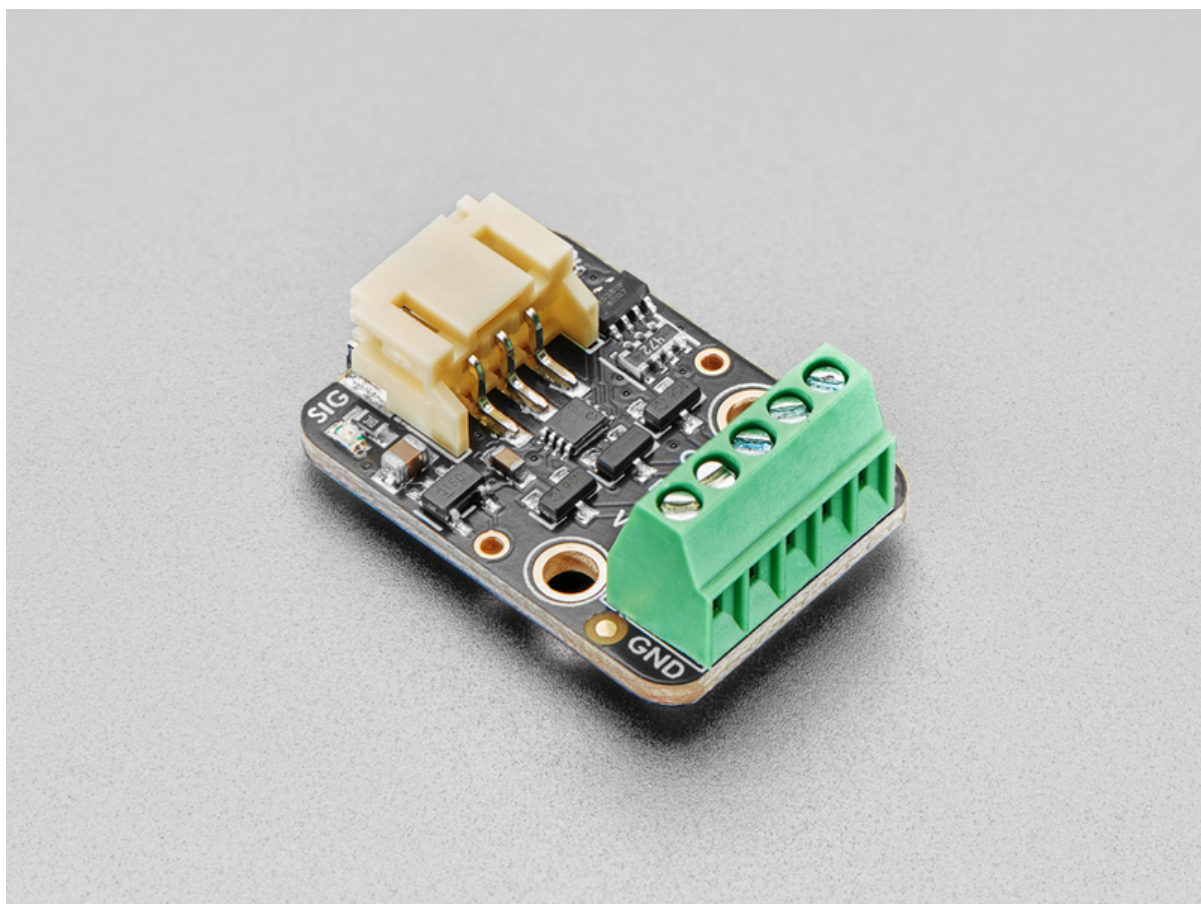




Adafruit NeoRGB Stemma

Created by Liz Clark



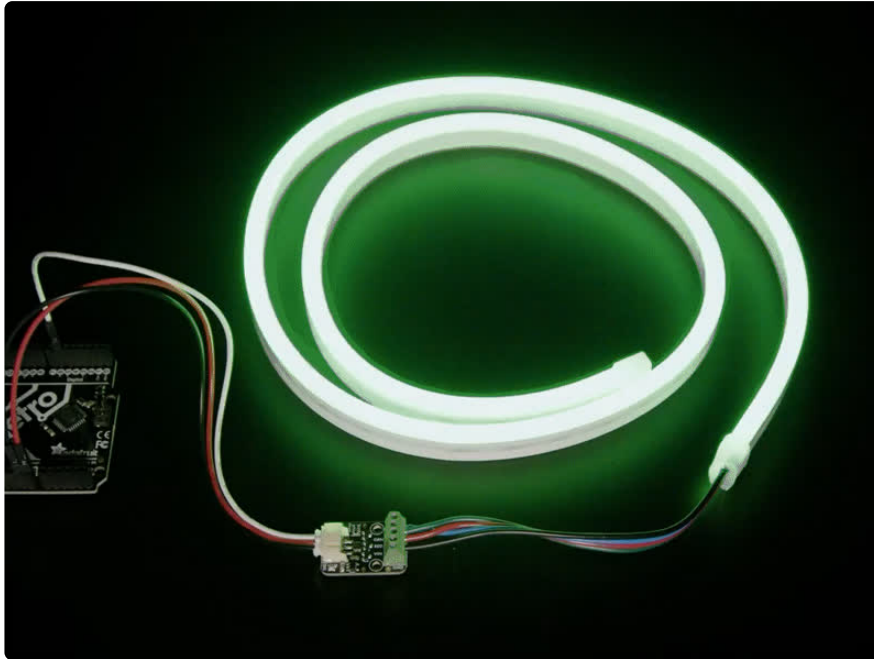
<https://learn.adafruit.com/adafruit-neorgb-stemma>

Last updated on 2024-04-04 03:45:30 PM EDT

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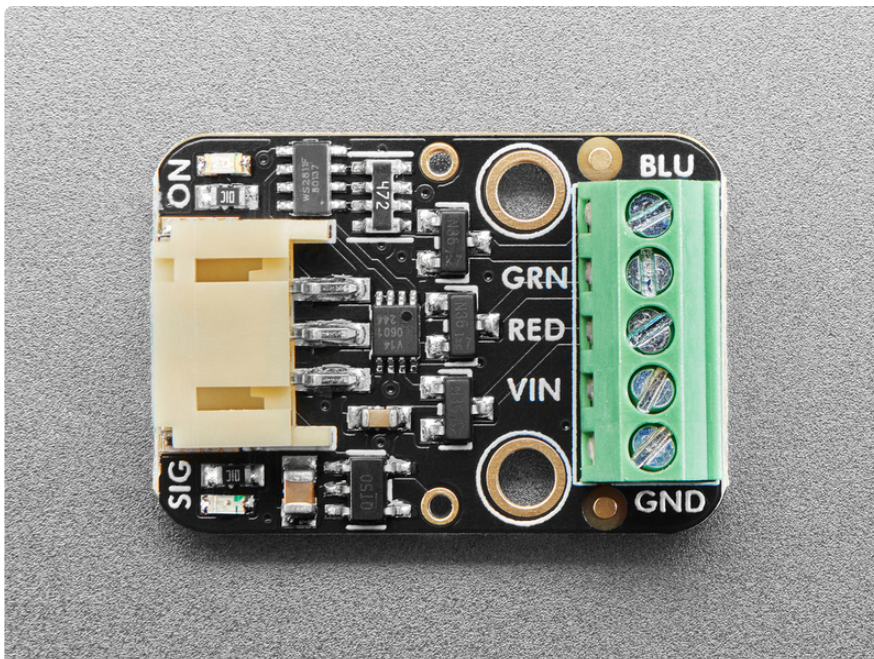
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Overview

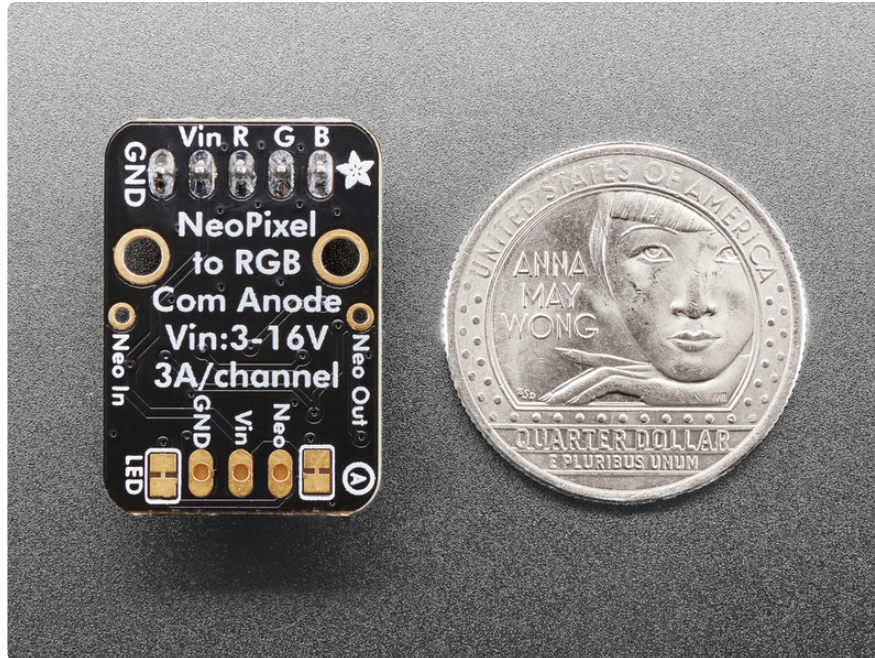


Whenever we're working with ['true analog' LED strips](https://adafru.it/19fX) (<https://adafru.it/19fX>), that have 1-3 channels of RGB or White LEDs, we wish we had already invented something to make wiring them easier: controlling these strips takes a bit of wiring since they almost always need 12VDC and driver FETs.

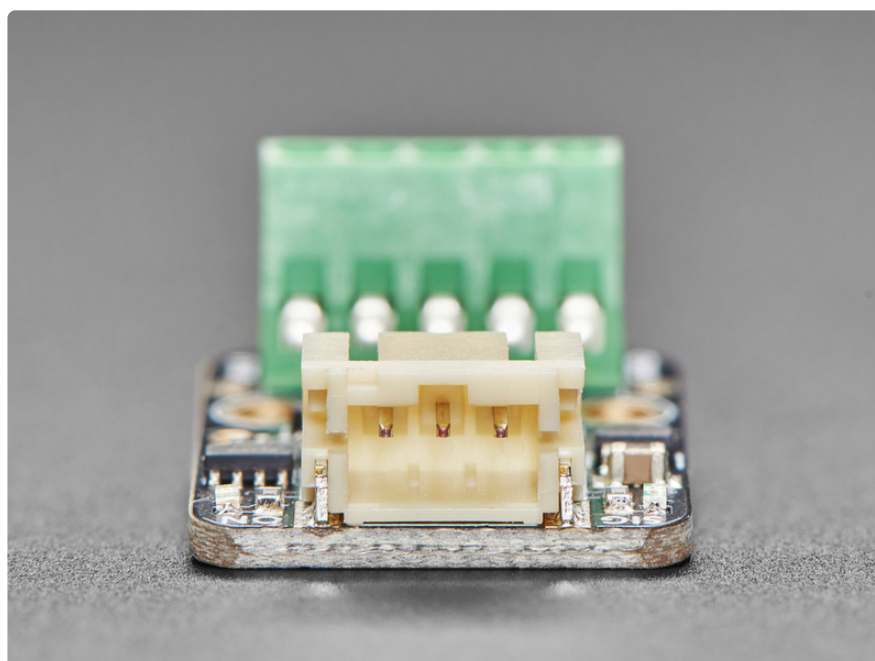
Now, we've finally created the **Adafruit NeoRGB Stemma** board - which will make our lives easier, and maybe even some customer's too!



The NeoRGB is a no-soldering, plug-and-play STEMMA board with a [2mm JST PH connector](http://adafru.it/3893) (<http://adafru.it/3893>) on one end, and a 5-pin 0.1" screw terminal block on the other. It can convert standard 800KHz NeoPixel signal using a WS2811F chip to [AO3406 N-channel FETs](https://adafru.it/19fY) (<https://adafru.it/19fY>) that are high efficiency and can sink a chunk of current - 3 Amps a piece with 50milliOhm Ron!



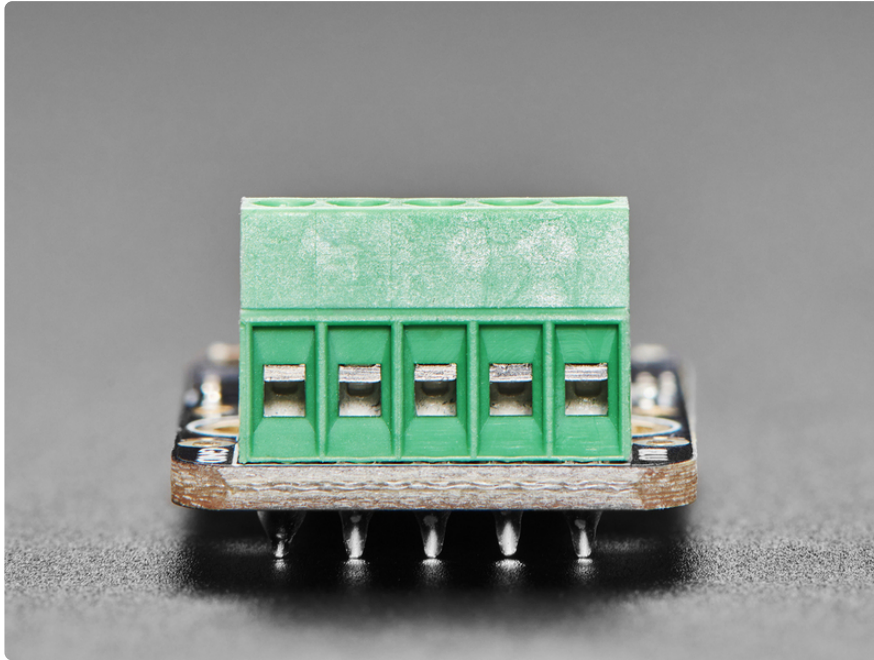
Basically, this means that you can treat any PWM-able common-anode RGB LED strip or LED as a single NeoPixel, at up to 16V and 3 Amps per channel. Perfect for large analog LEDs or arrays, LED strips, even ones that are not RGB, such as controlling 3 independent single-channel LEDs or strips. Note that the WS2811 bare chips don't support 4 channels, so this won't work on RGBW strips.



Usage is easy. First [you'll need a 2mm JST PH cable, such as this one with pins \(http://adafruit.it/3893\)](http://adafruit.it/3893). Then pick one of two powering options

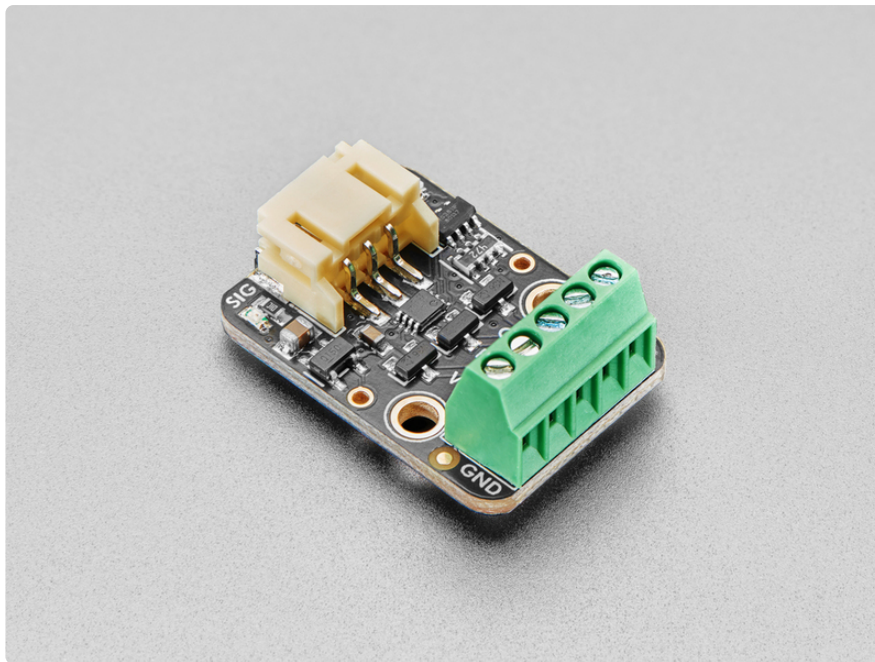
If you are using less than 2A of current total across all 3 channels:

1. Connect the white wire to your NeoPixel-compatible signal, 3 or 5V logic.
2. Connect the red wire to 3-16VDC, this will power the LED strip
3. Connect the black ground wire to your microcontroller and power supply shared ground



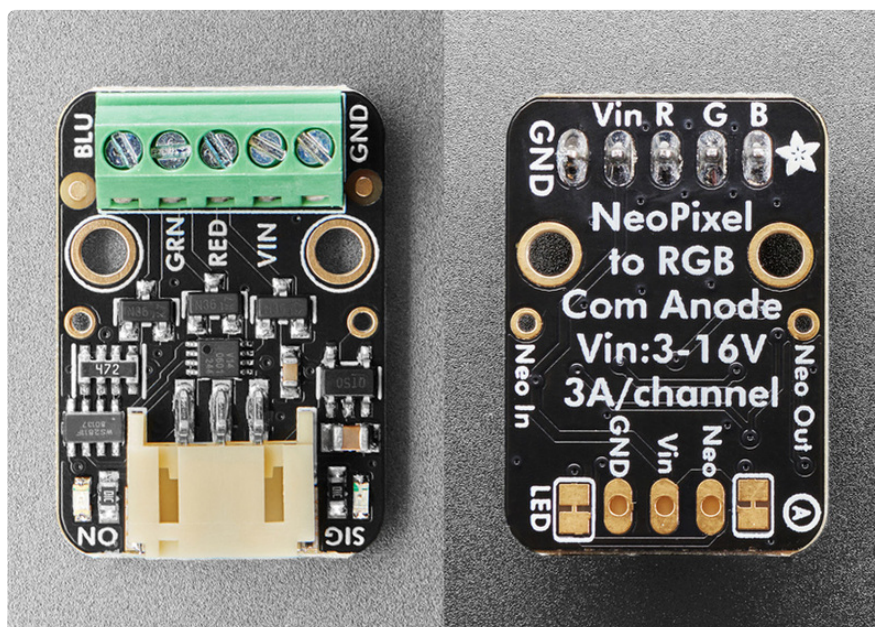
If you are using more than 2A of current total across all 3 channels, you'll need to wire the power supply to the terminal block since JST PH connectors are only rated for 2A.

1. Connect the white wire to your NeoPixel-compatible signal, 3 or 5V logic.
2. Connect your 3-16V power supply positive pin to the V+ to the terminal block, keep the red wire from being used by taping it or cutting it off.
3. Connect the 3-16V power supply ground pin to the GND on the terminal block
4. Connect the black wire as a 'reference' ground to your microcontroller that is providing the NeoPixel signal



An onboard green ON LED will let you know that it is powered correctly, and a red Signal LED will lightly blink when data is sent on the Signal line. If you need to chain more than one, or want to connect some other NeoPixels to the output, there's a pin for the Output signal on the board.

Pinouts



STEMMA JST PH

- **STEMMA JST PH** (<https://adafru.it/Ft4>) - 2mm pitch STEMMA JST port for use with **3-pin STEMMA JST PH cables** (<https://adafru.it/JRA>). It has connections for:
 - **GND** - common ground for power and data. It is the black wire on the JST PH cable.
 - **VIN** - power input for the RGB LED(s). It is the red wire on the JST PH cable. You can use 3-16VDC. Use the voltage that matches the requirements for your RGB LEDs (ex: 12V for a 12V strip). The JST PH connector is rated for 2A input. If you are using more than **2A of current total across all 3 RGB channels** then you need to use the **VIN** input on terminal block.
 - **SIG/Neo In** - NeoPixel-compatible signal from your microcontroller, 3 or 5V logic. It is the white wire on the JST PH cable.

If you are using more than 2A of current total across all 3 channels, you'll need to wire the power supply to the terminal block since JST PH connectors are only rated for 2A.

Terminal Block

- **GND** - common ground for power and data.
- **VIN** - power input for the RGB LED(s). You can use 3-16VDC. Use the voltage that matches the requirements for your RGB LEDs (ex: 12V for a 12V strip). **If you are using more than 2A of current total across all 3 RGB channels**, you'll need to wire the power supply to this input.
- **RED** - red channel output from the WS2811. Connect to the red channel input on your RGB LED strip.
- **GRN** - green channel output from the WS2811. Connect to the green channel input on your RGB LED strip.
- **BLU** - blue channel output from the WS2811. Connect to the blue channel input on your RGB LED strip.

NeoPixel Signal Input and Output Pins

On the edges of the board are pins for Neo In and Neo Out. These pins allow you to connect multiple NeoRGB Stemma boards together.

- **Neo In** - NeoPixel-compatible signal from your microcontroller, 3 or 5V logic.
- **Neo Out** - output of the NeoPixel-compatible signal from your microcontroller

Signal LED and Jumper

- **Signal LED** - to the left of the JST PH connector is the signal LED, labeled **SIG**. It is the red LED. It will lightly blink when data is sent on the **Neo In/Signal** line.
- **LED jumper** - in the upper left corner on the back of the board is a jumper for the signal LED. If you want to disable the signal LED, cut the trace on this jumper.

Power LED and Jumper

- **Power LED** - to the right of the JST PH connector is the power LED, labeled **ON**. It is the green LED.
- **LED jumper** - in the upper right corner on the back of the board is a jumper for the power LED. It is labeled **LED** on the board silk. If you want to disable the power LED, cut the trace on this jumper.

CircuitPython and Python

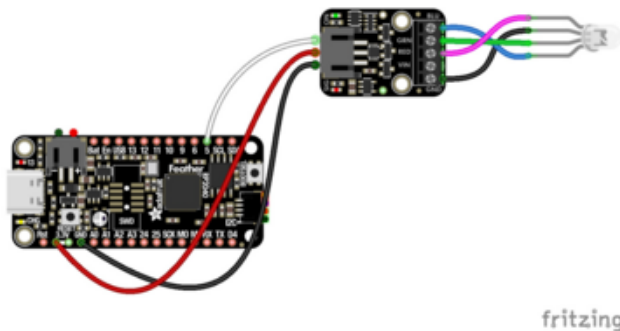
It's easy to use the **NeoRGB Stemma** with CircuitPython and the [Adafruit_CircuitPython_NeoPixel](https://adafru.it/yew) (<https://adafru.it/yew>) module. This module allows you to easily write Python code for NeoPixels.

You can use this driver with any CircuitPython microcontroller board or with a computer that has GPIO and Python [thanks to Adafruit_Blinka, our CircuitPython-for-Python compatibility library](https://adafru.it/BSN) (<https://adafru.it/BSN>). You should note though that many single board computers (SBCs) don't have NeoPixel support due to the precision timing required to send data.

Many single board computers don't have NeoPixel support due to the precision timing required to send data

CircuitPython Microcontroller Wiring

Your wiring will differ depending on how many total amps will be used across all three RGB channels. Here is how you'll wire the breakout to a Feather RP2040 and single RGB LED using less than 2A total used across all three RGB channels.



Feather 3V to NeoRGB JST PH VIN (red wire)

Feather GND to NeoRGB JST PH GND (black wire)

Feather pin 5 to NeoRGB JST PH SIG (white wire)

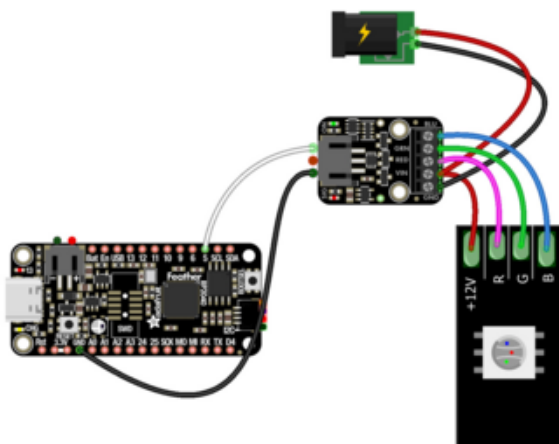
NeoRGB RED to RGB LED red anode (pink wire)

NeoRGB GRN to RGB LED green anode (green wire)

NeoRGB BLU to RGB LED blue anode (blue wire)

NeoRGB GND to RGB LED cathode (black wire)

Here is how you'll wire the breakout to a Feather RP2040 and a 12V RGB LED strip with more than 2A total used across all three RGB channels:



Feather GND to NeoRGB JST PH GND (black wire)

Feather pin 5 to NeoRGB JST PH SIG (white wire)

Power supply positive pin to NeoRGB terminal block VIN (red wire)

Power supply negative pin to NeoRGB terminal block GND (black wire)

NeoRGB RED to RGB strip red channel (pink wire)

NeoRGB GRN to RGB strip green channel (green wire)

NeoRGB BLU to RGB strip blue channel (blue wire)

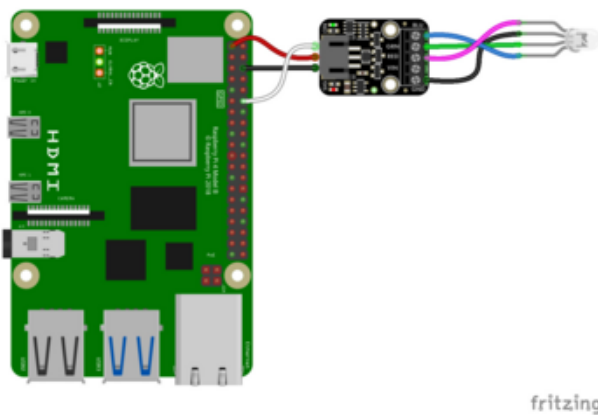
NeoRGB VIN to RGB strip VIN (red wire)

Python Computer Wiring

Since there are dozens of Linux computers/boards you can use, we will show wiring for Raspberry Pi. For other platforms, [please visit the guide for CircuitPython on Linux to see whether your platform is supported](https://adafru.it/BSN) (<https://adafru.it/BSN>).

Here's the Raspberry Pi wired to the breakout and a single RGB LED with **less than 2A** used across all three RGB channels:

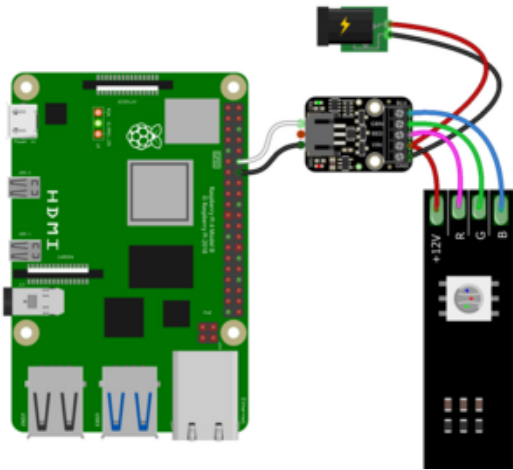
On the Raspberry Pi, NeoPixels must be connected to GPIO10, GPIO12, GPIO18 or GPIO21 to work!



Pi 3V to NeoRGB JST PH VIN (red wire)
Pi GND to NeoRGB JST PH GND (black wire)
Pi GPIO18 to NeoRGB JST PH SIG (white wire)
NeoRGB RED to RGB LED red anode (pink wire)
NeoRGB GRN to RGB LED green anode (green wire)
NeoRGB BLU to RGB LED blue anode (blue wire)
NeoRGB GND to RGB LED cathode (black wire)

On the Raspberry Pi, NeoPixels must be connected to GPIO10, GPIO12, GPIO18 or GPIO21 to work!

Here is how you'll wire the breakout to a Raspberry Pi and a 12V RGB LED strip with **more than 2A** total used across all three RGB channels:



Pi GND to NeoRGB JST PH GND (black wire)
 Pi GPIO18 to NeoRGB JST PH SIG (white wire)
 Power supply positive pin to NeoRGB terminal block VIN (red wire)
 Power supply negative pin to NeoRGB terminal block GND (black wire)
 NeoRGB RED to RGB strip red channel (pink wire)
 NeoRGB GRN to RGB strip green channel (green wire)
 NeoRGB BLU to RGB strip blue channel (blue wire)
 NeoRGB VIN to RGB strip VIN (red wire)

Python Installation of NeoPixel Library

You'll need to install the **Adafruit_Blinka** library that provides the CircuitPython support in Python. This may also require enabling I2C on your platform and verifying you are running Python 3. [Since each platform is a little different, and Linux changes often, please visit the CircuitPython on Linux guide to get your computer ready \(https://adafru.it/BSN\)!](https://adafru.it/BSN)

Once that's done, from your command line run the following command:

- `pip3 install adafruit-circuitpython-neopixel`

If your default Python is version 3 you may need to run 'pip' instead. Just make sure you aren't trying to use CircuitPython on Python 2.x, it isn't supported!

CircuitPython Usage

To use with CircuitPython, you need to first install the **Adafruit_CircuitPython_NeoPixel** library, and its dependencies, into the **lib** folder on your **CIRCUITPY** drive. Then you need to update **code.py** with the example script.

Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the **code.py** file

in a zip file. Extract the contents of the zip file, and copy the **entire lib folder** and the **code.py** file to your **CIRCUITPY** drive.

Your **CIRCUITPY/lib** folder should contain the following files:

- neopixel.mpy
- adafruit_pixelbuf.mpy



Python Usage

Once you have the library `pip3` installed on your computer, copy or download the following example to your computer, and run the following, replacing **code.py** with whatever you named the file:

```
python3 code.py
```

Example Code

If running CircuitPython: Once everything is saved to the **CIRCUITPY** drive, [connect to the serial console \(https://adafru.it/Bec\)](https://adafru.it/Bec) to see the data printed out!

If running Python: The console output will appear wherever you are running Python.

```
# SPDX-FileCopyrightText: 2024 Liz Clark for Adafruit Industries
#
# SPDX-License-Identifier: MIT

import time
import board
from rainbowio import colorwheel
import neopixel

num_pixels = 1
# pylint: disable=simplifiable-condition
# check to see if its a raspberry pi
if "CE0" and "CE1" in dir(board): # pi only zone
    pixel_pin = board.D18
# otherwise assume a microcontroller
```



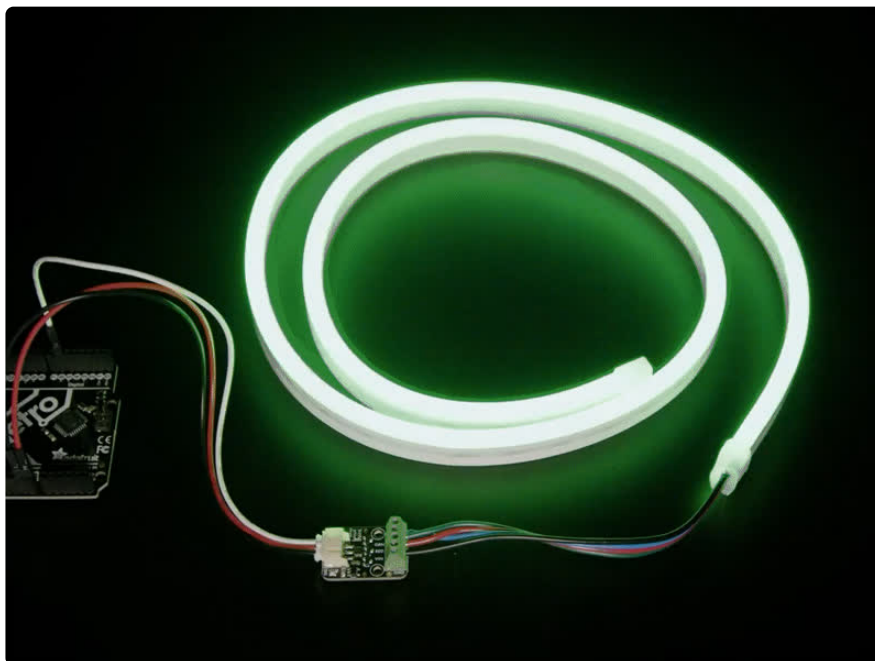
```
else:
    pixel_pin = board.D5

pixels = neopixel.NeoPixel(pixel_pin, num_pixels)

color_offset = 0

while True:
    for i in range(num_pixels):
        rc_index = (i * 256 // num_pixels) + color_offset
        pixels[i] = colorwheel(rc_index & 255)
    pixels.show()
    color_offset += 1
    time.sleep(0.01)
```

The code has a check to determine if you are running the code on a Raspberry Pi or not. If you are, the NeoPixel pin is set as **GPIO18**. Otherwise, the NeoPixel pin is set as **D5**. Once the loop starts, you'll see your RGB LED(s) cycle through the colors of the rainbow.



You should keep in mind when you write your own code that if you are using a strip, all of the LEDs will act as one LED from a programming perspective since they aren't individually addressable. That means some effects may look flashier or more abrupt.

Python Docs

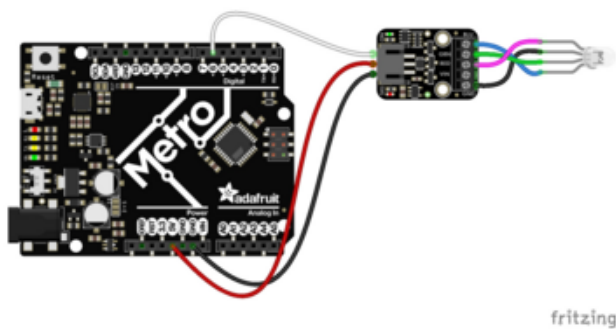
[Python Docs \(https://adafru.it/18gA\)](https://adafru.it/18gA)

Arduino

Using the NeoRGB Stemma with Arduino involves wiring up the breakout to your Arduino-compatible microcontroller, installing the [Adafruit_NeoPixel](https://adafru.it/aZU) (<https://adafru.it/aZU>) library and running the provided example code.

Wiring

Your wiring will differ depending on how many total amps will be used across all three RGB channels. Here is how you'll wire the breakout to an Adafruit Metro and a single RGB LED with **less than 2A total** used across all three RGB channels:



Metro 5V to NeoRGB JST PH VIN (red wire)

Metro GND to NeoRGB JST PH GND (black wire)

Metro pin 6 to NeoRGB JST PH SIG (white wire)

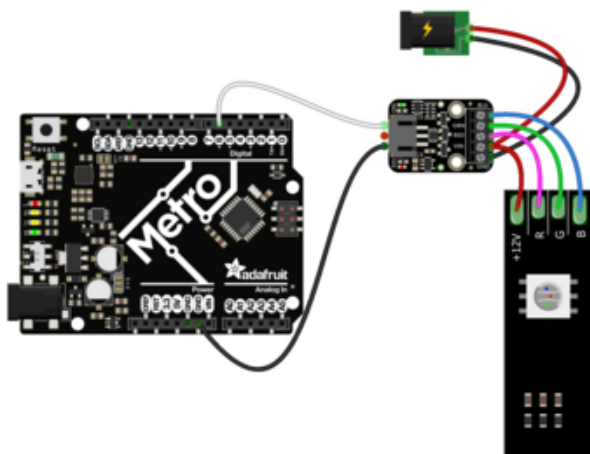
NeoRGB RED to RGB LED red anode (pink wire)

NeoRGB GRN to RGB LED green anode (green wire)

NeoRGB BLU to RGB LED blue anode (blue wire)

NeoRGB GND to RGB LED cathode (black wire)

Here is how you'll wire the breakout to an Adafruit Metro and a 12V RGB LED strip with **more than 2A total** used across all three RGB channels:



Metro GND to NeoRGB JST PH GND
(black wire)

Metro pin 6 to NeoRGB JST PH SIG (white wire)

Power supply positive pin to NeoRGB
terminal block VIN (red wire)

Power supply negative pin to NeoRGB
terminal block GND (black wire)

NeoRGB RED to RGB strip red channel
(pink wire)

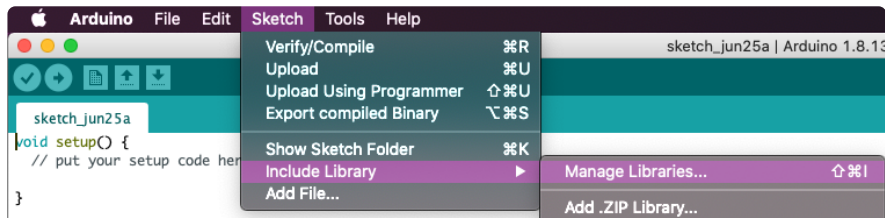
NeoRGB GRN to RGB strip green channel
(green wire)

NeoRGB BLU to RGB strip blue channel
(blue wire)

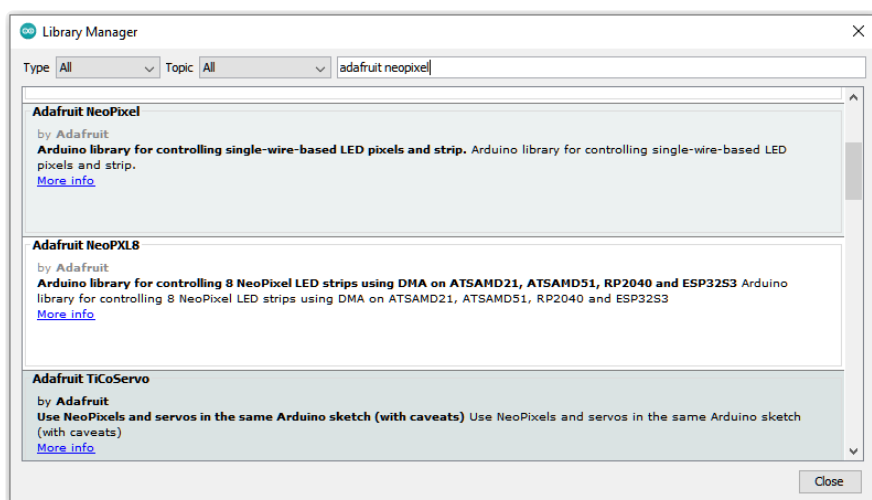
NeoRGB VIN to RGB strip VIN (red wire)

Library Installation

You can install the **Adafruit NeoPixel** library for Arduino using the Library Manager in the Arduino IDE.



Click the **Manage Libraries...** menu item, search for **Adafruit NeoPixel**, and select the **Adafruit NeoPixel** library:



There are no additional dependencies for the Adafruit NeoPixel library.

Example Code

```
// SPDX-FileCopyrightText: 2024 Limor Fried for Adafruit Industries
//
// SPDX-License-Identifier: MIT

#include <Adafruit_NeoPixel.h>
#ifdef __AVR__
  #include <avr/power.h> // Required for 16 MHz Adafruit Trinket
#endif

// Which pin on the Arduino is connected to the NeoPixels?
// On a Trinket or Gemma we suggest changing this to 1:
#define LED_PIN    6

// How many NeoPixels are attached to the Arduino?
#define LED_COUNT 1

// Declare our NeoPixel strip object:
Adafruit_NeoPixel strip(LED_COUNT, LED_PIN, NEO_GRB + NEO_KHZ800);
// Argument 1 = Number of pixels in NeoPixel strip
// Argument 2 = Arduino pin number (most are valid)
// Argument 3 = Pixel type flags

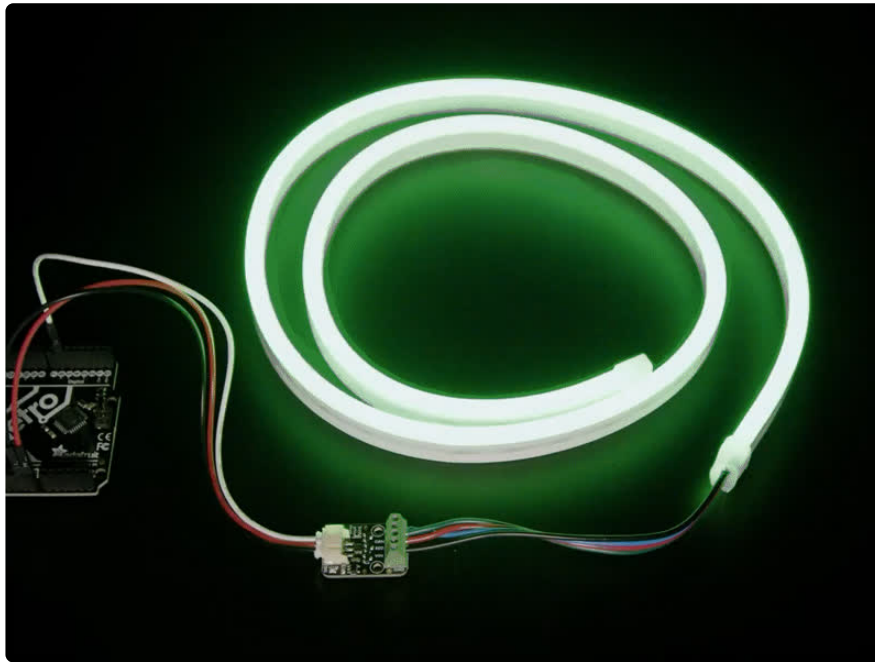
void setup() {
  // These lines are specifically to support the Adafruit Trinket 5V 16 MHz.
  // Any other board, you can remove this part (but no harm leaving it):
  #if defined(__AVR_ATtiny85__) && (F_CPU == 16000000)
    clock_prescale_set(clock_div_1);
  #endif
  // END of Trinket-specific code.

  strip.begin();           // INITIALIZE NeoPixel strip object (REQUIRED)
  strip.show();            // Turn OFF all pixels ASAP
  strip.setBrightness(50); // Set BRIGHTNESS to about 1/5 (max = 255)
}

void loop() {
  rainbow(10);              // Flowing rainbow cycle along the whole strip
}

// Rainbow cycle along whole strip. Pass delay time (in ms) between frames.
void rainbow(int wait) {
  // Hue of first pixel runs 5 complete loops through the color wheel.
  // Color wheel has a range of 65536 but it's OK if we roll over, so
  // just count from 0 to 5*65536. Adding 256 to firstPixelHue each time
  // means we'll make 5*65536/256 = 1280 passes through this loop:
  for(long firstPixelHue = 0; firstPixelHue < 5*65536; firstPixelHue += 256) {
    // strip.rainbow() can take a single argument (first pixel hue) or
    // optionally a few extras: number of rainbow repetitions (default 1),
    // saturation and value (brightness) (both 0-255, similar to the
    // ColorHSV() function, default 255), and a true/false flag for whether
    // to apply gamma correction to provide 'truer' colors (default true).
    strip.rainbow(firstPixelHue);
    // Above line is equivalent to:
    // strip.rainbow(firstPixelHue, 1, 255, 255, true);
    strip.show(); // Update strip with new contents
    delay(wait);  // Pause for a moment
  }
}
```


Upload the sketch to your board. You'll see your RGB LED(s) cycle through a rainbow swirl animation.

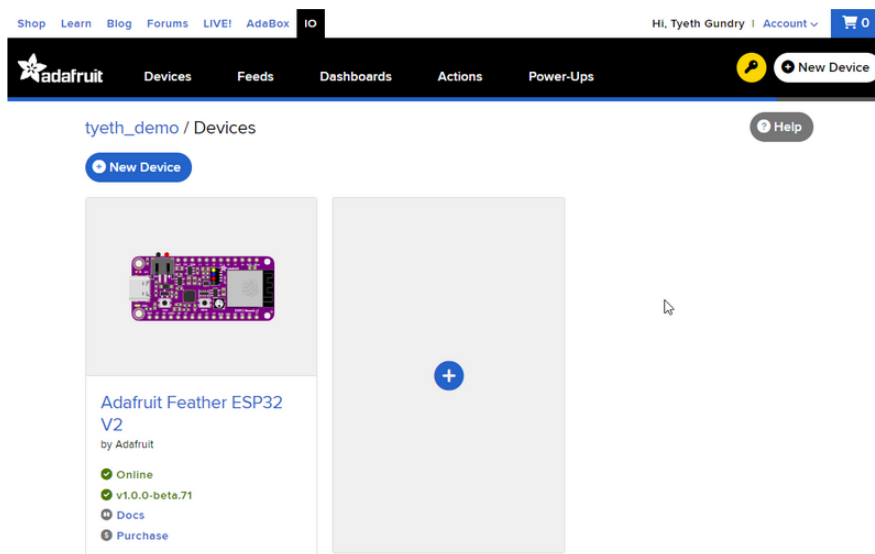


You should keep in mind when you write your own code that if you are using a strip, all of the LEDs will act as one LED from a programming perspective since they aren't individually addressable. That means some effects may look flashier or more abrupt.

Arduino Docs

[Arduino Docs \(https://adafru.it/Etk\)](https://adafru.it/Etk)

WipperSnapper



What is WipperSnapper

WipperSnapper is a firmware designed to turn any WiFi-capable board into an Internet-of-Things device without programming a single line of code. WipperSnapper connects to [Adafruit IO \(https://adafru.it/fsU\)](https://adafru.it/fsU), a web platform designed ([by Adafruit! \(https://adafru.it/Bo5\)](https://adafru.it/Bo5)) to display, respond, and interact with your project's data.

Simply load the WipperSnapper firmware onto your board, add credentials, and plug it into power. Your board will automatically register itself with your Adafruit IO account.

From there, you can add components to your board such as buttons, switches, potentiometers, sensors, and more! Components are dynamically added to hardware, so you can immediately start interacting, logging, and streaming the data your projects produce without writing code.

If you've never used WipperSnapper, click below to read through the quick start guide before continuing.

**Quickstart: Adafruit IO
WipperSnapper**

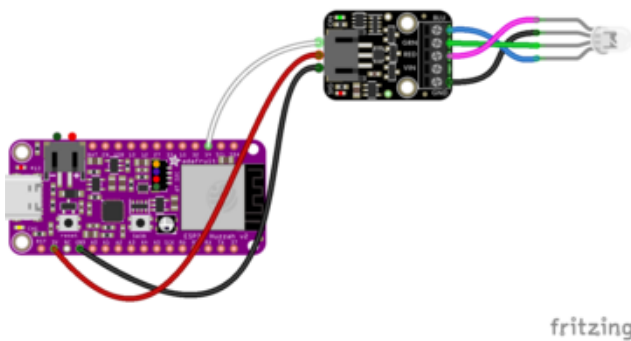
<https://adafru.it/Vfd>

Wiring

First, wire up a NeoRGB Stemma component to your board following one of the methods below, using a signal/data pin supporting [PWM \(https://adafru.it/19Fv\)](https://adafru.it/19Fv) (see the pinouts page on your board's learn guide).

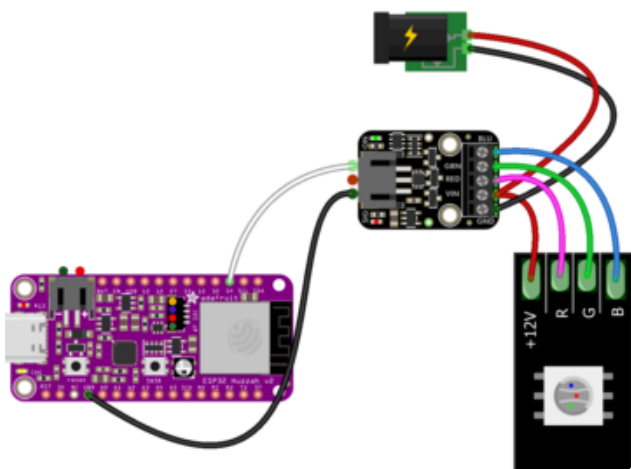
Your wiring will differ depending on how many total amps will be used across all three RGB channels (STEMMA / JST-PH connectors are [rated \(https://adafru.it/19Fw\)](https://adafru.it/19Fw) for 2 Amps continuous load).

Here is how you'll wire the breakout to an [Adafruit ESP32 Feather V2 \(http://adafru.it/5400\)](http://adafru.it/5400) using pin D14 and single RGB LED using less than 2A total used across all three RGB channels.



Feather 3V to NeoRGB JST PH VIN (red wire)
 Feather GND to NeoRGB JST PH GND (black wire)
 Feather pin 14 to NeoRGB JST PH SIG (white wire)
 NeoRGB RED to RGB LED red anode (pink wire)
 NeoRGB GRN to RGB LED green anode (green wire)
 NeoRGB BLU to RGB LED blue anode (blue wire)
 NeoRGB GND to RGB LED cathode (black wire)

Here is how you'll wire the breakout to an [Adafruit ESP32 Feather V2 \(http://adafru.it/5400\)](http://adafru.it/5400) using pin D14 and a 12V RGB LED strip with more than 2A total used across all three RGB channels:

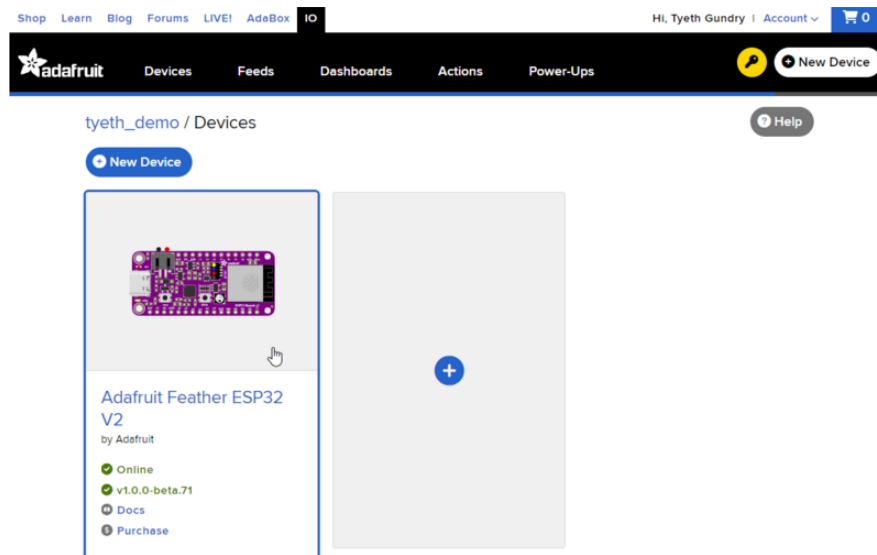


Feather GND to NeoRGB JST PH GND (black wire)
 Feather pin 14 to NeoRGB JST PH SIG (white wire)
 Power supply positive pin to NeoRGB terminal block VIN (red wire)
 Power supply negative pin to NeoRGB terminal block GND (black wire)
 NeoRGB RED to RGB strip red channel (pink wire)
 NeoRGB GRN to RGB strip green channel (green wire)
 NeoRGB BLU to RGB strip blue channel (blue wire)
 NeoRGB VIN to RGB strip VIN (red wire)

Usage

Connect your board to Adafruit IO Wippersnapper and [navigate to the WipperSnapper board list \(https://adafru.it/TAu\)](https://adafru.it/TAu).

On this page, select the WipperSnapper board you're using to be brought to the board's interface page.



If you do not see your board listed here - you need [to connect your board to Adafruit IO](https://adafru.it/Vfd) (<https://adafru.it/Vfd>) first.

Adafruit Feather ESP32 V2

by Adafruit

✓ Online

✓ v1.0.0-beta.70

📖 Docs

💰 Purchase

Adafruit Feather ESP32 V2

by Adafruit

✓ Online

! v1.0.0-beta.68 [Update](#)

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💰 Purchase

On the device page, quickly **check that you're running the latest version of the WipperSnapper firmware.**

The device tile on the left indicates the version number of the firmware running on the connected board.

If the firmware version is green with a checkmark - continue with this guide. If the firmware version is red with an exclamation mark "!" - [update to the latest WipperSnapper firmware](https://adafru.it/Vfd) (<https://adafru.it/Vfd>) on your board before continuing.

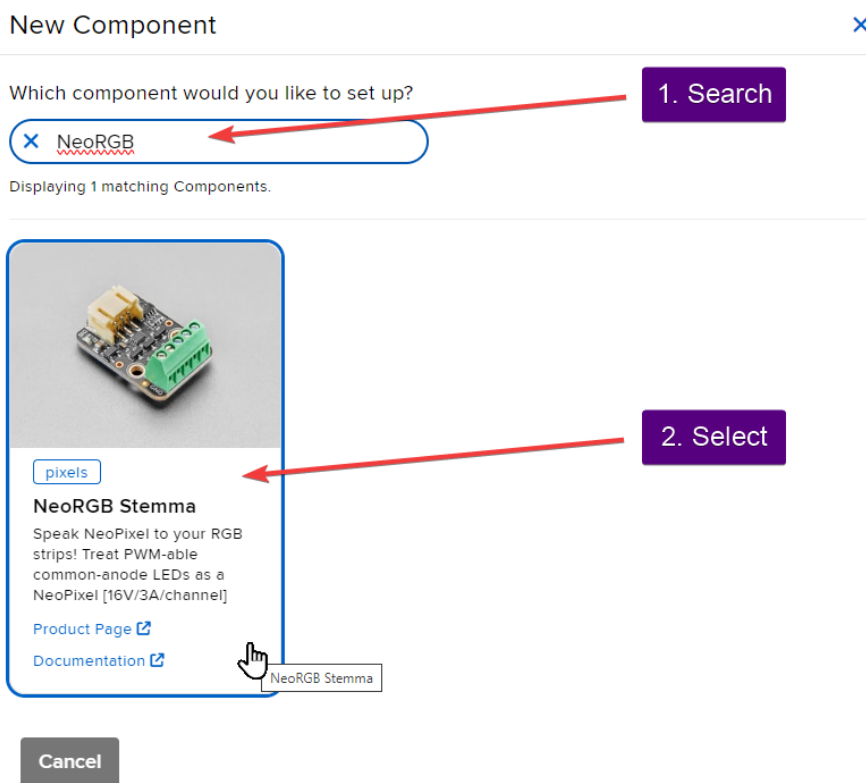
Next, make sure the component is plugged into your board, any external components are correctly wired and powered, and then finally that your board is powered too.

Now you're ready to add your component to your WipperSnapper device.

Click the **New Component** button or the **+** button to bring up the component picker.



Adafruit IO supports a large amount of components. To quickly find your sensor, type **NeoRGB** into the search bar, then select the **NeoRGB Stemma** component.



On the component configuration page, the NeoRGB's component settings should be listed. Select the **NeoPixel Pin** that has the NeoRGB / STEMMMA signal wire attached (**D12** here), and leave **Number of Pixels** set to **1**.

The **Color Order** option is specific to each RGB strip or your wiring. This option will tell the Feather which signals to match up to Red / Green / Blue, and as a result for

each color in the palette. Here the value is set to **RGB** as that matches the LED strip's wiring.

Finally **Brightness** is an overall maximum brightness for the LEDs, which can also be useful to limit the current. This will be used to scale the components chosen color and brightness via the Color Picker.

For this example, set the **Brightness** to 255, which is full brightness.

Create NeoRGB Stemma Component ✕

Settings


NeoRGB Stemma Name

NeoPixel Pin

Number of Pixels

Color Order

Brightness



[← Back to Component Type](#) [Create Component](#)

Your device interface should now show the NeoRGB component you created.

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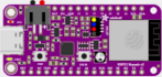
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NeoRGB Stemma D12 neorgb 1 pixel 🔗 ⚙️

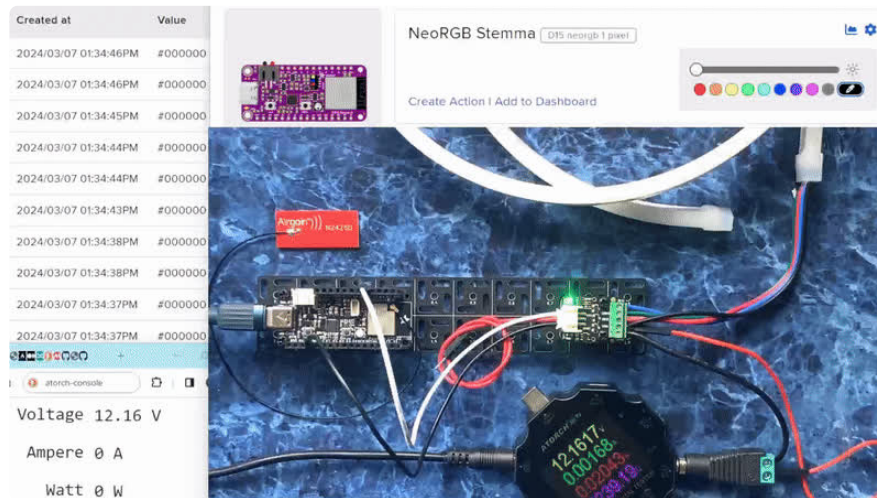
Create Action | Add to Dashboard

+

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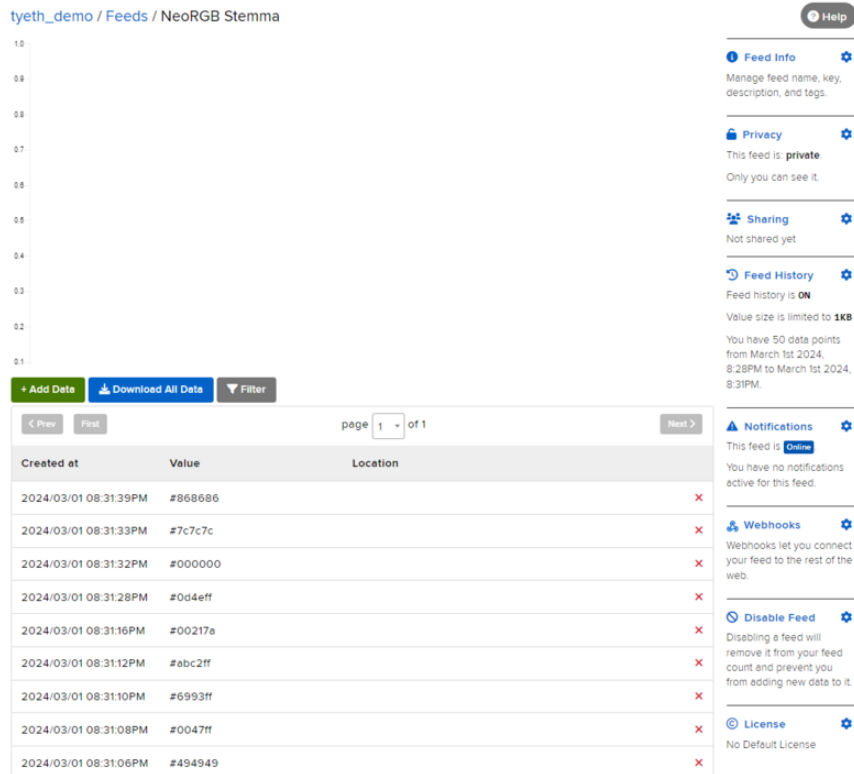
Clicking one of the colors in the Color Picker, using the color dropper, and adjusting the Brightness slider will cause WipperSnapper to automatically send Hexadecimal color values to the component via Adafruit IO.



To view the data that has been previously sent to the component, click on the graph next to the component name.



Here you can see the feed history and edit things about the feed such as the name, privacy, webhooks associated with the feed and more. If you want to learn more about how feeds work, [check out this page \(https://adafru.it/10aZ\)](https://adafru.it/10aZ).



Downloads

Files

- [WS2811 Datasheet \(https://adafru.it/19fZ\)](https://adafru.it/19fZ)
- [AO3406 N-channel FET Datasheet \(https://adafru.it/19ga\)](https://adafru.it/19ga)
- [EagleCAD PCB files on GitHub \(https://adafru.it/19gb\)](https://adafru.it/19gb)
- [Fritzing object in the Adafruit Fritzing Library \(https://adafru.it/19gc\)](https://adafru.it/19gc)

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