

LITEMAX

DLF/DLH2158-U

Sunlight Readable 21.5" LED B/L LCD

User Manual

Approved by	Checked by	Prepared by

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Record of Revision

Date	Page	Old Description	New Description	Remark
Oct/30/2025	all		Initial release	

Contents

Record of Revision	2
Contents	3
1 General Description	4
1.1 Key Features	4
1.2 General Specifications	4
1.3 Absolute Maximum Ratings	5
2 Electrical Absolute Ratings	6
2.1 TFT LCD Module	6
2.2 Signal Electrical Characteristics	7
2.3 Signal Characteristics	8
2.4 Signal Description	9
2.5 The Input Data Format	10
2.6 Timing Characteristics	10
2.7 Power On/Off Sequence	11
3 Optical Specification	12
4 LED Driving Board Specifications	14
4.1 Converter Characteristics	14
4.2 Connector Socket	15
4.3 Mechanical Characteristics	15
5 Mechanical Drawing	16
6 AD8891GDH Board & OSD Functions	18
6.1 General Description	18
6.2 Outline Dimensions	19
6.3 AD8891GDH Board Pin Define	20
6.4 OSD Function	25
6.5 OSD Menu	26
7 Precautions	32
7.1 Handling and Mounting Precautions	32
7.2 Storage Precautions	32
7.3 Operation Precautions	33
8 Disclaimer	33

1 General Description

The **DLF/DLH2158-U** is a **21.5** inch industrial grade sunlight readable LCD, with high brightness **1600** nits, 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 Key Features

- High Brightness 1600 nits
- Sunlight Readable
- LCD Blackening Defect Free (H-Tni 110°C)
- Low Power Consumption
- BL MTBF: 10,000 hours

1.2 General Specifications

Model Name	DLF/DLH2158-U
Description	21.5" TFT LCD, 1600 nits LED Backlight, 1920x1080
Screen Size	21.5"
Display Area (mm)	476.64(H) x 268.11(V)
Brightness	1600 cd/m ²
Resolution	1920x1080
Aspect Ratio	16 : 9
Contrast Ratio	2800 : 1
Pixel Pitch (mm)	0.24825(H) x 0.24825(V)
Pixel Per Inch (PPI)	102
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	80%
Display Colors	16.7M
Response Time (Typical)	25ms
Panel Interface	LVDS
AD Board Input Interface	VGA, DVI-D, HDMI
Input Power	DC12V
Power Consumption	44W (47W with AD board)
OSD Key	4 Keys (Power Switch, Menu, +, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position...etc
Dimensions (mm)	497.60 x 292.20 x 13.35 mm
Bezel Size(U/B/L/R)	12.045/12.045/10.480/10.480 mm
Weight (Net)	1.8kg
Operating Temperature	0 °C ~ 60 °C
Storage Temperature	-20 °C ~ 60 °C

DLF= Panel + LED Driving Board

DLH= Panel + LED Driving Board + AD Control Board

Specifications are subject to change without notice.

All brands or product names are trademarks or registered trademarks of their respective companies.

1.3 Absolute Maximum Ratings

Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive	VDD	0	5.5	[Volt]

Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating	TOP	0	60	[°C]
Operation Humidity	HOP	5	90	[%RH]
Storage	TST	-20	60	[°C]
Storage Humidity	HST	5	90	[%RH]

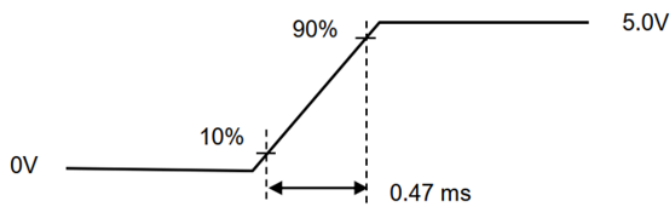
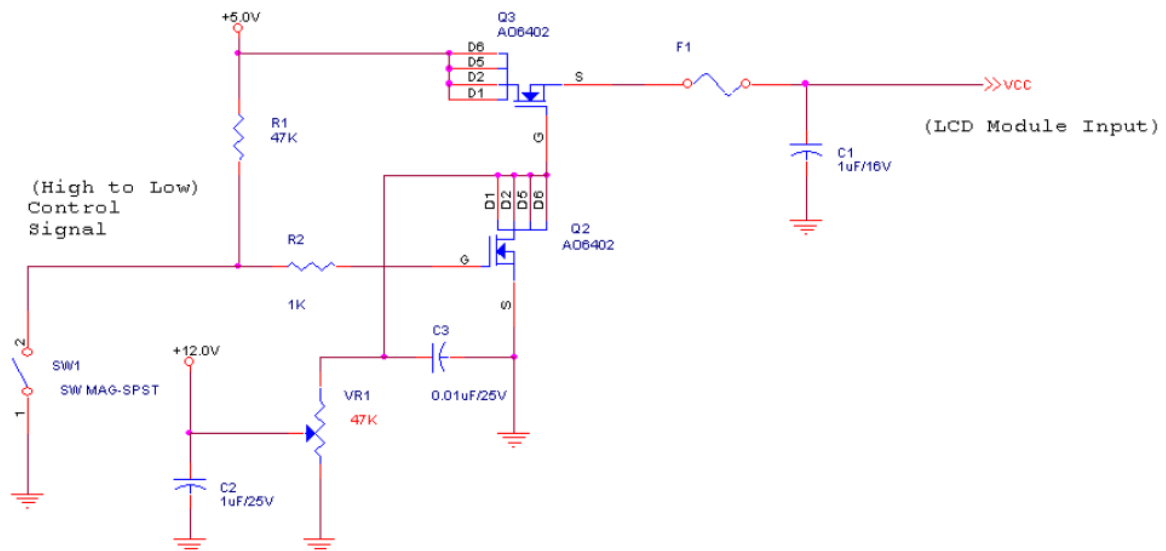
Note: Maximum Wet-Bulb should be 39°C and no condensation.

2 Electrical Absolute Ratings

2.1 TFT LCD Module

Symbol	Parameter	Min	Typ	Max	Unit	Remark
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	±10%
IDD	VDD Current	-	0.7	0.8	[A]	All White Pattern (VDD=5 V, at 60Hz)
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	3.5	4.4	[Watt]	All White Pattern (VDD=5 V, at 60Hz)

Note 1: Measurement condition:



VDD rising Time



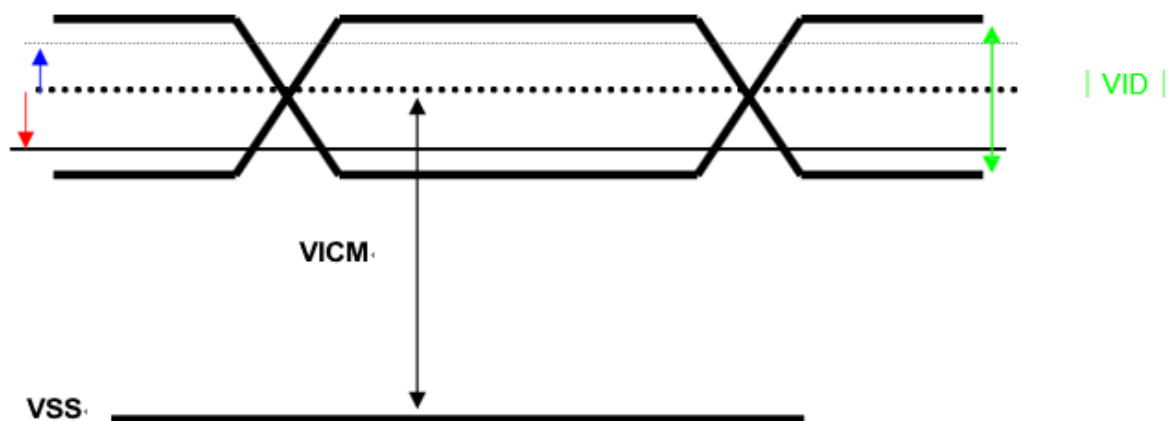
64 Gray pattern

2.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	+100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
VID	Input Differential Voltage	100	-	600	[mV]	
VICM	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	VTH/VTL=±100mV

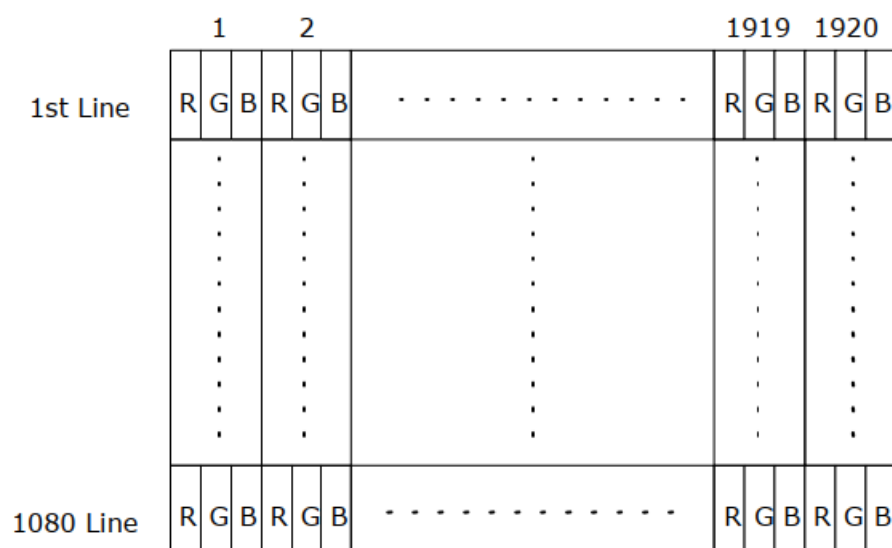
Notes: LVDS Wave Form



2.3 Signal Characteristics

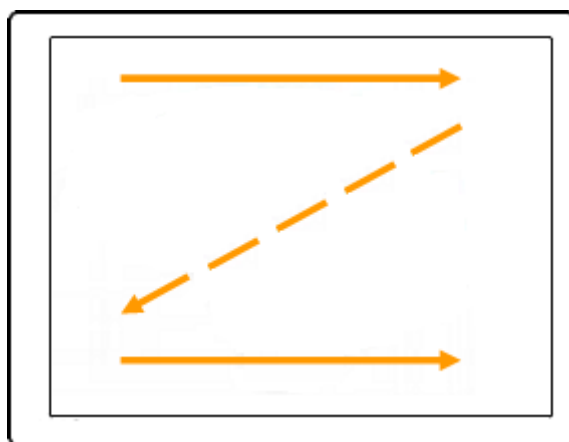
Pixel Format Image

Following figure shows the relationship between input signals and LCD pixel format



Scanning Direction

The following figures show the image see from the front view. The arrow indicates the direction of scan.

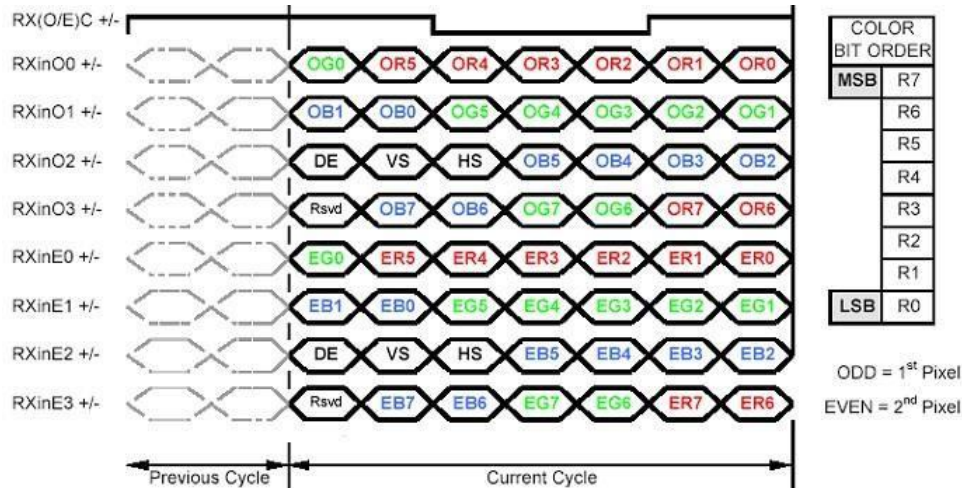


2.4 Signal Description

The Module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

PIN #	SIGNAL NAME	DESCRIPTION
1	RXinO0-	Negative LVDS differential data input (Odd data)
2	RXinO0+	Positive LVDS differential data input (Odd data)
3	RXinO1-	Negative LVDS differential data input (Odd data)
4	RXinO1+	Positive LVDS differential data input (Odd data)
5	RXinO2-	Negative LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG)
6	RXinO2+	Positive LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG)
7	GND	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RXinO3-	Negative LVDS differential data input (Odd data)
11	RXinO3+	Positive LVDS differential data input (Odd data)
12	RXinE0-	Negative LVDS differential data input (Even data)
13	RXinE0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RXinE1-	Negative LVDS differential data input (Even data)
16	RXinE1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RXinE2-	Negative LVDS differential data input (Even data)
19	RXinE2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	Positive LVDS differential clock input (Even clock)
22	RXinE3-	Negative LVDS differential data input (Even data)
23	RXinE3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection (for LiteMax test only. Do not connect)
26	NC	No connection (for LiteMax test only. Do not connect)
27	NC	No connection (for LiteMax test only. Do not connect)
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

2.5 The Input Data Format



2.6 Timing Characteristics

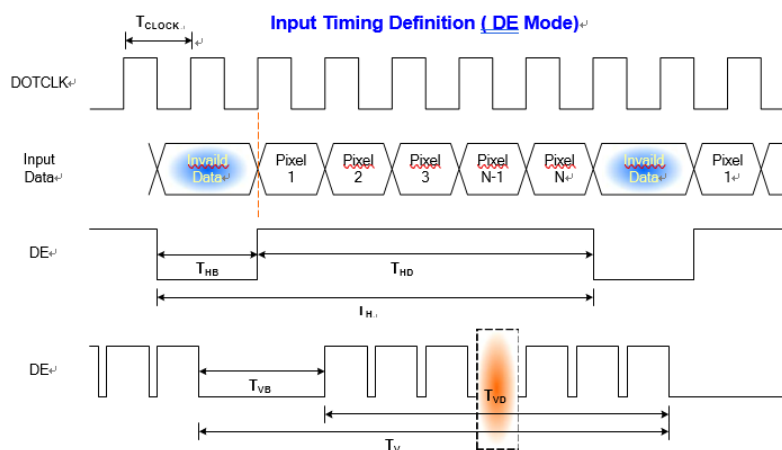
Interface timing

Signal↵	Parameter↵		Symbol↵	Min.↵	Typ.↵	Max.↵	Unit↵
Clock Timing↵	Clock frequency↵		1/ T _{Clock} ↵	40↵	72↵	83↵	MHz↵
Vsync Timing↵	Vertical Section↵	Period↵	T _V ↵	1092↵	1130↵	1653↵	T _{Line} ↵
		Active↵	T _{VD} ↵	1080↵	1080↵	1080↵	
		Blanking↵	T _{VB} ↵	12↵	50↵	573↵	
Hsync Timing↵	Horizontal Section↵	Period↵	T _H ↵	1004↵	1050↵	1100↵	T _{Clock} ↵
		Active↵	T _{HD} ↵	960↵	960↵	960↵	
		Blanking↵	T _{HB} ↵	44↵	90↵	140↵	
Frame Rate↵			F↵	50↵	60↵	75↵	Hz↵

Note: DE mode Only

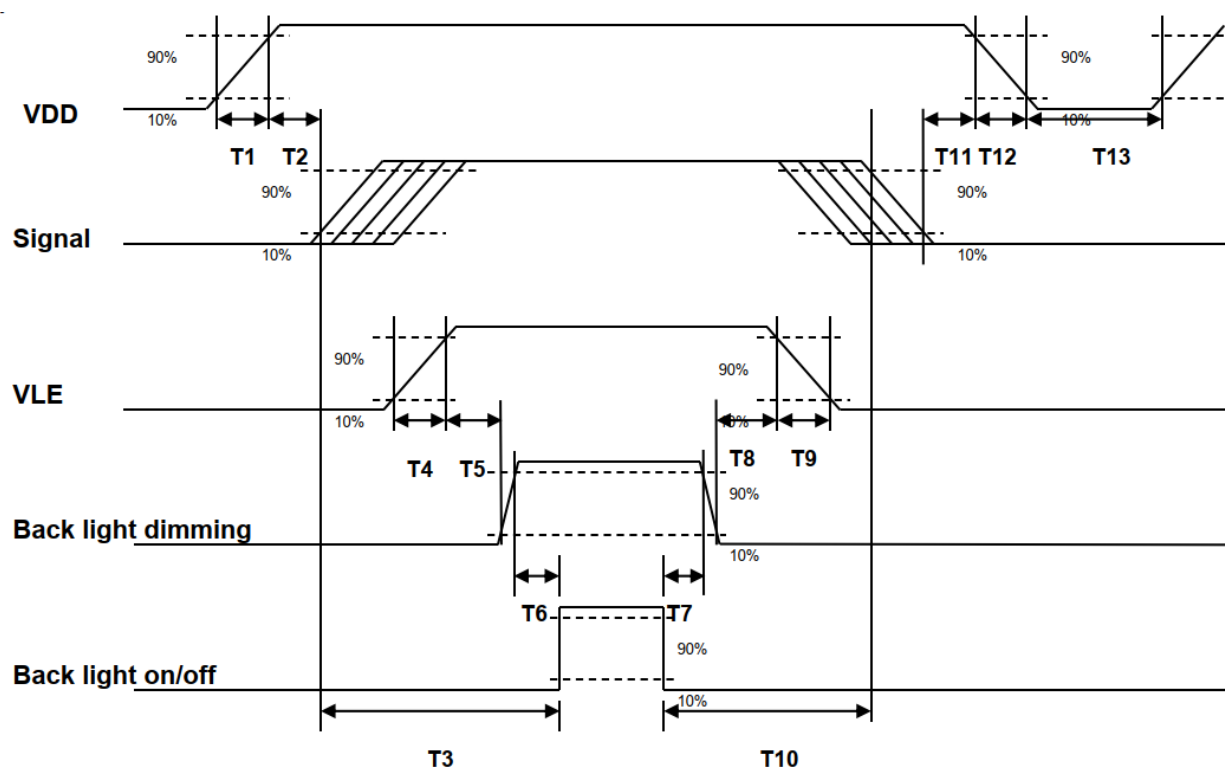
Note: Typical value refer to VESA STANDARD

Input Timing Diagram



2.7 Power On/Off Sequence

VDD power and LED on/off sequence are as follows. Interface signals are also shown in the chart. Signals from many system shall be Hi-Z state or low level when VDD is off.



Power On/Off sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	--	10	[ms]
T2	30	40	50	[ms]
T3	200	--	--	[ms]
T4	0.5	--	10	[ms]
T5	10	--	--	[ms]
T6	10	--	--	[ms]
T7	0	--	--	[ms]
T8	10	--	--	[ms]
T9	--	--	10	[ms]
T10	110	--	--	[ms]
T11	0	16	50	[ms]
T12	--	--	10	[ms]
T13	1000	--	--	[ms]

The above on/off sequence should be applied to avoid abnormal function in the display.

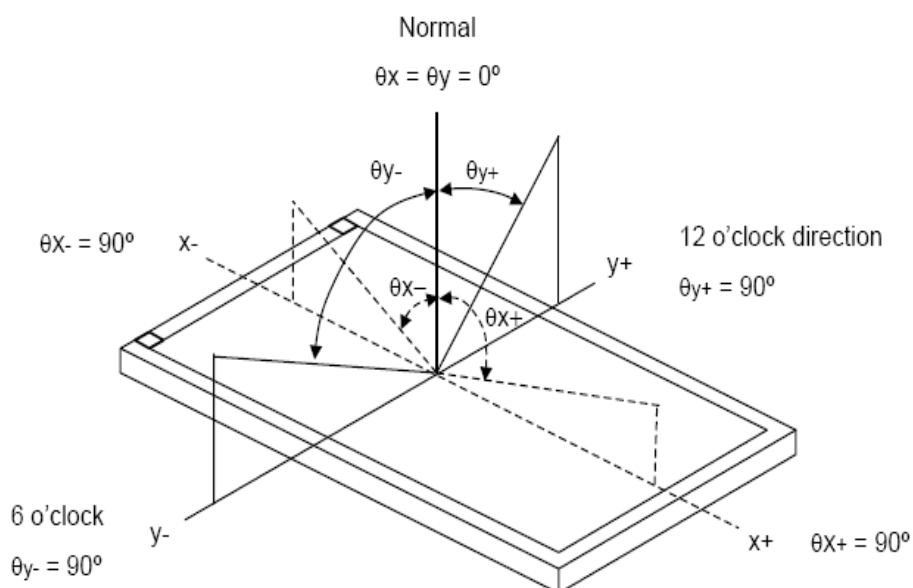
Please make sure to turn off the power when you plug the cable the input connector or pull the cable out of the connector.

3 Optical Specification

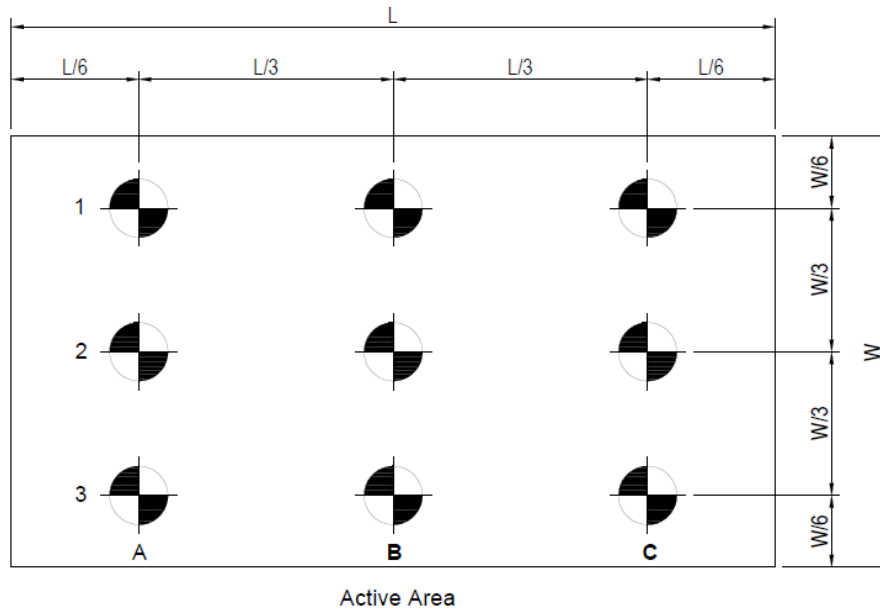
Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Color Chromaticity	Red	Rx	$\theta_x=0$ $\theta_y=0$ CA-410	0.605	0.635	0.665	-	Test Mode: (2) (3)
		Ry		0.300	0.330	0.360	-	
	Green	Gx		0.265	0.295	0.325	-	
		Gy		0.602	0.632	0.662	-	
	Blue	Bx		0.118	0.148	0.178	-	
		By		0.017	0.047	0.077	-	
	White	Wx		0.255	0.285	0.315	-	
		Wy		0.284	0.314	0.344	-	
Center Luminance of White		Lc	$\theta_x=0$ $\theta_y=0$	1440	1600	2080	cd/m ²	
Uniformity		Lu	CA-410		85		%	
Contrast Ratio		CR	$\theta_x=0$	2520:1	2800:1		-	Test Mode: (4)
Color Saturation		NTSC	$\theta_y=0$ Klein K-10		80		%	
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$		89		Deg	Test Mode: (1)
		θ_{x-}			89			
	Vertical	θ_{y+}			89			
		θ_{y-}			89			

Test Mode :

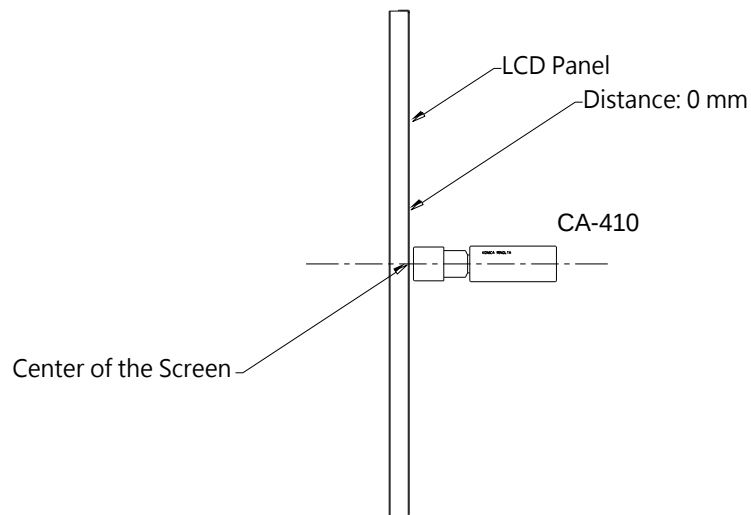
(1) Definition of Viewing Angle (θ_x , θ_y):



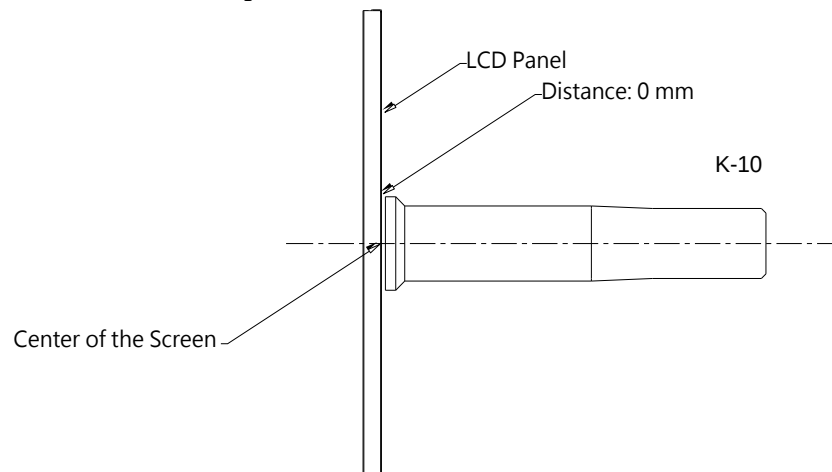
(2) Definition of Test Point:



(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 LiteMax 2158 1600nit LED backlight.

4.1 Converter Characteristics

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	Vin		10.0	12.0	14.0	V	
Input Current (Low Brightness)	IinL	PWM=0%	0.0	-----	-----	mA	
Input Current (High Brightness)	IinH	PWM=100%	3.66	3.18	2.85	A	
LED Current (Low Brightness)	IoutL	PWM=0%	0.0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	PWM=100%	1.55	1.6	1.65	A	
Working Frequency	Freq	PWM=100%	210	230	250	KHz	
Brightness Control	PWM	Connect to PWM	0	-----	100	%	Max ratio 1:100
	Freq		-----	200	300	Hz	
ON/OFF Control	Von	PWM=100%	2	-----	5	V	
	Voff	PWM=100%	0	-----	1.8	V	
Output Voltage	Vout	PWM=100%	21.3	21.8	22.3	V	
Efficiency	η	PWM=100%	90.2	91.4	92.2	%	

4.2 Connector Socket

Input Connector: J1(JST S8B-PH-SM3-TB or Compatible)

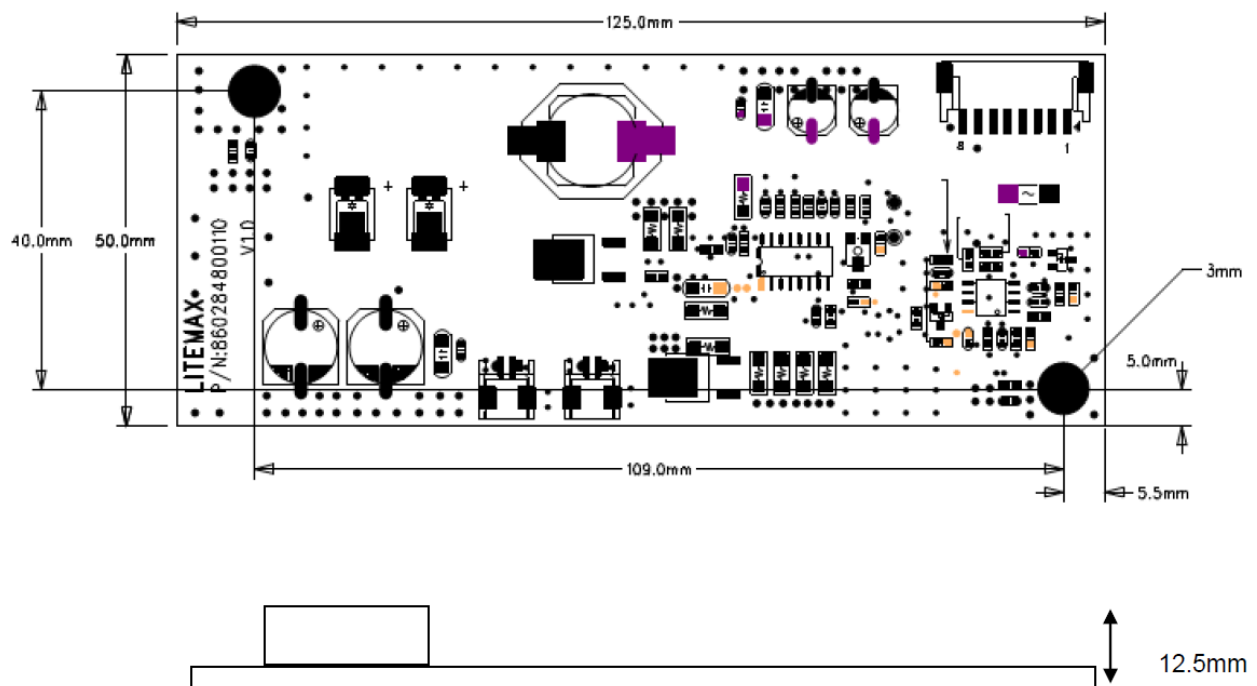
PIN No	Symbol	Description
1	Vin	DC+12V
2	Vin	DC+12V
3	Vin	DC+12V
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	Brightness	Brightness Control
8	Control	ON/OFF Control

Output Connector: J2,J3(JST S2B-EH or Compatible)

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

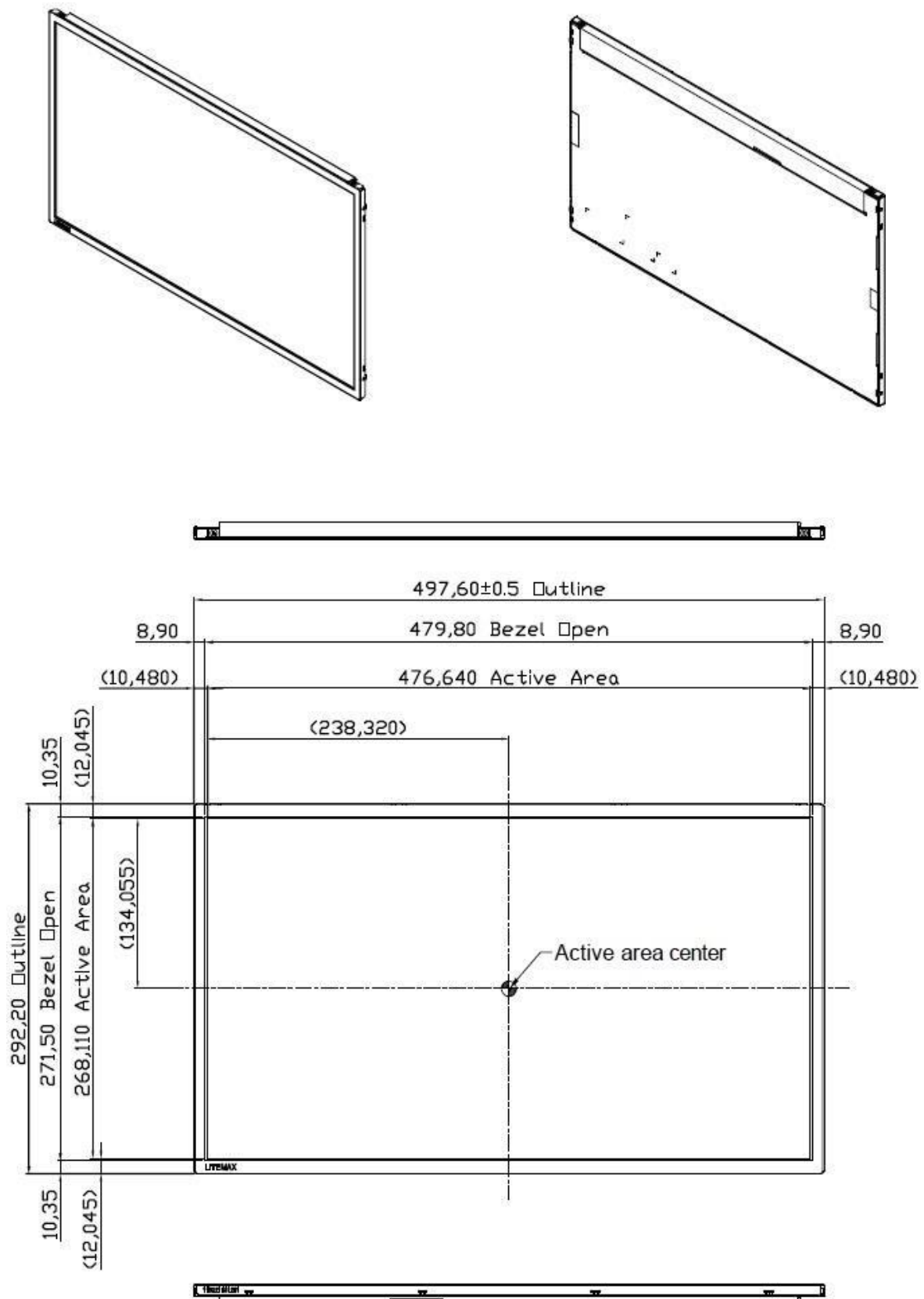
4.3 Mechanical Characteristics

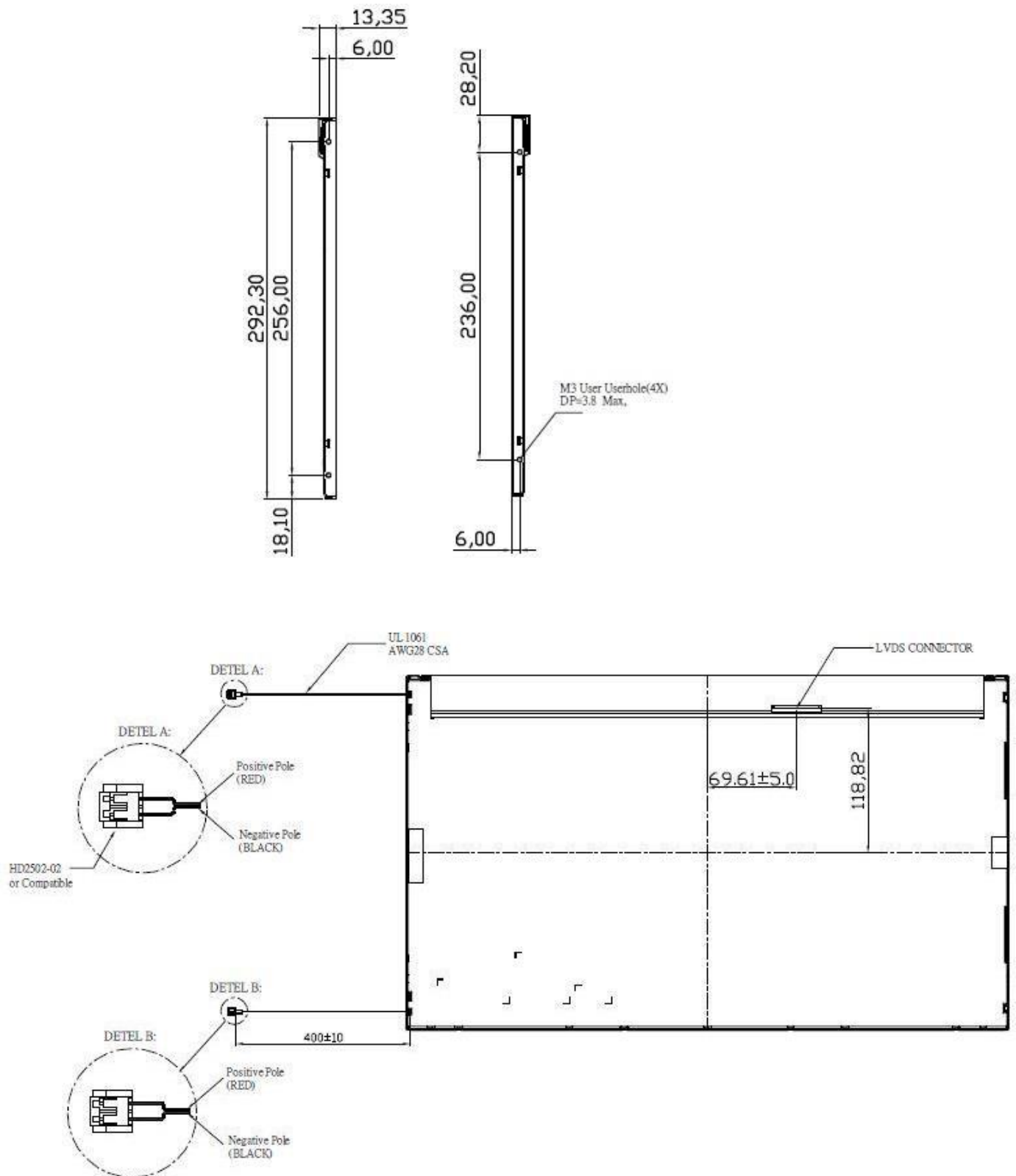
Dimension: 125 x 50 x 12.5mm



5 Mechanical Drawing

Unit:mm





Note:

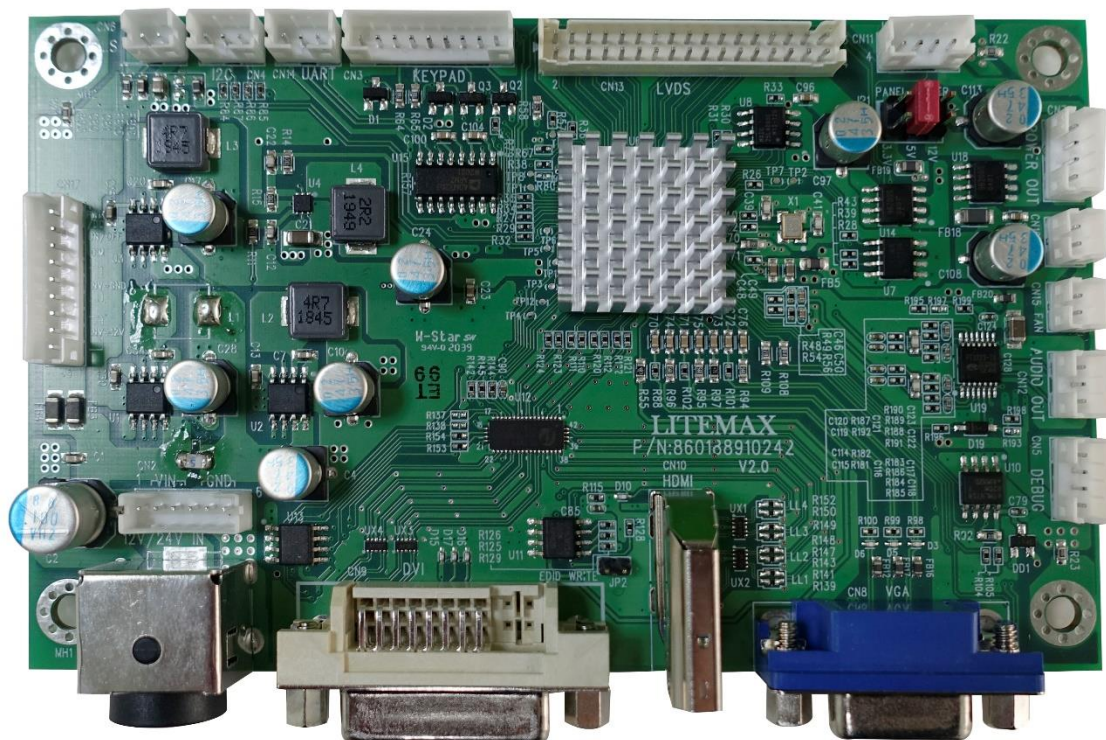
- 1.GENERAL TOLRANCE: $\pm 0.5\text{mm}$
- 2.ALLOW EDPTH OF USERHOLE SCREW INSERTION IS 3.8mm MAX
- 3.USER SCREW TORQUE=4.0kgf/cm MAX

6 AD8891GDH 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 VGA and DVI-D and HDMI input. Rev.1 is European RoHS compliant.

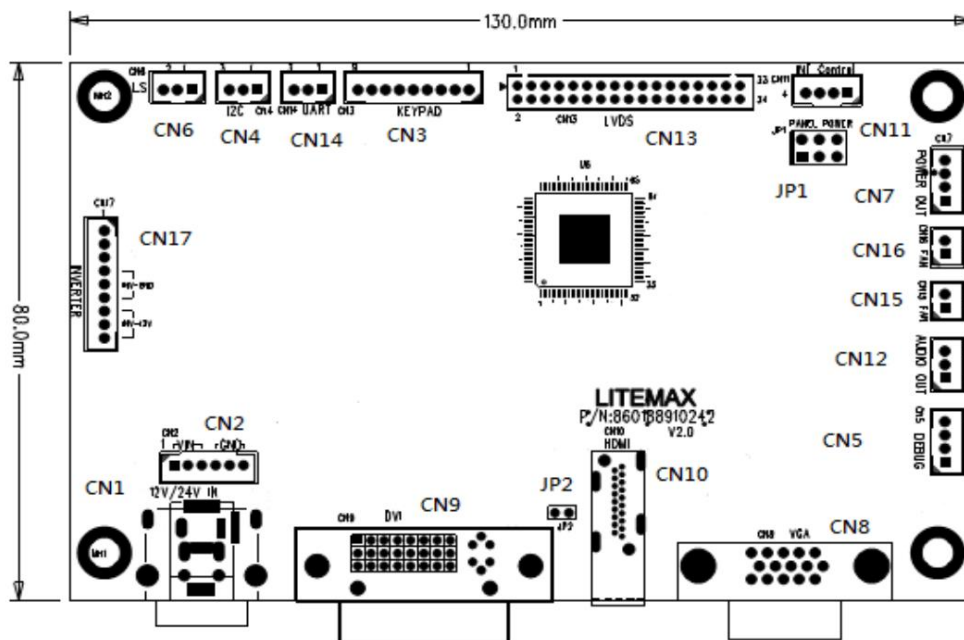
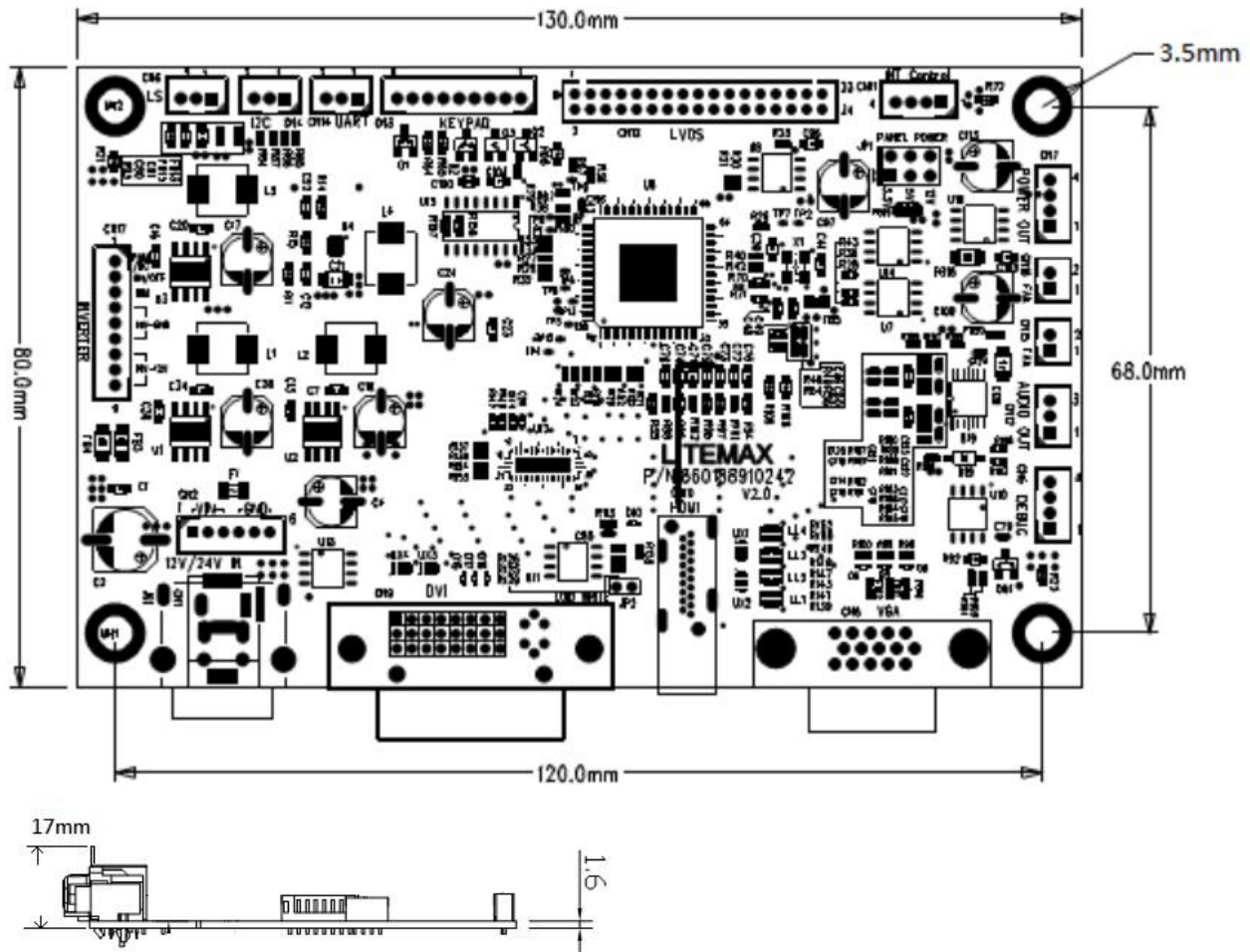
6.1 General Description

- Max Resolution Up To Full HD
- Analog RGB Input up to 205MHz
- Ultra-Reliable DVI-D Input
- HDMI Input (HDMI 1.3)
- Dual/single LVDS interface
- Inverter Analog or PWM Dimming Control
- Support Panel DC 5V or 12V,3.3V Output
- OSD Control
- External RS232 control (optional)
- Input Power 24V or 12V dc(optional)
- 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

AD8891GDH = 130mm X 80mm



6.3 AD8891GDH 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	NC
9	RxO3-	26	NC
10	RxO3+	27	GND
11	NC	28	GND
12	NC	29	Pull High
13	GND	30	Pull Low
14	GND	31	VLCD
15	RxE0-	32	VLCD
16	RxE0+	33	VLCD
17	RXE1-	34	VLCD

CN9: DVI-D 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	DET_DVI	19	T.M.D.S. Data0/5 Shield
4	NC	12	NC	20	NC
5	NC	13	NC	21	NC
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	NC	16	Hot Plug Detect	24	T.M.D.S. Clock-

CN8: Analog RGB input connector (D-SUB 15Pin)

Pin	Symbol	Description	Pin No.	Symbol	Description
1	RED	Analog Red	9	+5V	+5VDDC
2	GREEN	Analog Green	10	SGND	Sync GND
3	BLUE	Analog Blue	11	NCD	Reserved
4	GND	Reserved	12	SDA	DDC Serial Data
5	GND	DET_VGA	13	HSYNC	Horizontal Sync
6	RED_RTN	Red Return	14	VSYNC	Vertical Sync
7	GREEN_RTN	Green Return	15	SCL	DDC Data Clock
8	BLUE_RTN	Blue Return			

CN10: 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	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)

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

CN1: Power Jack (12V)

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

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

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

CN7: Touch power connector

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

CN15, CN16: 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		

JP1: Panel power

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

CN11: INT 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)/VR (3PIN 2.0mm)

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

CN12: 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	Pull High	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

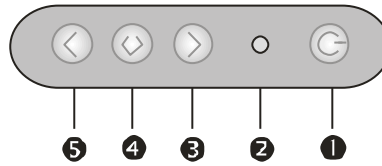
For F/W debug

CN17: Inverter connector (9PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	PWM/DC SEL	6	GND
2	Backlight ON/OFF	7	24V/12V
3	Dimming adjust	8	24V/12V
4	GND	9	24V/12V
5	GND		

6.4 OSD Function

MEMBRANE CONTROL BUTTON



- **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.

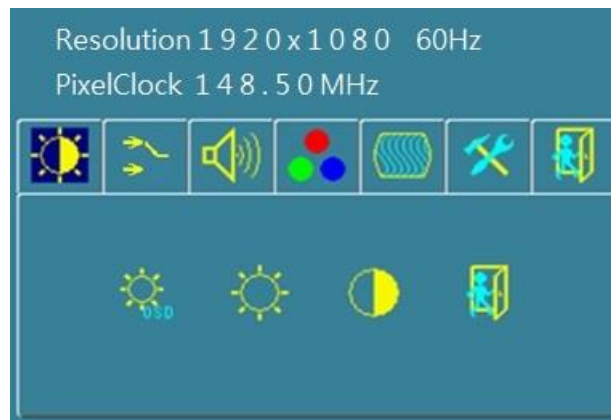
5. Return & Exit the main menu

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.

6.5 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. **(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” once, you can adjust the contrast from “0” to “100” by pressing the “Left” and “Right”.



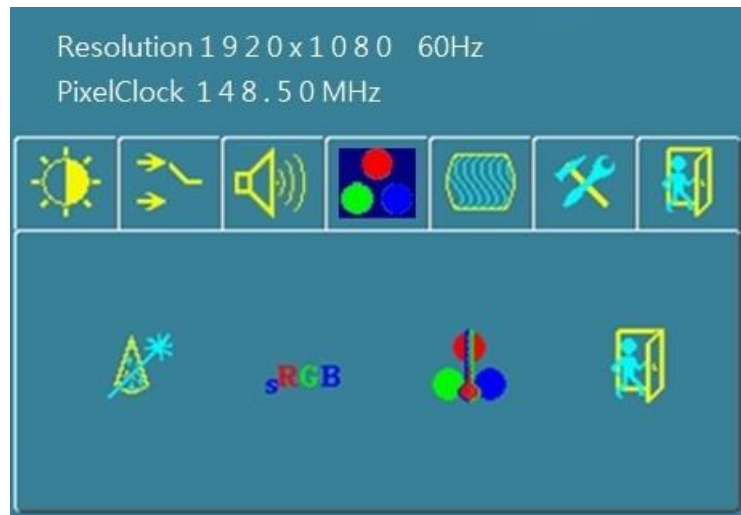
Exit: back to the beginning menu.



- VGA** **Analog:** RGB/VGA input
- DVI** **Digital:** DVI input
- HDMI** **HDMI:** HDMI 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”.



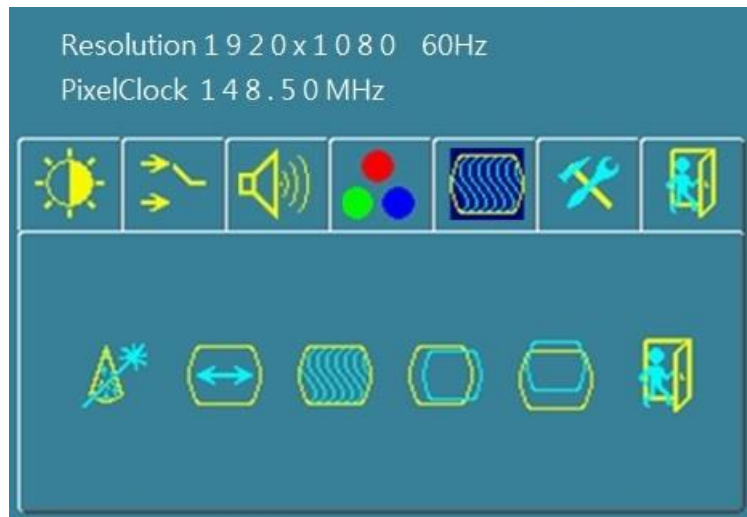
Color Tempture_6500K: Warm color scheme



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.



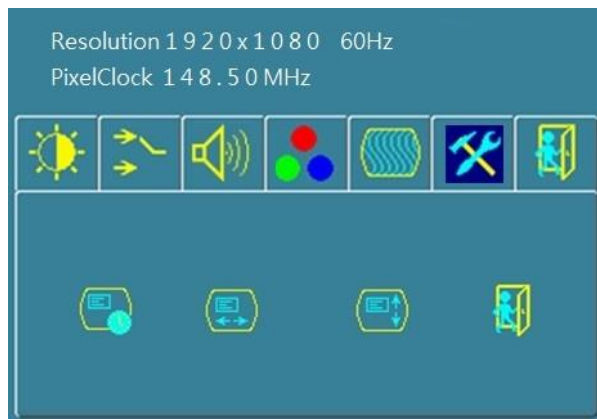
VPos: You can shift the screen vertically using this function.



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.



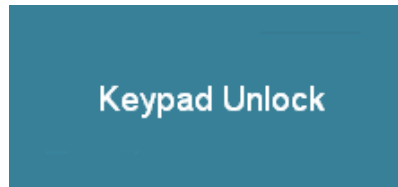
Exit: back to the normal screen

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 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.