I found this 2009 blog by Russell “OddBot” that outlined the important aspects of a power supply architecture for most robotics.

Of course, one size does not fit all, but this is pretty well thought out and contains most of the key power areas a robot would need. R2D2 would be happy with this I am sure!

One thing most robots need is a power supply that can put out a reasonable amount of current for servos and other small motors as well as run a processor and sensors. Probably the best setup is 5x 1.2V NiMh cells to provide 6V for motors and servos with a low dropout regulator providing 5V for the processor and sensors.

Unfortunately this isn't always practical. Sometimes you have motors that need higher voltages or maybe the only battery you have lying around is a 7.2V battery from a RC model. In many of these cases there are ways around the problem which I demonstrated in a walkthrough on voltage regulation.

There are instances however when these solutions just won't work or will be very inefficient. In these instances you can't beat a good DC-DC converter. Unfortunately suitable DC-DC converters can be hard to find and very expensive so I've decided to build my own. I made a wish list of what I wanted:

1. Input voltage between 9V and 24V
2. Output voltage of 5V or 6V preferably adjustable
3. At least 3A of current output for driving lots of big servos.
4. Light weight / small size
5. Reasonable price

I then searched the internet for suitable controller ICs. Eventually I found the TPS5450 from Texas Instruments. This is a great little IC that can handle input voltages up to 36V and can switch currents up to 5A. It needs very few external components.

The only problem I could find was that it was a surface mount device. This was good from the small lightweight point of view but bad from the difficult / fiddly point of view. What the heck, if it works then the super small size will be great.

Designing the circuit was a snap since the datasheet included a sample that was perfect for my
needs (figure 1). I just added a pot so that the voltage can be varied between 5V and 6V.

Figure 1: Author’s power supply schematic