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Service Manual

Mode Name:T241WHS

23.8” Color TFT LCD Display

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Operation Instructions

Thank you for purchasing this monitor, a high-resolution multi-scan color monitor.
Please read this guide thoroughly before installation.

FCC RADIO FREQUENCY INTERFERENCE STATEMENT WARNING: (FOR FCC CERTIFIED MODELS)

This monitor has been tested and found compliant with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide proper protection against harmful interference to a residential installation. This monitor generates, uses, and can radiate radio frequency energy. Harmful interference to radio communication may be led as a result if it's not properly installed and used. However, there is no guarantee that interference will not occur in a particular installation. If this monitor does cause serious interference to radio or television reception, resetting the monitor may determine it. Moreover, users are encouraged to correct interference by doing one or more of the following:

- Reorient or relocate the receiving antenna.
- Move the monitor and the receiver further away from each other.
- Connect the monitor into an outlet on a circuit different from that to which the receiver is connected.
- Consult your local dealer or an qualified technician.

FCC Warning:

To assure a continued FCC compliance, a user must use a grounded power supply cord and the provided shielded video interface cable with bonded ferrite cores. Also, any unauthorized changes or modifications to this monitor would void the user's authority to operate this device.

Note: If necessary, shielded interface cables and AC power cord must be used to meet the emission level limits.

Revision History

Revision	SM Editing Date	ECR Number	Description of Changes	Model

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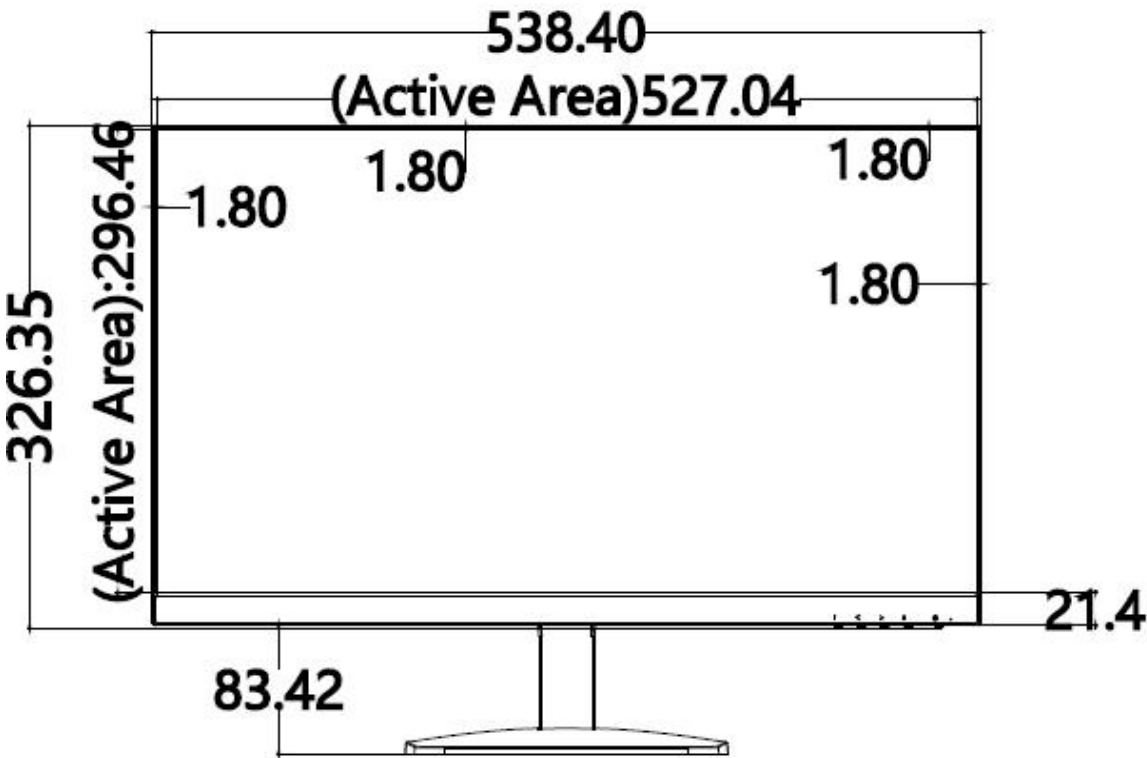
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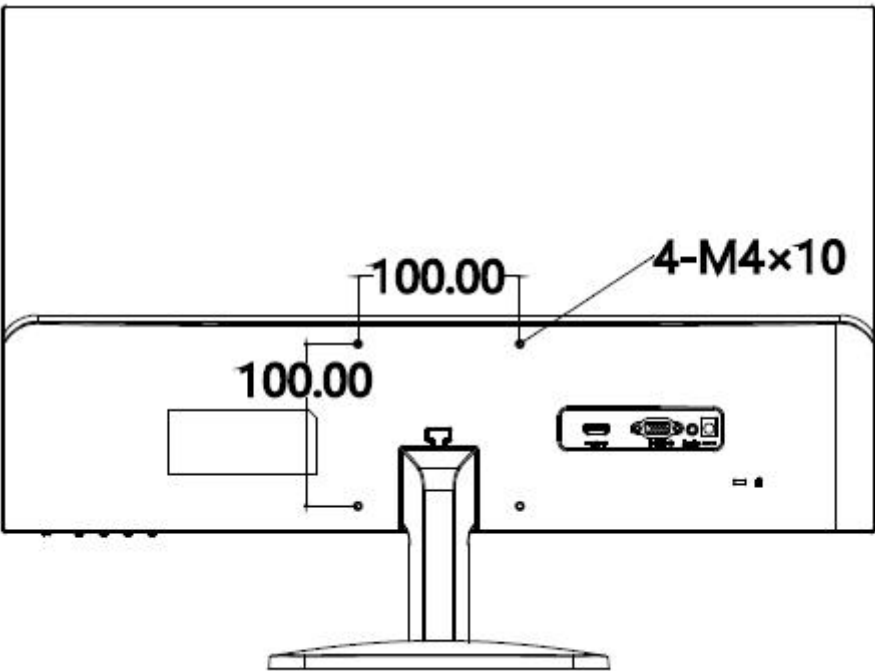
1. Dimensions

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1.1 Front View

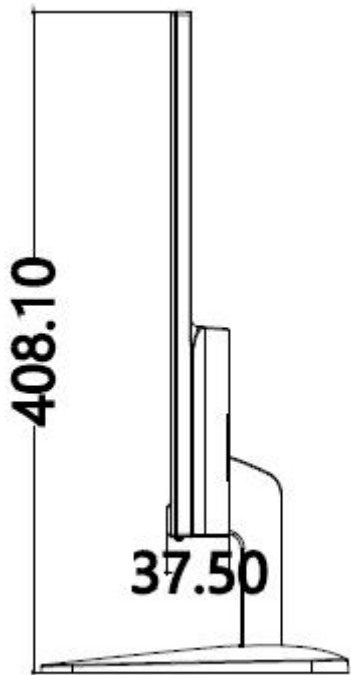


1.2 Back View

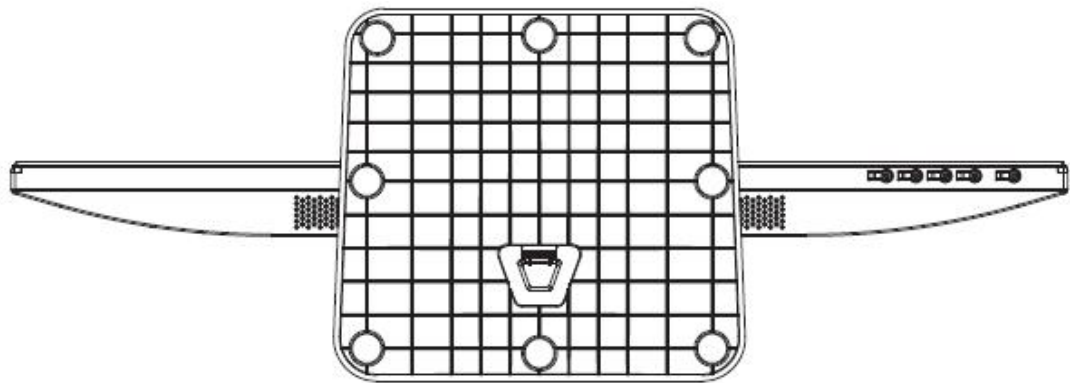


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1.3 Side View



1.4 Bottom View



2. Safety Precautions

This monitor is manufactured and tested on a ground principle that a user's safety comes first. However, improper

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use or installation may result danger to the monitor as well as to the user. Carefully go over the following WARNINGS before installation and keep this guide handy.

WARNINGS:

- ◆ This monitor should be operated only at the correct power sources indicated on the label on the rear end of the monitor. If you're unsure of the power supply in your residence, consult your local dealer or power company.
- ◆ Do not try to repair the monitor yourself as it contains no user-serviceable parts. The monitor should only be repaired by a qualified technician.
- ◆ Do not remove the monitor cabinet. There is high-voltage parts inside that may cause electric shock to human bodies, even when the power cord is disconnected.
- ◆ Stop using the monitor if the cabinet is damaged. Have it checked by a service technician.
- ◆ Put your monitor only in a clean, dry environment. Unplug the monitor immediately if gets wet and consult your service technician.
- ◆ Always unplug the monitor before cleaning it. Clean the cabinet with a clean, dry cloth. Apply non-ammonia based cleaner onto the cloth, not directly onto the glass screen.
- ◆ Keep the monitor away from magnetic objects, motors, TV sets, and transformer.
- ◆ Do not place heavy objects on the cable or power cord.
- ◆ For PLUGGABLE EQUIPMENT, the Socket-outlet shall be installed near the equipment and shall be easily accessible.
- ◆ For displays with glossy bezels the user should consider the placement of the displays as the bezel may cause disturbing reflections from surrounding light and bright surfaces.



According to WEEE regulation, this monitor can't be handled as normal trash in Europe when it is out of usage. Please refer to the recycle information from our website to handle it.

www.wortmann.de

3. Technical Specification

LCD Panel	60.5cm (23.8")
Power Management	VESA DPMS compatible Off Mode, ≤ 0.3 W

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Displayable Resolution	FHD 1920 x 1080 max. Vertical Frequency 100Hz max.
Pixel Dimension	0.2745 x 0.2745 mm
LCD Display Color	16.7M
Active Display Area	527.04 mm x 296.46 mm
Temperature	Operating: 0°C ~ + 40°C Storage: -20°C ~ + 60°C
Compliance	CE
Power	AC input 100-240V~,1.0A 50-60Hz DC output 12.0V $\overline{\text{=}}$ 2A (24W MAX)
Speaker	NA

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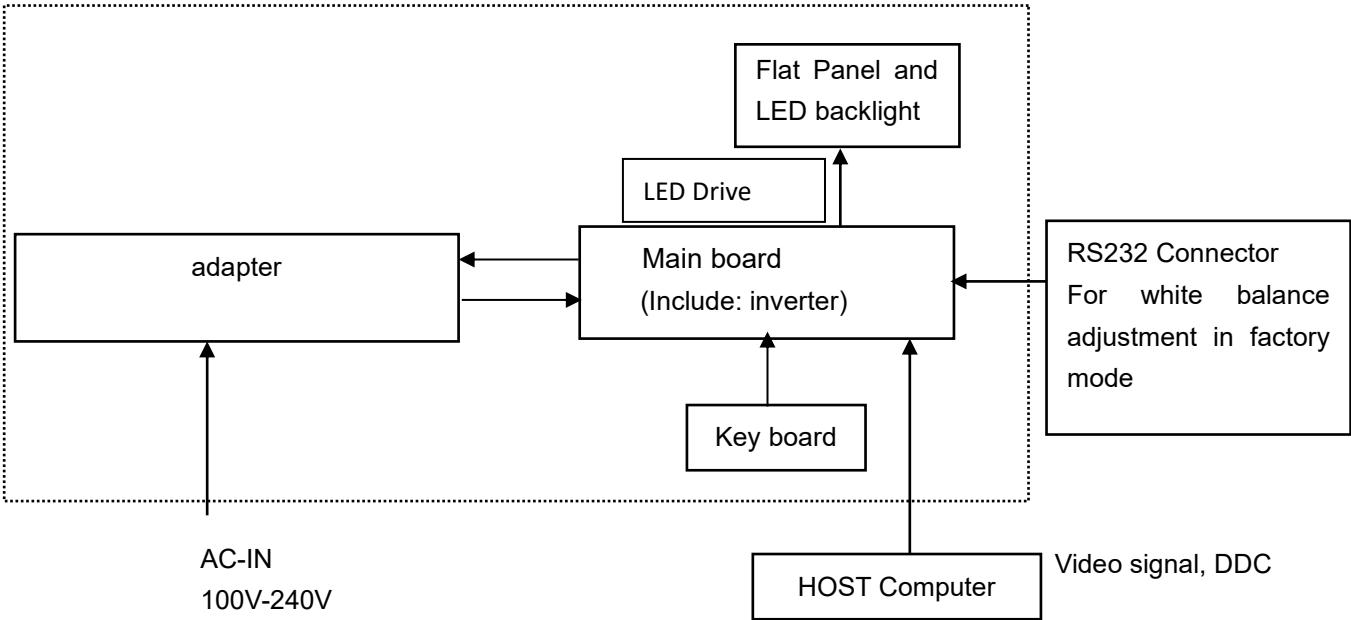
4. LCD Monitor Description

Assembly Description

The LCD MONITOR will contain a main board, a adapter, and a key board which house the flat panel control logic, brightness control logic and DDC.

The adapter will provide AC to DC Inverter voltage to drive the backlight of panel and the main board chips each voltage.

Monitor Block Diagram



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5. Operating Instructions

5.1 General Instructions

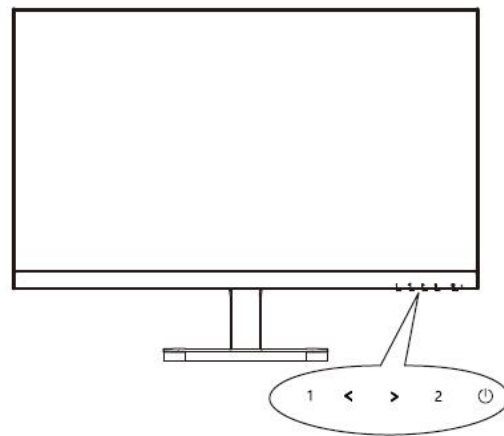
Press the power button to turn the monitor on or off. The control buttons are located in the front of the monitor.

By changing these settings, the picture can be adjusted to your personal preferences.

- The power cord should be connected.
- Connect the video cable from the monitor to the video card.
- Press the power button to turn on the monitor, the power indicator will light up.

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5.2 Control Buttons



1	1	Press it to open the OSD MENU, to select MENU options when the OSD MENU is displayed.
2	<	Hot key to adjust signal input Down selection button
3	>	Hot key to adjust brightness Up selection button
4	2	Hot key to automatically optimize positions, phase and clock when OSD is not shown(VGA only). To exit OSD MENU when OSD is shown.
5	⏻	Power on or off; LED-ON: Normal; LED flicker: Power Saving; LED-OFF: Power Off.

FRONT PANEL CONTROL

Power Indicator:

Blue — Power On mode.

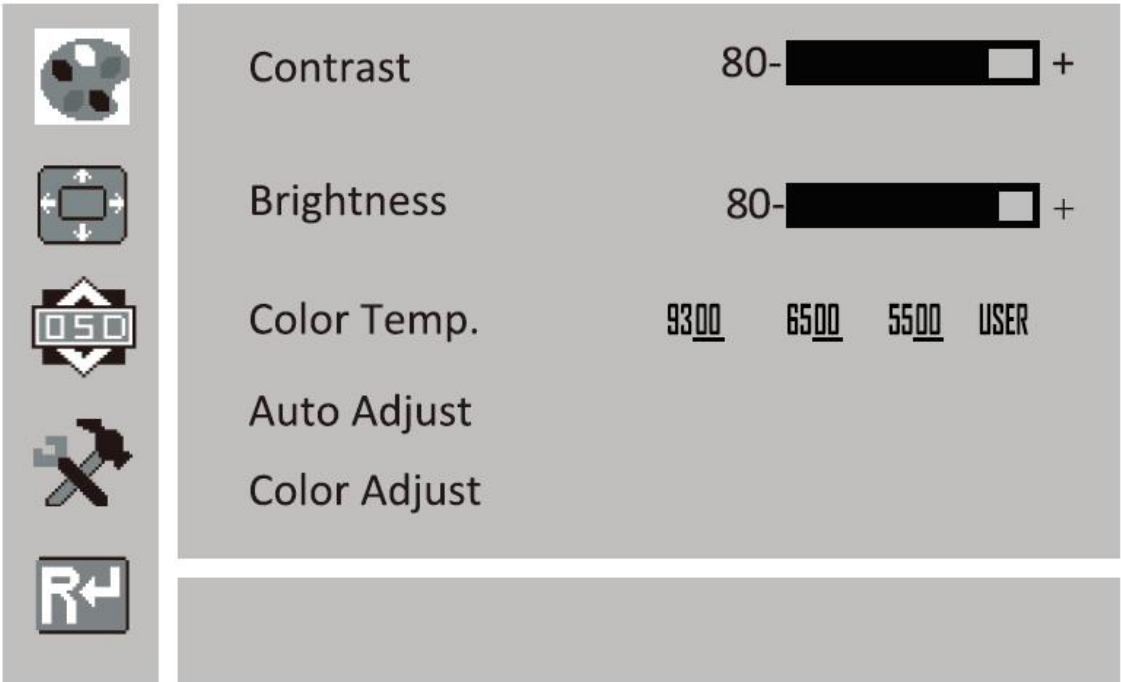
Flicker — Power Saving mode

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- Press the “1” button to start the OSD feature.
- Click the “<” or “>” to select the function to be adjusted.
- Click the “MENU” button to access into the function to be adjusted.
- Click the “<” or “>” button to change the current setting of the function
- To exit OSD MENU or go back to the previous action by “2”.
- To repeat above steps for changing the setting of the other function.

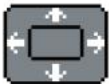
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5.3 Adjusting the Picture



Primary Directory	Secondary Directory	Description
Color 	Contrast	Adjust the contrast of the image
	Brightness	Adjust the brightness of the screen
	Color Temp	Set up the color Temp. to be 9300K 6500K 5500K USER red, green, blue to adjust red/green/blue
	Auto Adjust	Set up to adjust clock, phase and position automatically
	Color Adjust	Adjust the color of the screen

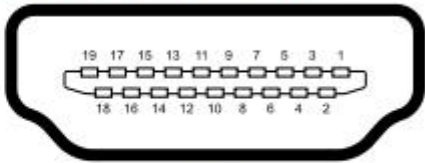
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Primary Directory	Secondary Directory	Description
Picture 	H.Position	Move the image left and right on the screen
	V.Position	Move the image up and down on the screen
	Clock	Adjust the clock pulse of the image
	Phase	Adjust the focus of image
OSD Menu 	Language	Select the language you want
	OSD H.Pos.	Move the OSD left and right on the screen
	OSD V.Pos.	Move the OSD up and down on the screen
	OSD Timer	Adjust OSD display time setting
	Transparency	Adjust OSD Transparency
Others 	MODE	Select PC GAME MOVIE display mode
	Audio Volume	Adjust the volume of the audio.(optional)
	Signal Selection	Select HDMI signal or VGA signal
	Aspect Ratio	Select the display mode : 16:9 AUTO 4:3
Reset 	Restore to factory settings	

6. Input/output Specification

6.1 Input Signal Connector

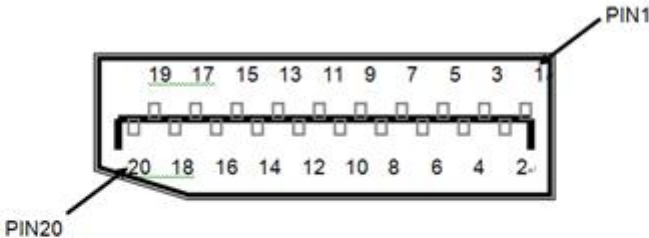
HDMI 19pin Connector Fig.5 (Female)



(Fig 5)

Pin	Input signal	Pin	Input signal	Pin	Input signal
1	T.M.D.S Data 2+	7	T.M.D.S Data 0+	13	CEC
2	T.M.D.S Data 2 Ground	8	T.M.D.S Data 0 Ground	14	
3	T.M.D.S Data 2-	9	T.M.D.S Data 0-	15	Clock line (SCL)*
4	T.M.D.S Data 1+	10	T.M.D.S Clock+	16	Data line (SDA)*
5	T.M.D.S Data 1 Ground	11	T.M.D.S Clock Ground	17	Ground
6	T.M.D.S Data 1-	12	T.M.D.S Clock-	18	+5V
				19	Hot Plug Detect

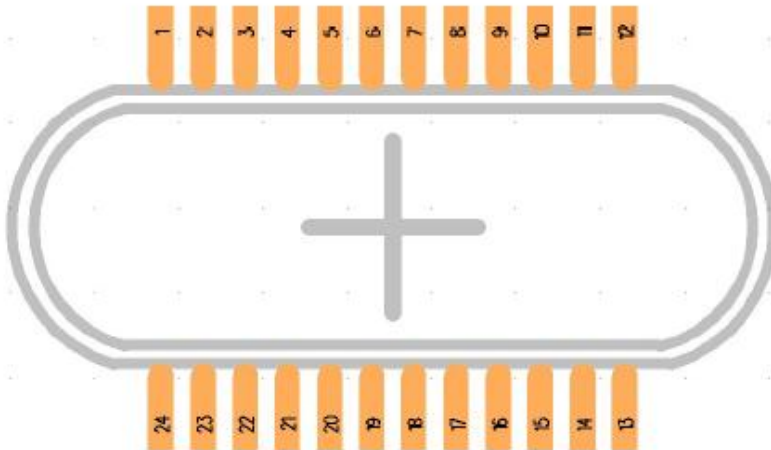
DISPLAY PORT 20pin Connector Fig.4 (Female)



(Fig 4)

19	17	15	13	11	9	7	5	3	1
GND	DAN	DAP	GND	GND	D1P	D1N	GND	D3P	D3N
20	18	16	14	12	10	8	6	4	2
POWER	HPD	GND	GND	D0P	D0N	GND	D2P	D2N	GND

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1	2	3	4	5	6	7	8	9	10	11	12
GND	TX_P1	TX_N1	VBUS	TYPEC-CC1	TYPEC-DP	TYPEC-DM	TYPEC-SBU1	VBUS	RX_N2	RX_P2	GND
24	23	22	21	20	19	18	17	16	15	14	13
GND	RX_P1	RX_N1	VBUS	TYPEC-SBU2	TYPEC-DM	TYPEC-DP	TYPEC-CC2	VBUS	TX_N2	TX_P2	GND

6.2 Factory Preset Display Modes

VGA	720 x 400 @ 70Hz
VGA	640 x 480 @ 60Hz
MAC	640 x 480 @ 67Hz
VESA	640 x 480 @ 72Hz
VESA	640 x 480 @ 75Hz
VESA	800 x 600 @ 56Hz
VESA	800 x 600 @ 60Hz
VESA	800 x 600 @ 72Hz
VESA	800 x 600 @ 75Hz
MAC	832 x 624 @ 75Hz
VESA	1024 x 768 @ 60Hz
VESA	1024 x 768 @ 70Hz
VESA	1024 x 768 @ 75Hz
VESA	1280 x 960 @ 60Hz
VESA	1152 x 864 @ 75Hz
MAC	1152 x 870 @ 75Hz
VESA	1280 x 1024 @ 60Hz

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VESA	1280 x 1024 @ 75Hz
VESA	1440 x 900 @ 60Hz
VESA	1440 x 900 @ 75Hz
VESA	1400 x 1050 @ 60H
VESA	1600 x 1200 @ 60Hz
VESA	1680 x 1050 @ 60Hz
VESA	1920 x 1080 @ 60Hz
VESA	1920 x 1080 @ 75Hz
VESA	1920 x 1080 @ 100Hz

***ONLY SUPPORT HDMI / DisplayPort / USB-C SOURCE**

- 480i
- 480p
- 576i
- 576p
- 720p
- 1080i
- 1080p

Warning: Do not set the graphic card in your computer to exceed these maximum refresh rates. Doing so may result in permanent damage to your monitor.

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6.3 Panel Specification

DW238EFA-V6 is a diagonal 23.8” color active matrix LCD open cell with 2Channel LVDS interface. This open cell is a transmissive type display operating in the normally black mode. It supports 1920 x 1080 FHD resolution and can display up to 16.7M colors (8bit). Each pixel is divided into Red, Green and Blue sub-pixels which are arranged in vertical stripe.

6.3.1 Display Characteristics

Item	Specification	Unit	Note
Active	527.04 (H) *296.46 (V)	mm	
Driving Scheme	a-Si TFT Active Matrix	-	
Number of Pixels	1920 * 1080	pixel	
Pixel Pitch (Sub Pixel)	0.0915 (H) *0.2745 (V)	-	
Pixel Arrangement	RGB Vertical Stripe	-	
Display Colors	16.7 M	color	8bit
Display Mode	Transmissive Mode, Normally Black	-	
Polarizer (CF side)	AG25%	-	

6.3.2 Electrical Characteristics

1. TFT LCD Module

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Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V _{CC}	4.5	5.0	5.5	V _{dc}	(4)
Permissive Input Ripple Voltage		V _{RIPPLE}	-	-	400	mVp-p	(1)
Rush Current		I _{RUSH}	-	-	3	A	(2)
Power Supply Current	White Pattern	I _{CC}	-	600	720	mA	100Hz
	Worst pattern		-	950	1140	mA	
	Black Pattern		-	555	666	mA	
	Mosaic Pattern(8*8)		-	580	695	mA	
	White Pattern		-	465	558	mA	60Hz
	Worst pattern		-	682	818	mA	
	Black Pattern		-	440	528	mA	
	Mosaic Pattern(8*8)		-	452	542	mA	
Power Consumption	Worst pattern	P _{CC}	-	4.75	5.70	Watt	100Hz
			-	3.41	4.09	Watt	60Hz

2. Backlight Unit

b.Back Light electrical parameters

(1)Led Lightbar Specification For Backlight

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max		
Input Voltage	V _{pin}	47	51	57.8	V	
Input Current	I _{pin}	-	240	-	mA	
LED Life Time	LT	(30,000)	-	-	Hrs	
Power Consumption	PBL		12.24		W	

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6.3.3 Optical Characteristics

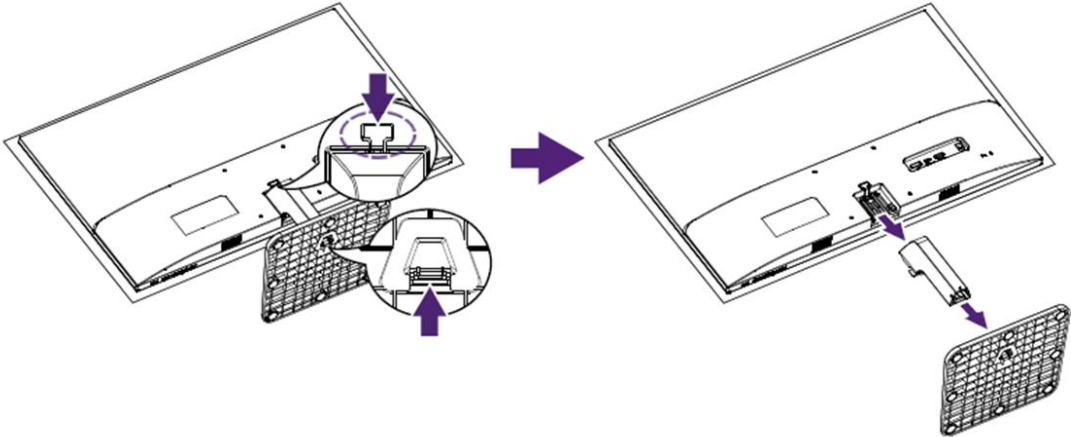
The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment :CA-310, BM-7A(TOPCON),
EZ-Contrast (Eldim) (Ta = 25 ± 2°C, VDD=5.0V, IBL = 240mA,51V

Item		Symb ol	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		C/R	3200	4000	-		[Note3]
Response Time		T _L	-	16	20	ms	
Luminance(central)		L _c	250	-	-	Nits	[Note4]
Brightness Uniformity (9 Points)		Lu	75	-	-	%	[Note5]
Color Chromaticity (Central)	White	W _x	Typ. -0.03	0.313	Typ. +0.03		CIE 1931(x, y) [Base On Customer data] [Note6]
		W _y		0.329			
	Red	R _x	Typ. -0.02	0.646	Typ. +0.02		
		R _y		0.337			
	Green	G _x		0.310			
		G _y		0.616			
	Blue	B _x		0.147			
		B _y		0.062			
Color Gamut	-	-	68	72	-	%	NTSC
Color Uniformity (9 pts, L/)	Δx/y	-	-	-	0.015	-	Color Uniformity (9 pts, L/)
Viewing Angle (CR≥10)	Horizontal	θ _H	80	89	-	Degr e	[Note2,9]
	Vertical	θ _V	80	89	-		

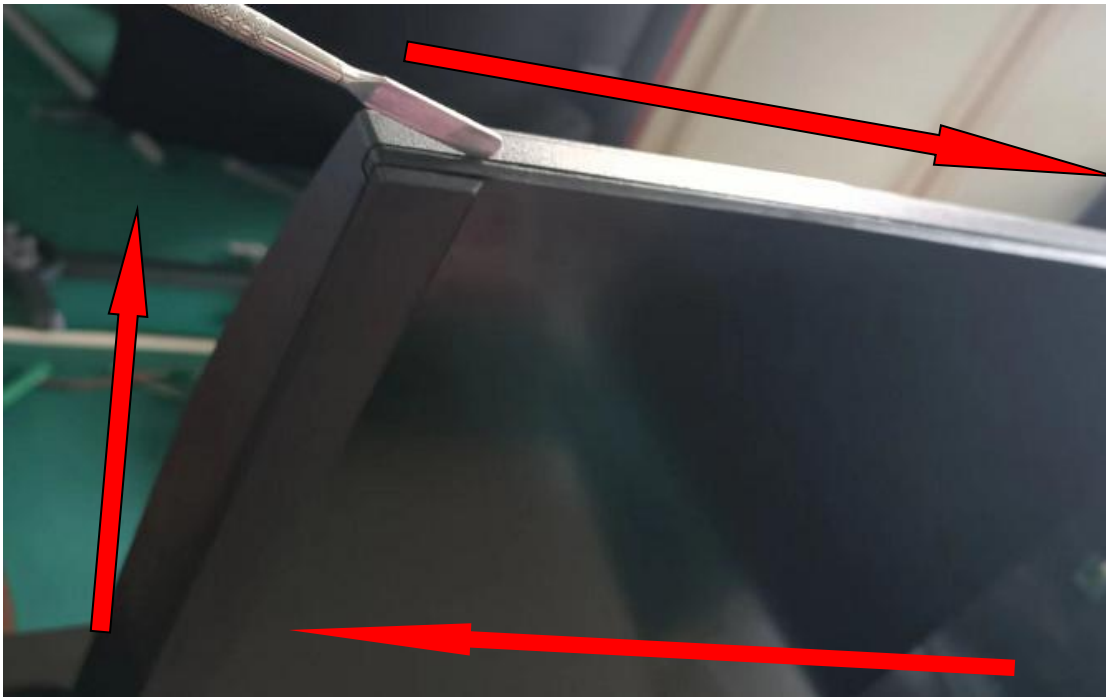
7. Mechanical Instructions

Step	Figure	Description
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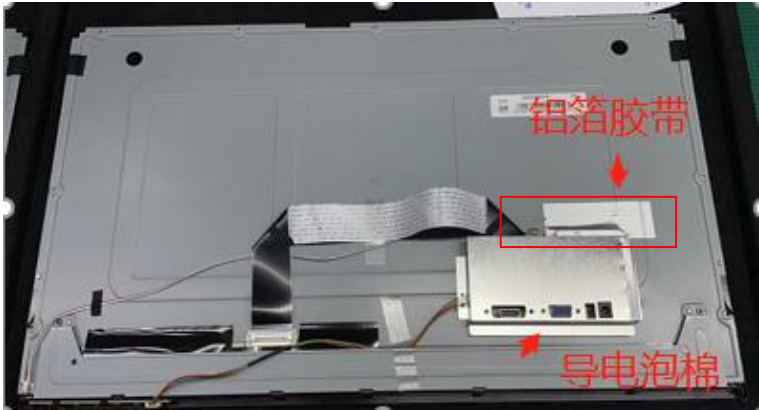
Preparation		Lay the LED on a flat, soft and clean surface.
Remove Base and Stand		Remove base and stand

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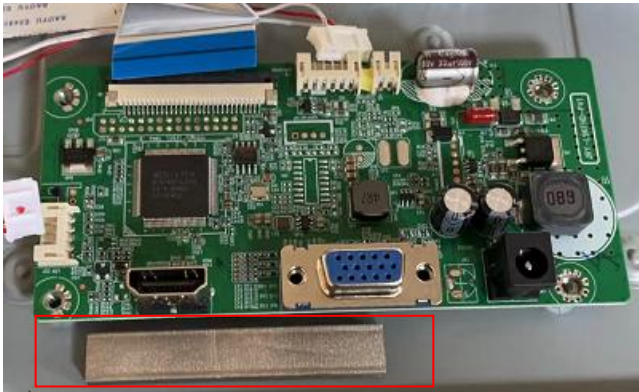


Open the rear cover with a crowbar. remarked in red

Remove the boards

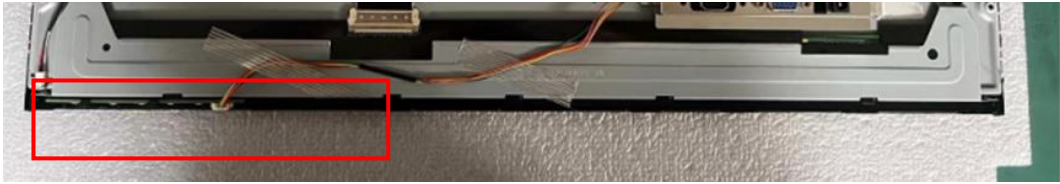


Peel off the aluminum foil and acetate tape remarked in red



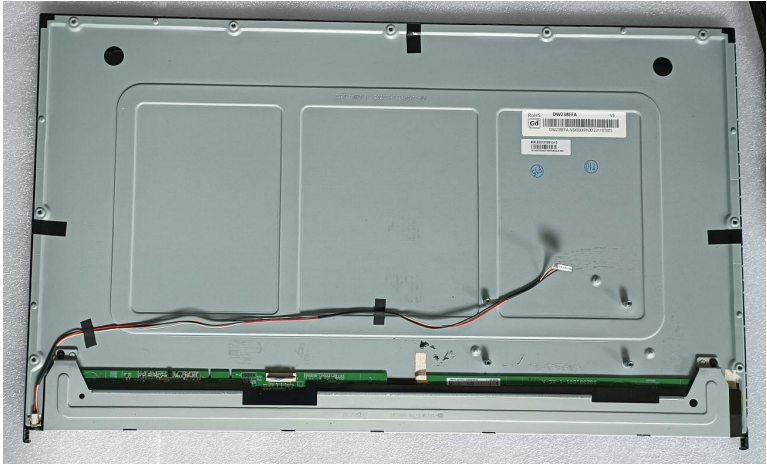
Remove the screw and EMI gasket remarked in red

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Unplug the key board cable and remove the front cover. remarked in red

The end

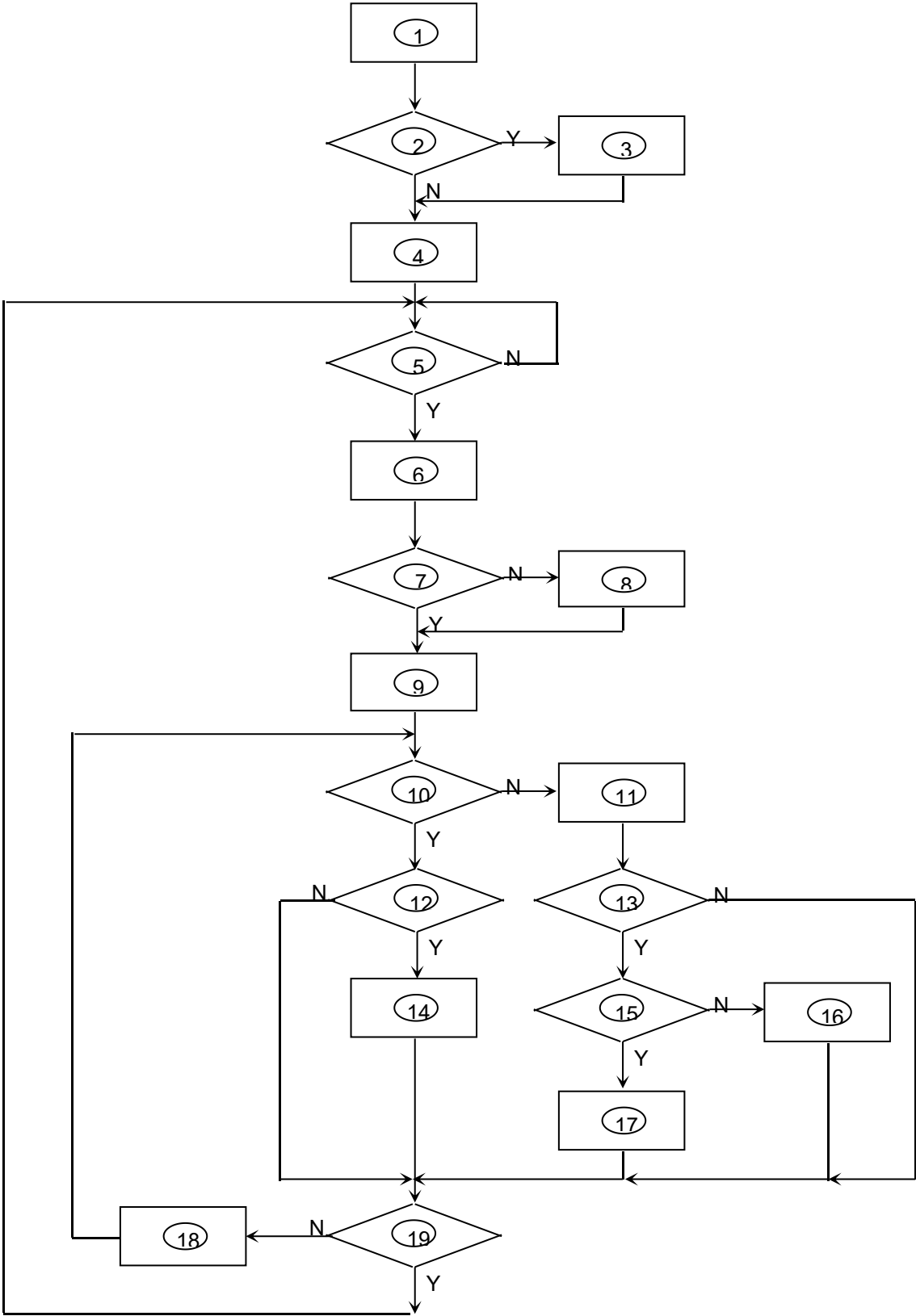


The panel

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8. Block Diagram

8.1 Software Flow Chat



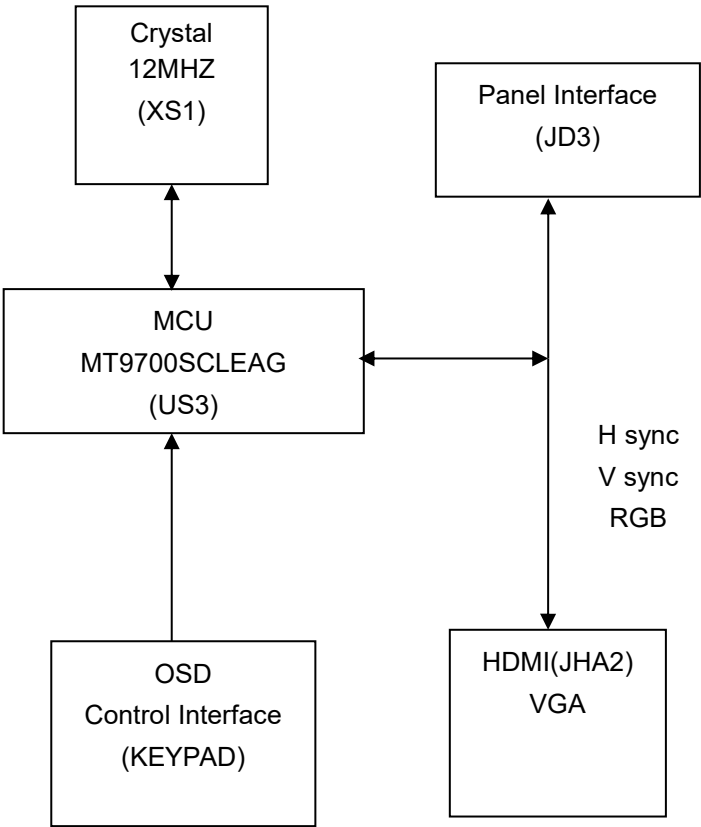
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1) MCU initialize.
2) Is the EPROM blank?
3) Program the EPROM by default values.
4) Get the PWM value of brightness from EPROM.
5) Is the power key pressed?
6) Clear all global flags.
7) Are the AUTO and SELECT keys pressed?
8) Enter factory mode.
9) Save the power key status into EPROM. Turn on the LED and set it to green color. Scalar initializes.
10) In standby mode?
11) Update the lifetime of back light.
12) Check the analog port, are there any signals coming?
13) Does the scalar send out an interrupt request?
14) Wake up the scalar.
15) Are there any signals coming from analog port?
16) Display "No connection Check Signal Cable" message. And go into standby mode after the message disappear.
17) Program the scalar to be able to show the coming mode.
18) Process the OSD display.
19) Read the keyboard. Is the power key pressed?

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8.2 Electrical Block Diagram

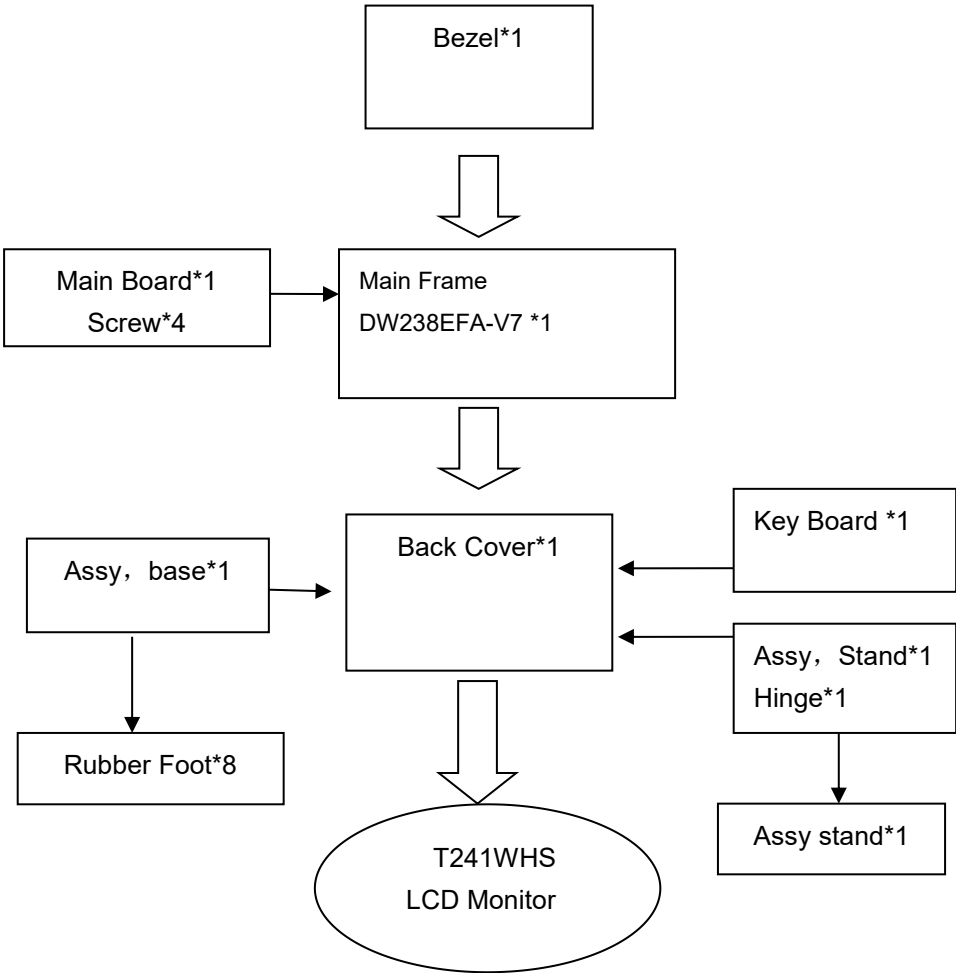
8.2.1 Main Board



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8.3 Mechanical Block Diagram

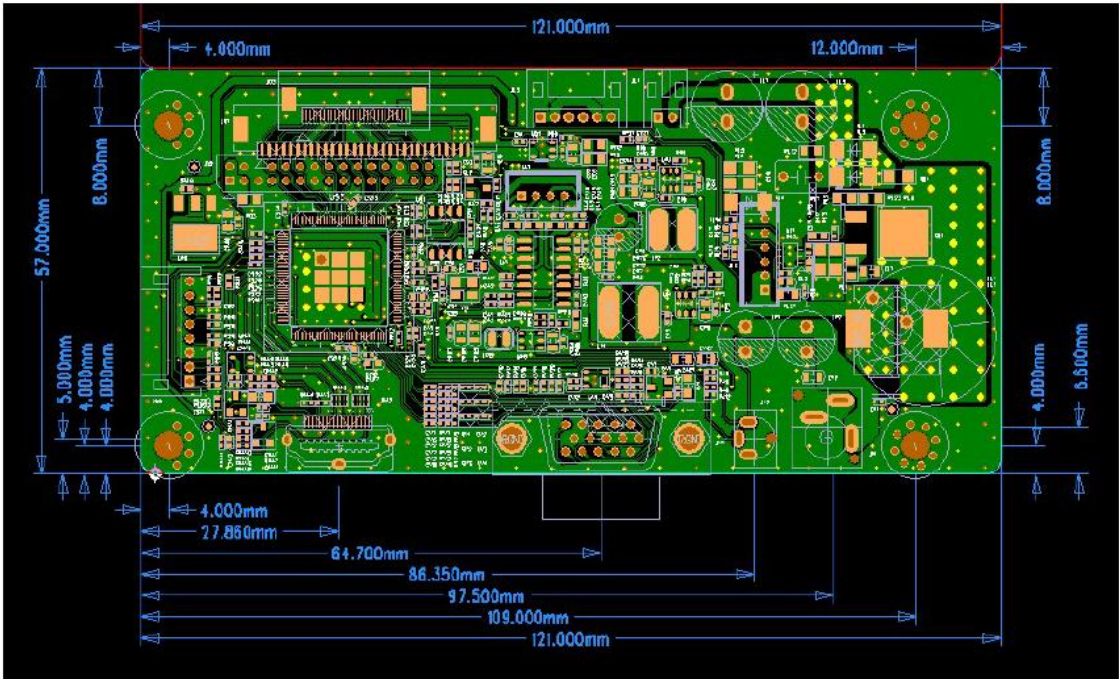
8.3.1 Assembly Block



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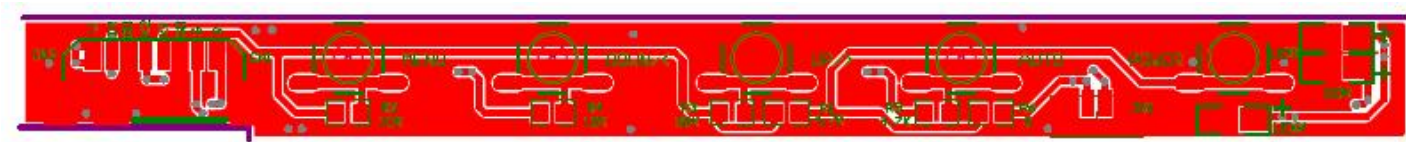
9. PCB Layout

9.1 Main Board



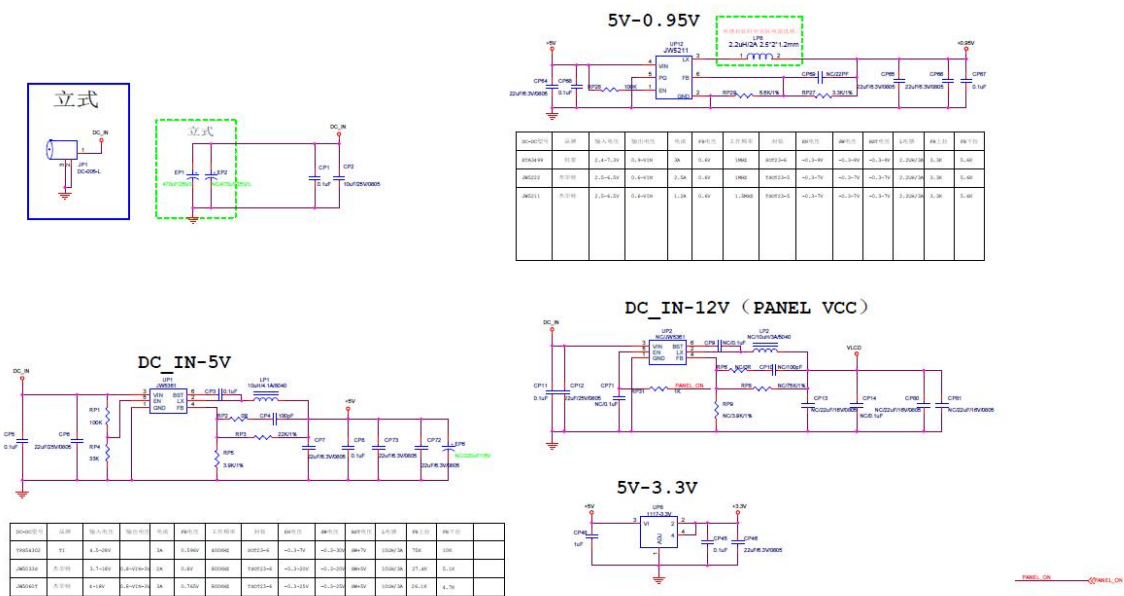
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9.2 key board



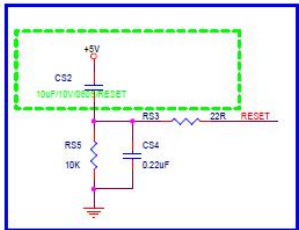
10. Schematic

10.1 Main Board

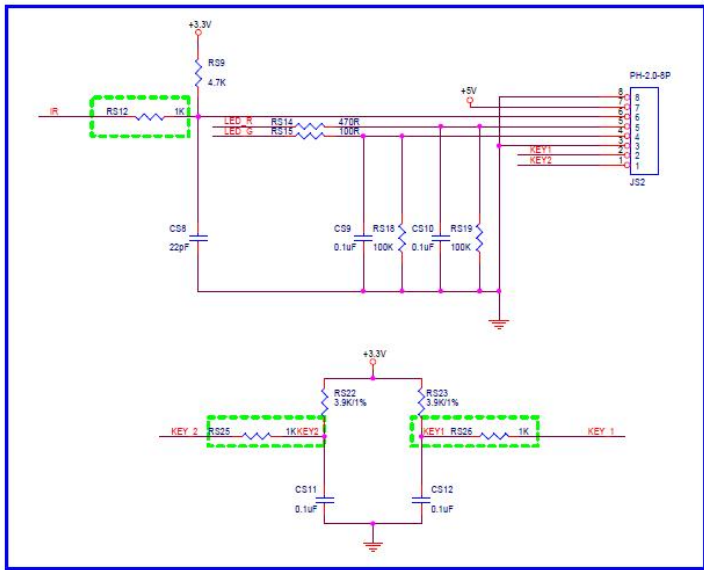


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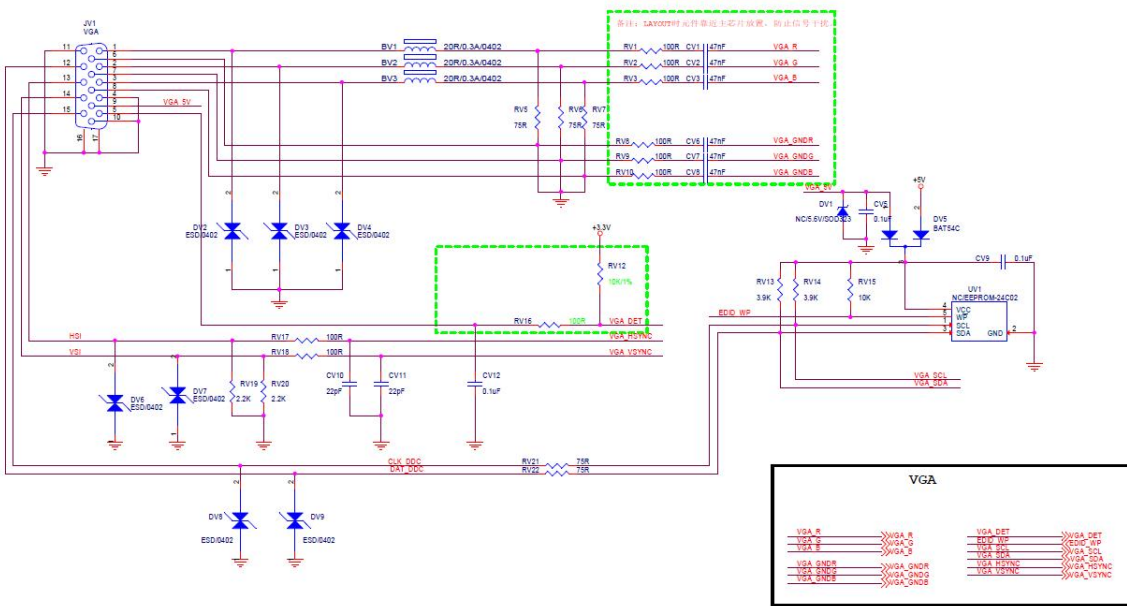
SYSTEM RESET



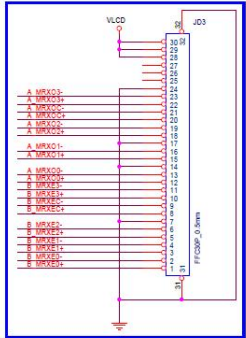
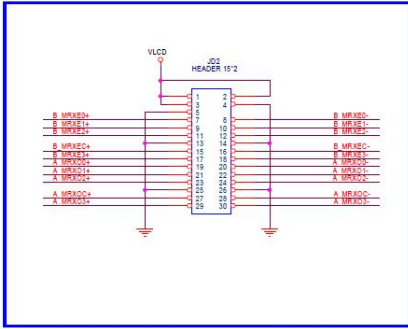
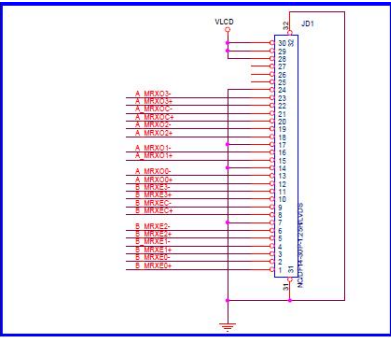
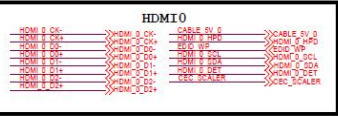
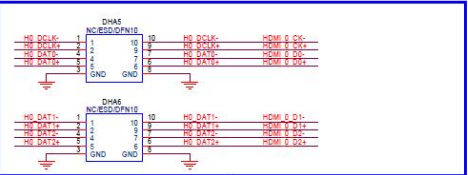
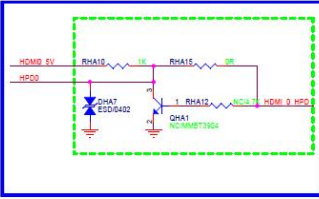
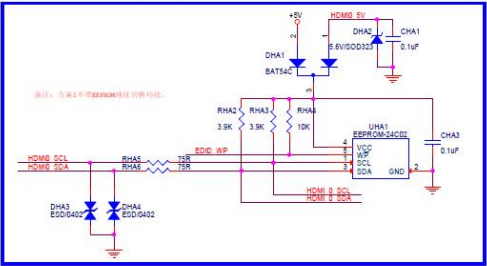
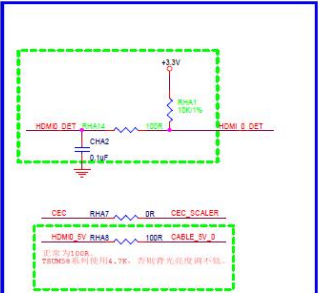
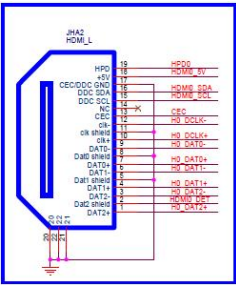
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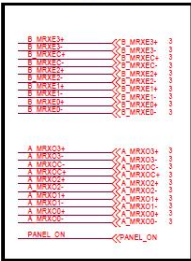
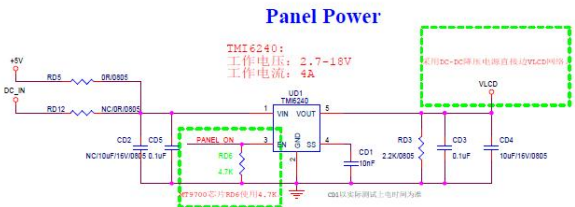
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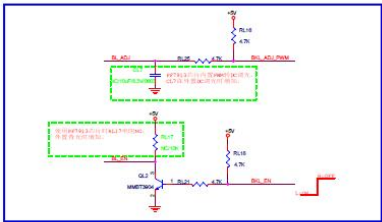
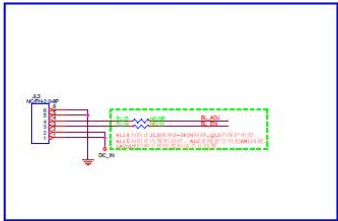
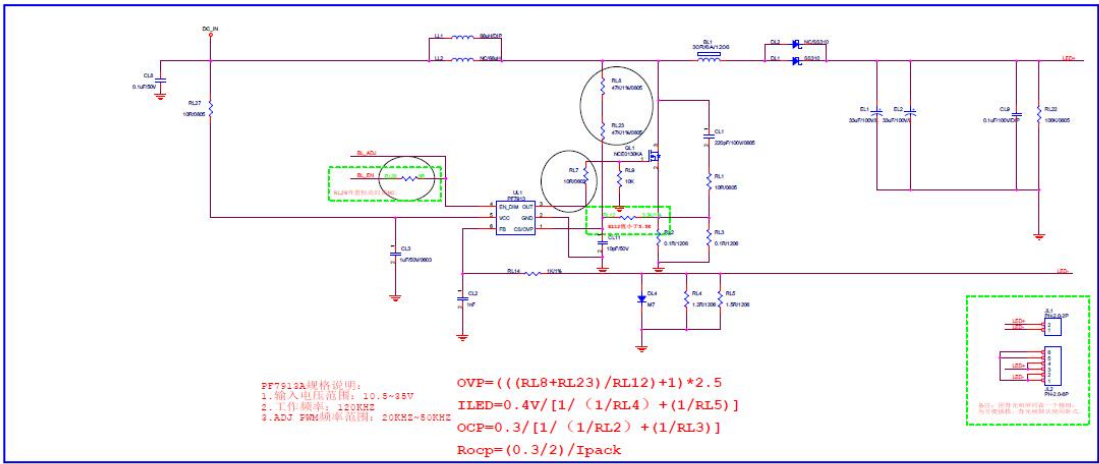
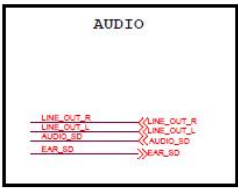
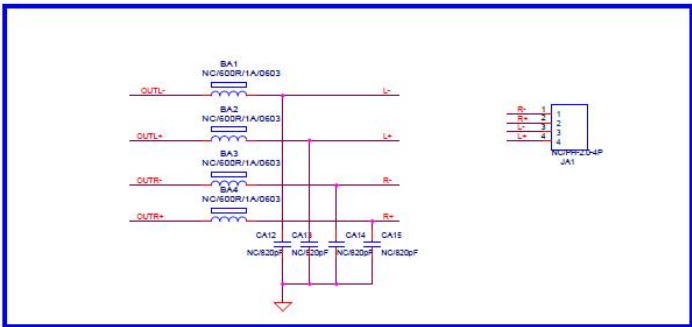
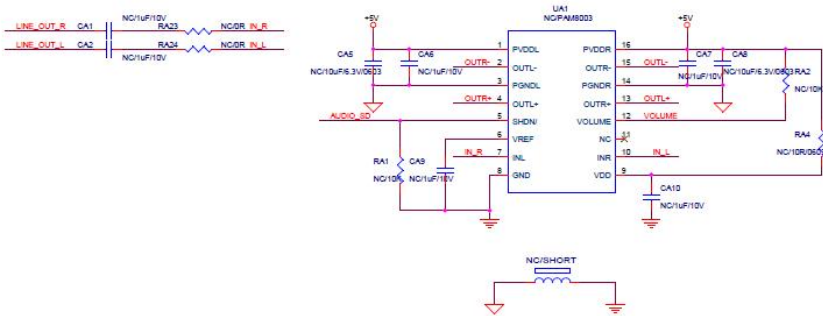
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