



## Arduino Lesson ( )

### Use of NeoPixel LED Stick

Name: \_\_\_\_\_ ( ) Class: \_\_\_\_\_ Date: \_\_\_\_\_

**Objectives:** At the end of this lesson, you would be able to

1. Connect an Arduino Uno microcontroller to a NeoPixel LED stick
2. Write sketches to light up the NeoPixel LED stick

#### Apparatus:

- 01 Arduino UNO microcontroller & USB cable
- 01 WS2812B NeoPixel LED Stick – 8 LED
- 01 breadboard
- 01 resistor 330  $\Omega$
- jumper wires

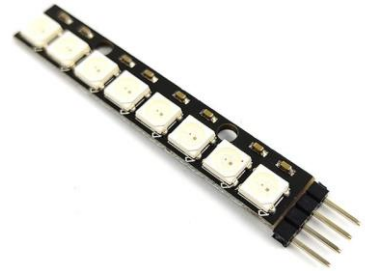


Image source: <https://sg.cytron.io/p-ws2812b-neopixel-led-stick-8-led>

#### Assignment 1: Set up a NeoPixel LED Stick with Arduino Uno

1. Plug the Arduino Uno into the USB port on the laptop installed with Arduino software.
2. Select **Tools** → **Board**: scroll down to select “**Arduino Uno**”
3. and select **Port**: “COM#”
4. Connect to the microcontroller:

##### NeoPixel LED stick

4/7VDC

DI → 330  $\Omega$

GND

##### Arduino Uno microcontroller

→ 5 V

→ D7 (digital pin 7)

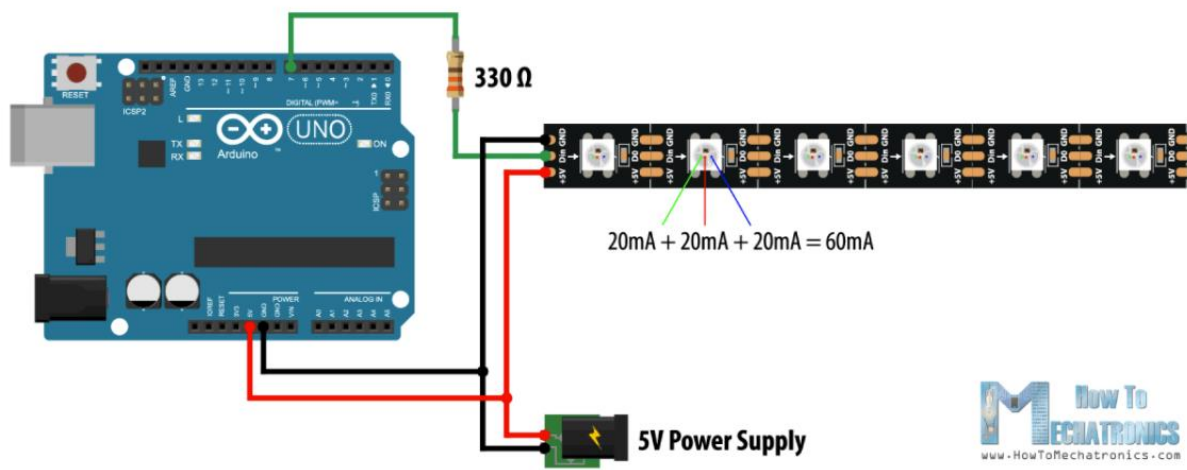
→ GND (ground)

**Note:** Can use 9V power module to power LED stick.

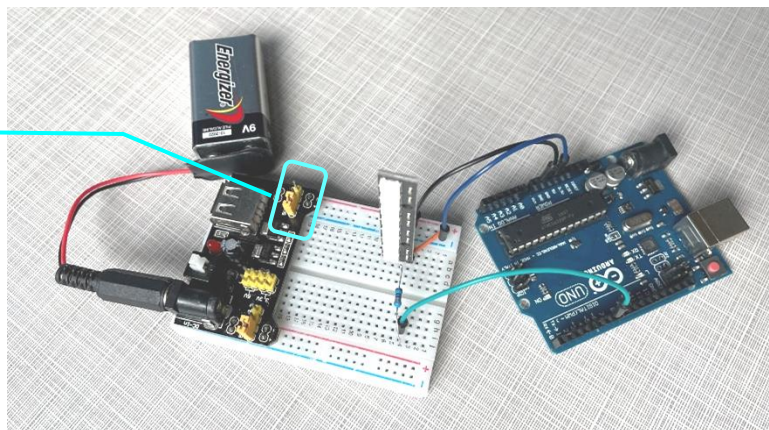
5. Search for and install FastLED library:  
- **Sketch** → **Include Library** → **Manage Libraries ...** → search & install “FastLED”
6. Copy sketch into Arduino IDE. Turn on power module.

#### 4. Connect NexPixel LED stick to microcontroller



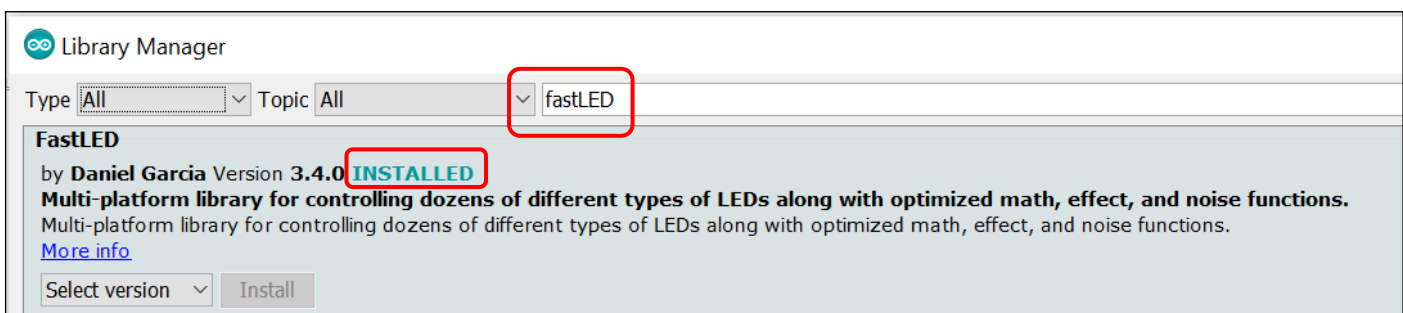
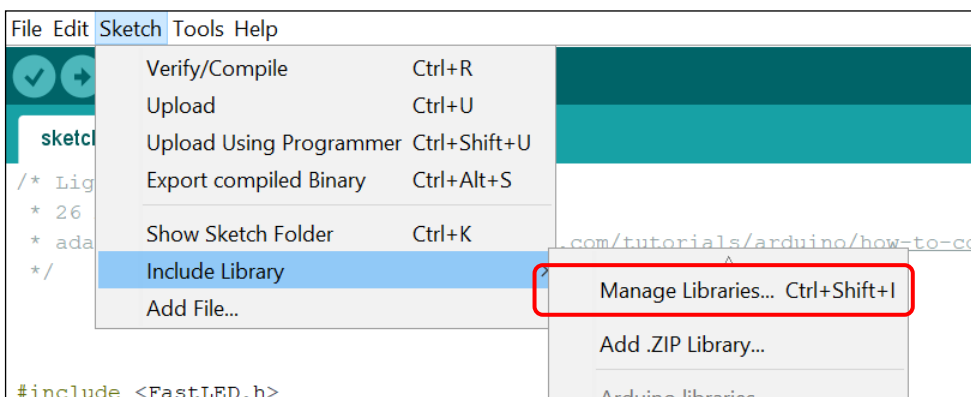


Remove & mount the yellow cap over the 2 terminals of the 5V supply



A power module is used to supply 5V NeoPixel LED stick & microcontroller.

## 5. Search & install FastLED library



**Note:**

- *FastLED is an excellent and well documented library which enables easy control of the WS2812B LEDs.*
- *The sketch included the FastLED library, define the pin to which the LED strip data is connected, define the number of LEDs, as well as define an array of type CRGB. This type contains the LEDs, with three one-byte data members for each of the three Red, Green and Blue colour channel.*
- **void setup** section: *we initialize the FastLED with the parameters defined above.*
- **void loop**: *we can control our LEDs anyhow we want. Using the CRGB function we can set up any LED to any colour using three parameters of Red, Green and Blue colour. To make the changes happen on the LEDs, we call the function FastLED.show().*

**Reference:**

- <https://howtomechatronics.com/tutorials/arduino/how-to-control-ws2812b-individually-addressable-leds-using-arduino/>

**Assignment 1: Sample sketch**

```
/* Lighting up a Neopixel LED strip - 26 May 2021
 * adapted from https://howtomechatronics.com/tutorials/arduino/how-to-control-ws2812b-individually-
 * addressable-leds-using-arduino/
 */
#include <FastLED.h>
#define LED_PIN 7
#define NUM_LEDS 8
CRGB leds[NUM_LEDS];

void setup() {
  FastLED.addLeds<WS2812, LED_PIN, GRB>(leds, NUM_LEDS);
}

void loop() {
  leds[0] = CRGB(255, 0, 0);
  FastLED.show();
  delay(500);
  leds[1] = CRGB(0, 255, 0);
  FastLED.show();
  delay(500);
  leds[2] = CRGB(0, 0, 255);
  FastLED.show();
  delay(500);
  leds[3] = CRGB(150, 0, 255);
  FastLED.show();
  delay(500);
  leds[4] = CRGB(255, 200, 20);
  FastLED.show();
  delay(500);
  leds[5] = CRGB(85, 60, 180);
  FastLED.show();
  delay(500);
  leds[6] = CRGB(50, 255, 20);
  FastLED.show();
  delay(500);
}
```

**Note:**

- *The FastLED library features many other functions which can be used for making really interesting animations and light shows.*

## **Assignment 2:** Same setup as previous Assignment.

1. Use “for” loop to make simple animations with the NeoPixel LED Stick.
2. Copy sketch into Arduino IDE. Turn on power module.

- The the first “for” loop lights up all 8 LEDs in blue, from the first to the last LED with 100 milliseconds delay. The next “for” loop lights up again all 8 LEDs, but this time in red colour and in reverse order, from the last to the first LED.

## **Assignment 2: Sample sketch**

```
/* Lighting up a Neopixel LED strip - 26 May 2021
 * adapted from https://howtomechatronics.com/tutorials/arduino/how-to-control-ws2812b-individually-
 addressable-leds-using-arduino/
 */

#include <FastLED.h>
#define LED_PIN 7
#define NUM_LEDS 8
CRGB leds[NUM_LEDS];

void setup() {
  FastLED.addLeds<WS2812, LED_PIN, GRB>(leds, NUM_LEDS);
}

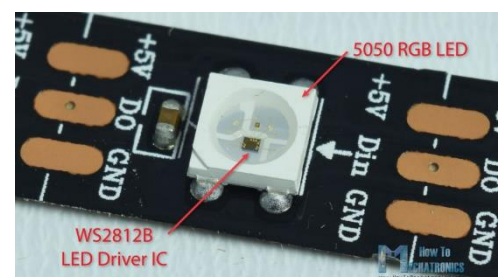
void loop() {

  for (int i = 0; i <= 7; i++) {
    leds[i] = CRGB ( 0, 0, 255);
    FastLED.show();
    delay(100);
  }

  for (int i = 7; i >= 0; i--) {
    leds[i] = CRGB ( 255, 0, 0);
    FastLED.show();
    delay(100);
  }
}
```

## **How WS2812B LEDs Work**

- The LED strip consists of type 5050 RGB LEDs in which the very compact WS2812B LED driver IC is integrated.
- Depending on the intensity of the three individual Red, Green, and Blue LEDs, we can simulate any colour we want.



**Reference:** <https://howtomechatronics.com/tutorials/arduino/how-to-control-ws2812b-individually-addressable-leds-using-arduino/>

- The simple colour mixing chart shows how we can produce different colours.

**Reference:** <https://randomnerdtutorials.com/electronics-basics-how-do-rgb-leds-work/>

