Building the Ruxcon 2015 Hardware Hacking Badge

Building

Step 1 – Prepare the board

Apply flux and a thin coating of solder to the exposed pads on the board. Try to keep this fairly thin to allow for components to lie flat. Check that no shorts between pads are made using a multimeter on continuity mode.

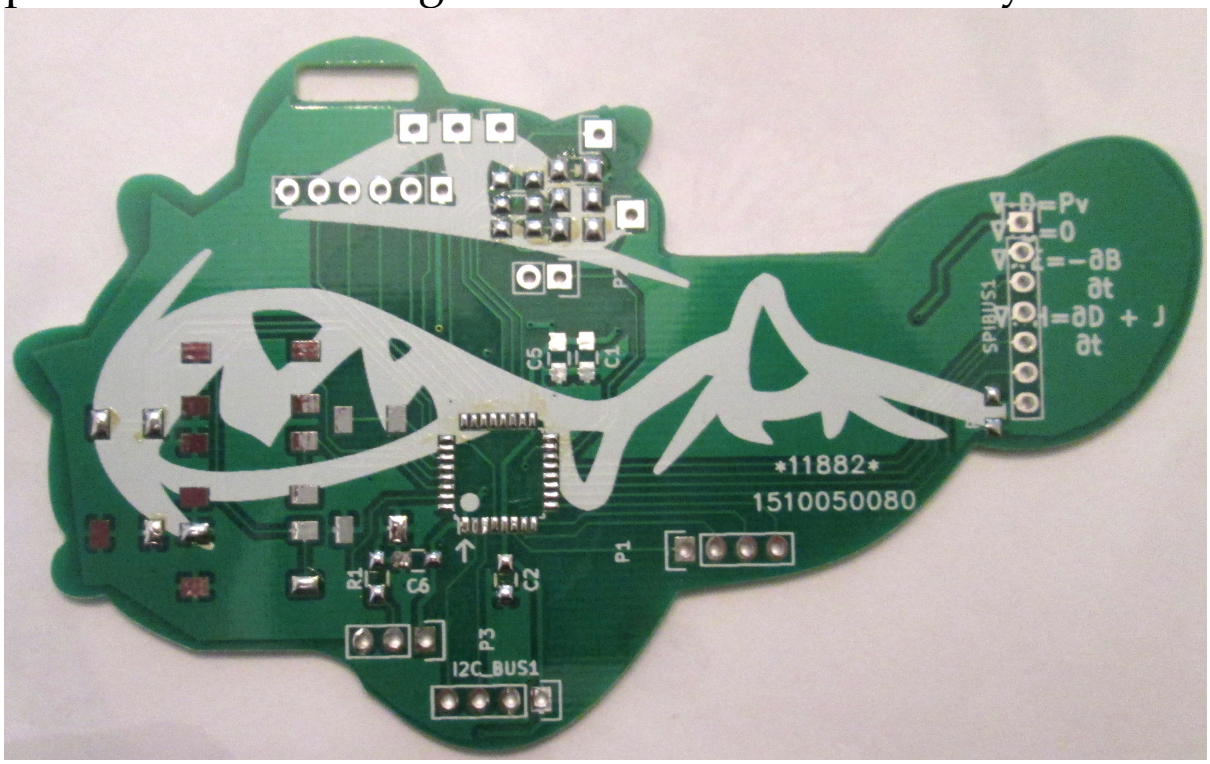

Figure 1 - Soldered pads

Step 2 – Soldering the processor

Carefully place the STM32 processor onto the board.
Align the processor up with the dot and ensure that the individual pins are aligned with the pads below.
Use a hot air gun to carefully reflow the solder taking care not to shift the processor.
Allow the solder to cool then use a fine-tipped soldering iron to go over the individual pins to ensure a good connection

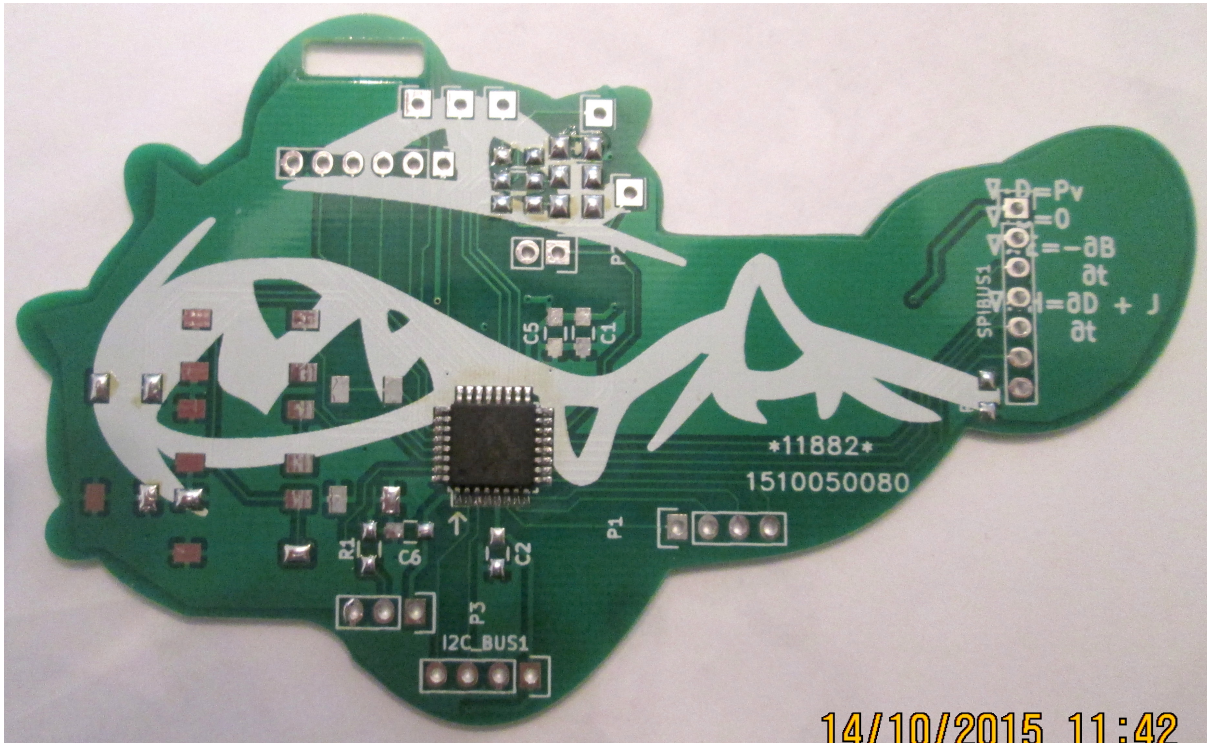

Figure 2 - Processor Placed and soldered

Step 3 – Placing the LED resistors

Place the 470 ohm LED resistors onto the pads and use a hot air gun to reflow the solder. Again use a thin tipped soldering iron to ensure good connections.

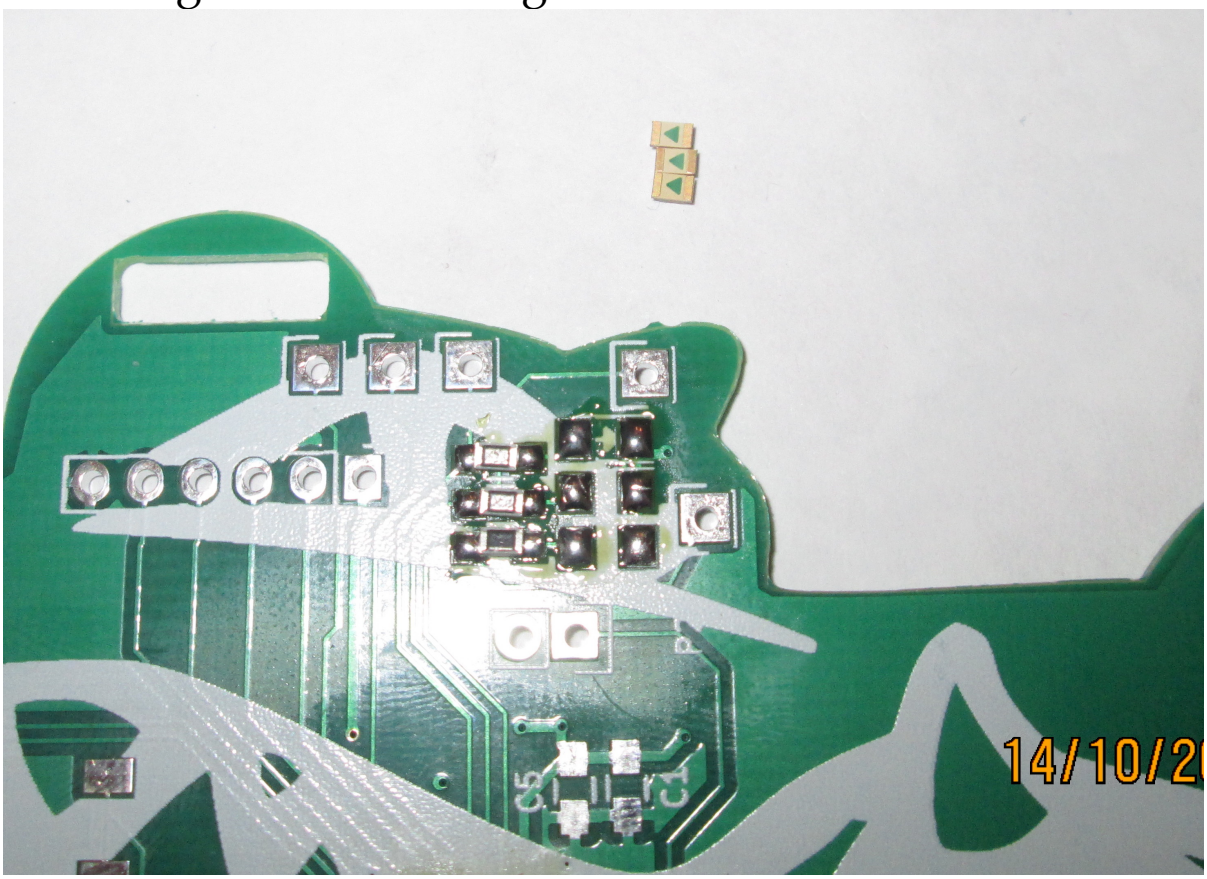

Figure 3 - LED Resistors Placed

Step 4. LED Placement

Place the LEDs onto the pads above. The arrow under the LEDs must be placed facing left. Take care to not overcook the LEDs

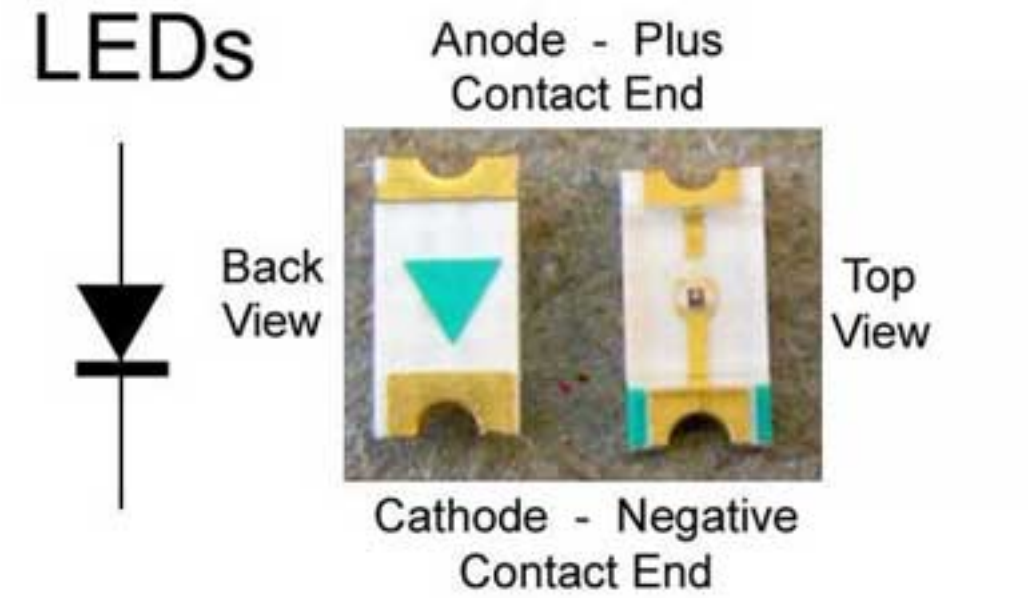

Figure 4 - LED Polarity

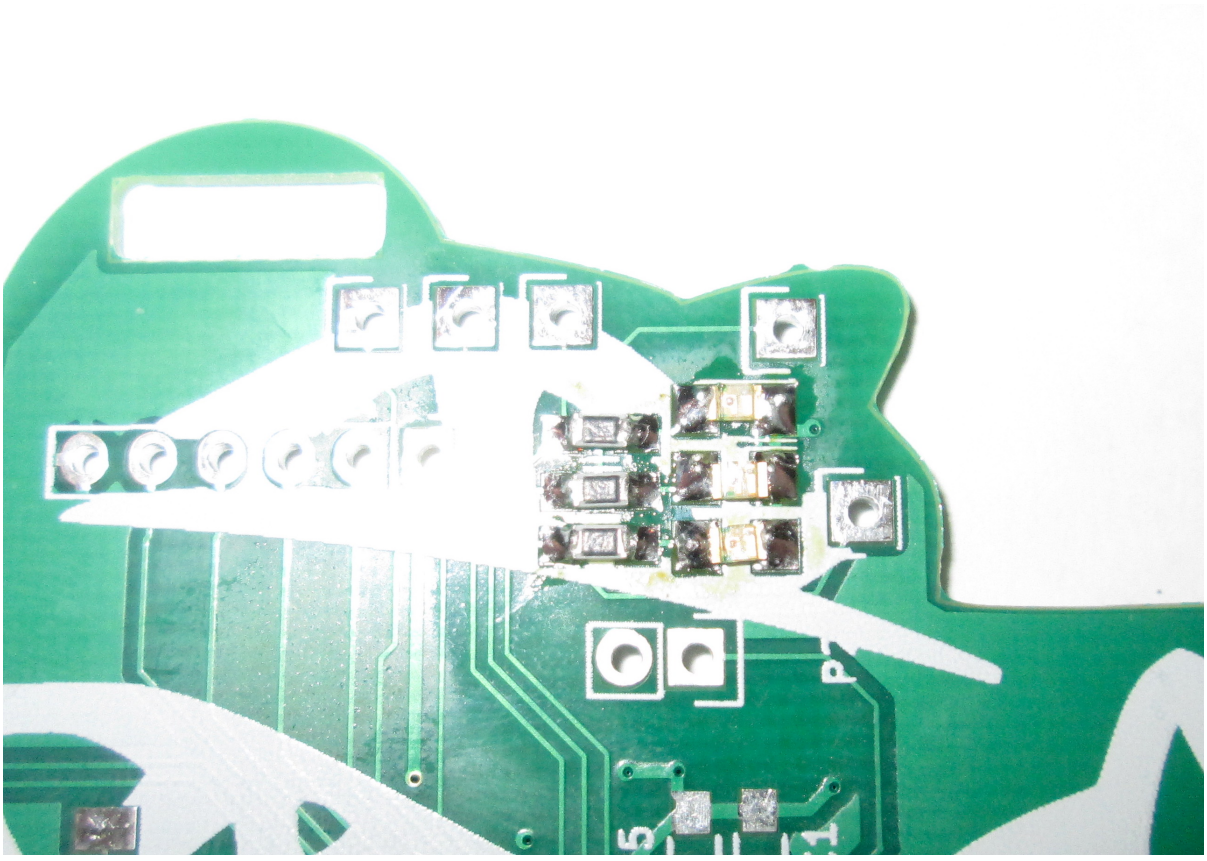

Figure 5 - LEDs soldered

Step 5. 100k ohm Resistors

Place the 100k ohm resistors in the places indicated. Use the same techniques as above to solder.

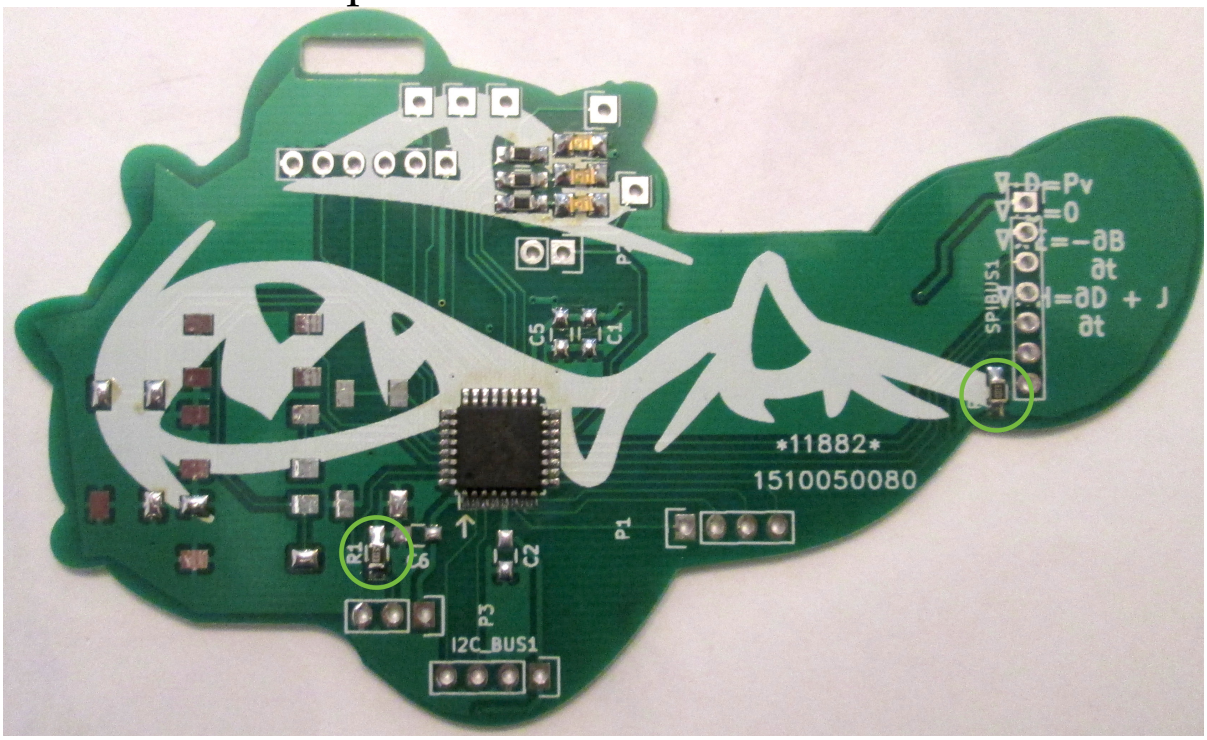

Figure 6 - 100k resistors soldered

Step 6. Placing 0.1uF Capacitors

Place the 0.1uF capacitors on the pads indicated.

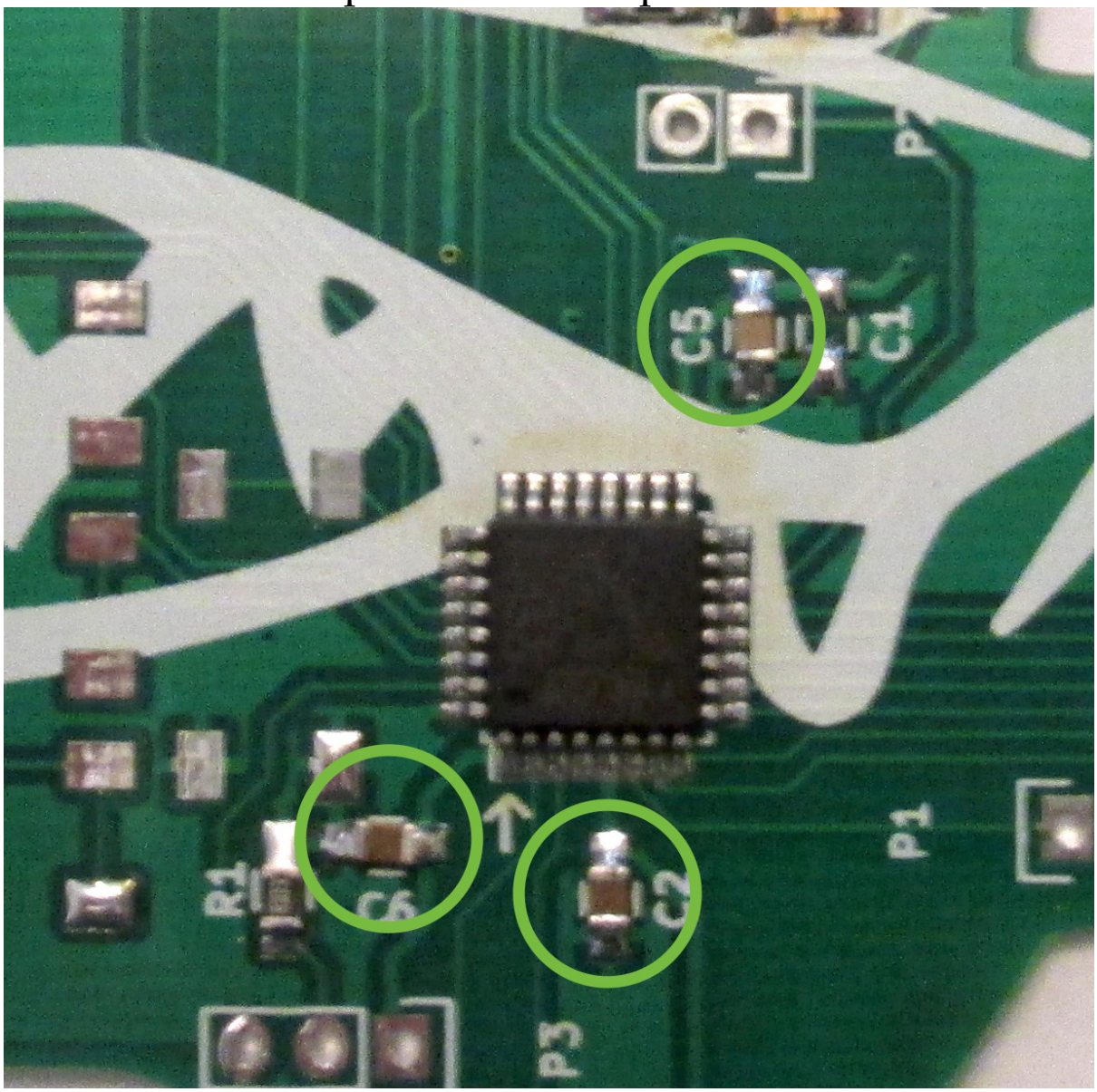

Figure 7 – 0.1uF Capacitors Placed

Step 7. Placing the 1uF capacitor

Place the 1uF capacitor in the place indicated

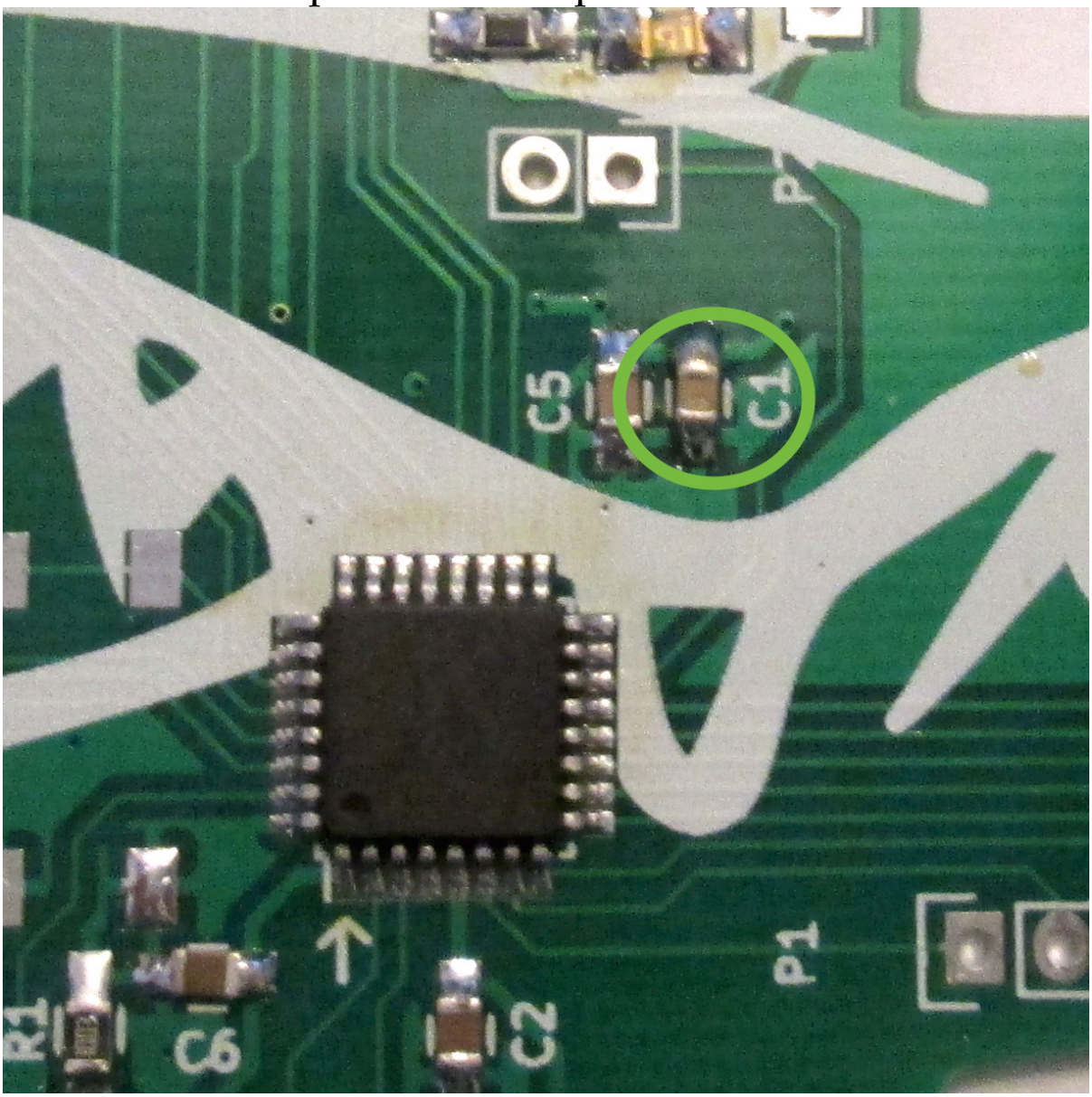

Figure 8 - 1uF Capacitor

Step 7 (Optional) Enabling the I2C bus.

Because the designer don't reed datashet propa – the i2c bus as indicated on the PCB is not actually connected to an i2c peripheral on the chip. So we have to turn to 'bodge' wires to connect it up.

Cut and tin two ~1 inch long wires.

Solder one wire to the "UP" switch contact and the other end to the left-most pin (blue wire in the photo) , and the other to the "enter" switch contact and the second from the left (green wire).

Alternatively, just read the datasheet and find another i2c port to use!

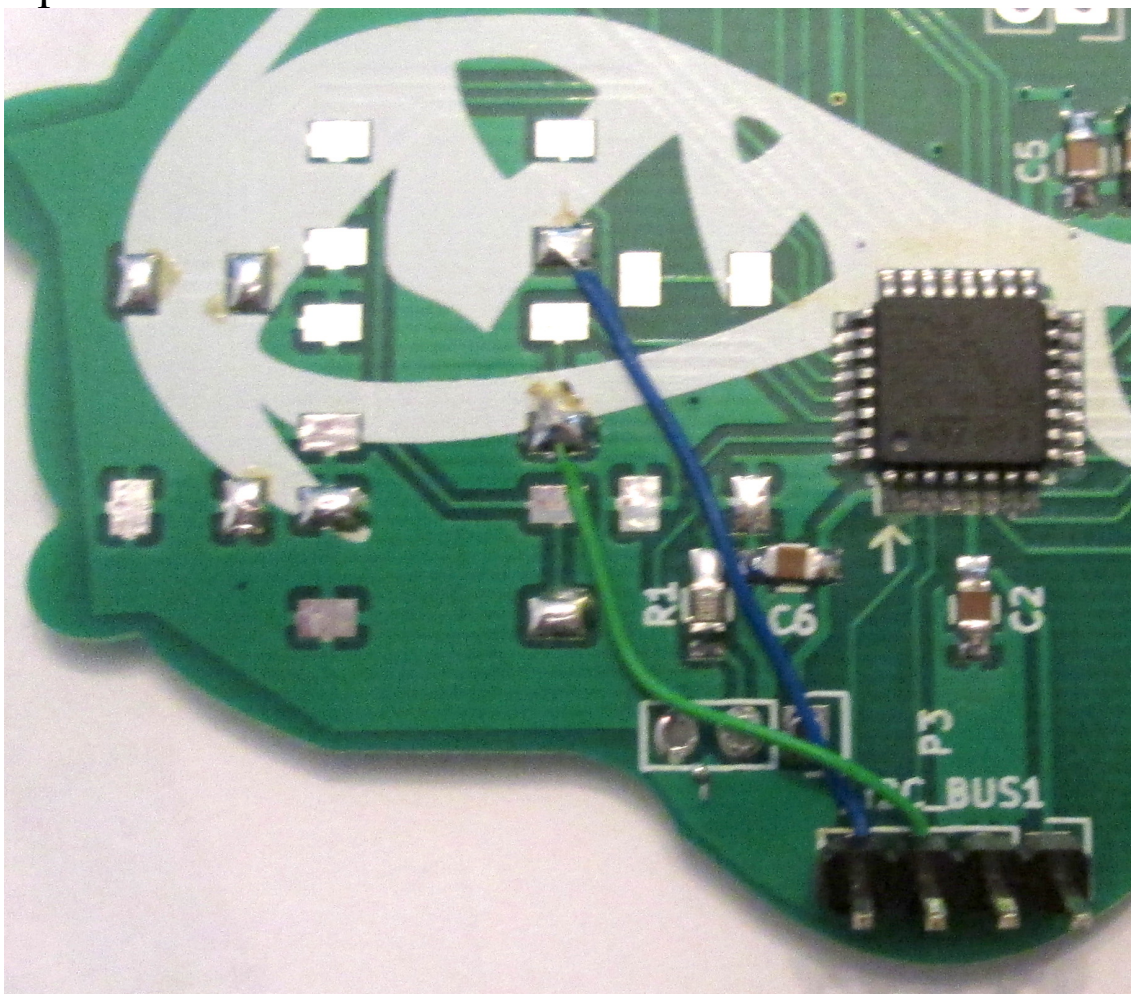

Figure 9 - I2C bodge wires

Step 8 (Optional). Placing switches

Again the "designer" of the board didn't read the switch datasheet properly (or possibly just did this on purpose); the current switch contacts on the board are shorted together if you connect them all together.
To solve this vexing issue – just clip the Top Left and Bottom Right (or alternatively Top Right and Bottom Left) off the switch to fix.

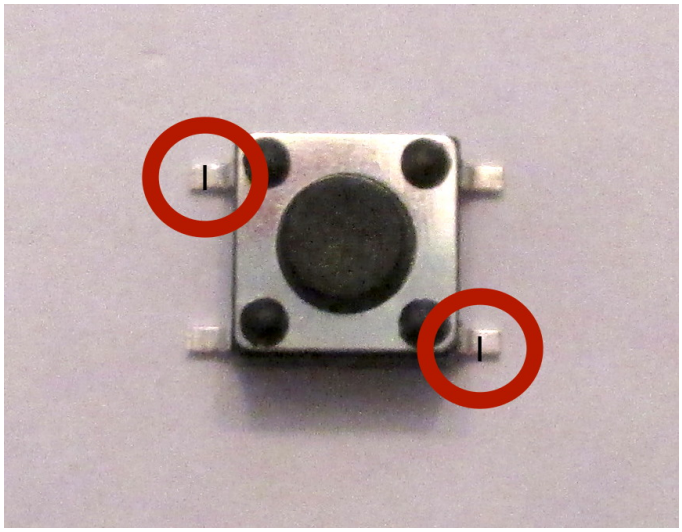

Figure 10 - Trim the tabs above

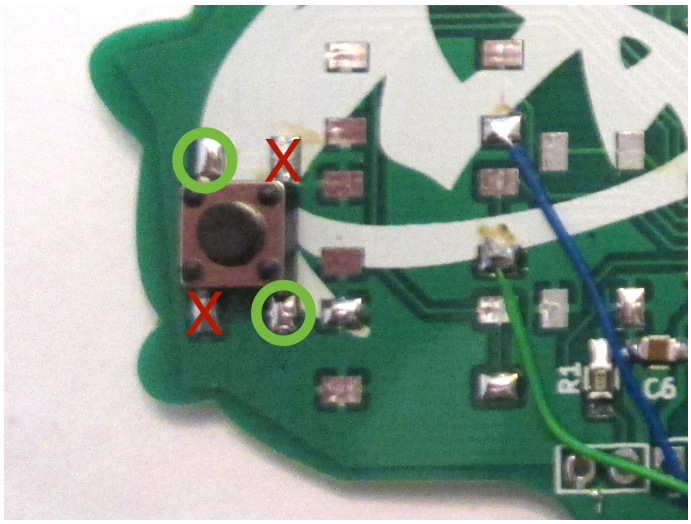

Figure 11-only solder the tabs in the green circle

Step 9 Placing the battery

Turn the board over and place the CR2032 battery connector into the slots shown. On a CR2032 battery – the top is + and the bottom -. So orientate the connector so the higher pins are on the + side, with the lower on the bottom.

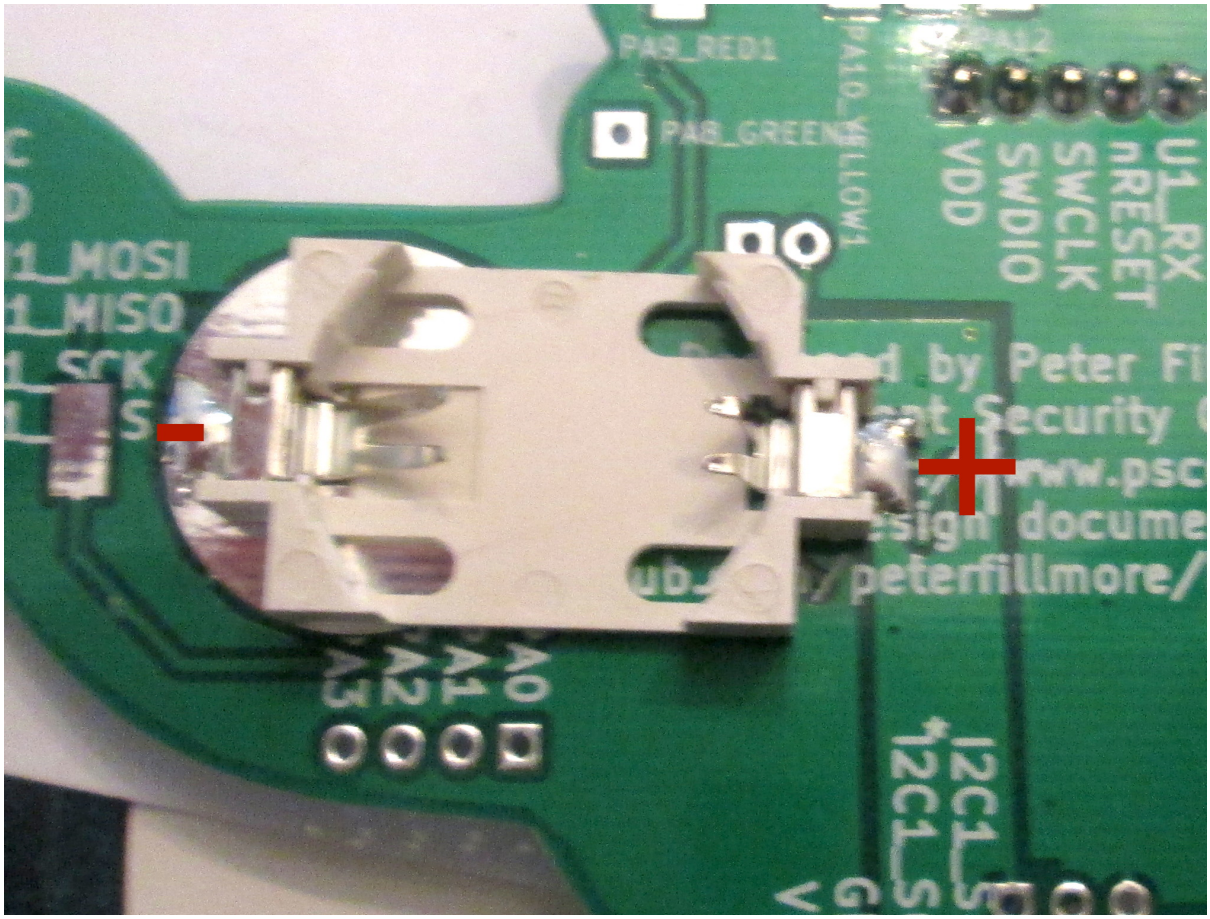

Figure 12 - Battery Holder

Programming

Here I'm gonna assume you have the toolchain installed and libraries all configured.
Toolchain stuff is located in the arm-none-eabi-*
Google It for install instructions.
Read the Makefiles for appropriate paths.

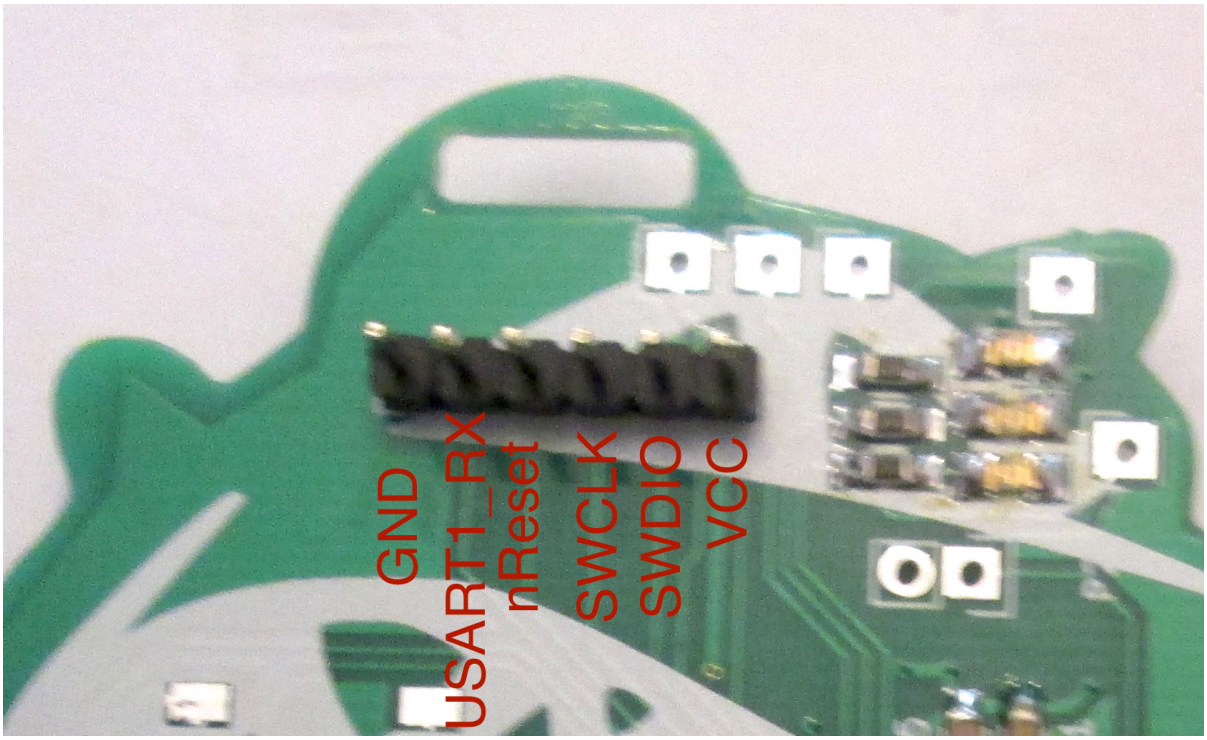

Figure 13 - Programming Header

Step 1. Solder the header.

Step 2. Connect up the header to a programmer

Step 3. Compile the test program:

[user@mycomputer /firmware/blinky]$ make

Step 4. Program the processor:

[user@mycomputer /firmware/blinky]$ sudo make program

Step 5. Behold the blinky lights!