SwitchBlox Industrial

Small 5 port 10/100Mbps Ethernet Switch

Datasheet

Applies to:
MPN: BB-SWI-B-1
MPN: BB-SWI-B-1-NDAA

May 2024

Contents

1 General Information

1.1 Functionality and Features of SwitchBlox Industrial

The BotBlox SwitchBlox Industrial is a small form factor 5 port 10/100Mbps (10BASE-T/100BASE-TX) Layer 2 unmanaged and lightly managed ethernet switch. It has a non-blocking fabric, meaning that 100Mbps speed can be achieved simultaneously on all ports. SwitchBlox Industrial is designed to be a more rugged and more capable upgrade to our SwitchBlox product and is designed for space, weight and price-sensitive (SWaP) industrial, mobile applications.

It runs from a wide input voltage range of 5 to 60V, and provides a 5A, 2A power output. It also features PoE injection onboard, and houses a microcontroller for custom firmware upload.

1.1.1 Features

- 5 x 10/100M (10BASE-T/100BASE-TX) ethernet ports
- Input voltage range from 5 to 60V
- Reverse protected voltage input
- Transient protected voltage input
- -40°C to +85°C operation range
- 38mm x 38mm board size
- Molex Picoblade connectors for power and ports
- 15W PoE injection on each port (selectable via a DIP switch)
- Automatic MDI-X crossover
- Unmanaged (out-the-box) functionality
- Embedded microcontroller (MCU) onboard for firmware to implement managed switch functions (VLANs, QoS, Port Mirroring)

1.1.2 General Information

Voltage Input	5V to 60V DC (65V absolute max)
Voltage Output	5V ± 5%, 2A
PoE Maximum Power Output	15W (IEEE 802.3af)
Supported Protocols	10BASE-T, 100BASE-TX
Power Consumption	300mW (idle) to 800mW (full switching)
Weight	15 grams
Size	38mm x 38mm x 9.2mm
Operating Temperature	-50°C to +85°C
Storage Temperature	-50°C to +85°C

Table 1: General Information

1.1.3 General Operating Instructions

SwitchBlox Industrial 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 5V and as high as 60V.

In the simplest case of an unmanaged switch application, SwitchBlox Industrial can be operated immediately by following the following steps.

1) Apply a voltage between 5V to 60V to the voltage input terminals.

2) Connect external devices to the ethernet ports using RJ45 to Picoblade cables.

3) SwitchBlox Industrial will automatically begin auto negotiation with connected devices and begin receiving and forwarding packets to/from all connected devices.

In managed mode using the [BotBlox ARIES software](#), SwitchBlox Industrial can implement VLAN setup, port mirroring and QoS.

> *By default SwitchBlox Industrial ships with firmware that allows switch management using BotBlox ARIES software. You do not need to interact with this software/firmware if you are simply using SwitchBlox Industrial in an unmanaged mode.*

1.2 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.
- The board temperature can reach 40°C above ambient when 2A is drawn from the 5V output. In such cases, passive air cooling or heat sinking should be considered.
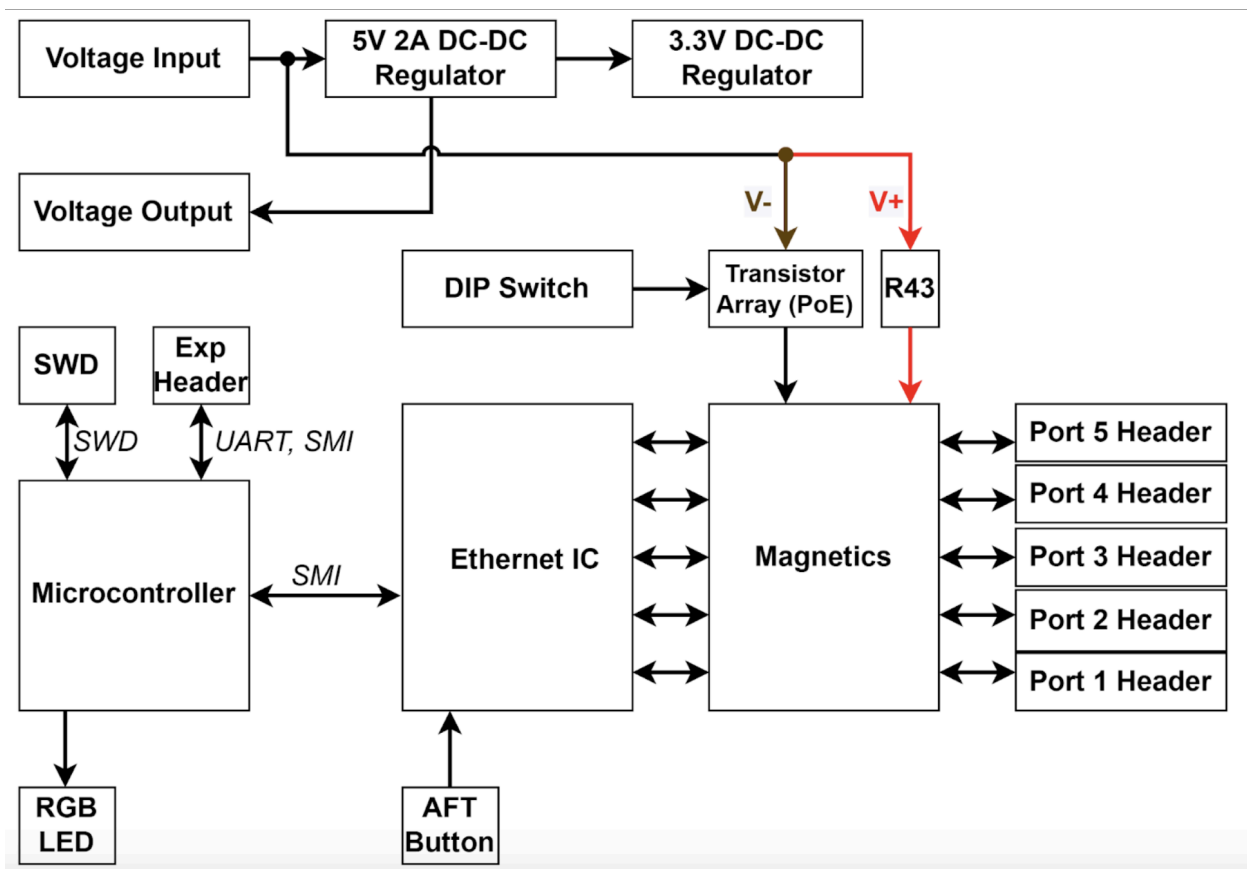
1.3 Block Diagram

Figure 1: SwitchBlox Industrial Block Diagram

1.4 Included Equipment

The product includes the following:
1 x SwitchBlox Industrial board
5 x Molex Picoblade to RJ45 4-way Unshielded Twisted Pair cables (300mm)
2 x Molex Picoblade to bare, tinned leads (300mm)

1.5 RoHS Certification of Compliance

The BotBlox SwitchBlox Industrial complies with the RoHS (Restriction of Hazardous Substances Directive) Certificate of Compliance.
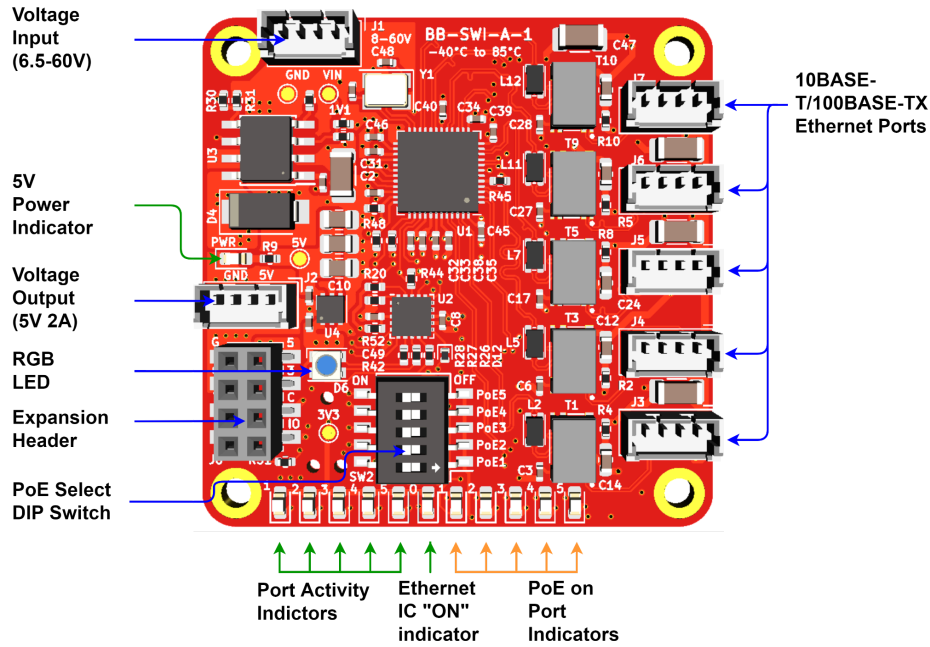
2 Hardware Interfaces

2.1 Board Map

Voltage Input (6.5-60V)

5V Power Indicator

Voltage Output (5V 2A)

RGB LED

Expansion Header

PoE Select DIP Switch

10BASE-T/100BASE-TX Ethernet Ports

Port Activity Indictors

Ethernet IC "ON" indicator

PoE on Port Indicators

Figure 2: SwitchBlox Industrial Board Map (front)

R43, PoE injection resistor
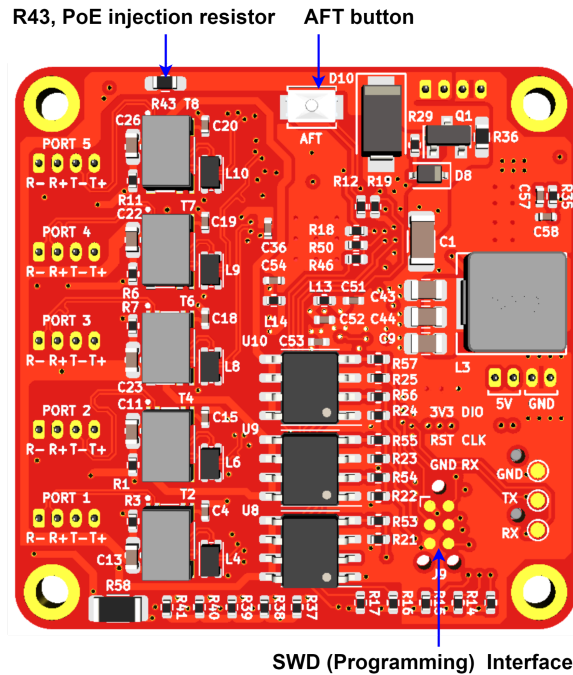
AFT button

SWD (Programming) Interface

Figure 3: SwitchBlox Industrial Board Map (back)

2.2 Connectors and Pinouts

2.1.1 Voltage Input

The top left connector is the voltage input terminal. A four pin 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 5 to 60V
- Maximum allowable voltage of 65V
- Transient voltage protection above 66V
- Reverse polarity protection

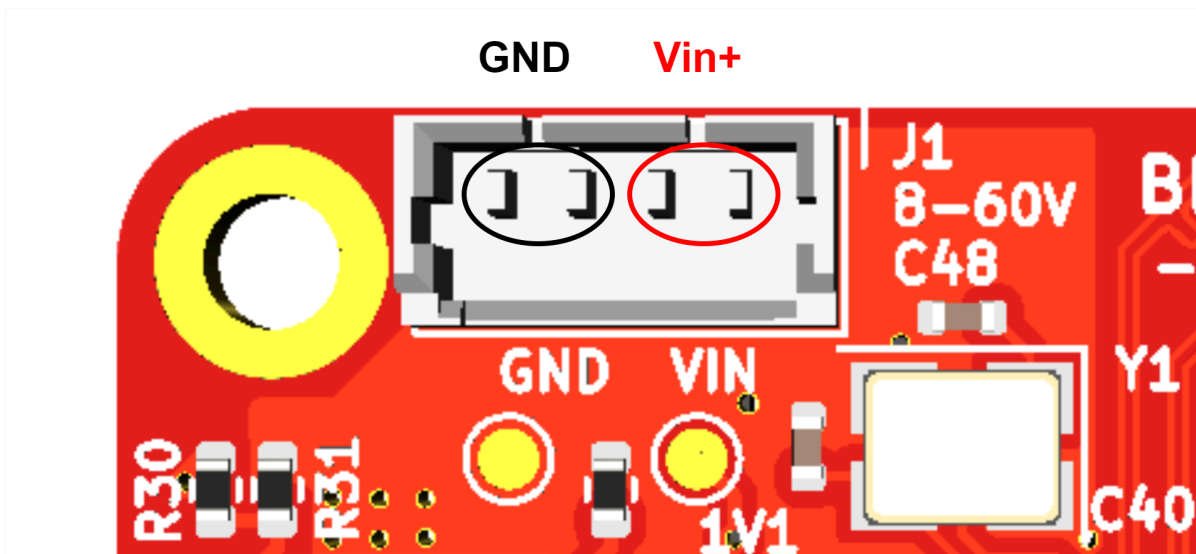The pinout of the voltage input connector is shown in Figure 4 below.

Figure 4: Voltage input header pinout

Connector part numbers

Connector on board	Mating header	Crimp used	Wire used
530470410	0510210400	500798000	UL1061, 28AWG

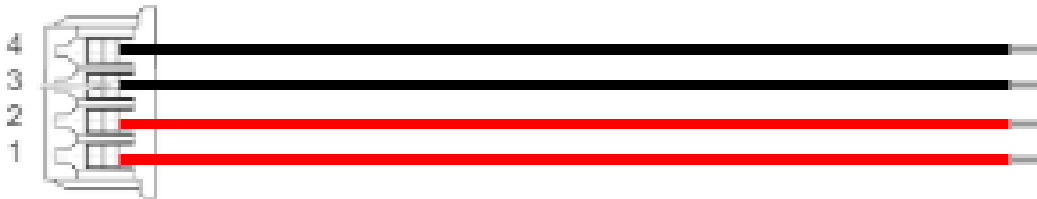*Table 2: Voltage input connector pinout and part numbers*

Cable pinout

Figure 5: Voltage input cable pinout (red = V+, black = GND)

2.1.2 Voltage Output

The middle left connector is the voltage output terminal. A four pin connector is used to increase the maximum output current.

The voltage output has the following features:
- Voltage output is nominally 5V with tolerance of ±5%
- Up to 2A output current

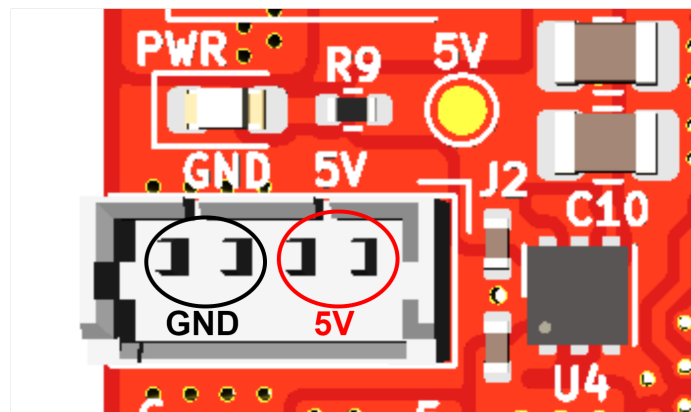The pinout of the voltage output connector is shown in Figure 6 below.

Figure 6: Voltage output header pinout

Cable pinout

Figure 7: Voltage input cable pinout (red = 5V, black = GND)

Connector part numbers

Connector on board	Mating header	Crimp used	Wire used
530470410	0510210400	500798000	UL1061, 28AWG

Table 3: Voltage output connector pinout and part numbers

2.1.3 Ethernet Ports

There are five ethernet connectors on SwitchBlox Industrial. Each connector has four pins corresponding to the four signals required for 100BASE-TX which are T+, T-, R+ and R-. The pin mapping of all five connectors is identical.
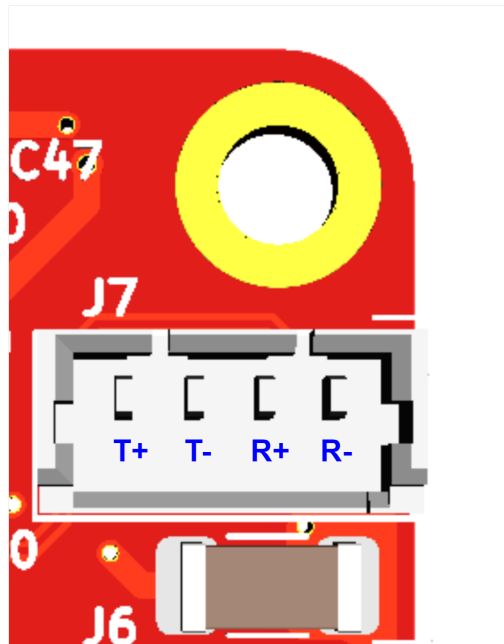

Figure 8: Ethernet port pinout

Connector on board	Mating header	Crimp used	Wire used
530470410	0510210400	500798000	UL1061, 28AWG

Table 4: Ethernet connector pinout and part numbers
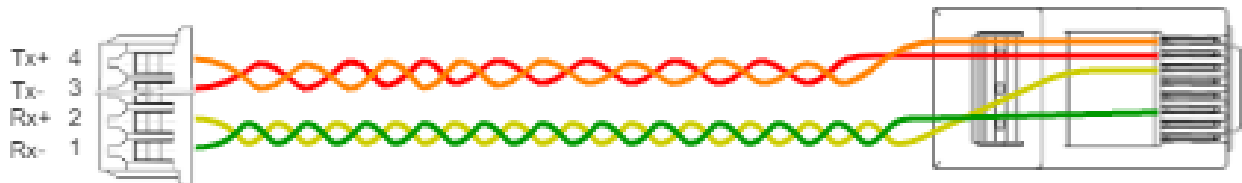
Cable pinout

Figure 9: Ethernet cable pinout

2.1.4 Extension header

SwitchBlox Industrial boards have an extension header for switch management. The extension header provides the following interfaces:

- UART (TX and RX)
- SMI/I2C
- Onboard 5V output rail (can be used to supply power to the board).
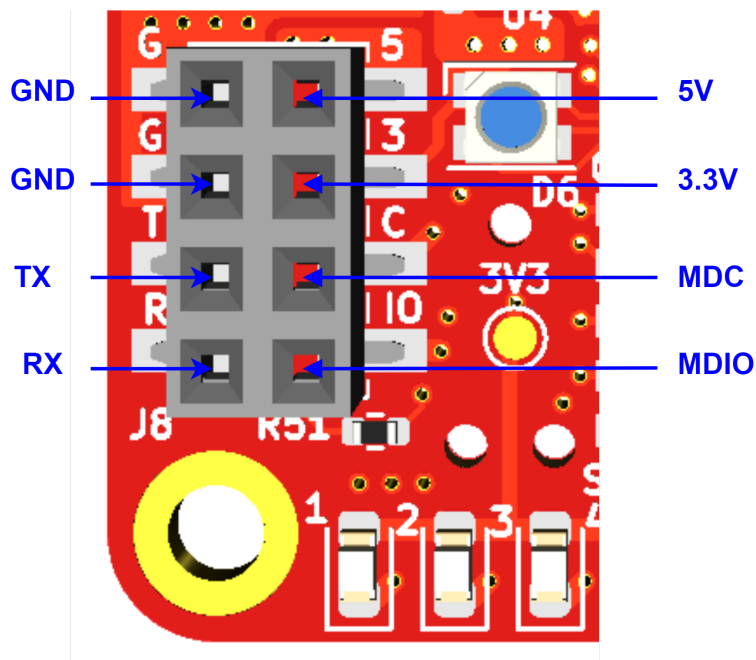- Onboard 3V3 rail (can be used to supply power to the board).

Figure 10: Extension header pinout

The part number for the extension header is NPPN042FFKP-RC, the mating part for this header is NRPN042PAEN-RC.

2.1.5 SWD Programming Header

A programming header on the back of the board allows the microcontroller on SwitchBlox Industrial to be programmed over SWD.
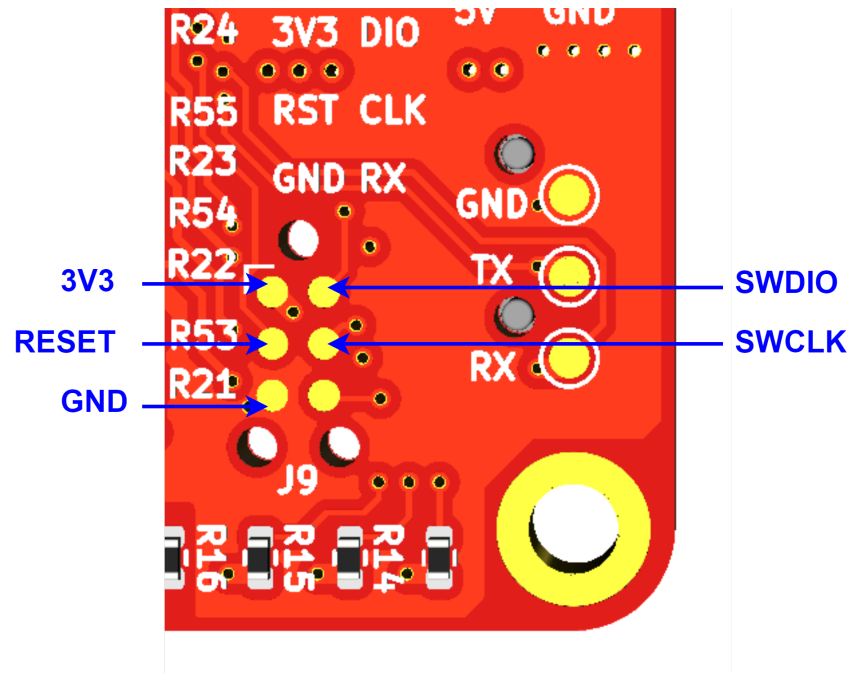

Figure 11: SWD programming header pinout

This header allows access to the SWD port on the onboard microcontroller, and requires the use of a 6-pin needle adapter such as the J-Link 6-pin needle adapter along with an in-circuit programmer such as the J-Link.

2.2 Other Interfaces

2.2.1 DIP Switch for PoE Injection

A DIP switch on the back of SwitchBlox Industrial allows the input voltage to be injected onto any of the ports. To achieve IEEE 802.3af compliant PoE on the port, an input voltage between 44V to 48V is needed. Once active, each PoE port can deliver a maximum of 300mW. PoE is not enabled by default. To enable, R43 needs to be populated with a 0603 0 ohm resistor.
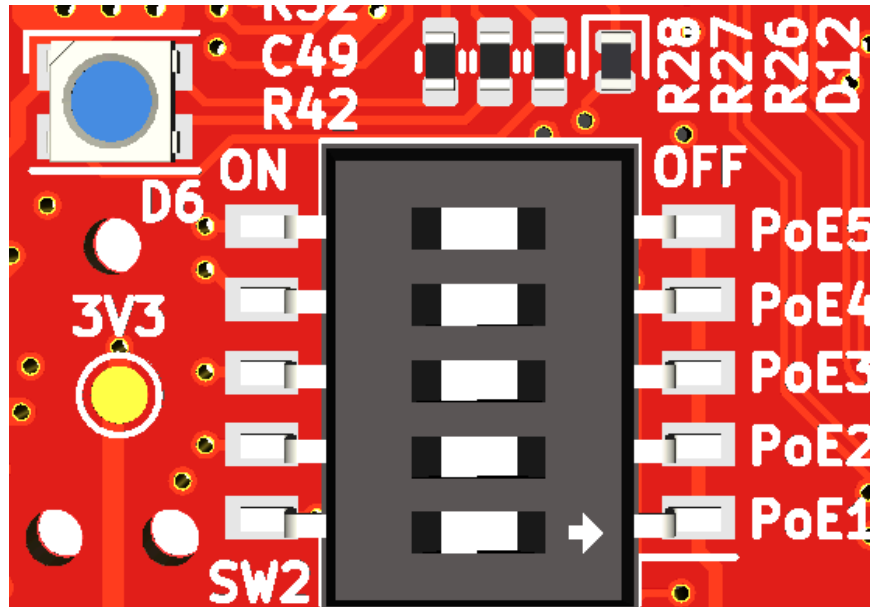

Figure 12: PoE select DIP switch

In the right-most position, the ethernet ports are not PoE enabled. In the left most position, the input voltage is injected onto the selected port, and the corresponding PoE port LED turns on to indicate PoE voltage on the board.

PoE injection is not a "hot-swappable feature". Only toggle PoE on a port when no load is applied. If PoE is toggled while a load is connected, the PoE will be stuck on.

Drawing 300mW from all PoE ports at the same time can lead to the board overheating. It is best to test this in the application first.

Resistor R43 must be populated with a 0 Ohm resistor to enable the PoE feature. This resistor is depopulated by default.

The pinout of PoE on the port pins is TX+/TX- DC Voltage = 0V, RX+RX- DC Voltage = Vin.

2.2.2 LEDs

There are 12 LEDs on SwitchBlox Industrial in total. None of the LED signals can be taken off board.

The 5V Power Indicator LED (**Green**) indicates that voltage is present on the 5V line. It should be solid green in normal operation.

The Ethernet IC "ON" Indicator LED (**Green**) indicates that the ethernet IC is powered up and working. It should be solid green in normal operation.

Each Port Activity LED (**Green**) 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. A solid green LED indicates either constant traffic, or a fault with the port.

The PoE on Port Indicator LEDs (**Orange**) indicates which of the ports currently has PoE injected onto it. This can be toggled on a port-by-port basis using the PoE Select DIP switch.

3 Software Interfaces

3.1 UART

TX and RX are exposed on the expansion header allowing 3.3V UART communication with the onboard microcontroller.

BotBlox have developed custom software that allows an external application to send and receive data to/from SwitchBlox Industrial using this UART port, for switch configuration. This software is called BotBlox ARIES, and more information can be found [here](#).

4 Device Configuration

4.1 Unmanaged Switch

To use SwitchBlox Industrial in an unmanaged application requires no configuration. Simply connect a voltage to the voltage input and connect downstream devices.

4.2 Managed Switch

Running SwitchBlox Industrial in a managed switch application can be done by downloading the BotBlox ARIES software onto your PC, and connecting SwitchBlox Industrial to your PC using a TTL (3.3V) UART port.

Read more about BotBlox ARIES software in the link below.

https://www.notion.so/botblox/BotBlox-ARIES-Software-Documentation-9c7f82d35771463d9bc911bae3d4c0d0

5 Device Characteristics

5.1 Operating Conditions

5.1.1 Absolute Maximum Ratings
Operating in these ranges will reduce the lifetime of the device.

Voltage Input Maximum	65V
PoE Current Delivery (per port)	350mA
Storage Temperature	-50°C to +85°C
Operating Temperature	-50°C to +85°C
5V Output Current	2.3A

5.1.2 Nominal (Test) Ratings

Voltage Input	65V
PoE Power Delivery (per port)	0mA
5V Output Current	0mA

6 Datasheet Changelog

Date	Datasheet Version	Author	Notes
01/10/2022	A_A	Josh Elijah	Initial release
21/05/2023	A_B	Josh Elijah	Updated voltage input range from 6.5V to 5V minimum
26/10/2023	A_C	Jaclyn Li	Table 1.1.2 General Information updated to be correct values
01/05/2024	B_D	Jaclyn Li	Updated storage and operating temperature range from "-40°C to +85°C" to "-50°C to +85°C"
10/05/2024	B_B	Josh Elijah	Revised datasheet to clarify that all SwitchBlox Industrial boards now ship with firmware pre-loaded, allowing easy integration with BotBlox ARIES.
14/09/2024	B_C	Josh Elijah	Fixed additional references of 6.5V, replaced it with 5V. Updated main product image on front page.

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/