adafruit learning system

Simple LED Unicorn Horn

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Last updated on 2018-08-22 03:56:14 PM UTC

Guide Contents

Overview

3D Printed Unicorn Horn

It's unicorn season! Last year we 3D printed a unicorn horn, this year we made it simpler! Redesigned in Fusion 360, this unicorn horn features a spiral design and tabs for sewing onto garments such as hats, hoodies and other headware. This unicorn horn lights up and features a UV Purple LED, so it's magical as it is whimsical.

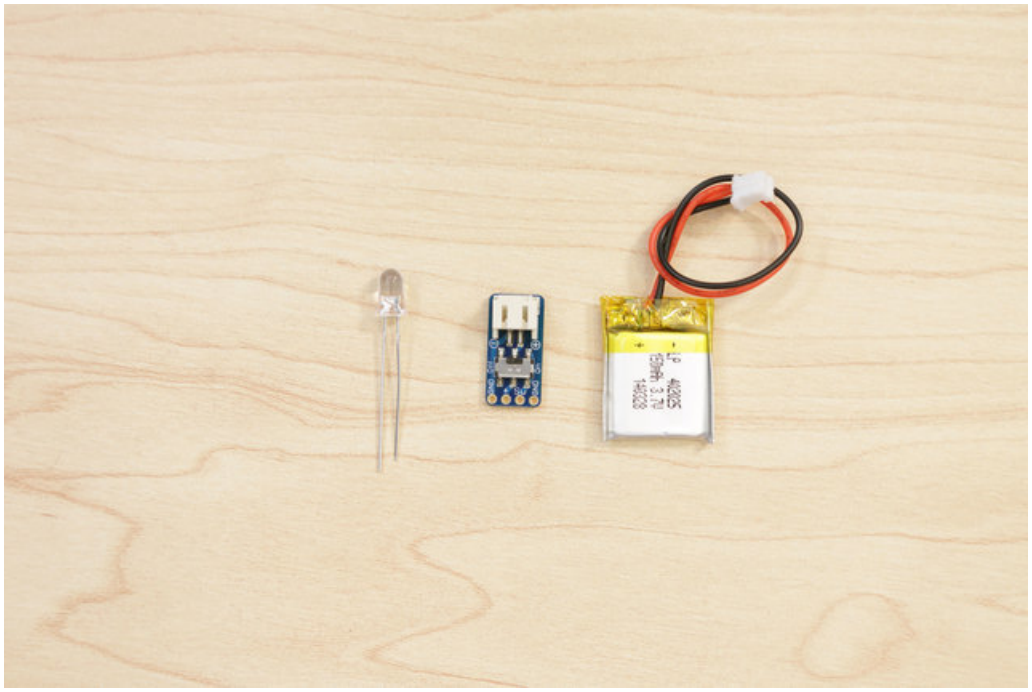
Want More Magic/Colors?

Want a more advanced unicorn horn? Check out our first Unicorn horn project!

- NeoPixel Unicorn Horn using GEMMA (https://adafru.it/rtb)

Great For Beginners

This project is as simple as it gets! There's no micro-controller or programming required. The circuit is just an LED, a JST breakout with on/off switch and a battery - That's it! If this is your first time using LEDs or soldering wires, this is the project for you!



Parts & Tools

We have all of the tools and parts you'll need for this project in the shop. Use the links below or on the right hand sidebar.

- UV/UVA Purple LED 5mm (http://adafru.it/1793)
- 150mAh Lipo Battery (http://adafru.it/1317)
- MicroLipo battery charger (http://adafru.it/1304)
- JST Breakout with Switch (http://adafru.it/1863)
- 3D Printer (http://adafru.it/2933) & Filament
- Silicone Cover Stranded Wire (http://adafru.it/3166)
- Soldering Iron (https://adafru.it/doU) & Solder (http://adafru.it/734)
- Wire Strippers (http://adafru.it/527)

You can also try our RGB Slow-Fade (http://adafru.it/679) or Fast-Fade LEDs (http://adafru.it/680)!

No 3D Printer? No Problem!

If you don't have access to a 3D printer, you could try sending the design file to a service like 3DHubs.com - local 3D printer operators can print and ship to you directly! If you want hands on experience, consider visiting a local Maker/Hacker Space (just search on google!).

3D Printing

unicorn-led-holder.stl	Holds LED in center of unicorn horn	Prints fine with regular PLA
horn-single.stl	Unicorn horn for single extruder. Fits on most 3D printers!	Prints best in TPU flexible filament
unicorn-dual-horn.stl	Designed for Dual Extrusion	Prints best in PLA, will work OK with flexible filament
unicorn-dual-spiral.stl	Designed for Dual Extrusion	Prints best in PLA, will work OK with flexible filament

Ninjaflex Filament

We recommend using flexible filament to 3D print the unicorn horn, because it will make it easier to sew and less likely to break or harm anyone. Ninjaflex filament comes in different colors and types. Some 3D printers can handle regular ninjaflex filament, but others (like the Micro M3D printer) work best with semiflex or Cheetah. Either way, this type of filament works best with 3D printer that feature a direct-drive extruder system.

Ninjaflex Slice Settings

We found the optimal slice settings for ninjaflex to variy but the settings below are a great starting point.

- 230C Extruder
- No heated bed / 60c Heated bed
- 40mm/sec default printing speed
- No retraction / disabled
- 50% fan speed

https://adafru.it/qwC

https://adafru.it/qwC

https://adafru.it/rxa

https://adafru.it/rxa

https://adafru.it/rxb

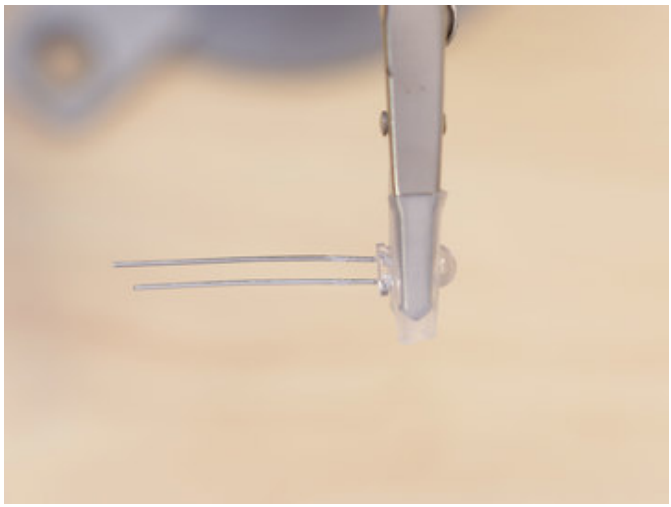
https://adafru.it/rxb

Tweak, Modiy, Design

We put this design together in Autodesk Fusion 360, so it's parametric and easy to remix or make small adjustments. If you're interest in seeing how we designed it, we have a Layer by Layer tutorial that walks through all of the steps.

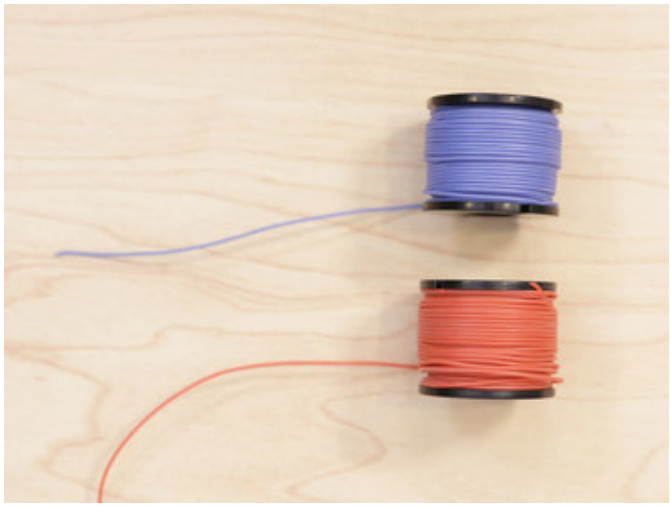
https://adafru.it/qwD

https://adafru.it/qwD



Secure LED

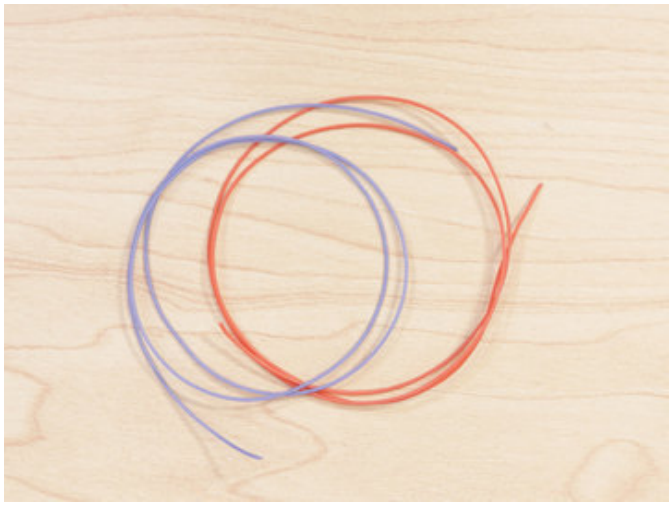
Let's start by wiring our LED. First, secure the LED to either a pair of helping third hands or a panavise - this will help us keep the LED sturdy while we solder wires to the legs.



Silicone Cover Stranded Wire

I highly recommend using silicone cover stranded wire for this project because it's flexible and won't break under stress. Regular wire wrap or PVC cover wire is OK but it could potentially break over time.

30AWG size wire works great here because it's thin and strong enough for the longevity of this project.

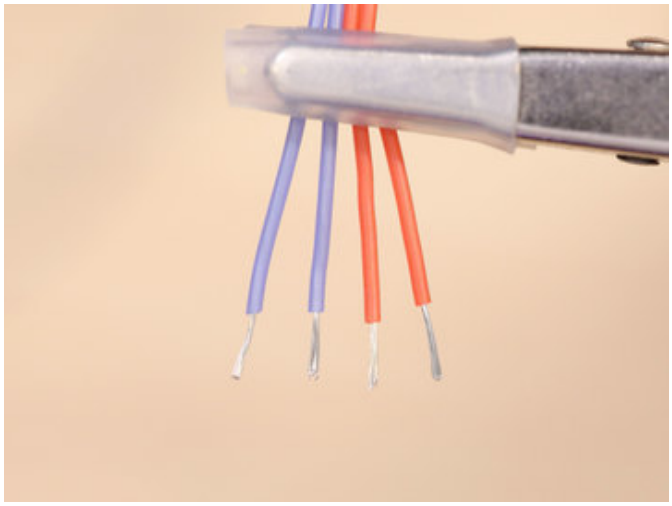


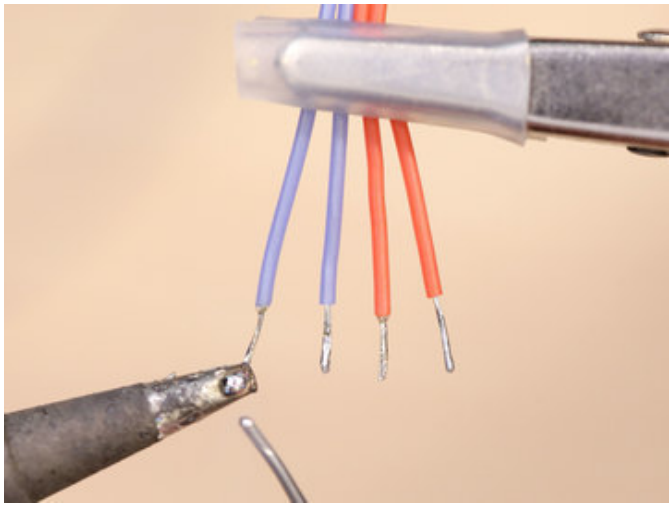
Wire Lengths

OK, now we'll need to figure our how long our wires need to be. This all depends on what your attching the unicorn horn too – Will it go on a hat? hoodie, bandana? All will require different wire lengths. A good rule a thumb is to use a bit more than you need, because it's easier to trim it down and to add more later.

Strip Wires

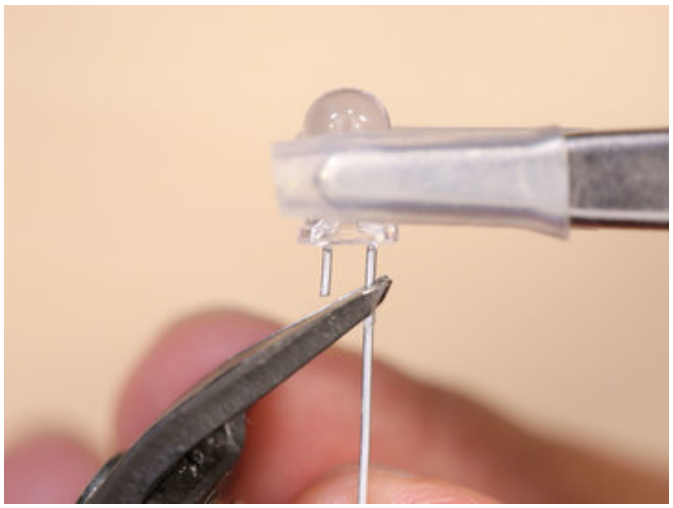
Once you have your wire length figured out, cut two pieces out (both in the same length) and use a pair of wire strippers to remove about 5m of insulation - exposing the bare wires. You'll need to do this for both ones, on both tips.





Tin Wires

It's good practice to *tin* your wires before soldering them to anything – *Tinning* is the act of applying a bit of solder to the exposed wire, effectively "glueing" the strands together to prevent them from fraying. I recommending using a pair of helping third hands to all of the wires together while soldering. It's much easier to do them all at the same time like shown in the photo.

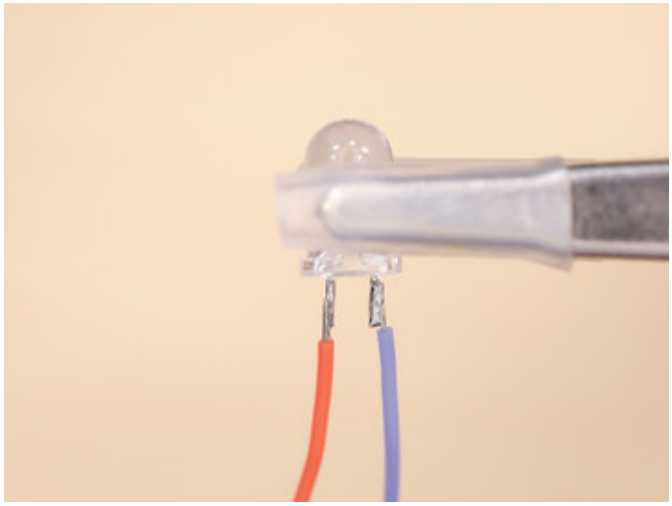


Trim LED

Most LEDs will have long legs. This is great for prototyping on breadboard, but we won't need them this long, so let's trim them short – But not before noting which is positive (anode) and which is negative (cathode). The longer led will be the postive anode, while the shorter one is the negative cathode.

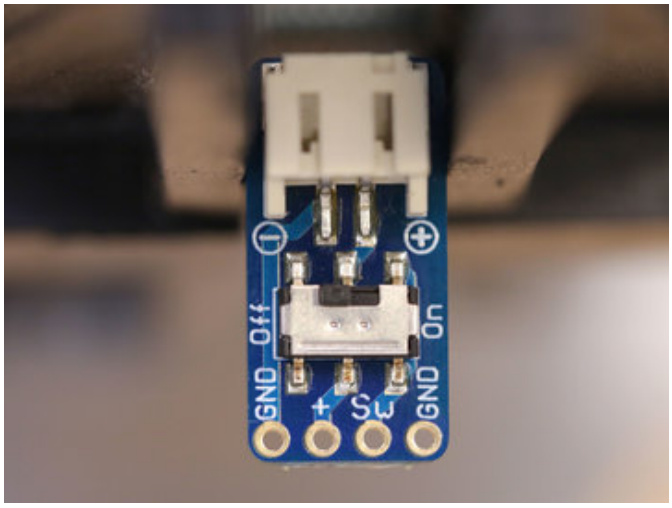
Tin LED

It's also a good idea to tin legs of components, not just wires. Now that the legs of our LED are shortened, apply a bit of solder to them. Again, this is really going to make it easier when we solder our wires to them.



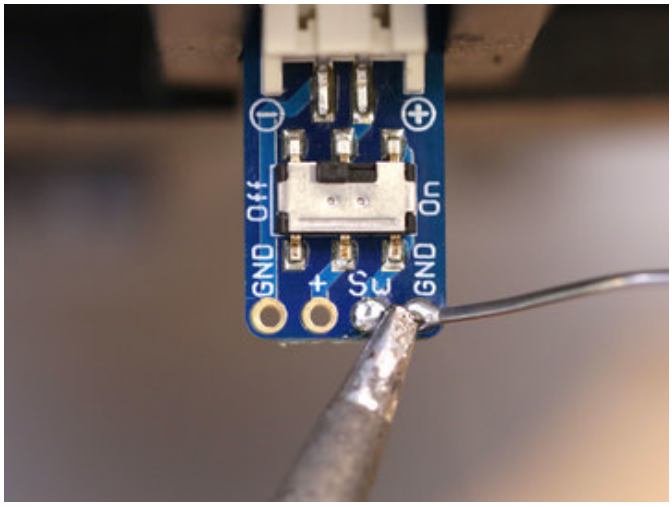
Solder Wires to LED

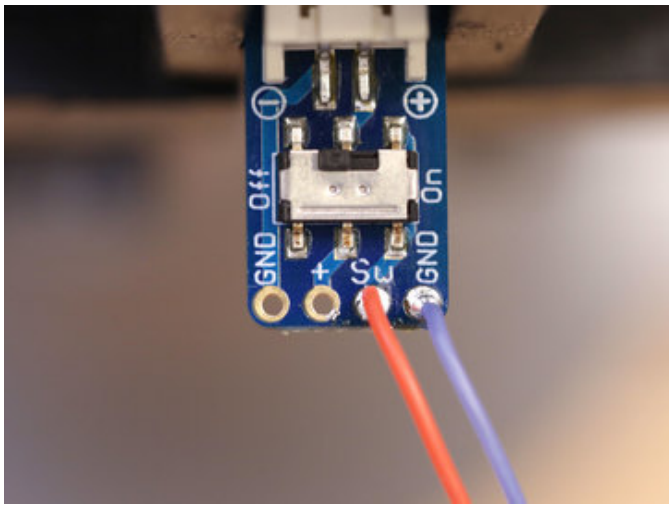
OK, now it's time to solder our wires to the legs of the LED. Here, I soldered the red wire to the postive anode, and the negative cathode to the blue wire. It doesn't really matter which color you use, but it is nice to keep it consistent with the electronics standard.



Tin Pins on JST Switch Breakout

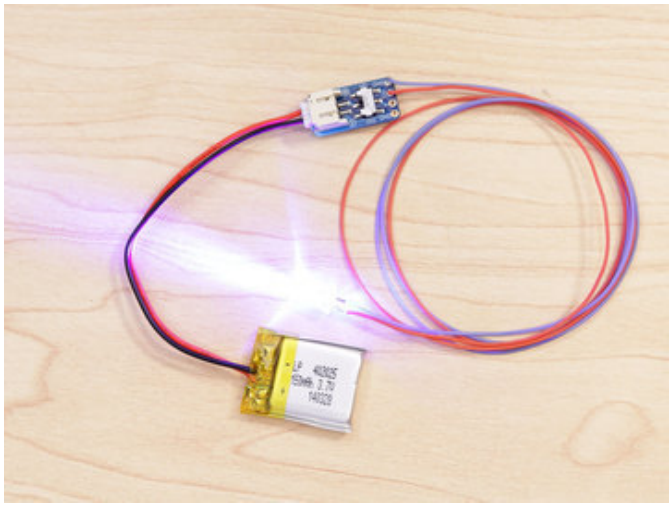
Now it's time to get out our JST switch breakout. Before we solder wires to this, let's tin the pins! Apply a bit of solder to the **SW** and **GND** labeled pins on the JST switch breakout. I'm sure you know by now why it's a good idea to tin these pins ;-)





Solder Wires to JST Breakout

OK, now we can solder in the **red wire** (positive anode) to the **SW** labeled pin on the JST breakout and the **blue wire** (negative cathode) to the **GND** labeled pin.



Test Circuit

Our components, legs and wires are all soldered up – Wohoo! Now's a good time to test our circuit. Plug in the male JST connector from the lipo battery into the female JST connector of the JST breakout board. Flip the on/off switch and the LED should glow!

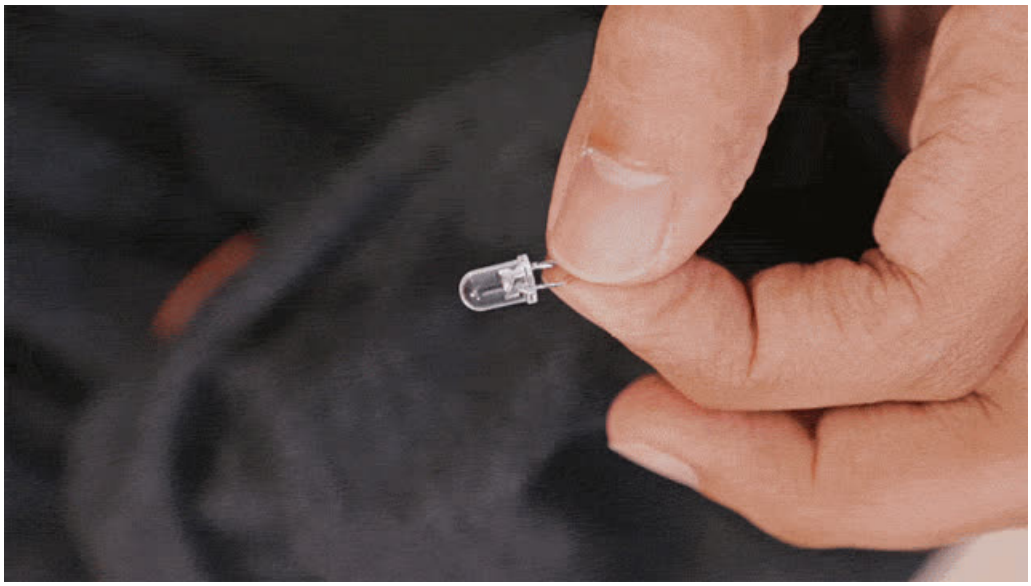
Assembly

Placement Planning

It's a good idea to plan out where you want the unicorn horn to be. Since I'm doing it on my hoodie, I'm placing it near the lower brim of the hoodie, in the center. Then, I used an X-acto blade to score the spot where I want the LED to be. Once it was marked out, I then dug into the fabric, effectively poking a hole.

Install LED into Hoodie

Once I had my hole in the hoodie, I proceeded to insert the LED from the inside of the hoodie and pull it out through the fabric so the LED went through the other side.

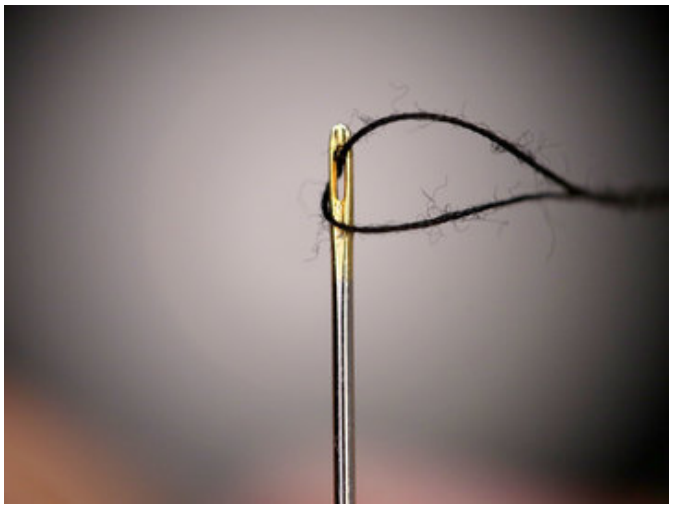


Install LED Holder

Then, I could install the LED holder piece by pressing the LED into it. Really easy, it just press fits into place.

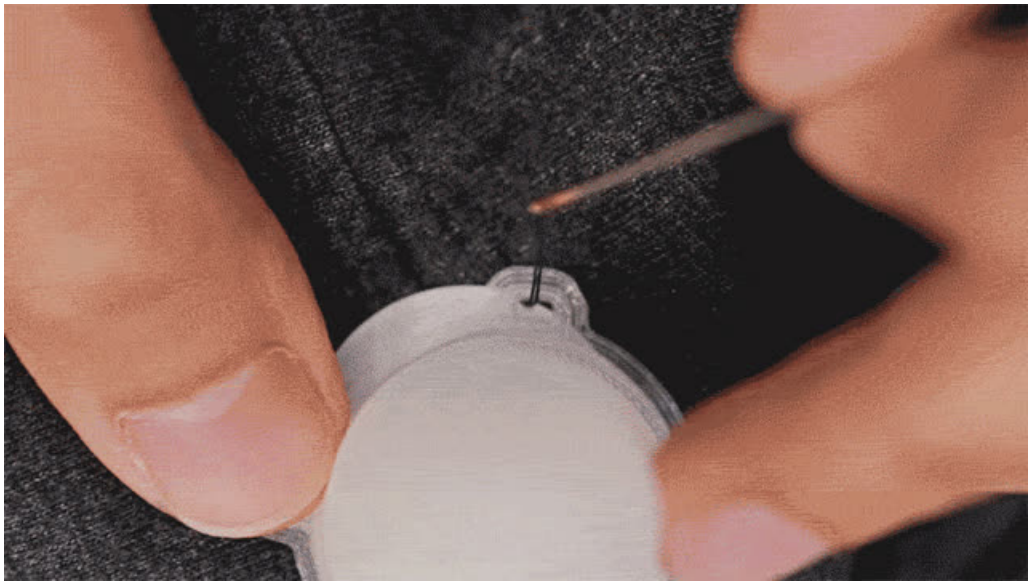
Install Horn onto Holder

With the LED installed into the holder, I proceeded to place it back onto the hoodie, so it's flush with the fabric. Then, place the 3D printed unicorn horn over the LED holder. I recommend orienting the horn so the tabs are away from any seam – that could potentially make it harder to poke a needle through.



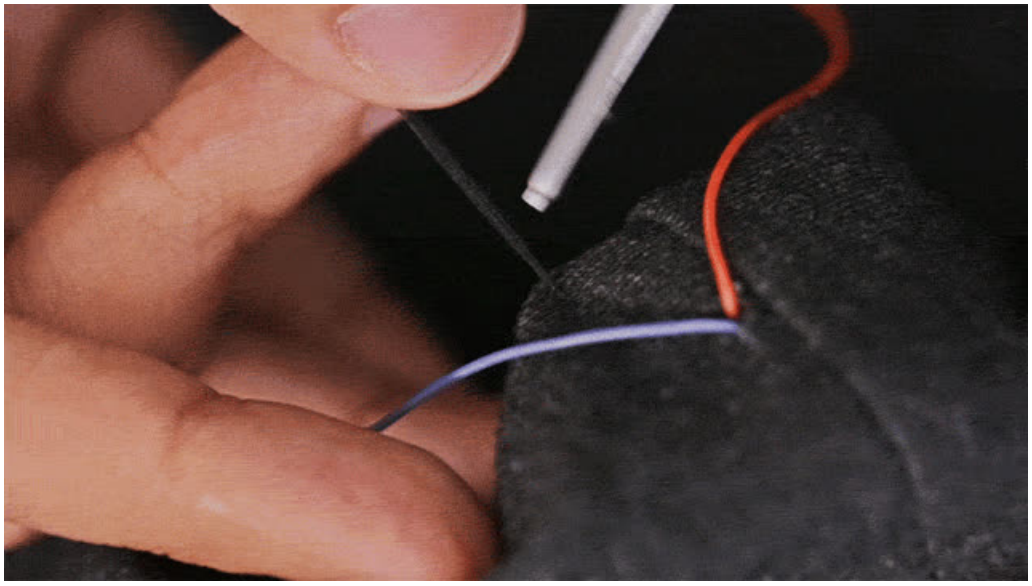
Needle & Thread

Now it's onto sewing! It's totally not duanting, if you can solder wire, you can totally sew! Start by picking out a fairely thin needle (if you're attching the horn to a hat, the thinner the better) and some thread – Ideally a color that matches your headware (here it's black, obviously ;-). Choose a decent length of thread, just make sure it's not too long or short. Then, thread through the eye of the needle and tie the two ends of the thread together so the eye of the needle will be in the middle of the thread.



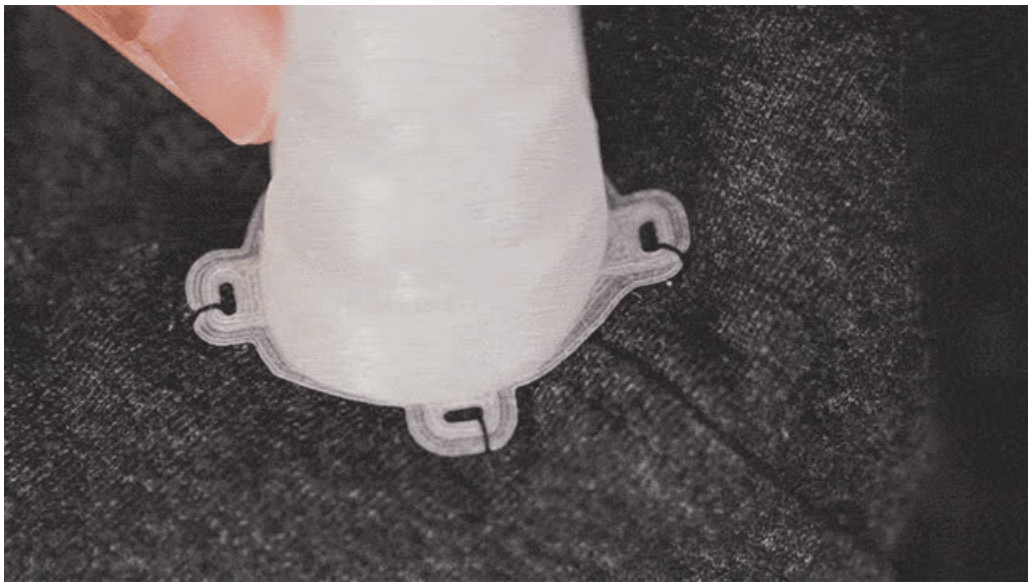
Sew Horn onto Hoodie

Now it's time to sew! I started by poking the needle through the inside of the hoodie and coming up through one of the sew tabs. Then, poke back down on the outside perimeter of the tab and thread until a tight loop is made, holding the sew tab down to the fabric. Then, create a few knots and tighten.



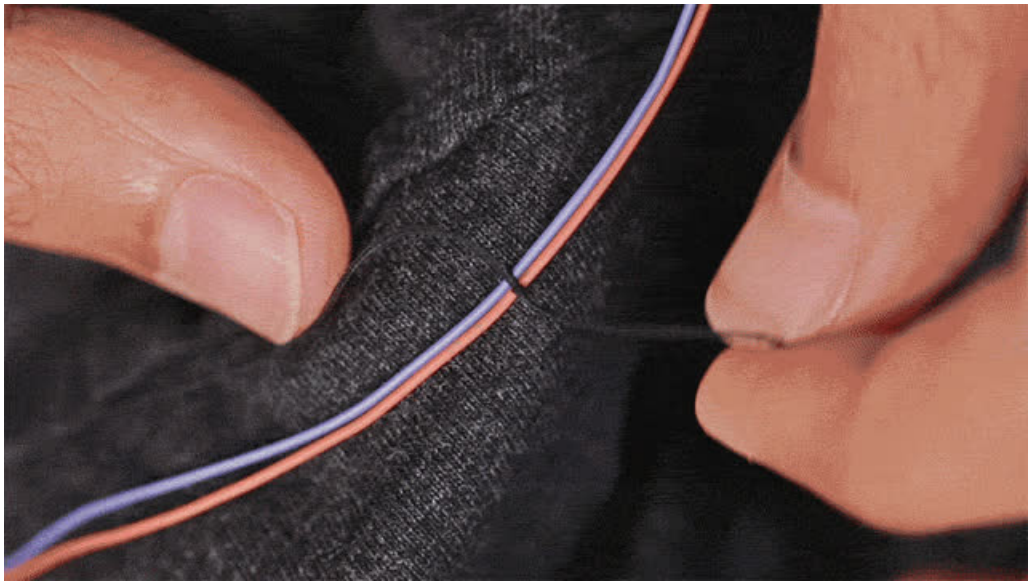
Snip Excess Thread

Use a pair of scissors to snip off the excess thread – fight the urge to use your teeth and byte off the thread ;-)



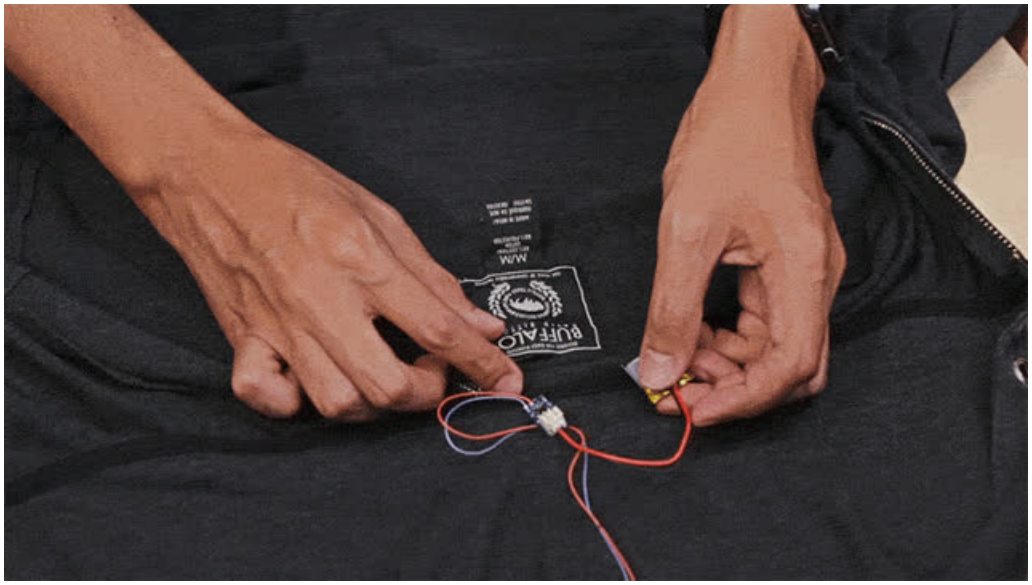
Sew All Tabs

Repeat this process for all for tabs! If you get stuck, not a problem! Just snip off any thread and try again. You'll get better with practice anyway! I was able to get away with a single loop for each tab – but obviously the more you add, the more secure the horn will be!



Sew Wire Loops

Since my wires were a bit lengthy, I ended up adding loops to the wires to keep them in line, preventing them from going all over the place. Just a few regular loops to guide the wires down to the back of the hoodie, near the tag.



Store Battery

Speaking of the tag, that's actually where a good spot if to store the battery and JST switch breakout. There was a large patch right above the tag – I made a slit there and turned it into a little store pocket but if you don't have one, you could just secure it to the tag.

Turn It On!

Welp, we're just about done. Now we can turn the switch on and see our sewed LED horn light up. All that's left to do that this point is to wear it out! Congrats, you're now a magic unicorn! :-D I hope you learned a lot while making this project and enjoyed building it. If you built one, PLEASE take a picture and share it with us on Twitter (https://adafru.it/IDX), Instagram (https://adafru.it/rtc) or even post a make on Thingiverse (https://adafru.it/rtd). We'd love to share it to the world!