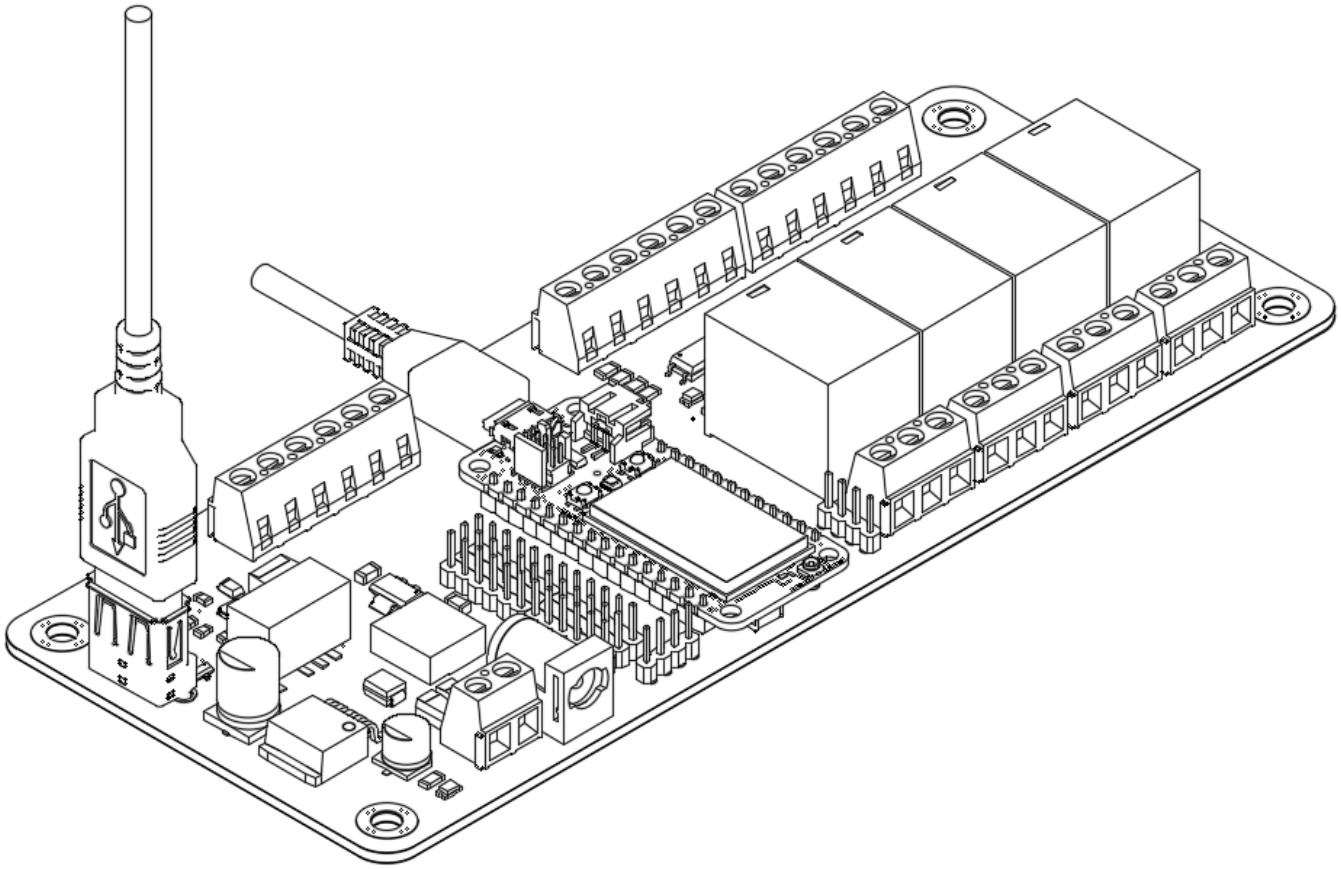
Boron-Argon Relay Shield 4-Channel User Manual

4 WiFi/LTE Controllable Relays



Functional Description

OVERVIEW

The Boron-Argon Relay Shield 4-Channel is the next-gen accessory for the third generation particle devices. This relay shield is designed to work with the Particle Argon Wi-Fi development board and the Particle Boron LTE development board. The Boron-Argon Relay Shield can operate off of a 12VDC supply or from a 3.7-4.2V lithium ion or polymer battery. This makes this a great board for controlling systems that are remote or off the grid. Mountability and packaging was kept in mind while designing this board. Using a DIN rail mount housing makes this board DIN rail mountable. This is perfect for mounting it inside of electrical cabinets, electronic control boxes, or industrial machinery.

Two power supplies can be connected to the board at the same time - the 12VDC supply and the battery supply. Both the Boron and the Argon have a power management IC that determines which power supply to use. For example if the main power supply (12VDC) is lost, the board will know to switch to the battery as a backup power supply. The battery will supply the entire board with power, as there is switching logic and a boost converter to supply the board with 5VDC and 3.3VDC. The 12VDC can be supplied in two different ways - by the 2 position screw terminal or by the 2.1mm barrel jack as found on the Arduino Uno and Mega2560. The battery needs to be plugged in directly to the development board; then the USB cable that is supplied with the development board needs to be plugged into the vertical USB-A connector on the relay shield and the micro USB-B connector on the development board. This is how the development board is supplied with power and can charge the battery when the power management system determines to do so.

The main functionality of this board is to switch four individual power relays on or off. Each relay has a screw terminal block for breaking out the relay pins. The other digital I/O, analog I/O, and communication pins of the development board can be accessed via pin headers or screw terminal breakouts.

FEATURES

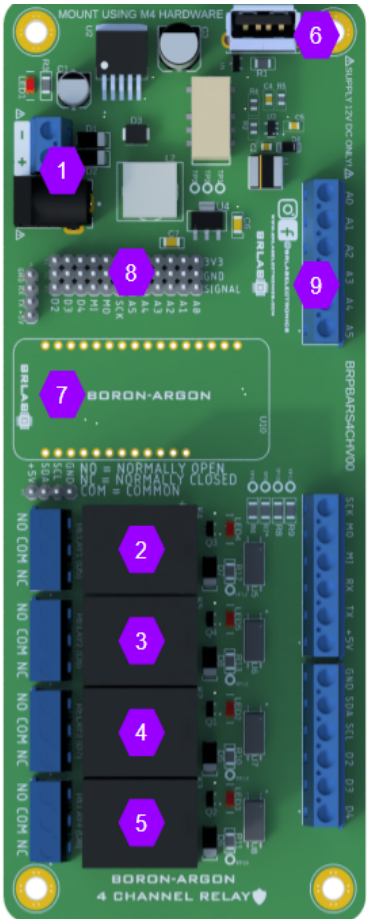
- 4 Individually Controlled Relays
- Relay Coils Isolated from Development Board
- Relay LED Indicator
- Power LED Indicator
- Screw Terminal Breakouts
- Pin Header Breakouts
- Serves 2 Different Development Boards:
    - Particle Argon Wi-Fi
    - Particle Boron LTE
- 2.1mm Barrel Jack Power Input
- Screw Terminal Power Input
- On-board Buck Converter
- On-board Boost Converter
- Battery Backup Control Logic
- 12VDC Main Supply Input
- 5VDC and 3.3VDC On Board
- DIN Rail Mountable
- Small Overall Footprint
- Lead Free
- Comes Fully Assembled

APPLICATIONS

- DIY Electronics
- IoT Prototyping
- Farming/Gardening Automation
- Irrigation System Automation
- Aquaculture Automation
- Home Automation
- Lighting
- Industrial Control/Monitoring/Automations
- Solar Power System
- HVAC System

PIN/SCREW TERMINAL DESCRIPTION

Pin	Description
+	This screw terminal position is connected to the positive leg of the 12V supply.
-	This screw terminal position is connected to the ground leg of the 12V supply.
5V	This screw terminal is a 5V output from the buck converter.
3V3	This pin is the output of the 3.3V voltage regulator.
GND	Board ground pin and screw terminal.
A0-A5	Analog input pins that can also act as standard digital GPIO and are PWM capable.
D2-D4	Common GPIO pins that are PWM capable.
MO,MI,SCK	SPI pins. They can also be used as digital GPIOs.
RX	Primarily used as a UART RX pin, can also be used as a digital GPIO.
TX	Primarily used as a UART TX pin, can also be used as a digital GPIO.
SDA	Primarily used as a data pin for I^2C, can also be used as a digital GPIO.
SCL	Primarily used as a clock pin for I^2C, can also be used as a digital GPIO.
NO	**N**ormally **O**pen pin for the relay.
COM	Common pin for the relay.
NC	**N**ormally **C**losed pin for the relay.



1. 12V POWER INPUT
2. RELAY 1 (D5)
3. RELAY 2 (D6)
4. RELAY 3 (D7)
5. RELAY 4 (D8)
6. USB CONNECTOR - PROVIDES POWER TO BORON-ARGON
7. HEADERS FOR BORON-ARGON
8. PIN HEADERS (3V3, GND, & SIGNAL)
9. SCREW TERMINAL CONNECTORS

Technical Specifications

These are technical specifications for the relay shield. Please refer to the development board datasheet for specific technical details about the board you are using.

ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Typ	Max	Unit
Supply Input Voltage			+14	V
Battery Input Voltage			+6.5	V
Buck Converter Supply Voltage			+5.5	V
Buck Converter Supply Current			3	A
Boost Converter Supply Voltage			+5.5	V
Boost Converter Supply Current			2	A
3V3 Power Supply		+3.3		VDC
3V3 Supply Current		1.35		A
Power Relay Switching Voltage			250, 30	VAC, VDC
Power Relay Switching Current (Resistive Load)			10	A
Power Relay Switching Current (Inductive Load)			5	A

Using the board beyond the absolute maximum ratings listed above may cause permanent damage to the board and possibly the development board.

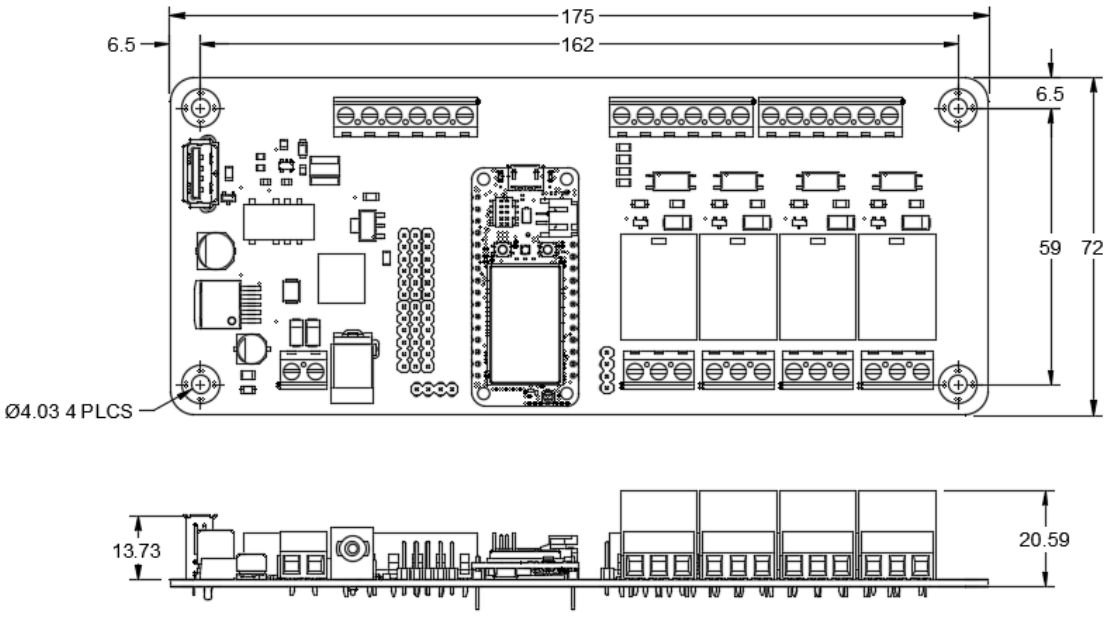
RECOMMENDED OPERATING CONDITIONS

Parameter	Min	Typ	Max	Unit
Supply Input Voltage	+9	+12	+13	V
LiPo Battery Input Voltage	+3.0	+3.3-3.7	+4.4	V
Buck Converter Supply Voltage	+5	+5.1	+5.2	V
Buck Converter Supply Current			2.8	A
Boost Converter Supply Voltage	+2.7	+5.15	+5.2	V
Boost Converter Supply Current			1.8	A
Operating Temperature	-20	35	60	℃

Mechanical Specifications

All dimensions are in millimeters.

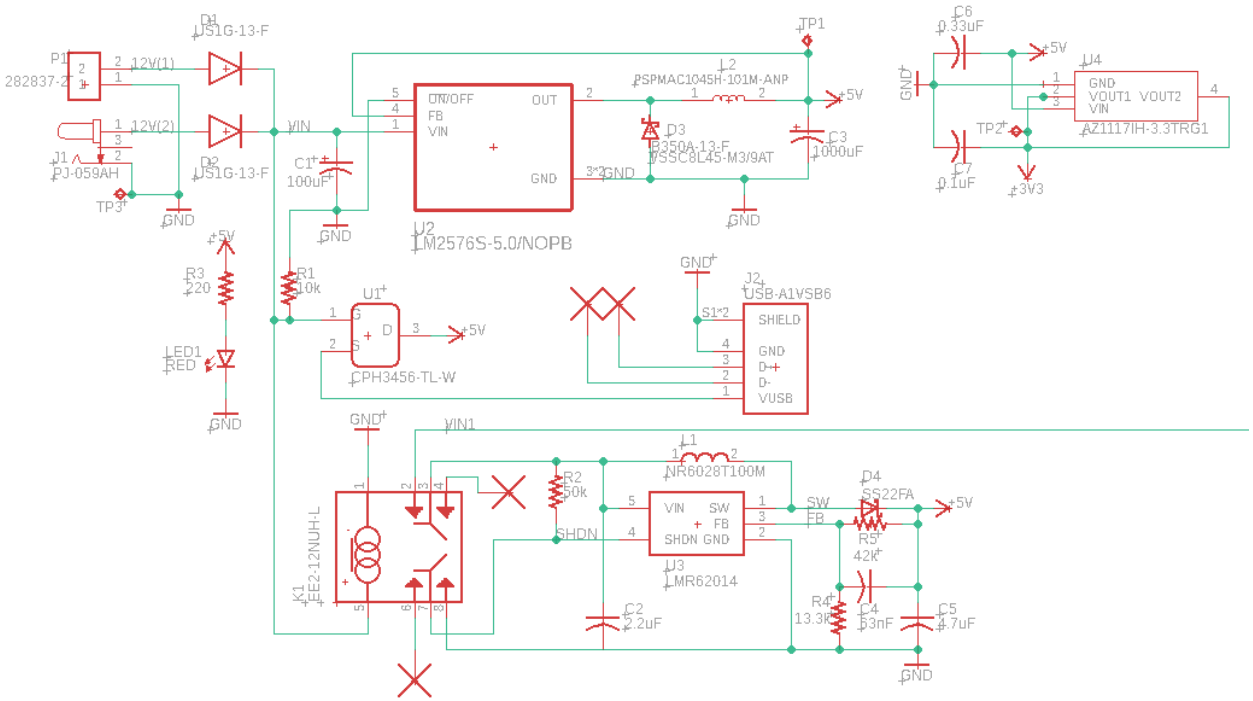
DIMENSIONS



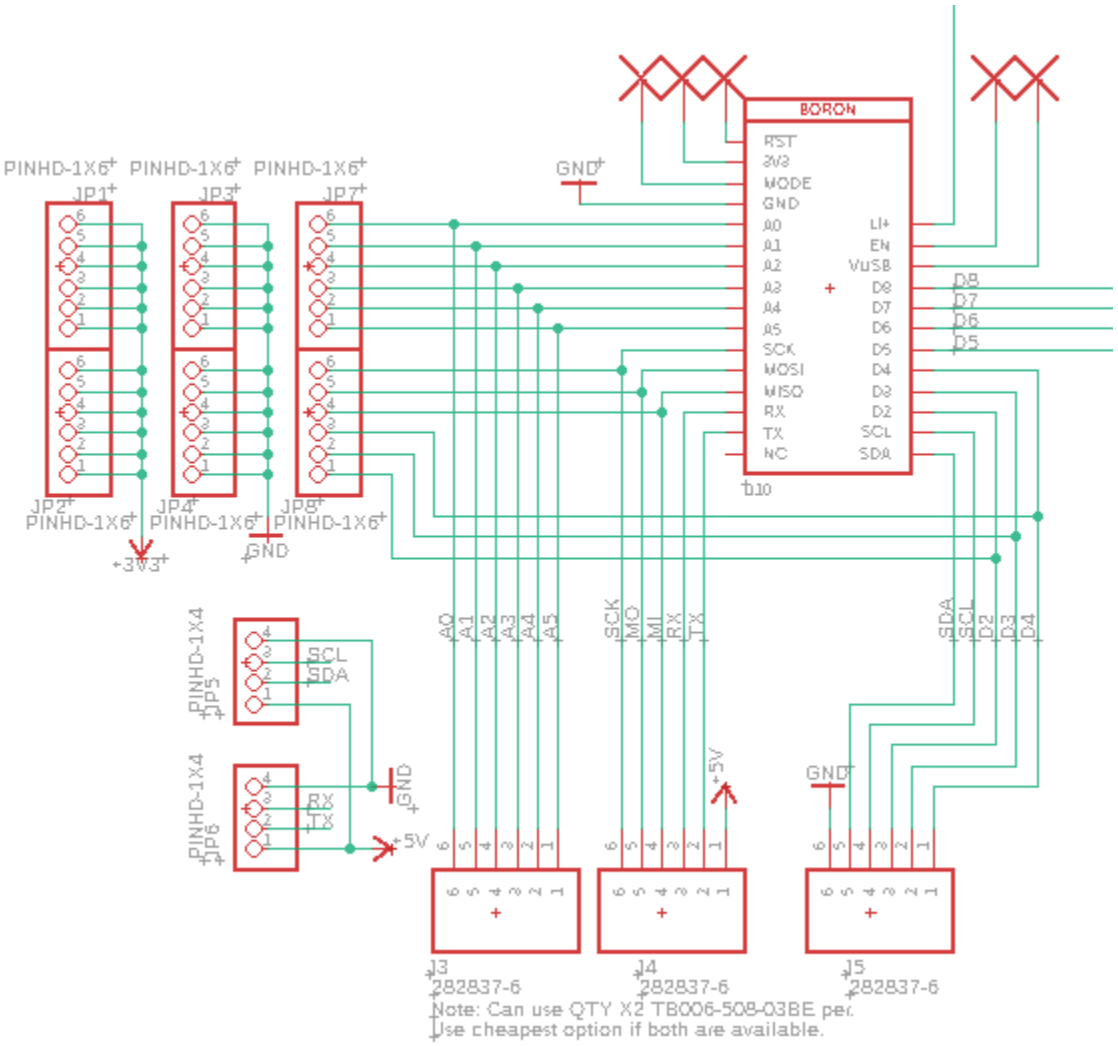
Schematic

The complete schematic is open source and is available on BRLAB ELECTRONICS GitHub repository [here]

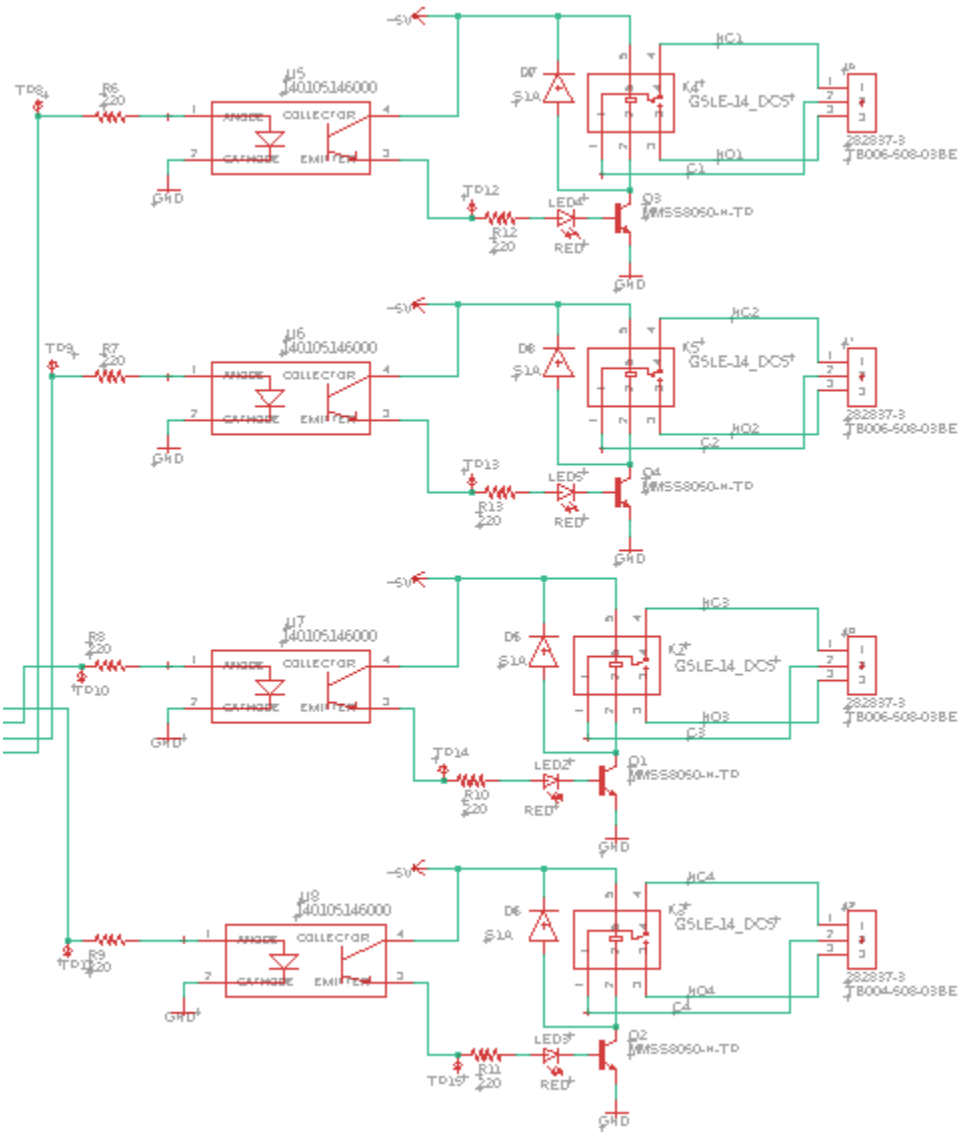
POWER



PIN HEADERS AND SCREW TERMINALS



RELAYS


-5V
U5
401051460000
ANODE
CATHODE
COLLECTOR
EMITTER
D7
S1A
K4
G5LE-14_DC5
HC1
HO1
C1
82837-3
B006-508-03BE
R6
220
TD8
GND
TD12
R12
220
LED4
RED
Q3
MMSS8050-H-TD
U6
401051460000
D8
S1A
K5
G5LE-14_DC5
HC2
HO2
C2
R7
220
TD9
TD13
R13
220
LED5
RED
Q4
MMSS8050-H-TD
U7
401051460000
D6
S1A
K2
G5LE-14_DC5
HC3
HO3
C3
R8
220
TD10
TD14
R10
220
LED2
RED
Q1
MMSS8050-H-TD
U8
401051460000
D5
S1A
K3
G5LE-14_DC5
HC4
HO4
C4
R9
220
TD11
TD15
R11
220
LED3
RED
Q2
MMSS8050-H-TD

Source Code

Source code can be found on our GitHub repository here.

Revision History

Revision	Date	Author(s)	Comments
v00	Feb 8, 2022	BR,DC	Initial Release
v01	Feb 17, 2022	BR	Fixed two component naming errors on the schematic.

Contact

Feel free to reach out with any questions you may have. Send your questions to contact@brlabelectronics.com or go to our website www.brlabelectronics.com and send us a message by clicking on contact us.