□Tentative Specification
□Preliminary Specification
■ Approval Specification

# MODEL NO.: V315H3
# SUFFIX: P01

**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. 2.0 | Oct. 29, 2010 | All | All | The approval specification was first issued. |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

V315H3-P01 is a 31.5" TFT Liquid Crystal Display product with driver ICs and 2ch-LVDS interface. This product supports 1920 x 1080 Full HDTV format and can display 16.7M colors (8-bit).

## 1.2 FEATURES

| CHARACTERISTICS ITEMS | SPECIFICATIONS |
|---|---|
| Screen Diagonal [in] | 31.51 |
| Pixels [lines] | 1920 x 1080 |
| Active Area [mm] | 698.4 (H) x 392.85 (V) (31.51" diagonal) |
| Sub-Pixel Pitch [mm] | 0.12125 (H) x 0.36375 (V) |
| Pixel Arrangement | RGB vertical stripe |
| Weight [g] | 1200 |
| Physical Size [mm] | 716.1(H)X410.0 (V) × 1.8(D) Typ. |
| Display Mode | Transmissive mode / Normallly black |
| Contrast Ratio | 6000:1 Typ.<br>(Typical value measure at CMI's module) |
| Glass thickness (Array / CF) [mm] | 0.7 / 0.7 |
| Viewing Angle (CR>20) | +88/-88(H), +88/-88(V) Typ. (CR≧20)<br>(Typical value measure at CMI's module) |
| Color Chromaticity | R = (0.658, 0.326)<br>G = (0.257, 0.587)<br>B = (0.133, 0.104)<br>W= (0.315, 0.362)<br>Standard light source "C" |
| Cell Transparency [%] | 4.7%Typ..<br>(Typical value measured at CMO's module) |
| Polarizer Surface Treatment | Super clear coating, Hard coating (3H) |

## 1.3 MECHANICAL SPECIFICATIONS

| Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Weight | | 1200 | | g | - |
| I/F connector mounting position | The mounting inclination of the connector makes the screen center within ± 0.5mm as the horizontal. | | | | (2) |

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

Note (2) Connector mounting position

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V315H1-L02)

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | +50 | ºC | (1), (2) |

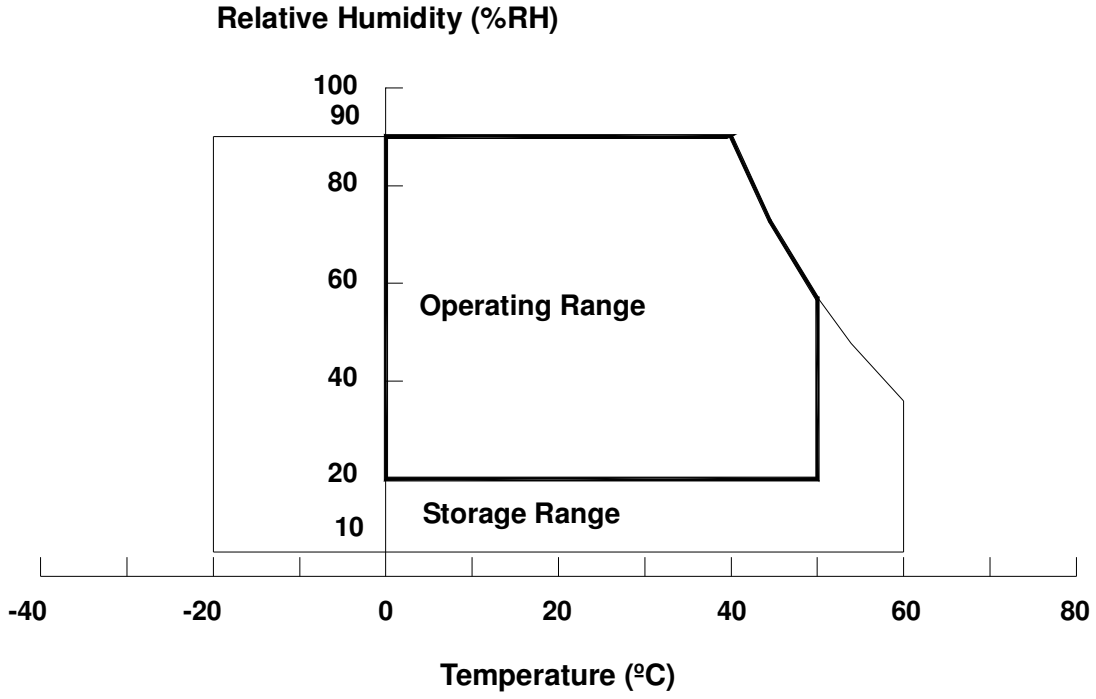
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(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 ºC 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 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.



## 2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Storage Condition : With shipping package.

Storage temperature range : 25±5 ℃

Storage humidity range : 50±10%RH

Shelf life : a month

## 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 | |

## 3. ELECTRICAL CHARACTERISTICS

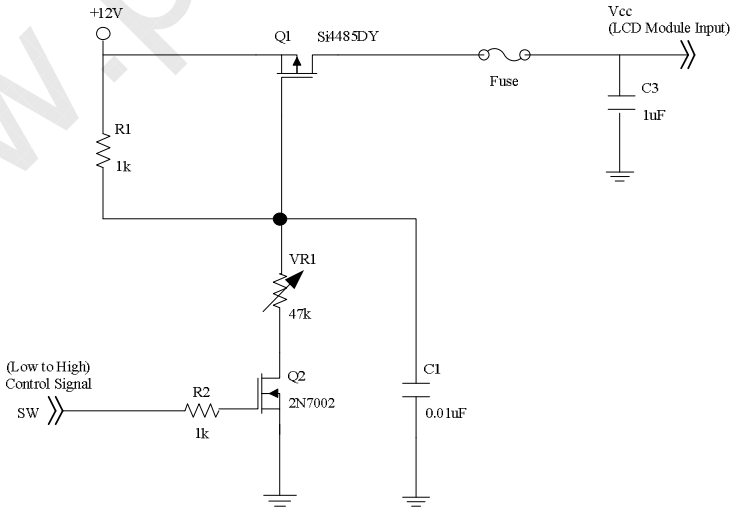
### 3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

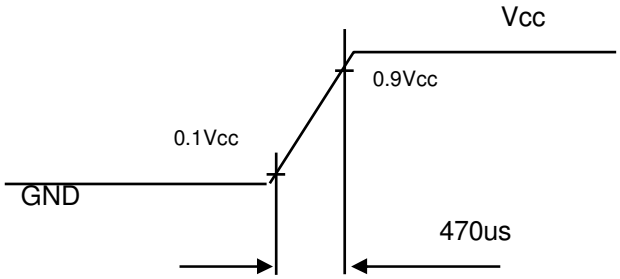
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Rush Current | | $I_{RUSH}$ | — | — | 3.5 | A | (2) |
| | | | | | | | |
| Power Supply Current | White Pattern | — | — | 0.40 | 0.49 | A | (3) |
| | Black Pattern | — | — | 0.36 | 0.45 | A | |
| | Horizontal Stripe | — | — | 0.58 | 0.69 | A | |
| LVDS interface | Differential Input High Threshold Voltage | $V_{LVTH}$ | +100 | — | — | mV | (4) |
| | Differential Input Low Threshold Voltage | $V_{LVTL}$ | — | — | -100 | mV | |
| | Common Input Voltage | $V_{CM}$ | 1.0 | 1.2 | 1.4 | V | |
| | Differential input voltage (single-end) | $\|V_{ID}\|$ | 200 | — | 600 | mV | |
| | Terminating Resistor | $R_T$ | — | 100 | — | ohm | |
| CMIS interface | Input High Threshold Voltage | $V_{IH}$ | 2.7 | — | 3.3 | V | |
| | Input Low Threshold Voltage | $V_{IL}$ | 0 | — | 0.7 | V | |

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

Note (2) Measurement Conditions:

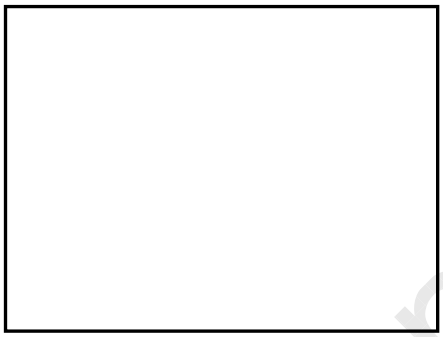


**Vcc rising time is 470us**




Note (3) The specified power supply current and power consumption is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

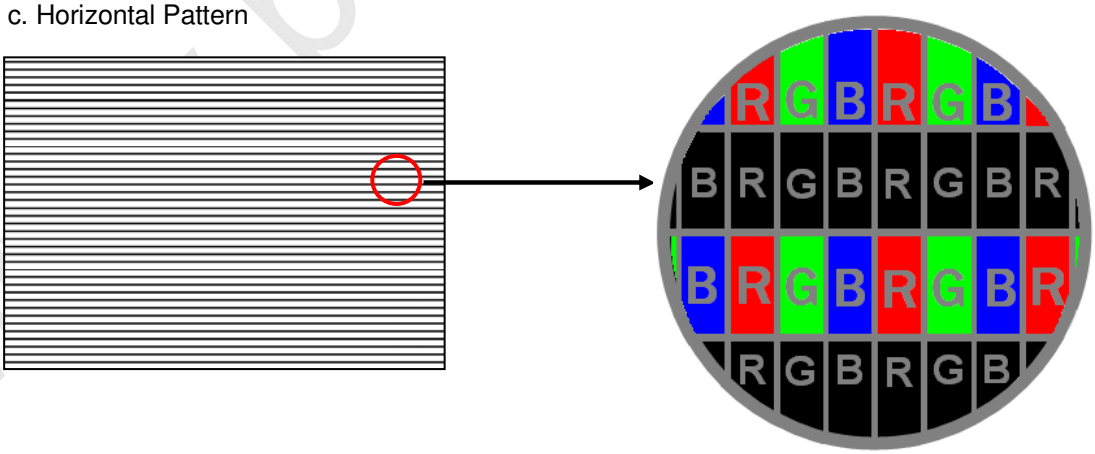


Active Area

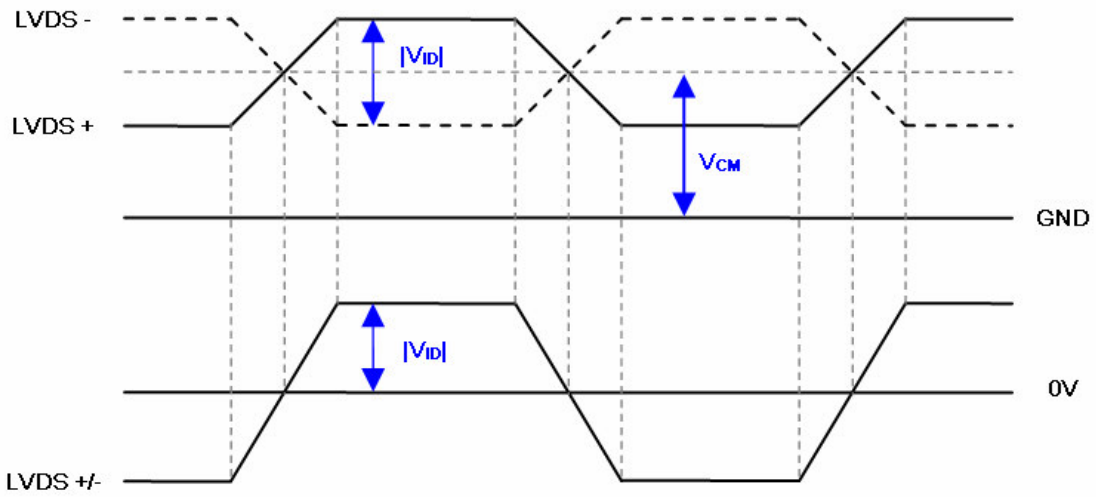
b. Black Pattern

Active Area

c. Horizontal Pattern

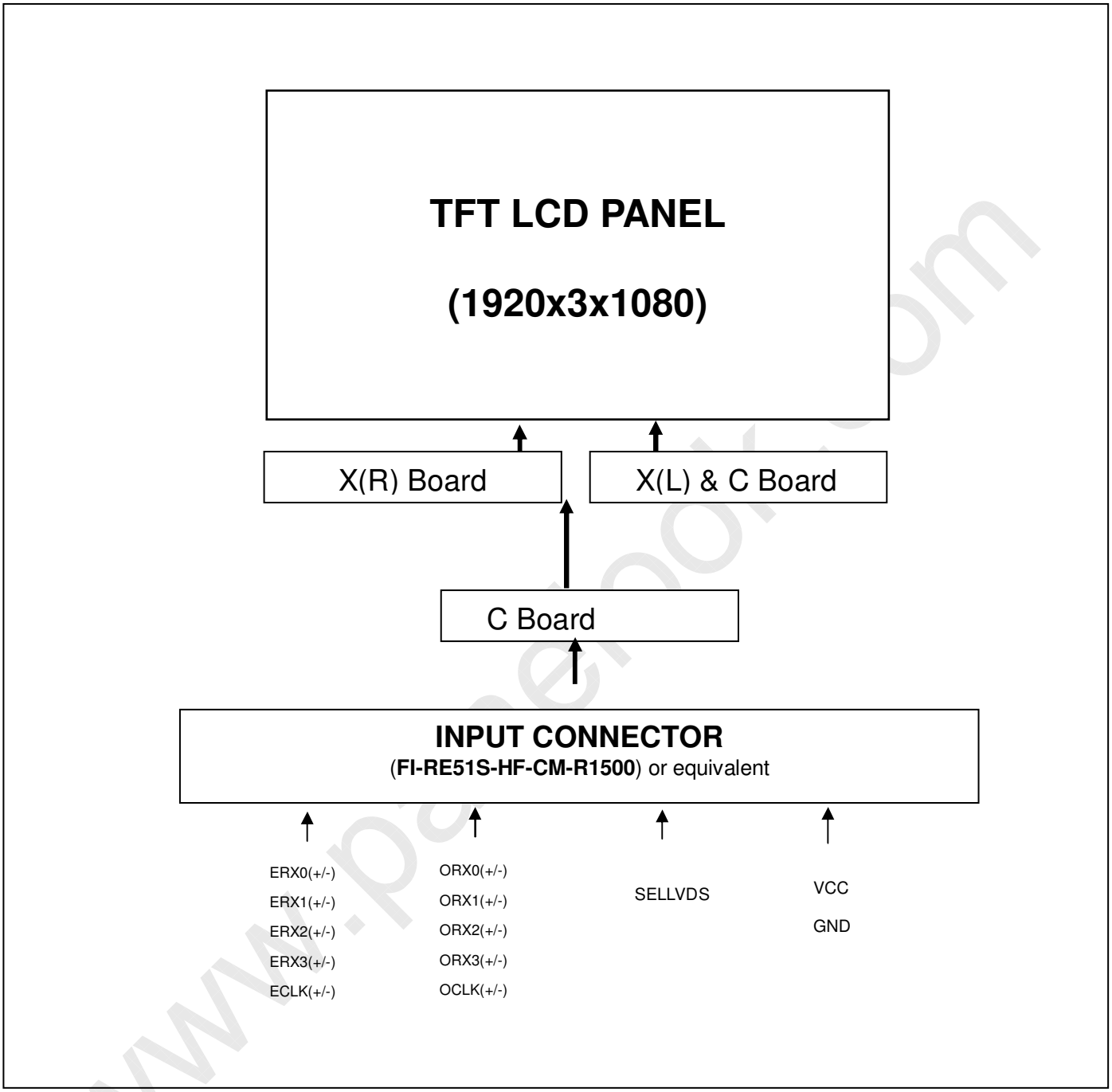


Note (4) The LVDS input characteristics are as follows :



## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

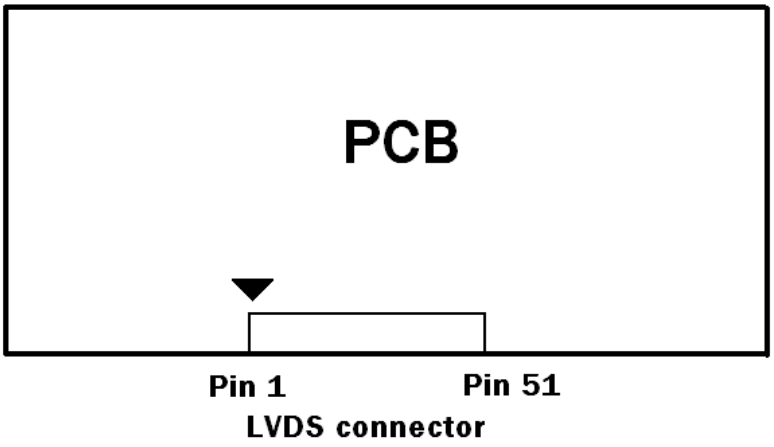
CNF1 Connector Part No.: JAE Taiwan (台灣航空電子) FI-RE51S-HF-CM-R1500 or equivalent.

| Pin | Name | Description | Note |
|---|---|---|---|
| 1 | VCC | +12V power supply | |
| 2 | VCC | +12V power supply | |
| 3 | VCC | +12V power supply | |
| 4 | VCC | +12V power supply | |
| 5 | VCC | +12V power supply | |
| 6 | N.C. | No Connection | (3) |
| 7 | GND | Ground | |
| 8 | GND | Ground | |
| 9 | GND | Ground | |
| 10 | ORX0- | Odd pixel Negative LVDS differential data input. Channel 0 | (1) |
| 11 | ORX0+ | Odd pixel Positive LVDS differential data input. Channel 0 | |
| 12 | ORX1- | Odd pixel Negative LVDS differential data input. Channel 1 | |
| 13 | ORX1+ | Odd pixel Positive LVDS differential data input. Channel 1 | |
| 14 | ORX2- | Odd pixel Negative LVDS differential data input. Channel 2 | |
| 15 | ORX2+ | Odd pixel Positive LVDS differential data input. Channel 2 | |
| 16 | GND | Ground | |
| 17 | OCLK- | Odd pixel Negative LVDS differential clock input | (1) |
| 18 | OCLK+ | Odd pixel Positive LVDS differential clock input. | |
| 19 | GND | Ground | |
| 20 | ORX3- | Odd pixel Negative LVDS differential data input. Channel 3 | (1) |
| 21 | ORX3+ | Odd pixel Positive LVDS differential data input. Channel 3 | |
| 22 | N.C. | No Connection | (3) |
| 23 | N.C. | No Connection | |
| 24 | GND | Ground | |
| 25 | ERX0- | Even pixel Negative LVDS differential data input. Channel 0 | (1) |
| 26 | ERX0+ | Even pixel Positive LVDS differential data input. Channel 0 | |
| 27 | ERX1- | Even pixel Negative LVDS differential data input. Channel 1 | |
| 28 | ERX1+ | Even pixel Positive LVDS differential data input. Channel 1 | |
| 29 | ERX2- | Even pixel Negative LVDS differential data input. Channel 2 | |
| 30 | ERX2+ | Even pixel Positive LVDS differential data input. Channel 2 | |
| 31 | GND | Ground | |
| 32 | ECLK- | Even pixel Negative LVDS differential clock input. | (1) |
| 33 | ECLK+ | Even pixel Positive LVDS differential clock input. | |
| 34 | GND | Ground | |
| 35 | ERX3- | Even pixel Negative LVDS differential data input. Channel 3 | (1) |
| 36 | ERX3+ | Even pixel Positive LVDS differential data input. Channel 3 | |
| 37 | N.C. | No Connection | (3) |
| 38 | N.C. | No Connection | |
| 39 | GND | Ground | |
| 40 | SCL | EEPROM Serial Clock | |
| 41 | N.C. | No Connection | (3) |

| | | | |
|---|---|---|---|
| 42 | N.C. | No Connection | (3) |
| 43 | WP | EEPROM Write Protection | |
| 44 | SDA | EEPROM Serial Data | |
| 45 | SELLVDS | LVDS data format selection | (4)(5) |
| 46 | N.C. | No Connection | (3) |
| 47 | N.C. | No Connection | |
| 48 | N.C. | No Connection | |
| 49 | N.C. | No Connection | |
| 50 | N.C. | No Connection | |
| 51 | N.C. | No Connection | |

Note (1) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel

Note (2) LVDS connector pin order defined as follows




Note (3) Reserved for internal use. Please leave it open.

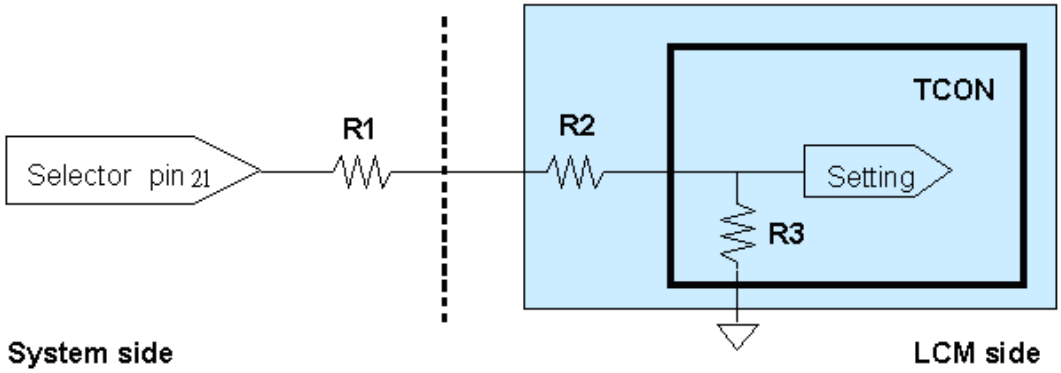
Note (4)

| SELLVDS | Mode |
|---|---|
| **L(default)** | JEIDA |
| H | VESA |

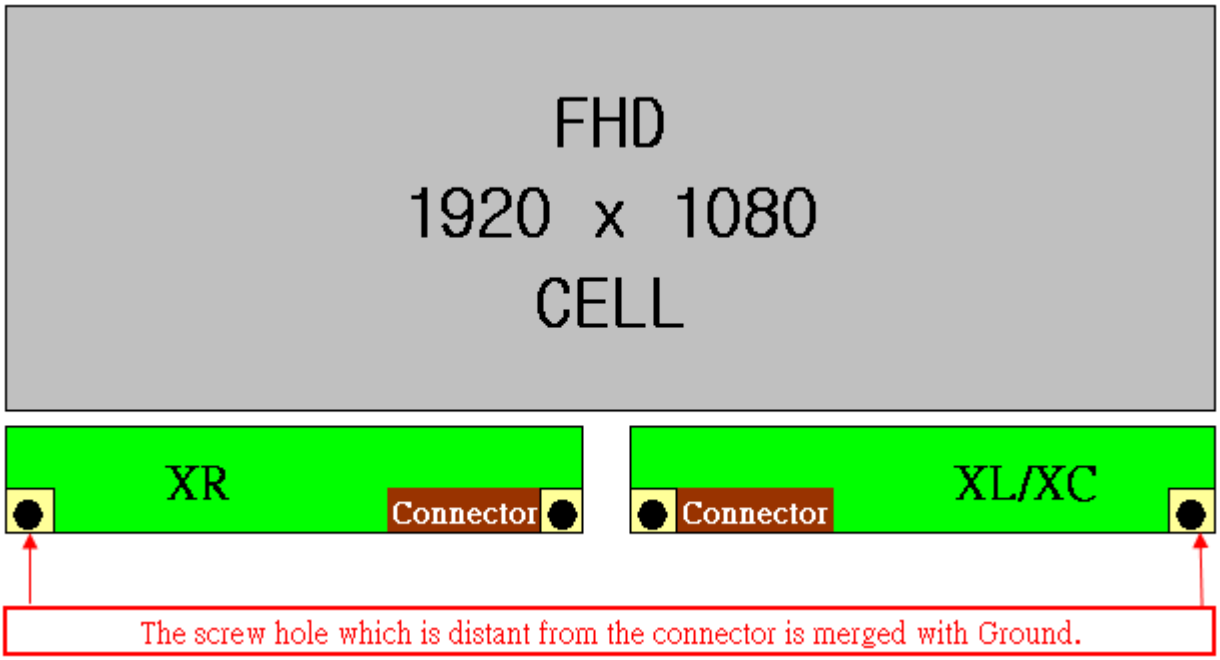
L: Connect to GND, H: Connect to +3.3V

Note (5) LVDS signal pin connected to the LCM side has the following diagram.

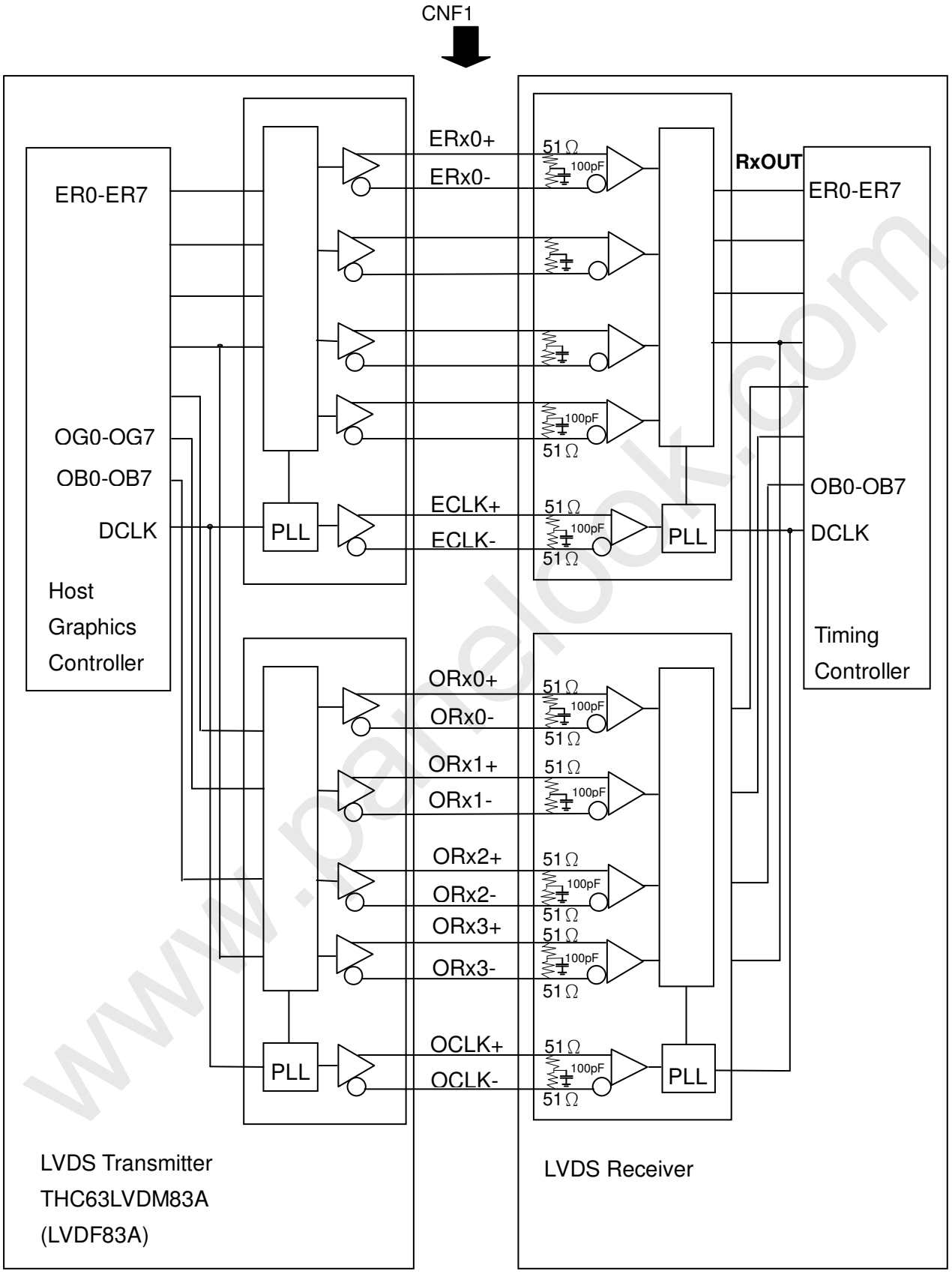
R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)



Note (6) The screw hole which is distant from the connector is merged with Ground



### 5.2 BLOCK DIAGRAM OF INTERFACE



ER0~ER7 : Even pixel R data
EG0~EG7 : Even pixel G data
EB0~EB7 : Even pixel B data
OR0~OR7 : Odd pixel R data
OG0~OG7 : Odd pixel G data
OB0~OB7 : Odd pixel B data
DE : Data enable signal
DCLK : Data clock signal

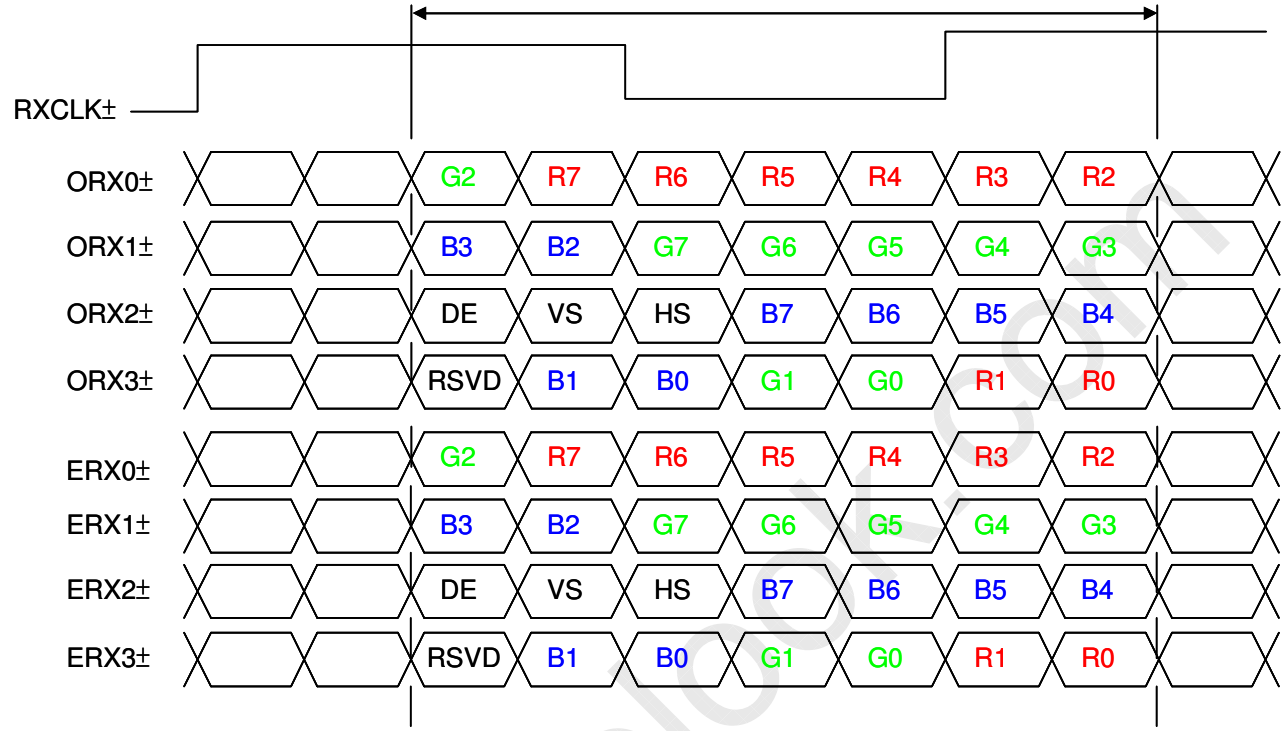
Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

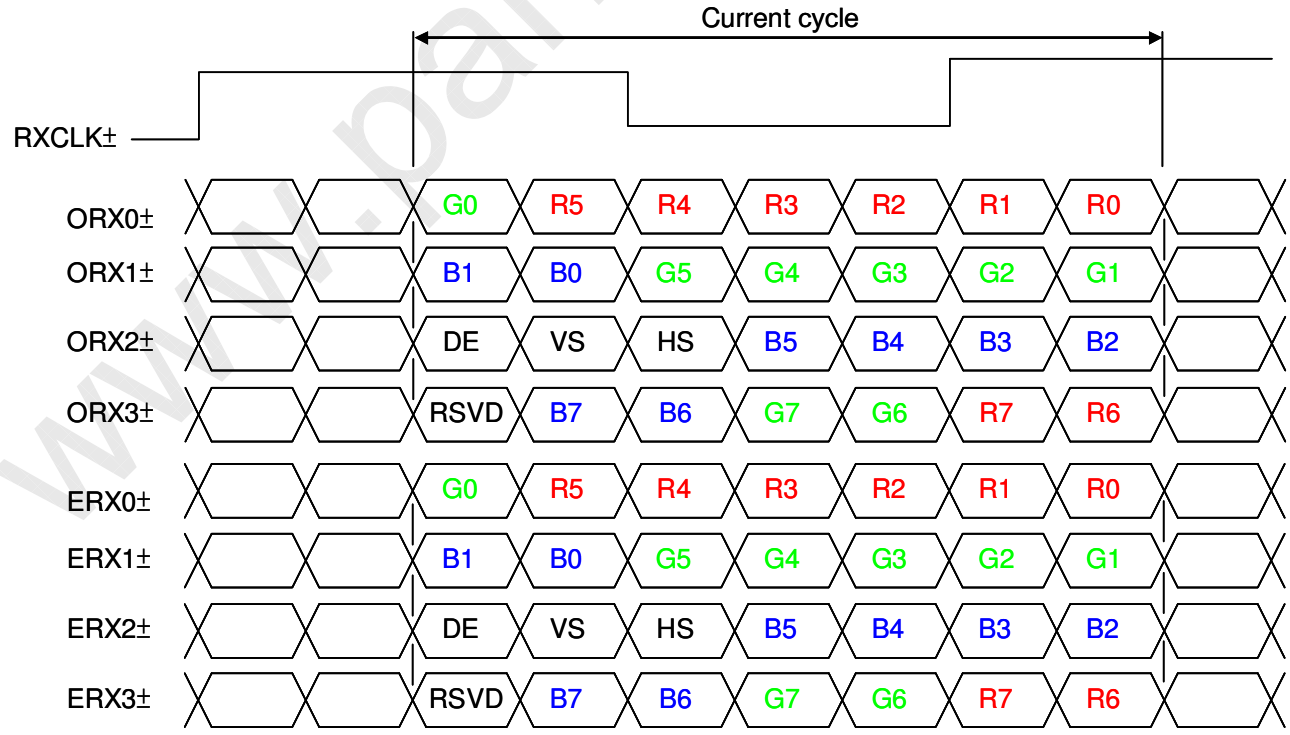
Note (3) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel.

### 5.3 LVDS INTERFACE

JEDIA Format：SELLVDS=L or Open




VESA Format：SELLVDS=H



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 | 0 | 1 | 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 ºC)

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 | $F_{clkin}$ (=1/TC) | 60 | 74.25 | 80 | MHz | |
| | Input cycle to cycle jitter | $T_{rcl}$ | — | — | 200 | ps | (3) |
| | Spread spectrum modulation range | $F_{clkin\_mod}$ | $F_{clkin}$-2% | — | $F_{clkin}$+2% | MHz | (4) |
| | Spread spectrum modulation frequency | $F_{SSM}$ | — | — | 200 | KHz | |
| LVDS Receiver Data | Setup Time | Tlvsu | 600 | — | — | ps | (5) |
| | Hold Time | Tlvhd | 600 | — | — | ps | |
| Vertical Active Display Term | Frame Rate | $F_{r5}$ | 47 | 50 | 53 | Hz | |
| | | $F_{r6}$ | 57 | 60 | 63 | Hz | |
| | Total | Tv | 1090 | 1125 | 1480 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 1080 | 1080 | 1080 | Th | |
| | Blank | Tvb | 10 | 45 | 400 | Th | |
| Horizontal Active Display Term | Total | Th | 1030 | 1100 | 1325 | Tc | Th=Thd+Thb |
| | Display | Thd | 960 | 960 | 960 | Tc | |
| | Blank | Thb | 70 | 140 | 365 | Tc | |

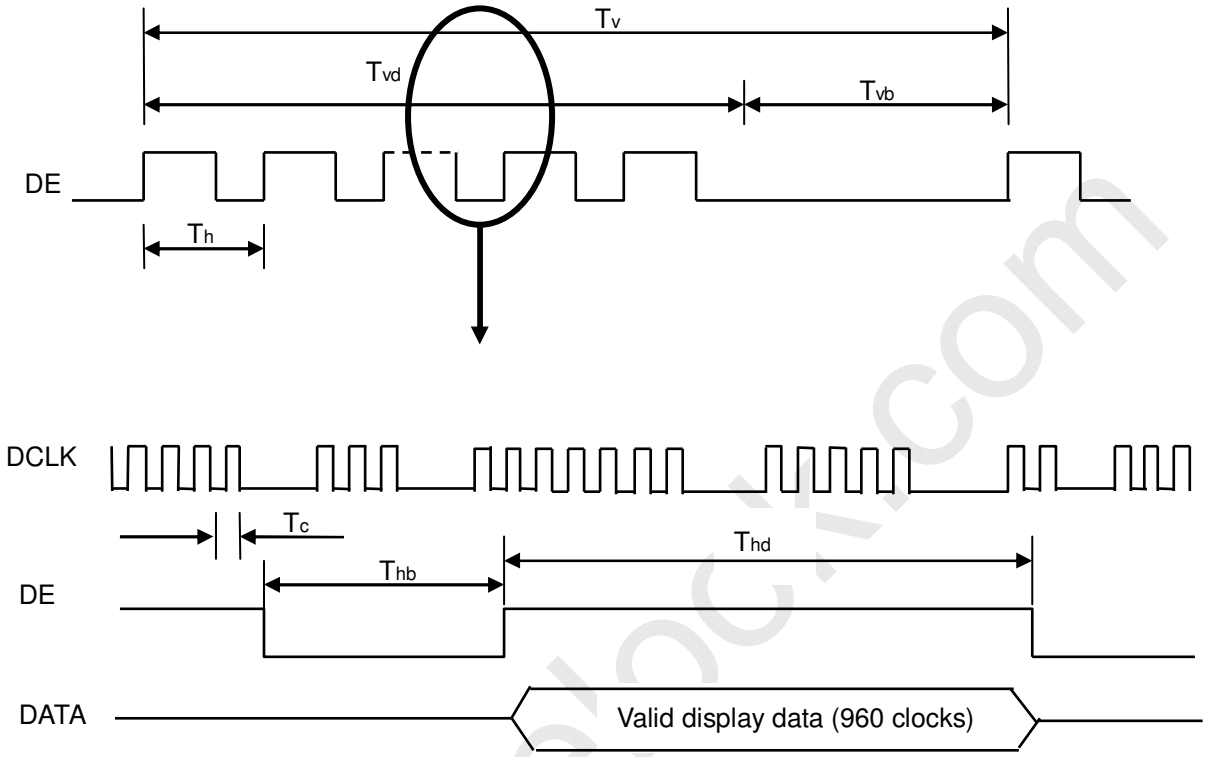
Note (1) Please make sure the range of pixel clock has follow the below equation :

$Fclkin(max) \geqq Fr6 \times Tv \times Th$

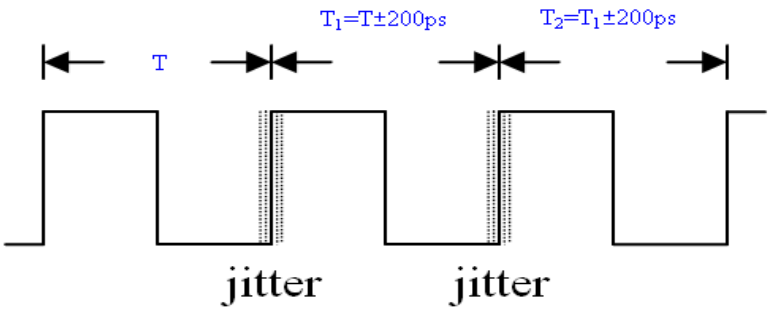
$Fr5 \times Tv \times Th \geqq Fclkin(min)$

Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below :

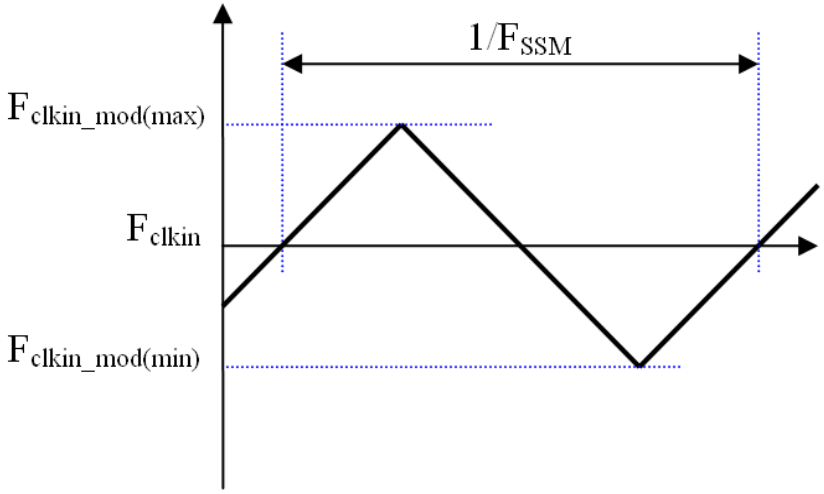
## INPUT SIGNAL TIMING DIAGRAM




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

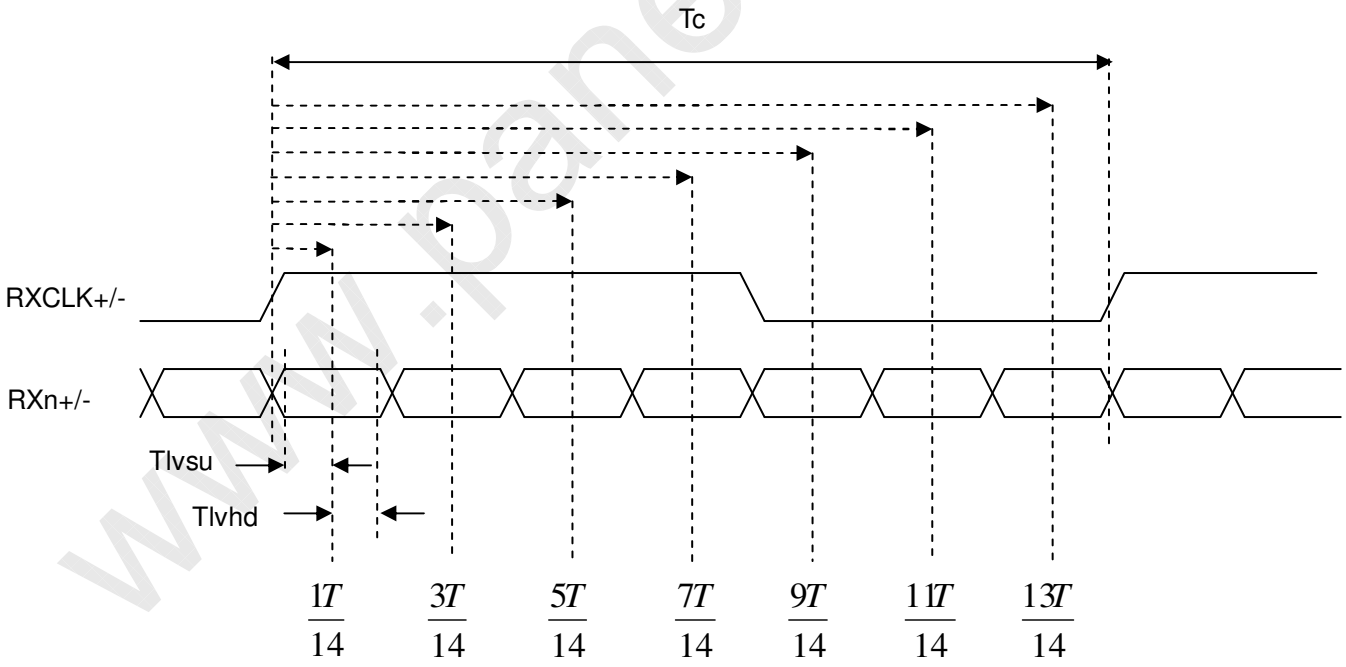


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.




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

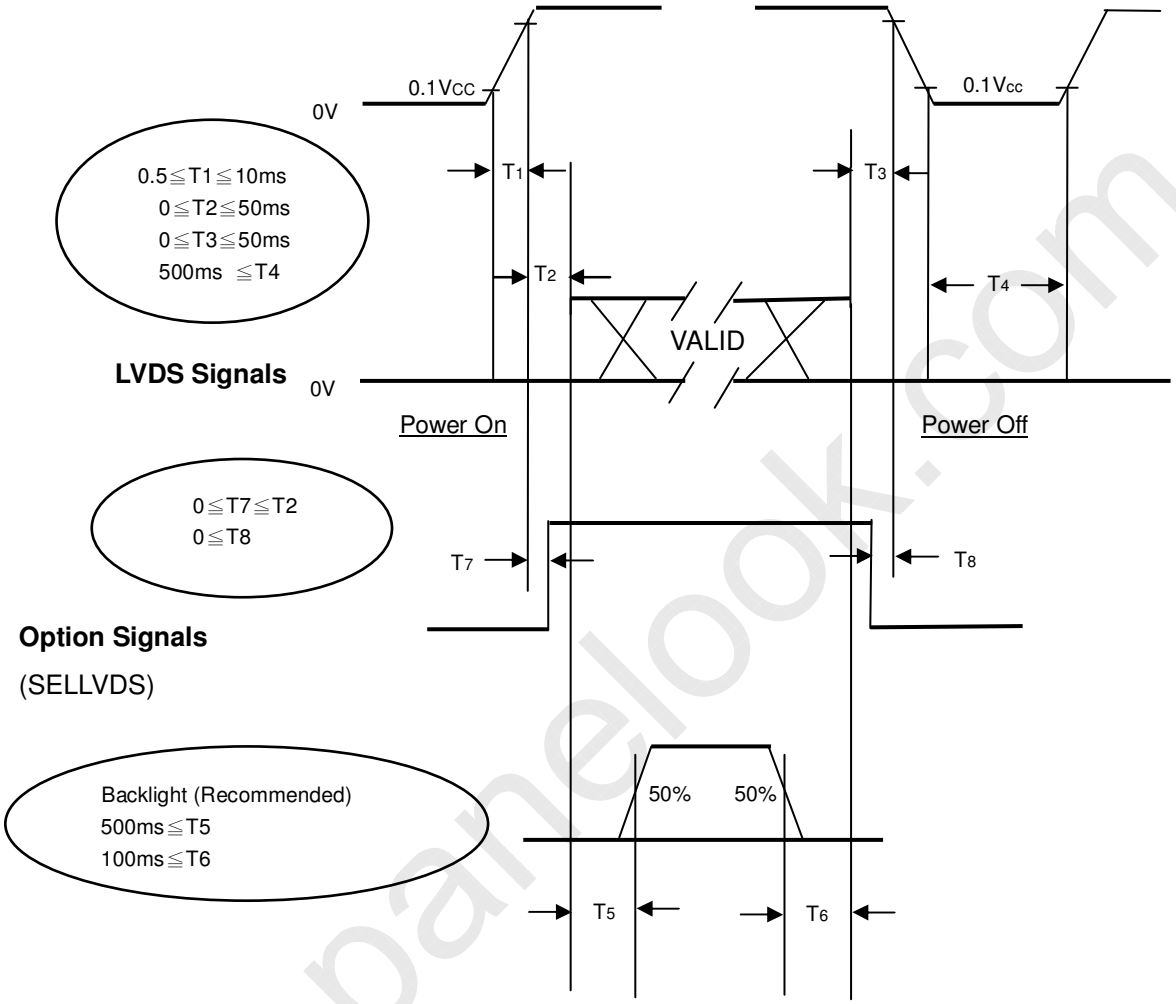
**LVDS RECEIVER INTERFACE TIMING DIAGRAM**



### 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

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**

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

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

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

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

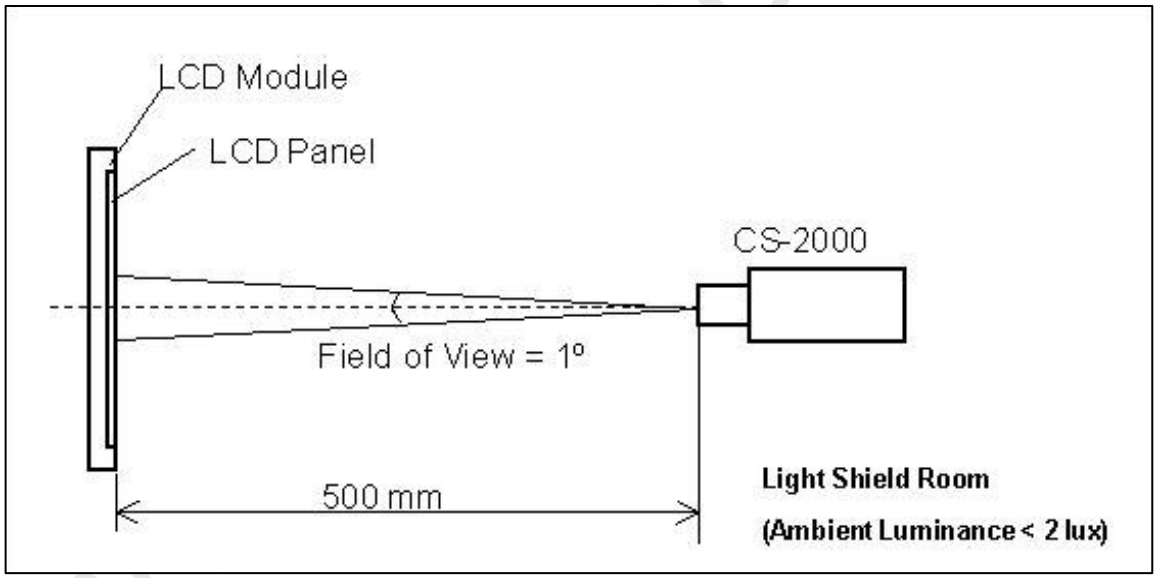
Note (5) Interface signal shall not be kept at high impedance when the power is on.

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | °C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | VCC | 12 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| Lamp Current | IL | 10.5 | mA |
| Oscillating Frequency (Inverter) | FW | 42 | KHz |
| Vertical Frame Rate | Fr | 60 | Hz |

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



### 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 |
|---|---|---|---|---|---|---|---|---|
| Color Chromaticity | Red | Rcx | $\theta_x$=0°, $\theta_Y$ =0° Viewing Angle at Normal Direction Standard light source "C" | - | 0.658 | - | - | (0),(5) |
| | | Rcy | | | 0.326 | | - | |
| | Green | Gcx | | | 0.257 | | - | |
| | | Gcy | | | 0.587 | | - | |
| | Blue | Bcx | | | 0.133 | | - | |
| | | Bcy | | | 0.104 | | - | |
| | White | Wcx | | | 0.315 | | - | |
| | | Wcy | | | 0.362 | | - | |
| Center Transmittance | | T% | $\theta_x$=0°, $\theta_Y$ =0° with CMI module | - | 4.7 | - | % | (1),(7) |
| Contrast Ratio | | CR | | 4000 | 6000 | - | - | (1),(3) |
| | | | | | | | | |
| Response Time (VA) | | Gray to gray | $\theta_x$=0°, $\theta_Y$ =0° with CMI Module@60Hz | - | 9 | 12 | | (1),(4) |
| White Variation | | δW | $\theta_x$=0°, $\theta_Y$ =0° with CMI module | - | - | 1.3 | - | (1),(6) |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥20 (VA) with CMI module | | 88 | | Deg. | (1),(2) |
| | | $\theta_x$- | | | 88 | | | |
| | Vertical | $\theta_Y$+ | | | 88 | | | |
| | | $\theta_Y$- | | | 88 | | | |

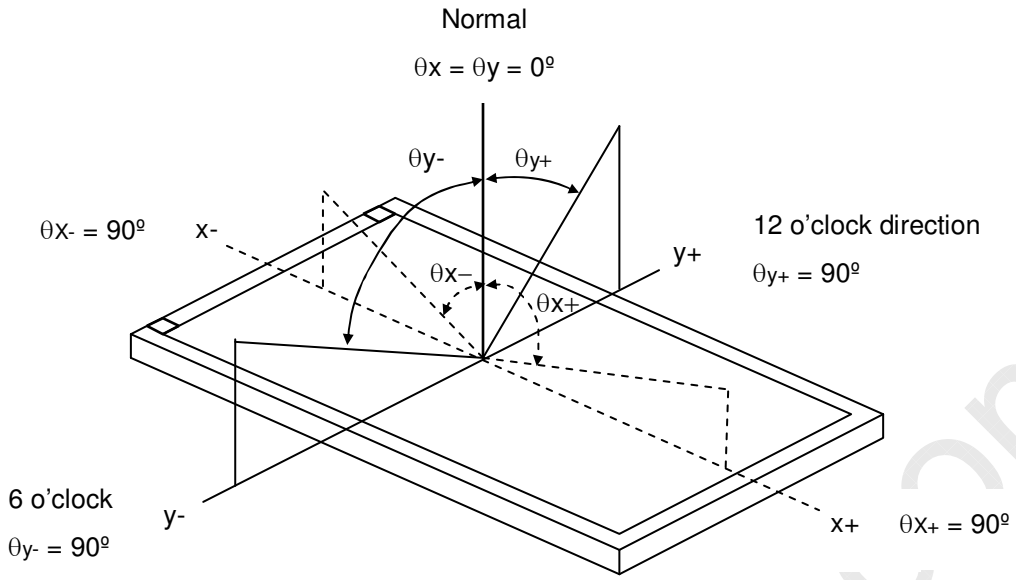
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following:

1. Measure Module's W,R,G,B spectrum and BLU's spectrum. Which BLU (for V260H1-L03) is supplied by CMI.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C".

Note (1) Light source is the BLU which supplied by CMI and driving voltage are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy):

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




Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

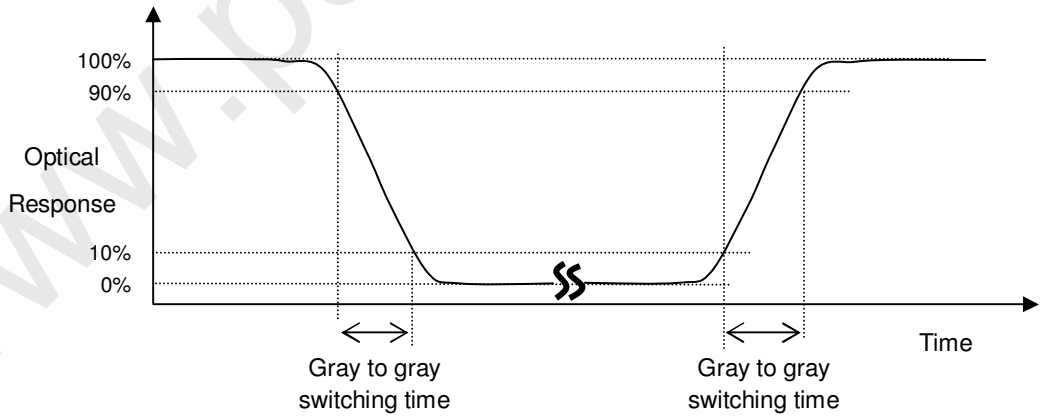
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

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).

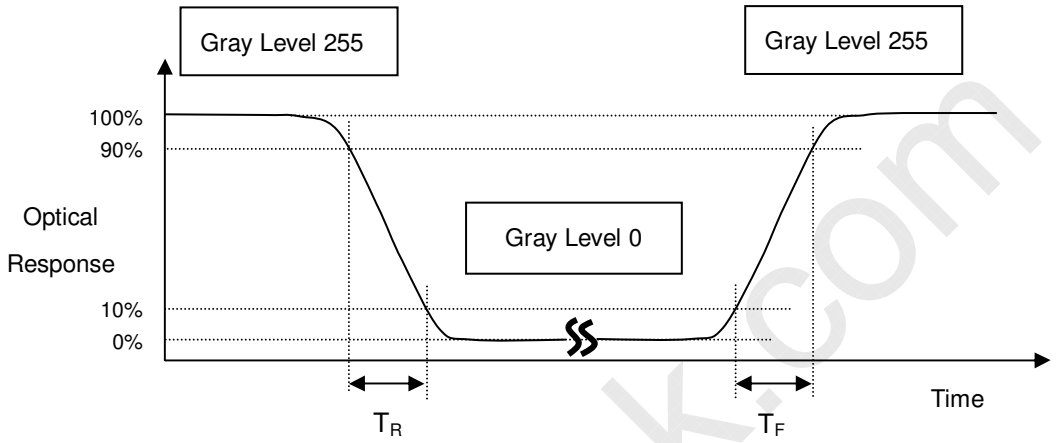
Note (4) Definition of Gray-to-Gray Switching Time:



The driving signal means the signal of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023.

Gray to gray average time means the average switching time of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023 to each other.

Note (5) Definition of Response Time ($T_R$, $T_F$):




Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

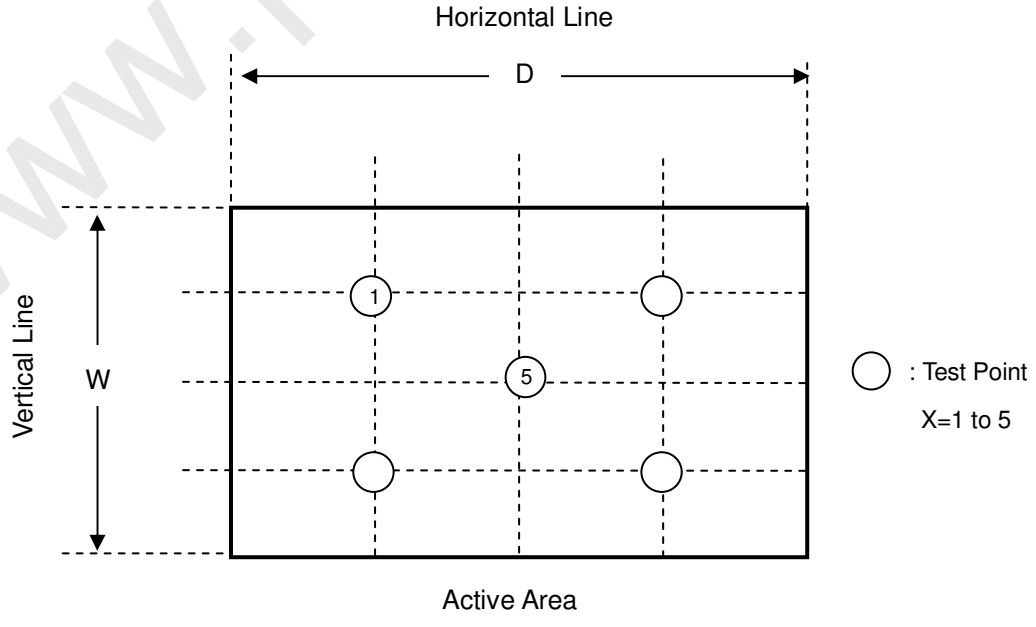
δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

[Dino Hint: SEC and AUO are 9 points and the test point distance is W/6]



## 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℃ 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 10ºC, 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.

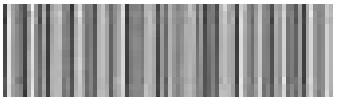
[ 3 ] After the module's end of life, it is not harmful in case of normal operation and storage.

## 9. DEFINITION OF LABELS

### 9.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMI internal control.

V315H3-P01 XX



XXXXXXXXXXXX

### 9.2 CARTON LABEL

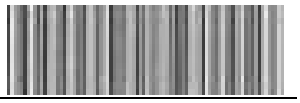
The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation.

P.O. NO._____

Parts ID._____

Model Name V315H3-P01 __

Carton ID._____ Quantities 18



XXXXXXXXXXXXX

Made In Taiwan

(a) Model Name: V315H3– P01

(b) Carton ID: CM0 internal control

(c) Quantities: 18

## 10. PACKAGING

### 10.1 PACKAGING SPECIFICATIONS

(1) 18 LCD TV Panels / 1 Box

(2) Box dimensions : 970 (L) X 640 (W) X 319 (H)

(3) Weight : approximately 36Kg ( 18 panels per box)

### 10.2 PACKAGING METHOD

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

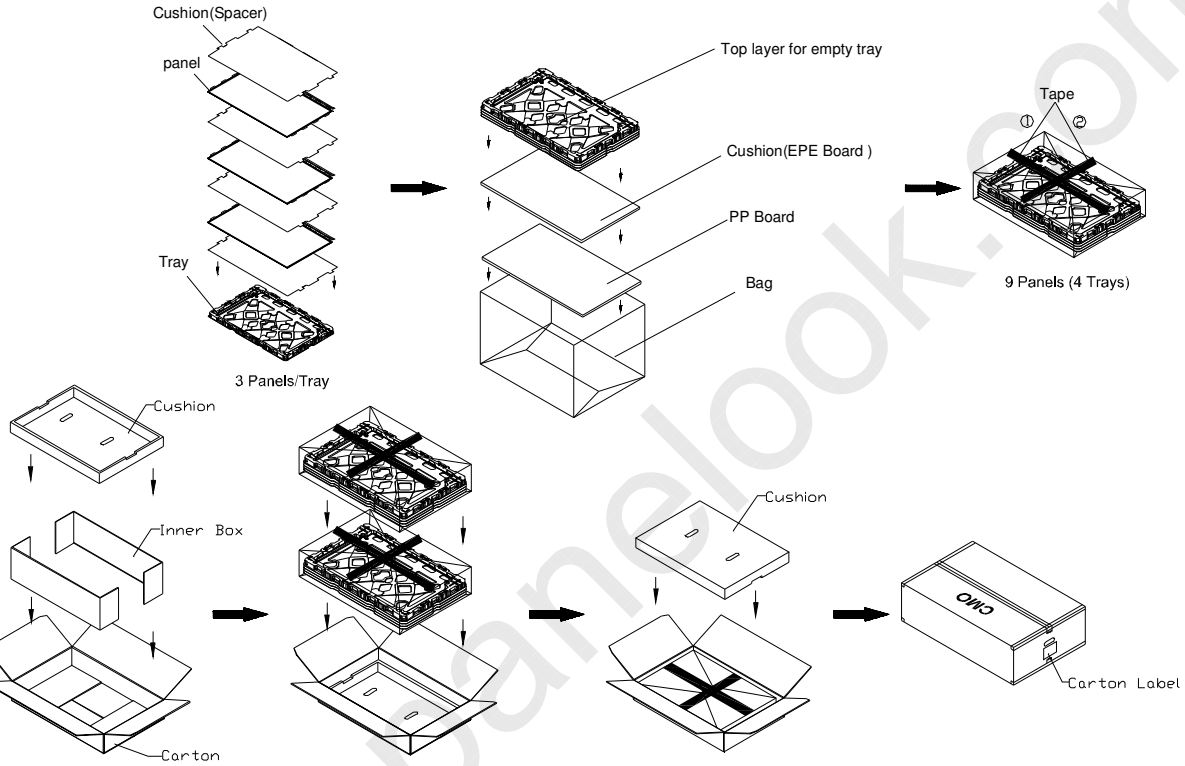
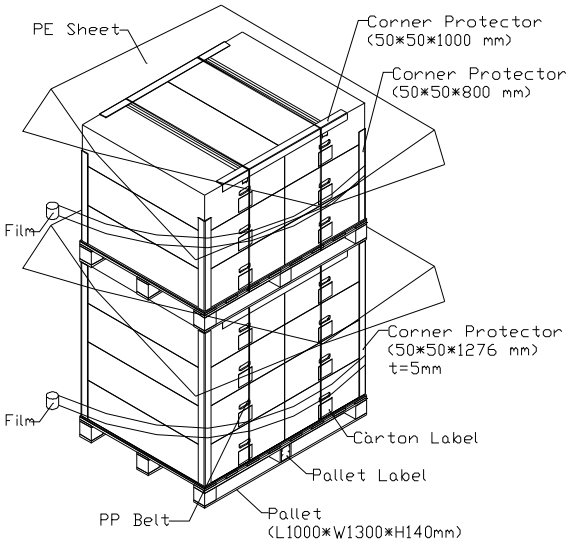
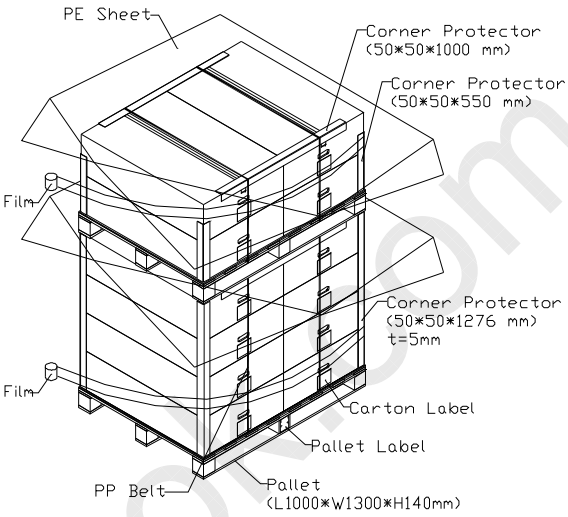



Figure.10-1 packing method

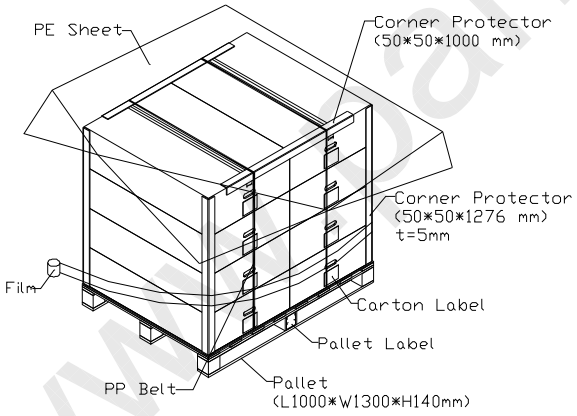
Sea / Land Transportation
(40ft HQ Container)




Sea / Land Transportation
(40ft Container)




Air Transportation



## 11. MECHANICAL CHARACTERISTIC