LG Display

SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	55.0” WUXGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Display Co., Ltd.
*MODEL	LC550EUB
SUFFIX	SCA1

*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
P.Y. Kim / Team Leader	
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J.Y.Jeong / Project Leader	
PREPARED BY	
S.H.Choi / Engineer	

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

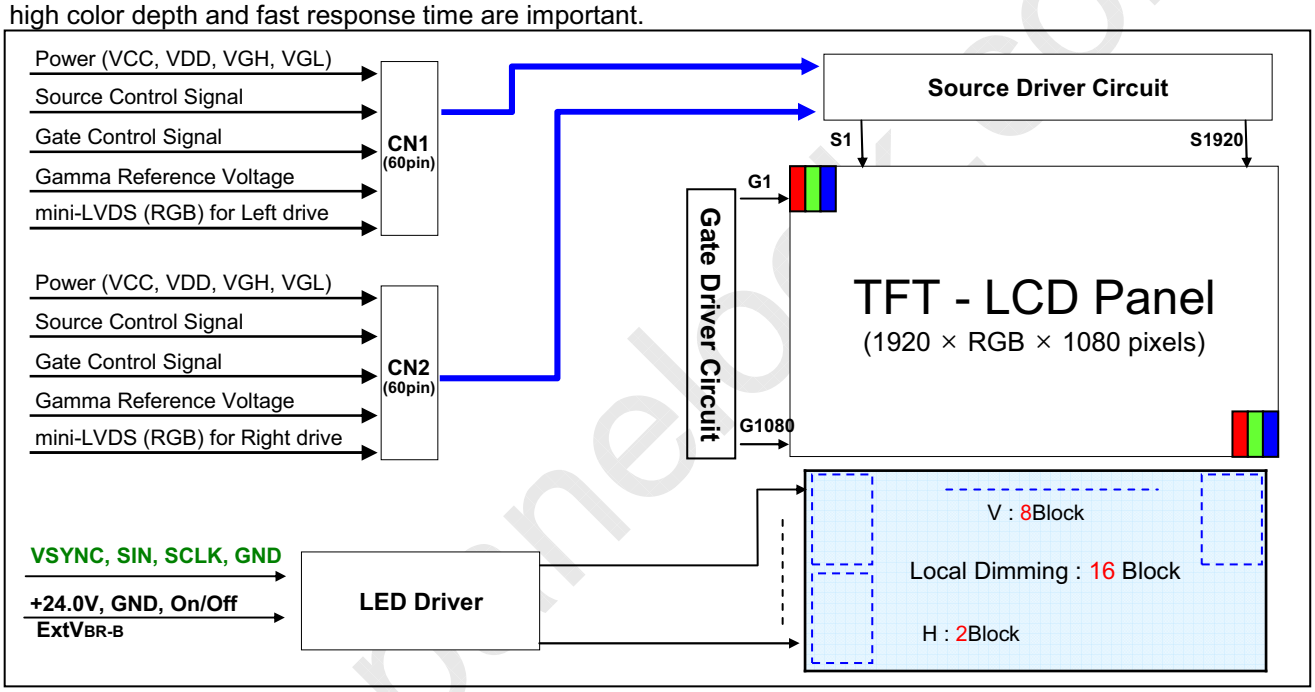
CONTENTS

RECORD OF REVISIONS

Revision No.	Revision Date	Page	Description
0.0	Aug, 21, 2009	-	Preliminary Specification(First Draft)
0.1	Sep, 15, 2009	8,9,20	Gamma Ref Position Change.
	Oct, 16, 2009	5,6	Absolute Maximum Rating/Electrical Specification Update.
		17,18	Power Sequence Update.
		19	Optical Specification.(Response Time)
0.2	Oct ,30, 2009	10	Pin Description changed (14pin : GND → N.C.)
		11	Pin Description updated
1.0	Dec,29,2009	6	Electrical Characteristics
		19	OPTICAL Characteristics
		27	Safety
2.0	Jan,27,2010	36	Power Sequence of source Drive IC added

1. General Description

The LC550EUB 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 type display 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 arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 8-bit gray scale signal for each dot. Therefore, it can present a palette of more than 16.7M(true) colors.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Active Screen Size	54.64 inches(1387.83mm) diagonal
Outline Dimension	1261.6(H) ×732.4(V) X 11.4(B)/24.2 mm(D) (Typ.)
Pixel Pitch	0.63mm × 0.63mm
Pixel Format	1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement
Color Depth	8-bit, 16.7 M colors (※ 1.06B colors @ 10 bit (D) System Output)
Drive IC Data Interface	Source D-IC : 8-bit mini-LVDS, gamma reference voltage, and control signals Gate D-IC : Gate control signals
Luminance, White	450 cd/m^2 (Center 1point ,Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Min.), U/D 178 (Min.))
Power Consumption	Total 142.3 W (Typ.) (Logic=8.3W with T-CON, LED Backlight =134W @ with Driver)
Weight	21.5 Kg (Typ.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 10%)

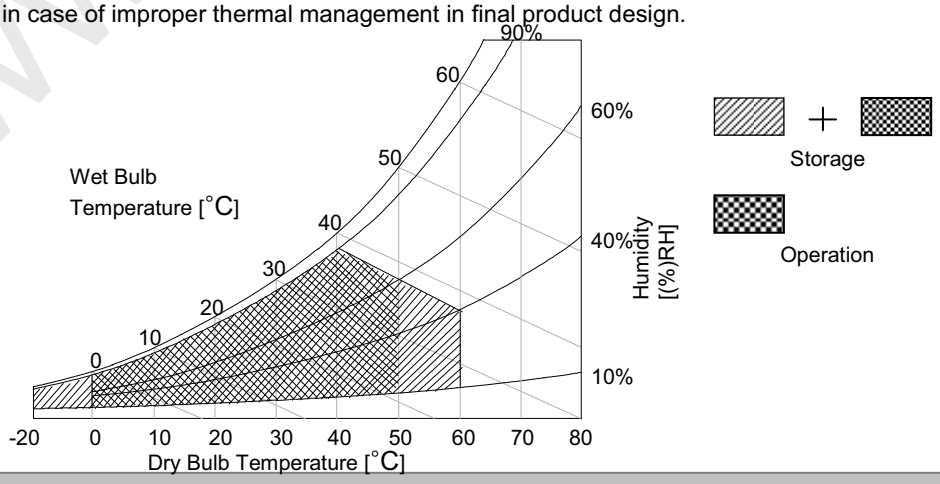
2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Driver Power Input Voltage		VBL	-0.3	+ 27.0		1
Driver Control Voltage	ON/OFF	VOFF / VON	-0.3	+5.5		
	Brightness	EXTVBR-B	0.0	+5.5		
Logic Power Voltage		VCC	-0.5	+4.0	VDC	
Gate High Voltage		VGH	+18.0	+30.0	VDC	
Gate Low Voltage		VGL	-8.0	-4.0	VDC	
Source D-IC Analog Voltage		VDD	-0.3	+18.0	VDC	
Gamma Ref. Voltage (Upper)		VGMH	½VDD-0.5	VDD+0.5	VDC	
Gamma Ref. Voltage (Low)		VGML	-0.3	½ VDD+0.5	VDC	
Panel Front Temperature		TSUR	-	+68	°C	4
Operating Temperature		TOP	0	+50	°C	2,3
Storage Temperature		TST	-20	+60	°C	
Operating Ambient Humidity		HOP	10	90	%RH	
Storage Humidity		HST	10	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℃ condition.
4. The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 68 ℃ 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 degrade in case of improper thermal management in final product design.



3. Electrical Specifications

3-1. Electrical Characteristics

It requires several power inputs. The VCC is the basic power of LCD Driving power sequence, Which is used to logic power voltage of Source D-IC and Gate D-IC.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit	Note
Logic Power Voltage	VCC	-	3.0	3.3	3.6	VDC	
Logic High Level Input Voltage	VIH		2.7		VCC	VDC	
Logic Low Level Input Voltage	VIL		0		0.6	VDC	
Source D-IC Analog Voltage	VDD	-	16.1	16.3	16.5	VDC	
Half Source D-IC Analog Voltage	H_VDD	-	7.85	7.9	8.15V	VDC	
Gamma Reference Voltage	V_{GMH}	(GMA1 ~ GMA9)	½*VDD		VDD-0.2		
	V_{GML}	(GMA10 ~ GMA18)	0.2		½*VDD		
Common Voltage	Vcom	Normal	6.56	6.86	7.16	V	
		Reverse	6.56	6.86	7.16		
Mini-LVDS Clock frequency	CLK	3.0V≤VCC ≤3.6V			312	MHz	
mini-LVDS input Voltage (Center)	VIB	Mini-LVDS Clock and Data	0.7 + (VID/2)		(VCC-1.2) − VID / 2	V	5
mini-LVDS input Voltage Distortion (Center)	ΔVIB				0.8	V	
mini-LVDS differential Voltage range	VID		150		800	mV	
mini-LVDS differential Voltage range Dip	ΔVID		25		800	mV	
Gate High Voltage	VGH	@ 25℃	27.7	28.0	28.3	VDC	
		@ 0℃					
Gate Low Voltage	VGL		-5.5	-5.3	-5.1	VDC	
Gate High Modulation Voltage	VGHM			16		V	
Total Power Current	ILCD	-		685	890	mA	2
Total Power Consumption	PLCD	-		8.3	10.7	Watt	2

Note:

1. The specified current and power consumption are under the VLCD=12V., 25 ± 2°C, f_V=120Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The above spec is based on the basic model.
3. All of the typical gate voltage should be controlled within 1% voltage level
4. Ripple voltage level is recommended under 10%
5. In case of mini-LVDS signal spec, refer to Fig 2 for the more detail.
6. Logic Level Input Signal : SOE,POL,GSP,H_CONV,OPT_N
7. HVDD Voltage level is half of VDD and it should be between Gamma9 and Gamma10

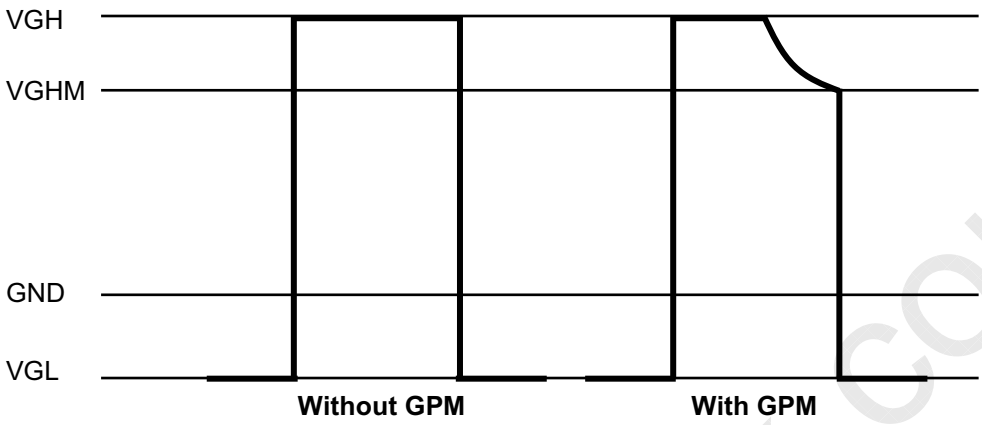


FIG. 1 Gate Output Wave form without GPM and with GPM

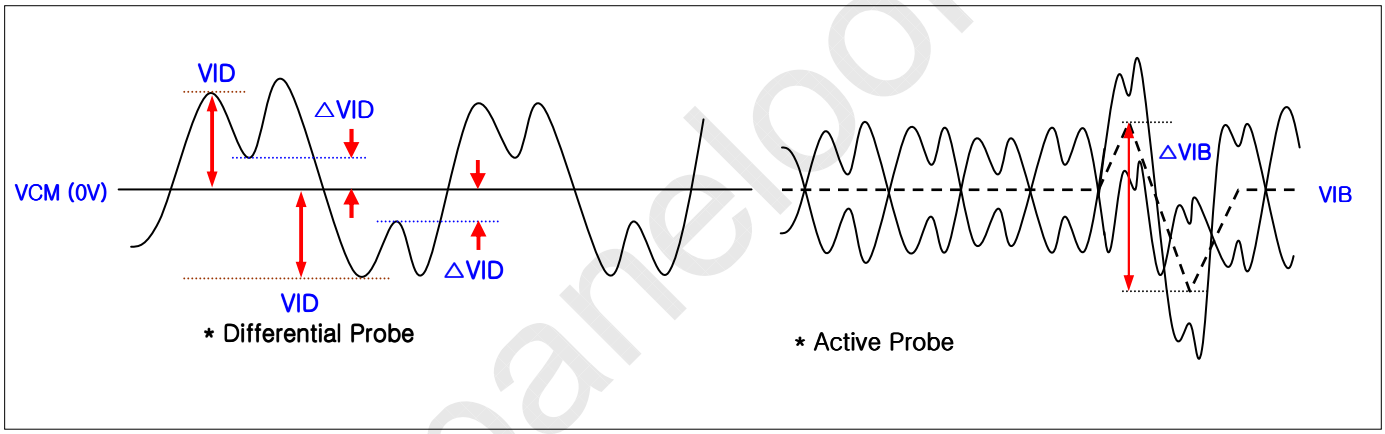


FIG. 2 Description of VID, ΔVIB, ΔVID

* Source PCB

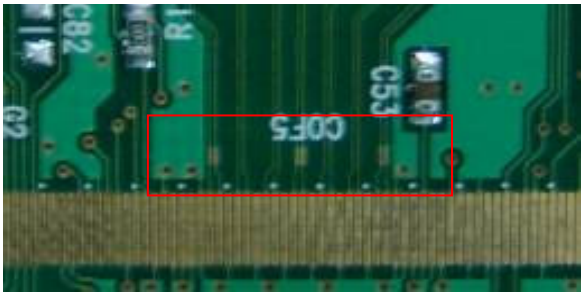


FIG. 3 Measure point

Table 3. ELECTRICAL CHARACTERISTICS (Continue)

Parameter			Symbol	Values			Unit	Notes
				Min	Typ	Max		
LED Driver :								
Power Supply Input Voltage			VBL	22.8	24.0	25.2	Vdc	1
Power Supply Input Current			IBL_A	-	5.6	5.95	A	Ext V_{BR-B} = 100%
Power Supply Input Current (In-Rush)			Irush	-	-	7.9	A	V_{BL} = 22.8V Ext V_{BR-B} = 100% 4
Power Consumption			PBL	-	134.4	142.8	W	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	0.0	0.7	Vdc	
	Brightness Adjust		ExtVBR-B	10	-	100	%	On Duty (With Local Dimming)
				1	-	100	%	On Duty (W/O Local Dimming)
	PWM Frequency for NTSC & PAL		PAL		100		Hz	3
			NTSC		120		Hz	3
	Pulse Duty Level (PWM)		High Level	2.5	-	5.0	Vdc	HIGH : on duty LOW : off duty
			Low Level	0.0	-	0.7	Vdc	
	VSYNC, SIN, SCLK Reverse (Local Dimming)		High Level	2.7	3.3	3.6	Vdc	
			Low Level	-0.3	0.0	0.4	Vdc	
LED :								
Life Time				30,000			Hrs	2

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 VBR-B : 100%), it is total power consumption.
2. The life time (MTTF) 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±2°C
3. LGD recommend that the PWM freq. is synchronized with One time harmonic of Vsync signal of system. Though PWM frequency is over 120Hz (max 252Hz), function of LED Driver is not affected.
4. The duration of rush current is about 10ms.
5. Even though inrush current is over the specified value, there is no problem if I^2T spec of fuse is satisfied.

3-2. Interface Connections

This LCD module employs two kinds of interface connection, two 60-pin FFC connector are used for the module electronics and 14-pin connectors are used for the integral backlight system.

3-2-1. LCD Module

-LCD Connector (CN1): TF06L-60S-0.5SH (Manufactured by HRS) or Equivalent

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

No	Symbol	Description	No	Symbol	Description
1	GND	Ground	31	LLV3 -	Left Mini LVDS Receiver Signal(3-)
2	Z_OUT	Z-INVERSION OUTPUT	32	LLV3 +	Left Mini LVDS Receiver Signal(3+)
3	GND	GROUND	33	LCLK -	Left Mini LVDS Receiver Clock Signal(-)
4	NC	NO CONNECTION	34	LCLK +	Left Mini LVDS Receiver Clock Signal(+)
5	GND	GROUND	35	LLV2 -	Left Mini LVDS Receiver Signal(2-)
6	GSC	GATE SHIFT CLOCK	36	LLV2 +	Left Mini LVDS Receiver Signal(2+)
7	GOE	GATE OUTPUT ENABLE	37	LLV1 -	Left Mini LVDS Receiver Signal(1-)
8	GND	GROUND	38	LLV1 +	Left Mini LVDS Receiver Signal(1+)
9	VGH_M	GATE MODULATION HIGH VOLTAGE	39	LLV0 -	Left Mini LVDS Receiver Signal(0-)
10	VGH_M	GATE MODULATION HIGH VOLTAGE	40	LLV0 +	Left Mini LVDS Receiver Signal(0+)
11	GND	GROUND	41	GND	Ground
12	GND	GROUND	42	SOE	Source Output Enable SIGNAL
13	VGL	GATE Low Voltage	43	POL	Polarity Control Signal
14	VGL	GATE Low Voltage	44	GSP	GATE Start Pulse
15	GND	Ground	45	H_CONV	Horizontal 2 Inversion Signal
16	VCOM_L_FB	VCOM Left Feed-Back Output	46	OPT_N	"H" Normal Display / "L" Rotation Display
17	VCOM_L	VCOM Left Input	47	GND	Ground
18	GND	Ground	48	GMA 18	GAMMA VOLTAGE 18 (Output From LCD)
19	VDD	Driver Power Supply Voltage	49	GMA 16	GAMMA VOLTAGE 16
20	VDD	Driver Power Supply Voltage	50	GMA 15	GAMMA VOLTAGE 15
21	H_VDD	Half Driver Power Supply Voltage	51	GMA 14	GAMMA VOLTAGE 14
22	H_VDD	Half Driver Power Supply Voltage	52	GMA 12	GAMMA VOLTAGE 12
23	GND	Ground	53	GMA 10	GAMMA VOLTAGE 10 (Output From LCD)
24	VCC	Logic Power Supply Voltage	54	GMA 9	GAMMA VOLTAGE 9 (Output From LCD)
25	VCC	Logic Power Supply Voltage	55	GMA 7	GAMMA VOLTAGE 7
26	GND	Ground	56	GMA 5	GAMMA VOLTAGE 5
27	LLV5 -	Left Mini LVDS Receiver Signal(5-)	57	GMA 4	GAMMA VOLTAGE 4
28	LLV5 +	Left Mini LVDS Receiver Signal(5+)	58	GMA 3	GAMMA VOLTAGE 3
29	LLV4 -	Left Mini LVDS Receiver Signal(4-)	59	GMA 1	GAMMA VOLTAGE 1 (Output From LCD)
30	LLV4 +	Left Mini LVDS Receiver Signal(4+)	60	**Open**	**Open**

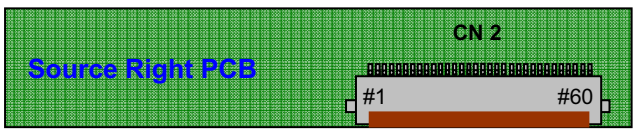
Note : 1. Please refer to application note (**Half VDD & Gamma Voltage setting & Control signal**) for details.
2. These 'input signal' (OPT_N,H_CONV) should be connected

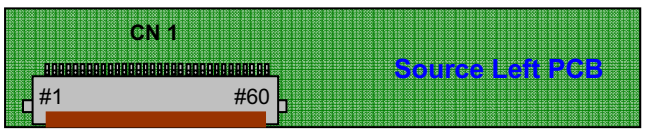
-LCD Connector (CN2) : TF06L-60S-0.5SH (Manufactured by HRS) or Equivalent

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

No	Symbol	Description	No	Symbol	Description
1	Open	Open	31	RLV1 -	Right Mini LVDS Receiver Signal(1-)
2	GMA 1	GAMMA VOLTAGE 1 (Output From LCD)	32	RLV1 +	Right Mini LVDS Receiver Signal(1+)
3	GMA 3	GAMMA VOLTAGE 3	33	RLV0 -	Right Mini LVDS Receiver Signal(0-)
4	GMA 4	GAMMA VOLTAGE 4	34	RLV0 +	Right Mini LVDS Receiver Signal(0+)
5	GMA 5	GAMMA VOLTAGE 5	35	GND	Ground
6	GMA 7	GAMMA VOLTAGE 7	36	VCC	DRIVER Logic Power Supply Voltage
7	GMA 9	GAMMA VOLTAGE 9 (Output From LCD)	37	VCC	DRIVER Logic Power Supply Voltage
8	GMA 10	GAMMA VOLTAGE 10 (Output From LCD)	38	GND	Ground
9	GMA 12	GAMMA VOLTAGE 12	39	H_VDD	Half Driver Power Supply Voltage
10	GMA 14	GAMMA VOLTAGE 14	40	H_VDD	Half Driver Power Supply Voltage
11	GMA 15	GAMMA VOLTAGE 15	41	VDD	Driver Power Supply Voltage
12	GMA 16	GAMMA VOLTAGE 16	42	VDD	Driver Power Supply Voltage
13	GMA 18	GAMMA VOLTAGE 18 (Output From LCD)	43	GND	Ground
14	GND	Ground	44	VCOM_R	VCOM Right Input
15	OPT_N	“H” Normal Display / “L” Rotation Display	45	VCOM_R_FB	VCOM Right Feed-Back Output
16	H_CONV	Horizontal 2 Inversion Signal	46	GND	Ground
17	GSP	GATE Start Pulse	47	VGL	GATE LOW VOLTAGE
18	POL	Polarity Control Signal	48	VGL	GATE LOW VOLTAGE
19	SOE	Source Output Enable SIGNAL	49	GND	GROUND
20	GND	Ground	50	GND	GROUND
21	RLV5 -	Right Mini LVDS Receiver Signal(5-)	51	VGH_M	GATE MODULATION HIGH VOLTAGE
22	RLV5 +	Right Mini LVDS Receiver Signal(5+)	52	VGH_M	GATE MODULATION HIGH VOLTAGE
23	RLV4 -	Right Mini LVDS Receiver Signal(4-)	53	GND	GROUND
24	RLV4 +	Right Mini LVDS Receiver Signal(4+)	54	GOE	GATE OUTPUT ENABLE
25	RLV3 -	Right Mini LVDS Receiver Signal(3-)	55	GSC	GATE SHIFT CLOCK
26	RLV3 +	Right Mini LVDS Receiver Signal(3+)	56	GND	GROUND
27	LCLK -	Right Mini LVDS Receiver Clock Signal(-)	57	OPT_P	“L” Normal Display / “H” Rotation Display
28	LCLK +	Right Mini LVDS Receiver Clock Signal(+)	58	GND	GROUND
29	RLV2 -	Right Mini LVDS Receiver Signal(2-)	59	Z-OUT	Z-INVERSION OUTPUT
30	RLV2 +	Right Mini LVDS Receiver Signal(2+)	60	GND	Ground

Note : 1.Please refer to application note (**Half VDD & Gamma Voltage setting & Control signal**) for details.
2. These 'input signal' (OPT_N,H_CONV) should be connected





3-2-2. Backlight Module

Master

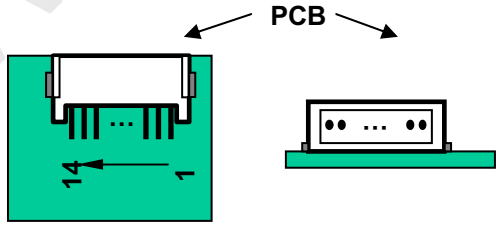
- LED Driver Connector : 20022WR-14B1(Yeonho)
  or Equivalent
- Mating Connector : 20022HS-14 or Equivalent

Table 5. LED DRIVER CONNECTOR PIN CONFIGURATION

Pin No	Symbol	Description	Master	Note
1	V_{BL}	Power Supply +24.0V	V_{BL}	
2	V_{BL}	Power Supply +24.0V	V_{BL}	
3	V_{BL}	Power Supply +24.0V	V_{BL}	
4	V_{BL}	Power Supply +24.0V	V_{BL}	
5	V_{BL}	Power Supply +24.0V	V_{BL}	
6	GND	Backlight Ground	GND	1
7	GND	Backlight Ground	GND	
8	GND	Backlight Ground	GND	
9	GND	Backlight Ground	GND	
10	GND	Backlight Ground	GND	
11	NC	No connection	OPEN or GND	
12	$V_{ON/OFF}$	Backlight ON/OFF control	$V_{ON/OFF}$	
13	EXTVBR-B	External PWM	EXTVBR-B	2
14	NC	No connection	OPEN or GND	

Notes : 1. GND should be connected to the LCD module's metal frame.
2. High : on duty / Low : off duty, Pin#13 can be opened. (if Pin #13 is open , EXTVBR-B is 100%)
3. #14 of Input CNT Must be Connected to Backlight Ground.
4. Each impedance of pin #12 and 13 is over 50 [KΩ].

◆ **Rear view of LCM**



<Master>

3-2-3. Local Dimming Interface

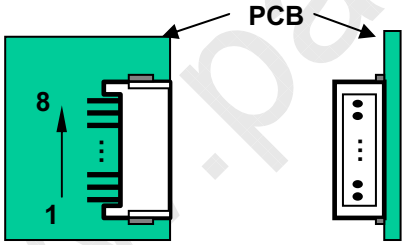
- Local Dimming Interface Connector : 12507WR-08L(YEONHO Elec.) or Equivalent
- Mating Connector: 12507HS-08L(YEONHO Elec.) or Equivalent

Table 5-2. LOCAL DIMMING INTERFACE CONNECTOR PIN CONFIGULATION

Pin No	Symbol	Description	Note
1	VSYNC	Vertical Sync signal	
2	N.C		
3	N.C		
4	SIN	Local Dimming Serial Data	
5	GND	Backlight Ground	1
6	SCLK	Local Dim Serial Clock	
7	Reserved	No Connection	
8	Reverse	Local Dimming data Reverse	2

Notes : 1. GND should be connected to the LCD module's metal frame.
2. High : Local Dimming data reverse mode
Low : Local Dimming data non-reverse mode

◆ **Rear view of LCM**



3-3. Signal Timing Specifications

Table 6. Timing Requirements

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Mini Clock pulse period	T_1		3.2	3.4		ns	1
Mini Clock pulse low period	T_2		1.6	-	-	ns	
Mini Clock pulse high period	T_3		1.6	-	-	ns	
Mini Data setup time	T_6		0.6	-	-	ns	
Mini Data hold time	T_7		0.6	-	-	ns	
Reset low to SOE rising time	T_8		0	-	-	ns	
SOE to Reset input time	T_9		200	-	-	ns	
Receiver off to SOE timing	T_{10}		10	-	-	CLK cycle	
POL signal to SOE setup time	T_{11}		-5	-	-	ns	
POL signal to SOE hold time	T_{12}		6	-	-	ns	
Reset High Period	T_{13}		3			CLK cycle	
SOE signal GSP setup time	T_{14}		100			ns	
SOE signal GSP Hold time	T_{15}		100			ns	
SOE signal Pulse Width	T_{16}		200			ns	

Note : 1. mini-LVDS timing measure conditions
: 268MHz < Clock Frequency < 312MHz, 150mV < VID < 800mV @ 3.0 < VCC < 3.3
2. Setup time and hold time should be satisfied at the same time

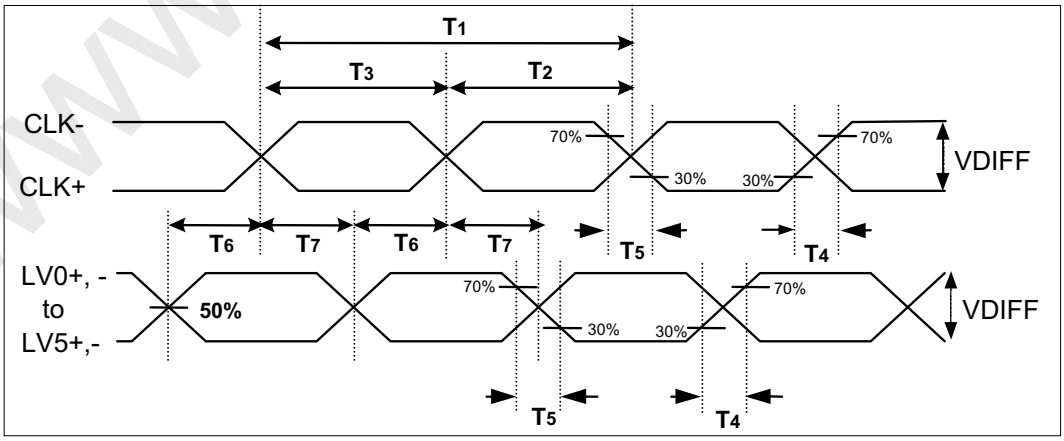


FIG 4. Source D-IC Input Data Latch Timing Waveform

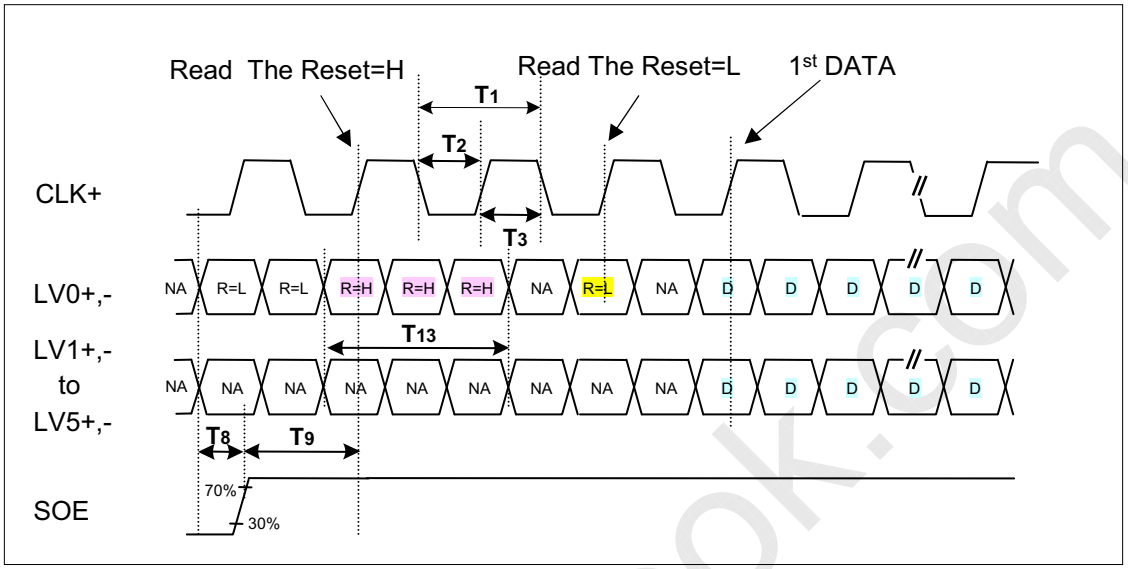


FIG 5-1. Input Data Timing for 1st Source D-IC Chip

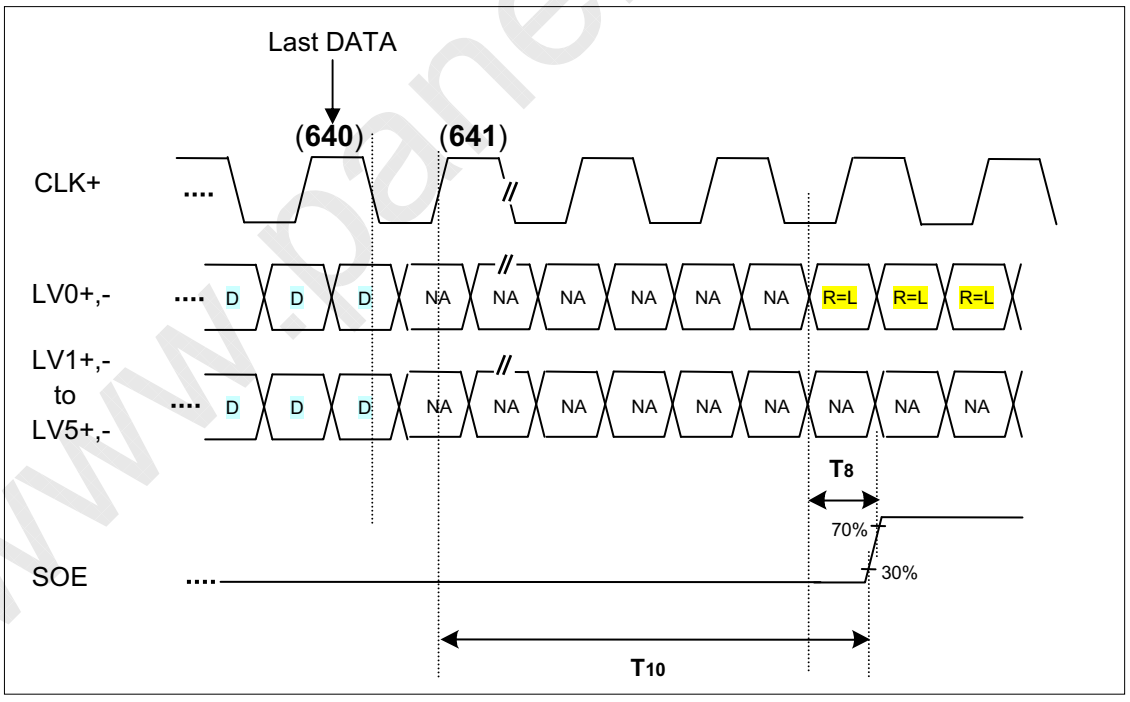


FIG 5-2. Last Data Latch to SOE Timing

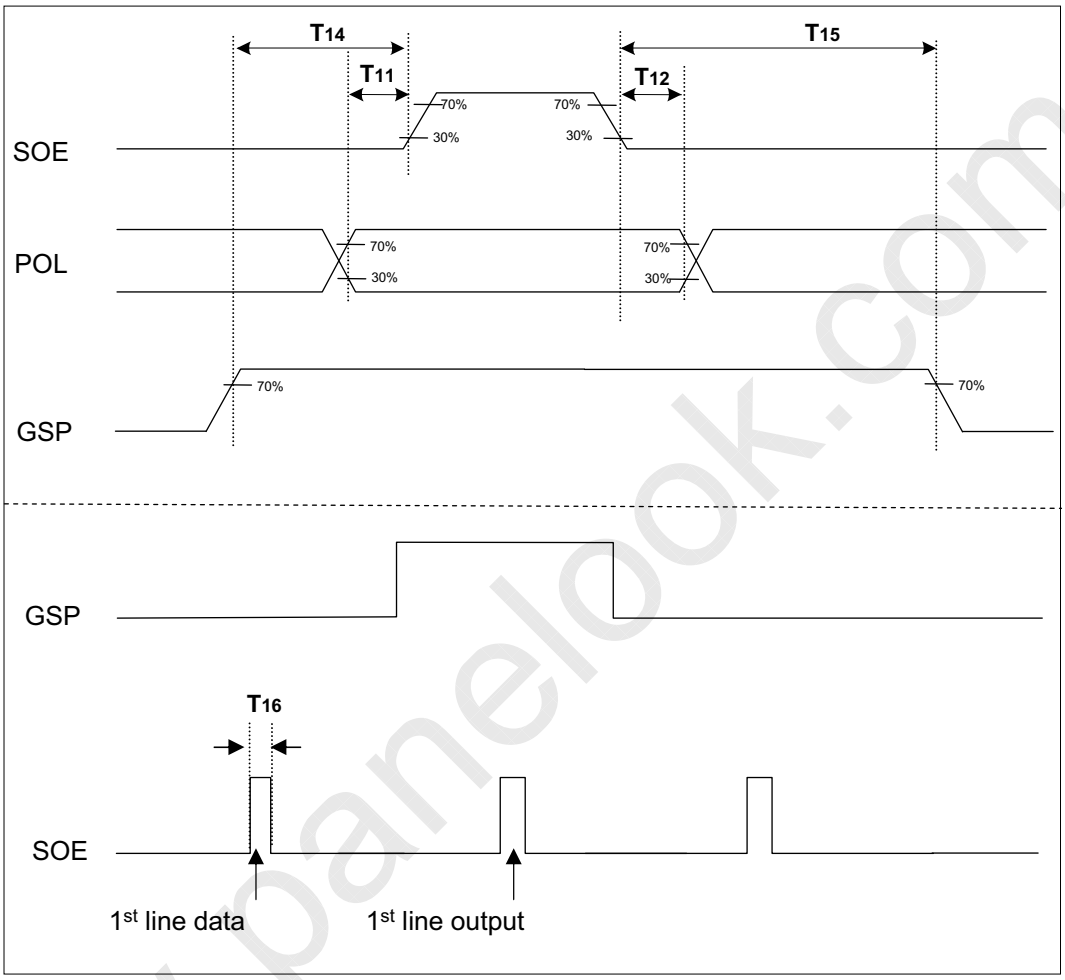
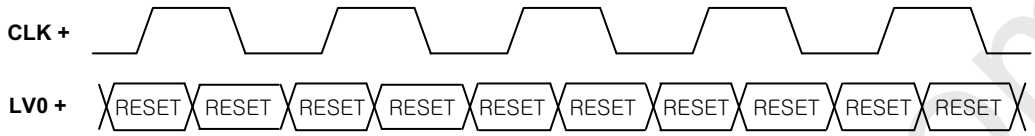


FIG 6. POL, GSP and SOE Timing Waveform

3-4. Data Mapping and Timing

Display data and control signal (RESET) are input to **LV0** to **LV5**.

3-4-1. Control signal input mode



3-4-2. Display data input mode

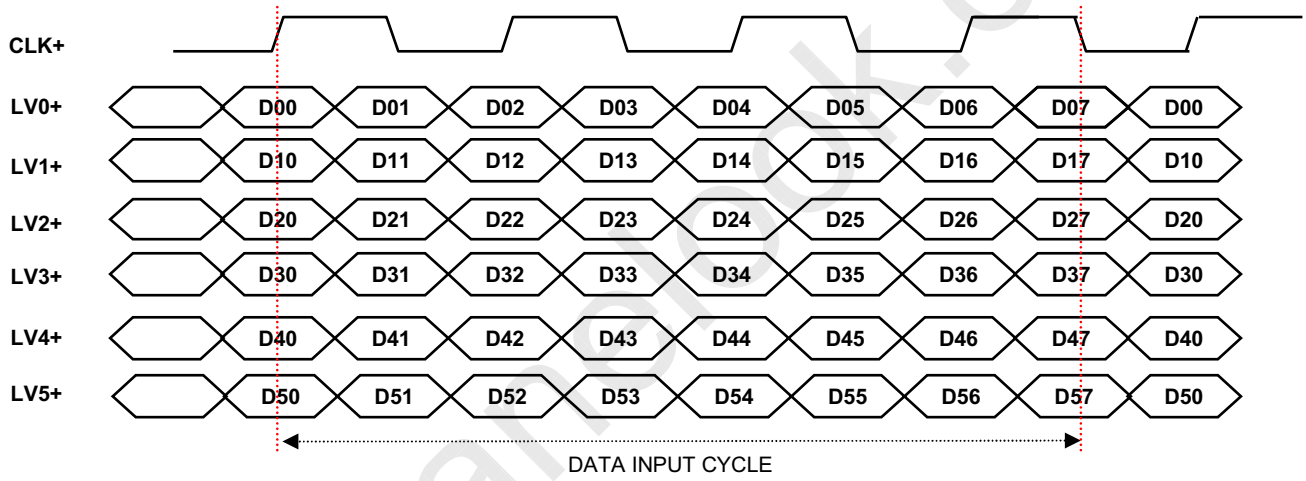


Fig. 7 Mini-LVDS Data

Note : 1. For data mapping, please refer to panel pixel structure Fig.8

3-5. Panel Pixel Structure

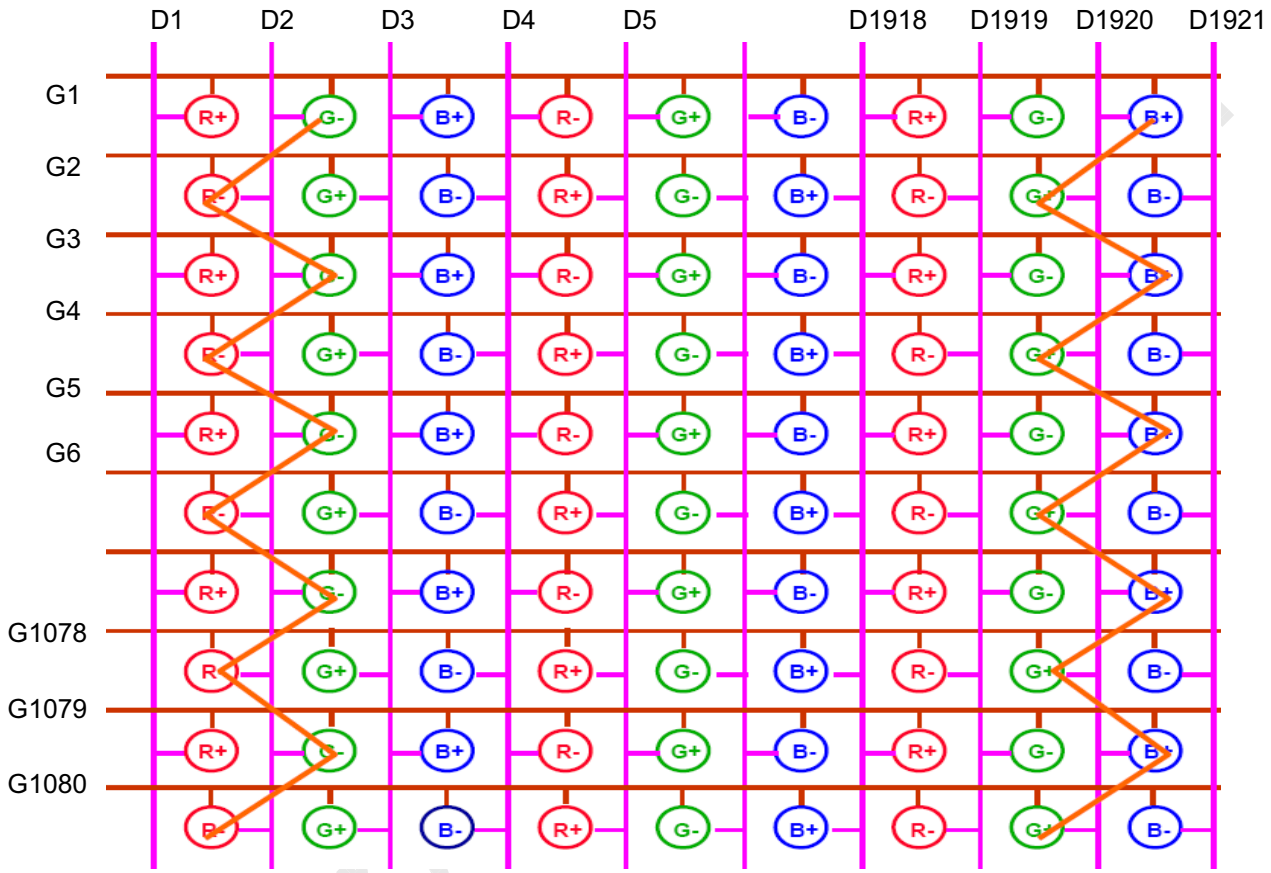


FIG. 8 Panel Pixel Structure

3-6. Power Sequence

3-6-1. LCD Driving circuit

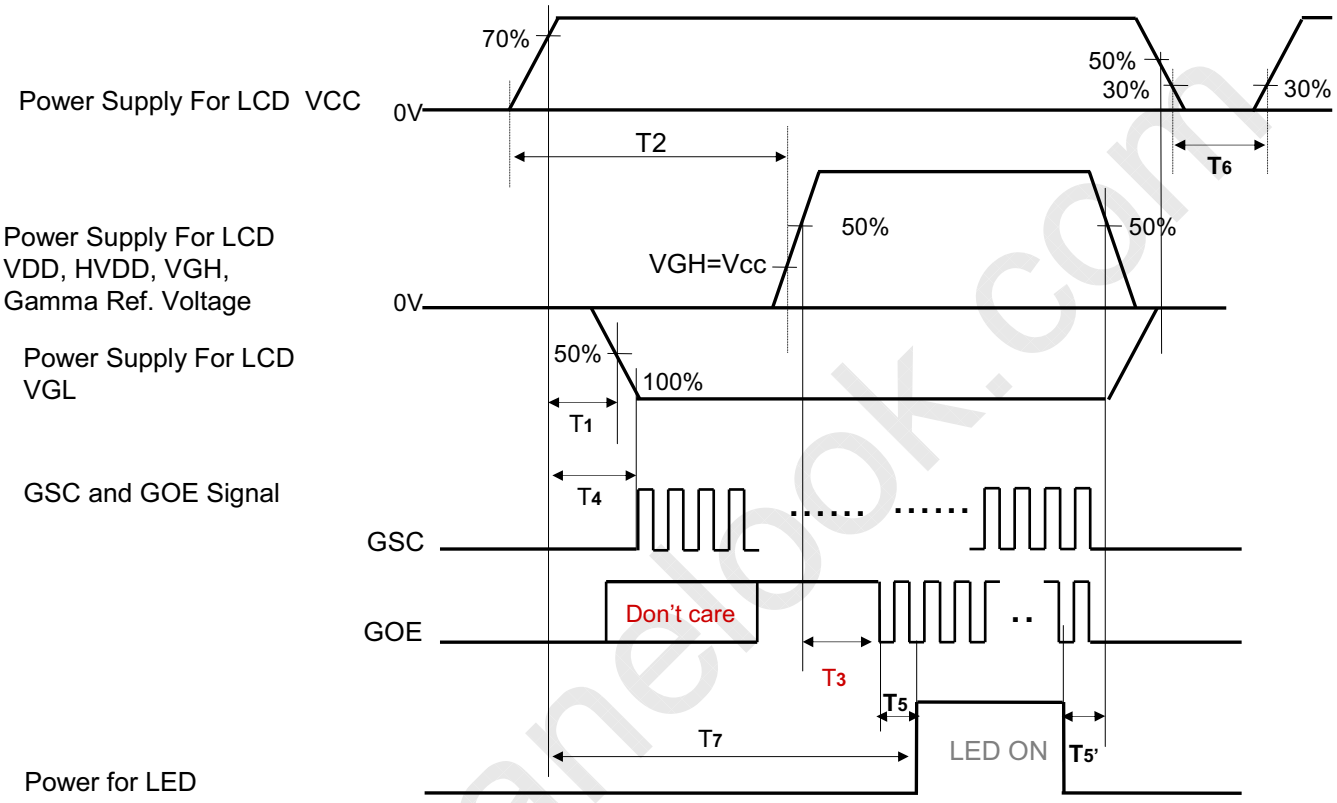


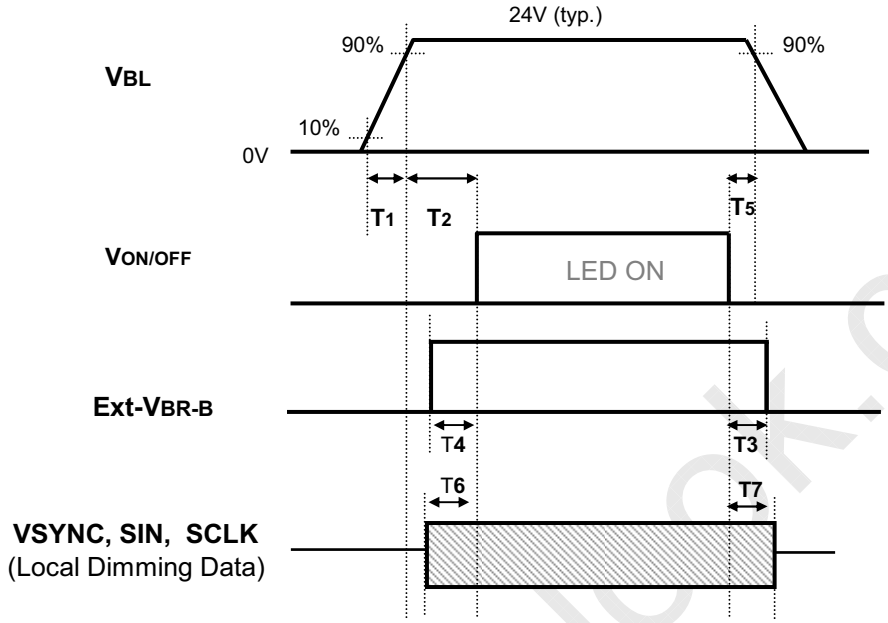
Table 7. POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5		-	ms	
T2	0.01		-	ms	
T3	10		-	ms	
T4	0		T2	ms	
T5 / T5'	20		-	ms	
T6	2		-	sec	
T7	0.5		-	s	

Note : 1. Power sequence for Source D-IC must follow the Case1 & 2.
※ Please refer to Appendix V for more details.
2. The Gate D-IC power on sequence must be VCC, VGL, logic input & VGH.
3. The 1st start of GSC is located between VGL and VGH.
4. GOE rising is before GSC.
5. Power off sequence order is reverse of power on sequence.

3-6-2. Sequence for LED Driver

Power Supply For LED Driver



3-6-3. Dip condition for LED Driver

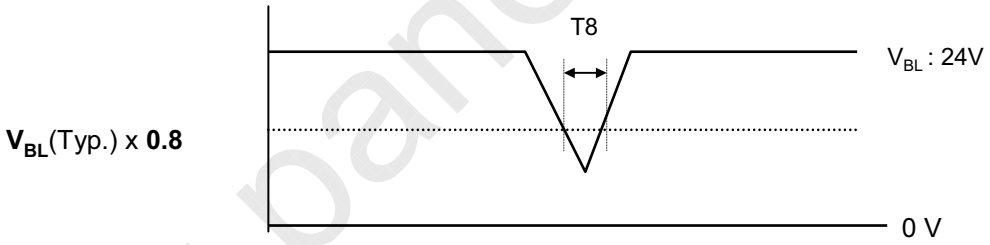


Table 9. Power Sequence for LED Driver

Parameter	Values			Units	Remarks
	Min	Typ	Max		
T1	20	-	-	ms	1
T2	500	-	-	ms	
T3	0	-	-	ms	
T4	0	-	-	ms	
T5	0	-	-	ms	
T6	0	-	T2	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 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 are specified at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
It is presented additional information concerning the measurement equipment and method in FIG. 9.

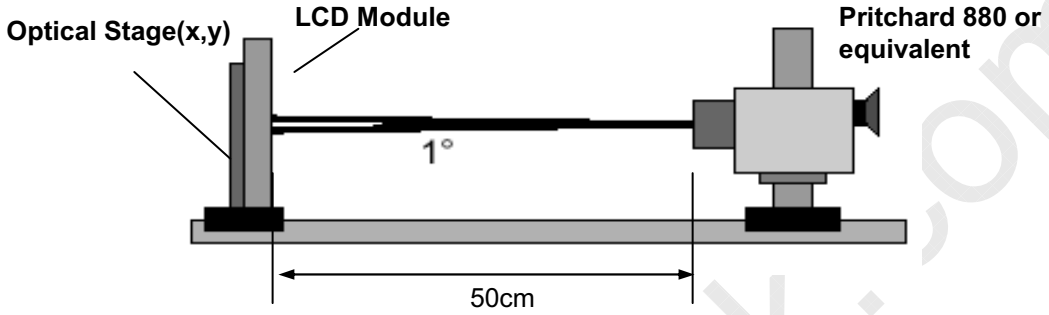


FIG. 9 Optical Characteristic Measurement Equipment and Method

Table 8. OPTICAL CHARACTERISTICS

Ta= 25±2°C, VDD,H_VDD,VGH,VGL=typ, fv=120Hz, Clk=297MHz, I_F = 55mA (Typ)

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	1000	1400	-		1
Surface Luminance, white		L_{WH}	360	450	-	cd/m^2	2
Luminance Variation		δ_{WHITE} 5P	-	-	1.35		3
Response Time	Rising	Tr	-	8	12	ms	4
	Falling	Tf	-	10	14		
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.649	Typ +0.03	-	-
		Ry		0.332			
	GREEN	Gx		0.307			
		Gy		0.595			
	BLUE	Bx		0.149			
		By		0.059			
	WHITE	Wx		0.279			
		Wy		0.292			
Color Temperature				10,000		K	
Color Gamut				72		%	
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	89	-	-	degree	5
	x axis, left (ϕ=180°)	θl	89	-	-		
	y axis, up (ϕ=90°)	θu	89	-	-		
	y axis, down (ϕ=270°)	θd	89	-	-		
Gray Scale			-	-	-		6

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

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

It is measured at center 1-point.

2. Surface luminance is determined after the unit has been 'ON' and 1Hour 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. 10.

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. 10.

4. Response time is the time required for the display to transit from G(255) to G(0) (Rise Time, Tr_R) and from G(0) to G(255) (Decay Time, Tr_D).

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. 12.

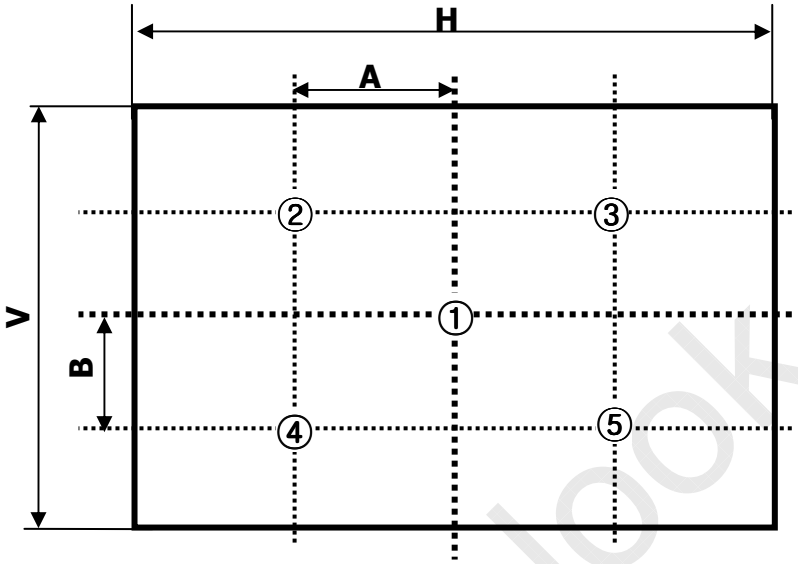
6. Gray scale specification
Gamma Value is approximately 2.2. For more information, see the Table 9.

Table 9. GRAY SCALE SPECIFICATION

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

	Gray Level	Gamma Ref.
Positive Voltage	L0	Gamma9
	L1	Gamma8
	L31	Gamma7
	L63	Gamma6
	L127	Gamma5
	L191	Gamma4
	L223	Gamma3
	L255	Gamma1
Negative Voltage	L255	Gamma18
	L223	Gamma16
	L191	Gamma15
	L127	Gamma14
	L63	Gamma13
	L31	Gamma12
	L1	Gamma11
	L0	Gamma10

Measuring point for surface luminance & luminance variation



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

FIG. 10 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)".

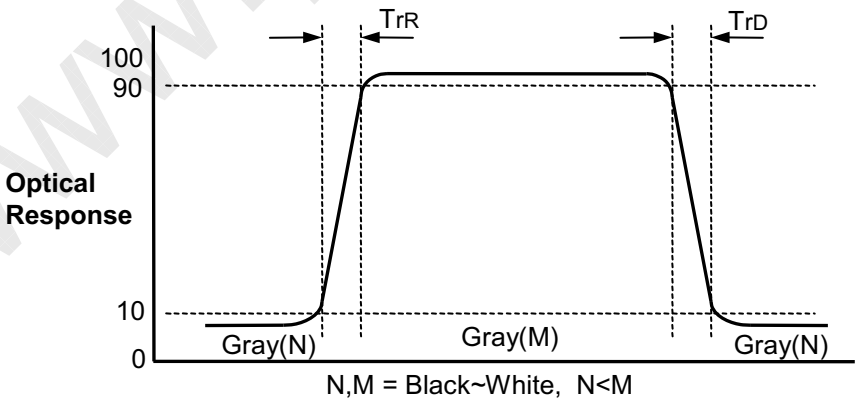


FIG. 11 Response Time

Dimension of viewing angle range

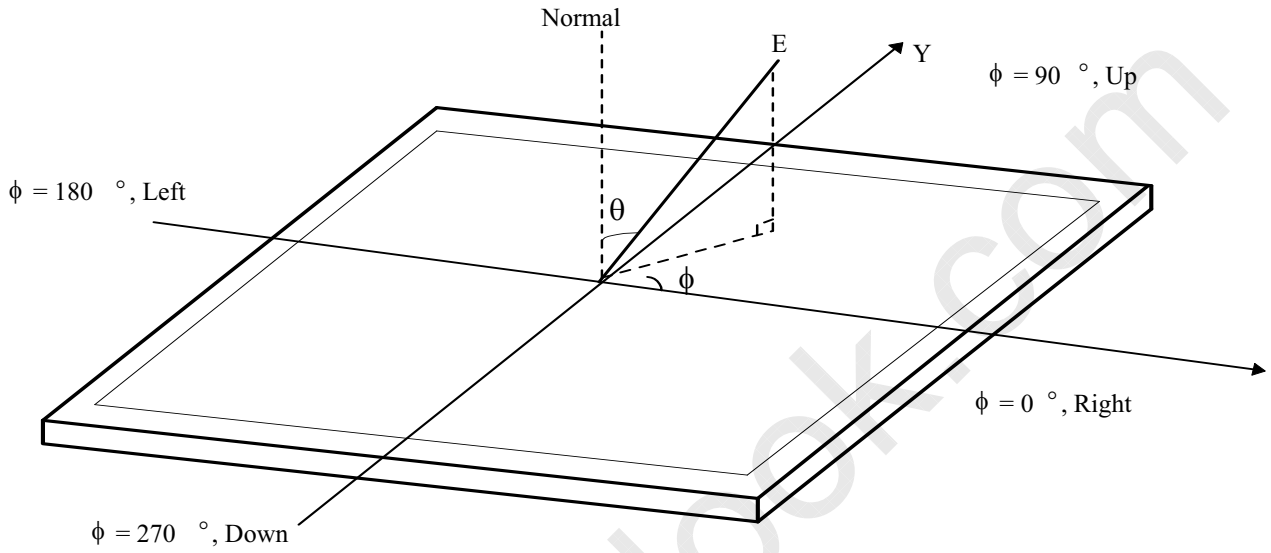


FIG.12 Viewing Angle

5. Mechanical Characteristics

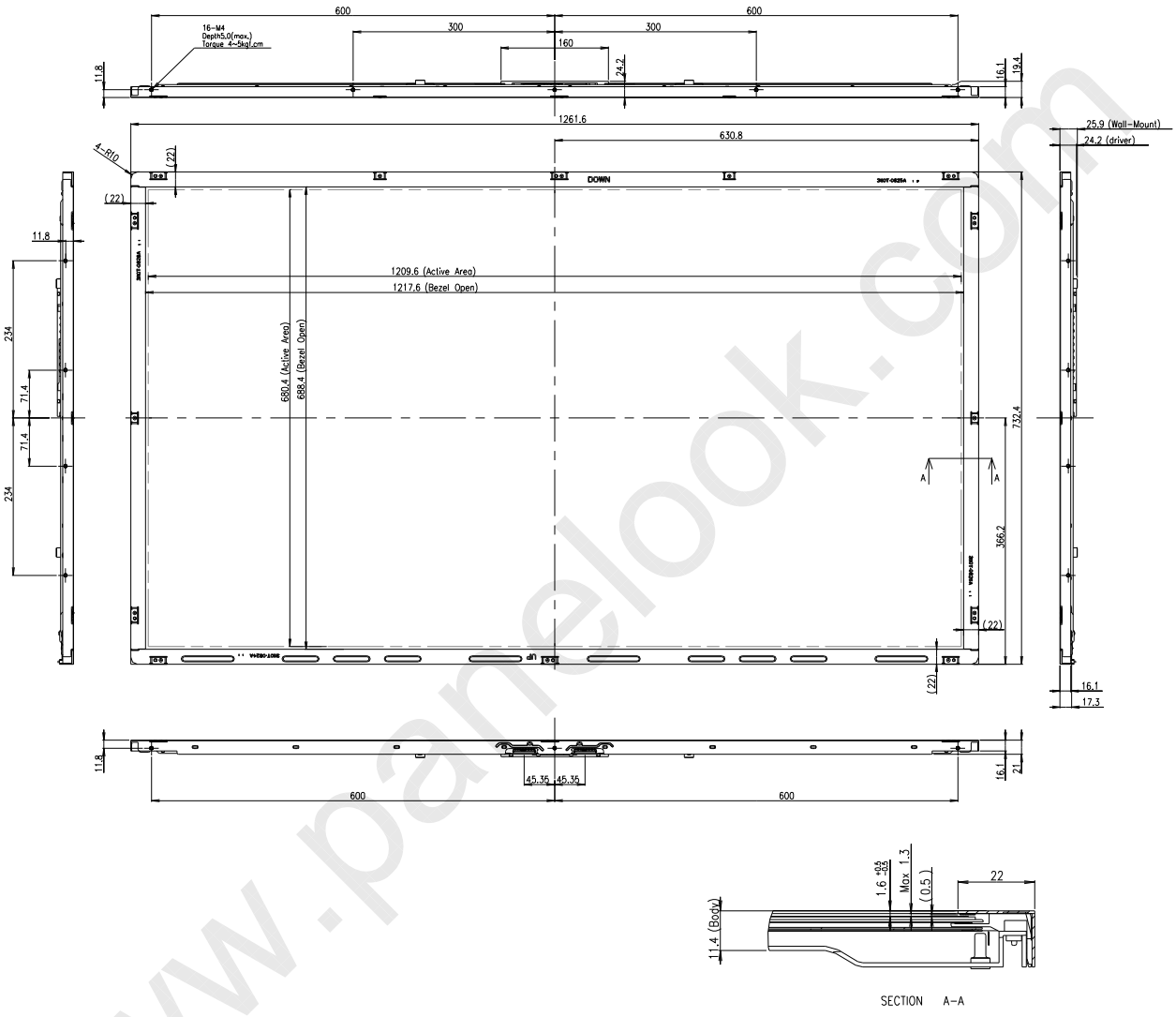
Table 10 provides general mechanical characteristics.

Table 10. MECHANICAL CHARACTERISTICS

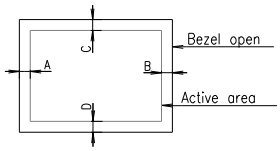
Item	Value	
Outline Dimension	Horizontal	1261.6 mm
	Vertical	732.4 mm
	Depth	11.4 mm
Bezel Area	Horizontal	1217.6 mm
	Vertical	688.4 mm
Active Display Area	Horizontal	1209.6 mm
	Vertical	680.4 mm
Weight	21.5 Kg (Typ.), 22.5 kg (Max.)	

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

[FRONT VIEW]



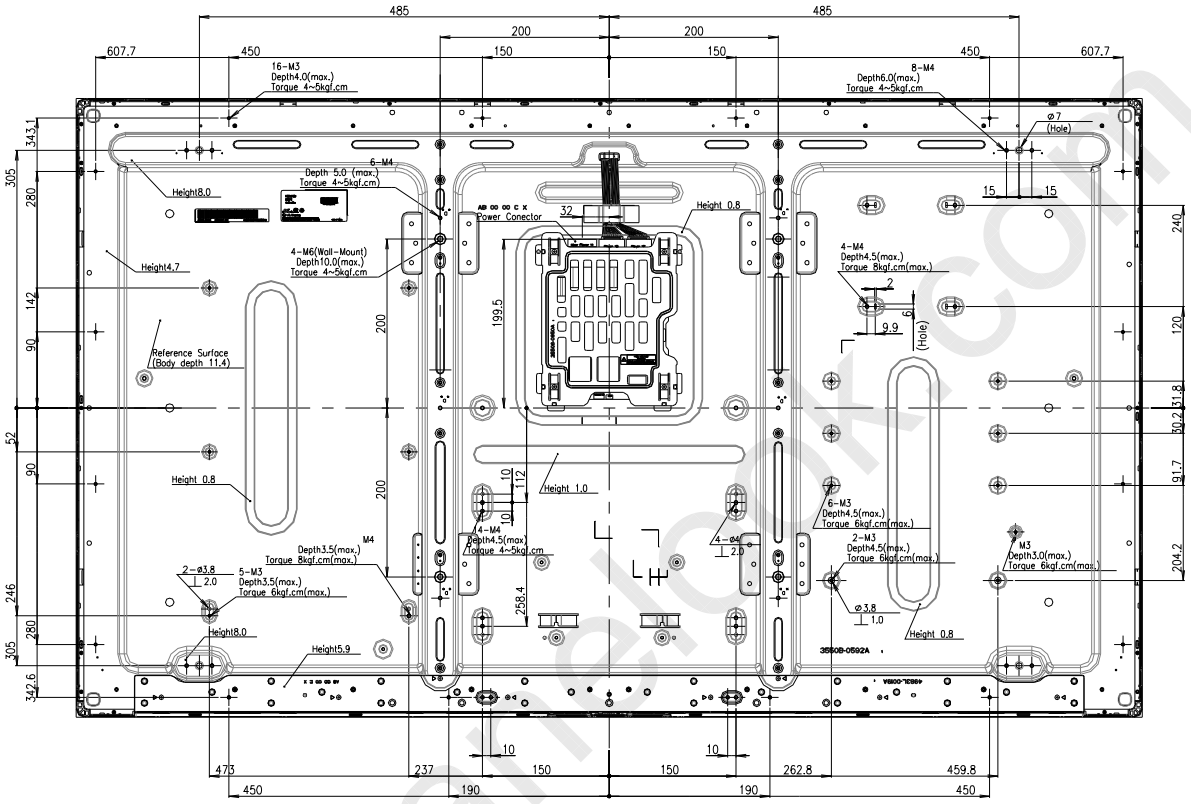
SECTION A-A



NOTES
1. Unspecified tolerances are to be ±1.0mm.

2. Tilt and partial disposition tolerance of display area are as following.
   (1) X-Direction : IA-BI ≤ 1.5mm
   (2) Y-Direction : IC-DI ≤ 1.5mm

[REAR VIEW]



6. Reliability

Table 11. 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 : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, 30 min Each direction per 10 min
6	Shock test (non-operating)	Shock level : 30G 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, Seventh Edition, Underwriters Laboratories Inc.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

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

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

d) IEC 60065:2005 + A1:2005, The International Electrotechnical Commission (IEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements.
(Including report of IEC60825-1:2001 clause 8 and clause 9)

Notes

1. Laser (LED Backlight) Information

Class 1M LED Product IEC60825-1 : 2001 Embedded LED Power (Class1M) Power : 6.5896 mW (Max.) Wavelength : 277 ~526 (nm) Width : 1.6 x 0.6 (mm)

2. Caution
: LED inside.
Class 1M laser (LEDs) radiation when open.
Do not open while operating.

7-2. Environment

a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

8. Packing

8-1. Information of LCM Label

a) Lot Mark

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

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

Note

1. YEAR

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

2. MONTH

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

b) Location of Lot Mark

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

8-2. Packing Form

a) Package quantity in one Pallet : 10 pcs

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

9. Precautions

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

9-1. Mounting Precautions

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

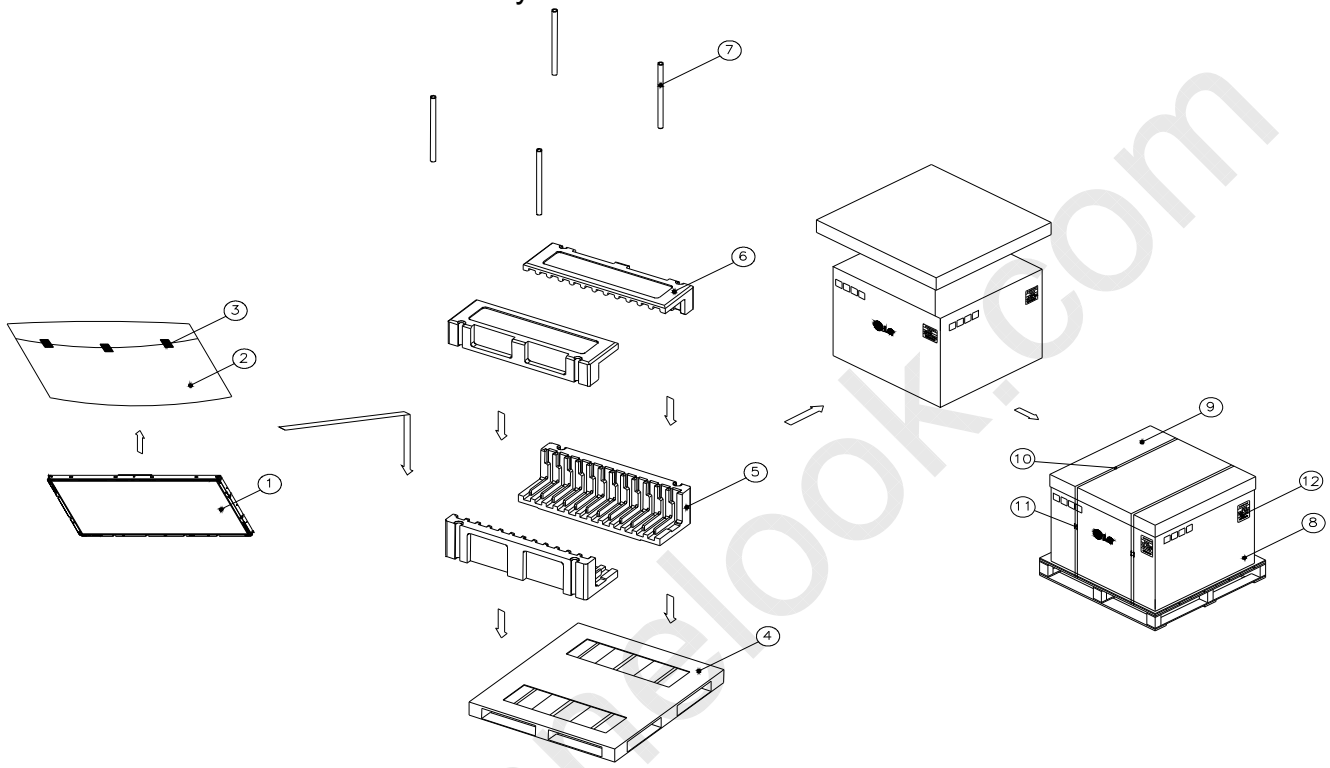
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were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

APPENDIX-I

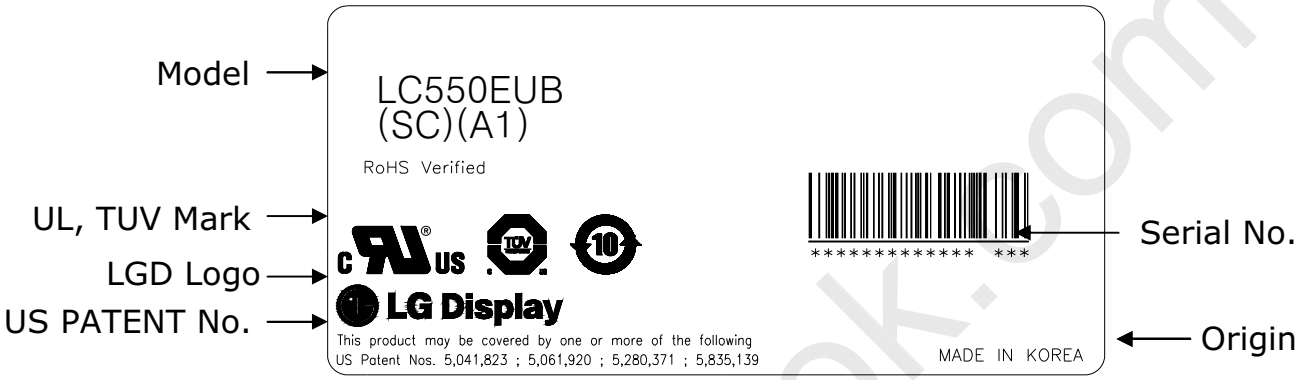
■ LC55OEUB-SCA1 – Pallet Ass'y



NO.	DESCRIPTION	MATERIAL
1	LCD Module	
2	BAG	55INCH
3	TAPE	MASKING 20MMX50M
4	PALLET	Plywood 1440X1140X125.5mm
5	PACKING,BOTTOM	EPS
6	PACKING,TOP	EPS
7	ANGLE,POST	PAPER
8	ANGLE,PACKING	PAPER
9	ANGLE.COVER	PAPER
10	BAND,CLIP	STEEL or PP
11	BAND	PP
12	LABEL	YUPO 80G 100X70

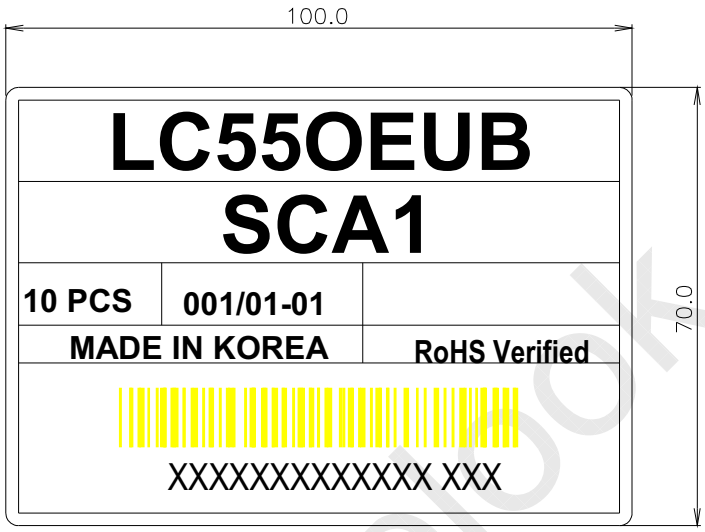
 # APPENDIX- II-1

■ LC550EUB-SCA1-LCM Label



 # APPENDIX- II-2

■ LC550EUB-SCA1-Pallet Label



APPENDIX- V

Local Dimming Interface Design Guide

▶ **Data Sequence** (※ based on 16 block)

8-bit : Indicator(1010_1010) / Command(8-bit) / Data1(8-bit) / Data2(8-bit) / ... / Data16 (8-bit) / check_Sum(8-bit)

▶ **Data field Definition** (※ based on 16 block)

1. Indicator Byte : Start of data sequence
2. Command Byte
   - Bit 0 : Local-Dimming Enable ('1' : Enable, '0' : Disable)
   - Bit 1 : Reserved
   - Bit 2 : Reserved
   - Bit 3 : Brightness-up Enable ('1' : Enable, '0' : Disable)
   - Bit 4 ~ 6 : Reserved
   - Bit 7 : Enable ('1' : Enable (Reverse), '0' : Disable (Normal))
3. Data Byte 1 ~ 16 : 8-bit Local-dimming gray value
4. Check_Sum Byte = Indicator ^ Command ^ Data1 ^ Data2 ^ … Data16 (※ ^ : Exclusive OR)

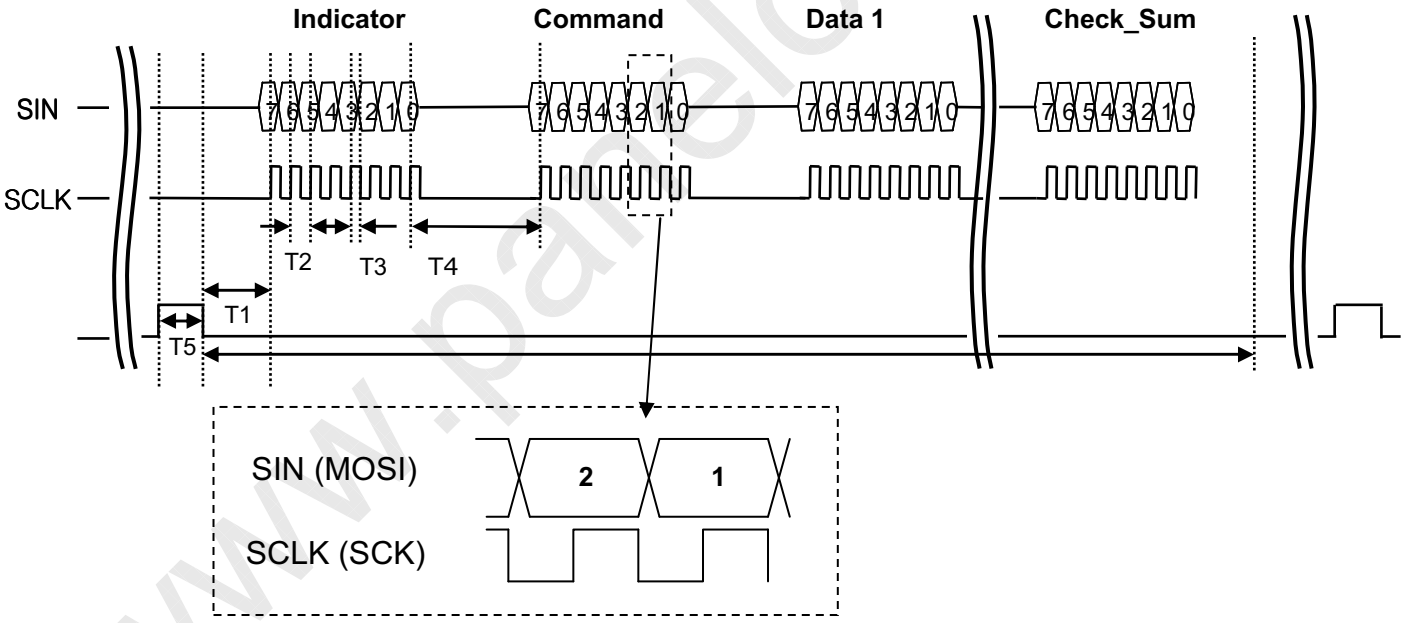


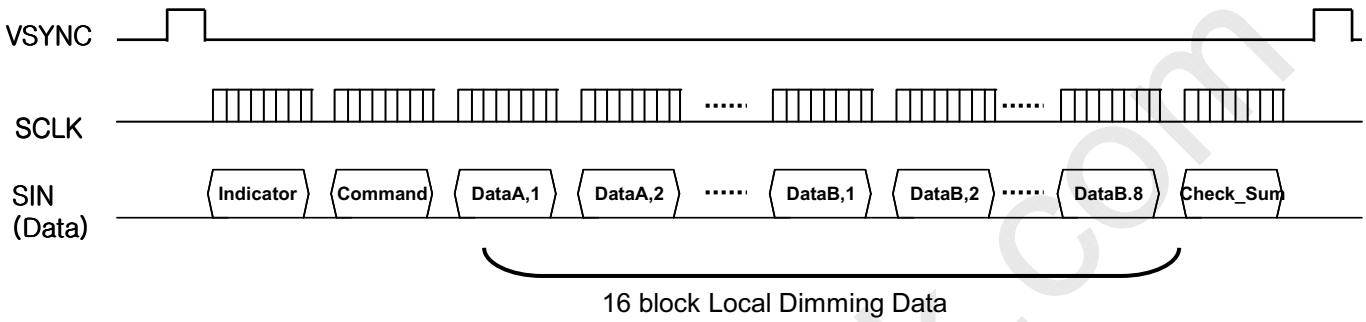
Table15. TIMING TABLE for Local Dimming Interface

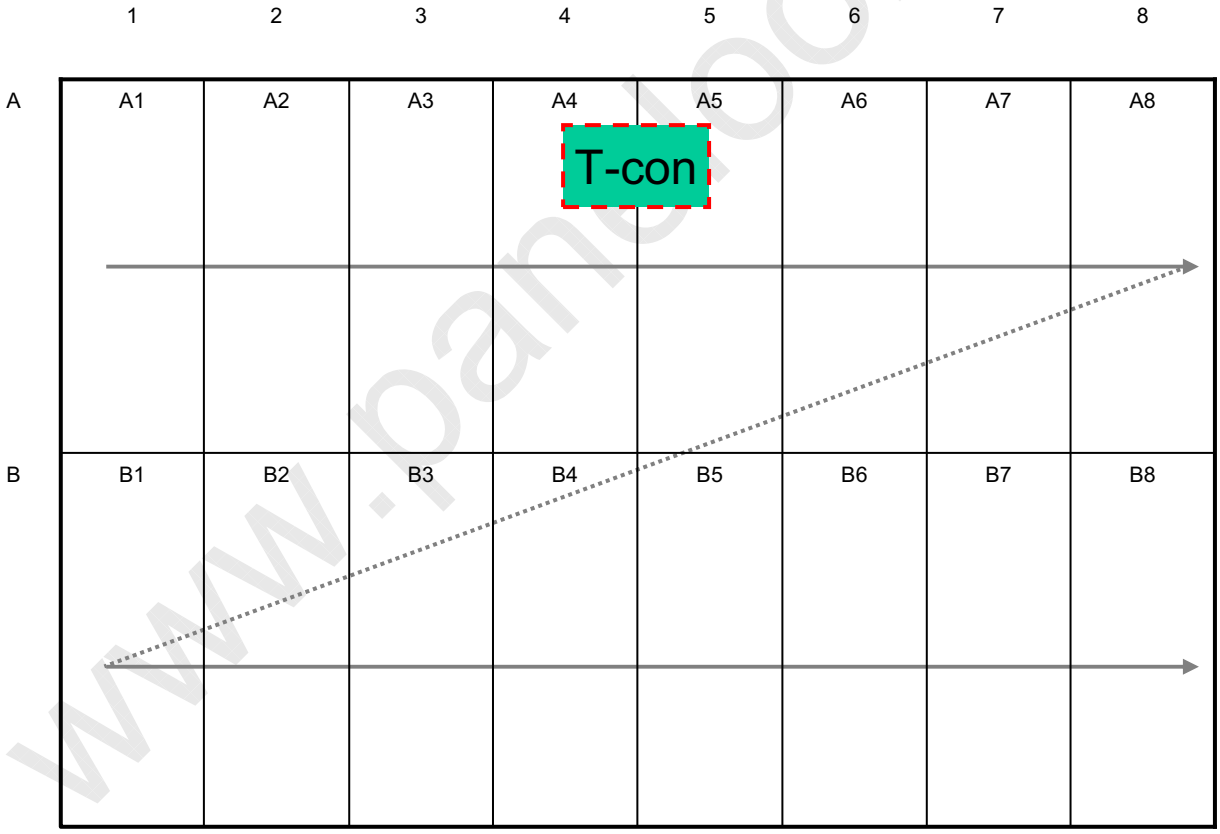
※ SPI Clock Range : Min 100 [KHz], Max 500 [KHz]

Parameter (DCLK rising edge기준)	Values			Units
	Min	Typ	Max	
T1	6.00	-	30.00	us
T2	2.00	-	10.00	us
T3	1.00	-	5.00	us
T4	6.00	-	30.00	us
T5	20.00	-	40.00	us

APPENDIX- V

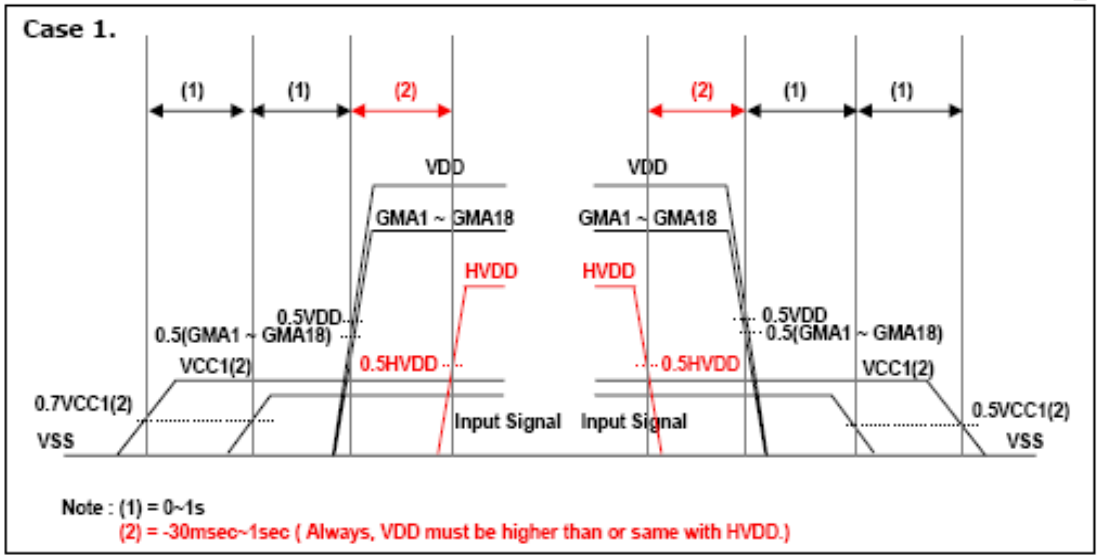
▶ Local Dimming Block Mapping

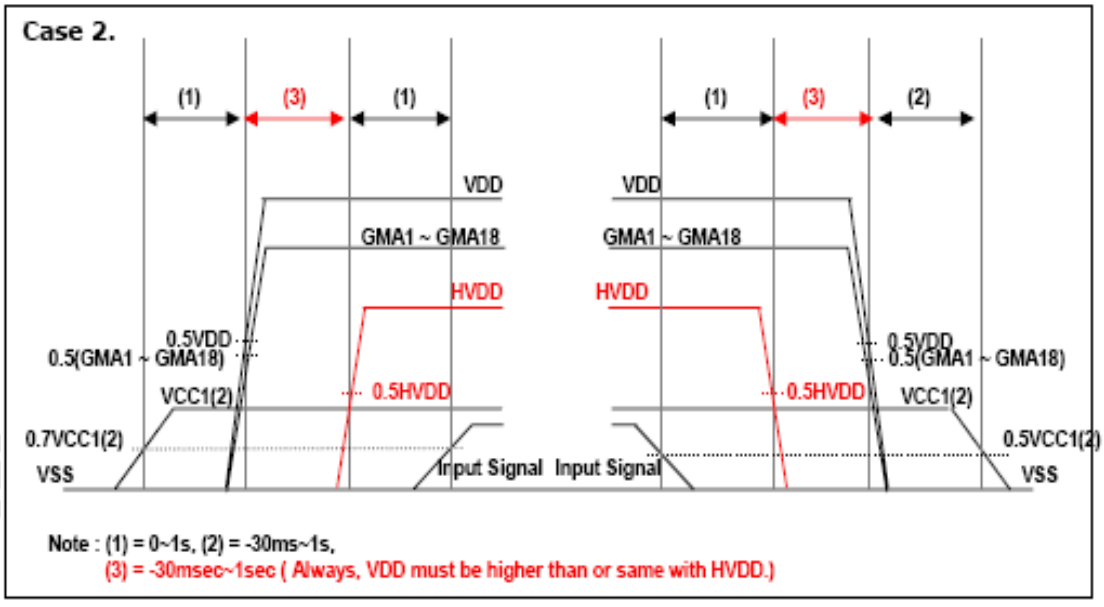




APPENDIX- V

■ LC550EUB-SCA1-Source D-IC Power Sequence





- Input Signal : SOE,POL,GSP,H_CONV,OPT_N