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LITEMAX

ULF/ULH1563-I

15.6” LED B/L LCD

User Manual

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Record of Revision

Version and Date	Page	Old Description	New Description	Remark
Nov./02/2023	all		Initial release	

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1 General Description

The ULF/ULH1563-I is a 15.6 inch industrial grade LCD, with high brightness 500 nits, it produce sharp images, crisp text and lifelike colors. The Ubipixel 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 500nits
- Resolutions: 1920 x 1080
- LED Backlight
- Aspect ratio of 16:9
- Wide temperature (-20℃~70℃)
- Low power consumption
- BL MTBF: 50,000 hours

1.2 General Specifications

Model Name	ULF/ULH1563-I
Description	15.6” TFT LCD, 500 nits LED Backlight, 1920 x 1080
Screen Size	15.6”
Display Area (mm)	344.16(H) x 193.59(V)
Brightness	500 cd/m2
Resolution	1920 x 1080
Aspect Ratio	16 : 9
Ultra high Contrast Ratio	1400:1
Pixel Pitch (mm)	0.17925(H) x 0.17925 (V)
Pixel Pre Inch (PPI)	141
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	81%
Display Colors	16.7M
Response Time (Typical)	25 ms
Panel Interface	LVDS
AD Board Input Interface	HDMI,DP
AD Board Input Power	DC12V
Power Consumption	11W(13W With AD Board)
OSD Key	4 Keys (Power Switch, Menu, +, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position…etc
Dimensions (mm)	363.8 x 215.9 x 9.3
Bezel Size(U/B/L/R)	11.16/11.16/9.82/9.82
Weight (Net)	1.25 Kg
Operating Temperature	-20 ˚C ~ 70 ˚C
Storage Temperature	-30 ˚C ~ 70 ˚C

ULF= Panel + LED Driving Board
ULH= Panel + LED Driving Board + AD Control Board

1.3 Absolute Maximum Ratings

Permanent damage may occur if exceeding the following maximum rating.

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Operating Ambient Temperature	T_{OP}	-20	+70	℃	(1)(2)
Storage Temperature	T_{ST}	-30	+70	℃	

Note (1)

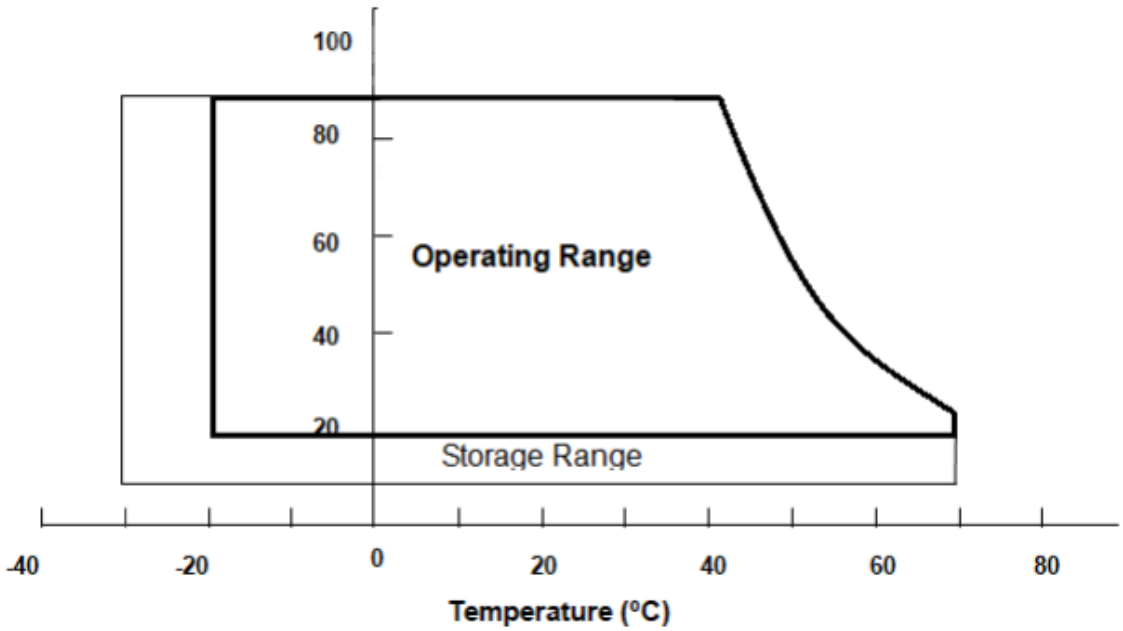
(a) 90 %RH Max.

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

(c) No condensation.

Note (2) Any condition of ambient operating temperature ,the surface of active area should be keeping not

higher than 70℃ . (Panel sureface temperature)



2 Electrical Specifications

2.1 TFT LCD Module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCC	-0.3	5.5	V	(1)
Logic Input Voltage	V_{IN}	-0.3	4.0	V	

BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	V	(1) , (2)
Enable Voltage	EN	---	5.5	V	
Backlight Adjust	Dimming	---	5.5	V	

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

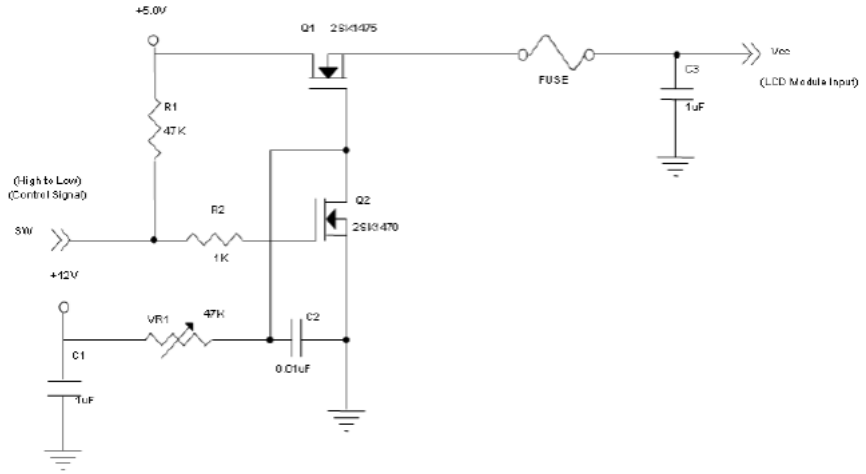
Note (2) Specified values are for LED (Refer to 3.2 for further information)

2.2 LCD Electrical Characteristics

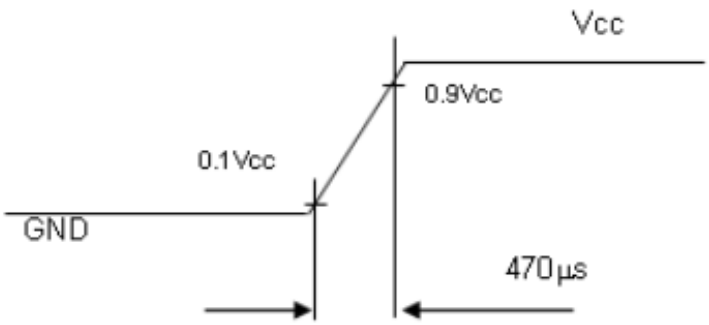
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	4.5	5	5.5	V	-
Ripple Voltage		V_{RP}	-	-	200	mVp-p	
Inrush Current		I_{INRUSH}	-	-	3.0	A	(2)
Power Supply Current	White	Icc	-	0.64	0.73	A	(3)a
	Black		-	0.38	0.45	A	(3)b
LVDS differential input voltage		V_{id}	100	-	600	mV	(4)
LVDS common input voltage		V_{ic}	1.0	1.2	1.4	V	(4)
Differential Input Voltage for LVDS Receiver Threshold	"H" Level	V_{IH}	-	-	100	mV	-
	"L" Level	V_{IL}	-100	-	-	mV	-
Terminating Resistor		R_T	-	100	-	Ohm	-

Note (1)The module should be always operated within above ranges.

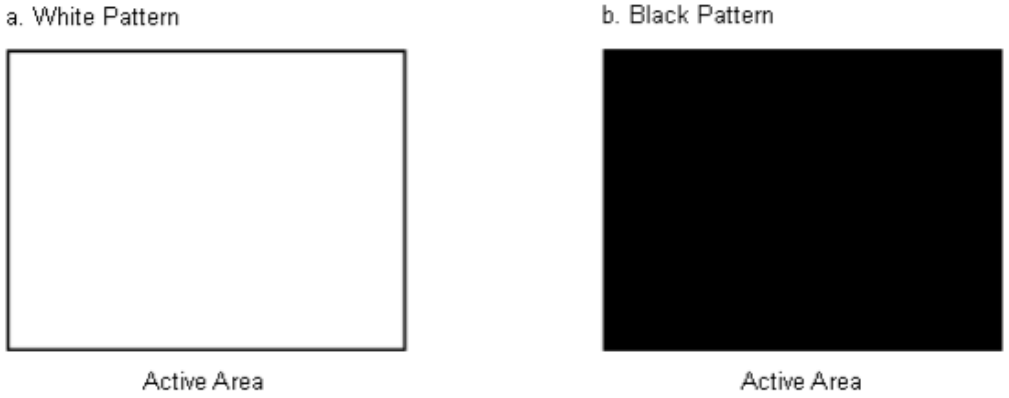
Note (2)Measurement Conditions:



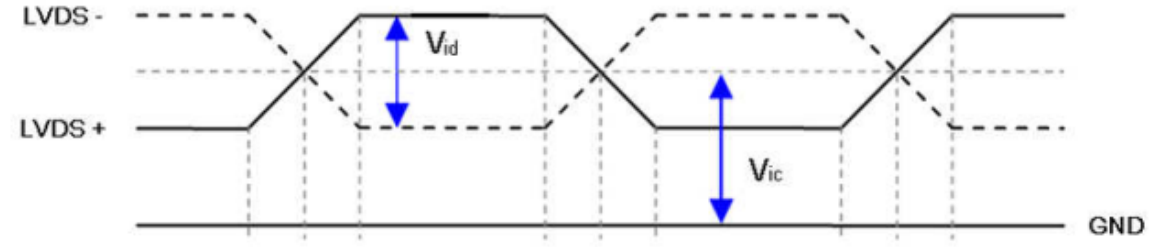
Vcc rising time is 470µs



Note (3) The specified power supply current is under the conditions at VDD =5.0V, Ta = 25 ± 2 ℃ , DC Current and fv = 60 Hz, whereas a power dissipation check pattern below is displayed

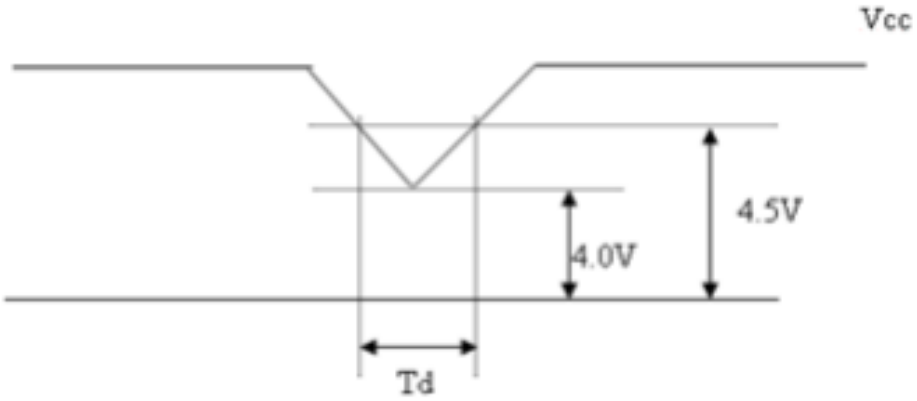


Note (4) VID waveform condition



Vcc Power Dip Condition

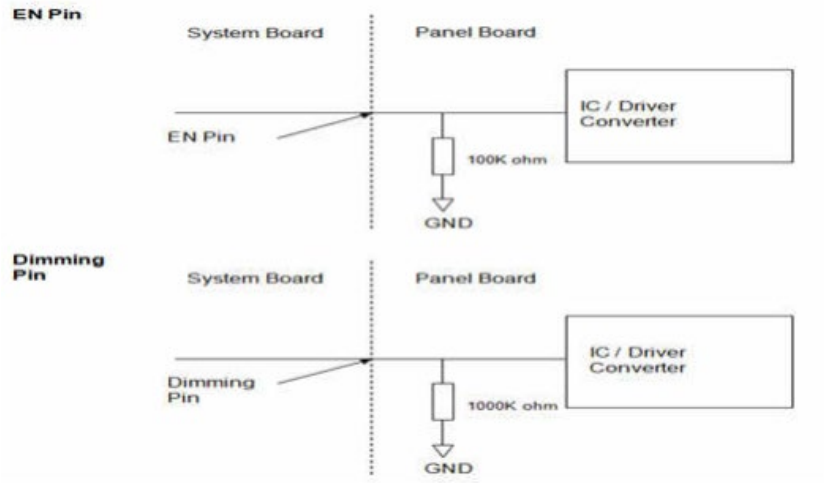
- Dip condition: 4.0V ≤ Vcc ≤ 4.5V,Td ≤ 20ms



2.3 Interface Pin Asignment

Pin	Name	Description	Note
1	LED _Vcc	+12V Vi power supply	-
2	LED _Vcc	+12V Vi power supply	-
3	LED _Vcc	+12V Vi power supply	-
4	LED _Vcc	+12V Vi power supply	-
5	GND	Ground	-
6	GND	Ground	-
7	GND	Ground	-
8	GND	Ground	-
9	LED_EN	Enable pin	-
10	LED_PWM	Backlight Adjust	-
11	LCD_VCC	LCD logic and driver power 5.0V	-
12	LCD_VCC	LCD logic and driver power 5.0V	-
13	LCD_VCC	LCD logic and driver power 5.0V	-
14	NC	Not connection, this pin should be open	-
15	NC	Not connection, this pin should be open	-
16	NC	Not connection, this pin should be open	-
17	NC	Not connection, this pin should be open	-
18	RXO0-	Negative LVDS differential data input. Channel O0 (odd)	-
19	RXO0+	Positive LVDS differential data input. Channel O0 (odd)	-
20	RXO1-	Negative LVDS differential data input. Channel O1 (odd)	-
21	RXO1+	Positive LVDS differential data input. Channel O1 (odd)	-
22	RXO2-	Negative LVDS differential data input. Channel O2 (odd)	-
23	RXO2+	Positive LVDS differential data input. Channel O2 (odd)	-
24	LCD GND	LCD logic and driver ground	-
25	RXOC-	Negative LVDS differential clock input. (odd)	-
26	RXOC+	Positive LVDS differential clock input. (odd)	-
27	LCD GND	LCD logic and driver ground	-
28	RXO3-	Negative LVDS differential data input. Channel O3(odd)	-
29	RXO3+	Positive LVDS differential data input. Channel O3 (odd)	-
30	RXE0-	Negative LVDS differential data input. Channel E0 (even)	-
31	RXE0+	Positive LVDS differential data input. Channel E0 (even)	-
32	RXE1-	Negative LVDS differential data input. Channel E1 (even)	-
33	RXE1+	Positive LVDS differential data input. Channel E1 (even)	-
34	LCD GND	LCD logic and driver ground	-
35	RXE2-	Negative LVDS differential data input. Channel E2 (even)	-
36	RXE2+	Positive LVDS differential data input. Channel E2 (even)	-
37	RXEC-	Negative LVDS differential clock input. (even)	-
38	RXEC+	Positive LVDS differential clock input. (even)	-
39	RXE3-	Negative LVDS differential data input. Channel E3 (even)	-
40	RXE3+	Positive LVDS differential data input. Channel E3 (even)	-

Note (1) Connector Part No.: I-PEX 20455-040E-76 or equivalent.
Note (2) User's connector Part No.: I-PEX 20453-040T-03 or equivalent



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

2.4 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input

Color		Data Signal																							
		Red								Green								Blue							
		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
	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
	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
	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
	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
	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	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	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(255)	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	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	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(255)	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	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	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(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

2.5 Signal Timing Specifications

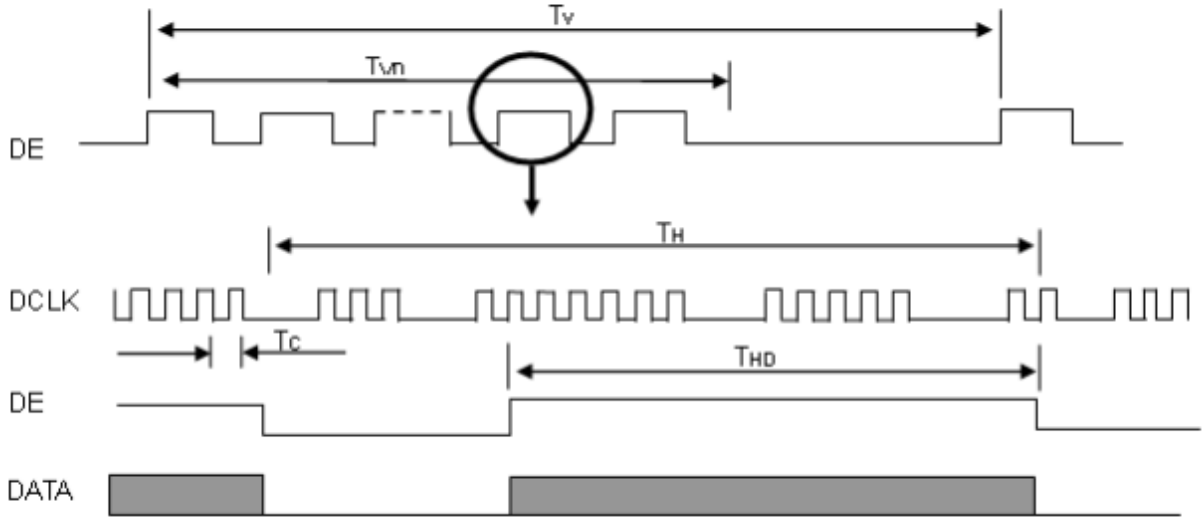
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	F_r	60	70.93	75	MHz	-
	Period	T_c		14.1		ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*Tc		0.02*Tc	ns	(3)
	Input Clock to data skew	TLVCCS	-0.02*Tc		0.02*Tc	ps	(4)
	Spread spectrum modulation range	F_{clkin_mod}	FC*98%		FC*102 %	MHz	(5)
	Spread spectrum modulation frequency	F_{SSM}			200	KHz	
Vertical Display Term	Frame Rate	F_r	50	60	60	Hz	$Tv=T_{vd}+T_{vb}$
	Total	T_v	1090	1110	1130	T_h	-
	Active Display	T_{vd}	1080	1080	1080	T_h	-
	Blank	T_{vb}	Tv-Tvd	30	Tv-Tvd	T_h	-
Horizontal Display Term	Total	T_h	1050	1065	1075	T_c	$T_h=T_{hd}+T_{hb}$
	Active Display	T_{hd}	960	960	960	T_c	-
	Blank	T_{hb}	Th-Thd	105	Th-Thd	T_c	-

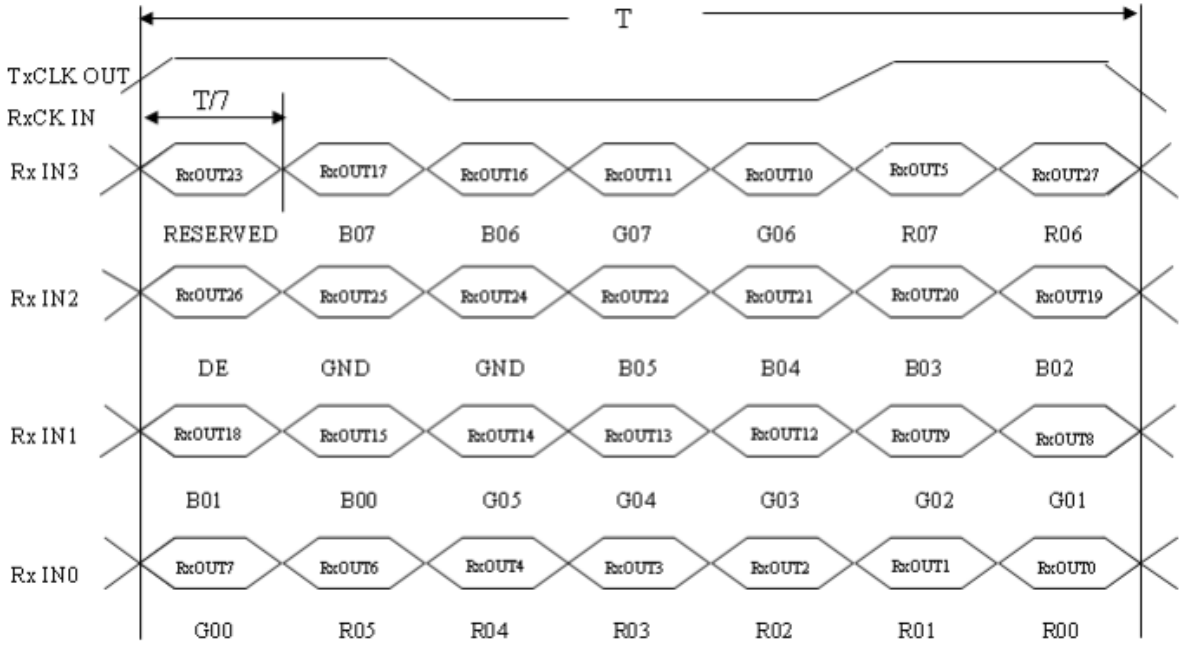
Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set tolow logic level or ground. Otherwise, this module would operate abnormally.

Note (2) The Tv(Tvd+Tvb) must be integer, otherwise, the module would operate abnormally.

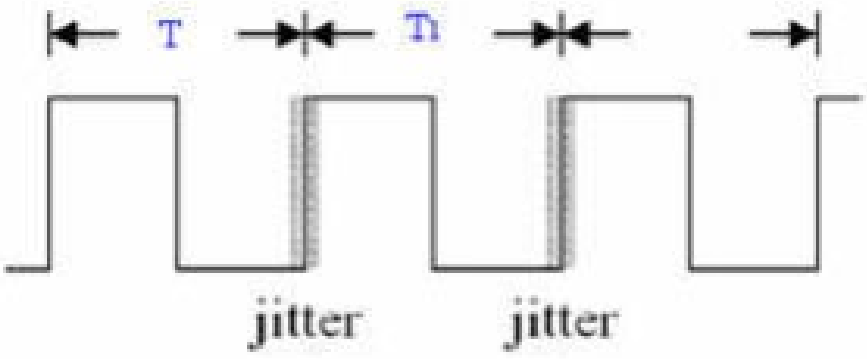
INPUT SIGNAL TIMING DIAGRAM



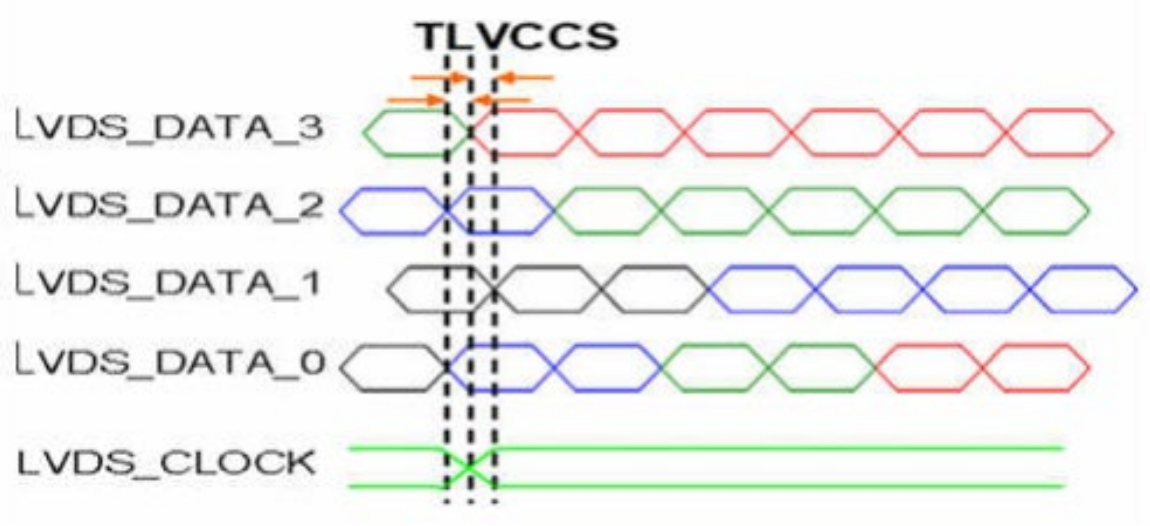
TIMING DIAGRAM of LVDS



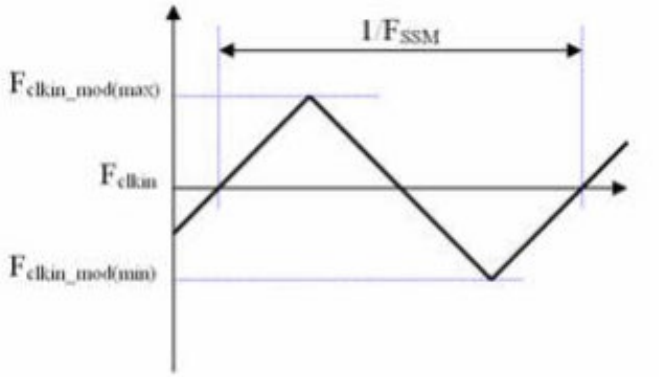
Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T1 – TI



Note (4) Input Clock to data skew is defined as below figures

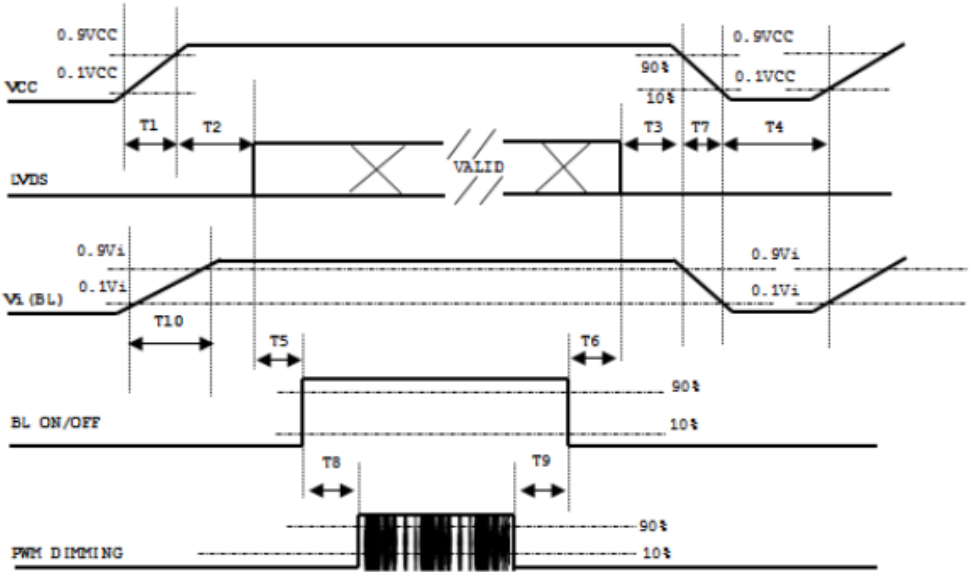


Note (5) The SSCG (Spread spectrum clock generator) is defined as below figures.



2.6 Power Sequence

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



Timing Specifications:

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	450	-	-	ms
T6	200	-	-	ms
T7	10	-	100	ms
T8	10	-	-	ms
T9	10	-	-	ms
T10	20	-	50	ms

Note:

(1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

(2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

(3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

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

(5) Interface signal shall not be kept at high impedance when the power is on.

(6) Litemax won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

(7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "T7 spec".

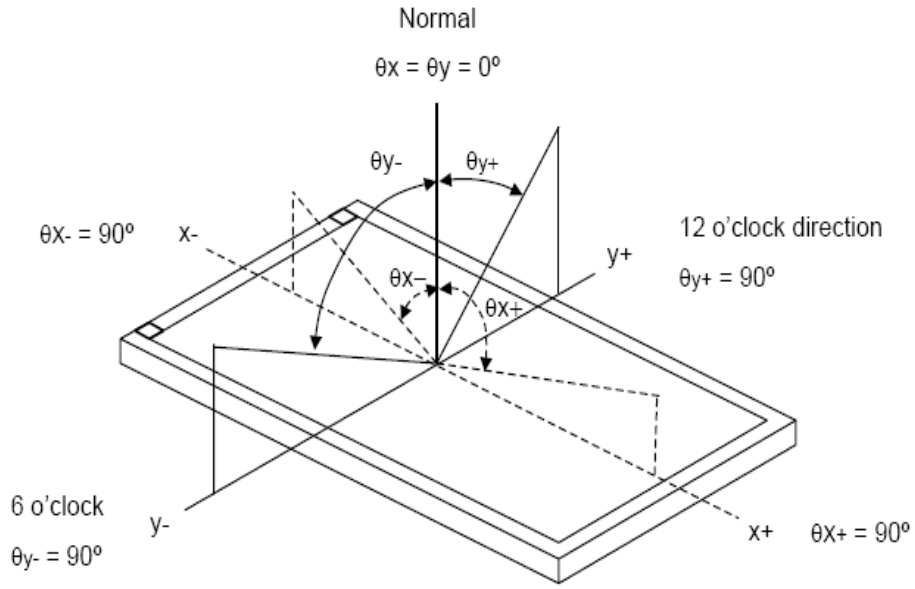
3 Optical Specification

OPTICAL SPECIFICATIONS

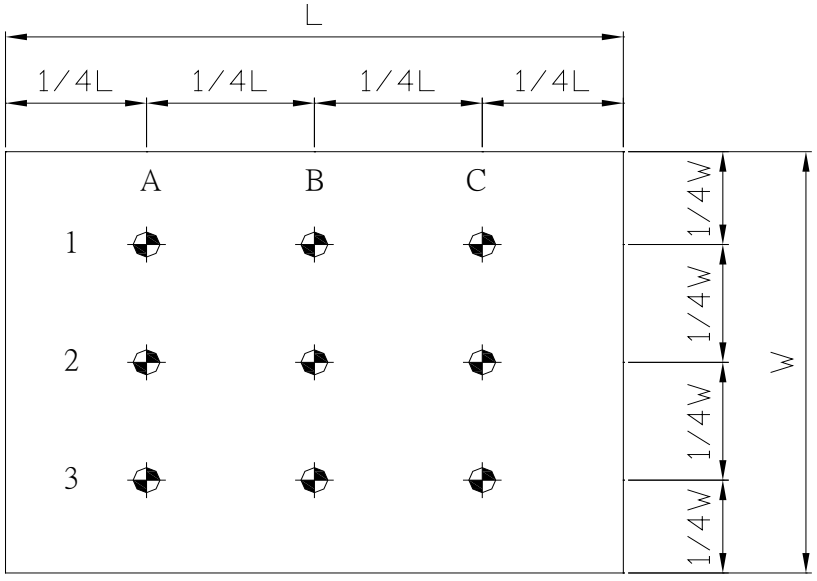
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 Klein K-10	0.619	0.649	0.679	-	Test Mode: (1) (2) (3)
		Ry		0.305	0.335	0.365	-	
	Green	Gx		0.274	0.304	0.334	-	
		Gy		0.593	0.623	0.653	-	
	Blue	Bx		0.116	0.146	0.176	-	
		By		0.024	0.054	0.084	-	
	White	Wx		0.273	0.303	0.333	-	
		Wy		0.310	0.340	0.370	-	
Center Luminance of White		Lc	θx=0 θy=0 BM-7		500		cd/m^2	
Uniform		Lu			88		%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10		1400:1		-	Test Mode: (1) (4)
Color Saturation		NTSC			81		%	
Viewing Angle	Horizontal	θx+	CR ≥ 10		89		Deg	Test Mode: (1) (3)
		θx-			89			
	Vertical	θy+			89			
		θy-			89			

Test Mode：

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

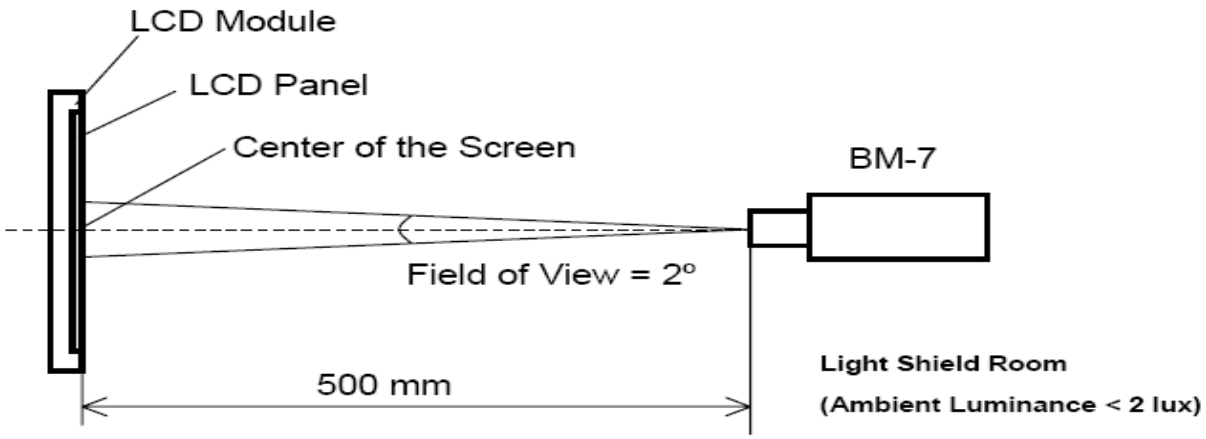


(2) Definition of Test Point:

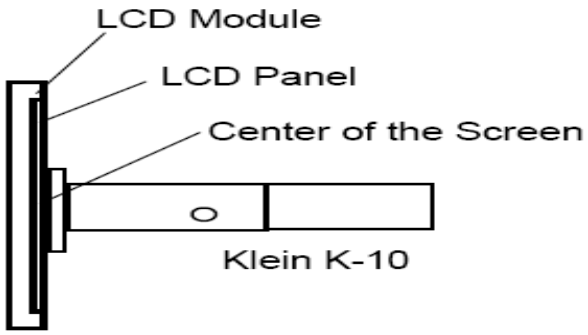


Active Area

(3) BM-7 Measurement Setup:



(4) Klein K-10 Measurement Setup:



4 LED Driving Board Specifications

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

4.1 Operating Characteristics

TFT LCD Module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCC	-0.3	5.5	V	(1)
Logic Input Voltage	V_{IN}	-0.3	4.0	V	

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	V	(1) , (2)
Enable Voltage	EN	---	5.5	V	
Backlight Adjust	Dimming	---	5.5	V	

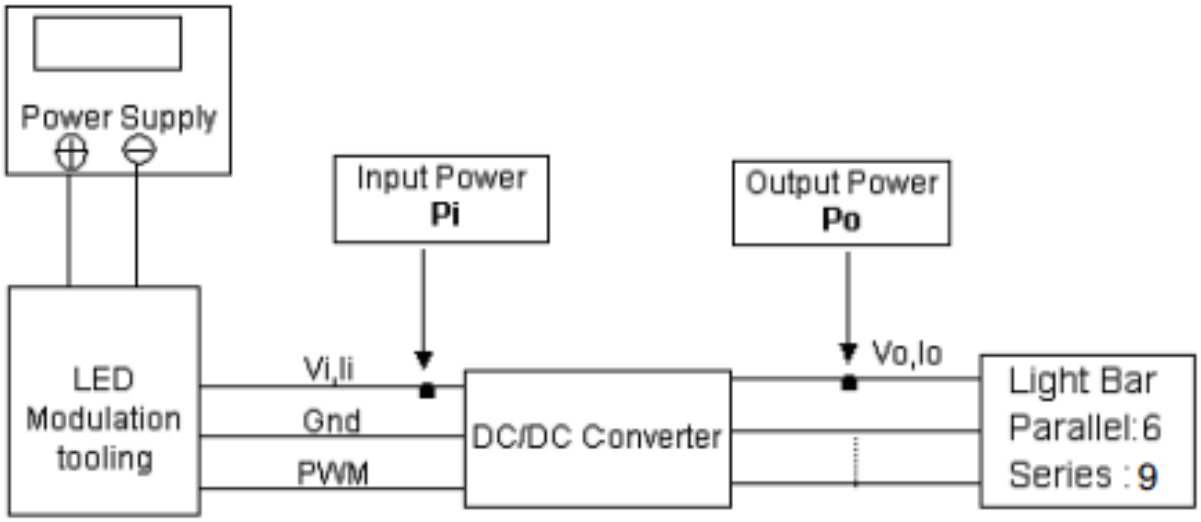
Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED (Refer to 3.2 for further information)

4.2 Backlight Unit

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input Voltage		V_i	10.8	12.0	13.2	V_{DC}	(Duty 100%)
Converter Input Ripple Voltage		V_{iRP}	-	-	500	mV	
Converter Input Current		I_i	0.5	0.65	0.8	A_{DC}	@ Vi = 12V (Duty 100%)
Converter Inrush Current		I_{iRUSH}	-	-	3.0	A	@ Vi rising time=10ms (Vi=12V)
Input Power Consumption		P_i	-	7.8	8.6	W	(1)
EN Control Level	Backlight on	ENLED (BLON)	2.0	3.3	5.0	V	
	Backlight off		0	-	0.3	V	
PWM Control Level	PWM High Level	Dimming (E_PWM)	2.0	-	5.0	V	
	PWM Low Level		0	-	0.15	V	
PWN Noise Range		VNoise	-	-	0.1	V	
PWM Control Frequency		f_{PWM}	190	200	20k	Hz	(2)
PWM Dimming Control Duty Ratio		-	5	-	100	%	(2), @ 190Hz<f_{PWM}<1kHz
			20	-	100	%	(2), @ 1kHz≦f_{PWM}<20kHz
LED Life Time		L_{LED}	50,000		-	Hrs	(3)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

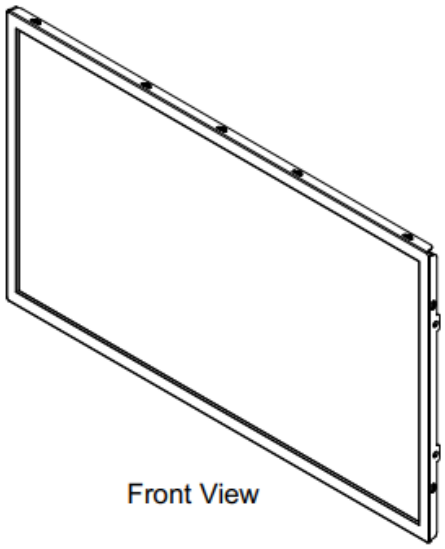


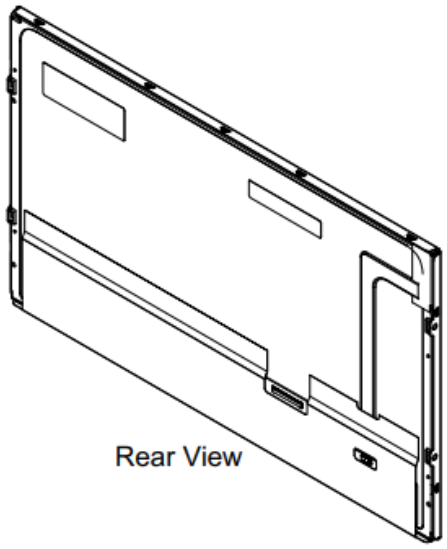
Note (2) The lifetime of LED is estimated data and defined as the time when it continues to operate underthe conditions at Ta = 25 ±2 ºC and Duty 100% until the brightness becomes ≦ 50% of its original value.Operating LED at high temperature condition will reduce life time and lead to color shift.

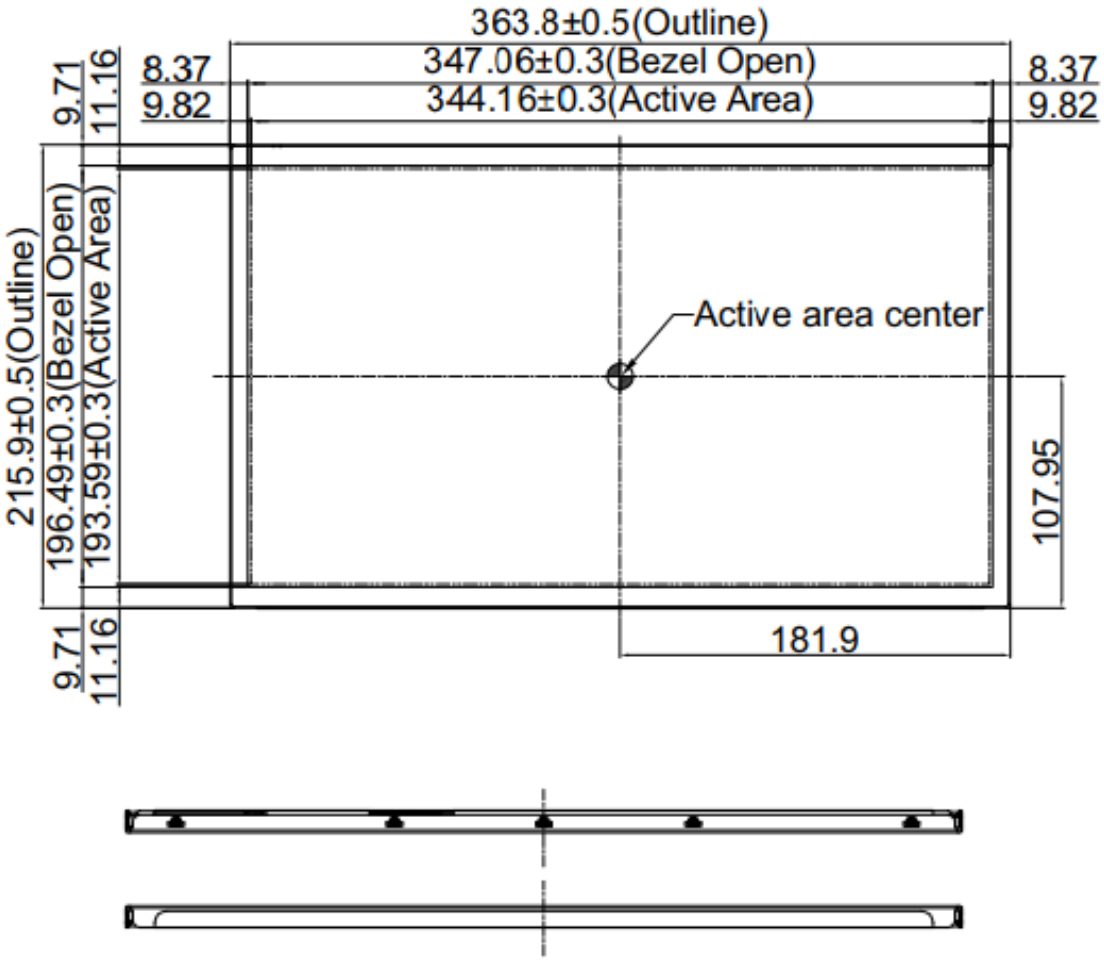
Note (3) At 190 ~1kHz PWM control frequency, duty ratio range is restricted from 5% to100%.1K ~20kHz PWM control frequency, duty ratio range is restricted from 20% to 100%.If PWM control frequencyis applied in the range from 1KHz to 20KHZ, The“non-linear” phenomenon on the Backlight Unit may be found. So It’ s a suggestion that PWM control frequency should be less than 1KHz

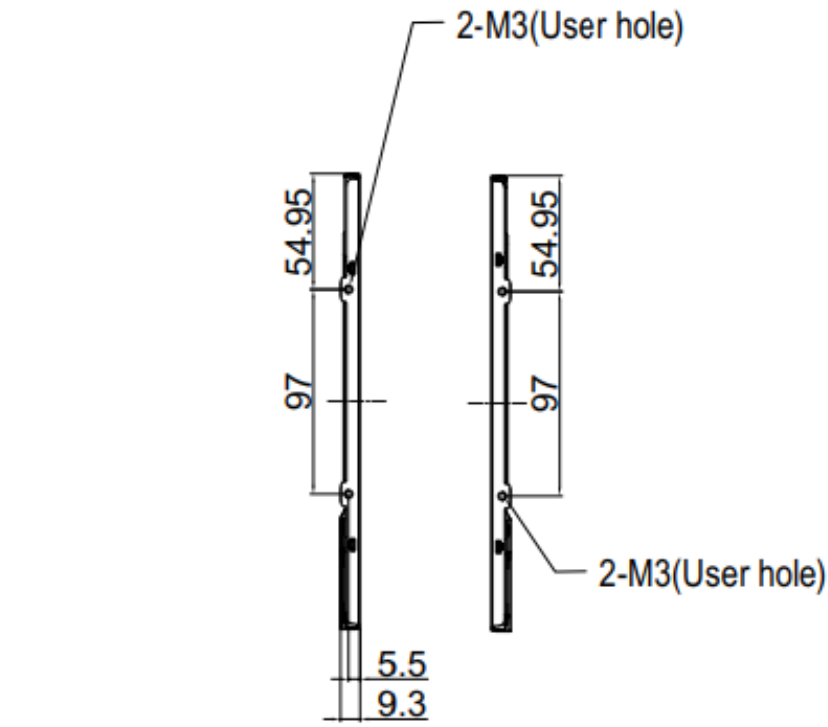
5 Mechanical Drawing

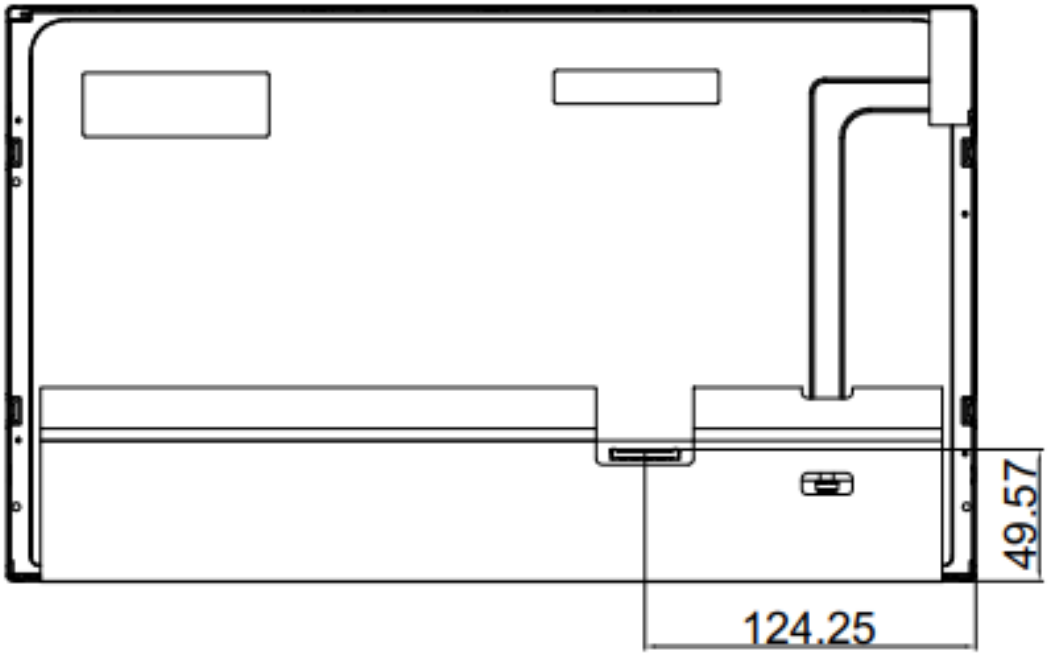
Outline Dimensions Unit:mm











Note：

1.THE DIMENSION EXCLUDES DEFORMATION.

2.MODULE THICKNESS TO BE 9.30mm MAX.

3.LED B/L CONNECTOR：JST EHR-2 OR COMPATIBLE

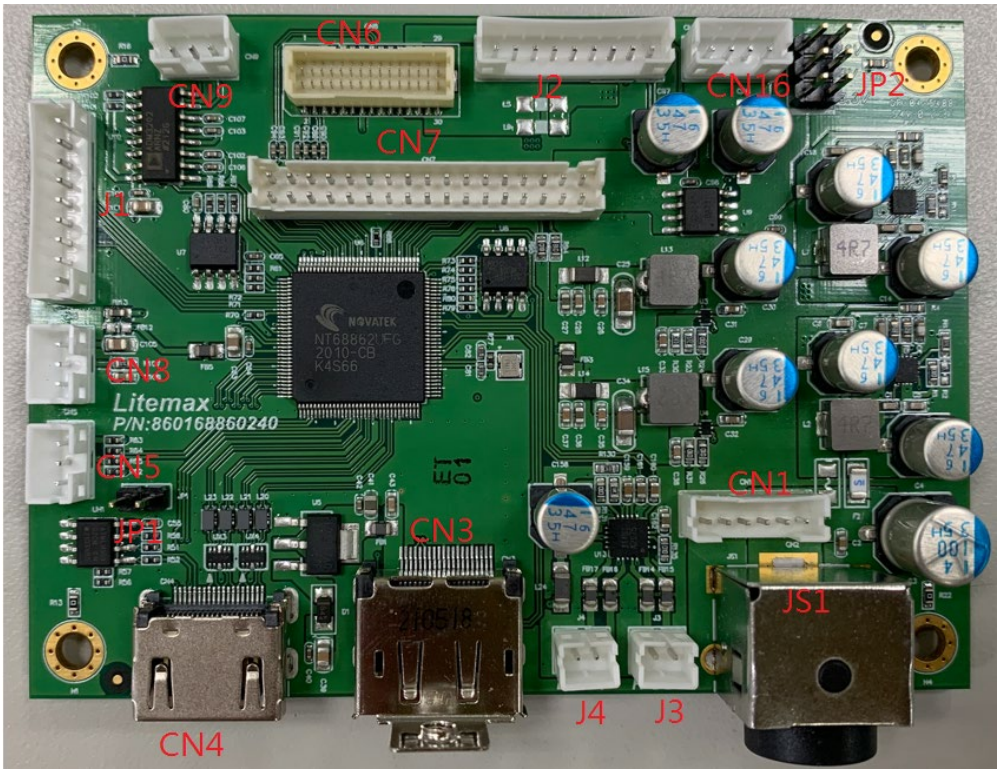
4.M3 USER HOLE SCREW TORQUE 5.0 kgf- cm MAX , HOLE Depth 3.0mm Max. V2

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.

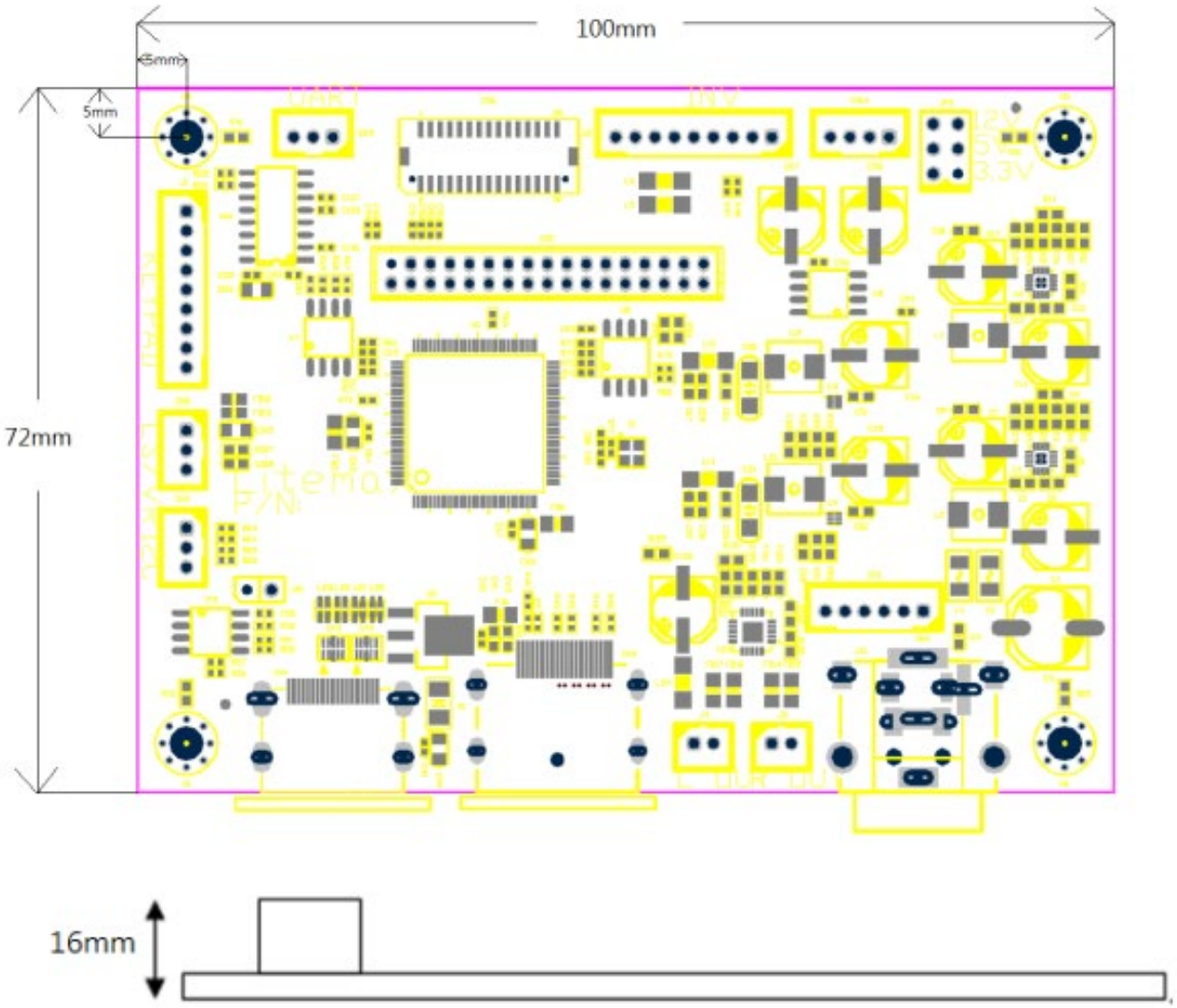
General Description

- **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_HPD
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)

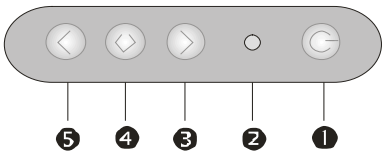
Pin	Function	Pin	Function
1	ROUTP	2	ROUTN

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.

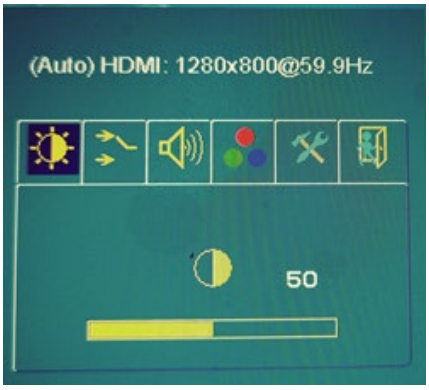
Ambient light sensor: (OPTION)
press this Icon, must to accompany with Litemax ambient light sensor to auto dimming.

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”

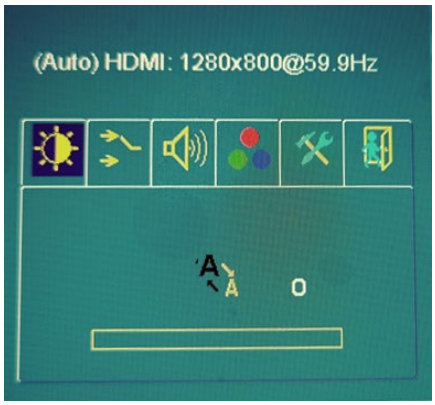
Contrast：

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



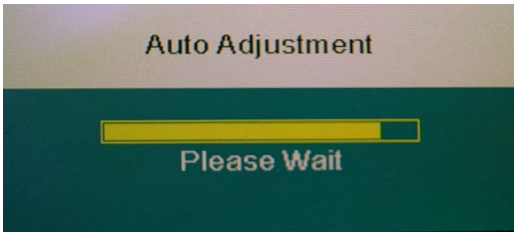
Sharpness：

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)

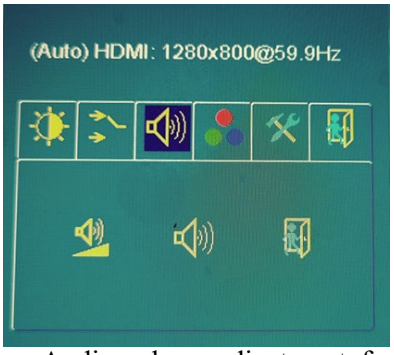
AUTO: auto detect

HDMI: HDMI input

DP: DisplayPort input

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.

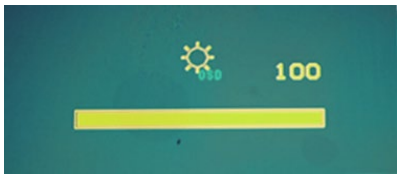
Rotation: You can rotate the screen to 0° (No)、270° (Yes).

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

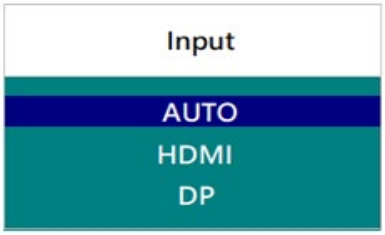
Exit: back to the beginning menu.

< **Hot Key** >

Left click to display brightness adjustment.

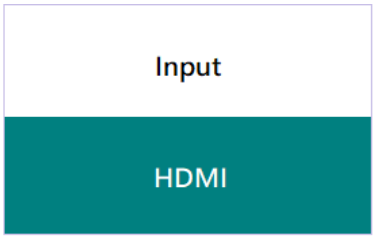


Right click to display Input Source Menu.



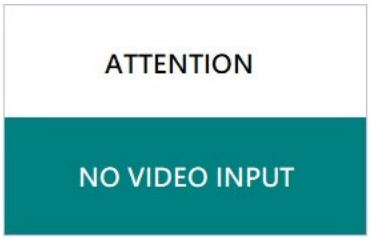
<Others>

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



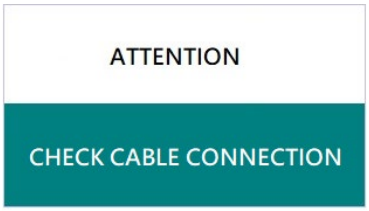
(Signal Information)

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 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°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.