

# Electronic components

Electronic components can be classified in:

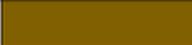
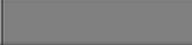
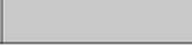
- **Active** components: usually can inject power into a circuit. They are made of semiconductors. E.g: Diodes, transistors.
- **Passive** components: cannot introduce net energy into the circuit. E.g: Resistors, capacitors

For a circuit to be properly called “electronic circuit” it must contain at least **one active** element.

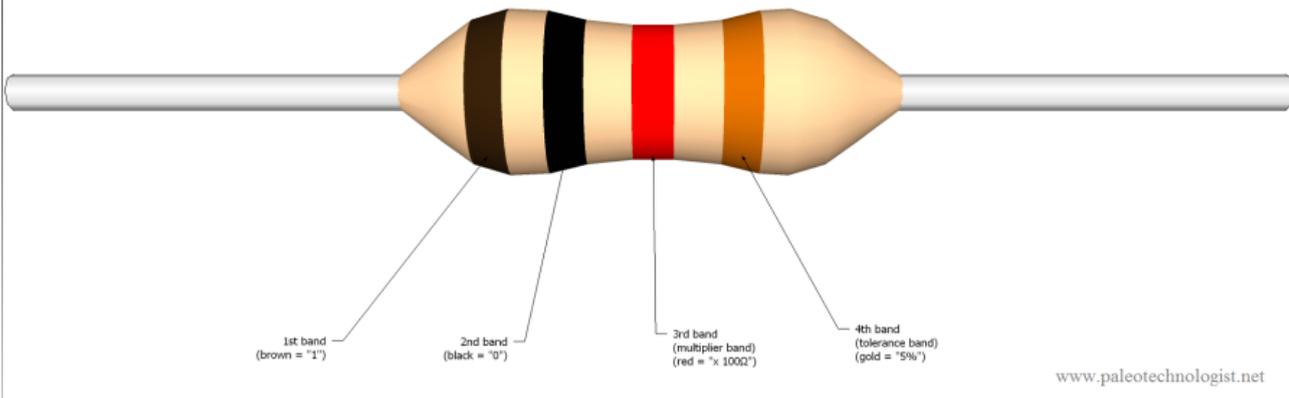
## Passive components

### Fixed resistors

- They impede the flow of electric current
- There is a colour code to know their value

Color	Color	1st Band	2nd Band	3rd Band Multiplier	4th Band Tolerance
Black		0	0	x1 $\Omega$	
Brown		1	1	x10 $\Omega$	$\pm 1\%$
Red		2	2	x100 $\Omega$	$\pm 2\%$
Orange		3	3	x1k $\Omega$	
Yellow		4	4	x10k $\Omega$	
Green		5	5	x100k $\Omega$	$\pm 0.5\%$
Blue		6	6	x1M $\Omega$	$\pm 0.25\%$
Violet		7	7	x10M $\Omega$	$\pm 0.10\%$
Grey		8	8	x100M $\Omega$	$\pm 0.05\%$
White		9	9	x1G $\Omega$	
Gold				x0.1 $\Omega$	$\pm 5\%$
Silver				x0.01 $\Omega$	$\pm 10\%$

## Resistor color codes: an example (a 1-kilohm 5% tolerance resistor)



## Variable resistors

- **Potentiometer:** A potentiometer is a **three-terminal resistor** with a sliding or rotating contact that forms an adjustable voltage divider.



### Electronic symbol



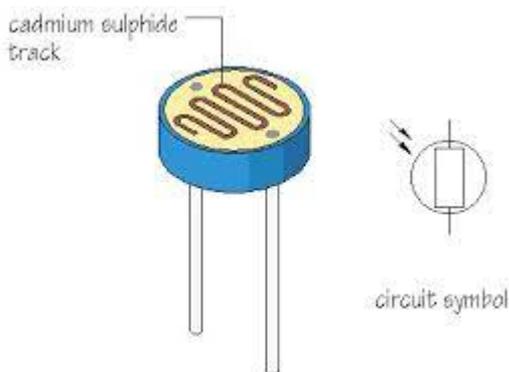
- **Thermistor:** semiconductor type of resistor whose resistance is strongly **dependent on temperature**. They can be
  - **Negative-temperature-coefficient (NTC):** thermistors have less resistance at higher temperatures



- **Positive-temperature-coefficient (PTC)**: thermistors have more resistance at higher temperatures

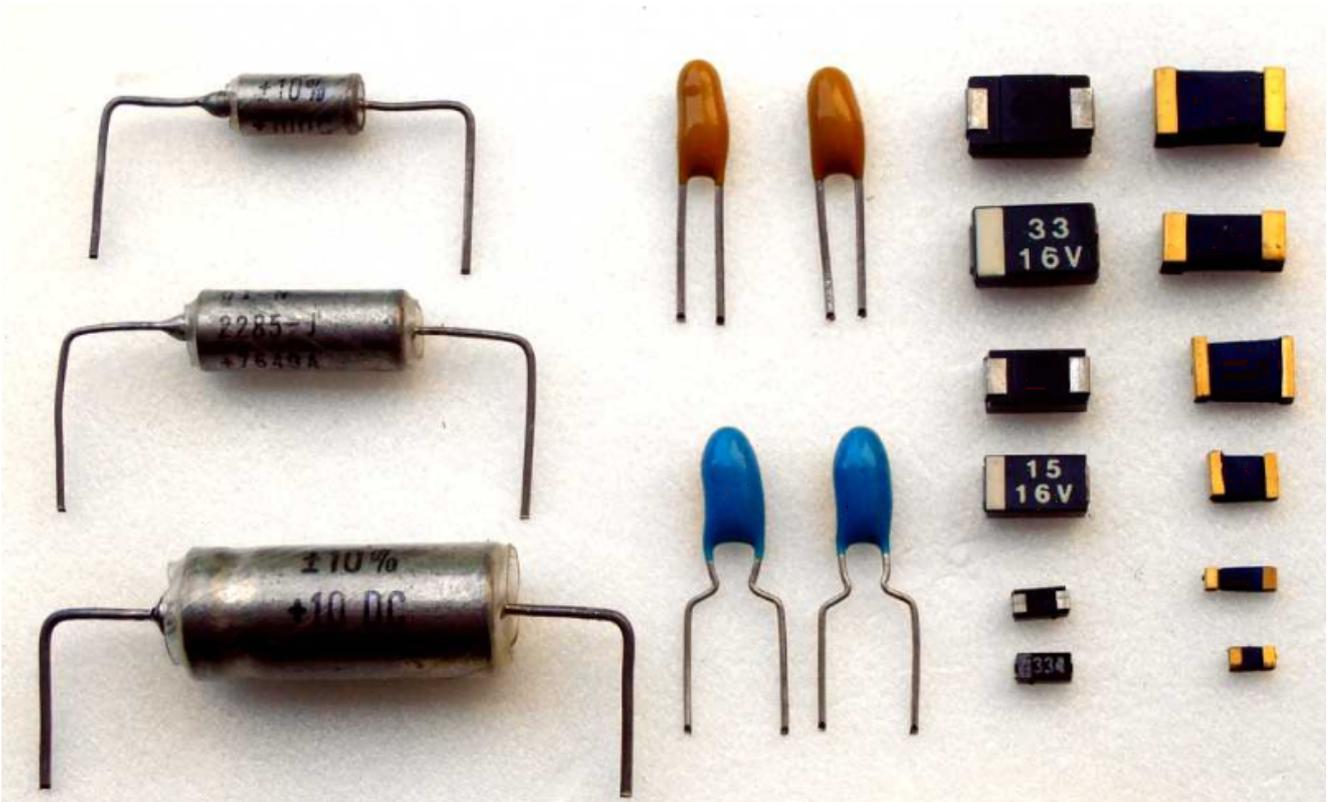


- **Light Dependent Resistors (LDR)**: passive component that **decreases resistance with** respect to receiving luminosity on the component's sensitive surface



## Capacitors

Device that **stores electrical energy** by accumulating electric charges on two closely spaced surfaces that are insulated from each other.



The property of a capacitor is the **capacitance (C)** that is defined as the amount of **charge** that can be stored at a given **voltage**. It is measured in **Farads (F)**

*capacitance of capacitor,  
measured in farads (F)*

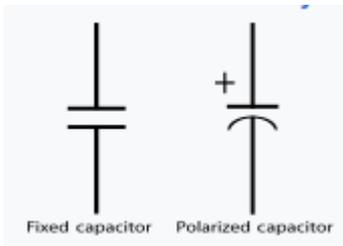
*charge stored,  
measured in coulombs (C)*

$$C = \frac{Q}{V}$$

*voltage across capacitor,  
measured in volts (V)*

A diagram showing the formula C = Q/V. Three green arrows point from text labels to the variables in the formula: one from 'capacitance of capacitor, measured in farads (F)' to 'C', one from 'charge stored, measured in coulombs (C)' to 'Q', and one from 'voltage across capacitor, measured in volts (V)' to 'V'.

**Electronic symbol**

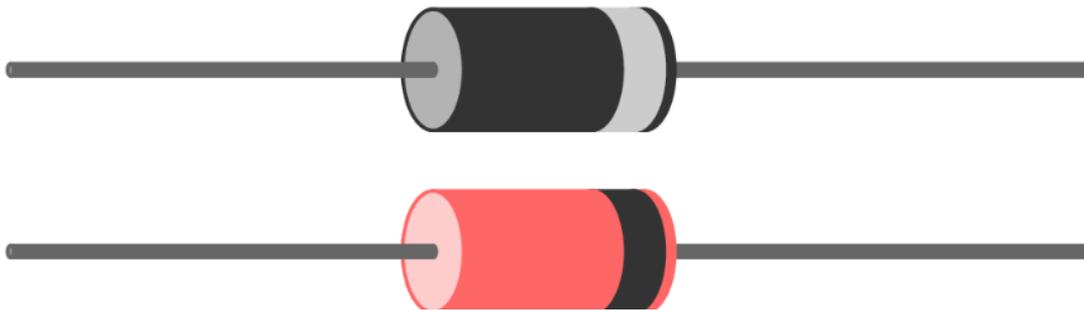
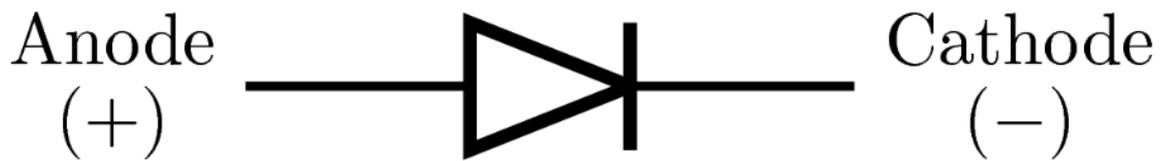


# Active components

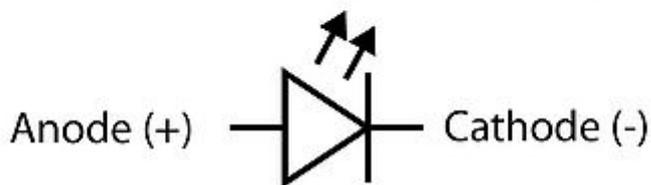
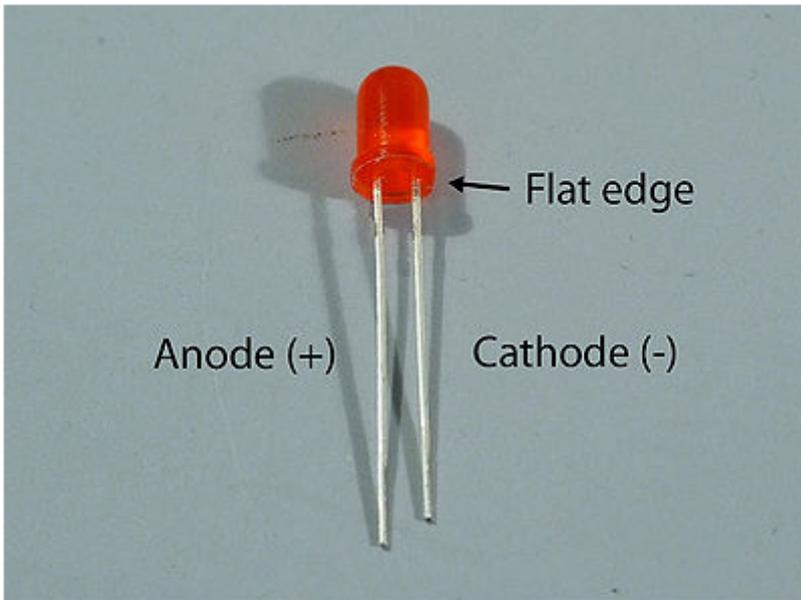
They are made up of semiconductor materials, whose properties allow to introduce "control" in the circuit.

## Diodes

Devices that allow current to flow just in one direction.

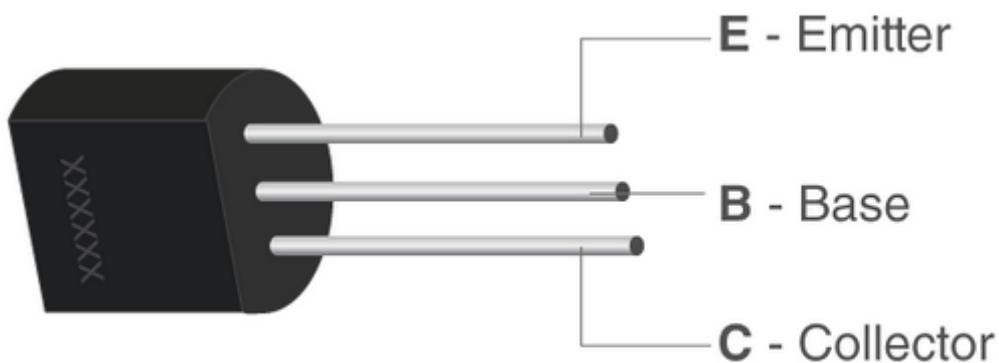


The most known are **LED's**: Light Emitting Diode



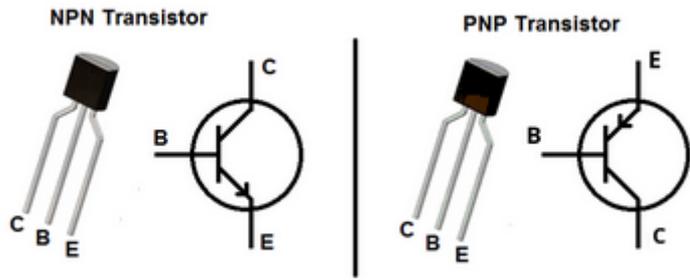
## Transistors

It is a semiconductor device used to **amplify or switch** electrical signals and power. It is composed of semiconductor material, usually with at least three terminals for connection to an electronic circuit. A voltage or current applied to one of the transistor's terminals (Base) controls the current through another pair of terminals (Collector and Emitter)



© Byjus.com

There are two main types of transistors depending on the sense of the controlled current: NPN and PNP



Information and images extracted from:

- [https://en.wikipedia.org/wiki/Electronic\\_component](https://en.wikipedia.org/wiki/Electronic_component)
- <https://en.wikipedia.org/wiki/Capacitor>
- <https://study.com/academy/lesson/capacitance-units-formula.html>
- [http://cmra.rec.ri.cmu.edu/products/electronicsv2/basic\\_components/what\\_is\\_an\\_led/1/vid1.html](http://cmra.rec.ri.cmu.edu/products/electronicsv2/basic_components/what_is_an_led/1/vid1.html)
- <https://simple.wikipedia.org/wiki/Transistor>
- <https://byjus.com/jee/transistor/>
- <https://shoptransmitter.com/blog/what-is-the-difference-between-pnp-and-npn/>

---

Revision #8

Created 13 January 2024 17:32:04 by Ana López Floría

Updated 7 March 2024 10:40:02 by Ana López Floría