Stitch Different: LED-Illuminated Embroidery with nOOds

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https://learn.adafruit.com/stitch-different-led-illuminated-embroidery-with-noods

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Overview

Bring a little retro magic into the modern age with glowing embroidered art! Apple's classic rainbow logo gets a high-tech makeover in this project, combining machine embroidery with Adafruit's LED nOOds. We'll explore how Large Language Models (LLMs) can help turn an idea into an embroidery-ready design, then use a computerized embroidery machine to bring it to life. Download the finished embroidery file to stitch your own, or use the same techniques to create something entirely original.

And... one more thing.

It lights up!

This is a fairly easy beginner project that requires a little soldering and some sewing skills.

Two different lengths of n00ds are used for this project: the 130mm and 300mm versions are just the right size to surround the leaf at the top of the logo and the apple itself. n00ds come in a lot of variations and colors (http://adafru.it/5503), so find what works with your vision. But remember, the longer 12v/24v n00ds won't work with this battery setup, so stick with the 3v versions.

Parts

Featured

nOOds - Flexible LED Filament - 3V 130mm long - Warm White

Our favorite food when hacking on code or electronics is a hot bowl of noodles - and around NYC these are often called 'noods'! What we've got here are flexible LED...

https://www.adafruit.com/product/5504

Featured

nOOds - Flexible LED Filament - 3V 300mm long - Warm White

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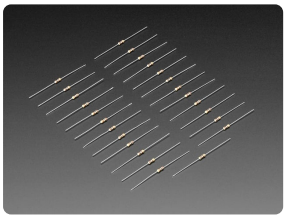
https://www.adafruit.com/product/5503

To make sure there is a steady glow without burning out the n00ds, this project adds a couple of 100 ohm resistors. Get some heat shrink to cover them up so the back of your project stays tidy.



Through-Hole Resistors - 100 ohm 5% 1/4W - Pack of 25

ΩMG! You're not going to be able to resist these handy resistor packs! Well, axially, they do all of the resisting for you!This is a 25 Pack of...

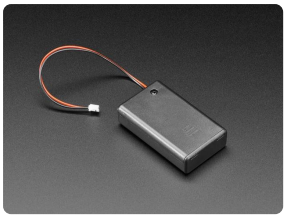
https://www.adafruit.com/product/4293

Heat Shrink Pack

Heat shrink is the duct tape of electronics, it keeps your stuff all safe and kept together. Especially when wiring and soldering, use heat shrink to add mechanical strength to cables....

https://www.adafruit.com/product/344

Power your n00ds with three AAA batteries. This battery pack comes with an on/off switch already on board. Get a male JST cable as well, to connect the n00ds to the batteries.

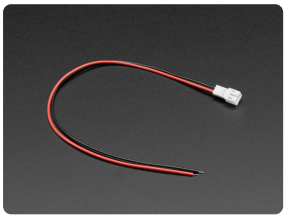


Featured

3 x AAA Battery Holder with On/Off Switch and 2-Pin JST

This battery holder connects 3 AAA batteries together in series for powering all kinds of projects. We spec'd these out because the box is slim, and 3 AAA's add up to about...

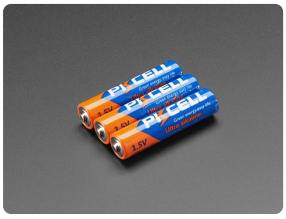
https://www.adafruit.com/product/727



JST PH 2-Pin Cable – Male Header 200mm

For a really long time we assumed that the JST PH didn't have a free-hanging male header version. But then we found this JST-PH 2-pin Male Cable, and we were...

https://www.adafruit.com/product/3814



Alkaline AAA batteries - 3 pack

Battery power for your portable project! These batteries are good quality at a good price, and work fantastic with any of the kits or projects in the shop that use AAA's. This is a...

https://www.adafruit.com/product/3520

Tools & Materials

Embroidery Supplies

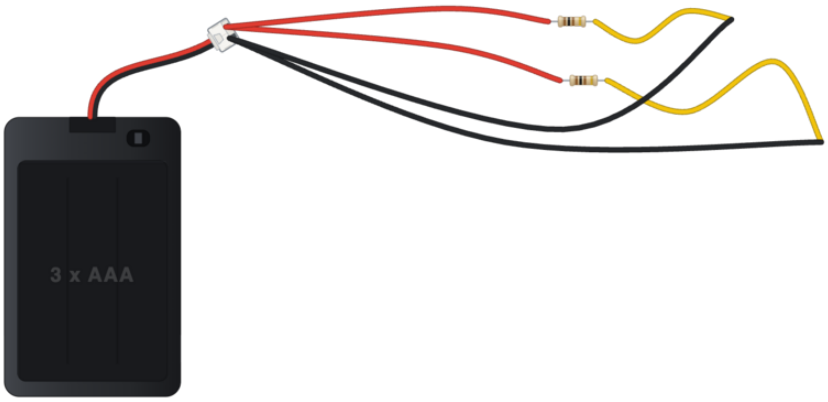
- Embroidery thread in your favorite colors: this project uses green, yellow, orange, red, purple, and blue
- White or off-white cotton fabric — preferably a sturdy, tightly woven fabric
- Medium-weight cut-away embroidery stabilizer
- Embroidery bobbin thread — white
- Machine embroidery needle — 75/11 is a good starting point
- Embroidery hoop — sized to fit your design and machine
- Clear monofilament or transparent sewing thread and a hand-sewing needle — for securing the nOOds without covering their light

Electronics Supplies

- Soldering iron & accessories
- Heat gun (optional but helpful)
- Extra silicone stranded wire, in case you want to place the battery pack further away
- A coin cell battery for testing n00d polarity

This independent educational project uses a familiar design to demonstrate embroidery digitization, stitch-file preparation, and adding flexible LEDs to fabric. Apple and the Apple logo are trademarks of Apple Inc. This project is not affiliated with, sponsored by, or endorsed by Apple Inc.

Wiring Diagram



The anode (+) end of each n00d is connected to a 100 ohm resistor, and the resistor is connected to the red lead coming from the JST connector.

The cathode (-) end of each n00d is soldered to the black lead coming from the JST connector.

The JST connector plugs into the battery pack, which has an onboard on/off switch.

Embroidery

Before you can stitch a design with a computerized embroidery machine, you'll need to turn your artwork into a file your machine understands. This process is called digitizing, and it converts shapes and colors into instructions that tell the machine exactly where to place each stitch.

There are several ways to get an embroidery-ready design, depending on how much customization you want to do.

As you refine your design, keep the dimensions of the n00ds in mind. They come in 130mm and 300mm lengths. You can hide any extra length behind the design, but if the area you want to trace is slightly longer than 300mm, you may want to resize the design so the n00ds align nicely with the edge.

Option 1: Download an Embroidery Design

The easiest way to get started is to download a ready-made embroidery pattern. There are lots of websites offering free and paid designs, with everything from flowers and animals to logos and elaborate decorative patterns. Just search for embroidery machine downloads, there are a lot of options out there.

Look for files that match your embroidery machine's format. My Brother SE-400 uses `.PES` files, but other machines may use `.DST`, `.JEF`, or other formats.

Make sure your chosen design fits within your machine's embroidery area. My machine has a 4" × 4" maximum embroidery field, so I need to keep my designs fairly small.

Here's the file I used in this project. It uses six different rainbow colors and each section of the apple has a different stitch texture. My machine uses the .pes format. If yours uses a different format, you can convert this file using the Ink/Stitch () software.

Option 2: Use Embroidery Design Software

If you want to create your own designs, embroidery digitizing software gives you control over stitch direction, density, texture, thread colors, and stitch order.

Ink/Stitch () is a free, open-source option that works with Inkscape, a popular vector graphics editor. You can import or draw artwork, convert shapes into stitches, preview the stitching process, and export files for your embroidery machine.

Commercial embroidery software is also available, but Ink/Stitch is a great place to start if you're interested in experimenting without buying an expensive software package.

Option 3: Generate an Embroidery File with AI

Large Language Models (LLMs) can help create embroidery designs, and some can even generate the machine-readable stitch files directly using code.

A few tips for working with AI-generated embroidery files:

- Tell your LLM which embroidery machine you're using, its maximum embroidery area, and the file format it requires.
- Start with simple shapes and a small number of thread colors.
- Ask for different stitch types and textures to give your design more depth.
- Preview the stitch sequence whenever possible, including the starting position, color changes, and jump stitches.
- Test your design on scrap fabric before stitching your final piece.

Not every LLM can generate valid embroidery files directly, and even files that load successfully may contain incorrect stitch instructions. Be prepared to troubleshoot and refine your design.

Stitch Your Design

Place a layer of embroidery stabilizer () behind your fabric, then secure both layers in your embroidery hoop. The fabric should lie flat without stretching.

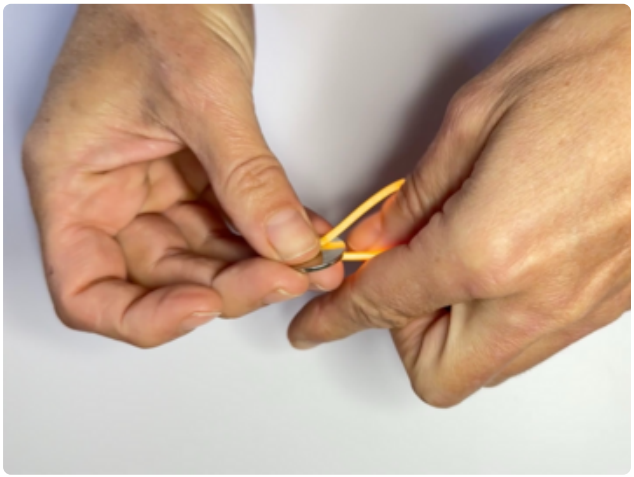
Load the embroidery file onto your machine and select your design. Double check that it fits within the available stitching area before you begin. Thread your machine with the first color and start stitching. Follow the machine's prompts to change thread colors as needed.

For this retro rainbow design, you'll need green, yellow, orange, red, purple, and blue embroidery thread. Once the machine finishes, remove the fabric from the hoop, trim any loose threads, and carefully cut away the excess stabilizer from the back.

Wire up the n00ds

Let's add some light! This design uses two flexible LED nOOds to outline our embroidered Apple logo: a 300mm nOOd for the body of the apple and a 130mm nOOd for the leaf.

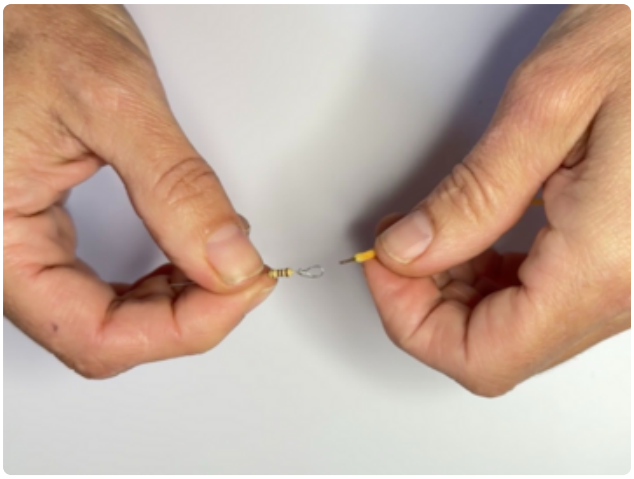
Wire both nOOds in parallel, with a separate 100Ω resistor for each, and power them with a 3xAAA battery pack, per the wiring diagram.

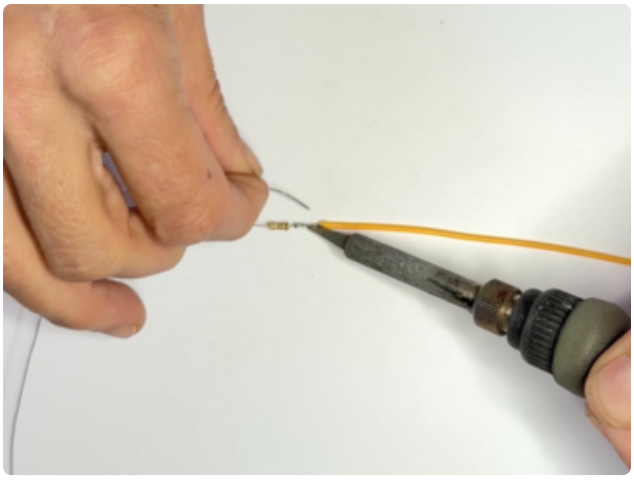


Test Your nOOds

Before soldering, check the polarity of each nOOd. LEDs only work in one direction: the anode is positive (+) and the cathode is negative (−).

Use a coin cell battery for a quick polarity test. Briefly touch the nOOd's leads to opposite sides of the battery. If it doesn't light, reverse the connections. Mark the positive end so you can identify it later.





Add the Resistors

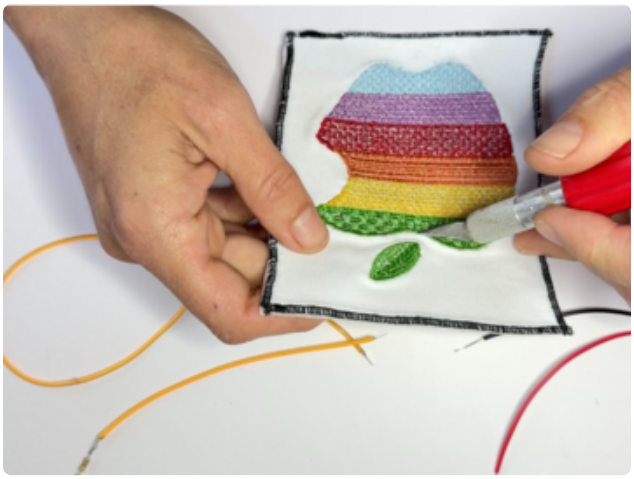
Each nOOd needs its own current-limiting resistor. This uses 100Ω resistors with a 3xAAA battery pack.

Bend one leg of a resistor into a small loop and hook it around the positive (anode) lead of your nOOd. Twist the connection together, then solder it securely.

Repeat with the second nOOd.

The resistors aren't polarized, so either end can connect to the nOOd. They can also go on either side of the LED circuit, as long as each nOOd has its own resistor in series.

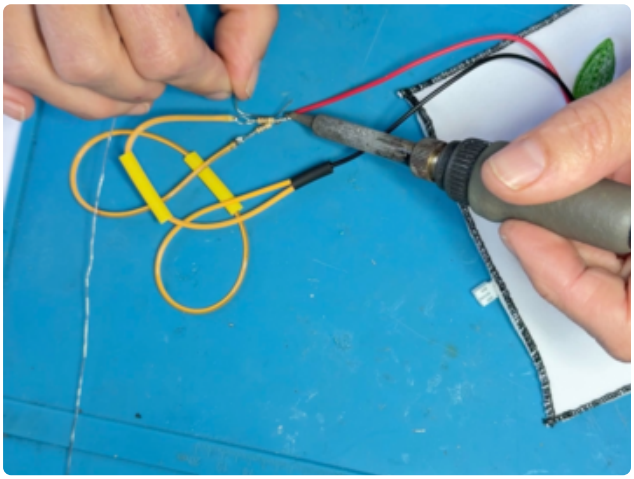
Trim any excess leads, but leave enough wire to connect to the battery pack.



Prepare the Embroidery

Decide where you want the nOOds to start and finish. We'll hide the electrical connections behind the embroidery, leaving only the glowing filaments visible on the front.

Use a sharp craft knife to carefully cut a small slit through the fabric near the base of the apple logo, where the nOOds will emerge. Take care not to cut through the embroidered stitches. Thread the wires from the male JST connector through the hole so they emerge on the front side.

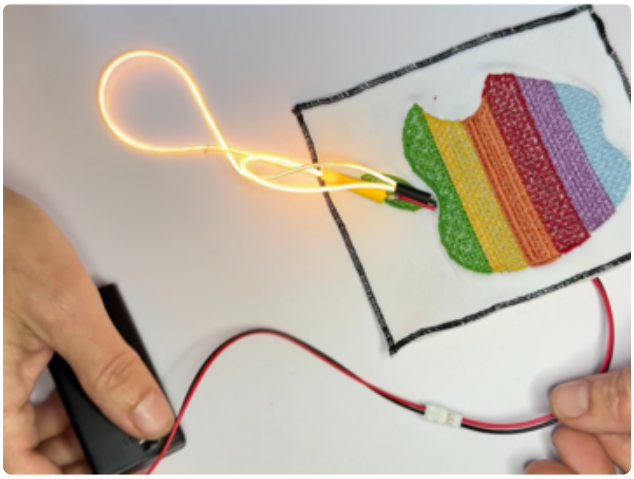


Connect the Power Wires

Slip some heat shrink onto the JST connector wires: a shorter piece on the black wire and a longer piece - long enough to cover both resistors -- on the red wires. Following the wiring diagram, connect both nOOd cathodes (negative leads) to the black wire from the battery connector.

Next, connect the free ends of both 100Ω resistors to the red wire from the battery connector.

Solder the connections securely, keeping the positive and negative wires separated.

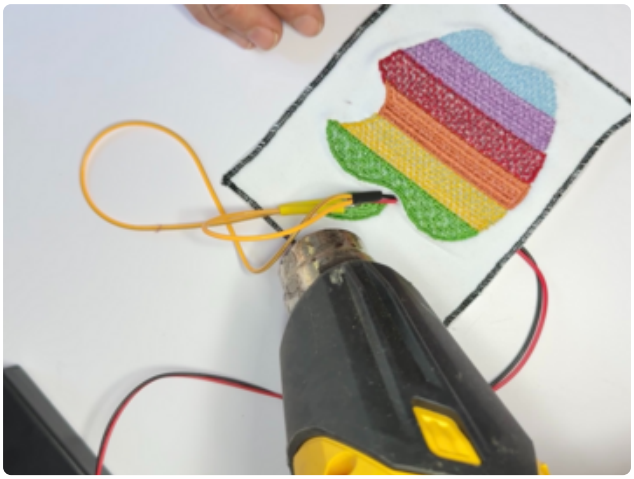


Test the Circuit

Insert three AAA batteries and connect the battery pack. Both nOOds should light up.

If one doesn't light, disconnect the battery and check its polarity, solder joints, and wiring. If neither lights, check the battery pack, connector, and common power connections.

It's much easier to troubleshoot now than after everything is tucked behind the embroidery.



Insulate the Connections

Once everything works, slide heat-shrink tubing over the exposed electrical connections.

Use a heat gun to shrink the tubing until it fits snugly around the wires. Make sure no bare conductors can touch each other.

Keep the heat moving and avoid directing it onto the nOOds or embroidery fabric.

Carefully feed the wire connections through the slit in the fabric, pulling the flexible illuminated portions onto the front while keeping the solder joints, resistors, and wiring behind the embroidery.

Take your time here. The nOOds are flexible, but their electrical connections are delicate. Avoid tugging on the solder joints or bending the filaments sharply at their ends.

Use a needle and clear thread to hand-stitch the n00d into place along the border of your design.

For my first attempt, I tried using a wide zig-zag stitch on my sewing machine but these n00ds are really delicate - I hit the n00d one time with the needle when going around a corner and the whole thing stopped working. Be careful with this step, so you don't need to re-do all your hard work!