Wiring up the power circuit

Components :

1. Lithium Ion Cylindrical Battery - 3.7V 2200mAh
2. SparkFun LiPo Charger/Booster - 5V/1A

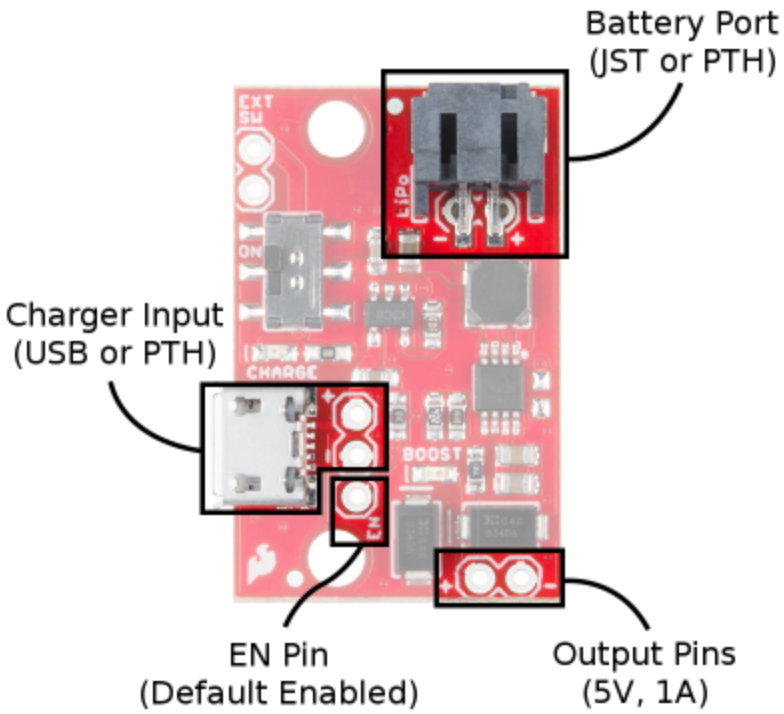
Main webpage of reference

https://learn.sparkfun.com/tutorials/sparkfun-5v1a-lipo-chargerbooster-hookup-guide?_ga=2.107674178.1175592164.1614741979-1564255163.1613960801

Hardware Overview

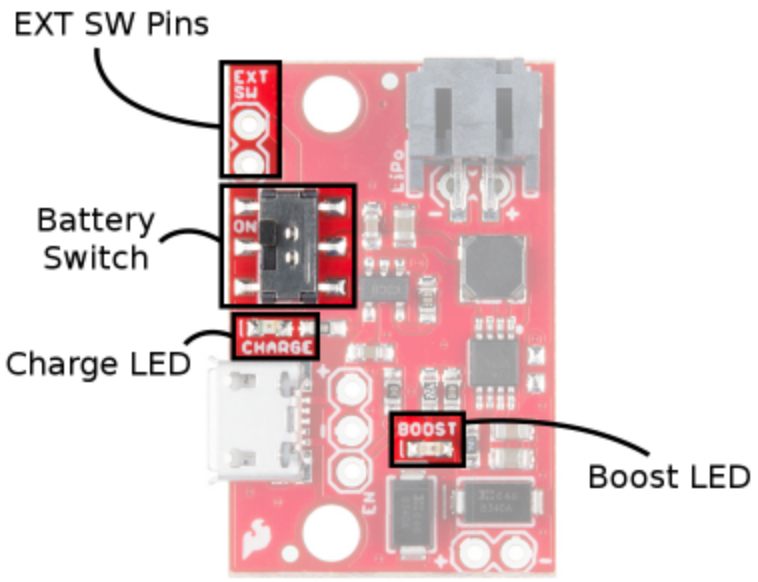
Parts of the Board

The circuit is constructed by feeding an MCP73831 charge controller IC to the LiPo battery port, and to the input of a PAM2401 boost controller. Power always flows to the boost circuit, so an enable pin is provided to allow the booster to be shut down during charging if desired. Multiple connection types are provided for the battery, charge source, and switch to allow flexibility of application.



Charger input, battery port, enable pin, and output pins of the 5V/1A Charger/Booster.

The image below shows the location of the surface mount battery switch and external switch pins which are included to provide an additional option to control the output. Two LEDs are included to provide feedback on system status.



Switch options and status LEDs provided for the 5V/1A Charger/Booster.

Functions

Item	Description
Output Pins	Get **5V, 1A** out here! The 'OUT' pins are labeled with polarity.
Battery Port	Insert a LiPo battery here through the JST connector or solder directly to the PTH pins underneath the connector. These ins are labeled with polarity.
Charger Input	Supply **5V, 500mA** here to charge. You can use a micro-B USB cable or solder directly to the PTH pins. These 'IN" pins are labeled with polarity.

Battery Switch	The on-board switch is a physical battery disconnect. When in the ON position, the battery is connected to the booster/charger. When flipped to the OFF position, the battery's positive lead is isolated from all electronics, and zero current will be drawn.
EXT SW Pins	These run parallel to on-board battery switch contacts. A higher current switch can be connected through these pins. If you're constantly drawing large currents or want a remote battery disconnect switch, connect it here.
EN Pin	The EN pin is enabled by default. This pin floats high and can be connected to ground to turn the output off. This is useful if your load circuit can't be put into low power mode for charging.
Charge LED	The charge LED indicates blue when the charger IC is attempting to charge the battery. It will turn off when the battery is fully charged. *Note: If current is being drawn while the battery is being charged, the charger may think the battery is never quite full and continue sourcing current.*
Boost LED	This LED indicates red when voltage is present on the output pins.

Charge Status LED

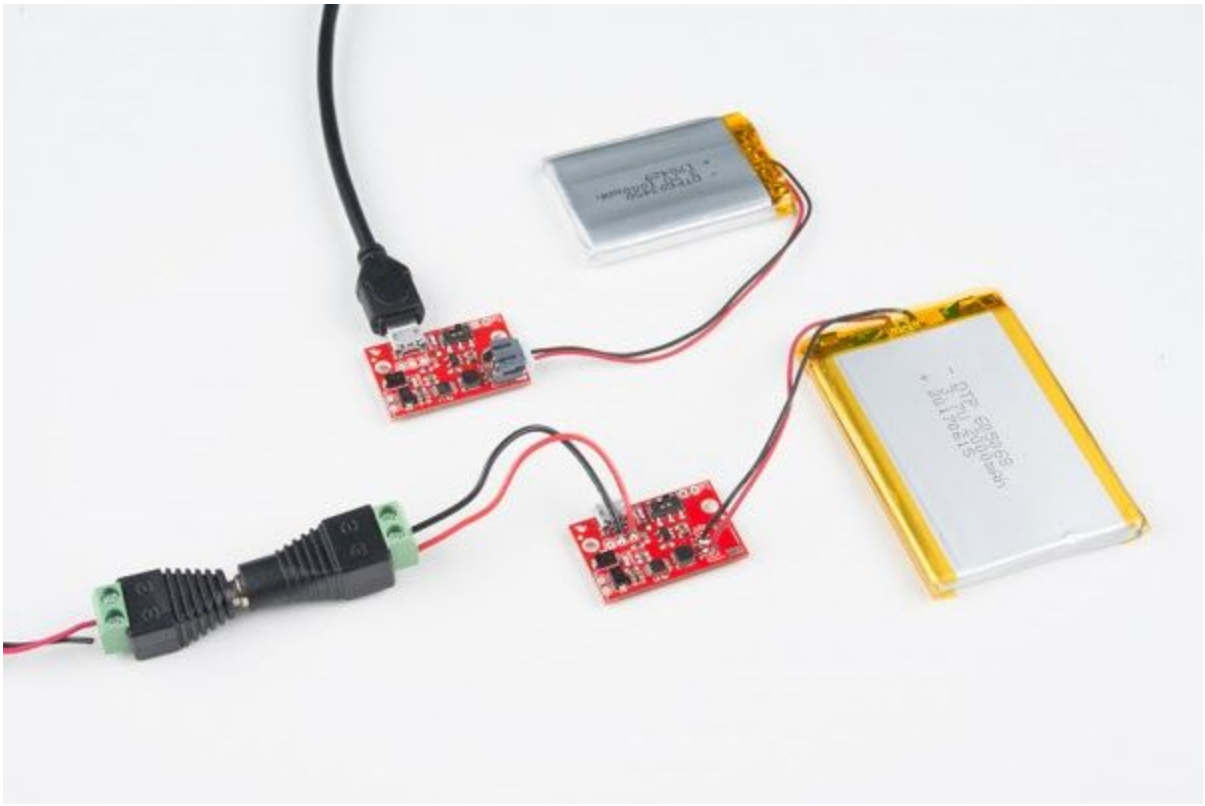
The on-board blue CHARGE LED can be used to get an indication of the charge status of your battery. Below is a table of other status indicators depending on the state of the charge IC.

Charge State	**LED status**
No Battery	Floating (should be OFF, but may flicker)
Shutdown	Floating (should be OFF, but may flicker)

Charging	ON
Charge Complete	OFF

Hardware Assembly

It's easy to get started on your bench. Simply plug the LiPo into the battery JST connector, charge with a micro-B USB supply, and solder your load to the output pins. This section shows some tips and alternate ways to configure the ports.

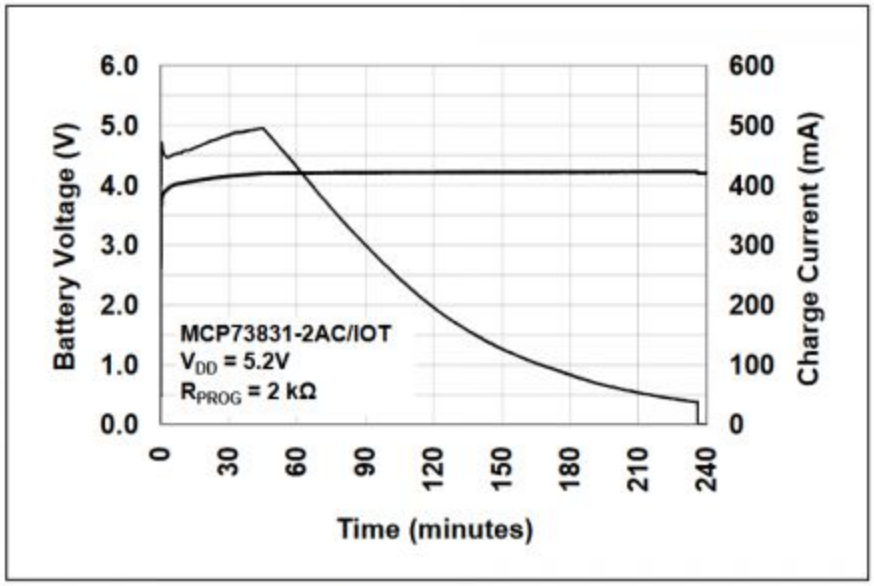


(top) Without modification, the charger and battery can be plugged straight in. (bottom) Connections can be made to one or both of the battery/charger ports by way of soldering wires into the provided holes.

Charging a Battery

When a voltage is supplied to the charger, the MCP73831 charge IC comes alive and starts making decisions on how to regulate. First, it regulates current to 500mA until a certain voltage is reached,

then it regulates voltage until current goes (close) to zero. When this happens, the charger IC shuts off.



Complete Charge Cycle (1000 mAh Li-Ion Battery).

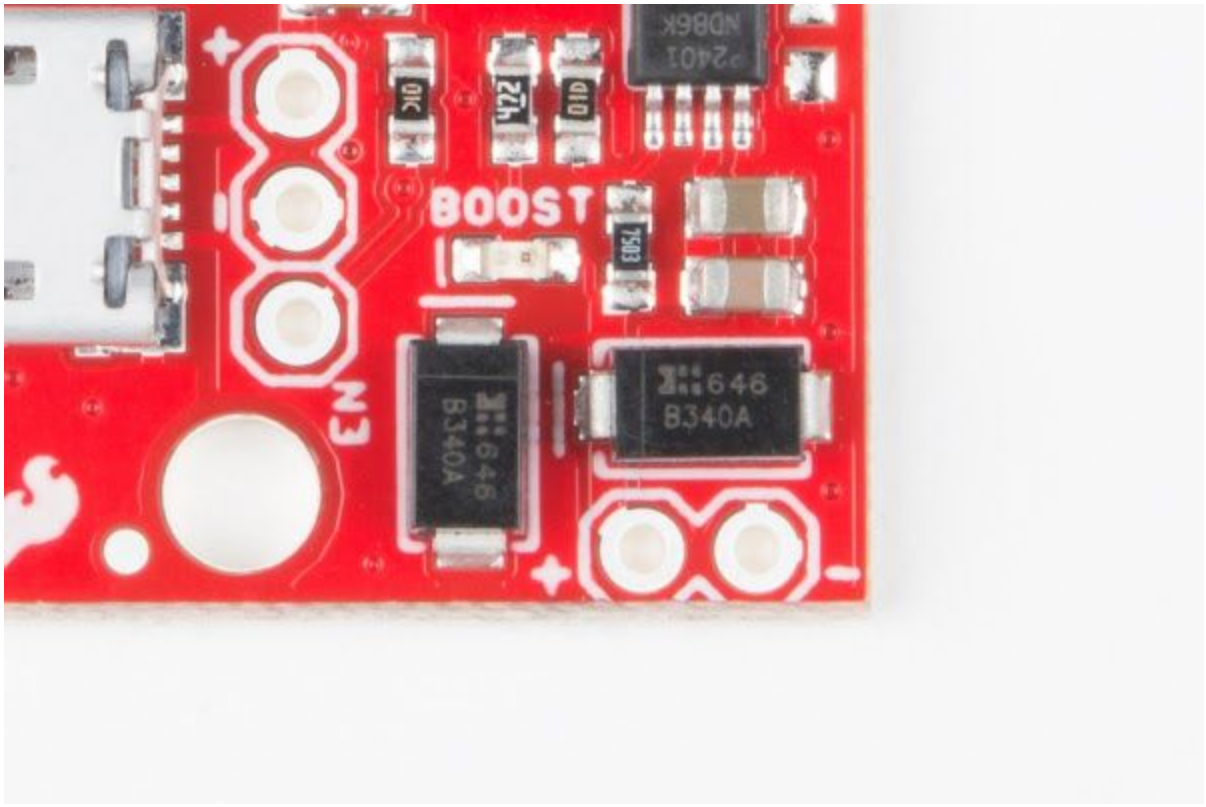
As shown in the MCP73831 datasheet, charge current drops as battery voltage rises

The charger IC is making decisions based on the battery voltage and output load, and can be tricked into an invalid mode. Follow these rules to get a reliable charge:

- Turn on the battery switch before connecting the charger.
- Consume no more than 20mA from the output terminals during charging.

Connecting a Load

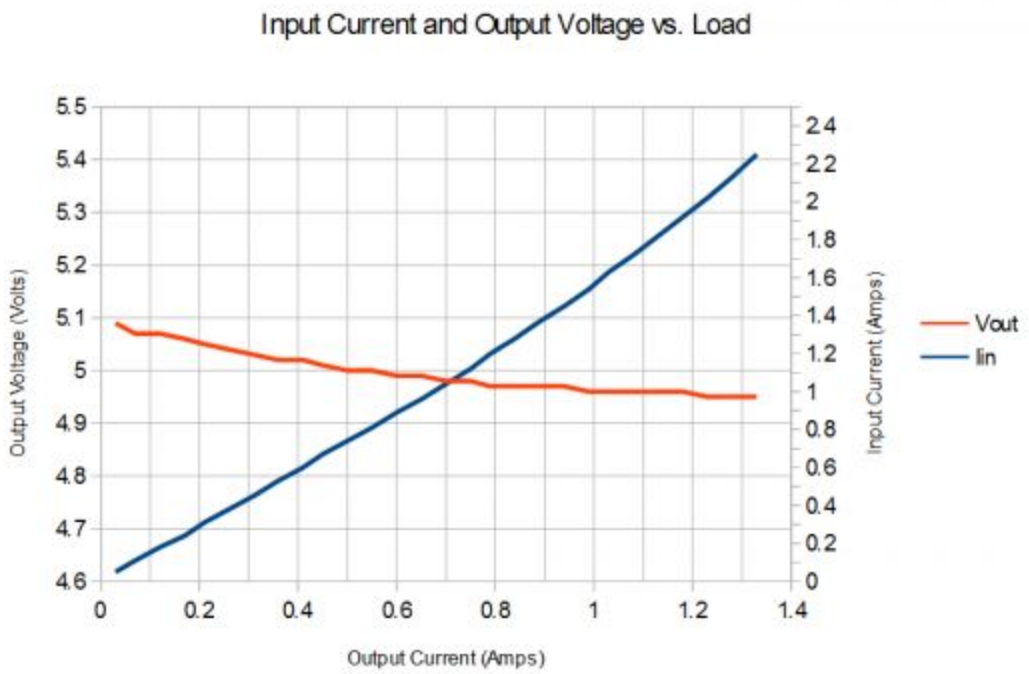
Eager to get your 5V? Just connect up to the output terminals!



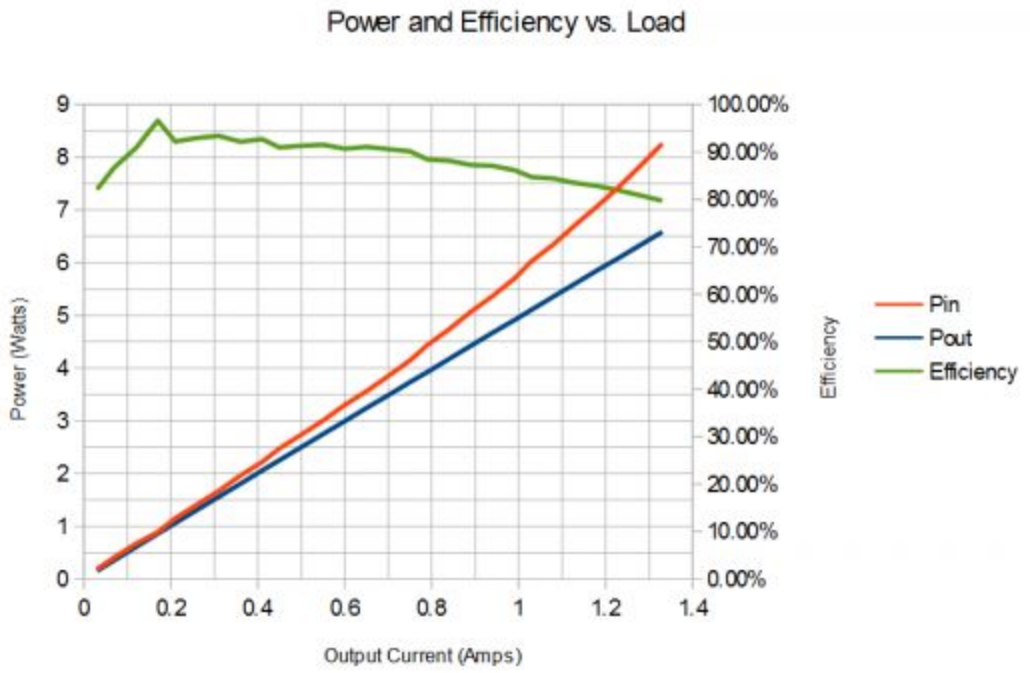
Closeup of the output terminals are marked with polarity.

But there's always more to know. An ideal booster circuit translates all input power to output power, so if the output is providing 5V @ 1A, or 5W, 5W must also be going *into* the booster. But if the input voltage is down to the battery lower limit of 3V, it will require 1.666A! With an efficiency of around 85%, it requires almost 2A on the input!

Here's a graph of the charger booster's measured performance:



Input current (right scale) and output voltage (left scale), shown as a function of output load. Notice that the output voltage sags slightly, but is pretty well regulated, and that input current is always larger than output current for a booster circuit.



Input and output power is shown (left scale), as well as overall efficiency (right scale).