

## PUCK MAXI

Rugged, Compact 11 Port switch 1GBASE-T Ethernet and 10G SFP



### DESCRIPTION

Puck Maxi is a rugged and compact managed ethernet switch that houses 8 × 1G BASE-T ports and 3 × 10G-capable SFPs in an IP54-rated metal chassis. Puck Maxi is designed to provide ethernet connectivity in harsh, challenging environments with high vibration, shock, temperature, and humidity, such as mobile platforms, aerial vehicles, and industrial equipment.

### FEATURES

- 8 × 10/100/1000BASE-T ports
- 3 × 10GBASE-R or 1000BASE-X SFP ports
- 1 × 3.3 V TTL UART management port
- Input voltage range from 5 V to 60 V, reverse polarity and overvoltage protected
- IEEE 802.3 compliant 1500 VRMS isolation between each ethernet port
- Positive locking vibration-resistant Molex Pico-Clasp connector
- Rugged aluminum chassis with four mounting points
- Passive heatsinking (excluding SFPs)
- SFP locking and heatsinking piece (only for use with 10GBASE-T SFPs)
- Automatic MDI-X crossover and polarity correction on the eight 10/100/1000BASE-T ports
- Auto-negotiation on all ports with connected devices to achieve maximum speed
- Command line interface management for port, VLAN, and LACP management
- Less than 5 W maximum power draw (not including SFPs)

## HOW TO ORDER

<b>Part Number</b>	CF-02BBPMX	Puck Maxi
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## General Information

<b>Voltage Input</b>	5 V to 60 V DC (65 V absolute maximum)
<b>Supported Protocols</b>	<ul style="list-style-type: none"><li>• 10BASE-T</li><li>• 100BASE-TX</li><li>• 1000BASE-T</li></ul>
<b>Power Consumption</b>	5 W maximum (not including SFPs)
<b>Weight</b>	250 grams
<b>Size</b>	91.8 mm × 81.8 mm × 33.9 mm (3.61 in × 3.22 in × 1.33 in)
<b>Operating Temperature</b>	-70°C to +110°C
<b>Storage Temperature</b>	-70°C to +125°C

Table 1: General Information

## General Operating Instructions

Puck Maxi is designed for use in harsh environments, operating from a nominal supply voltage of 24 V, but with the ability to operate from as low as 5 V and as high as 60 V.

Puck Maxi places the ethernet ports, power port, and serial management port onto individual Molex Pico-Clasp headers. These headers are positive locking, and thus, are vibration resistant. They are designed for mating with custom cable harnesses that are supplied with this product.

Puck Maxi can be used directly out of the box, with no configuration required. Upon applying a voltage between 5 V and 60 V to the power port, Puck Maxi will begin forwarding packets between connected ethernet devices. The eight gigabit ports on Puck Maxi can connect to 10BASE-T, 100BASE-T, and 1000BASE-T devices, and will auto-negotiate to the highest speed with each connected device.

Puck Maxi runs management software, provided as a command line interface on a 3.3 V level Serial UART port. This allows port status and management, tag and port-based VLAN, and link aggregation.

Puck Maxi houses three SFP+ (SFF-8431 4.1) ports that can be used with either 10G or 1G SFPs. Out of the box, these SFPs are designed to connect to 10G SFPs, and will not work with 1G SFPs. The serial command line interface provides the ability to switch between 10G and 1G mode on the SFP ports.

## Typical Applications

- Avionics and radars
- Ground-based vehicles
- UAVs and drones
- USVs and underwater robots
- Navigation systems
- Industrial equipment

## Safety Information

- This device can operate on voltages near and above 60 V. Please read this manual before operating.
- This device is fully functionally tested prior to shipment. However, in-application testing prior to integration is recommended.
- Do not operate this product beyond the rated temperature and voltages.

## Included Equipment

The product includes the following:

- 1 × Puck Maxi (BB-PUK-A-1)
- 1 × Puck Maxi SFP bracket and heatsink (BB-MBH-A-1)
- 8 × Molex Pico-Clasp to RJ45, 8-way, 0.4 meters, data cable (BB-PCRJ1-8-0.4)
- 2 × Molex Pico-Clasp to tinned leads, 4-way, 0.4 meters, PWR/MGMT cable (BB-PCTL1-4-0.4)

## Quick Start Guide

### Required Equipment

- 1 × Puck Maxi (included)
- 8 × Data cable (BB-PCRJ1-8-0.4)
- 2 × PWR/MGMT cable (BB-PCTL1-4-0.4)
- 1 × Power supply (5 V to 60 V) maximum power output of 5 W
- Two or more ethernet devices

### Quick Start Steps

Step 1: Plug a PWR/MGMT cable into the “PWR” port on Puck Maxi (refer to Figure 1).

Step 2: Set your power supply to any voltage between 5 V and 60 V. We recommend 12 V. Afterwards, turn off your power supply.

Step 3: Connect the power supply output terminals to the tinned leads of the Molex Pico-Clasp 4-way cable. The two red wires connect to the positive terminal of the power supply, and the two black wires connect to the negative terminal of the power supply.

Step 4: Connect two or more ethernet devices to any port on Puck Maxi.

Step 5: Turn on the power supply. Within a few seconds, Puck Maxi will establish links with connected devices and start forwarding packets.



## Hardware Interfaces

### Hardware Map

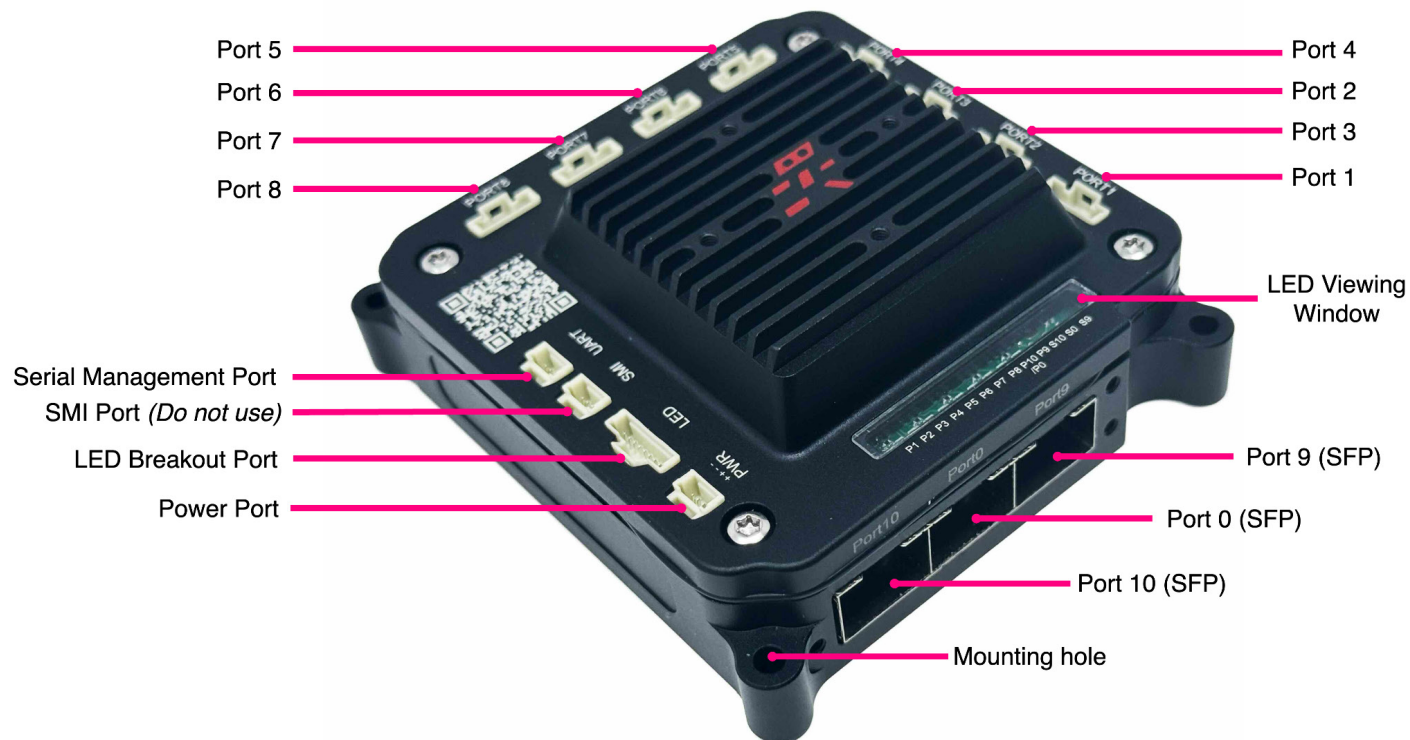


Figure 1. Top view of Puck Maxi

## Connectors and Pinouts

### Voltage Input



Figure 2. The power port on Puck Maxi

Connector	Mating header	Crimp used	Wire used
<a href="#">5019400407</a>	<a href="#">5019390400</a>	<a href="#">5013340000</a>	UL1061, 28AWG

Table 2. Power port connector pinout and part numbers

Pin Number	Signal Description	Notes
1	Vin+	Pins 1 and 2 are connected.
2	Vin+	
3	Vin- (GND)	Pins 3 and 4 are connected.
4	Vin- (GND)	

Table 3. Power port connector pinout

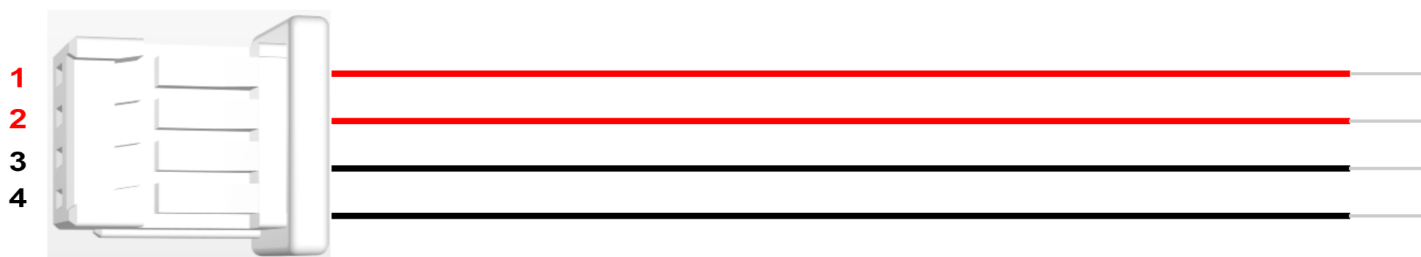


Figure 3. Voltage input cable pinout (red = V+, black = GND)

The voltage input has the following features:

- Voltage input range from 5 V to 60 V
- Maximum allowable voltage of 65 V
- Transient voltage protection above 66.3 V
- Reverse polarity protection

Puck Maxi is designed to be run from an unregulated, noisy power supply. However, the internal circuitry of Puck Maxi is not isolated from the applied power supply. If isolation is required, then use a small embedded isolated power module, such as the [Traco Power TMDC 06](#), to provide Puck Maxi with an isolated rail.

LED Breakout Port

An External LED header allows ethernet port activity indicator signals to be broken out to external LEDs.

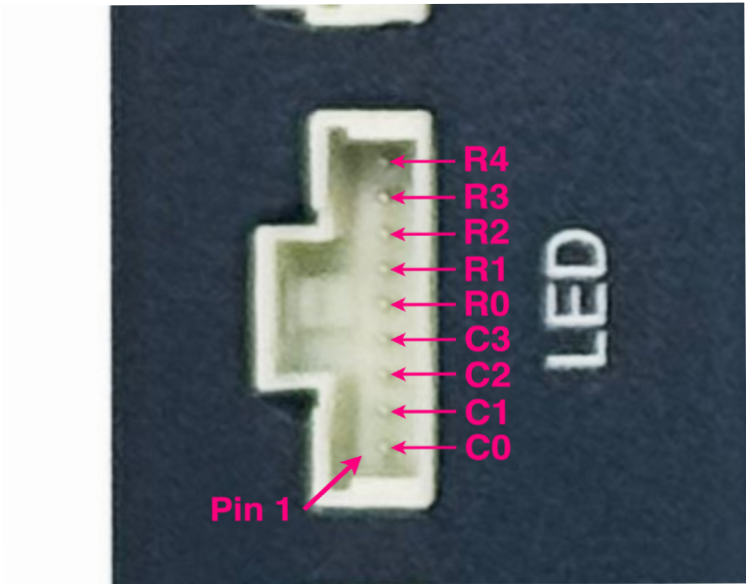


Figure 4. The LED Breakout port on Puck Maxi

Connector	Mating header	Crimp used	Wire used
<a href="#">5013310907</a>	<a href="#">5013300900</a>	<a href="#">5013340000</a>	UL1061, 28AWG

Table 4. LED Breakout port connector pinout and part numbers

Pin Number	Signal Description	Notes
1	Column 0 (C0)	—
2	Column 1 (C1)	—
3	Column 2 (C2)	—
4	Column 3 (C3)	—
5	Row 0 (R0)	—
6	Row 1 (R1)	—
7	Row 2 (R2)	—
8	Row 3 (R3)	—
9	Row 4 (R4)	—

Table 5. LED breakout port connector pinout

The LED indicator signals follow a matrix row and column arrangement. This allows fewer pins to control more LEDs, making it more efficient for space. However, this requires more consideration as to wiring up external LEDs.

Figure 5 shows which row and column connects to which LED. The rows connect to the cathodes of the LEDs, while the columns connect to the anodes of the LEDs.

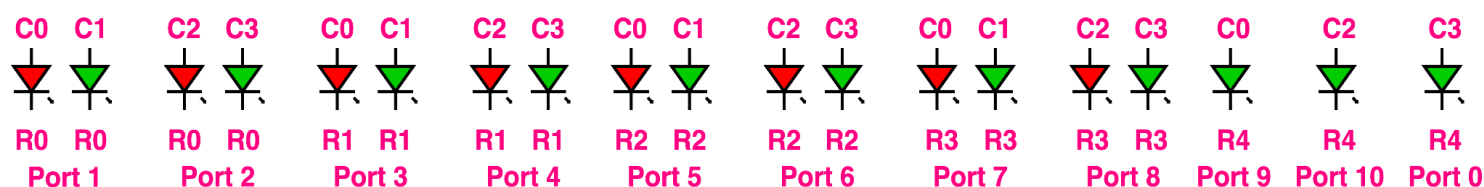


Figure 5. This figure shows which column and row combinations correspond to which port LED.

Ports 1 to 8 are dual signals that indicate link speed and activity. This means ports 1 to 8 use two LED indicators per port. Typically, a dual-color LED is used. When using a dual-color red/green LED, the color corresponding to the link speed and activity is shown via blinking.

This means:

- Green blinking indicates a 1000 Mbps connection.
- Red blinking indicates a 100 Mbps connection.
- Orange blink indicates a 10 Mbps connection.
- A solidly illuminated LED of any color indicates a link but no activity.
- A turned off LED indicates no link.

Ports 0, 9, and 10 LEDs are single signals that are either solid on (link but no activity), solid off (no link), or flashing (link and activity). Therefore, these signals only need a single-color LED.

A 150  $\Omega$  resistor is placed in series with each cathode row in Puck Maxi. This means external resistors are not required when connecting external LEDs. However, the brightness of the external LEDs can no longer be increased.

These signals are 3.3 V level with a maximum current source/sink ability of 20 mA.

## SMI Header

The SMI header is for factory use only and should not be accessed by the end user.

## Serial UART Management Port

The Serial (UART) management port allows access to the command line interface.

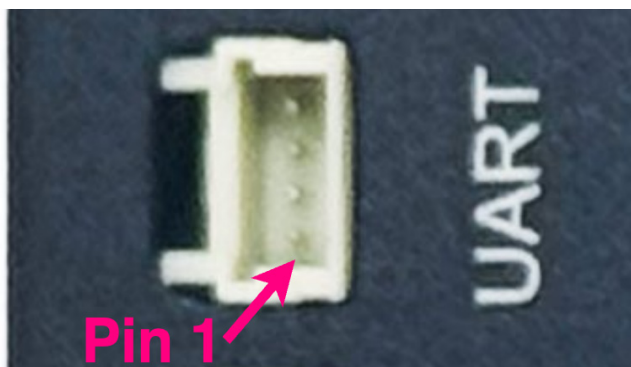


Figure 6. The Serial UART Breakout port on Puck Maxi

Connector	Mating header	Crimp used	Wire used
<a href="#">5019400407</a>	<a href="#">5019390400</a>	<a href="#">5013340000</a>	UL1061, 28AWG

Table 6. Serial UART port connector pinout and part numbers

Pin Number	Signal Description	Notes
1	3.3 V Output	This is an output pin. Do not connect a 3.3 V source to this. This signal can be used as a voltage level reference for a serial converter tool.
2	Ground	This pin should be connected to the same ground as the external serial tool connected to this port.
3	Serial Transmit (TX)	Output from Puck Maxi
4	Serial Receive (RX)	Input to Puck Maxi

Table 7. Serial UART port connector pinout

This Serial UART port is not RS232. Instead, it is a 3.3 V level serial protocol with the following characteristics:

Item	Specifications
<b>Baud rate</b>	115,200 bps
<b>Parameters</b>	8 data bits, no parity, 1 stop bit (8-n-1)
<b>Maximum allowable voltage</b>	3.6V

Table 8. Specifications for the Serial UART port

This Serial This interface is asynchronous (TX and RX only, no flow control or clock) and not compatible with RS232 voltage levels. It is neither protected nor isolated.

Please note the following connections to the UART port on Puck Maxi:

- UART\_TX is an output from Puck Maxi and should be connected to the input of the converter or other device.
- UART\_RX is an input to Puck Maxi and should be connected to the output of the converter or other device.
- The ground of Puck Maxi must be connected to the ground of the converter or other device.

**WARNING!**

- This serial port is not 5 V tolerant. Make sure to connect this port to a 3.3 V level device only.
  - Using a 5 V device on these pins will permanently damage Puck Maxi.

For more information on using the command line interface on this serial, please refer to Section 3. Software Interface.

Ethernet Ports

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

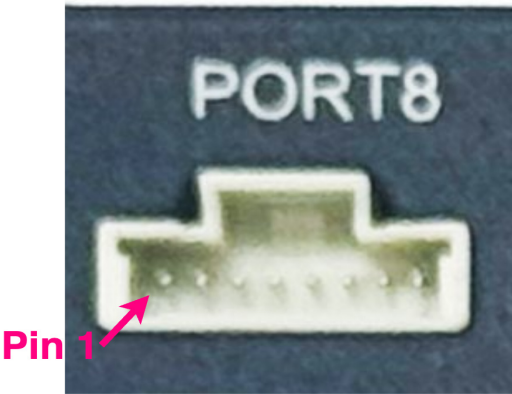


Figure 7. The Ethernet port on Puck Maxi

Connector on Board	Mating header	Crimp used	Wire used
<a href="#">5013310807</a>	<a href="#">5013300800</a>	<a href="#">5013340000</a>	UL1061, 28AWG

Table 9. Ethernet port connector pinout and part numbers

Pin Number	Signal Description	Notes
1	ETH C_N	—
2	ETH C_P	—
3	ETH D_P	—
4	ETH D_N	—
5	ETH B_P	RX_P (For 10/100BASE-T)
6	ETH B_N	RX_N (For 10/100BASE-T)
7	ETH A_P	TX_P (For 10/100BASE-T)
8	ETH A_N	TX_N (For 10/100BASE-T)

Table 10. Serial UART port connector pinout

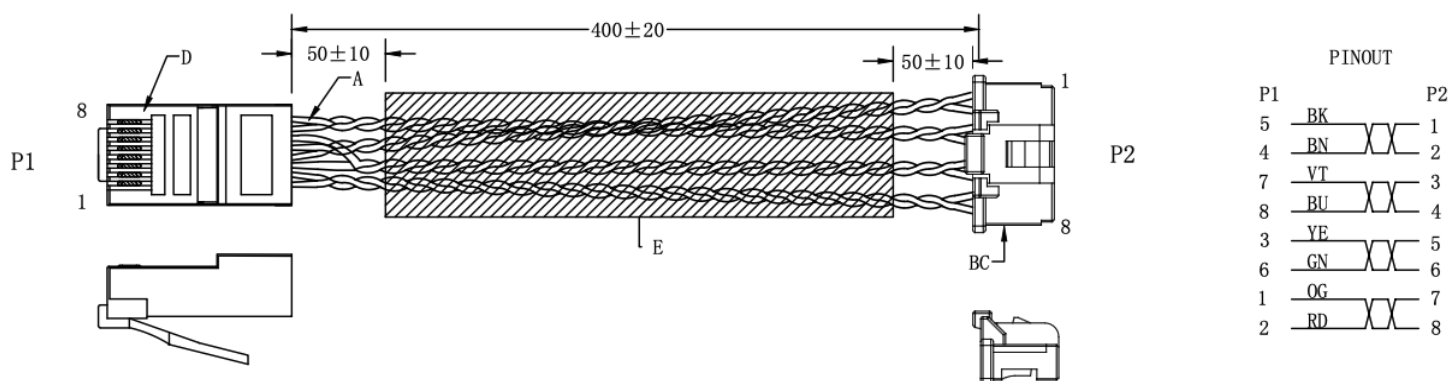


Figure 8. Molex Pico-Clasp to RJ45, 8 way, 0.4 meters, data cable (BB-PCRJ1-8-0.4)

The eight ethernet ports on Puck Maxi can operate in 10BASE-T, 100BASE-TX, and 1000BASE-T.

### Auto-negotiation

These eight ports support auto-negotiation and will automatically negotiate with any connected device to achieve the highest possible link speed based on the connected device's capabilities. This is the default configuration of these ports on Puck Maxi.

Auto-negotiation can be disabled through the command line interface on the 3.3 V UART serial port, and the port can be fixed to a particular speed. In most cases it is not advisable to do this since it is simpler to just let the auto-negotiation protocol handle any differences in port capabilities. However, some older ethernet devices do not fully support the auto-negotiation protocol, and therefore, will require a port on Puck Maxi to be set to a fixed speed. All ports on Puck Maxi can be configured independently.

### Auto-MDI/X

The eight ports support Auto-MDI/X by default, meaning the ports will automatically determine whether or not they need to cross over between its pairs as shown in Table 11. This means that an external crossover cable is not required when using these ports.

If you are using the supplied MLF-2-5-400 cable, then polarity and crossover is already handled correctly in the cable routing. If you are crimping a cable yourself, you will need to pay attention to match the correct cable routing on both sides. Since the ports support Auto-MDI/X, the ports can tolerate and fix polarity and direction errors.

Note that if a connected device cannot automatically correct for crossover, the ports on Puck Maxi will make the necessary adjustments prior to commencing auto-negotiation. If a connected device can automatically correct for crossover, Puck Maxi will implement a random algorithm as described in IEEE 802.3 clause 40.4.4 to determine which device performs the crossover. This feature can be disabled through switch configuration; however, this is not advised.



Pin	MDI			MDIX		
	1000BASE-T	100BASE-TX	10BASE-T	1000BASE-T	100BASE-TX	10BASE-T
MDIP/N[0]	BI_DA±	TX±	TX±	BI_DB±	RX±	RX±
MDIP/N[1]	BI_DB±	RX±	RX±	BI_DA±	TX±	TX±
MDIP/N[2]	BI_DC±	Unused	Unused	BI_DD±	Unused	Unused
MDIP/N[3]	BI_DD±	Unused	Unused	BI_DC±	Unused	Unused

Table 11. MDI/MDIX Pin Mapping

## Polarity Correction

Puck Maxi will automatically correct polarity errors (+ and - wiring mistakes) in the receive connections in 1000BASE-T and 10BASE-T. In 100BASE-TX, the polarity does not matter. This allows Puck Maxi to compensate for an incorrect polarity. This feature can also be turned off.

## SFP+ Ports

Puck Maxi supports three SFP+ modules. By default, these SFP+ ports only support 10GBASE-R compatible SFP modules. The SFP+ ports can be configured to support 1000BASE-X SFPs by using the command line interface.

For more information, refer to Section 3. Software Interface.



Figure 9. The three SFP+ ports on Puck Maxi

## MAC Ports

Ports 0, 9, and 10 on Puck Maxi are SERDES interfaces that implement MAC ports on the switch. These are different from the eight 1G ports, because they are not capable of being directly connected to an external network by themselves.

By default, Puck Maxi configures all these ports to operate in SFI mode as 10GBASE-R, meaning they are only compatible with 10G SFP modules. They can be configured to work in 1000BASE-X mode through the command line interface.

## Other Interfaces

### LEDs

There are thirteen visible LEDs on Puck Maxi. These are divided into three groups:

- Eight dual-color (red/green) LEDs, one for each gigabit ethernet port (port 1 to port 8).
- Two dual-color (red/green) LEDs that indicate link status and activity for the SFP+ ports (ports 0, 9, and 10).
- Three green LEDs that indicate SFP module presence.

Figure 10 shows the arrangement of these LEDs.

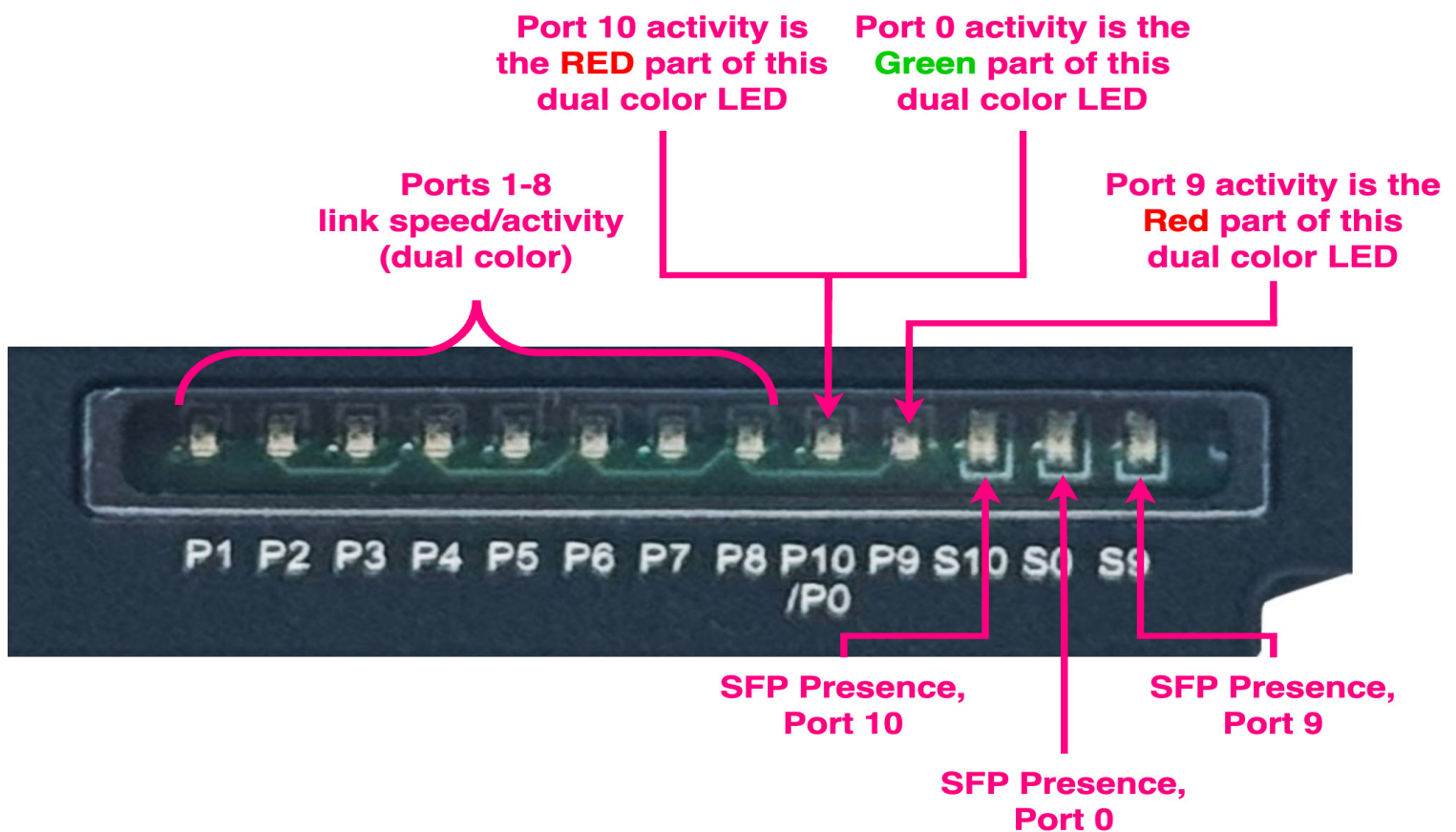


Figure 10. This figure shows the LEDs on Puck Maxi and how they correspond to the ports.

Puck The LED indicators for ports 0, 9, and 10 cannot display port speed. They can only indicate link presence and activity by flashing.

Ports 10 and 0 are represented by different colours on a single dual-color LED. This is somewhat of a design bug, as it makes it difficult to tell the individual status of each port.

Table 12 explains how the colors on this LED relate to different port settings.

P10/P0 LED Status	Port 10 Status	Port 0 Status
Off	No link	No link
Green on	No link	Link
Green flashing	No link	Link and activity
Red on	Link	No link
Red flashing	Link and activity	No link
Orange on	Link	Link
Orange with green flashing	Link	Link and activity
Orange with red flashing	Link and activity	Link

Table 12. Table explaining how to read the dual-color P10/P0 LED

The three SFP LEDs (labelled S0, S9, and S10) illuminate green when an SFP is detected and correctly seated in the associated SFP port.

Puck Maxi currently does not display a power indicator LED. This is expected to be fixed in future versions of the design.

## Mounting Holes

There are four mounting holes on Puck Maxi, located at each corner. These are unthreaded 3.5 mm holes that are not connected to the power ground.

## System Information

### Switch Fabric

The ethernet switch fabric on Puck Maxi has the following specifications:

Item	Specifications
Packet Buffer Memory	2 Mb
Jumbo Frame Support	10 KB (enabled by default)
# of MAC Addresses	16K
Ports 1-8 Capability	10/100/1000BASE-T (triple speed, auto-negotiation)
Ports 0, 9, 10 Capability	<ul style="list-style-type: none"> <li>• 10GBASE-R</li> <li>• 5GBASE-R</li> <li>• 2.5GBASE-R <ul style="list-style-type: none"> <li>• SGMII</li> </ul> </li> <li>• 1000BASE-X</li> <li>• USXGMII</li> </ul>

Table 13. Puck Maxi switch fabric capabilities

## Switch Management

The following switch management features are currently possible (as of 1 February 2025):

Item	Specifications
Port management (auto-negotiation enable/disable, auto MDI/X enable/disable, set port speed)	Yes
Link Aggregation (LAG / Port Trunking)	Yes
802.1p, TOS / DS / IPv6 TC, MAC	Not yet
Programmable Weighting	Not yet
Port-based VLANs	Yes
802.1Q VLANs	Yes, 4096 total
Double Tagging (Q in Q)	Not yet
LMP Entries	Not yet
802.1BR ECID	4K
Wake on LAN / Wake On Frame	Not yet
Remote Mgmt / Ethertype DSA	Not yet
TCAM	Not yet
802.1D/s/w Spanning Tree	Not yet
802.1X Port & MAC Authentication	Not yet
Port Mirroring	Yes
IGMP / MLD Snooping	No
802.1AS / Qat / Qav / 1588v2	Not yet
802.1Qbv	Not yet
Synchronous Ethernet	Not yet
Cut Through Switch Fabric	Not yet

Table 14. Puck Maxi switch fabric capabilities

## Software Interface

Puck Maxi features a 3.3 V TTL Serial UART port that runs a command line interface (CLI). This CLI allows a user to read and write various commands to Puck Maxi. The firmware running on Puck Maxi is called BloxOSLite, and is constantly being updated to add new features.

Refer to the following for the latest features and complete list of commands and syntax:

[BloxOSLite Documentation](#)

```
ubiswitch:~$ port 1 help
1 - Argument corresponds to port number
Subcommands:
  link      :Set port state:
             Required:
             port <int> - port
             link <str> - toggle port (on, off)
             Example:
             port 1 link off - set port 1 off, link will not be formed with link
             partner

  autoneg    :Set port autonegotiation:
             Required:
             port <int> - port
             autoneg <str> - toggle autoneg (on, off)
             -
             Optional:
             speed <int> - port speed (10, 100, 200, 1000, 2500, 5000, 10000)
             duplex <str> - port duplex (full, half)
             -
             Example:
             port 1 autoneg off speed 1000 duplex full - set port 1 phy autoneg
             off with speed 1000Mbps at full duplex
             port 1 autoneg on - set port 1 phy autoneg on

ubiswitch:~$ █
```

Figure 11. The command line interface running on Puck Maxi

The command line interface will appear automatically on bootup. No user action is required to bring up the command line interface.

## Device Configuration

### Unmanaged Switch

To use Puck Maxi in an unmanaged application, no configuration is required. Simply assemble the cable, connect the ethernet devices, apply a voltage to the voltage input, and then connect downstream devices. The switch will auto-negotiate a link with the connected devices and start forwarding packets. In this case, you can ignore the CLI on the Serial UART management port.

### Managed Switch

To use Puck Maxi in a managed switch application, refer to the following:

[Hardware Setup](#) | [CLI Bringup](#)

## Mechanical Considerations

### Mechanical Drawing

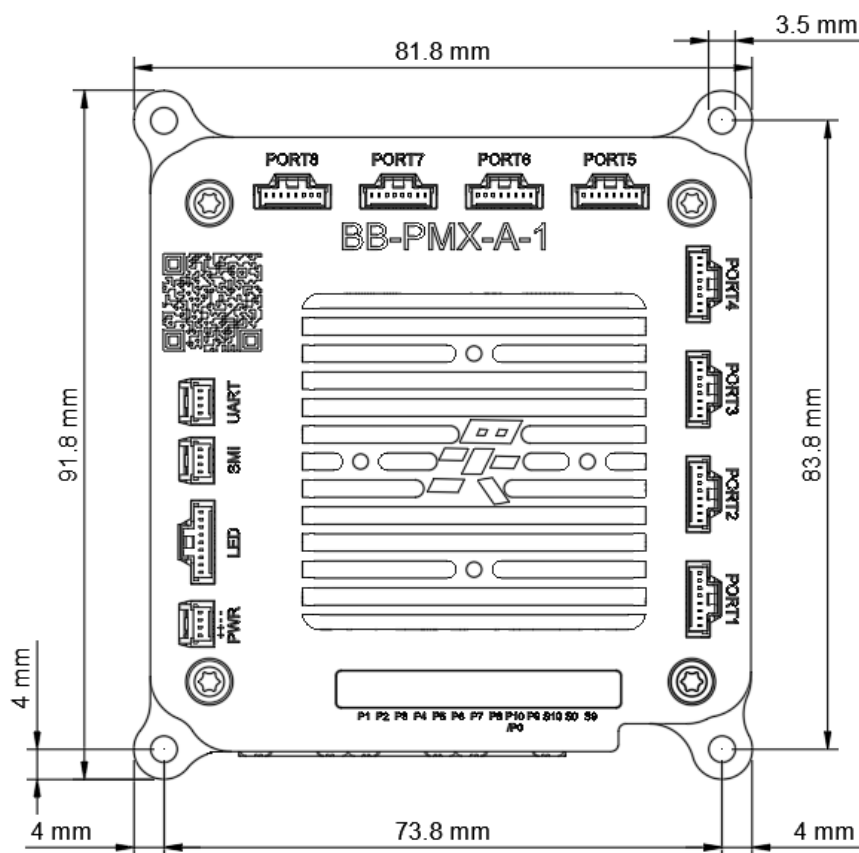


Figure 12. Front view mechanical drawing of Puck Maxi

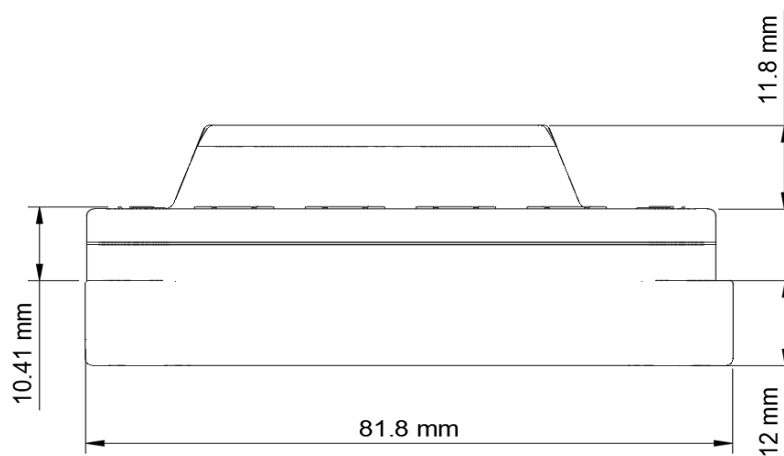


Figure 13. Side view mechanical drawing of Puck Maxi



## Mounting Considerations

The Puck Maxi has four mounting points that can be threaded using M3 × 12 mm screws. An additional heatsink can also be mounted on the device using three M8 × 3 mm screws.

Refer to the following examples of mounting hardware:

- For the main chassis: [M3 x 12mm Pozi Pan Head Screws \(DIN 7985Z\)](#)
- For the SFP bracket and heatsink: [M2 x 8mm Pozi Pan Head Screws \(DIN 7985Z\)](#)

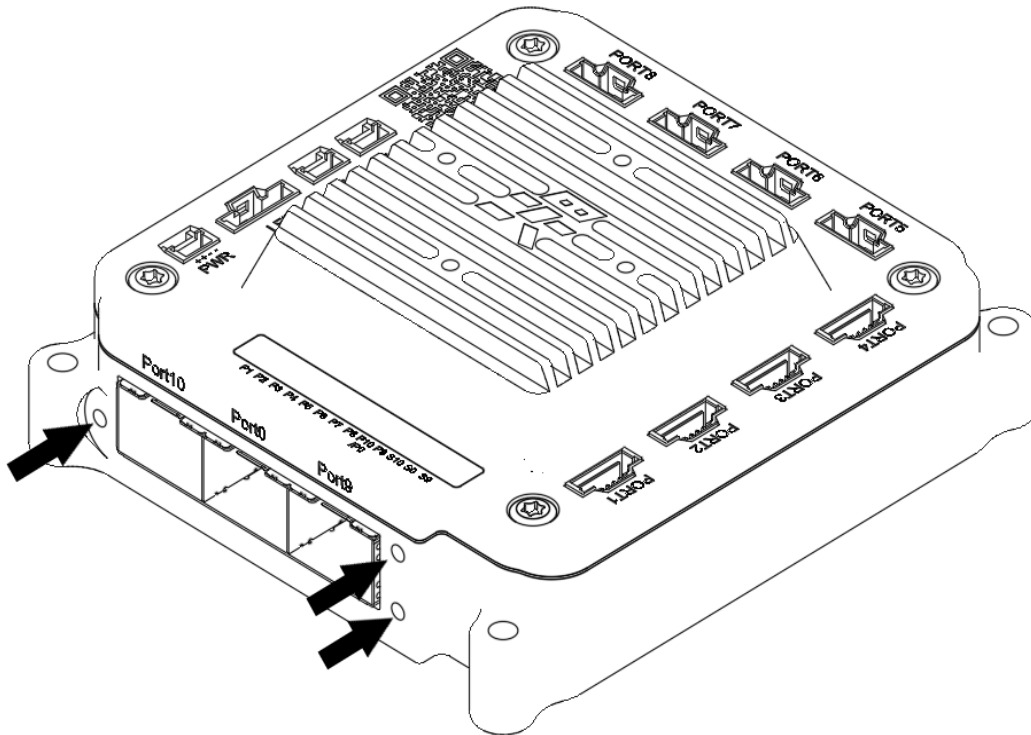


Figure 14. Mounting points for the SFP bracket and heatsink

## Thermal Considerations

The Puck Maxi is designed with an IP54-rated aluminum metal chassis that provides passive cooling even without an additional heatsink.

If the SFP ports are used, the SFP bracket and heatsinking piece is recommended to prevent overheating in this area.