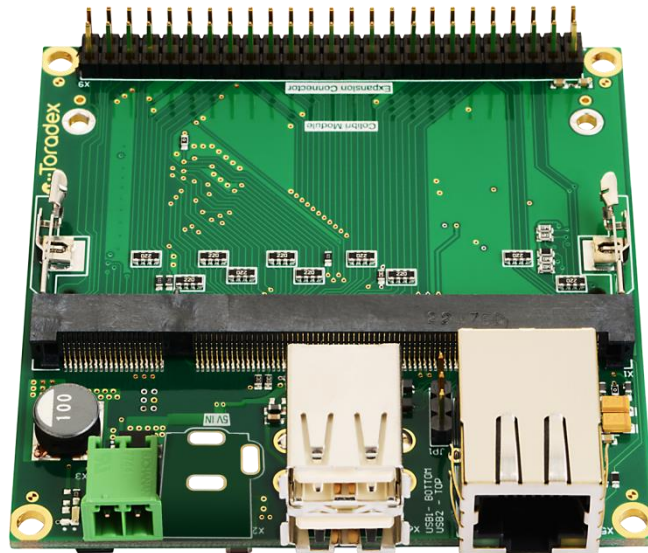


# Viola V1.1

## Preliminary Datasheet



## Revision History

Date	Doc. Rev.	Viola Version	Changes
08-May-14	Rev. 1.0	V1.0	Preliminary Draft
01-Sept-14	Rev. 1.1	V1.0	<ul style="list-style-type: none"> <li>- Section 1.2.2, Block Diagram: updated fig.1, added notes for RTC and CAN.</li> <li>- Section 2.2.5, Ethernet Connector (X5): added notes for ETH_TX0_P/N signals.</li> <li>- Some minor cosmetic corrections.</li> </ul>
01-Sept-14	Rev. 1.2	V1.1	Preliminary release <ul style="list-style-type: none"> <li>- Section 2.2.7: Extension Connector (X9): Renamed from Expansion Connector to Extension Connector. Changed net names from PIN_xx to SODIMM_xx. Connector X9 pin-out table is updated with new SODIMM pin numbers which are assigned as GPIOs. PWM pins are rearranged.</li> <li>- Section 2.4.1, USB Client (X4): Added details about USB Client interface.</li> <li>- Section 2.4.2, Unified TFT Interface (X7): Renamed from RGB connector to Unified TFT Interface.</li> <li>- Section 4.0, Assembly Options: Updated assembly options table. Updated fig. 6 and Fig. 7.</li> <li>- Section 5.1, Dimensions: Updated fig. 8 and Fig. 9.</li> <li>- Section 8.0, PCB Revision : Added PCB revision details, design changes from V1.0 to V1.1.</li> </ul>

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## 1. Introduction

---

Viola is a carrier board that is compatible with the entire family of the Colibri computer-on-modules. It comes with the smallest form factor among the Colibri carrier boards. The optimized price v/s feature trade-off makes it ideal for designing end-products for emerging markets.

### 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/AP6502.pdf>

#### 1.1.3 USB, Current-Limiter, Power-Distribution Switches

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

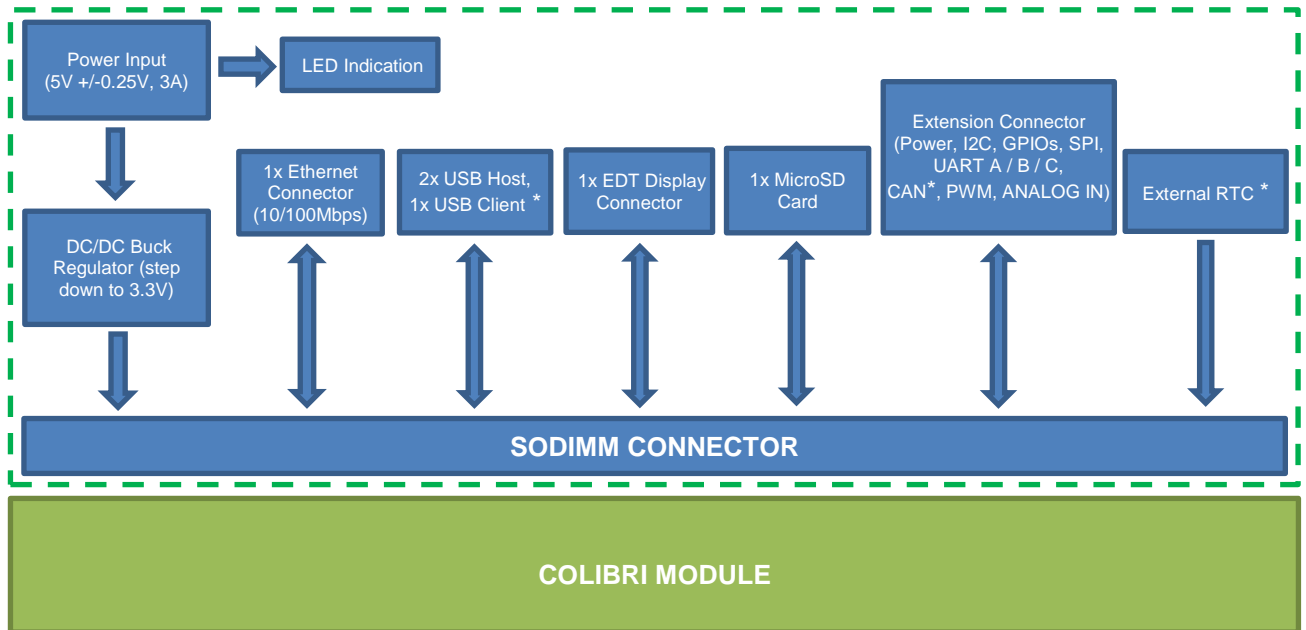
### 1.2. Features

#### 1.2.1 Overview

Viola provides the following features and communication interfaces:

- 2x USB Host, Type A USB connector.
- RJ45 Ethernet connector (10/100 Mbps)
- Micro SD Card connector
- Unified TFT Interface with built in resistive touch for direct LCD panel connection
- Communication Peripherals: SPI, UART, I2C (on extension connector)
- Digital I/O Interface: 4 PWM channels and 11 GPIOs (on extension connector)
- Analog Input Interface: 4 ADC channels (on extension connector)
- CAN (on extension connector) [\(Refer note 1\)](#)
- USB Client, Micro AB type Connector.  
(For more details, refer to [Section 4, Assembly Options](#)).
- External real-time clock with battery backup  
(For more details, refer to [Section 4, Assembly Options](#)).

### 1.2.2 Block Diagram



\* USB Client: For more details, refer to [Section 2.4.1, USB Client \(X4\)](#).

\* CAN: For more details, refer to [note 1](#).

\* External RTC: Not assembled by default. For more details, refer to [Section 4, Assembly Options](#).

### 1.2.3 User Interface

Viola provides a digital RGB interface port (18-bpp) to interface with the LCD panels. EDT Unified TFT display interface is provided on the board which has a built-in 4 wire resistive touch on the same connector. 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, Viola is fully compatible with 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>

LED indication is available to indicate +5V power supply status.

### 1.2.4 Communication

The commonly used communication functions are fully implemented on the Viola carrier board and include:

- 1x 10/100 Mbps Ethernet
- 2x USB 2.0 Host
- 1x SPI (on extension connector)
- 1x I2C (on extension connector)
- 3x UART(UART-A, UART-B, and UART-C on extension connector)
- 1x CAN (on extension connector) [\(Refer note 1\)](#)
- 1x USB Client (shared with connector X6 bottom)

### 1.2.5 Extension Connector

The extension connector provides 50 pins with different functionalities. Some of these functions might change depending on the Colibri module that is used. The available signals are selected to provide good flexibility in terms of peripherals which can be attached to it.

### 1.2.6 Power Supply

Viola provides two methods of supplying power to the board, which require 5V +/-0.25V DC input power supply.

- The connector X2, which is a standard 5.5 mm power jack barrel connector, is widely used in consumer electronic devices. By default, connector (X2) is not part of the assembly (For more details, refer to [Section 4, Assembly Options](#)).
- The connector X3, which is a pluggable, terminal block type connector, is widely used in industrial applications.

For more details, please refer to [Section 6, Electrical Characteristics](#)

**Note:** Power supply is not protected against reverse input voltage polarity and overvoltage.

### 1.2.7 Quick-Start Instructions

Perform the following steps to quick-start the Viola carrier board:

1. Insert a Colibri module into the SODIMM socket X1 on the Viola carrier board.
2. Connect the EDT Unified TFT display to the connector X7. Connect a keyboard and mouse to the USB ports.
3. Connect an external power supply (recommended: 5V +/-0.25V, 3A) to the board by the X2 (or X3) connector.

**Note:** Power consumption depends on the module/peripheral used.

4. The system starts as soon as the power supply is connected. LED will glow to indicate the presence of the 5V power and the pre-installed operating system boots.

For detailed documentation of the software as well as for the latest bootloader and software images please refer to the Toradex Developer Website: <http://developer.toradex.com>

## 2. Viola Interfaces

### 2.1. Top Side Connectors: Physical Drawing

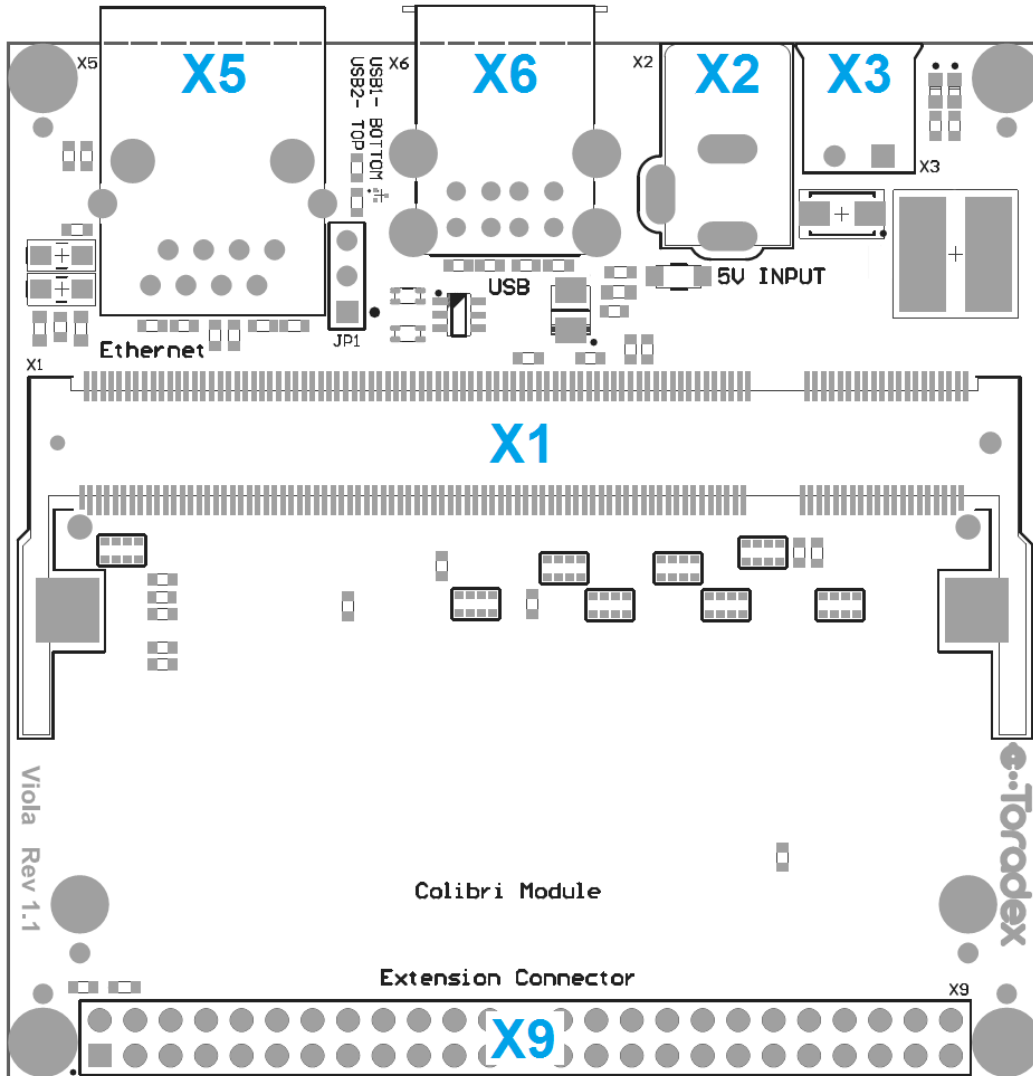


Fig.2 Viola connectors – Top Side

Ref	Description	Remarks
X1	Colibri SODIMM connector	
X2	Barrel power supply connector	Not assembled
X3	Terminal Block power supply connector	
JP1	Central tab jumper	
X5	Ethernet connector	
X6	2x USB Host, Type A	Bottom: USB1 (shared with connector X4), Top: USB2
X9	Extension connector	



## 2.2. Top Side Connectors: Pin Assignments

### 2.2.1 Colibri SODIMM Connector (X1)

Type: SODIMM 200 Socket

Manufacturer: Tyco Electronics-1473005-1

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

### 2.2.2 Barrel Power Supply Connector (X2)

Connector type: RAPC722X

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

**Note:** By default, connector (X2) is not part of the assembly.

### 2.2.3 Terminal Block Power Supply Connector (X3)

Connector type: Tyco 284512-2

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

### 2.2.4 Central Tab Jumper (JP1)

Jumper JP1 should be configured based upon the Ethernet controller which is present on the installed Colibri module. Header pin pitch: 2.54 mm.

Jumper position	Description
1-2	Use this configuration for Colibri PXA270 modules
2-3	Use this configuration for all other modules

### 2.2.5 Ethernet connector (X5)

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

Pin	Signal Name	SODIMM Pin	I/O Type	Voltage	Pull-up/Pull-down
1	ETH_TX0_P	187 *	O	+3.3V	50R to ETH_AVCC
2	ETH_TX0_N	189 *	O	+3.3V	50R to ETH_AVCC
3	ETH_RX1_P	195	I	+3.3V	50R to ETH_AVCC
4	ETH_AVCC (ETH_CT_TX)		PWR		
5	ETH_AGND (ETH_CT_RX)		PWR		
6	ETH_RX1_N	193	I	+3.3V	50R to ETH_AVCC
7	NC				
8	SHIELD				
9	+3.3V		PWR		
10	ETH_SPEED	185	I	+3.3V	
11	ETH_LINK_ACT	183	I	+3.3V	
12	+3.3V		PWR		
S1	SHIELD				
S2	SHIELD				

\* On Viola V1.0 and V1.1, ETH\_TX0\_P/N signals are swapped with respect to Colibri standard pin-out. The error won't affect Ethernet operation, since cable diagnostic (polarity detection) and correction are performed by the Ethernet PHY. The error will be fixed in the next hardware revision.

### 2.2.6 USB Host (X6)

Viola features 2X USB 2.0 host interface. The USB interface supports USB 2.0 high speed and operates at a maximum of 480 Mbit/s, depending upon the Colibri module being used.

Connector type: USB Type-A

Pin	Description	SODIMM Number	I/O Type	Voltage	Remarks
L1	VCC_USB1		PWR	+5V	
L2	USB_D1_N	145	I/O		Shared with connector X4
L3	USB_D1_P	143	I/O		Shared with connector X4
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				

### 2.2.7 Extension Connector (X9)

Connector type: 2x25 Pin Header Male, 2.54 mm

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	+5V		PWR	+5V	
2	RESET_EXT#	26	I	+3.3V	
3	RESET_OUT#	87	O	+3.3V	
4	+3.3V		PWR	+3.3V	
5	I2C_SCL	196	I/O	+3.3V	4.7K to +3.3V
6	I2C_SDA	194	I/O	+3.3V	4.7K to +3.3V
7	GND		PWR		
8	SODIMM_135 (GPIO)	135	I/O	+3.3V	
9	SODIMM_98 (GPIO)	98	I/O	+3.3V	
10	SODIMM_133 (GPIO)	133	I/O	+3.3V	
11	SODIMM_103 (GPIO)	103	I/O	+3.3V	
12	SODIMM_101 (GPIO)	101	I/O	+3.3V	
13	SODIMM_97 (GPIO)	97	I/O	+3.3V	
14	SODIMM_85 (GPIO)	85	I/O	+3.3V	
15	SODIMM_79 (GPIO)	79	I/O	+3.3V	
16	SODIMM_45 (GPIO)	45	I/O	+3.3V	
17	SODIMM_55 (GPIO) <a href="#">(Refer note 1)</a>	55	I/O	+3.3V	
18	SODIMM_63 (GPIO) <a href="#">(Refer note 1)</a>	63	I/O	+3.3V	
19	GND		PWR		
20	SSP_TX	92	O	+3.3V	
21	SSP_RX	90	I	+3.3V	

22	SSP_CLK	88	I/O	+3.3V
23	SSP_CS	86	I/O	+3.3V
24	GND		PWR	
25	UART_A_RI	37	I	+3.3V
26	UART_A_TXD	35	O	+3.3V
27	UART_A_RXD	33	I	+3.3V
28	UART_A_DCD	31	I	+3.3V
29	UART_A_DSR	29	I	+3.3V
30	UART_A_RTS	27	O	+3.3V
31	UART_A_CTS	25	I	+3.3V
32	UART_A_DTR	23	O	+3.3V
33	GND		PWR	
34	UART_C_TXD	21	O	+3.3V
35	UART_C_RXD	19	I	+3.3V
36	UART_B_TXD	38	O	+3.3V
37	UART_B_RXD	36	I	+3.3V
38	UART_B_RST	34	O	+3.3V
39	UART_B_CST	32	I	+3.3V
40	GND		PWR	
41	PWM_A	59	O	+3.3V
		<a href="#">(Refer remarks)</a>		
42	PWM_B	28	O	+3.3V
43	PWM_C	30	O	+3.3V
44	PWM_D	67, 152	O	+3.3V
		<a href="#">(Refer remarks)</a>		
45	GND		PWR	
46	AGND_AUDIO		PWR	
47	ANALOG_IN0	8	I	+3.3V
48	ANALOG_IN1	6	I	+3.3V
49	ANALOG_IN2	4	I	+3.3V
50	ANALOG_IN3	2	I	+3.3V

**Note 1:**

- On Colibri VFxx and iMX6, PIN\_55 and PIN\_63 supports on-module CAN. CAN1\_TX and CAN1\_RX are available on PIN\_55 and PIN\_63 respectively. 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.

**Remarks:**

- The PWM\_A signal is also routed to the RGB display connector (X7) to provide backlight brightness control for the connected LCD displays; for this reason a populated zero ohm resistor (R15) is placed before connector X9. Please refer to figure 6 in [Section 4.1](#) for the position of R15.
- The Colibri PXA3XX does not support the PWM\_D signal on pin 67; however, it is available on pin 152 of the SODIMM connector. An option has been provided through a 0 (zero) ohm resistor (R42), which is, by default, not part of the assembly. This resistor allows you to connect SODIMM 152 to pin 42 of the Extension Connector. Please refer to figure 7 in [Section 4.2](#) for the position of R42.

### 2.3. Bottom Side Connectors: Physical Drawing

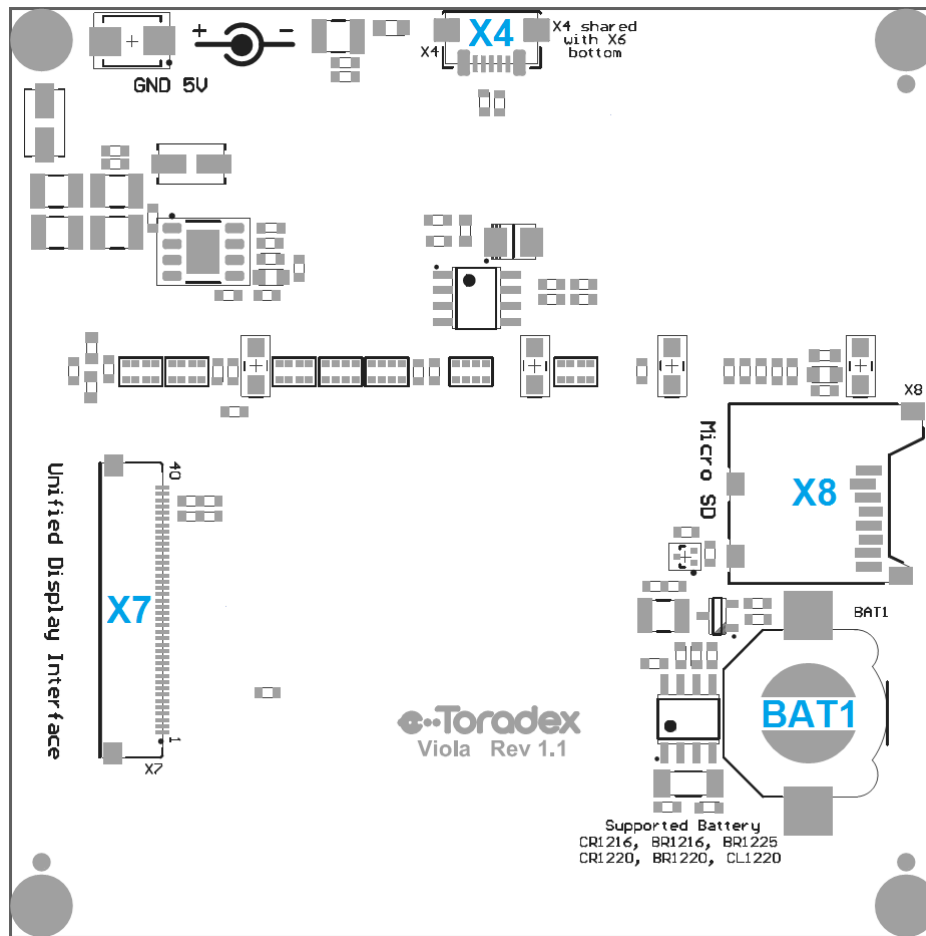


Fig.3 Viola connectors – Bottom Side

Ref.	Description	Remarks
X4	USB Client	Not assembled Shared with connector X6 bottom (USB1)
X7	Unified TFT Interface	
X8	Micro SD Card Holder	
BAT1	12 mm Battery Holder	Not assembled Supported batteries: BR1216, CR1216, BR1220, CL1220, CR1220, BR1225

## 2.4. Bottom Side Connectors: Pin Assignment

### 2.4.1 USB Client (X4)

The USB Client interface is shared with the dual stacked USB 2.0 type-A connector X6 bottom (USB1).

By default, USB1 interface is configured as host device. Assembly options have been provided to configure and use USB Client interface. Special attention need to be paid while using the USB Client Interface.

For more details, refer to [Section 4, Assembly Options](#).

Connector type: Micro AB

Pin	Description	SODIMM Number	I/O Type	Voltage	Remarks
1	VCC_USB1		PWR	+5V	
2	USB_CLIENT_D1_N	145 (via R56)	I/O		Shared with connector X6
3	USB_CLIENT_D1_P	143 (via R55)	I/O		Shared with connector X6
4	USB_ID				Not Connected
5	GND		PWR		
S1	SHIELD				
S2	SHIELD				
S3	SHIELD				
S4	SHIELD				

**Note:** By default, connector X4 is not part of the assembly.

### 2.4.2 Unified TFT Interface (X7)

The RGB (18-bpp) display interface uses the EDT Unified TFT display interface pin-out, for which there are a wide variety of displays of different sizes and resolutions available, which connect directly via a 40 way FFC.

The EDT Unified TFT Interface also features a resistive touch screen interface on the same FFC, providing support for displays which have integrated touch.

For further information about this interface and the available LCD panels, please refer to the Toradex developer website:

<http://developer.toradex.com/knowledge-base/edt-unified-interface-display-family>

Connector type: Omron XF2M-4015-1A

Pin	Signal Name	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	<a href="#">LCD_BLUE_5</a>	72	O	+3.3V	
9	<a href="#">LCD_BLUE_4</a>	78	O	+3.3V	
10	<a href="#">LCD_BLUE_3</a>	58	O	+3.3V	
11	<a href="#">LCD_BLUE_2</a>	60	O	+3.3V	
12	<a href="#">LCD_BLUE_1</a>	70	O	+3.3V	
13	<a href="#">LCD_BLUE_0</a>	76	O	+3.3V	

14	GND		PWR	
15	LCD_GREEN_5	50	O	+3.3V
16	LCD_GREEN_4	74	O	+3.3V
17	LCD_GREEN_3	48	O	+3.3V
18	LCD_GREEN_2	62	O	+3.3V
19	LCD_GREEN_1	46	O	+3.3V
20	LCD_GREEN_0	80	O	+3.3V
21	GND		PWR	
22	LCD_RED_5	61	O	+3.3V
23	LCD_RED_4	57	O	+3.3V
24	LCD_RED_3	64	O	+3.3V
25	LCD_RED_2	66	O	+3.3V
26	LCD_RED_1	54	O	+3.3V
27	LCD_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	Connected to 3.3V or GND via assembly option. The default assembly is GND. For more details, refer to <a href="#">Section 4, Assembly Options</a>		O	+3.3V / GND
34	Connected to 3.3V or GND via assembly option. The default assembly is GND. For more details, refer to <a href="#">Section 4, Assembly Options</a>		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

### 2.4.3 Micro SD Card Holder (X8)

Connector type: Amphenol 101-00581-59

Pin	Signal Name	SODIMM Number	I/O Type	Voltage	Pull-up/Pull-down
1	MM_DAT_2	51	I/O	+3.3V	68K to +3.3V
2	MM_DAT_3	53	I/O	+3.3V	68K to +3.3V
3	MM_CMD	190	I	+3.3V	33K to +3.3V
4	+3.3V		PWR	+3.3V	
5	MM_CLK	47	I	+3.3V	
6	GND		PWR		
7	MM_DAT_0	192	I/O	+3.3V	68K to +3.3V
8	MM_DAT_1	49	I/O	+3.3V	68K to +3.3V
CD1/2	MM_CD				
S1/2	SHIELD				

### 2.4.4 Battery Holder (BAT1)

Connector type: KEYSTONE-3000

Pin	Description	Voltage
1	VCC_BAT	+3.0V
2	GND	

**Note:** By default, battery holder is not part of the assembly.

## 2.5. LEDs

There are two LEDs on the top side of the PCB. LEDs glow, if the 5V power supply is provided in correct polarity.

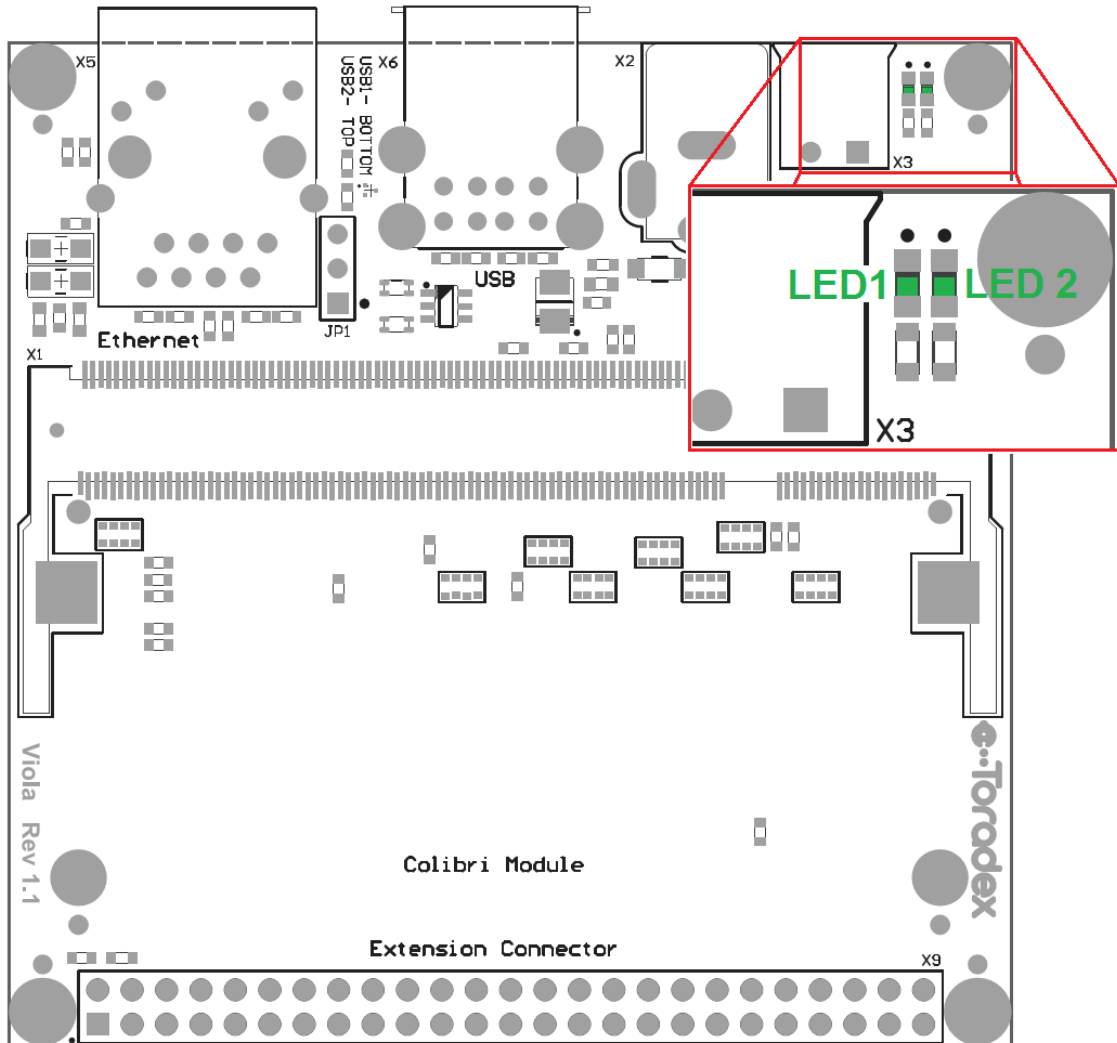


Fig.4 LED Positions

Ref.	Description
LED1	5V
LED2	3.3V

Note: By default, LED1 is part of the assembly.



### 3. Functional

---

#### 3.1. Display interfaces

Viola carrier board facilitates connection of the LCD panel directly to the board using a 40 way FFC. Unified TFT Interface supports 18 bit digital RGB configuration as per EDT Unified Interface display standard.

The following image shows the display interface architecture that has been implemented on the Viola carrier board.

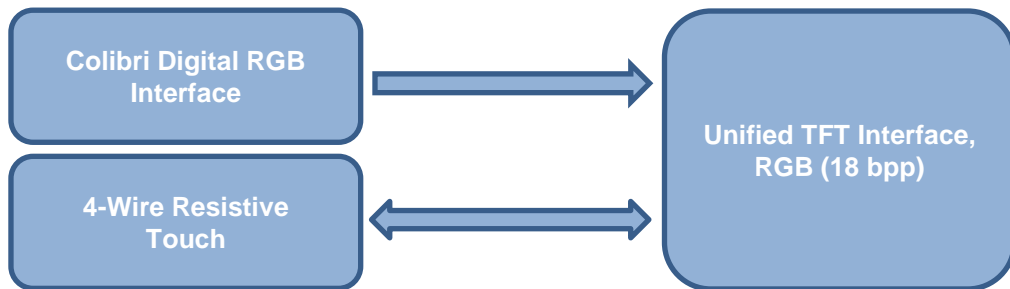


Fig.5 Display Interface Architecture

Unified TFT Interface also supports 4-wire resistive touch signals connection via the same 40 way FFC.

## 4. Assembly Options

This section describes the assembly options that can be used to configure different features and functional options.

The following table lists all the assembly options that have been described in the previous pages of this document.

Solution Selected	Assembly Options	Assembled Components	PCB Side
Recovery mode (Only with Colibri T20)	Assemble 10K $\Omega$ resistors R49 to enter recovery mode		Top
Disable Compact Flash card detect (Only with Colibri Txx)	R47 assembled	R47	Top
Disable PS/2 Driver (Only with Colibri T20)	R43, R44, R45, R46 assembled	R43, R44, R45, R46	Top/Bottom
SD Boot (only with Colibri T20)	Assemble 100 $\Omega$ resistors R50, R51, R52, R53, R54		Bottom
PWM_D for PXA3XX modules	Assemble the resistor R42		Bottom
Battery power internal RTC	Disassemble R39 and assemble R38	R39	Bottom
External RTC	Assemble components IC4, BAT1, C28, C29, C30, C31, D4, OSC1, R35, R36, R37		Bottom
EDT Unified Display , Rotate display	Assemble appropriate 0R resistors R24, R25, R26, and R27. Refer to LCD TFT datasheet for configuration details.	R25, R27	Bottom
USB Client	Assemble components X4, D5, R17, R55, R56		Top/Bottom
Barrel Power Supply Connector	Assemble component X2		Top

### 4.1. Viola Assembly Options - Top

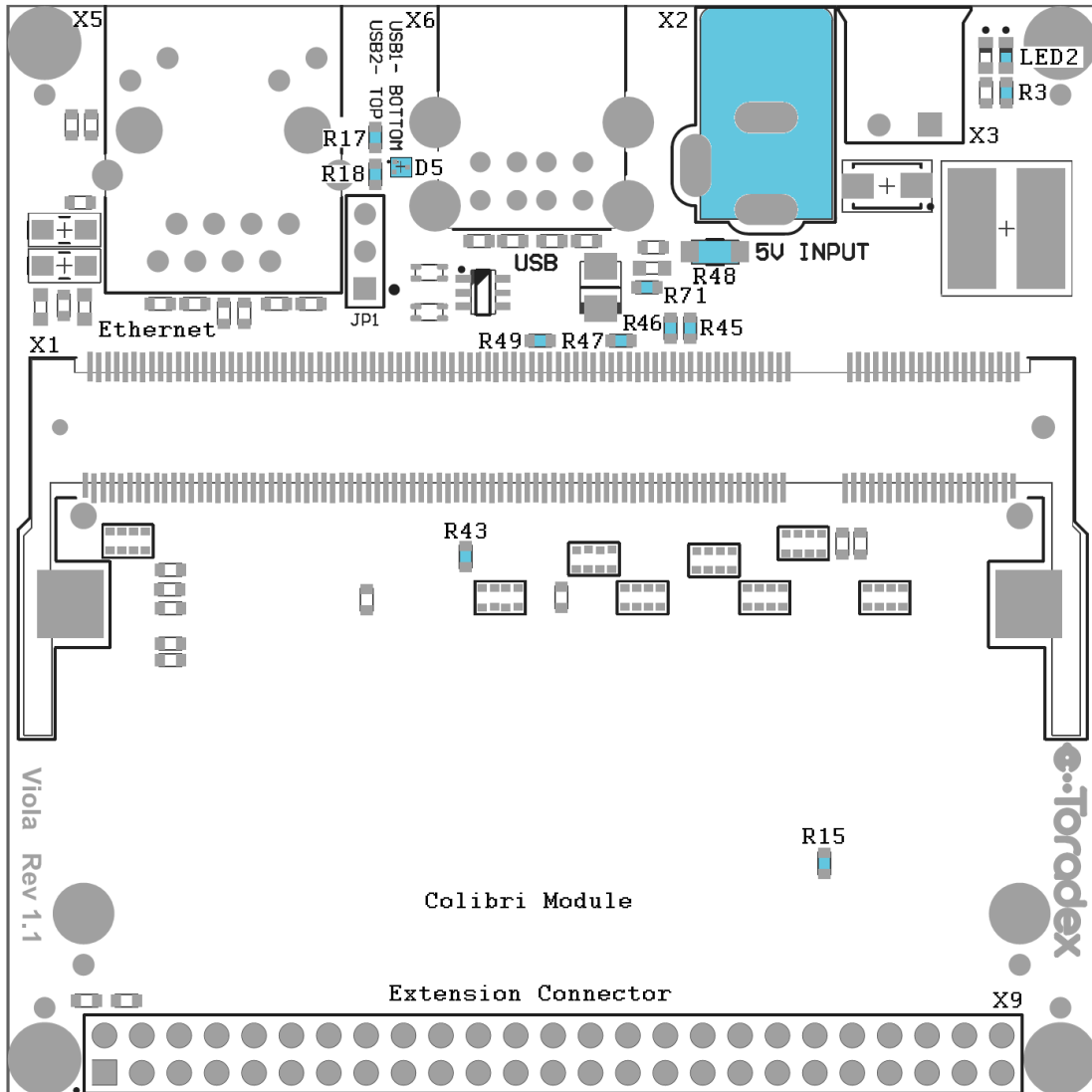


Fig.6 Viola Assembly Options – Top Side

### 4.2. Viola Assembly Options - Bottom

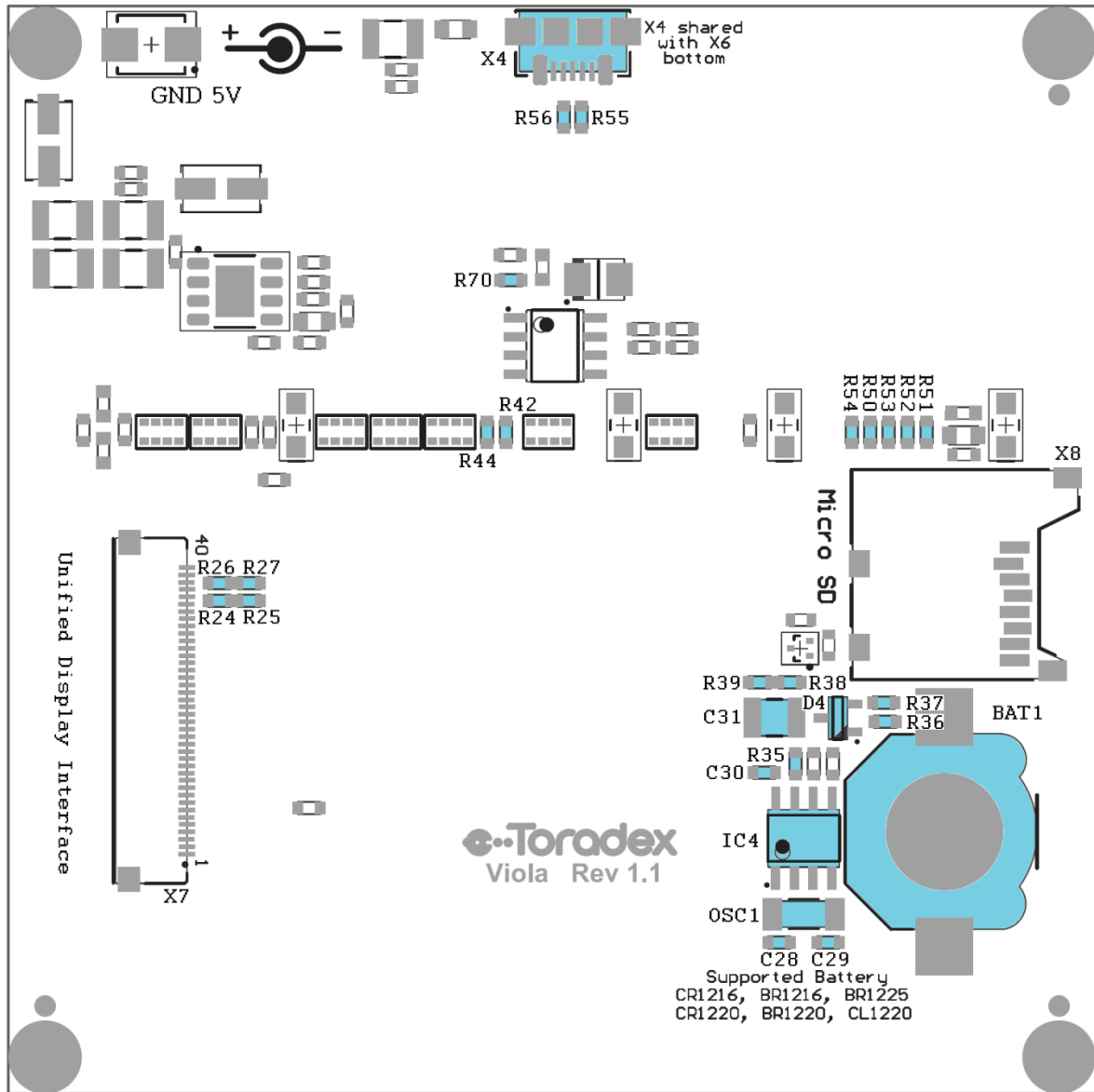


Fig.7 Viola Assembly Options – Bottom Side

## 5. Mechanical Data

### 5.1. Dimensions

#### 5.1.1 Viola Dimensions Top

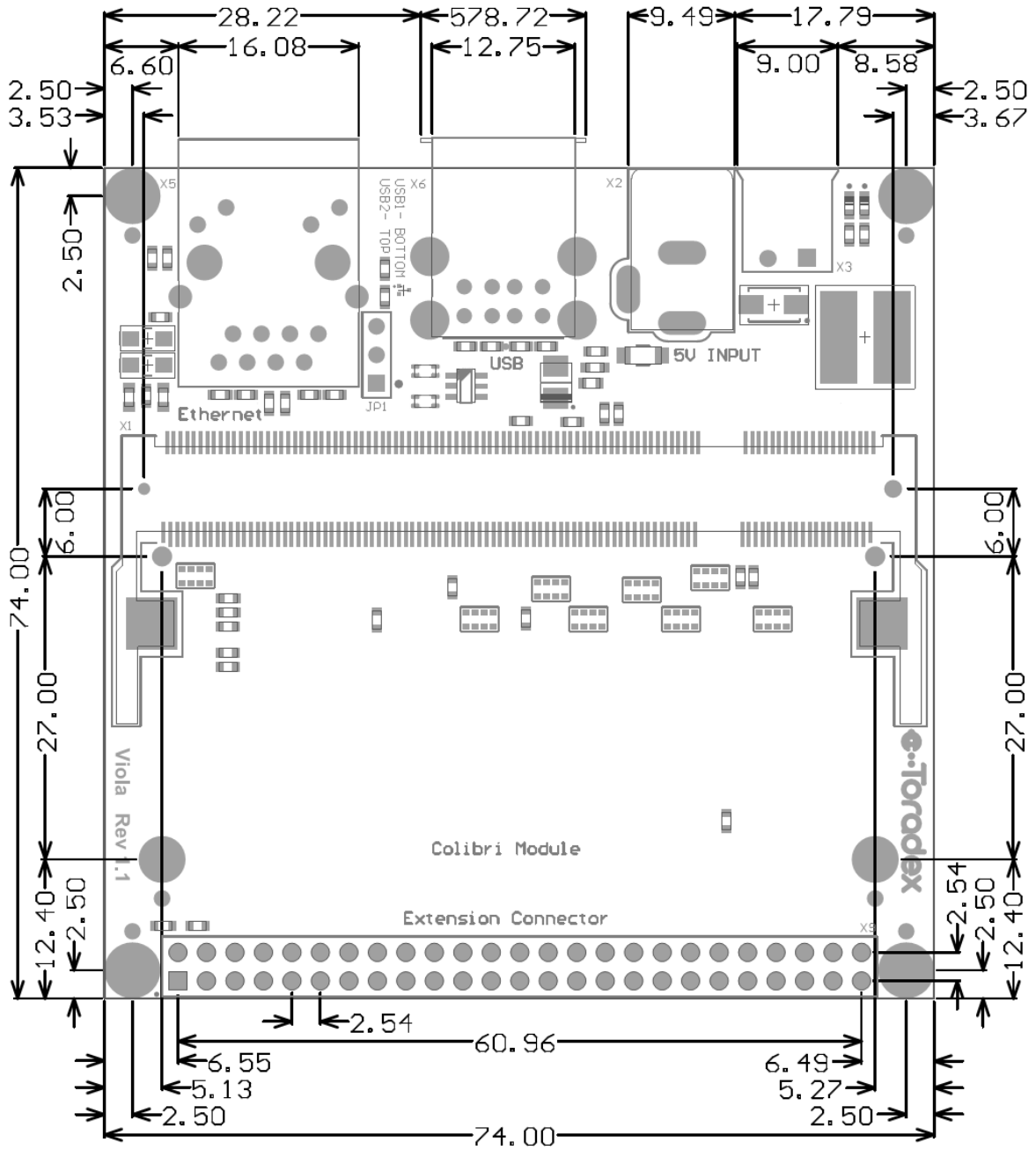


Fig.8 Viola Dimensions – Top Side, all dimensions are in millimetres (mm)

**5.1.2 Viola Dimensions Bottom**

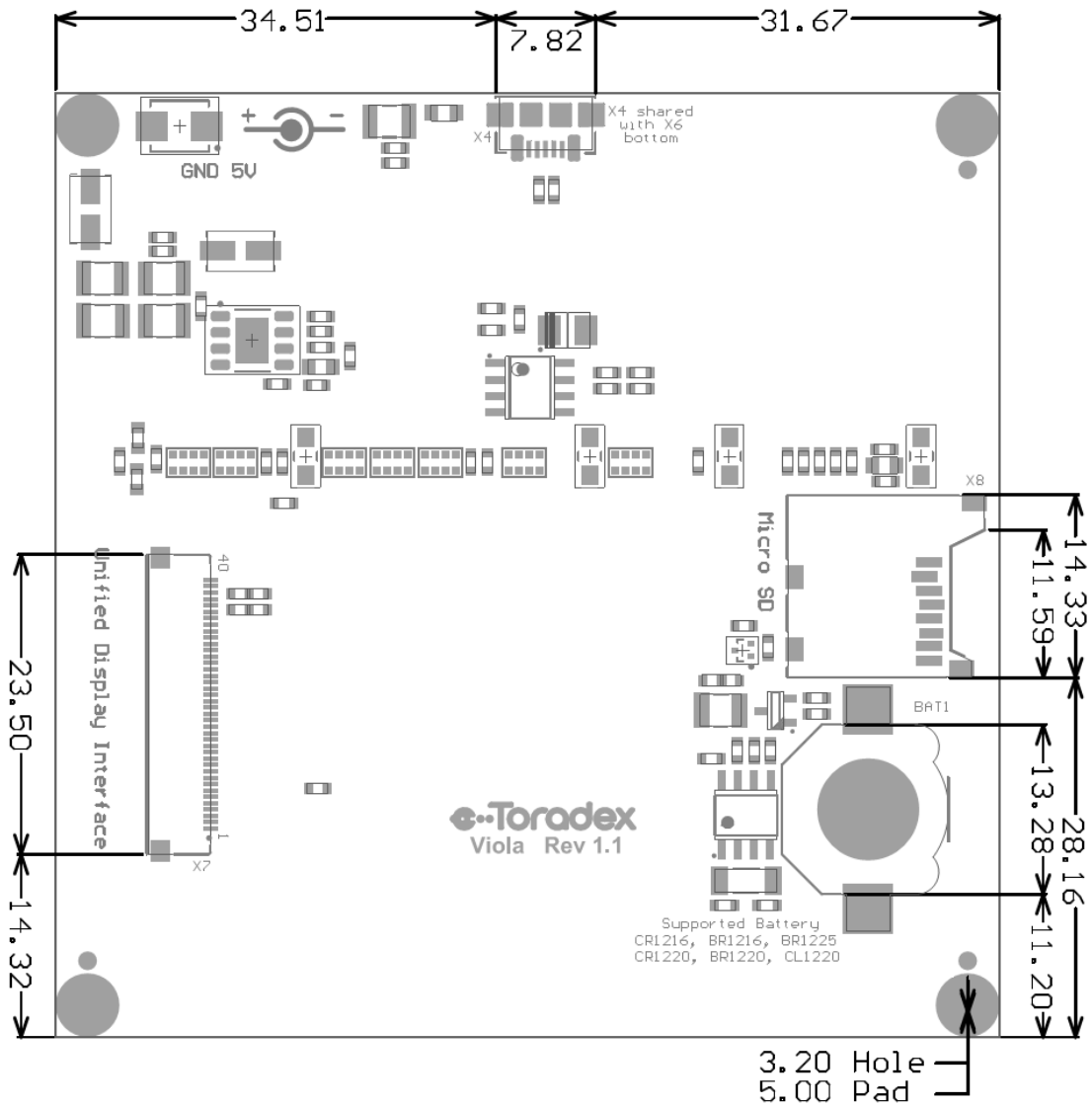


Fig.9 Viola Dimensions – Bottom Side, all dimensions are in millimetres (mm)

## 6. Electrical Characteristics

### 6.1. Electrical Specifications

Symbol	Description	Voltage	Min	Typ	Max	Unit
PWR_IN_V	Main power supply voltage		4.75	5	5.25	V
PWR_IN_I	Main power supply current		-		5	A
V_BACKUP	Optional RTC battery voltage		2.3	3	3.6	V
I_(+5V)	Maximum continuous current at power rail	+5V			2.0	A
I_(+3.3V)	Maximum continuous current at power rail	+3.3V			2.0	A
I_Pin(X9)	Current for single power pin 4 of connector X9	+3.3V			1.0	A
I_Pin(X9)	Current for single power pin 1 of connector X9	+5V			1.0	A
I_Pin(X6)	Current available for 2X USB Host on connector X6 Maximum current limit on each USB is 500mA	+5V			1.0	A

## 7. Temperature Range

### 7.1. Operating Temperature Range

- TBD

## 8. PCB Revision

Revision history of the Viola Carrier Board is as follows:

- Viola V1.0 : Initial Design
- Viola V1.1 : Hardware Release

From the version 1.0 to 1.1 the following changes have been made:

- Connector X9 has been renamed from Expansion Connector to Extension Connector. Updated silk-screen.
- Expansion Connector X9 pin-outs has been updated to maintain the compatibility with all the computer-on-modules in the Colibri family. PWM pins are rearranged.
- USB Client (X4) has been added as an assembly option. Connector X4 is shared with connector X6 bottom (USB1).

## 9. RoHS Compliance

The Viola baseboard complies with the European Union's Directive 2002/95/EC: "Restrictions of Hazardous Substances".

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