DATE :17. Oct. 2011

SAMSUNG TFT-LCD

MODEL : **LSJ550HW01-V**

The Information Described in this Specification is Preliminary and can be changed without prior notice

LCD Business

Samsung Electronics Co . , LTD.

Contents

Revision History

Date	Rev. No	Page	Summary
17.Oct.2011	000	all	First issued

General Description

Description

LSJ550HW01 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit. The resolution of a 60“ is 1920 x 1080 and this model can display up to 1.07 billion colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

Features

- High contrast & aperture ratio with wide color gamut
- SVA (Super Vertical Align) mode
- Wide viewing angle (±178°)
- High speed response
- FHD resolution (16:9)
- LVDS (Low Voltage Differential Signaling) interface (2pixel/clock)
- 2D / 3D function compatible

General Information

Items	Specification	Unit	Note
Panel Size	1227.6(H) x 700.5(V)	mm	±1.0mm
	1.76(D)		Max
Weight	3.4	kg	
Pixel Pitch	0.210(H) X 0.630(V)	mm	
Active Display Area	1209.6(H) X 680.4(V)	mm	
Surface Treatment	Haze 0%, Hard-coating (2H)		
Display Colors	1.07B (10Bits Dithering)	colors	
Number of Pixels	1920 x 1080	pixel	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		

1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

(V_{SS} = 0 V)

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	10.8	13.2	V	(1)
Storage temperature		T_{STG}	-20	65	℃	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	℃	(2)

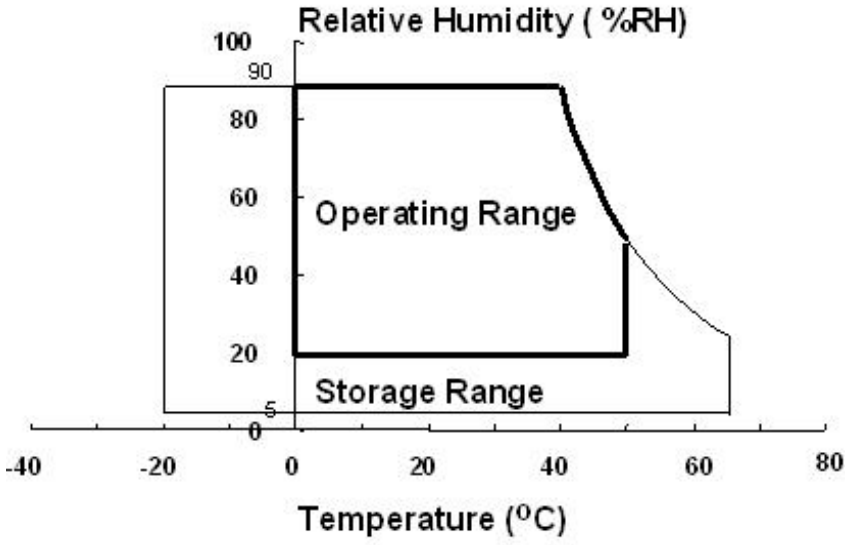
Note (1) Ta= 25 ± 2 °C

(2) Temperature and relative humidity range are shown in the figure below.

a. 90 % RH Max. (Ta ≤ 39 °C)

b. Relative Humidity is 90% or less. (Ta > 39 °C)

c. No condensation



2. Optical Characteristics

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ,ELDIM EZ-Contrast

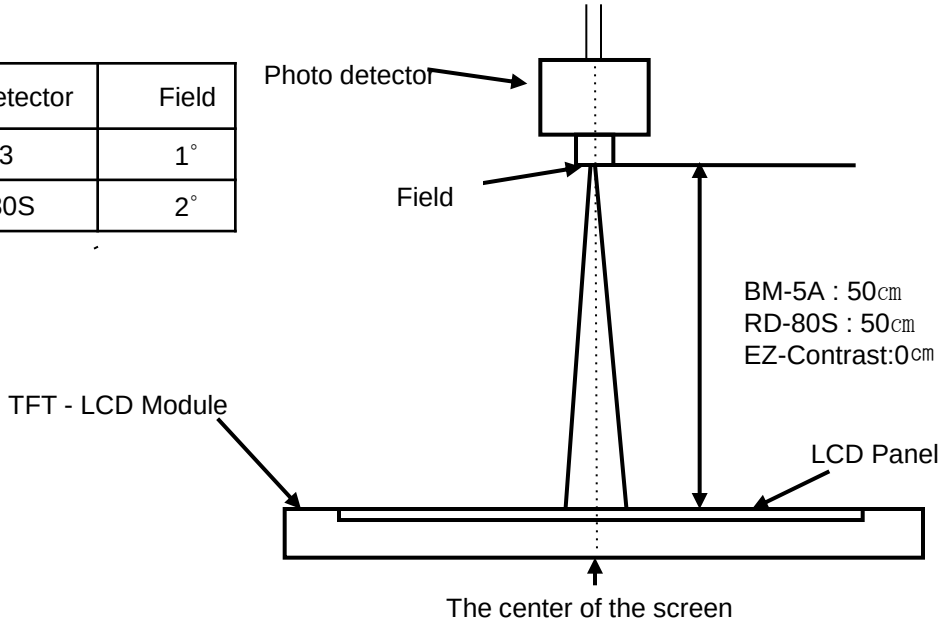
(Ta = 25 ± 2°C, VDD=12V, fv= 60Hz,)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal θL,R=0 θU,D=0 Viewing Angle	4,000	5,000	-		(1) SR-3
Response Time	G-to-G	Tg		-	8	15	msec	(3) RD-80S
Luminance of White (Center of screen)		Y_L		400	450	-	cd/m^2	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.640	TYP. +0.03		(5),(6) SR-3
		Ry			0.330			
	Green	Gx			0.300			
		Gy			0.600			
	Blue	Bx			0.150			
		By			0.060			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	72	-	%	(5) SR-3
Color Temperature		-		-	10000	-	K	
Viewing Angle	Hor.	θ_L	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		θ_R		75	89	-		
	Ver.	θ_U		75	89	-		
		θ_D		75	89	-		
Brightness Uniformity (9 Points)		B_{uni}		-	-	25	%	(2) SR-3

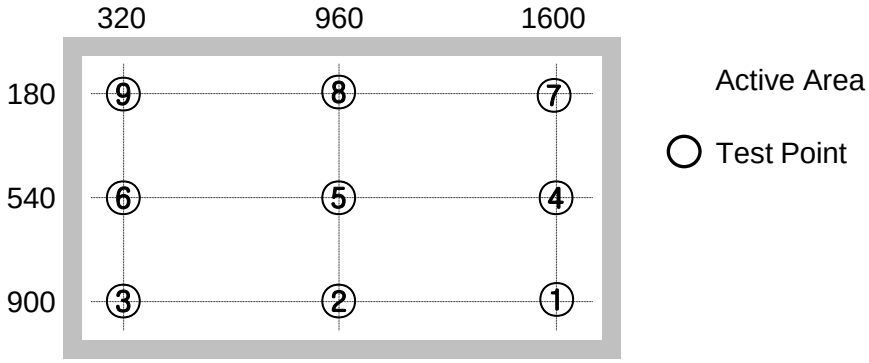
- Optical characteristics are based on VD standard module
- The measurement shall be executed 60 minutes after lighting at rating.
- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at 25 ± 2°C for stabilization of the back light. This should be measured in the center of screen.
Environment condition : Ta = 25 ± 2 °C

Photo detector	Field
SR3	1°
RD-80S	2°



- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G\max}{G\min}$$

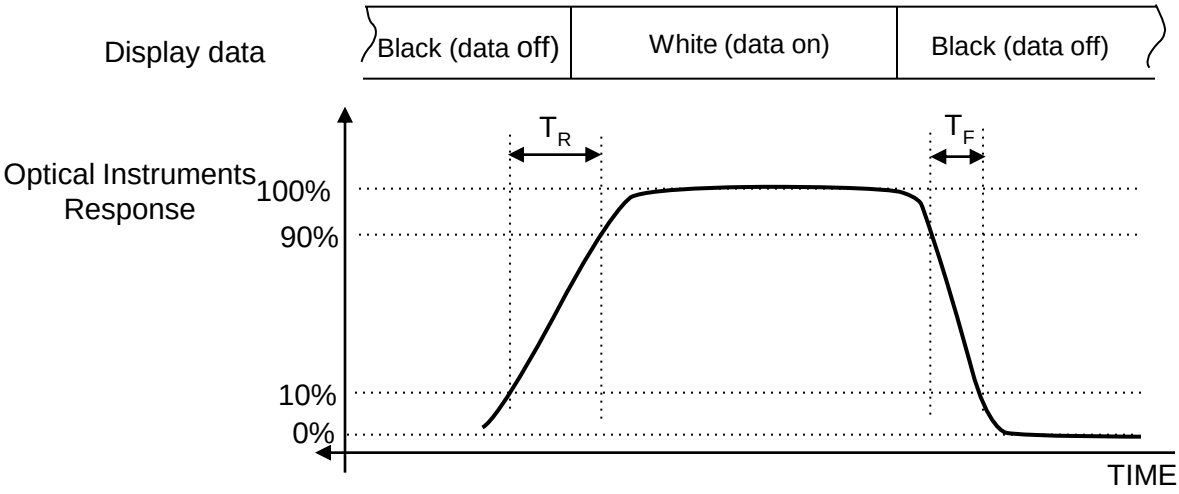
Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf

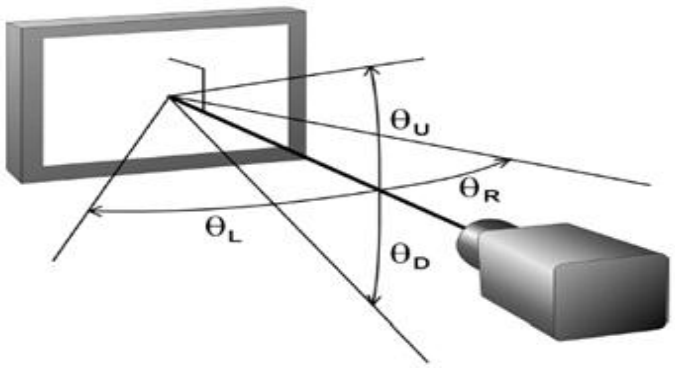


※ G-to-G : Average response time between Gray to Gray (Scale)

Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle
: Viewing angle range (C/R ≥10)



3. Electrical Characteristics

3.1 TFT LCD Module

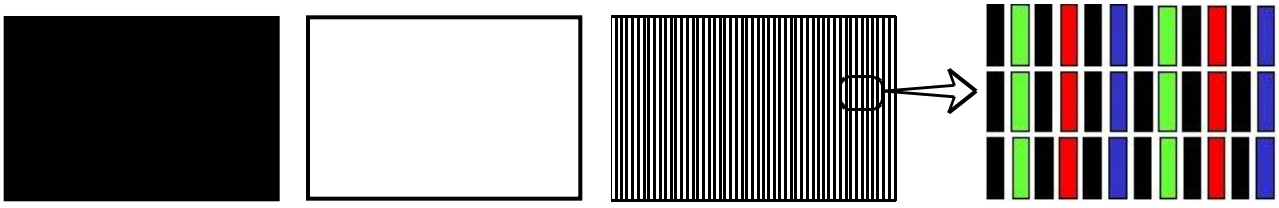
The connector for display data & timing signal should be connected.

Ta = 25°C ± 2 °C

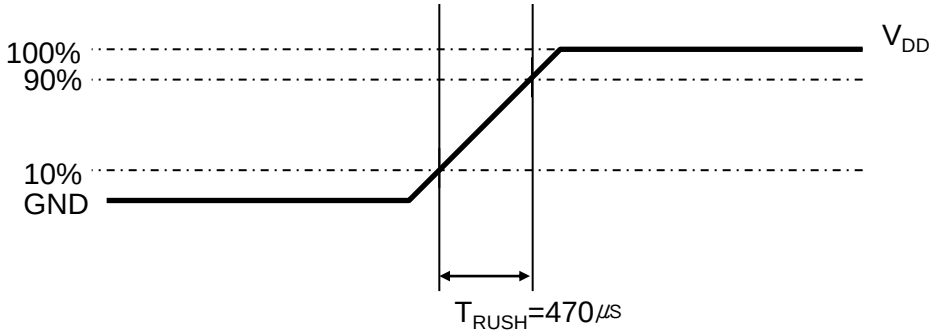
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		VDD	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	IDD	-	650	830	mA	(2),(3)
	(b) White		-	650	830	mA	
	(c) N-pattern		-	1,400	1,600	mA	
Vsync Frequency		fV	-	120	-	Hz	
Hsync Frequency		fH	-	135	-	kHz	
Main Frequency		Fdclk	-	297	-	MHz	
Rush Current		IRUSH	-	4	6	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}.
(2) fv= 120 Hz, f_{DCLK} = 297MHz, V_{DD} = 12.0V, DC Current.
(3) Power dissipation check pattern (LCD Module only)

a) Black Pattern b) White Pattern c) N-pattern



(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470㎲.

4. Input Terminal Pin Assignment

4.1. Input Signal & Power

Connector : FP7S082HA1(JAE)

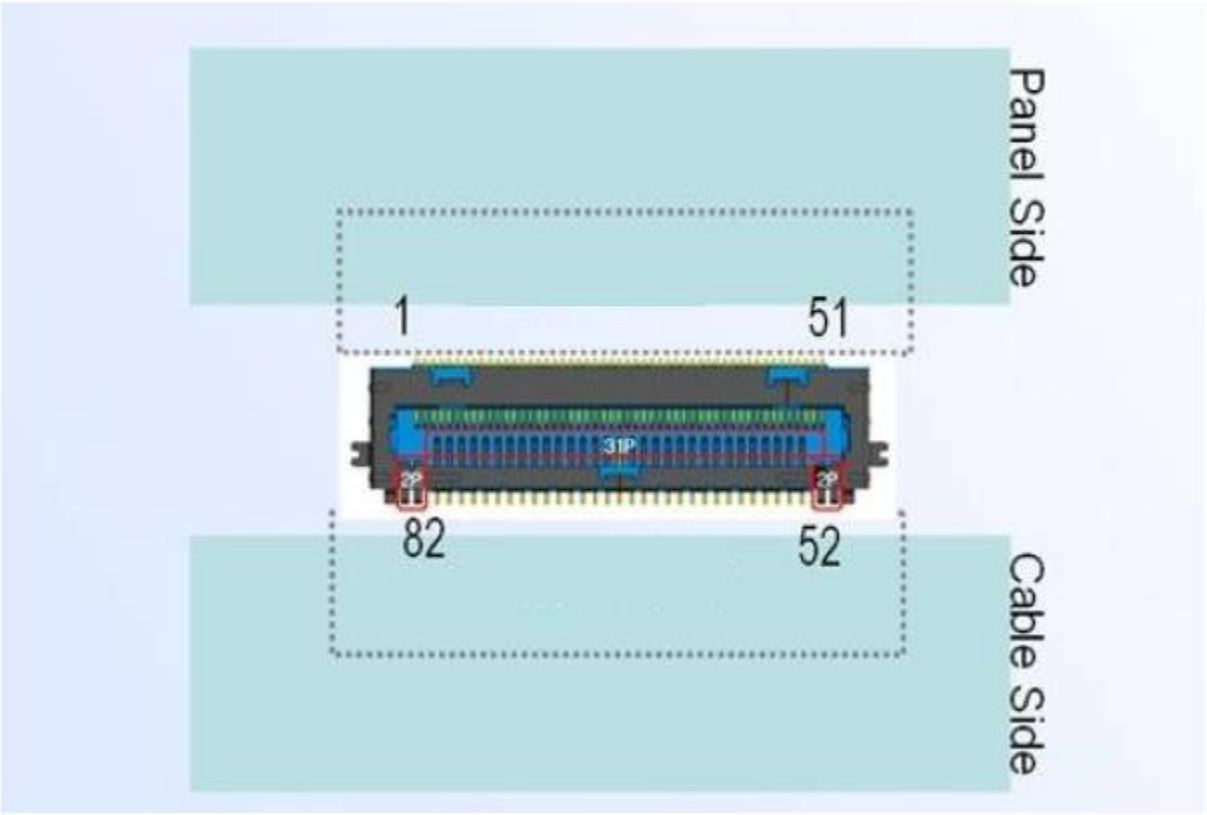
Pin	Description		Pin	Description	
1	Vdd (12V)		42	SEC Only	
2	Vdd (12V)		43	WP(BUS_R)	
3	Vdd (12V)		44	SDA_I	
4	Vdd (12V)		45	LVDS_SEL	Note 2)
5	Vdd (12V)		46	Aging_EN	Note 3)
6	N.C		47	SEC Only	
7	GND		48	SEC Only	
8	GND		49	SEC Only	
9	GND		50	SEC Only	
10	Even LVDS Signal	Rx1[0]N	51	SEC Only	
11		Rx1[0]P	52	GND	
12		Rx1[1]N	53	Even LVDS Signal	Rx4[4]P
13		Rx1[1]P	54		Rx4[4]N
14		Rx1[2]N	55		Rx4[3]P
15		Rx1[2]P	56		Rx4[3]N
16		GND	57		GND
17		Rx1CLK-	58		Rx4CLK+
18		Rx1CLK+	59		Rx4CLK-
19		GND	60		GND
20		Rx1[3]N	61		Rx4[2]P
21		Rx1[3]P	62		Rx4[2]N
22		Rx1[4]N	63		Rx4[1]P
23		Rx1[4]P	64		Rx4[1]N
24	GND		65		Rx4[0]P
25	Odd LVDS Signal	Rx3[0]N	66		Rx4[0]N
26		Rx3[0]P	67	GND	
27		Rx3[1]N	68	Even LVDS Signal	Rx2[4]P
28		Rx3[1]P	69		Rx2[4]N
29		Rx3[2]N	70		Rx2[3]P
30		Rx3[2]P	71		Rx2[3]N
31		GND	72		GND
32		Rx3CLK-	73		Rx2CLK+
33		Rx3CLK+	74		Rx2CLK-
34		GND	75		GND
35		Rx3[3]N	76		Rx2[2]P
36		Rx3[3]P	77		Rx2[2]N
37		Rx3[4]N	78		Rx2[1]P
38		Rx3[4]P	79		Rx2[1]N
39	GND		80		Rx2[0]P
40	SCL_I		81		Rx2[0]N
41	SEC Only		82	GND	

(NOTE1) SEC Only : THIS PINS ARE ONLY USED FOR SEC INTERNAL OPERATIONS.

(NOTE2) LVDS SELECTION OPTION : HIGH(3.3V) → Normal , LOW(GND) & Default → Jeida

(NOTE3) AGING EN : HIGH(3.3V) → AGING Pattern Enable , LOW(GND) & Default → AGING Pattern Disable

Note(1) Pin number starts from Bottom side



a. Power GND pins should be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pin should be separated from other signal or power.

5. Input Terminal Pin Assignment

5.1 LVDS Interface

- LVDS Receiver : Tcon (merged) - Data Format (JEIDA)

	LVDS pin	JEIDA
TxOUT/RxIN0	TxIN/RxOUT0	R4
	TxIN/RxOUT1	R5
	TxIN/RxOUT2	R6
	TxIN/RxOUT3	R7
	TxIN/RxOUT4	R8
	TxIN/RxOUT6	R9
	TxIN/RxOUT7	G4
TxOUT/RxIN1	TxIN/RxOUT8	G5
	TxIN/RxOUT9	G6
	TxIN/RxOUT12	G7
	TxIN/RxOUT13	G8
	TxIN/RxOUT14	G9
	TxIN/RxOUT15	B4
	TxIN/RxOUT18	B5
TxOUT/RxIN2	TxIN/RxOUT19	B6
	TxIN/RxOUT20	B7
	TxIN/RxOUT21	B8
	TxIN/RxOUT22	B9
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R2
	TxIN/RxOUT5	R3
	TxIN/RxOUT10	G2
	TxIN/RxOUT11	G3
	TxIN/RxOUT16	B2
	TxIN/RxOUT17	B3
	TxIN/RxOUT23	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0
	TxIN/RxOUT29	R1
	TxIN/RxOUT30	G0
	TxIN/RxOUT31	G1
	TxIN/RxOUT32	B0
	TxIN/RxOUT33	B1
	TxIN/RxOUT34	RESERVED

5.2 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																													GRAY SCALE LEVEL
		RED										GREEN										BLUE										
		R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	G0	G1	G2	G3	G4	G5	G6	G7	G8	G9	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R1020
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1021
		0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1022
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1023
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G1020
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1021
		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1022
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1023
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~ B1020
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	B1021
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B1022
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	B1023

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

6. Interface Timing

6.1 Timing Parameters

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	260	297	305	MHz	-
Vsync		F_V	95	120	125	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1092	1125	1350	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2092	2120	2348	clocks	-

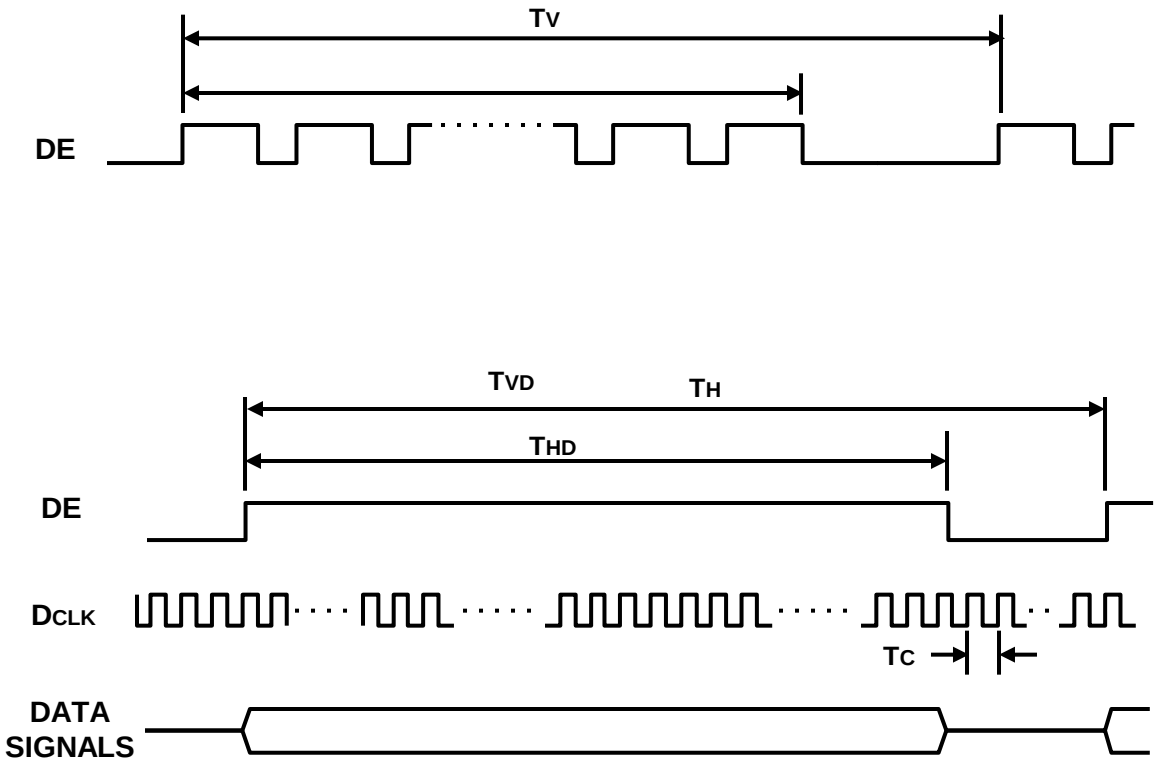
Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system

(2) Internal V_{DD} = 3.3V

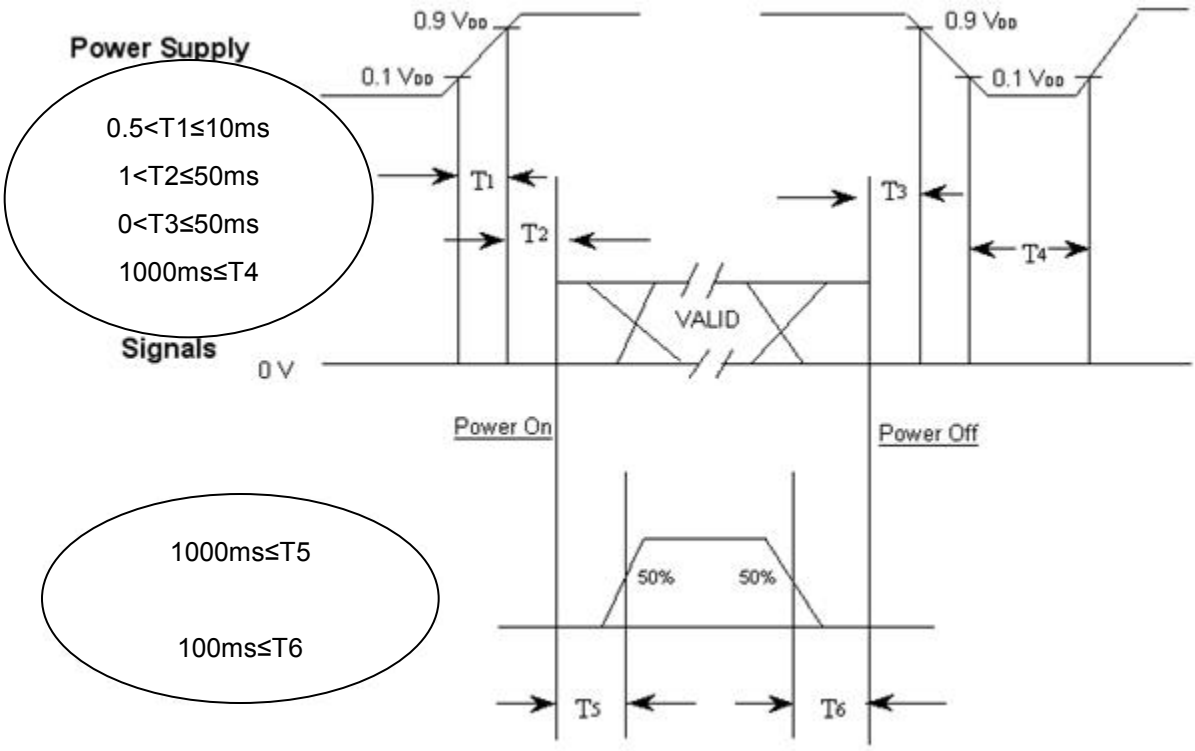
(3) Spread spectrum

6.2 Timing diagrams of interface signal (DE only mode)



6.3 Power ON/OFF Sequence

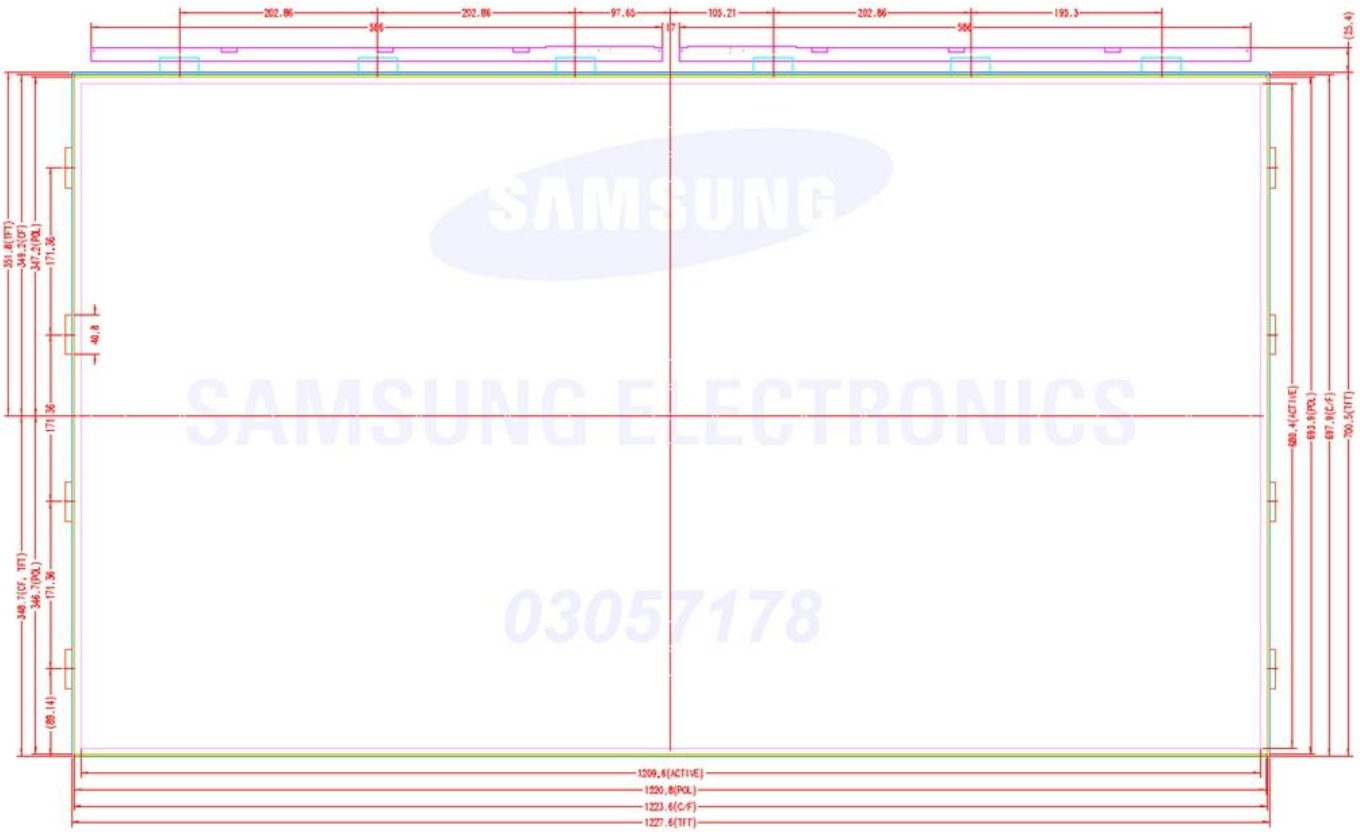
To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



T1 : V_{DD} rising time from 10% to 90%
T2 : The time from V_{DD} to valid data at power ON.
T3 : The time from valid data off to V_{DD} off at power Off.
T4 : V_{DD} off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

7. Outline Dimension



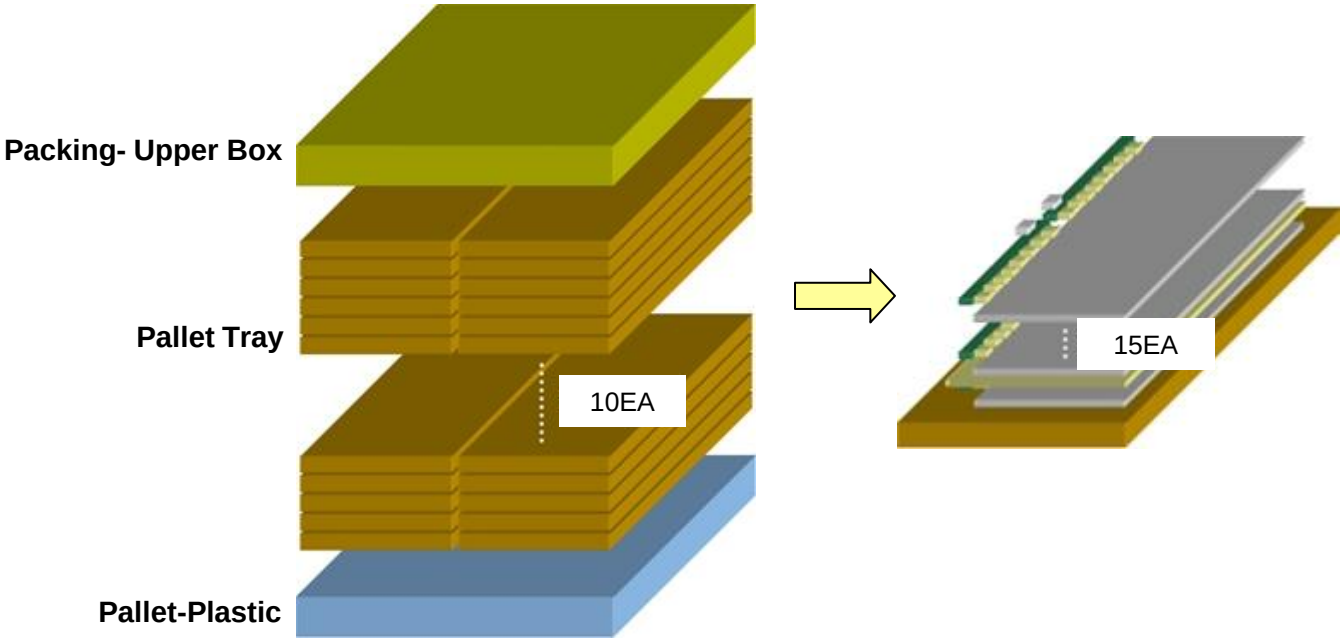
구 분	Size	공차
TFT Glass Size (H X V)	1227.6 X 700.5 mm	H : ± 0.2mm, V : ± 0.2mm
C/F Glass Size (H X V)	1227.6 X 697.6 mm	H : ± 0.2mm, V : ± 0.2mm
Active Size	1209.6 X 680.4 mm	
C/F Pol (H X V)	1220.8 X 693.9 mm	H : ± 0.6mm, V : ± 0.5mm
TFT Pol (H X V)	1220.8 X 693.9 mm	H : ± 0.6mm, V : ± 0.5mm
Panel Depth	1.76 mm	± 0.15mm
Panel Weight	3.4 Kg	± 0.1 Kg

8. PACKING

9.1 CARTON (Internal Package)

(1) Packing Form Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



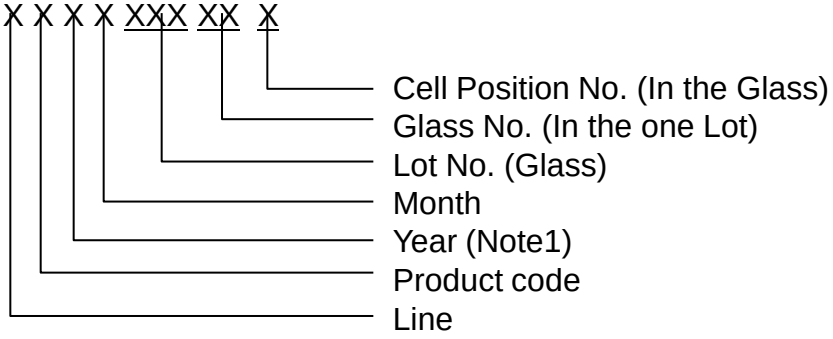
8.2 Packing Specification

ITEM	Specification	Remark
LCD Packing	150ea / Box	1. 3.43 Kg / LCD (15[ea]/Tray, 150[ea]/Pallet) 2. 9.54 Kg / Middle sheet (18[ea]/Tray, 180[ea]/Pallet) 3. 548.7 Kg / Panel tray (10ea/Pallet) 4. 1.8 Kg / Packing Box (1ea)
Pallet-Plastic	1Box / Pallet (W1475,L1150,H125)	1. Pallet weight = 21 kg 2. 21 Kg / Pallet
Packing Direction	Vertical	
Pallet size	H x V x height	1,360mm(H) x 940mm(V) x 1250mm(height)
Pallet weight	598.11 kg	Pallet(21kg) + Panel tray(51.27kg) + Panel(514.5kg) + Middle sheet(9.54Kg) + Packing Box (1.8kg)

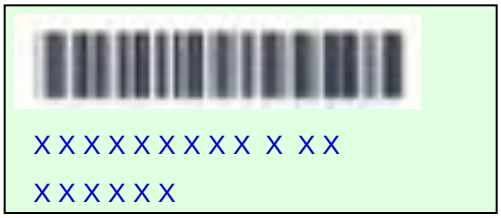
9. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

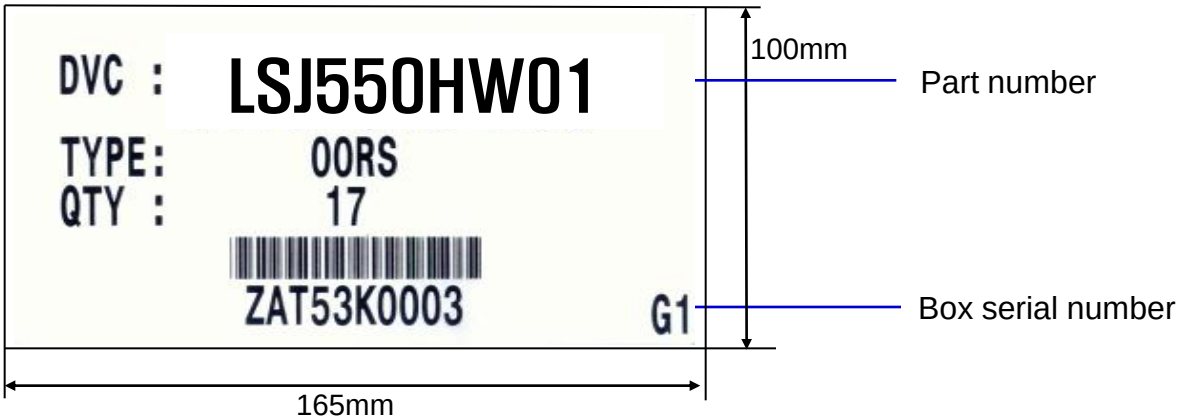
(1) Part number : LSJ550HW01-V0X
(2) Revision: One letter
(3) Control: One letter
(4) Lot number : X X X X XXX XX X



(4) Control PBA



(5) Packing box attach



(6) Others

1. After service part
   Lamps cannot be replaced because of the narrow bezel structure.

10. General Precautions

10.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.

(c) Refrain from strong mechanical shock and / or any force to the Module. In addition to damage, this may cause improper operation or damage to the Module and CCFL back light.

(d) Note that polarizers are very fragile and could be damage easily. Do not press or scratch the surface harder than a HB pencil lead.

(e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.

(f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.

(i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or Semiconductor would be damaged.

(j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(k) Do not disassemble the Module.

(l) Do not disassemble shield case of inverter & LVDS board.

(m) Do not connect N.C pins. (Samsung internal use only)

(n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handle a module

(o) Pins of I/F connector should not be touched directly with bare hands.

	Item	Management standard value and performance standard
1	Anti-static mat (shelf)	1 to 50 [Mohm]
2	Anti-static mat (floor, desk)	1 to 100 [Mohm]
3	Ionizer	Attenuate from ± 1,000V to ± 100V within 2 sec
4	Anti-static wrist band	0.8 to 10 [Mohm]
5	Anti-static wrist band entry and ground resistance	Below 1,000 [ohm]
6	Temperature	0 ~ 35℃
7	Humidity	60 to 70 [%RH]

10.2 Storage

We highly recommend to comply with the criteria in the table below.

Item	Unit	Min.	Max.
Storage Temperature	(℃)	10	40
Storage Humidity	(%rH)	35	75
Storage Life	12 Months		
Storage Condition	- The storage room should provide good ventilation and temperature control. - Products should not be placed on the floor, but on the Pallet away from a wall. - Prevent products from direct sunlight, moisture nor water; Be cautious of a build up of condensation. - Avoid other hazardous environment while storing goods. - If products delivered or kept in conditions of over the storage period of 3 months, the recommended temperature or humidity range, we recommend you leave them at a temperature of 20℃ and a humidity of 50% for 24 hours.		

10.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back light connector and its converter power supply should be connected directly with a minimized length. A longer cable between the back light and the converter may cause lower luminance of LED and may require higher startup voltage(Vs).

10.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
- Temperature : 20±15℃
- Humidity : 55±20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

10.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.