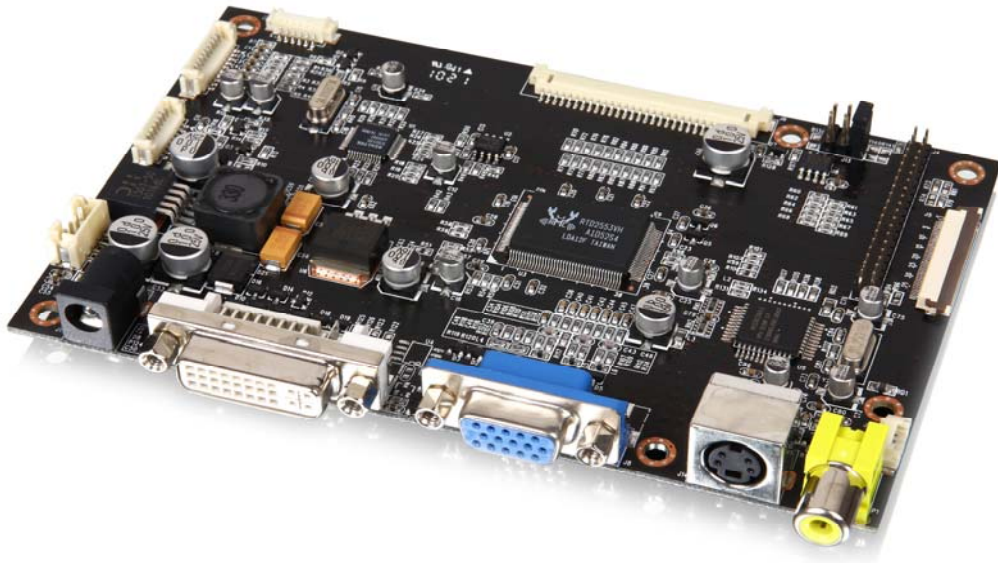


Data Sheet



TFT LCD CONTROL BOARD

Preliminary Specification

Model Name: NT03V

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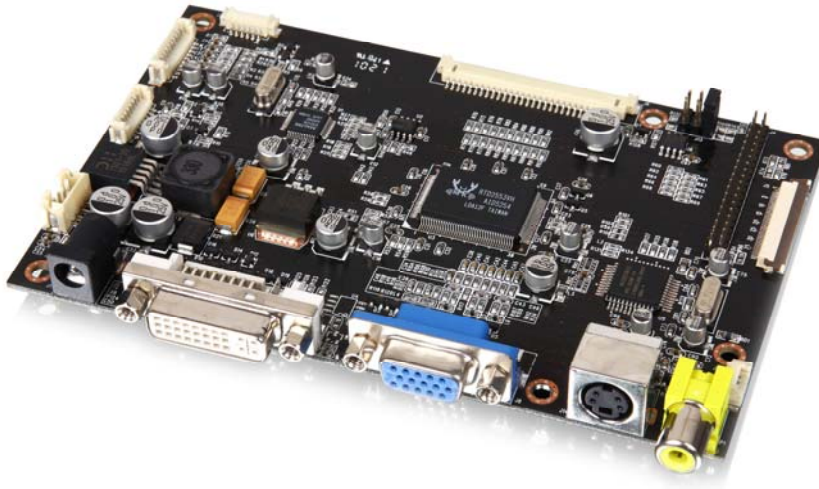
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1. GENERAL DESCRIPTION

This controller board is designed for a LCD monitor and other flat panel display application.

This controller board provides an auto-input synchronization and easy to sue interface controller for:

- TFT (active matrix) LCD panels of 800x480, 1024x768, 1280x768, 1366x768, 1280x1024 and 1600x1200 resolutions.
- Computer video signals of VGA, SVGA, XGA, WXGA, SXGA and UXGA standard Input Signal Support
 - ✓ All VESA standard



[NT03V]

2. INTRODUCTION

HOW TO PROCEED

- Ensure that you have all parts & they are correct, refer to:
 - ✓ Connection diagram
- Check controller switch & jumper settings (errors may damage the panel)
- Prepare the PC
- Connect the parts
- Understand the operation & functions

* Since LSI is used in this controller board, take care of static electricity and insure human earth when handling.

IMPORTANT USAGE NOTE

This equipment is for use by developers and integrators. The manufacturer accepts no liability for damage or injury caused by the use of this product. It is the responsibility of the developer, integrators or other users of this product to:

- Ensure that all necessary and appropriate safety measures are taken.
- Obtain suitable regulatory approvals as may be required.
- Check power settings to all component parts before connection.

DISCLAIMER

There is no implied or expressed warranty regarding this material.

3. GENERAL SPECIFICATION

No.	Item	Description		
1	Model name	Panel	1366 x 768(WXGA)	Note 1)
2	LCD Module	WVGA, SVGA, XGA, WXGA, SXGA, UXGA		
3	Signal Input	Analog RGB(R, G, B Separate H, V Sync), DVI-D(TMDS)		
4	Resolution Support	H: 31 ~ 80kHz		
		V: 55 ~ 76Hz		
5	OSD Control	Menu, Exit, Up, Down, Power		5 keys
	Plug & Play	VESA DDC 2B Ver1.3		
6	Power Consumption	Supply Voltage	12Vdc	
		Max Power	TBD	
7	Signal Connector	Analog	DSUB 15P(R, G, B Separate H, V Sync)	
		Digital	DVI-D 24P(TMDS)	
		Video	MINIDIN-4P(SVHS, RCA(CVBS))	
8	Board Size	W x H x D(mm)	140 x 90 x 20	

Notes 1) Depends On Panel Resolution

NT03V-[WX1](#)

WV – 800x480, SV – 800x600, NX – 1024x768, NW – 1280x768, WX – 1366x768, SX – 1280x1024

UX – 1600x1200, HD – 1920x1080, WU – 1920x1200

Model No.	Resolution	RGB Input	DVI Input	Video Input	Remarks
NT03V-SX1	1280 x 1024	Yes	No	No	
NT03V-SX2	1280 x 1024	Yes	Yes	No	
NT03V-SX3	1280 x 1024	Yes	Yes	Yes	
NT03V-WX1	1366x768	Yes	No	No	
NT03V-WX2	1366x768	Yes	Yes	No	
NT03V-WX3	1366x768	Yes	Yes	Yes	

4. ELECTRICAL SPECIFICATION

3.1 Input characteristic

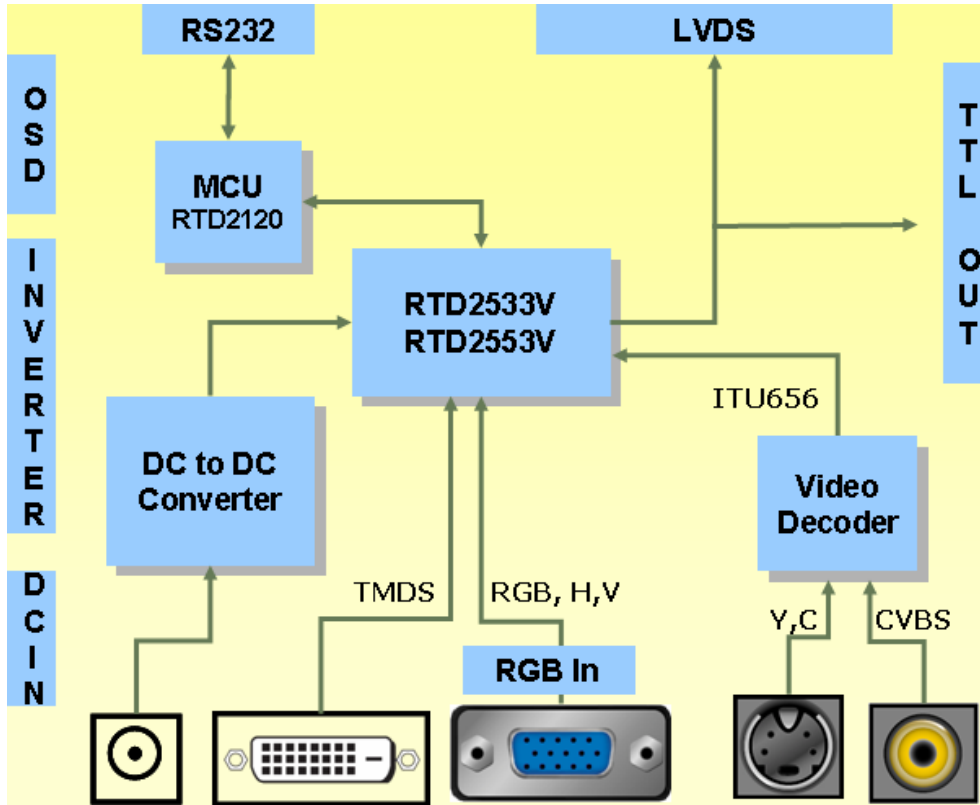
Description	Signal	Unit	Min	Typical	Max	Remarks
Power In (12Vdc)						
	Input	12VDC	11.4	12	12.6	
	Consumption	Watt		TBD		
RGB Input						
	Analog RGB	VPP	0	0.7	-	
	Sync	VDC	0	5	5.5	
	H Frequency	KHz	31		80	Depends on Mode
	V Frequency	Hz	55	75	77	Depends on Mode
DVI Input						
	TMDS	mVp-p	450	500	900	
NTSC/PAL						
	Y/CVBS	Vp-p	0.7	1.0	1.4	
	C	Vp-p	0.6	0.8	1.0	

3.2 Output Characteristics

Description	Signal	Unit	Min	Typical	Max	Remarks
Panel Power						
	LCD Power (12V)	VDC	11.4	12	12.6	Jumper option
	LCD Power (5V)	VDC	4.5	5	5.5	Jumper option
	LCD Power (3.3V)	VDC	3.16	3.3	3.5	Jumper option
LVDS Interface						
	Differential output	Vp-p (mV)	250	350	450	Differential +/-
TTL LCD Interface						
	RGB Data	Vp-p		3.3		
	DE, Sync, Clock	Vp-p		3.3		
	Clock Freq.	V(MHz)	25		80	
Inverter Interface						
	Power	V	11.4	12	12.6	Depends on Power
	On/Off control	V	0		3.3	L=off, H=on
	Brightness control	V	3.3		0	Option(1)
			0		4.0	

(1)Default setting: S/W dimming control(0V), If you want to use Analog dimming control, Please contact our company.

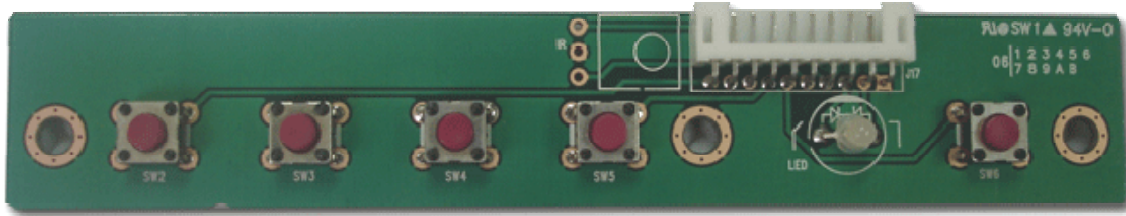
5. FUNCTIONAL BLOCK DIAGRAM



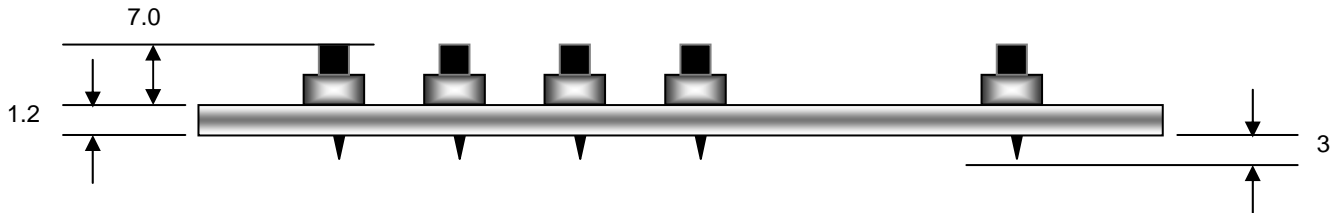
6. OSD Control Board

The OSD (On Screen Display) provides certain functions to have clear image and others. This board supports 5 buttons OSD operation as a standard. The control functions defined on OSD operation are as below. (Unit: mm)

Appearance

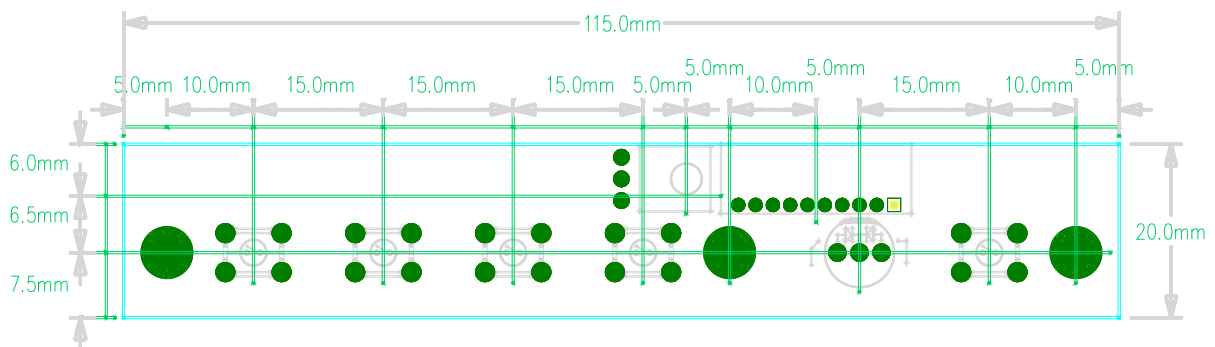


MENU SELECT DOWN UP POWER



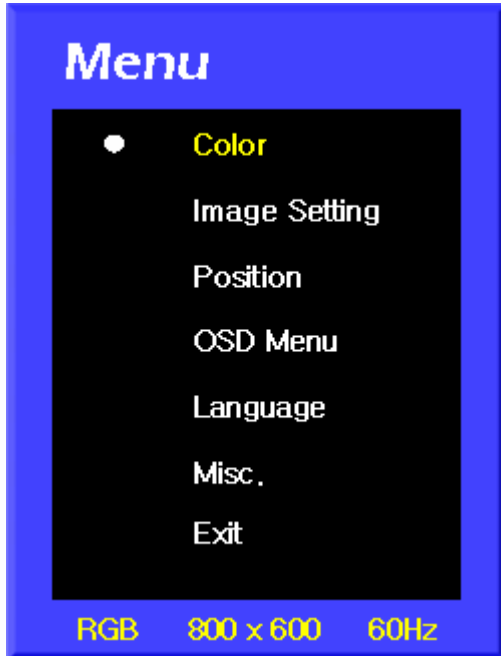
Board Size (W x H x D) : 115 x 20 x 14mm

Button	Function	Status	HOT Key
LED	Indicates operation status	Green/ Red/ Amber	On: Green Off: Red No Signal: Amber
POWER	Power on/off	On/Off	
MENU	Activate menu / Exit Menu		
SELECT	Menu Select / Source(option)		
DOWN	Cursor control Down / Auto Adjust		
UP	Cursor control Up / Auto Color		



7. OSD FUNCTION

A. Main Menu



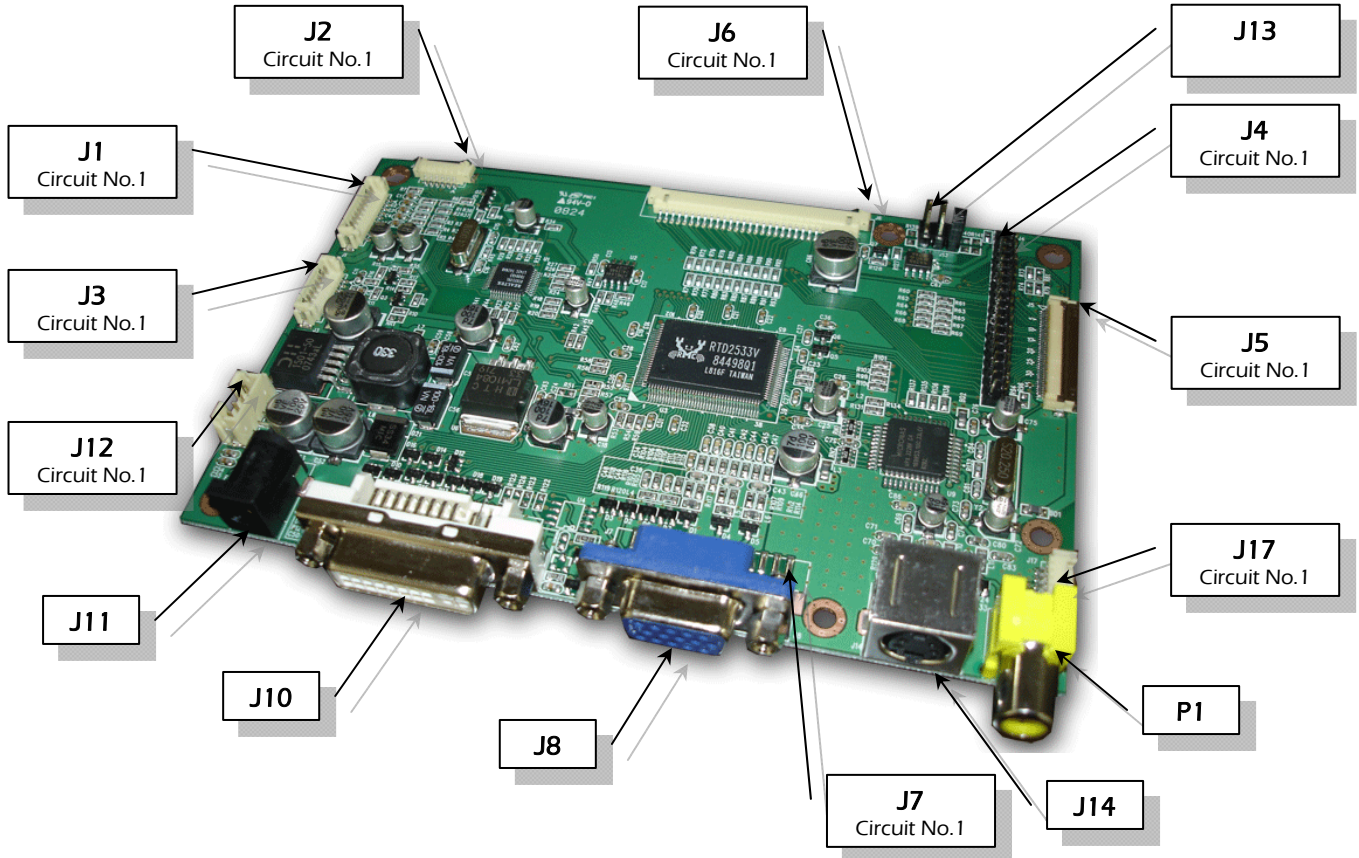
- Color: Contrast/Brightness/Color Adjust/Color Temp
 - Contrast : Contrast level Control
 - Brightness: Brightness level Control
 - Color Adjust: R,G,B color level Control
 - Color Temp: Color temperature Select
- Image Setting: Clock, Phase, Gamma, Sharpness
 - Clock: Fine tune the number of sampled data
 - Phase: Fine tune the position of sampled data
 - Gamma: Gamma value Select
 - Sharpness: Scaling performance Select
- Position: H, V position Control
 - H/V position: Image H, V position Control
- OSD Menu: OSD H, V position, OSD Off timer Control
 - OSD H/V position: OSD H,V position Control
 - OSD Off timer: OSD Off timer Control
- Language: OSD language Select
- Misc: Input Source/Reset
 - Input Source : Input signal select (Analog, DVI)
 - Reset: Restore to default Value
- Exit / Back:

B. Operation Message

 Auto Adjust . . .	<p>Execute 'Auto Adjust' Function.</p>
 Color Adjust	<p>Execute 'Color Adjust' Function.</p>
 Out of Range	<p>Input Signal is over the supporting range</p>
 No Cable	<p>Input Signal is not present and disconnected cable. This message is not disappeared before power off or activity of input signal.</p>
 No Signal	<p>Input Signal is not present. This message is disappeared after 5 seconds.</p>
 INITIALIZE	<p>Execute 'INITIALIZE' Function</p>

8. CONNECTOR, PINOUT & JUMPERS

The various connectors are:



Summary:

Reference	Item	Description	Type	Manufacture
J1	Connector	OSD Board Connector	12505WR-10	YEONHO
J3	Connector	Backlight Inverter Connector	12505WR-08	YEONHO
J12	Connector	SMPS Power Input Connector	20022WR-04	YEONHO
J11	Jack	DC power Input Jack	2.5Ø	-
J10	Connector	DVI Connector	DVI-D 24P	-
J8	Connector	Analog RGB Input Jack	15P D-SUB	-
J7	Connector	Analog RGB Input Connector	20022WR-13	YEONHO
J14	Connector	S-Video Video Input Connector	MINIDIN-4P	-
P1	Connector	Composite Video Input Jack	RCA(Yellow)	-
J2	Connector	Audio Control Connector	12505WR-06	YEONHO
J4	Connector	TTL Interface Connector	2*20P_2.0mm	-
J5	Connector	TTL Interface Connector	FH19-40S-0.5SH	HIROSE
J6	Connector	LVDS Dual Interface Connector	12507WR-30	YEONHO
J13	Jumper	Panel power select jumper	2*3P_2.5mm	-
J17	Connector	Composite Video Input Connector	12505WR-04	YEONHO

J1: OSD Board connector

Pin No.	Symbol	Description
1	MENU	Menu / Exit Key Control
2	SELECT	Select key control
3	DOWN	Down key Control
4	UP	Up key Control
5	POWR	Power key Control
6	IR_INT	IR Signal line
7	5DVCC	+5V power for IR sensor
8	LED_R	Red LED
9	LED_G	Green LED
10	GND	Ground

J3: Backlight Inverter connector

Pin No.	Symbol	Description
1	B	DIM-adjustment analog dimming control signal * make sure inverter specification
2	ON/OFF	Inverter digital ON(3.3V)/OFF(0V) signal
3,4,5	GND	Ground
6,7,8	B+	12V

(1) Default setting: S/W dimming control (0V), If you want to use Analog dimming control, Please contact our company.

J5: TTL Interface Connector

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	U/D	Select L/R	21	GND	Ground
2	L/R	Select U/D	22	ABLU ₂	Blue output data
3	GND	Ground	23	ABLU ₃	Blue output data
4	DCLK	Display Clock	24	ABLU ₄	Blue output data
5	GND	Ground	25	GND	Ground
6	ARED ₂	Red output data	26	ABLU ₅	Blue output data
7	ARED ₃	Red output data	27	ABLU ₆	Blue output data
8	ARED ₄	Red output data	28	ABLU ₇	Blue output data
9	GND	Ground	29	GND	Ground
10	ARED ₅	Red output data	30	HS	Hsync Signal
11	ARED ₆	Red output data	31	VS	Vsync Signal
12	ARED ₇	Red output data	32	DE	Data Enable Signal
13	GND	Ground	33	MODE	DE or HV mode
14	AGRN ₂	Green output data	34	VCC	Panel Power
15	AGRN ₃	Green output data	35	VCC	Panel Power
16	AGRN ₄	Green output data	36	GLED	Ground
17	GND	Ground	37	GLED	Ground
18	AGRN ₅	Green output data	38	ADJ	Adjust LED
19	AGRN ₆	Green output data	39	VLED	+5V
20	AGRN ₇	Green output data	40	VLED	+5V

J4: TTL Interface Connector

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	PANEL_VCC	Panel Power	21	ARED5	RED output data
2	5DVCC	5V	22	ARED6	RED output data
3	PANEL_VCC	Panel Power	23	ARED7	RED output data
4	5DVCC	5V	24	GND	Ground
5	GND	Ground	25	AGRN2	Green output data
6	GND	Ground	26	AGRN3	Green output data
7	MODE	Hync/DE select	27	AGRN4	Green output data
8	DCLK	Display data Clock	28	GND	Ground
9	VS	V Sync	29	AGRN5	Green output data
10	L_R	L/R select	30	AGRN6	Green output data
11	HS	H Sync	31	AGRN7	Green output data
12	U_D	U/D select	32	GND	Ground
13	DEN	Data Enable Signal	33	ABLU2	Blue output data
14	ADJB	Backlight On/Off	34	ABLU3	Blue output data
15	GND	Ground	35	ABLU4	Blue output data
16	GND	Ground	36	GND	Ground
17	ARED2	RED output data	37	ABLU5	Blue output data
18	ARED3	RED output data	38	ABLU6	Blue output data
19	ARED4	RED output data	39	ABLU7	Blue output data
20	GND	Ground	40	GND	Ground

J6: LVDS Dual Interface Connector

Pin No.	Symbol	Description
1	MOD_PWR	Panel Power (12V/18V, 5V or 3.3V)
2	MOD_PWR	Panel Power (12V/18V, 5V or 3.3V)
3	MOD_PWR	Panel Power (12V/18V, 5V or 3.3V)
4	5DVCC	5V
5	GND	Ground
6	ADJB	LED Backlight On/Off
7	GND	Ground
8	Y3P-EVEN	Positive(+) LVDS differential first 3 data(B port)
9	Y3M-EVEN	Negative(-) LVDS differential first 3 data(B port)
10	YCP-EVEN	Positive(+) LVDS differential first Clock(B port)
11	YCM-EVEN	Negative(-) LVDS differential first Clock(B port)
12	Y2P-EVEN	Positive(+) LVDS differential first 2 data(B port)
13	Y2M-EVEN	Negative(-) LVDS differential first 2 data(B port)
14	GND	Ground
15	Y1P-EVEN	Positive(+) LVDS differential first 1 data(B port)
16	Y1M-EVEN	Negative(-) LVDS differential first 1 data(B port)
17	YOP-EVEN	Positive(+) LVDS differential first 0 data(B port)
18	YoM-EVEN	Negative(-) LVDS differential first 0 data(B port)
19	GND	Ground
20	Y3P-ODD	Positive(+) LVDS differential second 3 data(A port)
21	Y3M-ODD	Negative(-) LVDS differential second 3 data(A port)
22	YCP-ODD	Positive(+) LVDS differential second Clock(A port)
23	YCM-ODD	Negative(-) LVDS differential second Clock(A port)
24	Y2P-ODD	Positive(+) LVDS differential second 2 data(A port)
25	Y2M-ODD	Negative(-) LVDS differential second 2 data(A port)
26	GND	Ground
27	Y1P-ODD	Positive(+) LVDS differential second 1 data(A port)
28	Y1M-ODD	Negative(-) LVDS differential second 1 data(A port)
29	YOP-ODD	Positive(+) LVDS differential second 0 data(A port)
30	YoM-ODD	Negative(-) LVDS differential second 0 data(A port)

* You can use an even port for 1Ch LVDS

J8: ANALOG RGB INPUT (D-Sub 15P)

Pin No.	Symbol	Description
1	Red1	Red analog input
2	Green1	Green analog input
3	Blue1	Blue analog input
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	NC	Not connected
10	GND	Ground
11	GND	Ground
12	DSDA	DDC-SDA
13	HSYNC	Horizontal Sync
14	VSNC	Vertical Sync
15	DSCL	Serial Clock Input

J7: ANALOG RGB INPUT (12P Connector)

Pin No.	Symbol	Description
1	VSYNC	Vertical Sync
2	GND	Ground
3	HSYNC	Horizontal Sync
4	NC	Not Connected
5	Bo+	Blue analog input
6	Bo-	Ground
7	Go+	Green analog input
8	Go-	Ground
9	Ro+	Red analog input
10	Ro-	Ground
11	DSCL	DDC-SCL
12	DSDA	DDC-SDA
13	CHK	Check Cable

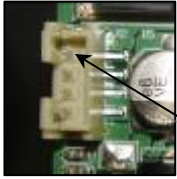
J10: DVI-D Input Connector

Pin No.	Symbol	Description
1	TMDS DATA2-	TMDS DATA2 Differential Negative Signal
2	TMDS DATA2+	TMDS DATA2 Differential Positive Signal
3	TMDS DATA2 Shield	Shield for TMDS Channel #2
4	NC	No Connection
5	NC	No Connection
6	DDC Clock	The Data Line for the DDC Interface
7	DDC Data	The Clock Line for the DDC Interface
8	NC	No Connection
9	TMDS DATA1-	TMDS DATA1 Differential Negative Signal
10	TMDS DATA1+	TMDS DATA1 Differential Positive Signal
11	TMDS DATA1 Shield	Shield for TMDS Channel #1
12	NC	No Connection
13	NC	No Connection
14	+5V Power	+5 Volt signal for EDID (Un-powered Monitor)
15	GND(for +5V)	Ground for +5 Volt Power pin, Sync return
16	HPD	Identify the presence of a monitor
17	TMDS DATA0-	TMDS DATA0 Differential Negative Signal
18	TMDS DATA0+	TMDS DATA0 Differential Positive Signal
19	TMDS DATA0 Shield	Shield for TMDS Channel #0
20	NC	No Connection
21	NC	No Connection
22	TMDS CLOCK Shield	Shield for TMDS Clock differential Pair
23	TMDS CLOCK+	TMDS DATA0 Differential Positive Signal
24	TMDS CLOCK-	TMDS DATA0 Differential Negative Signal

J11: DC power Input Jack (12V)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
Center	Vcc	12V	Shell	GND	Ground

J12: SMPS Power input connector



Pin No.	Symbol	Description
1,2	GND	Ground
3,4	12V	12V

J12
Circuit No.1

J17: Composite Video input connector



Pin No.	Symbol	Description
1	CVBS1	Composite Signal 1
2	CVBS2	Composite Signal 2(TBD)
3,4	GND	Ground

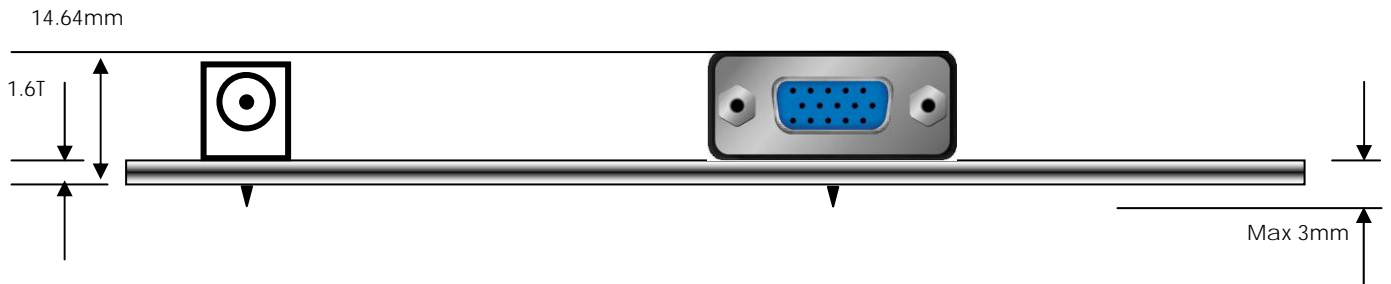
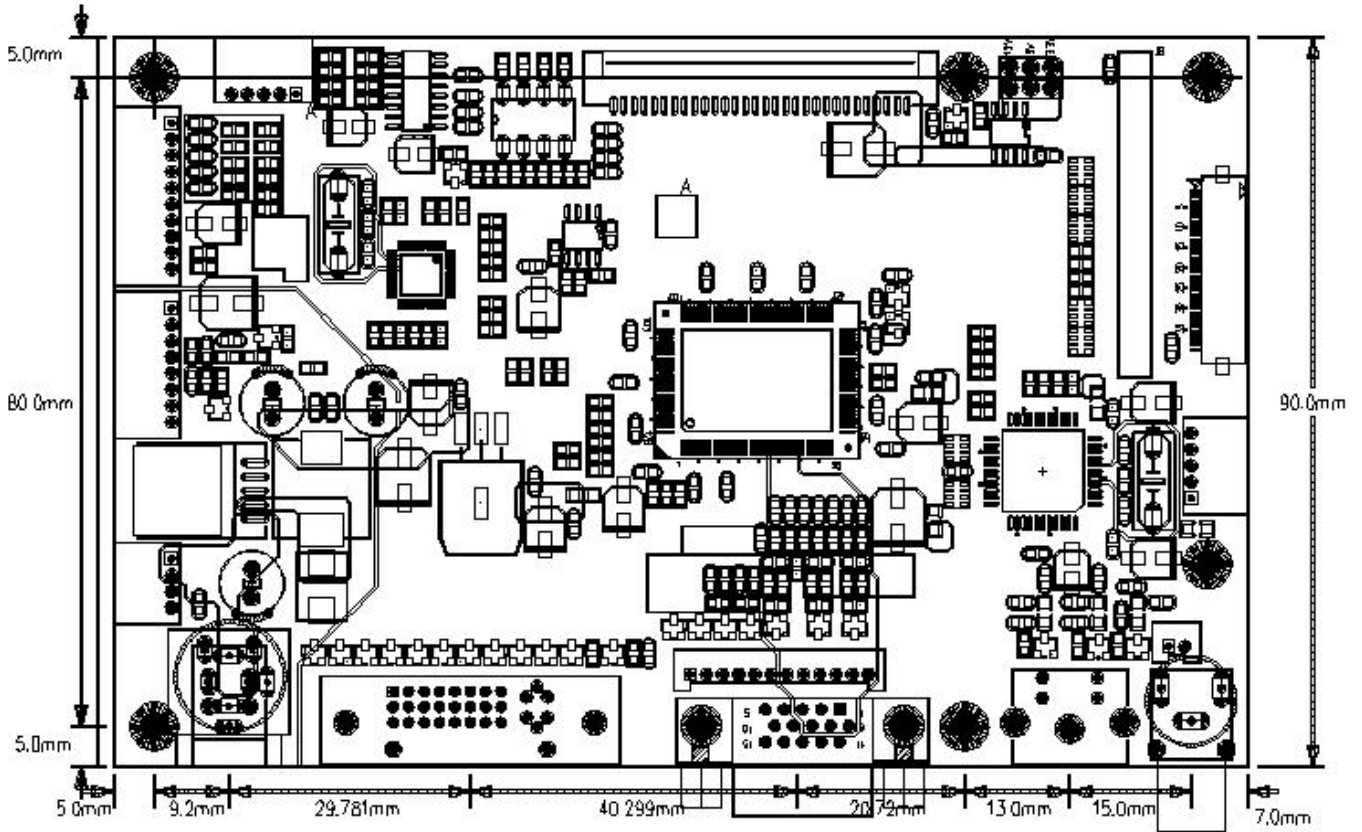
J17
Circuit No.1

J13: Summary: Panel Power Jumpers setting

Reference	Description	Connector Type
J13	3.3V panel power CAUTION: Incorrect setting can damage panel	 12V 5V 3.3V
	5.0V panel power CAUTION: Incorrect setting can damage panel	 12V 5V 3.3V
	12V/18V panel power CAUTION: Incorrect setting can damage panel	 12V 5V 3.3V

CAUTION: Incorrect setting can damage panel

9. CONTROLLER DIMENSIONS



10. APPLICATION NOTES

A. USING THE CONTROLLER WITHOUT BOTTONS ATTACHED:

This is very straightforward:

- Firstly setup the controller/display system with the buttons. With the attached controllers and display system active make any settings for color, contrast and image position as required then switch everything off.
- Remove the control switches, the 7-way cable.
- Refer to inverter specifications for details as to fixing brightness to a desired level, this may require a resistor, an open circuit or closed circuit depending on inverter

B. INVERTER CONNECTION:

There are 3 potential issues to consider with inverter connection:

- Power
- ON/OFF
- Brightness (DIM-ADJ)

Inverter power: This should be matched with the inverter specification.

Inverter ON/OFF: This is a pin provided on some inverter for ON/OFF function and is used by this panel controller for VESA DPMS compliance. If the inverter does not have on/off pin or the on/off pin is not used DPMS will not operate. Pin5 should be matched to the inverter specification for the ON/OFF pin.

Brightness Dimming control: This controller boards are analog dimming control method. And it is important to consider the specifications for the inverter to be used.

11. TROUBLESHOOTING

A. General:

A general guide to troubleshooting of a flat panel display system it worth considering the system as separate elements, such as:

- Controller (jumpers, PC settings)
- Panel (controller, cabling, connection, panel, PC settings)
- Backlight (inverter, cabling, connection, panel, Pc settings)
- Cabling
- Computer system (display settings, operating system)

Through checking the system step by step cross with instruction manuals and a process of elimination to isolate the problem it is usually possible to clearly identify the problem area.

B. No image:

- If the panel backlight is not working it may still be possible to see just some image.
- A lack of image is most likely to be caused by incorrect connection, lack of power, failure to provide a signal or incorrect graphic card settings.

C. Image position:

If it is impossible to position the image correctly, the image adjustment controls will not move the image far enough, then test using another graphics card. This situation can occur when a graphic card is not close to standard timing or when something is in the graphics line that may affect the signal such as a signal splitter (please note that normally a signal splitter will not have any adverse effect).

D. Image appearance:

- A faulty panel can have blank lines, failed sections, flickering or flashing display.
- Incorrect graphic card refresh rate, resolution or interlaced mode will probably cause the image to be the wrong size, to scroll to, flicker badly or possibly even no image.
- Incorrect jumper settings on the controller may cause everything from incorrect image viewing to total failure.

CAUTION: Do not set the panel power input incorrectly.

- Sparkling on the display: faulty panel signal cable.

E. Backlight::

Items to check include: Power input, controls, inverter and Tubes generally in this order.

If half the screen is dimmer than the other half:

- Check cabling for the inverter.
- Also: If system does not power down when there is a loss of signal.

12. APPLICABLE GRAPHIC MODE

The microprocessor measures the, H – sync V – sync and polarity for RGB Inputs, and uses this timing information to control all of the display operation to get the proper image on a screen. This board can detect all VESA standard Graphic modes shown on the table below and Provide more clear and stable image on a screen

RGB input format

Spec Mode	Pixel Freq.	Horizontal Timing			Vertical Timing		
		Sync Polar	Freq.	Active	Sync Polar	Freq.	Active
	MHz		KHz	Pixel		Hz	Lind
640*350@70Hz	25.144	P	31.430	640	N	70.000	350
640*400@70Hz	28.287	N	31.430	640	P	70.000	400
720*400@70Hz	28.287	N	31.430	720	P	70.000	400
640*480@60Hz	28.175	N	31.469	640	N	59.940	480
640*480@72Hz	31.500	N	37.861	640	N	72.809	480
640*480@75Hz	31.500	N	37.500	640	N	75.000	480
800*600@56 Hz	36.000	P	35.156	800	P	56.250	600
800*600@60Hz	40.000	P	37.879	800	P	60.317	600
800*600@72Hz	50.000	P	48.077	800	P	72.188	600
800*600@75Hz	49.500	P	46.875	800	P	75.000	600
1024*768@60Hz	65.000	N	48.363	1024	N	60.005	768
1024*768@70Hz	75.000	N	56.476	1024	P	70.070	768
1024*768@75Hz	78.750	P	60.023	1024	P	75.030	768
1280*720@60Hz	74.500	P	44.772	1280	P	59.855	720
1360*768@60Hz	84.75	P	47.72	1360	P	59.799	768
1280*1024@60Hz	108.000	P	63.981	1280	P	60.020	1024
1280*1024@75Hz	135.000	P	79.976	1280	P	75.035	1024
1600*1200@60Hz	162.000	P	75.000	1600	P	60.00	1200

13. ACCESSORY

This controller board requires several accessories to build a complete display unit. We can provide standard accessory for this board as below.

No.	Items	Part No.	Ex) LG Display LM215WF1
1	LCD signal cable	NHL – S32- Panel Part No. - mm	NHL-S32-FI-X30H-A-300AB
2	Inverter	Part no. of Manufacturer	FIF2242-01B
3	Inverter cable	NHI – S10 - Inverter Part No. - mm	NHI-S10-SMH200-08-A-300AA
4	OSD Board	NK05A	NK05A
5	OSD Cable	NHK- S07 - OSD Part No – mm	NHK-S07-12505HS-07-A-200AA

* SC: LCD Signal Cable

OC: OSD Board cable

IC: Inverter Interface cable

mm: Cable length (unit: mm)

14. APPENDIX

A. Tested panel

This controller board can support various LCD panels, which have WVGA, SVGA, XGA, WXGA and SXGA resolution.

The table below shows the model names of LCD panel, Jumper setting for LCD power, LCD panel selection and the dedicated inverter for each LCD panel. All of the LCD Panels listed can work without changing the control program of this board. And we will try continuously to the model names of the LCD panels that have been tested.

No.	LCD Model Name	LCD vendor	LCD VCC	Remarks
1	AT070TN84	INNOLUX(FOXCONN)	3.3V	TTL Interface, WVGA
2	AT080TN42	INNOLUX(FOXCONN)	3.3V	TTL Interface, SVGA
3	HV104X01-100	BOE-HYDIS	3.3V	LVDS Interface, XGA
4	HT12X21-221	BOE-HYDIS	3.3V	LVDS Interface, XGA
5	LTM170E8-L01	Samsung	5.0V	LVDS Interface, SXGA
6	LM190E03	LG Philips LCD	5.0V	LVDS Interface, SXGA

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