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Overview

In this project we'll use our small LED sequins to add lights to our face. These small LEDs are connected to a coin cell breakout board with a build-in on and off switch. We 3d printed a small enclosure and clip to attach the whole circuit to apparel!

This super easy project is great for Halloween or any character with glowing body parts. Perfect for cosplay events or even for safe night riding!

We used wire wrap to connect the LEDs because its thin and still has just enough strength for repeated use. We also tried using the ultra thin magnet wire. It definitely blends into skin better, making it basically invisible, but it will break after repeated use. You could try to strengthen it by doubling up and combining two wires together.
First we'll need to solder the LEDs to build two short strips to fit over your eyebrows. The LEDs are then connected to a small coin cell break out board with a build-in on and off switch. Finally, we'll 3d print a small enclosure and clip to attach the whole circuit to apparel!

This project is inspired by the popular LED eyelashes project (a.k.a. www.flashes.se). We wanted to make a simplified version that people could easily build!

LED sequins have build in resistors, so they are super easily to wire up. The 10 LEDs are powered by a 12mm 3v coin cell battery and should last for quite a while.

You do not need a microcontroller to drive these sequins, unless you want them to blink or fade!

They come in packs of five with breakaway tabs. You can separate them one at a time but for this project we'll leave them on the tabs to have equal spacing between the LEDs.
Parts, Tools and Supplies

Here's a list of the parts needed to make this project.

- two 5 packs of LED sequins ()
- 12mm coin cell breakout ()
- 12mm coin cell ()
- wire wrap ()
- 3d printer () (optional)
- transpore medical tape
Enameled Copper Magnet Wire – 11 meters / 0.1mm diameter
For winding custom coils, or very fine-pitch rework, we always reach for magnet wire. Magnet wire is very very thin (0.1mm diameter!) copper wire with a very thin... https://www.adafruit.com/product/3522

Adafruit LED Sequins - Royal Blue - Pack of 5
Sew a little sparkle into your wearable project with an Adafruit LED Sequin. These are the kid-sister to our popular Flora NeoPixel,... https://www.adafruit.com/product/1757

12mm Coin Cell Breakout w/ On-Off Switch
Simple but effective - this breakout board has a CR1220 coin cell battery holder soldered on, an on/off switch and 0.1" pitch breakout pins for easy connecting. Great for powering... https://www.adafruit.com/product/1867

CR1220 12mm Diameter - 3V Lithium Coin Cell Battery
These are the highest quality & capacity batteries, the same as shipped with the iCufflinks, iNecklace, Datalogging and GPS Shields, GPS HAT, etc. One battery per order... https://www.adafruit.com/product/380
Filament for 3D Printers in Various Colors and Types

Having a 3D printer without filament is sort of like having a regular printer without paper or ink. And while a lot of printers come with some filament there's a good chance...

https://www.adafruit.com/product/2080

"Wire Wrap" Thin Prototyping & Repair Wire - 200m 30AWG Blue

This stuff is called "wire-wrap wire" because it used to be used for wire-wrapping high-speed digital circuits on a special kind of contact board. It's pretty rare to see wire-wrapping in...

https://www.adafruit.com/product/1446
Wiring LEDs

There are 10 LEDs used in this project, four wires total. LED Sequins have built-in resistors, so this makes wiring super simple. We can add strength the strip by looping the wires in the through holes on the sequin PCBs.

To keep the spacing for each sequin, we'll leave the LEDs attached to the PCB until we solder all of the connections. We can then gently bend the sides of the PCB to break them away.

The + side of the sequin are connected to the SW pin on the coin cell breakout.

The - side is connected to one of the Gnd pins on the coin cell breakout.

This provides a visual reference for the wiring of the components. They aren't true to scale, just meant to be used as reference.
3D Printing

Slice Settings

Download the STL file and import it into your 3D printing slicing software. You'll need to adjust your settings accordingly if you're using material different than PLA.

- 220C Extruder Temp
- No heated bed (65C for heated)
- 100% Extrusion Multiplier
- 0.48 Extrusion Width
- 20% infill
- No Raft or Supports

CAD Model

The deck was designed in Autodesk Fusion 360. You can download the source file and modify the design to make a custom board. The STL file is available to download if you want to print "as is" without any modifications.

Download Fusion360 source
Download from Thingiverse
Download from Youmagine
Assemble

Measure Wires

First, we'll need to take measurements for how long the wires will need to be to reach the placement of the LEDs to where you plan to attach the coin cell clip.

In our case, we'll need the wires to reach from our eyes down to the back of the shirt. We made sure to add an extra bit of slack to compensate for curves around ears. We measured about 37 cm long to reach from the back of our shirt collar, around our ears and to the ends of our eyebrows.

We used wire wrap to connect the LEDs because it's thin and still has just enough strength for repeated use. We also tried using the ultra thin magnet wire. It definitely blends into skin better, making it basically invisible, but it will break after repeated use. You could try to strengthen it by doubling up and combining two wires together.
Thread wires

To keep the spacing even between the LEDs, we'll leave them attached to the PCB panels while we solder wires to each LED.

To increase the strength of the connections between the LEDs, we threaded the wires on the through holes for each LED.

We used tweezers to easily maneuver the wires through each hole. Start by looping the wires from the bottom of the PCB to the top of the next. Alternate the loop from top to bottom as shown in the picture.

Do this to each rail of the LEDs. Leave just a little bit of extra wire on each end.
Strip Wires

Now we can use a hobby knife to strip away the wire insulation. Carefully cut away the top and side sections of insulation. Strip sections close to each connection pad on the LEDs.

Remove enough insulation so there is a visible amount of wire. We'll leave the insulation on the bottom side of the LED intact to prevent the bare wire from touching skin.

Make sure to remove enough insulation for the solder to make a solid connection to the wire.

Solder LEDs

Now we can solder our connections. Apply heat to the solder and pads on the LEDs and then slide solder over to the exposed wire areas. Make sure to get enough solder on the pads to get a good connection to the exposed wires sections.
Twist Wires

Now we'll need to twist the power and ground cable to make them easier to shape around our head.

First mark one of the wires to identify which is power and ground. It'll be hard to tell them apart once twisted.

Add a couple of twists to each strip. You don't need to twist it so much as the wire wrap will do a good job keeping its shape.

Trim excess

Clean up any extra wires excess on the ends of the PCB. Feel around the LEDs to make sure its smooth. Cut away any sharp and jagged areas before adding the strip to your body.
Test LED

Test the LEDs before break off the PCB.

At this point we'll want to test the connections to the LEDs. You can touch the power and ground wires on the coin cell battery to make sure all of the connections are making contact with the pads on the LEDs.

Break off

With the LEDs soldered, we can now break them away from the PCB.

First, we'll grip one side of the PBC while gently bending the other side back and forth until the PCB breaks away.

Next, we'll break off the opposite side. Gently gripping the finished side, being careful not to bend the chain, and loosen the PCB by bending it back and forth.
Solder Coin cell

To help solder the coin cell breakout, we'll use third helping hand to hold it in place while soldering.

We'll need to solder two wires to each through hole on the SW pin (power) and GND (ground) on coin cell breakout.

Twist the two ground wires ends together and then twist the two power wires end together. Tin the wires by applying solder to the ends of the twisted wire pairs.

Insert Coin Cell
Now we can insert a 12mm CR1220 coin cell battery in the breakout. Insert the coin cell with the positive side (top flat) positive side up.
Test Connections

Test the connections by flipping the switching on the breakout.

If the LEDs don't turn on, check the solder points on the coin cell breakout and each pad of the led strip. You may need to apply a bit more solder on the get a solid connection.
Clip Assemble

Next we'll assemble the 3d printed clip for the breakout board. Slide the clip onto the plate part. Angle the clip part so the part with the end stop slides on the side with the standoffs.

The breakout will hold the clip in place once its screwed on to base plate part.

Clip on

Position the board so the wires are facing towards the top of your shirt. Pull the clip back with one hand, while slipping the part onto your neck collar. Slide the clip over so it's positioned close to were the strips are.
Prep Transpore Tape

We really like using the transpore medical tape for adhering parts to skin. It has a good amount of hold without leaving behind alot of sticky residue.

Strip off a small piece and then tear half of that piece to make a long thin piece. Use tweezers to roll up two pieces. We'll use these rolls to adhere the LEDs above our eyebrows.
Bend Wires

Guide the wires around the back of your neck, over the back of your ears and above of your eyebrows. Take note of where two ends of the strip and apply the rolled up pieces of tape to those areas. You can slide the rolls of tape to fine tune its position.

Adhere

Press on the LEDs to adhere them to the tape. If the tape won't stick to the LEDs, try washing your hands and face to remove any oil that will prevent it from sticking.

Over eyes

The wire wrap has just enough strength to hold the LEDs over the your eyes to make it look like you have lights in your eyes sockets. We can add a small strip of tape over around your temples to hold the strip while you bend the wire to position it over the eyes.