

LITEMAX

SSF/SSH1236-Y

Sunlight Readable 12.3" 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
July/4/2024	all		Initial release	

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1 General Description

The SSF/SSH1236-Y is a 12.3 inch color TFT-LCD display with special aspect ratio 16:6 and wide resolution 1920 x 720. It is Litemax's Spanpixel series product which designed for high brightness 1200 nits with power efficiency LED backlight. It provides LCD panel with specific aspect ratios and sunlight readable for digital signage, public transportation, exhibition hall, department store, and vending machine.

1.1 Features

- 12.3" Stretched LCD
- Ultra-Wide Screen (16 : 6)
- High Brightness 1200 nits
- LED Backlight
- Wide temperature (-30°C~85°C)
- Low Power Consumption
- BL MTBF: 30,000 hours

1.2 General Specifications

Model Name	SSF/SSH1236-Y
Description	12.3" TFT LCD, 1200 nits LED backlight, 1920x720
Screen Size	12.3"
Display Area (mm)	292.32(H) × 109.62(V)
Brightness	1200 cd/m ²
Resolution	1920x720
Aspect Ratio	16 : 6
Contrast Ratio	1500 : 1
Pixel Pitch (mm)	0.15225(H) x 0.15225(V)
Pixel Per Inch (PPI)	167
Viewing Angle	176°(H),176°(V)
Color Saturation (NTSC)	90%
Display Colors	16.7M
Response Time (Typical)	20ms
Panel Interface	LVDS
Input Interface	HDMI, DP
Input Power	DC 12V
Power Consumption	14W, 17W (with AD board)
OSD Key	4 Keys (Power Switch, Menu, +, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position...etc
Dimensions (mm)	305.92(H) x 123.62(V) x 7.00(T)
Bezel Size(U/B/L/R)	9.6/4.4/8.25/5.35 mm
Weight (Net)	0.32kg
Operating Temperature	-30°C ~ 85 °C
Storage Temperature	-40°C ~ 90 °C

SSF= Panel + LED Driving Board

SSH= Panel + LED Driving Board + AD Control Board

1.3 Absolute Maximum Ratings

Driving TFT LCD panel

GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Logic supply voltage	VLCD	-0.5	5	V	
Operating Temperature	Top	-30	85	°C	
Storage Temperature	Tst	-40	90	°C	

Note 1: Ta means the ambient temperature.

It is necessary to limit the relative humidity to the specified temperature range.

Condensation on the module is not allowed.

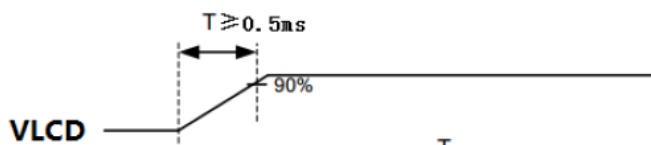
2 Electrical Specification

2.1 Electrical Characteristics

Driving TFT LCD Panel

Item	Symbol	Min	Typ	Max	Unit	Remark
Logic Supply Voltage	VLCD	3.2	3.3	3.4	V	
Permissible Inrush current of VDD	Ivlcd	--	TBD		MA	Note 1
Input High Voltage	V _{IH}	0.7*VDD	--	VDD	V	Note 2
Input Low Voltage	V _{IL}	GND	--	0.3*VDD	V	
Power Consumption	White mode (60Hz)		TBD		MW	Note 3

Note 1:



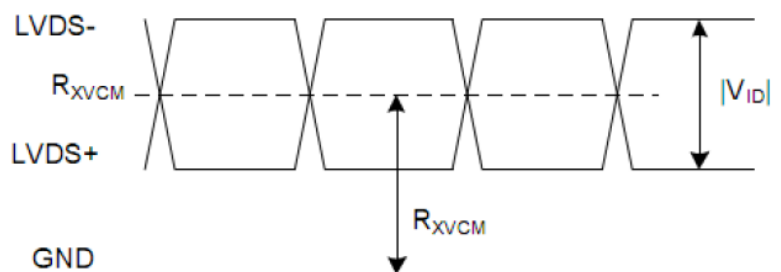
Note 2: Contain RESET, STYB,HVR

Note 3: VDD=3.3V.

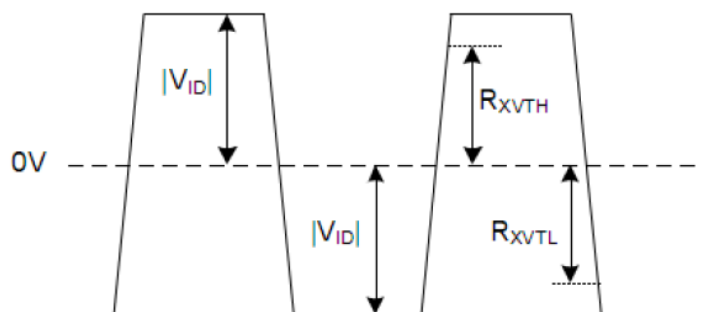
LVDS Interface DC characteristic

Parameter	Symbol	Condition	Spec			Unit
			Min	Typ	Max	
Differential input high threshold voltage	R_{XVTH}		-	-	+0.2	V
Differential input low threshold voltage	R_{XVTL}		-0.2-	-	-	V
Differential input common mode voltage	R_{XVCM}	-	1	1.2	$1.7- V_{ID} /2$	V
Differential input voltage	$ V_{ID} $	-	0.2	-	0.6	V
Differential input leakage current	I_{IVLEAK}		-10	-	10	μA
LVDS terminal match resistor	R_{LVDS}			100		Ω

Single-end Signal:



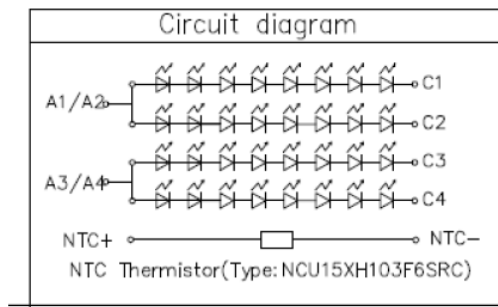
Differential Signal



DC Characteristics for Backlight Driving

Item		Symbol	Min	Typ	Max	Unit	Remark
Forward Current	+ 25°C	I_F		120		mA	Note1
Forward voltage	+ 25°C	V_{BL}		24.8		V	$I_F=120mA$
Backlight Power Consumption	+ 25°C	W_{BL}		11.9		W	$I_F=120mA$
Life Time		-	30000	-	-	Hrs	Note2

LED backlight characteristics



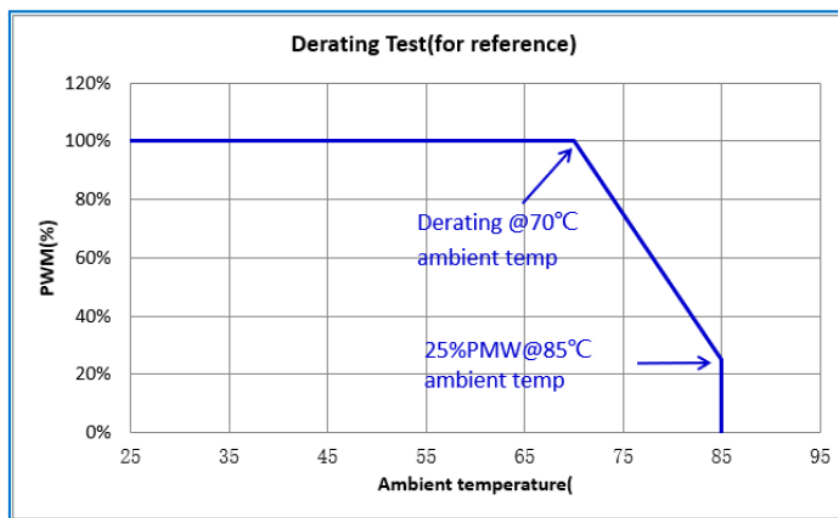
Note 1: IF=120mA is defined for one channel LED, There are total 4 LED channels in back light unit
Under LCM operating, the stable forward current should be inputted.

Note 2: Optical performance should be evaluated at Ta=25°C only. If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.
Operating life means brightness goes down to 50% of original brightness.

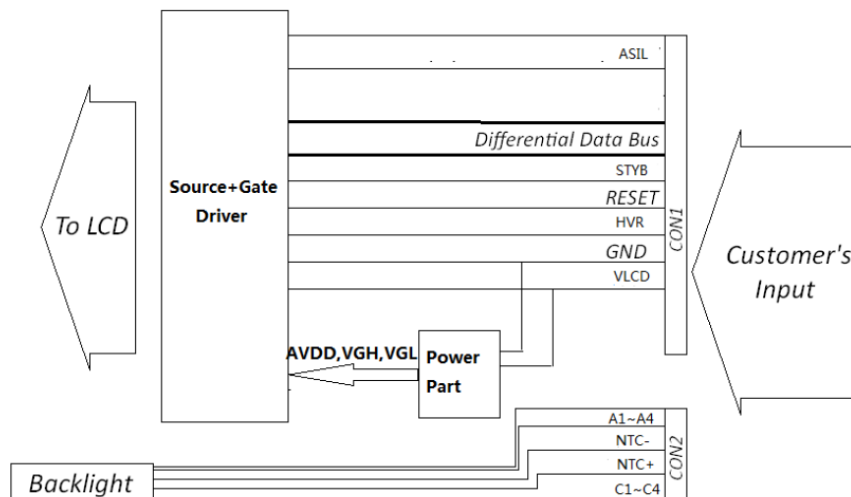
Note 3: it is suggested Customer to make sure the LCM module in the system is well heatdissipation.

Note 4: The NTC thermistor Part No.is NCU15XH103F6SRC. NTC thermistor is included in LED circuit. pls refer to appendix for NTC temperature behavior.

Note 5: The LED circuit de-rating curve evaluated as below,LED forward current should follow the De-rating curve and the NTC resistance should not be below 0.xx kΩ.



Block Diagram



2.2 LVDS Spec

LVDS Interface DC characteristic

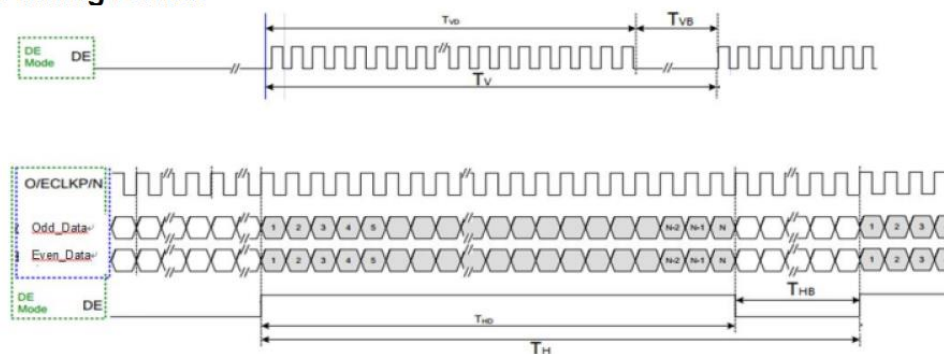
Parameter	Symbol	Condition	Spec			Unit
			Min	Typ	Max	
Differential input high threshold voltage	R_{XVTH}		-	-	+0.2	V
Differential input low threshold voltage	R_{XVTL}		-0.2-	-	-	V
Differential input common mode voltage	R_{XVCM}	-	1	1.2	$1.7- V_{id} /2$	V
Differential input voltage	$ V_{id} $	-	0.2	-	0.6	V
Differential input leakage current	I_{lvleak}		-10	-	10	μA
LVDS terminal match resistor	R_{LVDS}			100		Ω

Input timing chart

Parameter	Symbol	Unit	Min.	Typ.	Max.	REMARKS
Clock Frequency	f_{clk}	MHz	44.6	44.7	50.2	
H Total Time	T_{hp}	clocks	1020	1024	1150	
H Active Time	HA	clocks	960			
V Total Time	T_{vp}	lines	726	728	849	
V Active Time	VA	lines	720			
V Frequency	f_v	Hz	-	60Hz	-	

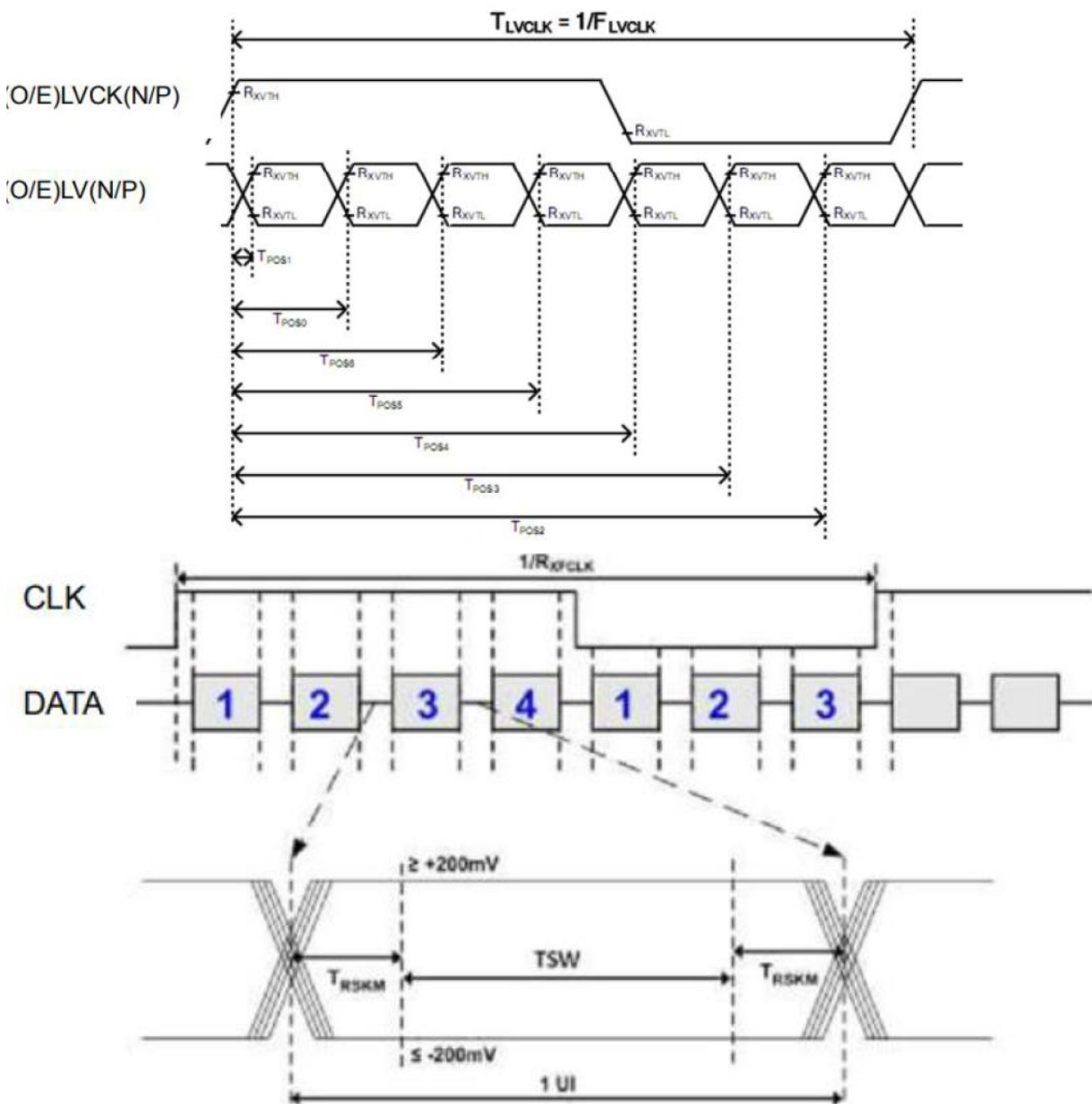
Note: Above of all these information is just for reference, the final information should be based on the test result of module and be set for module in initial code.
Timing will update later

LVDS input timing format



LVDS timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	FLVCLK	25	-	85	MHz	Refer to input timing table for each display resolution.
Clock Period	TLVCLK	11.76	-	40	ns	
Clock high time	TLVCH	-	$4/(7 \cdot \text{TLVCLK})$	-	ns	
Clock low time	TLVCL	-	$3/(7 \cdot \text{TLVCLK})$	-	ns	
Input data skew margin	TRSKM	-	-	0.25	UI	VCC _{IF} =1.8V w/o SSC
Strobe width	TSW	0.5	-	-	UI	
1 data bit time	UI	-	1/7	-	TLVCLK	
Position 1	TPOS1	-0.25	0	0.25	UI	
Position 0	TPOS0	0.75	1	1.25	UI	
Position 6	TPOS6	1.75	2	2.25	UI	
Position 5	TPOS5	2.75	3	3.25	UI	
Position 4	TPOS4	3.75	4	4.25	UI	
Position 3	TPOS3	4.75	5	5.25	UI	
Position 2	TPOS2	5.75	6	6.25	UI	



2.3 Interface Connection

LCD Connector :

Connector Type : FH41-50S-0.5SH

No	Symbol	I/O	Description	Remark
1	GND	P	GND	
2	GND	P	GND	
3	VLCD	P	Power supply for LCD (3.3V)	
4	VLCD	P	Power supply for LCD (3.3V)	
5	VLCD	P	Power supply for LCD (3.3V)	
6	VLCD	P	Power supply for LCD (3.3V)	
7	GND	P	GND	
8	GND	P	GND	
9	NC	N	Custom must floating	Note1
10	NC	N	Custom must floating	
11	GND	P	GND	
12	GND	P	GND	
13	OLV0N	I	Odd LVDS data input 0-	
14	OLV0P	I	Odd LVDS data input 0+	
15	GND	P	GND	
16	OLV1N	I	Odd LVDS data input 1-	
17	OLV1P	I	Odd LVDS data input 1+	
18	GND	P	GND	
19	OLV2N	I	Odd LVDS data input 2-	
20	OLV2P	I	Odd LVDS data input 2+	
21	GND	P	GND	
22	OCLKN	I	Odd LVDS Clock input -	
23	OCLKP	I	Odd LVDS Clock input +	
24	GND	P	GND	
25	OLV3N	I	Odd LVDS data input 3-	
26	OLV3P	I	Odd LVDS data input 3+	
27	GND	P	GND	
28	ELV0N	I	Even LVDS data input 0-	
29	ELV0P	I	Even LVDS data input 0+	
30	GND	P	GND	
31	ELV1N	I	Even LVDS data input 1-	
32	ELV1P	I	Even LVDS data input 1+	
33	GND	P	GND	
34	ELV2N	I	Even LVDS data input 2-	
35	ELV2P	I	Even LVDS data input 2+	
36	GND	P	GND	
37	ECLKN	I	Even LVDS Clock input -	
38	ECLKP	I	Even LVDS Clock input +	

39	GND	P	GND	
40	ELV3N	I	Even LVDS data input 3-	
41	ELV3P	I	Even LVDS data input 3+	
42	GND	P	GND	
43	NC(CSB)	N	Custom must floating	Note1
44	RESET	I	Global reset pin, RESET=H,normal operation. RESET=L,The controller is in reset state.	
45	NC	N	Custom must floating	
46	NC	N	Custom must floating	
47	HVR	I	Horizontally and Vertically Inverted	Note 2
48	STYB	I	Standby mode control STB="H", Normal operation. STB="L", Source output GNDA level.	
49	ASIL	O	Output for fail detection	Note 3
50	NC(VDD_OTP)	N	Custom must floating	Note1

I/O definition:

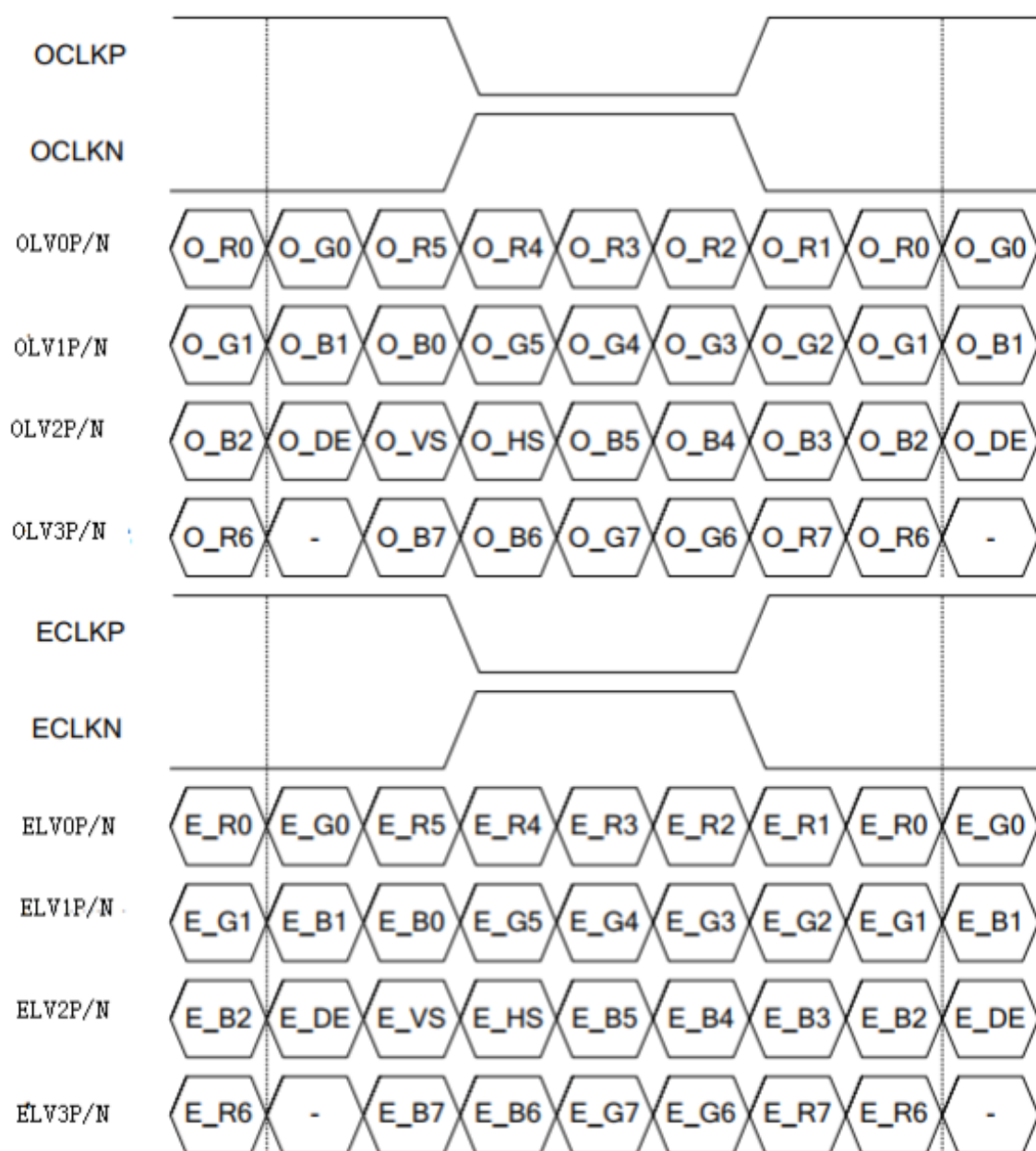
I----Input O----Output I/O----Input/Output P----Power/Ground N—No Connect

Note 1: Custom must floating

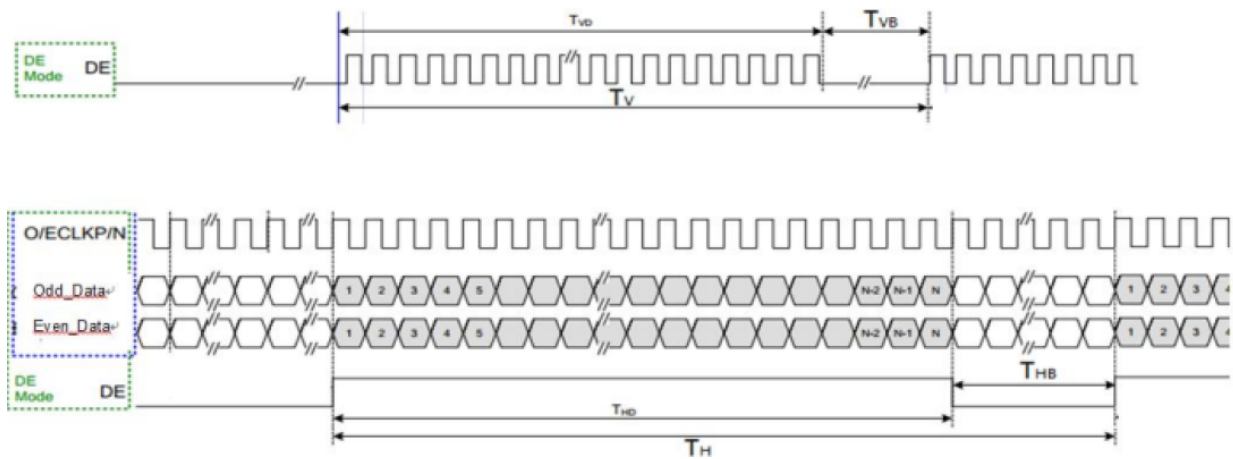
Note 2: HVR controlled by customer

HVR	Function	Remark
H	Left→Right, Top→Bottom	Default
L	Right→Left, Bottom→Top	-

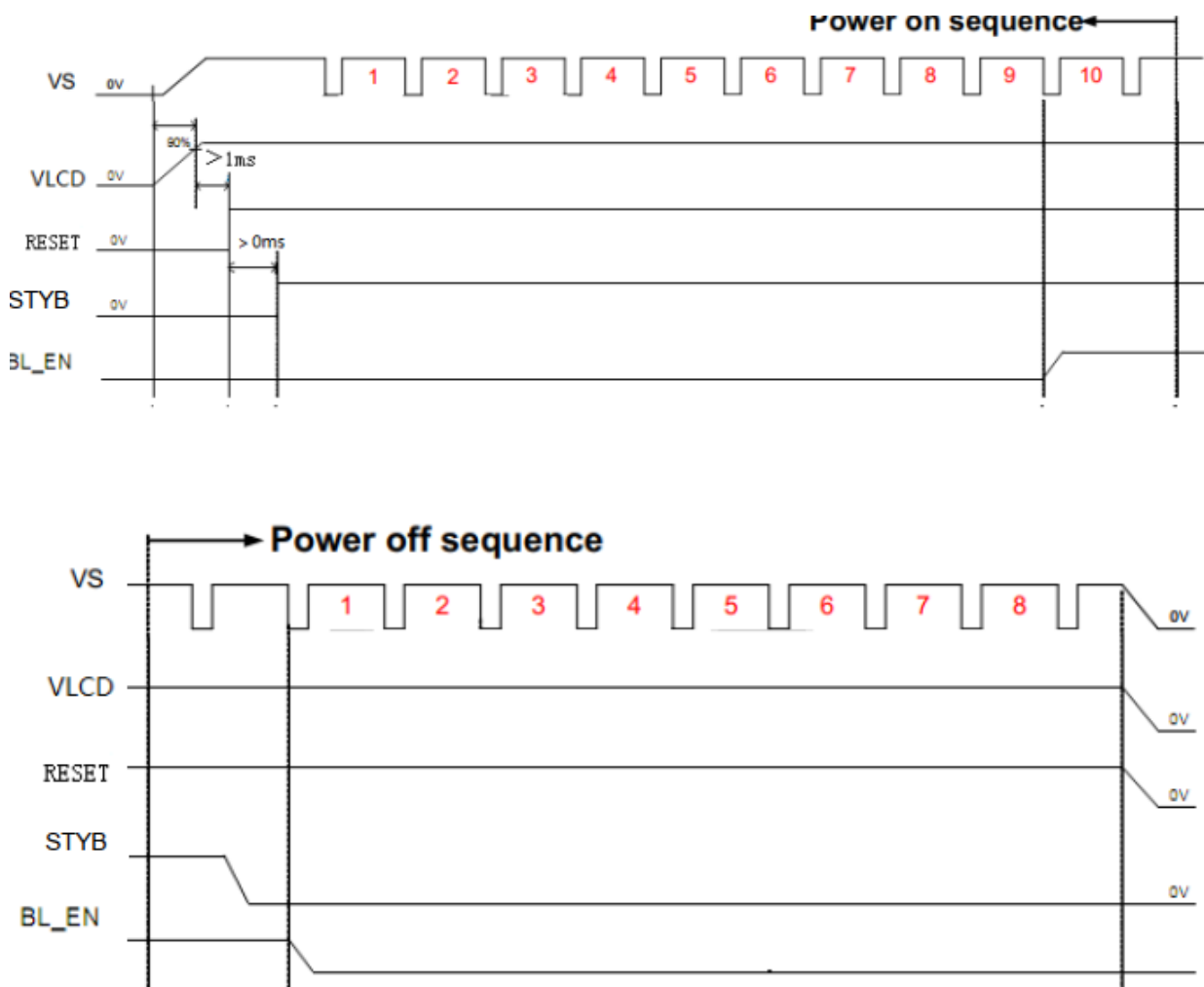
2.4 Input Data Format



2.5 Signal Timing Waveforms



2.6 Power Sequence

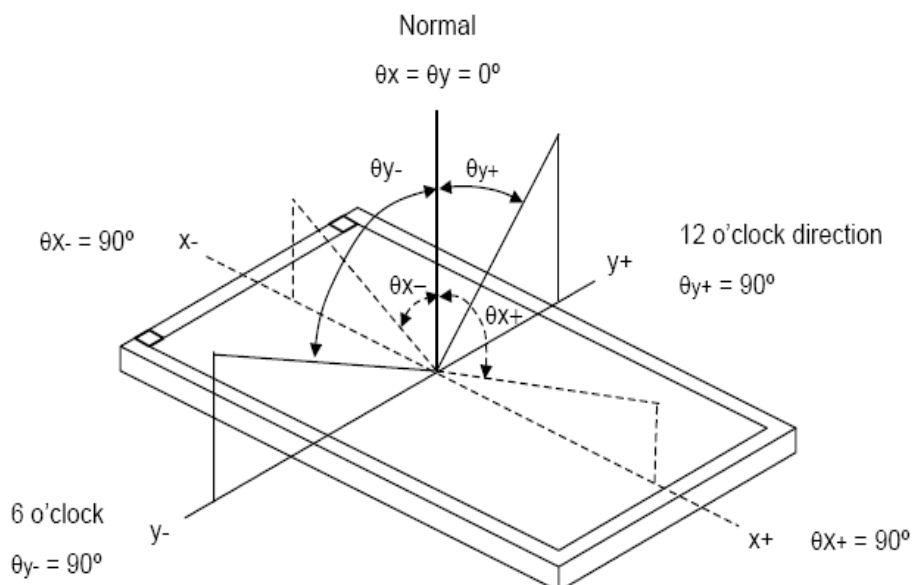


3 Optical Specification

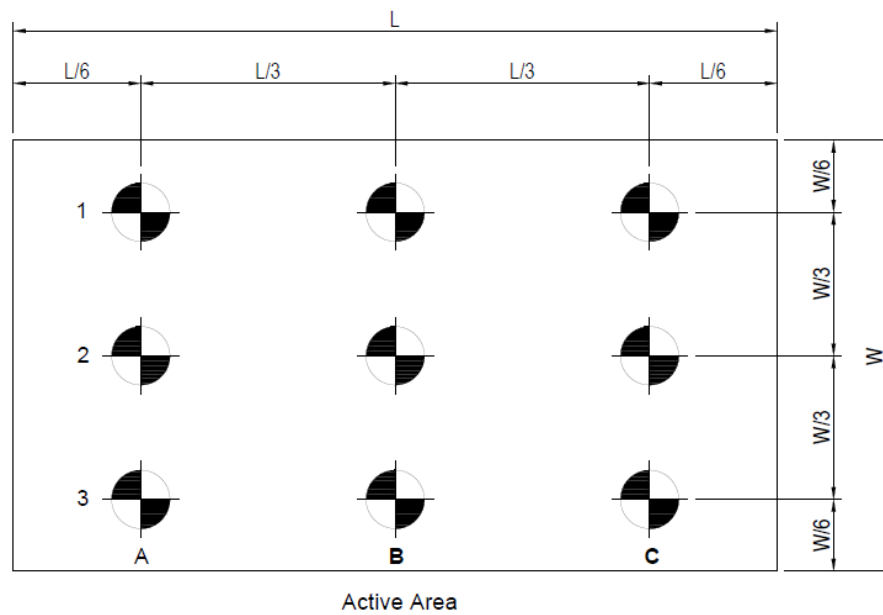
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	$\theta_x=0$ $\theta_y=0$ CA-410	0.633	0.663	0.693	-	Test Mode: (2) (3)
		Ry		0.276	0.306	0.336	-	
	Green	Gx		0.226	0.256	0.286	-	
		Gy		0.670	0.700	0.730	-	
	Blue	Bx		0.117	0.147	0.177	-	
		By		0.019	0.049	0.079	-	
	White	Wx		0.266	0.296	0.326	-	
		Wy		0.290	0.320	0.350	-	
Center Luminance of White		Lc	$\theta_x=0$	1080	1200	-	cd/m ²	
Uniformity		Lu	$\theta_y=0$ CA-410	-	92	-	%	
Contrast Ratio		CR	$\theta_x=0$	1350:1	1500:1	-	-	Test Mode: (4)
Color Saturation		NTSC	$\theta_y=0$ Klein K-10	-	90	-	%	
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$	-	88	-	Deg	Test Mode: (1)
		θ_{x-}		-	88	-		
	Vertical	θ_{y+}		-	88	-		
		θ_{y-}		-	88	-		

Test Mode :

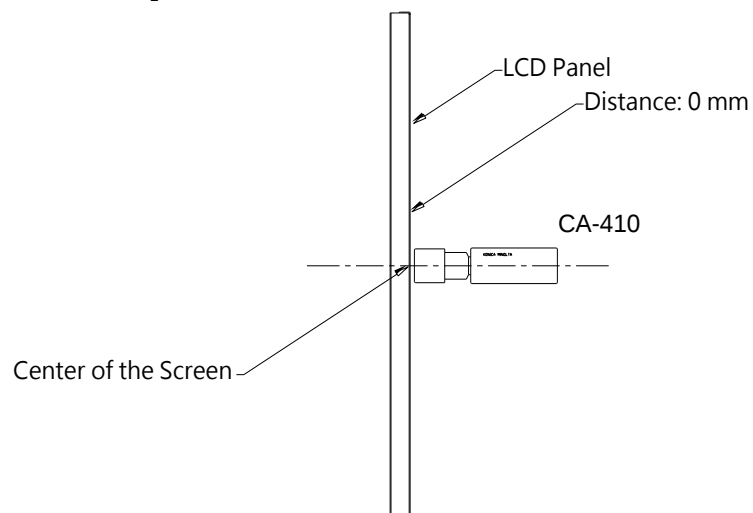
(1) Definition of Viewing Angle (θ_x , θ_y):



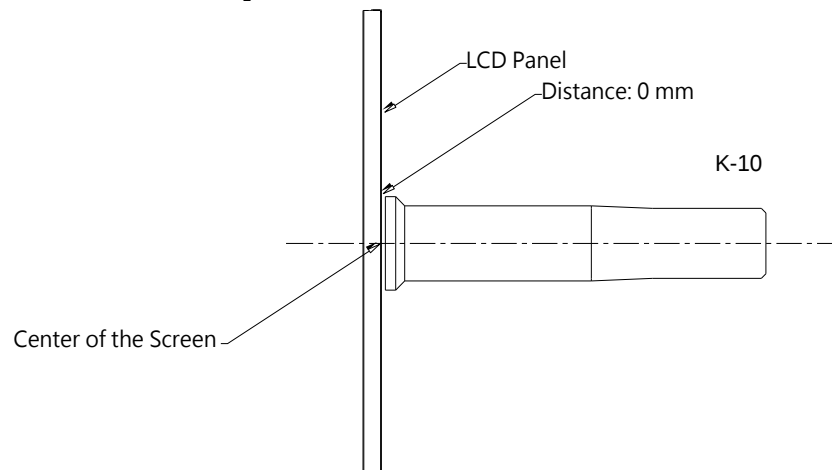
(2) Definition of Test Point:



(3) CA-410 Measurement Setup:



(4) Klein K-10 Measurement Setup:



4 LED Driving Board Specifications

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

4.1 Operating Characteristics

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	Vin		10.0	12.0	14.0	V	
Input Current (High Brightness)	IinH	PWM=100%	1.43	1.18	1.01	A	(1)
Input Power Consumption	Pin	PWM=100%	-----	14.16	-----	W	
LED Current (High Brightness)	IoutH	PWM=100%	-----	532	-----	mA	
Working Frequency	Freq	PWM=100%	-----	350	-----	KHz	
Brightness Control	PWM	Duty cycle	0	--	100	%	(3)
		Freq	-----	200	-----	Hz	(4)
ON/OFF Control	Von	Normal Operation	2	-----	4.8	V	(2)
	Voff		0	-----	0.8	V	
Output Voltage	Vout	PWM=100%	-----	24.10	24.15	V	
Efficiency	η	PWM=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). If the voltage is increased, the current will decrease. If the voltage is decrease, the current will increase.

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

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

4.2 Connector Socket

Input Connector:

J2(1.25mm,6P,SMD.90D,Molex,0532610671)

PIN No	Symbol	Description
1	V_{in}	DC+12V
2	V_{in}	DC+12V
3	GND	Ground
4	GND	Ground
5	Brightness	Brightness Control
6	Control	ON/OFF Control

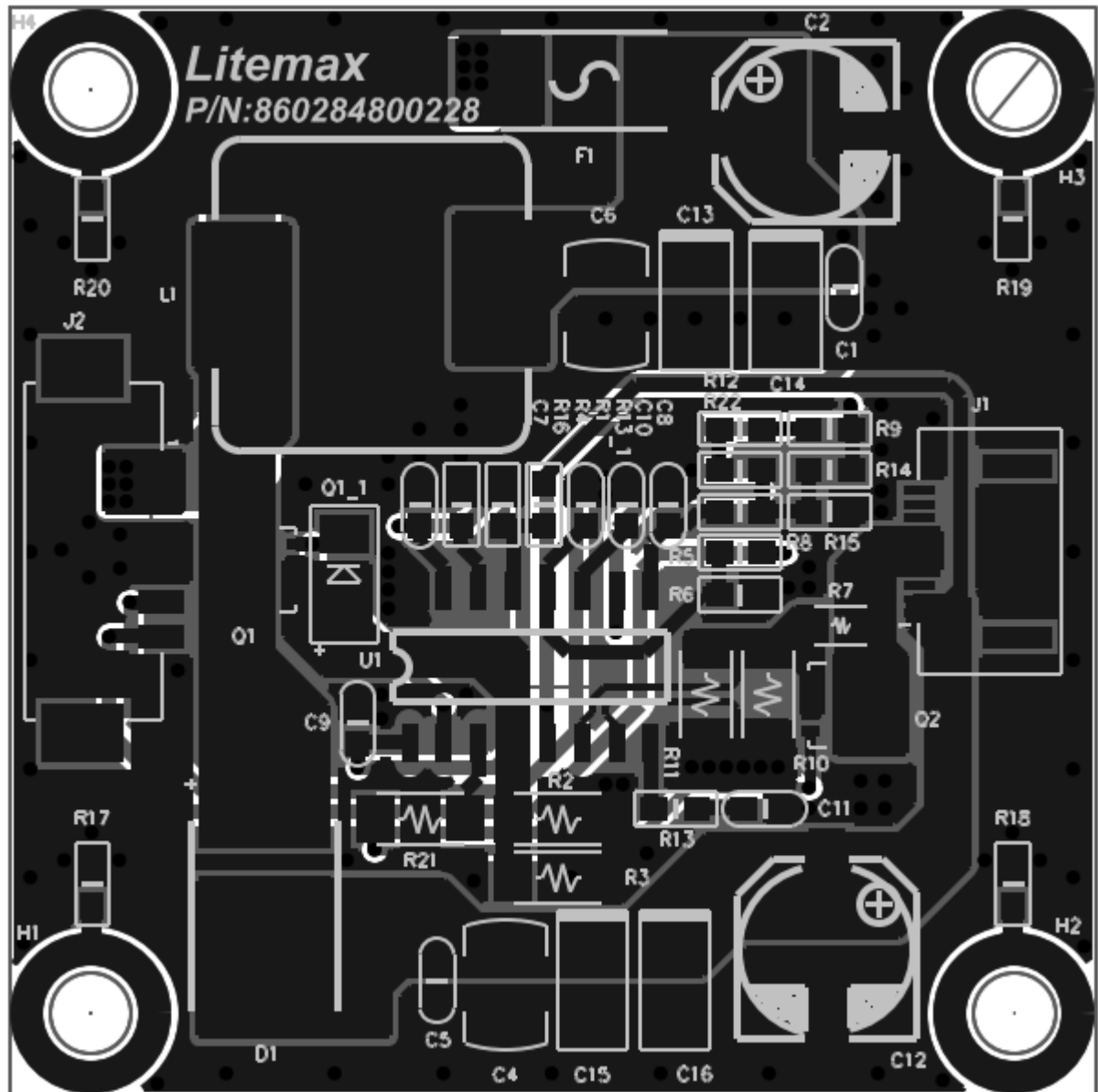
Output Connector:

J1(BOTTOM CONTACT,0.5mm,10P,SMD.90D)

PIN NO	Symbol	Description
1	Output	LED High Voltage(+)
2	Output	LED High Voltage(+)
3	NC	No connection
4	Output	LED Low Voltage (-)
5	Output	LED Low Voltage (-)
6	Output	LED Low Voltage (-)
7	Output	LED Low Voltage (-)
8	NC	No connection
9	NC	No connection
10	NC	No connection

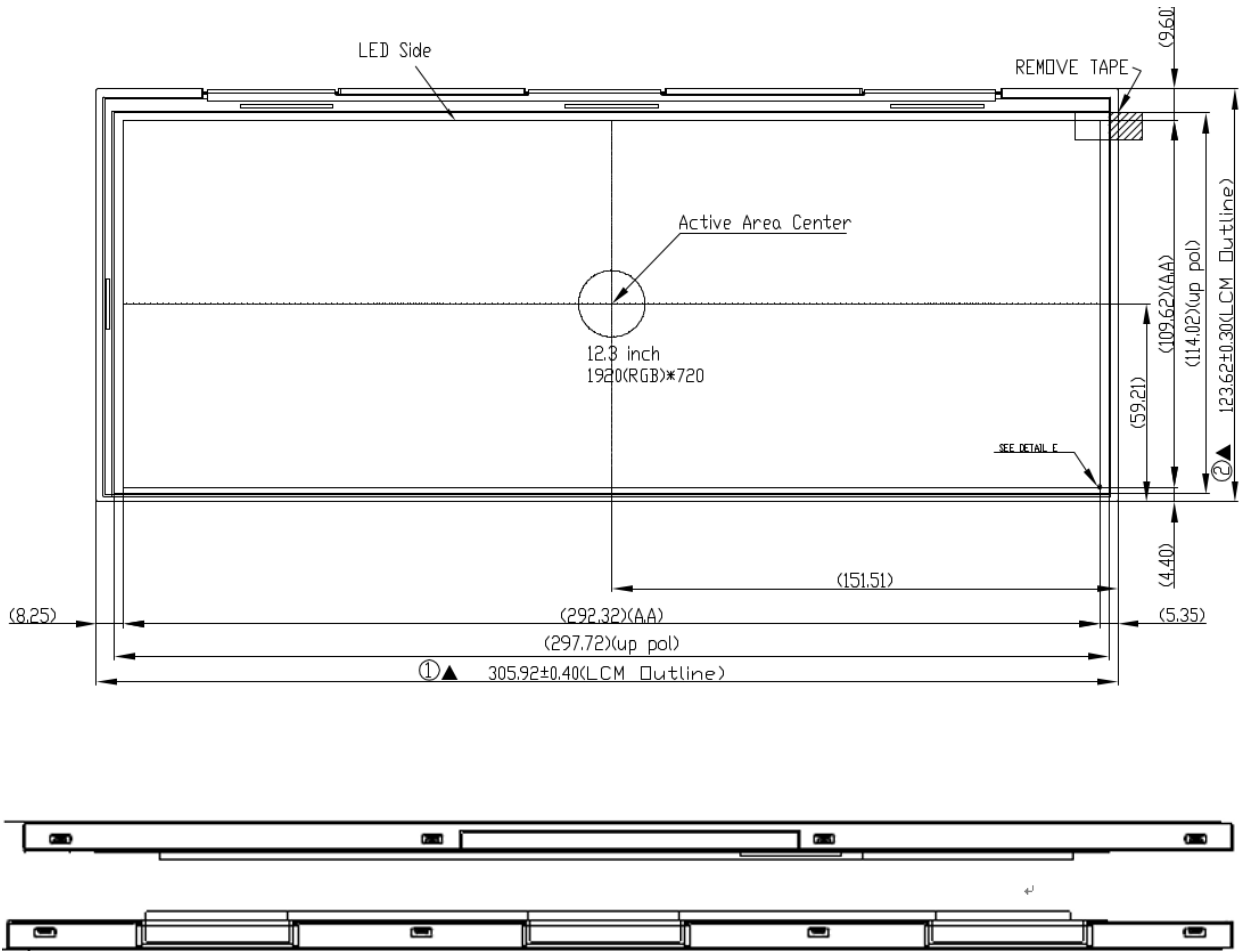
4.3 Mechanical Characteristics

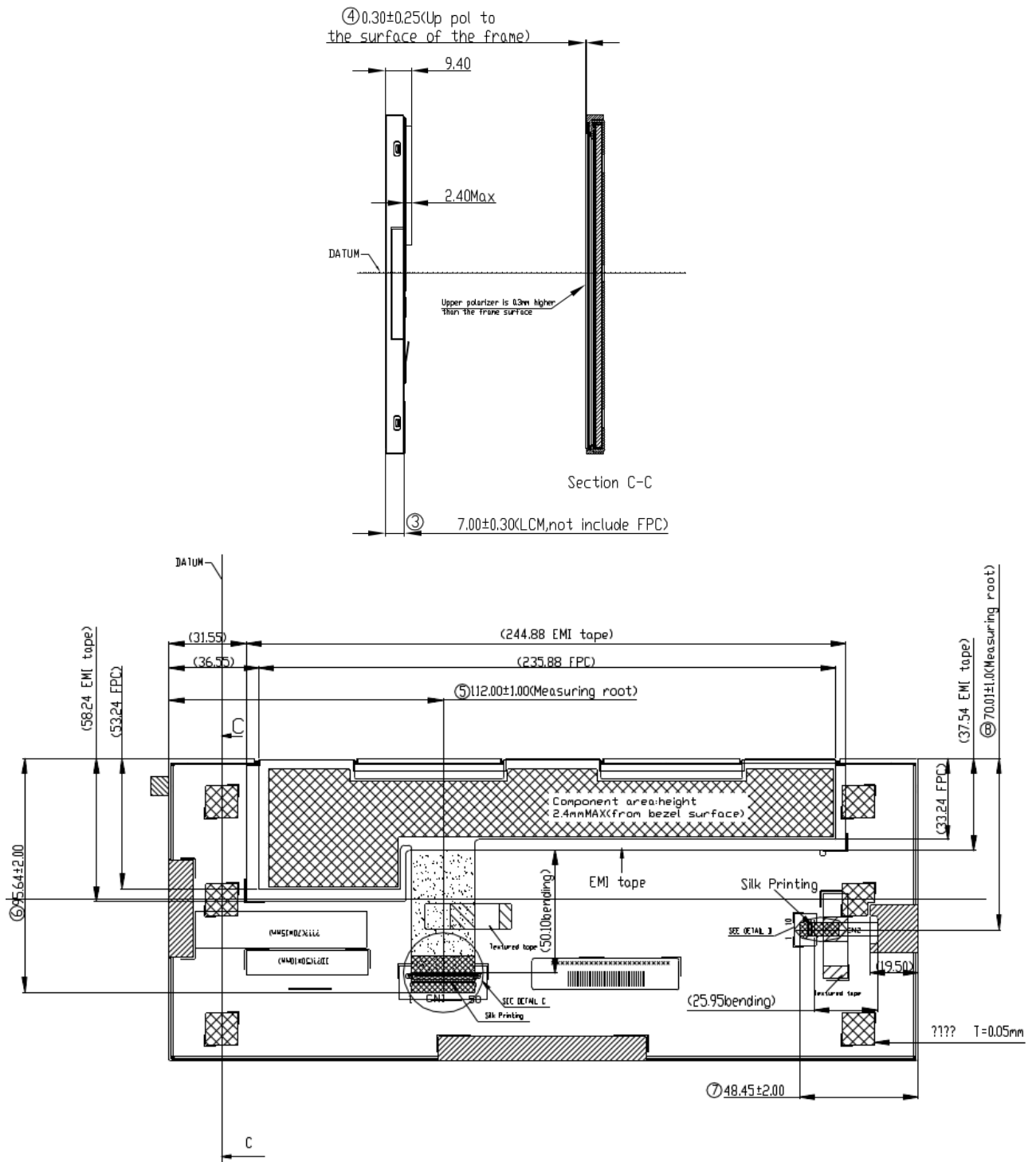
Dimension: 40mm x 40mm



5 Mechanical Drawing

Unit:mm





6 AD68862HP Board & OSD Functions

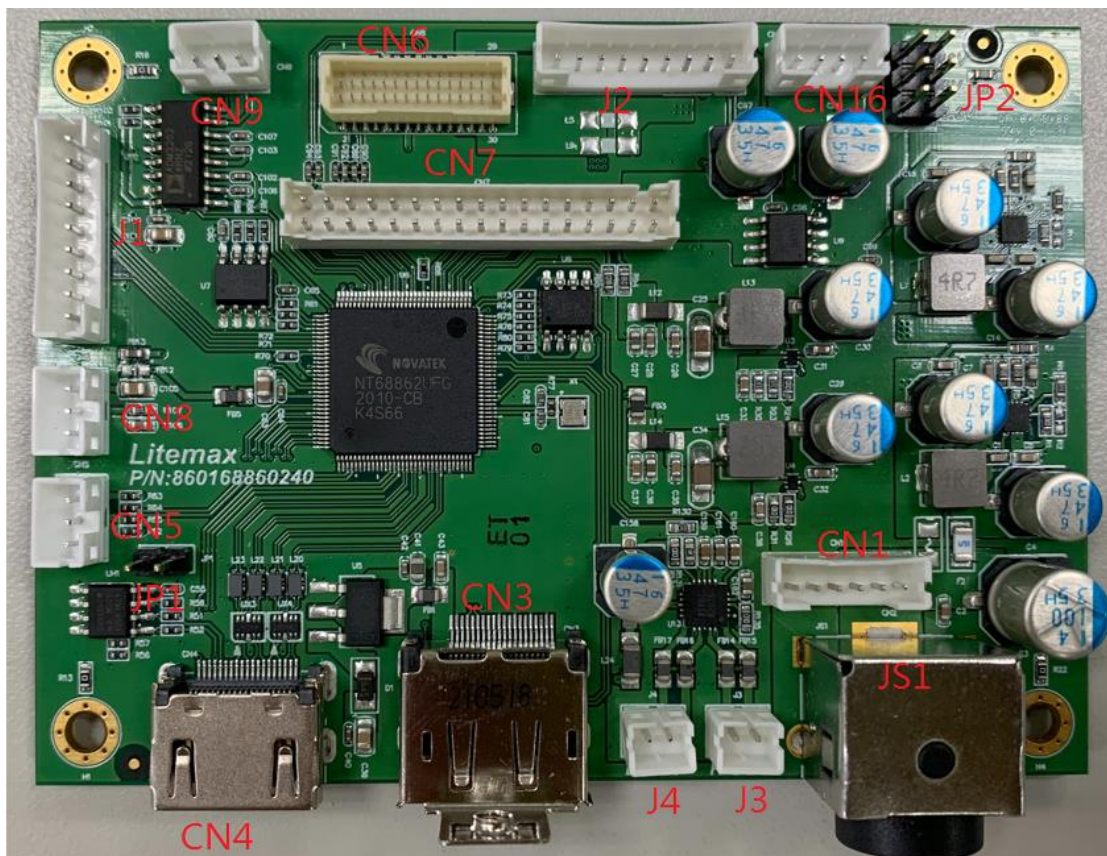
We developed this A/D board to support industrial high brightness and commercial applications. This A/D board has many functions. It has a HDMI and Display Port input. Rev.1 is European RoHS compliant.

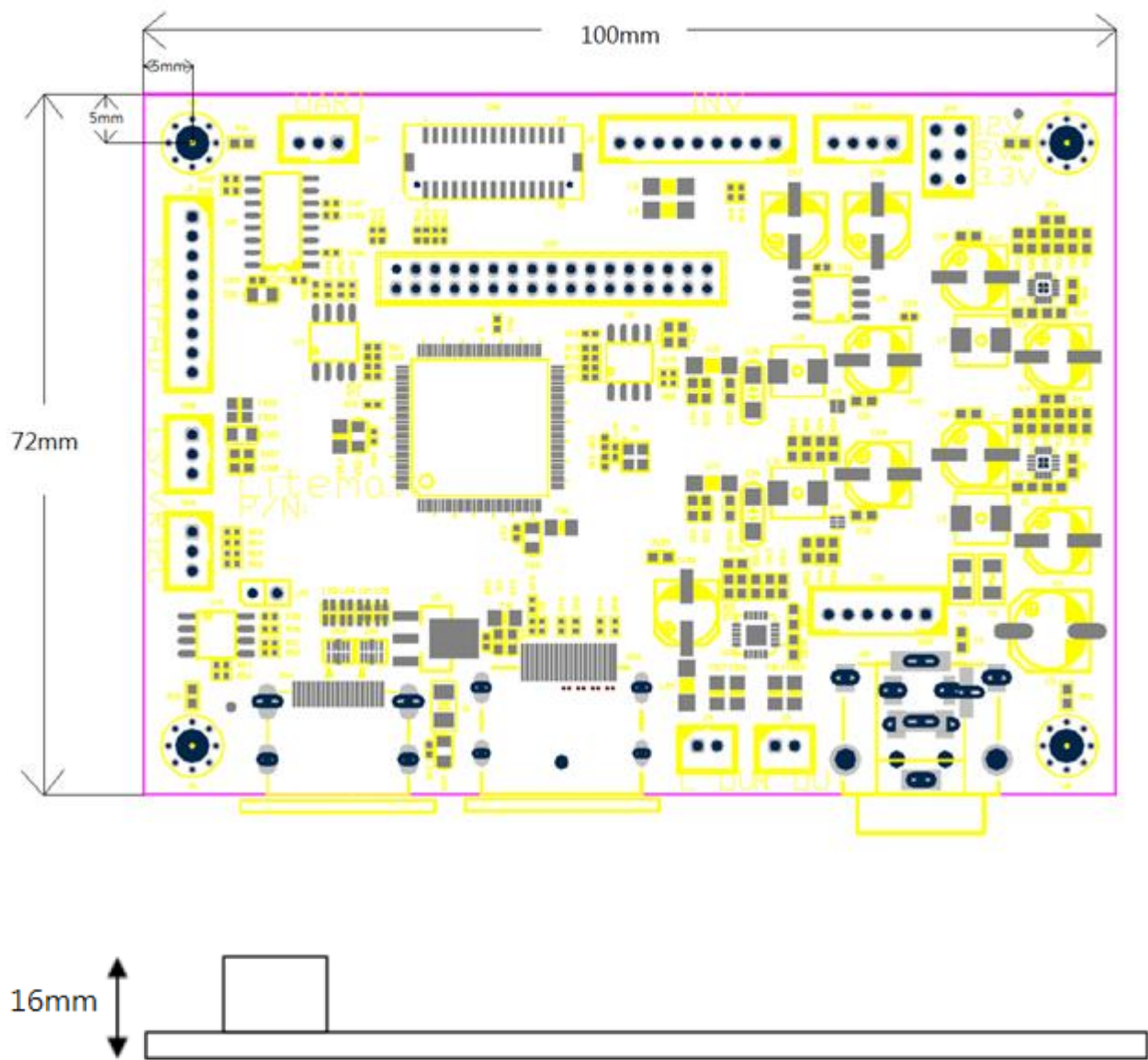
General Description

- 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)
- Support output voltage 12V(1A) or 5V(1A)

Outline Dimensions

AD68862 100mm x 72mm





AD68862 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 2 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)

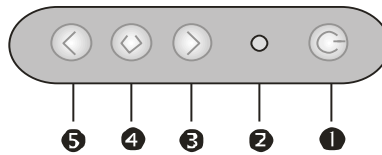
Pin	Function	Pin	Function
1	ROUTP	2	ROUTN

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



- **POWER SWITCH:** Pushing the power switch will turn the monitor on. Pushing it again to turn the monitor off.
- **Power LED:** Power ON-Green / Power off-No.
- **Up Key >:** Increase item number or value of the selected item.
- **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.
- **Down Key <:** Decrease item number or item value when OSD is on.

Screen Adjustment Operation Procedure

1. Entering the screen adjustment

The setting switches are normally at stand-by. Push the **Menu Key** once to display the main menu of the screen adjustment. The adjustable items will be displayed in the main menu.

2. Entering the settings

Use the **Down Key <** and **Up Key >** buttons to select the desired setting icon and push the **SELECT** button to enter sub-menu.

3. Change the settings

After the sub-menu appears, use the **Down Key <** and **Up Key >** buttons to change the setting values.

4. Save

After finishing the adjustment, push the **SELECT** button to memorize the setting.

5. Return & Exit the main menu

Exit the screen adjustment; push the "MENU" button. When no operation is done around 10 sec (default OSD timeout), it goes back to the stand-by mode and no more switching is accepted except MENU to restart the setting.

6.2 OSD Menu

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

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



There are 6 sub menus within the OSD user interface:

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



Brightness

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



Brightness Mode :

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



VR: (OPTION)

press this Icon to activate the VR control of brightness.



Ambient light sensor: (OPTION)

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





OSD Brightness :

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



Contrast :

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



Sharpness :

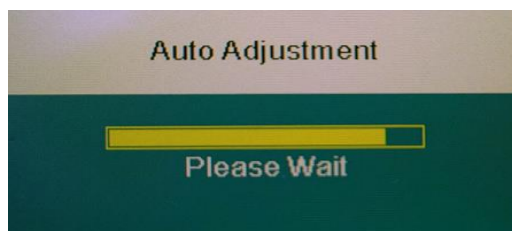
Press “Menu” once, you can adjust the Sharpness from “0” to “4” by pressing the “Left” and “Right”.





Auto Tune : (VGA only)

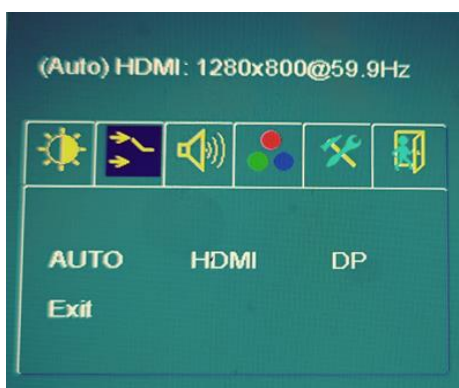
Press “Menu” once, you can activate the Auto Tune.



Exit: back to the beginning menu.



Input Signal: (default auto detect)



AUTO

AUTO: auto detect

HDMI

HDMI: HDMI input

DP

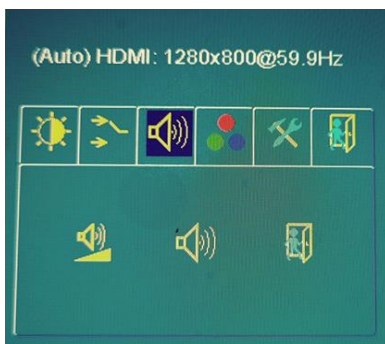
DP: DisplayPort input

Exit

Exit: back to the beginning menu.



Audio:



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



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



Exit: back to the beginning menu.



Color:



Auto Color (VGA only) :

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



Color Tempture_6500K: Warm color scheme.



Color Tempture_9300K: Cold color scheme.



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



Exit: back to the beginning menu.



Other Setting:



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



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



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



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



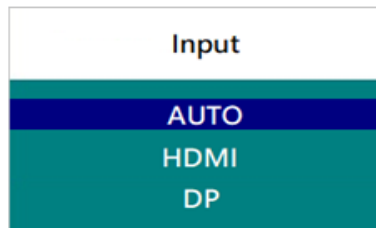
Exit: back to the beginning menu.

< Hot Key >

Left click to display brightness adjustment.

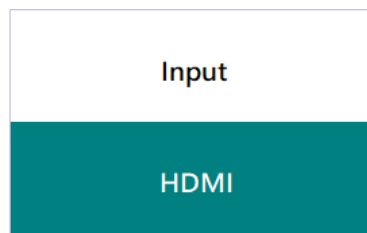


Right click to display Input Source Menu.



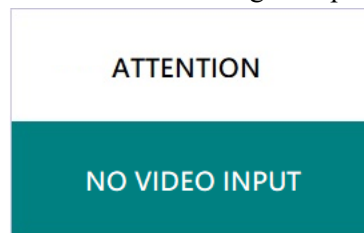
<Others>

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



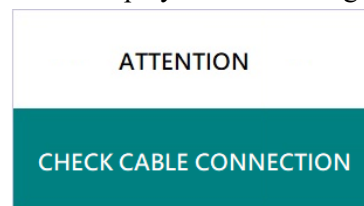
(Signal Information)

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



(No Video Input)

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



(Check Cable Connection)

7 Precautions

7.1 Handling 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.