

# Erik Katerborg

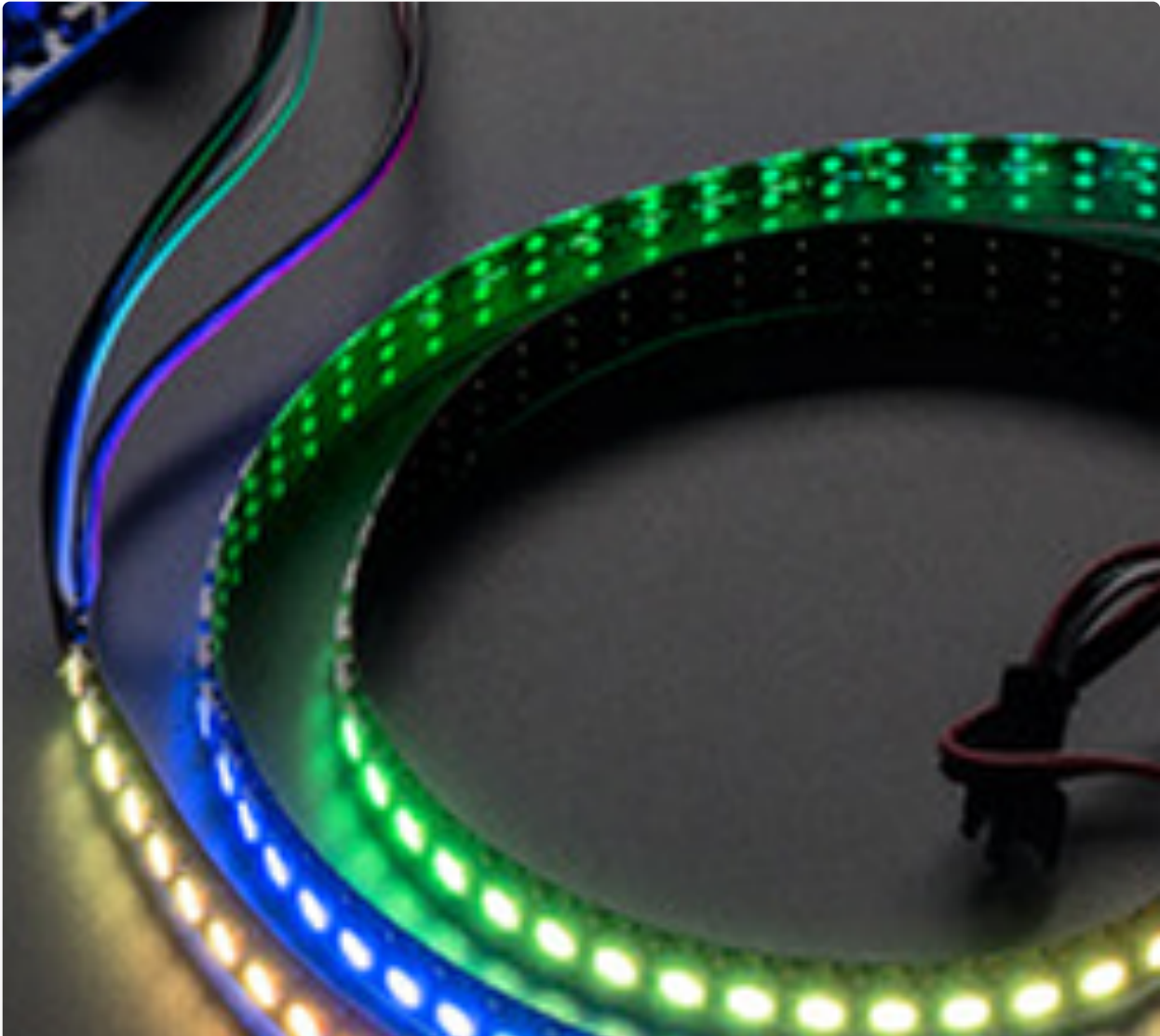
Digital creative

Work

Play

Tutorials

About me





## Powering lots of LEDs from Arduino

📅 February 24, 2016 👤 erik ➡ Tutorials

For a recent project I had to figure out how to power LOTS of Neopixel Leds from an Arduino board. **Neopixels** are digital RGB leds that can be controlled individually, even when in a strip of hundreds of Leds.



## How many Leds can my Arduino handle?

There are two factors to take into account: memory and power:

### Power

The USB port receives 5V and 500 mAmps from your power source (your laptop, a

charger or battery). That’s the maximum that your Arduino can handle and also the maximum that Arduino can provide to your leds. If you try to draw more than 500 mA from your laptop or battery, the laptop, battery and Arduino may get damaged or will shut themselves down.

One Neopixel can use 60 mA, that means you can only safely power 8 Neopixels straight from your Arduino!

Memory

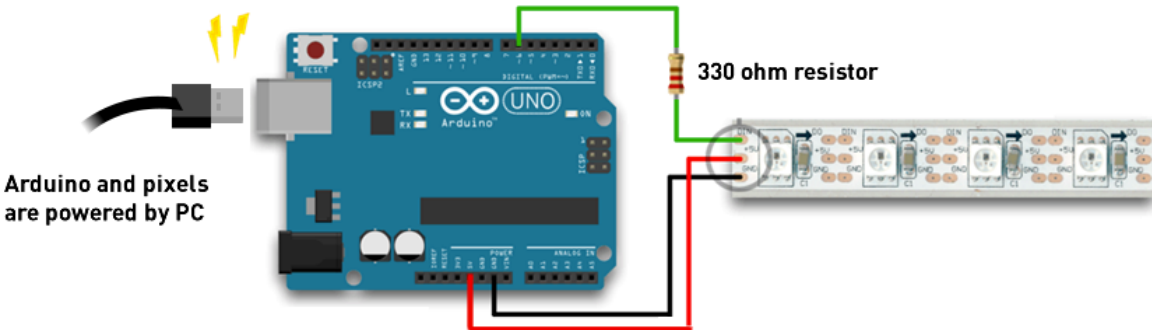
An Arduino Uno has 2kb of memory. One Neopixel led uses 3 bytes of memory. That means you can drive about 600 Neopixels, or a bit less, depending on the size of the rest of your program.

Power and RAM			Boards		
1 pixel	20 - 60 mA	3 bytes	Arduino UNO	2 kb	600 pixels
8 pixels	160 - 480 mA	25 bytes	Arduino MEGA	8 kb	2400 pixels
30 pixels	600 - 1800 mA	90 bytes	Adafruit Trinket	512 b	170 pixels
100 pixels	2000 - 6000 mA	300 bytes	Adafruit PRO trinket	2 kb	600 pixels
330 pixels	6600 - 19800 mA	990 bytes			

Powering up to 8 Neopixels

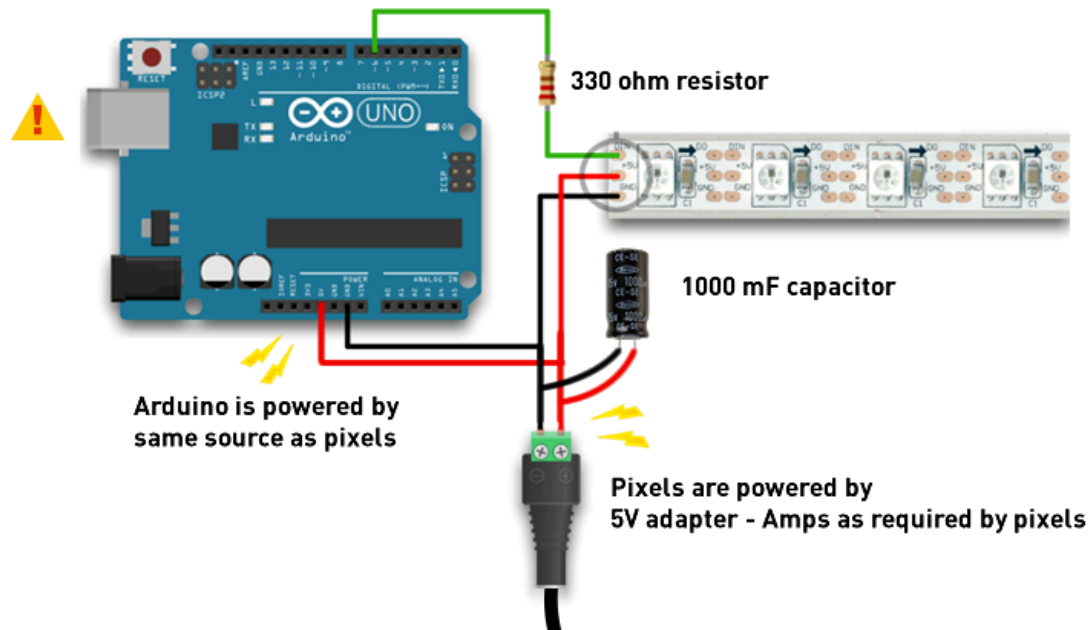
As long as you connect 8 or less Neopixels you can power them straight from your Arduino board. Assuming you want to be able to burn them at full brightness (white light at full power). One color only uses about 20mA, so if you only show one color at a time you can connect more than 8 leds.

This diagram shows how to connect everything. This way, you can program your Arduino while the RGB leds are connected.



## Powering more than 8 Neopixels

If you have more than 8 neopixels connected, you need a stronger power source that can provide more than 500 mAmps. The diagram below shows how to connect this power source. This could be a mobile charger that provides 5V and 2000 mAmps.



This diagram shows that the power source provides both the Arduino Board and the Leds with power. In this setup, the 'extra' power that your LEDS consume, is NOT flowing through the vulnerable Arduino circuitry. This way, you can connect as many Leds as you want, as long as the power source can provide the amps.

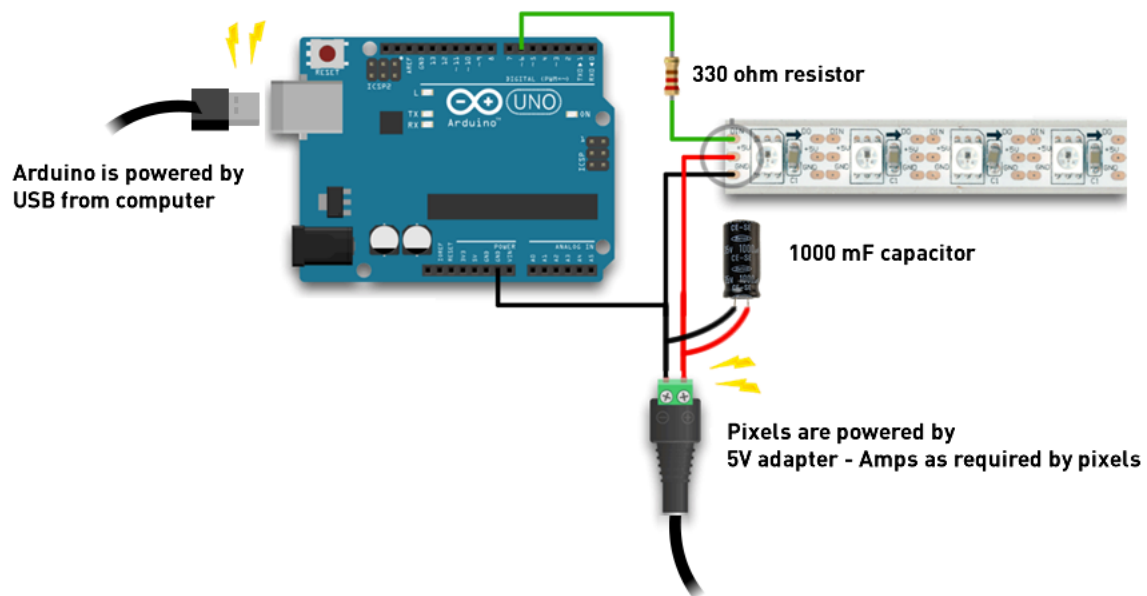
For example, if the power source has a maximum of 2000 mAmps, you can power 60 Neopixel RGB Leds. An adapter with 10Amps can power 166 RGB Leds. This setup is great if your project is finished and you want to install your lamp and arduino with a single power source.

It's very important **NOT** to connect a USB cable in this setup, because your Arduino board is already powered!

(Note: Adafruit advises to put a capacitor between the power source and your circuit).

## Powering more than 8 pixels while connected to USB

In the previous setup, you could power more than 8 RGB leds, but you can't upload a new program to your Board. This makes it hard to test new software, so you need a different setup for that purpose. What you'll do is disconnect the Arduino board from the external power source, and then you can connect the USB cord to your computer again:



Please note that this setup requires careful handling:

#### Connecting:

Power the RGB Leds first, then Arduino

#### Disconnecting:

Unplug the Arduino first, then the Power

### Amperage for hundreds of Leds

When working with hundreds of Leds, you may find yourself needing more than 20 Amps. For example:  $400 \text{ LEDs} \times 60\text{mA} = 24 \text{ amps}$ . That's a lot! We are starting to enter the realm of serious electronics here, and we need to consider safety.

Let's start by using thicker wire that will support the amount of amps we are using. Your electronics shop can advise you on this. I used standard speaker cable to power my 10 amp led strips.

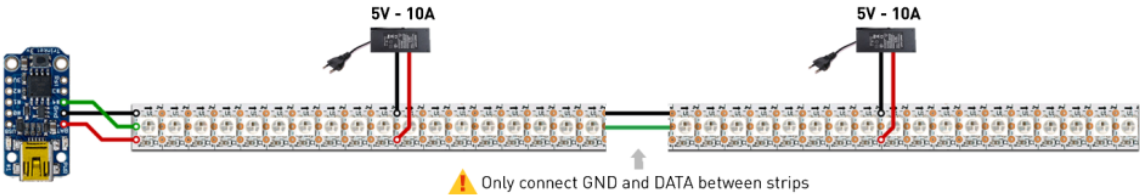
You can buy very large power sources that supply 20 or even 50 amps, but actually, there's a much safer solution to work with lots of LEDs: distribute the power in smaller groups of LED strips that use only 10 amps.

In the diagram below, each LED strip is connected to one adapter that provides 5V and 10 Amps. The strips are connected to each other through ground and data, but NOT

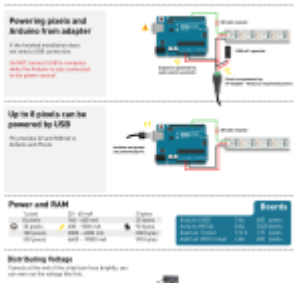
through power. Each strip has its own power source, which means we won't draw all the Amps through the entire circuit. Now we can use thinner wiring, and we won't electrify ourselves when a connection is loose somewhere!

Dividing Amperage

Divide several power sources along a large strip, to keep down the amperage. High amperage requires thicker cables and can be dangerous if exposed.



Download this page as a printable cheat sheet:



arduino / tutorial

< Previous Post

Next Post >

