SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	10.25”FHD (1920 X RGB X 720) TFT- LCD

BUYER	LGE
MODEL	EAT64195901
PROJECT	SK3

SUPPLIER	LG Display Co., Ltd.
MODEL	LA103WF4
SUFFIX	SL02

SIGNATURE	DATE
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Please return 1 copy for your confirmation With your signature and comments.

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Contents

Record of Revisions

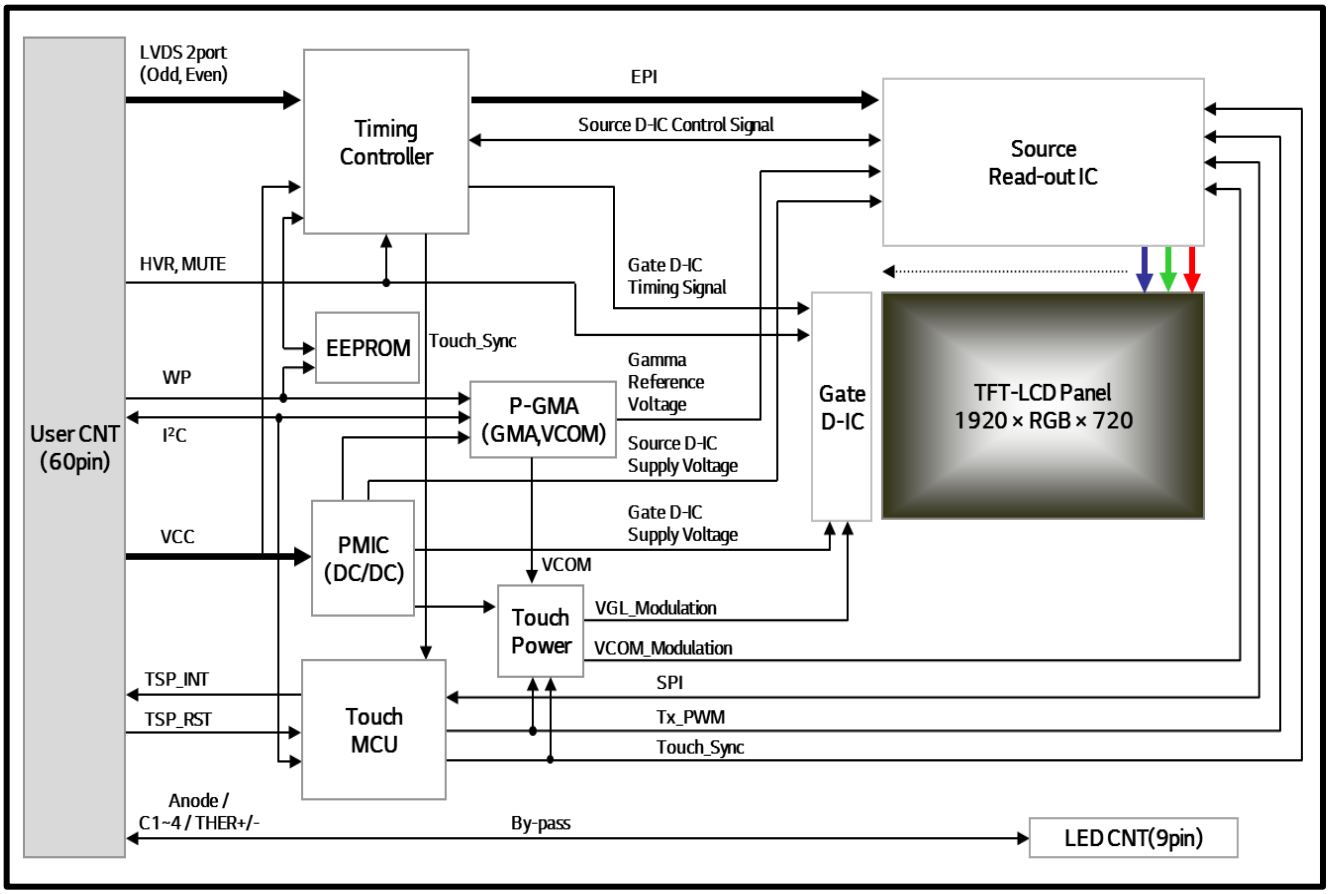
Revision No.	Revision Date	Page	Description	Note
0.0	Sep.29.2017	-	First Draft (Preliminary)	
0.1	Mar.13.2018	5	Update the General Description - Update the Surface Treatment information.	
		7	Update the Electrical Characteristics. - Power Supply Current & Consumption in Table 2.	
		8	Update the Ambient Temperature vs Allowable Forward Current Chart.	
		10	Add comments for WP pin control guide.	
		14	Add the Refresh rate timing guide in Note 2.	
		15	Update the Power Sequence & Note 3,4,5.	
		17	Update the Electro-optical Characteristics in Table 7.	
		20	Update the Mechanical Characteristics in Table 8. - Add the Cover Glass BM Area Information	
		21	Update the Rear View drawing information. - Add the Screw Torque & Cover Shield Tape Guide. - Update the Rear View drawing.	
		22	Update the Reliability information. - Change the ESD test judgment in Table 8. - Update the sentence of Result Evaluation in Note.	
		30,31	Update the Equivalent Circuits.	
		32	Update the Thermistor Characteristics.	
0.2	Jun.25.2018	23,24	Update the Touch information. - Update General Specifications in Table 10-1. - Add the Touch Performance Test.	
		27	Add ID label and Packing/Pallet label Image, Customer Barcode information.	
		34	Add the LCM Construction on APPENDIX-III	
1.0	Jul.20.2018	4	Update the Block diagram	
		21	Updated the Drawing Information that added Left side Cover Shield Tape.	
		28	Update the Packing Form Information.	
		35~48	Add IIS	
1.1	Oct.11.2018	5, 8,23	Update the contents for customer requirements	
		21	Change about Pemnut external diameter tolerance ±0.1 to ±0.05 in Drawing.	
		23~25	Changed touch specifications & performance test contents.	
		32	Update the Equivalent Circuits (pin 46, 47)	

1. Summary

This LCD panel utilizes amorphous silicon thin film transistors and a 8:3 aspect ratio. The 10.25” active matrix liquid crystal display allows 16,777,216 colors to be displayed by LVDS interface is available.
The applications are CID(Center Information Display), RSE(Rear Seat Entertainment) and Instrument Cluster for a vehicle.

2. Features

- Utilizes a panel with a 8:3 aspect ratio.
- The 10.25” screen produces a high resolution image that is composed of 1,382,400 pixel elements in a stripe arrangement.
- By adopting In Plane Switching (IPS) technology, provide a wide viewing angle.
- By adopting an active matrix drive, a picture with high contrast is realized.
- By adopting a high aperture panel, high transmittance color filter and high transmission polarizing plates, transmittance ratio is realized.
- Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal.
- By Adopting Advanced In Cell Touch technology, provide high performance touch solutions.



3. General Description

Active Screen Size		10.25 inches(260.35mm) diagonal
Outline Dimension		255.65mm (H) × 105.87mm (V) X 9.0mm (D) (Typ.) (w/ Cover Glass 1.1T)
Panel Dimension		252.648mm (H) X 102.2mm (V) X 1.0mm (D) (Typ.)
Pixel Pitch		0.1269mm x 0.1269mm (1Dot: 0.0423mm x 0.1269mm)
Pixel Format		1920 horiz. by 720 vert. Pixels, RGB stripe arrangement
Color Depth		8bit(D), 16,777,216 colors
Luminance, White		900 cd/m^2 (@Center 1point, Typ.)
Viewing Angle(CR>10)		Viewing angle free (R/L 178 (Min.), UD 178 (Min.))
Weight		415g (Typ.), 420g (Max.)
Display Mode		Transmissive mode, Normally Black
Surface Treatment	Material	Anti-Glare, Anti-Reflection, Anti-Finger (w/ASF)
	Hardness	3H, 500g (ISO15184, w/ASF)
	Reflectance	Max 3% (SCI, w/ASF)
Optical Bonding Material		Silicon Resin
Backlight Type		LED

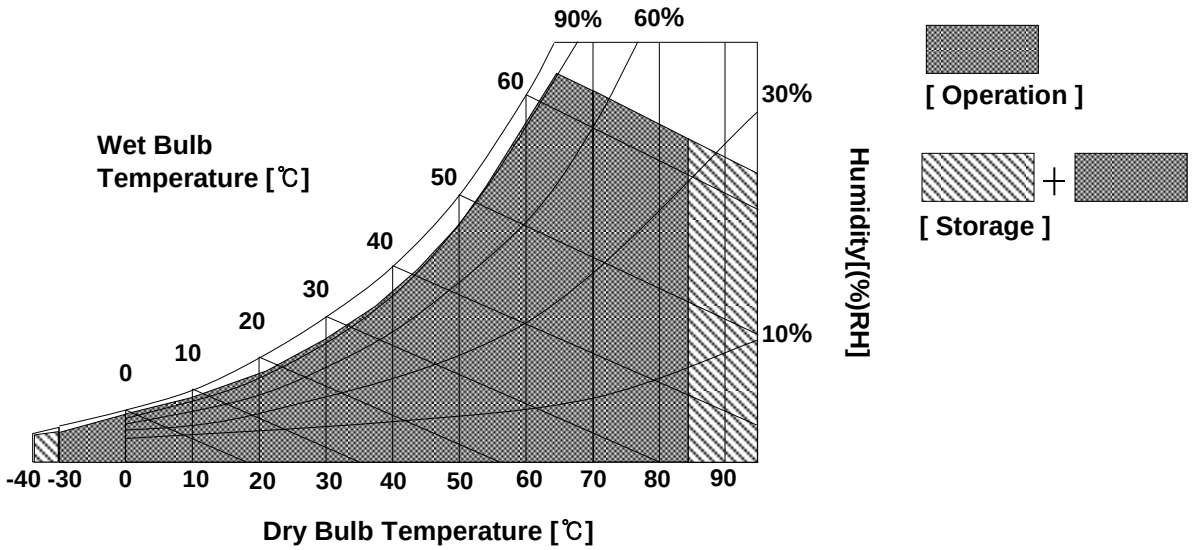
4. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	VCC	-0.2	5.5	V	1
Input Signal Voltage	V_{LVDS}	-0.3	2.5	V	2
	V_{CTRL}	-0.3	3.6	V	
Storage Temperature	T_{ST}	-40	95	°C	3
Operating Temperature	T_{OP}	-30	85	°C	3,4,5

Note 1. The system should supply enough current for TFT LCD's stable operation at -40 ~ +85℃.
2. V_{LVDS}: LVDS input signal (RAM/P_O/E, RBM/P_O/E, RCM/P_O/E, RCLKM/P_O/E, RDM/P_O/E)
V_{CTRL}: HVR, MUTE, SCL, SDA, WP, TSP_RST
3. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be Max. 62℃. Condensation of dew must be avoided,
because it may cause electrical current leakage, and deterioration of performance and quality.
4. The operating temperature means that LCD panel guarantees operation of the circuit.
All the contents of Electro-optical specifications are guaranteed under the room temperature condition.
5. This temperature is ambient temperature with regard to the heat which is generated under operation of circuit and backlight on. (reference value)



5. Electrical Specifications

5-1. Electrical Characteristics

Table 2. LCD DRIVING CIRCUIT ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Power Supply Voltage	VCC	4.7	5.0	5.3	V	
Power Supply Current	IVCC	-	400	500	mA	1
Power Consumption	PVCC	-	2.0	2.5	W	1, 2
Rush Current	IRUSH	-	-	2.5	A	3
Input Signal Voltage	V_H	2.7	-	3.6	V	4,5
	V_L	0	-	0.6	V	

Note 1. The specified current and power consumption are under the VCC = 5.0V, Ta=25 ± 2°C, fv=60Hz condition whereas Red, Green, Blue pattern is displayed and fv is the frame frequency.
2. P_{VCC}(Typ) = I_{VCC}(Typ)*VCC(Typ), P_{VCC}(Max) = I_{VCC}(Max)*VCC(Typ) @ White pattern.
3. The duration of rush current is about 2ms and rising time of power input is 0.5ms. (VCC = 5.0V, Ta=25 ± 2°C, fv=60Hz)
4. HVR, MUTE, SCL, SDA, WP, TSP_RST
5. The recommended operating conditions show the ranges in which the device can operate normally. Operation beyond the limit of the recommended operation conditions is not assured, even though operating conditions are within the limit of the maximum ratings.

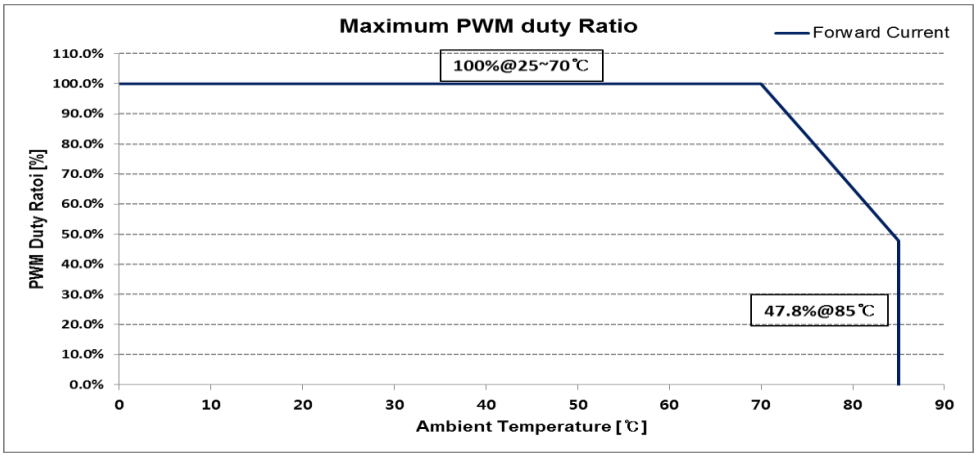
Table 3. BACKLIGHT ELECTRICAL CHARACTERISTICS (Continue)

Parameter		Symbol	Values			Unit	Note
			Min	Typ	Max		
LED Current		I_{LED}	-	95	100	mA	1,2,6
LED Voltage	-30℃	V_{LED}	19.8	22.8	24.2	V	
	+25℃		19.6	22.4	23.8		
	+85℃		18.4	20.9	22.2		
LED Power		P_{LED}	-	8.51	9.68	W	3
LED Chain			-	4	-	EA	4
Life Time			10,000	-	-	Hrs	5

Note 1. This values applies to one chain (LED 7ea X 4chain = LED 28ea)

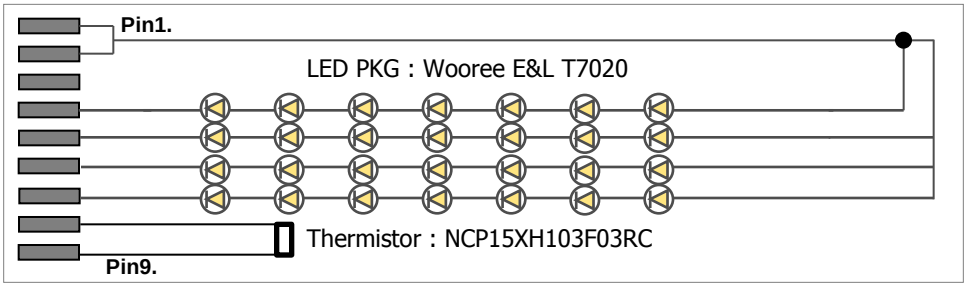
2. The permissible forward current of LED vary with environmental temperature.

Ambient Temperature vs. Allowable Forward Current



3. LED Power
   - Typ. LED Power = Typ. LED Current x +25℃ Typ. LED Voltage x LED Chain number
   - Max. LED Power = Max. LED Current x -30℃ Max. LED Voltage x LED Chain number

4. LED Chain



5. The life time is determined as the time at which brightness of LED is 80% compare to that of initial value at the typical LED current.

6. DC current dimming is recommended for LED control. If PWM dimming is needed, PWM frequency should be optimized for minimal wavy and audible noise.

5-2. Interface Connections

5-2-1. User Connector Pin Configuration

The electronics interface connector is a model 00-6499-860-921-864+60 manufactured by Kyocera or equivalent.

Table 4. USER CONNECTOR PIN CONFIGURATION

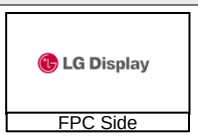
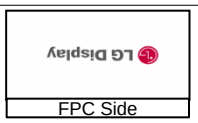
Pin No	Name	I/O	Description	Note
1	BIST	I	Built in Test Pattern Enable Signal	6
2	WP	I	Write Protection Signal for EEPROM	5, 6
3	GND	I	Ground	1
4	GND	I	Ground	1
5	NC	-	LGD use this pin that Data Signal for Touch Bootloader Download(JTAG)	3
6	NC	-	LGD use this pin that Clock Signal for Touch Bootloader Download(JTAG)	3
7	VCC	I	Power Supply Voltage	4
8	VCC	I	Power Supply Voltage	
9	VCC	I	Power Supply Voltage	
10	VCC	I	Power Supply Voltage	
11	GND	I	GROUND	1
12	HVR	I	Scanning Direction Control	2, 6
13	WP	I	Write Protection Signal for P-GMA IC	5, 6
14	MUTE	I	Panel Discharging Signal	6
15	GND	I	Ground	1
16	RA2M_E	I	LVDS Receiver Signal(A-)	
17	RA2P_E	I	LVDS Receiver Signal(A+)	
18	GND	I	GROUND	1
19	RB2M_E	I	LVDS Receiver Signal(B-)	
20	RB2P_E	I	LVDS Receiver Signal(B+)	
21	GND	I	GROUND	1
22	RC2M_E	I	LVDS Receiver Signal(C-)	
23	RC2P_E	I	LVDS Receiver Signal(C+)	
24	GND	I	GROUND	1
25	RCLK2M_E	I	LVDS Receiver Clock Signal(-)	
26	RCLK2P_E	I	LVDS Receiver Clock Signal(+)	
27	GND	I	GROUND	1
28	RD2M_E	I	LVDS Receiver Signal(D-)	
29	RD2P_E	I	LVDS Receiver Signal(D+)	
30	GND	I	GROUND	1
31	RA1M_O	I	LVDS Receiver Signal(A-)	
32	RA1P_O	I	LVDS Receiver Signal(A+)	
33	GND	I	GROUND	1
34	RB1M_O	I	LVDS Receiver Signal(B-)	
35	RB1P_O	I	LVDS Receiver Signal(B+)	
36	GND	I	GROUND	1
37	RC1M_O	I	LVDS Receiver Signal(C-)	
38	RC1P_O	I	LVDS Receiver Signal(C+)	
39	GND	I	GROUND	1
40	RCLK1M_O	I	LVDS Receiver Clock Signal(-)	

Table 4. USER CONNECTOR PIN CONFIGURATION (Continue)

Pin No	Name	I/O	Description	Note
41	RCLK1P	I	LVDS Receiver Clock Signal(+)	
42	GND	I	GROUND	1
43	RD1M_O	I	LVDS Receiver Signal(D+)	
44	RD1P_O	I	LVDS Receiver Signal(D+)	
45	GND	I	GROUND	1
46	SCL	I/O	I2C Clock Signal	6
47	SDA	I/O	I2C Data Signal	6
48	TSP_INT	O	Touch Interrupt Signal	6
49	TSP_RST	I	Reset Signal for Touch	6
50	GND	I	GROUND	1
51	THER-	O	Thermal sensor output(-)	
52	THER+	O	Thermal sensor output(+)	
53	Cathode4	I	Feedback current of channel4	
54	Cathode3	I	Feedback current of channel3	
55	Cathode2	I	Feedback current of channel2	
56	Cathode1	I	Feedback current of channel1	
57	NC	-	Not used	3
58	Anode	I	Power supply for Backlight	
59	Anode	I	Power supply for Backlight	
60	GND	I	GROUND	1

Note 1. All GND pins should be connected together.

2. Display Direction as following pictures.

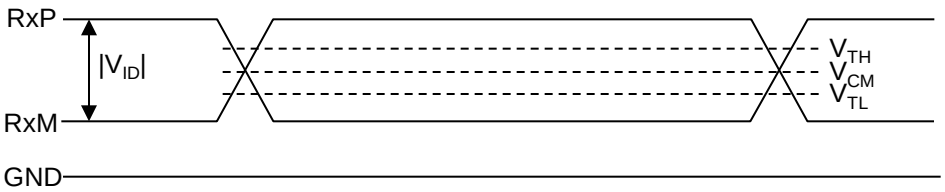
HVR	Display Image
Low (Regular Display)	
Hi (Horizontal and Vertical Inverted Display)	

3. Make sure that NC pins should be floated.
4. All VCC pins should be connected together.
5. WP pin is used for Write Protection. Customer should not control this pin (NC).
   WP(2) internally pulled-up, WP(13) internally pulled-down.
6. Please see the Appendix-I for more information about Equivalent Circuits.

5-3. LVDS Signal Specifications

5-3-1. DC Characteristics

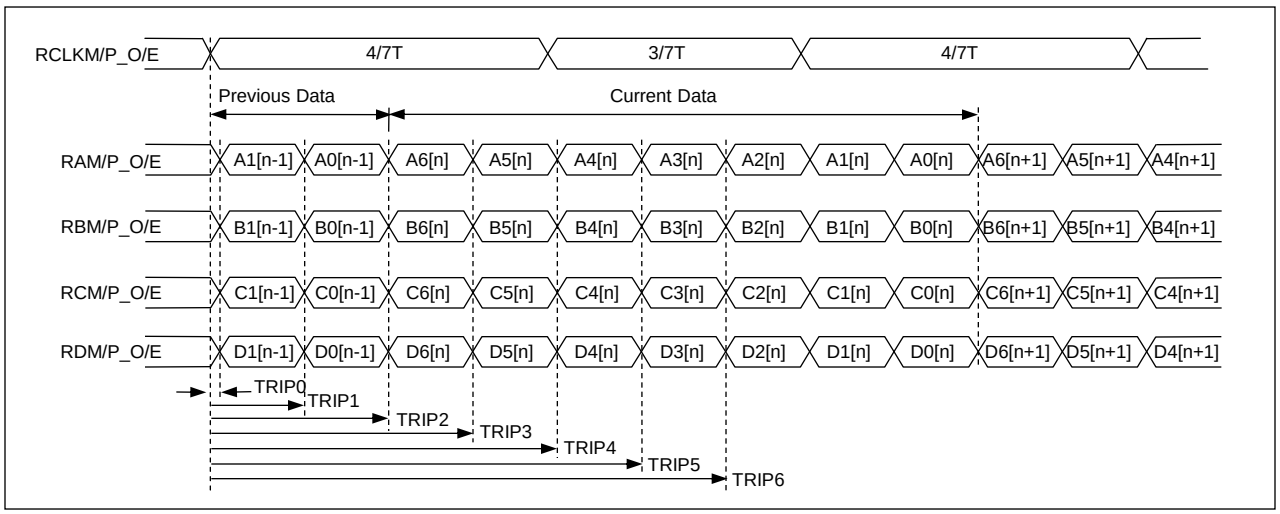
Parameter	Symbol	Min	Typ	Max	Unit	Notes
LVDS Differential Voltage	$\|V_{ID}\|$	200	350	500	mV	1
LVDS Input Common Mode Voltage	V_{CM}	1.0	1.2	1.4	V	
Positive-going Input Threshold Voltage	V_{TH}	-	-	100	mV	
Negative-going Input Threshold Voltage	V_{TL}	-100	-	-	mV	



Note 1. All LVDS Rx termination resistor(100Ω±20Ω) is integrated on the chip.(T-Con)

5-3-2. AC Characteristics (1/2)

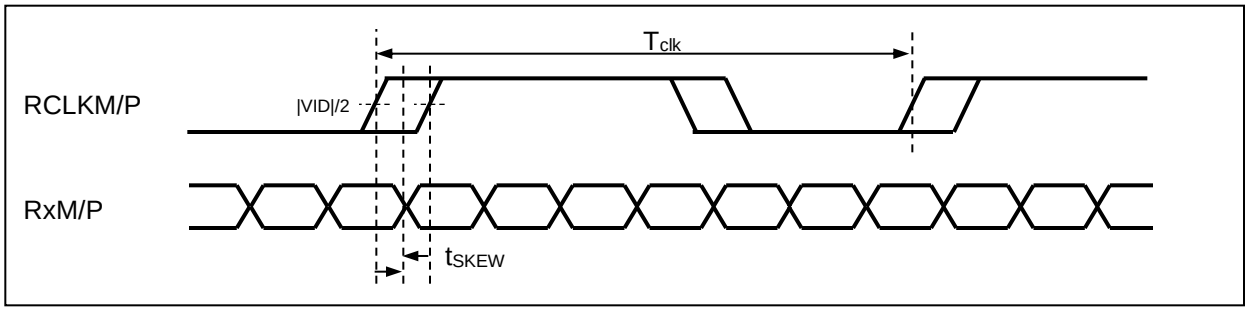
Parameter	Symbol	Min	Typ	Max	Unit
Input Data Position for Bit0	T_{RIP0}	-	0	-	ns
Input Data Position for Bit1	T_{RIP1}	-	T/7	-	ns
Input Data Position for Bit2	T_{RIP2}	-	2T/7	-	ns
Input Data Position for Bit3	T_{RIP3}	-	3T/7	-	ns
Input Data Position for Bit4	T_{RIP4}	-	4T/7	-	ns
Input Data Position for Bit5	T_{RIP5}	-	5T/7	-	ns
Input Data Position for Bit6	T_{RIP6}	-	6T/7	-	ns



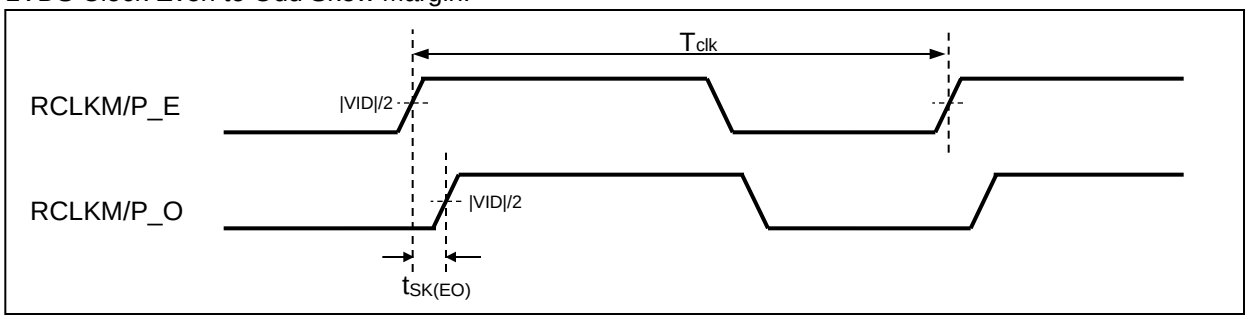
5-3-3. AC Characteristics (2/2)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
LVDS Clock to Data Skew Margin	t_{SKEW}	-300	-	+300	ps	1
Skew Even to Odd port	$t_{SK(EO)}$	-1/7	-	1/7	Tclk	2
Maximum deviation of input clock frequency during SSC	F_{DEV}	-	-	±2.5	%	3
Maximum modulation frequency of input clock during SSC	F_{MOD}		-	150	KHz	

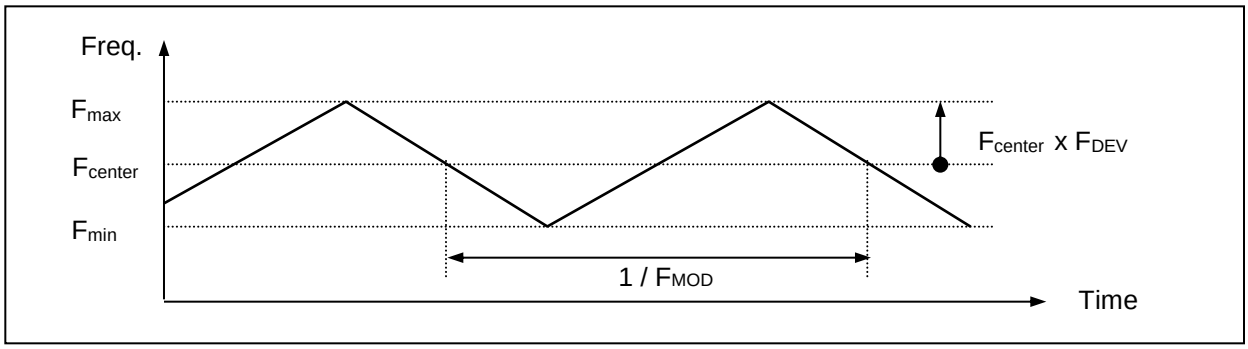
Note:
1. LVDS Clock to Data Skew Margin.



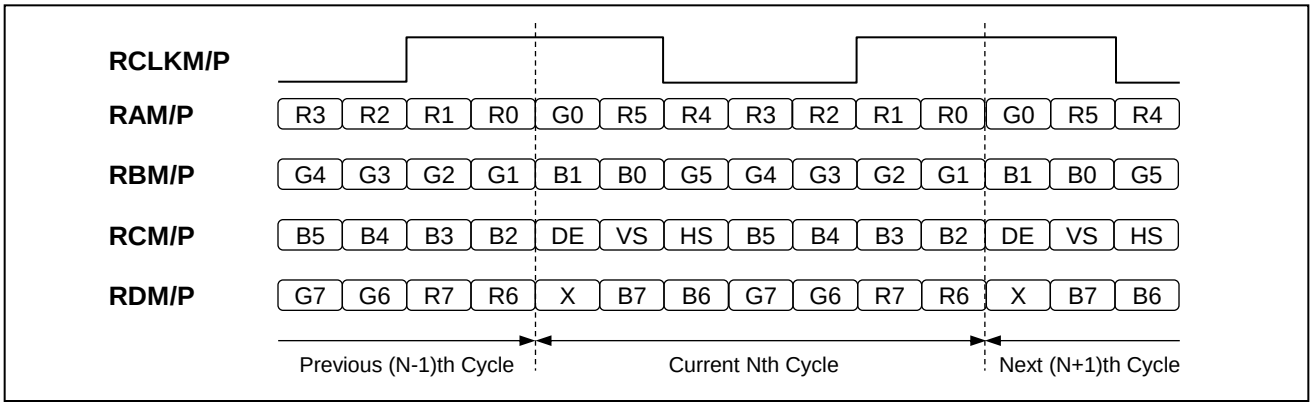
2. LVDS Clock Even to Odd Skew Margin.



3. Spread spectrum



5-3-4. LVDS Bit assignment (LVDS VESA Format)



5-4. Signal Timing Specifications

Table 5 shows the signal timing required at the input of the LVDS transmitter. All of the interface signal timings should be satisfied with the following specification for normal operation.

Table 5. SIGNAL TIMING CHARACTERISTICS (f_V=60Hz)

Parameter		Symbol	Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	44.5	44.8	45.1	MHz	2port
	Period	t_{CLK}	22.17	22.32	22.47	ns	
HSYNC	Period	t_{HP}	1020	1024 (2048)	1028	t_{CLK}	( ) 1port
	Width	t_{WH}	16	-	-		
	Horizontal Valid	t_{HV}	960 (1920)				( ) 1port
	Horizontal Back Porch	t_{HBP}	16	-	-		
	Horizontal Front Porch	t_{HFP}	16	-	-		
VSYNC	Period	t_{VP}	727	729	732	t_{HP}	
	Width	t_{WV}	2	-	-		
	Vertical Valid	t_{VV}	720				
	Vertical Back Porch	t_{VBP}	2	-	-		
	Vertical Front Porch	t_{VFP}	3	-	-		

Note 1. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.
Note 2. The Refresh rates should be followed 60Hz regardless of the DCLK & HSYNC & VSYNC.

5-5. Color Data Reference

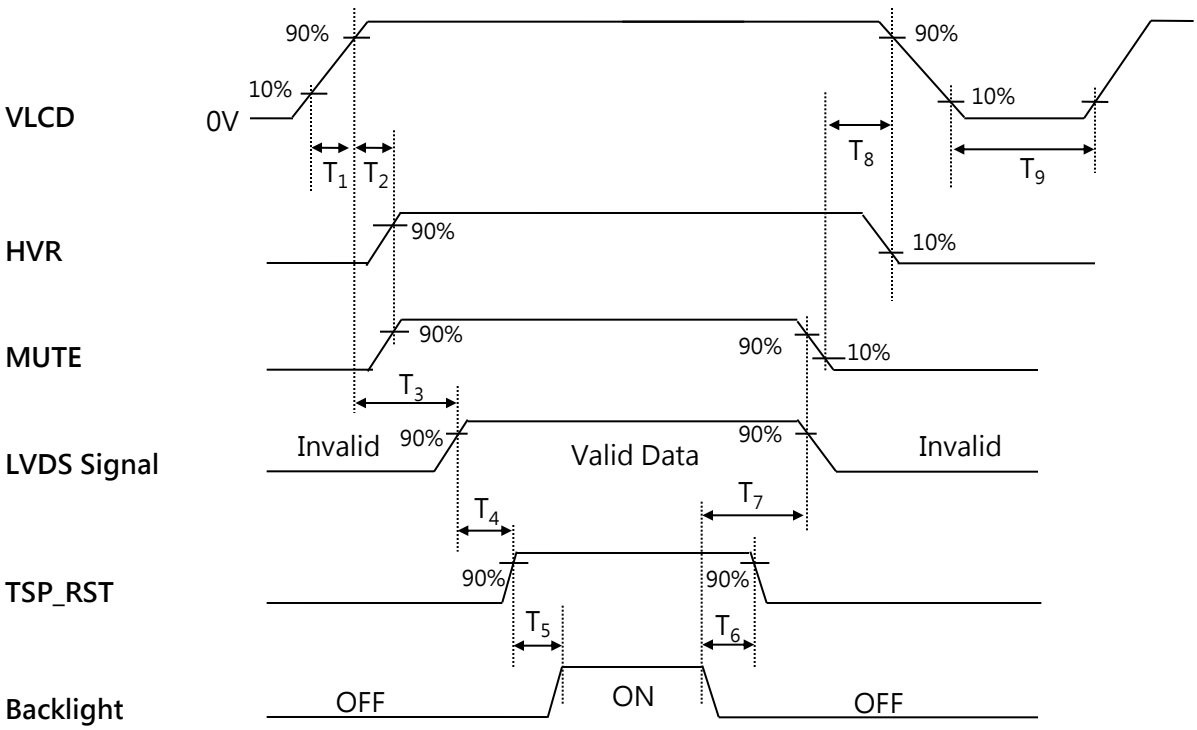
The brightness of each primary color(red, green, blue) is based on the 8bit gray scale data input for the color. The higher binary input, the brighter the color. Table 6 provides a reference for color versus data input.

Table 6. COLOR DATA REFERENCE

Color		Input Color Data		
		RED MSB LSB	GREEN MSB LSB	BLUE MSB LSB
		R7 R6 R5 R4 R3 R2 R1 R0	G7 G6 G5 G4 G3 G2 G1 G0	B7 B6 B5 B4 B3 B2 B1 B0
Basic Color	Black	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	Red (255)	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	Green (255)	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0
	Blue (255)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1
	Cyan	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1
	Magenta	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1
	Yellow	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0
	White	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1
RED	RED (00)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	RED (01)	0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	…	…	…	…
	RED (254)	1 1 1 1 1 1 1 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	RED (255)	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
GREEN	GREEN (00)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	GREEN (01)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1	0 0 0 0 0 0 0 0
	...	…	…	…
	GREEN (254)	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 0	0 0 0 0 0 0 0 0
	GREEN (255)	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0
BLUE	BLUE (00)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0
	BLUE (01)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1
	…	…	…	…
	BLUE (254)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 0
	BLUE (255)	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1

5-6. Power Sequence

For LCD's normal operation, it is recommended to keep below power supply sequence.



Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	10	ms	
T2	0	-	T3	ms	
T3	100	-	-	ms	
T4	17	-	-	ms	4,5
T5	0	-	-	ms	
T6	0	-	T7	ms	
T7	10	-	-	ms	
T8	34	-	-	ms	
T9	500	-	-	ms	

Note 1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply for VLCD to 0V.
3. Do not change HVR, WP, MUTE status to avoid abnormal display during LCD operation.
4. During the Low temperature operation, Display looks slow depending on the response speed characteristics of the Liquid Crystal.
5. After LVDS valid signal input, normal screen will be start after black screen for 6 frames.

6. Electro-optical Characteristics

Electro-optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25±2°C. The values are specified at an approximate distance 50cm from the LCD surface at a viewing angle of and equal to 0°. Measured value at the center point of LCD panel after more than 15 minutes while backlight turning on.

It is presented additional information concerning the measurement equipment and method in FIG. 1.

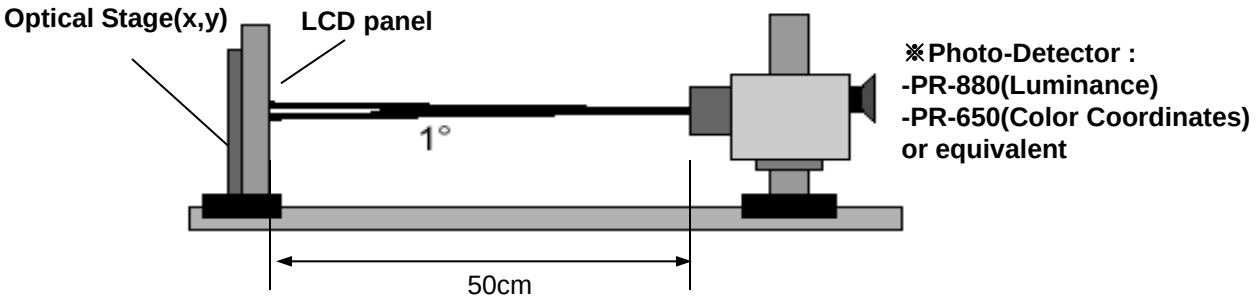


FIG. 1 Electro-optical Characteristic Measurement Equipment and Method

Table 7. ELECTRO-OPTICAL CHARACTERISTICS

Ta=25±2°C, VLCD=5.0V, VBL=95mA, BL_DIM=100%, fv=60Hz, fclk=44.8MHz

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio (Perpendicular)		CR	900	1100	-		1
Surface Luminance, white		L_{WH}	720	900	1170	cd/m^2	2
Luminance Uniformity(16point)		δ_{WHITE}	80	-	-	%	3
		δ_{BLACK}	50	-	-		
Response Time	@25℃	Tr+Tf	-	-	20	ms	4,5
	@-20℃ (Tp)	Tr+Tf	-	-	150	ms	
	@-30℃ (Tp)	Tr+Tf	-	-	400	ms	
Color Coordinates [CIE1931]	RED	Rx	Typ. -0.030	0.638	Typ. +0.030		
		Ry		0.333			
	GREEN	Gx		0.288			
		Gy		0.625			
	BLUE	Bx		0.150			
		By		0.047			
	WHITE	Wx		0.293			
		Wy		0.320			
Gamma			2.0	2.2	2.4	-	7
Color Gamut			-	72	-	%	
Viewing Angle (CR>10)	x axis, right(ϕ=0°)	θr	-	89	-	degree	6
	x axis, left (ϕ=180°)	θl	-	89	-		
	y axis, up (ϕ=90°)	θu	-	89	-		
	y axis, down (ϕ=270°)	θd	-	89	-		

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

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

It is measured at center 1-point.

2. Surface luminance are determined after the unit has been 'ON' and More than 15 Minute after lighting the backlight in a dark environment at 25±2°C. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 1.

3. Uniformity Measurement (White & Black)

$$\text{Panel total variation} = \frac{\text{Minimum Luminance}}{\text{Maximum Luminance}} \times 100\ (\%)$$

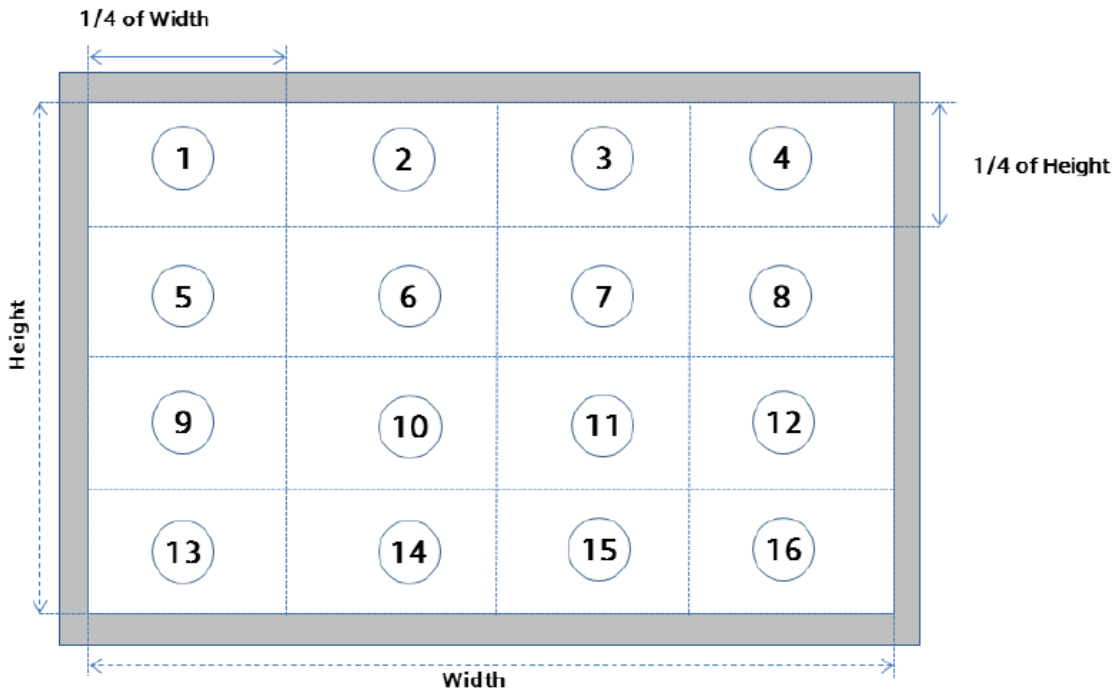


FIG. 2 16 Points for Luminance Measure

Note 4. Response time is obtained by measuring the transition time of photo detector output, when input signals are applied to make center point “black” and “white”. For more information, see the FIG. 3

5. Low temperature response time measure method
: The LCM has remained at low temperature(0℃ or -20 ℃ or -30 ℃)for 30 minutes and then kept turning on for 30 minutes before measured.
This is a part of design warranty. No additional management will be fulfilled for this in mass production.

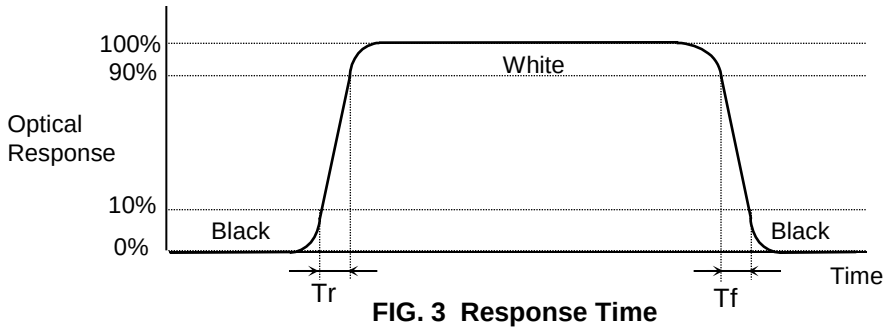


FIG. 3 Response Time

6. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG.4.

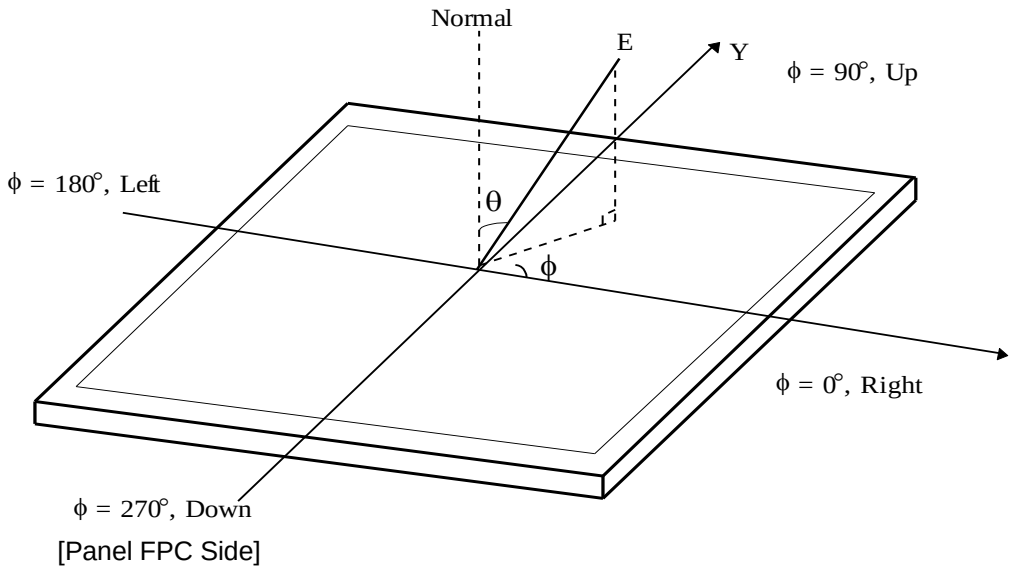


FIG. 4 Viewing Angle

7. Gamma is measured and evaluated according to “Information Display Measurements Standard" Version 1.03, 2012-07-01

- Measurements 9point: 255, 223, 191, 159, 127, 95, 63, 31, 0Gray

7. Mechanical Characteristics

The contents provide general mechanical characteristics for this panel.
In addition the figures in the next page are detailed mechanical drawing of the LCD.

Table 8. MECHANICAL CHARACTERISTICS

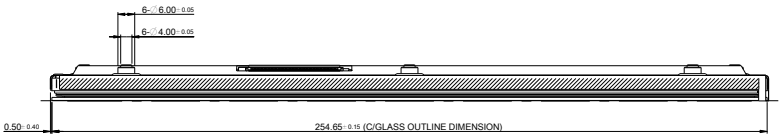
Parameter	Value	
Outline Dimension	Horizontal	255.65 ± 0.3 mm
	Vertical	105.87 ± 0.3mm
	Depth	9.0 ± 0.3 mm (on C/Bottom)
Cover Glass BM Area	Horizontal	244.548 ± 0.15mm
	Vertical	92.368 ± 0.15mm
Active Display Area	Horizontal	243.648 ± 0.3mm
	Vertical	91.368 ± 0.3mm
Weight	415g (Typ.), 420g (Max.)	

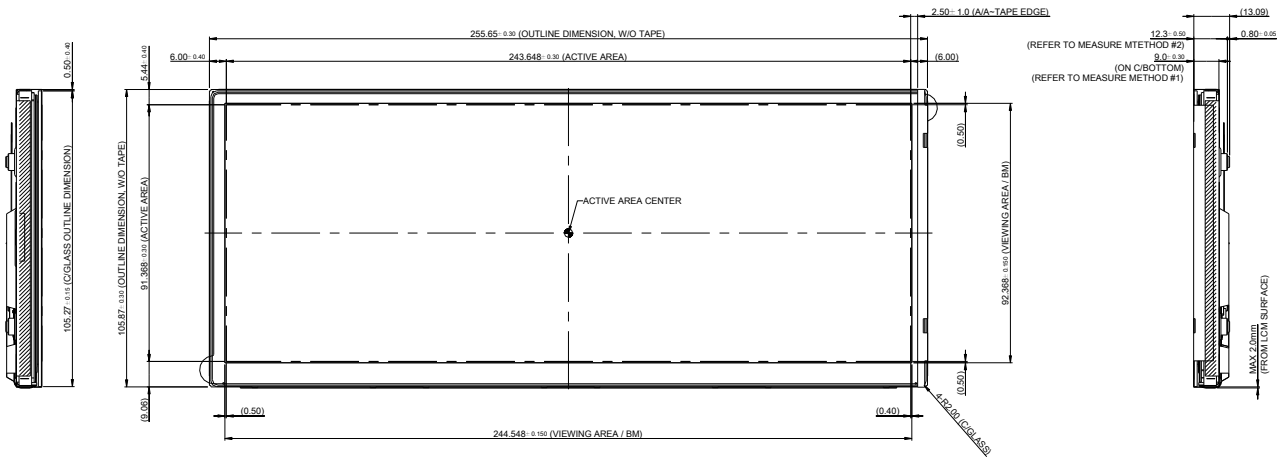
Note. Unit:[mm], General tolerance: ± 0.3mm

<FRONT VIEW>

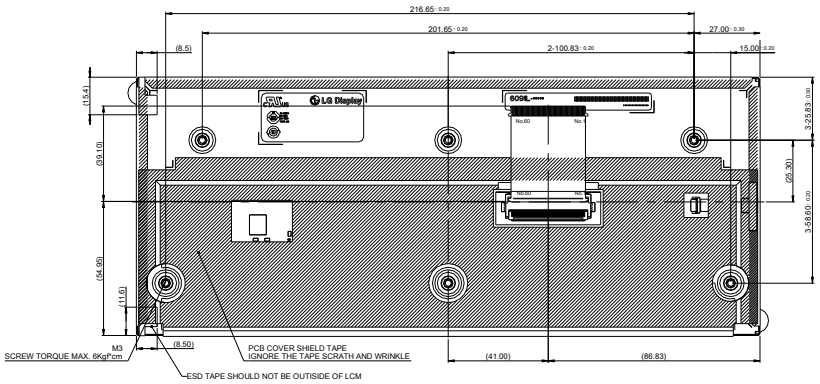
NOTES

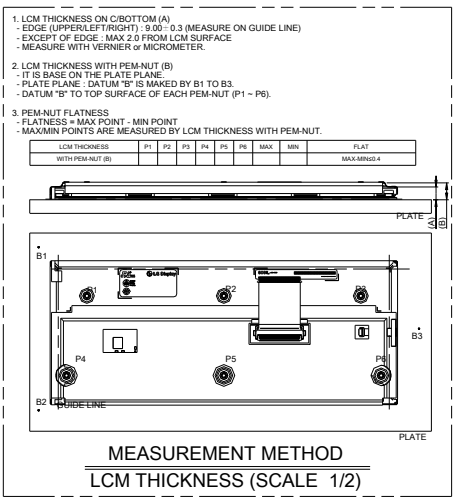
1. UNSPECIFIED DIMENSIONAL TOLERANCES ARE ±0.3mm.
2. EACH PARTS SPECIFICATION REFER TO THE EACH DRAWING.
3. COMPROMISE WITH DESIGNER ON DETAIL MATTERS.
4. ALL MATERIAL SHOULD BE APPLIED HALOGEN FREE MATERIAL.





<RAER VIEW>





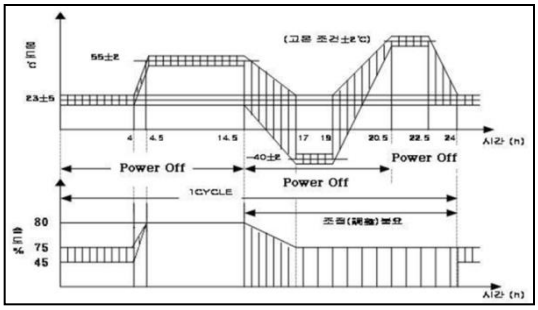
8. Reliability

Table 9. ENVIRONMENT TEST CONDITION

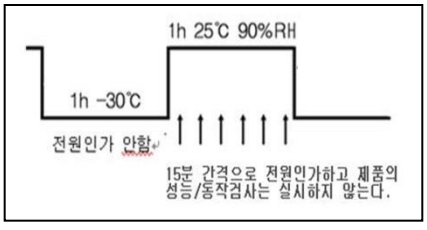
No.	Test Item	Test Condition	Note
1	High Temperature Storage Test	Ta = 95℃ 240h	
2	Low Temperature Storage Test	Ta = -40℃ 240h	
3	High Temperature Operation Test	Ta = 85℃ 240h	
4	Low Temperature Operation Test	Ta = -30℃ 240h	
5	High Humidity High Temperature Operation Test	Ta = 65℃ / 90%RH 240h	
6	Humid Heat Cyclic Test	Ta = -40℃~70℃, 4cycles	3
7	Thermal Shock Test (non-operating)	Ta = -40℃(0.5h) ↔ 95℃(0.5h), 240Cycles	
8	Dew Condensation	-30℃/1Hr ~ 25℃,90%RH/1Hr, 5Cycle	4
9	Electro Static Discharge Test	Condition / judgment Panel Surface, Operating, 330pF, 330Ω, Air, 5times, ±15kV, Accept Soft fail Cover Bottom, Operating, 150pF, 330Ω, Contact, 5times, ±10kV, Accept Soft fail User Connector Pin, Un-plug, ±2kV, Not Accept Hard fail	
10	Mechanical Shock	- Half sine wave, 50G, 11ms, 3times - One in each opposite direction of each perpendicular axis	Non Operating
11	Vibration Test	- 5Hz to 200Hz logarithm sweep for 20 min/cycle - 5Hz to12.2Hz : The amplitude is 10mm p-p - 12.2Hz to 100Hz : The acceleration is 3.0G 0-pk - 101Hz to 200Hz : The acceleration is 1.5G 0-pk - 3axes, 18 sweeps per axis	Non Operating

Note. Result Evaluation Criteria:

1. TFT-LCD panels should take place at room temperature for 24 hours after the reliability tests finish.
   * Panels should become room temperature within 2hours.
   * Panels should be in dry status. (The humidity during reliability test should be disappeared.)
2. After conduct reliability tests, only functional FOS(Front of Screen) quality is guaranteed by naked eyes. It means there is no function failure problems such as abnormal display, line defect.
3. Detail of Humid Heat Cycle Test



4. Detail of Dew Condensation



9. Touch

9-1. Touch Specifications

Table 10-1. General Specifications

Item		Spec.	Note.
General Specification	Touch Panel Technology	Projected Capacitive Touch	
	Sensor Type	In-cell	AIT
	Touch IC	MIT-401	Melfas
	Source Driver IC	SW9508	Siliconworks
	Gate Driver IC	SW8021B	Siliconworks
	Multi Touch Points	5 points	
	Active Touch Area [mm]	243.648 x 91.368	
	Finger Size	9Φ (6~25Φ)	
	Interface	I2C	
	Touch Block	48 by 18	

Table 10-2. Touch Performance

Item			Unit	Spec.			Notes
				Min.	Typ.	Max.	
Touch Performance	Point Accuracy	Center	mm	-	-	1.0	9Φ Finger (w/o Glove)
		Edge	mm	-	-	2.0	
	Linearity	Center	mm	-	-	1.0	9Φ Finger (w/o Glove)
		Edge	mm	-	-	2.0	
	Finger Separation		mm	14	-	-	(6Φ center to center)

Note 1. All kind of specifications and functions are optimized with the below Test condition.
-. Report rate 60Hz@1-finger
Note 2. Edge Accuracy 1,2,3 points, Edge linearity 4,5 area are max 3.0 mm (@ Fig 6, 7)

9-2.Touch Performance Test

The Touch test shown below are processed by the final inspection machine in Nan-Jing LG Display Module Line.

Table 10-3. Touch Performance Test List

No.	Test	Evaluation method	Spec.
1	Version Check	Boot Loader, Core, Customer, F/W Version Check.	Boot : 0406 Core : 05.01 Customer : 01.00 F/W : V00.14
2	Load open	Rawdata Min./Max comparison within Panel Load open.	Max : 12288 Min. : 6500
3	Raw-data	Rawdata Min./Max. comparison about 10Frame of Rawdata.	Max : 10000 Min : 1000
4	Open Short	Comparison of Rawdata value difference Calculations for the same column by MUX.	Max : 2000 Min : -2000
5	Jitter	Extraction of the maxium varitaion in the rawdata of 240frame based on average value of rawdata of 60 frame.	± 224
7	Drawing	Drawing along the line shown on the screen.	No Drawing Error

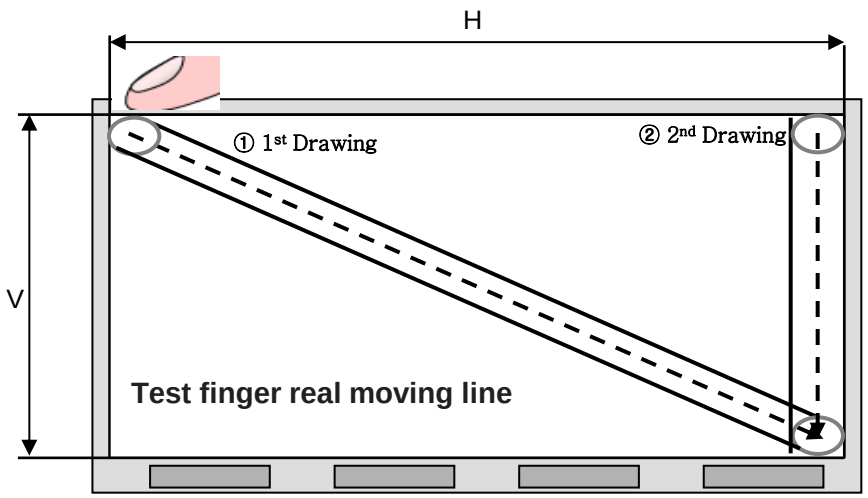


FIG. 5 Drawing Test Method

Note 2. Touch Performance measurement

- Test Machine : MIK K9600
- Test Tip : 9Φ Slug
- E : 4.5mm(Test Tip Size/2)

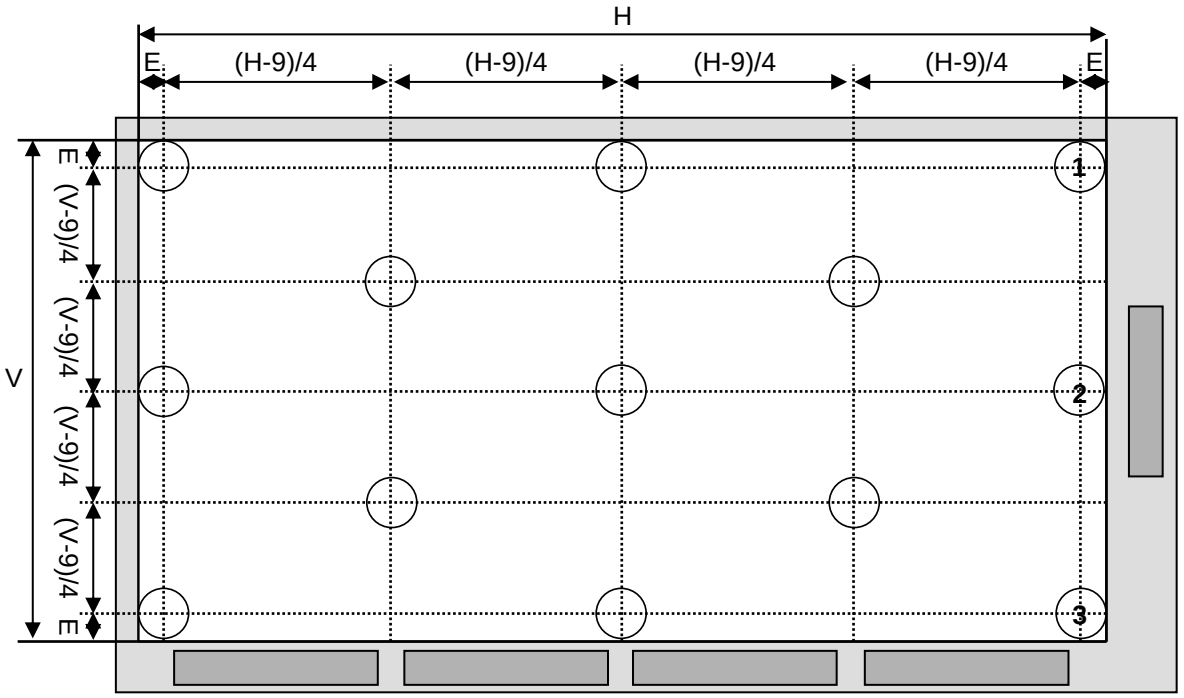


Fig 6. Accuracy Test

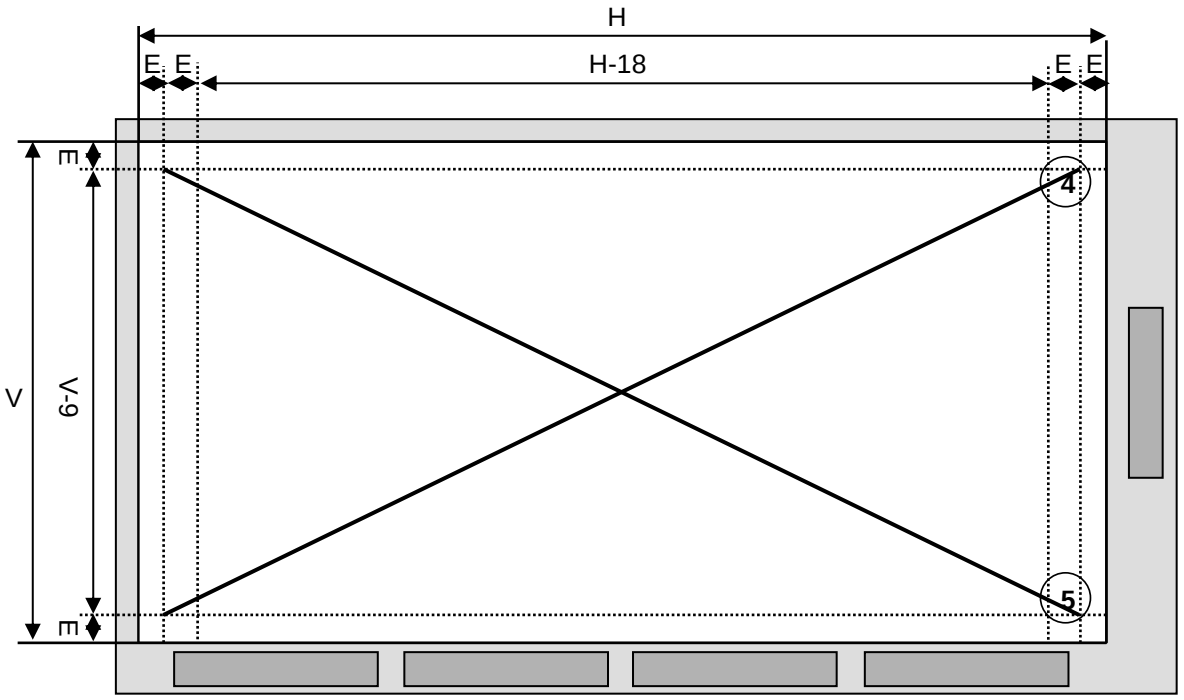


Fig 7. Linearity Test

10. International Standards

10-1. Safety

a) UL 60950-1, Underwriters Laboratories Inc.
Information Technology Equipment - Safety - Part 1 : General Requirements
b) CAN/CSA C22.2 No.60950-1-07, Canadian Standards Association.
Information Technology Equipment - Safety - Part 1 : General Requirements.
c) EN 60950-1, European Committee for Electrotechnical Standardization (CENELEC).
Information Technology Equipment - Safety - Part 1 : General Requirements.
d) Flammability test for determination of burning behaviour of interior materials in motor vehicles.
- ISO 3795, International Organization for Standardization
Road vehicles, and tractors and machinery for agriculture and forestry - Determination of burning behaviour of interior materials
- DIN 75200, Deutsche Industric Normen
Determination of burning behaviour of interior materials in motor vehicles.
- FMVSS 302, Federal Motor Vehicle Safety Standards
Flammability of Interior Materials

10-2. Environment

a) RoHS, Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011

11. Packing

11-1. Designation of Lot Mark

a) Lot Mark

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

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

Note

1. YEAR

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

2. MONTH

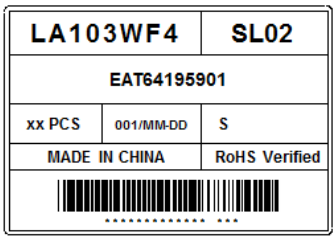
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

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

ID LABEL

BOX/PALLET LABEL

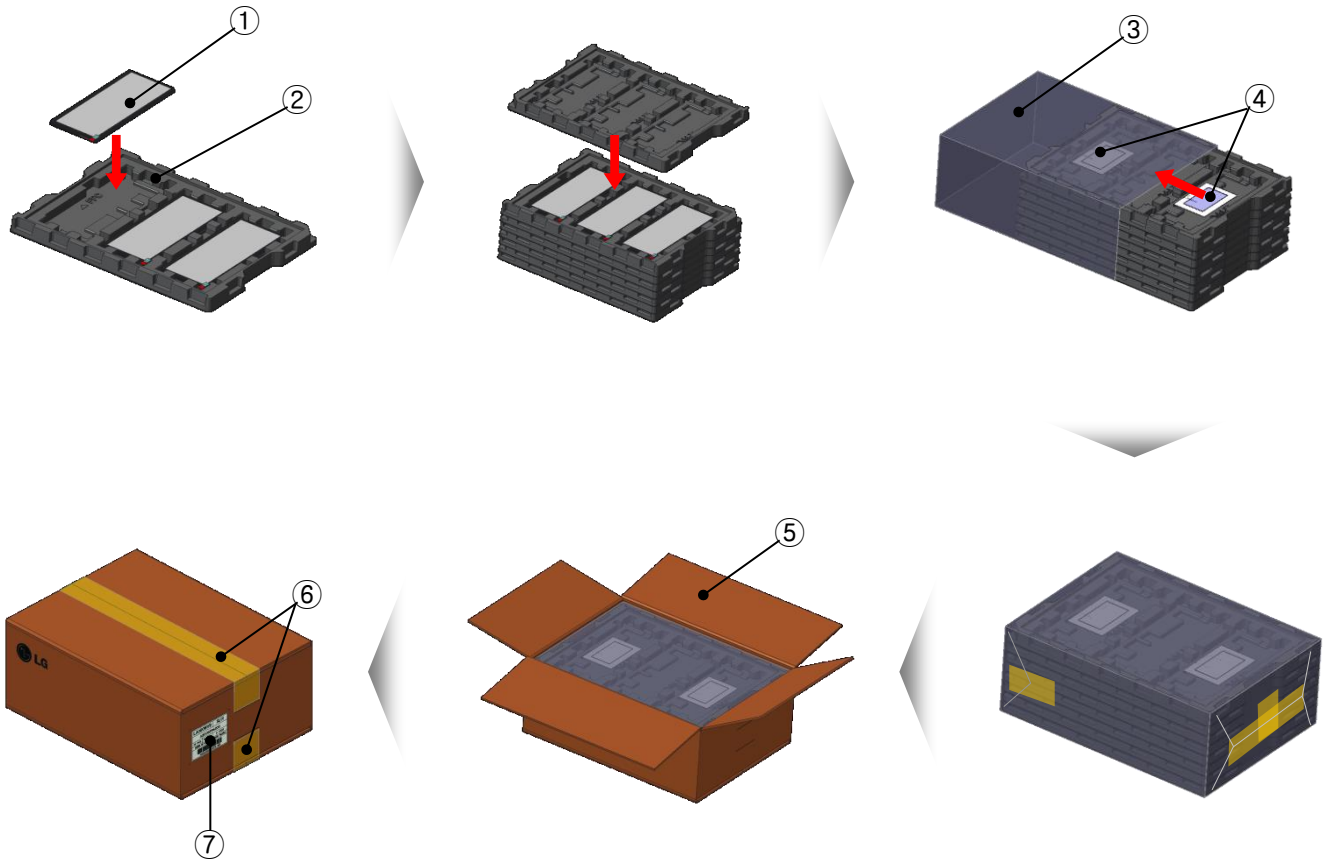


■ LGE 2D Barcode Information

Item	Information	Digit	Remarks
LGE P/N	EAT64195901	11	Fixing data per each model
Seq. No	0001	4	“0001”
Maker P/N	LA103WF4	8	Fixed
Lot No	LGD Barcode Rule	13	Same as LGD Barcode Rule
Q’ty	Quantity in Box	2	Quantity in Box

11-2. Packing Form

a) Package quantity in one box: 21 pcs
b) Box Size: 478 × 365 × 195 (mm)



NO.	Description	Material
1	LCD Panel	21ea/Box
2	Packing, Tray	PET
3	Bag	PET
4	Desiccant	Calcium Chloride
5	Box	Corrugated Board
6	Tape	OPP
7	Box Label	Yupo

12. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD panel.

12-1. MOUNTING PRECAUTIONS

(1) You should consider the assembling structure so that uneven force(ex. Twisted stress) is not applied to the LCD panel.
(2) Please attach a transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(3) You should adopt radiation structure to satisfy the temperature specification.
(4) Acetic acid type and chlorine type materials are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(5) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
(6) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(8) Do not touch, push the circuit component on PCB.
(9) The ground of a PCB should be contacted to electrical ground of your system.
(10) The metal case of a module should be contacted to electrical ground of your system.

12-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(5) LCD panel has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

12-3. ELECTROSTATIC DISCHARGE CONTROL

Since a LCD panel is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that handling persons are connected to ground through wrist band etc. And don't touch interface pin directly.

12-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

12-5. STORAGE

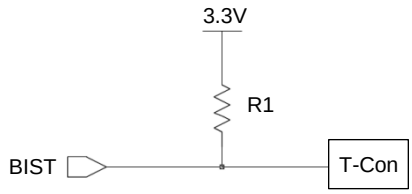
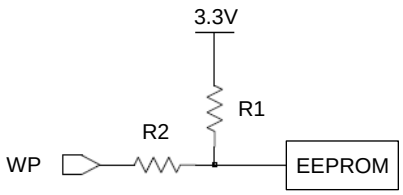
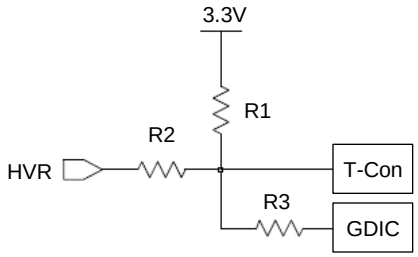
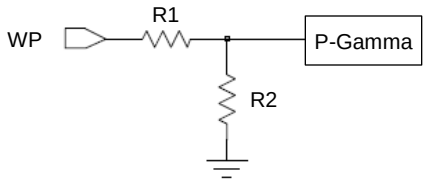
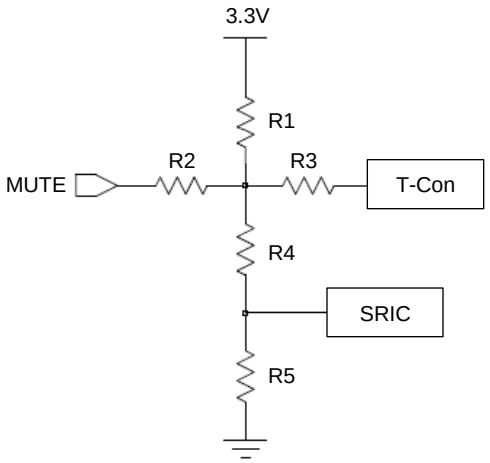
When storing LCD panel as spares for a long time, the following precautions are necessary.
(1) Store them in a dark place. Do not expose the LCD panel to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

12-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape or a double side tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the LCD panel with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.
(4) You can remove the glue and foreign material. When the glue remains on polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

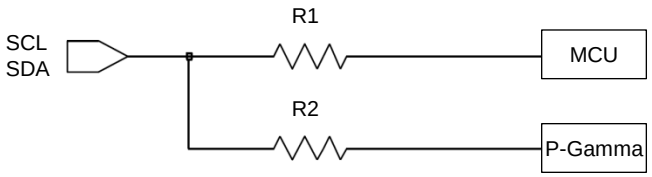
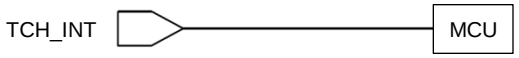
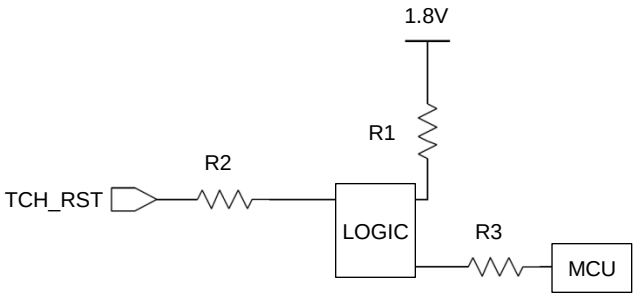
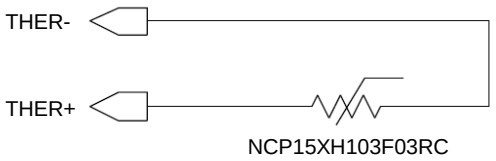
APPENDIX- I

■ I/O Equivalent Circuits

Pin No	Symbol	I/O	Description	Note
1	BIST	I		R1: 4.7kΩ
2	WP	I		R1: 1.0kΩ R2: 47Ω
12	HVR	I		R1: 4.7kΩ R2: 47Ω R3 : 0Ω
13	WP	I		R1: 47Ω R2: 1.0kΩ
14	MUTE	I		R1: 4.7kΩ R2: 47Ω R3: 0Ω R4: 47kΩ R5: 56kΩ

APPENDIX- I

■ I/O Equivalent Circuits

Pin No	Symbol	I/O	Description	Note
46 47	SCL SDA	I/O		R1: 47Ω R2: 47Ω
48	TSP_INT	O		
49	TSP_RST	I		R1: 0Ω R2: 0Ω R3: 0Ω
51	THER-	O		
52	THER+	O		

APPENDIX- II

■ Thermistor Characteristics (NCP15XH103F0SRC)

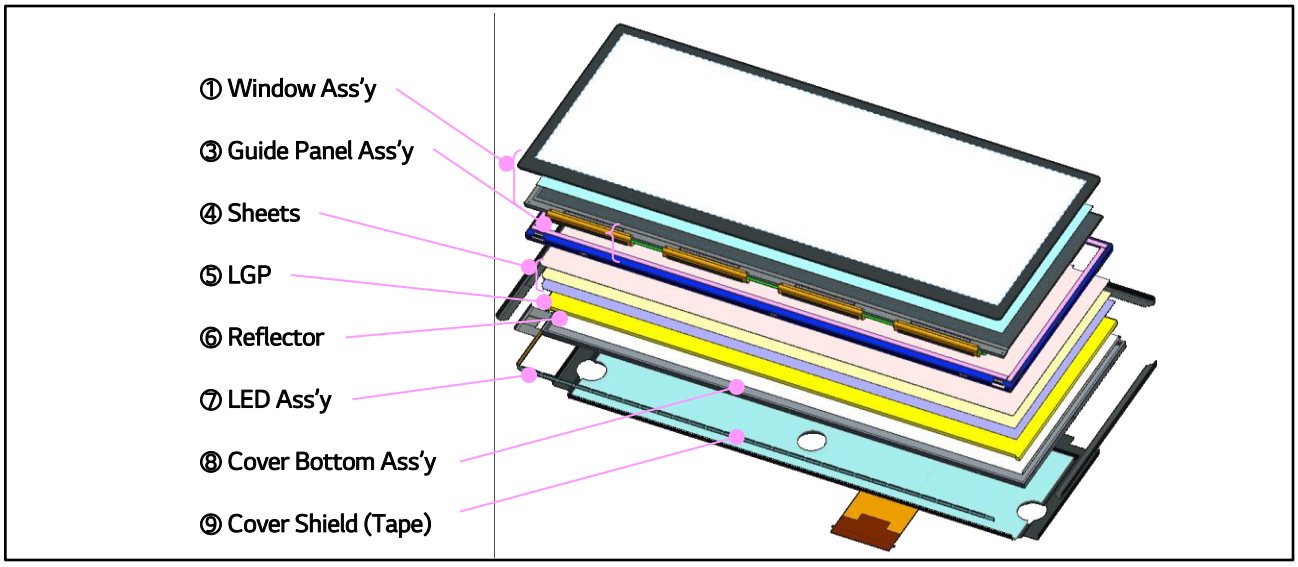
Note 1. The display module shall incorporate a NTC thermistor surface mounted to the display circuit board.
The user of LCD module can utilize this thermistor for some special purpose.
For example, the user can measure display temperature from the thermistor and
then turn off backlight when LCD module temperature exceeds maximum rating.

2. $R_{thermistor}$ in the table is the feature of the thermistor by itself, and R_{THER} is measured value in the LCM. Customers should refer to the value of R_{THER} for LED derating.
3. $R_{thermistor}$ tolerance is ±1% at 25℃.

℃ (Ta)	PWM duty Ratio[%]	$R_{thermistor}$ [kΩ] (Thermistor)	R_{THER} [kΩ] (NTC_Display Thermistor)
-40	100%	195.65	58.57
-35	100%	148.17	45.65
-30	100%	115.05	35.91
-25	100%	87.56	28.50
-20	100%	68.24	22.81
-15	100%	53.65	18.4
-10	100%	42.51	14.9
-5	100%	33.89	12.2
0	100%	27.22	10.0
5	100%	22.02	8.36
10	100%	17.93	6.97
15	100%	14.67	5.85
20	100%	12.08	4.93
25	100%	10.00	4.18
30	100%	8.32	3.57
35	100%	6.95	3.05
40	100%	5.83	2.63
45	100%	4.92	2.27
50	100%	4.16	1.97
55	100%	3.54	1.72
60	100%	3.01	1.50
65	100%	2.59	1.32
70	100%	2.23	1.16
75	82.6%	1.93	1.16
80	65.2%	1.67	1.16
85	47.8%	1.45	1.16

APPENDIX- III

■ LCM Construction



No	Part Name	Part No	Q'ty	Specification	Maker
①	Window Ass'y	6755L-0627A	1	Direct Bonding	LGD
②	Guide Panel Ass'y	4975L-1568A	1	Press, STS409HD + 3M,4734FP-86DH, 4ea	YD
③	Sheets	5146M-0910A 3032L-2964A 3022L-3751A	1	PLAS-D12 KS77-150 TDW10C	LMS Optivision Toray
④	LGP	5150L-1758A	1	PC, Flat, 2.8T	HSNJ
⑤	Rattle Pad	5022L-2246A	2	AD-5020FR(W)	Changsung
⑥	Reflector	3034L-2520A	1	XJSE225	Toray
⑦	LED Ass'y	6916L-3130A	1	T7020, 28ea	Wooree
⑧	Cover Bottom Ass'y	3551L-1744A	1	AL5052, 1.2T + STS303F, Pemnut 6ea	YD
⑨	Cover Shield(Tape)	3550S-2748A	1	LC50WB, 0.05T	Solueta

Incoming Inspection Standard

Model : LA103WF4-SL02/03

Customer : LGE

Part No. :EAT64195901/EAT64196001

Date: July. 10th, 2018

Prepared by : K.C. Kim

Approved by : J.H. Jung Jeahun Jung

Auto Customer supporting Team
LG.Display Co,. LTD.

Customer's Approval

Reviewed & Approved by

(NAME) .....

(TITLE) .....

(Signature) .....

(Date) .....(MM)/.....(DD)/.....(YY).....

Please (return / keep) this standard with your signature for approval

Contents

Revision Status

Rev. No.	Chapter	Contents	Date	Issued & amended by
1.0	All	Originated IIS	20/ Jun. / 2018	K.C. Kim

1.0 Introduction

1.1. Scope

This Incoming Inspection Standard shall be applied to TFT-LCD modules (hereafter called the "LCMs") supplied by LG Display (hereafter called the "Supplier") to its Customer.

1.2. Incoming inspection Right

The Customer shall have the right to conduct at its own cost and expense, an incoming inspection of the LCMs at the destination specified in the relevant B/L(Bills of Lading) in accordance with the LCM's specifications separately agreed upon and the inspection criteria set forth in this article.

The Customer shall notify the Supplier in writing of the inspection results (accept or reject) in accordance with the said Incoming Inspection Standard within 40 days from the date of the B/L.

Should the Customer fail to notify the results to Supplier within 40 days period, the right to reject the LCMs shall then lapse, and the said LCMs shall be deemed to have been accepted by the Customer.

1.3. Handling Precautions

- LCM Devices are made of fragile material such as Glass and plastic and may be broken or cracked if dropped it, so **PLEASE** handle them with care.
- **DO NOT** press the area covered with PET or such materials. These are weak point of LCMs since of TCPs(Driver ICs) and PWBs.
- **PLEASE** support the Bezel with your finger when connecting the interface cable.
- Please **DO NOT** touch the surface of the Glass(Polarizer).
- **PLEASE** wear the Wrist Strap when handling.
  Semiconductive devices are included in the LCMs and they should be handled with care to prevent any electrostatic discharge(ESD).
- **PLEASE** keep the LCMs in the specified, original packing boxes when storage.
- **DO NOT** stack the LCMs too high without wrapping material such as AIR CAP.
- Before using the LCMs, **PLEASE** check the Engineering specification.
- LCMs contain a small amount of Liquid Crystal and Mercury. **PLEASE** follow local ordinances or regulations for disposal.

2.0 Generals

2.1. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

2.1.1. Lot size : Quantity per shipment lot (minimum lot size : 100 pieces)
2.1.2. Sampling type : Normal inspection, Single sampling
2.1.3. Inspection level : II
2.1.4. Sampling table : ANSI Z1.4

2.2. Acceptable Quality Level(AQL)

The AQL for major and minor defects shall be respectively set forth below.

2.2.1. **Major = 0.4 %**
2.2.2. **Minor = 0.65 %**

2.3. Classification of defects

Defects are classified as either a major defect or a minor defect based on the degree of defect defined herein.

2.2.1. Major defect
The major defect is a defect that is likely to result in product failure, or reduction in the product's intended usage.

2.2.2. Minor defect
The minor defect is a defect that has little bearing on the effective use or operation of the product.

Specific criteria of judgment of major and/or minor defects or other related issues shall be in accordance with the Appendix A, "Classification of Defects".

2.4. Determination of acceptability and subsequent disposal

If the number of defects found in the LCM sampling lot is equal to or less than the AQL(Acceptable Quality Level), the lot shall be accepted.

If the number of defects found in the LCM sampling lot is greater than the AQL, the lot shall be rejected. The Customer shall inform the Supplier of the results of such inspection detailly within the time period stipulated in chapter 1.2. "Incoming inspection Right".

2.4.1. Accepted lot

An acceptance under the above incoming inspection shall constitute an acceptance by the Customer of such lot of the LCMs in terms of the landed quality thereof.

2.4.2. Rejected lot

If a shipment lot of products is rejected under the above incoming inspection due to any defects of which the Supplier is responsible and such a fact is clearly confirmed by the Supplier through a separate inspection or as otherwise decided, the Supplier shall choose one of the following three options which must be determined by mutual consent.

The Supplier shall advise the Customer of its choice not later than 10 working days(Monday through Friday) of receipt of the "Customer's notification of rejected lot" :

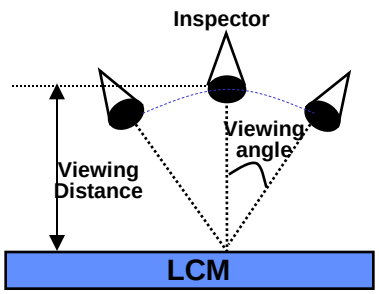
a. The Customer shall return the rejected lot to the place to be designated by the Supplier and the Supplier shall screen all of the products in the lot and repair or replace the defective LCMs.

b. The Supplier shall screen all of the LCMs in the lot and repair or replace the defective LCMs within a reasonable time period at the Customer's facility.

c. The Customer shall screen the entire lot of LCMs at the expense of Supplier's, and the expense must be agreed by the Supplier. The rejected LCMs shall be returned to the place designated by the Supplier.

2.5. Inspection Conditions

Viewing Distance	30 ~ 50cm	
Ambient illumination	Operating Inspection	50~150 lux
	Visual Inspection	300~700 lux
Viewing angle	Within 45 degrees : left, Right Within 45 degrees : Up, Down	
Ambient temperature	25±5℃	
Display patterns	R, G, B, Black, Half Gray, White	
Inspection zone	Active area which is operating with pixels.	



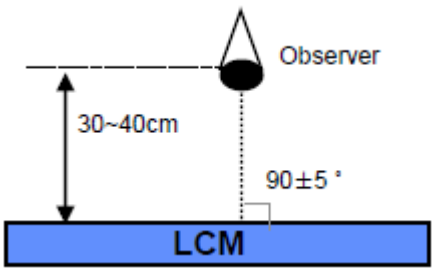
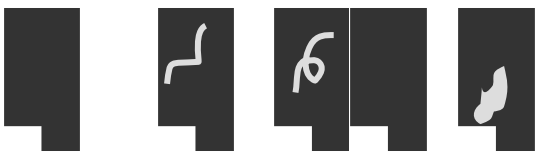
3.0 Inspection Criteria

3.1. Dot Defects

3.1.1. Bright Dots

Dots(sub-pixels) which appear bright in the screen when the LCM operates with Black pattern. (Including bright dots caused by foreign material)

Items		Criteria (acceptable level)	
Bright Dots	R,G or B 1 dot	N≤0	※ Weak Bright Dot It would be not counted as a bright dot But full screen pattern with half gray must not show weak bright dots
	Adjacent 2 dots	N≤0	
	Minimum distance	disregarded	
	Density	N≤0	
	total	N≤0	

Defect Modes	Bright dot types	Inspection standards
C/F damage, Domain, Foreign material in Panel		Inspection Patterns : Black, R,G,B, Half gray 
Foreign material in POL, POL bubble		

3.1.2. Dark Dots

Dots(sub-pixels) which appear dark in the screen when the LCM operates with White or Half Gray patterns.

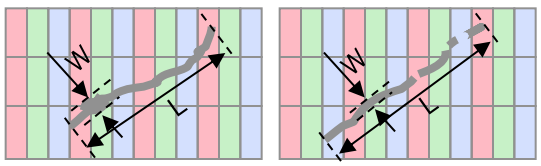
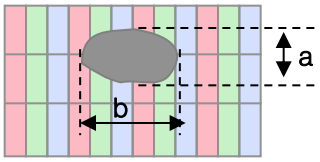
Items		Criteria (acceptable level)	
Dark Dots	1 dot	N ≤ 3	It would not be counted as a dark dot when Dot is not visible using 5% ND Filter, although it is visible with naked eyes
	Adjacent 2 dots	N ≤ 1	
	Minimum distance	L ≥ 5mm	
	total	N ≤ 3	

3.2. Polarizer Defects

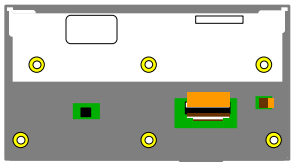
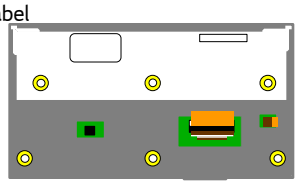
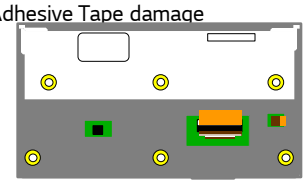
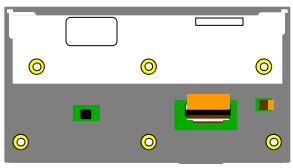
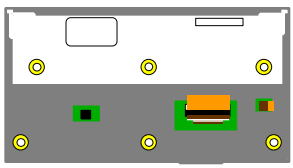
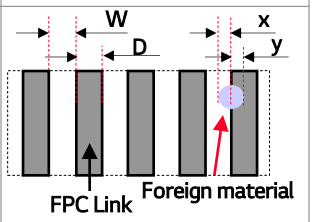
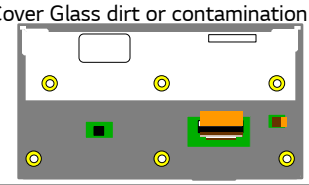
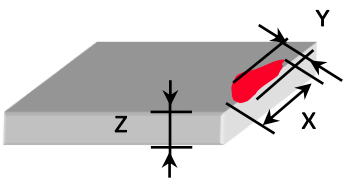
Items			Criteria(acceptable level)	
Scratches	Linear	Width	0.1≤W≤0.3	1. Extraneous substance which can be wiped out, like Finger Print, Particles, are not considered as a defect. 2. Defect which are on the Black Matrix (outside of Active Area) are not considered as a defect
		Length	L≤10.0	
		Quantity	N≤3	
Bubble & Dent	Circular	Diameter	0.1≤D≤0.5	
		Quantity	N≤3	

3.3 Foreign Material (Polarizer, Backlight)

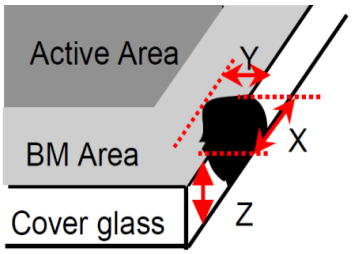
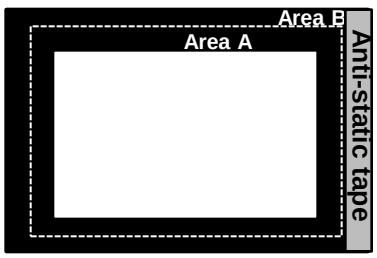
Items		Criteria(acceptable level)	
Linear	Width	0.05≤W≤0.1	In the case of foreign material in Polarizer which appears bright, it is based on inspection standards of Bright Dot.
	Length	0.1≤L≤2.0	
	Quantity	N≤2	
Circular	Diameter	0.15≤D≤0.5	
	Quantity	N≤2	

Defect modes	Definition	Inspection standards	
Scratches		• **Inspection patterns :** **White, Half Gray**	**L>4W : considered as Linear** **L≤4W : considered as Circular** **W: widest point [mm]** **L : longest point [mm]** **D= (a+b)/2**
Dent or Bubble			

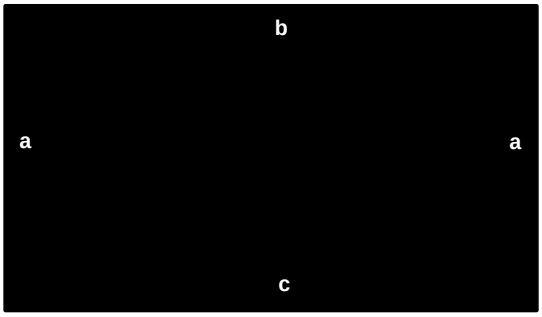
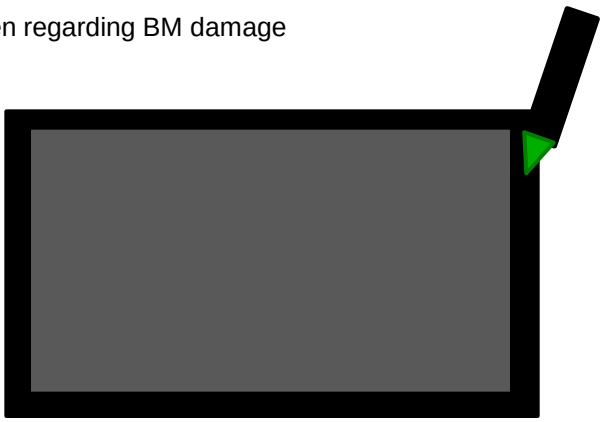
3.4. LCM Appearance

Items		Specifications	Acceptable Number	Remark
Cover Shield	Cover Shield 	• **Discoloration, Scratch, Dent** : It is O.K if it is not over 50% of the whole area. • It is O.K if it does not affect function/operation of LCM.	disregarded	
Label	Label 	• Although label printing is not clear, it is acceptable if scanners can read label information. 	disregarded	
Adhesive Tape	Adhesive Tape damage 	• Although point Adhesive Tape has Dent or Scratch and is pressed, it is acceptable if FPC is not exposed. (Non-FPC area : Ignore)	disregarded	
FPC	FPC Copper dirt and contamination 	• **FPC Pad area** 1) It is acceptable if it is wiped down. • **FPC non-Pad area** 1) It is O.K if it does not affect function/operation of LCM 2) It is O.K if customers do not have any problems during assembly.	disregarded	
FPC	FPC Link area damage and dirt, FPC bending 	• Wrinkles, Crease, Dent, Being pressed 1) Copper exposure is not allowed 2) It is O.K if it does not affect function/operation of LCM. • **Damage and Dirt on Link pad area** 1) Copper exposure is not allowed 2) x<2/3W, y<2/3W • **FPC bending** 1) It is O.K if it does not affect function/operation of LCM	disregarded	 Even Foreign material is small, It is not allow if LCM does not operate
Cover Glass	Cover Glass dirt or contamination 	• **It is O.K if it is wiped up.** : It could be cleaned by rubbing	disregarded	
Cover glass Chipping		• Side / Coner : X≤5mm, Y≤0.3mm, Z≤T • Crack Not allowed	-	When there are the BM damages like below pic , it can be allowed rework by pen.

3.5 Cover Glass

Items		Criteria (acceptable level)	Remark
Linear (ex. Scratch)	Width	0.10 ≤ W ≤ 0.2	(if W<0.10mm no count, Only at active area)
	Length	L ≤ 10.0	
	Quantity	N ≤ 3	
Circular (ex. Dot/Dent)	Diameter	0.15 ≤ D ≤ 0.5	(if D<0.15mm, no count, Only at active area)
	Quantity	N ≤ 3	
Air Bubble (Including OCR bubble)	Distance	0.15 ≤ D ≤ 0.5	(if D<0.15mm, no count, Only at active area)
	Quantity	N ≤ 3	
TSP Chipping	Edge Area	X ≤ 5, Y ≤ 0.3, Z ≤ T	
	Quantity	N ≤ 4	
Crack	-	Not Allowed	
Smudge (Stain & Contamination)	-	Front: Not Allowed Back side : Ignorance	Extraneous substance which can be wiped out, like finger print, particles, are not considered as a defect.
Front film Bubbles under the edge	Active Area	Not Allowed	 - Area A: visible BM area When assembly customer set - Area B : not visible BM area When assembly customer set
	Area A (BM) (Diameter)	Width : 0.15≤W≤0.5 Length : L≤5.0 Quantity : N ≤4 Minimum distance : L≥ 5.0	
Front film Adhesive Loss	Area B (BM) (Diameter)	Ignore	
Anti-static tape size (Only LA103WF4-SL02)	Area A (BM) (Diameter)	According to CAS Spec	
	Area B (BM) (Diameter)		
Anti-static tape Scratch, Dent (Only LA103WF4-SL02)	Area B (BM) (Diameter)	Ignore	It is O.K If it does not affect function/Operation of LCM

3.5 Cover Glass

No.	Note	Remark
1	If LGE system front cover LCD edge area, after discussion with customer that cosmetic defect is not counted as defect. Left/Right : up to 'a', Upper side : up to 'b' Bottom side : up to 'c'.	 Pic 1
2	When there are the BM damages like pic 2, it can be allowed rework by pen.	Rework can be possible black colored by pen regarding BM damage  Pic 2

3.6 Mura(Including light leakage)

Mura which appears in the screen when the LCM displayed. **(Using 2.0% ND Filter)**
It would not be counted as Mura, although it is visible with naked eyes
(For light leakage, using 5.0% ND filter)

3.7. Line Defect

All kinds of line defects such as vertical, horizontal or cross are not allowed.

3.8. Others

Issues which are not defined in this criteria shall be discussed with both parties, Customer and Supplier, for better solution.

4.0 RMAs

4.1. Verification

The Supplier can verify the defective LCMs to segregate the responsibilities at Customer's facility or can request the Customer to ship the defective LCMs to assigned place for verification

This verification result shall be agreed mutually by the Customer and Supplier. This result can be corrected/changed after detail failure analysis at Supplier's facilities.

4.2. Supplier Induced Defects

All of the Supplier induced defective LCMs shall be returned to the Supplier for repair or replacement.

Before return the defective LCMs, the Customer needs Supplier's confirmation with RMA Number.

All of the returned LCMs shall be returned to the Customer within agreed time period.

4.3. Customer Induced Defects

The Customer can return the customer induced defective LCMs to the Supplier for repair.

The repair cost for Customer induced defective LCMs shall be agreed with both parties, Customer and Supplier.

5.0 Warranty

5.1. Warranty Period

In-warranty period is 18 Months from manufacturing month of LCM.

Note)

a. Eighteen months are composed of twelfth months in-warranty period and sixth months distribution period.
b. The manufacturing Month is on the LCMs as Supplier's serial No.
c. If customer want to extend warranty, customer should pay 0.5% of a unit cost per 6months.

5.2. Warranty avoidance

The warranty will be avoided in cases of below,

a. When the warranty period is expired
b. The Customer induced defective LCMs
c. When the LCMs were repaired by 3rd party without Supplier's approval.
d. When the LCMs were treated like Disassemble and Rework by the Customer and/or Customer's representatives without Supplier's approval.

6. Others

If any problems arise with the LCMs supplied by supplier, the Customer and Supplier will cooperate and make efforts to solve it with mutual confidence and respect.

Appendix A. Classification of Defects

Defect Mode	Criterion for Defect	Class
Operating Frequency	Specified range in the CAS	Major
Power Consumption	Specified range in the CAS	Major
Contrast Ratio	Specified range in the CAS	Major
Line Defect	Not allowed any Vertical, Horizontal, and Cross line	Major
Polarizer Defects	Shall be accordance with the item 3.0 "Inspection Criteria" in this standard	Minor
Extraneous Substance	Shall be accordance with the item 3.0 "Inspection Criteria" in this standard	Minor
Dot Defect	Shall be accordance with the item 3.0 "Inspection Criteria" in this standard	Minor
Bezel Claw Forming	The bezel claw is not formed sufficiently	Minor