Electronics 101

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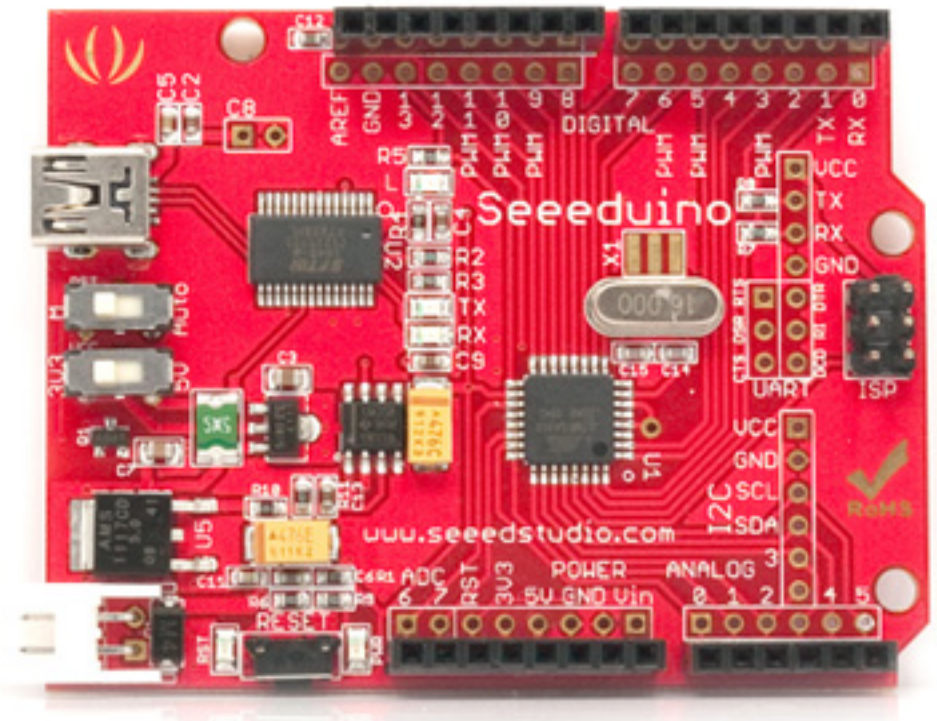
Content

- Seeeduino/Arduino presentation
- Voltage, Current, Resistors : Ohm's law
- Components: Switch, LED, Digital I/O
- Practice: Blink a LED (with the Switch)
- Circuit: Voltage divider
- Components: Potentiometer, Analog input, Servo
- Practice: Drive the servo with Potentiometer
- Components: Resistor sensors (Thermistor, photo resistor)
- Practice: Drive the servo with resistor sensors

- Bonus time (Capacitor, PWM - Analog output, Buzzer)

Seeeduino/Arduino

- Open source
- Important community
- Shields

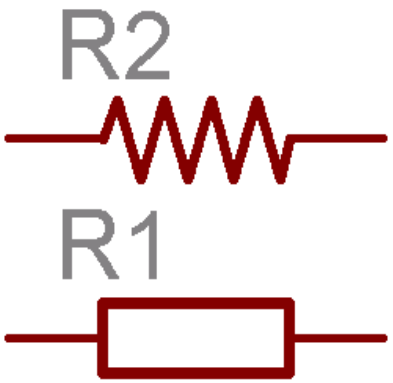


Ohm's law

- V = R I

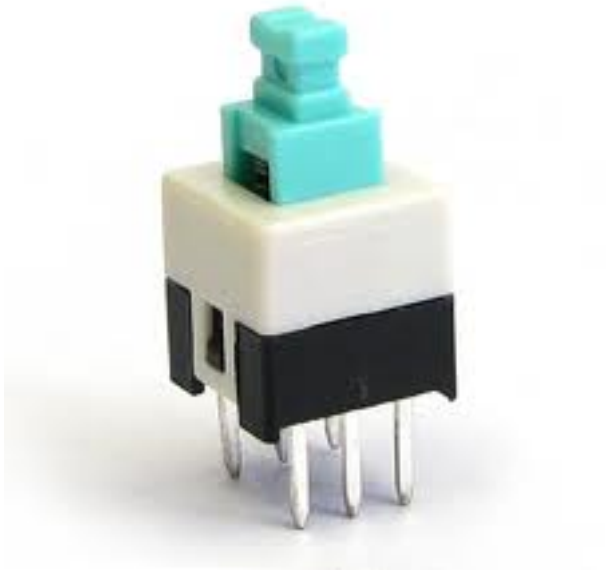
Resistor

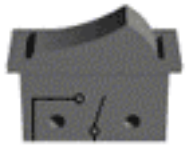
Limits current according to Ohm's law

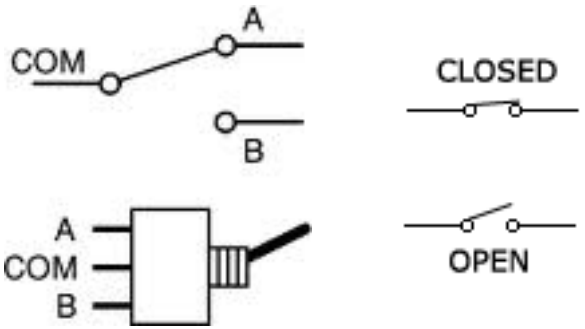


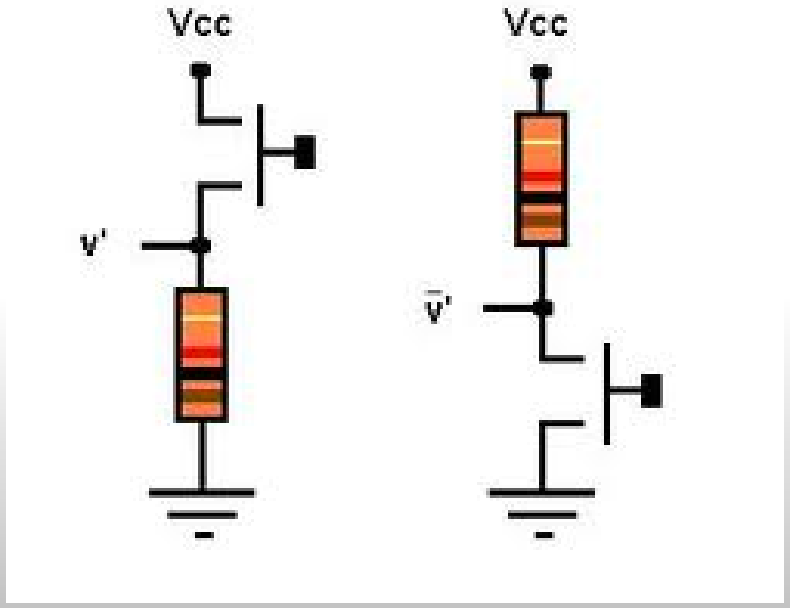
Switch

Allows or not the current to flow





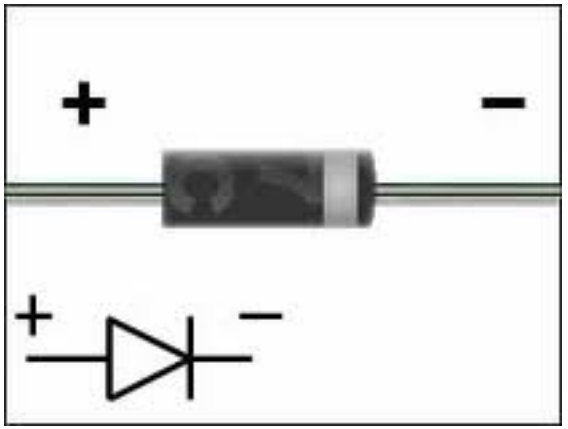


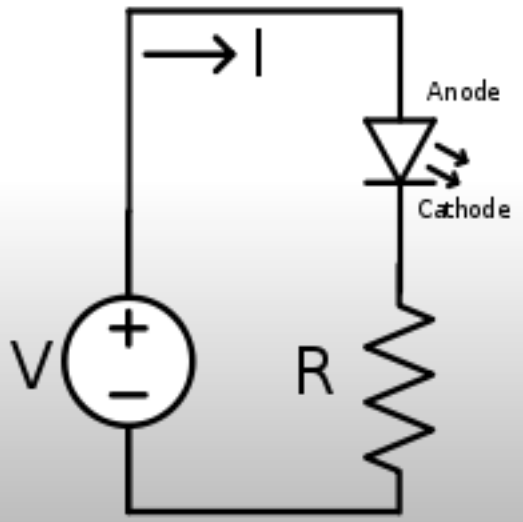


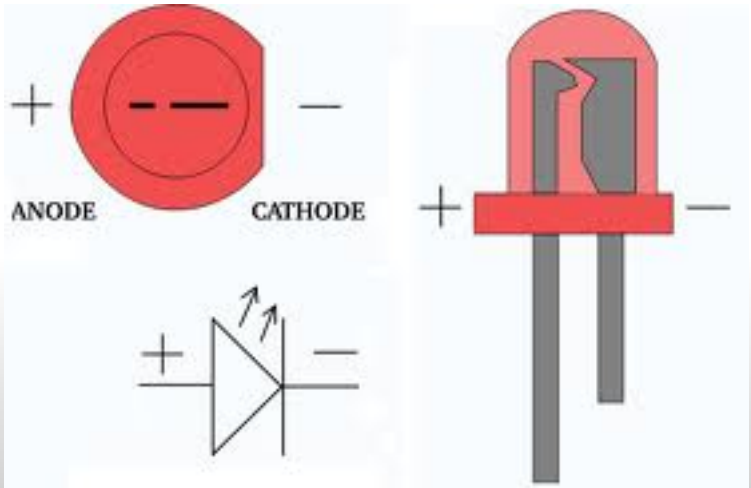
Diode and LED

Allows current only in one direction

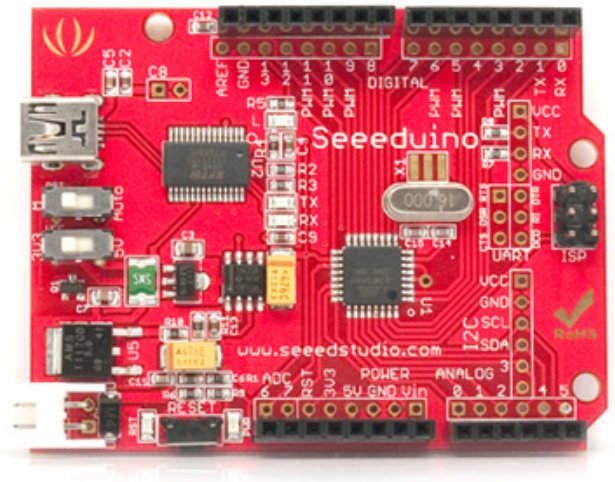
- Diodes: Vf = 0.7V
- LED:
  - Vf = [1.8; 3.3]V
  - Current: [10; 25] mA



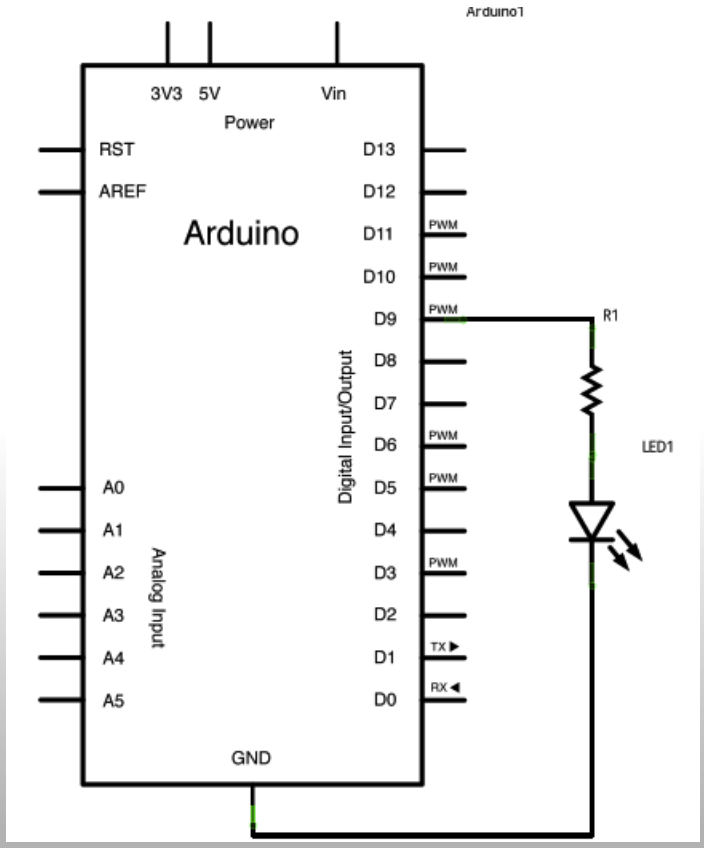




Digital Input/Output



- Output:
  - 1 -> 5V
  - 0 -> 0V
  - Current up to 25 mA
- Input:
  - [0; 1.5V] -> 0
  - [3.5V; 5V] -> 1
  - Between the two -> ???
  - No current flows in



Practice

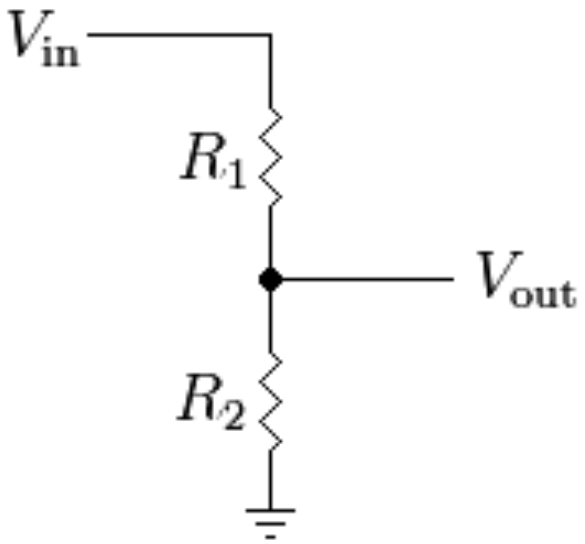
- Blink LED : http://arduino.cc/en/Tutorial/Blink
- Switch : http://arduino.cc/en/Tutorial/DigitalReadSerial

- Try to understand the schematics and why they choose those values (you will have to change one value)

Voltage divider

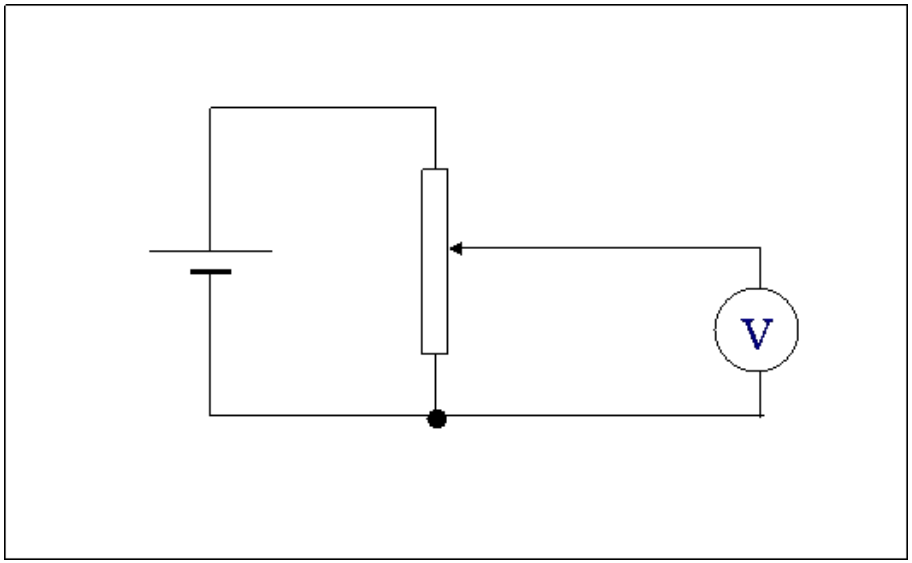
- One of the way to divide a voltage
- Only valid if no current flows through Vout

$$V_{\text{out}} = \frac{R_2}{R_1 + R_2} \cdot V_{\text{in}}$$

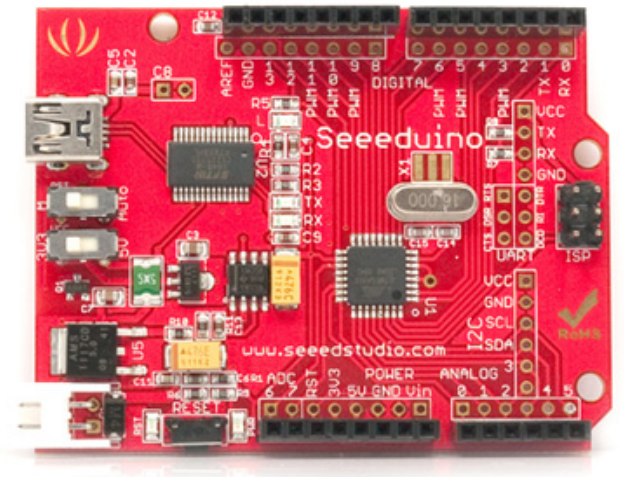


Potentiometer

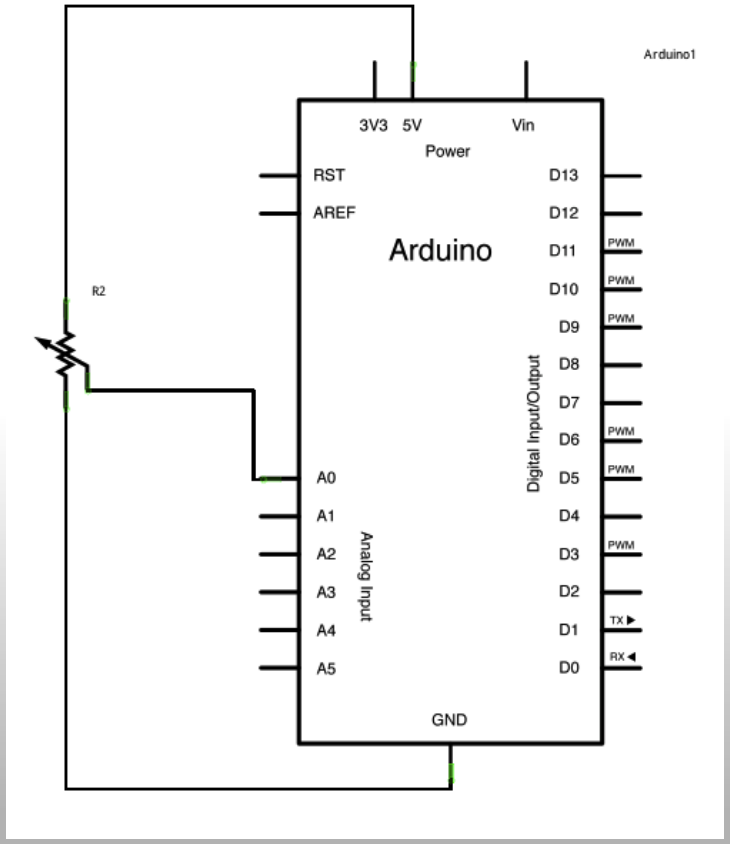
- Is a variable Voltage Divider



Analog input

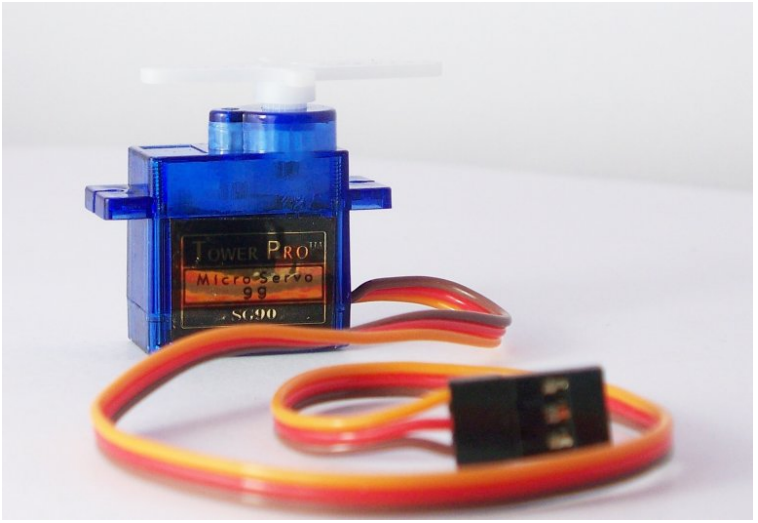


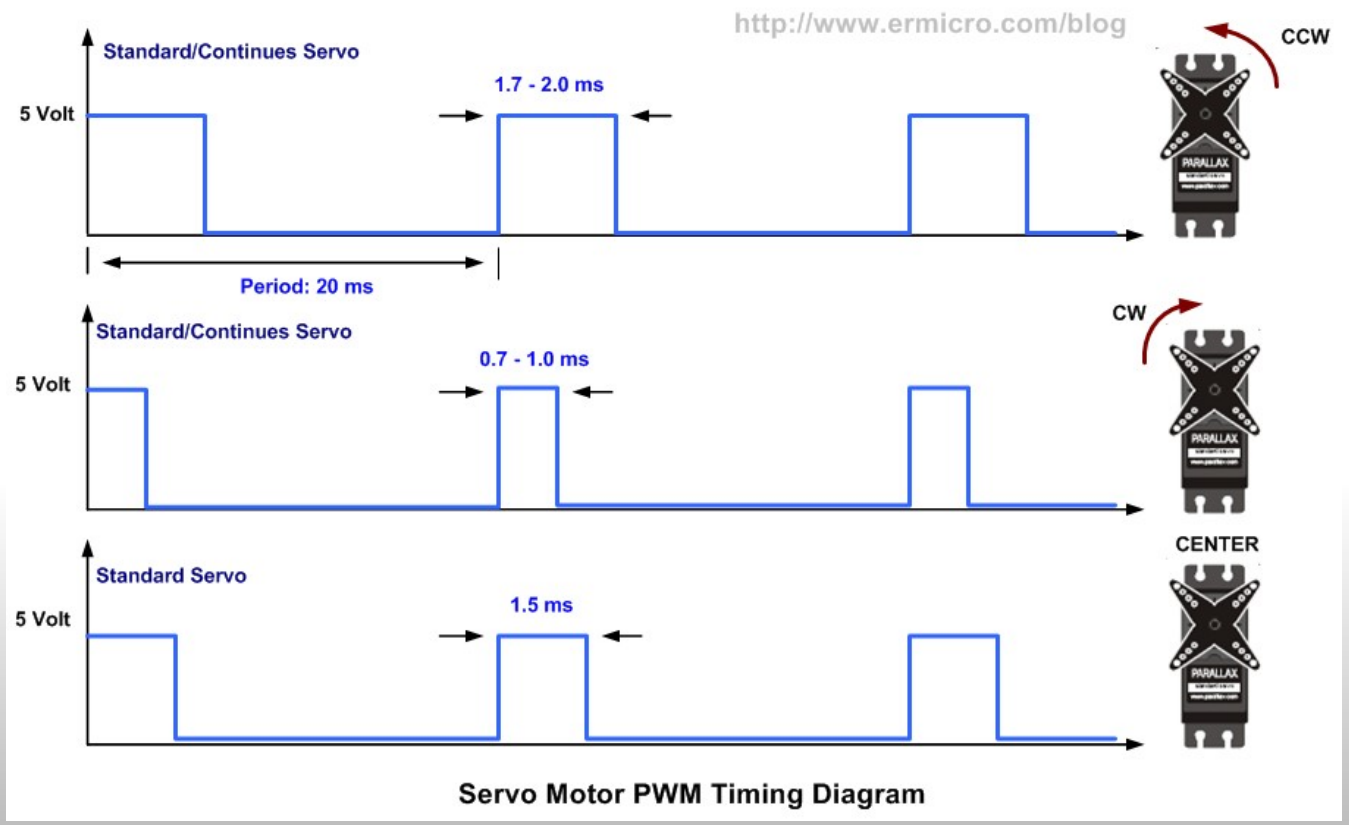
- Can read values between 0 and 5V
- 0V -> 0
- 5V -> 1023
- No current flows in



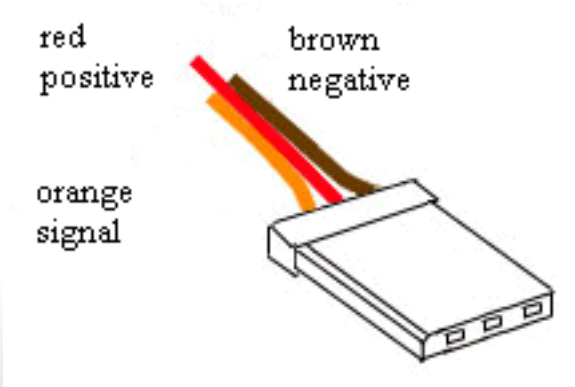
Servo

- Position controlled motor
- 0° -> 180°





Servo Motor PWM Timing Diagram

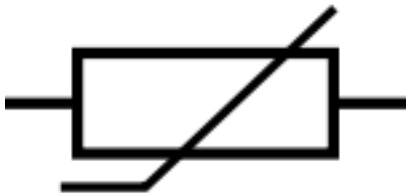


Practice

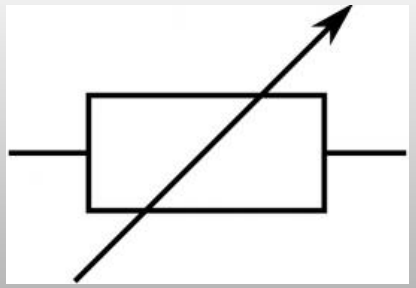
- Drive Servo with potentiometer
- http://arduino.cc/en/Tutorial/Knob

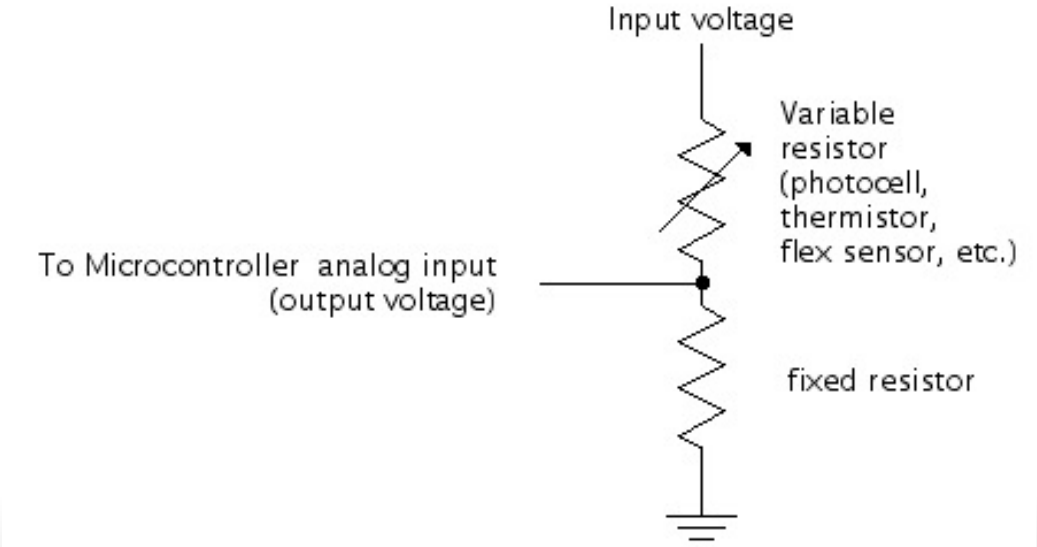
Sensors (Variable Resistance)

- Thermistor (Resistance varies with temperature)



- LDR Light Dependent Resistor (Come on!)





Practice

- Drive the servo with one of your resistor sensor
- Or anything else! Just play with the sensors ;-)