

## Cover page

# APPROVAL SHEET

Title	SPECIFICATION FOR APPROVAL LH550QH1-SD02 (B2)
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CUSTOMER	LG Electronics
MODEL	B2

SUPPLIER	LG Display
MODEL	LH550QH1-SD02

SIGNATURE	DATE

APPROVED BY	DATE
임민호	14.05.26
홍광표	14.05.26
송중록	14.05.26

- Preliminary Specification
- Final Specification

## Product Specification

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## Product Specification

## 1. Record of Revision

Revision No.	Date	Contents of Revision Change	Remark
1.0	14.04.08	Specification Released	All page
1.1	14.04.23	Camera Hole 외관 Spec 관련 문구 수정 (Lens Area 미허용)	P59
1.2	14.05.07	1. Module Part List Update 2. DB 장비 추가: 기존 (육일 반자동) → 변경 ( 육일,반자동 , I-Type )	P5
1.3	14.05.13	1. BLU Reflector 고정 Double Tape 재질 변경 기존 : SEKISUI, 3805 → 변경 : NITTO, 5605J 2. DB Site 추가: 기존 (육일) → 변경 (육일,M4) 3. Touch ITO 증착 업체 추가 기존 (에바) → 변경 (에바, 리지스) 4. Touch 후공정 업체 추가 기존 (모아텍) → 변경 ( 모아텍, KR,에스원) 5. FPC 업체 추가 기존 (Newflex) → 변경( Newflex, ACT )	P5
1.4	14.05.26	1. FPC SMT 업체 추가 기존 (대림) → 변경 (대림 , Krems) 2. CP Site 추가 기존 (YT) → 변경 (YT, M4) 3. BLU 업체 삼원화 기존 (KJP,e-litecom)→변경(KJP,e-litecom,Raygen) 4. Gapfilling Tape 변경 기존 (7250L-4044A+7250L-4748A)→ 변경(7250L-4044B , 일체형) 5. 고온 황변 개선 Mask 적용	P5

## Product Specification

## 2. General Description

## 2.1. General Feature

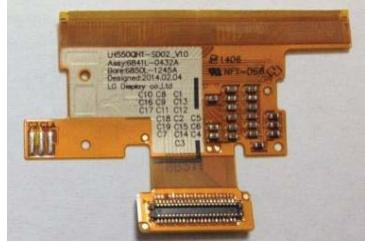
No	Item	Specification	Remark
1	Display Method	Active Matrix TFT	
2	Display Mode	Transmissive Type	
3	Display Resolution	1,440 RGB(H) × 2,560(V)	
4	Active Area [mm]	68.04(H) × 120.96(V)	
5	Screen Size [inch]	5.46"	
6	Pixel Pitch [um]	15.75 × RGB(H) × 47.25(V)	538 ppi
7	Display Color	16.7M color	
8	Surface Treatment	H/C	
9	Outside Dimension [mm]	72.64(H) × 142.01(V) × 2.08(D)	Cover Window Size
10	Viewing Angle	Wide view (80°/80°/80°/80°)	
11	Weight [g]	34.8 g	±10%
12	Driver IC	LG4941	32.52(H)×1.07(V)×0.2(D)
13	Inversion Method	Column Inversion	
14	Interface	MIPI	2Port 4Lane

## Product Specification

## 2.2. Module Part List



COG Ass'y



FPC ass'y

Touch Panel ass'y  
(G1F TSP)

BLU ass'y



Insulation Tape



Gap Filling Tape



Label

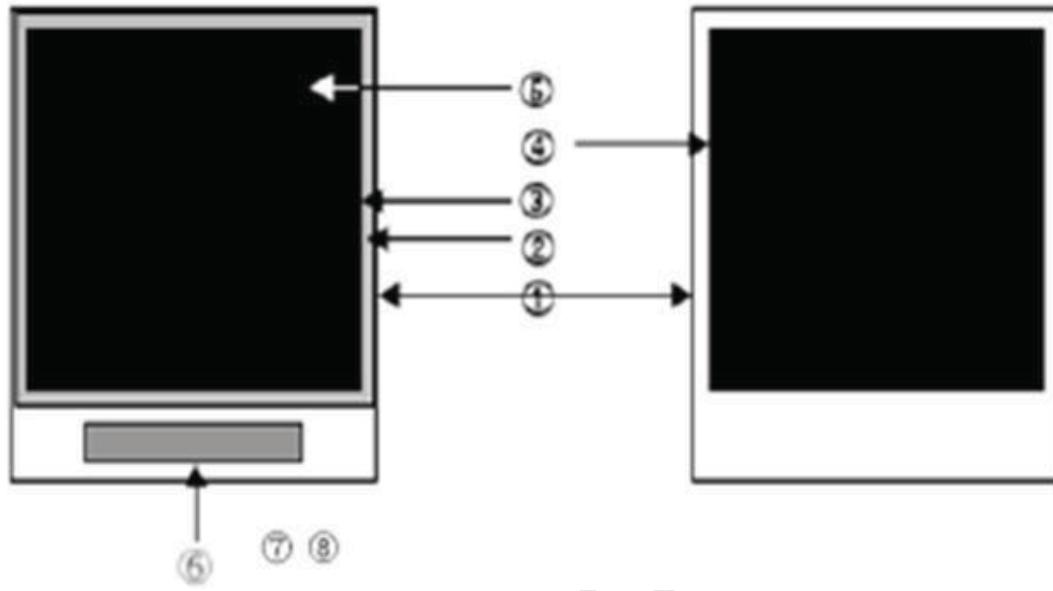
## ※ Attach Picture of Each Module Part

No.	Name	Part name	Maker	Amount
1	COG ass'y	6061L-3048A	LG Display <sup>1)</sup>	1
2	FPC ass'y	6841L-0432A 6841L-0432C	Newflex ACT	1
3	Touch Panel ass'y	6002L-0152A	LGIT	1
4	BLU ass'y	6091L-2716A	KJP (YANTAI) e-litecom (WUXI) Raygen (Waegwan)	1
5	Insulation Tape	7250L-4040A	Serveone	1
6	Gap Filling Tape	7250L-4044B	Serveone	1
7	2D Label	3850L-0214A	Serveone	1

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

## Product Specification

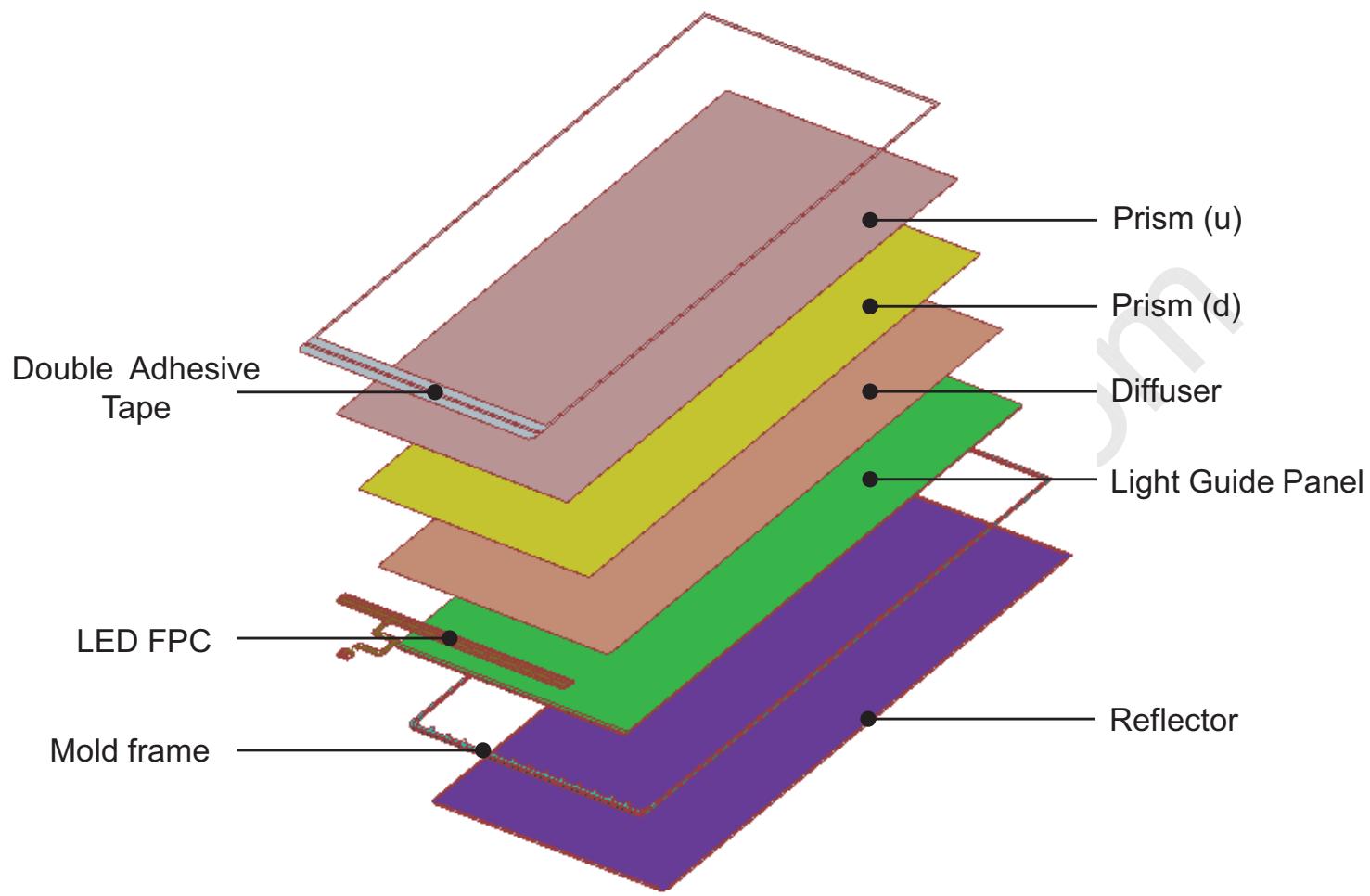
## 2.3. Panel Part List



No.	Name	Spec	Maker
1	TFT Glass	0.15T	Asahi
2	Color Filter Glass	0.15T	Asahi
3	Upper Polarizer	0-RT + H/C	LGC
4	Lower Polarizer	APFV4 + Diffuser 50%	LGC
5	Liquid Crystal	ML1104	Merck
6	Driver IC	LG4941, 32.52mm(H) × 1.07mm(V) × 0.2mm(D)	LGSIC
7	ACF(COG)	CP38931-17YA, 1.5mm	Dexterials
8	ACF(FOG)	CP5731, 1.0mm	Dexterials

## Product Specification

## 2.4. BLU &amp; Bezel Part List



No.	Part name	Material Maker P/N	Q'TY	Specification	Maker
1	Mold Frame	4974L-1530A	1	PC, LB1010W	KJP
2	Tape (Curtain, Double Adhesive, etc.)	7250L-4042A 7250L-4043A	1 1	5603BWN 5674E	NITTO NITTO
3	Diffuser	3022L-2643A	1	DLAS-25D	LMS
4	Prism (u)	3032L-2009A	1	TBEF2-GMv2	3M
5	Prism (d)	3032L-2010A	1	TBEF2-GT	3M
6	Reflector	3034L-1681A	1	ESR	3M
7	LGP	5150L-1144A	1	PC, Partial Wedge, T0.55 / 0.39	KJP
8	LED	6915L-0690A	14	NSSW306D	NICHIA
9	LED FPCB	6850L-1243A	1	PI + White C/L	U-TRONIX

## Product Specification

## 2.6. Optical Characteristic

Item	Symbol	Condition	Unit	Min.	Typ.	Max	Notes
Response Time	RT	25°C	ms	-	-	35	
Luminance	Bp	$\Theta = 0^\circ$	cd/m <sup>2</sup>	320	400	-	
Luminance uniformity	$\Delta L$	$\Theta = 0^\circ$	%	80	85	-	
Contrast Ratio	C/R	$\Theta = 0^\circ$		700	1,000	-	
Viewing Angle	Top	CR>10°	Degree	70	80	-	
	Bottom			70	80	-	
	Right			70	80	-	
	Left			70	80	-	
Color Coordination	Rx	$\Theta = 0^\circ$	NTSC (x,y)	0.615	0.640	0.665	1)
	Ry			0.305	0.330	0.355	1)
	Gx			0.275	0.300	0.325	1)
	Gy			0.590	0.615	0.640	1)
	Bx			0.125	0.150	0.175	1)
	By			0.035	0.060	0.085	1)
	Wx			0.276	0.301	0.326	1)
	Wy			0.293	0.318	0.343	1)
Color Gamut (CIE 1931)	sRGB	$\Theta = 0^\circ$	%	90	100	-	
Cross Talk	C/T	$\Theta = 0^\circ$	%	-	3	5	
Flicker	F/K	$\Theta = 0^\circ$	%	-	-	20	

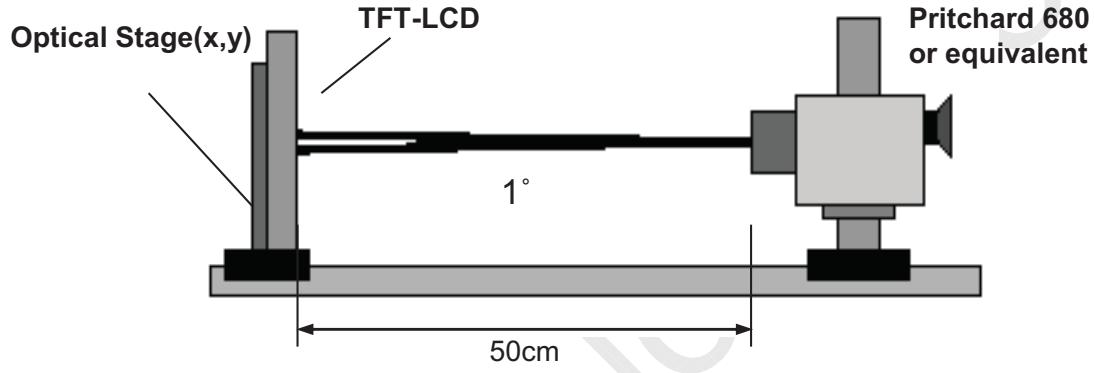
1) Measured value in  $\pm 0.025\text{--}0.030$ , LCD Modules require the separate discuss.

## 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 40mA.



**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;

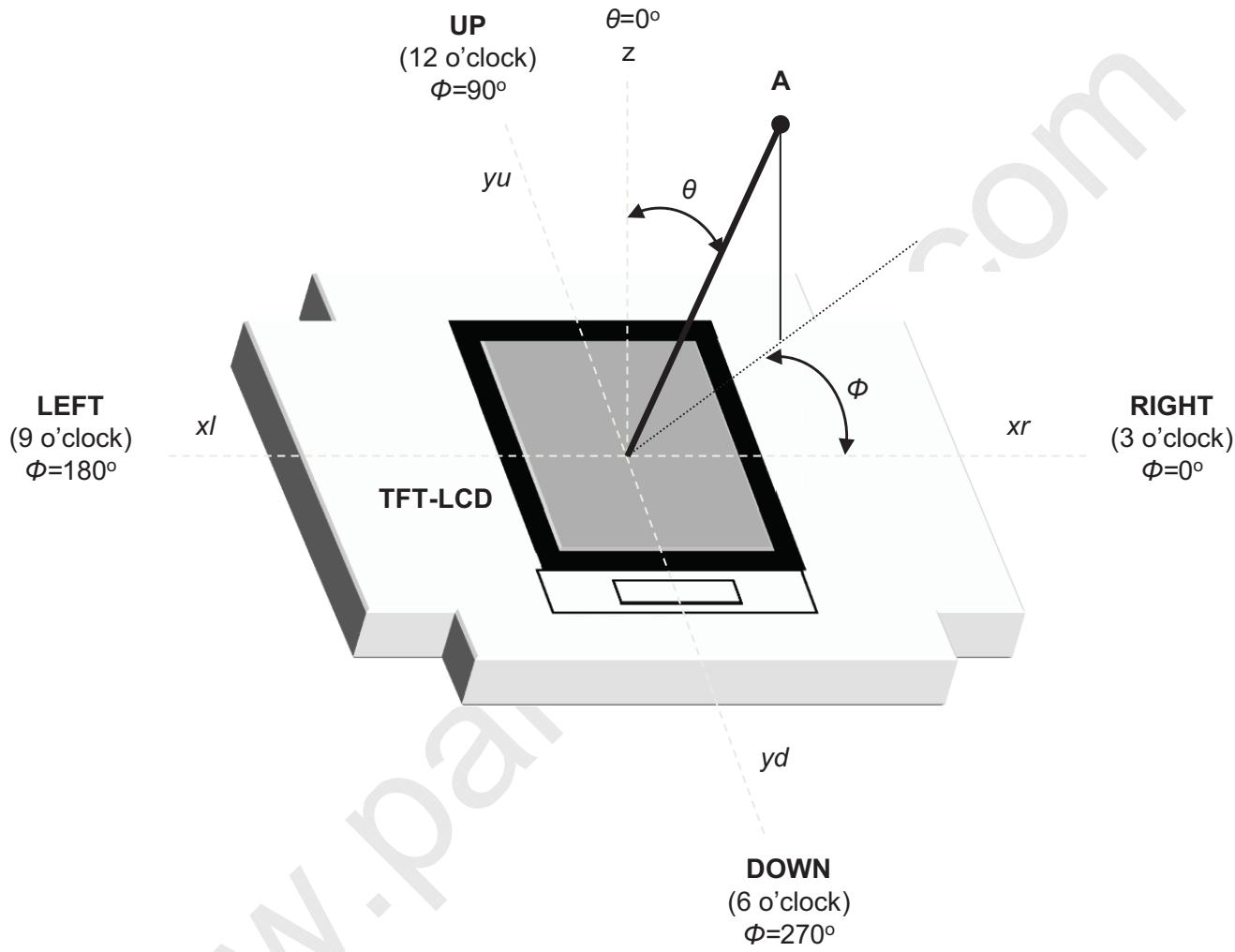


Fig 2-2. Viewing angle

[Note 3] Contrast Ratio

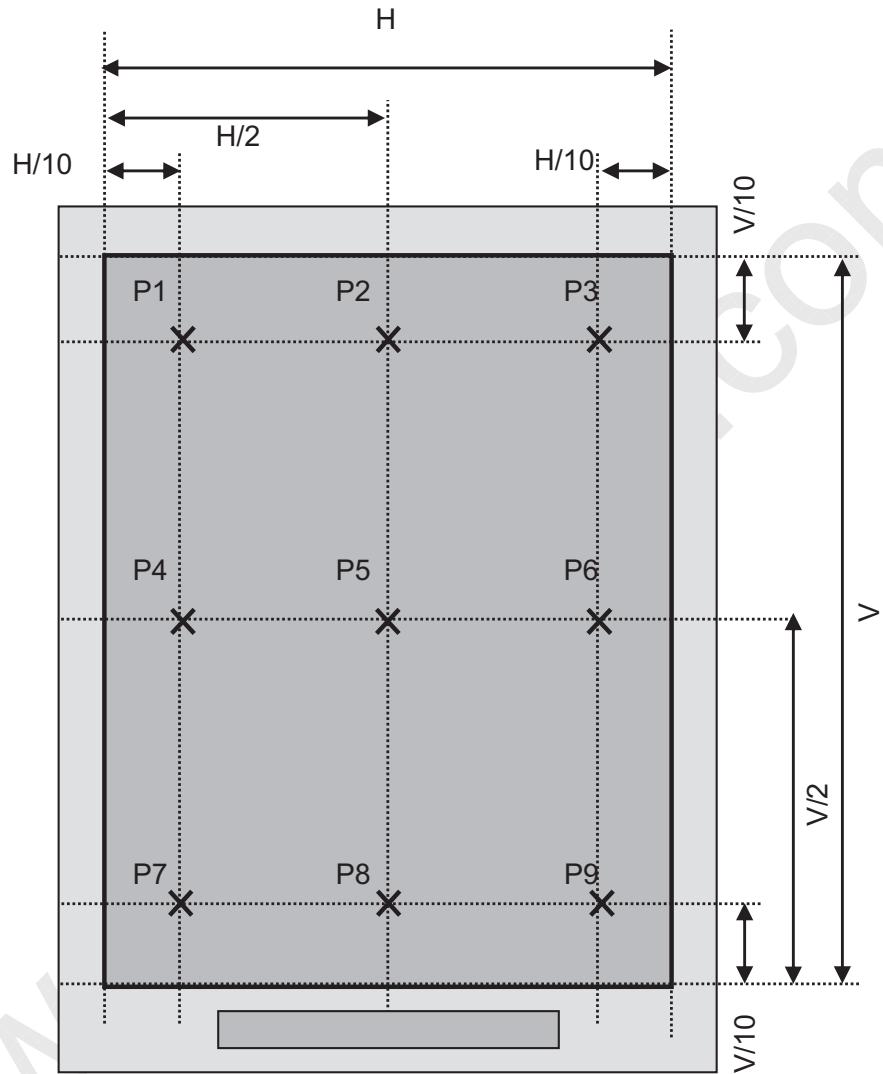
Contrast ratio is defined as follows;

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

## Product Specification

### [Note 4] Luminance & Color Coordination

The luminance & Color Coordination 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".

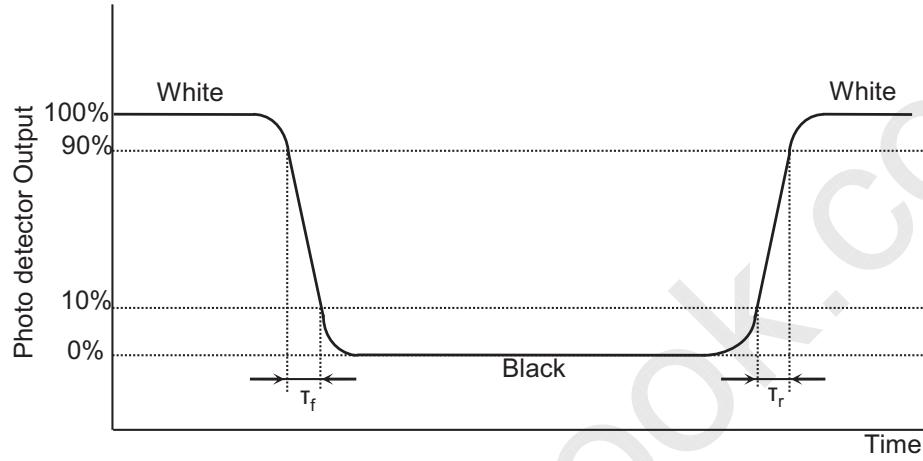
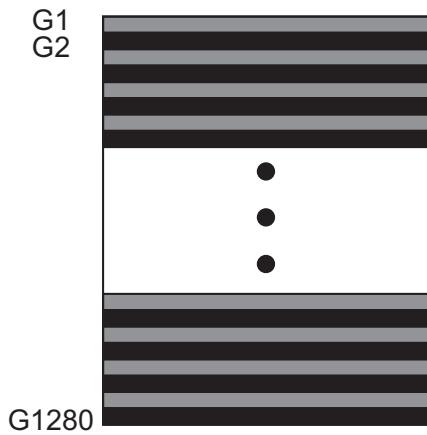


Fig 2-4. Response Time

## [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

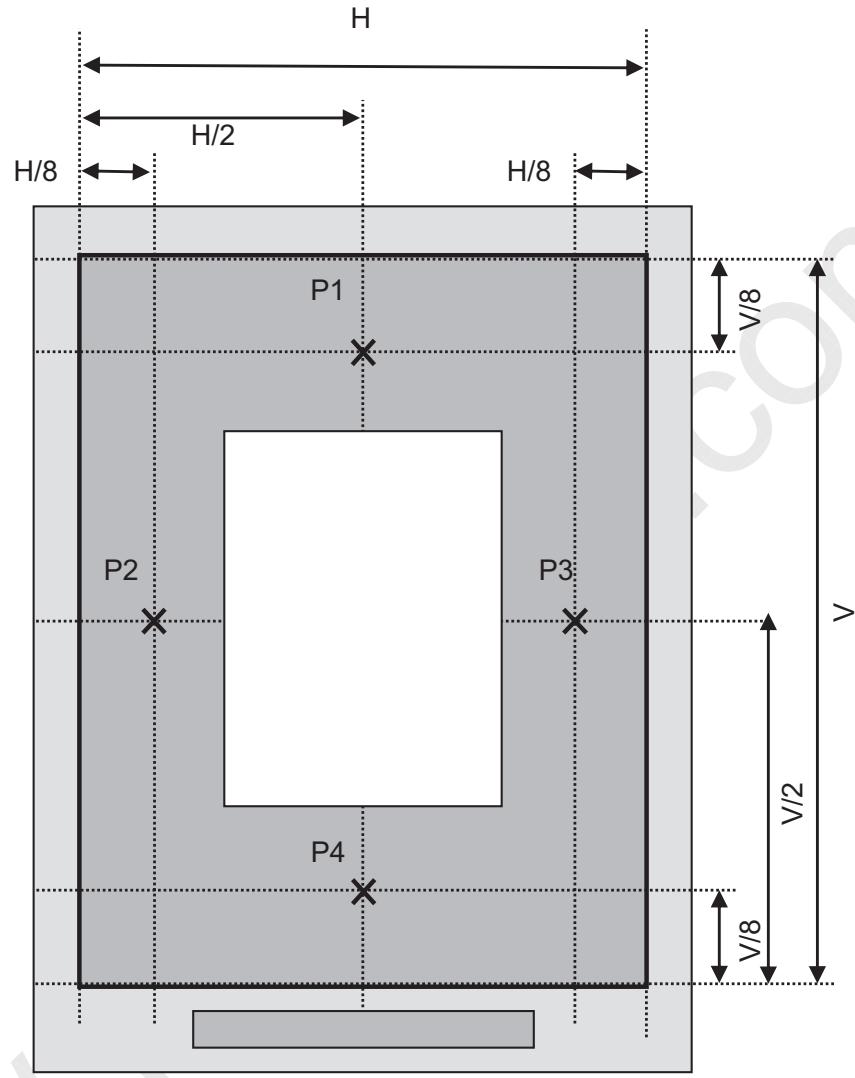


Fig 2-5. Crosstalk measurement points

A: Luminance for  $P1 \sim P4$  with all 127gray pixels

B: Luminance for  $P1 \sim P4$  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	DDVDH	4.5	5.5	6.0	V	
Power for Logic Circuit	DDVDL	-6.0	-5.5	-4.5	V	
Power for Interface Circuit	VDDI	1.65	1.8	1.95	V	
Storage Humidity	Hstg	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)

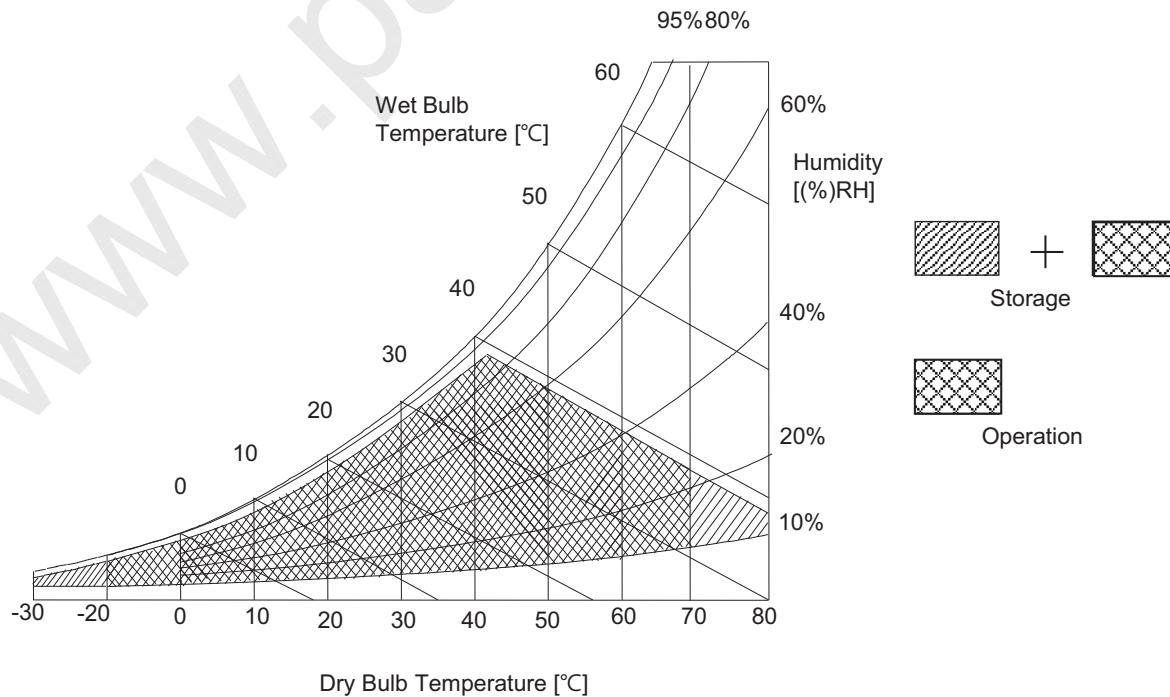
Note 1) Temp. ≤ 60°C , 90% RH MAX.

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

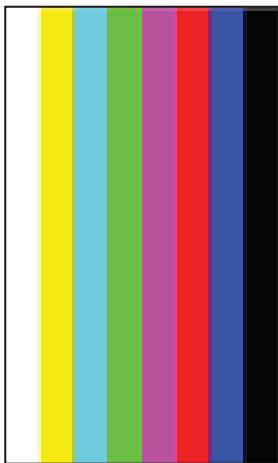
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power for Interface Circuit	VDDI	1.65	1.8	1.95	V	
Power for Positive Source	DDVDH	5.4	5.5	5.6	V	
Power for Negative Source	DDVDL	-5.4	-5.5	-5.6	V	
Power for BLU Driving	IBAT	-	20	-	mA	10LEDs serial
Logic Input High Voltage	VIH	$0.7 \times VDDI$	-	VDDI	V	
Logic Input Low Voltage	VIL	0	-	$0.3 \times IVDDI$	V	
Frame Frequency	Ff		60		Hz	
Current Consumption	Ivddi	-	53	73	mA	
	Iddvdh	-	14	20	mA	
	Iddvdl	-	14	20	mA	
	$I_{vddi-sleep}$	-	0.5	1.5	mA	
	Ibat	-	20	-	mA	20mA/LED
Power Consumption	Ivddi	-	95.4	131.4	mW	
	Iddvdh	-	77	110	mW	
	Iddvdl	-	77	110	mW	
	$I_{vddi-sleep}$	-	1	3	mW	
	Ibat	-	812	-	mW	20mA/LED

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

- VDDI : 1.8V, DDVDH : 5.5V, DDVDL : -5.5V, Column inversion, Ta 25°C

\*\* The Typ. current/power consumption is measured at the below 8Color Bar test pattern.

(Not applied D-IC Color Enhancement)

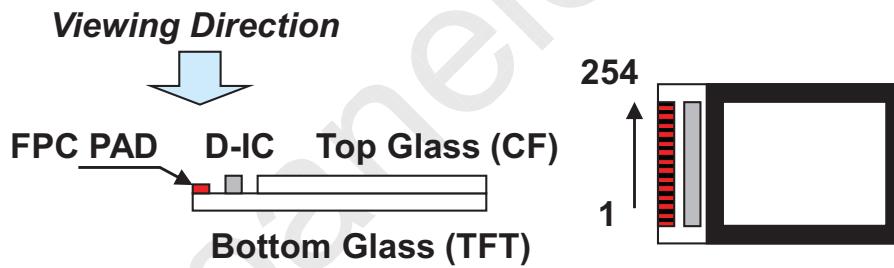


8Color Bar

## Product Specification

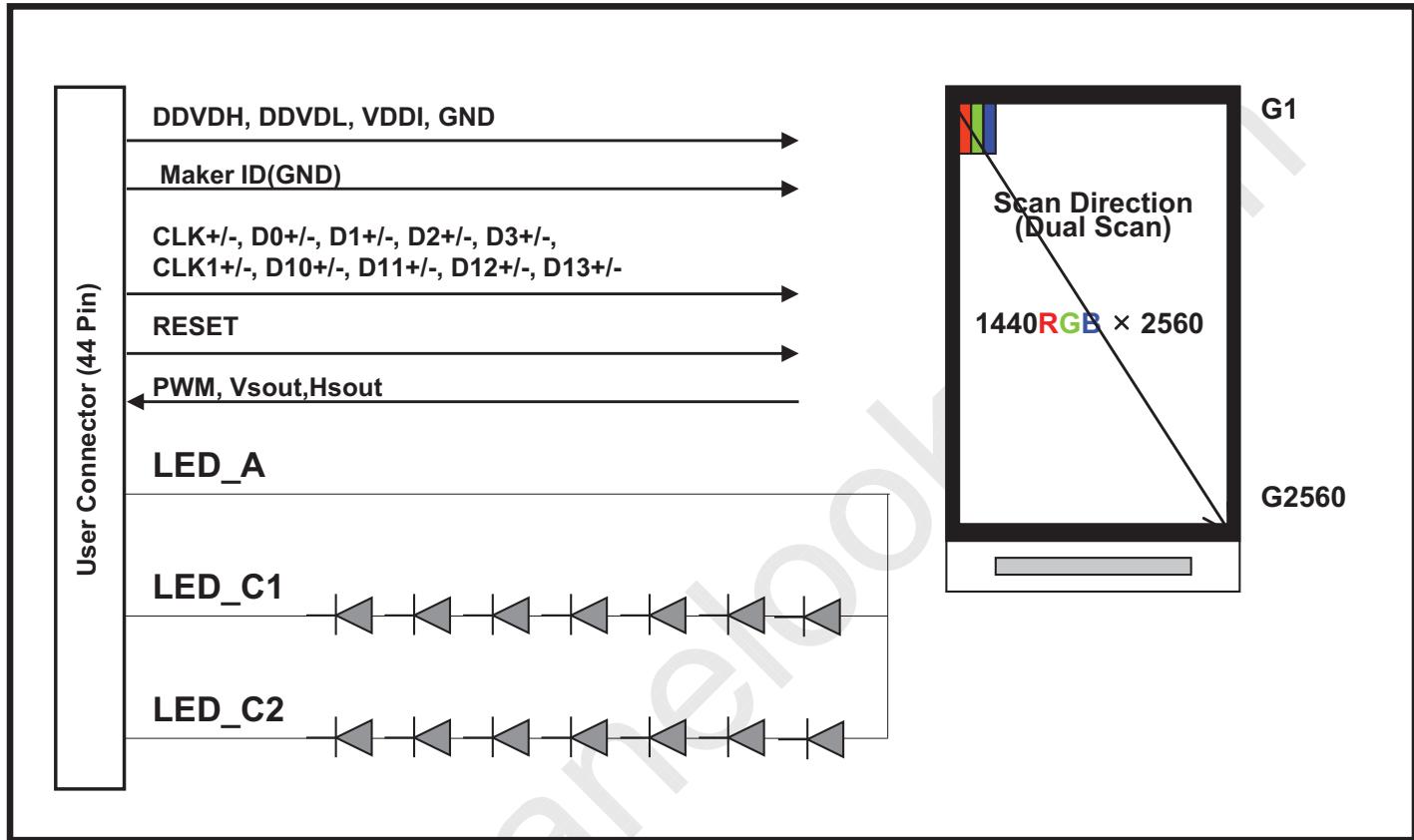
3.3. FPC PAD Pin Assignment (Panel) *continued*

No.	Symbol	Description	No.	Symbol	Description
245~247	VGLO	VGLO	252	DUMMY	NC
248~249	VGL	VGL	253	GROUND	GND
250	MUX2_TP	MUX2_TP	254	DUMMY	NC
251	MUX1_TP	MUX1_TP			



## Product Specification

## 3.5. Block Diagram



## Product Specification

## 3.6. Backlight Unit

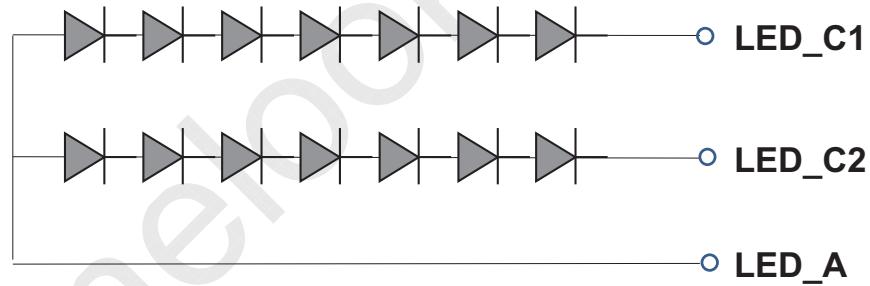
Item	Symbol	Min.	Typ.	Max.	Units
Surface Luminance	B	11800	13400	-	cd/m <sup>2</sup>
Surface Brightness Uniformity	B <sub>9</sub>	80	85	-	%
LED Voltage	V <sub>f</sub>	2.6	2.9	3.2	V (per LED)
LED Current	I <sub>f</sub>	-	20	-	mA (per LED)

## Note 1)

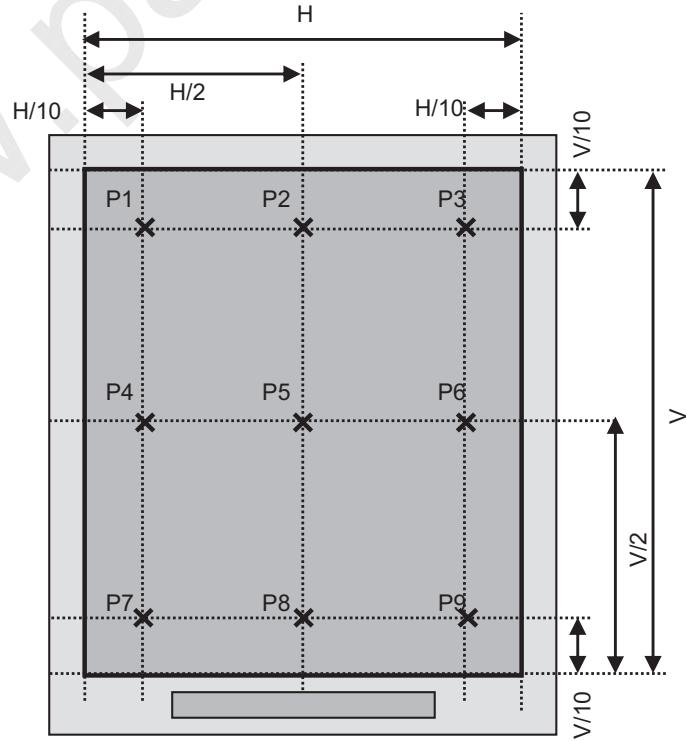
LED Maker : Nichia

LED Part name : NSSW306D

IF=40mA



## Note 2) Uniformity measure condition



## Product Specification

## 3.7. LED Specification

## 1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	$I_F$	35	mA
Pulse Forward Current	$I_{FP}$	100	mA
Reverse Voltage	$V_R$	5	V
Power Dissipation	$P_D$	112	mW
Operating Temperature	$T_{opr}$	-30~85	°C
Storage Temperature	$T_{stg}$	-40~100	°C
Junction Temperature	$T_J$	105	°C

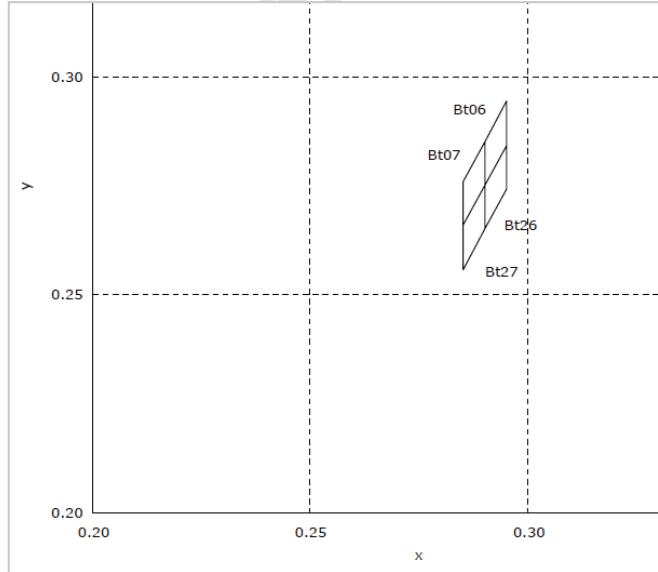
\* Absolute Maximum Ratings at  $T_A=25^{\circ}\text{C}$ .

\*  $I_{FP}$  conditions with pulse width  $\leq 10\text{ms}$  and duty cycle  $\leq 10\%$ .

## 2) Initial Electrical/Optical Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	$V_{F1}$	$I_F = 20\text{mA}$	2.6	-	3.2	V
Reverse Current	$I_R$	$V_R = 5\text{V}$	-	-	50	uA
Luminous Flux	$I_V$	$I_F = 20\text{mA}$	8.25	-	8.75	lm

## 3) Color Rank



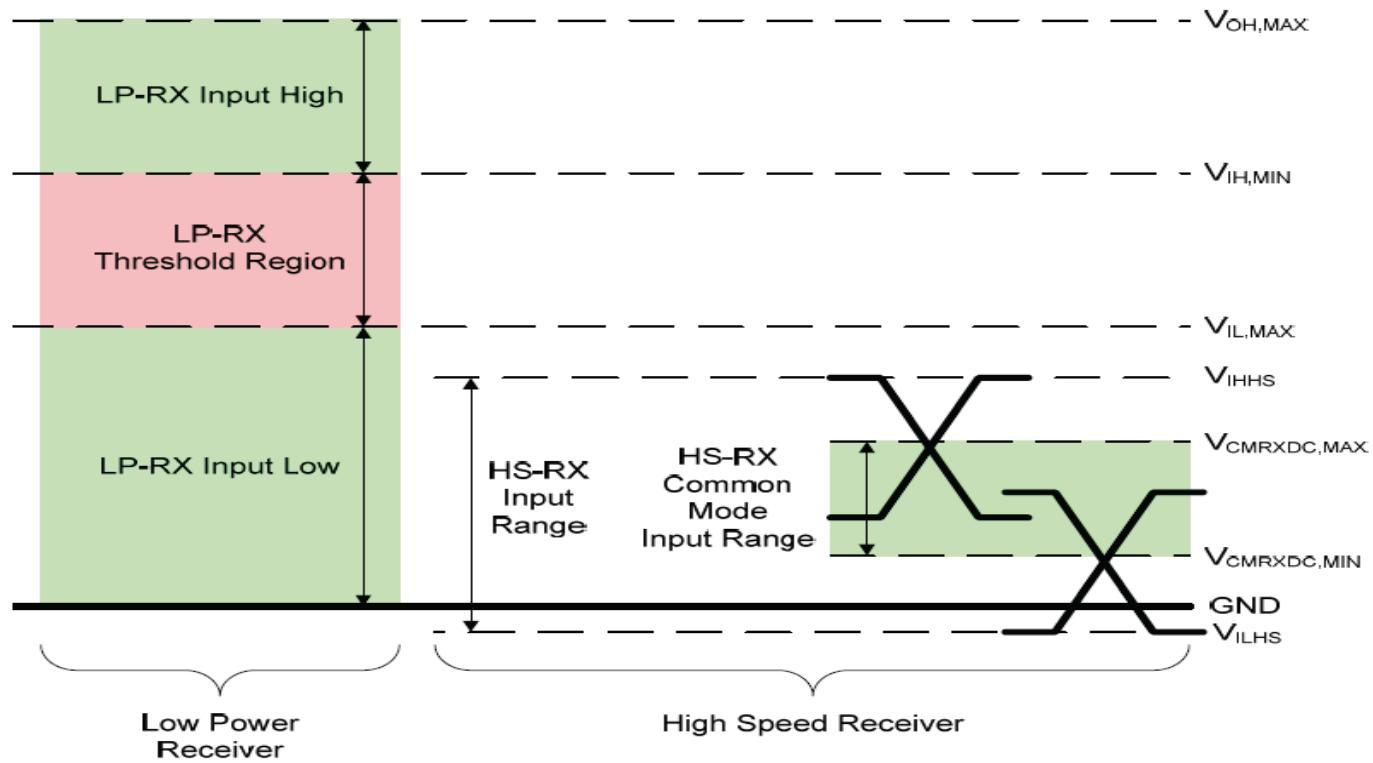
## Product Specification

### 3.8. Timing Characteristics

#### 3.8.1. DC Characteristics of MIPI HS Receiver

Parameter	Description	Min	Nom	Max	Units	Notes
$V_{CMRX(DC)}$	Common-mode voltage HS receive mode	70		330	mV	
$V_{IDTH}$	Differential input high threshold			70	mV	
$V_{IDTL}$	Differential input low threshold	-70			mV	
$V_{IHHS}$	Single-ended input high voltage			460	mV	
$V_{ILHS}$	Single-ended input low voltage	-40			mV	
$V_{TERM-EN}$	Single-ended threshold for HS termination enable			450	mV	
$Z_{ID}$	Differential input impedance	80	100	125	ohm	

Fig. 3.8.1. Signaling Voltage Levels



## Product Specification

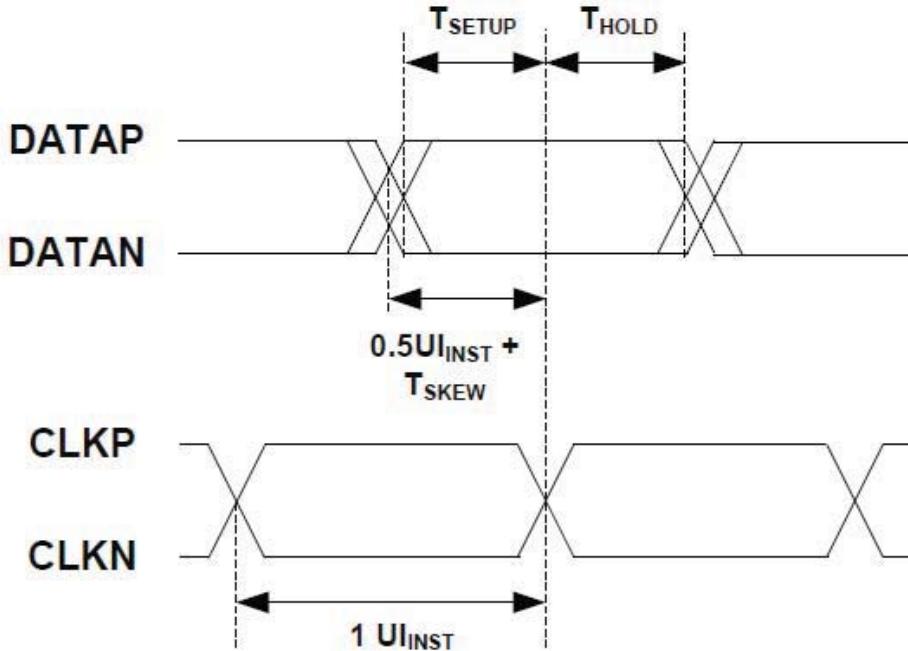
## 3.8.2. AC Characteristics of MIPI HS Receiver

Parameter	Description	Min	Nom	Max	Units	Notes
UI <sub>INST</sub>	Data Rate (UI instantaneous)	1.25		12.5	ns	
T <sub>SETUP</sub>	Data to Clock Setup Time	0.15			UI <sub>INST</sub>	1
T <sub>HOLD</sub>	Clock to Data Hold Time	0.15			UI <sub>INST</sub>	1
T <sub>SKW</sub>	Data to Clock Skew	-0.15		0.15	UI <sub>INST</sub>	

Notes:

1. Total setup and hold window for receiver of  $0.3 * UI_{INST}$

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



## Product Specification

## 3.8.3. DC Characteristics of MIPI LP Receiver

Parameter	Description	Min	Nom	Max	Unit	Notes
$V_{IH}$	Logic 1 input voltage	880			mV	
$V_{IL}$	Logic 0 input voltage			550	mV	
$V_{IL-ULPS}$	Logic 0 input voltage, ULP State			300	mV	
$V_{HYST}$	Input Hysteresis	25			mV	

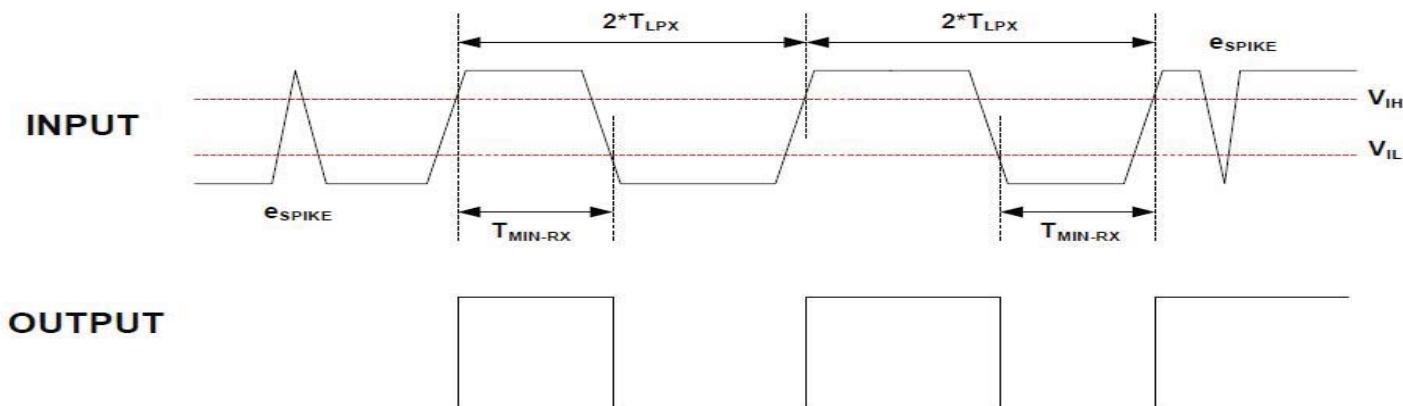
## 3.8.4. AC Characteristics of MIPI LP Receiver

Parameter	Description	Min	Nom	Max	Unit	Notes
$e_{SPIKE}$	Input pulse rejection			300	Vp-s	1, 2
$T_{MIN-RX}$	Minimum pulse width response	20			ns	3
$V_{INT}$	Peak interference amplitude			200	mV	
$f_{INT}$	Interference frequency	450			MHz	

Notes:

1. Time-voltage integration of a spike above  $V_{IL}$  when being in LP-0 state or below  $V_{IH}$  when being in LP-1 state.
2. An impulse less than this will not change the receiver state.
3. An input pulse greater than this shall toggle the output.

Fig. 3.8.3. AC Timing Waveform for LP Mode MIPI Operation



## Product Specification

## 3.8.5. DC Characteristics of MIPI LP Transmitter

Parameter	Description	Min	Nom	Max	Unit	Notes
$V_{OH}$	Thevenin output high level	1.1	1.2	1.3	V	
$V_{OL}$	Thevenin output low level	-50		50	mV	
$Z_{OLP}$	Output impedance of LP transmitter	110			ohm	1

Notes:

1. Though no maximum value for  $Z_{OLP}$  is specified, the LP transmitter output impedance shall ensure the  $T_{RLP}/T_{FLP}$  specification is met.

## 3.8.6. AC Characteristics of MIPI LP Transmitter

Parameter	Description		Min	Nom	Max	Units	Notes
$T_{RLP}/T_{FLP}$	15%-85% rise time and fall time				25	ns	1
$T_{REOT}$	Thevenin output low level				35	ns	1, 5, 6
$T_{LP-PULSE-TX}$	Pulse width of the LP exclusive-OR clock	First LP exclusive-OR clock pulse after Stop state or last pulse before Stop state	40			ns	4
		All other pulses	20			ns	4
$T_{LP-PER-TX}$	Period of the LP exclusive-OR clock		90			ns	
$\delta V/\delta t_{SR}$	Slew rate @ $C_{LOAD} = 0\text{pF}$		30		500	mV/ns	1, 2, 3
	Slew rate @ $C_{LOAD} = 5\text{pF}$		30		200	mV/ns	1, 2, 3
	Slew rate @ $C_{LOAD} = 20\text{pF}$		30		150	mV/ns	1, 2, 3
	Slew rate @ $C_{LOAD} = 70\text{pF}$		30		100	mV/ns	1, 2, 3
$C_{LOAD}$	Load capacitance		0		70	pF	1

Notes:

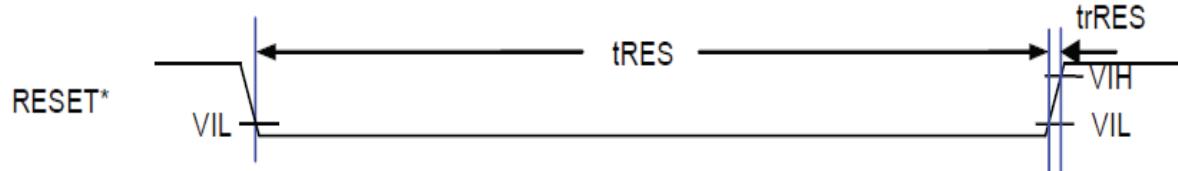
1.  $C_{LOAD}$  includes the low-frequency equivalent transmission line capacitance. The capacitance of TX and RX are assumed to always be  $<10\text{pF}$ . The distributed line capacitance can be up to  $50\text{pF}$  for a transmission line with 2ns delay.
2. When the output voltage is between 15% and below 85% of the fully settled LP signal levels.
3. Measured as average across any 50 mV segment of the output signal transition.
4. This parameter value can be lower than  $T_{LPX}$  due to differences in rise vs. fall signal slopes and trip levels and mismatches between Dp and Dn LP transmitters.
5. The rise-time of  $T_{REOT}$  starts from the HS common-level at the moment the differential amplitude drops below 70mV, due to stopping the differential drive.
6. With an additional load capacitance  $C_{CM}$  between 0-60pF on the termination center tap at RX side of the Lane

## Product Specification

## 3.8.7. Reset Timing Characteristics

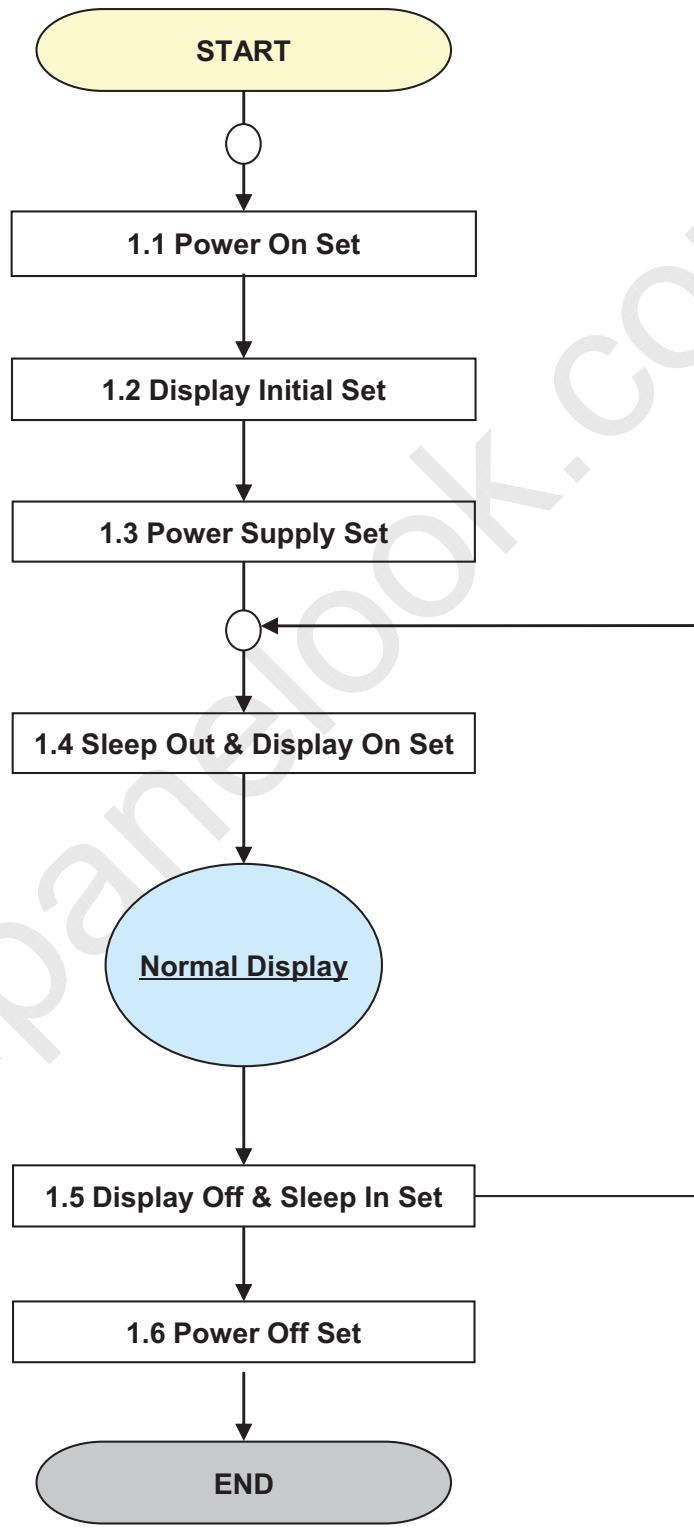
Item	Symbol	Unit	Min	Typ	Max
Reset "Low" level width	tRES	ms	1		
Reset rise time	trRES	μs			10

Fig. 3.7.4. Reset operation



## Product Specification

## 2. Operation Flow Chart



## Product Specification

Table 2.7. *continued*

		Host to RSP LCD driver Data Type (RX)									
DCS Command/Parameter		W/R	Write Type						Read Type		
		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 -	Generic 1 para	Generic 2 para	DCS no para
34h	set_tear_off	C	Yes	No	Yes	No	No	No	No	No	No
35h	set_tear_on	1	No	Yes	Yes	No	No	No	No	No	No
36h	set_address_mode	1	No	Yes	Yes	No	No	No	No	No	No
3Ah	set_pixel_format	1	No	Yes	Yes	No	No	No	No	No	No
44h	set_tear_scanline	2	No	Yes	Yes	No	No	No	No	No	No
51h	write_display_brightness	2	No	Yes	Yes	No	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 2.8. MCS Data Type List

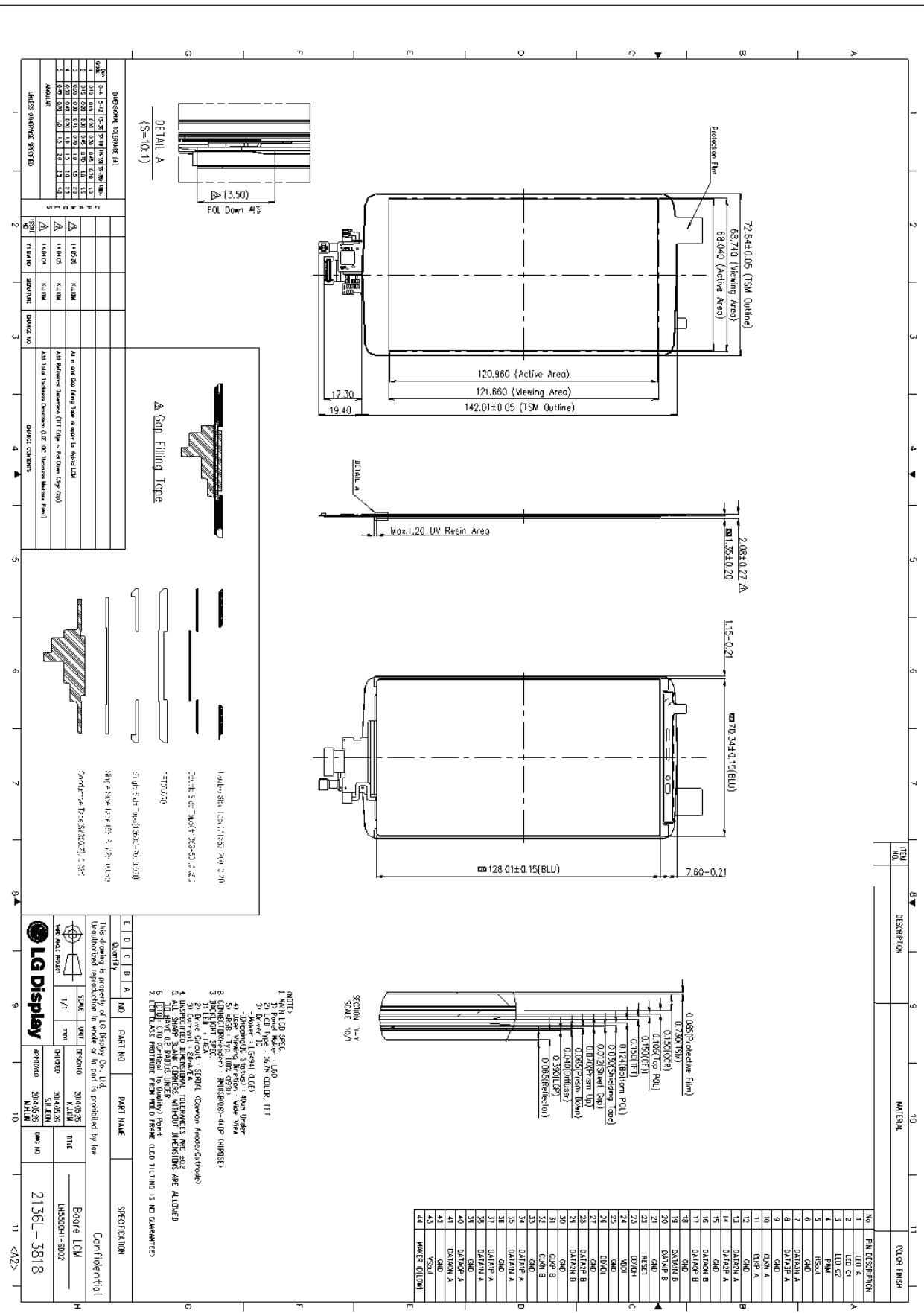
		Host to RSP LCD driver Data Type (RX)									
MCS Command/Parameter	W/R	Write Type						Read Type			Other
	Data Type	05'h	15'h	39'h	13'h	23'h	29'h	14'h	24'h	06'h	37'h
	Packet	Short	Short	Long	Short	Short	Long	Short	Short	Short	Short
	MCS para	DCS no para	DCS 1 para	DCS	Generic 1 para	Generic 2 para	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

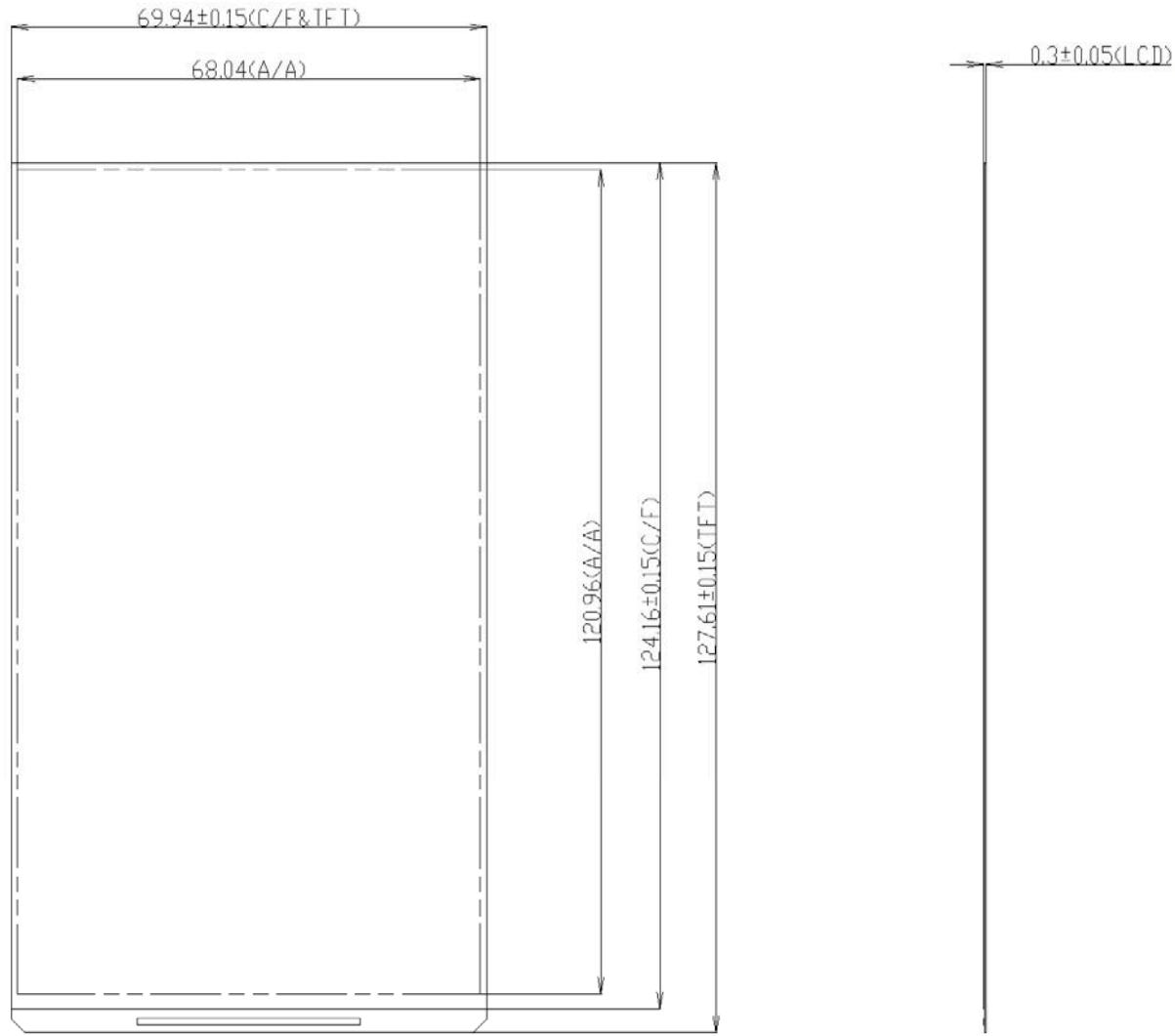
## 4.1 Module Layout



## Product Specification

## 4.2. Panel Layout

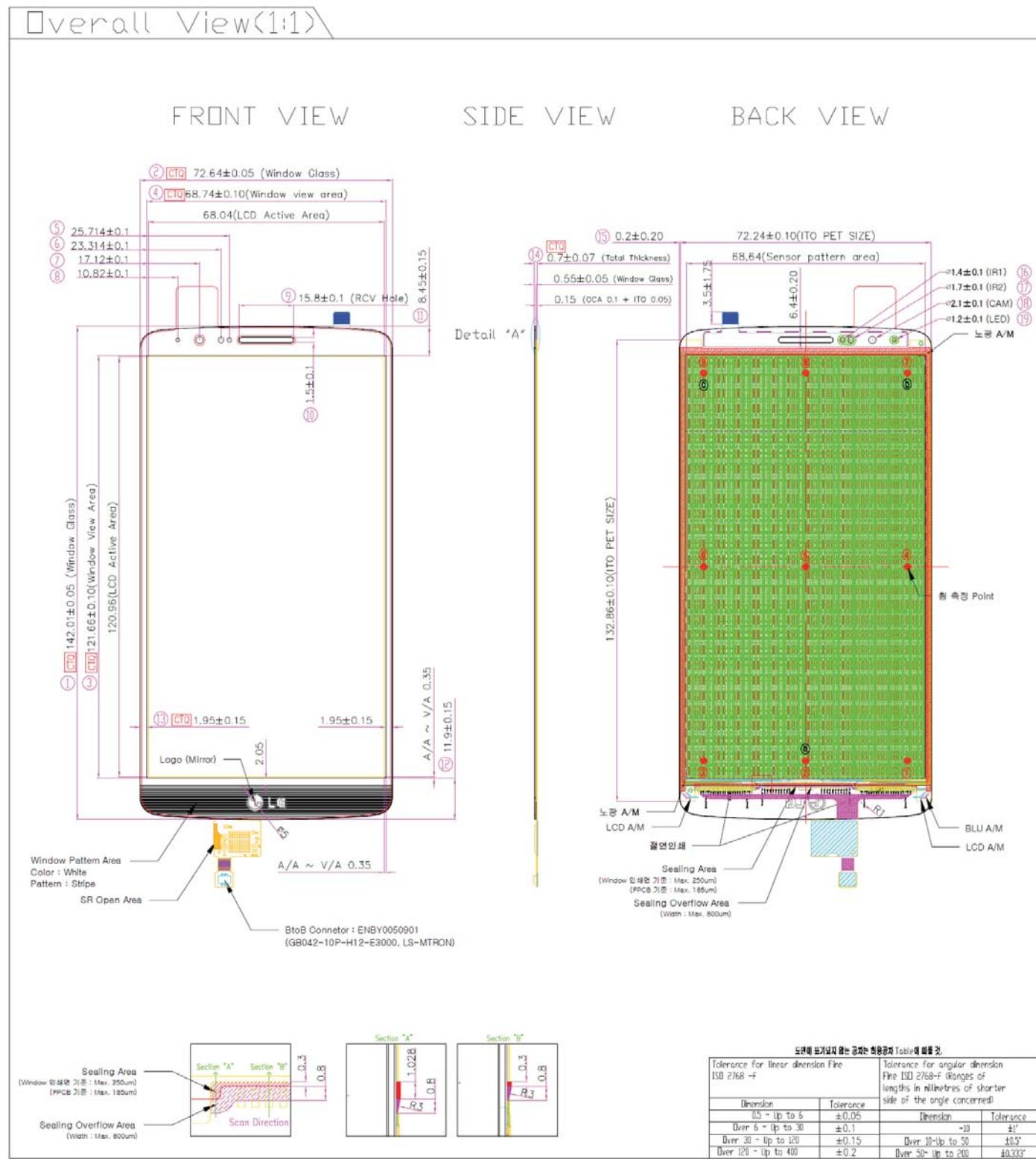
## 4.2.1 Main Panel



## Product Specification

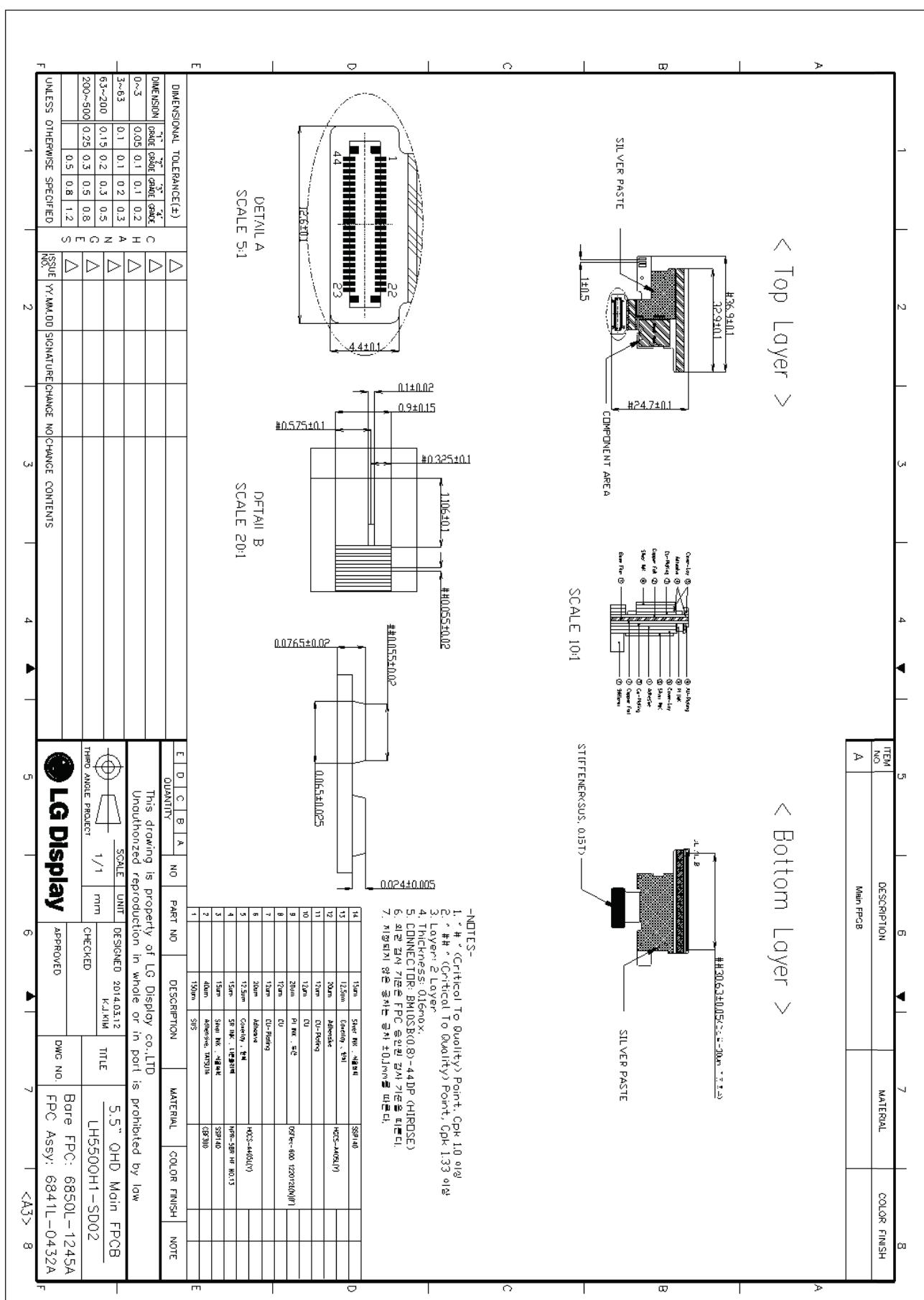
## 4.2. Panel Layout

## 4.2.2 TSP



## Product Specification

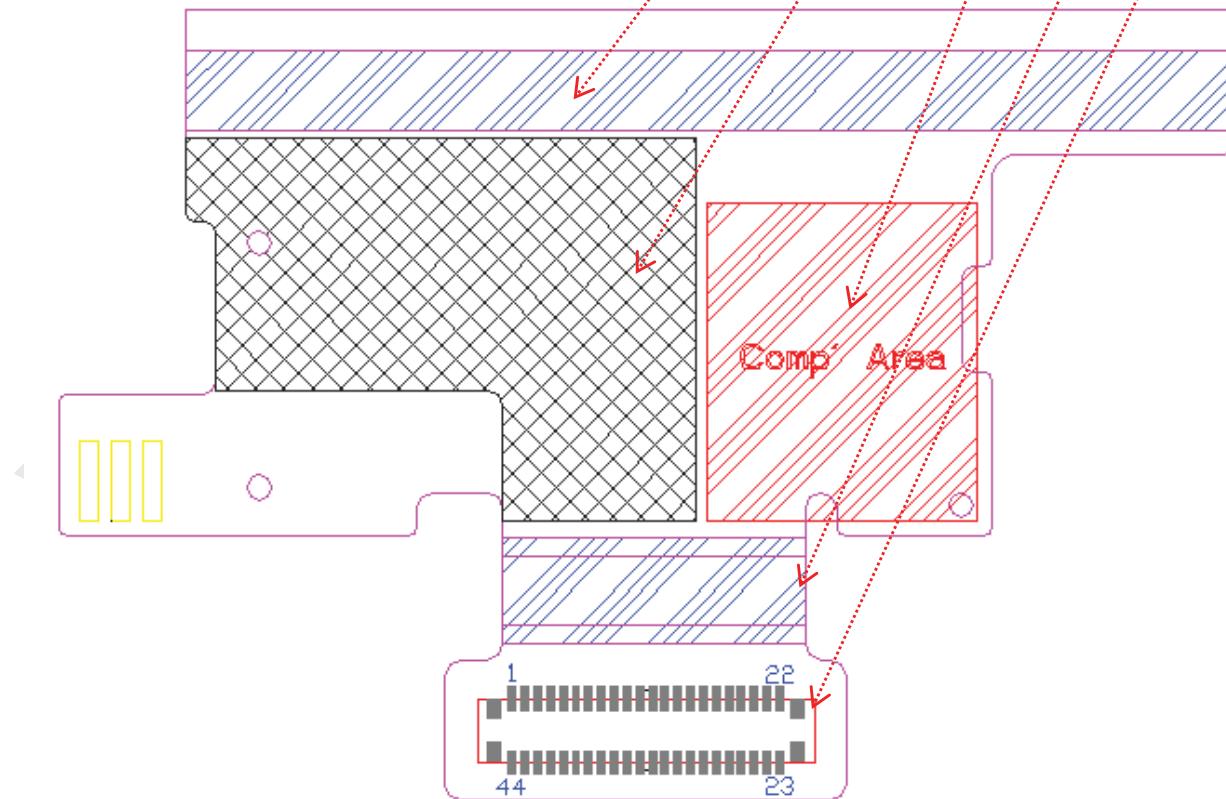
## 4.3. FPCB Layout



## Product Specification

## 4.3. FPCB Layout

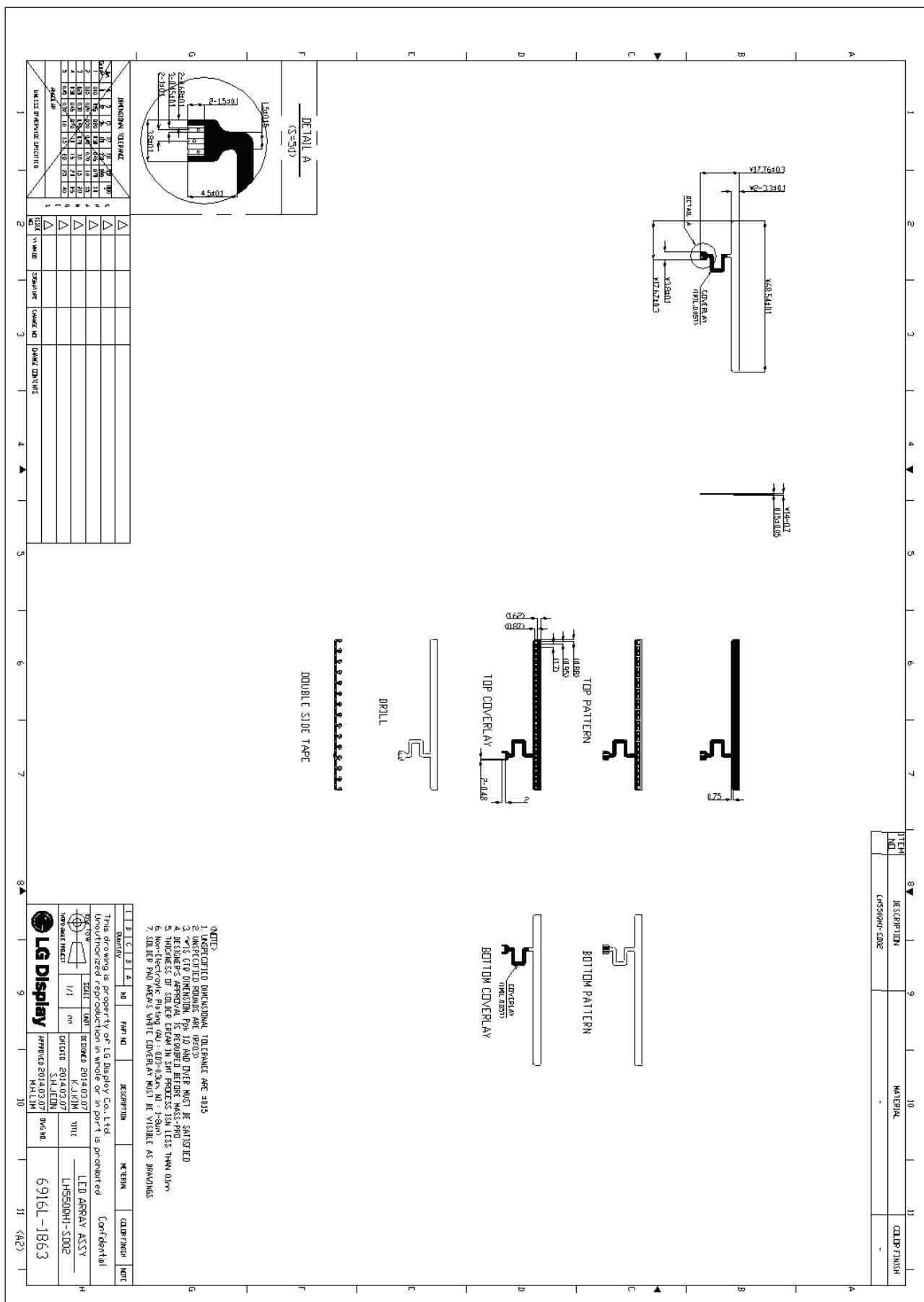
			기준	FPCB(1)	FPCB(2)	FPCB(3)	FPCB(4)	FPCB(5)	FPCB(6)
SILVERINK	-	[서울화학]SSP140	15			15		15	
COVERLAY	PI	[한화] 0.5MIL, AD : 20μm	12.5	12.5		12.5	12.5		12.5
	AD	자재명 : HGCS-A405L(Y)	20	20		20	20		20
동도금	CU-PLAT	표면두께 : 12μm (HOLE속 MIN 10μm 관리)	12			12	12		12
	CU		12			12	12		12
BASE	PI	[두산] 0.8MIL 1/3 / 1/3 oz ED 자재명 : DSFlex-600 122012E (P)(M)	20	20	20	20	20	20	20
	CU		12	12	12	12	12	12	12
동도금	CU-PLAT	표면두께 : 12μm (HOLE속 MIN 10μm 관리)	12	12	12	12	12	12	12
COVERLAY	AD	자재명 : HGCS-A405L(Y)	20			20	20	20	20
	PI	[한화] 0.5MIL, AD : 20μm	12.5			12.5	12.5	12.5	12.5
SR	INK	[니즈플라텍] NPR-5BR HF No.13, (두께 : 15±5μm)	15		15				
SILVERINK	-	[서울화학]SSP140	15			15	15	15	
BOND-S	AD	[TATSUTA] CBF300	40						40
SUS	-	0.15T SUS(Scratch)	150						150
TOTAL									
76.5 59 163 148 106.5 323									

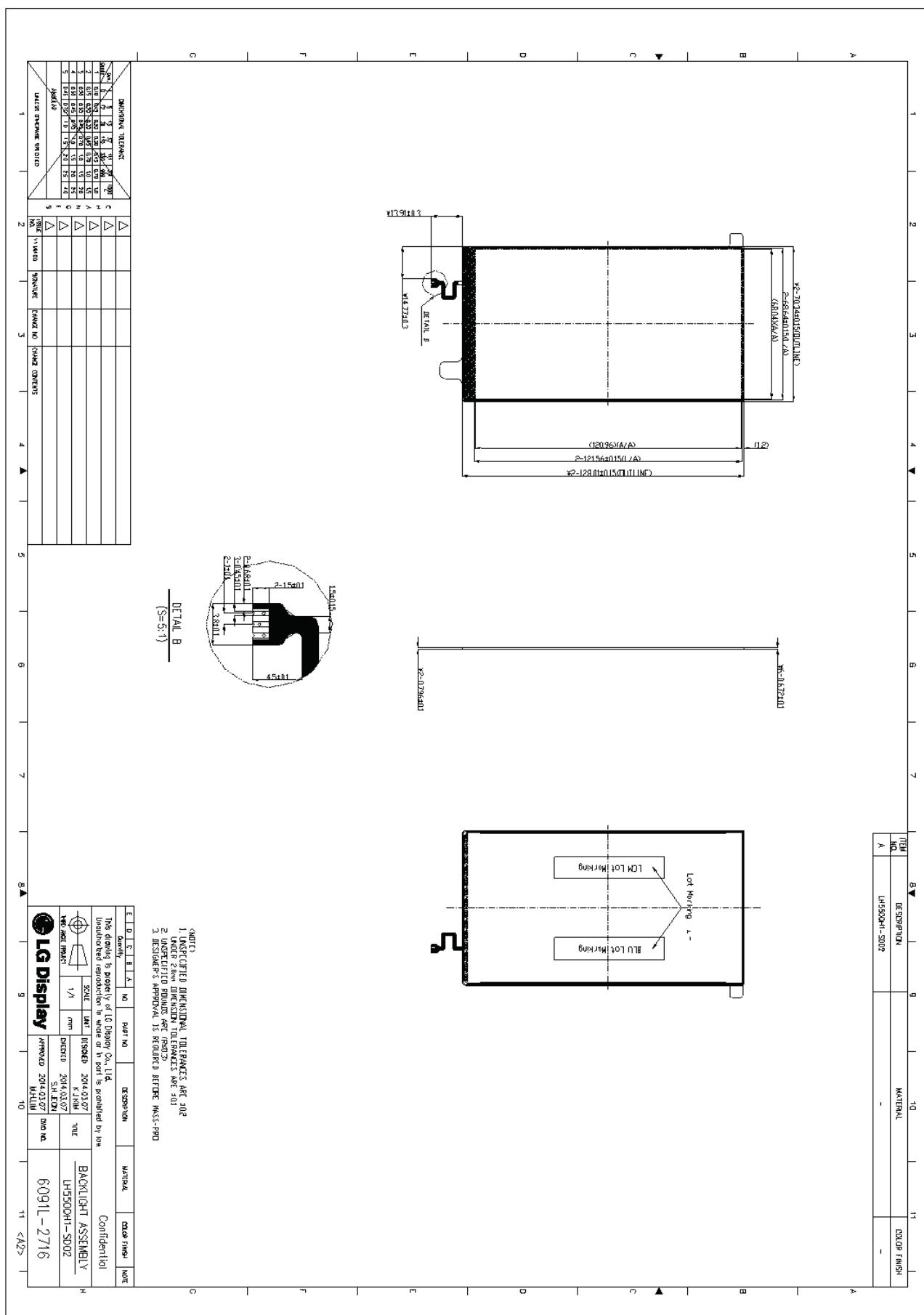




## Product Specification

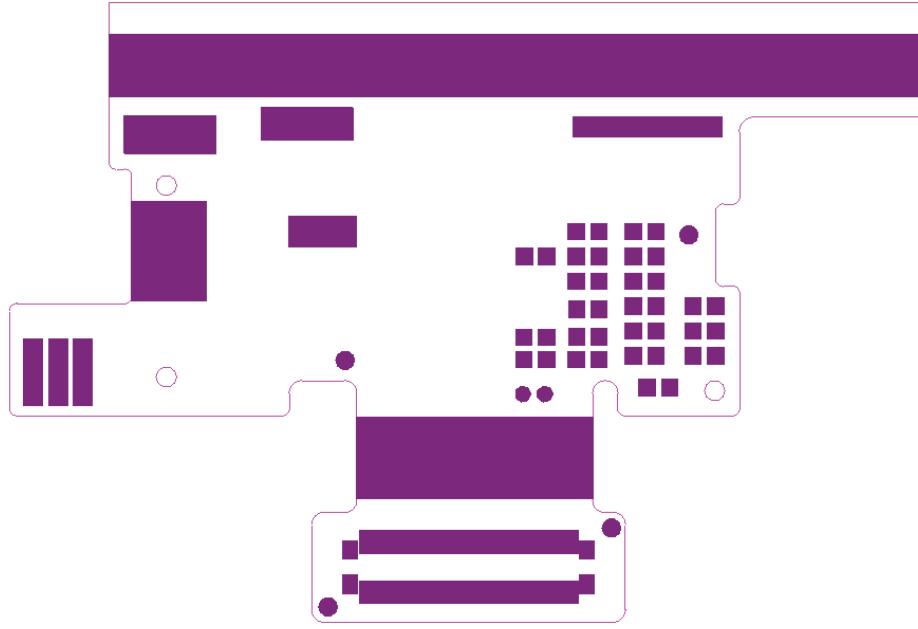
## 4.4. LED FPCB Layout



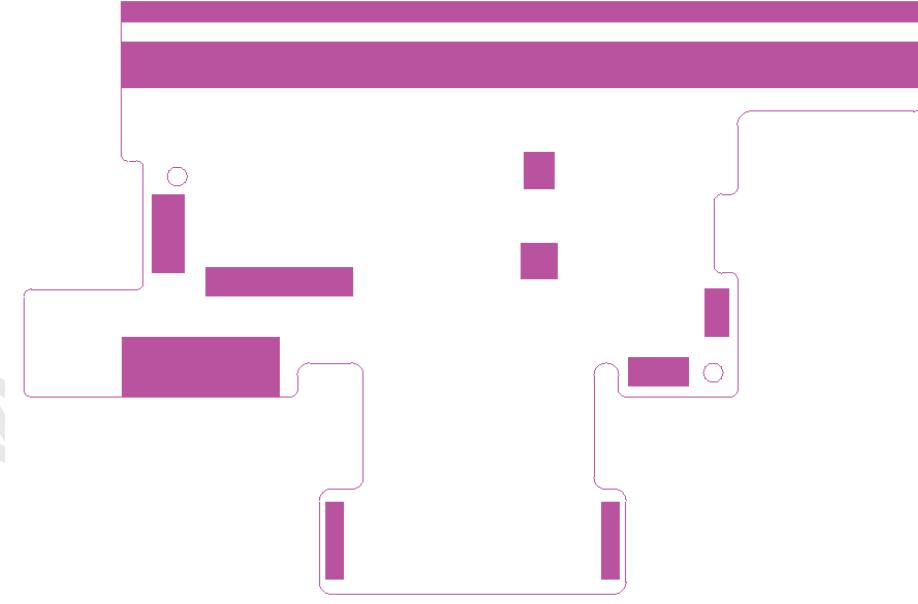
**Product Specification****4.5. BLU Layout**

## Product Specification

## 4.7. Gerber Data



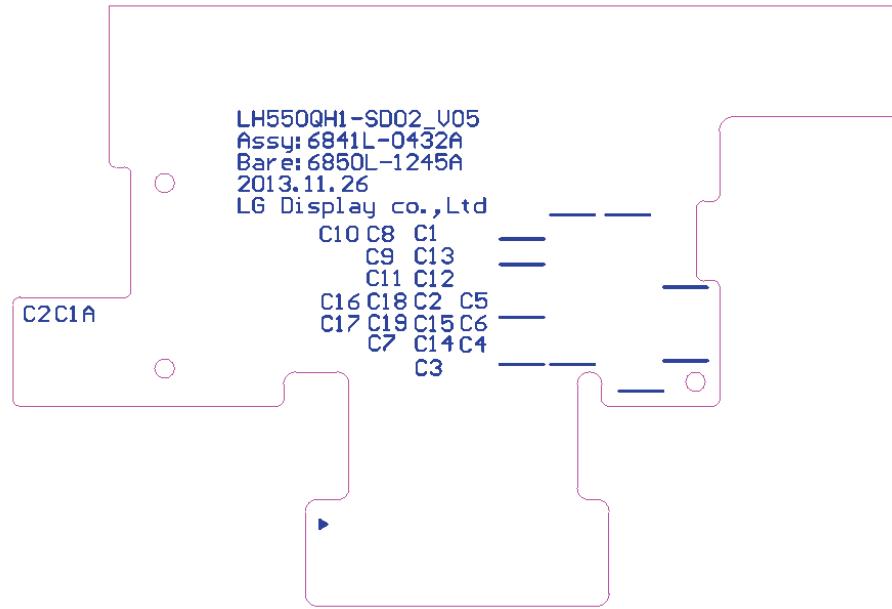
&lt; Top\_Coverlay open &gt;



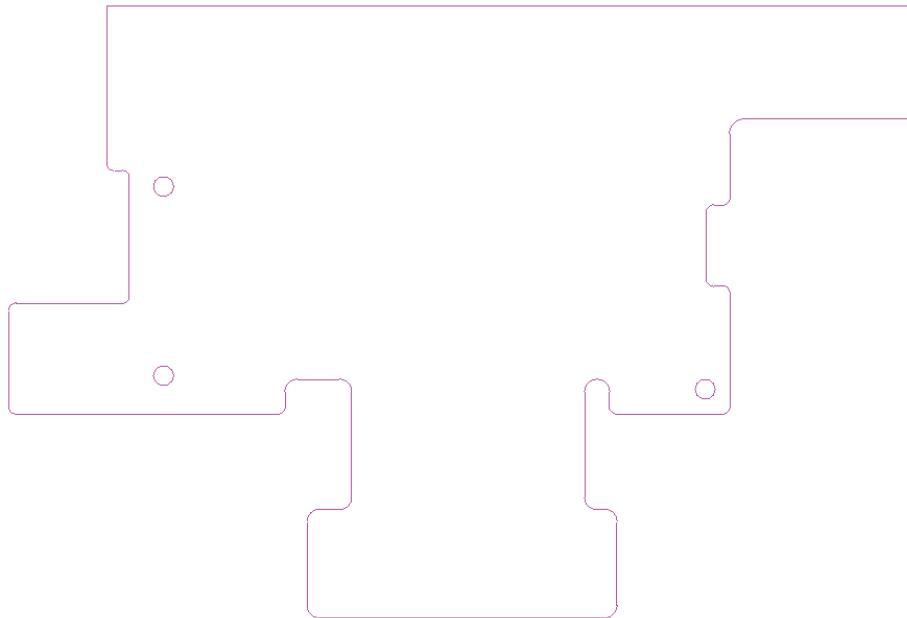
&lt; Bottom\_Coverlay open &gt;

## Product Specification

## 4.7. Gerber Data



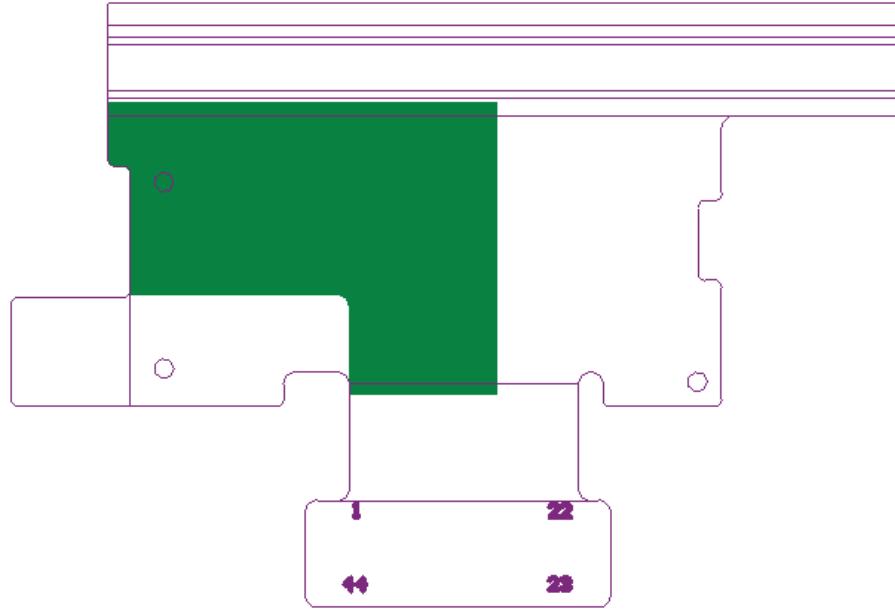
&lt; Top\_Silkscreen &gt;



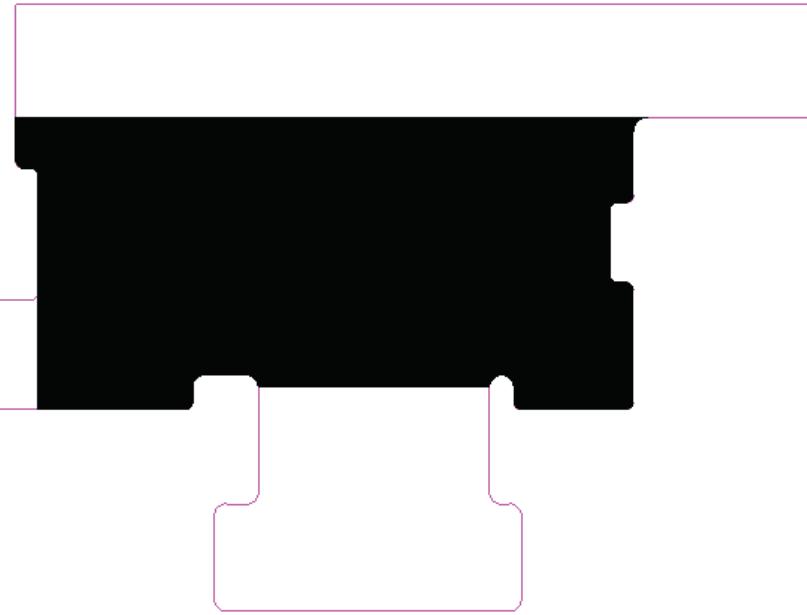
&lt; Bottom\_Silkscreen &gt;

## Product Specification

## 4.7. Gerber Data



&lt; Top\_Silver Paste &gt;



&lt; Bottom\_Silver Paste &gt;

## Product Specification

## 5. Incoming Inspection Specification

## 5.1. Hybrid LCD Specification



※ A면과 AA면의 외관 spec.은 별도의 영역으로 판정함

## Product Specification

## 5. Incoming Inspection Specification

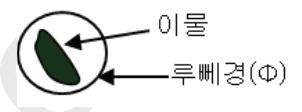
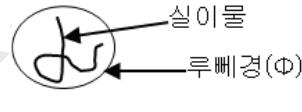
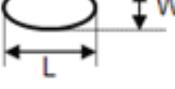
## 5.1. Hybrid LCD Specification

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 (Panel pixel dot defect) (Minor)	Spec.	Permissible Qty	<p>1: If blue sub-pixel number is 1 or 2ea, it is OK. But if 2ea in diameter 20mm, it is NG.</p> <p>2. If particle bright dot size is under 0.2mm, 2ea is OK. But if 2ea in diameter 20mm, it is NG.</p>
		Bright Point	0	
		Dark Point	2	

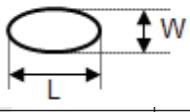
## Product Specification

## 5. Incoming Inspection Specification

## 5.1. Hybrid LCD Specification

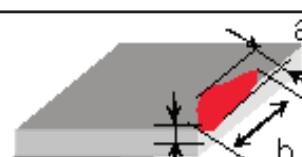
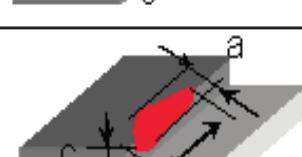
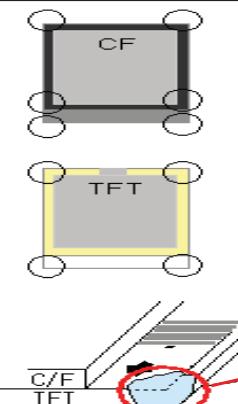
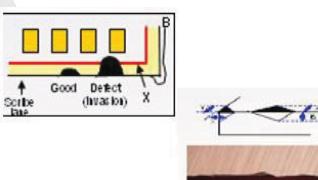
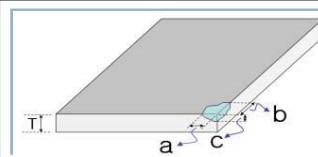
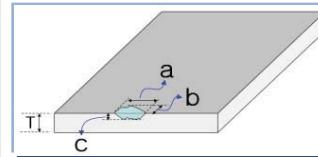
No	Defect	Criteria	Remark
5	흑점 백점 이물 실이물 (Complex Type)	<p>V/A 영역 내 (AA영역)</p> <p>1) 14년 5~6월            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.20\text{mm}</math> : 2 EA (결점간 거리 20mm이상)            ② <math>X \leq \Phi 0.1\text{mm}</math> : 허용 (결점간 거리 무시)</p> <p>2) 14년 7월 이후            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.25\text{mm}</math> : 3 EA (결점간 거리 10mm이상)            ② <math>X \leq \Phi 0.1\text{mm}</math> : 허용 (결점간 거리 무시)</p> <p>V/A 영역 외 (A영역)</p> <p>1) 흑점:            ① <math>\Phi 0.2 &lt; X \leq \Phi 0.3\text{mm}</math> : 1 EA            ② <math>X \leq \Phi 0.2\text{mm}</math> : 2 EA            ③ 결점간 거리 : 40mm이상</p> <p>2) 백점, 이물, 실이물(Complex type):            ① <math>X \leq \Phi 0.2\text{mm}</math> : 1 EA</p> <p>※ 전면 : 부유성, 제거 가능 이물 무시</p> <p>※ 배면 : 부유성 이물 무시,            전면에서 안 보이는 고착성 이물 허용</p> <p>※ 전면 보호필름 부유성 이물 허용</p>	<p>※ 루뻬(확대경)을 이용하여            결점의 크기 측정하여 판정함</p> <p>※ 반짜이는 백점도 동일한 기준            적용</p>    <p>※ Size= (W+L)/2</p>
6	실이물 (Straight Type)	<p>V/A 영역 내 (AA영역)</p> <p><math>0.03 &lt; W \leq 0.05\text{mm}</math>, <math>L \leq 1.0\text{mm}</math>(Length) : 1EA 이하  <math>0.05 &lt; W \leq 0.1\text{ mm}</math>, <math>L \leq 0.5\text{mm}</math>(Length) : 1EA 이하</p> <p>V/A영역 외 (A영역)</p> <p><math>0.05\text{mm}(\text{Width}) \times 3.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용  <math>0.1\text{mm}(\text{Width}) \times 2.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용</p>	<p>Straight Type</p> 
7	Scratch	<p>V/A 영역 내 (AA영역)</p> <p><math>0.03\text{mm}(\text{Width}) \times 10\text{mm}(\text{Length})</math> 이하 : 2EA 허용  <math>0.05\text{mm}(\text{Width}) \times 6\text{mm}(\text{Length})</math> 이하 : 2EA 허용</p> <p>※ Total 결점 2EA 이하</p> <p>V/A 영역 외 (A영역)</p> <p><math>0.05\text{mm}(\text{Width}) \times 3.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용  <math>0.1\text{mm}(\text{Width}) \times 2.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용</p> <p>※ Total 결점 1EA 이하</p>	
8	핀홀	<p>① <math>\Phi 0.1 &lt; X \leq \Phi 0.25\text{mm}</math> : 3 EA            ② <math>X &gt; \Phi 0.25\text{mm}</math> : NG</p> <p>※ 단, Icon부는 Set 조건 불빛샘 없을 것</p> <p>※ Phone set 조립 시, 시인되지 않거나, 규정된 네임펜(모나미)            으로 marking 후 phone set 조립 시, 시인되지 않으면 OK</p>	
9	얼룩	<p>전면 : 지워지는 얼룩 허용</p> <p>배면</p> <p>V/A 영역 내 (AA영역) : 한도 견본 설정 예정</p> <p>V/A 영역 외 (A영역) : 전면에서 안 보이는 얼룩 허용</p>	

## Product Specification

10	인쇄 벗겨짐	※ Phone set 조립 및 네임펜 마킹 후 시인안되면 OK	
11	IR Area部 White Dot & Black Dot &Scratch	<p>백점 &amp; 흑점            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.2 \text{mm}</math> : 2EA 허용</p> <p>Scratch            ① 0.03(Width) X 5mm(Length): 1EA 허용            ② 0.05(Width) X 3mm(Length): 2EA 허용</p>	
12	Camera부 (Line type)	<p><math>W \leq 0.05 \text{mm}</math>, <math>L \leq 1.5 \text{mm}</math> : 1ea 허용</p>	1: L=Length, W=Width 2: Can not accept Lens area 
13	Camera부 (Circular type)	<p><math>D &lt; 0.1 \text{mm}</math>: 2EA 허용  <math>0.1 &lt; D \leq 0.2 \text{mm}</math>: 1EA 허용</p>	1: $\Phi = (L+W)/2$ , L=Length W=Width 2: Can not accept Lens area
14	Logo	Spec 無 (한도 검본 설정 예정)	
15	Chipping	Spec 無 (한도 검본 설정 예정)	
16	Indicator hole 이물, 얼룩, S/C	Spec 無 (한도 검본 설정 예정)	
17	OCR 기포	$0.1 < \Phi \leq 0.2 \text{mm}$ : 2EA 허용	
17	기타사항	<p>※ 한도가 있는 항목에 대해서는, 한도를 최우선으로 적용            (한도가 정해지지 않은 항목은 한도설정 시 까지 B1,G2 외관한도 적용)</p> <p>※ 규정되지 않은 외관 항목, 정량화 되지 않은 spec은 3사 협의하여 한도 설정 후 적용</p> <p>※ Phone set 조립 시, 이상 없는 불량은 양사 또는 3사 협의 후 진행</p> <p>※ 5번 결점수(흑점, 백점, 이물, 원형실이물)는 각 항목별 판정기준을 만족하되            Total 결점 허용수는 V/A 내, 외 각각 3EA 이하임.</p>	

## Product Specification

## 5.2 Chipping and Broken

No`	Item	Criterion for Defects	Defect Type	Remark						
1	Glass Chipping [Pad Area]	 <table border="1"> <tr><td>Size [mm]</td></tr> <tr><td>a ≤ 0.3</td></tr> <tr><td>b ≤ 5.0</td></tr> <tr><td>c ≤ t</td></tr> </table>	Size [mm]	a ≤ 0.3	b ≤ 5.0	c ≤ t	Minor			
Size [mm]										
a ≤ 0.3										
b ≤ 5.0										
c ≤ t										
2	Glass Chipping [Rear of Pad Area]	 <table border="1"> <tr><td>Size [mm]</td></tr> <tr><td>a ≤ 0.5</td></tr> <tr><td>b ≤ 5.0</td></tr> <tr><td>c ≤ t</td></tr> </table>	Size [mm]	a ≤ 0.5	b ≤ 5.0	c ≤ t	Minor			
Size [mm]										
a ≤ 0.5										
b ≤ 5.0										
c ≤ t										
3	Glass Chipping [Except Pad Area]	 <table border="1"> <tr><td>Size [mm]</td></tr> <tr><td>a ≤ 0.5</td></tr> <tr><td>b ≤ 5.0</td></tr> <tr><td>c ≤ t</td></tr> </table>	Size [mm]	a ≤ 0.5	b ≤ 5.0	c ≤ t	Minor			
Size [mm]										
a ≤ 0.5										
b ≤ 5.0										
c ≤ t										
4	Glass Chipping [Corner]	 <table border="1"> <tr><td>Size [mm]</td></tr> <tr><td>a ≤ 0.5</td></tr> <tr><td>b ≤ 3.0</td></tr> </table> <table border="1"> <tr><td>Size [mm]</td></tr> <tr><td>a' ≤ 3.0</td></tr> <tr><td>b' ≤ 0.5</td></tr> </table>	Size [mm]	a ≤ 0.5	b ≤ 3.0	Size [mm]	a' ≤ 3.0	b' ≤ 0.5	Minor	
Size [mm]										
a ≤ 0.5										
b ≤ 3.0										
Size [mm]										
a' ≤ 3.0										
b' ≤ 0.5										
5	D-IC Chipping [Top/Back side]	 <p>Scribe Line 침범 없을것 (Red Line) X,Y(모서리)≤50um A,B(중앙)≤40um</p>	Minor							
6	Window Chipping [Corner]	 <p>한도 검본 참고</p>	Minor							
7	Window Chipping [Edge]	 <p>한도 검본 참고</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	5	
2	저온동작 Low Temperature Operation	-20°C, 96 Hr	10	
3	고온고습동작 High Temperature and High Humidity Operation	60°C, 90% RH, 96 Hr	5	
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	Air ±6Kv (330Ω, 150pF) Discharge Time : 10 Times Test Point : 9points - 1point : Panel Center - 8points : 10mm from Panel Edge AG Dot paste on Test points	5	
9	포장 진동 Package Vibration Test	Random truck & air 1.15Grms	1 box (120ea)	1Hr
10	포장 충격 Packing shock	8Corner/ 3 Side / 6Face 1clcy, 76Cm	1 box (120ea)	Packaged in a box

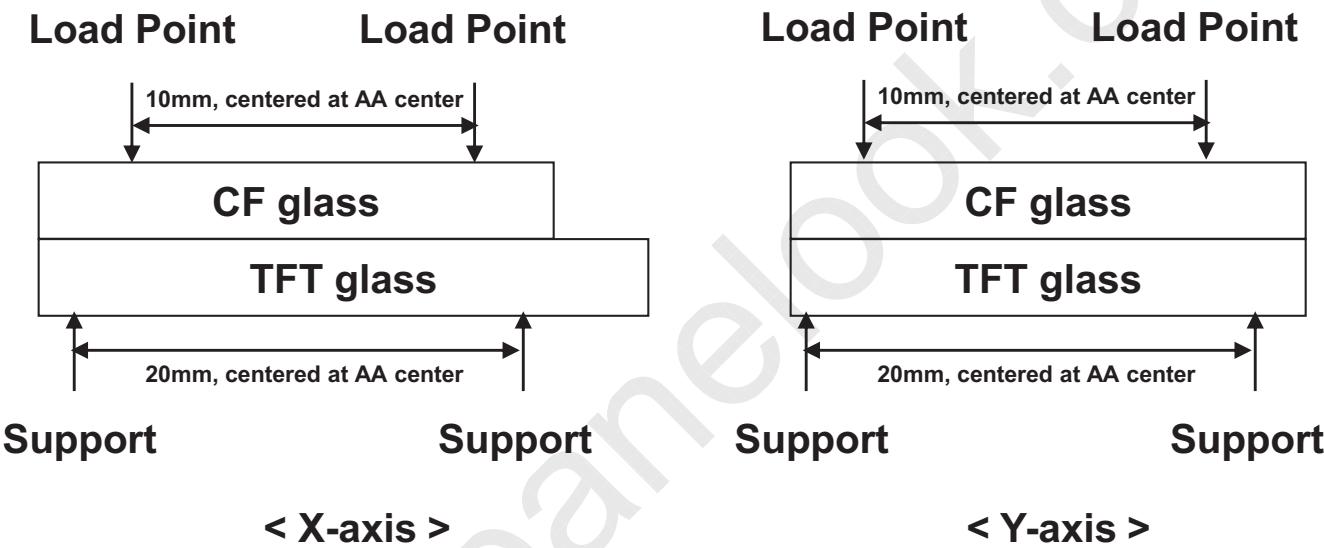
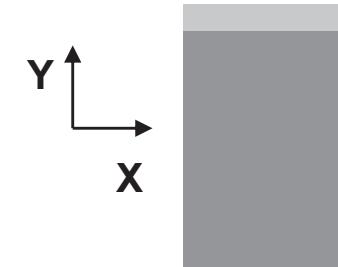
### 6.2 Fault Judgment Criteria

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, Y axis
4. Jig length (L):
  - L1 : 10mm, L2 : 20mm

## ● Criteria (SPEC)

Item	4-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 :

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

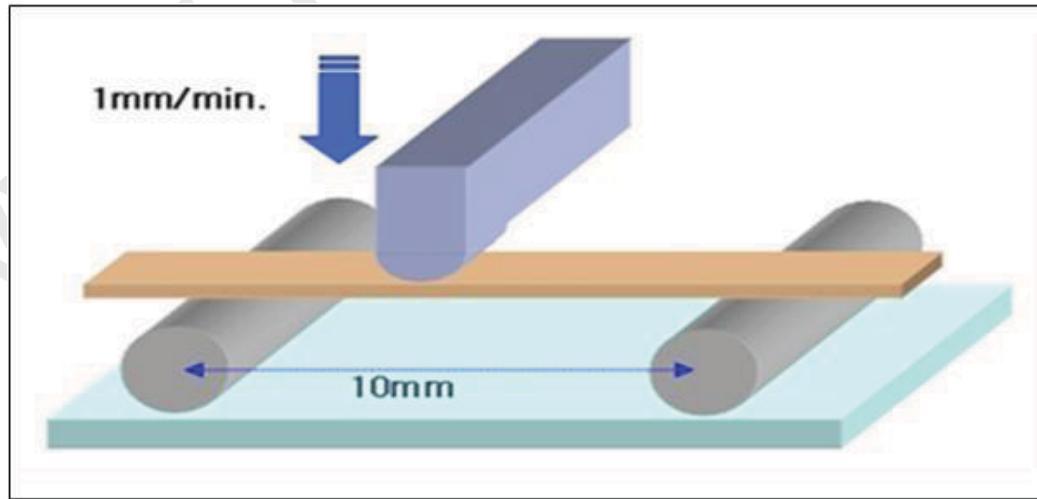
( $\sigma$  : Flexural Stress)

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) WIPPING 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

Packing Condition	Contents
Packing Type	PS packing type
PS material model	PS (Below $10^{12} \Omega$ )
PS packing type	See the picture 1
Number of panels per PS	6 pieces
Number of PS per carton	20+1(empty) units
Number of panels per carton	120 pieces

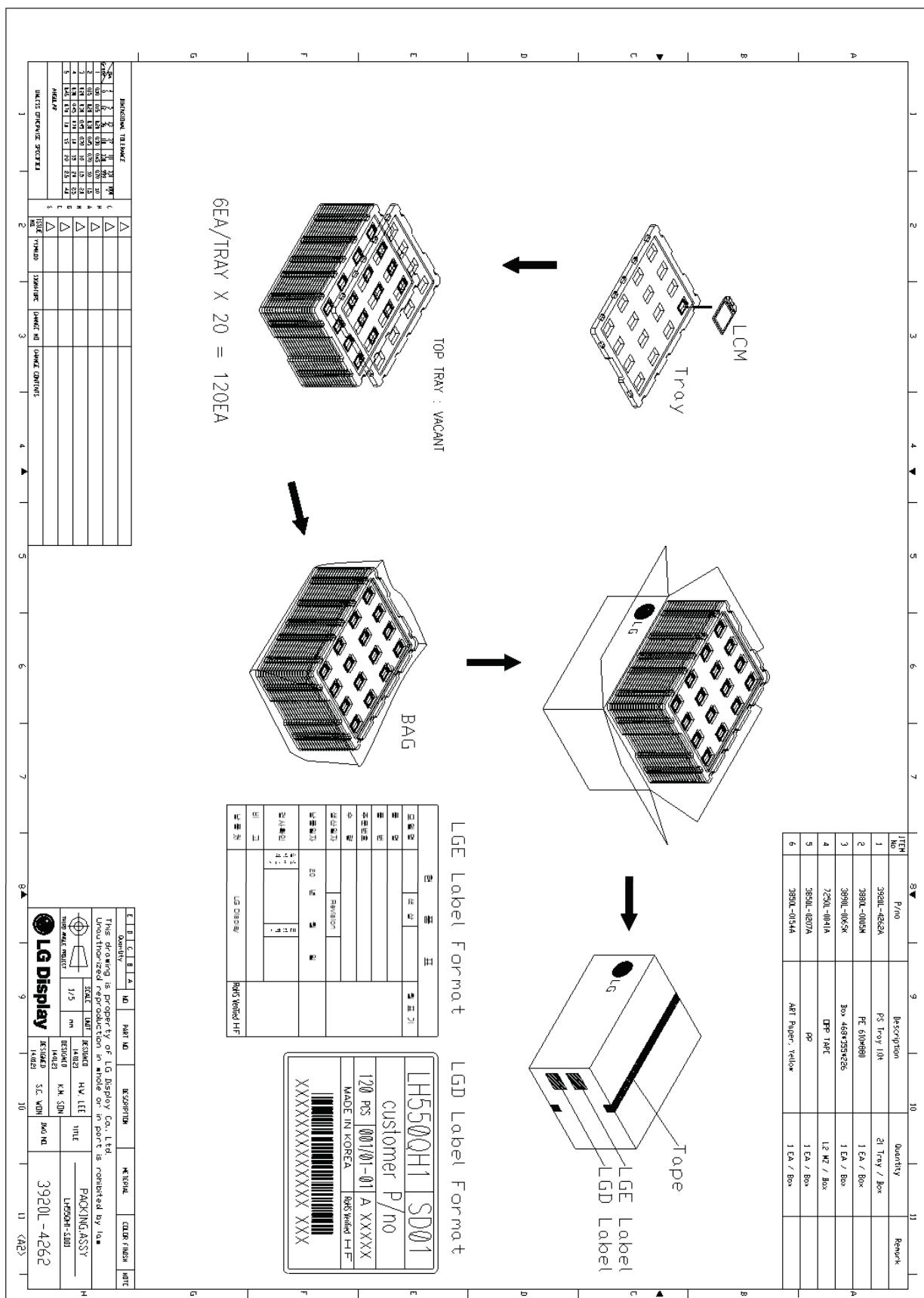
## 8.2. Description of Carton Material Composed

No.	1	2	3	4	5
Description	LCD Module	PS Tray	Packing Carton	Vacuum Bag	Carton
Quantity	120	21	1	1	1



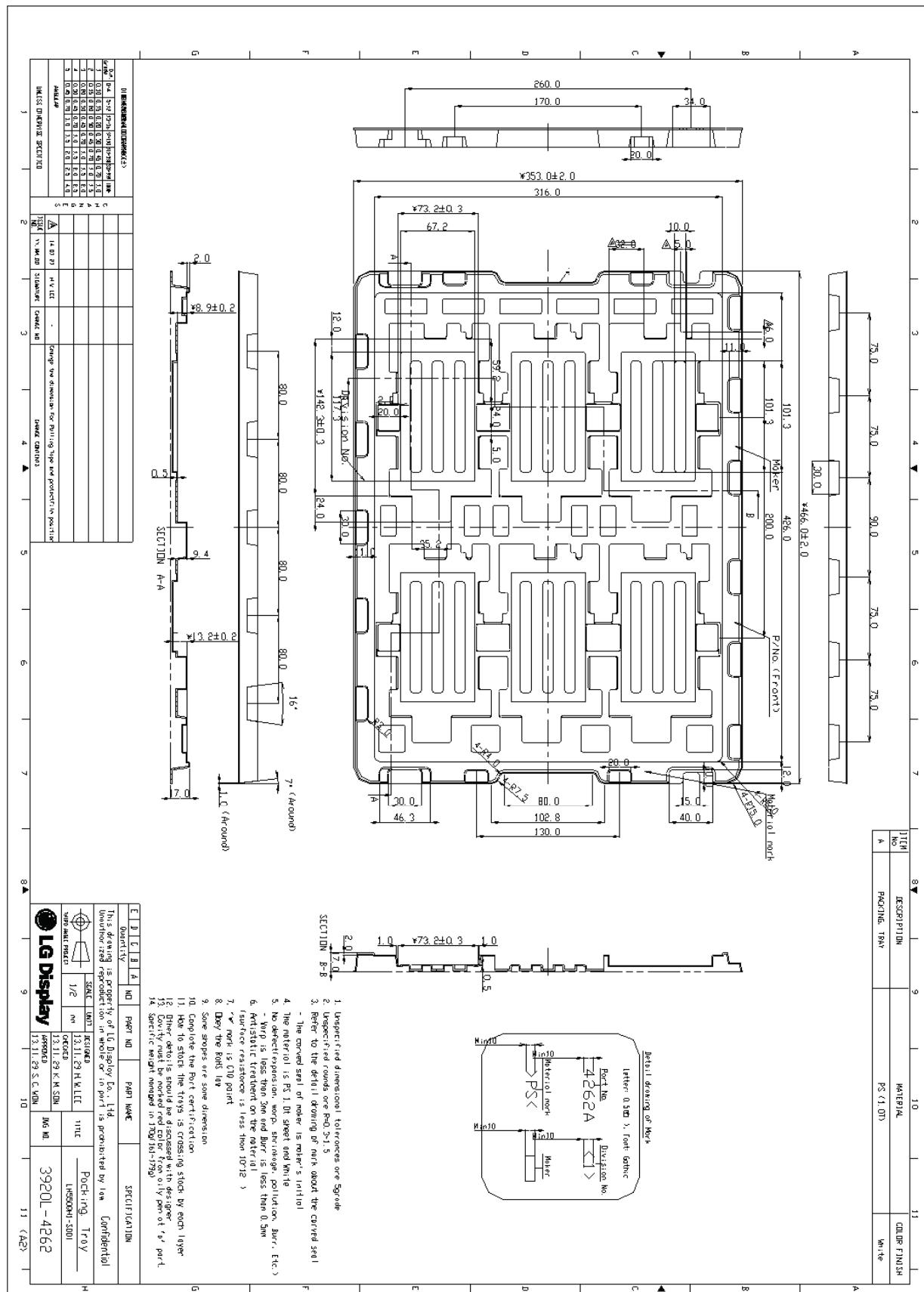
## Product Specification

### 8.3. Description of Packing Procedure



## Product Specification

## 8.4. Description of Packing Tray



## Product Specification

## 8.4. QC Flow Chart

공정 번호	Flow	공정명 / 작업 내용	설비, 치 / 공구명	번호	제품 (관리 항목)	공정 (점검 항목)	통증	통증	관리 방법				관리 표준	
									제품 / 공정 / 사양 / 규격		평가 측정 방법			
									수량	주기	샘플	관리 방법		
CP	M-1	Panel	Panel 세정	세정기 (연마포)	1	외관	입입량, 속도		Panel 파손, S/C 없을 것	육안 검사 (자주검사)	1회	M/C 후	MES, Check sheet	작업 지도서
	M-2	POL	POL 부착 (Vision 적용) 上: 630BL-5579A 下: 630BL-5459A	POL 부착	1	이물, 외관			이물, 오염 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	ACF 부착 YC-012(정식품번 Update 예정) 1.5mm x 100M 6884L-0140A	COG ACF 부착	1	ACF 부착 위치			D-IC Bonding 부 기준으로 부착	육안 검사 (자주검사)	n=2	M/C 후	MES, Check sheet	작업 지도서
					2	ACF 부착 상태			ACF 불균일 (들뜸, 기포, 둔감) 없을 것	육안 검사 (자주검사)	n=2	M/C 후		
					3	온도	80±10°C		설비 온도계					
					4	압력	2±1Kgf		설비 압력계					
					5	시간	0.5~2sec		설비 Timer					
M-5	Driver IC		Driver IC 부착 (COG) LG4941 0ILUL-0296B	COG 부착기	1	온도	65±10°C (기압착) 170±10°C (분입착)		설비 온도계		1회	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서
					2	입력	2±1kgf (기압착) 3±3kgf (분입착)		설비 압력계					
					3	시간	0.5sec (기압착) 6sec (분입착)		설비 Timer					
					4	Tool 평행도	균일한 색상 (감압 측정시)		육안 검사 (자주검사)					
M-6	FOG ACF		FOG ACF 부착 CP5731AL 1.0mm x 100M 6884L-0073A	ACF 부착기	1	ACF 부착 위치	Panel PAD 접근 기준으로 부착		육안 검사 (자주검사)	n=2	M/C 후	MES, Check sheet	작업 지도서	
					2	ACF 부착 상태	ACF 불균일 (들뜸, 기포, 둔감) 없을 것		육안 검사 (자주검사)	n=2	M/C 후			
					3	온도	100±10°C		설비 온도계					
					4	압력	2±1Kgf		설비 압력계					
					5	시간	0.5~2sec		설비 Timer					
M-7	FPC		FPC 부착 (FOG) ACT 6841L-0365A	FOG 부착기	1	온도	60±10°C (기압착) 150±10°C (분입착)		설비 온도계		1회	MC 후 이상발생 Shift Tool교체	MES, Check sheet	작업 지도서
					2	입력	2±1kgf (기압착) 10±2kgf (분입착)		설비 압력계					
					3	시간	2±1sec (기압착) 8sec (분입착)		설비 Timer					
					4	Tool 평행도	균일한 색상 (감압 측정시)		육안 검사 (자주검사)					
					5	CTQ 겹 칙적	≥500gf/cm (Weibull 90%)		Push/Pull gauge	n=4	1회 / Shift	MES, Check sheet X-Bar R Chart		
M-8		압축 검사 : COG	현미경	Source L/D 화면이상 Non Display Bonding 상태	1	Source L/D 화면이상 Non Display Bonding 상태	CTQ Align 정도	X, Y Space 7um 이상	현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr	MES, Check sheet X-Bar R Chart	검사 지도서	
		압축 검사 : FOG			2	압축 수준	CTQ Align 정도	3수준 이상 1개 Bump당 유효입자 5개 이상	현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr			
			현미경	화면이상 Non Display Bonding 상태	1	화면이상 Non Display Bonding 상태	Align 정도	X축 : 50% 이상 일치 Y축 : 20% 이상 일치	현미경 검사 (좌/우)	2EA	1회 / 2hr	MES, Check sheet	검사 지도서	
					2	압축 수준	3수준 이상 1개 Pad당 유효입자 10개 이상		현미경 검사 (좌, 중, 우)	2EA	1회 / 2hr			
M-9	Ag Paste	Dispensor SG-AG1000PLTU	Ag Paste Dotting	1	도포 상태	도포량, 압력	C/F ~ TFT 연결하여 도포할 것		육안 검사 (자주검사)	전수	Daily	MES, Check sheet	작업 지도서	
M-10	UV Resin	Dispensor TF3348	배면 UV Resin 도포	1	도포 상태	도포량, 압력	FPC 배면 open 영역 모두 도포할 것 TFT 넘지 않으며, open 없을 것 도포 폭 : 0.4mm ~ 1.1mm		육안 검사 (자주검사)	전수	Daily	MES, Check sheet	작업 지도서	
M-11		Auto Clave	Auto Clave	1		온도, 압력, 시간	55±5°C, 5Kgffar, 90sec		설비 온도, 압력계, Timer	2회	Daily	Check sheet	작업 지도서	
M-12		E/T Jig	표시 상태	1	검사 기준 숙지	검사 기준에 준합 (표시 상태 이상 없을 것)		루페 (Lupe), Spot gauge	전수	Daily	MES	검사 지도서		
M-13	TSM	Window 6002L-0100A	TSM 입고 (외관 검사) * TouchSensorModule	1	외관	검사 기준 숙지	TSM 파손, S/C 없을 것 얼룩 및 이물, 보호필름을 잔사 없을 것		육안 검사 (자주검사)	전수	Daily	MES	검사 지도서	

## Product Specification

M-14		Gap Filling Tape 부착	판센 3M 7250L-3054A	1 부착 위치(PAD전면) 부착 상태 외관	작업 방법 속지	C/F 빛나는 압출 것 Tape 누락, 끊어짐, 구겨짐, 틀림 없을 것 제품 파손 없을 것	측안 검사(자주검사)	전수	Daily	MES	작업 지도서
M-15	 * Bassy * TSM	Window 합착 Resin 종명: HRJ-304 규호기간: 6개월 6063L-0026A	Window 합착 UV 결화기	1 합착 정도	Jig 가공 치수 Vision 인식률 Window size, 필	Panel : ±0.05mm, Window : ±0.05mm 설비 Vision 인식률 80% 이상 외각 size±0.05mm, 0.1mm 이하	비니어탈리피스, 3차원 측정기 설비 Vision 인식률	1회	Jig 제작 시 M/C 후	Check sheet	작업 지도서
				2 도포 상태	Resin 도포량	1.00g±0.03g	전자계측 (CAS)	n=2	1회 / Shift		
				3 기광화 상태	UV Ramp 조도양	300mJ 이상	조도 측정기	3회	Shift		
				4 이음, 기포, 외관		이음, 기포, 손상, 파손 없을 것	측안 검사(자주검사)	전수	Daily	MES, Checksheet X-Bar R Chart	점검 지도서
				5 기구 간섭	 	0.15±0.085mm	Micrometer	n=4	1회 / 2hr		
				6 기구 간섭		BIA 외각 0.2±0.2mm	현미경 검사(현미경 위치)	n=4	1회 / 2hr		
D/B		Window 본경화 UV 결화기		1 본경화 상태	UV Ramp 조도양 Ramp 운도	적산 광량 1000mJ 이상 UV 결화기 내부 운도 55°C 이하	조도 측정기 운도 Profile	3회	Shift	Check sheet	작업 지도서
				2 Lamp 수명		1000Hr	설비 Timer	1회	Shift		
M-17		Window Assy 세정 NTC / IPA 무진전		1 외관		Window Assy 파손, S/C 있는 것		전수	Daily	MES	작업 지도서
				2 세정 상태	작업 방법 속지	이음, 오염 있는 것 (Resin 산자, NTC / IPA 얼룩)	측안 검사(자주검사)	전수	Daily	MES	
M-18		Black Ink 내입전 도포 IPA	내입전 IPA	1 도포 상태	도포방법 속지	BIA 높면 3면에 도포할 것(PAD 제외) CIG 높면 도포되지 말 것 (TSM Film 상면 도포 무한) 도포 누락, S/C 없을 것	측안 검사(자주검사)	전수	Daily	MES	작업 지도서
M-19		불빛검 검사	LED 점등 JIG	1 도포 상태	검사 기준 속지	측면 불빛 없을 것(반도시로 이하 관리)	측안 검사(자주검사)	전수	Daily	MES	작업 지도서
M-20		WIA 검사(Touch 조합)	E/T Jig	1 표시 상태	검사 기준 속지	검사 지도서에 준합 (표시 상태 이상 있는 것)	루페 (Lupe), Spot gauge	전수	Daily	MES	검사 지도서
M-21		WIA 회판 검사		1 외관	검사 기준 속지	검사 지도서에 준합 (표시 상태 이상 있는 것)	루페 (Lupe), Spot gauge	전수	Daily	MES	검사 지도서
M-22	 BLU Ion Blow Ion Nozzle WIA 8755L-0074A BLU 6091L-2431A	BLU 합착		1 Align 정도	Jig 가공 치수	Panel : ±0.10mm, BLU : ±0.10mm Window : ±0.05mm, BLU : ±0.10mm	비니어탈리피스, 3차원 측정기	1회	Jig 제작 시 Check sheet	작업 지도서	
				2 조립 상태	작업 방법 속지	BLU 외각으로 Panel 빛나는 압출 것 BLU 안쪽으로 Panel 차마로 안찰 것	측안 검사(자주검사)	전수	Daily	MES, Lot Card	
				3 이음, 외관		이음, 일룩, 손상, 파손 있는 것					
M-23		LED FPC Soldering 인두기		1 온도		인두 Tip 온도 340±20°C	온도 측정 gauge	1회	M/C 후	Check sheet	작업 지도서
				2 납땜 상태 외관		Align, Short 없는 것 납땜, 풀봉, 부품 Damage 없는 것 Flux 이동 및 잔자 없는 것 Align & 납땜점 70% 이상일 것	측안 검사(자주검사)	전수	Daily	MES, Lot Card	
M-24		Insulation Tape 부착	판센 3M 7250L-3052A	1 부착 위치(PAD전면) 부착 상태 외관	작업 방법 속지	Soldering & Component 연결 모두 닦을 것 FPC 외각 빛나는 압출 것 Tape 누락, 끊어짐, 구겨짐, 틀림 없을 것 제품 파손 없을 것	측안 검사(자주검사)	전수	Daily	MES, Lot Card	작업 지도서
M-25		2D Label 부착	판센 2D Label 인쇄용 Label 블록 Label 용지	1 부착 위치(TSM) 부착 상태 외관	작업 방법 속지	Touch Sigh Film 빛나는 압출 것 (부착 위치) Tape 누락, 끊어짐, 구겨짐, 틀림 없을 것 제품 파손 없을 것	측안 검사(자주검사)	전수	Daily	MES, Lot Card	작업 지도서
M-26		Lot marking	Inkjet Printer	1 인쇄물과 외관	작업 방법 속지	Marking 지워짐, 누락, 중복 있는 것 Marking 위치 바꿈 있는 것 Marking 위치 빛나는 압출 있는 것 제품 파손 있는 것	측안 검사(자주검사)	전수	Daily	MES, Lot Card	작업 지도서
M-27		화증검사(Touch 조합)	E/T Jig	1 표시 상태	검사 기준 속지	검사 지도서에 준합 (표시 상태 이상 있는 것)	루페 (Lupe), Spot gauge	전수	Daily	MES, Lot Card	검사 지도서
M-28		회중 외관 검사	판센	1 외관		검사 지도서에 준합 (표시 상태 이상 있는 것)	루페 (Lupe), Spot gauge	전수	Daily	MES, Lot Card	검사 지도서
				2 조립 품질	검사 기준 속지	조립 상태 이상 있는 것 D/C / FPC 누락 있는 것 Tape 누락, 끊어짐, 구겨짐, 틀림 있는 것 User CNT 손상 및 파손 있는 것 제품 파손 있는 것					
M-29		ORT	ORT Chamber	1 온도, 동작, 성능 외관		ORT 검사 규격에 준합	루페 (Lupe), Spot gauge	30ea 1회 / 1B		Check sheet	작업 지도서
				2 온도, 시간		70°C, 8Hr					
M-30		율히 검사(Touch 조합)	E/T Jig	1 특성 동작, 성능 외관		율히 Sampling 검사 규격에 준합 (CAS 참조)	루페 (Lupe), Spot gauge Height gauge	SPL/G 0.25	Lot	율히 검사 성적서	율히 검사 지도서
M-31		Tray Label 부착	Label 블록 Label 용지	1 부착 위치 부착 상태	Label 블록 내용 Label 부착 기준	LCM Tray 부착 풀 빛나는 압출 것 Tape 누락, 끊어짐, 구겨짐, 틀림 있는 것	측안 검사(자주검사)	전수	Daily		작업 지도서
M-32		내포장	Label 블록 Label 용지 PET Bag BOX	1 부착 위치 포장 상태	Label 블록 내용 Label 부착 기준 포장 사용	고객 요구 조건에 준합 (CAS 참조 및 포장 규격 참조)	측안 검사(자주검사)	전수	Daily		포장 규격서, 작업 지도서
M-33		외포장	Label 블록 Label 용지 Pallet Cover	1 부착 위치 포장 상태	Label 블록 내용 Label 부착 기준 포장 사용	고객 요구 조건에 준합 (CAS 참조 및 포장 규격 참조)	측안 검사(자주검사)	전수	Daily		포장 규격서, 작업 지도서

## Product Specification

## 8.5. Designation of Lot Mark

Byte	1	2	3	4	5	6	7	8	9	10
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1. Factory Code

Byte	1	2
------	---	---

Mark		Description		Mark		Description	
M	4	Gumi		X	W		육일
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
B	M4

3. Year/Month/Data of Production

Byte	4	→	Year : 0~9
Byte	5	→	Month : 1~C (Except I/O)
Byte	6	→	Date : 1~X (Except I/O)

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

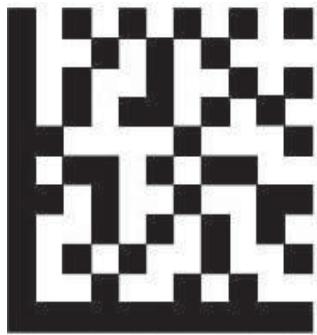
Byte	7	→	0~Z (Except I/O)
Byte	8	→	0~9
Byte	9	→	0~9
Byte	10	→	0~9



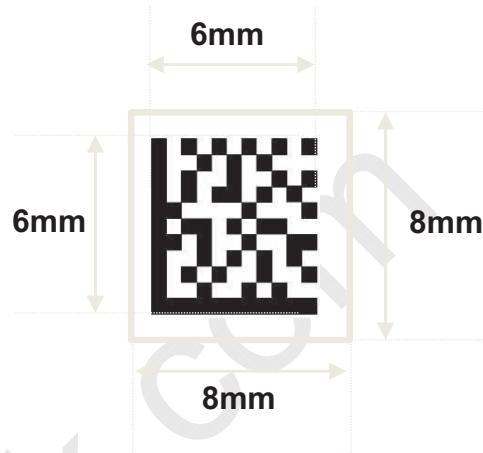
## Product Specification

## 8.6. Designation of 2D Bar code

## 1. Bar code format



## 2. Bar code size



## 3. Data Matrix information

**EAT62173901 -140327-XCN2BF0001-KR015410**

①      ②      ③      ④

①	LGE Part Number	* EAT62173901 (5.5" QHD B2) - It could be changed by Model Name
②	Production Data	* 140327 - 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



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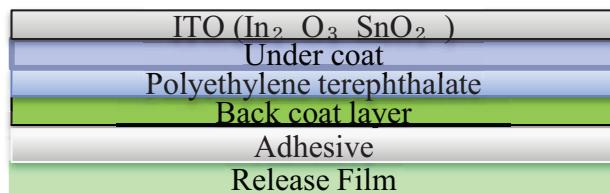
**1. General Description**

This specification of **TSMC-G516B** applies to the features, operating condition, reliability, inspection, package, QC flow and other conditions of the capacitive coupling type touch screen for **LG Electronics**.

**2. General Features****2.1 Features**

Component	Stack-Up	T/T	Material	제조사
Protect Film	—	0.085	ST-5487AS	대현ST
Window	■■■■■	0.550	Gorilla3_2320	Lensone
Top OCA	■■■■■	0.100	OC7102D	LG Hausys
Top ITO	—	0.050	N1502-SCC2	LG Chemical
ACF	■	-	TOU3020CP	H&S HIGTECH
		-	H&S EMA1880AHB	H&S HIGTECH
FPC	—	-	FPCBA	NewFlex/우진텔레콤
IC	■■■	-	S3528A1	Synaptics
Camera&IR Protect Film	-	-	AR694	에이엠텍

	Item	Spec.	Remark
Mechanical	Active Screen Size	5.5"	Diagonal
	Out Dimension (With Window)	72.64[W] x 142.01[H]	[mm]
	Out Dimension (Only TSP)	72.24[W] x 132.86[H]	[mm]
	View Area	68.74[W] x 121.66[H]	[mm]
	Thickness (Touch Module)	0.7	[mm]
	Input Method	Finger	-
Optical	Total light transmittance	≥ 88%	@550nm
	Type	Clear	-

**2.1-1 ITO Film Stack up****[Bottom ITO (N1502-SCC2) Stack up]**



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**2.2 Operating & Storage Condition**

Item	Spec.	Remark
Operating	Temp. -20 ~ +45°C, 10 ~ 90 %RH	Non-Condensing
	Temp. +45 ~ +70°C, 10 ~ 60 %RH	
Storage	Temp. 5 ~ 30°C, Normal Humidity	Non-Condensing

**2.3 Weight**

Item	weight	Remark
FPCBA	0.31 g	TAPE 이형지 제외
TSP	1.66 g	P.F 제외
Window	13.14 g	Window P/F 제외



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### 3. Electrical Specification

#### 3.1 Operating Supply Power

	Subject	Minimum	Maximum	Units
Power Supply Characteristics	VDDH	2.7	3.6	V
	VDDRX (Derived internally from VDDH)	2.6	3.5	V
	VDDL	1.65	1.95	V
	VBUS	1.65	3.6	V
	VDDCP (Internally generated)	2.7	7.2	V
	Power Supply Ripple (VDDH/VDDL/VBUS)	-	100	mV(pk-pk)
	Power on reset time (POR)	21	-	ms
	VDDL power okay threshold (V <sub>OKL</sub> )	1.2	-	V
	VBUS power okay threshold (V <sub>OKB</sub> )	1.5	-	V

	Operating Mode	Total Power
Power supply Current (For 3.0V VDDH With 1.8V VDDL)	No Sleep (Active – 1 finger)	59 mW
	No sleep ( Active – 10 fingers)	72 mW
	Normal Operation	1.8 mW
	Sensor Sleep (Deep Sleep)	31 uW

#### 3.2 Function Test

- 검사기 F/W : GEN4M\_LGIT\_B2\_TSM\_PLG313\_V111\_3005518B\_F23%\_20140321.hex
- Touch IC F/W : PLG313-V1.11-PR1623442-DS5.5.1.0.1054\_3005518B\_TestOnly.dso

#	Test 명	검사 내용
1	Power Test	VDD전압, VBUS전압, 소비전류
2	Version Check	Device ID, User Product ID, Touch Firmware Version.
3	Attention Test	Touch Controller의 Attention 체크
4	Full Raw Capacitance Test	각 Node의 Capacitance 검사
5	High Resistance Test	Tx 라인, Rx 라인, Ground의 Resistance를 측정
6	TRx-TRx and TRx-Vdd Short Test	Tx 라인들간의 Short가 되어있는지 확인



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## 3.3 Function Tester Tx-Rx Channel Limit (Min / Max)

Rx-16CH / Rx-28CH

Full Raw Capacitance : Each of Node Percentage : 23%

Full Raw Capacitance (Min : -23%)																		
Min	Pin No.	R20	R24	R23	R22	R34	R28	R36	R21	R32	R27	R25	R26	R18	R17	R19	R16	
Pin No.	Ch No	RX0	RX1	RX2	RX3	RX4	RX5	RX6	RX7	RX8	RX9	RX10	RX11	RX12	RX13	RX14	RX15	
T39	TX0	1726	1707	1699	1693	1689	1682	1684	1679	1679	1672	1667	1663	1662	1672	1663	1718	
T42	TX1	1642	1648	1641	1635	1638	1626	1626	1622	1622	1616	1612	1608	1607	1608	1609	1577	
T43	TX2	1634	1650	1643	1637	1634	1628	1629	1636	1625	1619	1614	1611	1610	1611	1612	1580	
T41	TX3	1635	1652	1646	1639	1639	1631	1632	1627	1628	1622	1617	1613	1612	1614	1626	1582	
T45	TX4	1637	1653	1659	1641	1639	1633	1634	1630	1631	1624	1619	1616	1615	1616	1618	1585	
T44	TX5	1639	1656	1649	1653	1641	1634	1635	1631	1632	1626	1622	1617	1617	1618	1619	1589	
T40	TX6	1642	1657	1651	1645	1643	1636	1638	1633	1636	1628	1623	1619	1629	1620	1622	1591	
T46	TX7	1645	1671	1654	1647	1646	1639	1641	1636	1638	1631	1627	1623	1622	1623	1626	1595	
T47	TX8	1648	1664	1658	1651	1648	1642	1644	1640	1641	1636	1641	1627	1627	1628	1629	1599	
T48	TX9	1652	1667	1661	1655	1652	1647	1647	1644	1644	1639	1636	1642	1632	1632	1634	1603	
T38	TX10	1657	1672	1666	1660	1659	1653	1662	1650	1649	1645	1642	1638	1638	1640	1620		
T50	TX11	1662	1677	1671	1665	1664	1669	1658	1654	1654	1650	1647	1644	1643	1644	1646	1616	
T5	TX12	1669	1682	1676	1671	1669	1663	1664	1660	1660	1656	1653	1650	1649	1650	1652	1622	
T49	TX13	1679	1690	1683	1676	1673	1667	1668	1665	1664	1669	1656	1651	1651	1652	1652	1623	
T0	TX14	1565	1593	1591	1589	1589	1588	1593	1595	1600	1599	1599	1600	1604	1609	1616	1603	
T7	TX15	1572	1601	1598	1595	1595	1592	1598	1599	1604	1602	1602	1602	1605	1611	1616	1602	
T2	TX16	1578	1607	1604	1601	1601	1599	1604	1605	1609	1609	1609	1609	1613	1619	1623	1609	
T11	TX17	1584	1614	1611	1608	1608	1606	1611	1613	1617	1617	1617	1618	1622	1626	1630	1616	
T9	TX18	1590	1621	1619	1616	1616	1615	1619	1621	1626	1626	1626	1627	1630	1635	1638	1622	
T15	TX19	1597	1628	1626	1623	1624	1622	1626	1629	1633	1632	1634	1635	1656	1642	1644	1632	
T14	TX20	1604	1634	1632	1629	1630	1629	1643	1635	1639	1639	1641	1641	1648	1647	1650	1636	
T1	TX21	1610	1641	1639	1636	1636	1636	1639	1641	1646	1646	1647	1647	1650	1652	1656	1641	
T3	TX22	1618	1648	1646	1644	1644	1643	1648	1650	1654	1655	1656	1655	1657	1660	1663	1649	
T4	TX23	1626	1657	1655	1652	1653	1651	1656	1659	1663	1663	1662	1666	1669	1672	1656		
T6	TX24	1633	1666	1663	1662	1662	1661	1666	1669	1673	1672	1672	1671	1672	1676	1680	1664	
T8	TX25	1643	1676	1674	1672	1672	1672	1677	1679	1683	1682	1682	1680	1682	1686	1690	1672	
T12	TX26	1610	1643	1642	1641	1652	1641	1645	1647	1651	1649	1649	1649	1651	1653	1657	1645	
T13	TX27	1674	1630	1627	1623	1622	1617	1619	1632	1640	1624	1625	1629	1644	1646	1632		

Full Raw Capacitance (Max : +23%)																		
Max	Pin No.	R20	R24	R23	R22	R34	R28	R36	R21	R32	R27	R25	R26	R18	R17	R19	R16	
Pin No.	Ch No	RX0	RX1	RX2	RX3	RX4	RX5	RX6	RX7	RX8	RX9	RX10	RX11	RX12	RX13	RX14	RX15	
T39	TX0	2758	2727	2715	2704	2697	2686	2690	2683	2681	2670	2663	2657	2654	2672	2657	2744	
T42	TX1	2622	2632	2621	2611	2616	2597	2598	2592	2592	2582	2576	2568	2567	2571	2519		
T43	TX2	2610	2636	2625	2615	2610	2600	2601	2613	2595	2587	2578	2573	2572	2573	2576	2524	
T41	TX3	2611	2638	2630	2617	2617	2605	2606	2599	2600	2590	2583	2577	2576	2578	2597	2528	
T45	TX4	2615	2641	2649	2621	2617	2609	2610	2604	2605	2594	2587	2581	2579	2582	2584	2533	
T44	TX5	2617	2645	2635	2641	2621	2610	2611	2605	2606	2597	2590	2583	2583	2584	2587	2538	
T40	TX6	2622	2647	2637	2627	2625	2613	2616	2609	2613	2600	2593	2587	2603	2588	2590	2541	
T46	TX7	2627	2669	2642	2631	2629	2617	2621	2614	2616	2605	2599	2593	2592	2597	2547		
T47	TX8	2632	2658	2648	2637	2632	2624	2626	2620	2621	2613	2621	2599	2599	2600	2601	2554	
T48	TX9	2638	2663	2653	2643	2638	2631	2626	2626	2617	2613	2624	2606	2608	2610	2651		
T38	TX10	2647	2672	2662	2652	2649	2641	2654	2636	2635	2627	2622	2616	2616	2620	2658		
T50	TX11	2654	2679	2669	2659	2658	2665	2648	2642	2642	2636	2631	2626	2625	2626	2629	2581	
T5	TX12	2665	2688	2678	2669	2665	2657	2658	2652	2652	2645	2641	2636	2635	2636	2638	2592	
T49	TX13	2681	2700	2689	2678	2673	2663	2664	2659	2658	2665	2645	2637	2637	2638	2640	2593	
T0	TX14	2499	2545	2541	2538	2539	2536	2545	2549	2556	2554	2554	2556	2562	2571	2581	2561	
T7	TX15	2512	2557	2552	2547	2547	2544	2552	2555	2562	2560	2560	2558	2565	2573	2582	2560	
T2	TX16	2520	2567	2562	2557	2557	2555	2562	2565	2571	2571	2571	2577	2586	2593	2571		
T11	TX17	2530	2578	2573	2568	2568	2566	2573	2577	2583	2583	2584	2590	2597	2604	2582		
T9	TX18	2540	2589	2587	2582	2582	2579	2587	2589	2597	2597	2598	2599	2604	2611	2616	2592	
T15	TX19	2551	2600	2597	2593	2594	2592	2598	2601	2609	2608	2610	2611	2646	2624	2626	2606	
T14	TX20	2562	2610	2606	2603	2604	2601	2625	2611	2617	2617	2621	2621	2632	2631	2636	2613	
T1	TX21	2572	2621	2617	2614	2614	2613	2619	2621	2629	2630	2631	2631	2636	2640	2646	2621	
T3	TX22	2584	2632	2630	2626	2626	2625	2632	2636	2642	2643	2645	2647	2652	2657	2633		
T4	TX23	2597	2647	2643	2640	2641	2637	2646	2651	2657	2657	2657	2656	2661	2665	2670	2646	
T6	TX24	2609	2661	2657	2654	2654	2653	2662	2665	2673	2672	2672	2669	2678	2684	2658		
T8	TX25	2625	2677	2674	2672	2672	2670	2679										



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## 5. Part List

No	Part Name	Specification	Vendor	EA	Note
1	WINDOW	GLASS(Gorilla3/2320_0.55T)	Lensone	1	EA
2	BTM OCA	OC7102D, 0.100T	LG Hausys	0.0238889	MR
3	BTM ITO FILM	N1502-SCC2, 140±40 Ω/sq , 0.050T	LG Chemical	0.0238889	MR
4	Ag Paste	PA-STP70-PP3	PHOENIX MATERIALS	0.0000061	KG
5	Insulation Printing	UVF-31T	Asahi Chemical	0.0000127	KG
6	ACF	H&S EMA1880AHB (1.2 mm)	H&S Hightech	0.0350000	MR
		TOU3020CP (1.0 mm)	H&S Hightech	0.0005600	RO
7	FPC	63.00mm(W) X 29.61mm(H)	NewFlex/우진	1	EA
8	IC	S3528 A1	Synaptics	1	EA
9	Capacitor	0.22uF,0603, 6.3V, X5R	Taiyo Yuden	2	EA
		2.2uF,1005, 6.3V, X5R	Taiyo Yuden	2	
		10uF,1005, 6.3V, X5R	Taiyo Yuden	1	
10	Resistor	10kΩ, 1005, 6V, J급	WALSIN	1	EA
		1k옴, 1005, 6.3V, J급	WALSIN	1	
11	Diode	0.8pF, 1006	SEMTECH	4	EA
12	Connector	GB042-10P-H12-E3000 (10Pin,0.40MM,MALE,SMD)	LS-MTRON	1	EA
13	Adhesive	TAPE #4972(0.05T)	TESA	1	EA
14	Front Protection Film	ST-5487AS(0.085T, Acrylic Adhesive)	에이엠텍	1	EA
15	Back Protection Film	Protection Film(0.068T, Acrylic Adhesive)	LG Chemical	0.0238889	MR
16	Camera Hole Protection Film	AR694	에이엠텍	1	EA
17	Packing Tray	TSMC-G516A Rev 03 480mm X 365mm X 16mm	코네프	0.1833333	EA
18	Packing Box	495mm X 380mmX 240mm	서브원	0.0083333	EA



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## SPECIFICATION

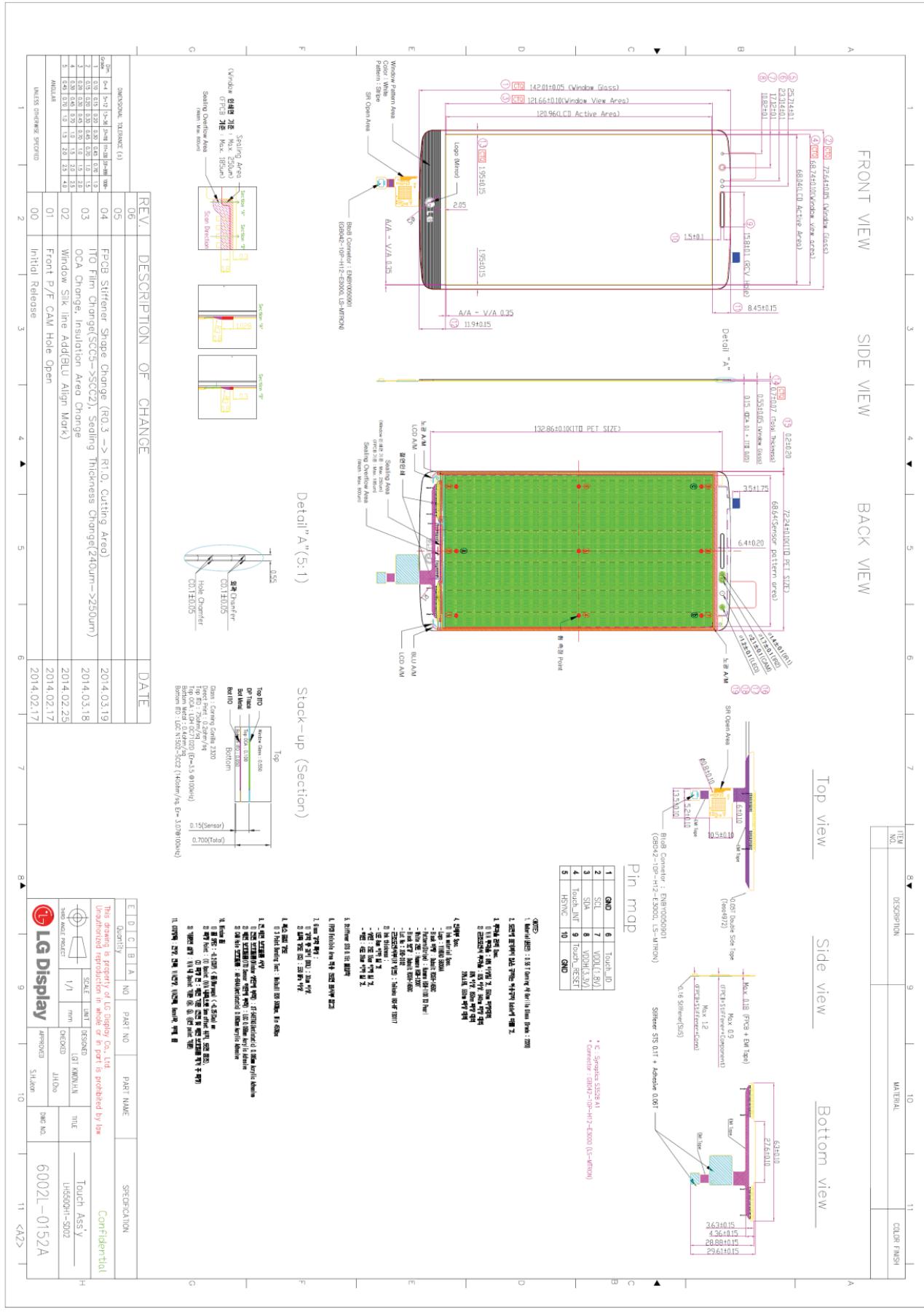
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## 6-1. Outline Dimension





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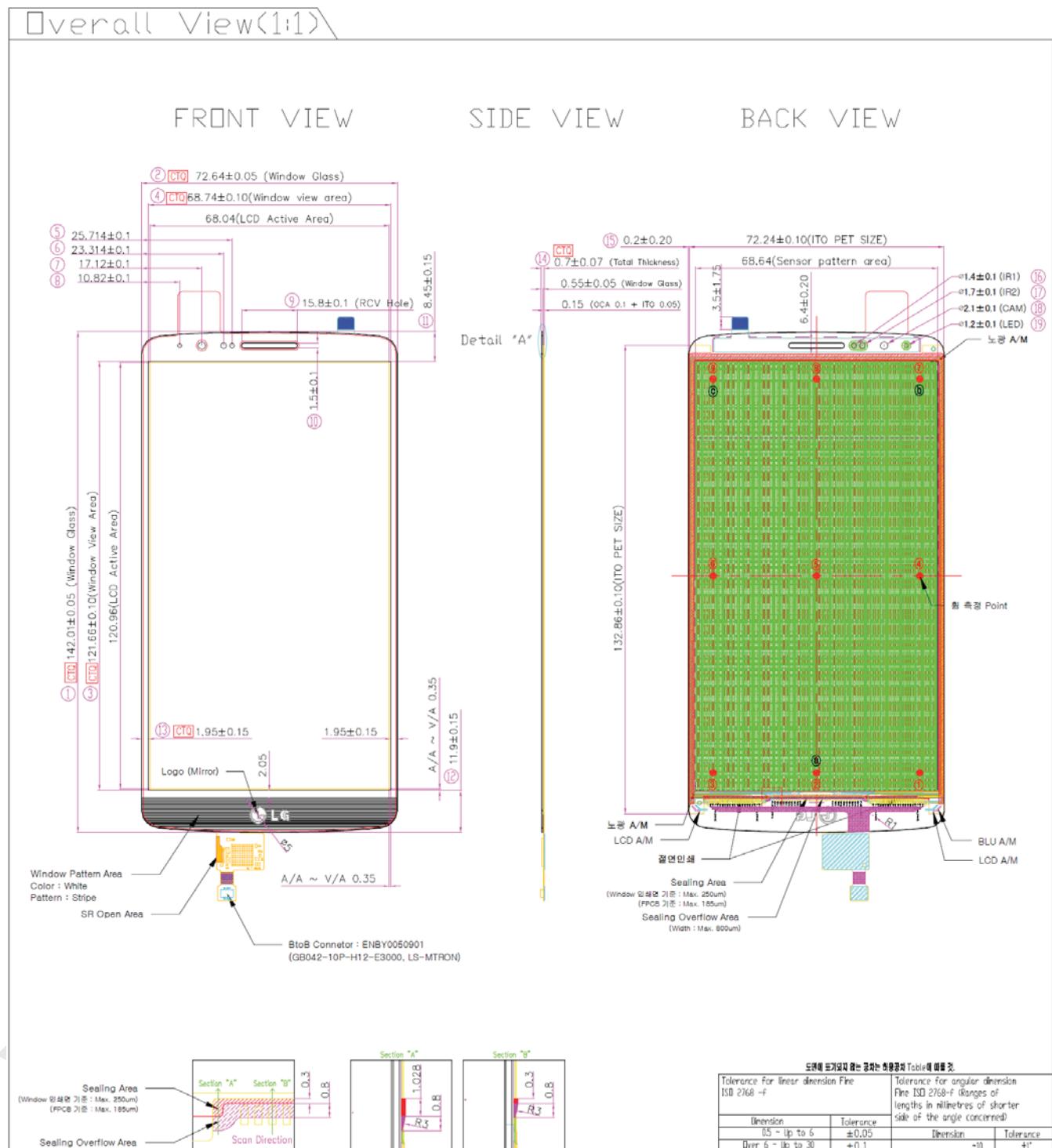
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## 6-2. Outline Dimension (Overall View)





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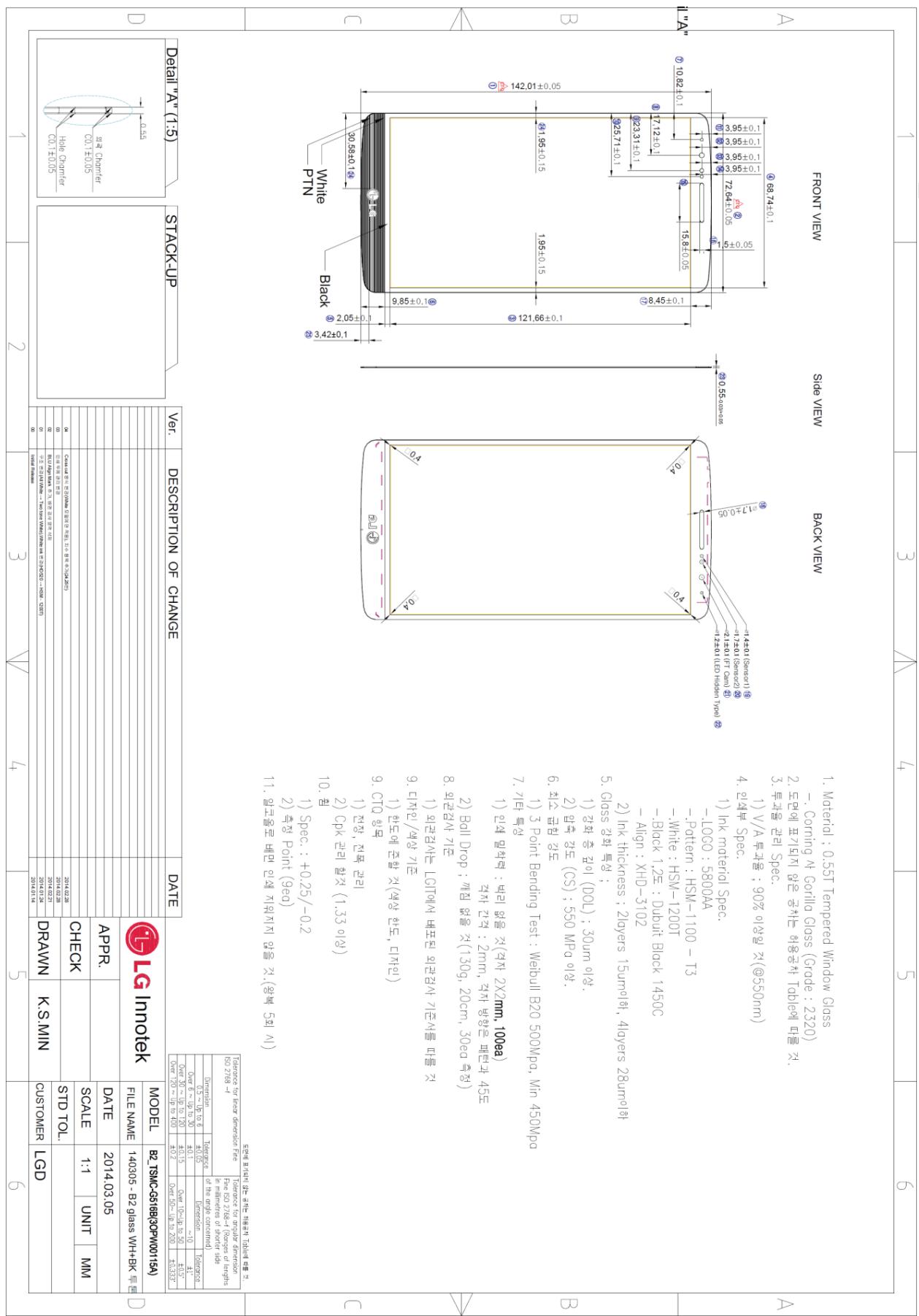
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## 6-3. Cover Window





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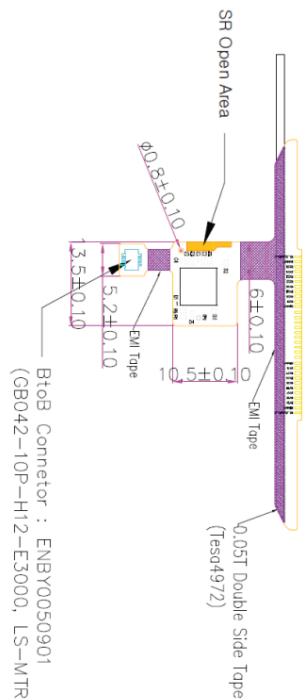
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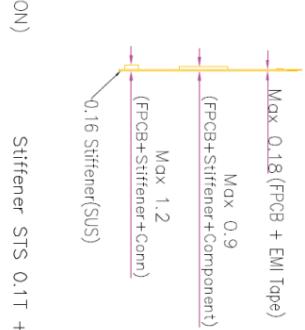
## 6-4. FPCB Layout

FPCBA (S/C 1:1) \

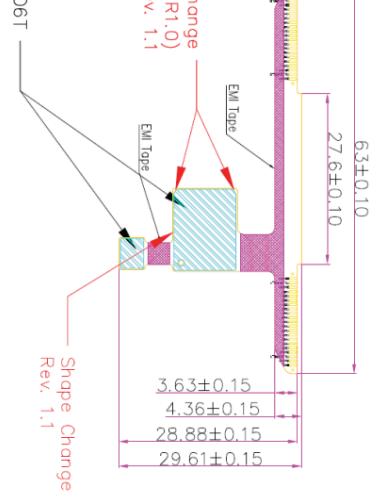
Top view



Side view



Bottom view



## Pin map

REV.	DESCRIPTION OF CHANGE	DATE	P/N
1	GND	6 Touch_ID	3MAP00036A
2	SCL	7 VDD(1.8V)	
3	SDA	8 VDDH(3.3V)	
4	Touch_INT	9 Touch_RESET	
5	H SYNC	10 GND	

\* ACF Bonding 층면 휴어짐 3mm 이내 일 것!  
\* IC : Synaptics S3528A1  
\* Connector : GB042-10P-H10-E3000 (LS-MTRON)

## \* NOTE

- CTQ는 중점 관리 항목입니다.
- 무지시 공차는 ±0.10이며, 별도 공차가 기입된 치수는 중점 관리 항목입니다.
- 제품 외관상 Scratch, 이물 등 기타 유해한 결함 없을 것
- 부착물을은 틸락 및 이탈이 없을 것
- 기타 상기 이외의 치수 및 성능 관련은 설계자와 협의 할 것.
- Underfill 적용 시 IC의 윗면을 침범하지 않을 것.

## 업체명 표기

APPR.	DATE	FILE NAME
J. W. JO	2014.03.18	B2_FPCBA_Rev1.1
CHECK	H. N. KWON	
SCALE	1: 1	UNIT MM
STD TOL.	± 0.1	
DRAWN	J. W. PARK	CUSTOMER LGIT



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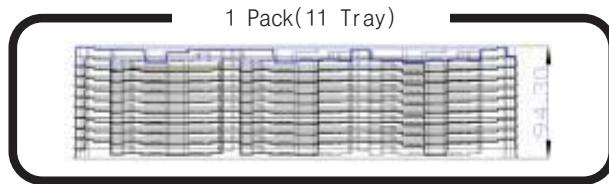
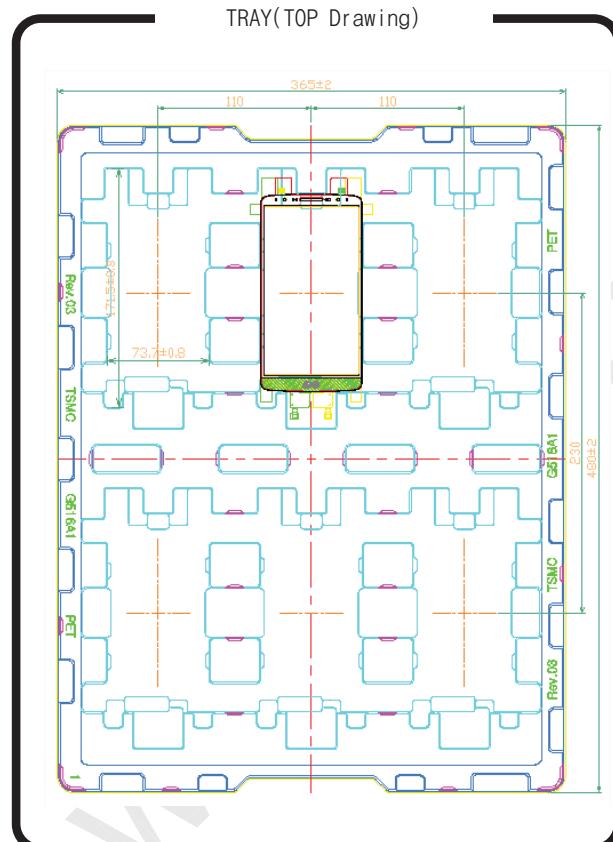
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**7. Package****7.1 Packing Form**

- a) Package quantity in one box : 120 pcs
- b) Package quantity in one tray : 6 pcs
- c) Box size : 495 x 380 x 240 [mm]
- d) 1Box = ( 10 Tray + 1 Tray (Dummy, Top) ) x 2= 22 Tray, 120 pcs
- e) Tray Size : 480 x 365 x 16 [mm]

**7.2 Guarantee period**

Period	Remark
6 Months(after shipment)	Non-Condensing

**1 PACK****495mm****240mm****380mm**



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## S P E C I F I C A T I O N

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## 8. Reliability and Inspection Standard

### 8.1 Reliability

시험항목	세부항목	평가항목	spec	시료수	판정기준	시험조건/방법	평가장비
신뢰성 시험	환경동작	• 고온 동작	Touch 성능, 외관 이상 없을 것	5ea	C=0	70°C, 1회) 96hr / 2회) 240hrs	외관 Touch 검사기
		• 고온고습 동작		5ea	C=0	60°C, 90%, 1회) 96hr / 2회) 240hrs	
		• 저온 동작		5ea	C=0	-20°C, 1회) 96hr / 2회) 240hrs	
	환경보존 1)	• 고온보존	Touch 성능, 외관 이상 없을 것	5ea	C=0	80°C, 1회) 96hr / 2회) 240hrs	
		• 고온고습 보존		5ea	C=0	60°C, 90%, 1회) 96hr / 2회) 240hrs	
		• 저온 보존		5ea	C=0	-30°C, 1회) 96hr / 2회) 240hrs	
		• 열충격		5ea	C=0	-40°C(30min) ↔ 80°C(30min), 1회) 24cycles / 2회) 100 cycles	
	전기/안전 2)	• ESD Withstand	±8kV @ Air	5ea	C=0	Frequency:1 time/sec 10 times for each testing points	ESD 측정 기
	강성	• Ball Drop	깨지지 않을 것	5ea	C=0	Steel Ball (weight=130g) 높이 20cm, Center 1회 (With film)	육안
		• Surface Hardness	5H이상	5ea	C=0	500gf/45도/5Line	연필 경도 Tester
	운송환경	• 포장 진동	Touch 성능, 외관 이상 없을 것	1box	C=0	X and Y axis : 1G ; Z axis : 2G 10 ~ 150Hz, 10ct/min, 5 sweeps	외관 Touch 검사기
		• 포장 낙하			C=0	61cm: 10~19kg, 46cm: 19~28kg	
	FPC	• FPC 자체 Peeling	Min. 1.0kgf/cm	5ea	C=0	Base film	Peel strength
		• FPC 절연저항	Min. 5E+8 Ω	5ea	C=0	DC 250V, 30초인가	절연저항 계
		• FPC 내전압	No Breakdown, Flashover	5ea	C=0	DC 1000V, 30초 인가	육안

#### [Note]

In this standard condition, there shall be no practical problems that may affect the Touch Screen function.  
 Touch Screen Panel should be at room temperature for 24 hours after the reliability test and then measured.,  
 환경 보존/동작 신뢰성은 보호Film을 붙인 상태이거나, LCM과 Hybrid bonding된 상태로 실시한다

1) 환경 보존 시험 시, 기본적으로 96시간 후 1회 확인, 240시간 후 2회 확인함.

1회 OK이고, 2회 NG일 경우, 고객사와 협의 후 진행 여부 결정함.



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## 8.2. Inspection Standard

항목	검사 조건		조건	비고
조도	1200 ± 200 lux			
광원	삼파장 Stand or 유사광원			
시료와 거리	30±10cm			
판정 각도	외관 검사	90±45°		
환경 조건	배경 온도 습도	Black & White 25±5°C 55±30%RH	 (Fig.1)	
Dimension (D)	직경기준			
Width (W), Length (L)	직선기준			선형이 180° 이상 휘었을 때 점으로 간주함.



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## S P E C I F I C A T I O N

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## 8.2. Inspection Standard

No.	외관유형	Spec.	비고
1	흑점 백점 이물 실이물 (Complex Type)	<p>V/A 영역 내 (AA영역)            1) 14년 5~6월            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.20\text{mm}</math> : 1 EA (결점간 거리 20mm이상)            ② <math>X \leq \Phi 0.1\text{mm}</math> : 허용 (결점간 거리 무시)            2) 14년 7월 이후            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.25\text{mm}</math> : 2 EA (결점간 거리 10mm이상)            ② <math>X \leq \Phi 0.1\text{mm}</math> : 허용 (결점간 거리 무시)</p> <p>V/A 영역 외 (A영역)            1) 흑점:            ① <math>\Phi 0.2 &lt; X \leq \Phi 0.3\text{mm}</math> : 1 EA            ② <math>\Phi 0.1 &lt; X \leq \Phi 0.2\text{mm}</math> : 2 EA            ③ 결점간 거리 : 40mm이상            2) 백점, 이물, 실이물(Complex type):            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.2\text{mm}</math> : 1 EA            ※ 전면 : 부유성, 제거 가능 이물 무시            ※ 배면 : 부유성 이물 무시,            전면에서 안 보이는 고착성 이물 허용            ※ 전/배면 보호필름 부유성 이물 허용</p>	※ 루뻬(확대경)을 이용하여 결점의 크기 측정하여 판정함 ※ 반짝이는 백점도 동일한 기준 적용 
2	실이물 (Straight Type)	<p>V/A 영역 내 (AA영역)  <math>0.03 &lt; W \leq 0.05\text{mm}</math>, <math>L \leq 1.0\text{mm}</math>(Length) : 1EA 이하  <math>0.05 &lt; W \leq 0.1\text{mm}</math>, <math>L \leq 0.5\text{mm}</math>(Length) : 1EA 이하            V/A영역 외 (A영역)  <math>0.05\text{mm}(\text{Width}) \times 3.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용  <math>0.1\text{mm}(\text{Width}) \times 2.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용</p>	Straight Type → 
3	Scratch	<p>V/A 영역 내 (AA영역)  <math>0.03\text{mm}(\text{Width}) \times 10\text{mm}(\text{Length})</math> 이하 : 1EA 허용  <math>0.05\text{mm}(\text{Width}) \times 6\text{mm}(\text{Length})</math> 이하 : 1EA 허용            ※ Total 결점 1EA 이하</p> <p>V/A 영역 외 (A영역)  <math>0.05\text{mm}(\text{Width}) \times 3.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용  <math>0.1\text{mm}(\text{Width}) \times 2.0\text{mm}(\text{Length})</math> 이하 : 1EA 허용            ※ Total 결점 1EA 이하</p>	
4	핀홀	<p>① <math>\Phi 0.1 &lt; X \leq \Phi 0.25\text{mm}</math> : 3 EA            ② <math>X &gt; \Phi 0.25\text{mm}</math> : NG            ※ 단, Icon부는 Set 조건 불빛샘 없을 것            ※ Phone set 조립 시, 시인되지 않거나, 규정된 네임펜(모나미)            으로 marking 후 phone set 조립 시, 시인되지 않으면 OK</p>	
5	얼룩, 기포	전면 : 지워지는 얼룩 허용 배면 V/A 영역 내 (AA영역) : 한도 견본 설정 예정 V/A 영역 외 (A영역) : 전면에서 안 보이는 얼룩 허용	



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## S P E C I F I C A T I O N

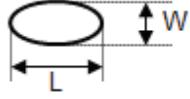
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## 8.2. Inspection Standard

6	인쇄 벗겨짐	※ Phone set 조립 및 네임펜 마킹 후 시인 안되면 OK	
7	IR Area部 White Dot & Black Dot &Scratch	<p>백점 &amp; 흑점            ① <math>\Phi 0.1 &lt; X \leq \Phi 0.2\text{mm}</math> : 2EA 허용</p> <p>Scratch            ① 0.03(Width) X 5mm(Length): 1EA 허용            ② 0.05(Width) X 3mm(Length): 2EA 허용</p>	
8	Camera부 (Line type)	<p><math>W \leq 0.05\text{mm}</math>, <math>L \leq 1.5\text{mm}</math> : 1ea 허용</p> <p>※ 부유성, 제거 가능 이물/얼룩 무시</p>	1: L=Length, W=Width 2: Can not accept Lens area 
9	Camera부 (Circular type)	<p><math>\Phi &lt; 0.1\text{mm}</math>: 2EA 허용  <math>0.1 &lt; \Phi \leq 0.2\text{mm}</math>: 1EA 허용</p> <p>※ 부유성, 제거 가능 이물/얼룩 무시</p>	1: $\Phi = (L+W)/2$ , L=Length W=Width 2: Can not accept Lens area
10	Logo	Spec 無 (한도 견본 설정 예정)	
11	Chipping	Spec 無 (한도 견본 설정 예정)	
12	Indicator hole 이물, 얼룩, S/C	Spec 無 (한도 견본 설정 예정)	
13	FPCB	IC Underfill 미도포 없을것. Underfill IC 윗면 텁/올라탐 무시.	
14	기타사항	<p>※ 한도가 있는 항목에 대해서는, 한도를 최우선으로 적용            (한도가 정해지지 않은 항목은 한도설정 시 까지 B1,G2 외관한도 적용)</p> <p>※ 규정되지 않은 외관 항목, 정량화 되지 않은 spec은 3사 협의하여 한도 설정 후 적용</p> <p>※ Phone set 조립 시, 이상 없는 불량은 양사 또는 3사 협의 후 진행</p> <p>※ 1번 결점수(흑점, 백점, 이물, 원형실이물)는 각 항목별 판정기준을 만족하되            Total 결점 허용수는 V/A 내, 외 각각 2EA 이하임.</p>	