

Power Strip Build Guide

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Introduction

A lot of the electronic projects I build are powered by 5V phone charger power packs.

The packs have USB outputs, so I often need a way of connecting a USB micro-connector to the thing I want to power.

I want a way of turning power on and off and an LED to let me see when the power is on.

Hence the power strip.

I originally built the power strip for Anastasia the micro:bit robot but I expect to use it (and variants) for other projects.

The free build guide for Anastasia is available on-line at <https://>

I'm publishing this construction guide in case you need one too.

You'll need to do a little soldering but it's simple and fun to build.

I managed to make a mistake during the build but I've documented it so you don't have to repeat it :)

Here's a picture of the completed strip.

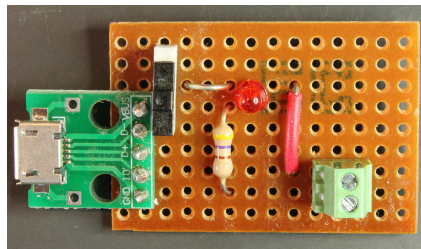


Figure 1: The final product

Design

Schematic

The power strip has a simple design.

The ground line runs from the USB connector to the ground of the terminal block.

A switch, when turned on, connects the 5 volt input to the 5 volt output of the terminal block.

The 5 volt output is connected to the anode of a LED. The cathode is connected to ground via a 470 ohm resistor.

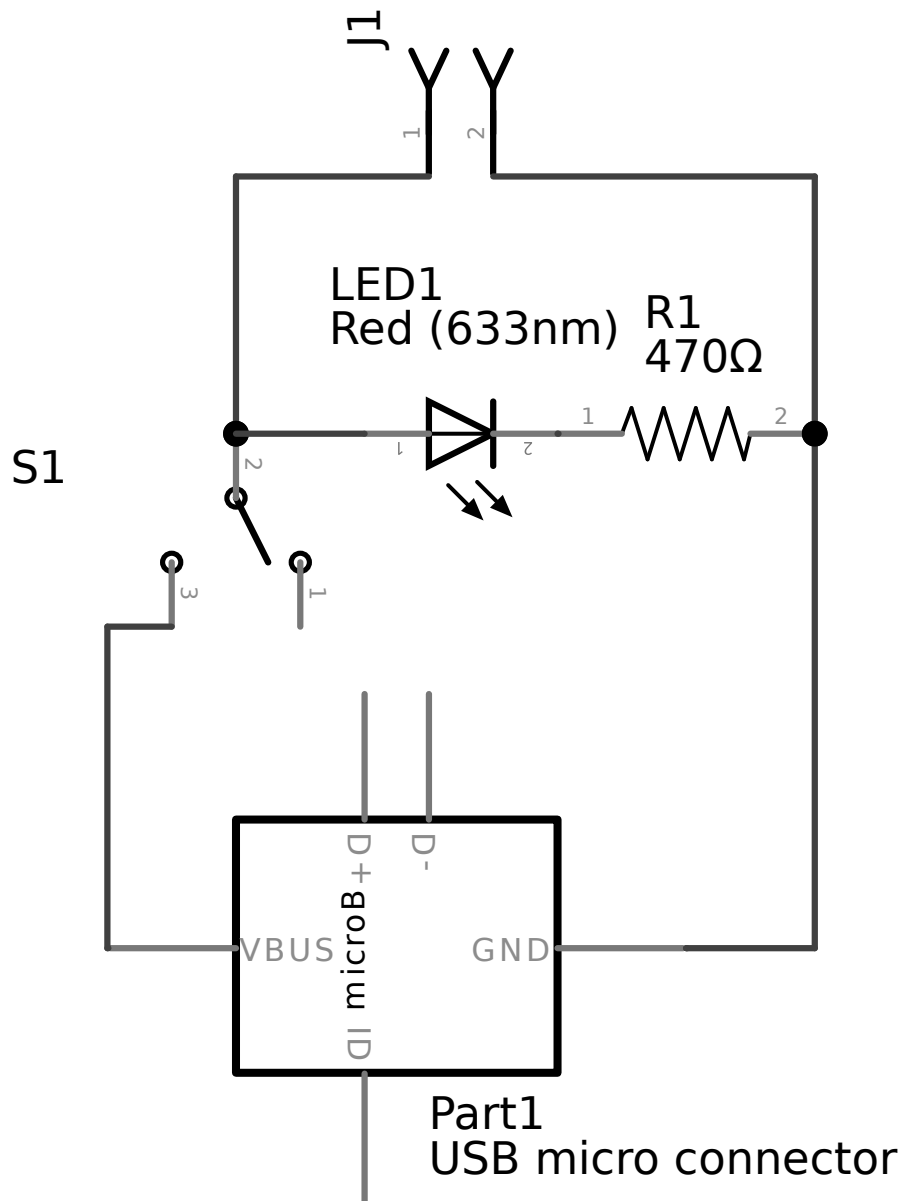


Figure 2: Schematic

Components

The components are inexpensive and widely available.

1. 2-way switch with 0.1" pins
2. USB micro to PCB connector. The original version used an Adafruit connector but I bought a small batch of unbranded connectors on Amazon. They work well and are excellent value.
3. 9x27 stripboard. This is larger than necessary. After I had finished the soldering I cut it down to size.
4. Vero pins. Some pins seem to have larger shafts which are too large to fit the holes of the USB connector. Make sure yours are small enough or use short lengths of thin wire.
5. Terminal block. Make sure you get one with 0.1" spacing.
6. 470 Ohm resistor. 5% or 10% tolerance would be fine.
7. 3mm red LED.

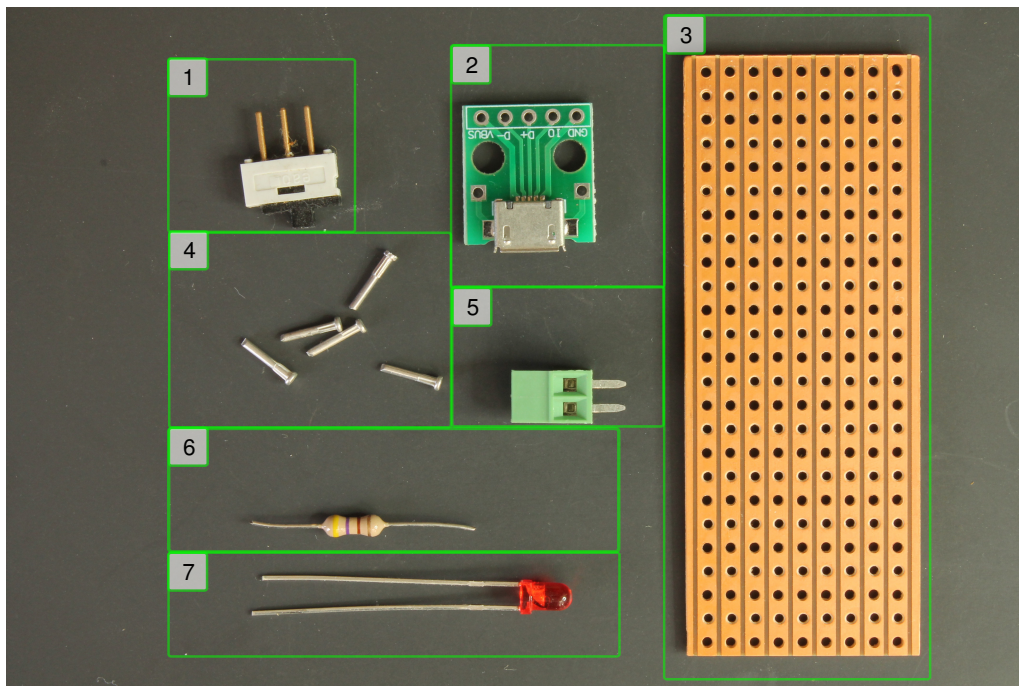


Figure 3: Components

Stripboard layout

Here's the stripboard layout, with views from above and below.

I've created diagrams that are spaced out to make it easier to see what's going on.

The actual design is a little more compact. You can see where I actually placed the components in the next section.

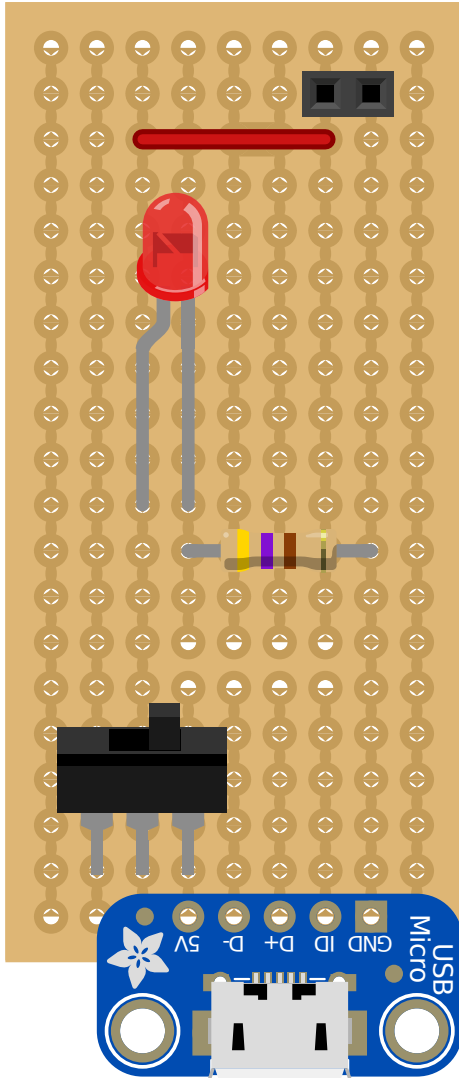
If you look carefully you will see that the design requires cuts in *four* of the copper tracks on the strip-board.

The easiest way to do that is with a tool called a spot face cutter. They are inexpensive and well worth the investment if you build a lot of strip-board based projects.

Advance warning:

When making the board I cut five tracks by mistake. You'll see more details, and how I repaired the board, in the next section of the guide.

from above



from below

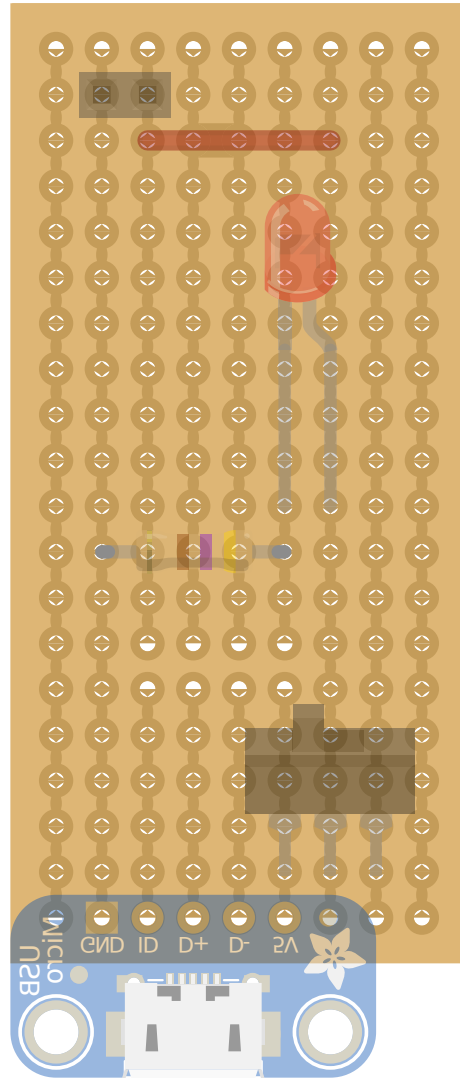


Figure 4: Stripboard layout

Soldering the power strip

I used a *Panavise Junior* to hold the strip-board while soldering.

Soldering the stripboard pins

Push the five strip-board pins into the board from below, and seat the USB connector on them from the top side of the board.

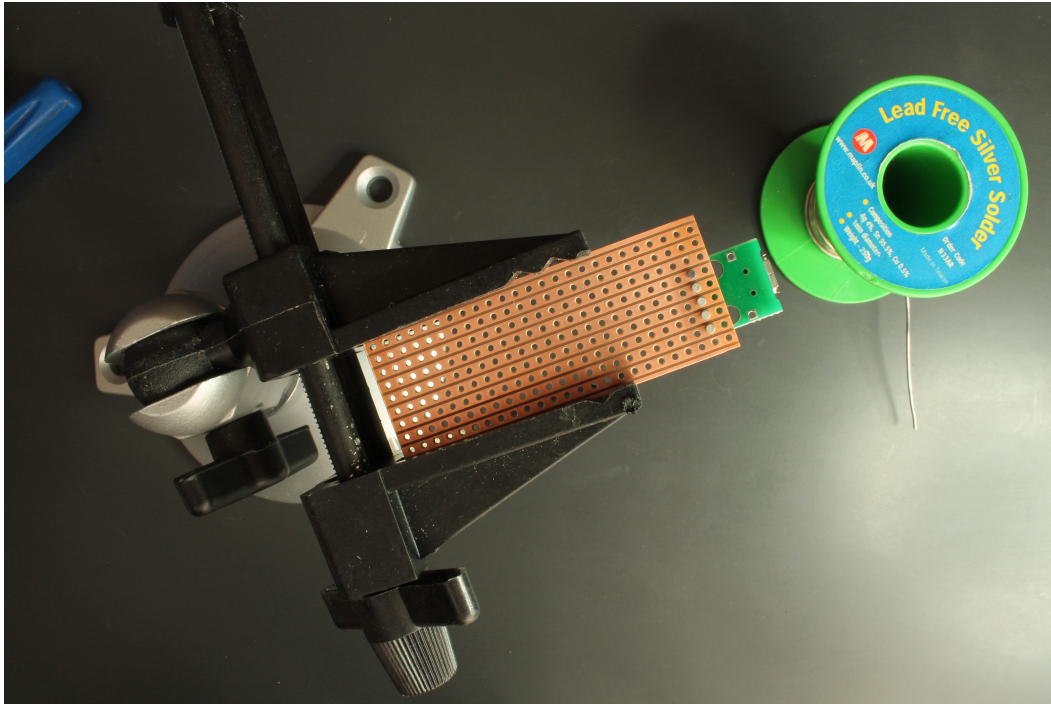


Figure 5: Soldering the stripboard pins

Pins after soldering to stripboard

Turn the board upside down and solder the pins to the strip-board.

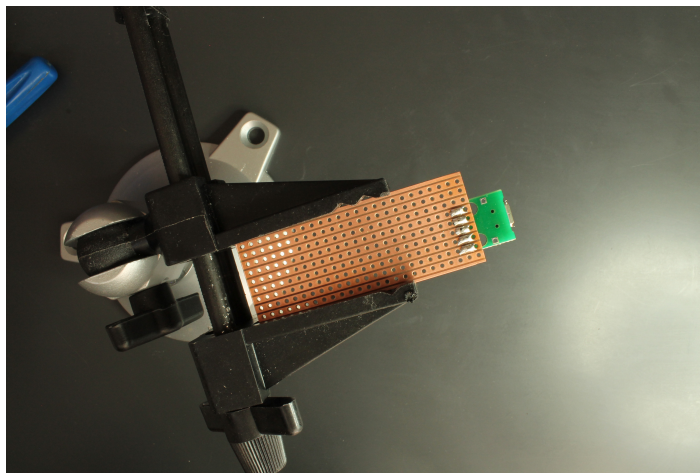


Figure 6: Pins after soldering to stripboard

USB connector soldered to the pins.

Flip the board again.

From the top side of the board, solder the connector to the pins.

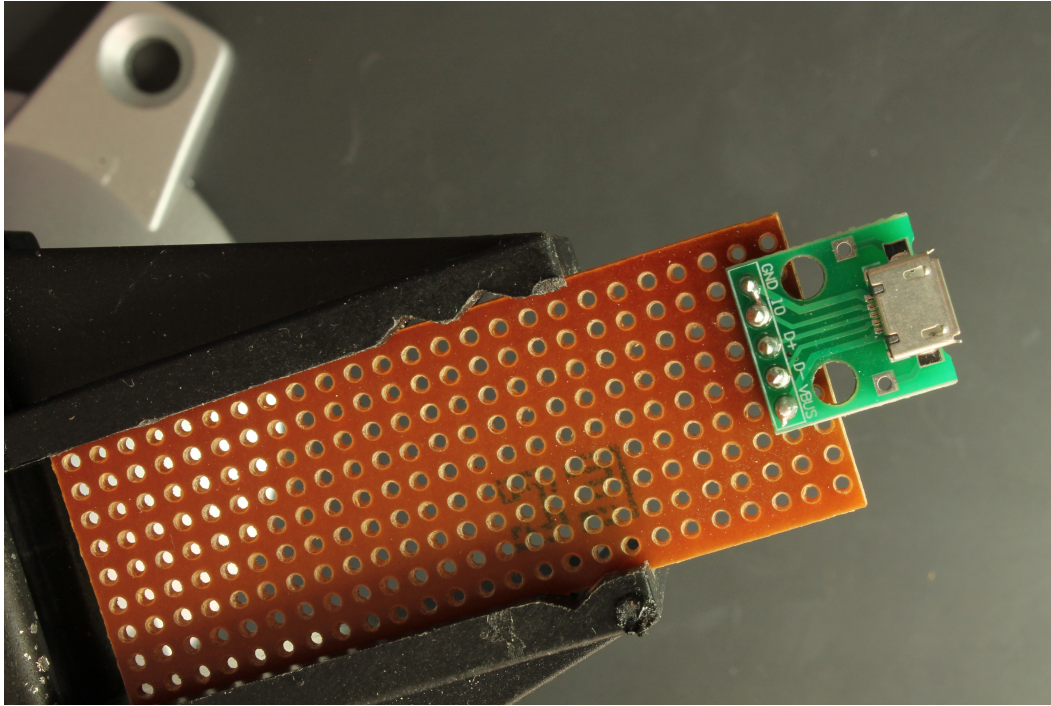


Figure 7: USB connector soldered to the pins.

Next insert the switch as in the diagram.

I used masking tape to hold the switch in place before turning the board over again for soldering.

Make sue you've inserted the switch in the right position!

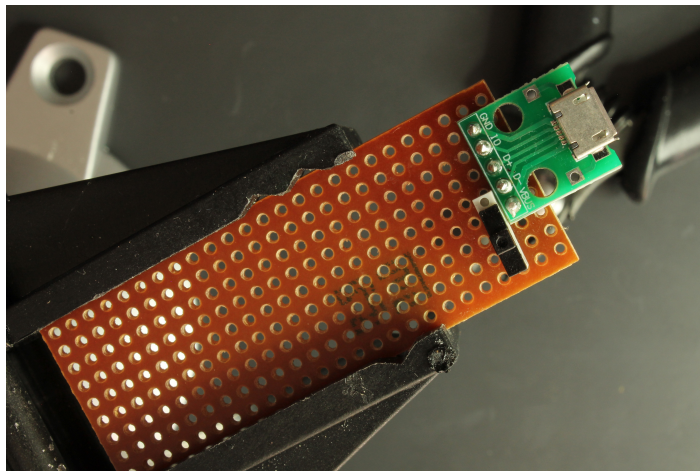


Figure 8: Inserting the switch

Switch soldering.

Solder one of the pins of the switch. Check the switch is square to the board, re-melting the soldered joint if necessary. Once you've checked the seating of the switch solder the remaining pins.

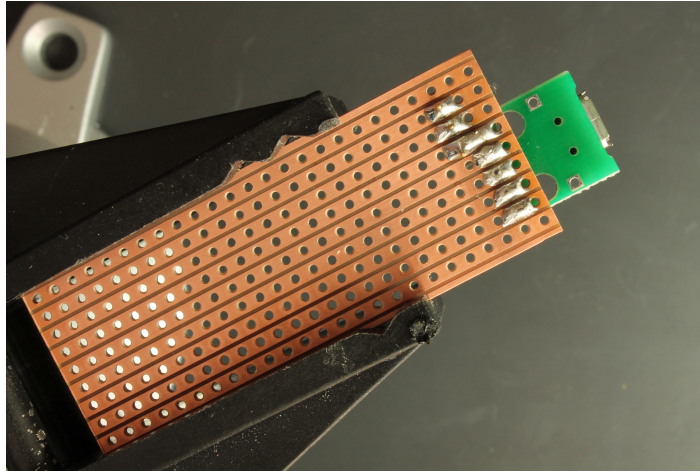


Figure 9: Switch soldering.

Cutting traces - oops!

I made a mistake breaking the strips with the spot face cutter. I cut one strip too many, but I didn't spot the error until later in the build.

You can see the four places you *should* cut in the green rectangle in the diagram below.

Don't cut the track in the red square!

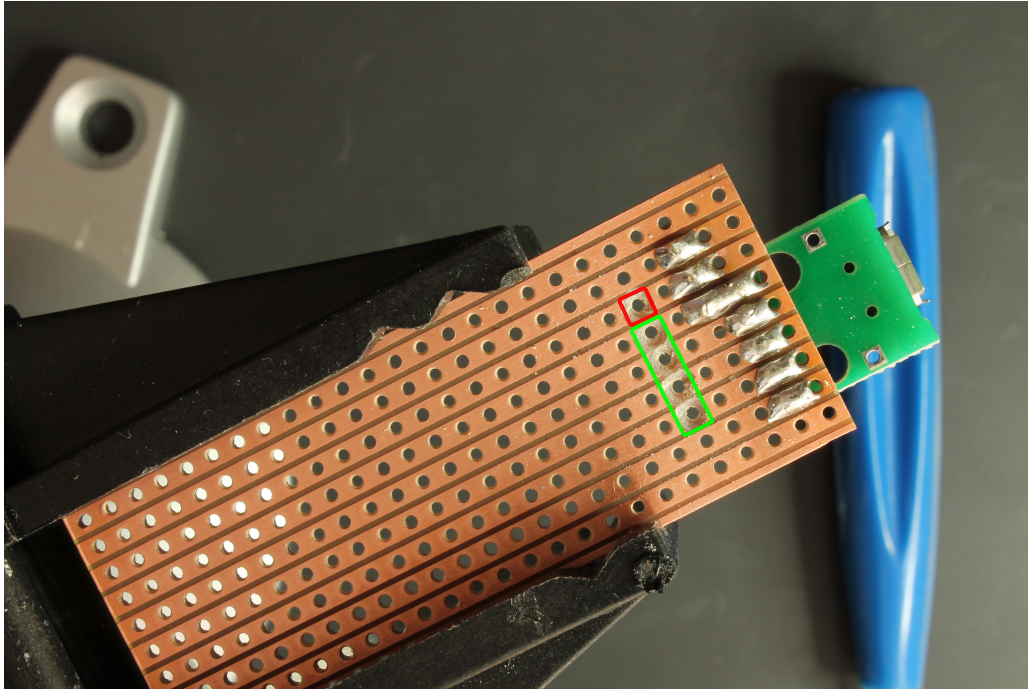


Figure 10: Cutting traces - oops!

The next component to add is the 470 Ohm load resistor for the LED.

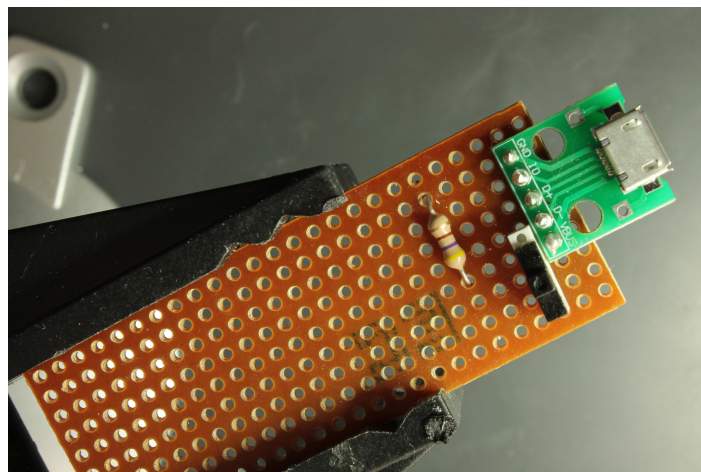


Figure 11: Adding the resistor

This lead former makes it easy to bend the leads of resistors to fit the strip-board exactly.

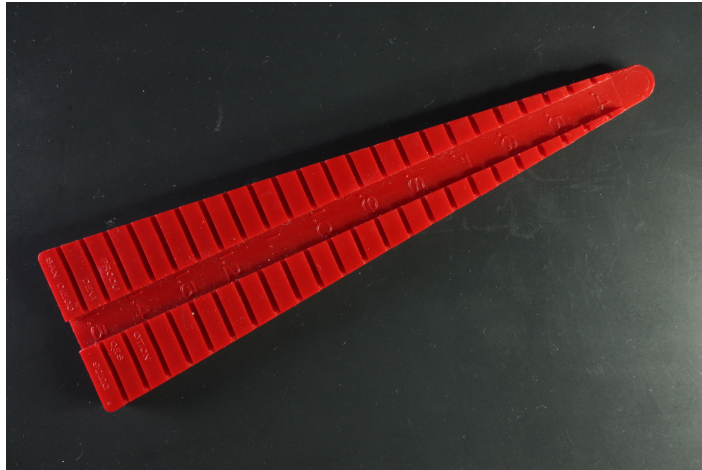


Figure 12: lead former

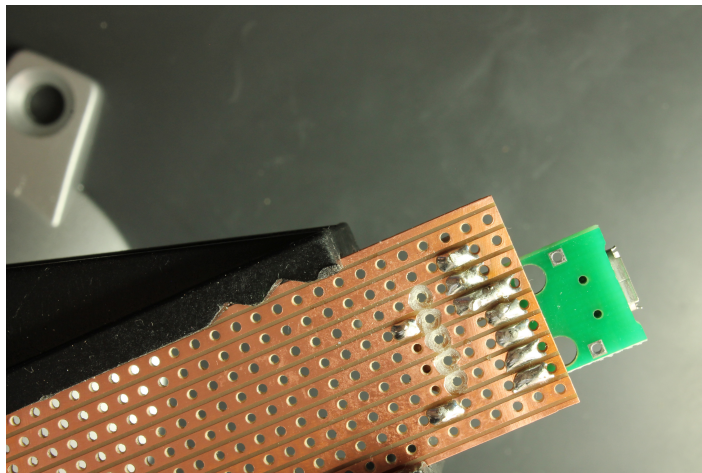


Figure 13: soldered resistor (from below)

Adding the LED

LEDs are polarised - it matters which way round you insert them.

The long lead of an LED is the anode - the positive side

I remember that by telling myself that the + leg is longer because it's plus :)

The long leg is in line with the switch and the short leg goes in line with the resistor.

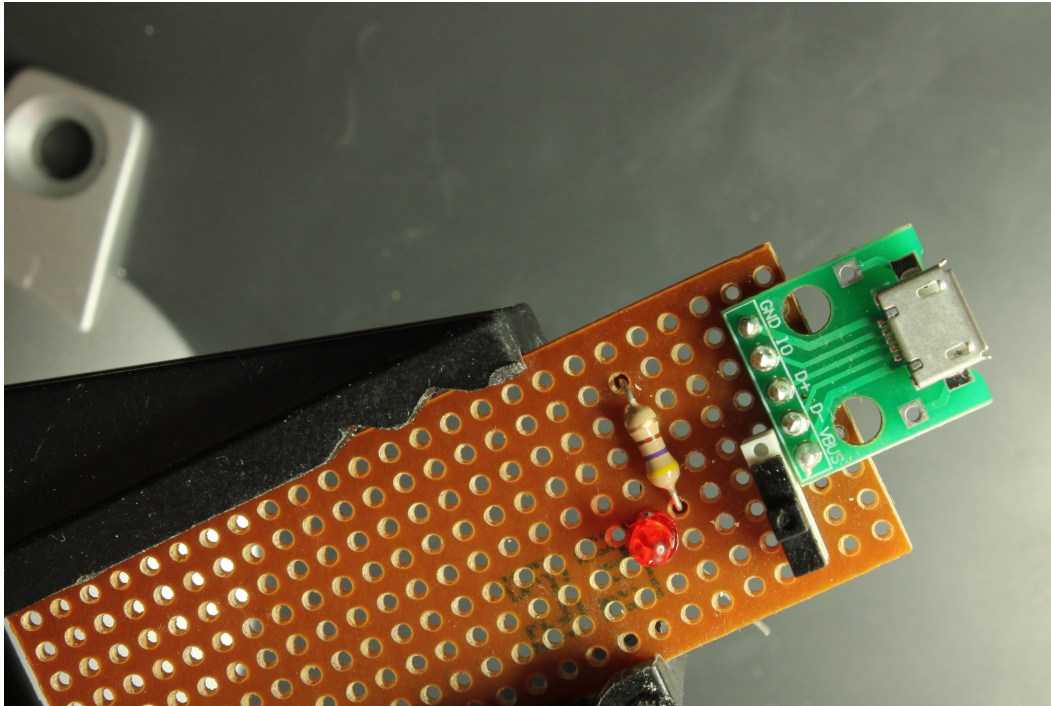


Figure 14: Adding the LED

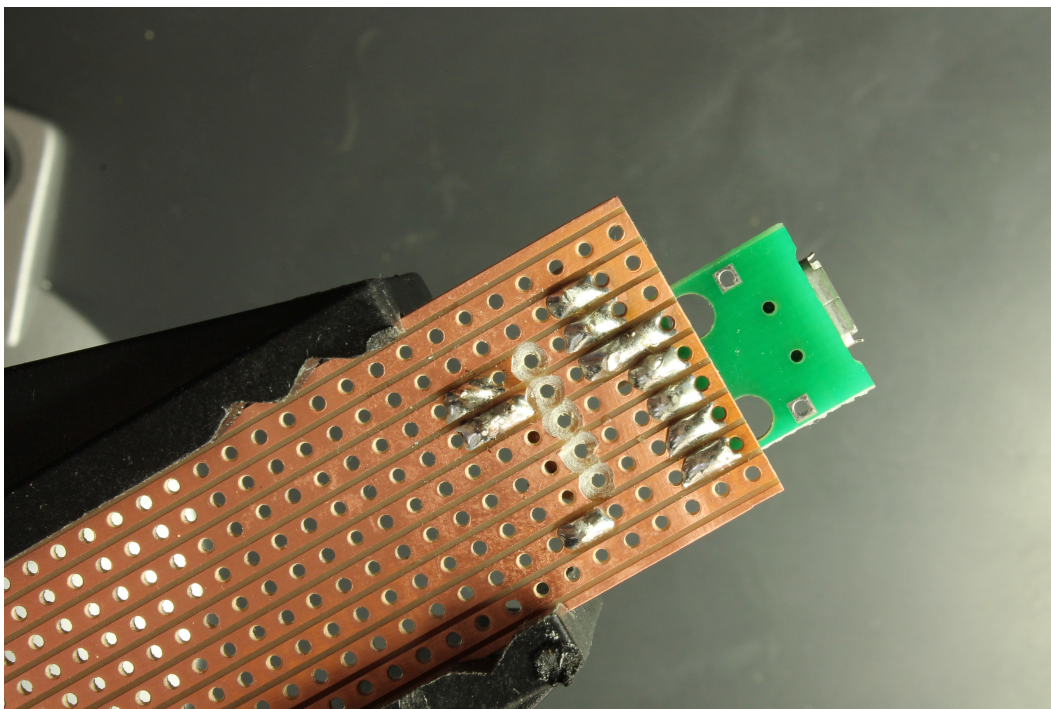


Figure 15: LED from below

Adding a wire

The red wire links the 5V supply to the 5V terminal. I used the lead former to make sure the wire was bent correctly. There's a common convention for wire colours. Red wires are live and positive.

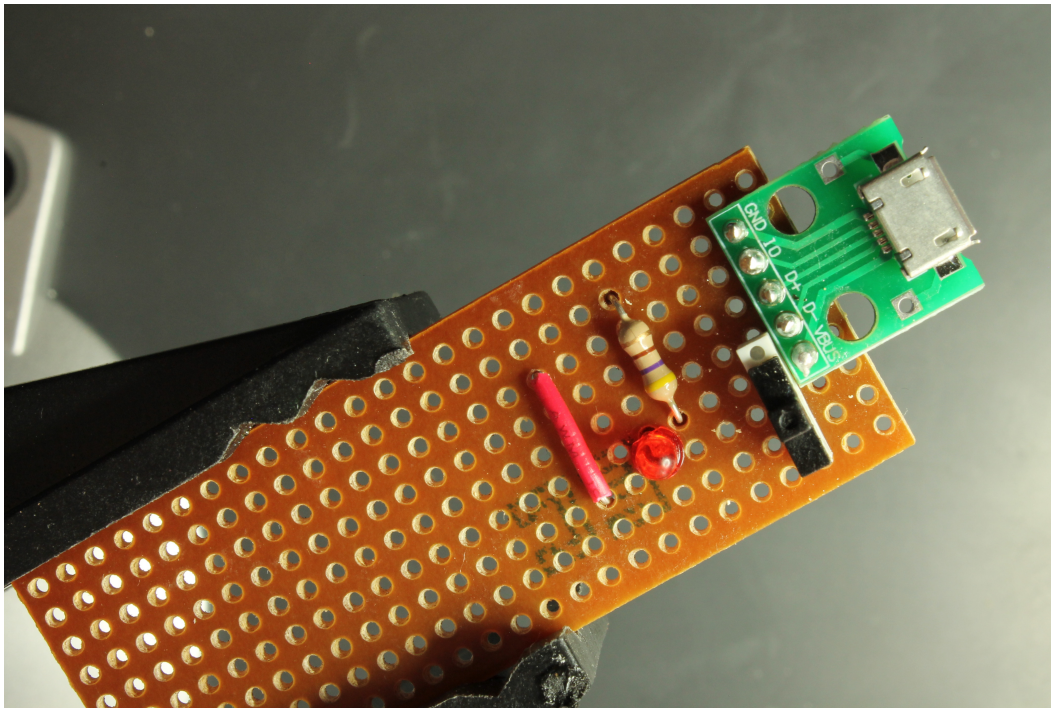


Figure 16: Adding a wire

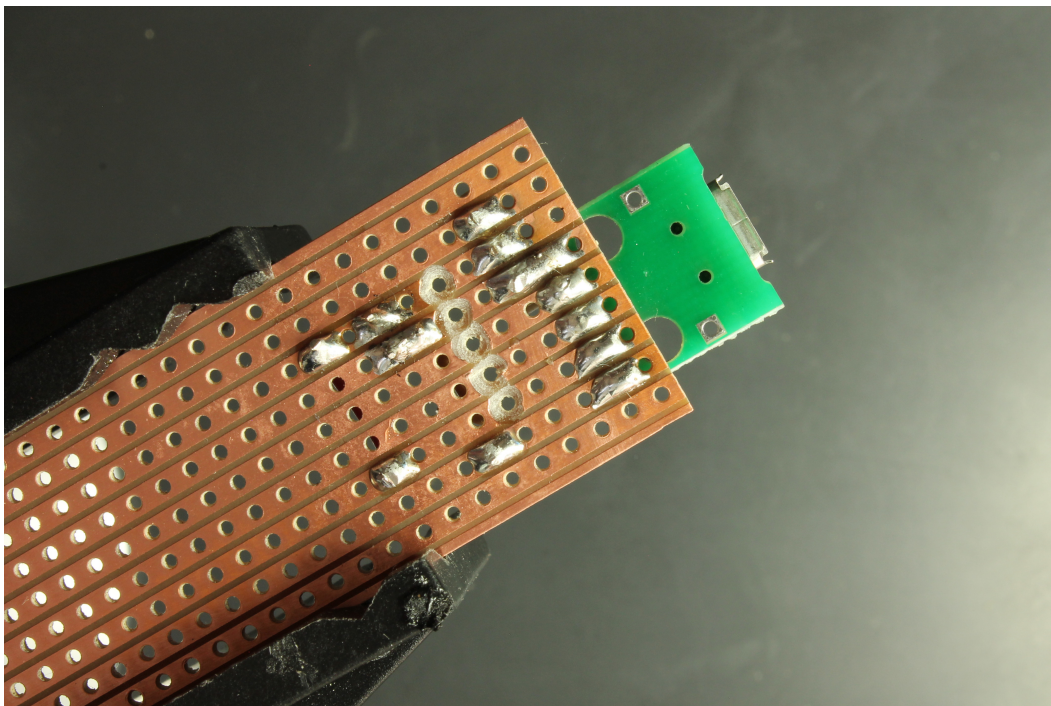


Figure 17: wire from below

You're almost finished! The terminal block is the last component to add.

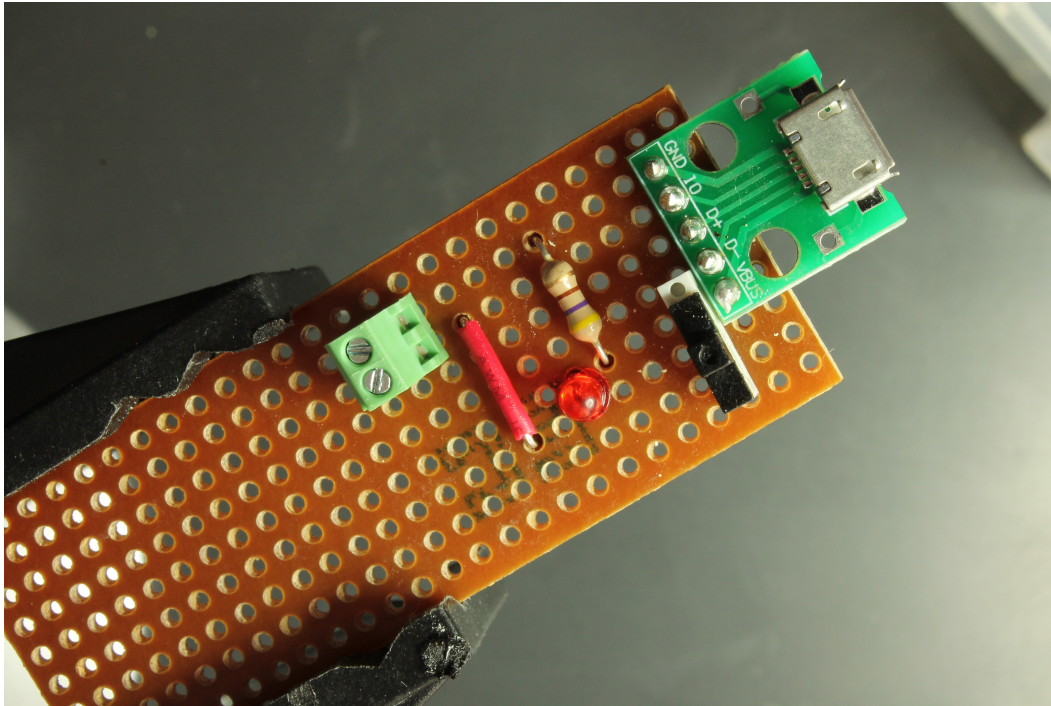


Figure 18: Adding the terminal block.

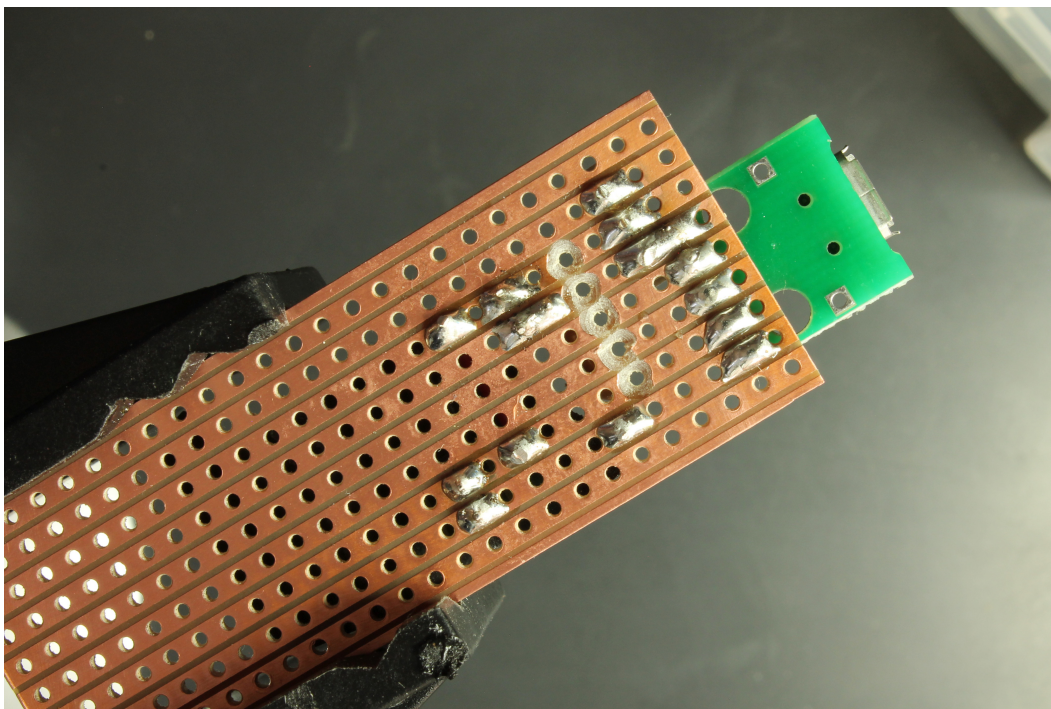


Figure 19: terminal block soldered in place

Repairing my mistake

You don't need to do the next steps which document the repair I had to make after I cut the extra trace by mistake. I added a loop of wire to bridge the cut. You can see it here.

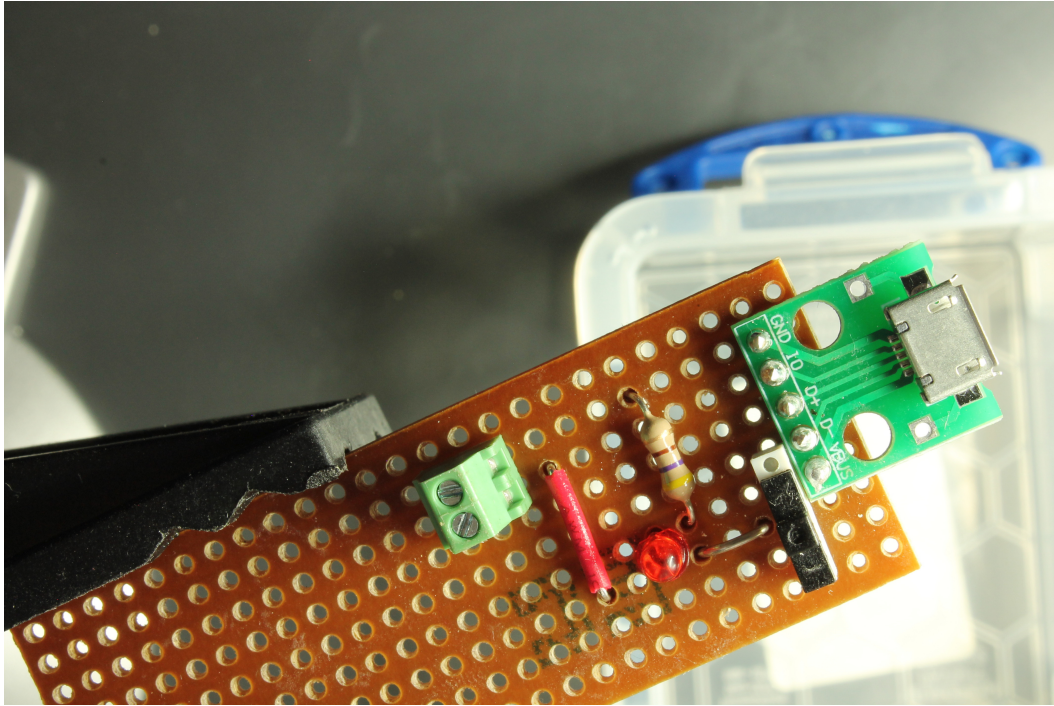


Figure 20: Repairing my mistake

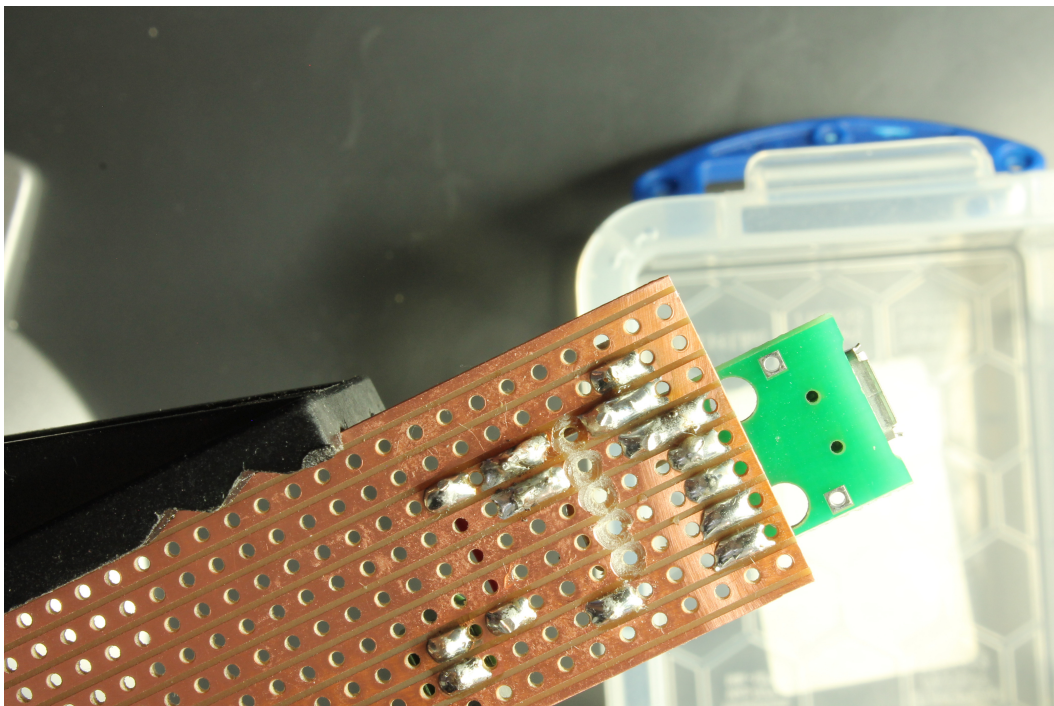


Figure 21: soldered bridge

Time to test!

I've inserted a USB micro power lead into the USB socket.

With the switch in this position the power is off so the LED does not light.

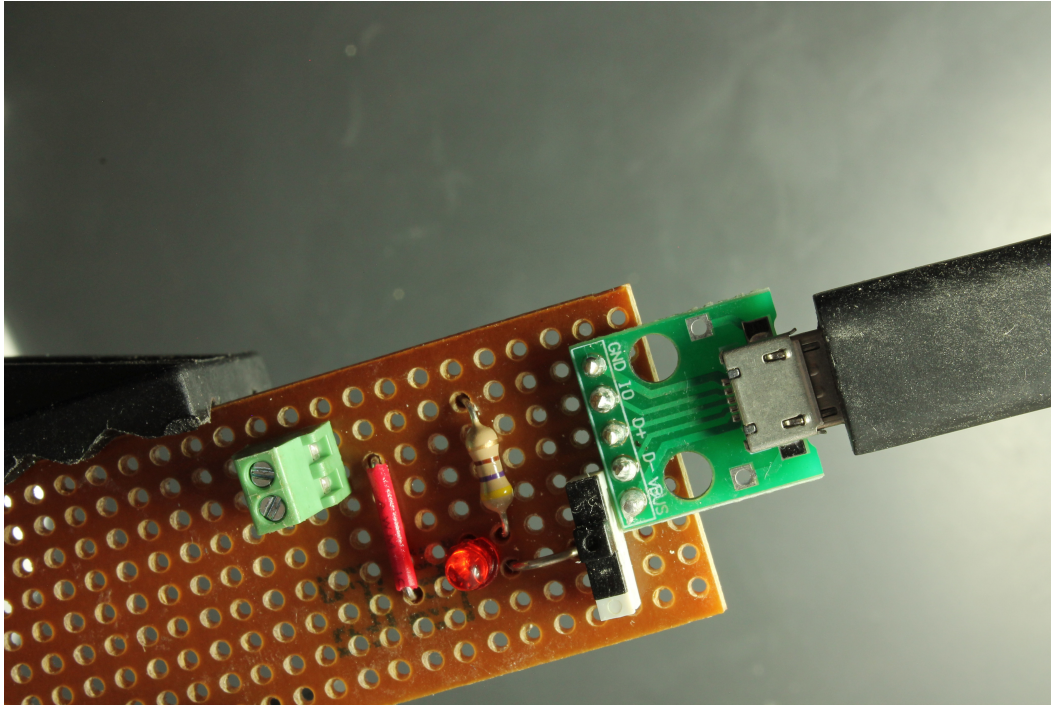


Figure 22: Time to test!

If you flip the switch the LED should light telling you that the power is on.

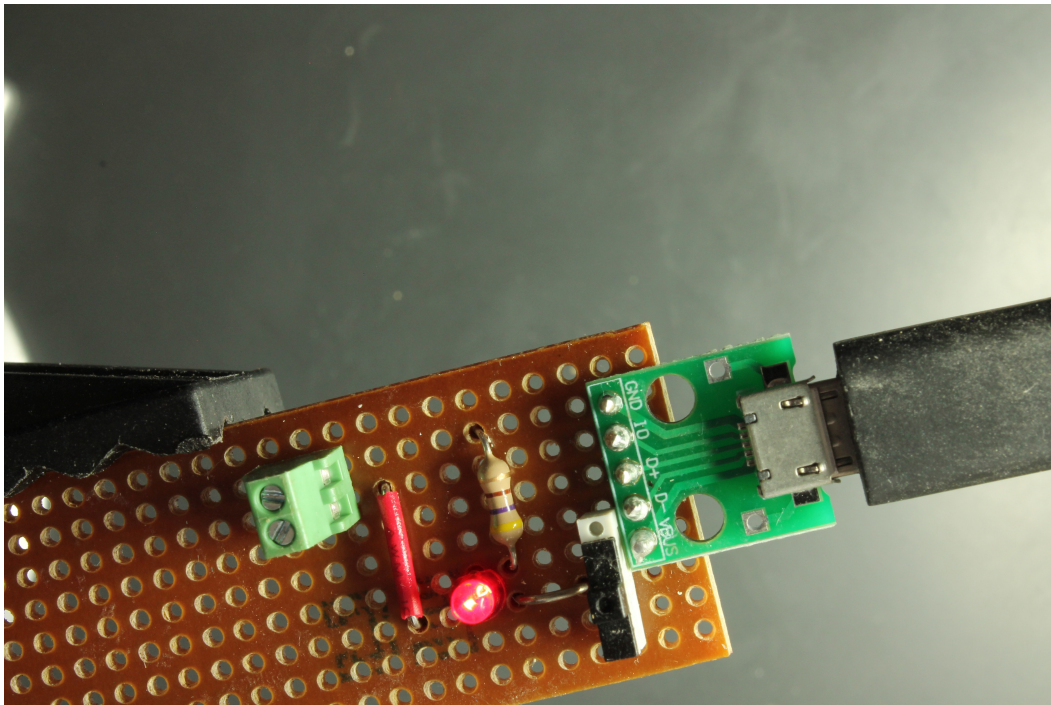


Figure 23: Power and LED on

Trimming the board

After I'd finished soldering I cut the unused area off the top of the strip-board and filed the edge smooth.

About the Author

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Appendix

About the Author



Figure 24: Romilly Cocking

Romilly Cocking has been programming computers since 1958!

He has been programming in Python for almost 20 years.

Now in his 70s, he still loves learning and sharing what he's learned with others. He's written several books about single board computers and physical computing

He's a contributor to several Open Source projects, and in 2012 he founded Quick2Wire, a start-up that made add-on boards for the Raspberry Pi.

He's a regular presenter at the London-based [Raspberry Pint meetups hosted at Microsoft Reactor London](#).

You can read his [blog](#) about Raspberry Pi, AI, Robotics and Electronics.

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