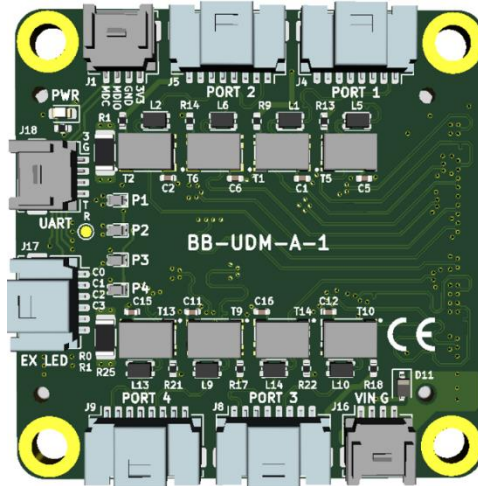


# UbiSwitch Baseboard Mini

Daughterboard for UbiSwitch



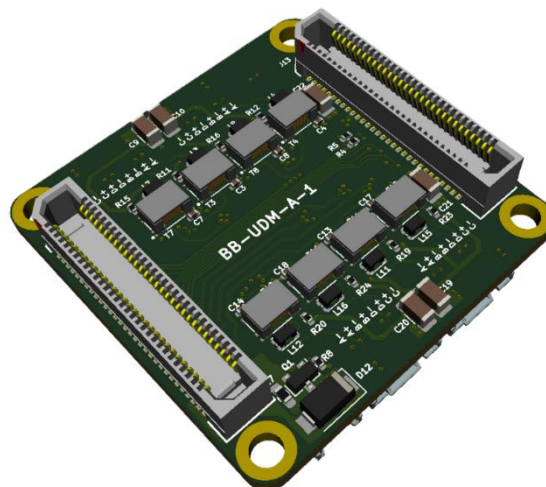
## DESCRIPTION

The Amphenol 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.

The UbiSwitch Baseboard 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 three 10GBASE-R SFP+, and eight Molex PicoClasp headers for direct connection to an external system.

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

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



## FEATURES

- 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

## HOW TO ORDER

|                    |            |                          |
|--------------------|------------|--------------------------|
| <b>Part Number</b> | CF-02BBUDM | UbiSwitch Baseboard Mini |
|--------------------|------------|--------------------------|

## GENERAL SPECIFICATIONS

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

## GENERAL OPERATING INSTRUCTIONS

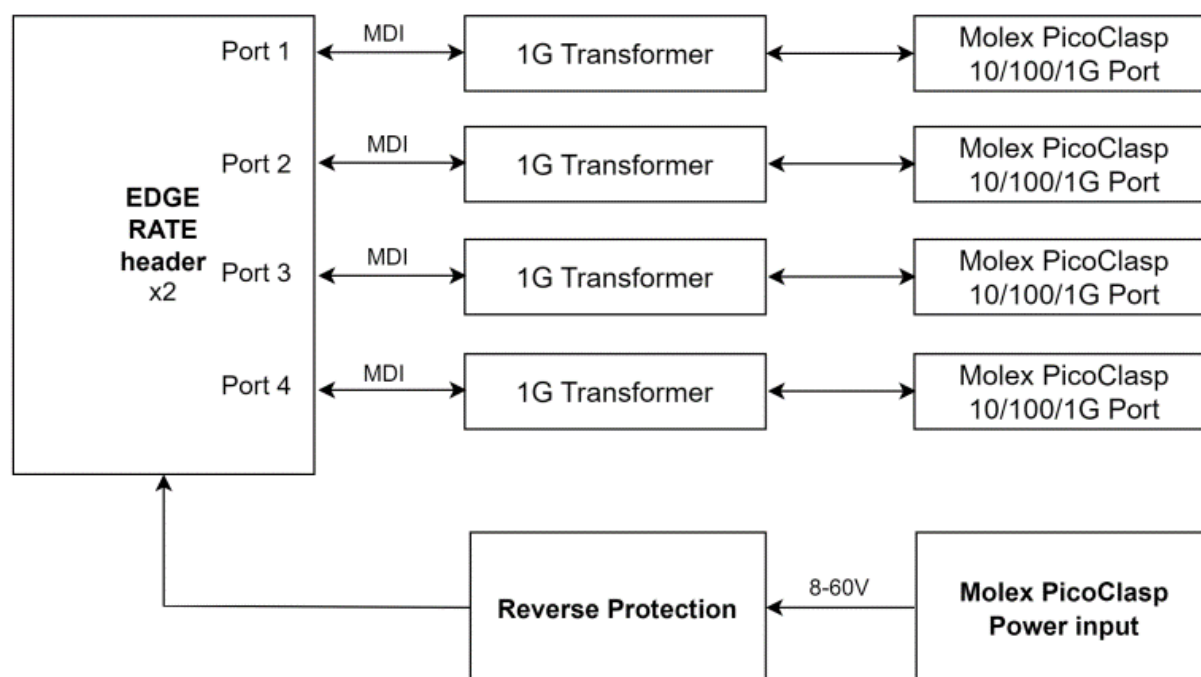
UbiSwitch Baseboard is designed for use in harsh environments, operating from a nominal supply voltage of 24V, but with the ability to operate from as low as 8V and as high as 60V. UbiSwitch Baseboard is purely a breakout board, and contains no switching capabilities by itself. It must be used with UbiSwitch to create a full ethernet switch system.

To use UbiSwitch Baseboard, 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 3 x 10GBASE-R SFP+ ports and 8 x 1GBASE-T ports.

## SAFETY INFORMATION

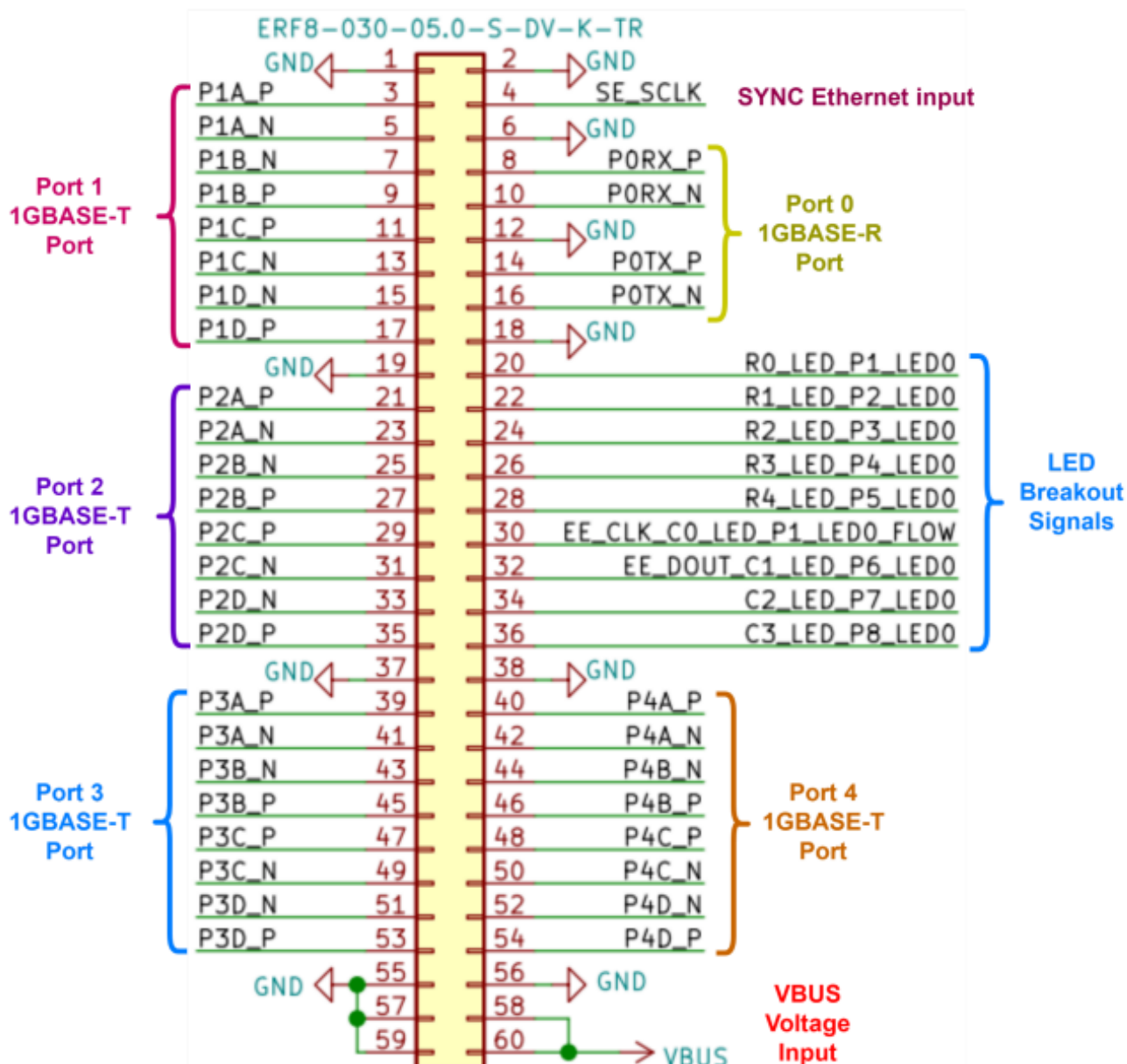
- This device can operate on voltages near and above 60V. Please read this manual before operating.
- This device is provided “as is” In-application testing prior to integration is recommended.
- This device is provided as an electronic circuit board, and requires integration into chassis for full ingress 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.

## BLOCK DIAGRAM

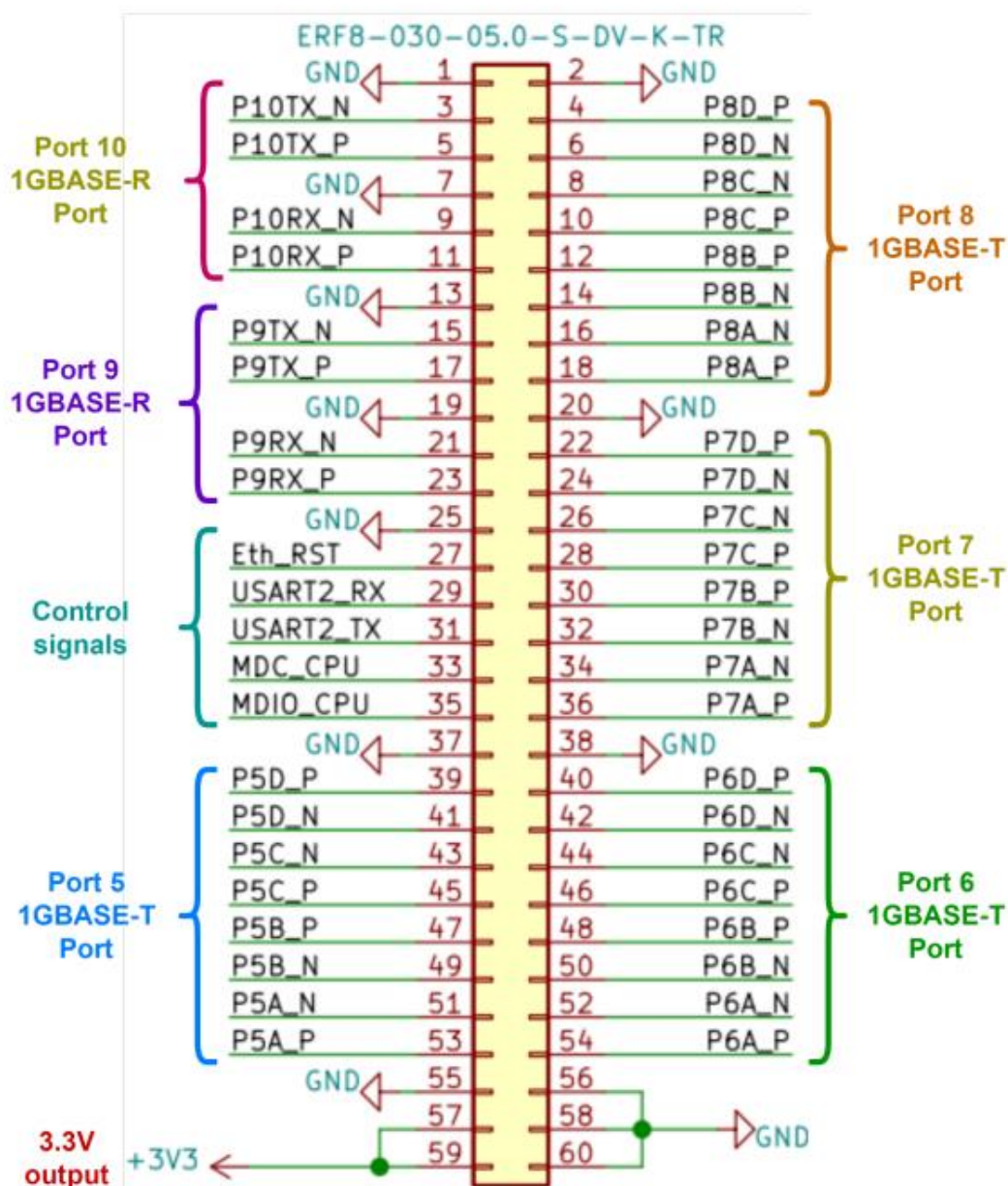


## SYSTEM DESIGN

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 several other power and control lines.



Signals on the UbiSwitch carried on the Samtec Edge Rate header 1



Signals on the UbiSwitch carried on the Samtec Edge Rate header 2

The signals shown in the previous diagrams enter UbiSwitch Baseboard through its corresponding Samtec EdgeRate header. UbiSwitch Baseboard then routes these signals in the following ways

- Ports 1-4 (the 10/100/1GBASE-T ports) are routed to Molex PicoClasp headers through ethernet magnetics.
- UbiBaseBoard houses a Molex PicoClasp header for 8-60V power input (VBus). This is then routed to the Samtec Edge Rate header to power the UbiSwitch.
- Serial signals are routed to a Molex PicoClasp header.
- SMI signals are routed to a Molex PicoClasp header.
- LED signals are routed to a Molex PicoClasp header.

In this way UbiBaseBoard provides physical access to the 1GBASE-T ports from UbiSwitch

### 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 UbiSwitch Baseboard and the connected device. This simplifies system connectivity, meaning eight of the ports on UbiSwitch Baseboard are compatible with any 10/100/1G device and three ports are compatible with Fiber SFP+ devices.

### INCLUDED EQUIPMENT

The product includes the following:

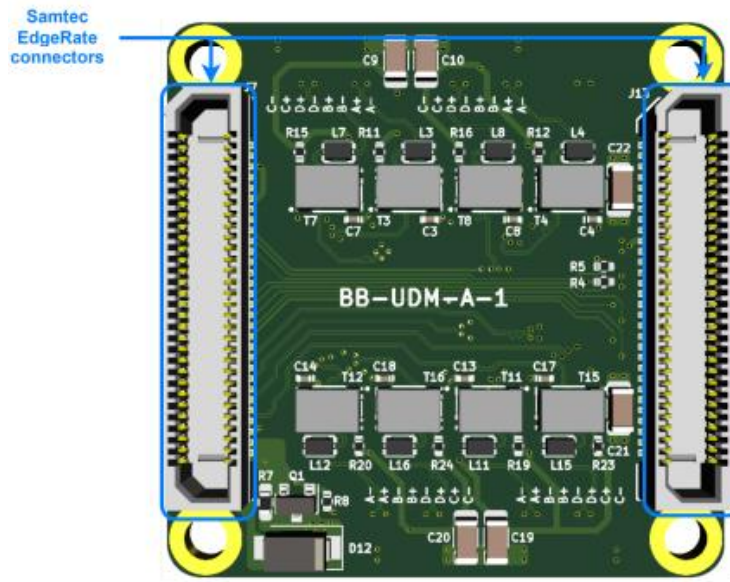
- 1 x UbiSwitch Baseboard board
- 4 x Molex PicoClasp to RJ45 4-way Shielded Twisted Pair cables (300mm)
- 1 x Molex PicoClasp Power Cable to bare, tinned leads (300mm)

### RoHS Compliance

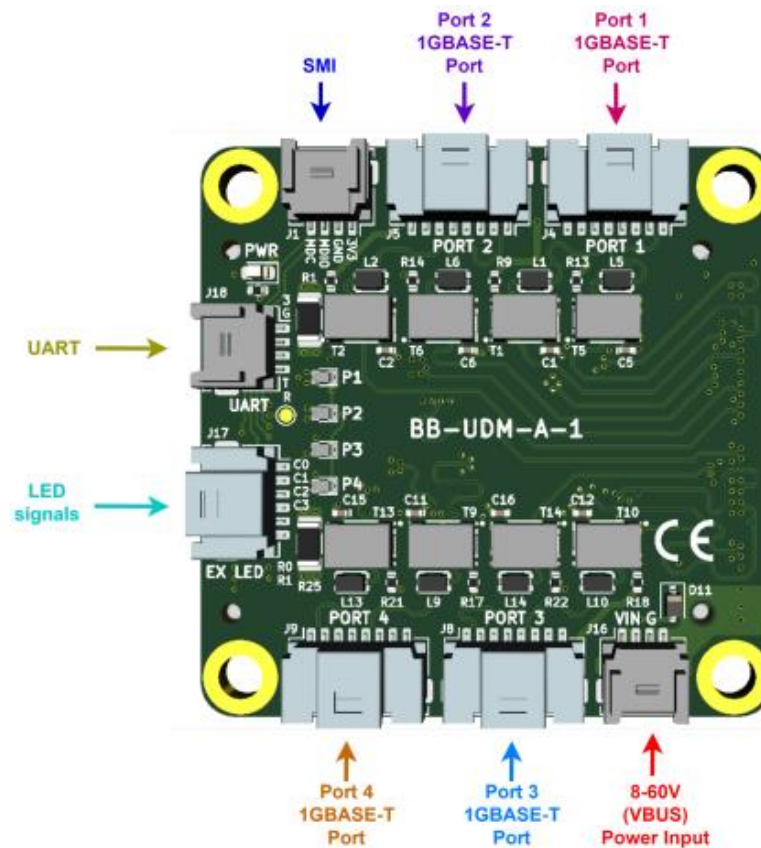
The Amphenol UbiSwitch Baseboard complies with the RoHS (Restriction of Hazardous Substances Directive) Certificate of Compliance.

## HARDWARE INTERFACES

Board Map (front)



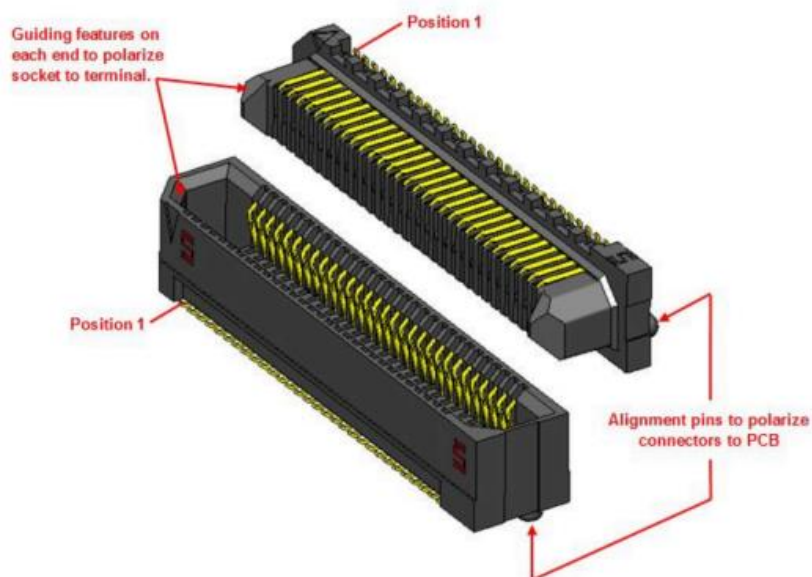
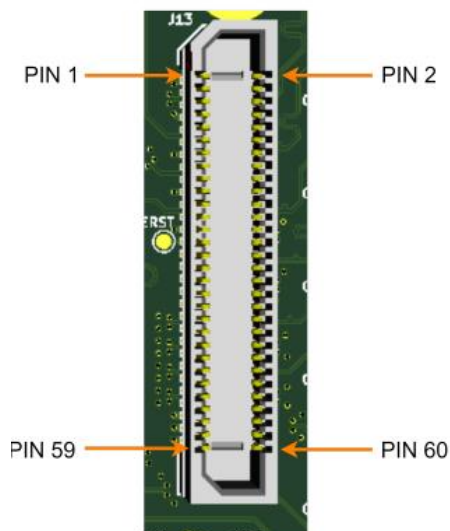
Board Map (Back)



## CONNECTORS AND PINOUTS

### 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 UbiSwitch Baseboard Board is shown below.



Edge rate connector mating

## SIGNAL TO PIN ASSIGNMENTS

| 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<br>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<br>Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs. |
|           | P2A_N    | 23         |                                                                                                                           |
|           | 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<br>Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs. |
|           | P3A_N    | 41         |                                                                                                                           |

|  |         |    |                                                                                                                                                                                                                                                                                                                                  |
|--|---------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | P3B_P   | 45 | Port 4 1000BASE-T Differential Data Pair A ~ D<br><br>Note: 100BASE-TX and 10BASE-Te are also supported on the A and B pairs.                                                                                                                                                                                                    |
|  | P3B_N   | 43 |                                                                                                                                                                                                                                                                                                                                  |
|  | P3C_P   | 47 |                                                                                                                                                                                                                                                                                                                                  |
|  | P3C_N   | 49 |                                                                                                                                                                                                                                                                                                                                  |
|  | P3D_P   | 53 |                                                                                                                                                                                                                                                                                                                                  |
|  | P3D_N   | 51 |                                                                                                                                                                                                                                                                                                                                  |
|  | P4A_P   | 40 |                                                                                                                                                                                                                                                                                                                                  |
|  | 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 | 2  | 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.                                                                                   |

| 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<br><br>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<br><br>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                                                                                |

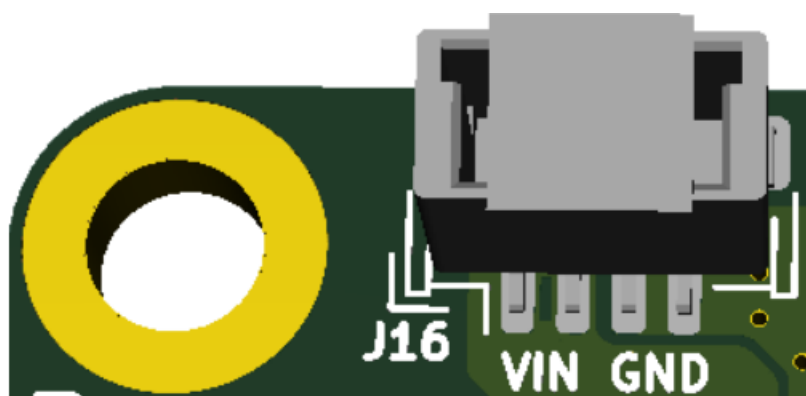
|  |           |    |                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-----------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | P7A_N     | 34 | Note: 100BASE-TX and 10BASE-T <sub>e</sub> are also supported on the A and B pairs.                                                                                                                                                                                                                                                                                                                   |
|  | 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<br><br>Note: 100BASE-TX and 10BASE-T <sub>e</sub> 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                                                                                                                                                                                                                                                                                                                                                                         |

## 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

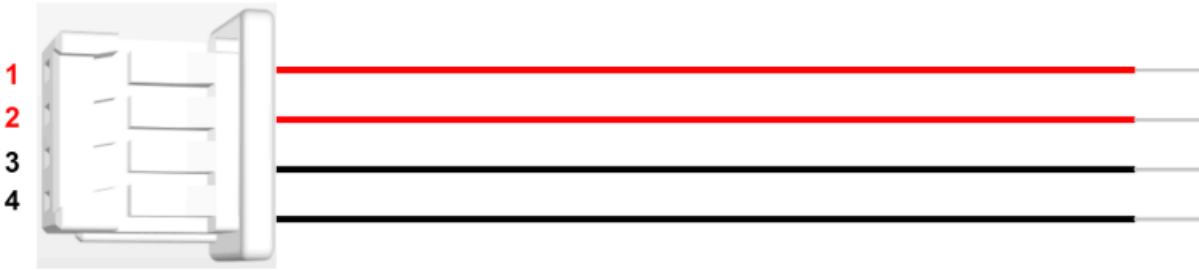


Voltage input header pinout

## Voltage input connector part numbers

| Connector on board | Mating header | Crimp used | Wire used     |
|--------------------|---------------|------------|---------------|
| 5019400407         | 5019390400    | 5013340000 | UL1061, 28AWG |

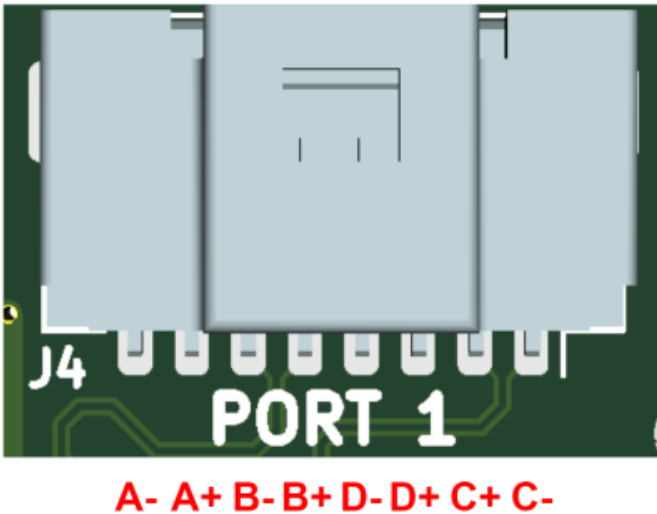
Cable pinout



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

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.

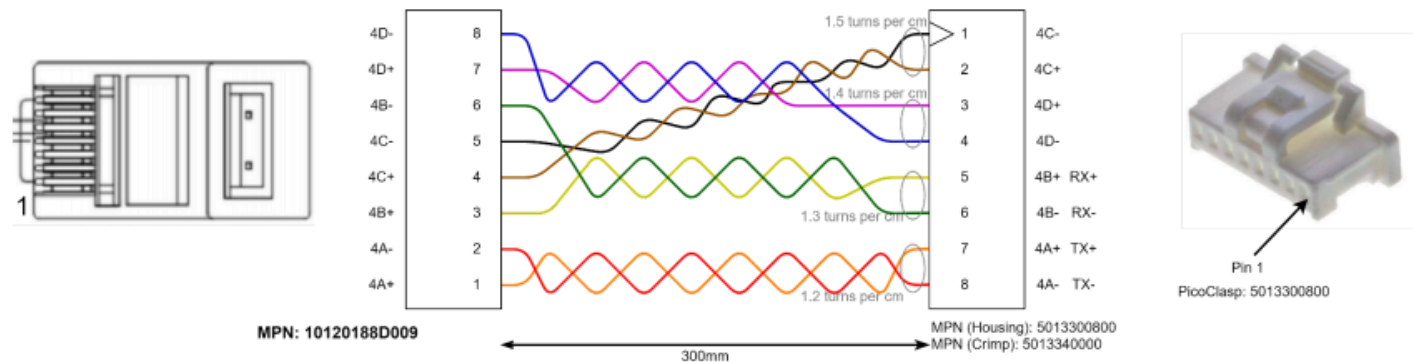


Ethernet Port Pinout

Ethernet connector pinout and part numbers

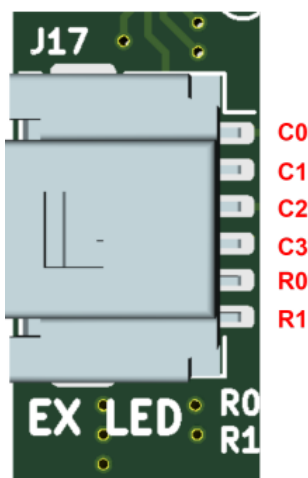
| Connector on board | Mating header | Crimp used | Wire used     |
|--------------------|---------------|------------|---------------|
| 5013310807         | 5013300800    | 5013340000 | UL1061, 28AWG |

## Ethernet Cable pinout



## 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.

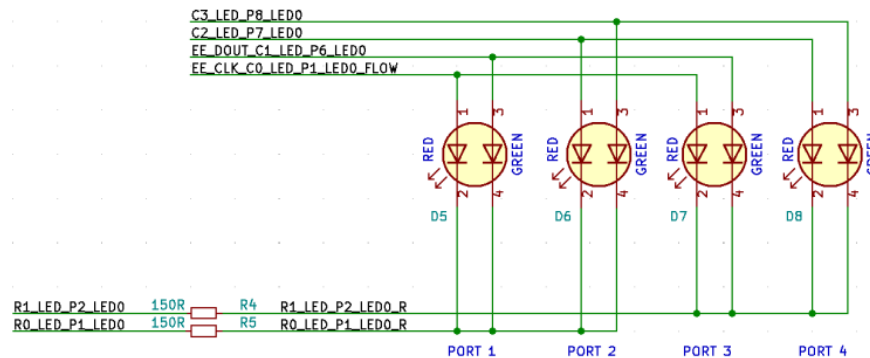


## External LED header pinout

## Ethernet connector pinout and part numbers

| Connector on board | Mating header | Crimp used | Wire used     |
|--------------------|---------------|------------|---------------|
| 5013310907         | 5013300900    | 5013340000 | UL1061, 28AWG |

External LEDs connection should be followed below diagram:

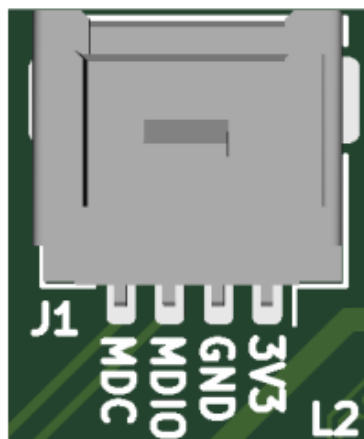


Ports 1 to 4 use two LED signals to indicate link speed and activity. In the diagram above, these two LED signals are mapped to a dual color LED, but this could alternatively be two single color LEDs. The color corresponds to the link speed and activity is shown via blinking. (Green blinking indicates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

150  $\Omega$  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.

## 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.



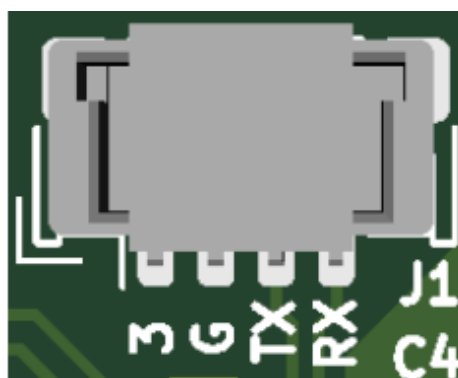
## SMI header pinout

### SMI connector part numbers

| Connector on board | Mating header | Crimp used | Wire used     |
|--------------------|---------------|------------|---------------|
| 5019400407         | 5019390400    | 5013340000 | UL1061, 28AWG |

### 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



header pinout

### Connector and part numbers

| Connector on board | Mating header | Crimp used | Wire used     |
|--------------------|---------------|------------|---------------|
| 5019400407         | 5019390400    | 5013340000 | UL1061, 28AWG |

### Other Interfaces

#### 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.

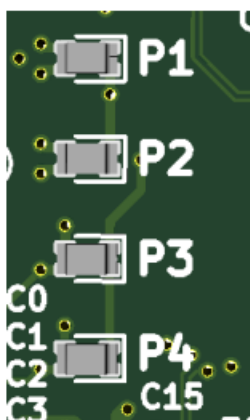
The 3.3V UBI Power Indicator LED (**Green**) indicates that 3.3V of the UbiSwitch module is present. That indicates that the UbiSwitch is stacked on the UbiSwitch Baseboard board correctly and both are powered. It should be solid green in normal operation.



Power Indicator LED

There are three LEDs (**Green**) at bottom left of UbiSwitch Baseboard indicating when SFP+ module is plugged to the SFP+ connector. Each LED indicates one SFP+ module at port 0, 9, 10. It should be solid green when SFP+ module is plugged.

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.

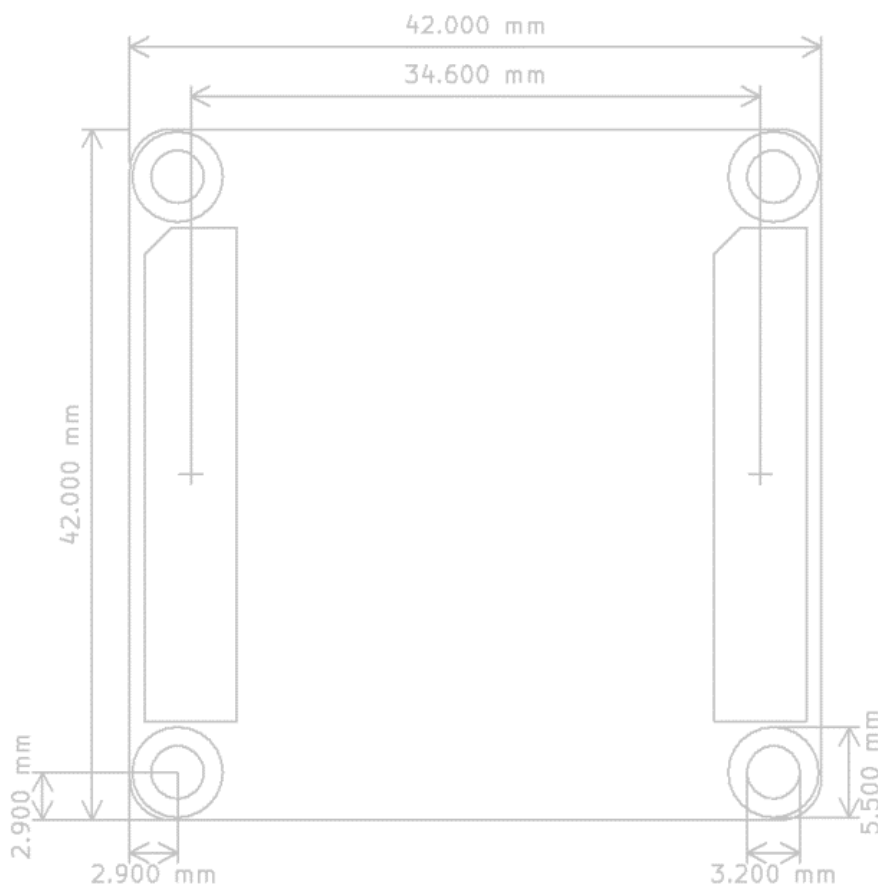


Port 1-4 Link/Activity LEDs

## DEVICE CONFIGURATION

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

## MECHANICAL DRAWING



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