

Materials

Quantity	Component name
1	× 2W M-140 blue laser diode with module
1	× LM2596 3A "ultra-small" dc-dc step-down module
1	× Thick aluminum or copper heatsink - at least 25 x 35 mm
1	× 100R 1/8W resistor
2	× 470R 1/8W resistor
1	× 1N4728 3.3V 1W Zener
2	× BD139 transistors
1	× 5K Pot. A small pot for laser power adjust
1	× Push button (optional). To provide a quick full-power burst
1	× Plastic or metal tubing to enclose everything. I used plastic packaging from a big drill bit with a diameter of 22mm
2	× 3.7V Lithium battery cell. Got mine from an old laptop
1	× Small heatsink. It's for the two transistors
1	× High current switch
1	× 30mm long x 23mm diam. pipe This covers the diode wires and allow the rest of the saber to be inserted inside

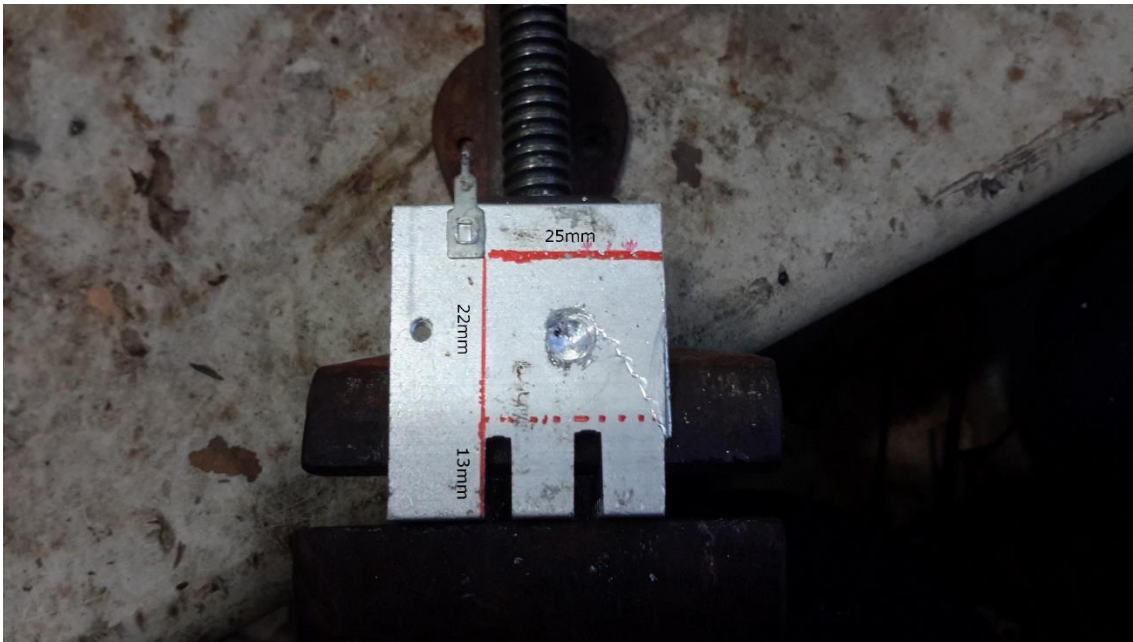


Figura 1:Some of the materials

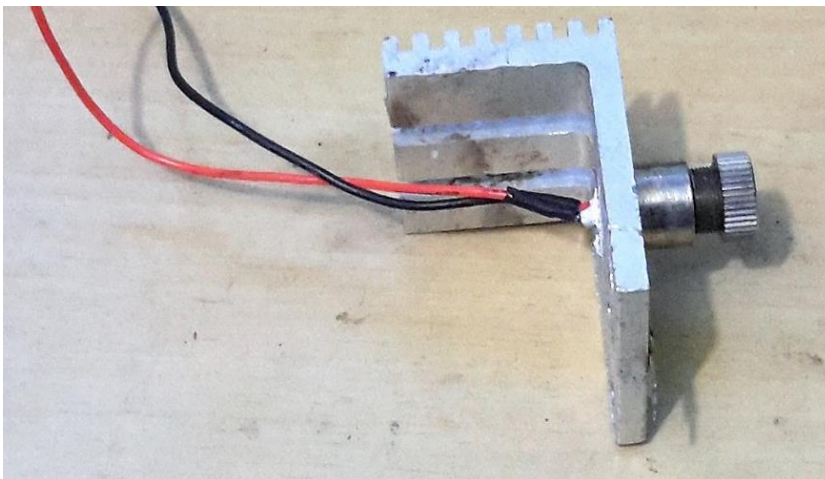
Instructions

1. Laser heatsink

Mark your big heatsink as in the image below and then drill a hole in the middle. The hole should fit the laser module tightly. I screwed the top part in it, but you may as well fit the whole module. Thermal grease is welcome.

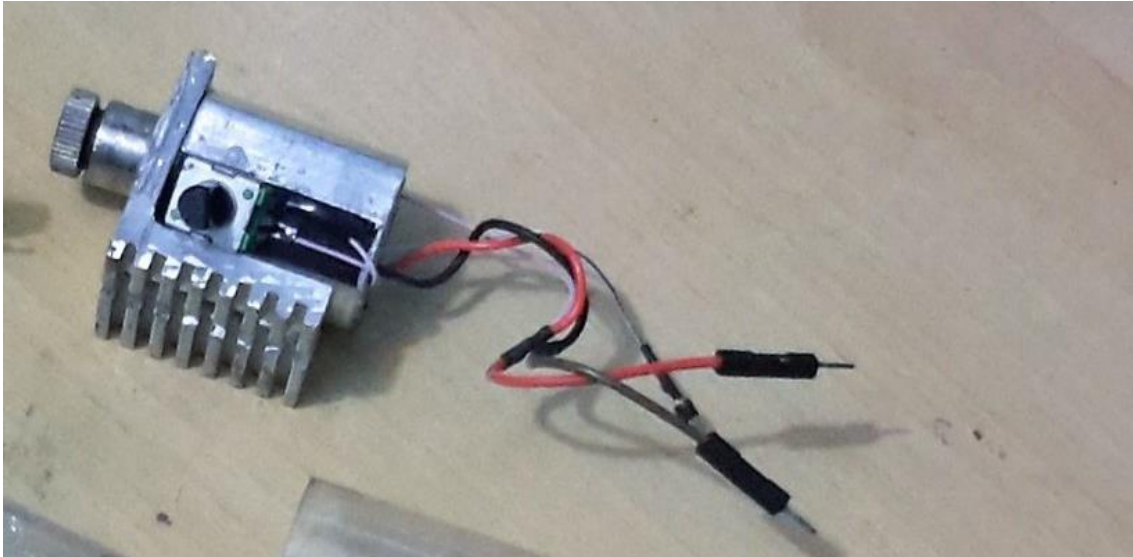


After putting the laser in place, use a saw to cut the heatsink on the solid lines we marked. Don't cut on the dashed line.



2. Finish the head

After the laser module, it's time to put the missing parts of the head in place. Glue the 30mm long tubing in the heatsink with superglue, then glue the 5k pot on it. Solder wires long enough to connect to the driver. I used regular pin connectors on the ends.



3. Batteries, switch and buck

First, solder the two lithium cells in series, leaving a wire connected to the middle of them, as it is needed for the balancing charger.



Now, solder the switch on one end and the LM2596 step-down on the other as shown, connecting another long wire to this end too.



With these 2 battery wires and the last one you will solder on the switch side, make a cable for your battery charger. For standard 2S lipo chargers, a servo cable will do just fine.

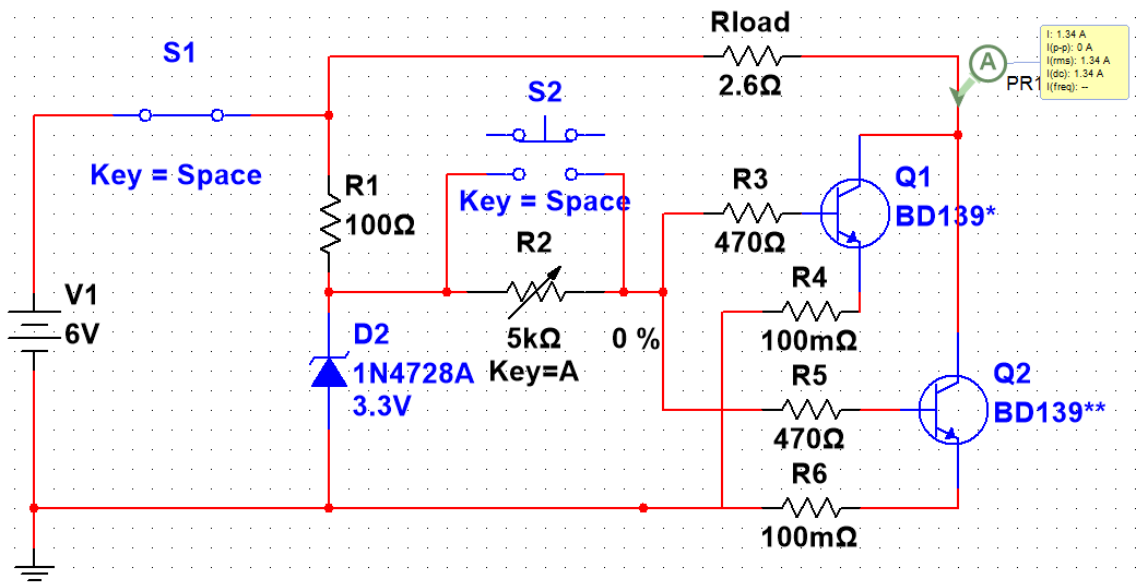


4. The driver

Build the driver according to the schematic, or use your own version. I didn't use a PCB, instead, I mounted everything on top of the buck regulator, putting 3 female connectors: a 2-pin one for the 5k pot; two for the diode.

Some things to note:

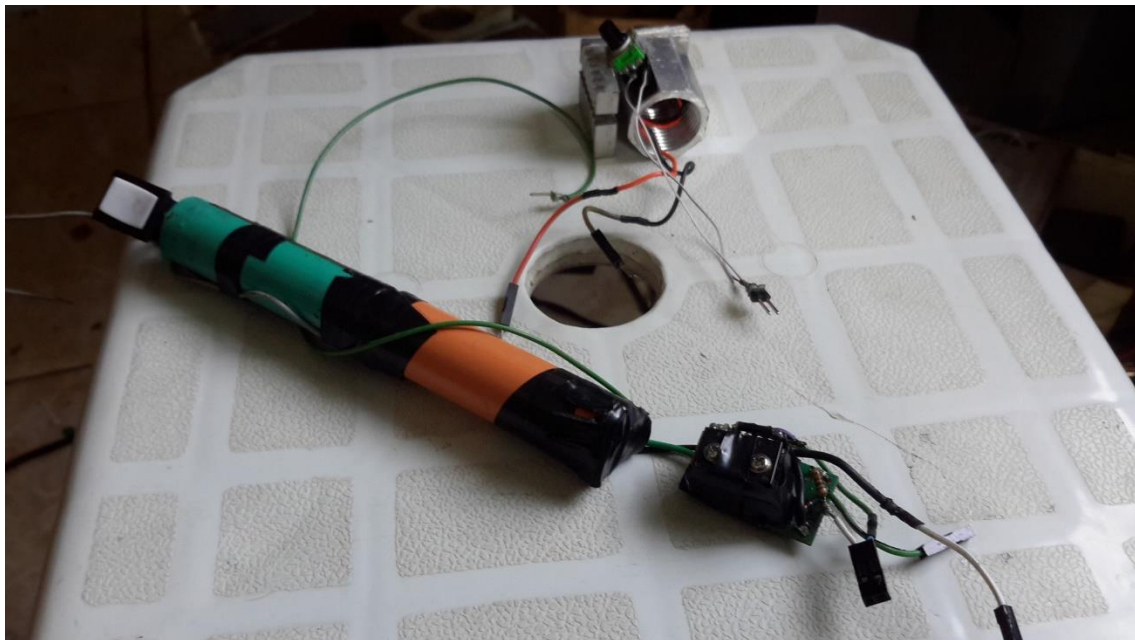
- Although R4 and R6 (emitter resistors) are good practice to ensure even current sharing between transistors in parallel, I didn't actually use them.
- V1 is not the battery, but the step down output, 6V is the value that I used. You may start with 5V and adjust later as I will explain below.
- The laser diode is connected in place of Rload, so Rload isn't actually part of the circuit, it's there for testing purposes.
- The push button S2 is optional, but it is kind of a shortcut to provide full output power when held down.
- **The main lesson I learned here is that if you have a constant current regulator after a constant voltage one, the load still follows $I=V/R$, so, while there's not enough voltage, it won't draw the desired current. Set the current with a load of small resistance, then put the real load in place and slowly rise voltage until you see the current level you want.**



After building the driver, you should test it with a load resistance to check whether current is really being limited or not. With a 2.5R resistance (Rload) and your ammeter in series you should get about 1.34A. If your current is lower, slowly increase the buck output voltage until you get there.

Now put the diode in place of Rload and check the current. Mine was about 1.25A, and you may again adjust the buck voltage to get there.

Higher currents are possible, but remember that this diode can break after 1.8A or voltages higher than 4.8V on its terminals.



5. Wire it up!

Now its time to put the enclosing. I've split my plastic tubing in 4 pieces for easier dissassembling. Follow the pictures below to see how to do it.

a)First, we cover the battery and put a small piece of thinner plastic (which has a transversal cut in the middle) inside to make the fit tighter. The same kind of trick is done with the laser head.



b)Now the driver cover



c) Then we connect the wires and put the head. All the joints are held together with electrical tape.

