SPECIFICATION
FOR
APPROVAL

( ) **Preliminary Specification**

(●) **Final Specification**

Title	55.0" WUXGA TFT LCD
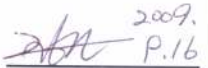
BUYER	LGE
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LC550WUL
SUFFIX	SBT2

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

APPROVED BY	SIGNATURE DATE
/	
/	
/	

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

APPROVED BY	SIGNATURE DATE
K.S. Nah /Team Leader	2009. 9. 16
REVIEWED BY	
S.J. Cho / Engineer	2009. P.16
PREPARED BY	
J.K.Kim/ Engineer	2009.09.16

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

Product Specification

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RECORD OF REVISIONS

| Revision No.	Revision Date	Page	Description
0.1	August, 03, 2009	-	Preliminary Specification
1.1	Sept,16,2009	16	Power sequence Diagram change

Product Specification

1. General Description

The LC550WUL is a Color Active Matrix Liquid Crystal Display with an integral Light Emitting Diode(LED) 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 1.06B(FRC) colors.

It has been designed to apply the 10-bit 4-port LVDS interface.

It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.
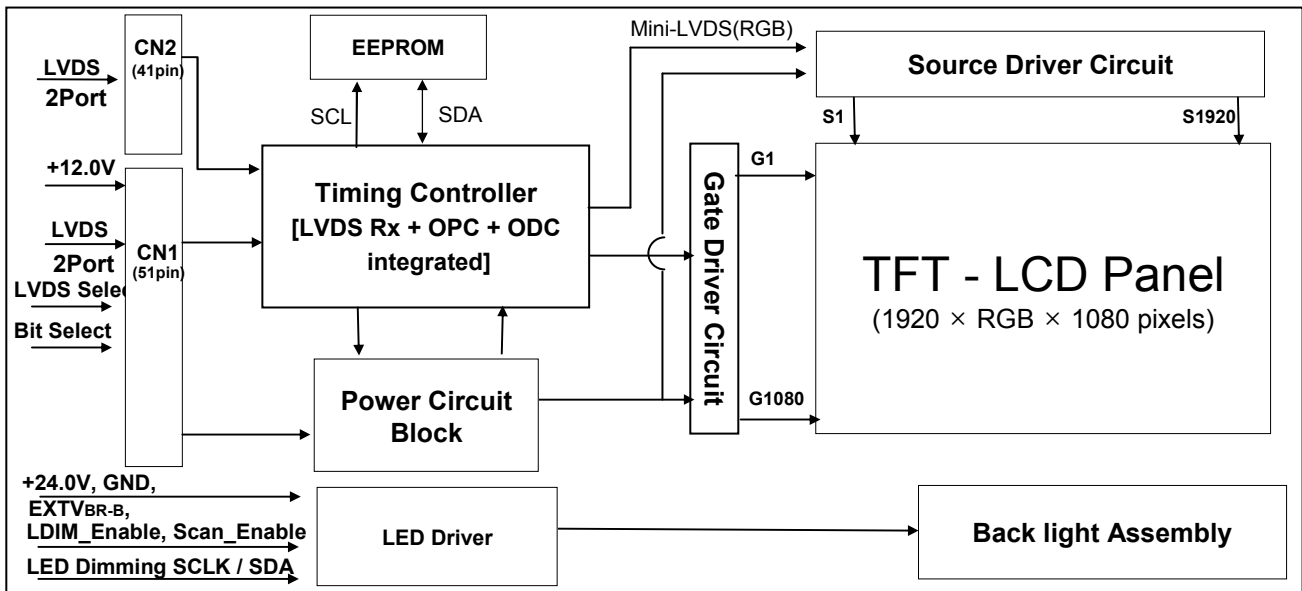
General Features

| Active Screen Size	54.64 inch (1387.80mm) diagonal
Outline Dimension	1251.6(H) x 722.4 (V) x 27.8 mm(D) (Typ.)
Pixel Pitch	0.630 mm x 0.630 mm x RGB
Pixel Format	1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement
Color Depth	10 Bit(D), 1.06 Billion colors
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 185.5W (Typ.) (Logic=7.5(Typ) W, Driver=178 W $(ExtVBR-B:100\%)$)
Weight	21.0 Kg (Typ.) , 22.0 Kg (Max.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(3H), Semi-glare treatment of the front polarizer(Haze10%)

2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Remark
			Min	Max		
Power Input Voltage	LCM	V_{LCD}	-0.3	+14.0	V_{DC}	at 25 ± 2 °C
	Backlight inverter	V_{BL}	-0.3	+27.0	V_{DC}	
ON/OFF Control Voltage		VON/OFF	-0.3	+5.5	V_{DC}	
Brightness Control Voltage		V_{BR}	0	+5.0	V_{DC}	
Operating Temperature		T_{OP}	0	+50	°C	Note 1,2
Storage Temperature		T_{ST}	-20	+60	°C	
Operating Ambient Humidity		H_{OP}	10	90	%RH	
Storage Humidity		H_{ST}	10	90	%RH	

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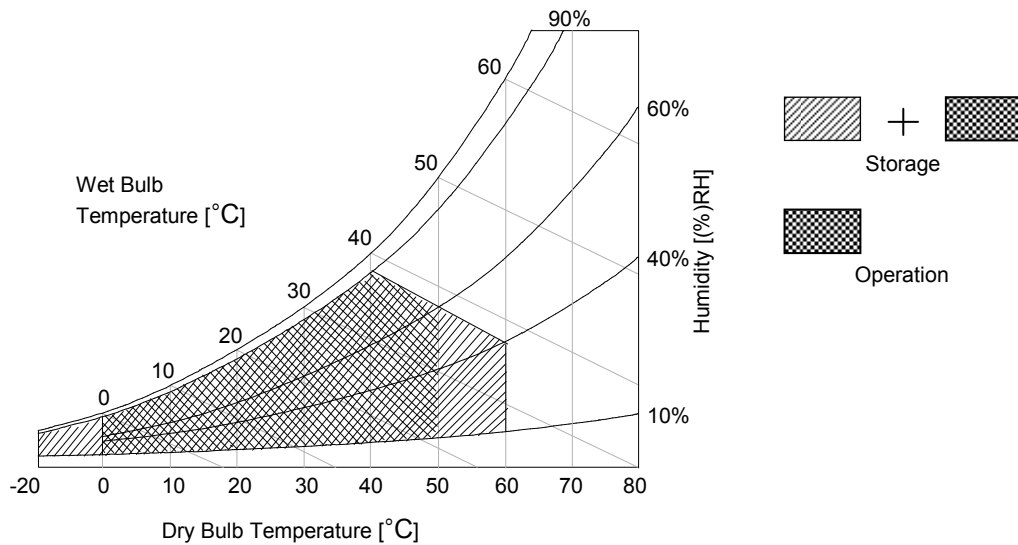
Product Specification

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$_{LCD}$	441	630	819	mA	1
		612	875	1137	mA	2
Power Consumption	P$_{LCD}$		7.56	9.82	Watt	1
Rush current	I$_{RUSH}$	-	-	5	A	3

Notes : 1. The specified current and power consumption are under the V$_{LCD}$=12.0V, 25 $\pm$ 2°C, 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 **0.5**ms (min.).

White : 1023Gray
Black : 0Gray
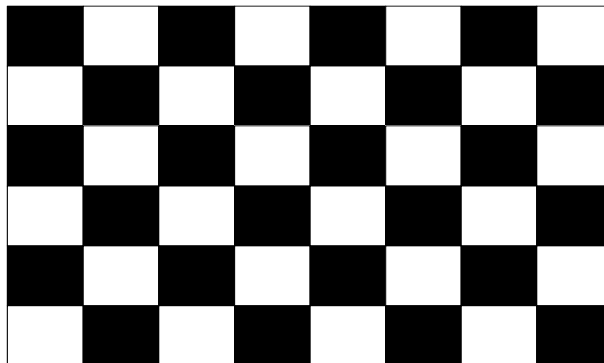
Mosaic Pattern(8 x 6)

Product Specification

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	
Unloading Input Voltage						27	Vdc	
Power Supply Input Voltage Ripple				-0.2		0.2	Vp-p	
Power Supply Input Current	After 120 minutes		IBL_A	-	7.4	-	A	Ext V_{BR-B} = 100%
Power Consumption			PBL	-	178	-	W	Ext V_{BR-B} = 100%
Power Supply Input Current(In-Rush)			Irush	-	10	-	A	V_{BL} = 24V Ext V_{BR-B} = 100%
Input Voltage for Control System Signals	On/Off	On	V on	2.5	-	5.0	Vdc	
		Off	V off	-0.3	-	0.8	Vdc	
	Brightness Adjust - B (Burst mode)	Dimming Ratio	ExtV_{BR-B}	10	-	100	%	V_{BL} = 24V Input기준
		Dimming Freq'	NTSC/PAL	110/90	120/100	130/110		V_sync * 1
		On	V on	2.5	-	5.0	Vdc	HIGH: LED on LOW:LED off
		Off	V off	0.0	-	0.8	Vdc	
Life Time					40,000		Hrs	3

Notes :
1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 120 minutes at 25±2°C. The specified current and power consumption are under the typical supply Input voltage 24Vand VBR (ExtVBR-B : 100%), it is total power consumption.
   The ripple voltage of the power supply input voltage is under 0.5 Vp-p. LGD recommend Input Voltage is 24.0V ± 5%.
2. Electrical characteristics are determined within 30 minutes at 25±2°C.
   The specified currents are under the typical supply Input voltage 24V.

3. The life time is determined as the time which luminance of the LED is 50% compared to that of initial value at the typical LED current (ExtVBR-B : 100%) on condition of continuous operating in LCM state at 25°C.

4. LGD recommend that the PWM freq. is synchronized with One time harmonic of Vsync signal of system.
5. The duration of rush current is about 10ms.

3-2. Interface Connections

This LCD module employs two kinds of interface connection, 51-pin and 41-pin connector are 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-R51S-HF(manufactured by JAE)
                    Refer to below and next Page table
- Mating Connector : FI-R51HL(JAE)

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

No	Symbol	Description	No	Symbol	Description
1	Reverse	No Connection	27	Bit Select	'H' or NC= 10bit(D) , 'L' = 8bit
2	NC	(Improve Interlace)	28	R2AN	SECOND LVDS Receiver Signal (A-)
3	NC	No Connection	29	R2AP	SECOND LVDS Receiver Signal (A+)
4	NC	(I2C DATA Interface)	30	R2BN	SECOND LVDS Receiver Signal (B-)
5	NC	(I2C CLK Interface)	31	R2BP	SECOND LVDS Receiver Signal (B+)
6	NC	(EEPROM Write Protection)	32	R2CN	SECOND LVDS Receiver Signal (C-)
7	LVDS Select	'H' =JEIDA , 'L' or NC = VESA	33	R2CP	SECOND LVDS Receiver Signal (C+)
8	NC	No Connection	34	GND	Ground
9	NC	No Connection	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	Reserved	No connection or GND
17	R1CP	FIRST LVDS Receiver Signal (C+)	43	Reserved	No connection or GND
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	Reserved	No connection or GND	-	-	-

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.
   If not used, these pins are no connection.
5. 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.
6. Specific pin No. #44 is used for "No signal detection" of system signal interface.
   It should be GND for NSB(No Signal Black) during the system interface signal is not.
   If this pin is "H", LCD Module displays AGP(Auto Generation Pattern).

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- LCD Connector(CN2): FI-RE41S-HF, Refer to below table
- Mating Connector : FI-RE41HL

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

No	Symbol	Description	No	Symbol	Description
1	NC	No connection	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	FOURTH LVDS Receiver Signal (A-)
6	NC	No connection	27	RA4P	FOURTH LVDS Receiver Signal (A+)
7	NC	No connection	28	RB4N	FOURTH LVDS Receiver Signal (B-)
8	NC	No connection	29	RB4P	FOURTH LVDS Receiver Signal (B+)
9	GND	Ground	30	RC4N	FOURTH LVDS Receiver Signal (C-)
10	RA3N	THIRD LVDS Receiver Signal (A-)	31	RC4P	FOURTH LVDS Receiver Signal (C+)
11	RA3P	THIRD LVDS Receiver Signal (A+)	32	GND	Ground
12	RB3N	THIRD LVDS Receiver Signal (B-)	33	RCLK4N	FOURTH LVDS Receiver Clock Signal(-)
13	RB3P	THIRD LVDS Receiver Signal (B+)	34	RCLK4P	FOURTH LVDS Receiver Clock Signal(+)
14	RC3N	THIRD LVDS Receiver Signal (C-)	35	GND	Ground
15	RC3P	THIRD LVDS Receiver Signal (C+)	36	RD4N	FOURTH LVDS Receiver Signal (D-)
16	GND	Ground	37	RD4P	FOURTH LVDS Receiver Signal (D+)
17	RCLK3N	THIRD LVDS Receiver Clock Signal(-)	38	RE4N	FOURTH LVDS Receiver Signal (E-)
18	RCLK3P	THIRD LVDS Receiver Clock Signal(+)	39	RE4P	FOURTH 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+)	-		

Notes : 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.

CN1   #1   #51   #1   CN2   #41

#1   #51   #1   #41
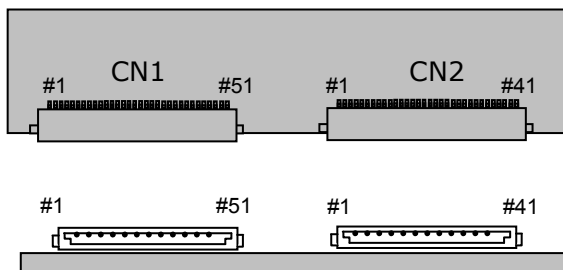
Rear view of LCM

[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)

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3-2-2. Backlight LED Driver

Master
- LED Driver Connector : 20022WR-14B1(Yeonho)
  or Equivalent
- Mating Connector : 20022HS-14 or Equivalent

Slave
- LED Driver Connector : 20022WR-12B1(Yeonho)
  or Equivalent
- Mating Connector : 20022HS-12 or Equivalent

Table 5. LED Driver CONNECTOR PIN CONFIGULATION

Pin No	Symbol	Description	Master	Slave	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	VBR-A	Don't care	Don't care	Don't care	
12	VON/OFF	Backlight ON/OFF control	VON/OFF	VON/OFF	2
13	EXTVBR-B	External PWM	EXTVBR-B	-	3
14	GND	Backlight Ground	GND	-	

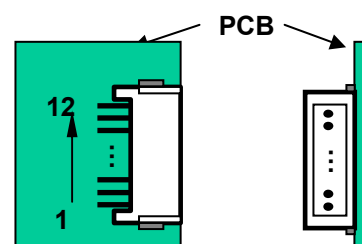Notes : 1. GND should be connected to the LCD module's metal frame.
2. ON : 2.5 ~ 5.0V / OFF : 0.0 ~ 0.8V . Open or 'H' for B/L On is default status.
3. High : LED ON/ Low : LED OFF, Pin#13 can be opened. (if Pin #13 is open , EXTVBR-B is 100%)

◆ **Rear view of LCM**
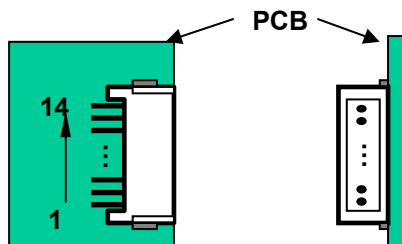
Master   **Slave**

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3-2-3. Local Dimming Interface

- Local Dimming Interface Connector : 12507WR-08L/10L(YEONHO) or Equivalent

Table 6. LOCAL DIMMING INTERFACE CONNECTOR PIN CONFIGULATION

Pin No	Description	Master	Slave	Note
1	Vertical Sync signal	VSYNC	VSYNC	
2	Connect to GND through serial 0Ω resistor	GND	GND.	
3	Connect to GND through serial 0Ω resistor	GND	GND	
4	SPI data	DIN	DIN	
5	Connect to GND through serial 0Ω resistor	GND	GND	
6	SPI Clock	CLK	CLK	
7	Connect to GND through serial 0Ω resistor	GND	GND	1
8	Connect to GND through serial 0Ω resistor	GND	GND	
9	Connect to GND through serial 0Ω resistor		GND	
10	Connect to GND through serial 0Ω resistor		GND	

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

◆ **Rear view of LCM**

Master   **Slave**
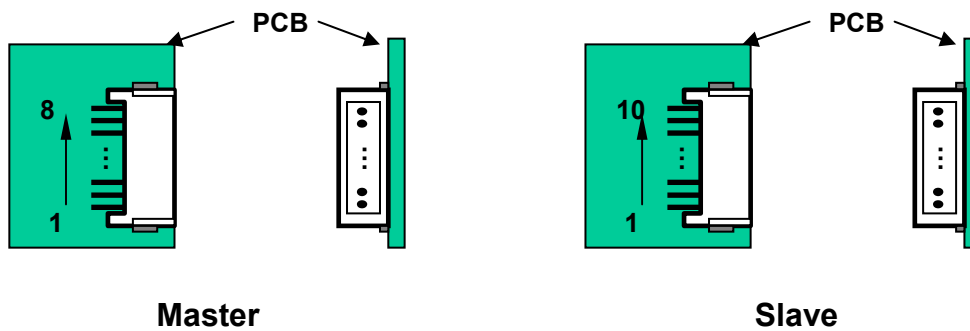
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3-3. Signal Timing Specifications

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

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

ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	t_{HV}	480	480	480	t_{CLK}	1920/4
	Blank	t_{HB}	40	70	200	t_{CLK}	1
	Total	t_{HP}	520	550	680	t_{CLK}	
Vertical	Display Period	t_{VV}	1080	1080	1080	Lines	
	Blank	t_{VB}	10	45	86	Lines	1
	Total	t_{VP}	1090	1125	1166	Lines	

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	f_{CLK}	66.97	74.25	75.00	MHz	
	Horizontal	f_H	121.8	135	136.4	KHz	2
	Vertical	f_V	108.2	120	121.2	Hz	2

Notes : 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.

Product Specification

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

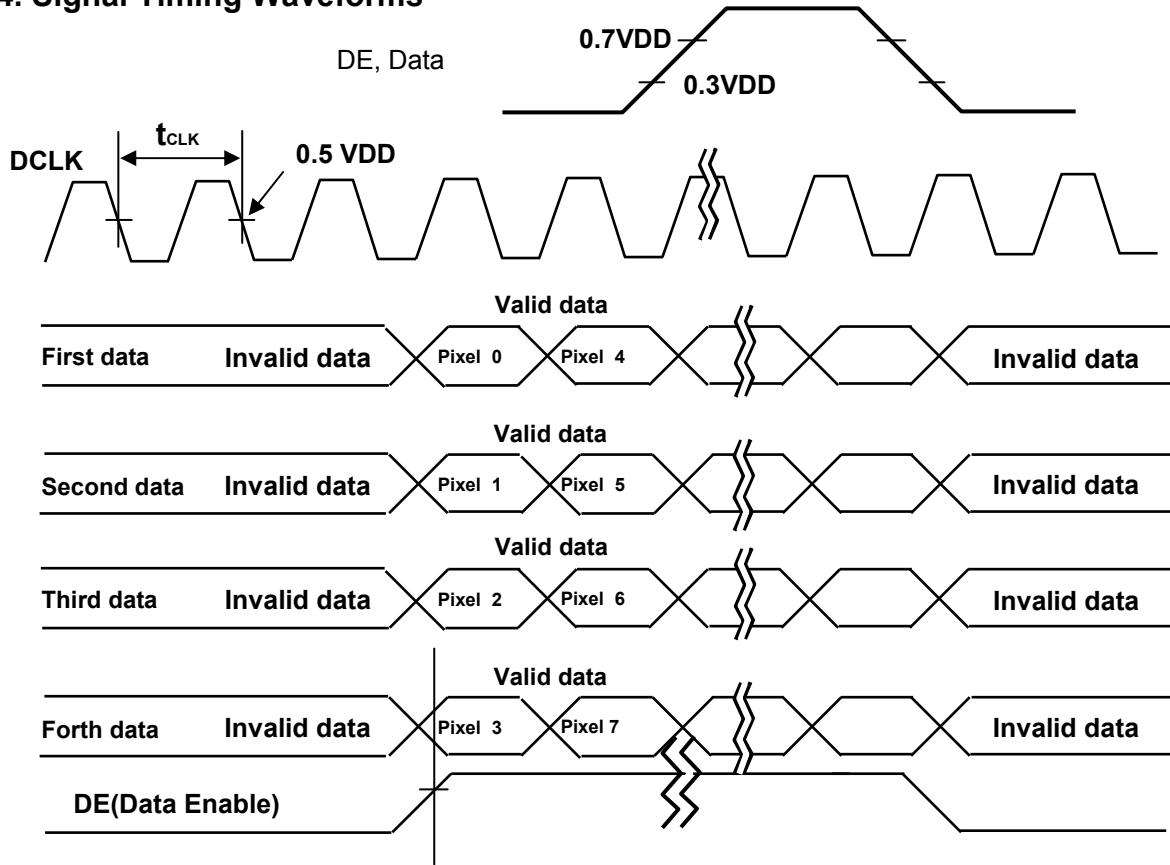**Table7. TIMING TABLE for DVB/PAL (DE Only Mode)**

ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	t_{HV}	480	480	480	t_{CLK}	1920/4
	Blank	t_{HB}	40	70	200	t_{CLK}	1
	Total	t_{HP}	520	550	680	t_{CLK}	
Vertical	Display Period	t_{VV}	1080	1080	1080	Lines	
	Blank	t_{VB}	228	270	300	Lines	1
	Total	t_{VP}	1308	1350	1380	Lines	

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	f_{CLK}	66.97	74.25	75.00	MHz	
	Horizontal	f_H	121.8	135	136.4	KHz	2
	Vertical	f_V	95	100	103.7	Hz	2

Notes : 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. Signal Timing Waveforms
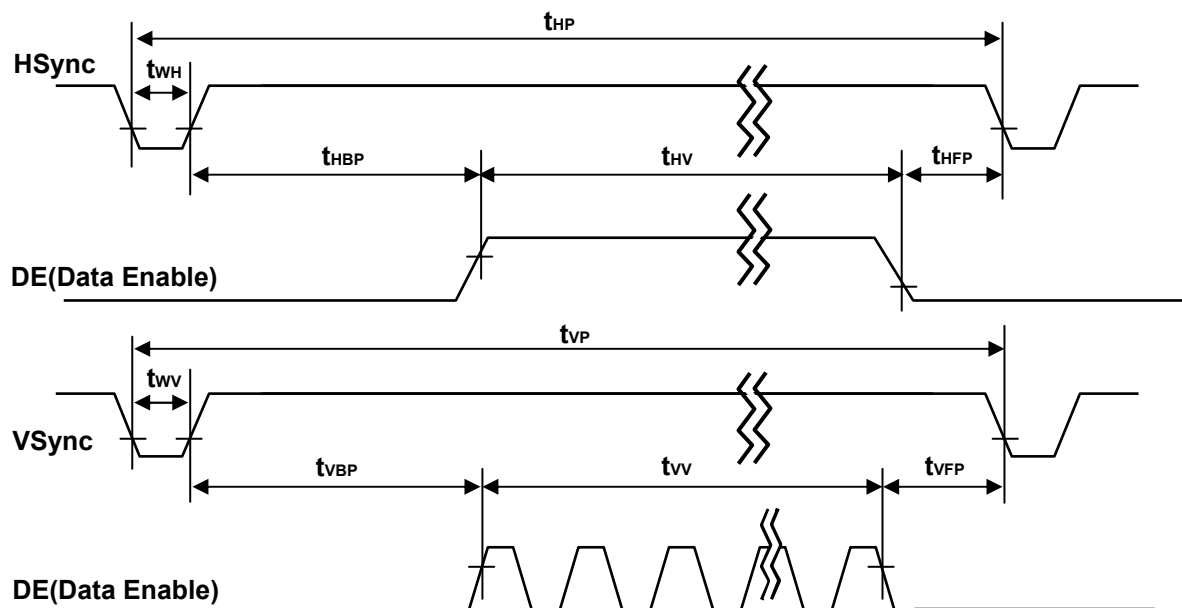
DE, Data

0.7VDD

0.3VDD

t_{CLK}

DCLK

0.5 VDD

Valid data

First data   Invalid data   Pixel 0   Pixel 4   Invalid data

Valid data

Second data   Invalid data   Pixel 1   Pixel 5   Invalid data

Valid data

Third data   Invalid data   Pixel 2   Pixel 6   Invalid data

Valid data

Forth data   Invalid data   Pixel 3   Pixel 7   Invalid data

DE(Data Enable)

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

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

* Reference : Sync. Relation

t_{HP}

HSync

t_{WH}

t_{HBP} t_{HV} t_{HFP}

DE(Data Enable)

t_{VP}

t_{WV}

VSync

t_{VBP} t_{VV} t_{VFP}

DE(Data Enable)

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 8. COLOR DATA REFERENCE

Color		Input Color Data		
		RED MSB　　　　　　　　LSB R9 R8 R7 R6 R5 R4 R3 R2 R1 R0	GREEN MSB　　　　　　　　LSB G9 G8 G7 G6 G5 G4 G3 G2 G1 G0	BLUE MSB　　　　　　　　LSB B9 B8 B7 B6 B5 B4 B3 B2 B1 B0
Basic Color	Black	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	Red(1023)	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	Green(1023)	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0
	Blue(1023)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1
	Cyan	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1
	Magenta	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1
	Yellow	1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0
	White	1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1
RED	RED(000)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	RED(001)	0 0 0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	...	...	...	...
	RED(1022)	1 1 1 1 1 1 1 1 1 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	RED(1023)	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
GREEN	GREEN(000)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	GREEN(001)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0 0 0
	...	...	...	...
	GREEN(1022)	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 0	0 0 0 0 0 0 0 0 0 0
	GREEN(1023)	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0
BLUE	BLUE(000)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
	BLUE(001)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 1
	...	...	...	...
	BLUE(1022)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 0
	BLUE(1023)	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1

3-6. Power Sequence

3-6-1. LCD Driving circuit
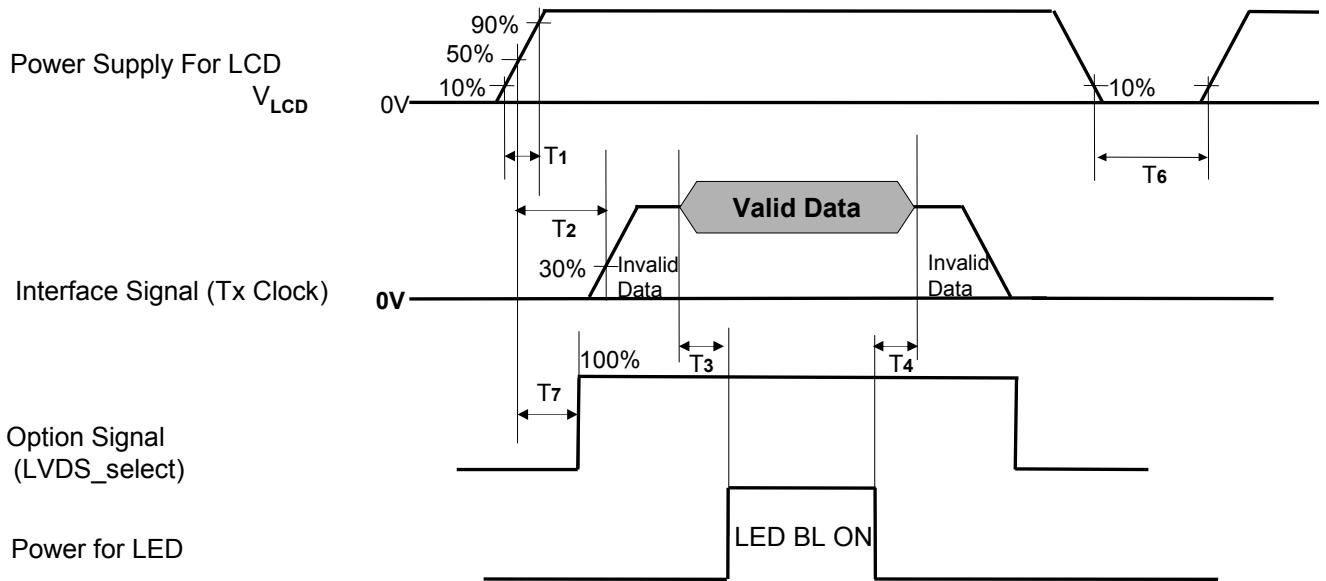
Table 9. POWER SEQUENCE

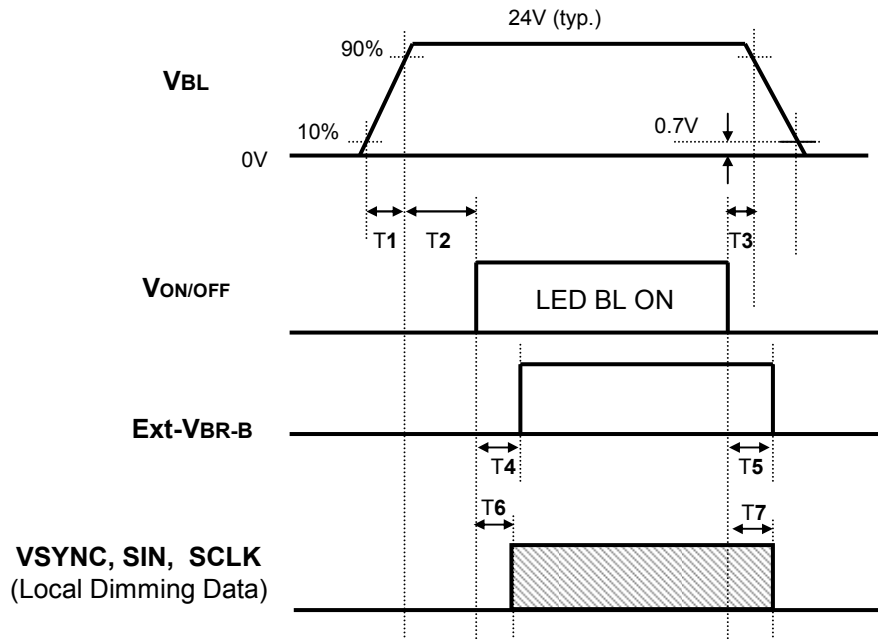| Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	
T2	0	-	-	ms	4
T3	200	-	-	ms	3, 6
T4	200	-	-	ms	3
T6	1.0	-	-	s	5
T7	0	-	T2	ms	4

Note :1. Please avoid floating state of interface signal at invalid period.

2. When the interface signal is invalid, be sure to pull down the power supply V_{LCD} to 0V.

3. The T3/T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

   But If LED backlight is turned on after starting of valid data, abnormal display would be not shown

4. If the on time of signals(Interface signal and Option signals) precedes the on time of Power(V_{LCD}), it will be happened abnormal display. When T7 is NC status, T7 doesn't need to be measured.

5. T6 should be measured after the Module has been fully discharged between power off and on period.

6. If LED backlight on after spec satisfy, abnormal display would be not shown
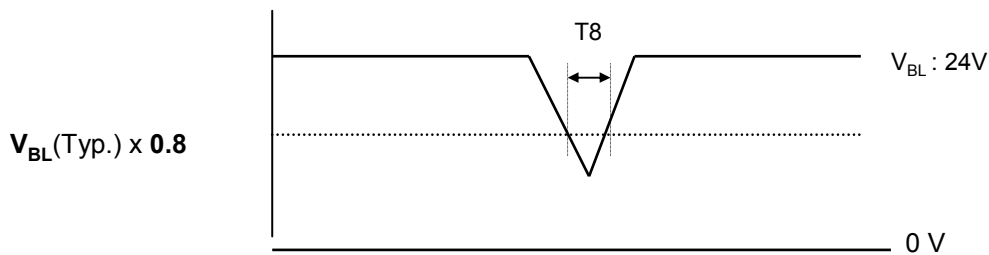
Product Specification

3-6-2. Sequence for LED Driver

Power Supply For LED Driver

3-6-3. Dip condition for LED Driver

Table 10. Power Sequence for LED Driver

Parameter	Values			Units	Remarks
	Min	Typ	Max		
T1	20	-	-	ms	1
T2	500	-	-	ms	
T3	10		-	ms	
T4	0	-	120	ms	
T5	0	-	-	ms	
T6	0	-	-	ms	
T7	0	-	-	ms	
T8	-	-	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 I2T spec of fuse is satisfied.

Product Specification

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 °.
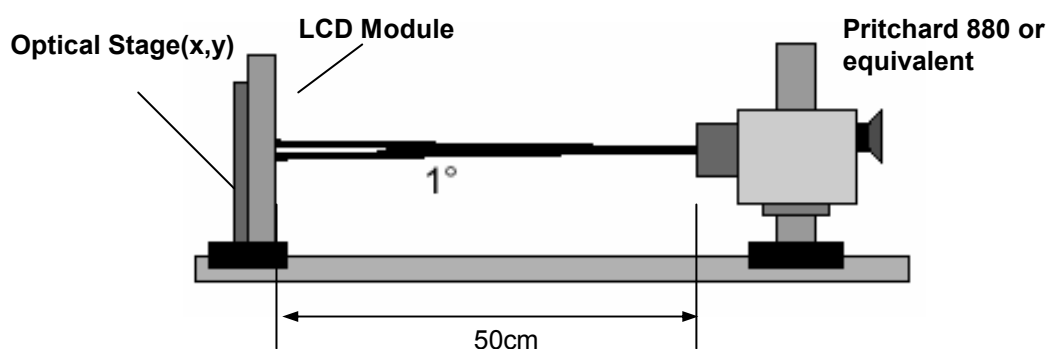FIG. 1 shows additional information concerning the measurement equipment and method.

FIG. 1 Optical Characteristic Measurement Equipment and Method

Ta= 25±2°C, V_{LCD}=12.0V, fv=120Hz, Dclk=74.25MHz, EXTV$_{BR\_B}$=100%

Table 11. OPTICAL CHARACTERISTICS

Parameter		Symbol		Value			Unit	Note
				Min	Typ	Max		
Contrast Ratio		CR		900	1300	-		1
Surface Luminance, white		L_{WH}		400	500	-	cd/m²	2
Luminance Variation		δ $_{WHITE}$	5P	-	-	1.3		3
Response Time	Gray-to-Gray	G to G		-	5	8	ms	4
	MPRT	MPRT		-	8	10	ms	5
	Uniformity	δ $_{MPRT}$		-	-	1		6
	Uniformity	δ $_{G TO G}$		-	-	1		6
Color Coordinates [CIE1931]	RED	Rx		Typ -0.03	0.646	Typ +0.03		
		Ry			0.331			
	GREEN	Gx			0.293			
		Gy			0.629			
	BLUE	Bx			0.150			
		By			0.054			
	WHITE	Wx			0.279			
		Wy			0.292			
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

Product Specification

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 is determined after the unit has been 'ON' and 120min after lighting the backlight in a dark environment at 25±2°C. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 2.

3. The variation in surface luminance , δ WHITE is defined as :

δ WHITE(5P) = Maximum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5}) / Minimum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5})

Where 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 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. 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 and MPRT Response time uniformity is Reference data. Please see Appendix Ⅸ.

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 12.

Table 12. 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

Product Specification

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

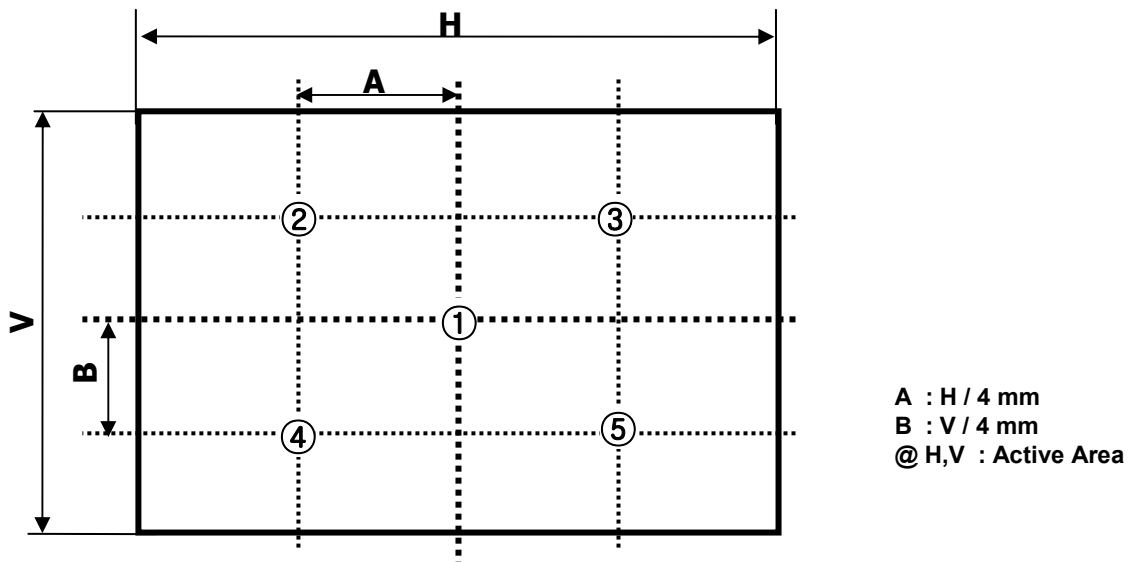A : H / 4 mm
B : V / 4 mm
@ H,V : Active Area

FIG. 2 5 Points for Luminance Measure

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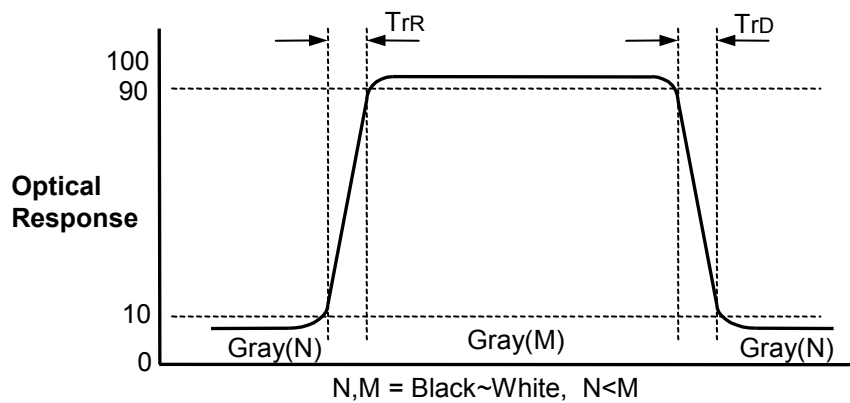

FIG. 3 Response Time

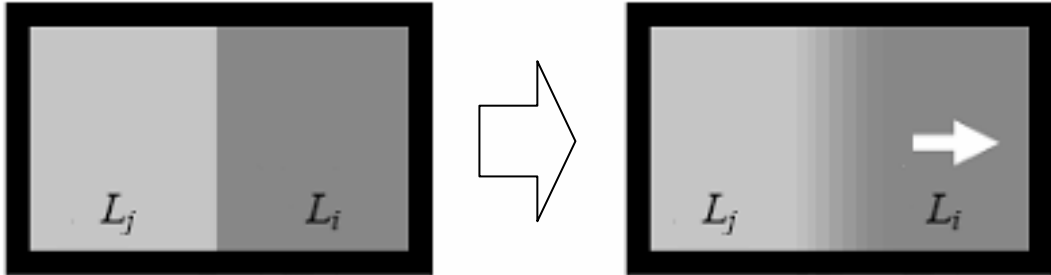Product Specification

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
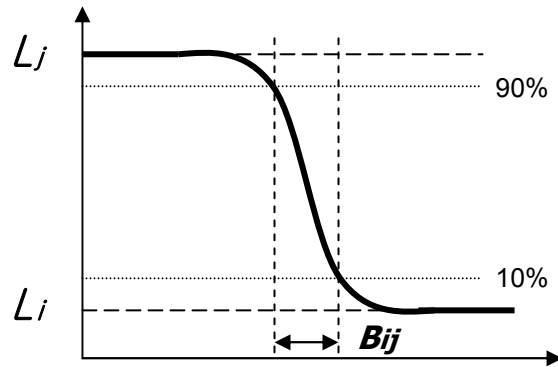
FIG. 4 MPRT

Dimension of viewing angle range
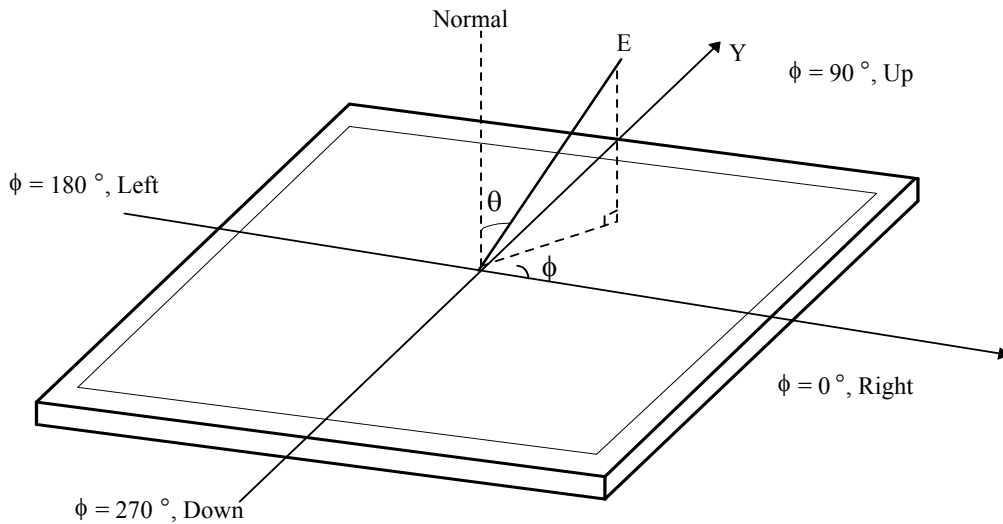
FIG. 5 Viewing Angle

5. Mechanical Characteristics

Table 13 provides general mechanical characteristics.

Table 13. MECHANICAL CHARACTERISTICS

Item	Value	
Outline Dimension	Horizontal	1251.6 mm
	Vertical	722.4 mm
	Depth	27.8 mm
Bezel Area	Horizontal	1217.6 mm
	Vertical	688.4 mm
Active Display Area	Horizontal	1209.6 mm
	Vertical	680.4 mm
Weight	21.0 Kg (Typ.) , 22.0 Kg (Max.)	

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

Product Specification

<FRONT VIEW>

LC550WUL

<REAR VIEW>
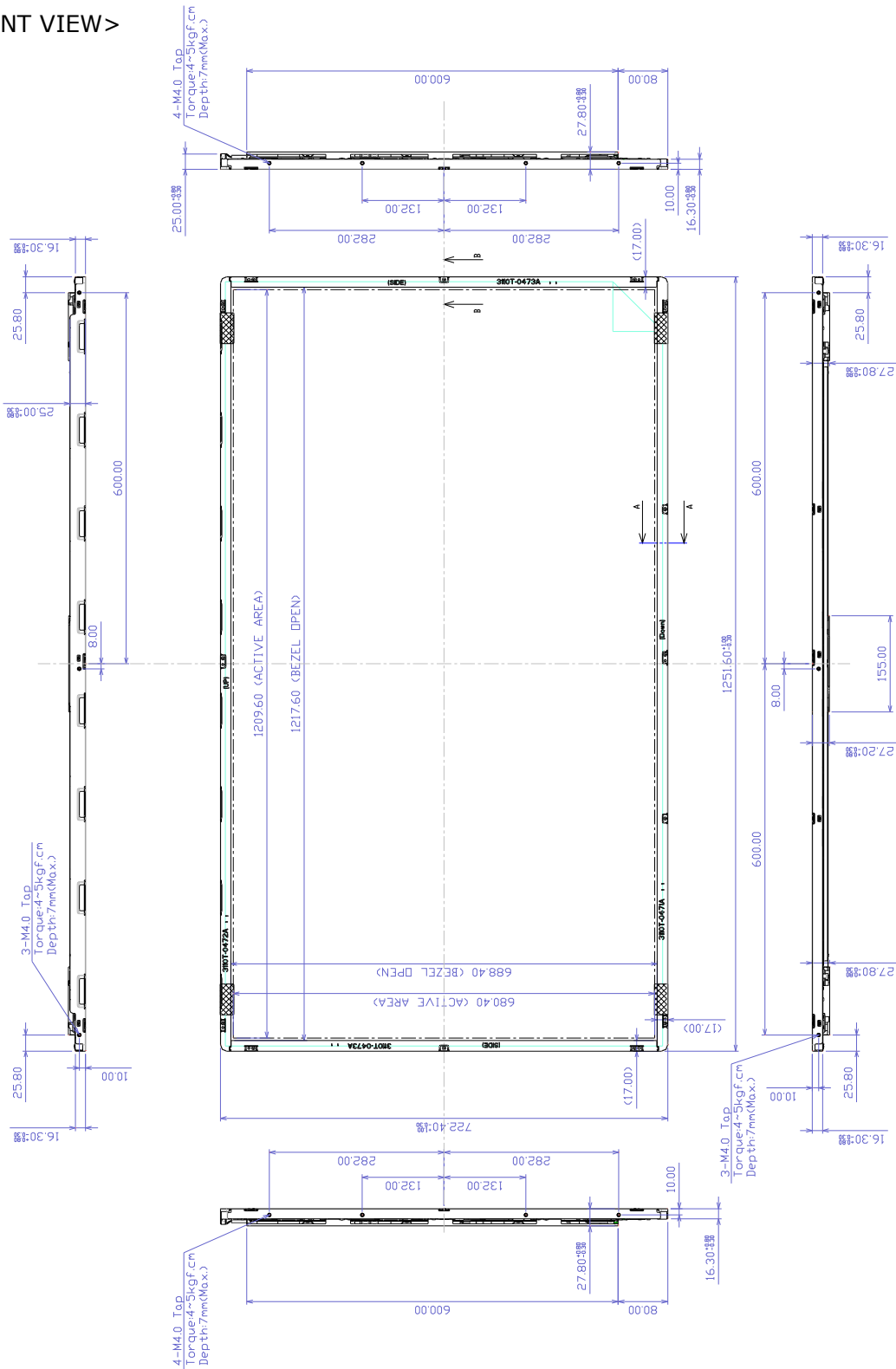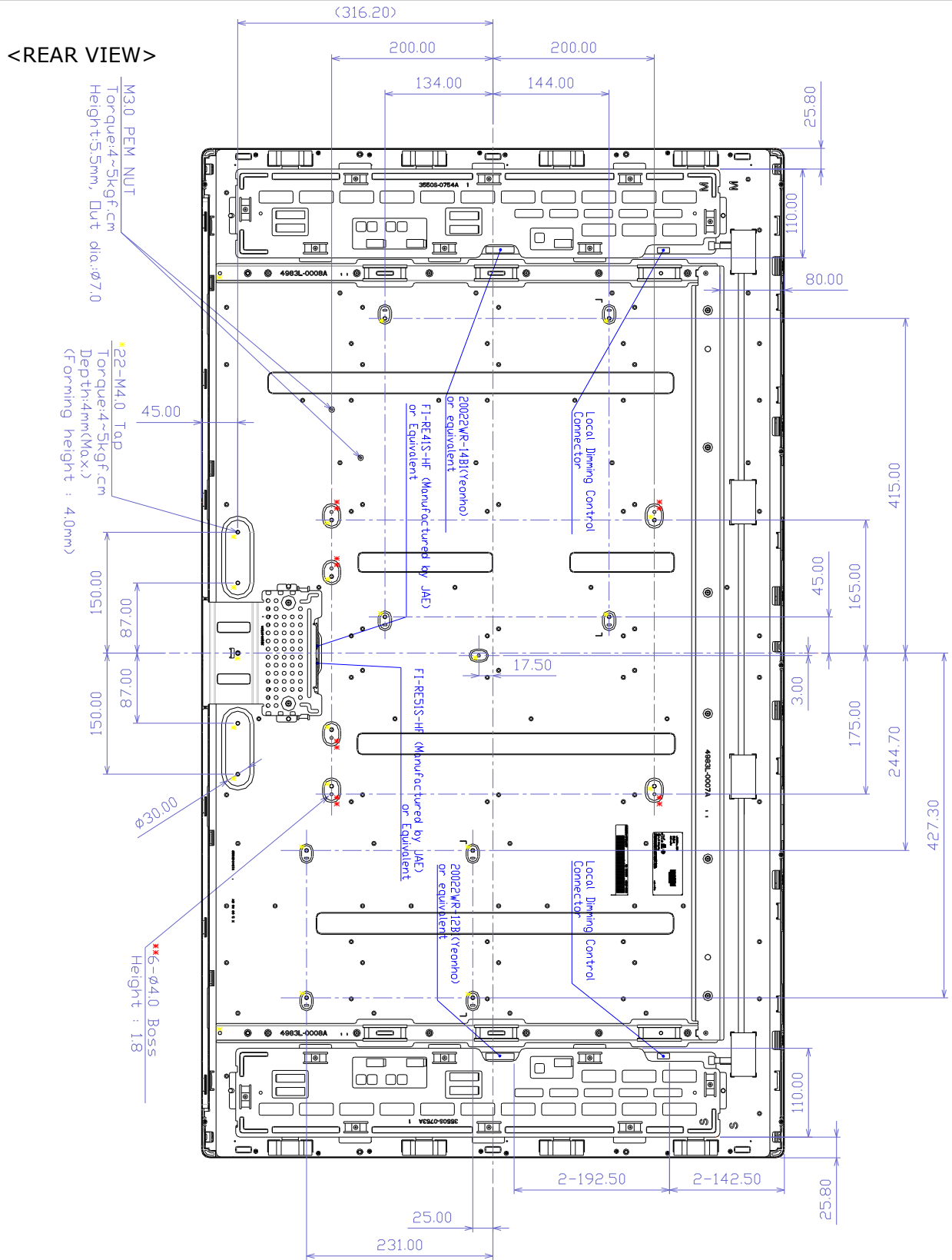
6. Reliability

Table 14. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 240h
4	Low temperature operation test	Ta= 0°C 240h
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0G RMS Bandwidth : 10-300Hz Duration : 10 min for X,Y,Z axis One time each direction
6	Shock test (non-operating)	Shock level :50G(X,Y axis) ,35G(Z axis) Waveform : half sine wave, 11ms Direction : ±X, ±Y, ±Z One time each direction
7	Humidity condition Operation	Ta= 40 °C ,90%RH
8	Altitude operating storage / shipment	0 - 15,000 ft 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, 7th Edition, dated June 30, 2003, Underwriters Laboratories, Inc.,
   Standard for Audio, Video and Similar Electronic Apparatus.
b) CAN/CSA C22.2, No. 60065:03, Canadian Standards Association,
   Standard for Audio, Video and Similar Electronic Apparatus.
c) IEC60065:2001, 7th Edition CB-scheme and EN 60065:2002,
   Safety requirements for Audio, Video and Similar Electronic Apparatus..

7-2. EMC

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

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

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

A,B,C : SIZE(INCH)
D : YEAR   E : MONTH
F : PANEL CODE   G : FACTORY CODE
H : ASSEMBLY CODE   I,J,K,L,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 holes arranged in four corners or four sides.
(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. * There is no problem of Panel crack under 5kgf / φ10mm
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. Operating Precautions

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

Product Specification

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.

Product Specification

APPENDIX- I-1

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

Host System 30 Bit	THC63LVD103 or Compatible
RED0	33
RED1	34
RED2	35
RED3	36
RED4	37
RED5	38
RED6	59
RED7	61
RED8	4
RED9	5
GREEN0	40
GREEN1	41
GREEN2	42
GREEN3	44
GREEN4	45
GREEN5	46
GREEN6	62
GREEN7	63
GREEN8	6
GREEN9	8
BLUE0	48
BLUE1	49
BLUE2	50
BLUE3	52
BLUE4	53
BLUE5	54
BLUE6	64
BLUE7	1
BLUE8	9
BLUE9	11
Hsync	55
Vsync	57
Data Enable	58
CLOCK	12

FI-RE51S-HF

Timing Controller

THC63LVD103	FI-RE51S-HF		Timing Controller
TA−	31	12	RA1N
TA+	30	13	RA1P (100Ω)
TB−	29	14	RB1N
TB+	28	15	RB1P (100Ω)
TC−	25	16	RC1N
TC+	24	17	RC1P (100Ω)
TCLK−	23	19	RCLK1N
TCLK+	22	20	RCLK1P (100Ω)
TD−	21	22	RD1N
TD+	20	23	RD1P (100Ω)
TE−	19	24	RE1N
TE+	18	25	RE1P (100Ω)
		7	**VESA** / JEIDA

GND

LCM Module

Notes:
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.

Product Specification

APPENDIX- I-2

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

Host System 30 Bit	THC63LVD103 or Compatible
RED0	4
RED1	5
RED2	59
RED3	61
RED4	33
RED5	34
RED6	35
RED7	36
RED8	37
RED9	38
GREEN0	6
GREEN1	8
GREEN2	62
GREEN3	63
GREEN4	40
GREEN5	41
GREEN6	42
GREEN7	44
GREEN8	45
GREEN9	46
BLUE0	9
BLUE1	11
BLUE2	64
BLUE3	1
BLUE4	48
BLUE5	49
BLUE6	50
BLUE7	52
BLUE8	53
BLUE9	54
Hsync	55
Vsync	57
Data Enable	58
CLOCK	12

FI-RE51S-HF

Timing Controller

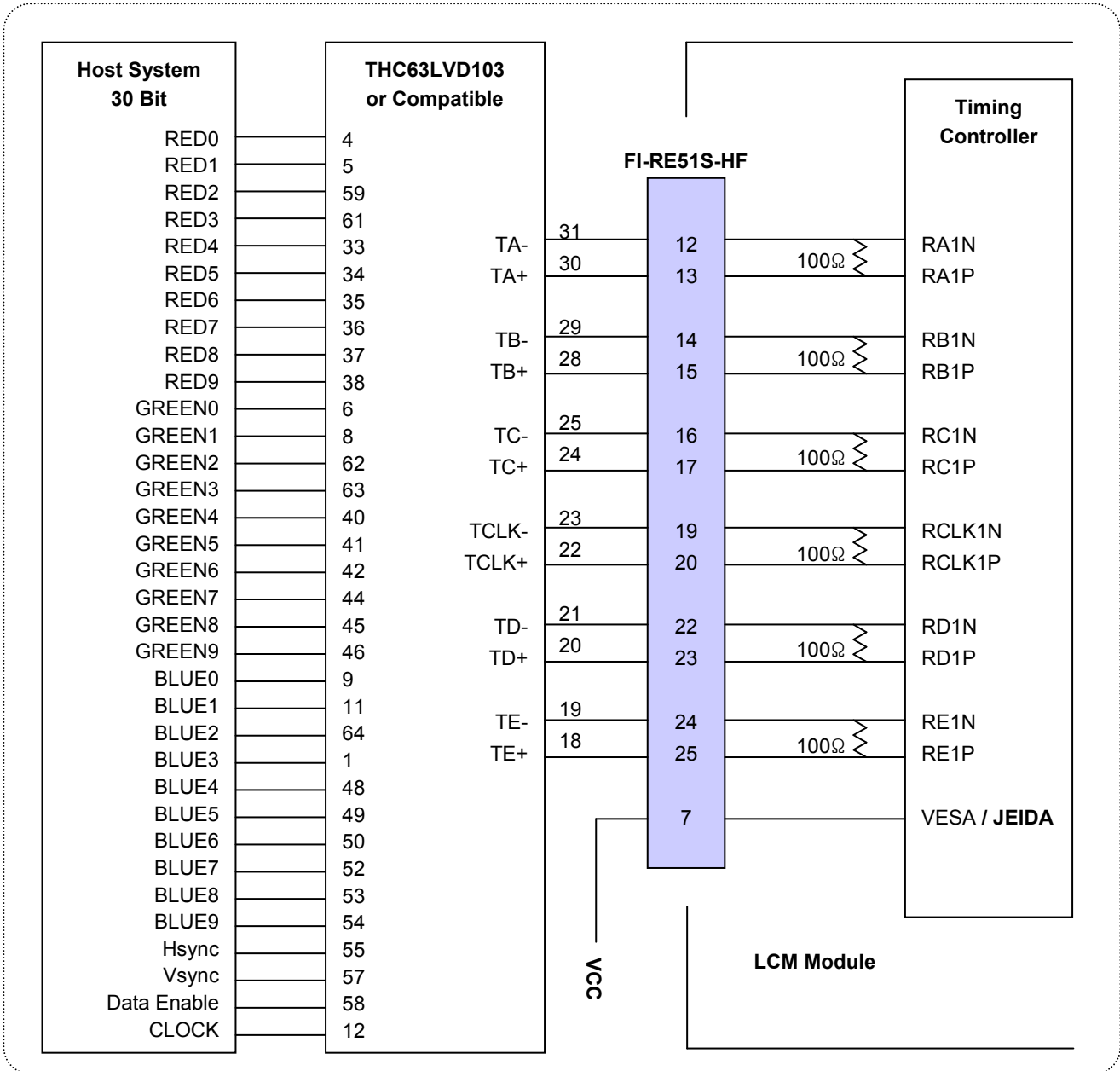| THC63LVD103	FI-RE51S-HF		Timing Controller
TA- 31	12	100Ω	RA1N
TA+ 30	13		RA1P
TB- 29	14	100Ω	RB1N
TB+ 28	15		RB1P
TC- 25	16	100Ω	RC1N
TC+ 24	17		RC1P
TCLK- 23	19	100Ω	RCLK1N
TCLK+ 22	20		RCLK1P
TD- 21	22	100Ω	RD1N
TD+ 20	23		RD1P
TE- 19	24	100Ω	RE1N
TE+ 18	25		RE1P
	7		VESA / JEIDA

VCC

LCM Module

Notes:
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.

Ver. 1.1	30 /40

Product Specification

APPENDIX-II

■ Pallet Ass'y
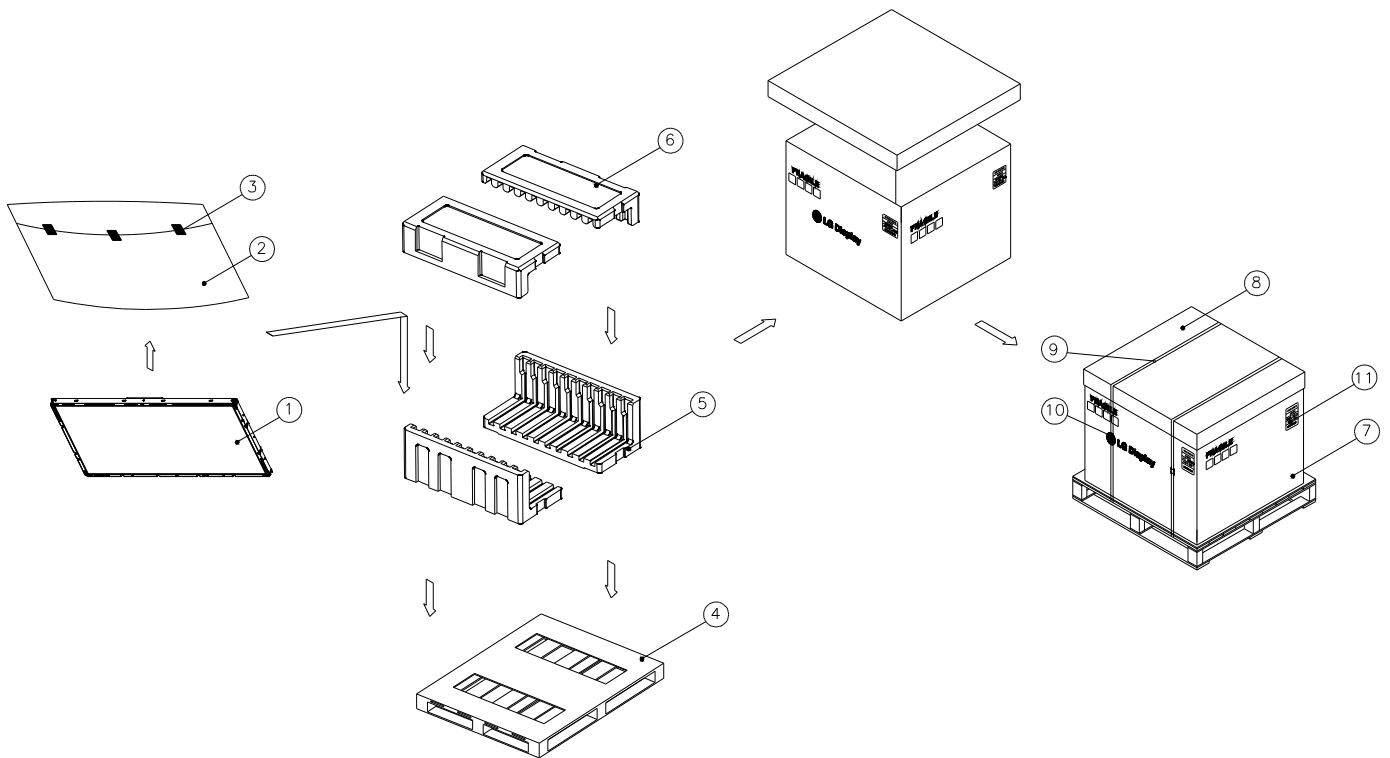
NO.	DESCRIPTION	MATERIAL
1	LCD Module	
2	BAG	55INCH
3	TAPE	MASKING 20MMX50M
4	PALLET	PLYWOOD
5	PACKING,BOTTOM	EPS
6	PACKING,TOP	EPS
7	ANGLE,PACKING	PAPER
8	ANGLE,COVER	PAPER
9	BAND	PP
10	BAND,CLIP	STEEL
11	LABEL	YUPO 80G 100X100

APPENDIX- III
■ LCM Label

Model → LC550WUL (SB)(T2)

RoHS Verified

UL, TUV Mark →

LGD Logo → LG Display

US PATENT No. → This product may be covered by one or more of the following
US Patent Nos. 5,041,823 ; 5,061,920 ; 5,280,371 ; 5,835,139

Serial No.

************ ***

MADE IN KOREA ← Origin
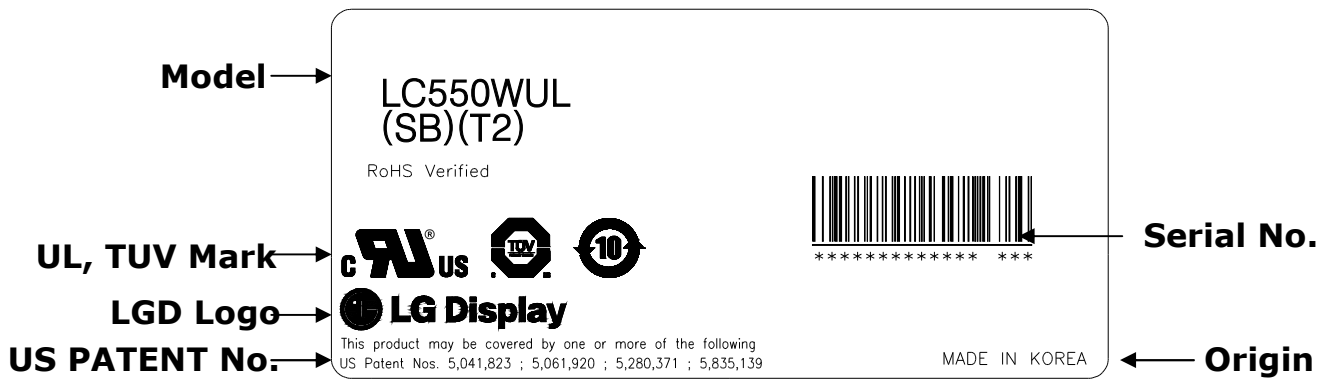
APPENDIX- IV
■ Pallet Label

100.0

LC550WUL SBT2	
10 PCS | **001/01-01**	
MADE IN KOREA	**RoHS Verified**

70.0

XXXXXXXXXXXX XXX
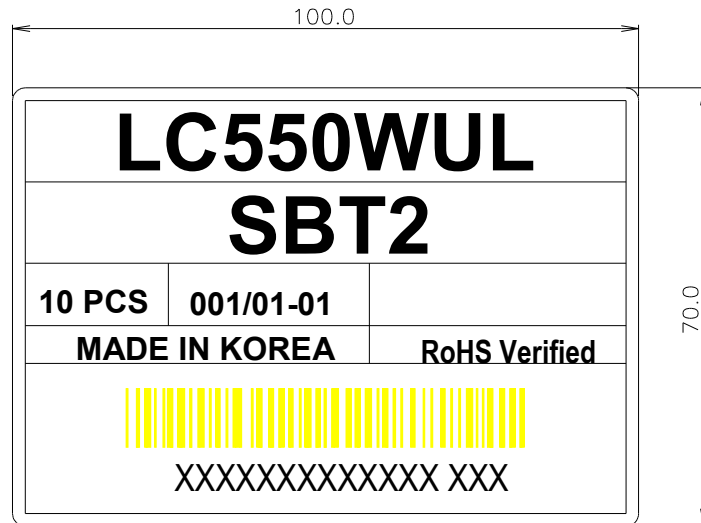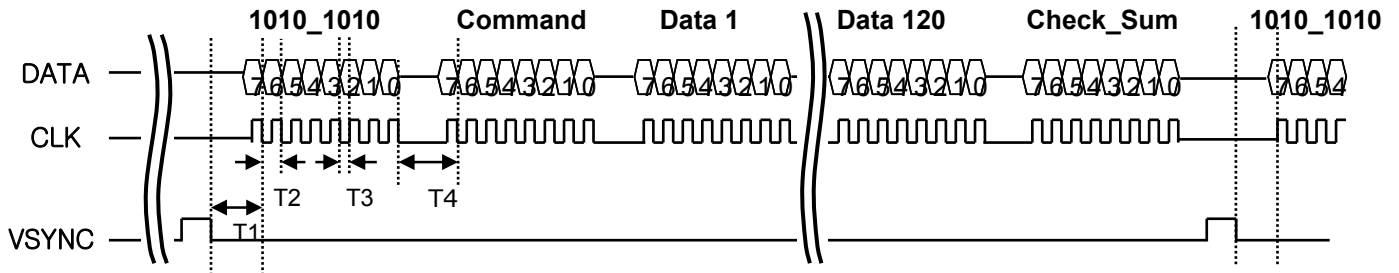
APPENDIX- V

Local Dimming Interface Design Guide

Local Dimming Signal Timing Waveforms

▶ **Data Sequence**

: Indicator (AAh) / Command / data1 / ... / data120 / Check_Sum (Master, Slave respectively)

Check_Sum = 1010_1010 ^ Command ^ Data1 ^ Data2 ^ … Data120 (^ : Exclusive OR)

▶ **Data field Definition**

1. Indicator Byte : Start of data sequence
2. Command Byte
   - Bit 0 : Local-Dimming Enable ('1':Enable, '0':Disable)
   - Bit 1 : Scanning Enable ('1':Enable, '0':Disable)
   - Bit 3 : Brightness up Enable ('1':Enable, '0':Disable)
   - Bit 4~7 : Reserved
3. Data Byte 1 ~ 120 : 8bit Local-dimming gray value (0 ~ 255)

Table15. TIMING TABLE for Local Dimming Interface

Parameter	Values			Units	Remarks
	Min	Typ	Max		
T1	9	10	11.1	us	
T2	0.9	1.0	1.1	us	1MHz (Typ.)
T3	0.45	0.5	0.55	us	
T4	9	10	11.1	us	

Table 16. Local Dimming GRAY SCALE SPECIFICATION

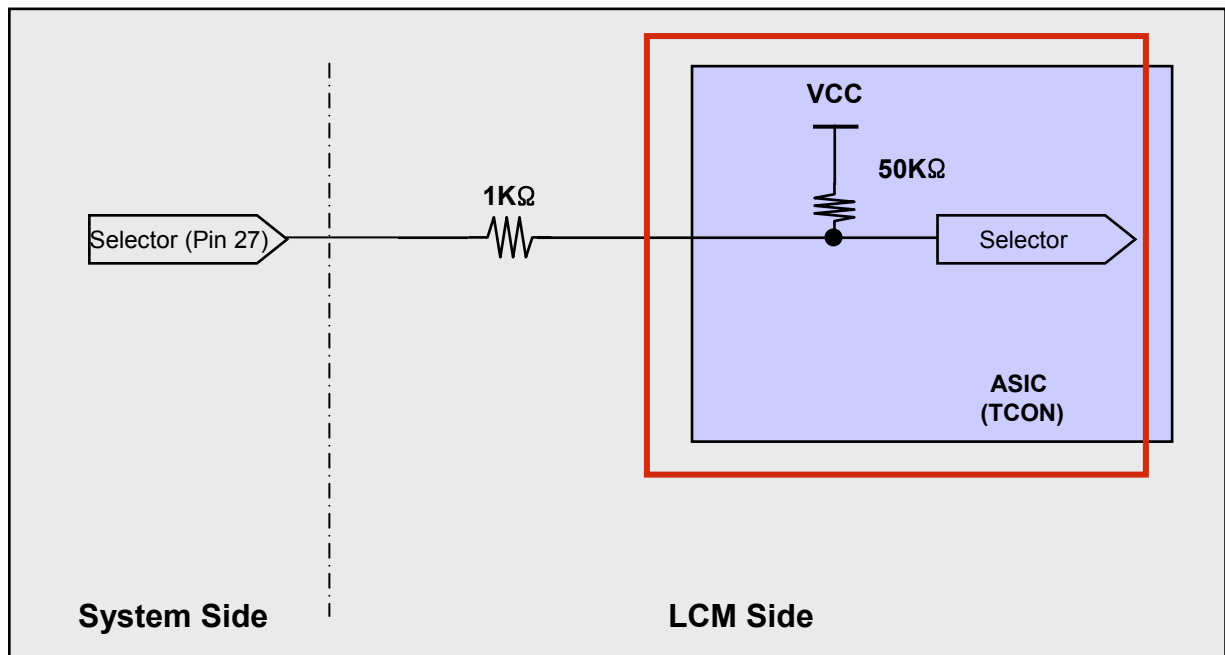| Local Dimming Data Value	Luminance [%] (Typ.)
0	0
63	25
127	50
191	75
255	100

APPENDIX- VI

Option Pin Circuit Block Diagram

Circuit Block Diagram of LVDS Format Selection pin
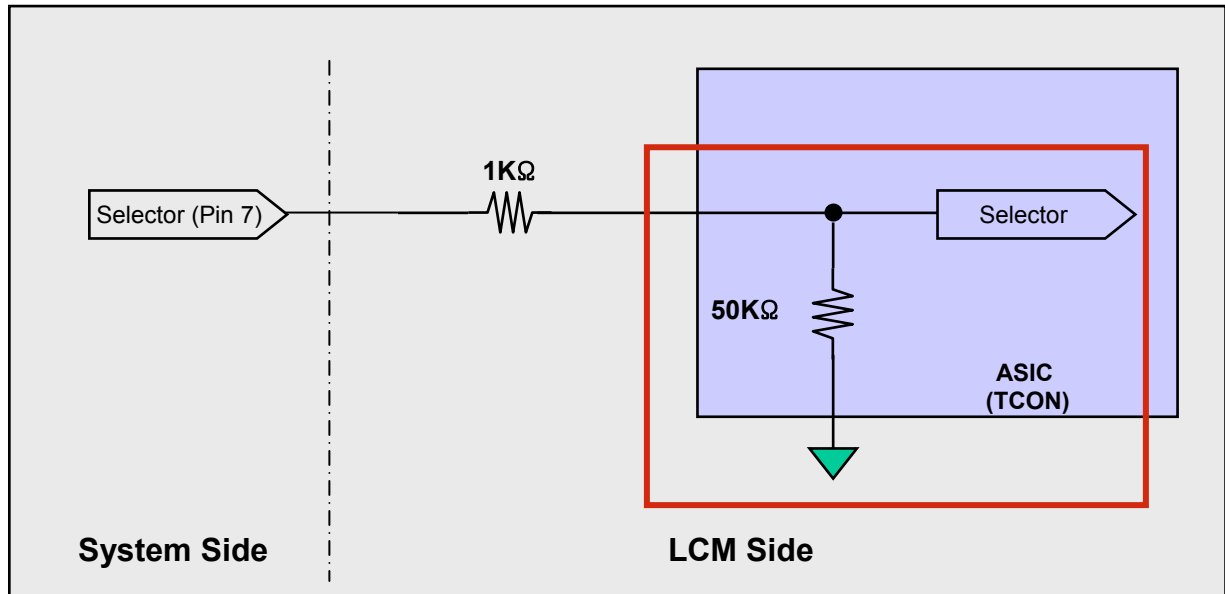
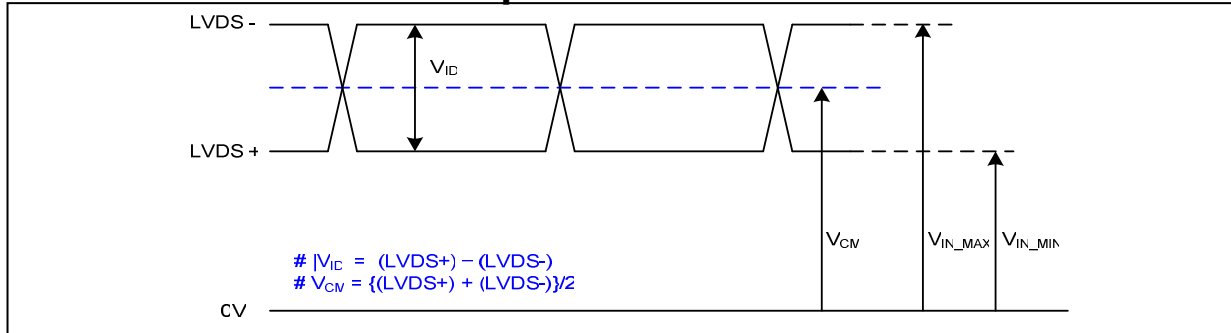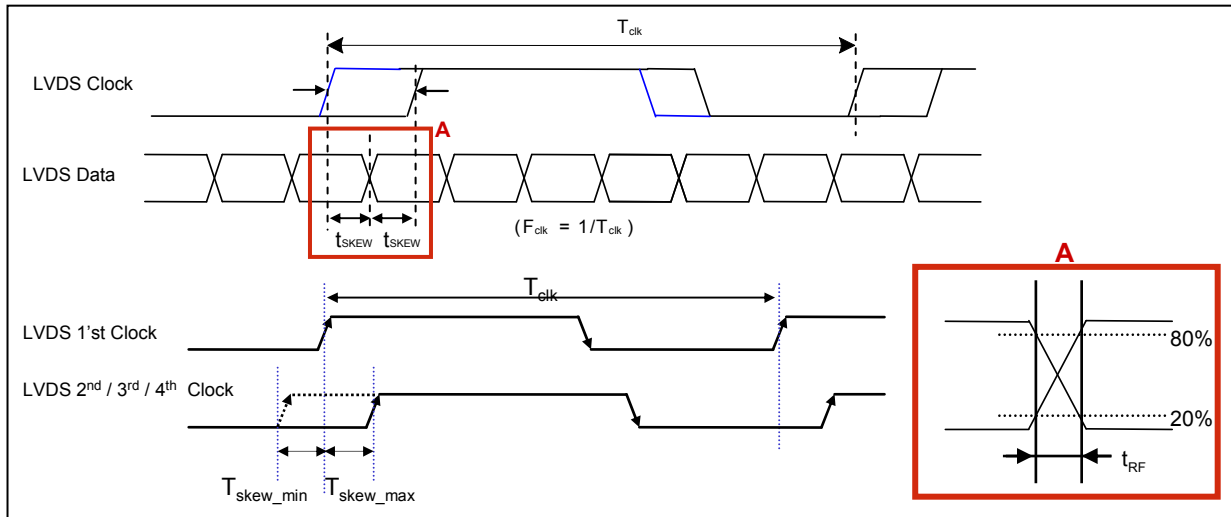## Circuit Block Diagram of Bit Selection pin

APPENDIX- VII-1

1. DC Specification

LVDS Input characteristics

$|V_{ID}| = (LVDS+) - (LVDS-)$
$V_{CM} = \{(LVDS+) + (LVDS-)\}/2$

Description	Symbol	Min	Max	Unit	Notes
LVDS Single end Voltage	$|V_{ID}|$	200	600	mV	-
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	ΔV_{CM}		250	mV	-

2. AC Specification

Description	Symbol	Min	Max	Unit	Notes
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}	± 350		ps	-
LVDS Clock to Clock Skew Margin (Even to Odd)	t_{SKEW_EO}		$1/7* T_{clk}$	T_{clk}	-

Notes : 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.

APPENDIX- VII-2

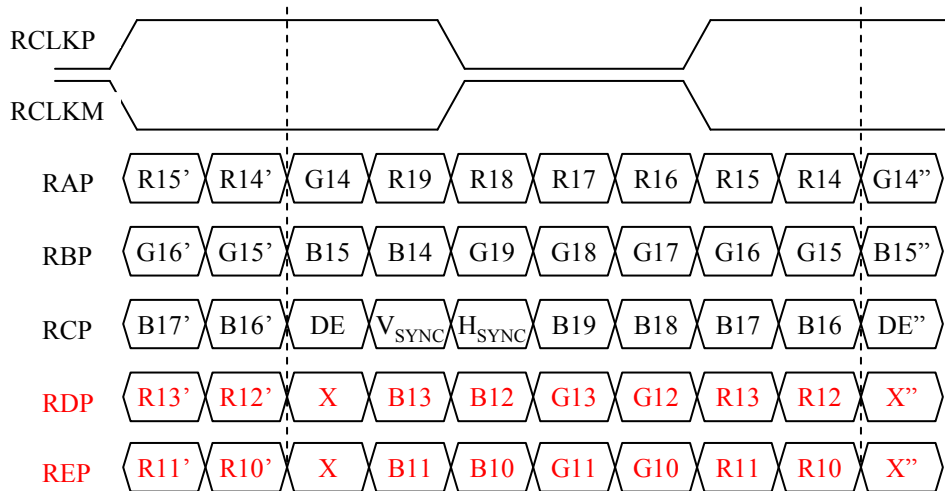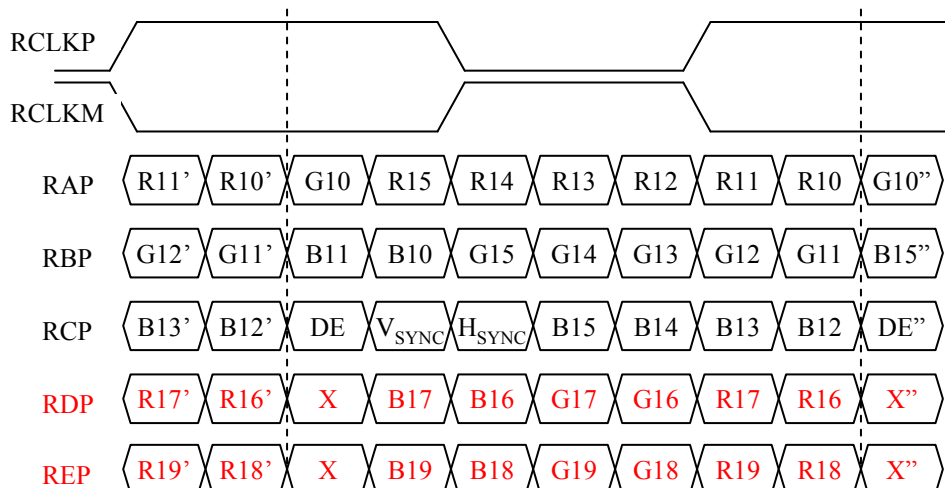# LVDS Input characteristics

Ver. 1.1
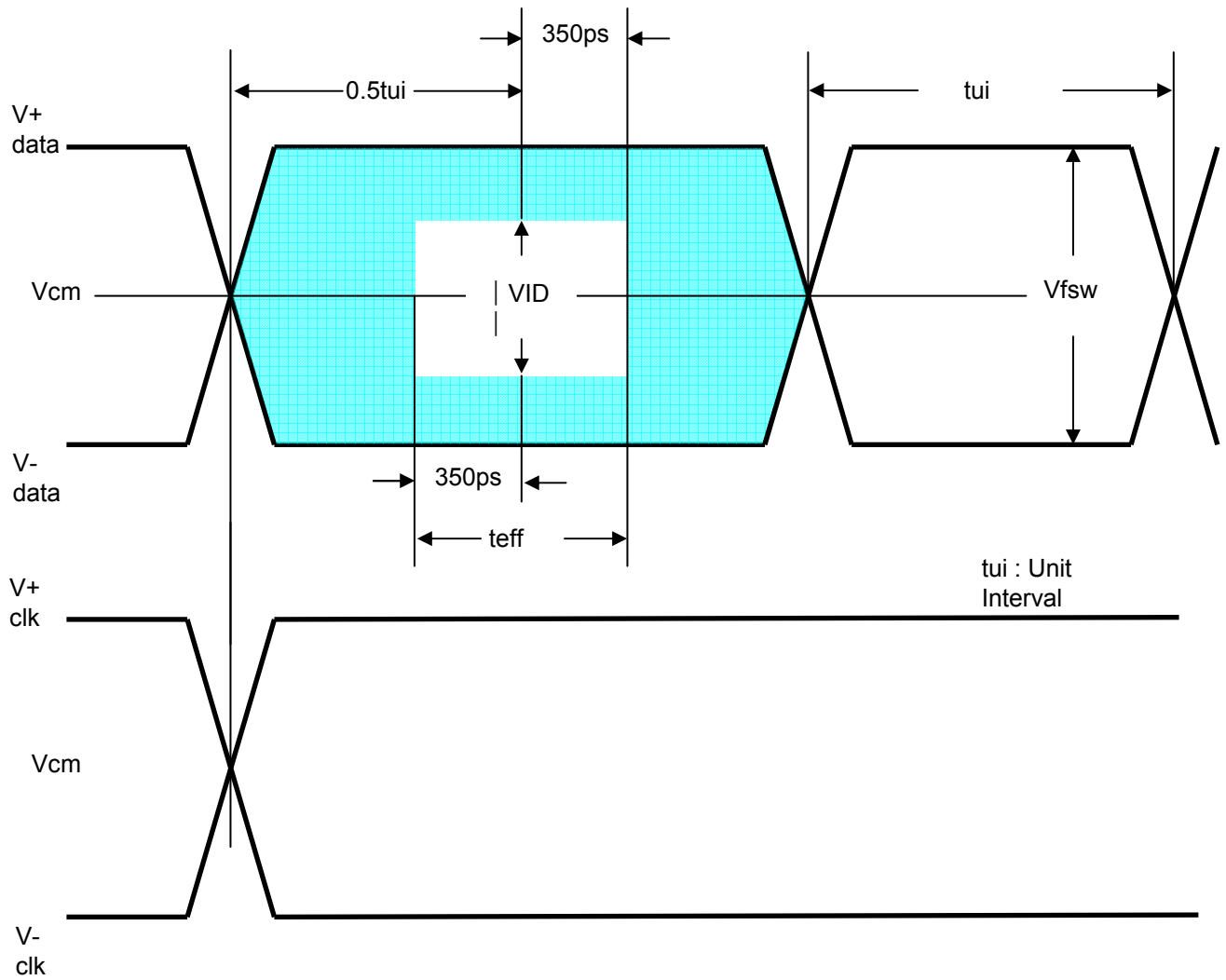
APPENDIX-VIII-1

LVDS Data-Mapping info. (10bit)

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

RCLKP										
RCLKM										
RAP	R15'	R14'	G14	R19	R18	R17	R16	R15	R14	G14"
RBP	G16'	G15'	B15	B14	G19	G18	G17	G16	G15	B15"
RCP	B17'	B16'	DE	V_{SYNC}	H_{SYNC}	B19	B18	B17	B16	DE"
RDP	R13'	R12'	X	B13	B12	G13	G12	R13	R12	X"
REP	R11'	R10'	X	B11	B10	G11	G10	R11	R10	X"

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

RCLKP										
RCLKM										
RAP	R11'	R10'	G10	R15	R14	R13	R12	R11	R10	G10"
RBP	G12'	G11'	B11	B10	G15	G14	G13	G12	G11	B15"
RCP	B13'	B12'	DE	V_{SYNC}	H_{SYNC}	B15	B14	B13	B12	DE"
RDP	R17'	R16'	X	B17	B16	G17	G16	R17	R16	X"
REP	R19'	R18'	X	B19	B18	G19	G18	R19	R18	X"

Product Specification

APPENDIX- VIII-2

LVDS Data-Mapping info. (8bit)

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

RAP	R13'	R12'	G12	R17	R16	R15	R14	R13	R12	G12"
RBP	G14'	G13'	B13	B12	G17	G16	G15	G14	G13	B13"
RCP	B15'	B14'	DE	V_{SYNC}	H_{SYNC}	B17	B16	B15	B14	DE"
RDP	R11'	R10'	X	B11	B10	G11	G10	R11	R10	X"

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

RAP	R11'	R10'	G10	R15	R14	R13	R12	R11	R10	G10"
RBP	G12'	G11'	B11	B10	G15	G14	G13	G12	G11	B15"
RCP	B13'	B12'	DE	V_{SYNC}	H_{SYNC}	B15	B14	B13	B12	DE"
RDP	R17'	R16'	X	B17	B16	G17	G16	R17	R16	X"
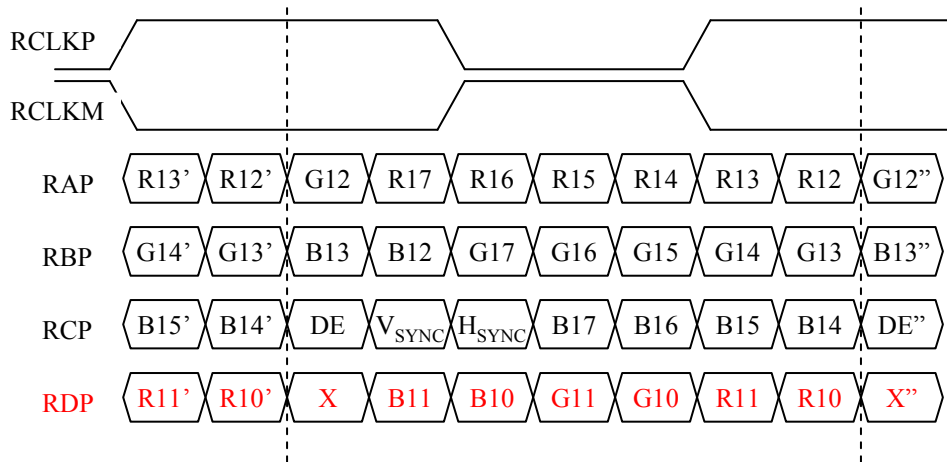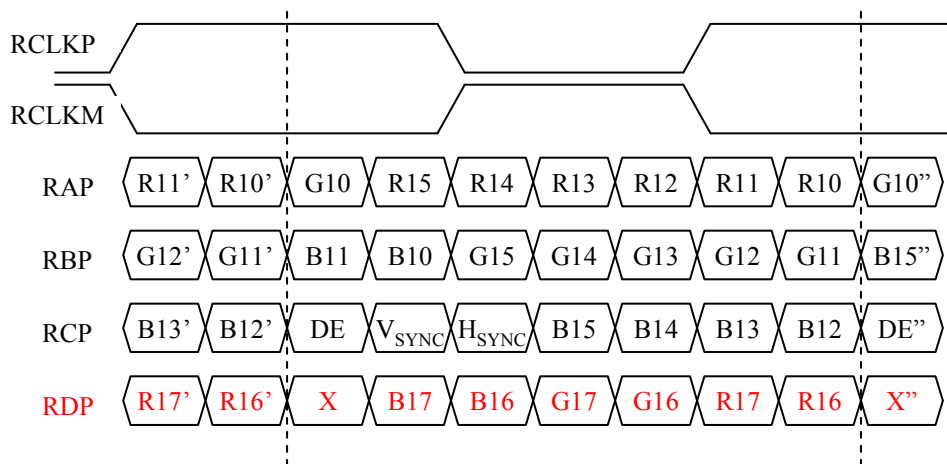
Product Specification

APPENDIX-IX

Gray to Gray Response Time Uniformity

This is only the reference data of G to G and uniformity for LC550WUL-SBT1 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)".(128 Gray Step at 10bit (D))

2. G to G Uniformity
   The variation of G to G Uniformity , δ G to G is defined as :

$$\text{G to G Uniformity } = \frac{Maximum(GtoG) - Typical(GtoG)}{Typical(GtoG)} \leq 1$$
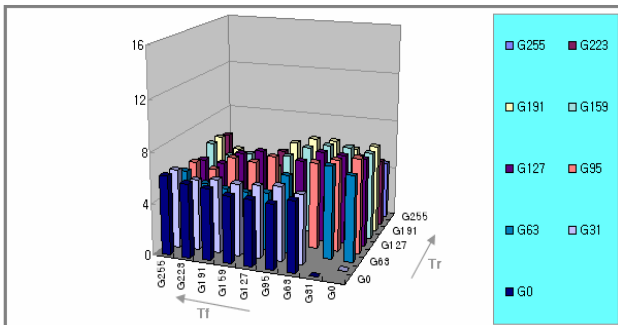
*Maximum (GtoG) means maximum value of measured time (N, M = 0 (Black) ~ 1023(White), 128 gray step).

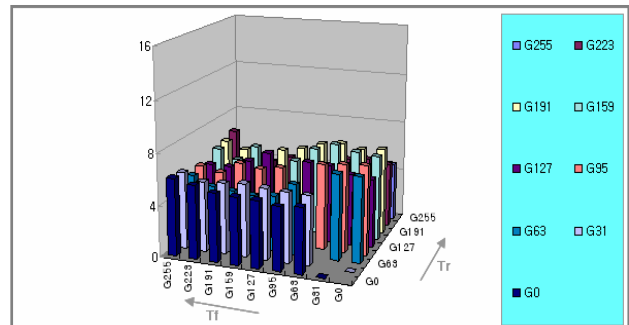|	0Gray	127ray	255Gray	...	895Gray	1023Gray
0Gray		TrR:0G→127G	TrR:0G→255G	...	TrR:0G→895G	TrR:0G→1023G
127Gray	TrD:127G→0G		TrR:127G→255G	...	TrR:127G→895G	TrR:127G→1023G
255Gray	TrD:255G→0G	TrD:255G→127G		...	TrR:255G→895G	TrR:255G→1023G
...	...	...	...	...	...	...
895Gray	TrD:895G→0G	TrD:895G→127G	TrD:895G→255G	...		TrR:895G→1023G
1023Gray	TrD:1023G→0G	TrD:1023G→127G	TrD:1023G→255G	...	TrD:1023G→895G	

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 May 7th, 2009 (LGD RV Event Sample)

	G to G Response Time [ms]		Uniformity
	Min.	Max.	
# 1	3.03	7.17	0.35
# 2	2.97	7.30	0.38

< # 1 >

< # 2 >