

# LITEMAX

## DLD2708-E

### Sunlight Readable 27" 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
Oct/30/2025	all		Initial release	

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## 1 General Description

The DLD2708-E is a 27inch industrial grade sunlight readable LCD, with high brightness 1600 nits, it produces 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 Features

- High Brightness 1600 nits
- Sunlight Readable
- LED Backlight
- Low Power Consumption
- LCD Blackening Defect Free (Hi-Tni 105 °C)
- BL MTBF: 50,000 hours

### 1.2 General Specifications

Model Name	DLD2708-E
Description	27" TFT LCD, 1600 nits LED Backlight, 1920x1080
Screen Size	27"
Display Area (mm)	597.888(H)x336.312(V)
Brightness	1600 cd/m <sup>2</sup>
Resolution	1920x1080
Aspect Ratio	16 : 9
Contrast Ratio	1300 : 1
Pixel Pitch (mm)	0.3114(H)x0.3114(V)
Pixel Per Inch (PPI)	82
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	81%
Display Colors	16.7M
Response Time (Typical)	14ms
Panel Interface	LVDS
Input Interface	HDMI,DP
Input Power	DC24V
Power Consumption	65W
OSD Key	4 Keys (Power Switch, Menu, +, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position...etc
Dimensions (mm)	628.6x366.4x48.3
Bezel Size(U/B/L/R)	15.04/15.04/15.36/15.36mm
Weight (Net)	5.7 kg
Mounting	100x100
Operating Temperature	-20 °C ~ 60 °C
Storage Temperature	-30 °C ~ 80 °C

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

### 1.3 Absolute Maximum Ratings

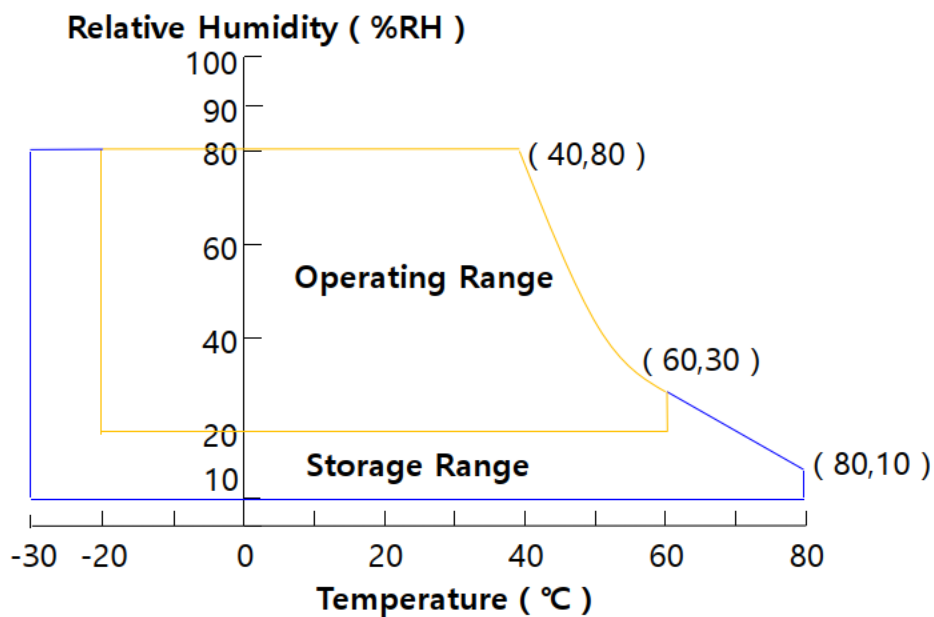
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table.

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	6	V	Ta = 25 °C
Logic Supply Voltage	Vin	Vss-0.3	Vdd+0.3	V	
Operating Temperature	T <sub>OP</sub>	-20	60	°C	Note 1
	T <sub>sur</sub>	-	80		
Storage Temperature	T <sub>ST</sub>	-30	+80	°C	

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

Wet bulb temperature should be 39°C max. and no condensation of water.



## 2 Electrical Specifications

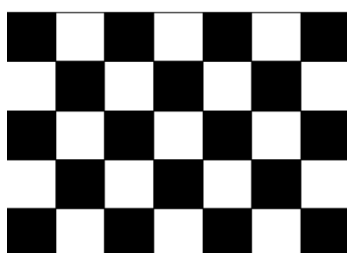
### 2.1 Electrical Characteristics

[Ta = 25±2°C]

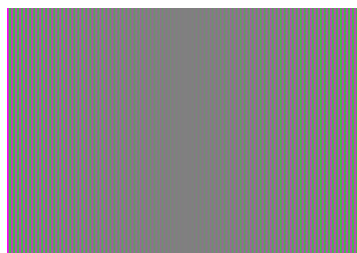
Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	4.5	5	5.5	Vdc	
Power Supply Ripple Voltage		VRP	-	-	300	mV	
Power Supply Current		IDD	-	1200	2000	mA	Note 1
Power Consumption		PDD	-	6	10	Watt	
Rush current		IRUSH	-		3.0	A	Note 2
LVDS Interface	Differential Input High Threshold Voltage	VLVTH		-	+100	mV	
	Differential Input Low Threshold Voltage	VLVTL	-100	-	-	mV	
	Input Differential Voltage	VID	100	-	600	mV	
	Common Input Voltage	VLVC	0.6	1.2	1.6	V	
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3		
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

Notes 1 : The supply voltage is measured and specified at the interface connector of LCM.  
The current draw and power consumption specified is for VDD=5.0V, Frame rate Fv=60Hz and Clock frequency = 74.25MHz. Test Pattern of power supply current.

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



b) Max : Vline Subline (L255)



c) Flicker Pattern



Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 1ms(min).

## 2.2 Electrical Interface Connection

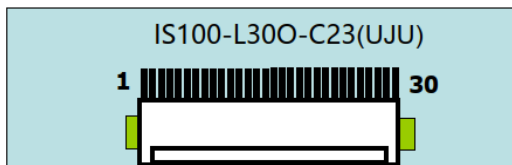
Interface Input Signal & Power : Cable length suggest less than 300mm

LVDS Connector: IS100-L300-C23(UJU).

Pin No	Symbol	Description	Pin No	Symbol	Description
1	RXO0-	Negative Transmission data of Pixel 0 (ODD)	16	RXE1+	Positive Transmission data of Pixel 1 (EVEN)
2	RXO0+	Positive Transmission data of Pixel 0 (ODD)	17	GND	Power Ground
3	RXO1-	Negative Transmission data of Pixel 1 (ODD)	18	RXE2-	Negative Transmission data of Pixel 2 (EVEN)
4	RXO1+	Positive Transmission data of Pixel 1 (ODD)	19	RXE2+	Positive Transmission data of Pixel 2 (EVEN)
5	RXO2-	Negative Transmission data of Pixel 2 (ODD)	20	RXEC-	Negative Transmission Clock (EVEN)
6	RXO2+	Positive Transmission data of Pixel 2 (ODD)	21	RXEC+	Positive Transmission Clock (EVEN)
7	NC	LCD Self test Pin	22	RXE3-	Negative Transmission data of Pixel 3 (EVEN)
8	RXOC-	Negative Transmission Clock (ODD)	23	RXE3+	Positive Transmission data of Pixel 3 (EVEN)
9	RXOC+	Positive Transmission Clock (ODD)	24	GND	Power Ground
10	RXO3-	Negative Transmission data of Pixel 3 (ODD)	25	NC	LCD Self test Pin
11	RXO3+	Positive Transmission data of Pixel 3 (ODD)	26	NC	LCD Self test Pin
12	RXE0-	Negative Transmission data of Pixel 0 (EVEN)	27	NC	No Connect
13	RXE0+	Positive Transmission data of Pixel 0 (EVEN)	28	VDD	Power Supply: +5V
14	GND	Power Ground	29	VDD	
15	RXE1-	Negative Transmission data of Pixel 1 (EVEN)	30	VDD	

Notes : 1. Input Level of LVDS signal is based on the EIA-644 Standard.

### Rear view of LCM



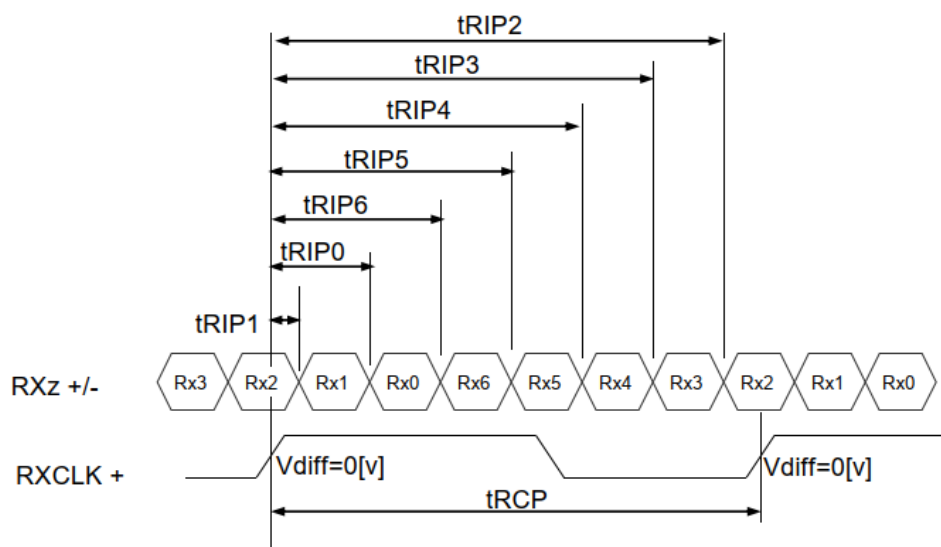
### BIST Pattern

PT1:Black (2sec)	PT2:White (2sec)	PT3:Red (2sec)	PT4:Green (2sec)	PT5:Blue (2sec)

## 2.3 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table.

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCP	10.47	13.47	16.84	nsec	
Receiver Data Input Margin	tRMG	-0.60	-	+0.60	nsec	fCLKIN=74.25M Hz
Input Data 0	tRIP1	-   tRMG	0.0	tRMG	Clock	
Input Data 1	tRIP0	T/7-   tRMG	T/7	T/7+   tRMG	Clock	
Input Data 2	tRIP6	2 T/7-   tRMG	2T/7	2T/7+   tRMG	Clock	
Input Data 3	tRIP5	3T/7-   tRMG	3T/7	3T/7+   tRMG	Clock	
Input Data 4	tRIP4	4T/7-   tRMG	4T/7	4T/7+   tRMG	Clock	
Input Data 5	tRIP3	5T/7-   tRMG	5T/7	5T/7+   tRMG	Clock	
Input Data 6	tRIP2	6T/7-   tRMG	6T/7	6T/7+   tRMG	Clock	



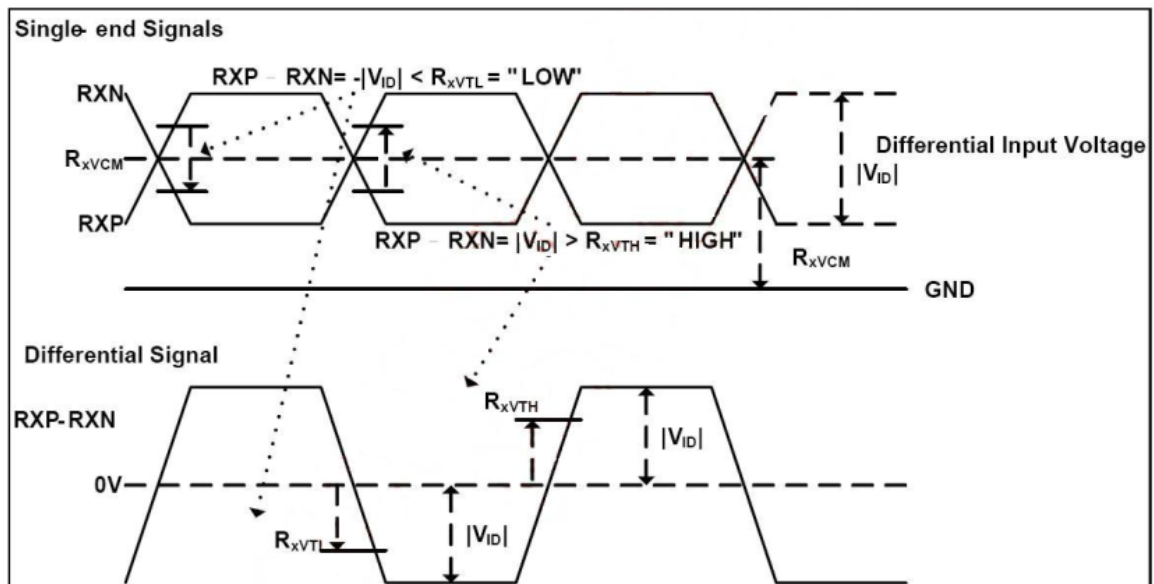
$$* V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$$



## 2.4 LVDS Specifications (DC&AC Characteristics)

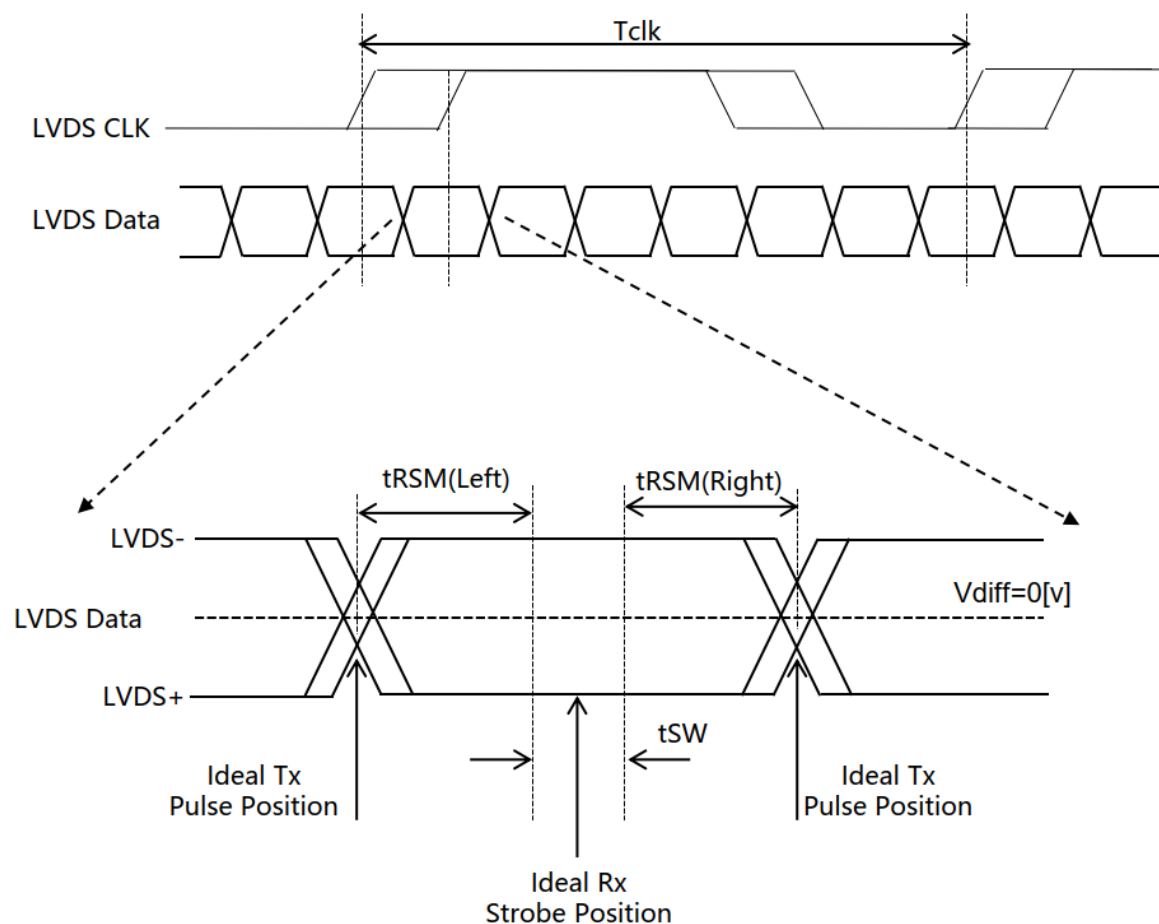
### LVDS Rx DC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Input High Threshold Voltage	VTH	-	-	+100	mV	VCM=1.2V
Differential Input Low Threshold Voltage	VTL	-100	-	-	mV	
Differential Input Common Mode Voltage	VCM	0.8	1.2	1.6	V	
Differential Input Voltage	VID	100	-	600	mV	



## LVDS Rx AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
LVDS Strobe Width	t <sub>SW</sub>	200	-	-	ps	V <sub>cm</sub> =1.2V VID = 400mV @65MHz
Receiver Skew Margin	t <sub>RSM</sub>	-	-	400	ps	



Note:

RSM: Receiver Skew Margin

SW: Strobe Width (Setup and Hold time ; TCON Internal data sampling window)

## 2.5 Signal Timing Waveforms of Interface Signal

### SIGNAL TIMING SPECIFICATION

Item	Symbols		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	10.77	13.47	16.18	ns	
	Frequency	-	61.8	74.25	92.8	MHz	
Horizontal	Horizontal Period	tHP	1050	1100	1120	tCLK	
	Horizontal Valid	tHV	960			tCLK	
	Horizontal Blank	tHB	90	140	160		
	Frequency	fH	56	67.5	84.5	KHz	
Vertical	Vertical Period	tVP	1110	1125	1251	tHP	
	Vertical Valid	tVV	1080			tHP	
	Vertical Blank	tVB	30	45	171	tHP	
	Frequency	fV	50	60	75	Hz	
LVDS Rx Clock	CLK Jitter	TJitter	-	-	200	ps	

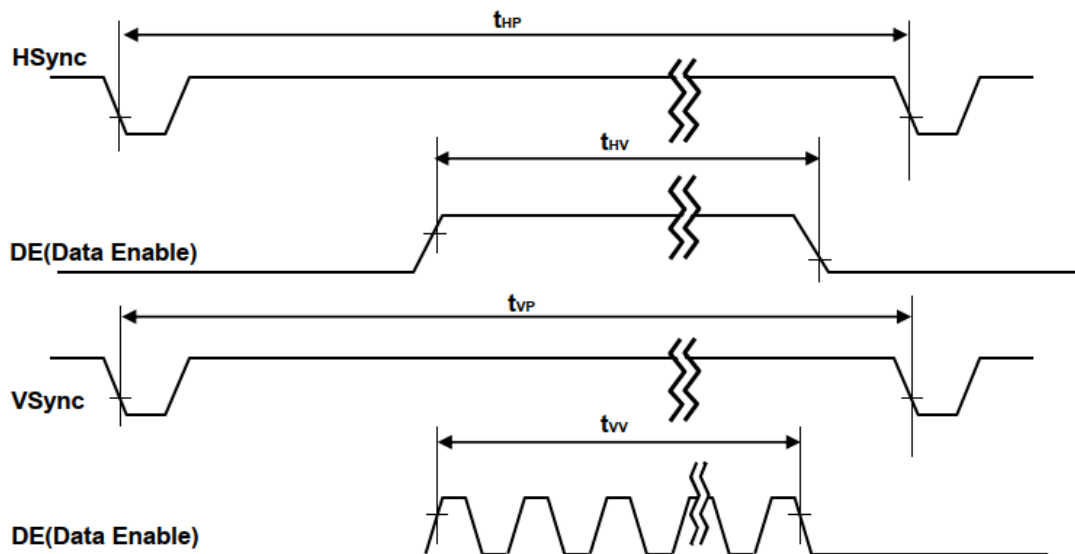
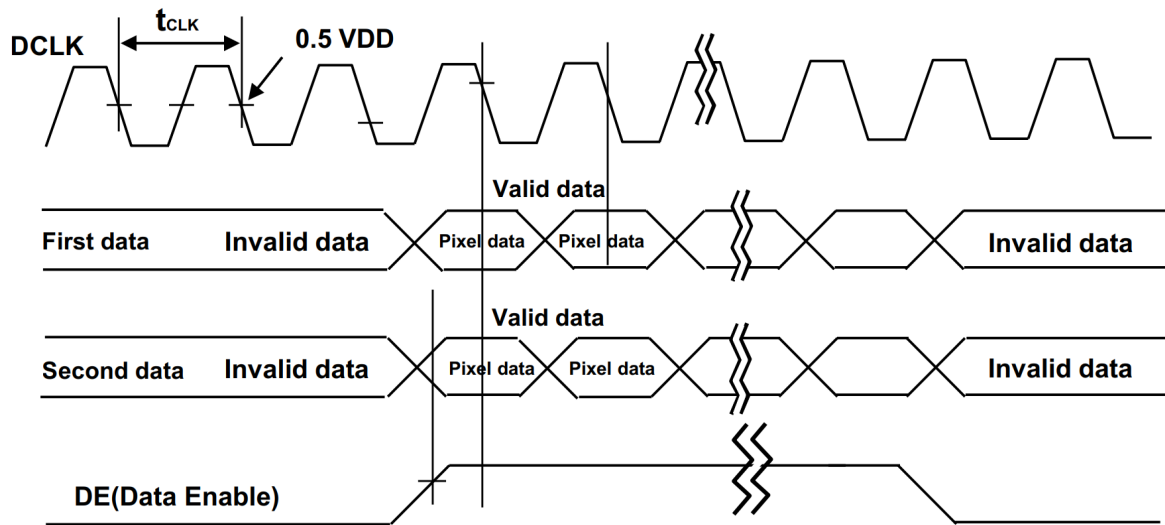
Note:

1. DE Only Mode, while operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation.
2. Best operation clock frequency is 74.25Mhz.
3. Frequency = [H Total] \* [V Total] \* [vertical Frame rate]  
H Total, V Total and Frame rate should operate within the range between Frequency\_Min and Max.
4. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.
5. Main frequency Max is 92.8 MHz without spread spectrum

### LVDS Input SSCG

Symbol	Parameter	Condition	Min	Typ	Max	Unit
F <sub>LVMOD</sub>	Modulating frequency of input clock during SSC	F=75MHz	30	-	100	KHz
F <sub>LVDEV</sub>	Maximum deviation of input clock frequency during SSC		-3	-	+3	%

## Sync Timing Waveforms



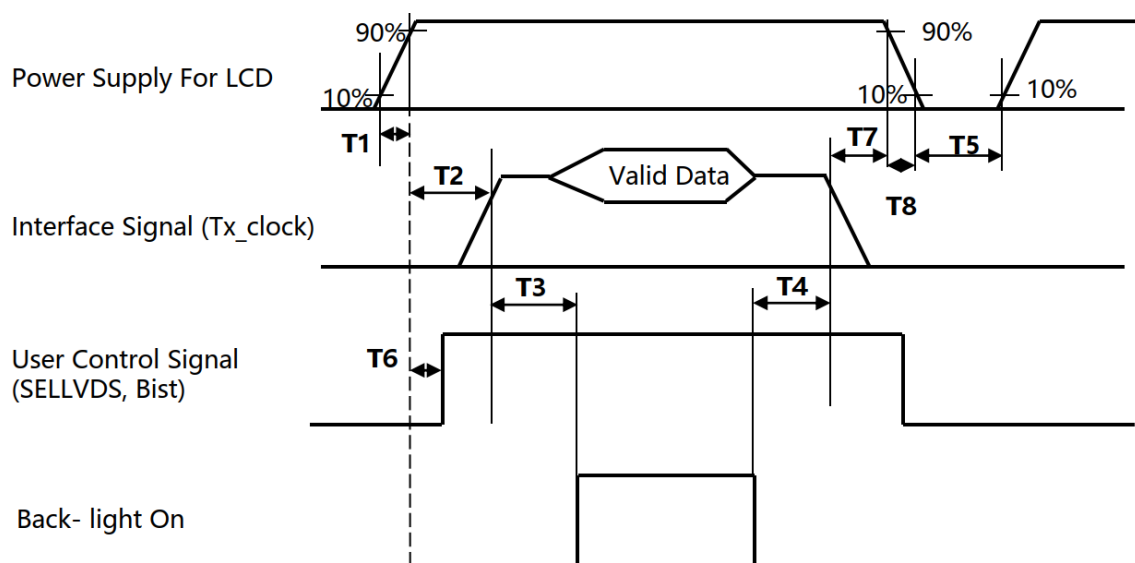
Note: While operation, DE signal should be having the same cycle and continuous.

## 2.6 Input Signals, Basic Display Colors & Gray Scale of Colors

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	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	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
Gray Scale of Red	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	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	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	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△																								
	▽																								
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△																								
	▽																								
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	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	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	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

## 2.7 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below:



Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0.1	-	T7	ms
T3	400	-	-	ms
T4	200	-	-	ms
T5	1	-	-	s
T6	0.1	-	T2	ms
T7	0.1	-	-	ms
T8	0.5	-	10	Ms

Note 1: Even though T1 is over the specified value, there is no problem if the rush current is within Spec.

Note 2: When the power supply VDD is 0V, keep the level of input signals on the low or high impedance ;

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

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

Note 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.

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

Note 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

Note 6: T8: Voltage of VDD must decay smoothly after power-off, there should be none rebounding voltage.

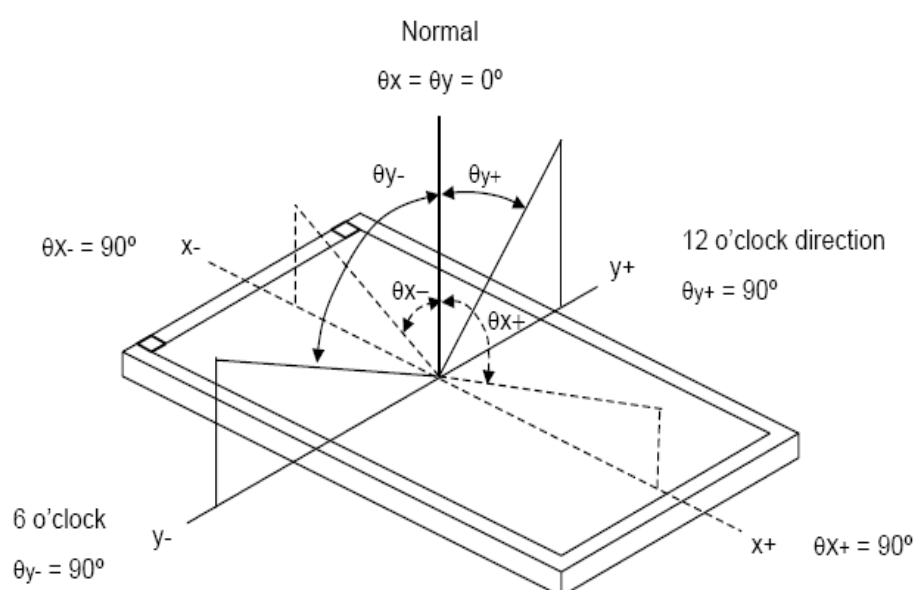
(customer system decides this value)

### 3 Optical Specification

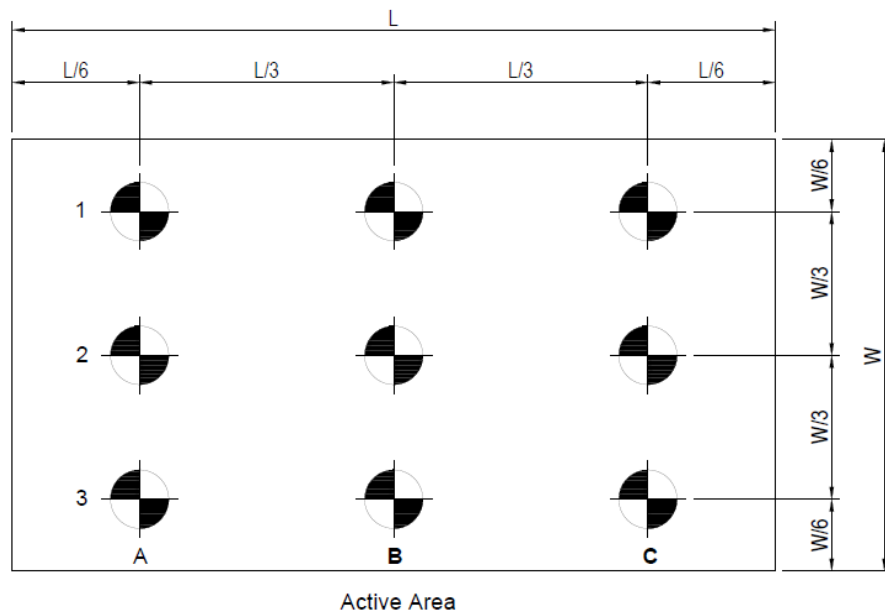
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	R <sub>x</sub>	$\theta_x=0$ $\theta_y=0$ CA-410	0.624	0.654	0.684	-	Test Mode: (2) (3)
		R <sub>y</sub>		0.307	0.337	0.367	-	
	Green	G <sub>x</sub>		0.298	0.328	0.358	-	
		G <sub>y</sub>		0.566	0.596	0.626	-	
	Blue	B <sub>x</sub>		0.117	0.147	0.177	-	
		B <sub>y</sub>		0.031	0.061	0.091	-	
	White	W <sub>x</sub>		0.286	0.316	0.346	-	
		W <sub>y</sub>		0.285	0.315	0.345	-	
Center Luminance of White		L <sub>c</sub>	$\theta_x=0$	1440	1600	2080	cd/m <sup>2</sup>	
Uniform		L <sub>u</sub>	$\theta_y=0$ CA-410		87		%	
Contrast Ratio		CR	$\theta_x=0$	1170:1	1300:1		-	Test Mode: (4)
Color Saturation		NTSC	$\theta_y=0$ Klein K-10		81		%	
Viewing Angle	Horizontal	$\theta_{x+}$	$CR \geq 10$		89		Deg	Test Mode: (1)
		$\theta_{x-}$			89			
	Vertical	$\theta_{y+}$			89			
		$\theta_{y-}$			89			

#### Test Mode :

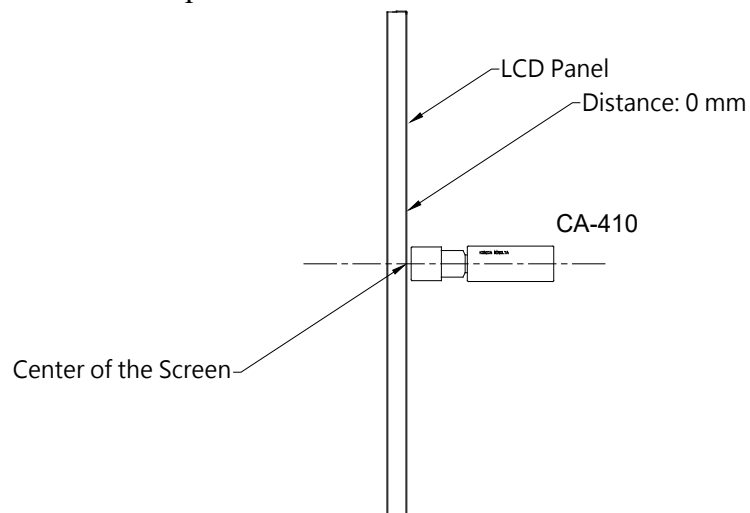
(1) Definition of Viewing Angle ( $\theta_x$  ,  $\theta_y$ ):



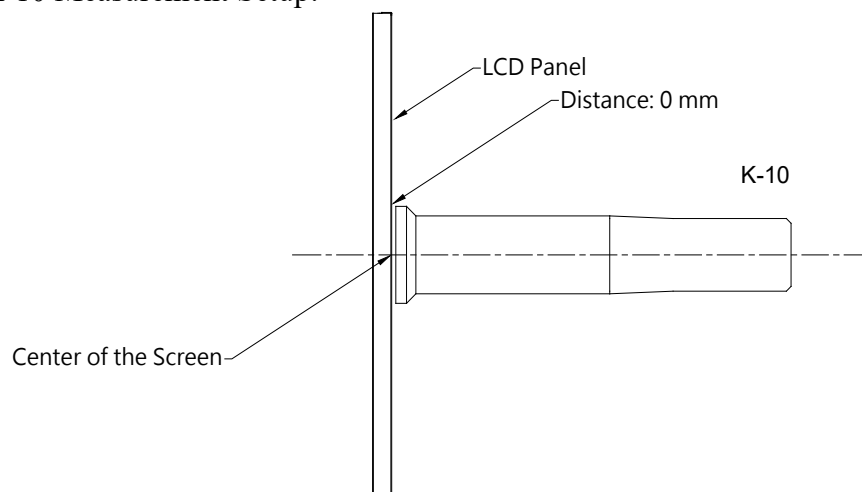
(2) Definition of Test Point:



(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

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	V <sub>in</sub>		22.0	24.0	26.0	V	
Input Current (High Brightness)	I <sub>inH</sub>	Brightness = 100%	2.65	2.36	2.05	A	(1)
Input Power Consumption	P <sub>in</sub>	Brightness = 100%	-----	56.64	-----	W	
LED Current (High Brightness)	I <sub>outH</sub>	Brightness = 100%	-----	0.8	-----	A	
Working Frequency	W_Freq	Brightness = 100%	-----	200	-----	KHZ	
Brightness Control	DC mode						
	V <sub>adj</sub>	Connection of Voltage	0.2	-----	4.8	V	(2)
	PWM mode						
	PWM	Connect to PWM	0	-----	100	%	(3)
	Freq		-----	200	-----	Hz	(4)
ON/OFF Control	V <sub>on</sub>	Normal Operation	2	-----	5	V	
	V <sub>off</sub>		0	-----	0.8	V	
Output Voltage	V <sub>out</sub>	Brightness = 100%	-----	66.7	-----	V	
Efficiency	η	Brightness = 100%	-----	94	-----	%	(5)

Remark:

(1) This data is based on the testing result of practical input voltage, I<sub>in</sub> is measured by related V<sub>in</sub>. (min, typ, max). If the voltage is increased, the current will decrease. If the voltage is decrease, the current will increase.

(2) Max brightness at V<sub>adj</sub>=0.2V. Min brightness at V<sub>adj</sub>=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)  $\eta_{\max} = V_{\text{out}(\max)} * I_{\text{outH}(\max)} / V_{\text{in}(\max)} * I_{\text{inH}(\min)}$   
 $\eta_{\min} = V_{\text{out}(\min)} * I_{\text{outH}(\min)} / V_{\text{in}(\min)} * I_{\text{inH}(\max)}$

## 4.2 Connector Socket

### Input Connector:

J3 (JST S9B-PH-SM3-TB or Compatible)

PIN No	Symbol	Description
1	V <sub>in</sub>	DC+
2	V <sub>in</sub>	DC+
3	V <sub>in</sub>	DC+
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	Brightness	Brightness Control
8	Control	ON/OFF Control
9	CL	PWM or DC selection

Note: Pin9 is dimming method control pin, Low → DC dimming, High → PWM dimming.  
If pin9 is be used, please NC JP1.

### Output Connector:

J1, J2(JST S2B-EH or Compatible)

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

### DC or PWM Connector:

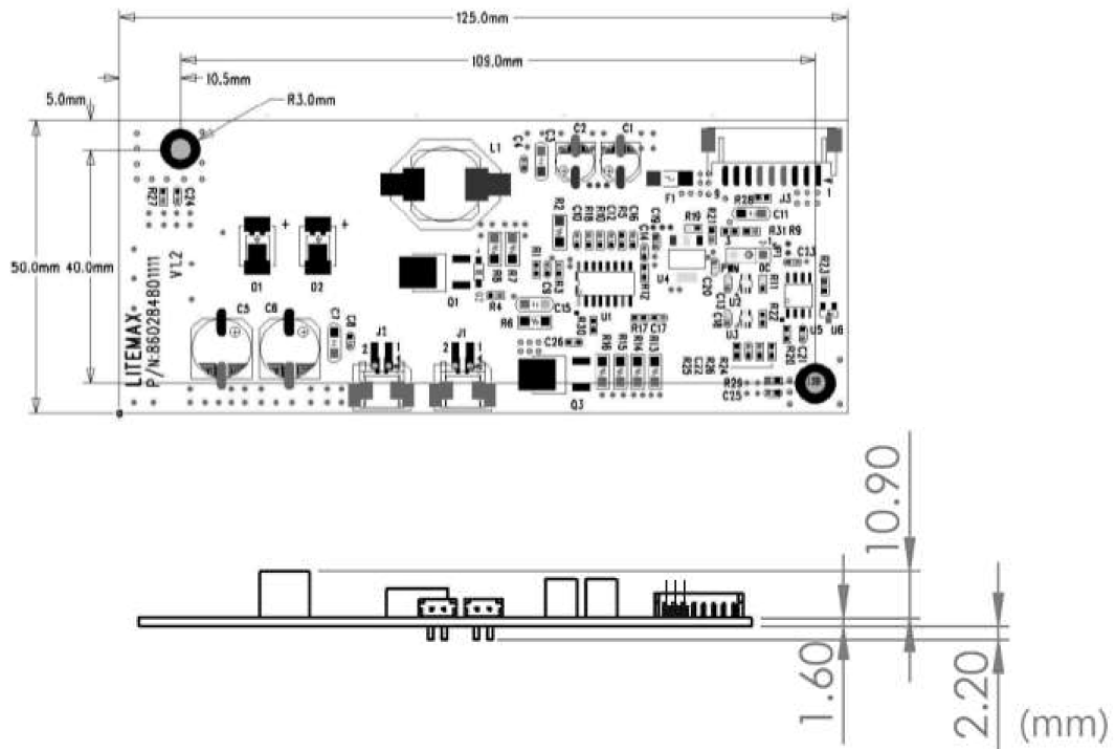
JP1

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 JP1 to set DC/PWM, please NC the pin9 of J3.

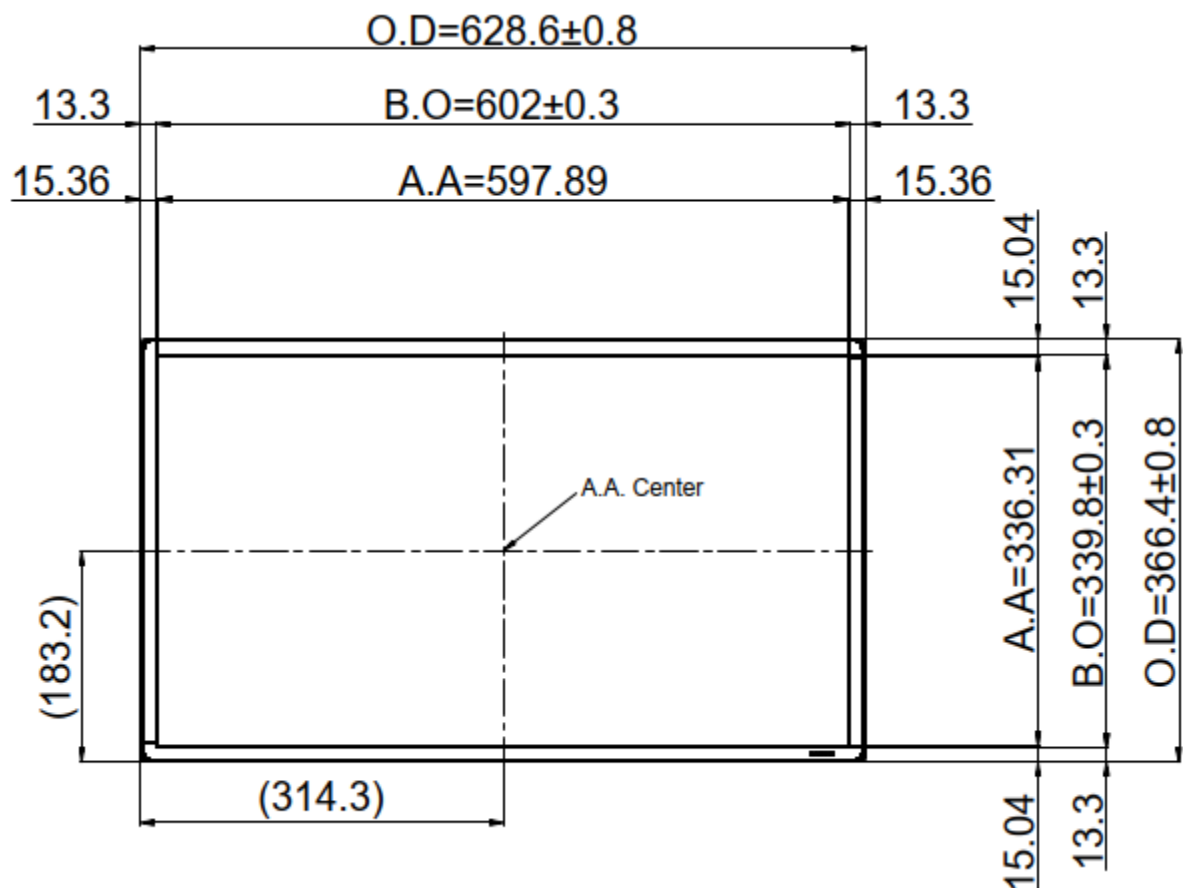
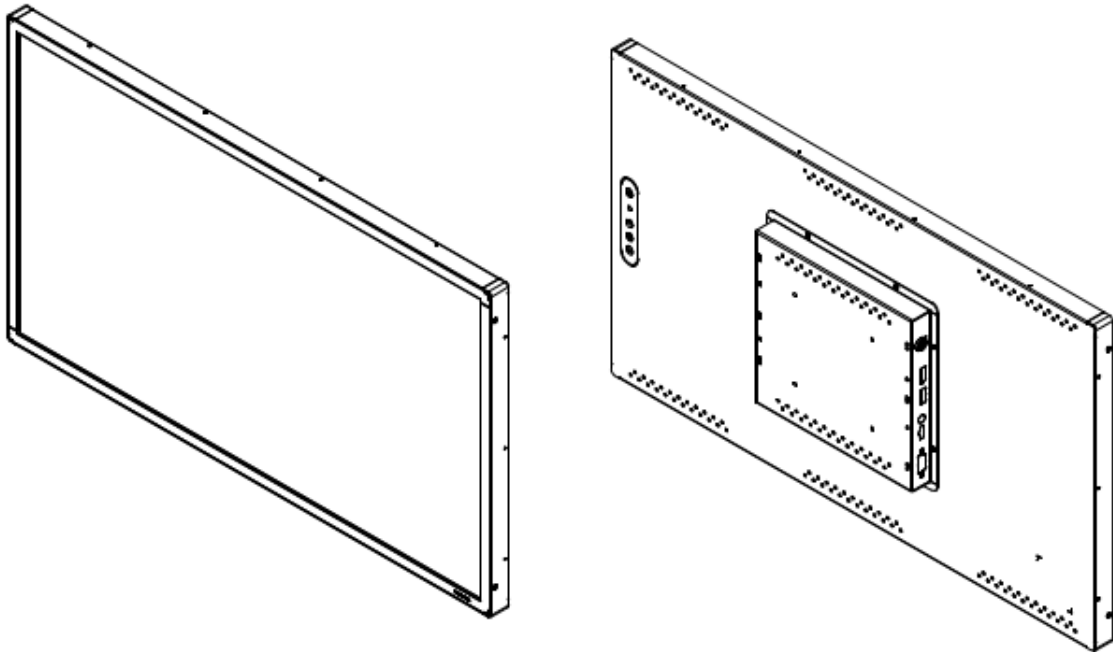
### 4.3 Mechanical Characteristics

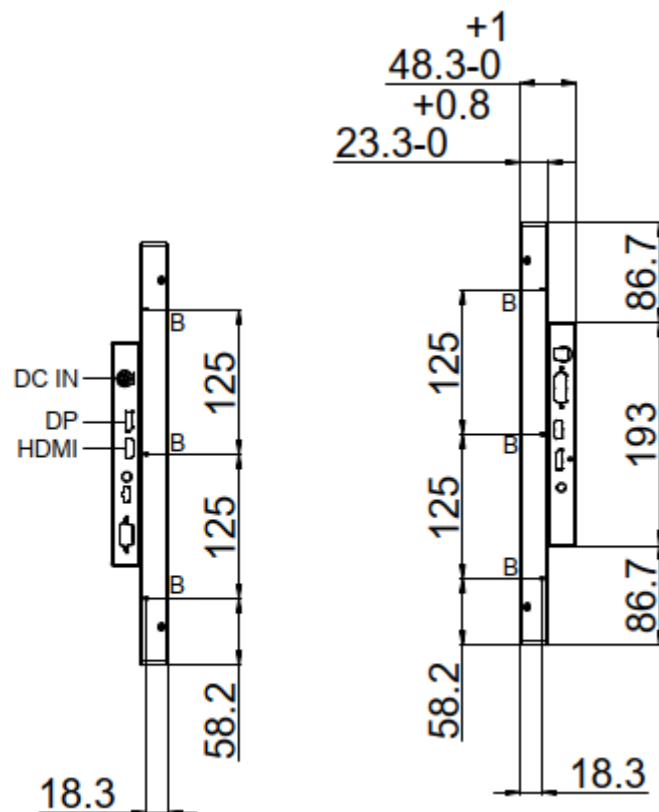
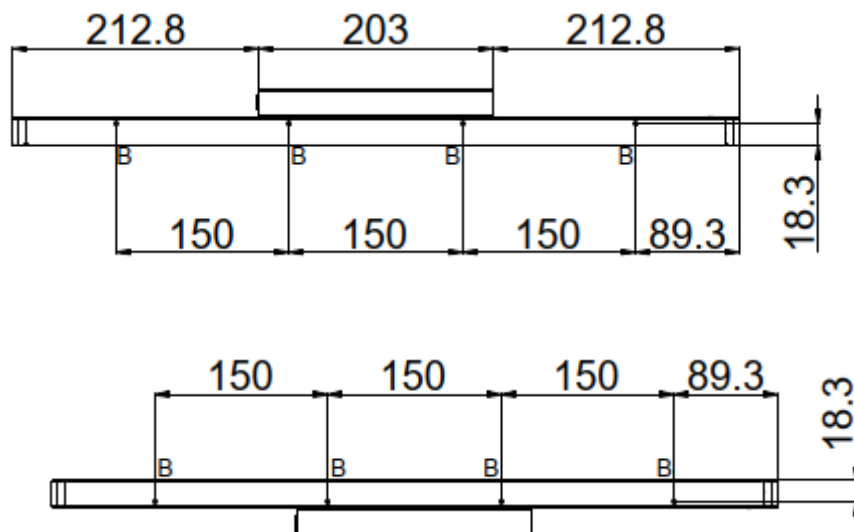
Dimension: 125mm x 50mm x 12.5mm

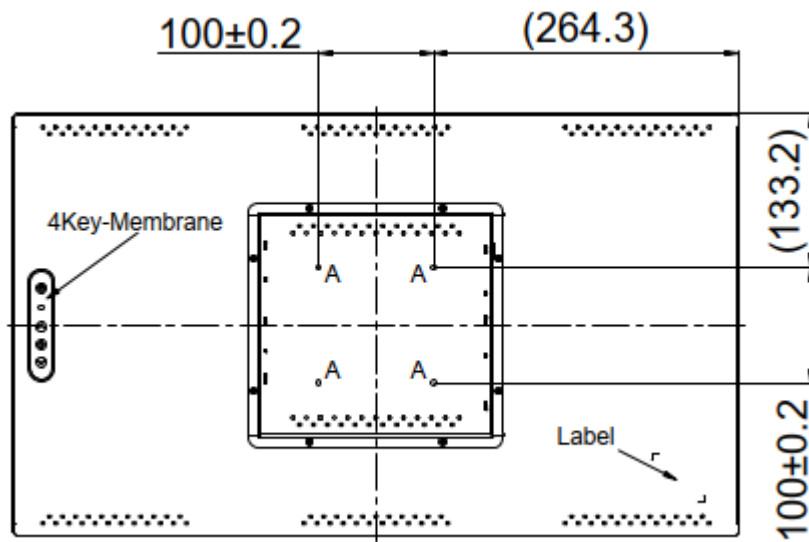


## 5 Mechanical Drawing

Unit:mm







Note:

O.D. : OUTLINE DIMENSION

B.O. : BEZEL OPENING

A.A. : ACTIVE AREA

A : M4\_USER HOLE\_MAX Depth=6mm

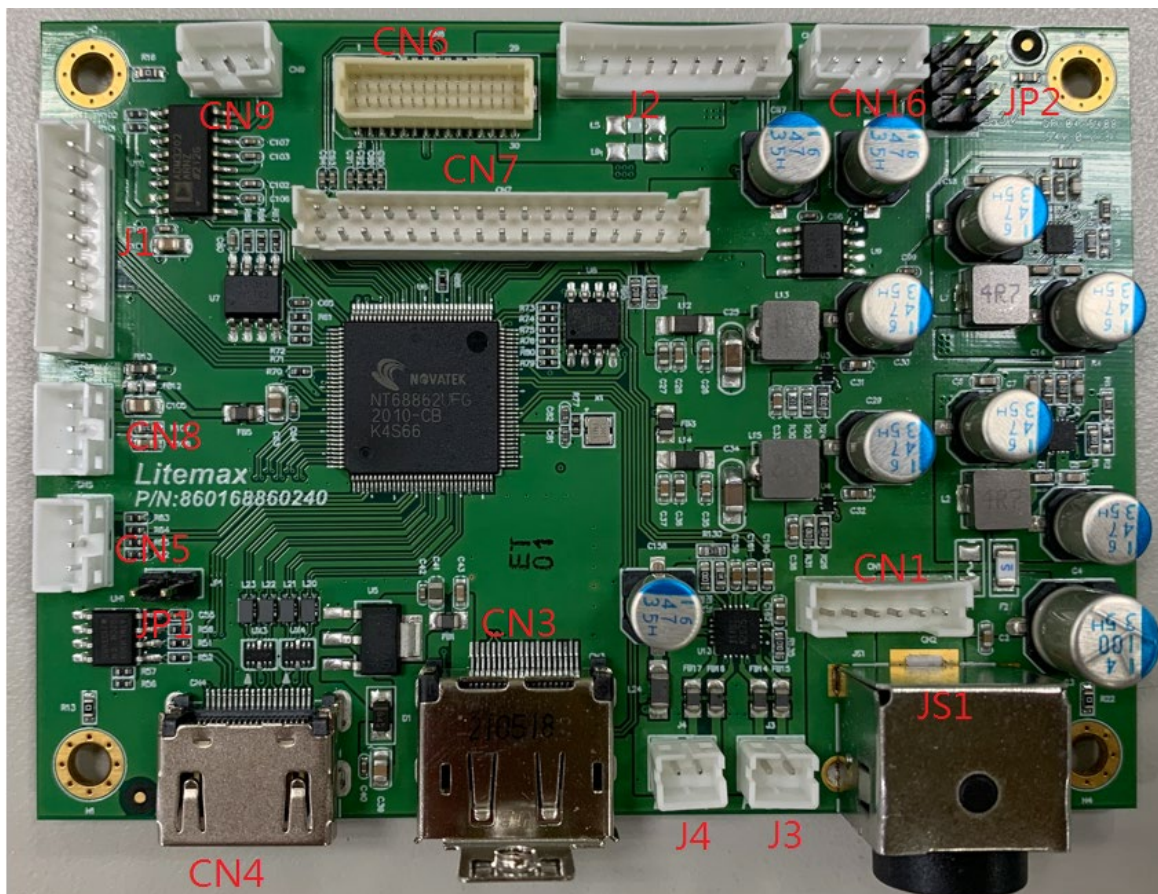
B : M3\_USER HOLE\_MAX Depth=3mm

## 6 AD68862HP 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 a HDMI and Display Port input. Rev.1 is European RoHS compliant.

### General Description

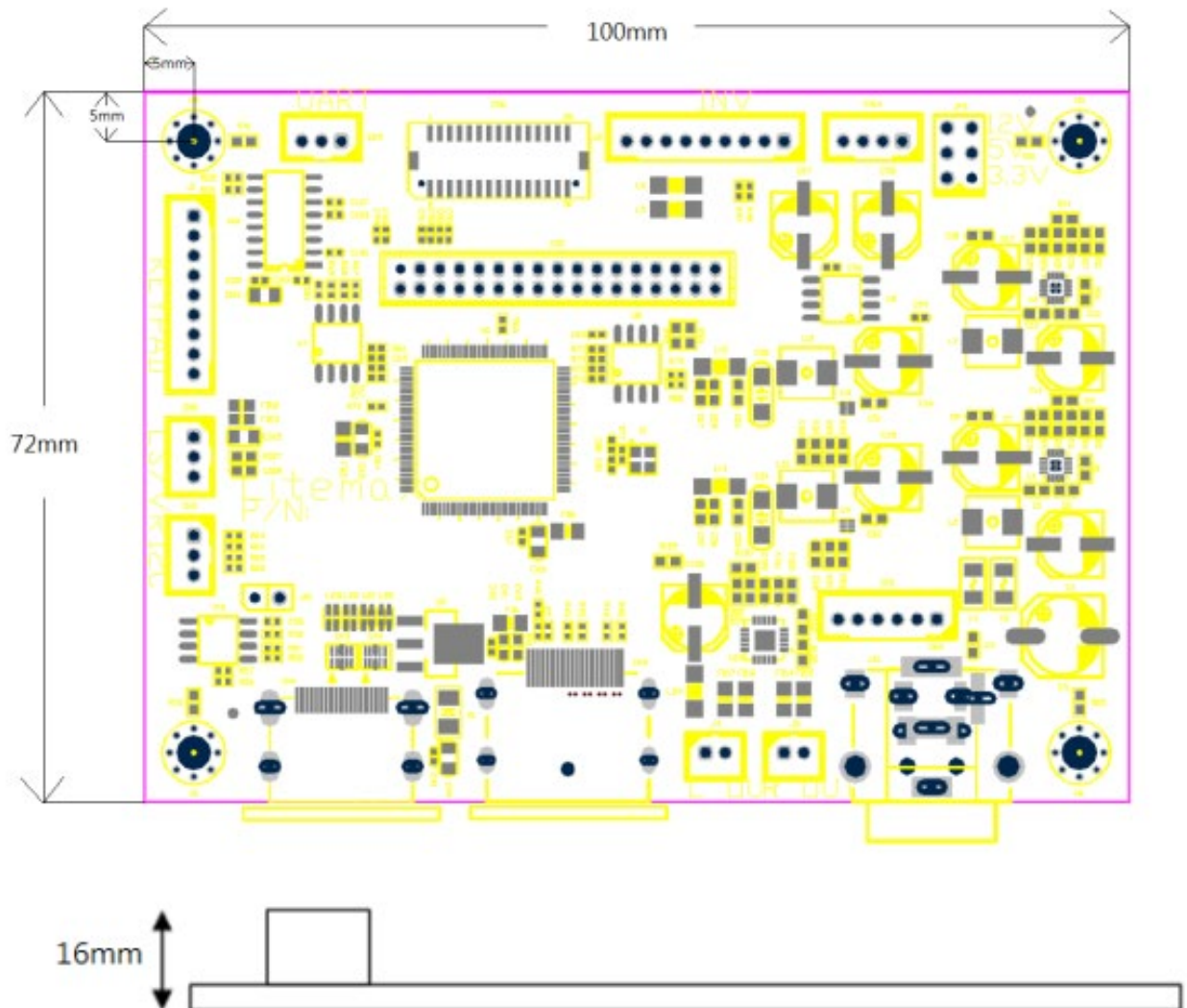
- Max resolution 1920 x 1080 60Hz
- One DP 1.2 , supports 1920 x 1080 60Hz
- One HDMI 1.4 , supports 1920 x 1080 60Hz
- Embedded MCU with ADC port for VR, Light Sensor application. (Optional)
- Embedded OSD.
- Support panel voltage 3.3/ 5/ 12 V
- Support eDP panel.
- Support Dual/Single LVDS
- Support 2.8W speaker x 2 (Optional)
- Size 100mm\*72mm
- Support output voltage 12V(1A) or 5V(1A)





## Outline Dimensions

AD68862HP 100 mm x 72mm





## AD68862HP Board Pin Define

### **CN6:** eDP output(Wafer 1.0mm, 15\*2P)

Pin	Function	Pin	Function
1	TX0P	16	TXAUX-
2	TX0N	17	TX_HPDP
3	TX1P	18	GND
4	TX1N	19	VCC
5	GND	20	VCC
6	GND	21	DIM_EDP
7	NC	22	ON/OFF_EDP
8	NC	23	INVGND
9	GND	24	INVGND
10	GND	25	INVGND
11	NC	26	GND
12	NC	27	12INV
13	GND	28	12INV
14	GND	29	12INV
15	TXAUX+	30	12INV

### **CN7:** LVDS output(Wafer 2.0mm,17x2P)

Pin	Function	Pin	Function
1	RXO0-	18	RXE1+
2	RXO0+	19	RXE2-
3	RXO1-	20	RXE2+
4	RXO1+	21	RXEC-
5	RXO2-	22	RXEC+
6	RXO2+	23	RXE3-
7	RXOC-	24	RXE3+
8	RXOC+	25	NC
9	RXO3-	26	NC
10	RXO3+	27	GND
11	NC	28	GND
12	NC	29	+3.3V
13	GND	30	GND
14	GND	31	VCC
15	RXE0-	32	VCC
16	RXE0+	33	VCC
17	RXE1-	34	VCC

**CN3: DP input**

Pin	Function	Pin	Function
1	ML_Lane3(n)	11	GND
2	GND	12	ML_Lane0(p)
3	ML_Lane3(p)	13	CONFIG1
4	ML_Lane2(n)	14	CONFIG2
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
9	ML_Lane1(p)	19	Return
10	ML_Lane0(n)	20	DP_PWR

**CN4: HDMI input**

Pin	Function	Pin	Function	Pin	Function
1	RX2+	9	RX0-	17	GND
2	GND	10	TMDS Clock+	18	HDMI +5V
3	RX2-	11	HDMI DET	19	HPD
4	RX1+	12	TMDS Clock-		
5	GND	13	NC		
6	RX1-	14	NC		
7	RX0+	15	HDMI_SCL		
8	GND	16	HDMI_SDA		

**CN1: 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

**JS1: Power input (Power Din 4 pin)**

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

**CN2: Power input (Power Jack 3 pin)**

Pin	Function	Pin	Function
1	Power Input	3	GND
2	GND		

**CN16: Power output (Wafer 2.0mm pitch 4 pin)**

Pin	Function	Pin	Function
1	+5V(1A)	3	+12V(1A)
2	GND	4	GND

**J2: 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.

**J1: Keypad (Wafer 2.0mm pitch 9 pin)**

Pin	Function	Pin	Function
1	POWER KEY	6	MENU KEY
2	GREEN LED	7	NC
3	RED LED	8	GND
4	DOWN KEY	9	NC
5	UP KEY		

**CN8: Light sensor (Wafer 2.0mm pitch 3 pin)**

Pin	Function	Pin	Function
1	3.3V	3	GND
2	Sensor Out		

**JP2: Panel power selection (2.54mm pitch 2x3 jump)**

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

**CN9: UART (Wafer 2.0mm pitch 3 pin)**

Pin	Function	Pin	Function
1	TX	3	GND
2	RX		

**CN5: I2C (Wafer 2.0mm pitch 3 pin)**

Pin	Function	Pin	Function
1	SDA	3	GND
2	SCL		

**J3: Audio out R (Wafer 2.0mm pitch 2 pin)(2.8W 4ΩLoad)**

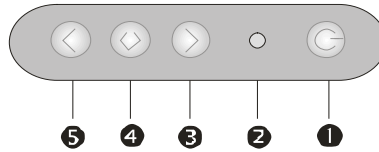
Pin	Function	Pin	Function
1	ROUTP	2	ROUTN

**J4: Audio out L (Wafer 2.0mm pitch 2 pin) (2.8W 4ΩLoad)**

Pin	Function	Pin	Function
1	LOUTP	2	LOUTN

## 6.1 OSD Function

### MEMBRANE CONTROL BUTTOM



- ❶ **POWER SWITCH:** Pushing the power switch will turn the monitor on. Pushing it again to turn the monitor off.
- ❷ **Power LED:** Power ON-Green / Power off-No.
- ❸ **Up Key >:** Increase item number or value of the selected item.
- ❹ **Menu Key:** Enter to the OSD adjustment menu. It also used for go back to previous menu for sub-menu, and the change data don't save to memory.
- ❺ **Down Key <:** Decrease item number or item value when OSD is on.

### 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 **SELECT** 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 10 sec (default OSD timeout), it goes back to the stand-by mode and no more switching is accepted except MENU to restart the setting.

## 6.2 OSD Menu

Here are some instructions for you to use the OSD (On Screen Display). By pressing the “menu”, you will see the below picture.

Timing shows resolution and V-frequency of the panel. This 2 information is not changeable by user.



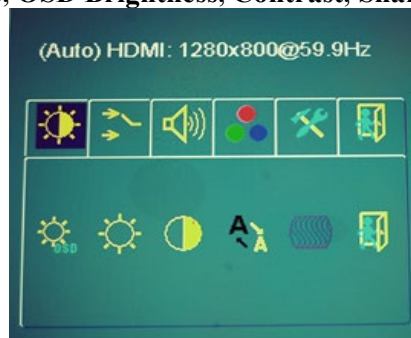
There are 6 sub menus within the OSD user interface:

**Brightness, Signal Select, Sound, Color, Tools, and Exit.**



### Brightness

When you press the “menu” button, you enter the “Brightness” sub directory. In this directory, you will see 6 selections: **Brightness Mode, OSD Brightness, Contrast, Sharpness, Auto Tune, Exit.**



### Brightness Mode :

press “menu” once, you can go into the Brightness Mode.



### VR: (OPTION)

press this Icon to activate the VR control of brightness.



### Ambient light sensor: (OPTION)

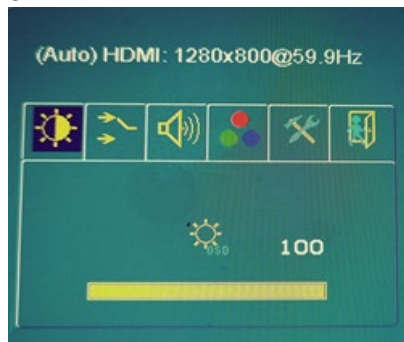
press this Icon, must to accompany with Litemax ambient light sensor to auto dimming.





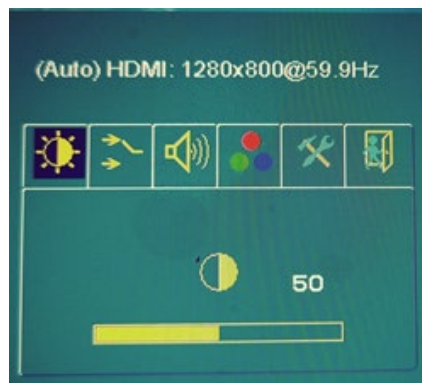
### OSD Brightness :

Press the “menu” once, to adjust the brightness. Press “left” to dim down the brightness to “0”, press “right” to increase the brightness to “100”



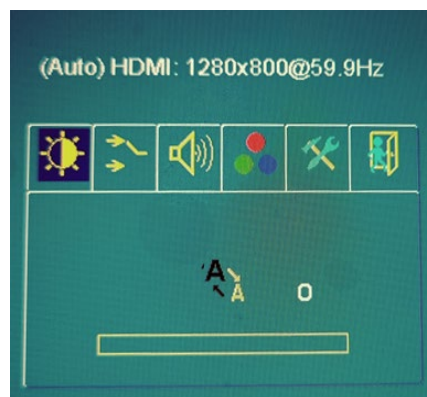
### Contrast :

Press “Menu” once, you can adjust the contrast from “0” to “100” by pressing the “Left” and “Right”.



### Sharpness :

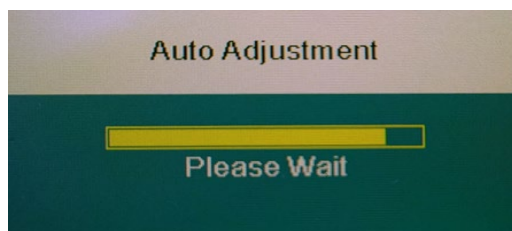
Press “Menu” once, you can adjust the Sharpness from “0” to “4” by pressing the “Left” and “Right”.





**Auto Tune :** (VGA only)

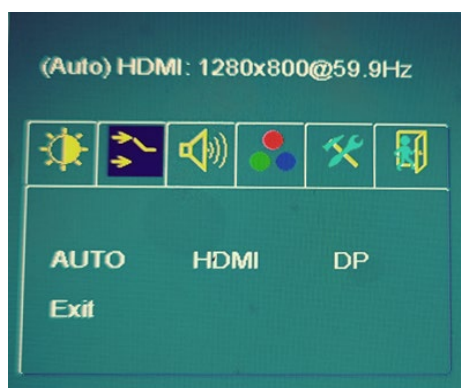
Press “Menu” once, you can activate the Auto Tune.



**Exit:** back to the beginning menu.



**Input Signal:** (default auto detect)



**AUTO**

**AUTO:** auto detect

**HDMI**

**HDMI:** HDMI input

**DP**

**DP:** DisplayPort input

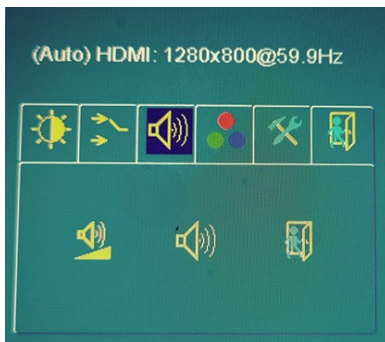
**Exit**

**Exit:** back to the beginning menu.





## Audio:



**Audio Volume:** Audio volume adjustment, from “0” to “100”.



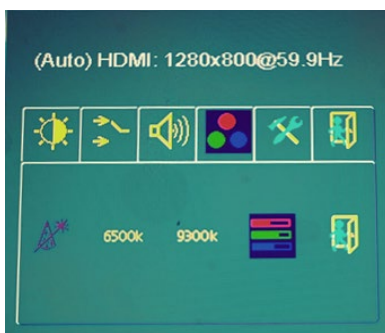
**UnMute/Mute:** You can mute the speaker by pressing this option.



**Exit:** back to the beginning menu.



## Color:



**Auto Color** (VGA only) :

By navigating over to the “Auto Color” option, optimal color performance is invoked.



**Color Tempture\_6500K:** Warm color scheme.



**Color Tempture\_9300K:** Cold color scheme.



**Color Temperature User Define:** Default is 100 for “R”, “G”, and “B”. Range is “0” to “255”.



**Exit:** back to the beginning menu.



## Other Setting:



**HPos:** You can shift the screen horizontally using this function.



**VPos:** You can shift the screen vertically using this function.



**Rotation:** You can rotate the screen to 0° (No) 、 270° (Yes).



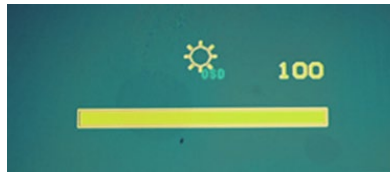
**Load Default:** You can load the default data using this function.



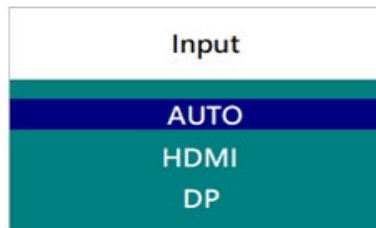
**Exit:** back to the beginning menu.

### < Hot Key >

Left click to display brightness adjustment.

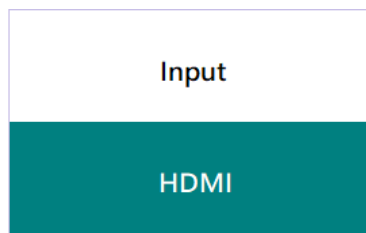


Right click to display Input Source Menu.



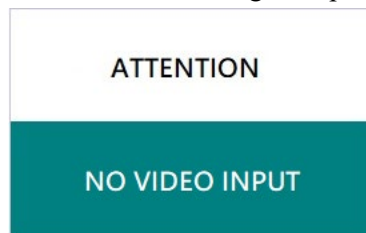
### <Others>

Signal Information will be displayed after powering on or switching the signal.



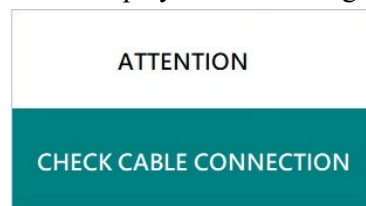
(Signal Information)

**NO VIDEO INPUT** will be displayed when there is no signal input.



(No Video Input)

**CHECK CABLE CONNECTION** will be displayed when the signal cable is not connected.



(Check Cable Connection)

## **7 Precautions**

### **7.1 Handling 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 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°C and 35°C 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.