



LED Neon Signs with NeoPixels

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<https://learn.adafruit.com/led-neon-signs-with-neopixels>

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Table of Contents

Overview	3
<hr/>	
<ul style="list-style-type: none">• Prerequisite Guides• Parts	
Circuit Diagram	5
<hr/>	
<ul style="list-style-type: none">• Adafruit Library for Fritzing• Wiring Connections	
CircuitPython	6
<hr/>	
<ul style="list-style-type: none">• CircuitPython Quickstart• Safe Mode• Flash Resetting UF2	
Code	10
<hr/>	
<ul style="list-style-type: none">• Upload the Code and Libraries to the QT Py RP2040	
Wiring NeoPixel Strip	11
<hr/>	
<ul style="list-style-type: none">• Unpack NeoPixel LED Strip• Data in and out• Data Out• Cut Data Cable• Connect Cable to QT Py• Tin Wires• Solder Wires to QT Py• Connect Strip to QT Py• Power QT Py	
3D Printing	14
<hr/>	
<ul style="list-style-type: none">• Slice Settings• Build Volume• Blinka The Python• Rainbow• Lightning Bolt• Neon Kitty	
NeoPixel Installation	17
<hr/>	
<ul style="list-style-type: none">• Installation• Installation (Continued)• Installation (Continued)• Installed Strip• Power it Up!	

Overview

Build neon-like signs using NeoPixel LEDs and 3D Printing! Use QT Py RP2040 and CircuitPython to make LED animations that bring them to life!



These strips feature flexible silicone diffusion for a neon look, with the individual addressable capabilities of NeoPixels.

We 3D printed some signs that allow you to use the full meter long strip of NeoPixels.



It's a simple easy press fit installation so there's no need for cutting or splicing.

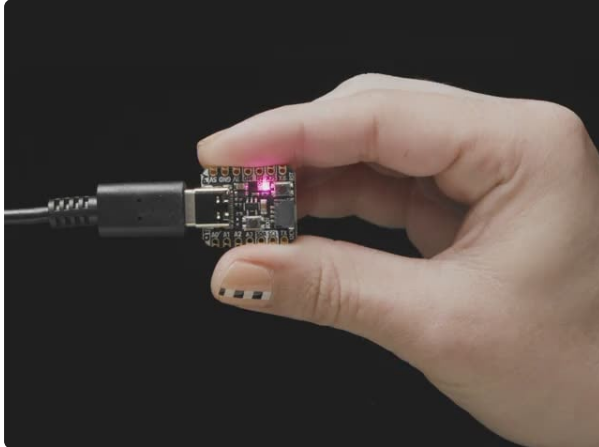
The four designs use a 1 meter strip to make simple shapes designed to fit on the bed of our 3D printer.

Prerequisite Guides

Take a moment to walk through the following guides.

- [CircuitPython LED Animations \(https://adafru.it/LZF\)](https://adafru.it/LZF)
- [QT Py RP2040 Introduction \(https://adafru.it/RWD\)](https://adafru.it/RWD)
- [NeoPixel Uber Guide \(https://adafru.it/dhw\)](https://adafru.it/dhw)

Parts



[Adafruit QT Py RP2040](https://www.adafruit.com/product/4900)

What a cutie pie! Or is it... a QT Py? This diminutive dev board comes with one of our new favorite chip, the RP2040. It's been made famous in the new

<https://www.adafruit.com/product/4900>



[Flexible Silicone Neon-like Skinny NeoPixel LED Strip](https://www.adafruit.com/product/4310)

You love NeoPixels, and you love silicone diffusion? Peep this Flexible Silicone Neon-like Skinny NeoPixel LED Strip! OK it's a bit of a mouthful, but check...

<https://www.adafruit.com/product/4310>



[Pink and Purple Woven USB A to USB C Cable - 2 meters long](https://www.adafruit.com/product/5044)

This cable is not only super-fashionable, with a woven pink and purple Blinka-like pattern, it's also made for USB C for our modernized breakout boards, Feathers and more.

<https://www.adafruit.com/product/5044>



5V 2A Switching Power Supply w/ USB-A Connector

Our 5V 2A USB power adapter is the perfect choice for powering single-board computers like Raspberry Pi, BeagleBone, or anything else that's power-hungry! This adapter was...

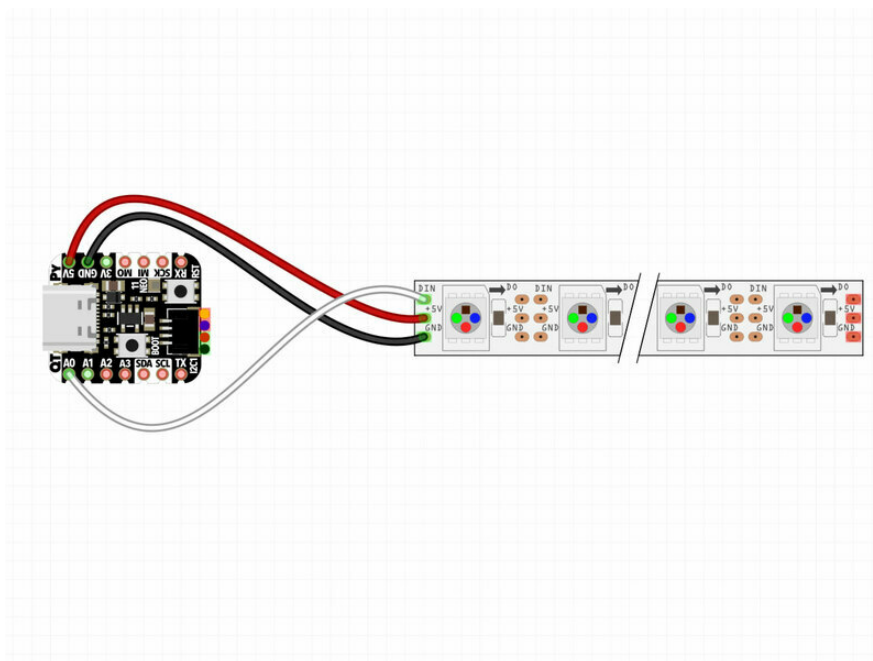
<https://www.adafruit.com/product/1994>

Circuit Diagram

The diagram below provides a visual reference for wiring of the components. This diagram was created using the software package [Fritzing](https://adafru.it/oEP) (<https://adafru.it/oEP>).

Adafruit Library for Fritzing

Use Adafruit's Fritzing parts library to create circuit diagrams for your projects. Download the library or just grab individual parts. Get the library and parts from [GitHub - Adafruit Fritzing Parts](https://adafru.it/AYZ) (<https://adafru.it/AYZ>).



Wiring Connections

NeoPixel Strip

- NeoPixel **GND** to QT Py RP2040 **GND**
- NeoPixel **5V** to QT Py RP2040 **5V**
- NeoPixel **DIN** to QT Py RP2040 **A0**

CircuitPython

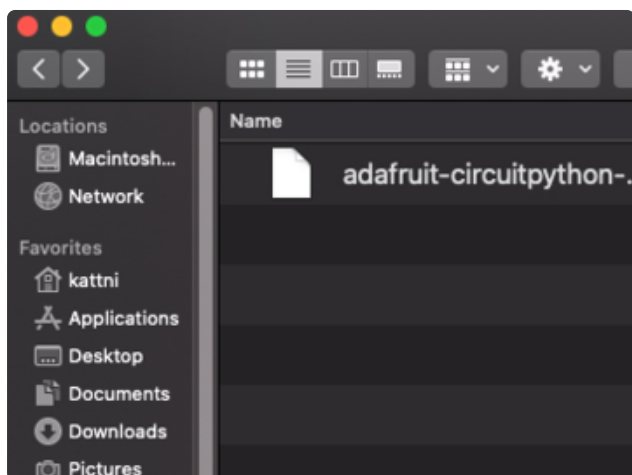
[CircuitPython](https://adafru.it/tB7) (<https://adafru.it/tB7>) is a derivative of [MicroPython](https://adafru.it/BeZ) (<https://adafru.it/BeZ>) designed to simplify experimentation and education on low-cost microcontrollers. It makes it easier than ever to get prototyping by requiring no upfront desktop software downloads. Simply copy and edit files on the **CIRCUITPY** drive to iterate.

CircuitPython Quickstart

Follow this step-by-step to quickly get CircuitPython running on your board.

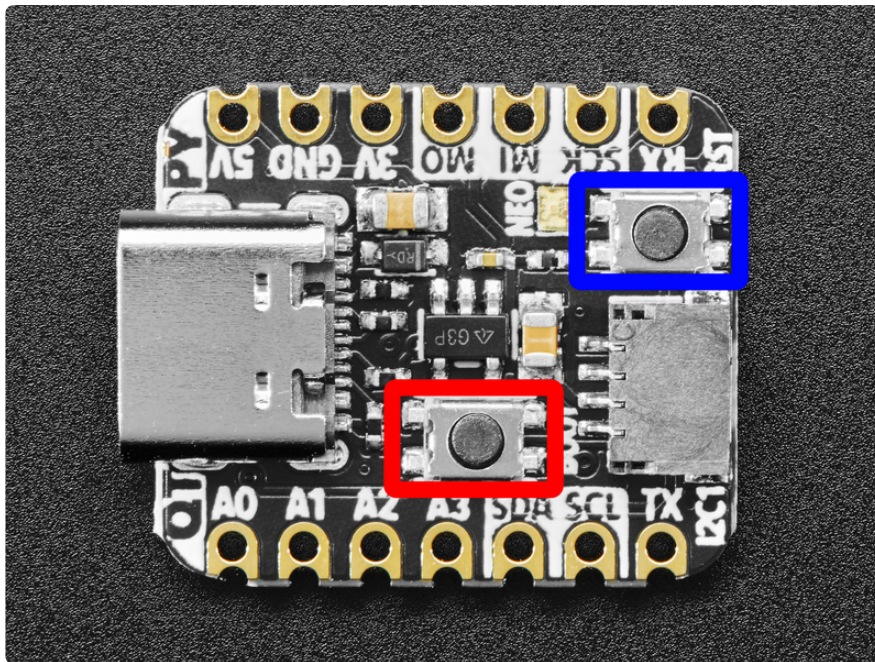
Download the latest version of
CircuitPython for this board via
[circuitpython.org](https://adafru.it/RLD)

<https://adafru.it/RLD>



Click the link above to download the latest CircuitPython UF2 file.

Save it wherever is convenient for you.

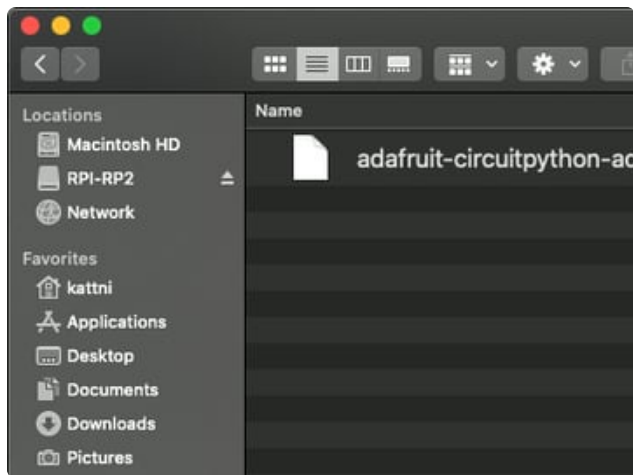


To enter the bootloader, hold down the **BOOT/BOOTSEL** button (highlighted in red above), and while continuing to hold it (don't let go!), press and release the **reset** button (highlighted in blue above). **Continue to hold the BOOT/BOOTSEL button until the RPi-RP2 drive appears!**

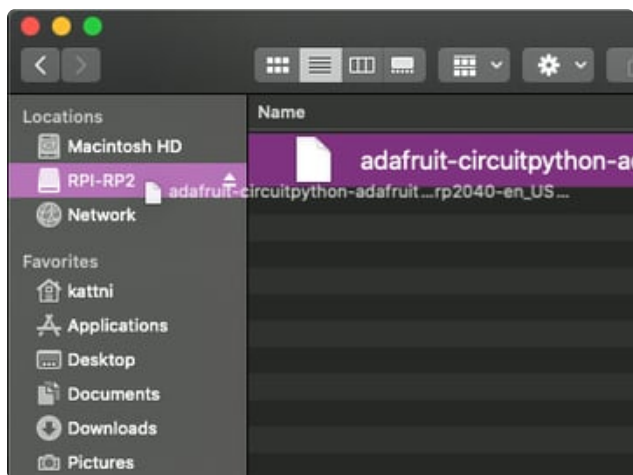
If the drive does not appear, release all the buttons, and then repeat the process above.

You can also start with your board unplugged from USB, press and hold the BOOTSEL button (highlighted in red above), continue to hold it while plugging it into USB, and wait for the drive to appear before releasing the button.

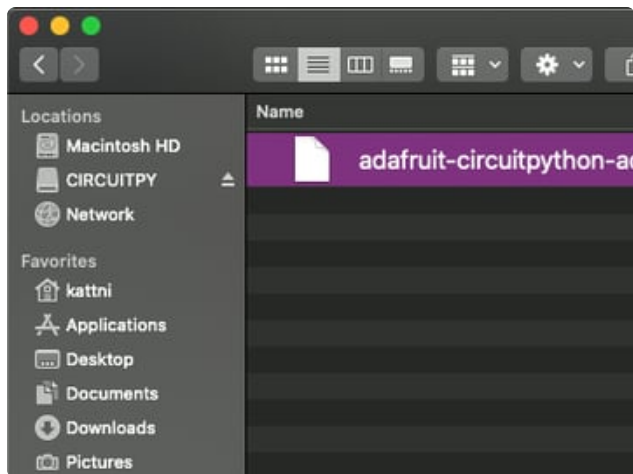
A lot of people end up using charge-only USB cables and it is very frustrating! **Make sure you have a USB cable you know is good for data sync.**



You will see a new disk drive appear called **RPI-RP2**.



Drag the **adafruit_circuitpython_etc.uf2** file to **RPI-RP2**.



The **RPI-RP2** drive will disappear and a new disk drive called **CIRCUITPY** will appear.

That's it, you're done! :)

Safe Mode

You want to edit your **code.py** or modify the files on your **CIRCUITPY** drive, but find that you can't. Perhaps your board has gotten into a state where **CIRCUITPY** is read-only. You may have turned off the **CIRCUITPY** drive altogether. Whatever the reason, safe mode can help.

Safe mode in CircuitPython does not run any user code on startup, and disables auto-reload. This means a few things. First, safe mode bypasses any code in **boot.py** (where you can set **CIRCUITPY** read-only or turn it off completely). Second, it does not run the code in **code.py**. And finally, it does not automatically soft-reload when data is written to the **CIRCUITPY** drive.

Therefore, whatever you may have done to put your board in a non-interactive state, safe mode gives you the opportunity to correct it without losing all of the data on the **CIRCUITPY** drive.

Entering Safe Mode

To enter safe mode when using CircuitPython, plug in your board or hit reset (highlighted in red above). Immediately after the board starts up or resets, it waits 1000ms. On some boards, the onboard status LED (highlighted in green above) will blink yellow during that time. If you press reset during that 1000ms, the board will start up in safe mode. It can be difficult to react to the yellow LED, so you may want to think of it simply as a slow double click of the reset button. (Remember, a fast double click of reset enters the bootloader.)

In Safe Mode

If you successfully enter safe mode on CircuitPython, the LED will intermittently blink yellow three times.

If you connect to the serial console, you'll find the following message.

```
Auto-reload is off.  
Running in safe mode! Not running saved code.  
  
CircuitPython is in safe mode because you pressed the reset button during boot.  
Press again to exit safe mode.  
  
Press any key to enter the REPL. Use CTRL-D to reload.
```

You can now edit the contents of the **CIRCUITPY** drive. Remember, your code will not run until you press the reset button, or unplug and plug in your board, to get out of safe mode.

Flash Resetting UF2

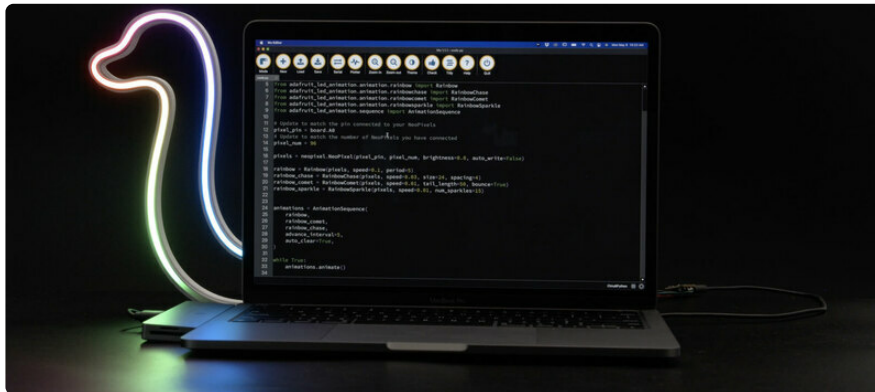
If your board ever gets into a really weird state and CIRCUITPY doesn't show up as a disk drive after installing CircuitPython, try loading this 'nuke' UF2 to RPI-RP2. which

will do a 'deep clean' on your Flash Memory. **You will lose all the files on the board,** but at least you'll be able to revive it! After loading this UF2, follow the steps above to re-install CircuitPython.

Download flash erasing "nuke" UF2

<https://adafru.it/RLE>

Code



Once you've finished setting up your QT Py RP2040 with CircuitPython, you can access the code and necessary libraries by downloading the Project Bundle.

To do this, click on the **Download Project Bundle** button in the window below. It will download as a zipped folder.

Upload the Code and Libraries to the QT Py RP2040

```
# SPDX-FileCopyrightText: 2021 Kattni Rembor for Adafruit Industries
# SPDX-License-Identifier: MIT

import board
import neopixel

from adafruit_led_animation.animation.rainbow import Rainbow
from adafruit_led_animation.animation.rainbowchase import RainbowChase
from adafruit_led_animation.animation.rainbowcomet import RainbowComet
from adafruit_led_animation.sequence import AnimationSequence

# Update to match the pin connected to your NeoPixels
pixel_pin = board.A0
# Update to match the number of NeoPixels you have connected
pixel_num = 96

pixels = neopixel.NeoPixel(pixel_pin, pixel_num, brightness=0.8, auto_write=False)

rainbow = Rainbow(pixels, speed=0.1, period=5)
rainbow_chase = RainbowChase(pixels, speed=0.03, size=24, spacing=4)
rainbow_comet = RainbowComet(pixels, speed=0.01, tail_length=50, bounce=True)

animations = AnimationSequence(
```

```

rainbow,
rainbow_comet,
rainbow_chase,
advance_interval=5,
auto_clear=True,
)

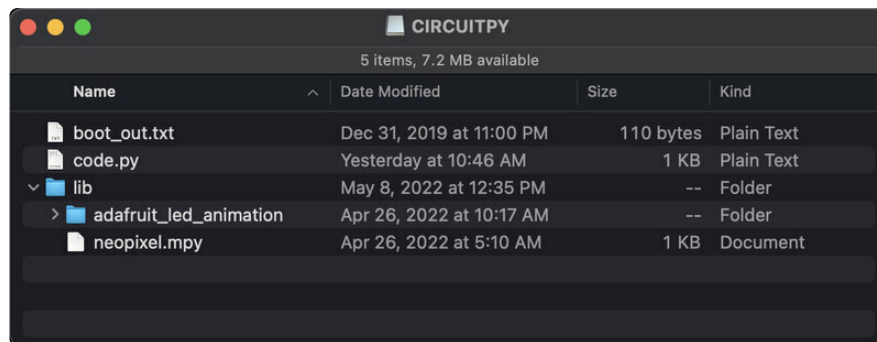
while True:
    animations.animate()

```

After downloading the Project Bundle, plug your QT Py RP2040 into the computer's USB port. You should see a new flash drive appear in the computer's File Explorer or Finder (depending on your operating system) called **CIRCUITPY**. Unzip the folder and copy the following items to the QT Py RP2040's **CIRCUITPY** drive.

- **lib** folder
- **code.py**

Your QT Py RP2040 **CIRCUITPY** drive should look like this after copying the **lib** folder and the **code.py** file.



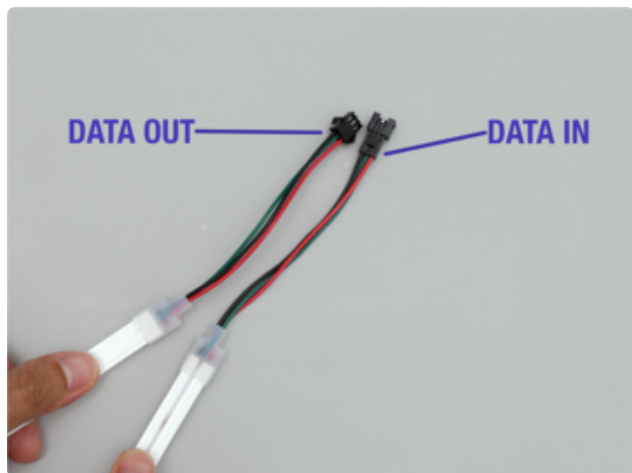
Wiring NeoPixel Strip



Unpack NeoPixel LED Strip

Take the NeoPixel strip out of the packaging to get it ready.

Remove the hook and loop banding and unwind the meter long strip onto your work surface.

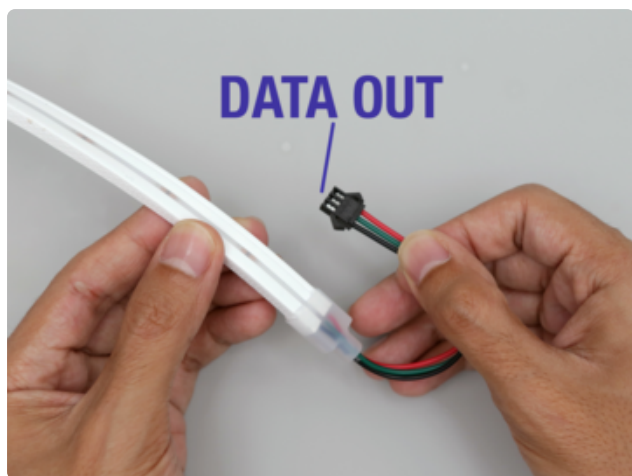


Data in and out

Locate the data in and data out connectors on each end of the strip.

The cable with the latching tab is **Data In** and is the start of the NeoPixel strip.

The other end is Data Out and has the last LED in the strip.



Data Out

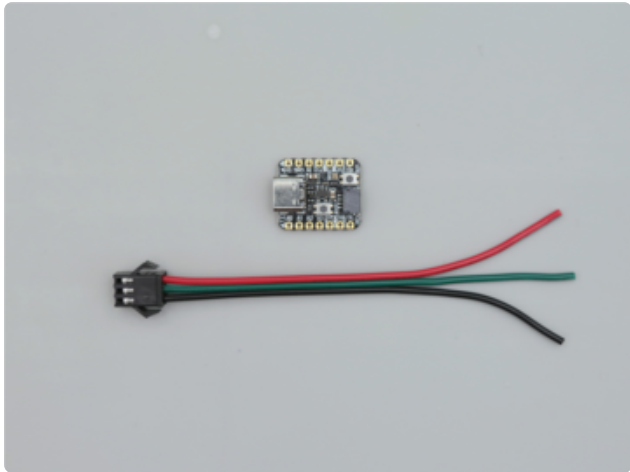
Locate the data out cable and get it ready to remove.

The data in cable will be soldered to the pins on the QT Py RP2040.



Cut Data Cable

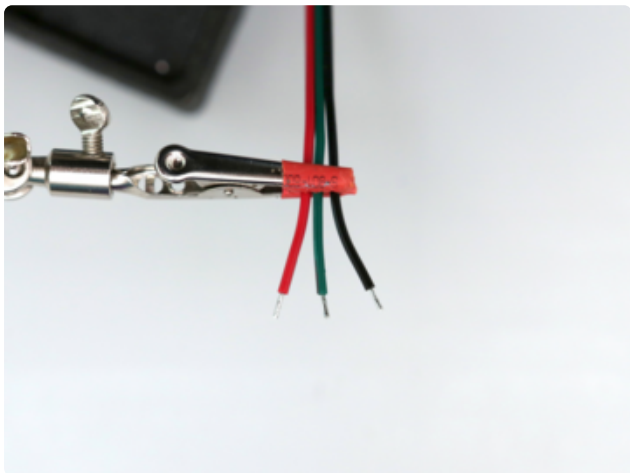
Use flush diagonal cutters to cut off the data out cable from the strip.



Connect Cable to QT Py

Get the data out cable ready to solder to the QT Py.

The wires might be fused together - if so, peel apart the three wires like the photo.

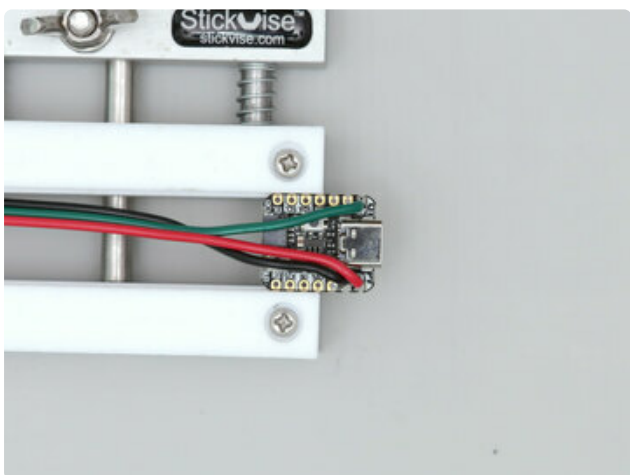


Tin Wires

Prep the wires using wire strippers to remove a bit of insulation from the tips of each wire.

Use third helping hands to help keep the wires sturdy while soldering.

Tin the wires by adding a bit of solder to them. This will help prevent the strands of wire from fraying.



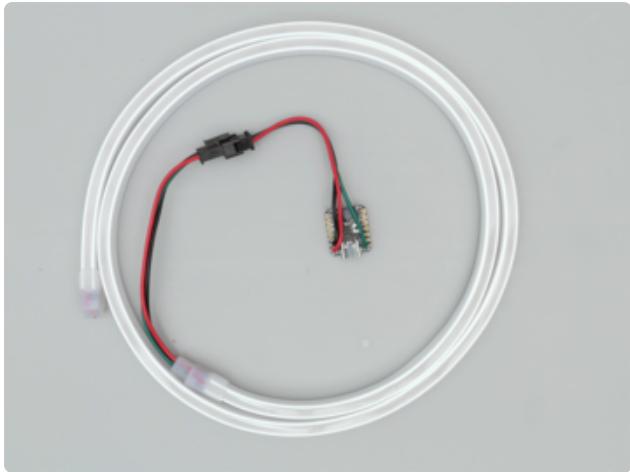
Solder Wires to QT Py

Use a vise to keep the Qt Py PCB sturdy while soldering.

Solder the red wire to the 5V pin.

Solder the black wire to the GND pin.

Solder the green wire to pin A0.



Connect Strip to QT Py

Remove the Qt Py from the vise and connect the cables together.

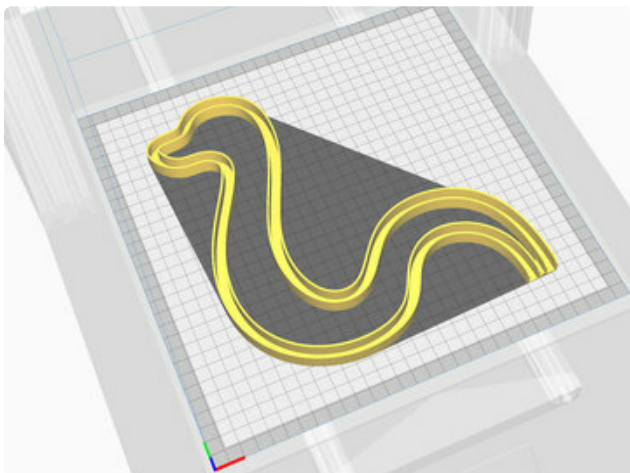


Power QT Py

Test the circuit by powering the QT Py RP2040 using a 5V USB battery or power supply.

If it doesn't light up, ensure CircuitPython and the code is on the QT Py.

3D Printing



Slice Settings

Use PLA filament that is tested and proven to produce strong parts. Reference the following slice settings for best results.

220C Nozzle Temperature

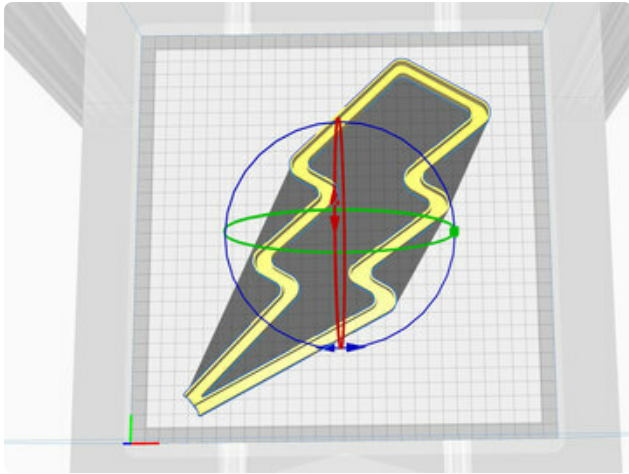
60C Heated Bed

0.4mm Line Width

2x Wall Line Count

10% Infill Gyroid

6x Top/Bottom Layers



Build Volume

The parts require a 3D printer with a minimum build volume.

Rotate lightning bolt sign to utilize diagonal length of the bed.

300mm (X) x 300mm (Y) x 100mm (Z)

Download STL files

<https://adafru.it/-9C>

Download CAD Source

<https://adafru.it/-9D>



Blinka The Python

A simple outline of Blinka, the CircuitPython mascot.



Rainbow

This is rainbow-like shape that curves at the end of each segment.



Lightning Bolt

This bolt features three segments and very tight corners.



Neon Kitty

This is a simple side-profile of a cat with a long and curvy tail. Meow!

NeoPixel Installation



Installation

Begin installing the NeoPixel LED strip by starting with the end of the strip going in first with the light side facing up.

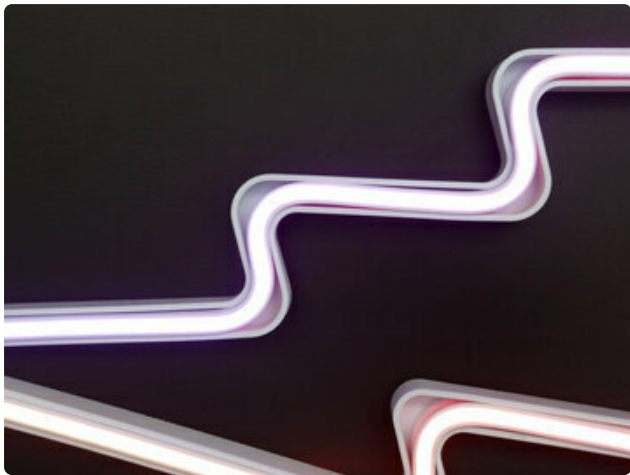
In the cat sign, the end of the strip is fitted into the tail first.



Installation (Continued)

Continue to press the strip into the channel.

Be careful not to bend the strip too much when fitting into sharp corners.



The strip won't fully conform to sharp corners due to the thickness of the silicone. Signs like the lightning bolt feature corners with minimum radius of 8mm.

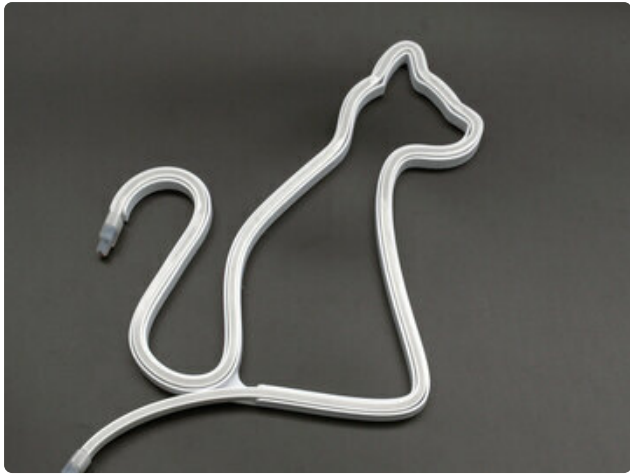
Excessive flexing and bending can damage the NeoPixel LED strip.



Installation (Continued)

Proceed to fit the NeoPixel LED strip into the sign with the starting end going in last.

Gently go back and forth pressing the strip into the sign to fully seat it into the channel.



Installed Strip

And thats it! Congratulations on building a Neon-like sign.

Power it Up!

Use a 5V USB battery or power supply to power the QT Py RP2040 using a USB-C to USB-A cable.

