

Aster V1.1

Preliminary Datasheet



Revision History

Date	Doc. Rev.	Aster Version	Changes
21-Dec-15	Rev. 1.0	V1.0	Preliminary Release: Sample Product
02-Nov-16	Rev. 1.1	V1.1	Initial Release
09-Nov-16	Rev. 1.2	V1.1	Section 5.1, Operating Temperature Range: Updated temperature range.
30-Nov-16	Rev. 1.3	V1.1	Section 3.2.2 USB Power Jumper (JP1): Micro USB connector X4 (only) can be used to power-up the carrier board. Section 3.10.2, Battery Holder (BAT1): Added note regarding battery holder spring contact issue. Section 3.11, JTAG: Added new section.
05-April-17	Rev. 1.4	V1.1	Section 3.2.2 USB Power Jumper (JP1): Updated details.
03 May 19	Rev. 1.5	V1.1	Section 3.9.3 Extension Connector (X20): Fixed SODIMM number for pin 26 Section 3.3.2 User controllable LEDs (LED4/5/6): Added SODIMM Pins for LEDs

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1. Introduction

Aster is a carrier board for the Colibri family of computer-on-modules. Aster carrier board has been designed primarily considering Colibri VFxx computer-on-modules, but the carrier board is compatible with all the products in the Colibri family.

Aster has been designed for students, makers and hobbyist. Aster carrier board has headers compatible with Arduino Uno and Raspberry Pi (RPi) maker boards, thus enabling users to use a variety of 3rd party modules/add-on boards like Arduino™ Shields and Raspberry Pi adapter boards.

1.1. Reference Documents

For detailed technical information about the suitable computer modules, please refer to the sections below:

1.1.1. Colibri Computer Modules

An overview of the Colibri product family:

<http://www.toradex.com/products/colibri-arm-modules>

1.1.2. Synchronous DC/DC Buck Converter

<http://diodes.com/datasheets/AP6503.pdf>

1.1.3. USB, Current Limiter, Power Distribution Switches

<http://www.ti.com/product/tps2042b>

1.1.4. USB to Serial UART Converter

http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT232R.pdf

1.1.5. Voltage Level Translator

<https://www.fairchildsemi.com/datasheets/FX/FXMA108.pdf>

1.1.6. I2C /SM Bus Voltage Level Translator

<http://www.ti.com/lit/ds/symlink/pca9306.pdf>

1.1.7. Video DAC

<http://www.analog.com/media/en/technical-documentation/data-sheets/ADV7125.pdf>

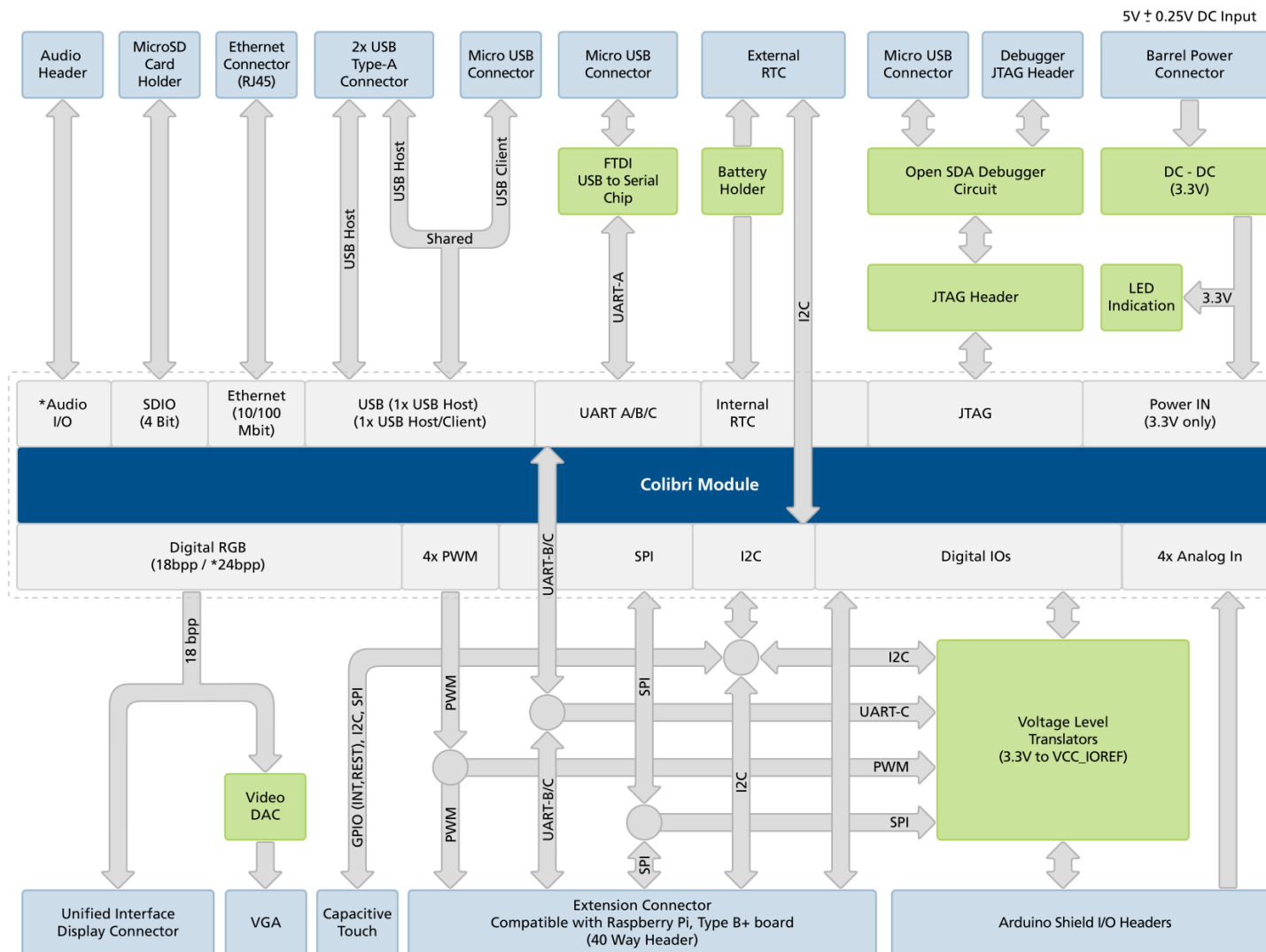
2. Features

2.1. Overview

Aster carrier board provides the following features and communication interfaces:

- 2x USB Host, Stacked USB Type A connector
- USB Client, Micro AB type connector
- RJ45 Ethernet connector, 10/100 Mbit
- SD/MMC card holder, 4 bit
- USB to Serial Interface with Micro AB type connector
- Unified Display Interface with built in resistive touch for direct LCD panel connection
- Capacitive Touch Interface connector
- Analog VGA interface on a 15 way D-type connector
- Arduino Shield connector (compatible with Arduino Uno)
- Extension Connector (compatible with RPi, Type B+, header pinout)
 - a. I2C, UART, SPI
 - b. Analog Out / PWM
 - c. GPIOs
- Real-time clock with battery backup
- LEDs
- JTAG Header
- Up-to three user-controllable LEDs

2.3. Hardware Architecture Block Diagram



* Please note that these features are module-specific and may not be supported by all the computer-on-modules in the Colibri family. For more details, refer to the datasheet of Colibri computer-on-modules.

Fig.1 Aster Carrier Board Hardware Architecture

2.4. Physical Drawings

2.4.1. Top Side Connectors

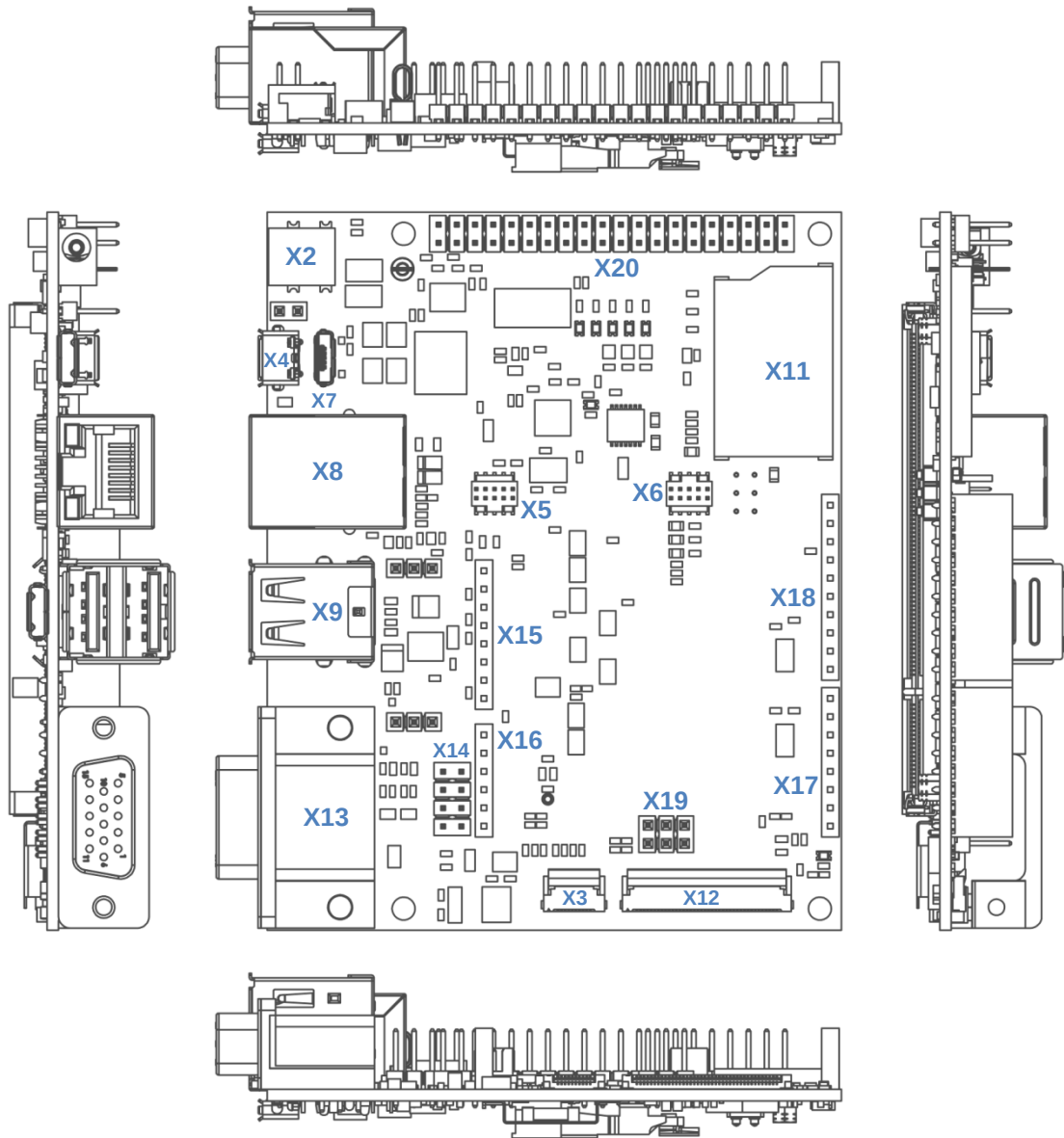


Fig. 2 Aster Carrier Board Connectors – Top Side

Ref.	Description	Remarks
X2	Barrel Power Supply Connector	Standard 3.5mm
X3	Capacitive Touch Interface connector	
X4	USB to Serial Interface, Micro AB Type Connector	
X5	Serial Debugger Header	Not Assembled
X6	Colibri JTAG Header	
X7	Serial Debugger, Micro AB Type Connector	Not Assembled
X8	Ethernet RJ45 Connector	
X9	USB Host, Stacked USB Type-A Connector	
X11	SD / MMC Card Holder	
X12	Unified Interface Display connector	Compatible with EDT Display

X13	Analog VGA, DSUB-15 Connector	
X14	Audio Header	Not Assembled
X15	Arduino Shield header: Power Pins	
X16	Arduino Shield header: Analog Input Pins	
X17	Arduino Shield header: Digital I/O Pins	
X18	Arduino Shield header: Digital I/O Pins	
X19	Arduino Shield header	Compatible with Arduino™ Uno shields
X20	Extension Header	Compatible with Raspberry Pi adapter boards

2.4.2. Bottom Side Connectors

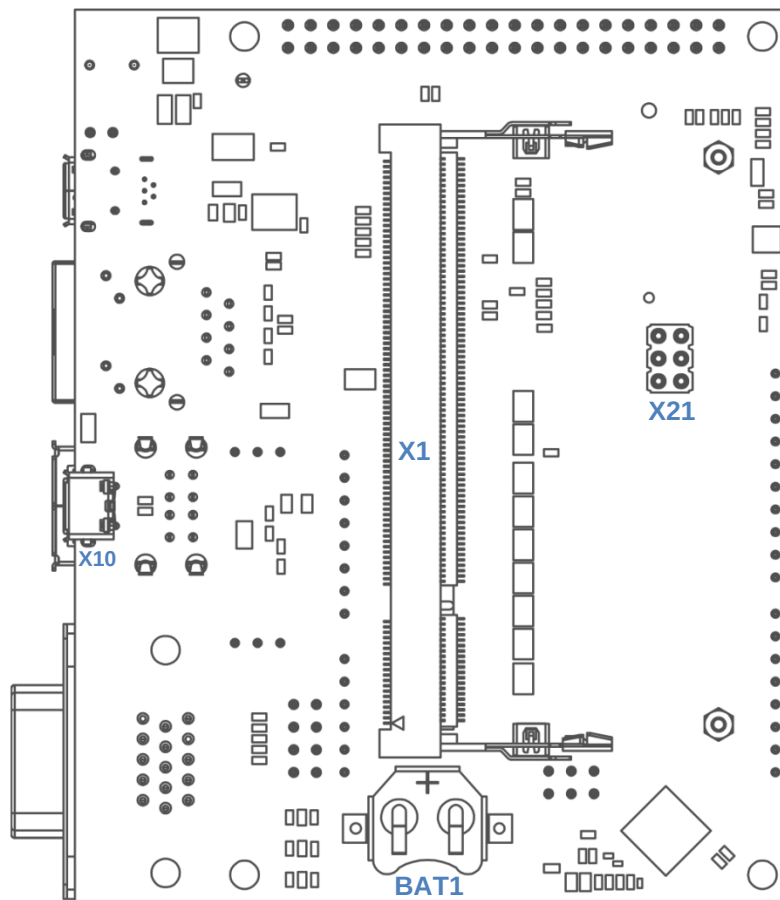


Fig. 3 Aster Carrier Board Connectors – Bottom Side

Ref.	Description	Remarks
X1	Colibri SODIMM connector	
X10	USB Client, Micro AB type connector	
X21	JTAG Pogo Pins	
BAT1	Battery Holder, 12 mm diameter	Supported batteries: BR1216, CR1216, BR1220, CL1220, CR1220, BR1225

2.5. Assembly Options

This section marks/highlights the components on the Aster carrier board that can be used to configure different features and functional options. The assembly options details with respect to an interface can be found in the interface description section.

WARNING:

- Changing the PCB assembly voids the product warranty.
- Toradex doesn't take any responsibility for malfunction or damages caused by changing any assembly option.

2.5.1. Aster Assembly Options – Top Side

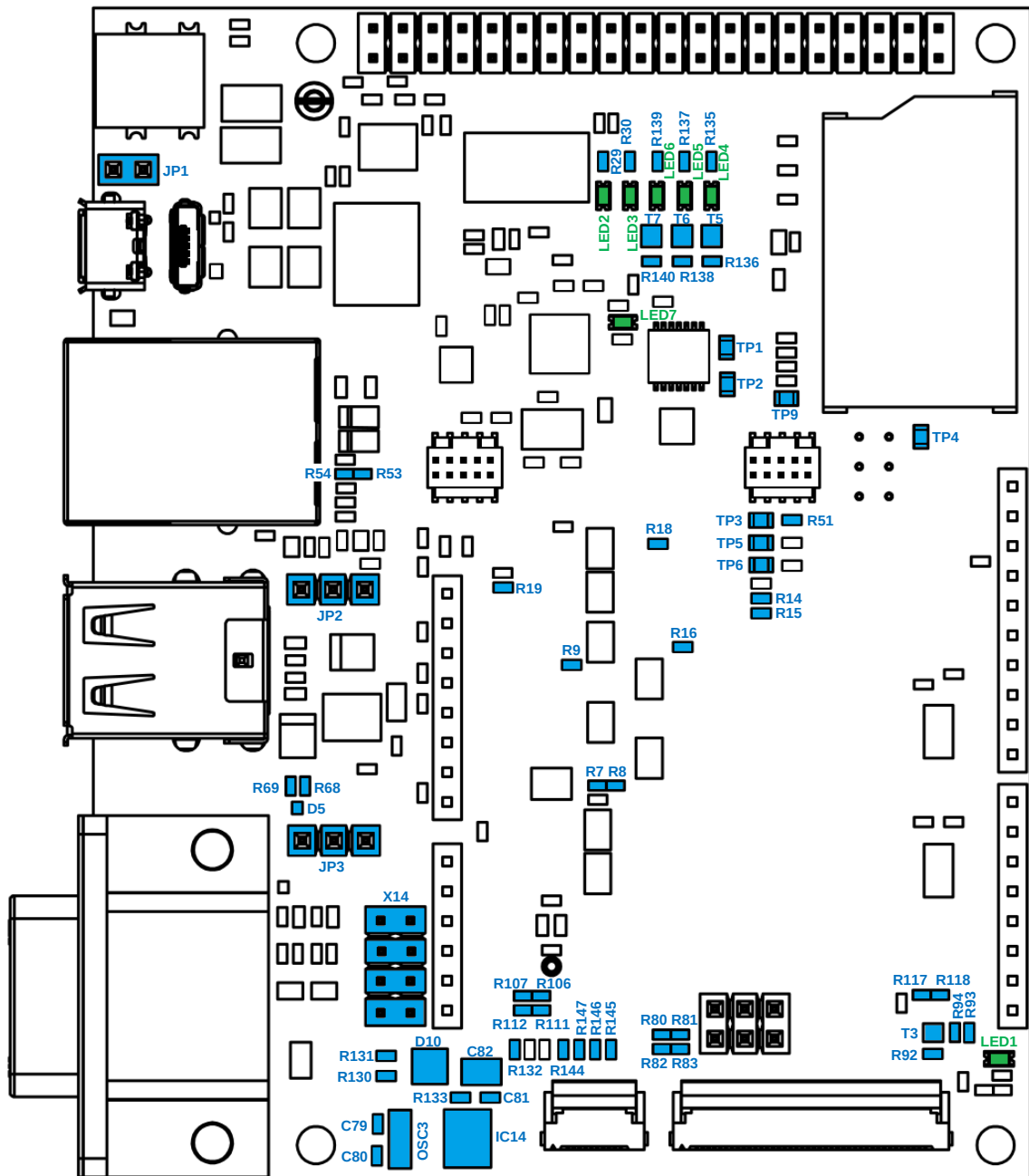


Fig.4 Aster Carrier Board Assembly Options – Top Side

2.5.2. Aster Assembly Options – Bottom Side

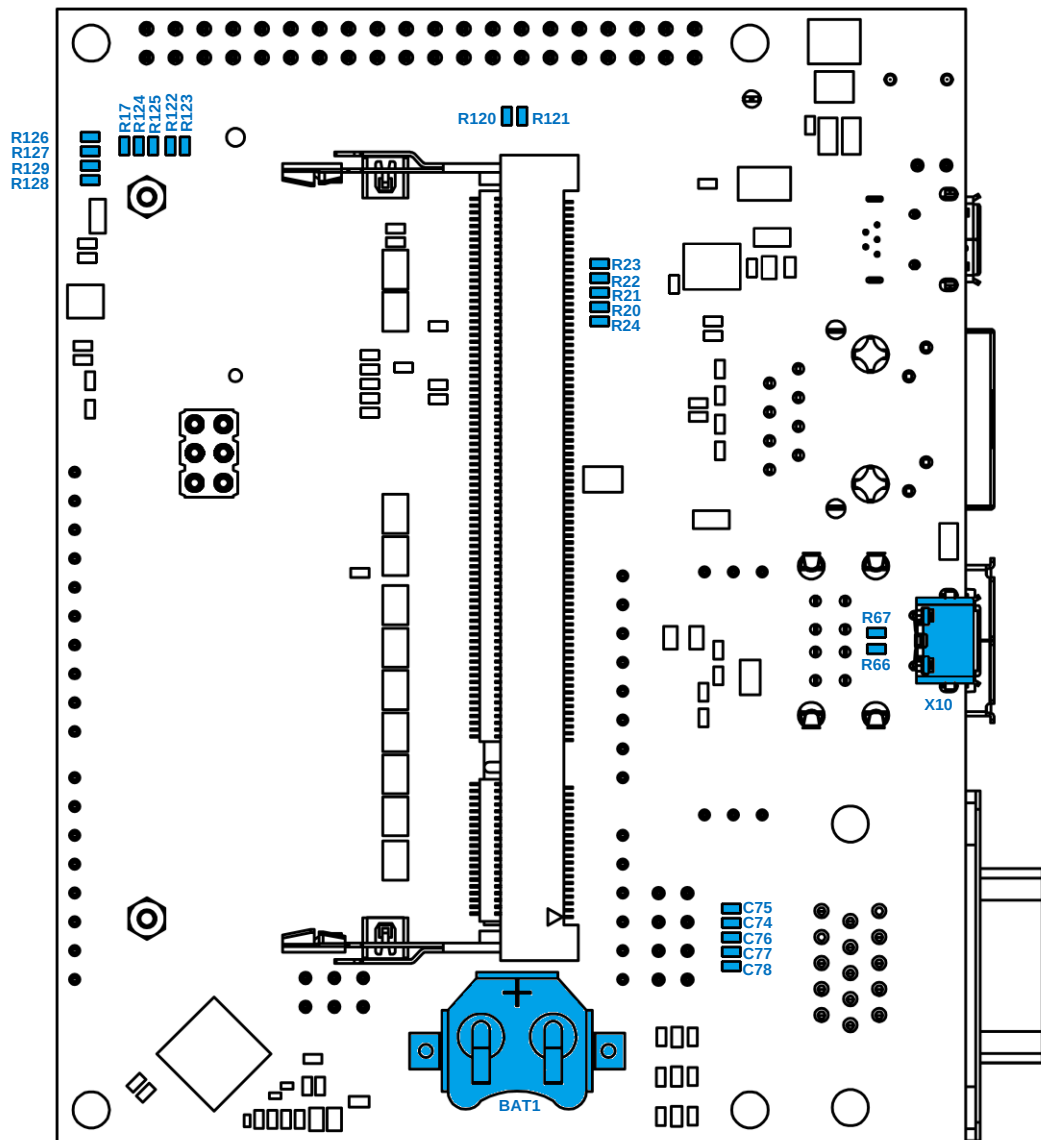


Fig.5 Aster Carrier Board Assembly Options – Bottom Side

3. Interface Description

3.1. Colibri Computer-On-Module

3.1.1. Colibri SODIMM Connector (X1)

Type: SODIMM 200 Socket

Manufacturer: Tyco Electronics-1473005-1

Refer to the [Colibri datasheets](#) for pin-out assignment details of the Colibri modules.

The following table describes the assembly option available on the Aster carrier board with respect to the Recovery and SD card boot mode:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Recovery mode (Only with Colibri Txx)	Assemble 10 K Ω resistors R19 to enter recovery mode		Top
SD card boot mode (Only with Colibri T20)	Assemble 100 K Ω resistors R20, R21, R22, R23 and 0 Ω resistor R24 to enter recovery mode		Bottom

Please refer to figure 4 and 5 in [Section 2.4, Assembly Options](#) for the position of the resistor R19.

3.2. Power Supply

The Aster carrier board provides a standard 3.5 mm power jack barrel connector to power-up the carrier board using external DC power supply.

A **5V +/-0.25V DC** power supply should only be used to power-up the Aster carrier board.

WARNING:

- Power supply is not protected against reverse input voltage polarity and overvoltage.

Toradex doesn't take any responsibility for any modification done by customers.

3.2.1. Barrel Power Supply Connector (X2)

Connector type: Wurth, 694103107102

Pin	Description	Voltage / range
1	PWR_IN	5V, +/- 0.25V Only
2	GND_IN	

3.2.2. USB Power Jumper (JP1)

Jumper JP1 can be used to power the Aster Carrier board using connector X4.

The total power consumption of the system depends on the module/peripheral/accessories used. Please note that power available via Micro USB connector may not be sufficient for the modules or applications with high power requirements. In such cases, it is recommended to use an external power supply to power-up the system. While using external power supply, please remove the shunt jumper (if any) from the USB Power Jumper (JP1) in order to avoid short circuiting the USB power and external power supply.

Connector type: 1x2 Pin Header Male, 2.54 mm

Jumper position	Description
Open	Use this configuration to power-up the Aster carrier board using external power supply
Closed	Use this configuration to power-up the Aster carrier board using Micro USB connector only

3.3. Indications

3.3.1. Power-On Indication (LED1)

An LED is provided on the top side of the Aster carrier board to indicate the presence of power in the 3.3 power rail. The LED should light-up, when the input power to the Aster carrier board is provided in the correct polarity.

Ref.	Description
LED1	3.3V

Please refer to the figure 4 in [Section 2.4, Assembly Options](#) for the position of the LED1.

3.3.2. User controllable LEDs (LED4/5/6)

Aster carrier board includes upto 3 LEDs which can be controlled using software. These LEDs can be used for testing and user indications.

The following table describes the assembly options available on the Aster carrier board with respect to the User Controllable LEDs :

Solution Selected	SODIMM Pin	Assembly Options	Assembled Components on Aster V1.1	PCB Side
LED4	104	Assemble components LED4, T5, R135 and R136	LED4, T5, R135, R136	Top
LED5	184	Assemble components LED5, T6, R137 and R138		Top
LED6	186	Assemble components LED6, T7, R139 and R140		Top

Please refer to figure 4 in [Section 2.4, Assembly Options](#) for the position of the components.

3.4. Ethernet

3.4.1. Ethernet Connector (X8)

Connector type: RJ-45, Pulse J00-0065NL

Pin	Signal Name	SODIMM Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	ETH_TX0_P	189	O	+3.3V	
2	ETH_TX0_N	187	O	+3.3V	
3	ETH_RXI_P	195	I	+3.3V	
4	ETH_AVCC (CT_TXD)		PWR		
5	ETH_AGND (CT_RXD)		PWR		
6	ETH_RXI_N	193	I	+3.3V	
7	NC				
8	SHIELD				
9	+3.3V		PWR	+3.3V	
10	ETH_LINK_ACT	183	I	+3.3V	
11	ETH_SPEED	185	I	+3.3V	
12	+3.3V		PWR	+3.3V	
S1	SHIELD				
S2	SHIELD				

Resistors R53 and R54 can be used to configure the Ethernet controller which is present on the installed Colibri module. The following table describes the assembly option available on the Aster carrier board to configure the Ethernet controller:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
For Colibri PXA270 modules	Assemble 0 Ω resistors R53. Disassembled 0 Ω resistors R54.	R54	Top
For all other Colibri modules	Assemble 0 Ω resistors R54. Disassembled 0 Ω resistors R53.	R54	Top

Please refer to figure 4 in [Section 2.4, Assembly Options](#) for the positions of resistors R53, and R54.

3.5. USB Interface

3.5.1. USB Host (X9)

The Aster carrier board features 2x USB 2.0 host interface using a dual stacked USB 2.0 type-A connector X9. The USB interface supports USB 2.0 high-speed and can operate at a maximum of 480 Mbit/s, depending on the Colibri module being used.

Connector type: USB Type-A Stacked, Mill-Max 896-43-008-90-000000

Pin	Description	SODIMM Number	I/O Type	Voltage	Remarks
L1	VCC_USB1		PWR	+5V	
L2	USB_D1_N	145	I/O		Shared with connector X10
L3	USB_D1_P	143	I/O		Shared with connector X10
L4	GND		PWR		
U1	VCC_USB2		PWR	+5V	
U2	USB_D2_N	141	I/O		
U3	USB_D2_P	139	I/O		
U4	GND		PWR		
S1	SHIELD				
S2	SHIELD				
S3	SHIELD				
S4	SHIELD				

3.5.2. USB Client (X10)

The USB Client interface is shared with the dual stacked USB 2.0 type-A connector X9 bottom (USB1). By default, USB1 interface is configured as the host device. Assembly options have been provided to configure and use USB Client interface. Special attention should be paid while using the USB Client Interface.

The Micro USB Connector (X10) is assembled on the Aster carrier board by default.

Connector type: Micro AB Type, Molex 47589-0001

Pin	Description	SODIMM Number	I/O Type	Voltage	Remarks
1	VCC_USB_C		PWR	+5V	
2	USB_CLIENT_D1_N	145 (via R66)	I/O		Shared with connector X9
3	USB_CLIENT_D1_P	143 (via R67)	I/O		Shared with connector X9
4	USB_ID				Not Connected
5	GND		PWR		
S1	SHIELD				
S2	SHIELD				
S3	SHIELD				
S4	SHIELD				

The following table describes the assembly options available on the Aster carrier board with respect to the USB Client:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
USB Client	Assemble components X10, D5, R66, R67, R68, R69	X10, D5, R66, R67, R68, R69	Top/Bottom

Please refer to figure 4 and 5 in [Section 2.4, Assembly Options](#) for the position of the components.

3.6. SD/MMC Interface

3.6.1. SD/MMC Holder (X11)

Connector type: Amphenol 101-00708-64

Pin	Signal Name	SODIMM Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	SD_DAT_3	53	I/O	+3.3V	68K to +3.3V
2	SD_CMD	190	O	+3.3V	33K to +3.3V
3	GND		PWR		
4	+3.3V_SD		PWR	+3.3V	
5	SD_CLK	47	O	+3.3V	
6	GND		PWR		
7	SD_DATA0	192	I/O	+3.3V	68K to +3.3V
8	SD_DATA1	49	I/O	+3.3V	68K to +3.3V
9	SD_DATA2	51	I/O	+3.3V	68K to +3.3V
10	SD_CD#	43	I	+3.3V	
11	SD_WP				
S1	SHIELD		PWR		
S2	SHIELD		PWR		
S3	SHIELD		PWR		
S4	SHIELD		PWR		

3.7. Display Interface

Aster carrier board provides two options for connecting LCD panels and monitors:

- 18 bit digital RGB
- Analogue VGA

The following image shows the display interface architecture that has been implemented on the Aster carrier board:

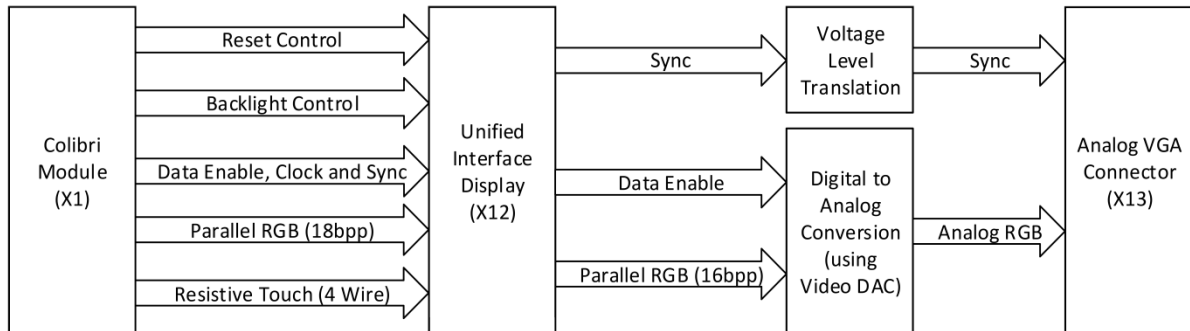


Fig.5 Display Interface Architecture

3.7.1. Unified Interface Display Connector (X12)

Aster carrier board provides a digital RGB interface port (18-bpp) to interface with the LCD panels using a 40-way, Unified Interface Display connector (X12). It also includes a 4-wire resistive touch screen interface on the same FFC connector.

The Unified Interface Display connector (X12) is compatible with the EDT Unified TFT Interface. A variety of LCD panels with integrated touch support for evaluation purposes are available at the Toradex Webshop.

For customers looking for capacitive touch display solution, Aster carrier boards are fully compatible with the Toradex Capacitive Multi-Touch Display solution. Please refer to the following developer page link for more details:

- <http://developer.toradex.com/product-selector/capacitive-multi-touch-display>

For more TFT display solutions, refer to the following developer webpage articles:

- <http://developer.toradex.com/knowledge-base/supported-displays>
- <http://developer.toradex.com/knowledge-base/tianma-rgb-display-adapter-board>
- <http://developer.toradex.com/knowledge-base/generic-rgb-display-adapter-board>

Connector type: Omron XF2M-4015-1A

Pin	Signal Name	Color Mapping 18bpp	SODIMM Number	I/O Type	Voltage	Pull-up/ Pull-down
1	GND			PWR		
2	GND			PWR		
3	+3.3V			PWR	+3.3V	
4	+3.3V			PWR	+3.3V	
5	BL_ON		71	O	+3.3V	
6	PWM_A		59	O	+3.3V	
7	LCD_RESET_OUT#		87	O	+3.3V	
8	LCD_BLUE_5	BLUE 5	72	O	+3.3V	
9	LCD_BLUE_4	BLUE 4	78	O	+3.3V	
10	LCD_BLUE_3	BLUE 3	58	O	+3.3V	
11	LCD_BLUE_2	BLUE 2	60	O	+3.3V	

Pin	Signal Name	Color Mapping 18bpp	SODIMM Number	I/O Type	Voltage	Pull-up/ Pull-down
12	LCD_ BLUE _1	BLUE 1	70	O	+3.3V	
13	LCD_ BLUE _0	BLUE 0	76	O	+3.3V	
14	GND			PWR		
15	LCD_GREEN_5	GREEN 5	50	O	+3.3V	
16	LCD_GREEN_4	GREEN 4	74	O	+3.3V	
17	LCD_GREEN_3	GREEN 3	48	O	+3.3V	
18	LCD_GREEN_2	GREEN 2	62	O	+3.3V	
19	LCD_GREEN_1	GREEN 1	46	O	+3.3V	
20	LCD_GREEN_0	GREEN 0	80	O	+3.3V	
21	GND			PWR		
22	LCD_RED_5	RED 5	61	O	+3.3V	
23	LCD_RED_4	RED 4	57	O	+3.3V	
24	LCD_RED_3	RED 3	64	O	+3.3V	
25	LCD_RED_2	RED 2	66	O	+3.3V	
26	LCD_RED_1	RED 1	54	O	+3.3V	
27	LCD_RED_0	RED 0	52	O	+3.3V	
28	LCD_PCLK_WR		56	O	+3.3V	
29	GND			PWR		
30	LCD_LCLK_A0		68	O	+3.3V	
31	LCD_FCLK_RD		82	O	+3.3V	
32	LCD_BIAS		44	O	+3.3V	
33	LCD_ROTATE_0 Connected to 3.3V or GND via assembly option. The default assembly is GND			O	+3.3V/GND	
34	LCD_ROTATE_1: Connected to 3.3V or GND via assembly option. The default assembly is GND			O	+3.3V/GND	
35	GND			PWR		
36	+3.3V			PWR	+3.3V	
37	TOUCH_TSPY		18	O	+3.3V	
38	TOUCH_TSMX		16	O	+3.3V	
39	TOUCH_TSMY		20	O	+3.3V	
40	TOUCH_TSPX		14	O	+3.3V	

The following table describes the assembly options available on the Aster carrier board with respect to the Unified Interface Display:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Unified Interface Display , Rotate display	Assemble appropriate 0R resistors R80, R81, R82, and R83. Refer to LCD TFT datasheet for configuration details.	R81, R83	Top

Please refer to figure 4 in [Section 2.4, Assembly Options](#) for the position of the resistors.

3.7.2. Analog VGA Connector (X13)

Connector type: DSUB-15 Female, AUK HDR15SN-H

Pin	Signal Name	Description	I/O Type	Voltage	Pull-up/Pull-down
1	VGA_RED	Analog Video: Red	O		
2	VGA_GREEN	Analog Video: Green	O		
3	VGA_BLUE	Analog Video: Green	O		
4	NC				
5	GND		PWR		
6	GND		PWR		
7	GND		PWR		
8	GND		PWR		
9	GND		PWR		
10	GND		PWR		
11	NC				
12	NC				
13	VGA_HSYNC	Analog Video: Horizontal Sync	O		
14	VGA_VSYNC	Analog Video: Vertical Sync	O		
15	NC				
S1	SHIELD		PWR		
S2	SHIELD		PWR		

3.7.3. Capacitive Touch Interface Connector (X3)

Connector type: Omron XF2M-1015-1A

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	I2C_SDA	194	I/O	+3.3V	4.7K to +3.3V
2	I2C_SCL	196	I/O	+3.3V	4.7K to +3.3V
3	GND		PWR		
4	TOUCH_INT#	107		+3.3V	
5	TOUCH_RESET#	106		+3.3V	
6	+3.3V		PWR	+3.3V	
7	TOUCH_SSP_CLK	88 (via R144)	O	+3.3V	
8	TOUCH_SSP_CS	86 (via R145)	O	+3.3V	
9	TOUCH_SSP_TX	92 (via R146)	O	+3.3V	
10	TOUCH_SSP_RX	90 (via R147)	I	+3.3V	

The following table describes the assembly options available on the Aster carrier board with respect to the Capacitive Touch Interface Connector:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Use SPI signals with Capacitive Touch	Assemble 0R resistors R144, R145, R146, R147		Top

Please refer to figure 4 in [Section 2.4, Assembly Options](#) for the position of the resistors.

3.8. Audio Interface

3.8.1. Audio Header (X14)

Connector type: 2x4 Pin Header Male, 2.54mm

Pin	Signal Name	SODIMM Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	AUDIO_MIC_IN	1	I		
2	AUDIO_HEADPHONE_R	17	O		
3	AUDIO_LINEIN_R	7	I		
4	AUDIO_HEADPHONE_GND	13	O		
5	AUDIO_LINEIN_L	5	I		
6	AUDIO_HEADPHONE_L	15	O		
7	AGND_AUDIO		PWR		
8	NC				

The following table describes the assembly options available on the Aster carrier board with respect to the Audio header:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Analog Audio Interface	Assemble components X14, C74, C75, C76, C77 and C78.		Top/Bottom

Please refer to figure 4 & 5 in [Section 2.5, Assembly Options](#) for the position of the components.

3.9. Digital and Analog I/O Interface

3.9.1. USB to Serial Connector (X4)

The Aster carrier board features a built in USB to Serial UART converter (FTDI FT232RL) which can be used to interface with the serial debug Full Function UART-A via the Micro AB Type, USB connector X4.

Connector type: Micro AB Type, Molex 47589-0001

Pin	Signal Name	Description	I/O Type	Voltage	Pull-up/Pull-down
1	VCC_USB_SDBG		PWR	+5V	
2	USB_FTDI_N		I/O		
3	USB_FTDI_P		I/O		
4	NC				
5	GND		PWR		
S1	SHIELD				
S2	SHIELD				
S3	SHIELD				
S4	SHIELD				

3.9.2. Arduino Headers

3.9.2.1. Arduino Shield header: Power Pins (X15)

Connector type: 1x8 Pin Header Female, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	NC				
2	VCC_IOREF		PWR	+3.3V / PWR_IN	
3	RESET#	87	O		
4	+3.3V		PWR	+3.3V	
5	PWR_IN_FILT		PWR	PWR_IN	
6	GND		PWR		
7	GND		PWR		
8	VCC_SHIELD		PWR	+3.3V / PWR_IN	

Please note that the voltage at pin number 5 is not regulated because PWR_IN_FILT power rail is connected to the input power supply (PWR_IN).

Jumpers JP2 and JP3 is used to configure the VCC_IOREF and VCC_SHIELD, respectively. Following table describes the configuration options:

Connector type: 1x3 Header Male, 2.54 mm Pitch

Jumper Position JP2, JP3	Description
1-2	VCC_IOREF / VCC_SHIELD set to +3.3V voltage level.
2-3	VCC_IOREF / VCC_SHIELD set to PWR_IN_FILT voltage level.

3.9.2.2. Arduino Shield header: Analog Input Pins (X16)

Connector type: 1x8 Pin Header Female, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	ANALOG_IN0	8	I		
2	ANALOG_IN1	6	I		
3	ANALOG_IN2	4	I		
4	ANALOG_IN3	2	I		
5	AIN4_SDA	95 / 194 (via IC13)	I/O		
6	AIN5_SCL	134 / 196 (via IC13)	I/O		

The following table describes the assembly options available on the Aster carrier board with respect to the Arduino Shield header: Analog Input pins:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
AIN4_SDA connected to SODIMM_95 (Analog Input with Colibri VFxx)	Assemble 0 Ω resistors R107. Disassembled 0 Ω resistors R106.	R107	Top
AIN4_SDA connected to UNO_I2C_SDA	Assemble 0 Ω resistors R106. Disassembled 0 Ω resistors R107.	R107	Top
AIN5_SCL connected to SODIMM_134 (Analog Input with Colibri VFxx)	Assemble 0 Ω resistors R112. Disassembled 0 Ω resistors R111.	R112	Top
AIN5_SCL connected to UNO_I2C_SCL	Assemble 0 Ω resistors R111. Disassembled 0 Ω resistors R112.	R112	Top

Please refer to figure 4 in [Section 2.4, Assembly Options](#) for the position of the resistors.

3.9.2.3. Arduino Shield header: Digital I/O Pins (X17)

Connector type: 1x8 Pin Header Female, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	UNO_UART_RXD	19 (via IC11)	I	VCC_IOREF	
2	UNO_UART_TXD	21 (via IC11)	O	VCC_IOREF	
3	UNO_GPIO1	45 (via IC11)	I/O	VCC_IOREF	
4	UNO_GPIO2	67 (via IC11)	I/O	VCC_IOREF	
5	UNO_GPIO3	133 (via IC11)	I/O	VCC_IOREF	
6	UNO_GPIO4	28 (via IC11)	I/O	VCC_IOREF	
7	UNO_GPIO5	30 (via IC11)	I/O	VCC_IOREF	
8	UNO_GPIO6	55 (via IC11)	I/O	VCC_IOREF	

Please note that the digital I/O signals available on the connectors X17 are level shifted of VCC_IOREF voltage level. Jumper JP2 can be used to configure the VCC_IOREF signal.

3.9.2.4. Arduino Shield header: Digital I/O Pins (X18)

Connector type: 1x8 Pin Header Female, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	UNO_GPIO7	63 (via IC12)	I/O	VCC_IOREF	
2	UNO_GPIO8	59 (via IC12)	I/O	VCC_IOREF	
3	UNO_SPI_CS	86 (via IC12)	O	VCC_IOREF	
4	UNO_SPI_MOSI	92 (via IC12)	O	VCC_IOREF	
5	UNO_SPI_MISO	90 (via IC12)	I	VCC_IOREF	
6	UNO_SPI_SCK	88 (via IC12)	O	VCC_IOREF	

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
7	GND		PWR		
8	AREF_SHIELD		PWR		
9	UNO_I2C_SDA	194 (via IC13)	I/O	VCC_IOREF	4.7K to VCC_IOREF
10	UNO_I2C_SCL	196 (via IC13)	O	VCC_IOREF	4.7K to VCC_IOREF

Please note that the digital signals available on the connectors X18 are level shifted of VCC_IOREF voltage level. Jumper JP2 can be used to configure the VCC_IOREF signal.

3.9.2.5. Arduino Shield header: Digital I/O Pins (X19)

Connector type: 1x8 Pin Header Female, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	UNO_SPI_MISO	90 (via IC12)	I	VCC_IOREF	
2	PWR_IN_FILT		PWR		
3	UNO_SPI_SCK	88 (via IC12)	O	VCC_IOREF	
4	UNO_SPI_MOSI	92 (via IC12)	O	VCC_IOREF	
5	UNO_NRESET	87 (via T4)	O	VCC_IOREF	
6	GND		PWR		

Please note that the digital I/O signals available on the connectors X19 are level shifted of VCC_IOREF voltage level. Jumper JP2 can be used to configure the VCC_IOREF signal.

3.9.3. Extension Connector (X20)

The extension connector provides 40 pins with different functionalities. The extension connector pinout is compatible with header pins available on the Raspberry Pi, Type B+ board. Some of these functions might change depending on the Colibri module that is used.

Connector type: 2x20 Pin Header Male, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	+3.3V		PWR	+3.3V	
2	PWR_IN_FILT		PWR	PWR_IN	
3	I2C_SDA	194	I/O	+3.3V	4.7K to +3.3V
4	PWR_IN_FILT		PWR	PWR_IN	
5	I2S_SCL	196	O	+3.3V	4.7K to +3.3V
6	GND		PWR		
7	CIF_PCLK	96	I/O	+3.3V	
8	UART_B_TXD	38	I/O	+3.3V	
9	GND		PWR		
10	UART_B_RXD	36	I/O	+3.3V	
11	UART_B_RTS	34	I/O	+3.3V	
12	GPIO18	59 (via R120) / 135 (via R121)	I/O	+3.3V	
13	CIF_D_5	97	I/O	+3.3V	
14	GND		PWR		
15	BL_ON	71	I/O	+3.3V	
16	CIF_D_1	98	I/O	+3.3V	
17	+3.3V		PWR		
18	CIF_D_3	103	I/O	+3.3V	
19	SSP_TX	92	I/O	+3.3V	

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
20	GND		PWR		
21	SSP_RX	90	I/O	+3.3V	
22	CIF_D_2	101	I/O	+3.3V	
23	SSP_CLK	88	I/O	+3.3V	
24	CIF_D_9	65	I/O	+3.3V	
25	GND		PWR		
26	CIF_D_8	85	I/O	+3.3V	
27	I2C_SDA_ID	29 (via R127) / 194 (via R126)	I/O	+3.3V	
28	I2C_SCL_ID	37 (via R128) / 196 (via R129)	I/O	+3.3V	
29	CIF_HSYNC	94	I/O	+3.3V	
30	GND		PWR		
31	CIF_VSYNC	81	I/O	+3.3V	
32	PWM_B	28	I/O	+3.3V	
33	PWM_C	30	I/O	+3.3V	
34	GND		PWR		
35	GPIO19	67 (via R122) / 188 (via R123)	I/O	+3.3V	
36	UART_B_CTS	32	I/O	+3.3V	
37	CIF_D_4	79	I/O	+3.3V	
38	CIF_MCLK	75	I/O	+3.3V	
39	GND		PWR		
40	GPIO21	69 (via R124) / 100 (via R125)	I/O	+3.3V	

The following table describes the assembly options available on the Aster carrier board with respect to the signals available on the extension connector (X20):

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
GPIO18 connected to SODIMM_59 (PWM_A)	Assemble 0 Ω resistor R120. Disassemble 0 Ω resistor R121.	R120	Bottom
GPIO18 connected to SODIMM_135	Assemble 0 Ω resistor R121. Disassemble 0 Ω resistor R120.	R120	Bottom
I2C_SDA_ID connected to SODIMM_29 (UART_A_DSR)	Assemble 0 Ω resistor R127. Disassemble 0 Ω resistor R126.	R127	Bottom
I2C_SDA_ID connected to SODIMM_194 (I2C_SDA)	Assemble 0 Ω resistor R126. Disassemble 0 Ω resistor R127.	R127	Bottom
I2C_SCL_ID connected to SODIMM_37 (UART_A_RI)	Assemble 0 Ω resistor R128. Disassemble 0 Ω resistor R129.	R128	Bottom
I2C_SCL_ID connected to SODIMM_196 (I2C_SCL)	Assemble 0 Ω resistor R129. Disassemble 0 Ω resistor R128.	R128	Bottom
GPIO19 connected to SODIMM_67 (PWM_D)	Assemble 0 Ω resistor R122. Disassemble 0 Ω resistor R123.	R122	Bottom
GPIO19 connected to SODIMM_188	Assemble 0 Ω resistor R123. Disassemble 0 Ω resistor R122.	R122	Bottom
GPIO21 connected to SODIMM_69 (CIF_D_10)	Assemble 0 Ω resistor R124. Disassemble 0 Ω resistor R125.	R124	Bottom
GPIO21 connected to SODIMM_100	Assemble 0 Ω resistor R125. Disassemble 0 Ω resistor R124.	R124	Bottom

Please refer to figure 5 in [Section 2.4, Assembly Options](#) for the position of the resistors.

3.9.4. Parallel Camera Interface (CIF)

The parallel camera interface signals are available at connectors X20 on the Aster carrier board.

Please note that parallel camera interface signals available on the connectors X20 are configured as alternate functions when using the factory settings. The user is responsible for reconfiguring these default settings prior to using the interface, which may involve changing the software configuration.

This is a module-specific feature and may not be supported by all the computer-on-modules in the Colibri family. For more details, refer to the datasheet of Colibri computer-on-modules.

The following table shows the Parallel Camera Interface (CIF) signals available on the connector X20:

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
38	CIF_MCLK	75	I/O	+3.3V	
7	CIF_PCLK	96	I/O	+3.3V	
29	CIF_HSYNC	94	I/O	+3.3V	
31	CIF_VSYNC	81	I/O	+3.3V	
15	CIF_D_0 (net name: BL_ON)	71	I/O	+3.3V	
16	CIF_D_1	98	I/O	+3.3V	
22	CIF_D_2	101	I/O	+3.3V	
18	CIF_D_3	103	I/O	+3.3V	
37	CIF_D_4	79	I/O	+3.3V	
13	CIF_D_5	97	I/O	+3.3V	
35	CIF_D_6 (net name: PWM_D via R122)	67	I/O	+3.3V	
12	CIF_D_7 (net name: PWM_A via R120)	59	I/O	+3.3V	
26	CIF_D_8	85	I/O	+3.3V	
24	CIF_D_9	65	I/O	+3.3V	
40	CIF_D_10 (via R124)	69	I/O	+3.3V	

The following table describes the assembly options available on the Aster carrier board with respect to the Parallel Camera Interface:

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Parallel Camera Interface Signals	Assemble resistors R120, R122 and R124. Disassembled resistor R121, R123 and R125.	R120, R122, R124	Bottom

Please refer to figure 5 in [Section 2.5, Assembly Options](#) for the position of the components.

3.10. Real-Time Clock (RTC)

3.10.1. External RTC

The Aster carrier board uses the STMicroelectronics, M41T0M6 chip as external RTC.

3.10.2. Battery Holder (BAT1)

A 12 mm (diameter) coin cell/battery should be used with the Battery Holder (BAT1). Coin cell can be used to provide power backup to the external / internal RTC circuits when external power supply is not available. The following type of batteries is supported: BR1216, CR1216, BR1220, CL1220, CR1220, BR1225.

Connector type: KEYSTONE-3000

Pin	Description	Voltage
1	VCC_BAT	+3.0V
2	GND	

Note:

The spring contact on the top side of the battery holder sets/bends based on the battery thickness.

In case a thicker battery (like BR1225, 2.5mm thickness) is inserted first, the spring contact will set and later if the battery is replaced by a thinner battery (like BR1220, 2.0mm thickness). The battery holder will not hold the replacement battery firmly.

Customers are advised to not to use thinner battery after using the thicker battery with the battery holder (BAT1).

The following table describes the assembly options available on the Aster carrier board with respect to the Real Time Clock (RTC):

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Internal RTC	Assemble components BAT1, D10, R8, R130 and R131. Disassembled resistor R7, R132.	BAT1, D10, R8, R130, R131	Top/Bottom
External RTC	Assemble components BAT1, D10, IC14, OSC3, C79, C80, C81, C82, R7, R130, R131, R132 and R133. Disassembled resistor R8.	BAT1, D10, R8, R130, R131	Top/Bottom

Please refer to figure 4 & 5 in [Section 2.5, Assembly Options](#) for the position of the components.

3.11. JTAG

The Aster carrier board provides a JTAG interface to the JTAG port available on the Colibri modules.

JTAG debugger can be connected to JTAG header X6 on the Aster carrier board using a 10-Pin (Pitch: 0.05") - Cortex Debug Connector.

In addition, the Aster carrier board features a spring loaded Pogo-pin connector X21 which is positioned directly underneath the installed Colibri module, allowing direct connection with the Colibri module JTAG test points.

3.11.1. Colibri JTAG Header (X6)

Connector type: Samtec, FTSH-105-01-L-DV-K

Pin	Signal Name	Description	I/O Type	Voltage	Pull-up/Pull-down
1	+3.3V		PWR	+3.3V	
2	COLIBRI_JTAG_TMS		O	+3.3V	
3	GND		PWR		
4	COLIBRI_JTAG_TCK		O	+3.3V	
5	GND		PWR		
6	COLIBRI_JTAG_TDO		I	+3.3V	
7	NC				
8	COLIBRI_JTAG_TDI		O	+3.3V	
9	NC				
10	COLIBRI_JTAG_RESET				

The following table describes the assembly options available on the Aster carrier board with respect to the Colibri JTAG header(X6):

Solution Selected	Assembly Options	Assembled Components on Aster V1.1	PCB Side
Colibri JTAG header - Pin 10 (COLIBRI_JTAG_RESET) connected to COLIBRI_JTAG_TRST# signal	Assemble 0 Ω resistor R51.	R51	Top

Please refer to figure 4 in [Section 2.5, Assembly Options](#) for the position of the components.

3.11.2. JTAG Pogo Pins (X21)

Connector type: Mill-Max, 823-22-006-10-000101

Pin	Signal Name	Description	I/O Type	Voltage	Pull-up/Pull-down
1	COLIBRI_JTAG_TDI		I	+3.3V	
2	COLIBRI_JTAG_TDO		I	+3.3V	
3	COLIBRI_JTAG_TCK		I	+3.3V	
4	COLIBRI_JTAG_TRST#		O	+3.3V	
5	COLIBRI_JTAG_TMS		I	+3.3V	
6	TP4				

4. Electrical Characteristics

4.1. Electrical Specifications

Symbol	Description	Voltage	Min	Typ	Max	Unit
PWR_IN_V	Main power supply voltage (PWR_IN)	PWR_IN	4.75	5	5.25	V
PWR_IN_I	Main power supply current	PWR_IN	-		5	A
V_BACKUP	Optional RTC battery voltage		2.3	3	3.6	V
I_(+3.3V)	Maximum continuous current at power rail	+3.3V			3.0	A
I_(VCC_USB_SDBG)	Power Input from USB to Serial connector	+5V			0.5	A
I_(VCC_USB_C)	Power Input from USB Client connector	+5V			0.5	A
I_(VCC_5V_SWB)	Power Input from Serial Debugger USB Connector	+5V			0.5	A
I_Pin(X20)	Current for single power pin 1 and 17 of connector X20	+3.3V			2.5	A
I_Pin(X20)	Current for single power pin 2 and 4 of connector X20	PWR_IN (5V)			2.5	A
I_Pin(X15)	Current for single power pin 2 of connector X15	+3.3V / PWR_IN (5V)			2.5	A
I_Pin(X15)	Current for single power pin 4 of connector X15	+3.3V			3	A
I_Pin(X15)	Current for single power pin 5 of connector X15	PWR_IN (5V)			3	A
I_Pin(X15)	Current for single power pin 8 of connector X15	+3.3V / PWR_IN (5V)			3	A
I_Pin(X6)	Current for single power pin 1 of connector X6	PWR_IN (5V)			3	A
I_Pin(X4)	Current available for 2X USB Host on connector X4 Maximum current limit on each USB is 500mA	PWR_IN (5V)			1.0	A

Please note that the +3.3V power rail maximum continuous current is limited to 3A (max) by DC/DC step down converter. The available power will be shared between Colibri module, on board peripherals/devices and external devices connected to the Aster carrier board via header pins/connectors.

5. Temperature Range

5.1. Operating Temperature Range

- 25 °C to +85 °C

6. Mechanical Data

6.1. Dimensions – Top Side

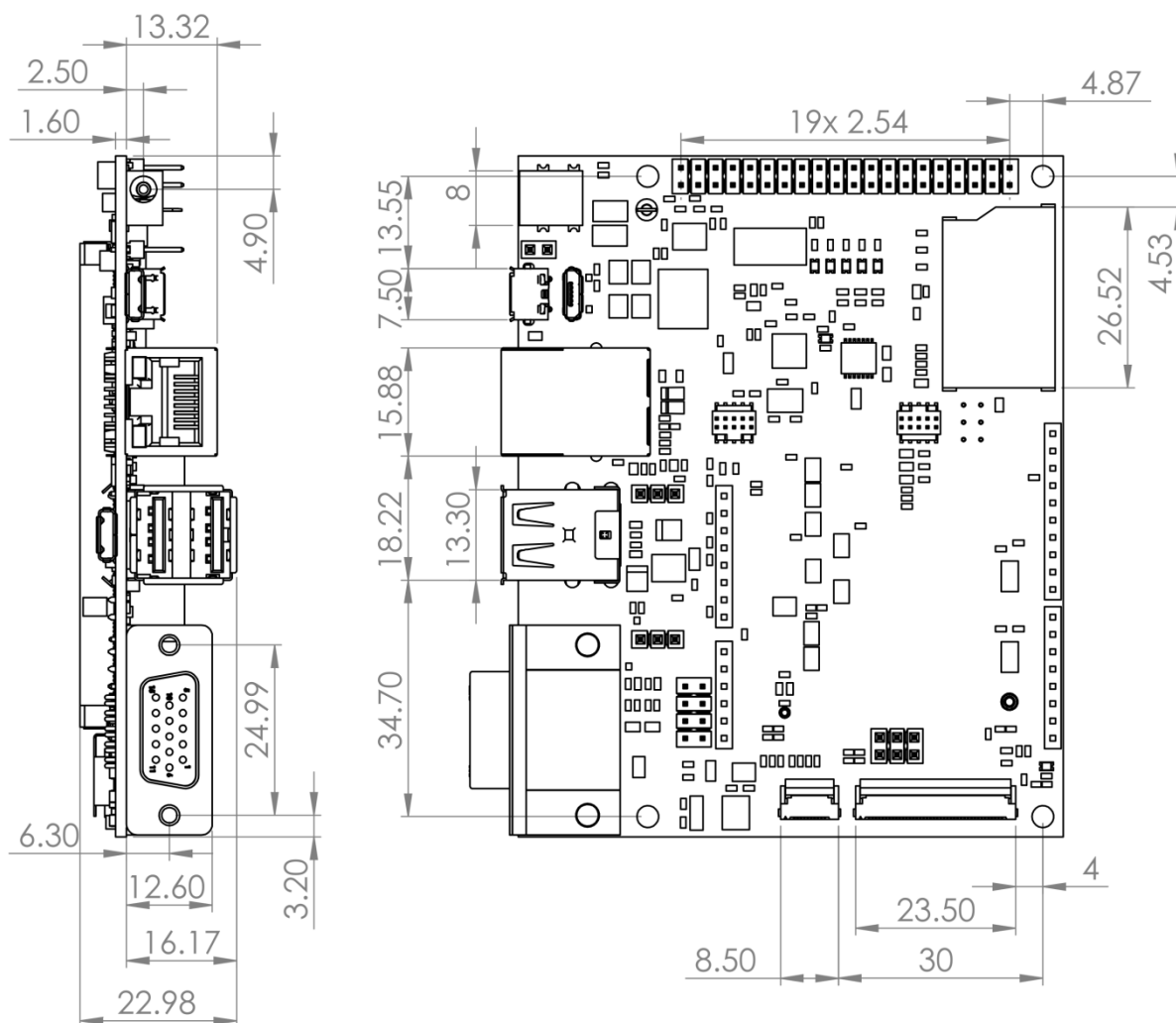


Fig.7 Dimensions – Top Side, all dimensions are in millimetres (mm)

6.2. Dimensions – Bottom Side

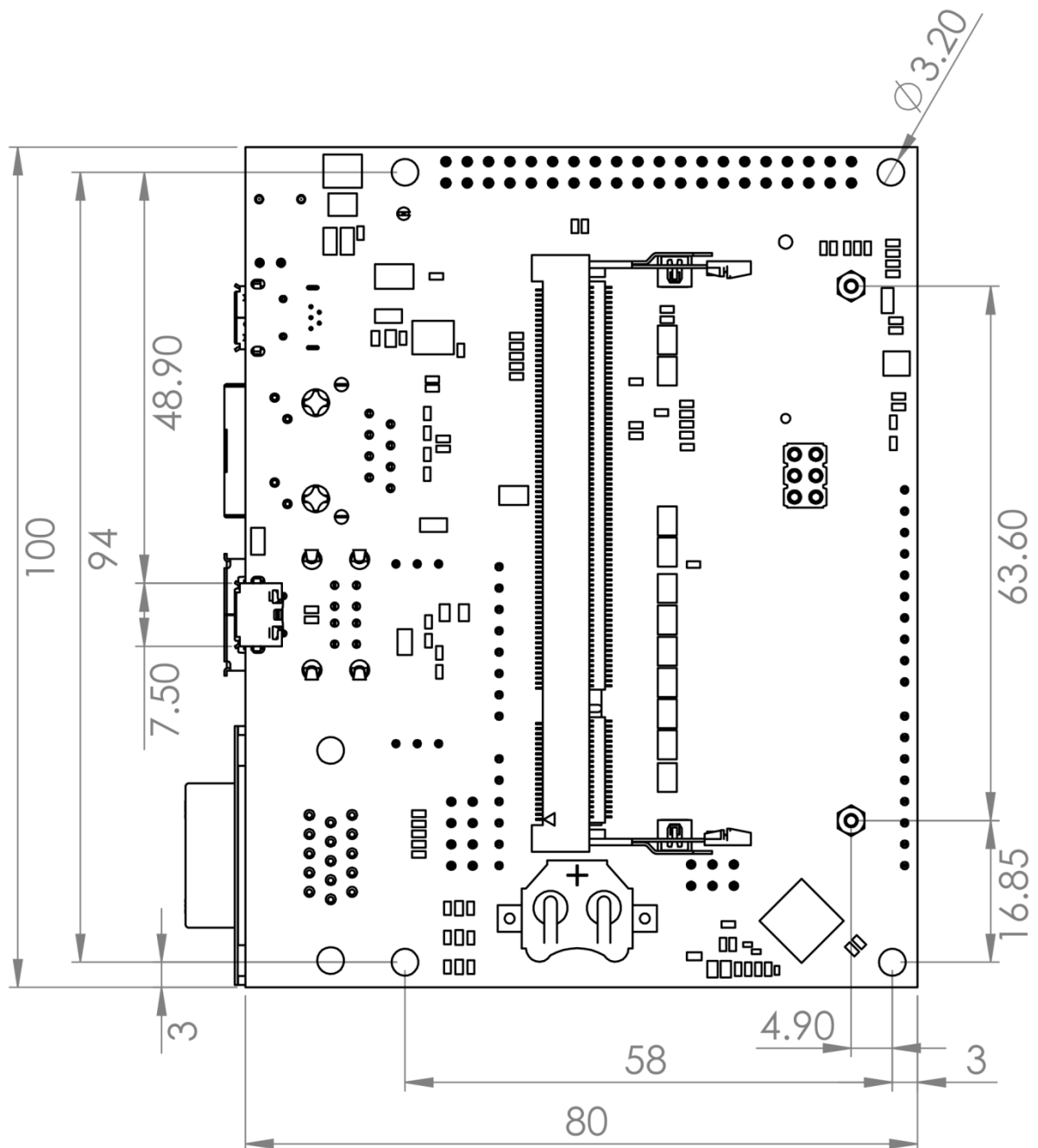


Fig.8 Dimensions – Bottom Side, all dimensions are in millimetres (mm)

7. Design Data

The design data for Toradex carrier boards are freely available in the Altium Designer format. The design data includes schematics, layout, and component libraries.

To download the carrier board design data, please use the web-link below:

<http://developer.toradex.com/carrier-board-design>

8. Product Compliance

Up-to-date information about product compliance such as RoHS, CE, UL-94, Conflict Mineral, REACH etc. can be found on our website at: <http://www.toradex.com/support/product-compliance>

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