Laboratorio 2:
Electrónica Básica

Motivación

- Conocimientos básicos de electrónica son necesarios para seleccionar y utilizar sensores o actuadores en proyectos básicos de IoT.

- Interpretar las señales de voltaje/corrientes provenientes de sensores y convertirlas a la magnitud física o química para la cual están diseñados.

- Saber cómo leer fichas de datos de componentes electrónicos.

Herramientas de Simulacion en línea

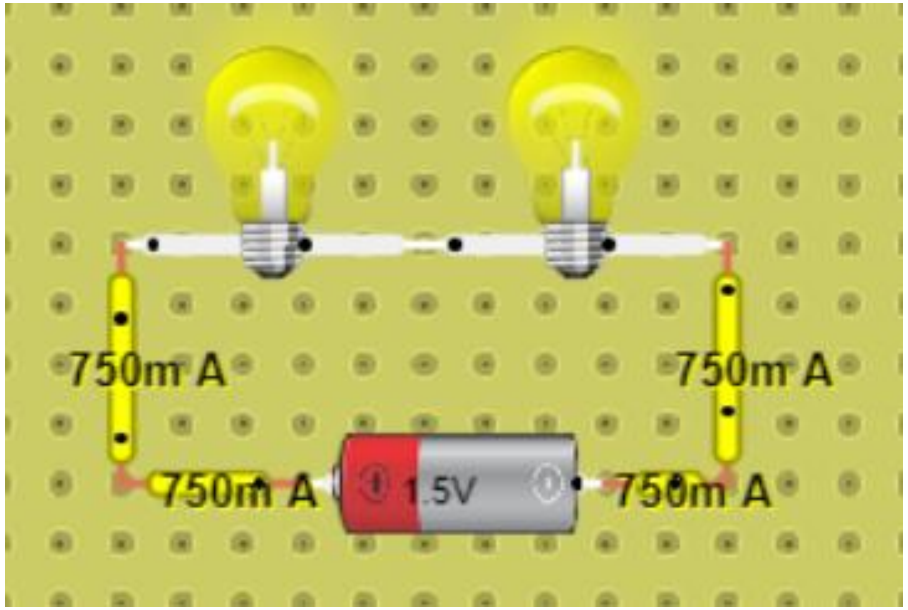
- **DCANLAB**: https://dcaclab.com/es/lab (Lab 2)
- **Wowki:** https://wokwi.com/ (Lab 3 y 4)
- Otras herramientas:

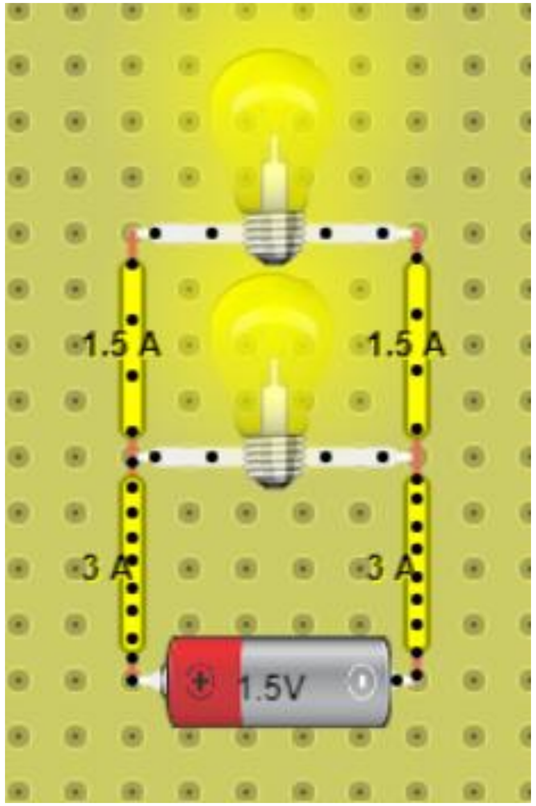
CircuitLab: permite diseñar, simular y compartir circuitos.www.circuitlab.com.

Tinkercad: simulación de circuitos, 3D y programación.www.tinkercad.com/circuits.

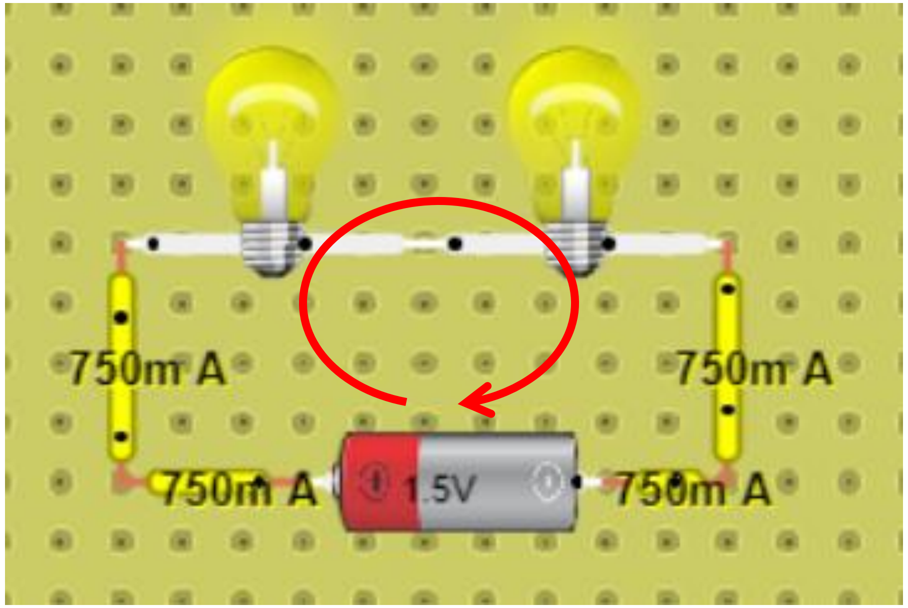
Falstad Circuit Simulator: permite diseñar, simular y compartir circuitos.www.falstad.com/circuit/

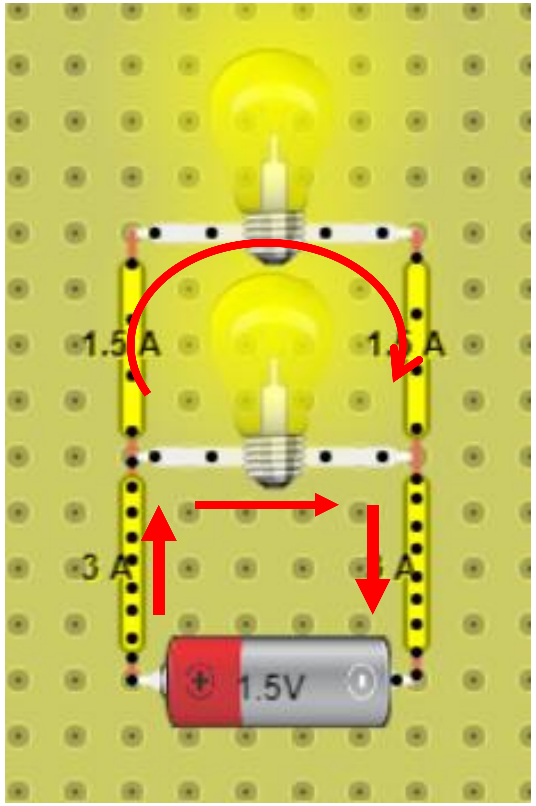
Circuitos en Serie y Paralelo



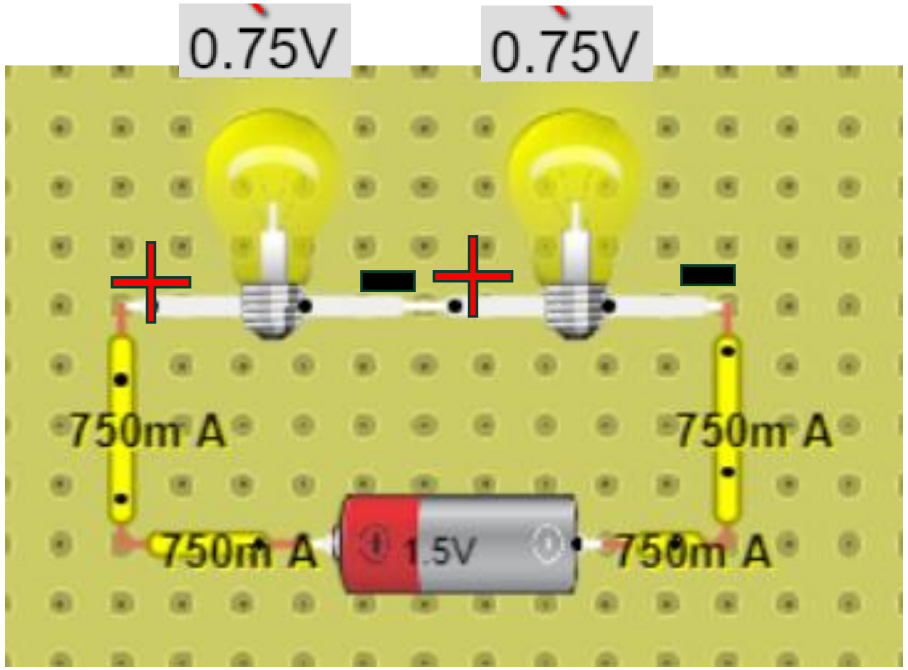


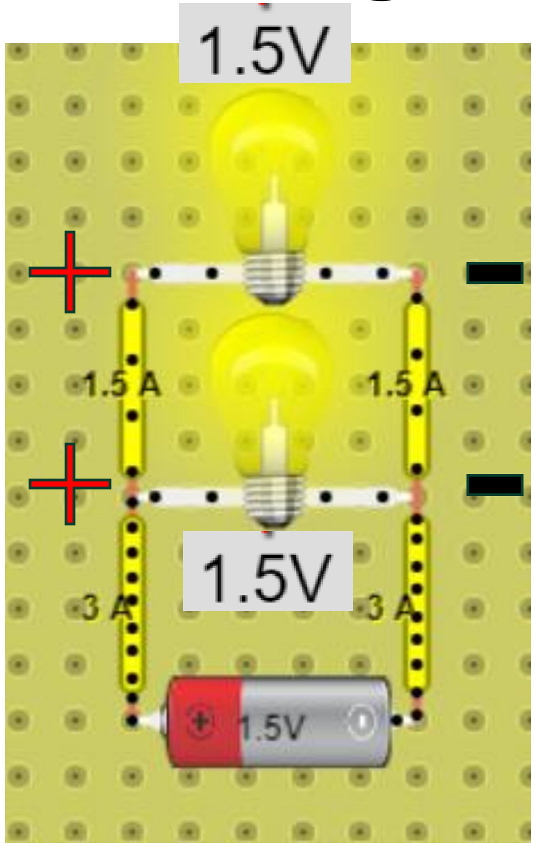
Circuitos en Serie y Paralelo: Corriente





Circuitos en Serie y Paralelo: Voltage





Ley De Ohm

$$V = I \times R$$

$$I = \frac{V}{R}$$

$$R = \frac{V}{I}$$

$$R_{circuito\ series} = \frac{V}{I} = \frac{1.5\ V}{0.75\ A} = 2\ \Omega$$

$$R_{circuito\ paralelo} = \frac{V}{I} = \frac{1.5\ V}{3\ A} = 0.5\ \Omega$$

Sumar Resistencias en Series y Paralelo

$$R_{circuito\ series} = \frac{V}{I} = \frac{1.5\ V}{0.75\ A} = 2\ \Omega$$

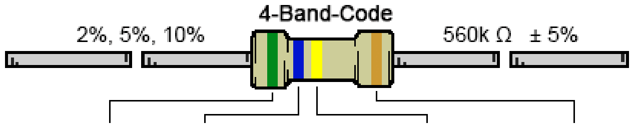
$$R_{Total} = R_1 + R_2\ , si\ R_1 = R_2\ entonces\ \ ; R_1 = R_2 = 1\ \Omega$$

$$R_{circuito\ paralelo} = \frac{V}{I} = \frac{1.5\ V}{3\ A} = 0.5\ \Omega$$

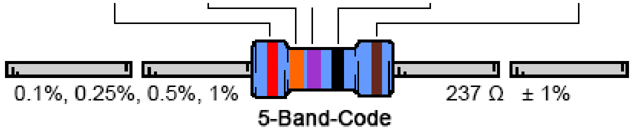
$$\frac{1}{R_{Total}} = \frac{1}{R_1} + \frac{1}{R_2}, si\ R_1 = R_2\ entonces\ \frac{1}{0.5\ \Omega} = \frac{2}{R_1}; R_1 = R_2 = 1\ \Omega$$

Como leer Resistencias

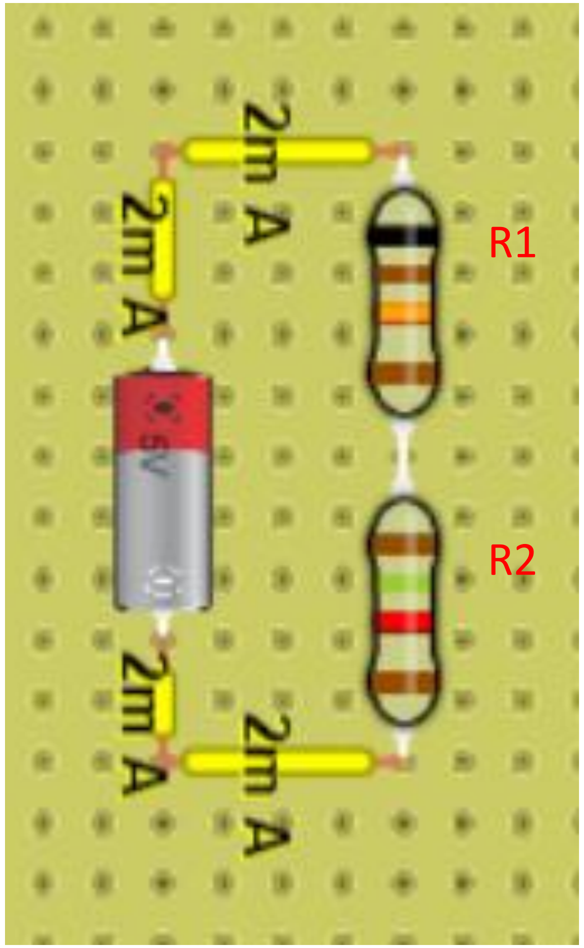
- Heramientas online permiten calcular los valores de resistencias: https://www.digikey.com/es/resources/conversion-calculators/conversion-calculator-resistor-color-code .



COLOR	1^{ST} BAND	2^{ND} BAND	3^{RD} BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8	100MΩ	± 0.05%
White	9	9	9	1GΩ	
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)



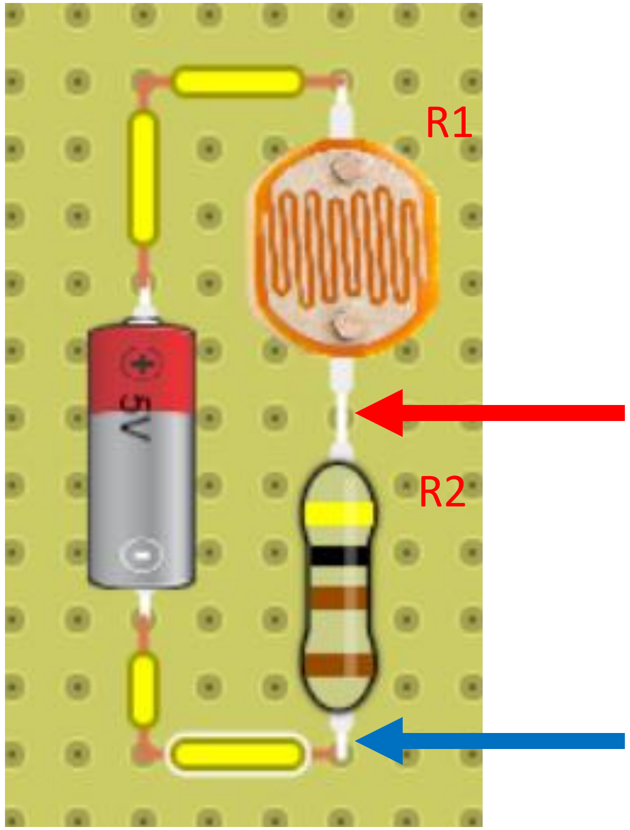
Division de Voltage



$$V_1 = \frac{R_1 \times V_{Total}}{R_1 + R_2} = \frac{1000\Omega \times 5\,V}{1000\Omega + 1500\Omega} = 2V$$

$$V_2 = \frac{R_2 \times V_{Total}}{R_1 + R_2} = \frac{1500\Omega \times 5\,V}{1000\Omega + 1500\Omega} = 3V$$

Como leer señales de voltaje



$$V_{2\ con\ emizion\ de\ luz} = \frac{R_2 \times V_{Total}}{R_1 + R_2} = \frac{400\Omega \times 5\ V}{400\Omega + 400\Omega} = 2.5V$$

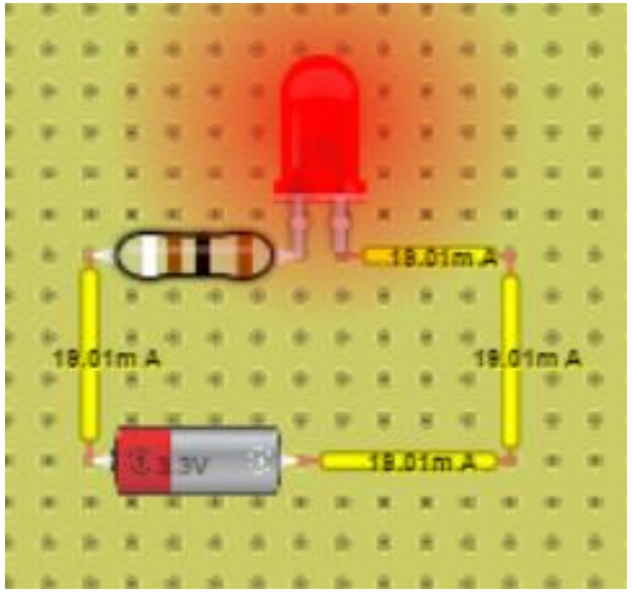
$$V_{2\ sin\ emizion\ de\ luz} = \frac{R_2 \times V_{Total}}{R_1 + R_2} = \frac{400\Omega \times 5\ V}{1M\Omega + 400\Omega}$$
$$= 0.0004V$$

Parameter	Conditions	Min.	Typ.	Max.	Units
Cell resistance	1000 lux 10 lux	- -	400 9	- -	Ω kΩ
Dark resistance	-	1.0	-	-	MΩ
Dark capacitance	-	-	3.5	-	pF
Rise time 1	1000 lux 10 lux	- -	2.8 18	- -	ms ms
Fall time 2	1000 lux 10 lux	- -	48 120	- -	ms ms

1. Dark to 110% R_L
2. To 10 × R_L
R_L = photocell resistance under given illumination.

Ficha tecnica:https://components101.com/sites/default/files/component_datasheet/LDR%20Datasheet.pdf

Como encender un LED

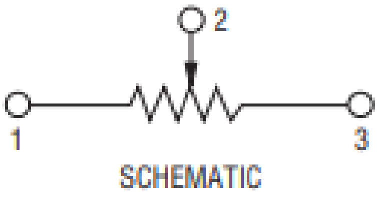


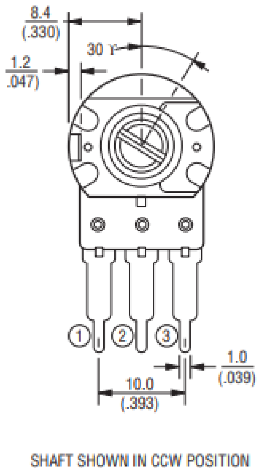
$$R = \frac{V_{total} - V_F}{I_F} = \frac{3.3\,V\ - 1.5V}{20\ mA} = 90\ \Omega$$

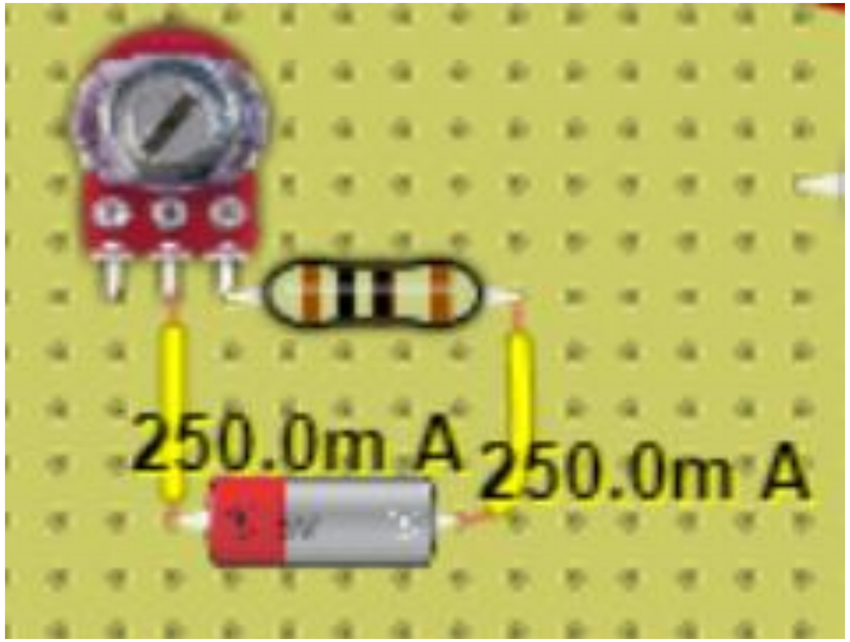
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Luminous Intensity	I_V	I_F = 20 mA	0.9	3.0	–	mcd
Peak Wavelength	λ_p	I_F = 20 mA	–	–	660	nm
Spectral Line Half Width	$\Delta\lambda$	I_F = 20 mA	–	20	–	nm
Forward Voltage	V_F	I_F = 20 mA	–	1.65	2.0	V
Reverse Current	I_R	V_R = 5.0V	–	–	100	λA
Reverse Voltage	λA	I_R = 100 λA	–	5.0	–	V
Capacitance	C	V = 0	–	35	–	pF
Viewing Angle	2θ1/2	Between 50% Points	–	60	–	degree
Rise Time	t_r	10% – 90% 50Ω	–	50	–	ns
Fall Time	t_f	90% – 10% 50Ω	–	50	–	ns

Ficha tecnica: https://us.rs-online.com/m/d/6355b8aba0b01578df0bb7b871ceefd7.pdf

Resistencia Ajustable

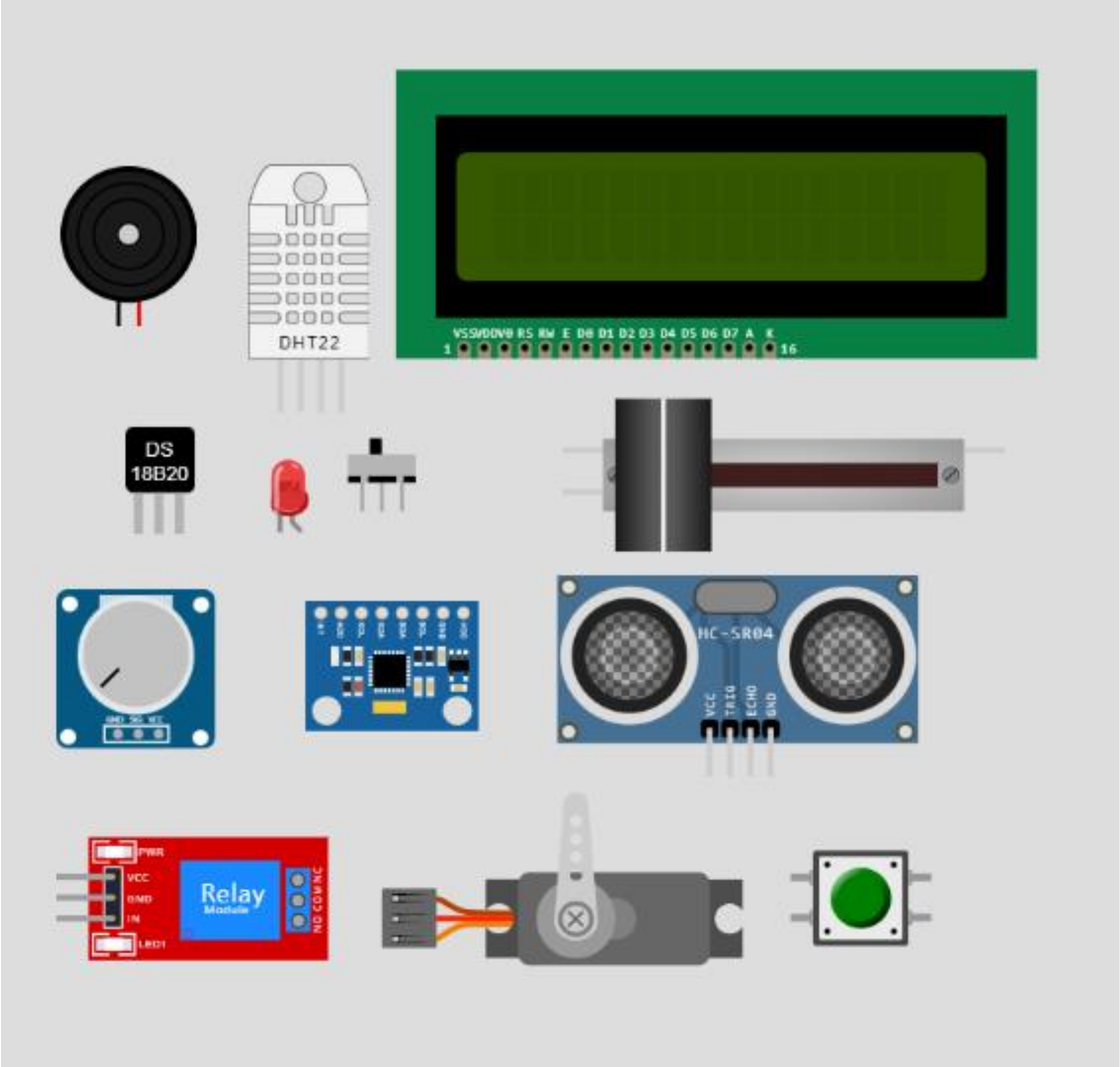






Otros Sensores

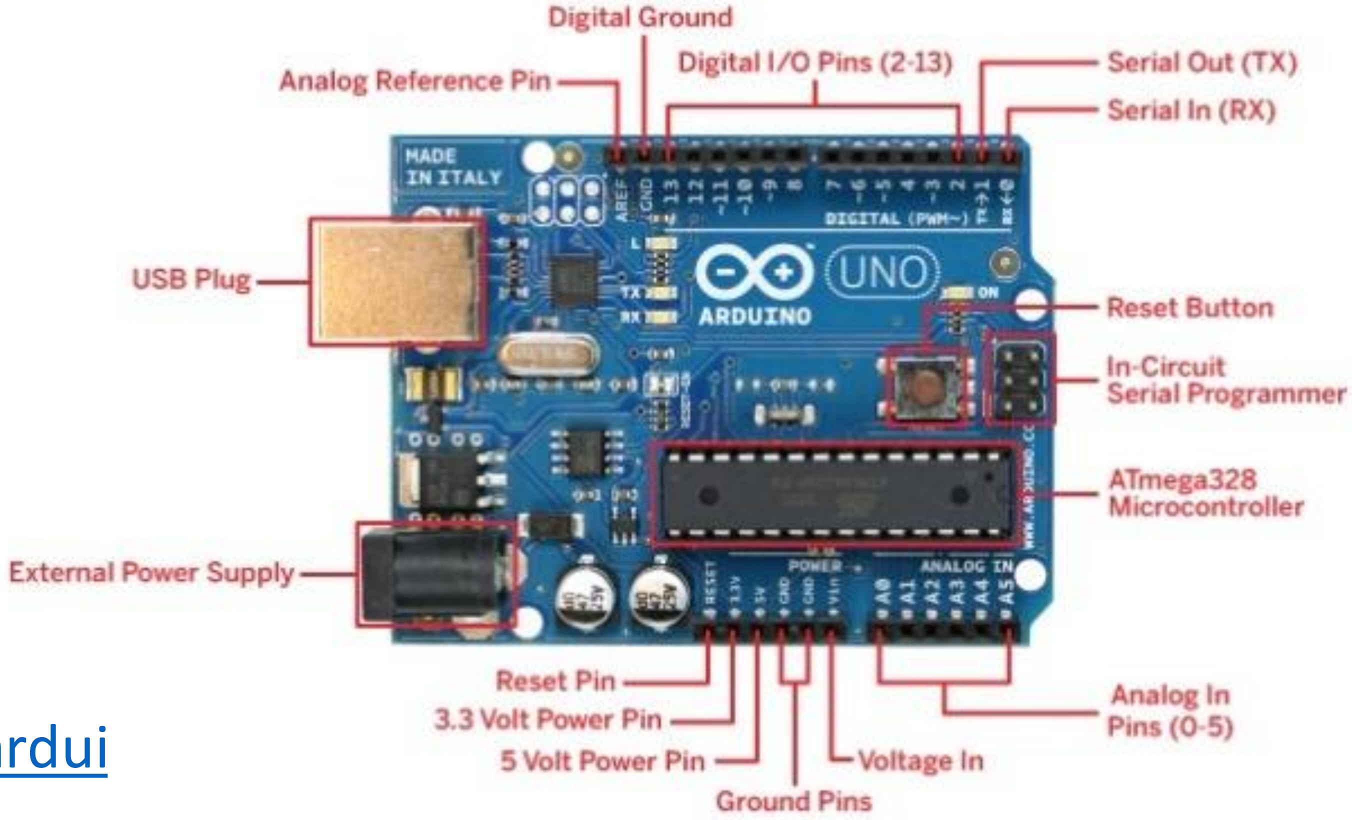
Sensor de Humedad: DHT22
Sensor de Temperatura: DS18B20
Resistencia Ajustable
LED
LCD Display
Motor Paso a Paso
Botones
Sensor Ultrasonico de Distancia
Sensor de aceleración de 6 ejes y Gyroscopio
Zumbador



Microcontrolador: Arduino Uno

6 Pines Análogos de entrada
11 Pines Digitales I/O (5V o 0V)
6 Pines PWM de los Pines digitales
2 Pines de comunicación serial
3.3 V Pin de Poder
5 V Pin de Poder Otros Sensores

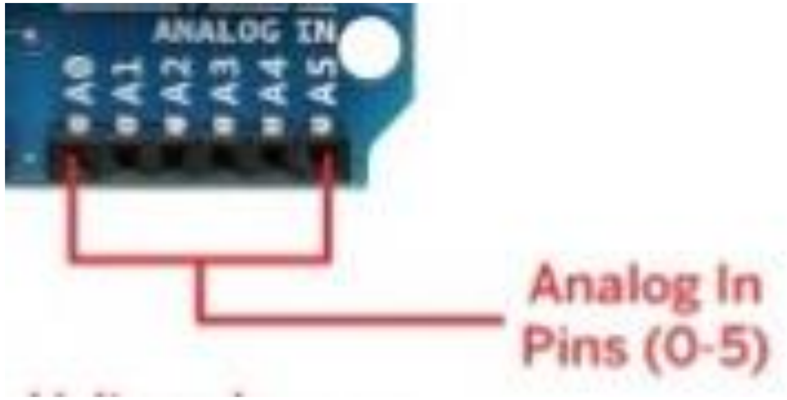
Simulación en plataforma Wowki:
https://wokwi.com/projects/new/arduino-uno

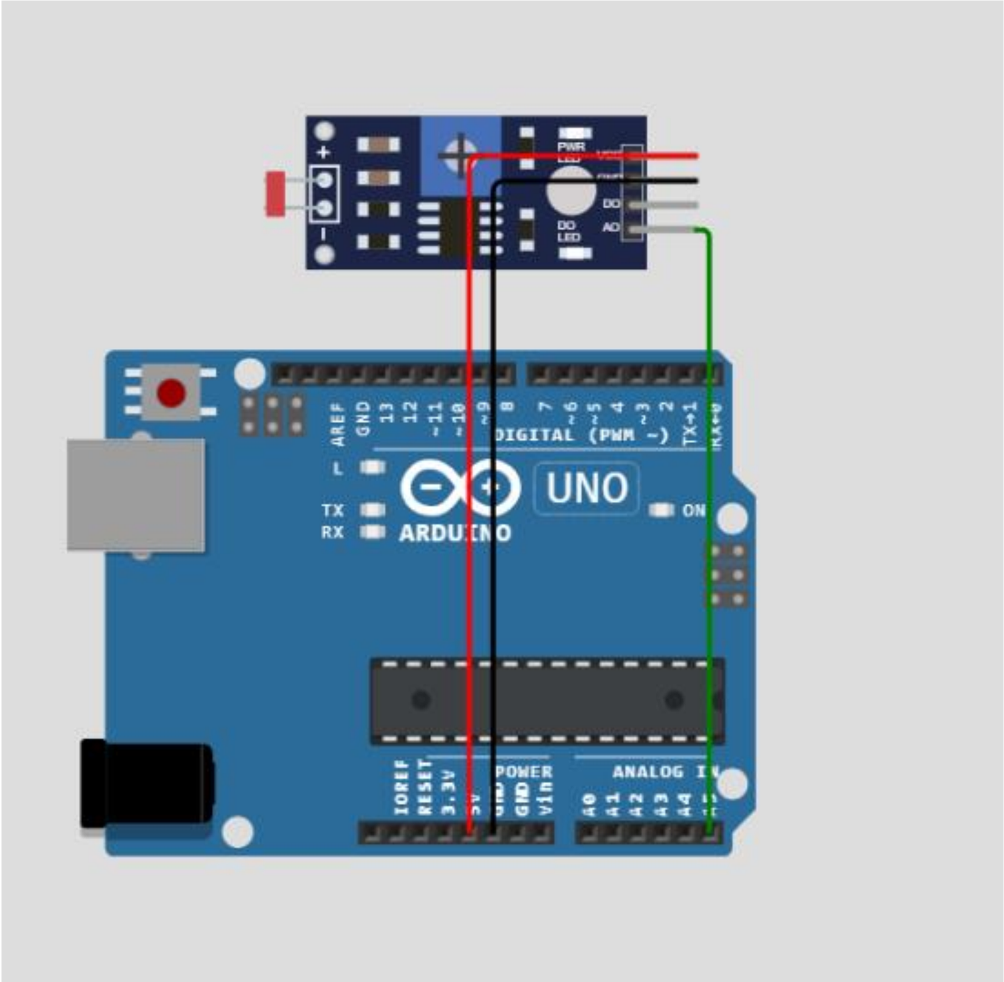


Microcontrolador: Pines Análogos (entrada)

6 Pines Análogos I/O (5V o 0V)

Pines de entrada o salida

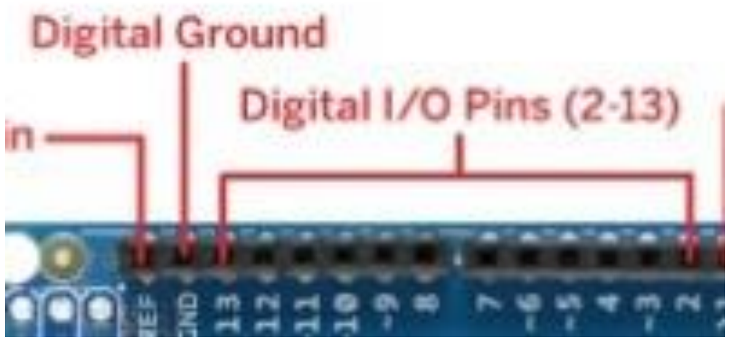


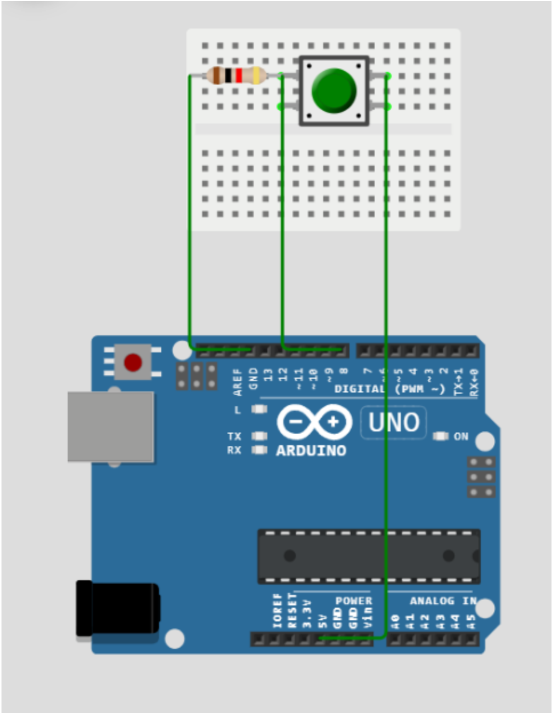


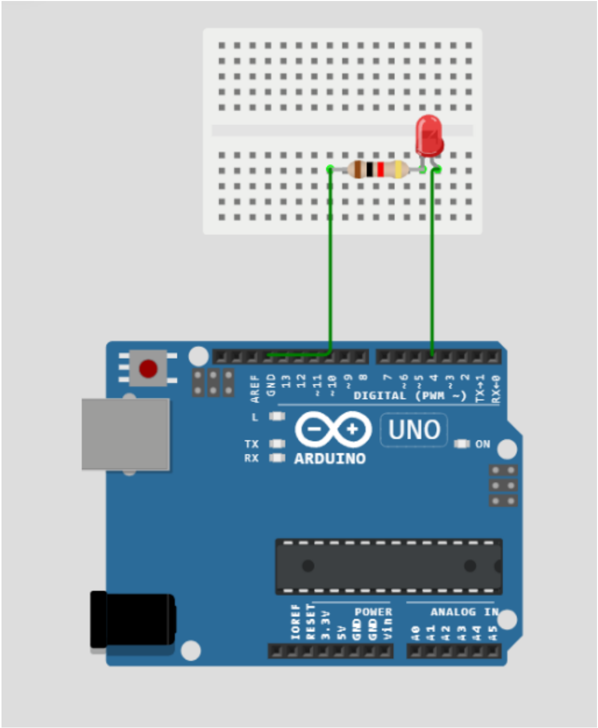
Microcontrolador: Pines Digitales

11 Pines Digitales I/O (5V o 0V)

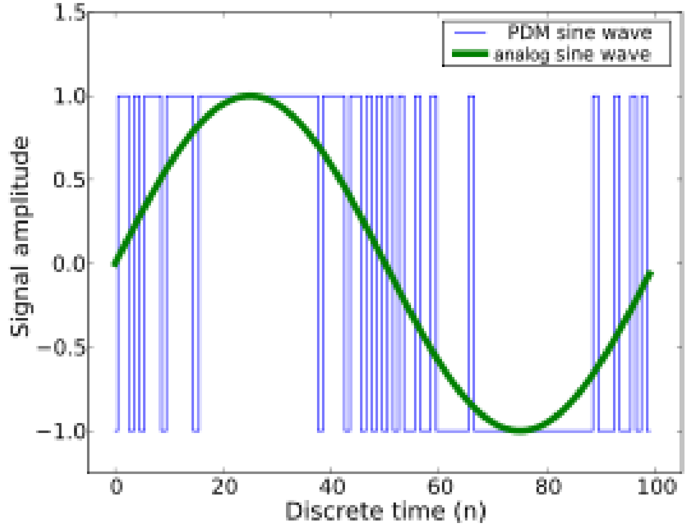
Pines de entrada o salida

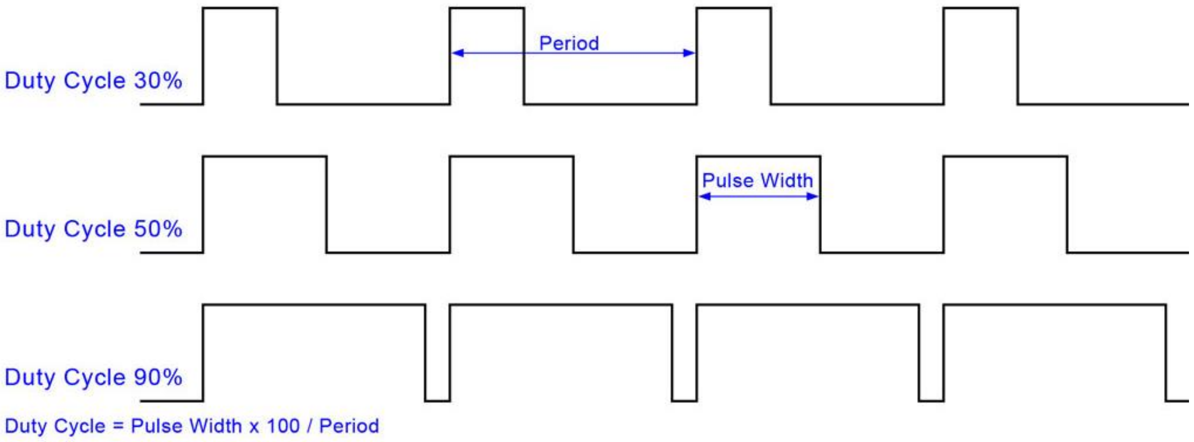






Microcontrolador: Pines PWM (salida)





6 Pines PWM de los Pines digitales