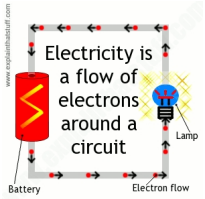
Introduction to microcontrollers and electronics

Basic Electronics

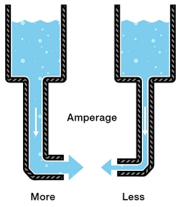


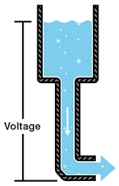
Electricity is the movement of electrons. Electrons create charge, which we can harness to do

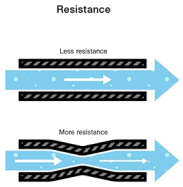
work. Your light-bulb, your stereo, your phone, etc., are all harnessing the movement of the electrons in order to do work. They all operate using the same basic power source: the movement of electrons.

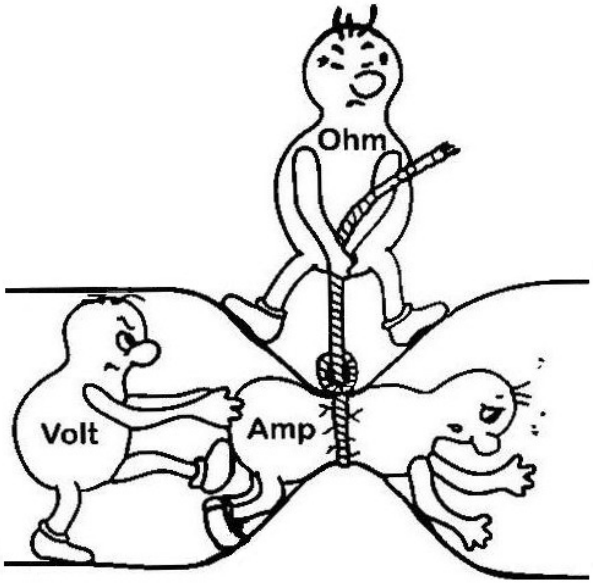
There are three basic principles to electricity

- **Voltage** is the difference in charge between two points. (The pressure)
- **Current** is the rate at which charge is flowing. (Flow)
- **Resistance** is a material's tendency to resist the flow of charge (current).

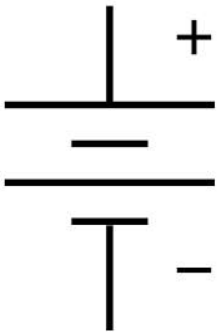






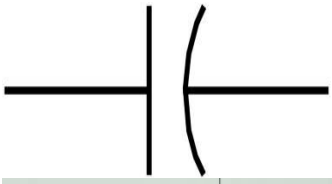


Basic Electrical Components

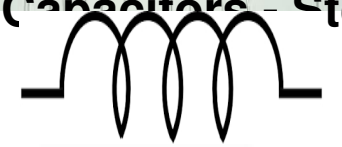


Battery - converts chemical energy into electricity

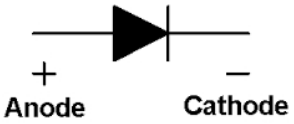
Resistors - Resists the flow of electricity



Capacitors - Stores electrons in an electric field

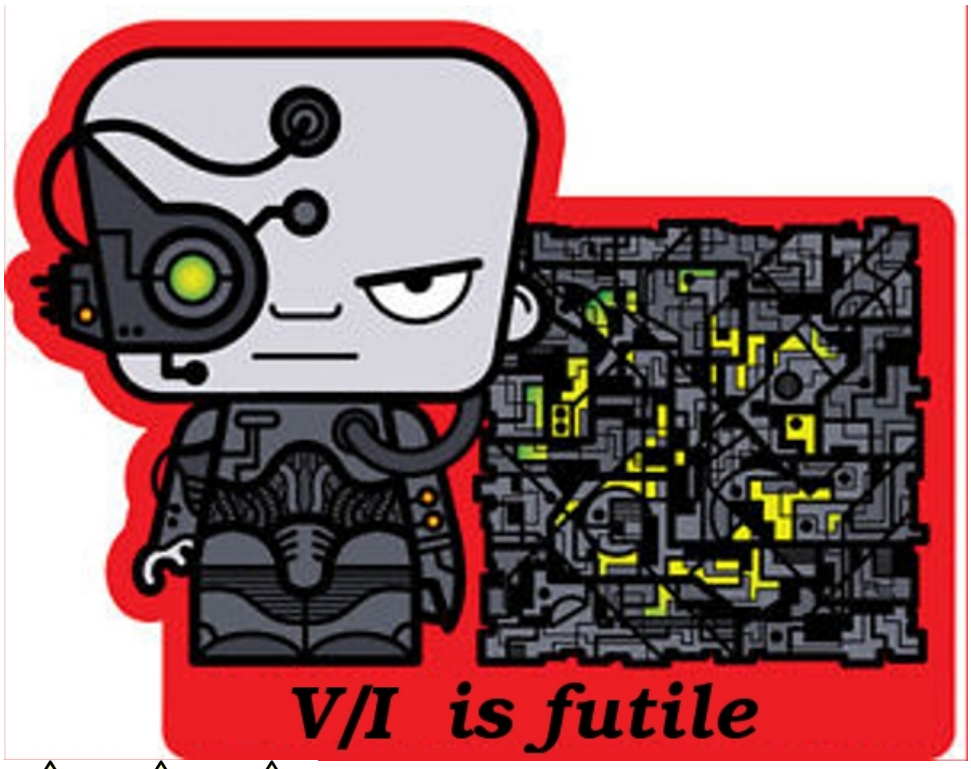


Inductors - Stores electrons in a magnetic field

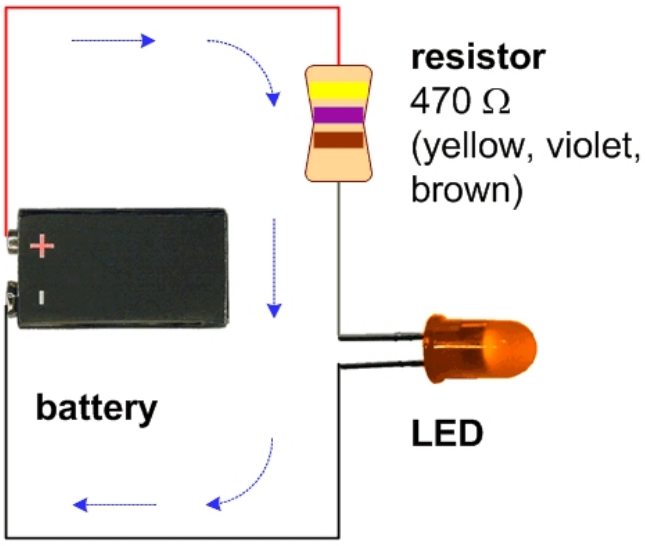


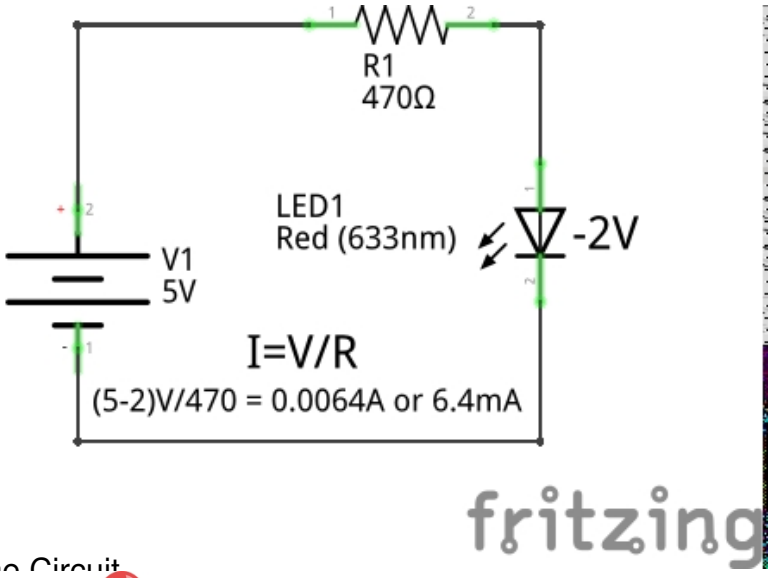
Diodes - Only allows electrons to flow in one direction

Ohm's Law

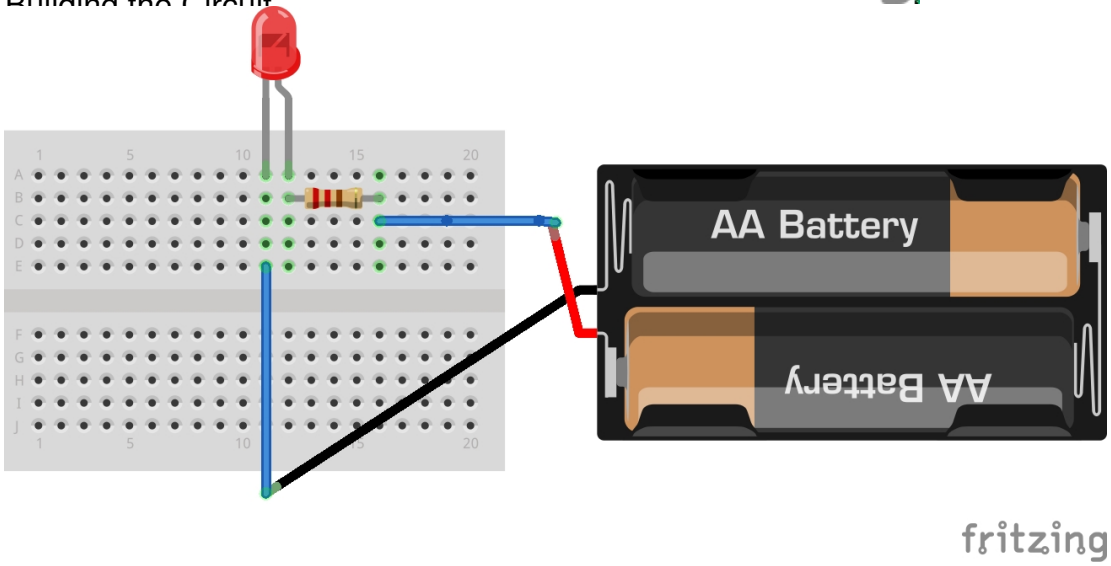


Using Ohm's law to check the max current in the circuit.
LED specs: -2V and 20mA or 0.02A Max

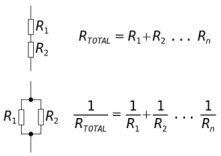




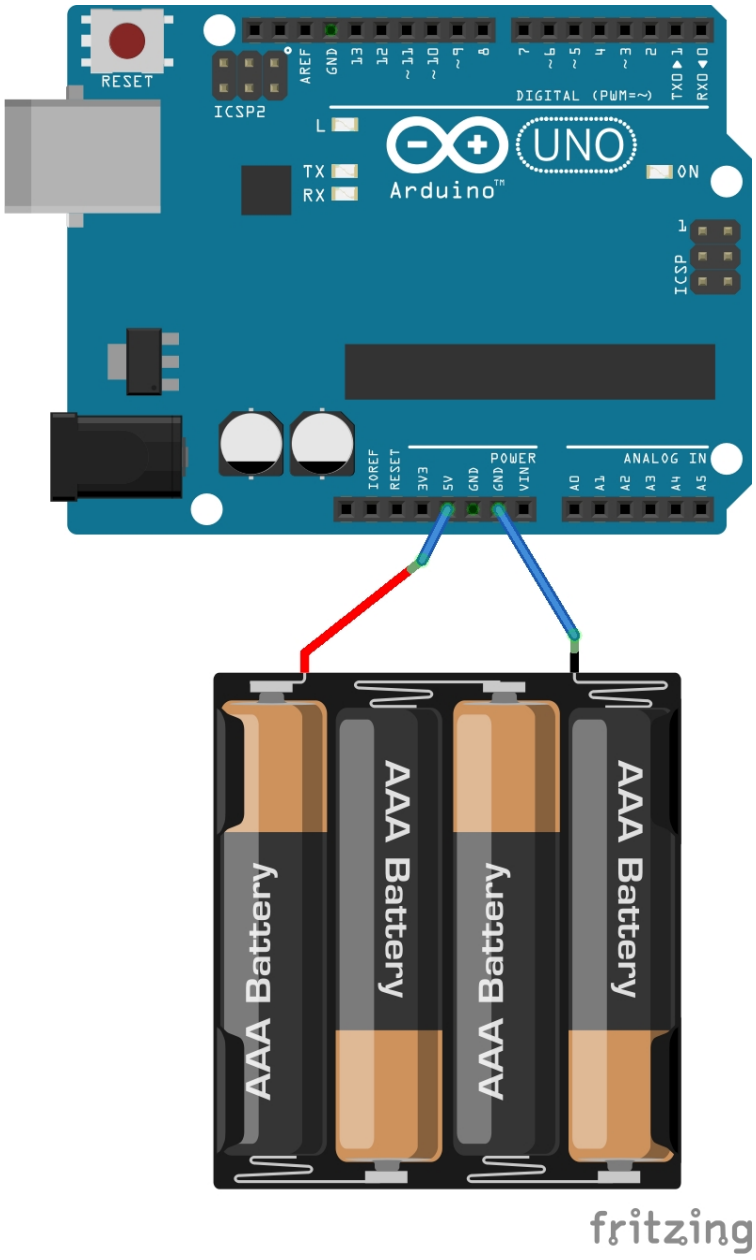
Building the Circuit



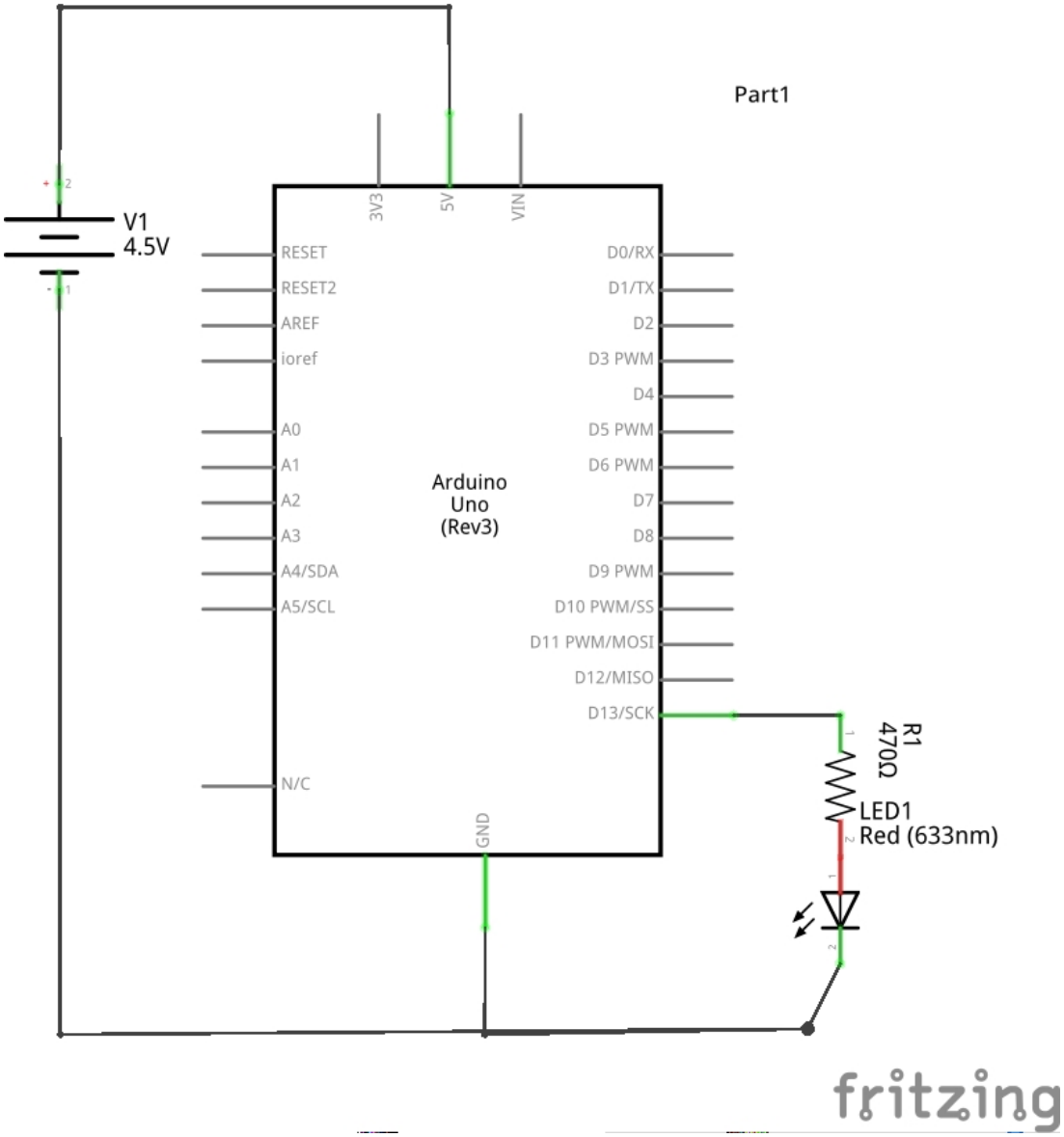
Resistors in parallel and series

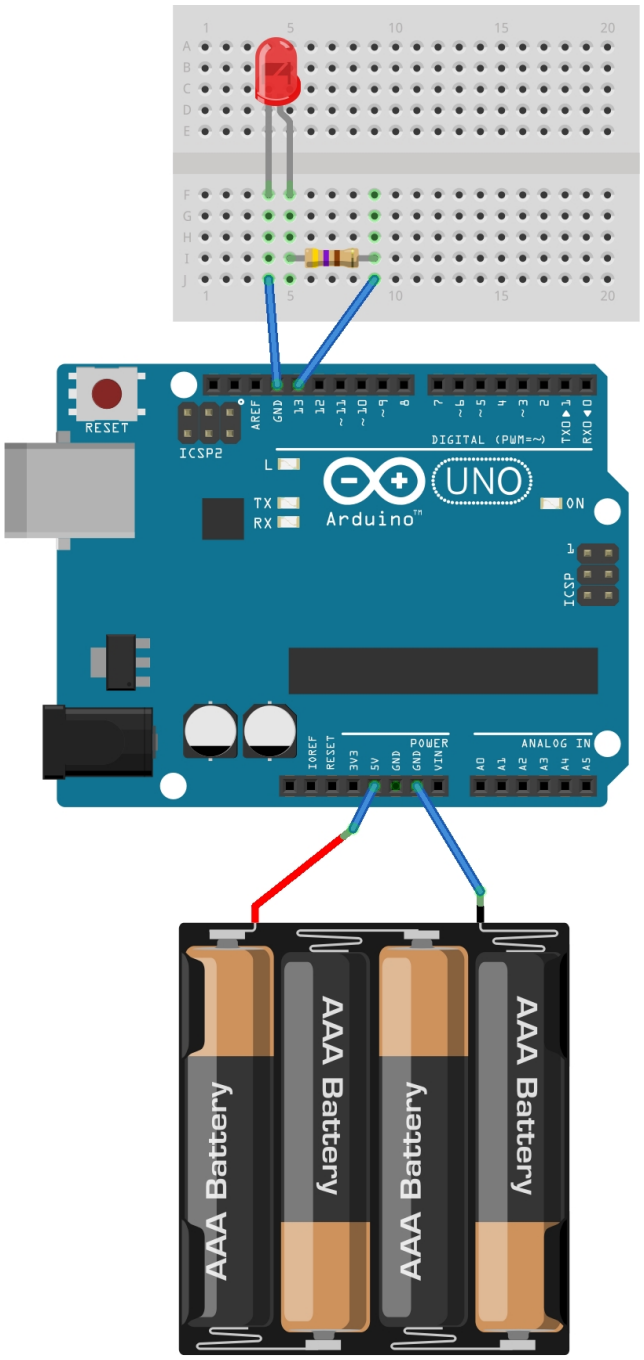


Using a microcontroller

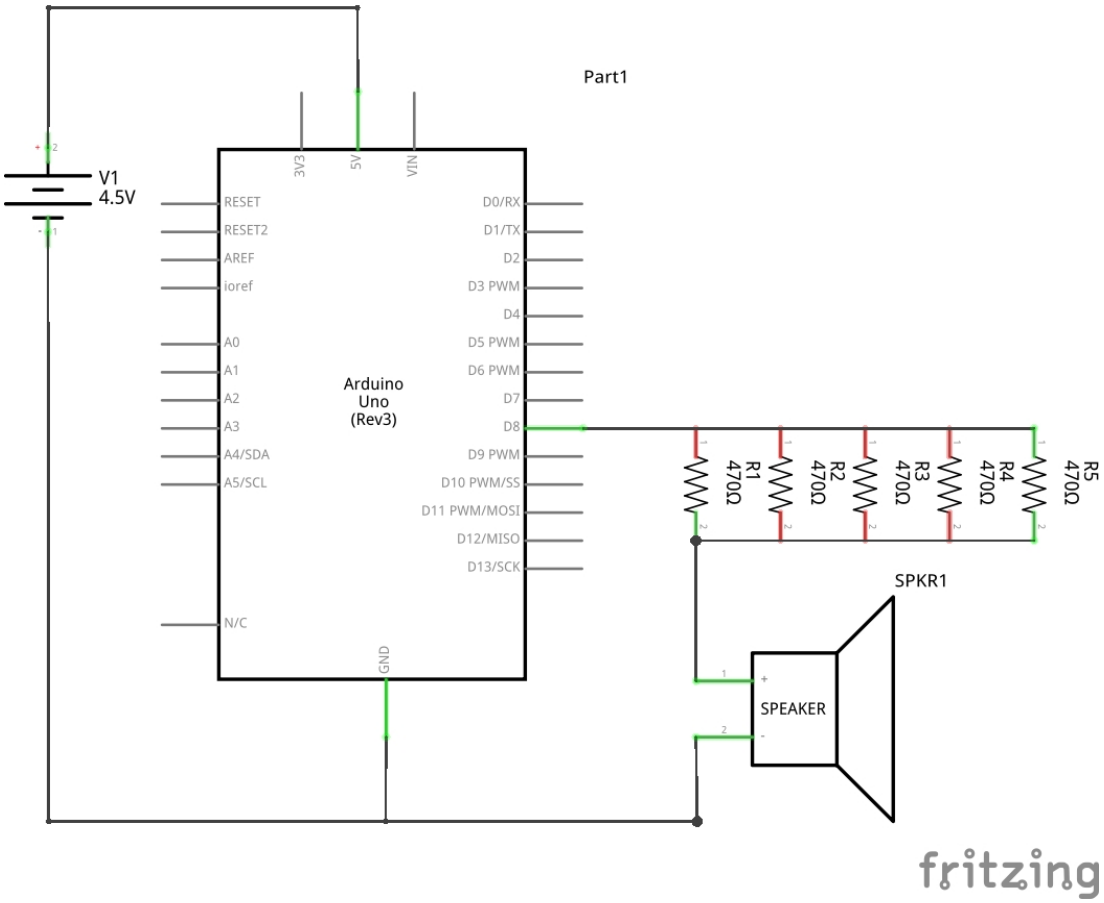


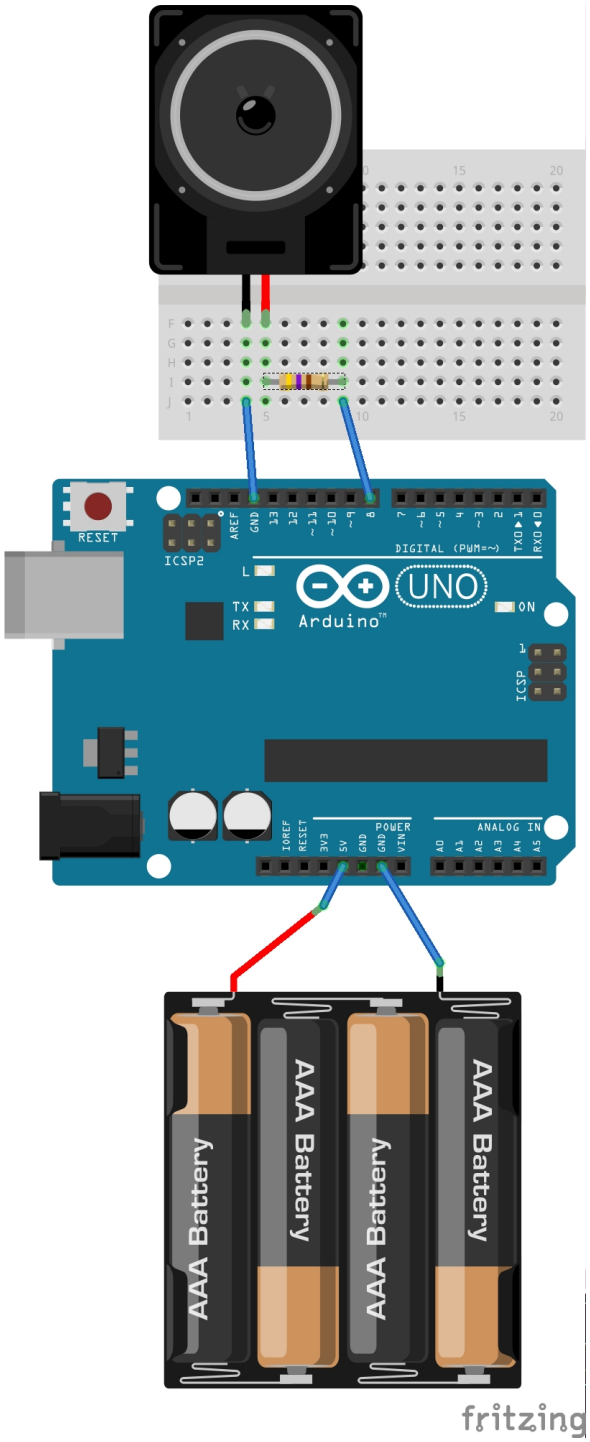
Using a microcontroller to control an LED

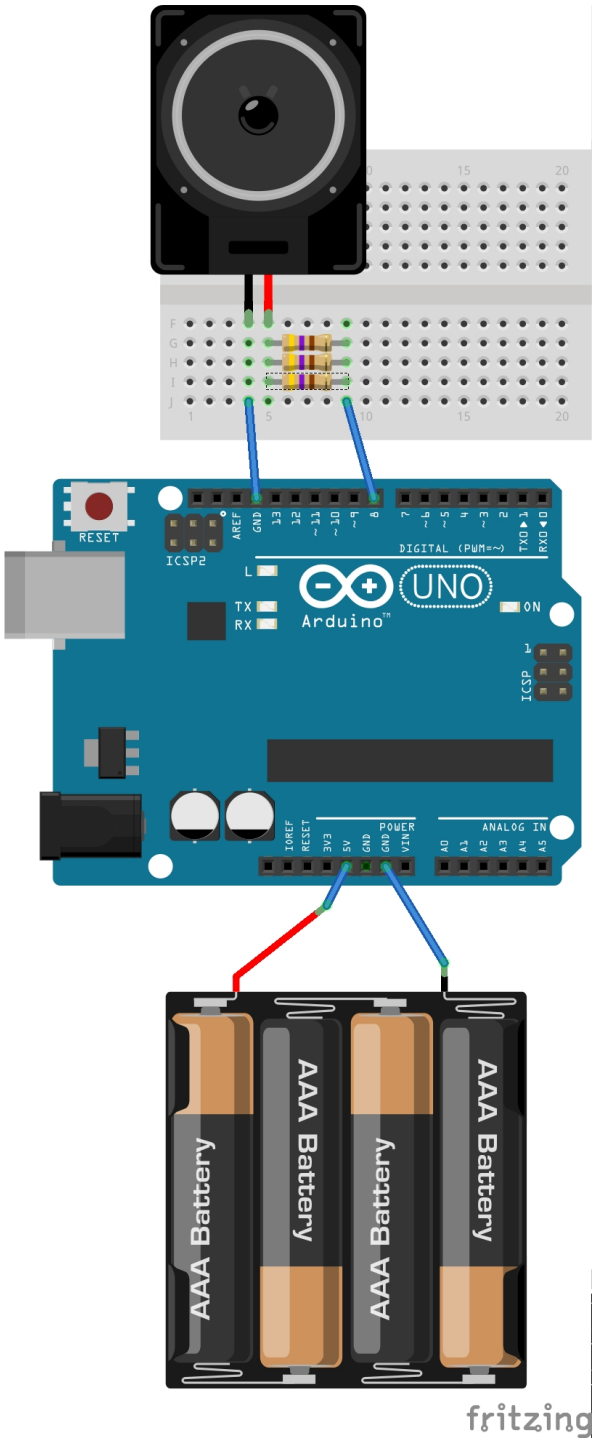

Part1
V1
4.5V
3V3
5V
VIN
RESET
RESET2
AREF
ioref
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
GND
Arduino
Uno
(Rev3)
D0/RX
D1/TX
D2
D3 PWM
D4
D5 PWM
D6 PWM
D7
D8
D9 PWM
D10 PWM/SS
D11 PWM/MOSI
D12/MISO
D13/SCK
R1
470Ω
LED1
Red (633nm)
fritzing



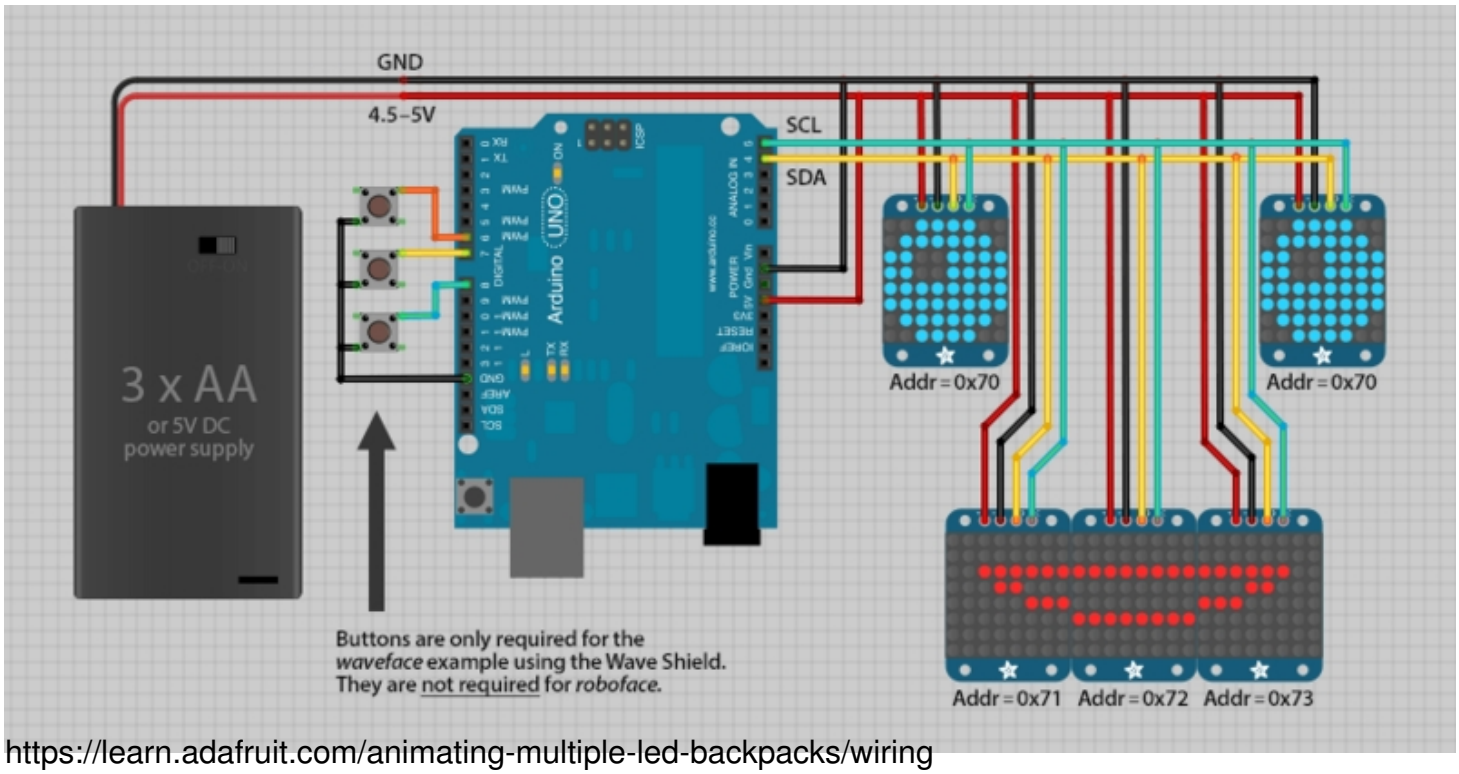
Using a microcontroller to control a speaker


Part1
V1
4.5V
3V3
5V
VIN
RESET
RESET2
AREF
Ioref
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
GND
Arduino
Uno
(Rev3)
D0/RX
D1/TX
D2
D3 PWM
D4
D5 PWM
D6 PWM
D7
D8
D9 PWM
D10 PWM/SS
D11 PWM/MOSI
D12/MISO
D13/SCK
R1
470Ω
R2
470Ω
R3
470Ω
R4
470Ω
R5
470Ω
SPKR1
SPEAKER
fritzing


RESET
ICSP2
DIGITAL (PWM=~)
UNO
Arduino
TX
RX
ON
ICSP
POWER
ANALOG IN
AAA Battery
AAA Battery
AAA Battery
AAA Battery
fritzing



Connecting the 8x8 LED matrix



https://learn.adafruit.com/animating-multiple-led-backpacks/wiring