# SPECIFICATION
# FOR
# APPROVAL

( ) **Preliminary Specification**

( ● ) **Final Specification**

| Title | 37.0” WUXGA TFT LCD |
|---|---|

| BUYER | General |
|---|---|
| MODEL | |

| SUPPLIER | LG.Display Co., Ltd. |
|---|---|
| *MODEL | LC370WUN |
| SUFFIX | SAC1(RoHS Verified) |

*When you obtain standard approval,
please use the above model name without suffix

| APPROVED BY | SIGNATURE DATE |
|---|---|
| / | |
| / | |
| / | |

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

| APPROVED BY | SIGNATURE DATE |
|---|---|
| **O.H. Lee / Manager** | |
| **REVIEWED BY** | |
| **J.H. Lee / Engineer** | |
| **PREPARED BY** | |
| **H.S. Choi / Engineer** | |

**TV Product Development Dept.**
**LG. Display Co., Ltd**

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# RECORD OF REVISIONS

| Revision No. | Revision Date | Page | Description |
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| 1.0 | May. 15. 2008 | - | Final CAS |
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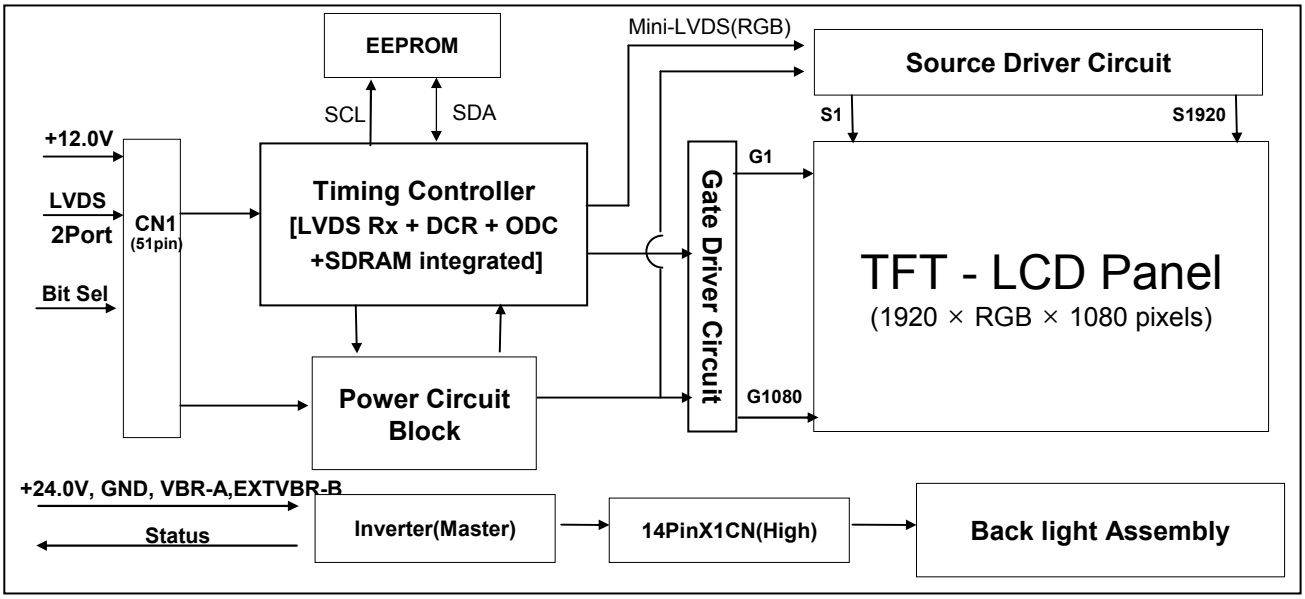
## 1. General Description

The LC370WUN is a Color Active Matrix Liquid Crystal Display with an integral External Electrode Fluorescent Lamp(EEFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive display type which is operating in the normally black mode. It has a 37 inch diagonally measured active display area with WUXGA resolution (1080 vertical by 1920 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arrayed in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 10-bit gray scale signal for each dot. Therefore, it can present a palette of more than 1.06B (true) colors.
It has been designed to apply the 10-bit 2-port LVDS interface.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.




## General Features

| | |
|---|---|
| Active Screen Size | 37 inches(940.091mm) diagonal |
| Outline Dimension | 877(H) x 516.8 (V) x 55.5 mm(D) (Typ.) |
| Pixel Pitch | 0.42675 mm x 0.42675 mm |
| Pixel Format | 1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement |
| Color Depth | 10-bit(D), 1.06 B colors |
| Luminance, White | 500 cd/m$^2$ (Center 1point ,Typ.) |
| Viewing Angle (CR>10) | Viewing angle free ( R/L 178 (Typ.), U/D 178 (Typ.)) |
| Power Consumption | Total 132.14W (Typ.) (Logic=7.44 W, Inverter=125W [VBR-A=1.65V] ) |
| Weight | 9.0Kg (Typ.) |
| Display Mode | Transmissive mode, Normally black |
| Surface Treatment | Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 13%) |

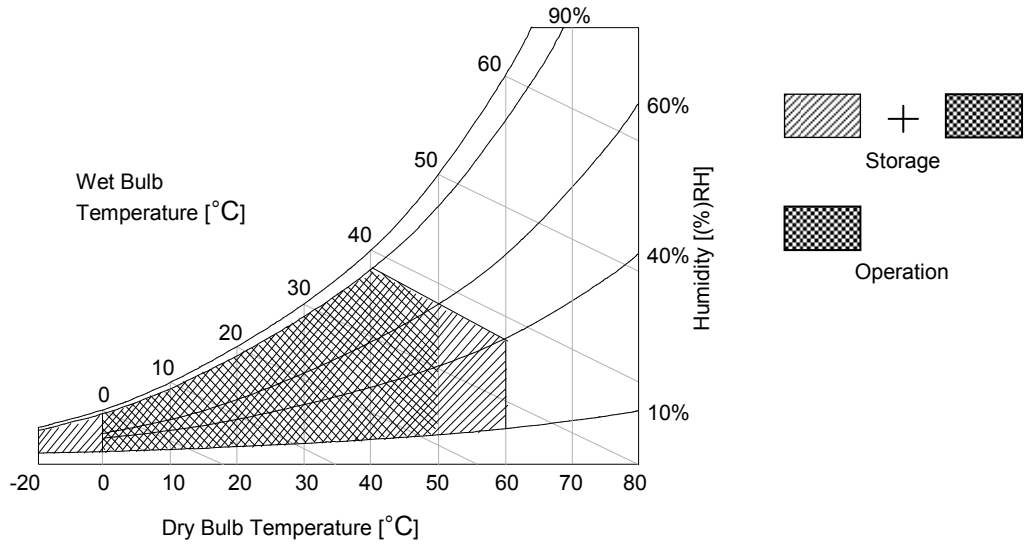
## 2. Absolute Maximum Ratings

The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

**Table 1. ABSOLUTE MAXIMUM RATINGS**

| Parameter | | Symbol | Value | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | | Min | Max | | |
| Power Input Voltage | LCM | $V_{LCD}$ | -0.3 | +14.0 | $V_{DC}$ | at 25 ± 2 °C |
| | Backlight inverter | $V_{BL}$ | -0.3 | +27.0 | $V_{DC}$ | |
| ON/OFF Control Voltage | | VON/OFF | -0.3 | +5. 5 | $V_{DC}$ | |
| Brightness Control Voltage | | $V_{BR}$ | 0 | +5.0 | $V_{DC}$ | |
| Operating Temperature | | $T_{OP}$ | 0 | +50 | °C | Note 1,2 |
| Storage Temperature | | $T_{ST}$ | -20 | +60 | °C | |
| Operating Ambient Humidity | | $H_{OP}$ | 10 | 90 | %RH | |
| Storage Humidity | | $H_{ST}$ | 10 | 90 | %RH | |

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be Max 39 °C and no condensation of water.
2. Gravity mura can be guaranteed below 40℃condition.



## 3. Electrical Specifications

### 3-1. Electrical Characteristics

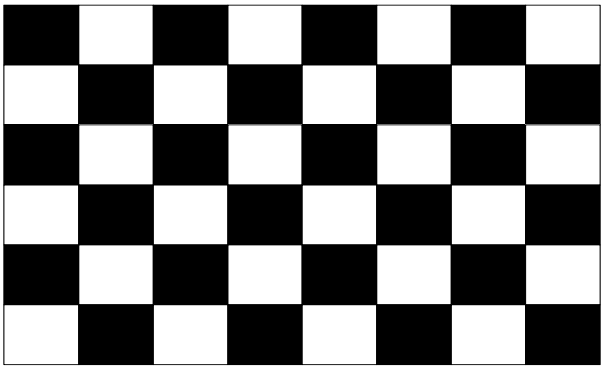
It requires two power inputs. One is employed to power for the LCD circuit. The other Is used for the EEFL backlight and inverter circuit.

**Table 2. ELECTRICAL CHARACTERISTICS**

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| MODULE : | | | | | | | |
| Power Input Voltage | | $V_{LCD}$ | 11.4 | 12.0 | 12.6 | $V_{DC}$ | |
| Option Input Voltage | High threshold | VIH | 2.3 | - | 3.3 | $V_{DC}$ | Page 8 #7,27 Pin |
| | Low threshold | VIL | 0 | - | 0.7 | $V_{DC}$ | |
| Power Input Current | | $I_{LCD}$ | - | 620 | 805 | mA | 1 |
| | | | - | 850 | 1105 | mA | 2 |
| | | $P_{LCD}$ | - | 7.44 | 9..66 | Watt | Full White Pattern |
| Rush current | | $I_{RUSH}$ | - | - | 4.0 | A | 3 |

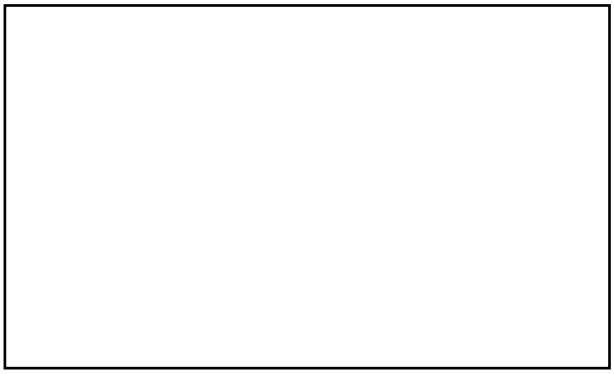
Note : 1. The specified current and power consumption are under the $V_{LCD}$=12.0V, 25 ± 2°C, $f_V$=60Hz condition whereas mosaic pattern(8 x 6) is displayed and $f_V$ is the frame frequency.
2. The current is specified at full white pattern.
3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).

White : 255Gray
Black : 0Gray



Mosaic Pattern(8 x 6)

White : 255 Gray



Full White pattern

**Table 3. ELECTRICAL CHARACTERISTICS (Continue)**

| Parameter | | | Symbol | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | | |
| Inverter : | | | | | | | | |
| Power Supply Input Voltage | | | VBL | 22.8 | 24.0 | 25.2 | Vdc | 1 |
| Power Supply Input Voltage Ripple | | | | - | - | 0.5 | Vp-p | 1 |
| Power Supply Input Current | After Aging | | IBL_A | - | 5.2 | 5.5 | A | Boost = 1.65V … 1 |
| | | | | - | 5.7 | 6 | A | Boost = 3.3V … 1 |
| | Before Aging | | IBL_B | - | 6 | 6.3 | A | Boost = 1.65V … 2 |
| | | | | - | 6.5 | 6.8 | A | Boost = 3.3V … 2 |
| Power Supply Input Current(In-Rush) | | | Irush | - | - | 8 | A | VBL = 24V EXTVbr-B=100% Boost = 1.65V…7 |
| Power Consumption | | | PBL | - | 125 | 132 | W | 1 |
| Input signal for Inverter control | Brightness Adjust | | Boost | 0.0 | - | 3.3 | Vdc | |
| | On/Off | On | V on | 2.5 | - | 5.0 | Vdc | |
| | | Off | V off | -0.3 | 0.0 | 0.8 | Vdc | |
| | Brightness Adjust | | $EXTV_{BR-B}$ | 20 | | 100 | % | On duty |
| PWM Frequency for NTSC & PAL | | | NTSC/PAL | | 120/100 | | Hz | 4 |
| Pulse Duty Level(PWM) (Burst mode) | | | High Level | 2.5 | - | 5.0 | Vdc | HIGH: Lamp on LOW:Lamp off |
| | | | Low Level | 0.0 | - | 0.8 | Vdc | |
| Lamp : | | | | | | | | |
| Lamp Voltage (ExtVbr-B = 100%) | | | Vout | 830 | 980 | 1130 | V(rms) | Boost = Typ |
| Lamp Current (ExtVbr-B = 100%) | | | $I_{O-MAX}$ | 102 | 112 | 122 | mA(rms) | Boost = Max |
| | | | $I_{O-TYP}$ | 110 | 120 | 130 | mA(rms) | Boost = TYP |
| | | | $I_{O-MIN}$ | 118 | 128 | 138 | mA(rms) | Boost = Min |
| Life Time | | | Boost(0V~3.3V) | 50,000 | | | Hrs | 5 |

Notes :

1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 120 minutes at 25±2°C. The specified current and power consumption are under the typical supply Input voltage 24V and Vbr 1.65V, it is total power consumption.
   The ripple voltage of the power supply input voltage is under 0.5 Vp-p. LGD recommend Input Voltage is 24.0V ± 5%.
2. Electrical characteristics are determined within 30 minutes at 25±2°C.
   The specified currents are under the typical supply Input voltage 24V.
3. Brightness Control. This VBR-A Voltage control brightness.

| Boost Voltage | Function | Boost Voltage | Function |
|---|---|---|---|
| 0V | Minimum Brightness (94%) | 3.3V | Maximum Brightness (106%) |

4. LGD recommend that the PWM freq. is synchronized with Two times harmonic of Vsync signal of system.
5. Specified Values are for a single lamp which is aligned horizontally.
   The life time is determined as the time which luminance of the lamp is 50% compared to that of initial value at the typical/ maximum lamp current on condition of continuous operating at 25 ± 2°C
6. The duration of rush current is about 10ms.

## 3-2. Interface Connections

This LCD module employs two kinds of interface connection, a 51-pin connector is used for the module electronics and Master 14-pin connector is used for the integral backlight system.

### 3-2-1. LCD Module

- LCD Connector(CN1): FI-R51S-HF(manufactured by JAE)
- Mating Connector : FI-R51HL(JAE) or compatible

**Table 4. MODULE CONNECTOR(CN1) PIN CONFIGURATION**

| No | Symbol | Description | No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | GND | Ground | 27 | Bit SEL | 'L' =8bit, 'H' =10bit(D) |
| 2 | NC | No Connection | 28 | RE0N | SECOND CHANNEL 0- |
| 3 | NC | No Connection | 29 | RE0P | SECOND CHANNEL 0+ |
| 4 | NC | No Connection | 30 | RE1N | SECOND CHANNEL 1- |
| 5 | NC | No Connection | 31 | RE1P | SECOND CHANNEL 1+ |
| 6 | NC | No Connection | 32 | RE2N | SECOND CHANNEL 2- |
| 7 | LVDS Select | 'H' = JEIDA, 'L' = VESA | 33 | RE2P | SECOND CHANNEL 2+ |
| 8 | NC | No Connection | 34 | GND | Ground |
| 9 | NC | No Connection | 35 | RECLKN | SECOND CLOCK CHANNEL C- |
| 10 | NC | No Connection | 36 | RECLKP | SECOND CLOCK CHANNEL C+ |
| 11 | GND | Ground | 37 | GND | Ground |
| 12 | RO0N | FIRST CHANNEL 0- | 38 | RE3N | SECOND CHANNEL 3- |
| 13 | RO0P | FIRST CHANNEL 0+ | 39 | RE3P | SECOND CHANNEL 3+ |
| 14 | RO1N | FIRST CHANNEL 1- | 40 | RE4N | SECOND CHANNEL 4- |
| 15 | RO1P | FIRST CHANNEL 1+ | 41 | RE4P | SECOND CHANNEL 4+ |
| 16 | RO2N | FIRST CHANNEL 2- | 42 | Reserved | No connection or GND |
| 17 | RO2N | FIRST CHANNEL 2+ | 43 | Reserved | No connection or GND |
| 18 | GND | Ground | 44 | GND | Ground |
| 19 | ROCLKN | FIRST CLOCK CHANNEL C- | 45 | GND | Ground |
| 20 | ROCLKP | FIRST CLOCK CHANNEL C+ | 46 | GND | Ground |
| 21 | GND | Ground | 47 | NC | No connection |
| 22 | RO3N | FIRST CHANNEL 3- | 48 | VLCD | Power Supply +12.0V |
| 23 | RO3P | FIRST CHANNEL 3+ | 49 | VLCD | Power Supply +12.0V |
| 24 | RO4N | FIRST CHANNEL 4- | 50 | VLCD | Power Supply +12.0V |
| 25 | RO4P | FIRST CHANNEL 4+ | 51 | VLCD | Power Supply +12.0V |
| 26 | Reserved | No connection or GND | - | - | - |

Note :

1. The pin no 44 is LCD Test option. "AGP" (Auto Generation LCM operates Pattern) or "NSB" (No Signal Black) is case that LVDS signals are out of frequency or abnormal condition in spite of 12 volt power supply. LGD recommends "NSB". ( AGP : "VCC" or "OPEN" / NSB : "GND" )
2. All GND(ground) pins should be connected together to the LCD module's metal frame.
3. All VLCD (power input) pins should be connected together.
4. All Input levels of LVDS signals are based on the IEA 664 Standard.
5. Specific pins(pin No. #1~#10) are used for internal data process of the LCD module. If not used, these pins are no connection.

### 3-2-2. Backlight Inverter

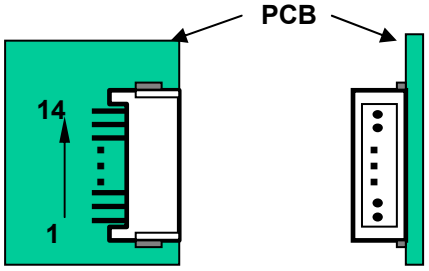
Inverter Connector : S14B-PH-SM3
(manufactured by JST) or Equivalent
- Mating Connector : PHR-14 or Equivalent

**Table 5. INVERTER CONNECTOR PIN CONFIGULATION**

| Pin No | Symbol | Description | Note |
|---|---|---|---|
| 1 | $V_{BL}$ | Power Supply +24.0V | |
| 2 | $V_{BL}$ | Power Supply +24.0V | |
| 3 | $V_{BL}$ | Power Supply +24.0V | |
| 4 | $V_{BL}$ | Power Supply +24.0V | |
| 5 | $V_{BL}$ | Power Supply +24.0V | |
| 6 | GND | Backlight Ground | |
| 7 | GND | Backlight Ground | |
| 8 | GND | Backlight Ground | 1 |
| 9 | GND | Backlight Ground | |
| 10 | GND | Backlight Ground | |
| 11 | $V_{BR-A}$ | Analog dimming voltage<br>DC 0.0V ~ 3.3V (Typ : 1.65V) | 2 |
| 12 | $V_{ON/OFF}$ | 0.0V ~ 5.0V | 3, Open/High for B/L on as default |
| 13 | $EXTV_{BR-B}$ | PWM signal (20 ~ 100%) input | 4 |
| 14 | Status | Normal : Under 0.7V<br>Abnormal : External Pull up | |

Notes : 1. GND should be connected to the LCD module's metal frame.
2. Minimum Brightness : Boost = 0.0V Maximum Brightness : Boost = 3.3V "OPEN" : Boost = 1.65V
3. Rising Edge : Lamp "ON" / Falling Edge : Lamp "OFF"
4. Pin#13 can be opened. ( if Pin #13 is open , EXTVBR-B is 100% )
5. Each impedance of pin #11, 12 and 13 is 200[KΩ] , 50[KΩ] and 100[KΩ].

## ◆ Rear view of LCM



## 3-3. Signal Timing Specifications

Table 6 shows the signal timing required at the input of the LVDS transmitter. All of the interface signal timing should be satisfied with the following specification for normal operation.

**Table 6. TIMING TABLE for NTSC (DE Only Mode)**

| ITEM | | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Horizontal | Display Period | tHV | - | 960 | - | tclk | |
| | Blank | tHB | 72 | 140 | 320 | tclk | |
| | Total | tHP | 1032 | 1100 | 1280 | tclk | 2200/2 |
| Vertical | Display Period | tVV | - | 1080 | - | Lines | |
| | Blank | tVB | 10 | 45 | 86 | Lines | |
| | Total | tVP | 1090 | 1125 | 1166 | Lines | |

| ITEM | | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Frequency | DCLK | fCLK | 70.5 | 74.25 | 78 | MHz | 148.5/2 |
| | Horizontal | fH | 64.1 | 67.5 | 70.9 | KHz | |
| | Vertical | fV | 57 | 60 | 63 | Hz | |

Table 7 shows the signal timing required at the input of the LVDS transmitter. All of the interface signal timing should be satisfied with the following specification for normal operation.

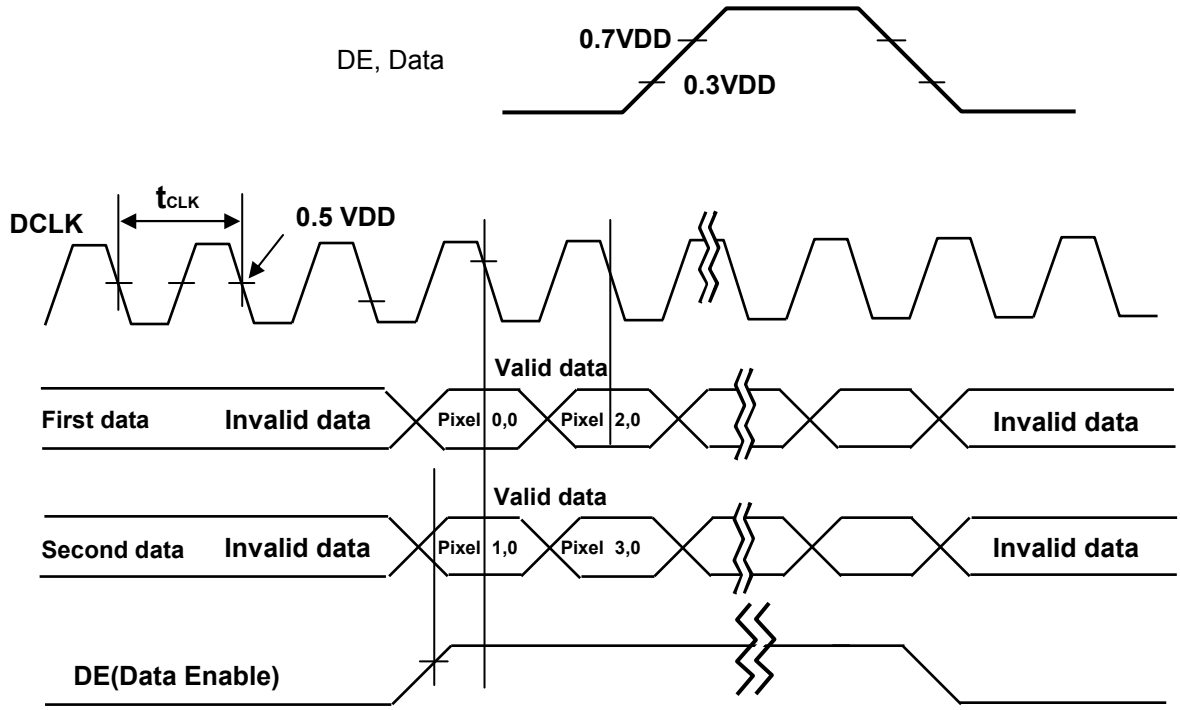
**Table 7. TIMING TABLE for PAL (DE Only Mode)**

| ITEM | | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Horizontal | Display Period | tHV | - | 960 | - | tclk | |
| | Blank | tHB | 72 | 140 | 320 | tclk | |
| | Total | tHP | 1032 | 1100 | 1280 | tclk | 2200/2 |
| Vertical | Display Period | tVV | - | 1080 | - | Lines | |
| | Blank | tVB | 228 | 270 | 300 | Lines | |
| | Total | tVP | 1308 | 1350 | 1380 | Lines | |

| ITEM | | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Frequency | DCLK | fCLK | 70.5 | 74.25 | 78 | MHz | 148.5/2 |
| | Horizontal | fH | 64.1 | 67.5 | 70.9 | KHz | |
| | Vertical | fV | 47.5 | 50 | 52.5 | Hz | |

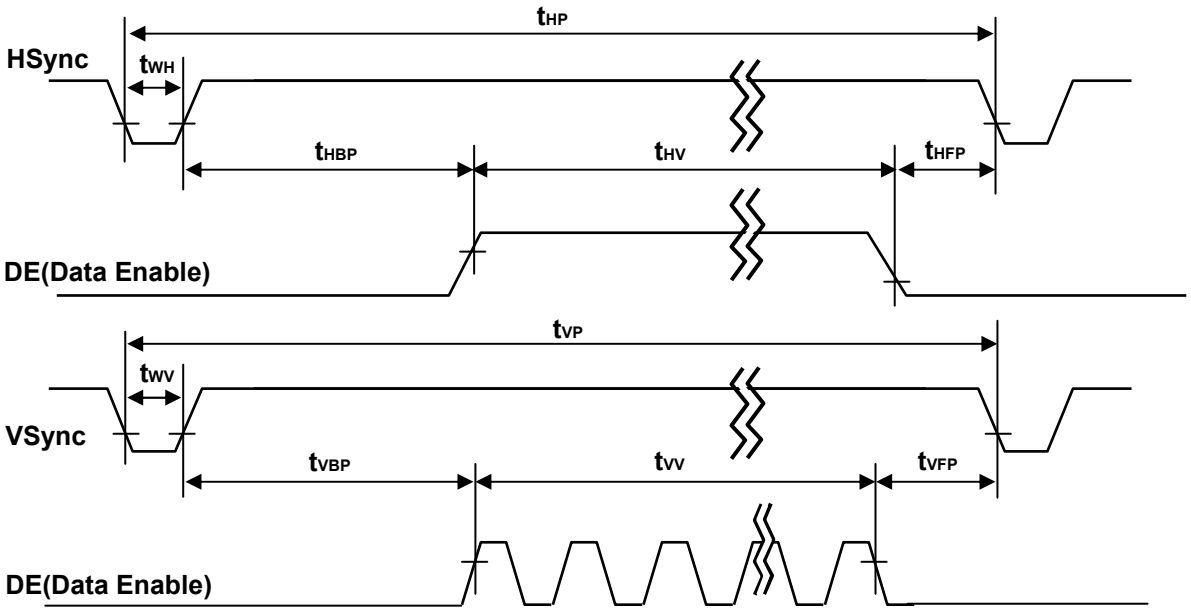
Note : The Input of HSYNC & VSYNC signal does not have an effect on normal operation(DE Only Mode).
The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate.

## 3-4. Signal Timing Waveforms




* tHB = tHFP + tWH +tHBP
* tVB = tVFP + tWV +tVBP

### * Reference : Sync. Relation



## 3-5. Color Data Reference

The brightness of each primary color(red,green,blue) is based on the 10-bit gray scale data input for the color. The higher binary input, the brighter the color. Table 10 provides a reference for color versus data input.

**Table 8. COLOR DATA REFERENCE**

| Color | | Input Color Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RED | | | | | | | | | | GREEN | | | | | | | | | | BLUE | | | | | | | | | |
| | | MSB | | | | | | | | | LSB | MSB | | | | | | | | | LSB | MSB | | | | | | | | | LSB |
| | | 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 Color | 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 (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 |
| | 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 |
| | 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 |
| | 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 |
| RED | RED (000) | 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 (001) | 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 (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 |
| GREEN | GREEN (000) | 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 (001) | 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 (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 |
| BLUE | BLUE (000) | 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 (001) | 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 (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 |

## 3-6. Power Sequence

### 3-6-1. LCD Driving circuit

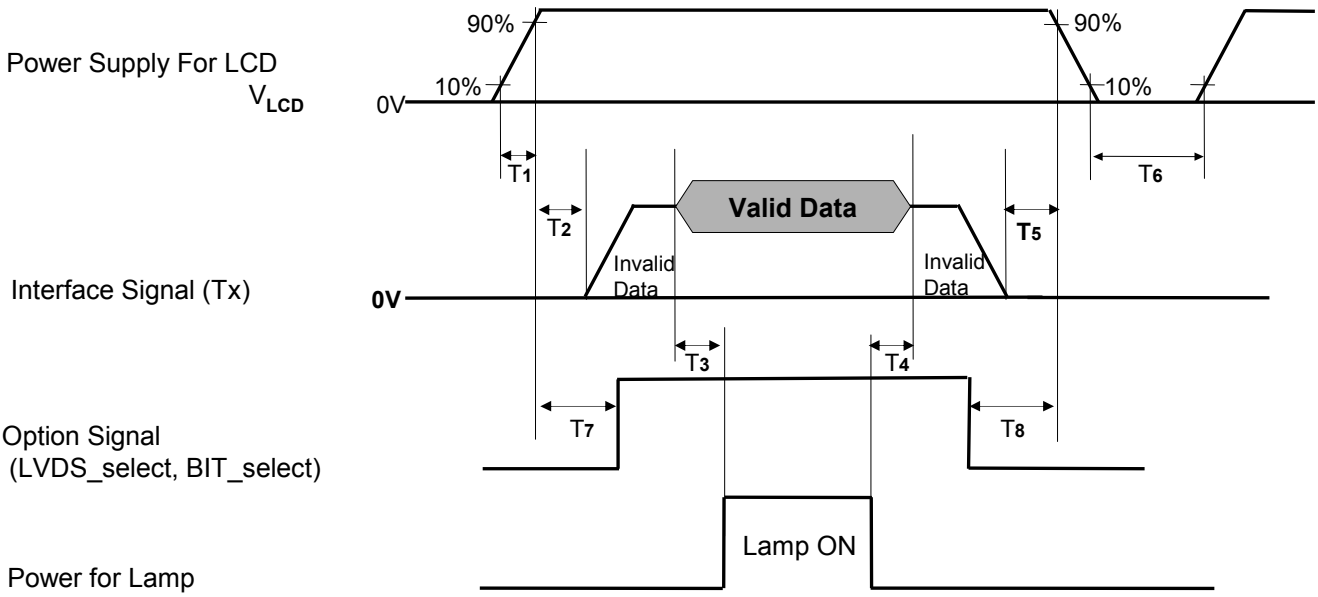


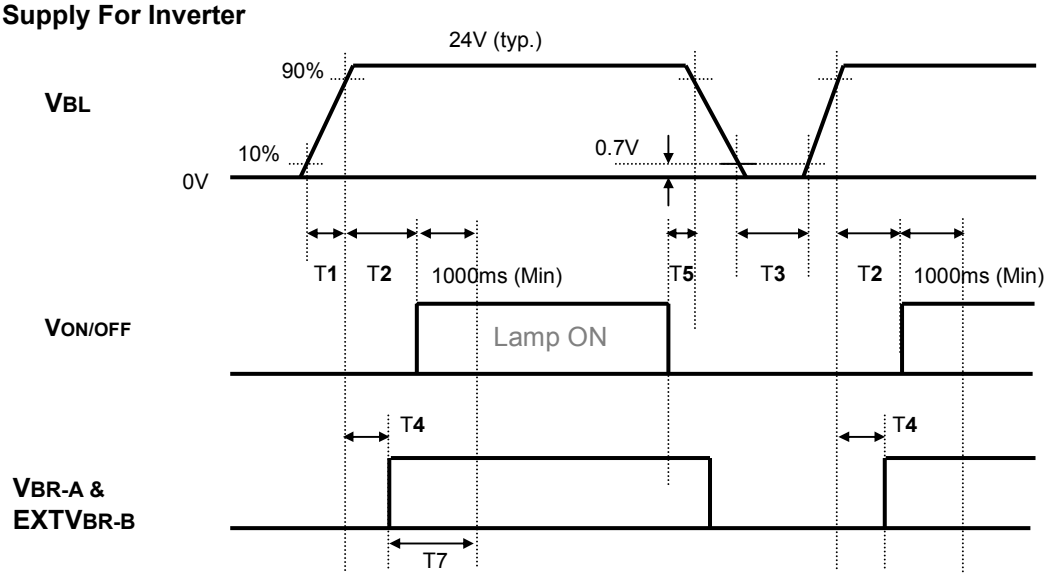

**Table 9. POWER SEQUENCE**

| Parameter | Value | | | Unit | Notes |
|---|---|---|---|---|---|
| | Min | Typ | Max | | |
| T1 | 0.5 | - | 20 | ms | |
| T2 | 0 | - | - | ms | 4 |
| T3 | 200 | - | - | ms | 3 |
| T4 | 200 | - | - | ms | 3 |
| T5 | 0 | - | - | ms | |
| T6 | 2.0 | - | - | s | 5 |
| T7 | 0 | - | T2 | ms | 4 |
| T8 | 0 | - | - | ms | 4 |

Note : 1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply $V_{LCD}$ to 0V.
3. The T3/T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.
4. If the on time of signals(Interface signal and Option signals) precedes the on time of Power($V_{LCD}$), check the LCD logic Power(Vcc) is under 0.8V, otherwise it will be happened abnormal display.
5. T6 should be measured after the Module has been fully discharged between power off and on period.

### 3-6-2. Sequence for Inverter

**Power Supply For Inverter**




### 3-6-3. Deep condition for Inverter

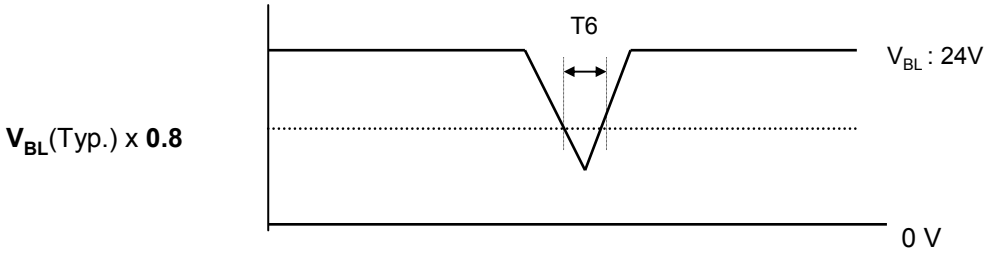



**Table 10. Power Sequence for Inverter**

| Parameter | Values | | | Units | Remarks |
|---|---|---|---|---|---|
| | Min | Typ | Max | | |
| T1 | 20 | - | - | ms | 1 |
| T2 | 500 | - | - | ms | |
| T3 | 200 | - | - | ms | |
| T4 | 0 | | - | ms | 2 |
| T5 | 10 | - | - | ms | |
| T6 | - | - | 10 | ms | $V_{BL}$(Typ) x 0.8 |
| T7 | 1000 | - | - | ms | 3 |

Notes : 1. T1 describes rising time of 0V to 24V and this parameter does not applied at restarting time.
2. T4(max) is less than T2.
3. In T7 section, VBR-A should be more than 1.65V and ExtVbr-B should be 100%.

## 4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25±2°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
FIG. 1 shows additional information concerning the measurement equipment and method.

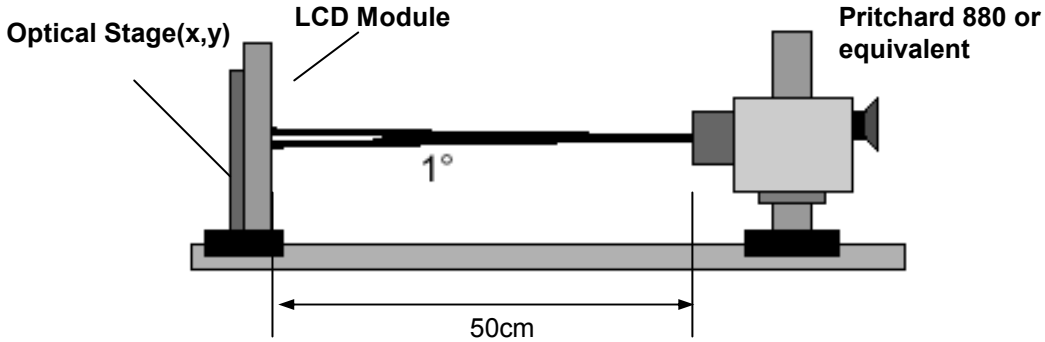



**FIG. 1 Optical Characteristic Measurement Equipment and Method**

**Table 11. OPTICAL CHARACTERISTICS**

Ta= 25±2°C, $V_{LCD}$=12.0V, fv=60Hz, Dclk=148.5MHz VBR_A=1.6V, ExtVBR_B=100%

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Contrast Ratio | | CR | 900 | 1300 | - | | 1 |
| Surface Luminance, white | | $L_{WH}$ | 400 | 500 | - | cd/m$^2$ | 2 |
| Luminance Variation | | $\delta_{WHITE}$ 5P | - | - | 1.3 | | 3 |
| Response Time | Gray-to-Gray | G to G | - | 6 | 8 | ms | 4 |
| | MPRT | | - | | - | | |
| Color Coordinates [CIE1931] | RED | Rx | Typ -0.03 | 0.638 | Typ +0.03 | | |
| | | Ry | | 0.334 | | | |
| | GREEN | Gx | | 0.291 | | | |
| | | Gy | | 0.607 | | | |
| | BLUE | Bx | | 0.145 | | | |
| | | By | | 0.062 | | | |
| | WHITE | Wx | | 0.279 | | | |
| | | Wy | | 0.292 | | | |
| Viewing Angle (CR>10) | | | | | | | |
| | x axis, right(ϕ=0°) | θr | 89 | - | - | degree | 5 |
| | x axis, left (ϕ=180°) | θl | 89 | - | - | | |
| | y axis, up (ϕ=90°) | θu | 89 | - | - | | |
| | y axis, down (ϕ=270°) | θd | 89 | - | - | | |
| Gray Scale | | | - | - | - | | 6 |

Note :**1** Contrast Ratio(CR) is defined mathematically as :

$$CR = \frac{\text{Surface Luminance at all white pixels}}{\text{Surface Luminance at all black pixels}}$$

It is measured at center 1-point.

2. Surface luminance are determined after the unit has been 'ON' and 30min after lighting the backlight in a dark environment at 25±2°C. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 2.

3. The variation in surface luminance , δ WHITE is defined as :
   δ WHITE(5P) = Maximum($L_{on1}$,$L_{on2}$, $L_{on3}$, $L_{on4}$, $L_{on5}$) / Minimum($L_{on1}$,$L_{on2}$, $L_{on3}$, $L_{on4}$, $L_{on5}$)
   Where Lon1 to Lon5 are the luminance with all pixels displaying white at 5 locations .
   For more information, see the FIG. 2.

4. Response time is the time required for the display to transition from G(N) to G(M) (Rise Time, $Tr_R$) and from G(M) to G(N) (Decay Time, $Tr_D$). For additional information see the FIG. 3. (N<M)
   ※ G to G spec is average of measured time(N,M= 0(Black)~255(White), 32Gray step

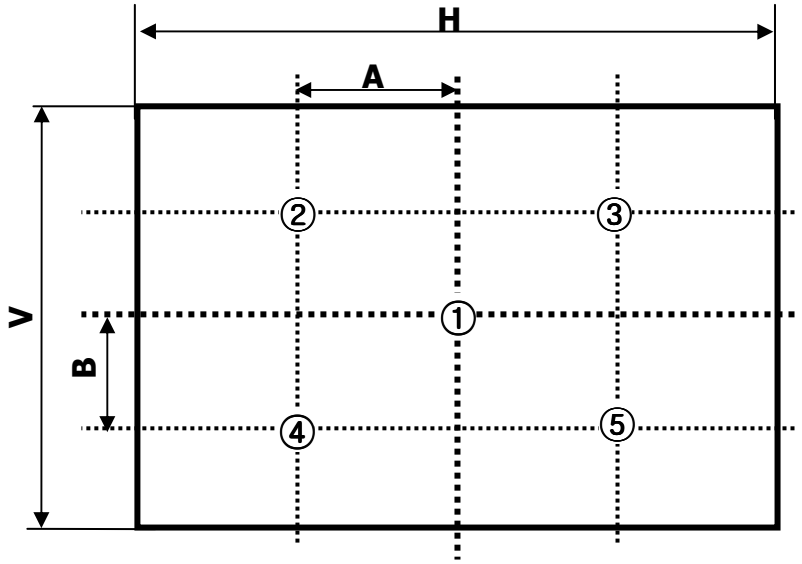
5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG. 5.

6. Gray scale specification
   Gamma Value is approximately 2.2. For more information, see the Table 12.

**Table 12. GRAY SCALE SPECIFICATION**

| Gray Level | Luminance [%] (Typ) | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| L0 | - | 0.08 | 0.14 |
| L15 | - | 0.20 | 1.7 |
| L31 | 0.20 | 1.08 | 3.10 |
| L47 | 0.69 | 2.07 | 4.55 |
| L63 | 1.68 | 4.51 | 7.91 |
| L79 | 3.35 | 7.75 | 11.89 |
| L95 | 5.52 | 12.05 | 16.90 |
| L111 | 8.44 | 17.06 | 23.43 |
| L127 | 12.01 | 22.36 | 31.59 |
| L143 | 15.82 | 28.21 | 39.80 |
| L159 | 21.56 | 35.56 | 48.32 |
| L175 | 28.11 | 43.96 | 58.53 |
| L191 | 36.97 | 53.00 | 69.27 |
| L207 | 46.75 | 63.37 | 79.45 |
| L223 | 59.52 | 74.66 | 89.50 |
| L239 | 75.74 | 88.17 | 96.50 |
| L255 | 100 | 100 | 100 |

Measuring point for surface luminance & measuring point for luminance variation.




**A : H / 4 mm**
**B : V / 4 mm**
**@ H,V : Active Area**

**FIG. 2 5 Points for Luminance Measure**

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".

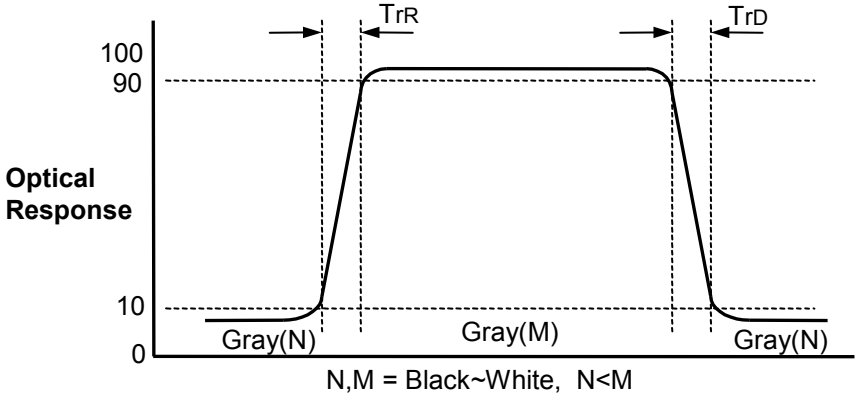



**FIG. 3 Response Time**

Dimension of viewing angle range

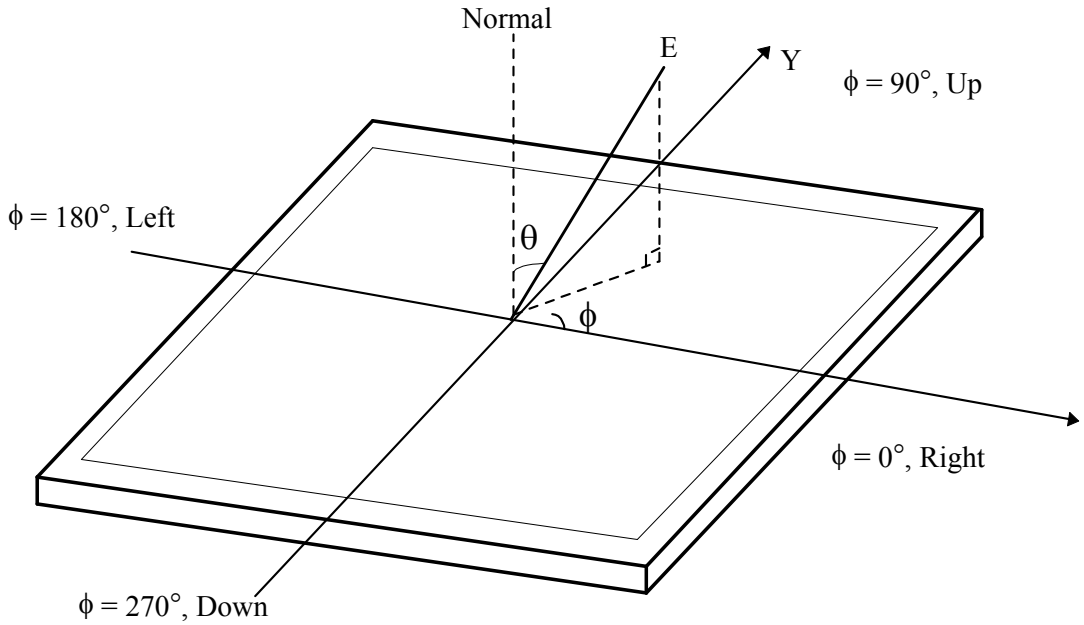
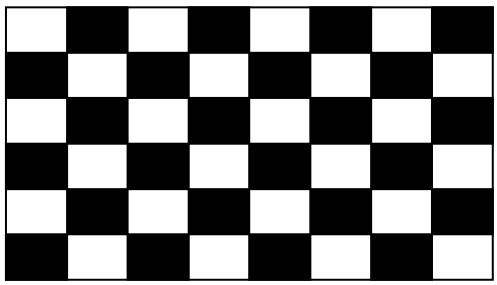



**FIG. 4 Viewing Angle**

7. Image sticking

When it changes into pattern-B after a 1-hour drive by pattern-A, it disappears within 10 minutes.

<Pattern-A, Chess board (8x6)>



<Pattern-B, Mid-gray(127 gray)>

## 5. Mechanical Characteristics

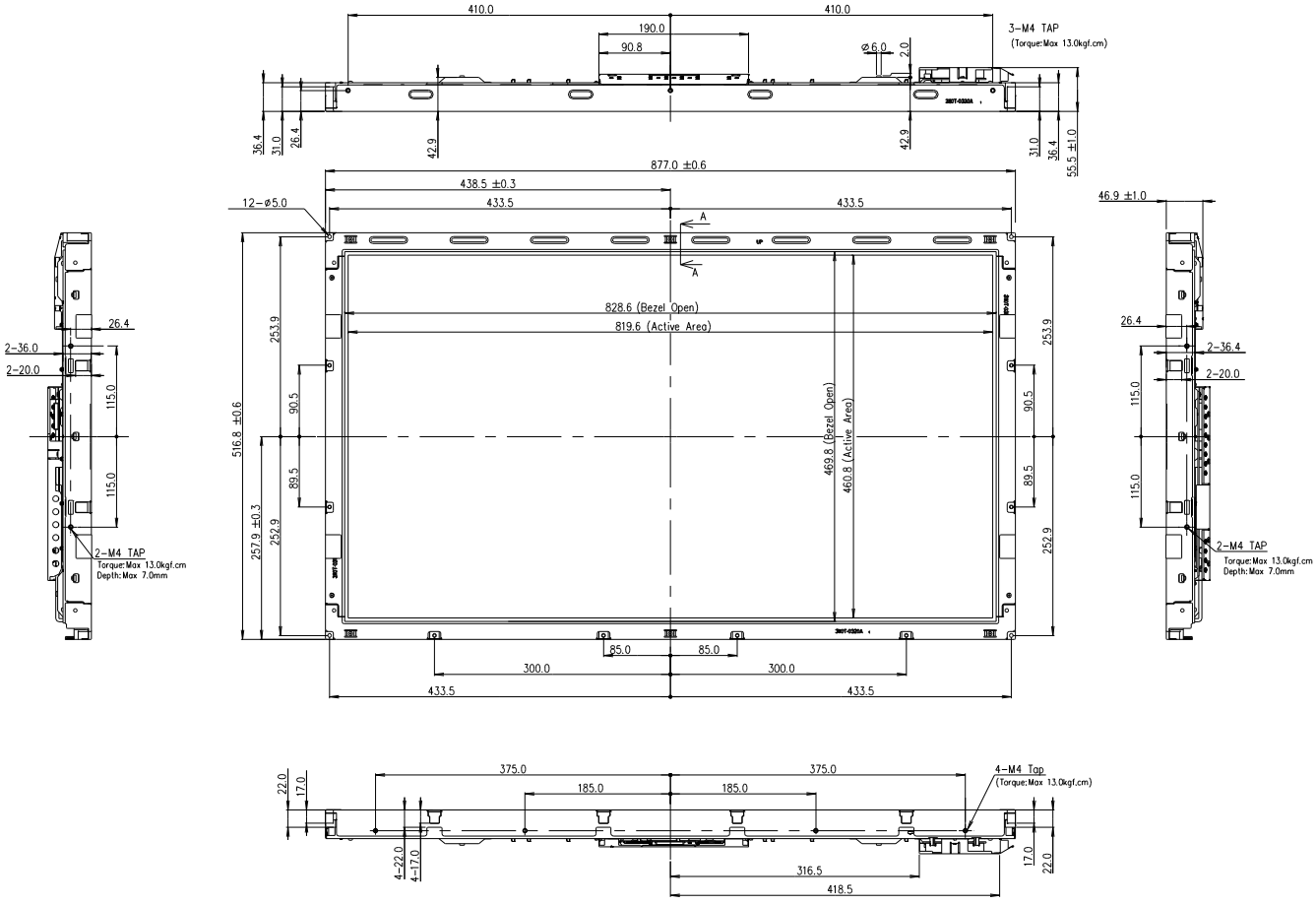
Table 13 provides general mechanical characteristics.

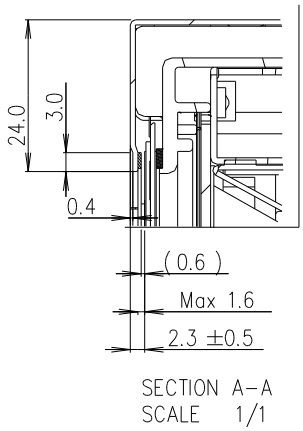
**Table 13. MECHANICAL CHARACTERISTICS**

| Item | Value | |
|---|---|---|
| Outline Dimension | Horizontal | 877.0 mm |
| | Vertical | 516.8 mm |
| | Depth | 55.5 mm |
| Bezel Area | Horizontal | 828.6 mm |
| | Vertical | 469.8 mm |
| Active Display Area | Horizontal | 819.36 mm |
| | Vertical | 460.89 mm |
| Weight | 9000(Typ.)/9500(Max) | |
| Surface Treatment | Hard coating(3H)<br>Anti-glare treatment of the front polarizer, Haze 13% | |

Note : Please refer to a mechanic drawing in terms of tolerance at the next page.

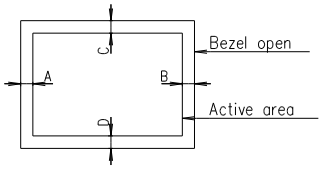
<FRONT VIEW>



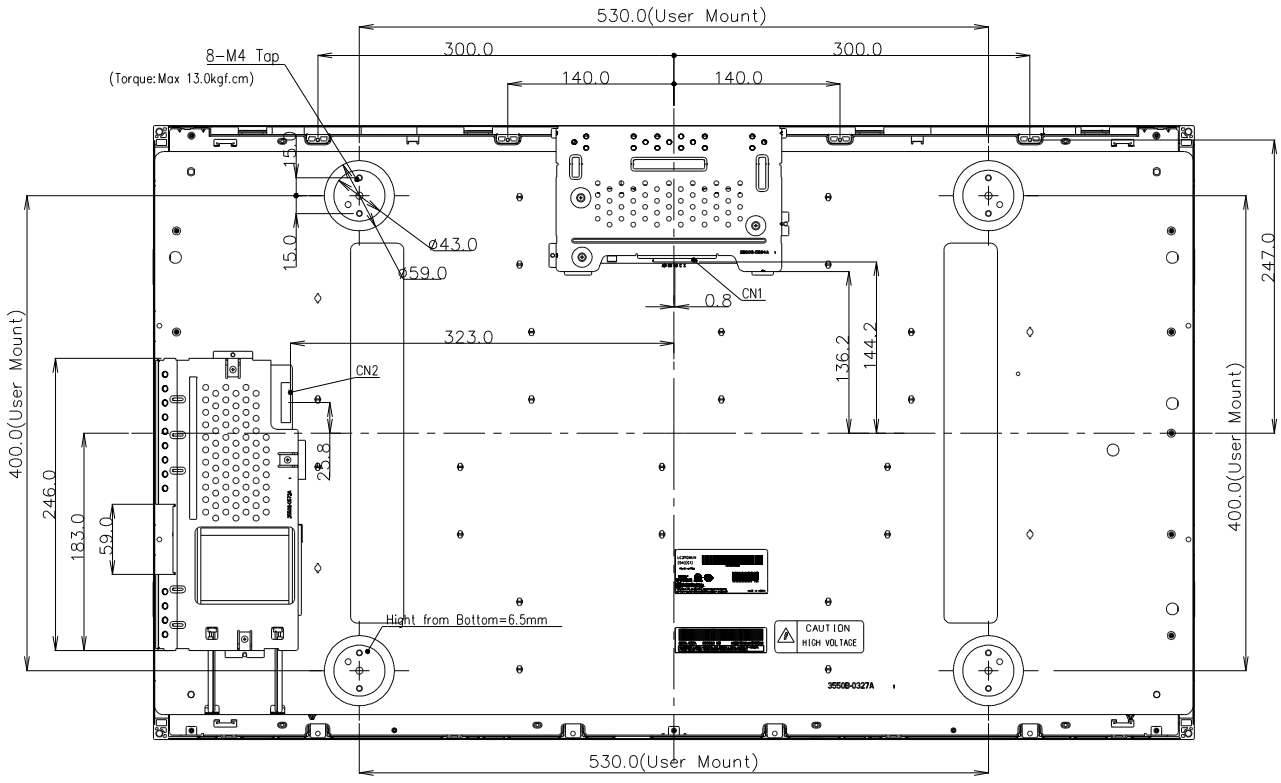




SECTION A-A
SCALE 1/1

NOTES
1. Unspecified tolerances are to be ±0.5mm.
2. This drawing is only preliminary data and can be changed without notice.
3. Tilt and partial disposition tolerance of display area is as following.
   (1) X-Direction : |A-B| ≤ 1.5mm
   (2) Y-Direction : |C-D| ≤ 1.5mm



<REAR VIEW>


530.0(User Mount)
300.0
300.0
140.0
140.0
8-M4 Tap
(Torque: Max 13.0kgf.cm)
15.0
15.0
ø43.0
ø59.0
CN1
0.8
323.0
CN2
136.2
144.2
247.0
400.0(User Mount)
246.0
183.0
59.0
23.8
Hight from Bottom=6.5mm
CAUTION
HIGH VOLTAGE
3550B-0327A
400.0(User Mount)
530.0(User Mount)

## 6. Reliability

**Table 14. ENVIRONMENT TEST CONDITION**

| No. | Test Item | Condition |
|---|---|---|
| 1 | High temperature storage test | Ta= 60°C, 500h |
| 2 | Low temperature storage test | Ta= -20°C, 500h |
| 3 | High temperature operation test | Ta= 50°C, 80%RH, 500h<br>Ta= 60°C, 500h(2000h) |
| 4 | Low temperature operation test | Ta= 0°C, 500h(1000h) |
| 5 | Heat cycle test | Ta= -20 °C ~ 60 °C,<br>30min/5min/30min, 100cycles |
| 6 | Soldering heat cycle test | Ta= -40 °C ~ 80 °C,<br>30min/5min/30min, 200cycles |
| 7 | Vibration test<br>(non-operating) | Wave form : random<br>Vibration level : 1.0Grms<br>Bandwidth : 10-300Hz<br>Duration : X,Y,Z, 10 min<br>One time each direction |
| 8 | Shock test<br>(non-operating) | Shock level : 100Grms<br>Waveform : half sine wave, 2ms<br>Direction : ±X, ±Y, ±Z<br>One time each direction |
| 9 | ESD test | Condition : 150pF, 330 ohm<br>Case , air<br>Evaluation : ± 15kV |
| 10 | Humidity storage test | Ta= 40 °C, 70%RH, 240h |

Note : Before and after Reliability test, LCM should be operated with normal function.

# 7. International Standards

## 7-1. Safety

a) UL 60065, 7th Edition, dated June 30, 2003, Underwriters Laboratories, Inc., Standard for Audio, Video and Similar Electronic Apparatus.
b) CAN/CSA C22.2, No. 60065:03, Canadian Standards Association, Standard for Audio, Video and Similar Electronic Apparatus.
c) IEC60065:2001, 7th Edition CB-scheme and EN 60065:2002, Safety requirements for Audio, Video and Similar Electronic Apparatus..

## 7-2. EMC

a) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. “American National Standards Institute(ANSI), 1992
b) CISPR13 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"
CISPR22 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" International Special Committee on Radio Interference.
c) EN55013 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"
EN55022 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" European Committee for Electro Technical Standardization.(CENELEC), 1988(Including A1:2000)

# 8. Packing

## 8-1. Designation of Lot Mark

a) Lot Mark

| A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |

2. MONTH

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | 1 | 2 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

## 8-2. Packing Form

a) Package quantity in one box : 4 pcs

b) Box Size : 968mm X 366mm X 595mm

# 9. Precautions

Please pay attention to the followings when you use this TFT LCD module.

## 9-1. Mounting Precautions

(1) You must mount a module using specified mounting holes (Details refer to the drawings).
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

## 9-2. Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer
(4) Be careful for condensation at sudden temperature change.Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can't be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw.
(if not, it can causes conductive particles and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.
(10) It is recommended to avoid the signal cable and conductive material over the inverter transformer for it can cause the abnormal display and temperature rising.
(11) Partial darkness may happen during 3~5 minutes when LCM is operated initially in condition that luminance is under 40% at low temperature (under 5℃). This phenomenon which disappears naturally after 3~5 minutes is not a problem about reliability but LCD characteristic

## 9-3. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

## 9-4. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

## 9-5. Storage

When storing modules as spares for a long time, the following precautions are necessary.

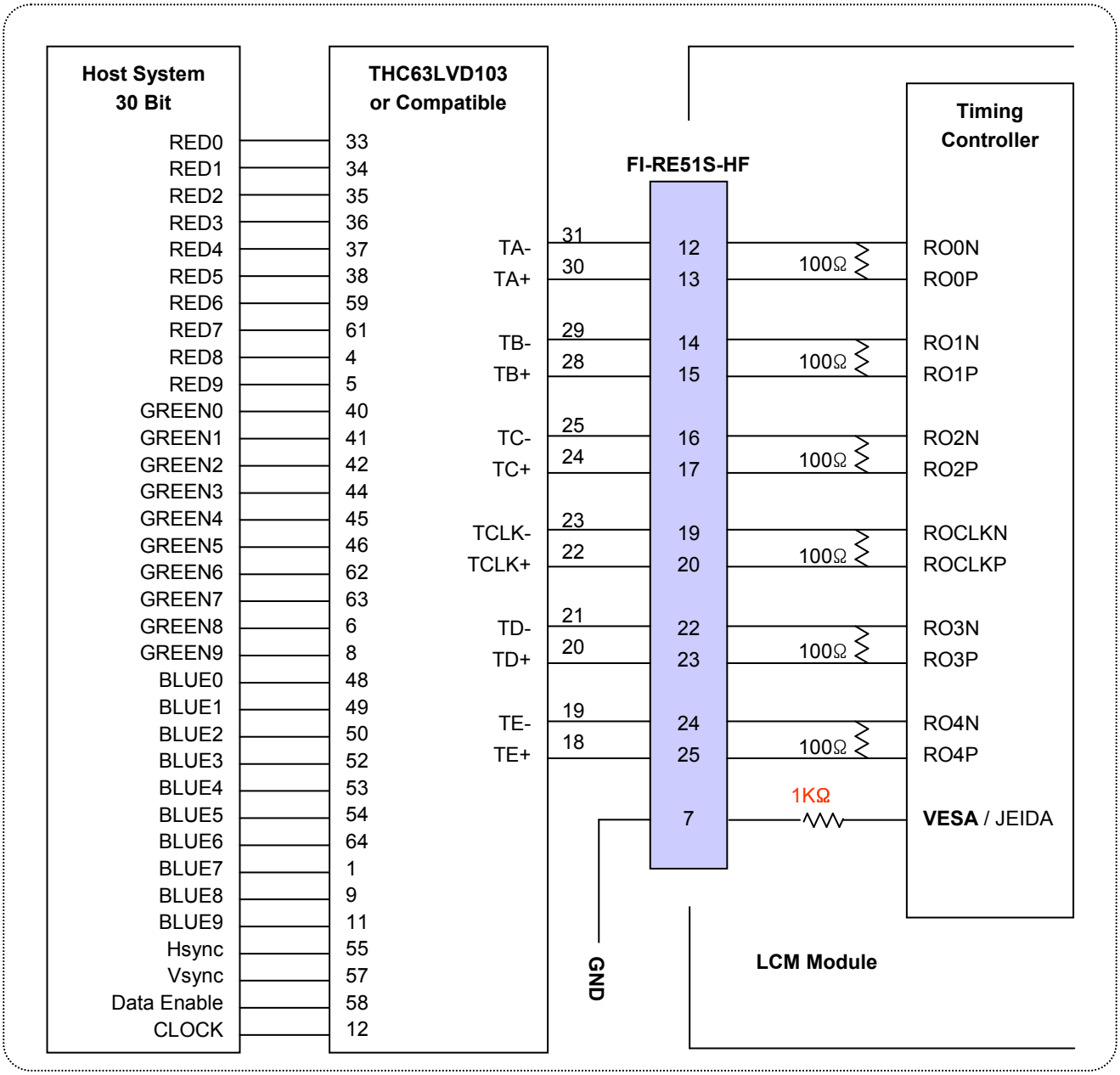
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

## 9-6. Handling Precautions for Protection Film

(1) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

# # APPENDIX-I-1

■ **Required signal assignment for Flat Link (Thine : THC63LVD103) Transmitter(Pin7="L")**

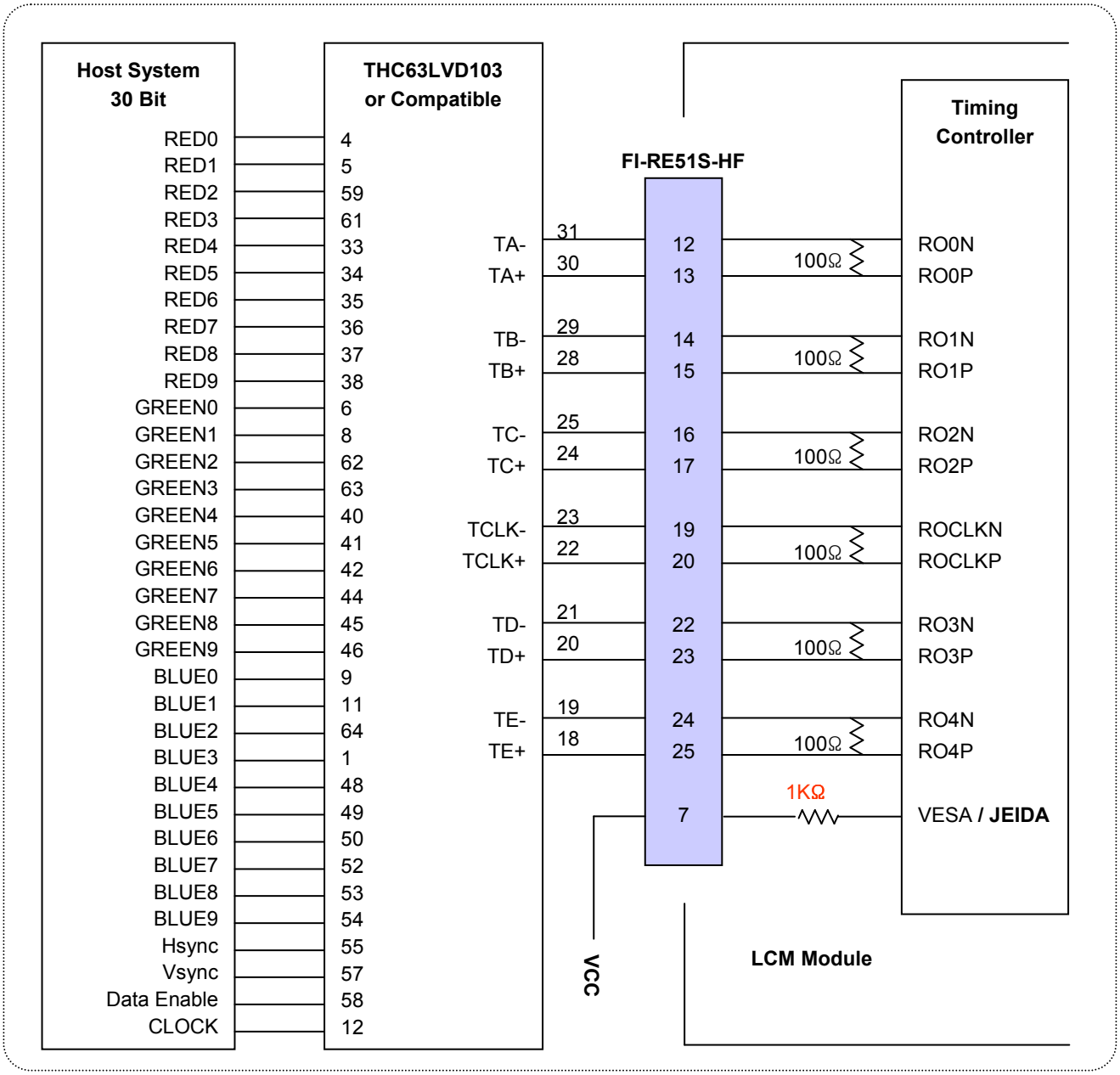



Note:

1. The LCD module uses a 100 Ohm(Ω) resistor between positive and negative lines of each receiver input.
2. Refer to LVDS transmitter data sheet for detail descriptions. (THC63LVD103 or Compatible)
3. '9' means MSB and '0' means LSB at R,G,B pixel data.

# # APPENDIX-I-2

■ **Required signal assignment for Flat Link (Thine : THC63LVD823) Transmitter(Pin7="H")**

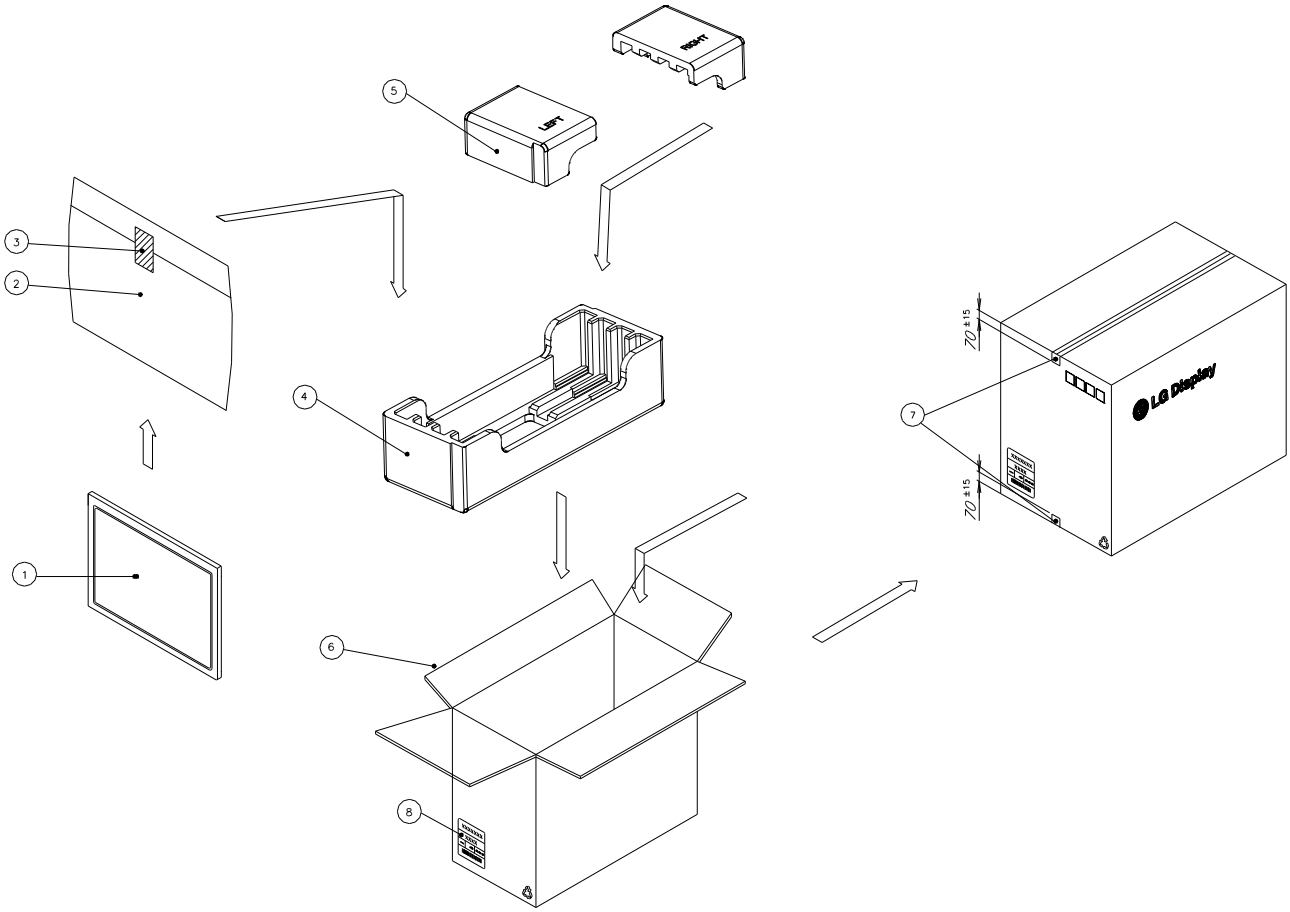



Note:

1. The LCD module uses a 100 Ohm(Ω) resistor between positive and negative lines of each receiver input.
2. Refer to LVDS transmitter data sheet for detail descriptions. (THC63LVD103 or Compatible)
3. '9' means MSB and '0' means LSB at R,G,B pixel data.

**# APPENDIX-Ⅱ-1**

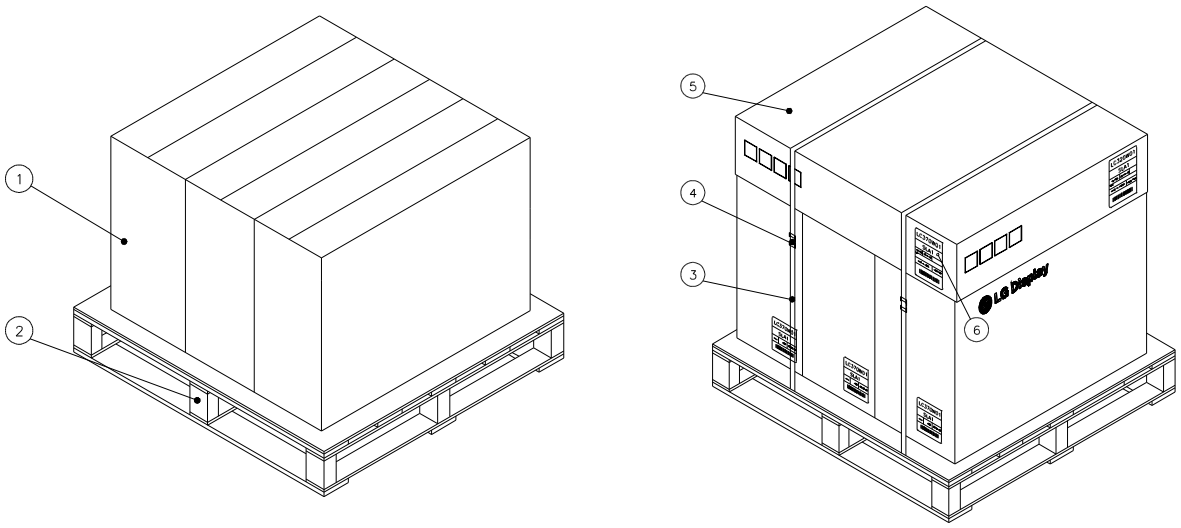
## ■ LC370WUN-SAC1 Packing Ass'y




| NO. | DESCRIPTION | MATERIAL |
|---|---|---|
| 1 | LCD MODULE | |
| 2 | BAG | AL |
| 3 | TAPE | MASKING 20MM X 50M |
| 4 | PACKING, BOTTOM | EPS |
| 5 | PACKING, TOP R_L | EPS |
| 6 | BOX | PAPER_DW3 |
| 7 | TAPE | OPP 70MMX300M |
| 8 | LABEL | YUPO PAPER 100X100 |

**# APPENDIX-Ⅱ-2**

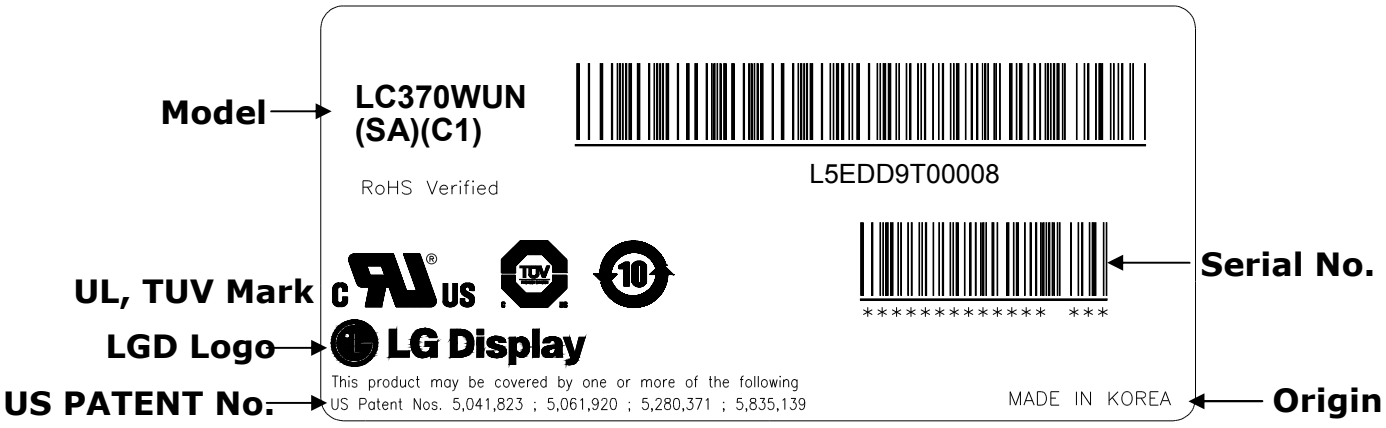
## ■ LC370WUN-SAC1 Pallet Ass'y




| NO. | DESCRIPTION | MATERIAL |
|---|---|---|
| 1 | PACKING ASS'Y | |
| 2 | PALLET | Plywood_1140X990X130 |
| 3 | BAND | PP |
| 4 | BAND, CLIP | CLIP 18MM |
| 5 | ANGLE, COVER | DW3 |
| 6 | LABEL | YUPO PAPER |

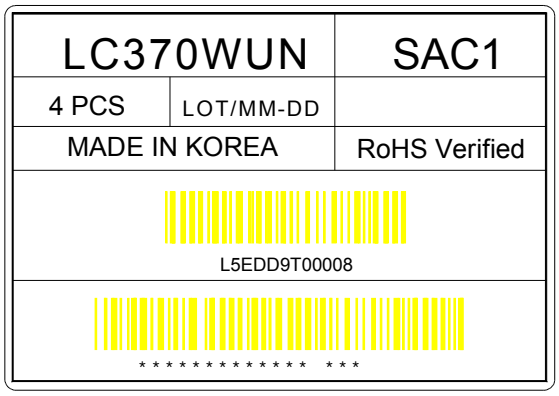
**# APPENDIX- II -3**

■ LCM Label

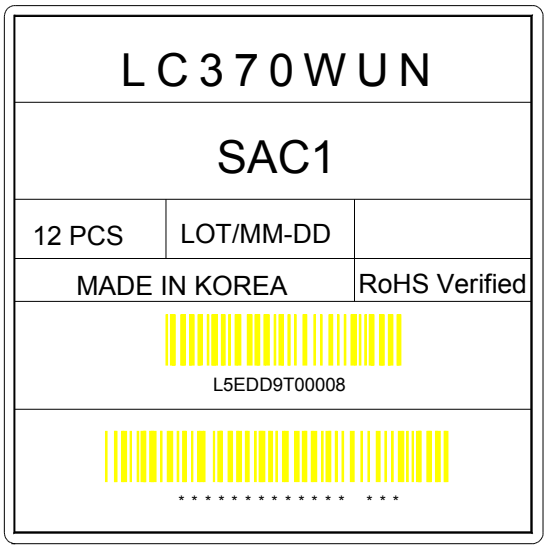


## # APPENDIX-II-4

■ Box Label



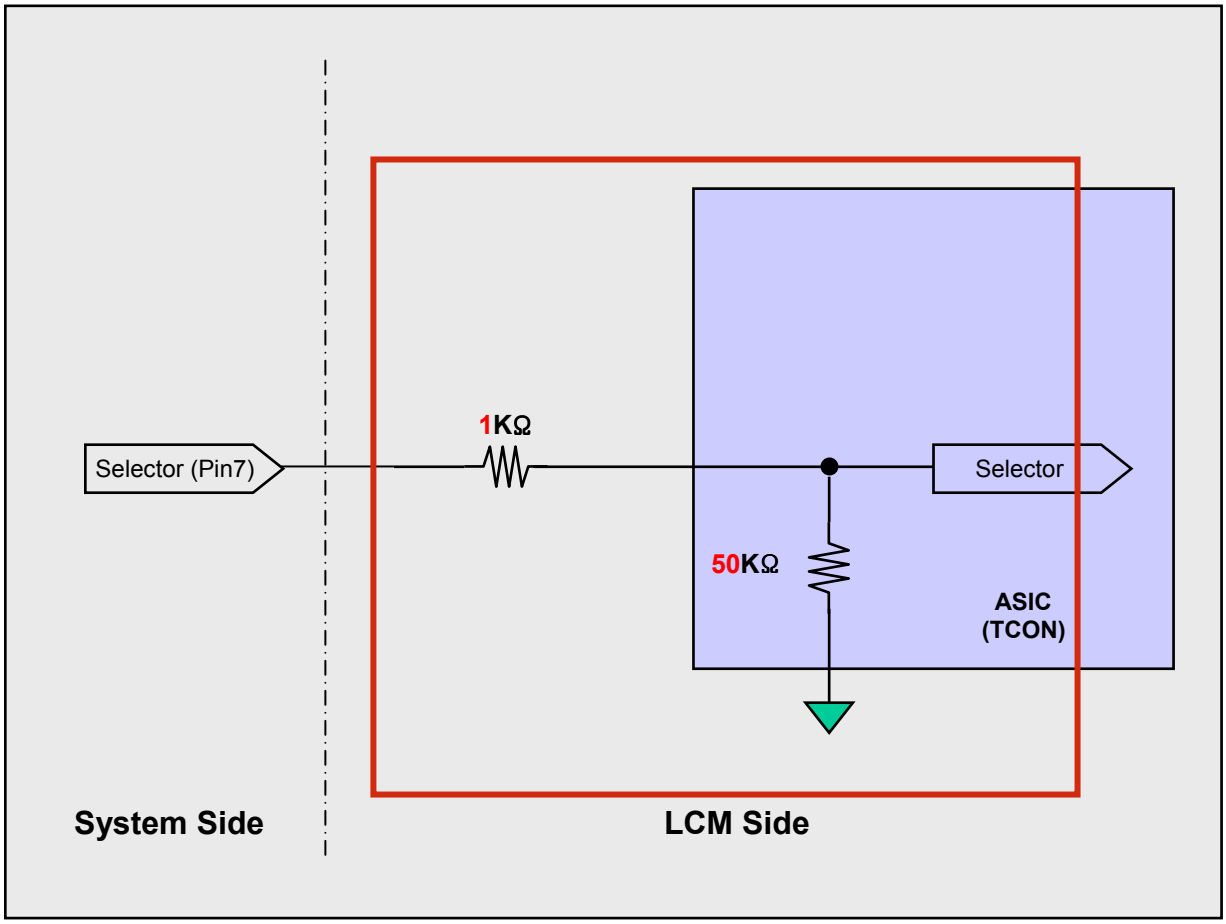

■ Pallet Label



**# APPENDIX- III**

# Option Pin Circuit Block Diagram

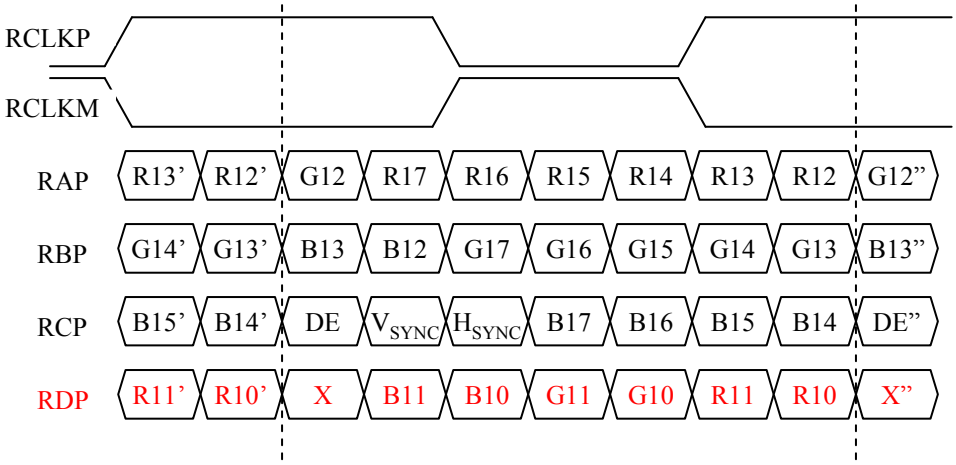
## Circuit Block Diagram of LVDS Format Selection pin



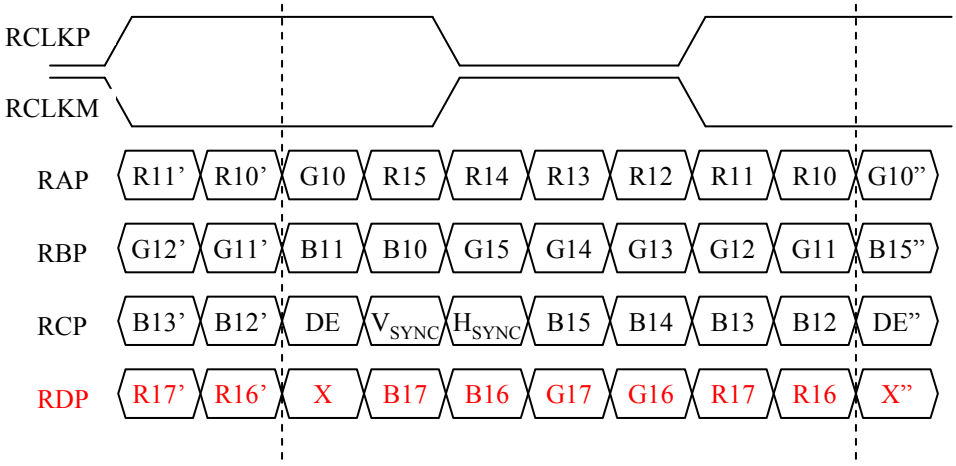
**# APPENDIX- IV**

# LVDS Data-Mapping info. (8bit)

## ■ LVDS Select : “H” Data-Mapping (JEIDA format)



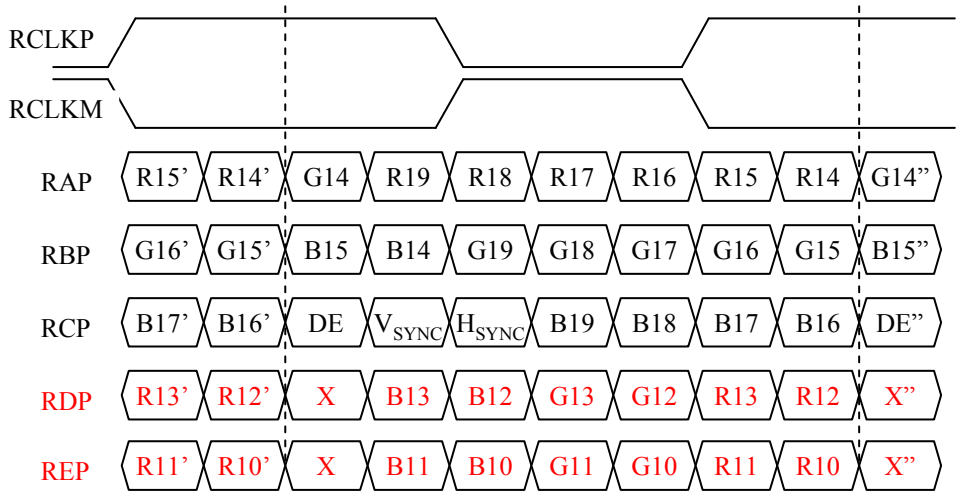

## ■ LVDS Select : “L” Data-Mapping (VESA format)



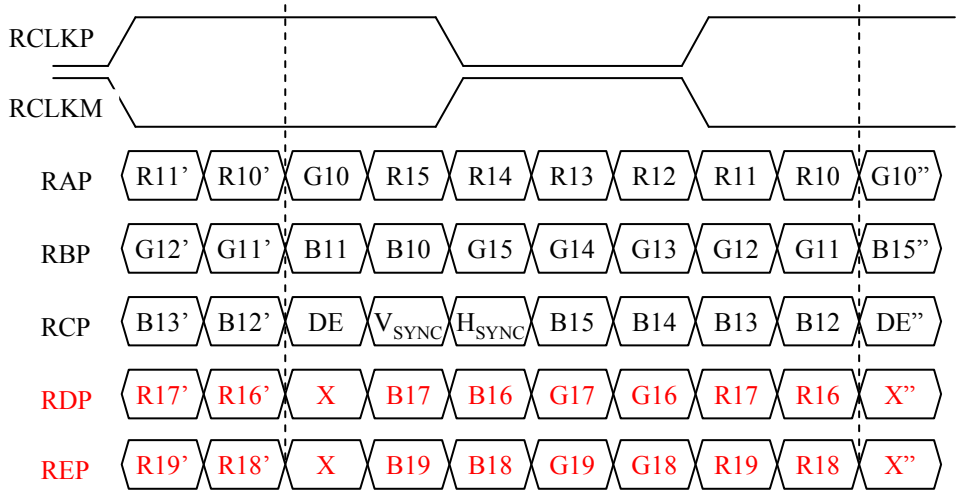
**# APPENDIX- IV**

# LVDS Data-Mapping info. (10bit)

## ■ LVDS Select : “H” Data-Mapping (JEIDA format)



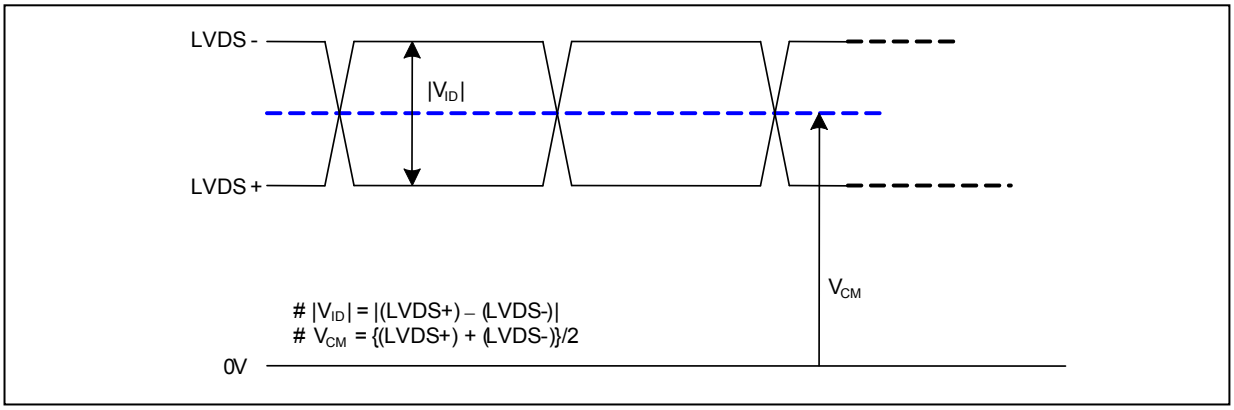

## ■ LVDS Select : “L” Data-Mapping (VESA format)



**# APPENDIX- V**

# LVDS Input characteristics

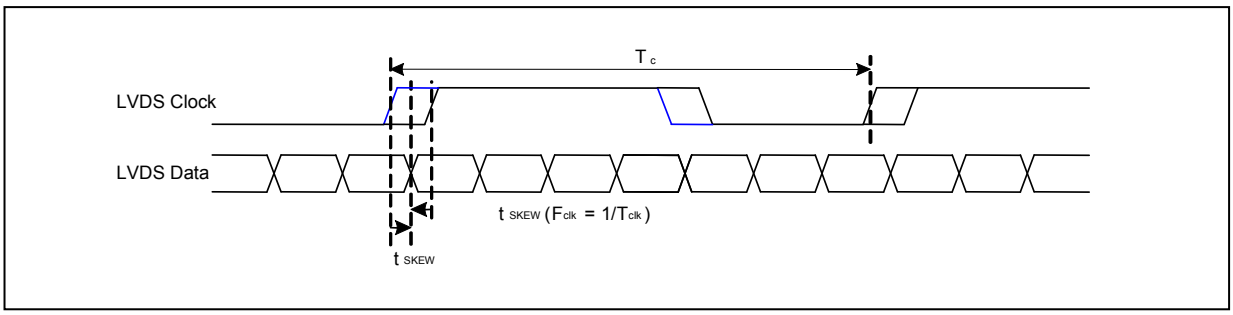
## 1. DC Specification




| Description | Symbol | Min | Max | Unit | Notes |
|---|---|---|---|---|---|
| LVDS Single End Voltage | $\|V_{ID}\|$ | 200 | 600 | mV | - |
| LVDS Common mode Voltage | $V_{CM}$ | $\|V_{ID}\|/2$ | 1.8-$\|V_{ID}\|/2$ | V | - |

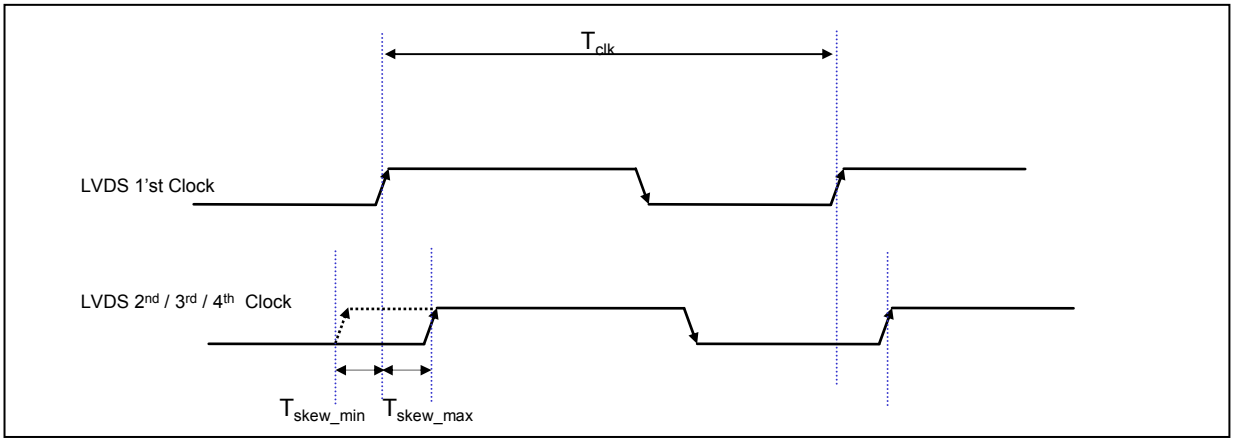
## 2. AC Specification

### 1 ) LVDS Clock to data timing




| Description | Symbol | Min | Max | Unit | Notes |
|---|---|---|---|---|---|
| LVDS Clock to Data Skew Margin | $t_{SKEW}$ | n*Tc / 7-620 | n*Tc / 7+620 | ps | f(clk)=68MHz |

2 ) LVDS Clock timing




< LVDS inter-port Clock timing >

| Description | Symbol | Min | Max | Unit | Notes |
|---|---|---|---|---|---|
| LVDS inter-port Clock Skew | $T_{skew}$ | -3/7 | +3/7 | $T_{clk}$ | - |