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TLD3000-L
Transpixel

30” Transparent OLED Display

User Manual

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Record of Revision

Date	Page	Old Description	New Description	Remark
Jan. /14 /2025	all		Initial release	

Contents

1 General Description

TLD3000-L is an innovative market-leading transparent OLED display, resolution 1366x768,self-emissive without backlight, high contrast ratio, and high color saturation. It is an innovative, transparent OLED display. it provides transparent OLED panel with specific aspect ratios for digital signage, AI virtual interaction, transparent window, exhibition hall, museums and boutiques.

1.1 Features

- Transparency OLED Display
- Wide screen 16:9
- 3-Sided Borderless
- Transparent Ratio 43%(typ.)
- High Color Saturation
- Low Power Consumption

1.2 General Specifications

Model Name	TLD3000-L
Description	30” Transparent OLED, 200nits , 1366x768
Screen Size	30”
Display Area (mm)	664.29(H) x 373.48(V)
Brightness	Normal 200 cd/m^2 and Peak 600 cd/m^2
Resolution	1366x768
Aspect Ratio	16:9
Contrast Ratio	210,000: 1
Pixel Pitch (mm)	0.4863(H) x 0.4863(V)
Pixel Per Inch (PPI)	52
Viewing Angle	120°(H),120°(V)
Color Saturation (NTSC)	87%
Display Colors	1.07 Billion colors
Response Time (Typical)	8ms
Panel Interface	V-by-One
Input Interface	HDMI, DP
Input Power	DC24V
Power Consumption	36W
OSD Key	5 Keys (Power Switch, Menu, Select (+,-), Auto)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position…etc
Dimensions (mm)	702x441.5x180
Bezel Size(U/B/L/R)	5.9/62.1/5.9/5.9mm
Weight (Net)	6.87Kg
Operating Temperature	0 ˚C ~ 45 ˚C
Storage Temperature	-20 ˚C ~ 60 ˚C

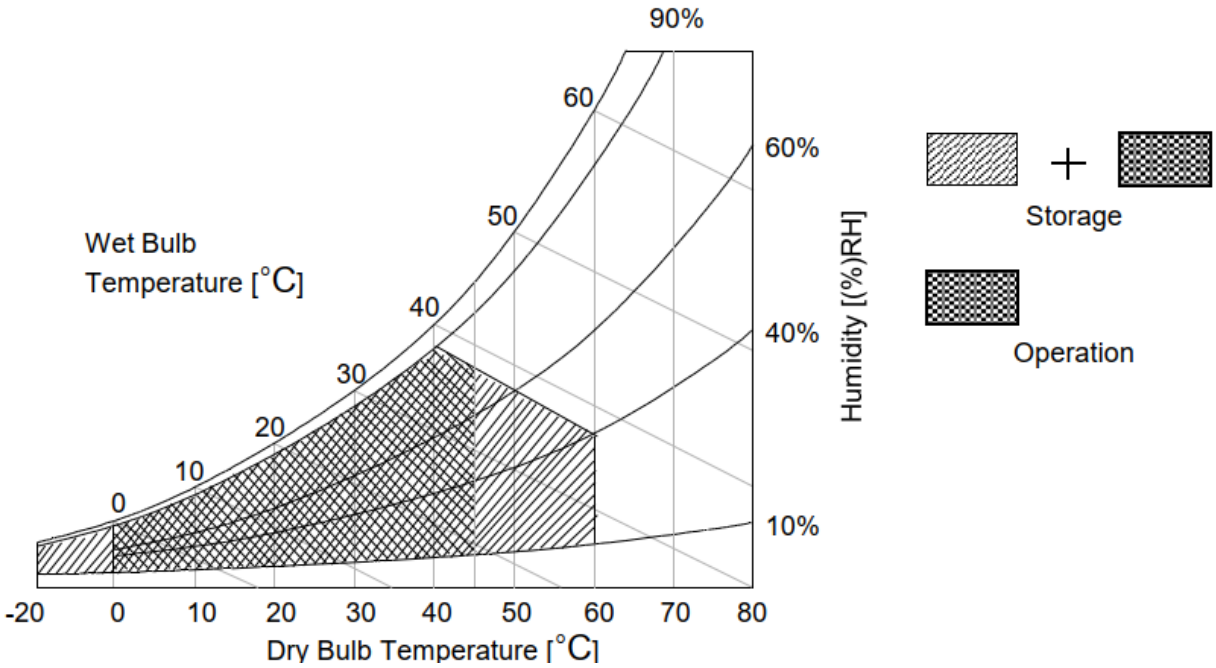
TLD= OLED Panel+ AD Control Board + Chassis

1.3 Absolute Maximum Ratings

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Power Input Voltage	Logic	VDD	-0.3	+14.0	V_{DC}	1
	OLED Panel	EVDD	-0.3	+27.0	V_{DC}	
T-Con Option Selection Voltage		V_{LOGIC}	-0.3	+3.7	V_{DC}	
Operating Temperature		T_{OP}	0	+45	°C	2
Storage Temperature		T_{ST}	-20	+60	°C	
Operating Ambient Humidity		H_{OP}	10	90	%RH	2
Storage Humidity		H_{ST}	10	90	%RH	

Notes

1. Ambient temperature condition (Ta = 25 ± 2 °C)
2. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be Max 39°C, and no condensation of water.



2 Electrical Specifications

2.1 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		23.8	25.0	26.3		
Power Input Current	I_{VDD}		-	0.50	0.55	A	1-1/1-2
			-	0.57	0.63		2
	I_{EVDD}		-	0.66	0.76		1-1
			-	0.64	0.74		1-2
			-	1.99	2.19		3
T-CON Option Voltage	V_{IL}		0	-	0.8	V	
	V_{IH}		2.7	-	3.6	V	
Power Consumption	P_{VDD}		-	6.00	6.60	Watt	1-1/1-2
			-	6.84	7.53		2
	P_{EVDD}		-	16.6	19.0		1-1
			-	16.1	18.5		1-2
			-	49.8	54.8		3
Rush current	I_{RUSH}	I_{RUSH_VDD}	-	-	7	A	4
		I_{RUSH_EVDD}	-	-	15		
		T_{RUSH_VDD}	-	-	100	us	
		T_{RUSH_EVDD}	-	-	2	ms	

Notes

1-1. The specified current and power consumption are under the VDD=12.0V, EVDD=25.0V Ta=25± 2°C,fV=120Hz, condition whereas standard moving picture(IEC62087) is displayed and fv is the frame frequency.

1-2 The specified current and power consumption are under the VDD=12.0V, EVDD=25.0V Ta=25±2°C, fv=120Hz condition whereas standard moving picture(CLASP) is displayed and fv 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=25.0V Ta=25±2°C condition.

3. The current (I_{EVDD}) is specified at the maximum current pattern (Secondary Color Pattern) and under the VDD=12.0V, EVDD=25.0V Ta=25±2°C condition.

2.2 Interface Connections

The 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.

OLED Module
-VDD Connector (CN400): GT05S-51S-H38(LSM)
-Mating Connector : FI-RE51HL(JAE) or compatible

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 #5, #15~17, #21, #34~48, #51 are used only for Litemax. (Do not connect)
6. 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).

OLED Module (EVDD)

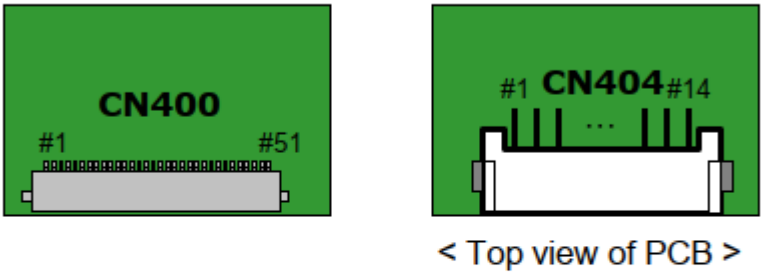
-EVDD Connector (CN404): : 20022WR-H14B2 (manufactured by Yeon Ho)

-Mating Connector : 2022HS-14B2(BK) (manufactured by Yeon Ho)

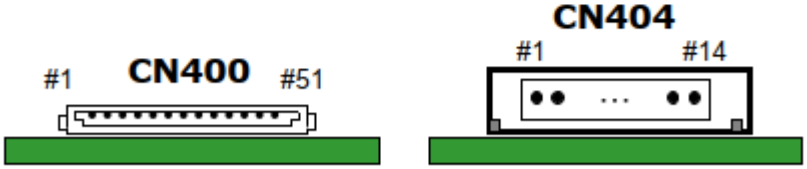
EVDD Connector(CN404) PIN configuration

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 +25V
9	EVDD	OLED Panel Power Supply +25V
10	EVDD	OLED Panel Power Supply +25V
11	EVDD	OLED Panel Power Supply +25V
12	EVDD	OLED Panel Power Supply +25V
13	EVDD	OLED Panel Power Supply +25V
14	EVDD	OLED Panel Power Supply +25V

Rear view of OLED Module



< Top view of PCB >



< Side view of PCB >

2.3 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.

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

2.4 Signal Timing Specifications

Timing table 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.

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:

1. 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.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency.
3. 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 / ±0.5%

※ Timing should be set based on clock frequency.

Timing Table(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:

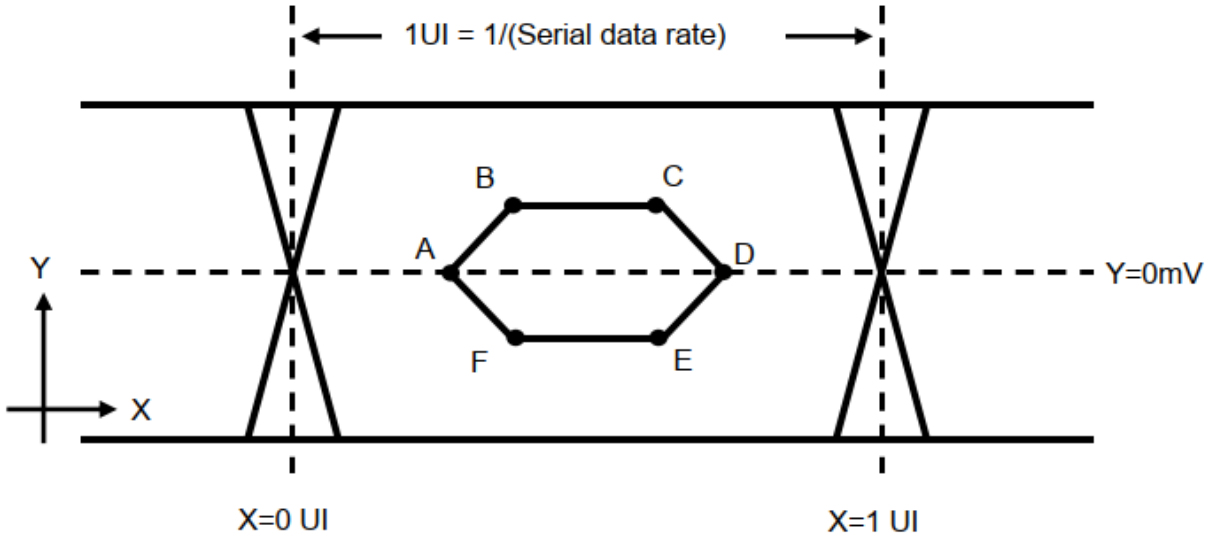
1. Only applicable to Gaming mode with VRR operation
2. The device could not work properly in case it is operated by VRR mode.

1) This OLED module supports adaptive sync timing only under moving picture in room temperature(25±5℃)

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.

2.5 V by One input Signal Characteristics



Eye Mask Specification

	X [UI]	Note	Y [mV]	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

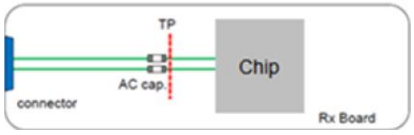
2. This is allowable maximum value.

3. This is allowable minimum value

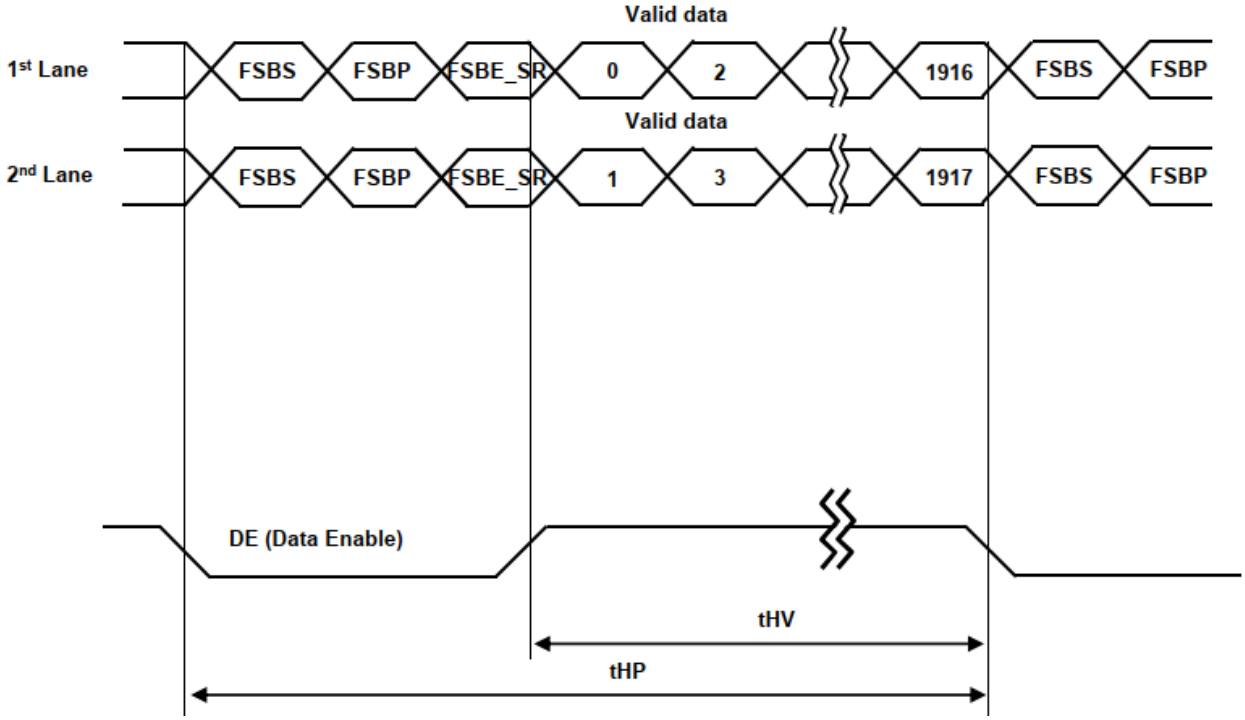
4. The eye diagram is measured by the oscilloscope and receiver CDR characteristic must be emulated.

- PLL Type : 2nd Order
- PLL bandwidth : 10MHz
- Damping Factor : 2

5. EYE mask measuring point

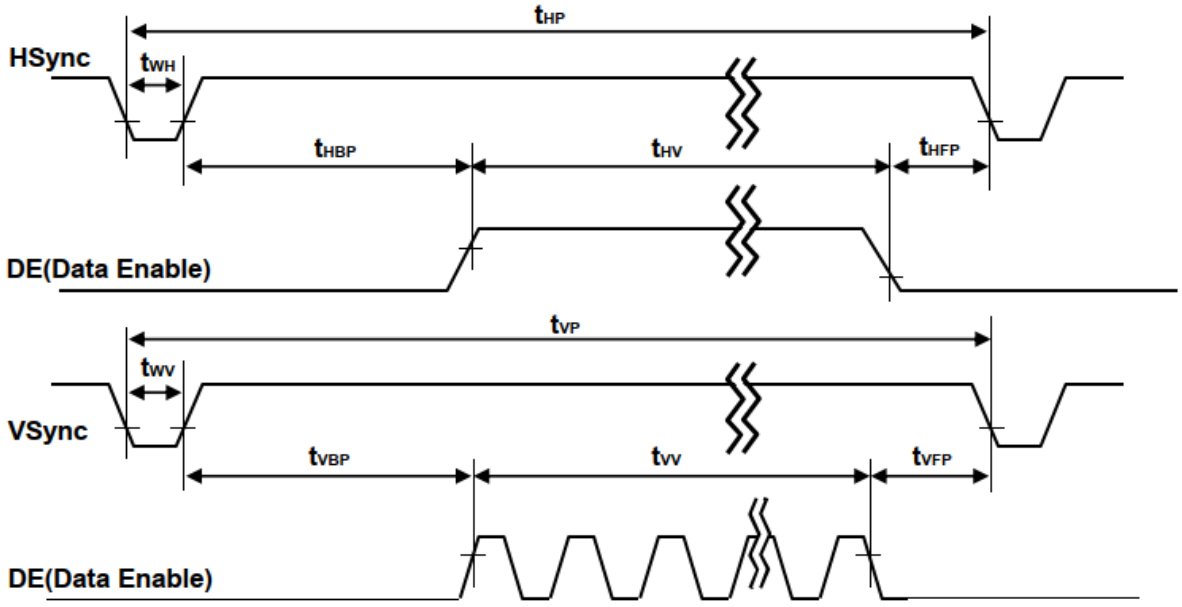


V by One Input Signal Timing Diagram



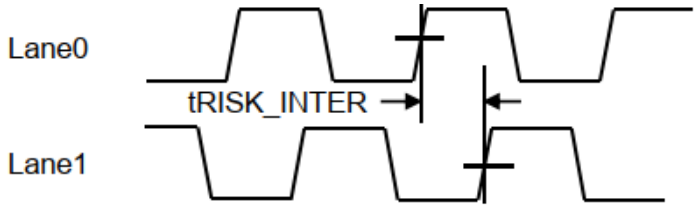
* Reference: Sync. Relation

* tHB = tHFP + tWH +tHBP
* tVB = tVFP + tWV +tVBP

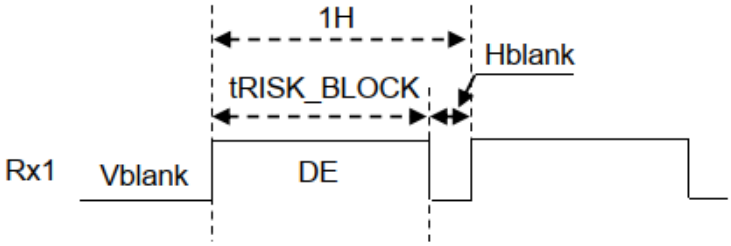


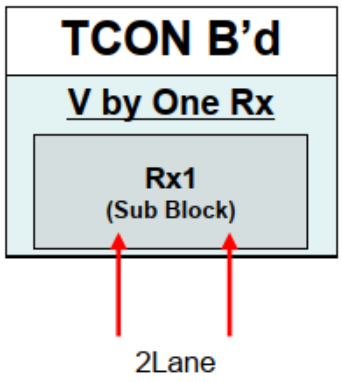
V by One Input Signal Characteristics

1) AC Specification



<Inter-pair skew between two lanes>





<V by One Brief Diagram >

<Inter-pair skew between two sub-blocks>

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/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.

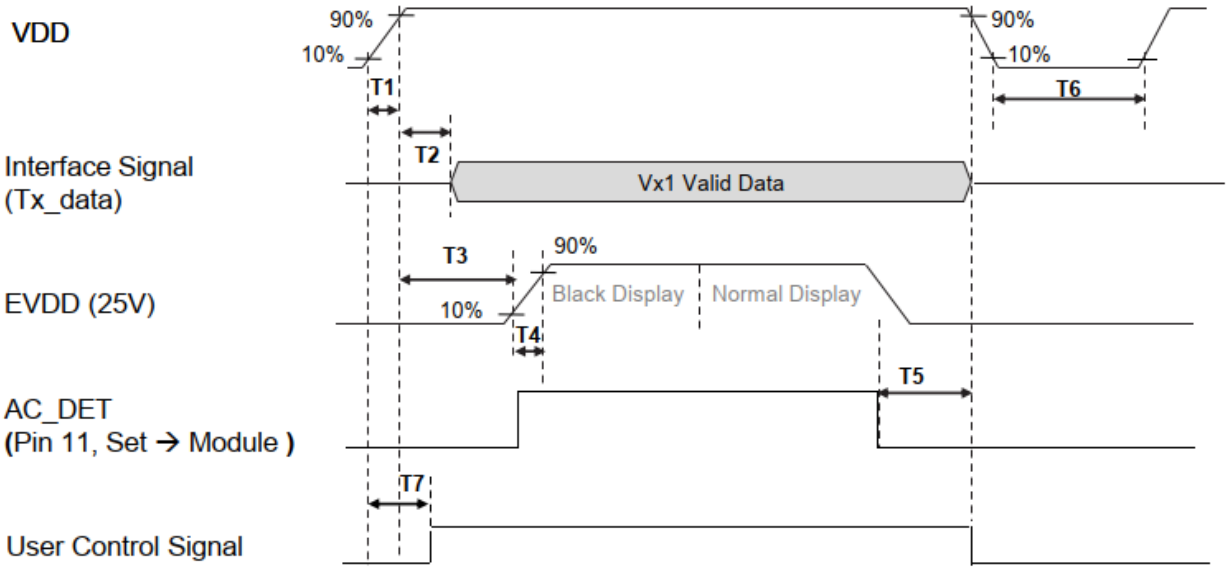
5. APL packet of Vx1 Input

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.

2.6 Power Sequence

OLED Driving circuit



POWER SEQUENCE

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

Notes

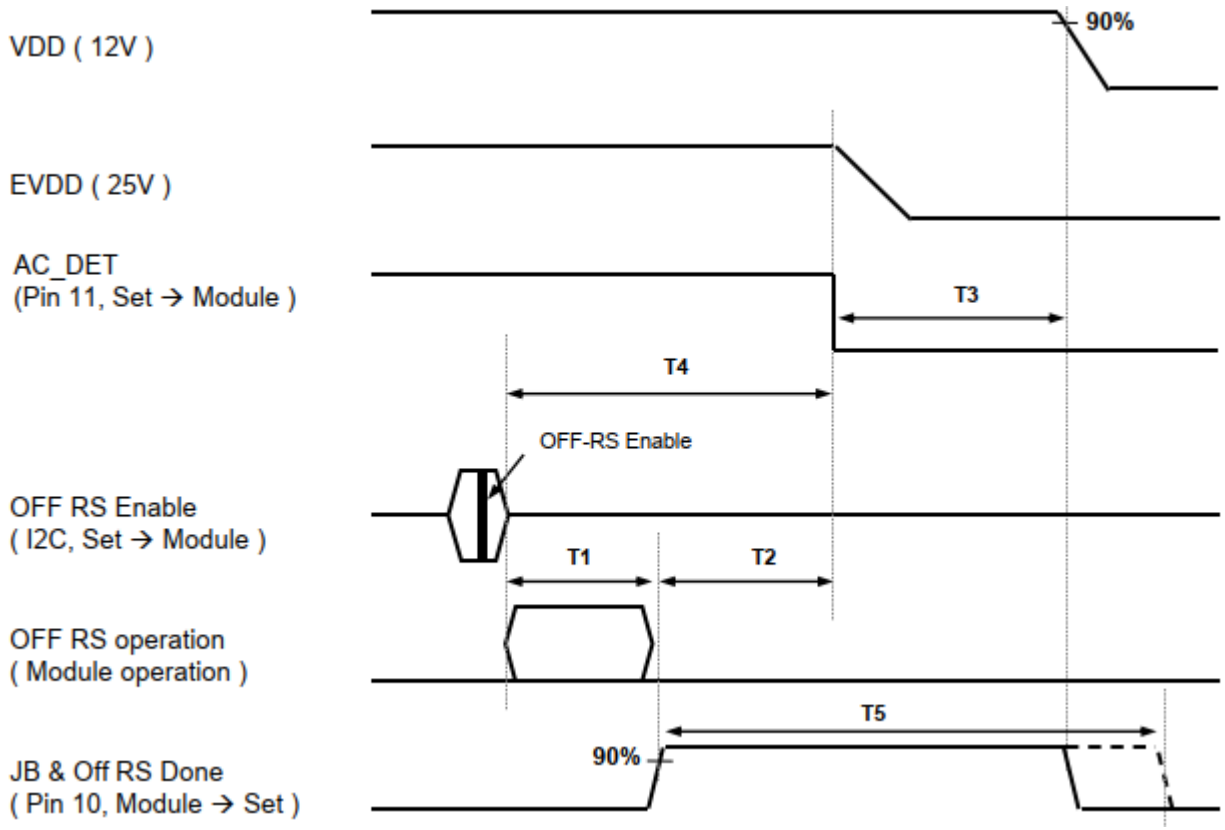
1. The T3 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem. T3 should be larger than T2.
2. T6 should be measured after the module has been fully discharge between power off and on period.
3. If the on time of 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 600ms after VDD 90% rising

※ Black pattern is displayed during black display period before normal display. (ON RF Time 1.6S)

※ When the power for logic (VDD) turns on, EVDD should be less than 5V.
But, it does not matter if there is no garbage image.

※ T5 is recommendation value when using power Adapter. It causes abnormal display.
Not reliability issue.

OFF RS Compensation Operation



POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	100	-	170	sec	1
T2	0	-	10	sec	
T3	30	-	-	ms	
T4	100	-	180	sec	2-1
	180	-	500	sec	2-2
T5	0.5	7	10	sec	

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

2-1. When Off-RS Done Signal is transferred normally.

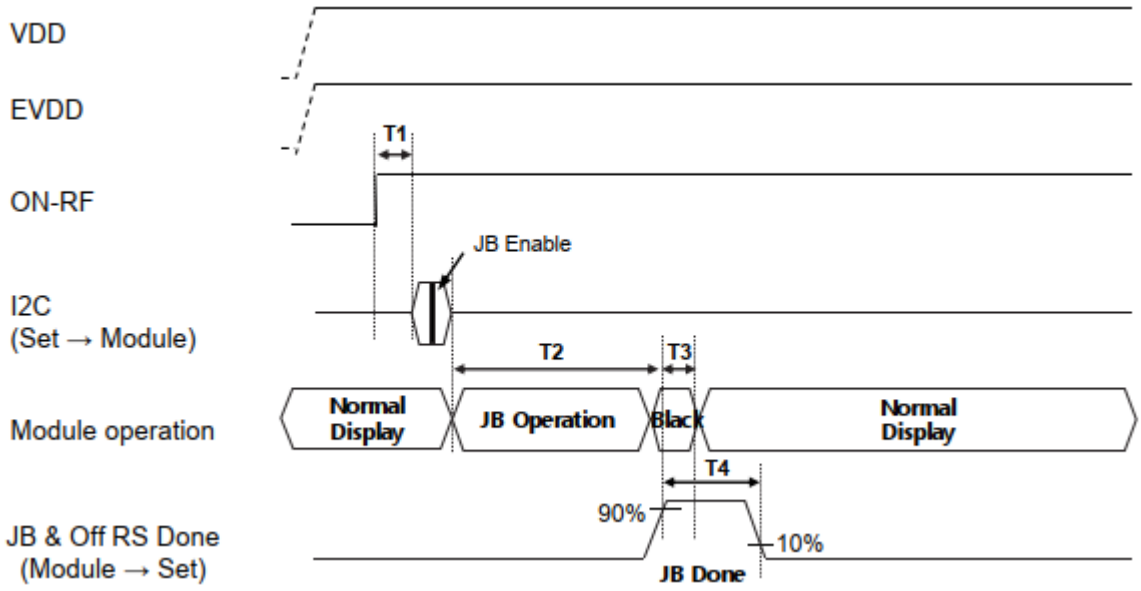
2-2. When Off-RS Done Signal is not transferred.

※ 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.

JB compensation operation



JB Power Sequence

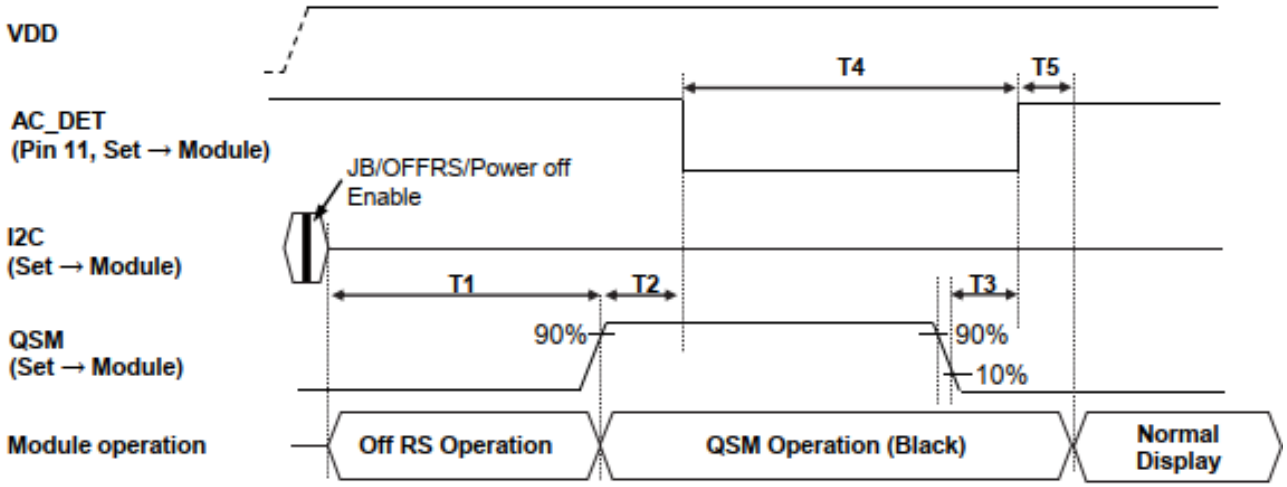
Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	200	-	-	ms	
T2	-	-	15	sec	
T3	140.0	-	508.0	ms	Black PTN
T4	0.5	7	10	sec	

Note : ※ T2 is the actual JB sensing time. This timing is determined according to the characteristics of the panel. (Litemax Internal timing)

※ At VRR mode, T3 can change by adaptive sync timing(T3 need 19 frame) (VRR Only)

※ T3 can change by adaptive sync timing(T3 need 19 frame) (VRR only)

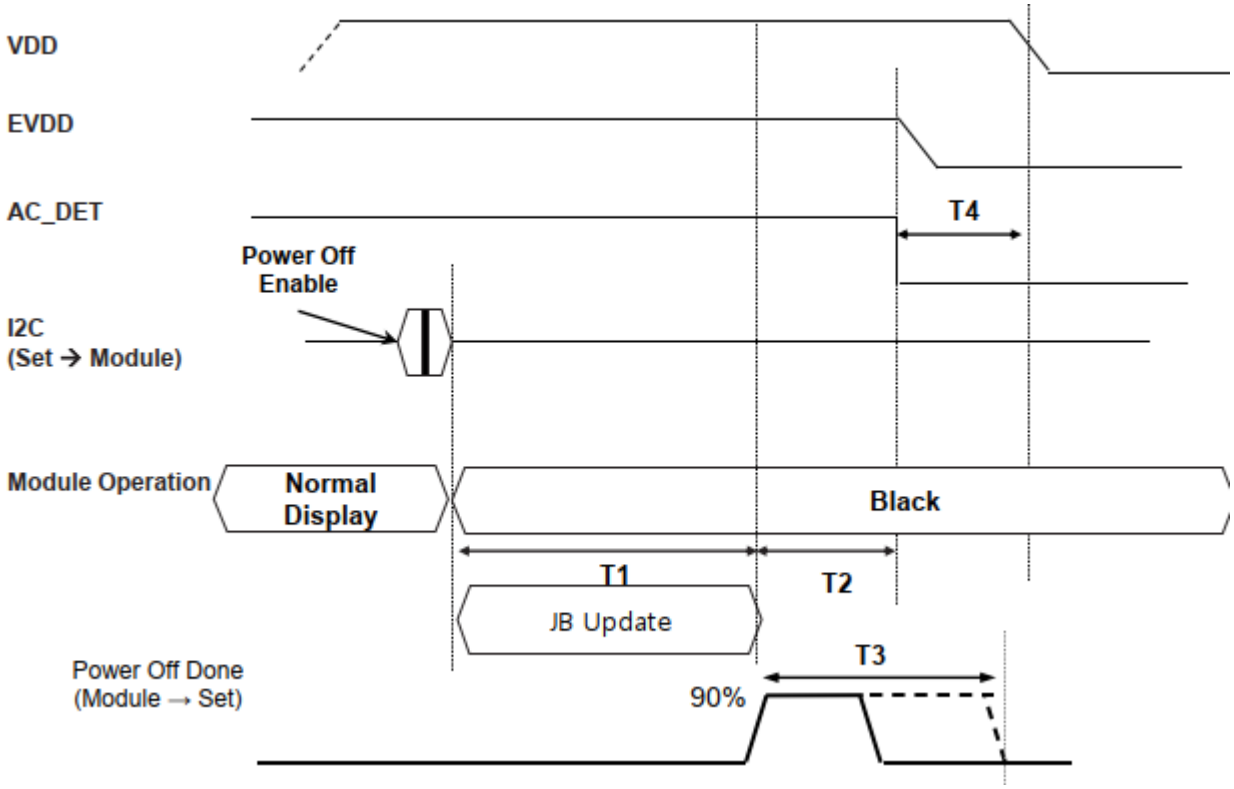
QSM Operation



QSM Sequence

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	3	-	-	sec	
T2	75	-	-	ms	
T3	10	-	-	ms	
T4	1	-	-	sec	
T5	200	-	500	ms	

Power off sequence



POWER SEQUENCE

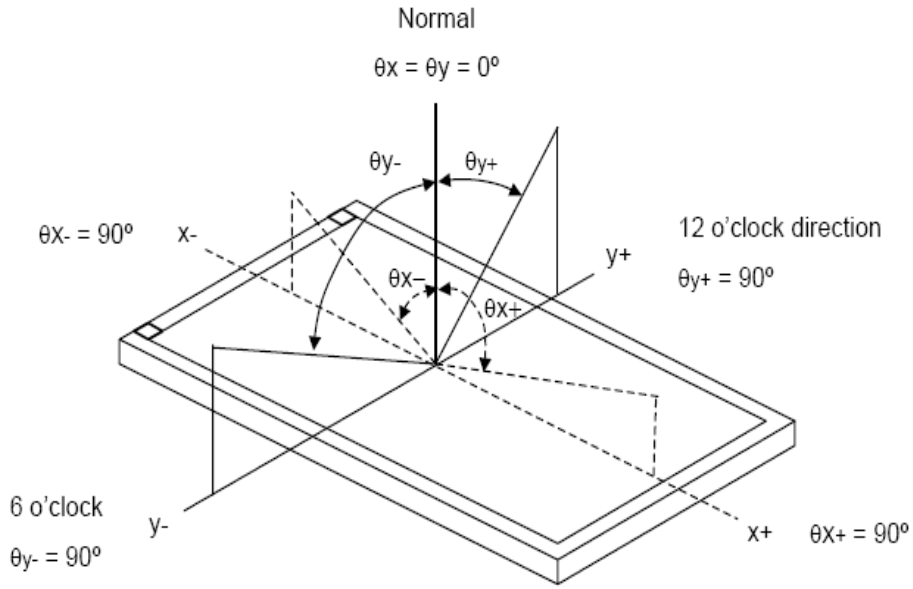
Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	-	-	16.5	sec	
T2	30	-	-	ms	
T3	5	7	10	sec	
T4	30	-	-	ms	

3 Optical Specification

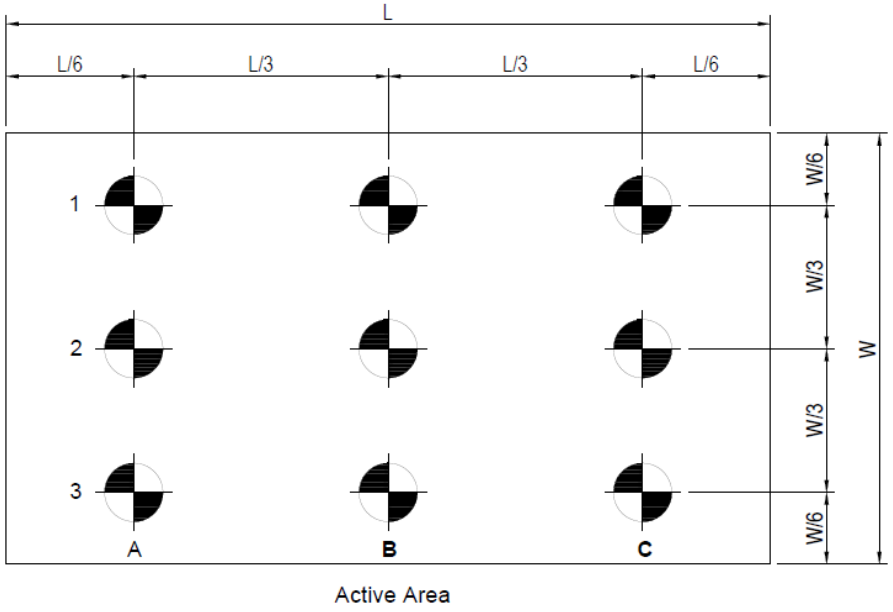
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θx=0 θy=0 CA-410	0.636	0.666	0.696	-	Test Mode: (2) (3)
		Ry		0.298	0.328	0.358	-	
	Green	Gx		0.269	0.299	0.329	-	
		Gy		0.623	0.653	0.683	-	
	Blue	Bx		0.118	0.148	0.178	-	
		By		0.024	0.054	0.084	-	
	White	Wx		0.256	0.286	0.316	-	
		Wy		0.265	0.295	0.325	-	
Center Luminance of White		Lc	θx=0 θy=0 CA-410	180	200	260	cd/m^2	
Uniform		Lu			96		%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10	189000:1	210000:1		-	Test Mode: (4)
Color Saturation		NTSC			87		%	
Viewing Angle	Horizontal	θx+	CR ≥ 10		60		Deg	Test Mode: (1)
		θx-			60			
	Vertical	θy+			60			
		θy-			60			

Test Mode：

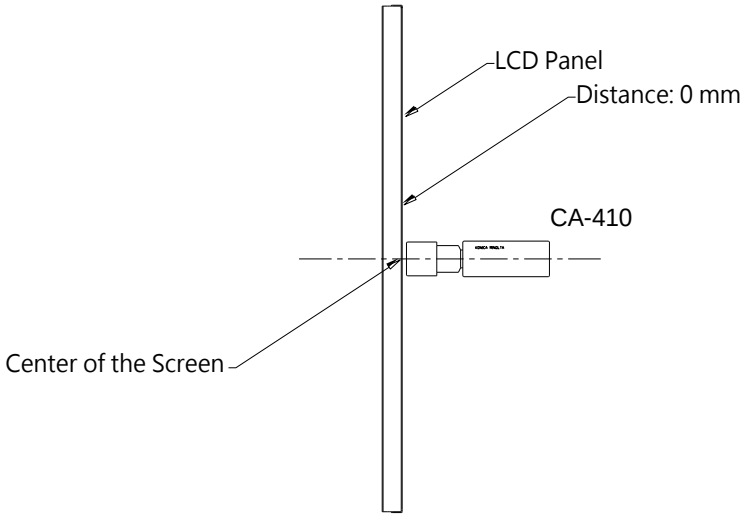
(1) Definition of Viewing Angle (θx , θy):



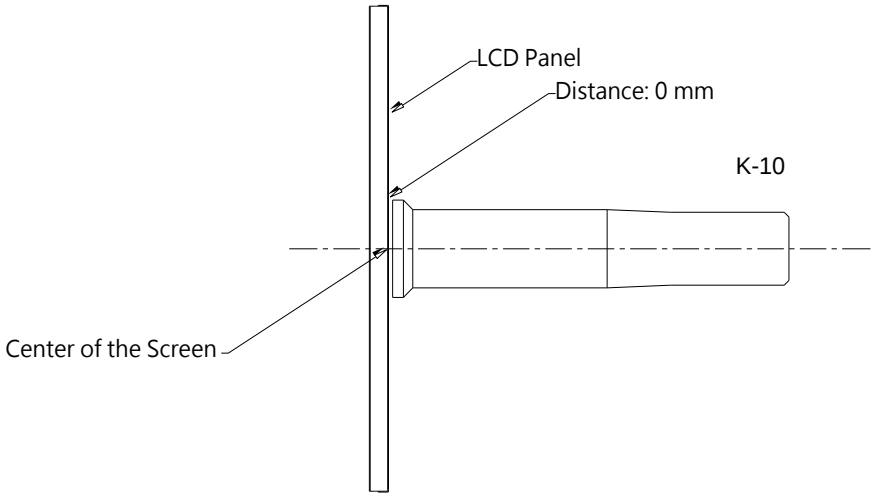
(2) Definition of Test Point:



(3) CA-410 Measurement Setup:

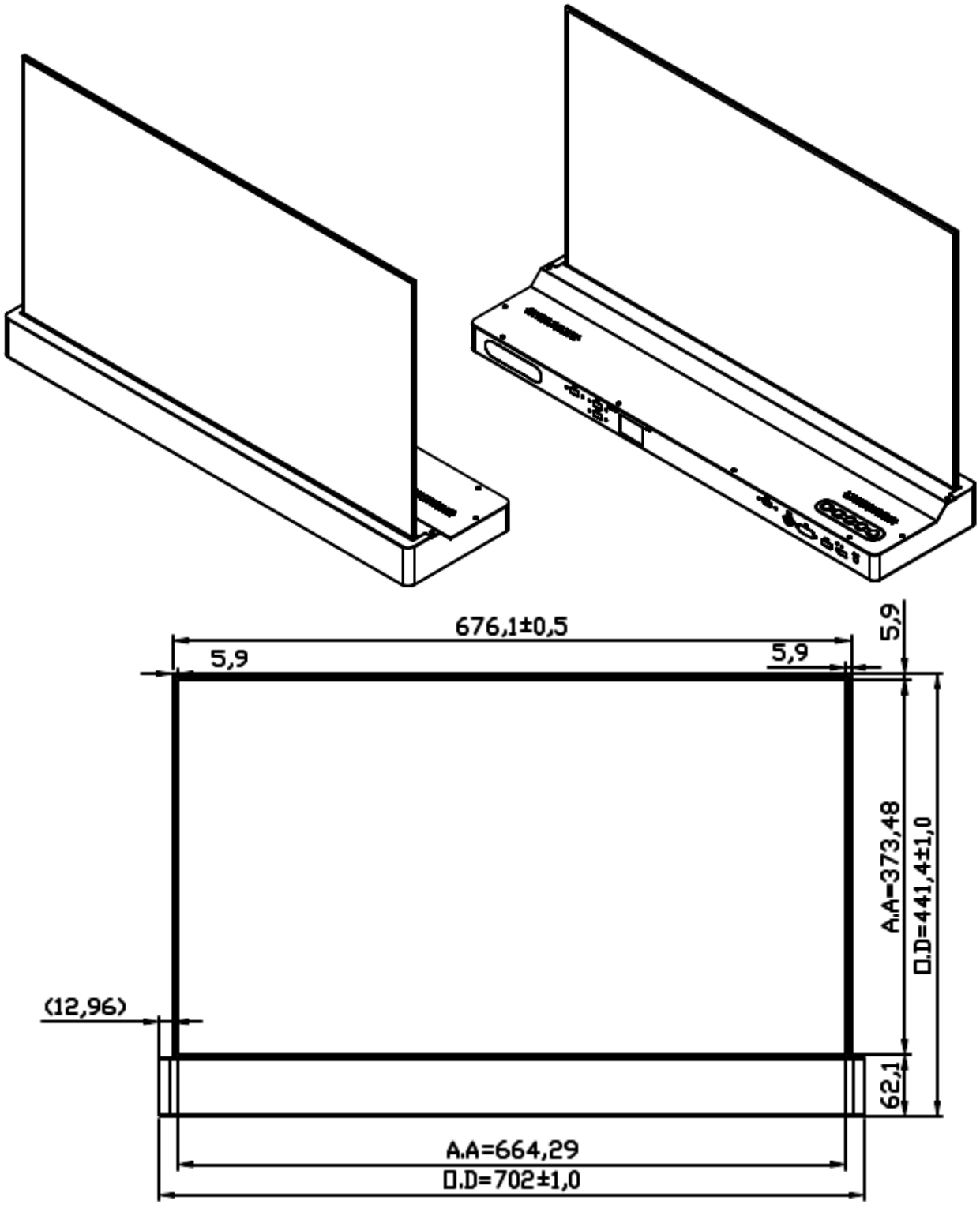


(4) Klein K-10 Measurement Setup:

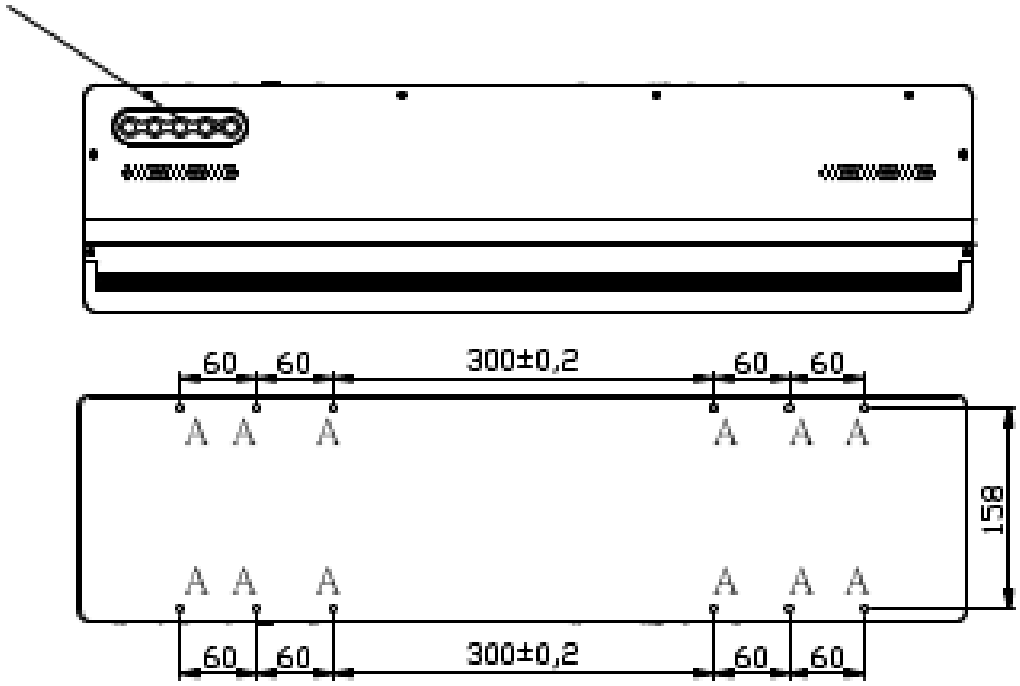


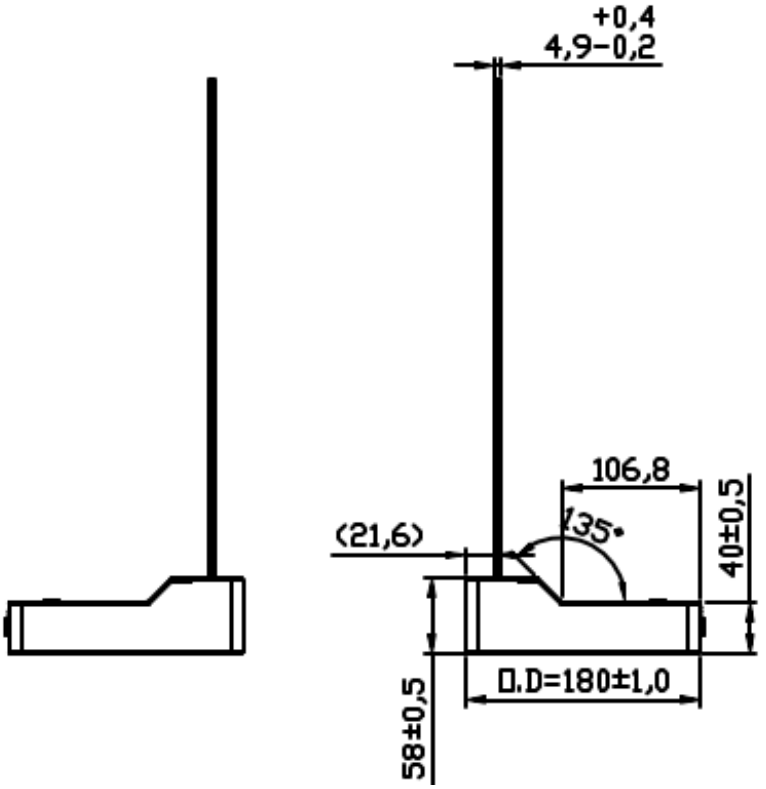
4 Mechanical Drawing

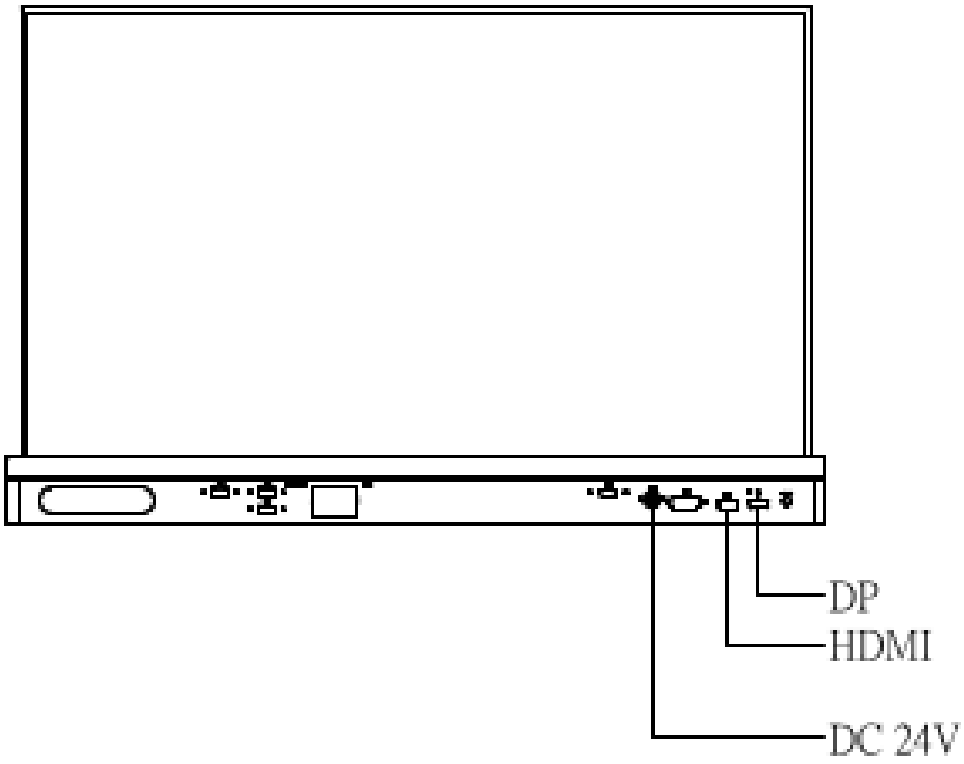
Unit:mm



5-KEY MEMBRANE







Note：
O.D : Outline Dimension
A.A : LCD Active Area
1.Active Screen Size:30.00 inches(762.08mm)
2.Resolution:1366X768

A:12-M6 USER HOLE _MAX. DEPTH=7mm

5 AD9800HP Board & OSD Functions

AD9800 is a good performance AD board for Litemax 4K resolution display product. Input interface supports HDMI, DP. Output supports V-by-1 and eDP panel. Max resolution up to 3840x2160.

For high level application, AD9800 supports screen rotation by embedded frame buffer.

General Description

- **Max resolution 3840x2160 60Hz**
- **One HDMI 2.1, supports 3840x2160 60Hz.**
- **One Display port 1.4, supports 3840x2160 60Hz.**
- **Support 90, 180, degree rotation.**
- **Embedded MCU with ADC port for VR, light sensor application.**
- **Support HDCP 2.3.**
- **Audio line in and speaker output.**
- **Embedded OSD.**
- **Support V-by-1, eDP panel.**
- **Support up to 64 zones LED local dimming control.**

Characteristics

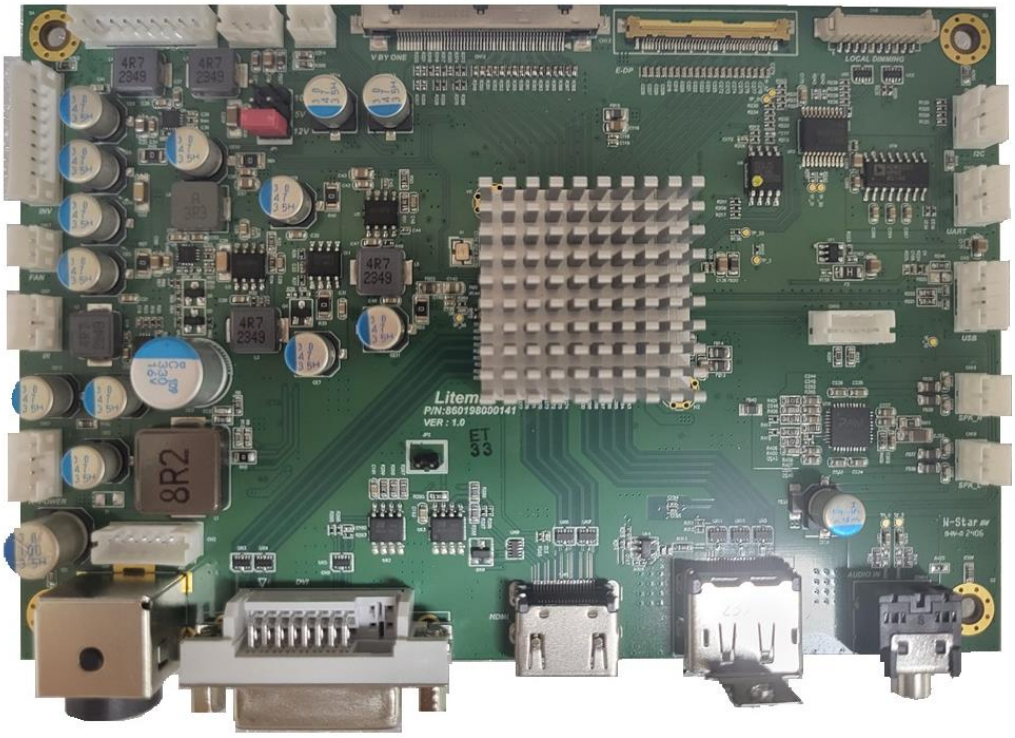
Power Input	12V/24V (Note1)
Power Consumption	15W Max. (Note2)
Input interface	HDMI 2.1, DP 1.4, DVI (Optional)
Output interface	V-by-1 8 lanes, eDP 8 lanes.
Resolution	Max 3840x2160. (DVI only 1080P)
Support panel voltage	5 / 10 / 12 V
Speaker	5W speaker x 2(8Ω)
Backlight control	EN and PWM or DC dimming for backlight
Operation Temperature	-20 ~ 70 degree C

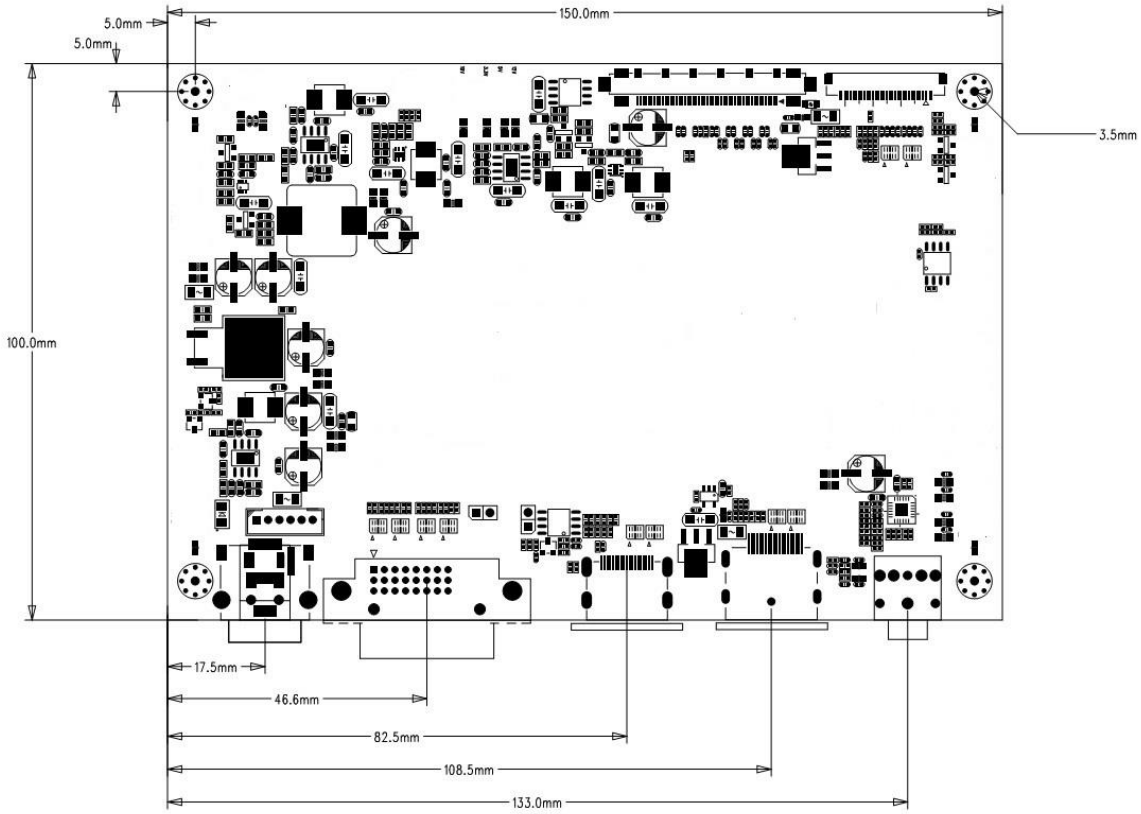
Note1: 12V or 24V are two different PCBA version, selection should be noted.

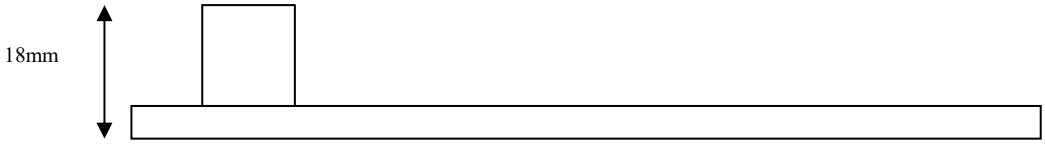
Note2: 15W means AD board own consumption, not include LCD and T-con.

Outline Dimensions

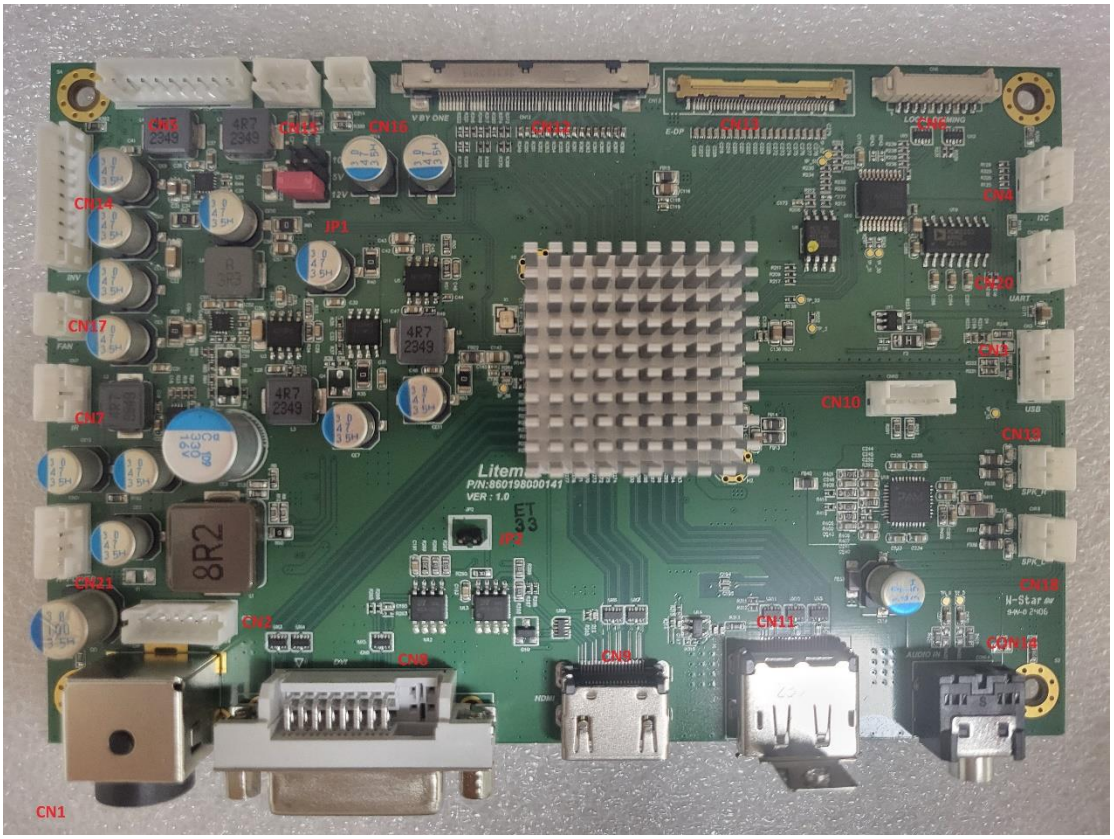
AD9800HP 150mm x 100mm







AD9800HP Board Pin Define



C12: Panel (V-By-one) connector

Pin No.	Function	Pin No.	Function
1	GND	27	HPD
2	X7P	28	8b/10b SEL
3	X7N	29	NC
4	GND	30	LD_EN_U
5	X6P	31	NC
6	X6N	32	NC
7	GND	33	SCL
8	X5P	34	SDA
9	X5N	35	3D_EN_U
10	GND	36	NC
11	X4P	37	NC
12	X4N	38	GND
13	GND	39	GND
14	X3P	40	GND
15	X3N	41	GND
16	GND	42	GND
17	X2P	43	NC

18	X2N	44	Panel power
19	GND	45	Panel power
20	X1P	46	Panel power
21	X1N	47	Panel power
22	GND	48	Panel power
23	X0P	49	Panel power
24	X0N	50	Panel power
25	GND	51	Panel power
26	LOCKN		

CN9: HDMI Connector

Pin No.	Function	Pin No.	Function	Pin No.	Function
1	T.M.D.S. Data2+	9	T.M.D.S. Data0-	17	GND
2	Shield	10	T.M.D.S. Clock+	18	HDMI 5V
3	T.M.D.S. Data2-	11	Shield	19	Hot Plug Detect
4	T.M.D.S. Data1+	12	T.M.D.S. Clock-		-
5	Shield	13	CEC		
6	T.M.D.S. Data1-	14	NC		
7	T.M.D.S. Data0+	15	HDMI_SCL		
8	Shield	16	HDMI_SDA		

CN11: DISPLAY PORT Connector (20pin DP)

Pin No.	Function	Pin No.	Function
1	LAN_C_D3N	11	GND
2	GND	12	ML_LANE0_P
3	LAN_C_D3P	13	GND
4	ML_LANE2_N	14	GND
5	GND	15	AUX _CH_P
6	ML_LANE2_P	16	GND
7	ML_LANE1_N	17	AUX _CH_N
8	GND	18	Hot plug detect
9	ML_LANE1_P	19	GND
10	ML_LANE0_N	20	DP +5V

CN1: Power input (Power DIN 4 pin)

Pin No.	Function	Pin No.	Function
1	Power Input	3	GND
2	Power Input	4	GND

CN1: Power input (Power Jack 3 pin)

Pin No.	Function	Pin No.	Function
1	Power Input	3	GND
2	GND		

CN2: Power input (Wafer 2.0mm pitch 6 pin)

Pin No.	Function	Pin No.	Function
1	Power Input	4	GND
2	Power Input	5	GND
3	Power Input	6	GND

CN21: Reserved 12/5V (Wafer 2.0mm pitch 4 pin)

Pin No.	Function	Pin No.	Function
1	5V	3	12V
2	GND	4	GND

CN14: Backlight Power and Control (Wafer 2.0mm pitch 9 pin)

Pin No.	Function	Pin No.	Function
1	DC/PWM SEL	6	GND
2	Enable	7	12V (Note3)
3	Dimming	8	12V (Note3)
4	GND	9	12V (Note3)
5	GND		

Note3: Pin 7,8,9 are for 12V version only. If you choose 24V version, these 3 pin are NC.

CN17: 12V for Fan power (Wafer 2.0mm pitch 2 pin)

Pin No.	Function	Pin No.	Function
1	Fan+ (12V)	2	Fan-

CN5: Keypad (Wafer 2.0mm pitch 9 pin)

Pin No.	Function	Pin No.	Function
1	POWER KEY	6	MENU KEY
2	GREEN LED	7	AUTO KEY
3	RED LED	8	GND
4	DOWN KEY	9	GND
5	UP KEY		

CN15: VR (Wafer 2.0mm pitch 3 pin)

Pin No.	Function	Pin No.	Function
1	3.3V	3	GND
2	VR		

CN16: Light sensor (Wafer 2.0mm pitch 2 pin)

Pin No.	Function	Pin No.	Function
1	5V/3.3V	2	Sensor Out

JP1: Panel power selection (2.54mm pitch 2x3 jump)

Pin No.	Function	Pin No.	Function
1-2 close	12V	5-6 close	10V
3-4 close	5V		

CN18,CN19: Speaker output (Wafer 2.0mm pitch 2 pin)

Pin No.	Function	Pin No.	Function
1	SPK+	2	SPK-

CN20: UART (Wafer 2.0mm pitch 3 pin)

Pin No.	Function	Pin No.	Function
1	TX	3	GND
2	RX		

CN4: I2C (Wafer 2.0mm pitch 3 pin

Pin No.	Function	Pin No.	Function
1	SDA	3	GND
2	SCL		

CN3: USB (Wafer 2.0mm pitch 4 pin)

Pin No.	Function	Pin No.	Function
1	USB_5V	3	D0+
2	D0-	4	GND

Note: CN3 only for update FW.

CN6: Local Dimming (Wafer 1.25mm pitch 10 pin)

Pin No.	Function	Pin No.	Function
1	LDSPI0_SDI_OUT	6	LD_VSYNC_OUT
2	LDSPI0_SDO_OUT	7	LD_HSYNC_OUT
3	LDSPI0_SCL_OUT	8	GND
4	LDSPI0_CS_OUT	9	VBLCTRL
5	GND	10	NC

JP2: EDID Write Protect (Wafer 2.0mm pitch 2 pin)

Pin No.	Function	Pin No.	Function
1	3.3V	2	GND

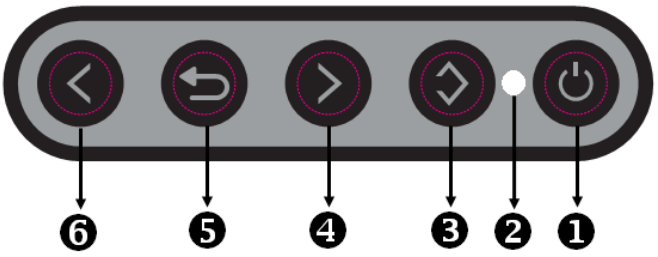
Note: When update EDID , this JP2 must be short.

CN14: Phone Jack(Optional)

Pin No.	Function	Pin No.	Function
1	GND	4	GND
2	Audio IN_R	5	GND
3	Audio IN_L		

5.1 OSD Function

MEMBRANE CONTROL BUTTOM



❶ **Key:** (Power) function key

Press the power switch will turn the monitor on.

Press it again to turn the monitor off.

❷ **LED Status:** Power ON-Green / Power off-No.

❸ **Key:** (Menu + Selection Right + Enter) function key

Press this button to the OSD “main menu”. And then press this button go to the “Selection Right” function, and press again this button to “Enter”.

❹ **Key:** (Menu + Selection Up + Increase) function key

Press this button to the OSD “main menu”. And then press this button go to the “Selection Up” function, and press again this button to adjustment value “Increase”.

❺ **Key:** (Menu + Exit) function key

Enter to the OSD adjustment menu. It also used for go back to previous menu for sub-menu.

❻ **Key:** (Menu + Selection Down + Decrease) function key

Press this button to the OSD “main menu”. And then press this button go to the “Selection Down” function, and press again this button to adjustment value “Decrease”.

Screen Adjustment Operation Procedure

1. **Entering the screen adjustment**

   The setting switches are normally at stand-by. Push the **Menu Key** once to display the main menu of the screen adjustment. The adjustable items will be displayed in the main menu.

2. **Entering the settings**

   Use the **Down Key**  and **Up Key**  buttons to select the desired setting icon and push the SELECT button to enter sub-menu.

3. **Change the settings**

   After the sub-menu appears, use the **Down Key**  and **Up Key**  buttons to change the setting values.

4. **Save**

   After finishing the adjustment, push the  button to memorize the setting.

5. **Return & Exit the Main Menu**

   Exit the screen adjustment; push the “MENU” button. When no operation is done around 30 sec (default OSD timeout), it goes back to the stand-by mode and no more switching is accepted except MENU to restart the setting.

5.2 OSD Menu

By pressing the “menu” button, you will see the below picture. Across from timing you will see resolution, frequency, and V-frequency of the panel. These cannot be altered by the user.

6 Precautions

6.1 Handling and Mounting Precautions

(1) The module should be assembled into the system firmly by using every mounting hole. Do not apply rough force such as bending or twisting to the LCD during assembly.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the LCD module.
(3) While assembling or installing LCD modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
(4) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
(5) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily be scratched.
(6) Please attach the surface transparent protection film to the surface in order to protect the polarizer. Transparent protection film should have sufficient strength in order to the resist external force.
(7) When the transparent 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.
(8) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
(9) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
(10) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
(11) Protect the LCD module from static electricity, it may cause damage to the C-MOS Gate Array IC.
(12) Do not disassemble the module.
(13) Do not pull or fold the lamp wire.
(14) Pins of I/F connector should not be touched directly with bare hands.

6.2 Storage Precautions

(1) High temperature or humidity may reduce the performance of LCD module. Please store LCD module within the specified storage conditions.
(2) If possible store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(3) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
(4) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

6.3 Operation Precautions

(1) Do not pull the I/F connector in or out while the LCD module is operating.
(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.
(3) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(4) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
(5) 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.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods are very important to minimize the interference.
(7) Please do not give any mechanical and/or acoustical impact to module. Otherwise, module can't be operated its full characteristics perfectly.
(8) Since a module 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) Do not display the fixed pattern for a long time because it may cause image sticking.
(10) In order to prevent image sticking, periodical power-off or screen save is needed after fixed pattern long time display.
(11) Black image or moving image is strongly recommended as a screen save.
(12) Static information display recommended to use with moving image. Cycling display between 10 minutes' information (static) display and 10 seconds' moving image.
(13) Background and character (image) color change is recommended. Use different colors for background and character, respectively. And change colors themselves periodically.
(14) LCD system is required to place in well-ventilated environment. Adapting active cooling system is highly recommended.
(15) Product reliability and functions are only guaranteed when the product is used under right operation usages.
(16) If product will be used in extreme conditions, such as high temperature/ humidity, shock and vibration it is strongly recommended to contact Litemax for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, taxi-top, in vehicle and controlling systems.

7 Disclaimer

All information in this document are subject to change, please constant LiteMax for any new design.