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DURApixel LED B/L LCD

RoHS·WEEE LITEMAX COMPLIANT

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DLD6501-B

Sunlight Readable 65” LED B/L LCD

User Manual

Customer	Approved by	Checked by	Prepared by

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Record of Revision

Version and Date	Page	Old Description	New Description	Remark
Jun/25/2024	all		Initial release	

Contents

4 General Description

The DLD6501-B is a 65 inch industrial grade sunlight readable LCD, with high brightness 2500 nits, it produce sharp images, crisp text and lifelike colors. The Durapixel LED backlight technology ensures high reliability and low power consumption, suitable for outdoor application, kiosk, factory automation, military, transportation and gaming application.

1.1 Key Features

- High Brightness 2500 nits
- Sunlight Readable
- LED Backlight
- Low Power Consumption
- LCD Blacking Defect Free (Hi-Tni 105℃)
- Wide Temperature -20 ˚C ~ 60 ˚C
- BL MTBF: 100,000 hours

1.2 General Specifications

Model Name	DLD6501-B
Description	65″ TFT LCD, 2500 nits LED backlight, 3840 x 2160
Screen Size	65″
Display Area (mm)	1428.48(H) x 803.52(V)
Brightness	2500 cd/m^2
Resolution	3840 x 2160
Aspect Ratio	16 : 9
Contrast Ratio	1100 : 1
Pixel Pitch (mm)	0.372(H) x 0.372(V)
Pixel Per Inch (PPI)	68
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	79%
Display Colors	1.07G
Response Time (Typical)	10ms
Panel Interface	V-by-One
Input Interface	DVI-D, HDMI, DP
Input Power	AC100~240V
Power Consumption	419W
OSD Key	5 Keys (Power Switch, Menu, +, Exit, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position…etc
Dimensions (mm)	1474.2 x 849.2 x 96.01
Bezel Size(U/B/L/R)	22.84/22.84/22.86/22.86 mm
Weight	48 kg
Mounting	400x200mm , 400x400mm
Operating Temperature	-20 ˚C ~ 60 ˚C
Storage Temperature	-20 ˚C ~ 60 ˚C

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

1.3 Absolute Maximum Rating

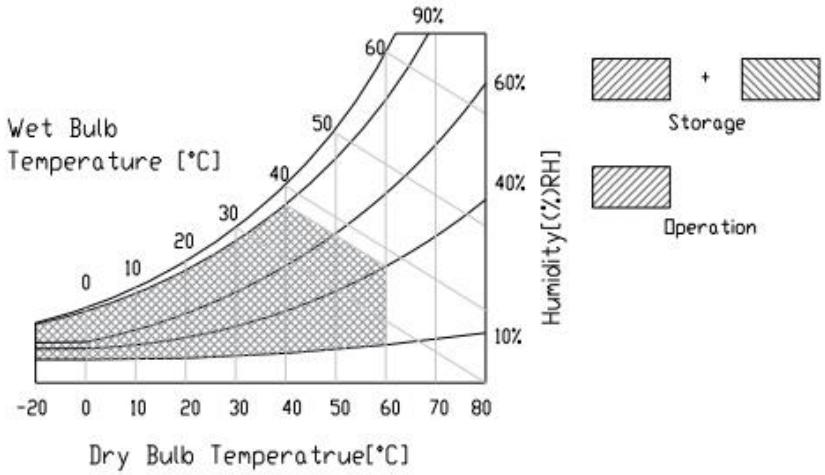
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in below Table.

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Operating Temperature	T_{OP}	-20	+60	℃	Note
Storage Temperature	T_{SUR}	-20	+60	℃	
	T_{ST}	-20	+60	℃	
Operating Ambient Humidity	Hop	10	80	%RH	
Storage Humidity	Hst	10	80	%RH	

Note 1 : Temperature and relative humidity range are shown in the figure below.

Note 2 : Wet bulb temperature should be 39℃max. and no condensation of water.



2 Electrical Specification

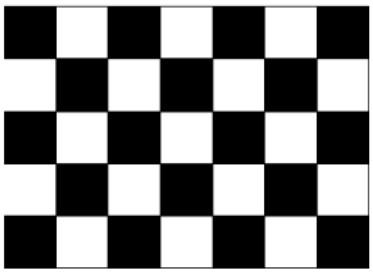
2.1 TFT LCD

[Ta =25±2 ℃]

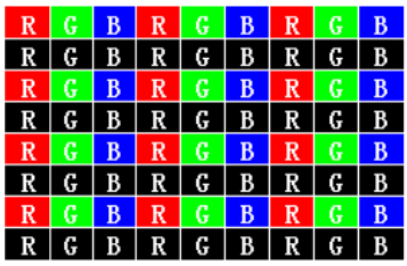
Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	13.2	Vdc	
Power Supply Ripple Voltage		VRP	-	-	600	mV	
Power Supply Current		IDD	-	900	2000	mA	Note 1
Power Consumption		PDD	-	10.8	24	Watt	
Rush current		IRUSH	-	-	10	A	Note 2
V by One Interface	Differential Input High Threshold Voltage	VLVTH	-	-	+50	mV	-
	Differential Input Low Threshold Voltage	VLVTL	-50	-	-	mV	-
	Common Input Voltage	VLVC	-	-	-	V	-
	Terminating Resistor	Rt	90	100	110	ohm	-
CMOS Interface	Input High Threshold Voltage	VIH	2.31	-	3.3	V	
	Input Low Threshold Voltage	VIL	-	-	0.8	V	

Note 1 : The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=12.0V,
Frame ratefV=60Hz and Clock frequency = 74.25MHz.
Test Pattern of power supply current

Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 0.5ms(min)



a) Typ : Mosaic 7X5 (L0/L255)



b) Max : Horizontal 1 Line (L0/L255)

c) Flicker Test Pattern

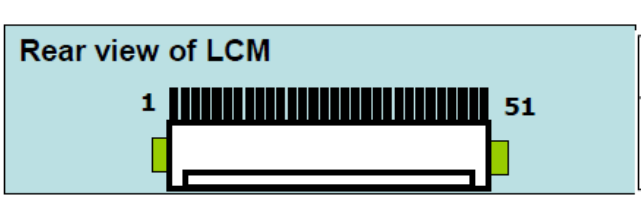
2.2 Interface Connection

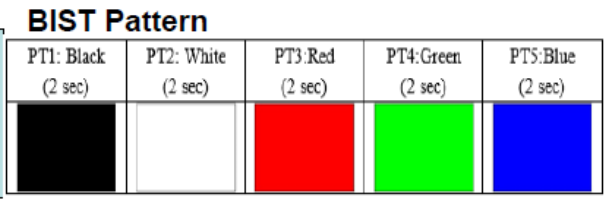
V by One Connector: FI-RXE51S-HF (manufactured by JAE) or compatible

Pin No	Symbol	Description	Pin 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 Lane 0
3	VDD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VDD	Power Supply +12.0V	30	GND	Ground
5	VDD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VDD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VDD	Power Supply +12.0V	33	GND	Ground
8	VDD	Power Supply +12.0V	34	Rx2n	V-by-One HS Data Lane 2
9	NC	No Connection	35	Rx2p	V-by-One HS Data Lane 2
10	GND	Ground	36	GND	Ground
11	GND	Ground	37	Rx3n	V-by-One HS Data Lane 3
12	GND	Ground	38	Rx3p	V-by-One HS Data Lane 3
13	GND	Ground	39	GND	Ground
14	GND	Ground	40	Rx4n	V-by-One HS Data Lane 4
15	NC	No Connection	41	Rx4p	V-by-One HS Data Lane 4
16	NC	No Connection	42	GND	Ground
17	NC	No Connection	43	Rx5n	V-by-One HS Data Lane 5
18	SDA	Tcon_SDA_IN	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	Tcon_SCL_IN	45	GND	Ground
20	NC	No Connection	46	Rx6n	V-by-One HS Data Lane 6
21	NC	No Connection	47	Rx6p	V-by-One HS Data Lane 6
22	Section	L : 1 division, H : 2 division Default: L	48	GND	Ground
23	NC	No Connection	49	Rx7n	V-by-One HS Data Lane 7
24	GND	Ground	50	Rx7p	V-by-One HS Data Lane 7
25	HTPDN	Hot plug detec	51	GND	Ground
26	LOCKN	Lock detect			

Note 1: NC (Not Connected) : This pins are only used for internal operations.

Note 2:BIST : This pin is used for selecting display pattern mode when input DE or input CLOCK quits toggling.

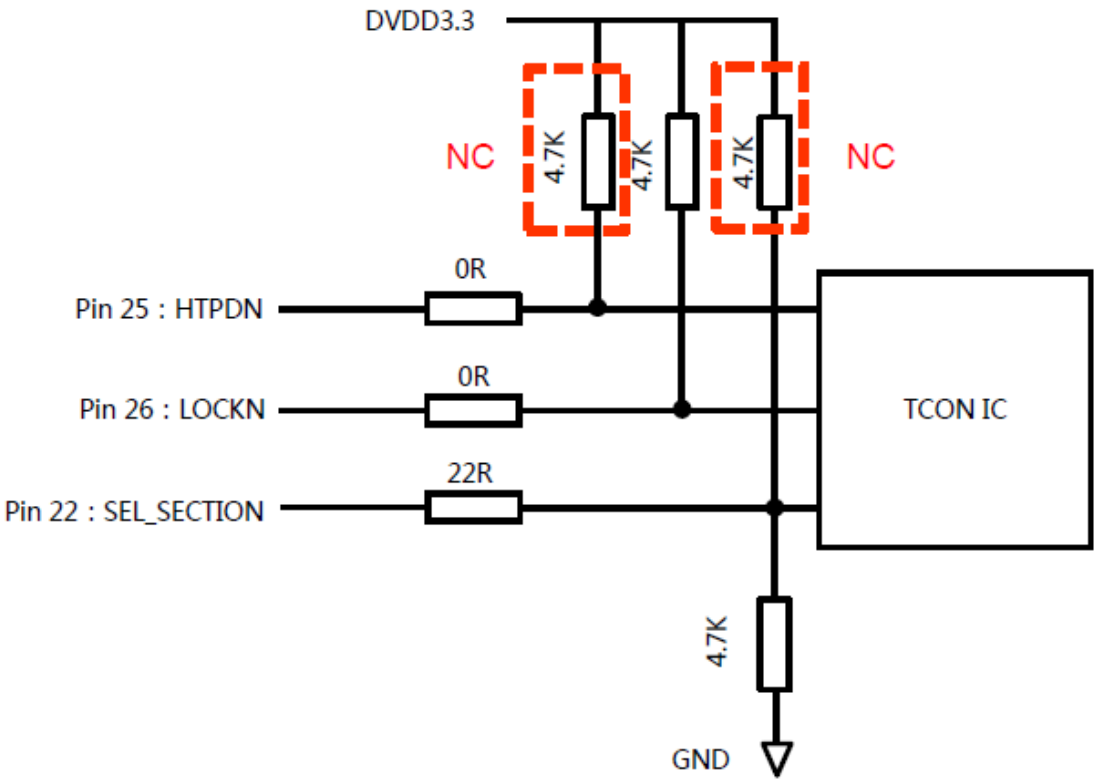




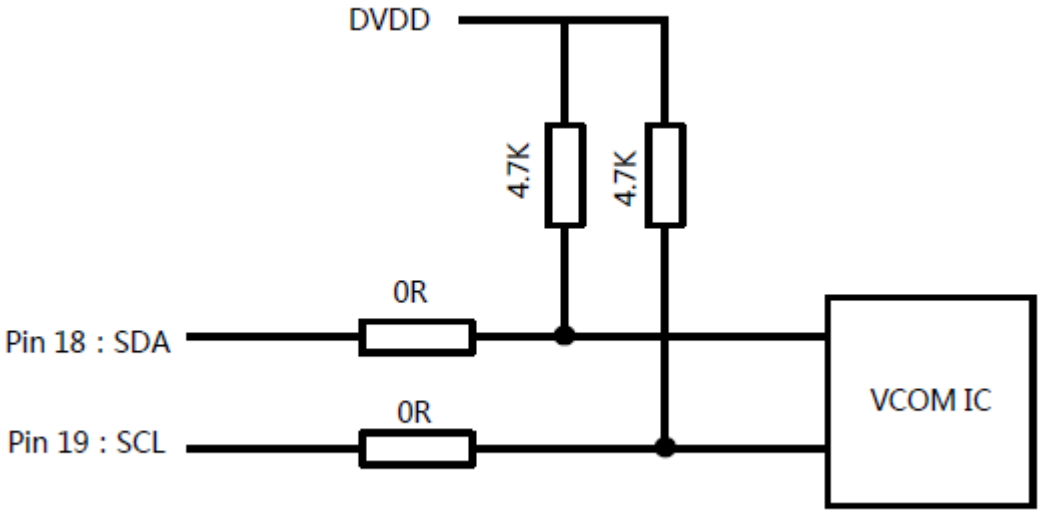
Notes : 1. NC (Not Connected) : This pins are only used for internal operations.

2.BIST : This pin is used for selecting display pattern mode when input DE or input CLOCK quits toggling.

3. Circuit Block Diagram of HTPDN/LOCKN/SEL_SECTION.



4. Circuit Block Diagram Pin of SDA/SCL/WP.



2.3 Interface Connector

2.3.1 V by one Misc. Setting.-1 Section

a) System side have to put pull high resistor on LOCKN/HTPDN pins.

b)V by one data mapping as follows.

1 Section								
Hactive = 3840								
	Port0		Port1		Port2		Port3	
	Lane0	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Lane7
V Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	…	…	…	…	…	…	…	…
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR
Line 1	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	Pixel 6	Pixel 7	Pixel 8
	Pixel 9	Pixel 10	Pixel 11	Pixel 12	Pixel 13	Pixel 14	Pixel 15	Pixel 16
	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…
	Pixel 3833	Pixel 3834	Pixel 3835	Pixel 3836	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840
H Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	…	…	…	…	…	…	…	…
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE
Line 2	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	Pixel 6	Pixel 7	Pixel 8
	Pixel 9	Pixel 10	Pixel 11	Pixel 12	Pixel 13	Pixel 14	Pixel 15	Pixel 16
	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…
	Pixel 3833	Pixel 3834	Pixel 3835	Pixel 3836	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840

2.3.2 V by one Misc. Setting.-2 Section

a)System side have to put pull high resistor on LOCKN/HTPDN pins.

b)V by one data mapping as follows.

2 Section								
Hactive = 3840								
	Port0		Port1		Port2		Port3	
	Lane0	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Lane7
V Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	…	…	…	…	…	…	…	…
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR
Line 1	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 1921	Pixel 1922	Pixel 1923	Pixel 1924
	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 1925	Pixel 1926	Pixel 1927	Pixel 1928
	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…
	Pixel 1917	Pixel 1918	Pixel 1919	Pixel 1920	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840
H Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	…	…	…	…	…	…	…	…
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE
Line 2	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 1921	Pixel 1922	Pixel 1923	Pixel 1924
	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 1925	Pixel 1926	Pixel 1927	Pixel 1928
	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…
	Pixel 1917	Pixel 1918	Pixel 1919	Pixel 1920	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840

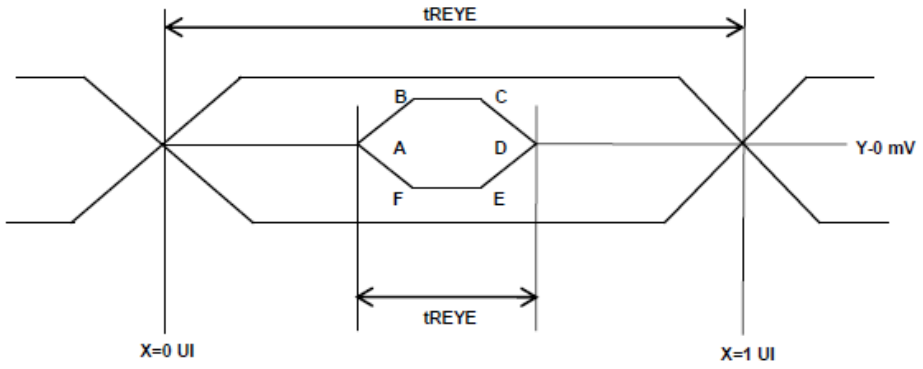
2.4 Signal Timing Waveforms Of Interface Signal

2.4.1 Input data specification

Byte	Packer input	Color data mapping
		30 bpp RGB
0	Bit-0	R2
	Bit-1	R3
	Bit-2	R4
	Bit-3	R5
	Bit-4	R6
	Bit-5	R7
	Bit-6	R8
	Bit-7	R9
1	Bit-8	G2
	Bit-9	G3
	Bit-10	G4
	Bit-11	G5
	Bit-12	G6
	Bit-13	G7
	Bit-14	G8
	Bit-15	G9
2	Bit-16	B2
	Bit-17	B3
	Bit-18	B4
	Bit-19	B5
	Bit-20	B6
	Bit-21	B7
	Bit-22	B8
	Bit-23	B9
3	Bit-24	-
	Bit-25	-
	Bit-26	B0
	Bit-27	B1
	Bit-28	G0
	Bit-29	G1
	Bit-30	R0
	Bit-31	R1

2.4.2 Input Signal Timing

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Unit Interval(VBO Operation Bit Rate)	tRBIT	3-byte	380	tTCIP/30	1667	PS
		4-byte	285	tTCIP/40	1250	PS
		5-byte	266	tTCIP/50	1000	PS
Eye Width at Package Pin	tREYE	-	-	1	-	UI
Eye Width Position A at Package Pin	tA	-	-	0.25	-	UI
Eye Width Position B at Package Pin	tB	-	-	0.3	-	UI
Eye Width Position Cat Package Pin	tC	-	-	0.7	-	UI
Eye Width Position D at Package Pin	tD	-	-	0.75	-	UI
Eye Width Position E at Package Pin	tE	-	-	0.7	-	UI
Eye Width Position F at Package Pin	tF	-	-	0.3	-	UI
Intra – pair Skew	TTOSK_intra	-	-0.3	-	0.3	UI
Inter – pair Skew	TTOSK_inter	-	-5	-	5	UI
SSCG	-	30KHz modulation	-0.5		0.5	%



	Y[mV]
A	0
B	50
C	50
D	0
E	-50
F	-50

2.5 Input Timing Specification

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	69	74.25	78	MHz
Vertical	Frame Rate	F	57	60	62	Hz
	Total	T_V	2180	2250	2450	T_H
	Display	T_{VD}		2160		T_H
	Blank	T_{VB}	20	90	290	T_H
Horizontal	Total	T_H	530	550	570	T_{CLK}
	Display	T_{HD}	-	480	-	T_{CLK}
	Blank	T_{HB}	50	70	90	T_{CLK}

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	69	74.25	78	MHz
Vertical	Frame Rate	F	47	50	51	Hz
	Total	T_V	2180	2700	2715	T_H
	Display	T_{VD}		2160		T_H
	Blank	T_{VB}	20	540	555	T_H
Horizontal	Total	T_H	530	550	570	T_{CLK}
	Display	T_{HD}	-	480	-	T_{CLK}
	Blank	T_{HB}	50	70	90	T_{CLK}

Note 1: This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

2.6 Color Data Reference

Input Signals, Basic Display Colors and Gray Scale of Colors

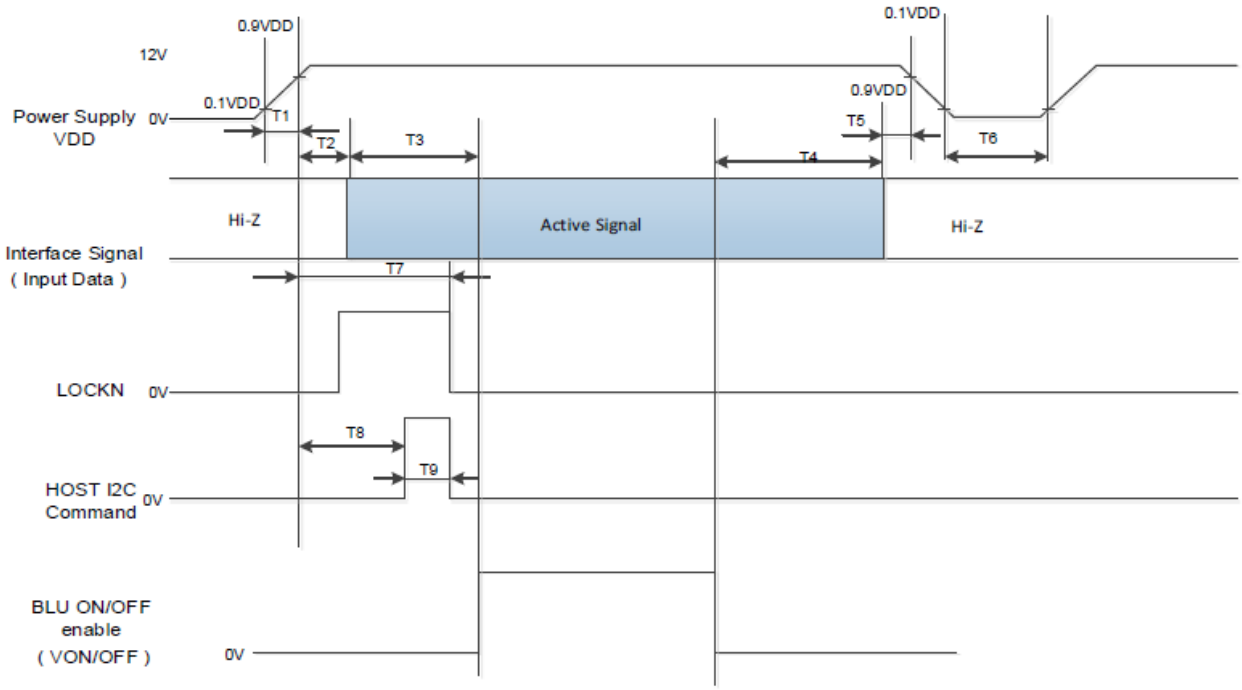
Color		Input Color Data																													
		MSB RED LSB										MSB GREEN LSB										MSB BLUE LSB									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1023)	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
	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
	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
	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
R	RED(000)	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(001)	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(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
G	Green (000)	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 (000)	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 (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
B	Blue(000)	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(000)	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(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

2.7 Power Sequence



Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	-	ms
T3	200	-	-	ms
T4	100	-	-	ms
T5	0	-	-	ms
T6	1	-	-	s
T7	-	-	200	ms
T8	1200	-	-	ms
T9	Depends on I2C command			ms

Note 1: Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.

Note 2: Even though T4 is over the specified value, there is no problem if I2T spec of fuse is satisfied.

Note 3: Back Light must be turn on after power for logic and interface signal are valid.

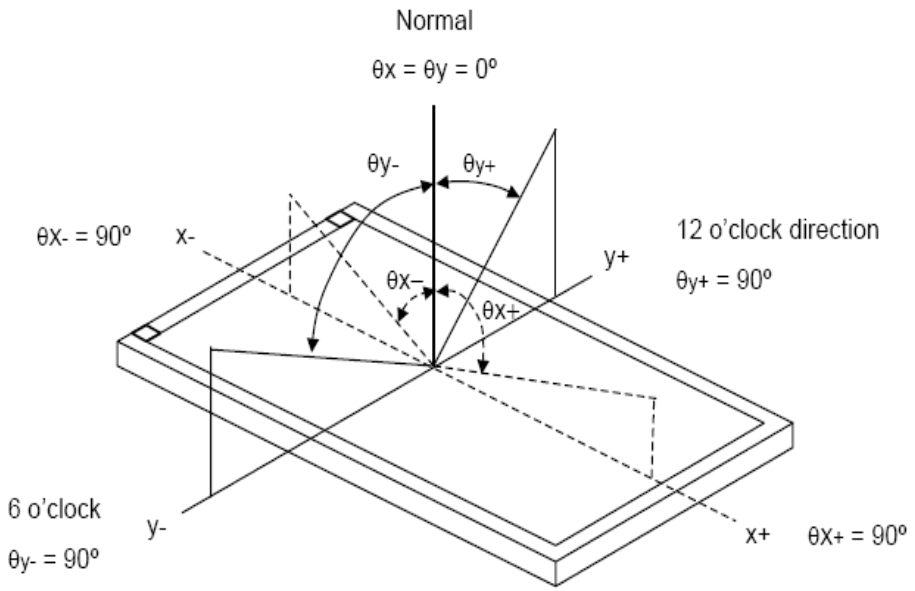
Note 4: HTPN(Hotplug) signal is pulled low on Tcon Board.

3 Optical Specification

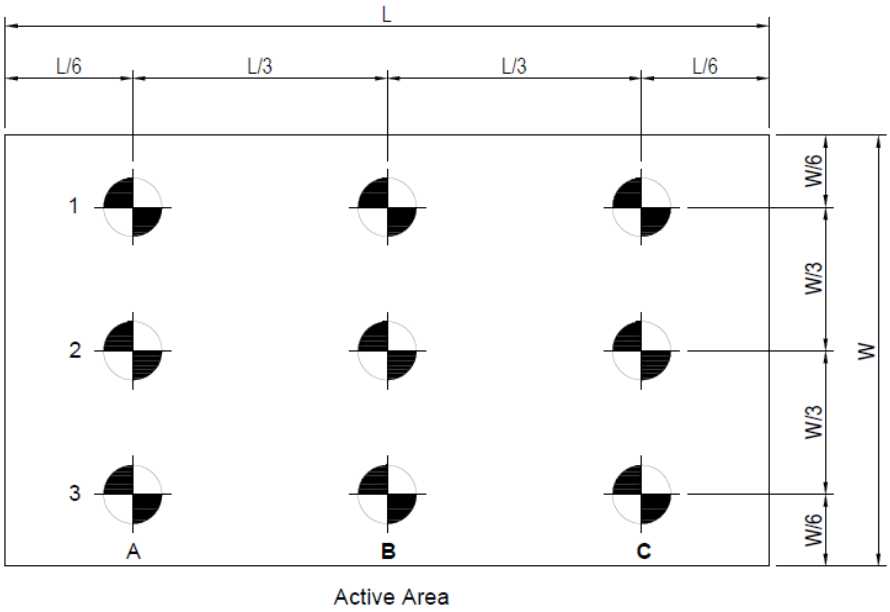
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 CA-410	0.613	0.643	0.673	-	Test Mode: (2) (3)
		Ry		0.308	0.338	0.368	-	
	Green	Gx		0.273	0.303	0.333	-	
		Gy		0.581	0.611	0.641	-	
	Blue	Bx		0.117	0.147	0.177	-	
		By		0.024	0.054	0.084	-	
	White	Wx		0.251	0.281	0.311	-	
		Wy		0.274	0.304	0.334	-	
Center Luminance of White		Lc	θx=0 θy=0 CA-410	2250	2500	3250	cd/m^2	
Uniformity		Lu		-	91	-	%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10	990:1	1100:1	-	-	Test Mode: (4)
Color Saturation		NTSC		-	79	-	%	
Viewing Angle	Horizontal	θx+	CR ≥ 10	-	89	-	Deg	Test Mode: (1)
		θx-		-	89	-		
	Vertical	θy+		-	89	-		
		θy-		-	89	-		

Test Mode：

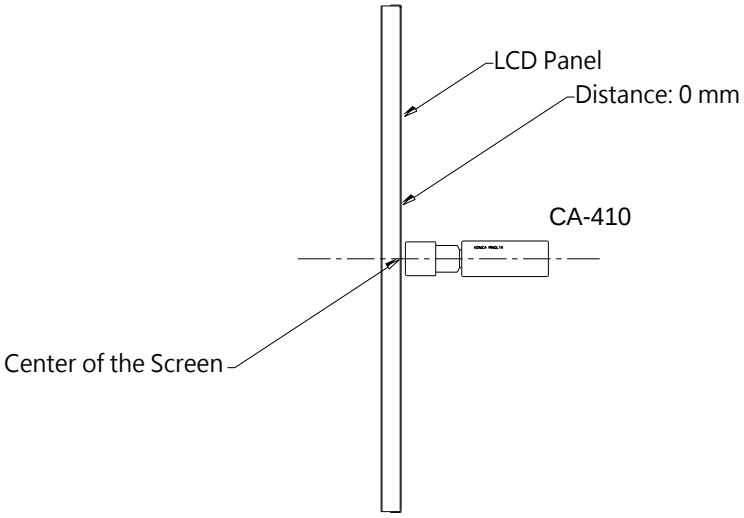
(1) Definition of Viewing Angle (θx , θy):



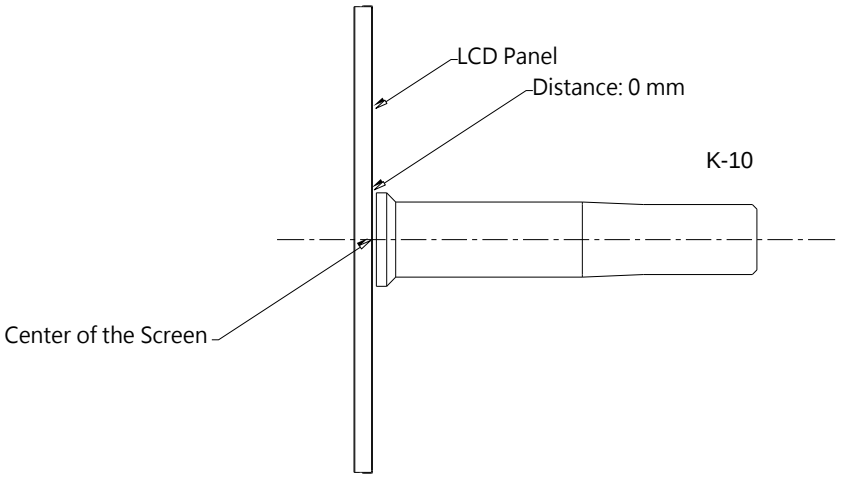
(2) Definition of Test Point:



(3) CA-410 Measurement Setup:



(4) Klein K-10 Measurement Setup:



4 LED Driving Board Specifications

This specification is applied to LED converter unit for LED backlight。

4.1 Operating Characteristics

(Part 1)

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%	4.98	4.65	4.37	A	(1)
LED Current (Low Brightness)	IoutL	Brightness = 0%	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	Brightness = 100%	1.25	1.27	1.29	A	J3、J2
			0.635	0.637	0.639	A	J6
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%	54.68	55.16	55.65	V	J1、J2
			54.68	55.16	55.65	V	J7、J8
Efficiency	η	Brightness = 100%	94.0	94.2	94.4	%	(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) ηmax = Vout(max)*IoutH(max)/Vin(max)*IinH(min)

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

(Part 2)

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%	6.62	6.03	5.67	A	(1)
LED Current (Low Brightness)	IoutL	Brightness = 0%	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	Brightness = 100%	1.24	1.25	1.26	A	J3、J2
			1.24	1.25	1.26	A	J6、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%	54.98	55.23	55.41	V	J1、J2
			54.98	55.23	55.41	V	J7、J8
Efficiency	η	Brightness = 100%	93.5	94.0	94.6	%	(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) ηmax = Vout(max)*IoutH(max)/Vin(max)*IinH(min)

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

Input Connector: CN2(JST B3B-PH-K-S or Compatible)

PIN NO	Symbol	Description
1	DC	Close pin 1,2 LED driver is DC dimming
2	GND	
3	PWM	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 B4B-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

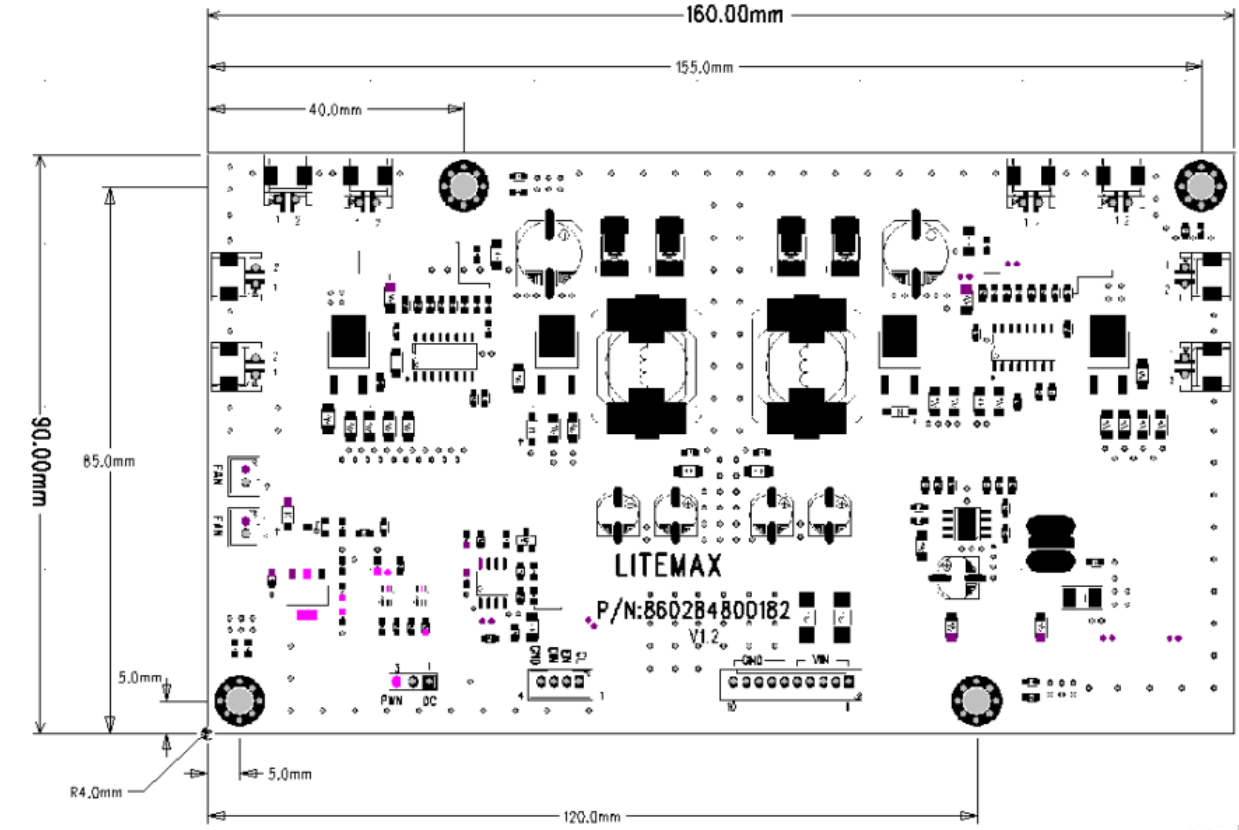
Note: Pin1 is dimming method control pin, Low →DC dimming, High → PWM dimming.
If pin1 is be used, please NC CN2.

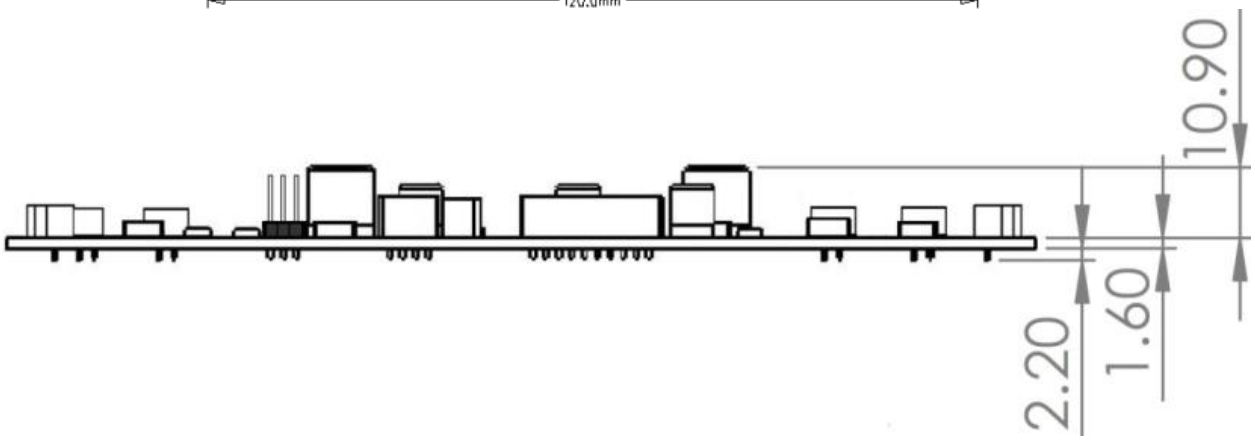
Output Connector: J2,J3,J6 (JST S2B-EH or Compatible)

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

4.3 Mechanical Characteristics

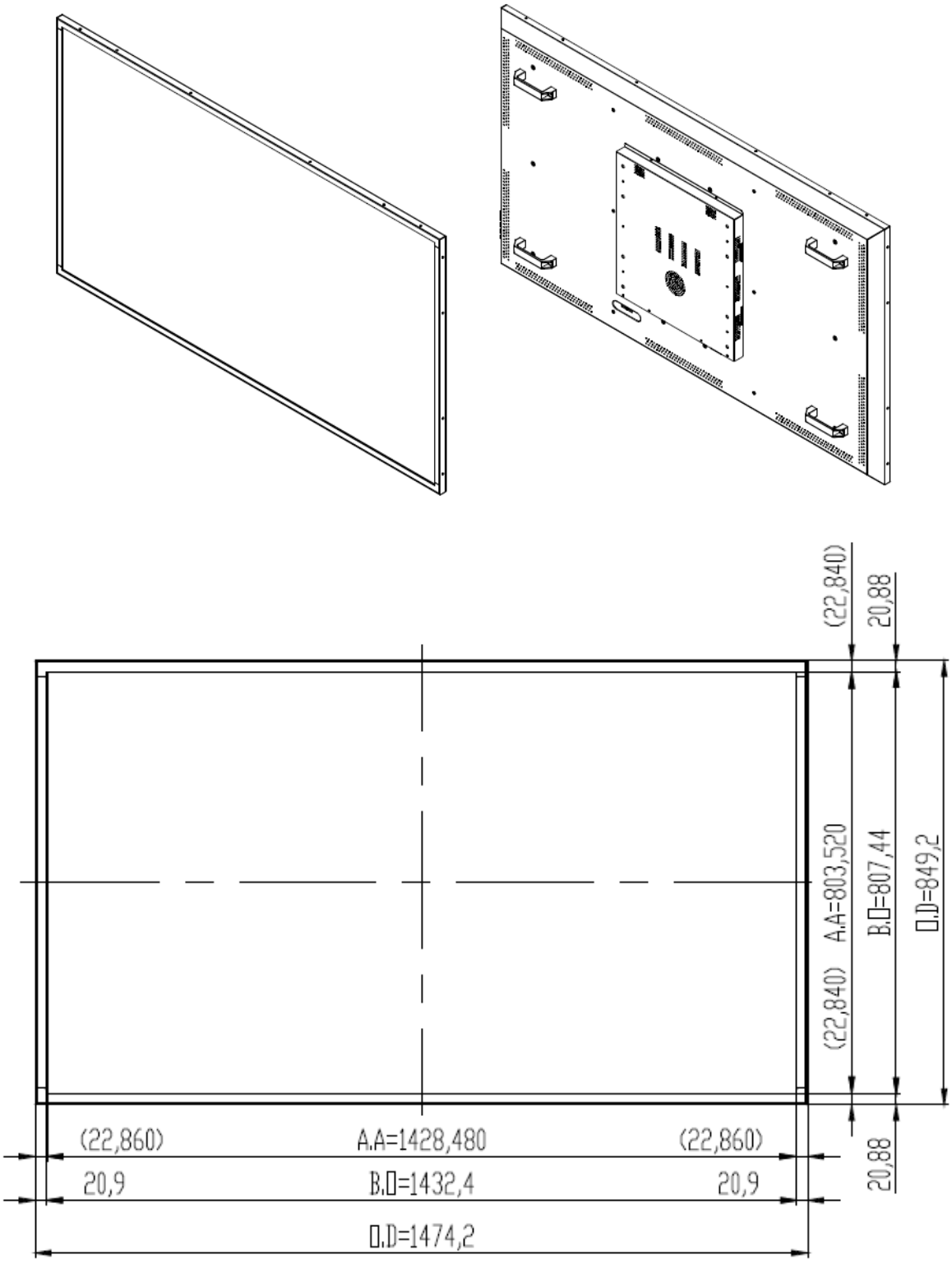
Dimension: 160 x 90 x 12.5mm

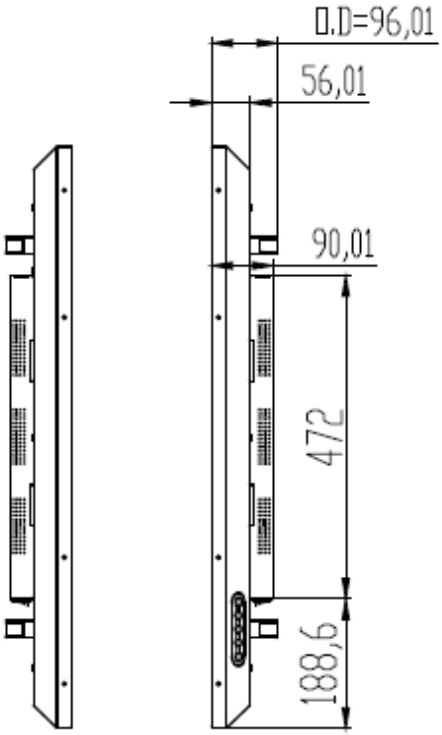


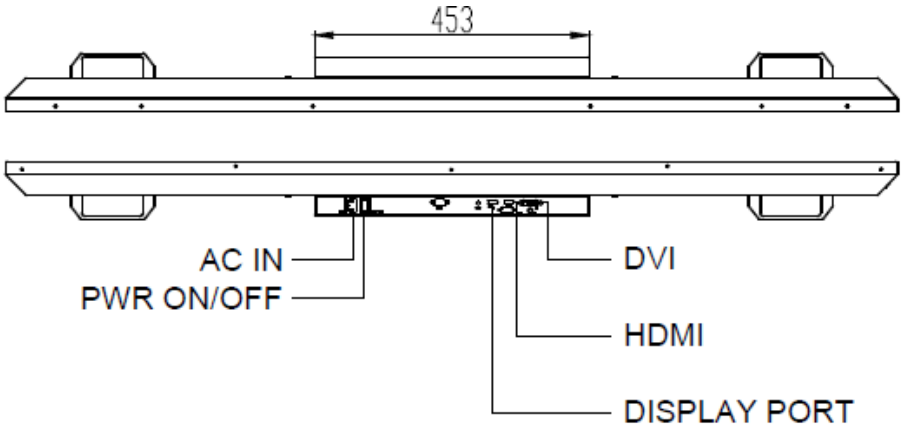


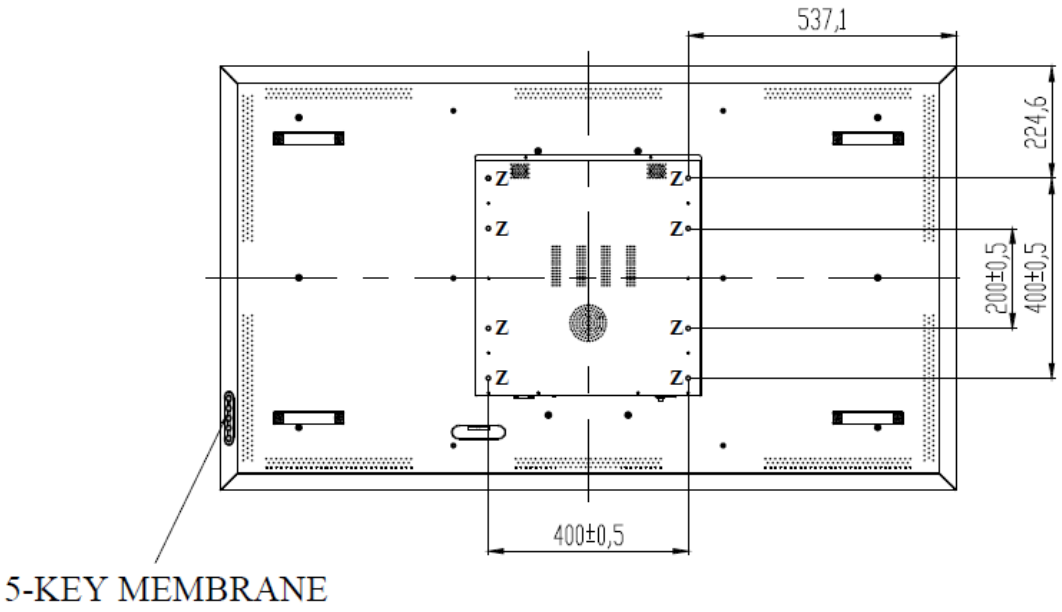
5 Mechanical Drawing

Unit:mm




O.D=96,01
56,01
90,01
472
188,6


453
AC IN
PWR ON/OFF
DVI
HDMI
DISPLAY PORT



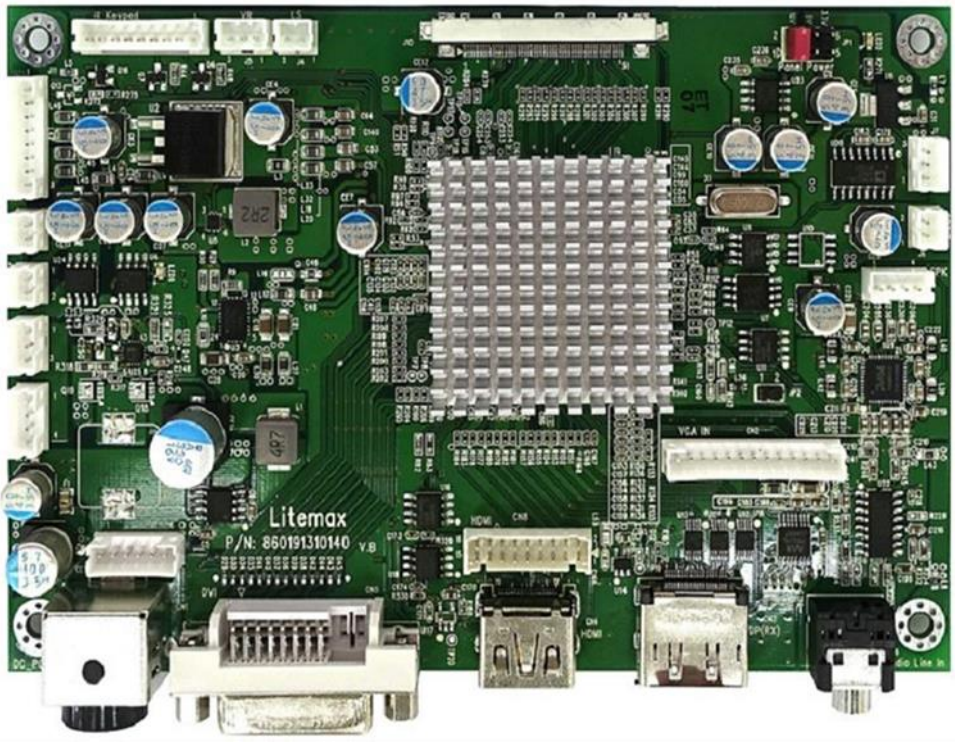
Note:
O.D : Outline Dimension
B.O : Bezel Opening
A.A : LCD Active Area
Z:8-M8 USER HOLE _MAX. DEPTH=12mm

6 AD9131GDHP Board & OSD Functions

We developed this A/D board to support industrial high brightness and commercial applications. This A/D board has many functions. It has an external luminance sensor as an option, or optional VR button to control brightness, fan rotation and RS232. Rev.2 is European RoHS compliant.

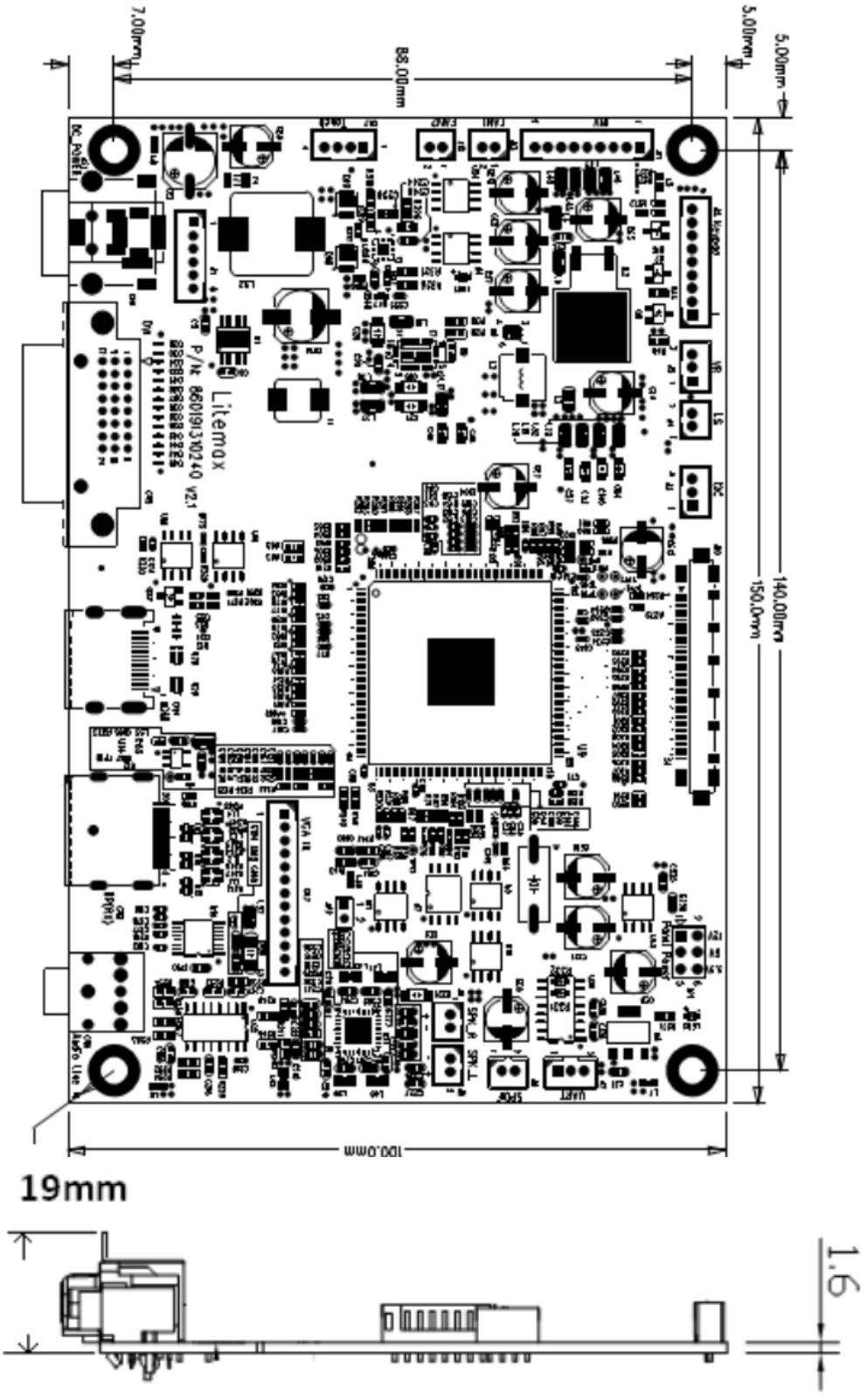
6.1 General Description

- **Max resolution up to UHD (4096x2160)**
- **Support V-By-one or e-DP panel**
- **Analog RGB Input up to 205MHz**
- **DVI operates up to165M Hz**
- **One VGA input**
- **One ultra-reliable dual-link DVI input(4K2K@30Hz)**
- **One HDMI(HDMI 2.0) input(4K2K@60Hz)**
- **One display port input (DP 1.2a) (4K2K@60Hz)**
- **V-by-One or e-DP interface**
- **Support panel DC5V or 3.3V, 12V output**
- **External fan control by software**
- **OSD control**
- **Inverter analog or PWM dimming control**
- **External V.R. brightness control (Optional)**
- **External light sensor brightness control (Optional)**
- **External RS232 control (Optional)**
- **Input power 24V DC or 12V DC (24V DC power input is optional)**

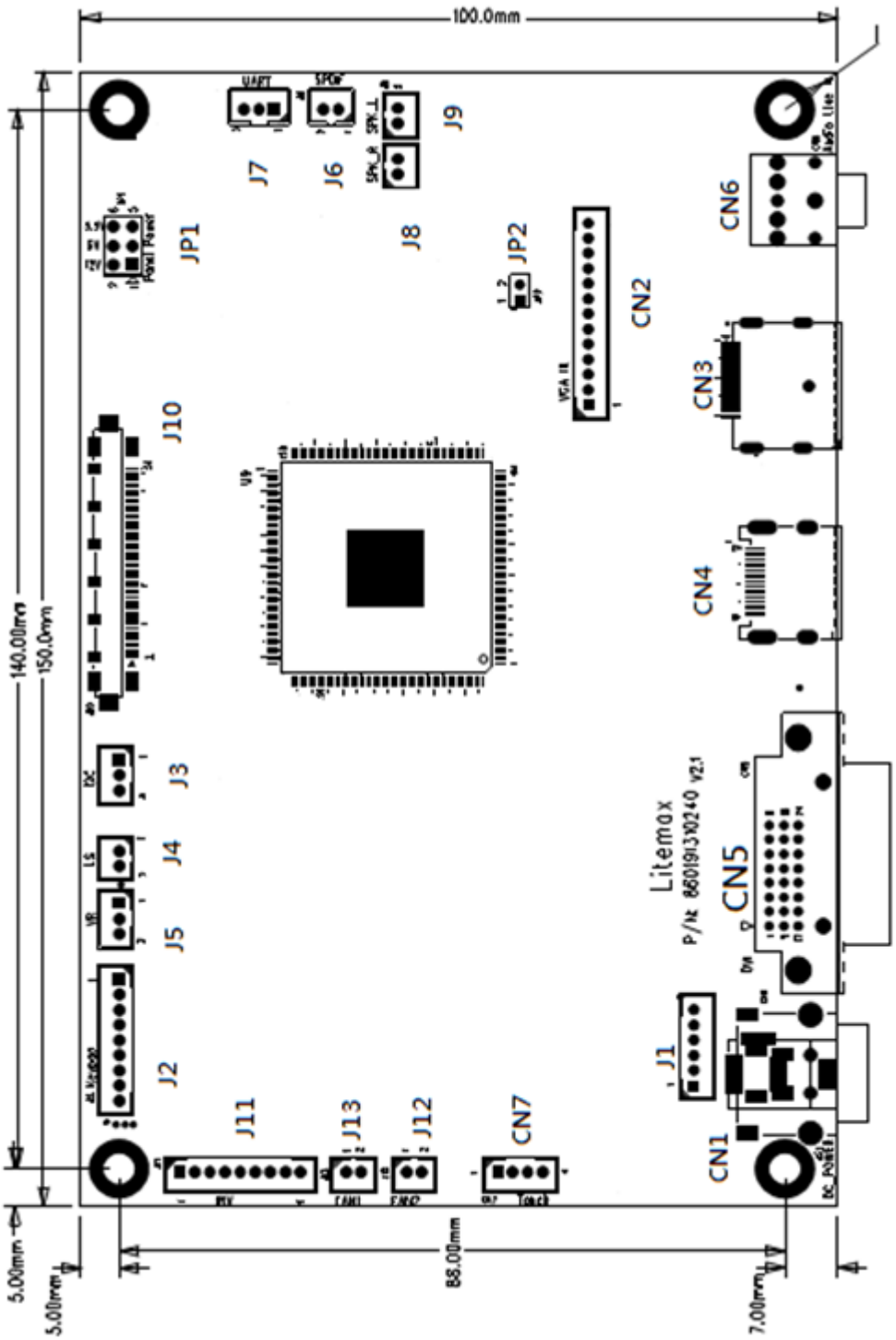


6.2 Outline Dimensions

AD9131 150mm x 100mm



6.3 AD9131GDHP Board Pin Define



J10: Panel (V-By-one or e-DP) connector

Pin No.	Function	Pin No.	Function
1	PANEL-VCC	27	GND
2	PANEL-VCC	28	RX0N
3	PANEL-VCC	29	RX0P
4	PANEL-VCC	30	GND
5	PANEL-VCC	31	RX1N
6	PANEL-VCC	32	RX1P
7	PANEL-VCC	33	GND
8	PANEL-VCC	34	RX2N
9	NC	35	RX2P
10	GND	36	GND
11	GND	37	RX3N
12	GND	38	RX3P
13	GND	39	GND
14	GND	40	RX4N
15	eDP_HPD1	41	RX4P
16	AUXTX_P1	42	GND
17	AUXTX_N1	43	RX5N
18	P_SDA	44	RX5P
19	P_SCL	45	GND
20	NC	46	RX6N
21	eDP_HPD0	47	RX6P
22	LD_EN	48	GND
23	AUXTX_P0	49	RX7N
24	AUXTX_N0	50	RX7P
25	HTPDN	51	GND
26	LOCKN		

CN5: DVI-D Input Connector (24pin)

Pin No.	Function	Pin No.	Function	Pin No.	Function
1	T.M.D.S. Data2-	9	T.M.D.S. Data1-	17	T.M.D.S. Data0-
2	T.M.D.S. Data2+	10	T.M.D.S. Data1+	18	T.M.D.S. Data0+
3	T.M.D.S. Data2/4 Shield	11	T.M.D.S Data1/3 Shield	19	T.M.D.S. Data0/5 Shield
4	T.M.D.S. Data4-	12	T.M.D.S. Data3-	20	T.M.D.S. Data5-
5	T.M.D.S. Data4+	13	T.M.D.S. Data3+	21	T.M.D.S. Data5+

6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	Ground (for +5V)	23	T.M.D.S. Clock+
8	Vertical SYNC.	16	Hot Plug Detect	24	T.M.D.S. Clock-

CN2: Analog RGB Input connector (13pin connector)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	SDA	DDC Serial Data	8	BLUE_RTN	Blue Return
2	SCL	DDC Data Clock	9	BLUE	Analog Blue
3	GND	Reserved	10	GREEN_RTN	Green Return
4	+5V	+5VDDC	11	GREEN	Analog Green
5	GND	Reserved	12	RED_RTN	Red Return
6	VSYNC	Vertical Sync	13	RED	Analog Red
7	HSYNC	Horizontal Sync			

CN4: HDMI Connector (19pin HDMI)

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		

CN3: 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

CN6: Audio Jack in

Pin No.	Function	Pin No.	Function
1	GND	2	LINE IN R
3	GND	4	GND
5	LINE IN L		

CN1: Power DIN(24V or 12V)

Pin No.	Function	Pin No.	Function
1	24Vdc or 12Vdc(Not 1)	2	24Vdc or 12Vdc (Not 1)
3	GND	4	GND

CN1: Power Jack (24V or 12V)

Pin No.	Function	Pin No.	Function
1	24Vdc or 12Vdc(Not 1)	2	GND
3	GND		

J1: Power input connector (6 pin 2.0mm)

Pin No.	Function	Pin No.	Function
1	24Vdc or 12Vdc(Not 1)	2	24Vdc or 12Vdc(Not 1)
3	24Vdc or 12Vdc(Not 1)	4	GND
5	GND	6	GND

Not 1:Power input has tow different versions,12V power input version and 24V input version don't mistake.

CN7: Power out connector (5V/12V)(4PIN 2.0mm)

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

J11: Inverter Connector (8PIN 2.0mm)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	DC/PWM	DC/PWM SEL	5	GND	GND
2	ON/OFF	Backlight ON/OFF	6	GND	GND
3	BRIGHT	Dimming adjust	7	12VDC	Input 12VDC
4	GND	GND	8	12VDC	Input 12VDC
9	12VDC	Input 12VDC			

J13,J12: FAN (2PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	FAN(+)	2	GND

J2: Key Pad (9PIN 2.0mm)

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		

J5: VR connector (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	3,3VDC	2	VR OUT
3	GND		

J4: Ambient (2PIN 2.0mm)

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

JP1: PANEL VCC (3PIN 2.54mm)

Pin No.	Function	Pin No.	Function
1-2	12V	5-6	3.3V
3-4	5V		

J8& J9: Speaker Connector (2PIN 2.0mm)

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

J7: UART Connector (RS232 IN) (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	TXD	2	RXD
3	GND		

J3: I2C Connector (3PIN 2.0mm)

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

J6: SPDIF (2PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	SPDIF_OUT	2	GND

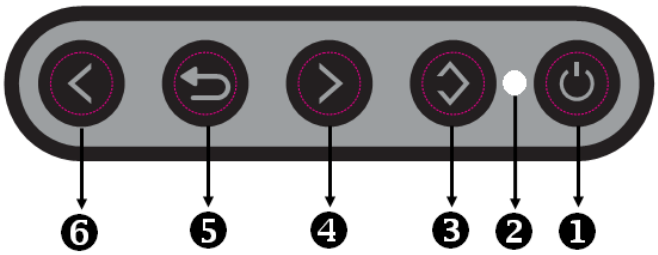
JP2: EDID (2PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	EEROM Write protect	2	GND

When need to rewrite EEROM EDID , short two pin .

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.

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.