



- ☐ Tentative Specification  
☒ Preliminary Specification  
☐ Approval Specification

**MODEL NO.: V315HH6**  
**SUFFIX: LS1**

**Customer:**

**APPROVED BY**

**SIGNATURE**

Name / Title

**Note**

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

| Approved By     | Checked By   | Prepared By  |
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**REVISION HISTORY**

| Version  | Date          | Page(New) | Section | Description                                                                                                                                                                                                                                                                                             |
|----------|---------------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ver. 1.0 | 17 Nov., 2010 | All       | All     | The preliminary specification was first issued.                                                                                                                                                                                                                                                         |
| 1.1      | 18 Nov., 2010 | 11        | 3.2.1   | Note(1): IL: 120 mA → 130 mA                                                                                                                                                                                                                                                                            |
|          |               | 11        | 3.2.2   | Revise converter 2D mode power consumption:<br>Typ: 45 → (50) Max: 51.8 → (57.5)<br>Revise converter 2D mode input current: 2.08 → (2.04)<br>Revise input inrush current, 3D mode: 9.5 → (6.67),<br>IL: 3*typ → 2*typ<br>Note(3): Specify for 2D mode duration<br>Revise note(6) test condition drawing |
| 1.2      | 10 Dec., 2010 | 12        |         | Depth(3) Min 34.9→25, Typ. 35.9→26, Max. 36.9→27;<br>Add depth(4) item<br>Weight: TBD → 4540 g                                                                                                                                                                                                          |
|          |               | 6         | 1.5     |                                                                                                                                                                                                                                                                                                         |
|          |               | 11        | 3.2.1   | One string voltage: Max.: 45.5 → 47.45                                                                                                                                                                                                                                                                  |
|          |               |           | 3.2.2   | Power consumption: Pbl(3D): Typ.: (21.6)→(24.0),<br>Max: (24.8)→(27.6)<br>Converter input current: Ibl(3D):Typ.: (0.9)→(1.0),<br>Max: (1.03)→(1.15)                                                                                                                                                     |
|          |               | 27        | 6.1.1   | Add column "Frame rate"                                                                                                                                                                                                                                                                                 |
|          |               | 28        | 6.1.2   | Add column "Frame rate"                                                                                                                                                                                                                                                                                 |
|          |               | 30        | 6.1     | Note(6) add 3D horizontal timing requirement                                                                                                                                                                                                                                                            |
|          |               | 31        | 6.2.2   | New added                                                                                                                                                                                                                                                                                               |
|          |               | 34        | 7.2     | Center Luminance: Min: - → (350)<br>Add 3D Luminance: Typ : (45)<br>Modify Color chromaticity R,G,B coordinates<br>Add column "Transmission direction of up polarizer"                                                                                                                                  |
| 1.3      | 11 Feb., 2011 | 37        | 7       | Add note(7) and note(8)                                                                                                                                                                                                                                                                                 |
|          |               | 8         | 3.1     | Rush current: (3) → (4)                                                                                                                                                                                                                                                                                 |
|          |               | 11        | 3.2.2   | Update note(3) description                                                                                                                                                                                                                                                                              |
|          |               | 27        | 6.1.1   | Vertical active display term: 3D, Total : 1524 → 1400                                                                                                                                                                                                                                                   |
|          |               | 28        | 6.1.2   | Vertical active display term: 3D, Total : 1524 → 1400                                                                                                                                                                                                                                                   |
|          |               | 37        | 7.2     | Update note(7) TN mode shutter glass reference drawing                                                                                                                                                                                                                                                  |
|          |               | 38        | 7.2     | Update note(8) 3D mode measurement illustration                                                                                                                                                                                                                                                         |

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V315HH6-LS1 is a 31.5" TFT Liquid Crystal Display module with LED Backlight unit and 4ch-LVDS interface. This module supports 1920 x 1080 Full HDTV format and can display 16.7M colors (8-bit). The converter module for backlight is built-in.

### 1.2 FEATURES

- High brightness (400 nits)
- High contrast ratio (1000 :1)
- Fast response time (3ms)
- High color saturation (NTSC 72%)
- Full HDTV (1920 x 1080 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for 120 Hz frame rate
- Viewing Angle : 160°(H)/150°(V) (CR>10) TN Technology

### 1.3 APPLICATION

- TFT LCD TVs
- Optimized Brightness, Multi-Media Displays

### 1.4 GENERAL SPECIFICATIONS

| Item                   | Specification                      | Unit  | Note |
|------------------------|------------------------------------|-------|------|
| Active Area            | 698.4(H) x 392.85(V)               | mm    | (1)  |
| Bezel Opening Area     | 705.4(H) x 399.8 (V)               | mm    |      |
| Driver Element         | a-si TFT active matrix             | -     | -    |
| Pixel Number           | 1920x R.G.B. x 1080                | pixel | -    |
| Pixel Pitch(Sub Pixel) | 0.12125 (H) x 0.36375 (V)          | mm    | -    |
| Pixel Arrangement      | RGB vertical stripe                | -     | -    |
| Power consumption      | (65)                               | Watt  | (2)  |
| Display Colors         | 16.7M                              | color | -    |
| Display Operation Mode | Transmissive mode / Normally White | -     | -    |
| Surface Treatment      | Anti-Glare coating (Haze 25%)      | -     | (3)  |

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

Note (2) Please refer sec 3.1 and 3.2 for more information of Power consumption

Note (3) The spec. of the surface treatment is temporarily for this phase. CMI reserves the rights to change this feature.

## 1.5 MECHANICAL SPECIFICATIONS

| Item        |                | Min.  | Typ.   | Max.  | Unit | Note |
|-------------|----------------|-------|--------|-------|------|------|
| Module Size | Horizontal (H) | 740.4 | 741.4  | 742.4 | mm   | (1)  |
|             | Vertical (V)   | 434.8 | 435.8  | 436.8 | mm   | (1)  |
|             | Depth (D)      | 19.55 | 20.55  | 21.55 | mm   | (2)  |
|             | Depth (D)      | 25    | 26     | 27    | mm   | (3)  |
|             | Derth (D)      | 34.9  | 35.9   | 36.9  | mm   | (4)  |
| Weight      |                |       | 4540 g |       |      | -    |

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

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

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

Note (4) Module Depth is between bezel to rear boss

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 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) |
| Shock (Non-Operating)         | SNOP   | -     | 50   | G    | (3), (5) |
| Vibration (Non-Operating)     | VNOP   | -     | 1.0  | G    | (4), (5) |

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

(a) 90 %RH Max. ( $T_a \leq 40\text{ }^{\circ}\text{C}$ ).

(b) Wet-bulb temperature should be 39 °C Max. ( $T_a > 40\text{ }^{\circ}\text{C}$ ).

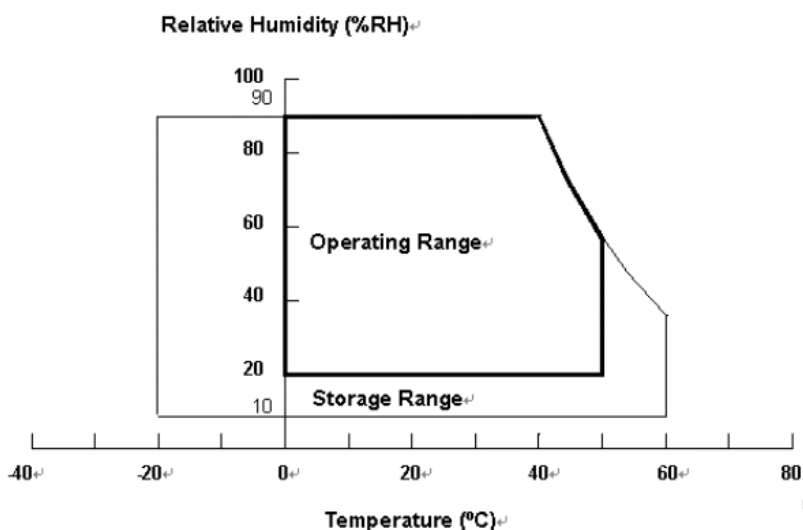
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for  $\pm X$ ,  $\pm Y$ ,  $\pm Z$ .

Note (4) 10 ~ 200 Hz, 30 min, 1 time each X, Y, Z.

Note (5) 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.



## 2.2 PACKAGE STORAGE

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

- Do not leave the module in high temperature, and high humidity for a long time, It is highly recommended to store the module with temperature from 0 to 35 °C at normal humidity without condensation.
- The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 TFT LCD MODULE

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

### 2.3.2 BACKLIGHT CONVERTER UNIT

| Item                 | Symbol | Value |      | Unit            | Note     |
|----------------------|--------|-------|------|-----------------|----------|
|                      |        | Min.  | Max. |                 |          |
| Light bar Voltage    | VW     | —     | 60   | V <sub>DC</sub> | 3D Mode  |
| Power Supply Voltage | VBL    | 0     | 30   | V               | (1)      |
| Control Signal Level | —      | -0.3  | 7    | V               | (1), (3) |

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) No moisture condensation or freezing.

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

## 3. ELECTRICAL CHARACTERISTICS

### 3.1 TFT LCD MODULE

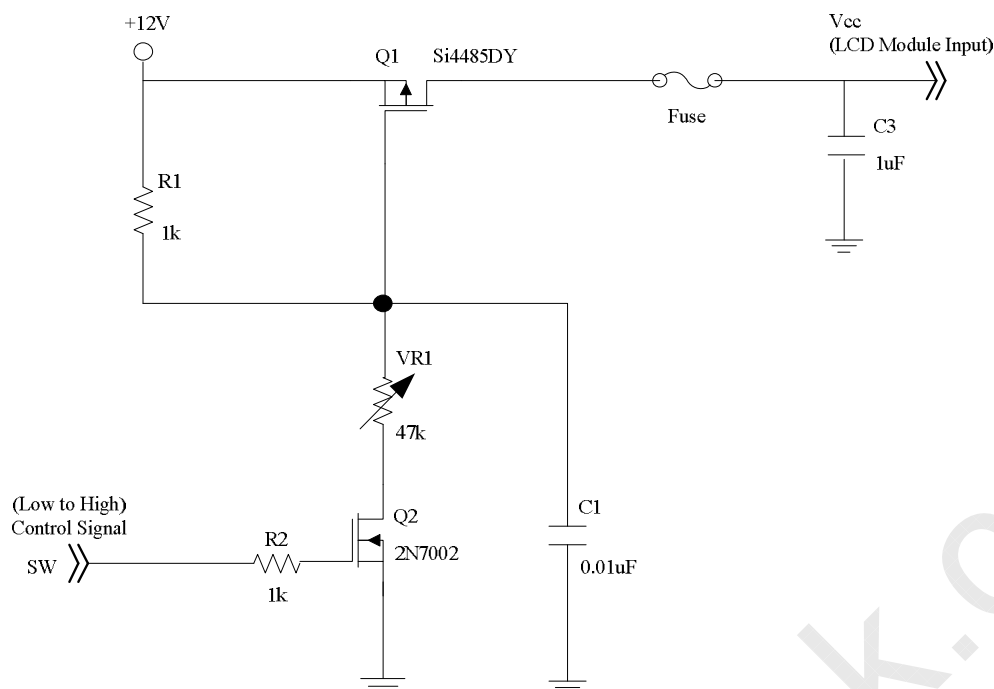
(Ta = 25 ± 2 °C)

| Parameter            |                                           | Symbol            | Value |        |        | Unit | Note |
|----------------------|-------------------------------------------|-------------------|-------|--------|--------|------|------|
|                      |                                           |                   | Min.  | Typ.   | Max.   |      |      |
| Power Supply Voltage |                                           | V <sub>CC</sub>   | 10.8  | 12     | (13.2) | V    | (1)  |
| Rush Current         |                                           | I <sub>RUSH</sub> | —     | —      | (4)    | A    | (2)  |
| Power Consumption    | White Pattern                             | —                 | —     | (6.6)  | (7.8)  | W    | (3)  |
|                      | Horizontal Stripe                         | —                 | —     | (15)   | (17.4) | W    |      |
|                      | Black Pattern                             | —                 | —     | (15)   | (17.4) | W    |      |
| Power Supply Current | White Pattern                             | —                 | —     | (0.55) | (0.65) | A    |      |
|                      | Horizontal Stripe                         | —                 | —     | (1.25) | (1.45) | A    |      |
|                      | Black Pattern                             | —                 | —     | (1.25) | (1.45) | A    |      |
| LVDS interface       | Differential Input High Threshold Voltage | V <sub>LVTH</sub> | +100  | —      | —      | mV   | (4)  |
|                      | Differential Input Low Threshold Voltage  | V <sub>LVTL</sub> | —     | —      | -100   | mV   |      |
|                      | Common Input Voltage                      | V <sub>CM</sub>   | 1.0   | 1.2    | 1.4    | V    |      |
|                      | Differential input voltage (single-end)   | V <sub>ID</sub>   | 200   | —      | 600    | mV   |      |
|                      | Terminating Resistor                      | R <sub>T</sub>    | —     | 100    | —      | ohm  |      |
| CMIS interface       | Input High Threshold Voltage              | V <sub>IH</sub>   | 2.7   | —      | 3.3    | V    |      |
|                      | Input Low Threshold Voltage               | V <sub>IL</sub>   | 0     | —      | 0.7    | V    |      |

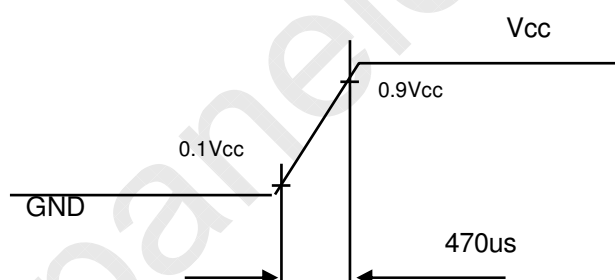
Note (1) The module should be always operated within the above ranges.

Note (2) Measurement condition:



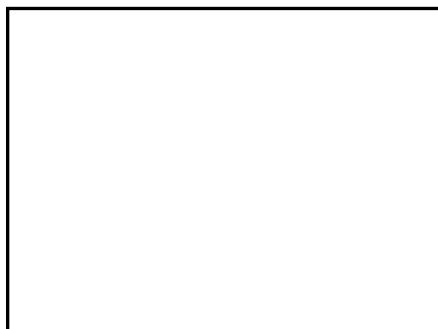


**Vcc rising time is 470us**



Note (3) The specified power consumption and power supply current is under the conditions at  $V_{cc} = 12\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $f_v = 120\text{ Hz}$ , where as a power dissipation check pattern below is displayed.

a. White Pattern



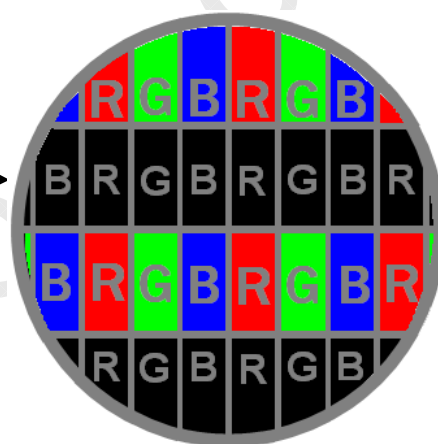
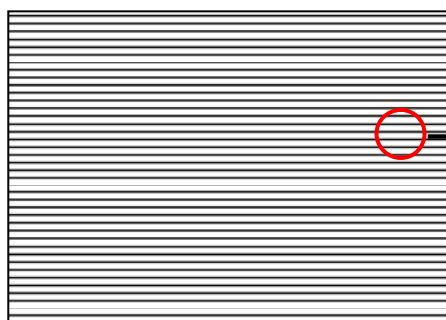
Active Area

b. Black Pattern

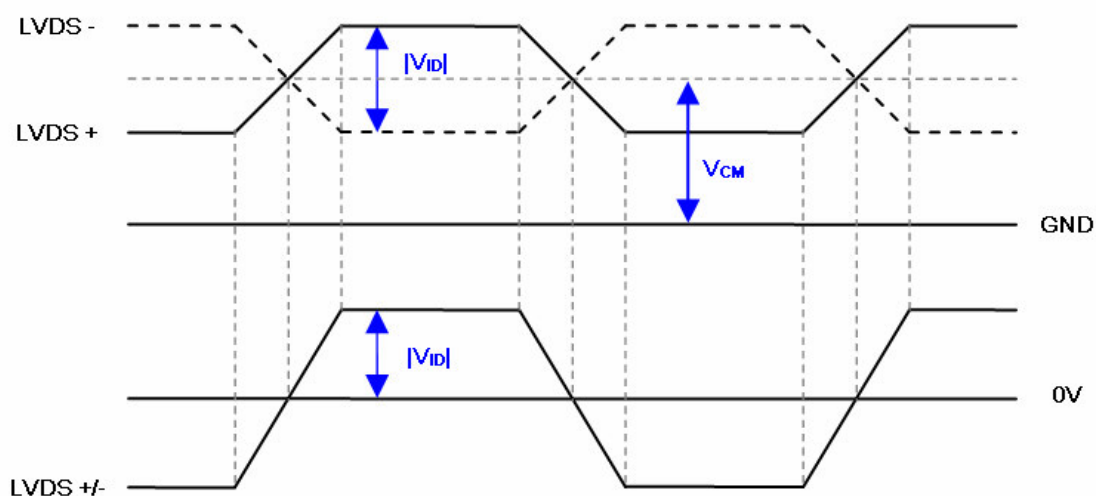


Active Area

c. Horizontal Pattern



Note (4) The LVDS input characteristics are as follows:



## 3.2 BACKLIGHT CONNECTOR PIN CONFIGURATION

### 3.2.1 LED LIGHT BAR CHARACTERISTICS (Ta = 25 ± 2 °C)

The backlight unit contains 2 pcs of light bars

| Parameter                    | Symbol             | Value  |      |        | Unit            | Note                   |
|------------------------------|--------------------|--------|------|--------|-----------------|------------------------|
|                              |                    | Min.   | Typ. | Max.   |                 |                        |
| Total Current (8 String)     | If                 | -      | 1040 | 1102.4 | mA              |                        |
| One String Current           | I <sub>L(2D)</sub> | -      | 130  | 137.8  | mA              |                        |
|                              | I <sub>L(3D)</sub> | -      | 260  | 275.6  | mApeak          | 3D ENA=ON              |
| One String Voltage           | V <sub>W</sub>     | 39     | -    | 47.45  | V <sub>DC</sub> | I <sub>L</sub> = 130mA |
| One String Voltage Variation | △V <sub>W</sub>    | -      | -    | 2      | V               |                        |
| Life time                    | -                  | 30,000 | -    | -      | Hrs             | (1)                    |

Note (1) The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value, Operating condition: Continuous operating at Ta = 25±2°C, I<sub>L</sub> = 130mA.

### 3.2.2 CONVERTER CHARACTERISTICS (Ta = 25 ± 2 °C)

| Parameter               | Symbol              | Value |        |        | Unit  | Note                                            |
|-------------------------|---------------------|-------|--------|--------|-------|-------------------------------------------------|
|                         |                     | Min.  | Typ.   | Max.   |       |                                                 |
| Power Consumption       | P <sub>BL(2D)</sub> | -     | (50)   | (57.5) | W     | (1), (2)<br>IL = 130 mA                         |
|                         | P <sub>BL(3D)</sub> | -     | (24.0) | (27.6) | W     | (1), (2)<br>IL=2*typ.                           |
| Converter Input Voltage | VBL                 | 22.8  | 24.0   | 25.2   | VDC   |                                                 |
| Converter Input Current | I <sub>BL(2D)</sub> | -     | (2.08) | (2.4)  | A     | Non Dimming                                     |
|                         | I <sub>BL(3D)</sub> | -     | (1.0)  | (1.15) | A     |                                                 |
| Input Inrush Current    | I <sub>R(2D)</sub>  | -     | -      | (3.24) | Apeak | V <sub>BL</sub> =22.8V, (IL=typ.)<br>(3), (7)   |
|                         | I <sub>R(3D)</sub>  | -     | -      | (6.67) | Apeak | V <sub>BL</sub> =22.8V, (IL=2*typ.)<br>(3), (6) |
| Dimming Frequency       | FB                  | 150   | 160    | 170    | Hz    | (5)                                             |
| Minimum Duty Ratio      | DMIN                | 5     | 10     | -      | %     | (4), (5)                                        |

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

Note (2) The measurement condition of Max. value is based on 31.5" backlight unit under input voltage 24V, average LED current 137.8mA at 2D Mode (LED current 275.6 mA<sub>peak</sub> at 3D Mode) and lighting 1 hour later.

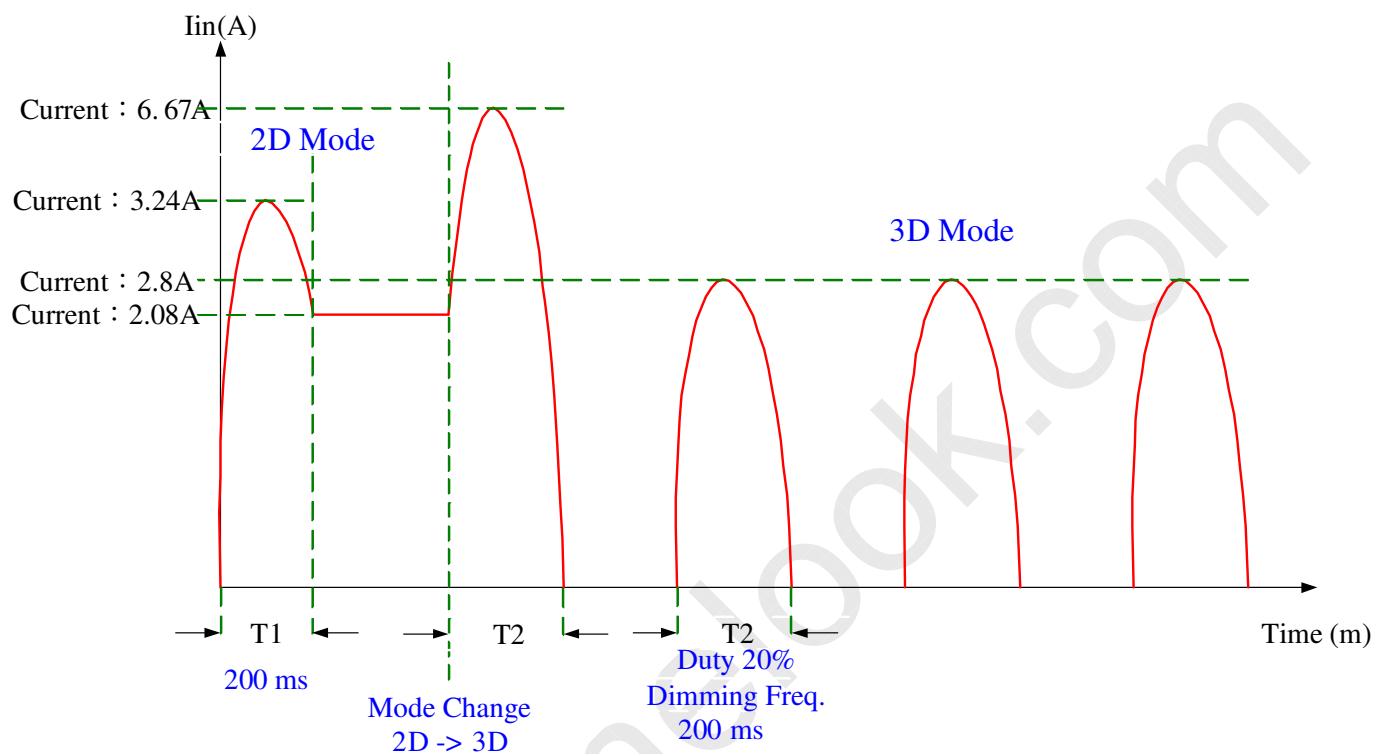
Note (3) For input inrush current measurement, the VBL rising time from 10% to 90% is about 30ms.

Note (4) 5% minimum duty ratio is only valid for electrical operation.

Note (5) FB and DMIN are available only at 2D Mode.

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

**Test Condition:  $V_{BL}=22.8V$ ,  $I_L=130mA$  at 2D Mode/  $I_L=(260mA)_{peak}$  at 3D Mode**



## 3.2.3 CONVERTER INTERFACE CHARACTERISTICS

| Parameter                    |     | Symbol           | Test Condition | Value |      |      | Unit | Note                                           |           |
|------------------------------|-----|------------------|----------------|-------|------|------|------|------------------------------------------------|-----------|
|                              |     |                  |                | Min.  | Typ. | Max. |      |                                                |           |
| On/Off Control Voltage       | ON  | VBLON            | —              | 2.0   | —    | 5.0  | V    |                                                |           |
|                              | OFF |                  | —              | 0     | —    | 0.8  | V    |                                                |           |
| External PWM Control Voltage | HI  | VEPWM            | —              | 2.0   | —    | 5.25 | V    | Duty on                                        | (5) , (6) |
|                              | LO  |                  | —              | 0     | —    | 0.8  | V    | Duty off                                       |           |
| Error Signal                 |     | ERR              | —              | —     | —    | —    | —    | Abnormal: Open collector<br>Normal: GND<br>(4) |           |
| VBL Rising Time              |     | Tr1              | —              | 30    | —    | —    | ms   | 10%-90%V <sub>BL</sub>                         |           |
| Control Signal Rising Time   |     | Tr               | —              | —     | —    | 100  | ms   |                                                |           |
| Control Signal Falling Time  |     | Tf               | —              | —     | —    | 100  | ms   |                                                |           |
| PWM Signal Rising Time       |     | TPWMR            | —              | —     | —    | 50   | us   | (6)                                            |           |
| PWM Signal Falling Time      |     | TPWMF            | —              | —     | —    | 50   | us   | (6)                                            |           |
| Input Impedance              |     | Rin              | —              | 1     | —    | —    | MΩ   | E_PWM, BLON                                    |           |
| PWM Delay Time               |     | TPWM             | —              | 100   | —    | —    | ms   | (6)                                            |           |
| BLON Delay Time              |     | T <sub>on</sub>  | —              | 300   | —    | —    | ms   |                                                |           |
|                              |     | T <sub>on1</sub> | —              | 300   | —    | —    | ms   |                                                |           |
| BLON Off Time                |     | Toff             | —              | 300   | —    | —    | ms   |                                                |           |

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

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

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

Turn ON sequence: VBL → PWM signal → BLON

Turn OFF sequence: BLOFF → PWM signal → VBL

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

Note (5) The EPWM interface that inserts a pull up resistor to 5V in Max Duty (100%), please refers to Fig.2.

Note (6) EPWM is available only at 2D Mode.

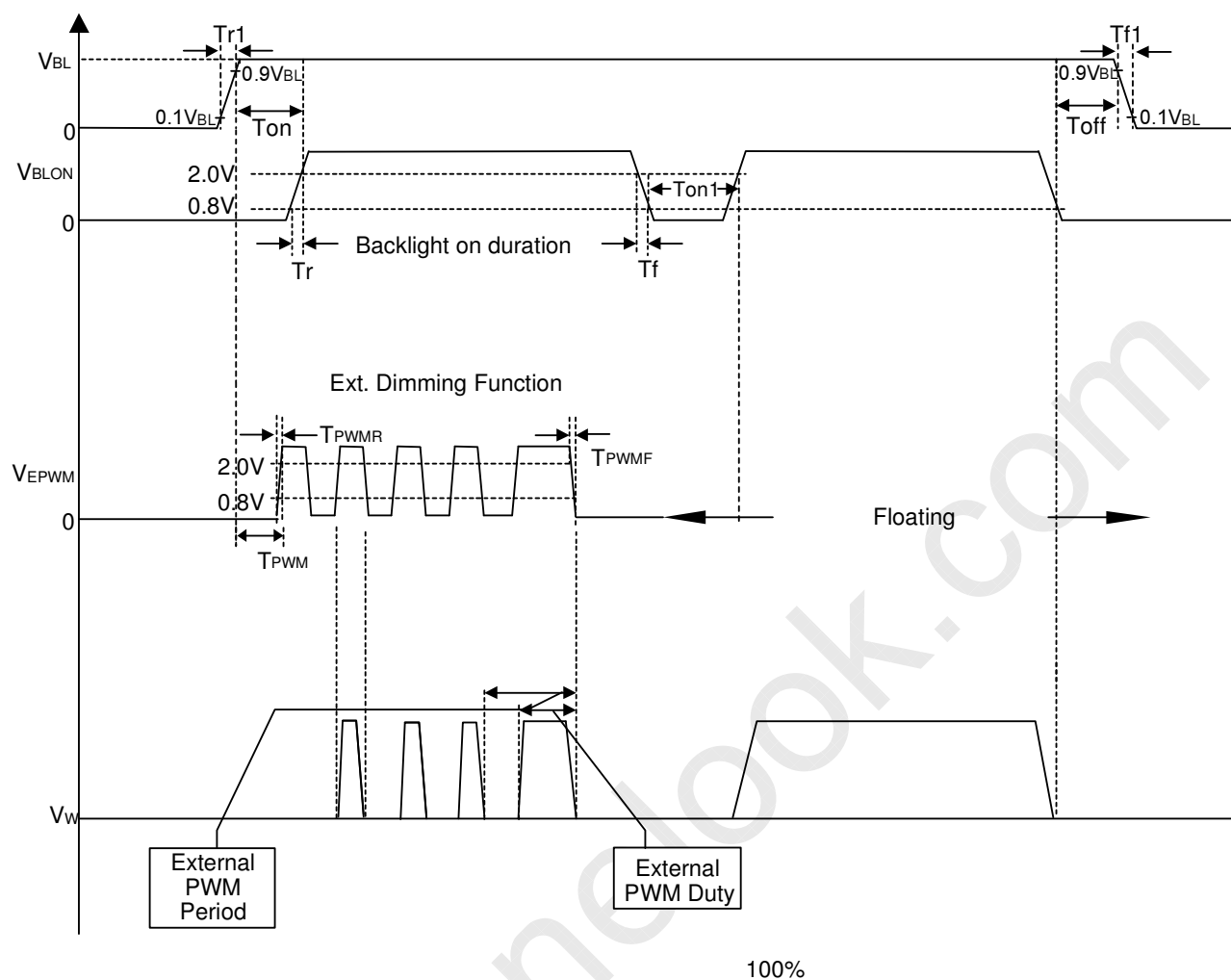


Fig. 1

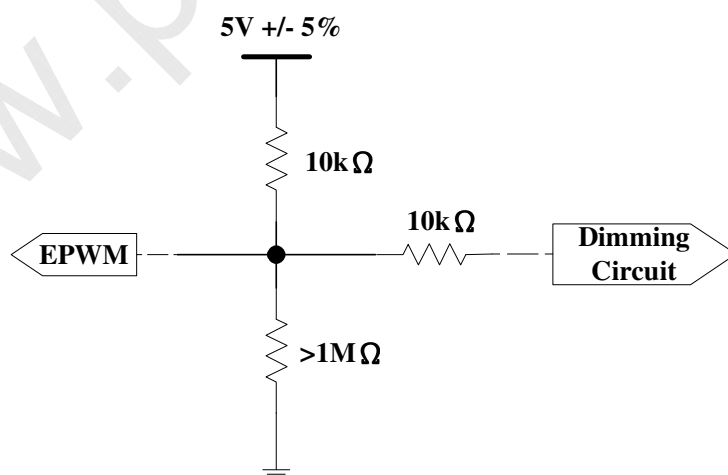
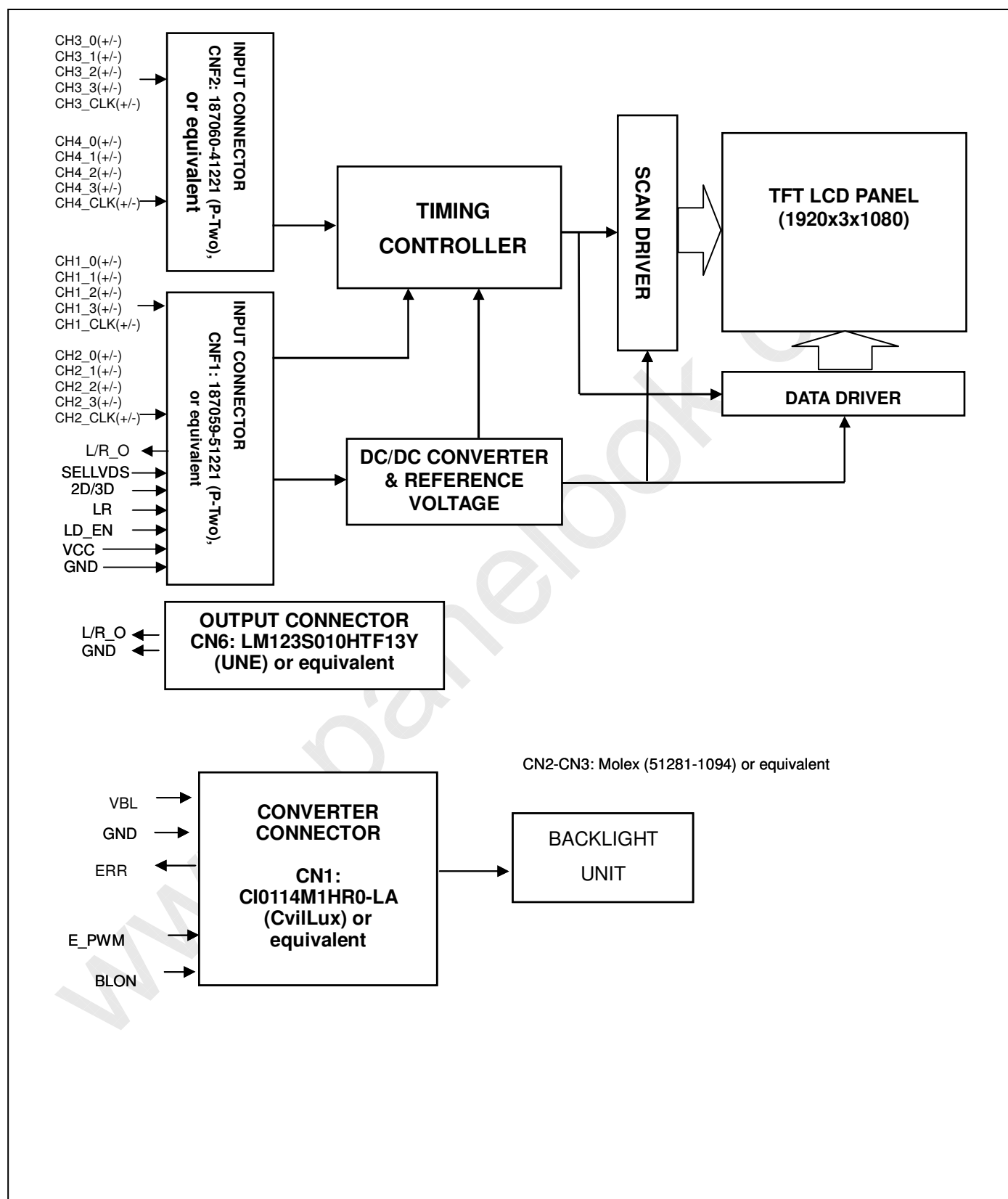


Fig. 2

## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

CNF1 Connector Pin Assignment: (187059-51221 (P-Two) or equivalent)

| Pin | Name    | Description                                                | Note   |
|-----|---------|------------------------------------------------------------|--------|
| 1   | N.C.    | No Connection                                              | (1)    |
| 2   | N.C.    | No Connection                                              |        |
| 3   | N.C.    | No Connection                                              |        |
| 4   | N.C.    | No Connection                                              |        |
| 5   | L/R_O   | Output signal for Left Right Glasses control               | (8)    |
| 6   | N.C.    | No Connection                                              | (1)    |
| 7   | SELLVDS | LVDS Data Format Selection                                 | (2)(6) |
| 8   | N.C.    | No Connection                                              | (1)    |
| 9   | N.C.    | No Connection                                              |        |
| 10  | N.C.    | No Connection                                              |        |
| 11  | GND     | Ground                                                     |        |
| 12  | CH1[0]- | First pixel Negative LVDS differential data input. Pair 0  |        |
| 13  | CH1[0]+ | First pixel Positive LVDS differential data input. Pair 0  |        |
| 14  | CH1[1]- | First pixel Negative LVDS differential data input. Pair 1  |        |
| 15  | CH1[1]+ | First pixel Positive LVDS differential data input. Pair 1  |        |
| 16  | CH1[2]- | First pixel Negative LVDS differential data input. Pair 2  |        |
| 17  | CH1[2]+ | First pixel Positive LVDS differential data input. Pair 2  |        |
| 18  | GND     | Ground                                                     |        |
| 19  | CH1CLK- | First pixel Negative LVDS differential clock input.        |        |
| 20  | CH1CLK+ | First pixel Positive LVDS differential clock input.        |        |
| 21  | GND     | Ground                                                     |        |
| 22  | CH1[3]- | First pixel Negative LVDS differential data input. Pair 3  |        |
| 23  | CH1[3]+ | First pixel Positive LVDS differential data input. Pair 3  |        |
| 24  | N.C.    | No Connection                                              | (1)    |
| 25  | N.C.    | No Connection                                              |        |
| 26  | 2D/3D   | Input signal for 2D/3D Mode Selection                      | (3)(6) |
| 27  | L/R     | Input signal for Left Right eye frame synchronous          | (4)(6) |
| 28  | CH2[0]- | Second pixel Negative LVDS differential data input. Pair 0 |        |





|    |         |                                                            |        |
|----|---------|------------------------------------------------------------|--------|
| 29 | CH2[0]+ | Second pixel Positive LVDS differential data input. Pair 0 |        |
| 30 | CH2[1]- | Second pixel Negative LVDS differential data input. Pair 1 |        |
| 31 | CH2[1]+ | Second pixel Positive LVDS differential data input. Pair 1 |        |
| 32 | CH2[2]- | Second pixel Negative LVDS differential data input. Pair 2 |        |
| 33 | CH2[2]+ | Second pixel Positive LVDS differential data input. Pair 2 |        |
| 34 | GND     | Ground                                                     |        |
| 35 | CH2CLK- | Second pixel Negative LVDS differential clock input.       |        |
| 36 | CH2CLK+ | Second pixel Positive LVDS differential clock input.       |        |
| 37 | GND     | Ground                                                     |        |
| 38 | CH2[3]- | Second pixel Negative LVDS differential data input. Pair 3 |        |
| 39 | CH2[3]+ | Second pixel Positive LVDS differential data input. Pair 3 |        |
| 40 | N.C.    | No Connection                                              | (1)    |
| 41 | N.C.    | No Connection                                              |        |
| 42 | LD_EN   | Local Dimming Enable                                       | (5)(6) |
| 43 | N.C.    | No Connection                                              | (1)    |
| 44 | GND     | Ground                                                     |        |
| 45 | GND     | Ground                                                     |        |
| 46 | GND     | Ground                                                     |        |
| 47 | N.C.    | No Connection                                              | (1)    |
| 48 | VCC     | +12V power supply                                          |        |
| 49 | VCC     | +12V power supply                                          |        |
| 50 | VCC     | +12V power supply                                          |        |
| 51 | VCC     | +12V power supply                                          |        |



CNF2 Connector Pin Assignment (187060-41221 (P-Two) or equivalent)

| Pin | Name    | Description                                                | Note |
|-----|---------|------------------------------------------------------------|------|
| 1   | N.C.    | No Connection                                              | (1)  |
| 2   | N.C.    | No Connection                                              |      |
| 3   | N.C.    | No Connection                                              |      |
| 4   | N.C.    | No Connection                                              |      |
| 5   | N.C.    | No Connection                                              |      |
| 6   | N.C.    | No Connection                                              |      |
| 7   | N.C.    | No Connection                                              |      |
| 8   | N.C.    | No Connection                                              |      |
| 9   | GND     | Ground                                                     |      |
| 10  | CH3[0]- | Third pixel Negative LVDS differential data input. Pair 0  |      |
| 11  | CH3[0]+ | Third pixel Positive LVDS differential data input. Pair 0  |      |
| 12  | CH3[1]- | Third pixel Negative LVDS differential data input. Pair 1  |      |
| 13  | CH3[1]+ | Third pixel Positive LVDS differential data input. Pair 1  |      |
| 14  | CH3[2]- | Third pixel Negative LVDS differential data input. Pair 2  |      |
| 15  | CH3[2]+ | Third pixel Positive LVDS differential data input. Pair 2  |      |
| 16  | GND     | Ground                                                     |      |
| 17  | CH3CLK- | Third pixel Negative LVDS differential clock input.        |      |
| 18  | CH3CLK+ | Third pixel Positive LVDS differential clock input.        |      |
| 19  | GND     | Ground                                                     |      |
| 20  | CH3[3]- | Third pixel Negative LVDS differential data input. Pair 3  |      |
| 21  | CH3[3]+ | Third pixel Positive LVDS differential data input. Pair 3  |      |
| 22  | N.C.    | No Connection                                              |      |
| 23  | N.C.    | No Connection                                              |      |
| 24  | GND     | Ground                                                     |      |
| 25  | GND     | Ground                                                     |      |
| 26  | CH4[0]- | Fourth pixel Negative LVDS differential data input. Pair 0 |      |
| 27  | CH4[0]+ | Fourth pixel Positive LVDS differential data input. Pair 0 |      |
| 28  | CH4[1]- | Fourth pixel Negative LVDS differential data input. Pair 1 |      |
| 29  | CH4[1]+ | Fourth pixel Positive LVDS differential data input. Pair 1 |      |

|    |         |                                                            |  |
|----|---------|------------------------------------------------------------|--|
| 30 | CH4[2]- | Fourth pixel Negative LVDS differential data input. Pair 2 |  |
| 31 | CH4[2]+ | Fourth pixel Positive LVDS differential data input. Pair 2 |  |
| 32 | GND     | Ground                                                     |  |
| 33 | CH4CLK- | Fourth pixel Negative LVDS differential clock input.       |  |
| 34 | CH4CLK+ | Fourth pixel Positive LVDS differential clock input.       |  |
| 35 | GND     | Ground                                                     |  |
| 36 | CH4[3]- | Fourth pixel Negative LVDS differential data input. Pair 3 |  |
| 37 | CH4[3]+ | Fourth pixel Positive LVDS differential data input. Pair 3 |  |
| 38 | N.C.    | No Connection                                              |  |
| 39 | N.C.    | No Connection                                              |  |
| 40 | GND     | Ground                                                     |  |
| 41 | GND     | Ground                                                     |  |

CN6 Connector Pin Assignment (LM123S010HTF13Y (UNE) or equivalent)

|    |       |                                              |     |
|----|-------|----------------------------------------------|-----|
| 1  | N.C.  | No Connection                                | (1) |
| 2  | N.C.  | No Connection                                |     |
| 3  | N.C.  | No Connection                                |     |
| 4  | GND   | Ground                                       |     |
| 5  | N.C.  | No Connection                                | (1) |
| 6  | L/R_O | Output signal for Left Right Glasses control | (8) |
| 7  | N.C.  | No Connection                                | (1) |
| 8  | N.C.  | No Connection                                |     |
| 9  | N.C.  | No Connection                                |     |
| 10 | N.C.  | No Connection                                |     |

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

Note (2) LVDS format selection.

L= Connect to GND, H=Connect to +3.3V

| SELLVDS   | Note         |
|-----------|--------------|
| L         | JEDIA Format |
| H or Open | VESA Format  |

Note (3) 2D/3D mode selection.

L= Connect to GND or Open, H=Connect to +3.3V

| 2D/3D | Note |
|-------|------|
|-------|------|

|           |         |
|-----------|---------|
| L or Open | 2D Mode |
| H         | 3D Mode |

Note (4) Left Right synchronous signal for glasses.

$V_{IL}=0\sim 0.8$ ,  $V_{IH}=2.0\sim 3.3$

|    |                          |
|----|--------------------------|
| LR | Note                     |
| L  | Right synchronous signal |
| H  | Left synchronous signal  |

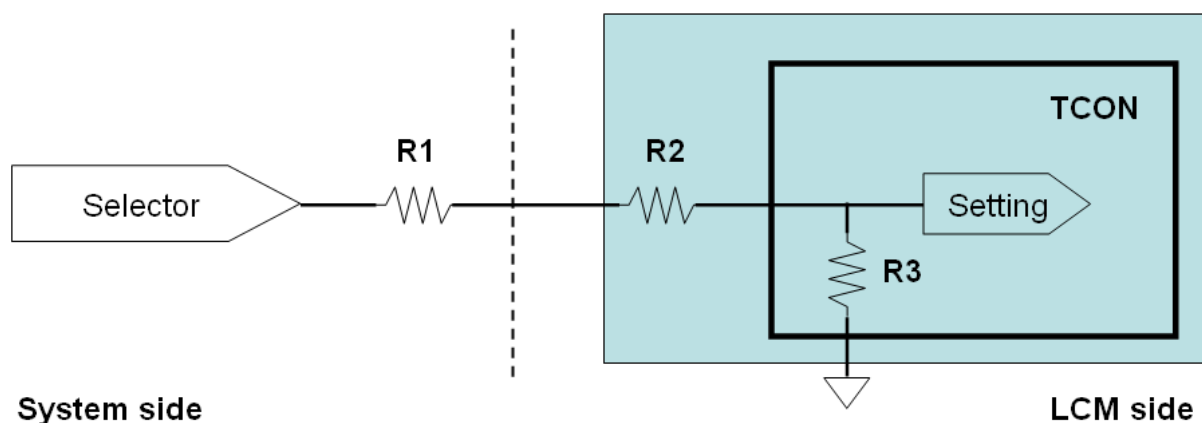
Note (5) Local dimming enable selection.

L= Connect to GND or Open, H=Connect to +3.3V

|           |                       |
|-----------|-----------------------|
| LD_EN     | Note                  |
| L or Open | Local Dimming Disable |
| H         | Local Dimming Enable  |

Note (6) SELLVDS, 2D/3D, LR and LD\_EN signal pin connected to the LCM side has the following diagram.

R1 in the system side should be less than 1K Ohm. ( $R1 < 1K\ \Omega$ )



System side:  $R1 < 1K$

Note (7) LVDS 4-port Data Mapping

| Port     | Channel of LVDS | Data Stream              |
|----------|-----------------|--------------------------|
| 1st Port | First Pixel     | 1, 5, 9, .....1913, 1917 |
| 2nd Port | Second Pixel    | 2, 6, 10, ....1914, 1918 |
| 3rd Port | Third Pixel     | 3, 7, 11, ....1915, 1919 |
| 4th Port | Fourth Pixel    | 4, 8, 12, ....1916, 1920 |

Note (8) The definition of L/R\_O signal as follows

L= 0V , H= +3.3V

|       |                     |
|-------|---------------------|
| L/R_O | Note                |
| L     | Right glass turn on |
| H     | Left glass turn on  |

**5.2 BACKLIGHT UNIT**

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

N2-CN3 (Housing): 51281-1094 (Molex) or equivalent

| Pin № | Symbol | Feature                |
|-------|--------|------------------------|
| 1     | VLED+  | Positive of LED String |
| 2     | VLED+  |                        |
| 3     | NC     | NC                     |
| 4     | NC     |                        |
| 5     | NC     |                        |
| 6     | NC     |                        |
| 7     | VLED-  | Negative of LED String |
| 8     | VLED-  |                        |
| 9     | VLED-  |                        |
| 10    | VLED-  |                        |

**5.3 CONVERTER UNIT**

CN1(Header): CI0114M1HR0-LA (CVILUX) or equivalent

| Pin № | Symbol | Feature                                  |
|-------|--------|------------------------------------------|
| 1     | VBL    | +24V                                     |
| 2     |        |                                          |
| 3     |        |                                          |
| 4     |        |                                          |
| 5     |        |                                          |
| 6     | GND    | GND                                      |
| 7     |        |                                          |
| 8     |        |                                          |
| 9     |        |                                          |
| 10    |        |                                          |
| 11    | ERR    | Normal (GND)<br>Abnormal(Open collector) |
| 12    | BLON   | BL ON/OFF                                |
| 13    | NC     | NC                                       |
| 14    | E_PWM  | External PWM Control                     |

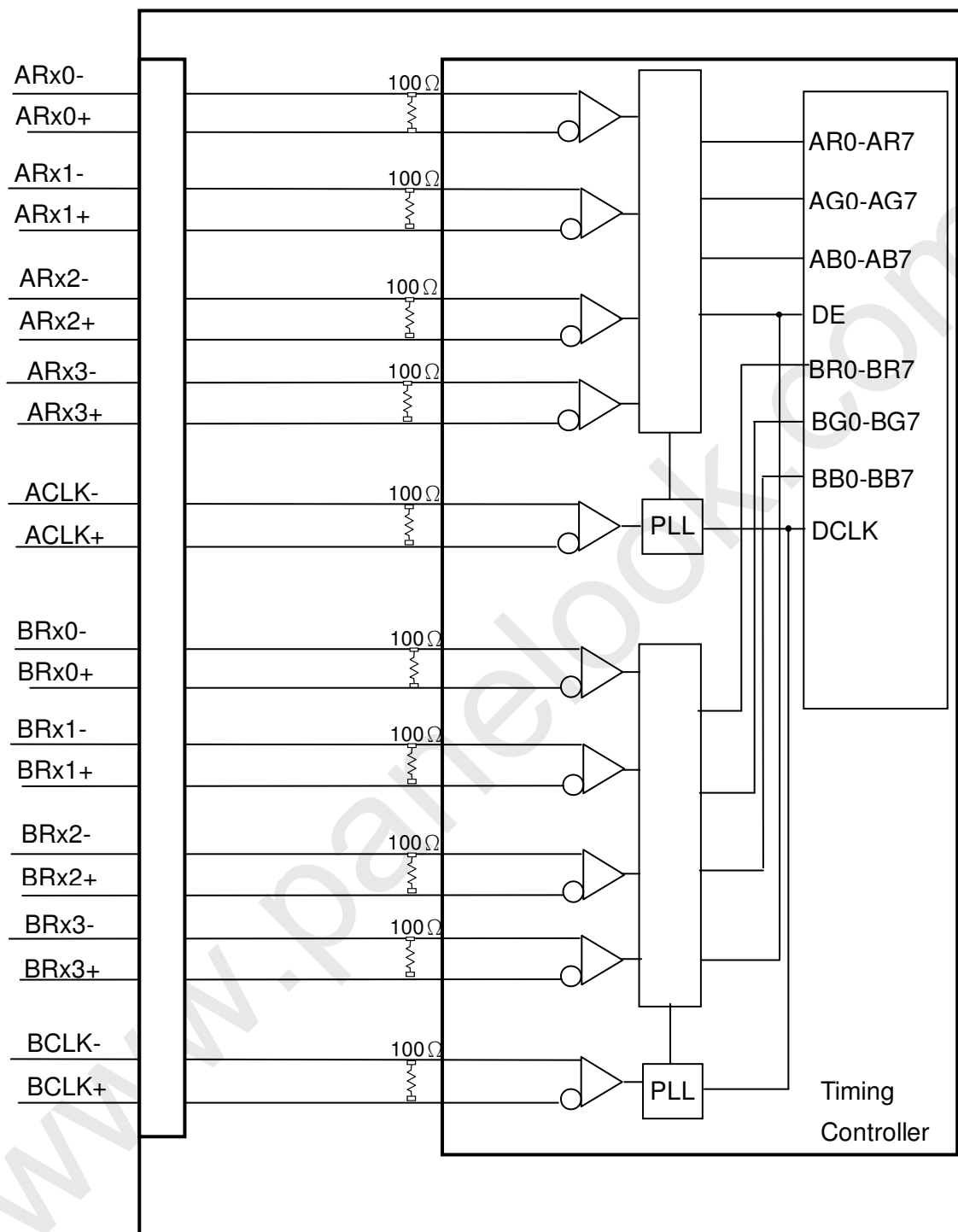
**Notice**

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

CN2 ~ CN3 : 51281-1094 (Molex) or equivalent

| Pin № | Symbol | Feature                |
|-------|--------|------------------------|
| 1     | VLED+  | Positive of LED String |
| 2     | VLED+  |                        |
| 3     | NC     | NC                     |
| 4     | NC     |                        |
| 5     | NC     |                        |
| 6     | NC     |                        |
| 7     | VLED-  | Negative of LED String |
| 8     | VLED-  |                        |
| 9     | VLED-  |                        |
| 10    | VLED-  |                        |

## 5.4 BLOCK DIAGRAM OF INTERFACE



|         |                    |         |                     |
|---------|--------------------|---------|---------------------|
| AR0~AR7 | First pixel R data | BR0~BR7 | Second pixel R data |
| AG0~AG7 | First pixel G data | BG0~BG7 | Second pixel G data |
| AB0~AB7 | First pixel B data | BB0~BB7 | Second pixel B data |
|         |                    | DE      | Data enable signal  |
|         |                    | DCLK    | Data clock signal   |

The third and fourth pixel are followed the same rules.

|         |                    |         |                     |
|---------|--------------------|---------|---------------------|
| CR0~CR7 | Third pixel R data | DR0~DR7 | Fourth pixel R data |
| CG0~CG7 | Third pixel G data | DG0~DG7 | Fourth pixel G data |
| CB0~CB7 | Third pixel B data | DB0~DB7 | Fourth pixel B data |
|         |                    | DE      | Data enable signal  |
|         |                    | DCLK    | Data clock signal   |

Note (1) A ~ D channel are first, second, third and fourth pixel respectively.

Note (2) The system must have the transmitter to drive the module.

Note (3) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

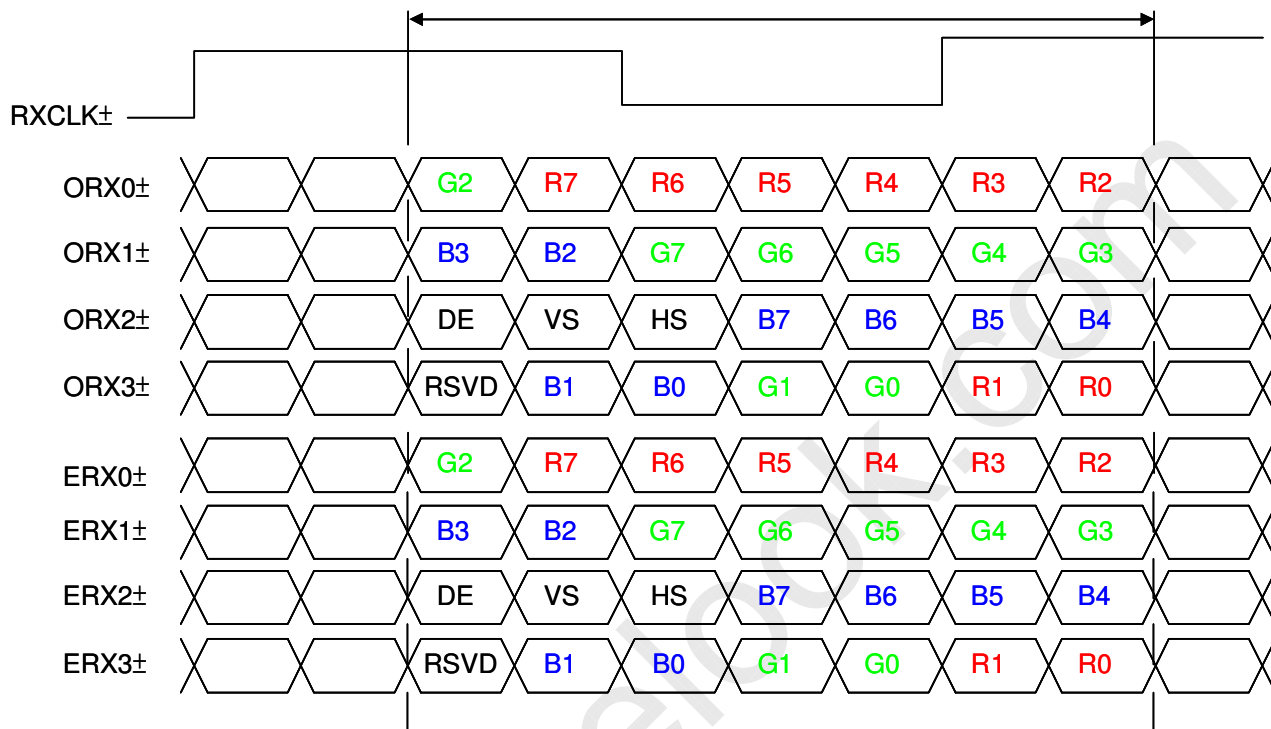


## 5.5 LVDS INTERFACE

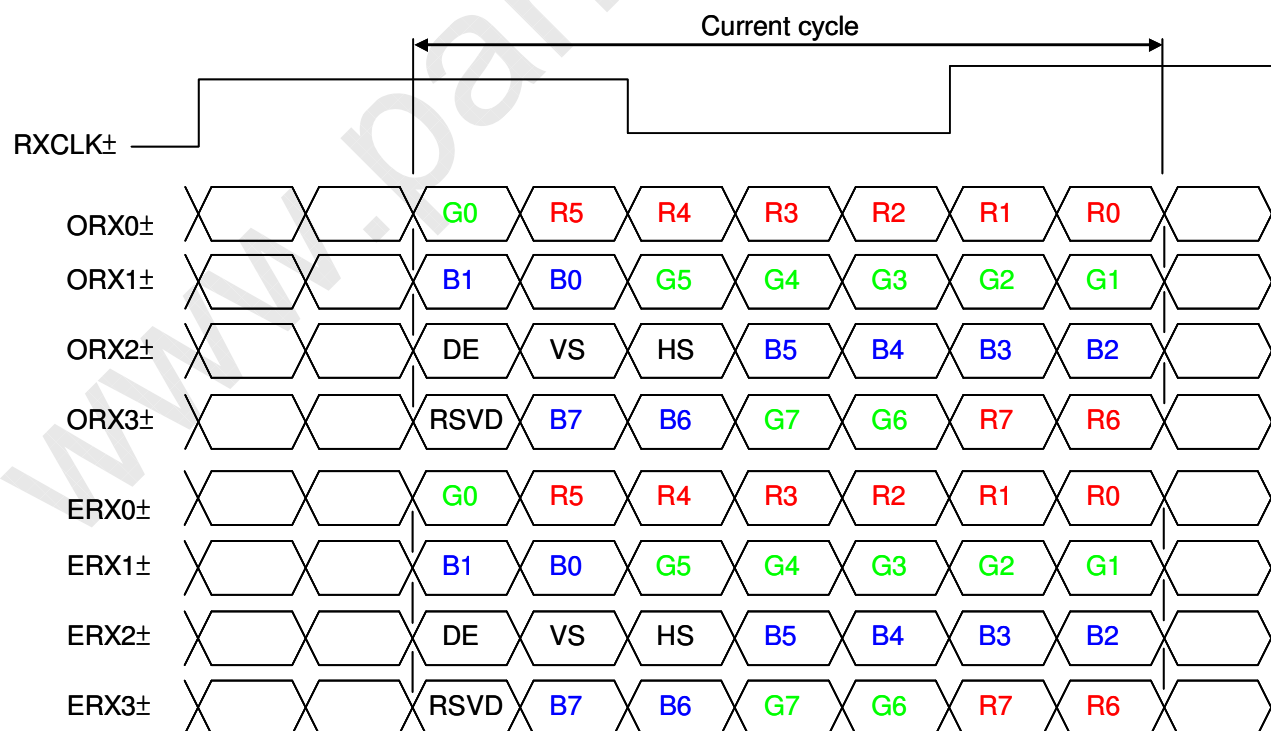
JEIDA Format : SELLVDS = L

VESA Format : SELLVDS = H or Open

JEDIA Format



VESA Format



R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

Notes (1) RSVD (reserved) pins on the transmitter shall be "H" or "L".

## 5.6 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 the color versus data input.

| Color               |                  | Data Signal |    |    |    |    |    |    |    |       |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |
|---------------------|------------------|-------------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|
|                     |                  | Red         |    |    |    |    |    |    |    | Green |    |    |    |    |    |    |    | Blue |    |    |    |    |    |    |    |
|                     |                  | R7          | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7    | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7   | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors        | Black            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red              | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Blue             | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan             | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Magenta          | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow           | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | White            | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Gray Scale Of Red   | Red (0) / Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (1)          | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (2)          | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | Red (253)        | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (254)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red (255)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale Of Green | Green (0) / Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (1)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (2)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | Green (253)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (254)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green (255)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Gray Scale Of Blue  | Blue (0) / Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Blue (1)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
|                     | Blue (2)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  | 0  | 0  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | :  | :  |
|                     | Blue (253)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                     | Blue (254)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 0  |
|                     | Blue (255)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  |

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

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 °C)

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

| Signal              | Item                                 | Symbol                     | Min.                   | Typ.  | Max.                   | Unit | Note |
|---------------------|--------------------------------------|----------------------------|------------------------|-------|------------------------|------|------|
| LVDS Receiver Clock | Frequency                            | $F_{\text{clkin}} (=1/TC)$ | 60                     | 74.25 | 96.012                 | MHz  |      |
|                     | Input cycle to cycle jitter          | $T_{\text{rcl}}$           | -                      | -     | 200                    | ps   | (3)  |
|                     | Spread spectrum modulation range     | $F_{\text{clkin\_mod}}$    | $F_{\text{clkin}}-2\%$ | -     | $F_{\text{clkin}}+2\%$ | MHz  | (4)  |
|                     | Spread spectrum modulation frequency | $F_{\text{SSM}}$           | -                      | -     | 200                    | KHz  |      |
| LVDS Receiver Data  | Setup Time                           | $T_{\text{lvsu}}$          | 600                    | -     | -                      | ps   | (5)  |
|                     | Hold Time                            | $T_{\text{lvhd}}$          | 600                    | -     | -                      | ps   |      |

#### 6.1.1 Timing spec for Frame Rate ( $F_{\text{r5}} = 100\text{Hz}$ )

| Signal                         | Item    |         | Symbol          | Min. | Typ. | Max. | Unit           | Note                                       |
|--------------------------------|---------|---------|-----------------|------|------|------|----------------|--------------------------------------------|
| Frame rate                     | 2D mode |         | $F_{\text{r5}}$ | 94   | 100  | 106  | Hz             |                                            |
|                                | 3D mode |         | $F_{\text{r5}}$ | 100  | 100  | 100  | Hz             |                                            |
| Vertical Active Display Term   | 2D Mode | Total   | $T_{\text{v}}$  | 1090 | 1125 | 1480 | Th             | $T_{\text{v}}=T_{\text{vd}}+T_{\text{vb}}$ |
|                                |         | Display | $T_{\text{vd}}$ | 1080 | 1080 | 1080 | Th             | —                                          |
|                                |         | Blank   | $T_{\text{vb}}$ | 10   | 45   | 400  | Th             | —                                          |
|                                | 3D Mode | Total   | $T_{\text{v}}$  | 1400 |      |      | Th             | (6)                                        |
|                                |         | Display | $T_{\text{vd}}$ | 1080 |      |      | Th             |                                            |
|                                |         | Blank   | $T_{\text{vb}}$ | 444  |      |      | Th             |                                            |
| Horizontal Active Display Term | 2D Mode | Total   | $T_{\text{h}}$  | 520  | 550  | 670  | $T_{\text{c}}$ | $T_{\text{h}}=T_{\text{hd}}+T_{\text{hb}}$ |
|                                |         | Display | $T_{\text{hd}}$ | 480  | 480  | 480  | $T_{\text{c}}$ | —                                          |
|                                |         | Blank   | $T_{\text{hb}}$ | 40   | 70   | 190  | $T_{\text{c}}$ | —                                          |
|                                | 3D Mode | Total   | $T_{\text{h}}$  | 525  |      |      | $T_{\text{c}}$ | (6)                                        |
|                                |         | Display | $T_{\text{hd}}$ | 480  |      |      | $T_{\text{c}}$ |                                            |
|                                |         | Blank   | $T_{\text{hb}}$ | 45   |      |      | $T_{\text{c}}$ |                                            |

## 6.1.2 Timing spec for Frame Rate ( $F_{r6} = 120\text{Hz}$ )

| Signal                         | Item    |         | Symbol   | Min. | Typ. | Max. | Unit  | Note                    |
|--------------------------------|---------|---------|----------|------|------|------|-------|-------------------------|
| Frame rate                     | 2D mode |         | $F_{r6}$ | 114  | 120  | 126  | Hz    |                         |
|                                | 3D mode |         | $F_{r6}$ | 120  | 120  | 120  | Hz    |                         |
| Vertical Active Display Term   | 2D Mode | Total   | $T_v$    | 1090 | 1125 | 1480 | Th    | $T_v = T_{vd} + T_{vb}$ |
|                                |         | Display | $T_{vd}$ | 1080 | 1080 | 1080 | Th    | —                       |
|                                |         | Blank   | $T_{vb}$ | 10   | 45   | 400  | Th    | —                       |
|                                | 3D Mode | Total   | $T_v$    | 1400 |      |      |       | (6)                     |
|                                |         | Display | $T_{vd}$ | 1080 |      |      |       |                         |
|                                |         | Blank   | $T_{vb}$ | 444  |      |      |       |                         |
| Horizontal Active Display Term | 2D Mode | Total   | $T_h$    | 520  | 550  | 670  | $T_c$ | $T_h = T_{hd} + T_{hb}$ |
|                                |         | Display | $T_{hd}$ | 480  | 480  | 480  | $T_c$ | —                       |
|                                |         | Blank   | $T_{hb}$ | 40   | 70   | 190  | $T_c$ | —                       |
|                                | 3D Mode | Total   | $T_h$    | 525  |      |      |       | (6)                     |
|                                |         | Display | $T_{hd}$ | 480  |      |      |       |                         |
|                                |         | Blank   | $T_{hb}$ | 45   |      |      |       |                         |

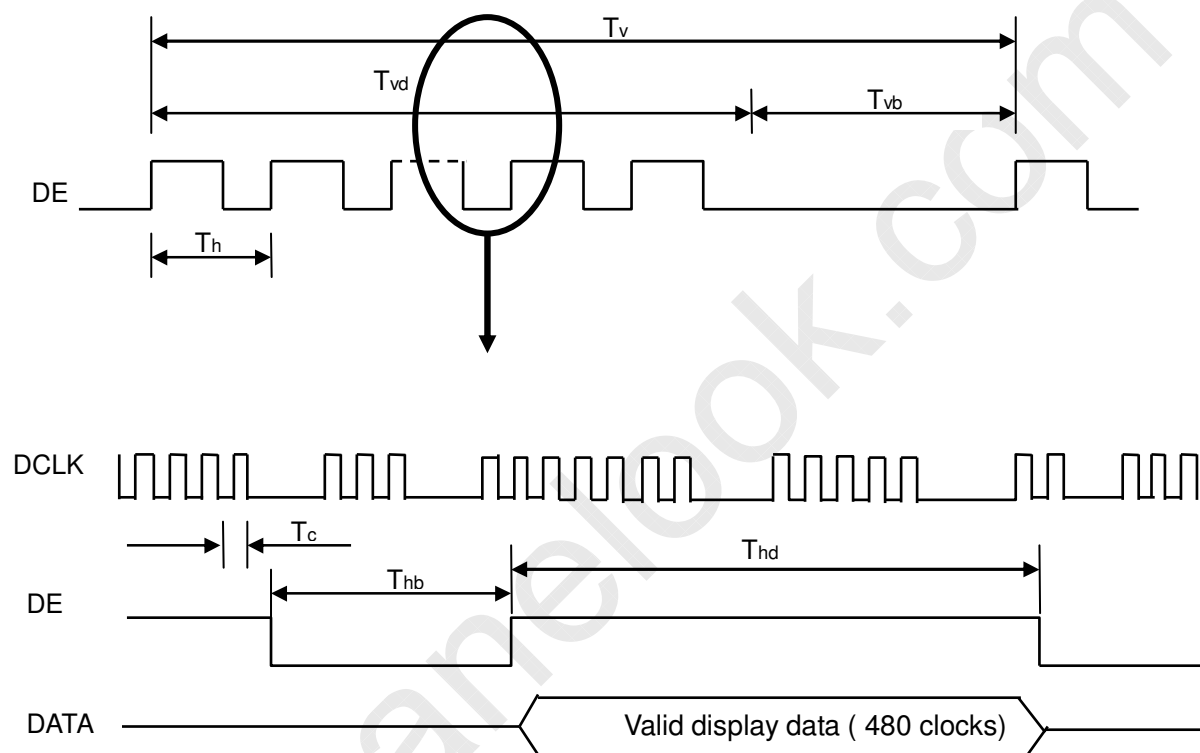
Note (1) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

Note (2) Please make sure the range of pixel clock has follow the below equation:

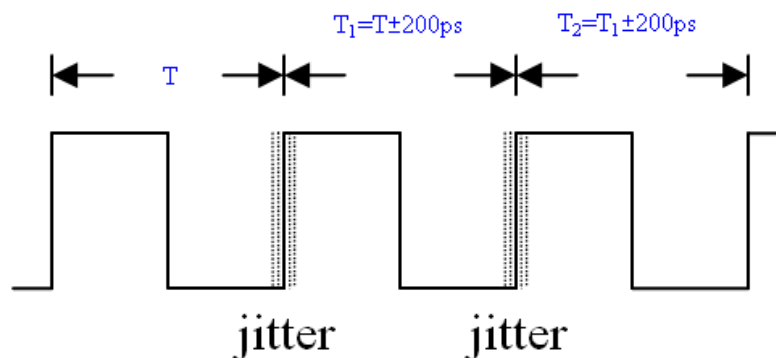
$$F_{clk}(max) \geq F_{r6} \times T_v \times T_h$$

$$F_{r5} \times T_v \times T_h \geq F_{clk}(min)$$

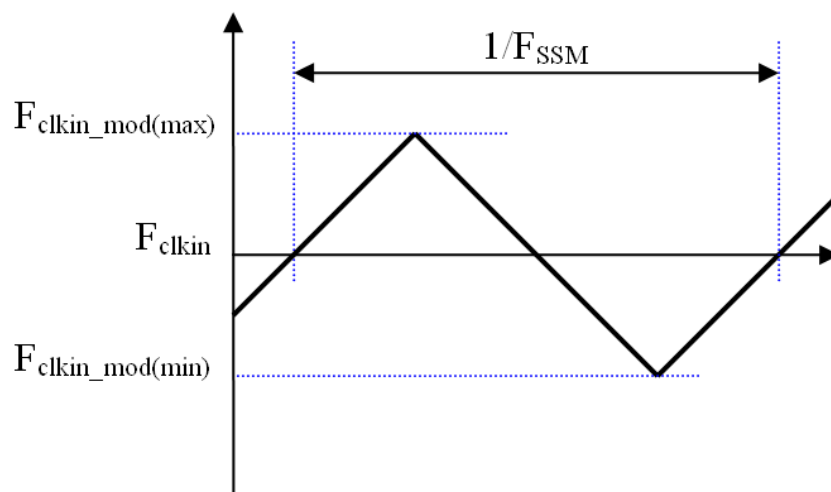
## INPUT SIGNAL TIMING DIAGRAM



Note (3) The input clock cycle-to-cycle jitter is defined as below figures.  $Trcl = |T_1 - T_1|$

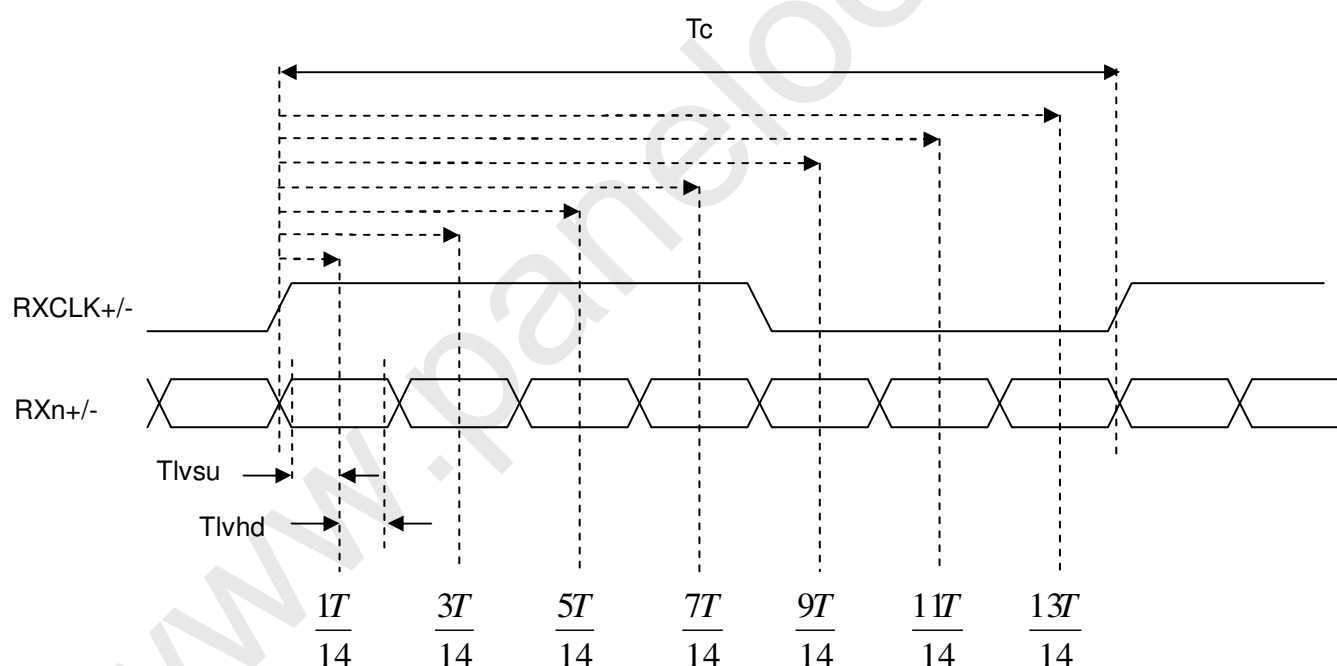


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

## LVDS RECEIVER INTERFACE TIMING DIAGRAM



Note (6) Please fix the Vertical timing (Vertical Total = 1524 / Display = 1080 / Blank = 444) in 3D mode.

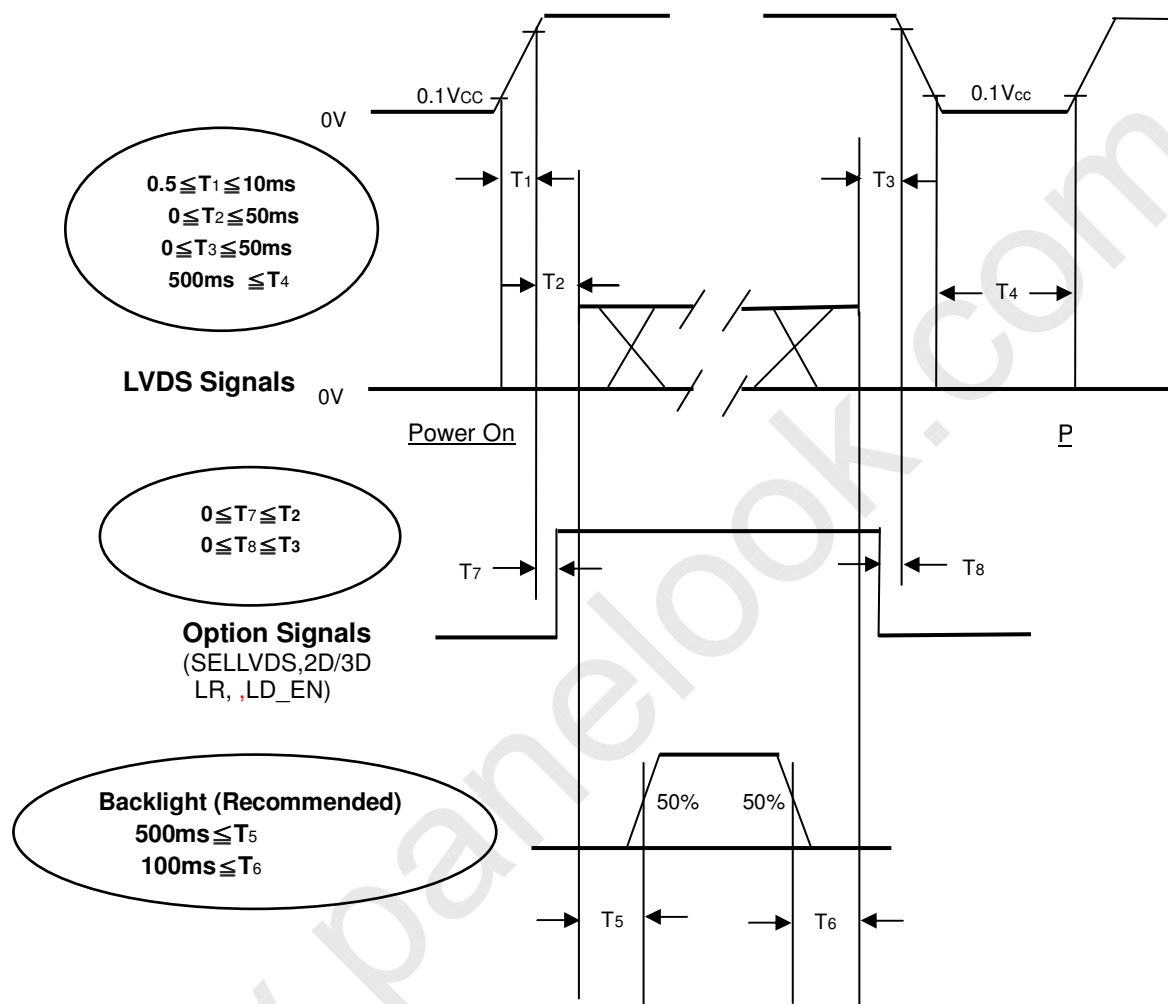
Please fix the Horizontal timing (Horizontal Total = 525 / Display = 480 / Blank = 45) in 3D mode.

## 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 °C)

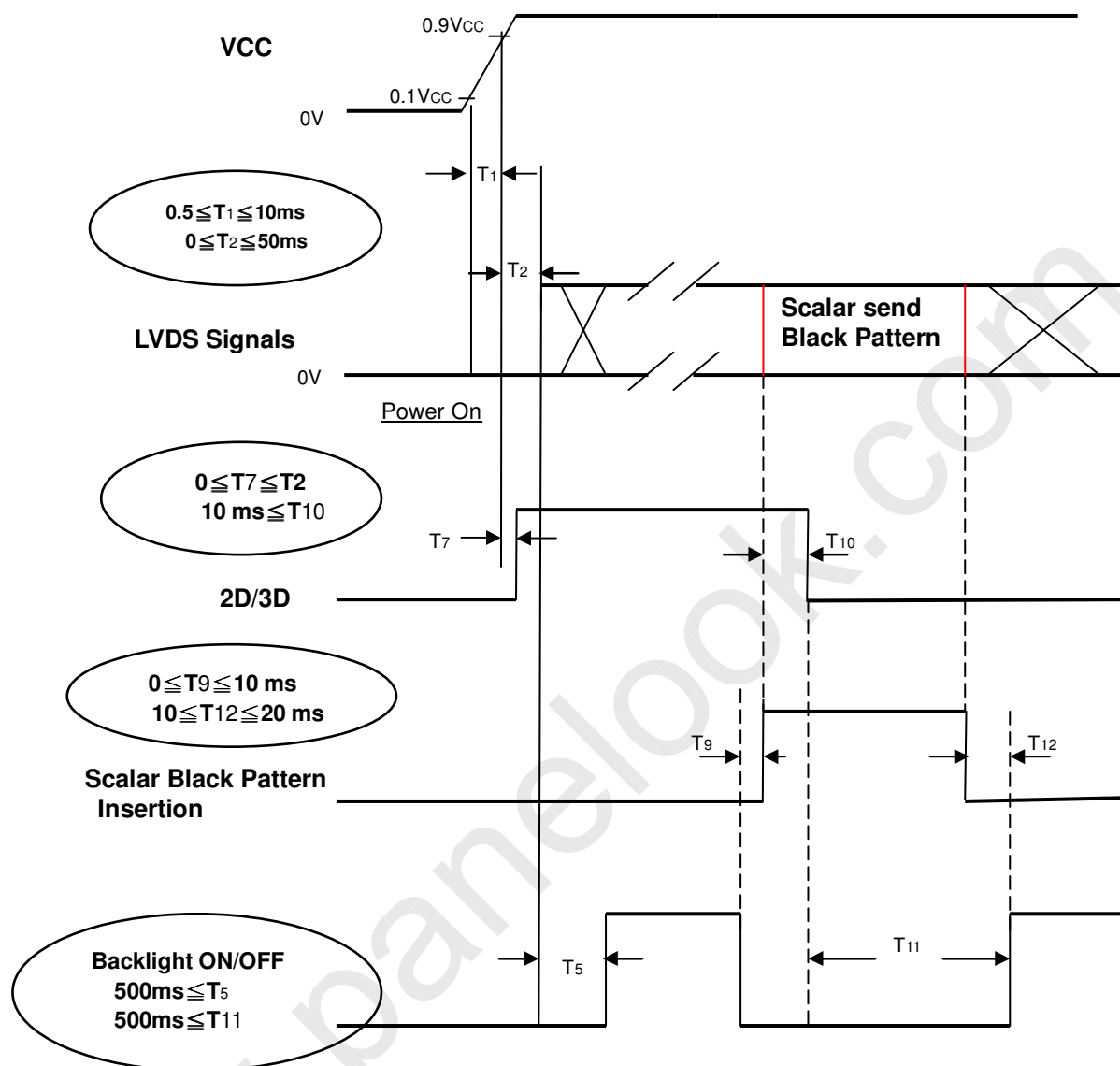
### 6.2.1 POWER ON/OFF SEQUENCE

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



Power ON/OFF Sequence

## 6.2.2 2D to 3D SIGNAL SEQUENCE WITHOUT VCC TURN OFF AND TURN ON



Note (1) The supply voltage of the external system for the module input should follow the definition of V<sub>CC</sub>.

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

Note (3) In case of V<sub>CC</sub> is in off level, please keep the level of input signals on the low or high impedance. If T<sub>2</sub><0, that maybe cause electrical overstress failure.

Note (4) T<sub>4</sub> should be measured after the module has been fully discharged between power off and on period.

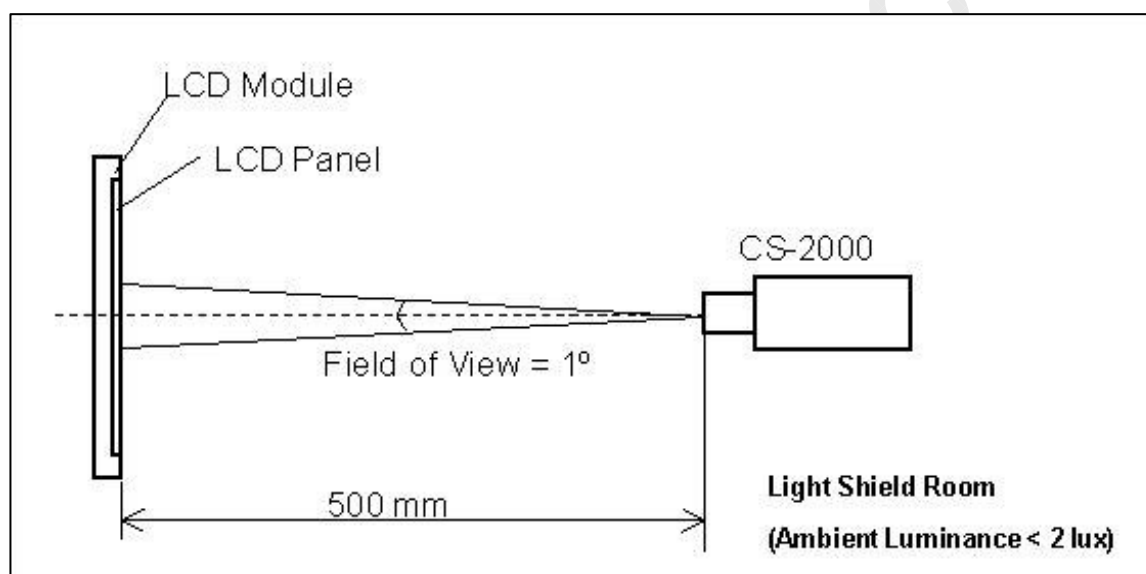
Note (5) Interface signal shall not be kept at high impedance when the power is on.



**7. OPTICAL CHARACTERISTICS****7.1 TEST CONDITIONS**

| Item                | Symbol                                                        | Value   | Unit |
|---------------------|---------------------------------------------------------------|---------|------|
| Ambient Temperature | Ta                                                            | 25±2    | oC   |
| Ambient Humidity    | Ha                                                            | 50±10   | %RH  |
| Supply Voltage      | V <sub>CC</sub>                                               | 12      | V    |
| Input Signal        | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |         |      |
| LED Current         | I <sub>L</sub>                                                | 130±7.8 | mA   |

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



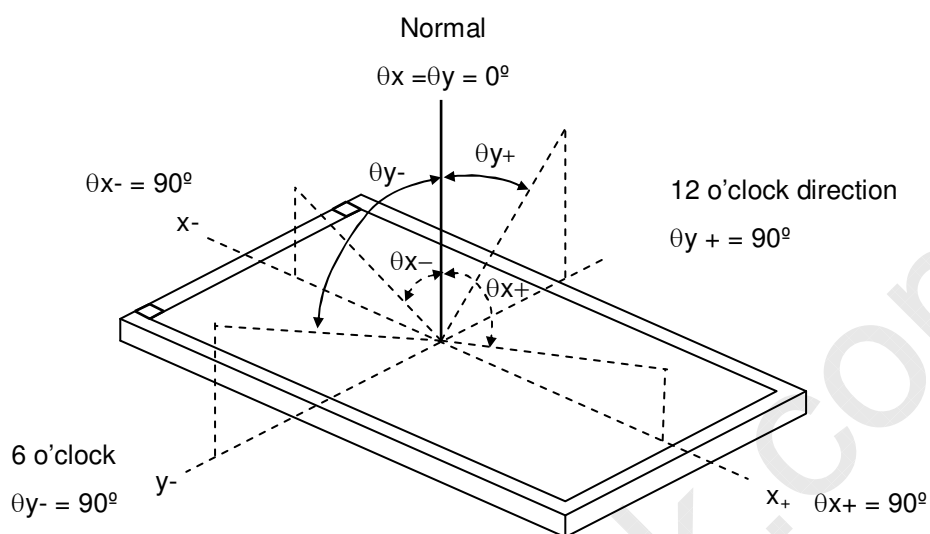
## 7.2 OPTICAL SPECIFICATIONS

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

| Item                                   |             | Symbol            | Condition                                                                        | Min.          | Typ.    | Max.          | Unit              | Note |
|----------------------------------------|-------------|-------------------|----------------------------------------------------------------------------------|---------------|---------|---------------|-------------------|------|
| Contrast Ratio                         |             | CR                | $\theta x=0^{\circ}, \theta y=0^{\circ}$<br>Viewing angle<br>at normal direction |               | (1000)  | -             | -                 | (2)  |
| Response Time (TN)                     |             | T <sub>R</sub>    |                                                                                  | -             | (1.1)   | -             | ms                | (3)  |
|                                        |             | T <sub>F</sub>    |                                                                                  | -             | (3.2)   | -             | ms                |      |
| Center Luminance of White              |             | 2D L <sub>C</sub> |                                                                                  | (350)         | (400)   | -             | cd/m <sub>2</sub> | (4)  |
|                                        |             | 3D L <sub>C</sub> |                                                                                  | -             | (45)    | -             |                   |      |
| White Variation                        |             | δW                |                                                                                  | -             | -       | 1.3           | -                 | (6)  |
| Cross Talk                             |             | 2D                |                                                                                  | -             | -       | 4             | %                 | (5)  |
|                                        |             | 3D_W              |                                                                                  |               | (4)     |               |                   | (8)  |
|                                        |             | 3D_D              |                                                                                  |               | (11)    |               |                   | (8)  |
| Color Chromaticity                     | Red         | R <sub>x</sub>    |                                                                                  | Typ.<br>-0.03 | (0.647) | Typ.<br>+0.03 | -                 | -    |
|                                        |             | R <sub>y</sub>    |                                                                                  |               | (0.328) |               | -                 |      |
|                                        | Green       | G <sub>x</sub>    |                                                                                  |               | (0.279) |               | -                 |      |
|                                        |             | G <sub>y</sub>    |                                                                                  |               | (0.633) |               | -                 |      |
|                                        | Blue        | B <sub>x</sub>    |                                                                                  |               | (0.154) |               | -                 |      |
|                                        |             | B <sub>y</sub>    |                                                                                  |               | (0.058) |               | -                 |      |
|                                        | White       | W <sub>x</sub>    |                                                                                  |               | (0.280) |               | -                 |      |
|                                        |             | W <sub>y</sub>    |                                                                                  |               | (0.290) |               | -                 |      |
|                                        | Color Gamut |                   | C.G                                                                              | -             | (72)    | -             | %                 | NTSC |
| Viewing Angle                          | Horizontal  | θ <sub>x+</sub>   | CR≥10 (TN)                                                                       |               | (80)    | -             | Deg.              | (1)  |
|                                        |             | θ <sub>x-</sub>   |                                                                                  |               | (80)    | -             |                   |      |
|                                        | Vertical    | θ <sub>Y+</sub>   |                                                                                  |               | (80)    | -             |                   |      |
|                                        |             | θ <sub>Y-</sub>   |                                                                                  |               | (70)    | -             |                   |      |
| Transmission direction of up polarizer |             | ϕ <sub>up</sub>   |                                                                                  |               | 90      |               | Deg               | (7)  |

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

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



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

The contrast ratio can be calculated by the following expression.

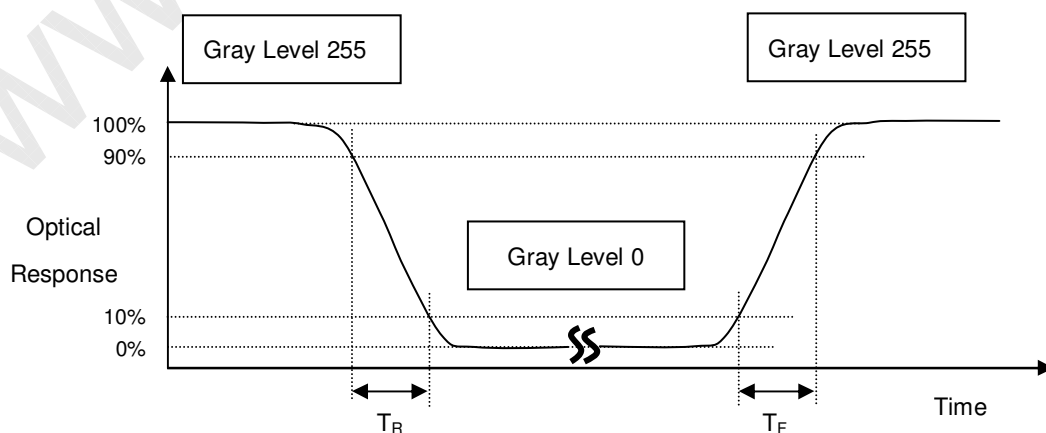
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

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



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

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

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

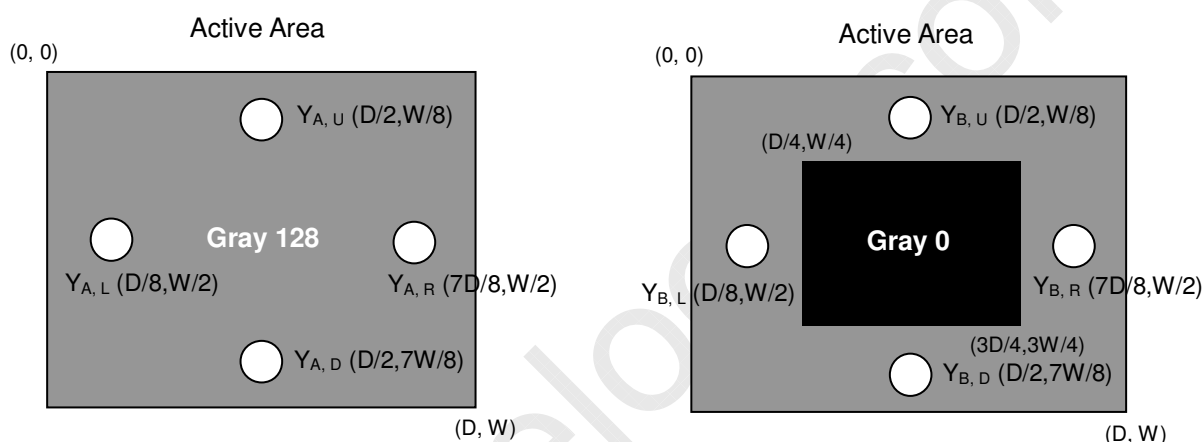
Note (5) Definition of Cross Talk (CT):

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

Where:

$Y_A$  = Luminance of measured location without gray level 0 pattern (cd/m<sup>2</sup>)

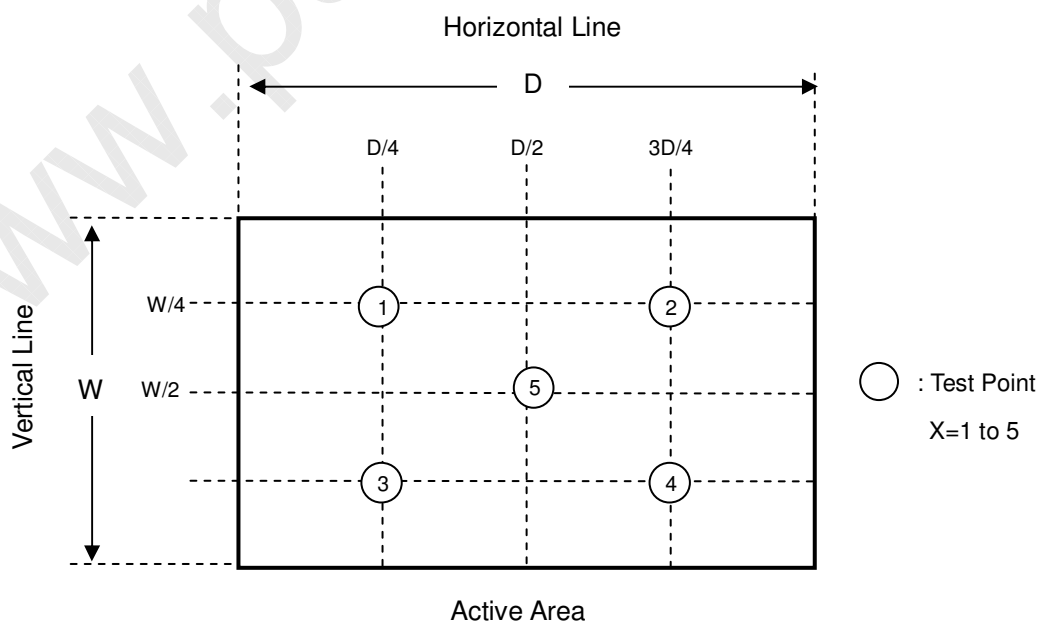
$Y_B$  = Luminance of measured location with gray level 0 pattern (cd/m<sup>2</sup>)



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

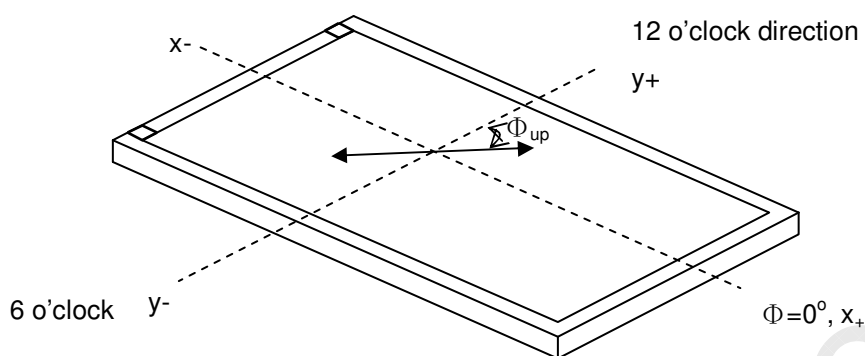
Measure the luminance of gray level 255 at 5 points

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

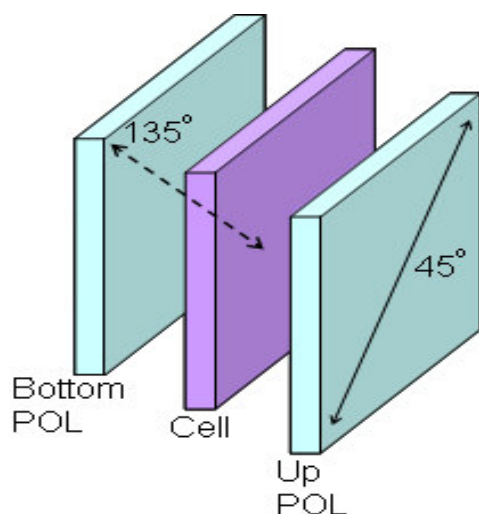


Note (7) This is a reference for designing the shutter glasses of 3D application(TN case).

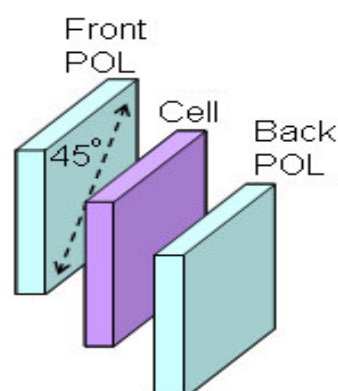
Definition of the transmission direction of the up polarizer:



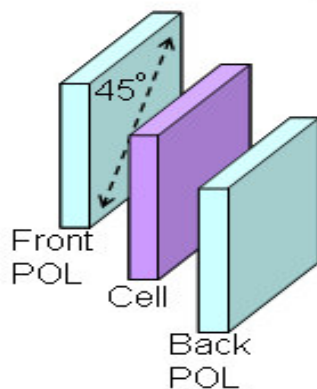
The absorption axis of the front polarizer of the shutter glasses should be parallel to this panel absorption direction to get a maximum 3D mode luminance.



**LCD Module**



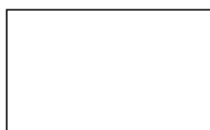
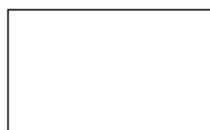
**Shutter Glass**



Note (8) Definition of the 3D mode performance(measured under 3D mode, using CMI's shutter glass):

a. Test pattern

Left eye image and right eye image are displayed alternated



WW

Left eye image: W255; Right eye image: W255



WB

Left eye image: W255; Right eye image: W0



BW

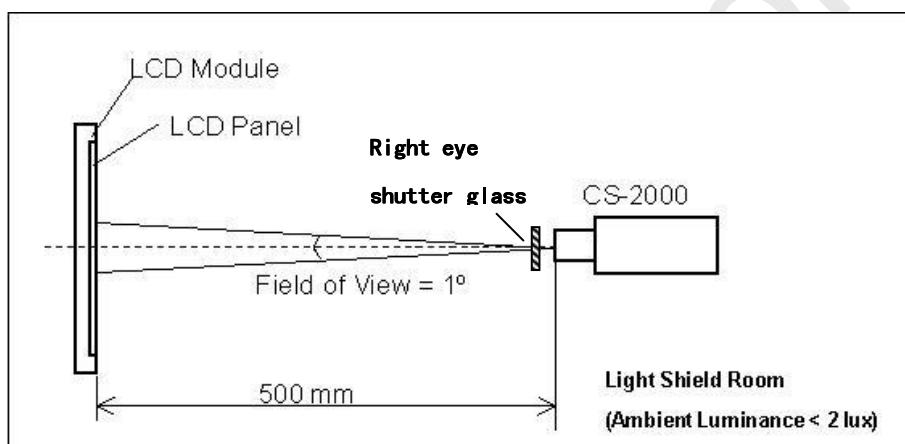
Left eye image: W0; Right eye image: W255



BB

Left eye image: W0; Right eye image: W0

## b. Measurement Setup



Shutter glasses are well controlled under suitable timing, and measure the luminance of the center point of the panel through the right eye glass. "The transmittance of the glass should be larger than 40.0% under 3D mode operation."

The luminance of the test pattern "WW", denoted  $L(WW)$ ; the luminance of the test pattern "WB", denoted  $L(WB)$ ; the luminance of the test pattern "BW", denoted  $L(BW)$ ; the luminance of the test pattern "BB", denoted  $L(BB)$

## c. Definition of the Center Luminance of White, $L_c$ (3D) : $L(WW)$

## d. Definition of the 3D mode white crosstalk, CT (3D-W)

$$CT(3D-W) = \frac{L(WB) - L(BB)}{L(WW) - L(BB)}$$

## e. Definition of the 3D mode dark crosstalk, CT (3D-D)

$$CT(3D-D) = \frac{L(WW) - L(BW)}{L(WW) - L(BB)}$$

**PRECAUTIONS****8.1 ASSEMBLY AND HANDLING PRECAUTIONS**

- [ 1 ] Do not apply rough force such as bending or twisting to the module during assembly.
- [ 2 ] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- [ 3 ] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- [ 4 ] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMIS LSI chips.
- [ 5 ] Bezel of Set can not press or touch the panel surface. It will make light leakage or scrape.
- [ 6 ] Do not plug in or pull out the I/F connector while the module is in operation.
- [ 7 ] Do not disassemble the module.
- [ 8 ] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- [ 9 ] Moisture can easily penetrate into LCD module and may cause the damage during operation.
- [ 10 ] When storing modules as spares for a long time, the following precaution is necessary.
  - [ 10.1 ] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C at normal humidity without condensation.
  - [ 10.2 ] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [ 11 ] When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

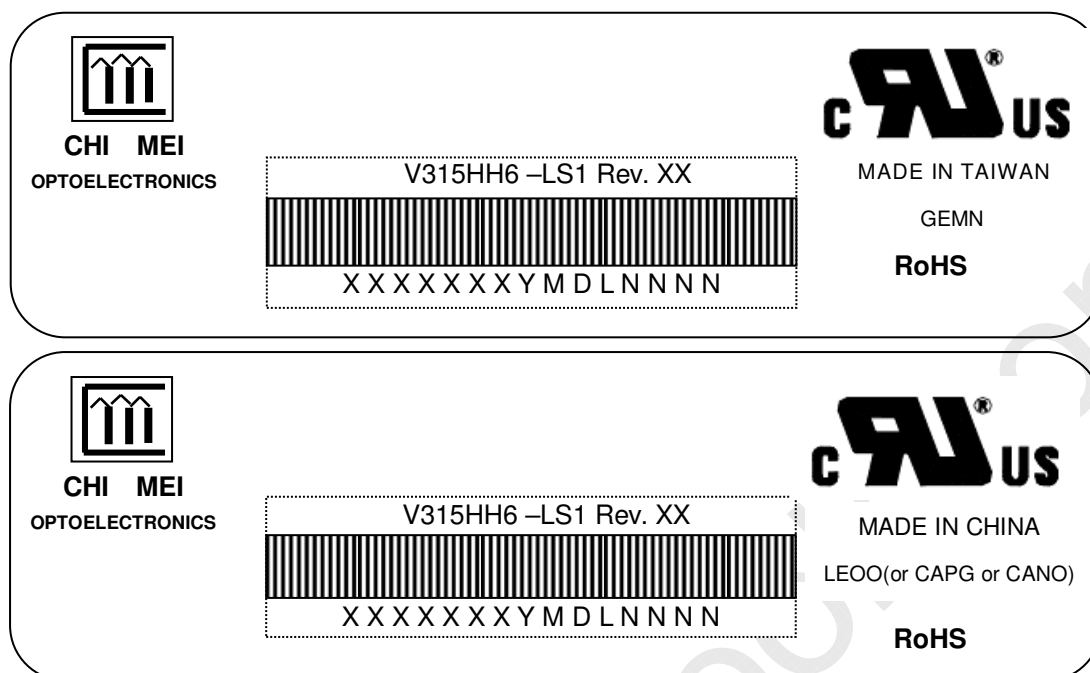
**8.2 SAFETY PRECAUTIONS**

- [ 1 ] The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.
- [ 2 ] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- [ 3 ] After the module's end of life, it is not harmful in case of normal operation and storage.

## 9. DEFINITION OF LABELS

### 9.1 CMI MODULE LABEL

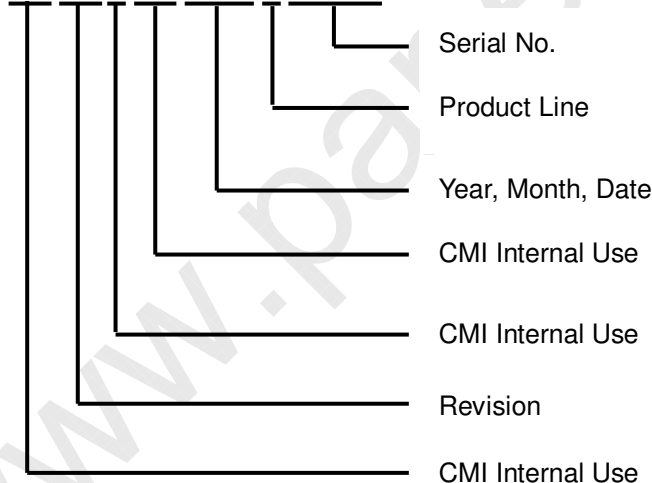
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



Model Name: V315HH6-LS1

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

Serial ID: XXXXXXXYMDLNNNN



Serial ID includes the information as below:

Manufactured Date:

Year : 2001=1, 2002=2, 2003=3, 2004=4...2010=0, 2011=1, 2012=2...

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

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

Revision Code : Cover all the change

Serial No. : Manufacturing sequence of product

Product Line : 1 → Line1, 2 → Line 2, ...etc.



**10. PACKAGING****10.1 PACKAGING SPECIFICATIONS**

- (1) 7 LCD TV modules / 1 Box
- (2) Box dimensions : 826(L)x376(W)x540(H)mm
- (3) Weight : Approx. 34Kg (7 modules per carton)

**10.2 PACKAGING METHOD**

Figures 10-1 and 10-2 are the packing method

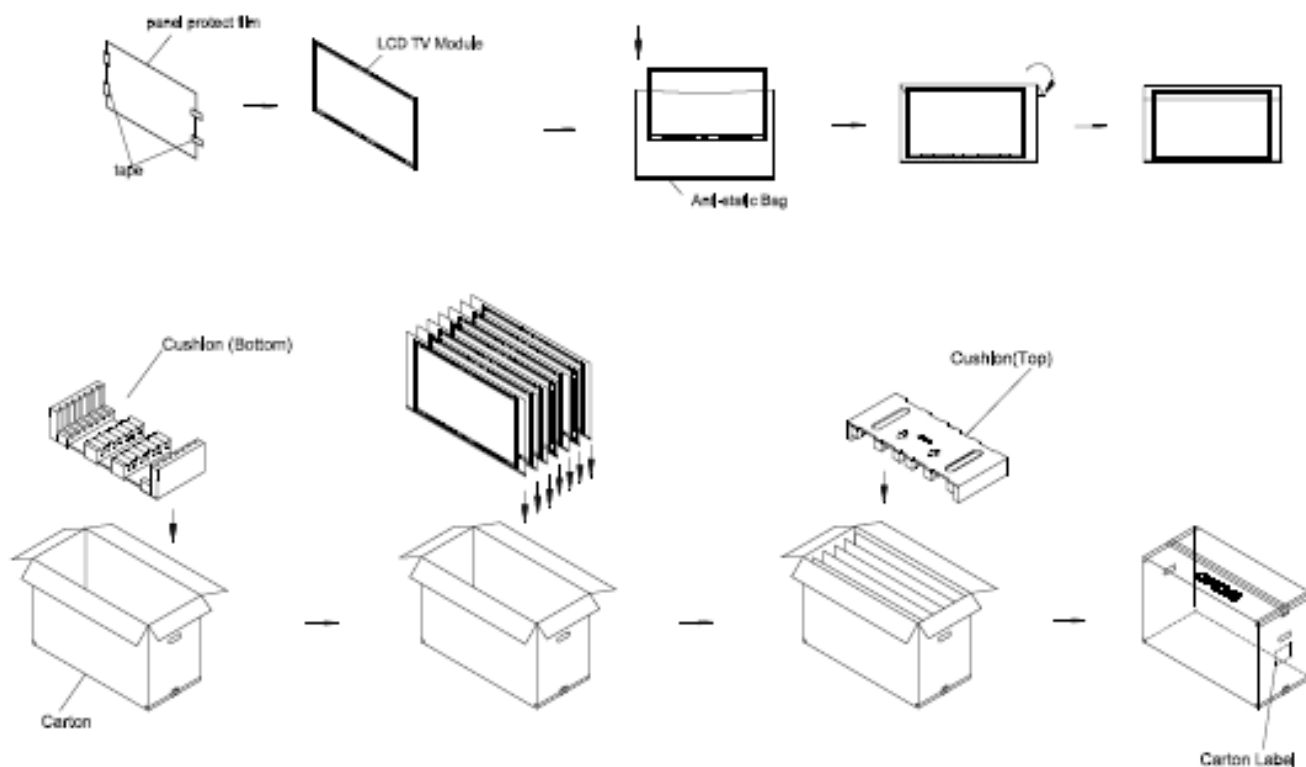
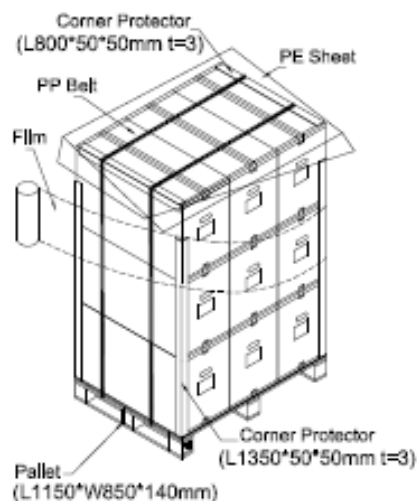
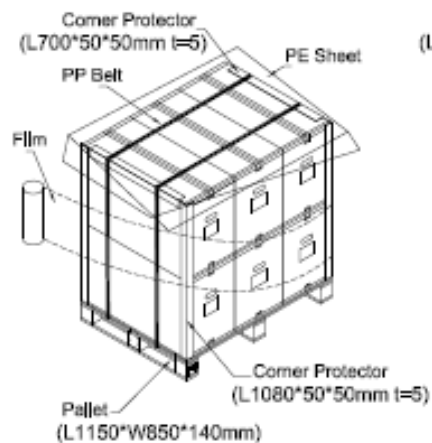


Figure 10-1 packing method

## Sea / Land Transportation (40ft Container)



## Air Transportation



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

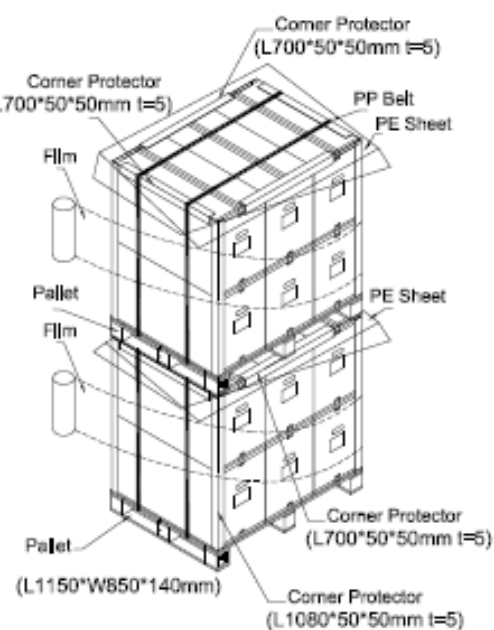
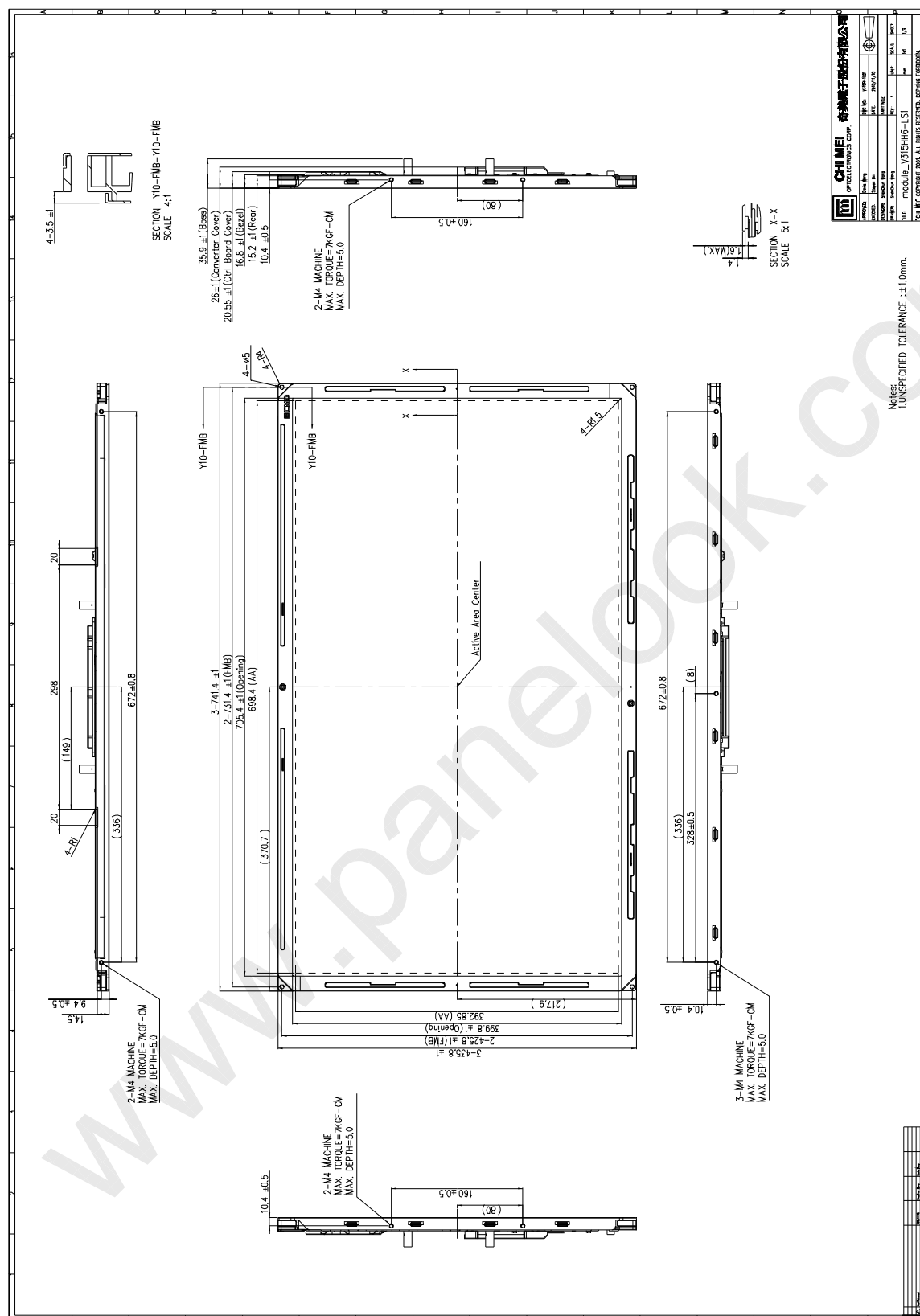
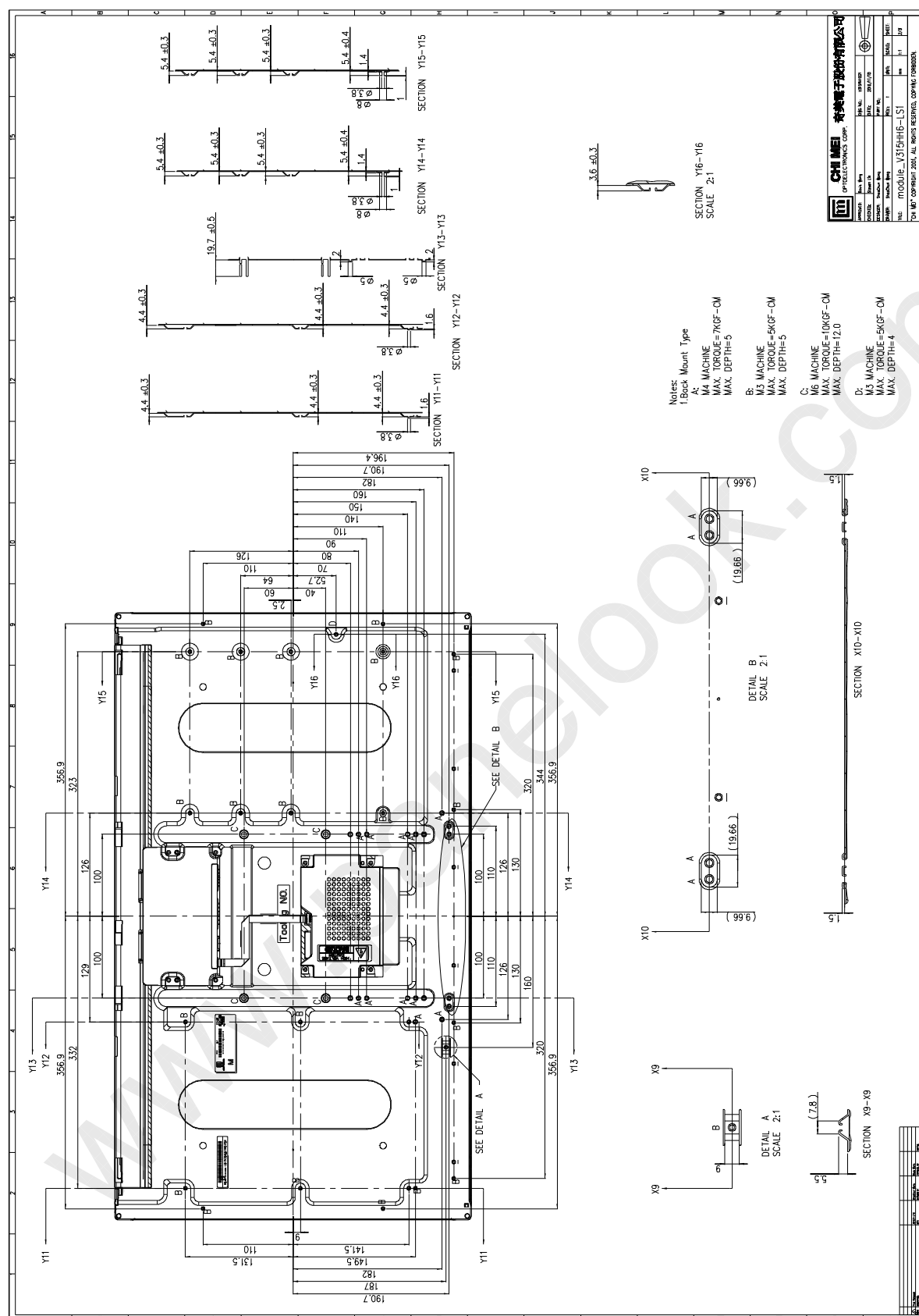


Figure 10-2 packing method

## 11. MECHANICAL CHARACTERISTIC



## PRODUCT SPECIFICATION



## PRODUCT SPECIFICATION

