PowerCell Quickstart Guide

by a1ronzo | September 13, 2012 Skill Level: ★ Beginner

Overview

The Powercell board can serve many purposes. The board is a single cell LiPo battery charger, along with an efficient regulator, that can supply 3.3V or 5V power to your project. The Powercell can also be permanently connected to your system, so that you will never need to remove the battery from your project.

This guide will go over how to charge your battery and how to add power to your system, as well as cover some of the configuration options for the Powercell.

Requirements

Here are a list of supplies you will need if you want to use the full features of this board.

- Soldering Iron w/ Solder
- micro-B USB Cable
- Powercell
- single cell LiPo battery
- Arduino or any other system that needs regulated power
- Break Away Male Headers - Right Angle
- Jumper Wires Premium 6" M/F Pack of 10

What it Does

The Powecell can act alone as a single cell Lipo battery charger, it can act as a boost (5V) or buck (3.3V) regulator for your project, or it can perform both of these functions. *No soldering required, if you are only using the board to charge your battery over USB.*

Battery Charger:

The charger on the Powercell uses the MCP73831 from Microchip and can supply up to 500mA to a single cell LiPo battery. If you charge over the micro-B USB connector, the charge current will be 100mA. You can also externally charge your battery using the pins labeled 'charge' using your own 5V power source, at 500mA.

The red stat LED indicates charge status and is ON when charging and OFF when fully charged.

There is also an under voltage lock out (UVLO) set at 2.6V with a couple of resistors, along with a jumper on the back of the board to disable the UVLO. The UVLO prevents your battery voltage from dropping too low and damaging the battery. Only advanced users should disable the UVLO.

Regulator:

The Powercell uses a TPS61200 switching regulator, from Texas Instruments, with a 3.3V or 5V output. The specifications for how much current you can use from this board are as follows:

- 5V @ 600mA max
- 3.3V @ 200mA max

The enable (EN) and power save (PS) pins are broken out and pulled high (enabled), so that you can shut off the regulator to save battery power. If you are permanently connecting your Powercell into your system, you will need to control the EN pin, so that when you are not using the system (all power OFF), the regulator can be shut down as well. You can shut down the regulator by pulling the EN pin low (GND). More information on pin functions in the TPS61200 datasheet (Resources section below).

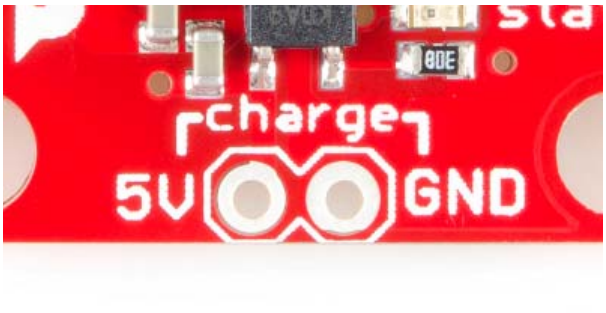
How to Use it

There are two basic circuits on this board, and each can be used independently or together. I will go over both options.

Battery Charger

If all you want to do is charge a battery, simply connect your single cell LiPo battery to the JST connector and a micro-USB cable from the Powercell to your computer, no soldering required. You should get about 500mA charge current and the red charge LED labeled 'stat' will light when charging and go off when finished.

You can also use your own 5V supply and charge over the charge pins labeled '5V' and 'GND.



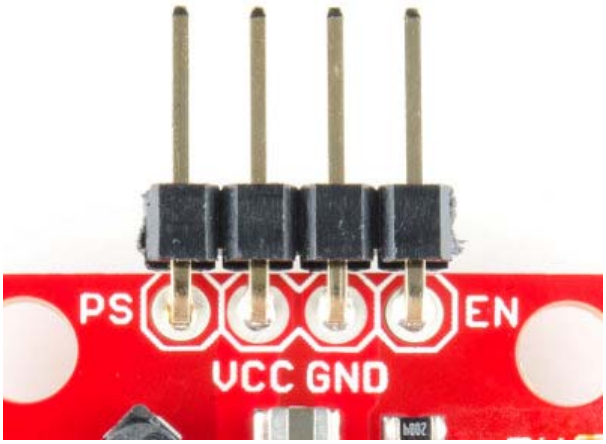
NOTE: When you are finished charging your battery, it is recommended that you remove the battery from the Powercell, since the charge will slowly drain without proper management. Or keep reading and learn how to control the charging and regulator output.

Using the Battery Charger and Regulator Together

If you want to use the regulator and charger as one system, there are a few extra things you will need to do to fully control the board and keep the battery charged. Below, we will outline an example setup. There are many other ways to do this, this is just one:

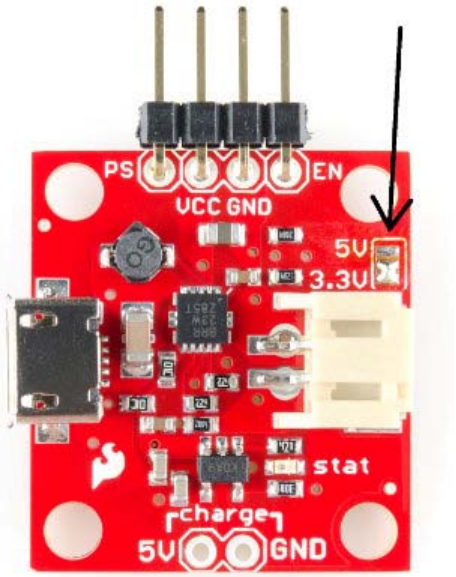
Step 1

It is highly suggested you solder your connections to the Powercell. Solder headers or wires to the 4-pin header.



Step 2

Select your output voltage.



Jumper shown above is selected for 3.3V.

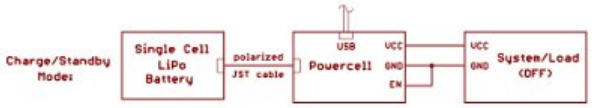
The board comes with 5V enabled (center pad and 5V connected). If you want to use 3.3V, clear the solder blob over the 5V pad and move it to the 3.3V pad (center pad and 3.3V connected). The safest way to do this is with some solder wick, or just turn your soldering iron down to a lower temp and move the solder blob with the iron's tip.

Step 3

When you connect your battery to the Powercell, you can power your system/load/Arduino with 3.3 or 5V. However, there are some control mechanisms that you must not overlook.

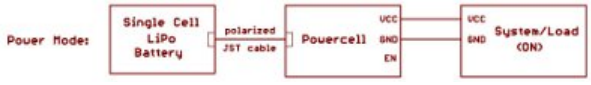
There are two main modes you can use (there are other configurations):

Charge Mode:



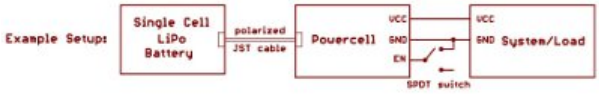
If you want to charge your battery or just let you system standby, with no power draw from the battery, you must pull the EN pin to GND (by default it is pulled high, ON). The EN pin turns the regulator portion of the circuit ON and OFF. Even if you have only your battery connected, you should still connect EN to GND.

Power Mode:



When you need to power your circuit, you can leave EN floating (no connection) or pull it to VCC. If you want to have USB charging as well, that is fine, it won't hurt anything.

Here is an example setup:



A good way to use the EN pin is to connect a SPDT switch. This way, you can turn everything OFF and ON.

Also, in any mode, you can charge the system, as long as the current draw from your system doesn't exceed the charge current. If your system is drawing more than the charge current, then you battery will just deplete and never charge.

In summary:

EN is high (VCC, default), Powercell is ON

EN is low (GND), Powercell is OFF

Troubleshooting

- If for any reason your battery will not charge and the charge LED is ON and will not go OFF, unplug your battery and plug it back into the Powercell and try to charge again.
- If the above doesn't work, then you might of drained your battery all the way past the cut-off on the battery itself. Please contact techsupport@sparkfun.com

Resources

- Eagle Files
- Schematic
- Datasheet (MCP73831T)
- Datasheet (TPS61200)