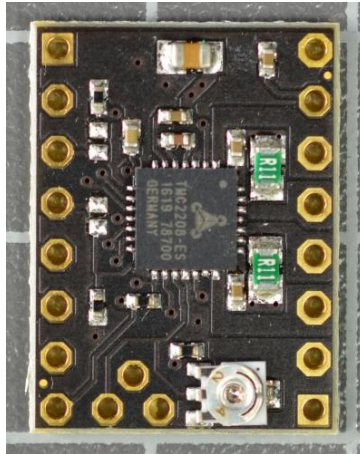


MK2(S) External Driver Board

TMC2208 Installation Manual



So, why using TMC2208? Mainly because:

stealthChop2™ No-noise, high-precision chopper algorithm for inaudible motion and inaudible standstill of the motor. Allows faster motor acceleration and deceleration than stealthChop™ and extends stealthChop to low stand still motor currents.

Benefits of using stealthChop2:

- Significantly improved microstepping with low cost motors
- Motor runs smooth and quiet
- Absolutely no standby noise
- Reduced mechanical resonance yields improved torque
- Reduced motor working temperature

Links:

<https://www.watterott.com/index.php?page=product&info=5089> (without soldered pins)

<https://www.watterott.com/en/SilentStepStick-TMC2208-with-Pins> (with soldered pins)

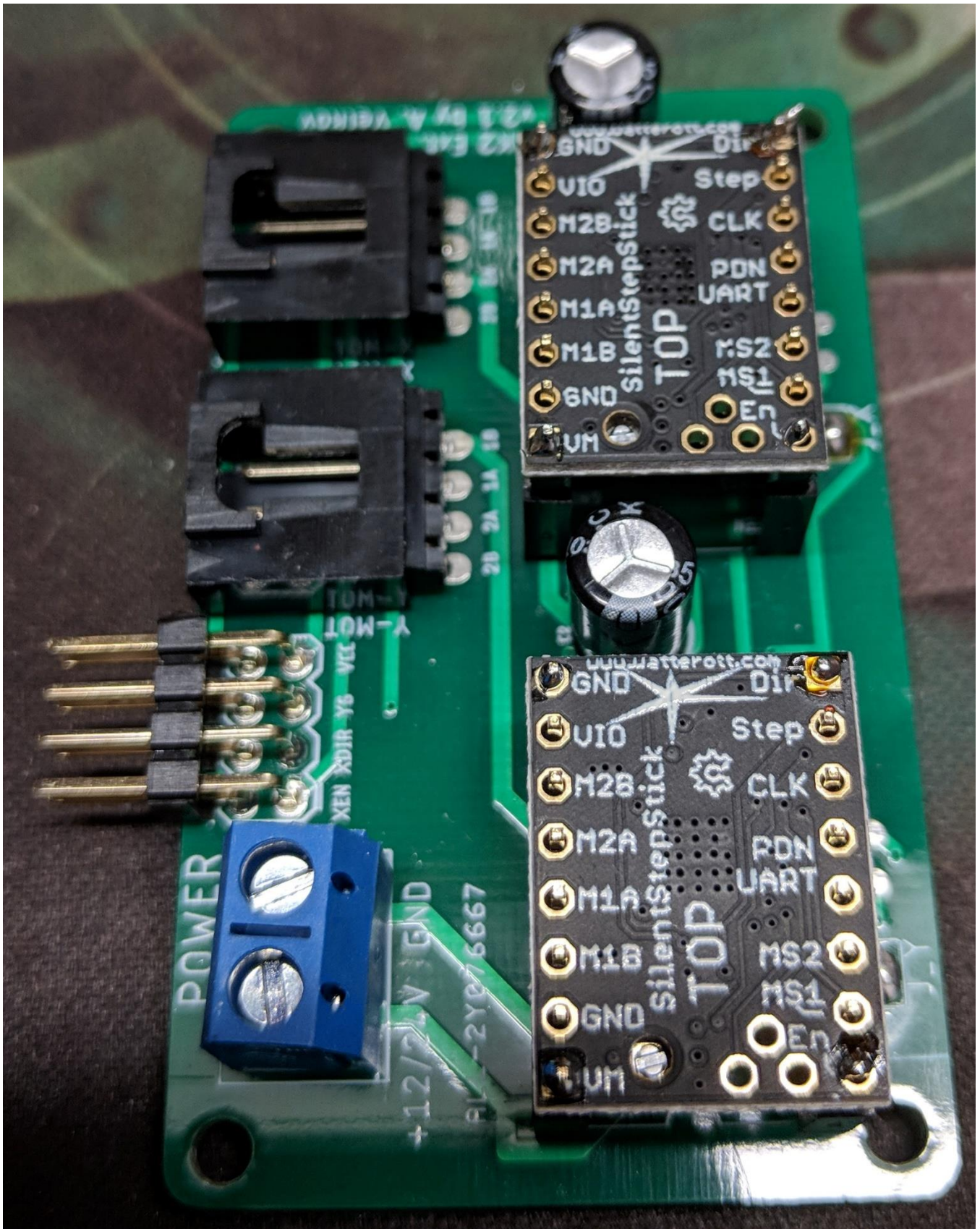
<https://www.watterott.com/en/Heatsink-9-x-9-x-12> (heatsinks)

Remark: the drivers from Watterott are being sold without heatsinks. You'll have to buy them separately.

WARNING!! I take no responsibility if you mess this modification up and/or damage your printer. You need to have basic soldering skills. Do at your own risk, or get someone more experienced to do it for you!

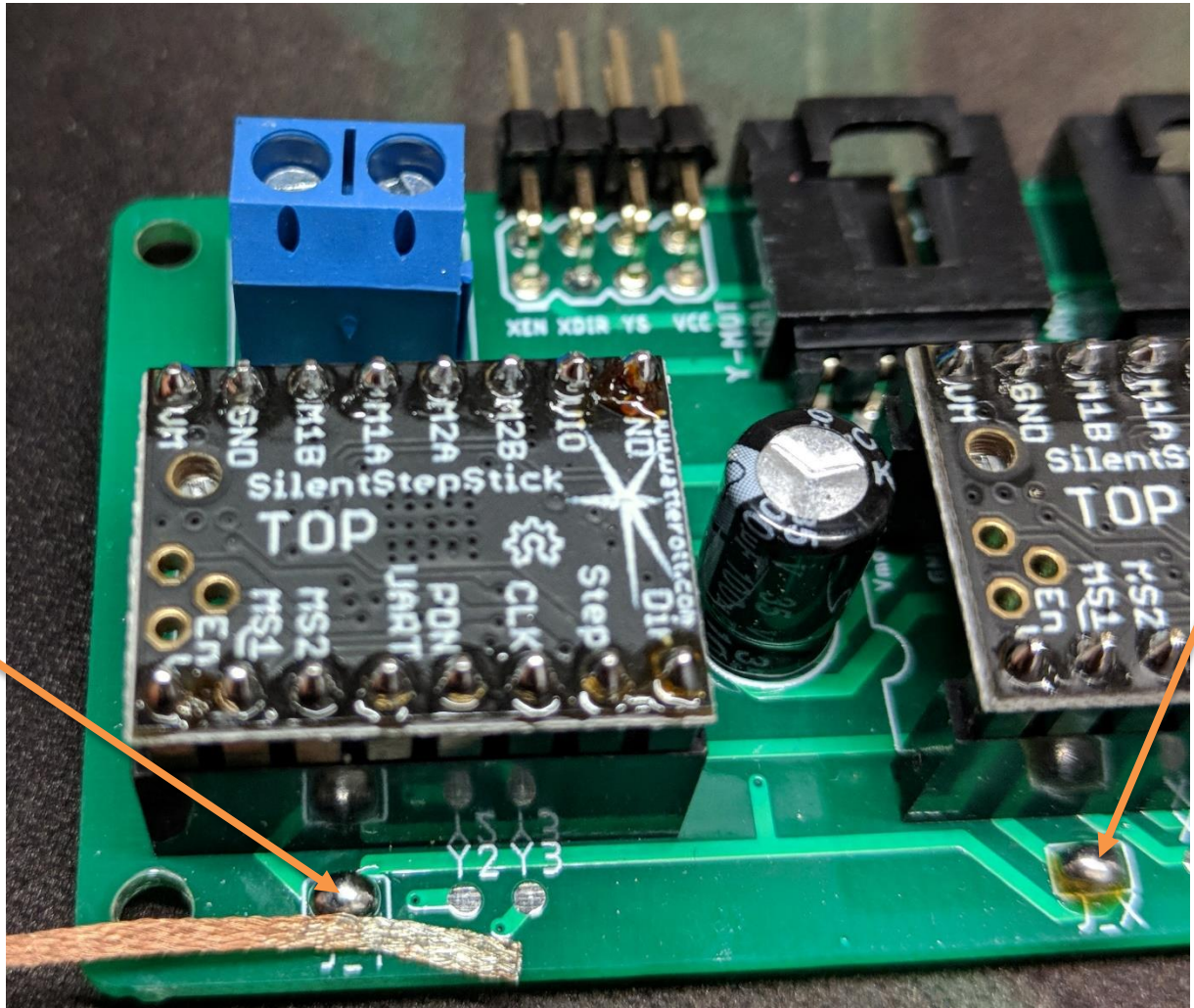
Let's start:

1. Make sure the printer is turned off. Remove the old TCM2100s from the external driver board. Remove the board from the box.
2. If you bought the drivers without pin headers the easiest way to solder them is to plug the headers in the sockets on the Ext. driver board and place the boards on top as shown (chip facing down) :

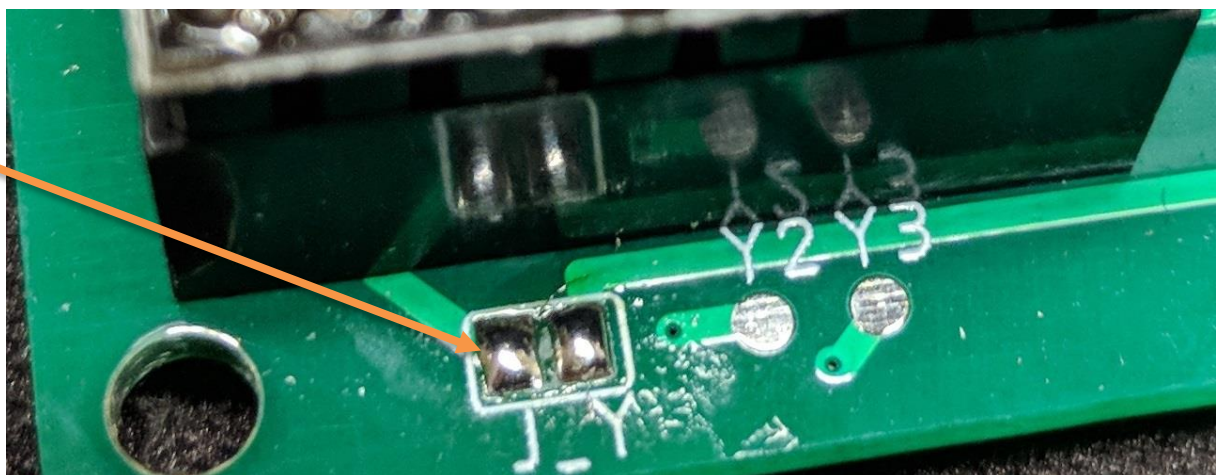


Now you can easily solder all the pins.

3. Desolder the two jumper bridges on the external driver board. You can use some desoldering wire, or any thicker wire. **WARNING! If you skip this step you WILL DAMAGE your RAMBO!!!**

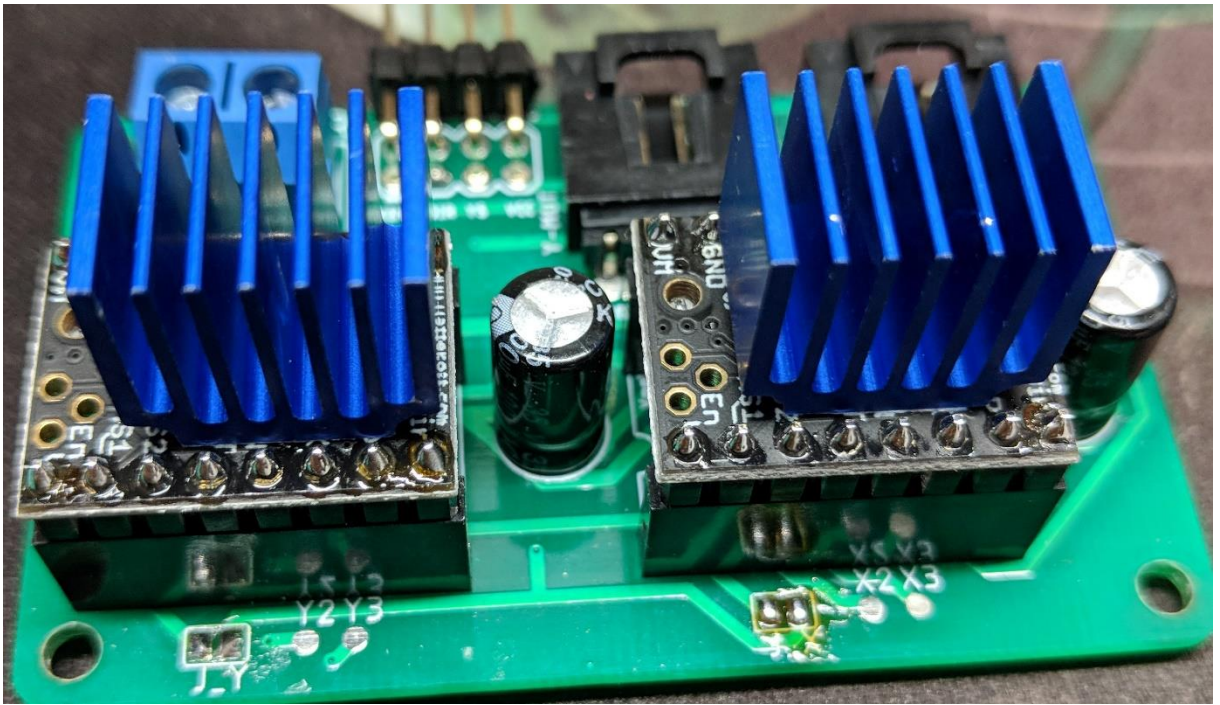


After desoldering there should be NO connection between the solder pads, like this:

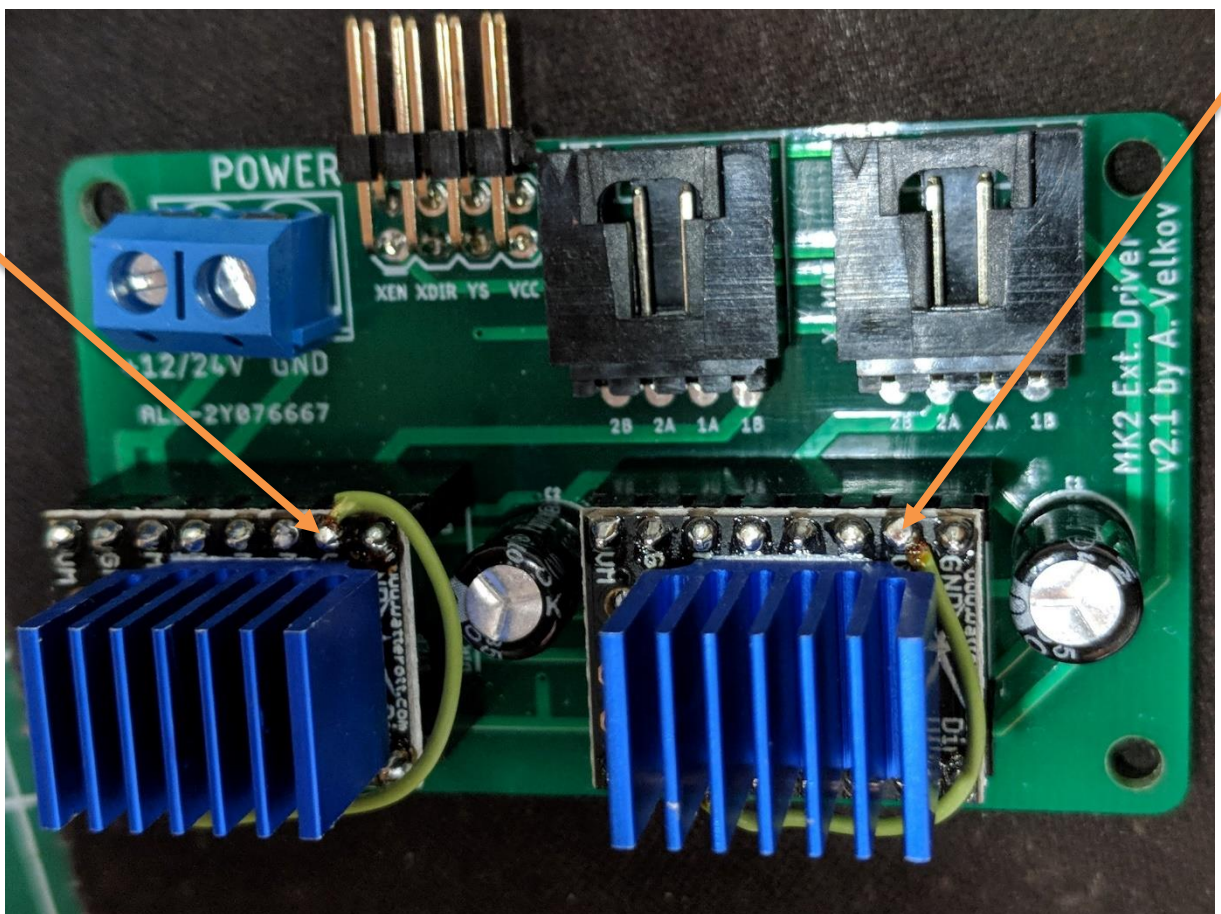


Make sure both jumpers are desoldered and look like the above picture! Remove the drivers from the board and check with multimeter that there is NO CONNECTIVITY between the solder pads on both jumper places!

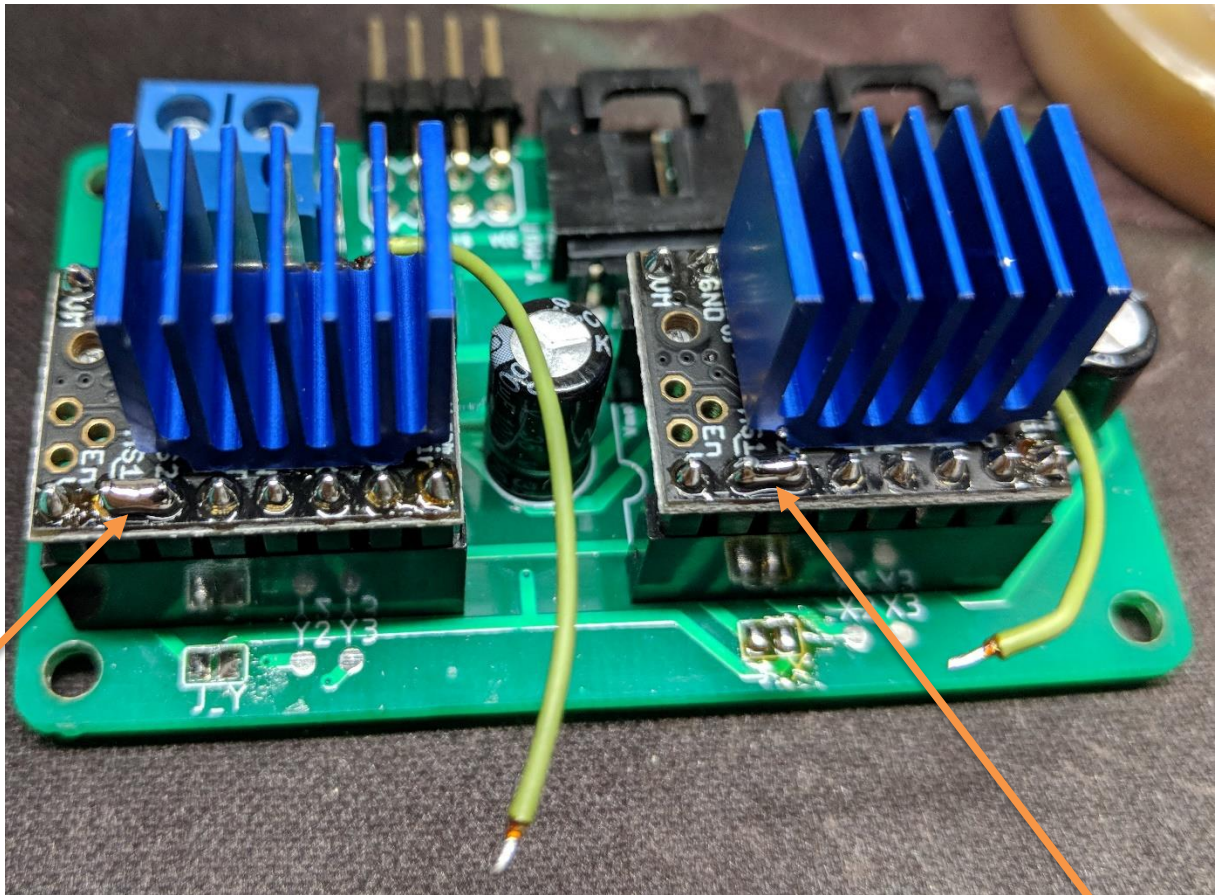
4. Place back the drivers in the sockets. Stick the heatsinks to the drivers as shown.



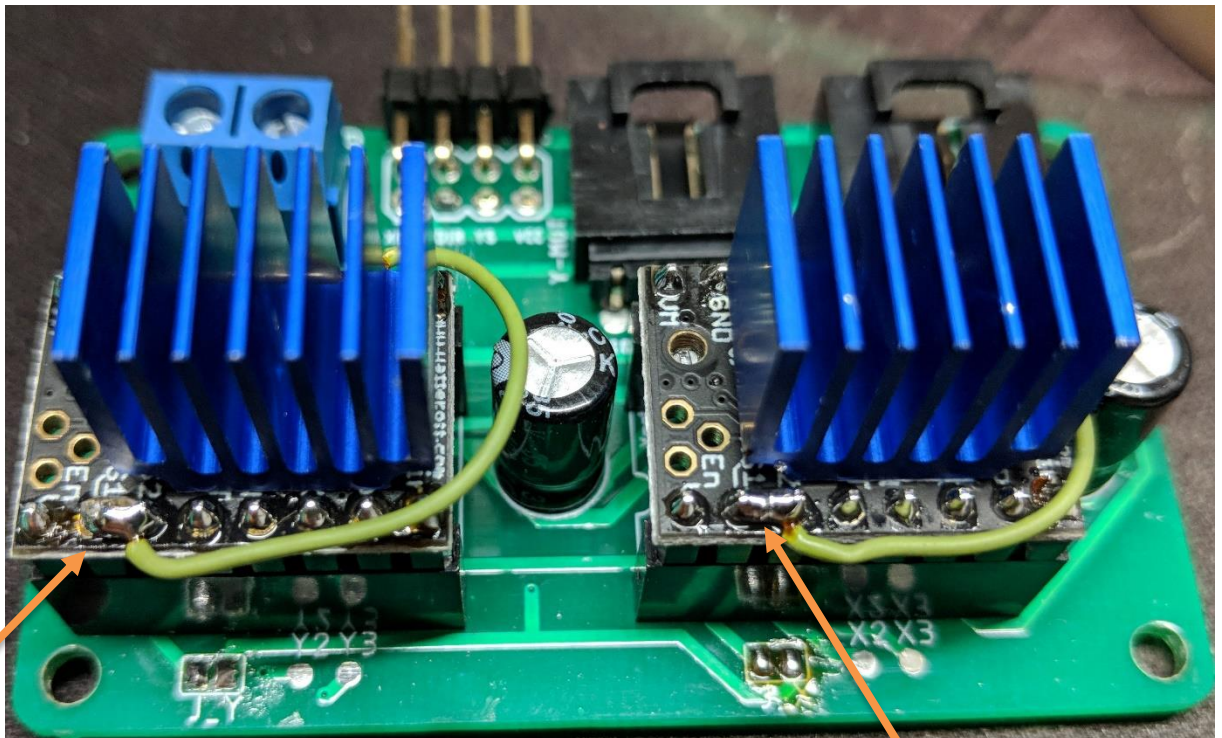
5. Solder a short wire to the VIO pin on each stepper driver like this:



6. Make a solder bridge between MS1 and MS2 pins on both drivers:

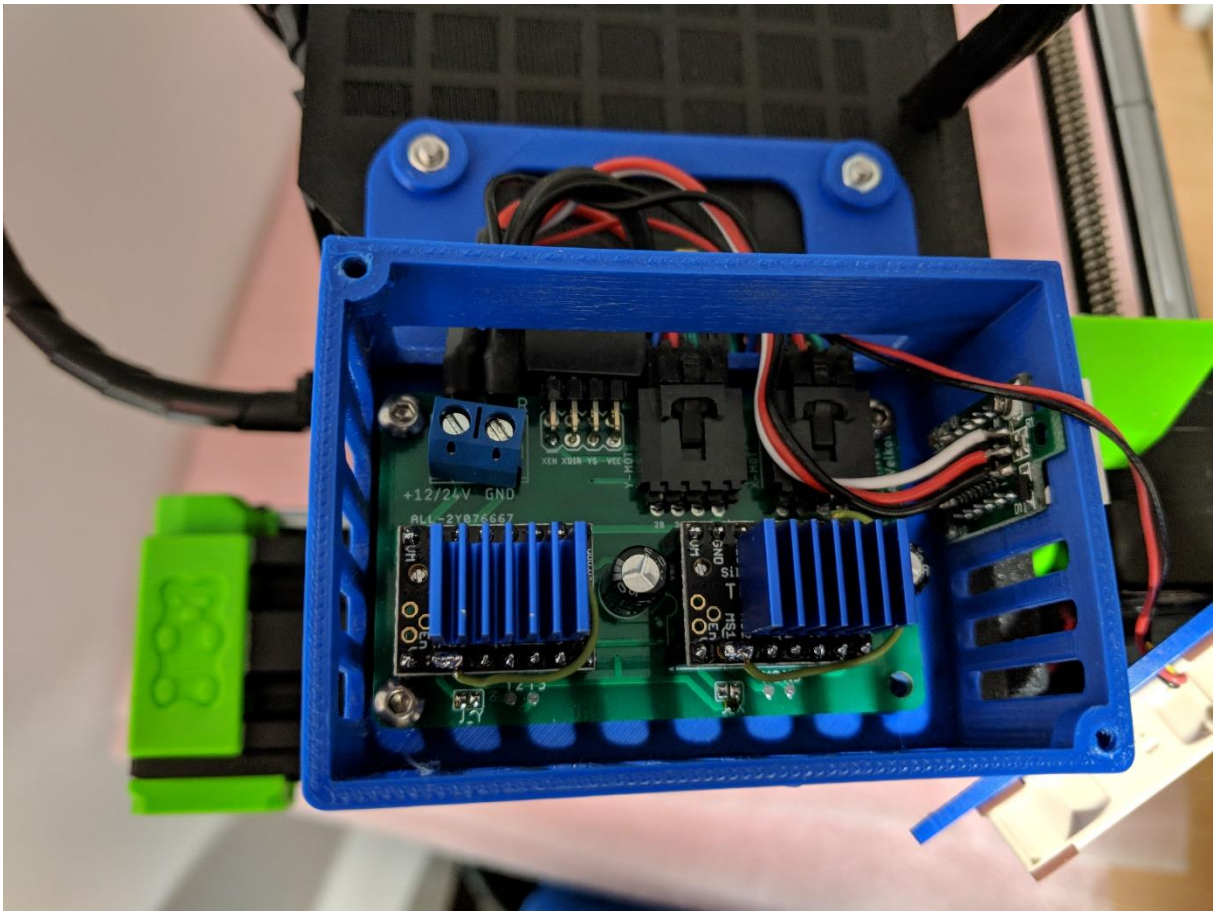


7. Solder the other end of the short wires to that bridge as shown:



Make sure you don't short anything else!

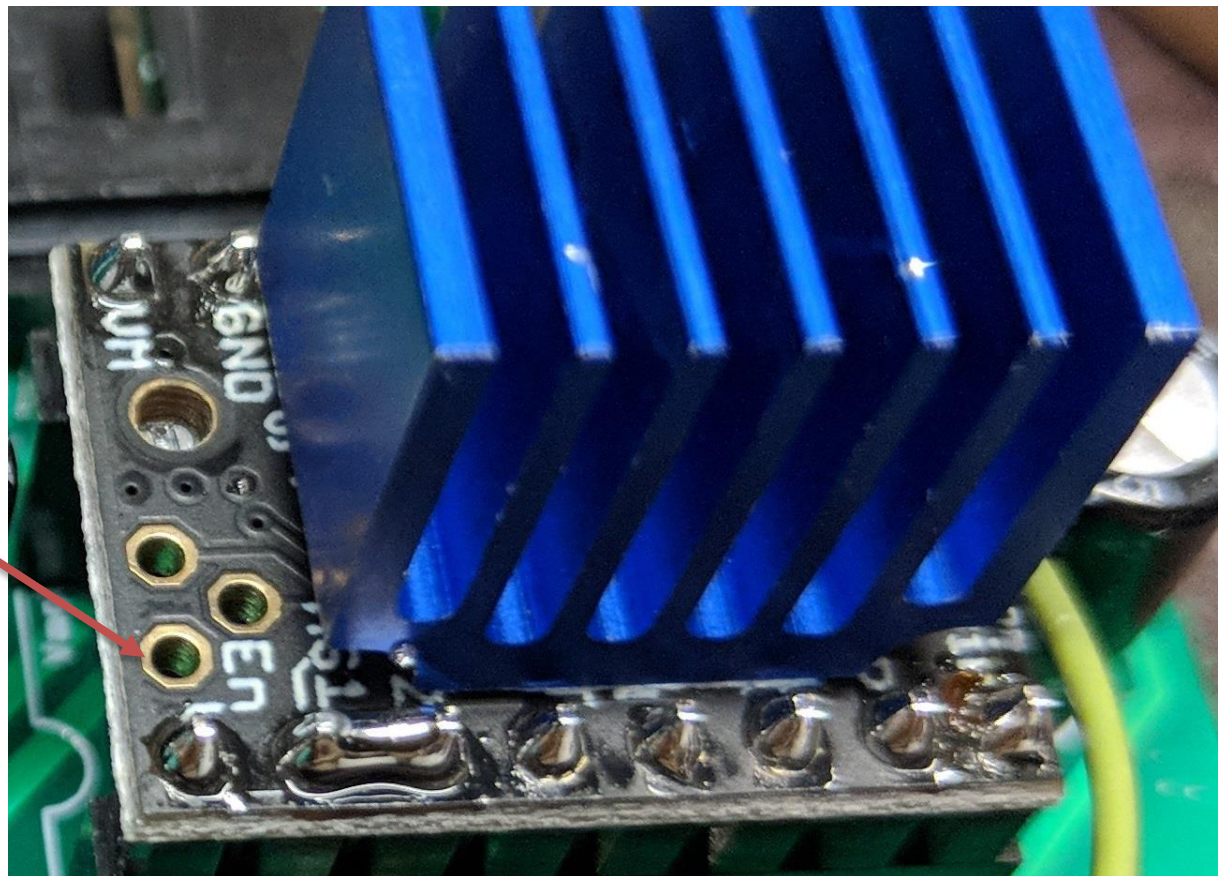
8. Place the board back in the box and reconnect all wires. It should look like this:



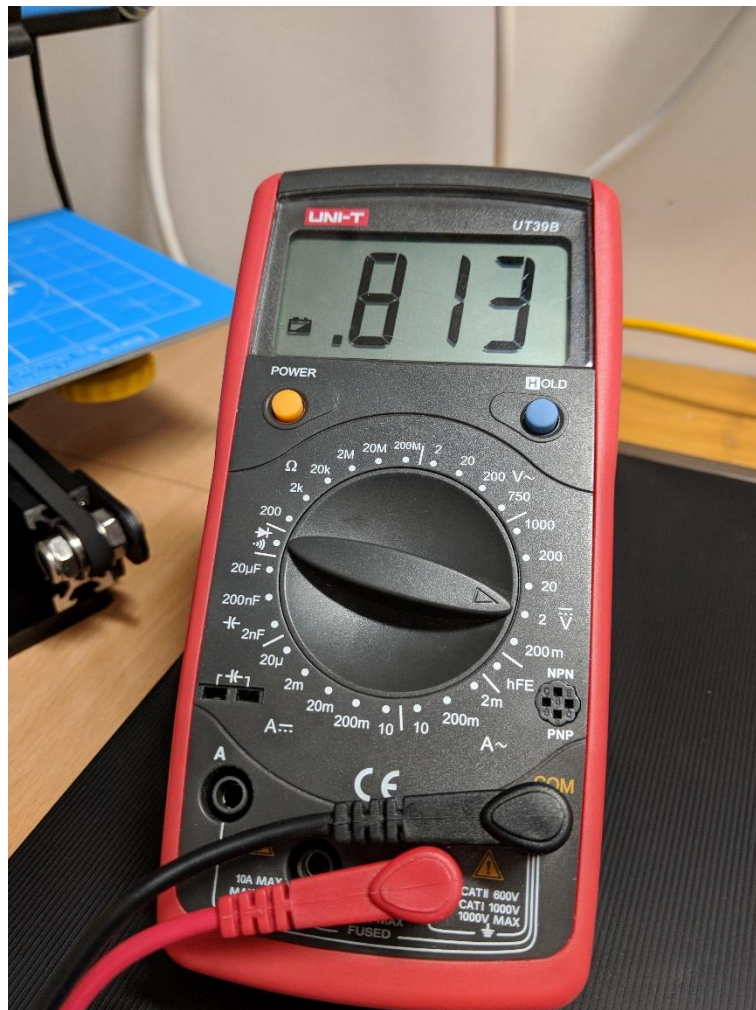
9. Check everything again (jumpers and solder bridges) and if you're sure you did it fine you can turn on the printer.

After powering on don't rush to print, follow this first:

1. Check X and Y motors movement directions (Settings -> Move axis). Move them from the menu one by one. Are directions correct?
2. Now you have to set Vref on the drivers, but it depends on what bearings you have on your Prusa. If you have LM8UU original bearings set Vref to 0.81V. If you use IGUS bearings I recommend to replace them back with the original metal ones, because IGUS will cause more friction and WILL cause layer shifting...
3. Set the Vref voltages **on both drivers** to 0.81 V with multimeter, here's how:
 - Put the multimeter to small DC voltage range (2 – 5 volts, etc.)
 - Place the Black lead to GND on the POWER socket.
 - Place the Red lead to the pin close to the En pin on each driver:



- Be careful not to touch anything else with the Red multimeter lead!
- Rotate the pot through the small hole with a tiny screwdriver slowly clockwise or anticlockwise so that voltage gets to 0.81 V.



4. Do XYZ calibration, and first layer calibration.

(<http://www.youtube.com/watch?v=JqH41K2vq0g&t=9m50s>)

5. Enjoy your even more quiet printer!

Troubleshooting:

1. XYZ calibration fails:
 - Increase Vref with 0.05V on both stepper drivers. Repeat if it appears again.
2. Layer shift in X or Y axis:
 - Check for hard movement on both directions.
 - Increase Vref with 0.05V on the affected axis stepper driver. Repeat if it appears again.