

Datasheet

Fortec Integrated

Prisma-V

All-In-One Compact Mini-DisplayPort/DVI(HDMI/HDCP)/RGB/Video Converter Board

PR-01-350; PR-01-351



Version 2.2

17.12.2024

FORTEC
UNITED STATES



FORTEC
INTEGRATED



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1 Revision History

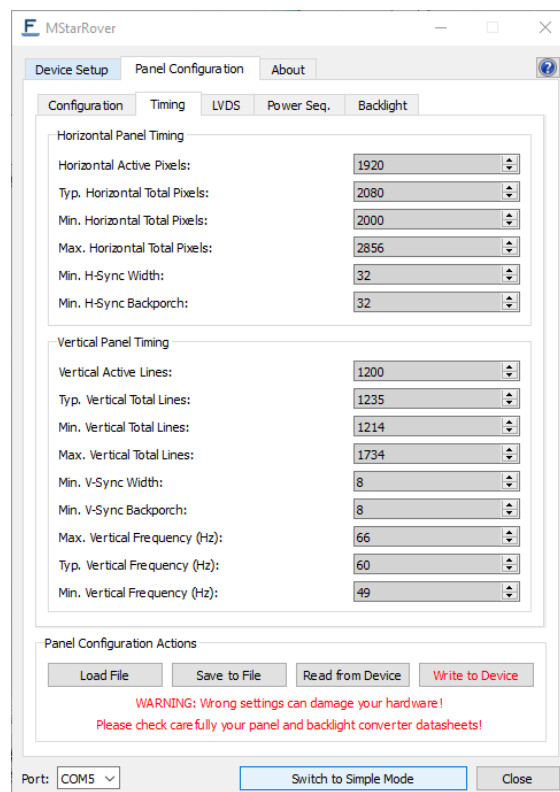
Date	Rev.No.	Description	Page
10.07.2020	1.0	Initial version	all
16.07.2020	1.1	Mechanical Specification updated CON26 optional Hardware Information updated for 2-ch and 4-ch LVDS output	1,11 22,29 30
20.07.2020	1.2	PR-01-351 added	1, 30
22.07.2020	1.3	Template updated	All
09.12.2021	1.4	CON3 Mini-DisplayPort Input changed to Pulse E9320-001-01 Swapped CON3 and CON2 CON8 changed from RS232 to UART (TTL-level) type DF13-5P-1.25H CON9 changed to standard HDMI connector Molex 47151-1001 CON27 Alternate internal USB connector added CON28 Fan Connector added	19, 22 22, 23 22, 24 22, 24 22, 27 22, 28
10.01.2022	1.5	CON2 changed to JAE DX07S016JA3R1500 CON2 and CON3 swapped SW20 obsolete	21, 22 2, 16, 21, 22 29
08.02.2022	1.6	Top View updated Input Connectors on Font Side, heatsink updated Alternate Power Supply Connector CON11# added CON26: Internal Power Connector added Connectors and Switchers updated	16 17 17, 24 18 21
14.02.2022	1.7	Rearranged table layout MstarRover picture updated	All 6
02.02.2023	1.8	Mechanical Specification updated CON28 Fan Connector updated CON18 SPI Programming added CON29 Debug Connector added	16 22 22, 27 22, 28
30.06.2023	1.9	CON26 Pin2 and Pin4 added	30
02.08.2024	2.0	New template, various changes, added Chapter 9, etc.	all
24.09.2024	2.1	Corrected USB-MINI>>USB-C	32
17.12.2024	2.2	OSD Menu updated	10-15

2 Overview

Prisma-V is a graphics processing board, providing high quality images for LCD TFT panels. The board supports TFT panels up to WUXGA and can be used in a variety of systems. It is developed by Fortec Integrated and can adapt almost every TFT panel.

3 General Features

- Scaler technology: frame buffer
- Zoom and shrink scaling
- Frame rate conversion
- Picture-In-Picture
- Sharpness enhancement and color control
- Supports VESA DDC/CI and a subset of VESA DPMS standards
- PWM or voltage-controlled backlight intensity
- Four button OSD - keypad interface and on-screen menus allow adjustments to the system
- True High Definition 1920x1080@144Hz on dual-link DVI connector, supporting HDMI 1.3 and 1.4
- HDMI2.0 input supporting resolutions up to 1920x1080@144Hz
- Mini-DisplayPort input supporting resolutions up to 1920x1080@144Hz
- Analog RGB/VGA input capture up to 205MHz
- USB-OTG: Firmware update using an USB-Stick via USB-Type-C connector.
- Serial Remote Control protocol using USB-Type-C COM Port or internal UART connector
- Fully Customizable through the configuration software "MstarRover"



4 Hardware Features

High-Quality Advanced Scaling

- Fully programmable shrink and zoom capabilities
- 10-bit data processing
- Support automatic 3:2 pull-down & 2:2
- Pull-down detection and recovery
- Supports sRGB and xvYCC color processing
- Supports 17x17x17 3D LUT
- Programmable 12-bit RGB gamma LUT
- Sharpness enhancement and color control

Analog RGB Input

- Supports up to 1792x1344@60Hz or 1920x1260@60Hz or 1600x1200@75Hz standard modes
- Supports up to 1920x1440@60Hz or 2128x1200@ 60Hz with reduced blanking
- Captures up to 205MHz

DVI/HDMI Receiver

- Single or Dual Link TMDS Rx for up to 12-bit 1080p
- Direct connect to all DVI/HDMI 1.3 and 1.4 compliant TMDS transmitters
- HDCP1.3

DisplayPort Receiver

- Mini-DisplayPort connector
- DisplayPort v1.2a complaint
- HDCP1.3

LVDS Interface

- Fully programmable 2-ch LVDS mappings for compliance with all LVDS protocols (PR-01-350)
- Fully programmable 4-ch LVDS mappings for compliance with all LVDS protocols (PR-01-351)

Auto-Configuration / Auto-Detection

- Phase and image positioning
- Input format detection

Frame Store

- Frame rate conversion
- Shrink scaling

On Screen Display

- Horizontal and vertical stretch of OSD images
- Transparency and blending
- Supports 512 color palette

Output Format

- Single/double/four channel up to 1920x1080@144Hz output for LVDS panels
- Support for 10, 8 or 6-bit panels (with high-quality dithering)

4.1 Power saving functionality

Prisma-V supports power supply unit remote control. This allows Prisma-V firmware to shut down display and / or backlight power if Prisma-V is in standby mode.

During normal operation/input search/input-not-supported, the external power supply will be enabled.

During power-off and standby-mode, the external power supply will be disabled.

Connection of switched power supply to CON16:

1. Verify the behaviour of desired power supply
2. Compare to table below (1st column)
3. Connect as described below (2nd, 3rd and 4th column)

The following features are supported (**without Board modifications**):

Behaviour of switched power supply in relation to control input (PSU_RC):	Connect control input (PSU_RC) to:	Connect Ground to:	Additional connections on CON16
Short=PowerOFF, Open=PowerON	CON16 PIN6	CON16 PIN2	None
Short=PowerON, Open=PowerOFF	CON16 PIN5	CON16 PIN2	None
0V=PowerON, 5V=PowerOFF	CON16 PIN5	CON16 PIN2	CON16 PIN4 to PIN1
5V=PowerON, 0V=PowerOFF	CON16 PIN6	CON16 PIN2	CON16 PIN4 to PIN1

See Appendix A: PSU low-power-control timings (CON16 pin 5&6) **for timing details.**

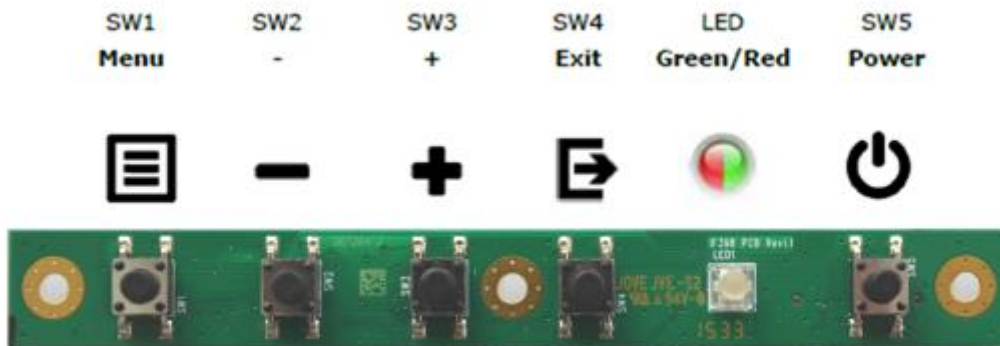
5 OSD Menu and User Controls

The OSD allows selection of input source and fine tuning of various functional parameters like brightness, contrast etc. These parameters can be adjusted via an external interface.

5.1 OSD Control through External Keypad

An OSD keypad can be used to control the OSD. There is a 4-Button OSD keypad available, it can be connected to CON10 of Prisma-V via cable **ZU-05-032**.

4-Button OSD Keypad IF398 (ZU-02-398)



The following tables give you an overview about the functionality.

	Menu	-	+	Exit	LED	Power
General					See below	Power ON/OFF
OSD closed	Open OSD		Hotkey Brightness	Input Select		
OSD open	Select	Down/Left/-	Up/Right/+	Exit/Back		

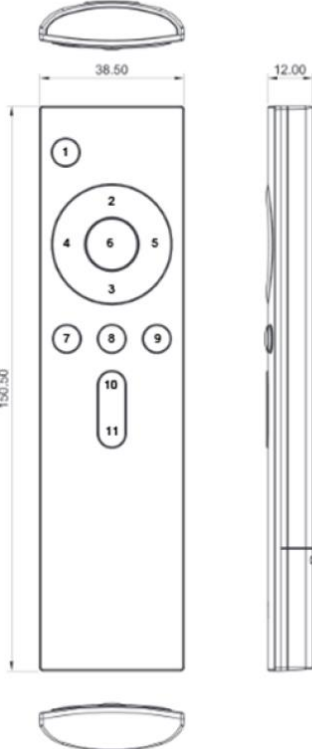

LED Status:

- Green: Signal Found
- Green flashing: Searching Signal
- Red: Power Safe
- Red flashing: Blank or corrupted panel config data. Please contact Distec support.
- LED OFF: Power OFF

5.2 OSD Control through IR Remote Control

Alternative to the external keypads, the Prisma-V can also be controlled by a remote-control device.

To communicate by IR, an IR-receiver **IF437 (ZU-02-406)** can be attached to connector CON25 of Prisma-V via cable **KA-30-467**. With this receiver you can control the Prisma-V using the IR Remote Control **RC-10-007** (see picture below).

Position	Code	Function	RC-10-007 Button Position	RC-10-007 Picture
1	0x01	Power		
2	0x0D	Key Up		
3	0x11	Key Down		
4	0x0E	Key Left / decrease Brightness		
5	0x10	Key Right / increase Brightness		
6	0x0F	Key Enter		
7	0x27	Menu		
8	0x13	Exit		
9	0x05	Mute		
10	0x04*	Volume +		
11	0x03*	Volume -		

(*) Not available, Prisma-V does not support audio

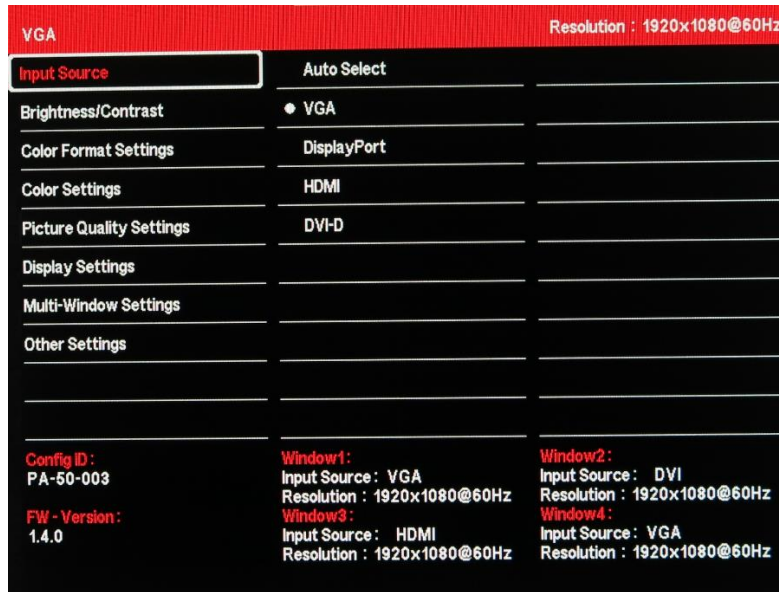
See also section 11.3.14 CON25: IR Remote Control Receiver Connector

5.3 Input Selection (Hot key)

When the OSD is closed press SW4 on your keypad (EXIT key on 4-button keypad) or button 8“Exit” on your IR remote control. This opens a dialog where you can manually switch to a specific input port. Note that only ports which are enabled in the Firmware can be selected in this dialog.

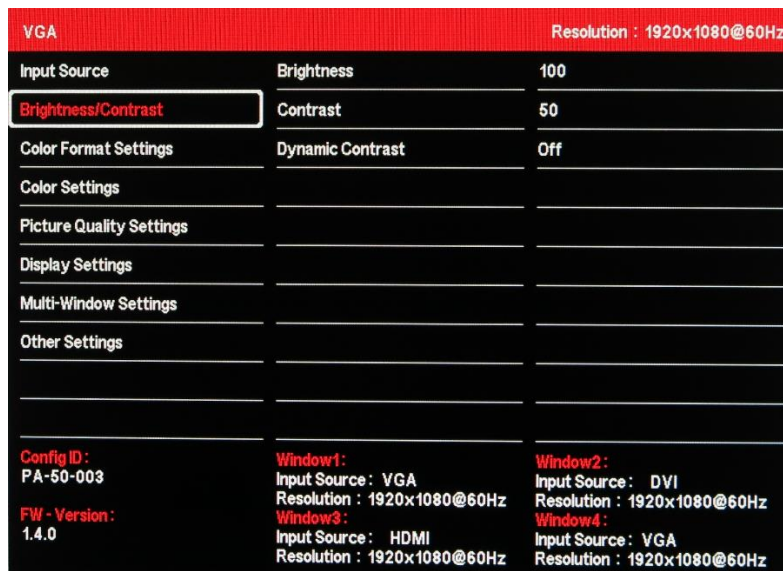
6 On-Screen-Menu (OSM)

6.1 Input Source



Enables the manual selection of the input source, **Auto Select** enables / disables input auto-detection

6.2 Brightness / Contrast



Brightness: Brightness of the image can be controlled using this function, with left and right buttons after the brightness slider is selected. This function modifies RGB data or Backlight brightness (depending on configuration set by using the MstarRover) to change the brightness.

Contrast: Allows <Contrast> adjustment in the Y domain. The modification affects all color channels and all input types and is a direct multiplication of the Y data after YUV black level adjustment.

6.3 Color Format Settings

VGA		Resolution : 1920x1080@60Hz
Input Source	Input Color Format	
Brightness/Contrast	Color Domain	RGB Domain
Color Format Settings	Range Extension	Full Range
Color Settings		
Picture Quality Settings		
Display Settings		
Multi-Window Settings		
Other Settings		
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2: Input Source : DVI Resolution : 1920x1080@60Hz
FW - Version: 1.4.0	Window3: Input Source : HDMI Resolution : 1920x1080@60Hz	Window4: Input Source : VGA Resolution : 1920x1080@60Hz

Input Color Format: Allows selection of different color formats such as RGB, YUV 4:2:2, YUV 4:4:4, YUV 4:2:0 or Auto Select. Not available for VGA input source.

Color Domain: Switches between RGB and YUV color spaces.

Range Extension: Allows selection between Full Range, Limited Range or Auto Select.

6.4 Color Settings

VGA		Resolution : 1920x1080@60Hz
Input Source	Bypass	Off
Brightness/Contrast	Gamma	2.2
Color Format Settings	Color Modes	
Color Settings	Color Temperature	RGB
Picture Quality Settings	Gain	
Display Settings	Independent Color Hue	
Multi-Window Settings	Independent Color Saturation	
Other Settings	Independent Color Brightness	
	Global Hue/Saturation	
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2 : Input Source : DVI Resolution : 1920x1080@60Hz
FW - Version : 1.4.0	Window3 : Input Source : HDMI Resolution : 1920x1080@60Hz	Window4 : Input Source : VGA Resolution : 1920x1080@60Hz

Bypass: Disables color settings below.

Gamma: Allows selection of different gamma values from 1.8 to 2.6.

Color Temperature: Allows selection of different predefined color temperature schemes such as 5700K, 6500K, 9300K or RGB.

Gain Red, Green, Blue: Control the amount of the corresponding color components in the displayed image.

Independent Color Hue: Allows <Hue> adjustment in the UV domain. The modification affects all color channels and all input types. Available if the color space of an input is not RGB.

Independent Color Saturation: Allows <Saturation> adjustment in the UV domain. The modification affects all color channels and all input types. Available if the color space of an input is not RGB.

Independent Color Brightness: Allows <Brightness> adjustment in the UV domain. The modification affects all color channels and all input types. Available if the color space of an input is not RGB.

Global Hue/Saturation: Allows <Hue> and <Satuarion> adjustment in the UV domain. The modification affects all color channels and all input types. Available if the color space of an input is not RGB.

6.5 Picture Quality Settings

VGA		Resolution : 1920x1080@60Hz
Input Source	Bypass	Off
Brightness/Contrast	Sharpness	50
Color Format Settings	Response Time	Off
Color Settings	Dynamic Noise Reduction	Off
Picture Quality Settings	Super Resolution	0
Display Settings	Skin Tone	0
Multi-Window Settings	SNR	Off
Other Settings	Static Luminance Control	0
	Dynamic Luminance Control	Off
	Film Detection	Off
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2: Input Source : DVI Resolution : 1920x1080@60Hz
FW - Version: 1.4.0	Window3: Input Source : HDMI Resolution : 1920x1080@60Hz	Window4: Input Source : VGA Resolution : 1920x1080@60Hz

Bypass: Disables color settings below.

Sharpness: Allows <Sharpness> adjustment of the image.

Response Time: Selects between On and Off.

Dynamic Noise Reduction: Allows selection between Off, High, Middle and Low.

Super Resolution: Allows image sharpening in five steps.

Skin Tone: Allows adjustment of the skin tone in ten steps.

SNR: Allows selection of the signal-to noise ratio between Off, High, Middle and Low.

Static Luminance Control: Allows selection of six non-linear contrast settings.

Dynamic Luminance Control: Allows enabling the dynamic luminance.

Film Detection: Allows enabling of the film detection.

6.6 Display Settings

VGA		Resolution : 1920x1080@60Hz
Input Source	Aspect Ratio	
Brightness/Contrast	Horizontal Position	50
Color Format Settings	Vertical Position	50
Color Settings	Pixel Clock	50
Picture Quality Settings	Phase	84
Display Settings	Auto Adjust	
Multi-Window Settings		
Other Settings		
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2: Input Source : DVI Resolution : 1920x1080@60Hz
FW - Version: 1.4.0	Window3: Input Source : HDMI Resolution : 1920x1080@60Hz	Window4: Input Source : VGA Resolution : 1920x1080@60Hz

Horizontal Position: Allows the horizontal adjustment of the input image. (available only for the analog input)

Vertical Position: Allows the vertical adjustment of the input image. (available only for the analog input)

Pixel Clock: This function is a slider to adjust the sample clock of the analog interface. This is helpful for improving the image quality for non-standard display modes. (available only for the analog input)

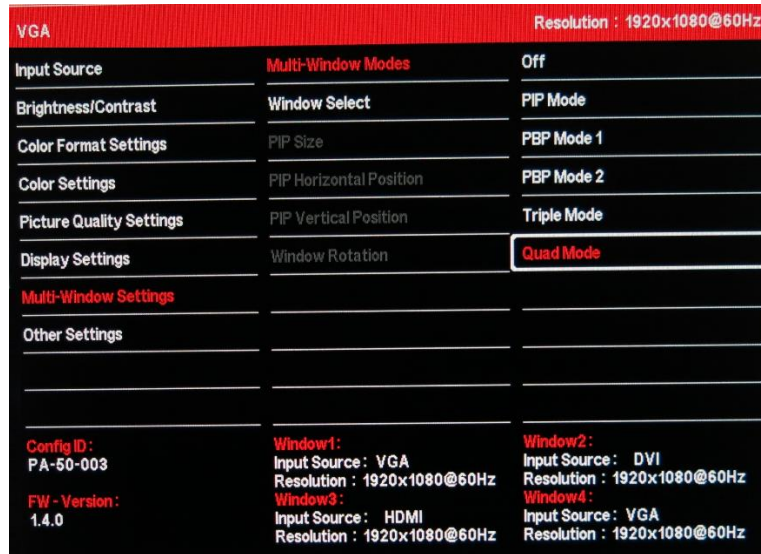
Phase: This function is a slider to adjust the sampling phase of the analog interface. For optimum image quality, input pixels should be sampled at the ideal sampling points. (available only for the analog input)

Auto Adjust: Allows initiating of auto adjustment. (available only for the analog input)

VGA		Resolution : 1920x1080@60Hz
Input Source	Aspect Ratio	Full Screen
Brightness/Contrast	Horizontal Position	Auto
Color Format Settings	Vertical Position	4 : 3
Color Settings	Pixel Clock	5 : 4
Picture Quality Settings	Phase	16 : 9
Display Settings	Auto Adjust	1 : 1
Multi-Window Settings		
Other Settings		
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2: Input Source : Resolution :
FW - Version: 1.4.0	Window3: Input Source : Resolution :	Window4: Input Source : Resolution :

Aspect Ratio: Allows adjustment of the display's width to height proportions. (available only for single window mode)

6.7 Multi Window Settings

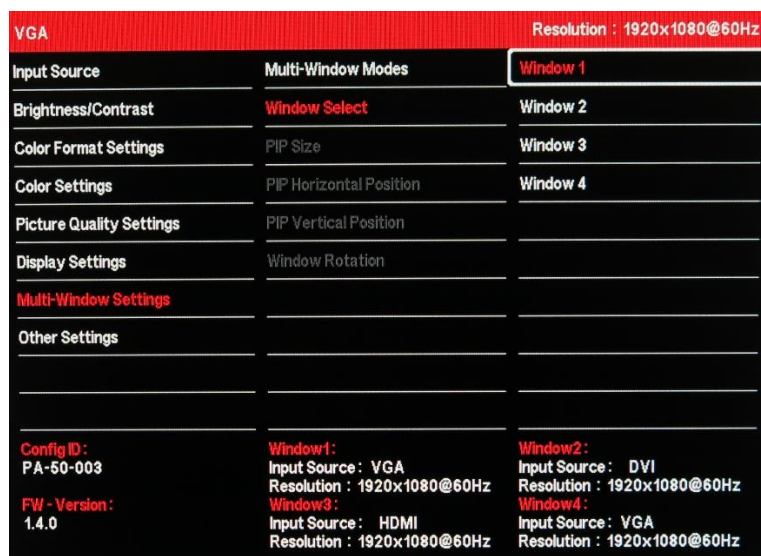


Multi Window Modes: Allows selection between Off (one window), Picture-in-Picture, Picture-by-Picture (two windows), Tripple Mode (tree windows) and Quad Mode (four windows).

PIP Size: Allows adjustment of the screen size in Picture-in-Picture mode only.

PIP Horizontal Position: Allows the horizontal adjustment of the sub window position in PIP mode only.

PIP Vertical Position: Allows the vertical adjustment of the sub window position in PIP mode only.



Window Select: Allows selection of one of four active windows. Further window related adjustments like contrast or gain have an effect on the selected window.

VGA		Resolution : 1920x1080@60Hz
Input Source	Multi-Window Modes	
Brightness/Contrast	Window Select	
Color Format Settings	PIP Size	
Color Settings	PIP Horizontal Position	None
Picture Quality Settings	PIP Vertical Position	90
Display Settings	Window Rotation	270
Multi-Window Settings		H-Mirror
Other Settings		Y-Mirror
		180
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2: Input Source : Resolution :
FW - Version: 1.4.0	Window3: Input Source : Resolution :	Window4: Input Source : Resolution :

Window Rotation: Allows image rotation and mirroring. (available only for single window mode)

6.8 Other Settings

VGA		Resolution : 1920x1080@60Hz
Input Source	Language	English
Brightness/Contrast	Menu Transparency	0
Color Format Settings	Menu Rotation	0
Color Settings	DP Config	
Picture Quality Settings	FreeSync Mode	Off
Display Settings	IR Remote	On
Multi-Window Settings	Factory Reset	
Other Settings		
Config ID: PA-50-003	Window1: Input Source : VGA Resolution : 1920x1080@60Hz	Window2: Input Source : Resolution :
FW - Version: 1.4.0	Window3: Input Source : Resolution :	Window4: Input Source : Resolution :

Language: Selects the language between English and Chinese.

Menu Transparency: Sets the transparency level of the OSD Menu on the 0 to 5 scale (0 – not transparent, 5 – barely visible)

Menu Rotation: Rotates the OSD Menu by 90, 180 or 270 degrees.

DP Config: Allows selection between DisplayPort Standard 1.1 and 1.2. (only when DP Input Port selected)

FreeSync Mode: Enables the FreeSync mode.

IR Remote: Enables the infrared remote control.

Factory Reset: Resets the display settings to the default ones.

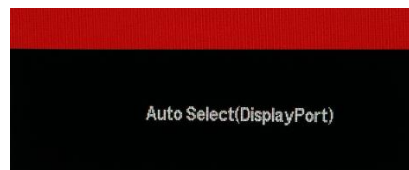
6.9 Info section

Config ID: Shows the "PA" number of the kit, determined by the using the MstarRover.

FW-Version: Shows the version of the firmware.

Window1 ~ Window4: Shows the corresponding input source, detected image resolution and frame rate.

6.10 Input Source Window



Select the input signal source without going into the main menu.

7 Supported Input Modes

The Prisma-V can support the following input modes. Other modes can be implemented on request. Please ask your sales contact for more details.

7.1 VGA

The factory preset supported input modes include:

Resolution	Resolution
640 x 480 @ 60 Hz (VESA)	1360 x 768 @ 60 Hz
800 x 600 @ 60 Hz (VESA)	1366 x 768 @ 60 Hz
1024 x 768 @ 60 Hz (VESA)	1600 x 1200 @ 60 Hz (VESA)
1280 x 768 @ 60 Hz	1920 x 1200 @ 60 Hz
1280 x 800 @ 60 Hz	1920 x 1080 @ 60 Hz
1280 x 1024 @ 60 Hz (VESA)	

7.2 DVI/HDMI

The integrated HDMI receiver is backward compatible with DVI 1.0 specifications, therefore both DVI and HDMI signals can be supplied to the DVI connector CON7 and to the HDMI2.0 connector CON9.

The factory preset supported graphic input modes include:

Resolution	Resolution
640 x 480 @ 60 Hz (VESA)	1366 x 768 @ 60 Hz
800 x 600 @ 60 Hz (VESA)	1600 x 1200 @ 60 Hz (VESA)
1024 x 768 @ 60 Hz (VESA)	1920 x 1200 @ 60 Hz
1280 x 768 @ 60 Hz	1920 x 1080 @ 60 Hz
1280 x 800 @ 60 Hz	1920 x 1080 @ 120 Hz (Dual Link-DVI) *
1280 x 1024 @ 60 Hz (VESA)	1920 x 1080 @ 144 Hz (Dual Link-DVI) *
1360 x 768 @ 60 Hz	

Note (*): only available on HW version Prisma-V-01 (PR-01-351) 4-channel LVDS

The factory preset supported video input modes include:

Resolution	Resolution
720 x 480 @ 60	1280 x 720 @ 60
720 x 576 @ 50	1920 x 1080 @ 50
1280 x 720 @ 50	1920 x 1080 @ 60

7.3 Mini-DisplayPort

The integrated DisplayPort receiver is v1.2a compliant.

The factory preset supported graphic input modes include:

Resolution	Resolution
640 x 480 @ 60 Hz (VESA)	1366 x 768 @ 60 Hz
800 x 600 @ 60 Hz (VESA)	1600 x 1200 @ 60 Hz (VESA)
1024 x 768 @ 60 Hz (VESA)	1920 x 1200 @ 60 Hz
1280 x 768 @ 60 Hz	1920 x 1080 @ 60 Hz
1280 x 800 @ 60 Hz	1920 x 1080 @ 120 Hz (Dual Link-DVI) *
1280 x 1024 @ 60 Hz (VESA)	1920 x 1080 @ 144 Hz (Dual Link-DVI) *
1360 x 768 @ 60 Hz	

Note (*): only available on HW version Prisma-V-01 (PR-01-351) 4-channel LVDS

8 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Supply Voltage	V_{in}	-0.2	30	VDC	1, 2
Storage Temperature	T_{st}	-35	+85	°C	
Operating Temperature	T_{op}	-20	+70	°C	3

Note (1) Within operating temperature range.

Note (2) Permanent damage to the device may occur if maximum values are exceeded.

Note (3) Correct operation is guaranteed from 0°C to +70°C. Specifications over the -20°C to +70°C operating temperature range are assured by design characterization and correlation with statistical process controls.

9 Electrical Specification

Remark: All values are average values of repeated measurements. Other Prisma-V types or Prisma-V / panel combinations may have different electrical characteristics. Measurements were performed at 25°C. Currents were measured at nominal supply voltage (12V and 24V, respectively).

Prisma-V covers both standard supply voltages of 12VDC and 24VDC in one assembly version.

For panels and backlight controllers requiring supply voltage of 12VDC, if the input voltage rises above 12V, the panel and backlight voltage remains at 12V for the wide input voltage range of 12.1V to 28V.

Item	Condition	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage (V_{in})		10.8	12.0	28.0	VDC	1
Input Current (@12V)	Power-off	24	30	36	mA	
	Sleep mode	30	38	46	mA	
	Board only	212	265	320	mA	2
Input Current (@5V) through CON16 low-power PSU	Power-off	23	29	35	mA	3

- 1) Supply voltage limits are for the Prisma-V, inverter and possibly panel supply limits must be met as well, when the backlight is to be powered by the Prisma-V board or the panel SVCC setting is set to 12V.
- 2) Resolution 1920x1200 60 Hz, PIP, HDMI IN, "Moire" test picture
- 3) External power supply unit is placed in low power mode through GPIO control: +12V input voltage is switched off, only +5V is supplied through CON16 pin 1.

9.1 Maximum allowed Power Consumption for TFT Panels (V_{SVCC})

Item	Symbol	Max.	Unit	Note
3.3V, (5V), [12V] (V_{SVCC}) Panel power	I_{SVCC}	1.5, (2.6), [2.6]	A	1,2,3

9.2 Maximum allowed Power Consumption for Backlight Inverter (V_{BKL})

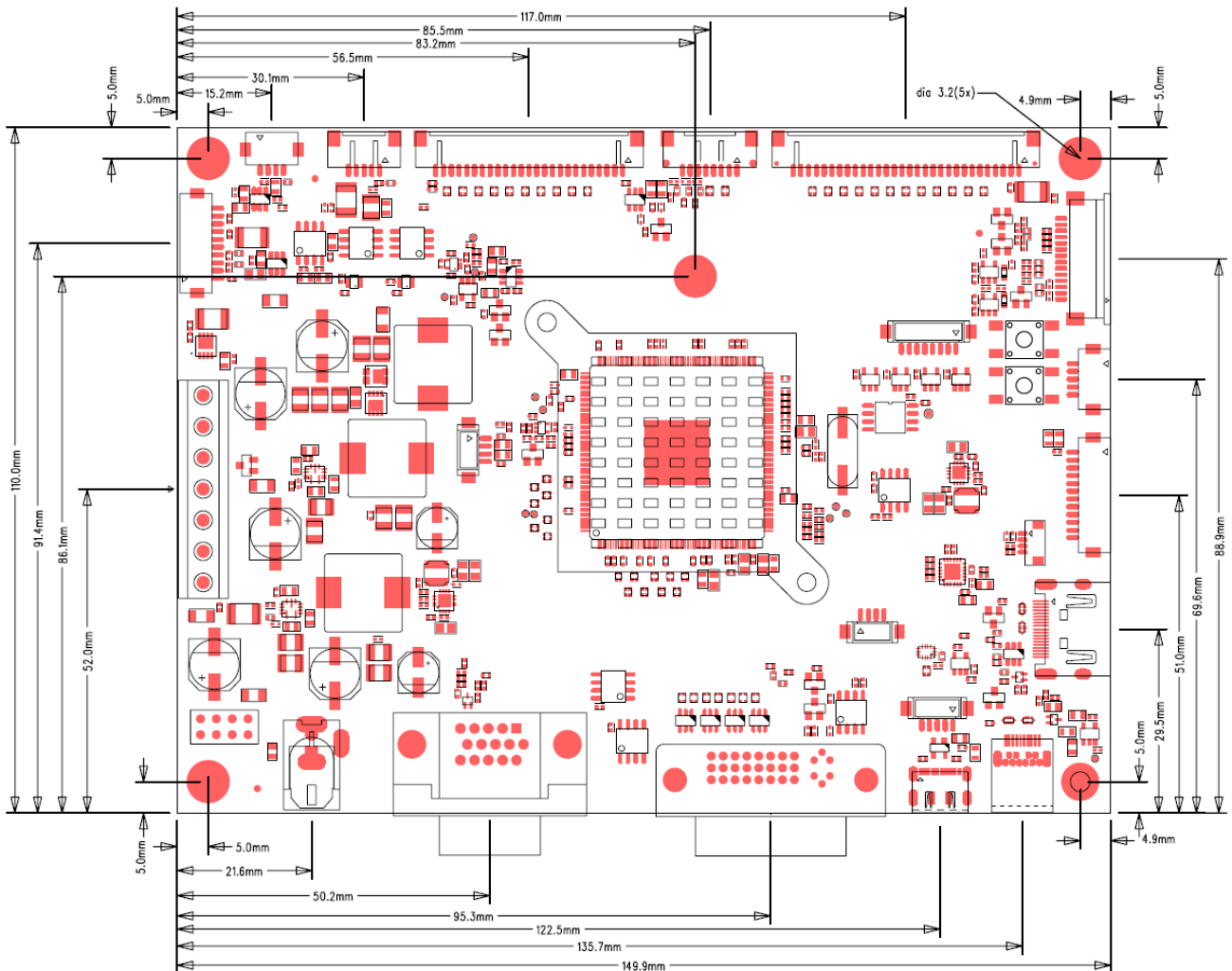
Item	Symbol	Max.	Unit	Note
+5V Backlight power on CON23	I_{BKL}	2,0	A	2, 3
+12V Backlight power on CON23	I_{BKL}	3,0	A	2, 3

- 1) Actual SVCC voltage is selected by software configuration.
- 2) Supply current limits are subject to balancing (cross load) and thermal issues. Given limits can be guaranteed for all combinations of SVCC and BKL power voltages. In case your application has higher requirements, please ask your sales contact if the desired application is possible with Prisma-V.
- 3) For the input voltage of 12V, there is a combined power limit of approximately 32 W for the group {5V Backlight, 5V SVCC, 12V SVCC} and of approx. 35 W for the group {12V Backlight, 3.3V SVCC}. For temperatures above 50°C, this is further derated. Please contact Distec sales to discuss possible solutions in case the limit might be reached.
For the input voltage of 24V, the additional cross load limitation to the above current values is that all power drawn from the board must not exceed 55W.

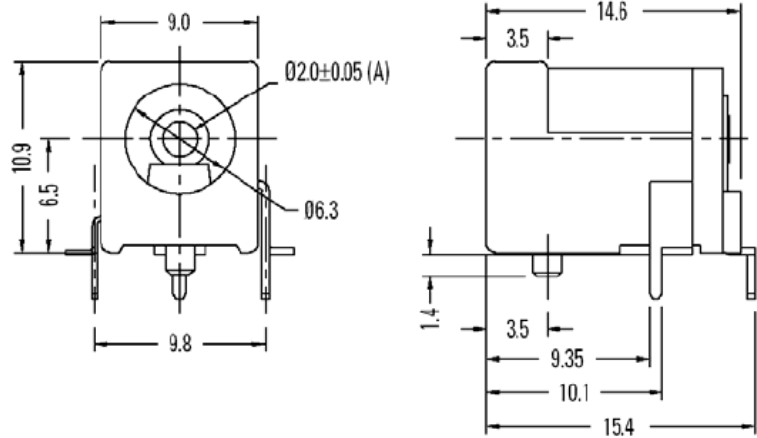
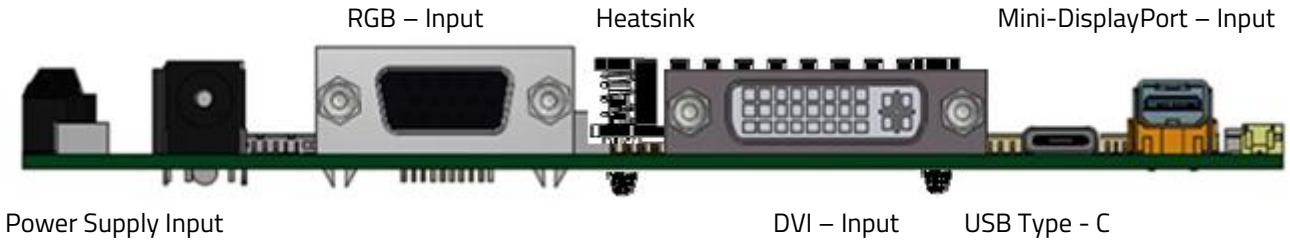
10 Mechanical Specification

ITEM	DESCRIPTION	REMARKS
Length	149.9mm	± 0.2 mm
Width	110.0mm	± 0.2 mm
Height (top side)	13.0 mm	± 0.2 mm
Height (PCB)	1.7mm	± 0.1 mm
Height (bottom side)	3.0mm	± 0.5 mm
Weight (Prisma-V-00)	158g	± 5 g
Weight (Prisma-V-01)	162g	± 5 g

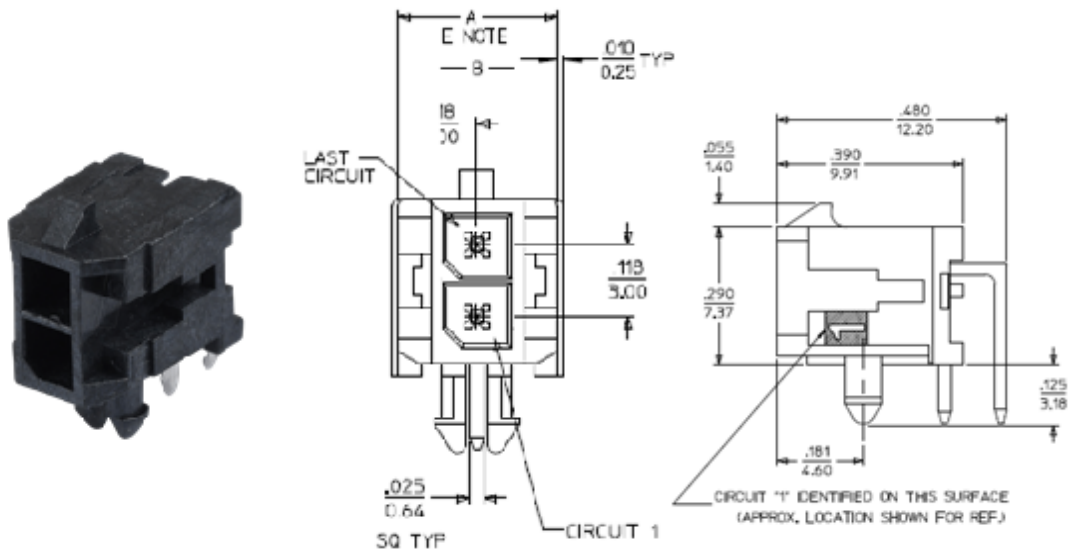
10.1 Top View



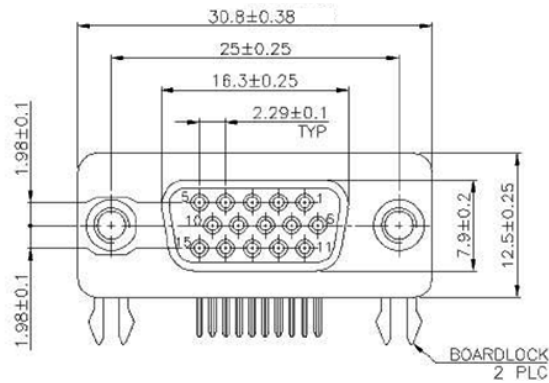
10.2 Input Connectors on Font Side



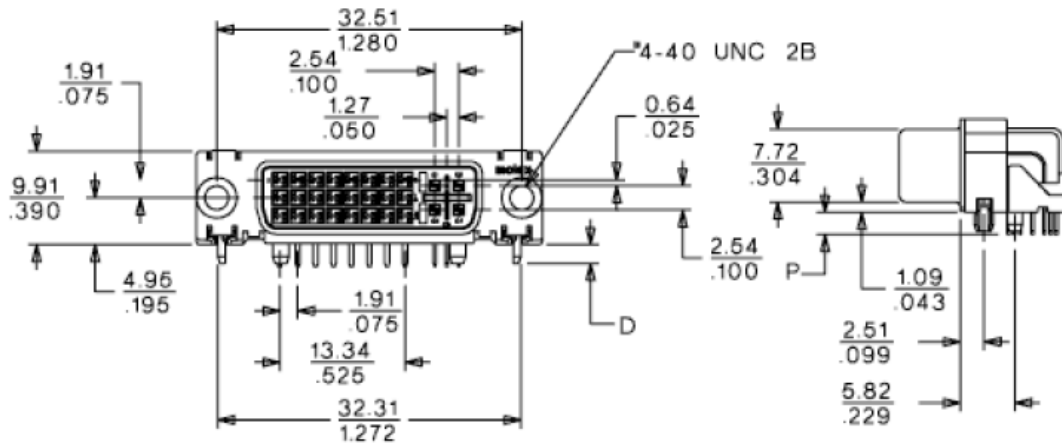
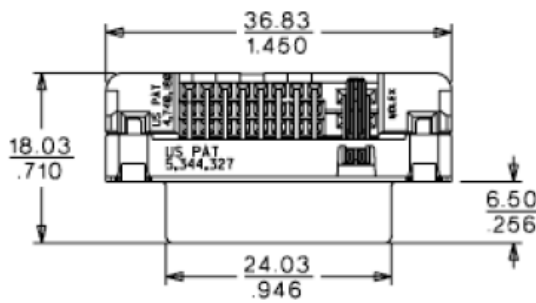
CON11: Power Supply Input



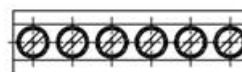
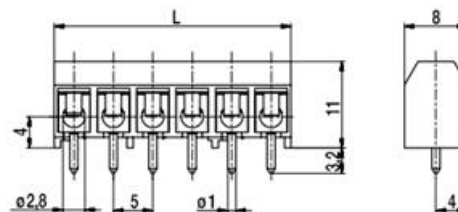
CON11#: Alternate Power Supply Input, on request



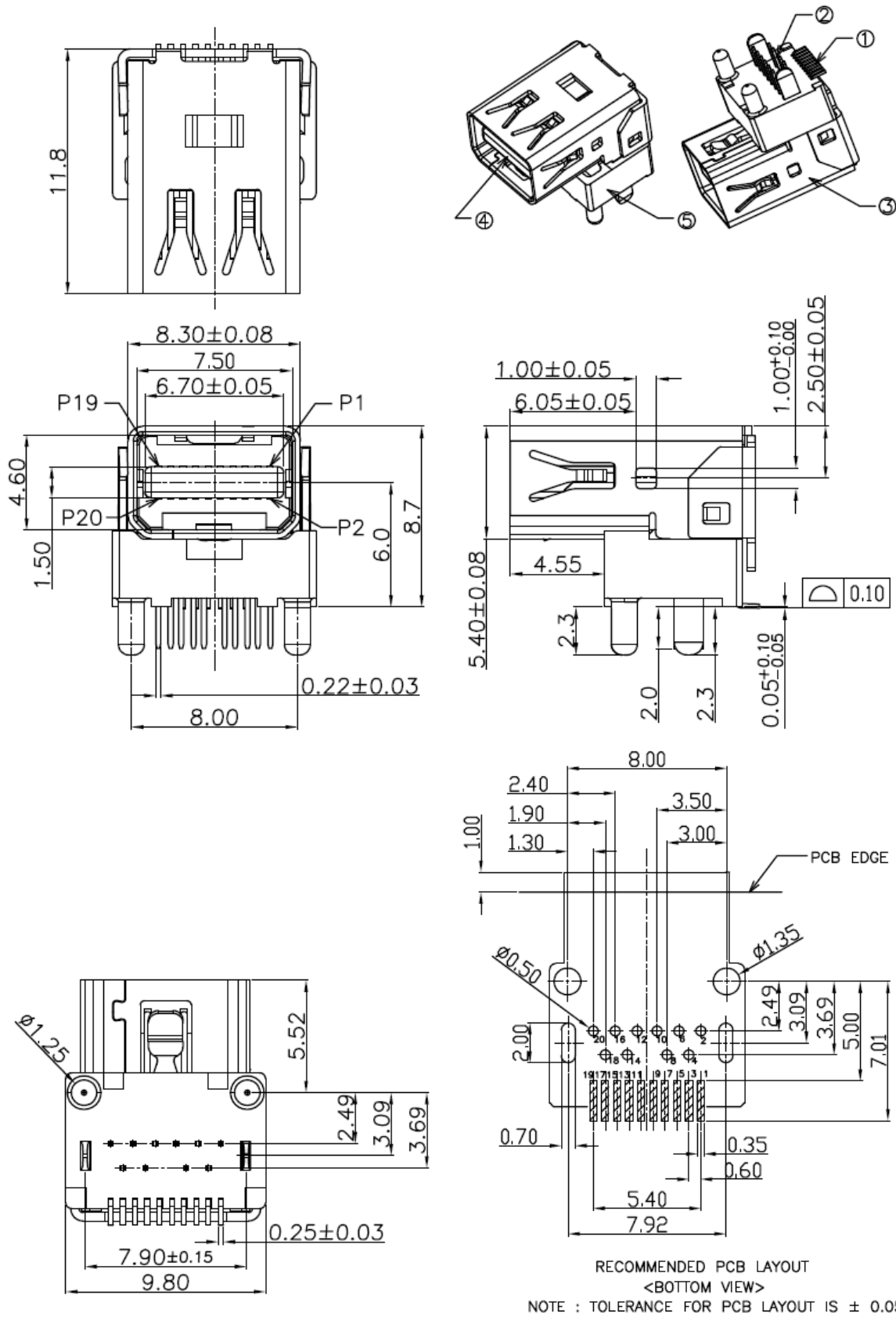
CON1: Analog VGA Input



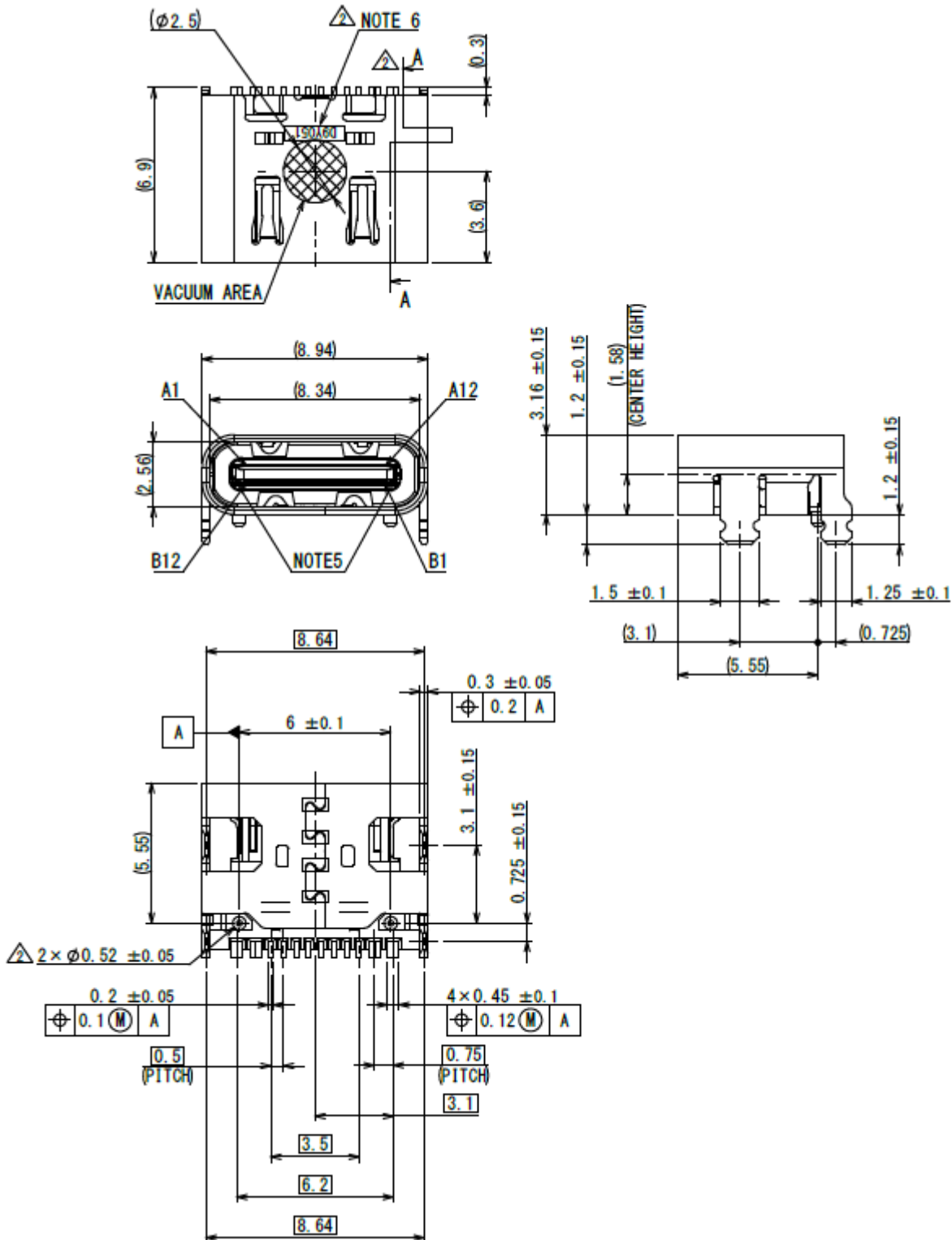
CON7: DVI Connector



CON26: Internal Power Connector



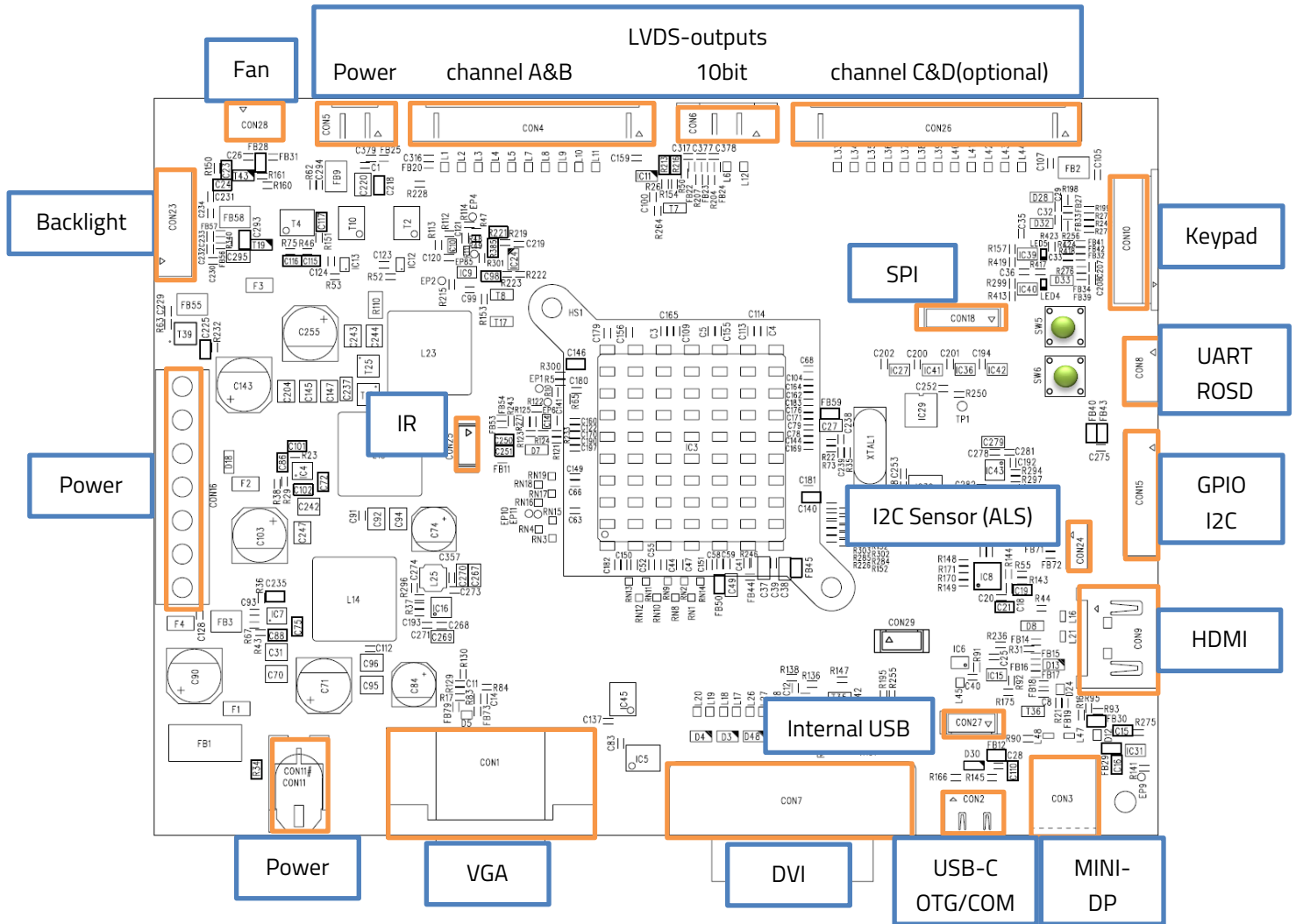
CON3: Mini-DisplayPort Connector



CON2: USB Type-C Connector (USB-OTG)

11 Switches and connectors

The following drawing shows the input and output interfaces of the Prisma-V. The design is implemented as a single printed circuit board.



11.1 Switches

There are two key switches on the board for local operation.

SW5 is the power switch to switch the board on and off. 

SW6 is the reset switch to force a hard reset. 

11.2 Connector Overview

CONNECTOR	DESCRIPTION	TYPE	MANUFACTURER
CON1	Analog VGA Input	3044F-15-B-A	Nexus
CON2	USB Type-C Input (USB-OTG)	DX07S016JA3R1500	JAE
CON3	Mini-DisplayPort Input	E9320-001-01	Pulse
CON4	LVDS, channels A & B	DF14-25P-1.25H	Hirose
CON5	Additional LVDS power	DF14-5P-1.25H	Hirose
CON6	Extra LVDS pair for 10-bit	DF14-8P-1.25H	Hirose
CON7	Dual-Link-DVI	G3281-01242424-X (A)	ASE
CON8	UART Programming Remote OSD	DF13-5P-1.25H	Hirose
CON9	HDMI (internal)	47151-1001	Molex
CON10	OSD Control	52271-1479	Molex
CON11	Power Supply Input	PJ-002AH	CUI Devices
CON11#	Alternate Power Supply Input	43045-0200	Molex
CON15	GPIO	DF13-12P-1.25H	Hirose
CON16	Power Supply Input	20.879.107	WECO
CON18	SPI Programming	DF13-8P-1.25V	Hirose
CON23	Backlight Power Supply Output	DF13-10P-1.25H	Hirose
CON24	Light Sensor	501331-0407	Molex
CON25	Infrared	DF13B-4P-1.25V	Hirose
CON26	LVDS, channels C & D (PR-01-351 only)	DF14-30P-1.25H	Hirose
CON27	Alternate Internal USB Connector	DF13-5P-1.25V	Hirose
CON28	Fan Connector	DF13-4P-1.25H	Hirose
CON29	Debug Connector (optional)	DF13-4P-1.25V	Hirose

11.3 Input Connectors

11.3.1 CON1: RGB – Analog Input Connector

Pin	Signal	Description
1	RED	Analog Red
2	GREEN	Analog Green
3	BLUE	Analog Blue
4	NC	Not connected
5	VGA_PLUG	Connect it to GND for cable detection
6	GND	Ground
7	GND	Ground
8	GND	Ground

Pin	Signal	Description
9	VGA_5V	Fused VCC
10	GND	Ground
11	NC	Not Connect
12	VGA_SDA	DDC Data
13	HSYNC	Horizontal Sync Input
14	VSYNC	Vertical Sync Input
15	VGA_SCL	DDC Clock

11.3.2 CON2: USB Type-C (USB-OTG or slave COM port)

Per default, the USB interface is in slave mode, emulating the standard COM port. Connected to a computer, Prisma-V can be remote controlled using Distec's Remote-OSD protocol.

Switching the USB interface to master mode allows flashing the firmware from a USB mass storage device.

Only USB2.0 is supported.

Connectors CON27 and CON2 are connected in parallel. Use either CON27 or CON2 (see section 11.3.15).

Pin	Signal	Description
A1	GND	Ground return
A2	SSTXp1	SuperSpeed differential pair #1, TX, positive
A3	SSTXn1	SuperSpeed differential pair #1, TX, negative
A4	VBUS	Bus power
A5	CC1	Configuration channel
A6	Dp1	USB 2.0 differential pair, position 1, positive
A7	Dn1	USB 2.0 differential pair, position 1, negative
A8	SBU1	Sideband use (SBU)
A9	VBUS	Bus power
A10	SSRXn2	SuperSpeed differential pair #4, RX, negative
A11	SSRXp2	SuperSpeed differential pair #4, RX, positive
A12	GND	Ground return

Pin	Signal	Description
B12	GND	Ground return
B11	SSRXp1	SuperSpeed differential pair #2, RX, positive
B10	SSRXn1	SuperSpeed differential pair #2, RX, negative
B9	VBUS	Bus power
B8	SBU2	Sideband use (SBU)
B7	Dn2	USB 2.0 differential pair, position 2, negative
B6	Dp2	USB 2.0 differential pair, position 2, positive
B5	CC2	Configuration channel
B4	VBUS	Bus power
B3	SSTXn2	SuperSpeed differential pair #3, TX, negative
B2	SSTXp2	SuperSpeed differential pair #3, TX, positive
B1	GND	Ground return

11.3.3 CON3: Mini-DisplayPort Input Connector

Pin	Signal	Description
1	GND	Ground
2	HPD	Hot Plug Detect
3	ML_Lane 0 (p)	Lane 0 (positive)
4	CONFIG1	CONFIG1
5	ML_Lane 0 (n)	Lane 0 (negative)
6	CONFIG2	CONFIG2
7	GND	Ground
8	GND	Ground
9	ML_Lane 1 (p)	Lane 1 (positive)
10	ML_Lane 3 (p)	Lane 3 (positive)

Pin	Signal	Description
11	ML_Lane 1 (n)	Lane 1 (negative)
12	ML_Lane 3 (n)	Lane 3 (negative)
13	GND	Ground
14	GND	Ground
15	ML_Lane 2 (p)	Lane 2 (positive)
16	AUX_CH (p)	Auxiliary Ch. (positive)
17	ML_Lane 2 (n)	Lane 2 (negative)
18	AUX_CH (n)	Auxiliary Ch. (negative)
19	GND	Ground
20	DP_PWR	Power for connector

11.3.4 CON7: Dual-Link DVI Connector

Pin	Signal	Description
1	TMDS2-	Differential TMDS Data 2-
2	TMDS2+	Differential TMDS Data 2+
3	GND	TMDS Shield
4	TMDS4-	Differential TMDS Data 4-
5	TMDS4+	Differential TMDS Data 4+
6	DVI_SCL	DDC EDID data clock
7	DVI_SDA	DDC EDID data
8	DVI_VS	Analog VSYNC
9	TMDS1-	Differential TMDS Data 1-
10	TMDS1+	Differential TMDS Data 1+
11	GND	TMDS Shield
12	TMDS3-	Differential TMDS Data 3-
13	TMDS3+	Differential TMDS Data 3+
14	DVI_5V	5V / 100mA Power Supply
15	GND	Ground

Pin	Signal	Description
16	DISPDET	Hot Plug Detection
17	TMDS0-	Differential TMDS Data 0-
18	TMDS0+	Differential TMDS Data 0+
19	GND	TMDS Shield
20	TMDS5-	Differential TMDS Data 5-
21	TMDS5+	Differential TMDS Data 5+
22	GND	TMDS Clock Shield
23	TMDS5SCL+	Differential TMDS Clock +
24	TMDS5SCL-	Differential TMDS Clock -
C1	NC	Not connected
C2	NC	Not connected
C3	NC	Not connected
C4	NC	Not connected
C5	NC	Not connected
C6	NC	Not connected

11.3.5 CON8: Serial Communication Connector

Pin	Signal	Description
1	TX	Serial Output (TTL-Level)
2	RX	Serial Input (TTL-Level)
3	+3.3V	3.3V Power supply

Pin	Signal	Description
4	+5V	5V Power supply
5	GND	Ground

Use CON8 together with cable KA-30-101 and USB-to-serial-adapter IF430 (ZU-02-430) to configure the Prisma-V with Fortec Integrated's MstarRover software or to control the board via Remote OSD.

11.3.6 CON9: HDMI2.0 Internal Input Connector

Pin	Signal	Description
1	TMDS2+	Differential TMDS Data 2+
2	GND	Ground
3	TMDS2-	Differential TMDS Data 2-
4	TMDS1+	Differential TMDS Data 1+
5	GND	Ground
6	TMDS1-	Differential TMDS Data 1-
7	TMDS0+	Differential TMDS Data 0+
8	GND	Ground
9	TMDS0-	Differential TMDS Data 0-
10	TMDSCLK+	Differential TMDS Clock+

Pin	Signal	Description
11	GND	Ground
12	TMDSCLK-	Differential TMDS Clock-
13	CEC	Consumer Electronic Control
14	Reserved	
15	HDMI_SCL	DDC Clock
16	HDMI_SDA	DDC Data
17	HDMI_PLUG	Connect it to GND for cable detection
18	HDMI_VCC	+5V
19	Hot Plug	Hot Plug Detection

11.3.7 CON10: OSD Control Panel Connector

Pin	Signal	Description
1	GND	GND
2	+5V**	+5V supply**
3	+3V	+3V supply
4	POWER_ON/OFF	System power on/off
5	LED_GREEN	Status LED green
6	LED_RED	Status LED red
7	NC	Not connected

Pin	Signal	Description
8	NC	Not connected
9	KEY_RIGHT	OSD – Key RIGHT*
10	KEY_LEFT	OSD – Key LEFT*
11	KEY_DOWN	OSD – Key DOWN (-)
12	KEY_UP	OSD – Key UP (+)
13	ENTER	OSD - Key EXIT
14	MENU	OSD - Key MENU

*Key Right and Key left not used for 4 Button-Keypad

Support for 6-Button Keypad upon request

** +5V not available during full power-off mode.

11.3.8 CON11: Power Supply Connector

Pin	Signal	Description
Center	+12V_VIN	12V or 24V Power supply (up to 5A)

Pin	Signal	Description
Bottom	GND	Ground

11.3.9 CON11#: Power Supply Connector (optional)

Pin	Signal	Description
1	GND	Ground

Pin	Signal	Description
2	+12V_VIN	12V or 24V Power supply

11.3.10 CON15: GPIO Connector

External GPIO pins are open drain, pulled up to 3.3V by 4.7kOhm resistor.

If GPIOs are needed, please contact Fortec Integrated's Customer service for firmware support.

Pin	Signal	Description
1	+3.3V	3.3V Power supply
2	EXT_GPIO_0	General Purpose Port 0 / AUDIO_MUTE
3	EXT_GPIO_1	General Purpose Port 1 / I2S_BCK
4	EXT_GPIO_2	General Purpose Port 2 / I2S_SD0
5	EXT_GPIO_3	General Purpose Port 3 / I2S_WS
6	EXT_GPIO_4	General Purpose Port 4 / I2S_MCK

Pin	Signal	Description
7	EXT_GPIO_5	General Purpose Port 5 / SPDIFO
8	EXT_GPIO_6	General Purpose Port 6
9	EXT_GPIO_7	General Purpose Port 7
10	SCL	I2C Clock
11	SDA	I2C Data
12	GND	Ground

11.3.11 CON16: Internal Power Supply Connector

Pin	Signal	Description
1	+5V_PWR_SAFE	5V/350mA low power mode supply
2	GND	Ground
3	+12V_VIN	12V or 24V Power supply (up to 5A)
4	EXT_STDBY_5V_PULL_UP	Externally provided pull-up signal for pins 5 and 6

Pin	Signal	Description
5	EXT_PWR_ON#	Low active power on signal for power supply remote control
6	EXT_PWR_ON	High active power on signal for power supply remote control
7	+5V OUT	+5V output, max. 300mA (not available in low-power mode)

11.3.12 CON18: SPI Programming Connector

Pin	Signal	Description
1	SPI_PROG_EN#	Enable Input
2	SPI_CLK_FLASH	SPI Clock Input
3	SPI_SI_FLASH	SPI_SI-Input
4	SPI_SO_FLASH	SPI_SO Output

Pin	Signal	Description
5	SPI_CS_FLASH	SPI_CS-Input
6	MSTAR_RESET_N	MSTAR_RESET_N
7	GND	GND
8	+3.3V Output	+3.3V Output

11.3.13 CON24: Light- and Temperature-Sensor Connector

Pin	Signal	Description
1	+3.3V	3.3V Power supply
2	GND	Ground

Pin	Signal	Description
3	SCL	I2C Clock
4	SDA	I2C Data

The ambient light sensor **IF440 (ZU-02-509)** can be attached to Prisma-III A to automatically adjust the panel brightness according to the ambient light. Fitting cable to CON24: **KA-30-786**.



Additionally, the temperature sensor **IF389 (ZU-02-389)** is available to check and control the temperature of a panel or monitor. FW support is provided upon request.

Fitting cable to CON24: **KA-30-323**.



11.3.14 CON25: IR Remote Control Receiver Connector

See also section 5.2. OSD Control through IR Remote Control

Pin	Signal	Description
1	IR	Demodulated IR signal
2	+3.3V	3.3V Power supply

Pin	Signal	Description
3*	+5V	5V/1A Power supply *
4	GND	Ground

* +5V not available during full power-off mode. Keep attention of the total allowed load on 5V rail using the power calculator

11.3.15 CON27 Internal USB connector

Connectors CON27 and CON2 are connected in parallel. Use either CON22 or CON2 (see section 11.3.2).

Pin	Signal	Description
1	+5V	5V Power Output for external device (max. 0.5A)
2	GND	Ground
3	D-	USB Data -

Pin	Signal	Description
4	D+	USB Data +
5	GND	Ground

11.3.16 CON28 Fan Connector

Pin	Signal	Description
1	GND	Ground
2	+12VF	+12V MOSFET-Switched Fan Power Output

Pin	Signal	Description
3	FAN_SENSE	Not connected
4	FAN_CONTROL	PWM Output

11.3.17 CON29 Debug Connector (optional)

For reference only

Pin	Signal	Description
1	NC	Not Connected
2	GND	Ground

Pin	Signal	Description
3	VGA_SCL	Serial Clock Input
4	VGA_SDA	Serial Data Input

11.4 Output Connectors

11.4.1 CON4: Dual LVDS Connector, channels A and B

Pin	Signal	Description
1	SVCC	Switched panel power supply +3.3V/ +5V/ 12V(Vin) (fused)
2		
3	GND	Ground
4		
5	TXB3+	LVDS data 1st pixel
6	TXB3-	LVDS data 1st pixel
7	TXBCL+	LVDS clock 1st pixel
8	TXBCL-	LVDS clock 1st pixel
9	TXB2+	LVDS data 1st pixel
10	TXB2-	LVDS data 1st pixel
11	TXB1+	LVDS data 1st pixel
12	TXB1-	LVDS data 1st pixel
13	TXB0+	LVDS data 1st pixel

Pin	Signal	Description
14	TXB0-	LVDS data 1st pixel
15	TXA3+	LVDS data 2nd pixel
16	TXA3-	LVDS data 2nd pixel
17	TXACL+	LVDS clock 2nd pixel
18	TXACL-	LVDS clock 2nd pixel
19	TXA2+	LVDS data 2nd pixel
20	TXA2-	LVDS data 2nd pixel
21	TXA1+	LVDS data 2nd pixel
22	TXA1-	LVDS data 2nd pixel
23	TXA0+	LVDS data 2nd pixel
24	TXA0-	LVDS data 2nd pixel
25	EBKL	Enable backlight signal

11.4.2 CON5: Panel Extra Power Connector

Pin	Signal	Description
1	LVDS_OPT_0	Selectable +3.3V/GND LVDS Option pin 0
2	SVCC	Switched panel power supply +3.3V/ +5V/ 12V(Vin) (fused)
3	SVCC	

Pin	Signal	Description
3	GND	Ground
4	GND	Ground

11.4.3 CON6: LVDS 10-BIT Connector

Pin	Signal	Description
1	GND	Ground
2	TXB4+	LVDS data 1st pixel
3	TXB4-	LVDS data 1st pixel
4	TXA4+	LVDS data 2nd pixel

Pin	Signal	Description
5	TXA4-	LVDS data 2nd pixel
6	LVDS_OPT_1	+3.3V/GND selectable LVDS Option pin 1
7	LVDS_OPT_2	+3.3V/GND selectable LVDS Option pin 2
8*	LVDS_OPT_3	+5V*/+3.3V/GND selectable LVDS Option pin 3

(*) +5V not available during power-off mode.

11.4.4 CON23: Backlight Supply Connector

Pin	Signal	Description
1	VBKL 12V	Switched backlight power supply
2	GND	Ground
3	BKLT_EN	Enable backlight signal
4	BRT_ADJ	Brightness control signal
5	+5V	5V power supply

Pin	Signal	Description
6	+5V	5V power supply
7	VBKL 12V	Switched backlight power supply
8	VBKL 12V	
9	GND	Ground Ground
10	GND	

11.4.5 CON26: Dual LVDS Connector, channels C and D (PR-01-351 only)

Pin	Signal	Description
1	SVCC	Switched panel power supply +3.3V/ +5V/ 12V(Vin) (fused)
2	SVCC	Switched panel power supply +3.3V/ +5V/ 12V(Vin) (fused)
3	GND	Ground
4	GND	Ground
5*	TXD4+	LVDS data 3rd pixel
6	TXD4-	LVDS data 3rd pixel
7	TXD3+	LVDS data 3rd pixel
8	TXD3-	LVDS data 3rd pixel
9	TXDCL+	LVDS clock 3rd pixel
10	TXDCL-	LVDS clock 3rd pixel
11	TXD2+	LVDS data 3rd pixel
12	TXD2-	LVDS data 3rd pixel
13	TXD1+	LVDS data 3rd pixel
14	TXD1-	LVDS data 3rd pixel
15	TXD0+	LVDS data 3rd pixel

Pin	Signal	Description
16	TXD0-	LVDS data 3rd pixel
17	TXC4+	LVDS data 4th pixel
18	TXC4-	LVDS data 4th pixel
19	TXC3+	LVDS data 4th pixel
20	TXC3-	LVDS data 4th pixel
21	TXCCL+	LVDS clock 4th pixel
22	TXCCL-	LVDS clock 4th pixel
23	TXC2+	LVDS data 4th pixel
24	TXC2-	LVDS data 4th pixel
25	TXC1+	LVDS data 4th pixel
26	TXC1-	LVDS data 4th pixel
27	TXC0+	LVDS data 4th pixel
28	TXC0-	LVDS data 4th pixel
29	GND	Ground
30	GND	Ground

* LVDS channels C and D can be swapped upon request from customer.

12 Programming, configuration and ROSD via serial port/SPI/USB-OTG

Preconfigured ("ready to run") HW is also available, please contact customer service for information.

Please refer to MStarRover Manual for details of configuration.

- For programming Firmware, the DediProg SF100 SPI programmer is needed.
- Updating the Firmware can also be performed using an USB stick if the USB Port is set as "Master"
- For configuration of Display settings/EDID configuration or for usage of ROSD either the use of USB to Serial UART Converter IF430, or alternatively a direct connection to USB Port CON2 (in "Slave" mode) is needed.

12.1 HW requirements

- Standard PC with Windows OS
- 1x USB port for serial programmer
- 1x USB port for DediProg SF100 SPI programmer

DediProg SF100 SPI Programmer		
Part#	Part description	Additional info
KI-90-035*	DediProg SF100 USB-SPI Programmer	
	IF399-00-SPI Buffer interface for PIIIA	
	Cable SPI-Buffer-Interface 8pol. 150mm	Cable between SPI Buffer CON1 and SPI connector CON18

(*) KI-90-035 consists of DediProg SF100 USB-SPI Programmer, buffer interface and cable (as shown below).



USB to serial adapter		
Part#	Part description	Additional info
ZU-02-430	IF430-00 USB to Serial UART Converter	RS232 programming adapter
KA-30-101	Cable Service & Remote 80cm	Cable from RS-232 adapter to Prisma-V (CON8)
KA-30-051	USB-Cable, Highspeed, type A/B m/m 2m	



USB to serial adapter integrated in Board		
Part#	Part description	Additional info
N. A	USB cable USB-A to USB-C	Any available cable USB-C is sufficient

12.2 ROSD Protocol

Prisma-V can be fully controlled via Remote OSD Protocol.

Details can be found in "MStar-ROSD.pdf" or contact Fortec Integrated's customer service.

12.3 USB-OTG: Firmware-update with USB-stick

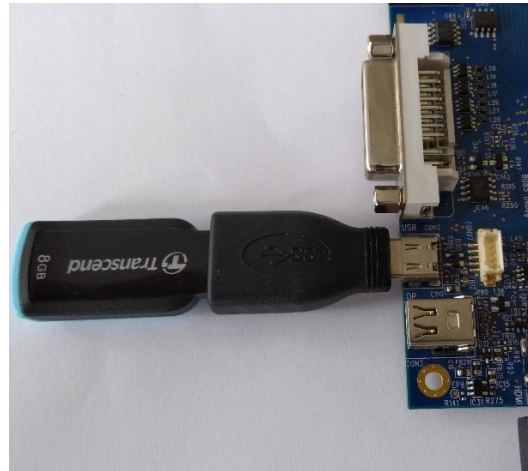
A Firmware update is possible using an USB mass storage device (USB-Stick).

Restrictions:

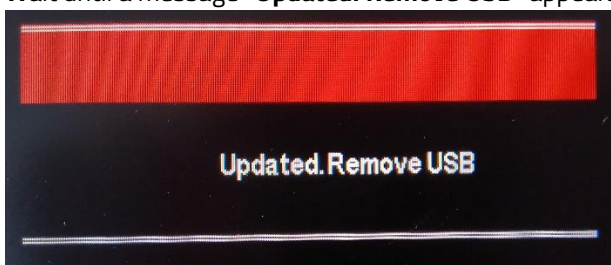
- Firmware upload via USB-OTG is not available when Board is blank (without Firmware).
- Configuration and EDID update not available using the USB-Stick. However, you can connect the same USB Type-C connector CON2 to the COM port of your computer and run the MstarRover application.

12.3.1 USB-OTG process definition:

1. Prepare an USB stick with the desired Firmware. *Remark:* it is mandatory the bin-file is named exactly: "FW_Prisma-V". Else the FW will not be recognized.
2. Stick the USB stick into CON2 (Use adapter USB to USB-C).



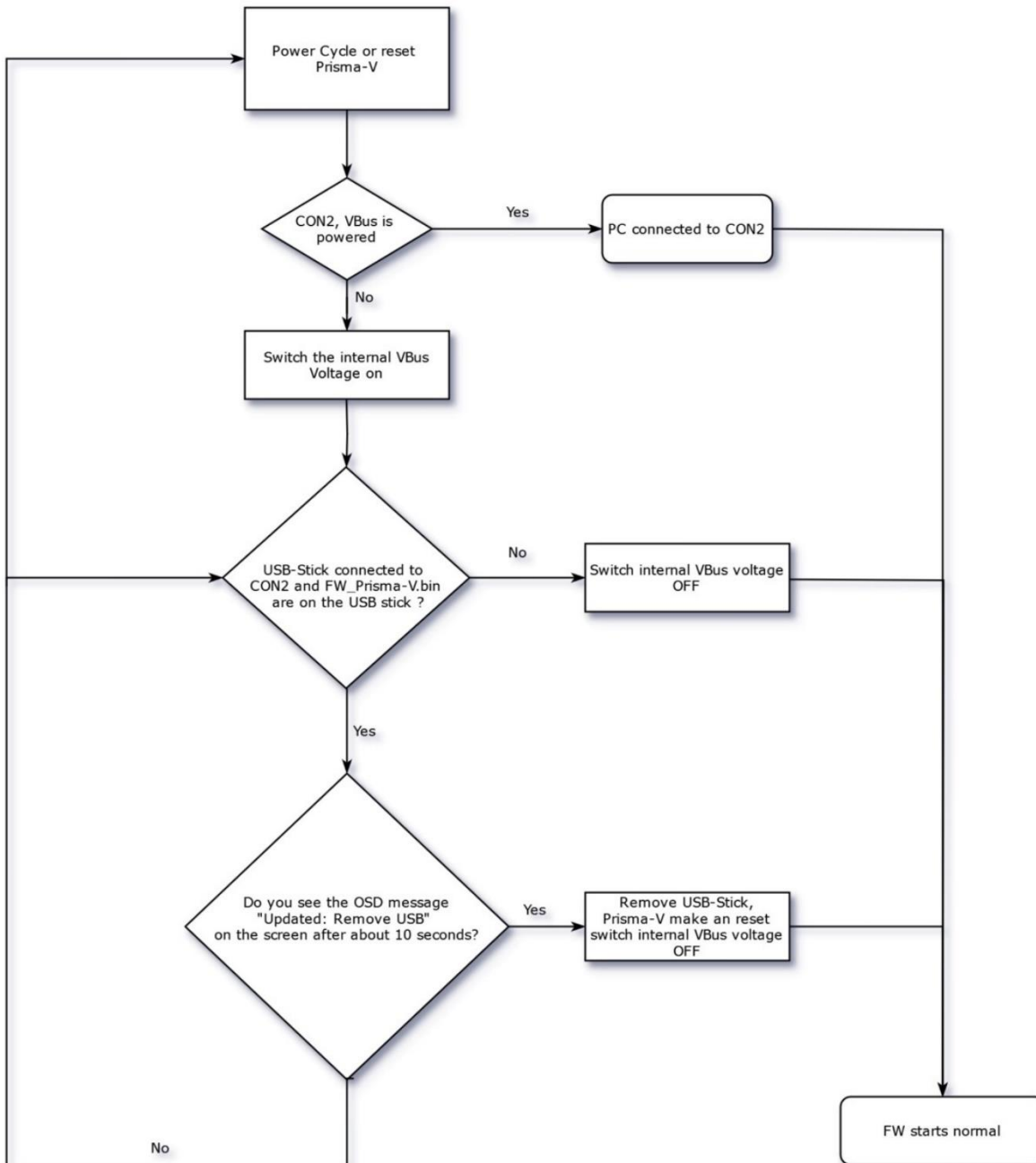
3. Restart Prisma-V (Either unpower and repower Prisma-V or press "Reset"-Button on PCB)
4. Wait until a message "**Updated: Remove USB**" appears on Display.



5. Unplug USB Device
6. Prisma-V performs a reset automatically and after that Firmware update is done.

12.3.2 Internal Flow-chart USB-OTG

For Reference only



13 Supported Panels and Backlights (Inverter/Converter)

Panels and Backlights Options (Note 1)	Hardware Options
Panel Voltage	3.3V
	5V
	12V
Pixel Per Clock	1
	2
Option Pin 0 Voltage Level	0V
	3.3V
Option Pin 1 Voltage Level	0V
	3.3V
Option Pin 2 Voltage Level	0V
	3.3V
Option Pin 3 Voltage Level	0V
	3.3V
	5V
Backlight Voltage	5V
	12V
Backlight Control Type	Analog
	PWM
Voltage Level of PWM Signal	3.3V
	5V
Analog Voltage Level Range	0V - 5V
Voltage Level of Backlight Enable Signal	3.3V
	5V

Note 1:

Prisma-V supports single/dual pixel 6/8/10 bit LVDS panels up to a resolution of WUXGA at 60Hz, or UXGA at 75Hz. For eDP panels an **LVDS2eDP** interface **ZU-09-034** is available from Fortec Integrated.

14 Hardware Information

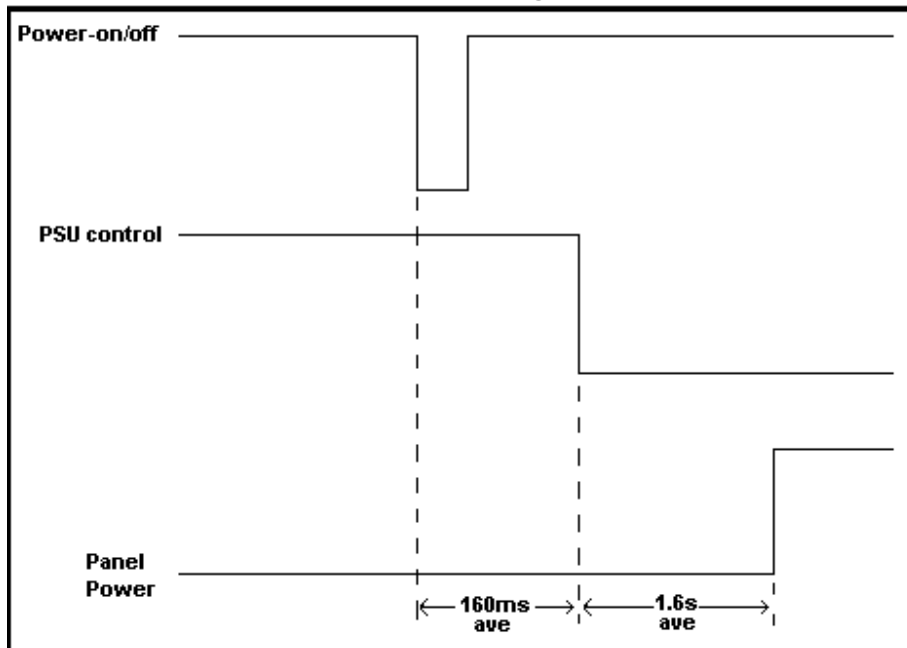
Part Number	Name	Operating Temperature Range	Input Voltage	LVDS Output	Status
PR-01-350	Prisma-V-00	-20°C... +70°C	12V or 24V	2-ch LVDS (without CON26)	active
PR-01-351	Prisma-V-01			4-ch LVDS (with CON26)*	active

(*) contact customer service if more information is needed.

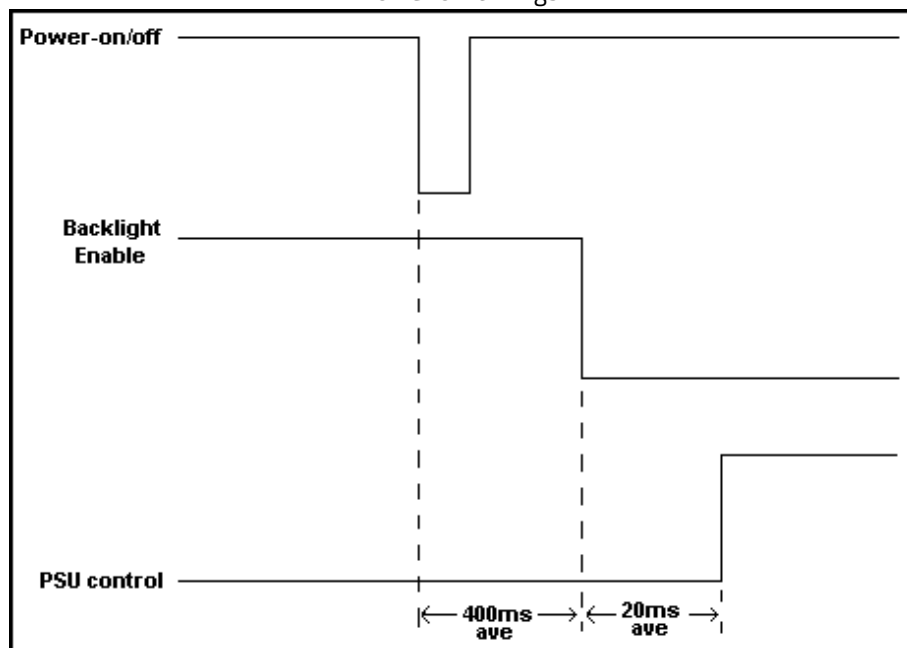
15 Appendix A: PSU low-power-control timings (CON16 pin 5&6)

The time between power-on/off to PSU signal state change may differ between different kits, mainly for the power-off, since the system first goes through a panel-power-down sequence which is different for every kit. Following measurements have been taken with a Samsung LTM170EU-L21 panel with C&C GH053A inverter and are average values. Given values are for the power-on/off button. IR works ~40ms faster for the first step in each case.

Power on timings:



Power off timings:



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