

SPEBlox-Long

Tini 10 Mbps over 1.6km

MPN: BB-SPL-A-1

Preliminary Datasheet

February 2022
Board revision A

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1 General Information

1.1 Functionality and Features of SPEBlox-Long

SPEBlox-Long is a communication device that provides 10Mbps at extremely long cable runs upto 1600m (1.6km) over simple twisted pair copper cable.

This technology is based around the 10BASE-T1L specification, and this board aims to provide a cheaper and simpler way of achieving reasonably low bandwidth communication over very long cable runs.

SPEBlox-Long is 31mm x 31mm and provides a standard 10BASE-T ethernet connection on PicoBlade header. The 10BASE-T1L (single pair ethernet) connection is placed onto a screw terminal for full flexibility of cable types. The board is powered by any voltage from 5 to 60V

1.1.1 Features

- 1 x 10Mbps (10BASE-T) ethernet port
- 1 x 10Mbps (10BASE-T1L) single pair ethernet
- Input voltage range from 5 to 60V
- Reverse protected voltage input
- Transient protected voltage input
- -40°C to 85°C Operation Range
- 31mm x 31mm board size
- Molex PicoBlade connectors for power and 10BASE-T port
- Screw terminal block for SPE port
- Automatic MDI-X crossover
- Unmanaged (out-the-box) functionality
- Embedded MCU to support customized firmware upload for managed switch functions
- Port Activity Indicators

1.1.2 General Information

| | |
|------------------------------|---------------------------------|
| Voltage Input | 5V to 60V DC (65V absolute max) |
| Voltage Output | None |
| Supported Protocols | 10BASE-T, 10BASE-T1L |
| Number of ports | 1 x 10BASE-T, 1 x 10BASE-T1 |
| Power Consumption | 0.5W at full data rate |
| Weight | 10 grams |
| Size | 31 mm x 31 mm x 17mm |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -55°C to +125°C |

Table 1: General Information

1.1.3 General Operating Instructions

SPEBlox-Long 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 5V and as high as 60V.

SPEBlox-Long can be operated immediately by following the steps below.

- 1) Connect two SPEBlox-Long together through the SPE port, using a 2-wire twisted pair cable
- 2) Connect external devices to the ethernet ports using RJ45 to Picoblade cables.
- 3) Apply a voltage between 5V to 60V to the voltage input terminals.

SPEBlox-Long will automatically begin auto-negotiation with connected devices and begin receiving and forwarding packets to/from all connected devices.

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.

1.3 Block Diagram

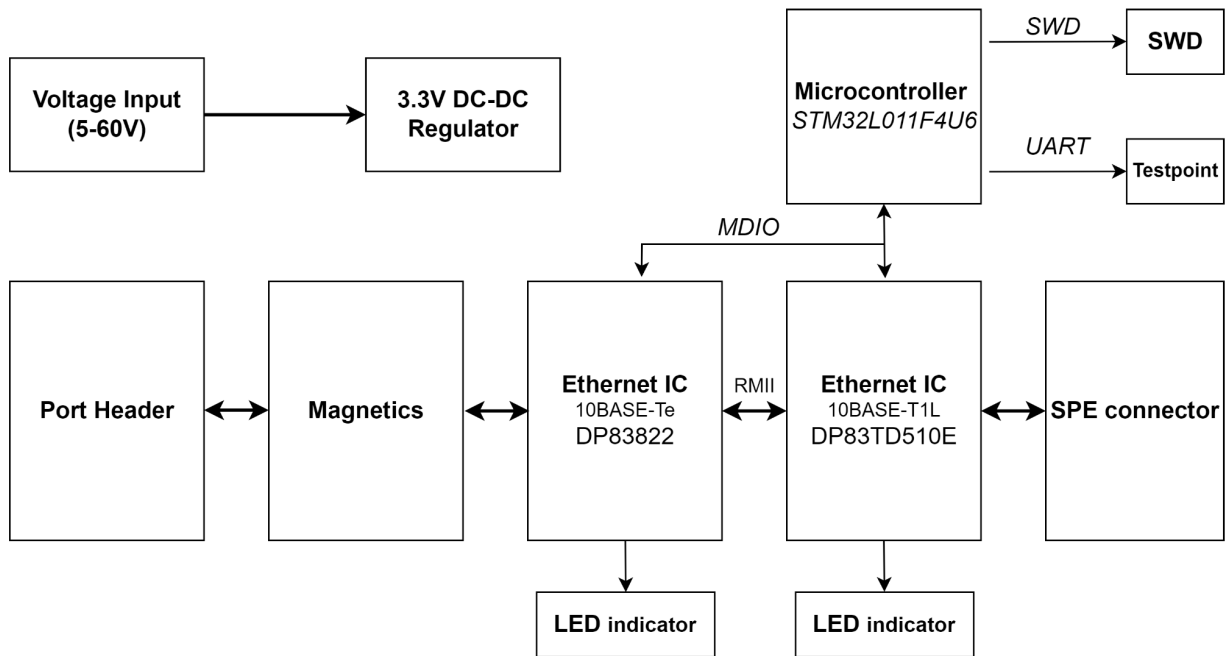


Figure 1: SPEBlox-Long Block Diagram

1.4 Included Equipment

The product includes the following:

1 x SPEBlox-Long

1 x Molex PicoBlade to RJ45 4-way Shielded Twisted Pair cables (300mm)

1 x Molex PicoBlade Power Cable to bare, tinned leads (300mm)

1.5 RoHS Certification of Compliance

SPEBlox-Long complies with the RoHS (Restriction of Hazardous Substances Directive) Certificate of Compliance.

2 Hardware Interfaces

2.1 Board Map

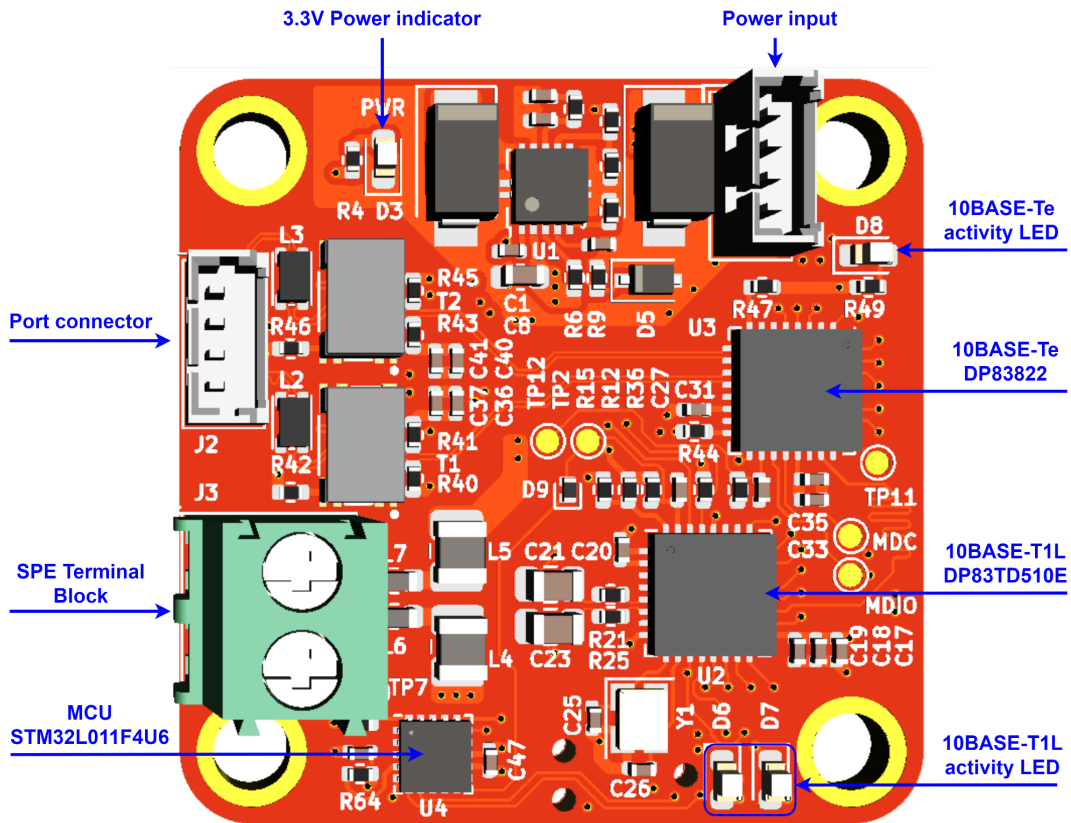


Figure 2: SPEBlox-Long Board Map (front)

2.2 Connectors and Pinouts

2.2.1 Voltage Input

The right 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 66.3V
- Reverse polarity protection

The pinout of the voltage input connector is shown in figure 3 below. Note that this pinout is identical to the pinout used on SwitchBlox.

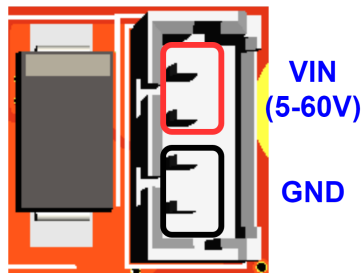


Figure 3: Voltage input header pinout

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

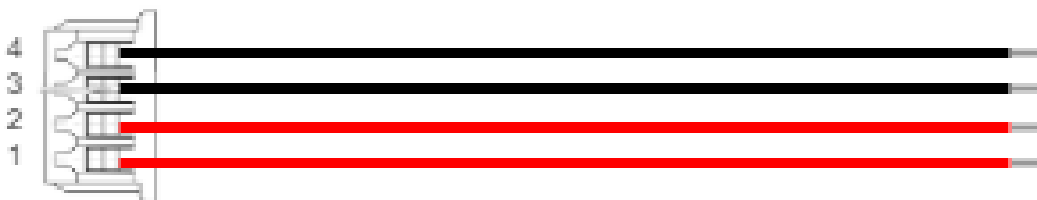


Figure 4: Voltage input cable pinout (red = V+, black = GND)

2.2.2 Ethernet Port

There is an ethernet connector on SPEBlox-Long. The connector has four pins corresponding to the four signals required for 10BASE-Te which are R-, R+, T- and T+.

Figure 5 below shows the pinout of the signals. Note that this pinout is unified across all our products.

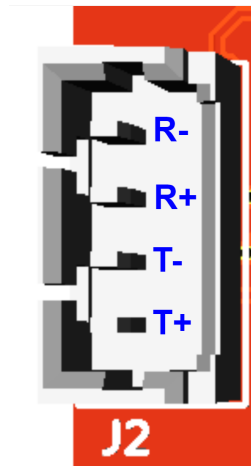


Figure 5: Ethernet port pinout

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

Table 3: Ethernet connector pinout and part numbers

Cable pinout

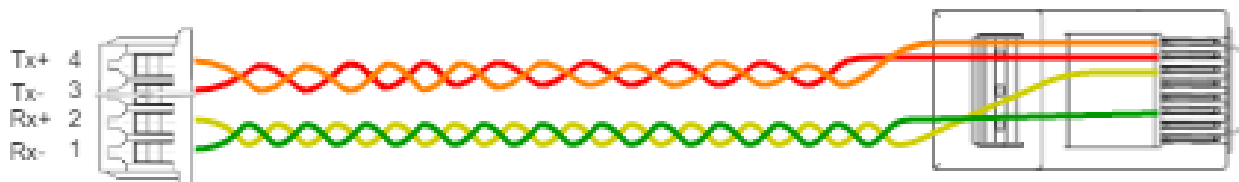


Figure 6: Ethernet cable pinout

2.2.3 SPE Port

There is a SPE terminal block on SPEBlox-Long (MPN: [1984617](#))
Figure 7 below shows the pinout of the signals

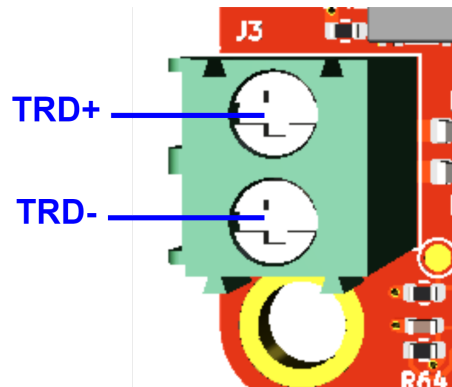


Figure 7: SPE Terminal Block pinout

2.2.4 SWD Programming Header

A programming header on the back of the board allows the STM32L011F4U6 on SPEBlox-Long to be programmed over SWD.

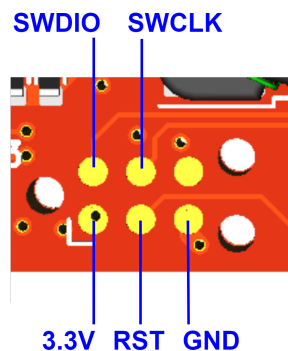


Figure 8: SWD programming header pinout

This header allows access to the SWD port on the onboard STM32 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](#).

2.3 Other Interfaces

2.3.1 LEDs

There are four LEDs on SPEBlox-Long in total. None of the LED signals can be taken off board.

The 3.3V Power Indicator LED (**Green**) indicates that voltage is present on the 3.3V line. It should be solid green in normal operation.

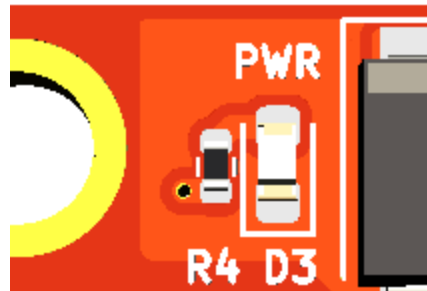


Figure 9: Power Indicator LED

SPE LED D6 (**Green**) indicates link status and blinks for TX/RX Activity for the 10BASE-T1L port.

SPE LED D7 solid on **Green** indicates Long Reach mode 10BASE-T1L port.

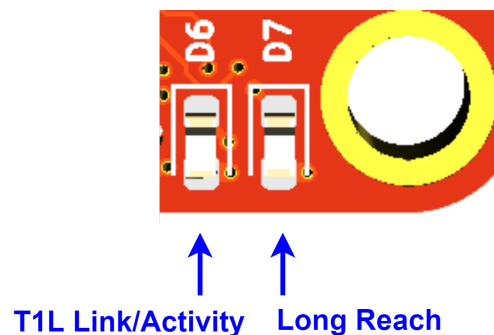


Figure 10: SPE Indicator LED

LED D8 (**Green**) indicates port Link/Activity on the 10BASE-T port. The LED is ON when the link is good. The LED blinks when the transmitter or receiver is active.



Figure 11: Port Indicator LEDs

3 Software Interfaces

3.1 UART

Pins PA0 (UART2_RX) and PA9 (UART2_TX) on the onboard STM32L011F4U6 are exposed on test points. The factory default firmware does not support configuration over UART.



Figure 12: UART Testpoint

4 Device Configuration

4.1 Unmanaged Converter

To use SPEBlox-Long in an unmanaged application requires no configuration, simply connect a voltage to the voltage input, connect two SPEBlox-Long devices via SPE port and connect downstream devices. More advanced configuration of the transceiver settings on SPEBlox-Long is possible by modifying the firmware running on the STM32 onboard. Please contact us for support on this.

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 |
| Storage Temperature | -55°C +125°C |
| Operating Temperature | -40°C +85°C |

6 Datasheet Changelog

| Date | Datasheet Version | Author | Notes |
|-------------|--------------------------|---------------|--|
| 20/02/2022 | A_A | Josh Elijah | Preliminary release |
| 26/10/2023 | A_B | Jaclyn Li | Updated Storage Temperature in Table 5.1.1 Absolute Maximum Ratings and section 8. |

7 Contact

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

info@botblox.org

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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/>