

## Cover page

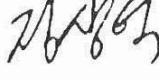
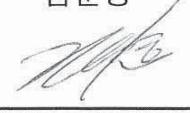
## APPROVAL SHEET

Title	SPECIFICATION FOR APPROVAL LH550WF1-SD01 (GK)
-------	--

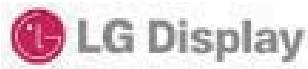
CUSTOMER	LG Electronics
MODEL	GK
CUSTOMER P/N	EAJ62117201

SUPPLIER	LG Display
MODEL	LH550WF1
SUFFIX	SD01

SIGNATURE	DATE
이병용	

APPROVED BY	DATE
정상덕 	13.03.28
이우창 	13.03.28
김준승 	13.03.28

- Preliminary Specification  
 Final Specification



## Product Specification

### Contents

1. Record of Revisions.....	3 Page
2. General Description	
2.1 General Feature.....	4 Page
2.2 Module Part List. ....	5 Page
2.3 Panel Part List.....	6 Page
2.4 BLU & Bezel Part List.....	7 Page
2.5 FPCB Part List & Structure.....	8 Page
2.6 Optical Characteristics.....	9 Page
2.7 Optical Specification (Note).....	10 Page
3. Electrical Characteristic	
3.1 Maximum Rating.....	15 Page
3.2 Electrical Characteristic.....	16 Page
3.3 FPC Pad Pin Assignment (Panel).....	17 Page
3.4 Pin Description (FPCB Connector) .....	19 Page
3.5 Block Diagram.....	20 Page
3.6 Backlight Unit.....	21 Page
3.7 LED Specification.....	22 Page
3.8 Timing Characteristics.....	24 Page
3.9 Operation Flow Chart.....	29 Page
4. Mechanical Drawing	
4.1 Module Layout .....	39 Page
4.2 Panel Layout .....	40 Page
4.3 FPCB Layout .....	41 Page.
4.4 LED FPCB Layout .....	43 Page
4.5 BLU Layout .....	44 Page
4.6 FPCB Schematic .....	45 Page
4.7 Gerber Data .....	46 Page



## Product Specification

### 5. Incoming Inspection Specification

5.1 Display Quality Specification .....	50 Page
5.2 Scratches, Dent and Extraneous Substances .....	51 Page
5.3 Glass Chipping and Broken .....	52 Page

### 6. Reliability

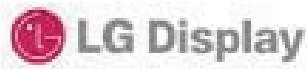
6.1 Environmental Reliability Tests .....	53 Page
6.2 Mechanical Reliability Tests .....	54 Page

### 7. Precautions for use

7.1 Safety .....	56 Page
7.2 Installation in Assembly.....	57 Page
7.3 Transportation and Storage.....	60 Page

### 8. Package

8.1 Packing Description.....	62 Page
8.2 Packing Box Dimension.....	63 Page
8.3 Packing Label Design .....	64 Page
8.4 QC Flow Chart.....	65 Page
8.5 Designation of Lot Mark.....	67 Page
8.6 Designation of 2D Bar code.....	68 Page



## Product Specification

### 1. Record of Revision

Revision No.	Date	Contents of Revision Change	Remark
1.0	12.10.22	Final Specification Release	All page
1.1	12.11.06	Change the Insulation & Pulling Tape size	5
	12.11.06	Change Power Max consumption	16
	12.11.06	Change DSI CLK Timing	25
	12.11.06	Change the drawing	39
1.2	12.11.28	Change the White Color coordination spec	9
	12.11.28	Change the Initial Code	29 ~ 38
1.3	13.01.17	Due to Change the FPC Vendor from siflex to Newflex, FPC Gerber and Drawing is changed	5, 8, 41, 46, 47
	13.01.17	Modify the Frame Frequency	16
1.4	13.01.24	Add 2D Bar code Information	5, 39, 65, 66, 67
	13.01.24	Add Designation of 2D Bar code	68
	13.01.24	Change the Initial Code	30 ~ 35
1.5	13.01.31	Add FPC ACF	6
1.6	13.02.25	Modify the LCM Drawing	39
1.7	13.03.28	Add BLU Maker	5



## Product Specification

## 2. General Description

## 2.1. General Feature

No	Item	Specification	Remark
1	Display Method	Active Matrix TFT	
2	Display Mode	Transmissive Type	
3	Display Resolution	1080RGB(H) × 1920(V)	
4	Active Area [mm]	68.04(H) × 120.96(V)	
5	Screen Size [inch]	5.46"	
6	Pixel Pitch [mm]	0.021 × RGB(H) × 0.063(V)	403 ppi
7	Display Color	16.7M color	
8	Surface Treatment	AR + QWP	
9	Outside Dimension [mm]	71.14(H) × 128.01(V) × 1.45(D)	
10	Viewing Angle	Wide view(80°/80°/80°/0°)	
11	Weight [g]	20.23 g	±10%
12	Driver IC	R63311	29.8mm(H) × 0.85mm(V) × 0.17mm(D)
13	Inversion Method	Column Inversion	



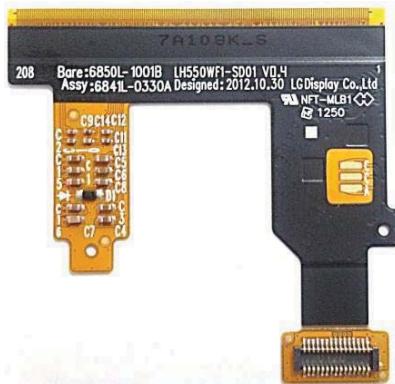
LH550WF1-SD01  
Liquid Crystal Display

## Product Specification

### 2.2. Module Part List



COG Ass'y



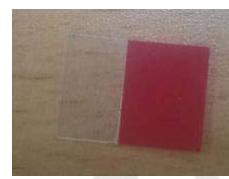
FPC ass'y



BLU ass'y



Gap Filling Tape



Pulling Tape



Insulation Tape



2D Label

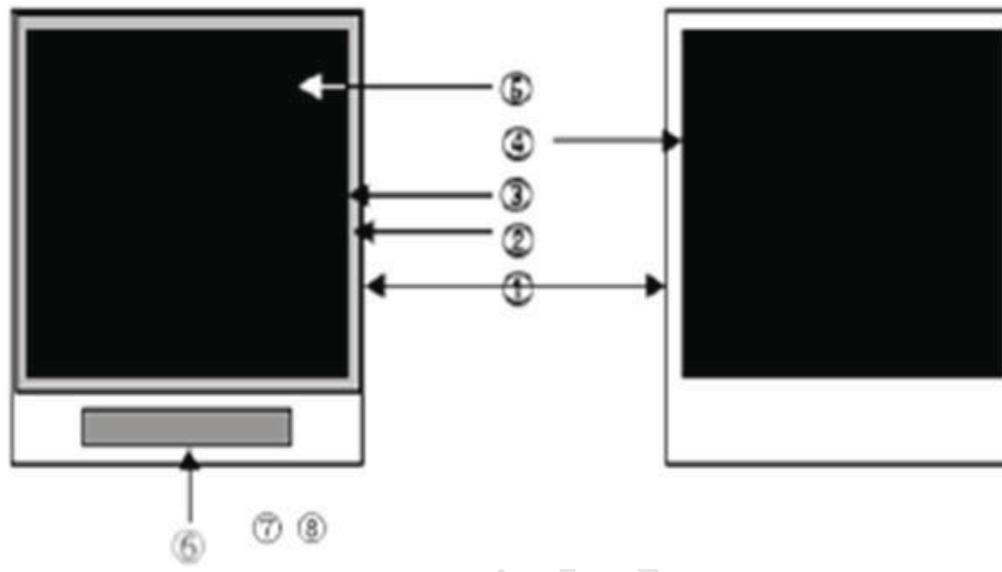
No	Name	Spec	Maker	Amount
1	COG Ass'y	6061L-2432A	LG Display <sup>1)</sup> (Kumi)	1
2	FOG Ass'y	6841L-0330B	Newflex (Anshan)	1
3	BLU Ass'y	6091L-2233A	KJP (Yantai) e-LITECOM (WUXI) Raygen (Yantai)	1
4	Insulation Tape	7250L-2603A	SERVEONE	1
5	Insulation Tape	7250L-2604A	SERVEONE	1
6	Remove Tape	7250L-0907A	SERVEONE	1
7	Gap Filling Tape	7250L-2859A	SERVEONE	1 (18.67*1.65*0.17t)
8	Gap Filling Tape	7250L-2860A	SERVEONE	1 (15.17*1.65*0.17t)
9	2D Label	3850L-0214A	SERVEONE	1

Note. 1) COG ass'y의 Panel은 LG Display 패널을 사용함.

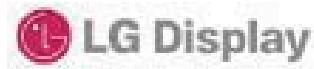


## Product Specification

## 2.3. Panel Part List

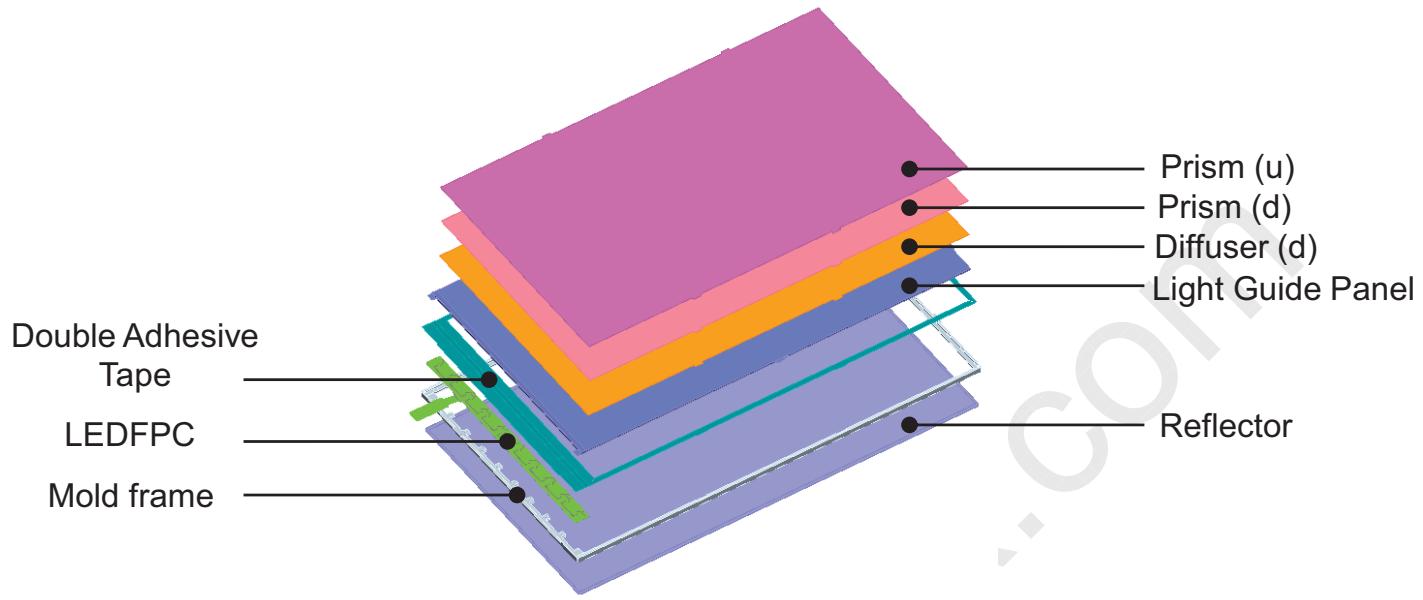


No.	Name	Spec	Maker
1	TFT Glass	0.18t	LGD
2	Color Filter Glass	0.18t	DNP
3	Upper Polarizer	NZCD+ ARC9+V	Nitto
4	Lower Polarizer	CVS + APCFH4 +D5+AS+V	Nitto
5	Liquid Crystal	ML1102	Merck
6	Driver IC	R63311 29.8(H) x 0.85(V) x 0.17(D)	Renesass
7	ACF(COG)	CP33731-18YA, 1.5mm	Sony
8	ACF(FOG)	AC-7823YM-18, 1.0mm OR AC11500Z, 1.2mm OR CP5731A, 1.0mm	Hitachi Hitachi Sony

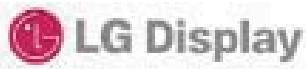


## Product Specification

## 2.4. BLU &amp; Bezel Part List

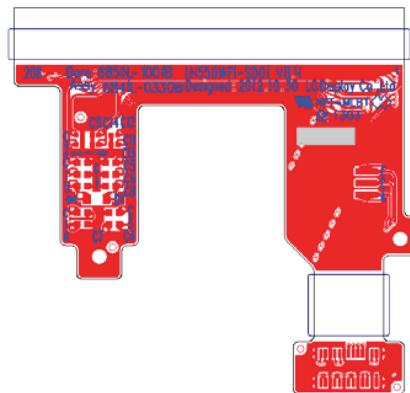


No.	Part name	Material Maker P/N	Q'TY	Specification	Maker
1	Mold Frame	4980L-0959A	1	PC, LB1010W	KJP
2	Tape (Curtain, Double Adhesive, etc.)	7250L-2861A	1	5684E	NITTO
3	Diffuser (d)	3022L-2263A	1	38K2S	KIMOTO
4	Prism (u)	3032L-1690A	1	BEF4-GMv2	3M
5	Prism (d)	3032L-1689A	1	TBEF2-GT	3M
6	Reflector	3035L-0021A	1	ESR	3M
7	LGP	5150L-0894A	1	PC	KJP
8	LED	6915L-0544A	12	SMFD07	SSC
9	LED FPCB	6580L-1042A	1	1 Layer	WHITE COVERAY

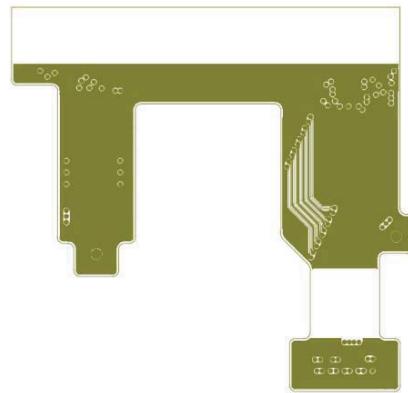


## Product Specification

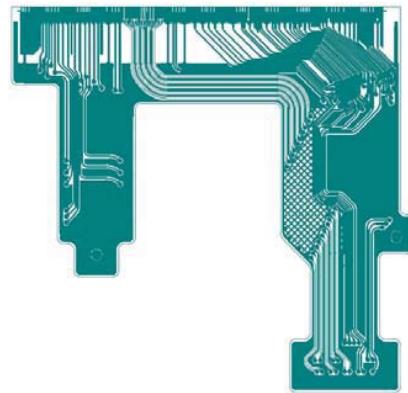
### 2.5. FPCB Part List & Structure



&lt; 1 Layer &gt;



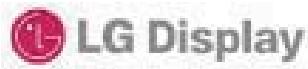
&lt; 2 Layer &gt;



&lt; 3 Layer &gt;

No	Part Name	Specification	Maker	EA	Note
1	FPC	3L, 33.70x33.48x0.26T	Newflex	1	-
2	Capacitor	1uF, K, 25V, X5R, 1005, 0.6T(Max)	Note 1)	6	C1, C2, C3, C4, C15, C16
3	Capacitor	4.7UF, K, 10V, X5R, 1005, 0.7T(Max)	Note 1)	2	C5, C7
4	Capacitor	2.2uF, K, 10V, X5R, 1005, 0.55T(Max)	Note 1)	2	C6, C8
5	Capacitor	1UF, K, 6.3V, X5R, 0603, 0.39T(Max)	Note 1)	2	C9, C14
6	Capacitor	2.2uF, K, 6.3V, X5R, 0603, 0.39T(Max)	Note 1)	4	C10, C11, C12, C13
7	Diode	SDM10U45, DIODES, SOD-523, 0.65T(Max)	DIODES	1	D1
8	Connector	GB042-30P-E1000, LS CABLE, 30, 0.4, HEADER, 1.0, R/TP, AU	LS Mtron	1	CNT1

Note 1) Capacitor Maker : MURATA, TAYO YUDEN, TDK, AVX-KYOCERA, Samsung Electro-Mechanics, Walsin



## Product Specification

### 2.6. Optical Characteristic

Item		Symbol	Condition	Unit	Min.	Typ.	Max	Notes
Response Time	Rise	Tr	25°C	ms	-	17	-	
	Fall	Tf	25°C	ms	-	18	-	
Luminance		Bp	$\Theta = 0^\circ$	cd/m <sup>2</sup>	360	450	-	
Luminance uniformity		$\Delta L$	$\Theta = 0^\circ$	%	80	85	-	
Contrast Ratio		C/R	$\Theta = 0^\circ$	-	700	1000	-	
Viewing Angle		Top	CR>10°	Degree	-	80	-	
		Bottom			-	80	-	
		Right			-	80	-	
		Left			-	80	-	
Color Coordination		Rx	$\Theta = 0^\circ$	NTSC (x,y)	0.610	0.640	0.670	1)
		Ry			0.300	0.330	0.360	1)
		Gx			0.260	0.290	0.320	1)
		Gy			0.570	0.600	0.630	1)
		Bx			0.120	0.150	0.180	1)
		By			0.030	0.060	0.090	1)
		Wx			0.277	0.302	0.327	1)
		Wy			0.298	0.323	0.348	1)
Color Gamut (CIE 1931)			$\Theta = 0^\circ$	%	65	70	-	
Cross Talk		C/T	$\Theta = 0^\circ$	%		3	5	
Flicker		F/K	$\Theta = 0^\circ$	%		-	20	

1) Measured value in  $\pm 0.025\sim 0.030$ , LCD Modules require the separate discuss.

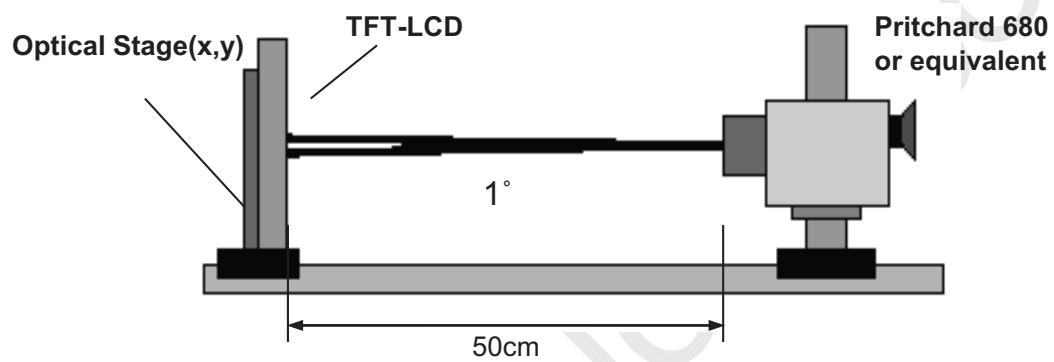


## Product Specification

## 2.7. Optical Specification (Note)

## [Note 1] Optical Test Equipment Setup

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 5 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface. And backlight LED current is 20mA per LED



**Fig 2-1. Optical Characteristic Measurement Equipment and Method**

## ※ Measuring Condition:

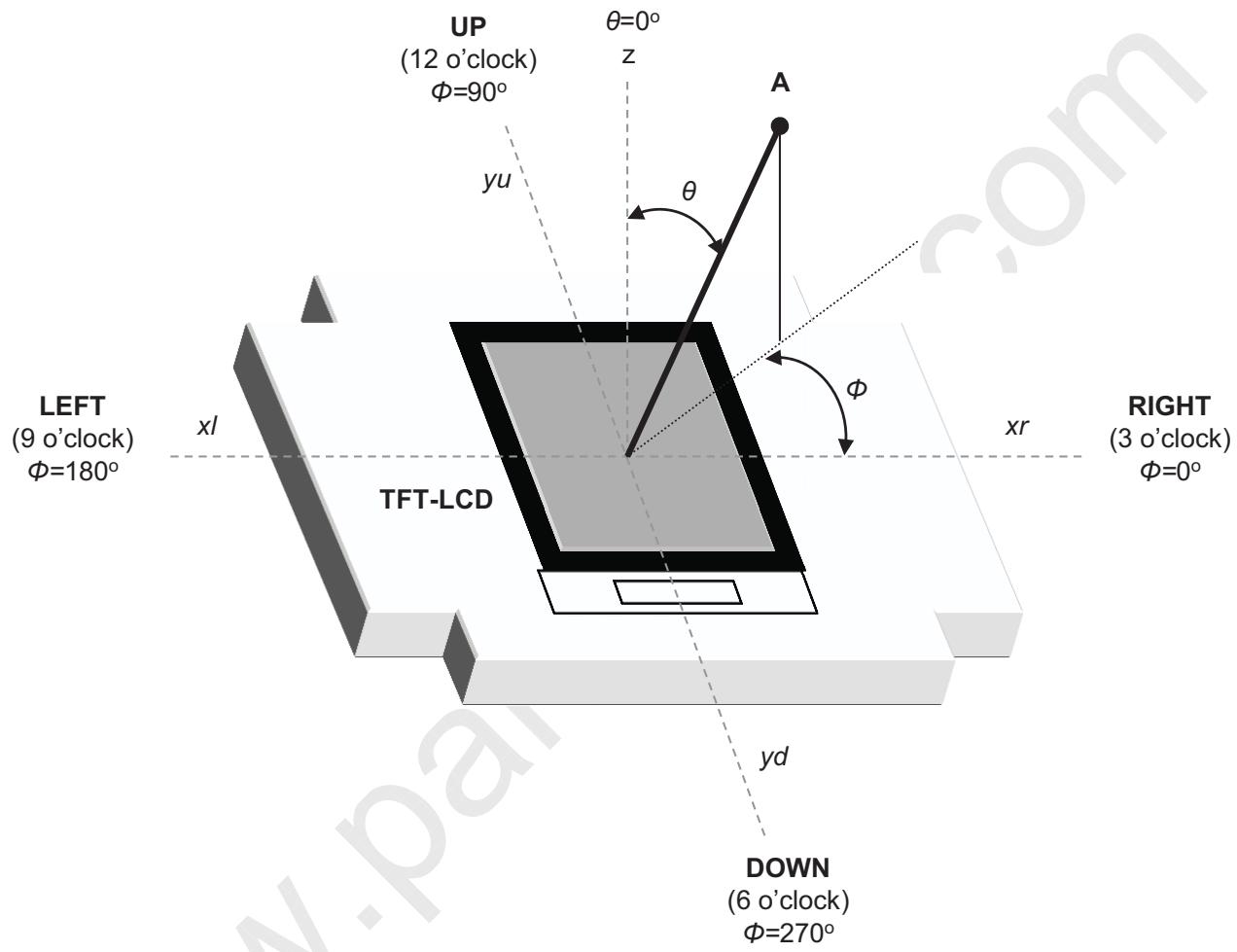
- Measuring surroundings : Dark Room
- Measuring temperature :  $T_a=25^{\circ}\text{C}$
- Adjust operating voltage to get optimum contrast at the center of the display.
- Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.



## Product Specification

## [Note 2] Viewing Angle

Viewing angle range is defined as follows;



**Fig 2-2. Viewing angle**

## [Note 3] Contrast Ratio

Contrast ratio is defined as follows;

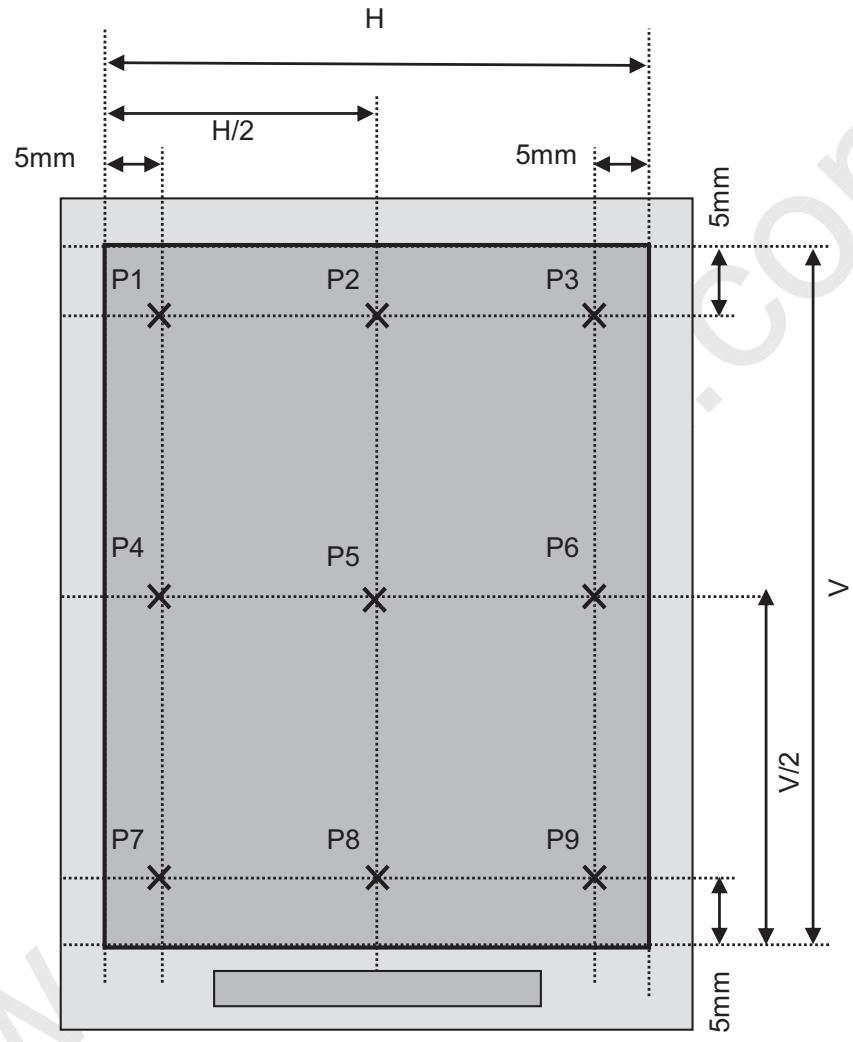
$$\text{ContrastRatio(CR)} = \frac{\text{Photo detector output with LCD being "WHITE"}}{\text{Photo detector output with LCD being "BLACK"}}$$



## Product Specification

### [Note 4] Luminance

The luminance measurement is taken at point P5.



**Fig 2-3. Luminance measurement points**

### [Note 5] Luminance Uniformity

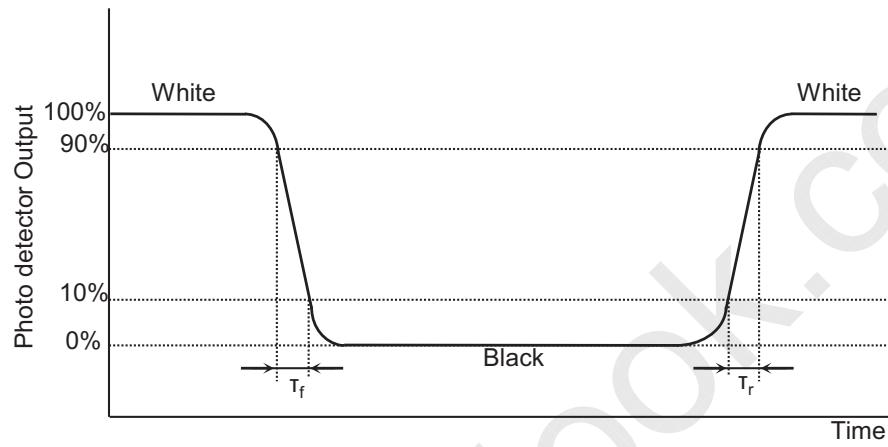
$$\text{Luminance Uniformity} = \frac{\text{Minimum Luminance for P1 ~ P9 with all white pixels}}{\text{Maximum Luminance for P1 ~ P9 with all white pixels}}$$



## Product Specification

### [Note 6] Response Time

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".

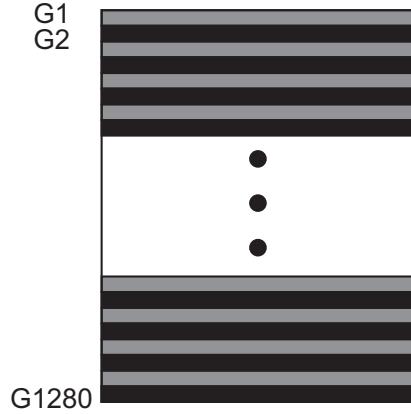


**Fig 2-4. Response Time**

### [Note 7] Flicker

The flicker level should be measured with horizontal gray/black stripes. The flicker is essentially a ratio of the powers in the frequency spectrum at 30 Hz ( $P_X$ ) and 0 Hz ( $P_0$ - DC level).

$$F = 20 \log (P_X / P_0)$$





## Product Specification

[Note 8] Crosstalk

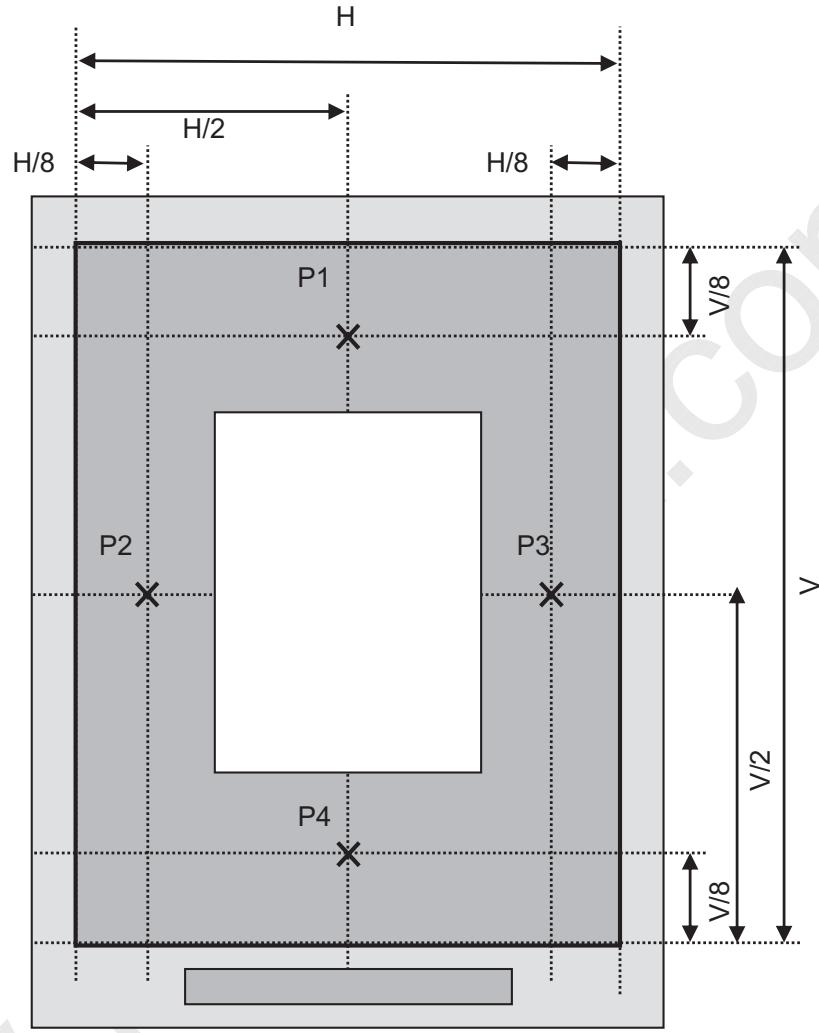


Fig 2-5. Crosstalk measurement points

A: Luminance for P1 ~ P4 with all 127gray pixels

B: Luminance for P1 ~ P4 with 127gray pixels when the white box is applied

$$\text{Crosstalk [%]} = \text{Maximum} \left[ \text{Absolute} \left( \frac{A - B}{A} \right) \right]$$



## Product Specification

## 3. Electrical Characteristic

## 3.1. Maximum Rating

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power for Analog Circuit	V <sub>SP</sub>	4.5	5.0	6.0	V	
Power for Logic Circuit	V <sub>SN</sub>	-6.0	-5.0	4.5	V	
Power for Interface Circuit	I <sub>OVCC</sub>	1.65	1.8	3.3	V	
Storage Humidity	H <sub>STG</sub>	10	-	90	%RH	Note 1), 2)
Storage Temperature	T <sub>STG</sub>	-30	-	80	°C	Note 1), 2)
Operating Ambient Humidity	H <sub>OP</sub>	10	-	90	%RH	Note 1), 2)
Operating Ambient Temperature	T <sub>OP</sub>	-20	-	70	°C	Note 1), 2)

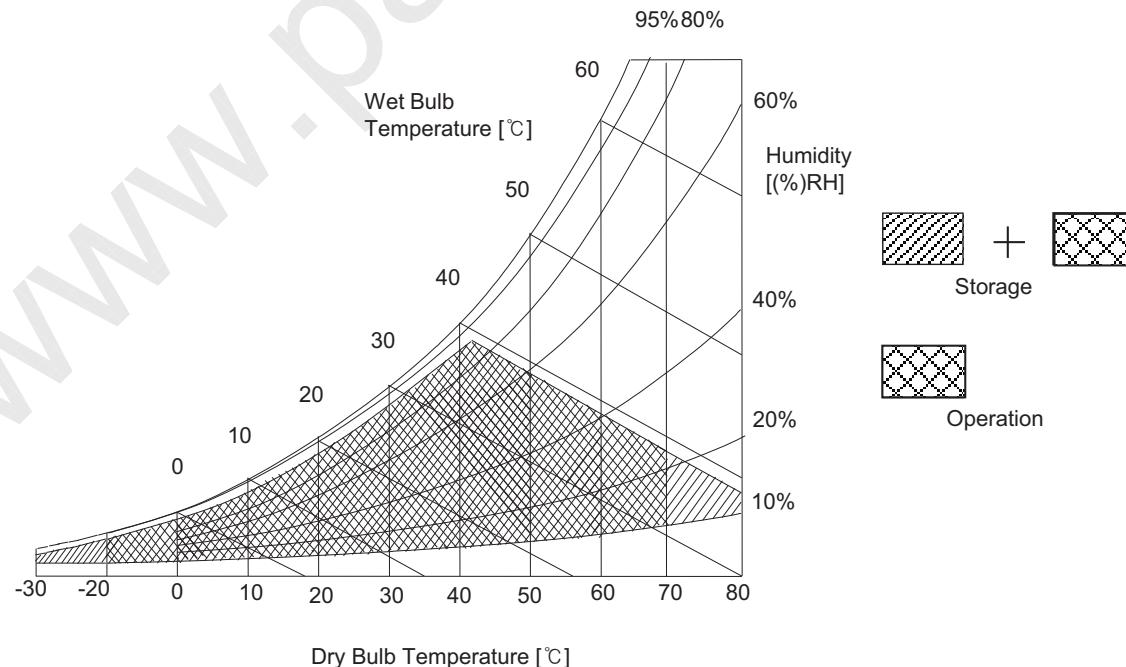
Note 1) Temp.  $\leq$  60 °C , 90% RH MAX.

Temp.  $>$  60 °C , Absolute humidity shall be less than 90% RH at 60 °C.

Note 2) The diagram below indicates the peripheral environment of the module.

The wet bulb temperature should be kept under 39 °C and there should be no compensation.

If the LSI is used above these absolute maximum ratings, it may become permanently damaged.





## Product Specification

## 3.2. Electrical Characteristic

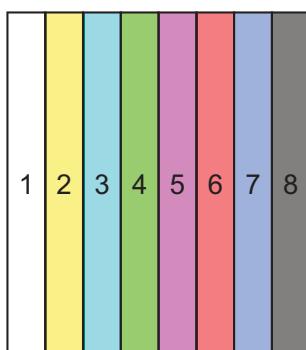
Ta + 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power for Interface Circuit	IOVCC	1.65	1.8	3.3	V	
Power for Positive Source	VSP	4.9	5.0	5.1	V	
Power for Negative Source	VSN	-5.1	-5.0	-4.9	V	
Power for BLU Driving	IBAT	-	20	-	mA	2chain 6serial
Logic Input High Voltage	VIH	0.7×IOVCC	-	IOVCC	V	
Logic Input Low Voltage	VIL	0	-	0.3×IOVCC	V	
Frame Frequency	Ff		60		Hz	
Current Consumption	Normal Display	I <sub>iovcc</sub>	-	17	20	mA
		I <sub>vsp</sub>	-	14	23	mA
		I <sub>vsn</sub>	-	11	20	mA
	Sleep Mode	I <sub>iovcc-stb</sub>	-	0.5	1.5	mA
		I <sub>iovcc-dsb</sub>	-	0.01	0.1	mA
	BLU Driving	I <sub>bat</sub>	-	20	-	mA 20mA/LED
Power Consumption	Normal Display	I <sub>iovcc</sub>	-	30	35	mW
		I <sub>vsp</sub>	-	70	115	mW
		I <sub>vsn</sub>	-	55	100	mW
	Sleep Mode	I <sub>iovcc-stb</sub>	-	1	3	mW
		I <sub>iovcc-dsb</sub>	-	0.02	0.2	mW
	BLU Driving	I <sub>bat</sub>	-	720	-	mW 20mA/LED

\* All kinds of specifications and functions are optimized with the below Test condition

- IOVCC 1.8V, VSP : 5.0V, VSN : -5.0V, Column inversion, Ta 25°C

\*\* The Typ. current/power consumption is measured at the below color bar test pattern



1. White
2. Yellow
3. Light blue
4. Green
5. Purple
6. Red
7. Blue
8. Black



## Product Specification

## 3.3. FPC PAD Pin Assignment (Panel)

No.	Symbol	Description	No.	Symbol	Description
1	Dummy		53, 54	VDD	For the internal logic operation
2	GND		55	IOVCRF	IOVCC
3	Dummy		56~58	IOVCC	
4	Ag_GND		59	GNDRF	GND
5, 6	VCOM		60, 61	GND	
7	AGND		62	LEDPWM	
8	GVSS		63	EXCK	Connected GND at FPC
9	GND		64	DBIST	
10	PBCTLA1	Open	65	LNSW1	Connected IOVCC at FPC
11	PBCTLA2		66	LNSW0	
12	PBCTLB1		67	PNSW	
13	PBCTLB2		68	IM2	
14, 15	GVDD		69	IM1	
16, 17	VGH		70	IMO	Connected GND at FPC
18~20	C21P	Capacitor connection Pins for step-up circuit	71	VSOUT	VSYNC OUT
21~22	C21M		72	HSOUT	Open
24~26	SVDD		73, 74	TE2/TE	
27~29	VSP		75	CSX	
30	EXPWRP	VSP	76	DCX	Connected IOVCC at FPC
31	VSWP	Open	77	WRX/SCL	
32, 33	SVSS		78	DOUT	
34, 35	VSN		79	DIN	Connected IOVCC at FPC
36, 37	AGND		80	RESX	
38, 39	C41M	Open	81, 82	IOVCC	
40, 41	C41P		83~86	GND	
42, 43	VCL		87~90	AGND	
44~46	VCI		91~94	VCI	
47	Dummy		95~99	SVDD	
48, 49	VCOM		100, 101	VGS	
50	VCOMDC	Capacitor connection Pins for internal VCOM	102~106	SVSS	
51, 52	AGND		107~110	VCL	

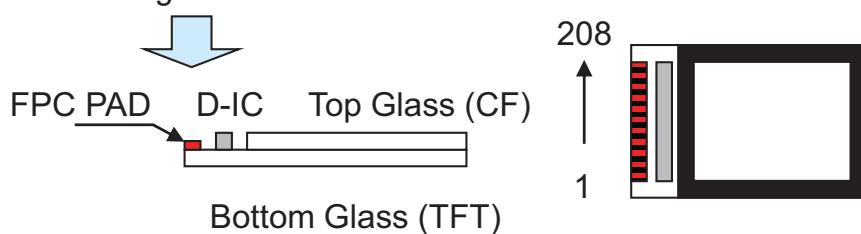


## Product Specification

3.3. FPC PAD Pin Assignment (Panel) *continued*

No.	Symbol	Description	No.	Symbol	Description
111~114	AGND		159~161	AGND	
115~118	GND		162	DUMMYR1	
119~120	VDD		163	DUMMYR2	Open
121	IOVCC		164~168	VCL	
122~123	GND		169, 170	SVDD	
127, 128	DATA2P	MIPI Data2+	171, 172	VSP	
129, 130	DATA2N	MIPI Data2-	173	EXPWRN	VSP
131	DPHYGNDDUM1	GND	174~176	VSN	
132, 133	DATA1P	MIPI Data1+	177~179	SVSS	
134, 135	DATA1N	MIPI Data1-	180	VSWN	Open
136	DPHYGNDDUM2	GND	181~183	C31P	Capacitor connection Pins for step-up circuit
137, 138	CLKP	MIPI CLK +	184~186	C31M	
139, 140	CLKN	MIPI CLK -	187, 188	VGL	
141	DPHYGNDDUM3	GND	189, 190	GVSS	
142, 143	DATA0P	MIPI Data0+	191, 192	GND	
144, 145	DATA0N	MIPI Data0-	193	GVDD	
146	DPHYGNDDUM4	GND	194, 195	AGND	
147, 148	DATA3P	MIPI Data3+	196, 197	VCOM	
149, 150	DATA3N	MIPI Data3-	198~206	Dummy	
151~153	DPHYVCC	Connected IOVCC at FPC	207	GND	
154, 155	VDDLP	Capacitor connection Pins for internal LDO	208	Dummy	
156~158	GND				

Viewing Direction





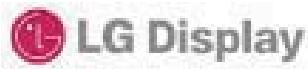
## Product Specification

### 3.4. Pin Description (FPCB Connector)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	30	GND	Ground
2	LED_A	LED ANODE	29	LED_C1	LED CATHODE1
3	GND	Ground	28	LED_C2	LED CATHODE2
4	VSP	5V	27	GND	Ground
5	VSN	-5V	26	IOVCC	1.8V
6	GND	Ground	25	LEDPWM	LED PWM CONTROL
7	DATA2P	MIPI DATA P2	24	VSYNC	Frame start pulse
8	DATA2N	MIPI DATA N2	23	RESET	LCD RESET
9	GND	Ground	22	GND	Ground
10	CLKP	MIPI CLKP	21	DATA1P	MIPI DATA P1
11	CLKN	MIPI CLKN	20	DATA1N	MIPI DATA N1
12	GND	Ground	19	GND	Ground
13	DATA3P	MIPI DATA P3	18	DATA0P	MIPI DATA P0
14	DATA3N	MIPI DATA N3	17	DATA0N	MIPI DATA N0
15	GND	Ground	16	ID	Maker ID (GND)

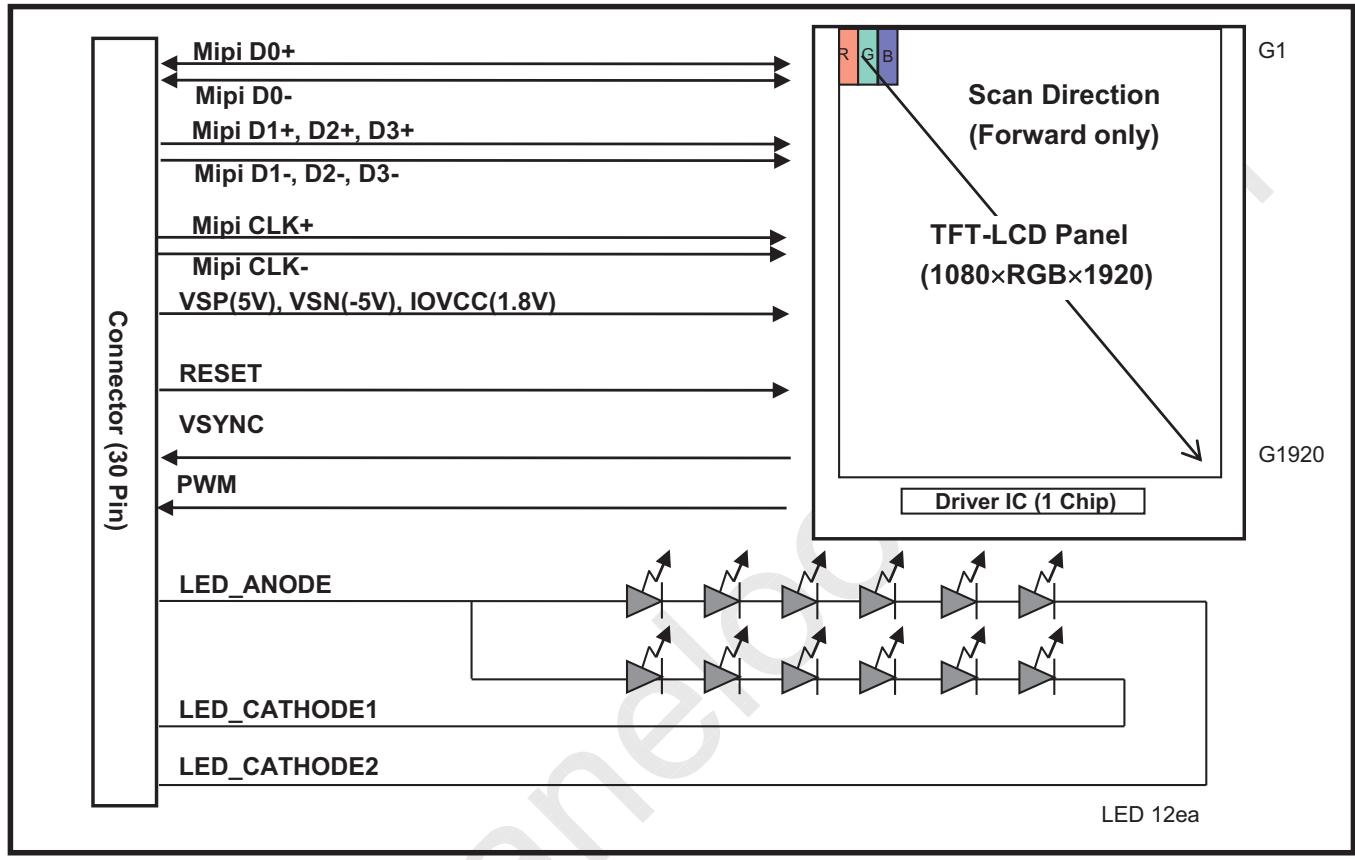
GB042-30P-E1000,

**Fig 1. FPC Connector Top View**



## Product Specification

## 3.5. Block Diagram





## Product Specification

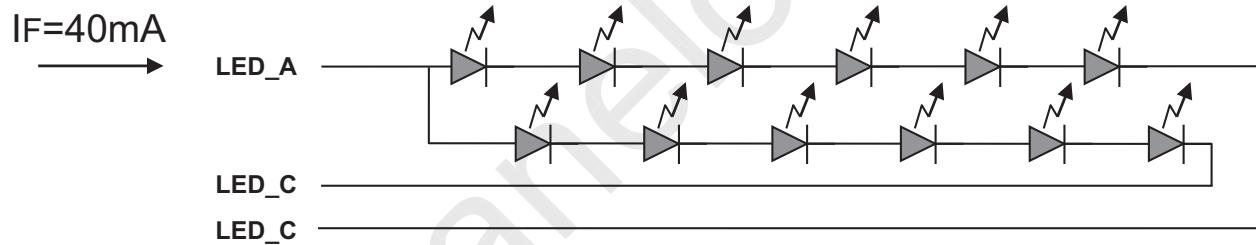
## 3.6. Backlight Unit

Item	Symbol	Min.	Typ.	Max.	Units
Surface Luminance	B	11,160	12,400	-	cd/m <sup>2</sup>
Surface Brightness Uniformity	B <sub>9</sub>	80	85	-	%
LED Voltage	V <sub>f</sub>	-	3.0	-	V (per LED)
LED Current	I <sub>f</sub>	-	20	-	mA (per LED)

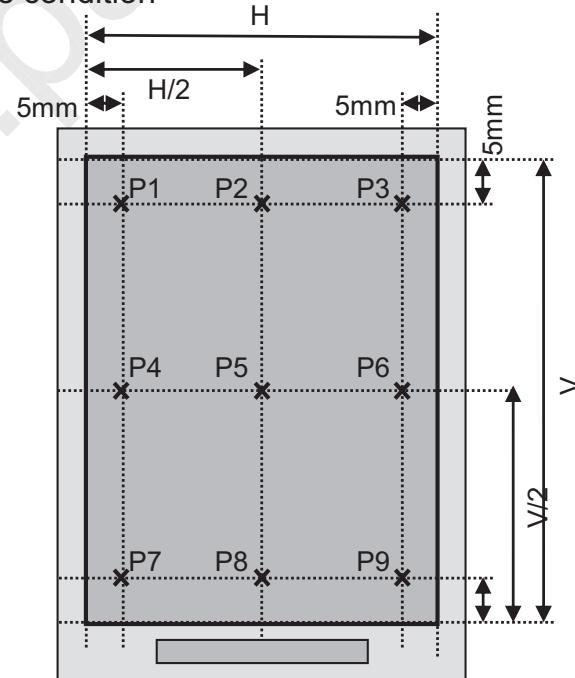
Note 1)

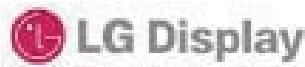
LED Maker : SSC

LED Part name : SMFD07



Note 2) Uniformity measure condition





## Product Specification

### 3.7. LED Specification

#### 1) Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power Dissipation	$P_d$ <sup>*1</sup>	96	mW
Forward Current	$I_F$	30	mA
Peak Forward Current	$I_{FM}$ <sup>*2</sup>	100	mA
Reverse Voltage	$V_R$	5	V
Operating Temperature	$T_{opr}$	-30 ~ +85	°C
Storage Temperature	$T_{stg}$	-40 ~ +100	°C
Junction Temperature	$T_j$ max	105	°C
Life Time ( $T_a=25^\circ\text{C}$ ) <sup>*3</sup>	-	15000	hrs
Life Time ( $T_a=60^\circ\text{C}$ ) <sup>*3</sup>	-	10000	hrs

\*1 Care is to be taken that power dissipation does not exceed the absolute maximum rating of the product.

\*2  $I_{FM}$  was measured at  $T_w \leq 0.1\text{msec}$  of pulse width and  $D \leq 1/10$  of duty ratio.

\*3 Estimated time to 50% degradation of initial luminous intensity.

Condition:  $T_a=25/60^\circ\text{C}$ ,  $T_j \leq 75^\circ\text{C}$  (Using SSC testing circuit board)

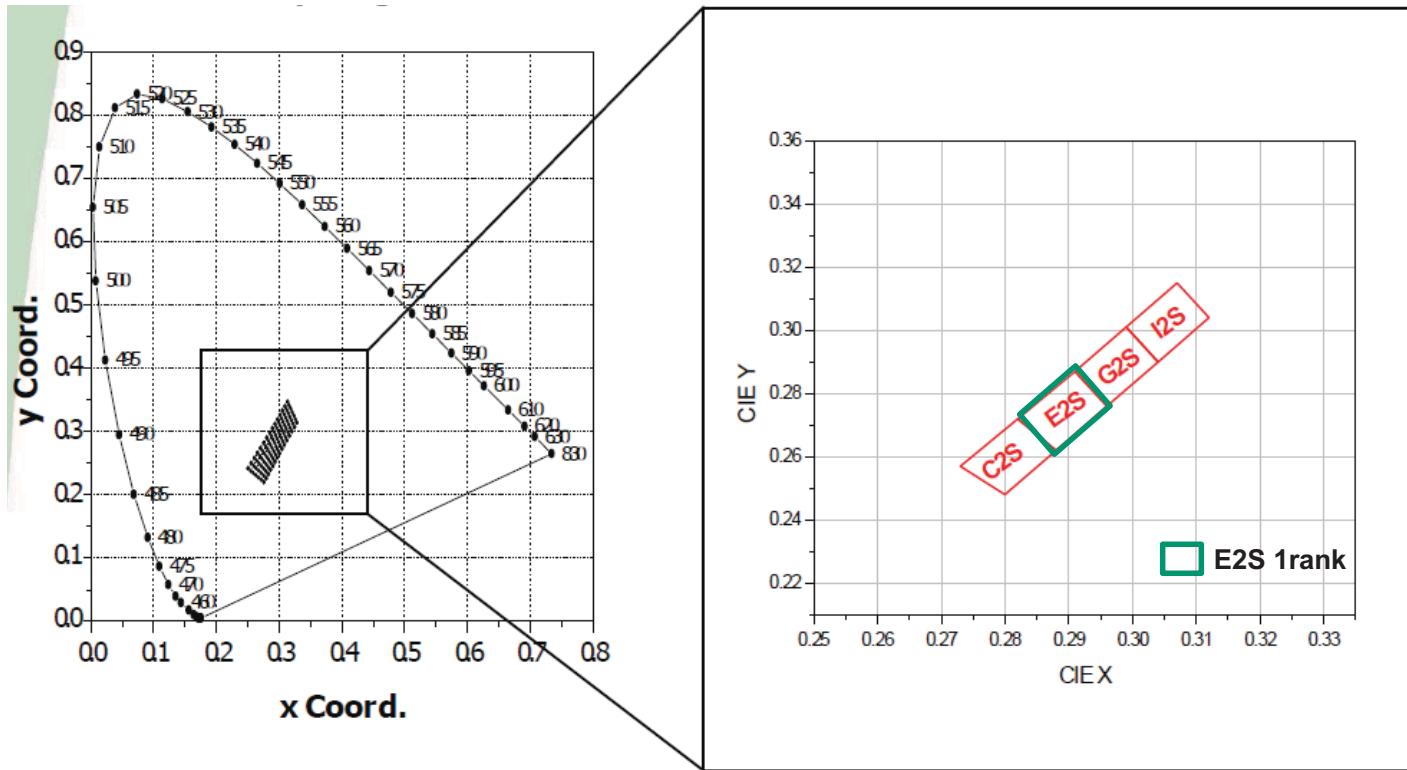
#### 2) Initial Electrical/Optical Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	$V_{F1}$	$I_F = 20\text{mA}$	2.8	-	3.2	V
Reverse Current	$I_R$	$V_R = 5\text{V}$	-	-	50	uA
Luminous Flux	$I_V$	$I_F = 20\text{mA}$	7.8	-	8.5	lm

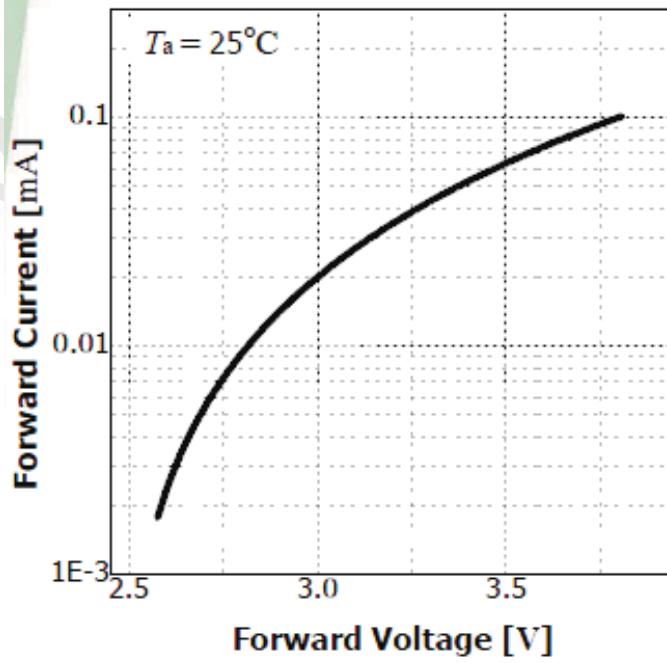


## Product Specification

## 3) Color Rank



Forward Current vs. Forward Voltage





## Product Specification

## 3.8. Timing Characteristics

## 3.8.1. MIPI DSI Characteristics

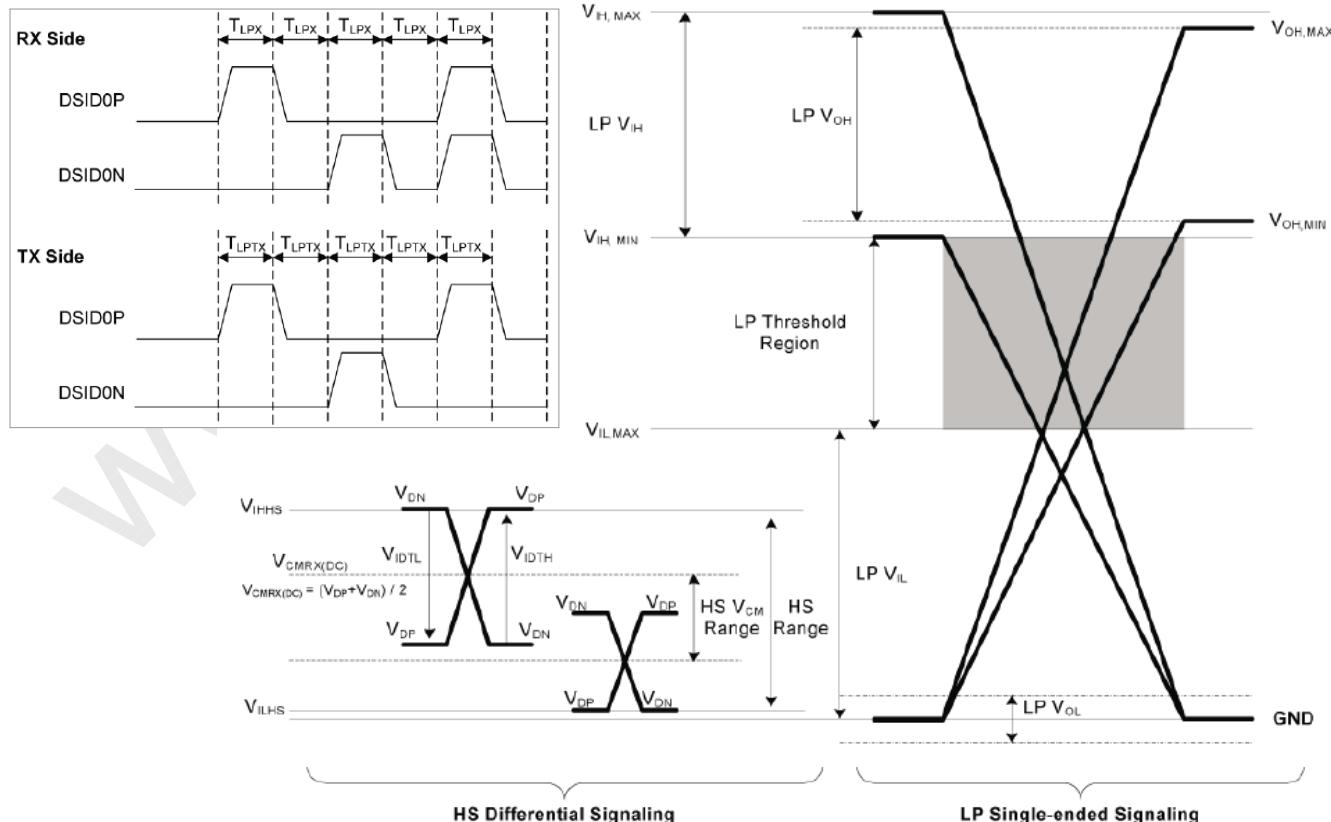
Item		Symbol	Unit	Min.	Typ.	Max.	Note
HS-RX	Differential input high threshold	VIDTH	mV	-	-	70	3
	Differential input low threshold	VIDTL	mV	-70	-	-	3
	Single-ended input low voltage	VILHS	mV	-40	-	-	
	Single-ended input high voltage	VIHHS	mV	-	-	460	
	Common-mode voltage HS receive mode	VCMRX(DC)	mV	70	-	330	1
	Differential input impedance	ZID	Ω	-	100	-	2
LP-RX	Logic 0 input voltage not in ULP State	VIL	mV	-50	-	550	
	Logic 1 input voltage	VIH	mV	880	-	1350	
	I/O leakage current	ILEAK	μA	-10	-	10	
LP-TX	Thevenin output low level	VOL	mV	-50	-	50	
	Thevenin output high level	VOH	V	1.1	1.2	1.3	
	Output impedance of LP transmitter	ZOLP	Ω	110	-	-	2
CD-RX	Logic 0 contention threshold	VILCD	mV	-	-	200	
	Logic 1 contention threshold	VIHCD	mV	450	-	-	

Notes 1. VCMRX (DC) =  $(V_{DP} + V_{DN}) / 2$ 

Notes 2. Excluding COG resistance (contact resistance and ITO wiring resistance). The values are tentative

Notes 3. Minimum 110mV/-110mV HS differential swing is required for display data transfer

Fig. 3.8.1. Signaling and Contention Voltage Levels





## Product Specification

## 3.8.2. MIPI DSI HS-RX Clock and Data-Clock Specifications

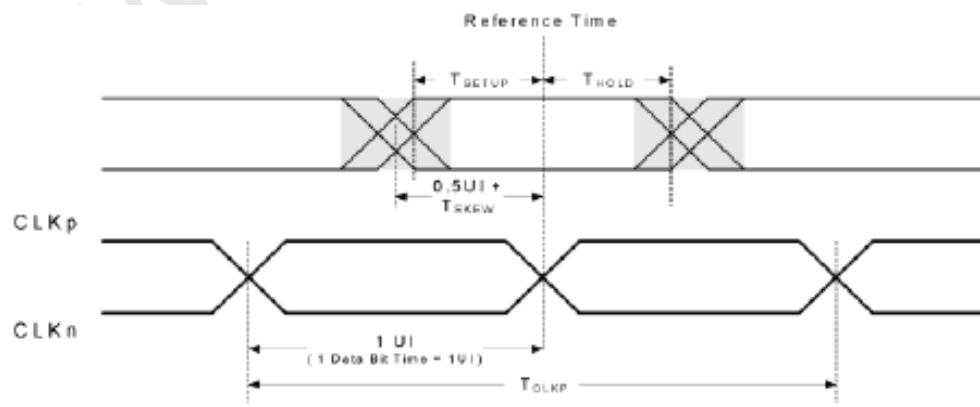
Item	Symbol	Unit	Min.	Typ.	Max.	Note
DSICLK Frequency	fDSICLK	MHz	100	-	450	4
DSICLK Cycle time	tCLKP	Ns	1.11	-	10	
DSI Data Transfer Rate	tDSIR	Mbps	200	-	900	4
Data to Clock Setup Time	tSETUP	UI	0.15	-	-	6
		Ns	0.15	-	-	5,6
Clock to Data Hold Time	tHOLD	UI	0.15	-	-	6
		ns	0.15	-	-	5,6

Notes 4. When fDSICLK<125MHz, change auto load NV setting so that it is compliant with THS-PREPARE+THS-ZERO spec.

Notes 5. Minimum tSETUP/tHOLD Time is 0.15UI. This value may change according to DSI transfer rate.

Notes 6. tSETUP/tHOLD Time are measured without HS-TX Jitter.

Fig. 3.8.2. AC Timing Waveform for HS Mode MIPI Operation





## Product Specification

## 3.8.3. MIPI DSI LP-RX/TX Clock and Data-Clock Specifications

Item	Symbol	Unit	Min.	Typ.	Max.	Note
Time to drive LP-00 to prepare for HS transmission	THS-PREPARE	ns	40ns + 4*UI	-	85ns + 6*UI	
THS-PREPARE + Time to drive HS-0 before the Sync sequence	THS-PREPARE + THS-ZERO	ns	145ms + 10*UI	-	-	
Time to drive flipped differential state after last payload data bit of a HS transmission burst	THS-TRAIL	ns	max (n*8*UI, 60ns + n*4*UI)	-	-	1,2
Time to drive LP-11 after HS burst	THS-EXIT	ns	100	-	-	
Time to drive LP-00 after Turnaround Request	TTA-GO			4*TLPTX		
Time-out before new TX side starts driving	TTA-SURE		1*TLPTX	-	2*TLPTX	
Time to drive LP-00 by new TX	TTA-GET			5*TLPTX		
Length of any Low-Power state period	TLPX	ns	50	-	-	
Ratio of TLPX(MASTER)/TLPX(SLAVE) between Master and Slave side	Ratio TLPX		2/3	-	3/2	
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	TCLK-POST	UI	60ns + 52UI	-	-	3
TCLK-PREPARE + time for lead HS-0 drive period before starting Clock	TCLK-PREPARE + TCLK-ZERO	ns	300	-	-	
Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	TCLK-PRE	UI	8	-	-	
Time to drive LP-00 to prepare for HS clock transmission	TCLK-PREPARE	ns	38	-	95	
Time to drive HS differential state after last payload clock bit of an HS transmission burst	TCLK-TRAIL	ns	60	-	-	
Time from start of THS-TRAIL period to start of LP-11 state	TEOT		-	-	105ns + n*12*UI	2
Length of Low-Power TX period in case of using DSI clock	TLPTX1	UI	-	32	-	4
Length of Low-Power TX period in case of using internal OSC clock	TLPTX2	ns	-	1/fosc	-	

Notes 1. If  $a > b$  then  $\max(a, b) = a$ , otherwise  $\max(a, b) = b$

Notes 2. Where  $n = 1$  for Forward-direction HS mode.

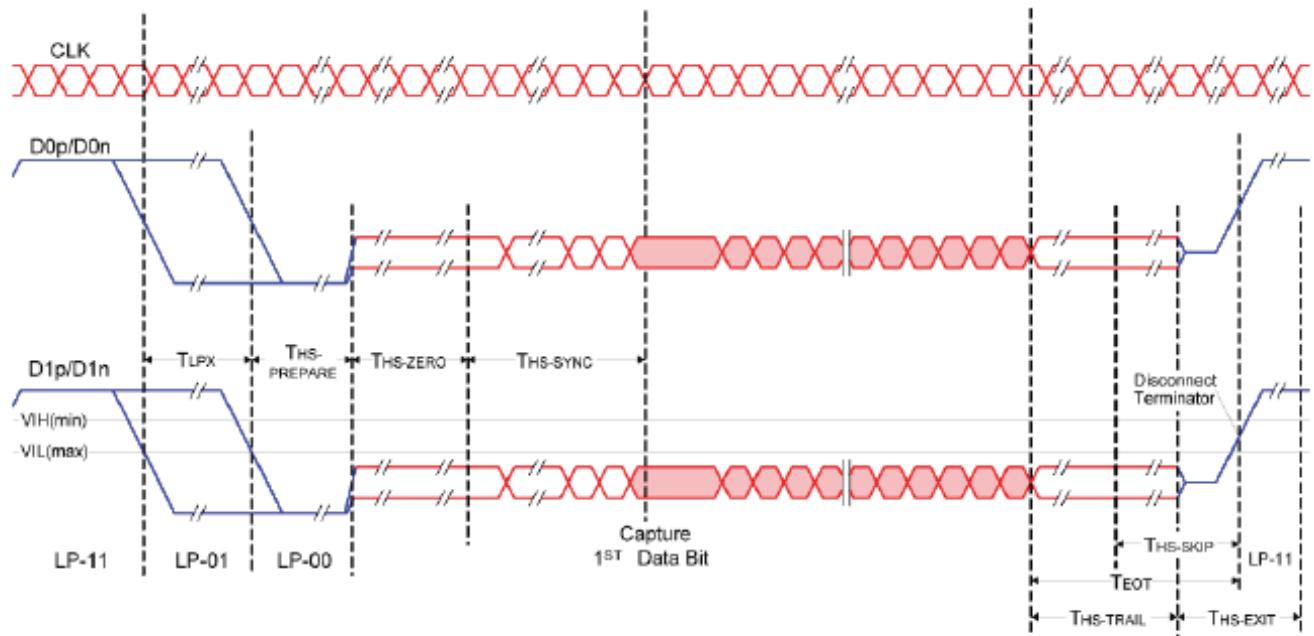
Notes 3. The R63311 can work with this specification although the end part of internal process is remained when Clock Lane enter LP-11 and the R63311 can work without the remained process if tCLK-POST is more than 256 UI.

Notes 4. The R63311 uses DSI clock from the Host processor if Clock Lane is active, and internal oscillator clock if Clock Lane is disabled. Here, "fosc" is the frequency of oscillator clock, typical 28 MHz.



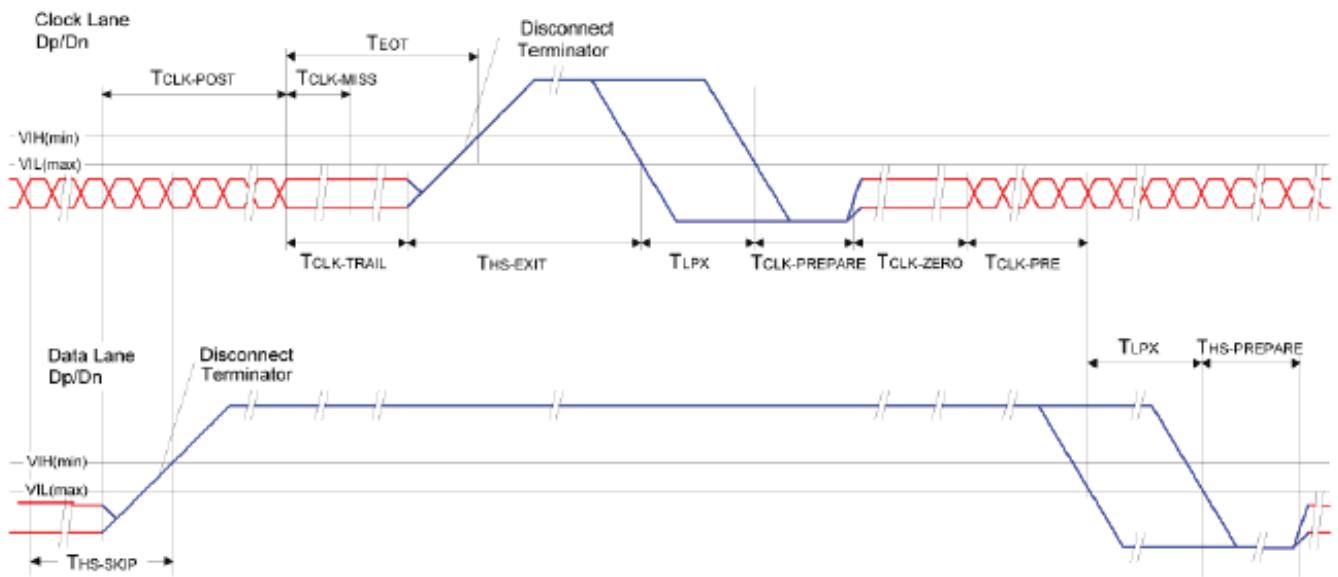
## Product Specification

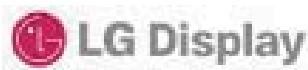
Fig. 3.8.3. HS Data Transmission in Bursts



Note: THS-SYNC: Proper match found for Sync sequence in HS stream, the following bits are payload data.

Fig. 3.8.3.1. Switching the Clock Lane between Clock Transmission and LP Mode





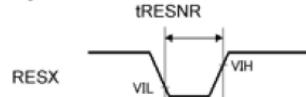
## Product Specification

## 3.8.4. Reset Characteristics

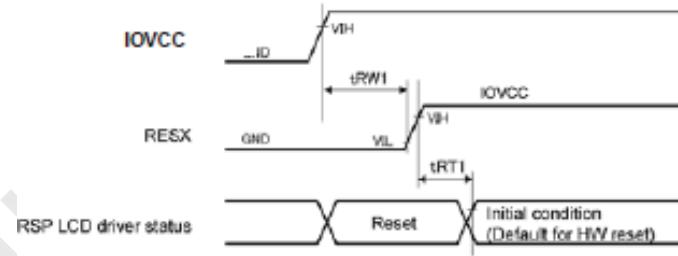
Item	Symbol	Test Condition	Unit	Min.	Typ.	Max.	Note
Reset low-level width1	tRW1	Power supply on	us	1000	-	-	
Reset low-level width1	tRW2	Operation	us	1000	-	-	
Reset time (Sleep IN)	tRT1	-	ms	-	-	3	
Reset time (Sleep OUT)	tRT2	-	ms	-	-	3	
Noise reject width	tRESNR	-	us	-	-	1	

Fig. 3.8.4. Reset operation

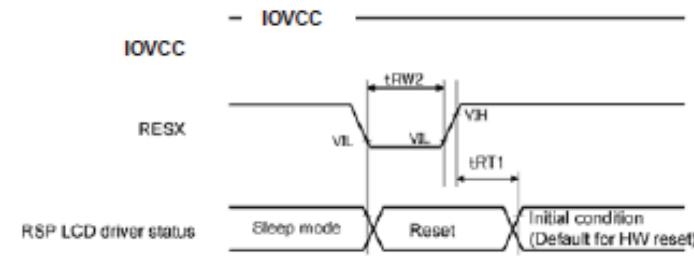
(1)Reset Reject



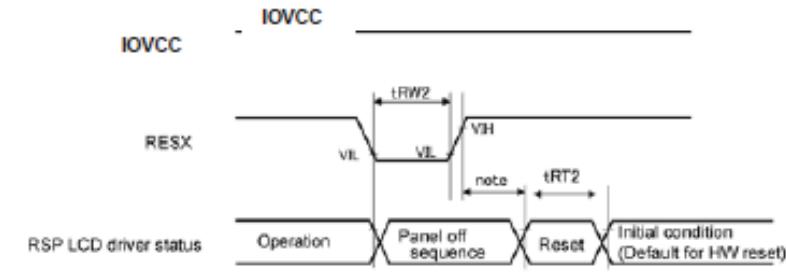
(2-a) Reset timing at power supply on



(2-b) Reset timing during operation (sleep in)

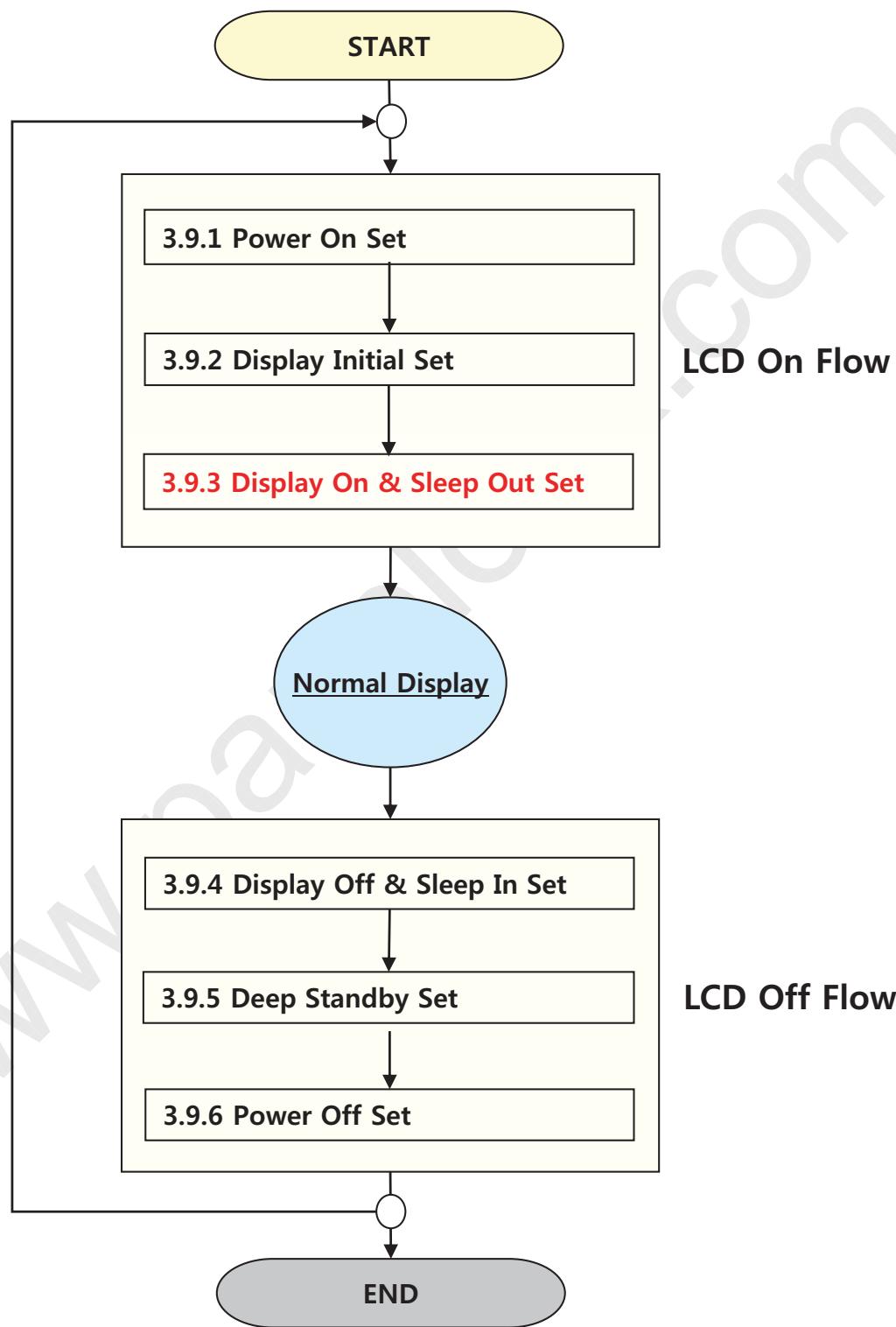


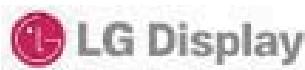
(2-c) Reset timing during operation (sleep out)



## Product Specification

## 3.9. Operation Flow Chart



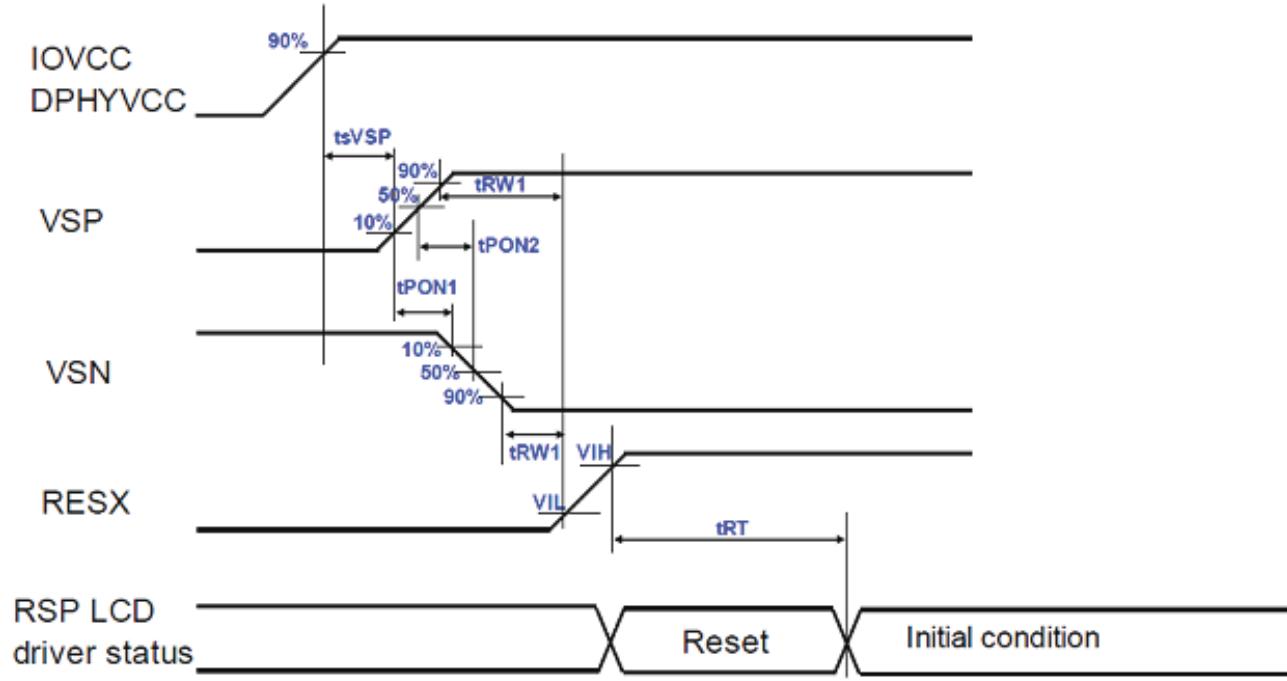


## Product Specification

Table 3.9.1. Power On Set

Step	REGISTER FUNCTION	INDEX/DATA	HEX
1		/RES = LOW	
2		Power (IOVCC, VSP, VSN) ON IOVCC → 20ms or more → VSP / VSN simultaneously ON	
3		20ms or more	
4		/RES = LOW	
5		10ms or more	
6		/RES = HIGH	
7		10ms or more	

Fig. 3.9.1 Power on sequence &amp; Timing



Item	Symbol	Unit	Test Condition	Min	Max
VSP-VSN delay time(10% to 10%)	t <sub>PON1</sub>	us	Power On	0	—
VSP-VSN delay time(50% to 50%)	t <sub>PON2</sub>	us	Power On	0	—
System power on to VSP ON time	t <sub>sVSP</sub>	ms	Power On	1	—
Reset low-level width1	t <sub>RW1</sub>	ms	Power On	1	—
Reset time(Sleep IN)	t <sub>RT</sub>	ms	Power On	3	—



## Product Specification

Table 3.9.2. Display Initial Set

Step	REGISTER FUNCTION	INDEX/DATA	HEX
1	<b>Manufacturer Command Access Protect</b>	INDEX	0xB0
		DATA	0x04
2	<b>nop Command</b>	INDEX	0x00
3	<b>nop Command</b>	INDEX	0x00
4	<b>Interface Setting</b>	INDEX	0xB3
		DATA	0x14 0x00 0x00 0x00 0x00
			0x00
5	<b>DSI Control (MIPI Speed)</b>	INDEX	0xB6
		DATA	0x3A 0xD3
6	<b>Display Setting1</b>	INDEX	0xC1
		DATA	0x84 0x60 0x50 0xEB 0xFF
			0x6F 0xCE 0xFF 0xFF 0x0F
			0x01 0x58 0x73 0xAE 0x31
			0x20 0xC6 0xFF 0xFF 0x1F
			0xF3 0xFF 0x5F 0x10 0x10
			0x10 0x10 0x00 0x00 0x00
			0x22 0x02 0x02 0x00
7	<b>Display Setting2</b>	INDEX	0xC2
		DATA	0x32 0xF7 0x80 0x0A 0x08
			0x00 0x00
8	<b>Touch Panel Sync Function (VSYNC Enable)</b>	INDEX	0xC3
		DATA	0x01 0x00 0x00



## Product Specification

Table 3.9.2. *continued*

Step	REGISTER FUNCTION	INDEX/DATA	HEX
9	<b>Source Timing Setting</b>	INDEX	0xC4
		DATA	0x70 0x00 0x00 0x00 0x07
			0x03 0x03 0x07 0x07 0x0C
			0x06 0x00 0x00 0x00 0x00
			0x07 0x03 0x03 0x07 0x07
			0x0C 0x06
10	<b>LTPS Timing Setting</b>	INDEX	0xC6
		DATA	0x00 0x69 0x00 0x69 0x00
			0x69 0x00 0x00 0x00 0x00
			0x00 0x69 0x00 0x69 0x00
			0x69 0x10 0x19 0x07 0x00
			0x01 0x00 0x69 0x00 0x69
			0x00 0x69 0x00 0x00 0x00
			0x00 0x00 0x69 0x00 0x69
			0x00 0x69 0x10 0x19 0x07
11	<b>Gamma Setting A set</b>	INDEX	0xC7
		DATA	0x00 0x09 0x14 0x23 0x30
			0x48 0x3D 0x52 0x5F 0x67
			0x6B 0x70 0x00 0x09 0x14
			0x23 0x30 0x48 0x3D 0x52
			0x5F 0x67 0x6B 0x70
12	<b>Gamma Setting B set</b>	INDEX	0xC8
		DATA	0x00 0x09 0x14 0x23 0x30
			0x48 0x3D 0x52 0x5F 0x67
			0x6B 0x70 0x00 0x09 0x14
			0x23 0x30 0x48 0x3D 0x52
			0x5F 0x67 0x6B 0x70



## Product Specification

Table 3.9.2. *continued*

Step	REGISTER FUNCTION	INDEX/DATA	HEX
13	<b>Gamma Setting C set</b>	INDEX	<b>0xC9</b>
		DATA	0x00 0x09 0x14 0x23 0x30
			0x48 0x3D 0x52 0x5F 0x67
			0x6B 0x70 0x00 0x09 0x14
			0x23 0x30 0x48 0x3D 0x52
			0x5F 0x67 0x6B 0x70
17	<b>Panel PIN Control</b>	INDEX	<b>0xCB</b>
		DATA	0x31 0xFC 0x3F 0x8C 0x00
			0x00 0x00 0x00 0xC0
14	<b>Panel Interface Control</b>	INDEX	<b>0xCC</b>
		DATA	0X09
15	<b>Power Setting (Charge Pump Setting)</b>	INDEX	<b>0xD0</b>
		DATA	0x00 0x00 0x19 0x18 0x99
			0x99 0x19 0x01 0x89 0x00
			0x55 0x19 0x99 0x01
16	<b>Power Setting for Internal Power</b>	INDEX	<b>0xD3</b>
		DATA	0x1B 0x33 0xBB 0xCC 0xC4
			0x33 0x33 0x33 0x00 0x01
			0x00 0xA0 0xD8 0xA0 0x0D
			0x39 0x33 0x44 0x22 0x70
			0x02 0x39 0x03 0x3D 0xBF
			0x00
17	<b>Vcom Setting</b>	INDEX	<b>0xD5</b>
		DATA	0x06 0x00 0x00 0x01 0x2C
			0x01 0x2C
18	<b>Vcom Setting (send 2 times)</b>	INDEX	<b>0xD5</b>
		DATA	0x06 0x00 0x00 0x01 0x2C
			0x01 0x2C
19	<b>If Customer want to set other things, add Index/Data in here.</b>		



## Product Specification

Table 3.9.3. Sleep Out &amp; Display On Set

Step	REGISTER FUNCTION	INDEX/DATA	HEX
1	Display On	INDEX	0x29
2	Sleep Out	INDEX	0x11
3	MIPI Video Pixel Stream ON		
4	6 Frames or more		
5	Image Display		

Table 3.9.4. Display Off &amp; Sleep In Set

Step	REGISTER FUNCTION	INDEX/DATA	HEX
1	Vcom Setting	INDEX	0xD5
		DATA	0x06 0x00 0x00 0x00 0x48
			0x00 0x48
2	Vcom Setting (send 2 times)	INDEX	0xD5
		DATA	0x06 0x00 0x00 0x00 0x48
			0x00 0x48
3	1 Frames or more		
4	Display Off	INDEX	0x28
5	20ms or more		
6	Sleep In	INDEX	0x10
7	100ms or more		

Table 3.9.5. Deep Standby Set

Step	REGISTER FUNCTION	INDEX/DATA	HEX
1	Deep Standby Mode In	INDEX	0xB1
		DATA	0x01
2	40ms or more		

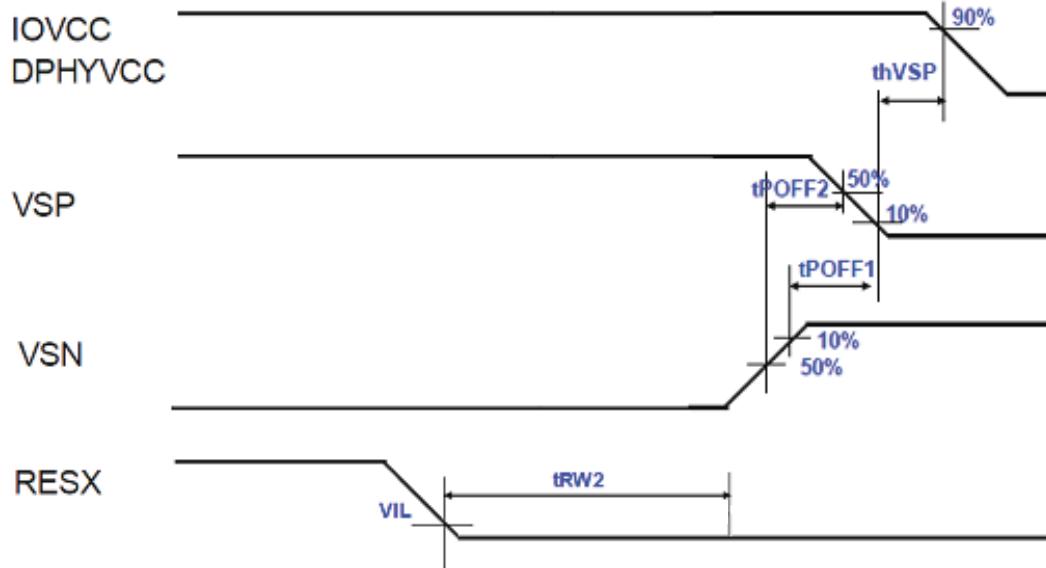


## Product Specification

Table 3.9.6. Power Off Set

Step	REGISTER FUNCTION	INDEX/DATA	HEX
1	<b>MIPI Video Pixel Stream OFF</b>		
2	/RES = LOW		
3	10ms or more		
4	Power (VSN, VSP, IOVCC) Off VSN / VSP simultaneously Off → 20ms or more → IOVCC Off		

Fig. 3.9.6 Power off sequence &amp; Timing



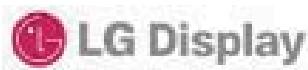
Item	Symbol	Unit	Test Condition	Min	Max
Reset low-level width2	$t_{RW2}$	ms	Power Off	1	-
VSN-VSP delay time(10% to 10%)	$t_{POFF1}$	us	Power Off	0	-
VSN-VSP delay time(50% to 50%)	$t_{POFF2}$	us	Power Off	0	-
VSP OFF to system power off time	$thVSP$	us	Power Off	0	-



## Product Specification

Table 3.9.7. DCS Data Type List

DCS Command/Parameter		W/R	Host to RSP LCD driver Data Type (RX)								Other	
			Data Type	05'h	15'h	39'h	13'h	23'h	29'h	14'h		
		Packet	Short	Short	Long	Short	Short	Long	Short	Short	Short	
DCS Command/Parameter	DCS para	DCS para	DCS no para	DCS 1 para	DCS	Generic 1 para	Generic 2 para	Generic -	Generic 1 para	Generic 2 para	DCS no para	
		00h	nop	C	Yes	No	Yes	No	No	No	No	-
		01h	soft_reset	C	Yes	No	Yes	No	No	No	No	-
		04h	read_DDB_start	16	No	No	No	No	No	No	No	Yes 16'h10
		05h	read_Number_of_the_Errorson_DSI	1	No	No	No	No	No	No	No	Yes 16'h1
		06h	get_red_channel	1	No	No	No	No	No	No	No	Yes
		07h	get_green_channel	1	No	No	No	No	No	No	No	Yes
		08h	get_blue_channel	1	No	No	No	No	No	No	No	Yes
		0Ah	get_power_mode	1	No	No	No	No	No	No	No	Yes 16'h1
		0Bh	get_address_mode	1	No	No	No	No	No	No	No	Yes 16'h1
		0Ch	get_pixel_format	1	No	No	No	No	No	No	No	Yes 16'h1
		0Dh	get_display_mode	1	No	No	No	No	No	No	No	Yes 16'h1
		0Eh	get_signal_mode	1	No	No	No	No	No	No	No	Yes 16'h1
		0Fh	get_diagnostic_result	1	No	No	No	No	No	No	No	Yes 16'h1
		10h	enter_sleep_mode	C	Yes	No	Yes	No	No	No	No	-
		11h	exit_sleep_mode	C	Yes	No	Yes	No	No	No	No	-
		20h	exit_invert_mode	C	YES	NO	YES	No	No	No	No	-
		21h	enter_invert_mode	C	YES	NO	YES	No	No	No	No	-
		26h	set_gamma_curve	1	No	Yes	Yes	No	No	No	No	-
		28h	set_display_off	C	Yes	No	Yes	No	No	No	No	-
		29h	set_display_on	C	Yes	No	Yes	No	No	No	No	-



## Product Specification

Table 3.9.7. *continued*

		Host to RSP LCD driver Data Type (RX)									
DCS Command/Parameter		W/R	Write Type						Read Type		Other
		Data Type	05'h	15'h	39'h	13'h	23'h	29'h	14'h	24'h	06'h
		Packet	Short	Short	Long	Short	Short	Long	Short	Short	Short
		DCS para	DCS no para	DCS 1 para	DCS	Generic 1 para	Generic 2 para	-	Generic 1 para	Generic 2 para	DCS no para
34h	set_tear_off	C	Yes	No	Yes	No	No	No	No	No	-
35h	set_tear_on	1	No	Yes	Yes	No	No	No	No	No	-
36h	set_address_mode	1	No	Yes	Yes	No	No	No	No	No	-
3Ah	set_pixel_format	1	No	Yes	Yes	No	No	No	No	No	-
44h	set_tear_scanline	2	No	Yes	Yes	No	No	No	No	No	-
51h	write_display_brightness	2	No	Yes	Yes	No	No	No	No	No	-
52h	read_display_brightness - value	2	No	No	No	No	No	No	No	Yes	16'h1
55h	write_content_adaptive_brightness_control	1	No	Yes	Yes	No	No	No	No	No	-
56h	read_content_adaptive_brightness_control	1	No	No	No	No	No	No	No	Yes	16'h1
5Eh	write_CABC_minimum_brightness	2	No	Yes	Yes	No	No	No	No	No	-
5Fh	read_CABC_minimum_brightness	2	No	No	No	No	No	No	No	Yes	16'h1
68h	read_automatic_brightness_control_self-diagnostic_result	1	No	No	No	No	No	No	No	No	16'h1
A1h	read_DDB_start (Note1)	16	No	No	No	No	No	No	No	Yes	16'h10
A8h	read_DDB_continue (Note1)	N	No	No	No	No	No	No	No	Yes	16'h10
DAh	Read ID1	1	No	No	No	No	No	No	No	Yes	-
DBh	Read ID2	1	No	No	No	No	No	No	No	Yes	-
DCh	Read ID3	1	No	No	No	No	No	No	No	Yes	-

Note. When each data type packet is sent, it is necessary to write all parameters of each DCS and MCS.

Note 1. maximum return packet size  $\geq 2$



## Product Specification

Table 3.9.8. MCS Data Type List

		Host to RSP LCD driver Data Type (RX)									
MCS Command/Parameter	W/R	Write Type						Read Type			Other
	Data Type	05'h	15'h	39'h	13'h	23'h	29'h	14'h	24'h	06'h	37'h
	Packet	Short	Short	Long	Short	Short	Long	Short	Short	Short	Short
	MCS para	DCS no para	DCS 1 para	DCS	Generic 1 para	Generic 2 para	Generic -	Generic 1 para	Generic 2 para	DCS no para	Set max. return packet size
MCS Read only command	1	No	No	No	No	No	No	Yes	No	No	16'h1
MCS write/read command	1	No	No	No	No	Yes	Yes	Yes	No	No	16'h1
MCS write/read command	1 < n	No	No	No	No	No	Yes	Yes	No	No	16'hn

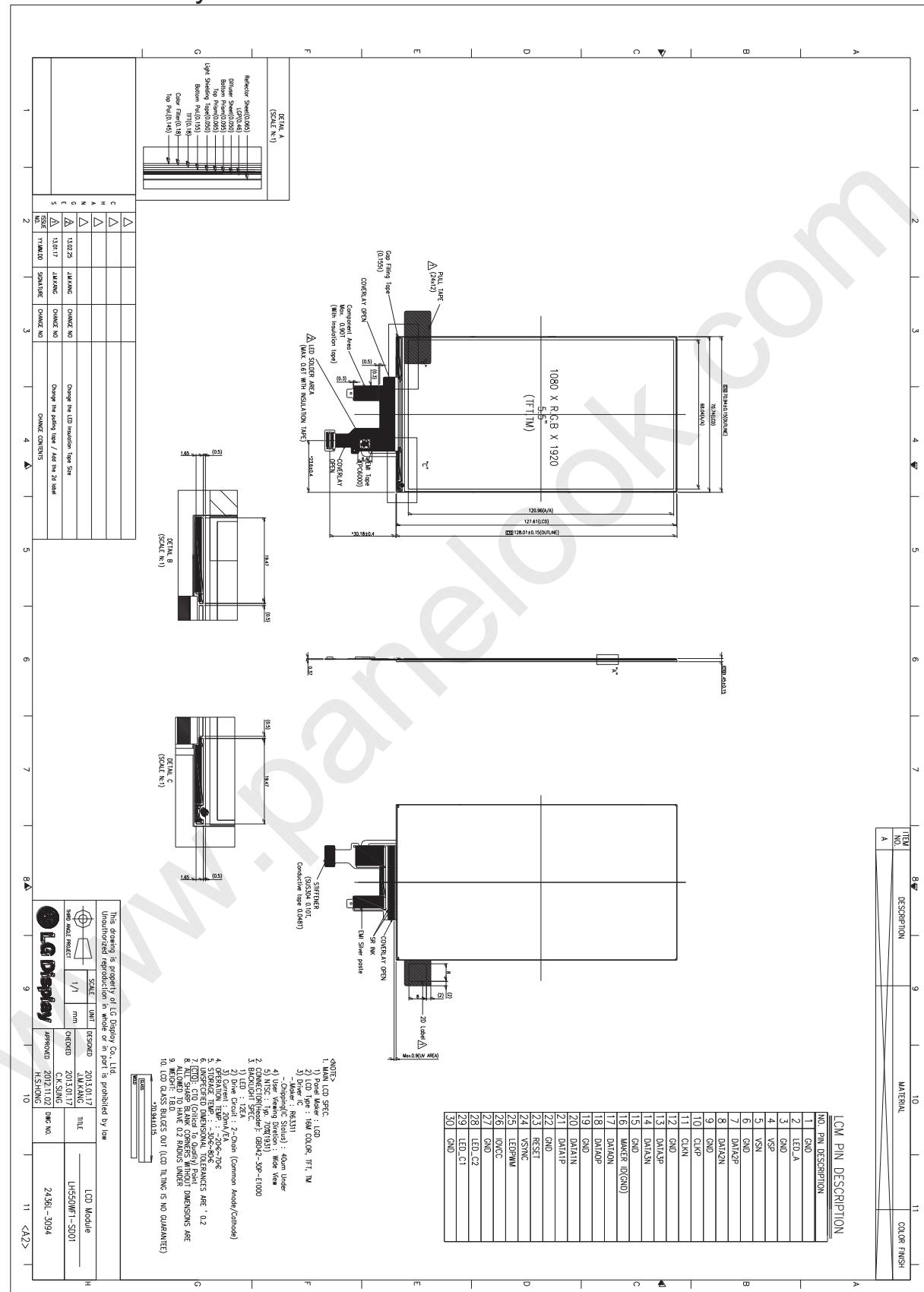
Note. When each data type packet is sent, it is necessary to write all parameters of each DCS and MCS.



## Product Specification

## 4. Mechanical Drawing

## 4.1 Module Layout

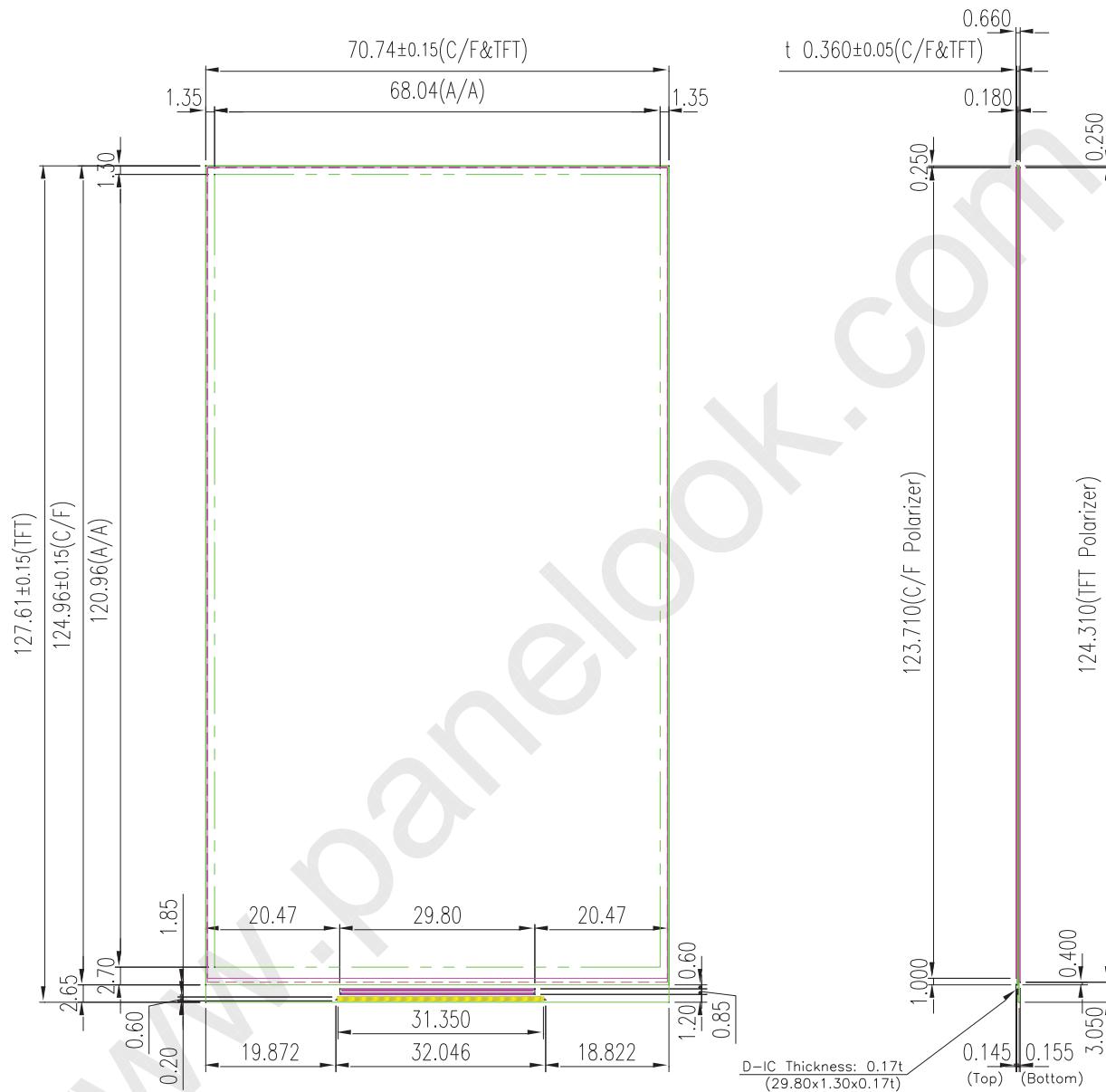


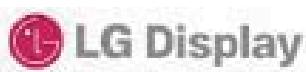


## Product Specification

## 4.2. Panel Layout

## 4.2.1 Main Panel

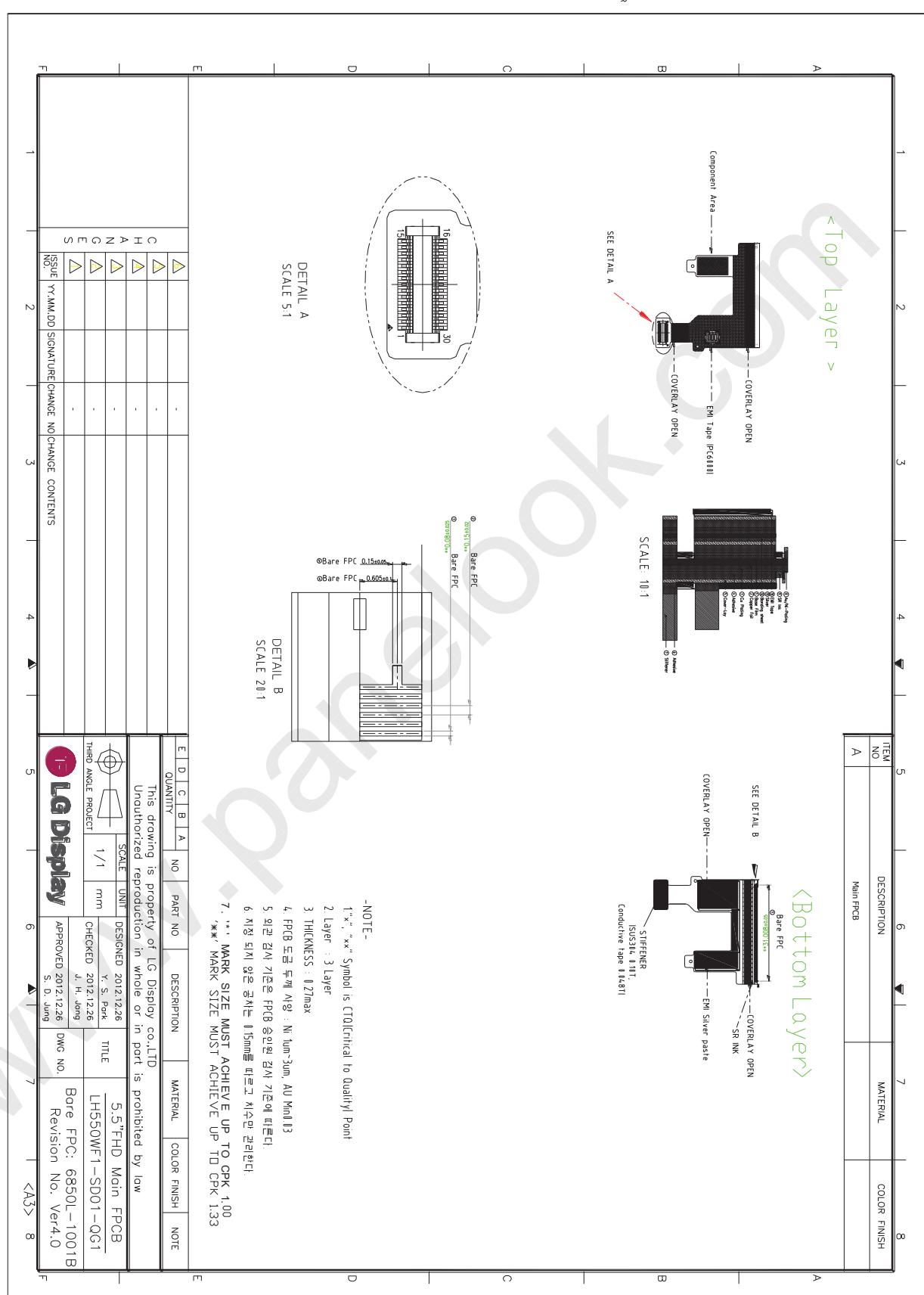




LH550WF1-SD01  
Liquid Crystal Display

## Product Specification

### 4.3. FPCB Layout

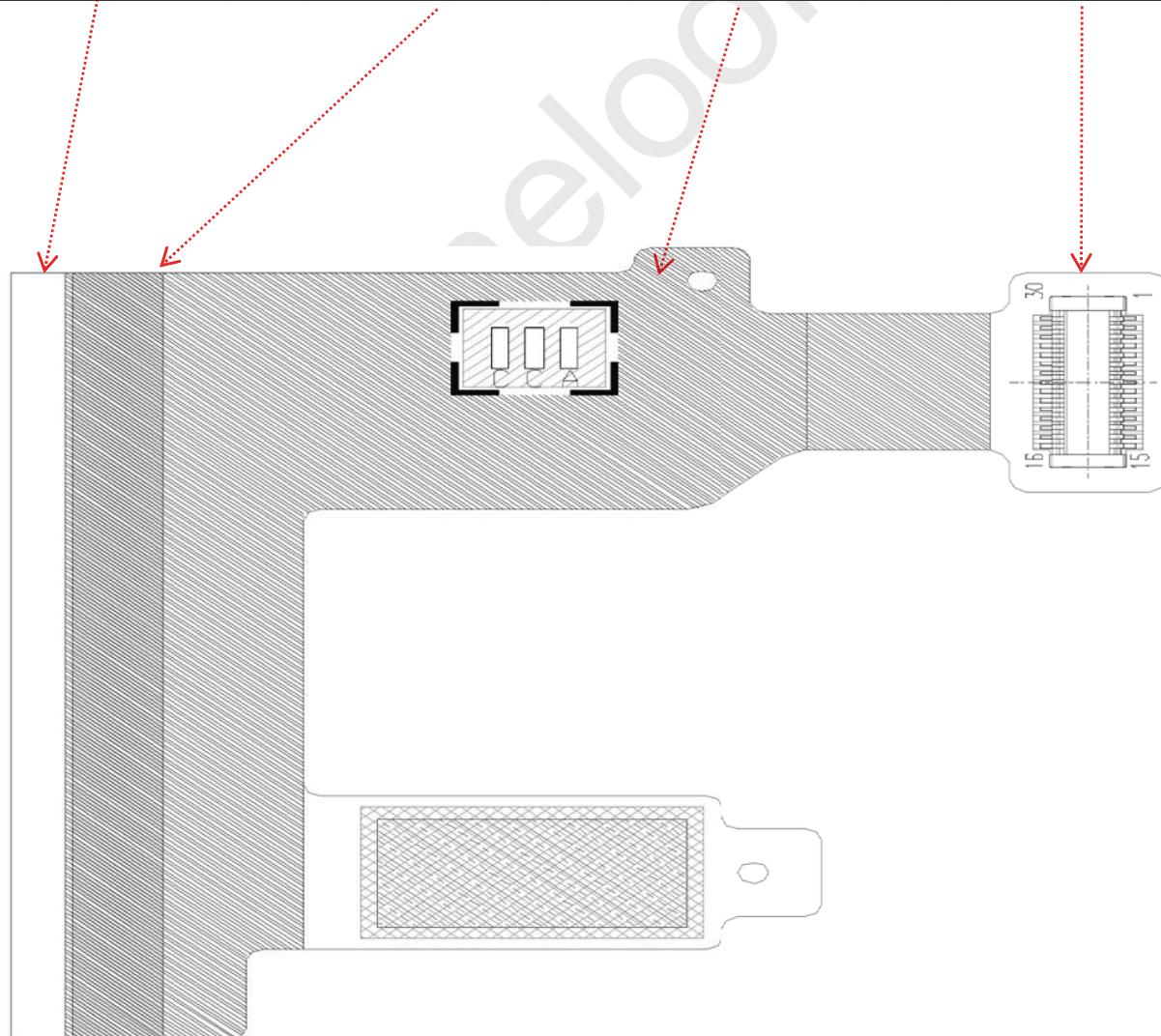




## Product Specification

## 4.3. FPCB Layout

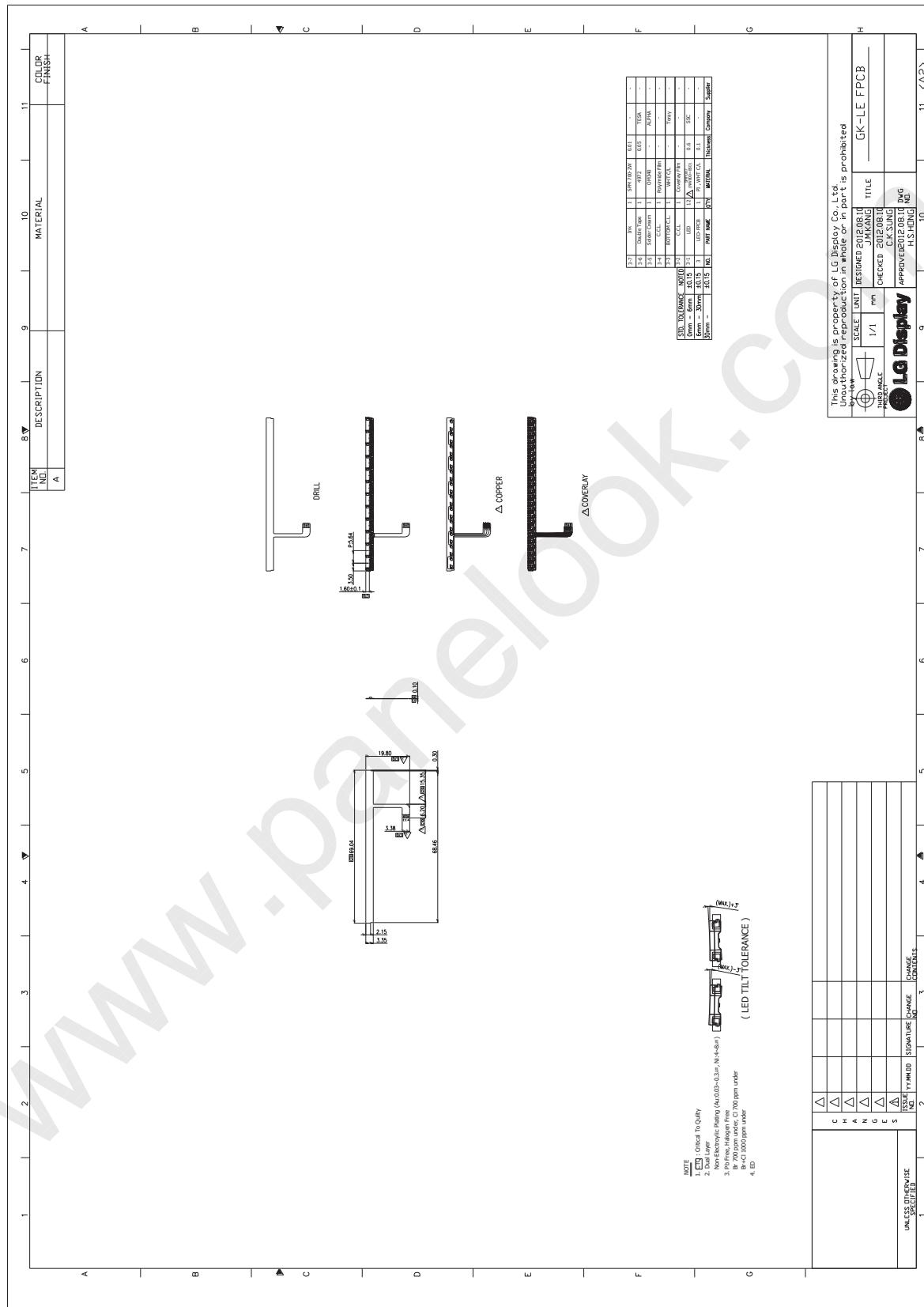
SPECIFICATION	두께	SPECIFICATION	두께	SPECIFICATION	두께	SPECIFICATION	두께			
		PC6000	19	μm		PC6000	19	μm		
COVERLAY	12.5	μm			COVERLAY	12.5	μm	COVERLAY	12.5	μm
ADHESIVE	25	μm			ADHESIVE	25	μm	ADHESIVE	25	μm
				COPPER PLATE	12	μm	COPPER PLATE	12	μm	
				BASE COPPER	12	μm	BASE COPPER	12	μm	
				BASE POLYIMIDE	20	μm	BASE POLYIMIDE	20	μm	
				BONDING SHEET	12.5	μm	BONDING SHEET	12.5	μm	
				COVERLAY	12.5	μm	COVERLAY	12.5	μm	
				ADHESIVE	15	μm	ADHESIVE	15	μm	
				BASE COPPER	12	μm	BASE COPPER	12	μm	
BASE POLYIMIDE	25	μm	BASE POLYIMIDE	25	μm	BASE POLYIMIDE	25	μm		
BASE COPPER	12	μm	BASE COPPER	12	μm	BASE COPPER	12	μm		
COPPER PLATE	12	μm	COPPER PLATE	12	μm	COPPER PLATE	12	μm		
				ADHESIVE	25	μm	ADHESIVE	25	μm	
				COVERLAY	12.5	μm	COVERLAY	12.5	μm	
		PI INK	20	μm	SILVER+OVER	20	μm			
							ADHESIVE	48	μm	
							SUS	100	μm	
이론치	76.5		이론치	88		이론치	259.5		이론치	368.5





## Product Specification

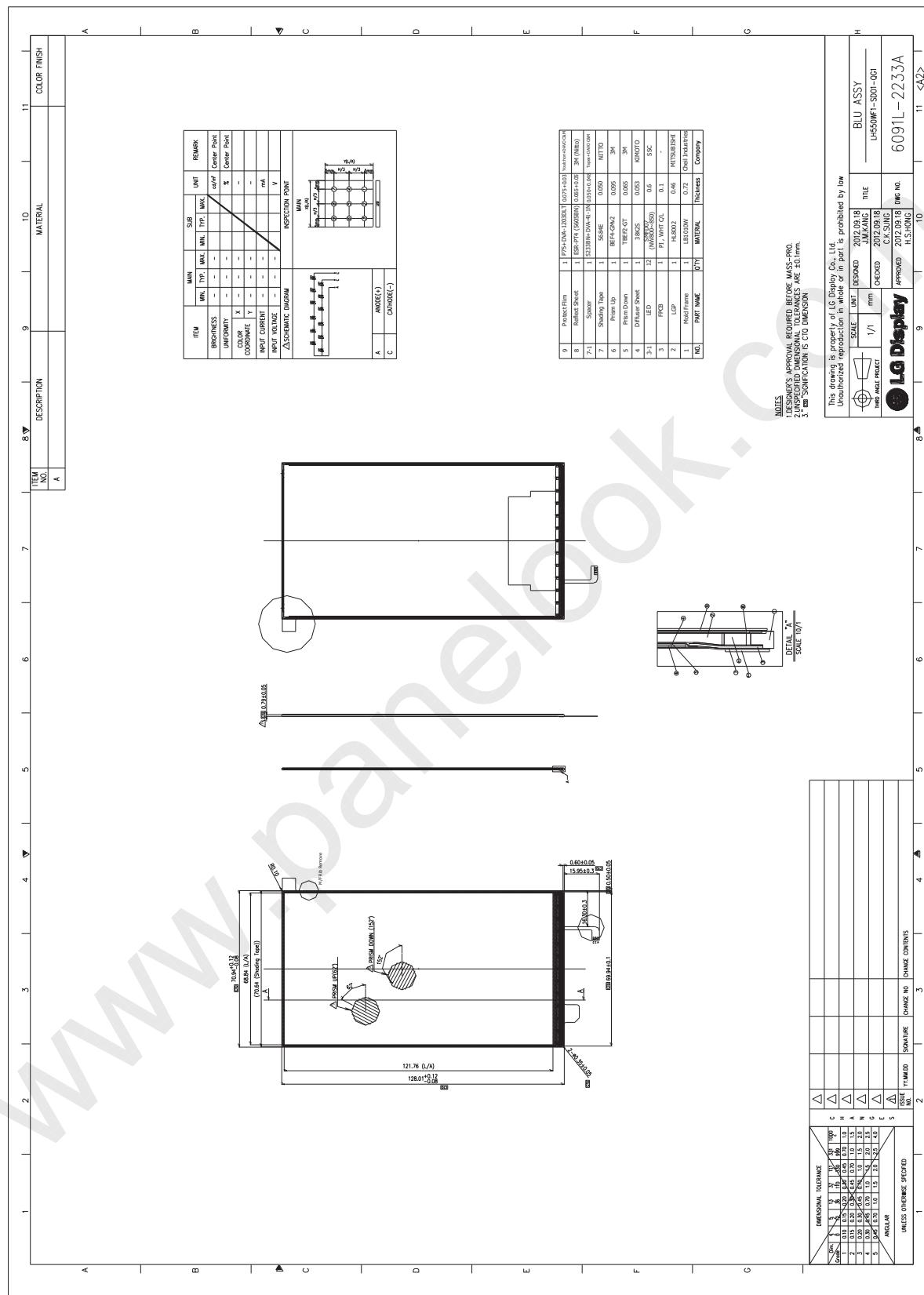
## 4.4. LED FPCB Layout




**LH550WF1-SD01**  
**Liquid Crystal Display**

## Product Specification

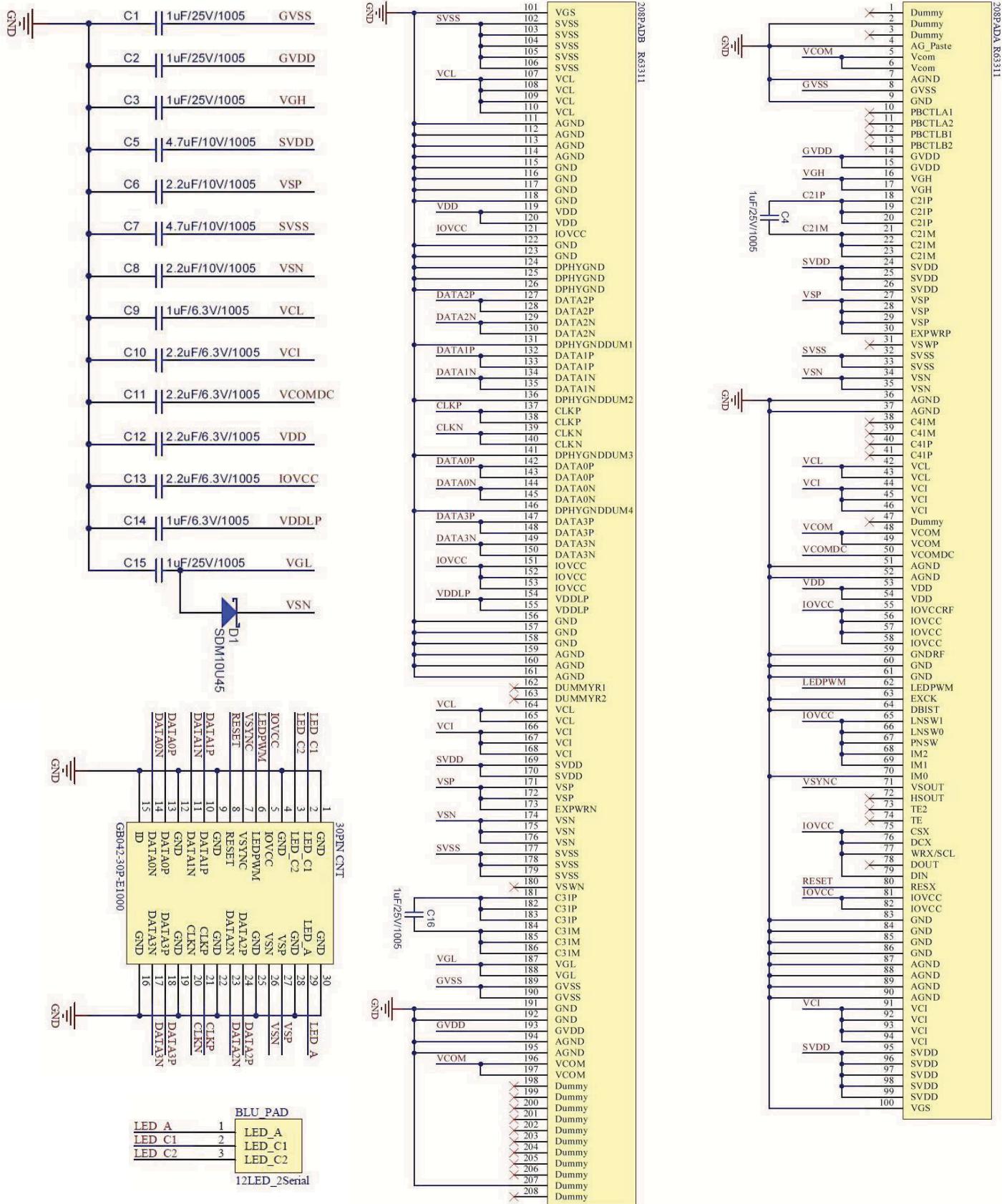
### 4.5. BLU Layout

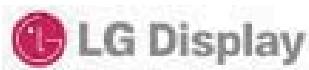




## Product Specification

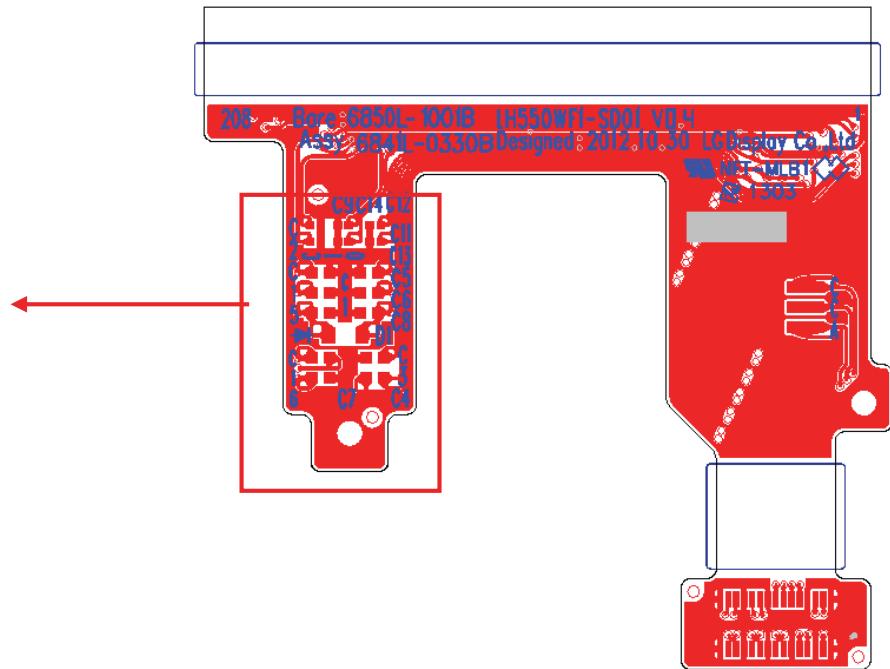
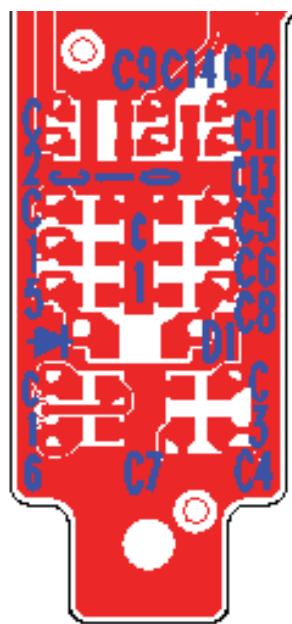
## 4.6. FPCB Schematic



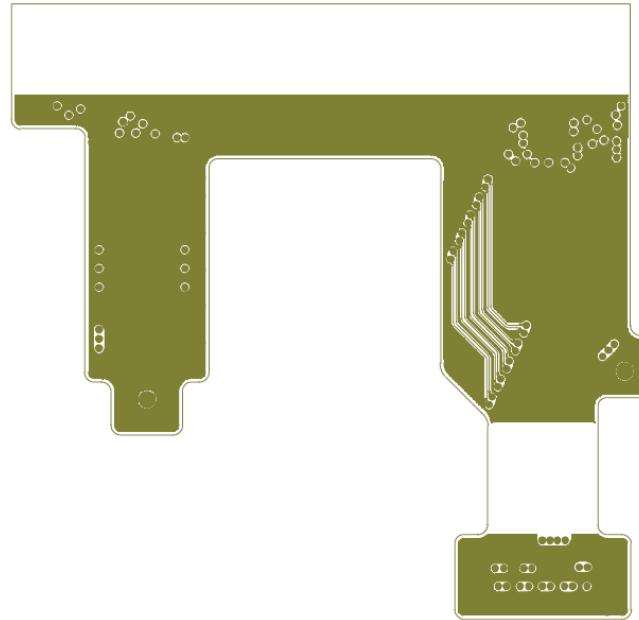


## Product Specification

## 4.7. Gerber Data



&lt; Top(1L) &gt;

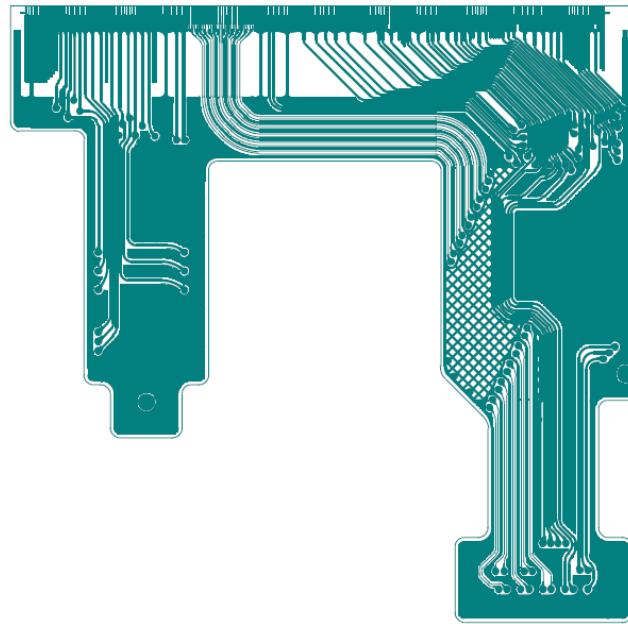


&lt; 2L &gt;

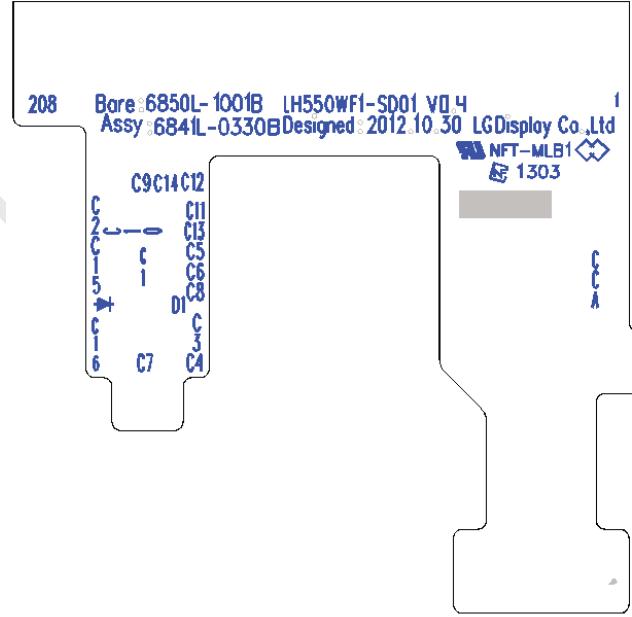
LH550WF1-SD01  
Liquid Crystal Display

## Product Specification

## 4.7. Gerber Data



&lt; Bottom(3L) &gt;

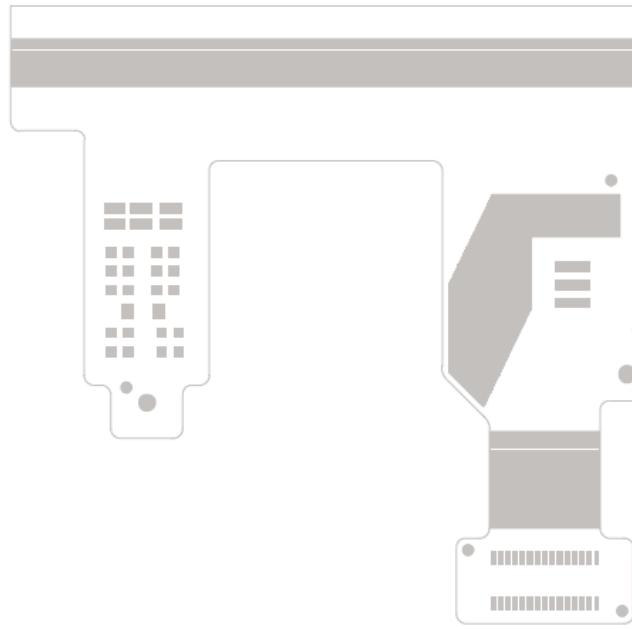


&lt; Top\_Silkscreen &gt;

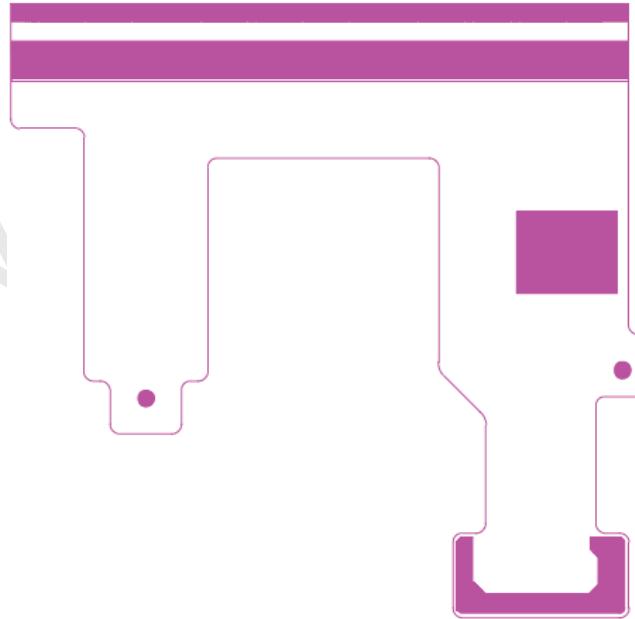
LH550WF1-SD01  
Liquid Crystal Display

## Product Specification

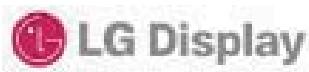
## 4.7. Gerber Data



&lt; Top\_Coverlay open &gt;

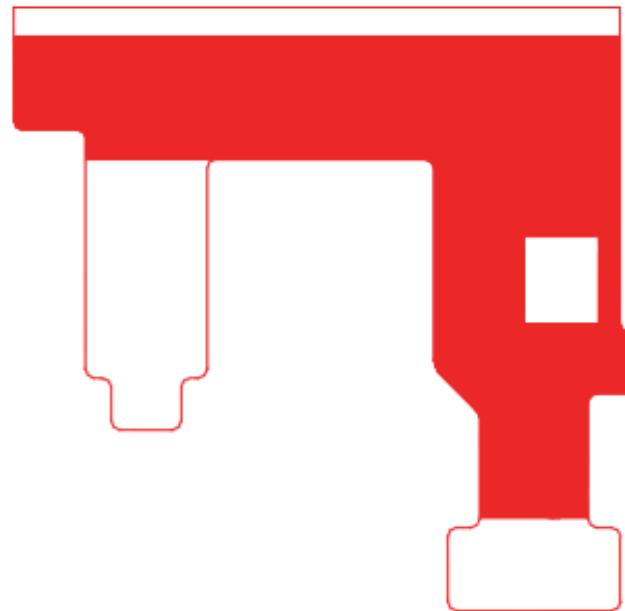


&lt; Bottom\_Coverlay open &gt;

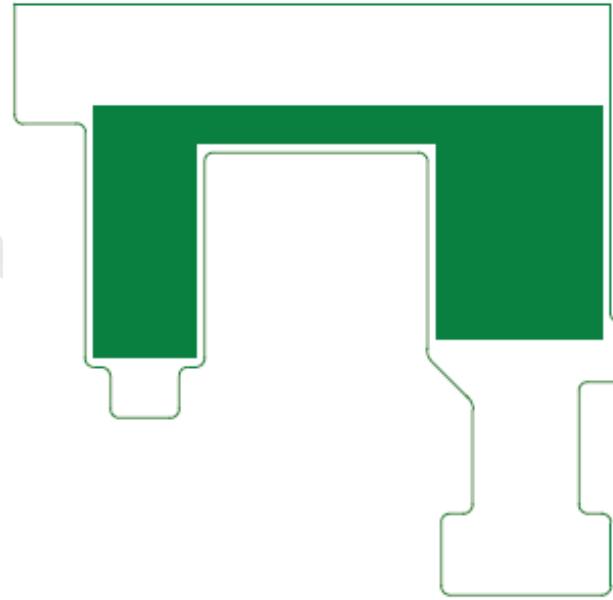
LH550WF1-SD01  
Liquid Crystal Display

## Product Specification

## 4.7. Gerber Data



&lt; Top\_PC6000 &gt;



&lt; Bottom \_ Silver Paste &gt;

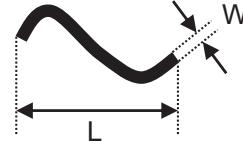
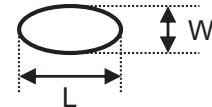


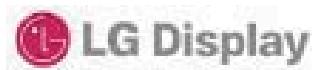
## Product Specification

## 5. Incoming Inspection Specification

## 5.1. Display Quality Specification

No	Defect	Criteria		Remark
1	No Display (Major)	Not allowed		
2	Missing Line (Major)	Not allowed		
3	Darker or Lighter Line (Major)	Not allowed		
4	Bright / Dark Point (Minor)	Spec.	Permissible Qty	If blue sub-pixel number is 1 or 2ea, it is OK.  But if 2ea in diameter 20mm, it is NG.
		Bright Point	0	
		Dark Point	2	
5	Round Type (Particle, bubble) (Minor)	Spec.	Permissible Qty	1: $\Phi = (L+W)/2$ , L=Length W=Width 2: Disregard if out of A/A
		$\Phi \leq 0.10\text{mm}$	Disregard	
		$0.10\text{mm} < \Phi \leq 0.15\text{mm}$	1	
		$0.15\text{mm} < \Phi$	0	
6	Line Type (Minor)	Spec.	Permissible Qty	1: L=Length, W=Width 2: Disregard if out of A/A
		$W \leq 0.03\text{mm}$	Disregard	
		$0.03\text{mm} < W \leq 0.05\text{mm}$ , $L \leq 2.0\text{mm}$	1	
		$W > 0.05\text{mm}$ or $L > 2.0\text{mm}$	0	

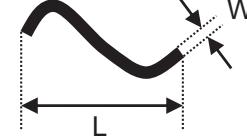
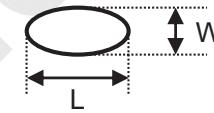


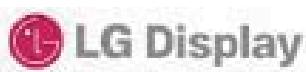


## Product Specification

## 5.2. Scratches, Dent and Extraneous Substances

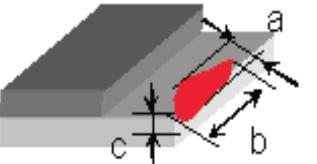
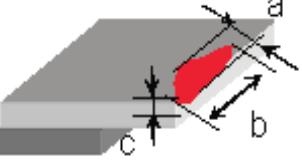
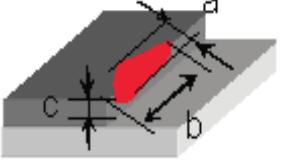
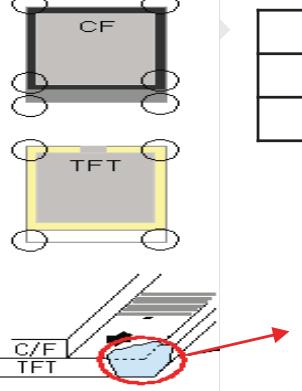
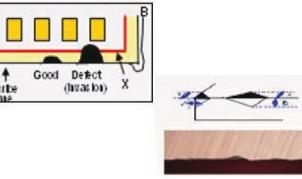
No	Defect	Criteria		Remark
1	Round Type (Minor)	Spec.	Permissible Qty	1: $\Phi = (L+W)/2$ , L=Length W=Width 2: Disregard if out of A/A 3: Disregard if can be removed by blowing
		$\Phi \leq 0.10\text{mm}$	Disregard	
		$0.10\text{mm} < \Phi \leq 0.15\text{mm}$	1	
		$0.15\text{mm} < \Phi$	0	
2	Line Type (Minor)	Spec.	Permissible Qty	1: L=Length, W=Width 2: Disregard if out of A/A
		$W \leq 0.03\text{mm}$	Disregard	
		$0.03\text{mm} < W \leq 0.05\text{mm}$ , $L \leq 1.0\text{mm}$	1	
		$W > 0.05\text{mm}$ or $L > 1.0\text{mm}$	0	
3	Polarizer Dent (Minor)	Spec.	Permissible Qty	1: $\Phi = (L+W)/2$ , L=Length W=Width 2: Disregard if out of A/A
		$\Phi \leq 0.10\text{mm}$	Disregard	
		$0.10\text{mm} < \Phi \leq 0.20\text{mm}$	1	
		$0.20\text{mm} < \Phi$	0	





## Product Specification

## 5.3 Chipping and Broken

No	Item	Criterion for Defects	Defect Type	Remark				
1	Glass Chipping [Pad Area]	 <p>Size [mm]</p> <table border="1"> <tr><td><math>a \leq 0.3</math></td></tr> <tr><td><math>b \leq 5.0</math></td></tr> <tr><td><math>c \leq t</math></td></tr> </table>	$a \leq 0.3$	$b \leq 5.0$	$c \leq t$	Minor		
$a \leq 0.3$								
$b \leq 5.0$								
$c \leq t$								
2	Glass Chipping [Rear of Pad Area]	 <p>Size [mm]</p> <table border="1"> <tr><td><math>a \leq 0.5</math></td></tr> <tr><td><math>b \leq 5.0</math></td></tr> <tr><td><math>c \leq t</math></td></tr> </table>	$a \leq 0.5$	$b \leq 5.0$	$c \leq t$	Minor		
$a \leq 0.5$								
$b \leq 5.0$								
$c \leq t$								
3	Glass Chipping [Except Pad Area]	 <p>Size [mm]</p> <table border="1"> <tr><td><math>a \leq 0.5</math></td></tr> <tr><td><math>b \leq 5.0</math></td></tr> <tr><td><math>c \leq t</math></td></tr> </table>	$a \leq 0.5$	$b \leq 5.0$	$c \leq t$	Minor		
$a \leq 0.5$								
$b \leq 5.0$								
$c \leq t$								
4	Glass Chipping [Corner]	 <p>Size [mm]</p> <table border="1"> <tr><td><math>a \leq 0.5</math></td></tr> <tr><td><math>b \leq 3.0</math></td></tr> </table> <p>Size [mm]</p> <table border="1"> <tr><td><math>a' \leq 3.0</math></td></tr> <tr><td><math>b' \leq 0.5</math></td></tr> </table>	$a \leq 0.5$	$b \leq 3.0$	$a' \leq 3.0$	$b' \leq 0.5$	Minor	
$a \leq 0.5$								
$b \leq 3.0$								
$a' \leq 3.0$								
$b' \leq 0.5$								
5	D-IC Chipping [Top/Back side]	 <p>Scribe Line 침범 없을것 (Red Line) <math>X, Y(\text{모서리}) \leq 50\mu\text{m}</math> <math>A, B(\text{중앙}) \leq 40\mu\text{m}</math></p>	Minor					



## Product Specification

## 6. Reliability

### 6.1 Environmental Reliability Tests

No	Test Item	Test Conditions	Quantity	Remark
1	고온동작 High Temperature Operation	70°C, 96 Hr	10	
2	저온동작 Low Temperature Operation	-20°C, 96 Hr	10	
3	고온고습동작 High Temperature and High Humidity Operation	60°C, 90% RH, 96 Hr	10	
4	고온저장 High Temperature Storage	80°C, 96Hr	10	
5	저온저장 Low Temperature Storage	-30°C, 96 Hr	10	
6	고온고습저장 High Temperature and High Humidity Storage	60°C, 90% RH, 96 Hr	10	
7	열충격 Thermal Shock	-30°C (30min) ~ 80°C (30min), 24 Cycle	5	
8	ESD Electrostatic Withstanding Voltage	HBM 기준 2KV, MM 기준 0.2KV * Human Body Model * Machine Model	2	Test Jig
9	포장 진동 Package Vibration Test	10~55Hz, 1.5mm, X/Y/Z 6시간	1	포장상태
10	포장 충격 Packing shock	76cm, 8corner , 6 face / Drop	1	Packing

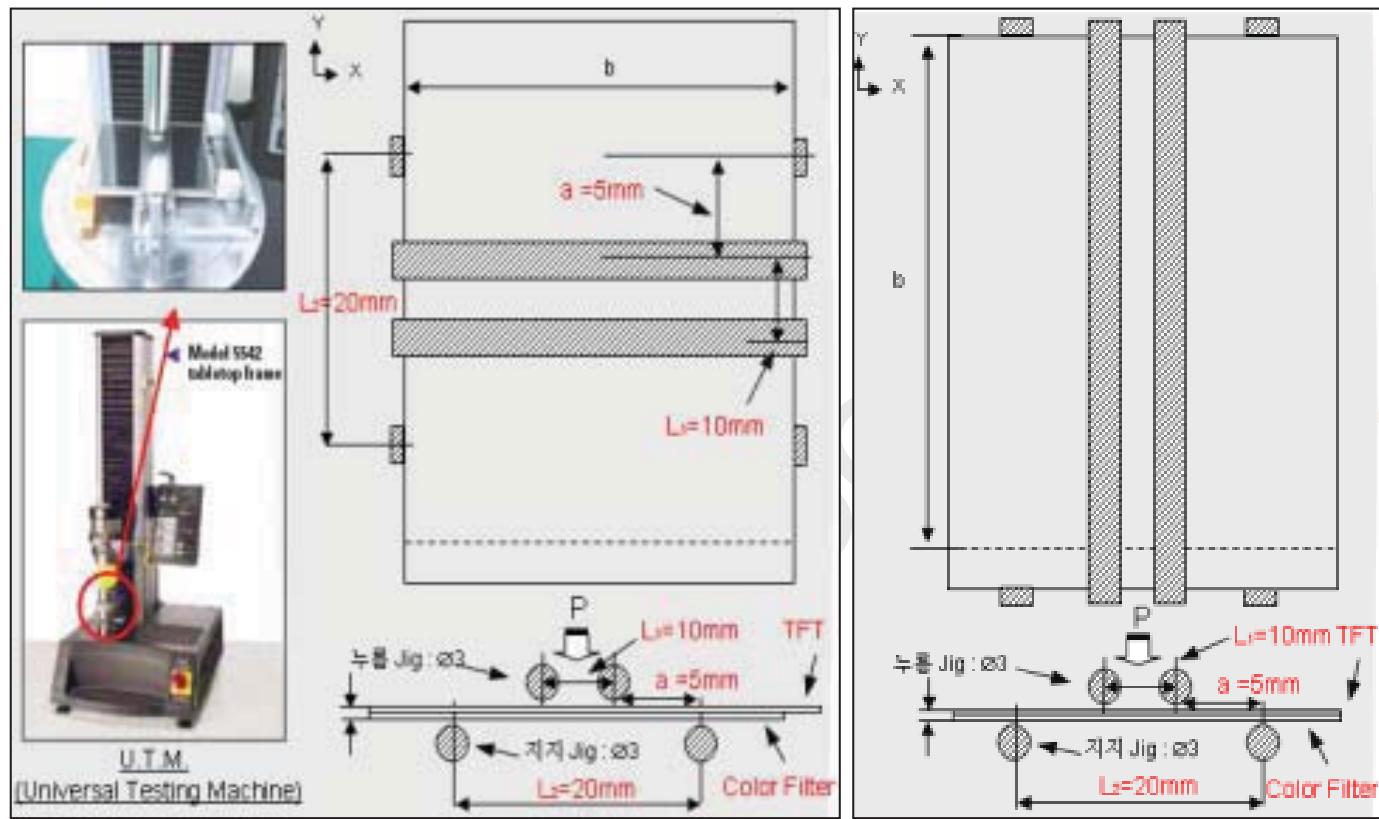
### 6.2 Fault Judgment Criteria

TFT-LCD Module should be at room temperature for 24 hours when the display quality test is over.  
 There should be no particular change which might affect the practical display function and the display quality test should be conducted under normal operating condition.

## Product Specification

## 6.2 Mechanical Reliability Tests

## 1) Panel 4 Point Bending



## ● Test Condition

1. Supporting Jig : Ø3, Loading Jig : Ø3
2. Jig Speed : 1mm/min
3. Test Point : X axis rear, Y axis rear
4. Jig length (L):
  - L1 : 10mm, L2 : 20mm

## ● Criteria (SPEC)

Item	3-Point Bending Test
Criteria	B10 (Weibull 10%)
Spec	B10 : X axis 90Mpa, Y axis 90Mpa
No. of Panel	24ea for each condition (48ea)

## Product Specification

## 2) Driver IC 3PB Test

## ● Test Condition

Test Method : 3 Point Bending Test

1. Supporting Jig : 3mm, Loading Jig : 3mm
2. Jig Speed : 1mm/min
3. Test Point : X axis, Y axis
4. Jig length (L) : 10mm
5. Jig Material : Steel (or Al)

## ● Criteria (SPEC)

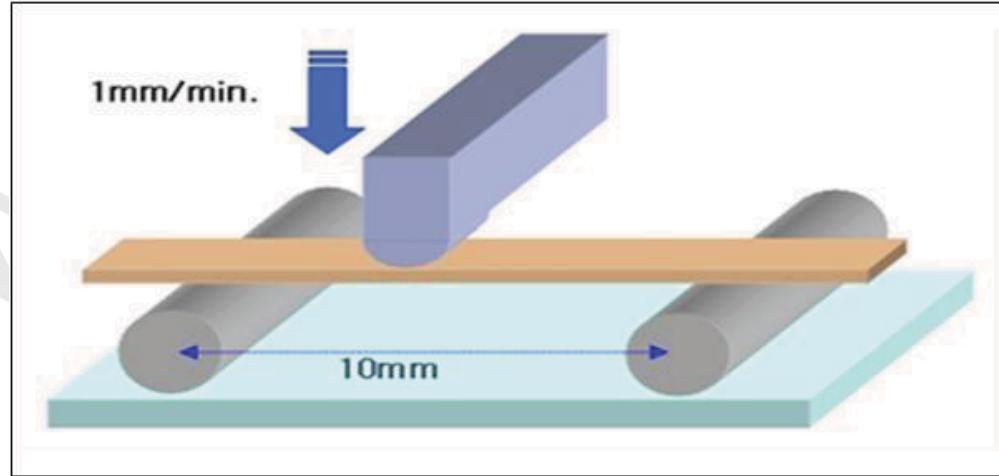
Item	3-Point Bending Test
Criteria	B10 (Weibull 10%)
Spec	B10 : Higher than 350Mpa
No. of IC	24ea

Formula for Stress :

$$\sigma = \frac{3 \cdot 9.8 \cdot P \cdot (L_2 - L_1)}{2 \cdot b \cdot h^2} \text{ (Mpa)}$$

( $\sigma$  : Flexural Stress)

b : item width (mm)  
 h : item thickness (mm)  
 L : Length between supports (mm)  
 P : Load (kgf)





## Product Specification

# 7. Precautions for Use

## 7.1. Safety

### 1) DISASSEMBLING OR MODIFICATION

Do not disassemble or modify the modules. Sensitive parts inside LCD module may be damaged, and dusts or scratches may mar the displays. LG Display does not warrant the modules, if customer disassembled or modified them.

### 2) BREAKAGE OF LCD PANEL

Do not Ingest liquid crystal material, Do not Inhale this material, and Do not Permit this material to contact the skin, if glass of LCD panel is broken. If liquid crystal material contacts the skin, mouth or clothing, take the following actions immediately.

In case contact to the eye or mouth, rinse with large amount of running water for more than 15 minutes. In case contact to the skin or clothing, wipe it off immediately and wash with soap and large amount of running water for more than 15 minutes. The skin or closing may be damaged if liquid crystal material is left adhered. In case ingestion, rinse out the mouth well with water. After spewing up by drinking large amount of water, get medical treatment.

### 3) GLASS OF LCD PANEL

Be careful with chips of Glass that may cause injuring fingers or skin, when the glass is broken.

### 4) ABSOLUTE MAXIMUM RATINGS

Do not exceed the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.

### 5) POWER PROTECTION CIRCUIT

Employ protection circuit for power supply, whenever the specification specifies it.  
A suitable protection circuit should be applied, based on each system design.

A fuse is not fitted to this module. Therefore, without a suitable power-supply protection device, dust or partial circuit failure may cause overheating and/or burning , which may lead to injury.

### 6) DISPOSAL

Always comply with all applicable environmental regulations, when disposing of the LCD.

### 7) EDGES OF PARTS

Be careful with edges of glass parts and metal frame, it may cause injuring.  
For designing the system, give special consideration that the wiring and parts do not touch those edges.



## Product Specification

### 8) RECOMMENDED OPERATING CONDITIONS

Don't exceed "the recommended operation conditions" in this specification. The performance and quality of the LCD module are warranted only when the LCD module is used within "the recommended operation conditions". To use the LCD module over "the recommended operation conditions" may have bad influence on the characteristics and reliability of the LCD module and may shorten the life of the LCD module.

Therefore, when designing the whole set, not to be over "the recommended operation conditions", you should fully take care of supply voltage change, characteristic of connection parts, surge of input-and-output line , and surrounding temperature.

## 7.2. Installation in Assembly

### 1. ESD (ELECTRO-STATIC DISCHARGE) PREVENTION

The circuit used in LCD module is very sensitive to ESD. The following caution should be taken when installing LCD module to an enclosure of the system in order to prevent damage of circuit used in LCD module.

#### 1) HUMIDITY

Ambient humidity of working area is recommended to be higher than 50%(RH) in order to avoid ESD.

#### 2) GROUNDING

- Person handling LCD modules should be grounded with wrist band.
- Tools like soldering iron and screw drivers and working benches should be grounded.
- Grounded electro-conductive mats are recommended to be cover'ed on the floor of working area and surface of working benches.
- The grounding should be done through a resister of 0.5~1Mohms in order to prevent spark of ESD.

#### 3) Be careful with touching metal portion of testing instruments in order to prevent unnecessary ESD.

#### 4) Do not touch the electrode area of PCB and electrical parts like LSI, capacitor, connector pin, etc.

#### 5) IONIZER

Using ionizer (an antistatic blower) is recommended at working area in order to reduce electro-static voltage.

#### 6) REMOVING PROTECTION FILM

When removing protection film from LCD panel, peel off the tag slowly (more than one second) while blowing with ionizer toward the peeling face to minimize ESD which may damage electrical circuit.



## Product Specification

### 2. DUST AND STAIN PREVENTION

#### 1) WORKING AREA

Reduce dust level in working area. Especially the level of metal particle should be decreased, otherwise electrical circuit in LCD module may be damaged due to short circuit by metal particles.

#### 2) FINGER PRINT

Use finger stalls or soft and dust-free gloves in order to keep clean appearance of LCD module when handled for incoming inspection and assembly.

#### 3) PROTECTION FILM

LCD module may be shipped with "protection film" on LCD panel in order to prevent from scratches and dust. It is recommended to remove the film at later process of assembling.

#### 4) WIPING OFF DUST ON THE PANEL

When LCD panel becomes dirty, wipe the panel surface off softly with absorbent cotton or another soft cloth. If necessary, breathe upon the panel surface and then wipe off immediately and softly again. Be careful not to spill organic solvents into the inside of LCD module. The solvents may damage driver IC and PCB area used inside module. The polarizer laminated to LCD panel and adhesives may be damaged by the solvents, so do not use any organic solvents for wiping off LCD panel.

#### 5) ADHESIVE ON LCD PANEL

Be careful not to attach adhesive, grease, etc., on LCD panel, because it is difficult to remove them without any damages on LCD panel.

#### 6) WATER SPOTS ON THE PANEL

Avoid the dewing or water condensation.

Wipe off a spot or spots of water or mist on LCD panel softly with absorbent cotton or another cloth as soon as possible if happened, otherwise discoloration or stain may be caused. And, damage may occur if water penetrates the inside.

### 3. INSTALLING LCD MODULE TO THE ENCLOSURE

#### 1) INSTALLING LCD MODULE TO THE ENCLOSURE

Do not bend or twist LCD module even momentarily when the LCD module is installed into the system. Bending or twisting the LCD module may cause permanent damage.

When the FPC is bent, the radius of FPC curvature must be more than value of recommendation to prevent bending and twisting forces from affecting the connection of FPC.

Even temporary bending or twisting sometimes causes damage.

#### 2) INTERFACE

Do not fasten screws, with catching interface FPC between LCD module and the enclosure. This may cause bending of LCD module, or become the cause of a failure by damaging FPC.



## Product Specification

### 4. MECHANICAL FORCES

#### 1) CARRY

Hold the side of the plastic frame when you carry an LCD module by hand. If an LCD is carried using the FPC, it is likely to be damaged and the LCD will then malfunction. If you turn on the LCD with a broken FPC, it may cause smoke or burning.

Protection (eg gloves) for fingers and hands is recommended to avoid injury by broken glass.

#### 2) STRONG MECHANICAL SHOCK

Avoid strong mechanical shock, such as dropping the LCD from the work bench, or knocking it against a hard object.

These may cause the glass panel to crack, or cause other mis-operation.

#### 3) EXCESSIVE FORCE

Avoid applying excessive force, like pushing the surface of LCD panel. This may cause scratches or breakage of the panel, or a failure of the module.

#### 4) SCRATCHES ON THE PANEL

Do not put heavy object such as tools, books, etc., and do not pile up LCD modules.

Be careful not to touch the surface of the polarizer with any hard and sharp object. These parts are so sensitive and can easily be scratched, even if protected by a film.

#### 5) Connector

When inserting or disconnecting the connector into a connector of the LCD module, care should be taken to ensure that no strong external force is applied to the connector on the LCD module side.

A strong external force applied to the connector or the FPC may damage their connections.

When assembling a module into a system, pay extra attention to ensure that no part such as the FPC etc. should be caught between the case of the system and the module. Make sure that the input signal connector of a module is securely and correctly connected to the connector on the system, not skewed, or incompletely connected.

Inputting a signal etc. into the module with connectors incorrectly inserted may cause a circuit component or components to malfunction.

#### 6) FPC

When inserting or disconnecting the connector of the LCD module into a connector of the system, care should be taken to ensure that no strong external force is applied to the FPC on the LCD module side. A strong external force applied to the FPC may damage their connections.

When assembling a module into a system, pay extra attention to ensure that no part such as the FPC etc. should be caught between the case of the system and the module.

Make sure that the input signal connector of a module is securely and correctly connected to the connector on the system, not skewed, or incompletely connected. Inputting a signal etc. into the module with connectors incorrectly inserted may cause a circuit component or components to malfunction. Be careful not to pull or damage the FPC cables, to avoid mechanical damage in FPC and connection part of FPC and cell.



## Product Specification

### 5. OPERATION

#### 1) POWER SUPPLY

Power supplies should always be turned off during the assembly process.  
Do not connect or disconnect the power cables and connectors with power applied to LCD module.  
This may cause damage to the LCD module circuit.  
In operating module at the inspection process, and so on, the supply voltage and signals of driving device must satisfy the sequence of power supplies and signals described in this specifications.

#### 2) GAS

Do not expose the LCD module to any gas which is not normally contained in the atmosphere, it may cause mis-operation or defects.

#### 3) USED FOR LONG TERM

When a LCD module is used for a long term, the characteristics of LCD module might be changed and it may be out of the standard of "4.3 Optical Specifications" due to LED discoloration.  
LED has the characteristics of shifting optical characteristics by the long term use.

### 7.3. Transportation and Storage

#### 1) TEMPERATURE

Do not store LCD modules in a high temperature and high humidity condition, higher than 35°C and 70%(RH) for a long term, meaning about one month or more, otherwise this may deteriorate the quality of the display. When you unavoidably store LCD modules for a long time, store between 0 and 35°C, with a relative humidity 70% or lower.

#### 2) LOW TEMPERATURE

Be careful not to leave it where the temperature is below specified storage temperature because the liquid crystal of the display panel may be damaged.

#### 3) ULTRA VIOLET RAY

Store LCD module without exposure to direct sunlight or fluorescent lamps in order to prevent the module from strong ultra violet ray.

#### 4) CLEANLINESS

Keep the LCD module in clean place, because any dust, hard particle may damage the polarizer, or dust invades the inside of the LCD module.



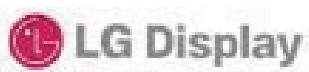
## Product Specification

### 5) CONDENSATION OF WATER

The modules should be stored under a condition where no condensation of water is allowed. It may cause mis-operation or defects. Be especially careful not to make a module work under the condition that condensation of water appears.

### 6) PACKAGING

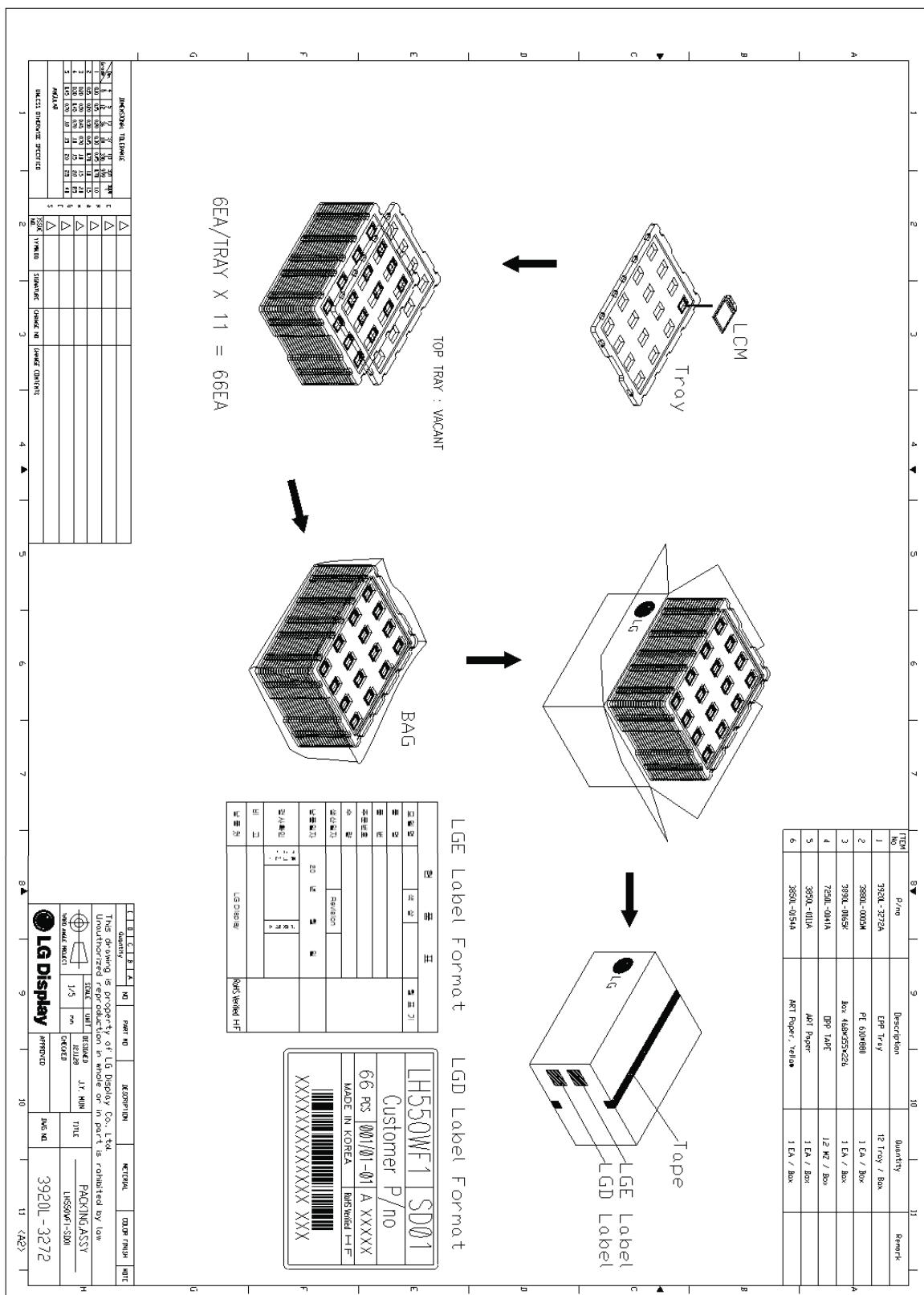
When you must re-package a LCD module after it has been removed from the original packaging, it is recommended to re-pack using the original package box and package material.



## Product Specification

## 8. Package

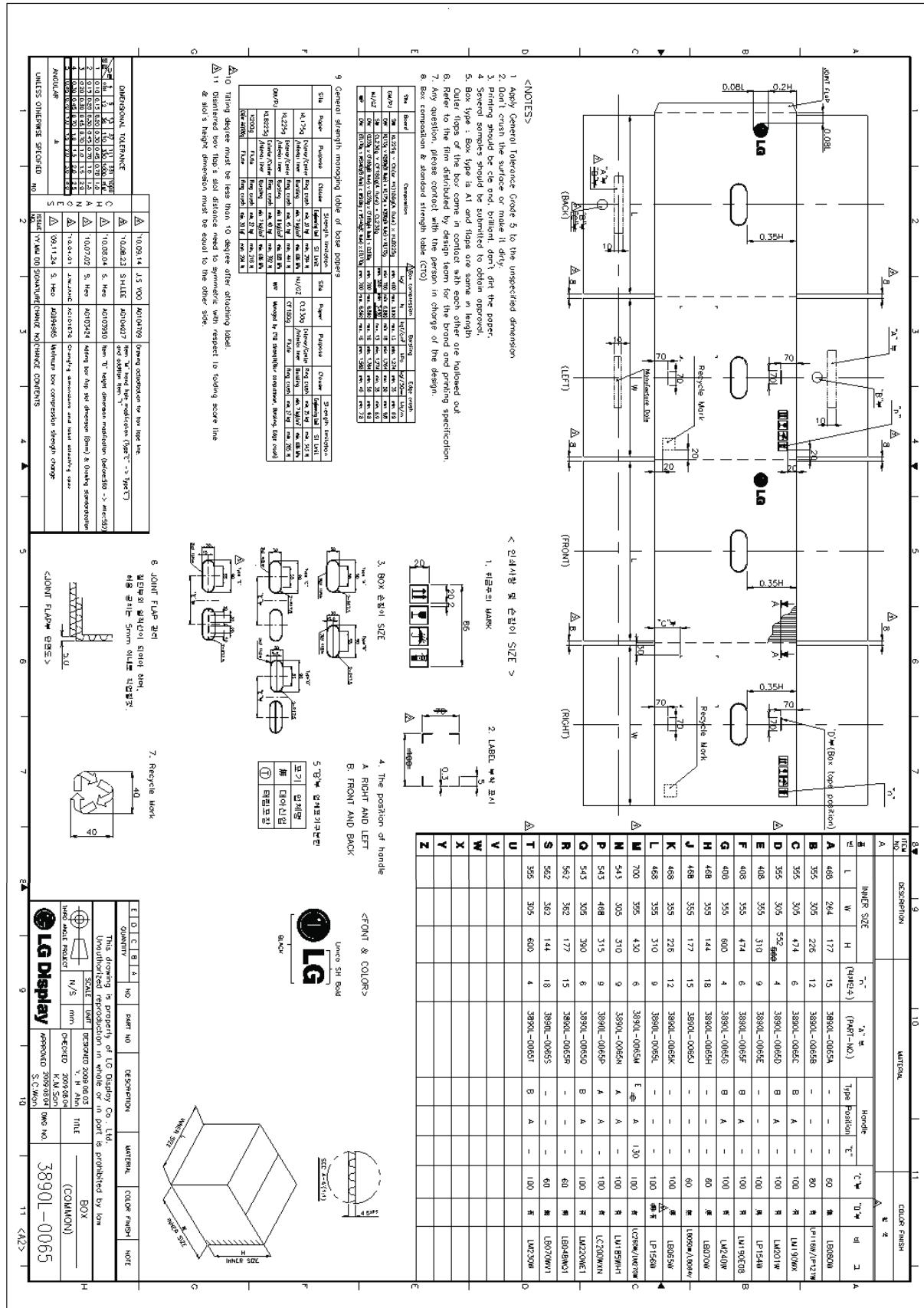
## 8.1. Packing Description





## Product Specification

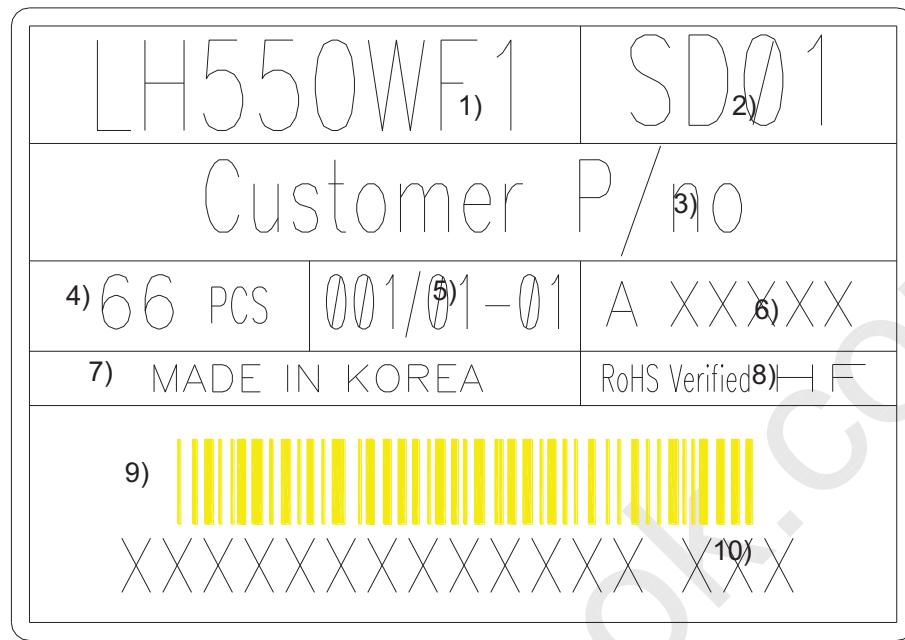
## 8.2. Packing Box Dimension





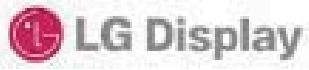
## Product Specification

## 8.3. Packing Label Design



&lt; BOX, Pallet Label &gt;

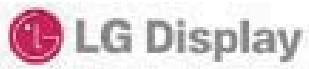
- 1) Base model name
- 2) Suffix1
- 3) LCD's Part Number at Customer
- 4) Product Volume : declaring the volume of product in the BOX/PALLET
- 5) Lot/MM-DD
  - Lot No : declaring the BOX/PALLET No. in the number according to Production plan in sequence.
  - MM-DD :declaring packing Month/day
- 6) REMARK
  - Register the Production change facts
- 7) Origin declaration : ( Only Module business)
  - LGD KUMI : MADE IN KOREA
- 8) Declaration RoHS and halogen free verified expression
- 9) Barcode Type : Code 128A Type
- 10) Suffix2



## Product Specification

### 8.4. QC Flow Chart

Control Plan Number			Key Contact / Phone 구미 Module 공정개발팀 장준혁 S			Date (Orig.) 2013. 01. 23	Date(Rev.) 2013. 01. 23	작성 점 제	승인	고객																																																																																																																																																																																																																																																																																																																											
Part Number / Latest Change Level 2436L-3094A / Rev 7			Core Team IT/Mobile LTPS 회로설계팀			Customer Engineering Approval / Date (If Req'd)																																																																																																																																																																																																																																																																																																																															
Part Name / Description LH550WF1-SD01-QG1 LGE 内 5.5" FHD			Supplier / Plant Approval / Date LGDisplay / M4-KR			Customer Quality Approval / Date (If Req'd)																																																																																																																																																																																																																																																																																																																															
Supplier / Plant LGDisplay / M4-KR			Supplier Code			Other Approval Date (If Req'd)			Other Approval Date (If Req'd)																																																																																																																																																																																																																																																																																																																												
<p>The flowchart illustrates the QC process for the LH550WF1-SD01 Liquid Crystal Display. It starts with 'Panel 세정 (연마포)' (Panel Cleaning) at M-1, followed by 'POL 부착' (POL Attachment) at M-2, 'PAD 세정 (Plasma)' (PAD Cleaning) at M-3, 'COG ACF 부착' (COG ACF Attachment) at M-4, 'Driver IC 부착 (COG)' (Driver IC Attachment (COG)) at M-5, 'FOG ACF 부착' (FOG ACF Attachment) at M-6, 'FPC 부착 (FOG)' (FPC Attachment (FOG)) at M-7, '입흔 검사 : COG' (Bump Inspection : COG) at M-8, 'Ag Paste Dotting' at M-9, '배면 UV Resin 도포' (Backside UV Resin Coating) at M-10, '탈포 (Auto Clave)' (Decompression) at M-11, and finally 'B/A 검사' (BA Inspection) at M-12.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">공정 번호</th> <th rowspan="2">Flow</th> <th rowspan="2">공정명 / 작업 내용</th> <th rowspan="2">설비, 치 / 공구명</th> <th colspan="2">특성</th> <th rowspan="2">제품 / 공정 / 사양 / 규격</th> <th colspan="2">관리 방법</th> <th rowspan="2">관리 표준</th> </tr> <tr> <th>번호</th> <th>제품 (관리 항목)</th> <th>공정 (점검 항목)</th> <th>수량</th> <th>생물 주기</th> </tr> </thead> <tbody> <tr> <td>M-1</td> <td></td> <td>Panel 세정 (연마포)</td> <td>세정기 (연마포)</td> <td>1</td> <td>외관</td> <td>Panel 파손, C/S 없을 것</td> <td>육안 검사 (자주검사)</td> <td>1회</td> <td>M/C 후</td> <td rowspan="2">MES, Check sheet</td> <td rowspan="2">작업 지도서</td> </tr> <tr> <td>M-2</td> <td></td> <td>POL 부착</td> <td>POL 부착기 (Vision 적용) 上: 6308L-5289A 下: 6308L-5324A</td> <td>1</td> <td>이물, 외관</td> <td>입입량, 속도</td> <td>이물 (유리가루), 기포, 혼상, 파손 없을 것</td> <td>육안 검사 (자주검사)</td> <td>1회</td> <td>M/C 후</td> </tr> <tr> <td>M-3</td> <td></td> <td>PAD 세정 (Plasma)</td> <td>Plasma 세정</td> <td>1</td> <td>POL 외관</td> <td>세기, 시간</td> <td>POL 탈 없을 것</td> <td>육안 검사 (자주검사)</td> <td>전수</td> <td>Daily</td> <td rowspan="2">MES, Check sheet</td> <td rowspan="2">작업 지도서</td> </tr> <tr> <td>M-4</td> <td></td> <td>COG ACF 부착</td> <td>ACF 부착기 CP33731-18YA 1.2mm x 100M 6884L-0177A</td> <td>1</td> <td>ACF 부착 위치</td> <td></td> <td>D-IC Bonding 부 기준으로 부착</td> <td>육안 검사 (자주검사)</td> <td>n=2</td> <td>M/C 후</td> </tr> <tr> <td>M-4</td> <td></td> <td></td> <td></td> <td>2</td> <td>ACF 부착 상태</td> <td></td> <td>ACF 불균일 (들뜸, 기포, 뜯김) 없을 것</td> <td>육안 검사 (자주검사)</td> <td>n=2</td> <td>M/C 후</td> <td rowspan="5">MES, Check sheet</td> <td rowspan="5">작업 지도서</td> </tr> <tr> <td>M-4</td> <td></td> <td></td> <td></td> <td>3</td> <td>온도</td> <td>100±10°C</td> <td>설비 온도계</td> <td>1회</td> <td>M/C 후 이상발생 Shift Tool교체</td> </tr> <tr> <td>M-4</td> <td></td> <td></td> <td></td> <td>4</td> <td>입력</td> <td>2±1Kgf</td> <td>설비 입력계</td> <td></td> <td></td> </tr> <tr> <td>M-4</td> <td></td> <td></td> <td></td> <td>5</td> <td>시간</td> <td>0.5~2sec</td> <td>설비 Timer</td> <td></td> <td></td> </tr> <tr> <td>M-5</td> <td></td> <td>Driver IC 부착 (COG)</td> <td>COG 부착기 R63311 0ILUL-0263A</td> <td>1</td> <td>온도</td> <td>80±10°C (기압착) 175±10°C (본입착)</td> <td>설비 온도계</td> <td>1회</td> <td rowspan="4">MC 후 이상발생 Shift Tool교체</td> <td rowspan="4">MES, Check sheet</td> <td rowspan="4">작업 지도서</td> </tr> <tr> <td>M-5</td> <td></td> <td></td> <td></td> <td>2</td> <td>입력</td> <td>2±1kgf (기압착) 30±3kgf (본입착)</td> <td>설비 입력계</td> <td></td> <td></td> </tr> <tr> <td>M-5</td> <td></td> <td></td> <td></td> <td>3</td> <td>시간</td> <td>2±1sec (기압착) 6sec (본입착)</td> <td>설비 Timer</td> <td></td> <td></td> </tr> <tr> <td>M-5</td> <td></td> <td></td> <td></td> <td>4</td> <td>Tool 평행도</td> <td>균일한 색상 (길임 측정시)</td> <td>육안 검사 (자주검사)</td> <td></td> <td></td> </tr> <tr> <td>M-6</td> <td></td> <td>FOG ACF 부착</td> <td>ACF 부착기 AC7823YM-18 1.0mm x 100M 6884L-0144A</td> <td>1</td> <td>ACF 부착 위치</td> <td>Panel PAD 끝단 기준으로 부착</td> <td>육안 검사 (자주검사)</td> <td>n=2</td> <td rowspan="5">MC 후 이상발생 Shift Tool교체</td> <td rowspan="5">MES, Check sheet</td> <td rowspan="5">작업 지도서</td> </tr> <tr> <td>M-6</td> <td></td> <td></td> <td></td> <td>2</td> <td>ACF 부착 상태</td> <td>ACF 불균일 (들뜸, 기포, 뜯김) 없을 것</td> <td>육안 검사 (자주검사)</td> <td>n=2</td> <td></td> </tr> <tr> <td>M-6</td> <td></td> <td></td> <td></td> <td>3</td> <td>온도</td> <td>100±10°C</td> <td>설비 온도계</td> <td>1회</td> <td></td> </tr> <tr> <td>M-6</td> <td></td> <td></td> <td></td> <td>4</td> <td>입력</td> <td>2±1Kgf</td> <td>설비 입력계</td> <td></td> <td></td> </tr> <tr> <td>M-6</td> <td></td> <td></td> <td></td> <td>5</td> <td>시간</td> <td>0.5~2sec</td> <td>설비 Timer</td> <td></td> <td></td> </tr> <tr> <td>M-7</td> <td></td> <td>FPC 부착 (FOG)</td> <td>FOG 부착기 Newflex 6841L-0330B</td> <td>1</td> <td>온도</td> <td>60±10°C (기압착) 180±10°C (본입착)</td> <td>설비 온도계</td> <td>1회</td> <td rowspan="5">MC 후 이상발생 Shift Tool교체</td> <td rowspan="5">MES, Check sheet</td> <td rowspan="5">작업 지도서</td> </tr> <tr> <td>M-7</td> <td></td> <td></td> <td></td> <td>2</td> <td>입력</td> <td>2±1kgf (기압착) 6±3kgf (본입착)</td> <td>설비 입력계</td> <td></td> </tr> <tr> <td>M-7</td> <td></td> <td></td> <td></td> <td>3</td> <td>시간</td> <td>2±1sec (기압착) 7sec (본입착)</td> <td>설비 Timer</td> <td></td> </tr> <tr> <td>M-7</td> <td></td> <td></td> <td></td> <td>4</td> <td>Tool 평행도</td> <td>균일한 색상 (길임 측정시)</td> <td>육안 검사 (자주검사)</td> <td></td> </tr> <tr> <td>M-7</td> <td></td> <td></td> <td></td> <td>5</td> <td>접착력</td> <td>≥500gft/cm</td> <td>Push/Pull gauge</td> <td>n=4</td> <td>1회 / Shift</td> <td>X-Bar R Chart</td> </tr> <tr> <td>M-8</td> <td></td> <td>입흔 검사 : COG</td> <td>현미경</td> <td>1</td> <td>Source L/D 화면이상 Non Display Bonding 상태</td> <td>CT Q Align 경도</td> <td>X Space 8um 이상, Y Space 8um 이상</td> <td>현미경 검사 (좌, 중, 우)</td> <td>2EA</td> <td>1회 / 2hr</td> <td rowspan="2">MES, Check sheet X-Bar R Chart</td> <td rowspan="2">검사 지도서</td> </tr> <tr> <td>M-8</td> <td></td> <td>입흔 검사 : FOG</td> <td>현미경</td> <td>2</td> <td>화면이상 Non Display Bonding 상태</td> <td>CT Q 압흔 수준</td> <td>3수준 이상 1개 Bump당 유효입자 5개 이상</td> <td>현미경 검사 (좌, 중, 우)</td> <td>2EA</td> <td>1회 / 2hr</td> </tr> <tr> <td>M-9</td> <td></td> <td>Ag Paste Dotting</td> <td>Dispensor SG-AG1000PLTU</td> <td>1</td> <td>도포 상태</td> <td>도포량, 입력</td> <td>C/F ~ TFT 연결하여 도포할 것</td> <td>육안 검사 (자주검사)</td> <td>전수</td> <td>Daily</td> <td rowspan="2">MES, Check sheet</td> <td rowspan="2">작업 지도서</td> </tr> <tr> <td>M-10</td> <td></td> <td>배면 UV Resin 도포</td> <td>Dispensor TF3348</td> <td>1</td> <td>도포 상태</td> <td>도포량, 입력</td> <td>FPC 배면 open 영역 모두 도포될 것 TFT 넘지 않으면, open 없을 것</td> <td>육안 검사 (자주검사)</td> <td>전수</td> <td>Daily</td> <td></td> </tr> <tr> <td>M-11</td> <td></td> <td>탈포 (Auto Clave)</td> <td>Auto Clave</td> <td>1</td> <td>온도, 입력, 시간</td> <td></td> <td>55±5°C, 5Kgff/cm, 90sec</td> <td>설비 온도, 입력계, Timer</td> <td>2회</td> <td>Daily</td> <td>Check sheet</td> <td>작업 지도서</td> </tr> <tr> <td>M-12</td> <td></td> <td>B/A 검사</td> <td>E/T Jig</td> <td>1</td> <td>표시 상태</td> <td>검사 기준 숙지</td> <td>검사 지도서에 준함 (표시 상태 이상 없을 것)</td> <td>루페 (Lupe), Spot gauge</td> <td>전수</td> <td>Daily</td> <td>MES</td> <td>검사 지도서</td> </tr> </tbody> </table>	공정 번호	Flow	공정명 / 작업 내용	설비, 치 / 공구명	특성		제품 / 공정 / 사양 / 규격	관리 방법		관리 표준	번호	제품 (관리 항목)	공정 (점검 항목)	수량	생물 주기	M-1		Panel 세정 (연마포)	세정기 (연마포)	1	외관	Panel 파손, C/S 없을 것	육안 검사 (자주검사)	1회	M/C 후	MES, Check sheet	작업 지도서	M-2		POL 부착	POL 부착기 (Vision 적용) 上: 6308L-5289A 下: 6308L-5324A	1	이물, 외관	입입량, 속도	이물 (유리가루), 기포, 혼상, 파손 없을 것	육안 검사 (자주검사)	1회	M/C 후	M-3		PAD 세정 (Plasma)	Plasma 세정	1	POL 외관	세기, 시간	POL 탈 없을 것	육안 검사 (자주검사)	전수	Daily	MES, Check sheet	작업 지도서	M-4		COG ACF 부착	ACF 부착기 CP33731-18YA 1.2mm x 100M 6884L-0177A	1	ACF 부착 위치		D-IC Bonding 부 기준으로 부착	육안 검사 (자주검사)	n=2	M/C 후	M-4				2	ACF 부착 상태		ACF 불균일 (들뜸, 기포, 뜯김) 없을 것	육안 검사 (자주검사)	n=2	M/C 후	MES, Check sheet	작업 지도서	M-4				3	온도	100±10°C	설비 온도계	1회	M/C 후 이상발생 Shift Tool교체	M-4				4	입력	2±1Kgf	설비 입력계			M-4				5	시간	0.5~2sec	설비 Timer			M-5		Driver IC 부착 (COG)	COG 부착기 R63311 0ILUL-0263A	1	온도	80±10°C (기압착) 175±10°C (본입착)	설비 온도계	1회	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서	M-5				2	입력	2±1kgf (기압착) 30±3kgf (본입착)	설비 입력계			M-5				3	시간	2±1sec (기압착) 6sec (본입착)	설비 Timer			M-5				4	Tool 평행도	균일한 색상 (길임 측정시)	육안 검사 (자주검사)			M-6		FOG ACF 부착	ACF 부착기 AC7823YM-18 1.0mm x 100M 6884L-0144A	1	ACF 부착 위치	Panel PAD 끝단 기준으로 부착	육안 검사 (자주검사)	n=2	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서	M-6				2	ACF 부착 상태	ACF 불균일 (들뜸, 기포, 뜯김) 없을 것	육안 검사 (자주검사)	n=2		M-6				3	온도	100±10°C	설비 온도계	1회		M-6				4	입력	2±1Kgf	설비 입력계			M-6				5	시간	0.5~2sec	설비 Timer			M-7		FPC 부착 (FOG)	FOG 부착기 Newflex 6841L-0330B	1	온도	60±10°C (기압착) 180±10°C (본입착)	설비 온도계	1회	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서	M-7				2	입력	2±1kgf (기압착) 6±3kgf (본입착)	설비 입력계		M-7				3	시간	2±1sec (기압착) 7sec (본입착)	설비 Timer		M-7				4	Tool 평행도	균일한 색상 (길임 측정시)	육안 검사 (자주검사)		M-7				5	접착력	≥500gft/cm	Push/Pull gauge	n=4	1회 / Shift	X-Bar R Chart	M-8		입흔 검사 : COG	현미경	1	Source L/D 화면이상 Non Display Bonding 상태	CT Q Align 경도	X Space 8um 이상, Y Space 8um 이상	현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr	MES, Check sheet X-Bar R Chart	검사 지도서	M-8		입흔 검사 : FOG	현미경	2	화면이상 Non Display Bonding 상태	CT Q 압흔 수준	3수준 이상 1개 Bump당 유효입자 5개 이상	현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr	M-9		Ag Paste Dotting	Dispensor SG-AG1000PLTU	1	도포 상태	도포량, 입력	C/F ~ TFT 연결하여 도포할 것	육안 검사 (자주검사)	전수	Daily	MES, Check sheet	작업 지도서	M-10		배면 UV Resin 도포	Dispensor TF3348	1	도포 상태	도포량, 입력	FPC 배면 open 영역 모두 도포될 것 TFT 넘지 않으면, open 없을 것	육안 검사 (자주검사)	전수	Daily		M-11		탈포 (Auto Clave)	Auto Clave	1	온도, 입력, 시간		55±5°C, 5Kgff/cm, 90sec	설비 온도, 입력계, Timer	2회	Daily	Check sheet	작업 지도서	M-12		B/A 검사	E/T Jig	1	표시 상태	검사 기준 숙지	검사 지도서에 준함 (표시 상태 이상 없을 것)	루페 (Lupe), Spot gauge	전수	Daily	MES	검사 지도서
						공정 번호	Flow		공정명 / 작업 내용	설비, 치 / 공구명		특성		제품 / 공정 / 사양 / 규격	관리 방법		관리 표준																																																																																																																																																																																																																																																																																																																				
		번호	제품 (관리 항목)	공정 (점검 항목)	수량			생물 주기																																																																																																																																																																																																																																																																																																																													
		M-1		Panel 세정 (연마포)	세정기 (연마포)	1	외관	Panel 파손, C/S 없을 것	육안 검사 (자주검사)	1회	M/C 후	MES, Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																								
		M-2		POL 부착	POL 부착기 (Vision 적용) 上: 6308L-5289A 下: 6308L-5324A	1	이물, 외관	입입량, 속도	이물 (유리가루), 기포, 혼상, 파손 없을 것	육안 검사 (자주검사)	1회			M/C 후																																																																																																																																																																																																																																																																																																																							
		M-3		PAD 세정 (Plasma)	Plasma 세정	1	POL 외관	세기, 시간	POL 탈 없을 것	육안 검사 (자주검사)	전수	Daily	MES, Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																							
		M-4		COG ACF 부착	ACF 부착기 CP33731-18YA 1.2mm x 100M 6884L-0177A	1	ACF 부착 위치		D-IC Bonding 부 기준으로 부착	육안 검사 (자주검사)	n=2	M/C 후																																																																																																																																																																																																																																																																																																																									
		M-4				2	ACF 부착 상태		ACF 불균일 (들뜸, 기포, 뜯김) 없을 것	육안 검사 (자주검사)	n=2	M/C 후	MES, Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																							
		M-4				3	온도	100±10°C	설비 온도계	1회	M/C 후 이상발생 Shift Tool교체																																																																																																																																																																																																																																																																																																																										
		M-4				4	입력	2±1Kgf	설비 입력계																																																																																																																																																																																																																																																																																																																												
		M-4				5	시간	0.5~2sec	설비 Timer																																																																																																																																																																																																																																																																																																																												
		M-5		Driver IC 부착 (COG)	COG 부착기 R63311 0ILUL-0263A	1	온도	80±10°C (기압착) 175±10°C (본입착)	설비 온도계	1회	MC 후 이상발생 Shift Tool교체	MES, Check sheet			작업 지도서																																																																																																																																																																																																																																																																																																																						
M-5				2	입력	2±1kgf (기압착) 30±3kgf (본입착)	설비 입력계																																																																																																																																																																																																																																																																																																																														
M-5				3	시간	2±1sec (기압착) 6sec (본입착)	설비 Timer																																																																																																																																																																																																																																																																																																																														
M-5				4	Tool 평행도	균일한 색상 (길임 측정시)	육안 검사 (자주검사)																																																																																																																																																																																																																																																																																																																														
M-6		FOG ACF 부착	ACF 부착기 AC7823YM-18 1.0mm x 100M 6884L-0144A	1	ACF 부착 위치	Panel PAD 끝단 기준으로 부착	육안 검사 (자주검사)	n=2	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																										
M-6				2	ACF 부착 상태	ACF 불균일 (들뜸, 기포, 뜯김) 없을 것	육안 검사 (자주검사)	n=2																																																																																																																																																																																																																																																																																																																													
M-6				3	온도	100±10°C	설비 온도계	1회																																																																																																																																																																																																																																																																																																																													
M-6				4	입력	2±1Kgf	설비 입력계																																																																																																																																																																																																																																																																																																																														
M-6				5	시간	0.5~2sec	설비 Timer																																																																																																																																																																																																																																																																																																																														
M-7		FPC 부착 (FOG)	FOG 부착기 Newflex 6841L-0330B	1	온도	60±10°C (기압착) 180±10°C (본입착)	설비 온도계	1회	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																										
M-7				2	입력	2±1kgf (기압착) 6±3kgf (본입착)	설비 입력계																																																																																																																																																																																																																																																																																																																														
M-7				3	시간	2±1sec (기압착) 7sec (본입착)	설비 Timer																																																																																																																																																																																																																																																																																																																														
M-7				4	Tool 평행도	균일한 색상 (길임 측정시)	육안 검사 (자주검사)																																																																																																																																																																																																																																																																																																																														
M-7				5	접착력	≥500gft/cm	Push/Pull gauge	n=4				1회 / Shift	X-Bar R Chart																																																																																																																																																																																																																																																																																																																								
M-8		입흔 검사 : COG	현미경	1	Source L/D 화면이상 Non Display Bonding 상태	CT Q Align 경도	X Space 8um 이상, Y Space 8um 이상	현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr	MES, Check sheet X-Bar R Chart	검사 지도서																																																																																																																																																																																																																																																																																																																									
M-8		입흔 검사 : FOG	현미경	2	화면이상 Non Display Bonding 상태	CT Q 압흔 수준	3수준 이상 1개 Bump당 유효입자 5개 이상	현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr																																																																																																																																																																																																																																																																																																																											
M-9		Ag Paste Dotting	Dispensor SG-AG1000PLTU	1	도포 상태	도포량, 입력	C/F ~ TFT 연결하여 도포할 것	육안 검사 (자주검사)	전수	Daily	MES, Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																									
M-10		배면 UV Resin 도포	Dispensor TF3348	1	도포 상태	도포량, 입력	FPC 배면 open 영역 모두 도포될 것 TFT 넘지 않으면, open 없을 것	육안 검사 (자주검사)	전수	Daily																																																																																																																																																																																																																																																																																																																											
M-11		탈포 (Auto Clave)	Auto Clave	1	온도, 입력, 시간		55±5°C, 5Kgff/cm, 90sec	설비 온도, 입력계, Timer	2회	Daily	Check sheet	작업 지도서																																																																																																																																																																																																																																																																																																																									
M-12		B/A 검사	E/T Jig	1	표시 상태	검사 기준 숙지	검사 지도서에 준함 (표시 상태 이상 없을 것)	루페 (Lupe), Spot gauge	전수	Daily	MES	검사 지도서																																																																																																																																																																																																																																																																																																																									



## Product Specification

Control Plan Number				Key Contact / Phone 구미 Module 공정개발팀 정준혁 S				Date (Orig.) 2013. 01. 23	Date(Rev.) 2013. 01. 23	결재	측정	승인	고객				
Part Number / Latest Change Level 2436L-3094A / Rev 7				Core Team IT/Mobile LTPS 회로설계팀				Customer Engineering Approval / Date (If Req'd)									
Part Name / Description LH550WF1-SD01-QG1 LGE 5.5" FHD				Supplier / Plant Approval / Date				Customer Quality Approval / Date (If Req'd)									
Supplier / Plant LGDisplay / M4-KR				Supplier Code				Other Approval Date (If Req'd)		Other Approval Date (If Req'd)							
공정 번호	Flow	공정명 / 작업 내용	설비, 치 / 품구명	특성			별도 특성	관리 방법			관리 표준						
번호	제품 (관리 항목)	공정 (점검 항목)	수량	제품 / 공정 / 사양 / 규격	평가 측정 방법	생물 주기	관리 방법	수량	주기	관리 방법	수량	주기	관리 표준				
M-13		BLU 합착(지동)	BLU 합착 JIG Ion Blow Ion Nozzle  B/A : 6060L-2986A BLU : 6091L-2233A	1 Align 정도 2 조립 상태 3 이물, 외관	Jig 가공 치수 BLU 외곽으로 Panel 벗어남 없을 것, BLU 안쪽에 Panel 대조로 인식 될 것 이물, 얼룩, 손상, 파손 없을 것	Window : ±0.025mm, BLU : ±0.05mm Panel : ±0.075mm, BLU : ±0.05mm  버니어캘리퍼스, 3차원 측정기  측인 검사 (자주검사)	1회	Jig 제작 시	Check sheet	1회	M/C 후	Check sheet	작업 지도서				
M-14		LED FPC Soldering	인도기	1 온도 2 낭필 상태 외관	온도 Tip 온도 340±20°C  Align, Short 없을 것 냉필, 들뜸, 부품 Damage 없을 것 Flux 이물 및 잔사 없을 것 Align & 낭파침 70% 이상일 것	온도 측정 gauge  측인 검사 (자주검사)	1회	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	작업 지도서				
M-15		Gap filling Tape 부착	핀셋 한국 EM 7250L-2859A	1 부착 위치(PAD전면) 부착 상태 외관	작업 방법 숙지	Panel PAD 벗어남 없을 것 BLU Mold 올리�� 없을 것 Driver IC 올리�� 없을 것 Tape 누락, 찢어짐, 구겨짐, 들뜸 없을 것  제품 파손 없을 것	측인 검사 (자주검사)	전수	Daily	MES	전수	Daily	MES	작업 지도서			
M-16		Gap filling Tape 부착	핀셋 한국 EM 7250L-2860A	1 부착 위치(PAD전면) 부착 상태 외관	작업 방법 숙지	Panel PAD 벗어남 없을 것 BLU Mold 올리获 없을 것 Driver IC 올리获 없을 것 Tape 누락, 찢어짐, 구겨짐, 들뜸 없을 것  제품 파손 없을 것	측인 검사 (자주검사)	전수	Daily	MES	전수	Daily	MES	작업 지도서			
M-17		Solder Tape 부착	핀셋 한국 뉴텍 7250L-2854A	1 부착 위치(Solder 부착) 부착 상태 외관	작업 방법 숙지	Soldering 영역 모두 닦을 것 FPC 외곽 및 Silk line 벗어남 없을 것 Tape 누락, 찢어짐, 구겨짐, 들뜸 없을 것 제품 파손 없을 것	측인 검사 (자주검사)	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	작업 지도서			
M-18		Solder Tape 부착	핀셋 한국 뉴텍 7250L-2855A	1 부착 위치(Solder 부착) 부착 상태 외관	작업 방법 숙지	Soldering 영역 모두 닦을 것 FPC 외곽 및 Silk line 벗어남 없을 것 Tape 누락, 찢어짐, 구겨짐, 들뜸 없을 것 제품 파손 없을 것	측인 검사 (자주검사)	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	작업 지도서			
M-19		Pull Tape 부착	핀셋 Daehyun ST 7250L-2168A	1 부착 위치 부착 상태 외관	작업 방법 숙지	POL 외곽에서 0.2mm 간격 유지 할 것 Tape 자유 베리 없을 것 Tape 누락, 찢어짐, 구겨짐, 들뜸 없을 것 제품 파손 없을 것	측인 검사 (자주검사)	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	작업 지도서			
M-20		2D Label 부착	핀셋 화성 쌔링 3850L-0214A	1 부착 위치 (Pull Tape 배면부) 부착 상태 외관	작업 방법 숙지	Pull tape 바깥 2.0mm Tilt 허용 2D Label 구김 없을 것 Tape 누락, 찢어짐, 구겨짐, 들뜸 없을 것 Matrix Code 인쇄 문제 없을 것	측인 검사 (자주검사)	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	작업 지도서			
M-21		Lot marking	Inkjet Printer	1 인쇄 품질 외관	작업 방법 숙지	Marking 지워짐, 누락, 충복 없을 것 Marking 틀어짐 없을 것 Marking 위치 벗어남 없을 것 제품 파손 없을 것	측인 검사 (자주검사)	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	작업 지도서			
M-22		최종검사(Touch 포함 E/T Jig)	1 표시 상태	검사 기준 숙지	검사 지도서에 준합 (표시 상태 이상 없을 것)	루페 (Lupe), Spot gauge	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	검사 지도서				
M-23		최종 외관 검사	핀셋	1 외관 2 조립 품질	검사 기준 숙지	검사 지도서에 준합 (표시 상태 이상 없을 것)	루페 (Lupe), Spot gauge	전수	Daily	MES, Lot Card	전수	Daily	MES, Lot Card	검사 지도서			
M-24		ORT	ORT Chamber	1 특성 동작, 성능 외관 2 온도, 시간		ORT 검사 규격에 준합	루페 (Lupe), Spot gauge	30ea	1회 / 1일	Check sheet	전수	Daily	MES, Lot Card	작업 지도서			
M-25		출하 검사(Touch 포함 E/T Jig)	1 특성 동작, 성능 외관			출하 Sampling 검사 규격에 준합 (CAS 참조)	루페 (Lupe), Spot gauge Height gauge	SPL/G 0.25	Lot	출하 검사 성적서	전수	Daily	출하 검사 지도서				
M-26		내포장	Label 발행 기 Label 용지 PET Bag BOX	1 부착 위치 포장 상태	Label 발행 내용 Label 부착 기준 포장 사양	고객 요구 조건에 준합 (CAS 참조 및 포장 규격 참조)	측인 검사 (자주검사)	전수	Daily	전수	전수	Daily	포장 규격서, 작업 지도서				
M-27		외포장	Label 발행 기 Label 용지 Pallet Cover	1 부착 위치 포장 상태	Label 발행 내용 Label 부착 기준 포장 사양	고객 요구 조건에 준합 (CAS 참조 및 포장 규격 참조)	측인 검사 (자주검사)	전수	Daily	전수	전수	Daily	포장 규격서, 작업 지도서				



LH550WF1-SD01  
Liquid Crystal Display

## Product Specification

### 8.5. Designation of Lot Mark

Byte	1	2	3	4	5	6	7	8	9	10
------	---	---	---	---	---	---	---	---	---	----

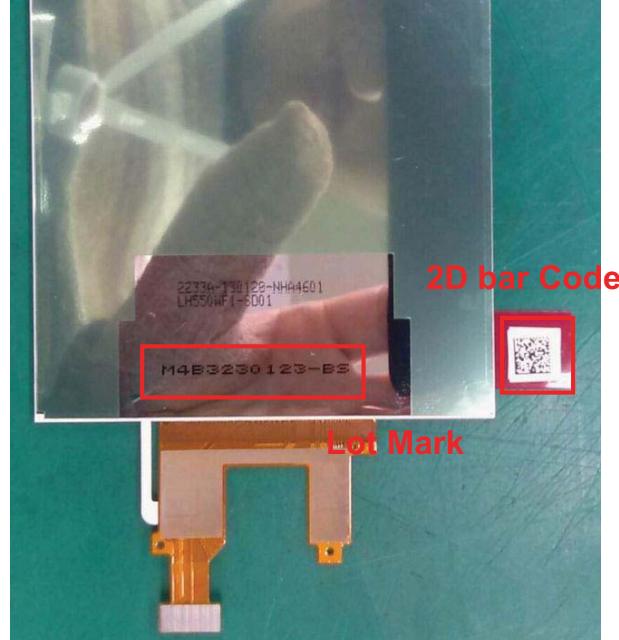
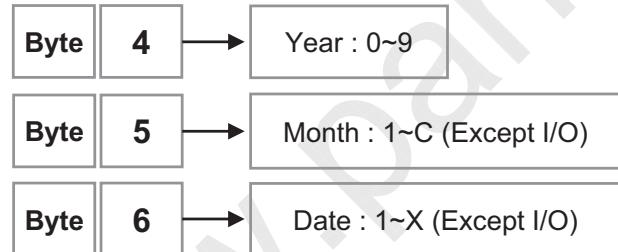
1. Factory Code

Byte	1	2	Mark	Description	Mark	Description
M	4	Gumi	X	P		Dasol
X	C	KRems	X	T		H&H
X	U	Tovis (Dalian)	J	1	LGD (Yantai)	
X	L	Raygen (Yantai)	X	K	Dasol (Yantai)	

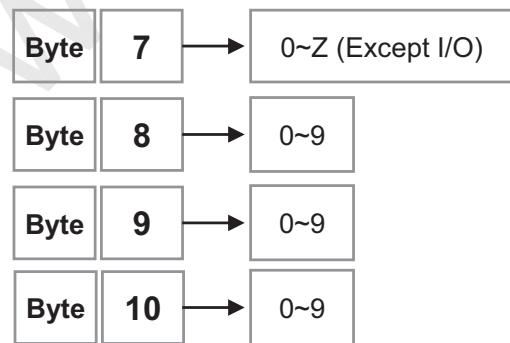
2. Lot Type

Byte	3	Mark	Desc.
N	Normal		
R	Rework		
G	GIB		
P	Packing		

3. Year/Month/Data of Production



4. Serial Number : 0001 ~ Z999 (Except I/O)

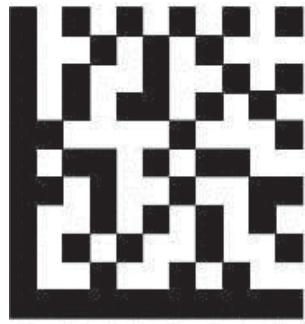




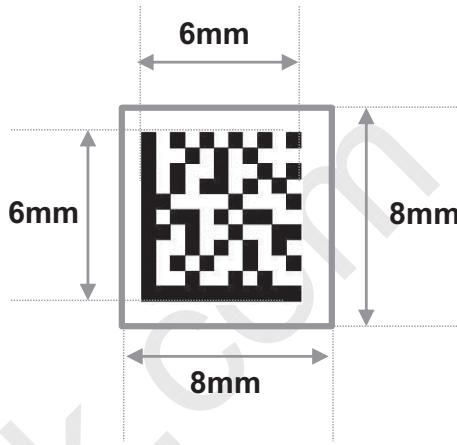
## Product Specification

## 8.6. Designation of 2D Bar code

## 1. Bar code format



## 2. Bar code size



## 3. Data Matrix information

**EAJ62117201-121115-XCN2BF0001-KR015410**

①

②

③

④

①	LGE Part Number	* EAJ62117201 (5.5" FHD GK) - It could be changed by Model Name
②	Production Data	* 121115 - Year/ Month/ Date - It could be changed by Product date in LGD
③	Lot No	* XCN2BF0001 ~ Z999 - It could be changed by Product Lot No
④	LG Vendor Code	* KR015410 - It is fixed for LGD