# SPECIFICATION
# FOR
# APPROVAL

( ) Preliminary Specification
( ● ) Final Specification

| Title | 55.0” WUXGA TFT LCD |
|---|---|

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

| SUPPLIER | LG.Display Co., Ltd. |
|---|---|
| *MODEL | LC550WUD |
| SUFFIX | SCA1 (RoHS Verified) |

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

| APPROVED BY | SIGNATURE / DATE |
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Please return 1 copy for your confirmation with your signature and comments.

| APPROVED BY | SIGNATURE / DATE |
|---|---|
| J. T Kim / Team Leader | |
| **REVIEWED BY** | |
| B. Y Kim / Project Leader | |
| **PREPARED BY** | |
| D. I Kim / Engineer | |

**TV Products Development Dept.**
**LG. Display LCD Co., Ltd**

# CONTENTS

# RECORD OF REVISIONS

| Revision No. | Revision Date | Page | Description |
|---|---|---|---|
| 0.0 | Aug, 13, 2008 | - | Preliminary Specification (First Draft) |
| 0.1 | Nov, 20, 2009 | | Several specification update |
| 1.0 | Dec, 22, 2009 | | Final Specification |
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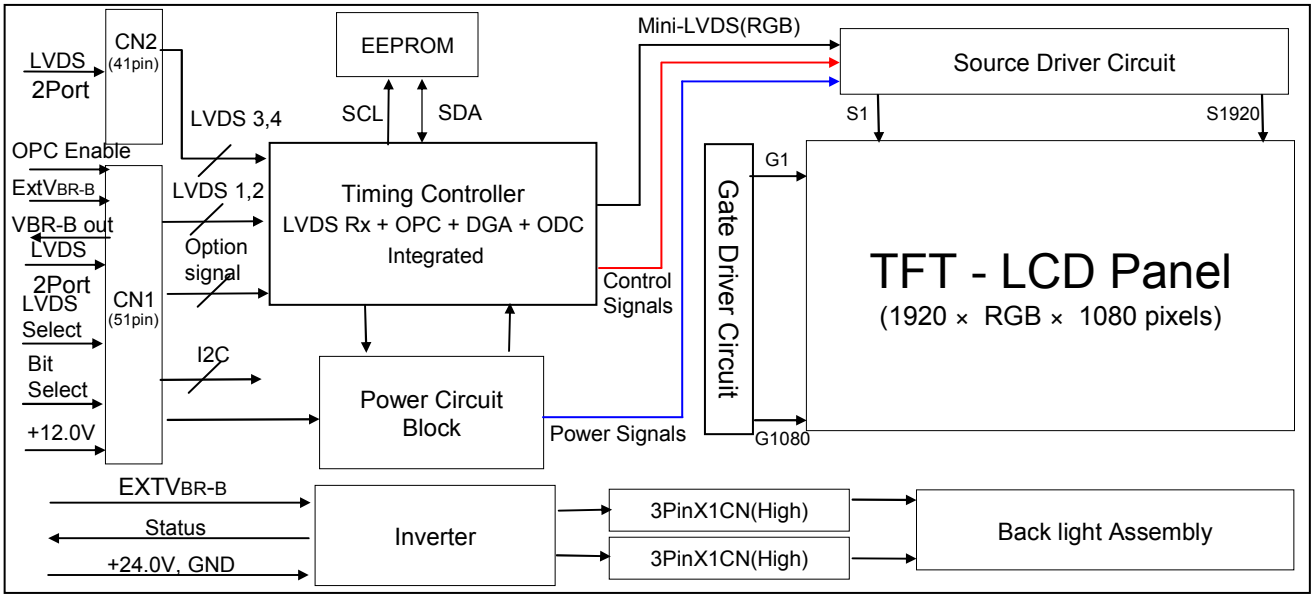
## 1. General Description

The LC550WUD is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) 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 54.64 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 1.06Bilion colors.
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 | 54.64 inches(1387.80mm) diagonal |
| Outline Dimension | 1286.0(H) x 745.0 (V) x 60.0 mm(D) (Typ.) |
| Pixel Pitch | 0.630 mm x 0.630 mm |
| Pixel Format | 1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement |
| Color Depth | 8-bit, 16.7 M colors (※ 1.06B colors @ 10 bit (D) System Output ) |
| Luminance, White | 500 cd/m$^2$ (Center 1point ,Typ.) |
| Viewing Angle (CR>10) | Viewing angle free ( R/L 178 (Min.), U/D 178 (Min.)) |
| Power Consumption | Total 248.2W (Typ.) (Logic=8.2 W with T-CON , Backlight=240W @ with Inverter ) |
| Weight | 19.5Kg (Typ.) |
| Display Mode | Transmissive mode, Normally black |
| Surface Treatment | Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 10%) |

## 2. Absolute Maximum Ratings

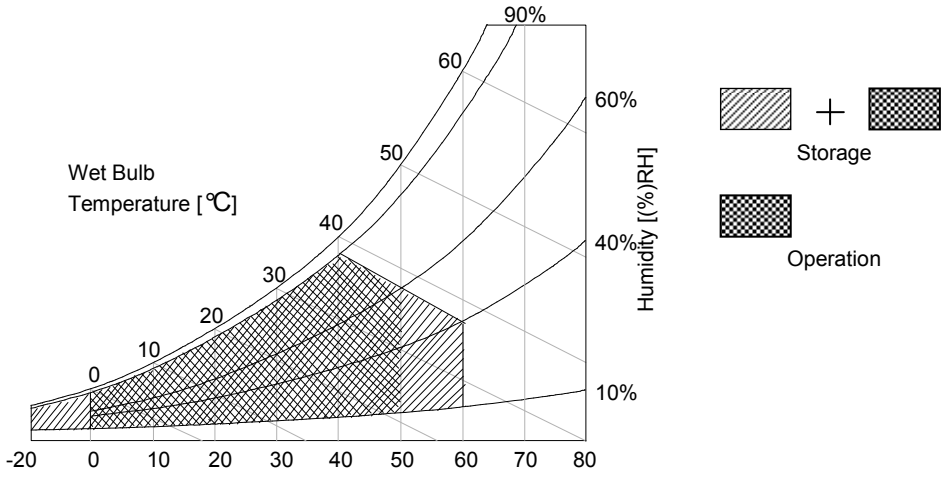
The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

**Table 1. ABSOLUTE MAXIMUM RATINGS**

| Parameter | | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|---|
| | | | Min | Max | | |
| Power Input Voltage | LCD Circuit | $V_{LCD}$ | -0.3 | +14.0 | $V_{DC}$ | 1 |
| | Inverter | $V_{BL}$ | -0.3 | + 27.0 | $V_{DC}$ | |
| Inverter Control Voltage | ON/OFF | $V_{OFF}$ / $V_{ON}$ | -0.3 | +5.5 | $V_{DC}$ | |
| | Brightness | $V_{BR}$ | 0.0 | +5.0 | $V_{DC}$ | |
| Brightness Control Voltage | | $EXTV_{BR-B}$ | -0.3 | +4.0 | $V_{DC}$ | |
| T-Con Option Selection Voltage | | $V_{LOGIC}$ | -0.3 | +4.0 | $V_{DC}$ | |
| Operating Temperature | | $T_{OP}$ | 0 | +50 | ℃ | 2,3 |
| Storage Temperature | | $T_{ST}$ | -20 | +60 | ℃ | |
| Panel Front Temperature | | $T_{SUR}$ | - | 68 | ℃ | 4 |
| Operating Ambient Humidity | | $H_{OP}$ | 10 | 90 | %RH | 2,3 |
| Storage Humidity | | $H_{ST}$ | 10 | 90 | %RH | |

Note1. Ambient temperature condition (Ta = 25 ± 2 ℃ )

2. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be Max 39℃, and no condensation of water.
3. Gravity mura can be guaranteed below 40℃ condition.
4. The maximum operating temperatures is based on the test condition that the surface temperature of display area is less than or equal to 65℃ 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℃. The range of operating temperature may degraded in case of improper thermal management in final product design.



# 3. Electrical Specifications

## 3-1. Electrical Characteristics

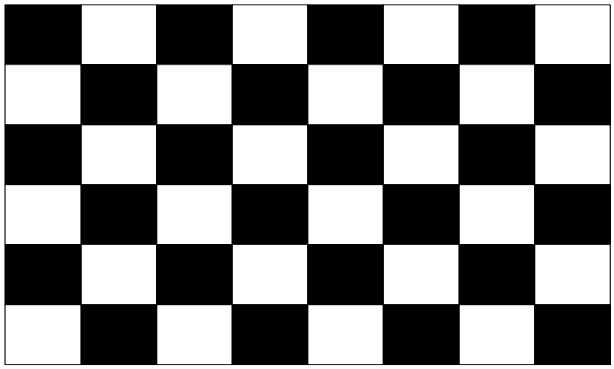
It requires two power inputs. One is employed to power for the LCD circuit. The other Is used for the CCFL backlight and inverter circuit.

**Table 2. ELECTRICAL CHARACTERISTICS**

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| **Circuit :** | | | | | | |
| Power Input Voltage | $V_{LCD}$ | 10.8 | 12.0 | 13.2 | $V_{DC}$ | |
| Power Input Current | $I_{LCD}$ | - | 685 | 890 | mA | 1 |
| | | - | 985 | 1280 | mA | 2 |
| Power Consumption | $P_{LCD}$ | | 8.2 | 10.7 | Watt | 1 |
| Rush current | $I_{RUSH}$ | - | - | 5.0 | A | 3 |

Note 1. The specified current and power consumption are under the $V_{LCD}$=12.0V, Ta=25 ± 2℃, $f_V$=120Hz condition whereas mosaic pattern(8 x 6) is displayed and $f_V$ is the frame frequency.
2. The current is specified at the maximum current pattern.
3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).

White : 1023 Gray
Black : 0 Gray



**Mosaic Pattern(8 x 6)**

**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 Current | After Aging | | IBL_A | - | 10 | 11 | A | 1 |
| | Before Aging | | IBL_B | - | 12 | 13.2 | A | 2 |
| Power Supply Input Current (In-Rush) | | | Irush | - | - | 15 | A | $V_{BL}$ = 22.8V **$EXTV_{BR-B}$** = 100% 5 |
| Power Consumption | | | PBL | - | 240 | 264 | W | 1 |
| Input Voltage for Control System Signals | On/Off | On | V on | 2.5 | - | 5.0 | VDC | |
| | | Off | V off | -0.3 | 0.0 | 0.8 | VDC | |
| | Brightness Adjust` | | **$EXTV_{BR-B}$** | 30 | - | 100 | % | On Duty 7 |
| | PWM Frequency for NTSC & PAL | | PAL | | 100 | | Hz | 5 |
| | | | NTSC | | 120 | | Hz | 5 |
| | 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:** | | | | | | | | |
| Discharge Stabilization Time | | | Ts | | | 3 | min | 3 |
| Life Time | | | | 50,000 | 60,000 | | Hrs | 4 |

Notes :

1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 120 minutes at 25± 2℃. The specified current and power consumption are under the typical supply Input voltage 24Vand $V_{BR}$ (**$EXTV_{BR-B}$** : 100%), it is total power consumption.
2. Electrical characteristics are determined within 30 minutes at 25± 2℃.
   The specified currents are under the typical supply Input voltage 24V.
3. The brightness of the lamp after lighted for 5minutes is defined as 100%.
   TS is the time required for the brightness of the center of the lamp to be not less than 95% at typical current.
   The screen of LCD module may be partially dark by the time the brightness of lamp is stable after turn on.
4. 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 lamp current (**$EXTV_{BR-B}$** :100%), on condition of continuous operating at 25± 2℃
5. LGD recommend that the PWM freq. is synchronized with One times harmonic of Vsync signal of system.
6. The duration of rush current is about 10ms.
7. **$EXTV_{BR-B}$** is based on input PWM duty of the inverter.

## 3-2. Interface Connections

This LCD module employs two kinds of interface connection, 51-pin connector and 41-pin connector are used for the module electronics and 14-pin,12-pin connector is used for the integral backlight system.

### 3-2-1. LCD Module

- LCD Connector (CN1) : FI-R51S-HF(manufactured by JAE) or KN25-51P-0.5SH(manufactured by Hirose) Refer to below and next Page table
- Mating Connector : FI-R51HL(JAE) or compatible

**Table 4-1. MODULE CONNECTOR(CN1) PIN CONFIGURATION**

| No | Symbol | Description | No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | GND | Ground | 27 | **Bit Select** | **'H' or NC= 10bit(D) , 'L' = 8bit** |
| 2 | NC | No Connection | 28 | R2AN | SECOND LVDS Receiver Signal (A-) |
| 3 | NC | No Connection | 29 | R2AP | SECOND LVDS Receiver Signal (A+) |
| 4 | NC | No Connection (Reserved for LGD) | 30 | R2BN | SECOND LVDS Receiver Signal (B-) |
| 5 | NC | No Connection (Reserved for LGD) | 31 | R2BP | SECOND LVDS Receiver Signal (B+) |
| 6 | NC | No Connection (Reserved for LGD) | 32 | R2CN | SECOND LVDS Receiver Signal (C-) |
| 7 | **LVDS Select** | **'H' =JEIDA , 'L' or NC = VESA** | 33 | R2CP | SECOND LVDS Receiver Signal (C+) |
| 8 | **$EXTV_{BR-B}$** | External VBR (From System) | 34 | GND | Ground |
| 9 | **VBR-B out** | OPC output (From LCM) | 35 | R2CLKN | SECOND LVDS Receiver Clock Signal(-) |
| 10 | **OPC Enable** | **'H' = Enable , 'L' or NC = Disable** | 36 | R2CLKP | SECOND LVDS Receiver Clock Signal(+) |
| 11 | GND | Ground | 37 | GND | Ground |
| 12 | R1AN | FIRST LVDS Receiver Signal (A-) | 38 | R2DN | SECOND LVDS Receiver Signal (D-) |
| 13 | R1AP | FIRST LVDS Receiver Signal (A+) | 39 | R2DP | SECOND LVDS Receiver Signal (D+) |
| 14 | R1BN | FIRST LVDS Receiver Signal (B-) | 40 | R2EN | SECOND LVDS Receiver Signal (E-) |
| 15 | R1BP | FIRST LVDS Receiver Signal (B+) | 41 | R2EP | SECOND LVDS Receiver Signal (E+) |
| 16 | R1CN | FIRST LVDS Receiver Signal (C-) | 42 | NC | No Connection |
| 17 | R1CP | FIRST LVDS Receiver Signal (C+) | 43 | NC | No Connection |
| 18 | GND | Ground | 44 | **GND** | **Ground** |
| 19 | R1CLKN | FIRST LVDS Receiver Clock Signal(-) | 45 | GND | Ground |
| 20 | R1CLKP | FIRST LVDS Receiver Clock Signal(+) | 46 | GND | Ground |
| 21 | GND | Ground | 47 | NC | No connection |
| 22 | R1DN | FIRST LVDS Receiver Signal (D-) | 48 | VLCD | Power Supply +12.0V |
| 23 | R1DP | FIRST LVDS Receiver Signal (D+) | 49 | VLCD | Power Supply +12.0V |
| 24 | R1EN | FIRST LVDS Receiver Signal (E-) | 50 | VLCD | Power Supply +12.0V |
| 25 | R1EP | FIRST LVDS Receiver Signal (E+) | 51 | VLCD | Power Supply +12.0V |
| 26 | NC | No Connection | - | - | - |

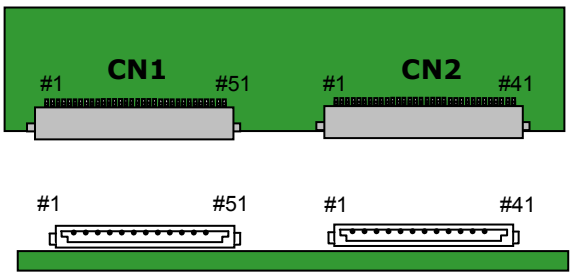
Note
1. All GND(ground) pins should be connected together to the LCD module's metal frame.
2. All $V_{LCD}$ (power input) pins should be connected together.
3. All Input levels of LVDS signals are based on the **EIA 644** Standard.
4. Specific pins (pin No. **#2~#6**) are used for internal data process of the LCD module. These pins should be no connection.
5. Specific pins (pin No. **# 8~#10**) are used for OPC function of the LCD module. If not used, these pins are no connection. (Please see the **Appendix III-4** for more information.)
6. LVDS pin (pin No. **#24,25,40,41**) are used for 10Bit(D) of the LCD module. If used for 8Bit(R), these pins are no connection.

-LCD Connector : FI-RE41S-HF (manufactured by JAE) or KN25-41P-0.5SH (manufactured by Hirose) (CN2)
- Mating Connector : FI-RE41HL

Table 4-2. MODULE CONNECTOR(CN2) PIN CONFIGURATION

| No | Symbol | Description | No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | NC | No connection (Reserved) | 22 | RE3N | THIRD LVDS Receiver Signal (E-) |
| 2 | NC | No connection | 23 | RE3P | THIRD LVDS Receiver Signal (E+) |
| 3 | NC | No connection | 24 | GND | Ground |
| 4 | NC | No connection | 25 | GND | Ground |
| 5 | NC | No connection | 26 | RA4N | FORTH LVDS Receiver Signal (A-) |
| 6 | NC | No connection | 27 | RA4P | FORTH LVDS Receiver Signal (A+) |
| 7 | NC | No connection | 28 | RB4N | FORTH LVDS Receiver Signal (B-) |
| 8 | NC | No connection | 29 | RB4P | FORTH LVDS Receiver Signal (B+) |
| 9 | GND | Ground | 30 | RC4N | FORTH LVDS Receiver Signal (C-) |
| 10 | RA3N | THIRD LVDS Receiver Signal (A-) | 31 | RC4P | FORTH LVDS Receiver Signal (C+) |
| 11 | RA3P | THIRD LVDS Receiver Signal (A+) | 32 | GND | Ground |
| 12 | RB3N | THIRD LVDS Receiver Signal (B-) | 33 | RCLK4N | FORTH LVDS Receiver Clock Signal(-) |
| 13 | RB3P | THIRD LVDS Receiver Signal (B+) | 34 | RCLK4P | FORTH LVDS Receiver Clock Signal(+) |
| 14 | RC3N | THIRD LVDS Receiver Signal (C-) | 35 | GND | Ground |
| 15 | RC3P | THIRD LVDS Receiver Signal (C+) | 36 | RD4N | FORTH LVDS Receiver Signal (D-) |
| 16 | GND | Ground | 37 | RD4P | FORTH LVDS Receiver Signal (D+) |
| 17 | RCLK3N | THIRD LVDS Receiver Clock Signal(-) | 38 | RE4N | FORTH LVDS Receiver Signal (E-) |
| 18 | RCLK3P | THIRD LVDS Receiver Clock Signal(+) | 39 | RE4P | FORTH LVDS Receiver Signal (E+) |
| 19 | GND | Ground | 40 | GND | Ground |
| 20 | RD3N | THIRD LVDS Receiver Signal (D-) | 41 | GND | Ground |
| 21 | RD3P | THIRD LVDS Receiver Signal (D+) | - | | |

Note : 1. All GND (ground) pins should be connected together to the LCD module's metal frame.
2. LVDS pin (pin No. #22,23,38,39) are used for 10Bit(D) of the LCD module.
If used for 8Bit(R), these pins are no connection.




**Rear view of LCM**

[CN1]
- Part/No. : FI-RE51S-HF(JAE)
- Mating connector : FI-RE51HL (Manufactured by JAE)

[CN2]
- Part/No. : FI-RE41S-HF(JAE)
- Mating connector : FI-RE41HL (Manufactured by JAE)

### 3-2-2. Backlight Module

**[ Master ]**

-Inverter Connector : 20022WR-14B1(Yeonho) or Equivalent

- Mating Connector : 20022HS-14 or Equivalent

**[ Slave ]**

-Inverter Connector : 20022WR-12B1(Yeonho) or Equivalent

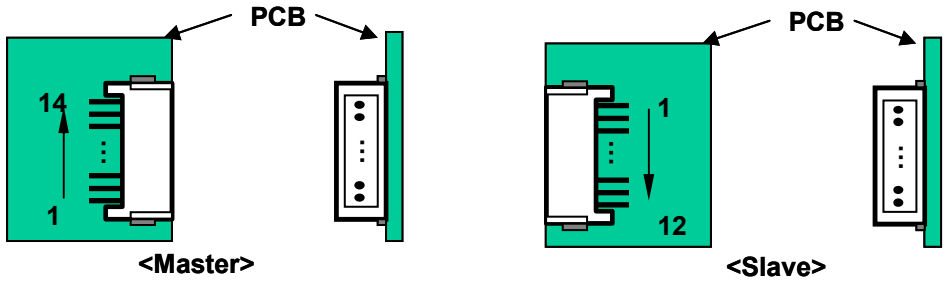
-Mating Connector : 20022HS-12 or Equivalent

**Table 5. INVERTER CONNECTOR PIN CONFIGULATION**

| Pin No | Symbol | Description | Master | Slave | Note |
|---|---|---|---|---|---|
| 1 | $V_{BL}$ | Power Supply +24.0V | $V_{BL}$ | $V_{BL}$ | |
| 2 | $V_{BL}$ | Power Supply +24.0V | $V_{BL}$ | $V_{BL}$ | |
| 3 | $V_{BL}$ | Power Supply +24.0V | $V_{BL}$ | $V_{BL}$ | |
| 4 | $V_{BL}$ | Power Supply +24.0V | $V_{BL}$ | $V_{BL}$ | |
| 5 | $V_{BL}$ | Power Supply +24.0V | $V_{BL}$ | $V_{BL}$ | |
| 6 | GND | Backlight Ground | GND | GND | |
| 7 | GND | Backlight Ground | GND | GND | |
| 8 | GND | Backlight Ground | GND | GND | 1 |
| 9 | GND | Backlight Ground | GND | GND | |
| 10 | GND | Backlight Ground | GND | GND | |
| 11 | NC | No Connection | NC | NC | |
| 12 | $V_{ON/OFF}$ | Backlight ON/OFF control | $V_{ON/OFF}$ | Don't care | |
| 13 | $EXTV_{BR-B}$ | External PWM | $EXTV_{BR-B}$ | - | |
| 14 | Status | Lamp Status | Status | - | 2 |

Note
1. GND should be connected to the LCD module's metal frame.
2. Normal : Low (under 0.7V) / Abnormal : High (upper 3.0V)
   Please see **Appendix IV-1** for more information.
3. The impedance of pin #12 is over 75[KΩ] & the impedance of Pin #13 is over 50[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 timings should be satisfied with the following specification for normal operation.

**Table 6-1. TIMING TABLE for NTSC (DE Only Mode)**

| ITEM | | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Horizontal | Display Period | $t_{HV}$ | 480 | 480 | 480 | tCLK | 1920 / 4 |
| | Blank | $t_{HB}$ | 40 | 70 | 200 | tCLK | 1 |
| | Total | $t_{HP}$ | 520 | 550 | 680 | tCLK | |
| Vertical | Display Period | $t_{VV}$ | 1080 | 1080 | 1080 | Lines | |
| | Blank | $t_{VB}$ | 16 | 45 | 86 | Lines | 1 |
| | Total | $t_{VP}$ | 1096 | 1125 | 1166 | Lines | |
| Frequency | DCLK | $f_{CLK}$ | 66.97 | 74.25 | 78.00 | MHz | |
| | Horizontal | $f_H$ | 121.8 | 135 | 140 | KHz | 2 |
| | Vertical | $f_V$ | 108 | 120 | 122 | Hz | 2 |

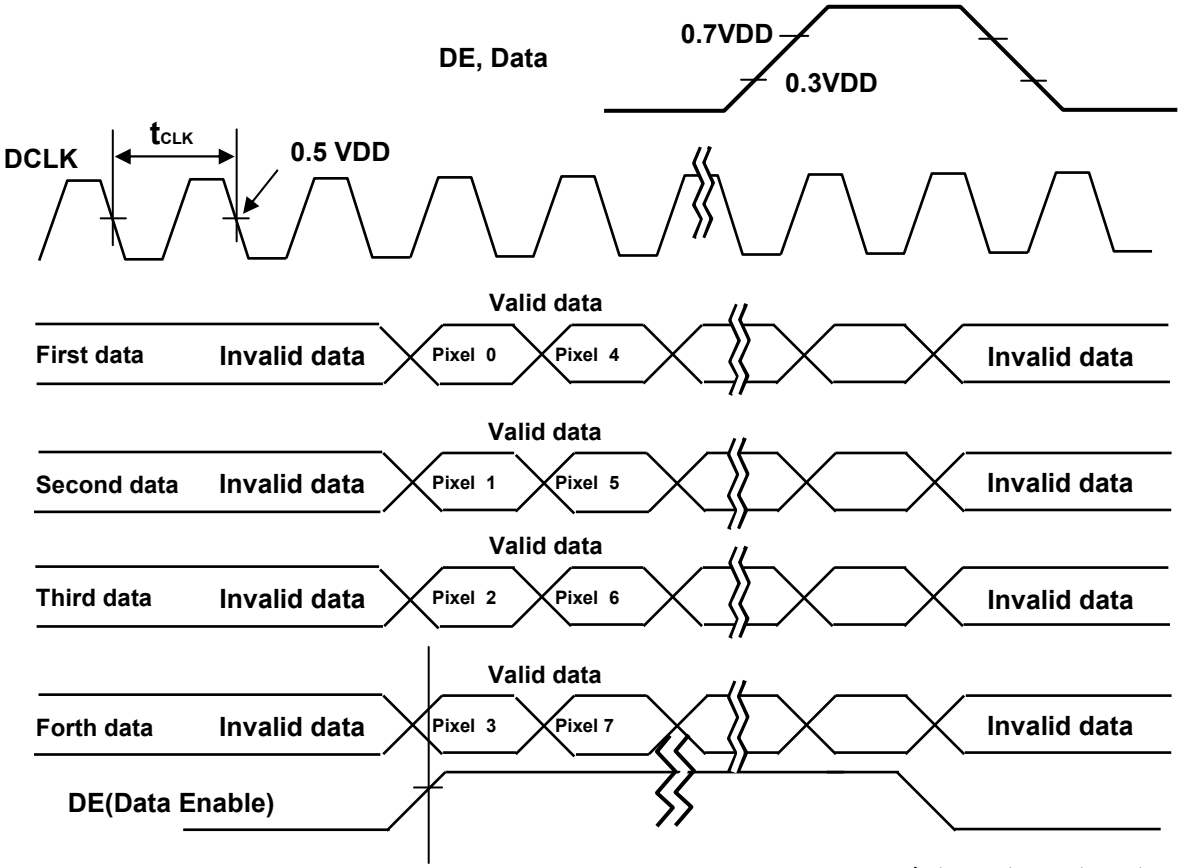
**Table 6-2 TIMING TABLE for DVB/PAL (DE Only Mode)**

| ITEM | | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Horizontal | Display Period | $t_{HV}$ | 480 | 480 | 480 | tCLK | 1920 / 4 |
| | Blank | $t_{HB}$ | 40 | 70 | 200 | tCLK | 1 |
| | Total | $t_{HP}$ | 520 | 550 | 680 | tCLK | |
| Vertical | Display Period | $t_{VV}$ | 1080 | 1080 | 1080 | Lines | |
| | Blank | $t_{VB}$ | 228 | 270 | 300 | Lines | 1 |
| | Total | $t_{VP}$ | 1308 | 1350 | 1380 | Lines | |
| Frequency | DCLK | $f_{CLK}$ | 66.97 | 74.25 | 78.00 | MHz | |
| | Horizontal | $f_H$ | 121.8 | 135 | 140 | KHz | 2 |
| | Vertical | $f_V$ | 95 | 100 | 104 | Hz | 2 |

Note 1. The Input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode). If you use spread spectrum for EMI, add some additional clock to minimum value for clock margin.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency.

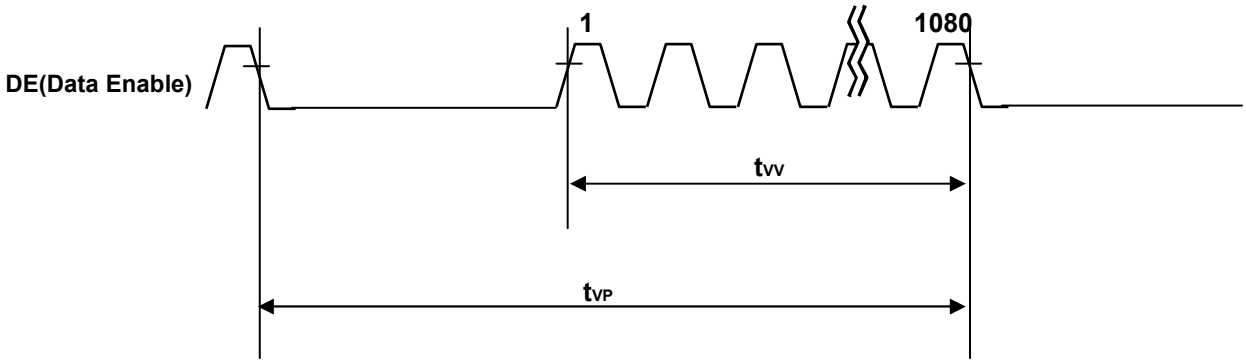
## 3-4. LVDS Signal Specification

### 3-4-1. LVDS Input Signal Timing Diagram



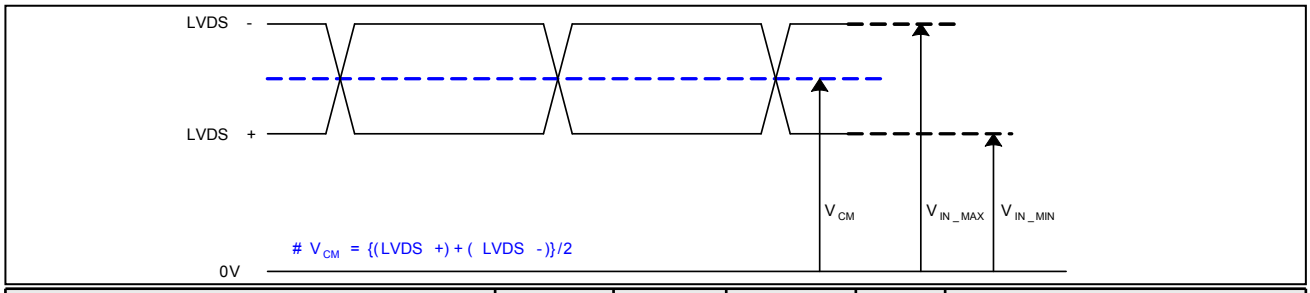

* $t_{HB} = t_{HFP} + t_{WH} + t_{HBP}$

* $t_{VB} = t_{VFP} + t_{WV} + t_{VBP}$



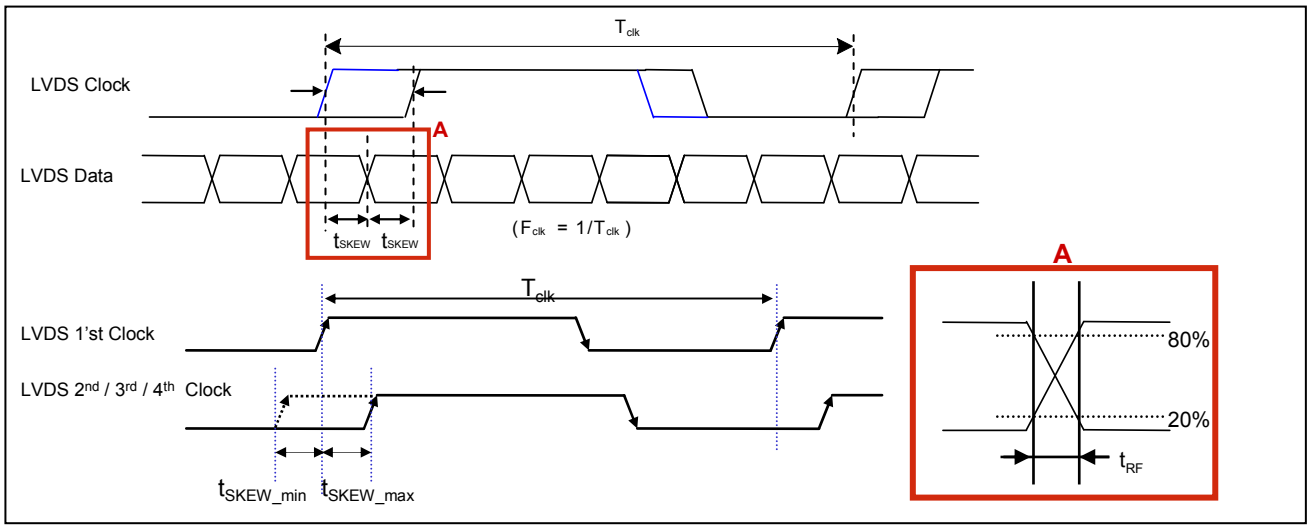
### 3-4-2. LVDS Input Signal Characteristics

#### 1) DC Specification



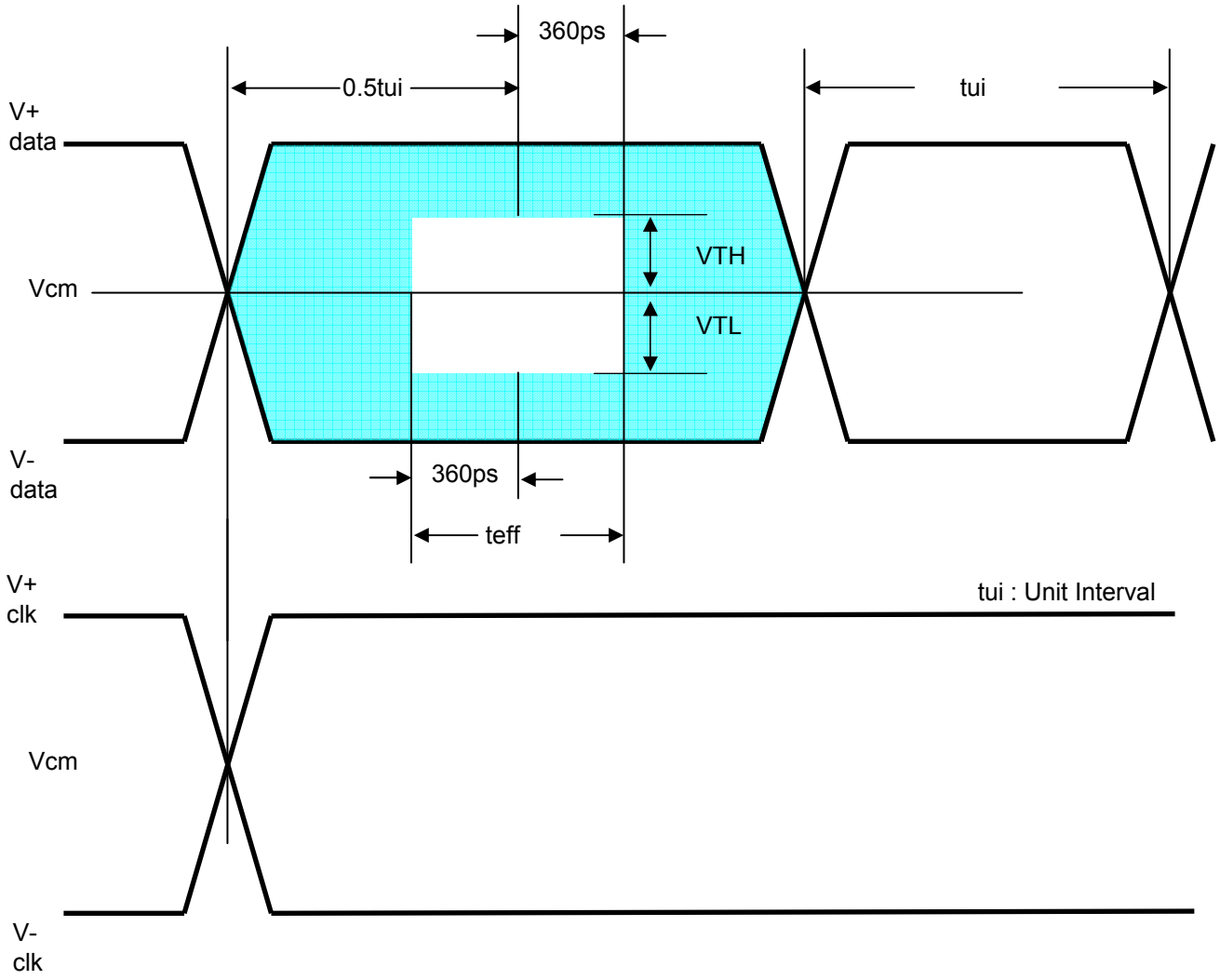

| Description | Symbol | Min | Max | Unit | Note |
|---|---|---|---|---|---|
| LVDS Common mode Voltage | $V_{CM}$ | 1.0 | 1.5 | V | - |
| LVDS Input Voltage Range | $V_{IN}$ | 0.7 | 1.8 | V | - |
| Change in common mode Voltage | ΔVCM | | 250 | mV | - |

#### 2) AC Specification




| Description | | Symbol | Min | Max | Unit | Note |
|---|---|---|---|---|---|---|
| LVDS Differential Voltage | High Threshold | $V_{TH}$ | 100 | 300 | mV | 3 |
| | Low Threshold | $V_{TL}$ | -300 | -100 | mV | |
| LVDS Clock to Data Skew Margin | | $t_{SKEW}$ | | \|(0.25*$T_{clk}$)/7\| | ps | - |
| LVDS Clock/DATA Rising/Falling time | | $t_{RF}$ | 260 | (0.3*$T_{clk}$)/7 | ps | 2 |
| Effective time of LVDS | | $t_{eff}$ | ± 360 | | ps | - |
| LVDS Clock to Clock Skew Margin (Even to Odd) | | $t_{SKEW\_EO}$ | | 1/7* $T_{clk}$ | $T_{clk}$ | - |

Note 1. All Input levels of LVDS signals are based on the EIA 644 Standard.
2. If $t_{RF}$ isn't enough, $t_{eff}$ should be meet the range.
3. LVDS Differential Voltage is defined within $t_{eff}$


360ps
0.5tui
tui
V+
data
VTH
Vcm
VTL
V-
data
360ps
teff
V+
clk
tui : Unit Interval
Vcm
V-
clk

### 3-5. Color Data Reference

The brightness of each primary color (red,green,blue) is based on the 10bit gray scale data input for the color. The higher binary input, the brighter the color. Table 7 provides a reference for color versus data input.

**Table 7. 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 (0000) | **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 (0001) | **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 (0000) | 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 (0001) | 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 (0000) | 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 (0001) | 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

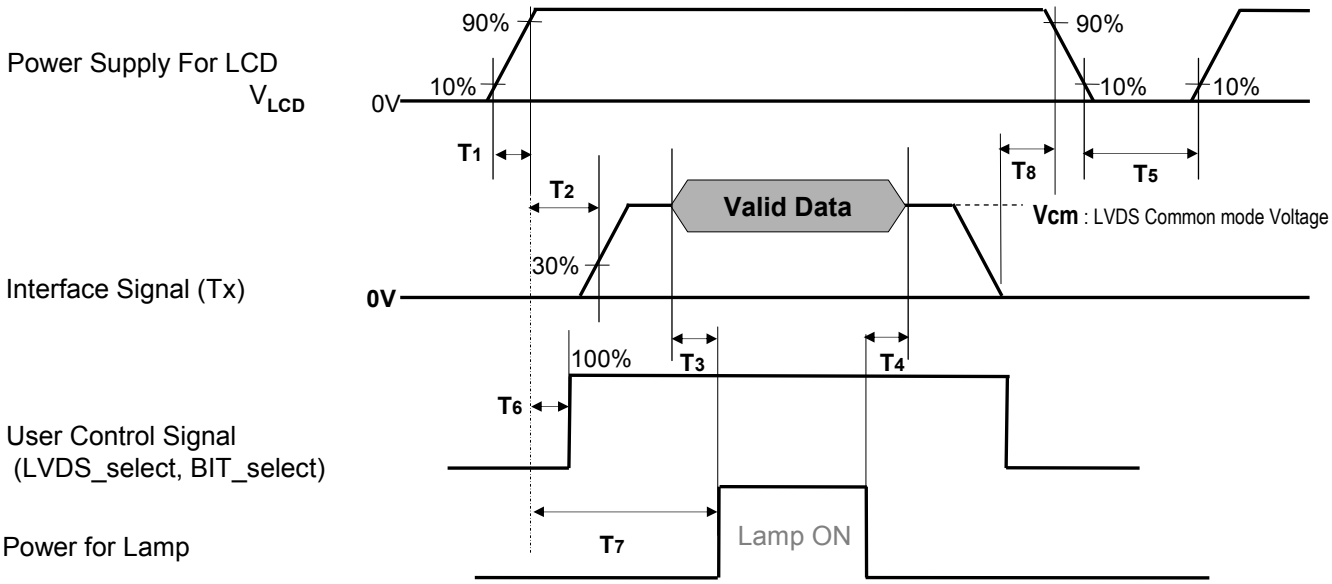


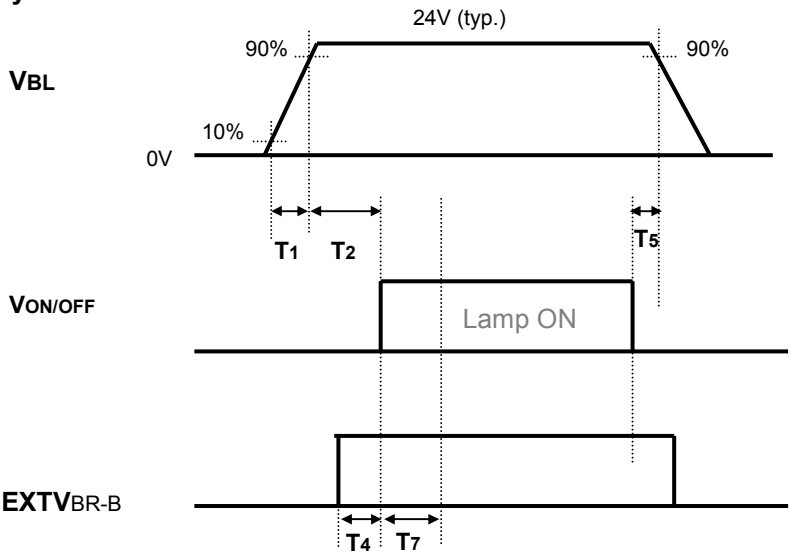

**Table 8. POWER SEQUENCE**

| 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** | 1.0 | - | - | s | 5 |
| **T6** | - | - | T2 | ms | 4 |
| **T7** | 0.5 | - | - | S | |
| **T8** | 100 | - | - | ms | 6 |

Note : 1. Please avoid floating state of interface signal at invalid period.
2. When the power supply for LCD (VLCD) is off, be sure to pull down the valid and invalid data 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 user control signals) precedes the on time of Power($V_{LCD}$), it will be happened abnormal display. When **T6** is NC status, **T6** doesn't need to be measured.
5. **T5** should be measured after the Module has been fully discharged between power off and on period.
6. It is recommendation specification that **T8** has to be 100ms as a minimum value.

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

**Power Supply For Inverter**




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

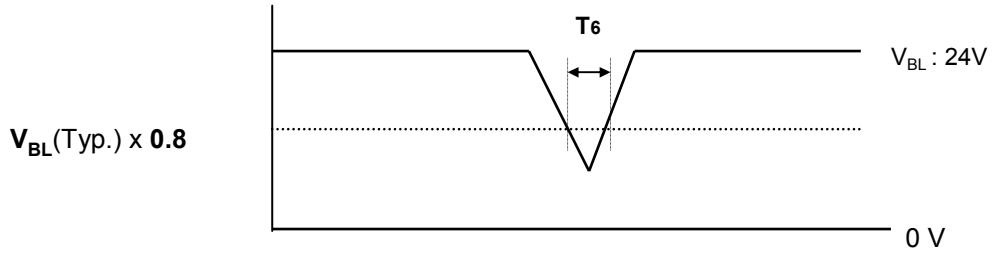



**Table 9. Power Sequence for Inverter**

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

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. It is the recommendation to input Max Duty to Inverter** for EXTVBR-B during T7 period.
**When OPC Function is applied, the Max Duty is input to T-Con.
* The recommendation of VON/OFF rising time is under 10ms.

## 4. Optical Specification

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

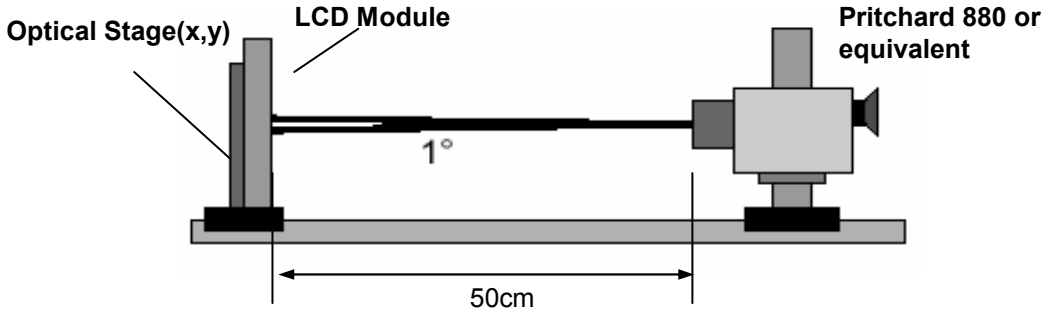



**FIG. 1 Optical Characteristic Measurement Equipment and Method**

Ta= 25± 2℃, $V_{LCD}$=12.0V, fv=120Hz, Dclk=74.25MHz, **EXTV**$_{BR-B}$ =100%

**Table 10. OPTICAL CHARACTERISTICS**

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Contrast Ratio | | CR | 1100 | 1450 | - | | 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 | - | 5 | 8 | ms | 4 |
| | MPRT | MPRT | - | 8 | 12 | ms | 5 |
| | Uniformity | $\delta_{MPRT}$ | - | - | 1 | | 6 |
| | Uniformity | $\delta_{G\ TO\ G}$ | - | - | 1 | | |
| Color Coordinates [CIE1931] | RED | Rx | Typ -0.03 | 0.637 | Typ +0.03 | | |
| | | Ry | | 0.333 | | | |
| | GREEN | Gx | | 0.287 | | | |
| | | Gy | | 0.605 | | | |
| | BLUE | Bx | | 0.145 | | | |
| | | By | | 0.064 | | | |
| | WHITE | Wx | | 0.279 | | | |
| | | Wy | | 0.292 | | | |
| Color Temperature | | | | 10,000 | | K | |
| Color Gamut | | | | 72 | | % | |
| Viewing Angle (CR>10) | | | | | | | |
| | x axis, right(ϕ=0°) | θr | 89 | - | - | degree | 7 |
| | x axis, left (ϕ=180°) | θl | 89 | - | - | | |
| | y axis, up (ϕ=90°) | θu | 89 | - | - | | |
| | y axis, down (ϕ=270°) | θd | 89 | - | - | | |
| Gray Scale | | | - | - | - | | 8 |

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

CR(Contrast Ratio) = Maximum CRn (n=1, 2, 3, 4, 5)

$$CRn = \frac{\text{Surface Luminance at position n with all white pixels}}{\text{Surface Luminance at position n with all black pixels}}$$

n = the Position number(1, 2, 3, 4, 5). For more information, see FIG 2.

2. Surface luminance are determined after the unit has been 'ON' and 1 Hour after lighting the backlight in a dark environment at 25± 2℃. 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 $L_{on1}$ to $L_{on5}$ 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 transit 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 stands for average value of all measured points.

Photo Detector : RD-80S / Field : 2˚

5. MPRT is defined as the 10% to 90% blur-edge width Bij(pixels) and scroll speed U(pixels/frame)at the moving picture. For more information, see FIG 4

6. Gray to Gray / MPRT Response time uniformity is Reference data. Please see **Appendix V-1 / V-2**.

7. 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.

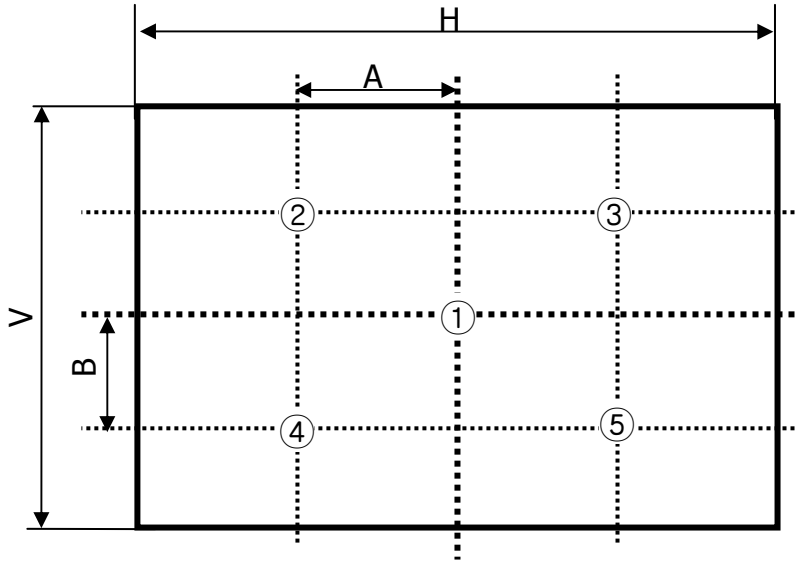
8. Gray scale specification

Gamma Value is approximately 2.2. For more information, see the Table 11.

**Table 11. GRAY SCALE SPECIFICATION**

| Gray Level | Luminance [%] (Typ) |
|---|---|
| L0 | 0.069 |
| L15 | 0.27 |
| L31 | 1.04 |
| L47 | 2.49 |
| L63 | 4.68 |
| L79 | 7.66 |
| L95 | 11.5 |
| L111 | 16.1 |
| L127 | 21.6 |
| L143 | 28.1 |
| L159 | 35.4 |
| L175 | 43.7 |
| L191 | 53.0 |
| L207 | 63.2 |
| L223 | 74.5 |
| L239 | 86.7 |
| L255 | 100 |

Measuring point for surface luminance & 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)".

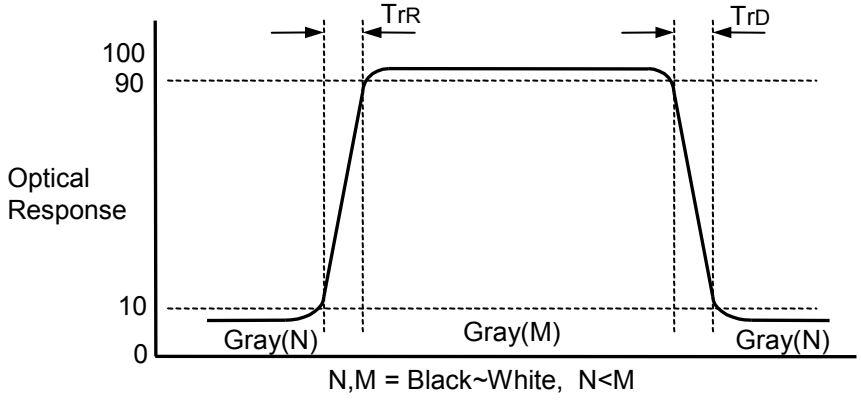
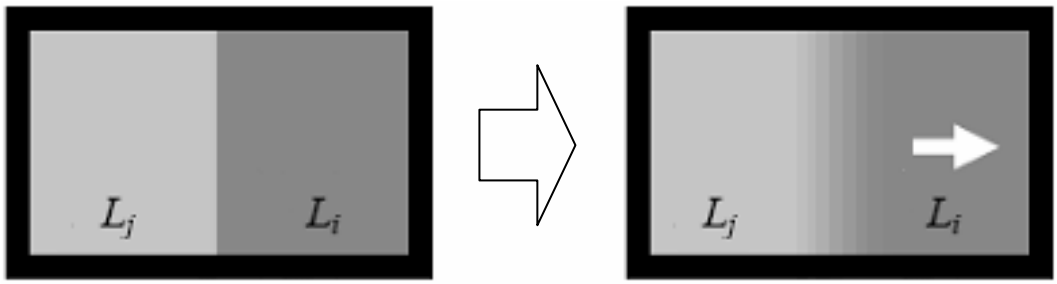
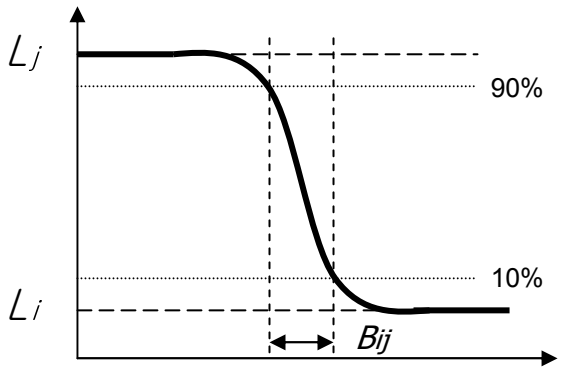



**FIG. 3 Response Time**

MPRT is defined as the 10% to 90% blur-edge with Bij(pixels) and scroll speed U(pixels/frame)at the moving picture.




$$M = \frac{1}{U} Bij \ (i \neq j)$$




Example) Bij = 12pixels, U = 10pixels / 120Hz

M = 12pixels / (10pixels / 120Hz)

= 12pixels / {10pixels / (1/120)s}

= 12 / 1,200 s

= 10 ms

**FIG. 4 MPRT**

Dimension of viewing angle range

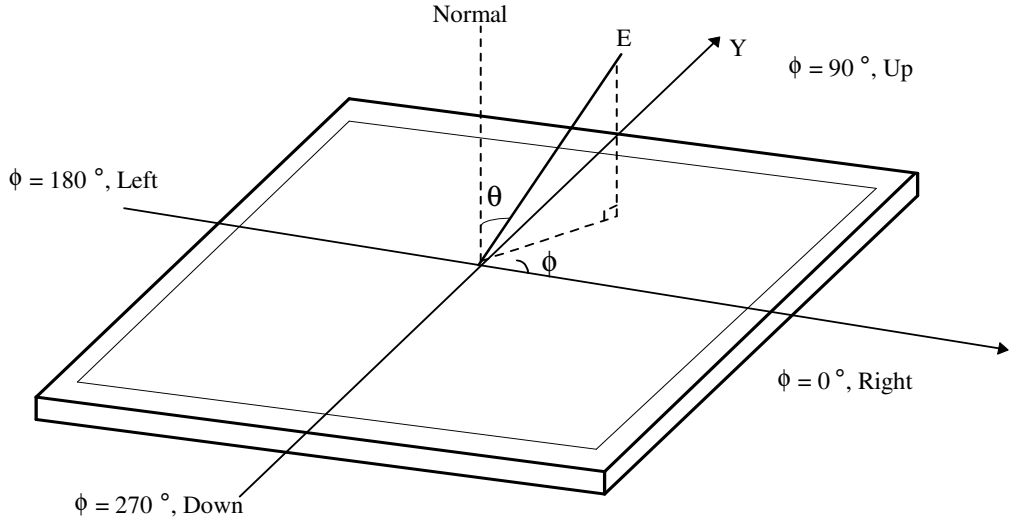



**FIG. 5 Viewing Angle**

## 5. Mechanical Characteristics

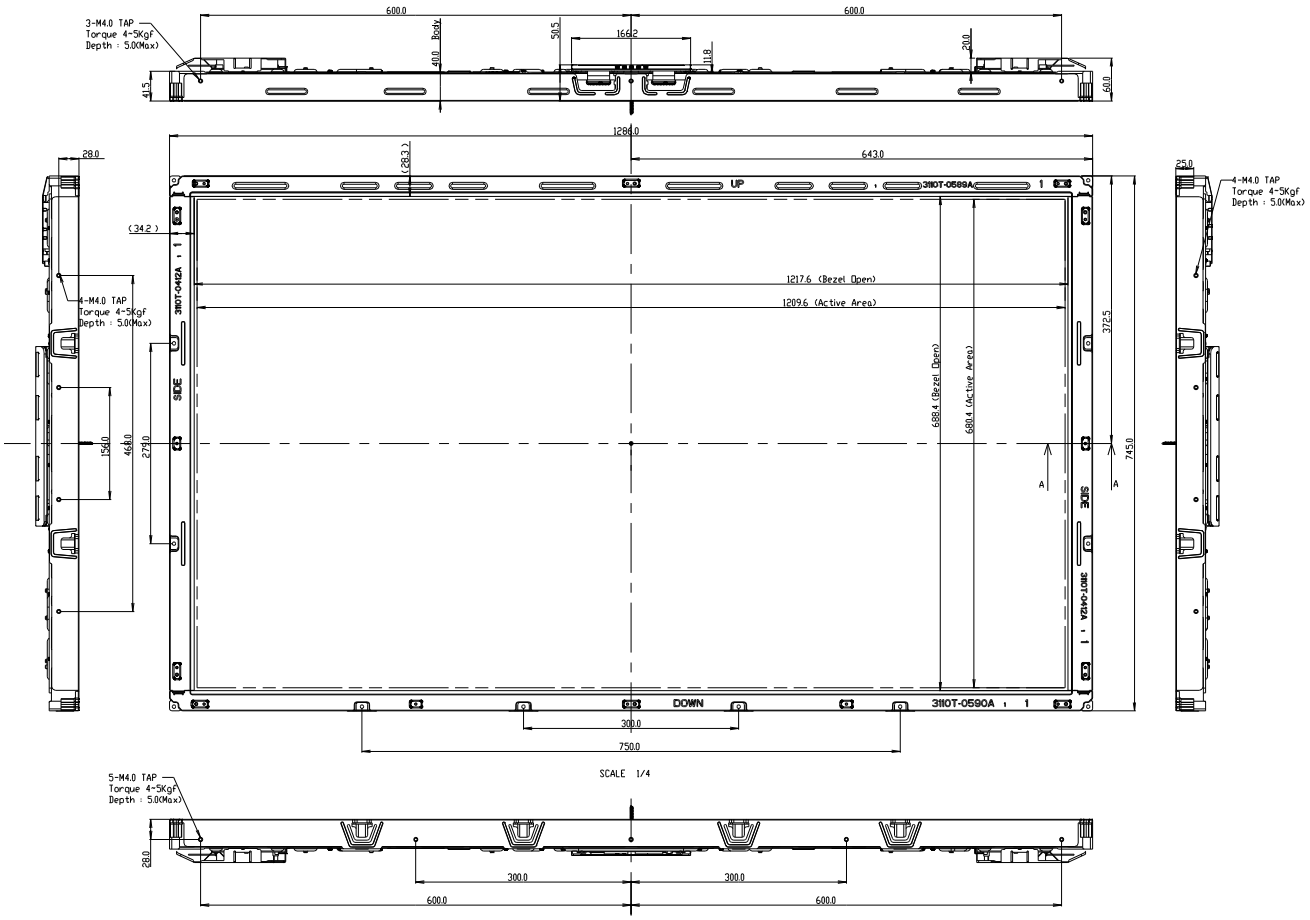
Table 12 provides general mechanical characteristics.

**Table 12. MECHANICAL CHARACTERISTICS**

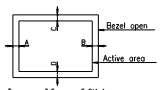
| Item | Value | |
|---|---|---|
| Outline Dimension | Horizontal | 1286.0 mm |
| | Vertical | 745.0 mm |
| | Depth | 60.0 mm |
| Bezel Area | Horizontal | 1217.6 mm |
| | Vertical | 688.4 mm |
| Active Display Area | Horizontal | 1209.6 mm |
| | Vertical | 680.4 mm |
| Weight | 19.5 Kg (Typ.) , 21 Kg (Max.) | |

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

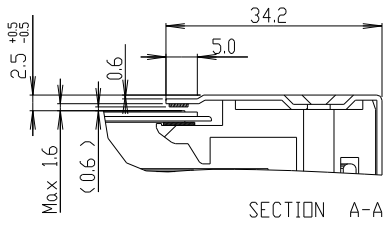
## [ FRONT VIEW ]



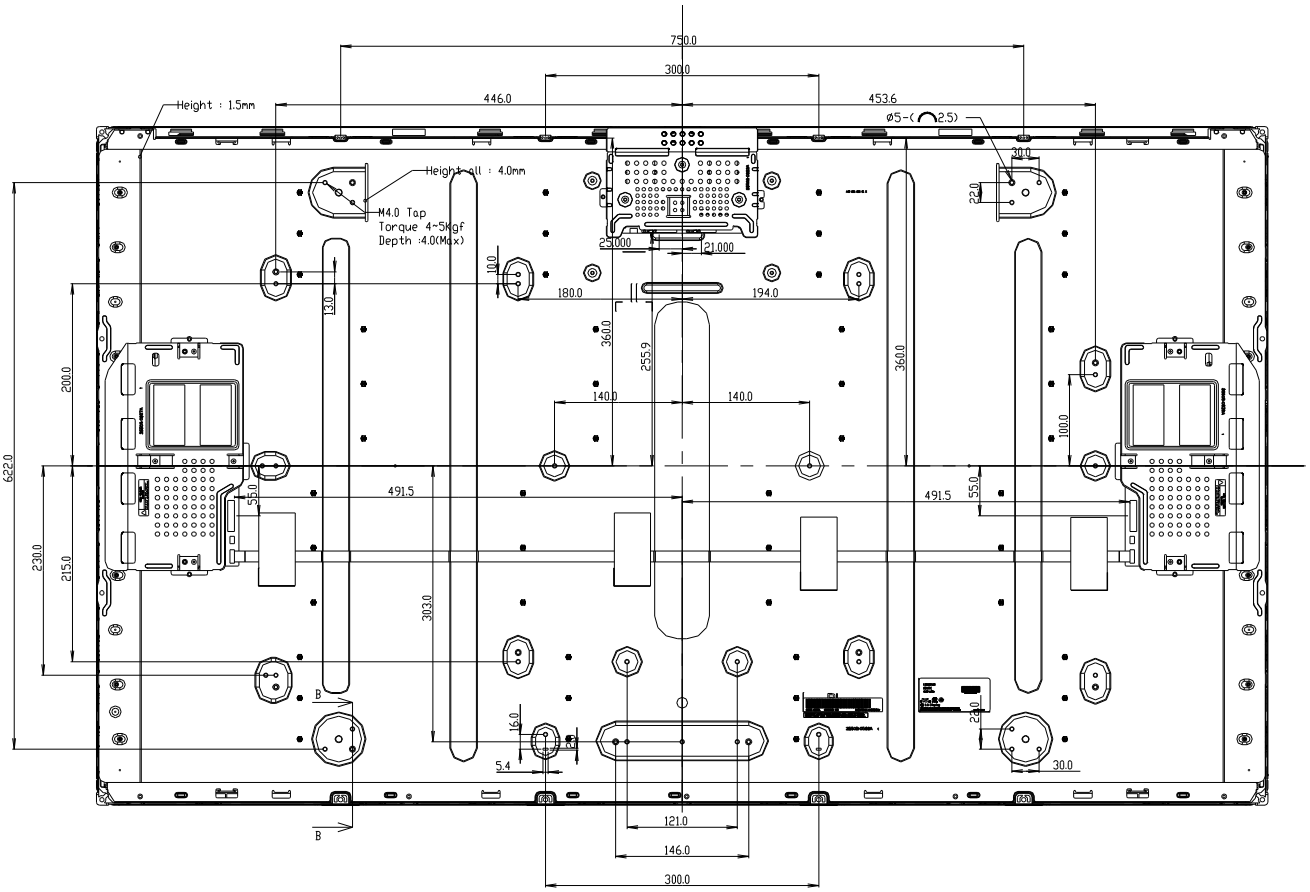

NOTES
1. Unspecified tolerances are to be ±1.0mm.
2. The length of mounting screw is MAX 4.0mm.
3. Tilt and partial disposition tolerance of display area are as following.
   (1) X-Direction : IA-BI ≤ 1.5mm
   (2) Y-Direction : IC-DI ≤ 1.5mm

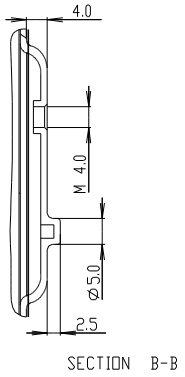



4. Torque : 3.5 ~ 5.0Kgf.cm
5. This part should be contains Eco-hazardous substances (Pb, Cd, Hg, Cr6+, PBB, PBDE, etc.) within standard level of LG display. Details should be followed Green Procurement standard[B-8022].
   Especially, Part should be followed and controlled the following specifications.
   (1) Eco-hazardous substances test report should be submitted when Part certification test and First Mass Production.
   (2) Don't flow Eco-hazardous substances into resin by using scrap.
   (3) Don't flow Eco-hazardous substances into metal by using impurities or improper stuff.



**[ REAR VIEW ]**




SECTION B-B

## 6. Reliability

**Table 13. ENVIRONMENT TEST CONDITION**

| No. | Test Item | Condition |
|---|---|---|
| 1 | High temperature storage test | Ta= 60℃ 240h |
| 2 | Low temperature storage test | Ta= -20℃ 240h |
| 3 | High temperature operation test | Ta= 50℃ 50%RH 240h |
| 4 | Low temperature operation test | Ta= 0℃ 240h |
| 5 | Vibration test<br>(non-operating) | Wave form : random<br>Vibration level : 1.0Grms<br>Bandwidth : 10-300Hz<br>Duration : 10 min for X,Y,Z, axis<br>One time each direction |
| 6 | Shock test<br>(non-operating) | Shock level : 50Grms(X,Y axis), 35G(Z axis)<br>Waveform : half sine wave, 11ms<br>Direction : ±X, ±Y, ±Z<br>One time each direction |
| 7 | Humidity condition Operation | Ta= 40 ℃ ,90%RH |
| 8 | Altitude operating<br>storage / shipment | 0 - 15,000 ft<br>0 - 40,000 ft |

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

# 7. International Standards

## 7-1. Safety

a) UL 60065, Seventh Edition, Underwriters Laboratories Inc.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

b) CAN/CSA C22.2 No.60065:03, Canadian Standards Association.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

c) EN 60065:2002 + A11:2008, European Committee for Electrotechnical Standardization (CENELEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

d) IEC 60065:2005 + A1:2005, The International Electrotechnical Commission (IEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

## 7-2. EMC

a) ANSI C63.4 “American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.” American National Standards Institute (ANSI), 2003.

b) CISPR 22 “Information technology equipment – Radio disturbance characteristics – Limit and methods of measurement." International Special Committee on Radio Interference (CISPR), 2005.

c) CISPR 13 “Sound and television broadcast receivers and associated equipment – Radio disturbance characteristics – Limits and method of measurement." International Special Committee on Radio Interference (CISPR), 2006.

## 7-3. Environment

a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003

# 8. Packing

## 8-1. Information of LCM Label

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 Pallet : 10 pcs

b) Pallet Size : 1440 mm X 1140 mm X 970 mm.

## 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) The conductive material and signal cables are kept away from transformers to prevent abnormal display, sound noise 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.

(12) Partial darkness may happen under the long-term operation of any dimming without power on/off. This phenomenon which disappears naturally after 5 minutes is not a problem about reliability but LCD characteristics.

## 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.

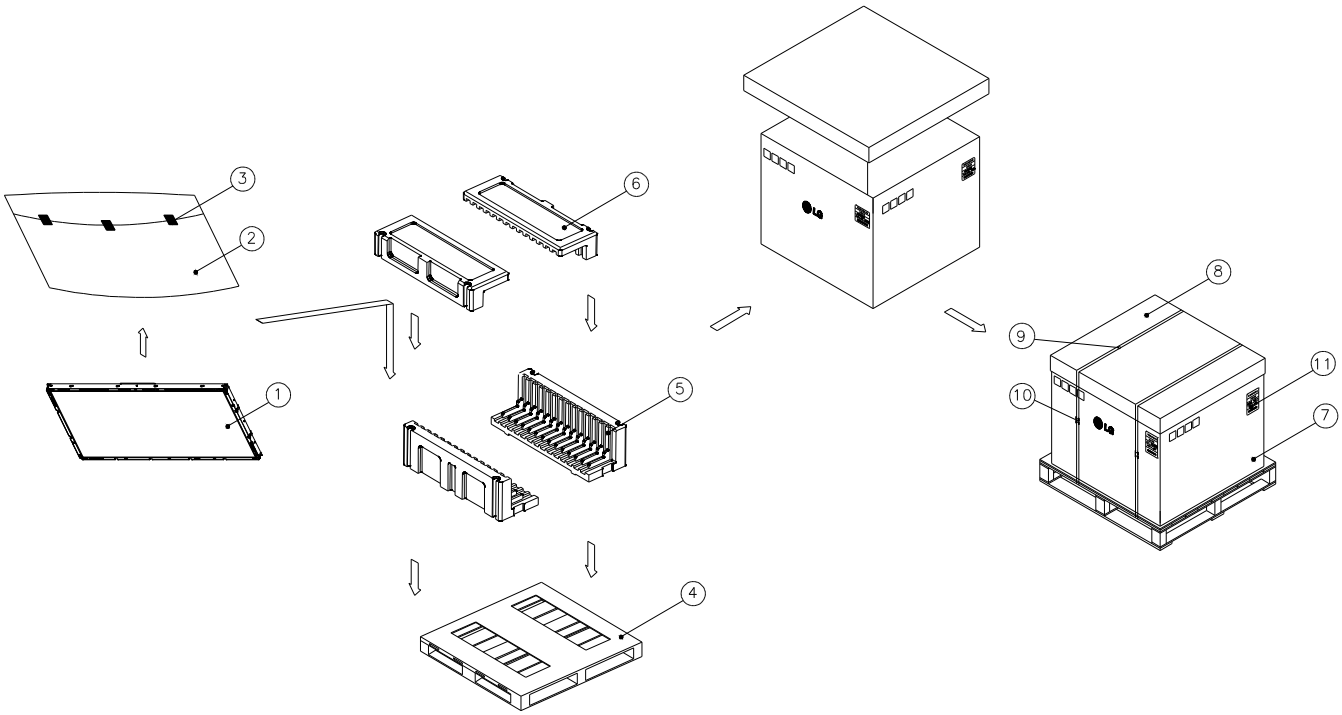
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were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

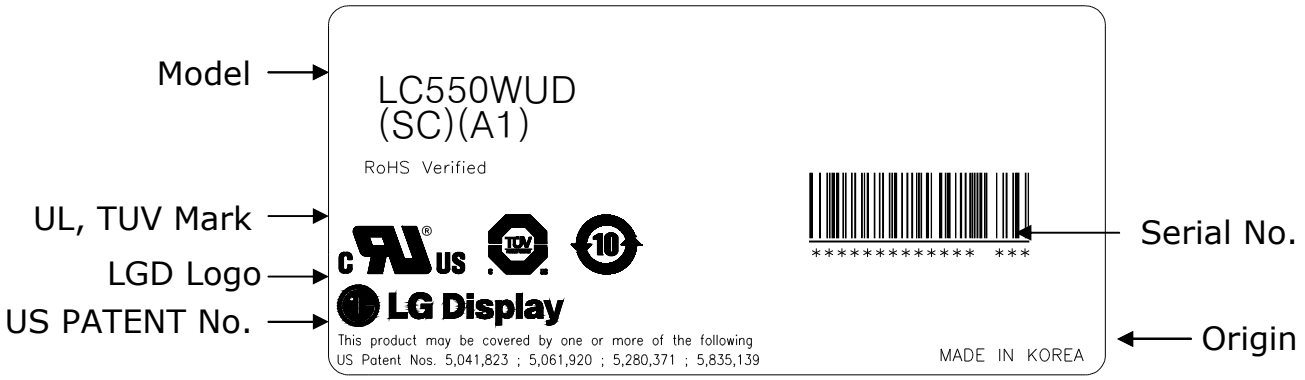
### ■ **LC550WUD-SCA1** – Pallet Ass'y



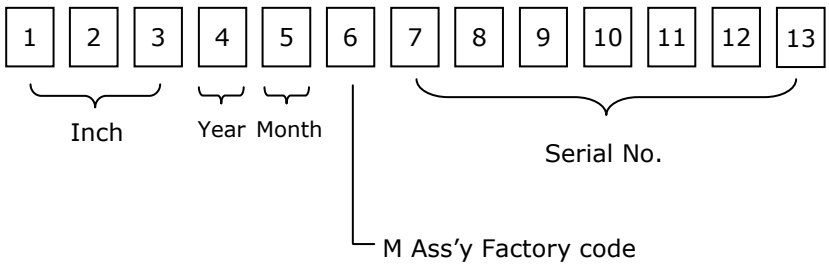

| NO. | DESCRIPTION | MATERIAL |
|---|---|---|
| 1 | LCD Module | |
| 2 | BAG | 55INCH |
| 3 | TAPE | MASKING 20MMX50M |
| 4 | PALLET | PLYWOOD |
| 5 | PACKING,BOTTOM | EPS |
| 6 | PACKING,TOP | EPS |
| 7 | ANGLE,PACKING | PAPER |
| 8 | ANGLE,COVER | PAPER |
| 9 | BAND | PP |
| 10 | BAND,CLIP | STEEL |
| 11 | LABEL | YUPO 80G 100X70 |

**# APPENDIX- II-1**

## ■ LC550WUD-SCA1-LCM Label

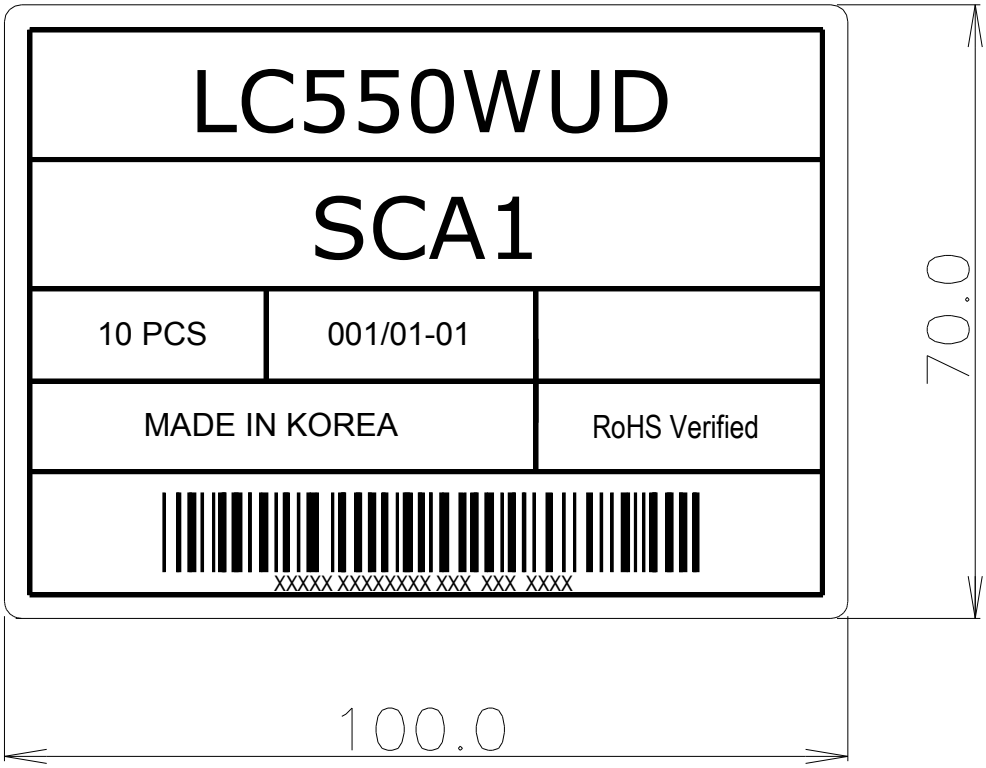



## ■ Serial No. (See CAS 27page for more information)



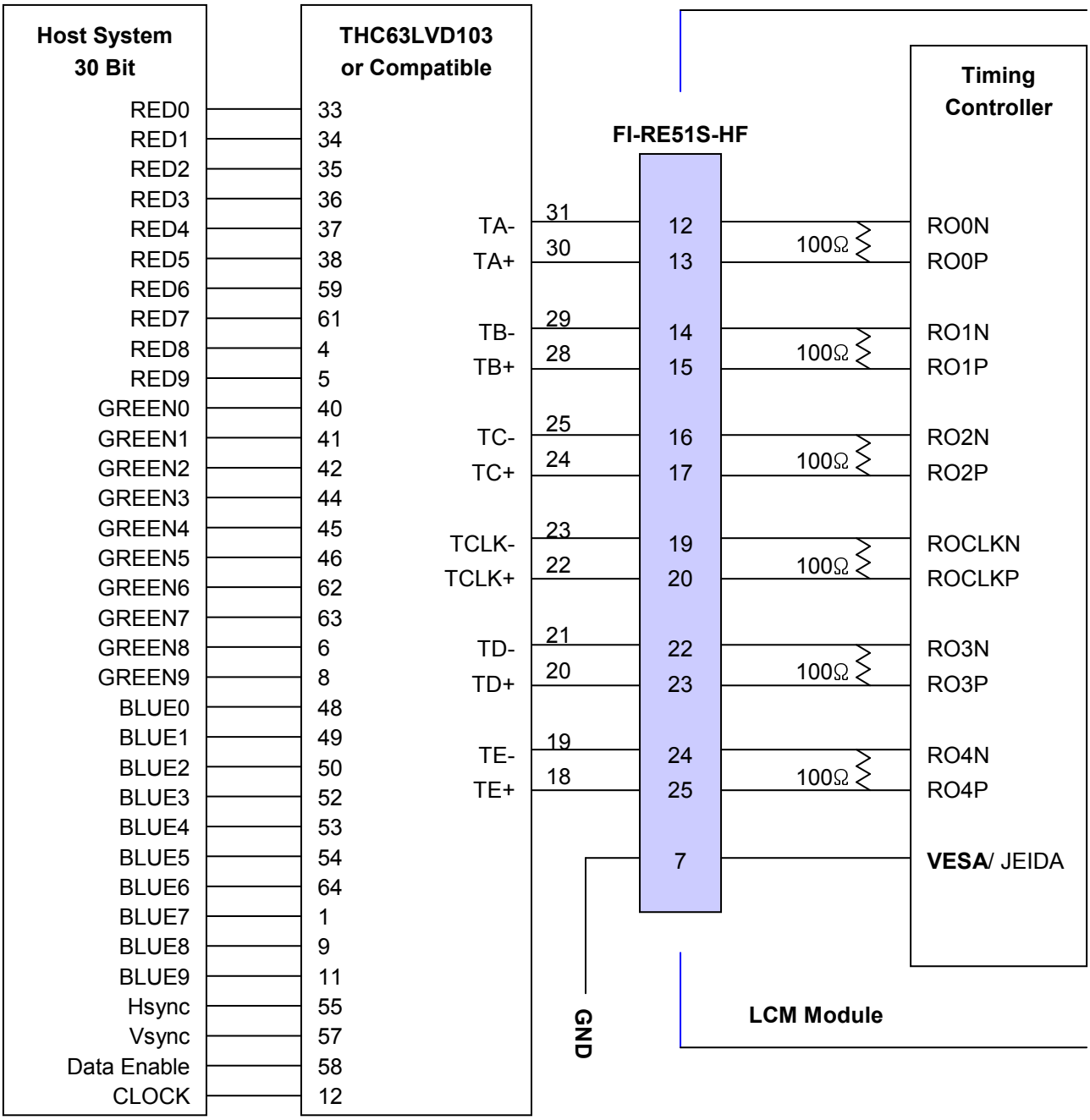
**# APPENDIX- II-2**

■ LC550WUD-SCA1-Pallet Label



## # APPENDIX- III-1

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



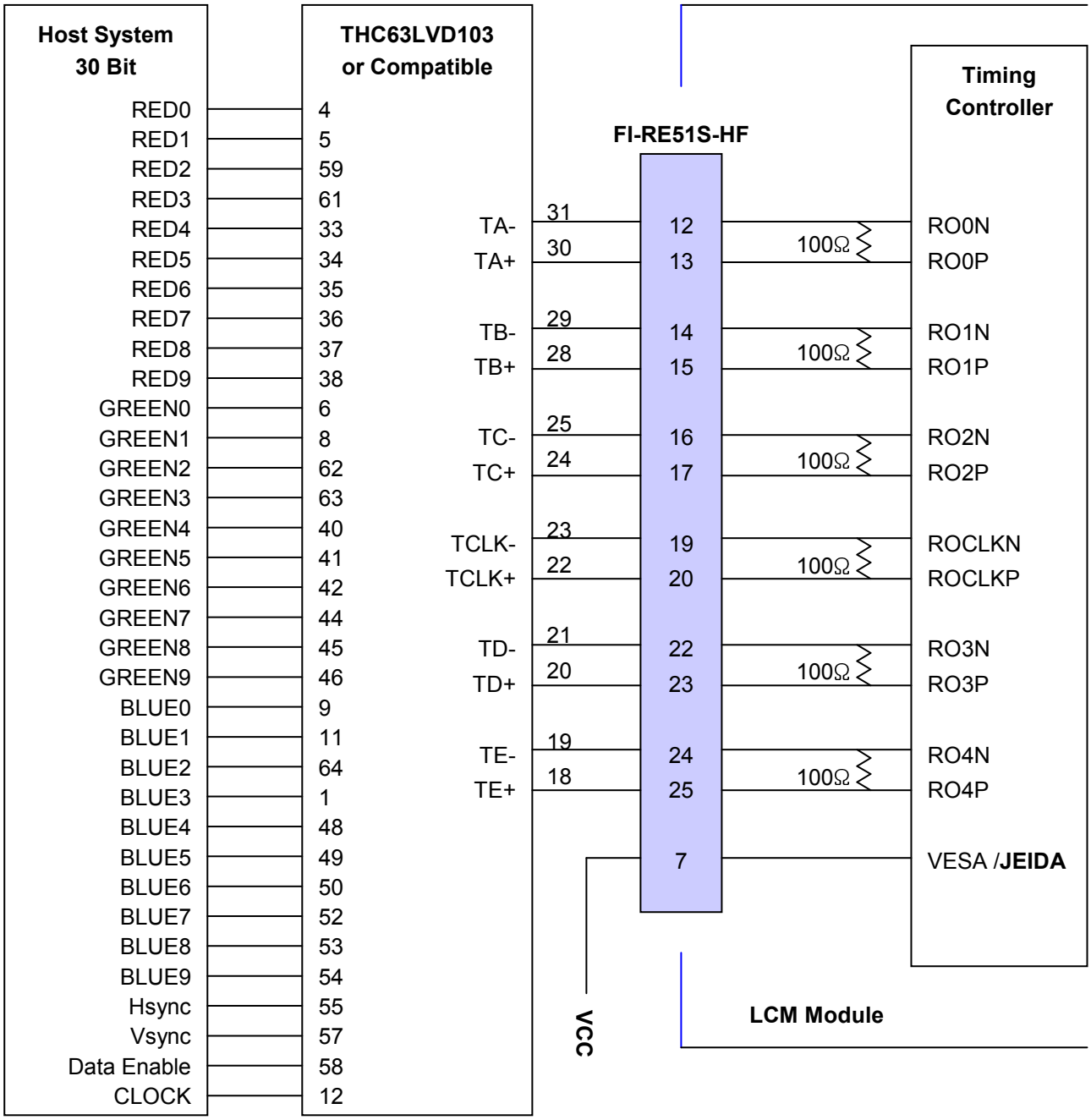

Note: 1. The LCD module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.

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- III-1

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




Note :1. The LCD module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.

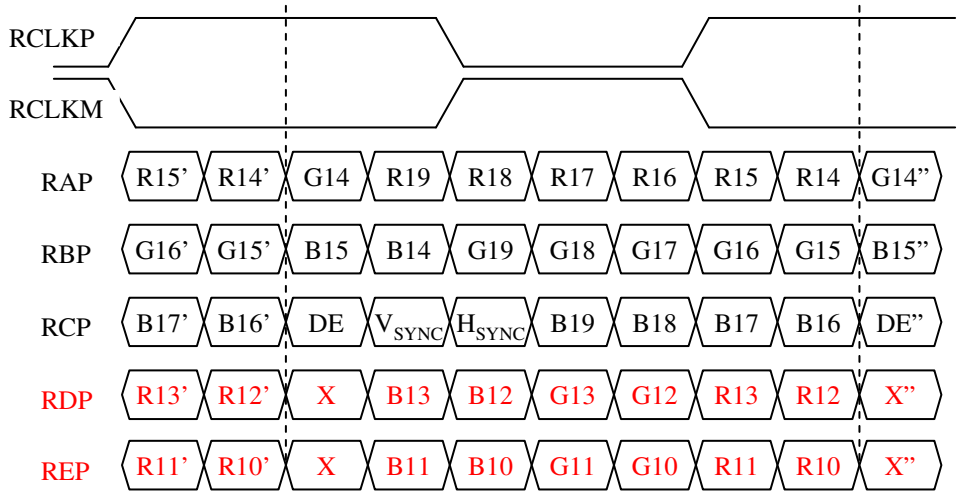
2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (THC63LVD103 or Compatible)

3. '9' means MSB and '0' means LSB at R,G,B pixel data.

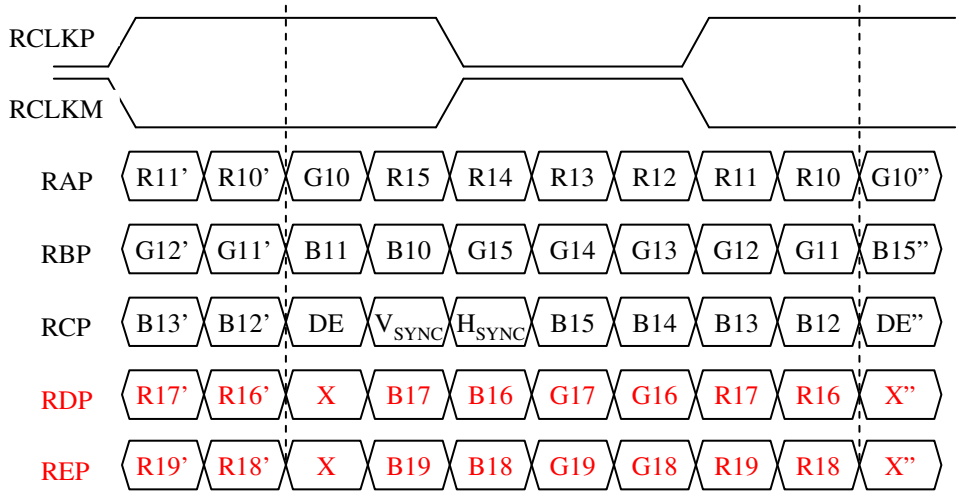
## # APPENDIX- III-2

### ■ LVDS Data-Mapping Information (**10 Bit** )

1) LVDS Select : "**H**" Data-Mapping (**JEIDA format**)



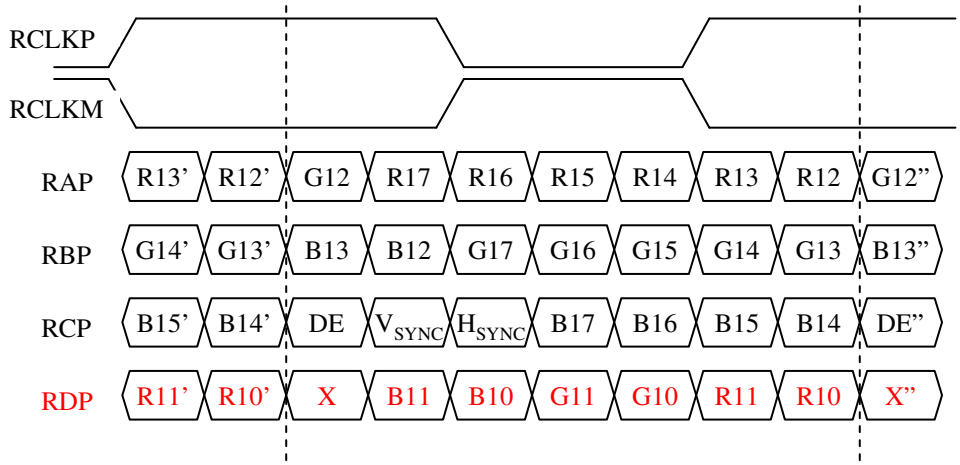

2) LVDS Select : "**L**" Data-Mapping (**VESA format**)



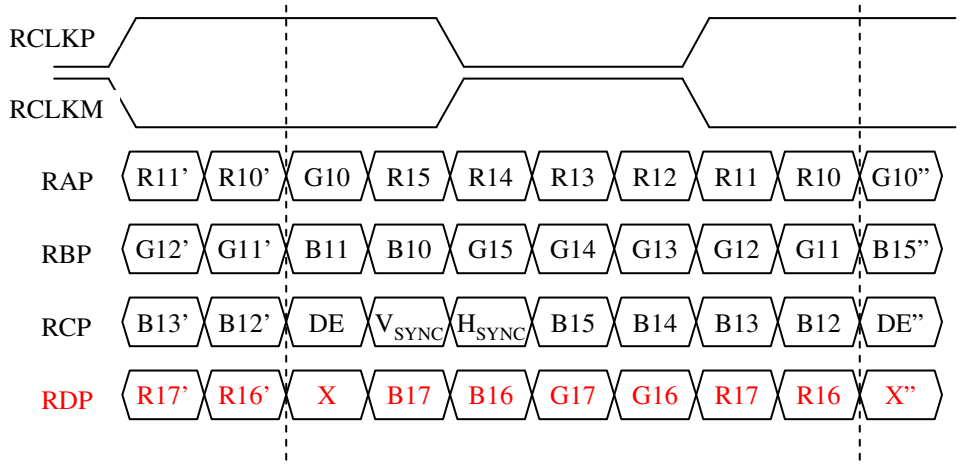
## # APPENDIX- III-2

### ■ LVDS Data-Mapping Information (**8 Bit** )

1) LVDS Select : "**H**" Data-Mapping (**JEIDA format**)



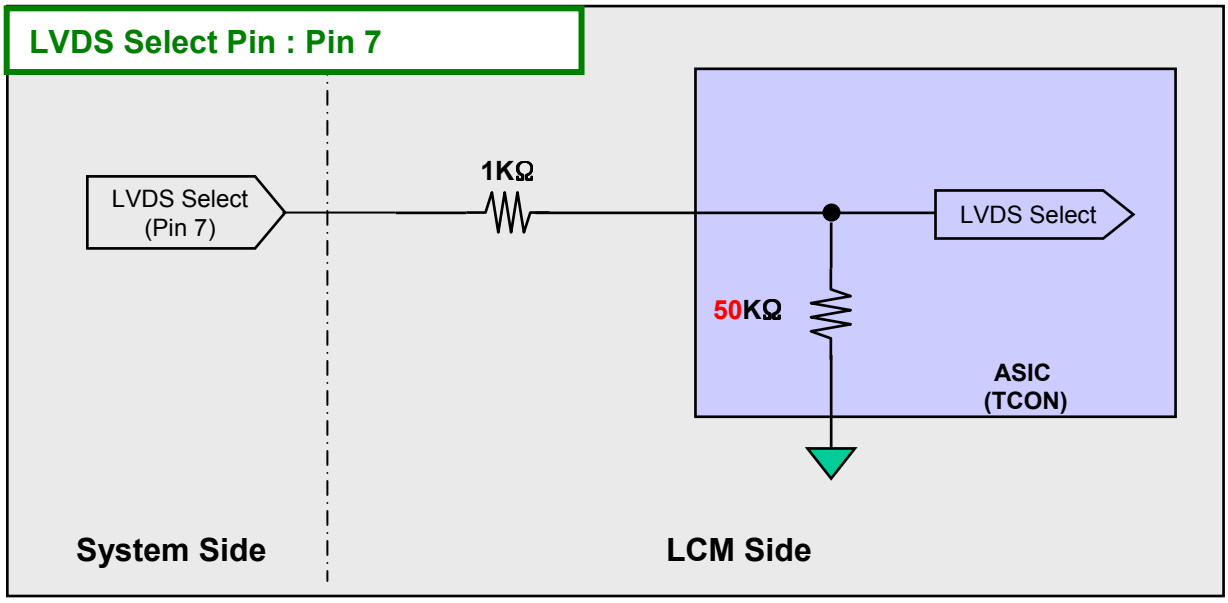

2) LVDS Select : "**L**" Data-Mapping (**VESA format**)



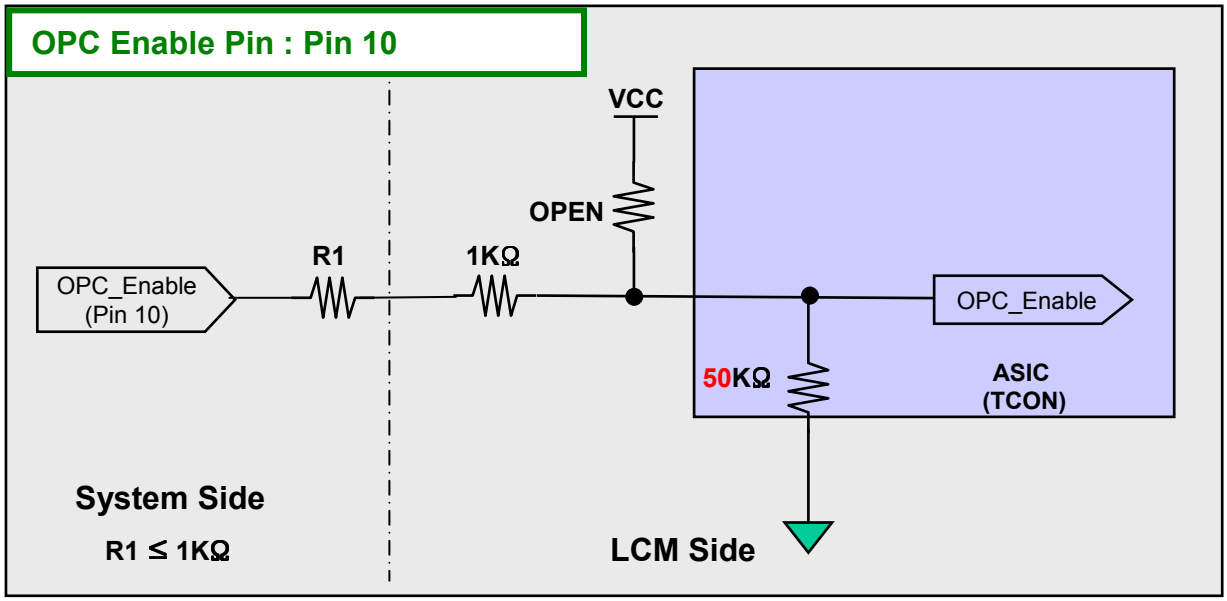
## # APPENDIX- III-3

## ■ **Option Pin** Circuit Block Diagram

1) Circuit Block Diagram of **LVDS Format** Selection pin



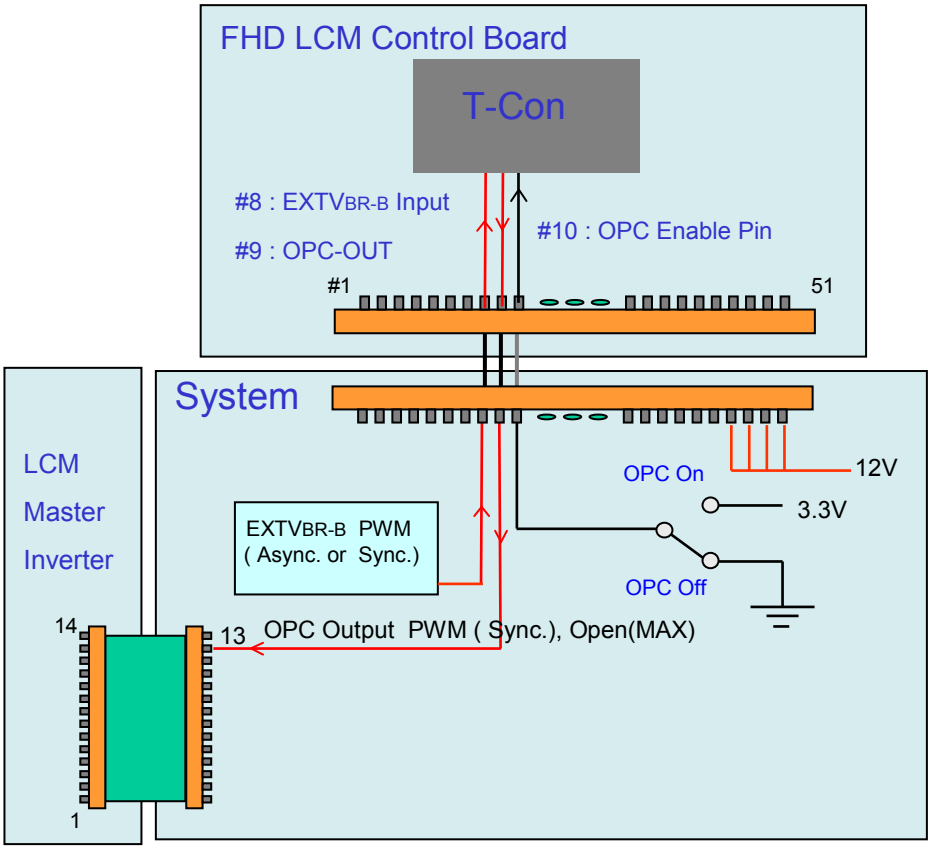

2) Circuit Block Diagram of **OPC Enable** Selection pin



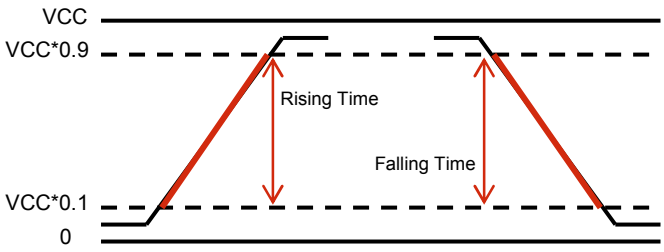
## # APPENDIX- III-4

### ■ EXTVBR-B & OPC Design Guide

1) When OPC Enable is “L", OPC Output = System Dimming.
2) OPC Output( PWM Signal) is synchronized with V-Sync Freq. of System in T-Con Board.
3) Regardless of OPC, System should always give dimming Signal (EXTVBR-B) to T-con.
4) PWM Specification ( VCC = 3.3V ) @ OPC
   a) PWM High Voltage Range : 2.5 V ~ 3.6 V
   b) PWM Low Voltage Range : 0.0 V ~ 0.8 V




| | |
|---|---|
| Input Frequency | MAX 1Khz (Recommendation: 50~300Hz) |
| Rising Time | MAX 10.0 μs |
| Falling Time | MAX 10.0 μs |



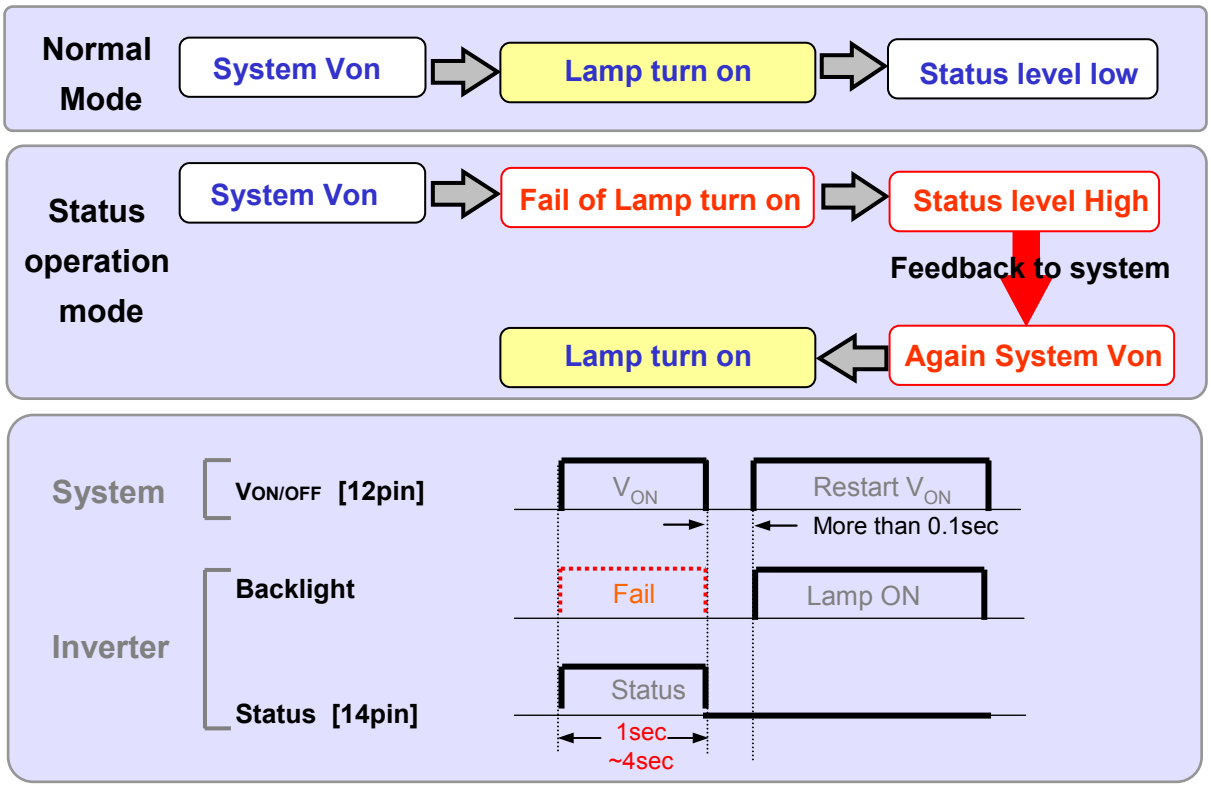
## # APPENDIX- IV-1

### ■ Inverter 14th Pin (**Status**) Design Guide

1) Function of Status pin

- Purpose : Preventing of backlight off by restarting the inverter technically
- How to : When inverter is abnormal operation, TV system inputs the Von signal in the inverter once more to turn on the lamp safely
- Attention : Restart system's Von signal when status pin is high for some time (min:1sec , max:4sec). (The turn on time of lamp can be late such as the low temperature or the storage time)

2) Status operation modes in TV set




3) Inverter pin map

| Pin No | Symbol | Description | Inv. |
|---|---|---|---|
| 11 | NC | No Connection | NC |
| 12 | VON/OFF | Backlight ON/OFF control | On/Off |
| 13 | **EXTVBR-B** | Burst Dimming Control PWM signal input | External PWM |
| **14** | Status | **Normal : Under 0.7V / Abnormal : Upper 3.0V** | **status** |

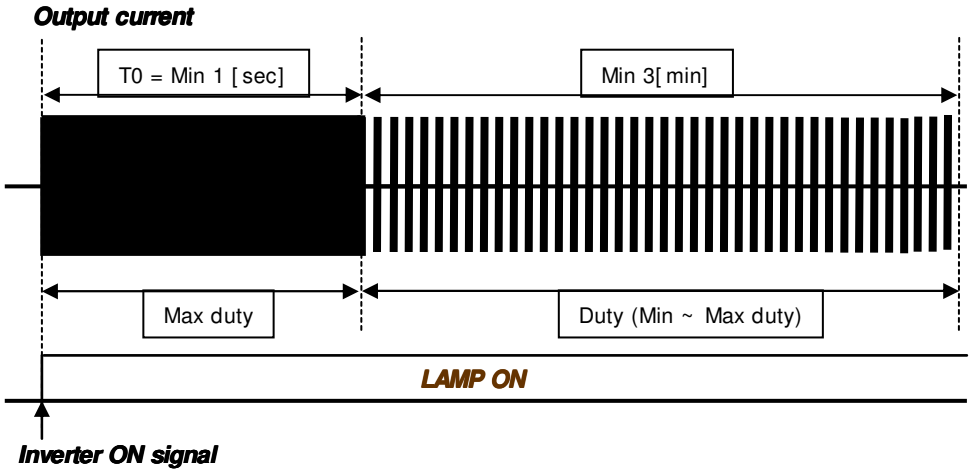
## # APPENDIX- IV-2

## ■ **Mega DCR** Using Condition (1)

● The Deep Dimming means using the input PWM duty less than Min duty.
The input PWM duty (Min & Max duty) refer to the table 3 on the page 7.

The Deep Dimming must be used very carefully due to limitation of lamp characteristics and specification.

1) For stable lamp on, its duty condition should follow below the condition.
After Inverter ON signal, T0 duration should be sustained.




2) B/L may not satisfy some of LCM specification at the Deep Dimming.

- Duration : The Deep Dimming must be limited within 10 minutes.

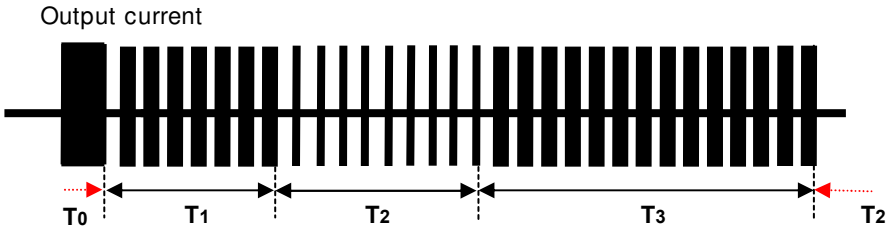
- Ratio : The operation time of the Deep Dimming must be less than 1/5 time of the Normal Duty (Min ~ Max duty) operation in a certain period to prevent unwanted operation.

- FOS : Partial darkness or darkness of center area during the Deep Dimming might be happened due to insufficient lamp current.

- Warm up : The Normal Duty (Min ~ Max duty) must be used 3 min after the lamps “ON”. In case of low temperature, more warm up time may be needed.

## # APPENDIX- IV-2

## ■ **Mega DCR** Using Condition (2)




| Parameter | Value | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min | Typ | Max | | |
| **T1** | 3 | - | - | min | Min ~ Max duty |
| **T2** | - | - | 10 | min | 0 ~ Min duty |
| **T3** | **T2** x 5 | - | - | min | Min ~ Max duty |

3) Following the recommended conditions as aforementioned, there is no difference of lamp lifetime between conventional method and new one.

## # APPENDIX- V-1

### ■ Gray to Gray Response Time Uniformity ($\delta_{G\,TO\,G}$)

This is only the reference data of G to G and uniformity for LC550WUD-SCA1 model.

1. G to G Response Time :
   Response time is defined as Figure3 and shall be measured by switching the input signal for "Gray (N) " and "Gray(M)".(32Gray Step at 8bit)

2. G to G Uniformity
   The variation of G to G Uniformity , $\delta_{G\,to\,G}$ is defined as :

$$\text{G to G Uniformity} = \frac{Maximum(GtoG) - Typical(GtoG)}{Typical(GtoG)} \leq 1$$

*Maximum (GtoG) means maximum value of measured time (N, M = 0 (Black) ~ 255(White), 32 gray step).

| | 0Gray | 32Gray | 64Gray | … | 223Gray | 255Gray |
|---|---|---|---|---|---|---|
| 0Gray | | TrR:0G→32G | TrR:0G→64G | … | TrR:0G→223G | TrR:0G→255G |
| 32Gray | TrD:32G→0G | | TrR:32G→64G | … | TrR:32G→223G | TrR:32G→255G |
| 64Gray | TrD:64G→0G | TrD:64G→32G | | … | TrR:64G→223G | TrR:64G→255G |
| … | … | … | … | | … | … |
| 223Gray | TrD:223G→0G | TrD:223G→32G | TrD:223G→64G | … | | TrR:223G→255G |
| 255Gray | TrD:255G→0G | TrD:255G→32G | TrD:255G→64G | … | TrD:255G→223G | |

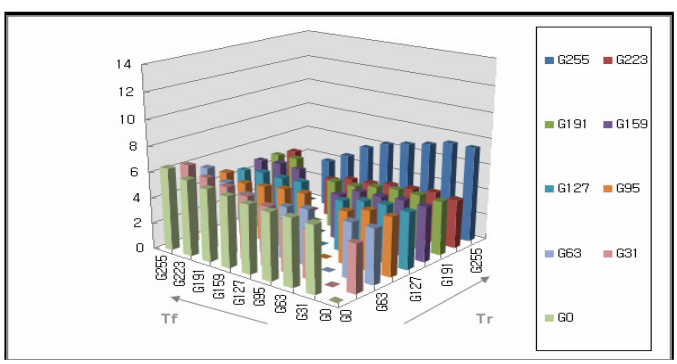
3. Sampling Size : 2 pcs

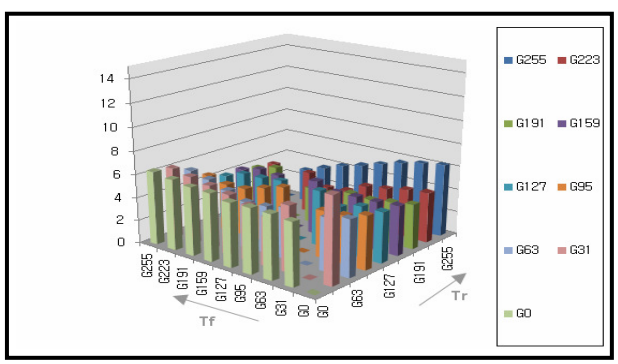
4. Measurement Method : Follow the same rule as optical characteristics measurement.

5. Current Status

   Below table is actual data of production on 11. 18. 2009 ( LGD RV Event Sample)

| Sample | G to G Response Time [ms] | | Uniformity |
|---|---|---|---|
| | Min. | Max. | |
| # 1 | 3.08 | 7.42 | 0.484 |
| # 2 | 2.68 | 7.44 | 0.488 |



## # APPENDIX- V-2

### ■ MPRT Response Time Uniformity ($\delta_{MPRT}$)

This is only the reference data of MPRT and uniformity for LC550WUD-SCA1 model.

1. MPRT Response Time :
   Response time is defined as Figure3

2. MPRT Uniformity
   The variation of MPRT Uniformity , $\delta_{MPRT}$ is defined as :

$$\text{MPRT Uniformity} = \frac{Maximum\ (MPRT) - Typical\ (MPRT)}{Typical\ (MPRT)} \leq 1$$

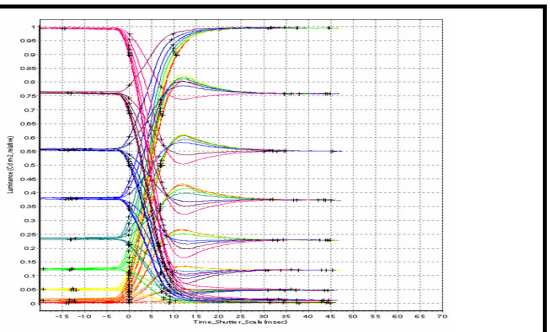
3. Sampling Size : 2 pcs

4. Measurement Method : Follow the same rule as optical characteristics measurement.

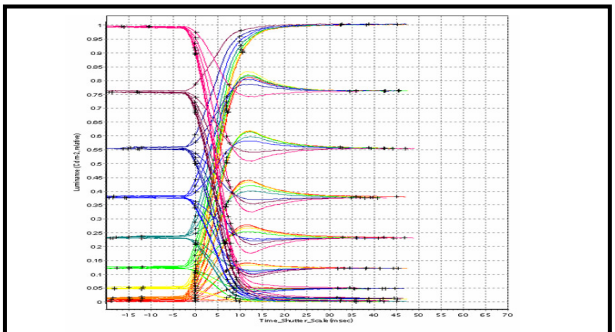
5. Current Status

   Below table is actual data of production on 11. 18. 2009 ( LGD RV Event Sample)

| Sample | MPRT Response Time [ms] | | Uniformity |
|---|---|---|---|
| | Min. | Max. | |
| # 1 | 6.38 | 10.56 | 0.32 |
| # 2 | 6.45 | 10.47 | 0.31 |



| | Ini: 0 | Ini: 1 | Ini: 2 | Ini: 3 | Ini: 4 | Ini: 5 | Ini: 6 | Ini: 7 | Ini: 8 |
|---|---|---|---|---|---|---|---|---|---|
| Fin: 0 | | | 9.073495 | 8.953429 | 9.05489 | 9.111049 | 9.162969 | 9.328393 | 9.618832 |
| Fin: 1 | | | 7.555462 | 7.618907 | 8.224287 | 8.593951 | 8.911819 | 9.148112 | 9.578669 |
| Fin: 2 | 7.271152 | 7.146867 | | 7.565355 | 7.18162 | 7.245485 | 7.875577 | 8.357251 | 8.916365 |
| Fin: 3 | 7.149716 | 6.985744 | 6.886341 | | 7.912505 | 7.36032 | 7.327797 | 7.238712 | 7.843162 |
| Fin: 4 | 6.757127 | 6.653591 | 6.596761 | 6.381182 | | 8.23555 | 7.705626 | 7.640511 | 7.249587 |
| Fin: 5 | 6.786358 | 6.793403 | 6.85982 | 7.05028 | 7.105495 | | 8.245686 | 7.68206 | 7.298319 |
| Fin: 6 | 7.082909 | 7.260001 | 7.108049 | 7.024955 | 7.114591 | 6.519435 | | 7.67168 | 7.161649 |
| Fin: 7 | 7.443319 | 7.314516 | 6.960496 | 7.008594 | 6.890252 | 6.771311 | 6.82792 | | 7.134677 |
| Fin: 8 | 10.55568 | 10.47298 | 10.30112 | 10.06912 | 9.924068 | 9.651348 | 9.473015 | 9.636272 | |
| average | 7.894537 | | | | | | | | |
| standard d | 1.118908 | | | | | | | | |
| maximum | 10.55568 | | | | | | | | |
| minimum | 6.381182 | | | | | | | | |



| | Ini: 0 | Ini: 1 | Ini: 2 | Ini: 3 | Ini: 4 | Ini: 5 | Ini: 6 | Ini: 7 | Ini: 8 |
|---|---|---|---|---|---|---|---|---|---|
| Fin: 0 | | | 9.116286 | 8.899772 | 8.955536 | 9.017742 | 9.168146 | 9.283536 | 9.576694 |
| Fin: 1 | | | 6.947934 | 7.550599 | 8.23194 | 8.574688 | 8.864113 | 9.11977 | 9.528864 |
| Fin: 2 | 7.148114 | 7.022497 | | 8.113736 | 7.531097 | 7.261326 | 7.793531 | 8.284279 | 8.937772 |
| Fin: 3 | 6.768512 | 6.904668 | 6.998658 | | 7.86322 | 7.663983 | 7.55506 | 7.576811 | 7.861778 |
| Fin: 4 | 6.55621 | 6.718442 | 6.655122 | 6.445227 | | 8.490246 | 8.015453 | 7.851114 | 7.299705 |
| Fin: 5 | 6.70831 | 6.80739 | 6.737651 | 6.991225 | 7.237719 | | 8.232635 | 7.748323 | 7.384808 |
| Fin: 6 | 7.100298 | 7.047563 | 7.012376 | 6.950051 | 7.06588 | 6.720331 | | 7.596461 | 7.085024 |
| Fin: 7 | 7.384651 | 7.213899 | 6.94182 | 7.000457 | 6.979176 | 6.833875 | 6.945591 | | 7.288063 |
| Fin: 8 | 10.42276 | 10.47002 | 10.39103 | 10.20704 | 10.0791 | 9.895855 | 9.923437 | 10.13659 | |
| average | 7.924166 | | | | | | | | |
| standard d | 1.151597 | | | | | | | | |
| maximum | 10.47002 | | | | | | | | |
| minimum | 6.445227 | | | | | | | | |