LITEMAX
Sunlight Readable LCD!

ENRICH YOUR VISUAL WORLD...

DURApixel™ by LITEMAX Wide Temp LED Backlight

RoHS·WEEE LITEMAX COMPLIANT

LITEMAX
DLD1015-V

Sunlight Readable 10.1” LED B/L LCD

(1st Edition 2015/05/29)

All information is subject to change without notice.

Approved by	Checked by	Prepared by

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RECORD OF REVISION

Version	Date	Description	Remark
V1.0	May,29,2015	Initial Release	

CONTENTS

1.0 GENERAL DESCRIPTION

OVERVIEW

The DLD1015-V is a 10.1 inch color TFT-LCD display with special aspect ratio 16:9 and wide resolution 1024 x 600. It is Litemax's Durapixel series product which designed for high brightness 1000 nits display, power efficiency LED backlight system. The DLD1015-V build in AD board supports input ports VGA.

Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with 8-bit gray scale signal for each dot. It is intended to support display where wide viewing angle, high color saturation, and high color depth.

FEATURES

- Sunlight Readable
- LED Backlight
- High Shock & Vibration Resistance
- Low Power Consumption
- Wide Operation Temp. (-20℃~70℃)
- High Uniformity
- Low EMI Noise
- Wide Dimming
- Life Expectancy

APPLICATION

- Transportation
- Advertising
- POS
- Marline
- Gaming
- Studio display
- Gas pump

GENERAL SPECIFICATI0NS

Model No.	**DLD1015-V**
Description	10.1" TFT LCD, LED Backlight 1000nits, WSVGA
Display Area (mm)	222.7 x 125.3 mm
Brightness	1000 cd/m^2
Resolution	1024 x 600 (WSVGA)
Contrast Ratio	900 : 1
Pixel Pitch (mm)	0.2175(H) x 0.2088(V)
Viewing Angle	+80°~-80°(H), +80°~-80°(V)
Display Colors	16.7M
Response Time (Typical)	16ms (Typical)
Sync	LVDS
Power Consumption	6.36W
Dimensions (mm)	244.0(H) X 148.2(V) X 36.5(B) mm
Weight (Net)	0.7kg

※ Specifications subject to change without notice.

DLD= Panel+LED Driving Board+Control Board

2.0 ABSOLUTE MAXIMUM RATINGS

ABSOLUTE RATINGS OF ENVIRONMENT

Table 1 Electrical Absolute Rating

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Supply Voltage	V_{IN}	-0.3	3.96	V	Logic power supply voltage
		-0.3	12	V	LED Driver Vin
Power Supply Fuse Current Setting	I_{FUSE}	-	1.5	A	Vin from10% ~ 90% · rise time 500us
Input Signal	V_S	-	3.6	V	LVDS signals
EN/PWM Voltage	V_{PWM}	-0.3	12	V	EN/PWM Voltage

Table 2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	-20	70	℃	(1) (2) (3) (4)
Operating Humidity	HOP	10	85	%RH	-
Storage Temperature	TST	-30	80	℃	-
Storage Humidity	HST	10	90	%RH	-

Note (1): Humidity: 85%RH Max. (T<=40℃) Note static electricity. Maximum wet bulb temperature at 39℃ or less. (T>40℃) No condensation.

Note (2): There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at 60~70℃ or -20~0℃.

Note (3): There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60% or more).

Note (4): In the operating temperature item, the low temperature side is the ambient temperature regulations. The high temperature side is the panel surface temperature regulations.

3.0 ELECTRICAL SPECIFICATION

3.1 ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
System Power Supply						
Input Power Supply Voltage	V_{IN}	3.0	3.3	3.6	V	
Input Power Supply Current	I_{VIN}	-	-	217	mA	Black pattern · 60Hz
Input Inrush Current	I_{RUSH}	-	-	1.5	A	0.5ms rise time (10%~90%)
Input Power Voltage Ripple	V_{RPL}	-	-	200	mV	Vp-p
LVDS Signals						
Differential Input High Threshold	V_{th}	-	-	+100	mV	V_{cm}=+1.2V
Differential Input Low Threshold	V_{tl}	-100	-	-	mV	V_{cm}=+1.2V
Magnitude Differential Input Voltage	$\|V_{id}\|$	200	-	600	mV	
Common Mode Voltage	V_{cm}	1.0	1.2	1.4	V	V_{th} - V_{tl} = 200mV
Common Mode Voltage Offset	ΔV_{cm}	-50	-	+50	mV	V_{th} - V_{tl} = 200mV
EDID Power Supply						
Input Power Supply Voltage	V_EDID	3.0		3.6	V	

Note: A. Input signals shall be low or Hi-Z state when VIN is off.

B. All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

C. White Pattern at 3.3V driving voltage.

3.2 Interface Connections

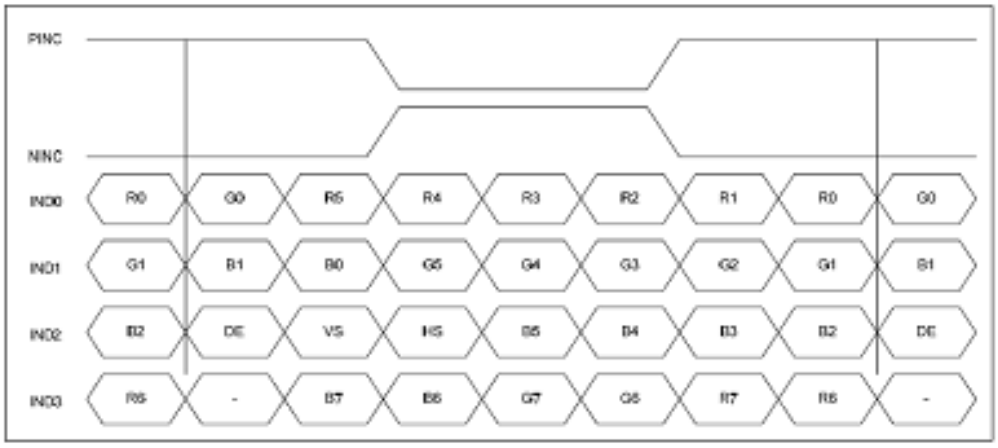
Pin #	Signal Name	Description	Remarks
1	BIST	BIST MODE SELECT(High Enable)	FOR INTERNAL TEST
2	VDD	LCD power supply (Typ. +3.3V)	
3	VDD	LCD power supply (Typ. +3.3V)	
4	V_EDID	EDID power supply	
5	NC	No connection	
6	CLK_EDID	EDID CLK signal	
7	Data_EDID	EDID Data signal	
8	LVDS input 0-	LVDS CH0 data signal(-)、R0～R5、G0	
9	LVDS input 0+	LVDS CH0 data signal(+)、R0～R5、G0	
10	GND	GND	
11	LVDS input 1-	LVDS CH1 data signal(-)、G1～G5、B0、B1	
12	LVDS input 1+	LVDS CH1 data signal(+)、G1～G5、B0、B1	
13	GND	GND	
14	LVDS input 2-	LVDS CH2 data signal(-)、B2～B5、DE	
15	LVDS input 2+	LVDS CH0 data signal(+)、B2～B5、DE	
16	GND	GND	
17	LVDS CLK -	LVDS CLK data signal(-)	
18	LVDS CLK +	LVDS CLK data signal(+)	
19	GND	GND	
20	LVDS input 3-	LVDS CH3 data signal(-)、R6~R7、G6~G7、B6~B7	
21	LVDS input 3+	LVDS CH3 data signal(-)、R6~R7、G6~G7、B6~B7	
22	GND	GND	
23	NC	No connection	
24	NC	No connection	

25	GND	GND	
26	NC	No connection	
27	NC	No connection	
28	GND	GND	
29	NC	No connection	
30	NC	No connection	
31	GND	GND	
32	GND	GND	
33	GND	GND	
34	NC	No connection	
35	PWM	LED dimming signal	
36	LED_EN	LED Enable signal	
37	NC	No connection	
38	VLED	LED power supply (Typ. 5V)	
39	VLED	LED power supply (Typ. 5V)	
40	VLED	LED power supply (Typ. 5V)	

3.3 Signal Timing Specification

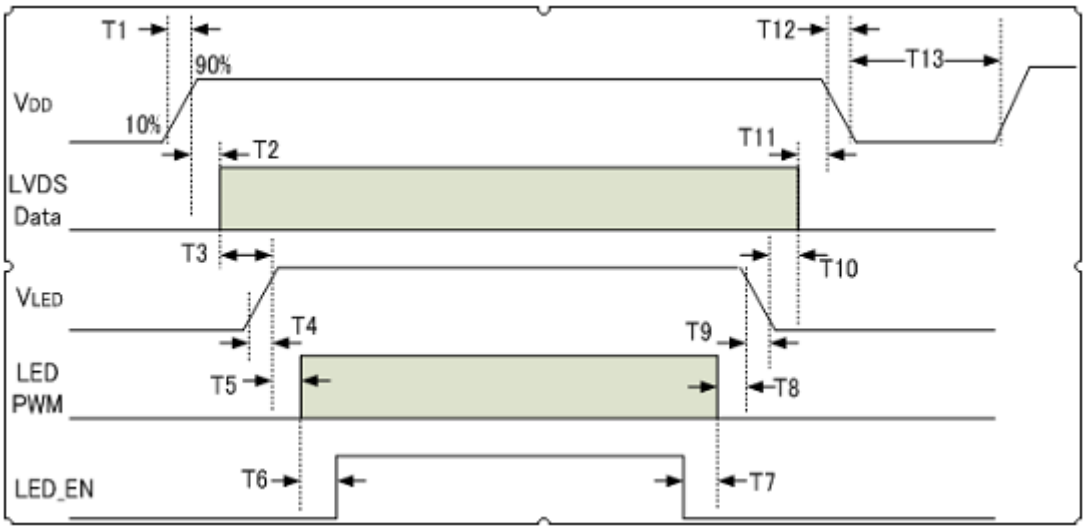
Synchronization Method : DE only

Parameter	Symbol	Unit	Min.	Typ.	Max.
LVDS Clock Frequency **<single>**	f_{dck}	MHz	45	51.2	65
H Total Time	T_{hp}	clocks	1,324	1,344	1,364
H Active Time	HA	clocks	1,024	1,024	1,024
H Blanking Time	TH_{BLANK}	clocks	300	320	340
V Total Time	T_{vp}	lines	615	635	645
V Active Time	VA	lines	600	600	600
V Blanking Time	TV_{BLANK}	lines	15	35	45
V Frequency	f_v	Hz	55	60	65



3.5 Power Consumption

Item	Symbol	Min.	Typ.	Max.	Units	Note
Input Power Supply Voltage	V_{IN}	3.0	3.3	3.6	V	
Input Power Supply Current	I_{VIN}	-	-	217	mA	Black pattern · 60Hz
Input Inrush Current	I_{RUSH}	-	-	1.5	A	0.5ms rise time (10%~90%)
Input Power Voltage Ripple	V_{RPL}	-	-	200	mV	Vp-p



Power Sequencing Requirements

Parameter	Symbol	Unit	min	Typ.	max
VDD rising Time	T1	ms	0.5	--	10
VDD Good to Signal Valid	T2	ms	30	--	90
Signal Valid to Backlight on	T3	ms	200	--	--
Backlight Power on time	T4	ms	0.5	--	--
Backlight VDD Good to System PWM on	T5	ms	10	--	--
System PWM on to Backlight Enable on	T6	ms	10	--	--
Backlight Enable off to System PWM off	T7	ms	0	--	--
System PWM off to B/L Power Disable	T8	ms	10	--	--
Backlight Power off time	T9	ms	1	10	30
Backlight off to signal Disable	T10	ms	200	--	--
Signal Disable to Power Down	T11	ms	0	--	50
VDD Falling Time	T12	ms	1	10	30
Power Off	T13	ms	500	--	--

4.0 LED Driving Board

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,Vadj=5V	0	-----	-----	mA	
Input Current (High Brightness)	IinH	VIN=12V,Vadj=0V	0.36	0.31	0.27	A	
LED Current (Low Brightness)	IoutL	VIN=12V,Vadj=5V	0	-----	-----	Arms	
LED Current (High Brightness)	IoutH	VIN=12V,Vadj=0V	138	140	145	mA	
Working Frequency	Freq	VIN=12V,Vadj=0V	230	235	240	KHz	
Brightness Control	Vadj	Connection of Voltage	0.2	-----	4.8	V	
ON/OFF Control	Von	Normal Operation	2	-----	5	V	
	Voff		0	-----	0.8		
Output Voltage	Vout	VIN=12V,Vadj=0V	22.8	23.12	23.5	V	
Efficiency	η	VIN=12V,Vadj=0V	86.5	87.0	89.8	%	

Environment

Operation Temperature	-20 ~ 70℃
Operation Humidity	% Max.RH
Storage Temperature	-40 ~ 85℃
Storage Humidity	% Max.RH

Connector Socket

4-1. Input Connector :J1 (JST S 8B-PH-SM3-TB or Compatible)

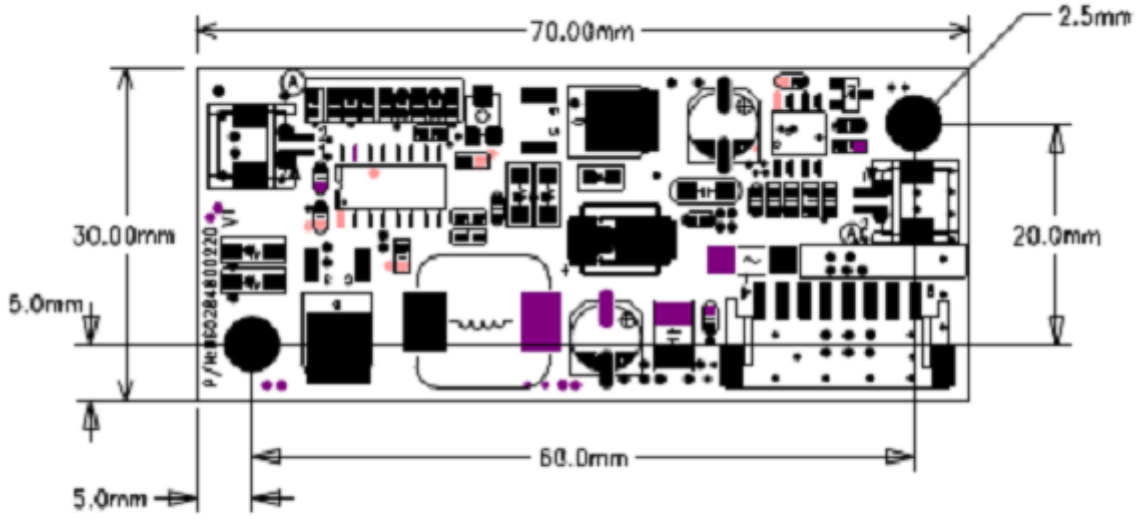
PIN No	Symbol	Description
1	Vin	DC+12V
2	Vin	DC+12V
3	Vin	DC+12V
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	Brightness	Brightness Control
8	Control	ON/OFF Control

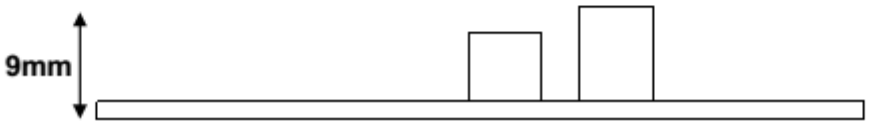
4-2 .Output Connector :J2,J3 (JST S 2B-ZR-SM3A-TF or Compatible)

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

Mechanical Characteristics

Dimension: 70mm*30mm*9mm



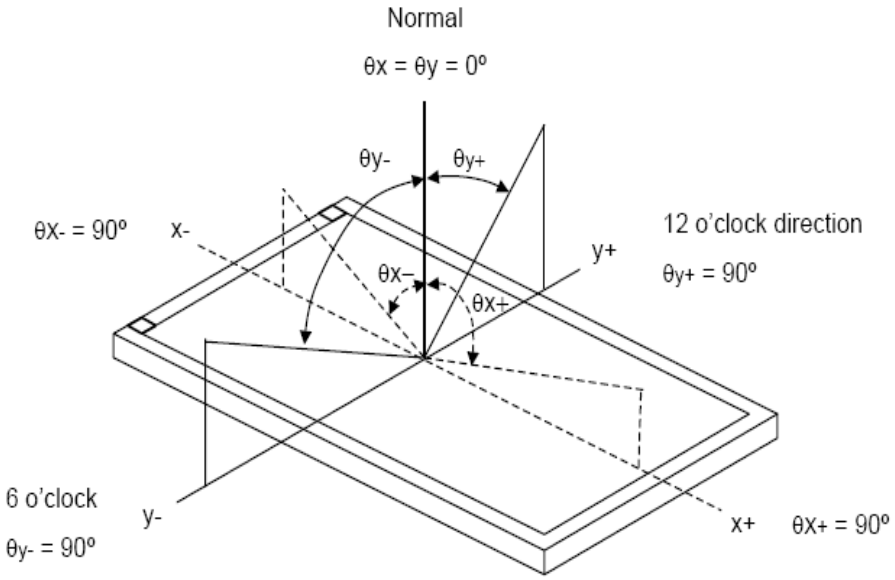


5.0 OPTICAL CHARACTERISTICS

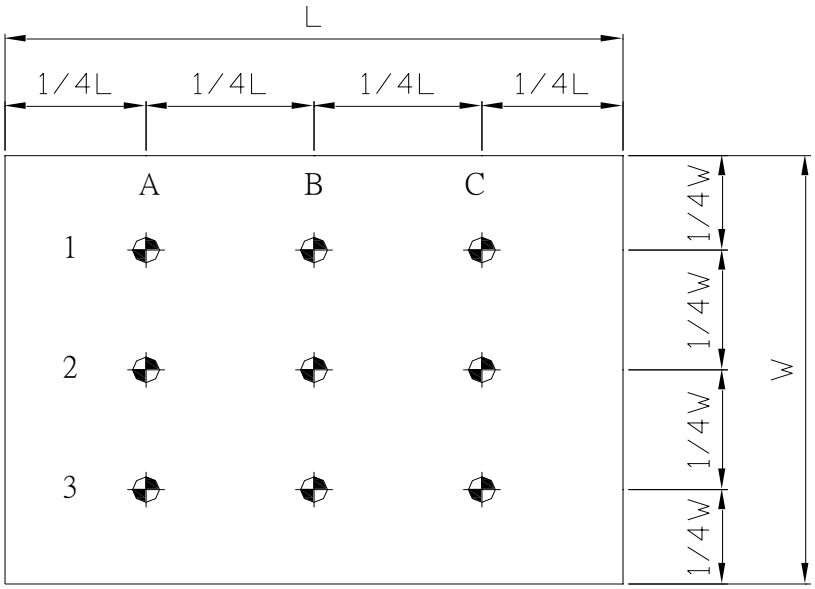
Item		Symbol	Condition	Data	Unit	Note
Color chromaticity	Red	Rx	θx=0 θy=0 BM-7	0.585	-	Test Mode：(1)(2)(3)
		Ry		0.353	-	
	Green	Gx		0.337	-	
		Gy		0.584	-	
	Blue	Bx		0.154	-	
		By		0.118	-	
	White	Wx		0.310	-	
		Wy		0.320	-	
Luminance of White		Lc		1000	cd/㎡	
Uniform		Lu		86	%	
Contrast Ratio		CR	θx=0 θy=0 Klein K-10	950:1	-	Test Mode：(1)(4)
Color Saturation		NTSC		49	%	
Viewing Angle	Horizontal	θx+	CR≧10	80	Deg	Test Mode：(1)(3)
		θx-		80		
	Vertical	θy+		80		
		θy-		80		

Test Mode：

（**1**） Definition of Viewing Angle（ θ x，θ y）：

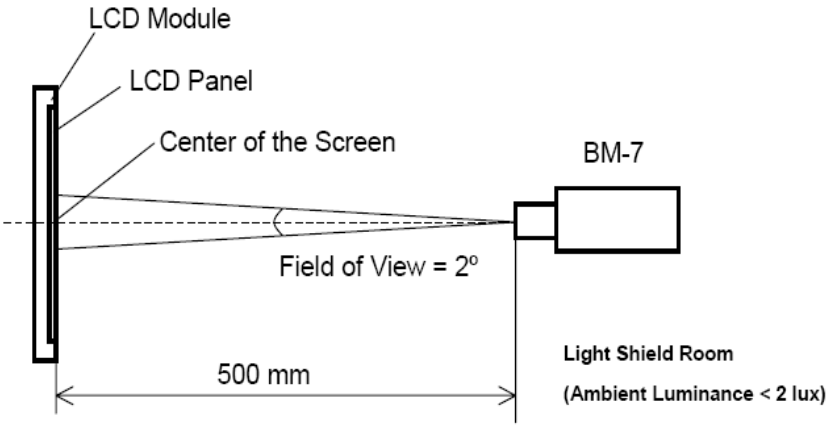


（**2**） Definition of Test Point：

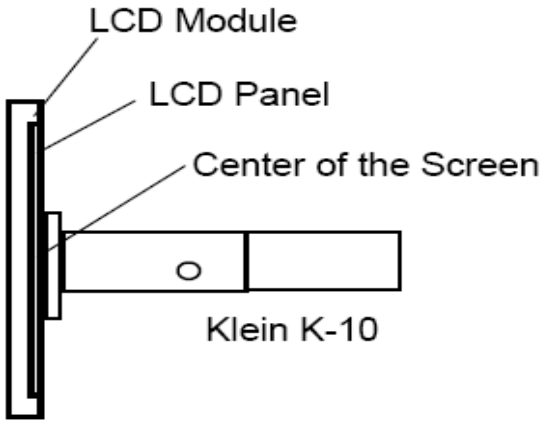


Active Area

（3）**BM-7** Measurement Setup**:**



（4）**Klein K-10** Measurement Setup**:**

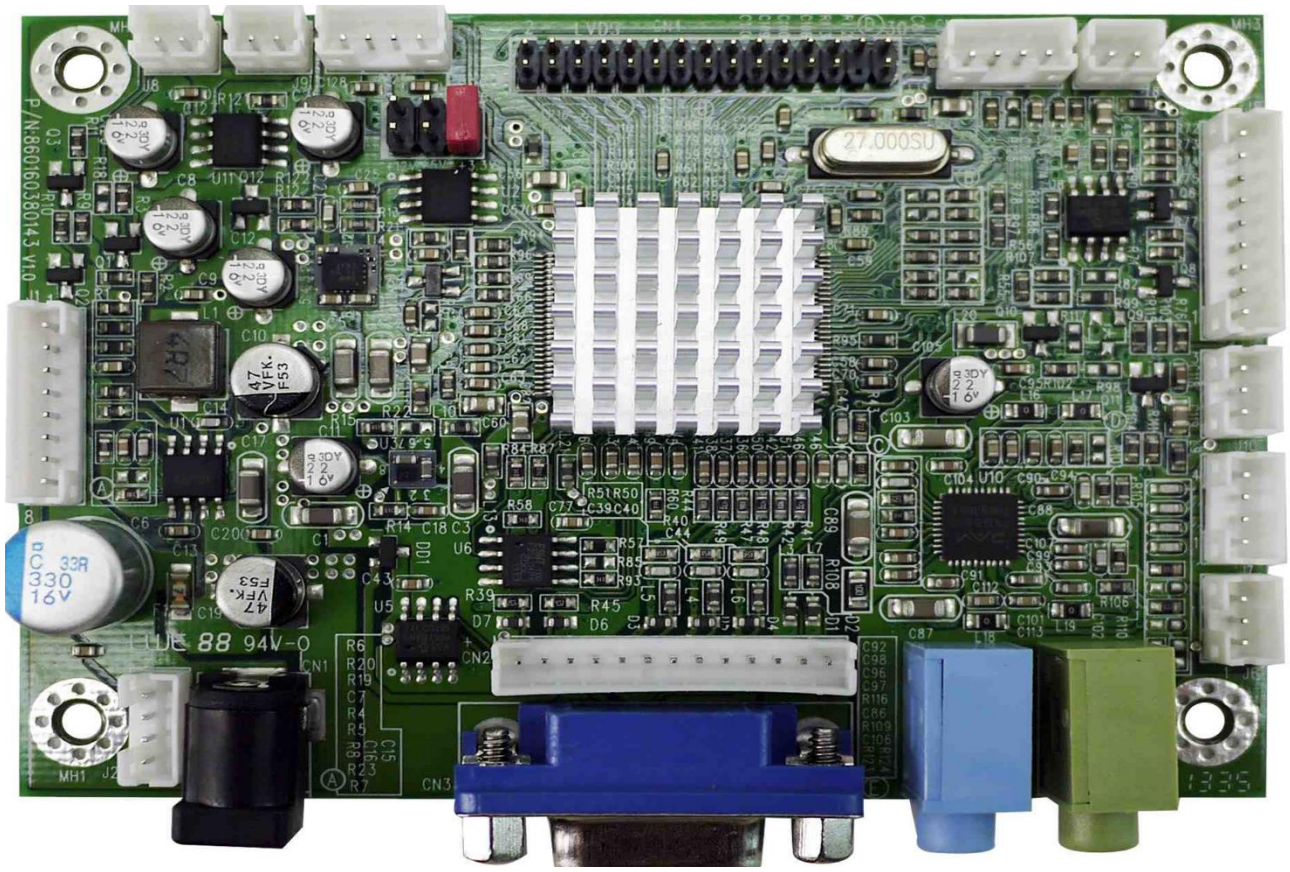


6.0 AD6038GA Board

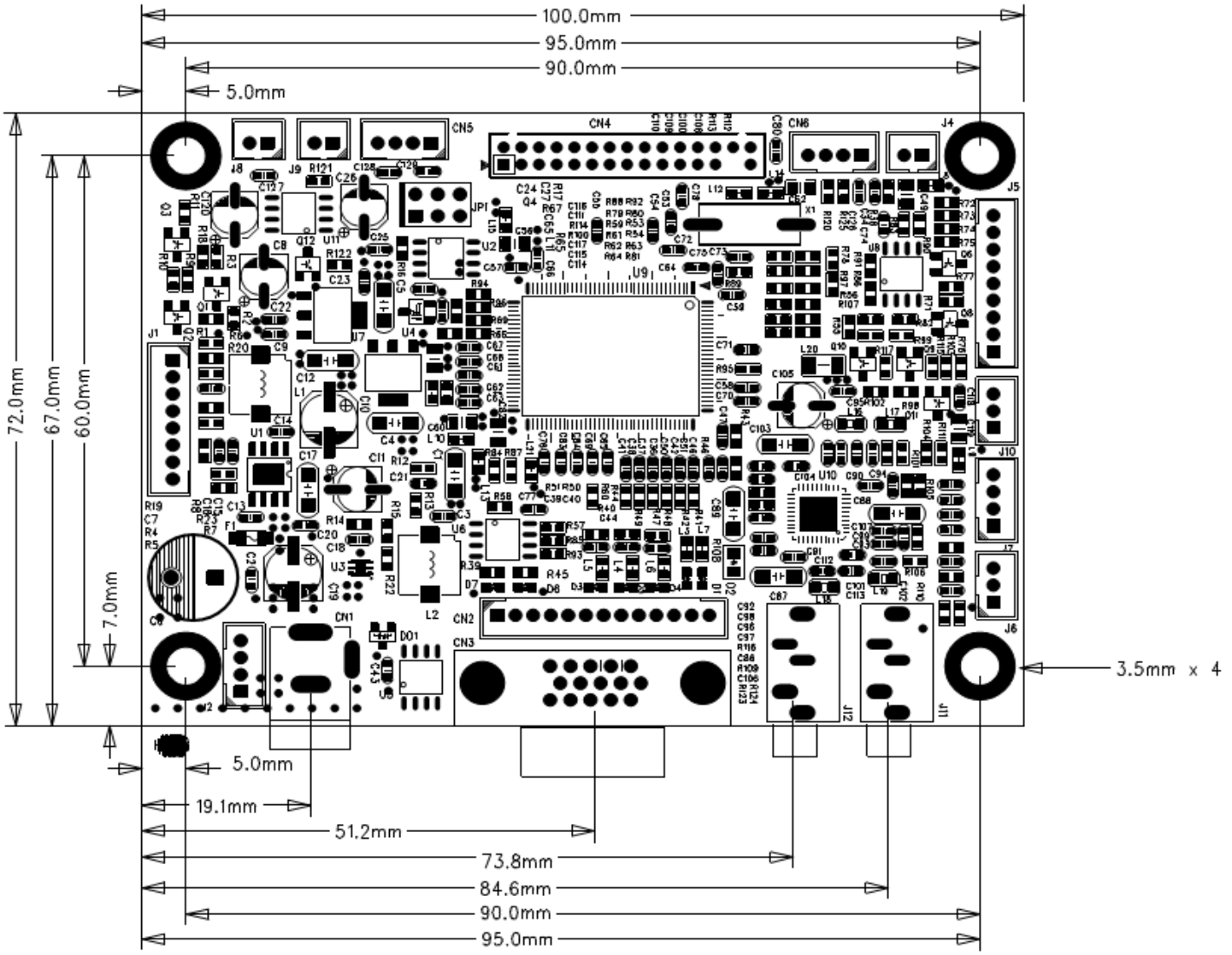
We developed this A/D board to support industrial high brightness and commercial applications. This A/D board has many functions. It has a display port and DVI-D input. Rev.1 is European RoHS compliant.

General Description

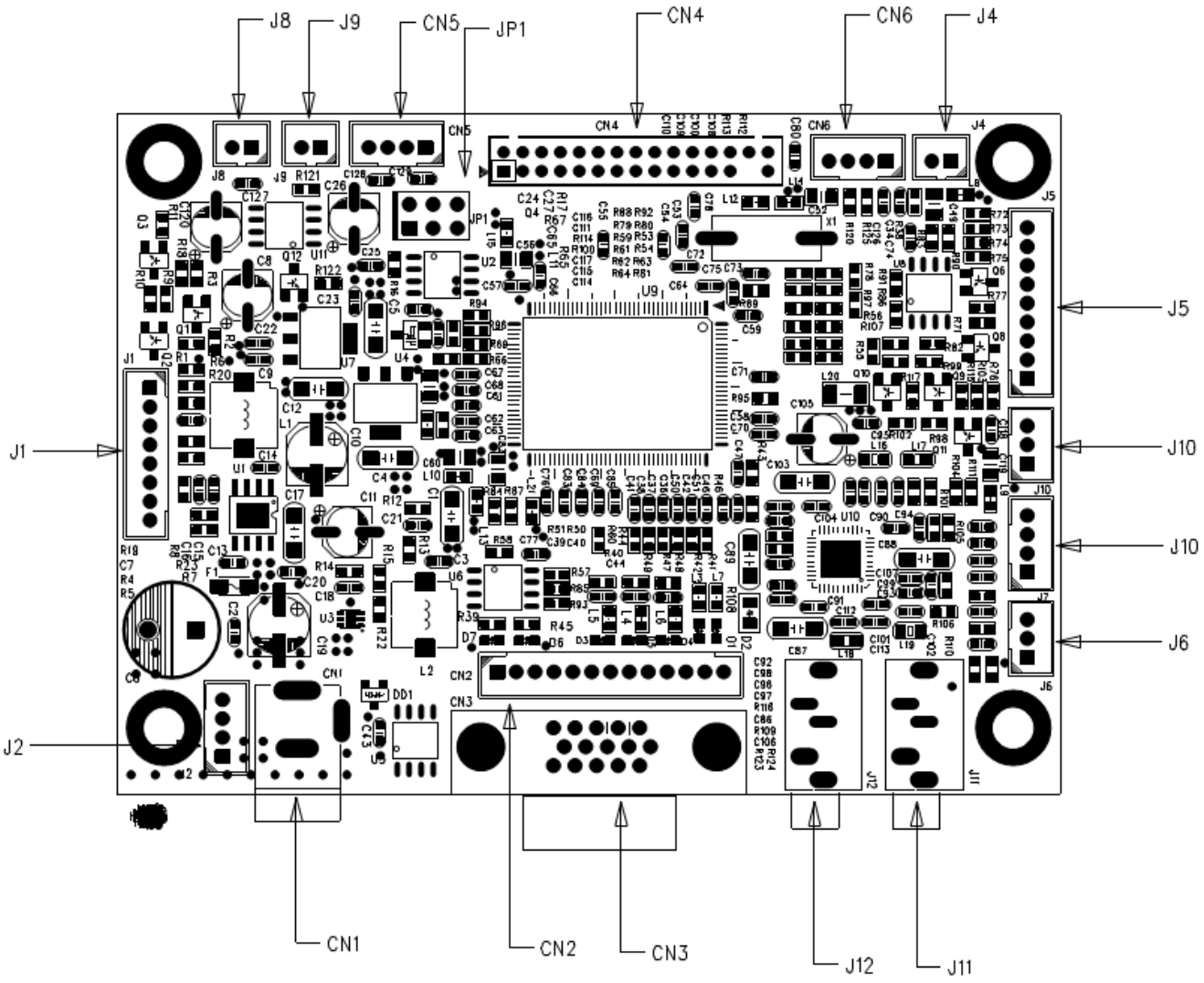
- Max Resolution Up To WUXGA+
- Analog RGB Input up to 205MHz
- Support Panel DC5V or 12V,3.3V Output
- OSD Control
- Inverter Analog or PWM Dimming Control.
- Input Power 12Vdc
- Audio in and 3Wx2 Audio Out(optional)
- *External V.R. brightness control (optional)
- *External light sensor brightness control (optional)
- *External IR control (optional)
- External Fan Control by Software
- Support external power 5V and 12V



AD6038GA 100mmX72mm



AD6038GA Board Pin Define



CN4: Panel connector

Pin No.	Function	Pin No.	Function
1	RxO0-	16	RxE1+
2	RxO0+	17	RxE2-
3	RxO1-	18	RxE2+
4	RxO1+	19	RxEC-
5	RxO2-	20	RxEC+
6	RxO2+	21	RxE3-
7	RxOC-	22	RxE3+
8	RxOC+	23	GND
9	RxO3-	24	GND
10	RxO3+	25	GND
11	GND	26	GND

12	GND	27	NC
13	RxE0-	28	PANEL-VCC
14	RxE0+	29	PANEL-VCC
15	RxE1-	30	PANEL-VCC

CN3: Analog RGB Input connector (D-SUB 15Pin)

Pin No.	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	VGA_CAB	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			

CN2: Analog RGB Input connector (13pin connector)

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

CN1: Power Jack (12V)

Pin No.	Function	Pin No.	Function
1	12VDC	2	GND
3	GND		

J2: Power Connector (12V)

Pin No.	Function	Pin No.	Function
1	GND	2	GND
3	12VDC	4	12VDC

CN5: Touch Power connector

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

J1: Inverter Connector(8PIN 2.0mm)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	ON/OFF	Backlight ON/OFF	5	GND	GND
2	BRIGHT	Dimming adjust	6	12VDC	Input 12VDC
3	GND	GND	7	12VDC	Input 12VDC
4	GND	GND	8	12VDC	Input 12VDC

J5: 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		

J8, J9: Fan control (2PIN 2.0mm)

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

JP1: Panel Power

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

J6: Audio connector (3PIN 2.0mm)

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

J12: Audio Line in

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

J11: Audio Line OUT

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

J7: Speaker Connector (4PIN 2.0mm)

Pin No.	Function	Pin No.	Function
1	SPK_R+	2	SPK_R-
3	SPK_L-	4	SPK_L+

CN6: RS232 Connector(Need converter BD) (For Scaler Debug)

Pin No.	Function	Pin No.	Function
1	5v	2	UART TX
3	UART RX	4	GND

J10: VR connector (3PIN 2.0mm)

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

J4: Ambient (2PIN 2.0mm)

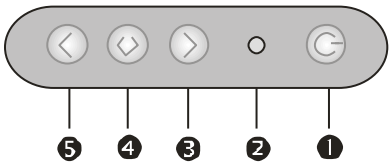
Pin No.	Function	Pin No.	Function
1	3.3VDC	2	Sensor Out

DC Characteristics.

Power Consumption	10W	Note1
Operation Temperature	0~70	℃
Storage Temperature	-20~85	℃

Note: These values are for the A/D board body.

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.

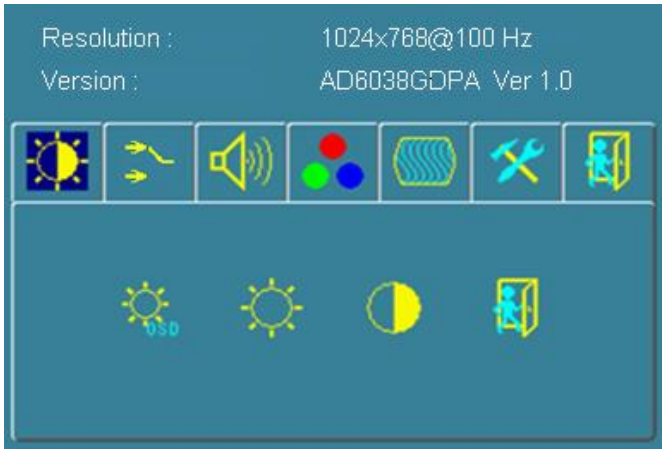
❺**Down Key <:** Decrease item number or item value when OSD is on.
When OSD is off, it is hot key for input switch between VGA, AV,
and S-video.

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.

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

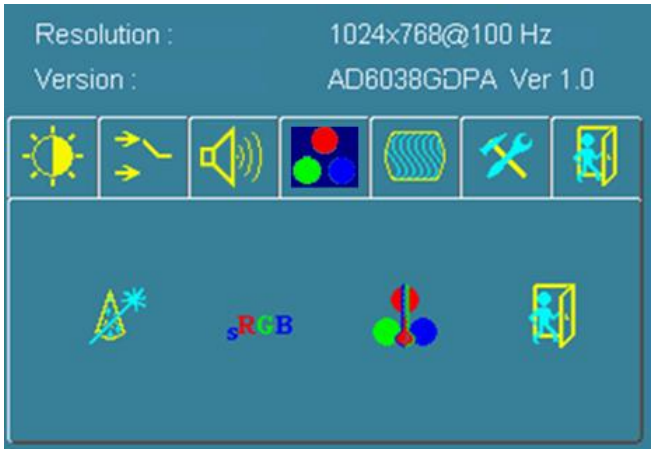
DP **DP:** DisplayPort input (Optional)

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

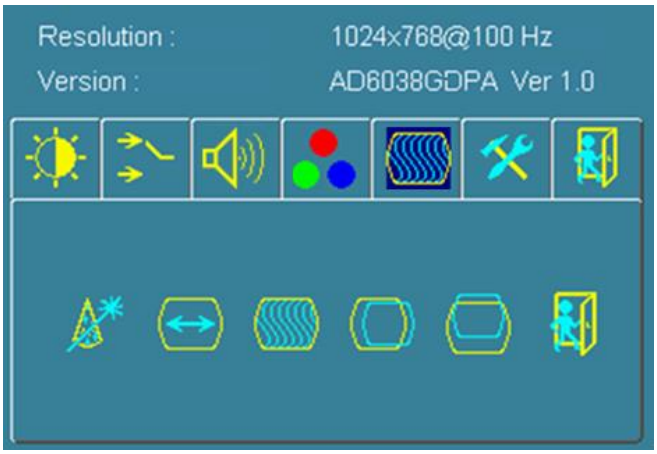
Color Temperature: You have 4 options in this selection
.

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 AD6038 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.

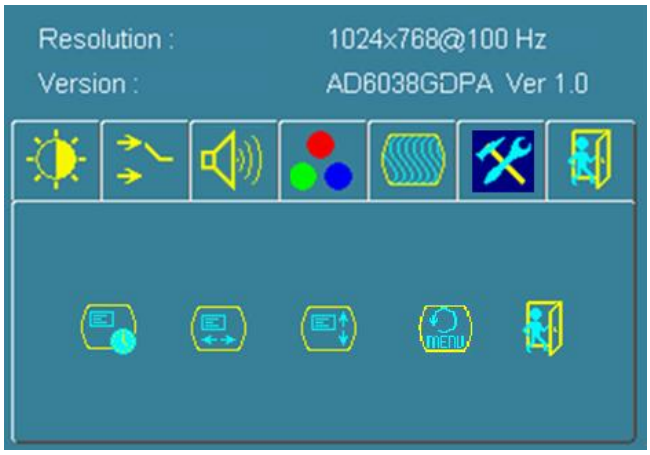
Phase: If "double images" appear around the characters, choose "Phase" to remove them..

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.

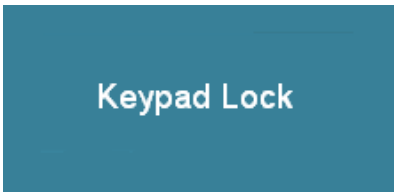
Sharpness: Sharpen characters.

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

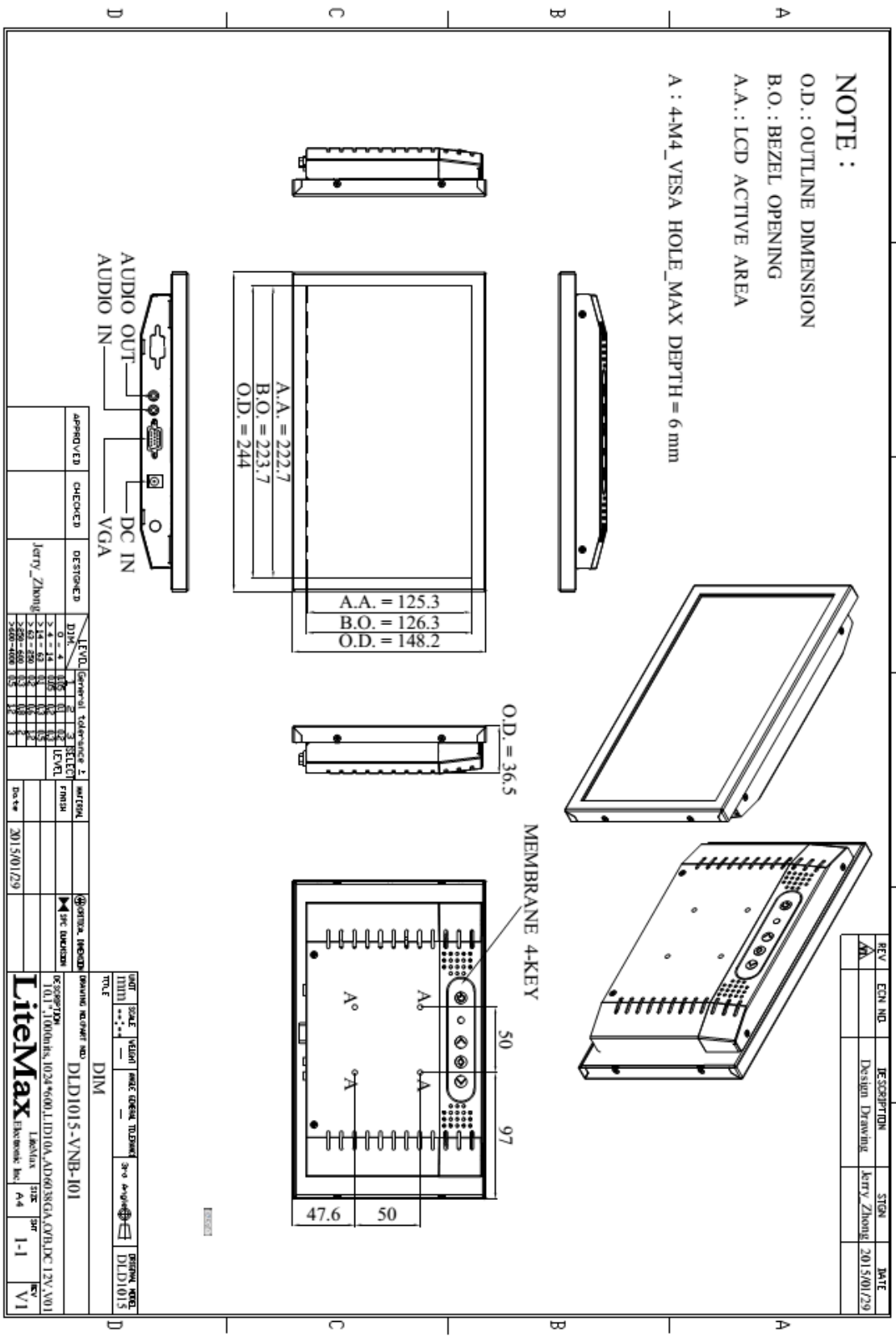
OSD Lock Function：

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.

7.0 MECHANICAL CHARACTERISTICS



8.0 PRECAUTIONS

HANDLING PRECAUTIONS

- The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- 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.
- Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- 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.
- Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- Do not disassemble the module.
- Do not pull or fold the lamp wire.
- Pins of I/F connector should not be touched directly with bare hands.

STORAGE PRECAUTIONS

- High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- It may reduce the display quality if the ambient temperature is lower than 10 ℃. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

OPERATION PRECAUTIONS

- Do not pull the I/F connector in or out while the module is operating.
- 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. MOS LSI chips from damage during latch-up.