



Under the Hood

The GreatScott! / Elektor DIY LiPo Supercharger Kit

By Alex Wende (USA)

Soldering is one of those essential skills that every electronics enthusiast learns early on. Soldering kits help fill in-between the steps of learning how to build a circuit on a breadboard, and designing your own printed circuit board. With the goal of the kit being to learn how to solder, these kits are often kept fairly basic where the circuit blinks a few LEDs, or makes noise of some kind. Are there any kits that actually build something useful though? Let's take a look at this kit from the electronics engineer and YouTuber GreatScott! in collaboration with Elektor, and see why I recommend it.

Unlike most electronic kits on the market, the DIY LiPo Supercharger kit teaches how to solder surface mount devices, or SMD for short. After it's assembled, the end result is a board that converts the power coming from a single lithium-ion or polymer battery, which has a voltage normally around 3.7 V, and boosts it up to either 5 V with a current output of up to 1.52 A, or 12 V and a current output of up to 0.76 A.

But it does more than just that. Because the battery will need recharging eventually, the circuit also has a dedicated battery charger circuit with a maximum output current of 1 A. Charging is accomplished through either a USB Type-C connector, or through a bench power supply using the 5 V and Ground power pins. Because this kit is

focused on beginners, it also has some protection circuitry for the battery with reverse-voltage protection, under-voltage lockout, and over voltage protection, along with short-circuit protection on the output of the board.

Opening and First Impressions

Aside from the tools needed, i.e. solder, a soldering iron, and tweezers, the kit comes with everything needed. The manual is accessible from either a URL or QR code, along with the printed circuit board layout, and an overview of the parts which need to be soldered. The board came with a few parts already soldered, all of the ICs, and even a little circuit board for the USB connector (**Figure 1**), which gets soldered to the main board using much larger pads along the edge.

Each of the resistors have numbers printed on them to represent the value, but because the capacitors and LEDs aren't made with values printed on them, they are each labeled on individual bags with their value, which makes it easy to see where each part needs to go.

SMD parts can get pretty small, and for a beginner can look intimidating. The smallest parts in the kit though are the resistors and capacitors. However, because they are around the same size as the ¼ W resistors commonly used for breadboard circuits and through-hole (TH) kits, it makes them the perfect size to try out SMD soldering for the first time (**Figure 2**).

The manual starts off really well by explaining how the board works, and what each of the main components are responsible for. Since this is most likely the first time soldering SMD components, it gives a quick guide on how to read number codes on the resistors to better understand where each part needs to go. After going over the required tools, it provides a few pictures along with some advice on the order to solder the components. For the more visual learners, GreatScott! produced a video [1] which not only gives a detailed overview of the board, but an SMD soldering tutorial as well (**Figure 3**).

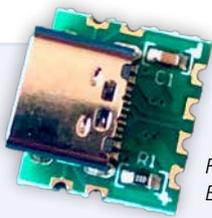


Figure 1: USB-C Adapter Board included in the kit.



Figure 3: Watch GreatScott! presenting his DIY LiPo Supercharger kit on YouTube.

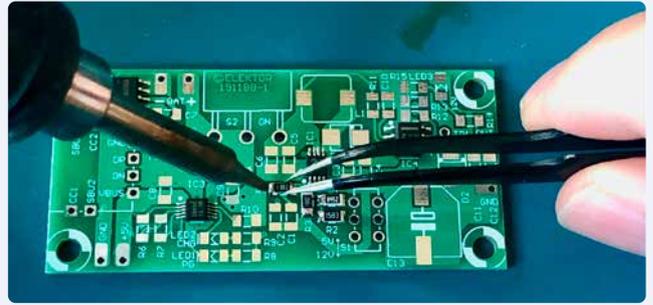


Figure 2: Soldering the resistors to the board.

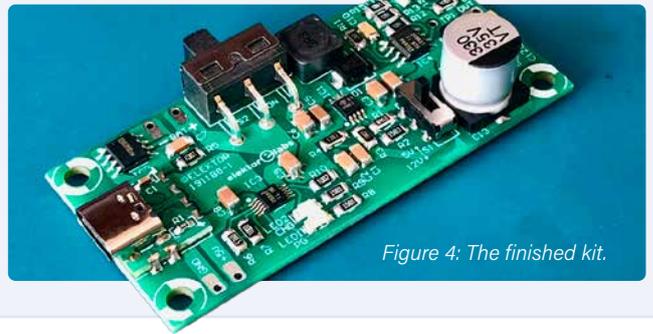


Figure 4: The finished kit.

Testing the Final Product

After putting the kit together (Figure 4), I first plugged in the charger to make sure I had a fully charged battery. As soon as I plugged it in, I saw both the power good and charging LEDs turn on. Once the battery was topped off it was time to put this board to the test.

The first step was to check and make sure I soldered it correctly. Thankfully, my meter showed me pretty close to 5 V and 12 V. Switch-mode power supplies are great because they're not only small, but efficient too. The one side effect however is that they can be pretty noisy on the output if not designed properly. After running a series of tests, I was glad to see that the noise produced was less than 40 mV_{pp} under a heavy load, but most of the time it was much lower.

With any type of voltage regulator, the biggest — and unfortunately unavoidable — enemy is heat. I was surprised with how efficient the board was, especially because it is boosting the battery's voltage instead of lowering it. Under heavy loads though, it does produce some heat. For continuous loads, the maximum current I would run at 5 V would be around 1.3 A, and at 12 V, 0.4 A. But for short bursts the board is perfectly capable of going to full load of 1.52 A and 0.76 A.

Overall Thoughts

The designer of the board did a great job focusing on the beginner. The SMD parts that might be difficult to solder for the first time were already soldered to the board. The parts that did need to be soldered were large enough that even if this was the first time soldering, there are enough components to get the hang of it by the end. The kit is organized in such a way that there wasn't any guessing about the values. Because

there are a couple dozen parts that need to be soldered, having to scan the board for the "R7" or "C3" was unnecessary with the interactive "click-and-locate" Bill of Materials found on the Elektor website. [2]

Personally, what I enjoyed the most about this kit though, is that after it's soldered together, it's something that I will actually use. A battery-powered project often needs a regulated power source. For a LED string project, or something with a couple small motors on it, being able to boost the battery's voltage to 5 V or 12 V is really handy to have available. Also, because of the well-thought-out protection circuit, charging circuit, and power switch, I would be more concerned about the circuitry I attached to the board than the board itself. Although because of the output protection, the board might even save me from myself a bit!

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Related Products

Looking for the main items mentioned in this article? Elektor has you covered!

- **DIY LiPo Supercharger Kit (by GreatScott!)**
www.elektor.com/diy-lipo-supercharger-kit-by-greatscott



WEBLINKS

[1] DIY LiPo SuperCharger Kit video: <https://youtu.be/6LxRnf6sQNQ>

[2] DIY LiPo SuperCharger Kit article and BoM: <https://www.elektormagazine.com/articles/diy-lipo-supercharger-kit>