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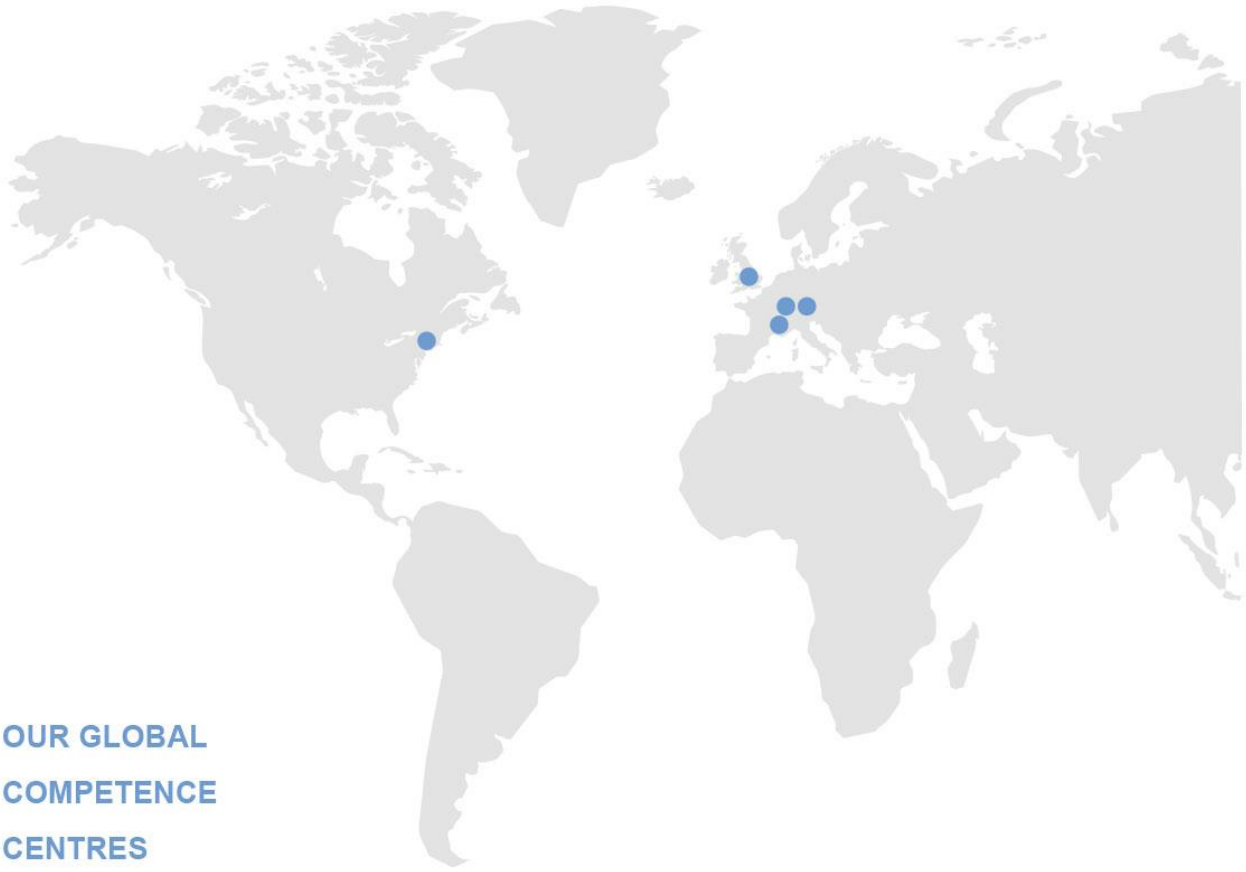

## OUR GLOBAL COMPETENCE CENTRES

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# Datasheet

# InnoLux

## V236BJ1-P03

CH-01-055

□ Tentative Specification
□ Preliminary Specification
■ Approval Specification

# MODEL NO.: V236BJ1

# SUFFIX: P03

Revision : CA
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 |
|---|---|---|
| Chao-Chun Chung | YP Lee | Wesun Yen |

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**REVISION HISTORY**

| Version | Date | Page(New) | Section | Description |
|---|---|---|---|---|
| 2.0 | 2015.12.23 | All | All | The Approval Specification was first issued |

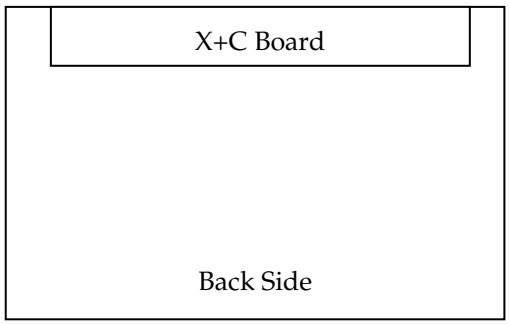
# 1. GENERAL DESCRIPTION

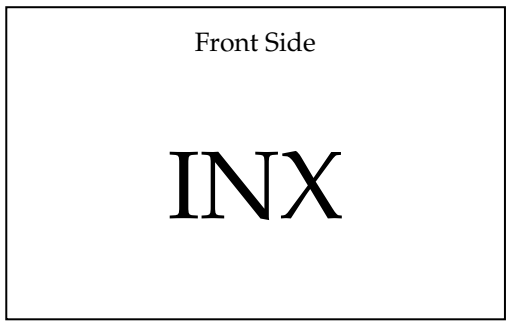
## 1.1 OVERVIEW

V236BJ1-P03 is a 23.6” TFT Liquid Crystal Display TV product with driver ICs and 1ch-LVDS interface. This product supports 1366*768 HDTV format and can display 16.7M colors (8-bit / color)..

## 1.2 FEATURES

| CHARACTERISTICS ITEMS | SPECIFICATIONS |
|---|---|
| Screen Diagonal [in] | 23.6 |
| Pixels [lines] | 1366 × 768 |
| Active Area [mm] | 521.4705(H) × 293.184(V) (23.6” diagonal) |
| Sub-Pixel Pitch [mm] | 0.12725(H) ×0.38175(V) |
| Pixel Arrangement | RGB Vertical Stripe |
| Weight [g] | 490 Typ. (g) |
| Physical Size [mm] | 535.06(W) × 306.34(H) × 1.315(D) Typ |
| Display Mode | Transmissive Mode / Normallly Black |
| Contrast Ratio | Typ.3000:1<br>(Typical value measure by INX’s Module) |
| Glass thickness (Array / CF) [mm] | 0.5 / 0.5 |
| Viewing Angle (CR>10) (VA Model) | Typ. +89/-89(H), +89/-89(V) (CR≧10)<br>(Typical value measured by INX’s module) |
| Color Chromaticity | R = 0.661, 0.326<br>G = 0.282, 0.587<br>B = 0.136, 0.101<br>W= 0.318, 0.355 |
| Cell Transparency [%] | 5.8% |
| Polarizer Surface Treatment | Anti-Glare coating (Haze 1%) |
| Rotation Function | Unachievable |



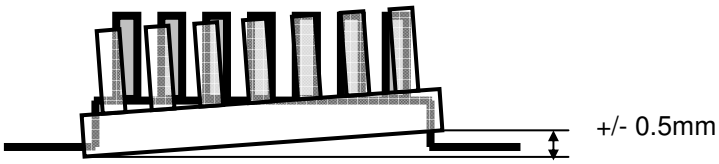



## 1.3 MECHANICAL SPECIFICATIONS

| Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Weight | - | 490 | 510 | 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

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

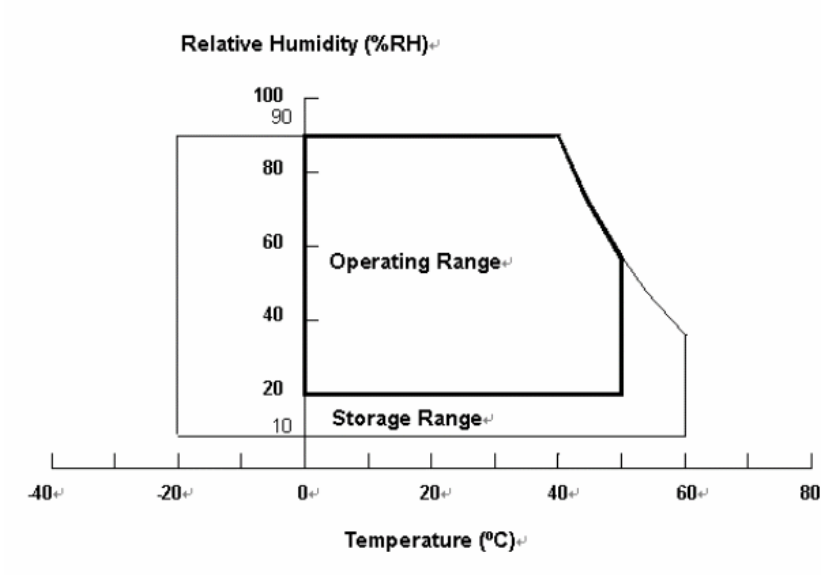
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

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

(c) No condensation.

Note (2) 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)

Recommended Storage Condition: With shipping package.

Recommended Storage temperature range: 25±5 ℃

Recommended Storage humidity range: 50±10%RH

Recommended 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 | |

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 OPEN CELL

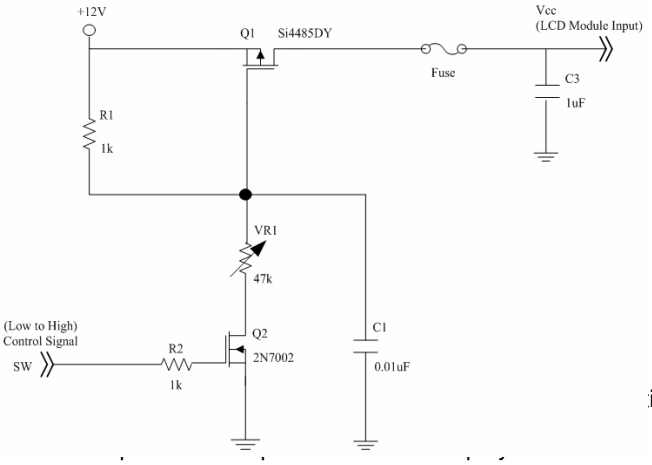
(Ta = 25 ± 2 ºC)

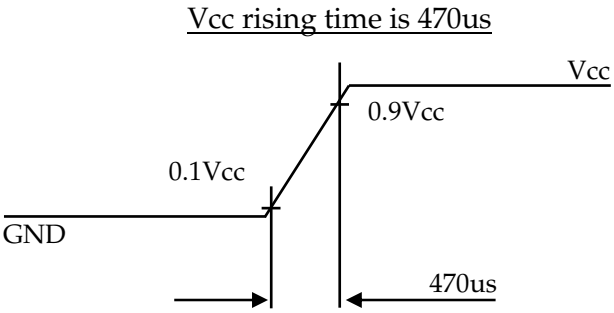
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Rush Current | | $I_{RUSH}$ | — | — | 2.015 | A | (2) |
| Power consumption | White Pattern | $P_T$ | — | 3.864 | 4.278 | W | (3) |
| | Black Pattern | $P_T$ | — | 2.346 | 2.622 | | |
| | Heavy Loading pattern Ex: Horizontal Stripe (by cell and platform) | $P_T$ | — | 3.864 | 4.278 | | |
| Power Supply Current | White Pattern | $P_T$ | — | 0.336 | 0.403 | A | |
| | Black Pattern | $P_T$ | — | 0.204 | 0.247 | | |
| | Heavy Loading pattern Ex: Horizontal Stripe (by cell and platform) | $P_T$ | — | 0.336 | 0.403 | | |
| 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 | $\|V_{ID}\|$ | 100 | — | 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.

The ripple voltage should be controlled under 10% of Vcc (Typ.).

Note (2) Measurement condition:




Nc ions at Vcc = 12 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power

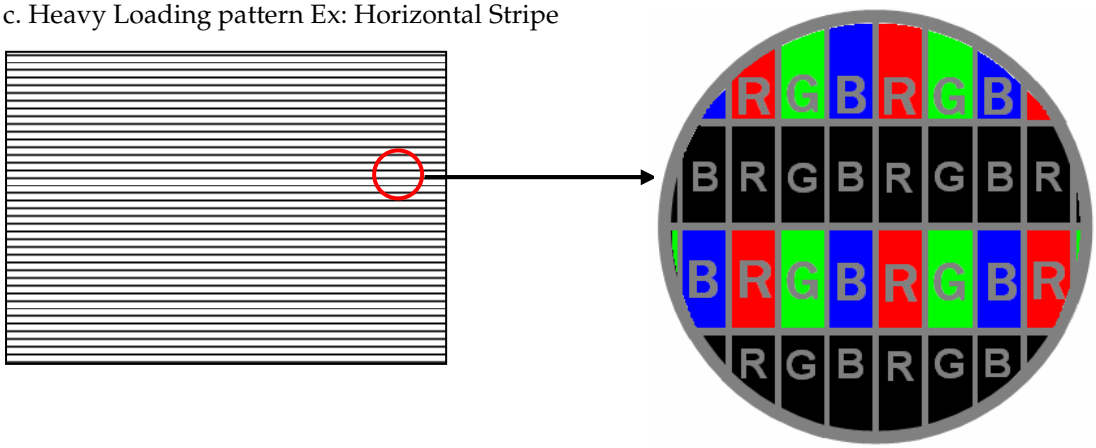
a. White Pattern

Active Area

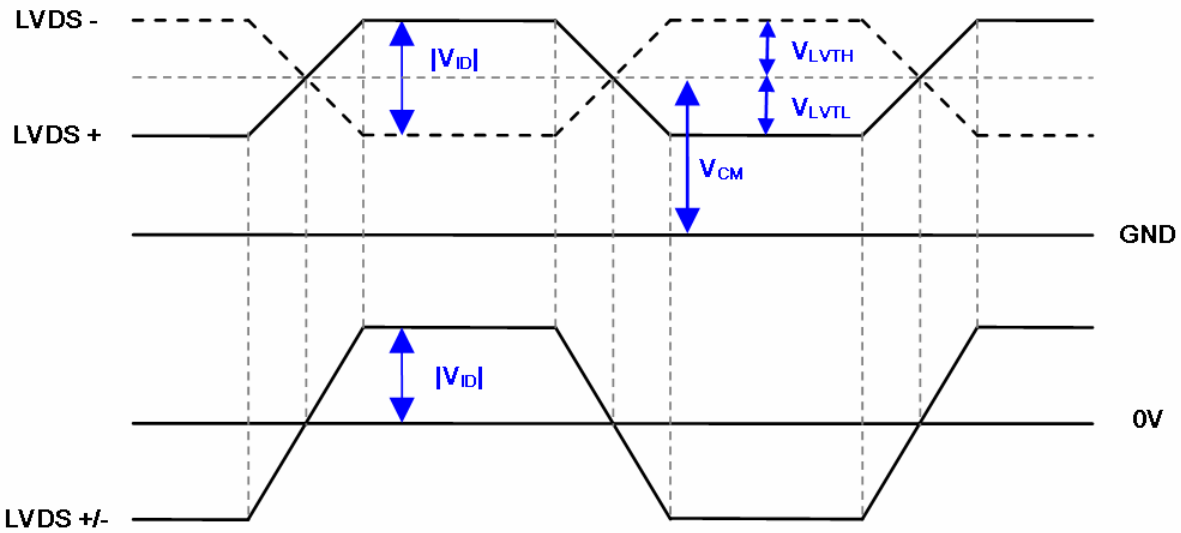
b. Black Pattern

Active Area

c. Heavy Loading pattern Ex: Horizontal Stripe

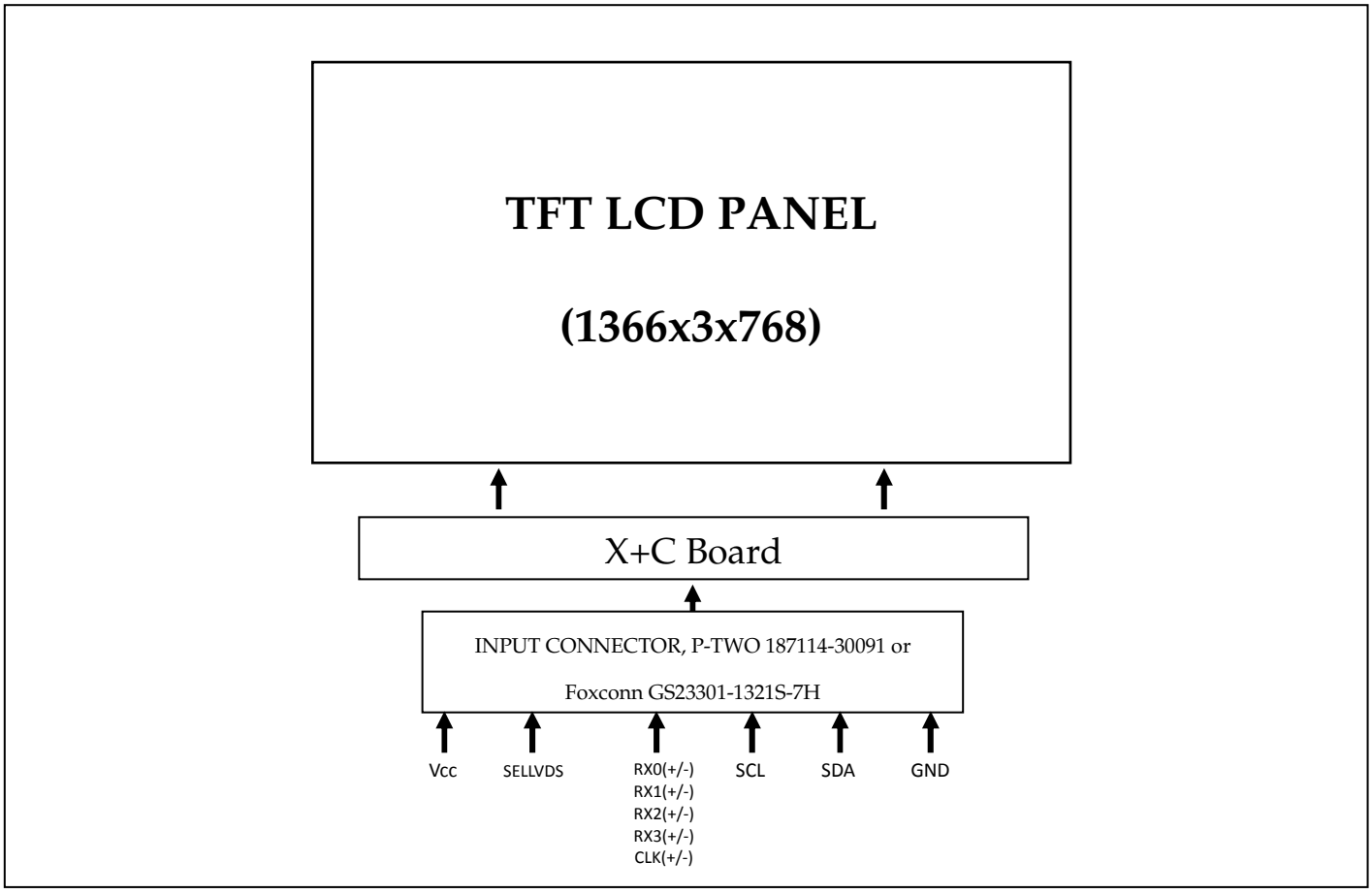



Note (4) The LVDS input characteristics is shown as below :



## 4. INPUT TERMINAL PIN ASSIGNMENT

### 4.1 TFT LCD OPEN CELL



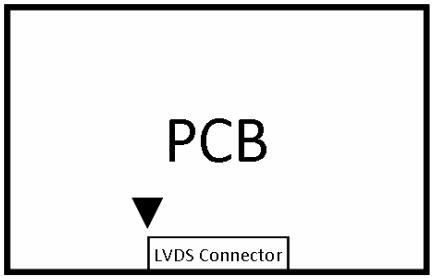
## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD OPEN CELL INPUT

CNF1 Connector Pin Assignment P-TWO=187114-30091 or FOXCONN=GS23302-1321S-7H

| Pin | Name | Description | Pin |
|---|---|---|---|
| 1 | VCC | +12.0V power supply | 1 |
| 2 | VCC | +12.0V power supply | 2 |
| 3 | VCC | +12.0V power supply | 3 |
| 4 | VCC | +12.0V power supply | 4 |
| 5 | NC | No connection | 5 |
| 6 | GND | Ground | 6 |
| 7 | GND | Ground | 7 |
| 8 | NC | No connection | 8 |
| 9 | SELLVDS | Select LVDS Format | 9 |
| 10 | NC | NC | 10 |
| 11 | GND | Ground | 11 |
| 12 | RX0- | Negative LVDS differential data input. Channel 0 | 12 |
| 13 | RX0+ | Positive LVDS differential data input. Channel 0 | 13 |
| 14 | GND | Ground | 14 |
| 15 | RX1- | Negative LVDS differential data input. Channel 1 | 15 |
| 16 | RX1+ | Positive LVDS differential data input. Channel 1 | 16 |
| 17 | GND | Ground | 17 |
| 18 | RX2- | Negative LVDS differential data input. Channel 2 | 18 |
| 19 | RX2+ | Positive LVDS differential data input. Channel 2 | 19 |
| 20 | GND | Ground | 20 |
| 21 | RXLCK- | Negative LVDS differential clock input. | 21 |
| 22 | RXCLK+ | Positive LVDS differential clock input. | 22 |
| 23 | GND | Ground | 23 |
| 24 | RX3- | Negative LVDS differential data input. Channel 3 | 24 |
| 25 | RX3+ | Positive LVDS differential data input. Channel 3 | 25 |
| 26 | GND | Ground | 26 |
| 27 | NC | No connection | 27 |
| 28 | SCL | I2C clock (For Vcom tunning) | 28 |
| 29 | SDA | I2C data (For Vcom tunning) | 29 |
| 30 | GND | Ground | 30 |

Note (1) LVDS connector pin orderdefined as below



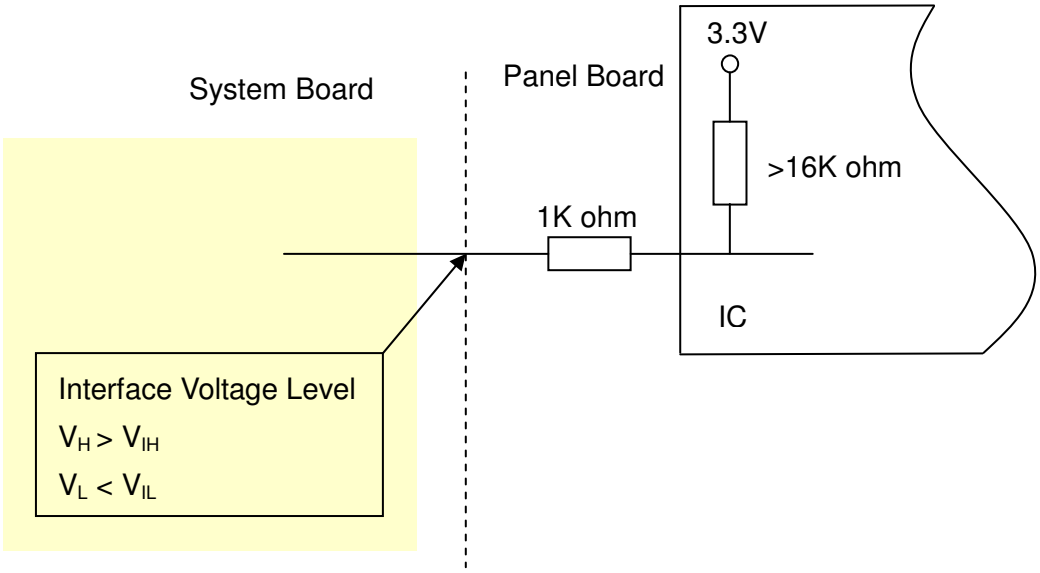

Note (2) Reserved for internal use. Please leave it open.

Note (3) Connect to Open or +3.3V: JEIDA Format, connect to GND: VESA Format.

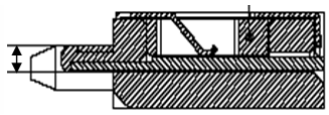
| SELLVDS | Mode |
|---|---|
| H(default) | JEIDA |
| L | VESA |

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

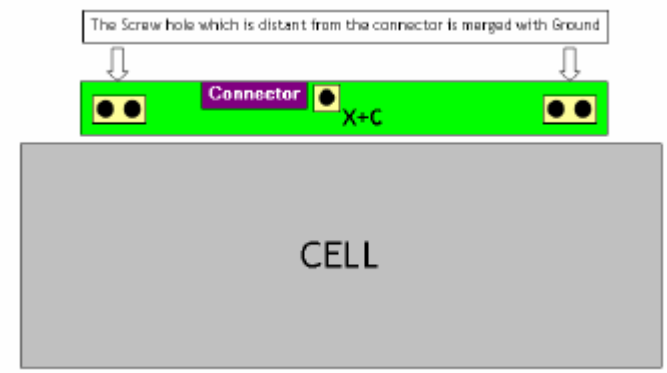
Note (4) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.




Note (5) LVDS connector mating dimension range request is 0.93mm~1.0mm as below.



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

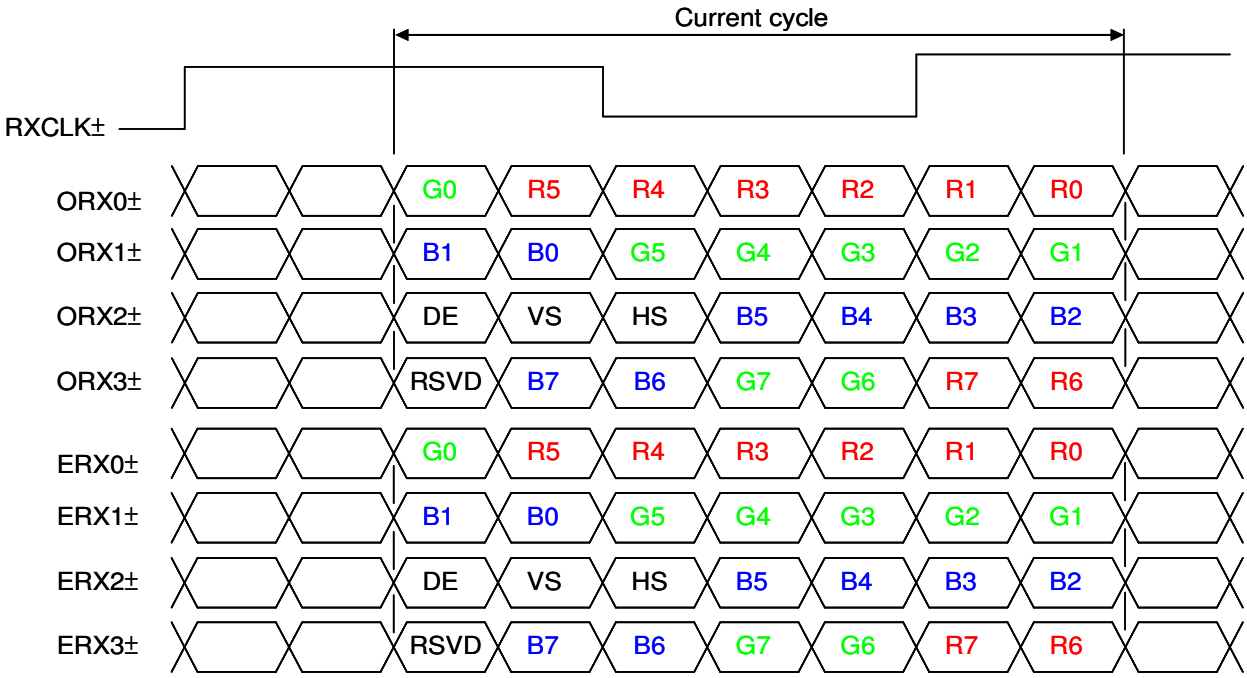



## 5.2 LVDS INTERFACE

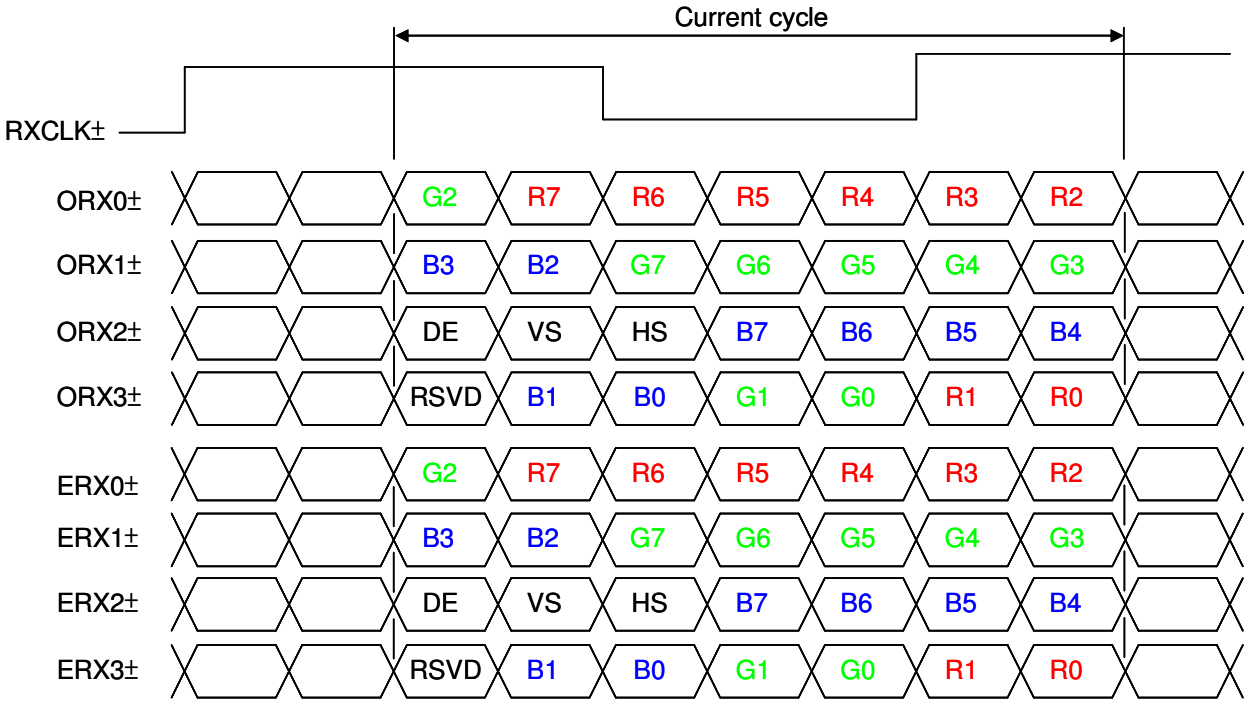
JEIDA Format: SELLVDS = H or Open

VESA Format: SELLVDS = L

VESA LVDS format




JEIDA LVDS format




R0~R7：Pixel R Data (7; MSB, 0; LSB)

G0~G7：Pixel G Data (7; MSB, 0; LSB)

B0~B7：Pixel B Data (7; MSB, 0; LSB)

DE：Data enable signal

DCLK：Data clock signal

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

## 5.2 COLOR DATA INPUT ASSIGNMENT

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

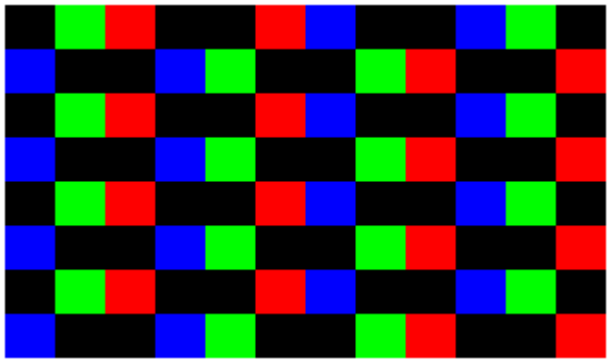
| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6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

## 5.4 FLICKER (Vcom) ADJUSTMENT

(1) Adjustment Pattern:

The adjustment pattern is shown as below. If customer needs below pattern, please directly contact with INX account FAE.



(2) Adjustment method: (Digital V-com)

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

a. USB Sensor Board.

b. Programmable software.

c. Document: Auto V-com adjustment suggestion OI.

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

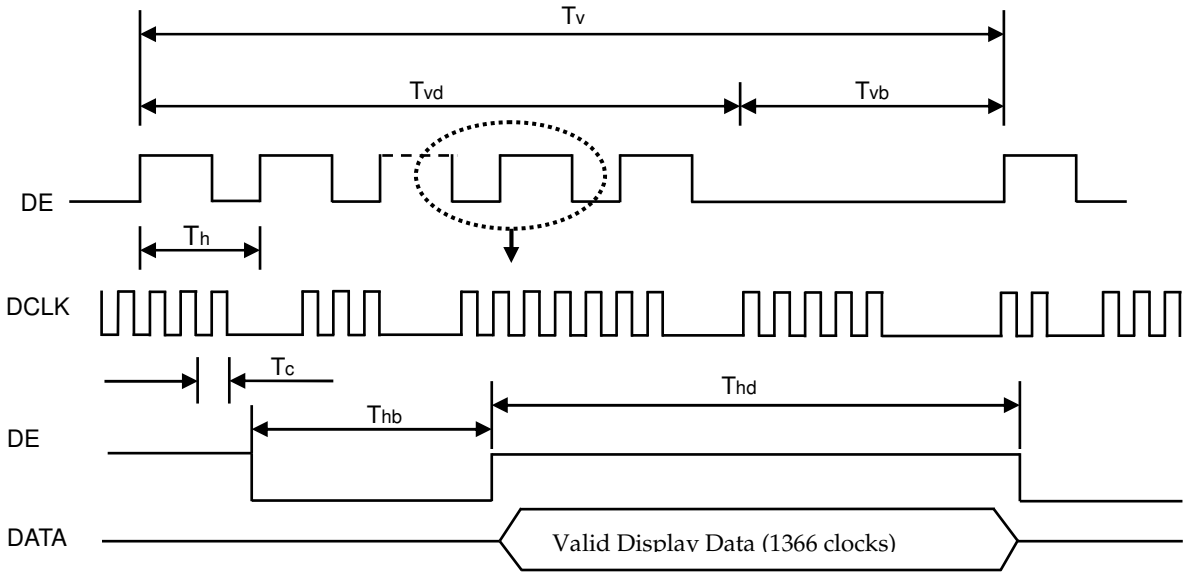
| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | $F_{clkin}$ (=1/TC) | 60 | 76 | 82 | MHz | |
| | Input cycle to cycle jitter | $T_{rcl}$ | - | — | 200 | ps | (3) |
| | Spread spectrum modulation range | $F_{clkin\_mod}$ | $F_{clkin}$-2% | — | $F_{clkin}$+2% | MHz | (4) |
| | Spread spectrum modulation frequency | $F_{SSM}$ | — | — | 200 | KHz | |
| LVDS Receiver Data | Receiver Skew Margin | $T_{RSKM}$ | -400 | — | 400 | ps | (5) |
| Vertical Active Display Term | Frame Rate | $F_{r5}$ | 47 | 50 | 53 | Hz | (6) |
| | | $F_{r6}$ | 57 | 60 | 63 | Hz | |
| | Total | Tv | 778 | 806 | 986 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 768 | 768 | 768 | Th | — |
| | Blank | Tvb | 10 | 38 | 218 | Th | — |
| Horizontal Active Display Term | Total | Th | 1446 | 1560 | 1936 | Tc | Th=Thd+Thb |
| | Display | Thd | 1366 | 1366 | 1366 | Tc | — |
| | Blank | Thb | 80 | 194 | 570 | Tc | — |

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

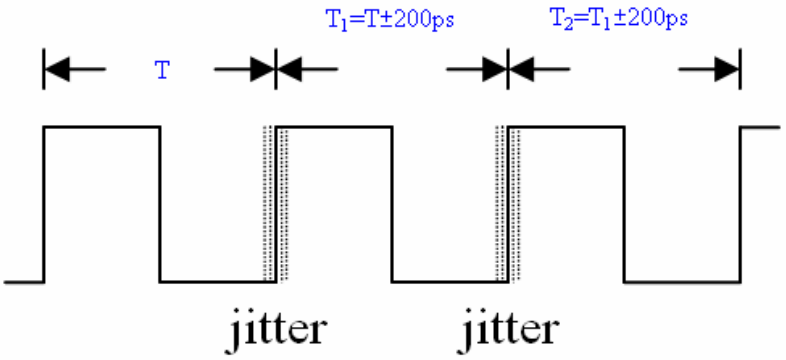
$$Fclkin(max) \geqq Fr6 \times Tv \times Th$$

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

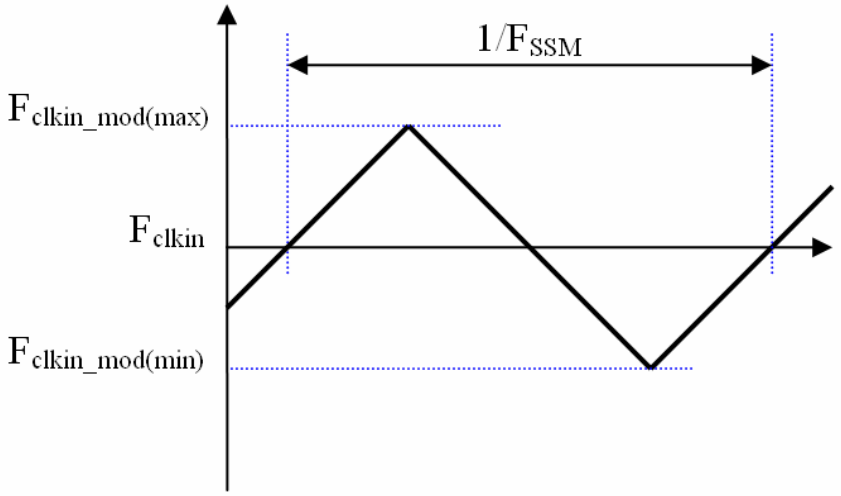
Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below :



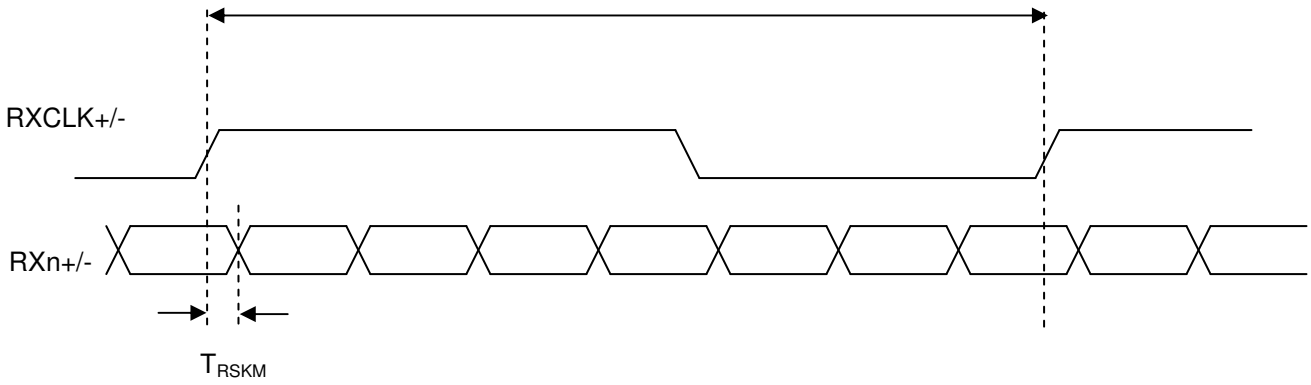
Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = | $T_1$ – T|




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

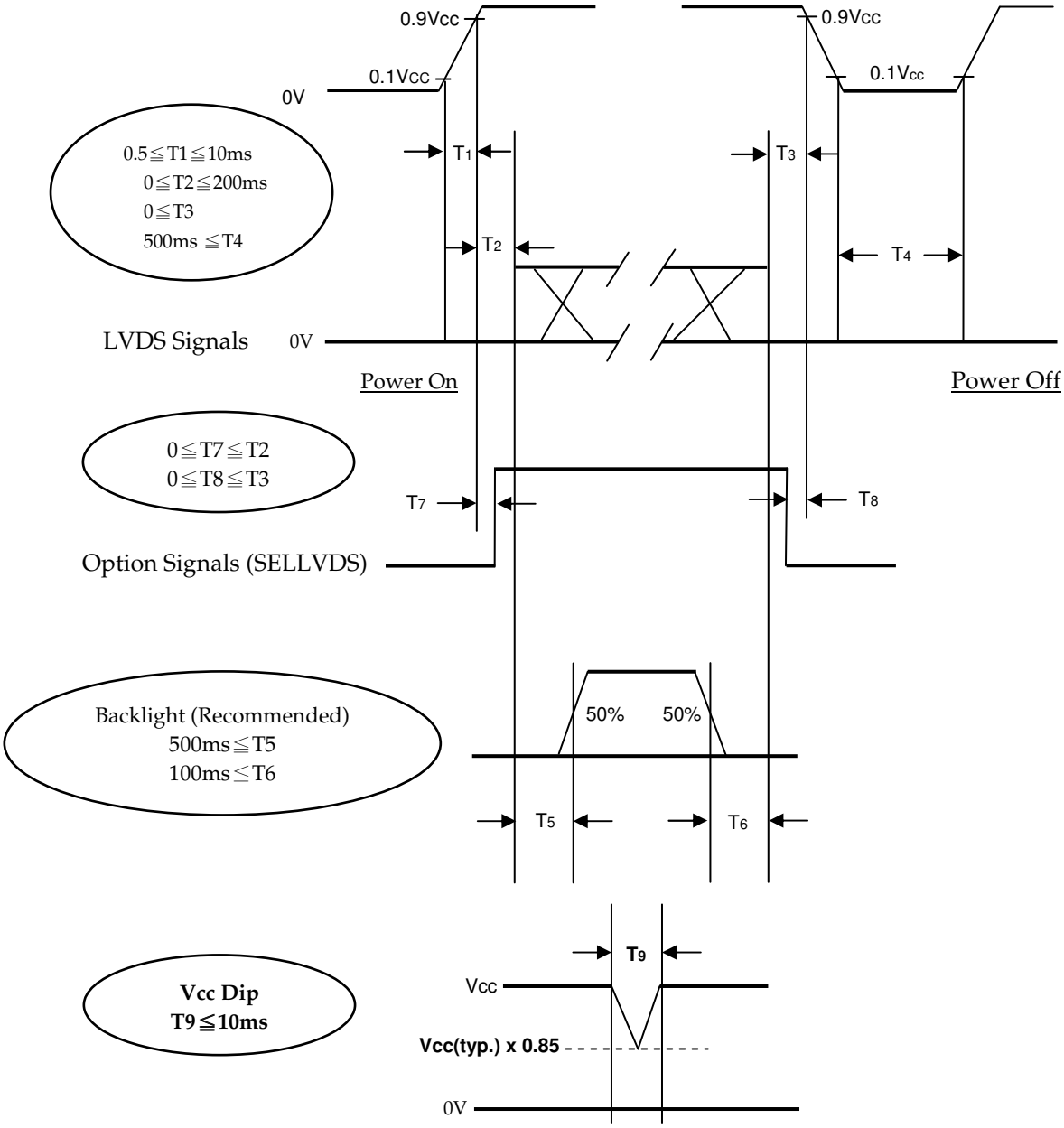



Note (5) The LVDS timing diagram and the receiver skew margin is defined and shown in following figure.



## 6.2 POWER ON/OFF SEQUENCE

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




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.

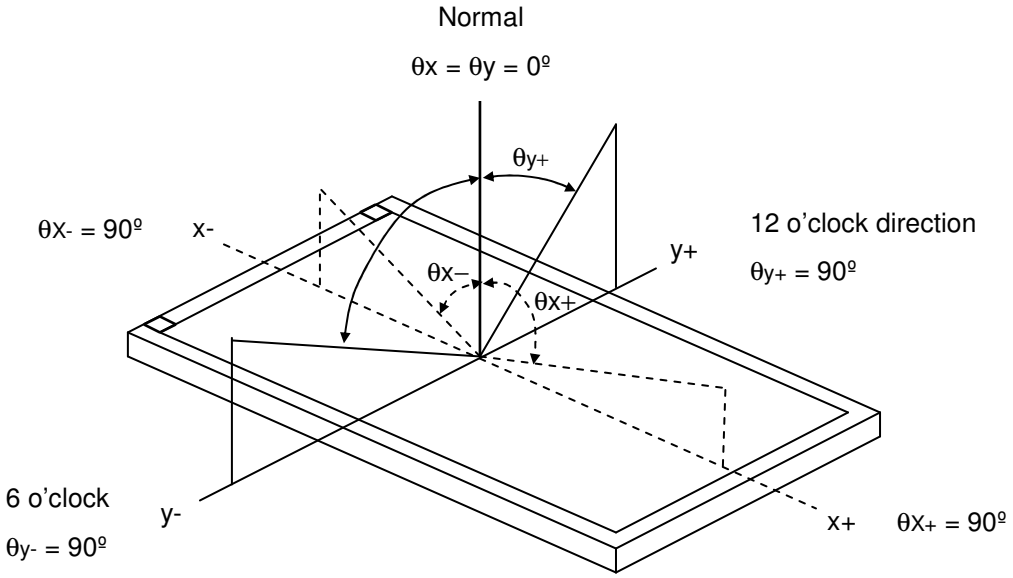
Note (6) Vcc must decay smoothly when power-off.

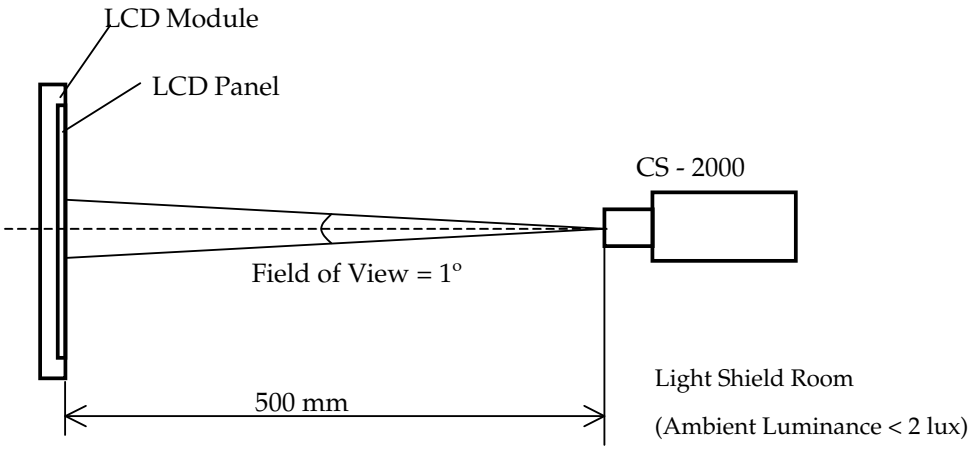
## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25 ±2 | °C |
| Ambient Humidity | Ha | 50 ±10 | %RH |
| Vertical Frame Rate | Fr | 60 | Hz |
| Supply Voltage | $V_{CC}$ | 12.0±1.2 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |

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 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<br>Standard light source "C" | -0.03 | 0.661 | +0.03 | - | (0) |
| | | Rcy | | | 0.326 | | - | |
| | Green | Gcx | | | 0.282 | | - | |
| | | Gcy | | | 0.587 | | - | |
| | Blue | Bcx | | | 0.136 | | - | |
| | | Bcy | | | 0.101 | | - | |
| | White | Wcx | | | 0.317 | | - | |
| | | Wcy | | | 0.355 | | - | |
| Transmittance | | T% | θx=0°, θY =0° With INX Module@60Hz | | 5.8 | - | % | (5) |
| Transmittance Variation | | δT | | | | 1.42 | | (6) |
| Contrast Ratio | | CR | | 2000 | 3000 | - | - | (1),(3) |
| Response Time (VA Model) | | Gray to gray | θx=0°, θY =0° With INX Module@60Hz | - | 8.5 | 20 | ms | (1),(4) |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥10<br>With INX Module | 80 | 89 | - | Deg. | (1),(2) |
| | | $\theta_x$- | | 80 | 89 | - | | |
| | Vertical | $\theta_Y$+ | | 80 | 89 | - | | |
| | | $\theta_Y$- | | 80 | 89 | - | | |

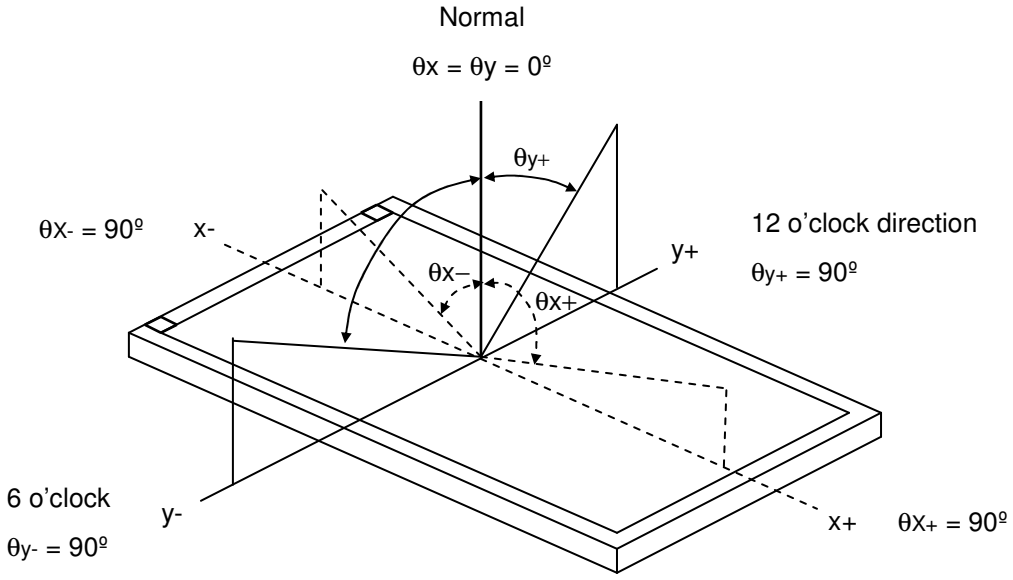
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following:

1. Measure Module's and BLU's spectrum at center point. W, R, G, B are with signal input. BLU (V236BJ1-LE2) is supplied by INX. (VA Model)
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 INX (V236BJ1-LE2) and the cell 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.

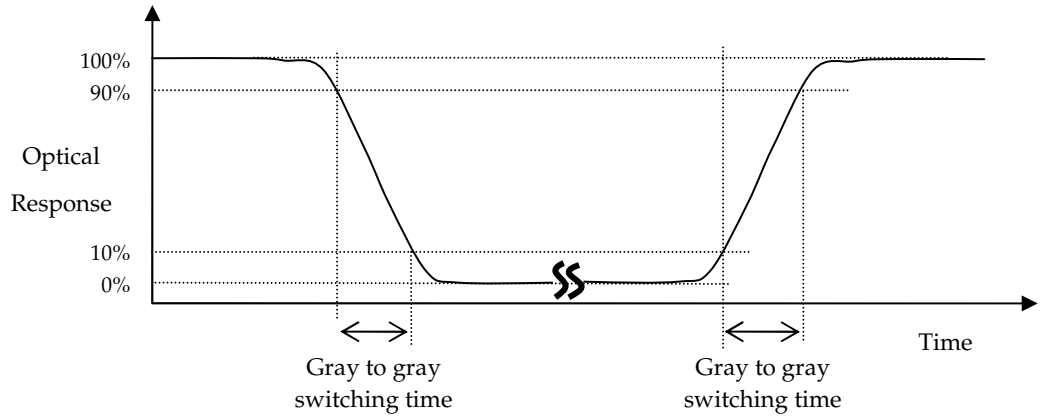
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L0: 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 (VA Model):




The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255.

Gray to gray average time means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255 to each other.

Note (5) Definition of Transmittance (T%): (VA Model)

Measure the transmittance at 5 points.

Light source is INX V236BJ1-LE2 module BLU and the cell driving voltage are based on suitable gamma voltages.

Transmittance (T%) = Average $[T(1), T(2), T(3), T(4), T(5)]$

The transmittance of each point can be calculated by the following expression.

$$T(X) = \frac{L255(X) \text{ of LCD module}}{\text{Luminance } (X) \text{ of BLU}} \times 100\%$$

L255: Luminance of gray level 255

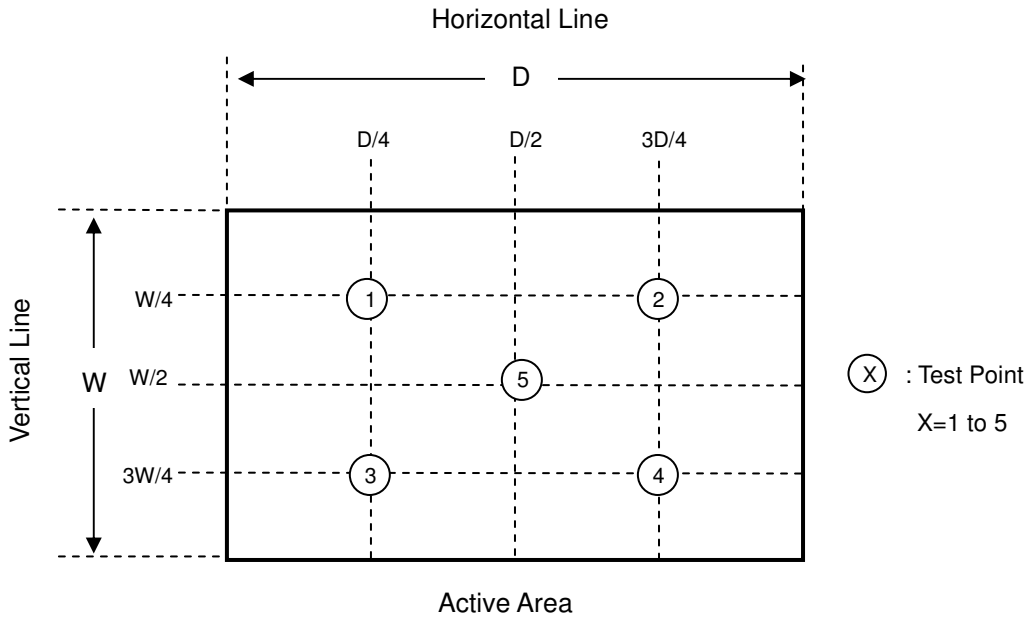
T(X) is corresponding to the point X1~X5 at the figure in Note (6).

Note (6) Definition of Transmittance Variation (δT): (VA Model)

Measure the transmittance at 5 points.

$$\text{Transmittance Variation } (\delta T) = \frac{\text{Maximum } [T(1), T(2), T(3), T(4), T(5)]}{\text{Minimum } [T(1), T(2), T(3), T(4), T(5)]}$$

T(X) is calculated as Note(5).



# 8. PRECAUTIONS

## 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

[ 1 ] Do not apply improper or unbalanced force such as bending or twisting to open cells during assembly.

[ 2 ] It is recommended to assemble or to install an open cell into a customer's product in clean working areas. The dust and oil may cause electrical short to an open cell or worsen polarizers on an open cell.

[ 3 ] Do not apply pressure or impulse to an open cell to prevent the damage.

[ 4 ] Always follow the correct power-on sequence when an open cell is assembled and turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

[ 5 ] Do not design sharp-pointed structure / parting line / tooling gate on the plastic part of a COF (Chip on film), because the burr will scrape the COF.

[ 6 ] If COF would be bended in assemble process, do not place IC on the bending corner.

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

[ 8 ] The bezel opening must have no burr and be smooth to prevent the surface of an open cell scraped.

[ 9 ] The bezel of a module or a TV set can not contact with force on the surface of an open cell. It might cause light leakage or scrape.

[ 10 ] In the case of no FFC or FPC attached with open cells, customers can refer the FFC / FPC drawing and buy them by self.

[ 11 ] It is important to keep enough clearance between customers' front bezel/backlight and an open cell. Without enough clearance, the unexpected force during module assembly procedure may damage an open cell.

[ 12 ] Do not plug in or unplug an I/F (interface) connector while an assembled open cell is in operation.

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

[ 14 ] Moisture can easily penetrate into an open cell and may cause the damage during operation.

[ 15 ] When storing open cells as spares for a long time, the following precaution is necessary.

[ 15.1 ] Do not leave open cells in high temperature and high humidity for a long time. It is highly recommended to store open cells in the temperature range from 0 to 35℃ at normal humidity without condensation.

[ 15.2 ] Open cells shall be stored in dark place. Do not store open cells in direct sunlight or fluorescent light environment.

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

[ 17 ] Unpacking (Cartons/Tray plates) in order to prevent open cells broken:

[ 17.1 ] Moving tray plates by one operator may cause tray plates bent which may induce open cells broken. Two operators carry one carton with their two hands. Do not throw cartons/tray plates, avoid any impact on cartons/tray plates, and put down & pile cartons/tray plates gently.

[ 17.2 ] A tray plate handled with unbalanced force may cause an open cell damaged. Trays should be completely put on a flat platform.

[ 17.3 ] To prevent open cells broken, tray plates should be moved one by one from a plastic bag.

[ 17.4 ] Please follow the packing design instruction, such as the maximum number of tray stacking to prevent the deformation of tray plates which may cause open cells broken.

[ 17.5 ] To prevent an open cell broken or a COF damaged on a tray, please follow the instructions below:

[17.5.1] Do not peel a polarizer protection film of an open cell off on a tray

[17.5.2] Do not install FFC or LVDS cables of an open cell on a tray

[17.5.3] Do not press the surface of an open cell on a tray.

[17.5.4] Do not pull X-board when an open cell placed on a tray.

[ 18 ] Unpacking (Hard Box) in order to prevent open cells broken:

[ 18.1 ] Moving hard boxes by one operator may cause hard boxes fell down and open cells broken by abnormal methods. Two operators carry one hard box with their two hands. Do handle hard boxes carefully, such as avoiding impact, putting down, and piling up gently.

[ 18.2 ] To prevent hard boxes sliding from carts and falling down, hard boxes should be placed on a surface with resistance.

[ 18.3 ] To prevent an open cell broken or a COF damaged in a hard box, please follow the instructions below:

[18.3.1] Do not peel a polarizer protection film of an open cell off in a hard box.

[18.3.2] Do not install FFC or LVDS cables of an open cell in a hard box.

[18.3.3] Do not press the surface of an open cell in a hard box.

[18.3.4] Do not pull X-board when an open cell placed in a hard box.

[ 19 ] Handling – In order to prevent open cells, COFs , and components damaged:

[ 19.1 ] The forced displacement between open cells and X-board may cause a COF damaged. Use a fixture tool for handling an open cell to avoid X-board vibrating and interfering with other components on a PCBA & a COF.

[ 19.2 ] To prevent open cells and COFs damaged by taking out from hard boxes, using vacuum jigs to take out open cells horizontally is recommended.

[ 19.3 ] Improper installation procedure may cause COFs of an open cell over bent which causes damages. As installing an open cell on a backlight or a test jig, place the bottom side of the open cell first on the backlight or the test jig and make sure no interference before fitting the open cell into the backlight/the test jig.

[ 19.4 ] Handle open cells one by one.

[ 20 ] Avoid any metal or conductive material to contact PCB components, because it could cause electrical damage or defect.

## 8.2 SAFETY PRECAUTIONS

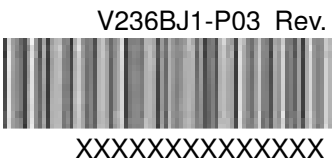
[ 1 ] If the liquid crystal material leaks from the open cell, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

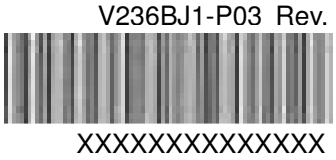
[ 2 ] After the end of life, open cells are not harmful in case of normal operation and storage.

# 9. DEFINITION OF LABELS

## 9.1 OPEN CELL LABEL

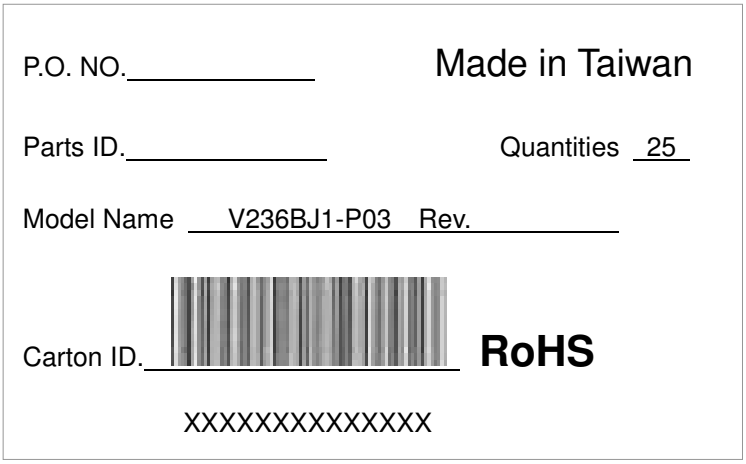
The barcode nameplate is pasted on each open cell as illustration for INX internal control.

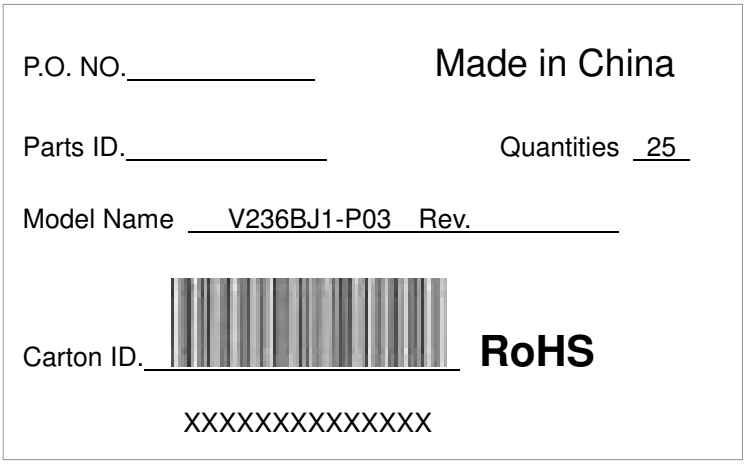



## 9.2 CARTON LABEL

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




(a) Model Name: V236BJ1– P03

(b) Carton ID: INX internal control

(c) Quantities: 25

## 10. PACKAGING

### 10.1 PACKAGING SPECIFICATIONS

(1) 25 PCS LCD Panels / 1 Box

(2) Box dimensions : 630 (L) X 473 (W) X143 (H)mm

(3) Weight : approximately 13.6 Kg

(4) 800 PCS LCD TV Panels / 1 Group

### 10.2 PACKING METHOD

Packing method (EPO Box) is shown in following figures

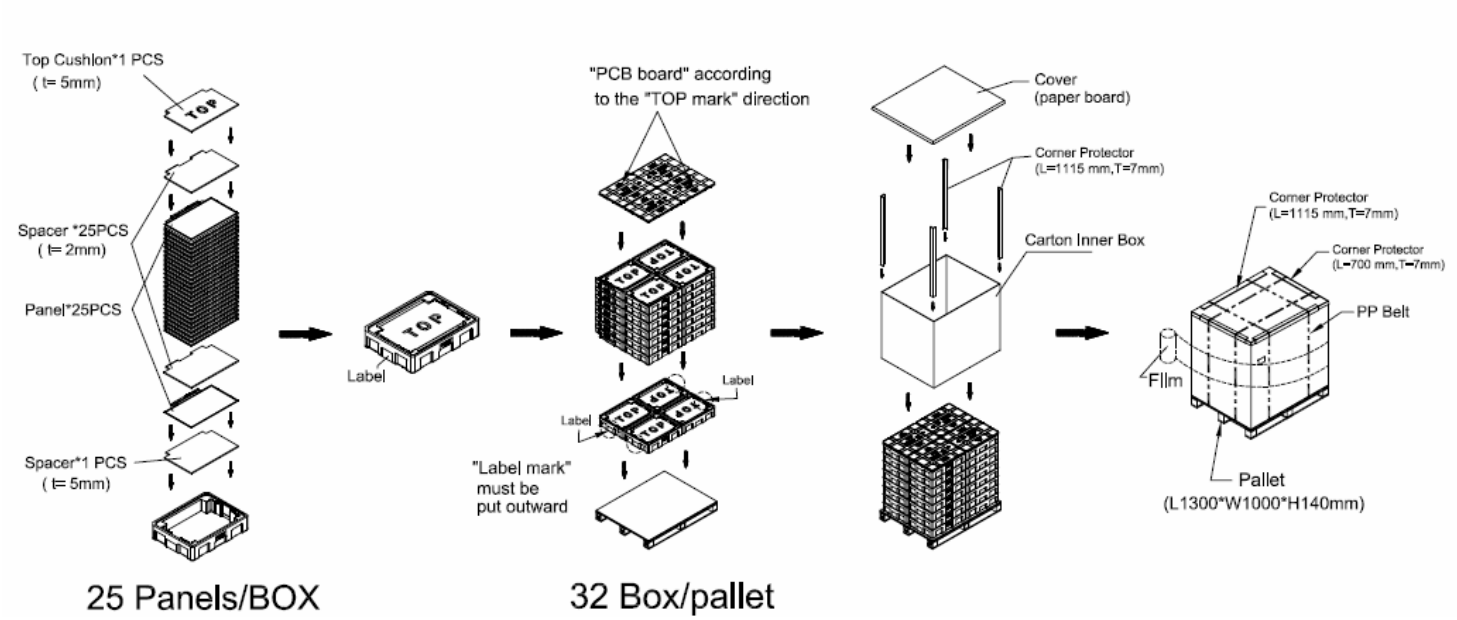



Figure.10-1 packing method

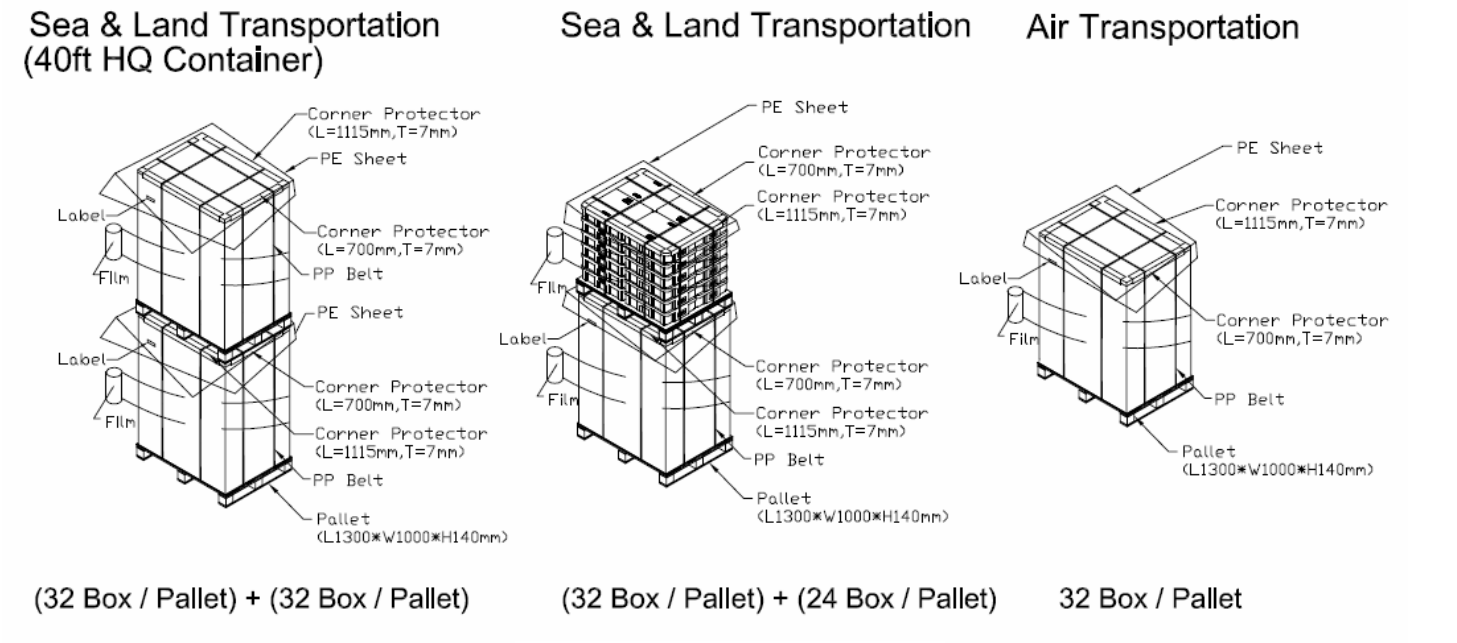



Figure.10-2 packing method

### 10.3 UN - PACKAGING METHOD

Without the outer Carton, Boxes stack under the package architecture

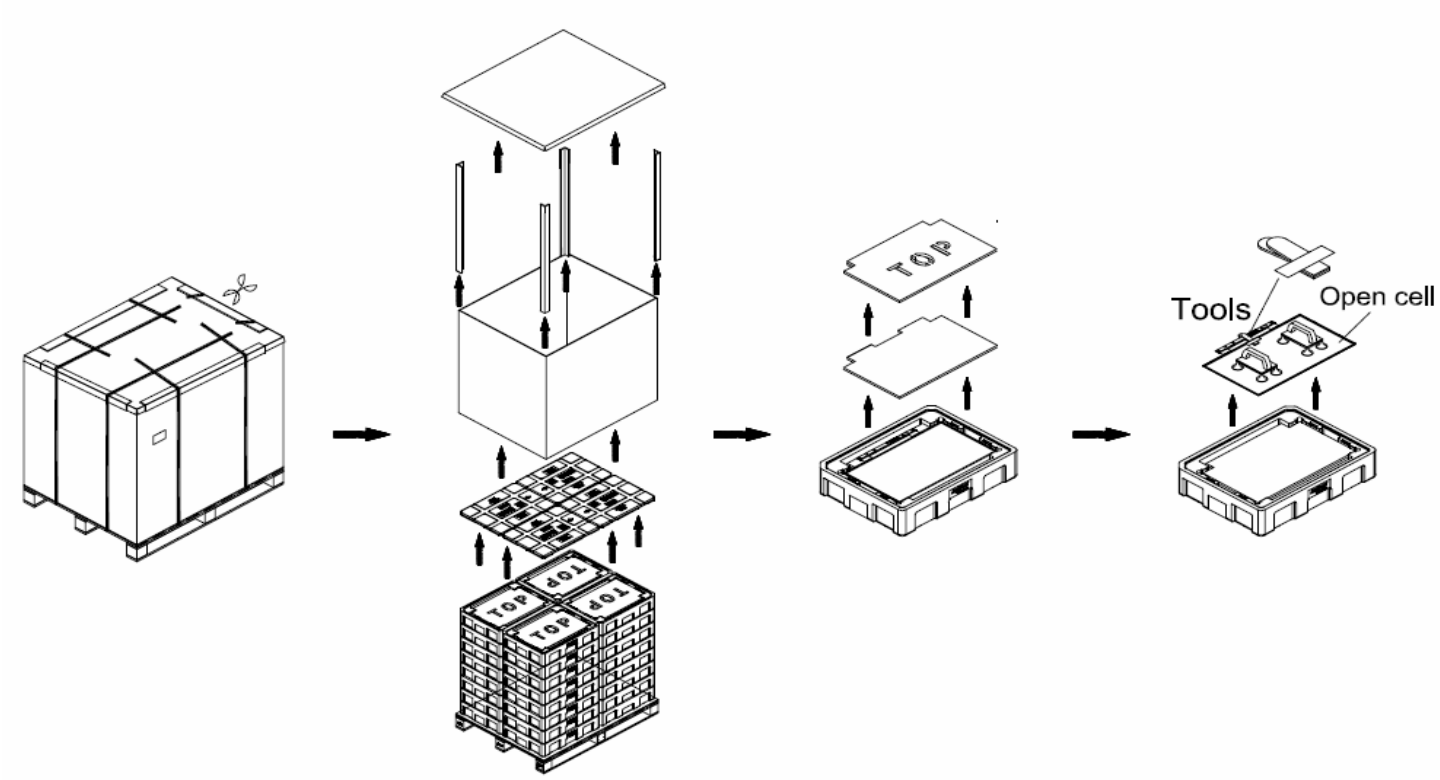
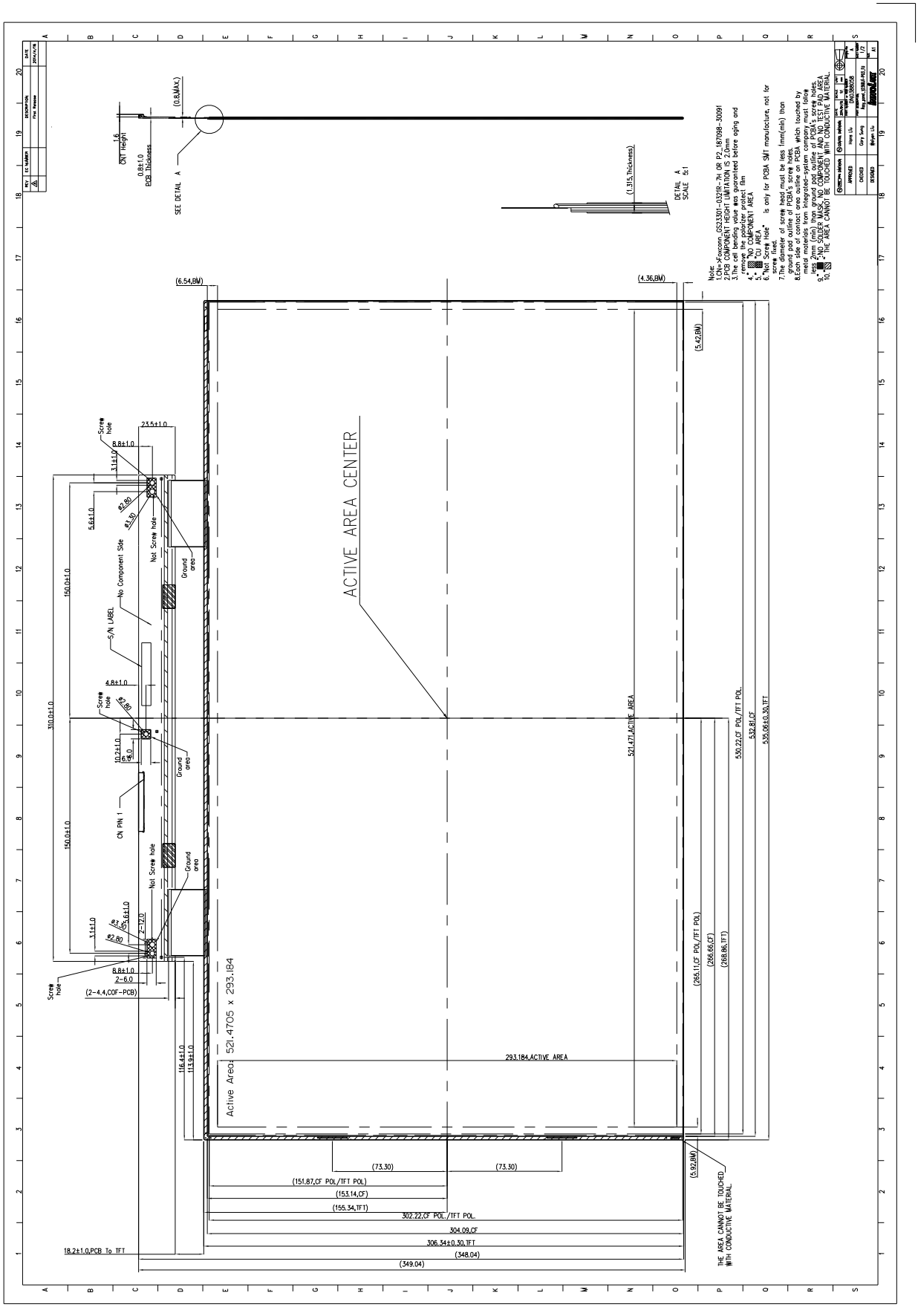
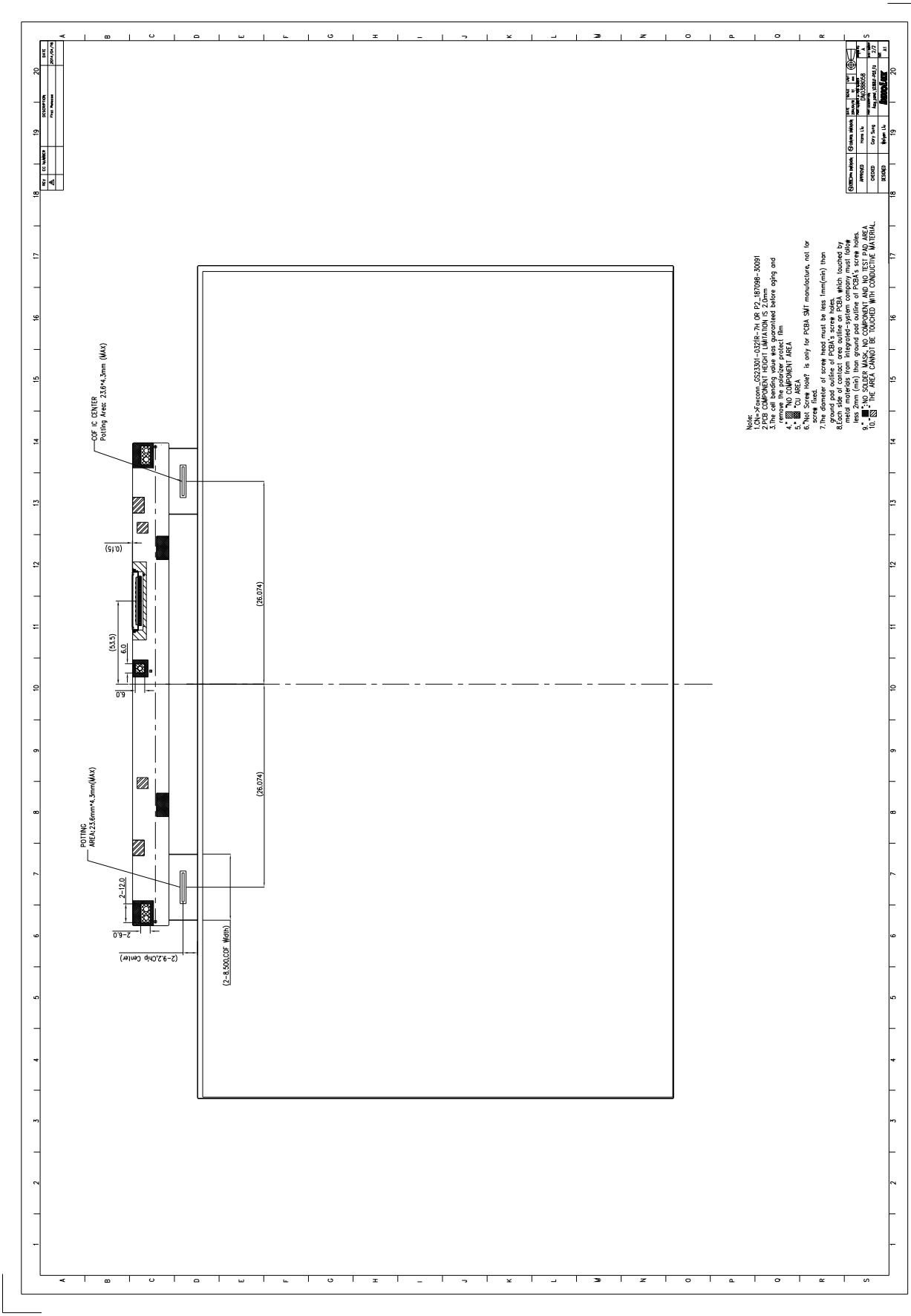



Figure.10-3 unpacking method

## 11. MECHANICAL CHARACTERISTIC





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