SAMSUNG DISPLAY

RoHS COMPLIANT

Product Specification

( ) **Product Information**
( ) **Preliminary Specification**
(√) **Approval Specification**

Any modification of Spec is not allowed without SDC's permission.

CUSTOMER	
DATE OF ISSUE	2015/11/11

MODEL NO.	ASI545FB01
EXTENSION CODE	-0

Customer Approval & Feedback

Approved by	Lee kwang soo 2015/11/11
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New Business Team **Samsung Display Co., Ltd**	

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REVISION HISTORY

Date	Rev.No.	Page	Revision Description
2015/11/11	000	all	First Issue (Initial Draft)

GENERAL DESCRIPTION

DESCRIPTION

ASI545FB01-0 uses an organic light emitting diodes (OLED) of low temperature poly silicon TFT as switching components. This model is composed of a OLED panel, a driver circuit, an Ass'y KIT of source and control PBA. This model has a resolution of a 1,920 x 1,080 and can display up to 1.07 billion colors with the wide viewing angle.
This panel is designed to support applications by providing a various public Information Display(PID) or Transparent Display Wall.

FEATURES

High contrast ratio
High speed response
High Transmittance
FHD resolution (1920 x1080, 16:9)
Viewing Angle Free
Low power consumption
DE (Data enable) mode
The interface (10 lanes @ 1920 x1080, 60Hz) of LVDS

APPLICATIONS

Public Information Display (PID)
If the intent to use this product is for other purpose, please contact Samsung Display.

GENERAL INFORMATION

Item	Specification	Unit	Note
Panel Size	1219.4(H) x 699.3(V)	mm	BP glass
	1219.4(H) x 697.0(V)		EN glass
Weight	3,200	g	Typ ±10%
Display area	1209.6(H) x 680.4(V)	mm	
Driver Element	Poly-silicon TFT Active matrix OLED		
Display colors	1.07Billion		10bit
Number of pixel	1,920 x 1,080	Pixel	16 : 9
Pixel Arrangement	RGB Horizontal Stripe		
Surface treatment	AR(Anti Reflection) Hardness 2H		
Luminance of White	Peak 1% 500 Full White 150	cd/m^2	Typ
Transmittance	45%		Typ

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power Supply voltage	V_{DD}	GND-0.3	13.2	V	(1)
Storage temperature	T_{STG}	-20	65	℃	(2)
Glass Surface temperature	T_{OPR2}	0	60	℃	
Operation Temperature	T_{OPR}	0	50	℃	(2)
Storage humidity	H_{STG}	5	95	%RH	(2)
Operating humidity	H_{OPR}	20	95	%RH	(2)
Endurance on static electricity			150	V	(3)
Shock(non-operating)	S_{NOP}	-	30	G	
Vibration(non-operating)	V_{nop}	-	1.5	G	

Note (1) The power supply voltage in operating temperature range

Note (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
d. Operating condition with module

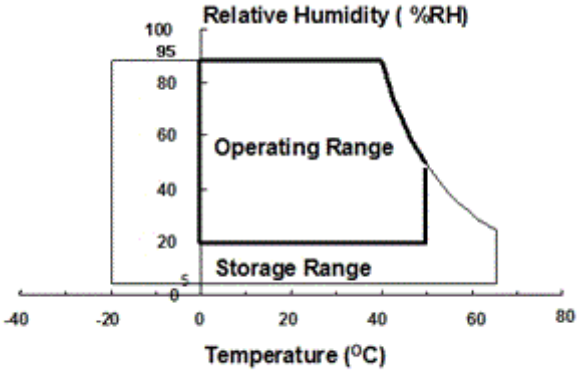


Fig. Range for temperature and relative humidity

Note (3) Keep the static electricity under 150V in Polarizer attaching process

1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TCON Board

Item	Symbol	Max	Unit	Note
Power Supply Voltage	V_{DD}	13.2	V	(1)

(2) EL Board

Item	Symbol	Max	Unit.	Note
Input Supply Voltage	V_{CC}	26	V	(1)

Note(1) Ta= 25 ± 2 °C
The permanent damage or defect to the device may occur if the panel is operated at the figure set, which exceeds a ceiling of maximum value stated in the former spec. The functional operation should be limited to the conditions described above under normal operating conditions.

2. APPLICATION INFORMATION FOR OLED PID (Public Information Display)

A PID's screen may display the sudden image such as an image retention.
To extend the lifetime and optimize a function of module, the below-mentioned operating conditions are required.

2.1 Normal operating condition

a. Temperature: 25 ±10℃
b. Humidity: 55 ±20 %
c. Display pattern: Moving image or image, which switches regularly.
Note) The sudden image on the screen can be displayed after the static image is shown in the long-term.

2.2 The operating conditions when the module is operated under the abnormal condition.

a. Ambient condition
-It is recommended to set the PID up in the well-ventilated place.
b. The function of power off and screen saver
-The function of periodical power-off or a screen saver is needed when the static image is displayed in the long-term.

2.3 Operating conditions to prevent the sudden display resulted from displaying the static image in the long-term.

a. The proper operating time: Under (12) hours a day.
b. The moving image shall be inserted between the static displays periodically.
-The refresh time for OLED is needed.
c. The periodic changing of background color and character's color(image)
-Use the different color for background and character (image) respectively.
-Change colors periodically.
d. Avoid combining the color for background with the color for character, which has a largely different luminance.
Note (1) Abnormal condition means all operating condition except normal operating condition.
Note (2) The moving image or black pattern is strongly recommended as a screen saver.

2.4 Only the lifetime of PID stated in this spec is guaranteed if the PID is used under the proper operating conditions.

2.5 Clean the system regularly for not accumulating the dust around the system considering user environment, otherwise, its reliability and function may not be satisfied.

3. OPTICAL CHARACTERISTICS

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON SR-UL

Ta = 25±2℃ , V_{DD} =12V, fv= 60Hz, f_{DCLK} = 74MHz

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Contrast Ratio		C/R	-	0.1M	1.0M	-	-	
Luminance of White (At the center of screen)		Y_P	-	450	500	550	cd/m^2	1% Peak
		Y_W	-	135	150	165		Full White
Color Chromaticity (CIE 1931)	Red	R_X	Normal ψ = 0 θ = 0 Viewing Angle	0.670	0.682	0.694	-	
		R_Y		0.303	0.318	0.332		
	Green	G_X		0.173	0.195	0.217		
		G_Y		0.712	0.729	0.744		
	Blue	B_X		0.130	0.137	0.145		
		B_Y		0.038	0.050	0.062		
	White	W_X		0.270	0.280	0.290		
		W_Y		0.278	0.288	0.298		
Color Gamut		-		-	100	-	%	Adobe, NTSC
Color temperature		-	-	8,000	10,000	-	K	
Viewing Angle	Hor.	θ_L	-	80	89	-	Degree	
		θ_R		80	89	-		
	Ver.	θ_U		80	89	-		
		θ_D		80	89	-		
Brightness Uniformity		B_{uni}	-	80	-	-	%	(2)
Transmittance		-	-	40	45		%	

Notice (a) Test Equipment Setup

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

(b) D65 media has the general light source.
The temperature of color is 6504K. The coordinate of color is Wx 0.313, Wy 0.329
The luminance of this product is 7217cd/㎡.

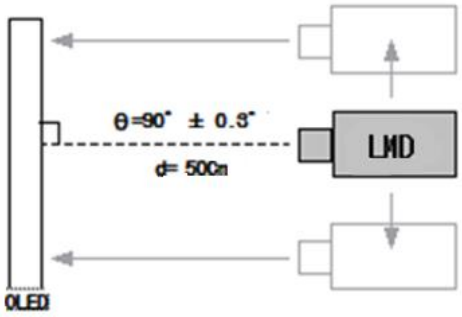
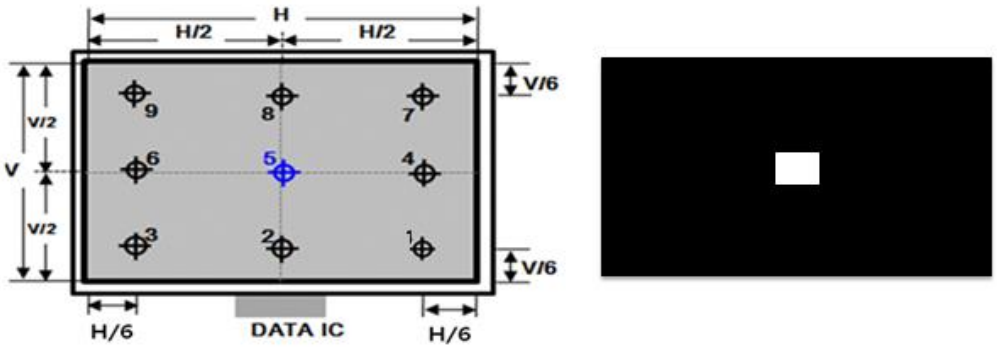


Photo detector	Field
SR-UL2	1°

(c) The CIE positions D65 as the standard daylight illuminant:
[D65] is intended to represent average daylight and has a correlated color temperature of approximately 6500 K. CIE standard illuminant D65 should be used in all colorimetric calculations requiring representative daylight, unless there are specific reasons for using a different illuminant.

- Definition of the test point



Note (1) Definition of contrast ratio (C/R)
: The ratio of White luminance (Lw) & Black luminance (Lk) at the center point ⑤ of the panel
: Peak white luminance(Lpw) = 1% window box luminance(@Gmax) At the center point⑤

$$C/R = \frac{L_{PW}}{L_K}$$

Lpw : The Peak white luminance with Gmax
Lk : The Black luminance with Gmin

Note (2) Definition of the White luminance uniformity of 9 points (Test pattern : The full white)

$$L_{w\_uni.} = 1 - \frac{(L_{w(max)} - L_{w(min)})}{L_{w(max)}}$$

Lw (max) : The maximum white luminance
Lw (min) : The minimum white luminance

Note (3) The definition of luminance of white: The luminance of white at the center point ⑤

Note (4) The definition of chromaticity (CIE 1931)
The color coordinate of red, green, blue and white at the center point ⑤

The chromaticity coordinates(CIE1931) is calculated using the spectrum data of OLED panel

① Calculate the spectral transmittance of the panel

$$\text{The spectral transmittance}_{Panel} = \frac{\text{The Spectrum}_{Panel+LihtSource}}{\text{The Spectrum}_{Lightsoure}}$$

② Calculate the spectral power distribution data (with SDC's OLED panel)
Module = SDC's OLED Panel

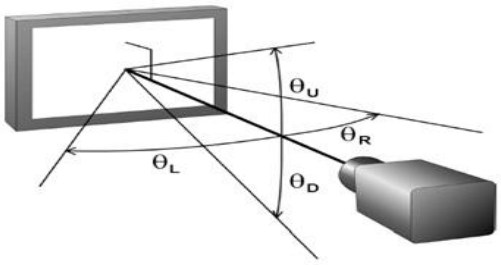
$$\text{The Spectral Power}_{Module} = \text{The spectral transmittance}_{Panel} \times \text{Spectrum}_{Customer's\ BLU}$$

③ Calculate three stimulus value X,Y,Z

$$X = \text{The Spectral Power}_{Module} \times CIE\ X\ \text{filter spectrum}$$
$$Y = \text{The Spectral Power}_{Module} \times CIE\ Y\ \text{filter spectrum}$$
$$Z = \text{The Spectral Power}_{Module} \times CIE\ Z\ \text{filter spectrum}$$

④ Calculate the CIE 1931 chromaticity coordinates

Note (5) Definition of viewing angle
: The range of viewing angle (C/R ≥TBD)
The measurement shall be executed with the SDC's OLED panel



4. ELECTRICAL CHARACTERISTICS

4.1 OLED MODULE

The connector to transmit a display data and a timing signal should be connected.

Ta = 25 ± 2 °C

Item		Symbol	Min	Typ	Max	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12	13.2	V	(1)
Current of Power Supply	(a) Black	I_{VIN}	-	1449	3000	mA	(2), (3)
	(b) White		-	1513			
	(c) H-Stripe		-	1601			
	(d) Dot		-	1639			
Vsync Frequency		f_V	59	60	61	Hz	
Hsync Frequency		f_H	67.9	69.3	70.8	kHz	-
Main Frequency		F_{dclk}	68	74	90	MHz	-
Rush Current		I_{RUSH}	-	-	10.8	A	(4)

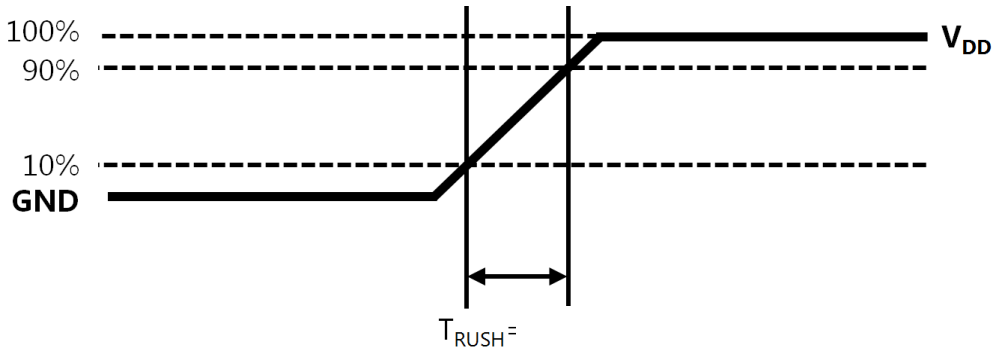
Note(1) The ripple voltage should be controlled under 10% of V_{DD}.

Note(2) f_V=60Hz, f_{DCLK}=74MHz, V_{DD}=12.0V, RMS Current.

Note(3) The pattern for checking the power dissipation (OLED module only).

(a)White pattern (b) Black pattern (c) H-stripe (d) Dot (one dot one off)

Note(4) Conditions for measurement



The rush current I_{RUSH} can be measured during T_{RUSH} is about 1.2ms.

4.2 OLED Lifetime/Image Retention Specification

The Lifetime of this model predicted the calculation depending on SDC standard contents.
The characteristics of OLED are shown in the following tables.

Ta = 25 ±2 ℃

Item	Symbol	Min	Typ	Max	Unit	Note
Operating Life Time	Hr	-	30.000	-	Hour	(1)

Note(1) It is defined as the time to take until the brightness reduces to 50% of its original value.

[Operating condition : Ta = 25±2℃, Brightness Average : 75nit, At moving image]

4.3 EL Power CHARACTERISTICS

Ta = 25 ±2 ℃ @ Full White Pattern

Items	Symbol	Conditions	Specifications			Unit	Note
			Min	Typ	Max		
Input Voltage	V_{IN}	Ta=25±2℃	22	24	26	V	
Power Consumption	P_W	V_{IN} * I_{IN}(RMS)	-	-	160	W	(3)
Input Current	I_{IN} (RMS)		-	-	7	A	(2)
Rush Current	I_{RUSH}	I_{RUSH} width < 240us	-	-	35	A	
EL Output Voltage	V_{EL}		13.3	14	14.7	V	
EL Output Current	I_{EL} (RMS)		-	10	20	A	(2)

Note(1) All data was approved after running 10 minutes.

Note(2) RMS : Root mean square

Note(3) Measured under Full White Full Gray condition

5. INPUT TERMINAL PIN ASSIGNMENT

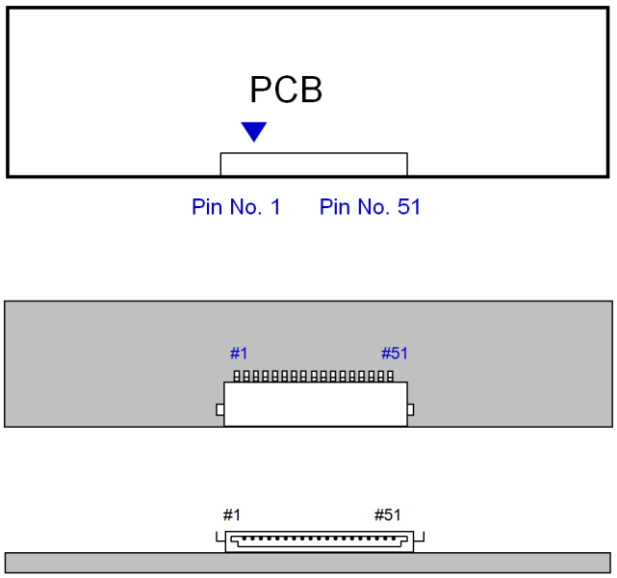
5.1 INPUT SIGNAL & POWER

Connector : IS050-C51B-C38-C (UJU)

PIN No.	Description		PIN No.	Description	
1	V_{DD} (12V)		26	ODD LVDS Signal	Rx2[A]P
2	V_{DD} (12V)		27		Rx2[B]N
3	V_{DD} (12V)		28		Rx2[B]P
4	V_{DD} (12V)		29		Rx2[C]N
5	V_{DD} (12V)		30		Rx2[C]P
6	No Connection		31		GND
7	GND		32		Rx2CLK_N
8	GND		33		Rx2CL_P
9	GND		34		GND
10	EVEN LVDS Signal	Rx1[A]N	35		Rx2[D]N
11		Rx1[A]P	36		Rx2[D]P
12		Rx1[B]N	37		Rx2[E]N (1)
13		Rx1[B]P	38		Rx2[E]P (1)
14		Rx1[C]N	39	GND	
15		Rx1[C]P	40	TCON_SCL	
16		GND	41	TCON_SDA	
17		Rx1CLK_N	42	I2C_ON	
18		Rx1CLK_P	43	No Connection	
19		GND	44	No Connection	
20		Rx1[D]N	45	No Connection	
21		Rx1[D]P	46	No Connection	
22		Rx1[E]N (1)	47	No Connection	
23		Rx1[E]P (1)	48	No Connection	
24	GND		49	No Connection	
25	ODD LVDS Signal	Rx2[A]N	50	No Connection	
			51	No Connection	

Note(1) These pins are only used for 10-bit LVDS input case.

Note(2) LVDS Connector



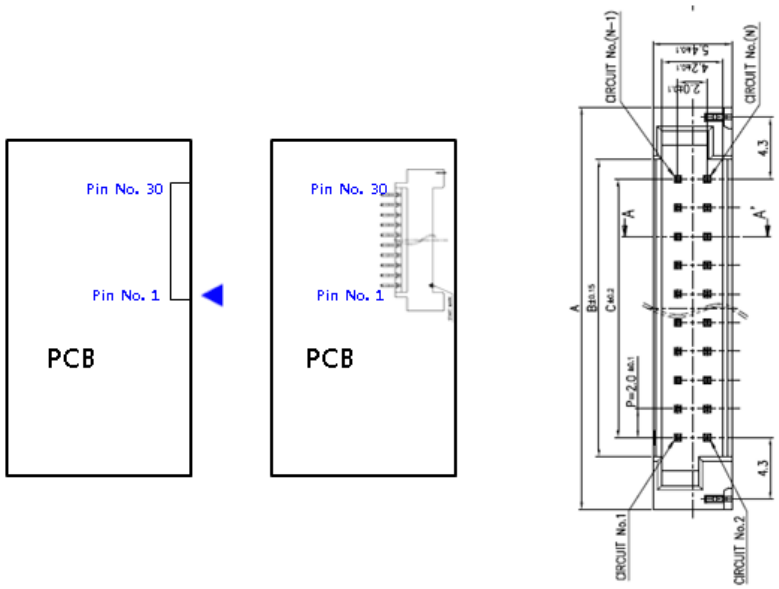
a. All GND pins should be connected together and also be connected to the SET's metal chassis.
b. All power input pins should be connected together.
c. All N.C pins should be separated from other signal or power.

5.2 EL Board INPUT PIN CONFIGURATION

Connector : SMAW200-H30SD(YEONHO)

PIN NO	Pin Configuration(FUNCTION)
1~14	GND
15,16	No Connection
17~30	V_{IN} (24V)

Note(1) EL Power Connector



5.5 INPUT SIGNALS, BASIC DISPLAY COLORS AND GRAY SCALE

COLOR	DISPLAY	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

Note) 8bit Mode Compatible

6. INTERFACE TIMING

6.1 TIMING PARAMETERS (DE ONLY MODE)

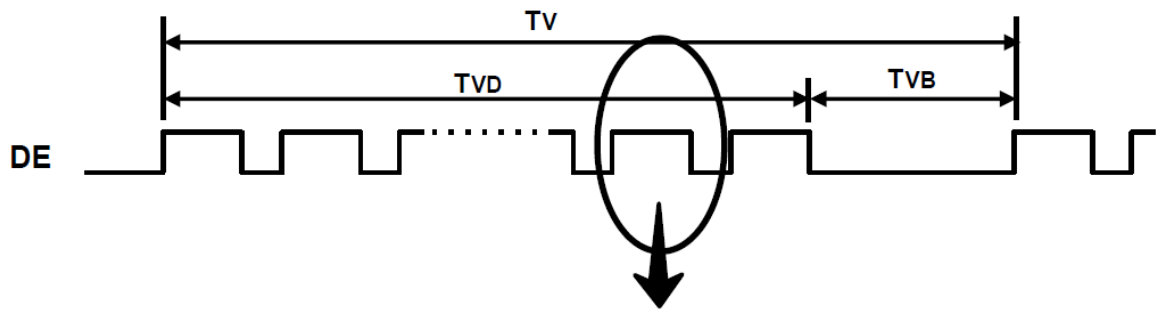
SIGNAL	ITEM	SYMBOL	MIN	TYP	MAX	Unit	NOTE
Clock	Frequency	$1/T_C$	68	-	-	MHz	-
Hsync		F_H	67.8	68.07	68.4	KHz	-
Vsync		F_V	59	60	61	Hz	-
Term for the vertical display	Active display period	T_{VD}	-	1080	-	Lines	-
	Total vertical	T_V	1130	1135	1140	Lines	-
Term for the horizontal display	Active display period	T_{HD}	-	960	-	Clocks	Per channel
	Total Horizontal	T_H	994	999	1003	Clocks	-

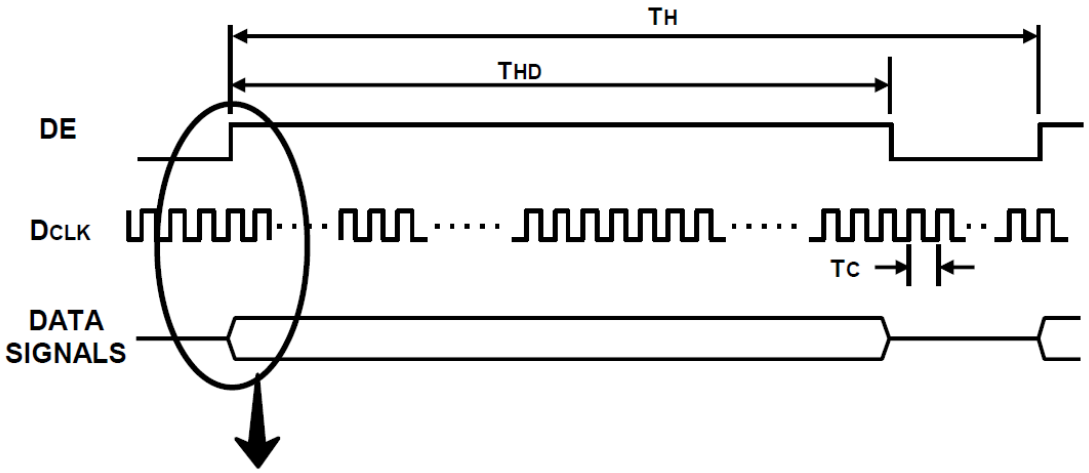
SIGNAL	ITEM	SYMBOL	MIN	TYP	MAX	Unit	NOTE
Clock	Frequency	$1/T_C$	-	74	-	MHz	-
Hsync		F_H	67.84	69.3	70.82	KHz	-
Vsync		F_V	59	60	61	Hz	-
Term for the vertical display	Active display period	T_{VD}	-	1080	-	Lines	-
	Total vertical	T_V	1130	1155	1180	Lines	-
Term for the horizontal display	Active display period	T_{HD}	960	960	960	Clocks	Per channel
	Total Horizontal	T_H	1045	1068	1091	Clocks	-

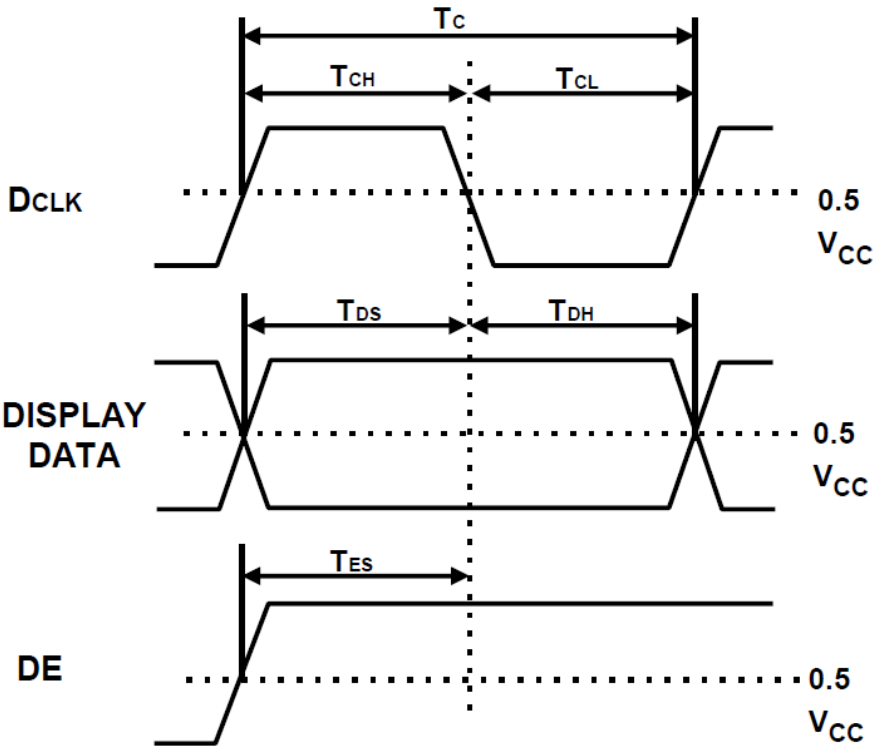
SIGNAL	ITEM	SYMBOL	MIN	TYP	MAX	Unit	NOTE
Clock	Frequency	$1/T_C$	-	-	90	MHz	-
Hsync		F_H	67.84	70.82	73.15	KHz	-
Vsync		F_V	59	60	61	Hz	-
Term for the vertical display	Active display period	T_{VD}	-	1080	-	Lines	-
	Total vertical	T_V	1130	1180	1220	Lines	-
Term for the horizontal display	Active display period	T_{HD}	960	960	960	Clocks	Per channel
	Total Horizontal	T_H	1230	1271	1327	Clocks	-

These products don't have to receive the signal of Hsync & Vsync from the input device.

6.2 TIMING DIAGRAMS OF INTERFACE SIGNAL (DE ONLY MODE)



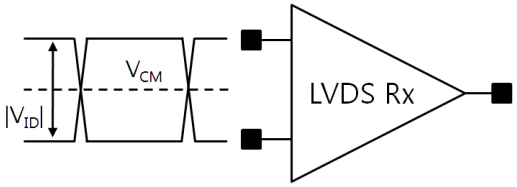




6.3 CHARACTERISTICS OF INPUT DATA OF LVDS

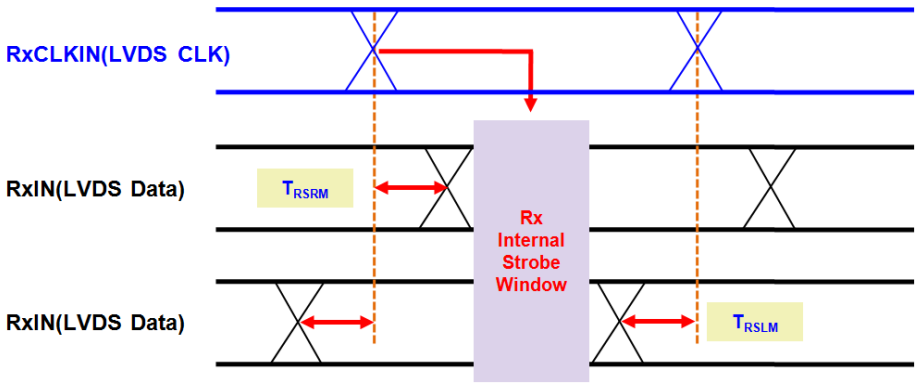
(1) Specification for DC

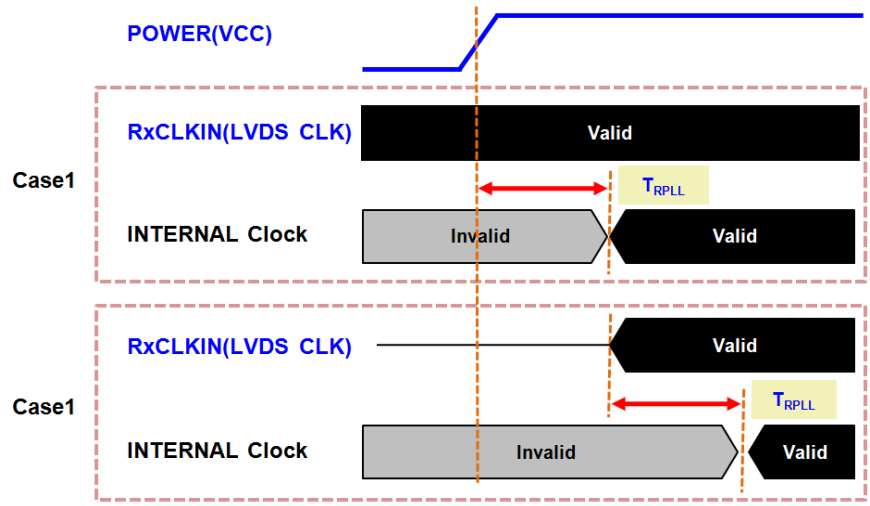
ITEM	SYMBOL	Min	Typ	Max	UNIT
Color depth	-	-	8/10	-	Bit
Input voltage at the common mode	V_{CM}	0.3	1.2	1.5	V
Input voltage for differential	$\|V_{ID}\|$	100	350	600	mV



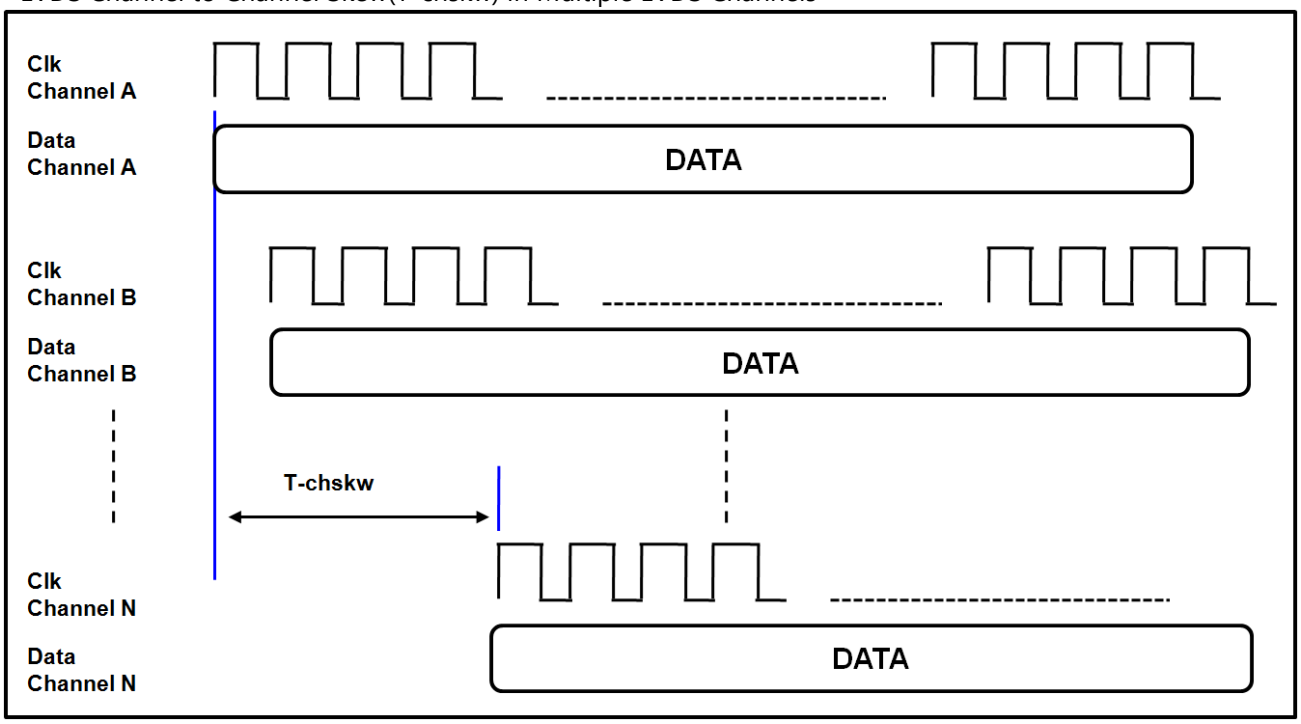
(2) Specification for AC

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT
Frequency for input clock (=1/T)		FIN	68	74	90	MHz
Position of input data	FIN=74MHZ	t_{RSRM}	-	-	+500	ps
Position of input data	FIN=74MHZ	t_{RSLM}	-500	-	-	ps
Duty ratio of Rx's clock for output		T_{duty}	45	50	55	%





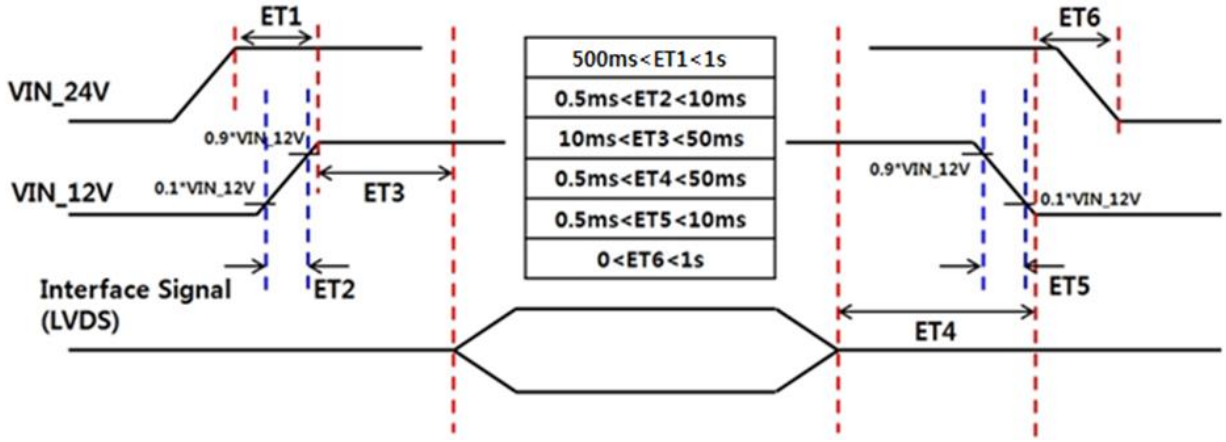
* LVDS Channel to Channel Skew(T-chskw) in Multiple LVDS Channels



Note : DE should be synchronized with DE per each LVDS Channel and T-chskw < 16* LVDS Clock Period

6.4 THE SEQUENCE OF POWER ON AND OFF

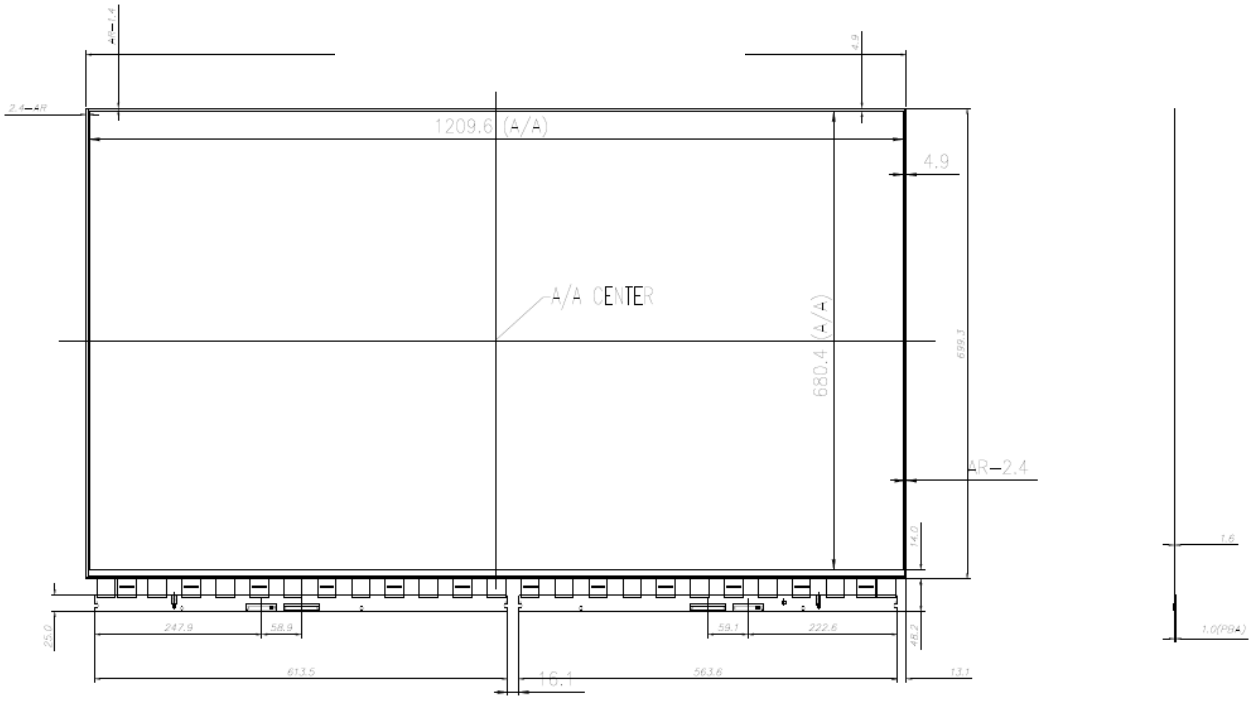
To prevent the product from being latched up or the DC in the OLED module from starting an operation, the order to turn the power on and off should be changed to the order as shown in the diagram below.



7. OUTLINE DIMENSION

7.1. The adhesive size of AR film

7.2. The drawing sheet for Panel (Open Cell)



8. RELIABILITY TEST

Item	Test condition	Quantity
Life Time	Full White pattern, 25℃/ 50% 1000hr	2EA
Storage Life Time	85℃/ 85% 500hr	4EA
HTOL	50℃, 1000hr, operation	8EA
LTOL	0℃, 500hr, operation	8EA
THB	50℃/ 90% 500hr, operation	8EA
TSS	-20℃ ↔ 65℃, On/Off, 114min/1cycle , 440cy	8EA
THBC	-5℃ ↔ 25℃ ↔ 60℃/ 75% , 448hr	4EA
HTS	70℃, storage	5EA
LTS	-25℃, storage	5EA
WHTS	60℃/ 90% storage, 500hr	5EA
T/C	-20 ~ 60℃, 100cycle	5EA
Decompression	50,000ft/0℃, 48hr, storage	4EA
Transportation Condition	Drop/ Temperature Humidity Complex/ Compression/ Vibration/ Drop, 1set	2Tray
Open Cell ESD	Input Terminal ±7 kV, Output Terminal ±4 kV, 1set	4EA

[Criteria on evaluation]

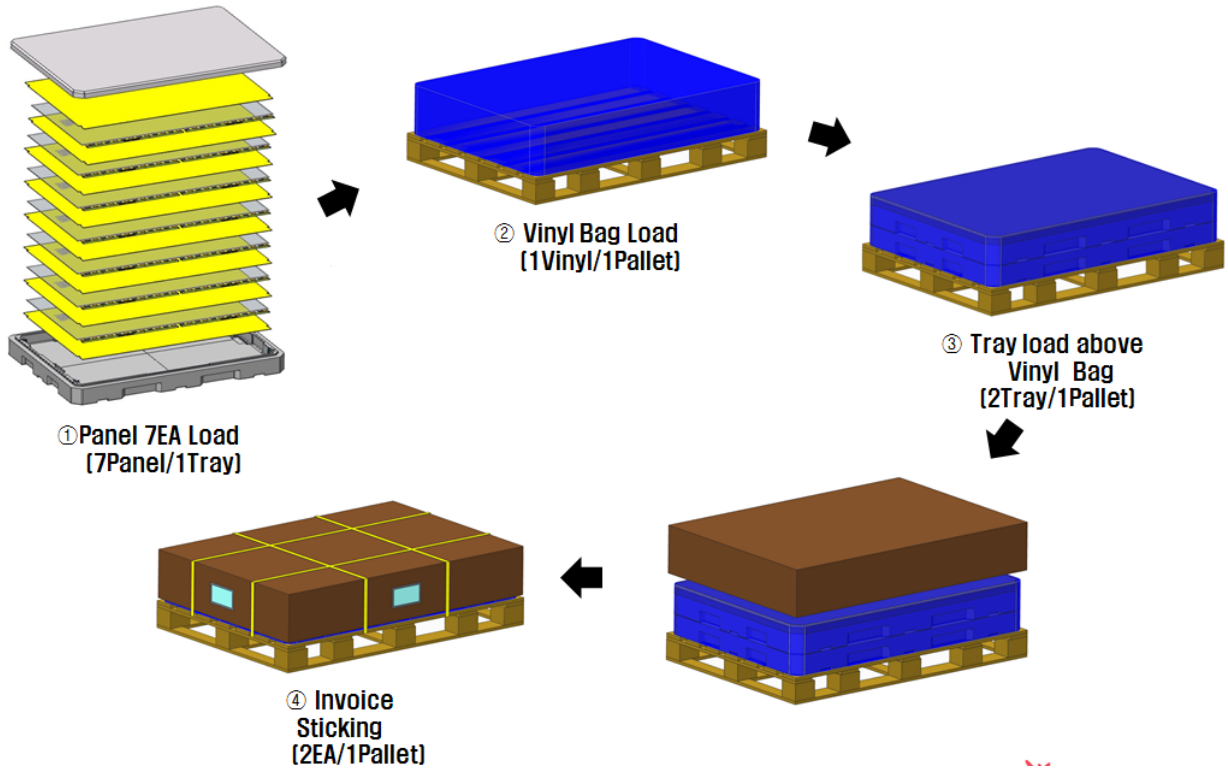
The components of product, which may affect to the function of display shall not be changed when the display quality test is executed under the normal operating condition.

* HTOL/ LTOL : The operating cycle on the high and low temperature
* THB : Temperature humidity slant
* HTS/LTS : The storage at the high and low temperature
* WHTS : The storage in the high temperature with the high humidity

9. PACKING

(1) Packing Form : EPS Cushion / Paper Box

(2) Packing Method



Note(1) Total Weight : Approximately 54Kg [With Pallet-Wood]
Note(2) Acceptance number of piling : Move – 3Pallet, Stock - 6Pallets
Note(3) Carton size : TBD 1380mm(H) x 960 mm(V) x 240 mm(Height) [Without Pallet Wood]
1430 mm(H) x 965 mm(V) x 363 mm(Height) [With Pallet Wood]

(3) Packing Material

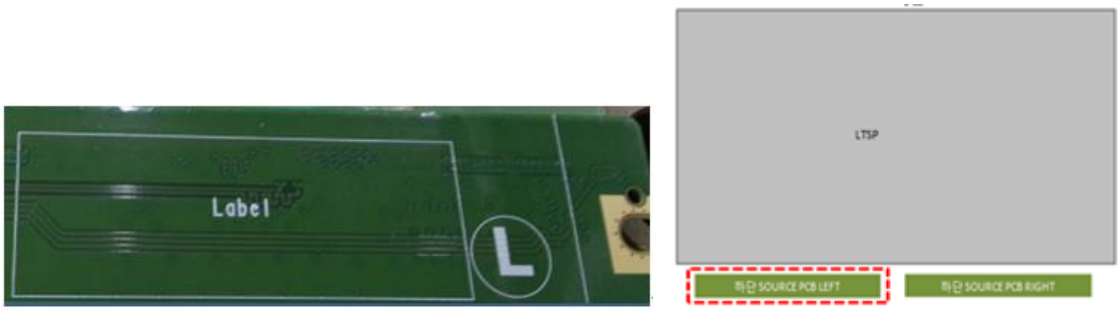
No	Part name	Quantity
1	Packing-Pallet box	1 EA
2	EPS cushion (Top / Bottom)	2 EA
3	Bag-Shielding	1 EA
4	Protector-Panel	16 EA
5	Pallet-Wood	1 EA

10. MARKINGS & OTHERS

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

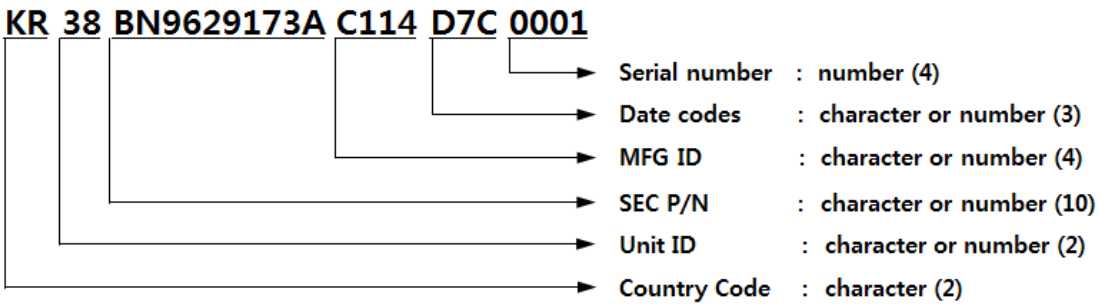
(1) Label position

- The backside of source board (left)



(2) Product label (example)

(3) S/N Indication (example)



- ✓ Country code - KR (S. Korea)
- ✓ Unit ID - 38 (Open Cell)
- ✓ SEC P/N - BN96729173A (OLED TV Cell)
- ✓ MFG ID - C114 (Samsung Display)
- ✓ Date Code - Production day: year / month / date
- ✓ Serial number - 0001 ~ 9999

11. GENERAL PRECAUTIONS

11.1 HANDLING

(a) When the panel kit is assembled, mechanical stress may not be put on the panel kit.

(b) Be careful not to place any extra mechanical stress to the panel when designing the set

(c) Be cautious not to exert any strong mechanical shock and / or any forces to the panel kit. Applying any forces to the panel may cause abnormal operation or damage to the panel kit and the back light unit kit.

(d) Refrain from applying any forces to the source PBA and the drive IC in the process of handling or installation to the set. If any forces are applied to the products, it may cause damage or a malfunction in the panel kit.

(e) Refrain from applying any forces which cause a constant shock to the back side of panel kit, and the set design. If any forces are applied to the products, it may cause an abnormal display, a functional failure, etc.

(f) Note that the polarizer could be damaged easily. Do not press or scratch the bare surface with material that is harder than a HB pencil lead.

(g) Wipe off water droplets or oil immediately. If droplets are left on the product for an extended period of time, they may cause staining or discoloration.

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

(i) Desirable cleaners are water or IPA (Isopropyl Alcohol). Do not use Kenton type materials (ex. Acetone), Ethyl -alcohol, Toluene, Ethyl acid or Methyl chloride. These might cause permanent damage to the polarizer due to chemical reaction.

(j) If the panel is broken, glass should be kept away from the eyes or mouth. When it comes into contact to hands, legs, or clothes, wash thoroughly with soap, and seek medical attention if necessary.

(k) Protect the panel kit from static electricity. Static may cause damage to the circuit IC.

* Reference: SDC Factory's Process Control Standard

No.	Item	Control standard
1	Ionizer	All Equipment should be controlled under 150V.(Typ. 100V)
2	Carrying Roller	Carrying Roller should be controlled under 200V.
3	Equipment Ground Resistance	All Equipment Ground Should be less than 1ohm.

(l) Remove stains with finger-stalls wearing soft gloves in order to keep the display clean during incoming inspection and the assembly process.

(m) Do not pull or fold the source drive IC which connects to the source PBA and the panel or the gate drive IC.

(n) Do not pull, fold or bend the source drive IC and the gate drive IC in any process. The source drive IC may be bent one time during the process of assembling the panel Kit.

(o) Do not touch the pins of the interface connector directly with bare hands.

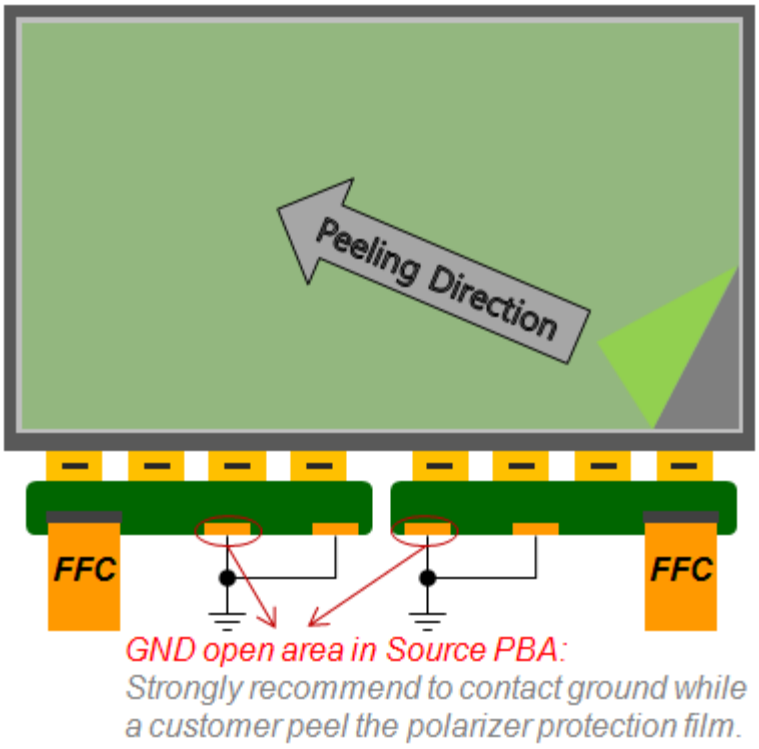
(p) The protection film for the polarizer on the panel kit should be slowly peeled off just before using so that the electrostatic charge can be minimized.

(q) The panel kit has high frequency circuits. The sufficient suppression to the EMI should be done by the set manufacturers.

(r) The set of which the panel is assembled to shall not be twisted. If the product is twisted, it may cause damage on the product.

(s) Surface Temp. of IC should be controlled to below 100℃. Operating over the temp. may cause damage or decrease of lifetime.

(t) Be cautious not to peel off the protection film.



- Make sure to peel off slowly
(It is recommended to peel it off at the speed lasting more than 8 sec, constantly.)

- The peeling direction is shown at the left Fig

- Instruct the ground worker to work with the adequate methods such as the antistatic wrist band.

- Make sure to ground the source PBA while peeling of the protection film.

- Ionized air should be blown over during peeling

- The protection film should not be contacted to the source driver IC.

- If the adhesive stains remain on the polarizer after the protection film is peeled off, please move stains with isopropyl-alcohol liquid.

11.2 STORAGE

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

ITEM	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	12 months / Based on shipping date at SDC site		
Storage Condition	- The storage room should be equipped with a good ventilation facility, which has a temperature controlling system. - Products should be placed on the pallet, which is away from the wall not on the floor. - Prevent products from being exposed to the direct sunlight, moisture, and water. Be cautious not to pile the products up. - Avoid storing products in the environment, which other hazardous material is placed. - If products are delivered or kept in the storage facility more than (3) months, we recommend you to leave products under the condition including a (20)℃ temperature and a humidity of (50)% for (24) hours. - If you store semi-manufactured products for more than 3 months, bake the products under the condition including the (50)℃ temp. and the (10)% humidity for (24)hrs after being used.		

11.3 OPERATION

(a) Do not connect or disconnect the FFC cable during the "Power On" condition.

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

(c) The module has high frequency circuits. The sufficient suppression to the electromagnetic interference should be done by the system manufacturers. The grounding and shielding methods is important to minimize the interference.

(d) The cables between TV SET connector and Control PBA interface cable should be connected directly to have a minimized length. A longer cable between TV SET connector and Control PBA interface cable maybe cause the display to operate abnormally

(e) Recommended to age for over 1 hour at least in the state, which the product is driving initially to stabilize the characteristic of the initial TFT.

11.4 OPERATION CONDITION GUIDE

(a) The OLED product shall be operated under normal conditions.
The normal condition is defined as below;
- Temperature: 20 ± 15°C
- Humidity: 55 ± 20%
- Display Pattern: continually changing pattern (Not stationary)

(b) If the product will be used under extreme conditions such as under high temperature, humidity, display patterns or the operation time etc.., it is strongly recommended to contact SDC for the advice about the

application of engineering. Otherwise, its reliability and the function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock markets, and controlling systems.

11.5 OTHERS

(a) The T-OLED is only for indoor operation. T-OLED must be protected from ultra-violet ray.

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

(c) Do not exceed the limit on the absolute maximum rating. (For example, the supply voltage variation, the input voltage variation, the variation in content of parts and environmental temperature, and so on). Otherwise, panel may be damaged.

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

(e) This Panel has its circuitry of PCB's on the rear side, so it should be handled carefully in order for a force not to be applied.

(f) Please contact SDC in advance when the same pattern is displayed for a long time

(g) Be careful not to subject the screen to strong impacts. If the screen cracks, injury may result from the broken fragments.

(h) Do not throw anything at the T-OLED display. Doing so may break the screen glass and cause serious injury. If the surface of the T-OLED display cracks, unplug the AC or DC power cord before touching the T-OLED display. Otherwise electric shock may result.

(i) Be careful not to subject the screen to strong impacts like objects hitting the screen or a fall onto a hard surface. If caution is not maintained, under certain circumstances, the screen may crack and may even result in broken fragments.

(j) Before attempting any remedial action, FIRST unplug the power cord. Not following this step may result in an electrical shock and lead to serious injury.

(k) Do not touch the broken glass with bare hands. User is strongly advised to maintain utmost caution and use appropriate safety tools since the broken fragments can cause injury.

(l) In case of injury caused due to contact with broken glass especially in the eyes or face, please seek medical help immediately.