# SPECIFICATION
# FOR
# APPROVAL

( ) **Preliminary Specification**

(●) **Final Specification**

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

| BUYER | GENERAL |
|---|---|
| MODEL | |

| SUPPLIER | LG DISPLAY Co., Ltd. |
|---|---|
| *MODEL | LD550DUN |
| SUFFIX | TMA4(RoHS Verified) |

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

| APPROVED BY | SIGNATURE / DATE |
|---|---|
| JaeBum Chun / Team Leader | |
| **REVIEWED BY** | |
| JongSeob Won / Project Leader | |
| **PREPARED BY** | |
| HyoJoon Park / Engineer | |

**PD Product Design Dept.**
**LG Display Co., Ltd**

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# RECORD OF REVISIONS

| Revision No. | Revision Date | Page | Description |
|---|---|---|---|
| 1.0 | Nov. 26. 2018 | - | Final CAS |
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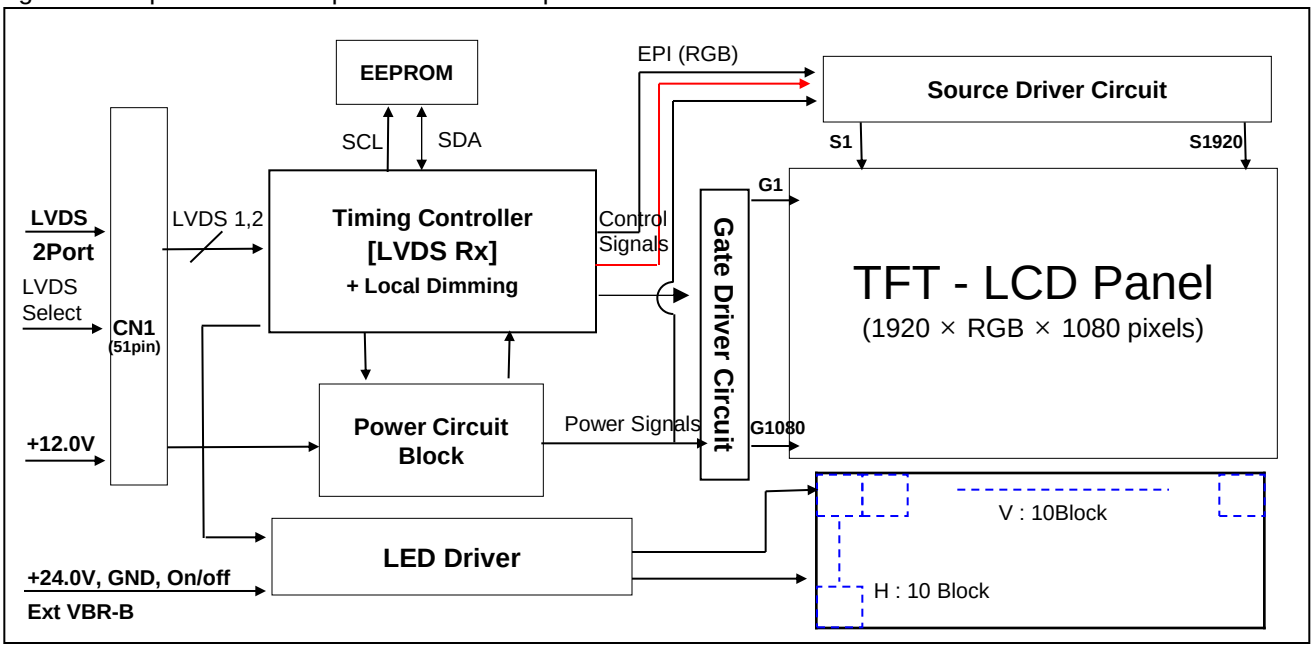
## 1. General Description

The LD550DUN is a Color Active Matrix Liquid Crystal Display with an integral Light Emitting Diode (LED) Local Block 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 1.07Bilion colors.
It has been designed to apply the 10-bit 2-port LVDS interface.
It is intended to support commercial Display 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(1387.83mm) diagonal |
| Outline Dimension | 1210.51 x 681.22 x 53.3(D) |
| Pixel Pitch | 0.630(H) X 0.630(V) |
| Pixel Format | 1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement |
| Color Depth | 10Bit (D), 1.07 Billion colors |
| Luminance, White | 500 cd/m2 (Center 1point ,Typ.) |
| Viewing Angle (CR>10) | Viewing angle free ( R/L 178 (Min.), U/D 178 (Min.)) |
| Power Consumption | Total 203.6W (Typ.) [Logic=6.6W, Backlight=197.0W (@EXTVBR-B = 100%)] |
| Weight | 12,500g (Typ.) |
| Display Mode | Transmissive mode, Normally black |
| Surface Treatment | Hard Coating(2H), Anti-glare treatment of the front polarizer ( Haze 28% ) |
| Possible Display Type | Landscape and Portrait Enabled |

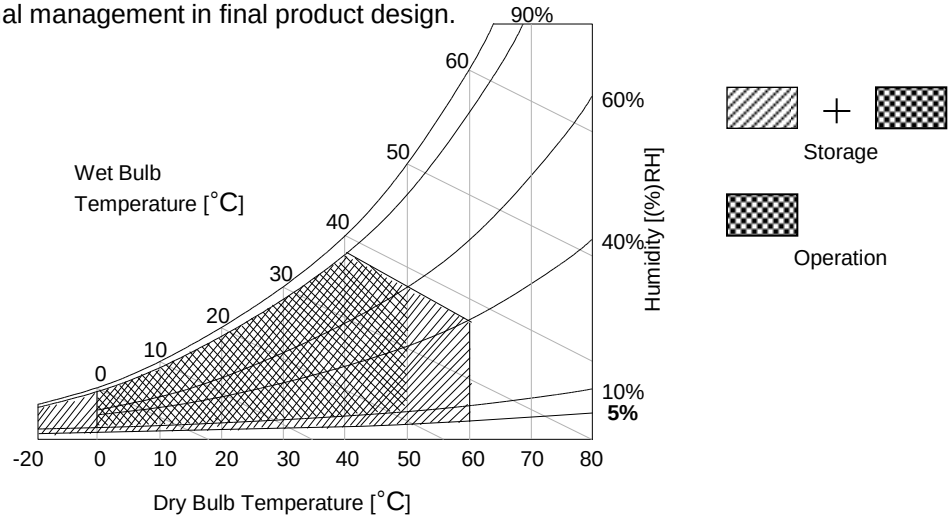
## 2. Absolute Maximum Ratings

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 |
| | Driver | $V_{BL}$ | -0.3 | + 27.0 | $V_{DC}$ | |
| Driver Control Voltage | ON/OFF | VON/OFF | -0.3 | +3.9 | $V_{DC}$ | |
| | Brightness | EXTVBR-B | -0.3 | +3.9 | $V_{DC}$ | |
| | Status | Status | -0.3 | +3.9 | $V_{DC}$ | |
| T-Con Option Selection Voltage | | $V_{LOGIC}$ | -0.3 | +4.0 | $V_{DC}$ | |
| Operating Temperature | | $T_{OP}$ | 0 | +50 | ˚C | 2,3 |
| Storage Temperature | | $T_{ST}$ | -20 | +60 | ˚C | |
| Panel Front Temperature | | $T_{SUR}$ | - | +68 | ˚C | 4 |
| Operating Ambient Humidity | | $H_{OP}$ | 10 | 90 | %RH | 2,3 |
| Storage Humidity | | $H_{ST}$ | 5 | 90 | %RH | |

Note.
1. Ambient temperature condition (Ta = 25 ± 2 ˚C )
2. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be Max 39˚C, and no condensation of water.
3. Gravity mura can be guaranteed below 40˚C 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 68˚C 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 68℃. The range of operating temperature may be degraded in case of improper thermal management in final product design.



# 3. Electrical Specifications

## 3-1. Electrical Characteristics

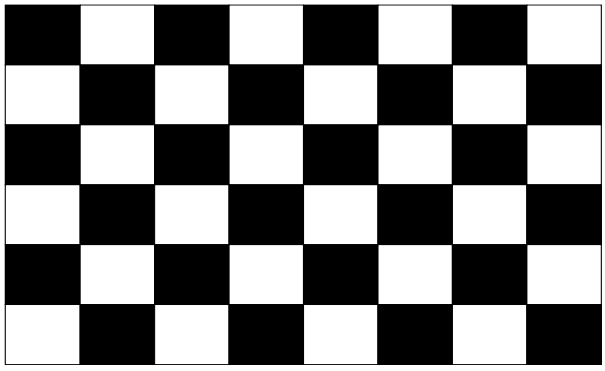
It requires two power inputs. One is employed to power for the LCD circuit. The other Is used for the LED backlight and LED Driver circuit.

**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 | | $I_{LCD}$ | - | 550 | 715 | mA | 1 |
| | | | - | 680 | 884 | mA | 2 |
| T-CON Option Selection Voltage | Input High Voltage | $V_{IH}$ | 2.7 | - | 3.6 | $V_{DC}$ | |
| | Input Low Voltage | $V_{IL}$ | 0 | - | 0.7 | $V_{DC}$ | |
| Power Consumption | | $P_{LCD}$ | - | 6.6 | 8.58 | Watt | 1 |
| Rush current | | $I_{RUSH}$ | - | - | 6 | A | 3 |

Notes: 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 maximum current pattern.
3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).
4. Ripple voltage level is recommended under ±5% of typical voltage

White : 1023Gray
Black : 0Gray



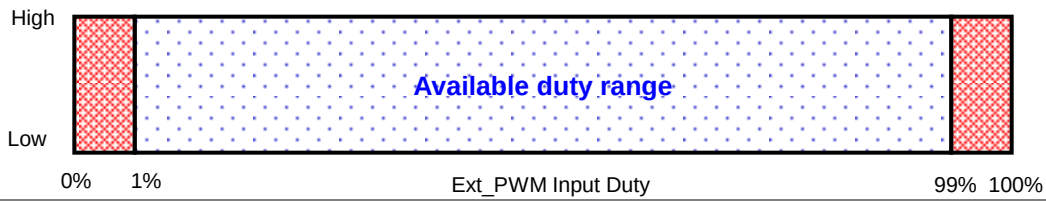
Mosaic Pattern(8 x 6)

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

| Parameter | | | Symbol | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | | |
| LED Driver : | | | | | | | | |
| Power Supply Input Voltage | | | VBL | 21.6 | 24.0 | 26.4 | Vdc | 1 |
| Power Supply Input Current | | | IBL | - | 8.2 | 9.6 | A | Ext $V_{BR-B}$ = 100% |
| Power Supply Input Current (In-Rush) | | | Irush | - | - | 12.5 | A | $V_{BL}$ = 21.6V<br>Ext $V_{BR-B}$ = 100%<br>3 |
| Power Consumption | | | PBL | - | 197.0 | 230.3 | W | Ext $V_{BR-B}$ = 100% |
| Input Voltage for Control System Signals | On/Off | On | V on | 2.5 | - | 3.6 | Vdc | |
| | | Off | V off | -0.3 | 0.0 | 0.7 | Vdc | |
| | Brightness Adjust | | ExtVBR-B | 1 | - | 100 | % | On Duty, 5 |
| | PWM Frequency for NTSC & PAL | | PAL | | 100 | | Hz | 2 |
| | | | NTSC | | 120 | | Hz | 2 |
| | Pulse Duty Level (PWM) | | High Level | 2.5 | - | 3.6 | Vdc | HIGH : on duty<br>LOW : off duty |
| | | | Low Level | 0.0 | - | 0.7 | Vdc | |
| LED : | | | | | | | | |
| Life Time | | | | 50,000 | | | Hrs | 6 |

Notes :

1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 60 minutes at 25±2°C. The specified current and power consumption are under the typical supply Input voltage 24Vand $V_{BR}$ (Ext$V_{BR-B}$ : 100%), it is total power consumption.
2. LGD recommend that the PWM freq. is synchronized with Two times harmonic of V_sync signal of system. Though PWM frequency is over 120Hz (max 252Hz), function of LED Driver is not affected.
3. The duration of rush current is about 200ms. This duration is applied to LED on time.
4. Even though inrush current is over the specified value, there is no problem if $I^2T$ spec of fuse is satisfied.
5. Ext_PWM Signal have to input available duty range.
   Between 99% and 100% Ext$V_{BR-B}$ duty have to be avoided. ( 99% < Ext$V_{BR-B}$ < 100%)
   But Ext$V_{BR-B}$ 0% and 100% is possible.
6. The life time is determined as the time at which brightness of the LED is 50% compared to that of initial value at the typical LED current on condition of continuous operating at 25 ± 2°C, based on duty 100%.



## 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 and Slave 12-pin connectors are used for the integral backlight system.

### 3-2-1. LCD Module

- LCD Connector(CN1): FI-RE51S-HF, Refer to below table.
- Mating Connector : FI-RE51HL

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

| No | Symbol | Description | No | Symbol | Description |
|---|---|---|---|---|---|
| 1 | Reverse | 'H' = Reverse, 'L' = Forward | 27 | Bit Select | H' or NC= 10bit(D) , 'L' = 8bit |
| 2 | NC | No Connection | 28 | RE0N | SECOND LVDS Receiver Signal (A-) |
| 3 | NC | No Connection | 29 | RE0P | SECOND LVDS Receiver Signal (A+) |
| 4 | NC | No Connection (Reserved for LGD) | 30 | RE1N | SECOND LVDS Receiver Signal (B-) |
| 5 | NC | No Connection (Reserved for LGD) | 31 | RE1P | SECOND LVDS Receiver Signal (B+) |
| 6 | NC | No Connection (Reserved for LGD) | 32 | RE2N | SECOND LVDS Receiver Signal (C-) |
| 7 | LVDS Select | 'H' =JEIDA , 'L' = VESA | 33 | RE2P | SECOND LVDS Receiver Signal (C+) |
| 8 | SCL | LED Driver Defect Detecting | 34 | GND | Ground |
| 9 | SDA | LED Driver Defect Detecting | 35 | RECLKN | SECOND LVDS Receiver Clock Signal(-) |
| 10 | Local Dimming | 'H' =Enable only | 36 | RECLKP | SECOND LVDS Receiver Clock Signal(+) |
| 11 | GND | Ground | 37 | GND | Ground |
| 12 | RO0N | FIRST LVDS Receiver Signal (A-) | 38 | RE3N | SECOND LVDS Receiver Signal (D-) |
| 13 | RO0P | FIRST LVDS Receiver Signal (A+) | 39 | RE3P | SECOND LVDS Receiver Signal (D+) |
| 14 | RO1N | FIRST LVDS Receiver Signal (B-) | 40 | RE4N | SECOND LVDS Receiver Signal (E-) |
| 15 | RO1P | FIRST LVDS Receiver Signal (B+) | 41 | RE4P | SECOND LVDS Receiver Signal (E+) |
| 16 | RO2N | FIRST LVDS Receiver Signal (C-) | 42 | NC | No Connection |
| 17 | RO2P | FIRST LVDS Receiver Signal (C+) | 43 | NC | No Connection |
| 18 | GND | Ground | 44 | NC | No Connection |
| 19 | ROCLKN | FIRST LVDS Receiver Clock Signal(-) | 45 | GND | Ground |
| 20 | ROCLKP | FIRST LVDS Receiver Clock Signal(+) | 46 | GND | Ground |
| 21 | GND | Ground | 47 | GND | Ground |
| 22 | RO3N | FIRST LVDS Receiver Signal (D-) | 48 | VLCD | Power Supply +12.0V |
| 23 | RO3P | FIRST LVDS Receiver Signal (D+) | 49 | VLCD | Power Supply +12.0V |
| 24 | RO4N | FIRST LVDS Receiver Signal (E-) | 50 | VLCD | Power Supply +12.0V |
| 25 | RO4P | FIRST LVDS Receiver Signal (E+) | 51 | VLCD | Power Supply +12.0V |
| 26 | NC | No Connection | - | - | - |

Notes:

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. It may be happened to Abnormal Display during the system interface signal is not
6. If Specific pin No. #7, #10, #27 is "NC" , LCD Module may be happened to Abnormal Display

※ Even when you use the reverse function, LCM can't be installed Reversed

7.Specially added pins #8 & #9, for LED Driver Defect Detecting (Appendix Ⅷ)

### 3-2-2. Backlight Module

Master

-LED Driver Connector

: 20022WR-14B2(Yeonho) / 20022WR-12B2(Yeonho)

- Mating Connector

: 20022HS-14 / 20022HS-12

**Table 5. LED DRIVER CONNECTOR PIN CONFIGULATION**

| Pin No | Symbol | Description | 14PIN | 12PIN | Note |
|---|---|---|---|---|---|
| 1 | VBL | Power Supply +24.0V | VBL | VBL | |
| 2 | VBL | Power Supply +24.0V | VBL | VBL | |
| 3 | VBL | Power Supply +24.0V | VBL | VBL | |
| 4 | VBL | Power Supply +24.0V | VBL | VBL | |
| 5 | VBL | Power Supply +24.0V | VBL | VBL | |
| 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 | Status | Status | Status | NC | 2 |
| 12 | VON/OFF | Backlight ON/OFF control | VON/OFF | NC | |
| 13 | EXTVBR-B | External PWM | EXTVBR-B | - | 3 |
| 14 | NC | No connection | NC | - | 1 |

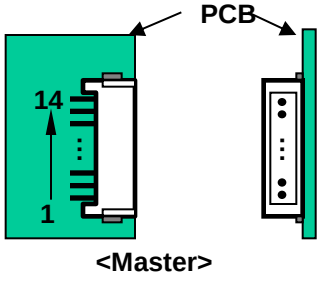
Notes :1. GND should be connected to the LCD module's metal frame.

2. Normal : Low (under 0.7V) / Abnormal :Open

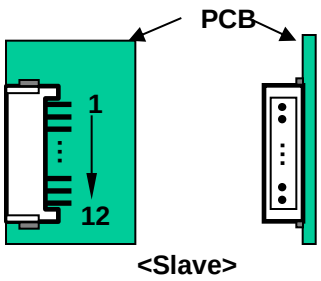
3. High : on duty / Low : off duty, Pin#13 can be opened. (if Pin #13 is open , EXTVBR-B is 100% )

4. Each impedance of pin #12 and #13 is over 50 [KΩ] .

◆ **Rear view of LCM**

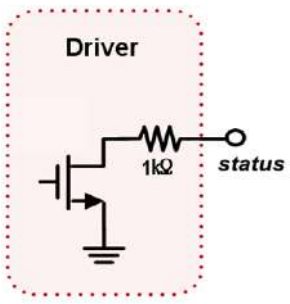



<Master>




<Slave>

◆ Status



## 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. TIMING TABLE for NTSC & PAL (DE Only Mode)**

| ITEM | | Symbol | Min | Typ | Max | Unit | notes |
|---|---|---|---|---|---|---|---|
| Horizontal | Display Period | $t_{HV}$ | 960 | 960 | 960 | tCLK | 1920 / 2 |
| | Blank | $t_{HB}$ | 100 | 140 | 240 | tCLK | 1 |
| | Total | $t_{HP}$ | 1060 | 1100 | 1200 | tCLK | |
| Vertical | Display Period | $t_{VV}$ | 1080 | 1080 | 1080 | Lines | |
| | Blank | $t_{VB}$ | 20 | 45 | 300 | Lines | 1 |
| | Total | $t_{VP}$ | 1100 | 1125 | 1380 | Lines | |

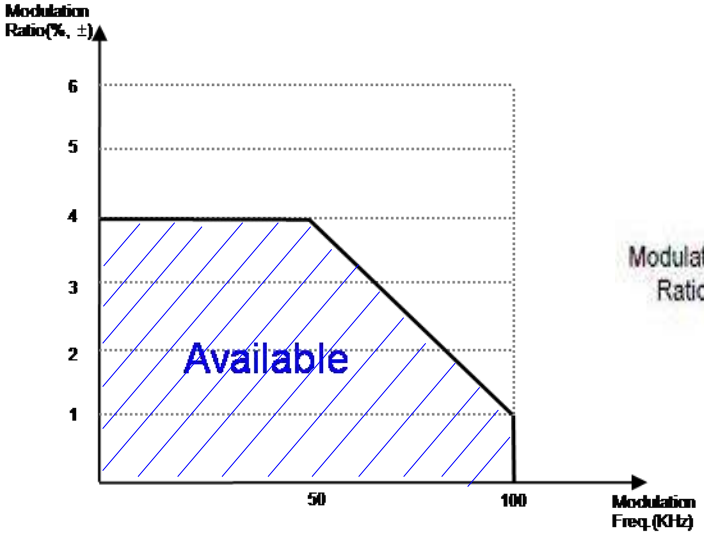
| ITEM | | Symbol | Min | Typ | Max | Unit | notes |
|---|---|---|---|---|---|---|---|
| Frequency | DCLK | $f_{CLK}$ | 63.00 | 74.25 | 78.00 | MHz | |
| | Horizontal | $f_H$ | 57.3 | 67.5 | 70 | KHz | 2 |
| | Vertical | $f_V$ | 47 | 60 | 63 | Hz | 2 |

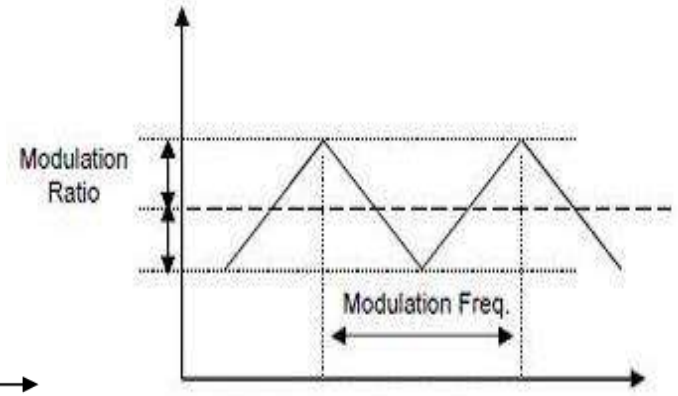
Note: 1. The input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode). If you use spread spectrum of EMI, add some additional clock to minimum value for clock margin.

2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency

3. Spread Spectrum Rate (SSR) for 50KHz ~ 100kHz Modulation Frequency(FMOD) is calculated by (7 – 0.06*Fmod), where Modulation Frequency (FMOD) unit is KHz.
LVDS Receiver Spread spectrum Clock is defined as below figure

※ Timing should be set based on clock frequency.



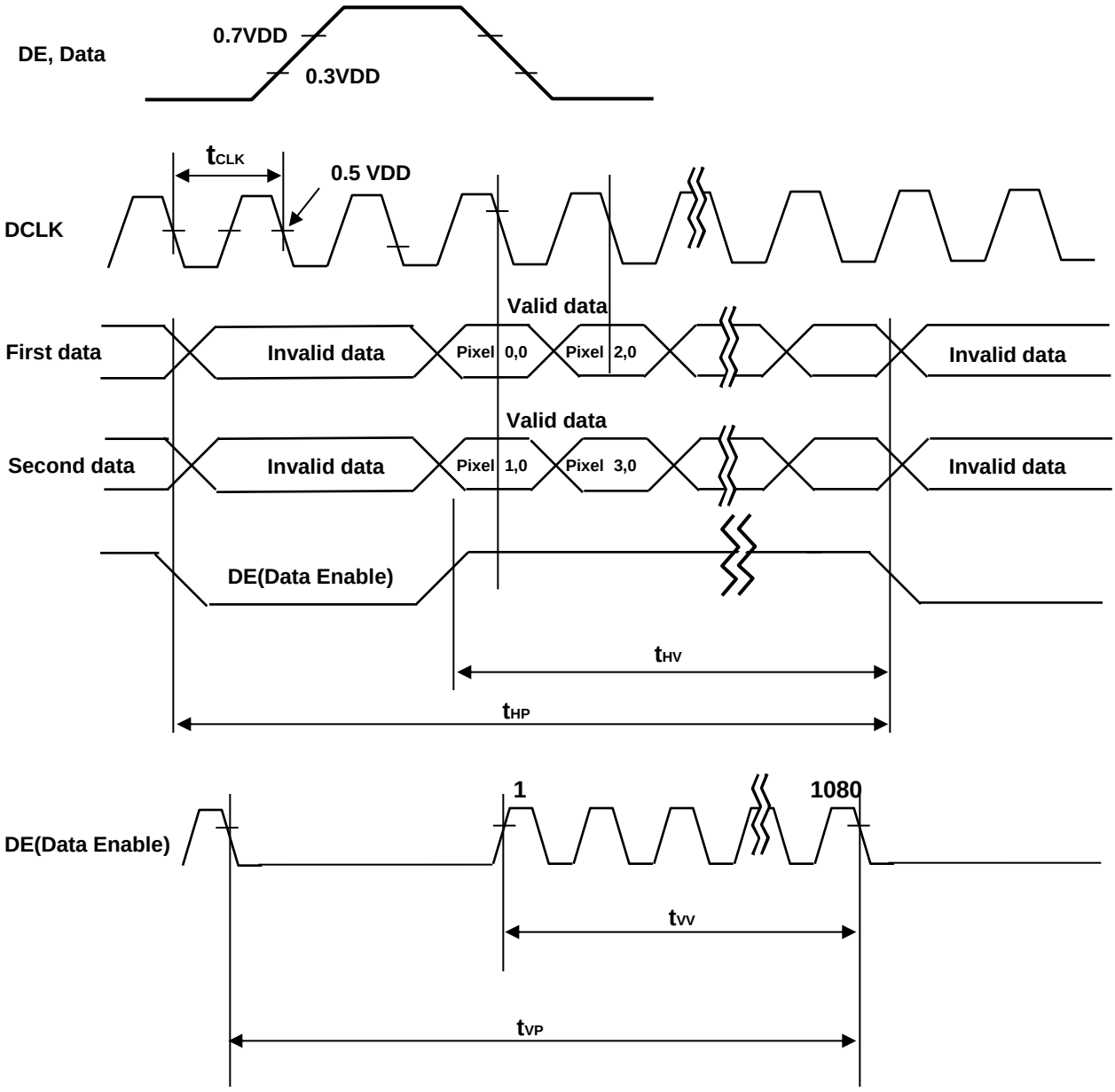

※ Please pay attention to the followings when you set Spread Spectrum Rate(SSR) and Modulation Frequency(FMOD)

1. Please set proper Spread Spectrum Rate(SSR) and Modulation Frequency (FMOD) of TV system LVDS output.

2. Please check FOS after you set Spread Spectrum Rate(SSR) and Modulation Frequency(FMOD) to avoid abnormal display. Especially, harmonic noise can appear when you use Spread Spectrum under FMOD 30 KHz.

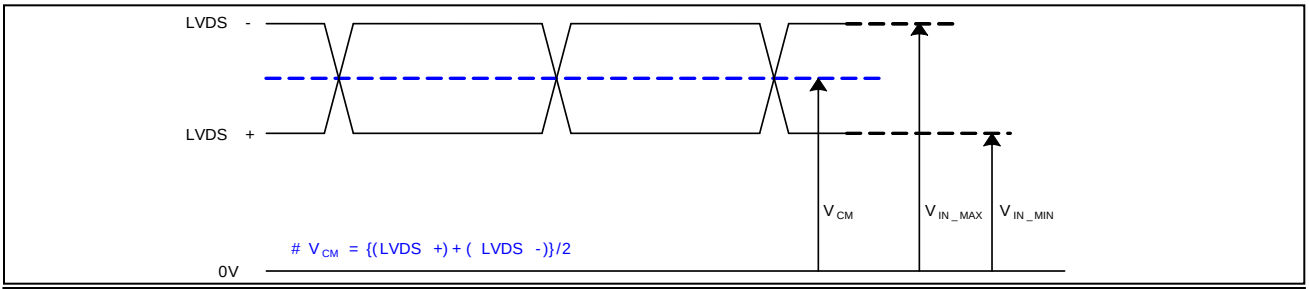
## 3-4. LVDS Signal Specification

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



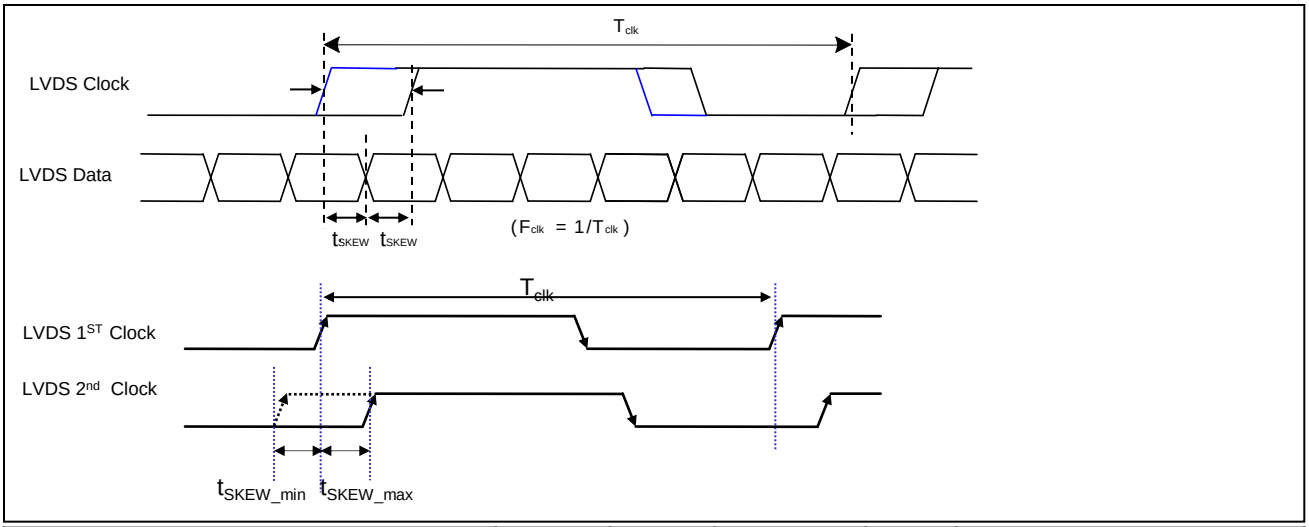
### 3-4-2. LVDS Input Signal Characteristics

#### 1) DC Specification



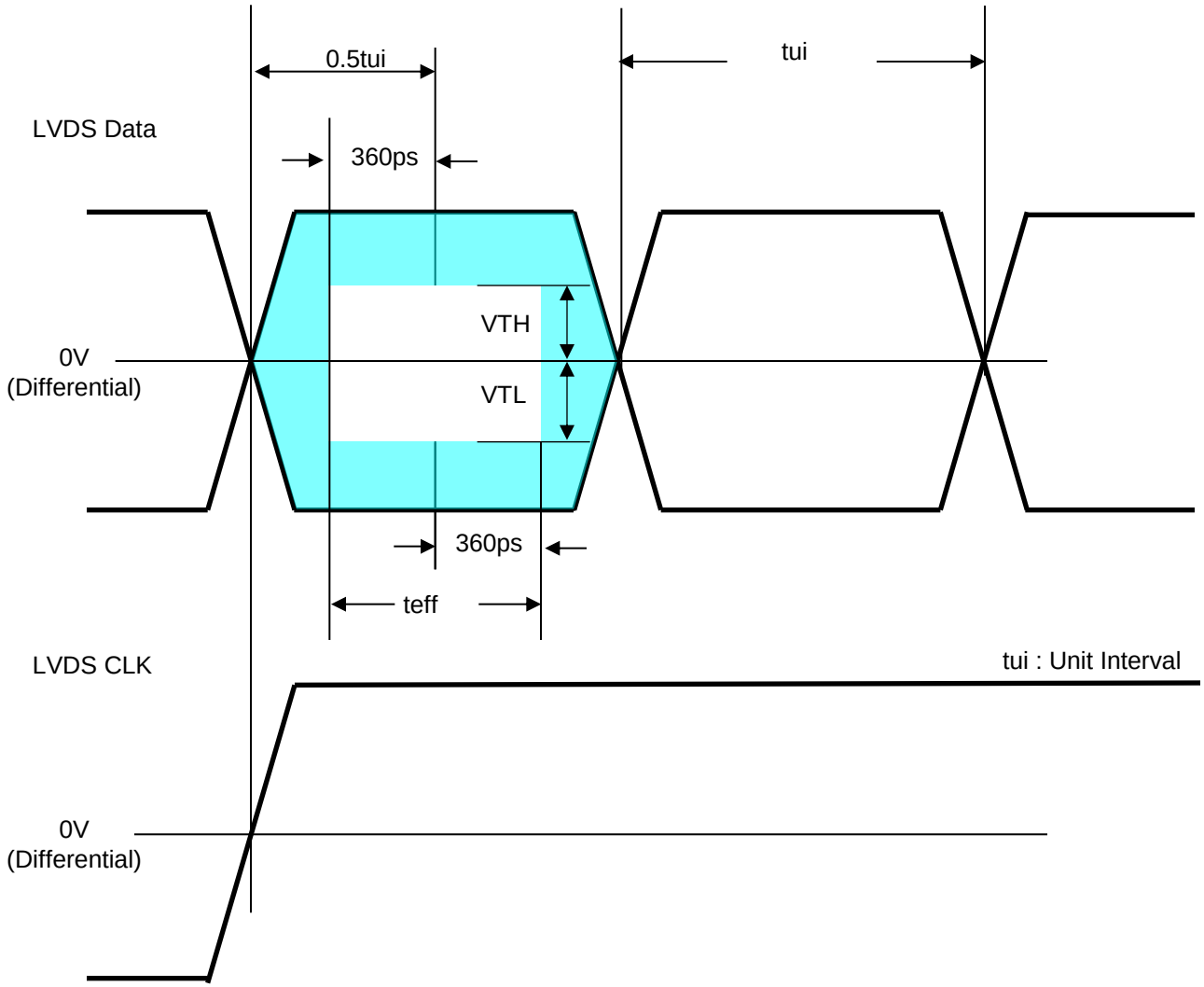

| Description | Symbol | Min | Max | Unit | Note |
|---|---|---|---|---|---|
| LVDS Common mode Voltage | $V_{CM}$ | 1.0 | 1.5 | V | - |
| LVDS Input Voltage Range | $V_{IN}$ | 0.7 | 1.8 | V | - |
| Change in common mode Voltage | ΔVCM | | 250 | mV | - |

#### 2) AC Specification




| Description | Symbol | Min | Max | Unit | notes |
|---|---|---|---|---|---|
| LVDS Differential Voltage | $V_{TH}$ | 100 | 600 | mV | Tested with Differential Probe 2 |
| | $V_{TL}$ | -600 | -100 | mV | |
| LVDS Clock to Data Skew | $t_{SKEW}$ | - | $\lvert(0.25*T_{clk})/7\rvert$ | ps | - |
| Effective time of LVDS | $t_{eff}$ | $\lvert\pm360\rvert$ | - | ps | - |
| LVDS Clock to Clock Skew (Even to Odd) | $t_{SKEW\_EO}$ | - | $\lvert1/7* T_{clk}\rvert$ | ps | - |

Note 1. All Input levels of LVDS signals are based on the EIA 644 Standard.
2. LVDS Differential Voltage is defined within $\mathbf{t_{eff}}$




* This accumulated waveform is tested with differential probe

## 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 8 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

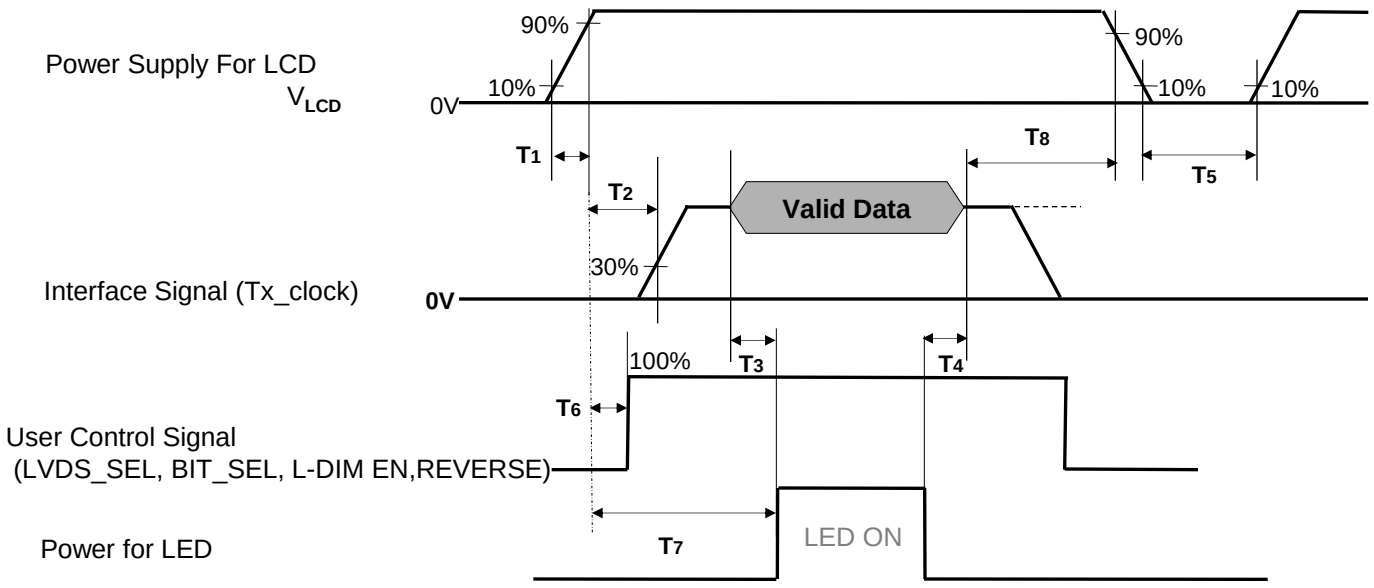



**Table 8. POWER SEQUENCE**

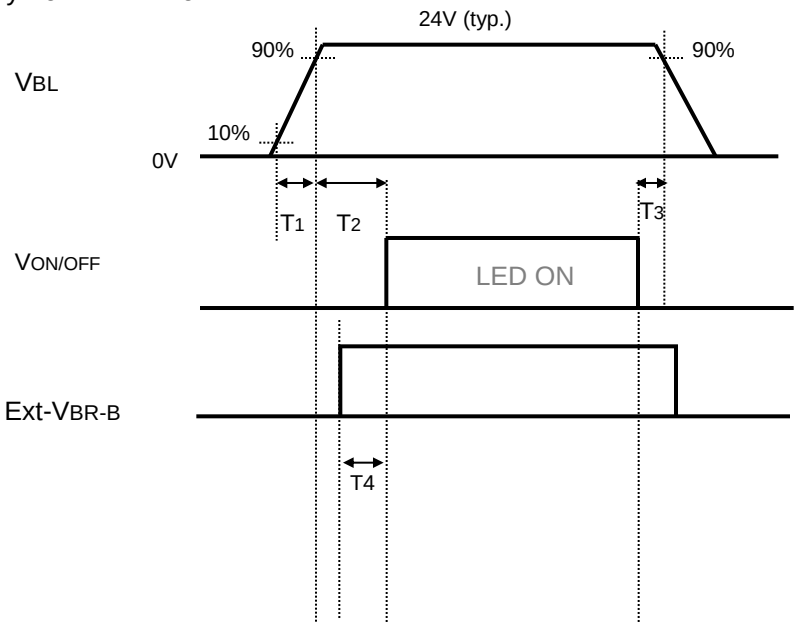
| Parameter | Value | | | Unit | Notes |
|---|---|---|---|---|---|
| | Min | Typ | Max | | |
| **T1** | 0.5 | - | 20 | ms | 1 |
| **T2** | 0 | - | - | ms | 2 |
| **T3** | 200 | - | - | ms | 3 |
| **T4** | 200 | - | - | ms | 3 |
| **T5** | 1.0 | - | - | s | 4 |
| **T6** | 0 | - | T2 | ms | 5 |
| **T7** | 0.5 | - | - | s | 6 |
| **T8** | 100 | - | - | ms | 7 |

notes :
1. Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.
2. If T2 is satisfied with specification after removing LVDS Cable, there is no problem.
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. T5 should be measured after the Module has been fully discharged between power off and on period.
5. 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.
6. If there is no abnormal display, no problem.
7. It is recommendation specification that T8 has to be 100ms as a minimum value.

※ Please avoid floating state of interface signal at invalid period.
※ When the power supply for LCD (VLCD) is off, be sure to pull down the valid and invalid data to 0V.

### 3-6-2. Sequence for LED Driver

Power Supply For LED Driver




### 3-6-3. Deep condition for LED Driver

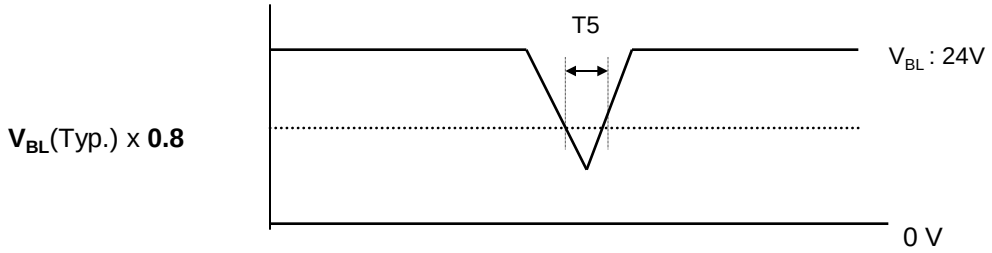



**Table 9. Power Sequence for LED DRIVER**

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

Notes : 1. T1 describes rising time of 0V to 24V and this parameter does not applied at restarting time.
Even though T1 is over the specified value, there is no problem if $I^2T$ spec of fuse is satisfied.

## 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.

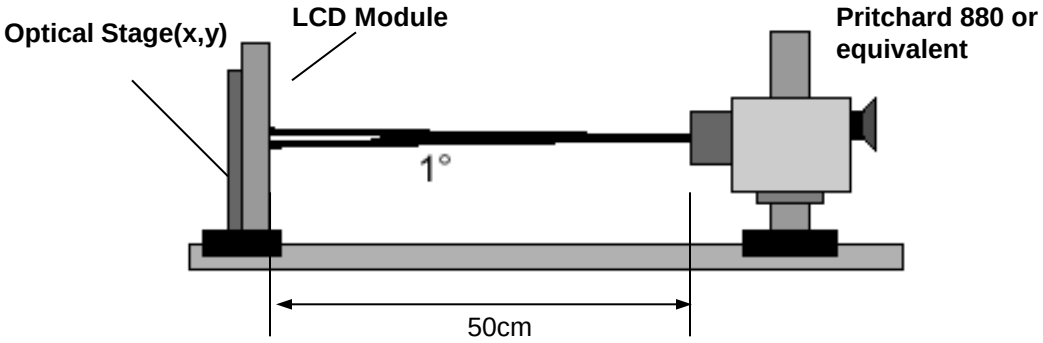



**FIG. 1 Optical Characteristic Measurement Equipment and Method**

**Table 10. OPTICAL CHARACTERISTICS**

Ta= 25±2°C, $V_{LCD}$=12.0V, fv=60Hz, Dclk=74.25MHz, Ext VBR-B=100%

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Contrast Ratio | | CR | 800 | 1100 | - | | 1 |
| Dynamic Contrast Ratio | | DCR | 20000 | 30000 | - | | 8 |
| Surface Luminance, white | | $L_{WH}$ | 400 | 500 | - | cd/m² | 2 |
| Luminance Variation | | $\delta_{WHITE}$ 13P | 80 | 90 | - | | 3 |
| Response Time | Gray-to-Gray | G to G | - | 8 | 12 | ms | 4 |
| Color Coordinates [CIE1931] | RED | Rx | Typ -0.03 | 0.647 | Typ +0.03 | | |
| | | Ry | | 0.331 | | | |
| | GREEN | Gx | | 0.313 | | | |
| | | Gy | | 0.609 | | | |
| | BLUE | Bx | | 0.154 | | | |
| | | By | | 0.056 | | | |
| | WHITE | Wx | Typ -0.02 | 0.279 | Typ +0.02 | | |
| | | Wy | | 0.292 | | | |
| Color Temperature | | | | 10,000 | | K | |
| Color Gamut | | | | 72 | | % | |
| Half Luminance Angle | | | | | | | |
| | Horizontal | Θr,l | 45 | - | - | degree | 5 |
| | Vertical | Θu,d | 45 | - | - | | |
| Viewing Angle (CR>10) | | | | | | | |
| | x axis, right(ϕ=0°) | θr | 89 | - | - | degree | 6 |
| | x axis, left (ϕ=180°) | θl | 89 | - | - | | |
| | y axis, up (ϕ=90°) | θu | 89 | - | - | | |
| | y axis, down (ϕ=270°) | θd | 89 | - | - | | |
| Gray Scale | | | - | - | - | | 7 |

Notes :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 60min 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. δ WHITE(13P) = Minimum(Lon1,Lon2, Lon3,…, Lon13) / Maximum(Lon1,Lon2, Lon3,…, Lon13)*100(%)

Where Lon1 to Lon9 are the luminance with all pixels displaying white at 9 locations . For more information, see the FIG. 2-2.

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) ~ 1023(White), 128 gray 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. 4.

Half Luminance Angle is the angle over the middle brightness 50%

6. Half Luminance Angle is a angle of half luminance compare to center luminance at 255 gray. For more information, see the FIG. 4

7. Gray scale specification

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

8. Dynamic Contrast Ratio(DCR) is defined mathematically as : Lw / Lk

-. Lw : White Center Pattern

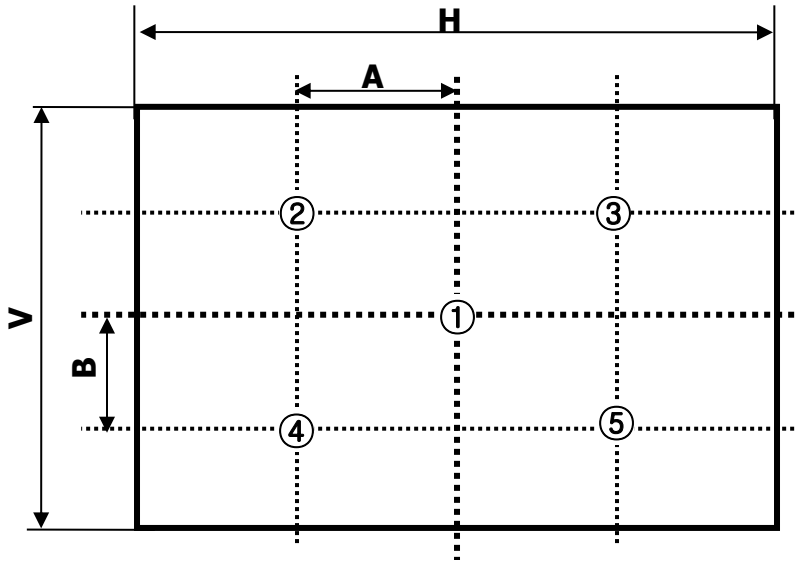
-. Lk : Black Center Pattern

Use the corner-box pattern for local dimming measurements , For more information, see the FIG. 5

**Table 11. GRAY SCALE SPECIFICATION**

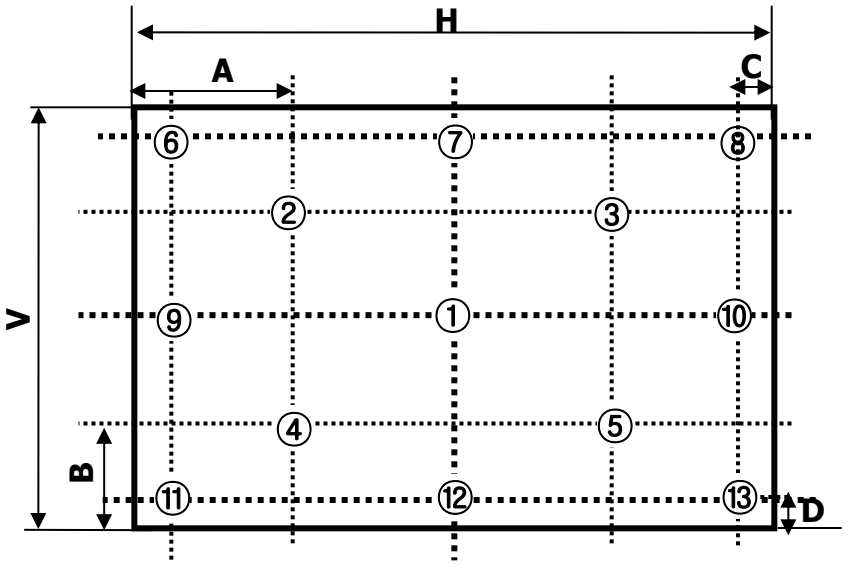
| Gray Level | Luminance [%] (Typ.) |
|---|---|
| L0 | 0.07 |
| L63 | 0.27 |
| L127 | 1.04 |
| L191 | 2.49 |
| L255 | 4.68 |
| L319 | 7.66 |
| L383 | 11.5 |
| L447 | 16.1 |
| L511 | 21.6 |
| L575 | 28.1 |
| L639 | 35.4 |
| L703 | 43.7 |
| L767 | 53.0 |
| L831 | 63.2 |
| L895 | 74.5 |
| L959 | 86.7 |
| L1023 | 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**




A : H / 4 mm
B : V / 4 mm
C : 25mm
D : 25mm
@ H,V : Active Area

**FIG. 2-2 13 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)".

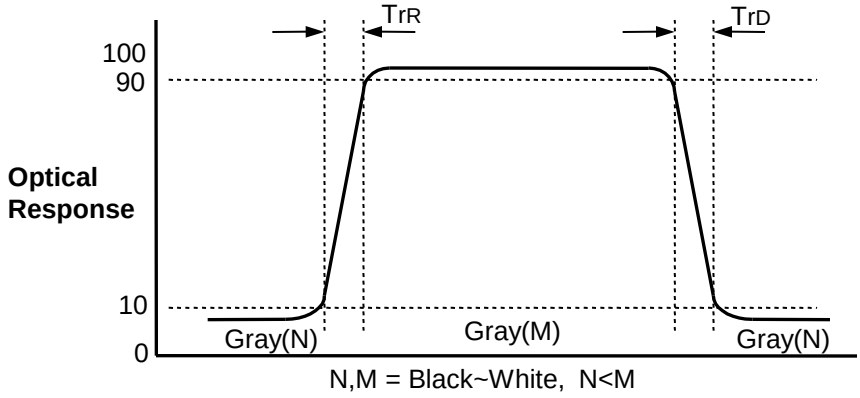



**FIG. 3 Response Time**

Dimension of viewing angle range

Half Luminance Angle : The angle of 50% luminance compare to normal direction luminance

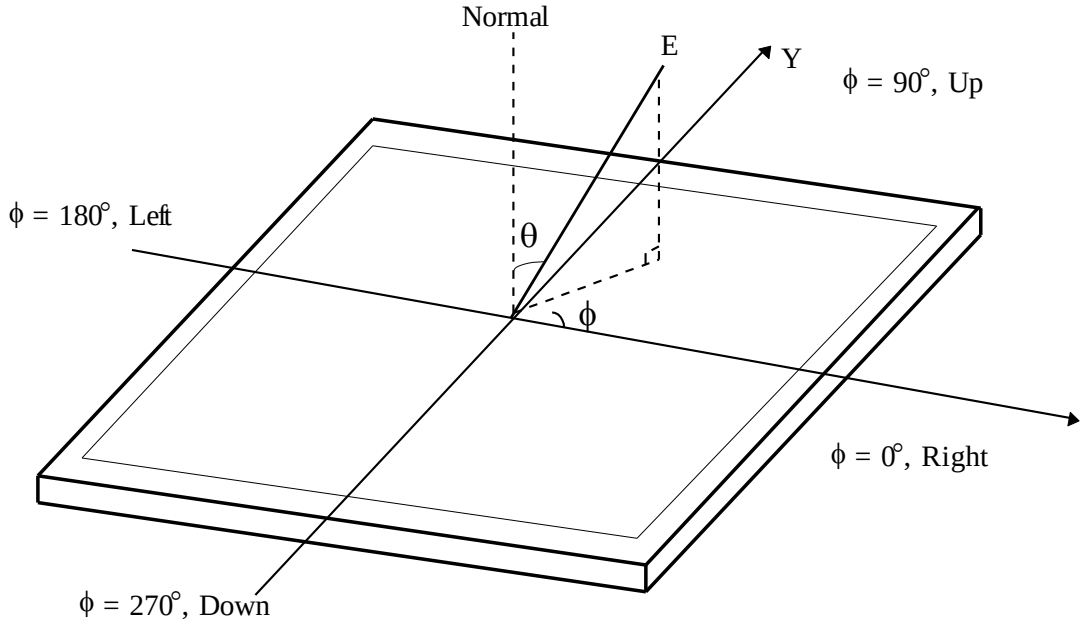


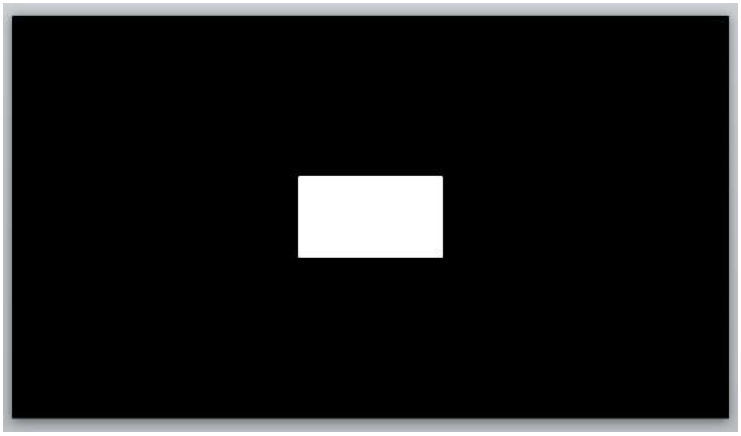

**FIG. 4 Viewing Angle**

Use the corner-box pattern for local dimming measurements.

We measure the center contrast of a 1/5 size white box compared to four 1/10 size boxes placed in each corner.

Measure the luminance Lw of the white-center pattern.
Measure the luminance Lk of the black-center pattern.

Calculate DCR = Lw / Lk.



White center measurement is made on 20% linear box ; Lw
(1/5 size of H and V of display)

Blaxk center measurement is made with 10% linear boxes in corners ; Lk
(1/10 size of H and V of display)

**FIG. 5 DCR Measurement Pattern**

## 5. Mechanical Characteristics

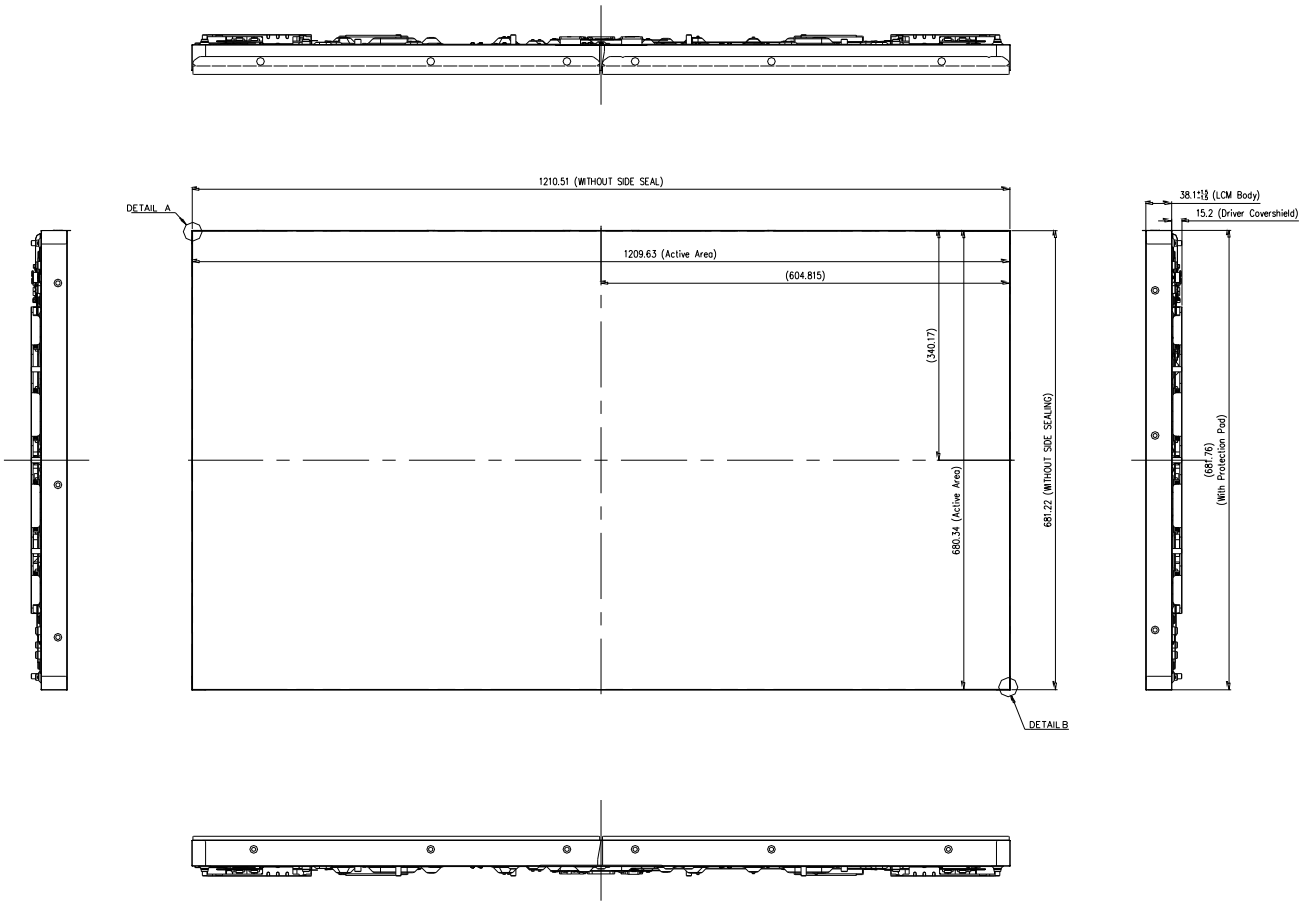
Table 12 provides general mechanical characteristics.

**Table 12. MECHANICAL CHARACTERISTICS**

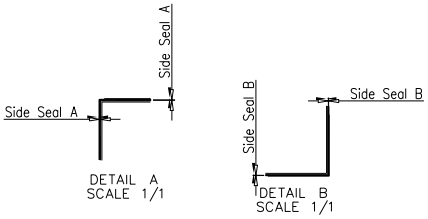
| Item | Value | |
|---|---|---|
| Outline Dimension | Horizontal | 1210.51 mm |
| | Vertical | 681.22 mm |
| | Depth | 53.3 mm |
| Active Display Area | Horizontal | 1209.63 mm |
| | Vertical | 680.34 mm |
| Weight | 12.5kg (Typ.), 12.9kg (Max.) | |

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

[ FRONT VIEW ]

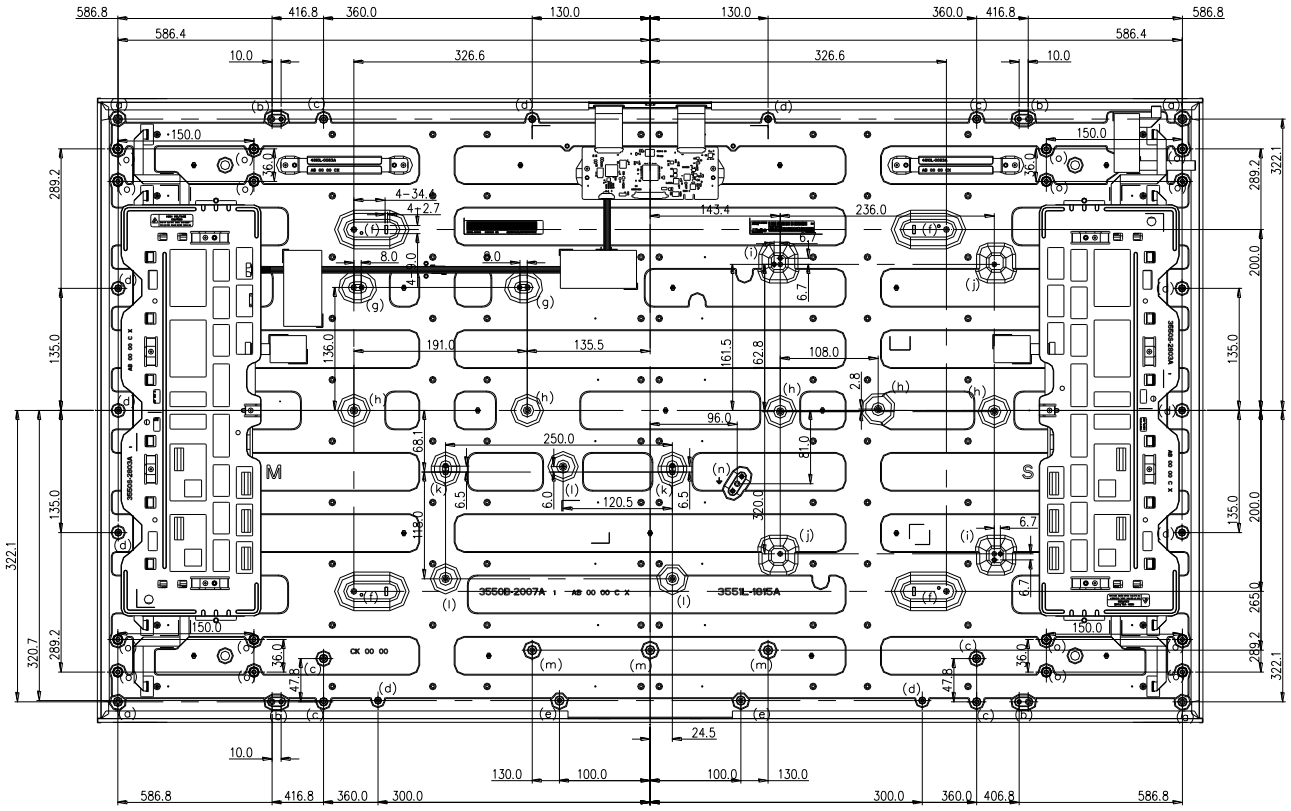



**NOTES**
1. Unsecified tolerance is ±1.0.
2. Side seal thickness about
   A: 0.11mm, B: 0.05mm
3. Max Torque : refer to the table
4. Max Depth : refer to the table
5. Same figure means the same dimension.
6. Don't peel off black circle tapes and don't use screw hole at 4 sides.




| Date | Version |
|---|---|
| 2018.03.28 | 0.0 |
| 2018.08.15 | 0.1 |
| 2018.09.18 | 0.2 |
| 2018.10.02 | 0.3 |
| 2018.11.16 | 0.4 |

<REAR VIEW>




| Item | tap | Height from Body | Depth | torque | note |
|---|---|---|---|---|---|
| (a) | M 4.0 | 4.0mm | Max 3.7 | Max 10kgf.cm | Emboes |
| (b) | M 4.0 | 4.0mm | Max 3.7 | Max 10kgf.cm | Emboes |
| (c) | M 4.0 | 8.5mm | Max 5.5 | Max 10kgf.cm | Pemnut |
| (d) | M 3.0 | 15.0mm | Max 7.0 | Max 6kgf.cm | Pemnut |
| (e) | M 3.0 | 4.5mm | Max 5.4 | Max 6kgf.cm | Emboes |
| (f) | M 4.0 | 10.3mm | Max 9.5 | Max 10kgf.cm | Emboes |
| (g) | M 3.0 | 11.0mm | Max 10.0 | Max 6kgf.cm | Emboes |
| (h) | M 3.0 | 11.0mm | Max 10.0 | Max 6kgf.cm | Emboes |
| (i) | M 3.0 | 11.0mm | Max 10.0 | Max 6kgf.cm | Emboes |
| (j) | M 3.0 | 11.0mm | Max 10.0 | Max 6kgf.cm | Emboes |
| (k) | M 3.0 | 9.7mm | Max 9.0 | Max 6kgf.cm | Emboes |
| (l) | M 3.0 | 9.7mm | Max 9.0 | Max 6kgf.cm | Emboes |
| (m) | M 3.0 | 4.5mm | Max 5.4 | Max 6kgf.cm | Emboes |
| (n) | M 4.0 | 6.0mm | Max 5.5 | Max 10kgf.cm | Emboes |
| (o) | M 4.0 | 8.5mm | Max 5.5 | Max 10kgf.cm | Pemnut |

| Date | Version |
|---|---|
| 2018.03.28 | 0.0 |
| 2018.08.15 | 0.1 |
| 2018.09.18 | 0.2 |
| 2018.10.02 | 0.3 |
| 2018.11.16 | 0.4 |

## 6. Reliability

**Table 13. ENVIRONMENT TEST CONDITION**

| No. | Test Item | Condition |
|---|---|---|
| 1 | High temperature storage test | Ta= 60˚C 90%, 240h |
| 2 | Low temperature storage test | Ta= -20˚C 240h |
| 3 | High temperature operation test | Ta= 50˚C 50%RH 500h |
| 4 | Low temperature operation test | Ta= 0˚C 500h |
| 5 | Humidity condition Operation | Ta= 40 ˚C ,90%RH |
| 6 | Altitude operating<br>storage / shipment | 0 - 16,400 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 60950-1, Underwriters Laboratories Inc.
Information Technology Equipment - Safety - Part 1 : General Requirements.
b) CAN/CSA-C22.2 No. 60950-1-07, Canadian Standards Association.
Information Technology Equipment - Safety - Part 1 : General Requirements.
c) EN 60950-1, European Committee for Electrotechnical Standardization (CENELEC).
Information Technology Equipment - Safety - Part 1 : General Requirements.
d) IEC 60950-1, The International Electrotechnical Commission (IEC).
Information Technology Equipment - Safety - Part 1 : General Requirements

## 7-2. Environment

a) RoHS, Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011

# 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 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mark | A | B | C | D | E | F | G | H | J | K |

2. MONTH

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | 1 | 2 | 3 | 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 : 10 pcs

b) Pallet Assy Size : 1440mm(W) X 1140mm(D) X 950mm(H)

# 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 LED driver inductor to prevent abnormal display, sound noise and temperature rising.

## 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.

## 9-7. Appropriate Condition for commercial Display

- Generally large-sized LCD modules are designed for consumer applications (TV).
Accordingly, a long-term display like in commercial Display (PD) application, can cause uneven display including image sticking. To optimize module's lifetime and function, several operating usages are required.

1. Normal operating condition
- Temperature: 0 ~ 40℃
- Operating Ambient Humidity : 10 ~ 90 %
- Display pattern: dynamic pattern (Real display)
Note) Long-term static display can cause image sticking.
-. Be careful for expose the module to sunlight. It causes degradation of polarizer and color filter.

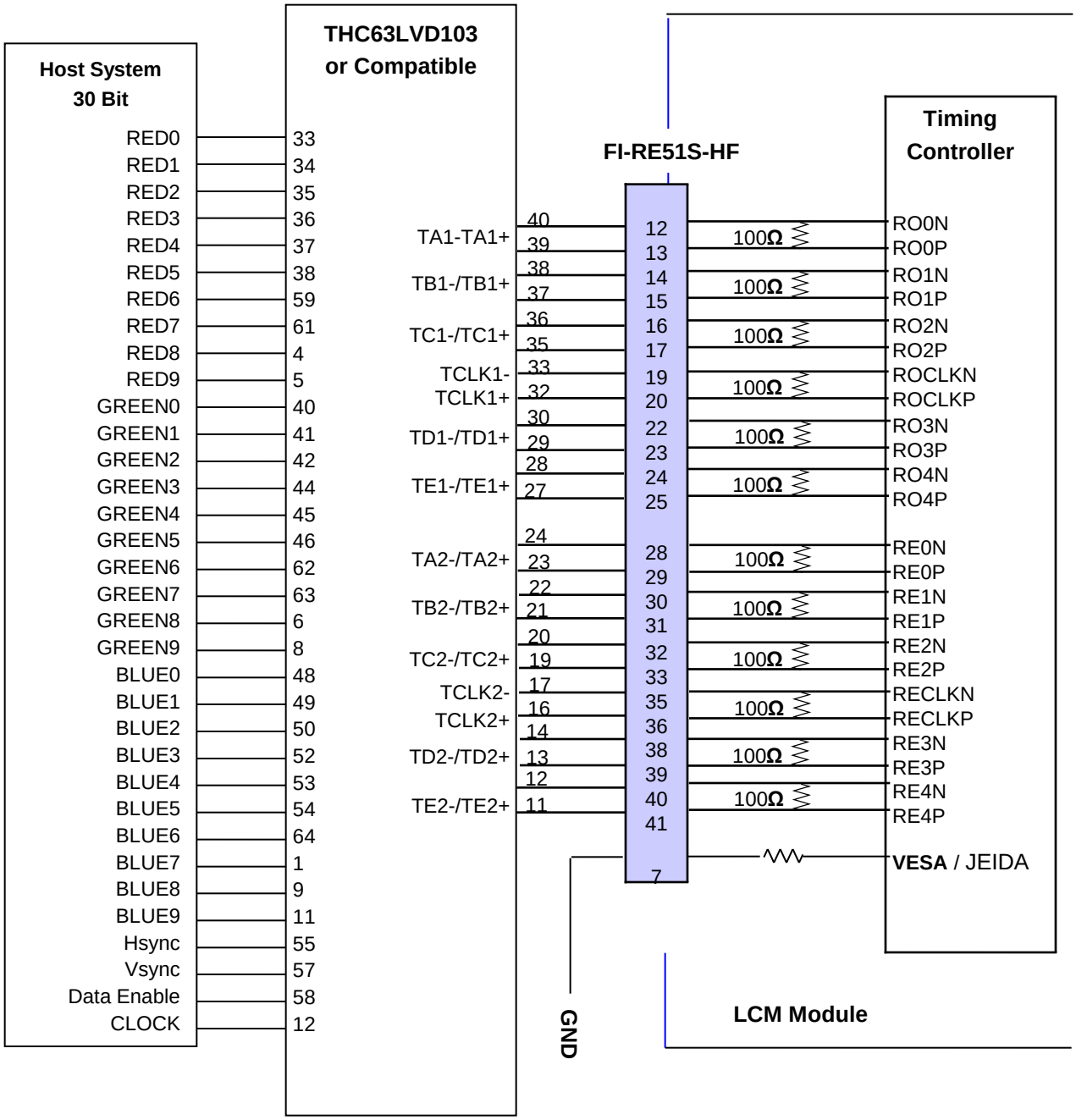
2. Operating usages under abnormal condition
a. Ambient condition
- Well-ventilated place is recommended to set up PD system.
b. Power and screen save
- Periodical power-off or screen save is needed after long-term display.

3. Operating usages to protect against image sticking due to long-term static display
   a. Suitable operating time: under 24 hours a day.
   b. Static information display recommended to use with moving image.
      - Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.
   c. Background and character (image) color change
      - Use different colors for background and character, respectively.
      - Change colors themselves periodically.
   d. Avoid combination of background and character with large different luminance.
   1) Abnormal condition just means conditions except normal condition.
   2) Black image or moving image is strongly recommended as a screen save.

4. Lifetime in this spec. is guaranteed only when PD is used according to operating usages.
5. Module should be turned clockwise based on front view when used in portrait mode.

## # APPENDIX-I-1

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



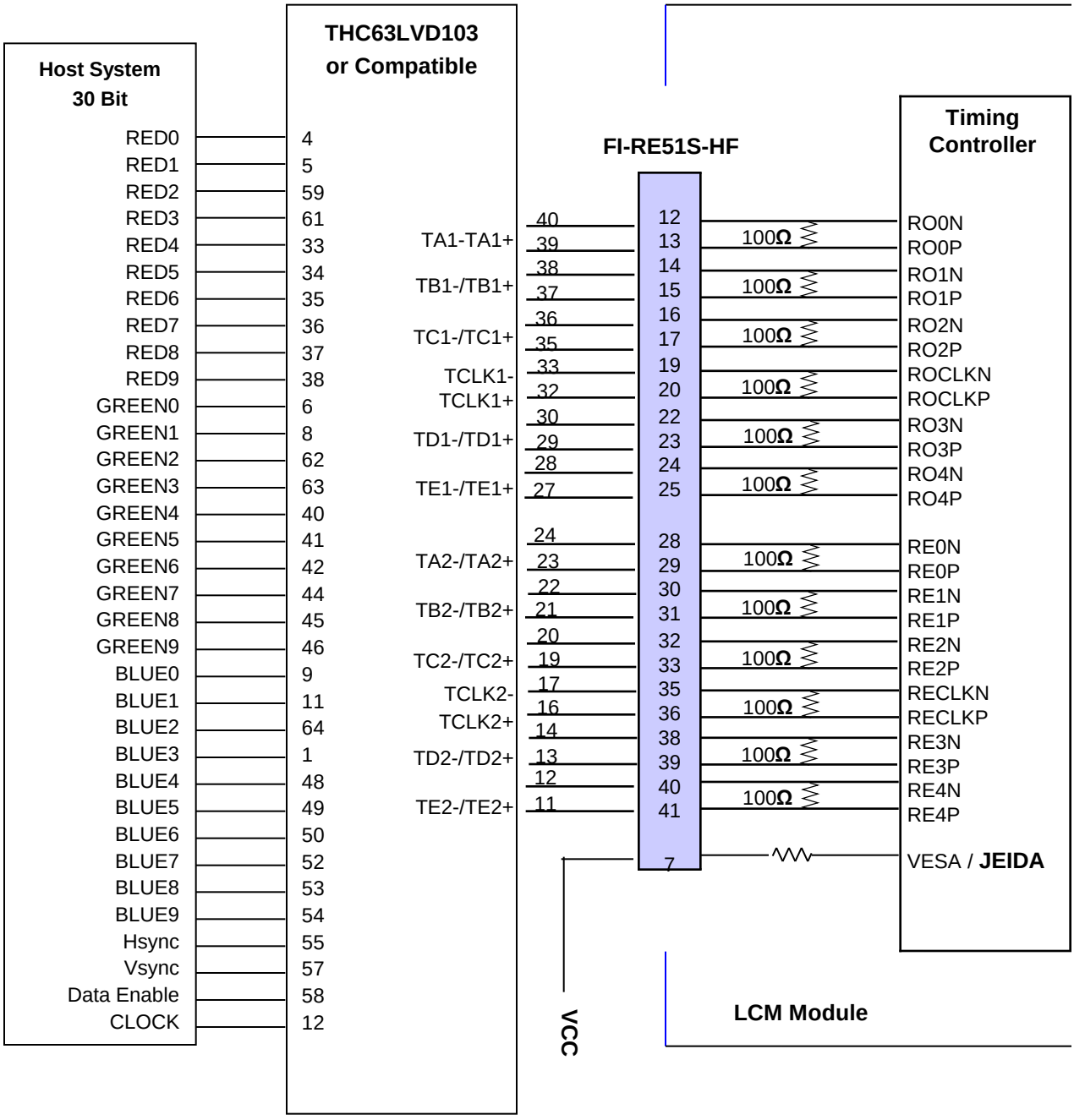

Note: 1. The LCD module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.

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 : THC63LVD103) Transmitter(Pin7="H")




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

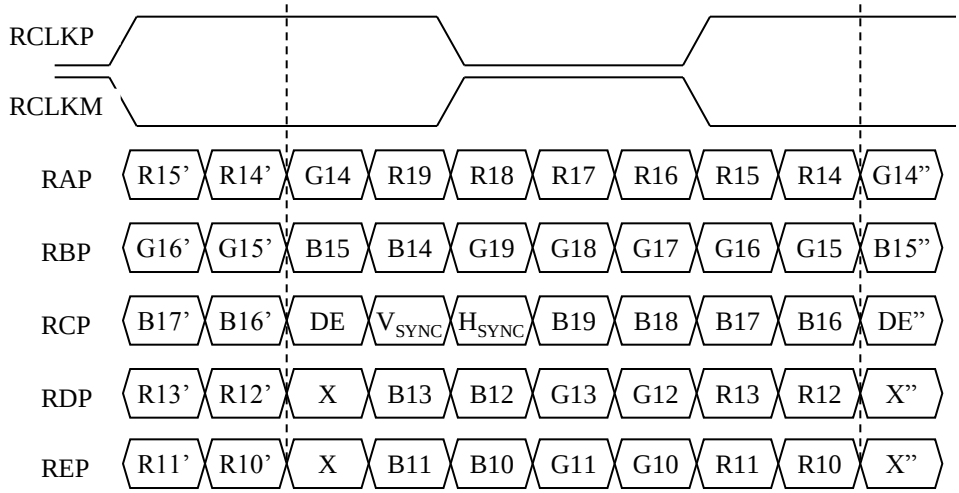
2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (THC63LVD103 or Compatible)

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

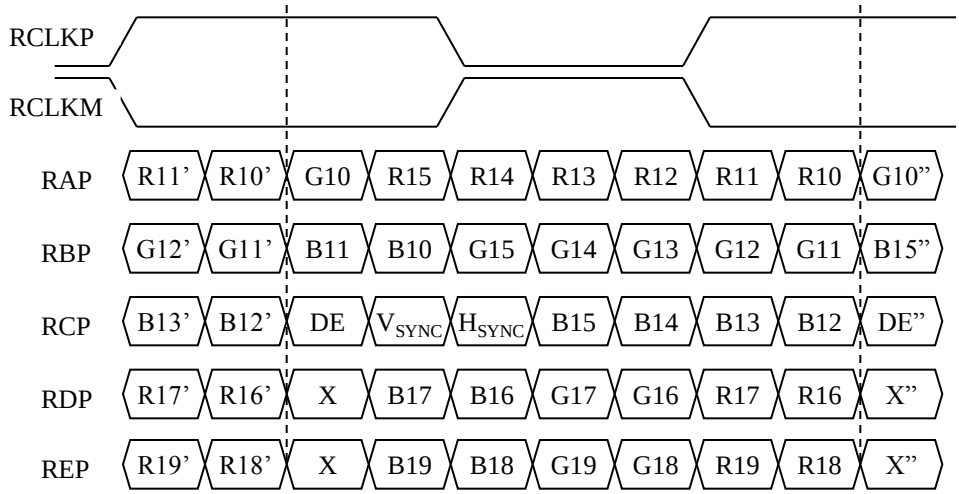
**# APPENDIX- II**

# LVDS Data-Mapping info. (10bit)

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

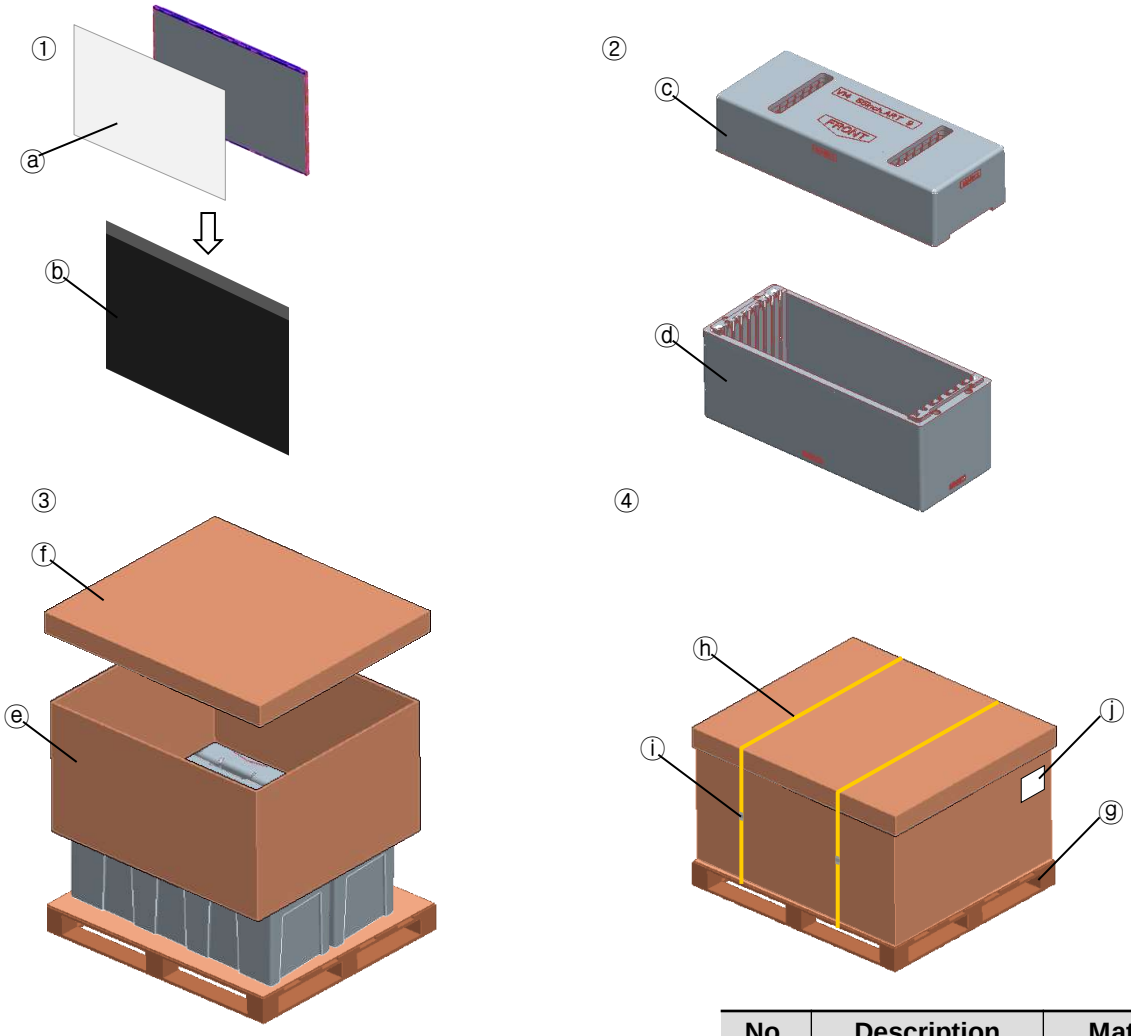



## ■ LVDS Select : “L” Data-Mapping (VESA format)



# APPENDIX- III

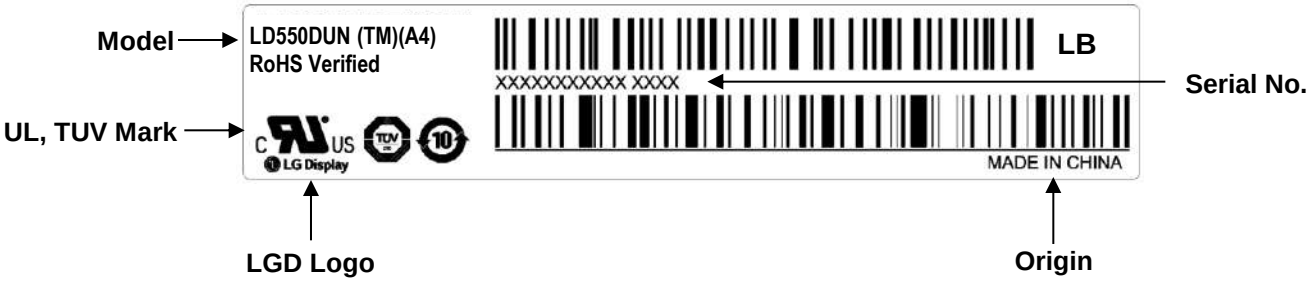
■ Pallet Ass'y




| No. | Description | Material |
|---|---|---|
| ⓐ | Protect Film | PP+PE |
| ⓑ | BAG | AL |
| ⓒ | PackingTop | EPS |
| ⓓ | Packing,Bottom | EPS |
| ⓔ | Angle Packing | Double Wall |
| ⓕ | Angle Cover | Single Wall |
| ⓖ | Pallet | Plywood |
| ⓗ | Band | PP |
| ⓘ | Clip | Steel |
| Ⓙ | Label | Paper |

# **APPENDIX-** Ⅳ

■ LCM Label




■ Production site

– LG Display (Guangzhou) Co., LTD

notes 1.The origin of LCM Label will be changed according to the production site.

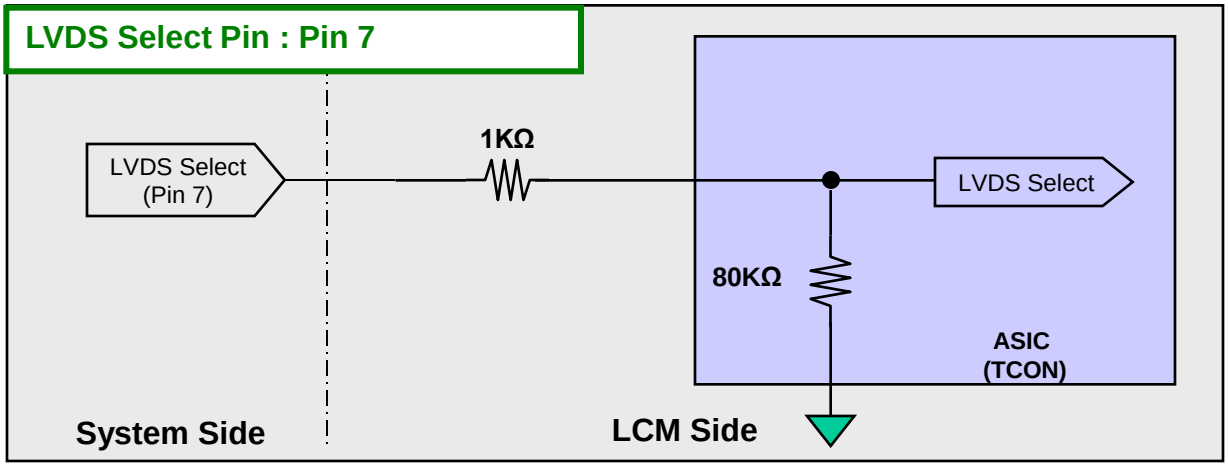
# **APPENDIX-** V

■ Pallet Label

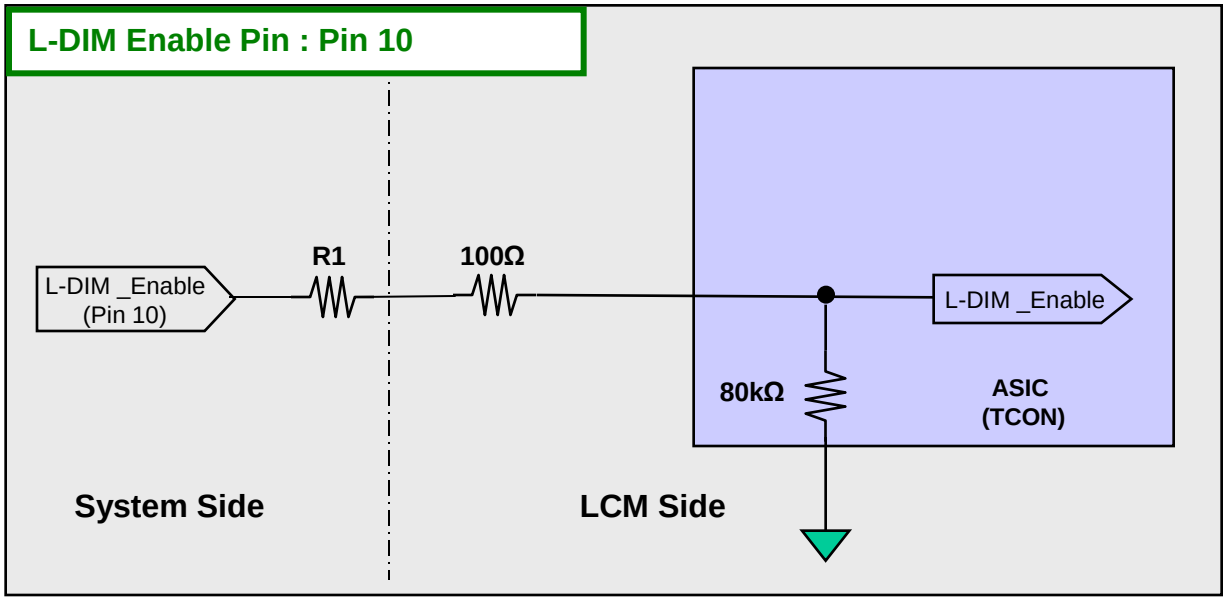
# APPENDIX- VI

## ■ Option Pin Circuit Block Diagram

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




2) Circuit Block Diagram of **L-DIM Enable** Selection pin



# APPENDIX- Ⅶ

## ■ EXTVBR-B & Local Dimming Design Guide

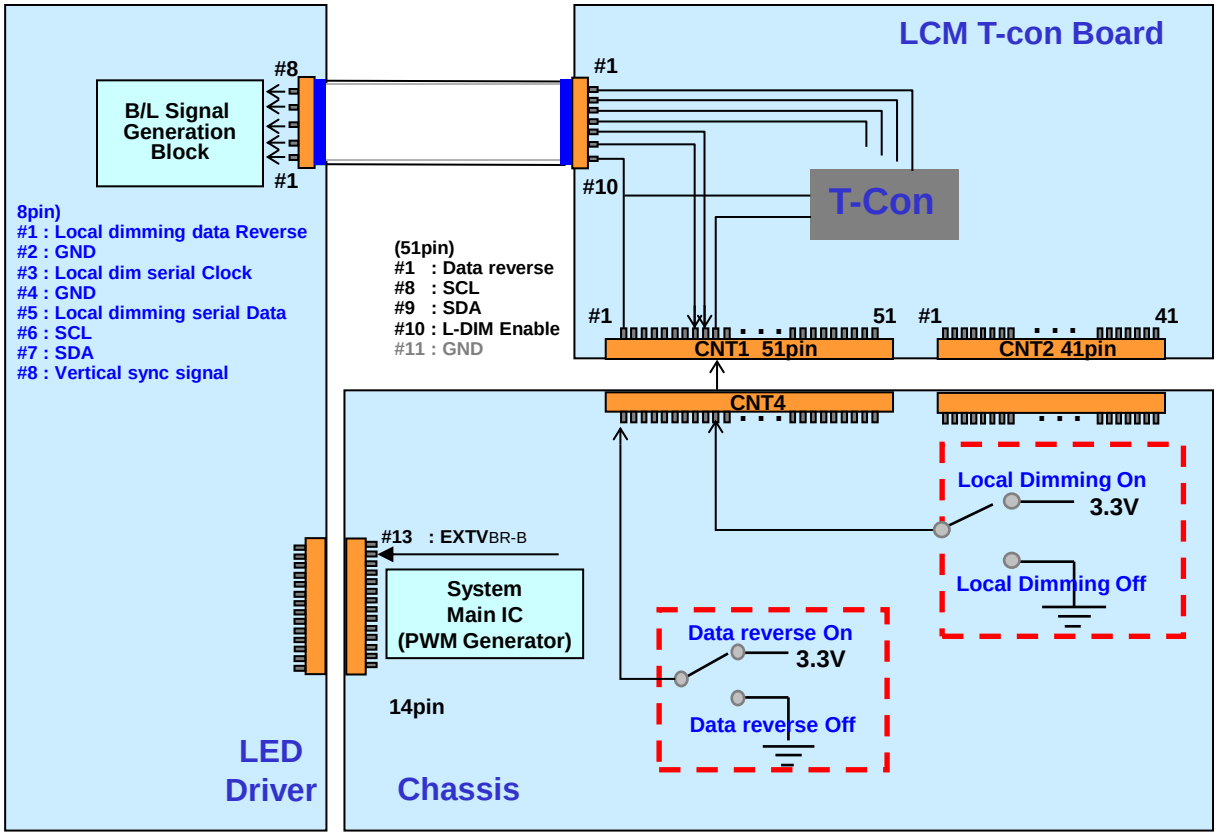
1) When L-Dim Enable is “L", Vertical Sync Signal = System Dimming with 100Hz or 120Hz frequency.

2) Local Dimming signals are synchronized with V-Sync Freq. of System in T-Con Board.

3) EXTVBR-B Specification ( VCC = 3.3V ) @ Local Dimming , Reverse Specification

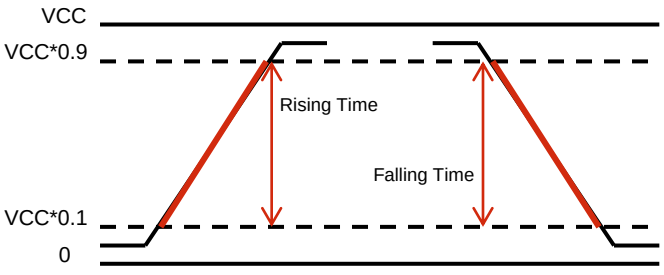
a) High Voltage Range : 2.5 V ~ 3.6 V

b) Low Voltage Range : 0.0 V ~ 0.7 V




**<With Driver Model>**

| | |
|---|---|
| EXTVBR-B Frequency | 100 Hz for PAL<br>120 Hz for NTSC |
| Rising Time | MAX 10.0 μs |
| Falling Time | MAX 10.0 μs |



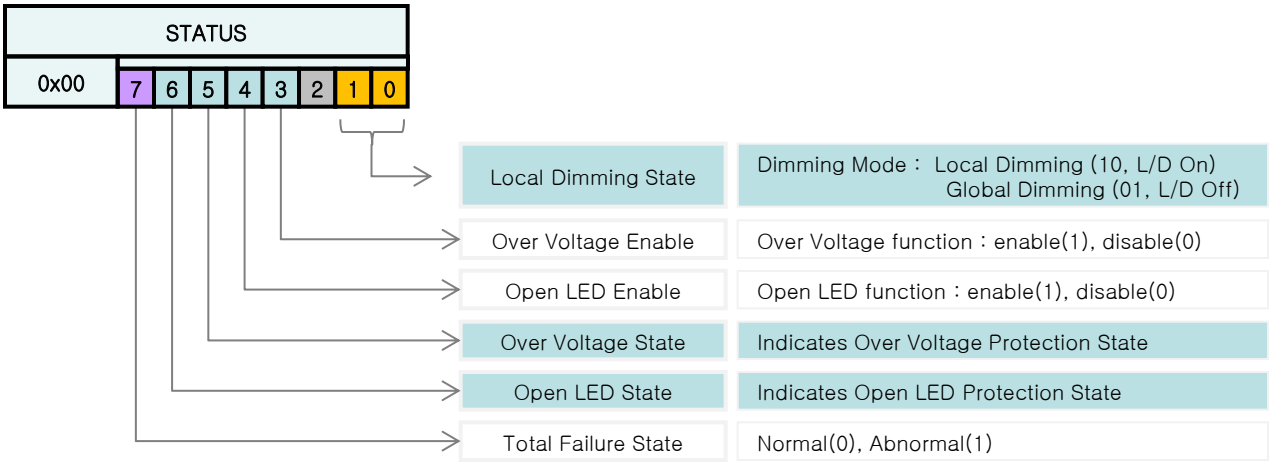
**# APPENDIX- Ⅷ-1**

## ■ Defect Detecting Mode (LED Driver)

1) It is possible to get defect information by I²C when LCM is defected

2) Failure mode that can be detected
- Open LED, Over Voltage
- Protection Operation status, Local Dimming Operation status

### ▶ I²C Data format (2Byte)





| | |
|---|---|
| 1 | REVERSE |
| 2 | GND |
| 3 | DCLK |
| 4 | GND |
| 5 | DIN |
| 6 | SCL |
| 7 | SDA |
| 8 | Vsync |

**LED Driver to Control Board**
**8Pin wire**

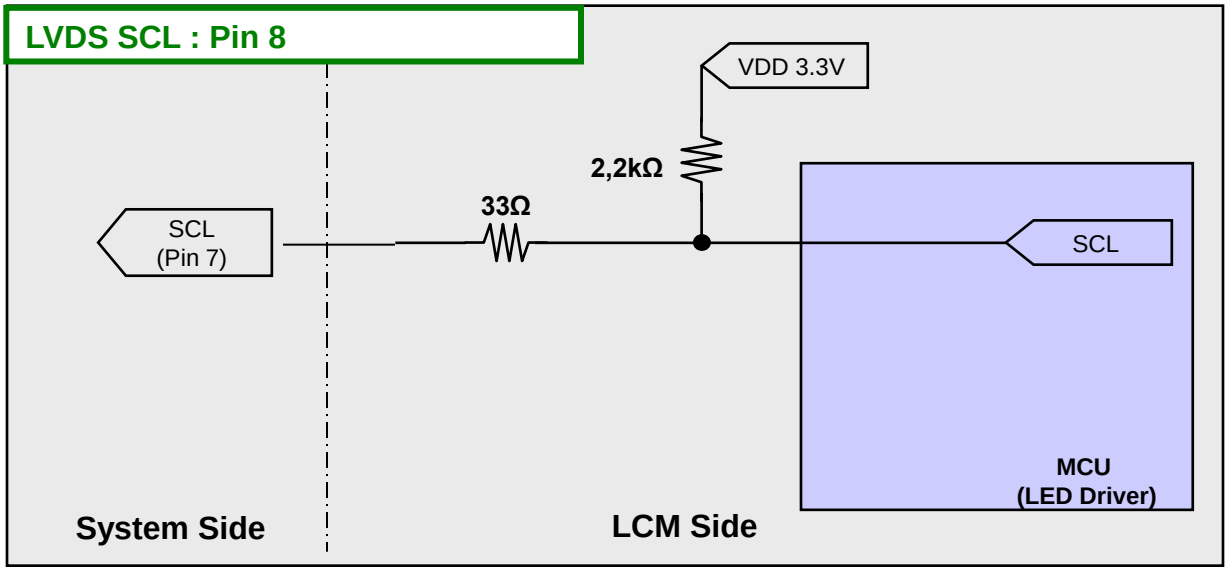
| | |
|---|---|
| 7 | LVDS sel |
| 8 | SCL |
| 9 | SDA |
| 10 | Local Dim |

**Control Board to SET**
**LVDS 51Pin**

**# APPENDIX- Ⅷ-2**

## ■ **SCL, SDA Pin** Circuit Diagram

1) Circuit Block Diagram of **LVDS SCL** pin




1) Circuit Block Diagram of **LVDS SDA** pin