

UbiSwitch BaseBoard Mini

PicoClasp Daughterboard
for UbiSwitch

MPN: BB-UDM-A-1

Datasheet

October 2023

Board revision A

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1 General Information

1.1 Functionality and Features of UbiSwitch iBaseBoard Mini

The BotBlox UbiSwitch BaseBoard Mini is a breakout system designed to provide a very compact (42mm x 42mm) plug and play system for UbiSwitch. UbiBaseBoard provides 4 x 1Gbps ethernet ports on Molex PicoClasp headers.

UbiBaseBoard itself does not contain any ethernet switching silicon, rather it contains the necessary connectors and routing required to use UbiSwitch as a complete system. This includes four Molex PicoClasp headers for direct connection to an external system.

When used with the UbiSwitch module, BaseBoard Mini will automatically begin auto negotiation with any connected devices and begin receiving and forwarding frames as an unmanaged ethernet switch.

UbiBaseBoard runs from a wide input voltage range of 8V to 60V allowing integration into a wide range of applications.

1.1.1 Features

The features described below apply when the board is used with UbiSwitch.

- 4 x 10/100/1000BASE-T ethernet ports
- Input voltage range from 8V to 60V
- 42mm x 42mm board size
- Positive Locking Molex PicoClasp connectors for power and Ethernet ports

1.1.2 General Information

Voltage Input	8V to 60V DC
Supported Protocols	10BASE-T, 100BASE-TX, 1000BASE-T
Weight	40 grams
Size	42 mm x 42 mm x 11 mm
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +125°C

Table 1: General Information

1.1.3 General Operating Instructions

UbiBaseBoard is designed for use in harsh environments, operating from a nominal supply voltage of 24V, but with the ability to operate from as low as 8V and as high as 60V.

UbiBaseBoard is purely a breakout board, and contains no switching capabilities by itself. It must be used with UbiSwitch to create a full ethernet switch system.

To use UbiBaseBoard, first mate the board with UbiSwitch then apply an input voltage from 8 to 60V. Then connect external devices and the Ubi system will begin functioning as an unmanaged switch with up to 4 x 1GBASE-T ports.

1.2 Safety Information

- This device can operate on voltages near and above 60V. Please read this manual before operating.
- This device is fully functionally tested prior to shipment however in-application testing prior to integration is recommended.
- This device is provided as an electronic circuit board, and requires integration into chassis for full ingress protection.
- Do not use this product in wet environments without integrating into a chassis.
- Do not operate this product beyond the rated temperature and voltages.

1.3 Block Diagram

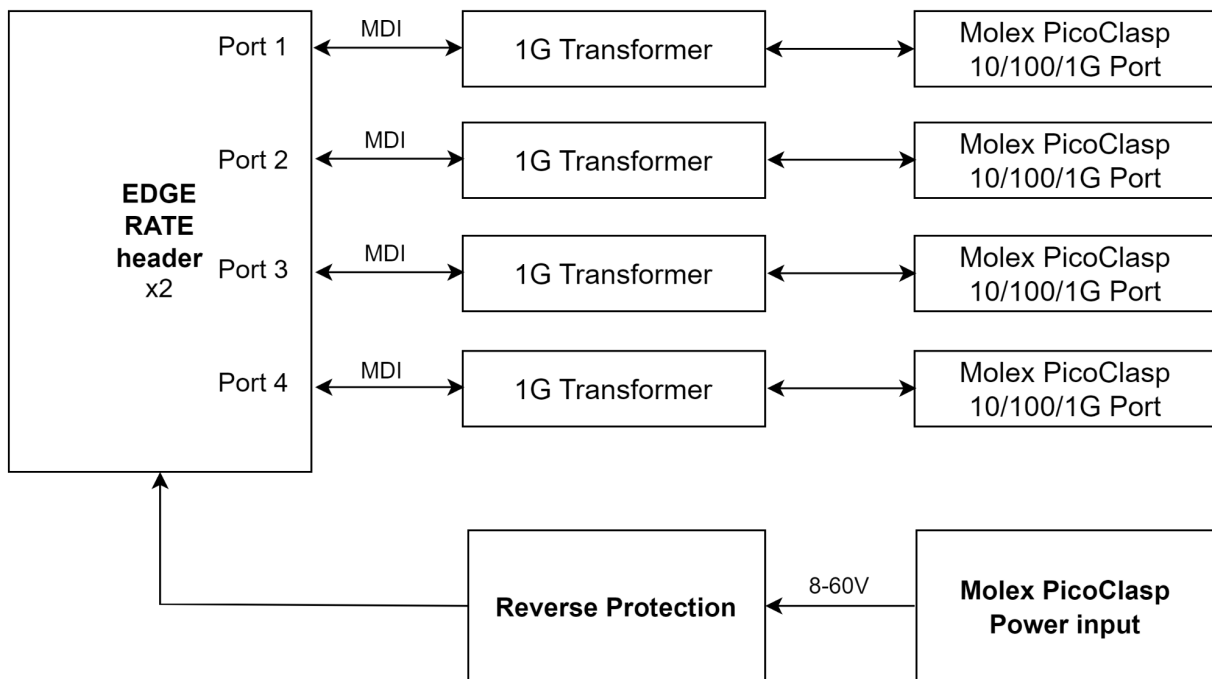


Figure 1: UbiBaseBoard Block Diagram

1.3.1 System Design

To understand how UbiSwitch and UbiBaseBoard work together, it is necessary to understand the UbiSwitch design. While the UbiSwitch has its own datasheet, a brief explanation is provided here.

UbiSwitch contains the main ethernet switch IC. This IC provides eight 1GBASE-T ethernet ports and three 10Gbps 10GBASE-R ports. These eleven ports are routed directly to a Samtec Edge Rate connector on UbiSwitch, along with a number of other power and control lines.

Figures 2 and 3 below show the signals carried on the UbiSwitch board.

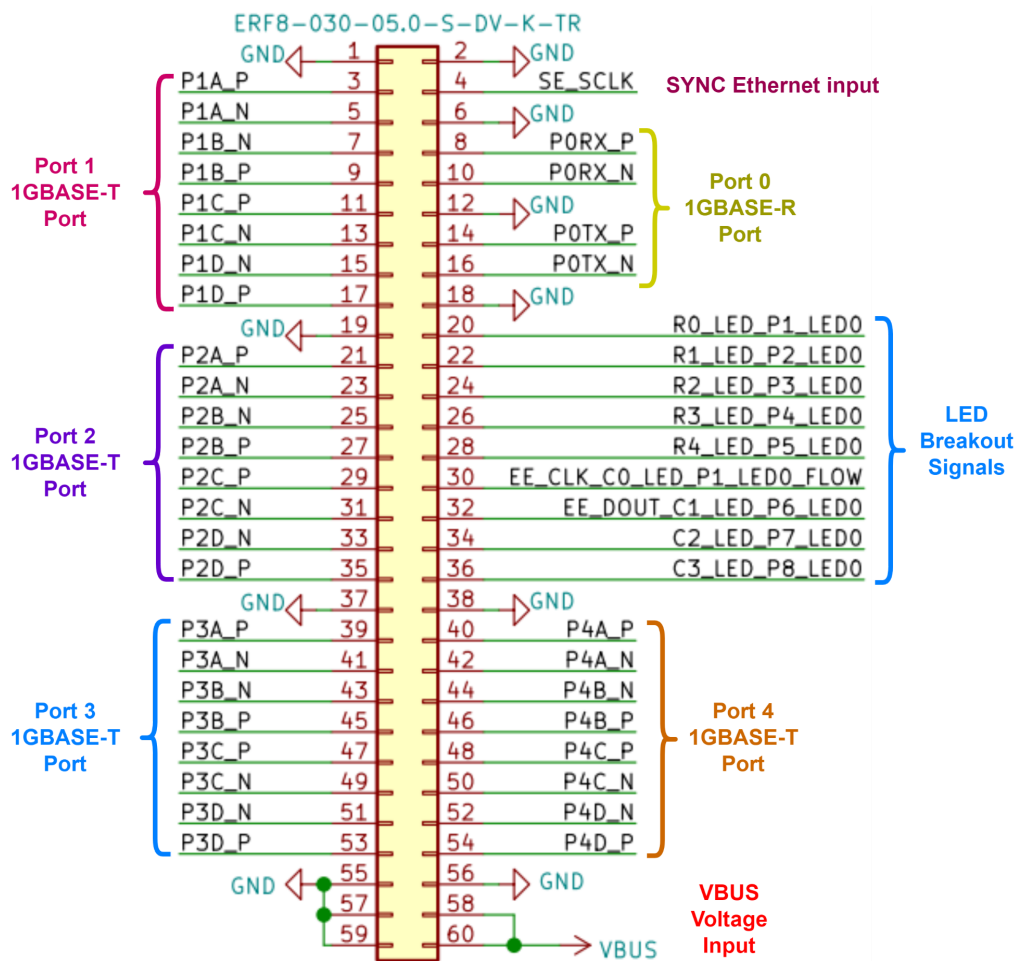


Figure 2: Signals on the UbiSwitch carried on the Samtec Edge Rate header 1

1.3.2 Auto negotiation

All ports on the UbiSwitch system support auto negotiation, auto-MDI/MDIX and polarity correction. Each port will auto negotiate with the connected device to achieve the fastest possible speed. The fastest possible speed will depend on what the connected device is capable of, and the quality of the cabling between UbiBaseBoard and the connected device. This simplifies system connectivity, meaning four of the ports on UbiBaseBoard are compatible with any 10/100/1G device. For more information on this, see section 2.4 on the UbiSwitch datasheet.

1.4 Included Equipment

The product includes the following:

- 1 x UbiBaseBoard board
- 4 x Molex PicoClasp to RJ45 4-way Shielded Twisted Pair cables (300mm)
- 1 x Molex PicoClasp Power Cable to bare, tinned leads (300mm)

1.5 RoHS Compliance

The BotBlox UbiBaseBoard complies with the RoHS (Restriction of Hazardous Substances Directive) Certificate of Compliance.

2 Hardware Interfaces

2.1 Board Map

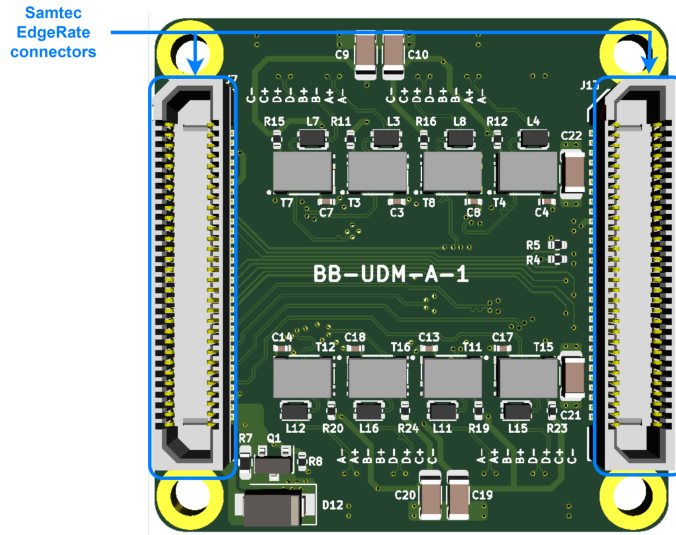


Figure 4: UbiBaseBoard Board Map (front)

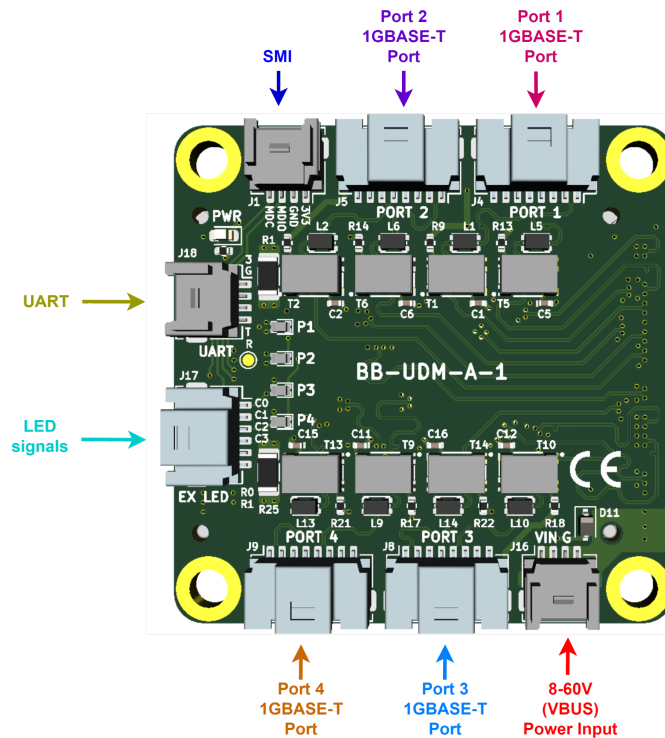


Figure 5: UbiBaseBoard Board Map (back)

2.2 Connectors and Pinouts

2.2.1 Edge Rate connector

The 8 ports, 3 SerDES, SMI, LED signals, UART, input voltage and output voltage are placed onto a Samtec Edge Rate™ (MPN: [ERF8-030-05.0-S-DV-K-TR](#)) stackable header. The Edge Rate connector on the UbiBaseBoard is shown in figure 6 below.

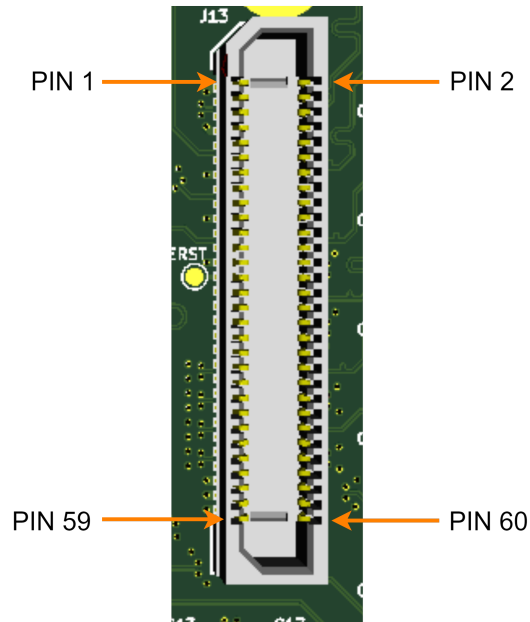


Figure 6: Edge Rate connector on UbiBaseBoard

Mating part: [ERM8-030-02.0-S-DV-TR](#) (used on UbiSwitch)

The mating method is shown in figure 7 below.

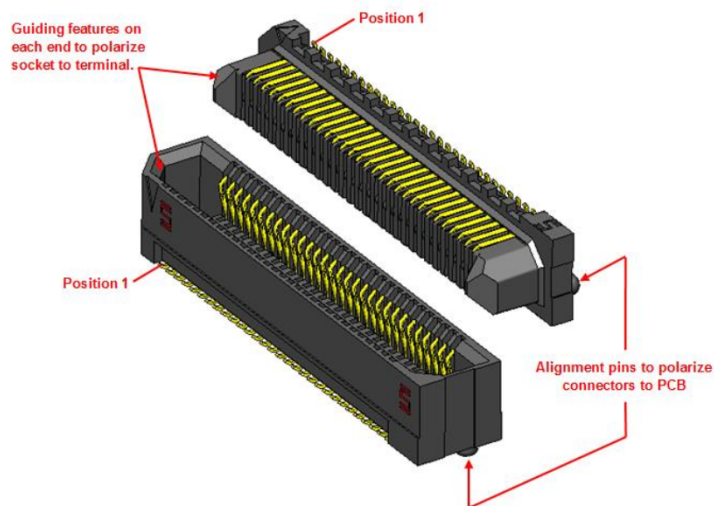


Figure 7: Edge Rate connector mating

The signal to pin assignments used on UbiBaseBoard is detailed in table 3 and table 4 below.

Connector	Pin name	Pin number	Description
J7	GND	1	Ground
	GND	2	Ground
	GND	6	Ground
	GND	12	Ground
	GND	18	Ground
	GND	19	Ground
	GND	37	Ground
	GND	38	Ground
	GND	55	Ground
	GND	56	Ground
	GND	57	Ground
	GND	59	Ground
	VBUS	58	Input supply voltage, 8V to 60V
	VBUS	60	Input supply voltage, 8V to 60V
	P1A_P	3	Port 1 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.
	P1A_N	5	
	P1B_P	9	
	P1B_N	7	
	P1C_P	11	
	P1C_N	13	
	P1D_P	17	
P1D_N	15		
P2A_P	21	Port 2 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also	

P2A_N	23	supported on the A and B pairs.
P2B_P	27	
P2B_N	25	
P2C_P	29	
P2C_N	31	
P2D_P	35	
P2D_N	33	
P3A_P	39	Port 3 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.
P3A_N	41	
P3B_P	45	
P3B_N	43	
P3C_P	47	
P3C_N	49	
P3D_P	53	
P3D_N	51	
P4A_P	40	Port 4 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.
P4A_N	42	
P4B_P	46	
P4B_N	44	
P4C_P	48	
P4C_N	50	
P4D_P	54	
P4D_N	52	
P0TX_P	14	SerDES Port 0 Transmit Data bus positive
P0TX_N	16	SerDES Port 0 Transmit Data bus negative
P0RX_P	8	SerDES Port 0 Receive Data bus positive

	P0RX_N	10	SerDES Port 0 Receive Data bus negative
	R0_LED	20	Parallel multiplexed LED outputs. These active low LED pins directly drive the port's LEDs supporting a range from 1 to 20 LEDs in a multiplexed fashion. In this mode the cathode of each LED connects to these pins through a series current limiting resistor. The anode of each LED connects to one of the Cx_LED pins below
	R1_LED	22	
	R2_LED	24	
	R3_LED	26	
	R4_LED	28	
	C0_LED	30	connect to the anode of LED column 0 for each row
	C1_LED	32	connect to the anode of LED column 1 for each row
	C2_LED	34	connect to the anode of LED column 2 for each row
	C3_LED	36	connect to the anode of LED column 3 for each row
	SE_SCLK	4	Synchronous Ethernet Source Clock. This is a 25 MHz reference clock which can be used as a synchronous clock input from the board or system. This signal must come from a high quality clock conditioning circuit or Synchronous Ethernet PLL.

Table 2: UbiBaseBoard J7 connector pin assignments

Connector	Pin name	Pin number	Description
J13	GND	1	Ground
	GND	2	Ground
	GND	7	Ground
	GND	13	Ground
	GND	19	Ground
	GND	20	Ground
	GND	25	Ground
	GND	37	Ground
	GND	38	Ground

GND	55	Ground
GND	56	Ground
GND	58	Ground
GND	60	Ground
+3V3	57	Output 3.3V, maximum 0.5A
+3V3	59	Output 3.3V, maximum 0.5A
P5A_P	53	Port 5 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.
P5A_N	51	
P5B_P	47	
P5B_N	49	
P5C_P	45	
P5C_N	43	
P5D_P	39	
P5D_N	41	
P6A_P	54	Port 6 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.
P6A_N	52	
P6B_P	48	
P6B_N	50	
P6C_P	46	
P6C_N	44	
P6D_P	40	
P6D_N	42	
P7A_P	36	Port 7 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.
P7A_N	34	
P7B_P	30	
P7B_N	32	

	P7C_P	28		
	P7C_N	26		
	P7D_P	22		
	P7D_N	24		
	P8A_P	18	Port 8 1000BASE-T Differential Data Pair A ~ D Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.	
	P8A_N	16		
	P8B_P	12		
	P8B_N	14		
	P8C_P	10		
	P8C_N	8		
	P8D_P	4		
	P8D_N	6		
	P9TX_P	17		SerDES Port 9 Transmit Data bus positive
	P9TX_N	15		SerDES Port 9 Transmit Data bus negative
	P9RX_P	23	SerDES Port 9 Receive Data bus positive	
	P9RX_N	21	SerDES Port 9 Receive Data bus negative	
	P10TX_P	5	SerDES Port 10 Transmit Data bus positive	
	P10TX_N	3	SerDES Port 10 Transmit Data bus negative	
	P10RX_P	11	SerDES Port 10 Receive Data bus positive	
	P10RX_N	9	SerDES Port 10 Receive Data bus negative	
	ETH_RST	27	Active low system reset	
	MDC_CPU	33	Management Data Clock, Slave. MDC_CPU is the reference clock input for the serial management interface (SMI) that connects to an external SMI master, typically a CPU. A continuous clock stream is not expected. The maximum frequency supported is 20.0 MHz The CPU's SMI interface is used to access the device's registers but it cannot be used until the device's INTn pin becomes active low.	

	MDIO_CPU	35	Management Data I/O, Slave. MDIO_CPU is used to transfer management data in and out of the device synchronously to MDC_CPU
	USART2_RX	29	Microcontroller USART RX line
	USART2_TX	31	Microcontroller USART TX line

Table 3: UbiBaseBoard J13 connector pin assignments

2.2.2 Voltage Input

The top left connector is the voltage input terminal. A four pin PicoClasp connector is used to allow the input voltage to be easily daisy chained between boards (two wires per power rail).

The voltage input has the following features:

- Voltage input can range from 8 to 60V
- Maximum allowable voltage of 65V
- Transient voltage protection above 66.3V
- Reverse polarity protection

The pinout of the voltage input connector is shown in figure 9 below.

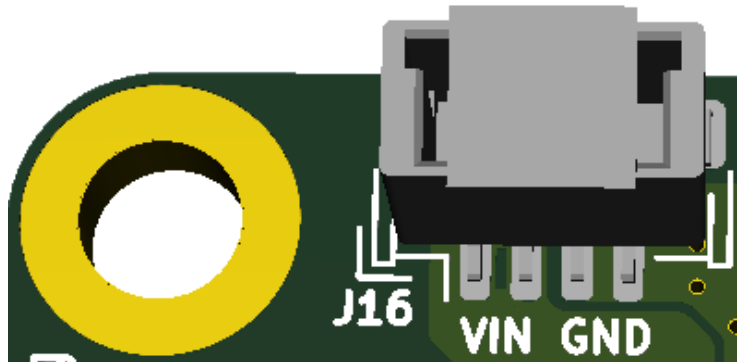


Figure 9: Voltage input header pinout

Connector part numbers

Connector on board	Mating header	Crimp used	Wire used
5019530407	5019390400	5013340000	UL1061, 28AWG

Table 4: Voltage input connector pinout and part numbers

Cable pinout

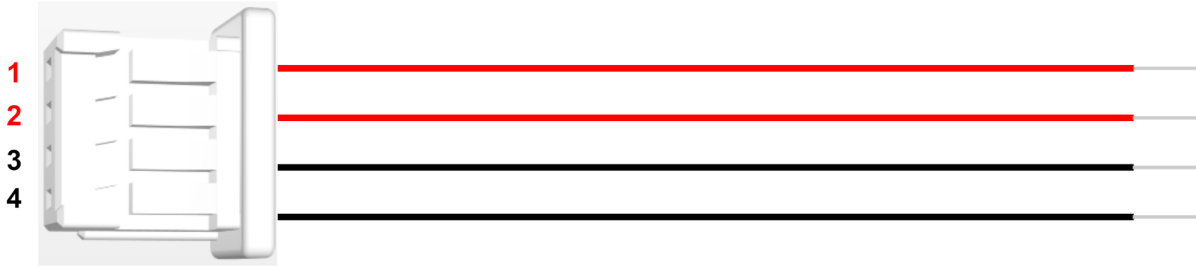
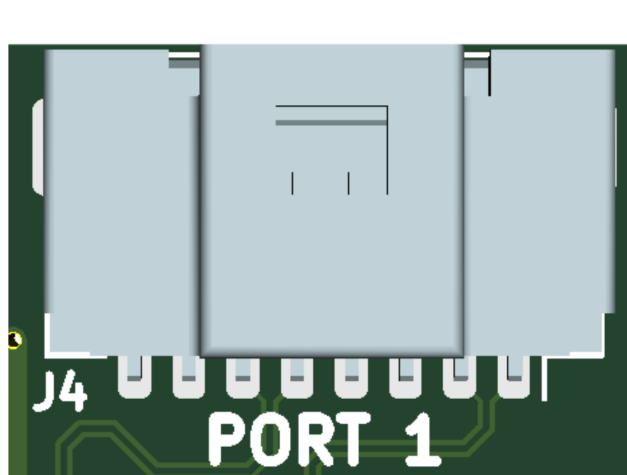


Figure 10: Voltage input cable pinout (red = V+, black = GND)

2.2.3 Ethernet Ports

There are eight ethernet connectors on UbiBaseBoard. Each connector has eight pins corresponding to the eight signals required for 1000BASE-T which are A-, A+, B-, B+, D-, D+, C+, C-. The pin mapping of all eight connectors is identical.



A- A+ B- B+ D- D+ C+ C-

Figure 11: Ethernet port pinout

Connector on board	Mating header	Crimp used	Wire used
5015680807	5013300800	5013340000	UL1061, 28AWG

Table 5: Ethernet connector pinout and part numbers

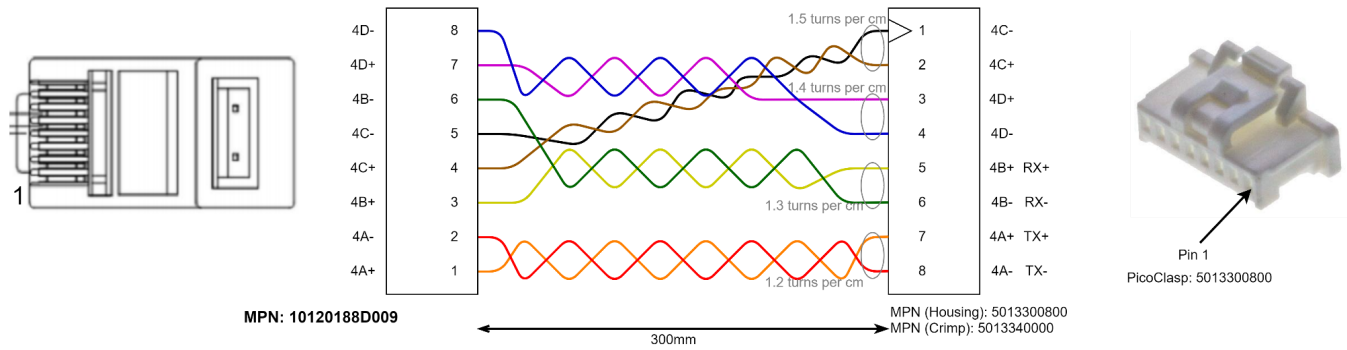


Figure 12: Ethernet cable pinout

2.2.4 External LED Header

An External LED header on the top of the board allows port activity indicator signals can be brought off-board for integration into a chassis

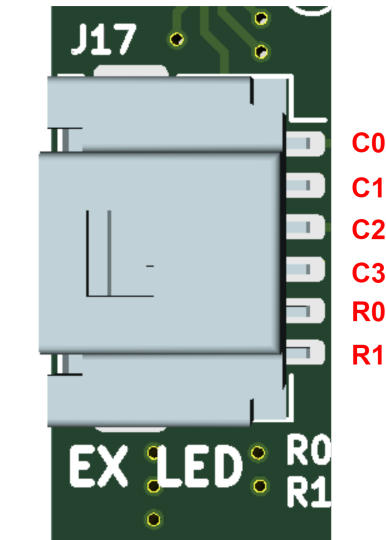


Figure 13: External LED header pinout

Connector on board	Mating header	Crimp used	Wire used
5015680607	5013300600	5013340000	UL1061, 28AWG

Table 6: Ethernet connector pinout and part numbers

External LEDs connection should be followed below diagram:

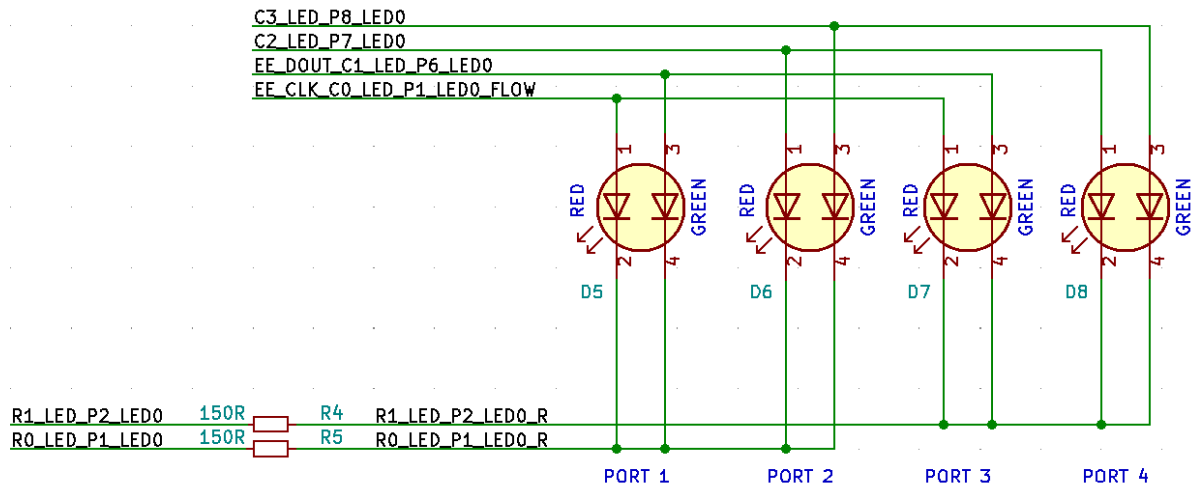


Figure 14: External LEDs connection

Ports 1 to 4 use two LED signals to indicate link speed and activity. In figure 14 above, these two LED signals are mapped to a dual color LED, but this could alternatively be two single color LEDs. In figure 14 above, the color corresponds to the link speed and activity is shown via blinking. (Green blinking indicates a 1000 Mbps connection, Red blinking indicates a 100Mbps connection, Orange blink indicates a 10Mbps connection). A solid on LED indicates Link/No Activity.

150Ω resistors are embedded onto the board and hence will already be in series with any external LEDs. This means that additional series resistors may not need to be added to any external LEDs.

2.2.5 SMI header

The SMI header on the top of the board allows access to the registers of Switch IC on the UbiSwitch module. We do not recommend using the SMI header for switch configuration. Instead, use the serial header.

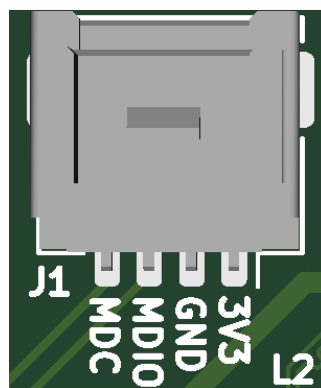


Figure 15: SMI header pinout

Connector on board	Mating header	Crimp used	Wire used
5019530407	5019390400	5013340000	UL1061, 28AWG

Table 7: SMI connector and part numbers

2.2.6 Serial header

The serial header allows control messages to be sent/received to/from the microcontroller on UbiSwitch to configure the device. This allows the user to wire any external serial device to UbiBaseBoard, and send serial commands to the system to provide switch configuration. For more information on this, see section 2.4.3 of the UbiSwitch datasheet.

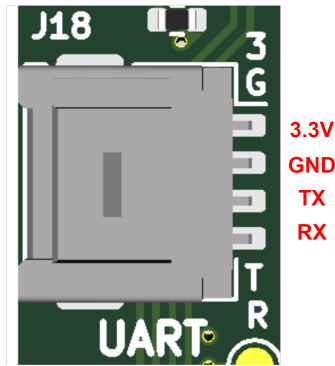


Figure 16: UART header pinout

Connector on board	Mating header	Crimp used	Wire used
5019530407	5019390400	5013340000	UL1061, 28AWG

Table 8: UART connector and part numbers

2.3 Other Interfaces

2.3.1 LEDs

There are 5 LEDs on UbiBaseBoard in total. Four of these LEDs are dual color LEDs, meaning there are a total of nine LED signals on this board. Eight of the LED signals can be taken off board.

The 3.3V Ubi Power Indicator LED (**Green**) indicates that 3.3V of the UbiSwitch module is present. That means the UbiSwitch is stacked on the UbiBaseBoard board correctly and both of them are powered. It should be solid green in normal operation.



Figure 17: Power Indicator LED

Each Port from 1 to 4 Activity LED is a **Red/Green** dual color LED and each corresponds to a specific port. They indicate activity on each port and will blink when there is traffic on a port. They should be solid off when a port is not connected to any device, and they should blink under normal operation (**Green** blinking indicates a 1000 Mbps connection, **Red** blinking indicates a 100Mbps connection, **Orange** blink indicates a 10Mbps connection). A solid on LED indicates Link/No Activity.

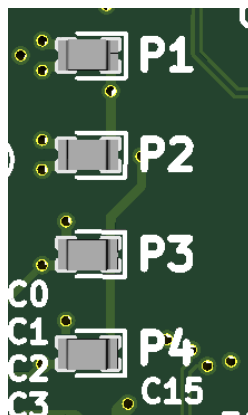


Figure 18: Port 1-4 Link/Activity LEDs

4 Device Configuration

UbiBaseBoard itself is a passive board and requires no configuration. For information on how to configure UbiSwitch, please refer to the UbiSwitch Datasheet.

5 Mechanical drawing

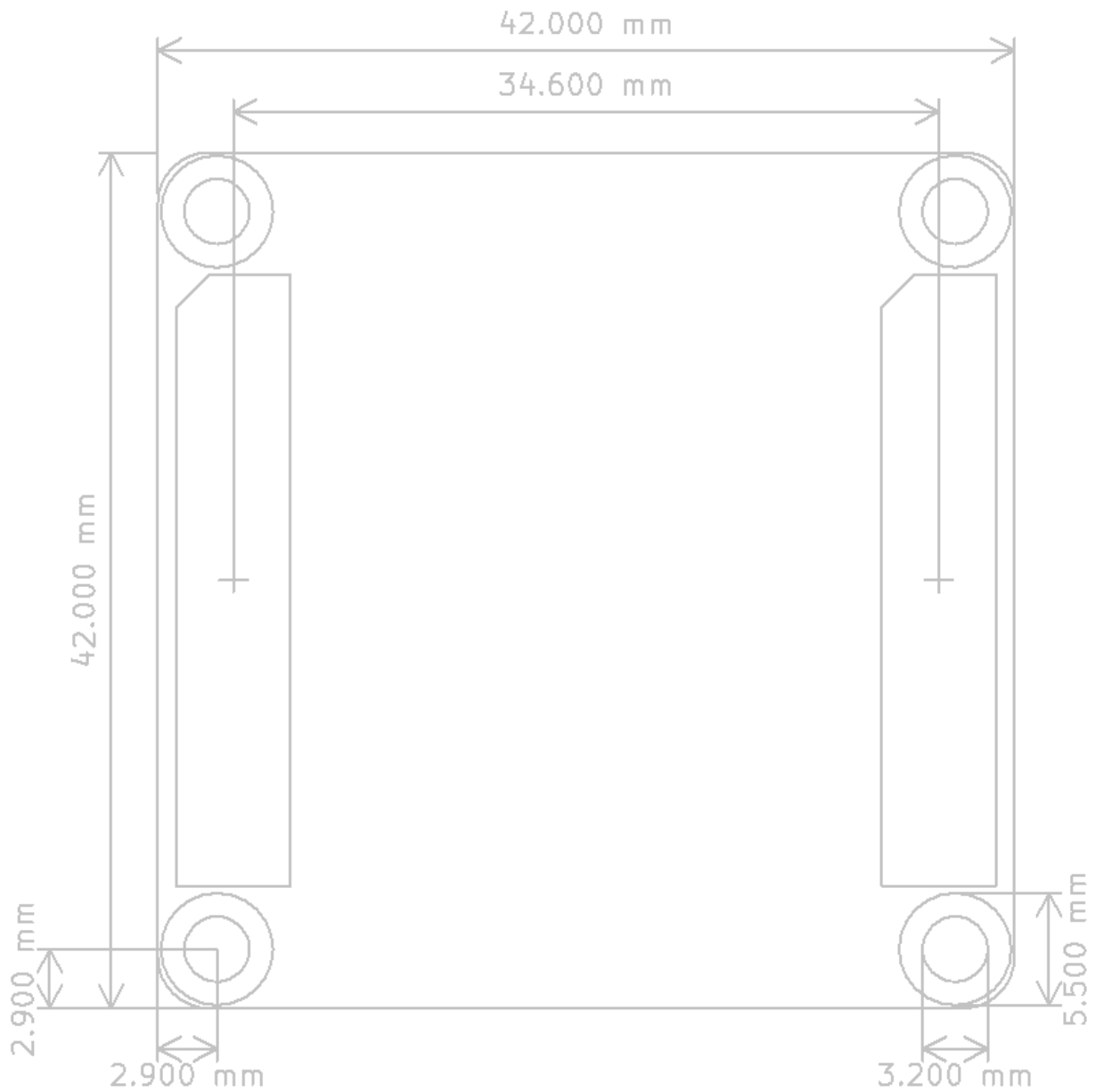


Figure 21. UbiBaseBoard mechanical drawing, viewed from the top down

6 Datasheet Changelog

Date	Datasheet Version	Author	Notes
11/07/2023	A_A	Binh Nguyen	Initial release
25/10/2023	A_B	Jaclyn Li	Added section 8

7 Contact

If you have any questions regarding this product, please contact us:

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8 Certificate of Conformity

The full text of the Certificate of Conformity of this product is available at the following web address. <https://botblox.io/documentation/>