

Introduction to Electronics and Breadboarding Circuits

What we're going to learn today:

What is an electronic circuit?

What kind of power is needed for these projects?

What are the fundamental principles of electronics?

What are the basic electronic components used in DC analog circuits?

How do these principles combine to make interesting things?

We're going to make some of those things, and you can take the kit, and the projects home with you.



Class Parts List

Breadboard 1
Wire kit 1
Red LEDs 3
Green LEDs 3
Yellow LEDs 1
Photoresistor 1
xPiezo sensor 1
Button 3
Slide button, switch 1
Reed switch 1
Potentiometer
Hall effect sensor 1
Rare Earth Magnet 1
Tilt ball switch 1
Transistor pn2222 1
TIP120 1
Relay 1
RGB led 1
Dc toy motor 1
Diode 1n4001 1
Lm7805 1
Power connector 1
9v snap power connector 1

10uf capacitor 1
47uf 1
100uf 1
1000uf Cap 1
1500uf cap 6.3v 1
10k Resistors 1
1k Resistors 1
330 ohm Resistors 1

About parts

Symmetric vs Asymmetric

Polarized

Physics and chemistry in a tiny package

Explain Data Sheets

What is electricity?

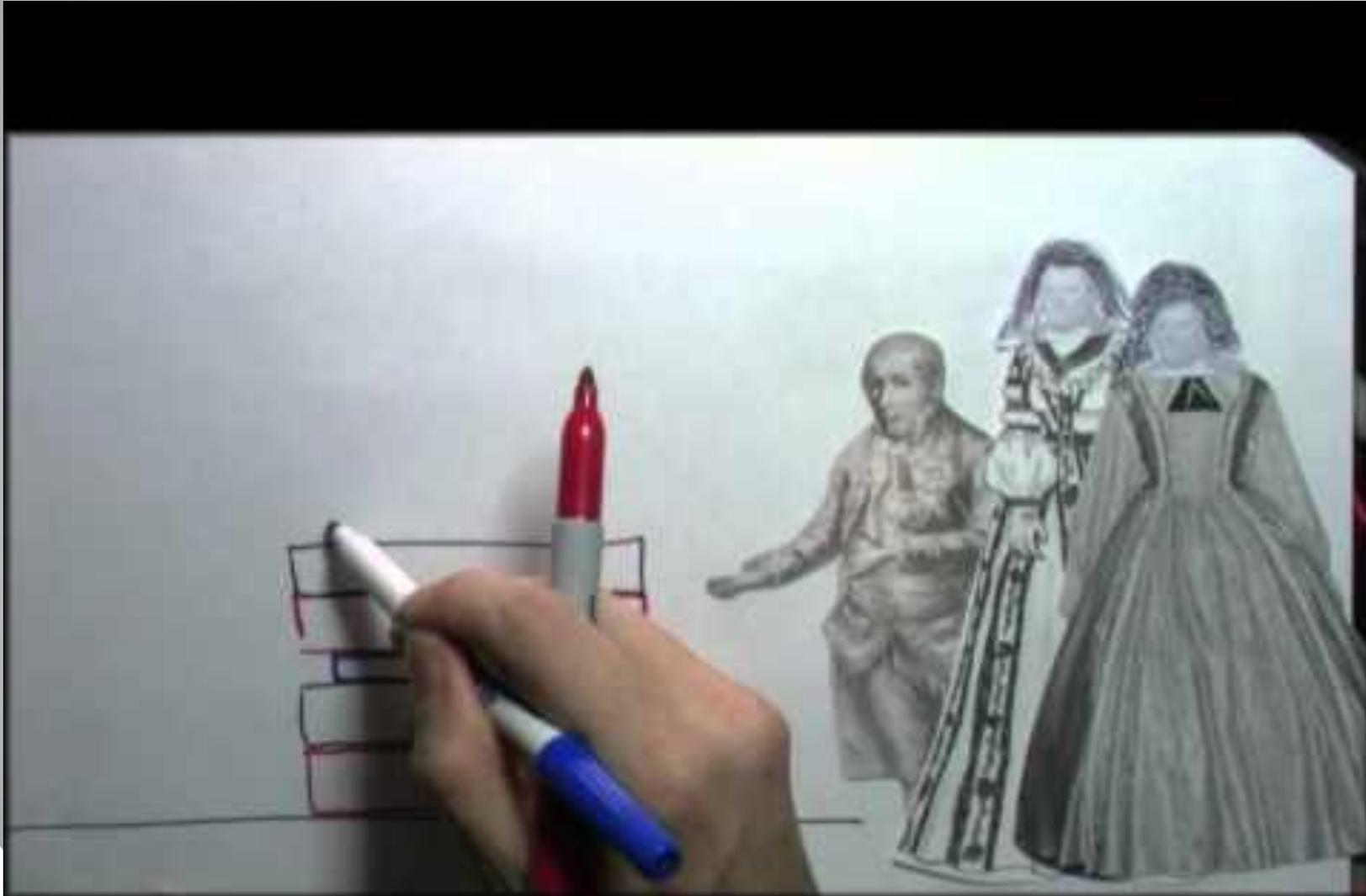
What kinds are there?

What can it do?

What are the dangers?

Batteries as a power source

What kinds of batteries are there?



What is a circuit?

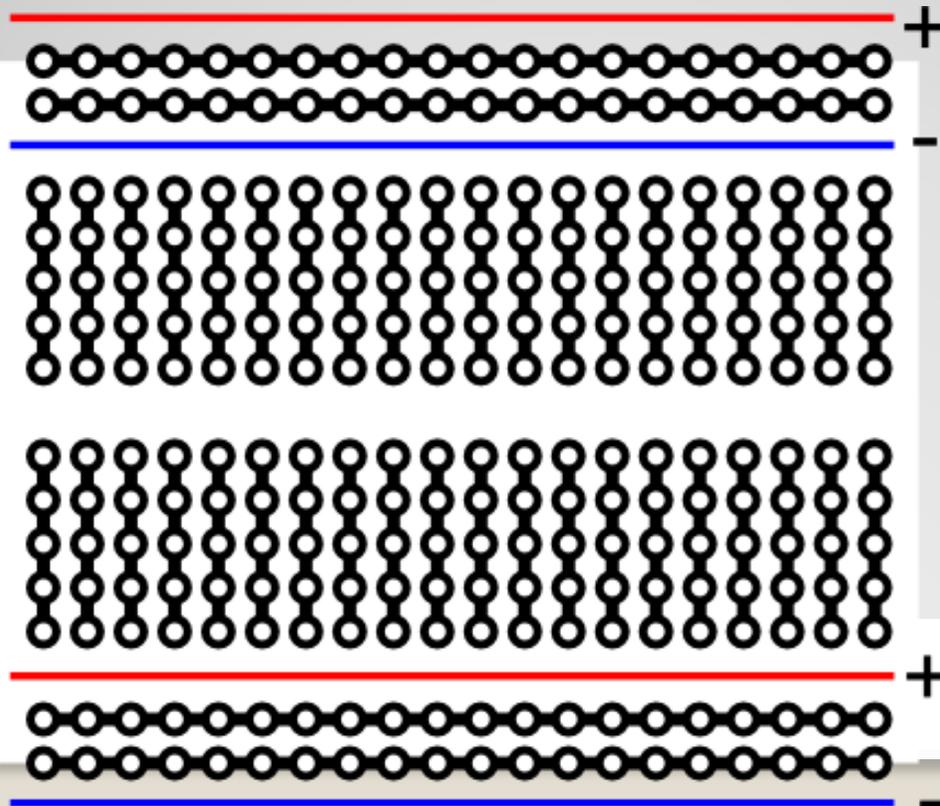
Combination of electronic parts, wires connected between power sources. It's like a physical program. It's also like setting up dominoes in sequence.

What is a breadboard?

What are they good for?

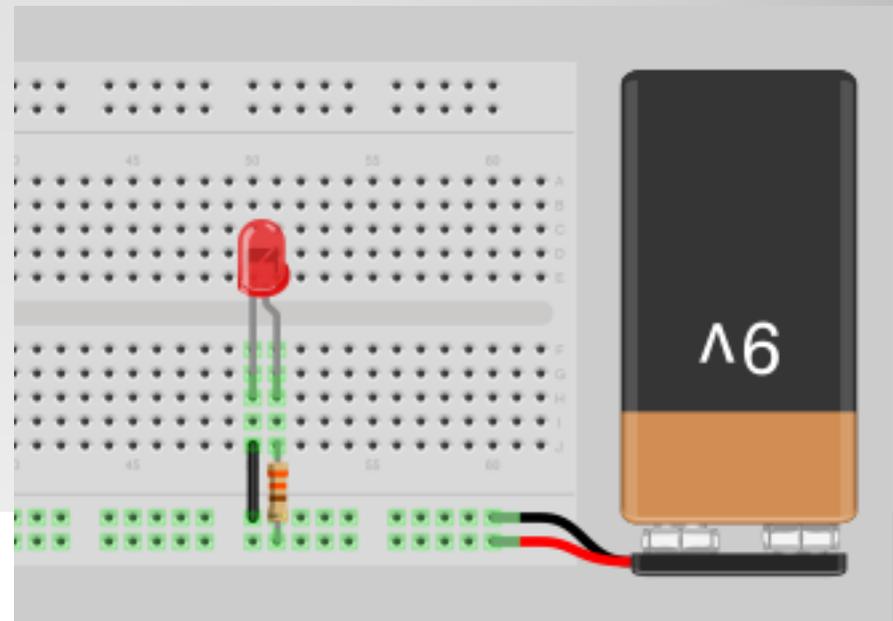
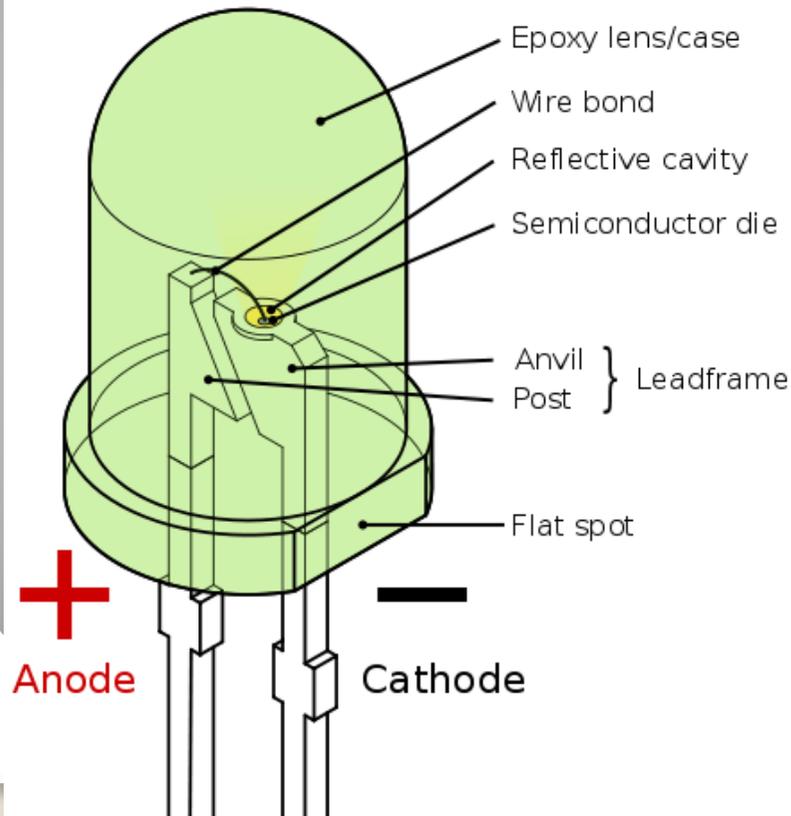
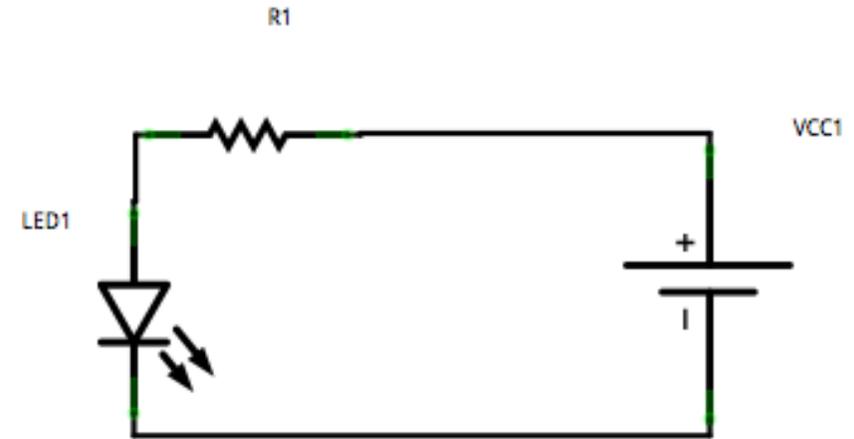
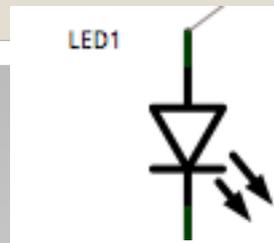
Creating, organizing, and prototyping a circuit.

Literally started out as a bread board with nails.



What are LEDs?

Light Emitting Diodes
Diode Symbol + Arrows for light
Points to ground



Hello World for a Circuit

Light and LED

Parts:

Battery

Resistor

LED

Why:

Power Source

An LED will light up when enough voltage is supplied but can also burn out if too much is allowed to pass through. The resistor will limit the voltage to prevent damage.

Do:

Connect Battery, Resistor, LED

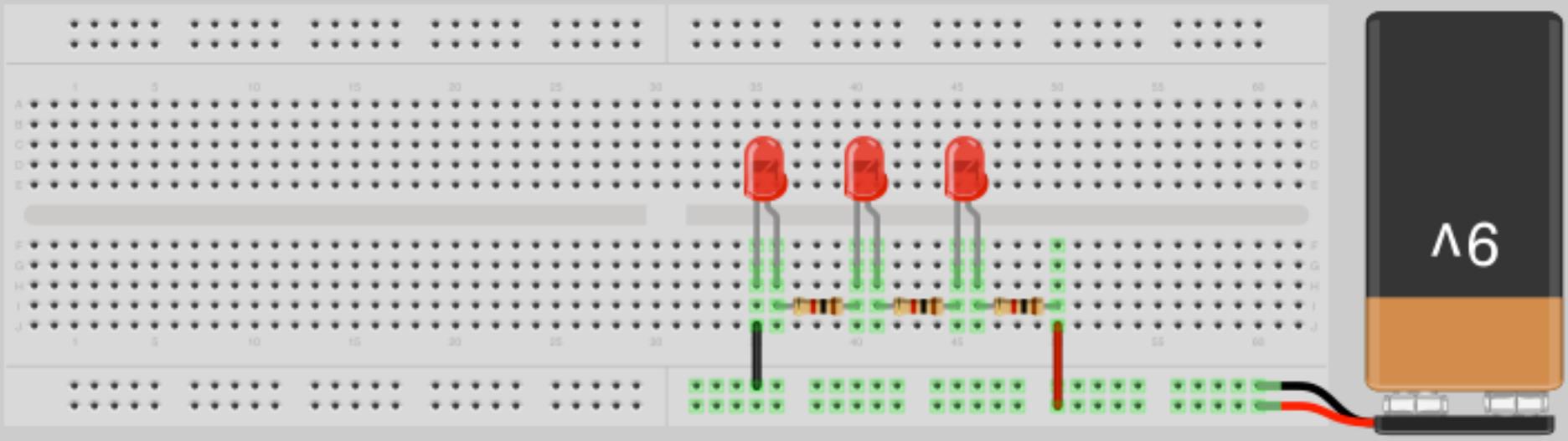
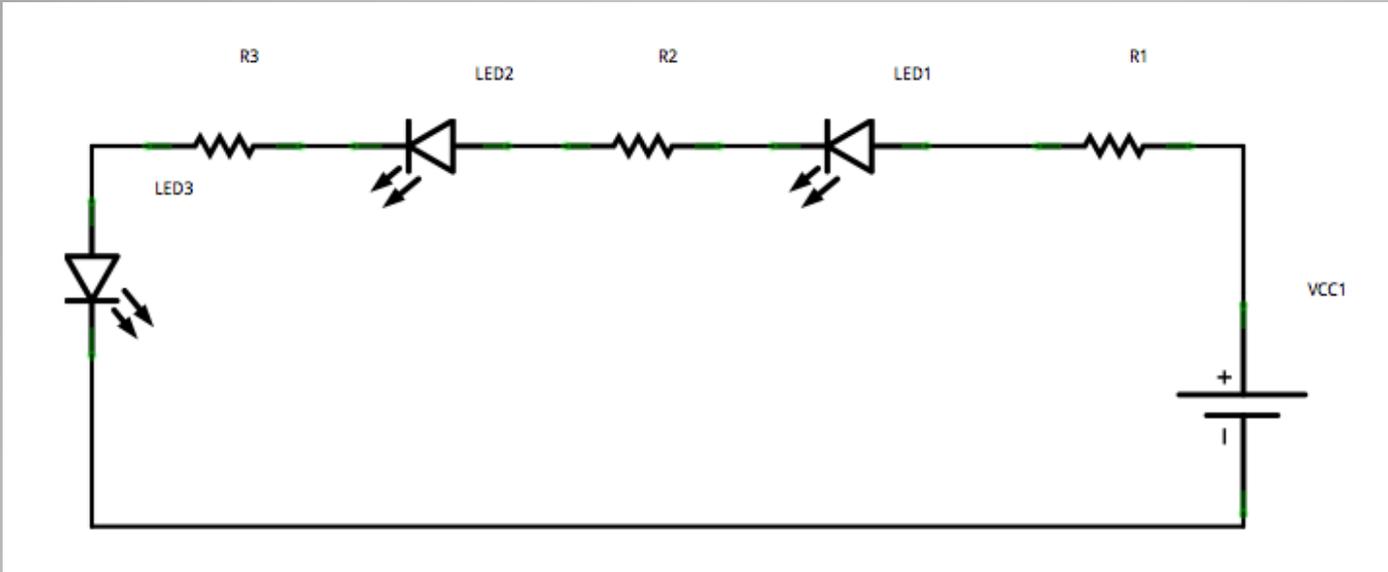
LED Circuit

1 LED Plus resistor

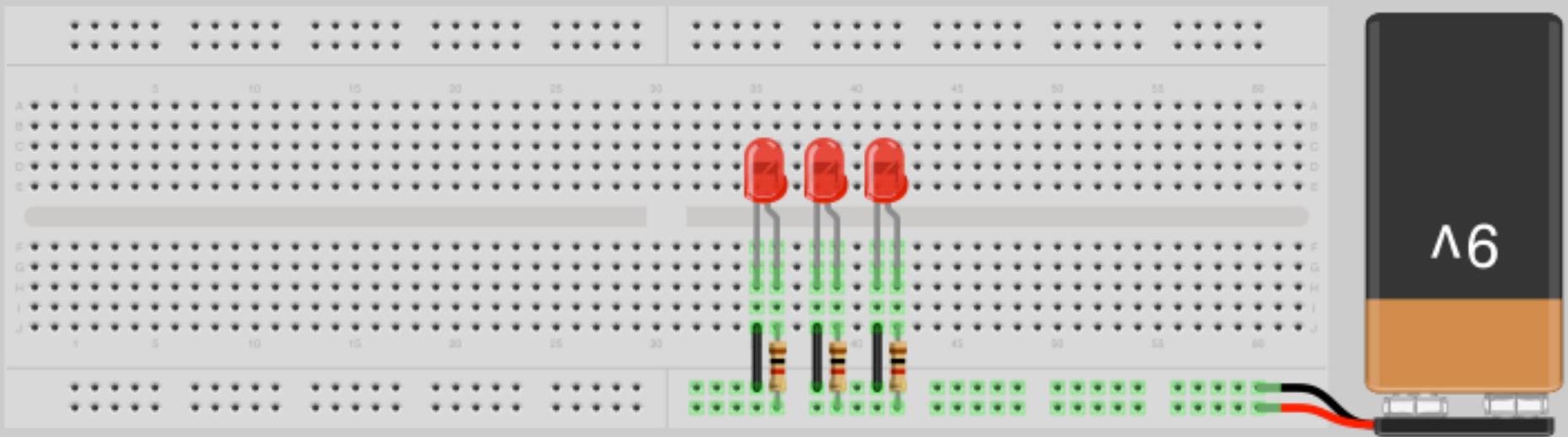
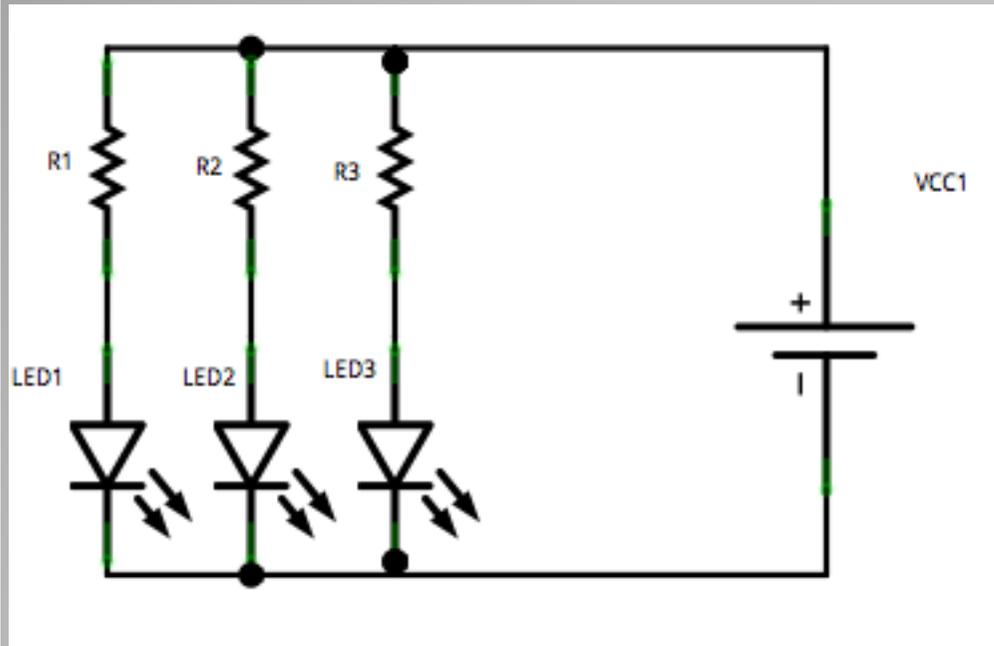
Why have a resistor?

Current, limiting.

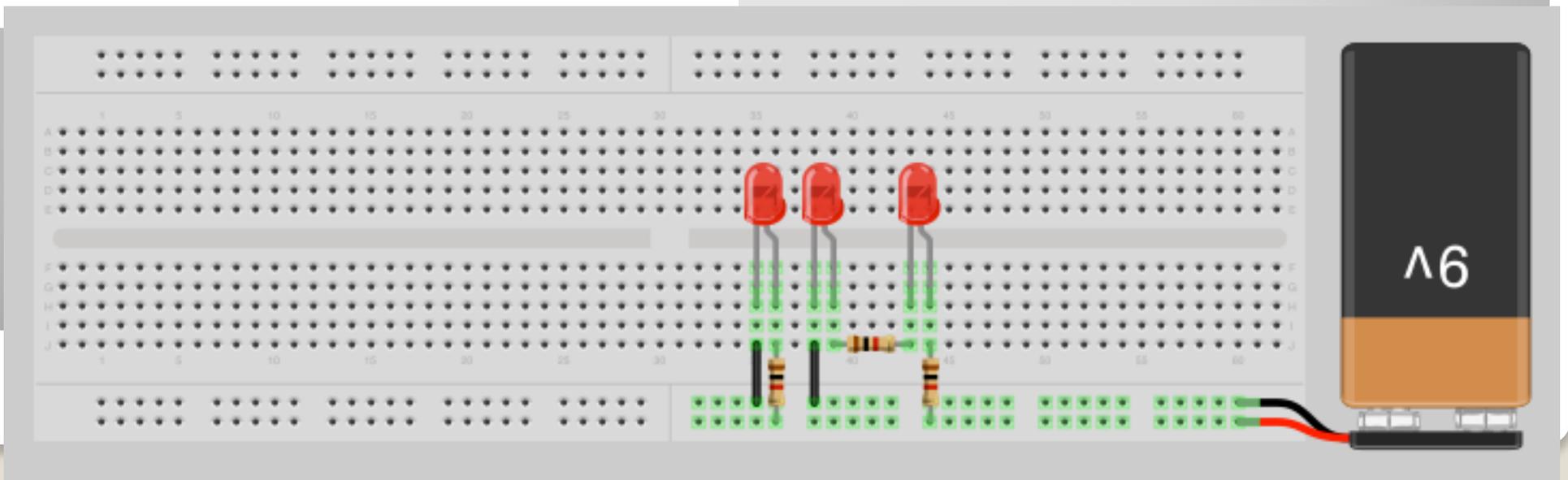
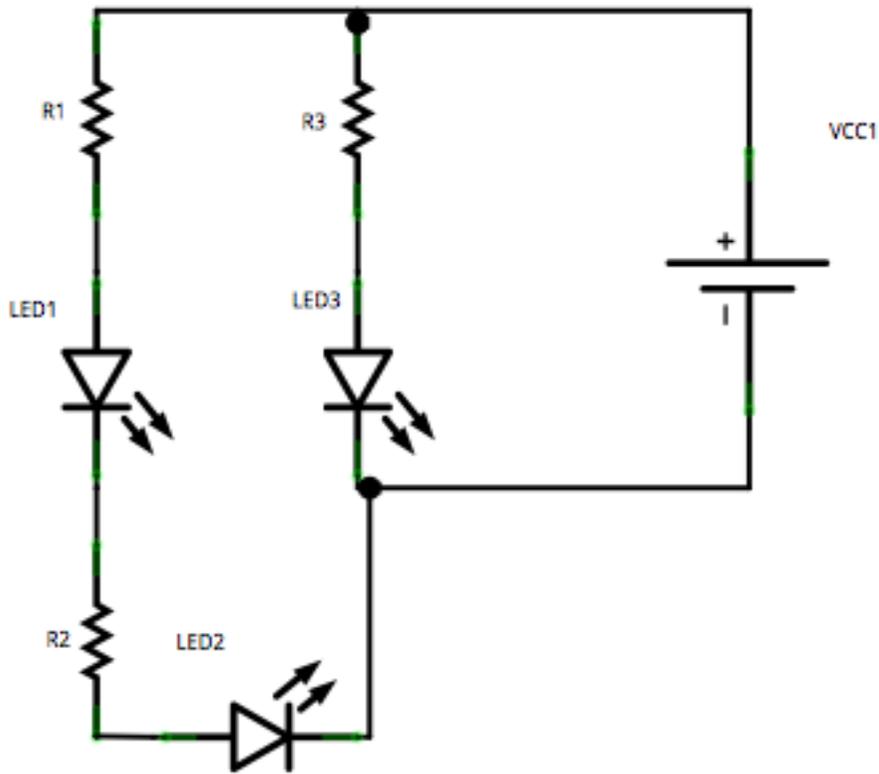
Series circuit example



Parallel Circuit example



Parallel and Series Circuit Example



Fundamental Parts

Resistor

Capacitor

Wire

Diodes

Light Emitting Diodes (LED)

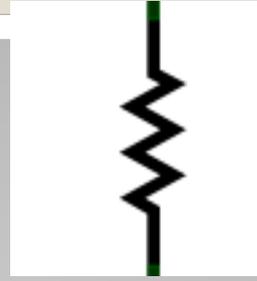
Battery

Transistors

Motors

They each have a physical property that interacts with electricity. When put in combination various actions occur.

What are resistors?



Resistors provide a specific amount of resistance to a path in a circuit or wire. Ohm's law is used to calculate the properties related to resistance.

Ohm's Law: $I = V/R$

I = Current measured in Amps

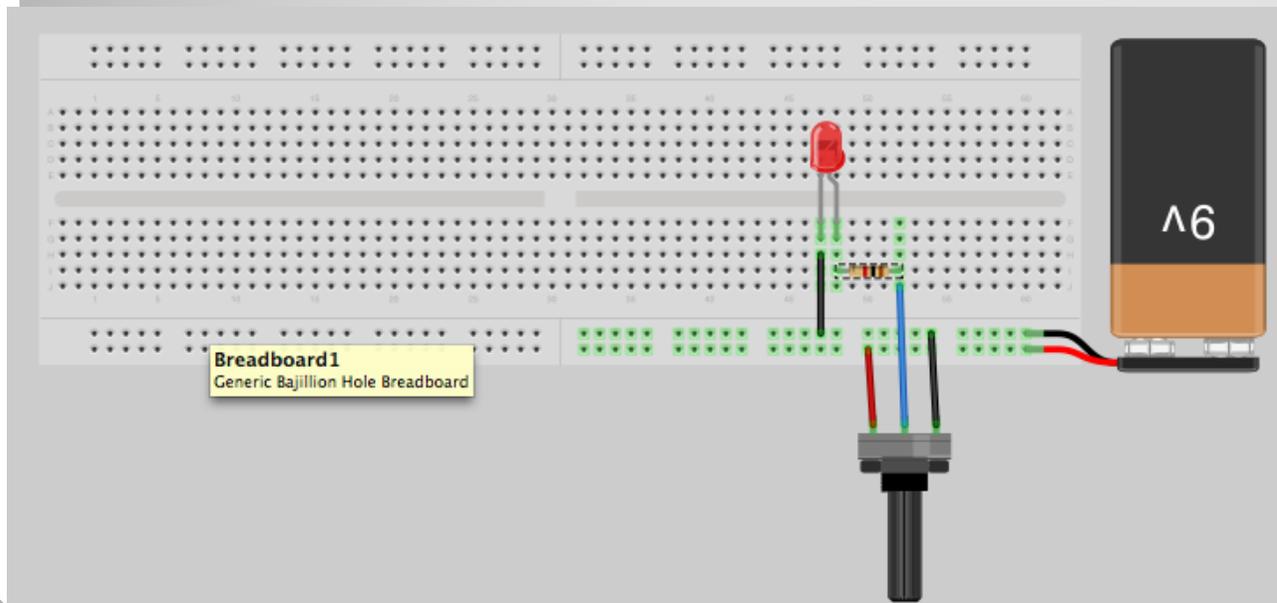
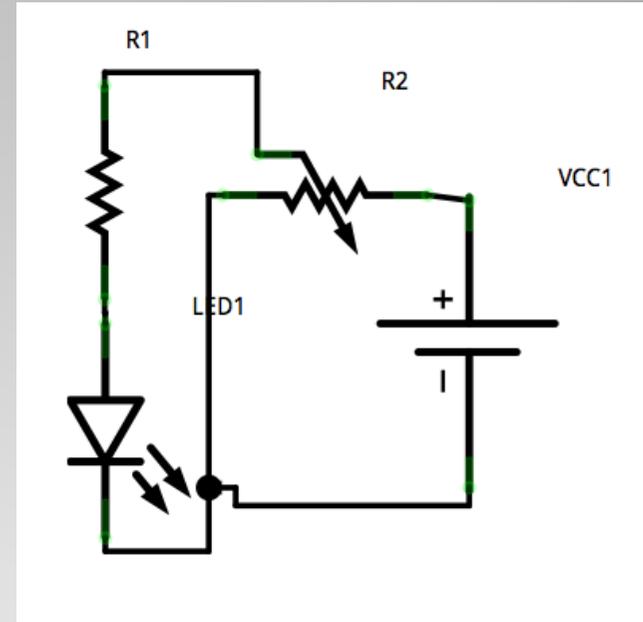
V = Voltage measured in Volts

R = Resistance measured in Ohms

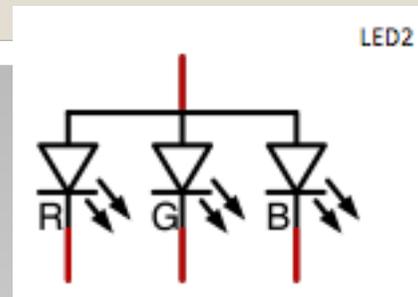
Resistors are color coded.

Variable resistor: The potentiometer

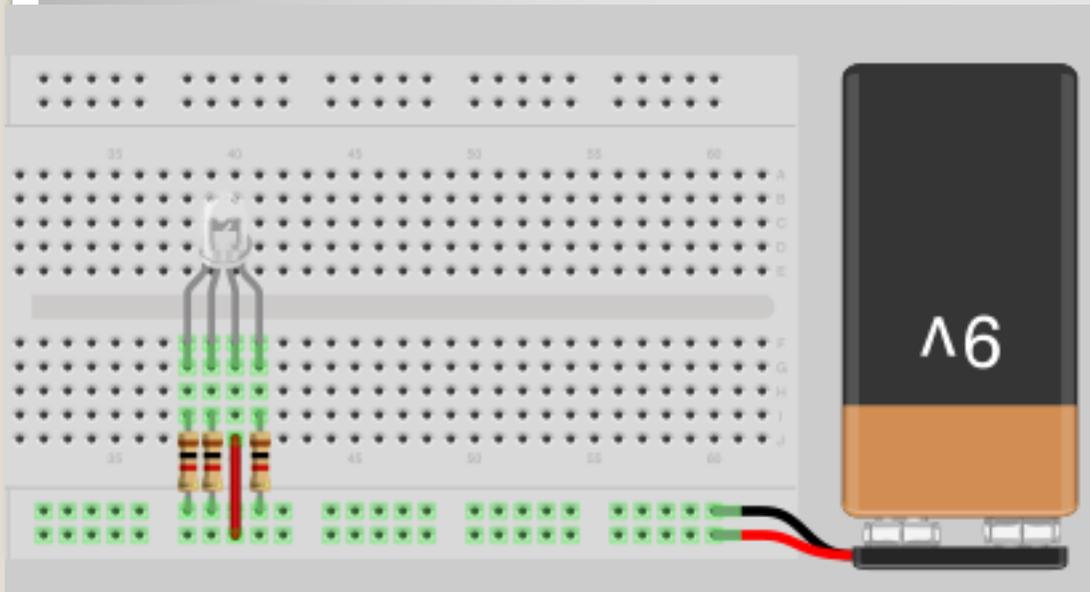
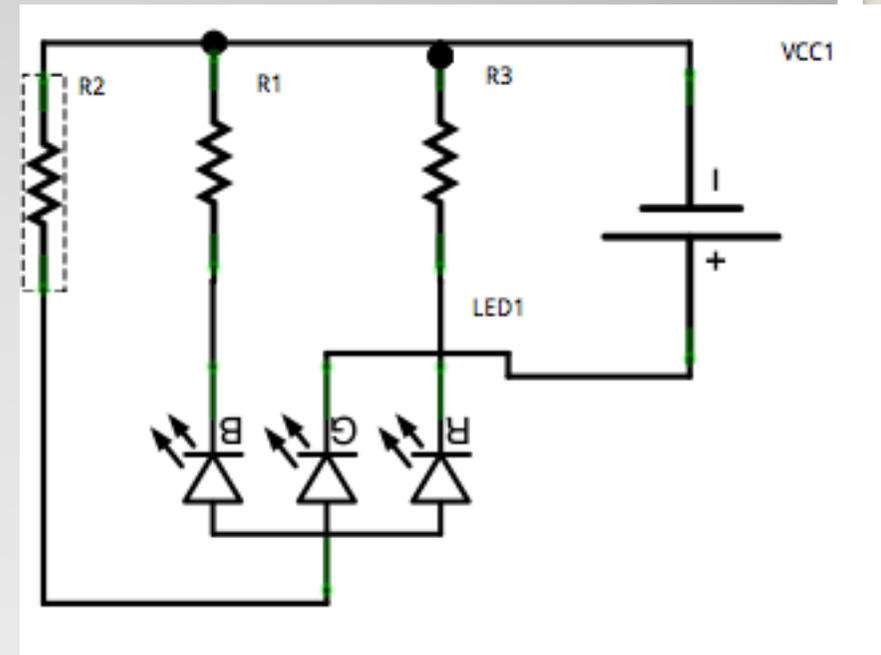
Voltage dividers
Try out the different pots.



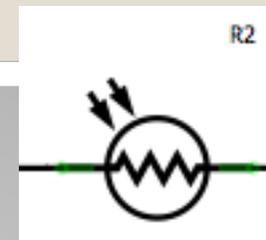
RGB LED



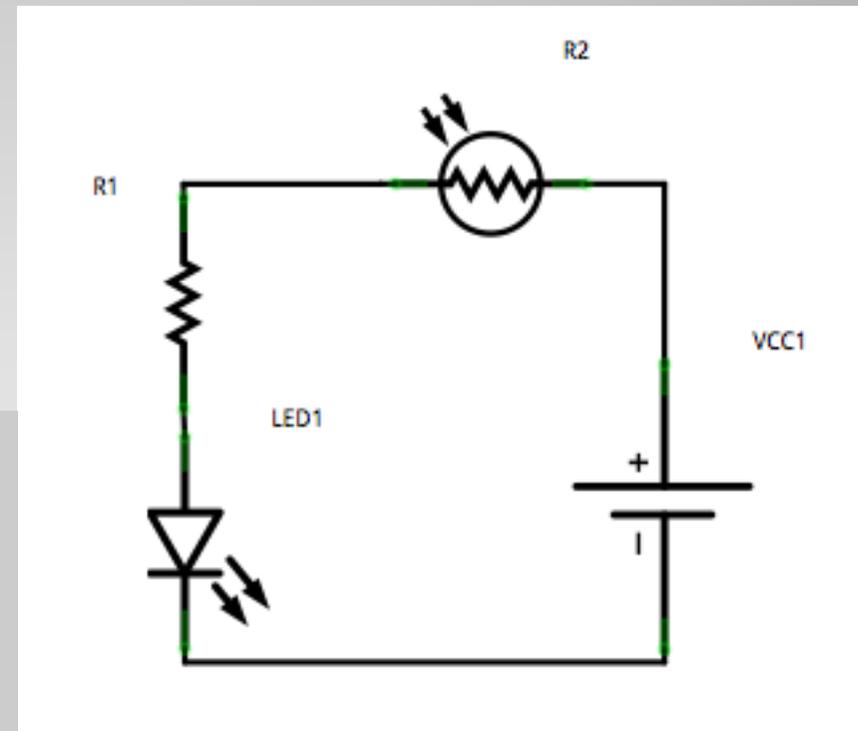
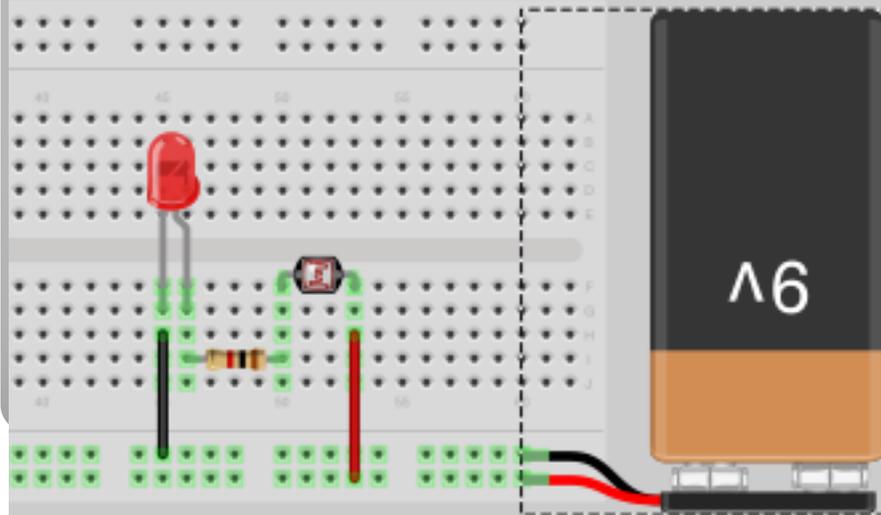
Try resistors out in various combination to make different colors. Experiment by adding potentiometers to the leads.



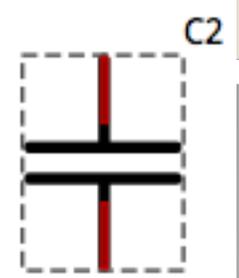
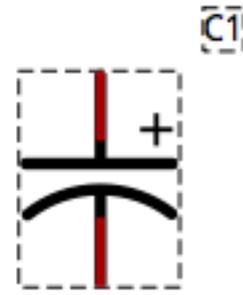
LED and Photoresistor



Photoresistors change their resistance by the amount of light detected.



What are capacitors?



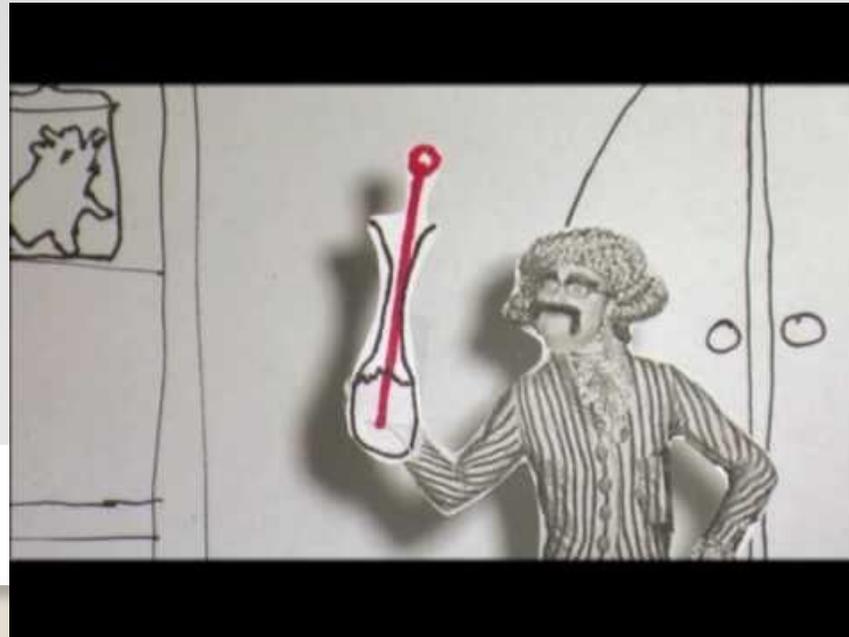
Capacitor is two separated charges.

Known charge up time.

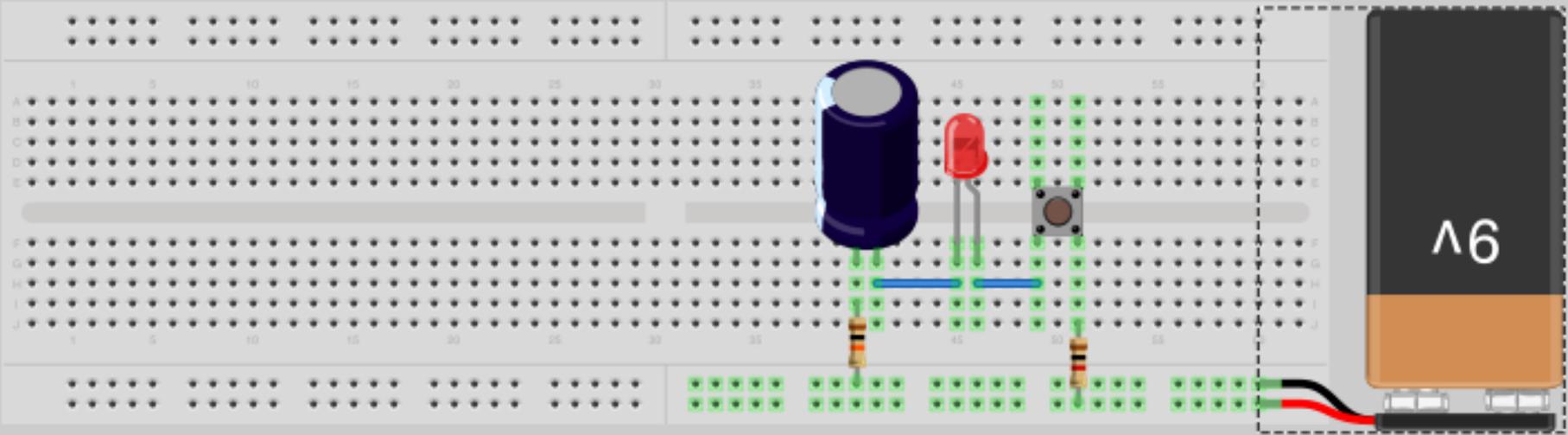
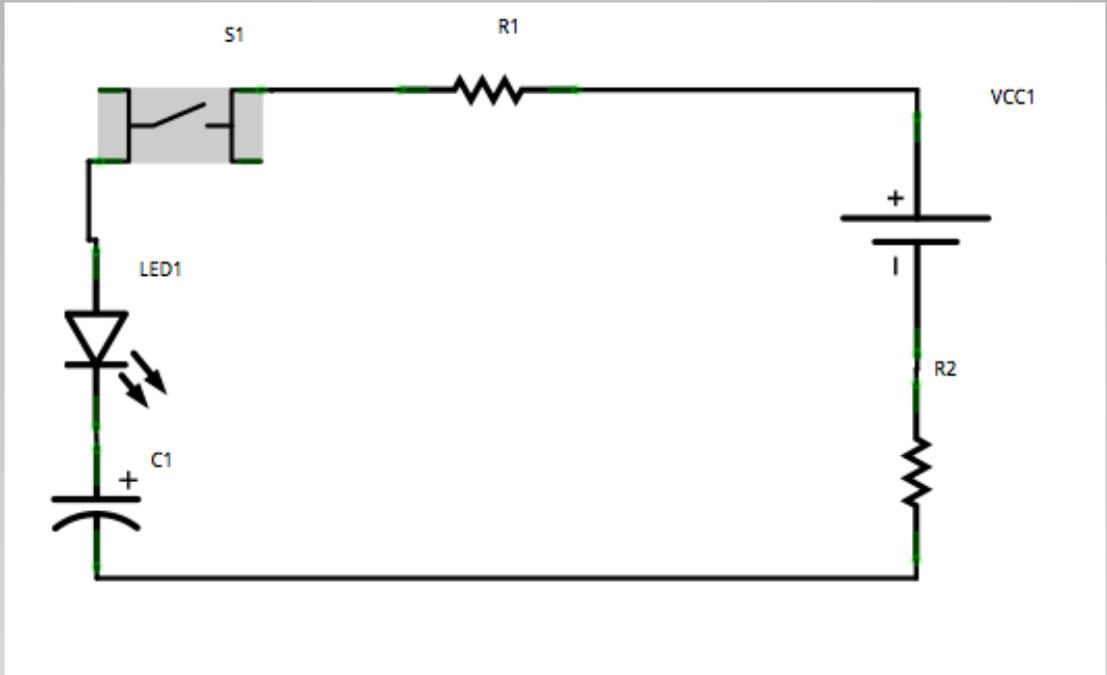
Known discharge time.

Two major kinds

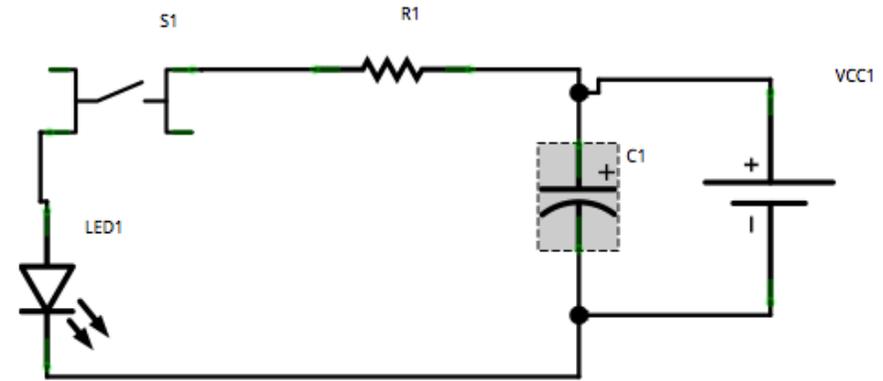
- Electrolytic, asymmetric, bipolar
- Ceramic, symmetric



Capacitors in series

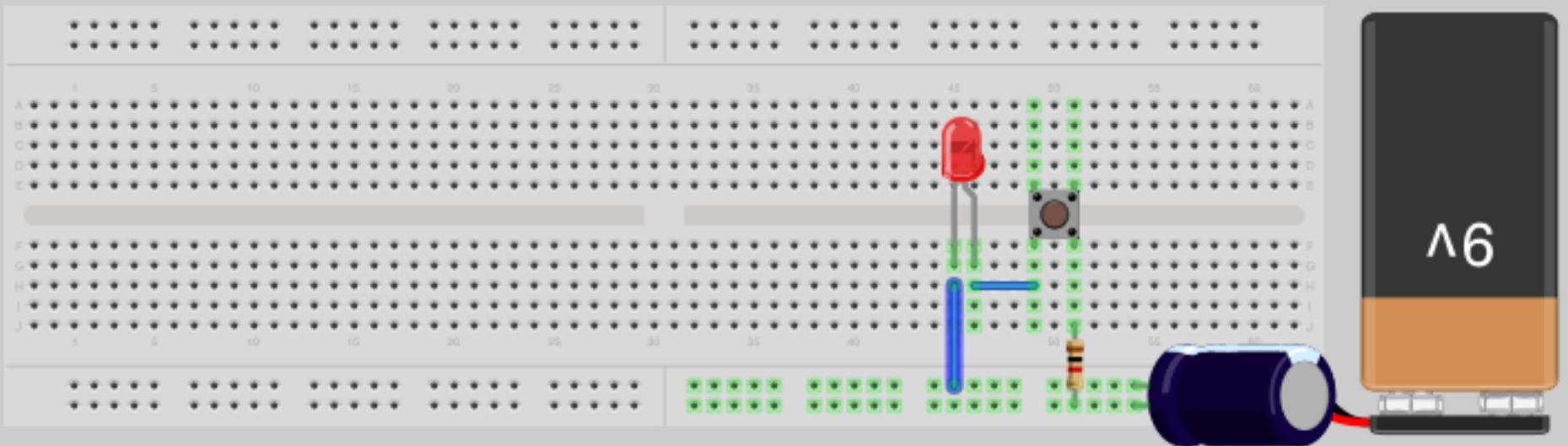


Capacitors in Paralle

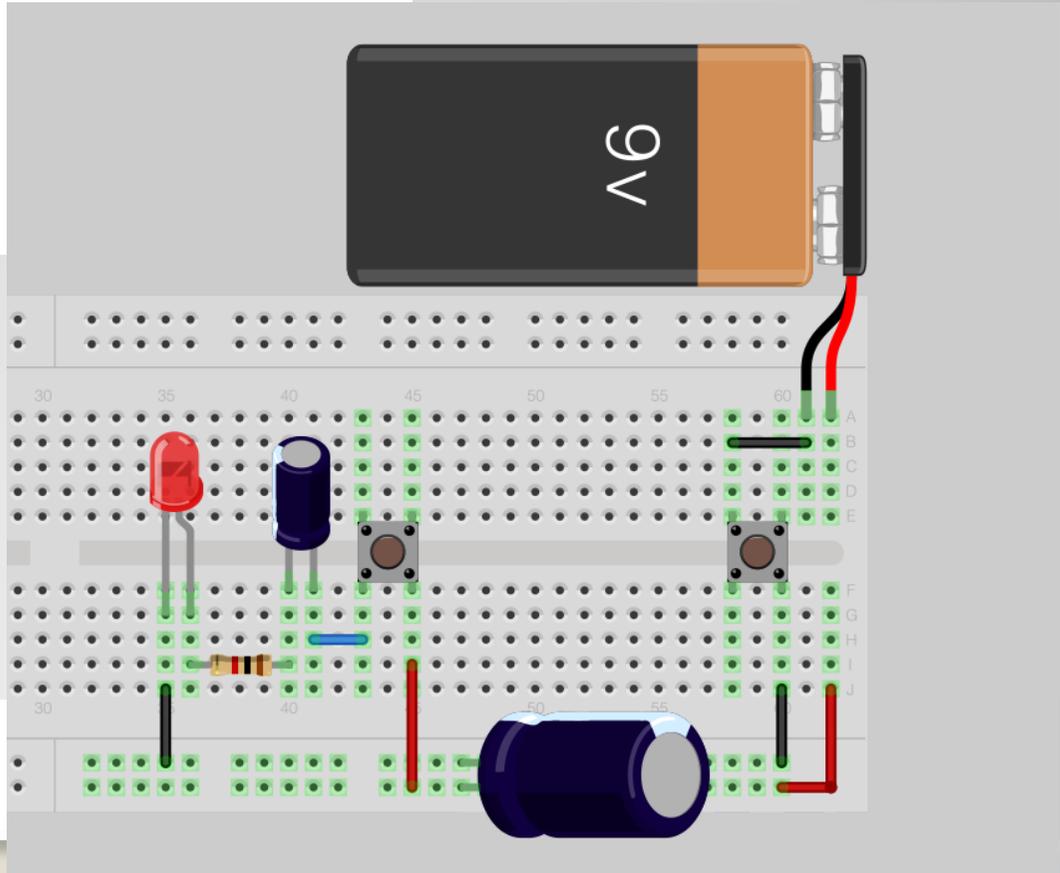
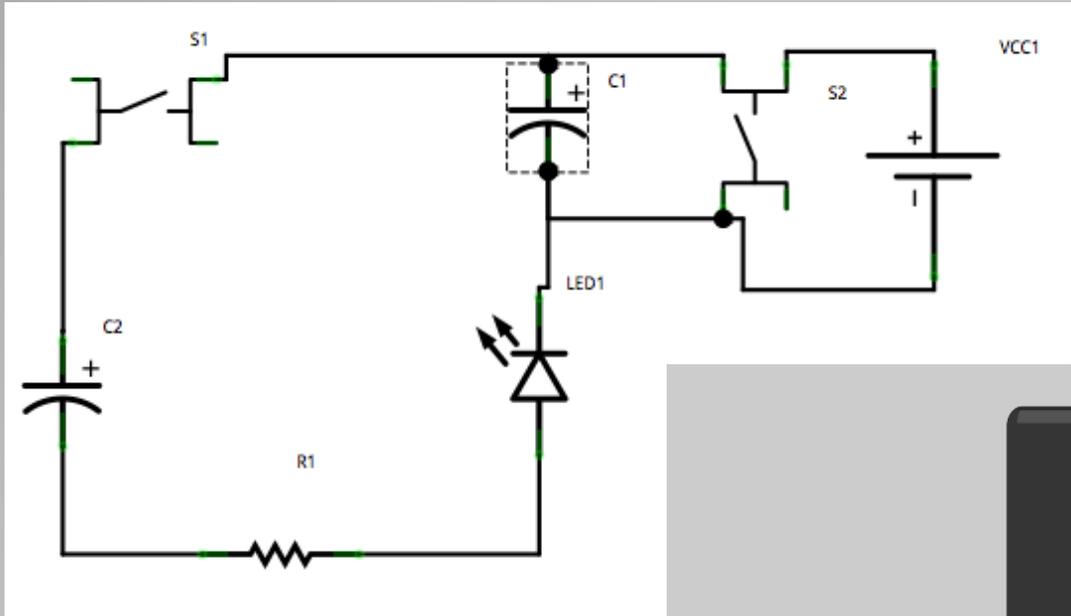


They can provide energy, however briefly.
They can smooth out a signal.

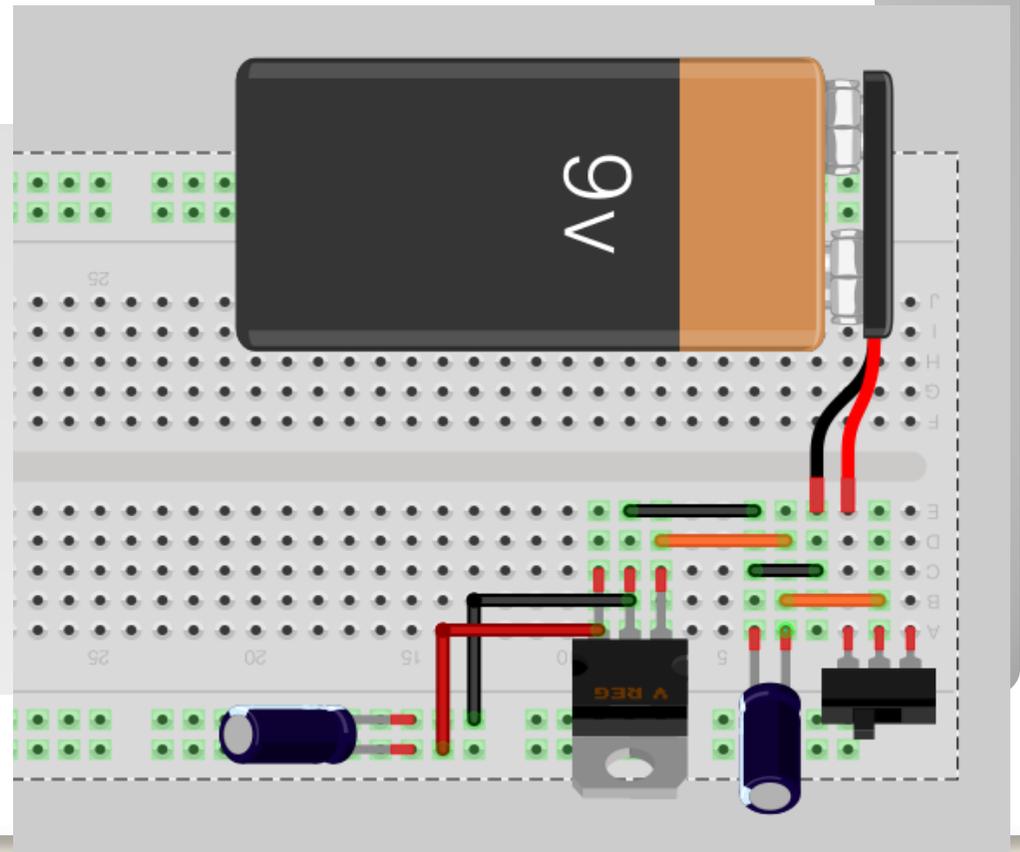
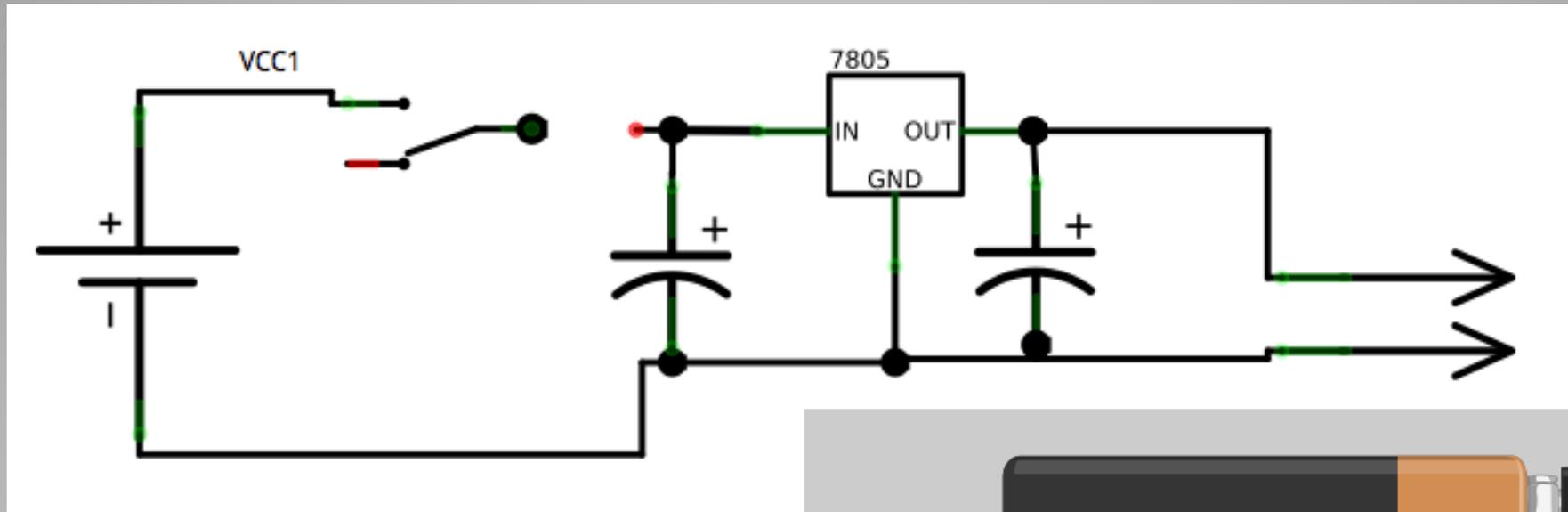
Attach the battery briefly to fill the capacitor.



Capacitors in series and parallel



Make a voltage regulator



Turn things on and off with a:

Wire

Button

Photoresistor

Hall Effect Sensor

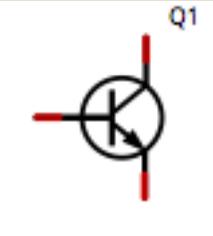
Relay

Transistor

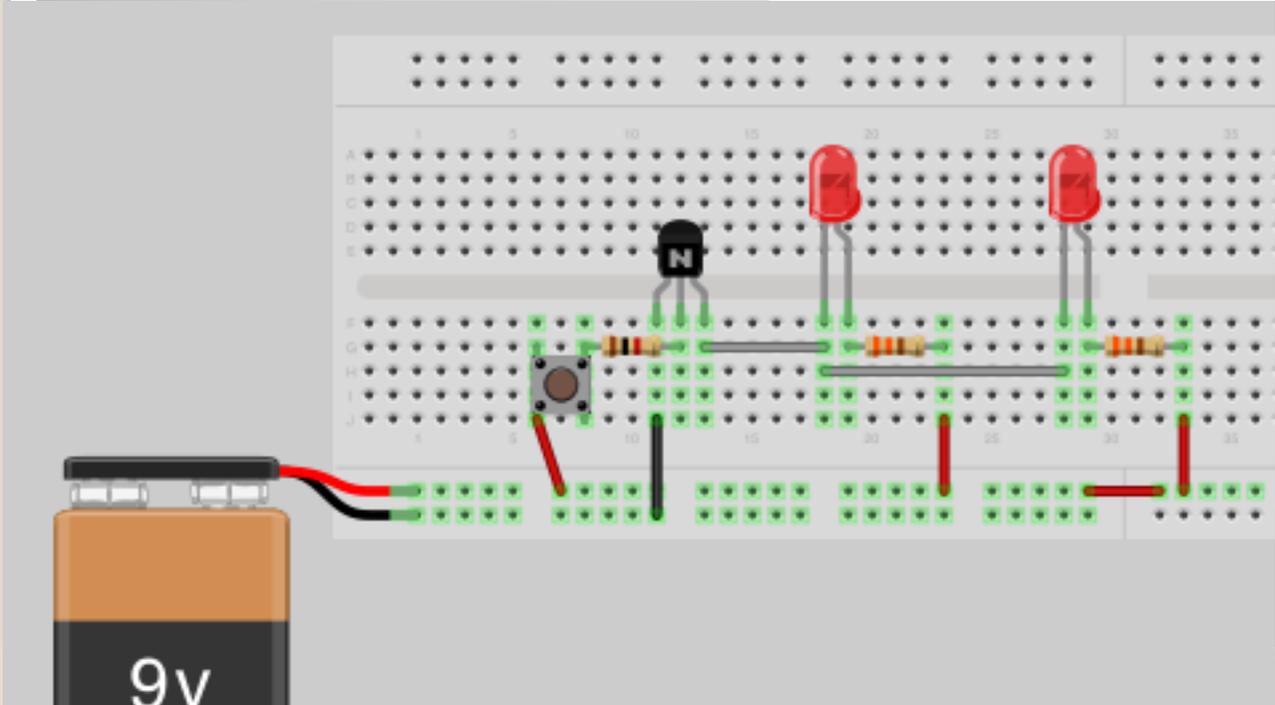
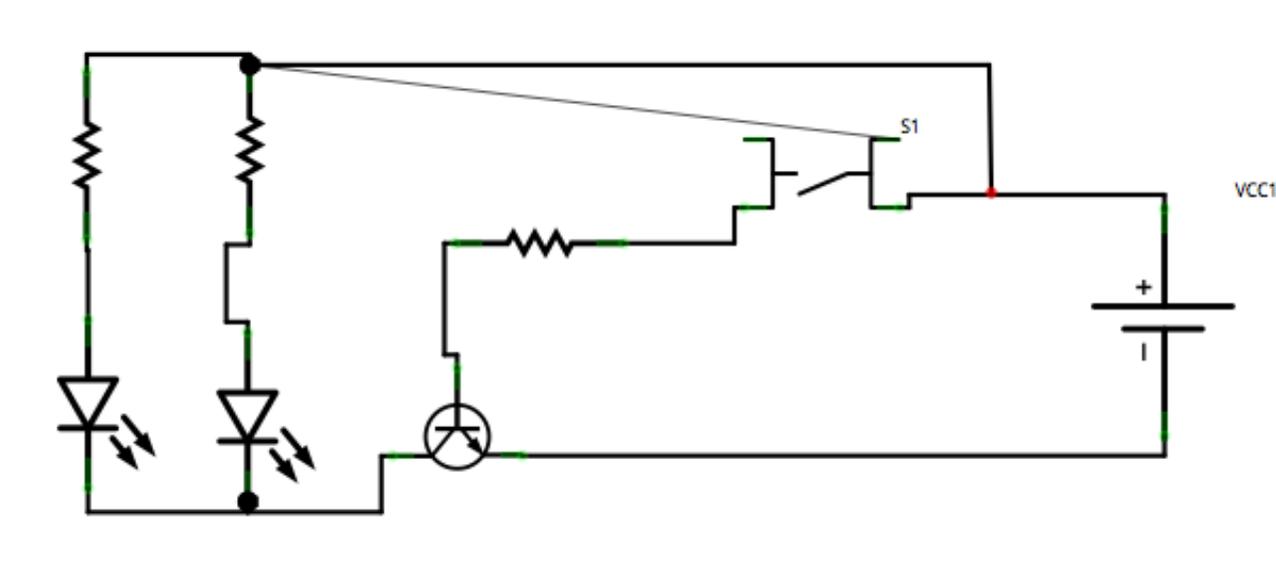
Button

Switch

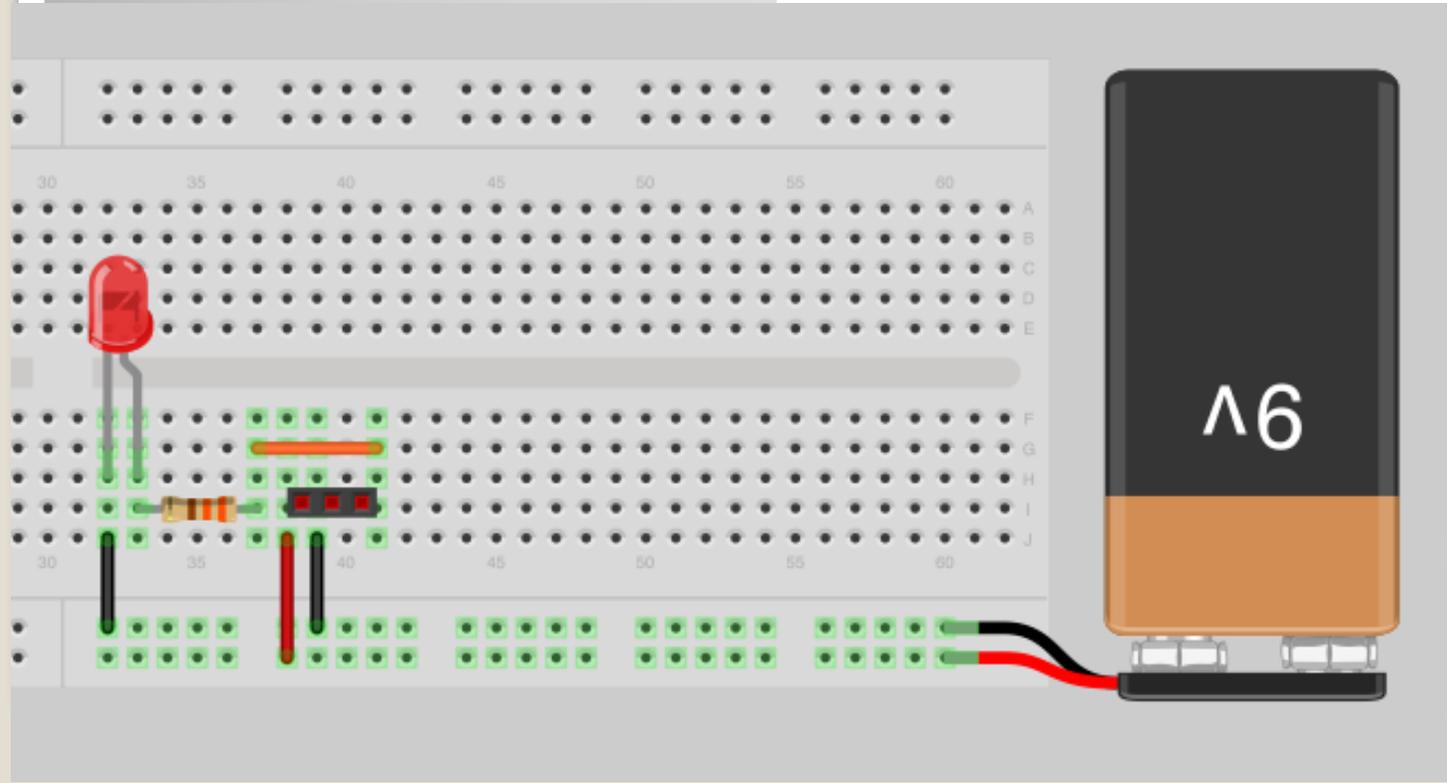
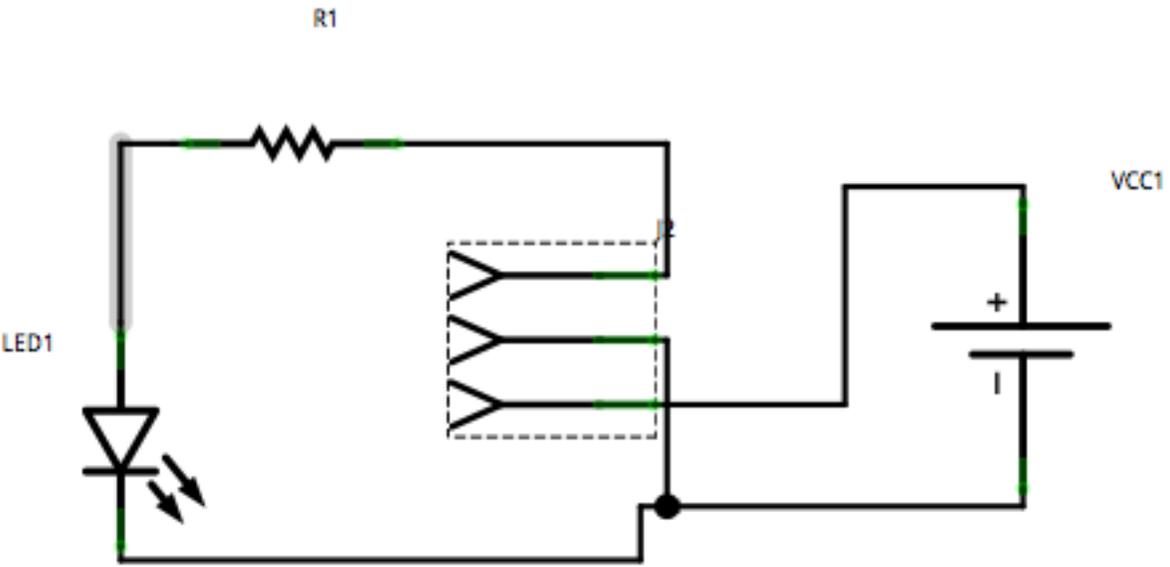
Transistors



NPN Transistor

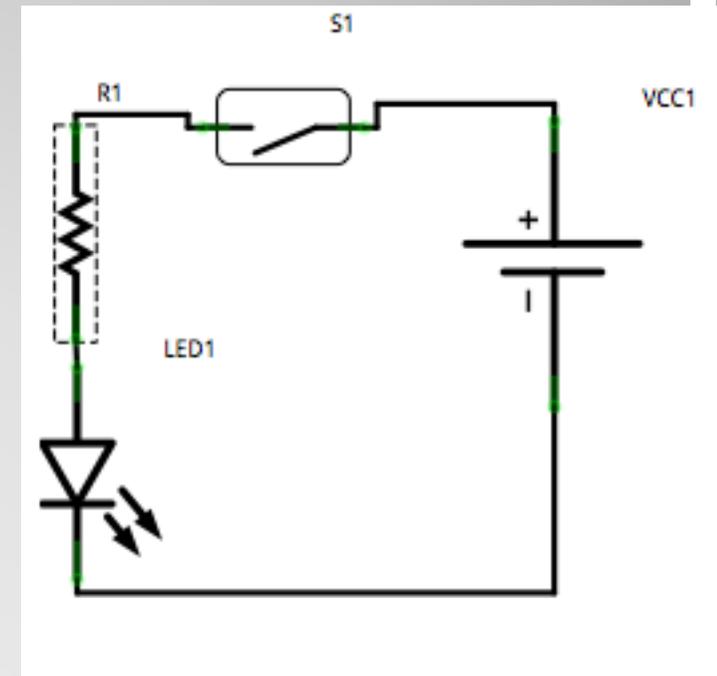
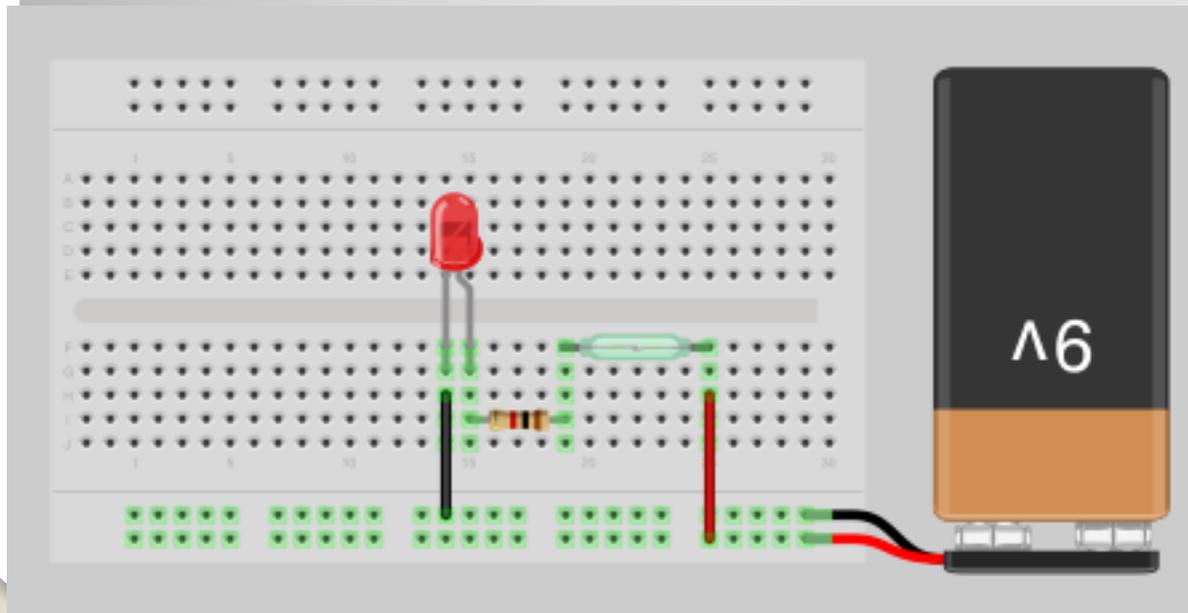


Hall Effect Sensor



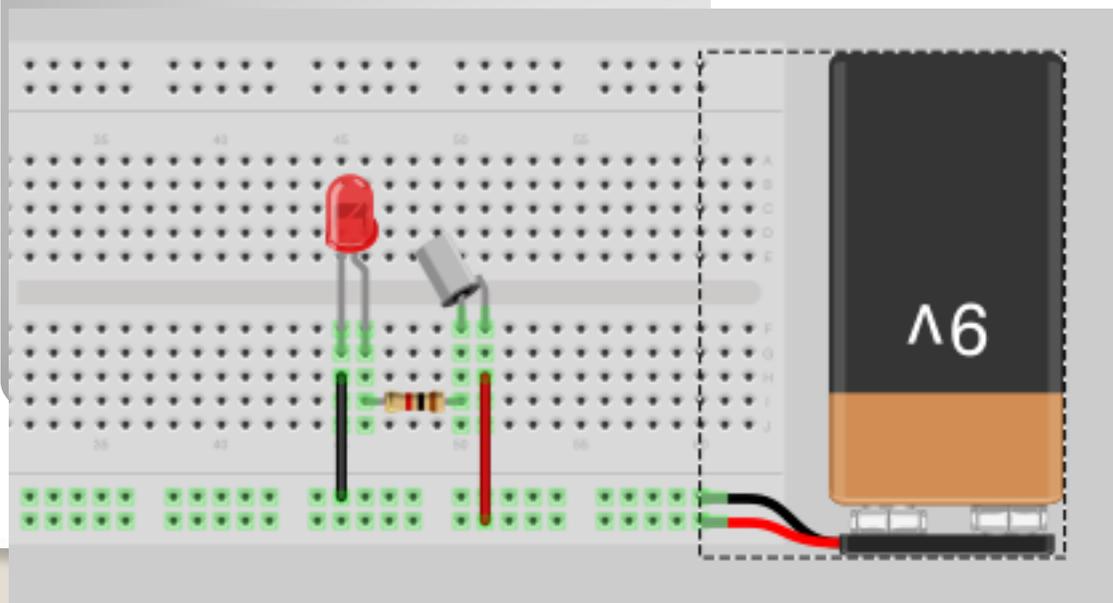
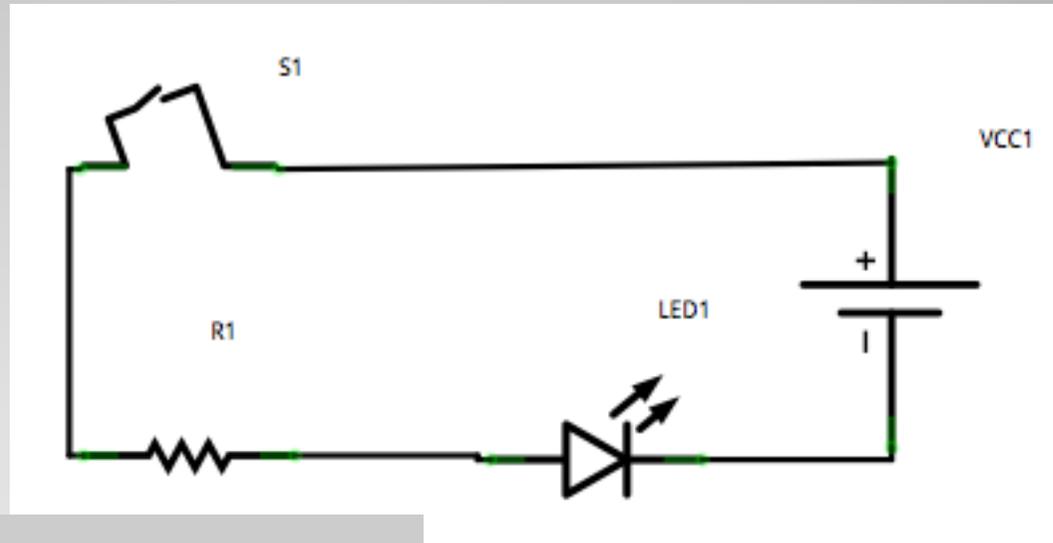
Reed Switch Example

A reed switch is closed when a magnet is in close proximity. It is symmetric so it can be placed either direction.

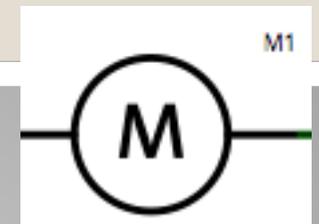


Tilt ball switch

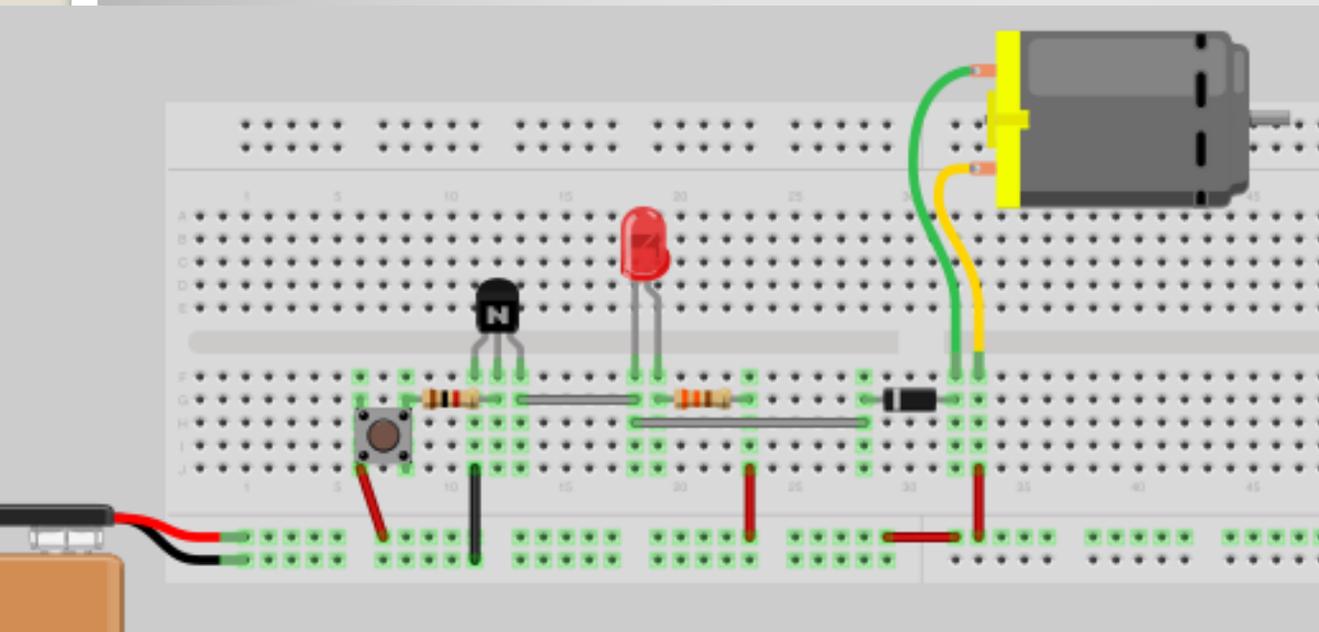
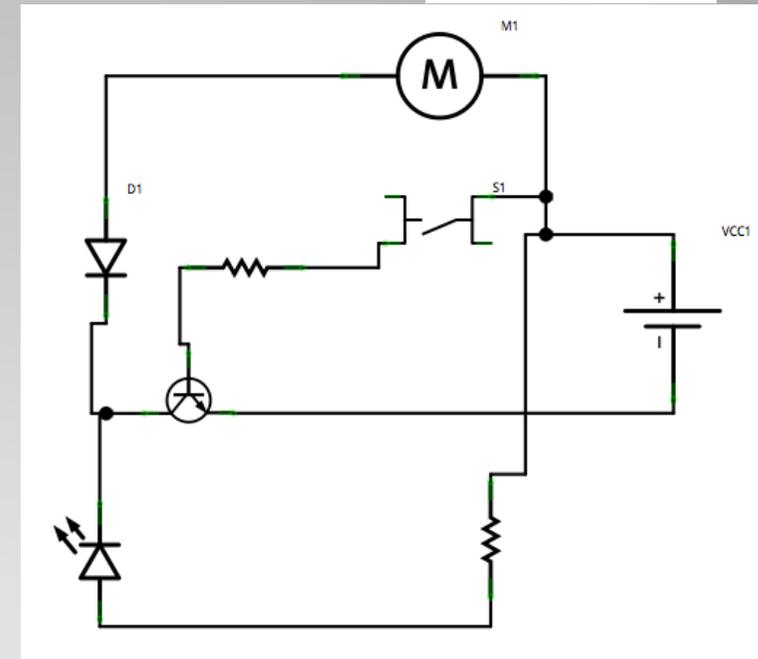
Emergency on/off if project tips over.



Motors



Try changing the direction of the diode.
What happens?



Relay

