

SwitchBlox Nano

Tiny 3 port 10/100Mbps Ethernet Switch

Datasheet

Applies to:

MPN: BB-SWN-E-1

MPN: BB-SWN-E-2

MPN: BB-SWN-E-1-NDAA

July 2024

Board revision E

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1 General Information

1.1 Functionality and Features of SwitchBlox Nano

The BotBlox SwitchBlox Nano is a tiny form factor 3 port 10/100Mbps (10BASE-T/100BASE-TX) Layer 2 unmanaged and managed ethernet switch. It has a non-blocking fabric, meaning that 100Mbps speed can be achieved simultaneously on all ports.

It runs from a wide input voltage range of 5.1 to 40V, and provides a 5A, 0.5A power output. It also features PoE injection onboard, and houses a microcontroller for custom firmware upload.

1.1.1 Features

- 3 x 10/100M (10BASE-T/100BASE-TX) ethernet ports
- Input voltage range from 5.1 to 40V
- Transient protected voltage input
- 25.5 mm x 25.5 mm board size
- Molex Picoblade connectors for power and ports
- Automatic MDI-X crossover
- Unmanaged (out-the-box) functionality

1.1.2 General Information

Voltage Input	5V to 45V DC (45V absolute max)
Voltage Output	5V ± 5%, 0.5A
Supported Protocols	10BASE-T, 100BASE-TX
Power Consumption	220mW (idle) to 400mW (full switching)
Weight	10 grams
Size	25.5mm x 25.5mm x 7.23mm
Operating Temperature	-10°C to +80°C
Storage Temperature	-40°C to +85°C

Table 1: General Information

1.1.3 General Operating Instructions

SwitchBlox Nano is designed for use in commercial and industrial environments, operating from a nominal supply voltage of 24V, but with the ability to operate from as low as 5.1V and as high as 40V.

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

- 1) Apply a voltage between 5.1V to 40V to the voltage input terminals.
- 2) Connect external devices to the ethernet ports using RJ45 to Picoblade cables.
- 3) SwitchBlox Nano will automatically begin auto negotiation with connected devices and begin receiving and forwarding packets to/from all connected devices.

In managed mode SwitchBlox Nano can implement VLAN setup, port mirroring and QoS.

Other methods of operation are possible by uploading firmware to the microcontroller on SwitchBlox Nano.

By default SwitchBlox Nano ships without any firmware.

1.2 Safety Information

- This device can operate on voltages near and above 40V. 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 60°C when 0.5A is drawn from the 5V output. In such cases, passive air cooling or heat sinking should be considered.

1.3 Block Diagram

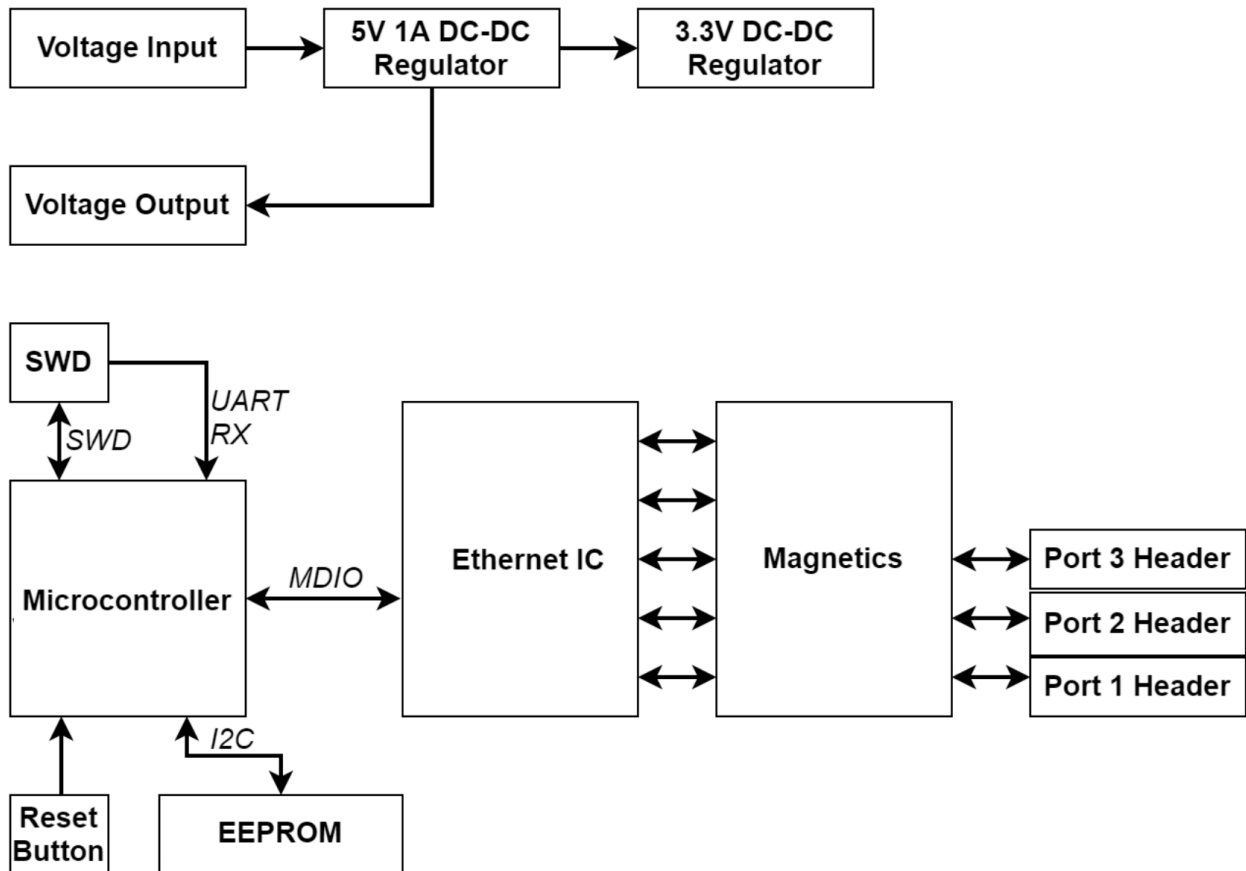


Figure 1: SwitchBlox Nano Block Diagram

1.4 Included Equipment

The product includes the following:

- 1 x SwitchBlox Nano board
- 3 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 Nano complies with the RoHS (Restriction of Hazardous Substances Directive) Certificate of Compliance.

2 Hardware Interfaces

2.1 Board Map

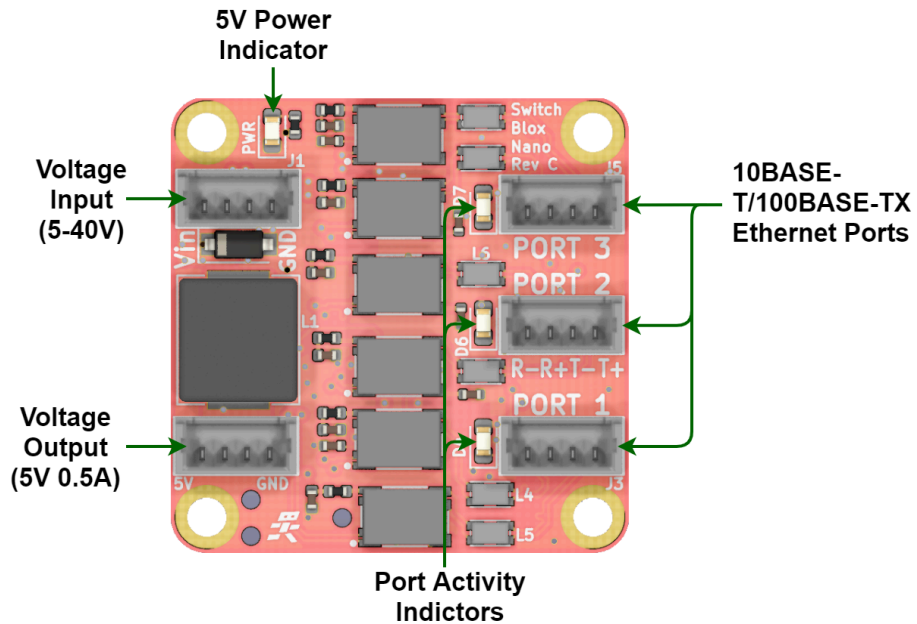


Figure 2: SwitchBlox Nano Board Map (front)

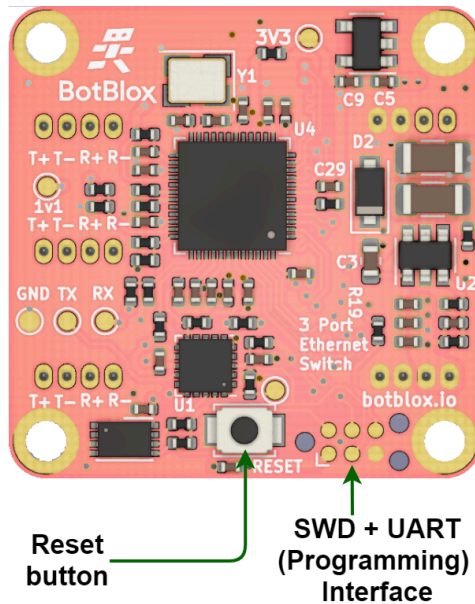


Figure 3: SwitchBlox Nano Board Map (back)

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 40V
- Maximum allowable voltage of 45V

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

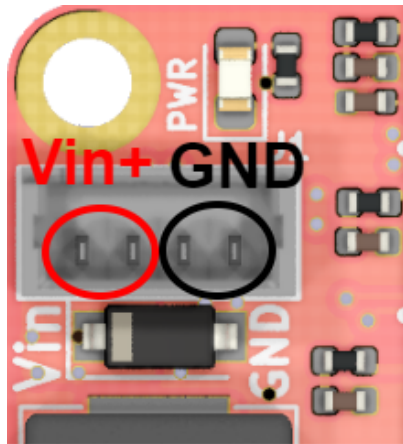


Figure 4: Voltage input header pinout

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 bottom 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 $\pm 5\%$
- Up to 0.5A output current
- Around 30uF of capacitance on the 5V rail

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

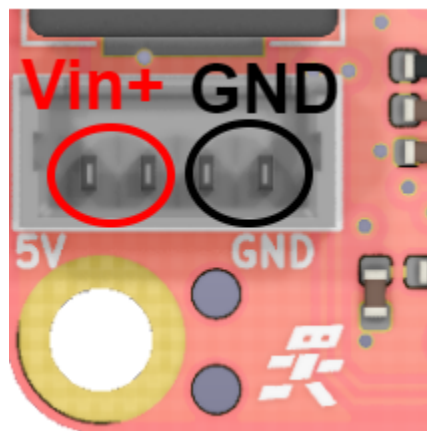


Figure 6: Voltage output header pinout

Cable pinout

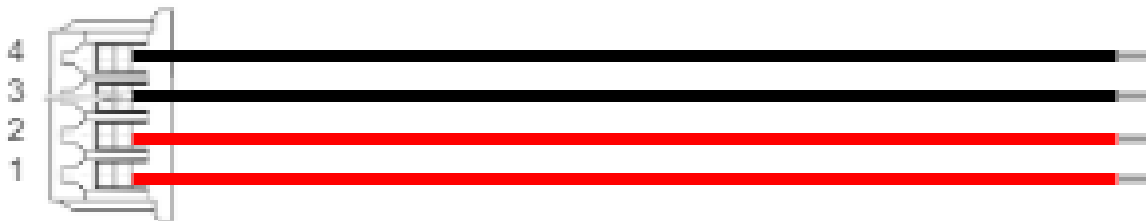


Figure 7: Voltage output cable pinout (red = 5V, black = GND)

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

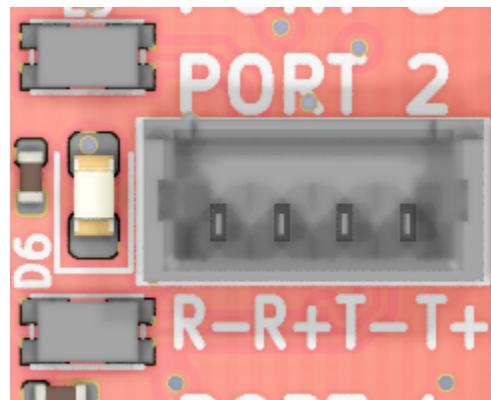


Figure 8: Ethernet port pinout

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

Table 4: Ethernet connector pinout and part numbers

Cable pinout

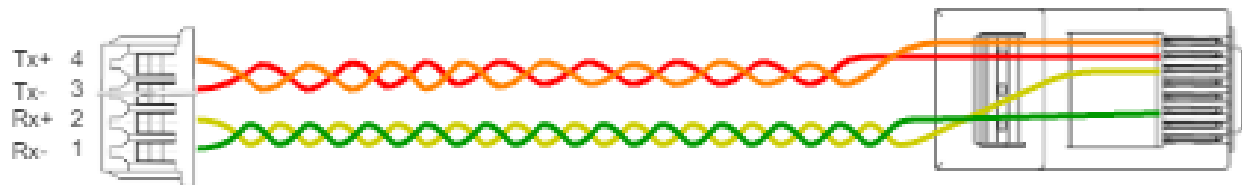


Figure 9: Ethernet cable pinout

2.1.4 SWD Programming and UART RX Header

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

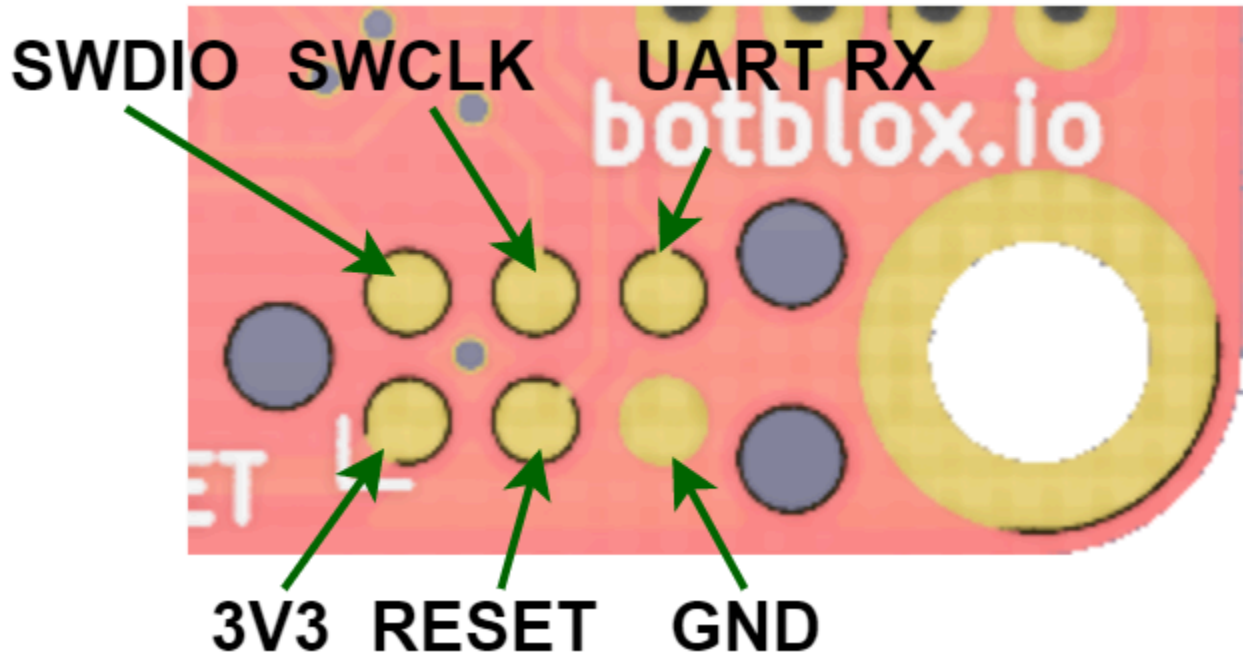


Figure 10: SWD programming and UART RX header pinout

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](#).

An unused pin on this header also connects to the UART RX on the microcontroller. This approach allows at least unidirectional UART communication (from a host to SwitchBlox Nano) for uploading switch management configuration, without needing another connector on the board. The same 6-pin needle adapter is used to access this pin. The needle adapter should then connect to any USB to UART converter, using the GND and UART_RX pins.

2.2 Other Interfaces

2.2.1 LEDs

There are 4 LEDs on SwitchBlox Nano 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.

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.

4 Device Configuration

4.1 Unmanaged Switch

To use SwitchBlox Nano 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 Nano in a managed switch application requires configuring the board with custom firmware.

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	45V
Storage Temperature	-30°C +85°C
Operating Temperature	-10°C to +80°C
5V Output Current	0.5A

6 Datasheet Changelog

Date	Datasheet Version	Author	Notes
04/01/2021	C_A	Josh Elijah	Initial release
09/11/2021	C_B	Josh Elijah	Fixed a typo on maximum input voltage
24/10/2023	C_C	Jaclyn Li	Table 1.1.2 General Information updated to be correct values.
19/12/2023	C_D	Jaclyn Li	Updated to revision E
01/05/2024	E_E	Jaclyn Li	Updated operating temperature range from "0°C to +70°C" to "-10°C to +80°C"
11/07/2024	E_F	Josh Elijah	Added BB-SWN-E-2 to applicable boards. BB-SWN-E-2 boards have test points added for improved manufacture testing speed.

7 Contact

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

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NN4 7SL

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/>