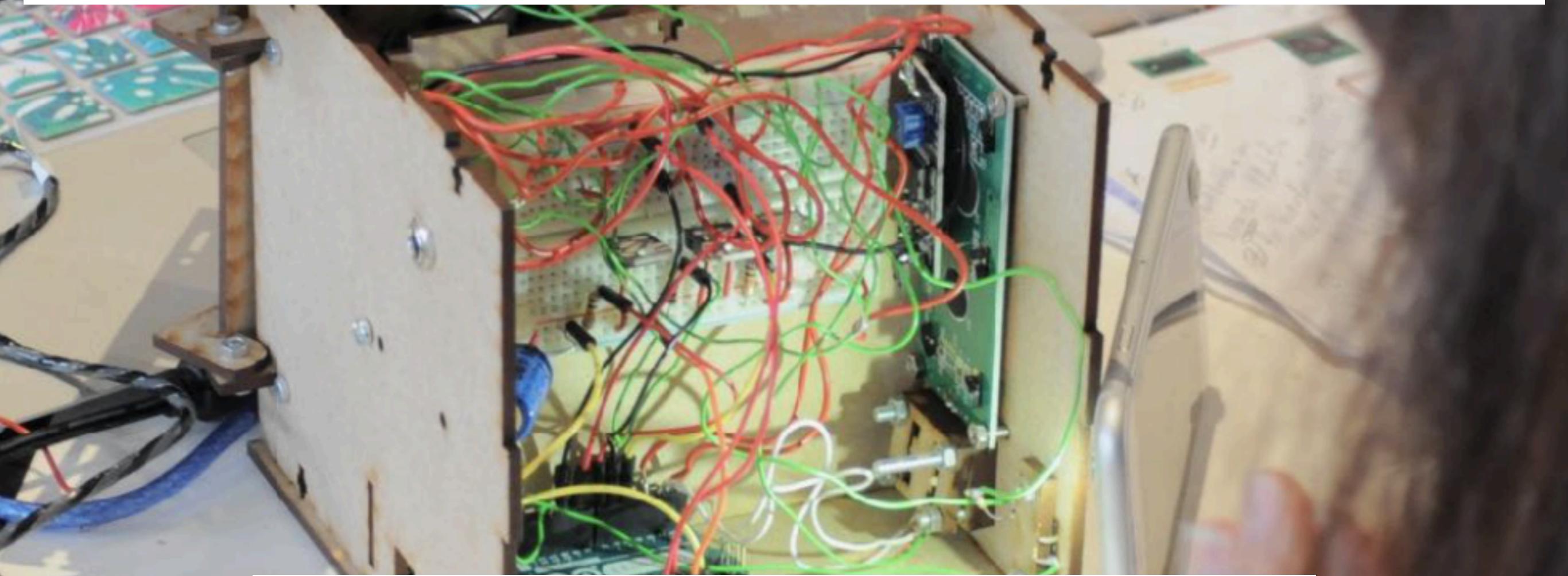


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Principles of Electronics



A circuit

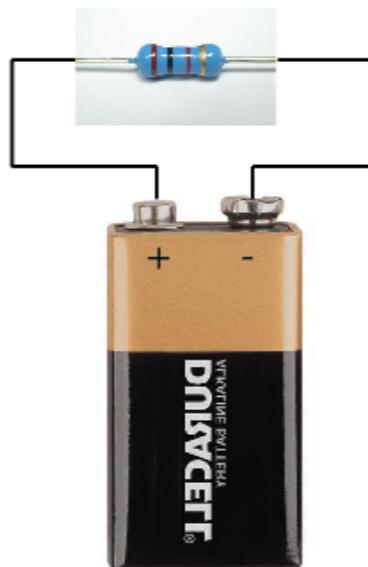
A circuit is a **CLOSED LOOP** in which electrons can flow.

Electrons flow = Current

How can I generate a Current?

By connecting two electrodes of a battery

For example: Battery + Resistor





Battery

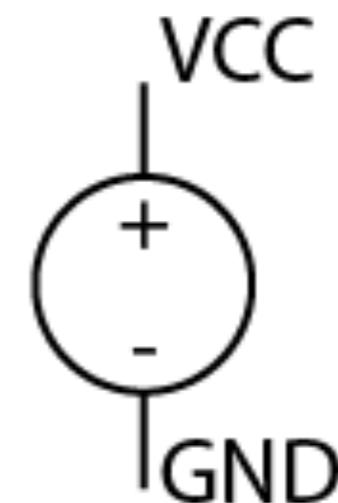
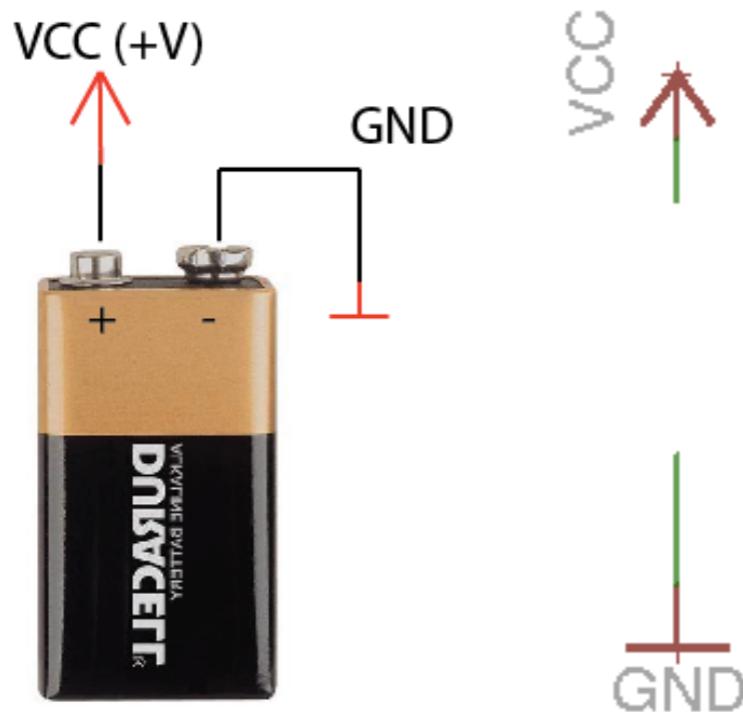
The battery is the power supply of our circuit.

It has two sides:

- + a.k.a. Plus, VCC, V+ or +V
- - a.k.a. Minus or GND

Voltage:
It's the difference in potential between two points

Unit of measure is Volt (V).





Batteries & Power Supplies

$VCC = 9V$



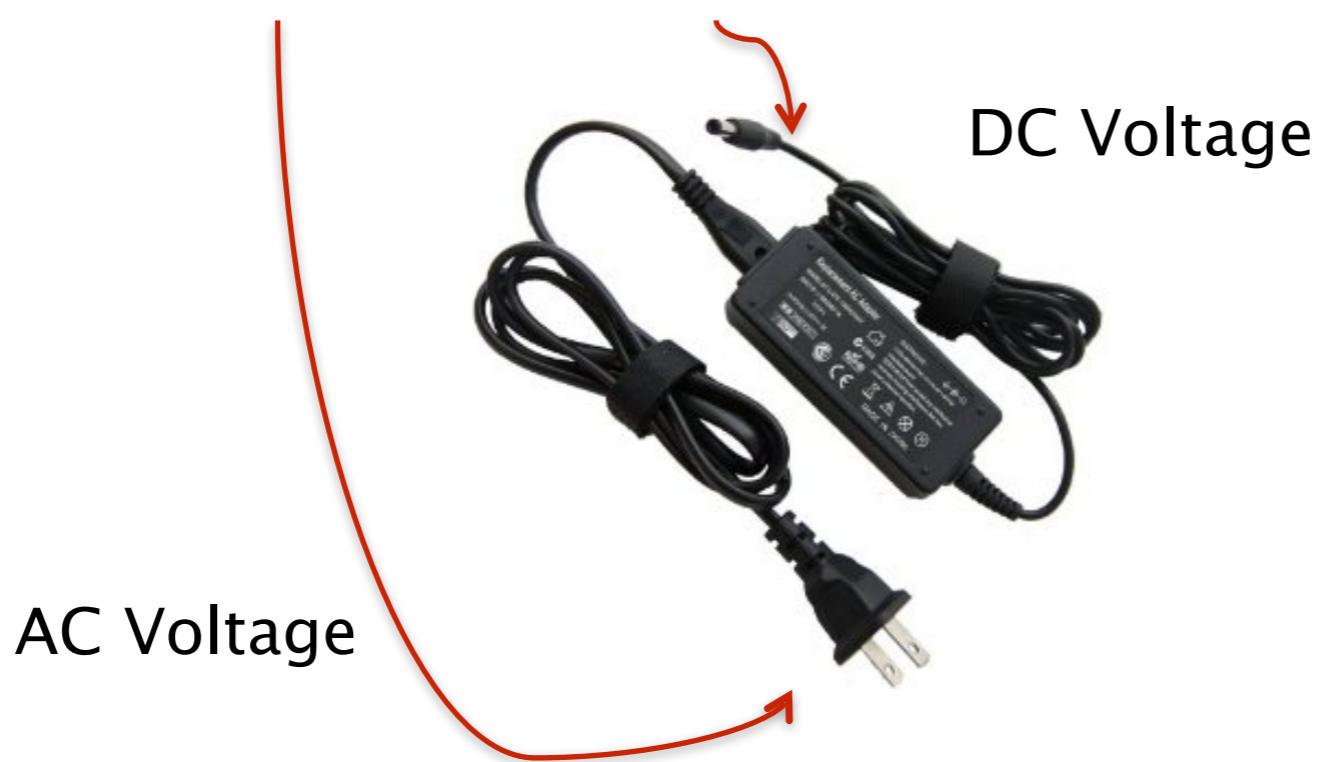
$1.5V$



$3V$



From the grid (220V) to 12V (the output that be different), $VCC = 12V$.

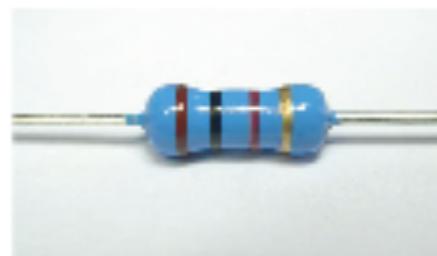




Resistor

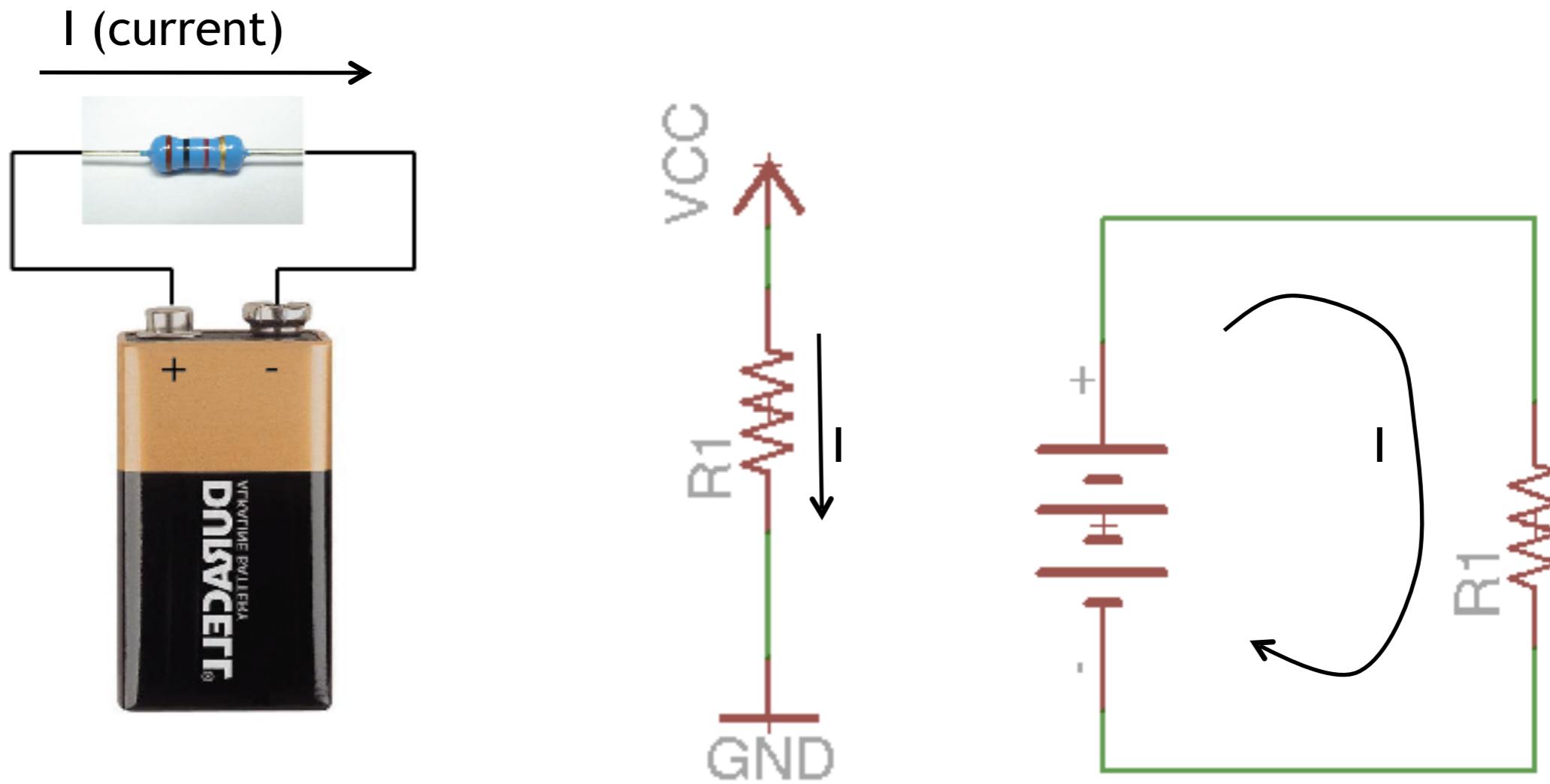
It has two sides
The orientation is irrelevant

Unit of measure is Ohm (Ω)





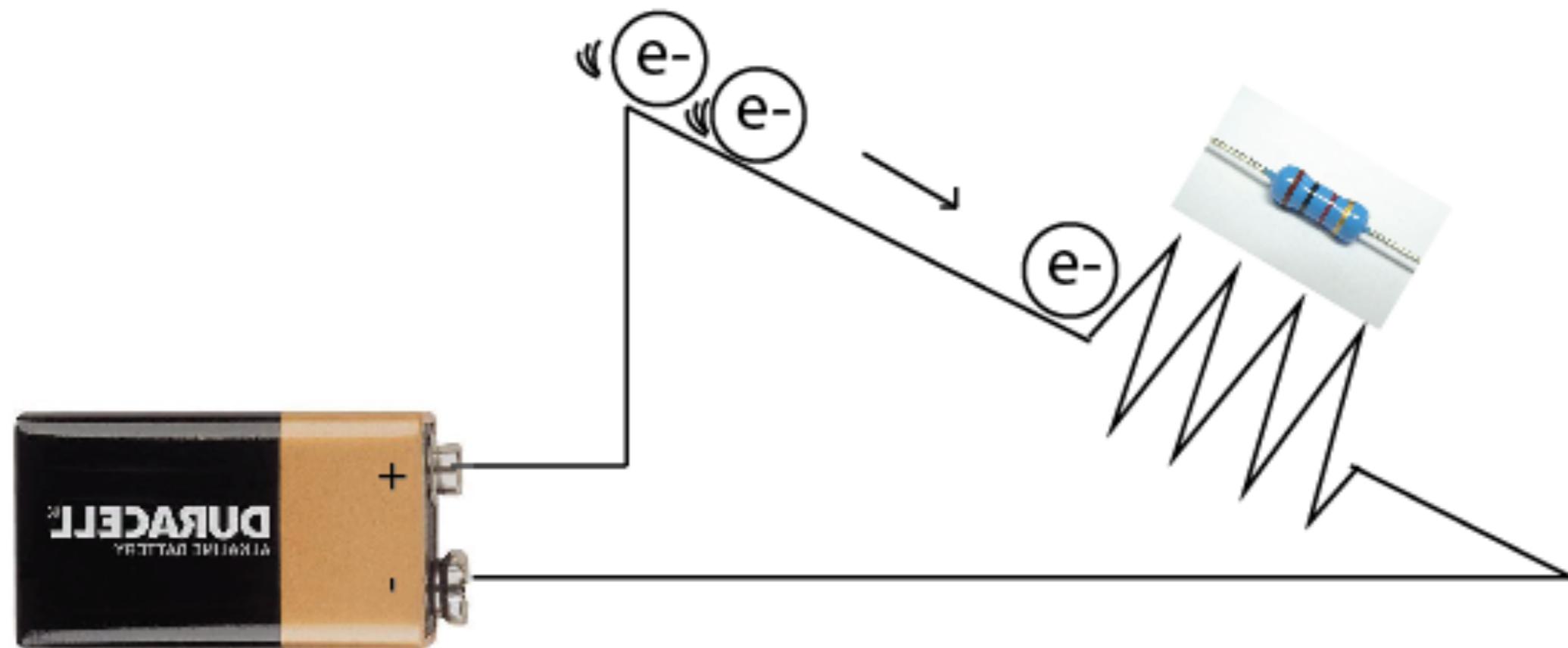
A basic circuit



- **Voltage:** is the difference in potential between two points
- **Current:** is the rate at which charge is flowing
- **Resistance:** is a material's tendency to resist the flow of electrons / current



A basic circuit





Electricity vs Waterfall

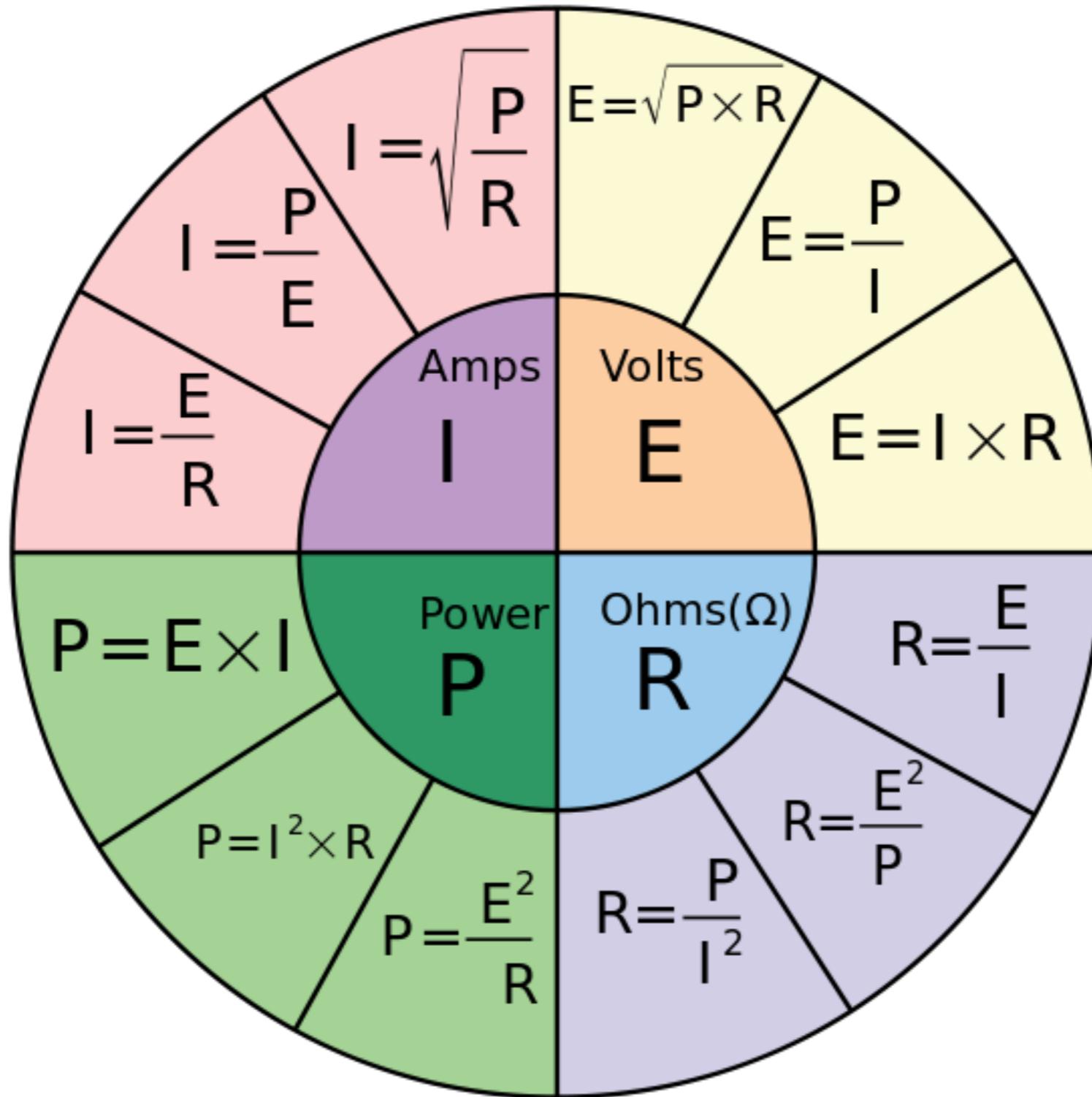
Height
=
Potential

Amount / time
=
Current

Power = Potential x Current

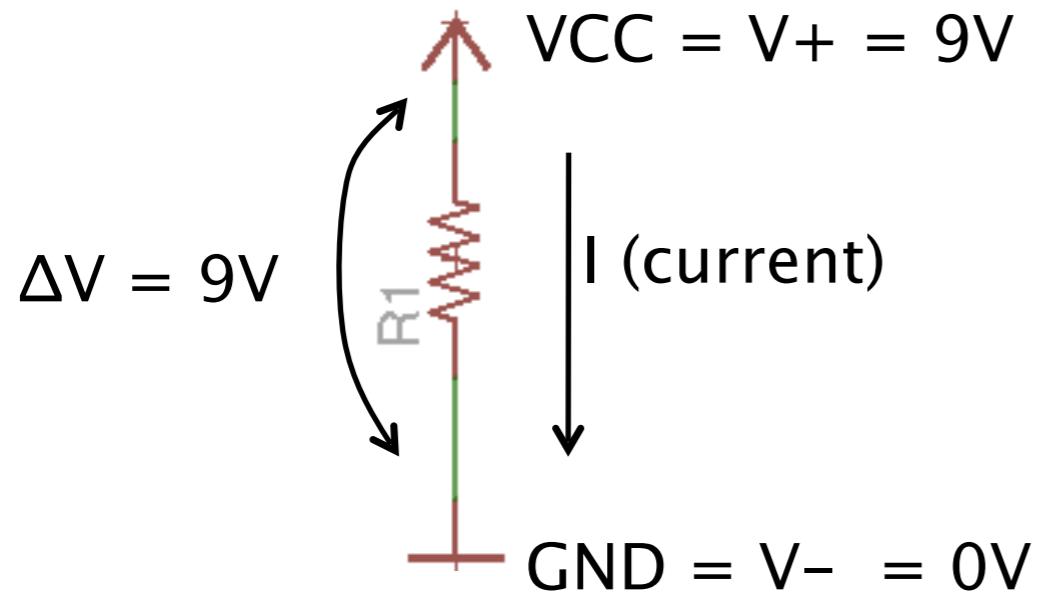


Ohm's Law





Using Ohm's Law



Ohm's Law

$$\Delta V = (V+) - (V-) = R * I$$

$$V = RI$$

$$I = V/R$$

$$R = V/I$$

Ex 1: Calculate the Current

$$V = 9V$$

$$R1 = 1k\Omega = 1000\Omega$$

$$I = V/R = (VCC - GND) / I = (9V - 0V)/1k\Omega = 9mA = 0.009 A$$

Ex 2: Calculate Resistance

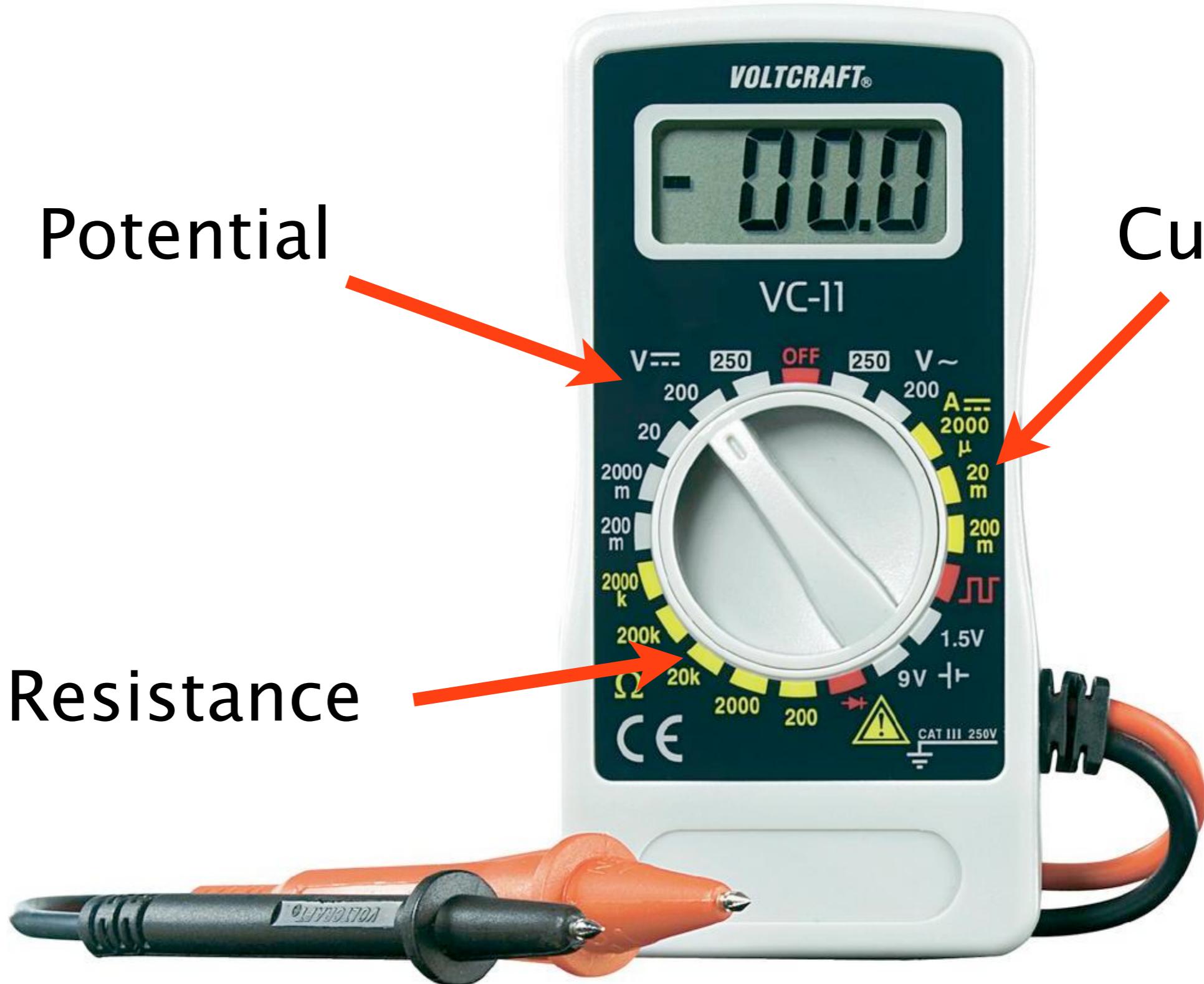
$$V = 3V$$

$$I = 20mA$$

$$R = V/R = 3V/20mA = 150\Omega$$



Measuring



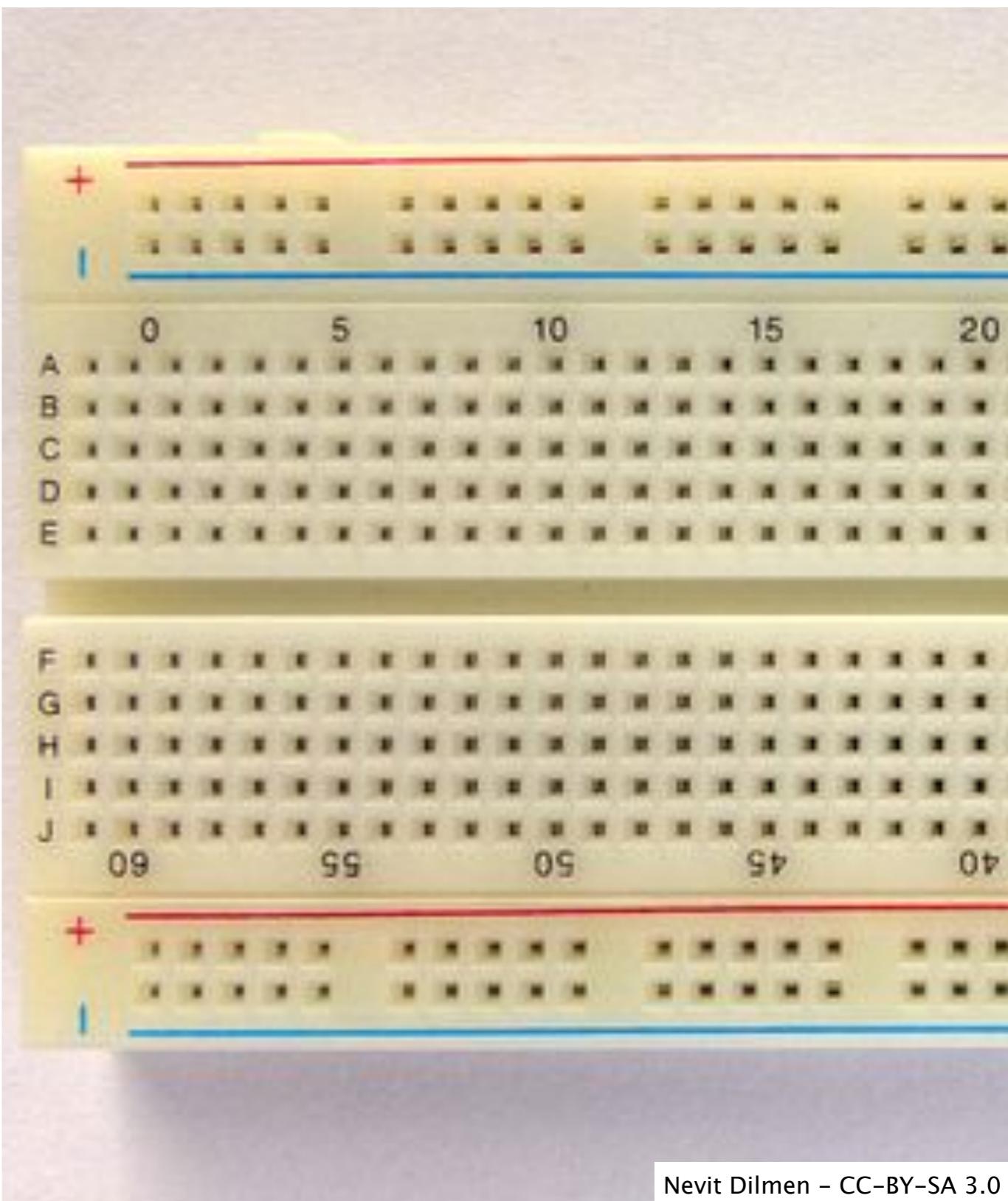
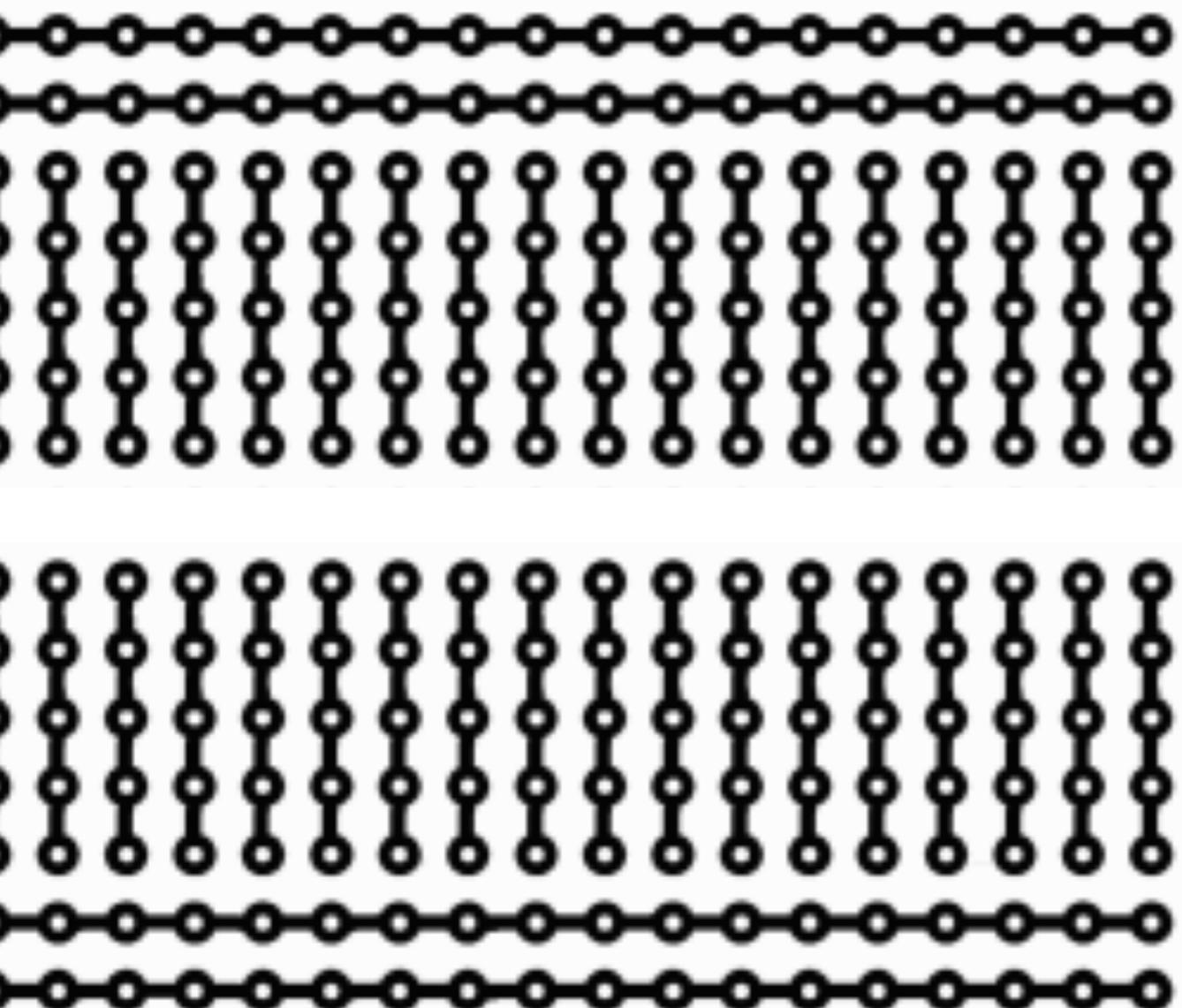
Potential

Current

Resistance



Breadboard





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Soldering



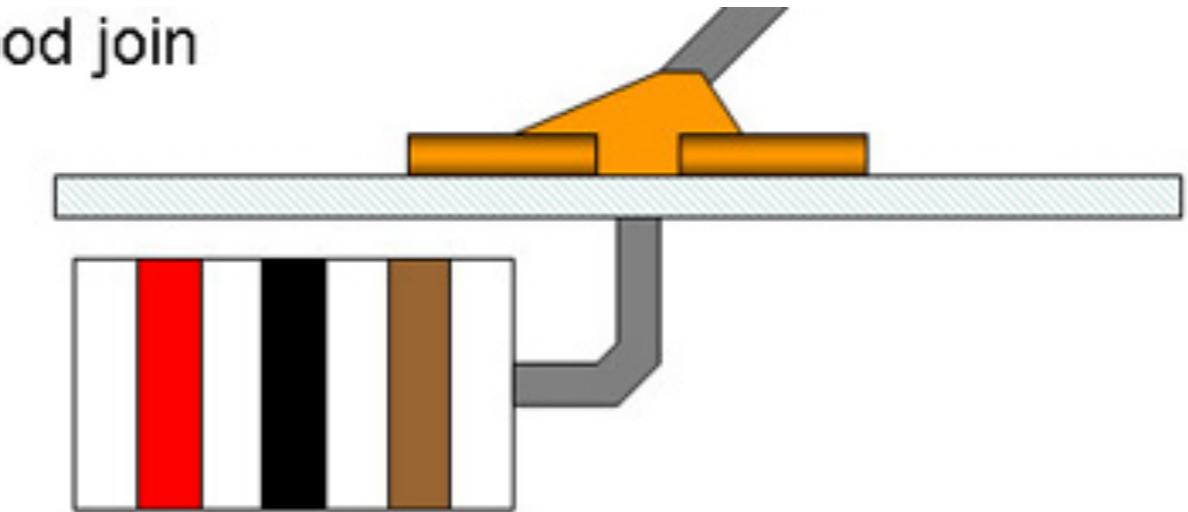
Soldering Iron - 350 C



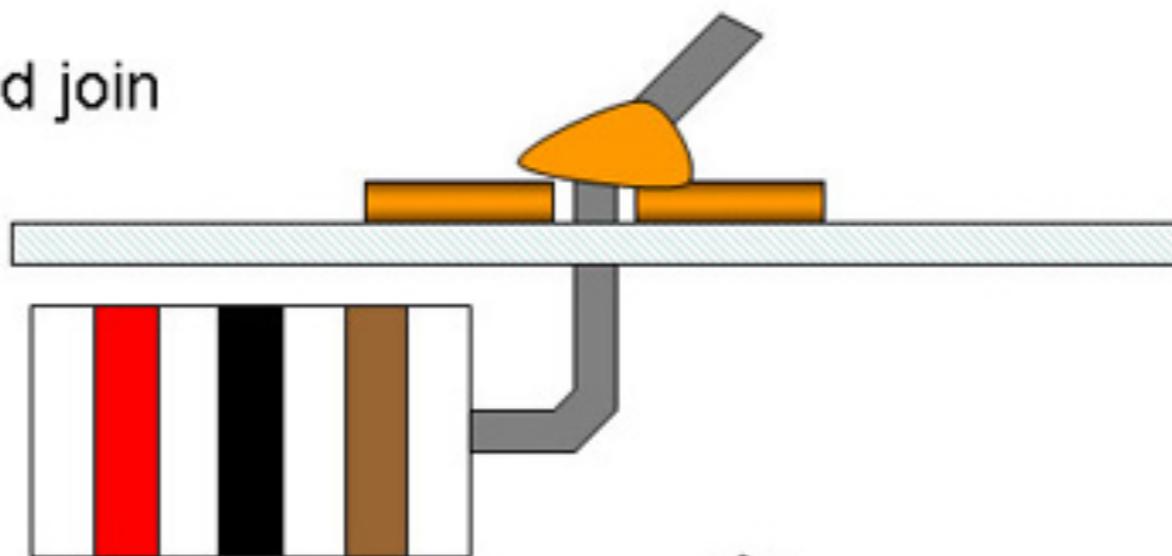


Soldering is easy

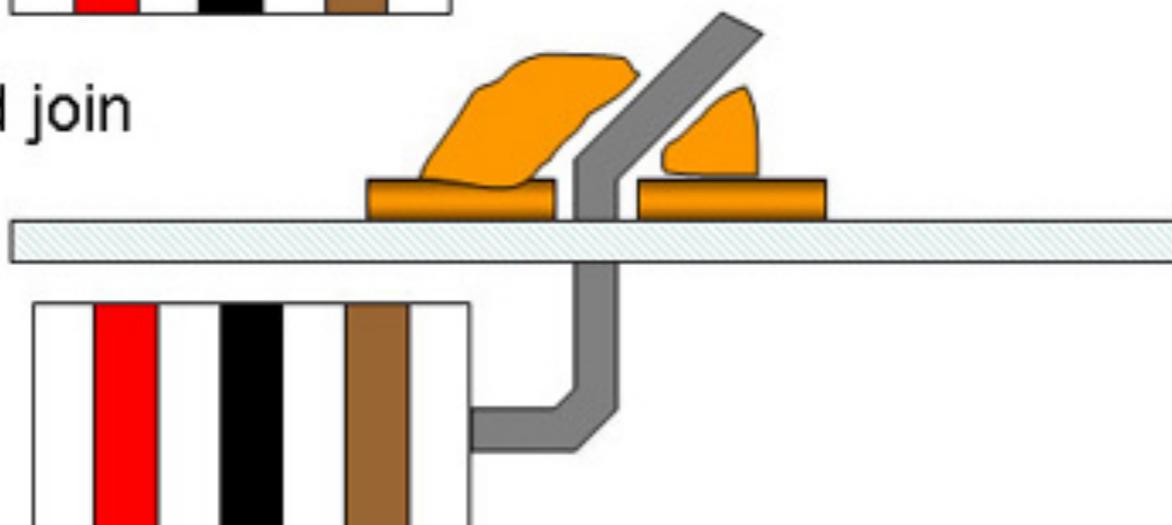
Good join



Bad join



Bad join





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Electrical Safety



Remember what your parents told you



220 VOLTS



Dangers:

- High voltage
- Low resistance
=
- High Current
- Make use of isolation!
- Better safe than sorry!





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