

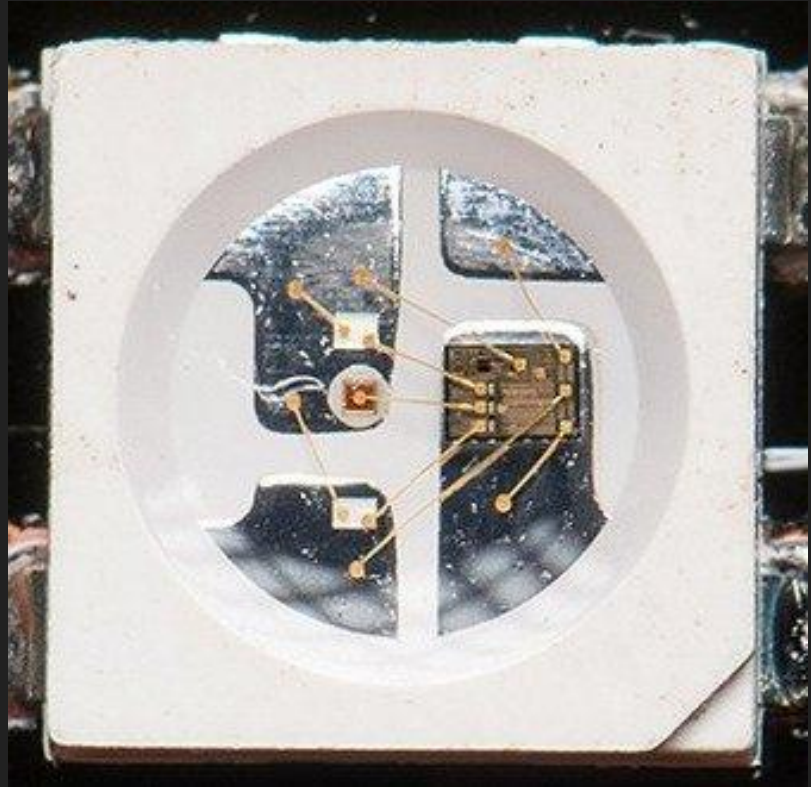
# Intro to NeoPixels

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# What is a NeoPixel?

- Named by Limor “Ladyada” Fried
  - [Adafruit.com](https://adafruit.com)
- WS281x family of LED's
  - 5050-style package RGB LED
  - Integrated driver chip
  - Single-wire serial communication
- Models include
  - WS2811
  - WS2812
  - WS2812b
  - SK6812



# Why are NeoPixels great?

- + Color!
  - + 24-bit
- + Individually addressable - per-pixel control
- + Variable brightness
- + Simple wiring (Power, ground, data)
- + A small strip can be powered directly from USB
- + No current-limiting resistors needed

# Why are NeoPixels not so great?

- Microcontroller + programming required
- 5 Volt DC power required
  - Higher current demands for many pixels
- Timing-critical serial protocol
  - Data must be continuously sent at a specific rate
  - May conflict with other timing-sensitive functions
    - Interrupts
    - Serial console
    - Servos
- Refresh rate too slow for POV projects
  - 400 Hz

# NeoPixel strip varieties

- Density - 30/60/72/96/144 pixels per meter
- PCB color
- Water/dust resistance
  - IP30 - not protected
  - IP65 - silicone dome applied directly to strip
  - IP67 - external silicone cover

# Other form factors

<https://www.adafruit.com/category/168>

# Mounting recommendations

- Mechanical attachment is preferred
  - Zipties
  - NeoPixel strip mounts
- Adhesive backing
  - Non-silicone cover strips only
- Hot glue
  - Does not stick to silicone covers
- Adhesives known to work
  - Permatex 66B - Clear RTV Silicone
  - Loctite Plastics Bonding System - 2-part cyanoacrylate

# Where to purchase NeoPixels

- **Adafruit.com**
  - + Fast shipping
  - + Tested
  - - Price
- **Amazon**
  - Varies by seller - look for US stock
- **eBay**
  - Varies by seller
- **AliExpress.com**
  - + Price
  - - Shipping time
  - - Mixed quality



# Connecting NeoPixels

# Powering NeoPixels

Lab time!

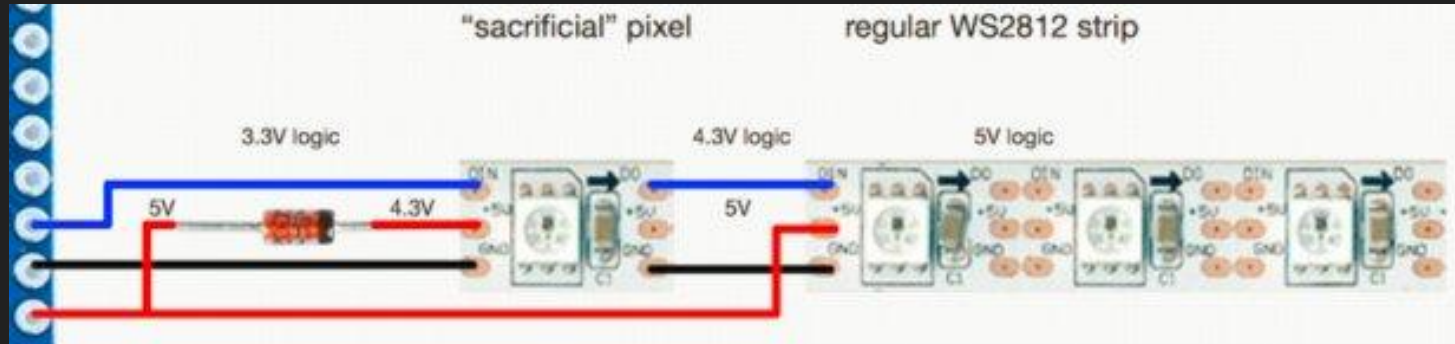


# Neopixels alternatives

- APA102 (Adafruit “DotStar”)
  - High refresh rate
- WS2801
- LPD8806
- Analog
  - 5050
  - 3528

# Can I use a 3.3V microcontroller?

- Logic level shifters
  - 74AHCT125
  - 74HCT245
- Diode + 1 pixel sacrifice method
  - <http://hackaday.com/2017/01/20/cheating-at-5v-ws2812-control-to-use-a-3-3v-data-line/>



# More on software libraries

- Adafruit
- FastLED.io
- Josh.com method
  - <https://github.com/bigjosh/SimpleNeoPixelDemo/blob/master/SimpleNeoPixelDemo/SimpleNeoPixelDemo.ino>
  - <https://wp.josh.com/2014/05/13/ws2812-neopixels-are-not-so-finicky-once-you-get-to-know-them/>
  - [https://www.youtube.com/watch?v=I-IR19\\_kigs](https://www.youtube.com/watch?v=I-IR19_kigs)
  -

Diffusing ideas

# Calculating power needs

- Rule of thumb = 20mA per pixel
  - Mixed colors
  - Example: 20 pixels \* 20mA = 400mA or 0.4A
  - Example: 240 pixels \* 20mA = 4800mA or 4.8A
- Maximum = 60mA per pixel
  - White, full brightness
  - Example: 20 pixels \* 60mA = 1200mA or 1.2A
  - Example: 240 pixels \* 60mA = 14400mA or 14.4A !



# Beyond the microcontroller

- Adafruit FadeCandy
- Raspberry Pi

# Additional resources

- AdaFruit NeoPixel Überguide
  - <https://learn.adafruit.com/adafruit-neopixel-uberguide/>
- <http://fastled.io/>
  - <https://github.com/FastLED/FastLED/wiki/Overview>
- Instructables.com
- Hive76