LITEMAX
Sunlight Readable LCD!

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SPANPIXEL
Resizing LCD

RoHS·WEEE LITEMAX COMPLIANT

LITEMAX

SSD6740-I V1

Sunlight Readable 67.4” LED B/L LCD

User Manual

Approved by	Checked by	Prepared by

LITEMAX Electronics Inc.
8F, No.137, Lane 235, Bau-chiau Rd.,
Shin-dian Dist., New Taipei City, Taiwan
R.O.C.
Tel : 886-2-8919-1858
Fax: 886-2-8919-1300
Homepage: http://www.litemax.com

Record of Revision

Version and Date	Page	Old Description	New Description	Remark
Sep /7/2020	all		Initial release	

Contents

1 General Description

The SSD6740-I is a 67.4 inch color TFT-LCD display with special aspect ratio 16:4.4 and wide resolution 3840 x 1076 . It is Litemax's Spanpixel series product which designed for high brightness 2000 nits with power efficiency LED backlight. It provides LCD panel with specific aspect ratios and sunlight readable for digital signage, public transportation, exhibition hall, department store, and vending machine.

1.1 Features

- Resizing LCD
- Ultra-Wide Screen (16 : 4.4)
- High Brightness 2000 nits
- Sunlight Readable
- LED Backlight
- BL MTBF: 100,000 hours

1.2 General Specifications

Model Name	SSD6740-I V1
Description	67.4" Resizing LCD, 2000 nits LED backlight, 3840x1076
Screen Size	67.4"
Display Area (mm)	1650.240(H) x 462.680(V)
Brightness	2000 cd/m^2
Resolution	3840x1076
Aspect Ratio	16 : 4.4
Contrast Ratio	5600 : 1
Pixel Pitch (mm)	0.430(H) x 0.430(V)
Pixel Per Inch (PPI)	59
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	84%
Display Colors	1.07G
Response Time (Typical)	9.5ms
Panel Interface	V-by-One
Input Interface	DVI-D, HDMI, DP
Input Power	AC100~240V
Power Consumption	271W
OSD Key	5 Keys (Power Switch, Menu, +, -, Exit)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position…etc
Dimensions (mm)	1699.70 x 500.40 x 71.40
Bezel Size(U/B/L/R)	18.86/18.86/24.73/24.73 mm
Weight (Net)	33.5 kg
Mounting	500x150mm, 900x150mm
Operating Temperature	0 ˚C ~ 50 ˚C
Storage Temperature	-20 ˚C ~ 60 ˚C

SSD= Panel + LED Driving Board + AD Control Board + Chassis

1.3 Absolute Maximum Ratings

Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	35	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta≦40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max.

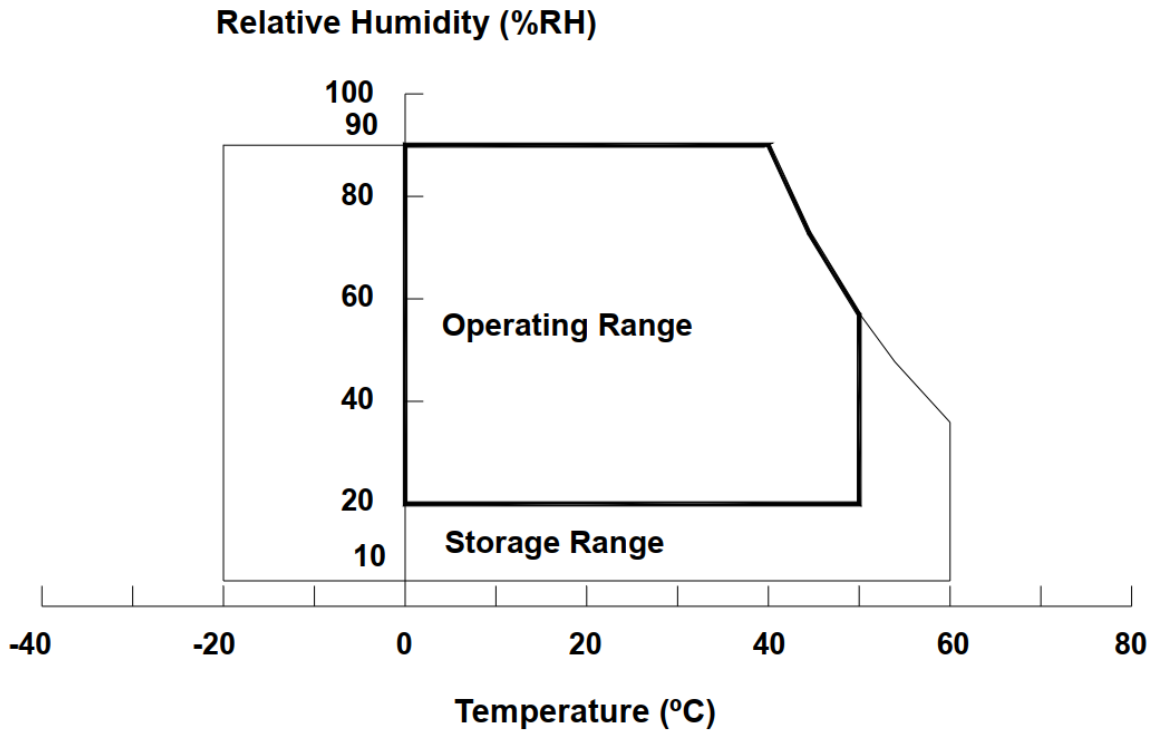
(c) No condensation.

Note (2) Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 30 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



Electrical Absolute Ratings

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCC	-0.3	13.5	V	(1)
Logic Input Voltage	VIN	-0.3	3.6	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

2 Electrical Specifications

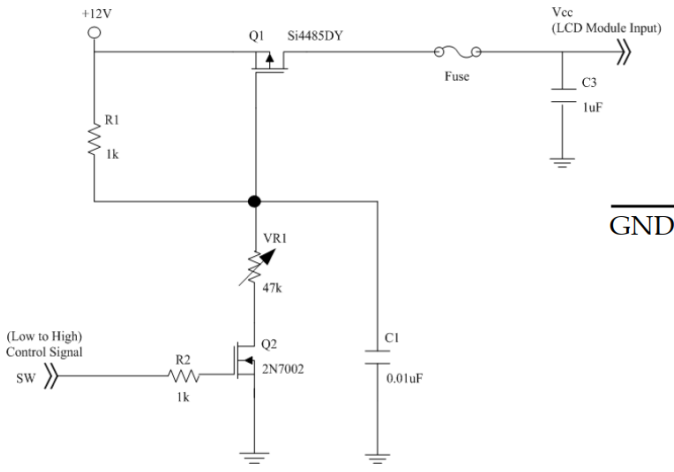
2.1 TFT LCD Characteristics

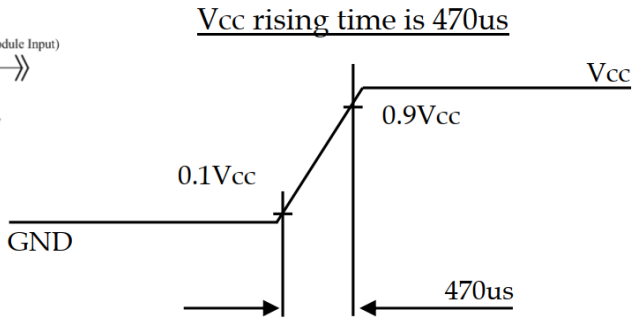
(Ta = 25 ± 2 ºC)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	–	–	7	A	(2)
OFHD 60Hz Output Power Consumption	White Pattern	P_T	–	17.1	18.70	W	(3)
	Black Pattern	P_T	–	16.42	18.10		
	Horizontal Stripe	P_T	–	55.89	61.47		
OFHD 60Hz Output Power Supply Current	White Pattern	–	–	1.63	1.76	A	
	Black Pattern	–	–	1.57	1.70	A	
	Horizontal Stripe	–	–	5.4	5.85	A	
VbyOne HS	Differential Input High Threshold Voltage	VLVTH	–	–	+50	mV	
	Differential Input Low Threshold Voltage	VLVTL	-50	–	–	mV	
	Differential Input Resistor	RRIN	80	100	120	ohm	
CMOS interface	Input High Threshold Voltage	VIH	2.7	–	3.6	V	
	Input Low Threshold Voltage	VIL	0	–	0.7	V	

Note (1) The module should be always operated within the above ranges. The ripple voltage should be controlled under 10% of Vcc (Typ.)

Note (2) Measurement condition :





Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC,fv = 60 Hz, whereas a power dissipation check pattern below is displayed.

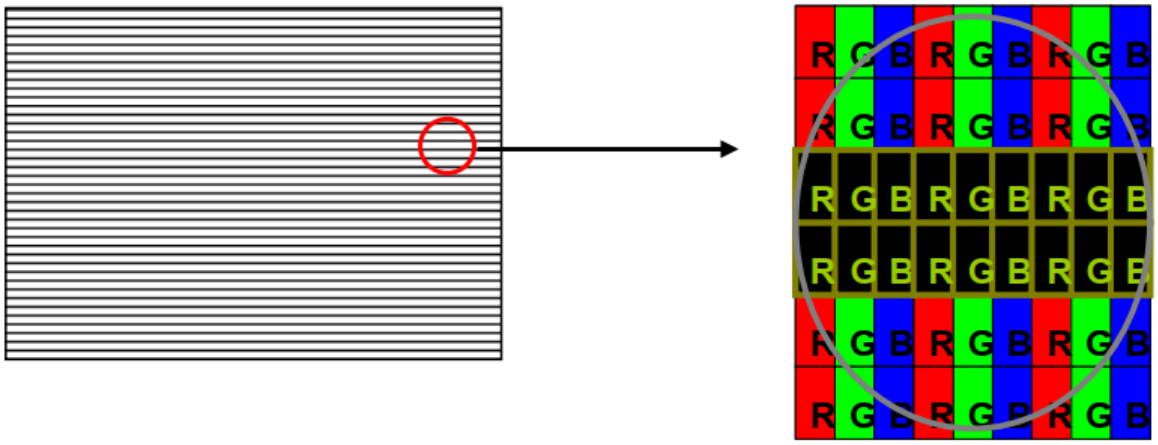
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Heavy Loading pattern



2.2 Input Terminal Pin Assignment

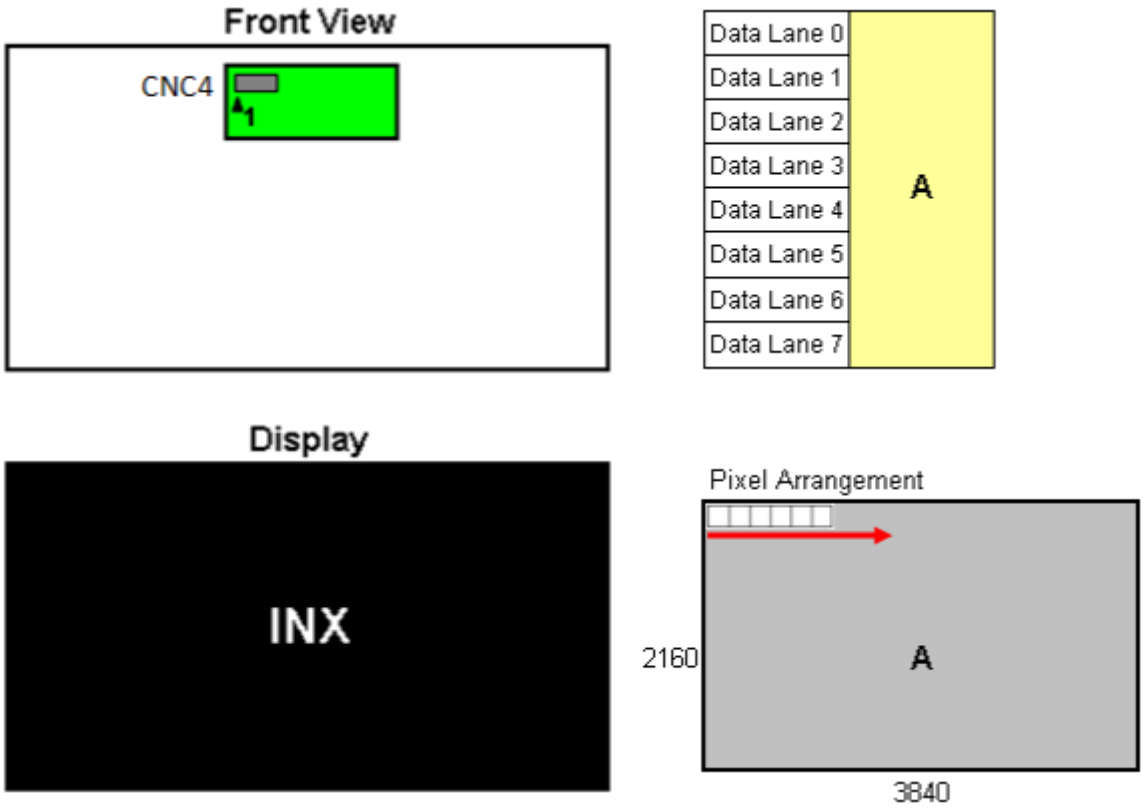
CNC4 Connector Pin Assignment: [187059-51221(P-TWO), WF23-402-5133(FCN)]
Matting Connector: [FI-RE51HL (JAE)]

Pin	Name	Description	Note
1	Vin	Power input (+12V)	
2	Vin	Power input (+12V)	
3	Vin	Power input (+12V)	
4	Vin	Power input (+12V)	
5	Vin	Power input (+12V)	
6	Vin	Power input (+12V)	
7	Vin	Power input (+12V)	
8	Vin	Power input (+12V)	
9	N.C.	No Connection	(6)
10	GND	Ground	
11	GND	Ground	
12	GND	Ground	
13	GND	Ground	
14	GND	Ground	
15	N.C.	No Connection	(6)
16	N.C.	No Connection	(6)
17	N.C.	No Connection	(6)
18	N.C.	No Connection	(6)
19	N.C.	No Connection	(6)
20	N.C.	No Connection	(6)
21	N.C.	No Connection	(6)
22	N.C.	No Connection	(6)
23	N.C.	No Connection	(6)
24	N.C.	No Connection	(6)
25	HTPDN	Hot plug detect output, Open drain.	
26	LOCKN	Lock detect output, Open drain.	
27	GND	Ground	
28	RX0N	1ST Pixel Negative V-by-One differential data input in area A. Lane 0	(1)
29	RX0P	1ST Pixel Positive V-by-One differential data input in area A. Lane 0	
30	GND	Ground	
31	RX1N	2ND Pixel Negative V-by-One differential data input in area A. Lane 1	(1)

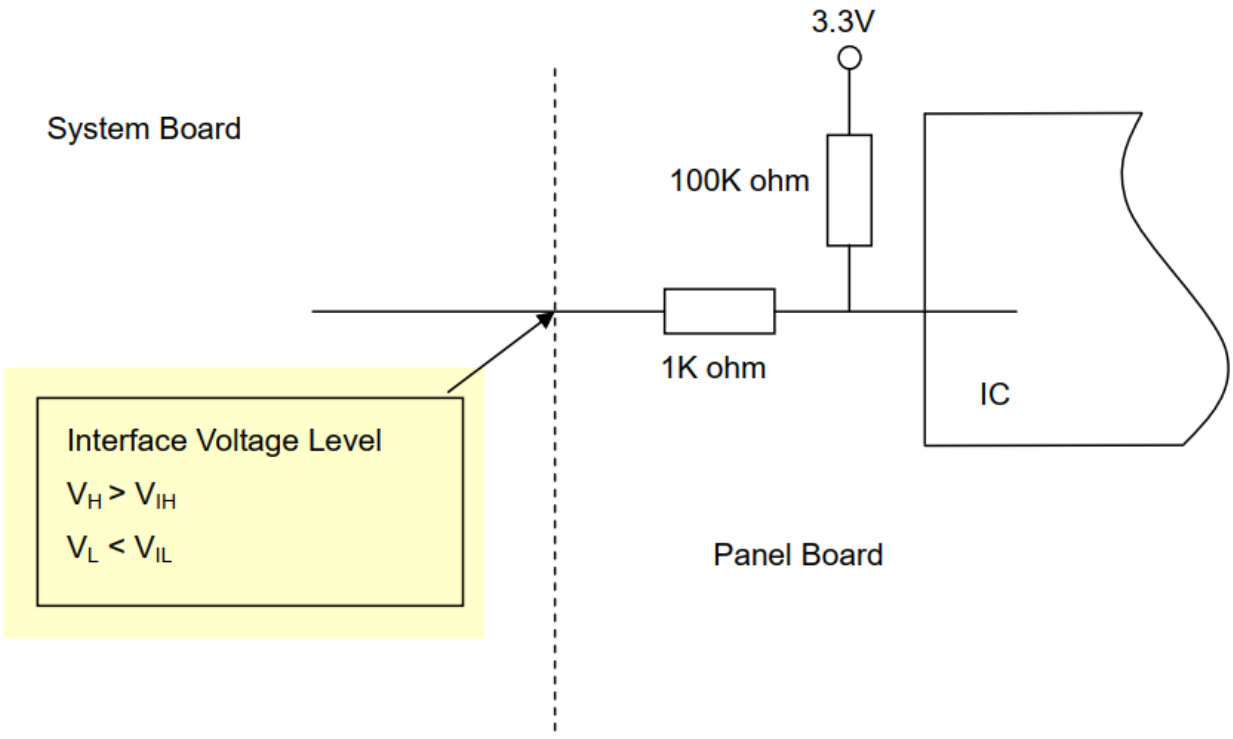
32	RX1P	2ND Pixel Positive V-by-One differential data input in area A. Lane 1	
33	GND	Ground	
34	RX2N	3RD Pixel Negative V-by-One differential data input in area A. Lane 2	(1)
35	RX2P	3RD Pixel Positive V-by-One differential data input in area A. Lane 2	
36	GND	Ground	
37	RX3N	4TH Pixel Negative V-by-One differential data input in area A. Lane 3	(1)
38	RX3P	4TH Pixel Positive V-by-One differential data input in area A. Lane 3	
39	GND	Ground	
40	RX4N	5TH Pixel Negative V-by-One differential data input in area A. Lane 4	(1)
41	RX4P	5TH Pixel Positive V-by-One differential data input in area A. Lane 4	
42	GND	Ground	
43	RX5N	6TH Pixel Negative V-by-One differential data input in area A. Lane 5	(1)
44	RX5P	6TH Pixel Positive V-by-One differential data input in area A. Lane 5	
45	GND	Ground	
46	RX6N	7TH Pixel Negative V-by-One differential data input in area A. Lane 6	(1)
47	RX6P	7TH Pixel Positive V-by-One differential data input in area A. Lane 6	
48	GND	Ground	
49	RX7N	8TH Pixel Negative V-by-One differential data input in area A. Lane 7	(1)
50	RX7P	8TH Pixel Positive V-by-One differential data input in area A. Lane 7	
51	GND	Ground	

Note (1) V-by-One® HS Data Mapping

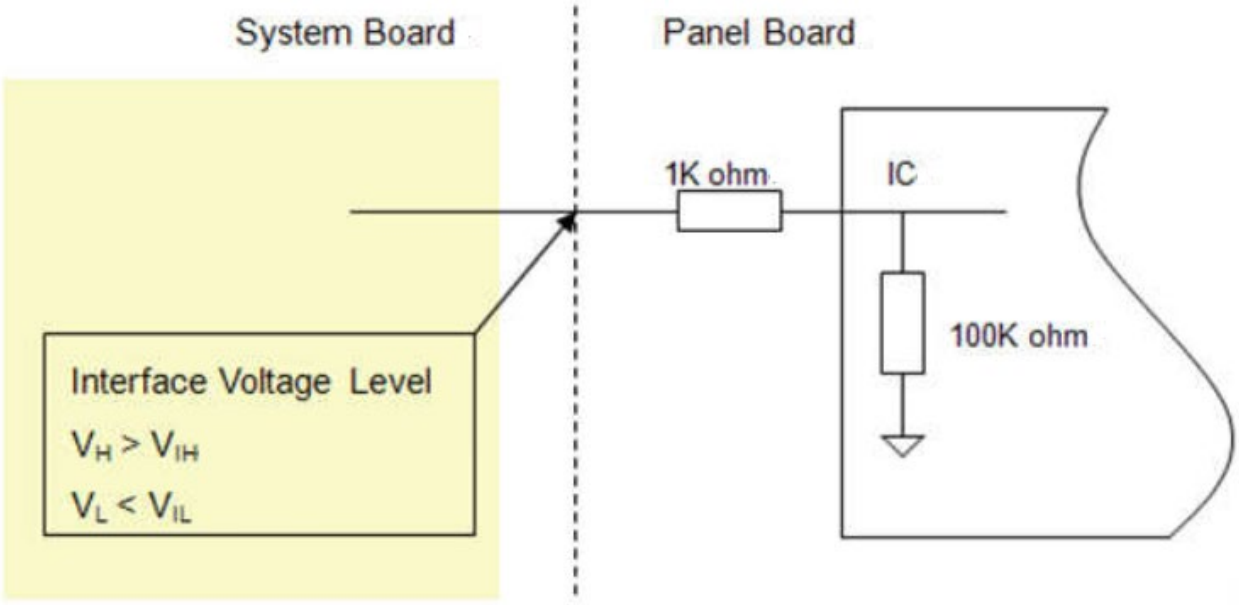
Area	Lane	Data Stream
A	Lane 0	1, 9, 17, ..., 3825, 3833
	Lane 1	2, 10, 18, ..., 3826, 3834
	Lane 2	3, 11, 19, ..., 3827, 3835
	Lane 3	4, 12, 20, ..., 3828, 3836
	Lane 4	5, 13, 21, ...,3829, 3837
	Lane 5	6, 14, 22, ..., 3830, 3838
	Lane 6	7, 15, 23, ..., 3831, 3839
	Lane7	8, 16, 24, ..., 3832, 3840



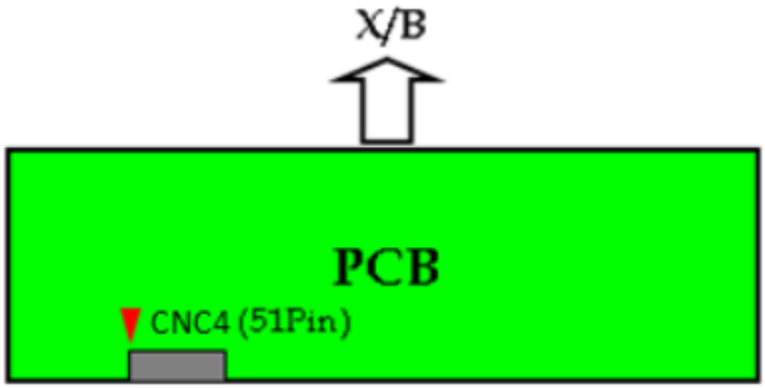
Note (2) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.



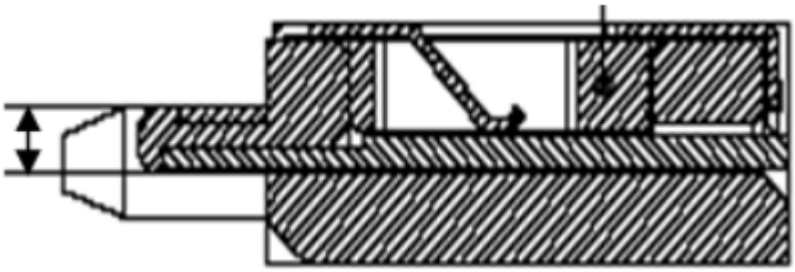
Note (3) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.



Note (4) V-by-One HS connector pin order defined as follows



Note (5) V-by-One connector mating dimension range request is 0.93mm~1.0mm as below



Note (6) Reserved for internal use. Please leave it open.

2.3 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 10-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																													
		Red										Green										Blue									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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
	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
	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
	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
	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
	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	Red (0) / Dark	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
	Red (1)	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	0
	Red (2)	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	0	0
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	Red (1021)	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1022)	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	0
	Red (1023)	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
Gray Scale Of Green	Green (0) / Dark	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
	Green (1)	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	0
	Green (2)	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	0	0
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	Green (1021)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	Green (1022)	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	0
	Green (1023)	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
Gray Scale Of Blue	Blue (0) / Dark	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 (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	1
	Blue (2)	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	1	0
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	Blue (1021)	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	0	1
	Blue (1022)	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	0
	Blue (1023)	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

Note (1) 0: Low Level Voltage， 1: High Level Voltage

2.4 Input Signal Timing Specifications

The input signal timing specifications are shown as the following table and timing diagram.
(Ta = 25 ± 2 ºC)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frequency	Data Clock	1/Tc	70	74.25	80	MHZ	(1)
V-by-One Receiver	Intra-Pair skew		-0.3	–	0.3	UI	(2)
	Inter-pair skew		-5	–	5	UI	(3)
	Spread spectrum modulation range	F_{clkin_mod}	1/Tc-0.5%	–	1/Tc+0.5%	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}	–	–	30	KHz	

Timing spec for QFHD Frame Rate = 50Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame rate	2D mode		Fr	49	50	51	Hz	
Frequency			Fh	122.8	135	140	KHz	
Vertical Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Tv	2200	2700	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	40	540	630	Th	
Horizontal Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Th	530	550	570	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	70	90	Tc	

Timing spec for QFHD Frame Rate = 60Hz

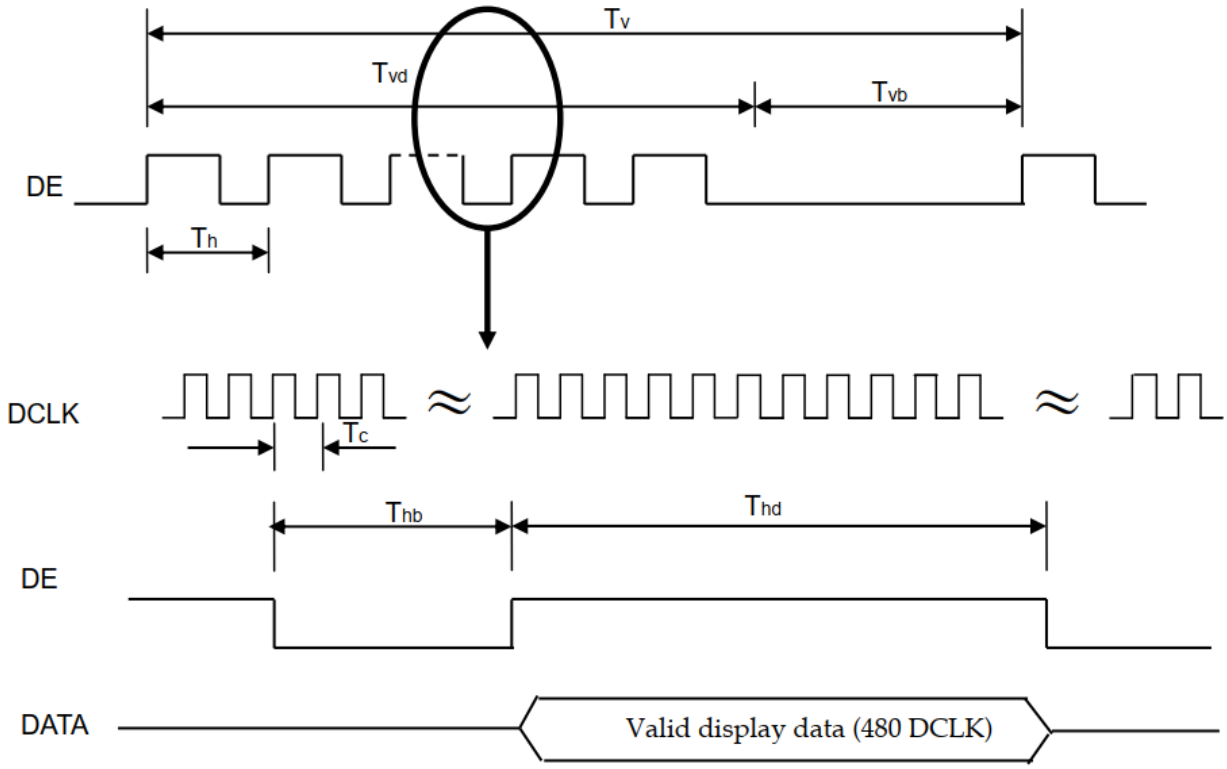
Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	59	60	61	Hz	
Frequency			Fh	122.8	135	140	KHz	
Vertical Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Tv	2200	2250	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	40	90	630	Th	
Horizontal Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Th	530	550	570	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	70	90	Tc	

Note (1) Please make sure the range of pixel clock has follow the below equation：

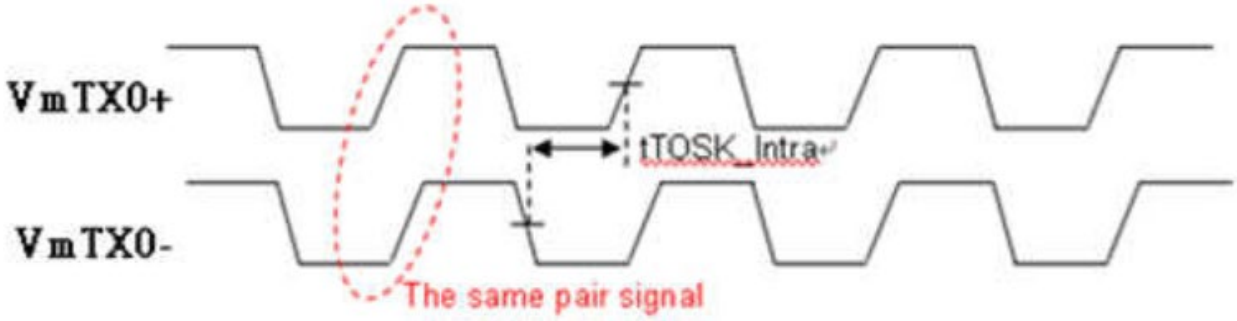
Fclkin(max)≧Fr╳Tv╳Th

Fr╳Tv╳Th≧Fclkin (min)

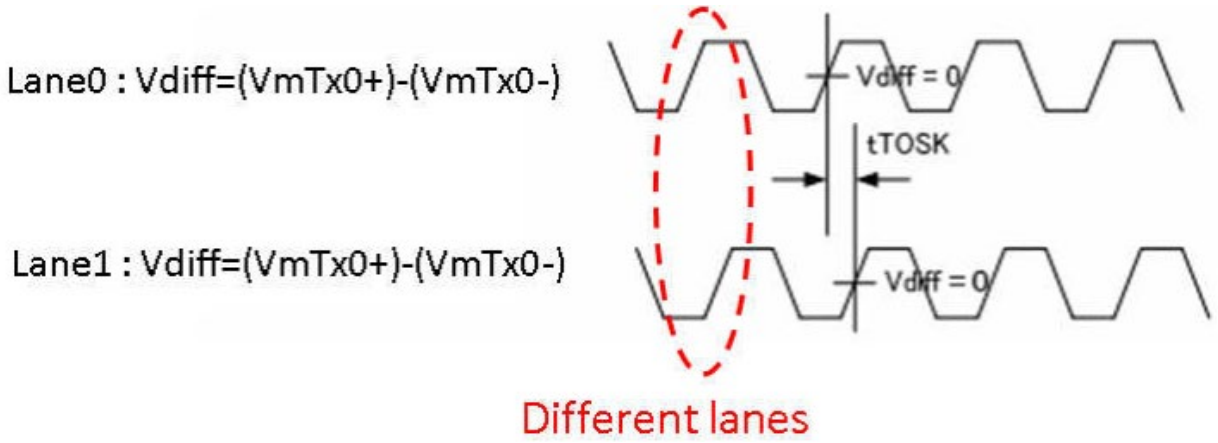
INPUT SIGNAL TIMING DIAGRAM



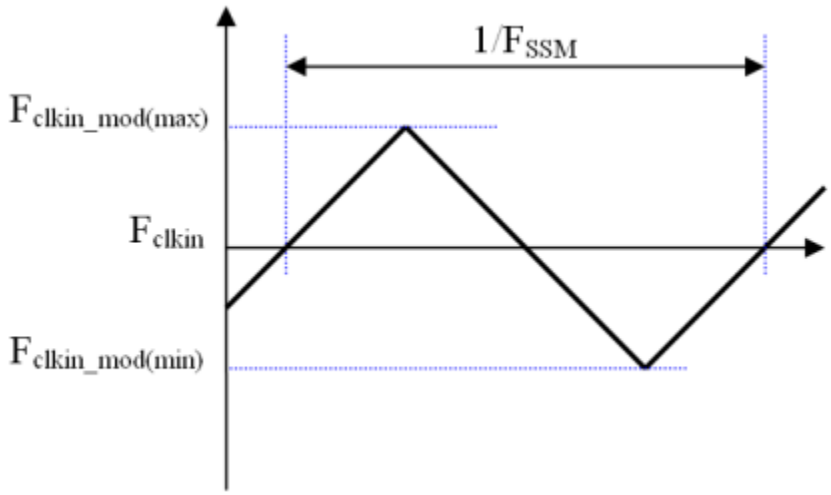
Note (2) Intra-pair Data skew.



Note (3) V-by-One HS Inter-pair skew.



Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



2.5 V by One Input Signal Timing Diagram

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

PLL bandwidth : 40MHz

Damping facto : 1.4

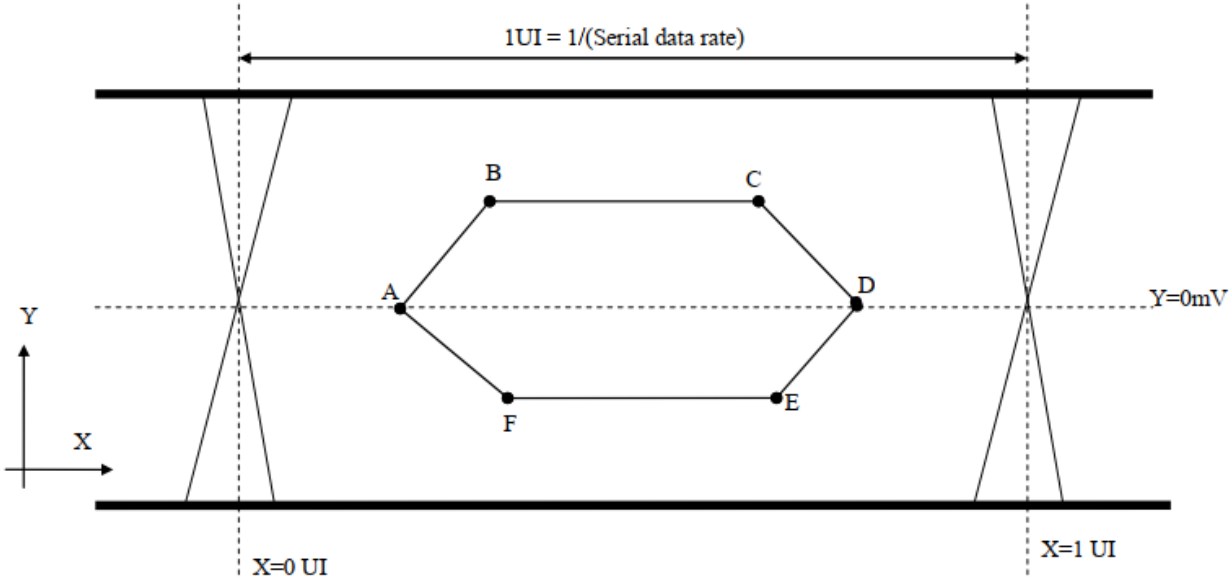


Table 1 Eye Mask Specification

	X [UI]	Y [mV]	Note
A	0.25	0	(1)
B	0.3	50	(1)
C	0.7	50	(1)
D	0.75	0	(1)
E	0.7	-50	(1)
F	0.3	-50	(1)

Note (1) Input levels of V-by-One HS signals are comes from “V-by-One HS Stander Ver.1.4”

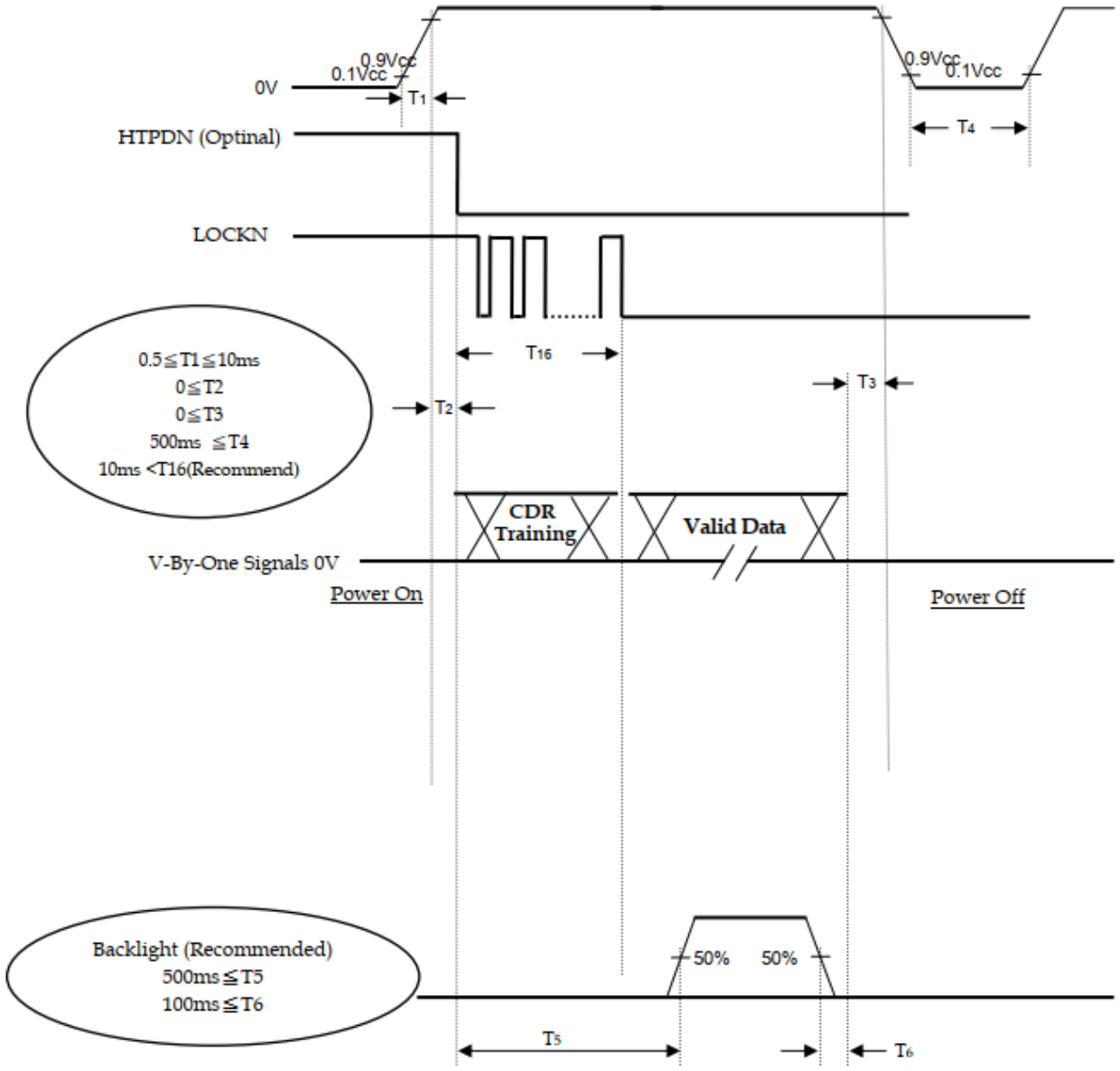
2.6 Byte Length and Color mapping of V-by-One HS

Packer input & Unpacker output		30bpp RGB (10bit)
Byte 0	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]
Byte 1	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]
Byte 2	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]
Byte 3	D[24]	X
	D[25]	X
	D[26]	B[0]
	D[27]	B[1]
	D[28]	G[0]
	D[29]	G[1]
	D[30]	R[0]
	D[31]	R[1]

2.7 Power ON/OFF Sequence

(Ta = 25 ± 2 ºC)

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



Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If T2<0, that maybe cause electrical overstress failure

Note (3) T4 should be measured after the module has been fully discharged between power off and on period.

Note (4) Vcc must decay smoothly when power-off.

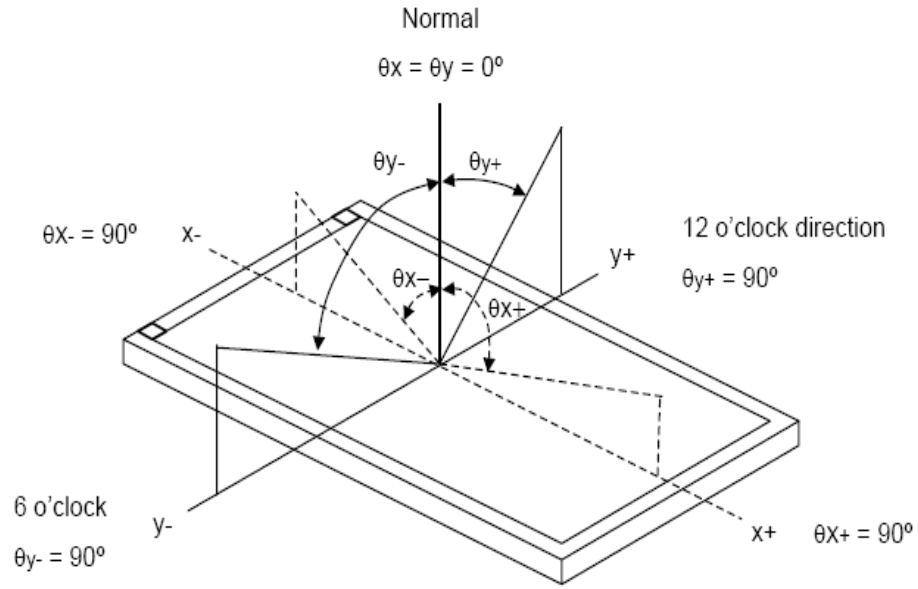
Note (5) Optional: For customer reference signal. It can be ignored if customer not use

3 Optical Specification

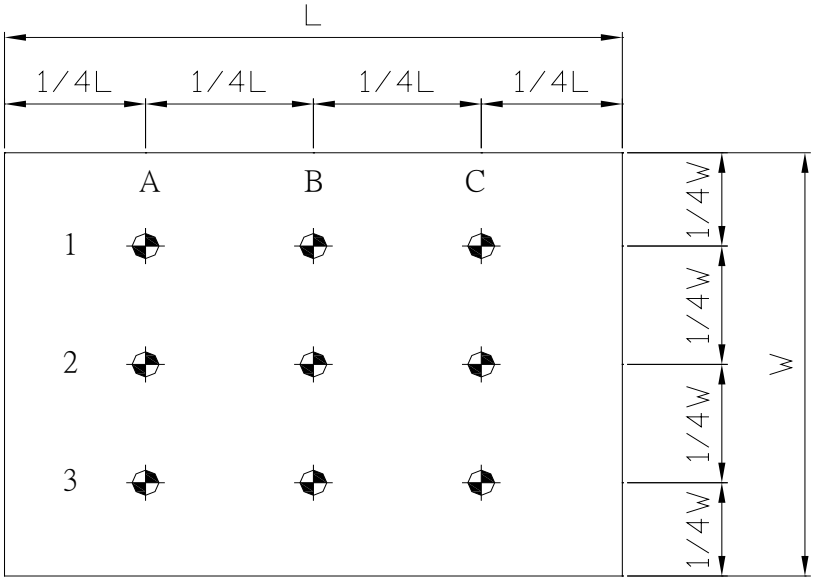
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 Klein K-10	0.622	0.652	0.682	-	Test Mode: (1) (2) (3)
		Ry		0.303	0.333	0.363	-	
	Green	Gx		0.263	0.293	0.323	-	
		Gy		0.616	0.646	0.676	-	
	Blue	Bx		0.117	0.147	0.177	-	
		By		0.020	0.050	0.080	-	
	White	Wx		0.247	0.277	0.307	-	
		Wy		0.278	0.308	0.338	-	
Center Luminance of White		Lc	θx=0 θy=0 BM-7		2000		cd/m^2	
Uniform		Lu			75		%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10		5600:1		-	Test Mode: (1) (4)
Color Saturation		NTSC			84		%	
Viewing Angle	Horizontal	θx+	CR ≥ 10		89		Deg	Test Mode: (1) (3)
		θx-			89			
	Vertical	θy+			89			
		θy-			89			

Test Mode：

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

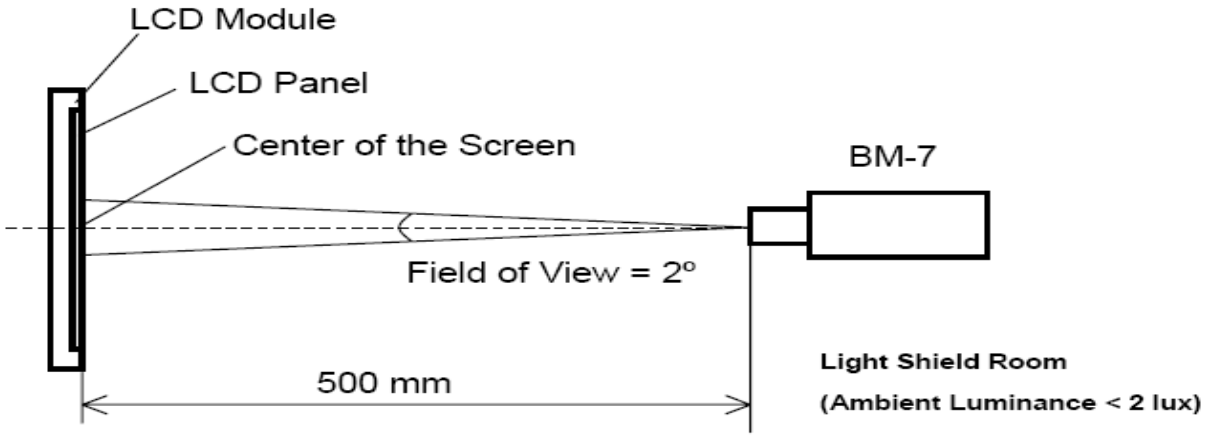


(2) Definition of Test Point:

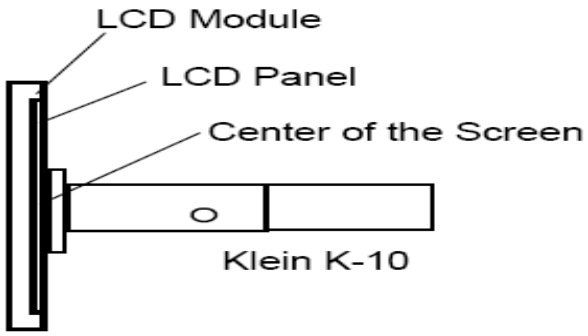


Active Area

(3) BM-7 Measurement Setup:



(4) Klein K-10 Measurement Setup:



4 LED Driving Board Specifications

This specification is applied to LED converter unit for SSD6740-I LED backlight.

4.1 Operating Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	Vin		22.0	24.0	26.0	V	
Input Current (Low Brightness)	IinL	Brightness = 0%	0.0	-----	-----	mA	
Input Current (High Brightness)	IinH	Brightness = 100%	6.22	5.81	5.49	A	(1)
LED Current (Low Brightness)	IoutL	Brightness = 0%	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	Brightness = 100%	2.57	2.6	2.63	A	J1、J2
			1.27	1.3	1.33	A	J7
Working Frequency	W_Freq	Brightness = 100%	350	400	450	KHZ	
Brightness Control	DC mode						
	Vadj	Connection of Voltage	0.2	-----	4.8	V	(2)
	PWM mode						
	PWM	Connect to PWM	0	-----	100	%	(3)
	Freq		-----	200	1000	Hz	(4)
ON/OFF Control	Von	Normal Operation	2	-----	5	V	
	Voff		0	-----	0.8	V	
Output Voltage	Vout	Brightness = 100%	30.3	30.8	31.3	V	J1、J2
			30.3	30.8	31.3	V	J7
Efficiency	η	Brightness = 100%	85.0	86.1	86.7	%	(5)

Remark:

(1)this data is based on the testing result of practical input voltage, Iin is measured by related Vin. (min, typ, max)

(2)Max brightness at Vadj=0.2V. Min brightness at Vadj=4.8V.

(3)Max dimming ratio = 1:100.

(4)Frequency can be adjusted in accordance with demand(120Hz minimum, or lights will be flickering)

(5)η max = Vout(max)*IoutH(max)/Vin(max)*IinH(min)

η min = Vout(min)*IoutH (min)/Vin(min)*IinH(max)

4.2 Connector Socket

Input Connector: CN1(JST B10B-PH-K-S or Compatible)

PIN No	Symbol	Description
1	Vin	DC+
2	Vin	DC+
3	Vin	DC+
4	Vin	DC+
5	Vin	DC+
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	GND	Ground

DC or PWM Connector: CN2

PIN No	Symbol	Description
1	DC	Close pin 1,2 LED driver is DC dimming
2	GND	
3	GND	Close pin 2,3 LED driver is PWM dimming

Note:If you use CN2 to set DC/PWM, please NC the pin1 of CN3.

Input Connector: CN3(JST B3B-PH-K-S or Compatible)

PIN No	Symbol	Description
1	CL	PWM or DC selection
2	Control	ON/OFF Control
3	Brightness	Brightness Control
4	GND	Ground

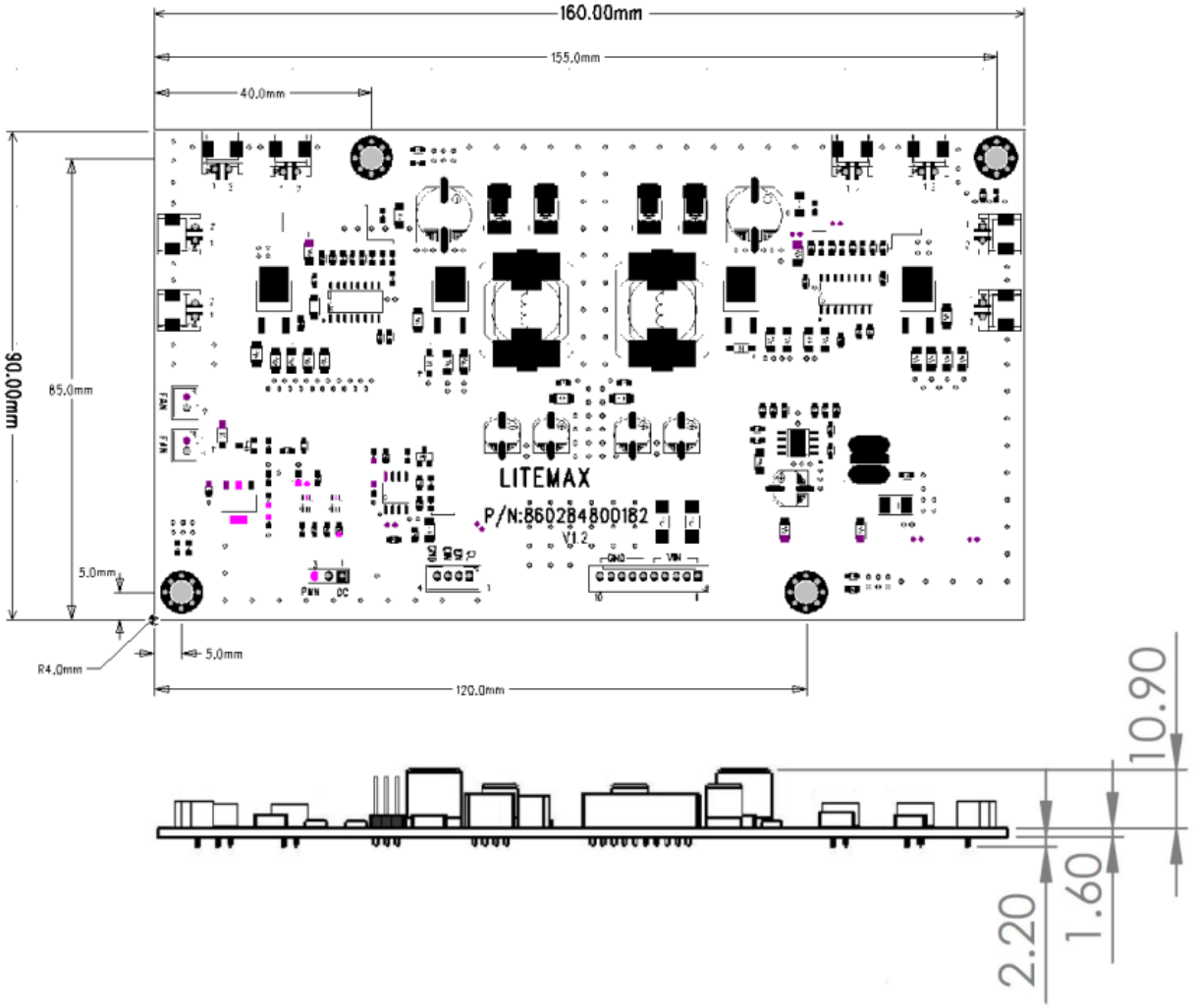
Note:Pin1 is dimming method control pin, Low → DC dimming, High → PWM dimming.
If pin1 is be used, please NC CN2.

Output Connector: J1,J2,J7,J8 (JST S2B-EH or Compatible)

PIN NO	Symbol	Description
1	Output	LED High Voltage(+)
2	Output	LED Low Voltage (-)

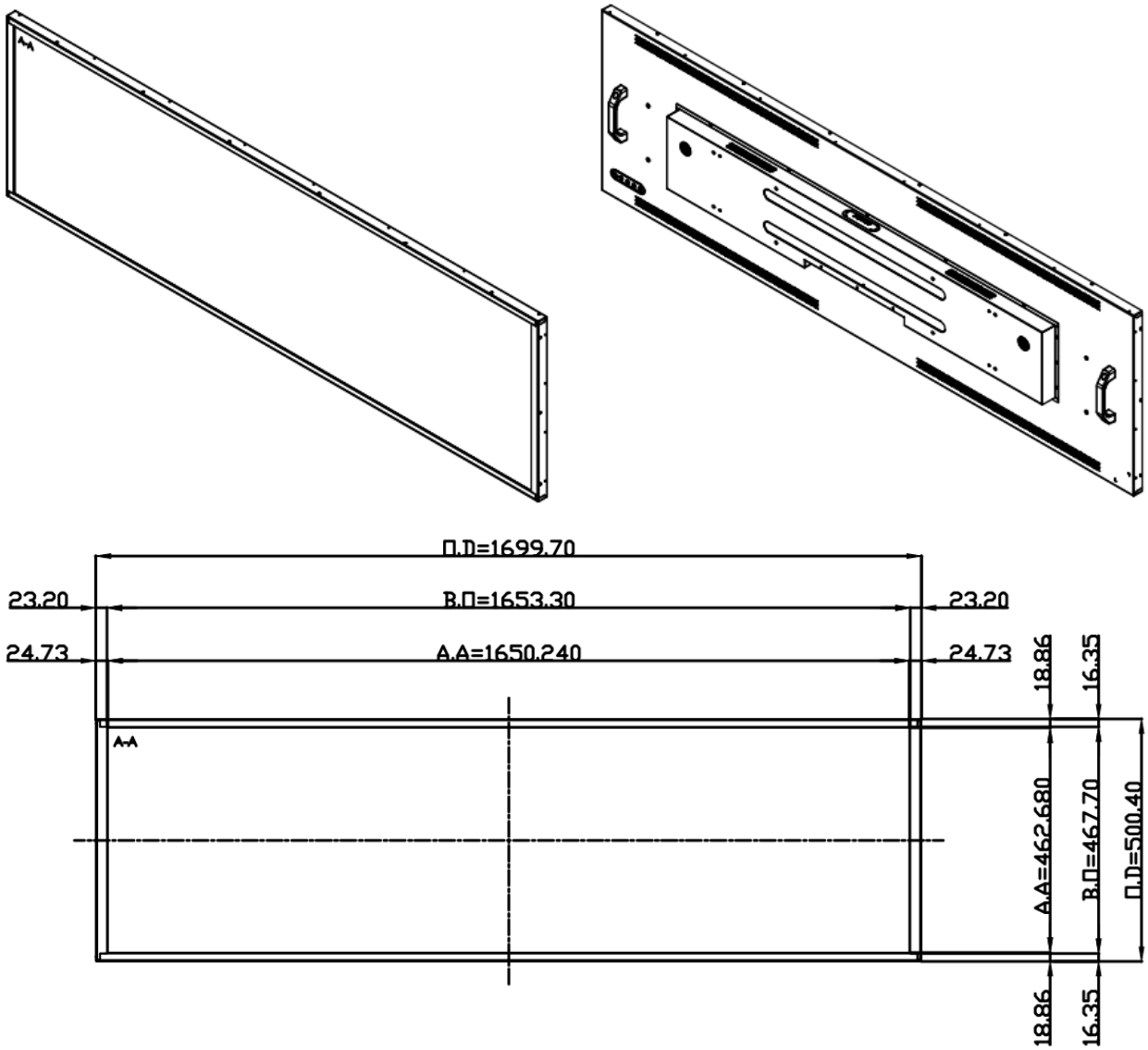
4.3 Mechanical Characteristics

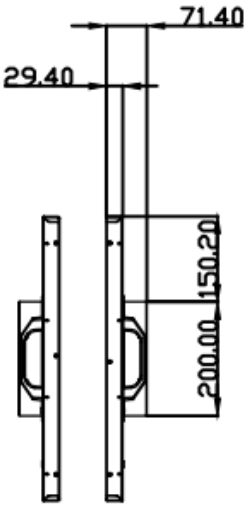
Dimension: 160mm x 90mm x 12.5mm

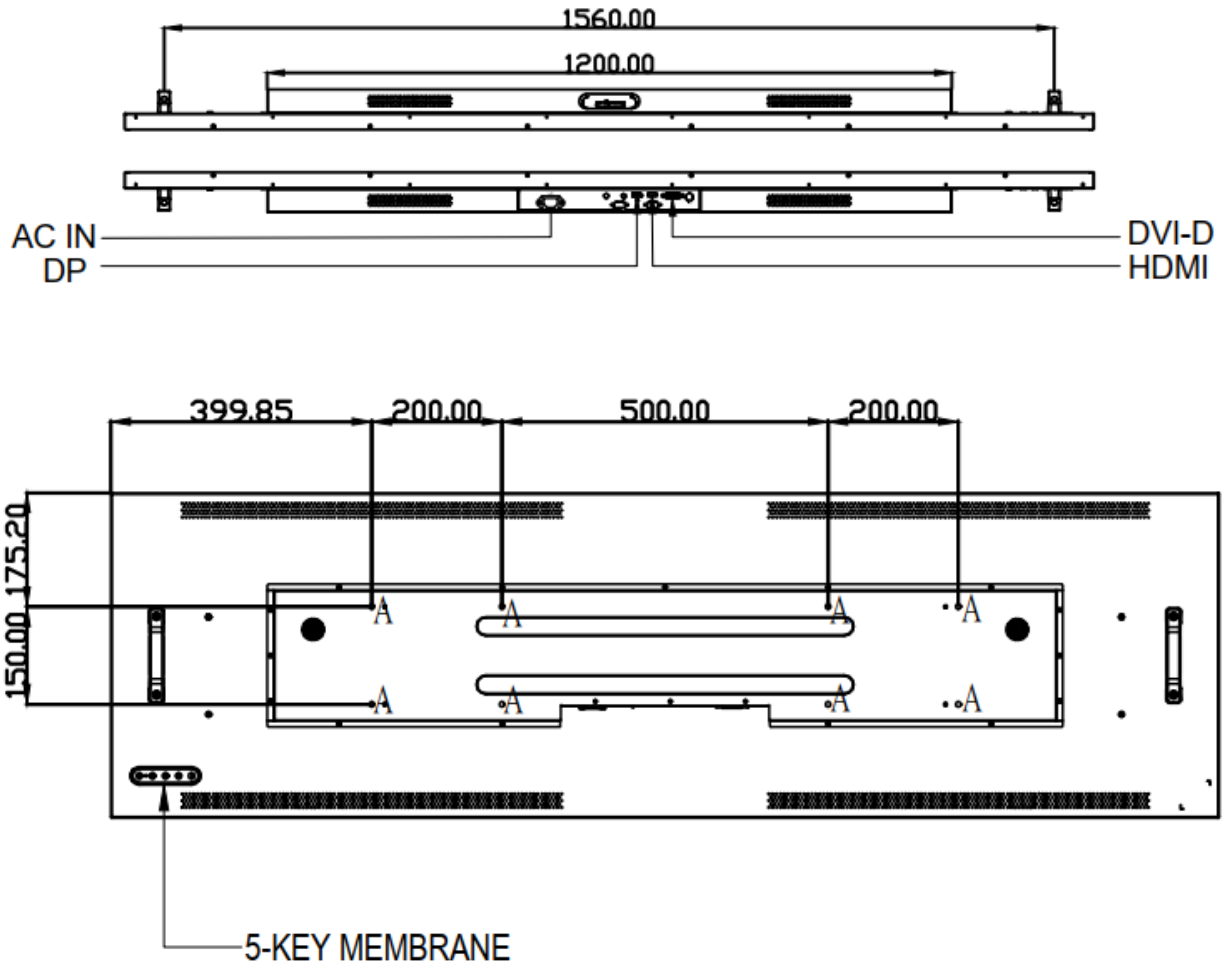


5 Mechanical Drawing

Unit:mm







Note :

O.D. : OUTLINE DIMENSION

B.O. : BEZEL OPENING

A.A. : LCD ACTIVE AREA

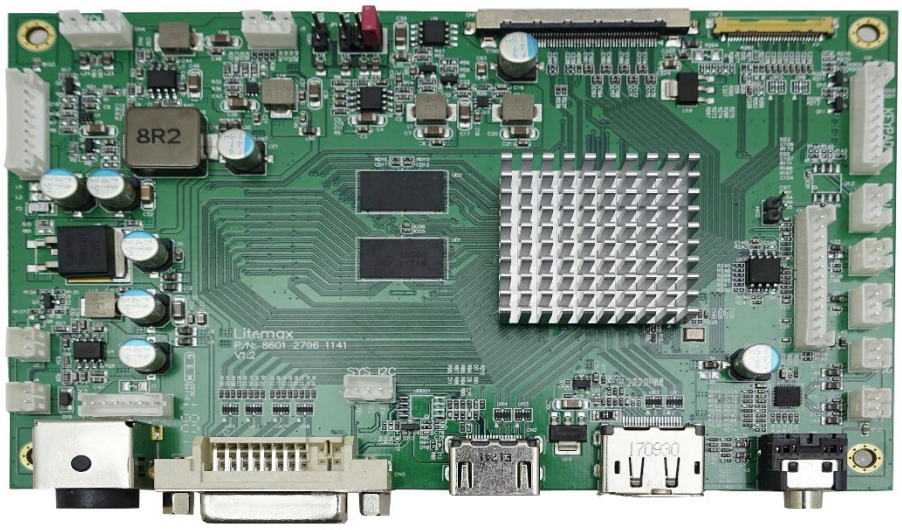
A : 8-M8_USER HOLE_MAX Depth=15mm

6 AD2796GDHP Board & OSD Functions

AD2796 is a good performance AD board for Litemax 4K resolution display product. Input interface supports VGA, DVI dual link, HDMI, DP. Output supports V-by-1 and eDP panel. Max resolution up to 4096x2160. For high level application, AD2796 supports PIP, and screen rotation by embedded frame buffer.

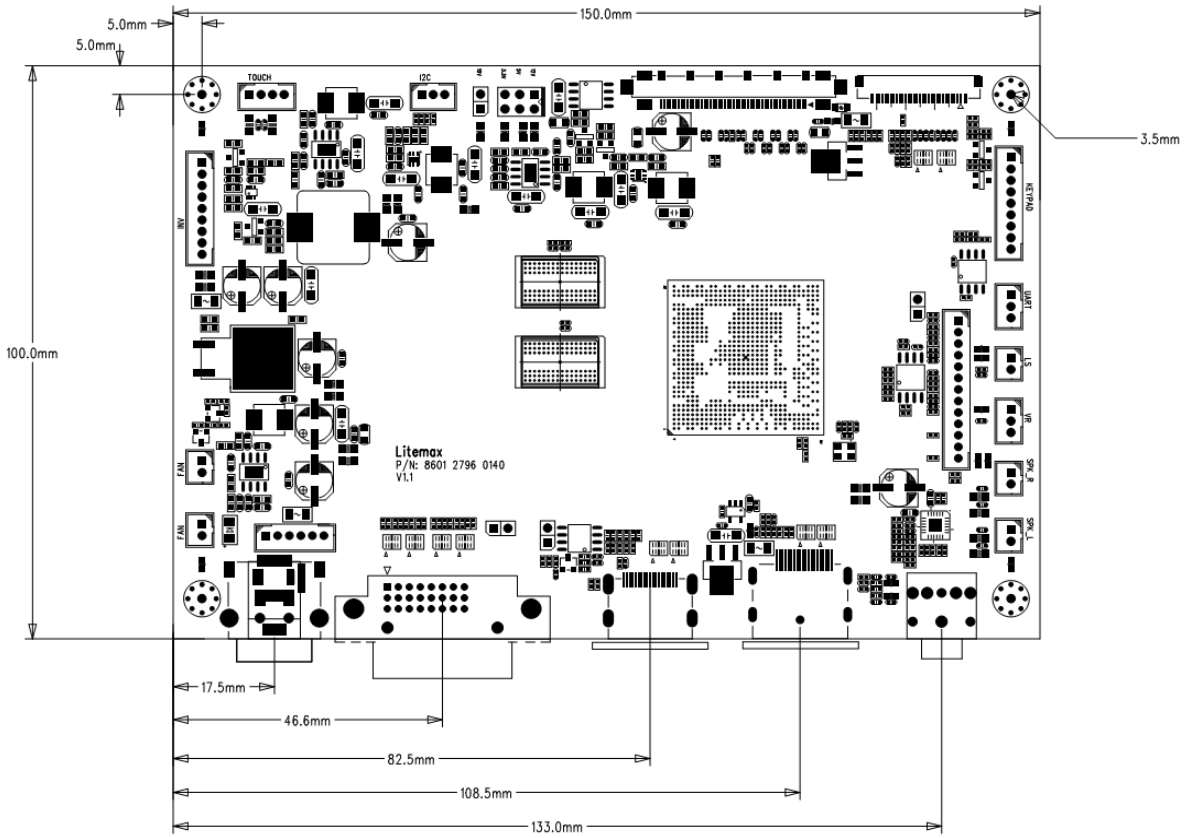
6.1 General Description

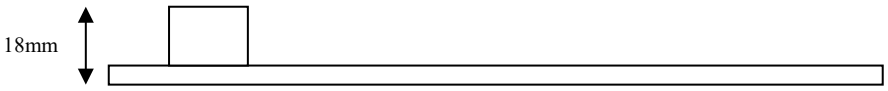
- Max resolution 4096x2160 60Hz
- One VGA input, supports 1080P. (Optional)
- One HDMI 2.0, supports 4096x2160 60Hz.
- One Display port 1.2, supports 4096x2160 60Hz.
- One DVI dual link, supports 4096x2160 30Hz.
- Support PIP, PBP, and 90, 180, 270 degree rotation.
- Embedded MCU with ADC port for VR, light sensor application.
- Support HDCP 1.4.
- Audio line in and speaker output.(Optional)
- Embedded OSD.
- Support V-by-1, eDP panel



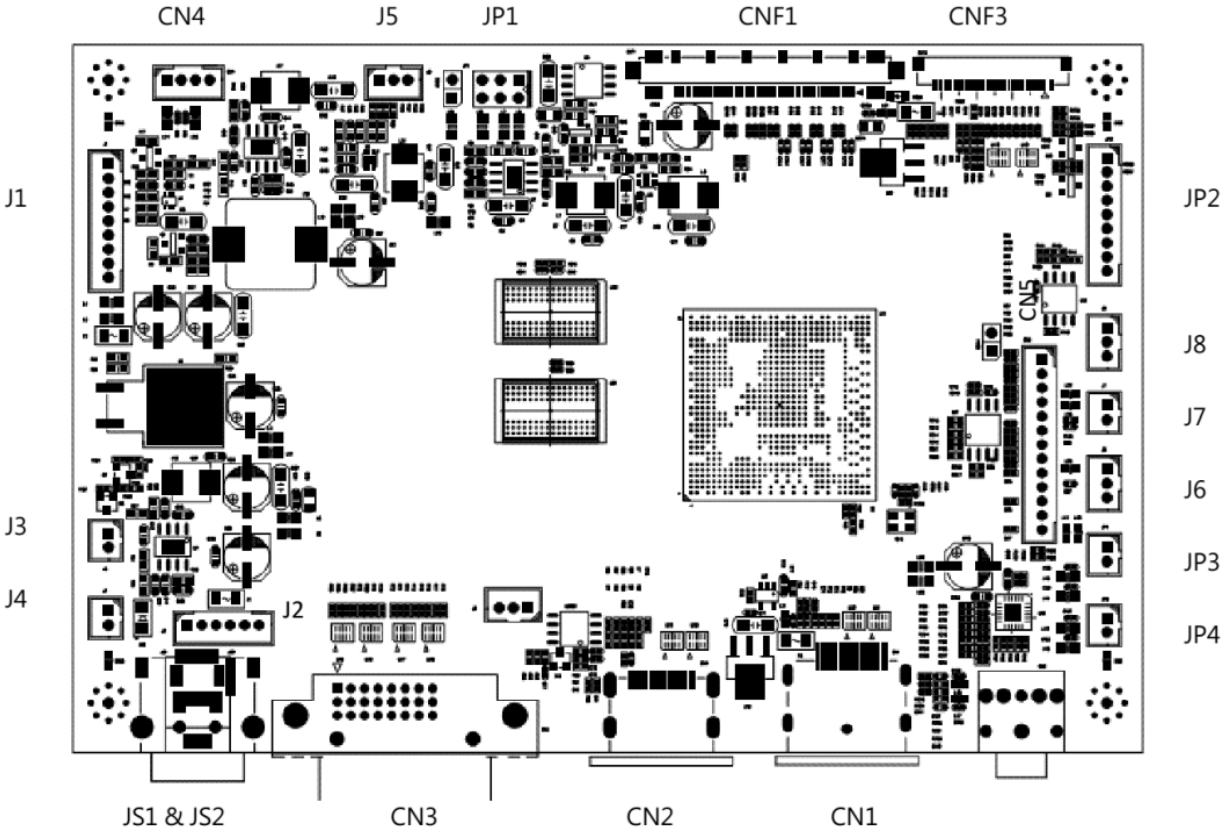
6.2 Outline Dimensions

AD2796GDHP 150mm x 100mm





6.3 AD2796GDHP Board Pin Define



- CNF1: V-by-one output

Pin	Function	Pin	Function
1	GND	27	HPD
2	X7P	28	8b/10b SEL
3	X7N	29	NC
4	GND	30	NC
5	X6P	31	NC
6	X6N	32	NC
7	GND	33	SCL
8	X5P	34	SDA
9	X5N	35	NC
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		

- CN3: DVI dual-link

Pin	Function	Pin	Function	Pin	Function
1	TMDS Data2-	9	TMDS Data1-	17	TMDS Data0-
2	TMDS Data2+	10	TMDS Data1+	18	TMDS Data0+
3	Shield	11	Shield	19	Shield
4	TMDS Data4-	12	TMDS Data3-	20	TMDS Data5-
5	TMDS Data4+	13	TMDS Data3+	21	TMDS Data5+
6	DDC Clock	14	+5V Power	22	Shield
7	DDC Data	15	Power ground	23	TMDS Clock+
8	Vertical SYNC	16	Hot Plug Detect	24	TMDS Clock-

- CN5: VGA input (Wafer 2.0mm pitch 13Pins)

Pin	Function	Pin	Function
1	SDA	8	BLUE_RTN
2	SCL	9	BLUE
3	GND	10	GREEN_RTN
4	+5V	11	GREEN
5	GND	12	RED_RTN
6	VSYNC	13	RED

7	HSYNC		

- CN2: HDMI input

Pin	Function	Pin	Function	Pin	Function
1	TMDS Data2+	9	TMDS Data0-	17	GND
2	Shield	10	TMDS Clock+	18	HDMI +5V
3	TMDS Data2-	11	Shield	19	HPD
4	TMDS Data1+	12	TMDS Clock-		
5	Shield	13	CEC		
6	TMDS Data1-	14	NC		
7	TMDS Data0+	15	HDMI_SCL		
8	Shield	16	HDMI_SDA		

- CN1: DisplayPort input

Pin	Function	Pin	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

- JS2: Power input (Power Din 4 pin)

Pin	Function	Pin	Function
1	Power Input	3	GND
2	Power Input	4	GND

- JS1: Power input (Power Jack 3 pin)

Pin	Function	Pin	Function
1	Power Input	3	GND
2	GND		

- J2: Power input (Wafer 2.0mm pitch 6 pin)

Pin	Function	Pin	Function
1	Power Input	4	GND
2	Power Input	5	GND
3	Power Input	6	GND

- CN4: Reserved 12/5V (Wafer 2.0mm pitch 4 pin)

Pin	Function	Pin	Function
1	5V	3	12V
2	GND	4	GND

- J1: Backlight Power and Control (Wafer 2.0mm pitch 9 pin)

Pin	Function	Pin	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.

- J3, J4: 12V for Fan power (Wafer 2.0mm pitch 2 pin)

Pin	Function	Pin	Function
1	Fan+ (12V)	2	Fan-

- JP2: Keypad (Wafer 2.0mm pitch 9 pin)

Pin	Function	Pin	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		

➢ J6: VR (Wafer 2.0mm pitch 3 pin)

Pin	Function	Pin	Function
1	3.3V	3	GND
2	VR		

➢ J7: Light sensor (Wafer 2.0mm pitch 2 pin)

Pin	Function	Pin	Function
1	5V	2	Sensor Out

➢ JP1: Panel power selection (2.54mm pitch 2x3 jump) (Note4)

Pin	Function	Pin	Function
1-2 close	12V	5-6 close	3.3V
3-4 close	5V		

➢ SSW1: Panel power selection (2.54mm pitch 2x1 jump) (Note4)

Pin	Function		
1-2 close	10V		

Note4: Panel power selection can only be chosen one. If you short multi jump at the same time, it will damage product.

➢ JP3, JP4: Speaker output (Wafer 2.0mm pitch 2 pin)

Pin	Function	Pin	Function
1	SPK+	2	SPK-

➢ J8: UART (Wafer 2.0mm pitch 3 pin)

Pin	Function	Pin	Function
1	TX	3	GND
2	RX		

- J5: I2C (Wafer 2.0mm pitch 3 pin)

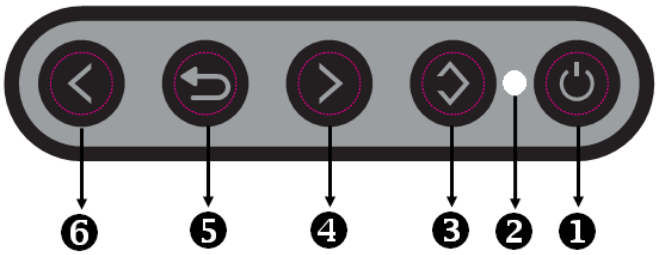
Pin	Function	Pin	Function
1	SDA	3	GND
2	SCL		

- CNF3: eDP output

Pin	Function	Pin	Function
1	GND	16	GND
2	NC	17	AUX_P
3	GND	18	AUX_N
4	GND	19	GND
5	L3N	20	HPD
6	L3P	21	GND
7	GND	22	NC
8	L2N	23	NC
9	L2P	24	GND
10	GND	25	NC
11	L1N	26	Panel power
12	L1P	27	Panel power
13	GND	28	Panel power
14	L0N	29	Panel power
15	L0P	30	Panel power

6.4 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**

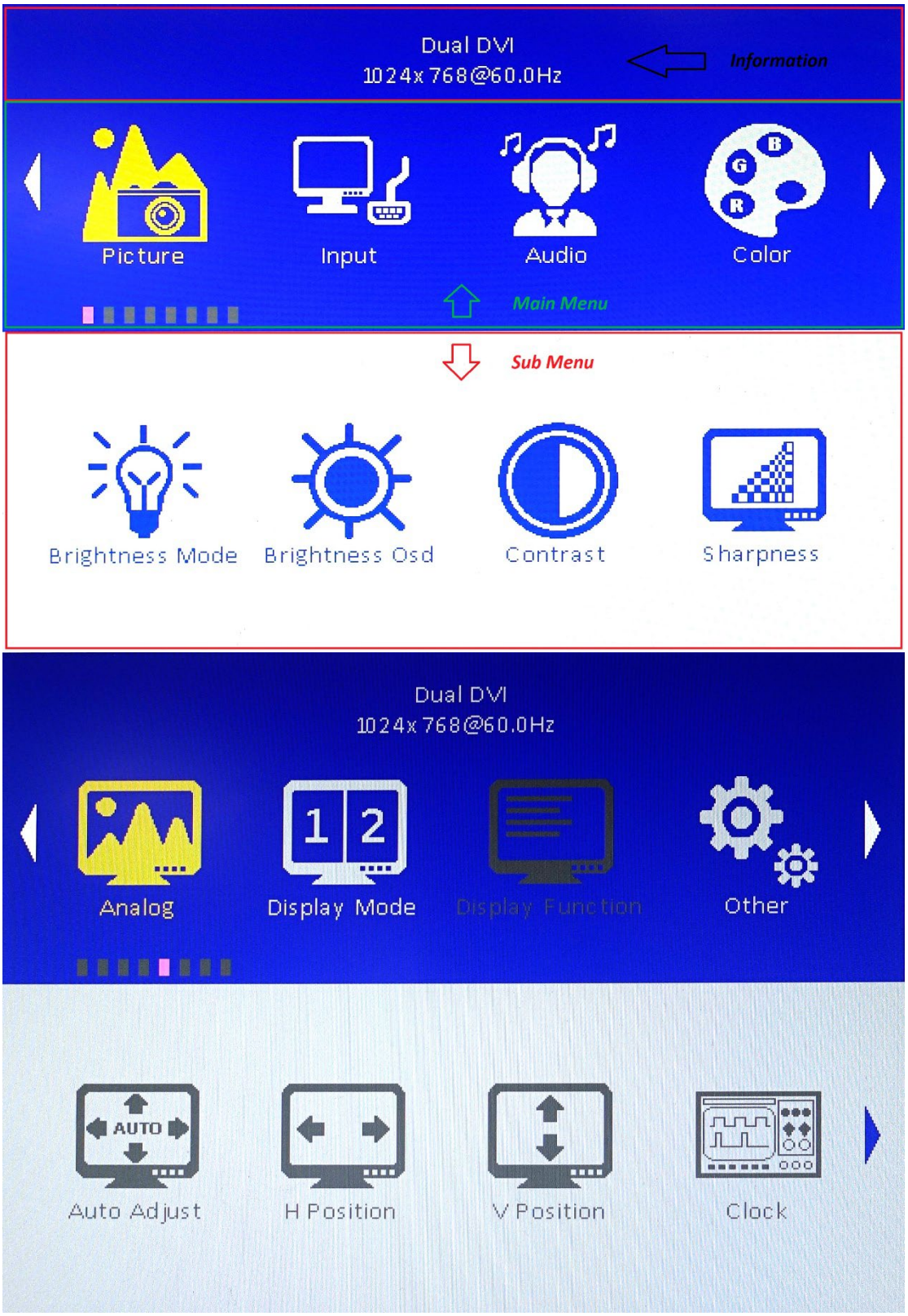
   After finishing the adjustment, push the  button to memorize the setting.

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.

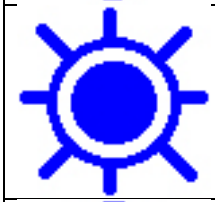
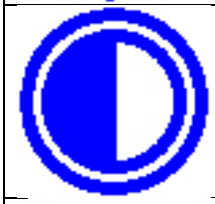
6.5 OSD Menu

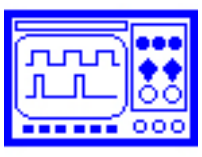
By pressing the “menu” button, you will see the below picture. Across from timing you will see resolution, frequency, and V-frequency of the panel. These cannot be altered by the user.

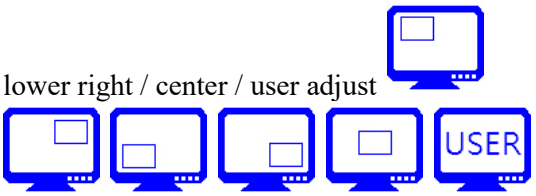


【Information】Display screen information, include input source and resolution.

【Main menu】Main function 【Sub menu】Sub function

Main	Sub	Function
		Brightness mode select: Brightness / VR / Light sensor 
		Brightness adjust: 0 to 100
		Contrast adjust: 0 to 100
		Sharpness adjust: 0 to 4
		Input source select: VGA
		Input source select: DP
		Input source select: HDMI
		Input source select: DVI

		Auto detect function
		Volume adjust: 0 to 100
		Mute ON/OFF
		Color temperature mode: 9300 / 6500 / User 
		Saturation adjust: 0 to 100
		Auto adjust [VGA input only]
		Horizontal position adjust for image: 0 to 100 [VGA input only]
		Vertical position adjust for image: 0 to 100 [VGA input only]
		Clock adjust: 0 to 100 [VGA input only]

		Phase adjust: 0 to 100 [VGA input only]
		PIP disable
		PIP enable
		PIP position setting: top left / top right / lower left / lower right / center / user adjust 
		PIP size adjust: 0 to 10
		Main and sub image swap
		System reset
		OSD menu time: 10 to 60 (Second)
		OSD horizontal position adjust: 0 to 100

		OSD vertical position adjust: 0 to 100
		OSD transparency adjust: 0 to 255
		OSD rotate: 0 / 90 / 270

OSD MENU FUNCTION STRUCTURE

OSD			Input Source		PIP
Main	Sub	Value	VGA	DVI / HDMI / DP	ENABLE
Picture	Brightness Mode	OSD / VR / LS	◎	◎	◎
	Brightness	0~100	◎	◎	◎
	Contrast	0~100	◎	◎	◎
	Sharpness	0~4	◎	◎	◎
Input		VGA / DP / HDMI / DVI / Auto	◎	◎	
		Main: VGA / DP / HDMI / DVI / Auto Sub: VGA / DP / HDMI / DVI / Auto			◎
Audio	Volume	0~100	◎	◎	◎
	Mute	ON / OFF	◎	◎	◎
Color	Temperature	9300 / 6500 / User	◎	◎	◎
	Saturation	0~100	◎	◎	◎
Analog	Auto Adjust		◎		◎
	Horizontal Position	0~100	◎		◎
	Vertical Position	0~100	◎		◎
	Clock	0~100	◎		◎
	Phase	0~100	◎		◎
Display Mode		1P / 2P PIP	◎	◎	◎
Display Function	PIP Position	Top left / Top right / Lower left / Lower right / Center / User			◎

	PIP Size	0~10			◎
	Input SWAP				◎
Other	Reset		◎	◎	◎
	Menu Time	10~60	◎	◎	◎
	OSD Horizontal Position	0~100	◎	◎	◎
	OSD Vertical Position	0~100	◎	◎	◎
	Transparency	0~255	◎	◎	◎
	Rotate	0 / 90 / 270	◎	◎	◎
◎Support					

7 Precautions

7.1 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.

7.2 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.

7.3 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.

8 Disclaimer

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