE2+ | Positive LVDS differential data input. Channel E2 (even) |
| 20  | RXEC- | Negative LVDS differential clock input. (even)           |
| 21  | RXEC+ | Positive LVDS differential clock input. (even)           |
| 22  | RXE3- | Negative LVDS differential data input. Channel E3 (even) |
| 23  | RXE3+ | Positive LVDS differential data input. Channel E3 (even) |
| 24  | GND   | Ground                                                   |
| 25  | NC    | For LCD internal use only, Do not connect                |
| 26  | NC    | For LCD internal use only, Do not connect                |
| 27  | NC    | For LCD internal use only, Do not connect                |
| 28  | Vcc   | +5.0V power supply                                       |
| 29  | Vcc   | +5.0V power supply                                       |
| 30  | Vcc   | +5.0V power supply                                       |

Note (1) Connector Part No.:

WF13-422-3033(Fullconn) or 187098-30091(P-two) equivalent

Note (2) User's connector Part No:

Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)

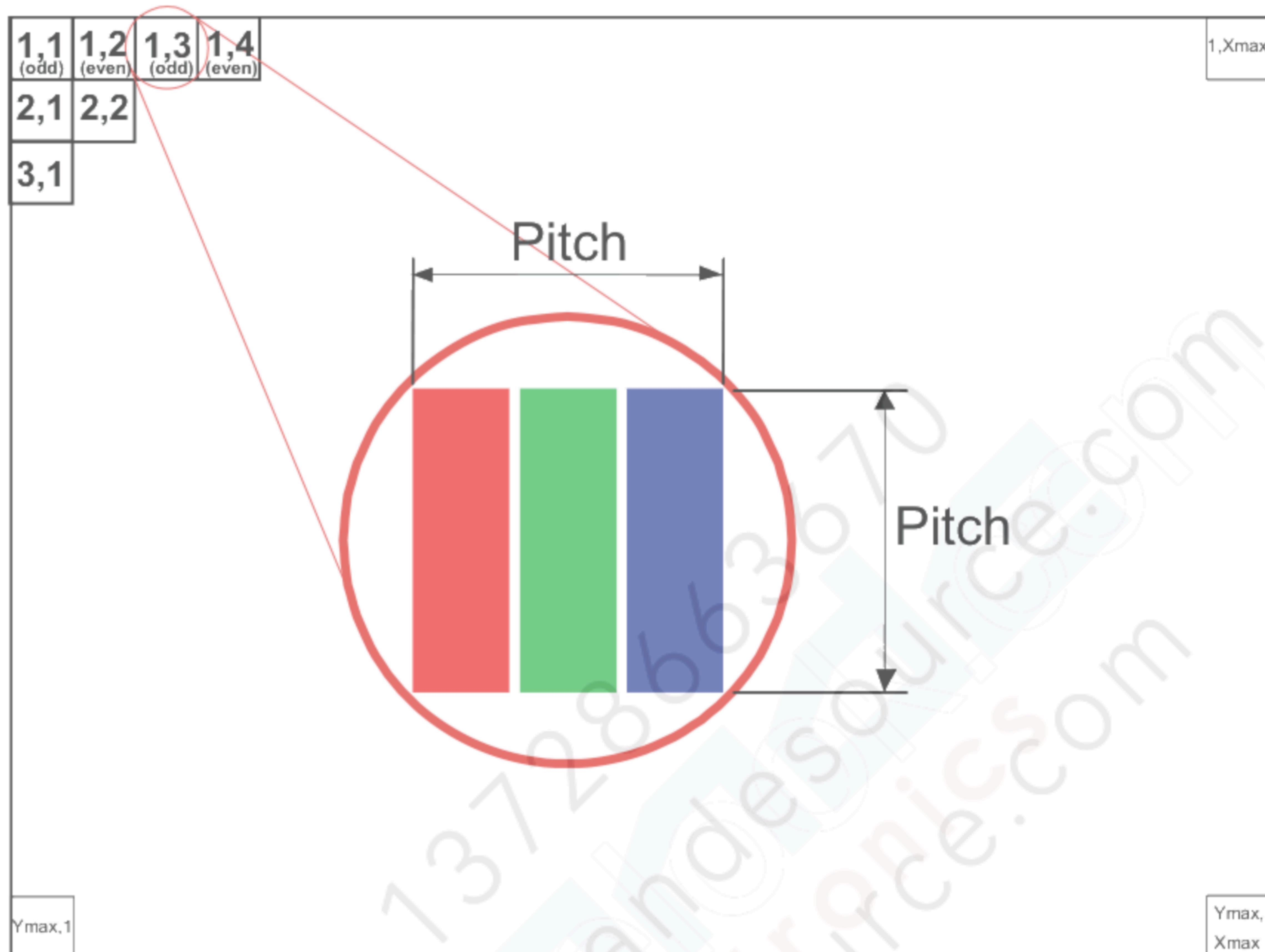
Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE).

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

Note (3) The first pixel is odd.

Note (4) Input signal of even and odd clock should be the same timing.







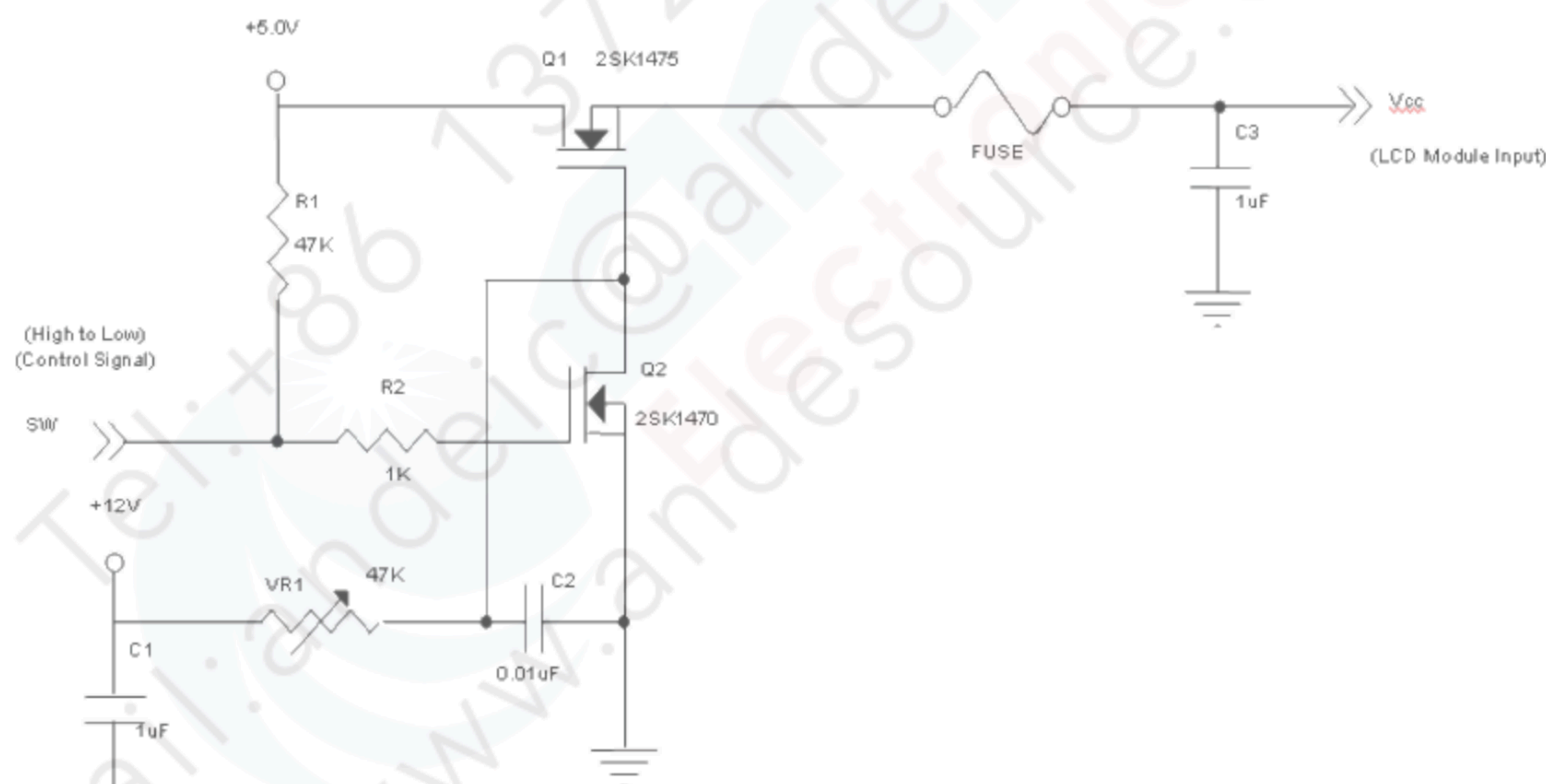
## 4.3 ELECTRICAL CHARACTERISTICS

### 4.3.1 LCD ELETRONICS SPECIFICATION

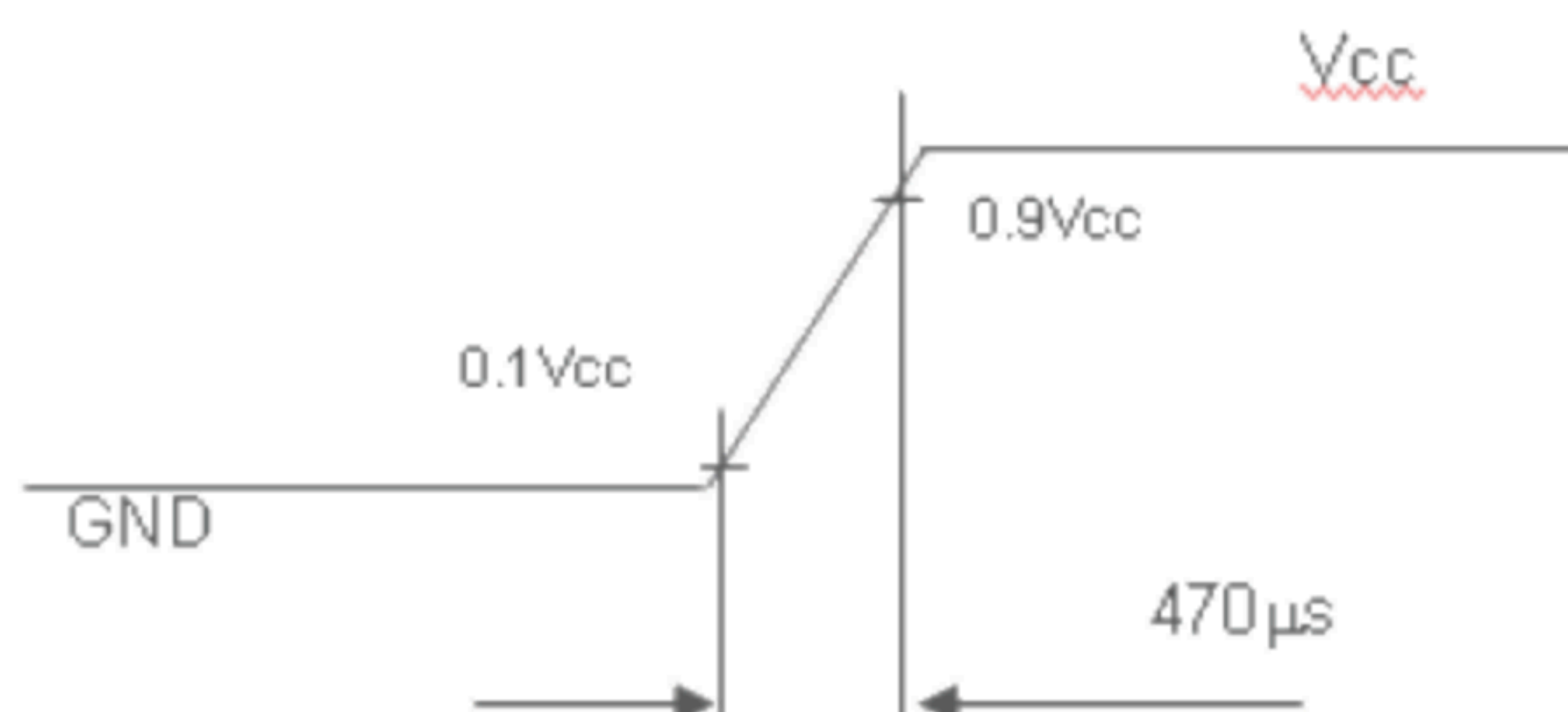
| Parameter            |                                           | Symbol            | Value |      |      | Unit | Note |
|----------------------|-------------------------------------------|-------------------|-------|------|------|------|------|
|                      |                                           |                   | Min.  | Typ. | Max. |      |      |
| Power Supply Voltage |                                           | V <sub>CC</sub>   | 4.5   | 5.0  | 5.5  | V    | -    |
| Ripple Voltage       |                                           | V <sub>RP</sub>   | -     | -    | 300  | mV   | -    |
| Rush Current         |                                           | I <sub>RUSH</sub> | -     | -    | 3    | A    | (2)  |
| Power Supply Current | White                                     | -                 | -     | 768  | 910  | mA   | (3)a |
|                      | Black                                     | -                 | -     | 720  | 845  | mA   | (3)b |
|                      | Vertical Stripe                           | -                 | -     | 948  | 1105 | mA   | (3)c |
| Power Consumption    |                                           | PLCD              | -     | 4.8  | 5.6  | Watt | (4)  |
| LVDS interface       | Differential Input Voltage                | V <sub>ID</sub>   | 100   | -    | 600  | mV   |      |
|                      | Common Input Voltage                      | V <sub>CM</sub>   | 1.0   | 1.2  | 1.4  | V    |      |
|                      | Differential Input High Threshold Voltage | V <sub>TH</sub>   | -     | -    | +100 | mV   |      |
|                      | Differential Input Low Threshold Voltage  | V <sub>TL</sub>   | -100  | -    | -    | mV   |      |

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

Note (2) Measurement Conditions:

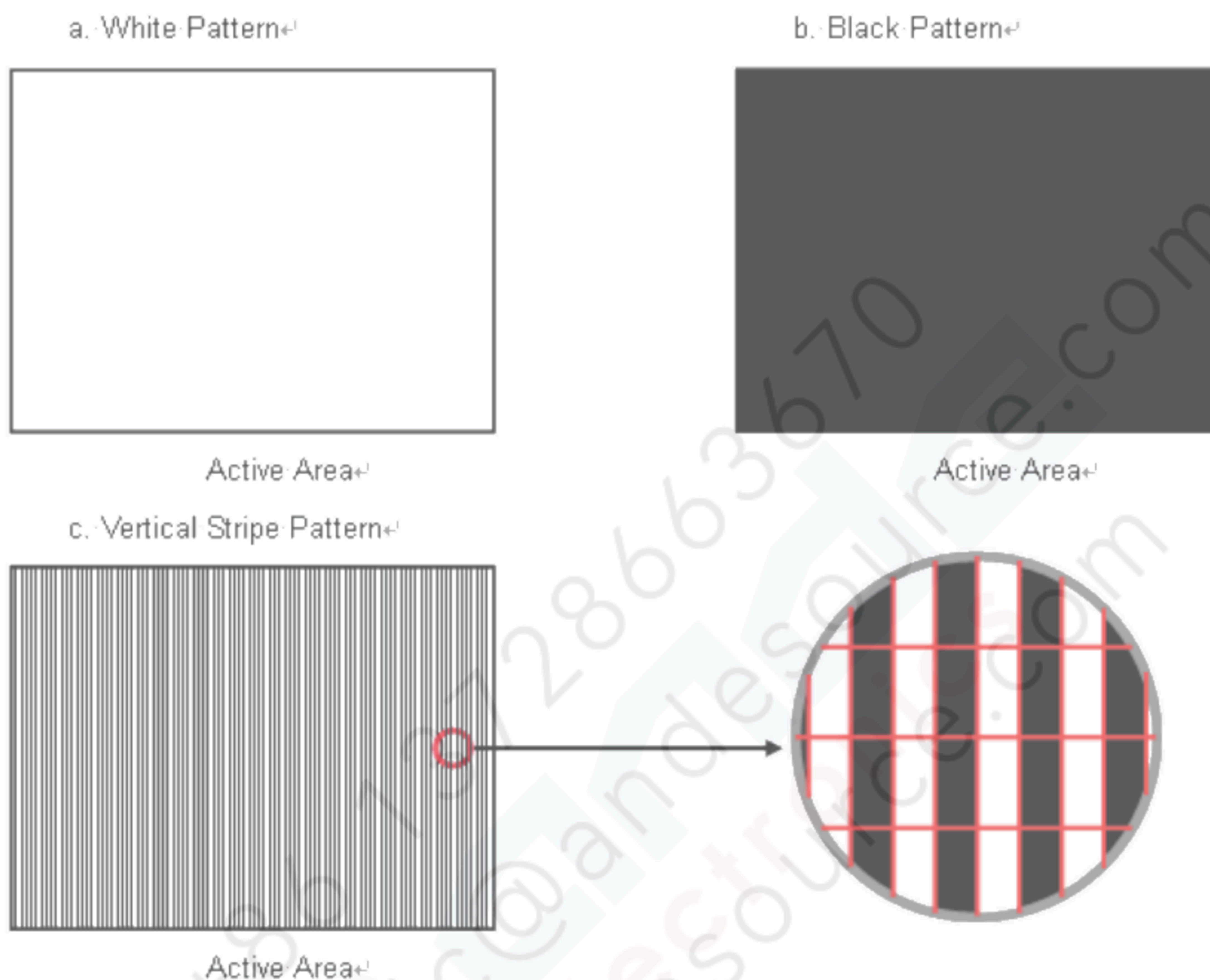


**V<sub>CC</sub> rising time is 470μs**





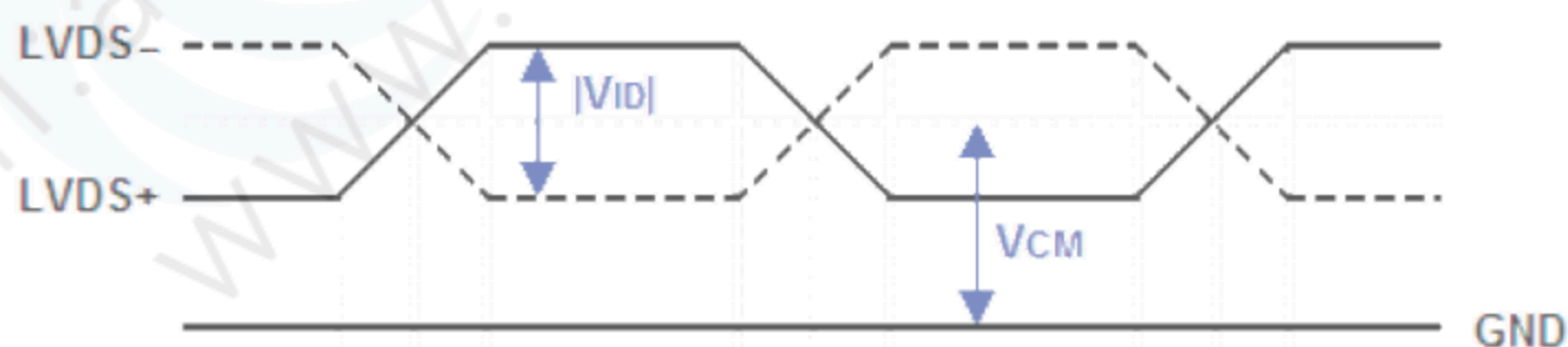
Note (3) The specified power supply current is under the conditions at  $V_{CC} = 5.0\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $F_r = 75\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.



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

Note (5) The LVDS input characteristics are as follows:

## Single-end Signals

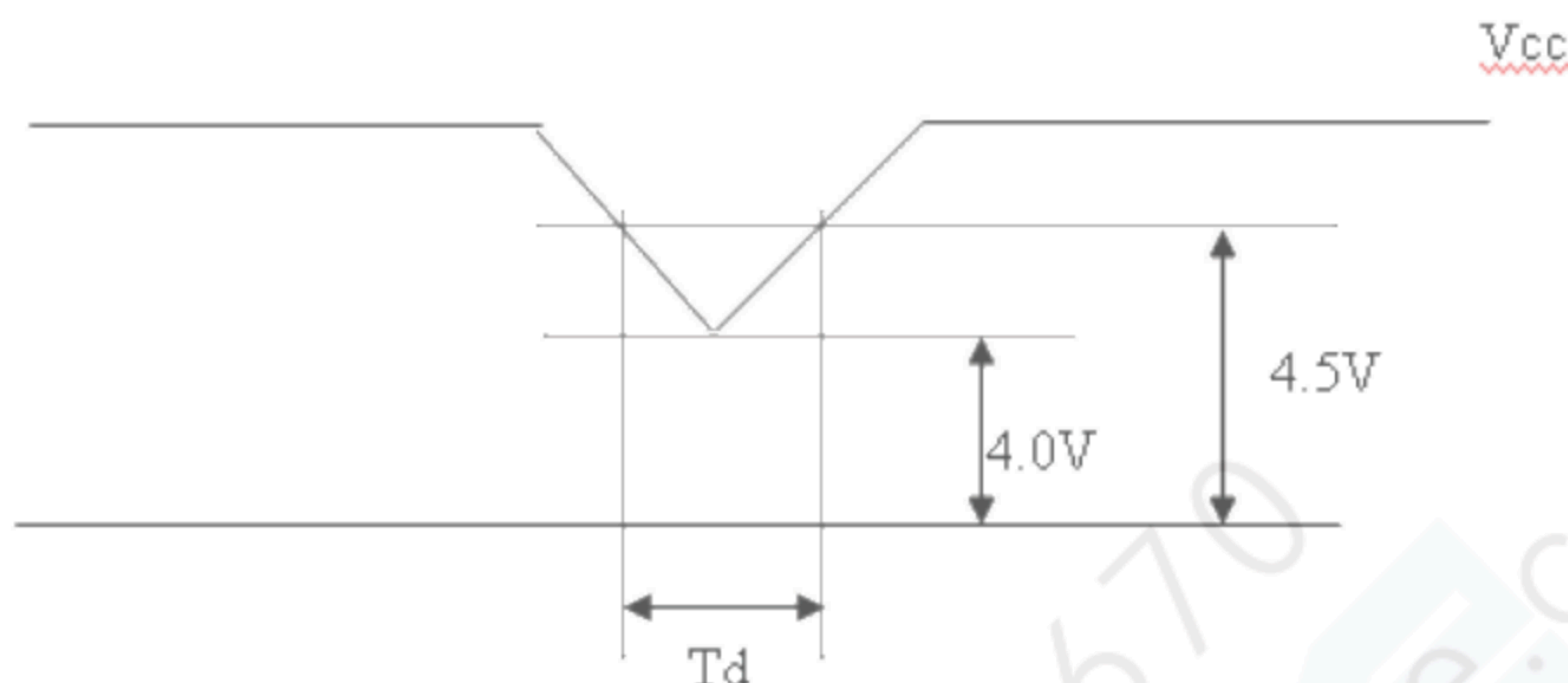


## Differential Signal





### 4.3.2 Vcc Power Dip Condition



Dip condition:  $4.0 \leq V_{cc} \leq 4.5$ ,  $T_d \leq 20\text{ms}$

### 4.3.3 BACKLIGHT UNIT

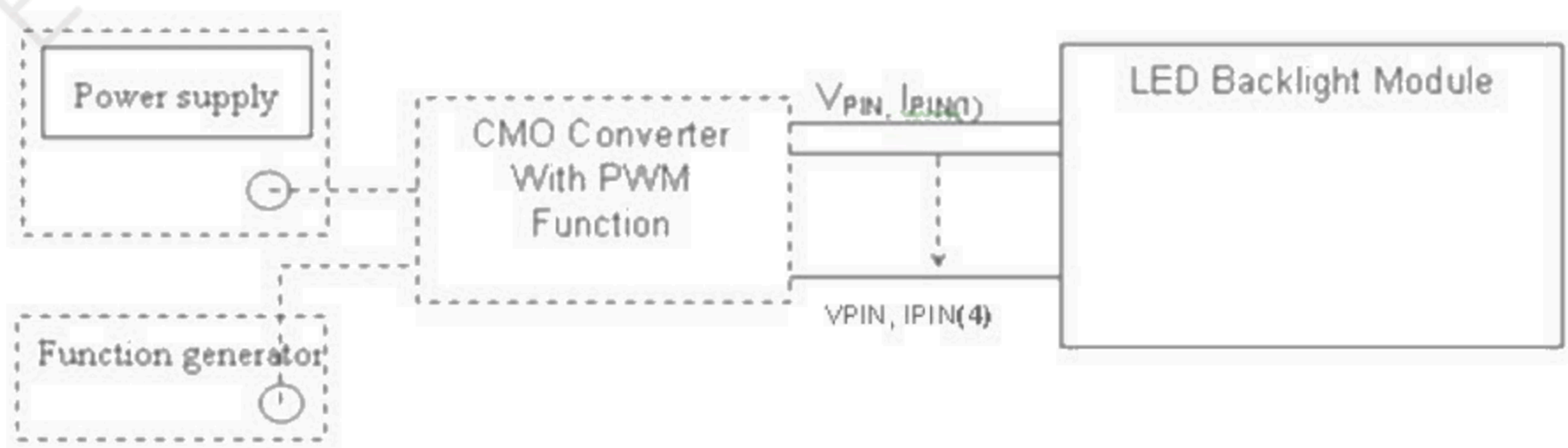
| Parameter                                 | Symbol | Value |        |        | Unit | Note                              |
|-------------------------------------------|--------|-------|--------|--------|------|-----------------------------------|
|                                           |        | Min.  | Typ.   | Max.   |      |                                   |
| LED Light Bar Input Voltage Per Input Pin | VPIN   | --    | 38.4   | 42     | V    | (1),<br>Duty=100%,<br>IPIN=(80mA) |
| LED Light Bar Current Per Input Pin       | IPIN   | --    | 80     | 85     | mA   | (1), (2)<br>Duty=100%             |
| LED Life Time                             | LLED   | 40000 | --     | --     | Hrs  | (3)                               |
| Power Consumption                         | PBL    | --    | 12.288 | 13.056 | W    | (1)<br>Duty=100%,<br>IPIN=(80mA)  |

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

Note (2)  $PBL (Typ) = IPIN(Typ) \times VPIN(Typ) \times (4)$   $PBL(Max) = IPIN(Typ) \times VPIN(Max) \times (4)$  input pins ,

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at  $T_a = 25 \pm 2^\circ\text{C}$  and  $I = (80)\text{mA}$  (per chip) until the brightness becomes  $\leq 50\%$  of its original value.

Note (4) The module must be operated with constant driving current

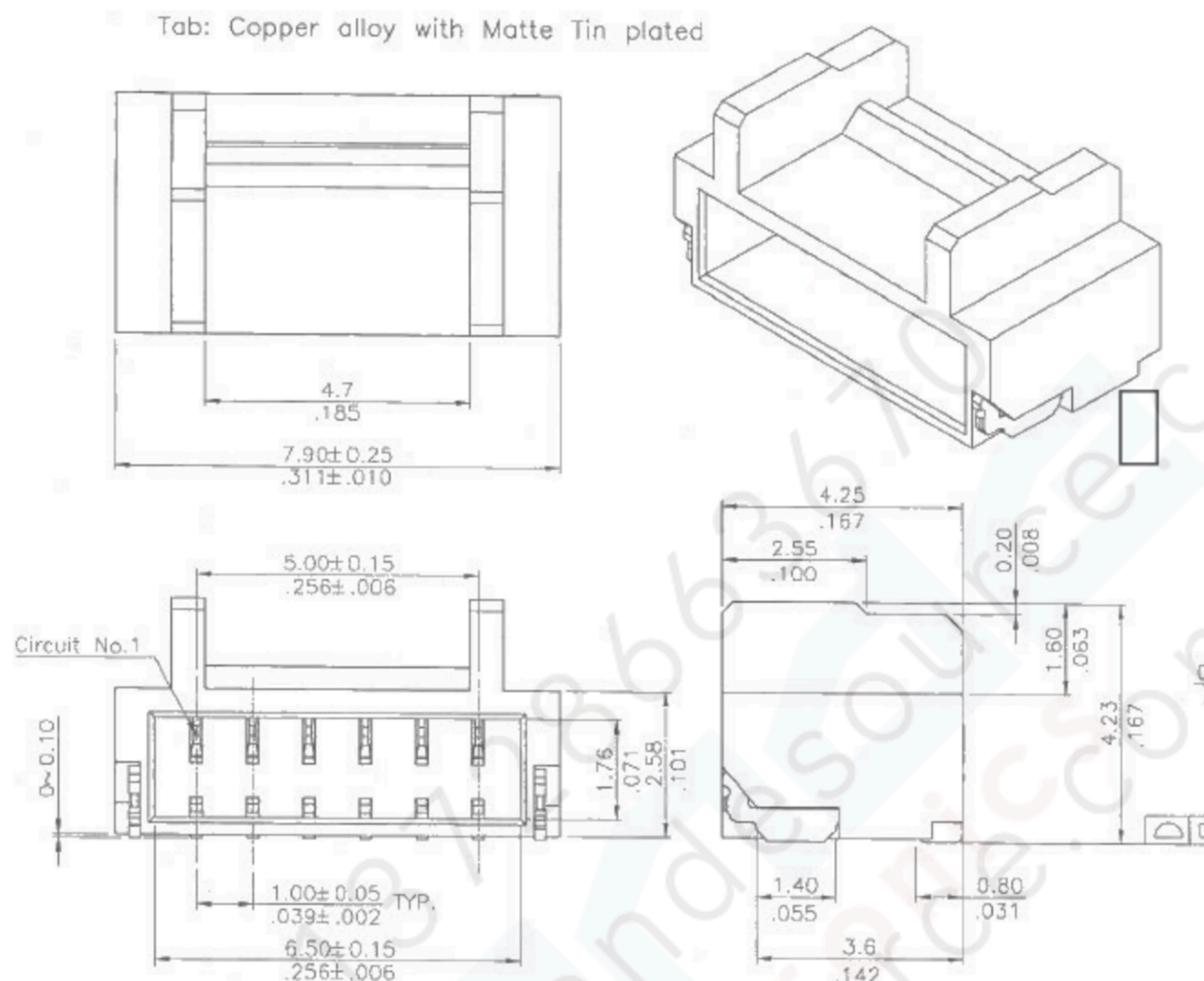




#### 4.3.4 LIGHTBAR Connector Pin Assignment

(1).Connector: WM13-406-063N & CI1406M1HRK-NH.

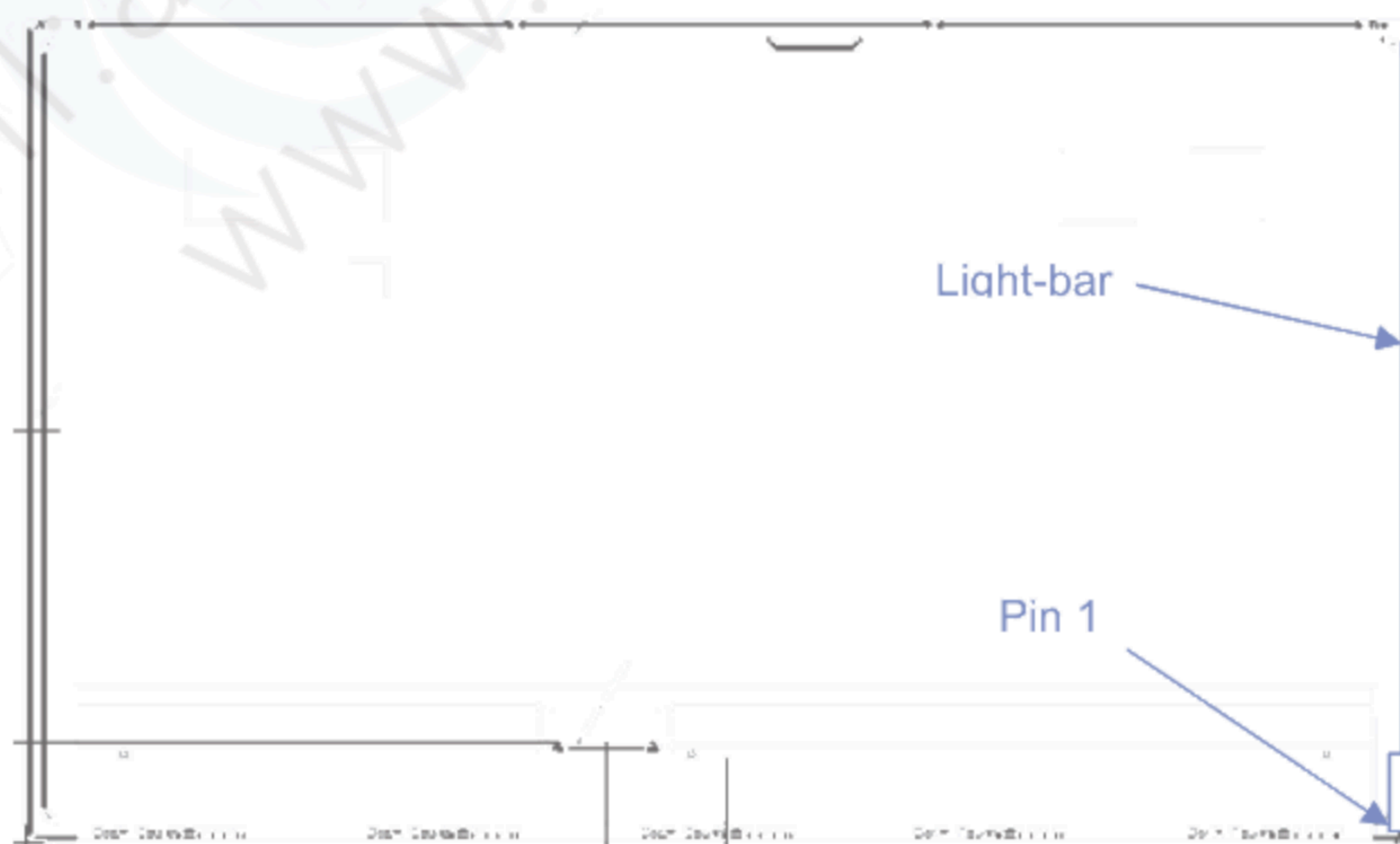
(2) LB Connector drawing:



CN1

| Pin number | Description           |
|------------|-----------------------|
| 1          | Cathode of LED string |
| 2          | Cathode of LED string |
| 3          | VLED                  |
| 4          | VLED                  |
| 5          | Cathode of LED string |
| 6          | Cathode of LED string |

Note (1) User's Mating Connector Part No.: CI1406SL000-NH (CviLux) or Compatible.





## 4.4 LVDS INPUT SIGNAL SPECIFICATIONS

### 4.4.1 LVDS DATA MAPPING TABLE

|                 |             |     |     |     |     |     |     |     |
|-----------------|-------------|-----|-----|-----|-----|-----|-----|-----|
| LVDS Channel O0 | LVDS output | D7  | D6  | D4  | D3  | D2  | D1  | D0  |
|                 | Data order  | OG0 | OR5 | OR4 | OR3 | OR2 | OR1 | OR0 |
| LVDS Channel O1 | LVDS output | D18 | D15 | D14 | D13 | D12 | D9  | D8  |
|                 | Data order  | OB1 | OB0 | OG5 | OG4 | OG3 | OG2 | OG1 |
| LVDS Channel O2 | LVDS output | D26 | D25 | D24 | D22 | D21 | D20 | D19 |
|                 | Data order  | DE  | NA  | NA  | OB5 | OB4 | OB3 | OB2 |
| LVDS Channel O3 | LVDS output | D23 | D17 | D16 | D11 | D10 | D5  | D27 |
|                 | Data order  | NA  | OB7 | OB6 | OG7 | OG6 | OR7 | OR6 |
| LVDS Channel E0 | LVDS output | D7  | D6  | D4  | D3  | D2  | D1  | D0  |
|                 | Data order  | EG0 | ER5 | ER4 | ER3 | ER2 | ER1 | ER0 |
| LVDS Channel E1 | LVDS output | D18 | D15 | D14 | D13 | D12 | D9  | D8  |
|                 | Data order  | EB1 | EB0 | EG5 | EG4 | EG3 | EG2 | EG1 |
| LVDS Channel E2 | LVDS output | D26 | D25 | D24 | D22 | D21 | D20 | D19 |
|                 | Data order  | DE  | NA  | NA  | EB5 | EB4 | EB3 | EB2 |
| LVDS Channel E3 | LVDS output | D23 | D17 | D16 | D11 | D10 | D5  | D27 |
|                 | Data order  | NA  | EB7 | EB6 | EG7 | EG6 | ER7 | ER6 |



## 4.4.2 COLOR DATA INPUT ASSIGNMENT

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

| Color               |                 | Data Signal |    |    |    |    |    |    |    |       |     |     |     |    |    |    |    |      |    |    |    |    |    |     |     |
|---------------------|-----------------|-------------|----|----|----|----|----|----|----|-------|-----|-----|-----|----|----|----|----|------|----|----|----|----|----|-----|-----|
|                     |                 | Red         |    |    |    |    |    |    |    | Green |     |     |     |    |    |    |    | Blue |    |    |    |    |    |     |     |
|                     |                 | R7          | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G 7   | G 6 | G 5 | G 4 | G3 | G2 | G1 | G0 | B 7  | B6 | B5 | B4 | B3 | B2 | B 1 | B 0 |
| Basic Colors        | Black           | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Red             | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Green           | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1   | 1   | 1   | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Blue            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1   | 1   |
|                     | Cyan            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1   | 1   | 1   | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1   | 1   |
|                     | Magenta         | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1   | 1   |
|                     | Yellow          | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1   | 1   | 1   | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | White           | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1   | 1   | 1   | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1   | 1   |
| Gray Scale Of Red   | Red(0) / Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Red(1)          | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Red(2)          | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | Red(253)        | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Red(254)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
| Red(255)            | 1               | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   |     |
| Gray Scale Of Green | Green(0) / Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Green(1)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Green(2)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | Green(253)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1   | 1   | 1   | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Green(254)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1   | 1   | 1   | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
| Green(255)          | 0               | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1     | 1   | 1   | 1   | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   |     |
| Gray Scale Of Blue  | Blue(0) / Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 0   |
|                     | Blue(1)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0   | 1   |
|                     | Blue(2)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  | 0   | 0   |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | ⋮               | ⋮           | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮     | ⋮   | ⋮   | ⋮   | ⋮  | ⋮  | ⋮  | ⋮  | ⋮    | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮   |     |
|                     | Blue(253)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 0   | 1   |
|                     | Blue(254)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1   | 0   |
| Blue(255)           | 0               | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0   | 0   | 0   | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1   |     |

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



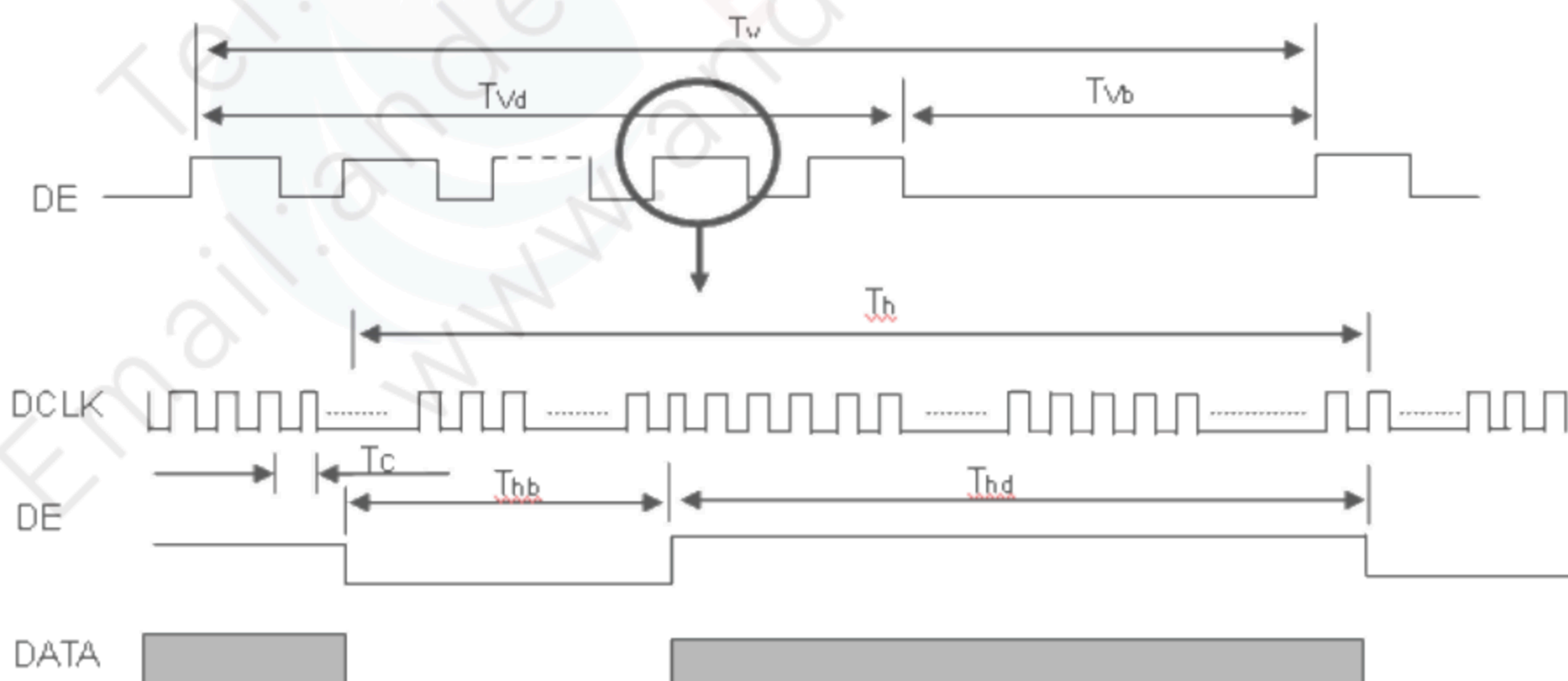
## 4.5 DISPLAY TIMING SPECIFICATIONS

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

| Signal                  | Item                                 | Symbol                 | Min.     | Typ.   | Max.    | Unit | Note        |
|-------------------------|--------------------------------------|------------------------|----------|--------|---------|------|-------------|
| LVDS Clock              | Frequency                            | Fc                     | 58.54    | 74.25  | 97.98   | MHz  | -           |
|                         | Period                               | Tc                     | -        | 13.47  |         | ns   |             |
|                         | Input cycle to cycle jitter          | T <sub>rdl</sub>       | -0.02*TC | -      | 0.02*TC | ns   | (1)         |
|                         | Input Clock to data skew             | TLVCCS                 | -0.02*TC |        | 0.02*TC |      | (2)         |
|                         | Spread spectrum modulation range     | F <sub>clkin_mod</sub> | 0.97*FC  | -      | 1.03*FC | MHz  | (3)         |
|                         | Spread spectrum modulation frequency | F <sub>SSM</sub>       | -        | -      | 100     | KHz  |             |
| Vertical Display Term   | Frame Rate                           | Fr                     | 50       | 60     | 75      | Hz   |             |
|                         | Total                                | Tv                     | 1115     | 1125   | 1136    | Th   | Tv=Tvd+Tvb- |
|                         | Active Display                       | Tvd                    | 1080     | 1080   | 1080    | Th   | -           |
|                         | Blank                                | Tvb                    | Tv-Tvd   | Tv-Tvd | Tv-Tvd  | Th   | -           |
| Horizontal Display Term | Total                                | Th                     | 1050     | 1100   | 1150    | Tc   | Th=Thd+Thb  |
|                         | Active Display                       | Thd                    | 960      | 960    | 960     | Tc   | -           |
|                         | Blank                                | Thb                    | Th-Thd   | Th-Thd | Th-Thd  | Tc   | -           |

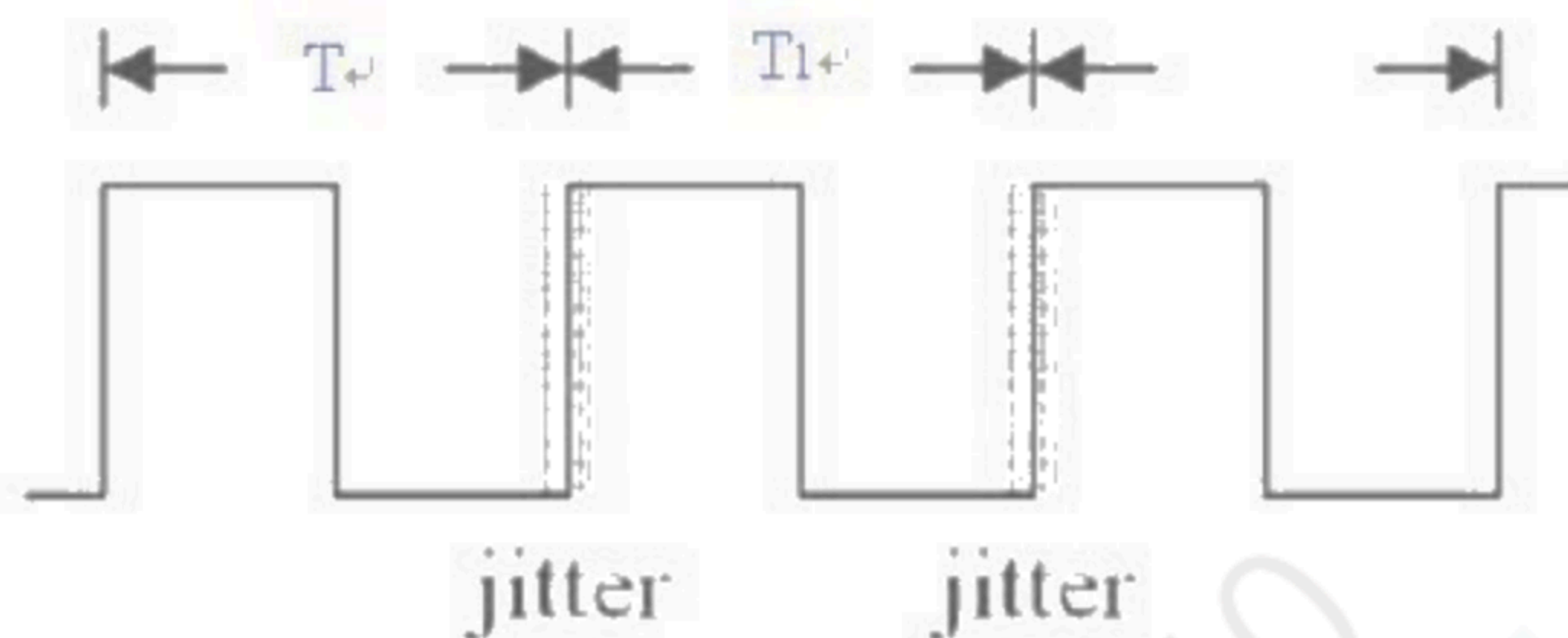
Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

### INPUT SIGNAL TIMING DIAGRAM

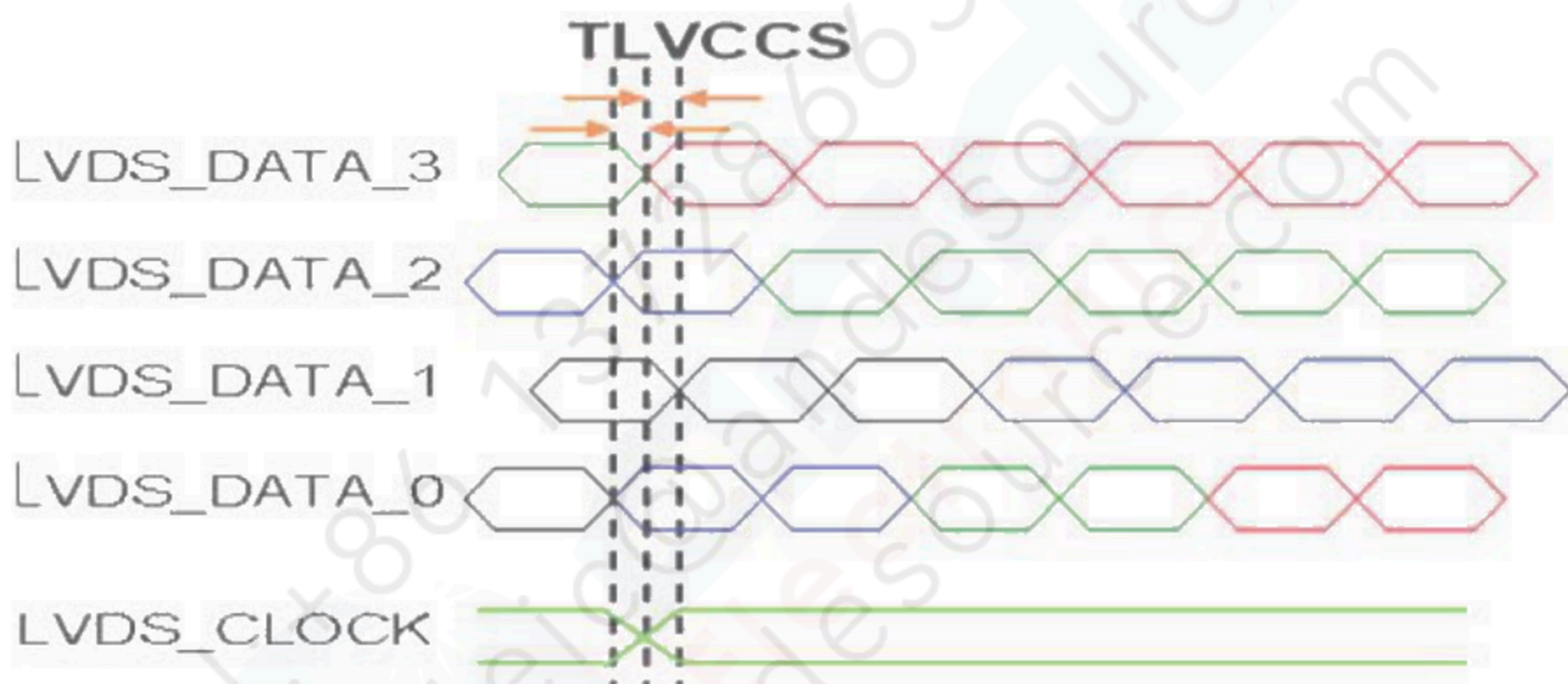




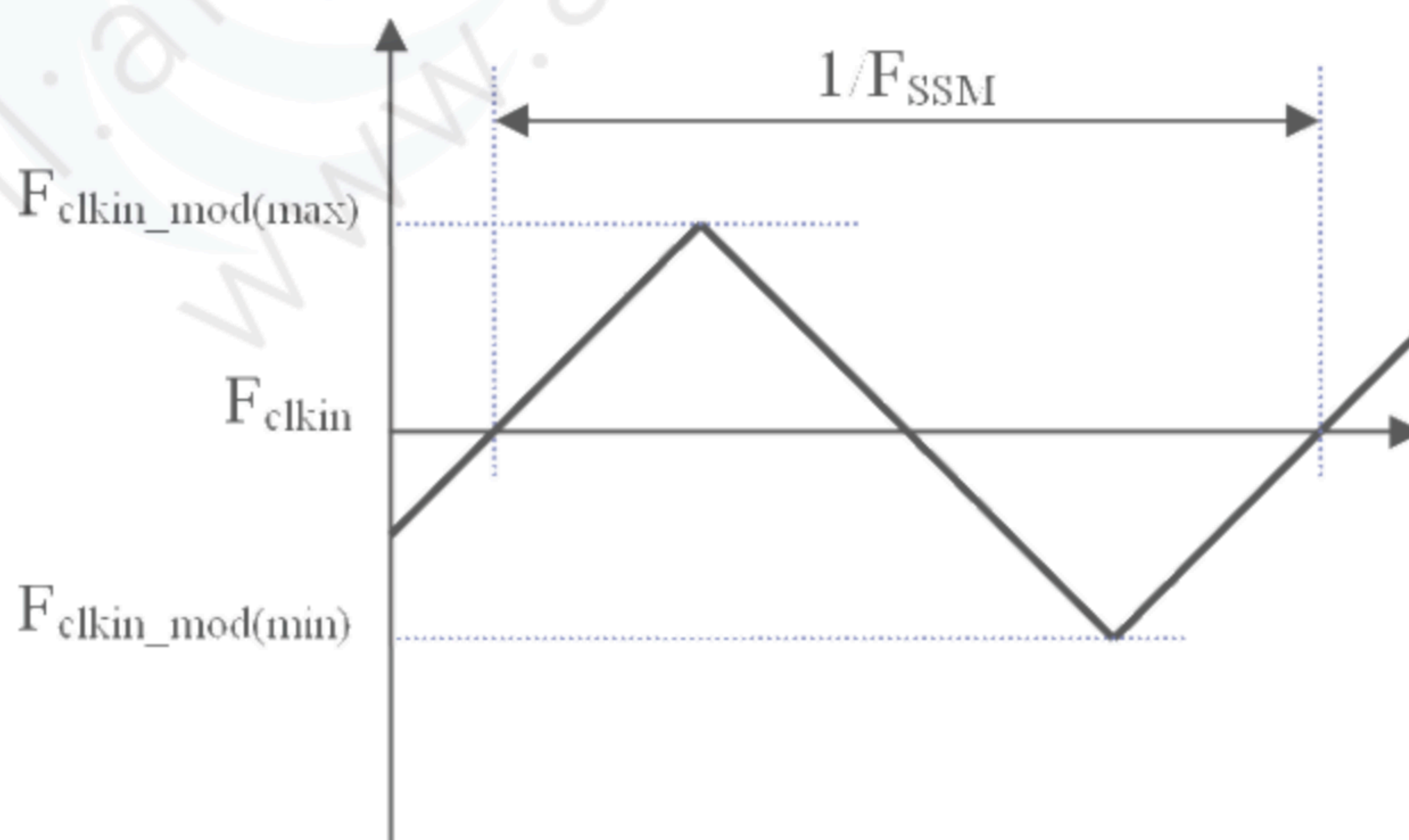
Note (1) The input clock cycle-to-cycle jitter is defined as below figures.  $Trcl = |T_1 - T_1|$



Note (2) Input Clock to data skew is defined as below figures.



Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.

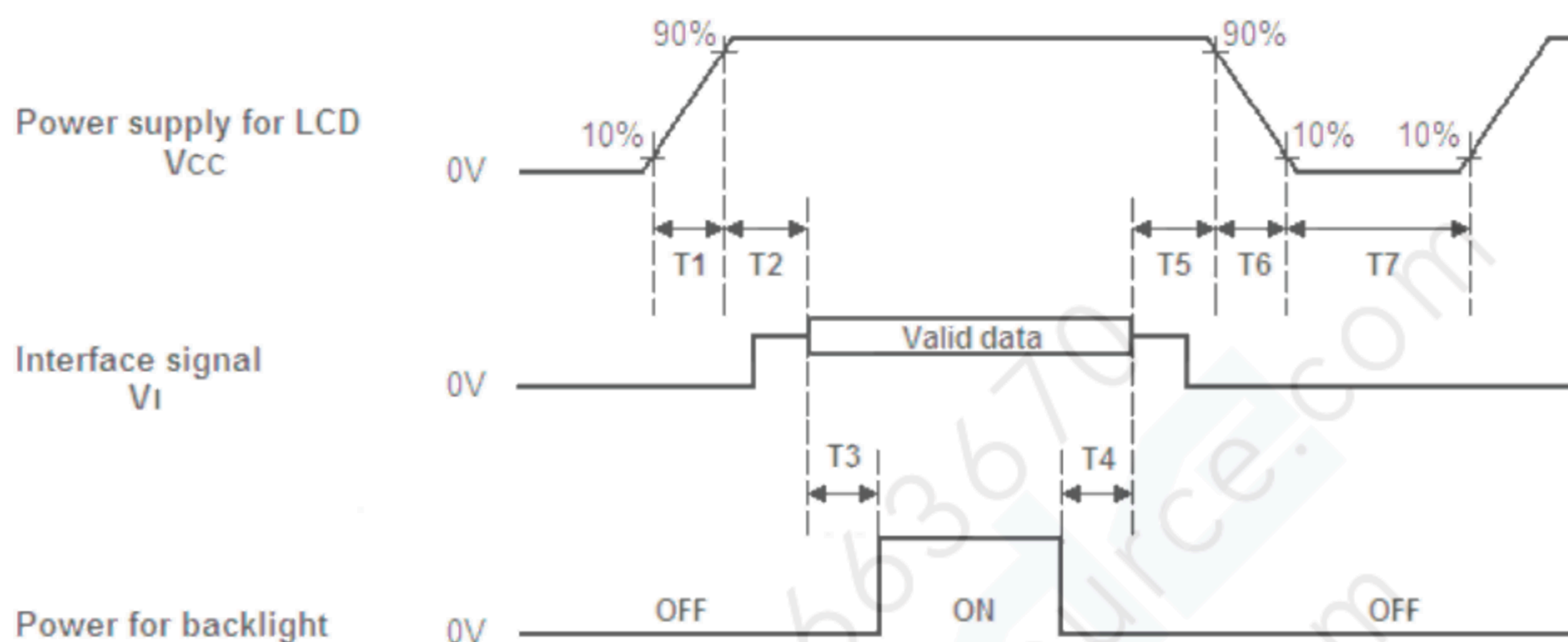


Note (4) The DCLK range at last line of V-blank should be set in 0 to Hdisplay/2



## 4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Timing Specifications:

| Parameters | Values |      |     | Units |
|------------|--------|------|-----|-------|
|            | Min    | Typ. | Max |       |
| T1         | 0.5    | --   | 10  | ms    |
| T2         | 0      | 30   | 50  | ms    |
| T3         | 450    | --   | --  | ms    |
| T4         | 100    | 250  | --  | ms    |
| T5         | 0      | 20   | 50  | ms    |
| T6         | 0.1    | --   | 100 | ms    |
| T7         | 1000   | --   | --  | ms    |

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

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T7 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) INX won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".



## 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                                                           | 5        | V    |
| Input Signal                                 | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |          |      |
| LED Light Bar Input Current<br>Per Input Pin | IPIN                                                          | 80 ± 1.5 | mADC |
| PWM Duty Ratio                               | D                                                             | 100      | %    |
| LED Light Bar Test Converter                 | (INX Part No.: R373B0000UT000)                                |          |      |

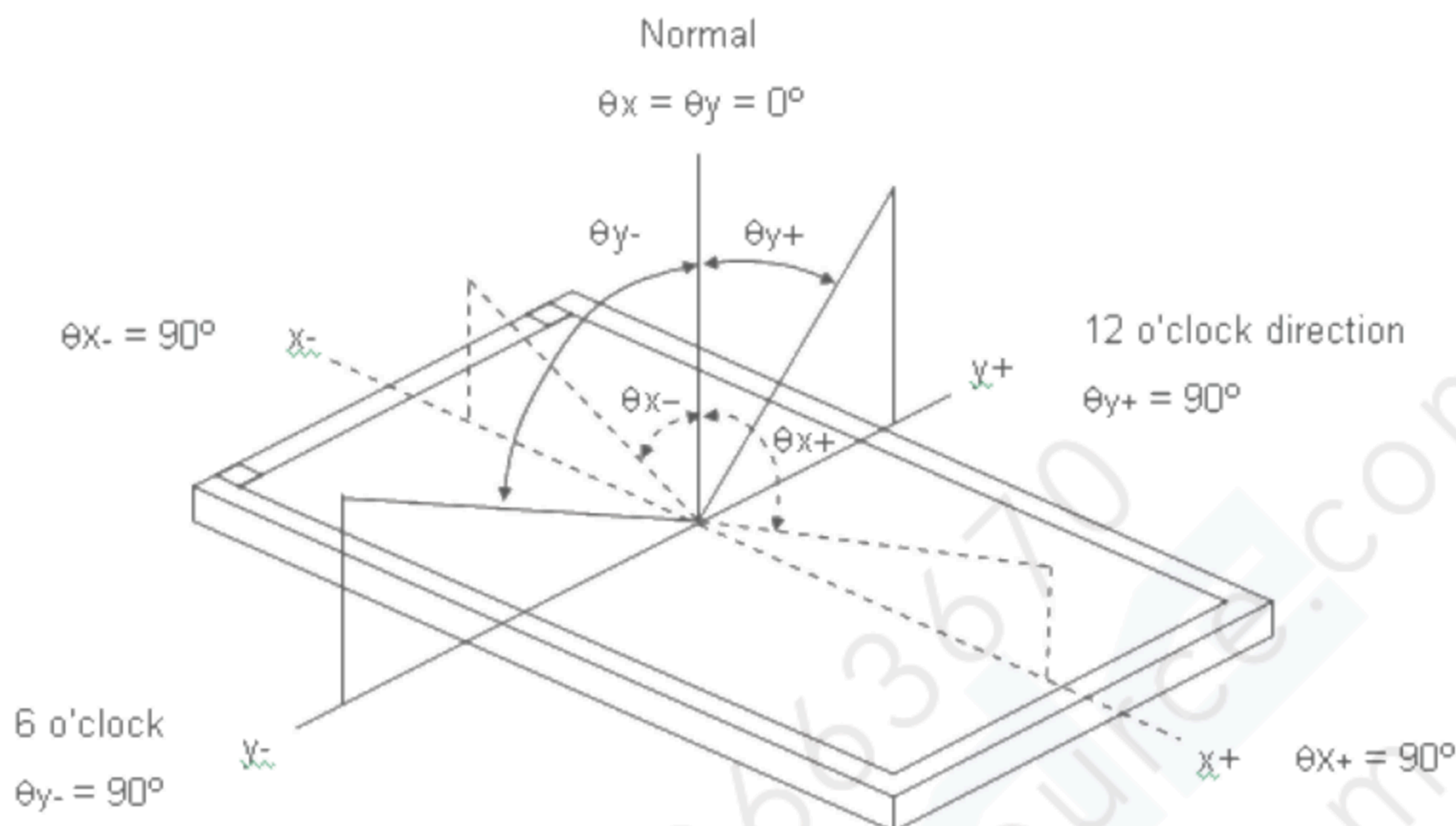
### 5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

| Item                                         |            | Symbol                            | Condition                                                                  | Min.       | Typ.  | Max.         | Unit              | Note     |
|----------------------------------------------|------------|-----------------------------------|----------------------------------------------------------------------------|------------|-------|--------------|-------------------|----------|
| Color Chromaticity (CIE 1931)                | Red        | R <sub>x</sub>                    | $\theta_x=0^\circ, \theta_y=0^\circ$<br>CS-2000<br>R=G=B=255<br>Gray scale | Typ – 0.03 | 0.635 | Typ + - 0.03 | -                 | (1), (5) |
|                                              |            | R <sub>y</sub>                    |                                                                            |            | 0.340 |              |                   |          |
|                                              | Green      | G <sub>x</sub>                    |                                                                            |            | 0.315 |              |                   |          |
|                                              |            | G <sub>y</sub>                    |                                                                            |            | 0.635 |              |                   |          |
|                                              | Blue       | B <sub>x</sub>                    |                                                                            |            | 0.155 |              |                   |          |
|                                              |            | B <sub>y</sub>                    |                                                                            |            | 0.050 |              |                   |          |
|                                              | White      | W <sub>x</sub>                    |                                                                            |            | 0.313 |              |                   |          |
|                                              |            | W <sub>y</sub>                    |                                                                            |            | 0.329 |              |                   |          |
| Center Luminance of White (Center of Screen) |            | L <sub>C</sub>                    |                                                                            | 200        | 250   | -            | cd/m <sup>2</sup> | (4), (5) |
| Contrast Ratio                               |            | CR                                |                                                                            | 2000       | 3000  | -            | -                 | (2), (5) |
| Response Time                                |            | T <sub>R</sub>                    |                                                                            |            | 20    | 25           | ms                | (3)      |
|                                              |            | T <sub>F</sub>                    |                                                                            |            | 5     | 10           | ms                | (3)      |
|                                              |            | T <sub>GtG_AVE_</sub>             | $\theta_x=0^\circ, \theta_y=0^\circ$                                       | -          | 30    | 35           | ms                | (3)      |
| White Variation                              |            | δW                                | $\theta_x=0^\circ, \theta_y=0^\circ$                                       | 70         | -     | -            | %                 | (5), (6) |
| Viewing Angle                                | Horizontal | θ <sub>x-</sub> + θ <sub>x+</sub> | CR ≥ 10                                                                    | 160        | 178   | -            | Deg.              | (1), (5) |
|                                              | Vertical   | θ <sub>y-</sub> + θ <sub>y+</sub> |                                                                            | 160        | 178   | -            |                   |          |



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



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

The contrast ratio can be calculated by the following expression.

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

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

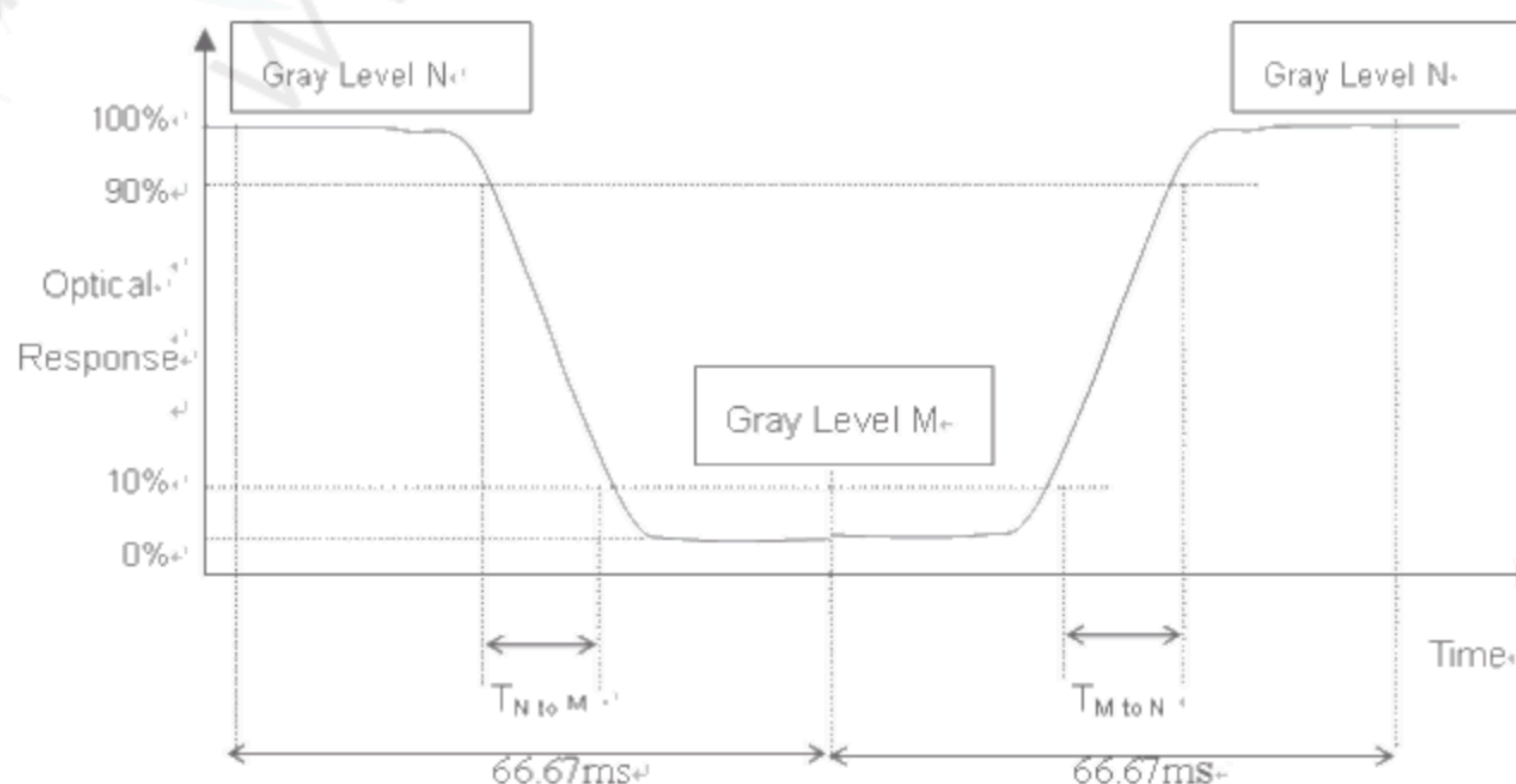
$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time :

-The TR is the rising-time means the transition time from "Full-Black (gray 0)" to "Full-White (gray 255)" and the TF is the falling-time means the transition time from "Full-White (gray 255)" to "Full-Black (gray 0)" as the following figure. (Measured by TEKTRONIX TDS3054B).

-The TGtG is the response time means the transition time from "Gray N" to "Gray M" (N,M=0~255).





- $T_{GTG\_AVE}$  is the total average of the  $T_{GTG}$  data (Measured by INX GTG instrument)
- The gray (N,M) stands for the (0,31,63,~255) as the following table.
- If system use ODC ( Over Driving Circuit) function,  $T_{GTG\_AVE}$  may be 5ms~15ms.
- \* It depends on Overshoot rate

| Gray to Gray |     | Rising time |    |    |    |     |     |     |     |     |
|--------------|-----|-------------|----|----|----|-----|-----|-----|-----|-----|
|              |     | 0           | 31 | 63 | 95 | 127 | 159 | 191 | 223 | 255 |
| Falling time | 0   |             |    |    |    |     |     |     |     |     |
|              | 31  |             |    |    |    |     |     |     |     |     |
|              | 63  |             |    |    |    |     |     |     |     |     |
|              | 95  |             |    |    |    |     |     |     |     |     |
|              | 127 |             |    |    |    |     |     |     |     |     |
|              | 159 |             |    |    |    |     |     |     |     |     |
|              | 191 |             |    |    |    |     |     |     |     |     |
|              | 223 |             |    |    |    |     |     |     |     |     |
|              | 255 |             |    |    |    |     |     |     |     |     |

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

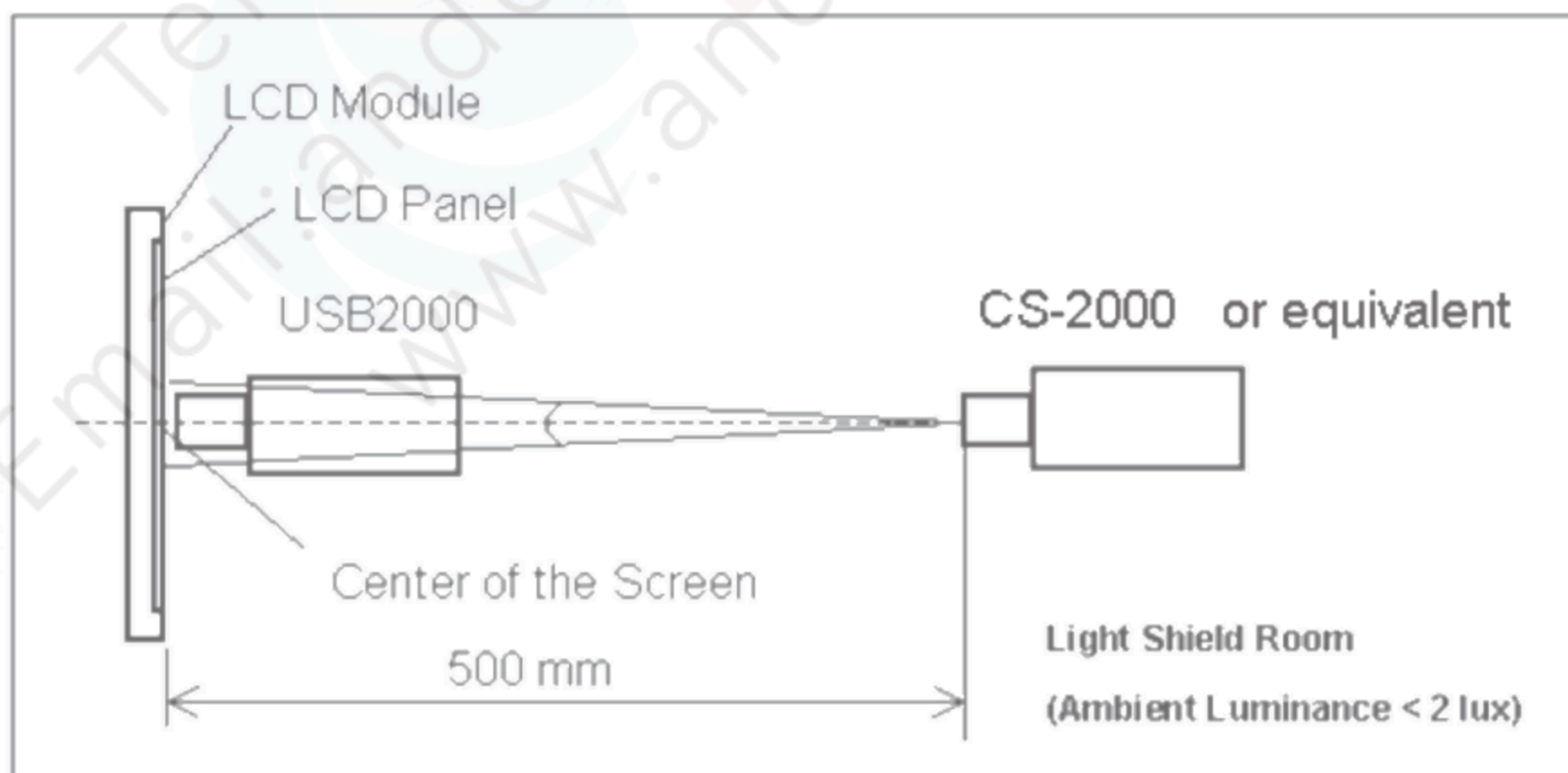
Measure the luminance of gray level 255 at center point

$$L_C = L(5)$$

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

Note (5) Measurement Setup:

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

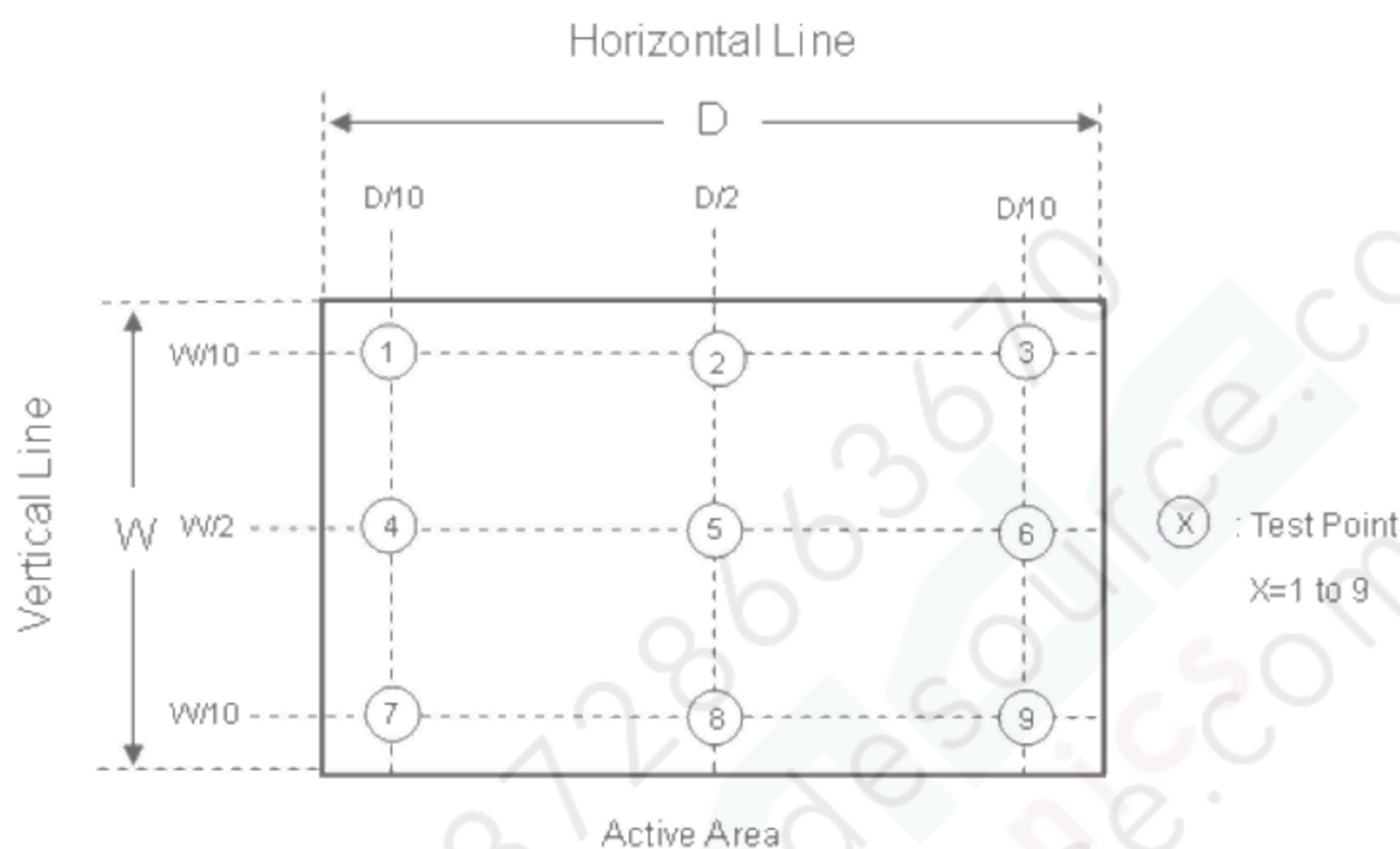




Note (6) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 255 at 9 points

$$\delta W = ( \text{Minimum } [L(1) \sim L(9)] / \text{Maximum } [L(1) \sim L(9)] ) * 100\%$$





## 6. RELIABILITY TEST ITEM

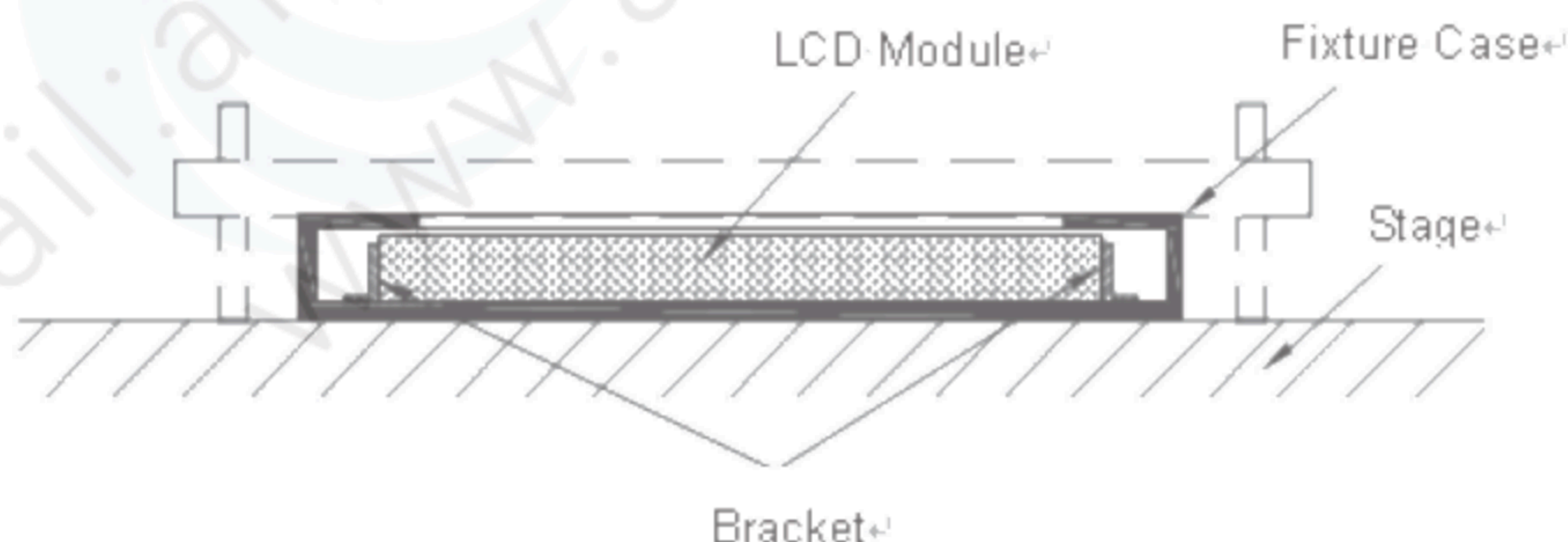
| Items                            | Required Condition                                                                                                | Note |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------|------|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

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

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

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

The fixing condition is shown as below:





## 7. Mechanical Strength Characteristics

### 7.1 Mechanical Strength Specifications

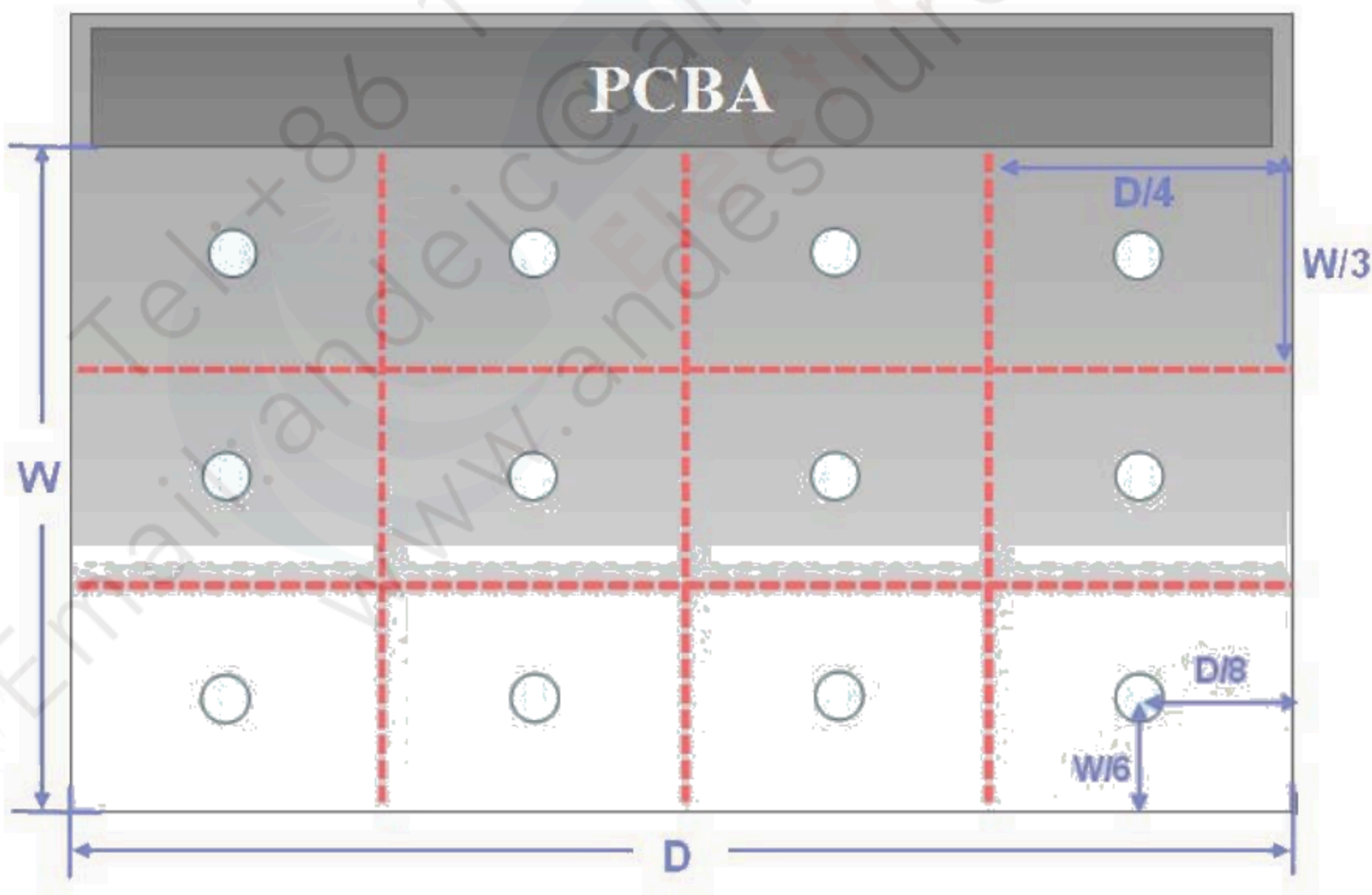
| Item                | Condition                      | Min | Unit | Note |
|---------------------|--------------------------------|-----|------|------|
| Mechanical Strength | 128 <sup>th</sup> Gray Pattern | 0.6 | Kgf  |      |

### 7.2 Test Conditions

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

### 7.3 Definition of Test Points

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





## 8. PACKING

### 8.1 PACKING SPECIFICATIONS

- (1) 13 LCD modules / 1 Box
- (2) Box dimensions: 567(L) X 356(W) X 376(H) mm
- (3) Weight: approximately: 28.84kg (13 modules per box)

### 8.2 PACKING METHOD



Figure. 8-1 Packing method



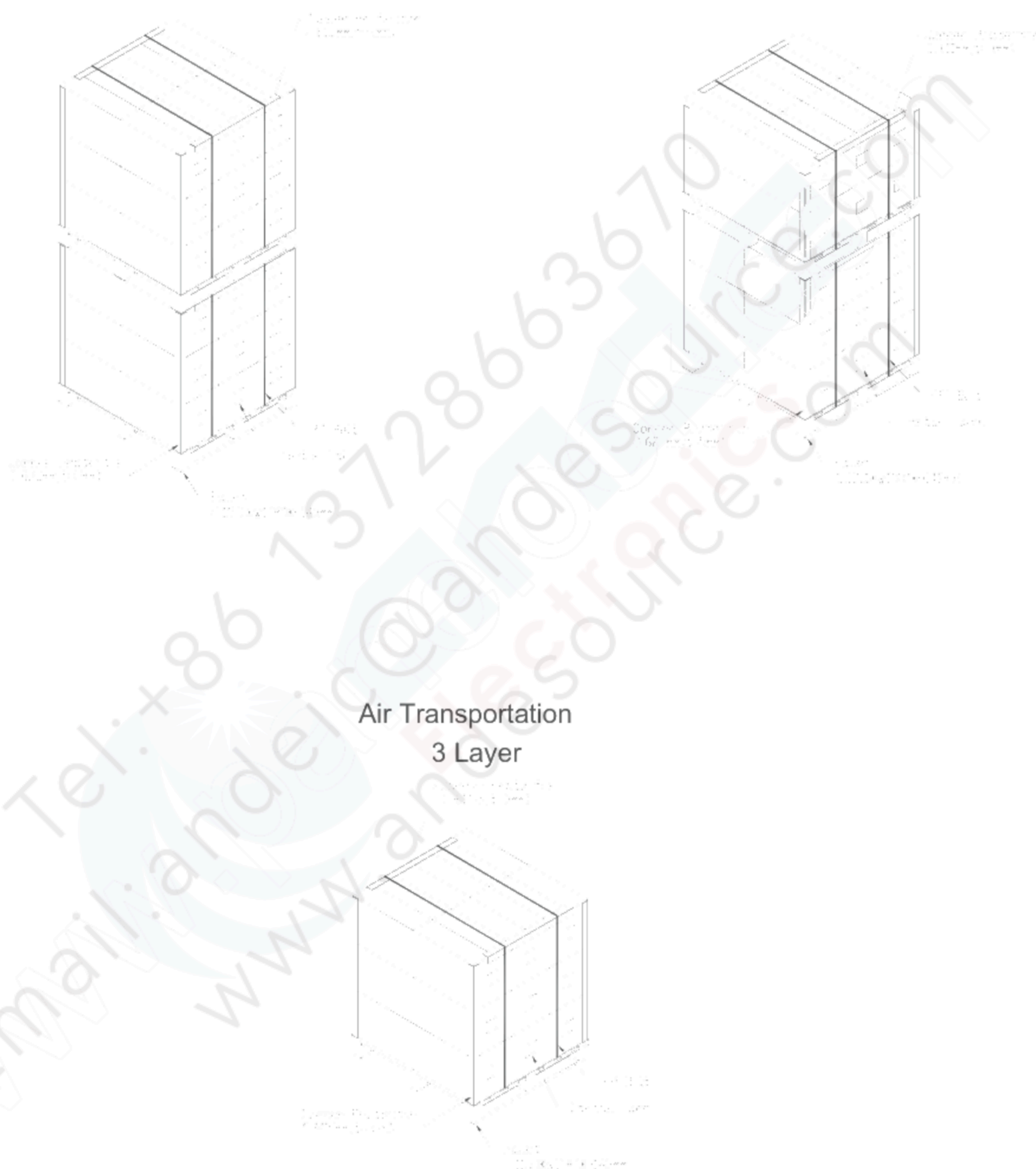
### 8.3 PALLET

Sea / Land Transportation (40ft HQ Container)

### 3+3 Layer

Sea / Land Transportation (40ft Container)

3+2 Layer



### Figure. 8-2 Packing method



## 8.4 UN-PACKING METHOD

UN-packaging method is shown as following figures.



**Figure. 8-3 Un-packing method**



## 9. INX MODULE LABEL

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



(a) Model Name: M215HJJ-L30

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

(c) INX barcode definition:

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

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

(d) Customer's barcode definition:

Serial ID: CM- L5J30-X-X-X-XX-L-XX-L-YMD-NNNN

| Code  | Meaning               | Description                                                                                                                                                                                                                                     |
|-------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CM    | Supplier code         | INX=CM                                                                                                                                                                                                                                          |
| L5J30 | Model number          | M215HJJ-L30= L5J30                                                                                                                                                                                                                              |
| X     | Revision code         | Non ZBD: 1,2,~,8,9 / ZBD: A~Z                                                                                                                                                                                                                   |
| X     | Source driver IC code | Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatek=C, OKI=D, Philips=E, Renesas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M, ILITEK=Q, Fiti=Y, None IC =Z |
| X     | Gate driver IC code   |                                                                                                                                                                                                                                                 |
| XX    | Cell location         | Tainan Taiwan=TN, Ningbo China=CN, Hsinchu Taiwan=SC                                                                                                                                                                                            |
| L     | Cell line #           | 1,2,~,9,A,B,~,Y,Z                                                                                                                                                                                                                               |
| XX    | Module location       | Tainan, Taiwan=TN ; Ningbo China=NP, Shenzhen China=SH                                                                                                                                                                                          |
| L     | Module line #         | 1,2,~,9,A,B,~,Y,Z                                                                                                                                                                                                                               |
| YMD   | Year, month, day      | Year: 0~9, 2001=1, 2002=2, 2003=3...2010=0, 2011=1, 2012=2...<br>Month: 1~12=1, 2, 3, ~, 9, A, B, C<br>Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V                                                                                             |
| NNNN  | Serial number         | By LCD supplier                                                                                                                                                                                                                                 |



(e) FAB ID(UL Factory ID):

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

## 10. PRECAUTIONS

### 10.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
- (4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
- (9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (10) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly.

### 10.2 STORAGE PRECAUTIONS

- (1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0°C to 35°C and relative humidity of less than 70%
- (2) Do not store the TFT – LCD module in direct sunlight
- (3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

### 10.3 OPERATION PRECAUTIONS

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

Normal condition is defined as below :

Temperature : 20±15°C

Humidity: 65±20%

Display pattern : continually changing pattern(Not stationary)



- (2) If the product will be used in extreme conditions such as high temperature, high humidity, high altitude, display pattern or operation time etc... It is strongly recommended to contact CMI for application engineering advice. Otherwise, its reliability and function may not be guaranteed..

#### 10.4 SAFETY PRECAUTIONS

- (1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (2) After the module's end of life, it is not harmful in case of normal operation and storage.

#### 10.5 SAFETY STANDARDS

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

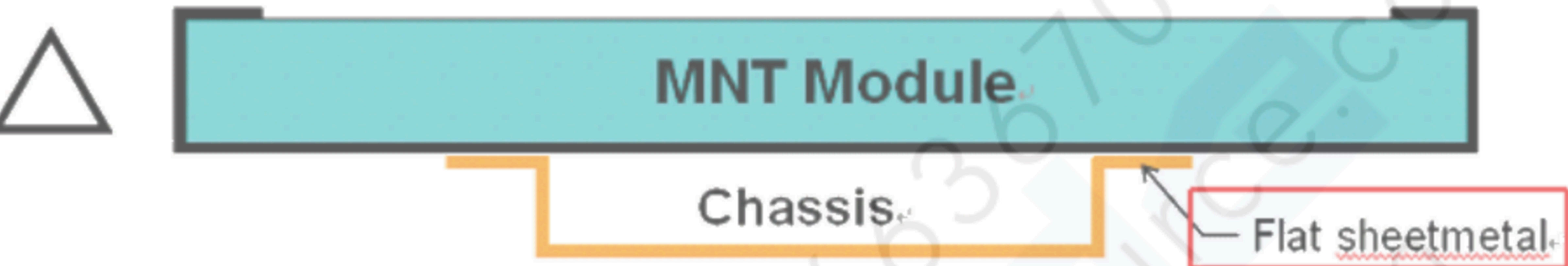
- (1) UL60950-1 or updated standard.
- (2) IEC60950-1 or updated standard.

#### 10.6 OTHER

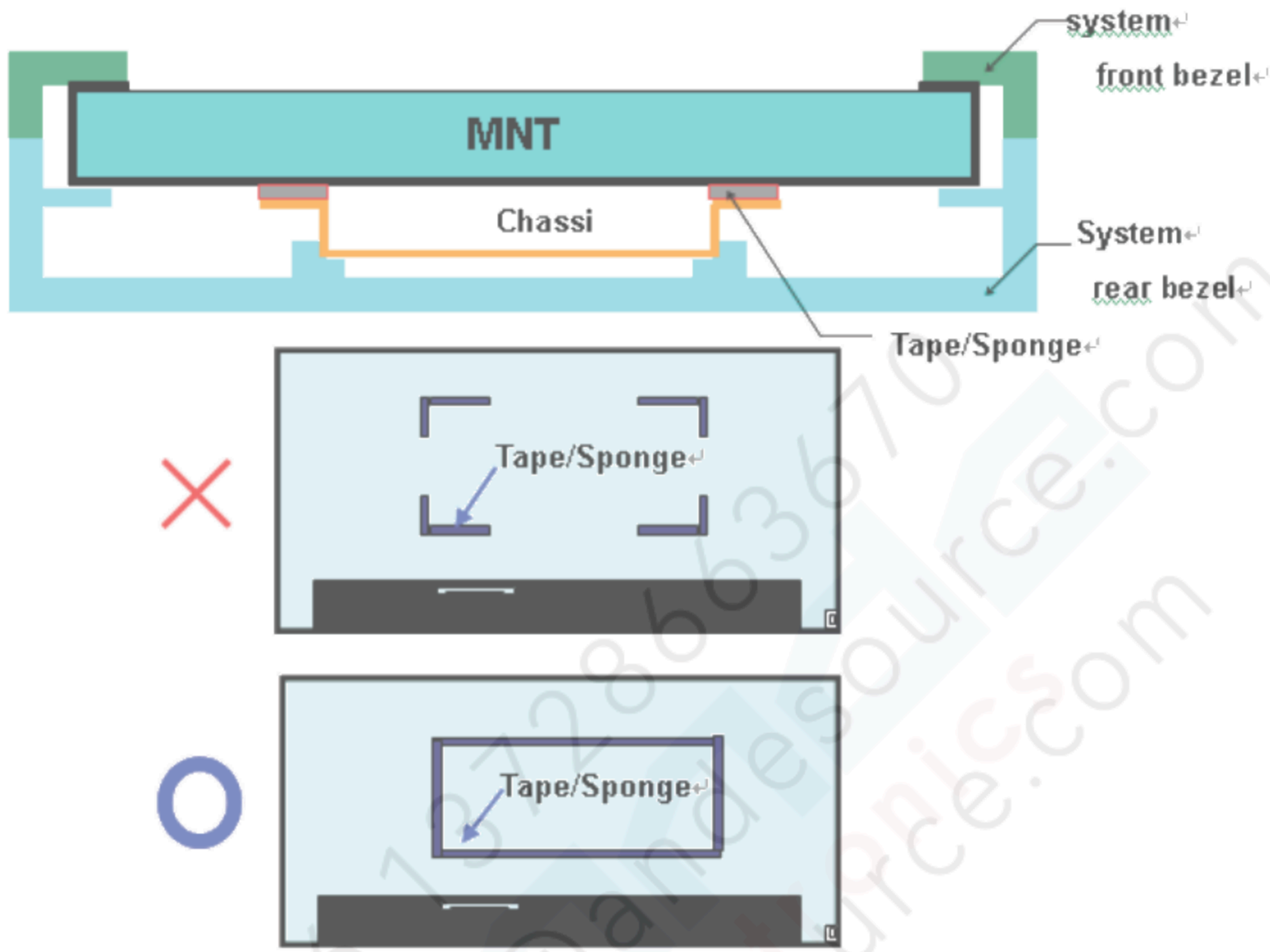
When fixed patterns are displayed for a long time, remnant image is likely to occur.



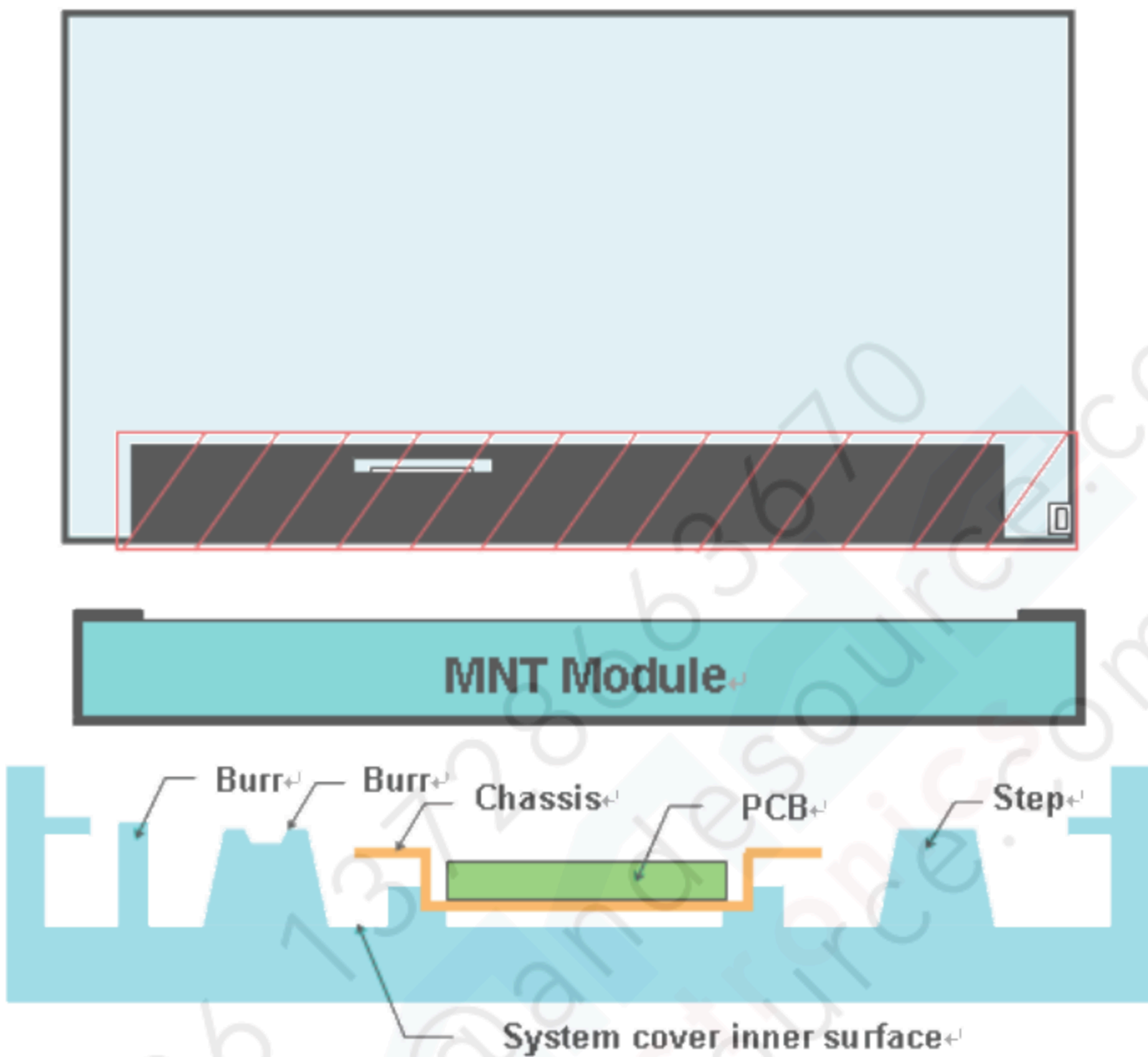
Appendix 1. SYSTEM COVER DESIGN NOTICE

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

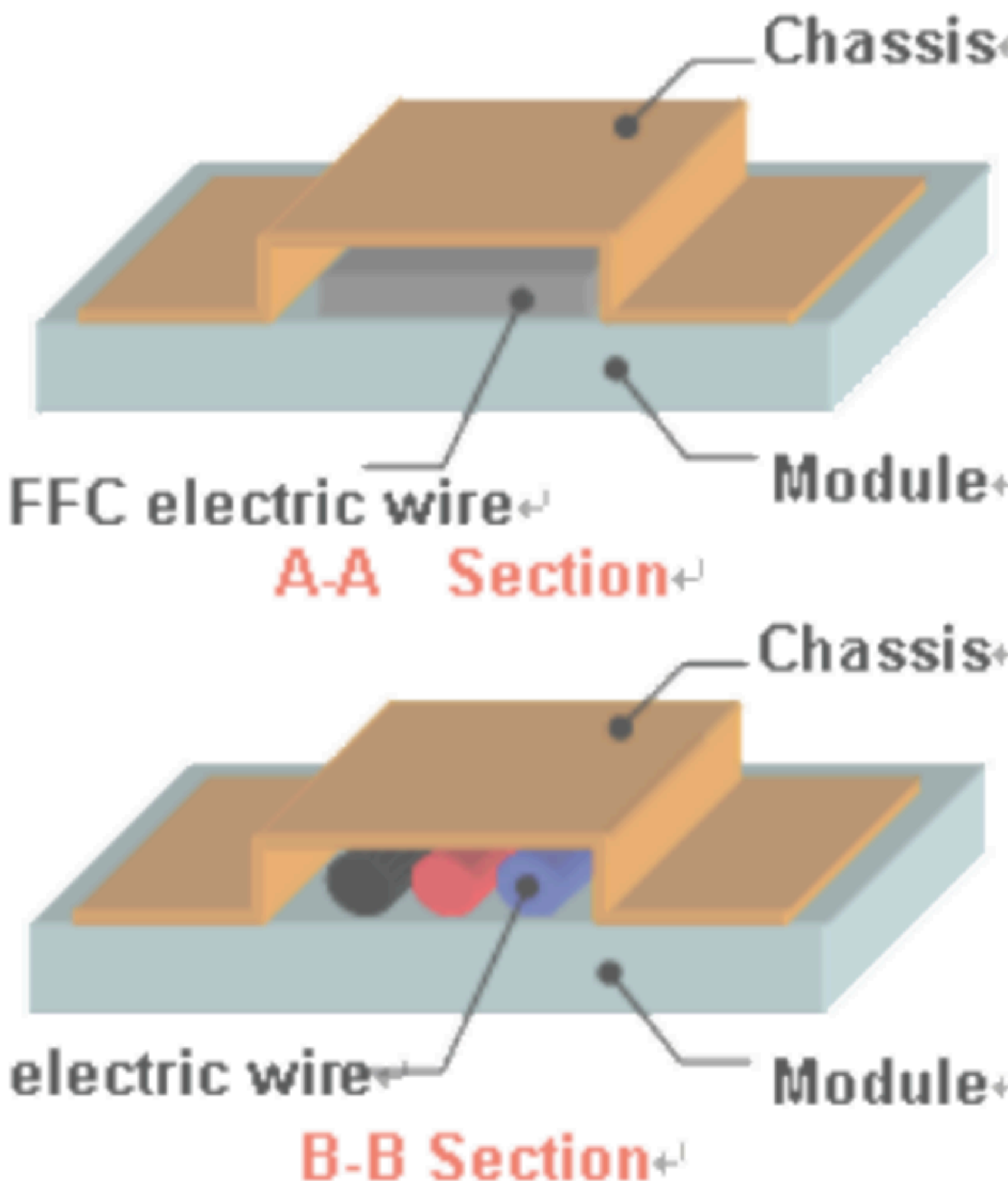
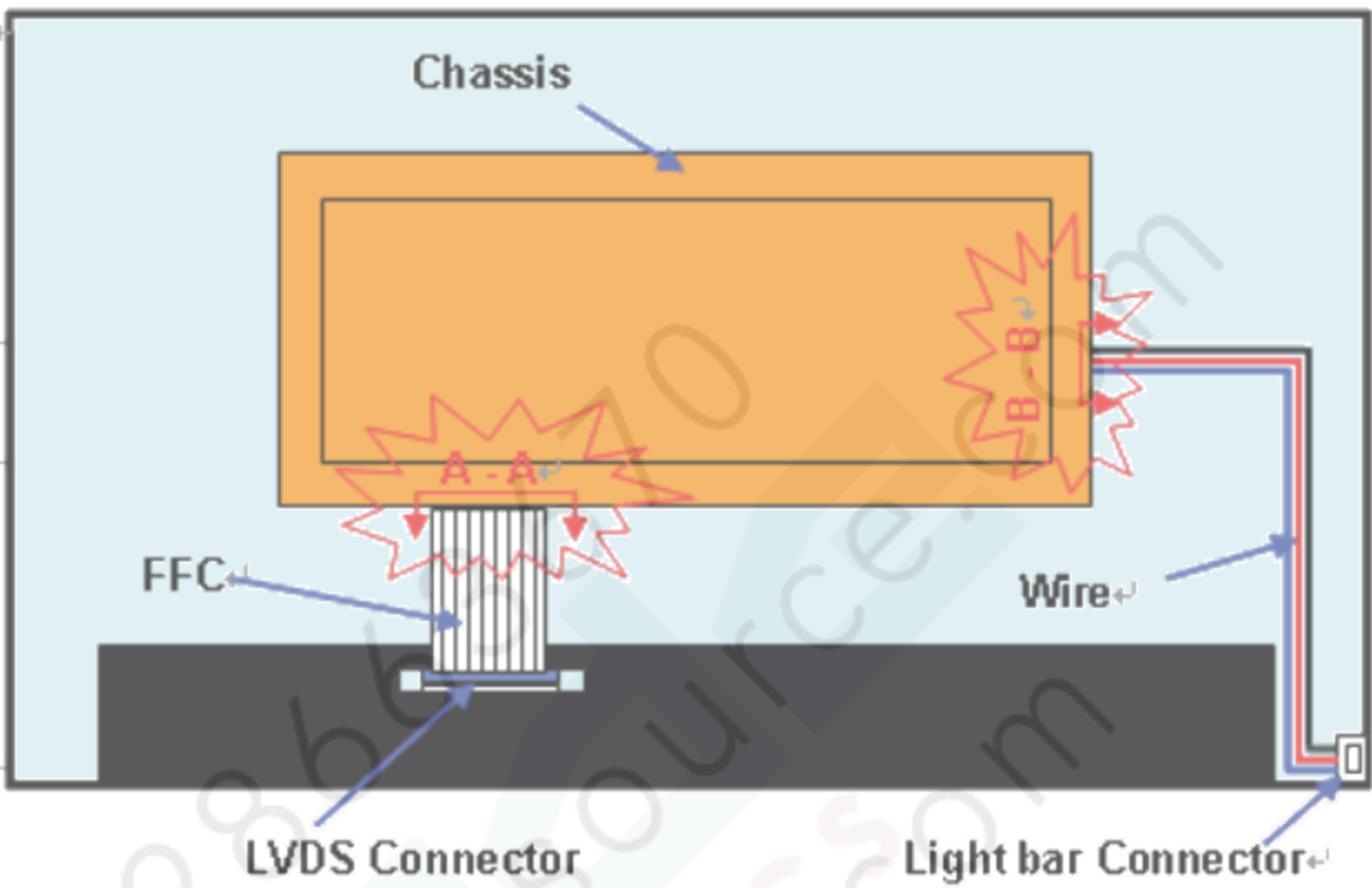


| 2          | Tape/sponge design on system inner surface                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |                                                                                                                                                                                                                                                                                                                                                                   |
| Definition | <p>a) To prevent from abnormal display &amp; white spot after Mechanical test, We suggest using Tape/Sponge as medium between chassis and Module rear cover could reduce the occurrence of white spot.</p> <p>b) When using the Tape/Sponge, suggest it be lay over between set chassis and module rear cover. it is not recommended to add tape/sponge in separate location. Since each tape/sponge may act as pressure concentration location.</p> |

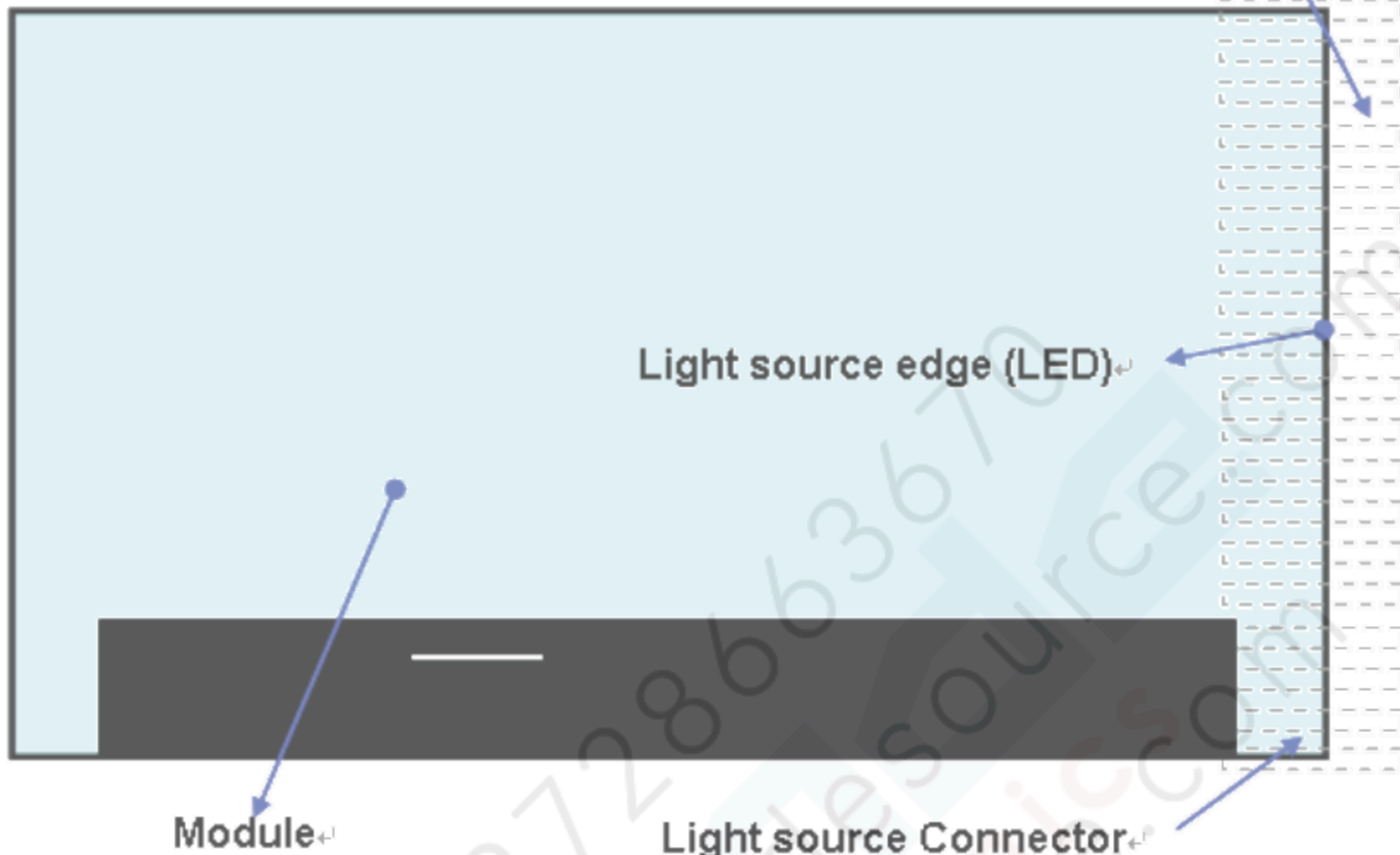


| 3          | System inner surface examination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |  <p>The diagram illustrates the system inner surface examination. The top part is a top-down view of a light blue rectangular area, likely the system cover, with a red hatched rectangle at the bottom indicating a specific area of interest. Below this is a cross-sectional view showing the MNT Module (teal) mounted on the System cover inner surface (light blue). The surface features are labeled: Burr, Burr, Chassis, PCB, and Step. A green PCB is shown within the chassis.</p> |
| Definition | <p>a). Burr at logo edge, step, protrusion or PCB board will easily cause white spot.</p> <p>b). Keeping flat surface underneath module is recommended.</p> <p>c). The area (  ) on Module PCBA and Light bar connector should keep at least 1mm gap to any structure with System cover inner surface.</p>                                                                                                                                                                                    |



|                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                      | The overlapping part on System's Chassis and electric wire needs gap structure.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|  <p>The left side of the diagram shows two cross-sectional views. The top view, labeled 'A-A Section', shows an 'FFC electric wire' (orange) connected to a 'Module' (grey) on a 'Chassis' (blue). The bottom view, labeled 'B-B Section', shows a standard 'electric wire' (red and blue) connected to a 'Module' (grey) on a 'Chassis' (blue).</p> |  <p>The right side of the diagram is a top-down view of the assembly. It shows a 'Chassis' (orange rectangle) with an 'FFC' (orange strip) connected to an 'LVDS Connector' (black) on a 'Module' (black rectangle). A 'Wire' (red and blue) is connected to a 'Light bar Connector' (black) on the same module. Red jagged lines indicate the 'A-A' and 'B-B' section lines. The 'Wire' is shown overlapping the 'Chassis'.</p> |
| Definition                                                                                                                                                                                                                                                                                                                                                                                                                             | The overlapping part on System's Chassis and electric wire (FPC、FFC and wire) needs gap structure to avoid display of white spot by pressing overlapping part cause interference.                                                                                                                                                                                                                                                                                                                                   |



|                                                                                                                                                                                                                                       |                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5                                                                                                                                                                                                                                     | System cover's ventilation outlet structure                                                                                                                  |
| <p>Set ventilation outlet structure on Light source side of module</p>  <p>Module</p> <p>Light source edge (LED)</p> <p>Light source Connector</p> |                                                                                                                                                              |
| Definition                                                                                                                                                                                                                            | To prevent from abnormal display of light leakage, We suggest to set ventilation outlet structure on side of Module Light bar in system cover inner surface. |

## Appendix 2. OUTLINE DRAWING



