



## Festive Feather Holiday Lights

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# Overview

Spice up your holiday decorations using [Adafruit's Feather boards \(http://adafru.it/keK\)](http://adafru.it/keK) to add interactivity in a tiny package. Feathers are little Arduino-compatible microcontrollers that give you all the functionality of a full-size Arduino in a much smaller and battery-friendly package.

You can put a Feather into almost any project, like these festive holiday lights that animate and change color at your command. The [32u4 Feather \(http://adafru.it/keL\)](http://adafru.it/keL) combined with a [color \(http://adafru.it/keM\)](http://adafru.it/keM) and [proximity \(http://adafru.it/keN\)](http://adafru.it/keN) sensor lets you change the color of holiday lights by holding up a brightly colored object to them. The [Bluefruit LE Feather \(http://adafru.it/keO\)](http://adafru.it/keO) lets you change the color of lights using a smartphone or tablet and the Bluefruit LE app. Your holiday decorations will be full of joy with Adafruit's Feathers!



To build these projects you'll want to be familiar with the basics of Arduino. Check out these guides for some background information:

- [Learn Arduino Series \(http://adafru.it/ja3\)](http://adafru.it/ja3)
- [Adafruit Arduino IDE Setup \(http://adafru.it/jAc\)](http://adafru.it/jAc)

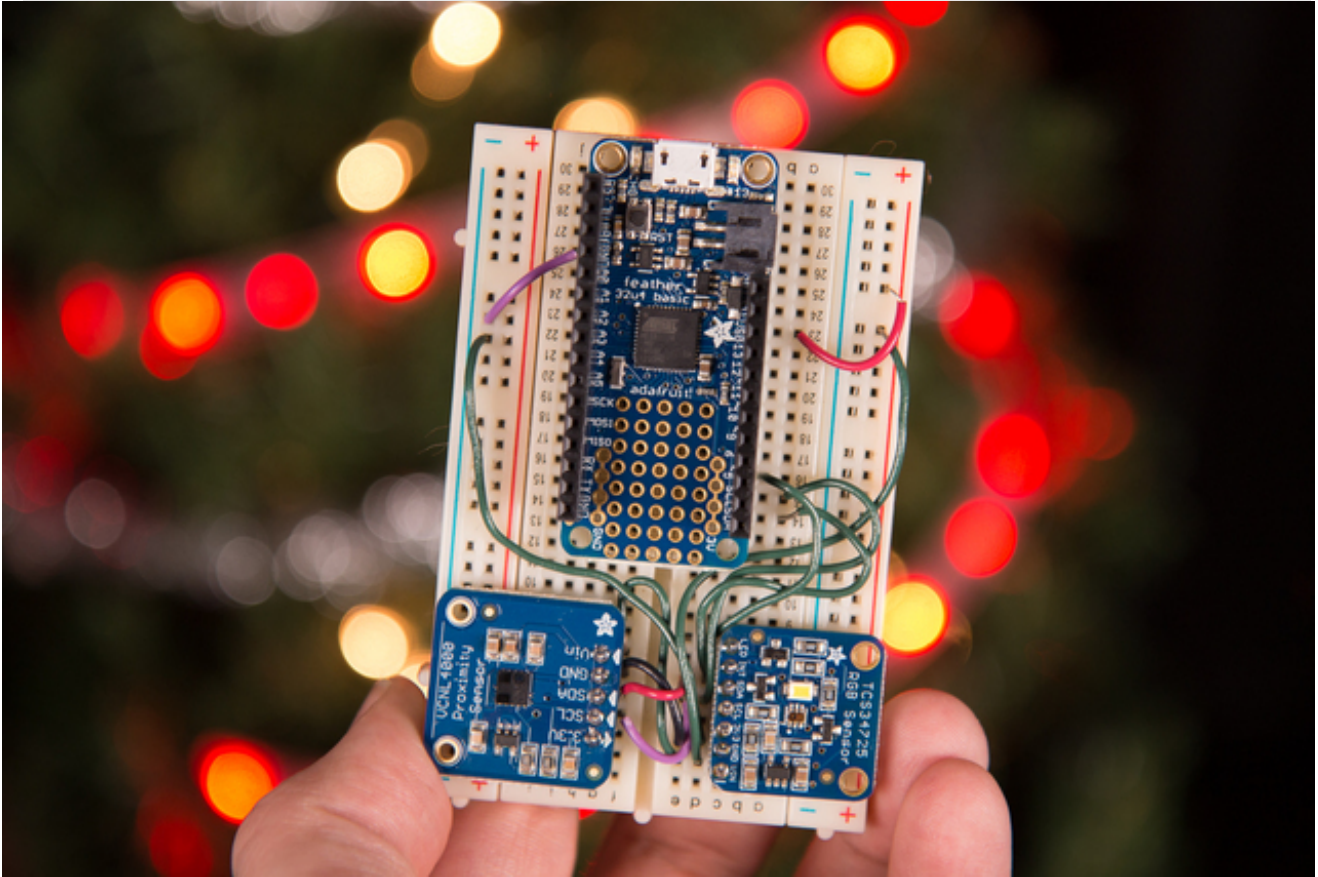
You'll also need to do a little bit of soldering to assemble Feather boards. If you're new to soldering be sure to see the [guide to excellent soldering \(http://adafru.it/dxy\)](http://adafru.it/dxy).

Finally for Bluetooth Low Energy it will help to skim these guides for some background information:

- [Introduction to Bluetooth Low Energy \(http://adafru.it/iCS\)](http://adafru.it/iCS)
- [Bluefruit LE Connect for iOS \(http://adafru.it/iCm\)](http://adafru.it/iCm)



# Color Sensing Lights



These holiday lights change their color when you hold an object up to them. A proximity sensor detects when an object is near, and a color sensor detects the object's color so the lights can change to match it--like a chameleon!

## Parts

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To build these lights you'll need the following parts:

- **32u4 Feather** (<http://adafru.it/keL>)
- **VCNL4010 Proximity Sensor** (<http://adafru.it/466>)
- **TCS34725 Color Sensor** (<http://adafru.it/1334>)
- **NeoPixels** (<http://adafru.it/dYn>)
  - You can use a strip, ring, matrix, or even bare pixels. Just make sure your power supply can handle all the pixels you intend to use!
- **5V Power Supply**
  - I recommend the **5 volt 10 amp supply** (<http://adafru.it/eCD>) as it can handle lighting up to about 150 NeoPixels. Remember each pixel can take up to 60mA alone! Also a **DC power jack terminal adapter** (<http://adafru.it/368>) makes it easy to connect a power

- **Breadboard** (<http://adafru.it/keP>), **jumper wires** (<http://adafru.it/fE2>), and **soldering tools** (<http://adafru.it/fE3>).

First follow the guide for each component to assemble and test it:

- Then wire up the components as shown below:



- Connect **power supply 5V** to **32u4 Feather USB pin**, **TCS34725 VDD pin**, **VCNL4010 VIN pin**, and **NeoPixel +5V**.
- Connect **32u4 Feather SCL** to **TCS34725 SCL**, **VCNL4010 SCL**.
- Connect **32u4 Feather SDA** to **TCS34725 SDA**, **VCNL4010 SDA**.
- Connect **32u4 Feather pin 5** to **TCS34725 LED pin**.
- Connect **32u4 Feather pin 6** to **NeoPixel signal input (Din)**.

## Sketch

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Before loading the sketch make sure you have the following libraries installed. Remember you can use the [Arduino library manager \(http://adafru.it/fCN\)](http://adafru.it/fCN) to easily search for and install them:

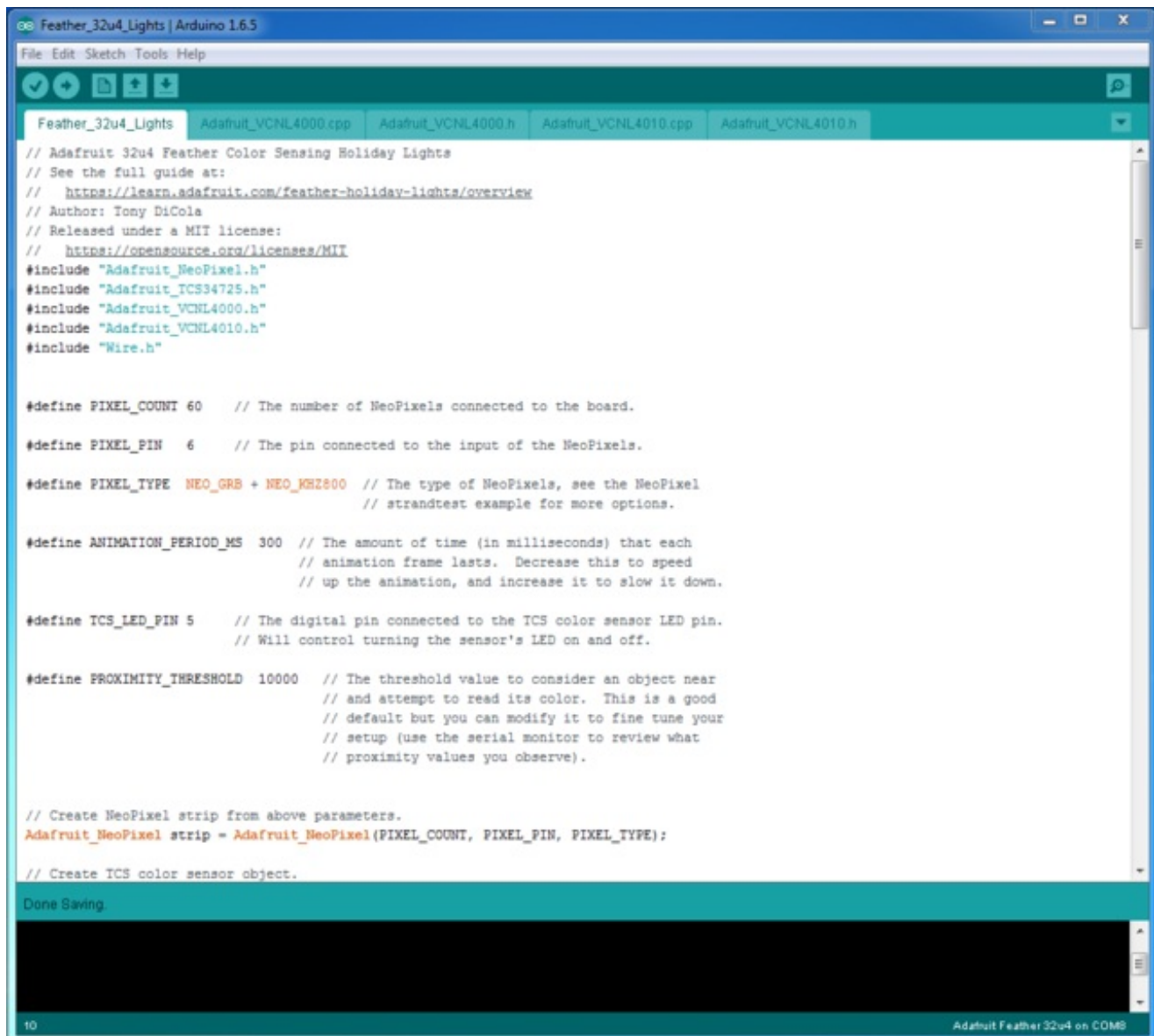
- [Adafruit TCS34725 Library \(http://adafru.it/cb1\)](http://adafru.it/cb1)
- [Adafruit NeoPixel Library \(http://adafru.it/aZU\)](http://adafru.it/aZU)

Next download the sketch from its [home on GitHub \(http://adafru.it/keS\)](http://adafru.it/keS) by clicking the button below:

Download Sketches

<http://adafru.it/keT>

Unzip the archive and load the **Feather\_32u4\_Lights** sketch in the Arduino IDE.



```
// Adafruit 32u4 Feather Color Sensing Holiday Lights
// See the full guide at:
// https://learn.adafruit.com/feather-holiday-lights/overview
// Author: Tony DiCola
// Released under a MIT license:
// https://opensource.org/licenses/MIT
#include "Adafruit_NeoPixel.h"
#include "Adafruit_TCS34725.h"
#include "Adafruit_VCNL4000.h"
#include "Adafruit_VCNL4010.h"
#include "Wire.h"

#define PIXEL_COUNT 60 // The number of NeoPixels connected to the board.

#define PIXEL_PIN 6 // The pin connected to the input of the NeoPixels.

#define PIXEL_TYPE NEO_GRB + NEO_KHZ800 // The type of NeoPixels, see the NeoPixel
// strandtest example for more options.

#define ANIMATION_PERIOD_MS 300 // The amount of time (in milliseconds) that each
// animation frame lasts. Decrease this to speed
// up the animation, and increase it to slow it down.

#define TCS_LED_PIN 5 // The digital pin connected to the TCS color sensor LED pin.
// Will control turning the sensor's LED on and off.

#define PROXIMITY_THRESHOLD 10000 // The threshold value to consider an object near
// and attempt to read its color. This is a good
// default but you can modify it to fine tune your
// setup (use the serial monitor to review what
// proximity values you observe).

// Create NeoPixel strip from above parameters.
Adafruit_NeoPixel strip = Adafruit_NeoPixel(PIXEL_COUNT, PIXEL_PIN, PIXEL_TYPE);

// Create TCS color sensor object.
```

Near the top of the sketch are **#define** values that you can adjust for your light configuration:

- **PIXEL\_COUNT** - Set this to the number of NeoPixels you're using.
- **PIXEL\_PIN** - Set this to the pin connected to the NeoPixel input (pin 6 if you followed the wiring).
- **PIXEL\_TYPE** - Set this to the type of NeoPixel. Use the default unless you know you're using a different type of NeoPixel (see the strandtest example in the NeoPixel library for more information on types of NeoPixels).
- **ANIMATION\_PERIOD\_MS** - This is the amount of time a single animation frame takes (in milliseconds). Adjust this to slow down and speed up the animation.
- **TCS\_LED\_PIN** - Set this to the digital pin connected to the TCS color sensor LED pin (pin 5 if you followed the wiring).
- **PROXIMITY\_THRESHOLD** - This is the proximity value that's used to consider an object close enough to read its color with the TCS sensor. You can tune this by looking at the serial



monitor output to see the stream of proximity values and adjusting the threshold to be near the values you see when an object is near the sensor.

You can also adjust a part of the code depending on if you're using a VCNL4010 or older VCNL4000 proximity sensor:

```
// Create VCNL sensor object (defined in this sketch).  
// If you're using a VCNL4010 sensor use this line:  
Adafruit_VCNL4010 vcnl = Adafruit_VCNL4010();  
// However if you're using a VCNL4000 sensor comment the above line and uncomment this one:  
//Adafruit_VCNL4000 vcnl = Adafruit_VCNL4000();
```

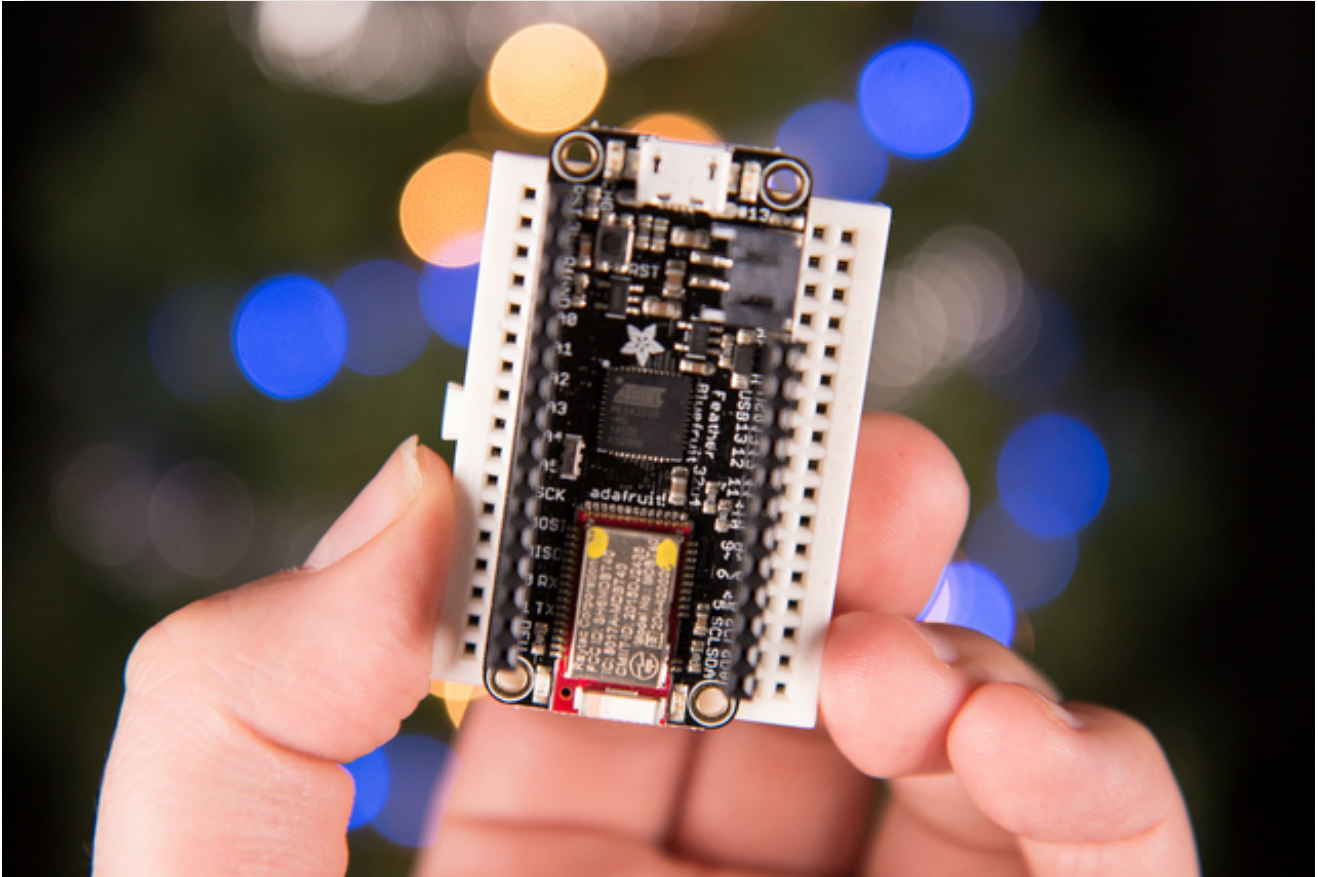
Make sure only one of the lines above is uncommented, depending on what sensor you're using.

Now load the sketch on your hardware, then open the serial monitor at 115200 baud. You should see proximity measurement values printed continuously to the console.

Move a colored object right above the VCNL and TCS color sensor. If the proximity value crosses the threshold the TCS sensor's LED will turn on and read the color of the object. The sensor will wait about a second for you to remove the object, then the lights will start to animate using the color of the object.

Woo hoo, that's all there is to the 32u4 Feather Color Sensing Holiday Lights project! This project is great for coloring lights on the tree using brightly wrapped gifts.

# Bluetooth Low Energy Lights



These holiday lights can be controlled right from your smartphone or tablet. Just open the Bluefruit LE app and use its color picker to choose the best color for any celebration.

## Parts

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To build these lights you'll need the following parts:

- **Bluefruit LE Feather** (<http://adafru.it/keO>)
- **NeoPixels** (<http://adafru.it/dYn>)
  - You can use a strip, ring, matrix, or even bare pixels. Just make sure your power supply can handle all the pixels you intend to use!
- **5V Power Supply**
  - I recommend the [5 volt 10 amp supply](http://adafru.it/eCD) (<http://adafru.it/eCD>) as it can handle lighting up to about 150 NeoPixels. Remember each pixel can take up to 60mA alone! Also a [DC power jack terminal adapter](http://adafru.it/368) (<http://adafru.it/368>) makes it easy to connect a power supply to the circuit.
- **Breadboard** (<http://adafru.it/keP>), **jumper wires** (<http://adafru.it/fE2>), and **soldering**

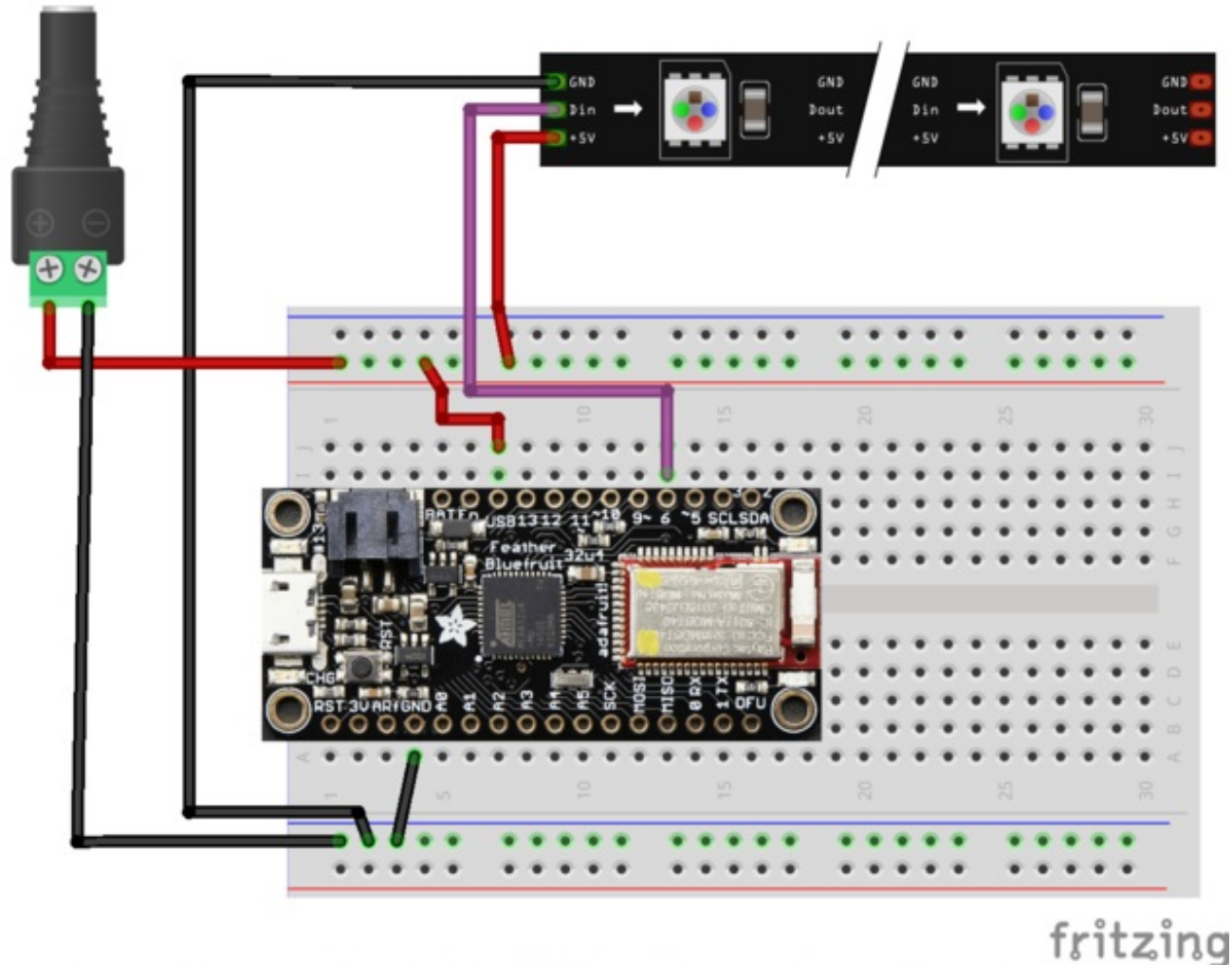
[tools \(http://adafru.it/fE3\)](http://adafru.it/fE3).

## Wiring

First follow the guide for each component to assemble and test it:

- [Adafruit Bluefruit LE Feather Guide \(http://adafru.it/kcc\)](http://adafru.it/kcc)

Then wire up the components as shown below:



- Connect **power supply ground** to **Bluefruit LE Feather ground** and **NeoPixel ground**.
- Connect **power supply 5V** to **Bluefruit LE Feather USB pin** and **NeoPixel +5V**.
- Connect **Bluefruit LE Feather pin 6** to **NeoPixel signal input (Din)**.

## Sketch

Before loading the sketch make sure you have the following libraries installed. Remember you can

use the [Arduino library manager \(http://adafru.it/fCN\)](http://adafru.it/fCN) to easily search for and install them:

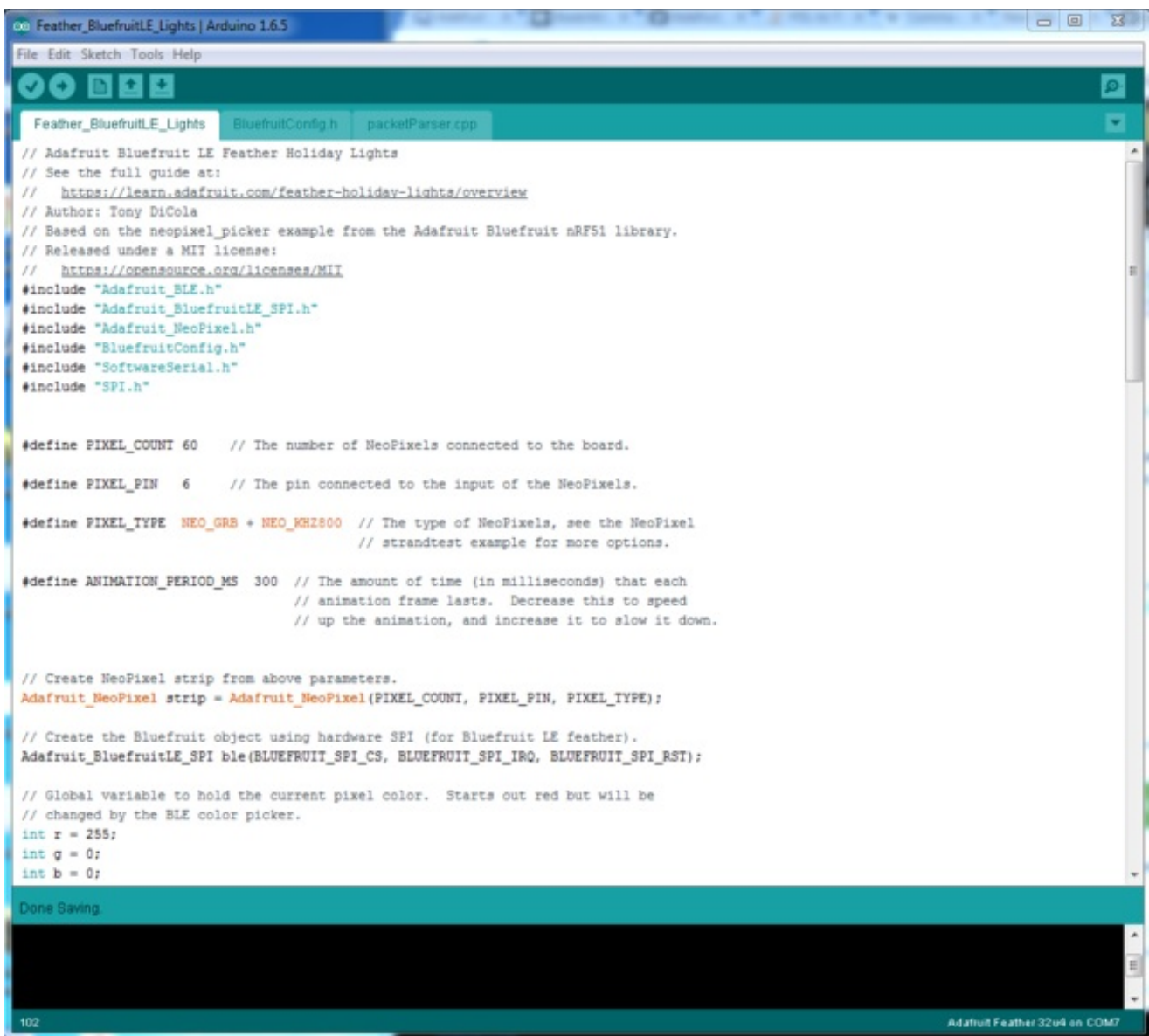
- [Adafruit Bluefruit nRF51 \(http://adafru.it/f4V\)](http://adafru.it/f4V)
- [Adafruit NeoPixel Library \(http://adafru.it/aZU\)](http://adafru.it/aZU)

Next download the sketch from its [home on GitHub \(http://adafru.it/keS\)](http://adafru.it/keS) by clicking the button below:

Download Sketches

<http://adafru.it/keT>

Unzip the archive and load the **Feather\_BluefruitLE\_Lights** sketch in the Arduino IDE.



```
Feather_BluefruitLE_Lights | Arduino 1.6.5
File Edit Sketch Tools Help

Feather_BluefruitLE_Lights BluefruitConfig.h packetParser.cpp

// Adafruit Bluefruit LE Feather Holiday Lights
// See the full guide at:
//   https://learn.adafruit.com/feather-holiday-lights/overview
// Author: Tony DiCola
// Based on the neopixel_picker example from the Adafruit Bluefruit nRF51 library.
// Released under a MIT license:
//   https://opensource.org/licenses/MIT
#include "Adafruit_BLE.h"
#include "Adafruit_BluefruitLE_SPI.h"
#include "Adafruit_NeoPixel.h"
#include "BluefruitConfig.h"
#include "SoftwareSerial.h"
#include "SPI.h"

#define PIXEL_COUNT 60 // The number of NeoPixels connected to the board.

#define PIXEL_PIN 6 // The pin connected to the input of the NeoPixels.

#define PIXEL_TYPE NEO_GRB + NEO_KHZ800 // The type of NeoPixels, see the NeoPixel
// strandtest example for more options.

#define ANIMATION_PERIOD_MS 300 // The amount of time (in milliseconds) that each
// animation frame lasts. Decrease this to speed
// up the animation, and increase it to slow it down.

// Create NeoPixel strip from above parameters.
Adafruit_NeoPixel strip = Adafruit_NeoPixel(PIXEL_COUNT, PIXEL_PIN, PIXEL_TYPE);

// Create the Bluefruit object using hardware SPI (for Bluefruit LE feather).
Adafruit_BluefruitLE_SPI ble(BLUEFRUIT_SPI_CS, BLUEFRUIT_SPI_IRQ, BLUEFRUIT_SPI_RST);

// Global variable to hold the current pixel color. Starts out red but will be
// changed by the BLE color picker.
int r = 255;
int g = 0;
int b = 0;

Done Saving.

102 Adafruit Feather 32u4 on COM7
```



Near the top of the sketch are **#define** values that you can adjust to suite your light configuration:

- **PIXEL\_COUNT** - Set this to the number of NeoPixels you're using.
- **PIXEL\_PIN** - Set this to the pin connected to the NeoPixel input (pin 6 if you followed the wiring).
- **PIXEL\_TYPE** - Set this to the type of NeoPixel. Use the default unless you know you're using a different type of NeoPixel (see the strandtest example in the NeoPixel library for more information on types of NeoPixels).
- **ANIMATION\_PERIOD\_MS** - This is the amount of time a single animation frame takes (in milliseconds). Adjust this to slow down and speed up the animation.

Upload the sketch to your hardware and you should see the lights turn on and animate with a red color. Now use the Bluefruit LE app on an [iOS](http://adafru.it/iCm) or [Android](http://adafru.it/f4G) device and connect to the Bluefruit Feather in **Controller** mode. Use the **Color Picker** to pick a color and **send** it to the Bluefruit--woo hoo, the lights will change color!

Check out the [Bluetooth NeoPixel Goggles project](http://adafru.it/keU) for a little more explanation about using the color picker.

That's all there is to the Bluefruit LE Feather holiday light project! Use the color picker on your phone/table to control your holiday lights with ease!