CHI MEI OPTOELECTRONICS CORP.

Issued Date：Nov. 9, 2009
Model No.：V370B1-P03
**Approval**

# TFT LCD Approval Specification

# MODEL NO.: V370B1-P03

Customer: _____

Approved by: _____

Note:

| | |
|---|---|
| Approved By | TV Product Marketing & Management Div |
| | Chao-Chun Chung |

| | | |
|---|---|---|
| Reviewed By | QA Dept. | Product Development Div. |
| | Hsin-Nan Chen | WT Lin |

| | | |
|---|---|---|
| Prepared By | LCD TV Marketing and Product Management Div. | |
| | Josh Chi | Chloe Chen |

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## REVISION HISTORY

| Version | Date | Page (New) | Section | Description |
|---|---|---|---|---|
| 2.0 | Nov. 9, 09 | All | All | Approval Specification was first issued. |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

V370B1- P03 is a 37" TFT LCD cell with driver ICs and a 1-ch LVDS interface. The product supports 1366 x 768 WXGA mode and can display true 16.7M(8-bit/color) colors. The backlight unit is not built in.

## 1.2 CHARACTERISTICS

| CHARACTERISTICS ITEMS | SPECIFICATIONS |
|---|---|
| Screen Diagonal [in] | 37 |
| Pixels [lines] | 1366×768 |
| Active Area [mm] | 819.6×460.8 |
| Sub -Pixel Pitch [mm] | 0.2(H)×0.6(V) |
| Pixel Arrangement | RGB vertical stripe |
| Weight [g] | TYP. 1692 |
| Physical Size [mm] | 841.4(W) x 480.4(H) x 1.75(D) Typ. |
| Display Mode | Transmissive mode / Normally black |
| Contrast Ratio | 3000:1 Typ.<br>(Typical value measured at CMO's module) |
| Glass thickness (Array/CF) [mm] | 0.7 / 0.7 |
| Viewing Angle (CR>20) | +88/-88(H),+88/-88(V) Typ.<br>(Typical value measured at CMO's module) |
| Color Chromaticity | R=(0.645, 0.335)<br>G=(0.277, 0.595)<br>B=(0.144,0.067)<br>W=(0.285, 0.293)<br>*Please refer to "color chromaticity" on p.16 |
| Cell Transparency [%] | 6.0%Typ.<br>(Typical value measured at CMO's module) |
| Polarizer (CF side) | Anti-glare coating,<br>834.2(W) x 475.8(H). Hardness: 3H |
| Polarizer (TFT side) | 834.2(W) x 475.8(H) |

## 1.3 MECHANICAL SPECIFICATIONS

| Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Weight | | 1692 | | 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.

(2) Connector mounting position

+/- 0.5mm

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V260B1-L11)

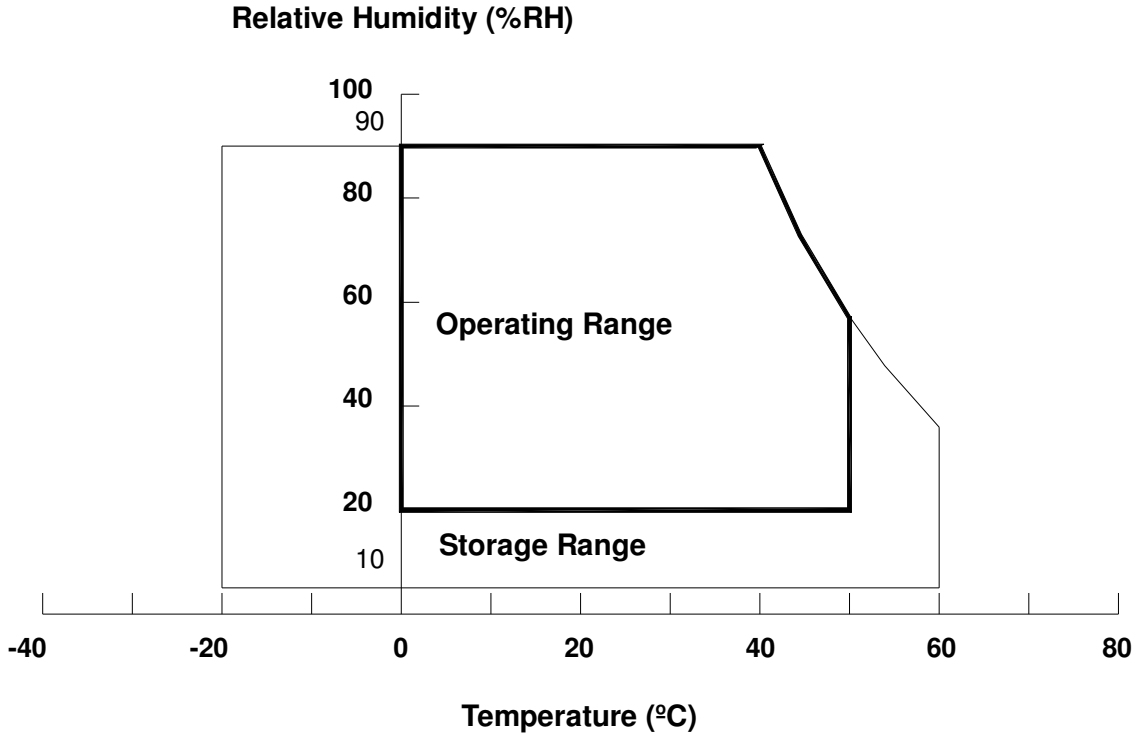
| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1), (3) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | 50 | ºC | (1), (2), (3) |
| Altitude Operating | $A_{OP}$ | 0 | 5000 | M | (3) |
| Altitude Storage | $A_{ST}$ | 0 | 12000 | M | (3) |

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 your 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 your product design.

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

## 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) |
| Input Signal Voltage | $V_{IN}$ | -0.3 | 3.6 | V | |

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

## 3. ELECTRICAL CHARACTERISTICS

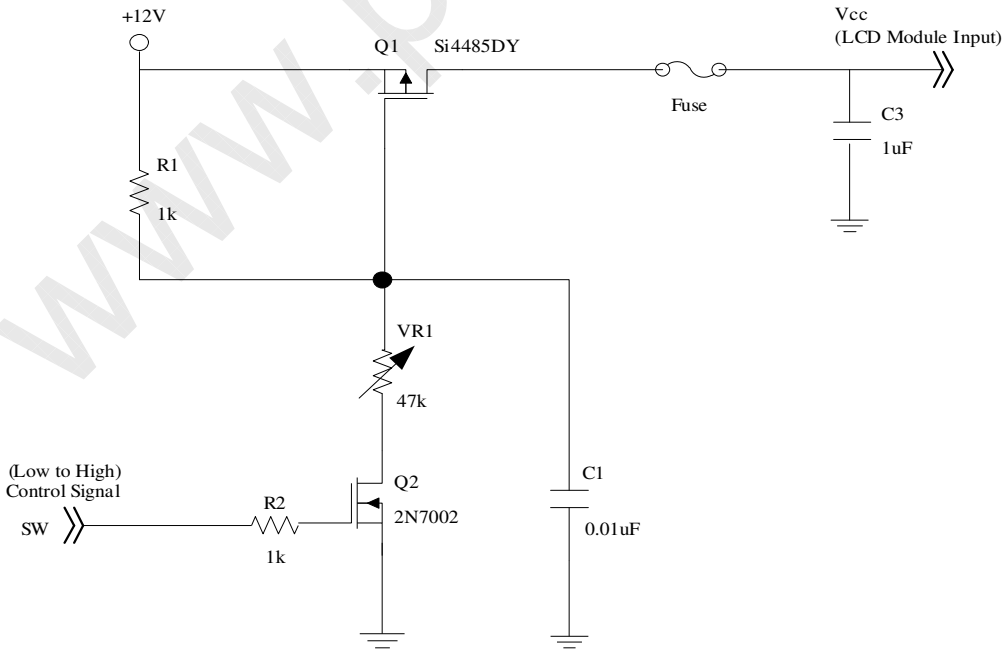
### 3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

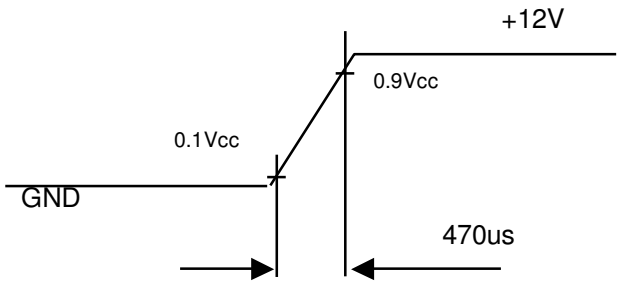
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Rush Current | | $I_{RUSH}$ | — | — | 3 | A | (2) |
| Power Supply Current | White Pattern | — | — | 0.50 | — | A | (3) |
| | Horizontal Stripe | — | — | 0.63 | 0.77 | A | |
| | Black Pattern | — | — | 0.38 | — | 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 | $\|V_{ID}\|$ | 200 | — | 600 | mV | |
| | Terminating Resistor | $R_T$ | — | 100 | — | ohm | |
| CMOS 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 condition:

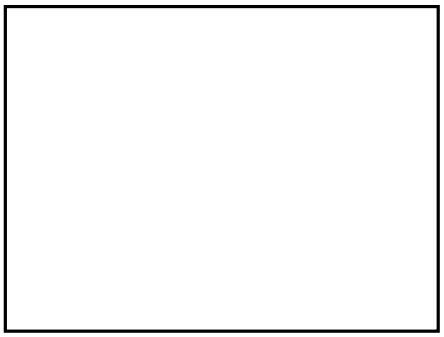


**Vcc rising time is 470us**




Note (3) The specified power supply current 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

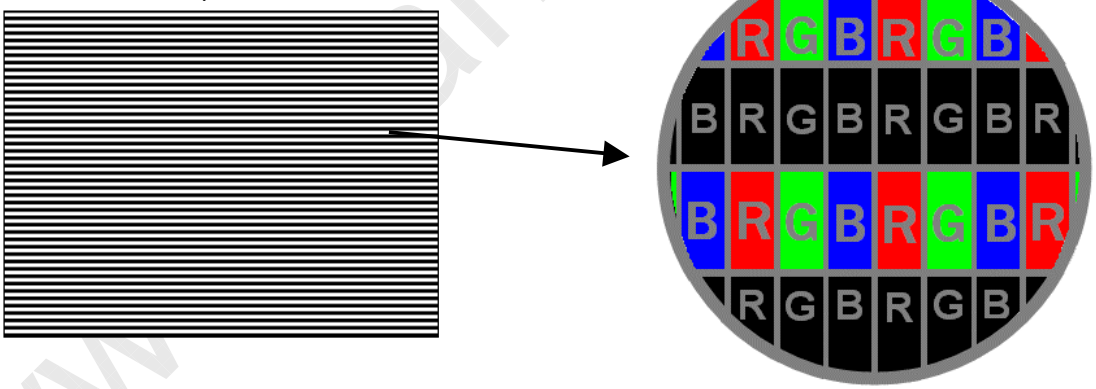


Active Area

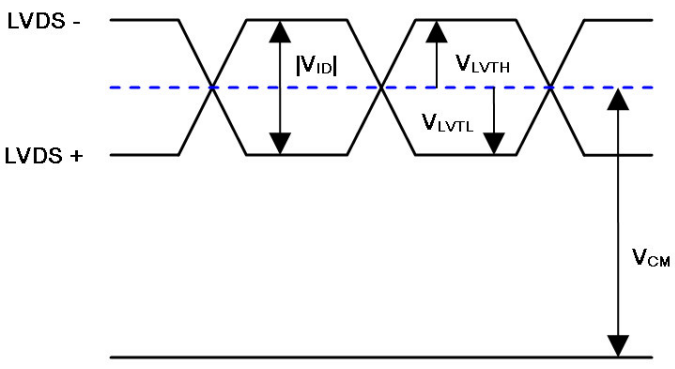
b. Black Pattern

Active Area

c. Horizontal Stripe

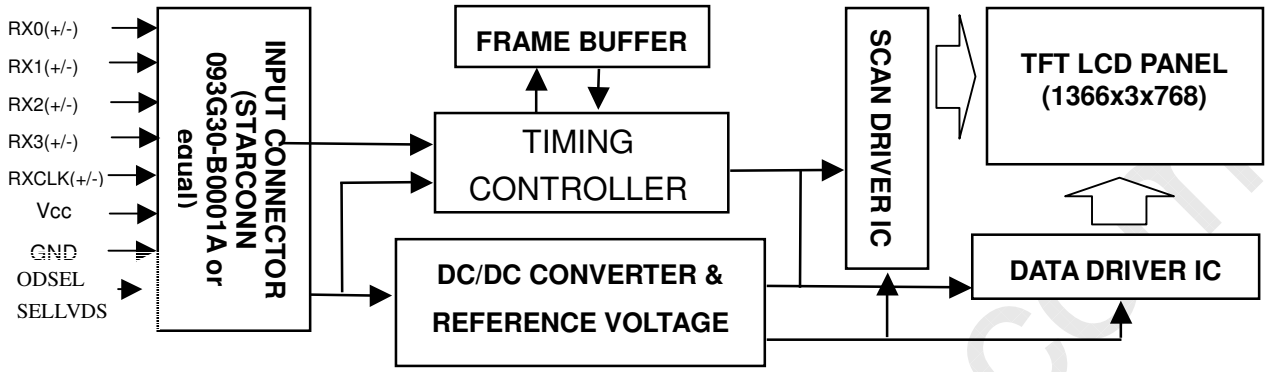



Note (4) The LVDS input characteristics are as follows:



## 4. BLOCK DIAGRAM

### 4.1 TFT LCD OPEN CELL



## 5. INPUT TERMINAL PIN ASSIGNMENT

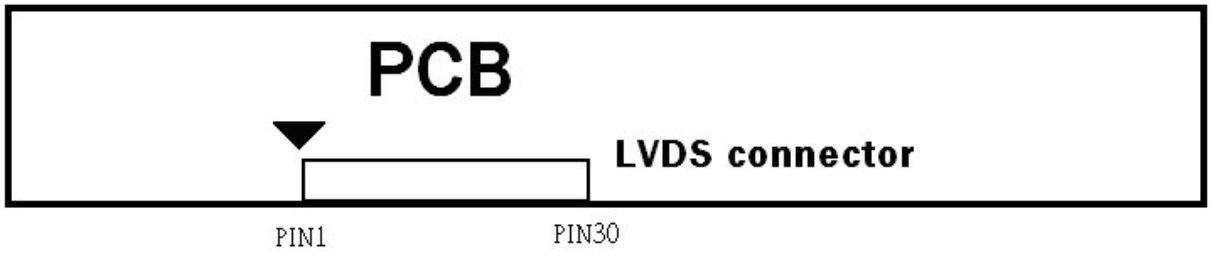
### 5.1 TFT LCD MODULE

**CNF1 Connector Pin Assignment**

| Pin No. | Symbol | Description | Note |
|---|---|---|---|
| 1 | VCC | Power supply: +12V | |
| 2 | VCC | Power supply: +12V | |
| 3 | VCC | Power supply: +12V | |
| 4 | VCC | Power supply: +12V | |
| 5 | GND | Ground | |
| 6 | GND | Ground | |
| 7 | GND | Ground | |
| 8 | NC | No connection | (4) |
| 9 | SELLVDS | Select LVDS data format | (2),(5) |
| 10 | ODSEL | Overdrive Lookup Table Selection | (3),(5) |
| 11 | GND | Ground | |
| 12 | RX0- | Negative transmission data of pixel 0 | |
| 13 | RX0+ | Positive transmission data of pixel 0 | |
| 14 | GND | Ground | |
| 15 | RX1- | Negative transmission data of pixel 1 | |
| 16 | RX1+ | Positive transmission data of pixel 1 | |
| 17 | GND | Ground | |
| 18 | RX2- | Negative transmission data of pixel 2 | |
| 19 | RX2+ | Positive transmission data of pixel 2 | |
| 20 | GND | Ground | |
| 21 | RXCLK- | Negative of clock | |
| 22 | RXCLK+ | Positive of clock | |
| 23 | GND | Ground | |
| 24 | RX3- | Negative transmission data of pixel 3 | |
| 25 | RX3+ | Positive transmission data of pixel 3 | |
| 26 | GND | Ground | |
| 27 | NC | No connection | (4) |
| 28 | NC | No connection | (4) |
| 29 | NC | No connection | (4) |
| 30 | GND | Ground | |

Note (1) Connector type: STARCONN 093G30-B0001A or Faxconn GS23302-1311S-7F or compatible

LVDS connector pin defined as follows




Note (2) Low = Open or connect to GND: VESA Format, High = Connect to +3.3V: JEIDA Format.

Please refer to 5.5 LVDS INTERFACE

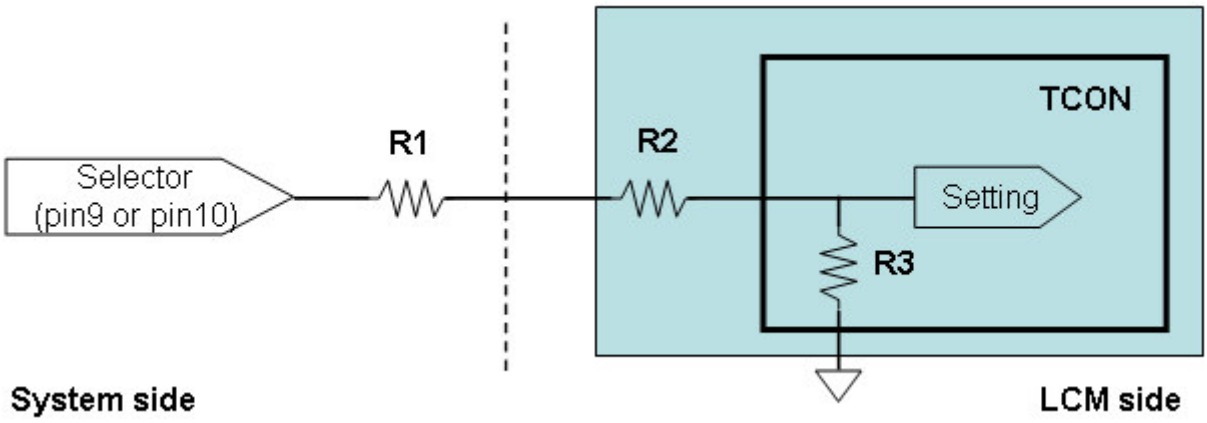
Note (3) Overdrive lookup table selection. The Overdrive lookup table should be selected in accordance to the frame rate to optimize image quality.

Low = Open or connect to GND, High = Connect to +3.3V

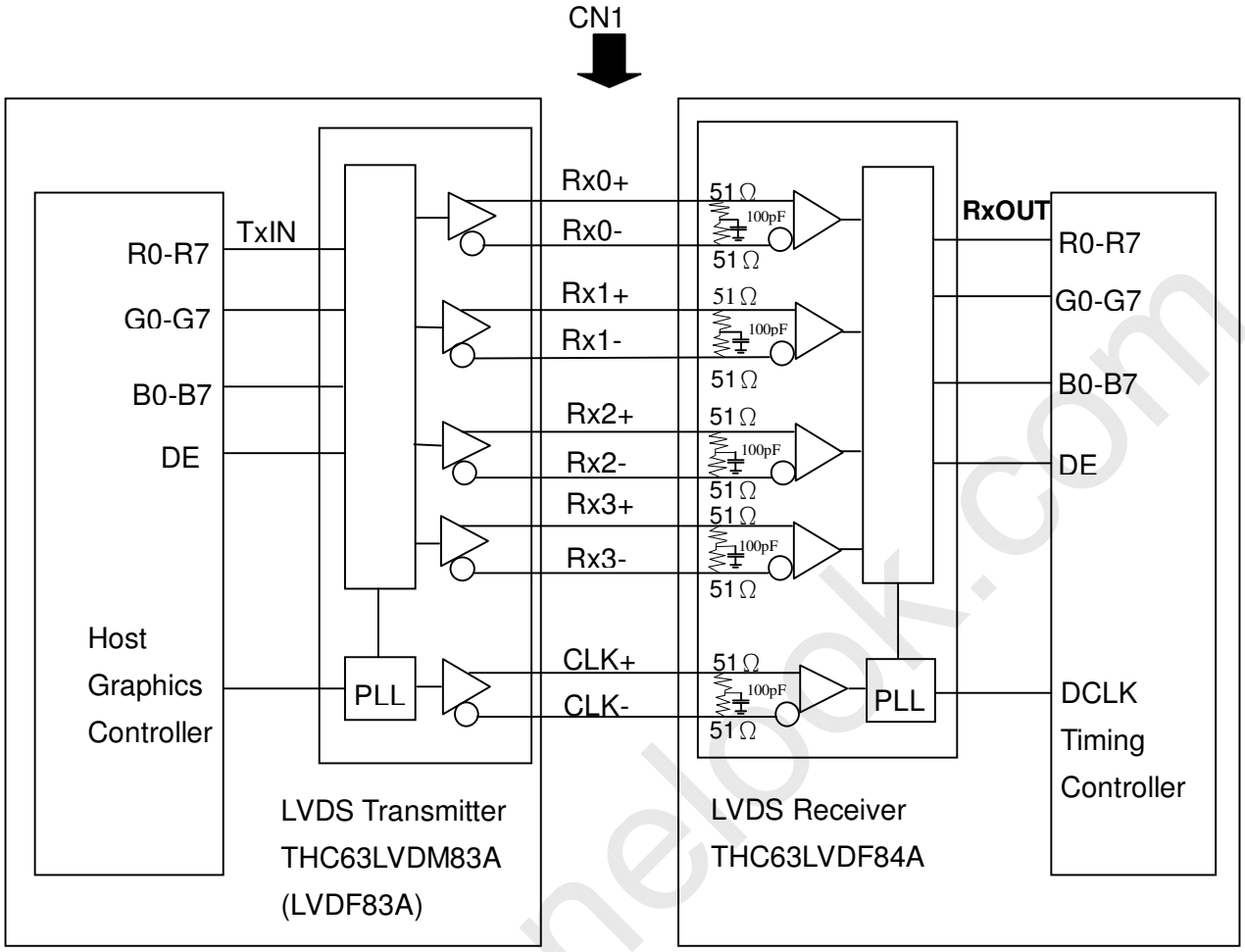
| ODSEL | Note |
|---|---|
| L or Open | Lookup table was optimized for 60 Hz frame rate. |
| H | Lookup table was optimized for 50 Hz frame rate. |

Note (4) Reserved for internal use. Left it open.

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)



## 5.2 BLOCK DIAGRAM OF INTERFACE



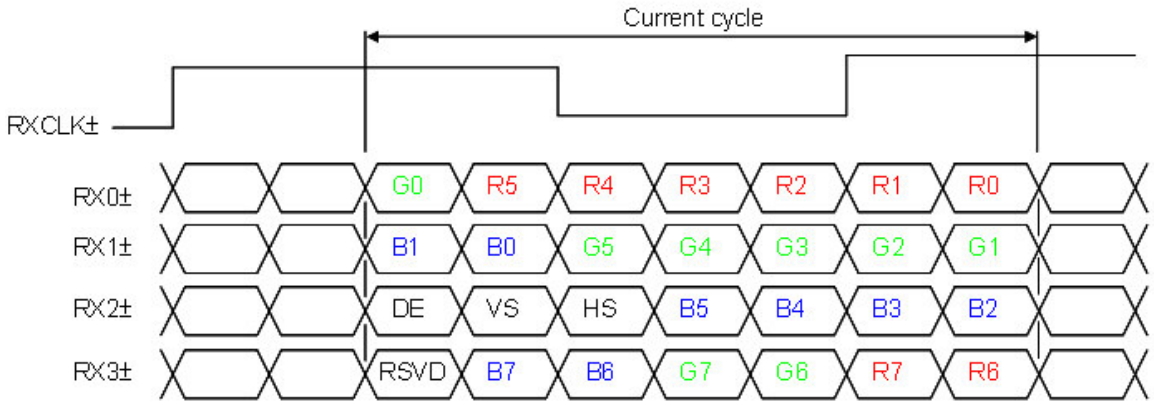

R0~R7 : Pixel R Data ,
G0~G7 : Pixel G Data ,
B0~B7 : Pixel B Data ,
DE : Data enable signal

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

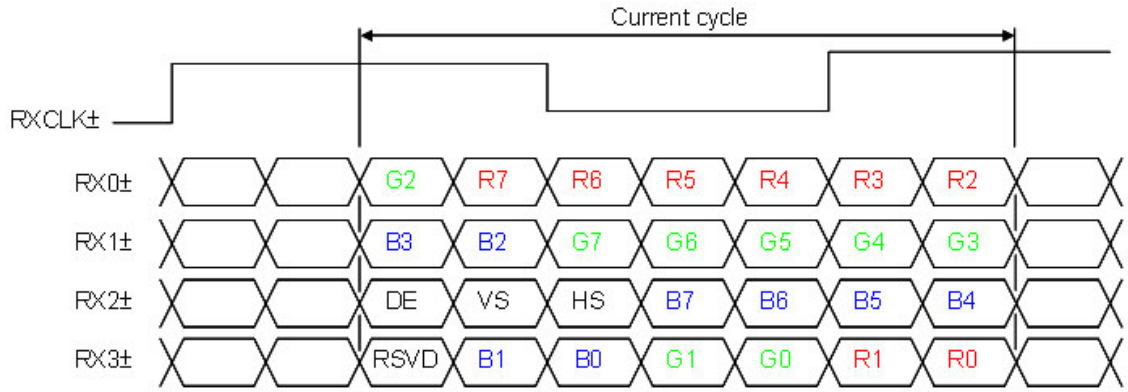
Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

### 5.3 LVDS INTERFACE

**SELLVDS = L or Open (VESA)**




**SELLVDS = H (JEIDA)**




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

Notes(1) RSVD(reserved)pins on the transmitter shall be “H” or( “L” or OPEN)

### 5.4 COLOR DATA INPUT ASSIGNMENT

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

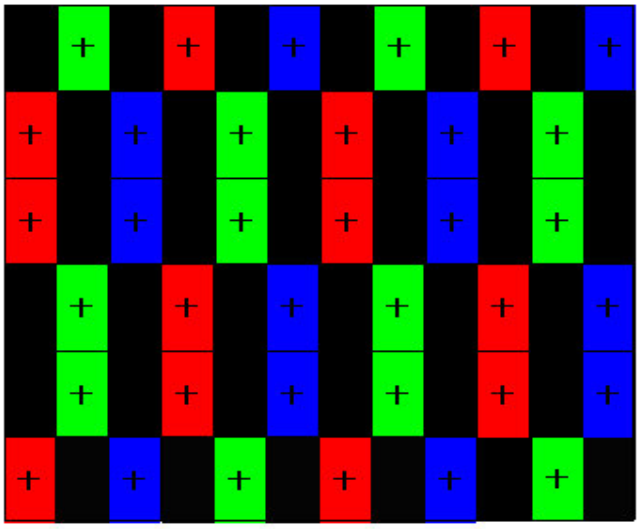
| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | 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

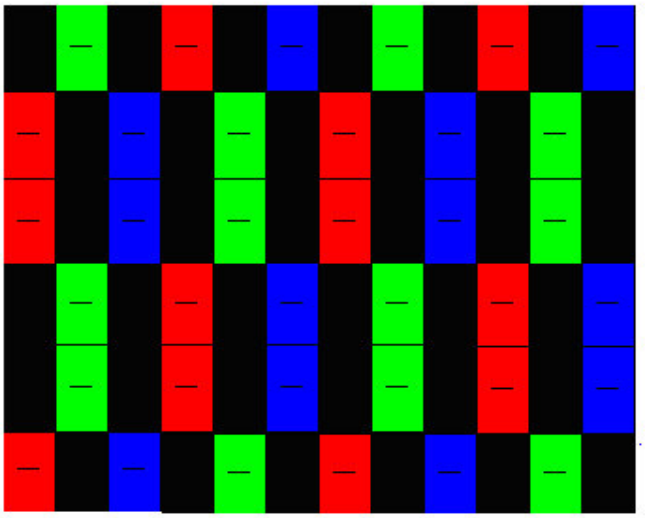
### 5.5 PATTERN FOR Vcom ADJUSTMENT

**2line-inversion pattern ( 2n+1)**

Frame N



Frame N+1



Gray level = 128

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | $F_{clkin}$ (=1/TC) | 60 | 76 | 82 | MHz | |
| | Input cycle to cycle jitter | Trcl | - | - | 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 | Fr5 | 47 | 50 | 53 | Hz | (6) |
| | | Fr6 | 57 | 60 | 63 | Hz | |
| | Total | Tv | 778 | 806 | 888 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 768 | 768 | 768 | Th | - |
| | Blank | Tvb | 10 | 38 | 120 | Th | - |
| Horizontal Active Display Term | Total | Th | 1442 | 1560 | 1936 | Tc | Th=Thd+Thb |
| | Display | Thd | 1366 | 1366 | 1366 | Tc | - |
| | Blank | Thb | 76 | 194 | 570 | Tc | - |

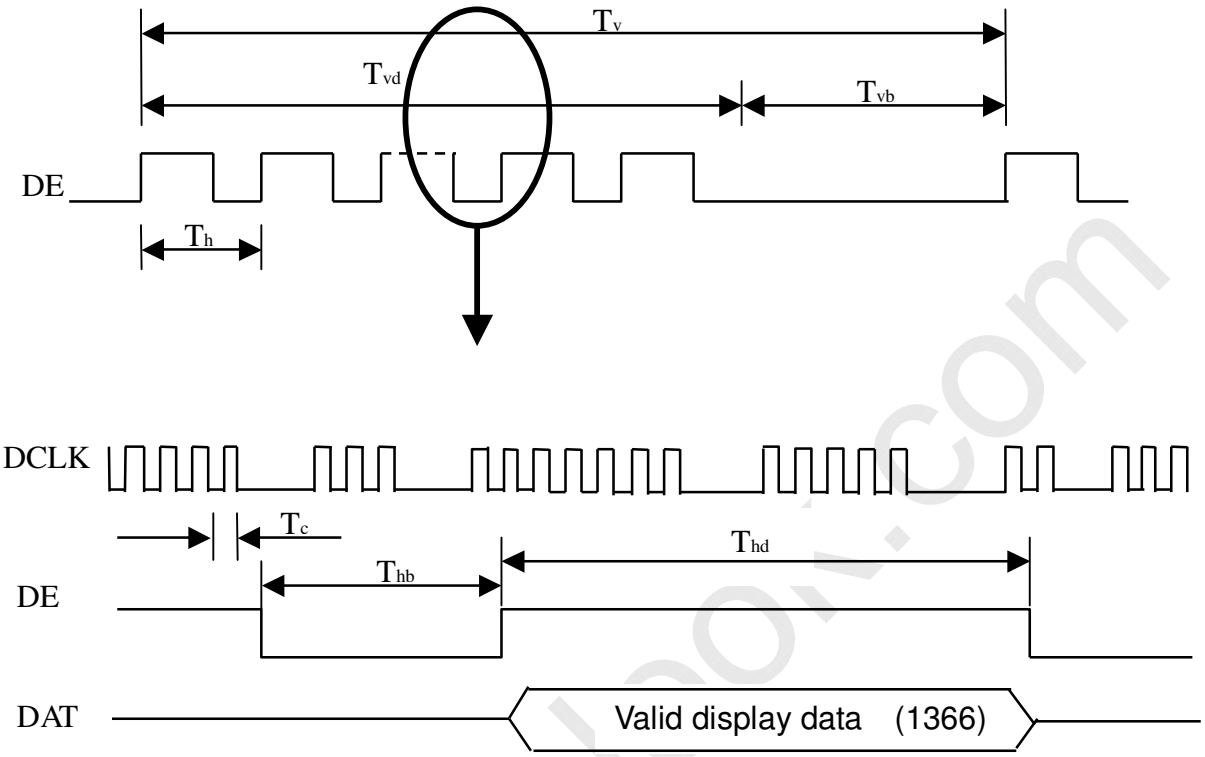
Note (1) Please make sure the range of pixel clock has follow the below equation：

$$F_{clkin(max)} \geqq F_{r6} \times Tv \times Th$$

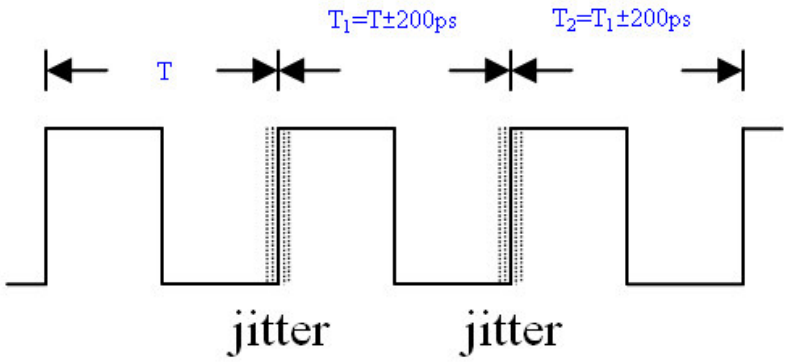
$$F_{r5} \times Tv \times Th \geqq F_{clkin(min)}$$

Note (2) Since this 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.

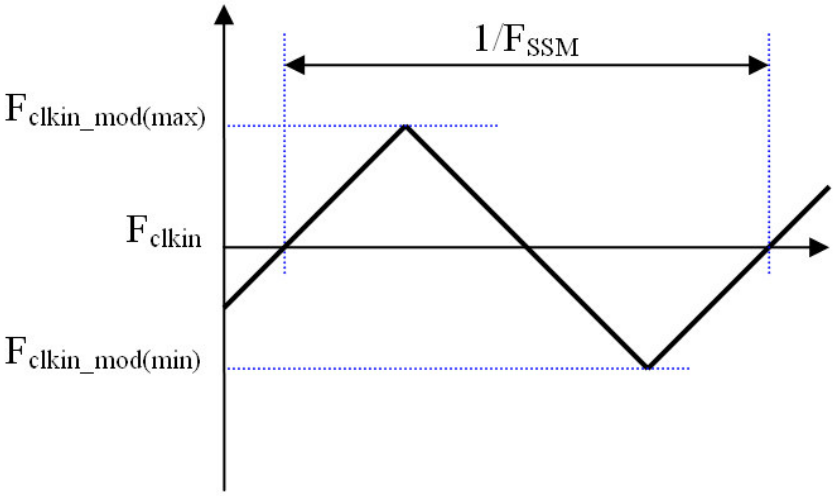
## INPUT SIGNAL TIMING DIAGRAM




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

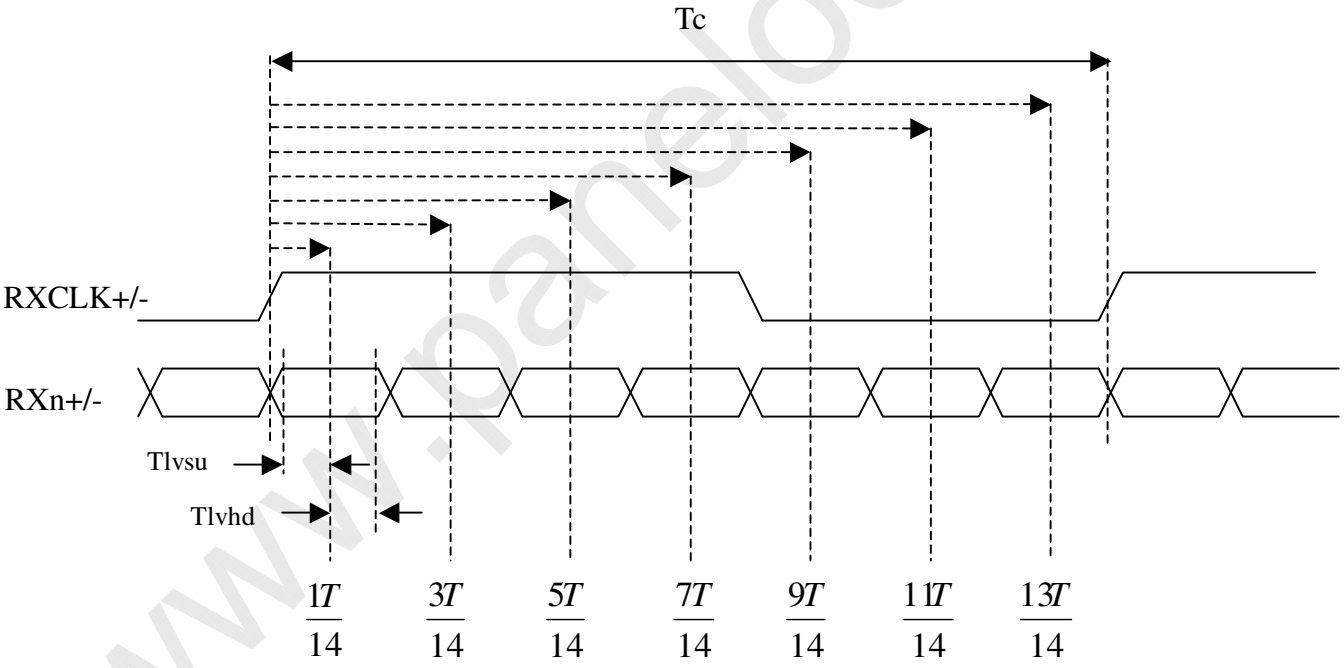


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.




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

**LVDS RECEIVER INTERFACE TIMING DIAGRAM**

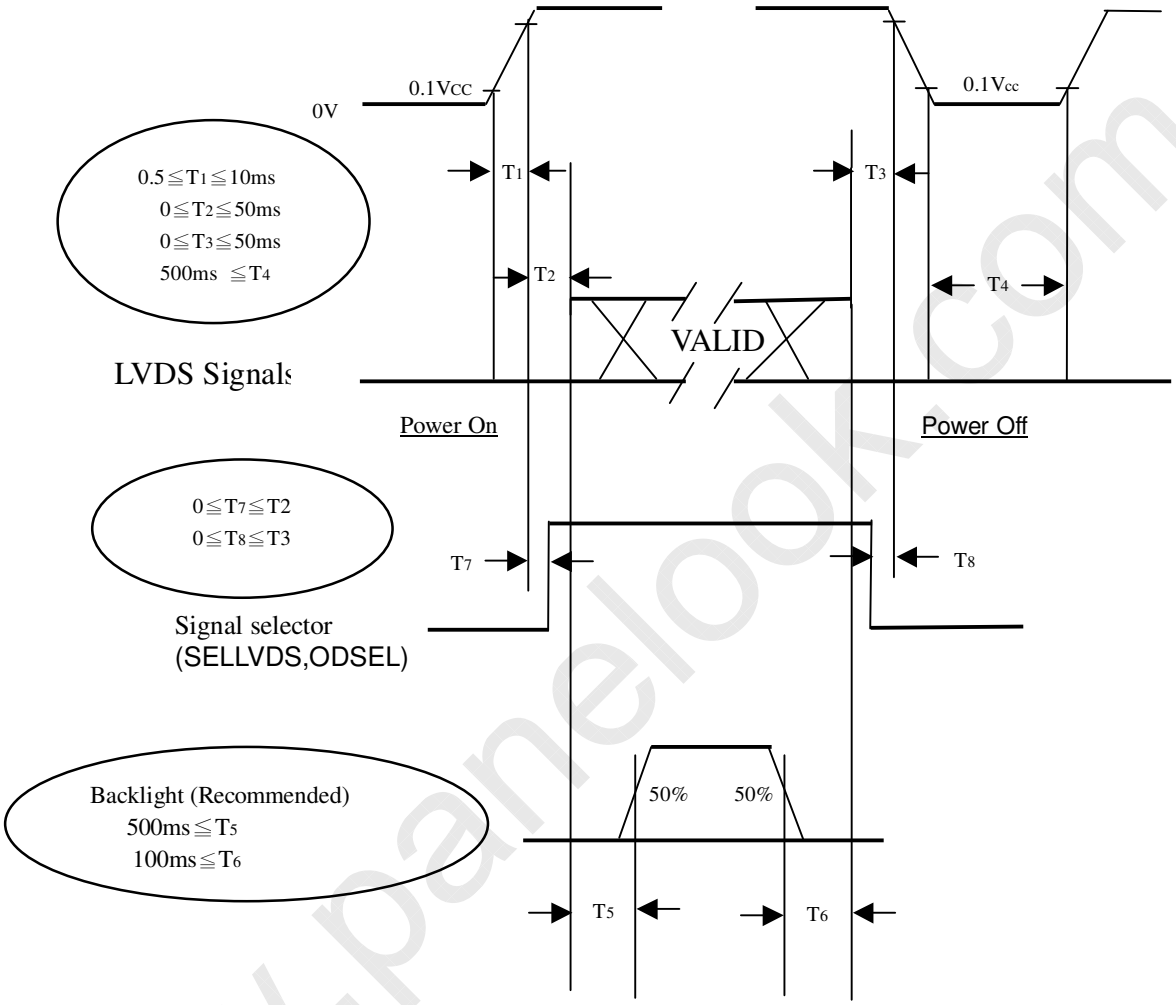



Note (6) : (ODSEL) = H/L or open for 50/60Hz frame rate. Please refer to 5.1 for detail information

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

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 | $V_{CC}$ | 12.0 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| Lamp Current ( High side ) | $I_L$ | 7.5mA ± 0.5 | mA |
| Oscillating Frequency (Inverter) | $F_W$ | 58±3 | KHz |
| Frame rate | | 60 | Hz |

## 7.2 OPTICAL SPECIFICATIONS

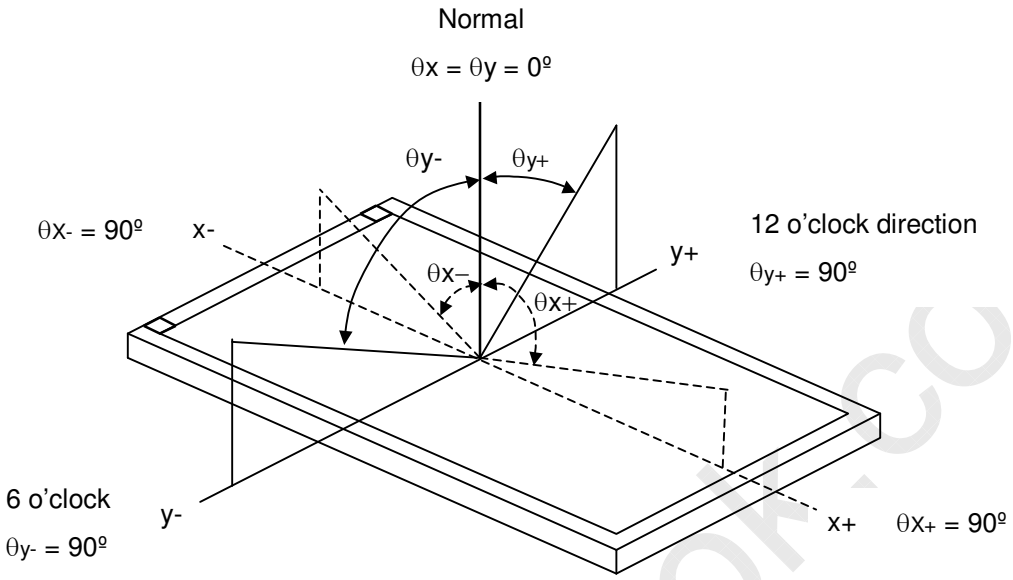
The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Color Chromaticity | Red | Rcx | $\theta_x$=0°, $\theta_Y$ =0° Viewing angle at normal direction With CMO module | Typ. -0.03 | 0.645 | Typ. +0.03 | - | (1),(5) |
| | | Rcy | | | 0.335 | | - | |
| | Green | Gcx | | | 0.277 | | - | |
| | | Gcy | | | 0.595 | | - | |
| | Blue | Bcx | | | 0.144 | | - | |
| | | Bcy | | | 0.067 | | - | |
| | White | Wcx | | | 0.285 | | - | |
| | | Wcy | | | 0.293 | | - | |
| Center Transmittance | | T% | $\theta_x$=0°, $\theta_Y$ =0° with CMO module | | 6.0 | - | % | (1),(7) |
| Contrast Ratio | | CR | | 2000 | 3000 | - | | (1),(3) |
| Response Time | | Gray to gray average | $\theta_x$=0°, $\theta_Y$ =0° with CMO Module@60Hz | - | 6.5 | 12 | ms | (4) |
| White Variation | | δW | $\theta_x$=0°, $\theta_Y$ =0° with CMO module | - | - | 1.3 | - | (1),(6) |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥20 With CMO module | 80 | 88 | - | Deg. | (1),(2) |
| | | $\theta_x$- | | 80 | 88 | - | | |
| | Vertical | $\theta_Y$+ | | 80 | 88 | - | | |
| | | $\theta_Y$- | | 80 | 88 | - | | |

Note (1) Light source is CMO's V370B1-L01 BLU and driving voltages are based on suitable gamma voltages.

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

Viewing angles are measured by Autronic Conoscope Cono-80




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

The contrast ratio can be calculated by the following expression.

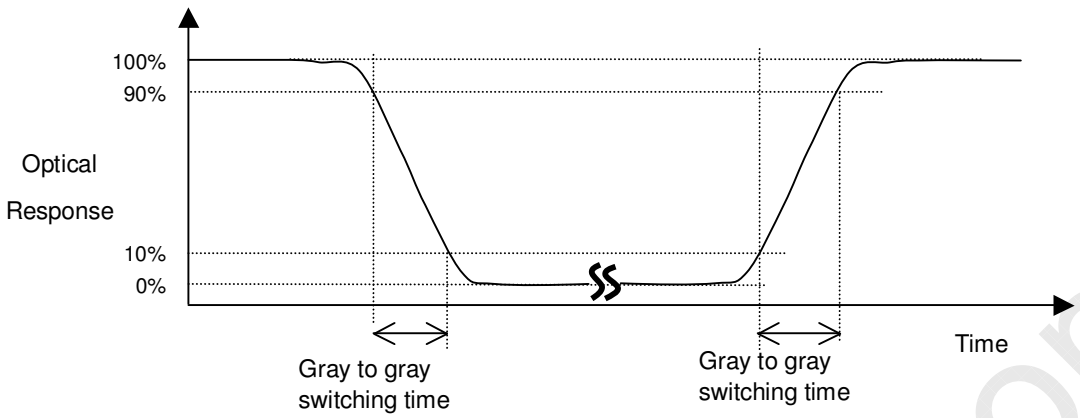
Contrast Ratio (CR) = L255 / L0

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).

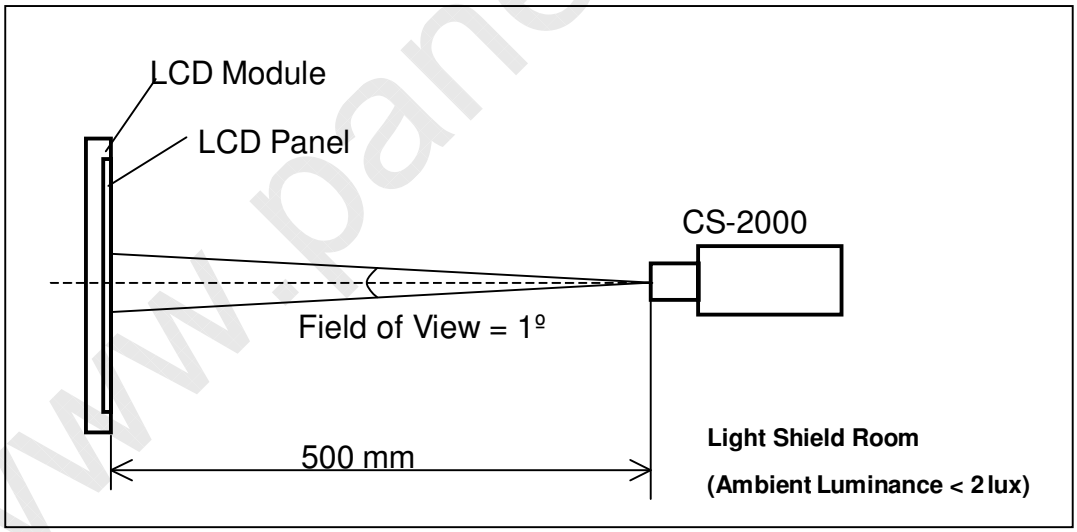
Note (4) Definition of Gray to Gray Switching Time :




The driving signal means the signal of gray level 0, 123, 168, 202, 230,255. Gray to gray average time means the average switching time of gray level 0, 123, 168, 202, 230,255 to each other .

Note (5) Measurement Setup:

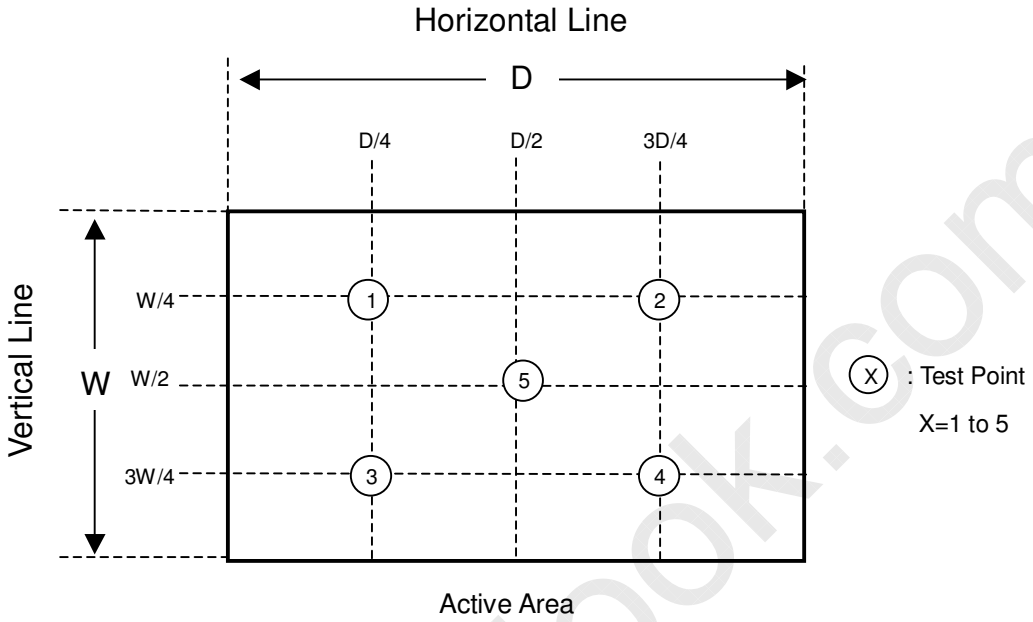
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



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 Transmittance (T%) :

Module is without signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

# 8. PRECAUTIONS

## 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble backlight or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel will be damaged.

(4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

## 8.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the product's end of life, it is not harmful in case of normal operation and storage.

# 9. PACKAGING

## 9.1 PACKING SPECIFICATIONS

(1) 15PCS LCD TV Panels / 1 Box

(2) Box dimensions : 982 (L) X 642 (W) X 268 (H)

(3) Weight : approximately 36 Kg

## 9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

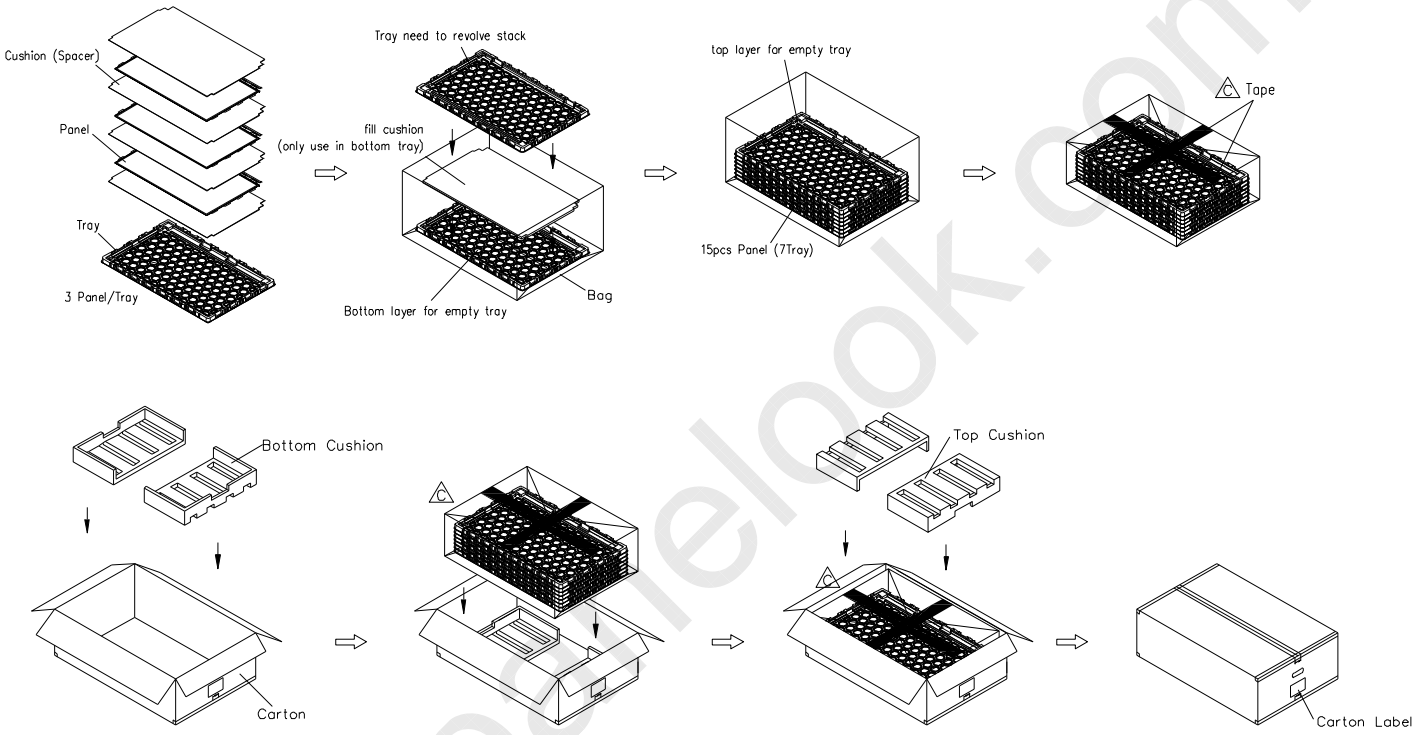
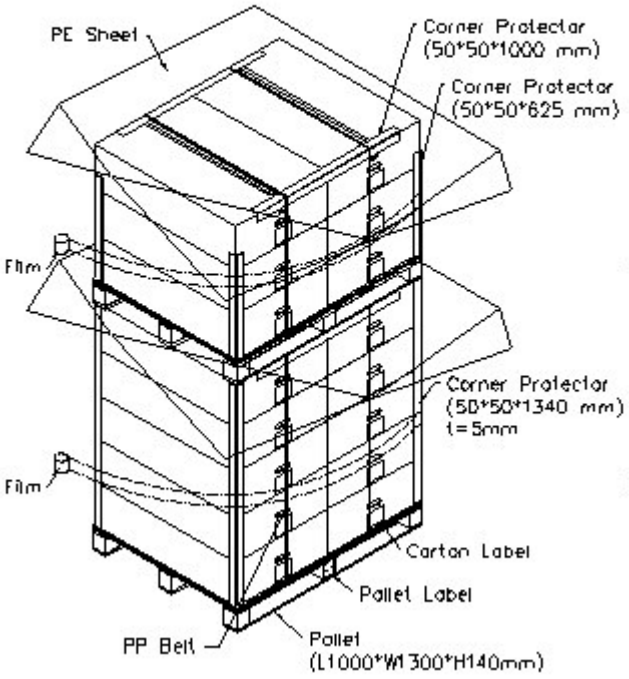
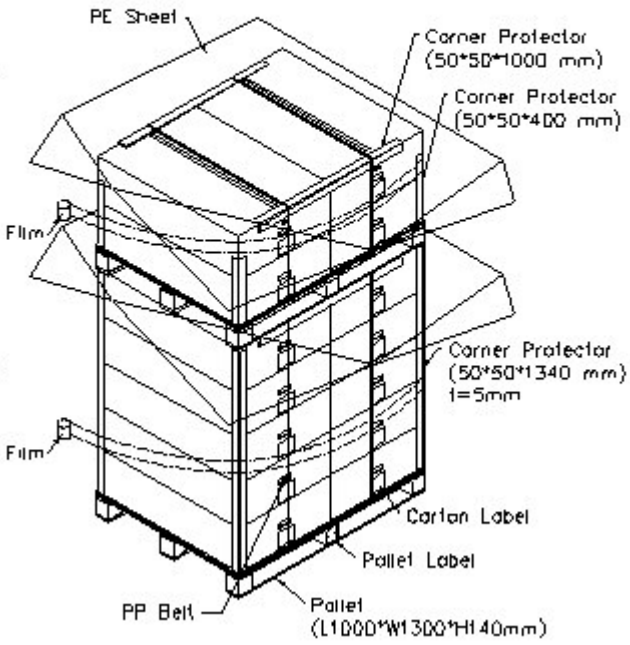



Figure.9-1 packing method

Sea / Land Transportation
(40ft HQ Container)




Sea / Land Transportation
(40ft Container)




Air Transportation

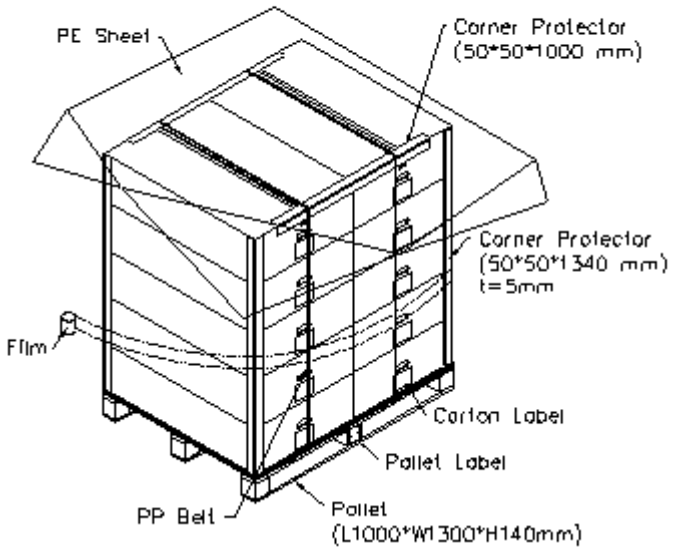



Figure.9-2 packing method

## 10. REGULATORY STANDARDS

### 10.1 SAFETY

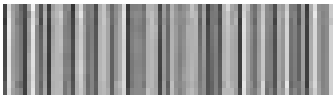
| Regulatory | Item | Standard |
|---|---|---|
| Information Technology equipment | UL | UL 60950-1: 2003 |
| | cUL | CAN/CSA C22.2 No.60950-1-03 |
| | CB | IEC 60950-1:2001 |
| Audio/Video Apparatus | UL | UL 60065: 2003 |
| | cUL | CAN/CSA C22.2 No.60065-03 |
| | CB | IEC 60065:2001 |

# 11. DEFINITION OF LABELS

## 11.1 OPEN CELL LABEL

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

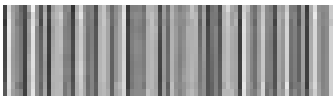
V370B1-P03



XXXXXXXXXXXXX

The barcode nameplate is pasted on Protector Film of each open cell as illustration for CMO internal control.

V370B1-P03 Rev.



XXXXXXXXXXXXX

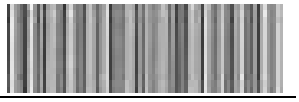
## 11.2 CARTON LABEL

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

P.O. NO._____

Parts ID._____

Carton ID._____ Quantities 15



XXXXXXXXXXXXX

Made in Taiwan(China)

(a) Model Name: V370B1– P03

(b) Carton ID: CMO internal control

(c) Quantities: 15

## 12. Mechanical Drawing