TFT-Display Datasheet

LG Display
Model: LB270WF1-SLA1

Brief spec.:

Main Feature	Landscape
	High color Saturation
	Wide aspect ratio

Active Screen Area	597.88 x 336.3
Diagonal	Format	27"	16:9
Resolution	1920 X 1080
Colors	1,07B Colors, 10 Bit
Backlight	LED
Brightness	1000 cd/m²
LED Life Time	30K(h)
Interface	LVDS
Viewing Angle	89/89 L/R 89/89
Touchscreen	no
Power Supply	5.0 V
Module Outline	622.4 x 364.2 x 17.35 (mm)
Operation Temperature	- 0 ... +50 °C
Storage Temperature	-20... +60 °C
Surface Treatment	Anti-Glare (Haze 25% 3H)

SPECIFICATION
FOR
APPROVAL

(●) Preliminary specification
( ) Final specification

Title	27.0" FHD TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LB270WF1
SUFFIX	

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

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

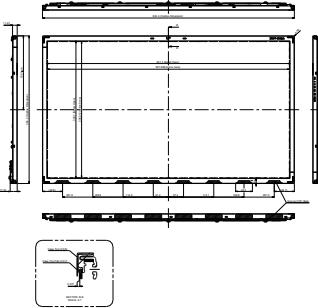| **APPROVED BY**	**SIGNATURE DATE**
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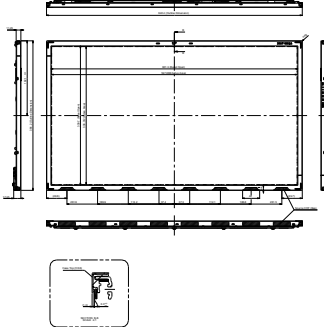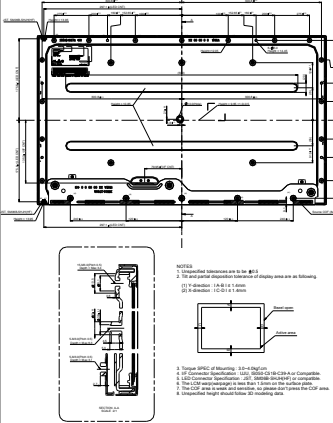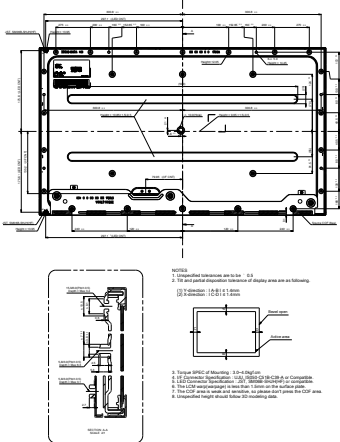
Product engineering dept.
LG Display Co., Ltd

Product specification

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Product specification

<u>Record of revisions</u>

Revision No.	Revision Date	Page	Before	After	Application Date
0.0	Oct. 12. 2017	-	First Draft, Preliminary Specifications	-	-
0.1	Dec. 21. 2017	-	Update		
0.2	Jan. 2. 2018	14	Update timing table - Vsync max freq. : 63Hz - Hsync max freq. : 69.3KHz - DCLK max freq. : 75.4MHz - DCLK min period : 12.44ns - DCLK max period : 17.76ns	- Vsync max freq. : 75Hz - Hsync max freq. : 82.5KHz - DCLK max freq. : 89.7MHz - DCLK min period : 11.14ns - DCLK max period : 17.40ns	
		24	Update front view 		
		25	Update rear view 		
0.3	Jan. 8. 2018	26	7. No item.	Add Pressure Spec. <table><tr><td>7</td><td>Pressure Operating Storage</td><td>700~1060hpa 500~1060hpa</td></tr></table>	
0.4	Jan. 19, 2018	24,25	Add Side Mount		

Product specification

1. General description

LB270WF1-SLA1 is a color active matrix liquid crystal display with a light emitting diode (WLED) backlight assembly without LED driver. 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 27 inch diagonally measured active display area with FHD resolution.(1920 horizontal by 1080 vertical pixels array)
Each pixel is divided into red, green and blue sub-pixels or dots which are arranged in vertical stripes.
Gray scale or the brightness of the sub-pixel color is determined with a 10-bit gray scale signal for each dot, thus, presenting a palette of more than 1.07Billion colors. It has been designed to apply the 10-Bit 2port LVDS interface. It is intended to support displays where high brightness, super wide viewing angle, high color saturation, and high color are important.
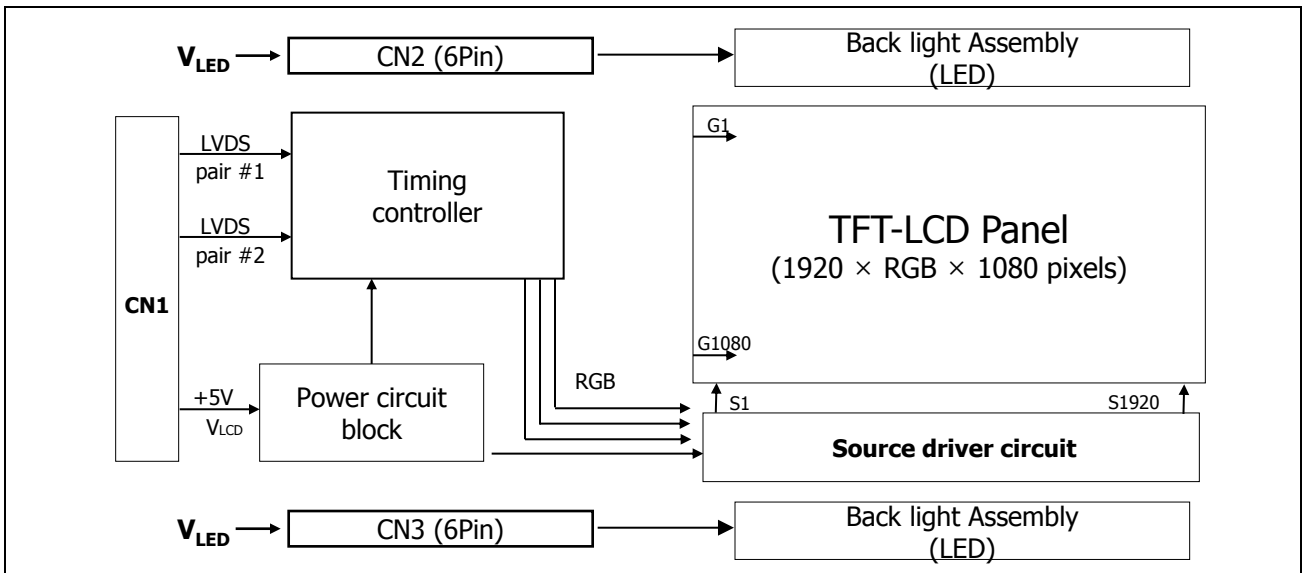
[FIG. 1] Block diagram

General features

Active screen size	27 inches(68.6cm) (Aspect ratio 16:9)
Outline dimension	622.4(H) x 364.2(V) x 17.35 mm (Typ.)
Pixel pitch	0.3114(H)mm x 0.3114(V)mm
Pixel format	1920(H) x 1080(V) Pixels. RGB stripes arrangement
Color depth	1.07B colors, 10Bit
Luminance (@White)	1000 cd/m^2 (Center 1 Point, Typ.)
Viewing angle(CR>10)	View angle free (R/L 178(Typ.), U/D 178(Typ.))
Power consumption	Total TBD Watt (TBD Watt @V$_{LCD}$, (47.20) Watt @Is= (130)mA)
Weight	TBDg (Typ.)
Display operating mode	Transmissive mode, normally black
Panel type	Reverse type
Surface treatment	Anti-glare treatment of the front polarizer (Haze 25%, 3H)

Product specification

2. Absolute maximum ratings

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

Table 1. Absolute maximum ratings

Parameter	Symbol	Values		Units	Notes
		Min.	Max.		
Power supply input voltage	V_{LCD}	-0.3	6.0	V_{DC}	At 25℃
Operating temperature	T_{OP}	0	50	℃	
Storage temperature	T_{ST}	-20	60	℃	1,2,3
Operating ambient humidity	H_{OP}	10	90	%RH	
Storage humidity	H_{ST}	10	90	%RH	
LCM surface temperature (Operation)	$T_{Surface}$	0	65	℃	1, 4

Notes :
1. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be 39 °C Max., and no condensation of water.
2. Maximum storage humidity is up to 40℃, 70% RH only for 4 corner light leakage mura.
3. Storage condition is guaranteed under packing condition
4. LCM surface temperature should be measured under the condition of V_{LCD}=5.0V, fv=60Hz,
   T_a=25℃, no humidity and typical LED string current.
   ※. T_a= Ambient temperature

[FIG. 2] Temperature and relative humidity
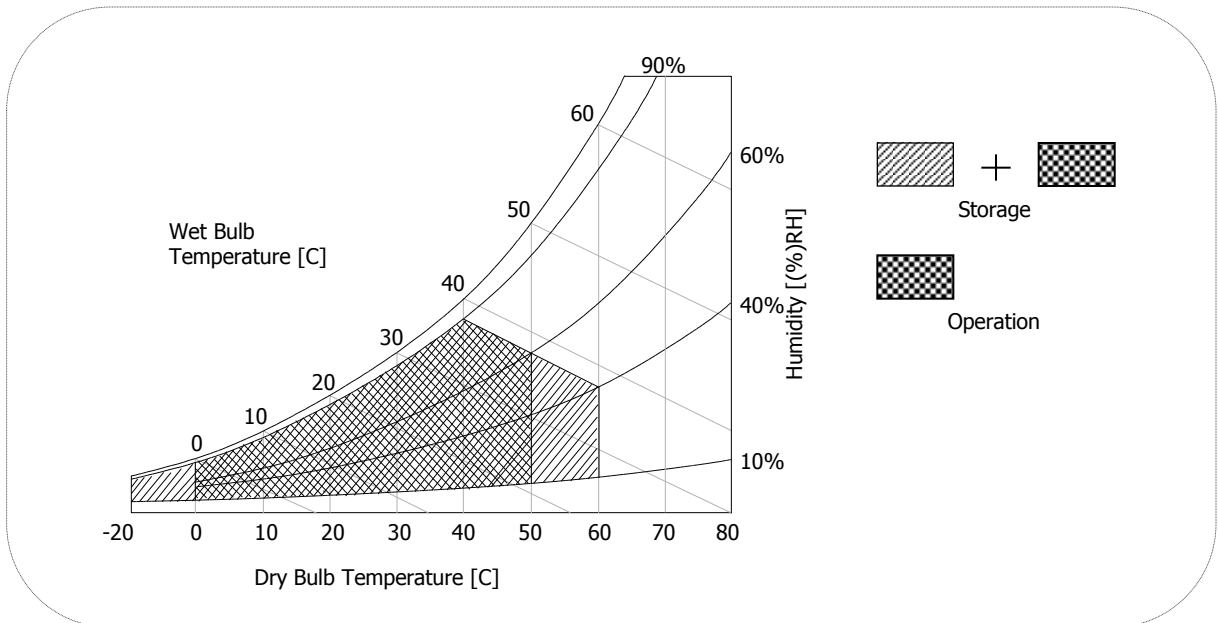
3. Electrical specifications

3-1. Electrical characteristics

It requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The other input power for the LED/Backlight, is typically generated by a LED Driver. The LED Driver is an external unit to the LCDs.

Table 2-1. Electrical characteristics

| Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
MODULE :						
Power supply input voltage	V_{LCD}	4.5	5	5.5	V	4
Permissive power input ripple	V_{ripple}	-	-	400	mVp-p	1
Power supply input current	I_{LCD} Typ.	-	TBD	TBD	A	2
	I_{LCD} Max.	-	TBD	TBD	A	
Power consumption	Pc Typ.	-	TBD	TBD	Watt	
	Pc Max.	-	TBD	TBD	Watt	
Rush current	I_{RUSH}	-	-	3.5	A	3

Notes :
1. Permissive power ripple should be measured under the condition of V_{LCD}=5.0V, 25°C,*fv=max.
    Refer to page 7 for the pattern and more information.
2. The specified current and power consumption can be measured under the V_{LCD}=5.0V, 25°C, f_V=60Hz
    and the pattern should be changed according to the typical or maximum power condition.
    The max. current can be measured only with the maximum power pattern.
    See the page 7 for details.

3. Maximum condition of inrush current :
    The duration of rush current is about 5ms and rising time of power input is 500us $\pm$ 20%. (min.).

4. V_{LCD} level must be measured between two points on PCB of LCM [V_{LCD} (test point) ~ LCM Ground)
    (Test condition : maximum power pattern, 25°C, f_V=60Hz)

* fv=frame frequency

Product specification

• **Permissive power input ripple (**V_{LCD} =5.0V, 25°C, fv (frame frequency)=Max. condition**)**
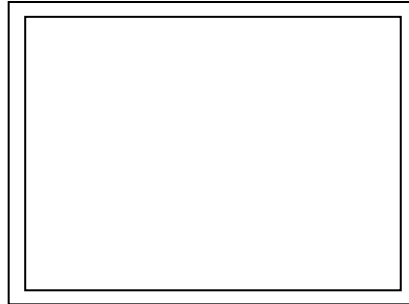
White pattern

For the exact ripple measurement, the condition of max. 20Mhz is recommended
in the bandwidth configuration of oscilloscope.

• **Power consumption (**V_{LCD} =5V, 25°C, fv (frame frequency=60Hz condition**)**
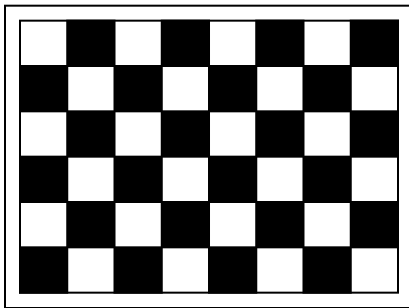
Typical power pattern   **Maximum power pattern**

[FIG. 3] Mosaic pattern & White pattern for power consumption measurement

Product specification

Table 2-2. Electrical characteristics of LED bar in normal operating condition

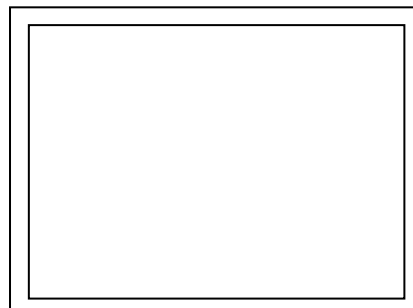| Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
LED string current	Is	-	(130)	(135)	mA	1, 2
LED string voltage	Vs	(45.3)	(48.5)	(51.7)	V	1, 3
Power consumption	P$_{Bar}$	-	(50.4)	(53.7)	Watt	1, 2, 5
LED life time	LED_LT	30,000	-	-	Hour	4

Notes : The LED bar consists of 144 LED packages, 4 strings (parallel) x 18 packages (serial) x 2 bar

1. The specified values are for single LED bar.
2. The specified current is defined as the input current for single LED string with 100% duty cycle.
3. The specified voltage is the input LED string voltage at typical current 100% duty cycle.
4. The LED life time is defined as the time when the LED PKG brightness reach to the 50% of initial value under the conditions at Ta = 25 ± 2°C and typical LED string current.
5. The power consumption shown above does not include the loss of external LED driver.
   The typical power consumption is calculated as P$_{Bar}$ = Vs(Typ.) x Is(Typ.) x No. of strings.
   The maximum power consumption is calculated as P$_{Bar}$ = Vs(Max.) x Is(Typ.) x No. of strings.

Product specification

3-2. Interface connections

3-2-1. LCD Module

- LCD Connector(CN1): IS050-C51B-C39-A (manufactured by UJU) or FI-RE51S-F (manufactured by JAE)
-                     or GT05P-51S-H38-E1500 (manufactured by LSM) or equivalent.
- Mating Connector : FI-RE51HL(JAE) or compatible

Table 3-1. Module connector (CN1) pin configuration

No	Symbol	Description	No	Symbol	Description
1	GND	Ground	27	GND	Ground
2	NC	No Connection	28	REAN	SECOND LVDS Receiver signal (A-)
3	NC	No Connection	29	REAP	SECOND LVDS Receiver signal (A+)
4	NC	No Connection (I2C serial interface for LCM)	30	REBN	SECOND LVDS Receiver signal (B-)
5	NC	No Connection (I2C serial interface for LCM)	31	REBP	SECOND LVDS Receiver signal (B+)
6	GND	Ground	32	RECN	SECOND LVDS Receiver signal (C-)
7	GND	Ground	33	RECP	SECOND LVDS Receiver signal (C+)
8	NC	No Connection	34	GND	Ground
9	PWM_OUT	Reference signal for LED driver control	35	RECLKN	SECOND LVDS Receiver Clock signal(-)
10	GND	Ground	36	RECLKP	SECOND LVDS Receiver Clock signal(+)
11	GND	Ground	37	GND	Ground
12	ROAN	FIRST LVDS Receiver signal (A-)	38	REDN	SECOND LVDS Receiver signal (D-)
13	ROAP	FIRST LVDS Receiver signal (A+)	39	REDP	SECOND LVDS Receiver signal (D+)
14	ROBN	FIRST LVDS Receiver signal (B-)	40	REEN	SECOND LVDS Receiver signal (E-)
15	ROBP	FIRST LVDS Receiver signal (B+)	41	REEP	SECOND LVDS Receiver signal (E+)
16	ROCN	FIRST LVDS Receiver signal (C-)	42	GND	Ground
17	ROCP	FIRST LVDS Receiver signal (C+)	43	GND	Ground
18	GND	Ground	44	GND	Ground
19	ROCLKN	FIRST LVDS Receiver Clock signal(-)	45	GND	Ground
20	ROCLKP	FIRST LVDS Receiver Clock signal(+)	46	NC	No Connection
21	GND	Ground	47	NC	No Connection
22	RODN	FIRST LVDS Receiver signal (D-)	48	VLCD	Power Supply +5.0V
23	RODP	FIRST LVDS Receiver signal (D+)	49	VLCD	Power Supply +5.0V
24	ROEN	FIRST LVDS Receiver signal (E-)	50	VLCD	Power Supply +5.0V
25	ROEP	FIRST LVDS Receiver signal (E+)	51	VLCD	Power Supply +5.0V
26	GND	Ground	-	-	-

Notes :
1. All GND(ground) pins should be connected together to the LCD module's metal frame.
2. All V_{LCD} (input power) pins should be connected together.
3. All input level of LVDS signals are based on the EIA 644 standard.
4. PWM_OUT is a reference signal for LED PWM control. This PWM signal is synchronized with vertical frequency. If the system don't use this pin, do not connect.
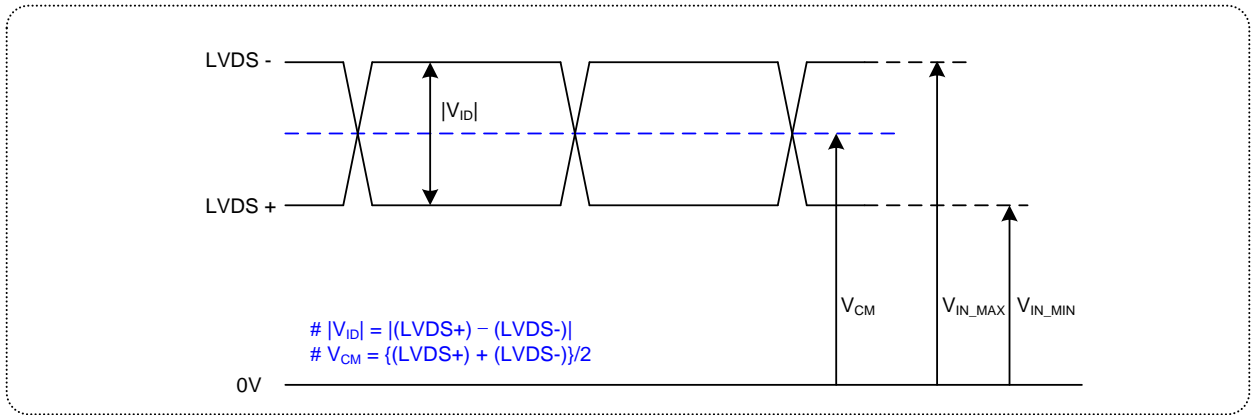

#1   #51

#1   #51

Rear view of LCM
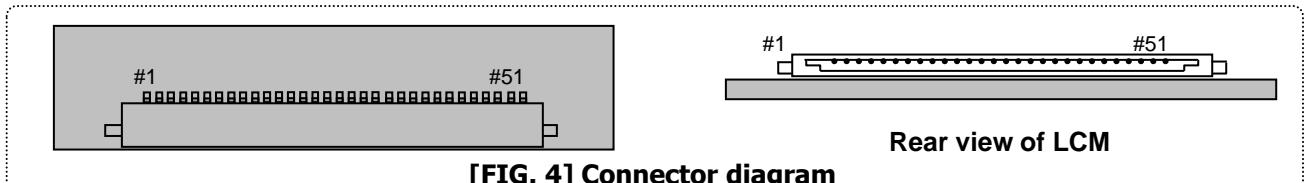
[FIG. 4] Connector diagram

3-2-2. LVDS Input characteristics

1. DC Specification

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

Description	Symbol	Min	Max	Unit	Notes
LVDS Differential voltage	$|V_{ID}|$	150	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	-

Notes : Dose not have any Noise & Peaking in LVDS Signal

2. AC Specification

t_{SKEW} $(F_{clk} = 1/T_{clk})$
1) 95 MHz > Fclk ≥ 85 MHz : -300 ~ +300
2) 85 MHz > Fclk ≥ 65 MHz : -400 ~ +400
3) 65 MHz > Fclk ≥ 30 MHz : -600 ~ +600
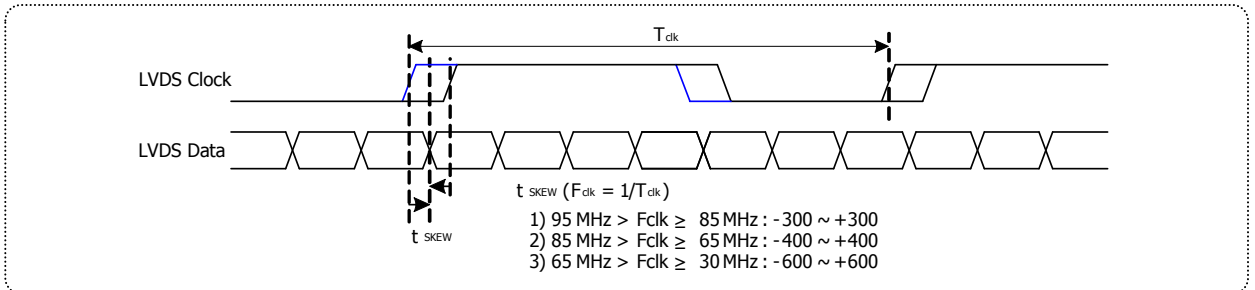
Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to data skew margin	t_{SKEW}	- 300	+ 300	ps	95MHz > Fclk ≥ 85MHz
	t_{SKEW}	- 400	+ 400	ps	85MHz > Fclk ≥ 65MHz
	t_{SKEW}	- 600	+ 600	ps	65MHz > Fclk ≥ 30MHz
LVDS Clock to clock skew margin (Even to odd)	t_{SKEW_EO}	- 1/7	+ 1/7	T_{clk}	-

Product specification
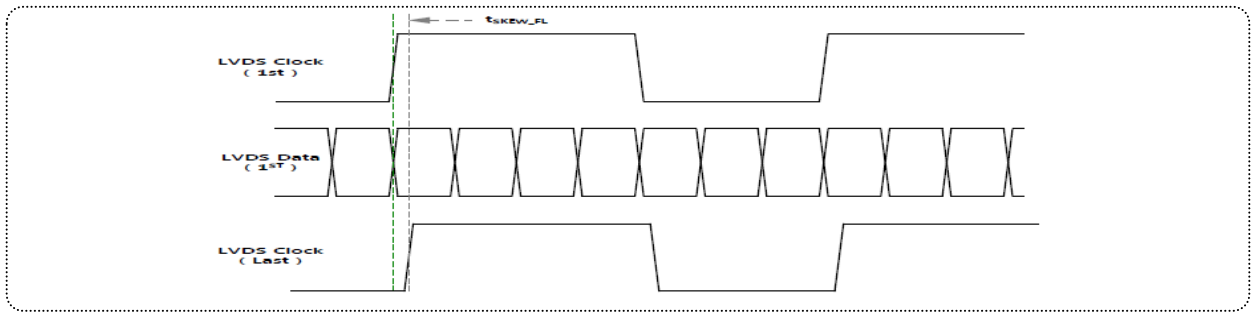
< Clock skew margin between channel >

3. Data Format
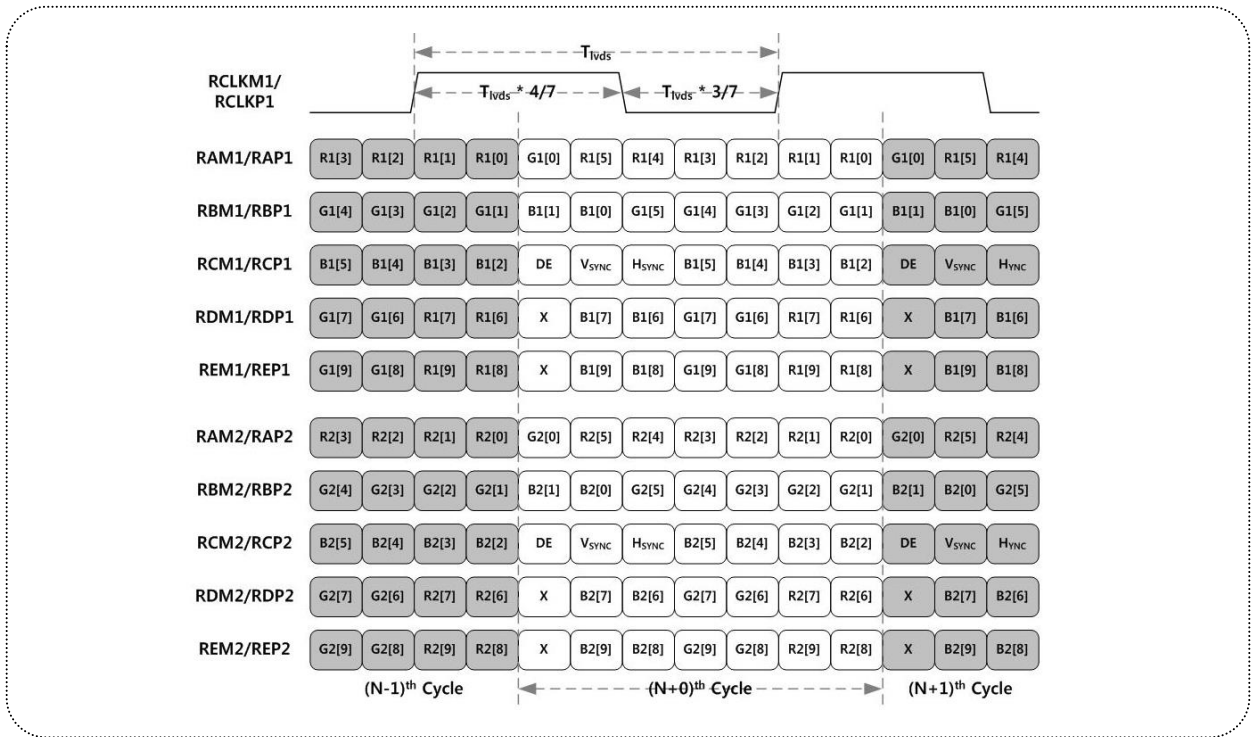
1) LVDS 2 Port (10Bit, VESA)

3-2-3. Backlight connector pin configuration

Table 5. Backlight connector pin configuration(CN2, CN3)

The LED interface connector is SM06B-SHJH(HF)_wire-locking type manufactured by JST or equivalent.
The mating connector is a SHJP-06V-S(HF) or 10035HS-H06C(HF) or equivalent.
The pin configuration for the connector is shown in the table below.

Pin	Symbol	Description	Notes
1	FB1	Channel1 current feedback	
2	FB2	Channel2 current feedback	
3	VLED	LED power supply (Common anode)	
4	VLED	LED power supply (Common anode)	
5	FB3	Channel3 current feedback	
6	FB4	Channel4 current feedback	

Rear view of LCM
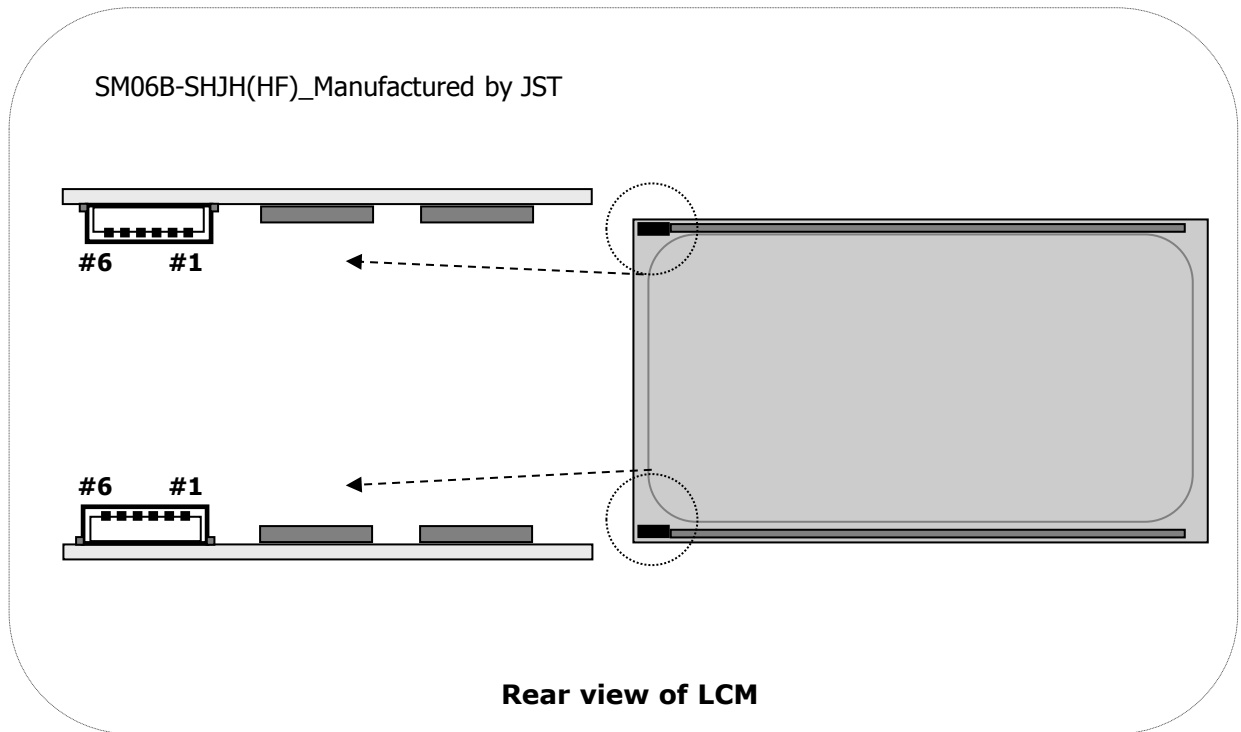
[FIG. 5] Backlight connector view

3-3. Signal timing specifications

This is signal timing requirement from the signal transmitter. All of the interface signal timing should satisfy the following specifications for its proper operation.
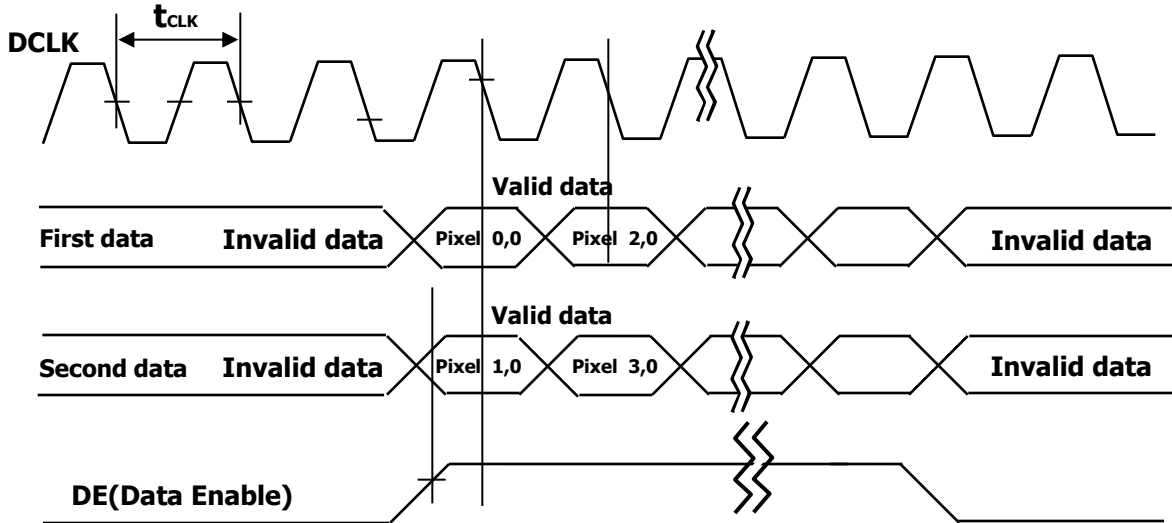
Table 6. Timing table

ITEM	Symbol		Min.	Typ.	Max.	Unit	Note
DCLK	Period	tCLK	12.44	13.9	17.76	ns	Pixel frequency (Typ. 144Mhz)
	Frequency	-	57.4	71.8	75.4	MHz	
Hsync	Period	tHP	1076	1088	1100	tCLK	1,3,4
	Horizontal Valid	tHV	960	960	960	tCLK	
	Horizontal Blank	tHB	116	128	140	tCLK	
	Frequency	fH	52.8	66	69.3	KHz	
Vsync	Period	tVP	1090	1100	1160	tHP	2,4
	Vertical Valid	tVV	1080	1080	1080	tHP	
	Vertical Blank	tVB	10	20	80	tHP	
	Frequency	fV	48	60	63	Hz	

Notes :

1. The value of Hsync period, Hsync Blank and Hsync valid should be even number times of tCLK.
   If the value is odd number times of tCLK, it can make asynchronous signal timing and cause abnormal display.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.
3. The value of Hsync Period, Hsync Blank should be divided by 4 without a remainder.
4. The polarity of Hsync, Vsync is not restricted.
5. The input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode).

3-4. Signal timing waveforms

1. D$_{CLK}$**, DE, DATA waveforms**

DCLK

t_{CLK}

Valid data

First data   **Invalid data**   Pixel 0,0   Pixel 2,0   **Invalid data**

Valid data

Second data   **Invalid data**   Pixel 1,0   Pixel 3,0   **Invalid data**

DE(Data Enable)

2. Horizontal waveform

t_{HP}

t_{HV}

DE(Data Enable)   DE

3. Vertical waveform

t_{VP}

t_{VV}

t_{HP}

DE(Data Enable)   DE
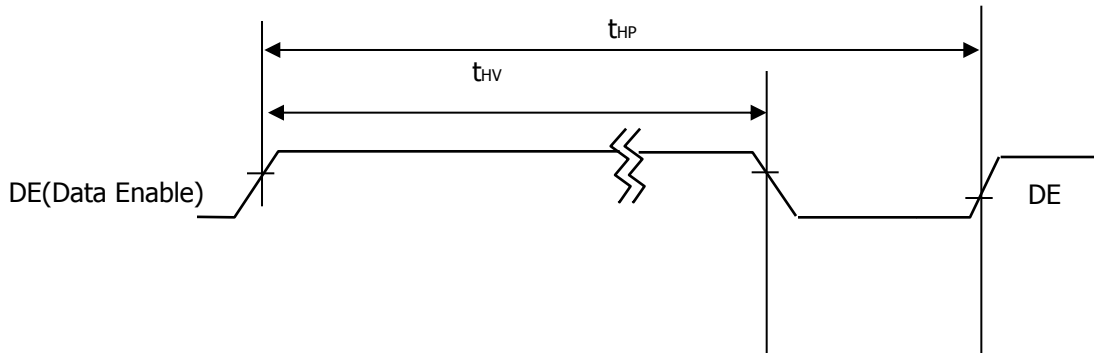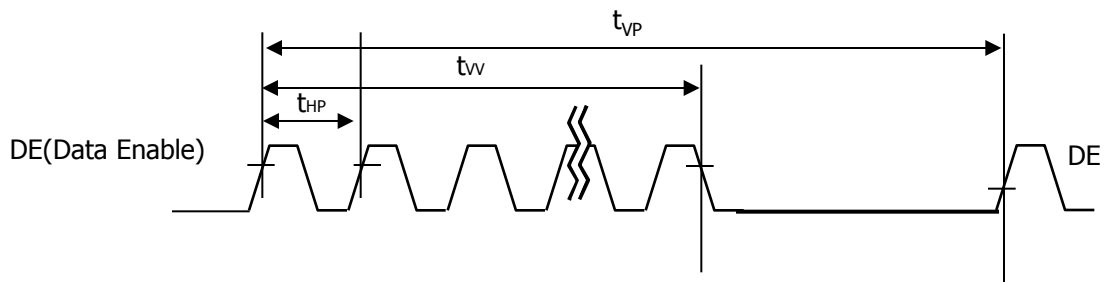
Product specification

3-5. Color input data reference

The brightness of each primary color(red,green,blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 7. 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
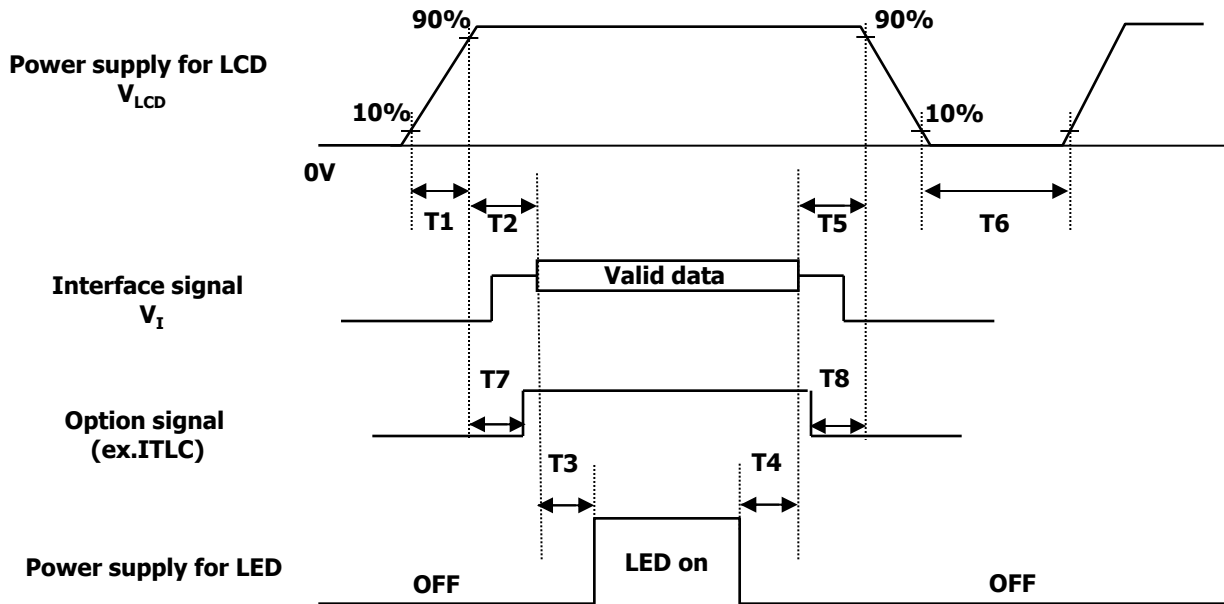
3-6. Power sequence

Table 8. Power sequence

Parameter	Values			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0.01	-	50	ms
T3	500	-	-	ms
T4	200	-	-	ms
T5	0.01	-	50	ms
T6	1000		-	ms
T7	0.5	-	T2	ms
T8	0		-	ms

Notes :
1. Power sequence should be kept all the time including below cases for normal operation.
    -.AC/DC Power On/Off
    -.Mode change (resolution, frequency, timing, sleep mode, color depth change, etc.)
    The violation of power sequence can cause a significant trouble in display and reliability.
2. Please avoid floating state of interface signal during signal invalid period.
3. When the interface signal is invalid, be sure to pull down the $V_{LCD.}$(0V).
4. Please turn off the power supply for LED when the level of V_{LCD} changes to prevent noise issue.
5. When measuring valid data starting point, it can be measured that LVDS signal starts swing.

3-7. V$_{LCD}$ Power dip condition
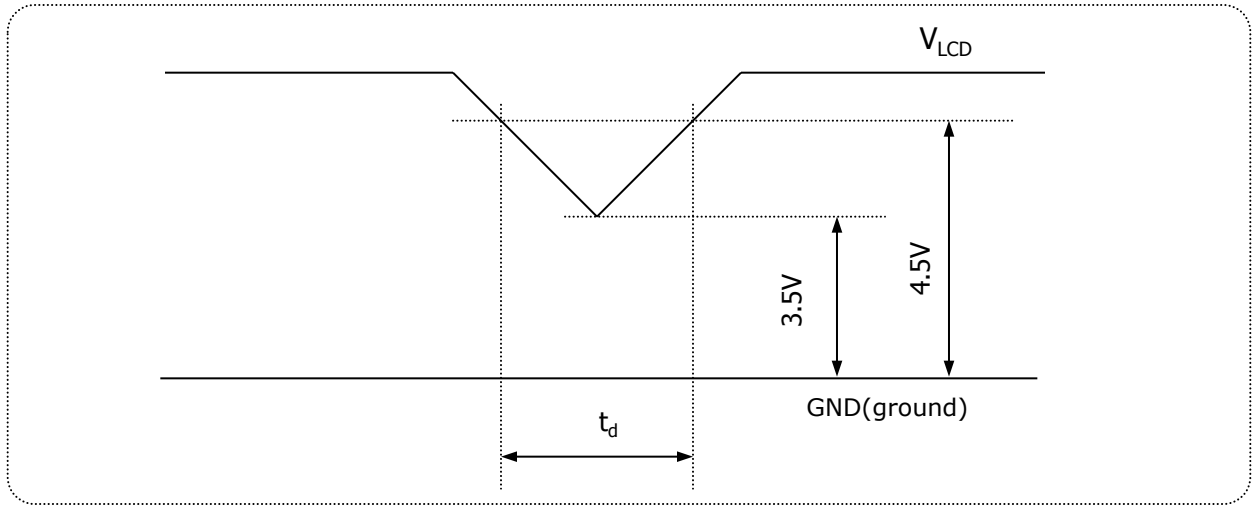
[FIG. 6] Power dip condition

For proper operation, stable power supply of V$_{LCD}$ is necessary and power dip is allowed only in below condition. Except this condition, power on/off should follow power sequence specification in previous page exactly.

1) Dip condition

3.5V ≤V$_{LCD}$< 4.5V , t$_d$≤20ms

Product specification

4. Optical specifications

Optical characteristics are determined after the unit has been 'ON' for approximately 30 minutes in a dark environment at $25\pm2°C$. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 ° and aperture 1 degree.
FIG. 7 presents additional information concerning the measurement equipment and method.
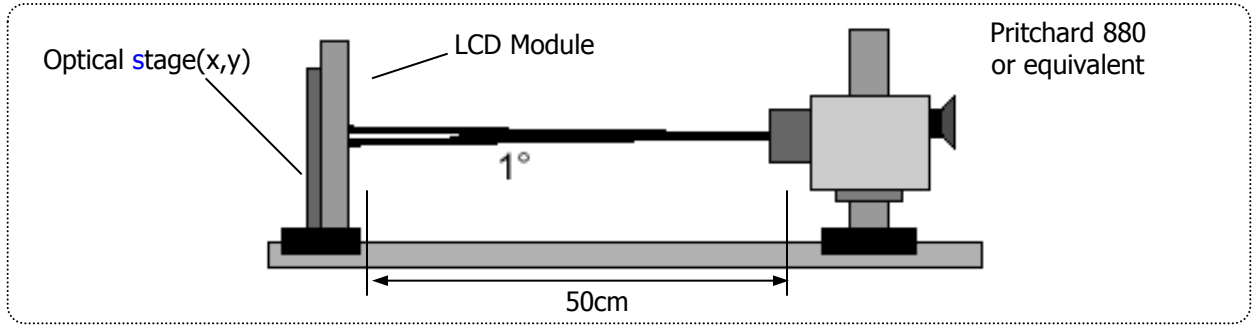
[FIG. 7] Optical characteristic measurement equipment and method

Table 9. Optical characteristics   (Ta=25 °C, V_{LCD}=5.0V, f_V=60Hz Dclk=144MHz, I_S= (130)mA)

| Parameter		Symbol	Values			Units	Notes
			Min.	Typ.	Max.		
Contrast Ratio		CR	700	1000	-		1
Surface luminance, white		L_{WH}	800	1000	-	cd/m²	2
Luminance variation		δ_{WHITE}	75	-	-	%	3
Response time	Gray To Gray	T_{GTG_AVR}	-	14	25	ms	4
Color gamut (CIE1931)		sRGB	(96)	(99)	-	%	
Color coordinates [CIE1931] **(By PR650)**	Red	Rx	Typ. -0.03	TBD	Typ . +0.03		
		Ry		TBD			
	Green	Gx		TBD			
		Gy		TBD			
	Blue	Bx		TBD			
		By		TBD			
	White	Wx		0.313			
		Wy		0.329			
Color temperature		-	-	6500	-	K	
Viewing angle (CR>10, General)	Horizontal	θ_H	170	178	-	Degree	5
	Vertical	θ_V	170	178	-		
Gray Scale		-		2.2			6

Product specification

4. The Gray To Gray response time is defined as the following figure and shall be measured by switching the input signal for "Gray To Gray ".

  - Gray step : 5 Step
  - TGTG_AVR is the total average time at rising time and falling time for "Gray To Gray ".
  - By RD80S

Table 10. GTG Gray table

Gray to Gray		Rising Time				
		G1023	G767	G511	G255	G0
Falling Time	G1023					
	G767					
	G511					
	G255					
	G0					

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".
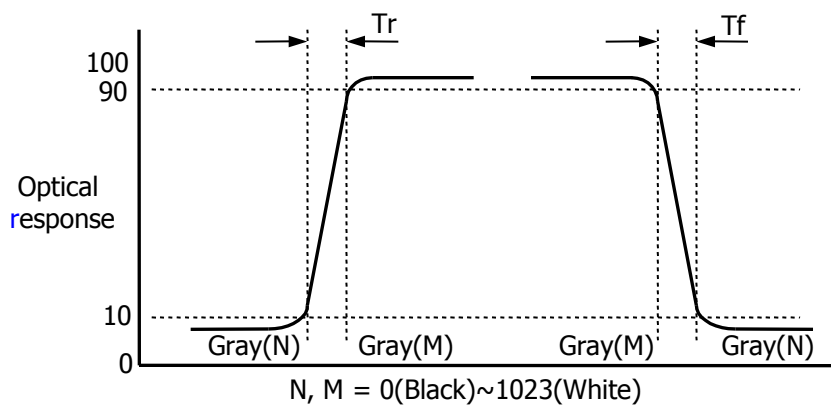
[FIG. 9] Response Time

Product specification

Notes :

    1. Contrast Ratio(CR) is defined mathematically as : **(By PR880)**

$$\text{Contrast Ratio} = \frac{\text{Surface luminance with all white pixels}}{\text{Surface luminance with all black pixels}}$$
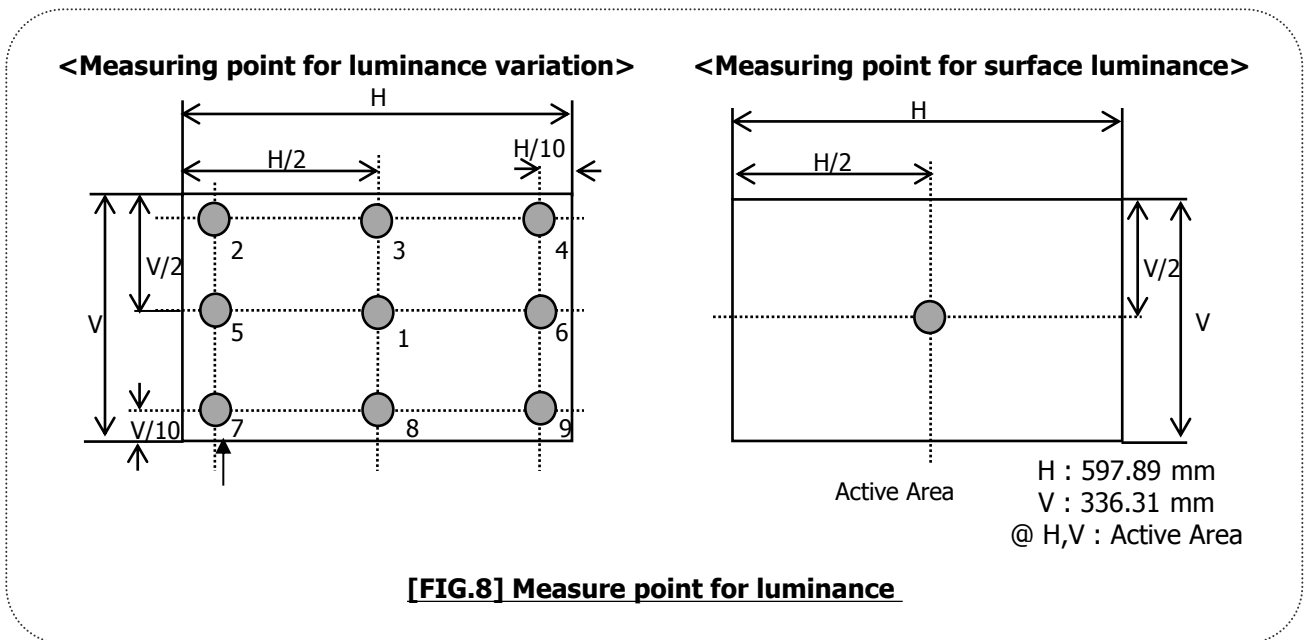
  It is measured at center point(Location P1)

  2. Surface luminance(LwH)is luminance value at Center 1 point(P1) across the LCD surface 50cm
from the surface with all pixels displaying white. For more information see FIG.7 **(By PR880)**

  3. The variation in surface luminance , δ WHITE is defined as : **(By PR880)**

$$\delta_{WHITE} = \frac{\text{Minimum}(L_{P1}, L_{P2}, \ldots L_{P9})}{\text{Maximum}(L_{P1}, L_{P2}, \ldots L_{P9})} \times 100$$

  Where L1 to L9 are the luminance with all pixels displaying white at 9 locations.
For more information see FIG.8

<Measuring point for luminance variation>　　**<Measuring point for surface luminance>**

H : 597.89 mm
V : 336.31 mm
@ H,V : Active Area

Active Area

[FIG.8] Measure point for luminance

Product specification

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 surface. For more information see FIG.10 *(By PR880)*
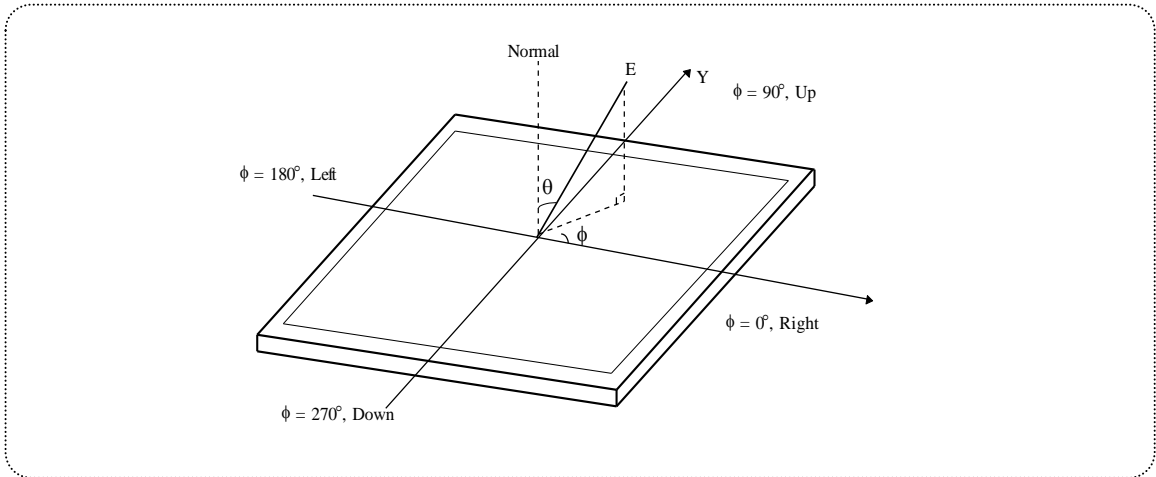
[FIG. 10] Viewing angle

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

Table 11. Gray Scale Specification

Gray Level	Relative Luminance [%] (Typ.)
0	0.10
63	0.30
127	1.08
191	2.50
255	4.72
319	7.70
383	11.49
447	16.20
511	21.66
575	28.20
639	35.45
703	43.80
767	53.00
831	63.30
895	74.48
959	86.80
1023	100

Product specification

5. Mechanical characteristics

The contents provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD.
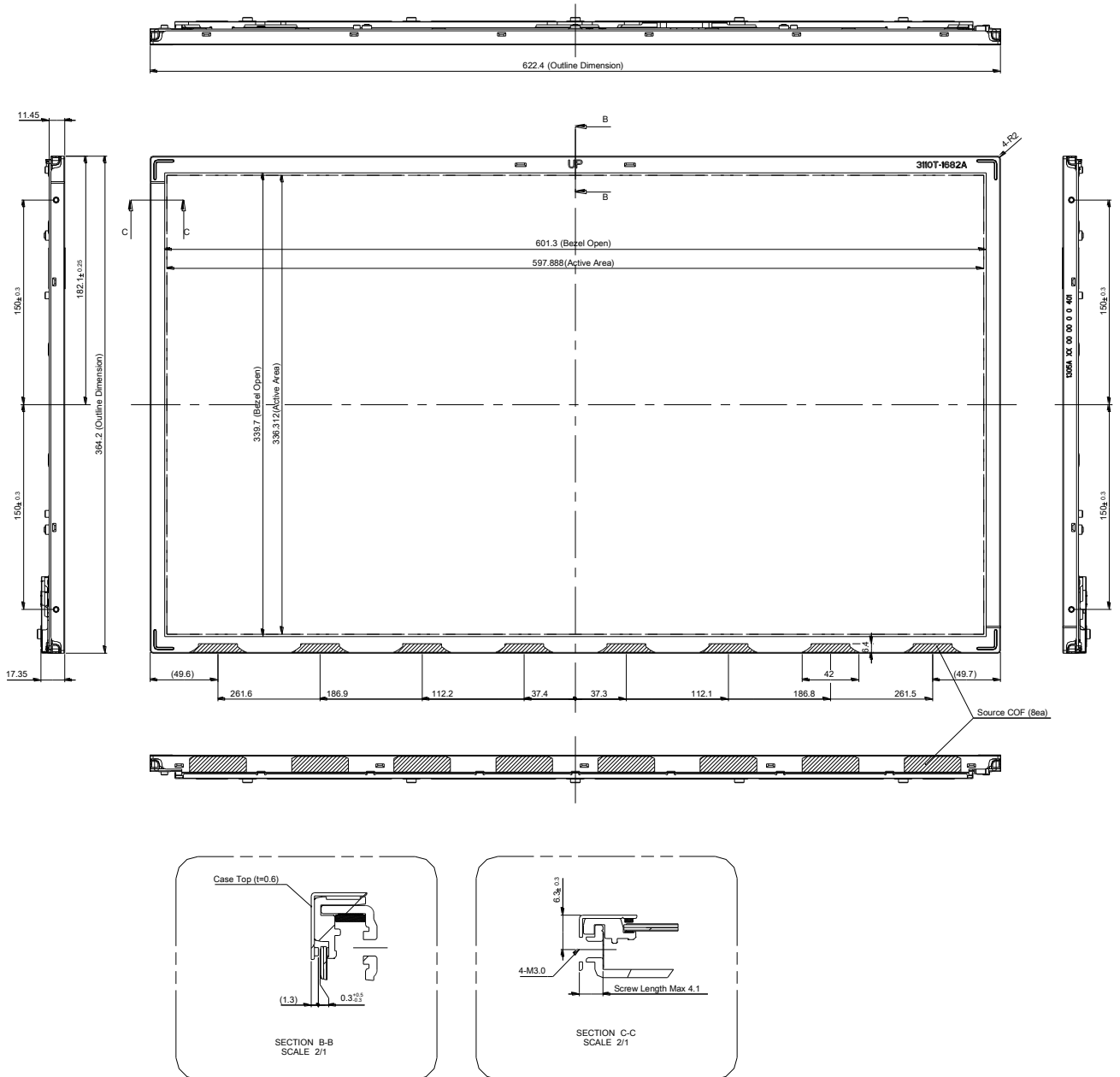
Outline dimension	Horizontal	622.4mm
	Vertical	364.2mm
	Depth	17.35 mm
Bezel area	Horizontal	601.3mm
	Vertical	339.7mm
Active display area	Horizontal	597.89mm
	Vertical	336.31mm
Weight	Typ. : TBDg, Max. : TBDg	
Surface treatment	Low Haze treatment of the front polarizer (3H)	

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

Outline dimensions (horizontal, vertical and outside depth) are measured by using vernier calipers.
The inside depth dimensions are measured by using height gauge, when LCM is put face down onto a flat surface.

Product specification

<FRONT VIEW>

622.4 (Outline Dimension)

11.45

B

UP

3110T-1682A

4-R2

C C

601.3 (Bezel Open)

597.888 (Active Area)

182.1±0.25

150±0.3

364.2 (Outline Dimension)

150±0.3

339.7 (Bezel Open)

336.312 (Active Area)

150±0.3

150±0.3

17.35

(49.6)

261.6 | 186.9 | 112.2 | 37.4 | 37.3 | 112.1 | 186.8 | 261.5

42

(49.7)

Source COF (8ea)

Case Top (t=0.6)

(1.3)   0.3⁺⁰·⁵₋₀·₃

SECTION B-B
SCALE 2/1

6.3±0.3

4-M3.0

Screw Length Max 4.1

SECTION C-C
SCALE 2/1

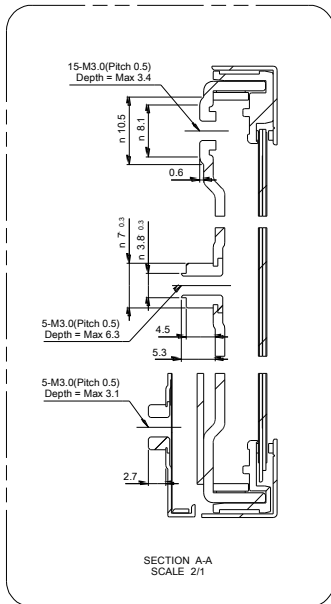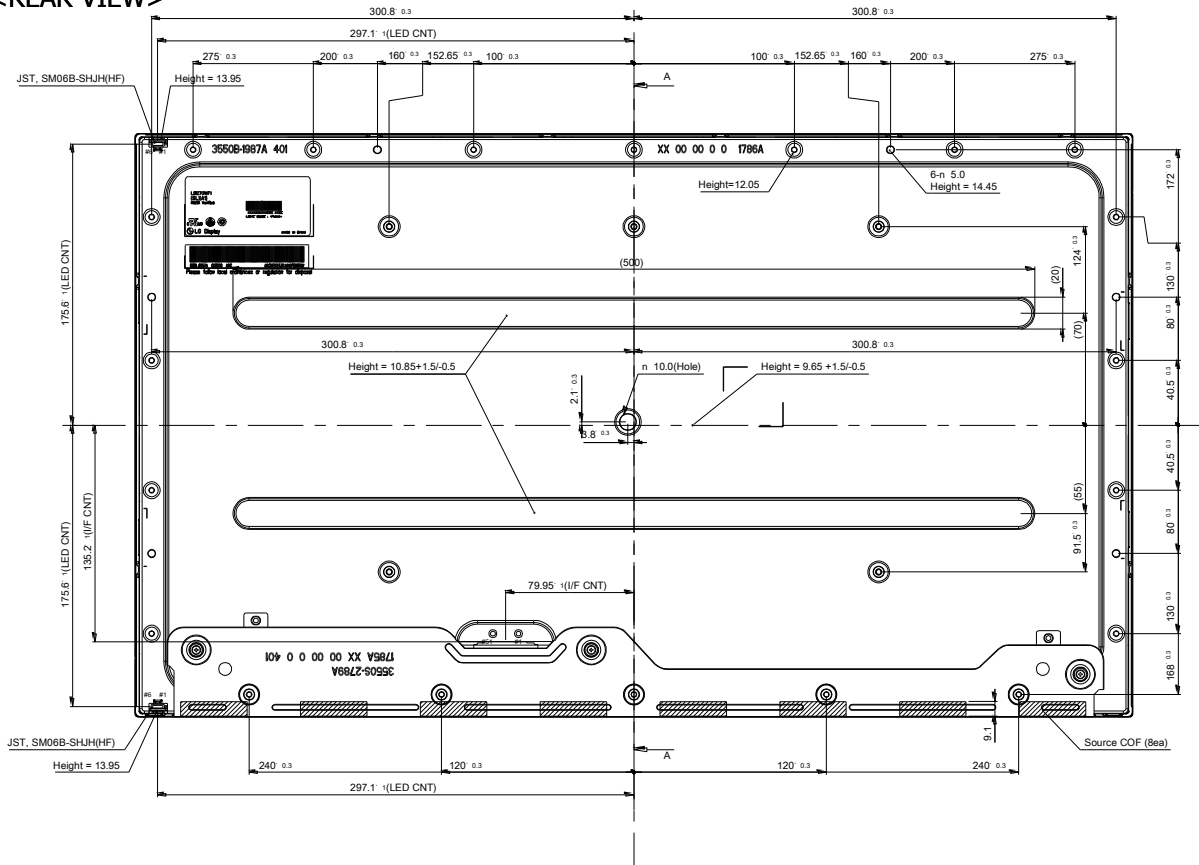## Product specification
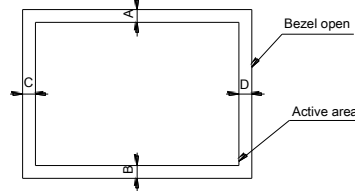
<REAR VIEW>

NOTES
1. Unspecified tolerances are to be ` 0.5
2. Tilt and partial disposition tolerance of display area are as following.

   (1) Y-direction : I A-B I ≤ 1.4mm
   (2) X-direction : I C-D I ≤ 1.4mm

Bezel open

Active area

3. Torque SPEC of Mounting : 3.0~4.0kgf.cm
4. I/F Connector Specification : UJU, IS050-C51B-C39-A or Compatible.
5. LED Connector Specification : JST, SM06B-SHJH(HF) or compatible.
6. The LCM warp(warpage) is less than 1.5mm on the surface plate.
7. The COF area is weak and sensitive, so please don't press the COF area.
8. Unspecified height should follow 3D modeling data.

SECTION A-A
SCALE 2/1

LGD Highly recommendation :
System chassis or frame should be designed to keep the IPS Panel flat as it is vulnerable to panel light-leakage
caused by deformation.

6. Reliability

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 : X,Y,Z, 10 min 　　　　One time each direction
6	Shock test (non-operating)	Shock level : 100Grms Waveform : half sine wave, 2ms Direction : ±X, ±Y, ±Z 　　　　One time each direction
7	Pressure 　　　Operating 　　　Storage	700~1060hpa 500~1060hpa
8	Altitude 　　　Operating 　　　Storage / Shipment	0 – 16,400 feet (5,000m) 0 - 40,000 feet (12,192m)

Note 1. Result evaluation criteria:
　　TFT-LCD panels test should take place after cooling enough at room temperature.
　　In the standard condition, there should be no particular problems that may affect the display function.

※. T_a= Ambient Temperature

Product specification

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. Designation of lot mark

a) Lot mark

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

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

Note
　1. YEAR

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

　2. MONTH

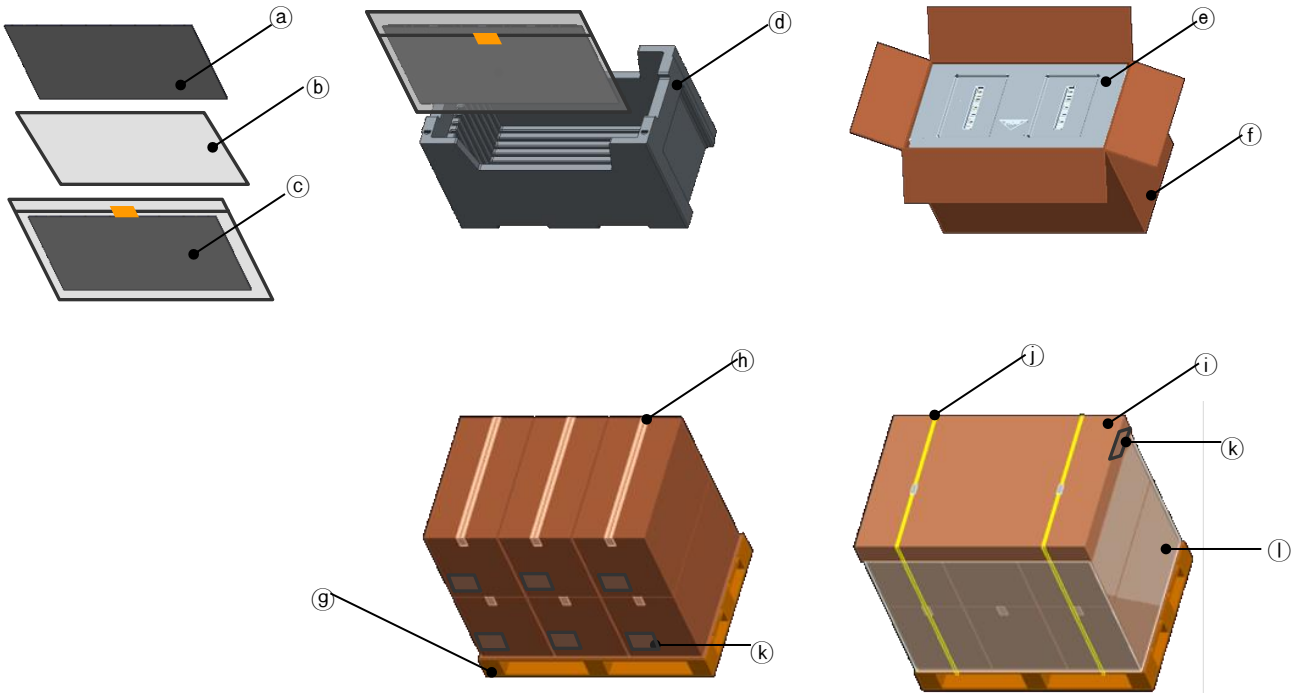| Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

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.

Product specification

8-2. Packing form

a) Package quantity in one box : 8ea
   Package quantity in one Pallet : 48ea
b) Box Size : 365mm X 710mm X 448mm
C) Pallet Ass'y Size: 1,140mmX740mmX1,019mm

No.	Description	Material
ⓐ	LCM	-
ⓑ	Protect film	PET
ⓒ	AL-Bag	AL
ⓓ	Packing,Bottom	EPS
ⓔ	Packing,Top	EPS
ⓕ	Box	Paper(SW)
ⓖ	Pallet	Plywood
ⓗ	Tape	OPP
ⓘ	Angle Cover	Paper(SW)
ⓙ	BAND	PP
ⓚ	LABEL	YUPO PAPER
ⓛ	Wrap	-

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 rear side.
(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 benzene. 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) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(2) Brightness depends on the temperature. (In higher temperature, it becomes lower.)
   And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(3) 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.
(4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(5) 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.
(6) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can't be operated its full characteristics perfectly.
(7) A screw which is fastened up the steels should be a machine screw.
   (If not, it causes metallic foreign material and deal LCM a fatal blow)
(8) Please do not set LCD on its edge.
(9) When LCMs are used for public display, defects such as Yogore & image sticking can not be guaranteed.
(10) LCM cannot support "Interlaced scan method"
(11) When this reverse model is used as a forward-type model (PCB on top side), LGD can not guarantee any defects of LCM.
(12) Please conduct image sticking test after 2-hour aging with Rolling pattern and normal temperature.
   (25~40℃)

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 AND HAZARDOUS MATERIALS EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.
The LCM should be avoided direct contact with Hazardous materials such as sulfur, acetic acid, chlorine, etc.
These materials may cause chemical reaction such as sulfurization, corrosion, discoloration, etc.

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.