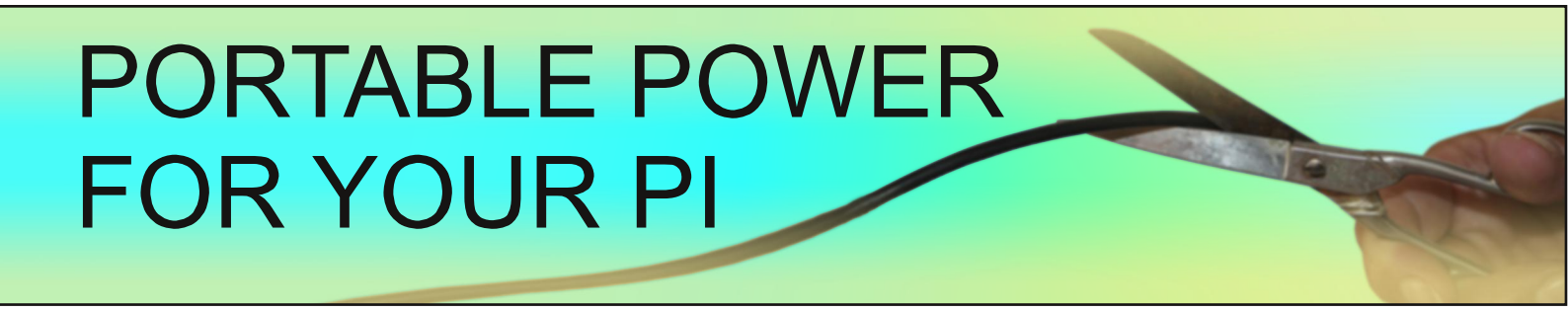
PORTABLE POWER FOR YOUR PI



Untether your Raspberry Pi with a portable power supply.

There are plenty of interesting projects that require your Pi to be untethered from its mains power supply, or require a separate 5V supply that is capable of providing more power than is available from the Pi's GPIO pins – here's one way to do this.

The main requirement is to provide suitable regulation at 5V, with sufficient current capacity for your project. Although I initially looked at the cheap and popular 7805 regulator, I rejected it because it's not very efficient – a major consideration for a battery-powered supply – and it's only capable of handling 1 Amp – as the Pi uses up to 700mA, that doesn't leave much spare for driving anything else.

I eventually settled for the LM2576T-5.0 switching step-down voltage regulator – this device is much more efficient than the 7805, and is capable of handling up to 3 Amps. It will take any input voltage from 7 – 40V DC, giving you a wide choice of battery pack - I'm using 8 x 1.2v NiMH batteries, which give a 9.6V supply voltage, but you could use a 12v lead-acid battery if that was more suitable for you. Apart from the regulator chip itself, only 4 other components are needed – 2 capacitors, a choke and a Shottky diode.

Here are the RS part numbers:

1 x LM2576T-5.0	460-477
1 x 100uF 25v electrolytic capacitor	684-1942
1 x 1000uf 25v electrolytic capacitor	684-1951
1 x 100uH choke (Min 3A Rating)	228-416
1 x Shottky Diode 40V 3A	714-6819
1 x Stripboard	206-5879
1 x Roll of Insulation Tape	513-553
1 x Heatsink (optional, see note opposite)	189-9306

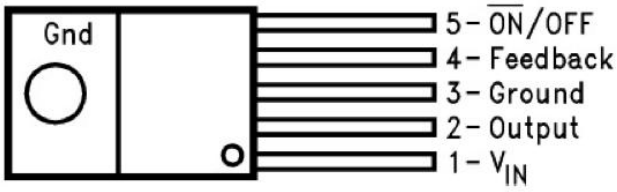
The data sheet for the regulator is here:

http://www.ti.com/lit/ds/symlink/lm2576.pdf

where you will also find the circuit details as shown in diagram, opposite.

And the connections on the regulator chip are:

5-Lead TO-220 (T)
Top View



The circuit is easily built on a piece of stripboard and no track cuts are required; an indicator LED can be added – use a 200 ohm series resistor - and I would recommend 3.25A fuses in series with the positive input and output.Take care to get the 2 capacitors and the diode the right way round.

This is what mine looks like:

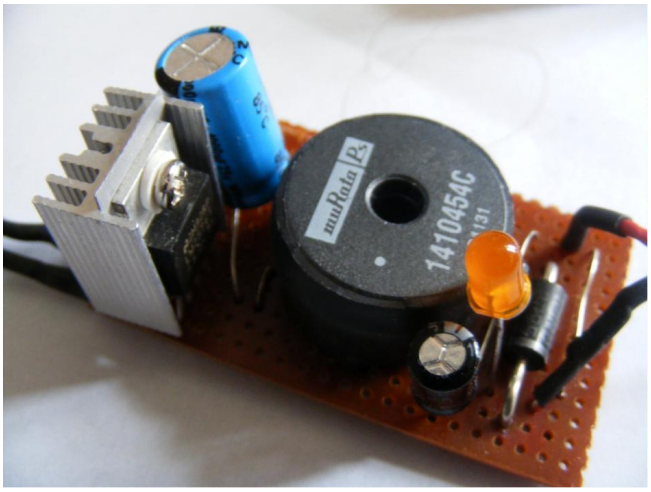
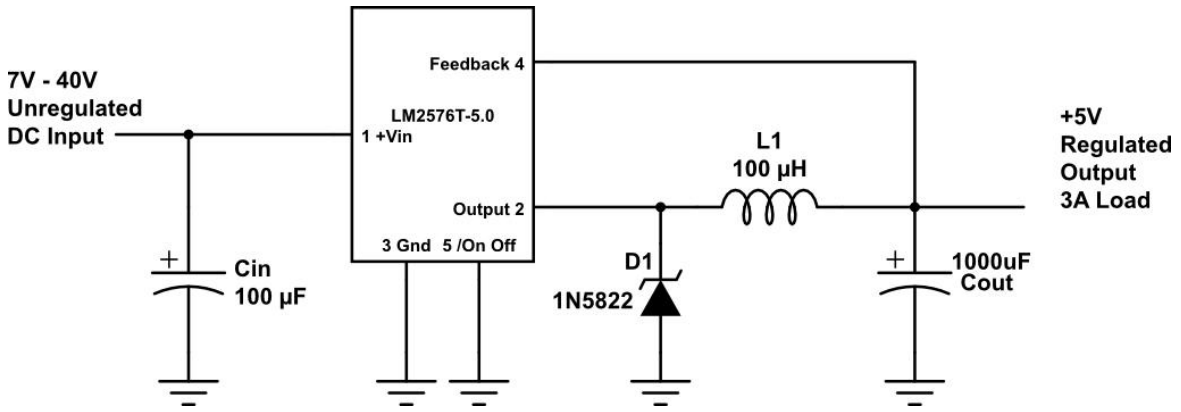
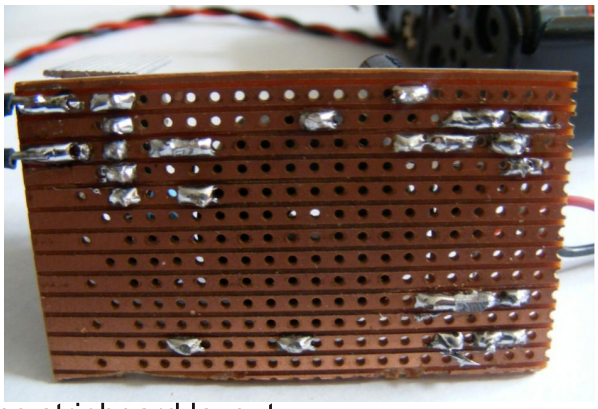


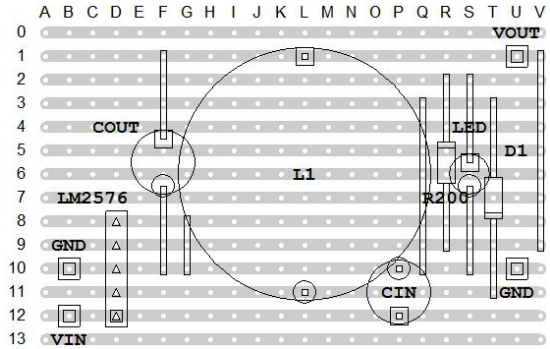
diagram 1:



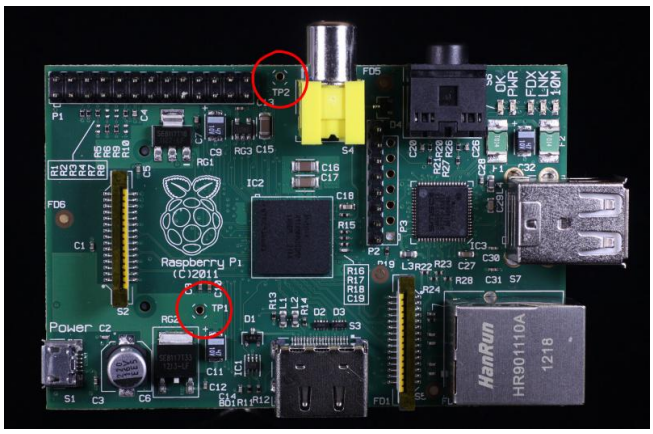
And from the underneath:



The stripboard layout:



Care should be taken to ensure that there are no short-circuits caused by solder bridging adjacent strips of the stripboard. After you have built and tested the supply, if you are going to connect it directly to the Pi, it should be connected via the 2 points marked TP1 and TP2, with the positive feed going to TP1.



The method I have shown does not utilize the micro-usb socket, this is a personal preference and to reduce costs. Alternatively, a cut-up micro-usb connector can be used, the common wire colours are as follows.

Red=5V
Black=Gnd
White=Data + (not used)
Green=Data - (not used)

Remember, the stripboard base is live, so keep it on an insulated surface, possibly use insulating tape (RS part number 513-553) or mount into plastic housing. If using housing, the unit will become warm so ventilation holes would be required to allow for cooling of the device. Remember don't try to connect a mains supply at the same time!

Depending on how much load you put on it, the regulator chip may get warm – if it's getting hot, a heatsink should be added, as I have done – there are plenty to choose from, just search on TO-220 heatsink (RS part number 189-9306).

Note that the metal tab on the regulator is connected to ground / pin 3, so either isolate the heat-sink (most are supplied with a suitable insulating kit) or keep it away from any contact with the other parts of the circuit.

Also note this regulator doesn't mean that you can take more power from the Pi's GPIO pins, any project load should be connected directly to the regulator output.

Article by John Ellerington