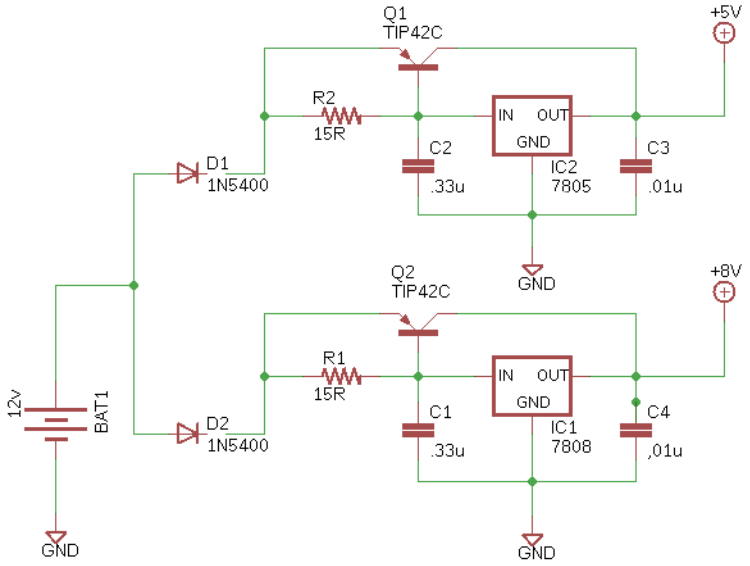
Dual Voltage Power Supply For Astrophotography

There comes a time when it's good to reduce the number of wires and boxes that are hanging around your mount. I've always used a DC/DC adapter to convert 12V down to 8V for my DSLR and another to convert 12V to 5V for my 4-port USB hub. Finally I decided that enough was enough and merged the two into a single small unit.

The idea behind this power supply is that on each output side there is a 78XX three-lead positive voltage regulator that determines the output voltage and a PNP pass transistor that boosts the available current. The 78XX series regulators can only provide up to an amp or so, and they get VERY hot at that current level. To alleviate this and to bring the total current available up I'm using an external pass transistor.

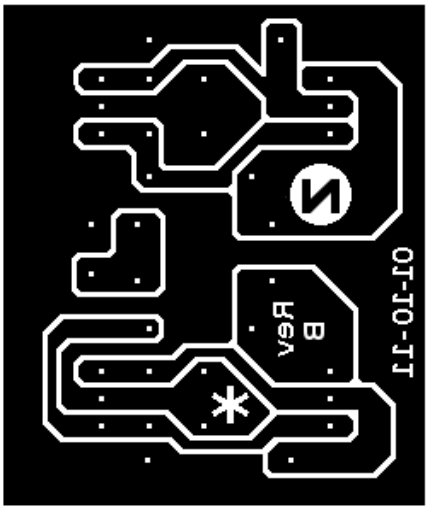
Here is a schematic of the circuit.



In the schematic the pass transistors are labeled as Q1 and Q2. I'm using TIP42 transistors here. The circuit works as follows. If the current is less than a certain level then the 78XX regulator will work as normal, but as the current is increased at a certain point the voltage across resistor R1 or R2 increases to the point that the transistor starts to turn on. This allows the regulator to determine the voltage while the transistor passes most of the current.

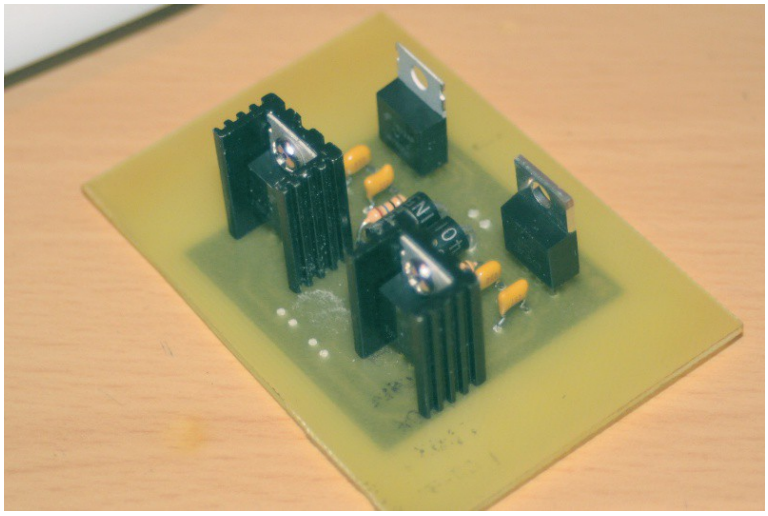
Resistor R1/R2 is determined by: R1 = .07/Imax where Imax is the maximum current you wish the 78XX to handle. I've chosen 15 ohms which leaves 50mA going through the regulator.

I used The GIMP to make a mask so that I could create a circuit board for this project. I made sure that it was small enough to fit into a Hammond 1591 enclosure which I found locally.

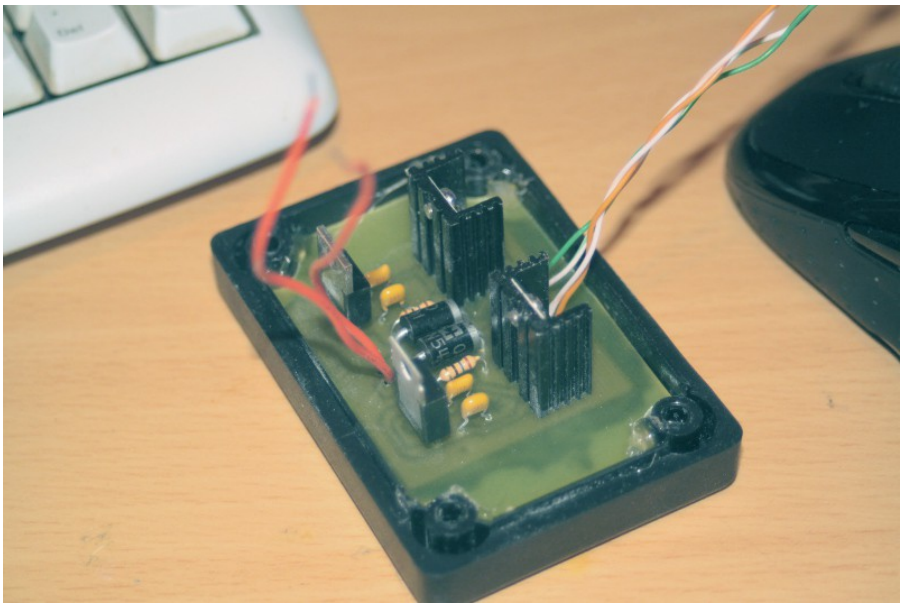


As you can see from the mask I'm not wasting etchant and only removing what copper from the board that I have to.

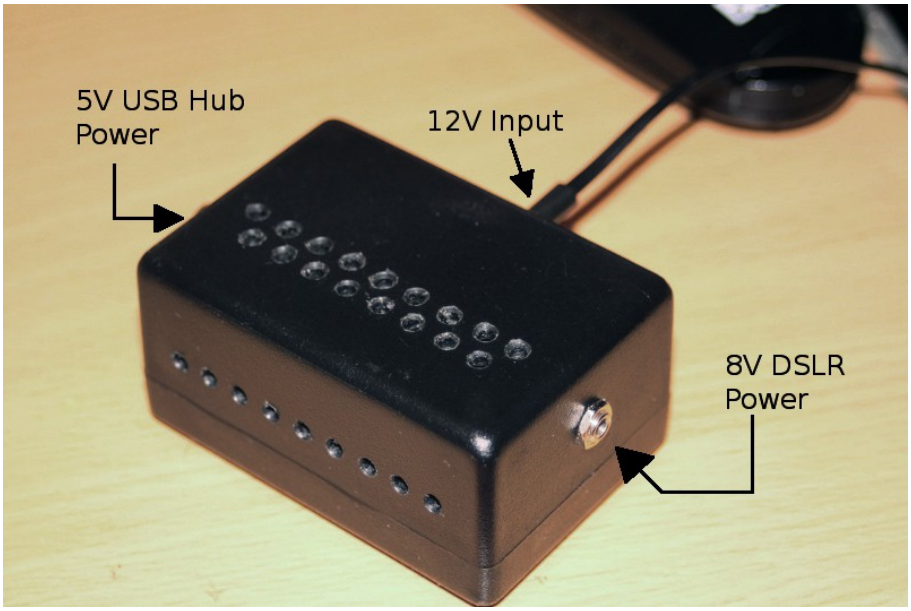
Once the board has been etched, drilled and populated brushed on a layer of lacquer to protect the copper then used my Dremel tool to fit it quite precisely to the bottom of the Hammond enclosure. There are no standoffs for the the board in this box but I put a dab of hot-glue in each corner to keep the board off of the bottom and, once fitted, another dab above the board to hold it in place. With the fit I had the second dabs probably weren't needed, but better safe than sorry.



Finished board



Board mounted in bottom of enclosure



Finished unit

The finished unit above has 1/8” cooling holes drilled along the bottom of the two long edges of the top of the enclosure and a double row drilled over top of the heat sinks on the pass transistors. The 8V side probably doesn't need a heatsink (or a pass transistor for that matter) when powering a DSLR but I might want to use it to power something else at times. I use an RCA plug for the 5V side and a 3.5mm mono phone plug for the DSLR side. This matches with the battery eliminator I use with the camera.

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