LITEMAX
Sunlight Readable LCD!

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DURApixel™ LED B/L LCD

RoHS·WEEE LITEMAX COMPLIANT

LITEMAX

DLF/DLH4305-B V2

Sunlight Readable 43” 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 /02/2023	all		Initial release	

Contents

1 General Description

The DLF/DLH4305-B is a 43 inch industrial grade sunlight readable LCD,with high brightness 1000 nits and high color saturation, 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 Features

- High Brightness 1000 nits
- Sunlight Readable
- Wide Viewing Angle of 178°(H), 178°(V)
- LED Backlight
- Low Power Consumption
- BL MTBF: 100,000 hours

1.2 General Specifications

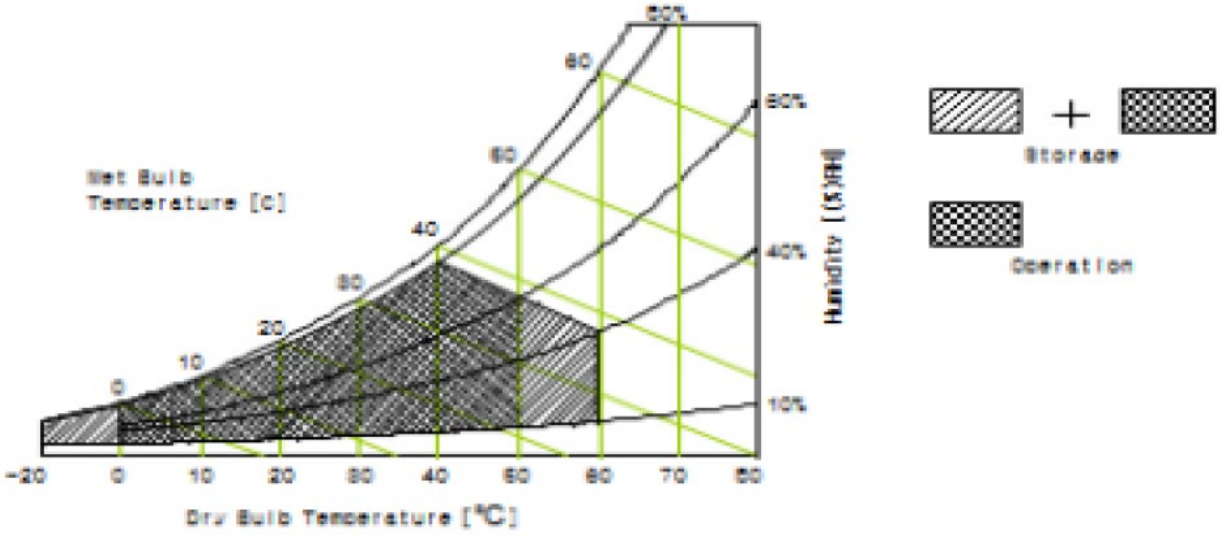
Model Name	DLF/DLH4305-B V2
Description	43” TFT LCD, 1000 nits LED Backlight, 1920x1080
Screen Size	43”
Display Area (mm)	940.896(H) x 529.254(V)
Brightness	1000 cd/m^2
Resolution	1920x1080
Aspect Ratio	16 : 9
Contrast Ratio	1300 : 1
Pixel Pitch (mm)	0.49005(H) x 0.49005 (V)
Pixel Pre Inch (PPI)	51
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	84%
Display Colors	16.7M
Response Time (Typical)	8ms
Panel Interface	LVDS
AD Board Input Interface	DVI-I, HDMI, DP
AD Board Input Power	AC100~240V
Power Consumption	79.8W (84.8W with AD board)
OSD Key	4 Keys (Power Switch, Menu, +, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position…etc
Dimensions (mm)	962.1x 550.45x 27.9
Bezel Size(U/B/L/R)	10.6/10.6/10.6/10.6 mm
Weight (Net)	8.17 kg
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

Parameter		Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	LCD Module	VDD	VSS-0.3	13.5	V	Ta=25℃
Operating Temperature		TOP	0	+50	℃	Note1
		TSUR	-20	+60	℃	
Storage Temperature		TST	-20	+60	℃	
Operating Ambient Humidity		HOP	10	80	%RH	
Storage Humidity		HST	10	80	%RH	

Note 1 : Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



2 Electrical specifications

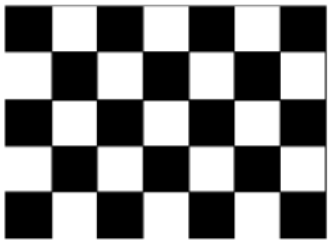
2.1 TFT LCD Module

[Ta =25±2 ℃]

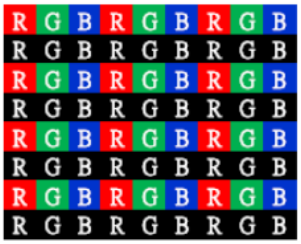
Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	13.2	Vdc	
Power Supply Ripple Voltage		VRP			300	mV	
Power Supply Current		IDD	-	0.5	0.95	A	Note 1
Power Consumption		PDD		6	11.4	Watt	
Rush current		IRUSH	-	-	3.0	A	Note 2
LVDS Interface	Differential Input High Threshold Voltage	VLVTH	+100		+300	mV	
	Differential Input Low Threshold Voltage	VLVTL	-300		-100	mV	
	Common Input Voltage	VLVC	1.0	1.2	1.4	V	
	Terminating Resistor	Rt	90	100	110	ohm	
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

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

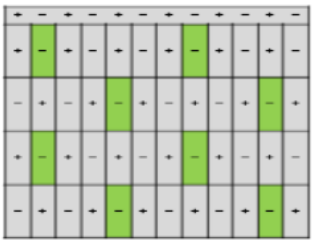
a) Typ : Mosaic 7X5 (L0/L255)



b) Max : Horizontal 1 Line (L0/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 Interface Connections

Pin Assignment (LVDS Connector: PM.LVS.S040505101(UJC) or Equivalent.)

Pin No	Symbol	Description	Pin No	Symbol	Description
1	NC	No connection	21	GND	Ground
2	SDA	I²C Data	22	CH1[3]-	First pixel negative LVDS differential data input. Pair3
3	SCL	I²C Clock	23	CH1[3]+	First pixel positive LVDS differential data input. Pair3
4	NC	Not Connected	24	NC	No connection
5	NC	Not Connected	25	NC	No connection
6	NC	Not Connected	26	NC	No connection
7	SELLVDS	High: JEIDA Low or Open: VESA	27	NC	No connection
8	NC	Not Connected	28	CH2[0]-	Second pixel negative LVDS differential data input. Pair0
9	NC	Not Connected	29	CH2[0]+	Second pixel positive LVDS differential data input. Pair0
10	NC	Not Connected	30	CH2[1]-	Second pixel negative LVDS differential data input. Pair1
11	GND	Ground	31	CH2[1]+	Second pixel positive LVDS differential data input. Pair1
12	CH1[0]-	First pixel negative LVDS differential data input. Pair0	32	CH2[2]-	Second pixel negative LVDS differential data input. Pair2
13	CH1[0]+	First pixel positive LVDS differential data input. Pair0	33	CH2[2]+	Second pixel positive LVDS differential data input. Pair2
14	CH1[1]-	First pixel negative LVDS differential data input. Pair1	34	GND	Ground
15	CH1[1]+	First pixel positive LVDS differential data input. Pair1	35	CH2CLK-	Second pixel negative LVDS clock
16	CH1[2]-	First pixel negative LVDS differential data input. Pair2	36	CH2CLK+	Second pixel positive LVDS clock
17	CH1[2]+	First pixel positive LVDS differential data input. Pair2	37	GND	Ground
18	GND	Ground	38	CH2[3]-	Second pixel negative LVDS differential data input. Pair3
19	CH1CLK-	First pixel negative LVDS clock	39	CH2[3]+	Second pixel positive LVDS differential data input. Pair3
20	CH1CLK+	First pixel positive LVDS clock			

Pin No	Symbol	Description	Pin No	Symbol	Description
40	NC	Not Connected	46	GND	Ground
41	NC	Not Connected	47	NC	Not Connected
42	NC	Not Connected	48	VCC	Input Voltage +12V
43	NC	Not Connected	49	VCC	Input Voltage +12V
44	GND	Ground	50	VCC	Input Voltage +12V
45	GND	Ground	51	VCC	Input Voltage +12V

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

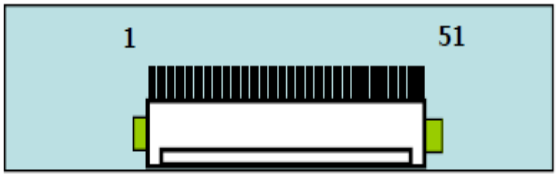
2. Input level of LVDS signal is based on the IEA 664 standard.

3. LVDS_SEL: This pin is used for selecting LVDS signal data format.

If this pin: High (3.3V) → JEIDA LVDS format

Otherwise: Low (GND) or Open (NC) → Normal NS LVDS Format

Rear view of LCM



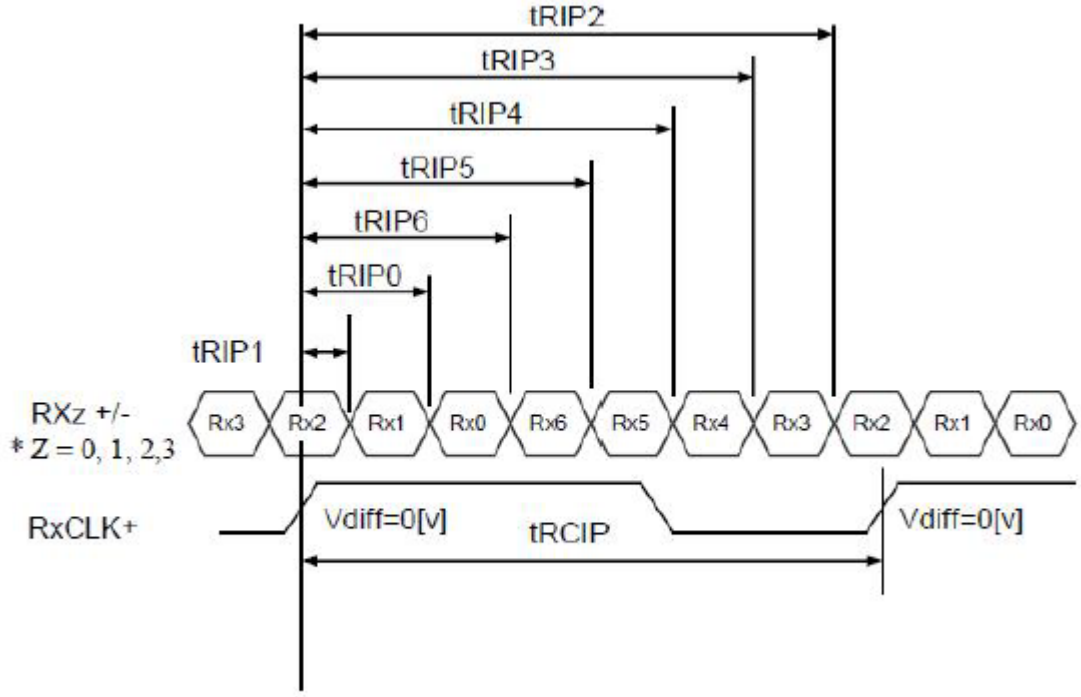
BIST Pattern

2.3 LVDS Interface

-LVDS Receiver : Timing controller (LVDS Rx merged) / LVDS data : Pixel data

< LCD input connector pin configuration>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.31	13.47(10.78)	15.87	nsec	
Input Data 0	tRIP1	-0.42	0.0	+0.42	nsec	
Input Data 1	tRIP0	tRCIP/7-0.42	tRCIP/7	tRCIP/7+0.42	nsec	
Input Data 2	tRIP6	2 ×tRCIP/7-0.42	2 ×tRCIP/7	2 ×tRCIP/7+0.42	nsec	
Input Data 3	tRIP5	3 ×tRCIP/7-0.42	3 ×tRCIP/7	3 ×tRCIP/7+0.42	nsec	
Input Data 4	tRIP4	4 ×tRCIP/7-0.42	4 ×tRCIP/7	4 ×tRCIP/7+0.42	nsec	
Input Data 5	tRIP3	5 ×tRCIP/7-0.42	5 ×tRCIP/7	5 ×tRCIP/7+0.42	nsec	
Input Data 6	tRIP2	6 ×tRCIP/7-0.42	6 ×tRCIP/7	6 ×tRCIP/7+0.42	nsec	

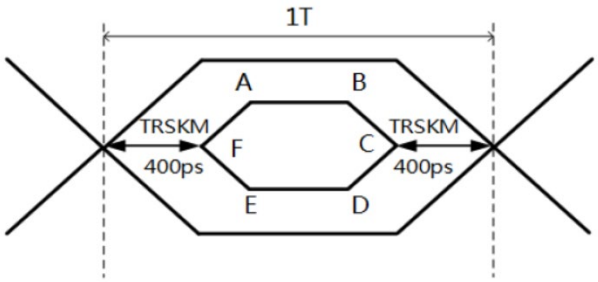


* Vdiff = (RXz+)-(RXz-),…. ,(RXCLK+)-(RXCLK-)

LVDS Rx Interface Eye Diagram

< LVDS Rx interface Eye Diagram>

Symbol	Min	Typ	Max	Unit	Note
A	–	100	–	mV	
B	–	100	–	mV	
C	–	0	–	mV	
D	–	-100	–	mV	
E	–	-100	–	mV	
F	–	0	–	mV	

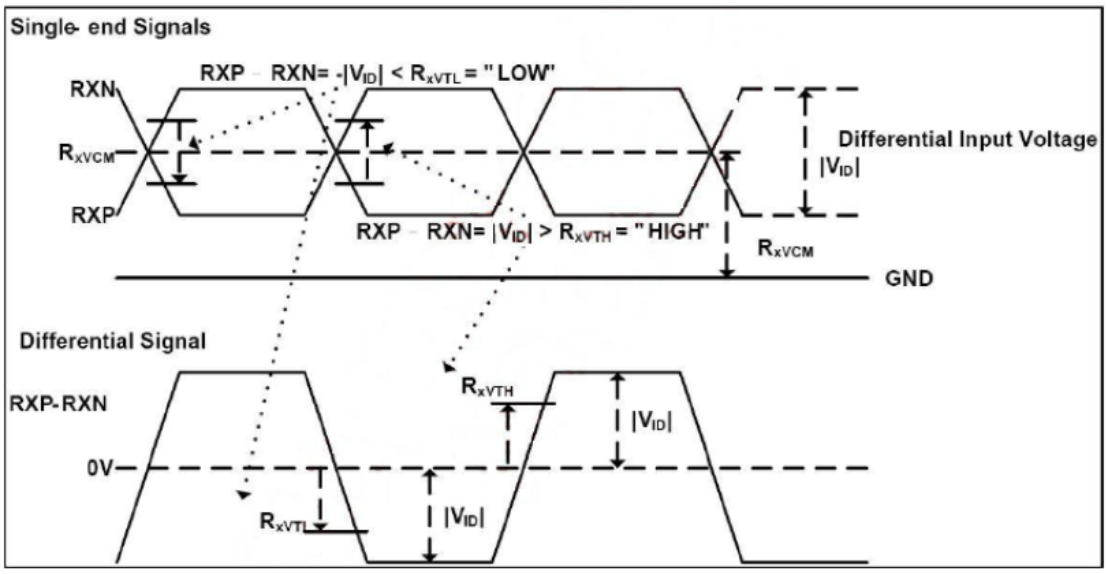


Notes:
1. Time F to A,B to C,C to D,E to F is 150p second.
2. LVDS clock=85Mhz.
3. The time A to B=1T-2*TRSKM-2*150ps.

LVDS Receiver Differential Input

< LVSD Receiver differential input>

Symbol	Parameter	Min	Typ	Max	Unit	Condition
R_{xVTH}	Differential input high threshold voltage			+0.1v	V	RxVCM =1.2V
R_{xVTL}	Differential input low threshold voltage	-0.1V			V	
R_{XVIN}	Input voltage range (singled-end)	0		2.4	V	
R_{xVCM}	Differential input common mode voltage	$\|V_{ID}\|/2$		2.4-$\|V_{ID}\|/2$	V	
$\|V_{ID}\|$	Differential input voltage	0.1		0.6	V	



2.4 Signal Timing Specifications (DE only mode)

< Timing table >

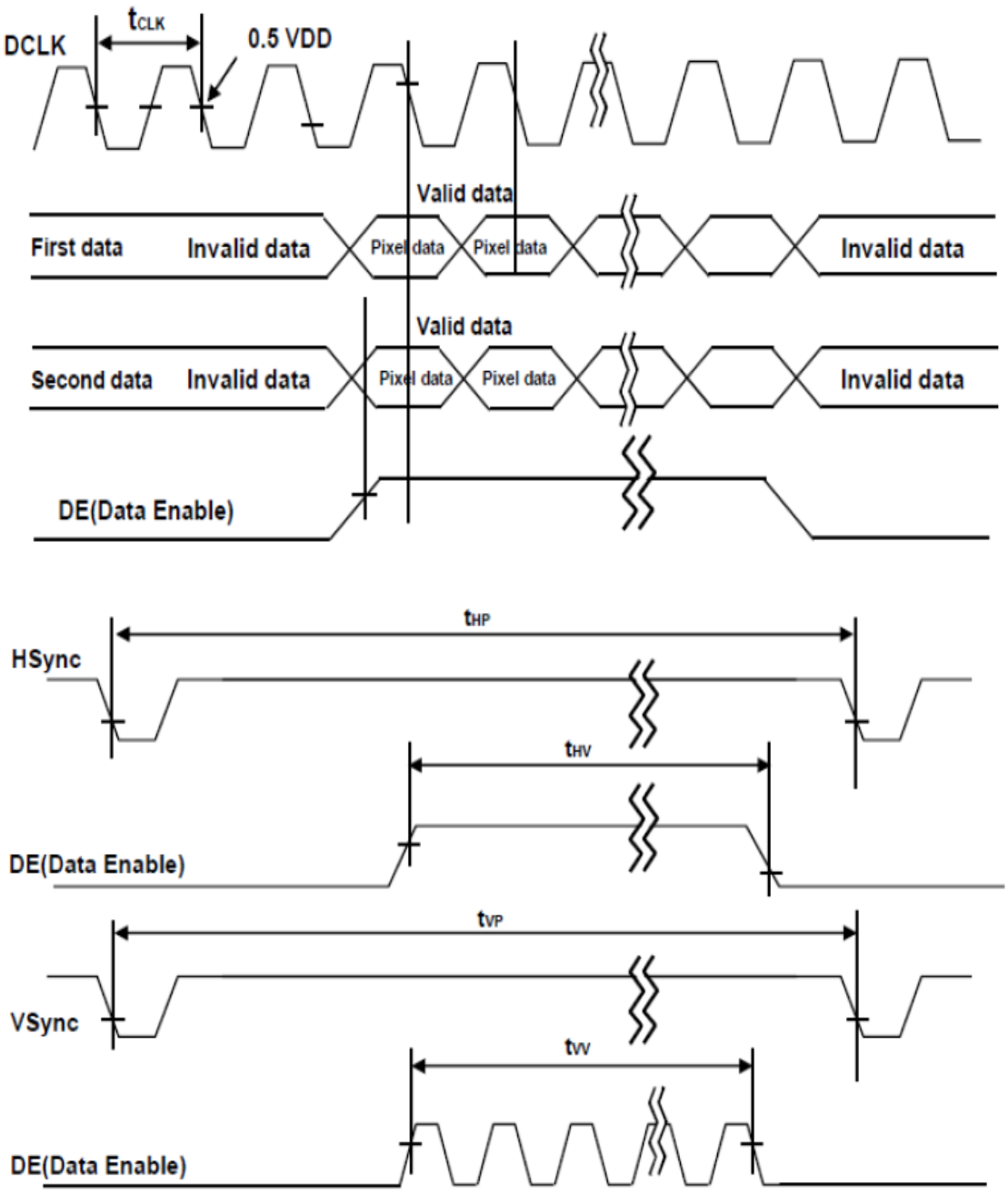
Item		Symbols		Min	Typ	Max	Unit
Clock	Frequency	1/Tc		60	74.25	78	MHz
	High Time	Tch		-	4/7Tc	-	
	Low Time	Tcl		-	4/7Tc	-	
Frame Period		Tv		1100	1125	1149	lines
				48.5	60	63	Hz
Horizontal Active Display Term		Valid	t_{HV}	-	960	-	t_{CLK}
		Total	t_{HP}	1060	1100	1200	t_{CLK}
Vertical Active Display Term		Valid	t_{VV}	-	1080	-	t_{HP}
		Total	t_{VP}	1100	1125	1149	t_{HP}

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

< LVDS input SSCG >

Symbol	Parameter	Condition	Min	Typ	Max	Unit
F	LVDS Input frequency	-	60	74.25	78	MHz
T_{LVSK}	LVDS channel to channel skew	F=100MHz V_{IC}=1.2V V_{ID}=±400mV	-380	-	+380	ps
F_{LVMOD}	Modulating frequency of input clock during SSC		60	-	85	KHz
F_{LVDEV}	Maximum deviation of input clock frequency during SSC		-3	-	+3	%
T_{CY-CY}	Cycle to Cycle jitter		-	-	100	ps

Signal Timing Waveform



Color Data Input Assignment

Input signals, Basic display colors and gray scale of colors

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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(252)	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(252)	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(252)	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(252)	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(252)	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(252)	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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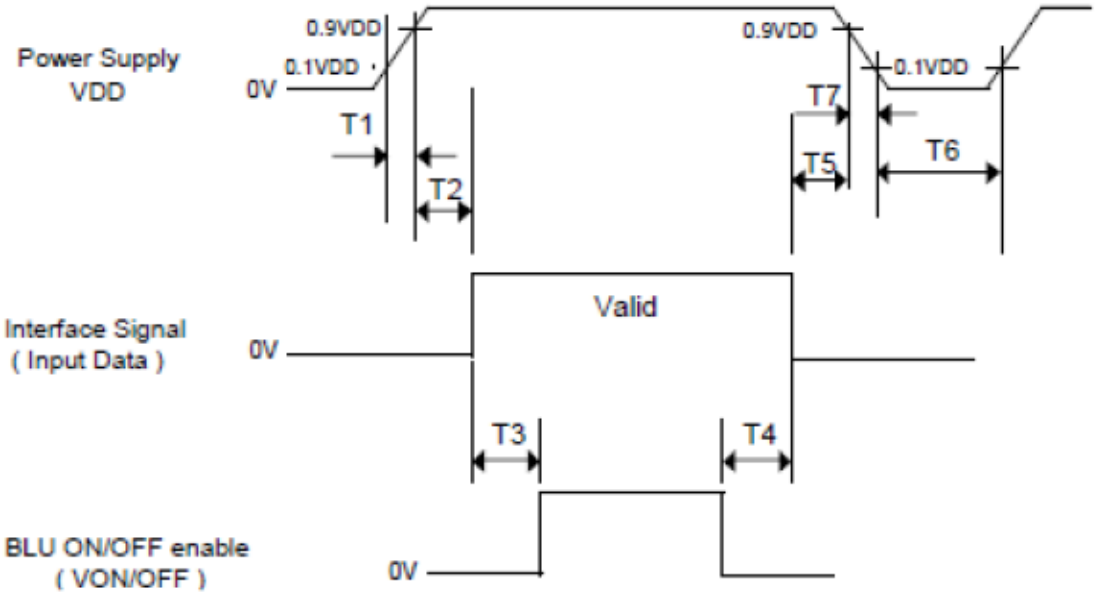
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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

2.5 Power Sequence

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



Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	20	ms
T2	10	-	100	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0	-	-	ms
T6	1	-	-	s

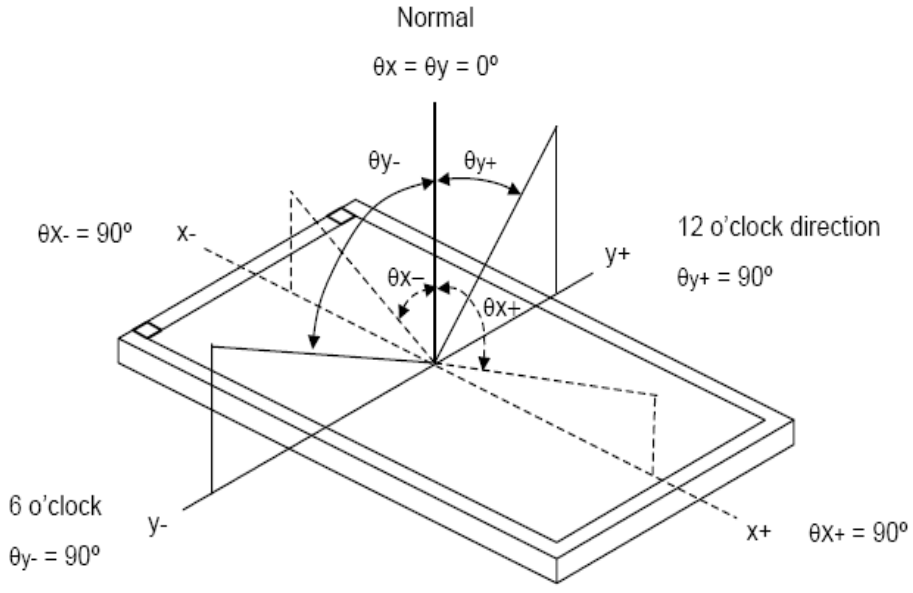
Notes: 1. Back Light must be turn on after power for logic and interface signal are valid.
2.Even though T1 is out of SPEC, it is still ok if the inrush current of VDD is below the limit.
3. When VDD<0.9VDD(Typ.),Power off.
4. T7 decreases smoothly, if there were rebounding voltage, it must smaller than 5 volts.

3 Optical Specification

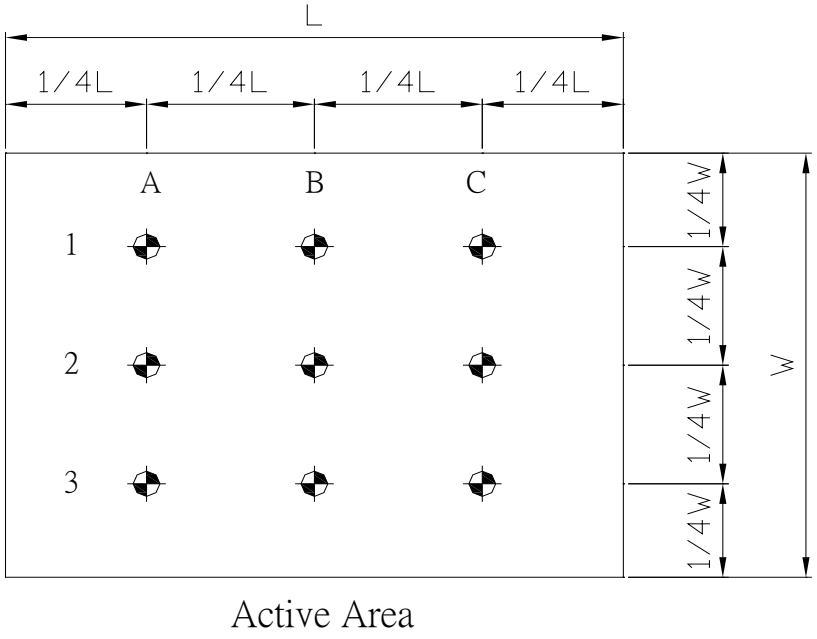
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 Klein K-10	0.617	0.647	0.677	-	Test Mode: (1) (2) (3)
		Ry		0.303	0.333	0.363	-	
	Green	Gx		0.258	0.288	0.318	-	
		Gy		0.606	0.636	0.666	-	
	Blue	Bx		0.116	0.146	0.176	-	
		By		0.035	0.065	0.095	-	
	White	Wx		0.257	0.287	0.317	-	
		Wy		0.300	0.330	0.360	-	
Center Luminance of White		Lc	θx=0 θy=0 BM-7		1000		cd/m^2	
Uniformity		Lu			89		%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10		1300:1		-	Test Mode: (1) (4)
Color Saturation		NTSC			84		%	
Viewing Angle	Horizontal	θx+	CR ≥ 10		89		Deg	Test Mode: (1) (3)
		θx-			89			
	Vertical	θy+			89			
		θy-			89			

Test Mode：

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

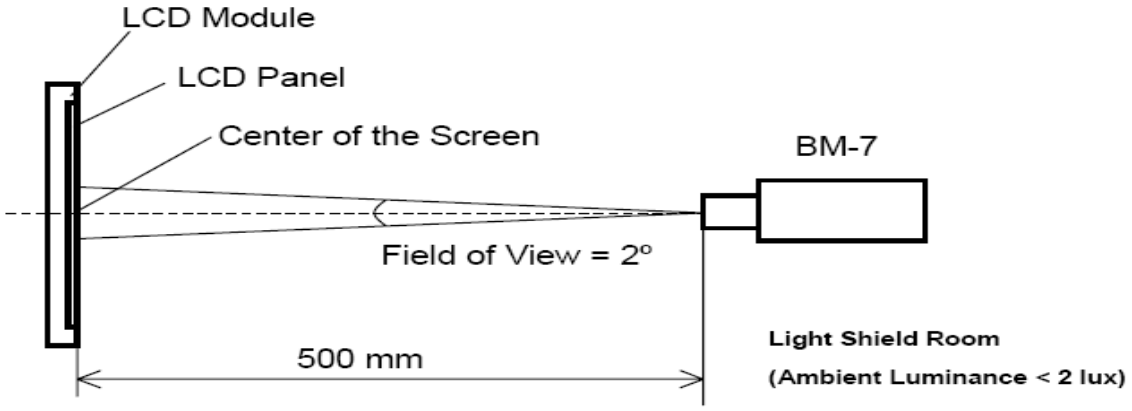


(2) Definition of Test Point:

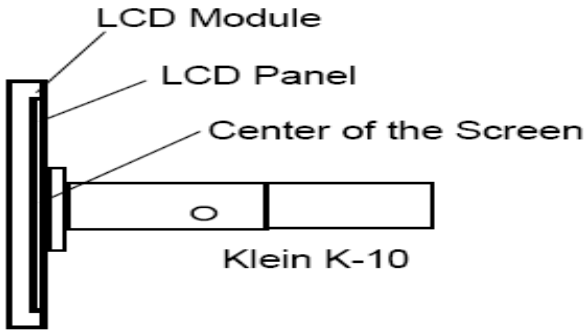


Active Area

(3) BM-7 Measurement Setup:



(4) Klein K-10 Measurement Setup:



4 LED Driving Board Specifications

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

4.1 Operating Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	Vin		22.0	24.0	26.0	V	
Input Current (Low Brightness)	IinL	Brightness = 0%	0.0	-----	-----	mA	
Input Current (High Brightness)	IinH	Brightness = 100%	--	3.0	4.0	A	(1)
LED Current (Low Brightness)	IoutL	Brightness = 0%	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	Brightness = 100%	0.75	0.8	0.85	A	J1
			0.75	0.8	0.85	A	J5
Working Frequency	W_Freq	Brightness = 100%	350	400	450	KHZ	
Brightness Control	DC mode						
	Vadj	Connection of Voltage	0.2	-----	4.8	V	(2)
	PWM mode						
	PWM	Connect to PWM	0	-----	100	%	(3)
	Freq		-----	200	500	Hz	(4)
ON/OFF Control	Von	Normal Operation	2	-----	5	V	
	Voff		0	-----	0.8	V	
Output Voltage	Vout	Brightness = 100%	40.5	41	42	V	J1
			40.5	41	42	V	J5
Efficiency	η	Brightness = 100%	--	90.5	--	%	(5)

Remark:

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

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

(3) Max dimming ratio = 1:100.

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

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

4.2 Connector Socket

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

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

DC or PWM Connector: CN2

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

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

Input Connector: CN3 (JST B4B-PH-K-S or Compatible)

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

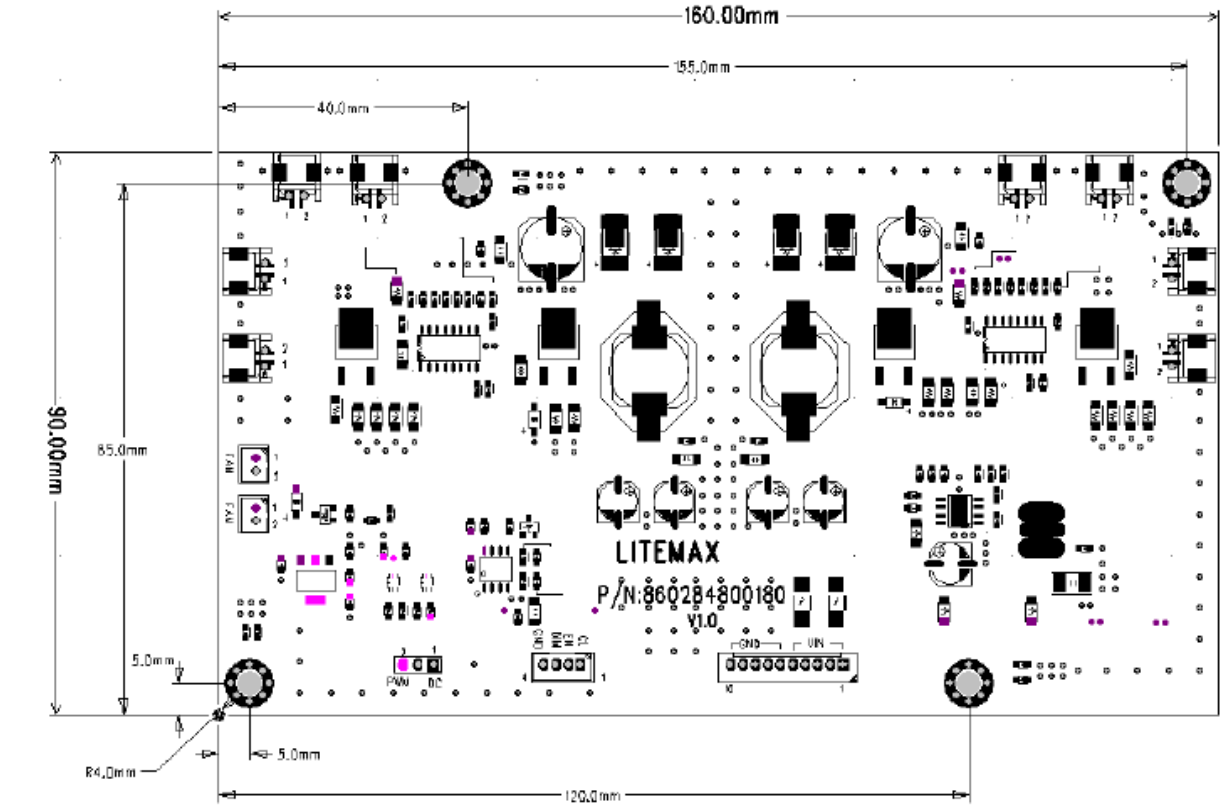
Note: Pin1 is dimming method control pin, Low → DC dimming, High → PWM dimming. If pin1 is be used, please NC CN2

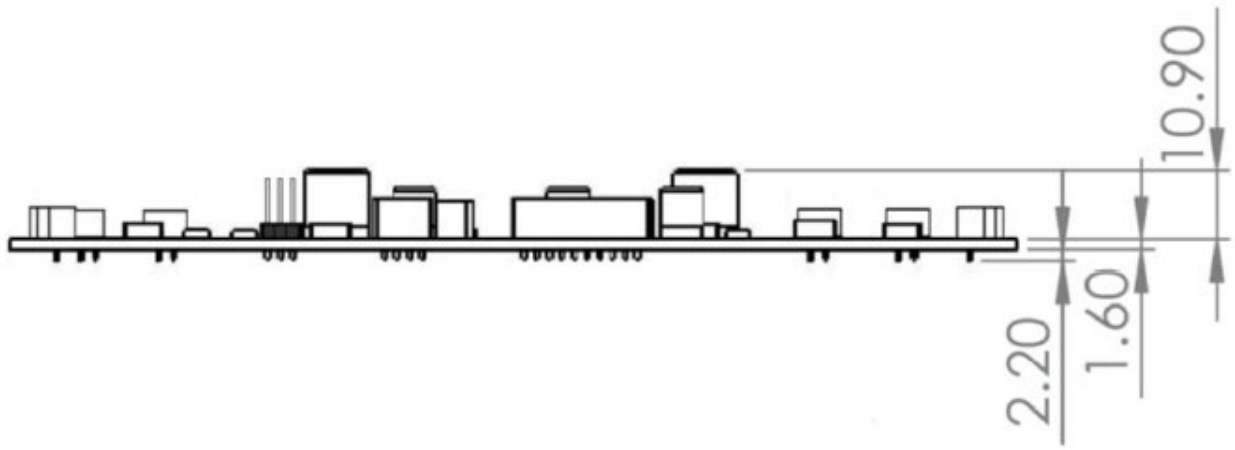
Output Connector: J1,J5 (JST S2B-EH or Compatible)

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

Mechanical Characteristics

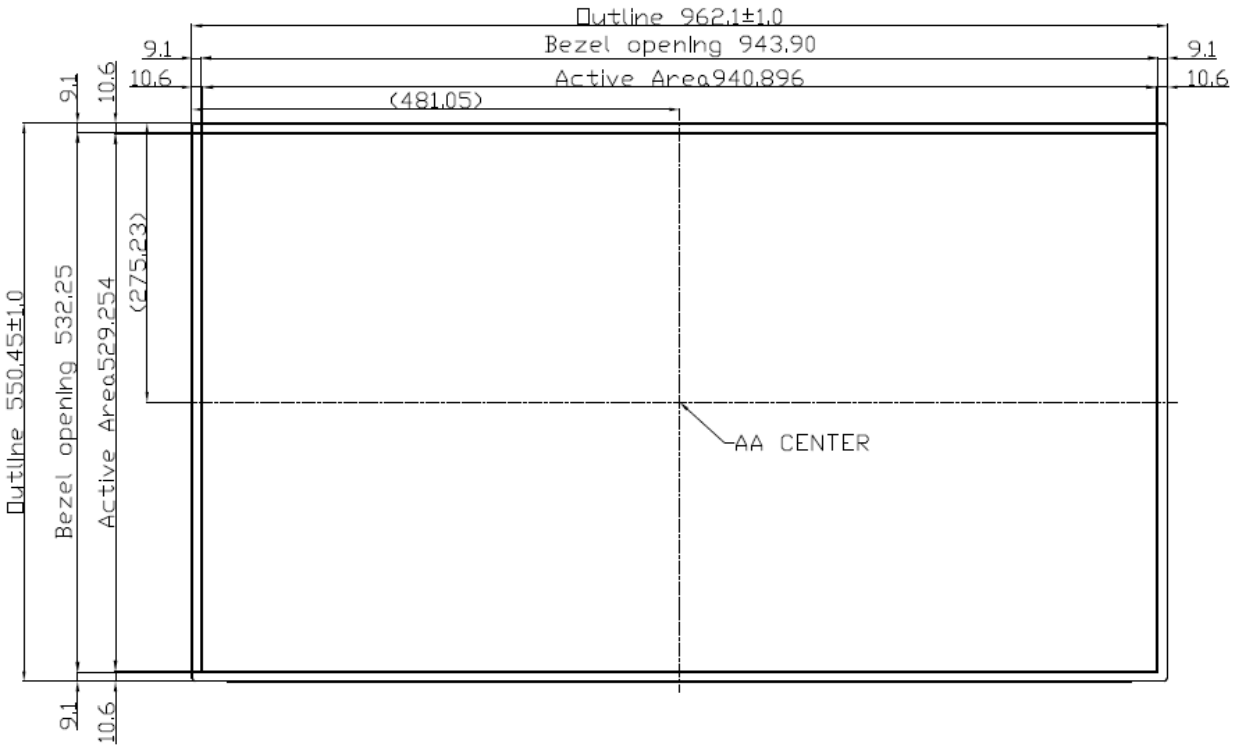
Dimension: 160mm*90mm*12.5mm

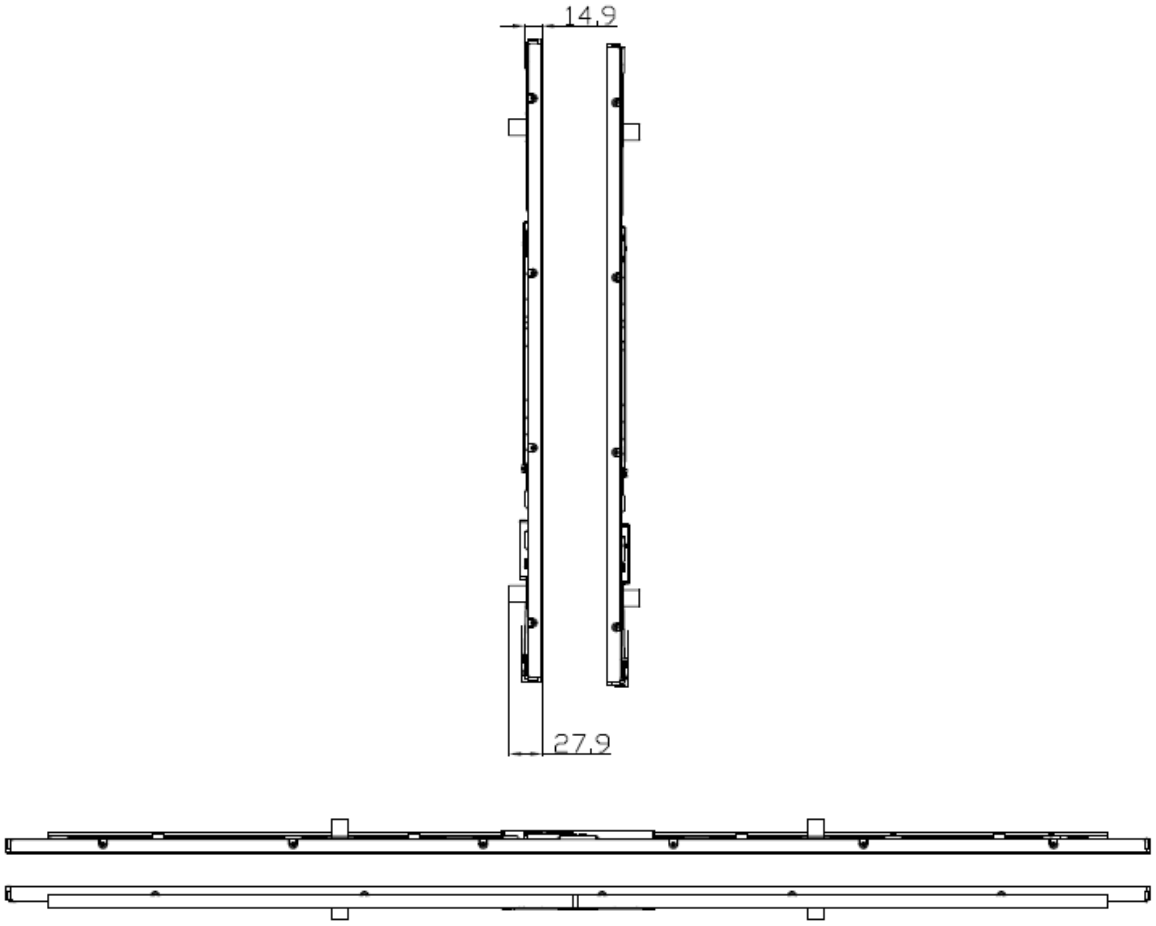


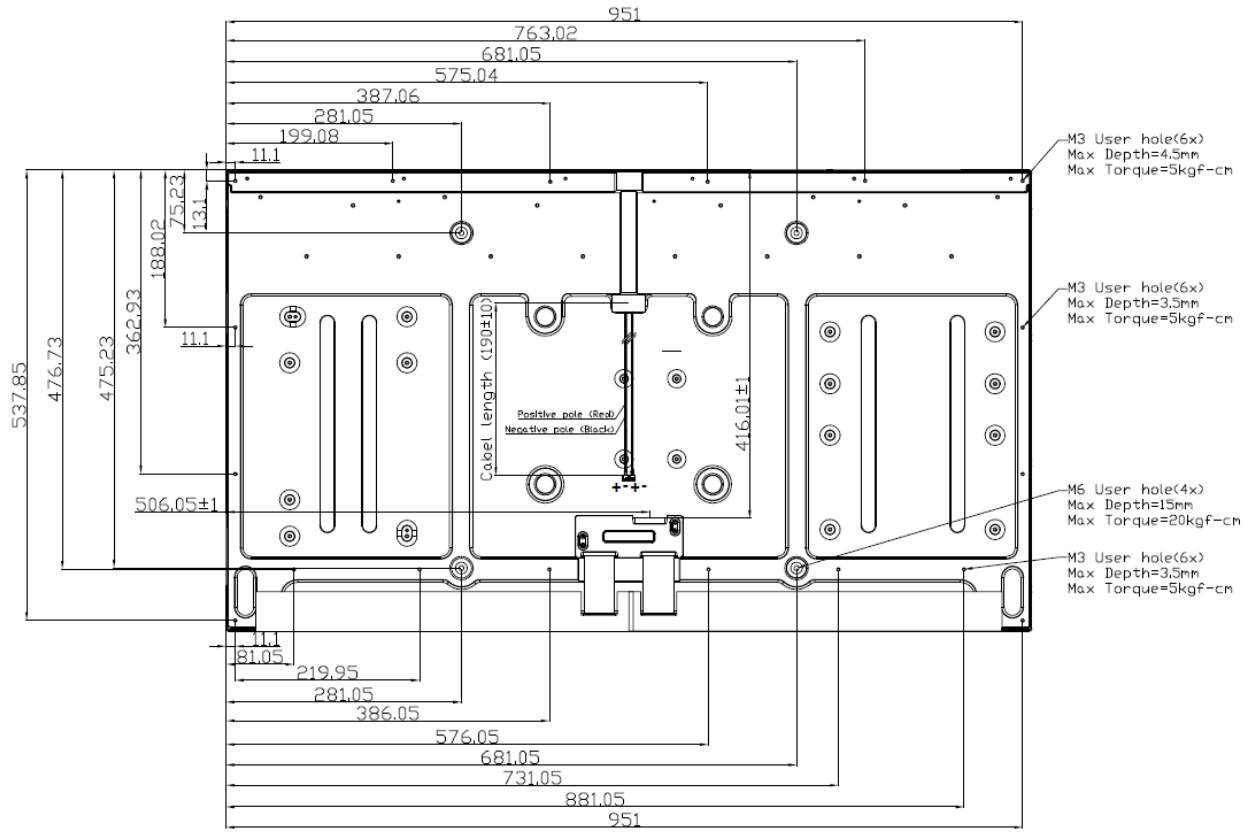


5 Mechanical Drawing

Unit:mm







Note：

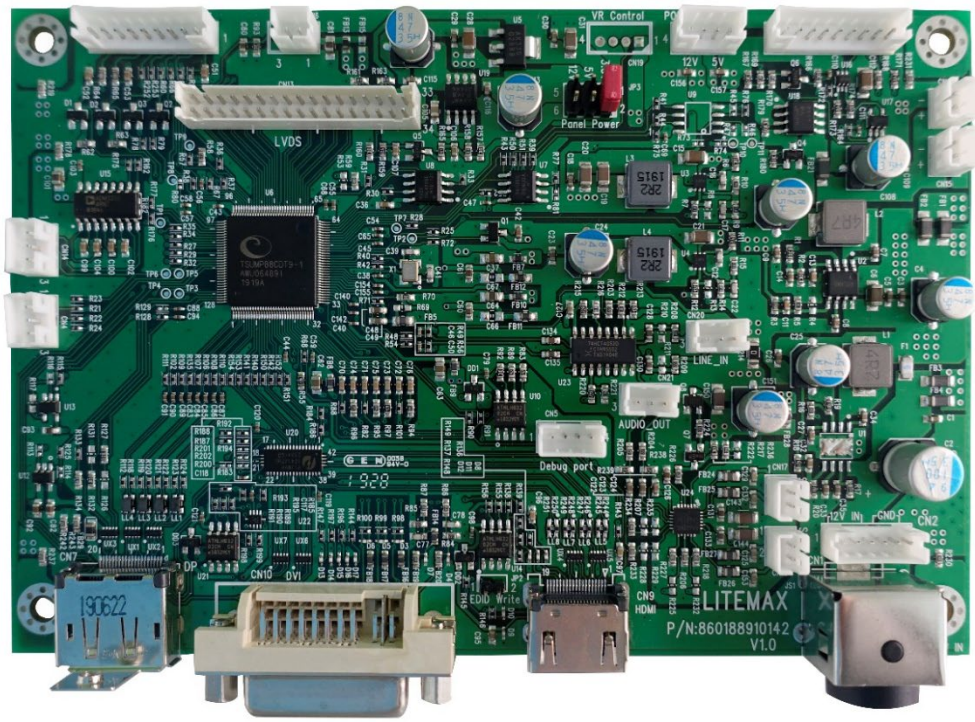
1. Tolerance is ±0.5mm unless noted.
2."( )" marks the reference dimension.

6 AD8891DHP Board & OSD Functions

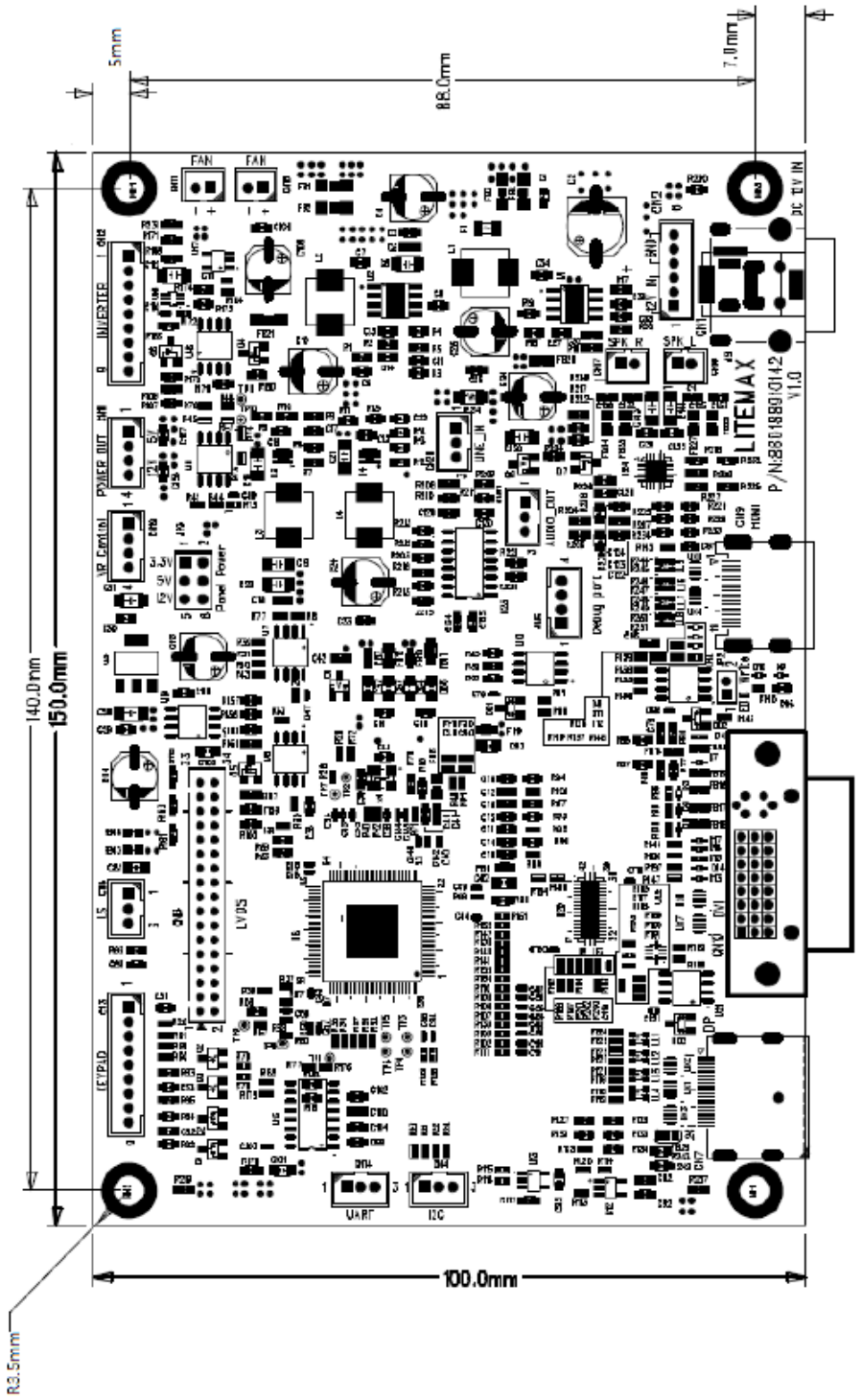
We developed this A/D board to support industrial high brightness and commercial applications. This A/D board has many functions. It has a display port and DVI-I and HDMI input. Rev.1 is European RoHS compliant.

General Description

- **Max resolution up to Full HD**
- **Analog RGB input up to 205MHz**
- **Ultra-Reliable DVI-I input**
- **HDMI input(HDMI 1.3)**
- **Dual/Single LVDS interface**
- **Support panel DC 3.3V、5V or 12V output**
- **OSD control**
- **PWM/DC dimming control for backlight driver.**
- **External RS232 control (optional)**
- **Input power DC12V or DC24V(optional)**
- **Display port input (support display port 1.2a)**
- **Audio in and 3Wx2(4Ω) audio out(optional)**
- ***External digital light sensor brightness control (optional)**
- ***External light sensor brightness control (optional)**
- **Support output voltage 12V(1A) and 5V(1A)**



Outline Dimensions
AD8891 150mmX100mm



AD8891 Board Pin Define

CN13: Panel LVDS connector

Pin No.	Function	Pin No.	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	N.C
9	RxO3-	26	N.C
10	RxO3+	27	GND
11	N.C	28	GND
12	N.C	29	Pull High
13	GND	30	Pull Low
14	GND	31	VLCD
15	RxE0-	32	VLCD
16	RxE0+	33	VLCD
17	RXE1-	34	VLCD

CN10: DVI-I Input Connector

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(DET_DVI)	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-
C1	Red input	C2	Green input	C3	Blue input
C4	Horizontal SYNC.	C5	Analog GND		

CN7: DISPLAY PORT

Pin No.	Function	Pin No.	Function
1	RX3-	11	GND
2	GND	12	RX0+
3	RX3+	13	GND
4	RX2-	14	GND
5	GND	15	AUX+
6	RX2+	16	GND
7	RX1-	17	AUX-
8	GND	18	Hot plug detect
9	RX1+	19	GND
10	RX0-	20	DP +3.3V

CN9: HDMI Input connector (HDMI 19Pin)

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(HDMI_DET)	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		

CN1: Power DIN (12V or 24V)

Pin No.	Function	Pin No.	Function
1	12V/24VDC	2	12V/24VDC
3	GND	4	GND

CN2: Power connector (12V or 24V) (6PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	12V/24VDC	2	12V/24VD
3	12V/24VD	4	GND
5	GND	6	GND

CN16: Touch Power connector

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

CN12: Inverter Connector(9PIN 2.0mm)

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

CN11, CN15: Fan control (2PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	12V	2	GND

CN3: 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	NC
5	Up key		

JP3: Panel Power

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

CN14: RS232 Connector (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	UART TX	2	UART RX
3	GND		

CN20: Line In (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	Audio-R	2	Audio-L
3	GND		

CN17: Speaker Connector (2PIN 2.0mm)

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

CN18: Speaker Connector (2PIN 2.0mm)

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

CN19: VR Control (4PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	5V	2	INT
3	GPIO	4	GND

Reserve for some control

CN6: Ambient (2PIN 2.0mm)

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

CN21: Audio out connector (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	Audio R out	2	Audio L out
3	GND		

For audio connector to another Audio AMP

CN4: I2C Connector (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	I2C_SDA	2	I2C_SCL
3	GND		

For digital LS

JP2: EDID Jumper (2PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	3.3V	2	GND

When EDID want to update it must be short.

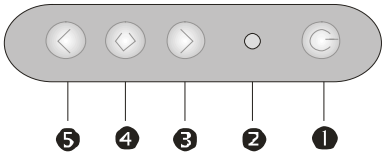
CN5: Debug Connector (4PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	3.3V	2	DDCA_SCL
3	DDCA_SDA	4	GND

For F/W debug

6.4 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.

6.5 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 7 sub menus within the OSD user interface:
Brightness, Signal Select, Sound, Color, Image, Tools, and Exit.

When you press the “menu” button, you enter the “Brightness” sub directory. In this directory, you will see 4 selections:

Press “menu” once, you can go into the **Ambient light sensor**.

Ambient light sensor:
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”.

Exit: Back to the beginning menu.

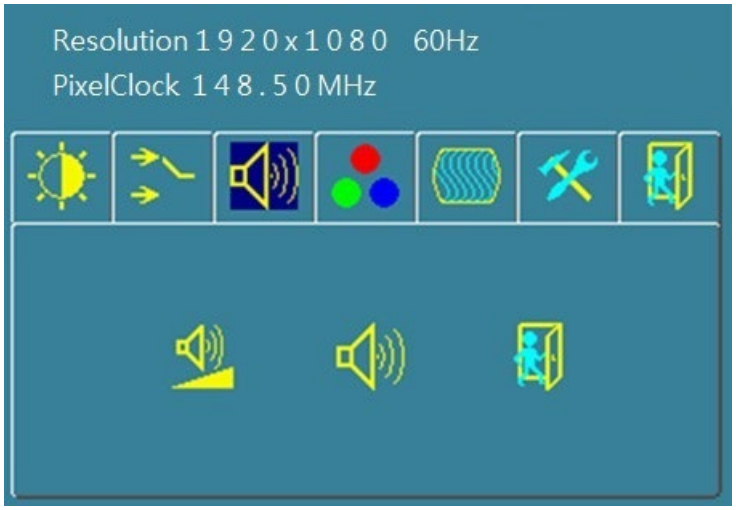
VGA **VGA:** VGA input

HDMI **HDMI:** HDMI input

DVI **Digital:** DVI input

DP **DP:** Display Port input

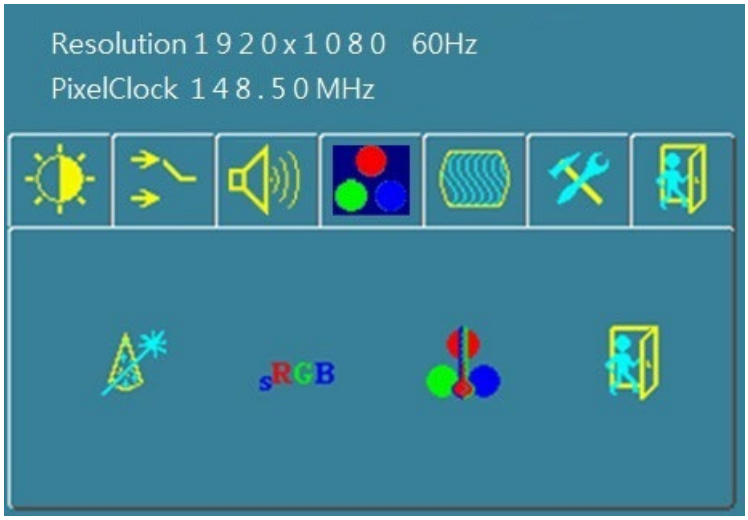
Exit **Exit:** Back to the beginning menu.



Audio Volume: Audio volume adjustment.

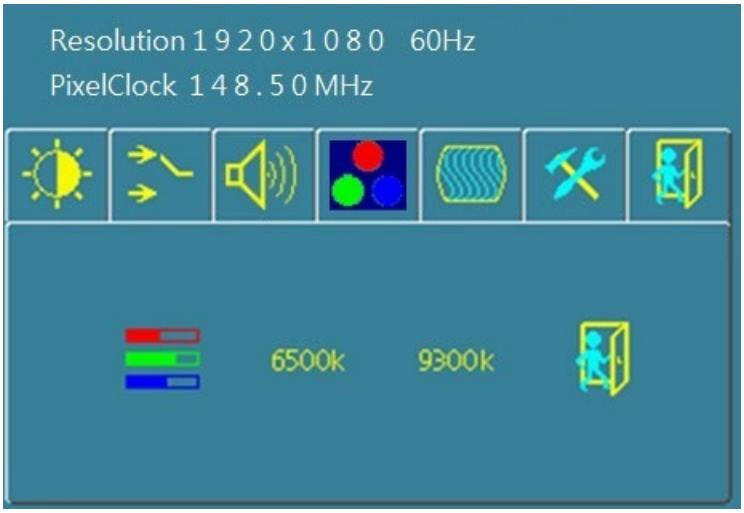
UnMute/Mute: You can mute the speaker by pressing this option.

Exit: Back to the beginning menu.



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

SRGB: Windows standard color setting



Color Temperature: You have 4 options in this selection

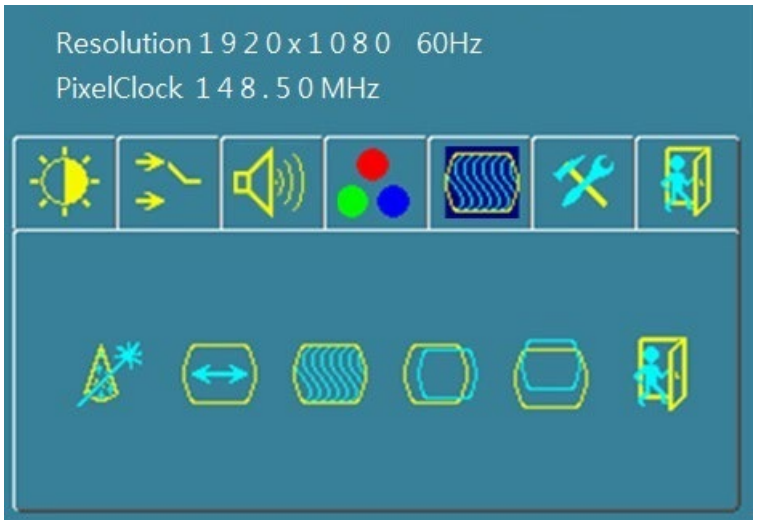
.

Color Temperature User Define: Default is 100 for “R”, “G”, and “B”.

Color Tempture_6500K: Warm color scheme

Color Tempture_9300K: Cold color scheme

Exit: Back to the beginning menu.



Auto Adjust:
Choose this option and the AD8891 will adjust to the optimal horizontal and vertical frequency.

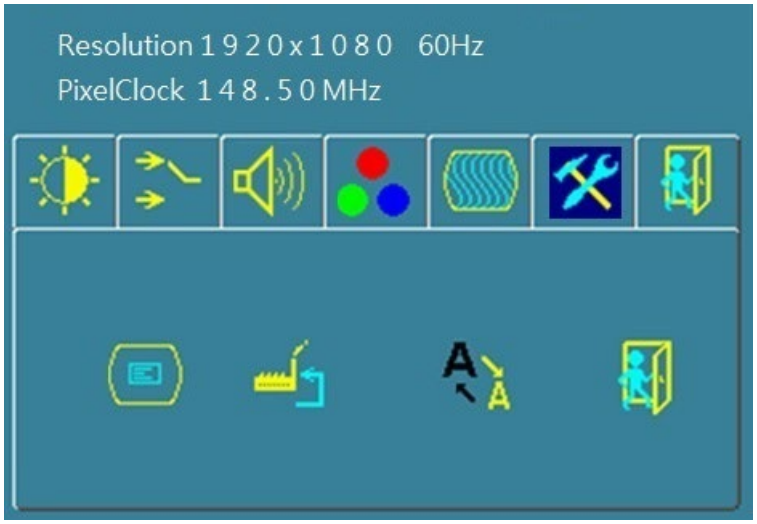
Clock: If you are not satisfied with the Auto tune result, you can adjust manually by pressing “Clock”. Using this will make the image wider.

Phase: If “double images” appear around the characters, choose “Phase” to remove them..

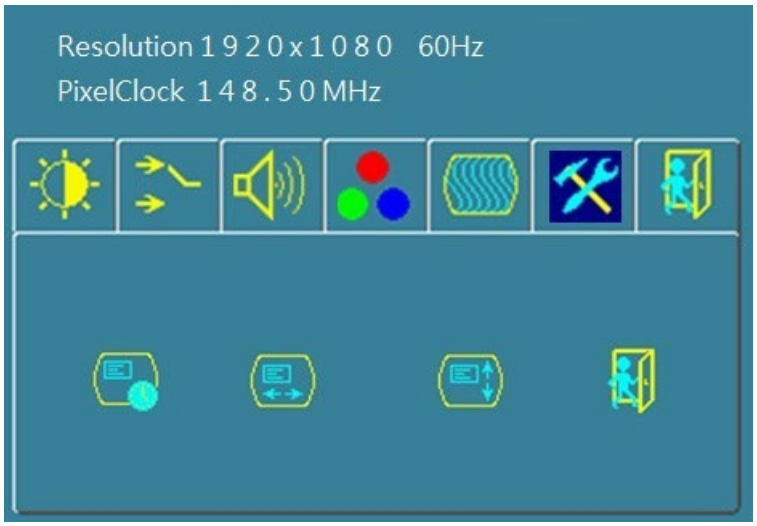
HPos: You can shift the screen horizontally using this function.

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

Exit: Back to the beginning menu.



OSD Control: Selecting this option, brings you to 4 more options:



OSD_time: Select time for the OSD user interface to stay on screen, for 2 sec. to 16 sec. Default is 10 sec.

OSD_HPos: Moves the OSD user interface horizontally on screen.

OSD_VPos: Moves the OSD user interface vertically on screen.

Exit: You can exit this sub menu back to the beginning

Factory_Reset: By pressing this, the screen will revert to factory settings, and the previous settings will be deleted.

Sharpness: Sharpen characters.

Exit: Back to the normal screen

OSD Lock Function：

It is possible to lock all the OSD buttons to prevent unauthorized changes to occur by pressing "**right >**" and "Menu" buttons simultaneously. You will see the "lock" icon below on the center of the screen for 8 ~ 9 seconds. If any button is pushed after the lock function is initiated, the below icon will appear on the screen.'

To release the OSD lock, press and "**right >**" and "Menu". The below icon will appear on the center of the screen for 8 ~ 9 seconds. Now all OSD keys are active again.

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.