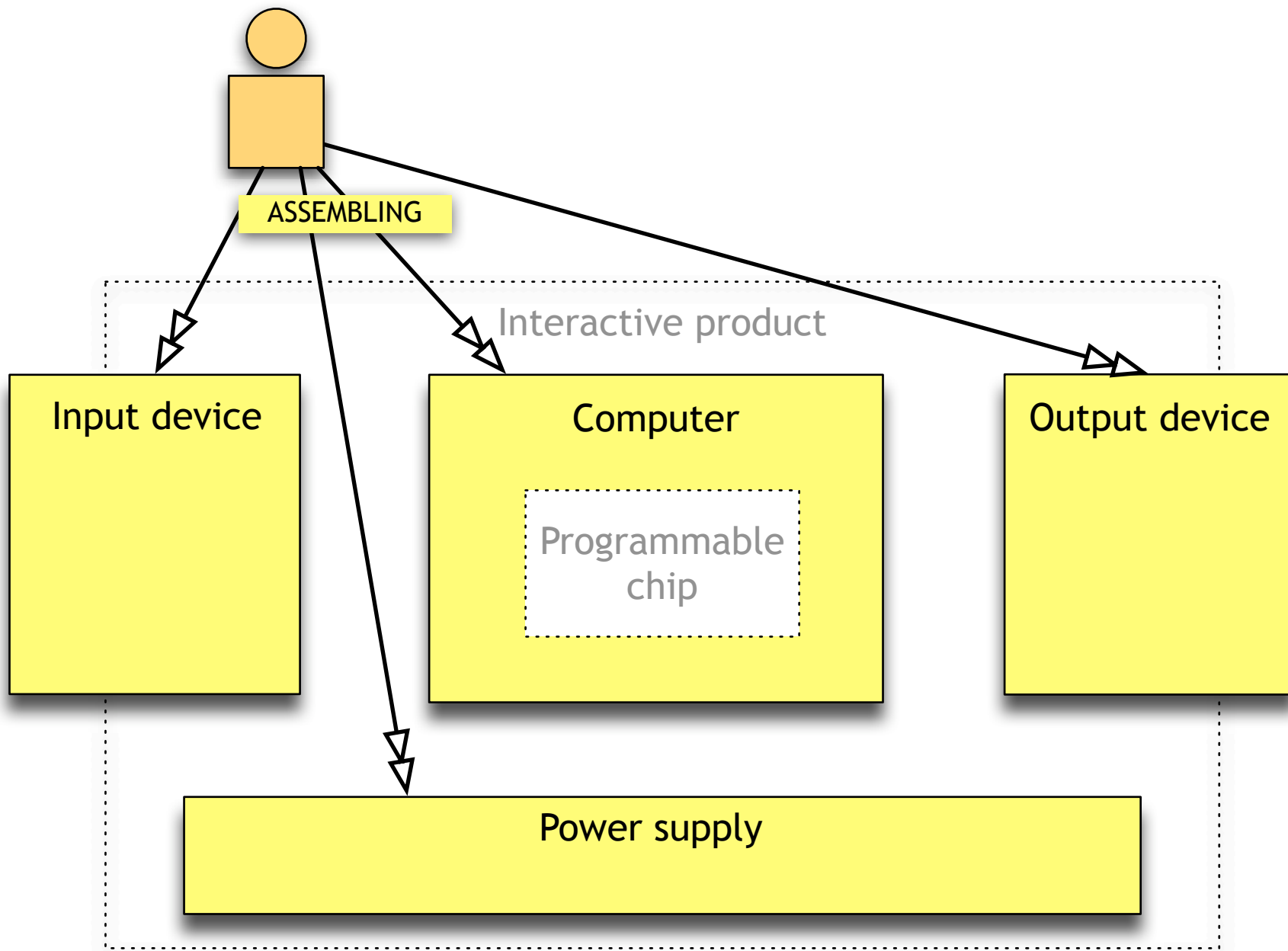


**Hardware**

**(assembling electronics)**



**9V adapter and USB A-B mini cable**



## BASIC Stamp 2 (Microcontroller)



# Board of Education Development Board

Plug a 9V adapter here.

Plug USB B-mini here.

Breadboard access for power

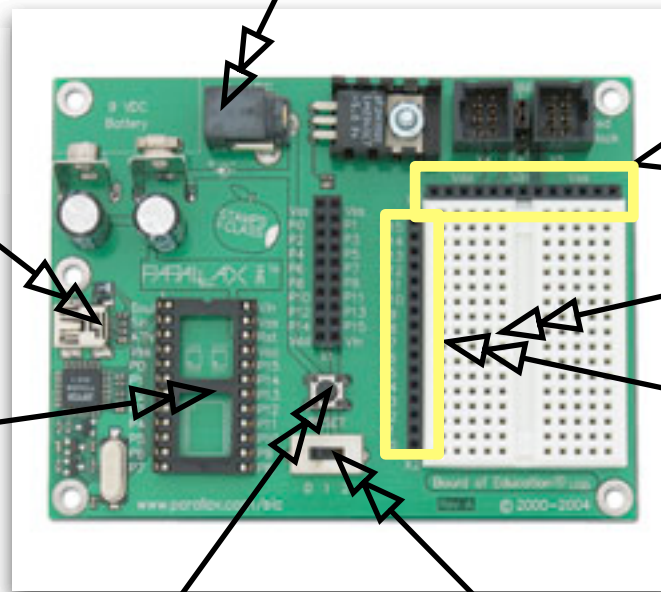
Breadboard

Breadboard access for BS2 pins

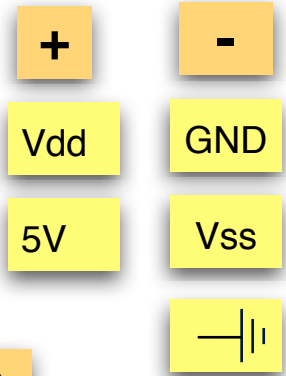
Install the BASIC Stamp 2 here.

Reset button

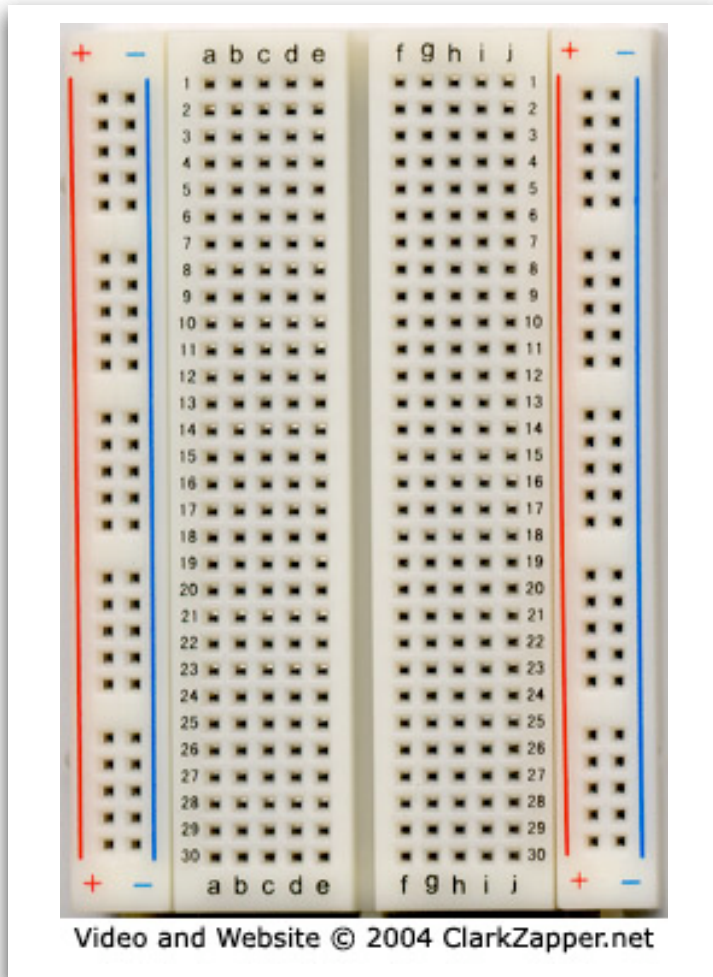
Power Switch



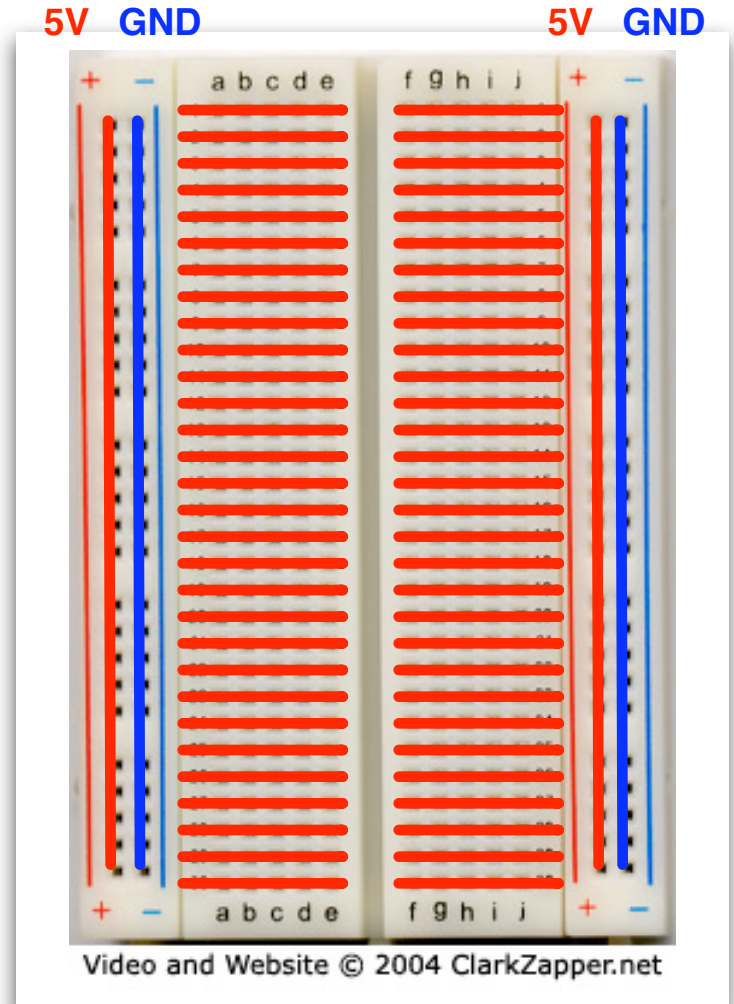
# Breadboard



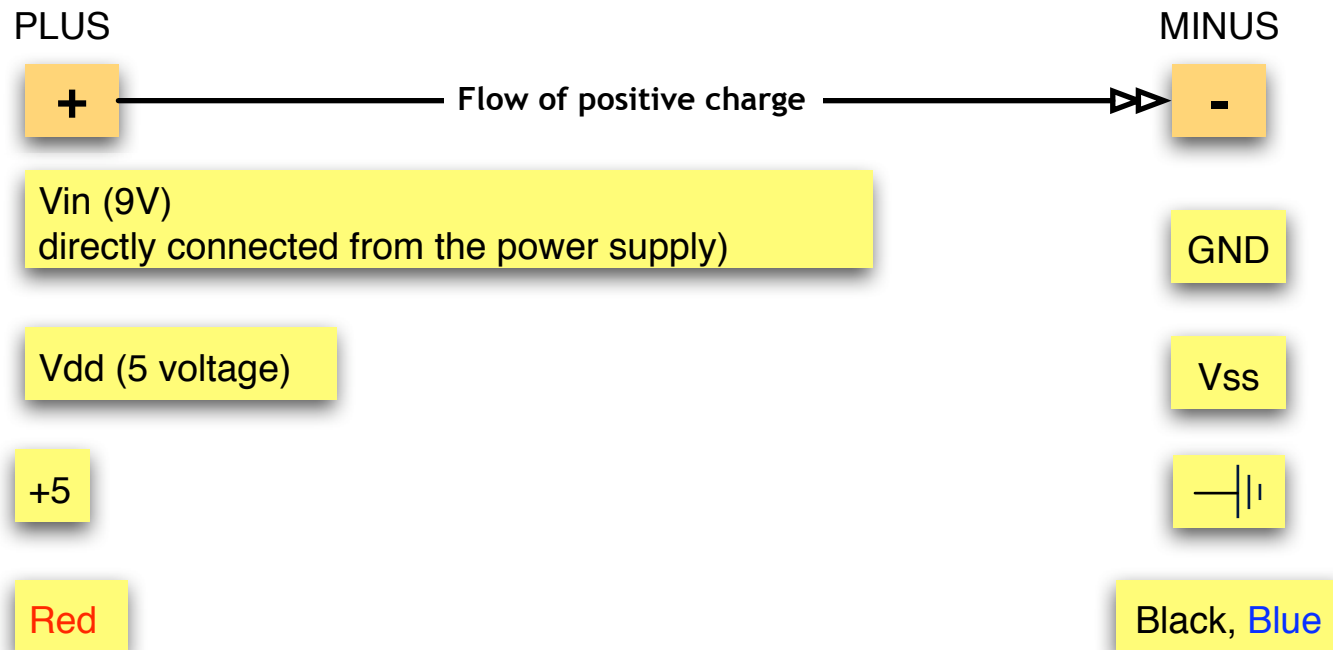
Breadboard (photo)



Breadboard (schematic)

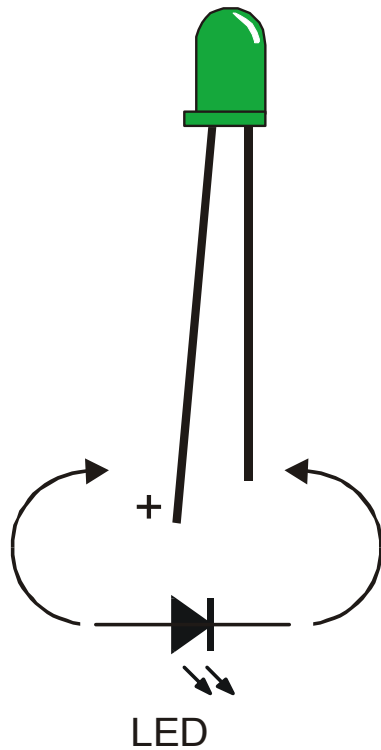


# Flow of positive charge



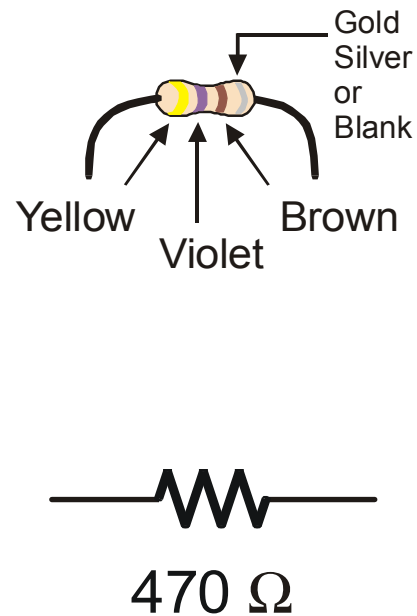
# Symbols

## LED (Light emitting diode)



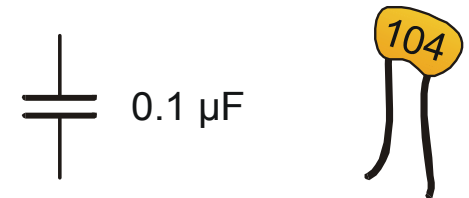
a semiconductor device with two terminals, typically allowing the flow of current in one direction only.

## Resistor



a device having a designed resistance to the passage of an electric current.

## Capacitor

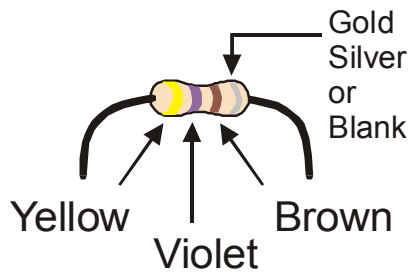


a device used to store an electric charge



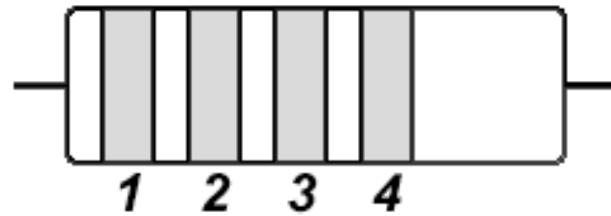
# Markings

## Resistor



470 Ω

a device having a designed resistance to the passage of an electric current.



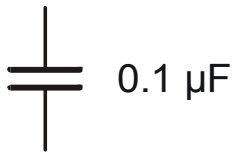
1, 2 3 4

Color	Number	Multiplier	Tolerance
Black	0	1	-
Brown	1	10	±1%
Red	2	10 <sup>2</sup>	±2%
Orange	3	10 <sup>3</sup>	±0.05%
Yellow	4	10 <sup>4</sup>	-
Green	5	10 <sup>5</sup>	±0.5%
Blue	6	10 <sup>6</sup>	±0.25%
Purple	7	10 <sup>7</sup>	±0.1%
Gray	8	10 <sup>8</sup>	-
White	9	10 <sup>9</sup>	-
Shiver	-	10 <sup>-2</sup>	±10%
Gold	-	10 <sup>-1</sup>	±5%
No color	-	-	±20%

Download a widget called "Resistulator".

# Markings

## Capacitor



a device used to store an electric charge

Capacitor three digit markings

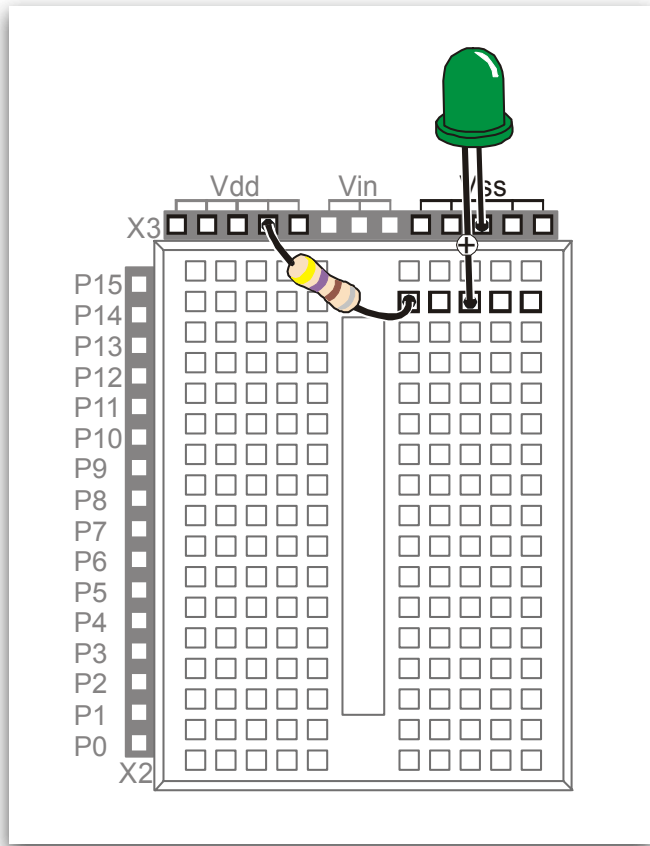
CODE / Marking	$\mu\text{F}$ microfarads	nF nanofarads	pF picofarads
1R0	0.000001	0.001	1
100	0.00001	0.01	10
101	0.0001	0.1	100
102	0.001	1	1,000
103	0.01	10	10,000
104	0.1	100	100,000
105	1	1,000	1,000,000
106	10	10,000	10,000,000
107	100	100,000	1,000,000,000

The most popular capacitors

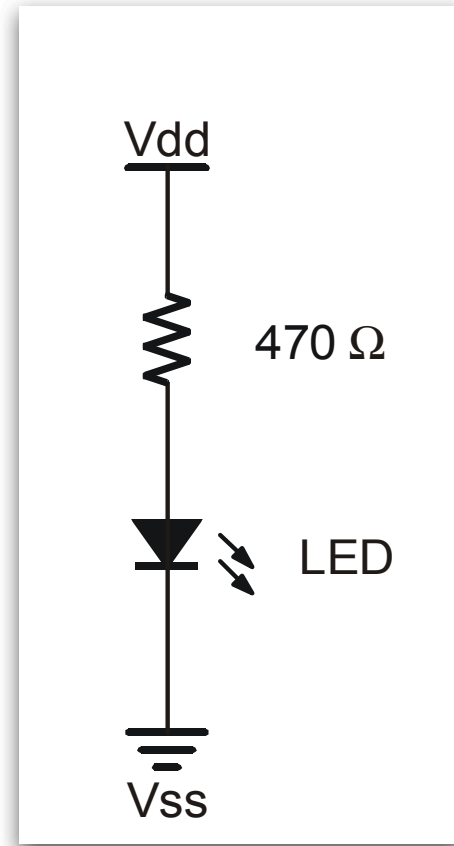
# First assembling

+	-
Vdd	GND
5V	Vss
—	

Breadboard (photo)

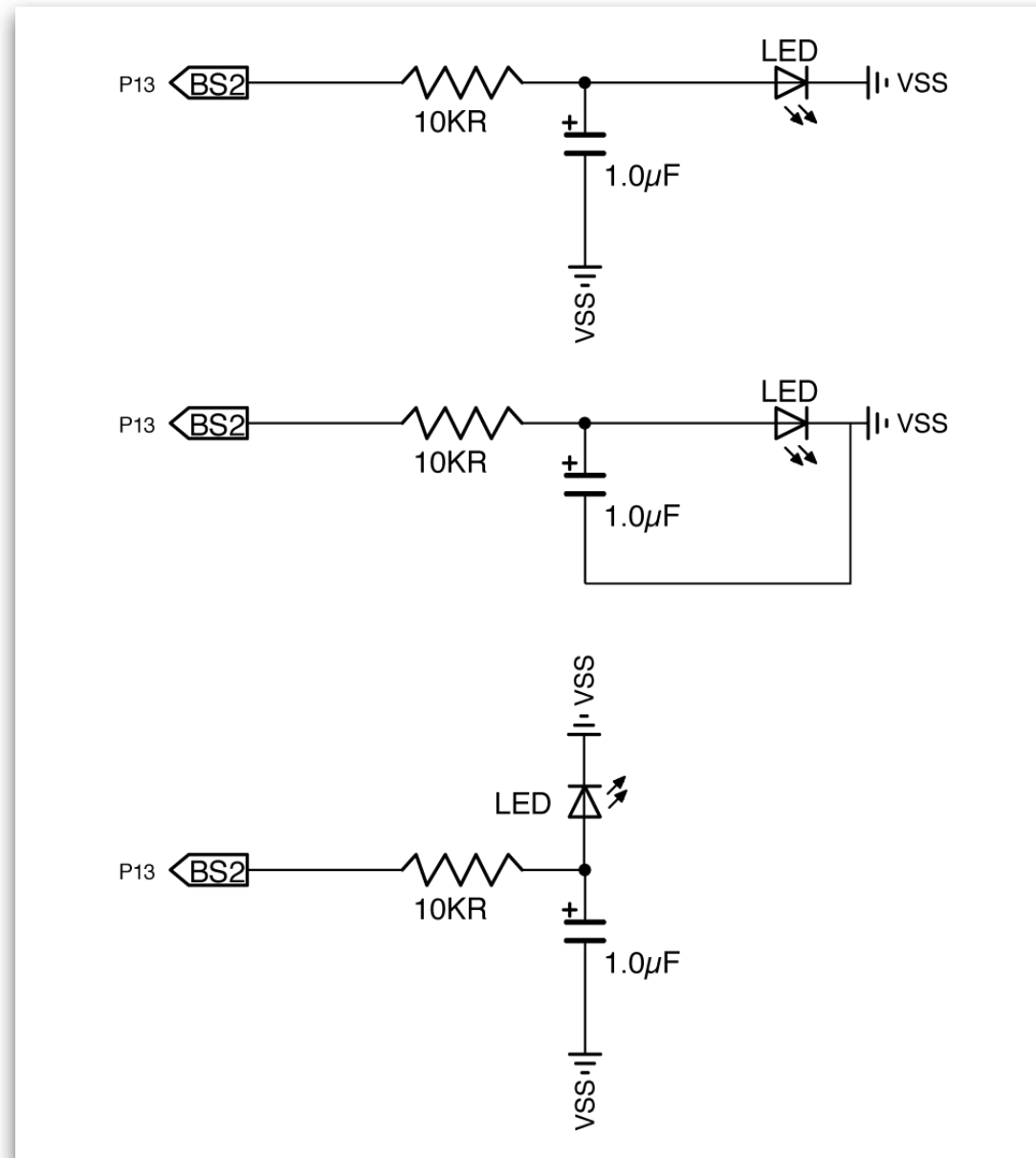


Breadboard (schematic)



## Schematic plans

These are all same schematics.



# Multimeter



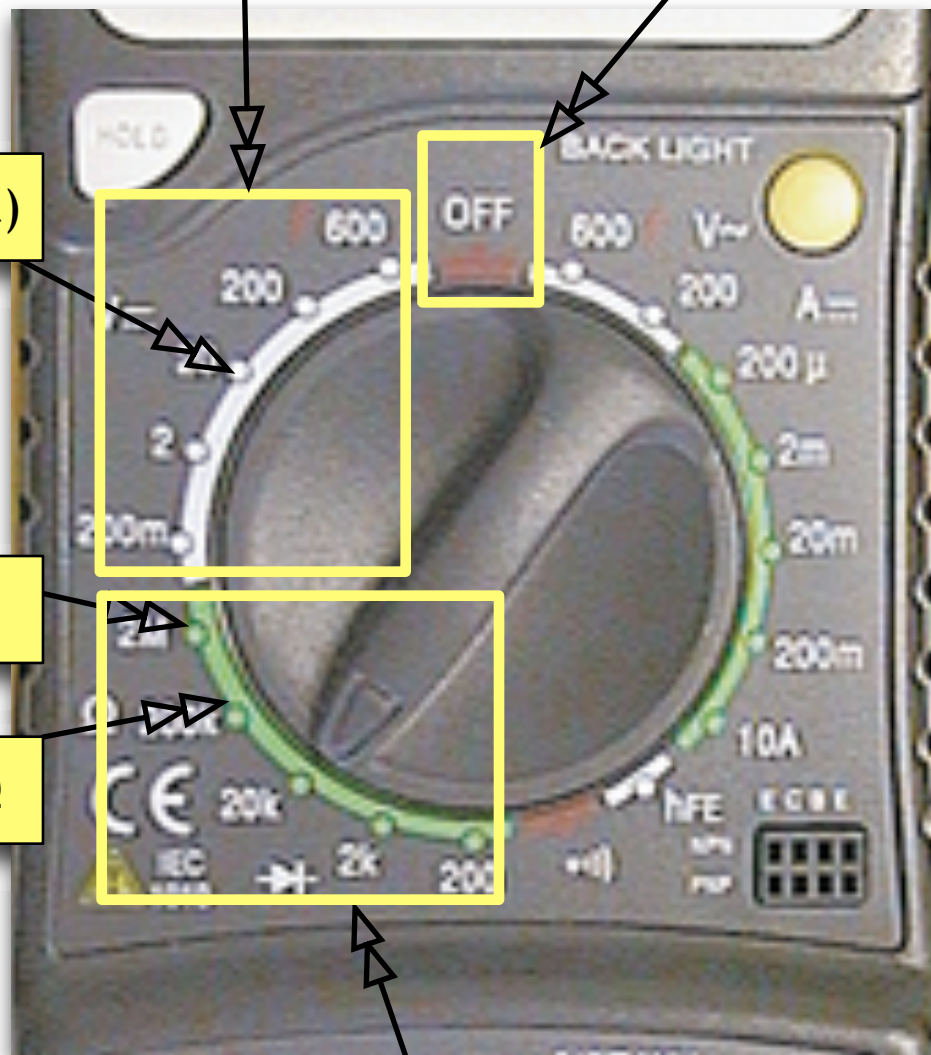
Measuring voltages

Off switch

20V(DC)

2MΩ

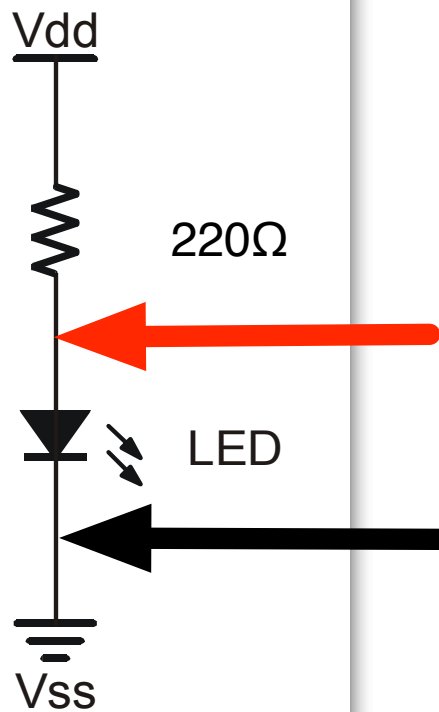
200KΩ



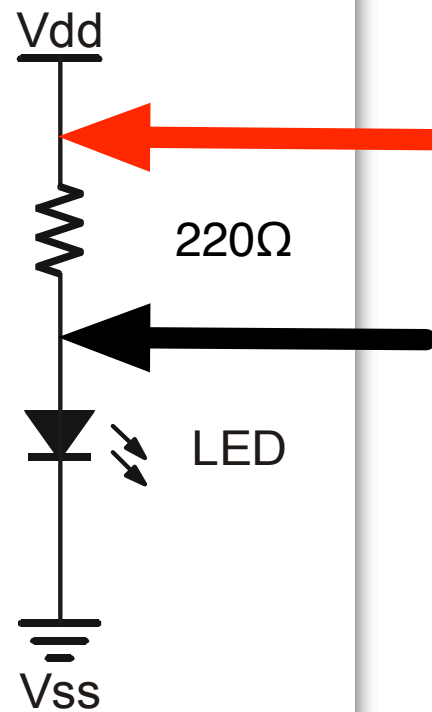
Measuring conductivity and resistance

# Measuring

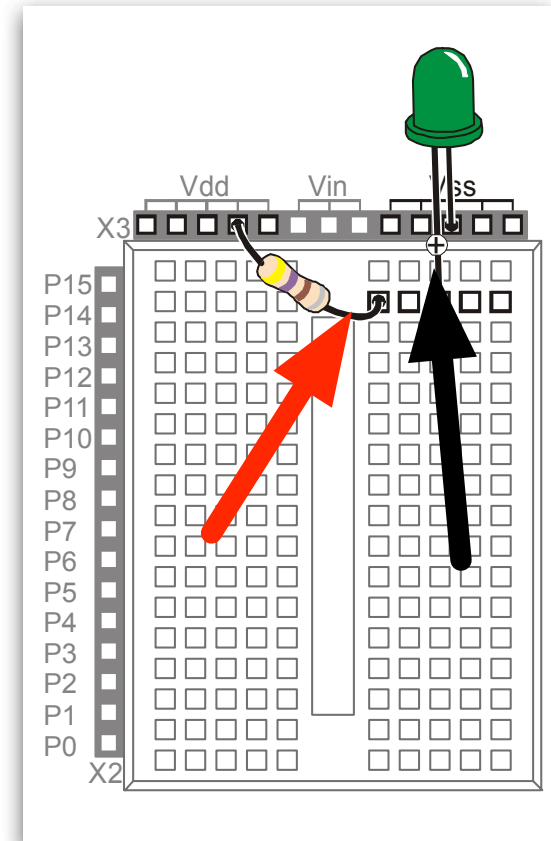
## Voltage



## Resistance

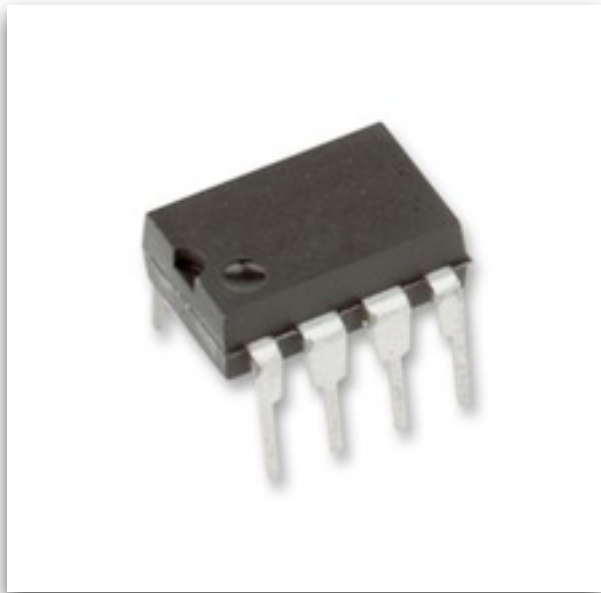


## Conductivity

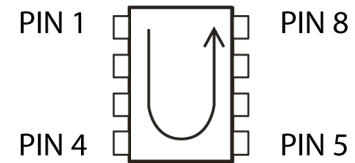
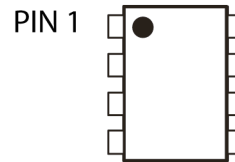
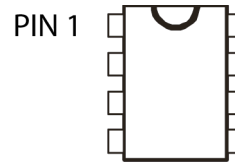


# IC (Integrated Circuit)

It's a magic blackbox!



## PIN assignment



# IC (Integrated Circuit)

It's a magic blackbox!

