奇美電子
CHIMEI INNOLUX

PRODUCT SPECIFICATION

☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

# MODEL NO.: V400HK3
# SUFFIX: PE1

**Customer: SEC**

**APPROVED BY**          **SIGNATURE**

Name / Title _____          _____
**Note**

_____

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

| Approved By | Checked By | Prepared By |
|---|---|---|
| Chao-Chun Chung | Josh Chi | Joanne Chung |

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**Version 2.0**                    **2**                    **Date：7 Dec. 2010**

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**REVISION HISTORY**

| Version | Date | Page(New) | Section | Description |
|---------|------|-----------|---------|-------------|
| Ver. 2.0 | Dec. 7, 2010 | All | All | The approval specification was first issued. |

**Version 2.0**                                    **4**                                    **Date：7 Dec. 2010**

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## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V400HK3-PE1 is a 40" TFT Liquid Crystal Display product with driver ICs and 4ch-LVDS interface. This product supports 1920 x 1080 Full HDTV format and can display 1.07G (8-bit+Hi-FRC)colors. The backlight unit is not built in.

### 1.2 FEATURES

| CHARACTERISTICS ITEMS | SPECIFICATIONS |
|---|---|
| Screen Diagonal [in] | 40.00 |
| Pixels [lines] | 1920 × 1080 |
| Active Area [mm] | 885.6(H) x 498.15 (V)    (40" diagonal) |
| Sub-Pixel Pitch [mm] | 0.15375 (H) x 0.46125 (V) |
| Pixel Arrangement | RGB vertical stripe |
| Weight [g] | TYP. 1900g |
| Physical Size [mm] | 905.3(W) x 552.4(H) x 1.82(D) Typ. |
| Display Mode | Transmissive mode / Normallly black |
| Contrast Ratio | (5000:1) Typ. (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) (Typical value measure at CMI's module) |
| Color Chromaticity | R = (0.657, 0.327)<br>G = (0.267, 0.583)<br>B = (0.131, 0.112)<br>W= (0.300, 0.351)<br>* Please refer to "color chromaticity" on p.23 |
| Cell Transparency [%] | (4.8%) |
| Polarizer Surface Treatment | Glare coating (Super Clear), Hard coating (3H) |

### 1.3 MECHANICAL SPECIFICATIONS

| Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Weight | --- | (1900) | --- | g | - |
| I/F connector mounting position | The mounting inclination of the connector makes the screen center within ± 0.5mm as the horizontal. | | | 51.75/22.25 | (1)(2) |

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

Note (2) Connector mounting position

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## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

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

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

      (a) 90 %RH Max. (Ta $\leqq$ 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.

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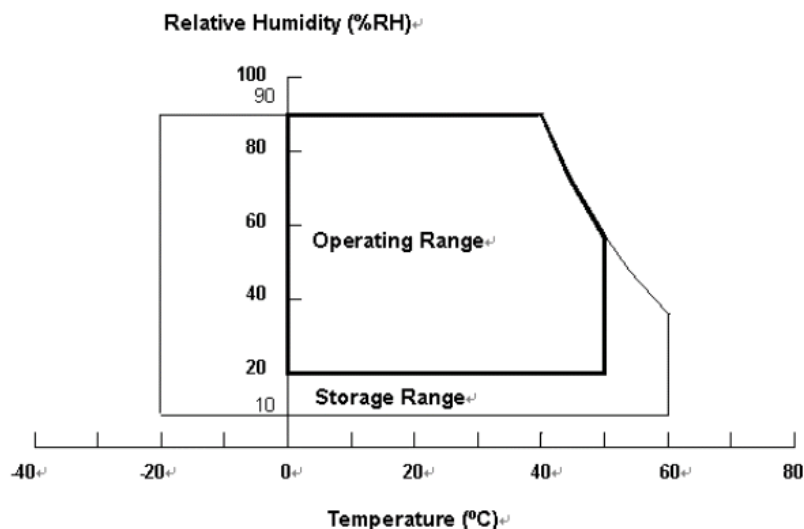
## 2.2 PACKAGE STORAGE

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

(a) 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.

(b) The module shall be stroed 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 | |

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.
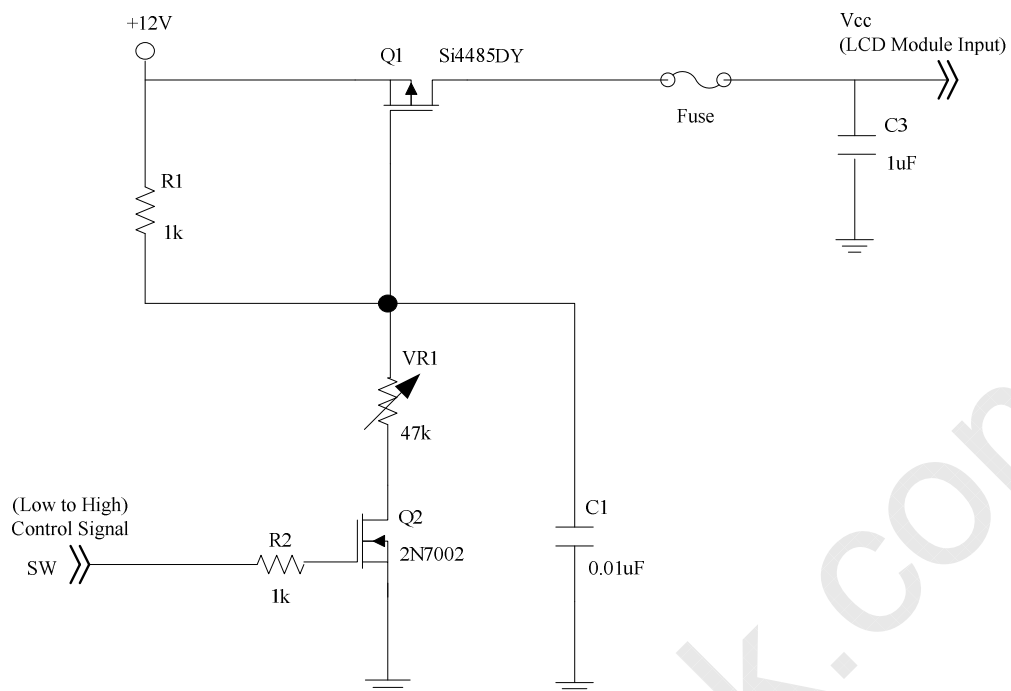
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## 3. ELECTRICAL CHARACTERISTICS

### 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 | | $I_{RUSH}$ | — | — | 3.45 | A | (2) |
| Power Supply Current | White Pattern | — | — | 0.46 | — | A | (3) |
| | Horizontal Stripe | — | — | 0.767 | 0.844 | A | |
| | Black Pattern | — | — | 0.451 | — | 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:

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+12V

Q1    Si4485DY

Vcc
(LCD Module Input)

Fuse

C3
1uF

R1
1k

VR1
47k

(Low to High)
Control Signal

SW

R2
1k

Q2
2N7002

C1
0.01uF

**Vcc rising time is 470us**

Vcc

0.9Vcc

0.1Vcc

GND

470us
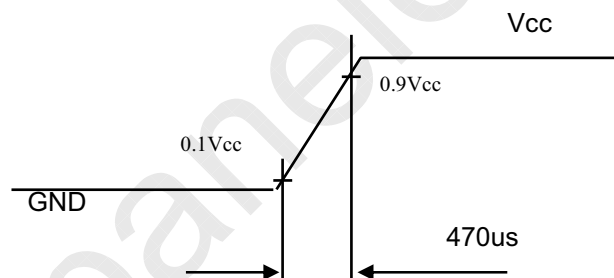
Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, $f_v$ = 120 Hz, whereas a power dissipation check pattern below is displayed.

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a. White Pattern

b. Black Pattern



Active Area



Active Area
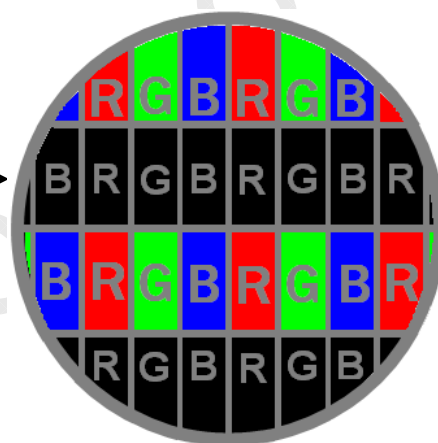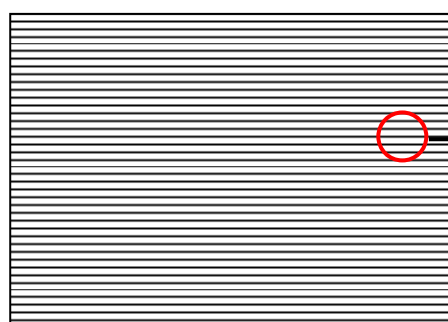




Note (4) The LVDS input characteristics are as follows:

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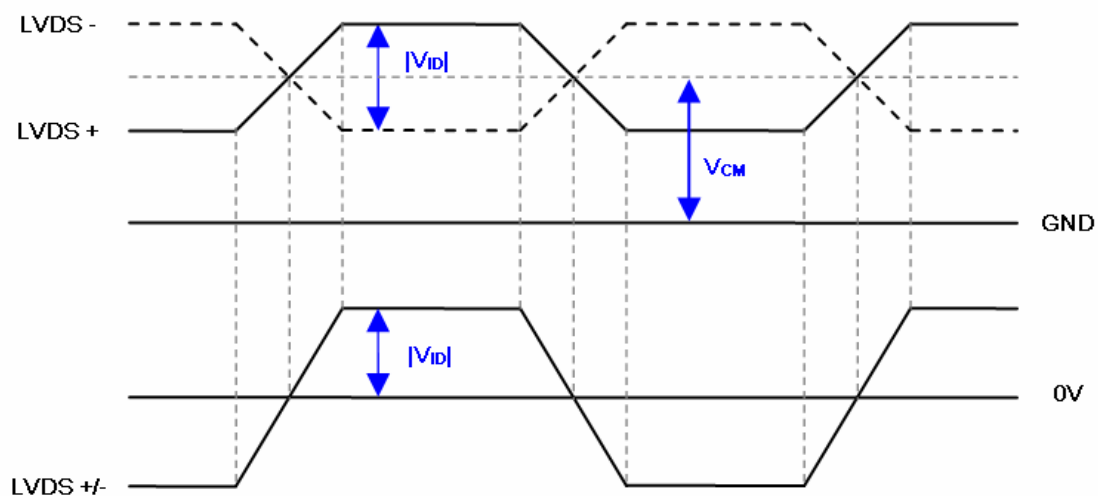
## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE

**TFT LCD PANEL**

**(1920x3x1080)**

| X(R) Board | X(L) Board |

C Board

**INPUT CONNECTOR**
(FP7S082HA1, JAE) or equivalent

CH1_0(+/-)    CH2_0(+/-)    CH3_0(+/-)    CH4_0(+/-)    SELLVDS    VCC

CH1_1(+/-)    CH2_1(+/-)    CH3_1(+/-)    CH4_1(+/-)                GND

CH1_2(+/-)    CH2_2(+/-)    CH3_2(+/-)    CH4_2(+/-)

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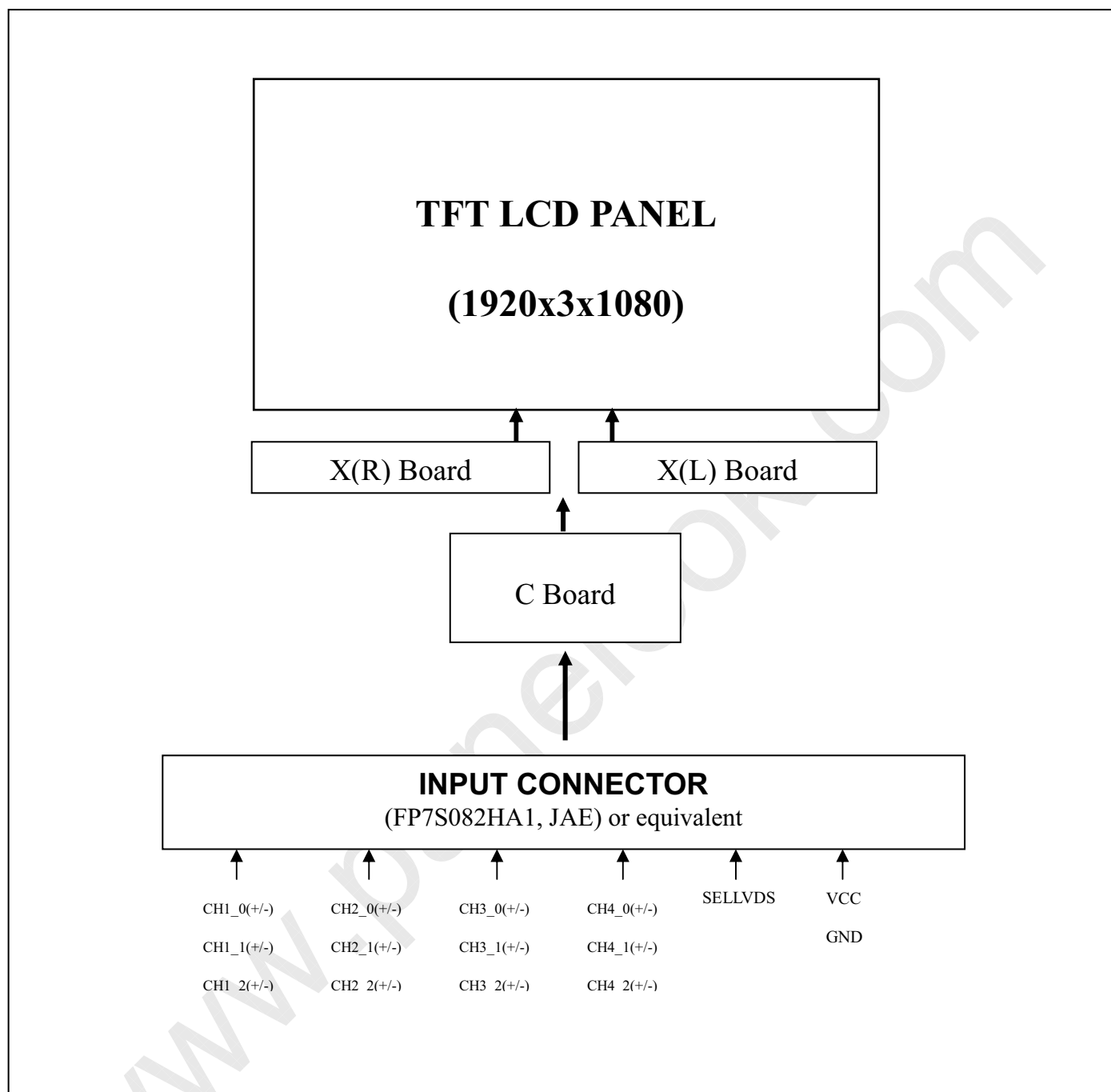
## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

CNF1 Connector Pin Assignment (FP7S082HA1R1200,JAE Taiwan(台灣航空電子) 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 | (1) |
| 7 | GND | Ground | |
| 8 | GND | Ground | |
| 9 | GND | Ground | |
| 10 | CH1[0]- | First pixel Negative LVDS differential data input. Pair 0 | |
| 11 | CH1[0]+ | First pixel Positive LVDS differential data input. Pair 0 | |
| 12 | CH1[1]- | First pixel Negative LVDS differential data input. Pair 1 | |
| 13 | CH1[1]+ | First pixel Positive LVDS differential data input. Pair 1 | |
| 14 | CH1[2]- | First pixel Negative LVDS differential data input. Pair 2 | |
| 15 | CH1[2]+ | First pixel Positive LVDS differential data input. Pair 2 | |
| 16 | GND | Ground | |
| 17 | CH1CLK- | First pixel Negative LVDS differential clock input. | |
| 18 | CH1CLK+ | First pixel Positive LVDS differential clock input. | |
| 19 | GND | Ground | |
| 20 | CH1[3]- | First pixel Negative LVDS differential data input. Pair 3 | |
| 21 | CH1[3]+ | First pixel Positive LVDS differential data input. Pair 3 | |
| 22 | CH1[4]- | First pixel Negative LVDS differential data input. Pair 4 | |
| 23 | CH1[4]+ | First pixel Positive LVDS differential data input. Pair 4 | |
| 24 | GND | Ground | |
| 25 | CH3[0]- | Third pixel Negative LVDS differential data input. Pair 0 | |
| 26 | CH3[0]+ | Third pixel Positive LVDS differential data input. Pair 0 | |
| 27 | CH3[1]- | Third pixel Negative LVDS differential data input. Pair 1 | |
| 28 | CH3[1]+ | Third pixel Positive LVDS differential data input. Pair 1 | |

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| 29 | CH3[2]- | Third pixel Negative LVDS differential data input. Pair 2 | |
| 30 | CH3[2]+ | Third pixel Positive LVDS differential data input. Pair 2 | |
| 31 | GND | Ground | |
| 32 | CH3CLK- | Third pixel Negative LVDS differential clock input. | |
| 33 | CH3CLK+ | Third pixel Positive LVDS differential clock input. | |
| 34 | GND | Ground | |
| 35 | CH3[3]- | Third pixel Negative LVDS differential data input. Pair 3 | |
| 36 | CH3[3]+ | Third pixel Positive LVDS differential data input. Pair 3 | |
| 37 | CH3[4]- | Third pixel Negative LVDS differential data input. Pair 4 | |
| 38 | CH3[4]+ | Third pixel Positive LVDS differential data input. Pair 4 | |
| 39 | GND | Ground | |
| 40 | SCL | I2C Bus | |
| 41 | 3D_EN | 3D Enable | (3) |
| 42 | LUT0 | Look UP Table Select | (4) |
| 43 | Bus_EN | Bus Switch Enable | |
| 44 | SDA | I2C Bus | |
| 45 | LVDS_SEL | LVDS Data Format Selection | (2) |
| 46 | N.C. | No Connection | (1) |
| 47 | N.C. | No Connection | (1) |
| 48 | N.C. | No Connection | (1) |
| 49 | WP | Write Protection for EEPROM | |
| 50 | LUT1 | Look UP Table Select | (4) |
| 51 | N.C. | No Connection | (1) |
| 52 | GND | Ground | |
| 53 | CH4[4]+ | Fourth pixel Positive LVDS differential data input. Pair 4 | |
| 54 | CH4[4]- | Fourth pixel Negative LVDS differential data input. Pair 4 | |
| 55 | CH4[3]+ | Fourth pixel Positive LVDS differential data input. Pair 3 | |
| 56 | CH4[3]- | Fourth pixel Negative LVDS differential data input. Pair 3 | |
| 57 | GND | Ground | |
| 58 | CH4CLK+ | Fourth pixel Positive LVDS differential clock input. | |
| 59 | CH4CLK- | Fourth pixel Negative LVDS differential clock input. | |
| 60 | GND | Ground | |

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| 61 | CH4[2]+ | Fourth pixel Positive LVDS differential data input. Pair 2 | |
|----|---------|-----------------------------------------------------------|---|
| 62 | CH4[2]- | Fourth pixel Negative LVDS differential data input. Pair 2 | |
| 63 | CH4[1]+ | Fourth pixel Positive LVDS differential data input. Pair 1 | |
| 64 | CH4[1]- | Fourth pixel Negative LVDS differential data input. Pair 1 | |
| 65 | CH4[0]+ | Fourth pixel Positive LVDS differential data input. Pair 0 | |
| 66 | CH4[0]- | Fourth pixel Negative LVDS differential data input. Pair 0 | |
| 67 | GND | Ground | |
| 68 | CH2[4]+ | Second pixel Positive LVDS differential data input. Pair 4 | |
| 69 | CH2[4]- | Second pixel Negative LVDS differential data input. Pair 4 | |
| 70 | CH2[3]+ | Second pixel Positive LVDS differential data input. Pair 3 | |
| 71 | CH2[3]- | Second pixel Negative LVDS differential data input. Pair 3 | |
| 72 | GND | Ground | |
| 73 | CH2CLK+ | Second pixel Positive LVDS differential clock input. | |
| 74 | CH2CLK- | Second pixel Negative LVDS differential clock input. | |
| 75 | GND | Ground | |
| 76 | CH2[2]+ | Second pixel Positive LVDS differential data input. Pair 2 | |
| 77 | CH2[2]- | Second pixel Negative LVDS differential data input. Pair 2 | |
| 78 | CH2[1]+ | Second pixel Positive LVDS differential data input. Pair 1 | |
| 79 | CH2[1]- | Second pixel Negative LVDS differential data input. Pair 1 | |
| 80 | CH2[0]+ | Second pixel Positive LVDS differential data input. Pair 0 | |
| 81 | CH2[0]- | Second pixel Negative LVDS differential data input. Pair 0 | |
| 82 | GND | Ground | |

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

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

Note (3) High=connect to +3.3V : 3D mode ； Low= connect to GND or Open : 2D mode.

Note (4) Look up Table. Select

| LUT1 | LUT0 | Table |
|------|------|-------|
| 0 | 0 | 2D OD |
| 0 | 1 | 3D OD (High Temperature) |
| 1 | 0 | 3D OD (Room Temperature) |
| 1 | 1 | 3D OD (Low Temperature) |

Note (5) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement as below.

System Board                    Panel

1K ohm          IC

Interface Voltage
Level
VH > 3.0V

>20K ohm
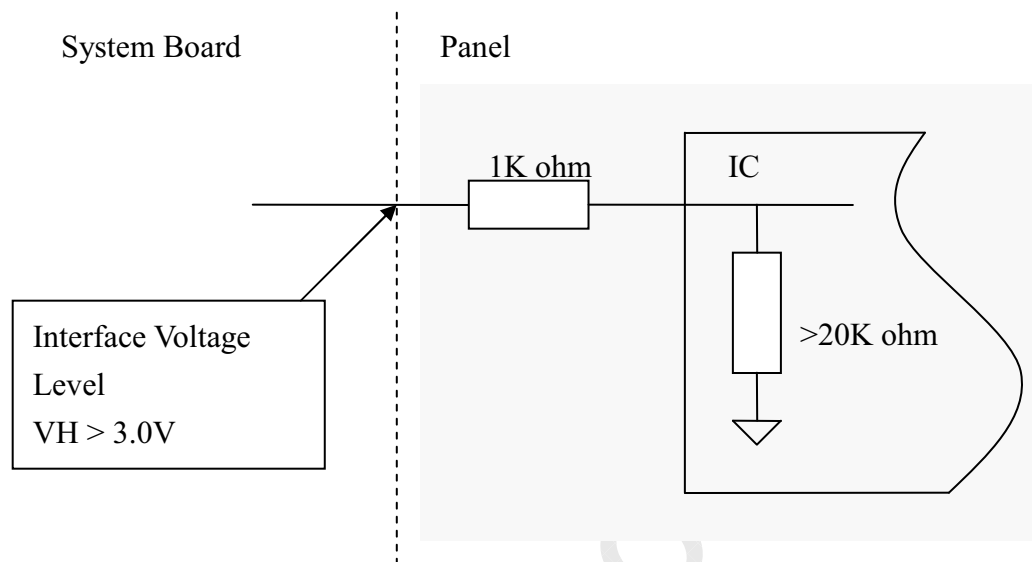
Note (6) LVDS 4-port Data Mapping

| 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 (7) The screw hole which is distant from the connector is merged with Ground

FHD
1920 x 1080
CELL

XR          Connector          Connector          XL/XC

The screw hole which is distant from the connector is merged with Ground.

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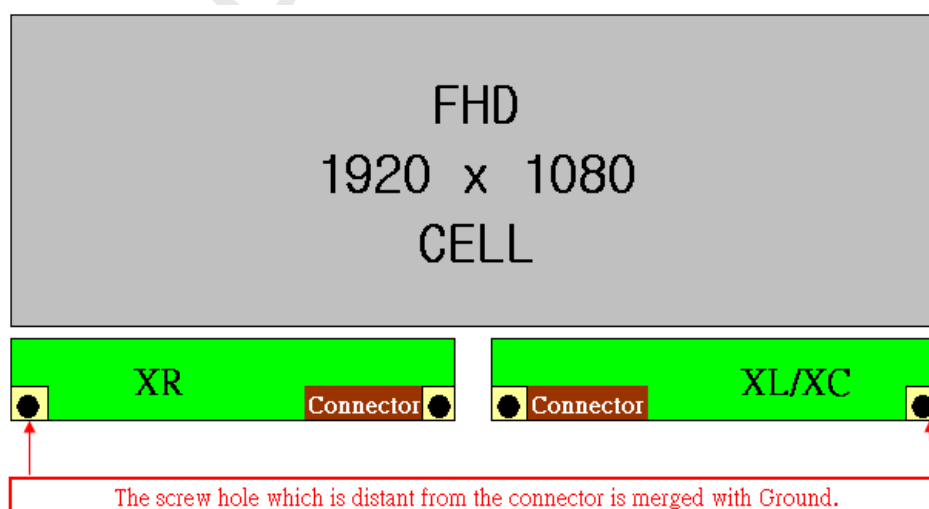
**5.2 LVDS INTERFACE**

VESA Format : SELLVDS = H

JEIDA Format : SELLVDS = L or Open
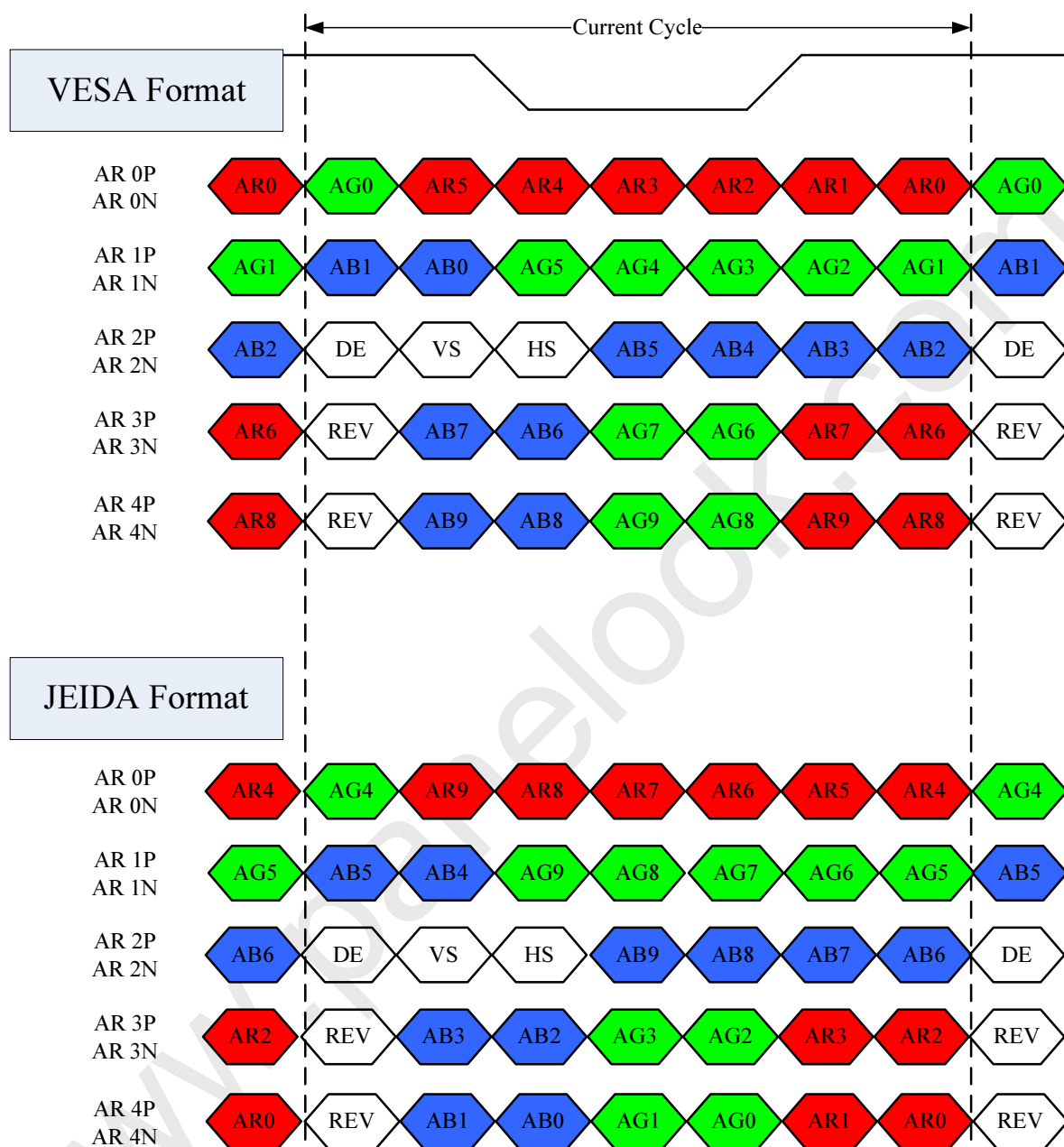


AR0~AR9: First Pixel R Data (9; MSB, 0; LSB)

AG0~AG9: First Pixel G Data (9; MSB, 0; LSB)

AB0~AB9: First Pixel B Data (9; MSB, 0; LSB)

DE    : Data enable signal

DCLK : Data clock signal

RSV : Reserved

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## 5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-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 | | | | | | | | | |
| | | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G9 | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B9 | B8 | 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 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 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 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 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 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 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 | 1 | 1 | 1 | 1 | 0 | 0 | 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 | 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 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red (1021) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1022) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1023) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 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 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green (1021) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 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 | 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 | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue (1021) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue (1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue (1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

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

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## 5.4 FLICKER (Vcom) ADJUSTMENT

(1) Adjustment Pattern:

Column-inversion pattern was shown as below. If customer need below pattern, please directly contact with Account FAE.

Frame N

Frame N+1

(2) Adjustment method: (VR)

Flicker should be adjusted by turning the volume for flicker adjustment by the ceramic driver. It is adjusted to the point with least flickering of the center screen. After making it surely overrun at once, it should be adjusted to the optimum point.
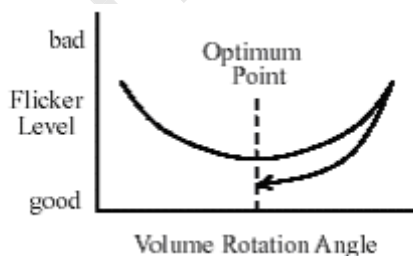
(3) Adjustment method: (Digital V-com)

Programmable memory IC is used for Digital V-com adjustment in this model. CMI provide Auto Vcom tools to adjust Digital V-com.The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com adjustment OI. Below items is suggested to be ready before Digital V-com adjustment in customer LCM line.

PRODUCT SPECIFICATION

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 ℃)

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 | $F_{r5}$ | — | 100 | — | Hz | (6) |
| | | $F_{r6}$ | — | 120 | — | Hz | |
| | Total | Tv | 1115 | 1125 | 1135 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 1080 | 1080 | 1080 | Th | — |
| | Blank | Tvb | 35 | 45 | 55 | Th | — |
| Horizontal Active Display Term | Total | Th | 1050 | 1100 | 1150 | Tc | Th=Thd+Thb |
| | Display | Thd | 960 | 960 | 960 | Tc | — |
| | Blank | Thb | 90 | 140 | 190 | Tc | — |

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

$F_{clkin(max)} \geqq F_{r6} \times Tv \times Th$
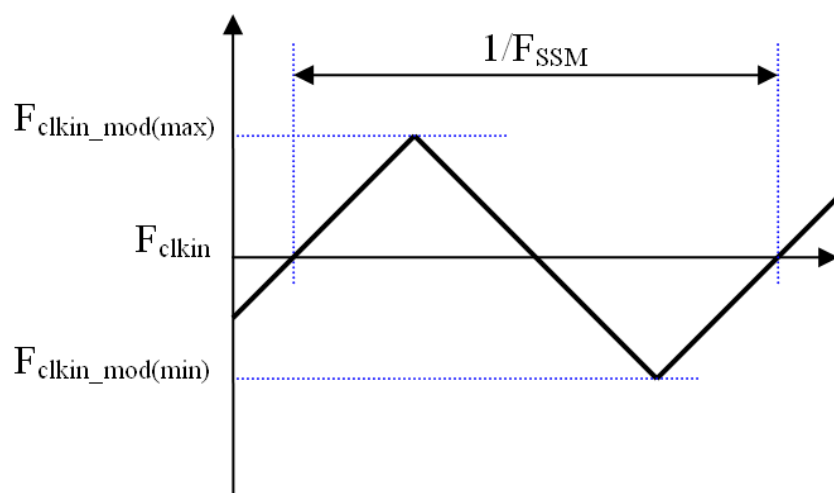
$F_{r5} \times Tv \times Th \geqq F_{clkin(min)}$

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

PRODUCT SPECIFICATION

**INPUT SIGNAL TIMING DIAGRAM**
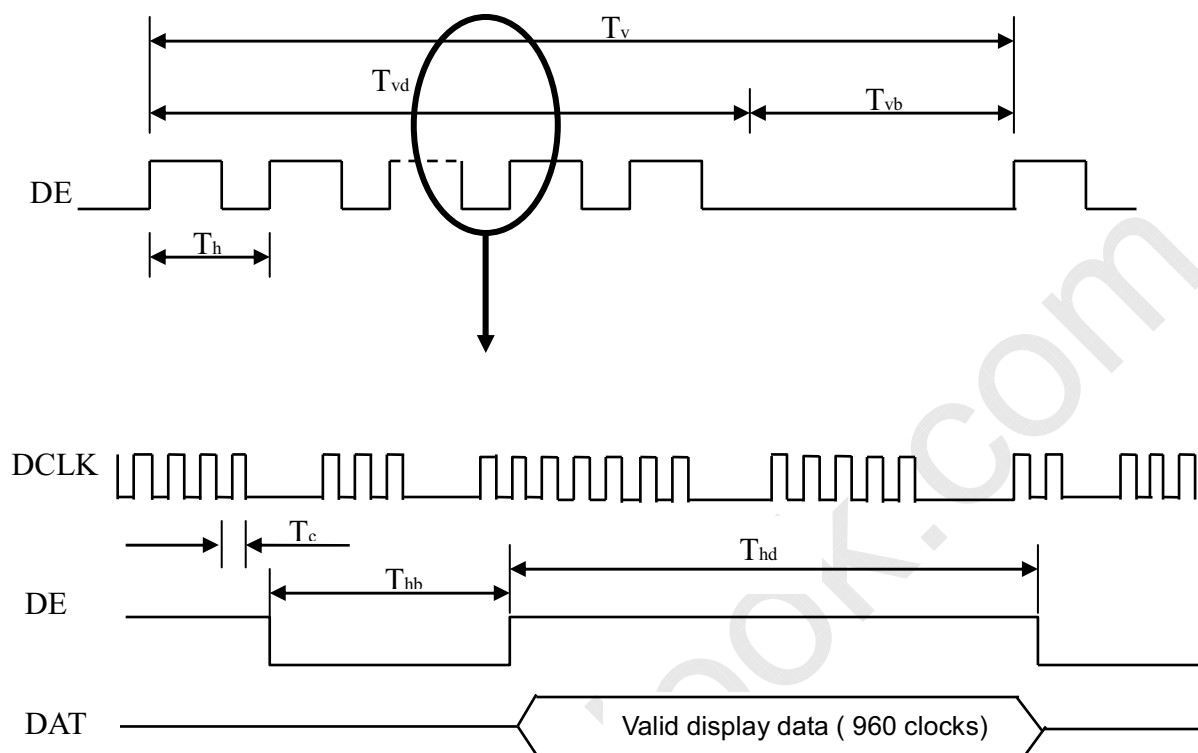


Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I $T_1$ – TI
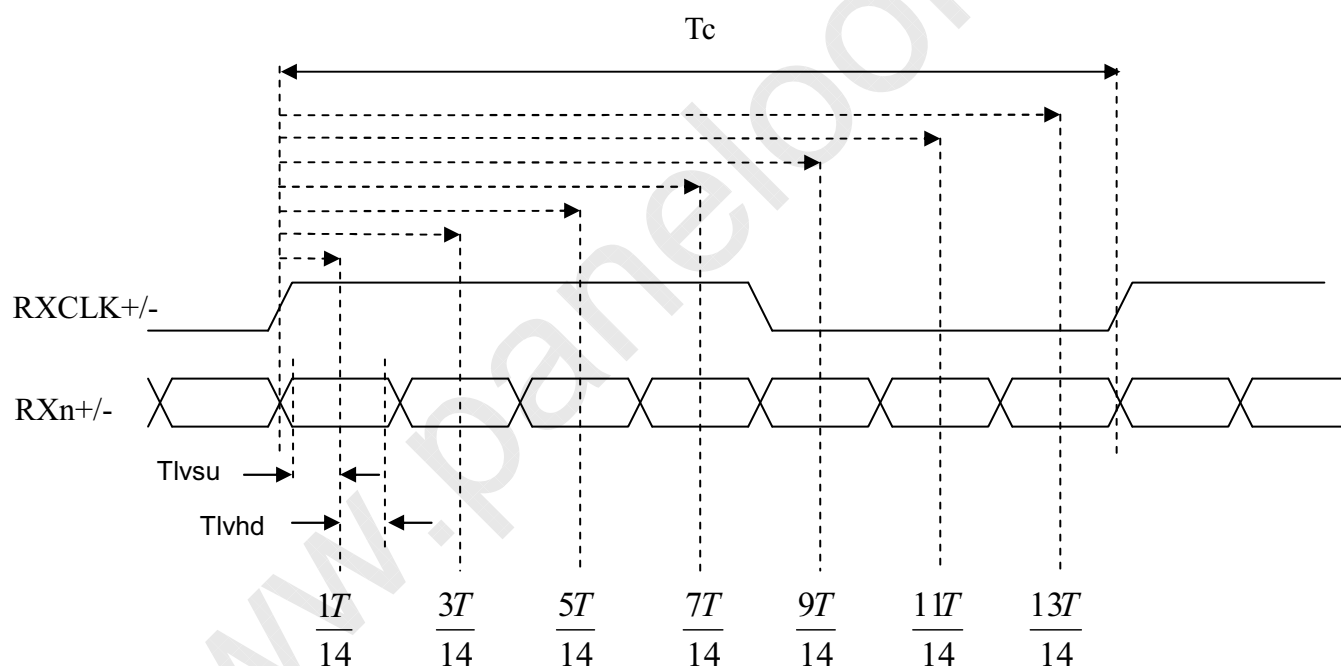
PRODUCT SPECIFICATION
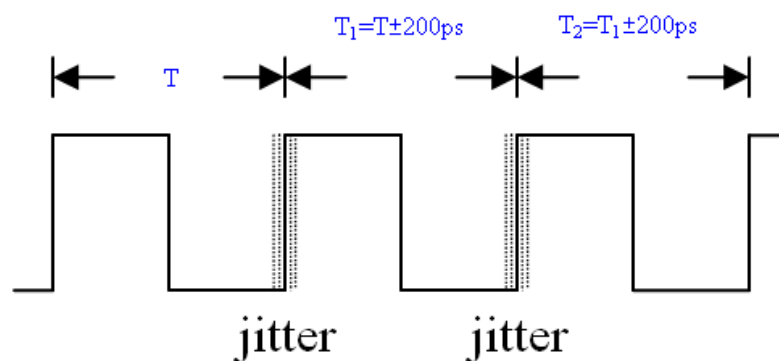
Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



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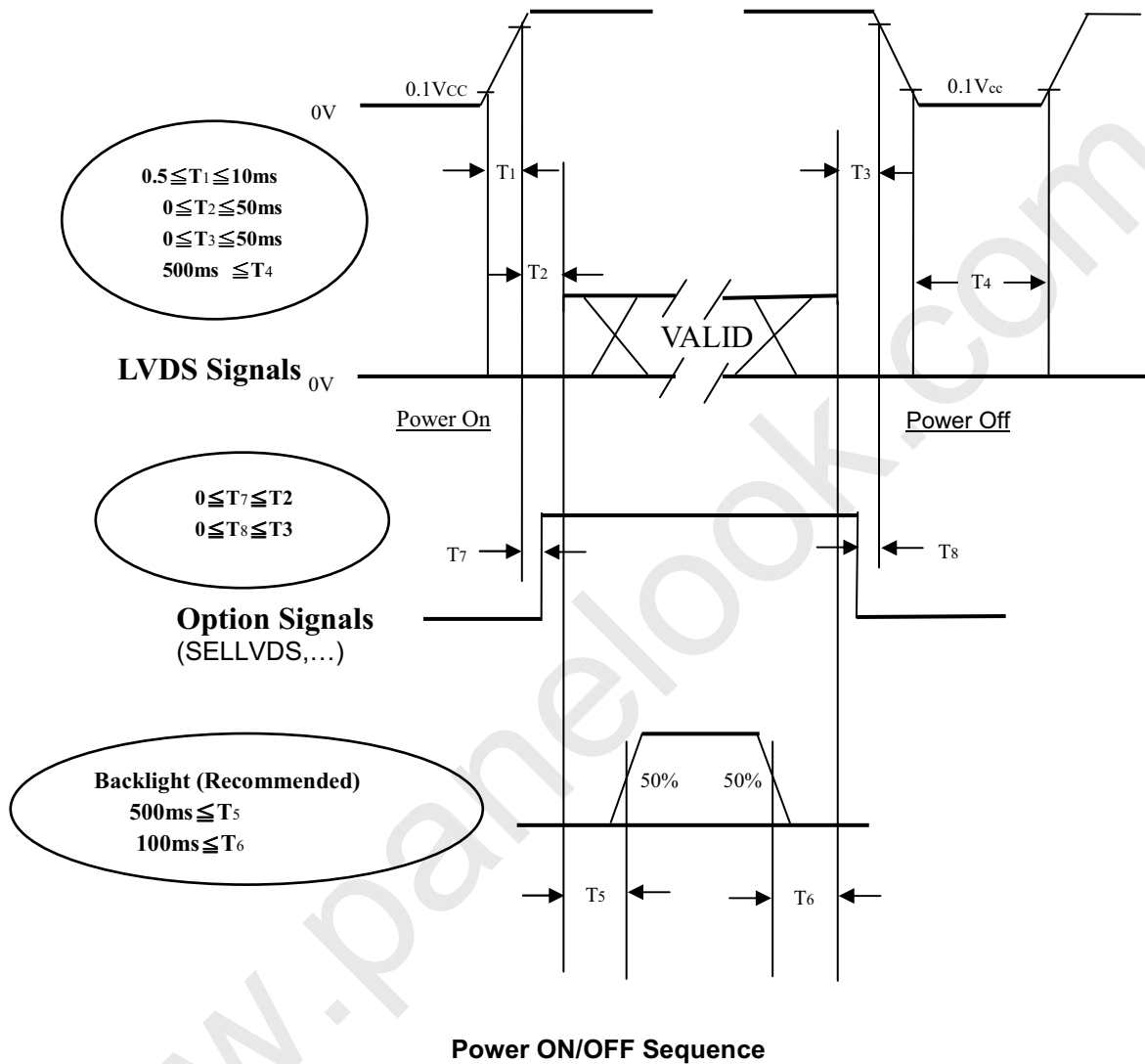
**LVDS RECEIVER INTERFACE TIMING DIAGRAM**

PRODUCT SPECIFICATION

## 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ℃)

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 $T_2 < 0$, 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.

PRODUCT SPECIFICATION

## 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 | $I_L$ | 7.5 ± 0.5 | mA |
| Oscillating Frequency (Balance Board) | $F_W$ | 40 ± 3 | KHz |
| Vertical Frame Rate | Fr | 120 | Hz |

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

PRODUCT SPECIFICATION
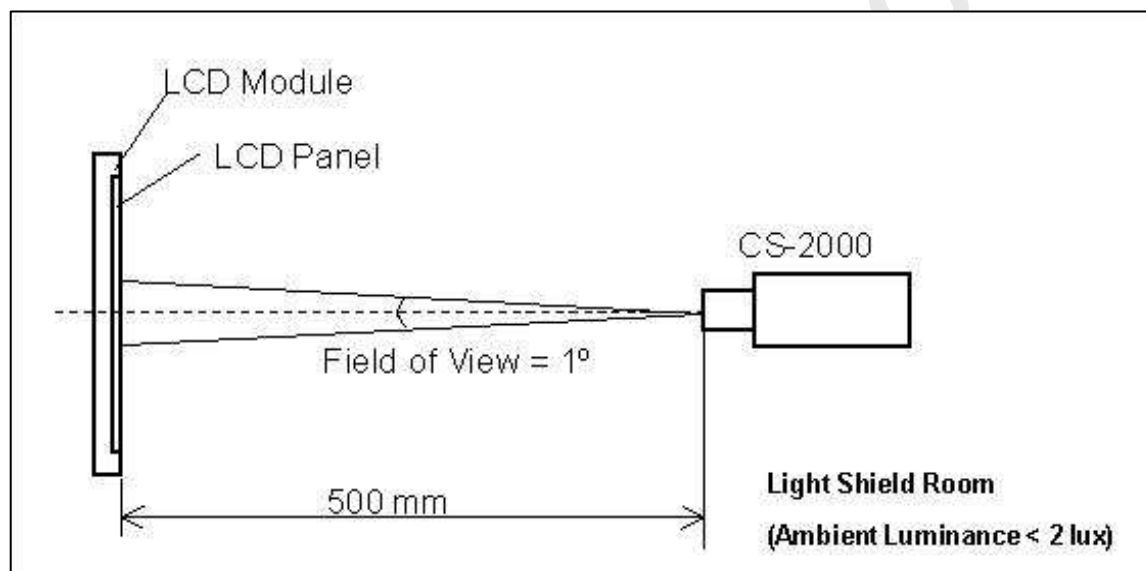
## 7.2 OPTICAL SPECIFICATIONS

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 7.1.

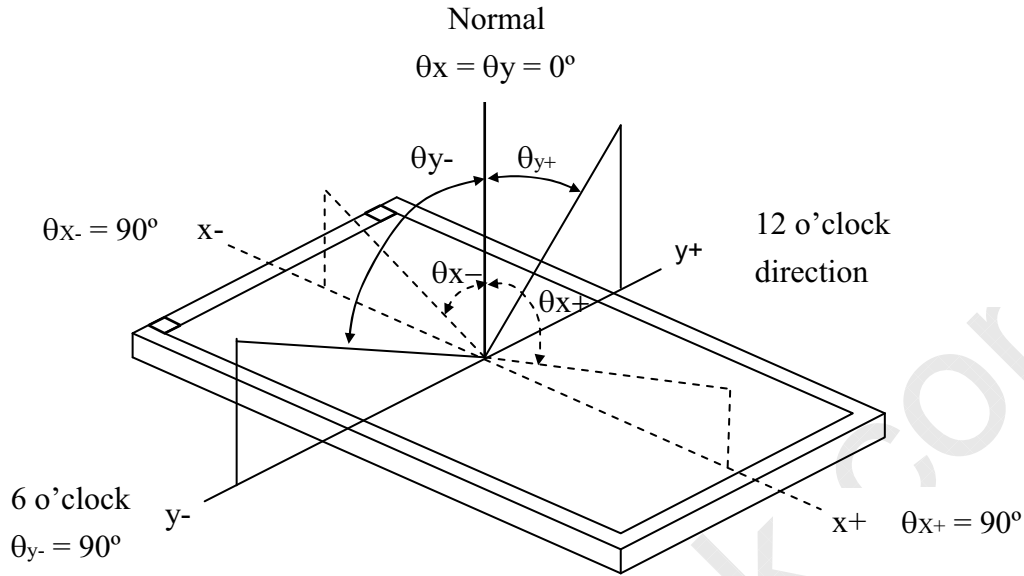| Item | | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|---|
| Color Chromaticity | Red | Rcx | | $\theta_x=0°$, $\theta_Y=0°$ Viewing Angle at Normal Direction Standard light source "C" | Typ-0.03 | 0.657 | Typ+0.03 | - | (0),(5) |
| | | Rcy | | | | 0.327 | | - | |
| | Green | Gcx | | | | 0.267 | | - | |
| | | Gcy | | | | 0.583 | | - | |
| | Blue | Bcx | | | | 0.131 | | - | |
| | | Bcy | | | | 0.112 | | - | |
| | White | Wcx | | | | 0.300 | | - | |
| | | Wcy | | | | 0.351 | | - | |
| Center Transmittance | | | T% | $\theta_x=0°$, $\theta_Y=0°$ with CMI module | - | 4.8 | - | % | (1),(7) |
| Contrast Ratio | | | CR | | 3500 | 5000 | - | - | (1),(3) |
| Response Time | | | Gray to gray | $\theta_x=0°$, $\theta_Y=0°$ with CMI Module@60Hz | - | 6.5 | | | (1),(4) |
| White Variation | | | $\delta W$ | $\theta_x=0°$, $\theta_Y=0°$ with CMI module | - | - | 1.3 | - | (1),(6) |
| Viewing Angle | Horizontal | $\theta_x+$ | | CR≥20 with CMI module | 80 | 88 | | Deg. | (1),(2) |
| | | $\theta_x-$ | | | 80 | 88 | | | |
| | Vertical | $\theta_Y+$ | | | 80 | 88 | | | |
| | | $\theta_Y-$ | | | 80 | 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 V460H1-LE3) 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.

奇美電子
CHIMEI INNOLUX

PRODUCT SPECIFICATION

Note (2) Definition of Viewing Angle ($\theta x$, $\theta y$):

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

Normal
$\theta x = \theta y = 0^o$

$\theta y-$        $\theta y+$

$\theta x- = 90^o$    x-

$\theta x-$

$\theta x+$

y+

12 o'clock
direction

6 o'clock
y-
$\theta y- = 90^o$

x+    $\theta x+ = 90^o$

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

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L1023}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 1023

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:

100%
90%

Optical

Response

10%
0%

Gray to gray
switching time

Gray to gray
switching time
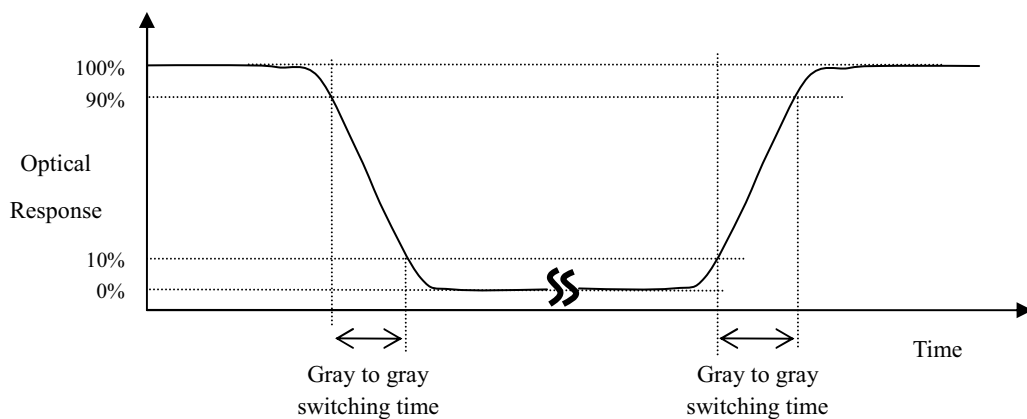
Time

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 ($T_R$, $T_F$):

Gray Level 1023

Gray Level 1023

100%
90%

Optical

Response

Gray Level 0

10%
0%

Time

$T_R$

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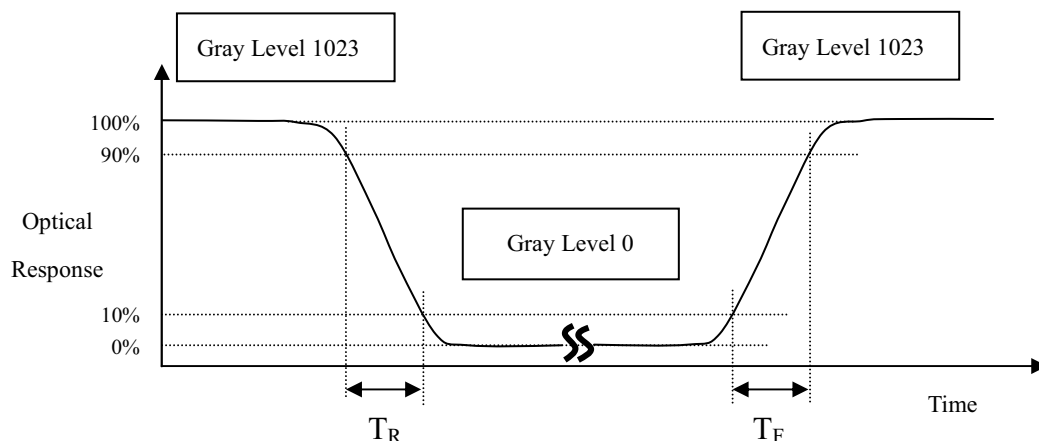
Note (6) Definition of White Variation ($\delta W$):

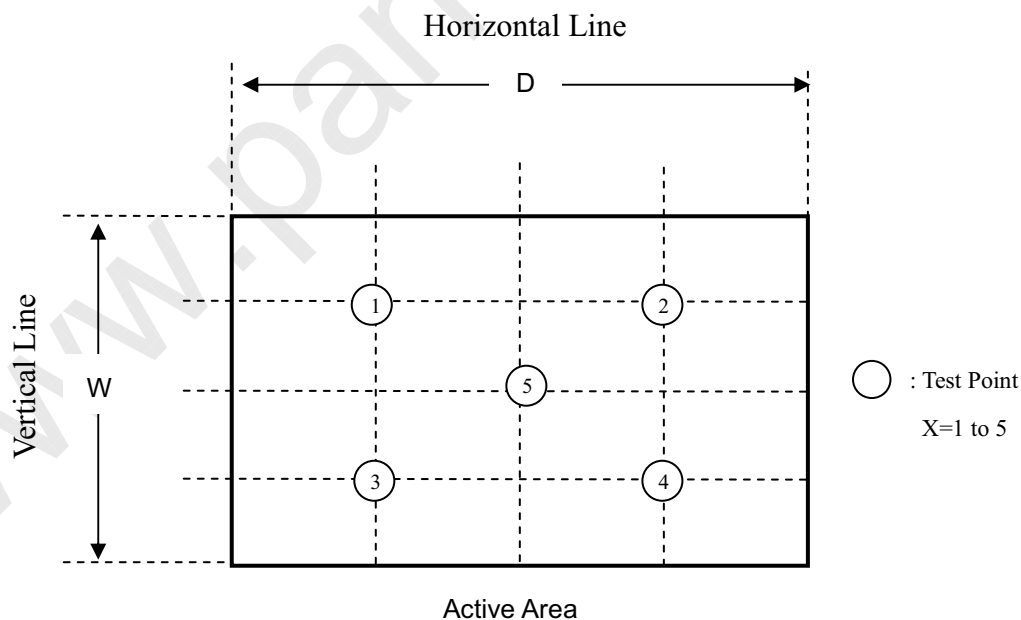Measure the luminance of gray level 1023 at 5 points

$\delta W$ = 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 ($\delta W$):

Measure the luminance of gray level 1023 at 5 points

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

Horizontal Line

D

Vertical Line

W

1　　2

5

3　　4

○ : Test Point

X=1 to 5

Active Area

Note (8) Definition of Transmittance (T%) :

Measure the luminance of gray level 1023 at center point of LCD module.

$$\text{Transmittance (T\%)} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backligh unit}} \times 100\%$$

## 8. 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 CMOS LSI chips.

[ 5 ]   The distance between COF edge and rib of BLU must bigger than 5mm. This can prevent the damage of COF when assemble the module.

[ 6 ]   Do not design sharp-pointed structure / parting line / tooling gate on the COF position of plastic parts, because the burr will scrape the COF.

[ 7 ]   If COF would bended to assemble in the module. Do not put the IC location on the bending corner of COF.

[ 8 ]   The gap between COF IC and any structure of BLU must bigger than 2mm. This can prevent the damage of COF IC

[ 9 ]   Bezel opening must have no burr. Burr will scrape the panel surface.

[ 10 ]  Bezel of module and bezel of set can not press or touch the panel surface. It will make light leakage or scrape.

[ 11 ]  When module used FFC / FPC, but no FFC / FPC to be attached in the open cell. Customer can refer the FFC / FPC drawing and buy it by self.

[ 12 ]  The gap between Panel and any structure of Bezel must bigger than 2mm. This can prevent the damage of Panel.

[ 13 ]  Do not plug in or pull out the I/F connector while the module is in operation.

[ 14 ]  Do not disassemble the module.

[ 15 ]  Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

[ 16 ]  Moisture can easily penetrate into LCD module and may cause the damage during operation.

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

   [ 17.1 ] 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.

   [ 17.2 ] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

[ 18 ]  When ambient temperature is lower than 10ºC, the display quality might be reduced.


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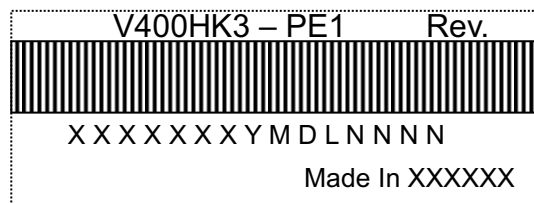
[ 3 ]　　After the module's end of life, it is not harmful in case of normal operation and storage.

PRODUCT SPECIFICATION

## 9. DEFINITION OF LABELS

### 9.1 CMI OPEN CELL LABEL

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

V400HK3 – PE1          Rev.

X X X X X X X Y M D L N N N N

Made In XXXXXX

### 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._____

Carton ID._____          Quantities ___12___

XXXXXXXXXXXXXX

Made in XXXXXX

(a) Model Name: V400HK3– PE1

(b) Carton ID: CMI internal control

(c) Quantities: 12

PRODUCT SPECIFICATION

## 10. PACKAGING

### 10.1 PACKAGING SPECIFICATIONS

(1)  12 PCS LCD TV Panels / 1 Box

(2)  Box dimensions :1008(L) X 738(W) X 252(H)mm

(3)  Weight : approximately 38 Kg

### 10.2 PACKAGING METHOD

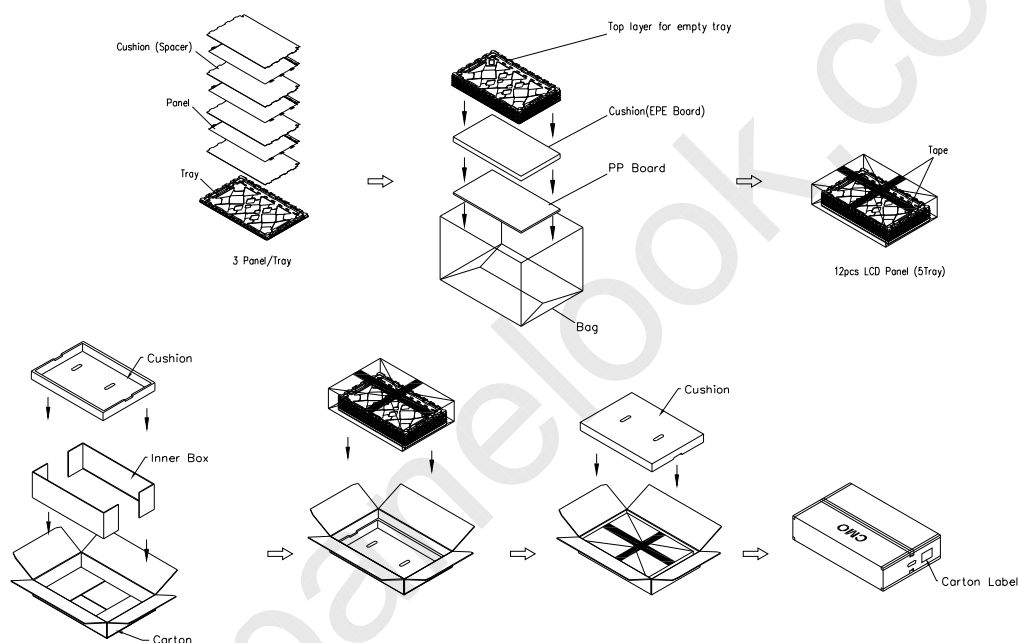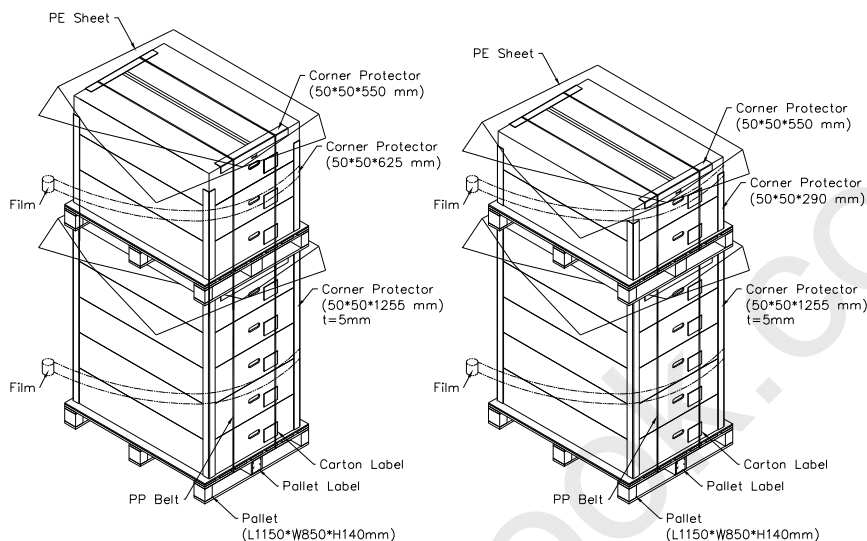Packing method is shown in Figure 10.1 & 10.2



Figure.10-1 packing method

**PRODUCT SPECIFICATION**

Sea / Land Transportation
(40ft HQ Container)

Sea / Land Transportation



Air Transportation
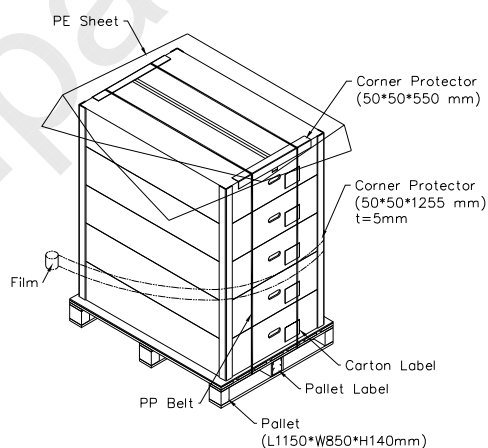


Figure.10-2 packing method

# PRODUCT SPECIFICATION

## 11. MECHANICAL CHARACTERISTIC