

LITEMAX

DLF/DLH1335-A (V1) Sunlight Readable 13.5" LED B/L LCD User Manual

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Record of Revision

Version and Date	Page	Old Description	New Description	Remark
July /11/2019	all		Initial release	
April /9/2019	P4		Update AD Board Input Interface	

Contents

Record of Revision.....	2
Contents.....	3
1 General Description.....	4
1.1 Features.....	4
1.2 General Specifications.....	4
1.3 Absolute Maximum Ratings.....	5
2 Electrical Specifications.....	6
2.1 Electrical Characteristics.....	6
2.2 Input Connection.....	7
2.3 LVDS Signal Characteristics.....	8
2.4 Signal Timing Specifications.....	10
2.5 Power Sequence.....	11
3 Optical Specification.....	12
4 LED Driving Board Specifications.....	14
4.1 Operating Characteristics.....	14
4.2 Connector Socket.....	15
4.3 Mechanical Characteristics.....	16
5 Mechanical Drawing.....	17
6 AD8220GDHPAR Board & OSD Functions.....	19
6.1 General Description.....	19
6.2 Outline Dimensions.....	20
6.3 AD8220GDHPAR Board Pin Define.....	21
6.4 OSD Function.....	26
6.5 OSD Menu.....	27
7 Precautions and Mounting.....	34
7.1 Handling Precautions.....	34
7.2 Storage Precautions.....	34
7.3 Operation Precautions.....	35
8 Disclaimer.....	35

1 General Description

The **DLF/DLH1335-A** is a **13.5** inch industrial grade sunlight readable LCD, with high brightness **1000** nits and high color saturation, it produce sharp images, crisp text and lifelike colors. The Durapixel LED backlight technology ensures high reliability and low power consumption, suitable for outdoor application, kiosk, factory automation, military, transportation and gaming application.

1.1 Features

- High Brightness 1000 nits
- Sunlight Readable
- LED Backlight
- Low Power Consumption
- Wide Operation Temperature
- BL MTBF: 100,000 hours

1.2 General Specifications

Model Name	DLF/DLH1335-A V1
Description	13.3" TFT LCD, LED Backlight 1000 nits, 1920x1080
Screen Size	13.3"
Display Area (mm)	293.47(H) x 165.08(V)
Brightness	1000 cd/m ²
Resolution	1920x1080
Aspect Ratio	16 : 9
Contrast Ratio	1000 : 1
Pixel Pitch (mm)	0.15285(H) x 0.15285(V)
Pixel Pre Inch (PPI)	166
Viewing Angle	178°(H),178°(V)
Color Saturation (NTSC)	87%
Display Colors	16.7M
Response Time (Typical)	25ms
Panel Interface	LVDS
AD Board Input Interface	DVI-I, HDMI, DP
AD Board Input Power	DC12V
Power Consumption	11W, 15.5W (with AD board)
OSD Key	4 Keys (Power Switch, Menu, +, -)
OSD Control	Brightness, Color, Contrast, Auto Turing, H/V Position...etc
Dimensions (mm)	309.7 x 184.1 x 9.6
Bezel Size(U/B/L/R)	5.77/11.65/7.31/7.31 mm
Weight (Net)	0.8kg
Operating Temperature	-20 °C ~ 70 °C
Storage Temperature	-20 °C ~ 70 °C

DLF= Panel+ LED Driving Board

DLH= Panel+ LED Driving Board + AD Control Board

1.3 Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+4.0	[Volt]	Note 1,2
Signal Voltage	RinI-/+, ClkIN-/+	-0.3	VDD+0.3	[Volt]	Note 1, I=0,1,2,3
Signal Voltage	LED_EN , LED_PWM	-0.3	+5.5	[Volt]	Note 1,2

Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Conditions
Operating Temp.	TOP	-20	+70	[°C]	
Operation Humidity	HOP	8	90	[%RH]	
Storage Temperature	TST	-20	+70	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: At Ta (25°C)

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: LED specification refer to section 4

2 Electrical Specifications

2.1 Electrical Characteristics

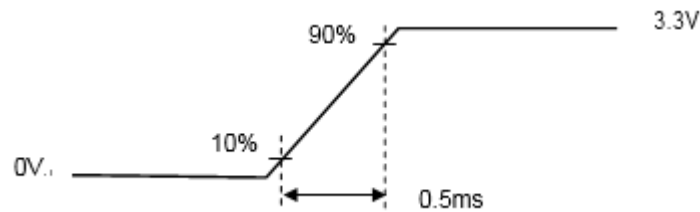
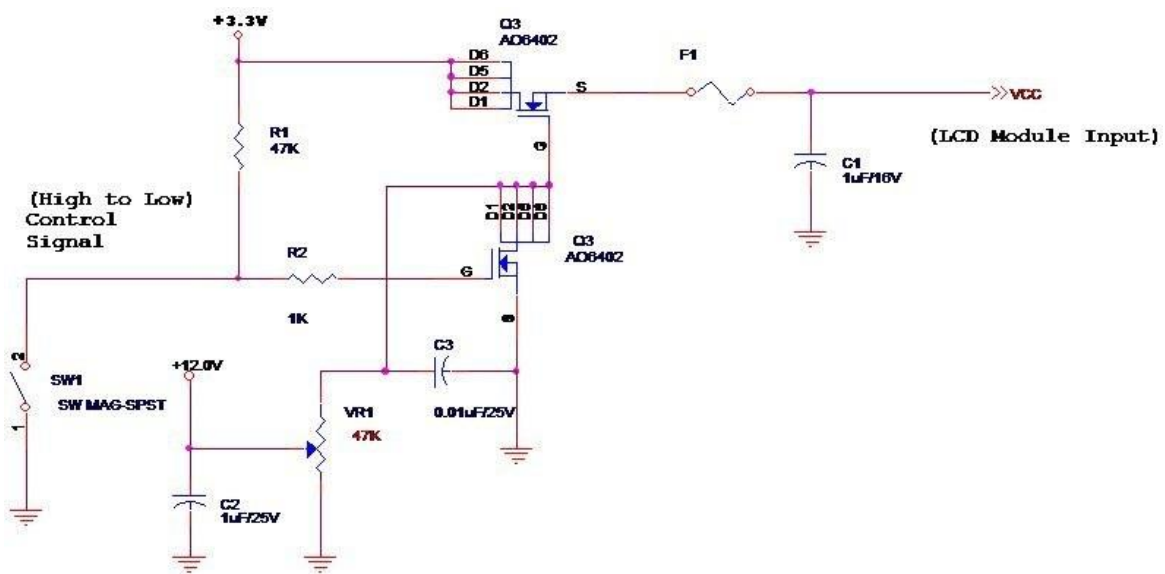
Input power specifications are as follows;

The power specification are measured under 25 °C and frame frequency under 60Hz

Symble	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	-	-	1.8	[Watt]	Note 1
IDD	IDD Current	-	-	500	[mA]	Note 1
IRush	Inrush Current	-	-	2	[A]	Note 2
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	200	[mV] p-p	

Note 1: Maximum Measurement Condition : White Pattern at 3.6V driving voltage ($P_{max}=V_{3.6V} I_{white}$)

Note 2: Measure Condition



2.2 Input Connection

This LCD module employs two kinds of interface connection, 30-pin connector is used for the module electronics.

LCD Connector(CN1): HRS DF19K-30P-1H(54)

Pin	Signal	Description
1	RxOIN0-	Negative LVDS differential data input (Odd data)
2	RxOIN0+	Positive LVDS differential data input (Odd data)
3	RxOIN1-	Negative LVDS differential data input (Odd data)
4	RxOIN1+	Positive LVDS differential data input (Odd data)
5	RxOIN2-	Negative LVDS differential data input (Odd data, DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data, DSPTMG)
7	GND	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential data input (Odd data)
11	RxOIN3+	Positive LVDS differential data input (Odd data)
12	RxEIN0-	Negative LVDS differential data input (Even data)
13	RxEIN0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RxEIN1-	Negative LVDS differential data input (Even data)
16	RxEIN1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	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	RxEIN3-	Negative LVDS differential data input (Even data)
23	RxEIN3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	AGBSEN	For AUO internal use
26	VDD	Power +3.3V
27	VDD	Power +3.3V
28	SCL	For AUO internal use
29	SDA	For AUO internal use
30	GND	Power Ground

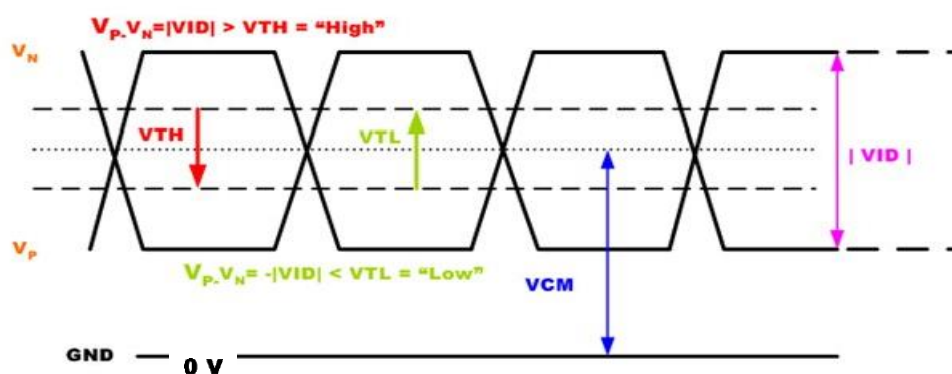
2.3 LVDS Signal Characteristics

Input signals shall be low or High-impedance state when VDD is off

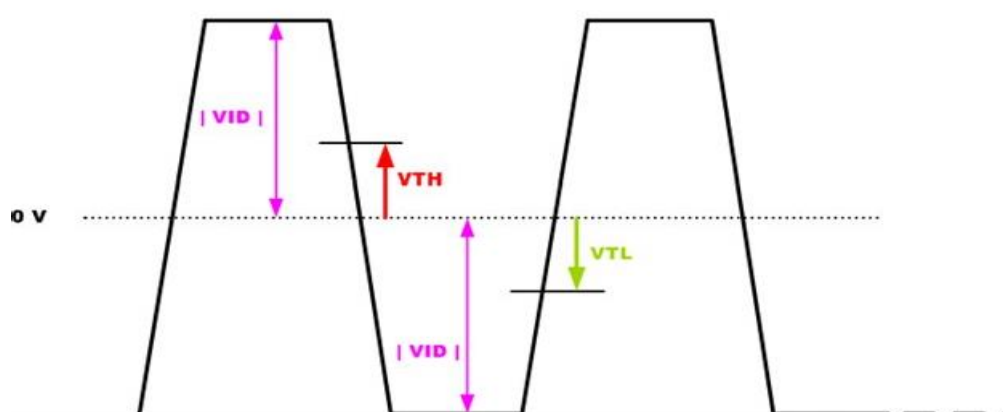
Signal electrical characteristics are as follows:

Symbol	Parameter	Min	Typ	Max	Units	Condition
V_{TH}	Differential Input High Threshold	-	-	+100	[mV]	$V_{CM} = 1.2V$ Note 1
V_{TL}	Differential Input Low Threshold	-100	-	-	[mV]	$V_{CM} = 1.2V$ Note 1
$ V_{ID} $	Input Differential Voltage	100	400	600	[mV]	Note 1
V_{CM}	Differential Input Common Mode Voltage	+1.125	-	+1.375	[Volt]	$V_{TH}-V_{TL} = 200mV$ (max) Note 1

Single-end Signal

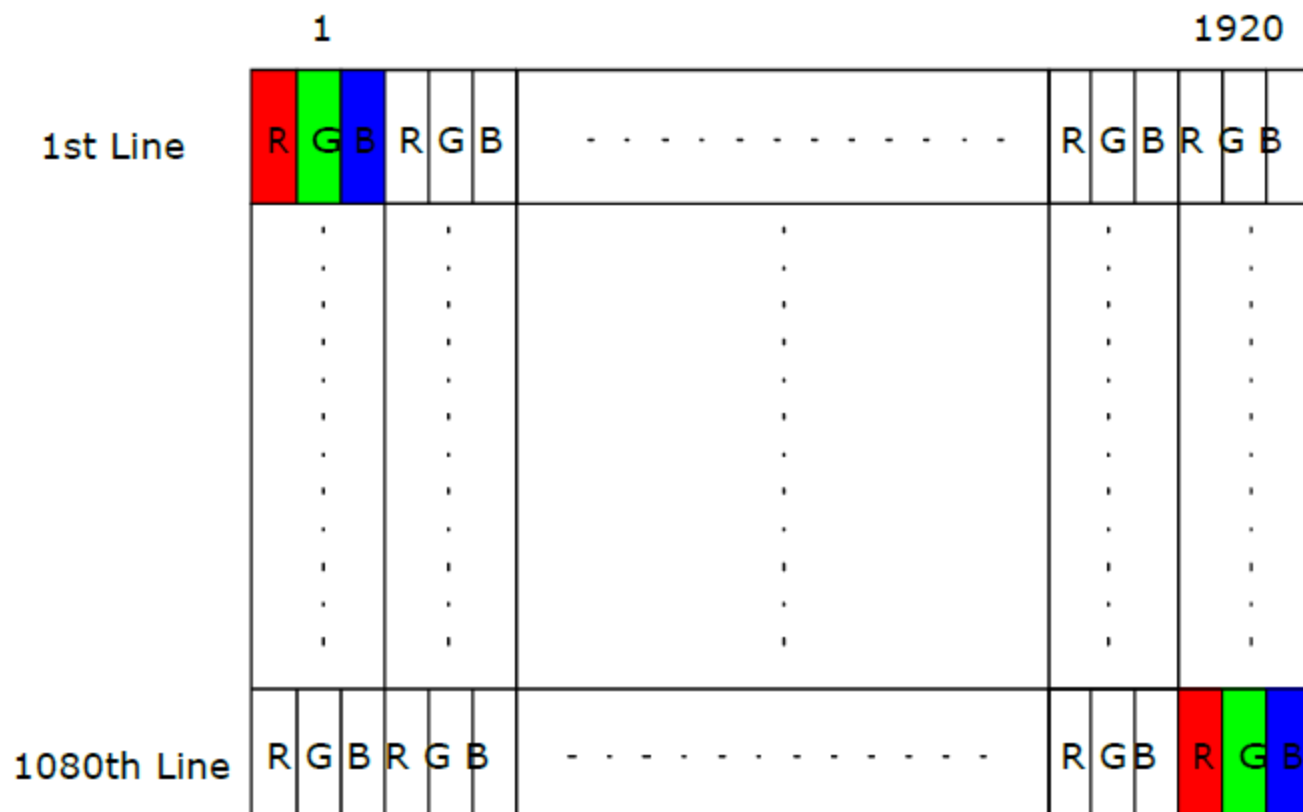


Differential Signal



Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



2.4 Signal Timing Specifications

Basically, interface timings should match the 1920x1080/ 60Hz manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-	60	60	60	Hz
Clock frequency		1/ T _{Clock}	67	70.6	74.5	MHz
Horizontal Section	Period	T _H	1023	1054	960+B	T _{clock}
	Active	T _{HD}	960			
	Blanking	T _{HB}	63	94	B	
Vertical Section	Period	T _V	1092	1116	1080+A	T _{line}
	Active	T _{VD}	1080			
	Blanking	T _{VB}	12	36	A	

Note1 : The above is as optimized setting

Note2 : The maximum clock frequency = $[(960 + B) \cdot (1080 + A) \cdot 60] < 74.5\text{MHz}$

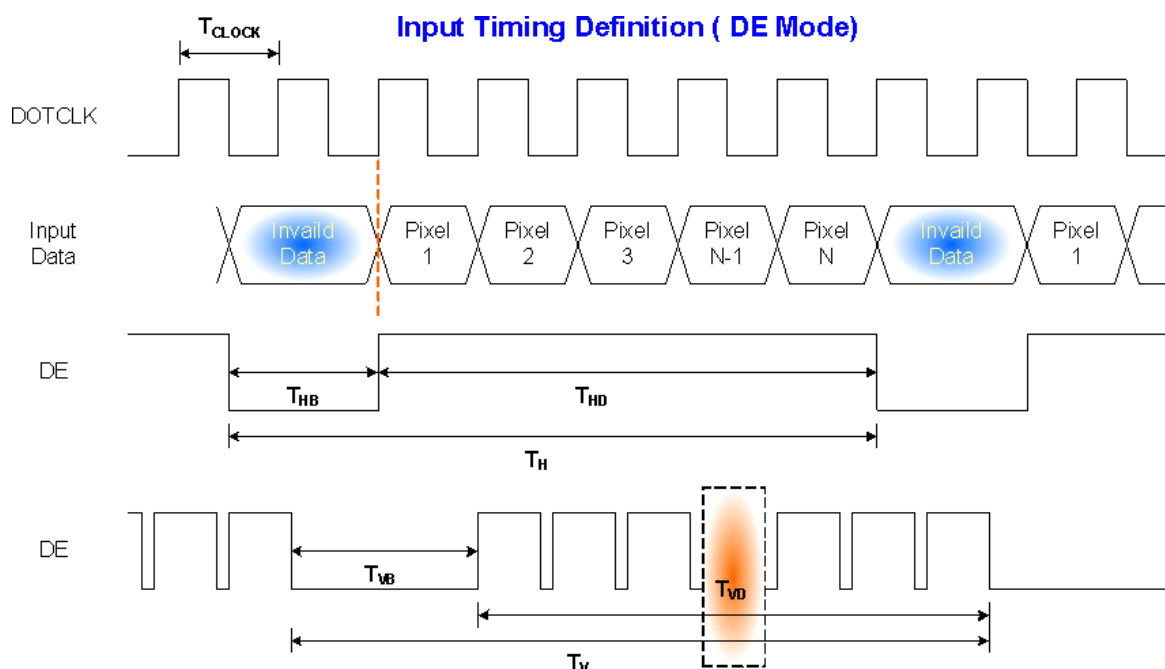
Note3 : Horizontal related parameters must be constant without variation(H_Sync_Width, H_Front_Porch and H_Back_Porch must be constant on each scanline)

Note4 : On vertical blank area, H_Sync_Width and H_Total must be same as on the V_Active area.

Note5 : Vertical related parameters must be constant without variation.(V_Sync_Width, V_Front_Porch and V_Back_Porch must be constant on each video field).

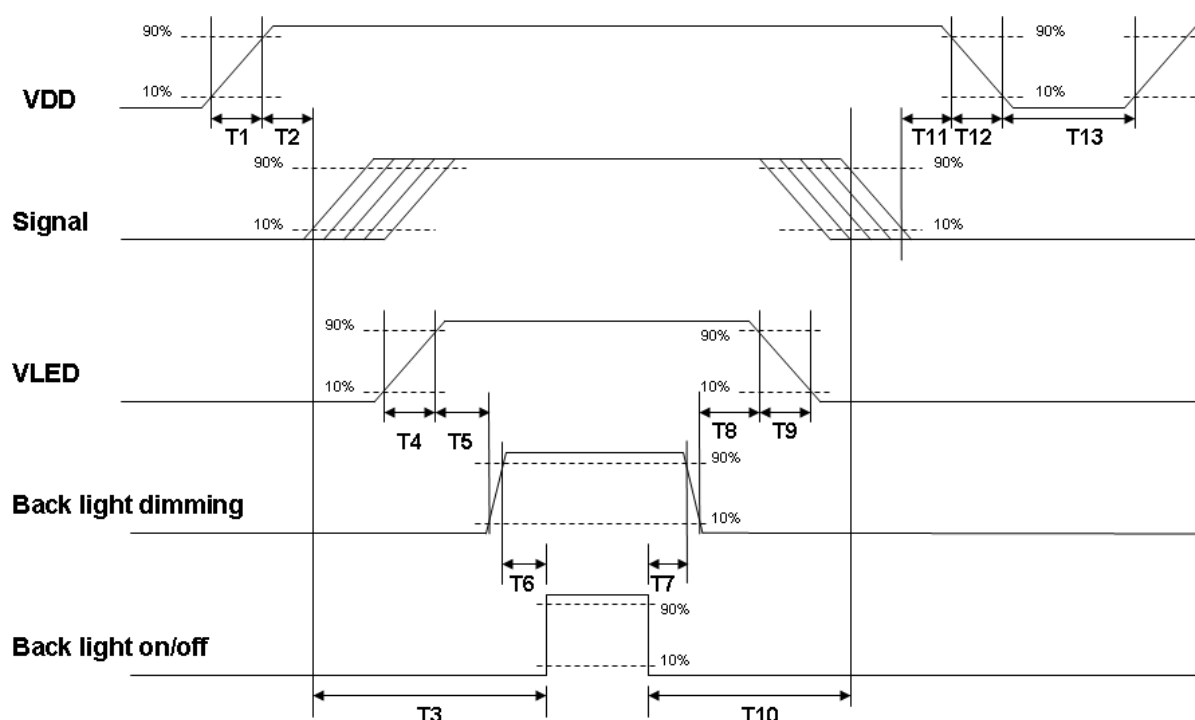
Note6 : The DE timings also must be constant without variation(H/V timing requirements are as same as previous. Blank

TIMING Diagram



2.5 Power Sequence

VDD power and LED on/off sequence is as below. Interface signals are also shown in the chart. Signals from any 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	0.1	-	10	[ms]
T2	200	-	-	[ms]
T3	50	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	10	-	-	[ms]
T8	10	-	-	[ms]
T9	0.5	-	10	[ms]
T10	50	-	-	[ms]
T11	10	-	-	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

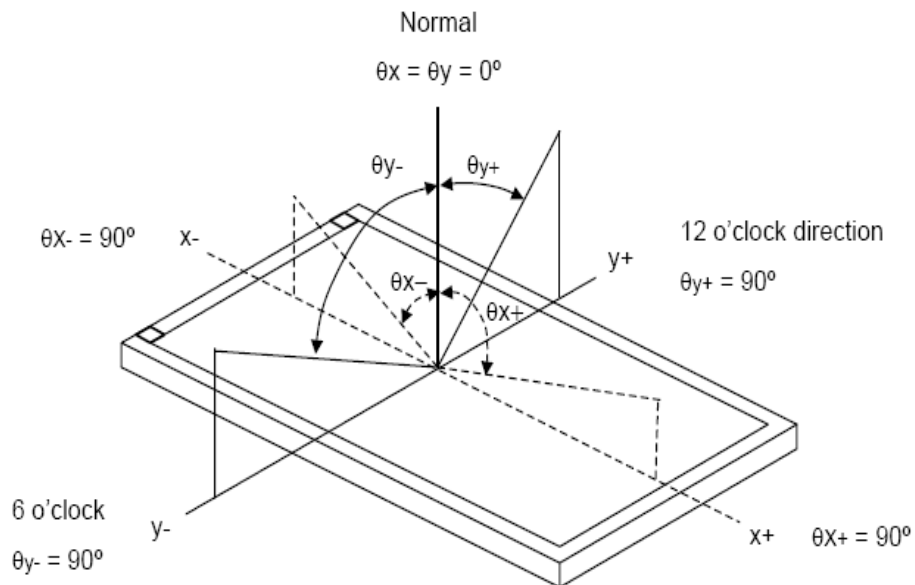
The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

3 Optical Specification

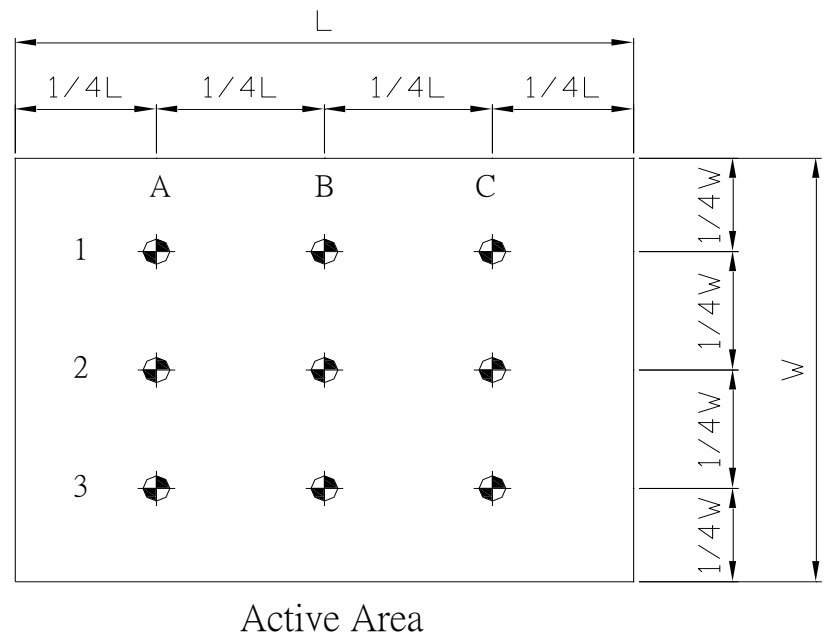
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color chromaticity	Red	Rx	$\theta_x=0$ $\theta_y=0$ Klein K-10	0.626	0.656	0.686	-	Test Mode: (1) (2) (3)
		Ry		0.300	0.330	0.360	-	
	Green	Gx		0.243	0.273	0.303	-	
		Gy		0.637	0.667	0.697	-	
	Blue	Bx		0.118	0.148	0.178	-	
		By		0.003	0.033	0.063	-	
	White	Wx		0.263	0.293	0.323	-	
		Wy		0.306	0.336	0.366	-	
Center Luminance of White		Lc	$\theta_x=0$ $\theta_y=0$		1000		cd/ m ²	Test Mode: (1) (4)
Uniform		Lu	BM-7		80		%	
Contrast Ratio		CR	$\theta_x=0$ $\theta_y=0$ Klein K-10		1000:1		-	
Color Saturation		NTSC			87		%	
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$		89		Deg	Test Mode: (1) (3)
		θ_{x-}			89			
	Vertical	θ_{y+}			89			
		θ_{y-}			89			

Test Mode :

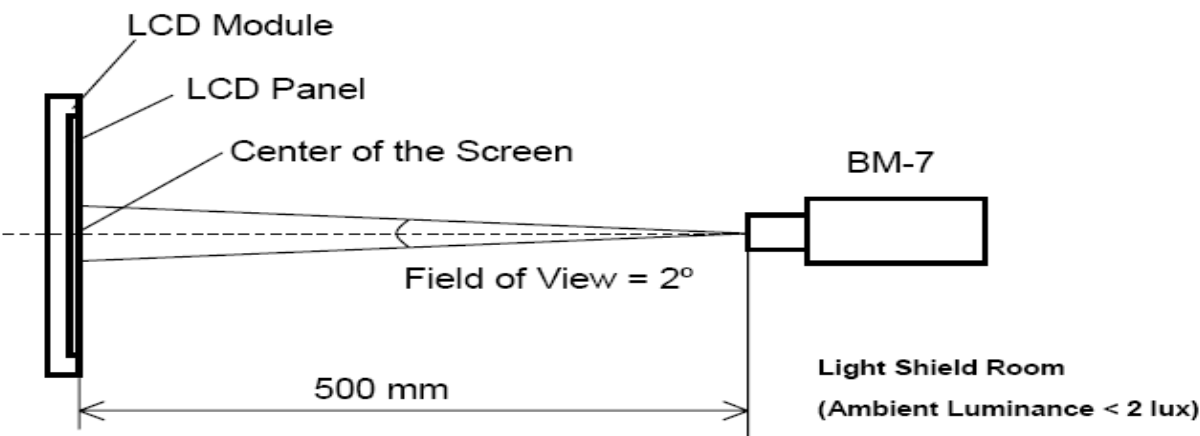
(1) Definition of Viewing Angle (θ_x , θ_y):



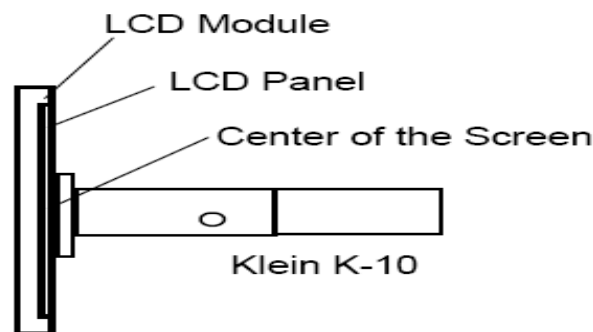
(2) Definition of Test Point:



(3) 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	Conditions	MIN.	TYP.	MAX.	Unit	Remark
Input Voltage	Vin		10.0	12.0	14.0	V	
Input Current (Low Brightness)	IinL	VIN=12V, PWM=0%	0	-----	-----	mA	
Input Current (High Brightness)	IinH	VIN=12V, PWM=100%	0.84	0.768	0.722	A	
4.1.1.1.1 LED Current (Low Brightness)	IoutL	VIN=12V, PWM=0%	0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	VIN=12V, PWM=100%	0.348	0.378	0.408	A	
Working Frequency	Freq	VIN=12V, PWM=100%	230	235	240	KHz	
Brightness Control	PWM	Connection of PWM	0	-----	100	%	
PWM Frequency	Freq	Dimming Signal	180	200	220	Hz	
ON/OFF Control	Von	Normal Operation	2	-----	5	V	
	Voff		0	-----	1.8	V	
Output Voltage	Vout	VIN=12V, PWM=100%	22.1	22.6	23.1	V	
Efficiency	η	VIN=12V, PWM=100%	91.6	92.7	93.3	%	

4.2 Connector Socket

Input Connector:

J1 (JST S 8B-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

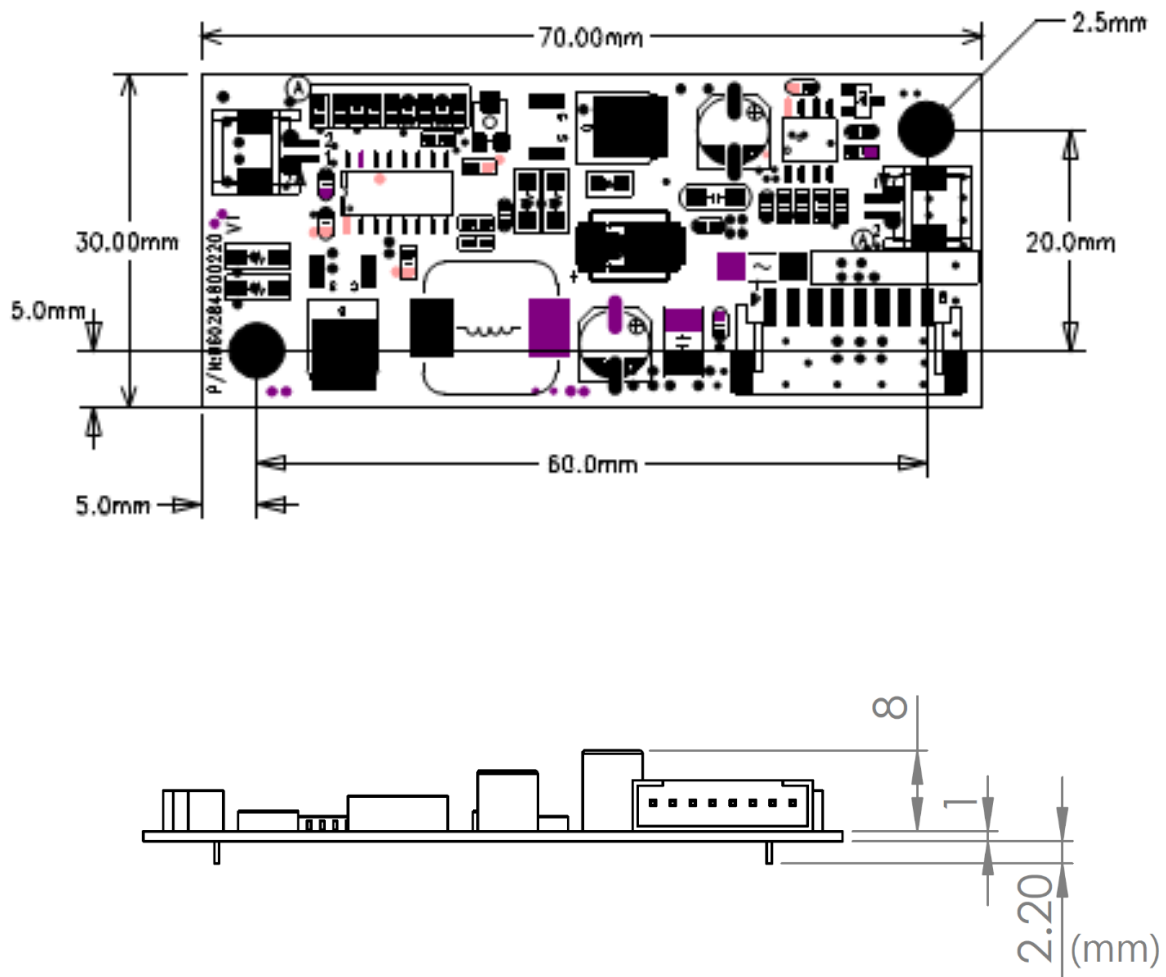
Output Connector:

J2,J3 (JST S2B-ZR-SM3A-TF or Compatible)

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

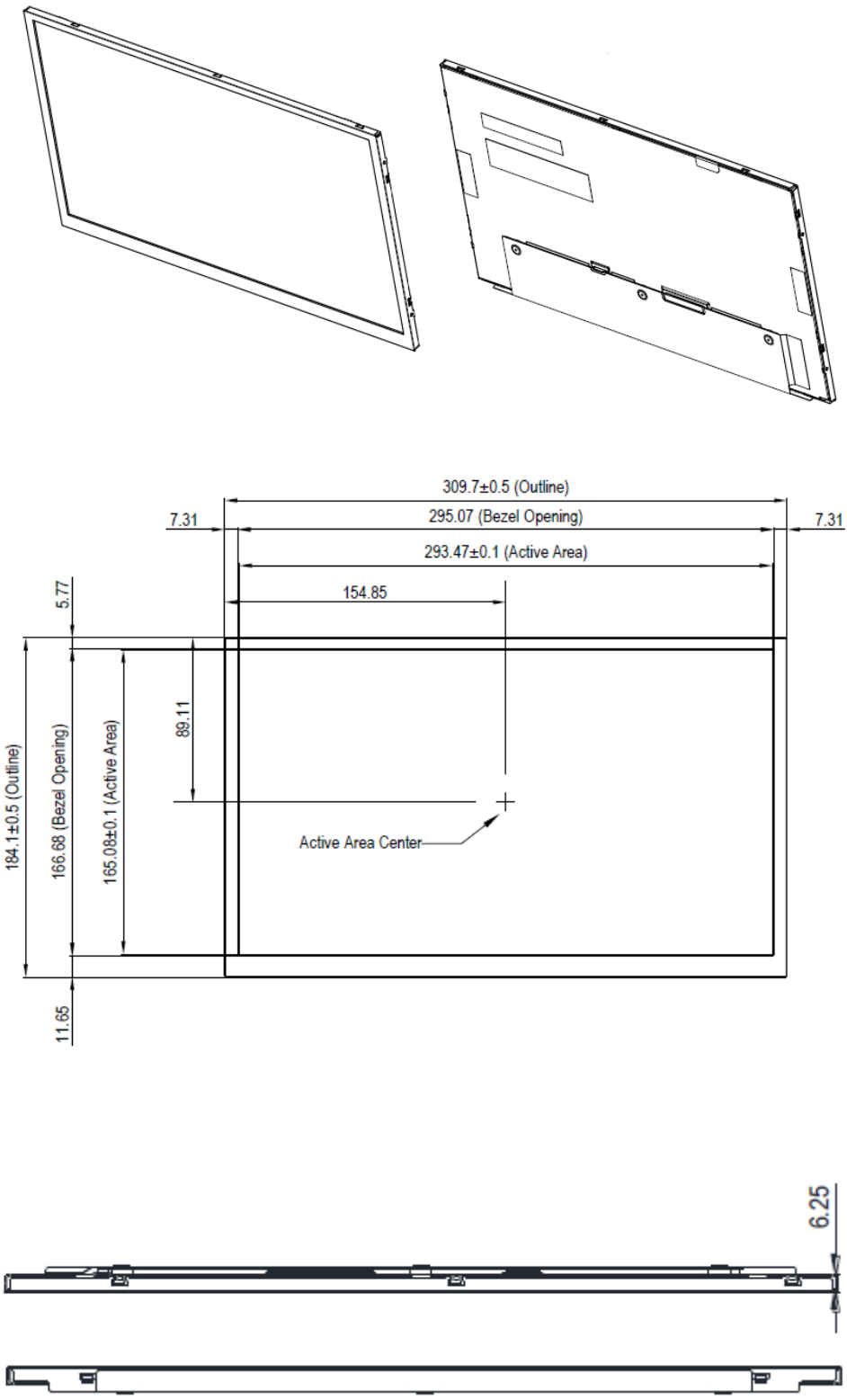
4.3 Mechanical Characteristics

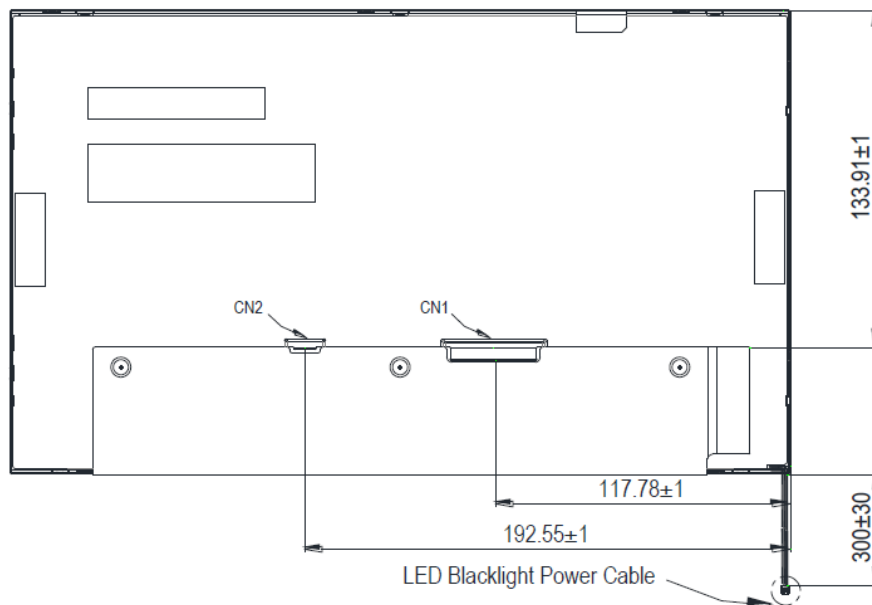
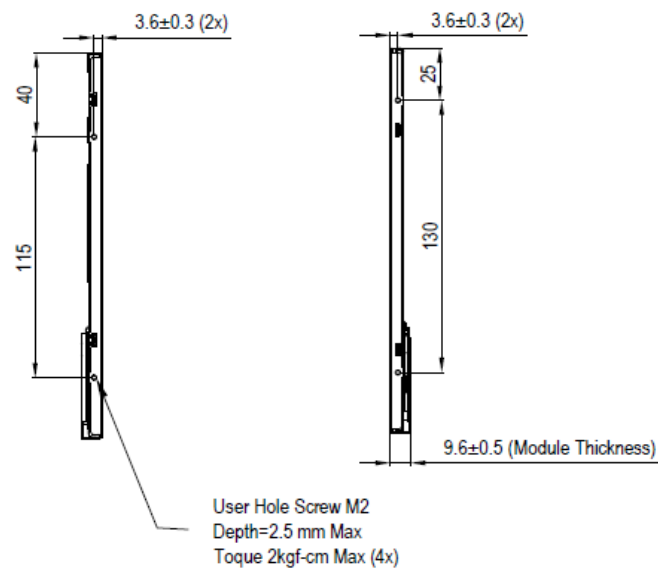
Dimension: 70mm*30mm*9mm



5 Mechanical Drawing

Unit:mm





Connector View

Note:

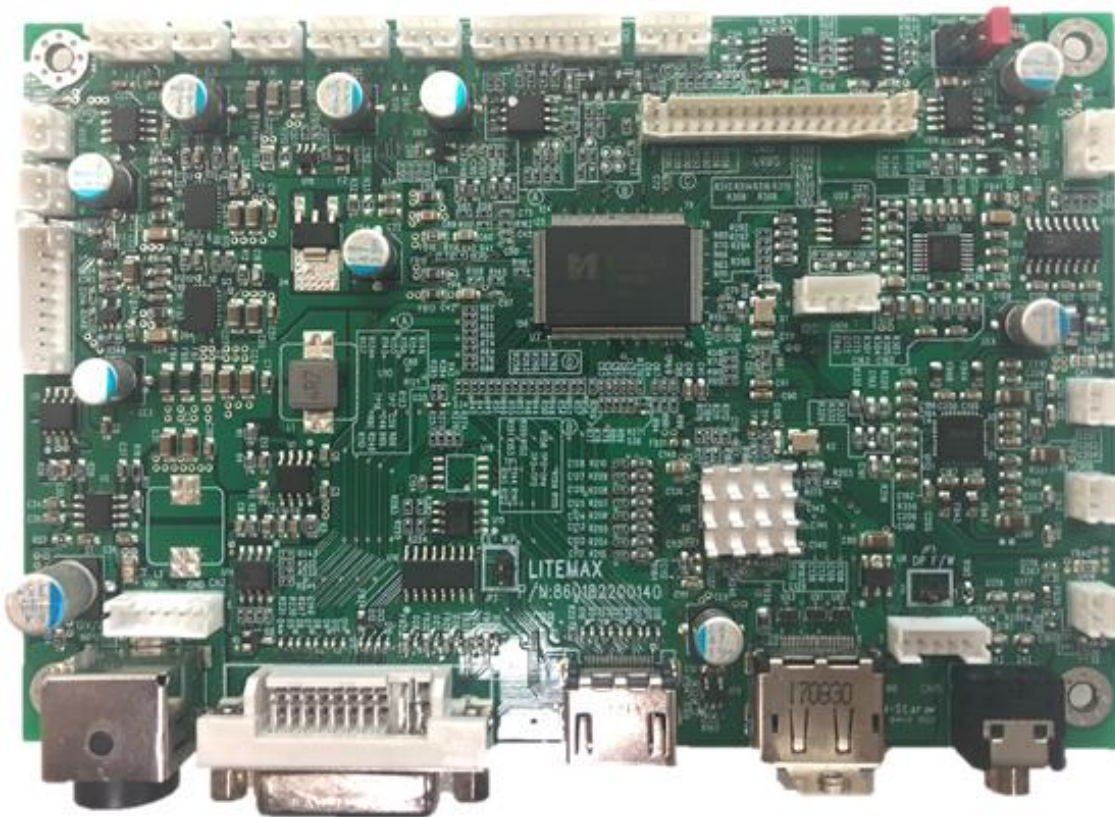
1. CN1: LVDS Interface Connector To Be HRS DF19K-30P-1H(54)
2. CN2: LED Driver Connector To Be HRS DF19G-8P-1H(54)
3. User Hole Maximun Insertion Depth Is 2.5mm
4. Unspecified Tolorance To Be ±0.5mm

6 AD8220GDHPAR Board & OSD Functions

AD8220GDHPARA is a high integrated display controller solution for producing real time, top quality digital video and computer graphic images on LCD panel. The AD8220GDHPARA provides an ideal interface between industry standard digital graphics controllers and a wide variety of LCD panel devices.

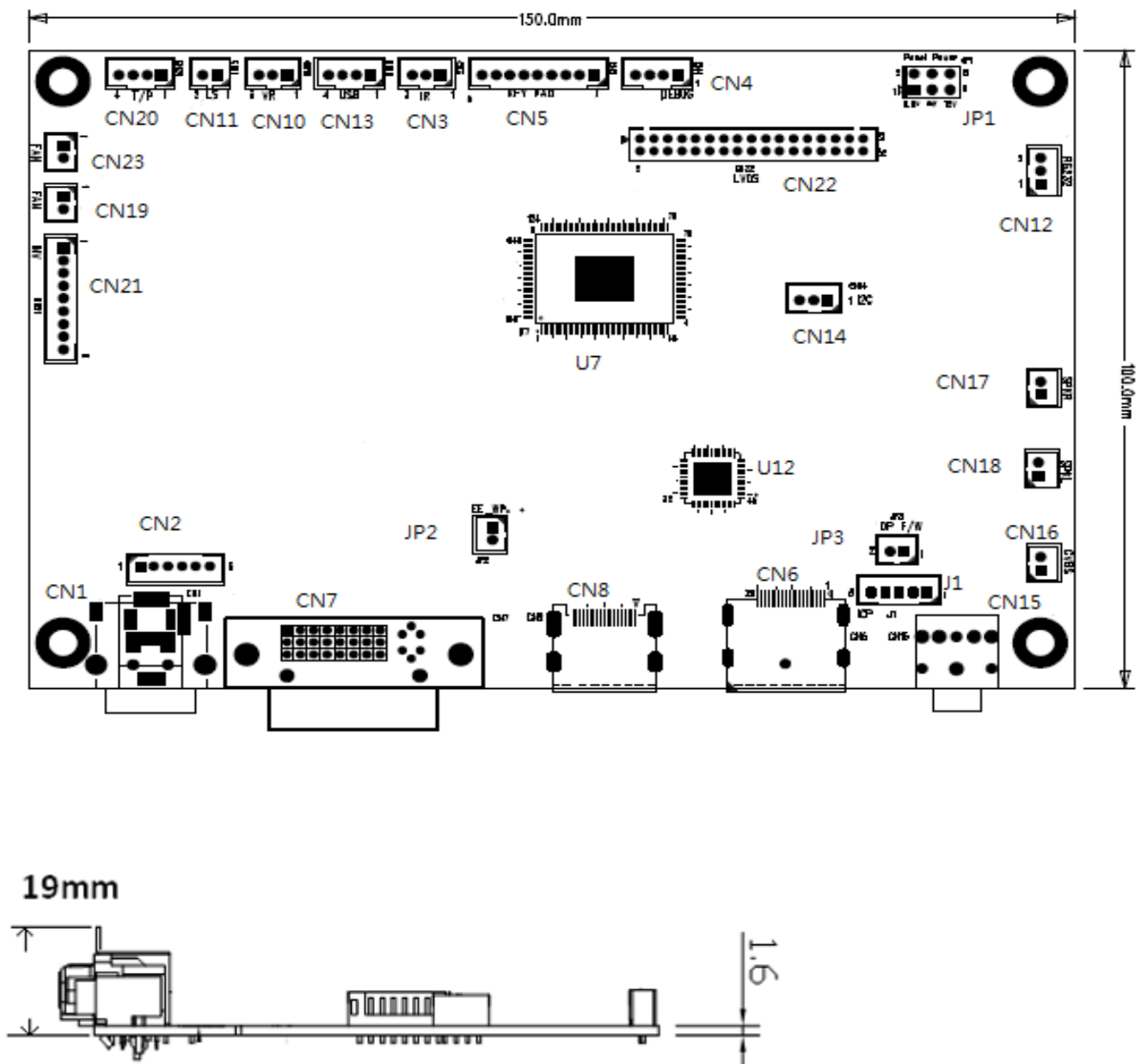
6.1 General Description

- Max resolution FHD(1920x1080)
- Analog RGB Input up to 205MHz
- ULTRA-RELIABLE DVI-I INPUT
- HDMI INPUT(HDMI 1.4)
- Dual/single LVDS interface
- Support Panel DC5V or 12V,3.3V 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 1.2)
- Audio in and 5Wx2 (4 Ω)Audio Out(optional)
- *External V.R. brightness control (optional)
- *External light sensor brightness control (optional)
- Support output voltage 12V(1A) and 5V(1A)



6.2 Outline Dimensions

AD8220 150mm x 100mm



6.3 AD8220GDHPAR Board Pin Define

CN22: 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	RxE4-
9	RxO3-	26	RxE4+
10	RxO3+	27	GND
11	RxO4-	28	GND
12	RxO4+	29	Pull Low
13	GND	30	Pull Height
14	GND	31	VLCD
15	RxE0-	32	VLCD
16	RxE0+	33	VLCD
17	RXE1-	34	VLCD

CN7: 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		

CN6: 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

CN8: 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/24V)

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

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

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

CN20: Touch Power connector

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

CN21: 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	12/24INV
3	BRIGHT	Dimming adjust	8	12VDC	12/24INV
4	GND	GND	9	12VDC	12/24INV
5	GND	GND			

CN19, CN23: Fan control (2PIN 2.0mm)

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

CN5: 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	GND
5	UP KEY		

JP1: Panel Power

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

CN12: RS232 Connector (3PIN 2.0mm)

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

CN15:LINE IN (Earphone Jack)

Pin No.	Function	Pin No.	Function
1	GND	4	GND
2	AUDIO-R	5	AUDIO-L
3	GND		

CN16: CVBS connector (2PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	CVBS IN	2	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-

CN10: VR connector (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	3,3VDC	2	VR Out
3	GND		

CN11: Ambient (2PIN 2.0mm)

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

CN3: IR connector (3PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	IR VCC	2	GND
3	IR		

CN13: USB Connector (4PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	USB 5V	2	D-
3	D+	4	GND

For update F/W

CN14: I2C Connector (3PIN 2.0mm)

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

For digital LS

J1: ICP Connector (5PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	NC	2	MCU_OP
3	GND	4	MCU_P71
5	MCU_P70		

For update U12 FW

JP3: ICP Jumper (2PIN 2.0mm)

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

When U12 F/W wan to update it must be short .

JP2: EDID Jumper (2PIN 2.0mm)

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

When EDIE wan to update it must be short .

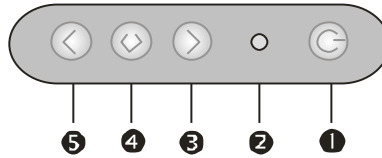
CN4: Debug Connector (4PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	3.3V	2	UART-TX
3	UART-RX	4	GND

For F/W debug

6.4 OSD Function

MEMBRANE CONTROL BUTTOM



① POWER SWITCH: Pushing the power switch will turn the monitor on. Pushing it again to turn the monitor off.

② Power LED: Power ON-Green / Power off-No.

③ Up Key >: Increase item number or value of the selected item.

④ 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.

⑤ 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

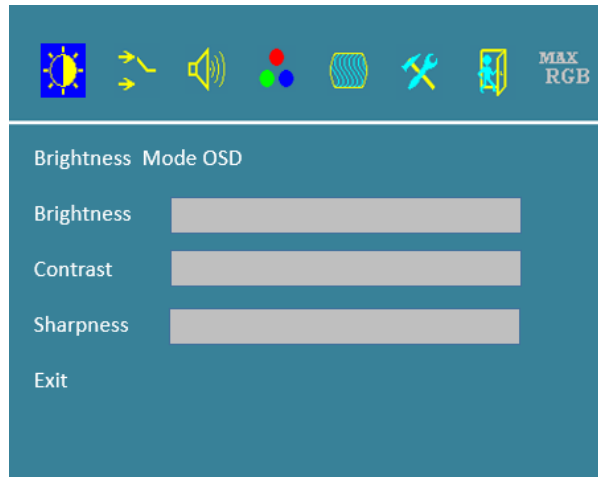
After finishing the adjustment, push the SELECT button to memorize the setting.

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 8 sub menus within the OSD user interface:

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

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 **Brightness Mode 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:

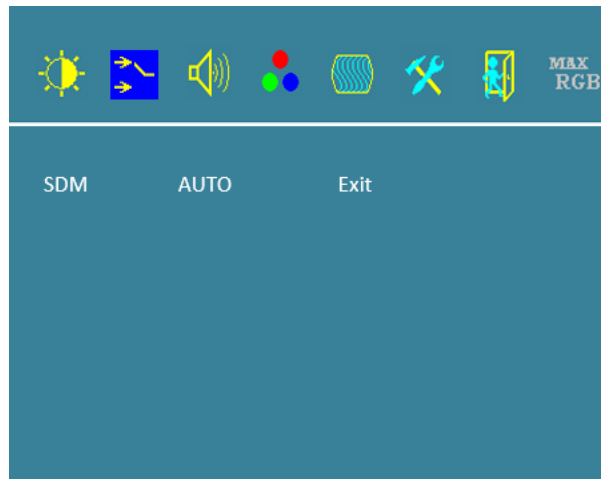
Press “menu” and “right” buttons to adjust the contrast from “0” to “100”. To adjust from “100” to “0”, press “menu” and the “left” buttons.

Sharpness:

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

Exit: back to the beginning menu.

Source:

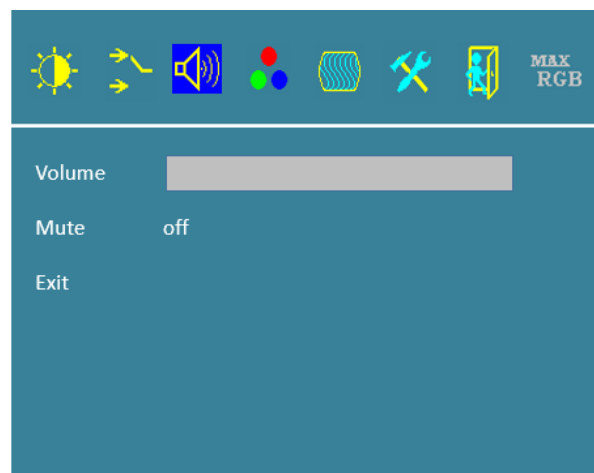


SDM: Intel® Smart Display Module (SDM)

AUTO: Auto adjustment

Exit: back to the beginning menu.

Sound:

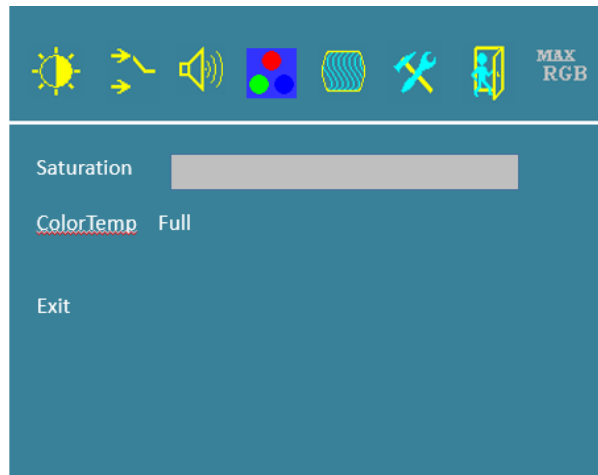


Volume: volume adjustment.

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

Exit: back to the beginning menu.

Colors:



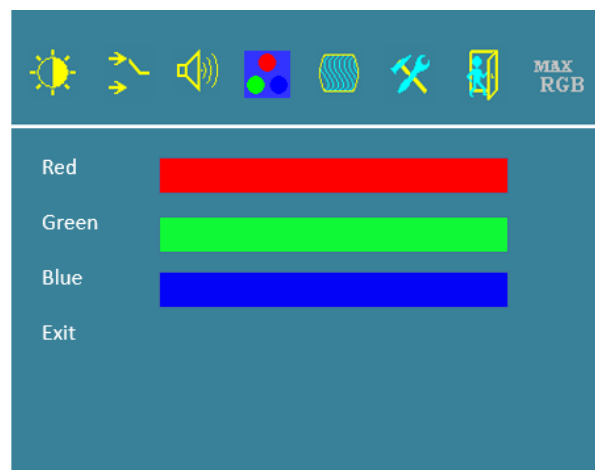
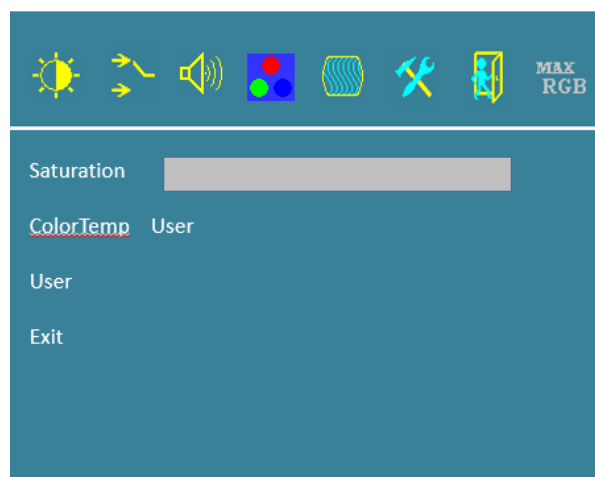
Saturation: You can adjust the saturation using this function.

ColorTemp:

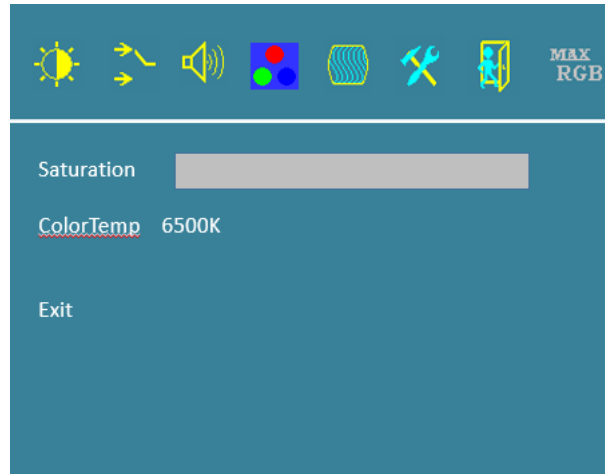
When you press the “menu” button, you enter the “Color” sub directory. In this directory, you will see 4 selections:

Full : Default is all open

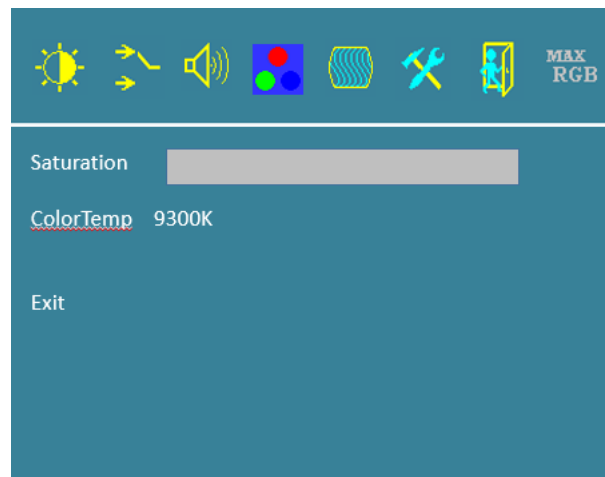
User : press ColorTemp User, then chose User. You can adjust “R”, “G”, and “B” by yourself



6500K: Warm color scheme

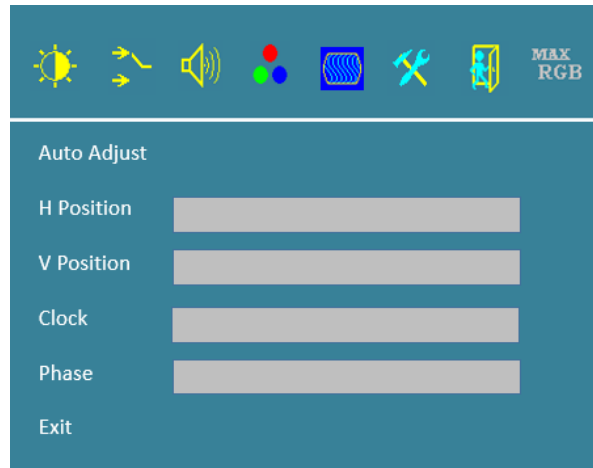


9300K: Cold color scheme



Exit: back to the beginning menu.

Image:



H Position: You can shift the screen horizontally using this function.

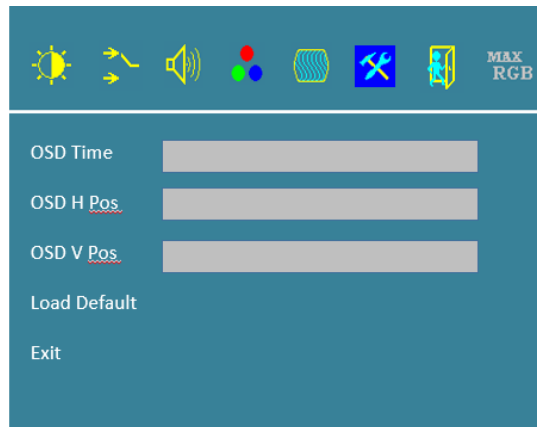
V Position: You can shift the screen vertically using this function.

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..

Exit: back to the beginning menu.

Tools:

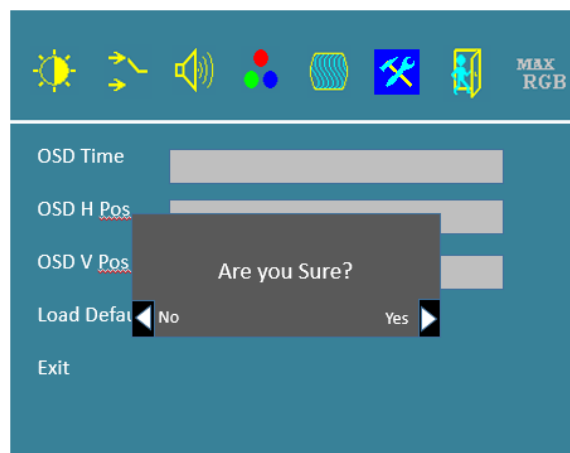


OSD_Time: Select time for the OSD user interface to stay on screen, for 2 sec. to 16 sec. Default is 6 sec.

OSD H Pos: Moves the OSD user interface horizontally on screen.

OSD V Pos: Moves the OSD user interface vertically on screen.

Load Default: By pressing this, the screen will load to initial default value



Exit: back to the beginning menu



mean DLF/H1335 is nonMAXRGB model.

OSD Lock Function :

It is possible to lock all the OSD buttons to prevent unauthorized changes to occur by pressing “**Left <**” and “Menu” buttons simultaneously. You will see the “lock” icon below on the center of the screen for 2 ~ 16 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 “Menu”. The below icon will appear on the center of the screen for 2 ~ 16 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.