☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

# MODEL NO.: V185BJ1
# SUFFIX: LE1

**Customer: Common**

**APPROVED BY SIGNATURE**

Name / Title

**Note**

Rev. C1

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

| Approved By | Checked By | Prepared By |
|---|---|---|
| Chao-Chun Chung | Ying-Ping Lee | Kolo Huang |

## CONTENTS

## REVISION HISTORY

| Version | Date | Page(New) | Section | Description |
|---|---|---|---|---|
| Ver. 2.0 | Jan.10, 2014 | All | All | The Approval Specification was first issued. |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

V185BJ1-LE1 is a 18.5" TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 1ch-LVDS interface. This module supports 1366 x 768 HDTV format and can display up to 16.7M (8 bit) colors. The converter module for Backlight is not built in.

## 1.2 FEATURES

- High brightness (250 nits)
- High contrast ratio (3000：1)
- Fast response time (Gray to gray average 9.0 ms)
- High color saturation (NTSC 72%)
- HDTV (1366 x 768 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for 60 Hz frame rate
- Ultra wide Viewing Angle: Super MVA Technology
- RoHS compliance.

## 1.3 APPLICATION

- Personal TV /Public Display Application
- Home Theater Application
- MFM Application

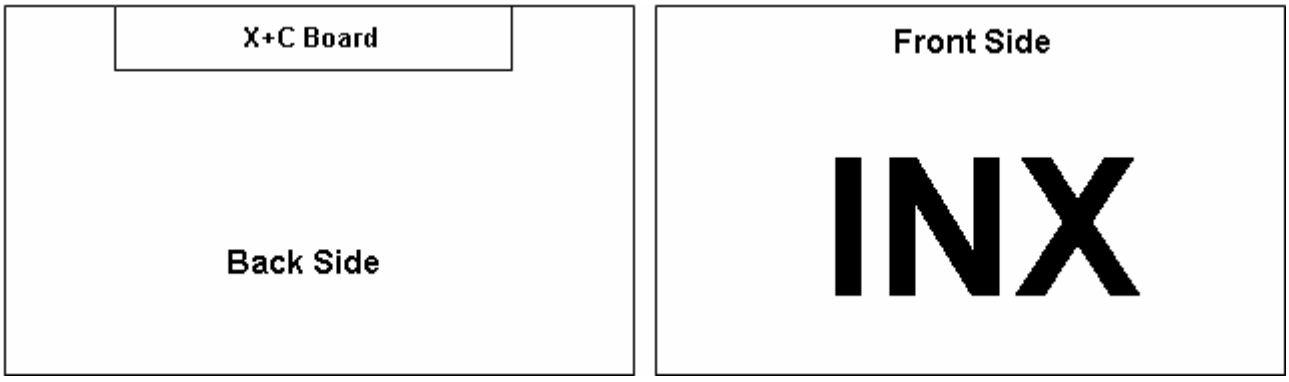
## 1.4 GENERAL SPECIFICATIONS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 409.8 (H) x 230.4 (V) | mm | (1) |
| Bezel Opening Area | 413.4 (H) x 234.0 (V) | mm | |
| Driver Element | a-si TFT active matrix | - | - |
| Pixel Number | 1366 x R.G.B. x 768 | pixel | - |
| Pixel Pitch(Sub Pixel) | 0.1 (H) x 0.3 (V) | mm | - |
| Pixel Arrangement | RGB vertical stripe | - | - |
| Power consumption | 14.89W (Max.) [Cell 4.89W (Max.) + BLU 10.00W (Max.)] | Watt | (2) |
| Display Colors | 16.7M | color | - |
| Display Operation Mode | Transmissive Mode / Normally Black | - | - |
| Surface Treatment | Anti-Glare coating (Haze 1.0%),Hard coating (3H) | - | - |

Note (1) Please refer to the attached drawings in chapter 11 for more information about the front and back outlines.

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

Note(3) Module display direction.




## 1.5 MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal (H) | 429.87 | 430.37 | 430.87 | mm | (1) |
| | Vertical (V) | 254.1 | 254.6 | 255.1 | mm | (1) |
| | Depth (D) | 9.5 | 10.5 | 11.5 | mm | (1) |
| Weight | | 1170 | 1230 | 1290 | g | - |

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

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

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

(a) 90 %RH Max. (Ta ≦ 40 ºC).

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

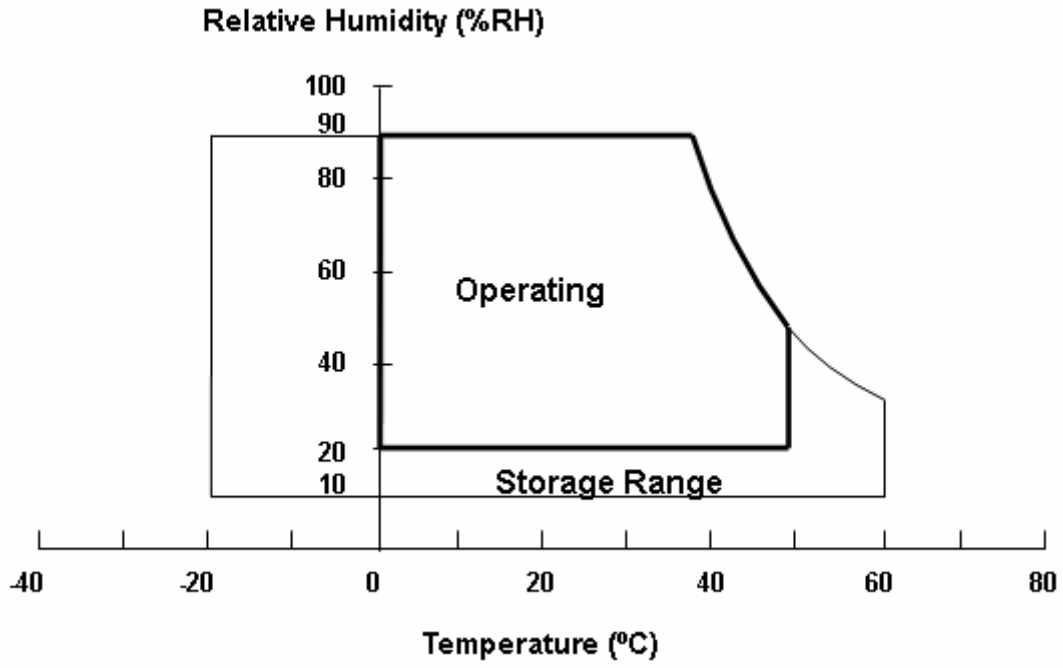
(c) No condensation.

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

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

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

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



## 2.2 PACKAGE STORAGE

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

(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 stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | $V_{CC}$ | -0.3 | 5.5 | V | (1) |
| Logic Input Voltage | $V_{IN}$ | -0.3 | 3.6 | V | |

### 2.3.2 BACKLIGHT CONVERTER UNIT

| Item | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| LED Forward Current Per Input Pin | $I_F$ | 150.4 | 160 | 169.6 | mA | (1) (2) Duty=100% |
| LED Pulse Forward Current Per Input Pin | $I_{FP}$ | 420 | 450 | 480 | mA | Pulse Width≦10msec. and Duty≦25% |

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

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 ℃ (Refer to 3.2 for further information).

## 3. ELECTRICAL CHARACTERISTICS

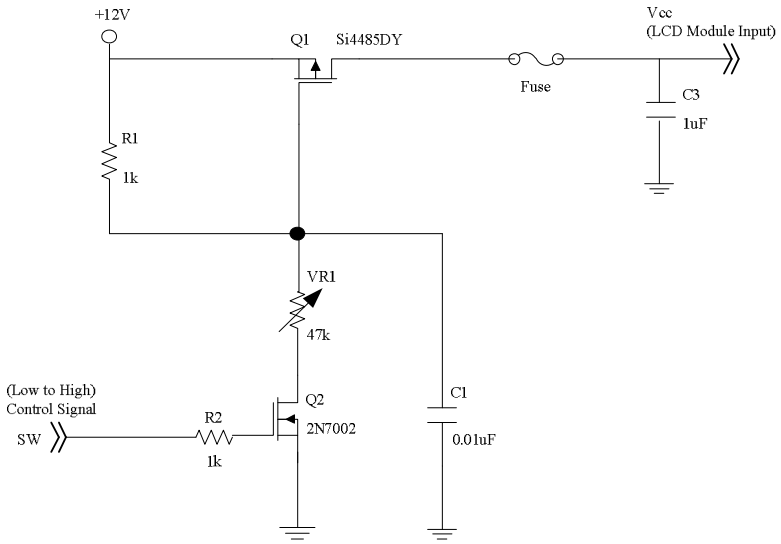
### 3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

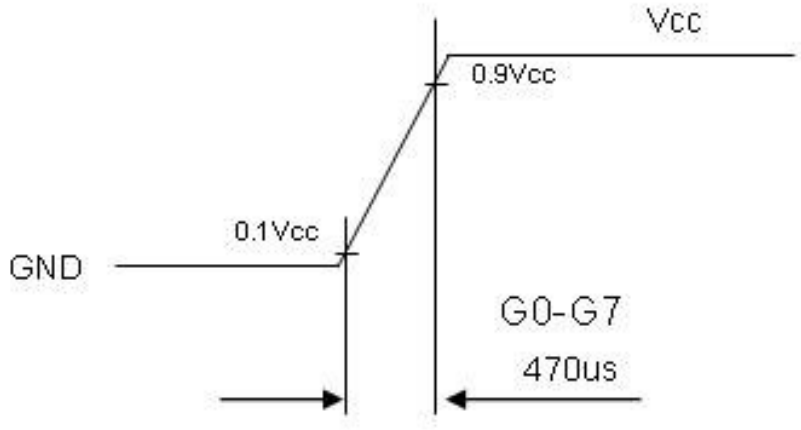
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 4.5 | 5 | 5.5 | V | (1) |
| Rush Current | | $I_{RUSH}$ | — | — | 2.64 | A | (2) |
| Power consumption | White Pattern | $P_T$ | — | 4.15 | 4.89 | Watt | (3) |
| | Black Pattern | $P_T$ | — | 2.70 | 3.05 | Watt | |
| | Heavy Loading pattern (Vertical Stripe) | $P_T$ | — | 3.80 | 4.50 | Watt | |
| Power Supply Current | White Pattern | — | — | 0.83 | 0.98 | A | |
| | Black Pattern | — | — | 0.53 | 0.61 | A | |
| | Heavy Loading pattern (Vertical Stripe) | — | — | 0.76 | 0.90 | A | |
| LVDS interface | Differential Input High Threshold Voltage | $V_{LVTH}$ | +100 | — | — | mV | (4) |
| | Differential Input Low Threshold Voltage | $V_{LVTL}$ | — | — | -100 | mV | |
| | Common Input Voltage | $V_{CM}$ | 1.0 | 1.2 | 1.4 | V | |
| | Differential input voltage (single-end) | $\|V_{ID}\|$ | 200 | — | 600 | mV | |
| | Terminating Resistor | $R_T$ | — | 100 | — | ohm | |
| CMIS interface | Input High Threshold Voltage | $V_{IH}$ | 2.7 | — | 3.3 | V | - |
| | Input Low Threshold Voltage | $V_{IL}$ | 0 | — | 0.7 | V | - |

Note (1) The module should be always operated within the above ranges. The ripple voltage should be controlled under 10% of Vcc(Typ.).

Note (2) Measurement condition：



**Vcc rising time is 470us**

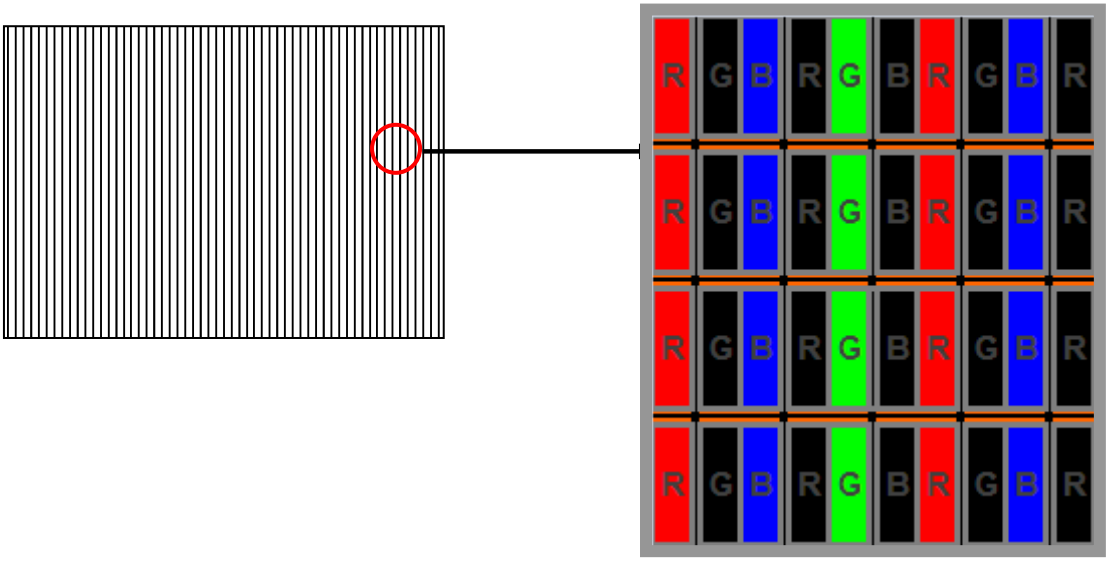



Note (3) The specified power supply current is under the conditions at Vcc = 5V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

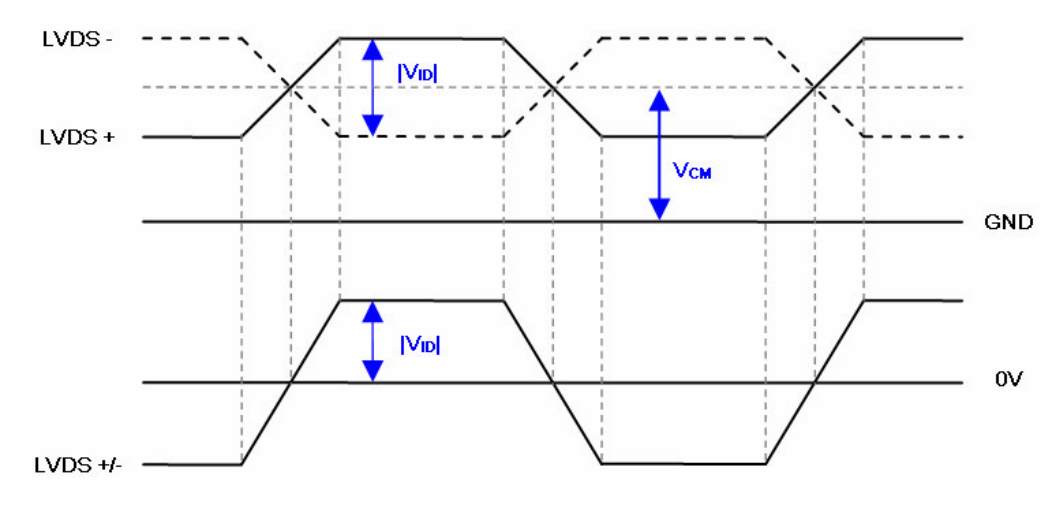
a. White Pattern

Active Area

c. Vertical Stripe Pattern



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




### 3.2 BACKLIGHT NUIT

#### 3.2.1 LED LIGHT BAR CHARACTERISTICS

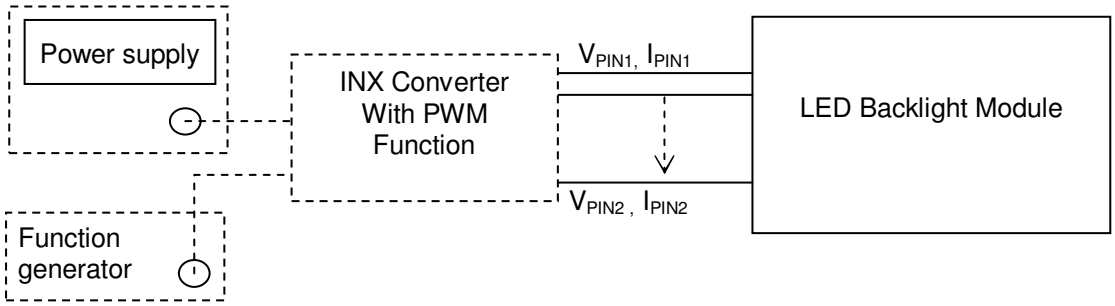
(Ta = 25 ± 2 ºC)

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| LED Light Bar Input Voltage Per Input Pin | $V_{PIN}$ | 26.00 | 29.04 | 31.50 | V | (1), Duty=100%, $I_L$ =160mA |
| LED Light Bar Current Per Input Pin | $I_{PIN}$ | 150.40 | 160.00 | 169.60 | mA | (1), (2) Duty=100% |
| Power consumption | $P_{BL}$ | — | 9.29 | 10.00 | W | (1), (2) Duty=100%, $I_L$ =160mA |
| LED Life time | $L_{LED}$ | 30,000 | — | — | Hrs | (3) |

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below.

Note (2) $P_{BL}$(Typ.)= $I_{PIN}$(Typ.) x $V_{PIN}$(Typ.) x ( 2 ), $P_{BL}$(Max.)= $I_{PIN}$(Typ) x $V_{PIN}$(Max.) x ( 2 ) input pins.

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25 ±2 ℃ and (I= 160mA) (per chip) until the brightness becomes ≦ 50% of its original value.



### 3.2.2 LIGHTBAR CONNECTOR PIN ASSIGNMENT

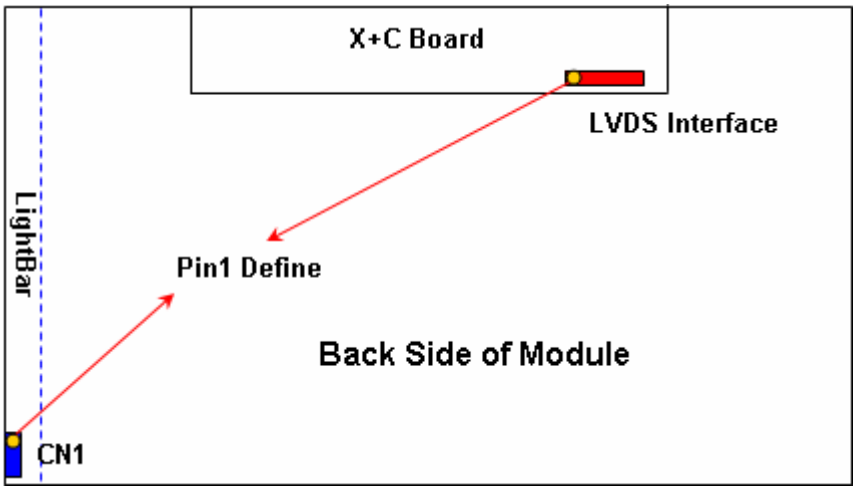
Connector：WM13-406-063N (FCN)

CI1406M1HRK-NH (CviLux)

Input connector pin assignment：CN1

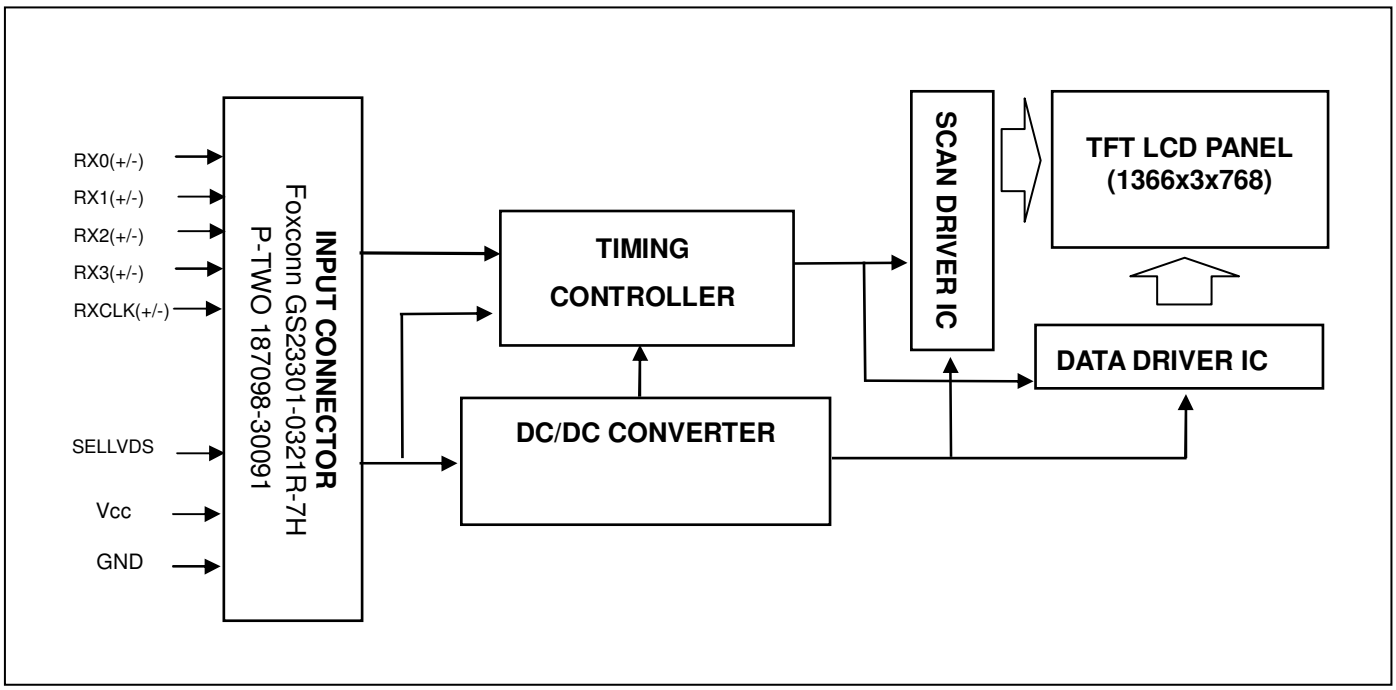
| Input connector CN1 | | Comments |
|---|---|---|
| (vendor)<br>FCN<br>CviLux | (type)<br>WM13-406-063N<br>CI1406M1HRK-NH | |
| Pin | Function | |
| 1 | VLED | VLED |
| 2 | NC | Not connection, this pin should be open |
| 3 | NC | Not connection, this pin should be open |
| 4 | NC | Not connection, this pin should be open |
| 5 | LED2 | Cathode of LED string |
| 6 | LED1 | Cathode of LED string |

## 3.3 LVDS INPUT SIGNAL SPECIFICATIONS



## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE



## 5. INPUT TERMINAL PIN ASSIGNMENT

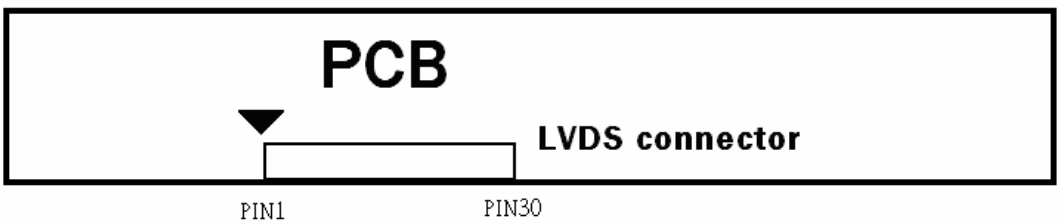
### 5.1 TFT LCD MODULE INPUT

**Connector Pin Assignment**

| Pin | Name | Description | Remark |
|---|---|---|---|
| 1 | VCC | +5.0V power supply | - |
| 2 | VCC | +5.0V power supply | - |
| 3 | VCC | +5.0V power supply | - |
| 4 | VCC | +5.0V power supply | - |
| 5 | GND | Ground | - |
| 6 | GND | Ground | - |
| 7 | GND | Ground | - |
| 8 | NC | No connection | (2) |
| 9 | SELLVDS | Select LVDS Format<br>LVDS data format Selection(0V~0.7V→JEDIA, 2.7V~3.3V/Open→VESA) 【Do Not Floating】 | (3) |
| 10 | NC | NC | (2) |
| 11 | GND | Ground | - |
| 12 | RX0- | Negative LVDS differential data input. Channel 0 | - |
| 13 | RX0+ | Positive LVDS differential data input. Channel 0 | - |
| 14 | GND | Ground | - |
| 15 | RX1- | Negative LVDS differential data input. Channel 1 | - |
| 16 | RX1+ | Positive LVDS differential data input. Channel 1 | - |
| 17 | GND | Ground | - |
| 18 | RX2- | Negative LVDS differential data input. Channel 2 | - |
| 19 | RX2+ | Positive LVDS differential data input. Channel 2 | - |
| 20 | GND | Ground | - |
| 21 | RXLCK- | Negative LVDS differential clock input. | - |
| 22 | RXCLK+ | Positive LVDS differential clock input. | - |
| 23 | GND | Ground | - |
| 24 | RX3- | Negative LVDS differential data input. Channel 3 | - |
| 25 | RX3+ | Positive LVDS differential data input. Channel 3 | - |
| 26 | GND | Ground | - |
| 27 | NC | No connection | (2) |
| 28 | NC | No connection | (2) |
| 29 | NC | No connection | (2) |
| 30 | GND | Ground | - |

Note (1) Connector type：(FOXCONN= GS23301-0321R-7H or P-TWO=187098-30091)

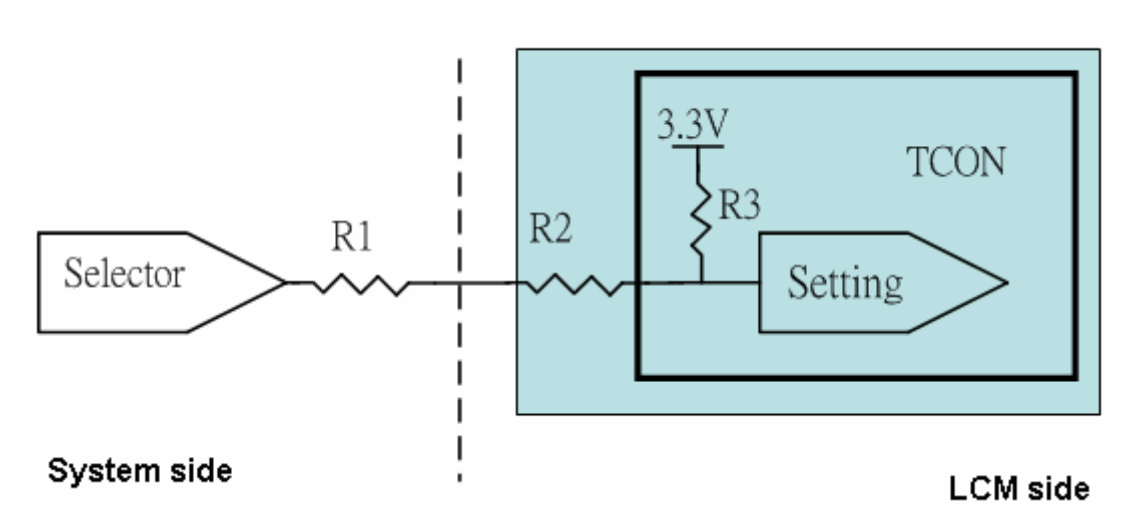
LVDS connector pin order defined as follows：



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

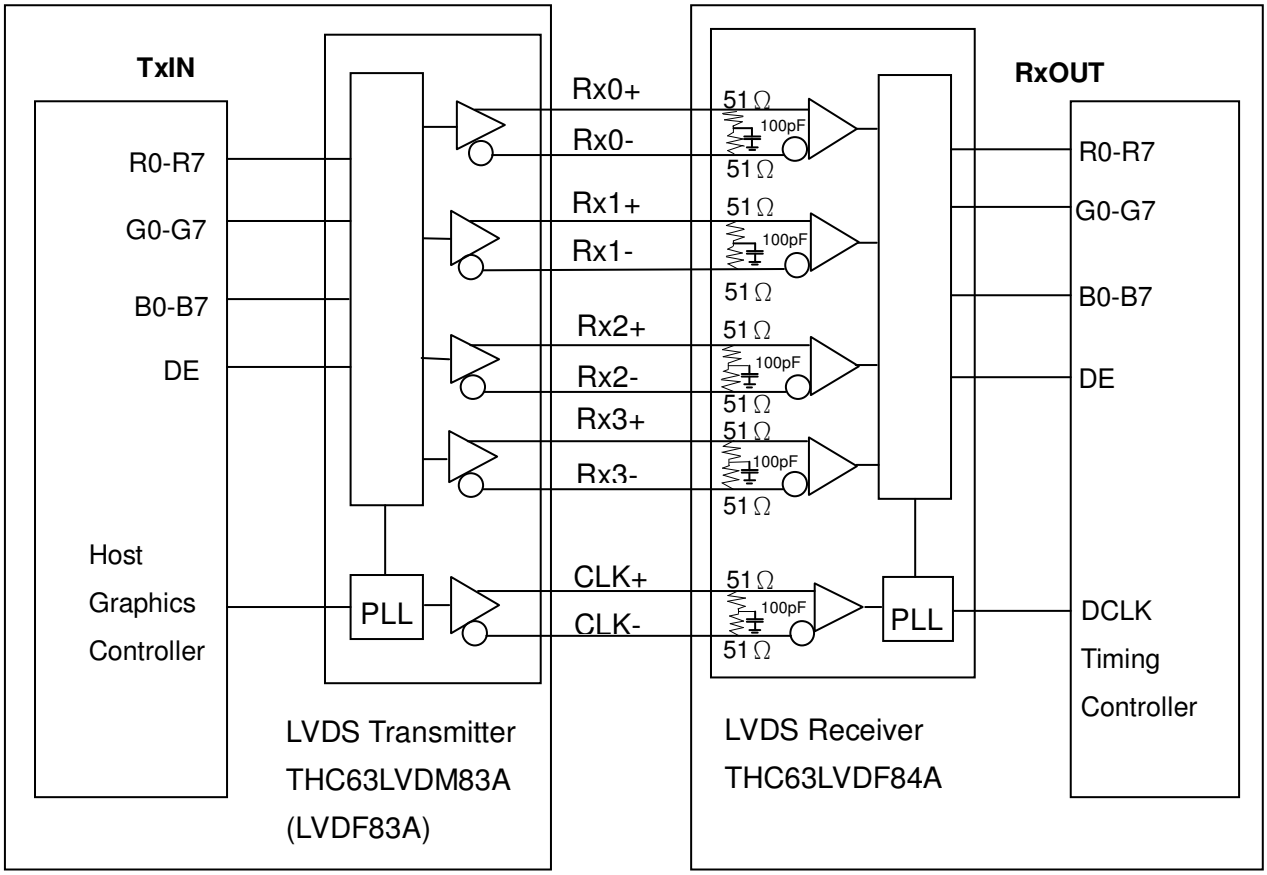
Note (3) LVDS data format Selection：0V~0.7V→JEDIA；2.7V~3.3V/OPEN→VESA

Note (4) LVDS signal pin connected to the LCM side has the following diagram. R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)




Note (5) Suggested connector connected in series：JAE FI-X30HL (Japan Aviation Electronics Ind. LTD.)

### 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

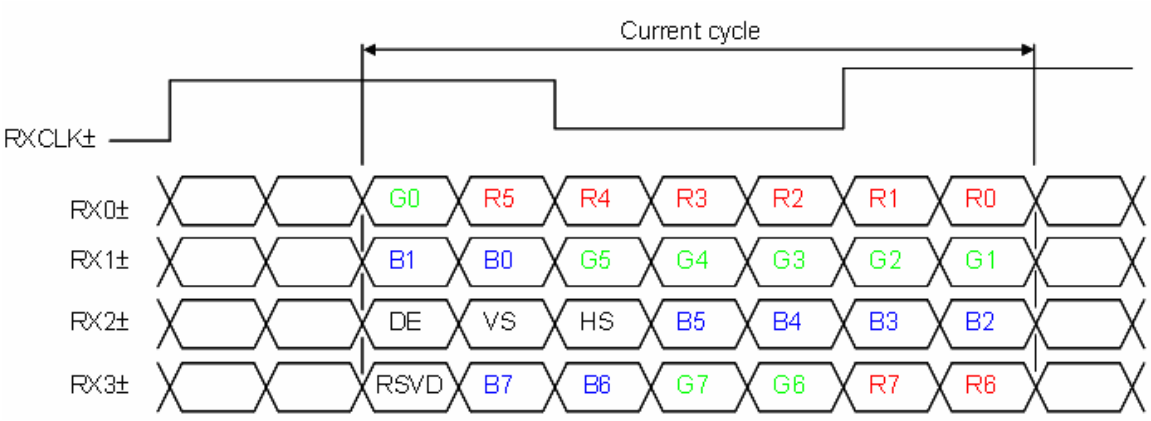
DCLK ：Data clock signal

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

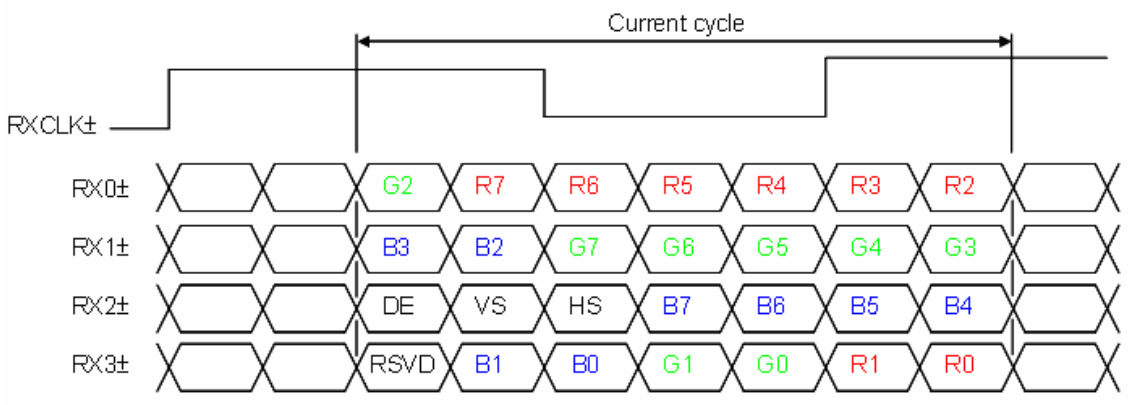
Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

### 5.3 LVDS INTERFACE

VESA LVDS format：SELLVDS pin= High or Open




JEDIA LVDS format：SELLVDS pin= Low




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”.

### 5.4 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 the color versus data input.

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

Note (1) 0：Low Level Voltage；1：High Level Voltage.

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram. (Ta = 25 ± 2 ºC)

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | $F_{clkin}$ (=1/TC) | 67.7 | 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 | Setup Time | Tlvsu | 600 | — | — | ps | (5) |
| | Hold Time | Tlvhd | 600 | — | — | ps | |
| Vertical Active Display Term | Frame Rate | $F_{r5}$ | 47 | 50 | 53 | Hz | - |
| | | $F_{r6}$ | 57 | 60 | 63 | Hz | |
| | Total | Tv | 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 | - |

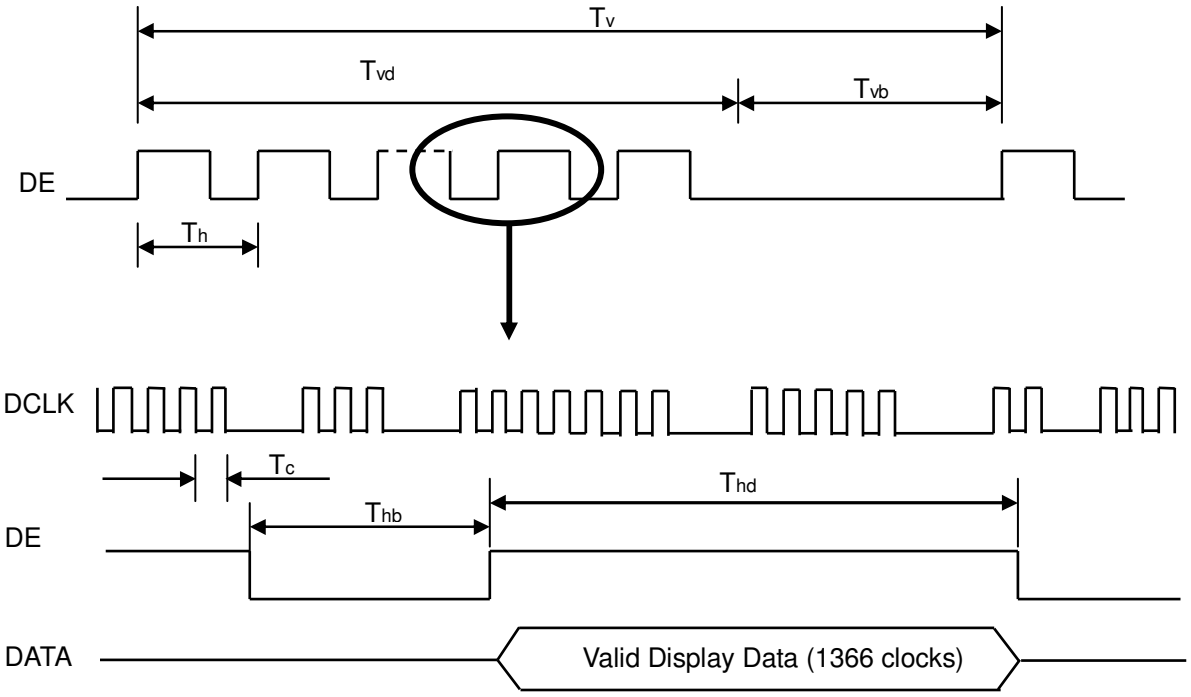
Note (1) Please make sure the range of frame rate has follow the below equation：

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

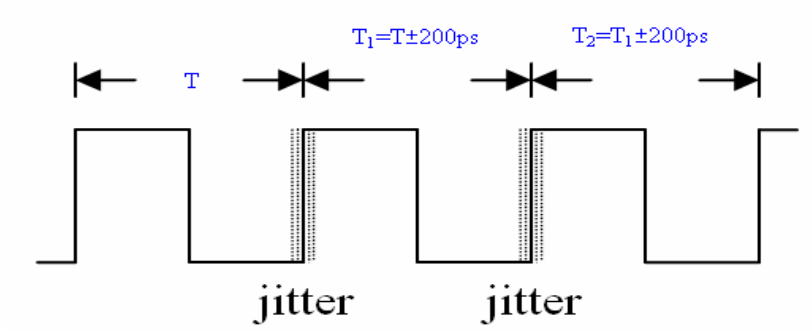
$$F_{r5} \times Tv \times Th \geqq F_{clkin}(min)$$

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

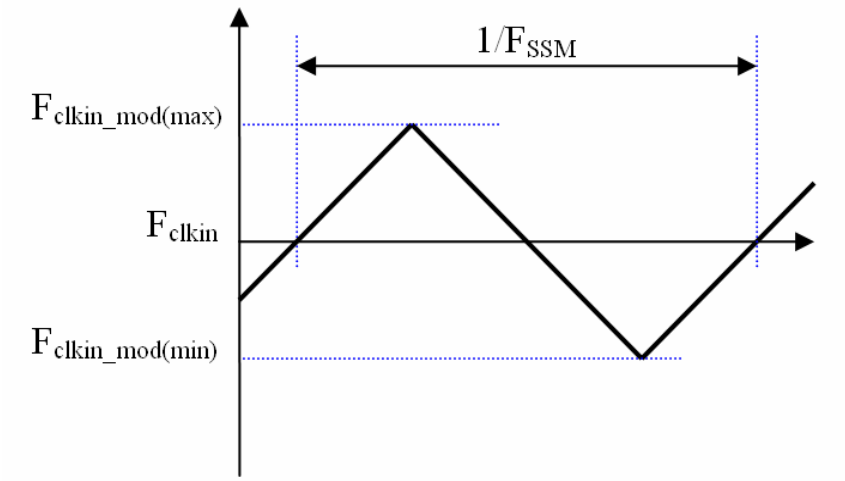
**INPUT SIGNAL TIMING DIAGRAM**




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

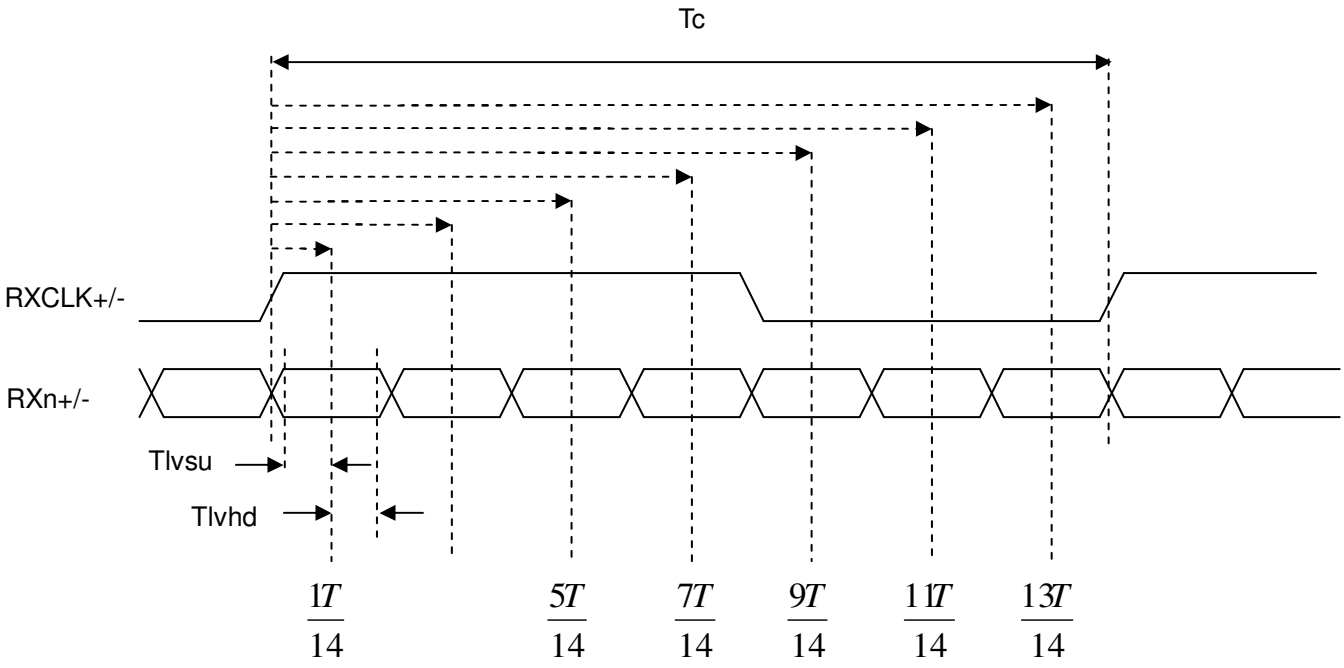



Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



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

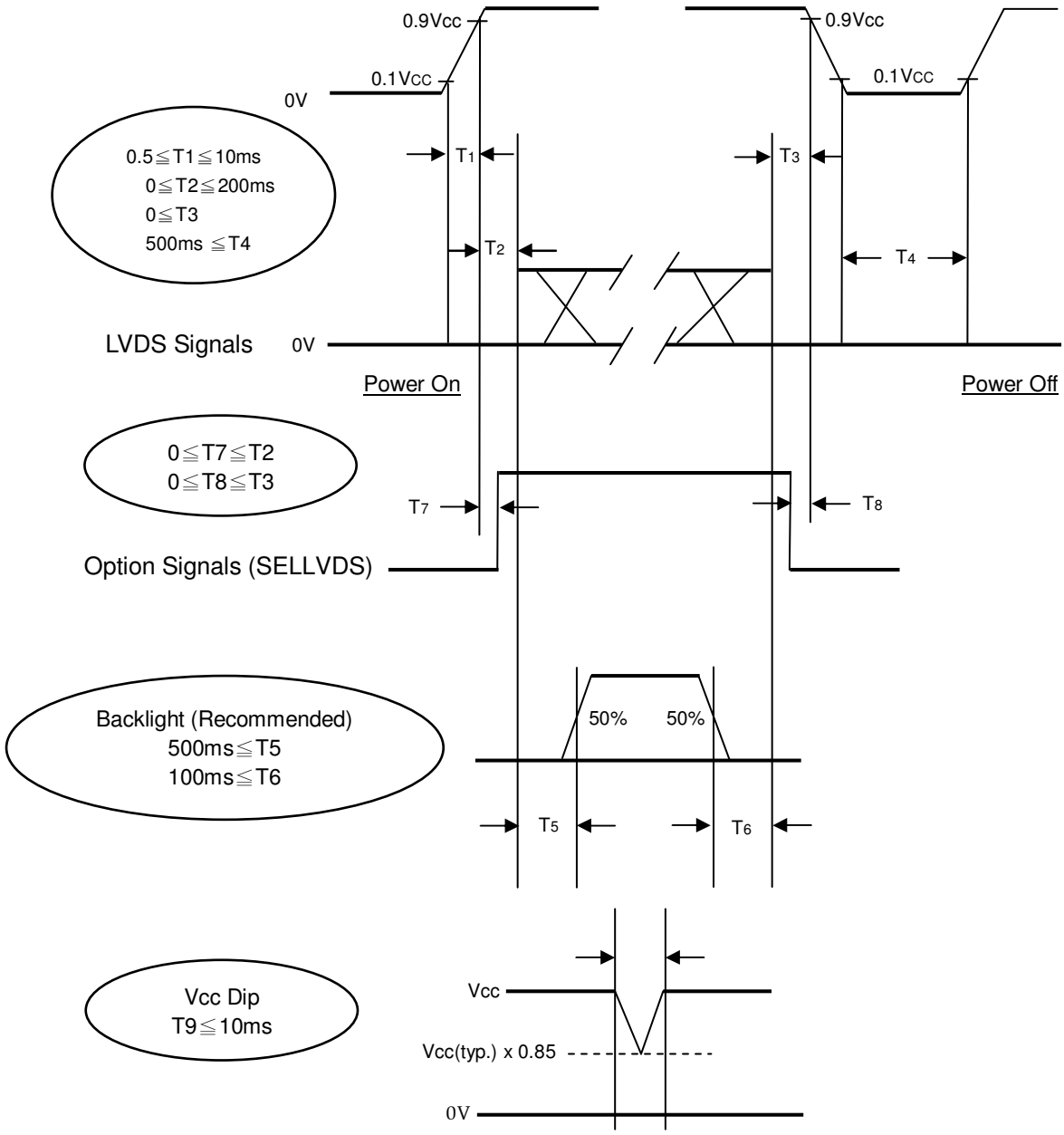
**LVDS RECEIVER INTERFACE TIMING DIAGRAM**



## 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

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




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

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

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

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

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

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 | ℃ |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | Vcc | 5 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| LED Light Bar Input Current Per Input Pin | $I_{PIN}$ | 160 | $mA_{DC}$ |
| PWM Duty Ratio | D | 100 | % |

Note (1) No guarantee level of water flow.

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.

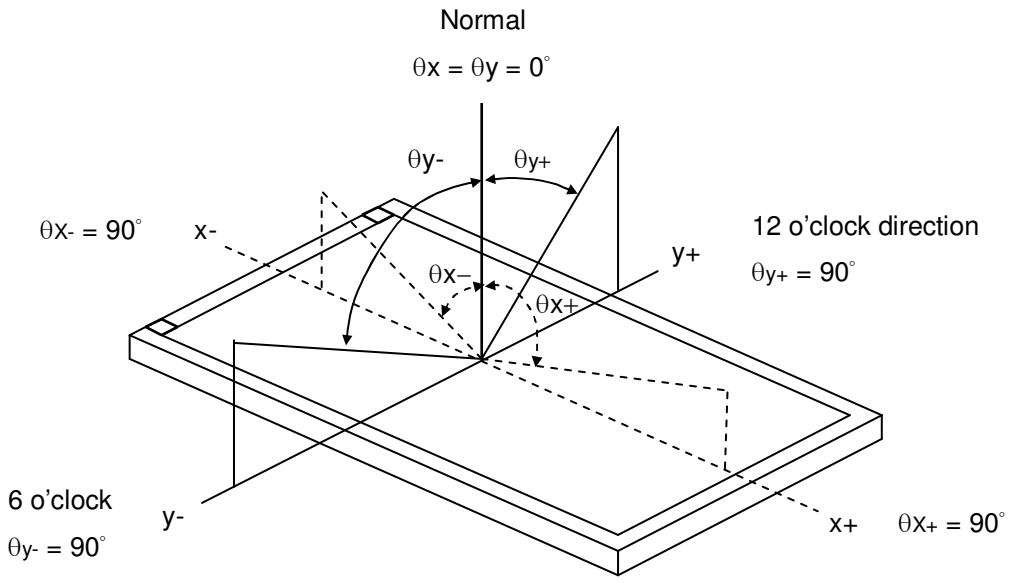
## 7.2 OPTICAL SPECIFICATIONS

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

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | θx=0°, θy =0° Viewing angle at normal direction | 2000 | 3000 | - | - | (2) |
| Response Time | | Gray to gray | | - | 9 | 20 | ms | (3) |
| Center Luminance of White | | $L_C$ | | 200 | 250 | - | $cd/m^2$ | (5) |
| White Variation | | δW | | - | - | 1.42 | - | (7) |
| Cross Talk | | CT | | - | - | 4.0 | % | (6) |
| Color Chromaticity | Red | Rx | | Typ. -0.03 | 0.639 | Typ. +0.03 | - | (1)(4) |
| | | Ry | | | 0.336 | | - | |
| | Green | Gx | | | 0.308 | | - | |
| | | Gy | | | 0.612 | | - | |
| | Blue | Bx | | | 0.150 | | - | |
| | | By | | | 0.057 | | - | |
| | White | Wx | | | 0.285 | | - | |
| | | Wy | | | 0.293 | | - | |
| | Color Gamut | C.G | | - | 72 | - | % | NTSC |
| Viewing Angle | Horizontal | θx+ | CR≥10 With INX Module | 80 | 89 | - | Deg. | (1)(4) |
| | | θx- | | 80 | 89 | - | | |
| | Vertical | θY+ | | 80 | 89 | - | | |
| | | θY- | | 80 | 89 | - | | |

Note (1) Definition of Viewing Angle (θx, θy)：

Viewing angles are measured by Autronic Conoscope Cono-80



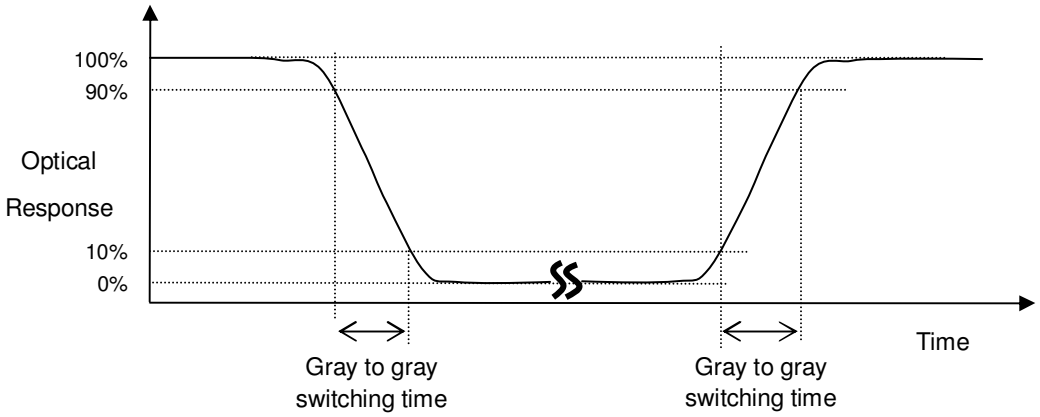

Note (2) Definition of Contrast Ratio (CR)：

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note(7).

Note (3) Definition of Gray-to-Gray Switching Time：

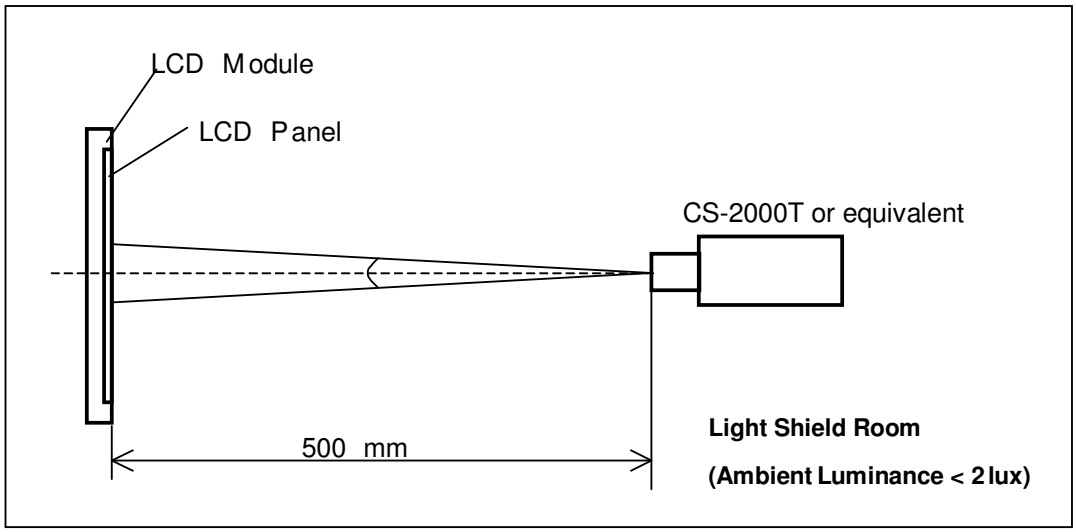



The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255.

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 (4) 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 (5) Definition of Luminance of White ($L_C$, $L_{AVE}$)：

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

$L_C$ = L (5), where L (X) is corresponding to the luminance of the point X at the figure in Note (7).

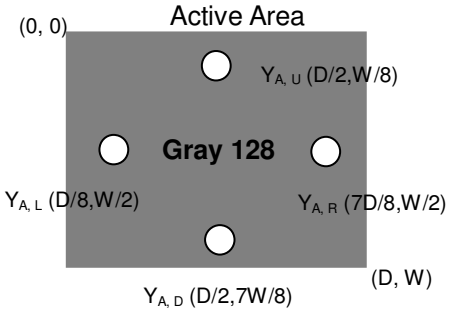
Note (6) Definition of Cross Talk (CT)：

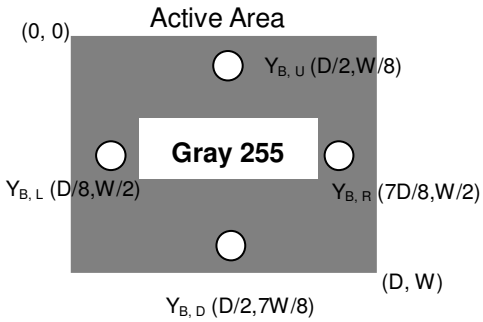
CT = | YB – YA | / YA × 100 (%)

Where：

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

YB = Luminance of measured location with gray level 0 pattern (cd/m2)

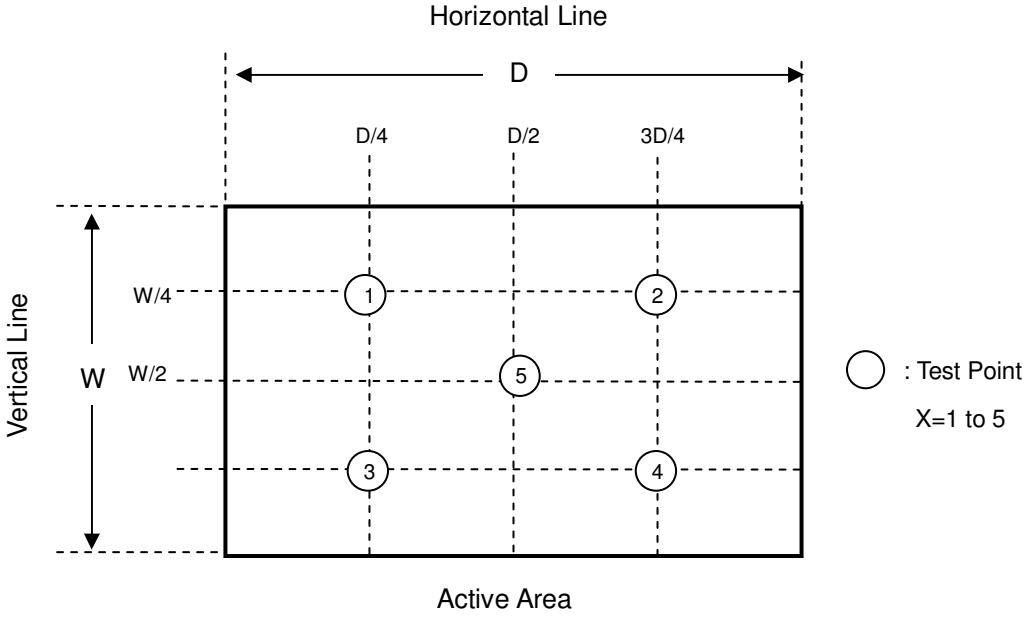


Note (7) Definition of White Variation (δW)：

Measure the luminance of gray level 255 at 5 points.

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



# 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 ] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

[ 3 ] Bezel of Set can not press or touch the panel surface. It will make light leakage or scrape.

[ 4 ] It should be attached to the system firmly using all mounting holes.

[ 5 ] 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, do not press or scratch the surface harder than a HB pencil lead.

[ 6 ] Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

[ 7 ] Protection film for polarizer on the module should be slowly peeled off just before use so that the electrostatic charge can be minimized.

[ 8 ] Do not disassemble the module.

[ 9 ] 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.

[ 10 ] Do not plug in or pull out the I/F connector while the module is in operation, pins of I/F connector should not be touched directly with bare hands. Do not adjust the variable resistor located on the module.

[ 11 ] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched. Water, IPA (Isopropyl Alcohol) or Hexane are desirable cleaners. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

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

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

[ 13.1 ] 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 (under 70%) without condensation.

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

[ 14 ] When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of LED will be higher than that of room temperature.

## 8.2 SAFETY PRECAUTIONS

To optimize PID module's lifetime and functions, operating conditions should be followed as below.

[ 1 ] Normal operating condition.

[ 1.1 ] Temperature：20±15℃.

[ 1.2 ] Humidity：55±20%.

[ 1.3 ] Well-ventilated place is suggested to set up PID module and system.

[ 1.4 ] Display pattern：regular switched patterns or moving pictures.

[ 1.5 ] Periodical power-off or screen saver is needed after long-term static display.

[ 1.6 ] Moving picture or black pattern is strongly recommended for screen saver.

[ 2 ] Operating requirements of PID modules and systems to prevent uneven display under long-term operating.

[ 2.1 ] PID suitable operating time：under 20 hrs a day.

[ 2.2 ] Periodical display contents should be changed from static image to moving picture.

[ 2.3 ] Different background and image colors changed respectively, and changed colors periodically.

[ 2.4 ] Background and image with large different luminance displayed at the same time should be avoided.

[ 3 ] The startup voltage of a Backlight may cause an electrical shock while assembling with the converter. Do not disassemble the module or insert anything into the Backlight unit.

[ 4 ] Do not connect or disconnect the module in the “Power On” condition.

[ 5 ] Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature…) Otherwise the module may be damaged.

[ 6 ] 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.

[ 7 ] Module should be turned clockwise (regular front view perspective) when used in portrait mode.

[ 8 ] Ultra-violet ray filter is necessary for outdoor operation.

[ 9 ] Only when PID module is operated under right operating conditions, lifetime in this spec can be guaranteed. After the module’s end of life, it is not harmful in case of normal operation and storage.

### 8.3 SAFETY STANDARDS

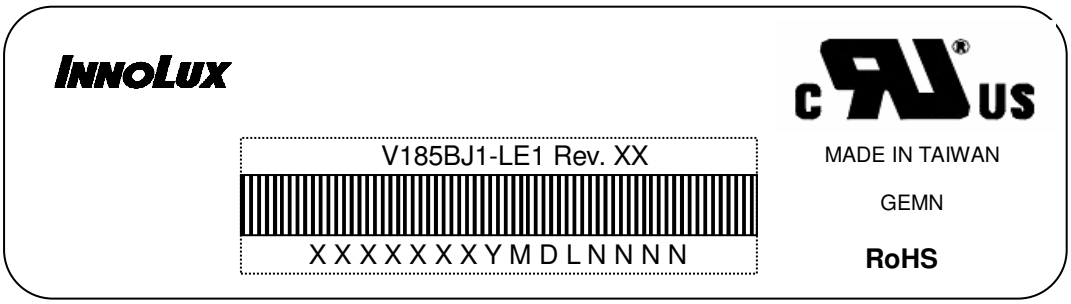
The LCD module should be certified with safety regulations as follows：

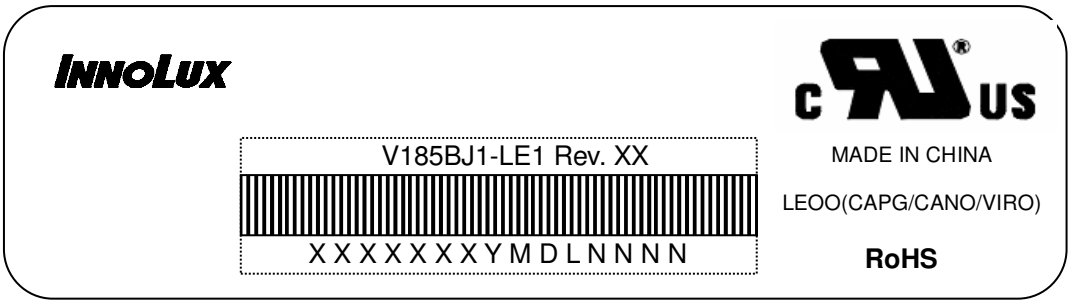
| Regulatory | Item | Standard |
|---|---|---|
| Information Technology equipment | UL | UL60950-1 Ed.2 :2011 |
| | cUL | CAN/CSA C22.2 No.60950-1-07 Ed.2 : 2011 |
| | CB | IEC60950-1:2005+ A1:2009 /<br>EN60950-1:2006+ A11:2009+ A1:2010+ A12:2011 |
| Audio/Video Apparatus | UL | UL60065 Ed.7:2007 |
| | cUL | CAN/CSA C22.2 No.60065-03:2006+ A1:2006 |
| | CB | IEC60065:2001+ A1:2005+ A2:2010 /<br>EN60065:2002+ A1:2006+ A11:2008+ A2:2010+ A12:2011 |

## 9. DEFINITION OF LABELS

### 9.1 INX MODULE LABEL

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

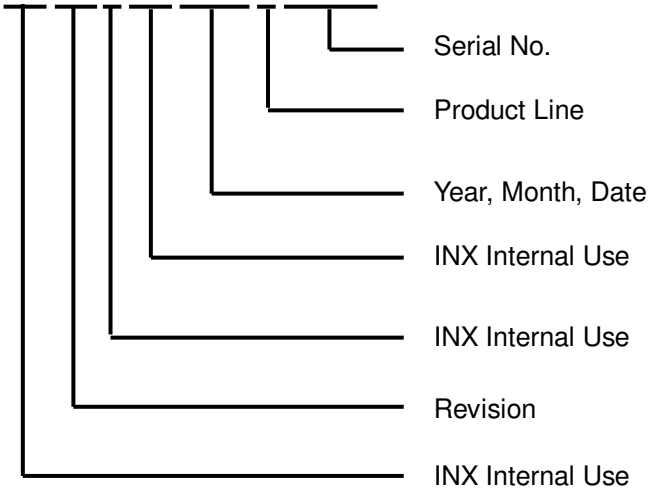



Model Name: V185BJ1–LE1

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

Serial ID: X X X X X X Y M D L N N N N




Serial ID includes the information as below：

Manufactured Date：

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

Month：1~9, A~C, for Jan. ~ Dec.

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

Revision Code：Cover all the change.

Serial No.：Manufacturing sequence of product.

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

## 10. PACKAGING

### 10.1 PACKING SPECIFICATIONS

(1) 13 LCD modules / 1 Box

(2) Box dimensions: 528mm(L) x 378mm(W) x 360mm(H)

(3) Weight：approximately：18.50kg (13 modules per box)

### 10.2 PACKAGING METHOD

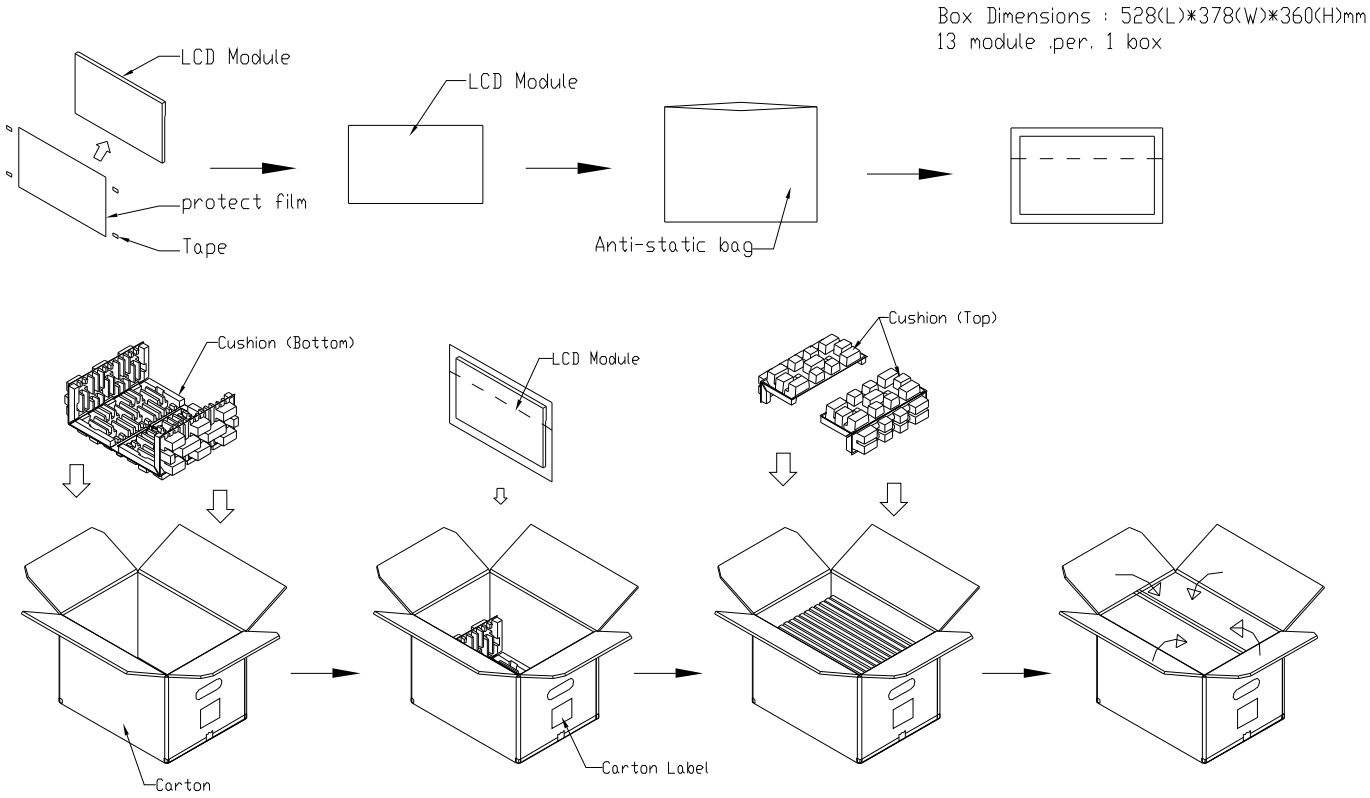
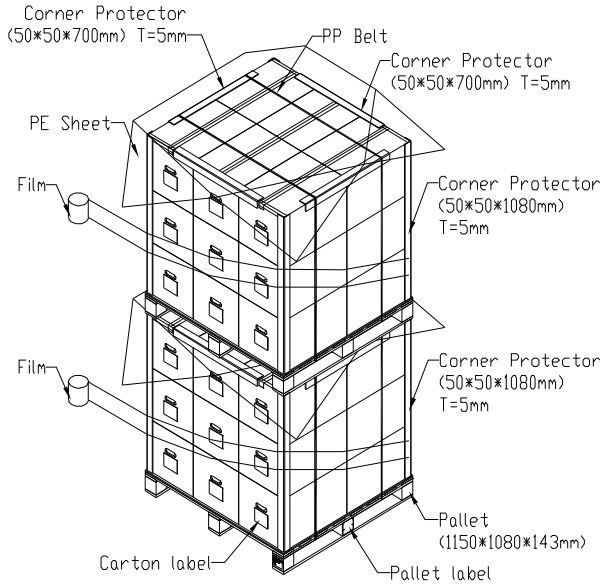
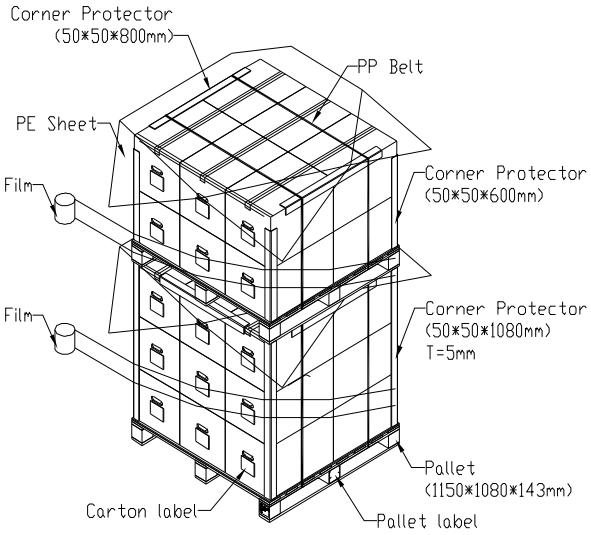



Figure 10-1 packing method

Sea / Land Transportation
(40ft HQ Container)




Sea / Land Transportation
(40ft Container)




Air Transportation

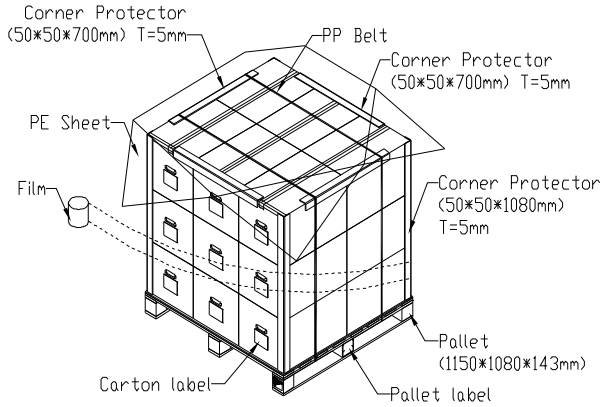



Figure 10-2 packing method

**10.3 UN-PACKAGING METHOD**

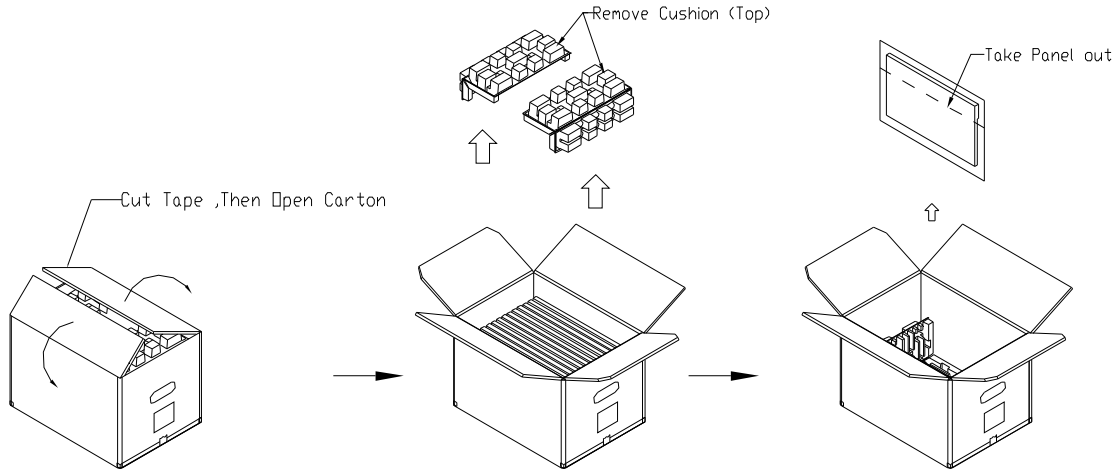



Figure 10-3 UN-packing method

## 11. MECHANICAL CHARACTERISTIC