LITEMAX
Sunlight Readable LCD!

ENRICH YOUR VISUAL WORLD...

DURApixel LED B/L LCD

LITEMAX

DLF/DLH1566-I

Sunlight Readable 15.6” LED B/L LCD

User Manual

Approved by	Checked by	Prepared by

LITEMAX Electronics Inc.
8F, No.137, Lane 235, Bau-chiau Rd.,
Shin-dian Dist., New Taipei City, Taiwan
R.O.C.
Tel : 886-2-8919-1858
Fax: 886-2-8919-1300
Homepage: http://www.litemax.com

Record of Revision

Version and Date	Page	Old Description	New Description	Remark
Apr./22/2021	all		Initial release	

Contents

1 General Description

The DLF/DLH1566-I is a 15.6 inch industrial grade sunlight readable LCD, with high brightness 1200 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 1200 nits
- Sunlight Readable
- LED Backlight
- Low Power Consumption
- Wide Temperature Range
- BL MTBF: 100,000 hours

1.2 General Specifications

Model Name	DLF/DLH1566-I
Description	15.6" TFT LCD, 1200 nits LED Backlight, 1920x1080
Screen Size	15.6"
Display Area (mm)	344.16 (H) x 193.59(V)
Brightness	1200 cd/m^2
Resolution	1920x1080
Aspect Ratio	16 : 9
Contrast Ratio	1200 : 1
Pixel Pitch (mm)	0.17925(H) x 0.17925(V)
Pixel Per Inch (PPI)	141
Viewing Angle	170 ℃(H),170 ℃(V)
Color Saturation (NTSC)	82%
Display Colors	16.2M
Response Time (Typical)	25ms
Panel Interface	LVDS
Input Interface	VGA, DVI-I, DP
Input Power	DC12V
Power Consumption	15W (19W 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 mm
Weight (Net)	1.1kg
Operating Temperature	-30 ˚C ~ 70 ˚C
Storage Temperature	-40 ˚C ~ 70 ˚C

DLF= Panel+ LED Driving Board

DLH= Panel+ LED Driving Board + AD Control Board

1.3 Absolute Maximum Ratings

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	Tst	-40	70	℃	(1), (2)
Operating Ambient Temperature	Top	-30	70	℃	(1), (2)

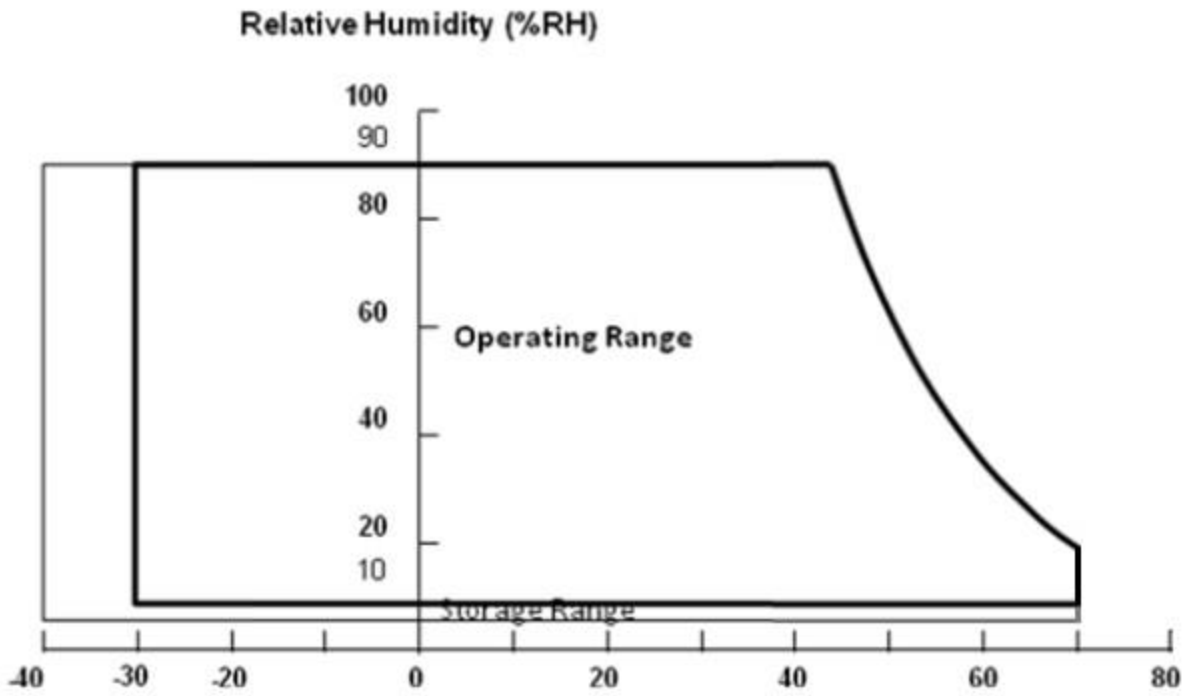
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ℃).

(b) Wet-bulb temperature should be 39 ℃ Max. (Ta > 40 ℃).

(c) No condensation.

(2) The absolute maximum rating values of this product are not allowed to be exceeded at any times. The module should not be used over the absolute maximum rating value. It will cause permanently unrecoverable function fail in such an condition



2 Electrical Absolute Ratings

2.1 TFT LCD Module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	3.6	V	(1)
Logic Input Voltage	V_{IN}	-0.3	4.0	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.

2.2 Interface Connections

Pin Assignment

Pin	Name	Description
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 3.3V
12	LCD_VCC	LCD logic and driver power 3.3V
13	LCD_VCC	LCD logic and driver power 3.3V
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	LCD GND	LCD logic and driver ground
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.

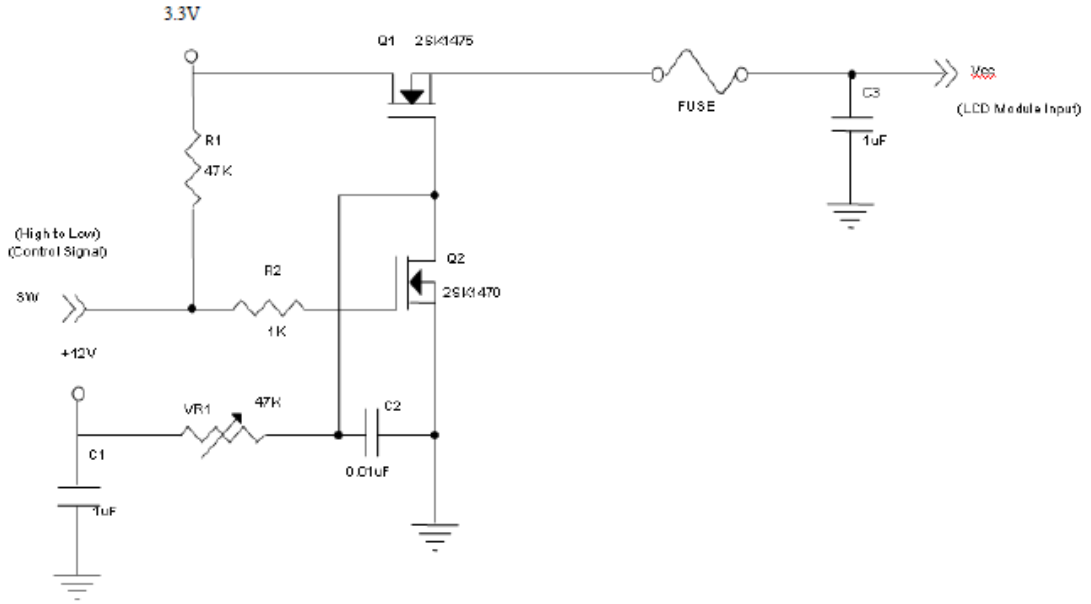
Note (2) User's connector Part No.: I-PEX 20453-040T-03 or equivalent.

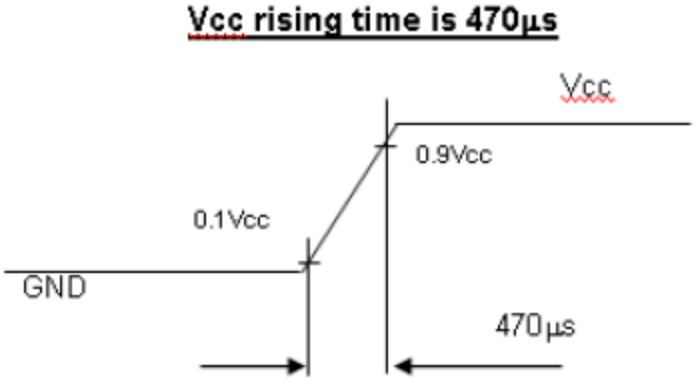
2.3 LCD Electronics Specifications

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	-	150	mV	-
Rush Current		I_{RUSH}	-	-	3	A	(2)
Power Supply Current	White	-	-	1.22	1.5	A	(3)a
	Black	-	-	0.51	0.7	A	(3)b
	Vertical Stripe	-	-	0.82	1	A	(3)c
Power Consumption		PLCD	-	4	5	Watt	(4)
LVDS differential input voltage		Vid	200		600	mV	(5)
LVDS common input voltage		Vic	1.0	1.2	1.4	V	(5)
LVDS terminating resistor		R_T		100		ohm	

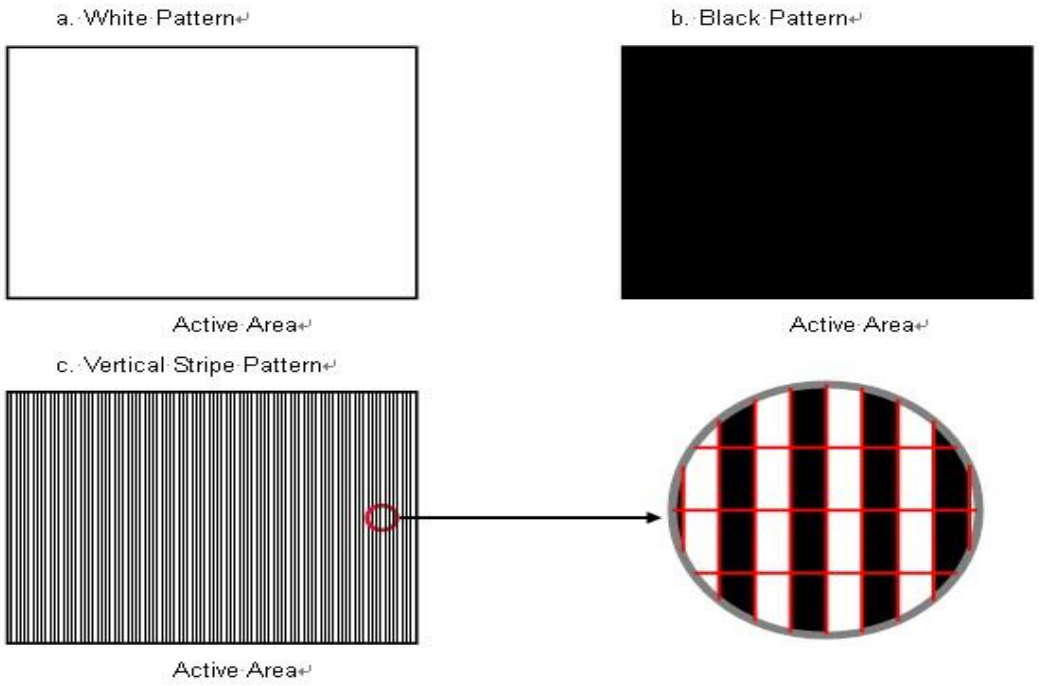
Note (1) The ambient temperature is Ta = 25 ± 2 ℃.

Note (2) Measurement Conditions:



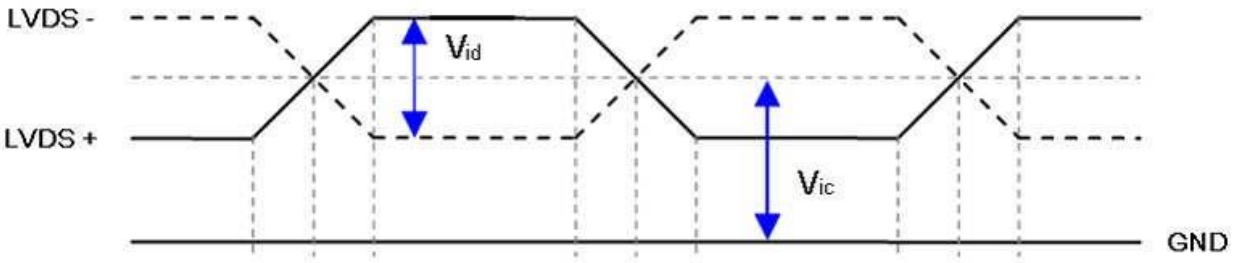


Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ±2 ℃, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.



Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) VID waveform condition



2.3.1 LVDS Input Signal Specifications

LVDS Data Mapping Table

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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

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

2.4 Display Timing Characteristics

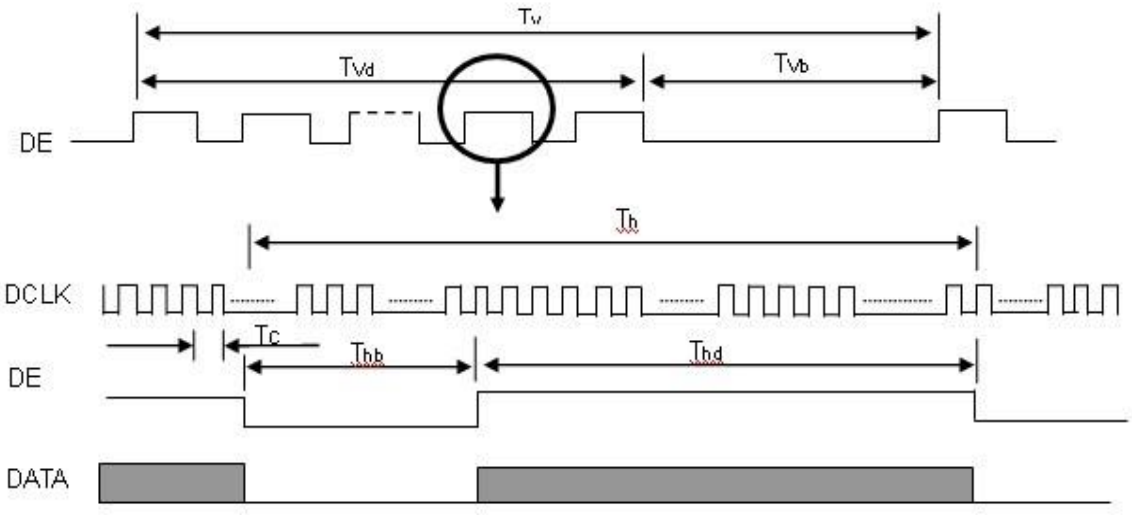
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	60	70.93	75	MHz	-
	Period	Tc		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	ns	(4)
	Spread spectrum modulation range	Fclkin_ mod	FC*98%		FC*102%	MHz	(5)
	Spread spectrum modulation frequency	F_{SSM}			200	KHz	
Vertical Display Term	Frame Rate	Fr	50	60	60	Hz	Tv=Tvd+Tvb
	Total	Tv	1090	1110	1130	Th	-
	Active Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	Tv-Tvd	30	Tv-Tvd	Th	-
Horizontal Display Term	Total	Th	1050	1065	1075	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	-
	Blank	Thb	Th-Thd	105	Th-Thd	Tc	-

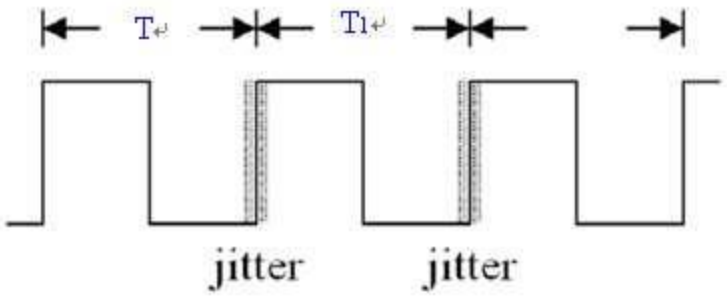
Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

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

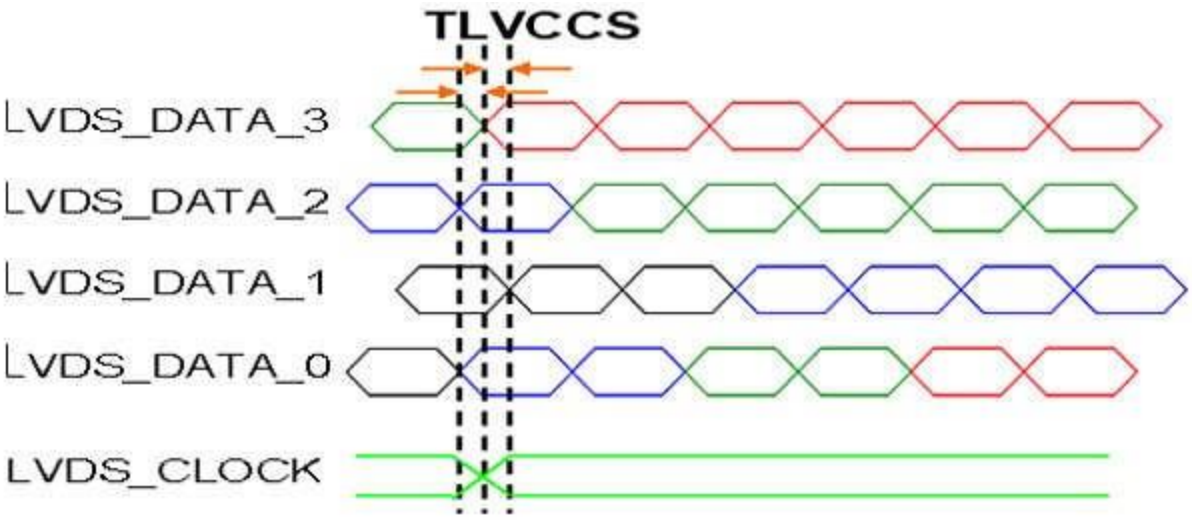
INPUT SIGNAL TIMING DIAGRAM



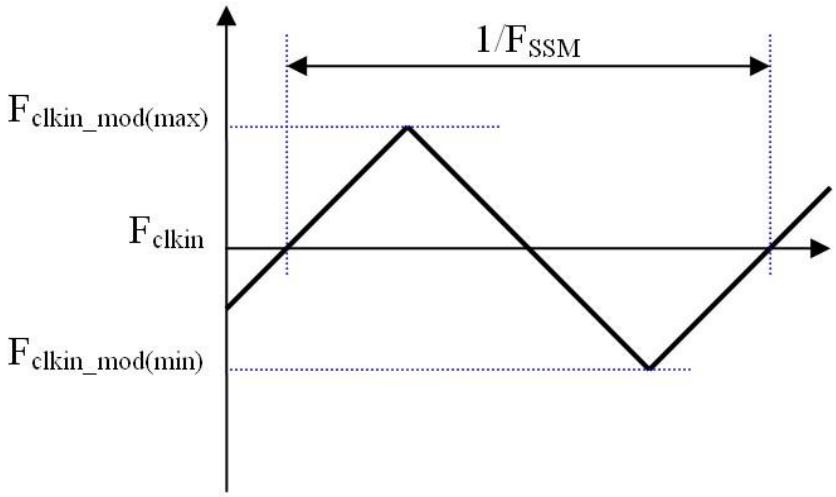
Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T1 – TI



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

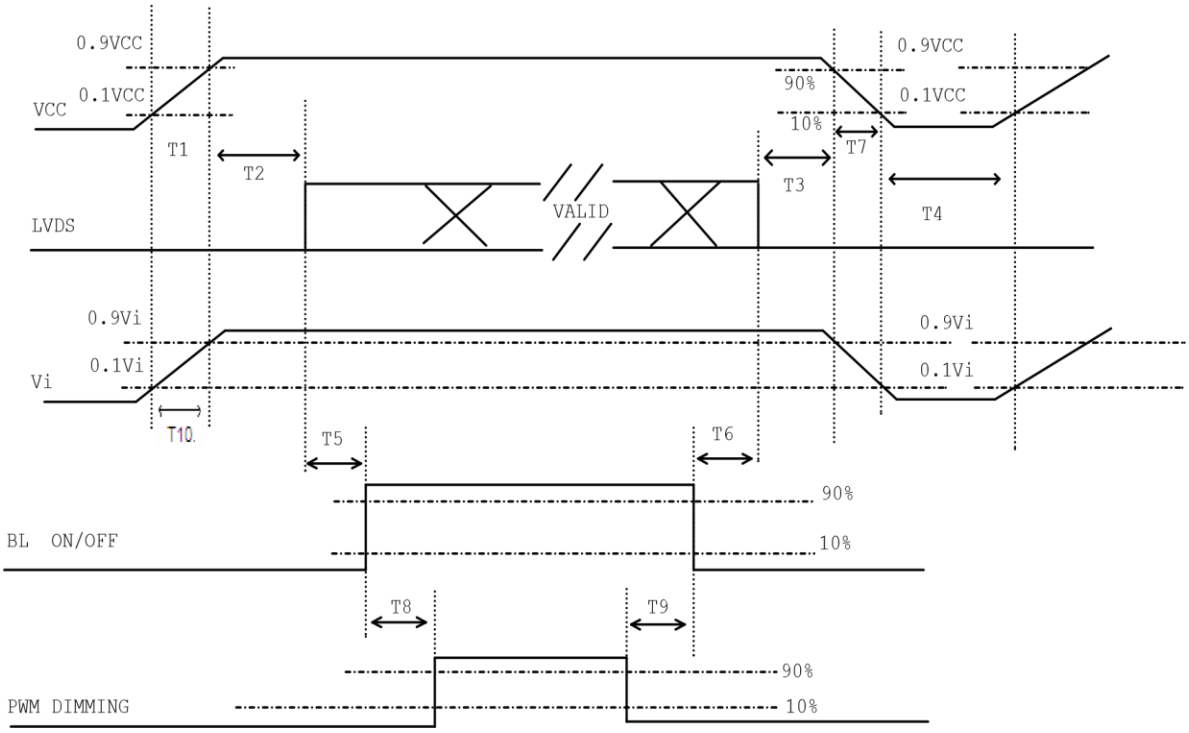


Note (5) The SSCG (Spread spectrum clock generator) is defined as below figures.



2.5 Power ON/OFF Sequence

The power sequence specifications are shown as the following table and diagram.



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	20	-	-	ms
T7	10	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms
T10	20	-	-	ms

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

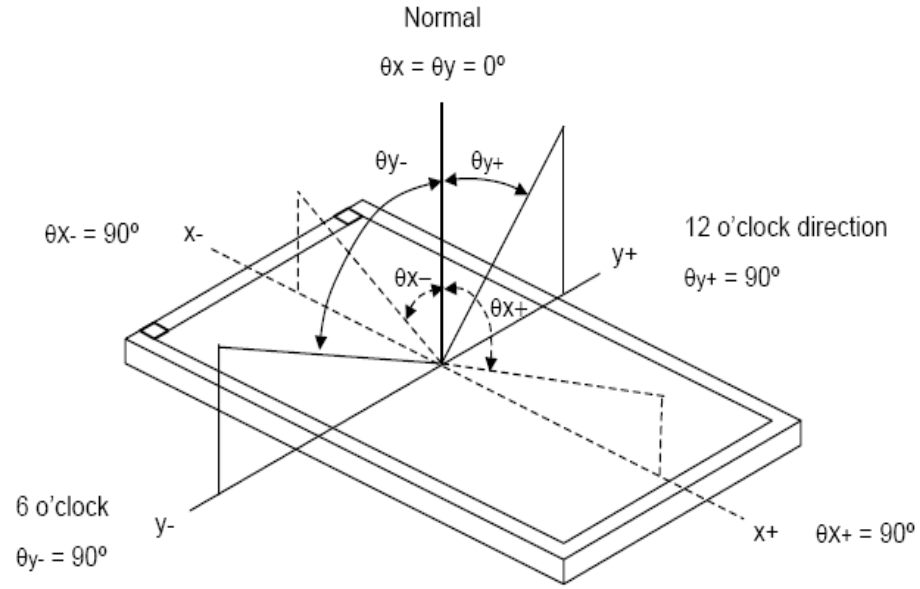
Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

3 Optical Specification

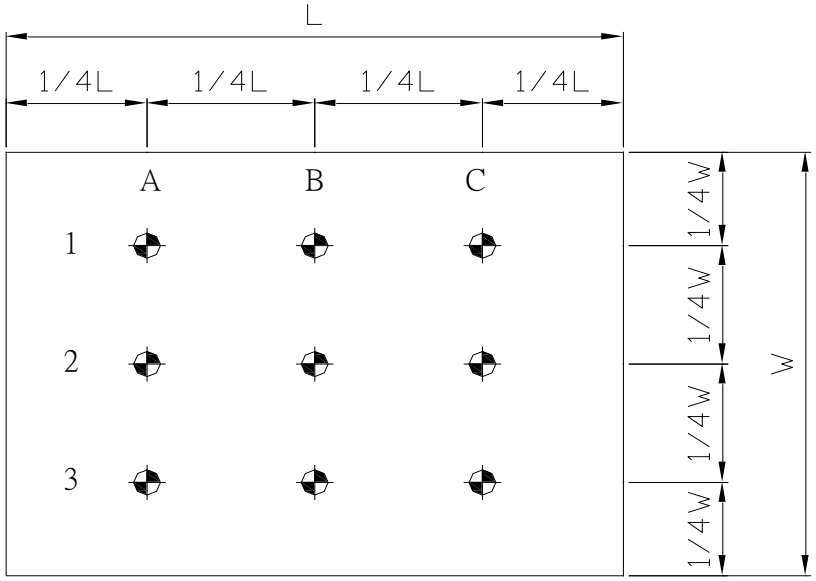
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 Klein K-10	0.623	0.653	0.683	-	Test Mode: (1) (2) (3)
		Ry		0.308	0.338	0.368	-	
	Green	Gx		0.277	0.307	0.337	-	
		Gy		0.603	0.633	0.663	-	
	Blue	Bx		0.116	0.146	0.176	-	
		By		0.024	0.054	0.084	-	
	White	Wx		0.275	0.305	0.335	-	
		Wy		0.319	0.349	0.379	-	
Center Luminance of White		Lc	θx=0 θy=0 BM-7		1200		cd/m^2	
Uniformity		Lu			88		%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10		1200:1		-	Test Mode: (1) (4)
Color Saturation		NTSC			82		%	
Viewing Angle	Horizontal	θx+	CR ≥ 10		85		Deg	Test Mode: (1) (3)
		θx-			85			
	Vertical	θy+			85			
		θy-			85			

Test Mode：

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

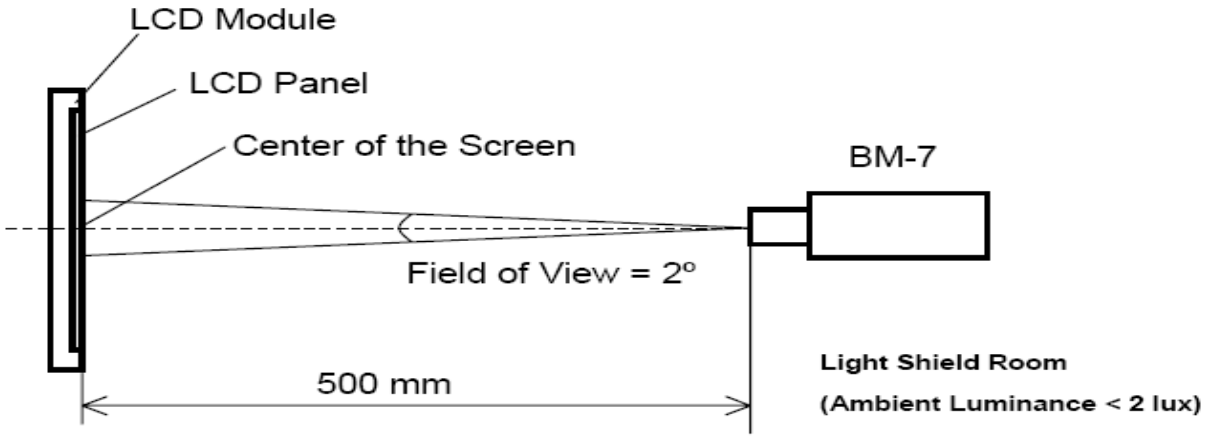


(2) Definition of Test Point:

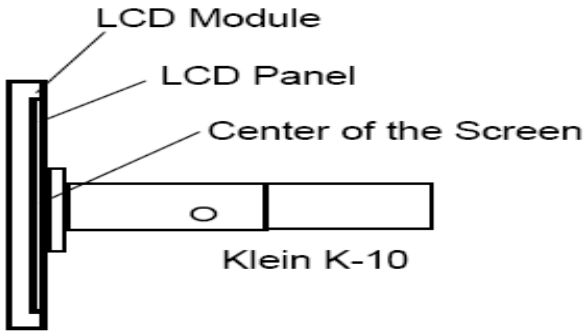


Active Area

(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		10.0	12.0	14.0	V	
Input Current (Low Brightness)	IinL	Brightness = 0%	0.0	-----	-----	mA	
Input Current (High Brightness)	IinH	Brightness = 100%	1.49	1.32	1.2	A	(1)
LED Current (Low Brightness)	IoutL	Brightness = 0%	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	Brightness = 100%	0.6	0.63	0.66	A	
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	400	Hz	(4)
ON/OFF Control	Von	Normal Operation	2	-----	5	V	
	Voff		0	-----	0.8	V	
Output Voltage	Vout	Brightness = 100%	22.0	22.5	23.0	V	
Efficiency	η	Brightness = 100%	88.4	89.5	90.1	%	(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:

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

PIN No	Symbol	Description
1	Vin	DC+
2	Vin	DC+
3	Vin	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 (Low → DC , Hi → PWM)

Output Connector:

J1,J2(JST S2B-EH or Compatible)

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

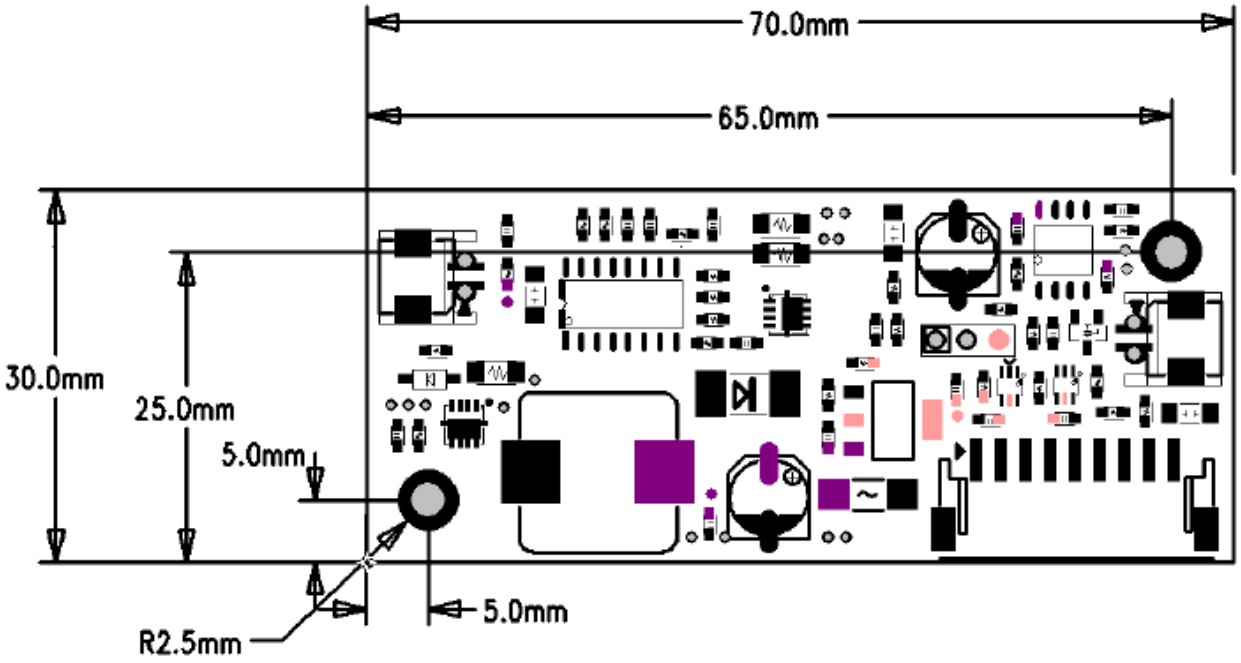
DC or PWM Connector :

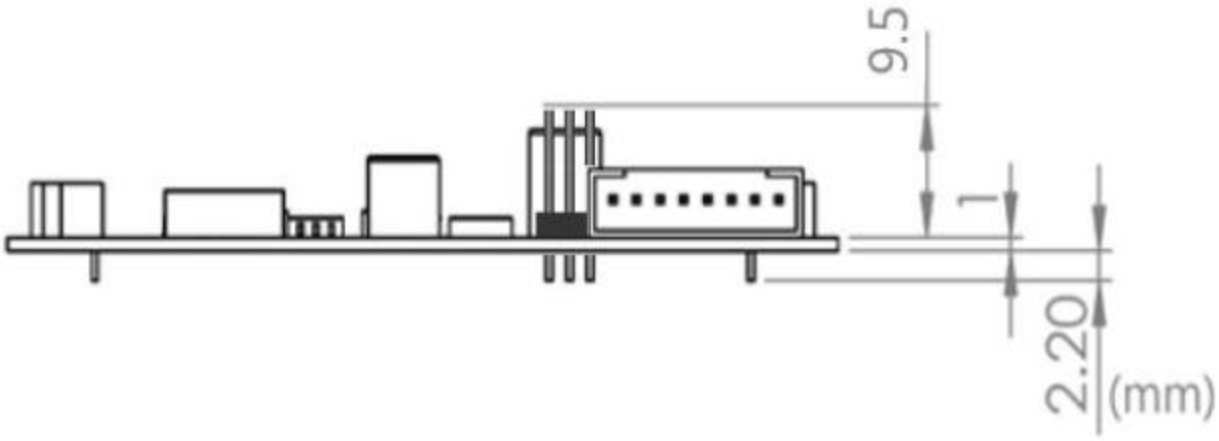
J4

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

4.3 Mechanical Characteristics

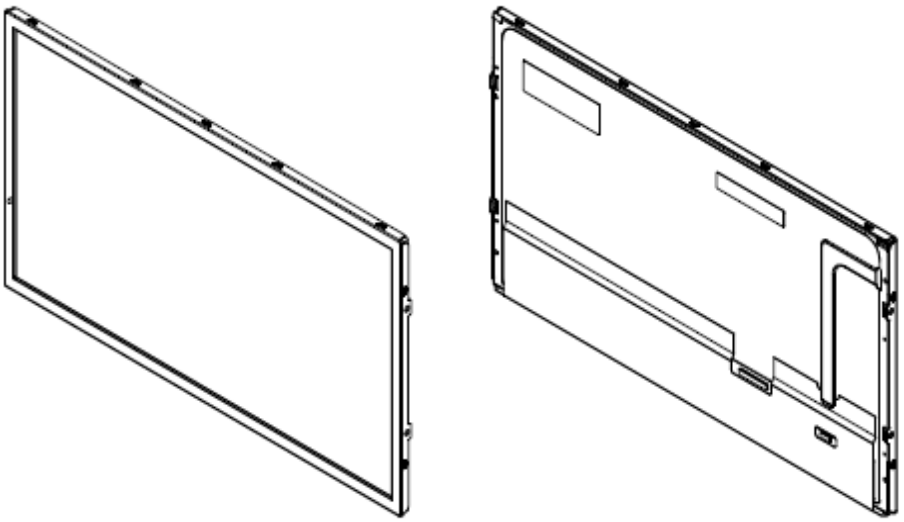
Dimension: 70mm*30mm*10.5mm

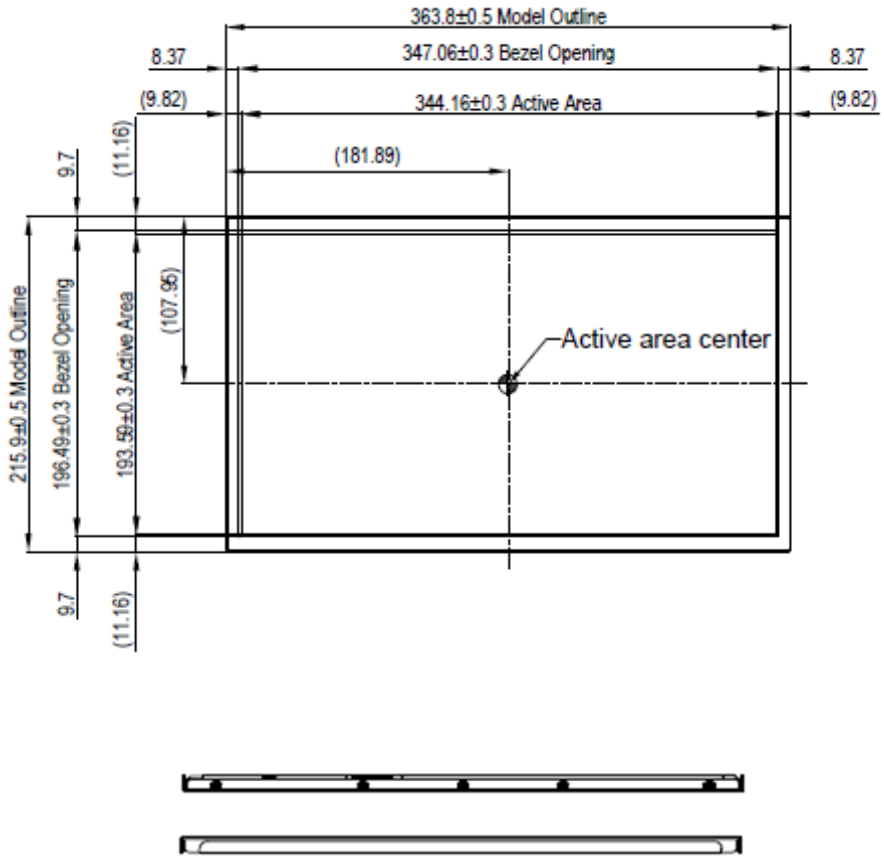


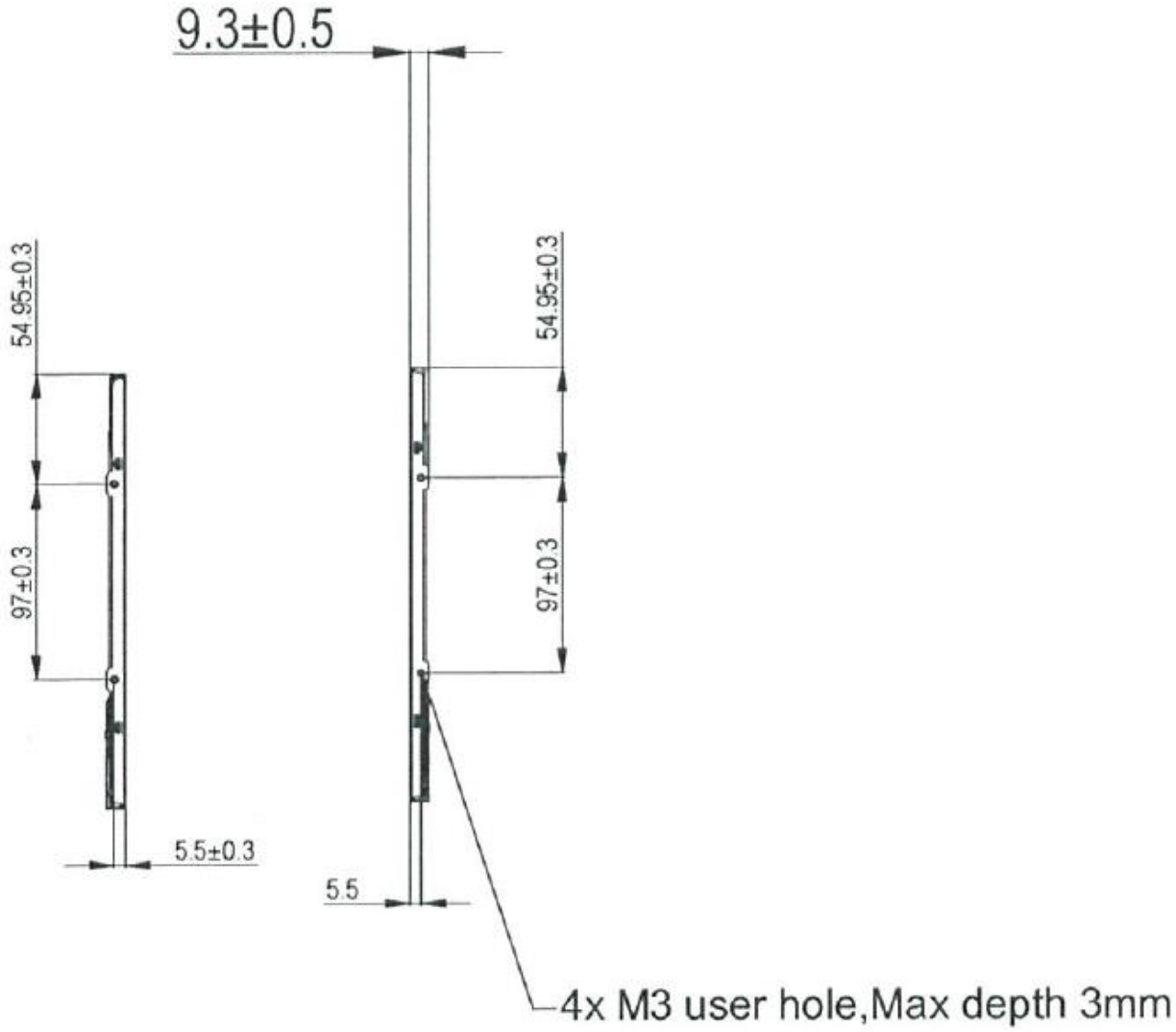


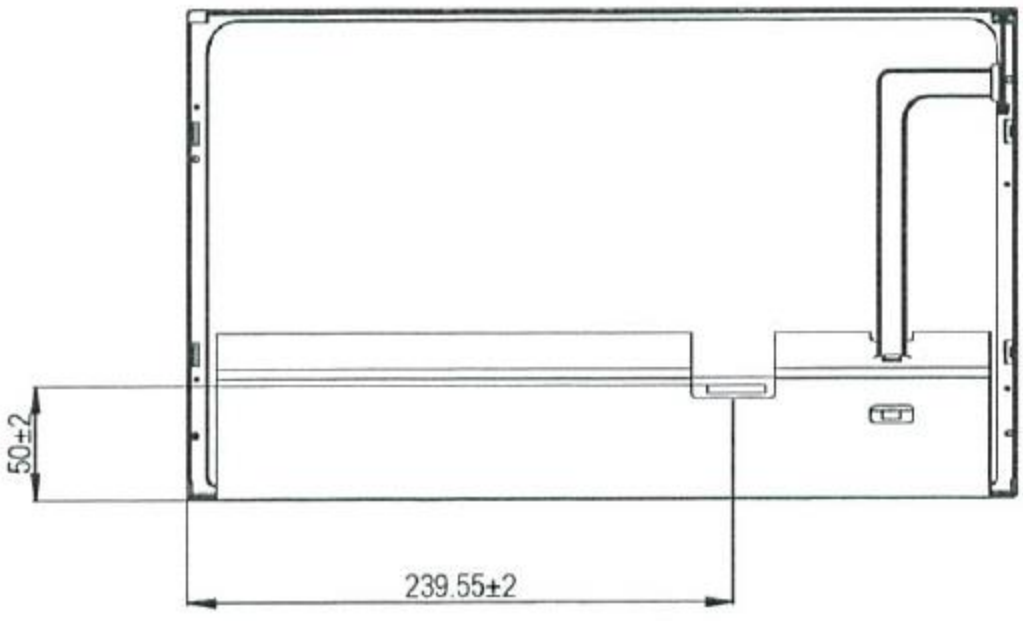
5 Mechanical Drawing

Unit:mm






9.3±0.5
54.95±0.3
97±0.3
5.5±0.3
54.95±0.3
97±0.3
5.5
4x M3 user hole,Max depth 3mm


50±2
239.55±2

6 AD8891GDPH Board & OSD Functions

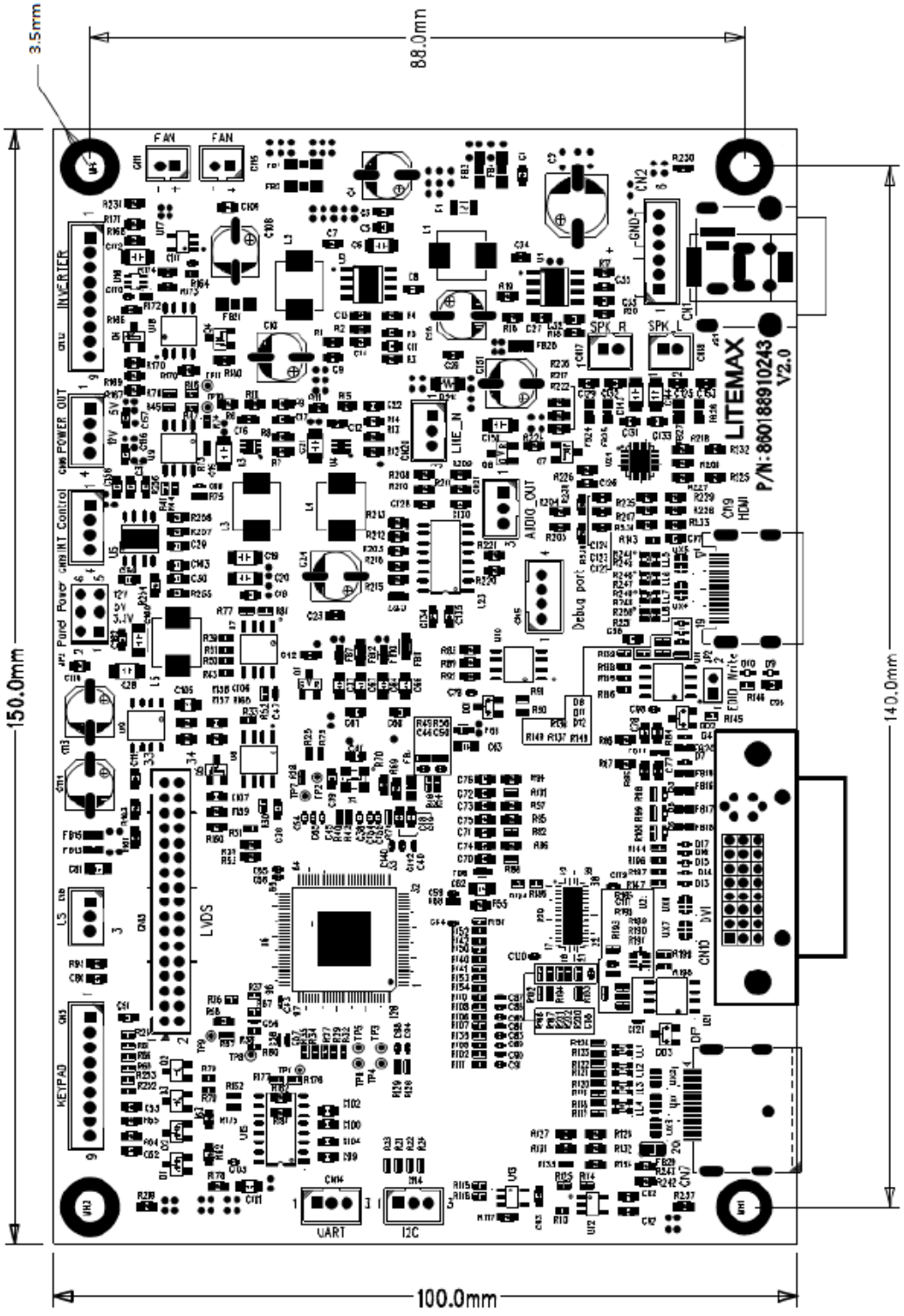
We developed this A/D board to support industrial high brightness and commercial applications. This A/D board has many functions. It has a display port and DVI I and HDMI input. Rev.1 is European RoHS compliant.

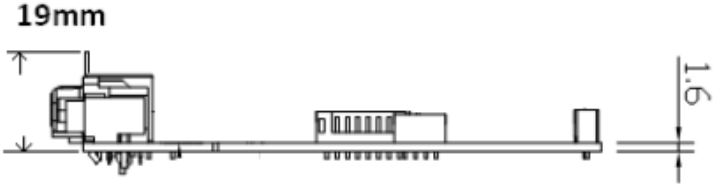
6.1 General Description

- 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 5V or 12V, 3.6V Output
- OSD Control
- PWM/DC Dimming Control for backlight driver.
- External RS232 control (optional)
- Input Power 12Vdc or 24Vdc
- Display port input. (Support display port 1.2a)
- Audio in and 3Wx2 (4 Ω) Audio Out (optional)
- *External Digital light sensor brightness control (optional)
- *External light sensor brightness control (optional)
- Support output voltage 12V(1A) and 5V(1A)

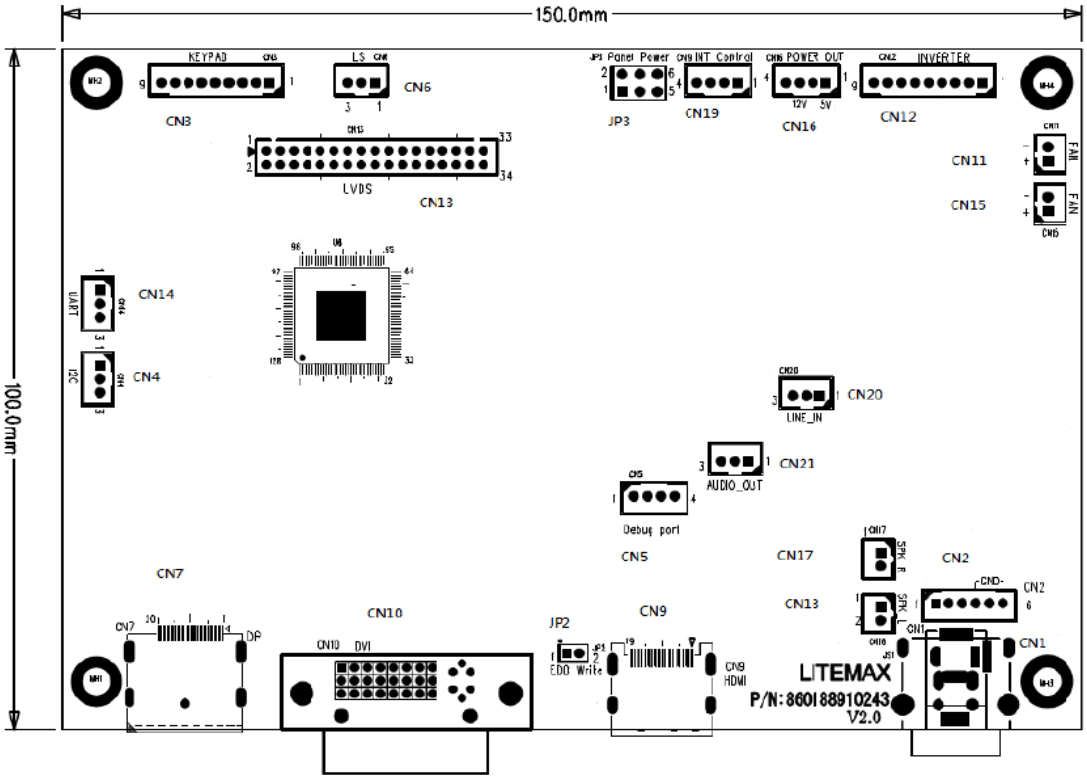
6.2 Outline Dimensions

AD8891GDPH 150 mmX100mm





6.3 AD8891GDPH Board Pin Define



CN13: Pane l 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	RxE4-
9	RxO3-	26	RxE4+
10	RxO3+	27	GND
11	RxO4-	28	GND
12	RxO4+	29	Pull Hight
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	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 19 Pin)

Pin No.	Function	Pin No.	Function	Pin No.	Function
1	T.M.D.S. Data2+	9	T.M.D.S. Data0-	17	GND
2	Shield	10	T.M.D.S. Clock+	18	HDMI 5V
3	T.M.D.S. Data2-	11	Shield	19	Hot Plug Detect
4	T.M.D.S. Data1+	12	T.M.D.S. Clock-		-
5	Shield	13	CEC		
6	T.M.D.S. Data1-	14	NC		
7	T.M.D.S. Data0+	15	HDMI_SCL		
8	Shield	16	HDMI_SDA		

CN1: Power DIN (24V or 12V)

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

CN1: Power Jack (24V or 12V)

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

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

Pin No.	Function	Pin No.	Function
1	12V/24VDC	2	12V/24VDC
3	12V/24VDC	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	3.6V	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: INT Control (4 PIN 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 connect 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	Audio R out	2	Audio L out

When EDIE want to update it must be short.

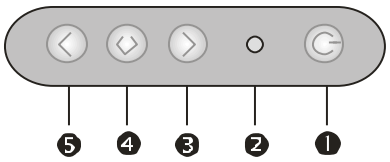
CN5: Debug Connector (4PIN 2.0mm)

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.

When OSD is off, it is hot key for input switch between VGA, AV, and S-video.

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

6.5 OSD Menu

By pressing the "menu" button, you will see the below picture. Across from timing you will see resolution, frequency, and V-frequency of the panel. Version shows the firmware control version. These cannot be altered by the 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 "right" key, you can go into the **OSD Brightness**.
press "menu" onc, you can go into the **Potentiometer** or the **Ambient light sensor**.

Potentiometer:
press this Icom, adjust VR function.**(OPTION)**

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

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" and "right" buttons to adjust the contrast from "0" to "100". To adjust from "100" to "0", press "menu" and the "left" buttons.

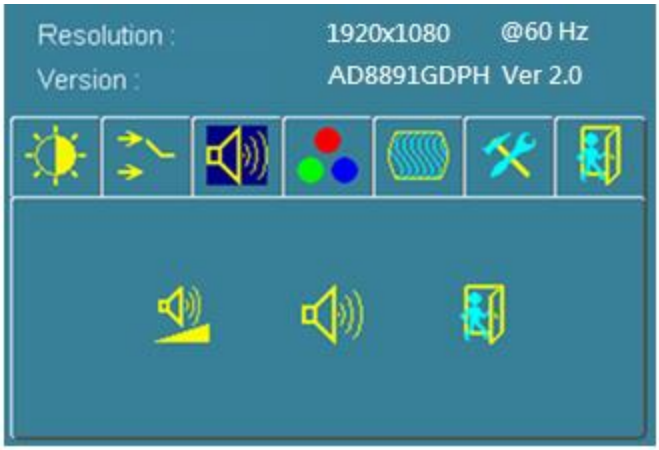
Exit: back to the beginning menu.

VGA **Analog:** RGB/VGA input

DVI **Digital:** DVI input

DP **DP:** DisplayPort input (Optional)

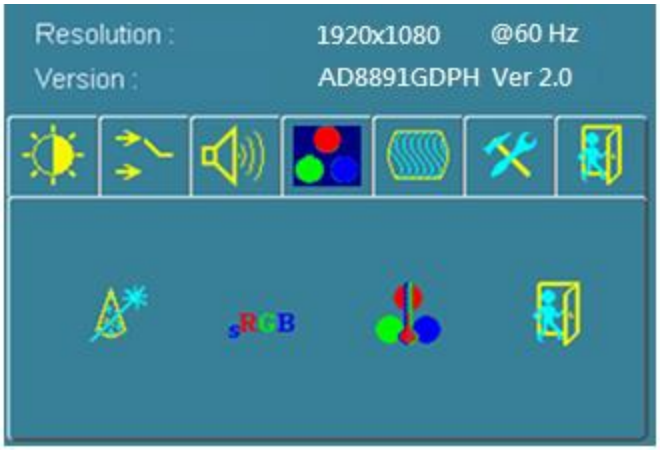
Exit **Exit:** back to the beginning menu.



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

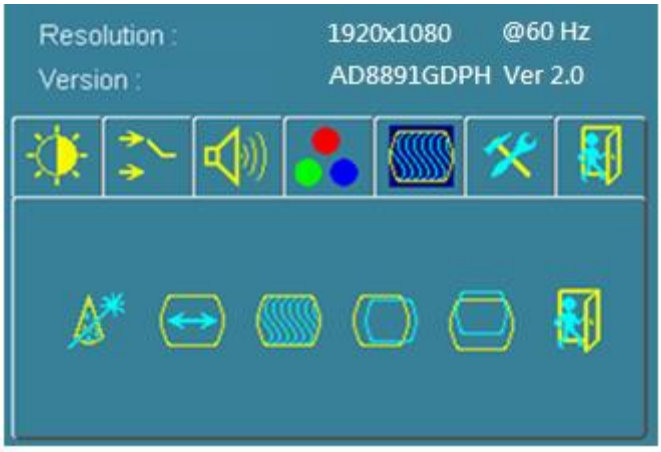
Color Temperature: You have 4 options in this selection
.

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

Color Tempture_6500K: Warm color scheme

Color Tempture_93OOK: 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.

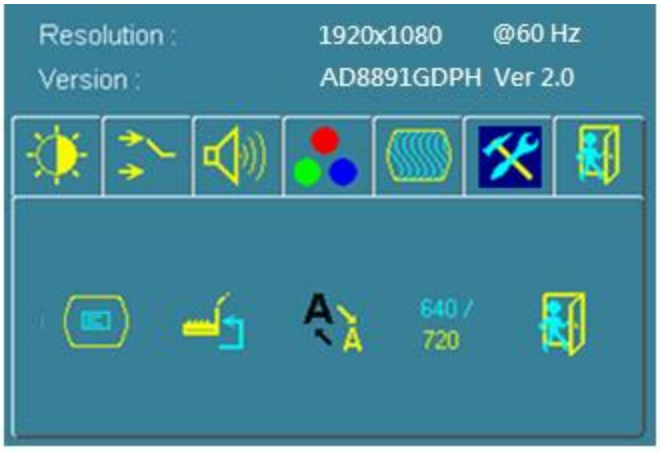
Clock: If you are not satisfied with the Auto tune result, you can adjust manually by pressing "Clock". Using this will make the image wider.

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

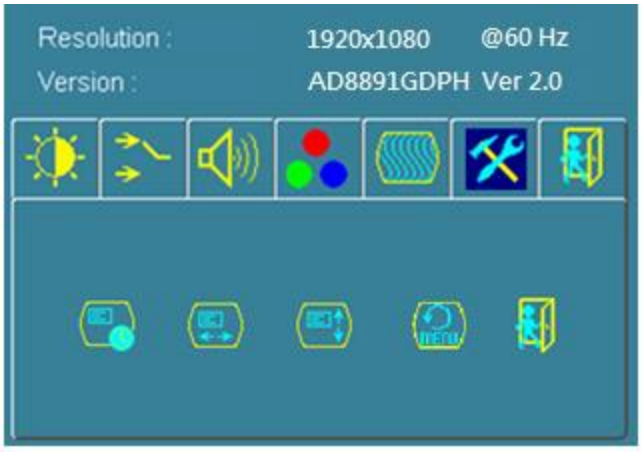
HPos: You can shift the screen horizontally using this function.

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

Exit: back to the beginning menu.



OSD Control: Selecting this option, brings you to 5 more options:



Osd_time: Select time for the OSD user interface to stay on screen, for 2 sec. to 16 sec. Default is 6 sec.

Osd_HPos: Moves the OSD user interface horizontally on screen.

Osd_VPos: Moves the OSD user interface vertically on screen.

Osd_Rotation: Rotates the OSD user interface Rotation(0 °/90 °/180 °/270 °) 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.

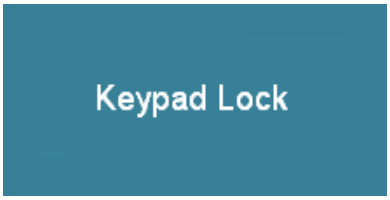
Sharpness: Sharpen characters.

Dos_mode/Gxf_mode: For some old programs which use 640x400 and 720x400 (DOS Mode and graphics mode), This option needs to be selected manually.

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 "**Left** <" and "**right** >" and "Menu" buttons simultaneously. You will see the "lock" icon below on the center of the screen for 3 ~ 6 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 "**Left** <" and "**right** >" and "Menu". The below icon will appear on the center of the screen for 3 ~ 6 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.