LITEMAX

DLF/DLH4906-L V1

Sunlight Readable 49" LED B/L LCD

User Manual

Approved by	Checked by	Prepared by

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Record of Revision

Version and Date	Page	Old Description	New Description	Remark
Aug /22 /2024	all		Initial release	

Contents

1 General Description

The DLF/DLH4906-L V1 is a 49 inch industrial grade sunlight readable LCD, with high brightness 1200 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 1200 nits
- Sunlight Readable
- LED Backlight
- LCD Blacking Defect Free (Hi-Tni 110˚C)
- Slim Bezel
- BL MTBF: 100,000 hours

1.2 General Specifications

Model Name	DLF/DLH4906-L V1
Description	49" TFT LCD, LED Backlight 1200 nits, 3840x2160
Screen Size	49"
Display Area (mm)	1073.8(H) x 604(V)
Brightness	1200 cd/m²
Resolution	3840 x 2160
Aspect Ratio	16 : 9
Contrast Ratio	1100 : 1
Pixel Pitch (mm)	0.27963(H) x 0.27963(V)
Pixel Pre Inch (PPI)	90
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	82%
Display Colors	1.07G
Response Time (Typical)	8ms
Panel Interface	V-by-One
AD Board Input Interface	DVI, HDMI, DP
Input Power	AC 100~240V
Power Consumption	138W, 148W (with AD board)
OSD Key	5 Keys (Power Switch, Menu, +, Exit, -)
OSD Control	Brightness, Color, Contrast, H/V Position…etc
Dimensions (mm)	1107.3 x 635.7 x 27.42
Bezel Size(U/B/L/R)	15.85/15.85/16.75/16.75 mm
Weight (Net)	15.33kg
Operating Temperature	0 ˚C ~ 50 ˚C
Storage Temperature	-20 ˚C ~ 60 ˚C

DLF= Panel+ LED Driving Board
DLH= Panel+ LED Driving Board + AD Control Board

1.3 Absolute Maximum Ratings

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

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Power Input Voltage	LCD Circuit	V_{LCD}	-0.3	+14.0	V_{DC}	
LED Input Voltage	Forward Voltage	V_F	-	150.3	V_{DC}	1
T-Con Option Selection Voltage		V_{LOGIC}	-0.3	+4.0	V_{DC}	
Operating Temperature		T_{OP}	0	+50	°C	
Storage Temperature		T_{ST}	-20	+60	°C	2,3
Panel Front Temperature		T_{SUR}	-	+68	°C	4

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.

3. Gravity mura can be guaranteed below 40°C condition.

4. The maximum operating temperatures is based on the test condition that the surface temperature of display area is less than or equal to 68°C with LCD module alone in a temperature controlled chamber.

Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 68°C. The range of operating temperature may be degraded in case of improper thermal management in final product design.
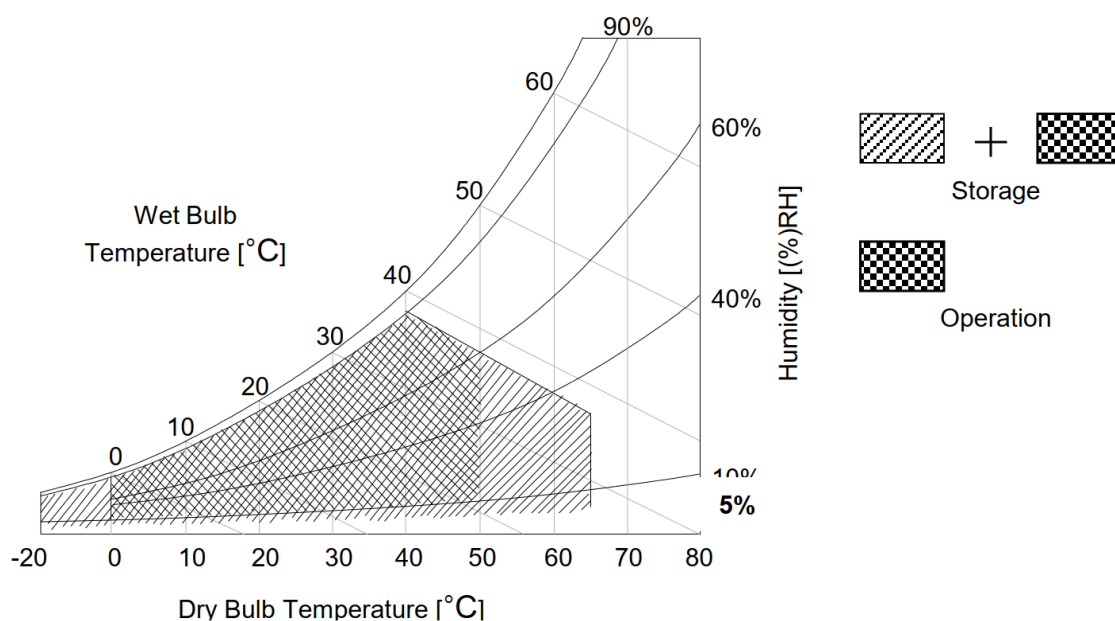
2 Electrical Specifications

2.1 Electrical Characteristics

It requires two power inputs. One is employed to power for the LCD circuit.

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Circuit :							
Power Input Voltage		V_{LCD}	10.8	12.0	13.2	V_{DC}	
Power Input Current		I_{LCD}	-	1130	1470	mA	1
			-	1600	2080	mA	2
T-CON Option Selection Voltage	Input High Voltage	V_{IH}	2.7	-	3.6	V_{DC}	
	Input Low Voltage	V_{IL}	0	-	0.7	V_{DC}	
Power Consumption		P_{LCD}	-	13.56	17.62	Watt	1
				19.2	25.0	Watt	2
Rush current		I_{RUSH}	-	-	10.0	A	3

Notes

1. The specified current and power consumption are under the VLCD =12.0V, Ta=25 ±2° C, fV=60Hz condition, and mosaic pattern(8 x 6) is displayed and fV is the frame frequency.

2. The current is specified at the maximum current pattern.

3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).

4. Ripple voltage level is recommended under ± 5% of typical voltage

White : 1023 Gray
Black :   0 Gray
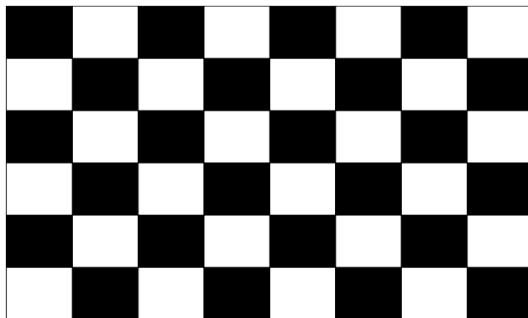
Mosaic Pattern(8 x 6)
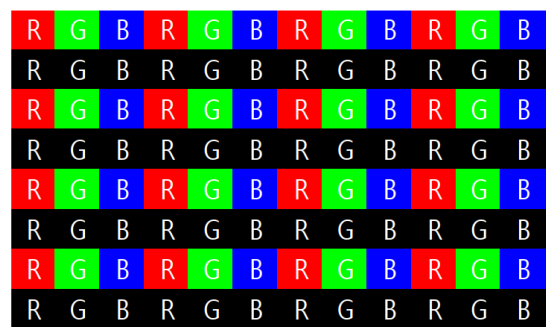
Max Current Pattern

Connector Interface PIN & Function

2.2 Connector Interface PIN & Function

MODULE CONNECTOR(CN1) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	VLCD	Power Supply +12.0V	27	GND	Ground
2	VLCD	Power Supply +12.0V	28	Rx0n	V-by-One HS Data Lane 0
3	VLCD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VLCD	Power Supply +12.0V	30	GND	Ground
5	VLCD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VLCD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VLCD	Power Supply +12.0V	33	GND	Ground
8	VLCD	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	NC	NO CONNECTION	40	Rx4n	V-by-One HS Data Lane 4
15	NC	NO CONNECTION	41	Rx4p	V-by-One HS Data Lane 4
16	Input Mode	Vx1 Input Data Format 'L'=Non-Division , 'H'=2-Division	42	GND	Ground
17	NC	NO CONNECTION	43	Rx5n	V-by-One HS Data Lane 5
18	NC	NO CONNECTION	44	Rx5p	V-by-One HS Data Lane 5
19	NC	NO CONNECTION	45	GND	Ground
20	NC	NO CONNECTION	46	Rx6n	V-by-One HS Data Lane 6
21	Bit SEL	'H' = 10bit(D) , 'L' = 8bit	47	Rx6p	V-by-One HS Data Lane 6
22	NC	NO CONNECTION	48	GND	Ground
23	RBF	'H' : AGP 'L' : NSB (No signal Black)	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 detect	51	GND	Ground
26	LOCKN	Lock detect	-	-	-

notes
1. All GND (ground) pins should be connected together to the LCD module's metal frame.
2. All Input levels of V-by-One signals are based on the V-by-One HS Standard Version **1.4.**
3. #9 & #14 & # 15 & #17~#20 & #22 NC(No Connection) : These pins are used only for Litemax (Do not connect)
4. Specific pin No. #23 is 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", LCD Module displays AGP (Auto Generation Pattern).

2.3 Color Data Input Assignment

The brightness of each primary color (red, green, blue) is based on the 10bit or 8bit gray scale data input for the color.
The higher binary input, the brighter the color. Table 7 provides a reference for color versus data input.

Table   COLOR DATA REFERENCE

Packer input & Unpacker output		30bpp RGB (10bit)	24bpp RGB (8bit)
Byte 0	D[0]	R[2]	R[0]
	D[1]	R[3]	R[1]
	D[2]	R[4]	R[2]
	D[3]	R[5]	R[3]
	D[4]	R[6]	R[4]
	D[5]	R[7]	R[5]
	D[6]	R[8]	R[6]
	D[7]	R[9]	R[7]
Byte 1	D[8]	G[2]	G[0]
	D[9]	G[3]	G[1]
	D[10]	G[4]	G[2]
	D[11]	G[5]	G[3]
	D[12]	G[6]	G[4]
	D[13]	G[7]	G[5]
	D[14]	G[8]	G[6]
	D[15]	G[9]	G[7]
Byte 2	D[16]	B[2]	B[0]
	D[17]	B[3]	B[1]
	D[18]	B[4]	B[2]
	D[19]	B[5]	B[3]
	D[20]	B[6]	B[4]
	D[21]	B[7]	B[5]
	D[22]	B[8]	B[6]
	D[23]	B[9]	B[7]
Byte 3	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]	

2.4 Input Signal Timing Specifications

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	t_{HV}	480	480	480	t_{CLK}	
	Blank	t_{HB}	60	70	120	t_{CLK}	1
	Total	t_{HP}	540	550	600	t_{CLK}	
Vertical	Display Period	t_{VV}	2160	2160	2160	Lines	
	Blank	t_{VB}	40	90	600	Lines	1
	Total	t_{VP}	2200	2250	2760	Lines	

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	f_{CLK}	67.00	74.25	78.00	MHz	
	Horizontal	f_H	121.8	135	140	KHz	2
	Vertical	f_V	47	60	63	Hz	2

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.
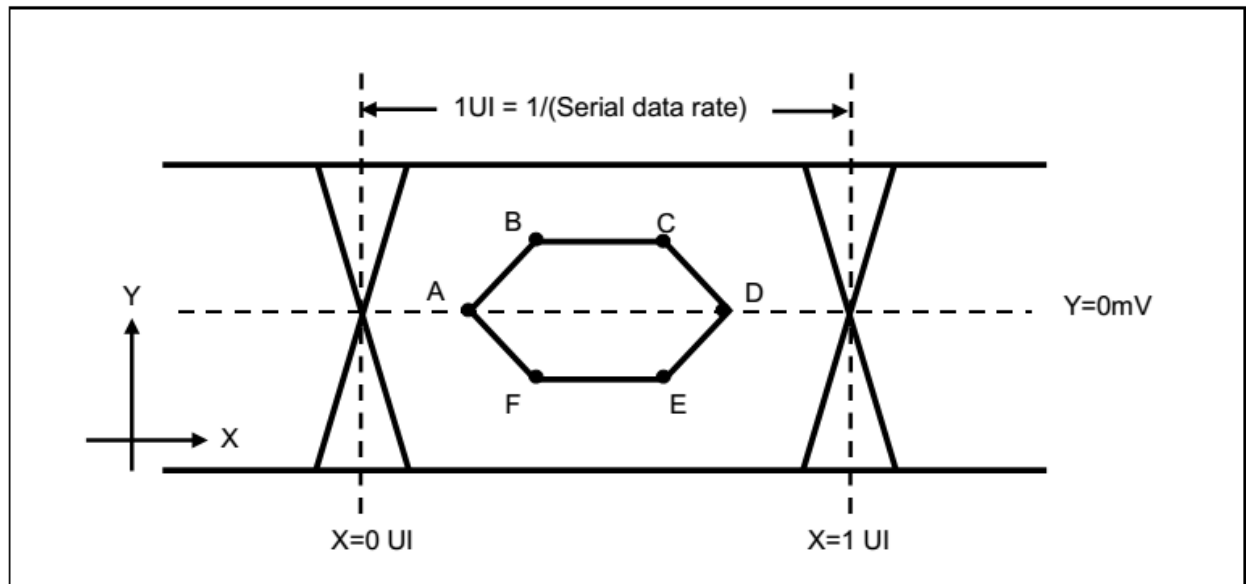
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency

3. Spread Spectrum Rate (SSR) is limited to ±0.5% center spread at 30KHz

※ Timing should be set based on clock frequency.

## 2.5 V by One Input Signal Characteristics

V by One Input Signal Timing Diagram

Eye Mask Specification

	X[UI]	Note	Y[mV]	Note
A	0.25 (max)	2	0	-
B	0.3 (max)	2	50	3
C	0.7(min)	3	50	3
D	0.75(min)	3	0	-
E	0.7(min)	3	I -50 I	3
F	0.3(max)	2	I -50 I	3

Notes

1. All Input levels of V by One signals are based on the V by One HS Standard Ver. 1.4

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 bandwidth : 15 Mhz

- Damping Factor : 1.5

<Inter-pair Skew between two Lanes>

<Inter-pair Skew between two sub Blocks>

<TCON – VbyOne Brief Diagram >
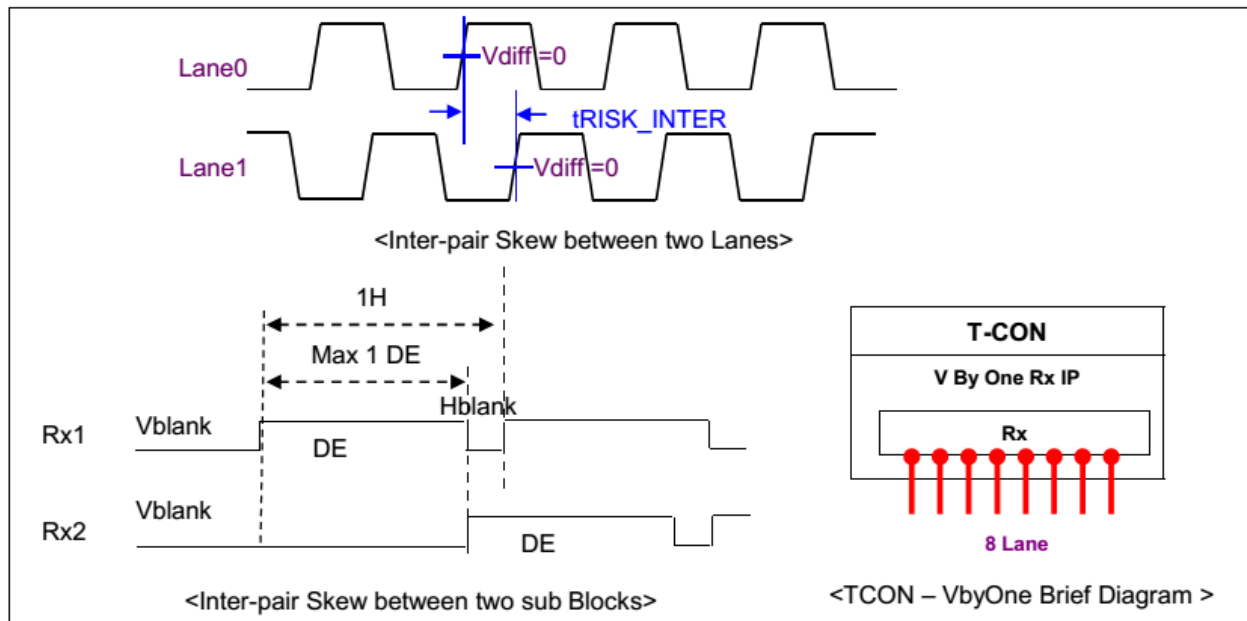
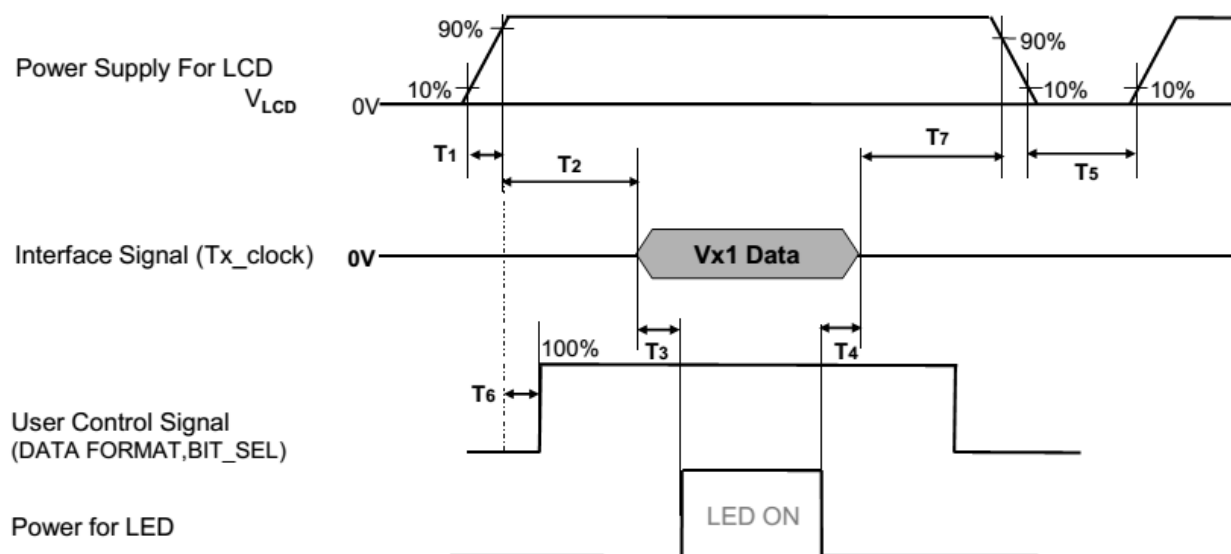| Description	Symbol	Min	Max	Unit	notes
Allowable inter-pair skew between lanes	tRISK_INTER	-	5	UI	1,2

Notes

1. 1UI = 1/serial data rate

2. it is the time difference of the differential voltage between any two lanes in one sub block.

2.6　Power Sequence

LCD Driving circuit

POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	1
T2	0	-	-	ms	2
T3	400	-	-	ms	3
T4	100	-	-	ms	3
T5	1.0	-	-	s	4
T6	0	-	T2	ms	5
T7	0	-	-	ms	6

Notes

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

2. If T2 is satisfied with specification after removing V by One Cable, there is no problem.

3. The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

4. T5 should be measured after the Module has been fully discharged between power off and on period.

5. If the on time of signals (Interface signal and user control signals) precedes the on time of Power (VLCD),it will be happened abnormal display. When T6 is NC status, T6 doesn't need to be measured.

6. It is recommendation specification that T7 has to be 0ms as a minimum value.

※ Please avoid floating state of interface signal at invalid period.

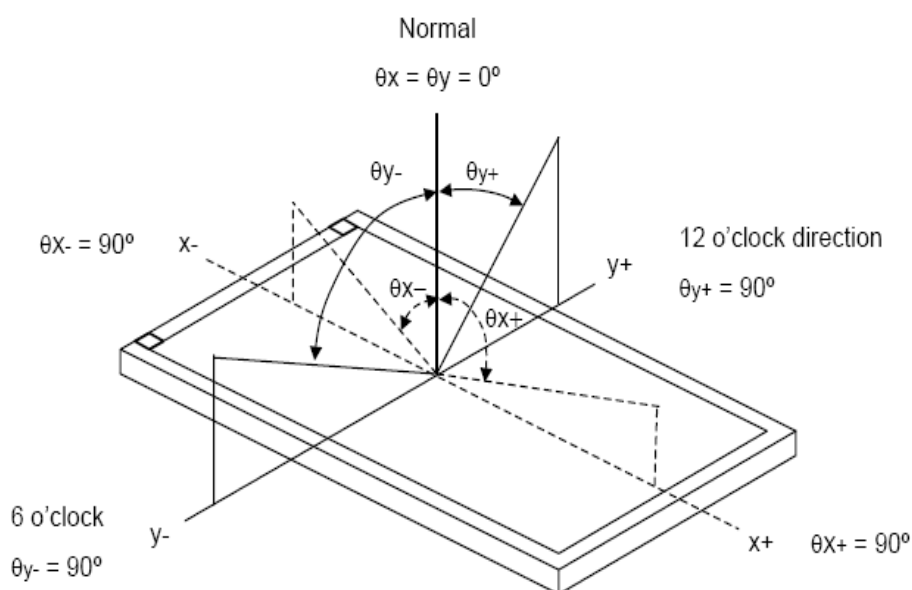※ When the power supply for LCD (VLCD) is off, be sure to pull down the valid and invalid data to 0V.

3　Optical Specification

OPTICAL SPECIFICATIONS

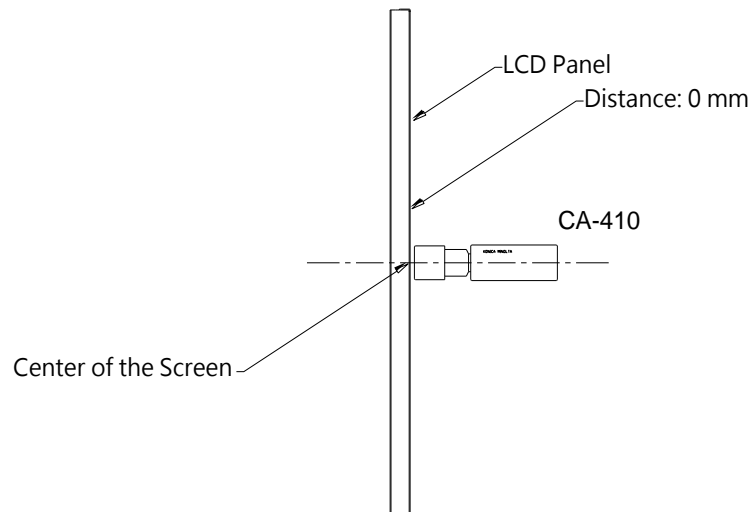| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 CA-410	0.622	0.652	0.682	-	Test Mode: (2) (3)
		Ry		0.300	0.330	0.360	-	
	Green	Gx		0.279	0.309	0.339	-	
		Gy		0.592	0.622	0.652	-	
	Blue	Bx		0.115	0.145	0.175	-	
		By		0.034	0.064	0.094		
	White	Wx		0.265	0.295	0.325	-	
		Wy		0.306	0.336	0.366	-	
Center Luminance of White		Lc	θx=0 θy=0 CA-410	1080	1200	1560	cd/m^2	
Uniform		Lu		-	81	-	%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10	990:1	1100:1	-	-	Test Mode: (4)
Color Saturation		NTSC		-	82		-	
Viewing Angle	Horizontal	θx+	-	-	89	-	Deg	Test Mode: (1)
		θx-	-	-	89	-		
	Vertical	θy+	-	-	89	-		
		θy-	-	-	89	-		

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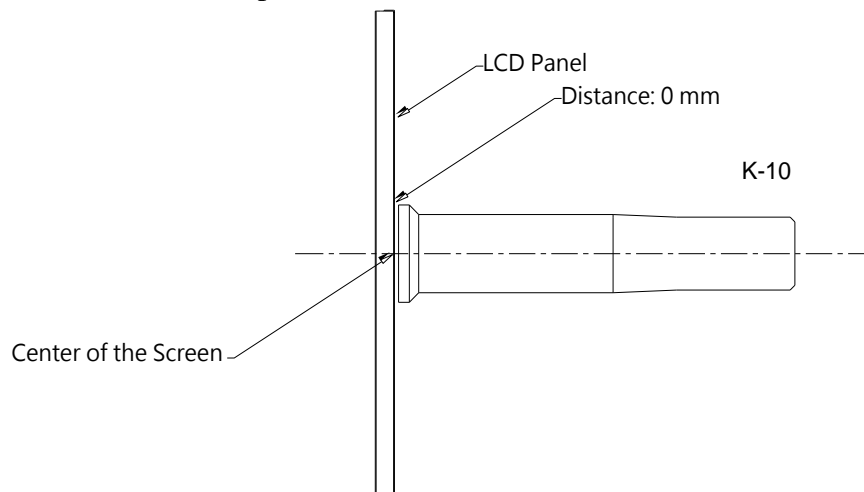
(1) Definition of Viewing Angle (θx , θy):

(2) Definition of Test Point:

Active Area
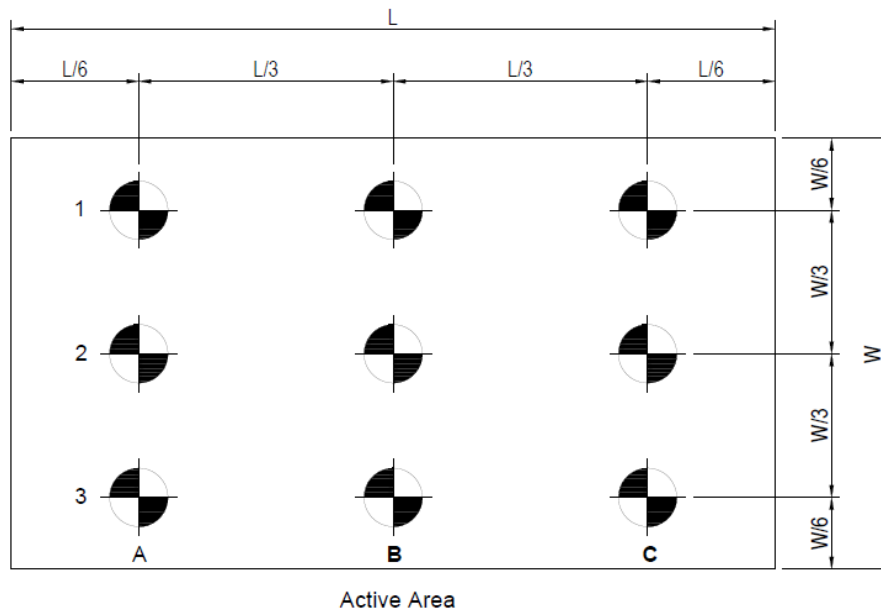
(3) CA-410 Measurement Setup:

(4) Klein K-10 Measurement Setup:

4 LED Driving Board Specifications

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

4.1 Converter Characteristics

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	Vin		22	24	26	V	
Input Current (Low Brightness)	IinL	Vadj=5V	0.0	-----	-----	mA	
Input Current (High Brightness)	IinH	Vadj=0V	4.726	4.456	4.252	A	(1)
LED Current (Low Brightness)	IoutL	Vadj=5V	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	Vadj=0V	1.72	1.76	1.8	A	J1~J4
			1.72	1.76	1.8	A	J5~J8
Working Frequency	Freq	Vadj=0V	350	400	450	KHz	
Brightness Control	Vadj	Connection of Voltage	0.2	-----	4.8	V	Vadj±5%
ON/OFF Control	Von	Normal Operation	2	-----	5	V	
	Voff		0	-----	0.8	V	
Output Voltage	Vout	Vadj=0V	28.5	28.9	29.3	V	J1~J4
			28.5	28.9	29.3	V	J5~J8
Efficiency	η	Vadj=0V	94.3	95.1	95.4	%	(2)

Remark:

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

(2) $\eta_{max} = V_{out(max)} * I_{outH(max)} / V_{in(max)} * I_{inH(min)}$

$\eta_{min} = V_{out(min)} * I_{outH(min)} / V_{in(min)} * I_{inH(max)}$

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

Input Connector:

CN2(JST B3B-PH-K-S or Compatible)

PIN No	Symbol	Description
1	Control	ON/OFF Control
2	Brightness	Brightness Control
3	GND	Ground

Output Connector:

J3, J7 (JST S2B-EH or Compatible)

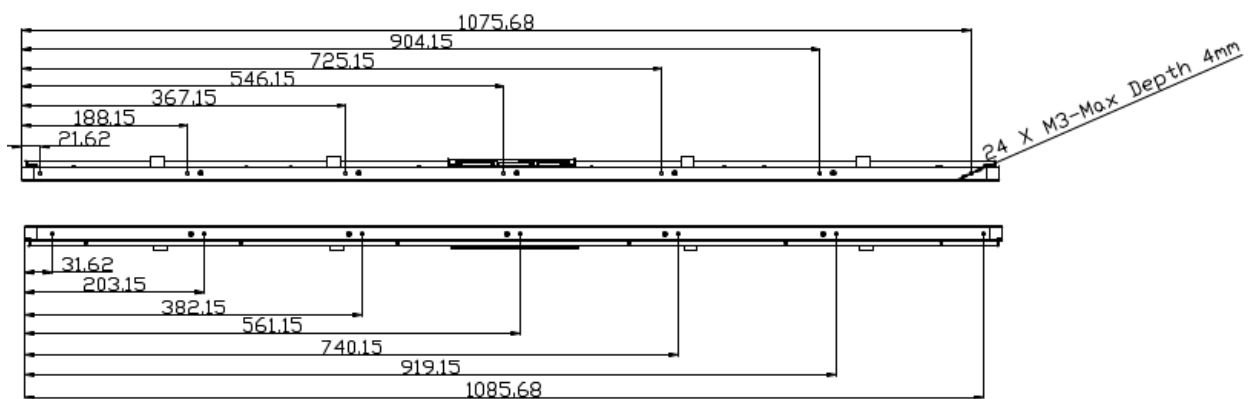| PIN NO	Symbol	Description
1	Output	LED High Voltage(+)
2	Output	LED Low Voltage (-)

4.3 Mechanical Characteristics

Dimension: 160 x 90 x 12.5mm
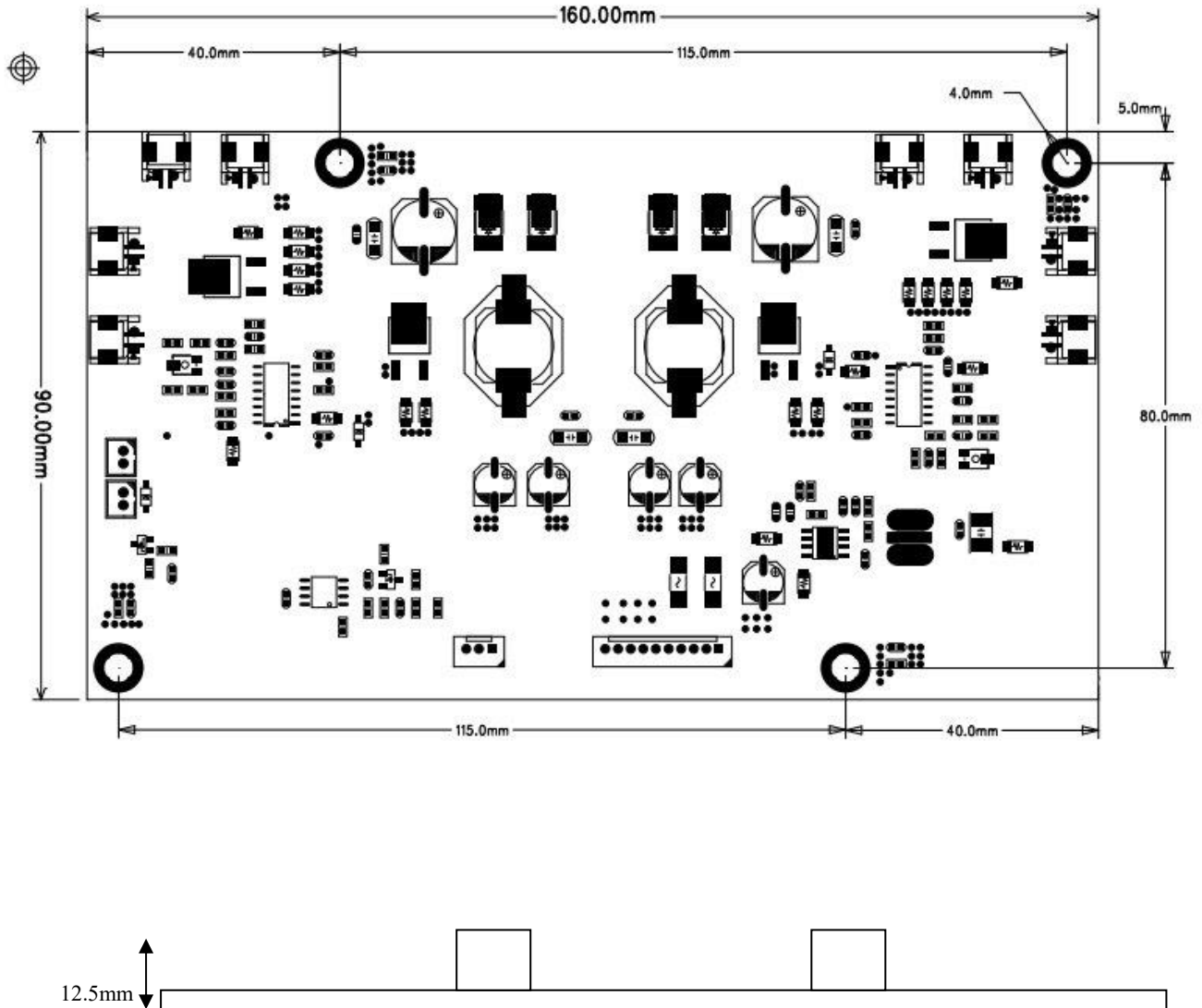
5 Mechanical Drawing

Unit:mm

Outline 1107.3±1.0
Bezel opening 1078.4
Active Area 1073.800

14.45
(16.75)

14.45
(16.75)

(553.65)

13.55
(15.85)

Outline 635.7±1.0
Bezel opening 608.6
Active Area 604.000

(317.85)

AA CENTER

15.85
(15.85)

1075.68
904.15
725.15
546.15
367.15
188.15
21.62

24 X M3-Max Depth 4mm

31.62
203.15
382.15
561.15
740.15
919.15
1085.68
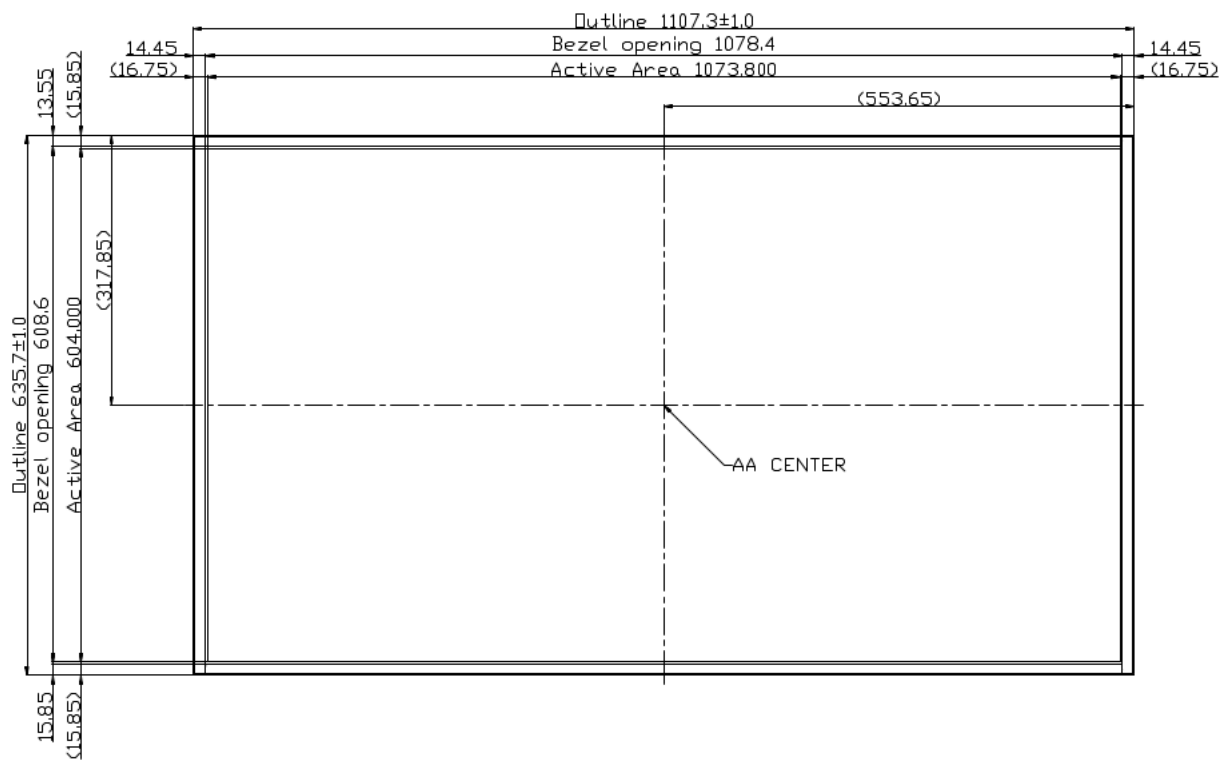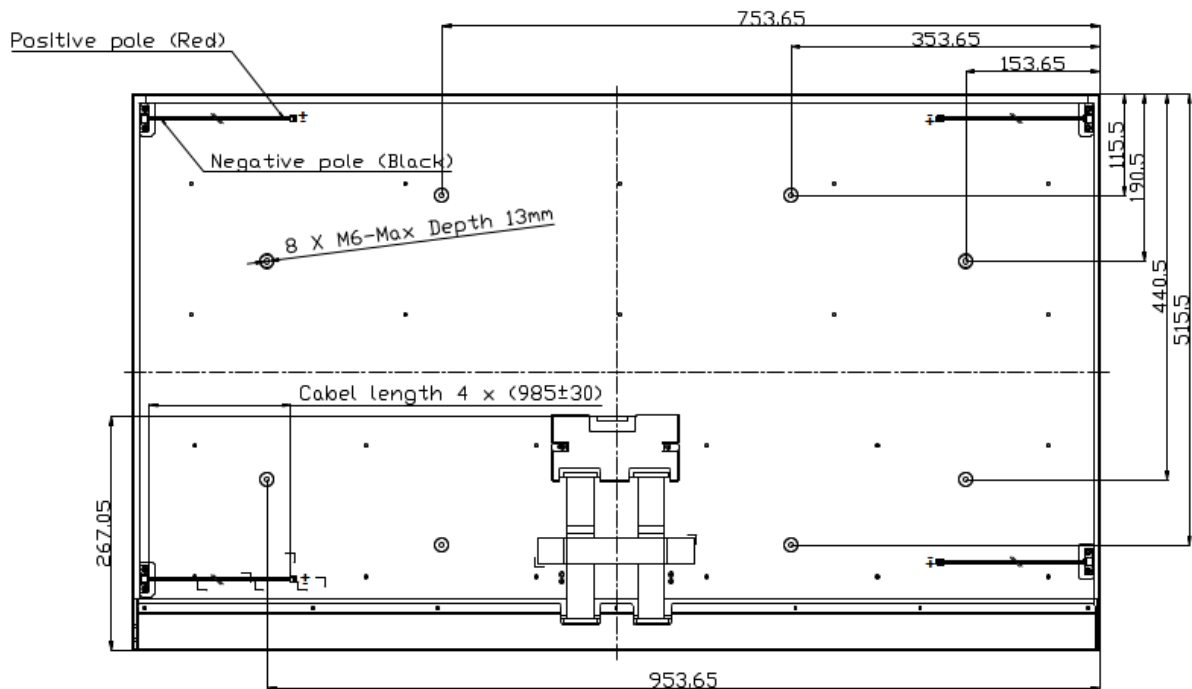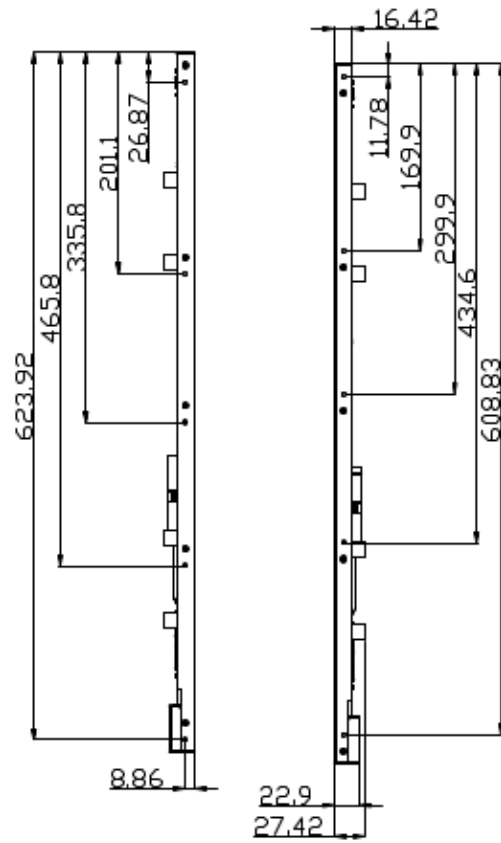
Note：
1. Tolerance is ±0.5mm unless noted.
2."(　)" marks the reference dimension.

6 AD9131DHP 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**
- **DVI operates up to165M Hz**
- **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)**
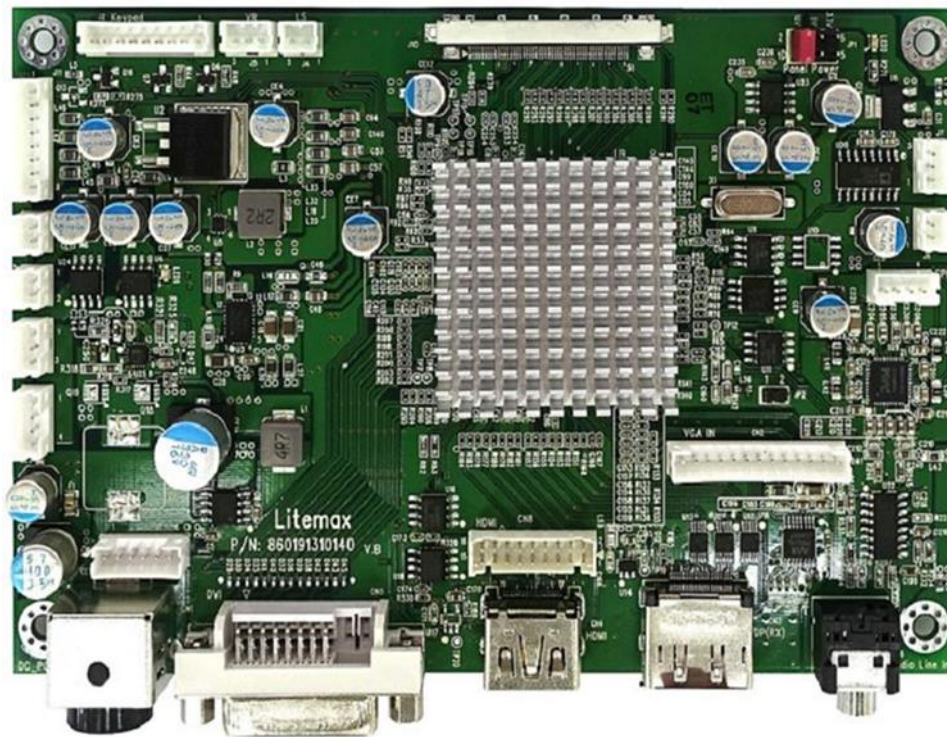
6.2   Outline Dimensions

AD9131 150mm x 100mm
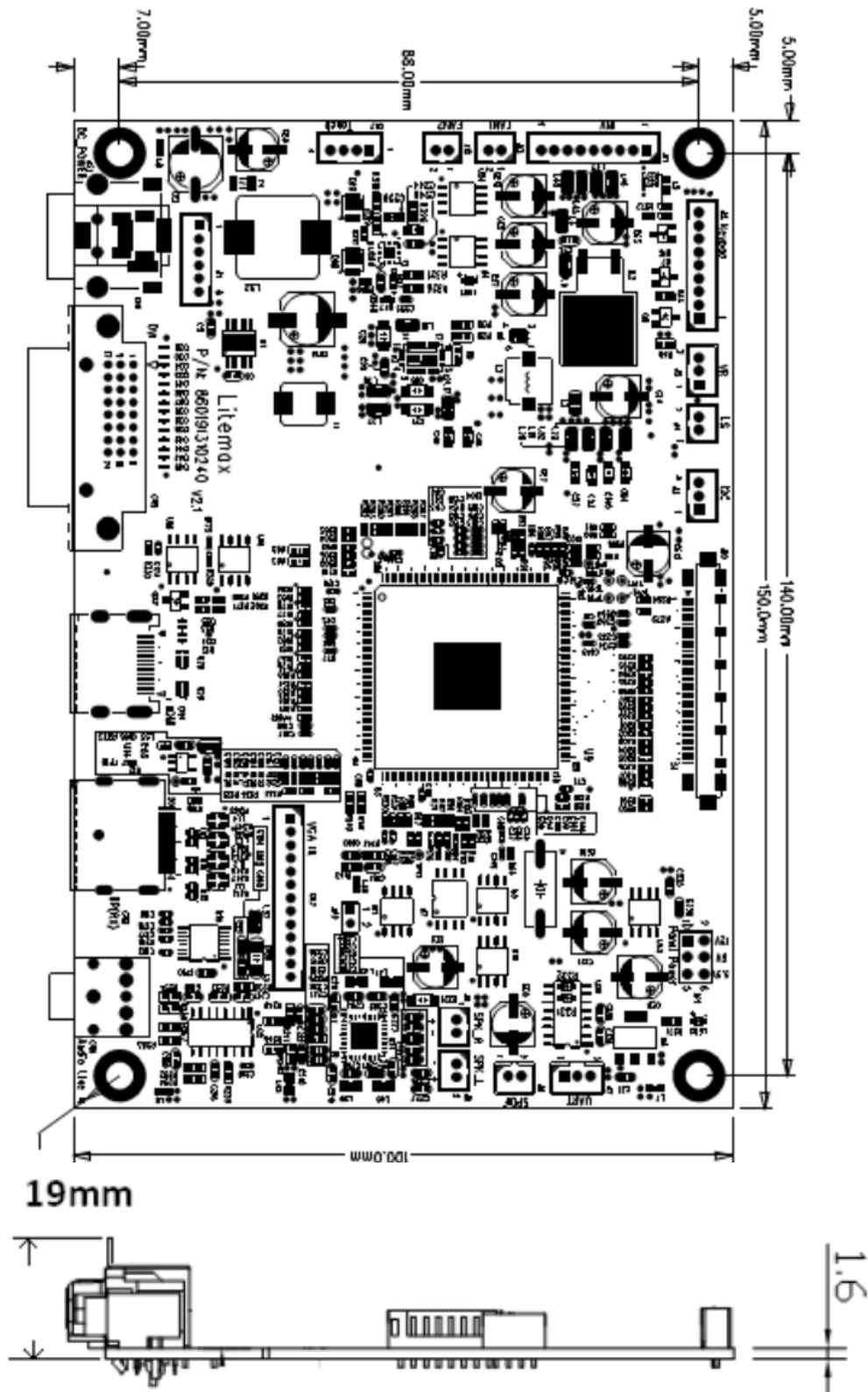
6.3   AD9131DHP   Board Pin Define

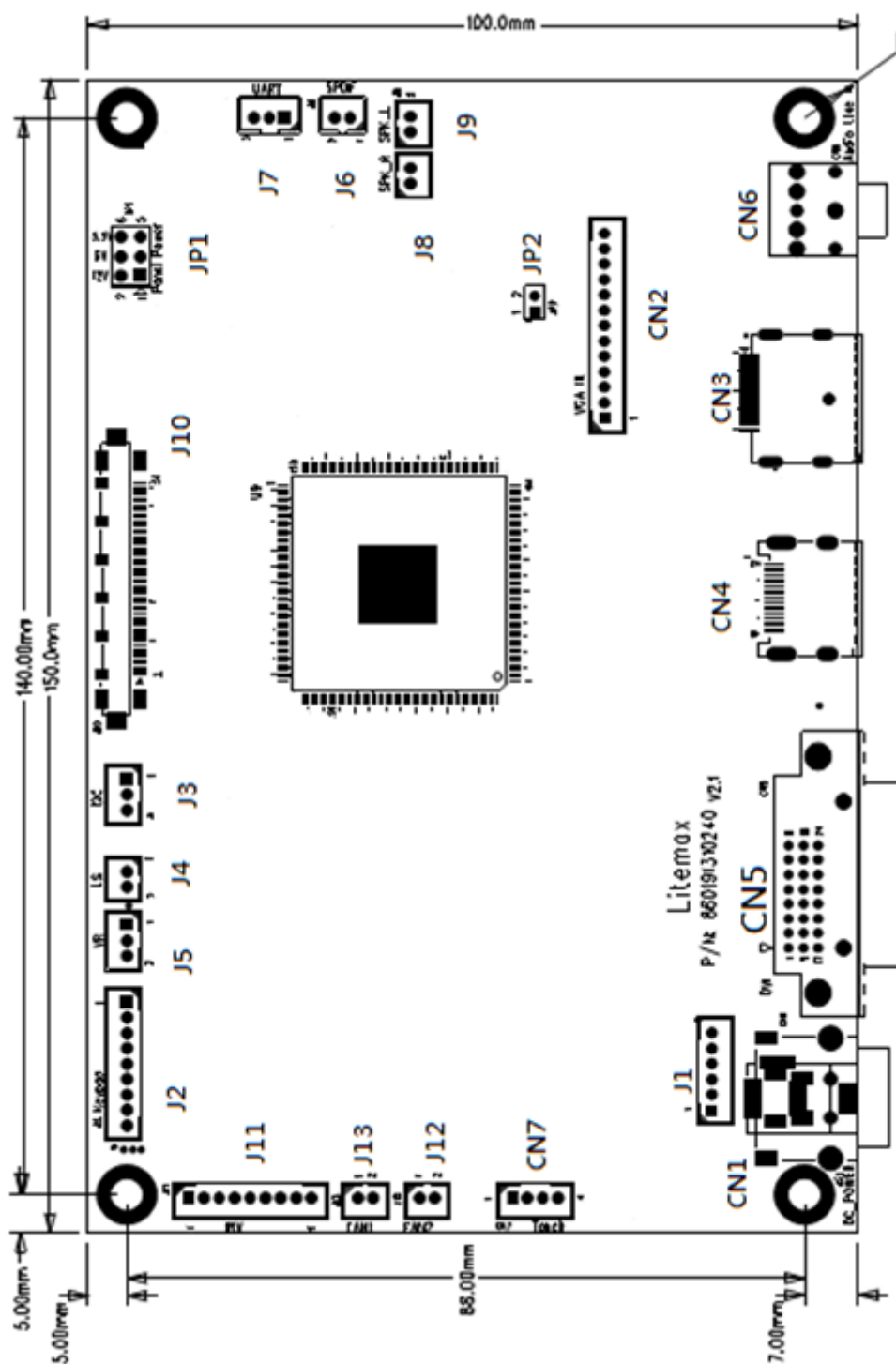**J10**: **Panel (V-By-one or e-DP) connector**

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-

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(Note 1)	2	24Vdc or 12Vdc (Note 1)

3	GND	4	GND

CN1: Power Jack (24V or 12V)

Pin No.	Function	Pin No.	Function
1	24Vdc or 12Vdc(Note 1)	2	GND
3	GND		

J1: Power input connector (6 pin 2.0mm)

Pin No.	Function	Pin No.	Function
1	24Vdc or 12Vdc(Note 1)	2	24Vdc or 12Vdc(Note 1)
3	24Vdc or 12Vdc(Note 1)	4	GND
5	GND	6	GND

Note 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
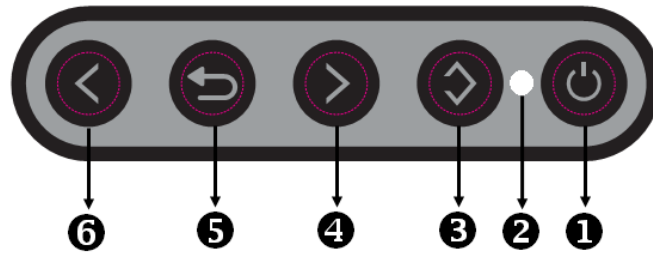
❶ **Key:** (Power) function key

> 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.
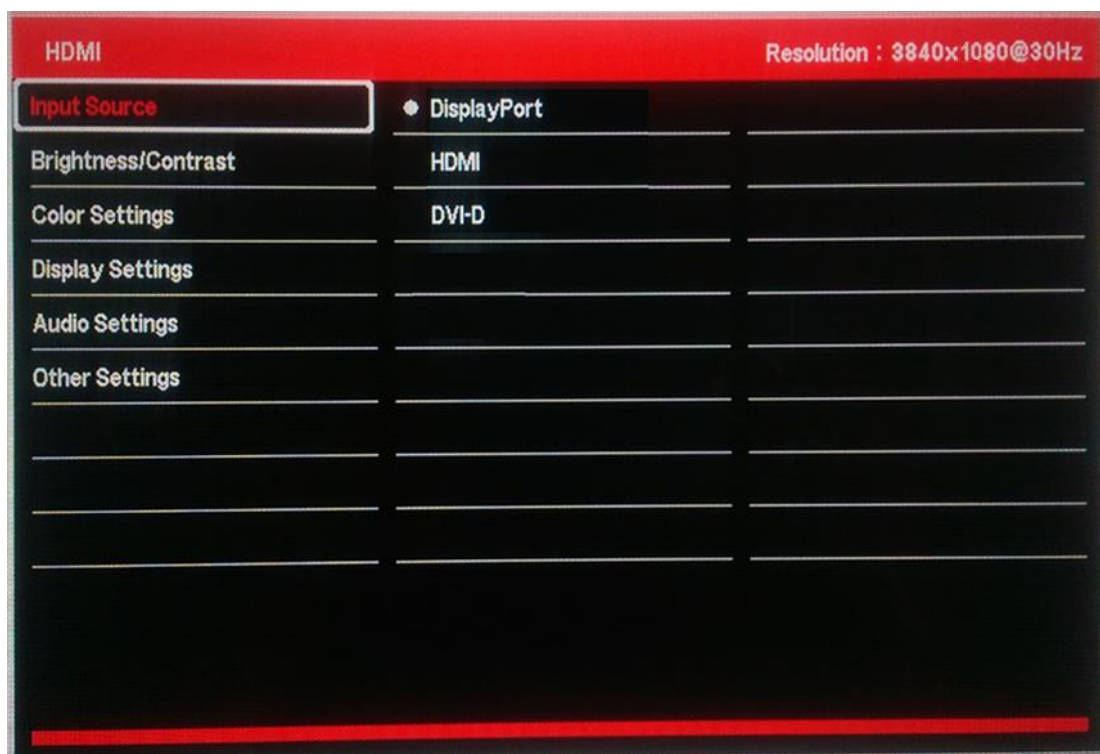
7   Precautions

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.