

# SPECIFICATION FOR APPROVAL

(●) Preliminary Specification

( ) Final Specification

Title	30.0" HD OLED
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BUYER	General
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LW300PXL
SUFFIX	HRT1

APPROVED BY	SIGNATURE DATE
/	_____
/	_____
/	_____

Please return 1 copy for your confirmation with your signature and comments.

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**OLED TV Development Dept.  
LG Display Co., Ltd.**

## Product Specification

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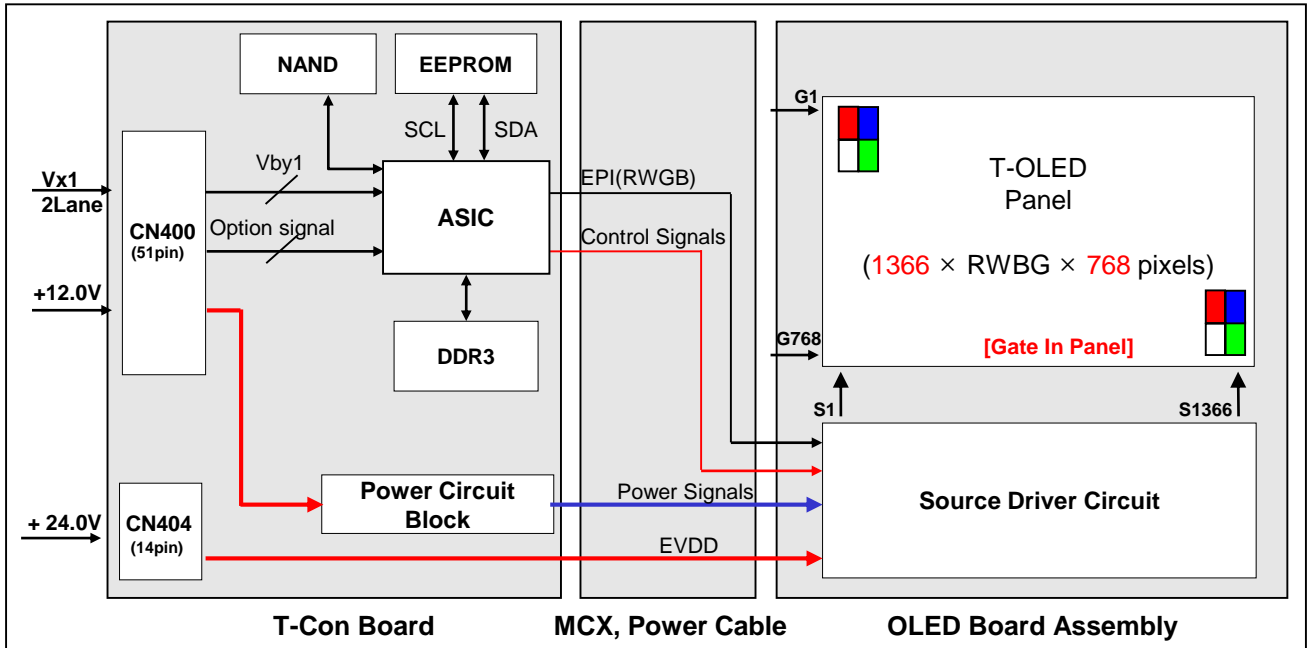
### 1. General Description

The LW300PLX is a Transparent Color Active Matrix Organic Light Emitting Diode Display (T-OLED). The matrix employs Oxide Thin Film Transistor as the active element. It is a Top emission display type. It has a 30 inch diagonally measured active display area with HD resolution (768 vertical by 1366 horizontal pixel array).

Each pixel is divided into Red, Green, Blue and White sub-pixels or dots which are arrayed in Quad. Gray scale or the luminance of the sub-pixel color is determined with a 10-bit gray scale signal for each dot. Therefore, it can present a palette of more than 1.07B(true) colors.

It has been designed to apply the 10-bit 2 Lane V by One interface.

It is intended to Public Display where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



### General Features

Active Screen Size	30.00 inches(762.08mm)
Outline Dimension	676.09(H) x 387.48 (V) mm (Typ.)
Pixel Pitch	0.4863 mm x 0.4863 mm
Pixel Format	1366 horiz. by 768 vert. Pixels, RWBG Quad arrangement
Color Depth	10bit(R), 1.07Billion colors
Luminance, White	350/135cd/m <sup>2</sup> (Center 1point ,Typ.)
Color Viewing Angle	R/L 120 (min.), U/D 120 (min.) ( $\Delta u'v' \leq 0.026$ )
Power Consumption	Total W (Typ.) [Logic= <b>10.56W</b> , EVDD=8.9W @ IEC62087] (TBD)
Weight	1.04kg (W/O C-PCB)(TBD)
Display Mode	Normally Transparent
Transparent Ratio	43%(typ.) (TBD)
Reflectivity	20% (typ.) (TBD)
Surface Treatment	Hard coating(2H)

## Product Specification

## 2. Absolute Maximum Ratings

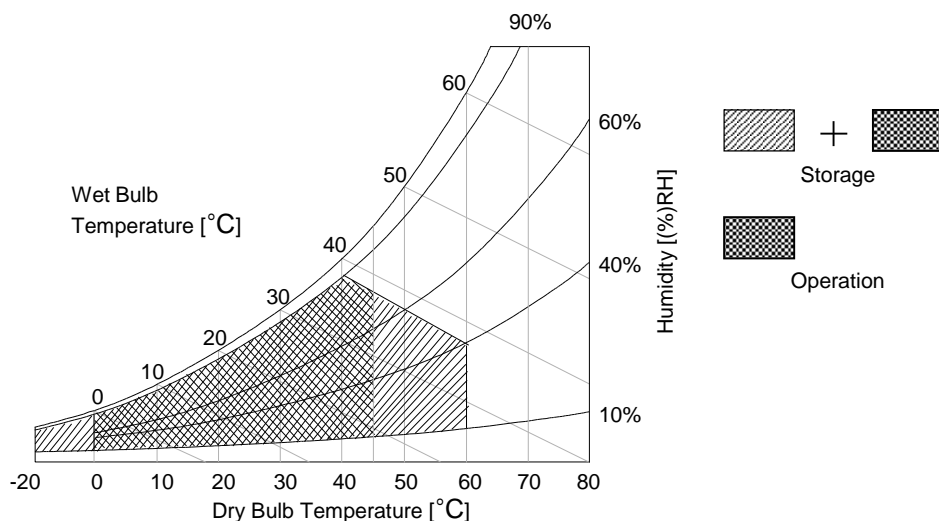
The following items are maximum values which, if exceeded, may cause faulty operation or damage to the OLED module.

**Table 1. ABSOLUTE MAXIMUM RATINGS**

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Power Input Voltage	Logic	VDD	-0.3	+14.0	V <sub>DC</sub>	1
	OLED Panel	EVDD	-0.3	+26(TBD)	V <sub>DC</sub>	
T-Con Option Selection Voltage		V <sub>LOGIC</sub>	-0.3	+3.7	V <sub>DC</sub>	
Operating Temperature		T <sub>OP</sub>	0	+45	°C	2
Storage Temperature		T <sub>ST</sub>	-20	+60	°C	
Operating Ambient Humidity		H <sub>OP</sub>	10	90	%RH	2
Storage Humidity		H <sub>ST</sub>	10	90	%RH	

### Notes

- Ambient temperature condition ( $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ )
- Temperature and relative humidity range are shown in the figure below.  
Wet bulb temperature should be Max 39°C, and no condensation of water.



## Product Specification

## 3. Electrical Specifications

## 3-1. Electrical Characteristics

It requires two power inputs. One is employed to power for the circuit. The other is used for the EVDD.

Parameter	Symbol	Values			Unit	Notes	
		Min	Typ	Max			
Power Input Voltage	VDD	10.8	12.0	13.2	V		
	EVDD	21.9(TBD)	23.0(TBD)	24.2(TBD)			
Power Input Current	$I_{VDD}$	-	0.88(TBD)	0.97(TBD)	A	1-1/1-2	
		-	1.21(TBD)	1.33(TBD)		2	
	$I_{EVDD}$	-	0.39(TBD)	0.43(TBD)		1-1	
		-	0.38(TBD)	0.41(TBD)		1-2	
T-CON Option Voltage	$V_{IL}$	0(TBD)	-	0.8(TBD)	V		
	$V_{IH}$	2.7(TBD)	-	3.6(TBD)	V		
Power Consumption	$P_{VDD}$	-	10.56(TBD)	11.62(TBD)	Watt	1-1/1-2	
		-	14.52(TBD)	15.97(TBD)		2	
	$P_{EVDD}$	-	8.9(TBD)	9.8(TBD)		1-1	
		-	8.7(TBD)	9.5(TBD)		1-2	
		-	28.3(TBD)	31.1(TBD)		3	
Rush current	$I_{RUSH}$	$I_{RUSH\_VDD}$	-	-	7 (TBD)	A	4
		$I_{RUSH\_EVDD}$	-	-	15 (TBD)		
		$T_{RUSH\_VDD}$	-	-	100 (TBD)	us	
		$T_{RUSH\_EVDD}$	-	-	2 (TBD)	ms	

## Note

- 1-1. The specified current and power consumption are under the VDD=12.0V, EVDD=23.0V  $T_a=25 \pm 2^\circ\text{C}$ ,  $f_v=120\text{Hz}$ , condition whereas standard moving picture(IEC62087) is displayed and  $f_v$  is the frame frequency.
- 1-2 The specified current and power consumption are under the VDD=12.0V, EVDD=23.0V  $T_a=25 \pm 2^\circ\text{C}$ ,  $f_v=120\text{Hz}$  condition whereas standard moving picture(CLASP) is displayed and  $f_v$  is the frame frequency.
2. The current ( $I_{VDD}$ ) is specified at the maximum current pattern (1by1 Horizontal Pattern) and under the VDD=12.0V, EVDD=23.0V  $T_a=25 \pm 2^\circ\text{C}$  condition.
3. The current ( $I_{EVDD}$ ) is specified at the maximum current pattern (Secondary Color Pattern) and under the VDD=12.0V, EVDD=23.0V  $T_a=25 \pm 2^\circ\text{C}$  condition.

## Product Specification

**3-2. Interface Connections**

This OLED module employs two kinds of interface connection, 51-pin connector is used for the module electronics and 14-pin connector is used for the EVDD.

**3-2-1. OLED Module**

- VDD Connector (CN400): FI-RE51S-HF(JAE)
- Mating Connector : FI-RE51HL(JAE) or compatible

**Table 3. MODULE CONNECTOR(CN400) PIN CONFIGURATION**

No	Symbol	Description	No	Symbol	Description
1	VDD	Power Supply +12.0V	27	GND	Ground
2	VDD	Power Supply +12.0V	28	Rx0N	V-by-One HS Data Lane0
3	VDD	Power Supply +12.0V	29	Rx0P	V-by-One HS Data Lane0
4	VDD	Power Supply +12.0V	30	GND	Ground
5	NC (Reserved)	No Connection (Reserved)	31	Rx1N	V-by-One HS Data Lane1
6	GND	Ground	32	Rx1P	V-by-One HS Data Lane1
7	GND	Ground	33	GND	Ground
8	GND	Ground	34	NC (Reserved)	No Connection (Reserved)
9	GND	Ground	35	NC (Reserved)	No Connection (Reserved)
10	JB&Off-RS Power_off done	JB&Off-RS&Power_off done (H), Set ← Module (Note 3)	36	NC (Reserved)	No Connection (Reserved)
11	AC_DET	AC_DET (H= On), Set → Module	37	NC (Reserved)	No Connection (Reserved)
12	Error Detection	H' = Error , 'L' = Normal (note 4)	38	NC (Reserved)	No Connection (Reserved)
13	I2C_SDA1	I2C for Customer	39	NC (Reserved)	No Connection (Reserved)
14	I2C_SCL1		40	NC (Reserved)	No Connection (Reserved)
15	NC (Reserved)	No Connection (Reserved)	41	NC (Reserved)	No Connection (Reserved)
16	NC (Reserved)	No Connection (Reserved)	42	NC (Reserved)	No Connection (Reserved)
17	NC (Reserved)	No Connection (Reserved)	43	NC (Reserved)	No Connection (Reserved)
18	I2C_SDA	I2C for Customer	44	NC (Reserved)	No Connection (Reserved)
19	I2C_SCL		45	NC (Reserved)	No Connection (Reserved)
20	EVDD_DET	EVDD reset, Set ← Module	46	NC (Reserved)	No Connection (Reserved)
21	NC (Reserved)	No Connection (Reserved)	47	NC (Reserved)	No Connection (Reserved)
22	GND	AGP2 (note 6)	48	NC (Reserved)	No Connection (Reserved)
23	GND	AGP1 (note 6)	49	QSMEN	QSMEN (Set→Module)
24	GND	Ground	50	ON_RF	On_RF_Done (Set ← Module)
25	HTPDN	Hot plug detect	51	NC (Reserved)	No Connection (Reserved)
26	LOCKN	Lock detect	-	-	-

**Notes**

1. All GND(ground) pins should be connected together.
2. All Input levels of V-by-One signals are based on the V-by-One HS Standard.
3. Specific pin No. **#10** is used for compensation when Power turn off.
4. Specific pin No. **#12** is used for “Power Error detection” of the OLED module.
5. Specific pins No. **#22** and **#23** are used for “No signal detection” of system signal interface.  
It should be GND for NSB (No Signal Black) while the system interface signal is not.  
If this pin is “H” or “NC”, OLED module displays AGP (Auto Generation Pattern).

## Product Specification

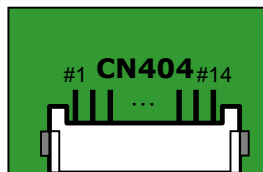
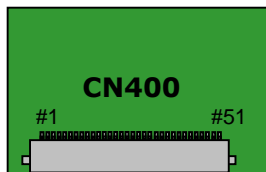
### 3-2-2. OLED Module (EVDD)

- EVDD Connector (CN404) : 20022WR-H14B2 (manufactured by Yeon Ho)
- Mating Connector : 2022HS-14B2(BK) (manufactured by Yeon Ho)

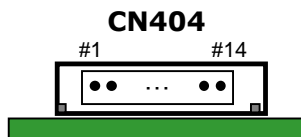
**Table 4. EVDD CONNECTOR(CN404) PIN CONFIGURATION**

No	Symbol	Description
1	EVSS	OLED Panel Ground
2	EVSS	OLED Panel Ground
3	EVSS	OLED Panel Ground
4	EVSS	OLED Panel Ground
5	EVSS	OLED Panel Ground
6	EVSS	OLED Panel Ground
7	NC	Don't care
8	EVDD	OLED Panel Power Supply +23V
9	EVDD	OLED Panel Power Supply +23V
10	EVDD	OLED Panel Power Supply +23V
11	EVDD	OLED Panel Power Supply +23V
12	EVDD	OLED Panel Power Supply +23V
13	EVDD	OLED Panel Power Supply +23V
14	EVDD	OLED Panel Power Supply +23V

◆ **Rear view of OLED Module**



< Top view of PCB >



< Side view of PCB >



## Product Specification

**3-3. Signal Timing Specifications**

Table 6-1 shows the signal timing required at the input of the **Vx1** transmitter. All of the interface signal timings should be satisfied with the following specification for normal operation.

**Table 6-1. TIMING TABLE (DE Only Mode)**

ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	tHV	683	683	683	tCLK	1366/2
	Blank	tHB	65	67	68	tCLK	1
			0.875	0.905	0.921	us	3
Total	tHP	748	750	751	tCLK		
Vertical	Display Period	tVv	768	768	768	Lines	
	Blank	tVB	54	55	60	Lines	1
			(200)	(220)	(271)		
			542.9	556.9	614.1	us	3
			(2010.8)	(2227.6)	(2773.7)		
Total	tVP	822 (968)	823 (988)	828 (1039)	Lines		

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	fCLK	73.82	74.07	74.32	MHz	148.14/2
	Horizontal	fH	97.704	98.760	99.462	KHz	1
	Vertical	fV	118 (95.05)	120 (99.96)	121 (102)	Hz	2 NTSC (PAL)

## Notes:

- The input of HSYNC & VSYNC signal does not have an effect on normal operation (DE Only Mode).  
If you use spread spectrum of EMI, add some additional clock to minimum value for clock margin.
- The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency.
- If you change the DCLK, must satisfy the minimum horizontal & vertical blank time.  
※ This OLED module supports Spread Spectrum Clocking tolerance with up to 40kHz /  $\pm 0.5\%$   
※ Timing should be set based on clock frequency.

## Product Specification

Table 6-2. Timing Table(Only Gaming mode : VRR Mode)

ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	tHV	683	683	683	tCLK	1366/2
	Blank	tHB	67	67	67	tCLK	
	Total	tHP	750	750	750	tCLK	
Vertical	Display Period	tVv	768	768	768	Lines	
	Blank	tVB	55	55	1701	Lines	
	Total	tVP	823	823	2469	Lines	
ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	fCLK	74.07	74.07	74.07	MHz	148.14/2
	Horizontal	fH	98.760	98.760	98.760	KHz	
	Vertical	fV	40	120	120	Hz	

## Note:

1. Only applicable to Gaming mode with VRR operation
2. The device could not work properly in case it is operated by VRR mode.
  - 1) This OLED module supports adaptive sync timing only under moving picture in room temperature(25±5°C)
  - 2) It would not work usually under still image & reliability test.
  - 3) Under those condition, the phenomenon such as image sticking, flickering, flashing and dither noise in low gray could be found on the screen.

## Product Specification

## 3-4. V by One input Signal Characteristics

## 3-4-1. V by One Input Signal Timing Diagram

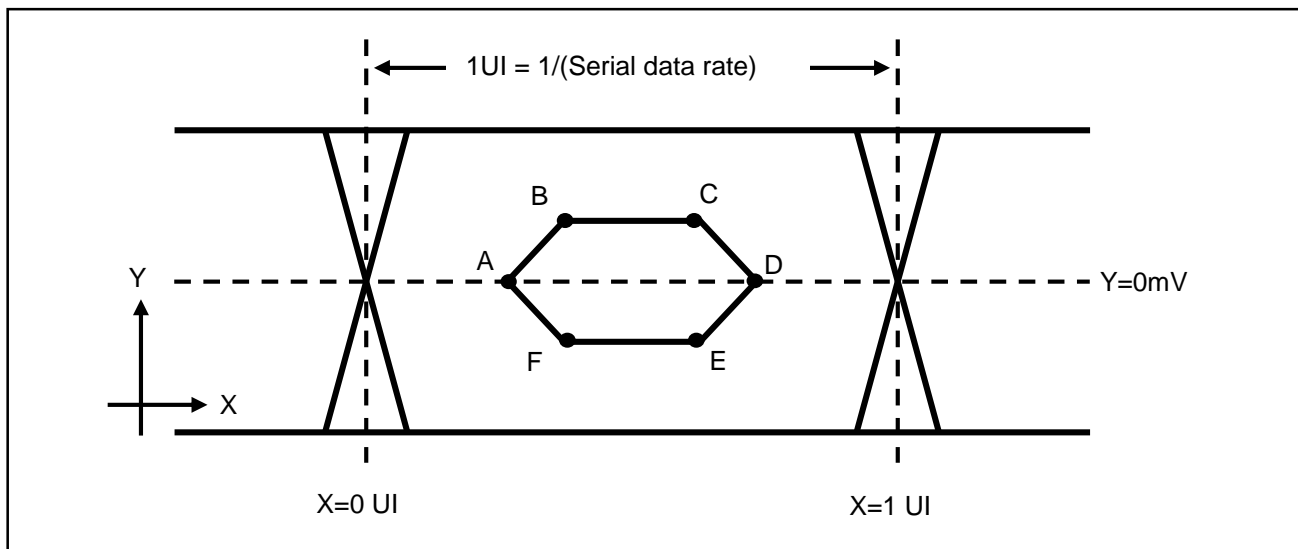
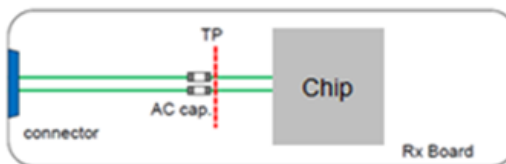


Table 7. Eye Mask Specification

	X [mV]	Note	Y [UI]	Note
A	0.25 (max)	2	0	-
B	0.30 (max)	2	50	3
C	0.70 (min)	3	50	3
D	0.75 (min)	3	0	-
E	0.70 (min)	3	-50	3
F	0.30 (max)	2	-50	3

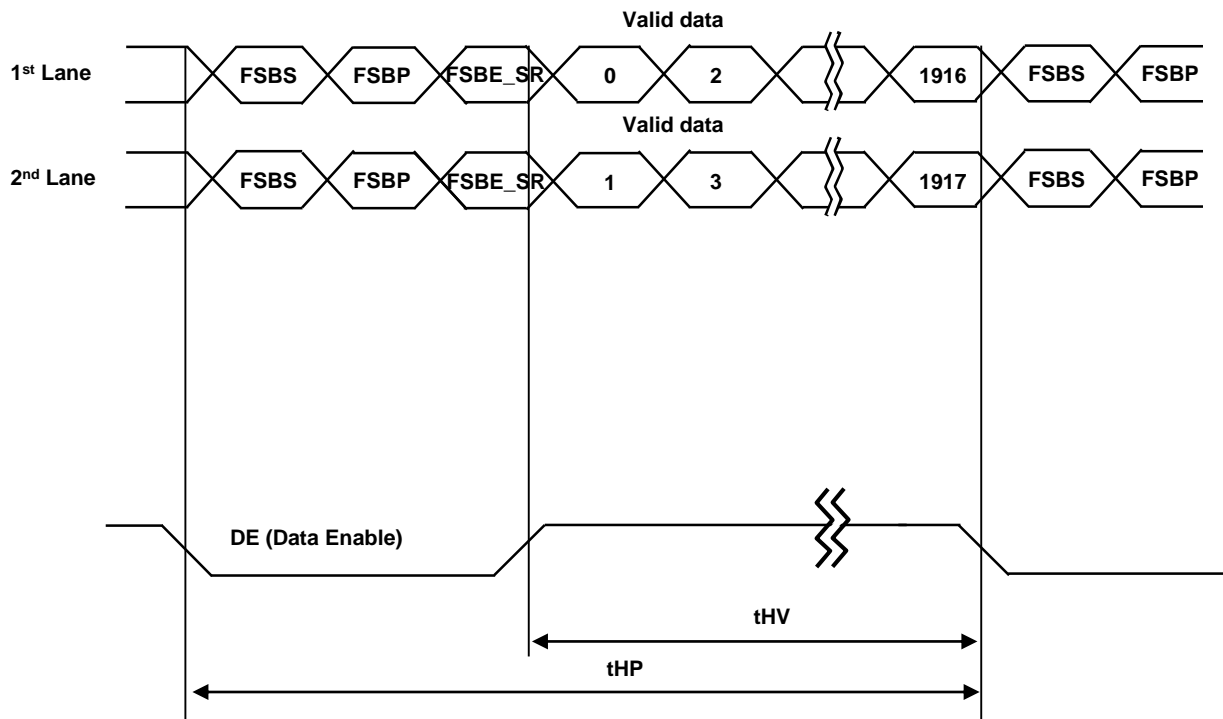
## Notes

- 1.1 All Input levels of V by One signals are based on the V by One HS Standard.
- 1.2 When using the Tx's Pre-Emphasis function to be set to a minimum value that meets the EYE Mask Spec
2. This is allowable maximum value.
3. This is allowable minimum value
4. The eye diagram is measured by the oscilloscope and receiver CDR characteristic must be emulated.
  - PLL Type : 2nd Order
  - PLL bandwidth : 10MHz
  - Damping Factor : 2
5. EYE mask measuring point



Product Specification

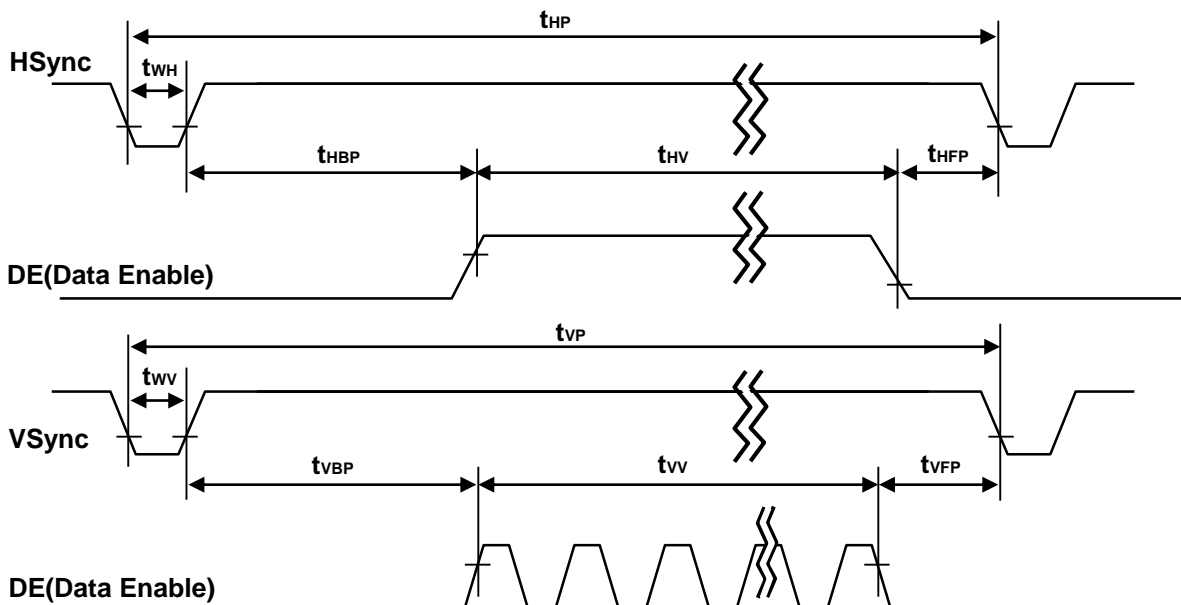
3-4-2. V by One Input Signal Timing Diagram



\* Reference: Sync. Relation

\*  $t_{HB} = t_{HFP} + t_{WH} + t_{HBP}$

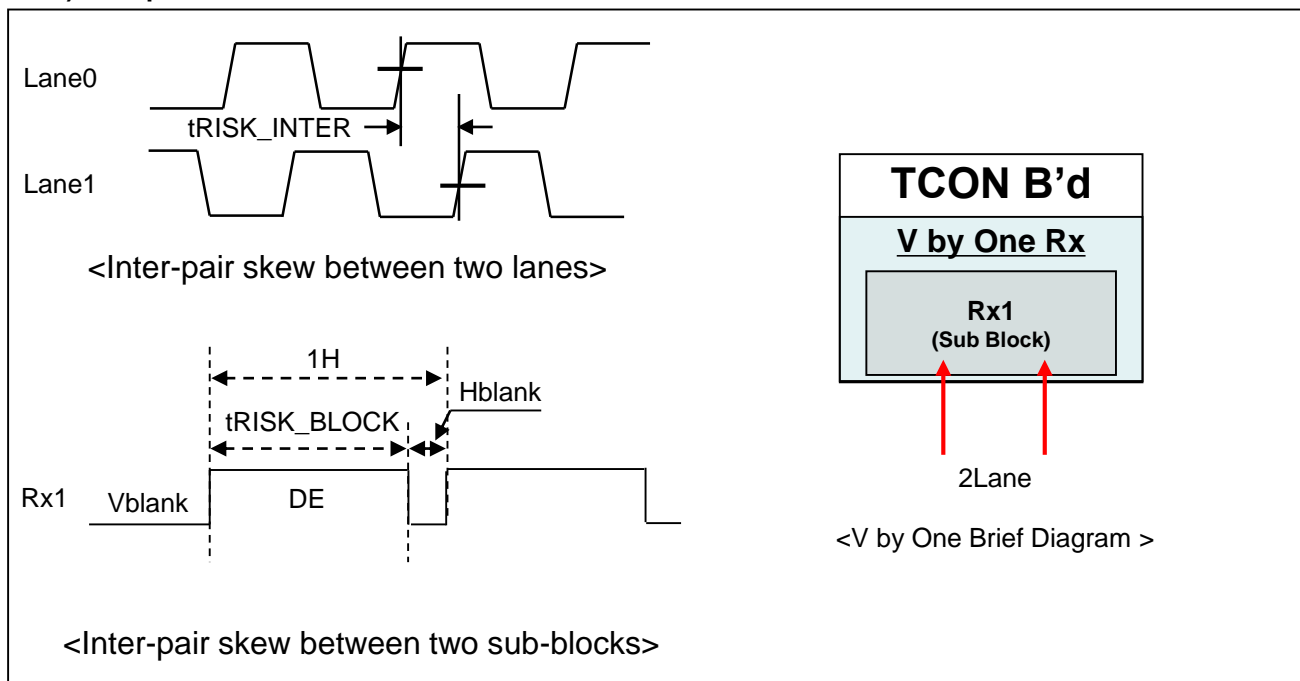
\*  $t_{VB} = t_{VFP} + t_{WV} + t_{VBP}$



## Product Specification

## 3-4-3. V by One Input Signal Characteristics

## 1) AC Specification



Description	Symbol	Min	Max	Unit	Note
Allowable inter-pair skew between lanes	tRISK_INTER	-	5	UI	1, 3
Allowable inter-pair skew between sub-blocks	tRISK_BLOCK	-	1	DE	1, 4

Notes: 1.  $1UI = 1/\text{serial data rate}$

2. it is the time difference between the true and complementary single-ended signals.
3. it is the time difference of the differential voltage between any two lanes in one sub block.
4. it is the time difference of the differential voltage between any two blocks in one IP.
5. APL packet of Vx1 Input
  - 5-1) APL data transmission should be completed between after 5H from frame last DE falling and 10H before next frame DE rising.
  - 5-2) APL data transmission should be inputted only one time during V blank period.

## Product Specification

**3-5. Color Data Reference**

The brightness of each primary color (red,green,blue) is based on the 10bit gray scale data input for the color. The higher binary input, the brighter the color. Table 8 provides a reference for color versus data input.

**Table 8. COLOR DATA REFERENCE**

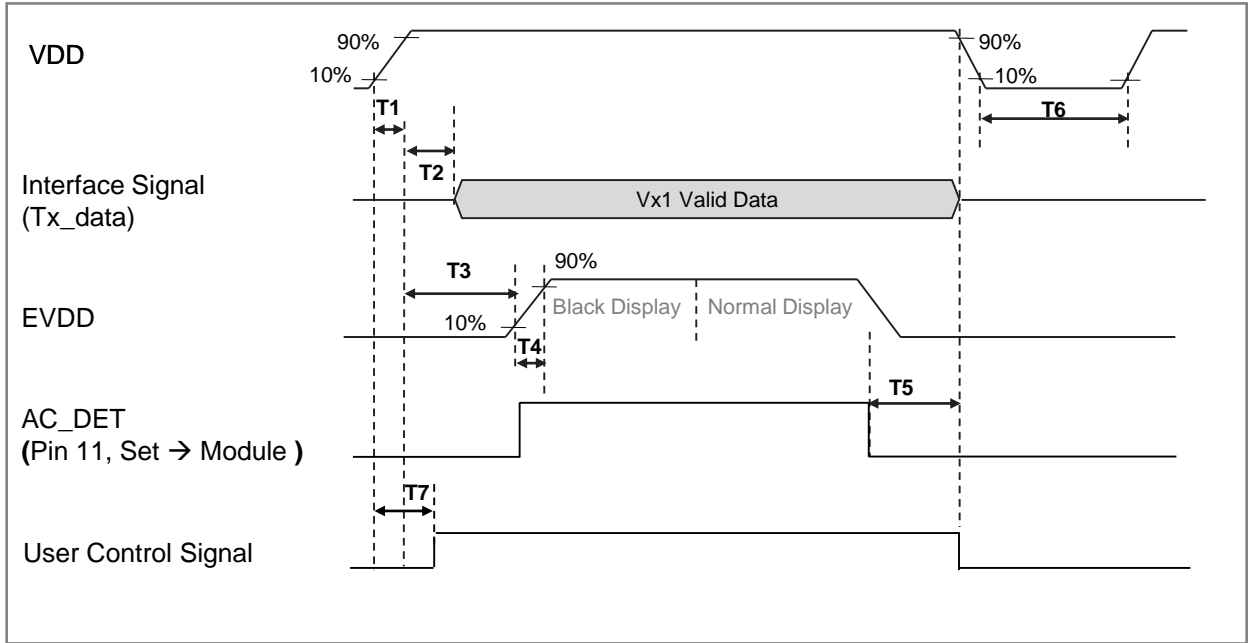
Packer input & Unpacker output		30bpp RGB (10bit)
Byte0	D[0]	R[2]
	D[1]	R[3]
	D[2]	R[4]
	D[3]	R[5]
	D[4]	R[6]
	D[5]	R[7]
	D[6]	R[8]
	D[7]	R[9]
Byte1	D[8]	G[2]
	D[9]	G[3]
	D[10]	G[4]
	D[11]	G[5]
	D[12]	G[6]
	D[13]	G[7]
	D[14]	G[8]
	D[15]	G[9]
Byte2	D[16]	B[2]
	D[17]	B[3]
	D[18]	B[4]
	D[19]	B[5]
	D[20]	B[6]
	D[21]	B[7]
	D[22]	B[8]
	D[23]	B[9]
Byte3	D[24]	Don't care
	D[25]	Don't care
	D[26]	B[0]
	D[27]	B[1]
	D[28]	G[0]
	D[29]	G[1]
	D[30]	R[0]
	D[31]	R[1]

Notes 1. 30bpp RGB (10bit) is 4 byte mode

## Product Specification

### 3-6. Power Sequence

#### 3-6-1. OLED Driving circuit



**Table 9. POWER SEQUENCE**

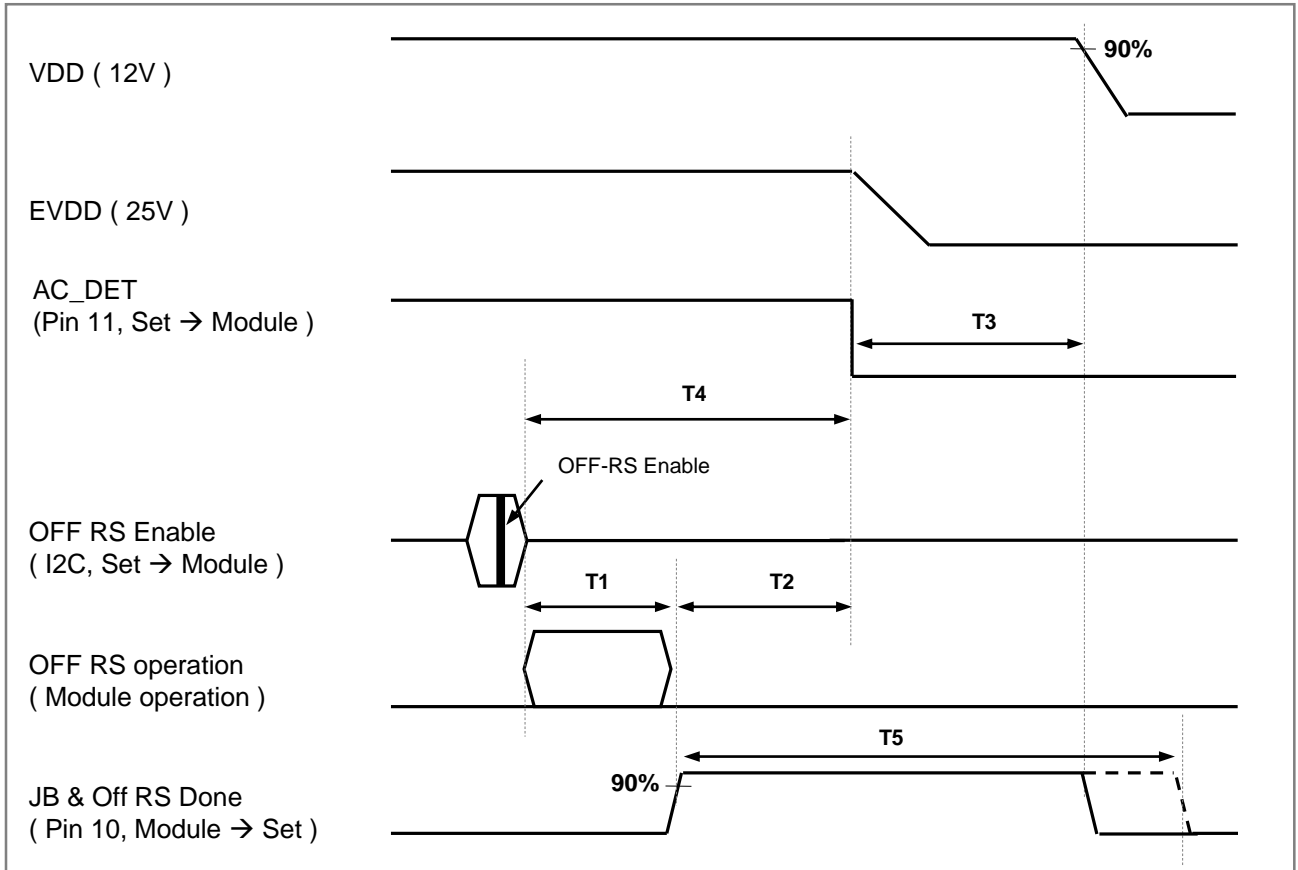
Parameterz	Value			Unit	Notes
	Min	Typ	Max		
T1	1(TBD)	-	20(TBD)	ms	1
T2	58(TBD)	-	-	ms	
T3	0.6(TBD)	-	-	sec	2
T4	5(TBD)	-	50(TBD)	ms	
T5	30(TBD)	-	-	ms	
T6	1.5(TBD)	-	-	sec	3
T7	0(TBD)	-	T1+T2(TBD)	ms	4

**Notes**

1. The T3 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem. T3 should be larger than T2.
2. T6 should be measured after the module has been fully discharge between power off and on period.
3. If the on time of signals (Interface signal and user control signals) precedes the on time of Power(VDD) it will be happened abnormal display. When T7 is NC status, T7 doesn't need to be measured
4. I2C is able to be accessed from 540ms after VDD 90% rising
  - ※ Black pattern is displayed during black display period before normal display. (ON RF Time 2.7S(TBD))
  - ※ When the power for logic (VDD\_12V) turns off, EVDD should be less than 8.0V. But, it does not matter if there is no garbage image.

## Product Specification

### 3-6-2. OFF RS Compensation Operation



**Table 10. POWER SEQUENCE**

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	100(TBD)	-	170(TBD)	sec	1
T2	0(TBD)	-	10(TBD)	sec	
T3	30(TBD)	-	-	ms	
T4	180(TBD)	-	-	sec	2
T5	0.5(TBD)	7(TBD)	10(TBD)	sec	

Note : 1. It is the actual RS sensing time. This timing is determined according to the characteristics of the panel. (LGD Internal timing)

2. TV system is recommended to be turned off **immediately** after **T4 min.** although Off-RS Done signal is not transferred.

※ When there is power on action before completing OFF RS operation, don't change OFF RS enable signal (1→0). Just do power off and power on.

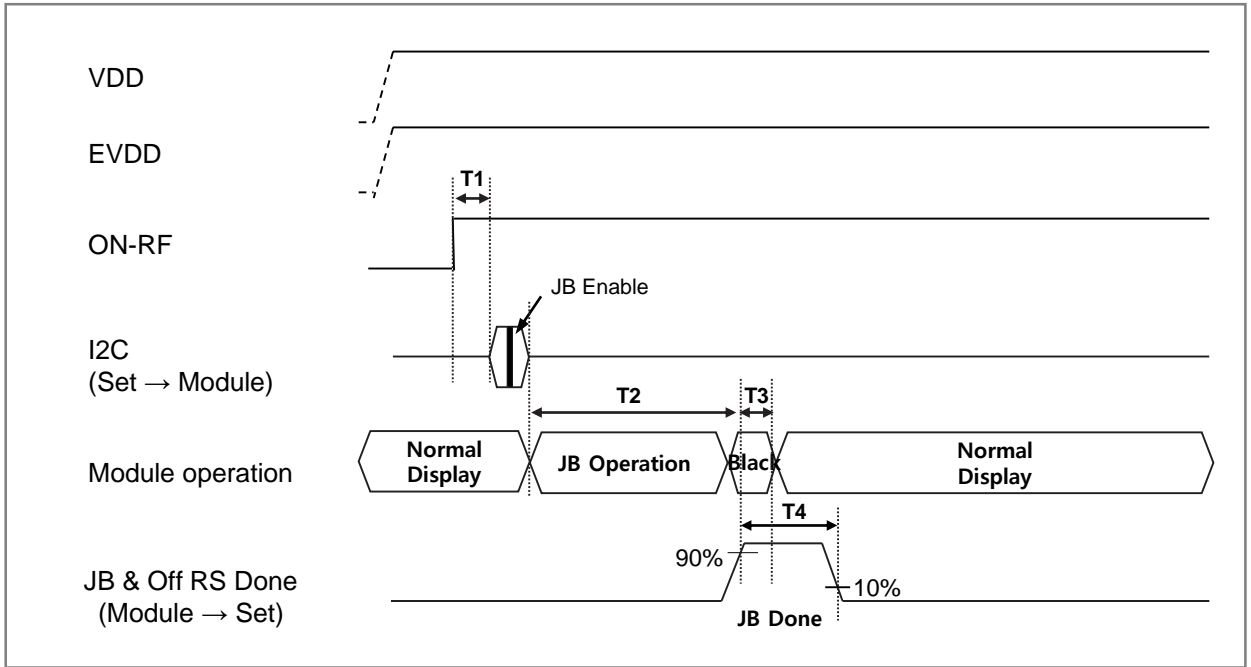
※ Off RS Enable is only available during Normal Display period

※ In order to prevent mura defects, it is recommended that customer do Off-RS in their lines.



## Product Specification

### 3-6-3. JB compensation operation



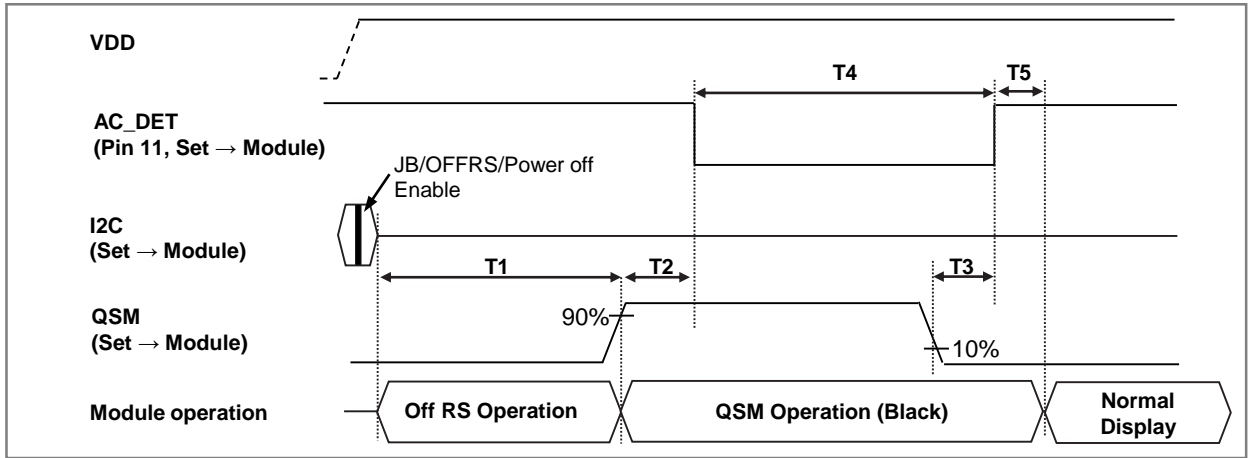
**Table 11. JB Power Sequence**

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	200(TBD)	-	-	ms	
T2	2(TBD)	-	15(TBD)	sec	
T3	415.6(TBD)	-	508.0(TBD)	ms	Black PTN
T4	0.5(TBD)	7	10(TBD)	sec	

Note : ※ At VRR mode, T3 can change by adaptive sync timing(T3 need 19 frame ) (VRR only)  
 ※ T2 is the actual JB sensing time. This timing is determined according to the characteristics of the panel. (LGD Internal timing)

## Product Specification

### 3-6-4. QSM Operation

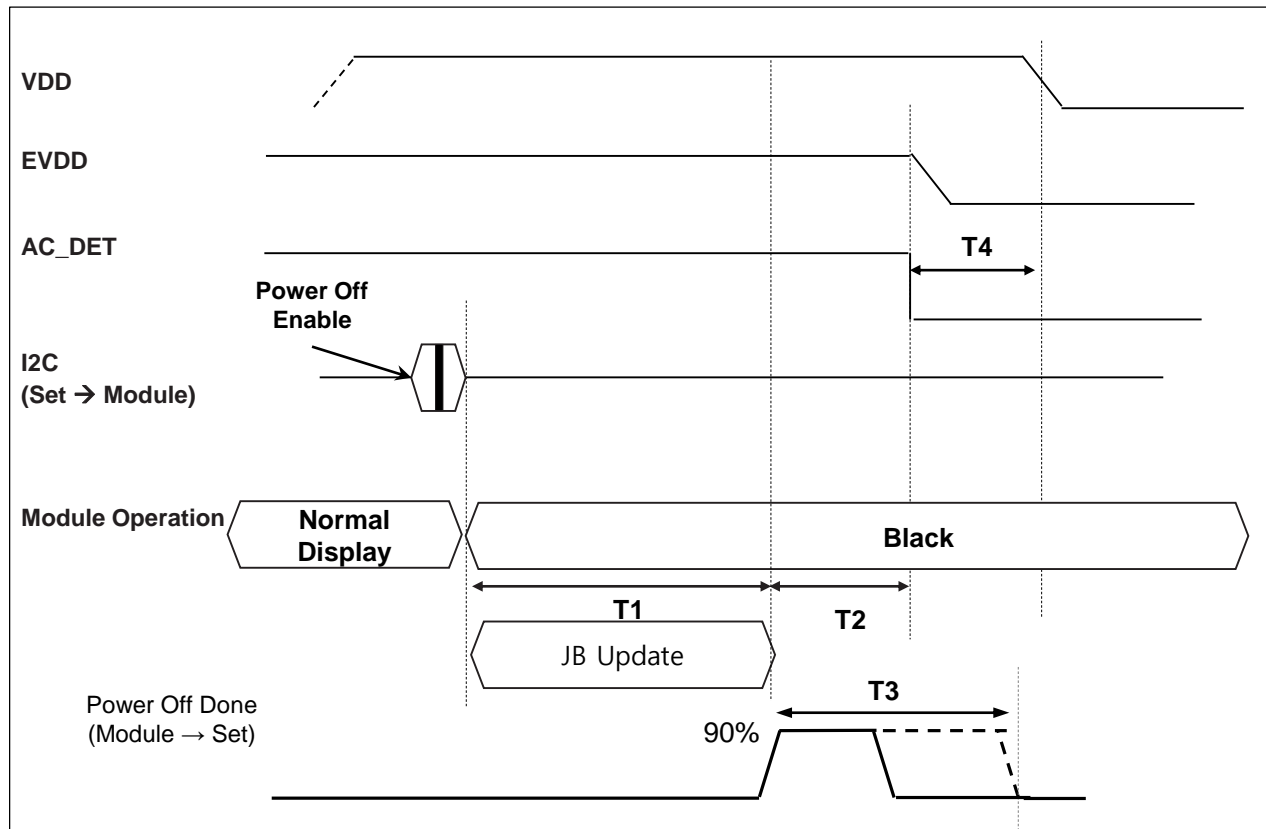


**Table 12. QSM Sequence**

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	3(TBD)	-	-	sec	JB/OFFRS
	1(TBD)	-	-	sec	POWER OFF
T2	75 (TBD)	-	-	ms	
T3	10(TBD)	-	-	ms	
T4	1(TBD)	-	-	sec	
T5	200(TBD)	-	500(TBD)	ms	

## Product Specification

### 3-6-5. Power off sequence



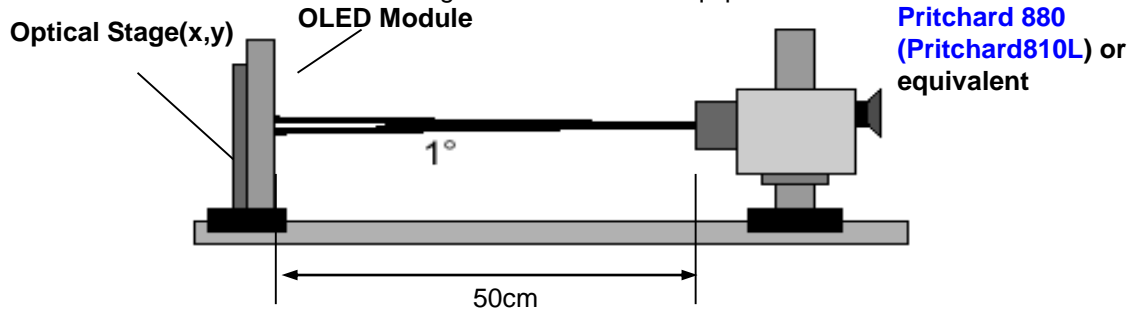
**Table 13. POWER SEQUENCE**

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	-	-	16.5(TBD)	sec	
T2	30(TBD)	-	-	ms	
T3	5(TBD)	7(TBD)	10(TBD)	sec	
T4	30(TBD)	-	-	ms	

## Product Specification

### 4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at  $25 \pm 2^\circ\text{C}$ . The values are specified at distance 50cm from the OLED surface at a viewing angle of  $\Phi$  and  $\theta$  equal to  $0^\circ$ . FIG. 1 shows additional information concerning the measurement equipment and method.



**FIG. 1 Optical Characteristic Measurement Equipment and Method**

**Table 14. OPTICAL CHARACTERISTICS**

$T_a = 25 \pm 2^\circ\text{C}$ , VDD=12.0V, EVDD=23V,  $f_v = 120\text{Hz}$ , Dclk=74.07MHz

Parameter	Symbol		Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio	CR @ Pritchard 880		108,000(TBD)	135,000(TBD)	-		1
	CR @ Pritchard 810L (25% APL)		840,000 (TBD)	1,050,000 (TBD)			
Surface Luminance, white	$L_{WH}$	2D	Normal	108(TBD)	135(TBD)	cd/m <sup>2</sup>	2
			Peak	280(TBD)	350(TBD)		
Luminance Uniformity	$\delta_{WHITE}$	9P	70(TBD)	80(TBD)	-	%	3
Response Time	Gray-to-Gray	G to G	-	0.1(TBD)	3	ms	4
	MPRT	MPRT	-	8(TBD)	12	ms	5
Color Coordinates [CIE1931]	RED	Rx	Typ -0.02	0.669(TBD)	Typ +0.02		
		Ry		0.327(TBD)			
	GREEN	Gx		0.307(TBD)			
		Gy		0.651(TBD)			
	BLUE	Bx		0.150(TBD)			
		By		0.059(TBD)			
	WHITE	Wx		0.285(TBD)			
		Wy		0.294(TBD)			
Color Temperature				9,300(TBD)		K	
Color Gamut (DCI)				90(TBD)		%	
Color Viewing Angle							
$(\Delta u'v' \leq 0,026)$	x axis, right( $\phi=0^\circ$ )	$\theta_r$	60	-	-	degree	6
	x axis, left ( $\phi=180^\circ$ )	$\theta_l$	60	-	-		
	y axis, up ( $\phi=90^\circ$ )	$\theta_u$	60	-	-		
	y axis, down ( $\phi=270^\circ$ )	$\theta_d$	60	-	-		
Life Time (B10)	Hrs		-	30,000	-		7
Gray Scale				2.2			8

## Product Specification

Notes : 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.

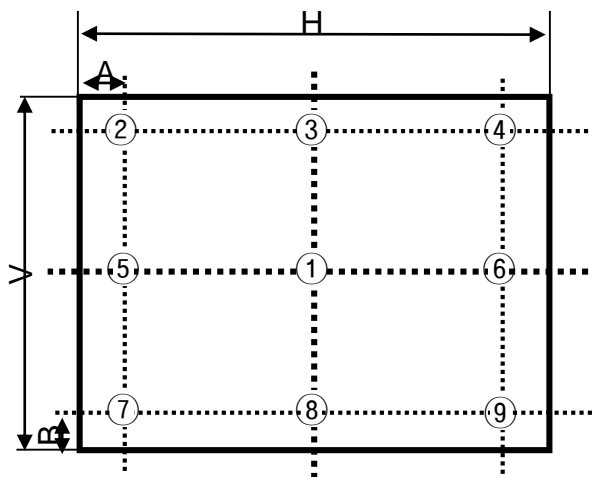
2. Normal full white luminance is determined with 100% APL after 30 minutes 'ON' with APL 100%(Full white) pattern in a dark environment at  $25 \pm 2^{\circ}\text{C}$  . It is the luminance value at center 1-point across the OLED surface 50cm from the surface with all pixels displaying white. For additional measurement, OLED module need to power-off for 2 minutes(min). Peak luminance is determined with 25% APL after 60 seconds at least 'ON' with 25% white window box.
  - ※ Normal : APL 100% (Full white) / Peak : APL 25
3. The variation in surface luminance ,  $\delta$  WHITE is defined as :
 
$$\delta \text{ WHITE}(9\text{P}) = \text{Minimum}(L_{\text{on}1}, \dots, L_{\text{on}9}) / \text{Maximum}(L_{\text{on}1}, \dots, L_{\text{on}9})$$
 Where  $L_{\text{on}1}$  to  $L_{\text{on}9}$  are the luminance with all pixels displaying white at 9 locations .  
For more information, see the FIG. 2.
4. Response time is the time required for the display to transit from G(N) to G(M) (Rise Time,  $\text{Tr}_R$ ) and from G(M) to G(N) (Decay Time,  $\text{Tr}_D$ ). For additional information see the FIG. 3. ( $N < M$ )
  - ※ G to G Spec stands for average value of all measured points.
  - ※ Test equipment : PR-810, Test Distance : Display Height \* 0.35  
Measuring Field :  $1^{\circ}$ , Test Pattern : APL10% Window Box
5. MPRT is defined as the 10% to 90% blur-edge width Bij(pixels) and scroll speed U(pixels/frame)at the moving picture. For more information, see FIG 4
6. Viewing Angle Color Shift (VACS) is defined as follows after measuring color coordinates at each angle.;  $\text{VACS} = \sqrt{du^3 + dv^3}$  (@ CIE ( $u'$ ,  $v'$ ) color space) For more information, see the FIG. 5.
7. Test Condition : IEC62087 standard video with OFF-RS every 4 hours at room temperature  $25^{\circ}\text{C}$  (If the cumulative time of usage is over 4 hours, OFF-RS compensation should be performed.)
8. Gray scale specification. Gamma Value is approximately 2.2. For more information, see the Table 15.

**Table 15. GRAY SCALE SPECIFICATION**

Gray Level	Luminance [%] (Typ)
L0	0.001
L63	0.20
L127	0.97
L191	2.42
L255	4.61
L319	7.59
L383	11.4
L447	16.0
L511	21.6
L575	28.0
L639	35.4
L703	43.7
L767	53.0
L831	63.2
L895	74.5
L959	86.7
L1023	100

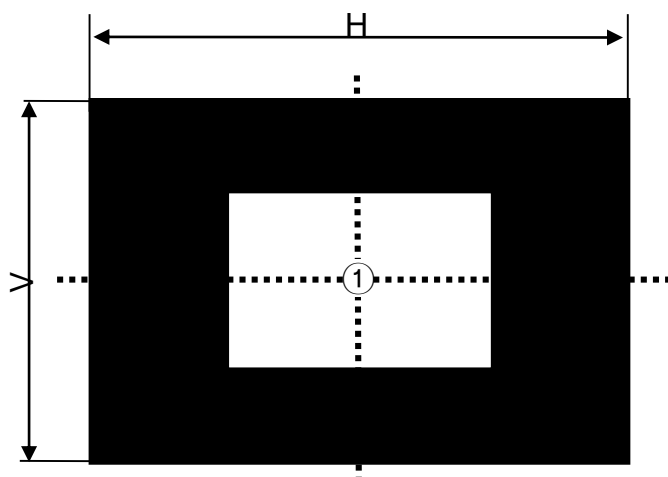
## Product Specification

Measuring point for surface luminance & measuring point for luminance variation.



**FIG. 2-1 9 Points for Luminance Measure with 100% APL**

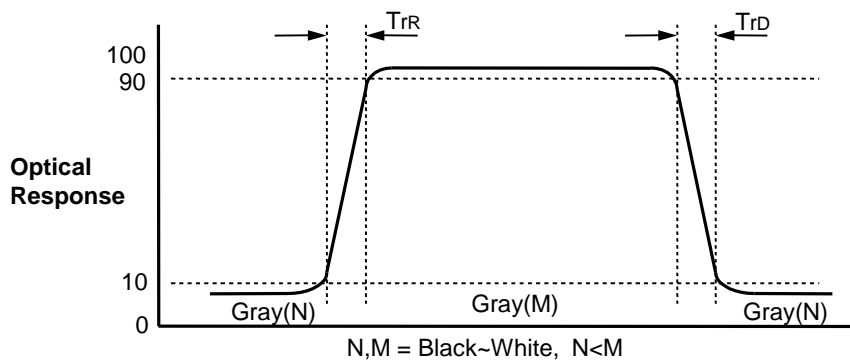
A:  $H/9$  B:  $V/9$  @ H,V: Active Area



**FIG. 2-2. 1 Points for peak luminance measure with 25% APL**

@ H,V: Active Area

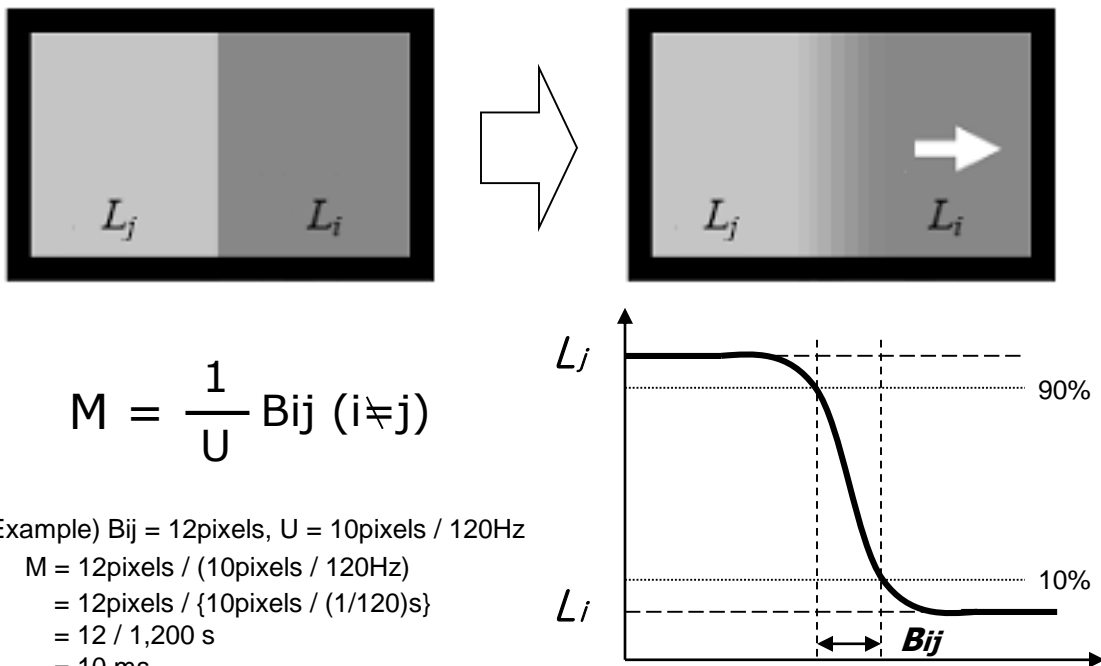
Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".



**FIG. 3 Response Time**

Product Specification

MPRT is defined as the 10% to 90% blur-edge with  $B_{ij}$ (pixels) and scroll speed  $U$ (pixels/frame)at the moving picture.



$$M = \frac{1}{U} B_{ij} \quad (i \neq j)$$

Example)  $B_{ij} = 12\text{pixels}$ ,  $U = 10\text{pixels} / 120\text{Hz}$

$$\begin{aligned} M &= 12\text{pixels} / (10\text{pixels} / 120\text{Hz}) \\ &= 12\text{pixels} / \{10\text{pixels} / (1/120)\text{s}\} \\ &= 12 / 1,200 \text{ s} \\ &= 10 \text{ ms} \end{aligned}$$

FIG. 4 MPRT

Dimension of viewing angle range

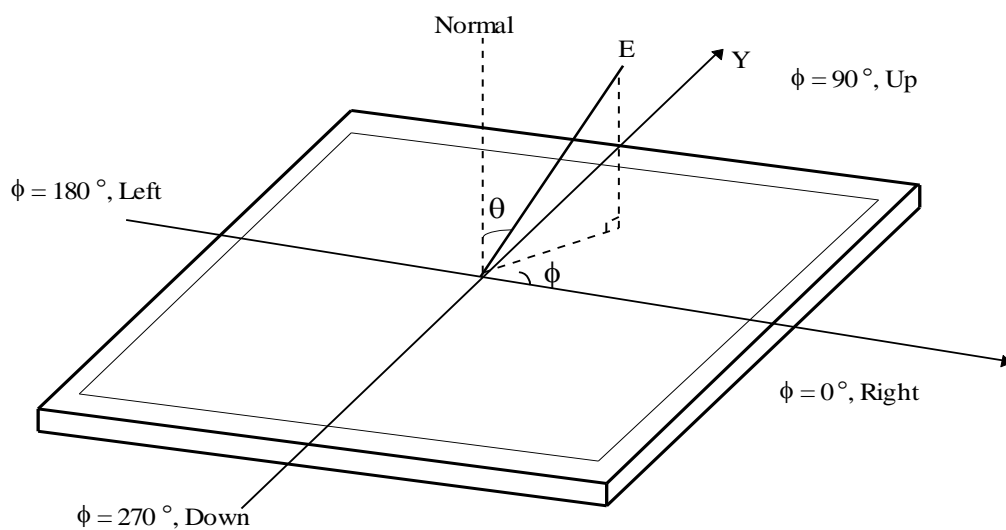


FIG. 5 Viewing Angle

## Product Specification

## 5. Mechanical Characteristics

Table 16 provides general mechanical characteristics.

**Table 16. Mechanical Characteristics**

Item	Value	
Outline Dimension (Sealing Board Ass'y)	Horizontal	676.09mm(TBD)
	Vertical	387.48mm(TBD)
	Thickness (at slimmest part)	1.6mm(TBD)
Active Display Area	Horizontal	664.29mm(TBD)
	Vertical	373.48mm(TBD)
Weight	1.04kg(W/O C-PCB) (TBD)	

Note : Please refer to a mechanical drawing in terms of tolerance at the next page.

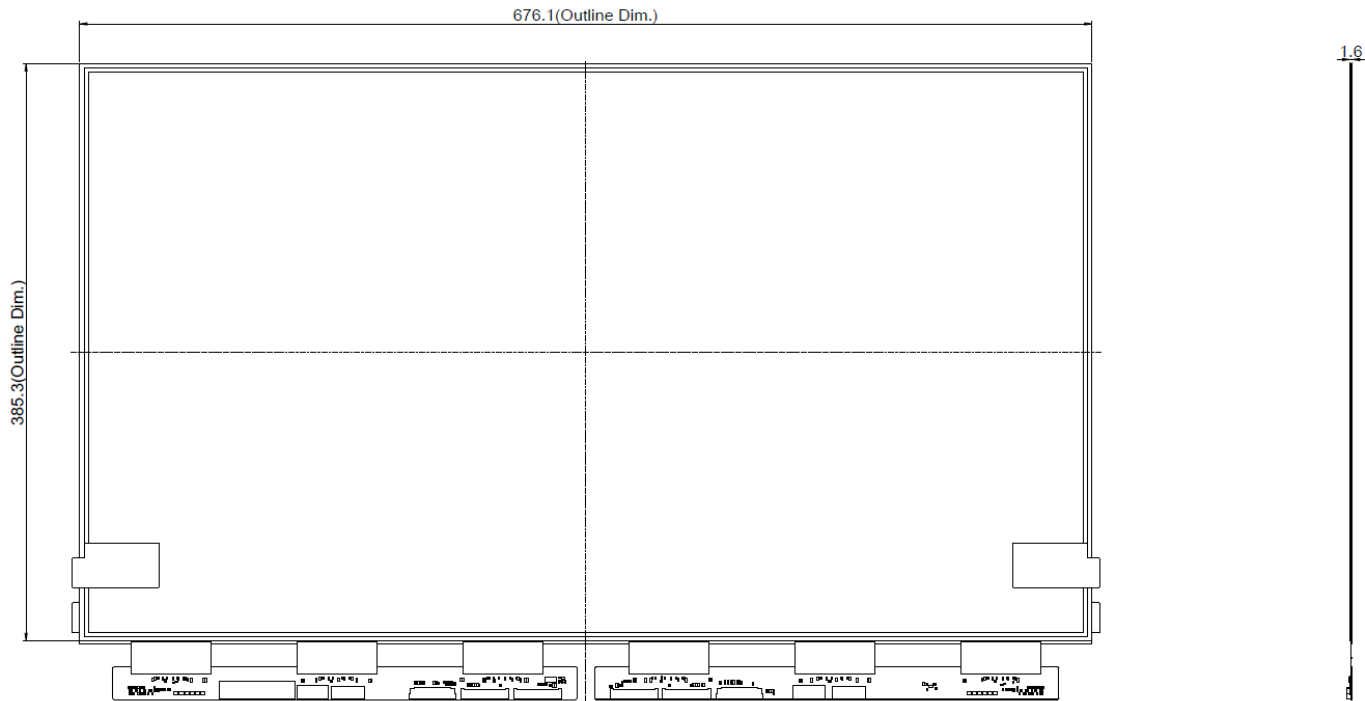
Item	Value	
On Bezel (Active Area ~ Edge of Sealing Board ASS'y)	Horizontal	5.9mm(Left) / 5.9mm(Right) (TBD)
	Vertical	5.9mm(Top) / 8.1mm(Bottom) (TBD)



Product Specification

[Front View of Board Assem

TBD



SCALE 1/2

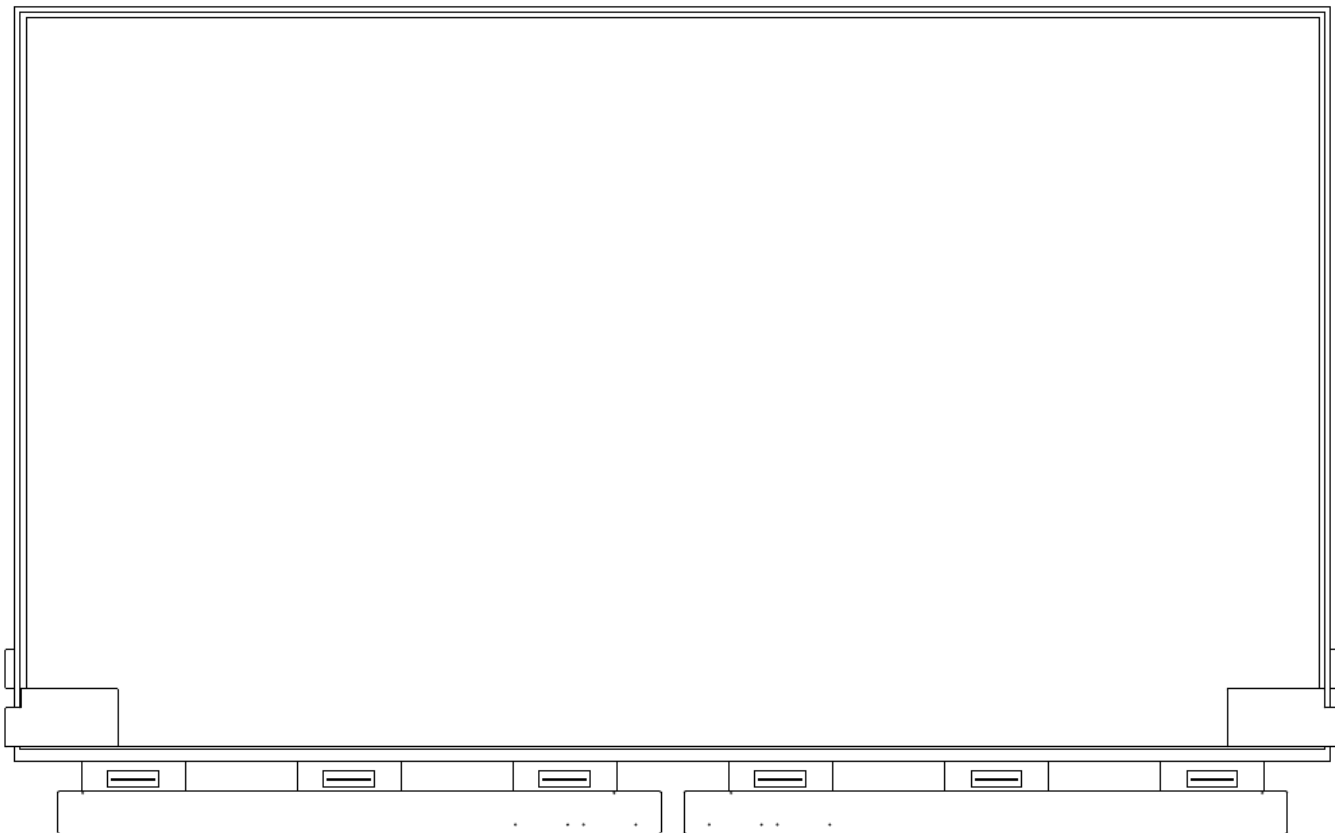
Note

1. Unspecified tolerance is  $\pm 0.2\text{mm}$

Product Specification

[Rear View of Board Assem

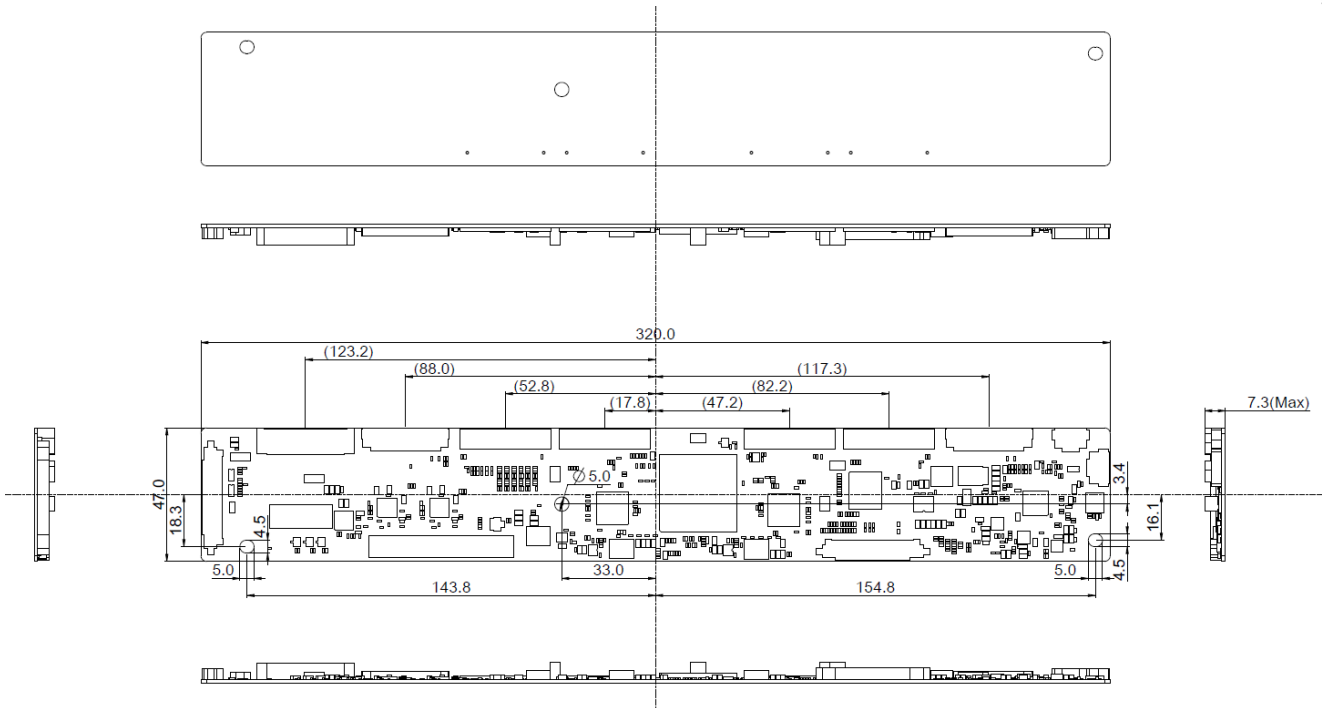
TBD



## Product Specification

[Control Board Assembly Dimension]

TBD

**NOTE**

1. Unspecified tolerance is  $\pm 1.0\text{mm}$

## Product Specification

**6. Reliability****Table 17. ENVIRONMENT TEST CONDITION**

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 240h
4	Low temperature operation test	Ta= 0°C 240h
5	Pallet packing vibration test (non-operating)	Wave form : random Vibration level : 2.0Grms Bandwidth : 3-300Hz Duration : Z, 60 min
6	Humidity condition Operation	Ta= 40 °C, 90%RH
7	Altitude    operating storage / shipment	0 - 15,000 ft 0 - 40,000 ft

Note : 1. Before and after Reliability test, OLED Module should be operated with normal function.

## Product Specification

**7. International Standards****TBD****7-1. Safety**

- (1) IEC 62368-1, The International Electro-technical Commission(IEC).  
Audio/video, Information and Communication Technology Equipment - Safety - Safety Requirements.
- (2) EN 62368-1, European Committee for Electro-technical Standardization (CENELEC)  
Audio/video, Information and Communication Technology Equipment - Safety Requirements
- (3) UL 62368-1, UL LLC.  
Audio/video, Information and Communication Technology Equipment - Safety Requirements.
- (4) CAN/CSA C22.2 No.62368-1, Canadian Standards Association (CSA).  
Audio/video, Information and Communication Technology Equipment - Safety Requirements
- (5) IEC 60065, The International Electro-technical Commission (IEC).  
Audio, Video and Similar Electronic Apparatus - Safety Requirements

**7-2. Environment**

- (1) RoHS, Commission Delegated Directive (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council

## Product Specification

**8. Packing****8-1. Information of OLED Module Label**

(1) Lot Mark

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

A,B,C : SIZE(INCH)  
E : MONTH

D : YEAR  
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mark	K	L	M	N	P	Q	R	S	T	U	V

2. MONTH

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

(2) Location of Lot Mark

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

**8-2. Packing Form**

(1) Package quantity in one Pallet : 54 pcs  
(9\*pcs/Packing \* 6packings = Total 54 pcs/pallet)

(2) Pallet Size : 1140 mm(W) X 910 mm(D) X 1140 mm(H)

## Product Specification

## 9. Precautions

Please pay attention to the followings when you use this OLED Board Assembly.

### 9-1 Operating Precautions

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :  
 $V = \pm 200\text{mV}$  (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, Image Retention is likely to occur.
- (5) 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 minimized the interference.
- (6) Please do not give any mechanical and/or acoustical impact to Module. Otherwise, Module can't be operated its full characteristics perfectly.
- (7) A screw which is fastened up the steels should be a machine screw.  
(if not, it can causes conductive particles and deal Module a fatal blow)
- (8) Please do not set OLED on its edge.

### 9-2. Electrostatic Discharge Control

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

### 9-3. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

### 9-4. Storage Precautions

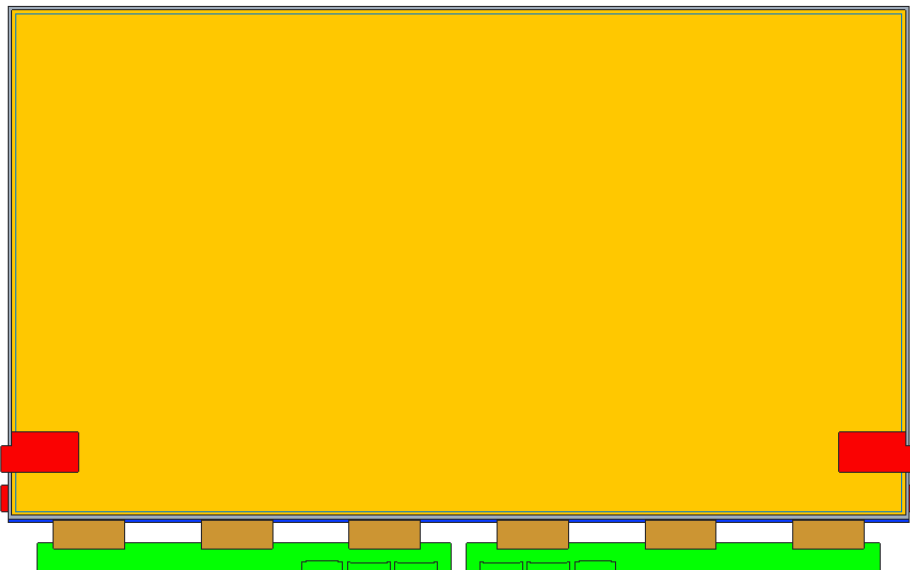
When storing modules as spares for a long time, the following precautions are necessary.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between  $5^{\circ}\text{C}$  and  $35^{\circ}\text{C}$  at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.  
It is recommended that they are stored in the container in which they were shipped.
- (3) Wet bulb temperature should be Max  $39^{\circ}\text{C}$ , and no condensation of water.
- (4) It must be stored in AL Bag packing

## Product Specification

## 9-5. Handling Precautions

- (1) The protection film is attached to the bezel with a small masking 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 module 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) The Glass Encap surfaces(Rear of Board Assembly) should not be any residual moisture & Salinity.
  - Always handle the Board Assembly with gloves.
  - Chlorine or water from human sweat can accelerate the corrosion of Glass encapsulation
  - Glass Encap surface should be protected by the moisture, salinity
- (4) 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.  
Using a dry towel or fabric, remove water or solution like a cleaner from Board Assembly after finishing the install
  - Do not use the cleaner containing acid or chlorine ingredient
- (5) Be careful that the washing droplet is not flooded into the border gap on the panel edge, when cleaning the surface of OLED Module. It may cause abnormal operating or a malfunction in the OLED Module.
- (6) When the OLED Module is assembled, mechanical stress may not be put on the panel.
- (7) Be careful not to place any extra mechanical stress to the OLED module when designing the set.
- (8) Be cautious not to any extra strong force (mechanical shock, strong tapping, shooting etc.) to the OLED module. It may cause abnormal operating or a malfunction in the OLED Module.
- (9) If the panel is broken, glass should be kept away from the eyes and mouth. When it comes to contact to hands, legs, skin, or clothes, wash thoroughly with soap, and seek medical attention if necessary.
- (10) Surface temperature of the Component on PCB should be controlled under 100°C with TV Set status.  
If not, problems such as IC damage or decrease of lifetime could occur.



[Board Assembly ]



## 9-6. Appropriate Condition for Commercial Display

- To extend the lifetime and optimize a function of module, the below-mentioned operating conditions are required.

- (1) Operating usages to reduce the risk of image sticking due to static image
  - a. OLED compensation should need.
    - Refer to the 3-6-3. OLED compensation operation(Page19).
  - b. Information display recommended to use with moving picture.
  - c. Logo (image) and characteristics
    - Logo image recommended not to use.
      - If needed, recommend that its position needs to be periodically shifted.
    - Change colors themselves periodically.
  - d. The below-mentioned conditions are not recommended .
    - Combination of Logo( or character) and background with largely different luminance.
    - Using a single moving picture. (Recommend to use several different moving pictures.)
    - The masked image with aspect ratio other than 16:9
    - The division of screen

Note1) Abnormal condition just means conditions except normal condition.

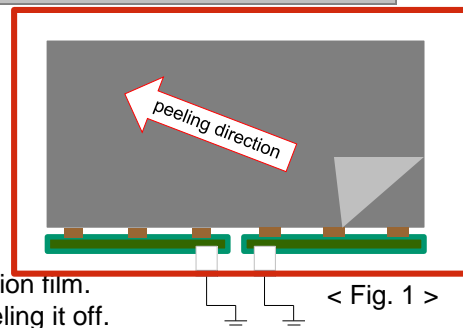
Note2) Black image or moving image is strongly recommended as a screen saver.

- (2) If the module will be used under severe conditions such as high temperature, high humidity, display patterns or operation time etc., it is strongly recommended to contact LG Display for the advice about usage and applications. Otherwise, its reliability and function may not be guaranteed.

## Product Specification

**9-7. Protection Film**

- (1) Please don't remove the protection film before assembly.
- (2) Please peel off the protection film slowly.
- (3) Please peel off the protection film just like shown in the Fig.1
- (4) Ionized air should be blown over during the peeling.
- (5) Source PCB should be connected to the ground when peel off the protection film.
- (6) The protection film should not be contacted to the source D-IC during peeling it off.
- (7) **When handling the H/C Film, in particular, please be aware of the following precautions.**
  - Please do not damage on the edge of the polarizer in any form.
  - Peeling off the protection film must be done only with the adhesive tape, not with other means by fingers, tweezers and so on.
  - It is recommended to peel off the protection film as slowly as possible at an initial step.
  - Refer to Appendix – XIV for more details



&lt; Fig. 1 &gt;

**9-8. B/A Box Pretreatment Precautions**

In winter season , in particular, please be aware of the following precautions.

- (1) Before putting B/A boxes on the line, aging process is required to make the temperature of products similar to the temperature of workplace.
- (2) Place the lid open on the B/A box and allowed to stand for 24 hours in the similar environment of work place. It was shown in Fig.2



&lt; Fig. 2 &gt;

TBD

**9-9. Packing Precautions**

Product assembled into module should be stored in the Al-bag (cover case).

## Product Specification

## # APPENDIX - I

## ■ Pallet Ass'y

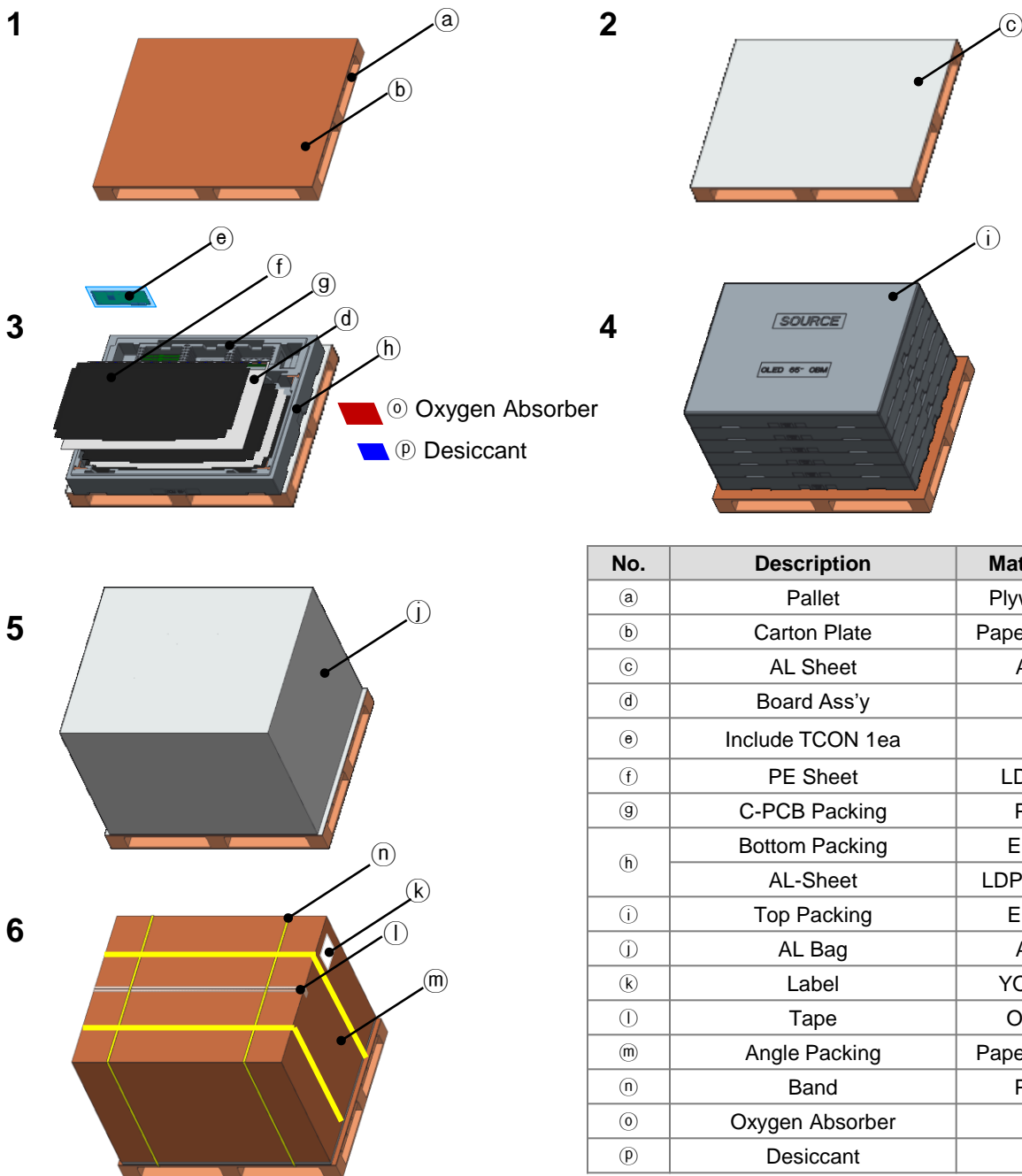
a) AL Sheet + B/Ass'y Qty + PE Sheet / Box : 1pcs + 9pcs + 10pcs

b) B/Ass'y Qty / Pallet : 54pcs

c) Oxygen Absorber + Desiccant / Box : 3ea + 5ea

d) Oxygen Absorber + Desiccant / Pallet : 18ea + 30ea

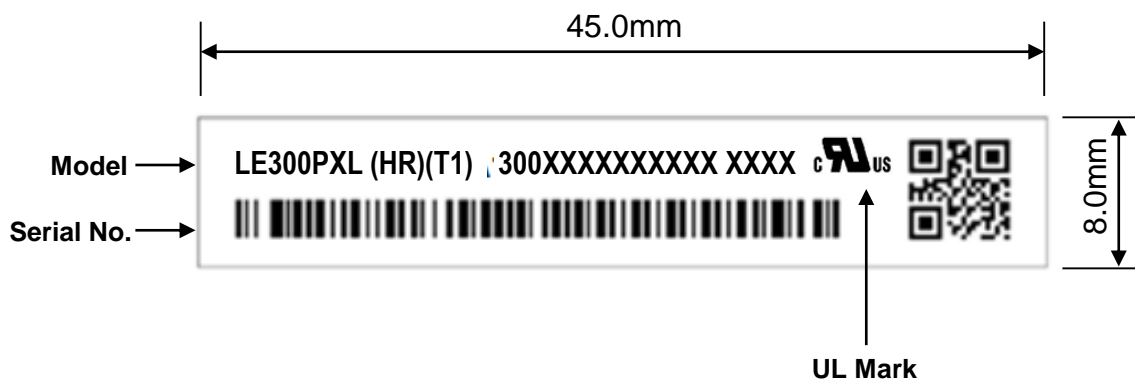
e) Box Qty / Pallet : 6Box



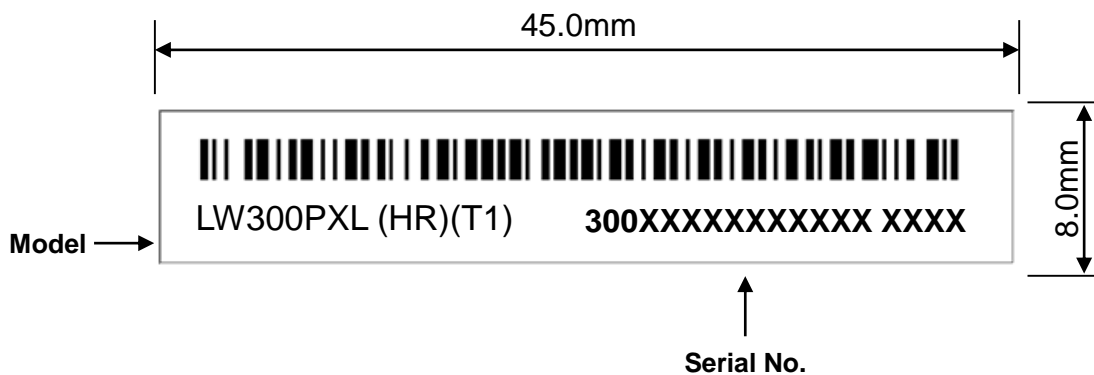
No.	Description	Material
ⓐ	Pallet	Plywood
ⓑ	Carton Plate	Paper(SW)
ⓒ	AL Sheet	AL
ⓓ	Board Ass'y	-
ⓔ	Include TCON 1ea	-
ⓕ	PE Sheet	LDPE
ⓖ	C-PCB Packing	PP
ⓗ	Bottom Packing	EPS
	AL-Sheet	LDPE+AL
Ⓢ	Top Packing	EPS
Ⓣ	AL Bag	AL
Ⓚ	Label	YOPO
Ⓛ	Tape	OPP
Ⓜ	Angle Packing	Paper(SW)
Ⓝ	Band	PP
Ⓞ	Oxygen Absorber	
Ⓟ	Desiccant	

### # APPENDIX - II

#### ■ Board Ass'y Label



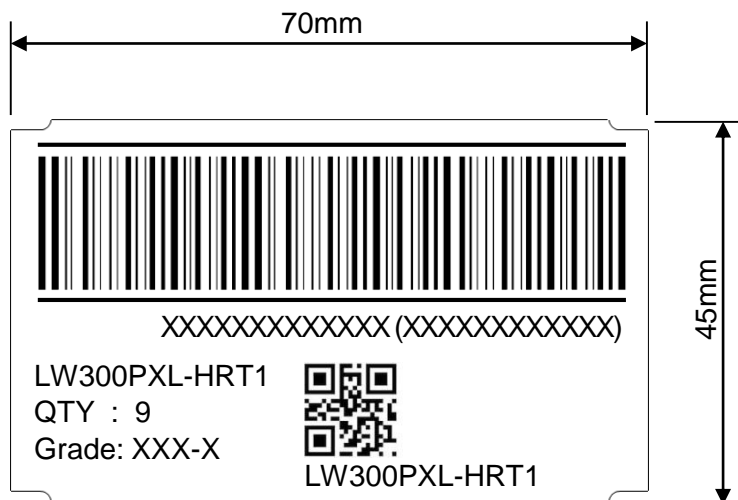
#### ■ Control PCB Label



Product Specification

# APPENDIX - III

■ Box Label



■ Pallet Label

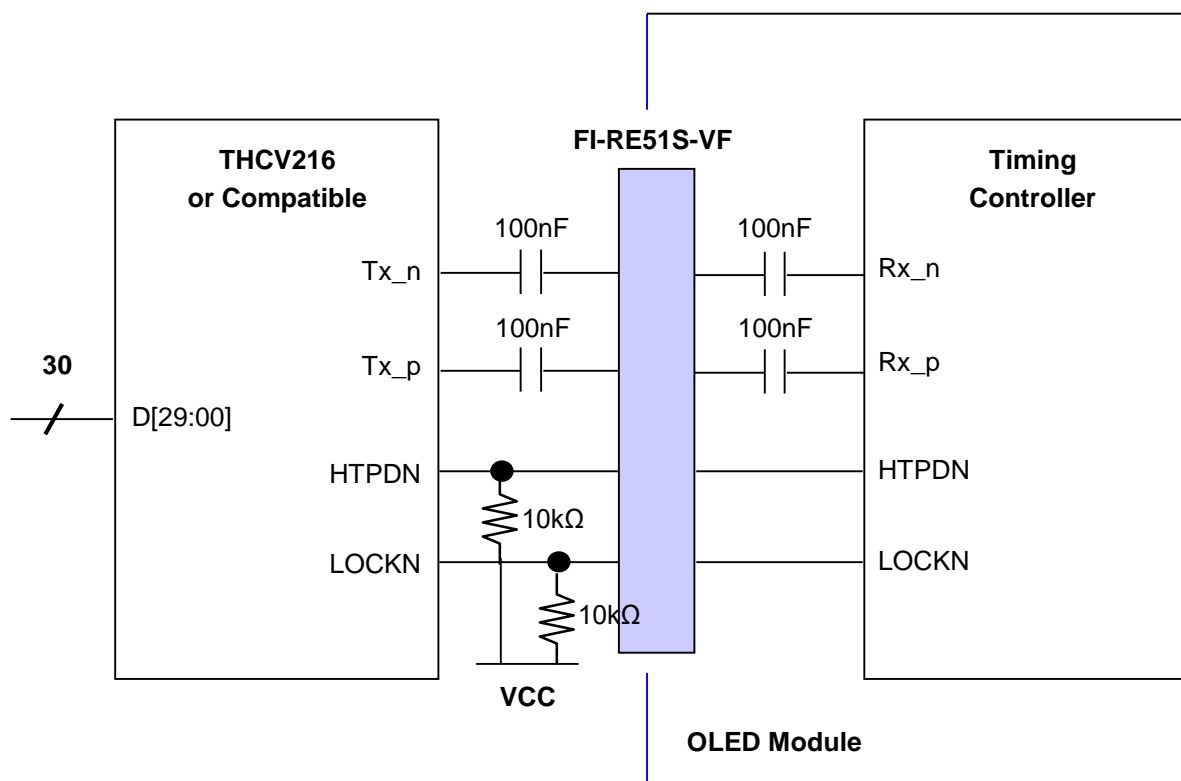


\* LGD Haiphong : MADE IN VIETNAM

## Product Specification

## # APPENDIX - IV

## ■ Required signal assignment for Flat Link (Thine : THCV216) Transmitter



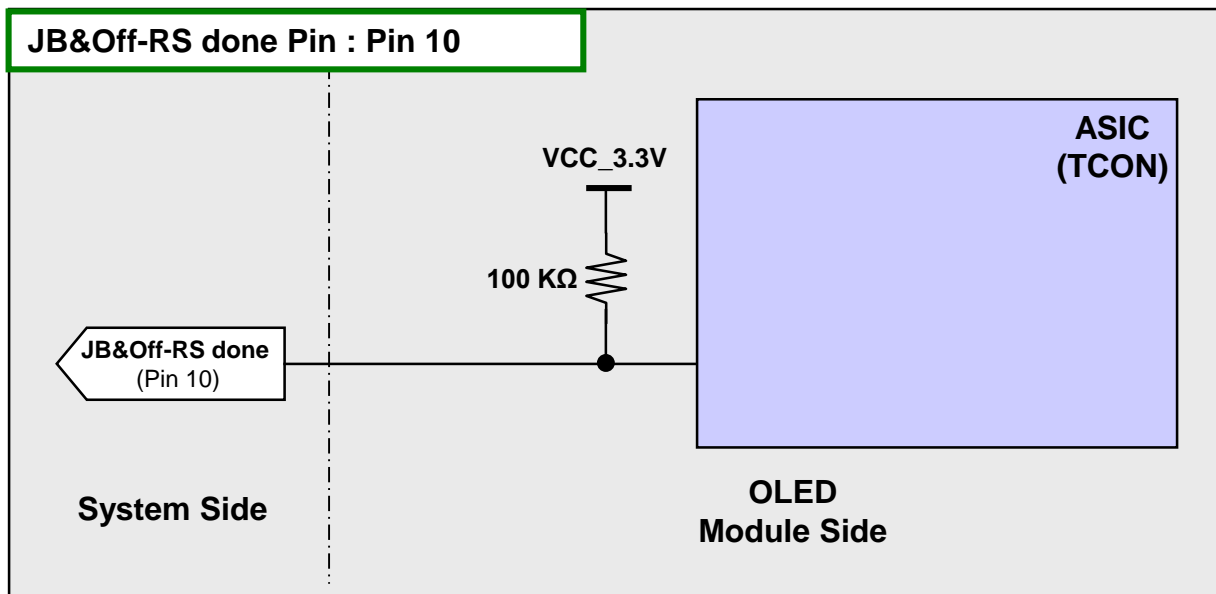
- Note: 1. The OLED module uses a 100 nF capacitor on positive and negative lines of each receiver input.  
 2. Refer to VbyOne Transmitter Data Sheet for detail descriptions. (THCV216 or Compatible)  
 3. About Module connector pin configuration, Please refer to the Page 9.

## # APPENDIX - V-1

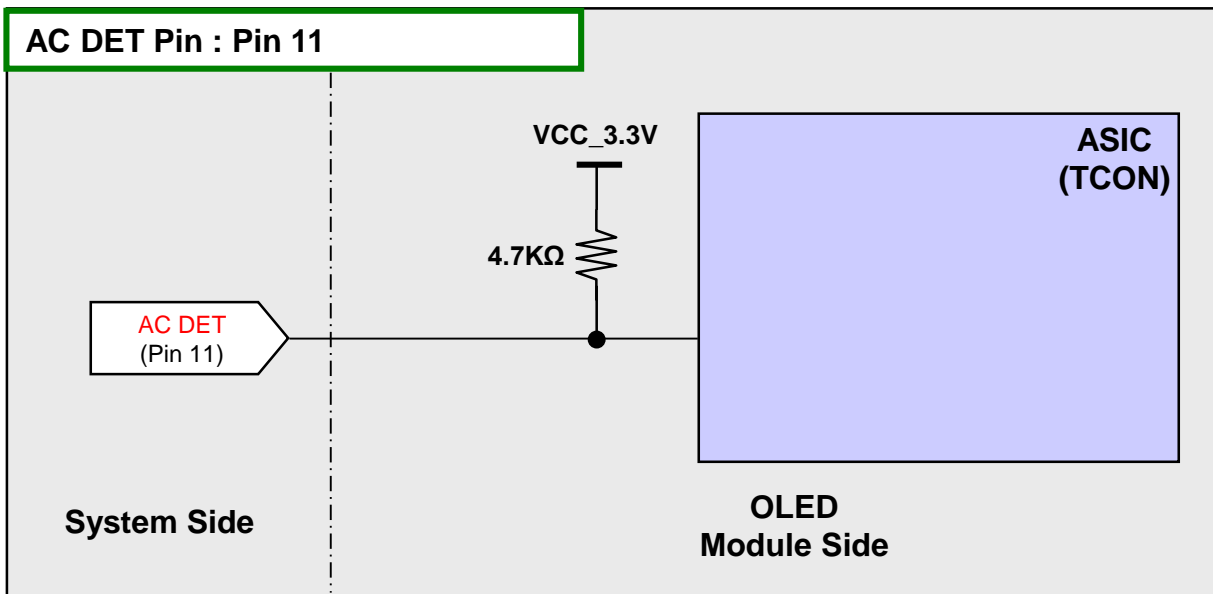
## ■ Circuit Block Diagram for Option Pin

TBD

(1) Circuit Block Diagram of JB&amp;Off-RS done pin



(2) Circuit Block Diagram of AC\_DET pin

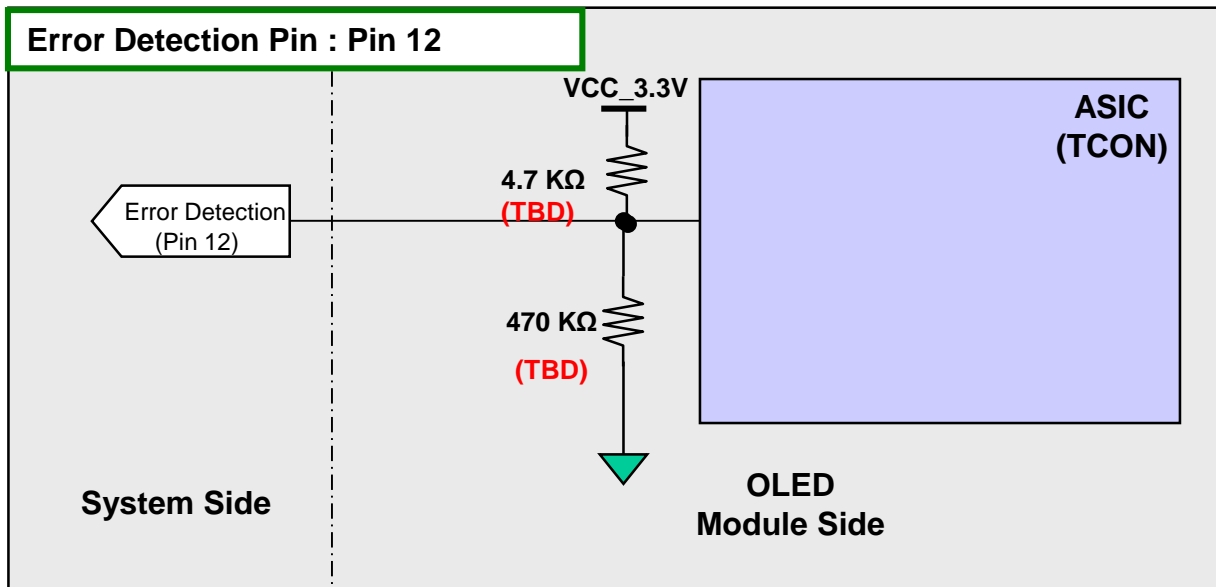


# APPENDIX - V-2

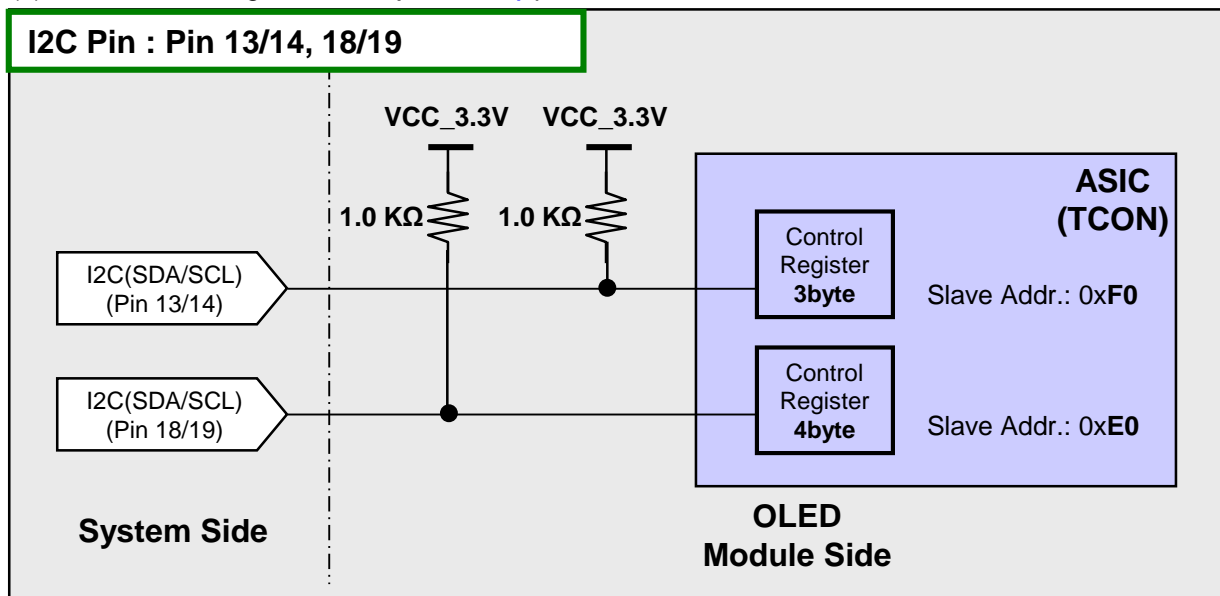
TBD

■ Circuit Block Diagram for Option Pin

(3) Circuit Block Diagram of Error Detection pin



(4) Circuit Block Diagram of I2C(SDA/SCL) pin



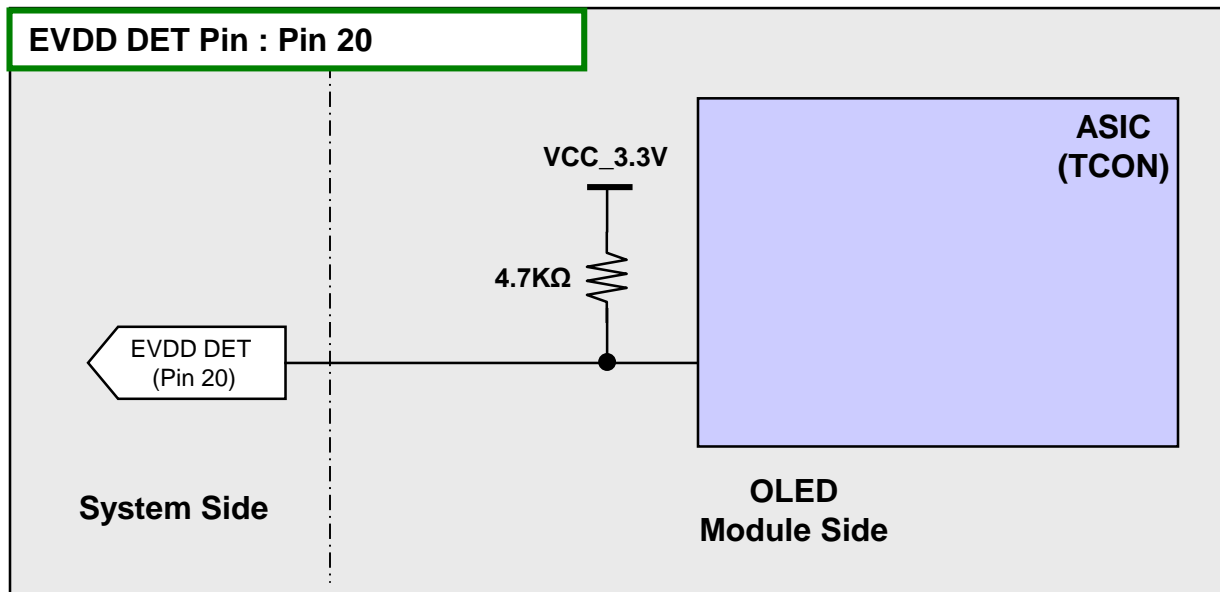


## # APPENDIX - V-3

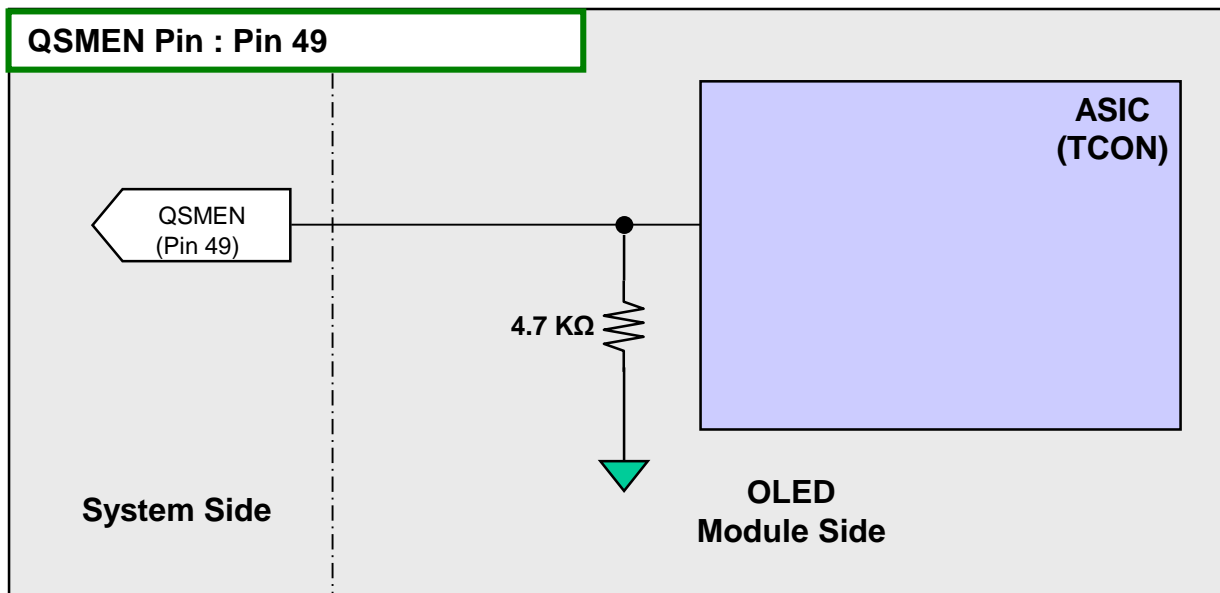
## ■ Circuit Block Diagram for Option Pin

TBD

(5) Circuit Block Diagram of EVDD DET pin



(6) Circuit Block Diagram of QSMEN pin

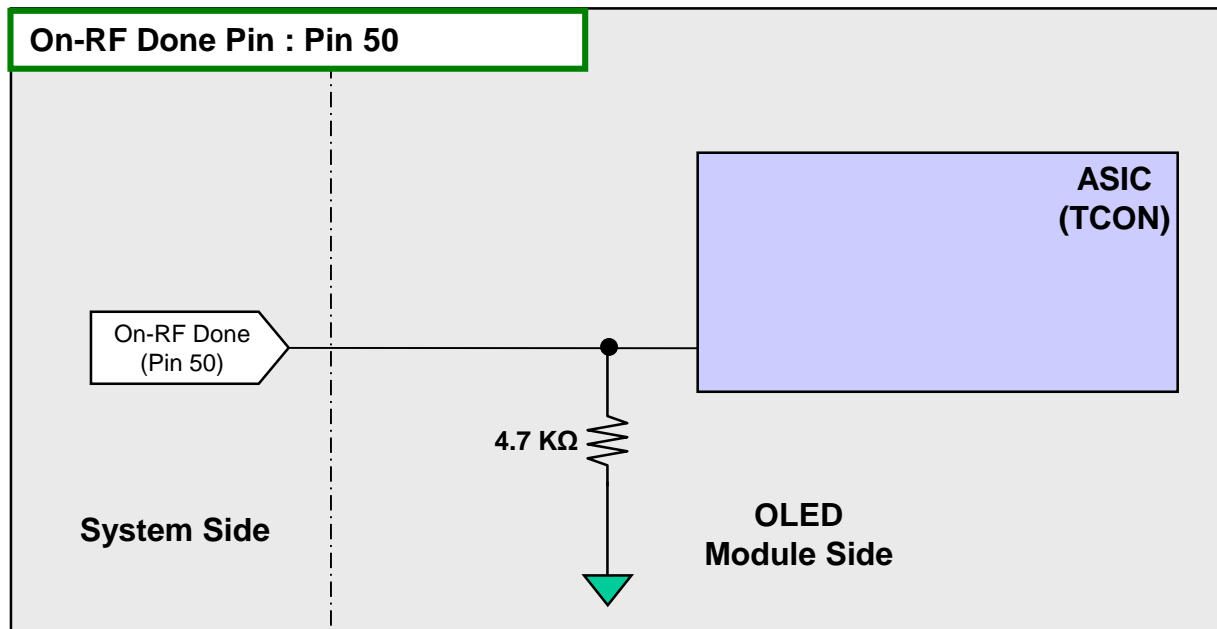


## # APPENDIX - V-4

TBD

## ■ Circuit Block Diagram for Option Pin

(7) Circuit Block Diagram of On-RF Done pin



## Product Specification

## # APPENDIX- VI

TBD

## ■ ASIC Firmware

Category	FW version Value	Checksum Value
Pre-CAS	TBD	TBD

## ■ Register map

The following register is controlled by I2C Interface.

Addr :	Bit[7]: MSB	Bit[6]	Bit[5]	Bit[4]	Bit[3]	Bit[2]	Bit[1]	Bit[0]: LSB
0x001	CPC EN	TPC EN	Not Use	OFF RS EN	Not Use	Not Use	Not Use	Not Use

Device Address: 0xE0

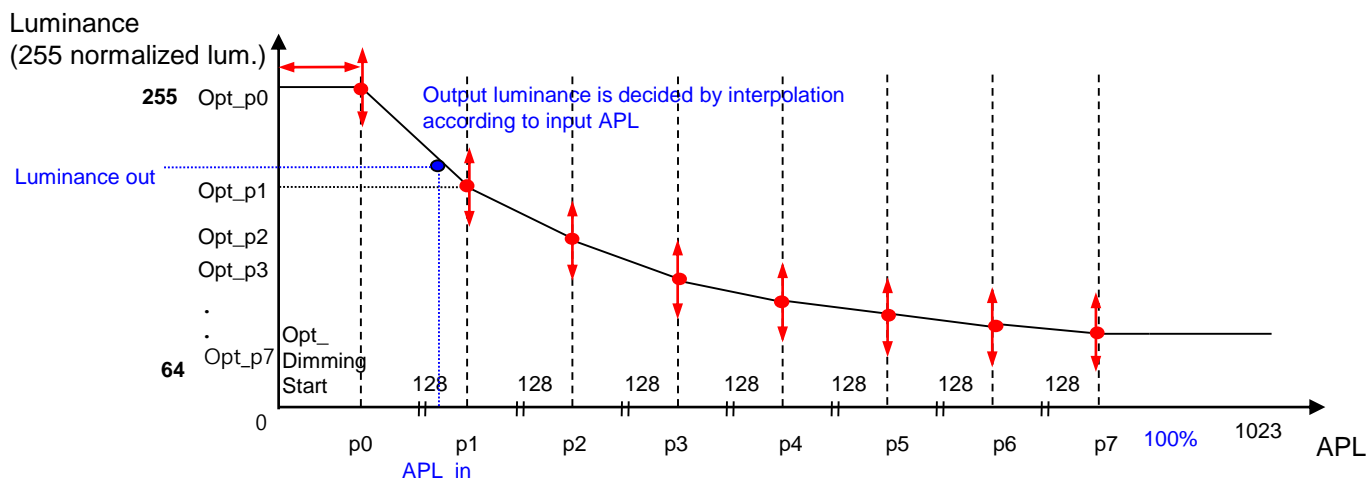
Address [HEX]	Register Name	Description	Remark
0x000	Valid	Read only register (LGD use)	
0x001	[7] : CPC enable	1: enable (default), 0: disable	
	[6] : TPC enable	1: enable (default), 0: disable	
	[5] : Not use	LGD reserved	
	[4] : Off RS enable	1: enable, 0: disable	
	[3] : Not use	LGD reserved	
	[2] : Not use	LGD reserved	
	[1:0] : Not use	LGD reserved	
0x002	Not use		
0x003	Opt_p0	APL P0 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x004	Opt_p1	APL P1 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x005	Opt_p2	APL P2 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x006	Opt_p3	APL P3 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x007	Opt_p4	APL P4 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x008	Opt_p5	APL P5 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x009	Opt_p6	APL P6 point corresponds to the 255 normalized luminance	Value Range: 0~255
0x00A	Opt_p7	APL P7 point corresponds to the 255 normalized luminance	Value Range: 0~255

## Product Specification

TBD

Address [10:0]	Register Name	Description	Remark
0x00B	[7] : Not used	LGD reserved	
	[6:5] : LEA mode sel [1:0]	b00: Normal operation, <b>b01 / b10 / b11: LGD reserved</b>	
	[4] : LEA refresh mode en	1: LEA Refresh, 0: Normal LEA	
	[3] : HDR_en	1: Enable, 0: Disable	
	[2]: Not use	LGD reserved	
	[1:0] : Not use	LGD reserved	

### □ PLC curve parameter



Every interval between each points except P0 is fixed to 128

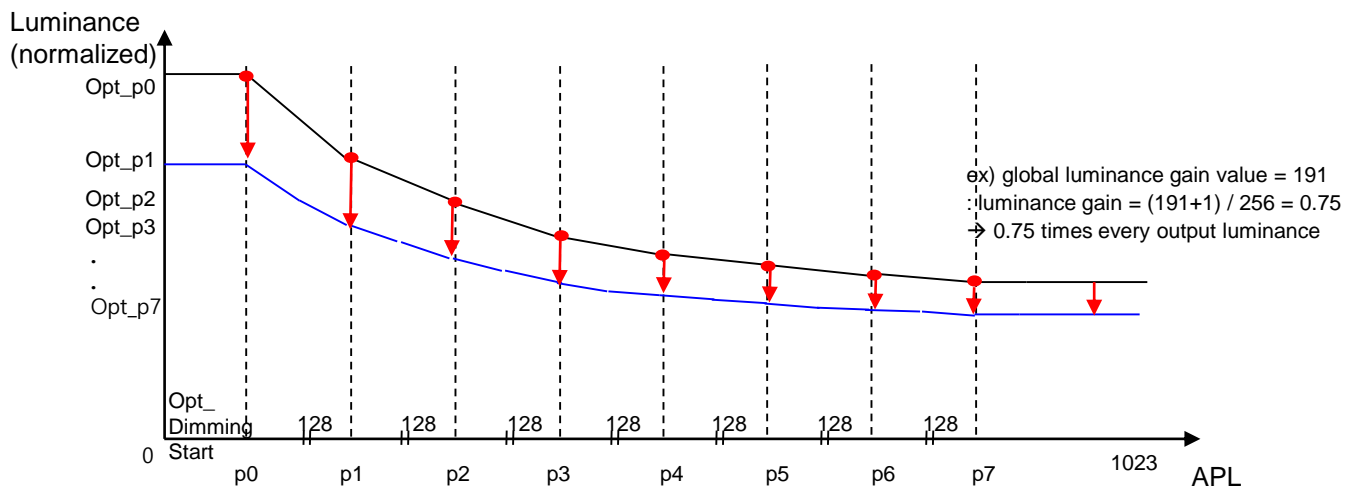
- Luminance of p7~1023 interval are Opt\_p7  
- The point over 1023 is discarded

## Product Specification

TBD

Address [Hex]	Register Name	Description	Remark
0x016	Opt_global_luminance_gain	Adjust global luminance gain 0~1 luminance gain according to 0~255 value (Same luminance gain is applied to every P0~P7 points)	Value Range: 0~255
0x017	Opt_ACL_PTN_ratio	Adjust ACL level gain for LGE PTN detect	Value Range: 0~255
0x054	[7] Power Off Enable	1: Enable, 0: Disable (JB Update)	
	[6:0] Not used	LGD reserved	
0x05D	[7] JB Enable	1: Enable, 0: Disable(JB Operation)	
	[6:0] Not used	LGD reserved	
0x05E	Test_temp[15:8]	temperature sensor	Read only
0x05F	Test_temp[7:0]		

### Global luminance gain



## Product Specification

# APPENDIX- VII-1

TBD

## Gray to Gray Response Time Uniformity

This is only the reference data of G to G and uniformity for LW330PXL-HRT1 model.

### 1. G to G Response Time :

Response time is defined as FIG.1. and shall be measured by switching the input signal for "Gray (N) " and "Gray(M)".(32Gray Step at 8bit)

### 2. G to G Uniformity

The variation of G to G Uniformity ,  $\delta_{G \text{ to } G}$  is defined as :

$$G \text{ to } G \text{ Uniformity} = \frac{\text{Maximum}(G \text{ to } G) - \text{Typical}(G \text{ to } G)}{\text{Typical}(G \text{ to } G)} \leq 1$$

\*Maximum (GtoG) means maximum value of measured time (N, M = 0 (Black) ~ 1023(White), 128 gray step).

	0Gray	127ray	255Gray	...	895Gray	1023Gray
0Gray		TrR:0G→127G	TrR:0G→255G	...	TrR:0G→895G	TrR:0G→1023G
127Gray	TrD:127G→0G		TrR:127G→255G	...	TrR:127G→895G	TrR:127G→1023G
255Gray	TrD:255G→0G	TrD:255G→127G		...	TrR:255G→895G	TrR:255G→1023G
...	...	...	...	...	...	...
895Gray	TrD:895G→0G	TrD:895G→127G	TrD:895G→255G	...		TrR:895G→1023G
1023Gray	TrD:1023G→0G	TrD:1023G→127G	TrD:1023G→255G	...	TrD:1023G→895G	

### 3. Sampling Size : 2 pcs

4. Measurement Method : Follow the same rule as optical characteristics measurement.

### 5. Current Status

Below table is actual data of production on **X. XX. XXXX (LGD DV Event Sample)**

	G to G Response Time [ms]		Average
	Min.	Max.	
# 1			

FIG. 1



< # 1 >

## Product Specification

TBD

## # APPENDIX- VII-2

■ MPRT Response Time Uniformity ( $\delta_{MPRT}$ )

This is only the reference data of MPRT and uniformity for LW330PXL-HRT1 model.

## (1). MPRT Response Time :

Response time is defined as FIG. 4.

## (2). MPRT Uniformity

The variation of MPRT Uniformity ,  $\delta_{MPRT}$  is defined as :

$$\text{MPRT Uniformity} = \frac{\text{Maximum (MPRT)} - \text{Typical (MPRT)}}{\text{Typical (MPRT)}} \leq 1$$

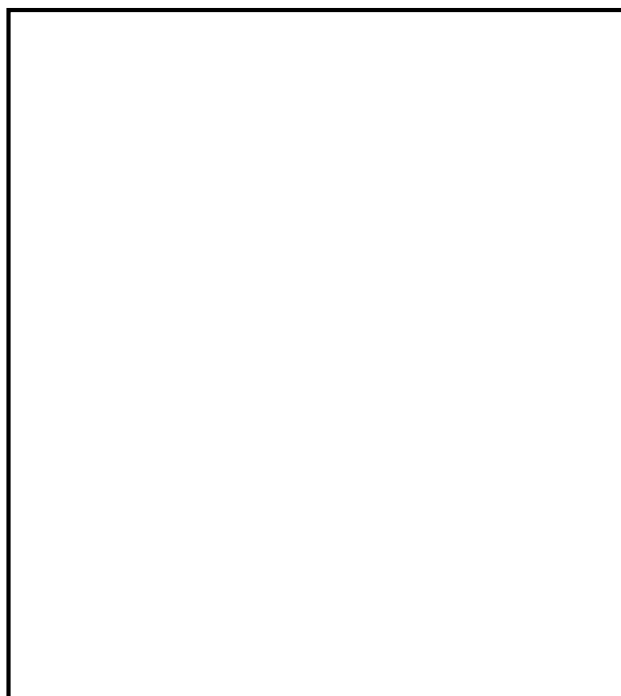
## (3). Sampling Size : 1 pcs

## (4). Measurement Method : Follow the same rule as optical characteristics measurement.

## (5). Current Status

Below table is actual data of production on **XX. XX. XXXX (LGD DV Event Sample)**

Sample	MPRT Response Time [ms]		Average
	Min.	Max.	
# 1			



## # APPENDIX –VIII

## ■ PLC Curve

(1) It is recommended to set the TV Set Peak Luminance to 50% of the Module Peak Luminance at P0 point in Default display mode for considering power savings and prevention of Image retention.

(Fig. 1. Set PLC Curve )

- If End users watch videos with fixed images such as broadcast logos for a long time at the level of Module Peak luminance, there is a risk of image retention defects.

Therefore, the shipping mode luminance control can proactively prevent the risk of image retention defects.

- If customer need to promote the Picture Quality, It is recommended to use store mode.

- It is recommended that the HDR function be applied to the module shipment condition, 'HDR Off'.

(2) It is recommended to automatically operate the light sensor 'On' in Set shipping mode.

- It is recommended to prevent the risk of eye fatigue and image retention defects through the user of appropriate illumination depending on the user's environment.

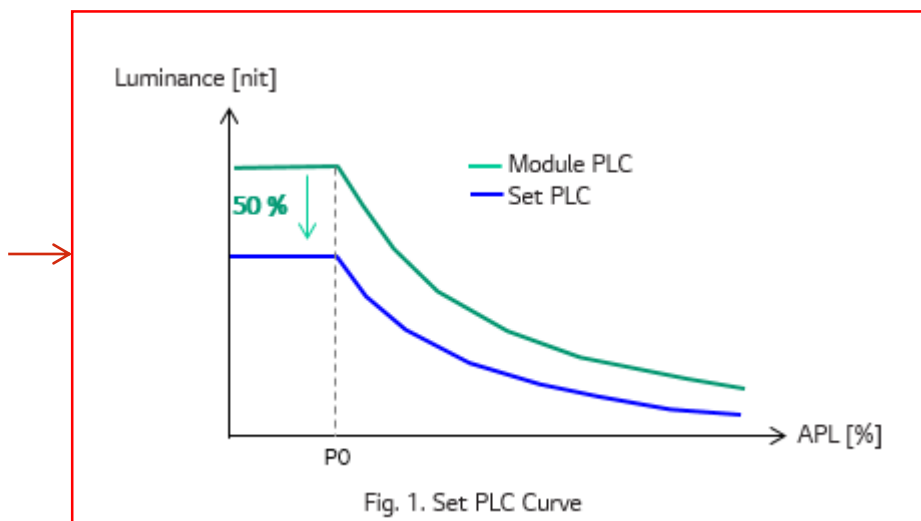


Fig. 1. Set PLC Curve

※ Default Display mode(End-user) : Set Peak Luminance  $\leq$  50% of Module Peak Luminance

※ Shipment mode : Picture mode first used by end-users after factory shipments

ex) Standard mode



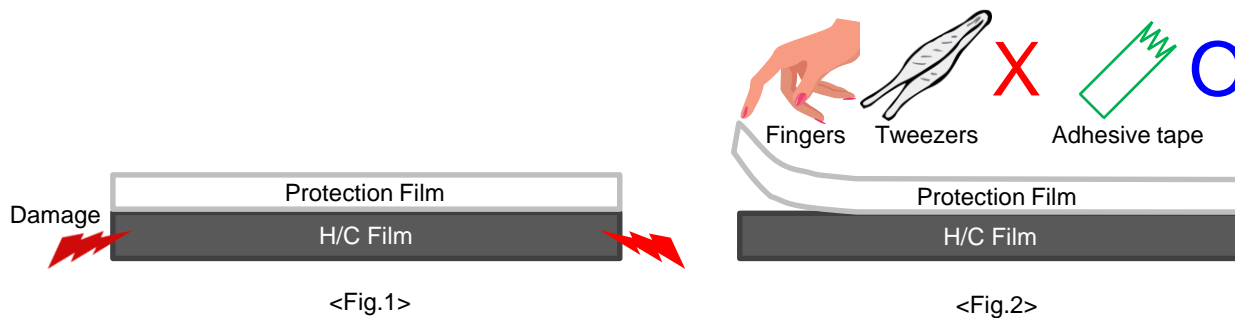
## Product Specification

## # APPENDIX- IX

## ■ Things to avoid to prevent the H/C Film from breakage

Any kind of damage on the edge of the polarizer is not allowed. <Fig.1>

Use an adhesive tape to peel off the protection film from the polarizer. <Fig.2>



## ■ Recommended values for peeling velocity and angle

The values for peeling velocity and angle should be under 2m/min and 15 degrees each. <Fig.3>



- Peeling velocity  $\leq 2\text{m/min}$
- Peeling angle  $\leq 15^\circ$



<Fig.3>

## # APPENDIX- X

## ■ Design guide for Heat dissipation for SOURCE D-IC

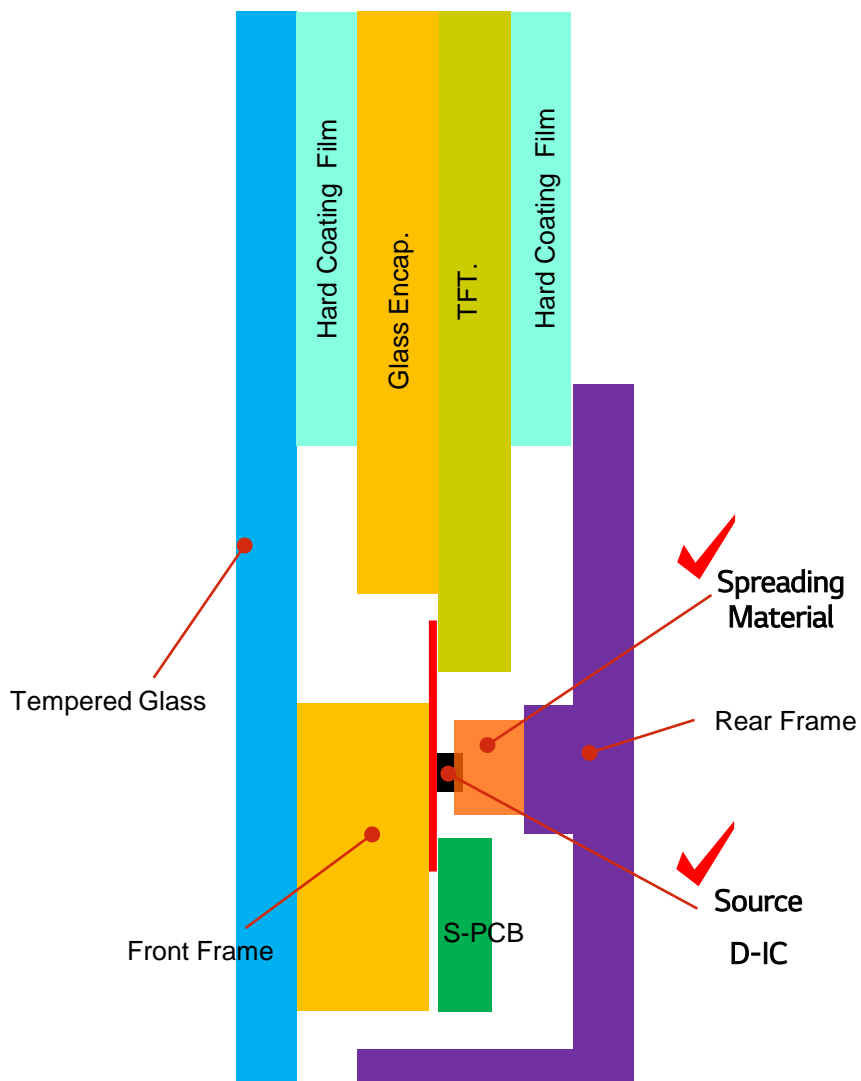
## 1. Potential issue

The heat transfer efficiency down if D-IC is not contacted.

## 2. Recommendation

In case of using Heat spreading sheet

- 1) Contact the SOURCE D-IC with embossment on Heat spreading sheet for heat dissipation.
- 2) Not be overlapped much to prevent COF damage.
- 3) The contact area to exceed the area of the SOURCE D-IC.



## # APPENDIX- XI

### ■ Design guide for Electrostatic Discharging design for Board Assembly

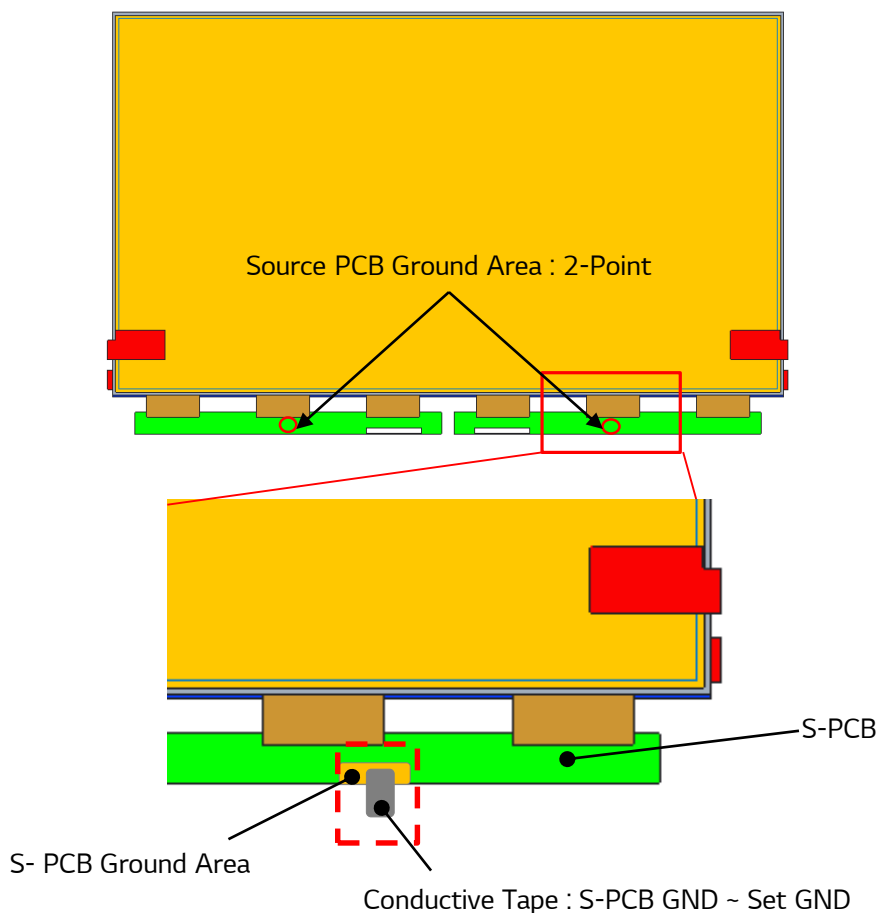
#### 1. Purpose

To design the contact structure for electrostatic discharging on Board Assembly

#### 2. Recommendation

Electrostatic discharging design for Board Assembly (Ground Path)

- 1) To design the contact structure for electrostatic discharging on Board Assembly
- 2) Attach Conductive Tape or Equivalent between S-PCB Ground and Set Ground



## Product Specification

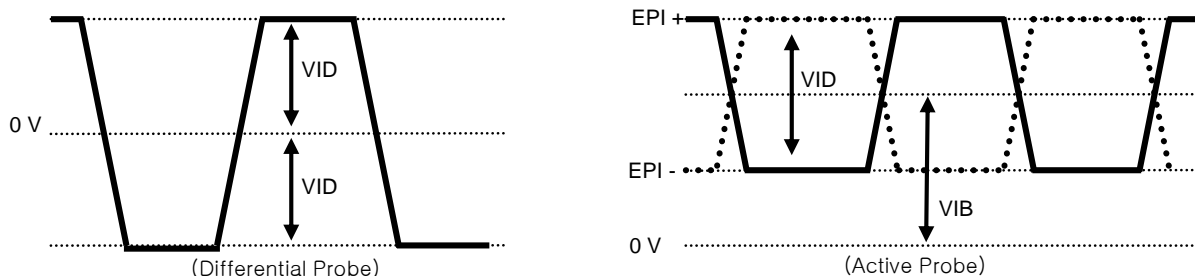
# APPENDIX – XII-1  
Intra interface Signal Specification

TBD

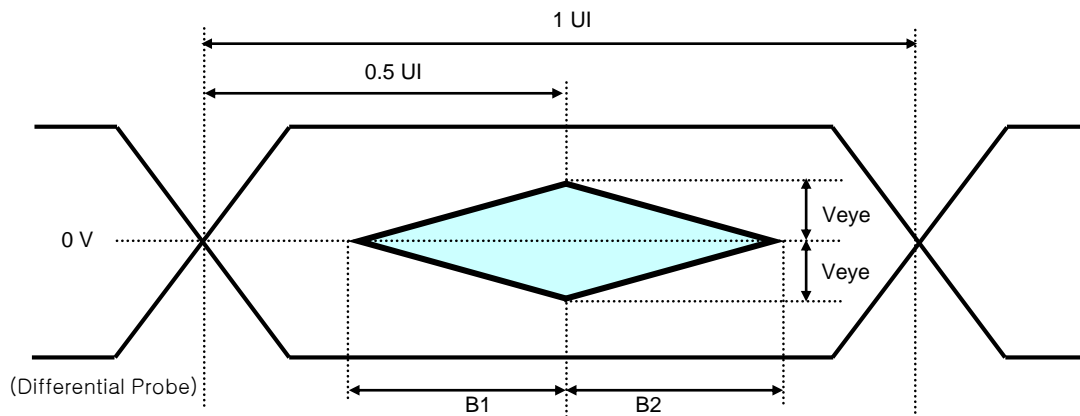
## EPI Signal Specification

Table 1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit	notes
Logic & EPI Power Voltage	VCC	-	1.62	1.8	1.98	VDC	
EPI input differential voltage	VID	-	150	-	500	mV	1
TERM Voltage	Vterm	-	1.62	1.8	1.98	V	
EPI input center voltage	VIB	CML Type	0.7	-	1.76	V	2
EPI Input eye diagram	Veye	-	90	-	-	mV	
Effective Veye width time	B1&B2	-	0.25	-	-	UI	



EPI Differential signal characteristics



Eye Pattern of EPI Input

※ Eye Pattern of EPI input specification must be satisfied in the Condition of Equalizer setting

Table 2. EPI EQUALIZER SETTING CONDITION

DC Gain	Zero [GHz]	Pole1 [GHz]	Pole2 [GHz]	Loop B/W [MHz]	Damping Factor
1	0.38	2	2.1	2.428	0.7

- Note:
1. EPI input differential voltage(VID) must be measured in clock training phase.
  2. Vterm is Termination Voltage for CML (Current Mode Logic) application.
  3. Refer to Appendix XI for Eye Pattern of EPI Measurement point.
  4. Refer to Appendix XII for Cable Spec guide.

※ It is Guaranteed based on mcx cable 3m (Design and reliability verification completed based on cable 3m)

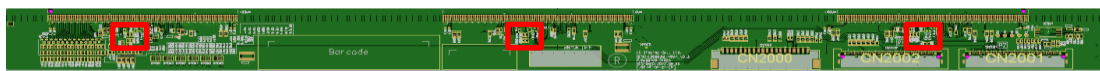
Product Specification

# APPENDIX – XII-2

■ Eye Pattern of EPI Measurement Guide

1. Measurement points of S-PCB

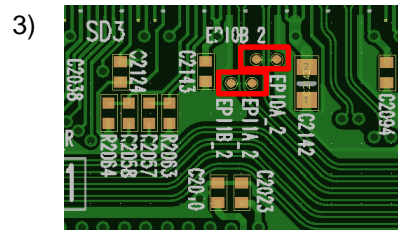
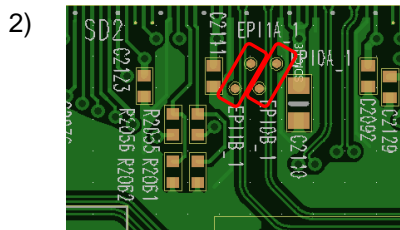
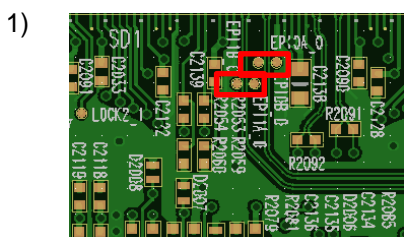
- Right Source PCB



1)

2)

3)



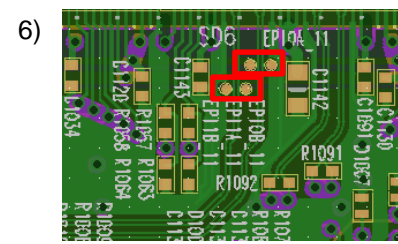
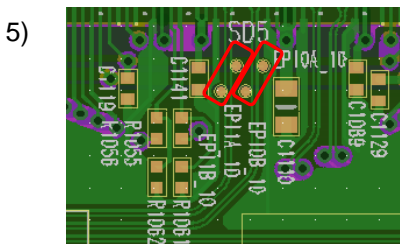
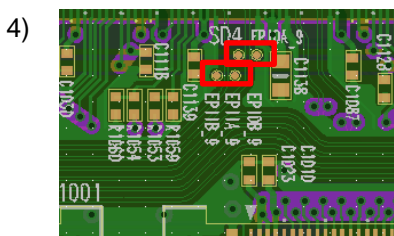
- Left Source PCB



4)

5)

6)



## Product Specification

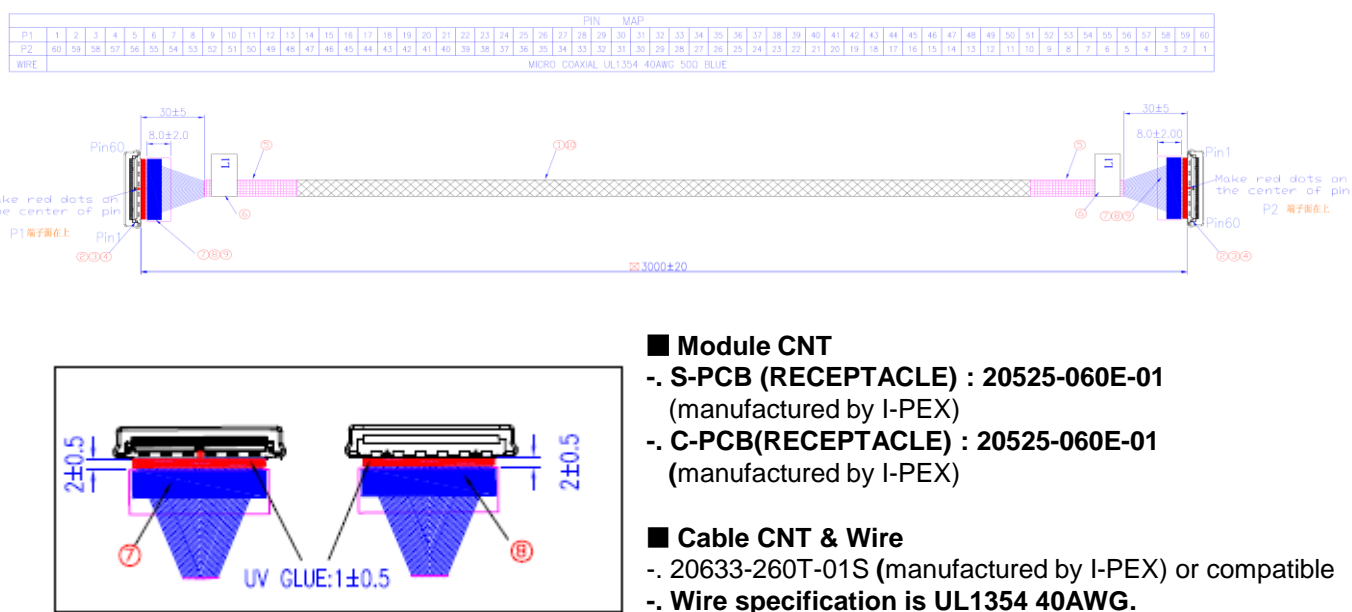
## # APPENDIX - XII-3

## ■ CPCB to SPCB cable design guide

## 1) MCX cable Characteristics

Description	Symbol	Min	Max	Unit	Note
Conductor Resistance	-	-	16	Ω(ohm)	
Insulation Resistance	-	1000	-	MΩ(ohm)	DC 200V, 1 min
Impedance (TDR)	-	-	135	Ω(ohm)	
Connector Mate Forces	-	-	2.97	kgf	
Connector Unmate Forces	-	0.61	-	kgf	

## 2) MCX Cable INFORMATION (OLED Connector)



## 3) Power Cable Information (OLED Connector)

## ■ Module CNT

- S-PCB (RECEPTACLE) : 12507WR-20L (manufactured by YEON HO)
- C-PCB (RECEPTACLE) : 12507WR-20L (manufactured by YEON HO)

## ■ Cable CNT &amp; Wire

- 12507HS-20L (manufactured by YEON HO) or compatible
- Wire specification is 11150 26AWG.
- Conductor Resistance : 150.00Ω/Km.