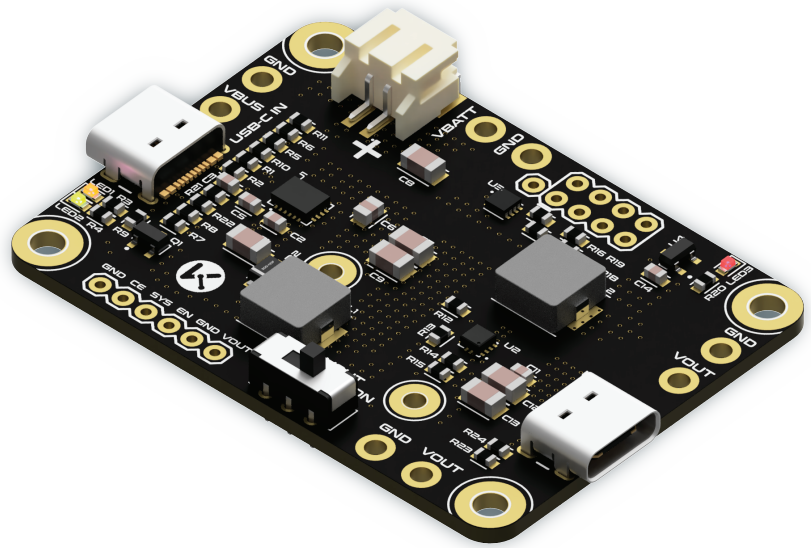


Introduction

The AmpRipper 4000 Li-ion battery charger & boost module offers enhanced functionality, communication, and control options over its predecessor. The best Raspberry Pi, Arduino, and DIY battery power supply just got better. With improved fast-charge and Plug and Play capabilities, The AR4000 now features a 4A output, I2C communication, increased efficiency, greater input voltage range, adjustable charge rate, and more options for user control. Fully compatible with Arduino, Raspberry Pi 4, Teensy, or any other 5V device, the AmpRipper 4000 is a bulletproof choice for battery powered DIY electronics projects.



Built around the MP3424 boost converter and the MP2617 lithium-ion charger, the AmpRipper 4000 module can supply a whopping 5V/4A, 20W output with a fast-charge rate of up to 3A. Smart power path management technology ensures that power to your project is not interrupted, even if either the battery or charger are removed. The AR4000 module also accepts a wider input voltage range of 5-14V. Similar to its predecessor, AR4000 is compatible with 3.7-4.2V 1S[N]P lithium ion/polymer batteries. Battery voltage and charge percentage can now be monitored via I2C, thanks to the MAX17048 battery monitor. AR4000 also features improved accessibility with more i/o and expanded connectivity options. Power input and output can be accessed by either USB-C or thru-hole terminals. Connection points for the battery include a JST PH-2.0 connector, as well as thru-hole terminals. See pg.3 for more information about connections and pin functions.

Technical Specifications

- Input Voltage: 5-14V
- Input Current Limit: 3A (adjustable via resistor)
- Battery Voltage: 0-4.2V
- System Voltage: 2.5-4.4V
- Charge Current: 3A (adjustable via resistor)
- Output Voltage: 5.2V
- Output Current: 0-4A
- Low Battery Voltage: 2.5-3.3V
- Battery Requirements: Li-ion | Li-Po 3.7-4.2V 1S[N]P w/ external BMS for multi-cell
- PCB Operating Temperature: 0°C to +125°C
- Battery Operating Temperature: 0-50°C (10k thermistor connected)

Features

- I2C Battery Voltage & Percentage Monitoring
- Plug and Play Device
- USB-C In/ Out
- Seamless Load Sharing for UPS Applications
- 5.2V-4A Output
- Up to 3A fast-charge
- Optional Heatsink

Applications

- Raspberry Pi 4 power supply
- USB-C battery bank
- Battery-powered consumer electronics
- DIY portable electronics projects
- Arduino projects
- Portable robotics projects

Function Diagram

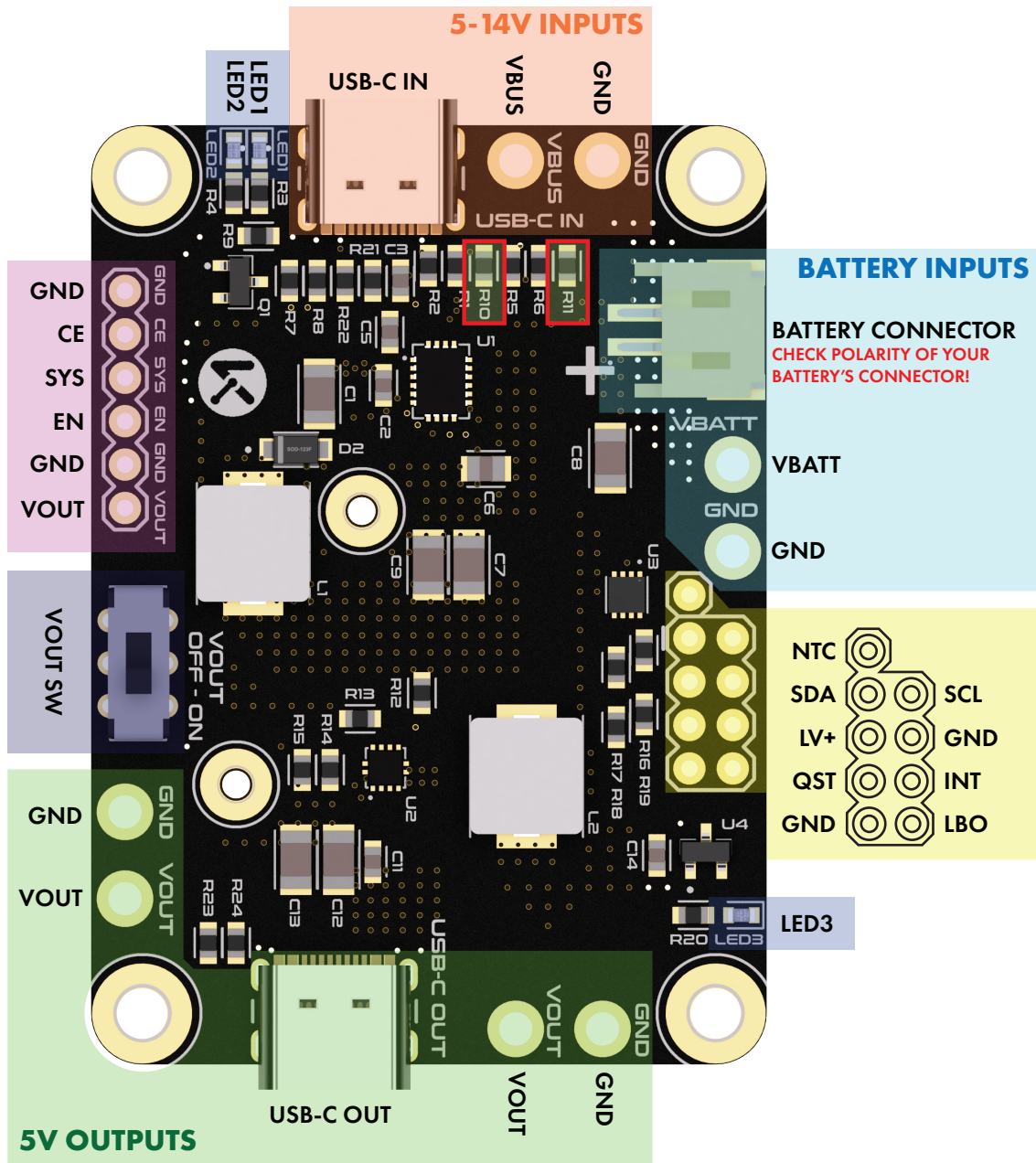


Fig. 1

Pin & Board Functions

| Symbol | I/O | Description |
|-------------------|----------------|--|
| GND | - | Ground. |
| CE | Input | Charge Enable. Function logic control of the MP2617 IC. Drive CE LOW to enable charging. Drive CE HIGH to disable charging. CE is automatically driven LOW when valid input power is present, and HIGH when no input is present, unless overridden. |
| SYS | Output | System Power. Regulated output from the MP2617 IC to power the MP3424 IC boost converter and charge the battery. |
| EN | Input | Boost Enable. Function logic control of the MP3424 IC. Drive EN HIGH to enable VOUT . Drive EN LOW to disable VOUT . EN is automatically driven HIGH unless overridden. |
| GND | - | Ground. |
| VOUT | - | Power Output. Regulated 5V output from the MP3424 IC. Up to 4A output. |
| NTC | Input | Thermistor Input. Connect to the battery thermistor (10k) for battery thermal protection (optional). |
| SDA | Bi-directional | I2C Data Pin. Connect to your microcontroller I2C data line. Pulled up to LV+ with a 10K resistor. |
| SCL | Input | I2C clock pin. connect to your microcontroller I2C clock line. Pulled up to LV+ with a 10K resistor. |
| LV+ | Input | Logic Voltage Input. Connect the same power as the logic level of your microcontroller. For a 5V microcontroller like Arduino, use 5V. For Raspberry Pi, use 3.3V. |
| GND | - | Ground. |
| QST | Input | Quick-Start Input. Allows reset of MAX17048 through hardware. Pulled down to GND with a 10K resistor. |
| INT | Output | Interrupt Signal. MAX17048 open-drain, active-low alert. Can be set to pull LOW when battery voltage or percentage drops below a user-set threshold. Pulled up to LV+ with a 10K resistor. |
| GND | - | Ground. |
| LBO | Output | Low Battery Output. Open drain, active-low output. LBO is driven LOW when battery voltage is less than 3.3V. LBO is driven HIGH when battery voltage is greater than 3.3V |
| VOUT SW | - | VOUT Toggle Switch. Connects EN to GND in the OFF position, disabling VOUT . EN is driven HIGH in the ON position. |
| USB-C IN | Input | USB-C Power Input. 5-14V. 3A supply recommended. |
| VBUS | Input | Power Input. 5-14V. 3A supply recommended. |
| GND | - | Ground. |
| USB-C OUT | Output | USB-C Power Output. Regulated 5V output from the MP3424 IC. Up to 4A output. |
| VOUT | Output | Power Output. Regulated 5V output from the MP3424 IC. Up to 4A output. |
| GND | - | Ground. |
| BATTERY CONNECTOR | Input | JST PH-2.0 Battery Connector. Check polarity of your battery connector before inserting! |
| VBATT | Input | Positive Battery Terminal. Connect to the positive terminal of your battery if you are not using the battery connector. |
| GND | - | Ground. Connect to the negative terminal of your battery if you are not using the battery connector. |
| LED1 | Output | Orange LED. Indicates charging status and fault condition. LED1 is illuminated during charging. LED1 shuts off when charging is complete or during thermal shutdown. LED1 will blink when battery is removed or during NTC fault. |
| LED2 | Output | Green LED. Indicates the presence of a valid input power supply. LED1 will stay illuminated during charge and once charge is complete. LED2 shuts off when input power is absent, CE is driven HIGH , or during thermal shutdown. |
| LED3 | Output | Red LED. Indicates low battery voltage. LED3 is illuminated when the battery voltage dips below a fixed threshold of 3.3V. |
| R10 | - | Input Current Limit Resistor. R10 can be swapped to modify the max. input current, up to 3A. Reference the table below for pre-determined resistor values, or use the following equation: Input Current Limit = 45600/R10(Ω) . |
| R11 | - | Charge Rate Resistor. R11 can be swapped to modify the max. charge rate, up to 3A. Reference the table below for pre-determined resistor values, or use the following equation: Charge Rate = 2070/R11(Ω) . |

Tbl. 1

R11 Common Charge Rate Resistor Values

| Charge Rate | Resistor Value |
|-------------|----------------|
| 3A | 698Ω (stock) |
| 2.5A | 825Ω |
| 2A | 1.05kΩ |
| 1.5A | 1.37kΩ |
| 1A | 2.1kΩ |
| 500mA | 4.22kΩ |

Tbl. 2

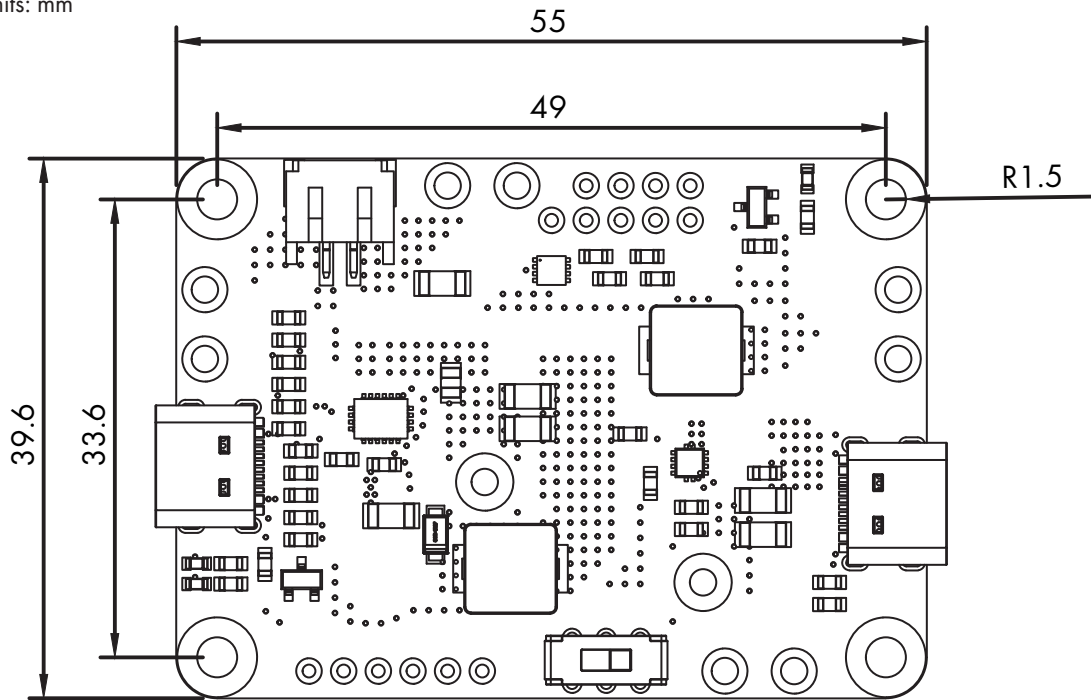
R10 Common Input Current Limiting Resistor Values

| Input Current Limit | Resistor Value |
|---------------------|----------------|
| 3A | 15.4kΩ (stock) |
| 2.5A | 18.2k |
| 2A | 22.9k |
| 1.5A | 30.5k |
| 1A | 45.9k |

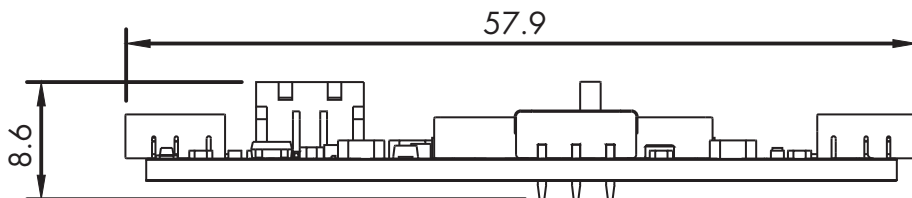
Tbl. 3

Dimensions

Units: mm



Without Heatsink



With Heatsink

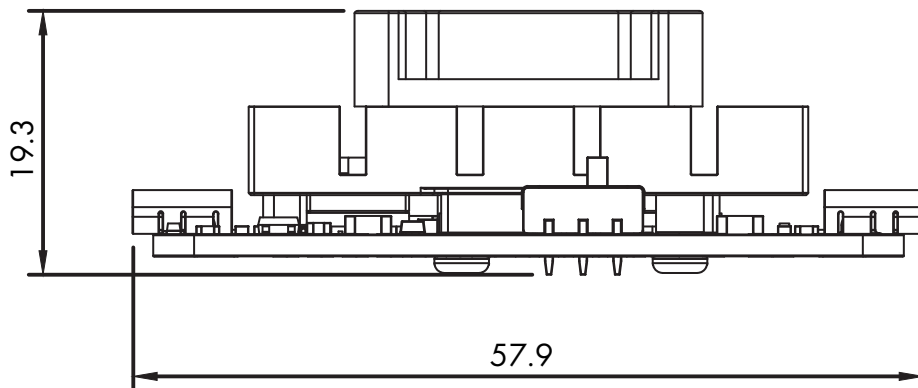


Fig. 2