

**ELECTRONICS**

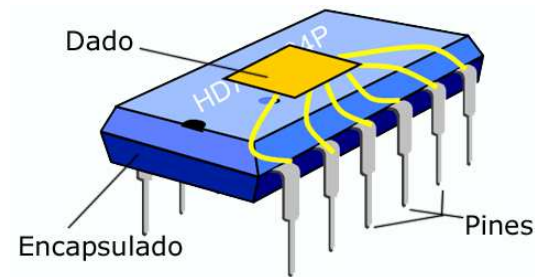
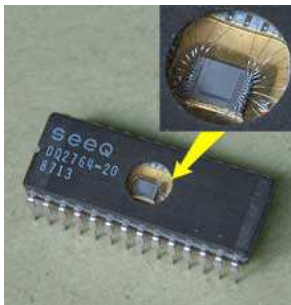
Electronics & Electricity. Electricity is the efficient use of electrical energy. Electronics is the control or decision in this use.

\* Discrete components → Individual

- Passive: Resistors, capacitors.
- Active: Semiconductors. Diode, Transistor, Integrated circuits.

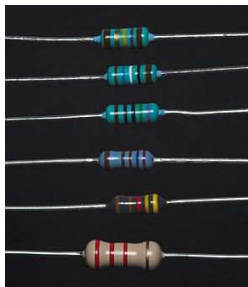
\* Integrated circuits

Complete circuits formed by passive and active components that are assembled in one small semiconductor block.



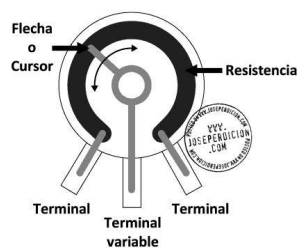
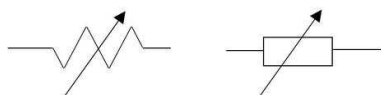
**Resistors**

- Fixed → Colour code.

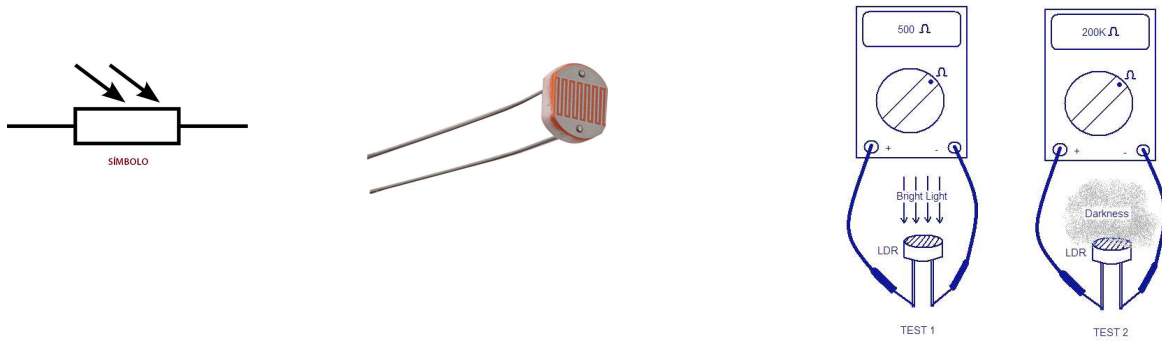


- Variable Resistors

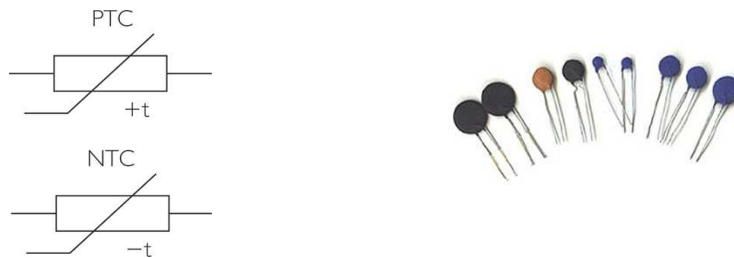
Potentiometer



**LDR (Light Dependent Resistor)**

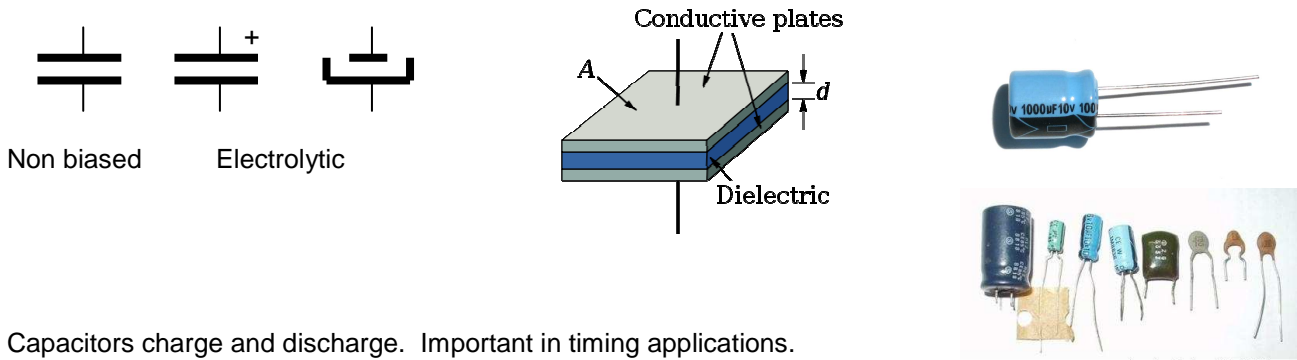


**NTC – PTC (Negative – Positive Temperature Coefficient)**



**Capacitors**

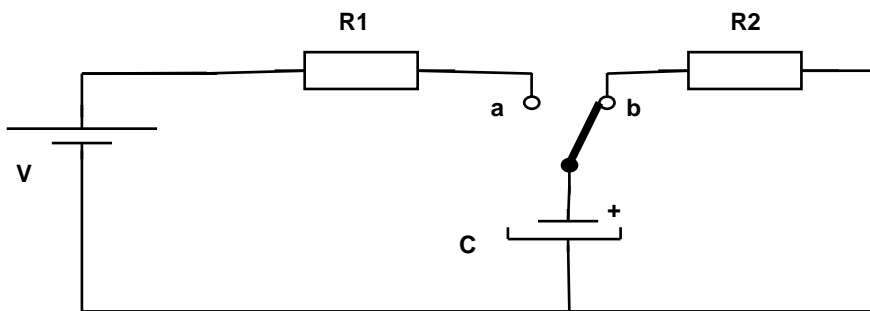
Capacitors → Components that store electric charge.



Capacitors charge and discharge. Important in timing applications.

$T_c = 3 \cdot R_1 \cdot C$

$T_d = 3 \cdot R_2 \cdot C$



$R_1 = 22K\Omega$

$R_2 = 470\Omega$

$C = 100\mu F$

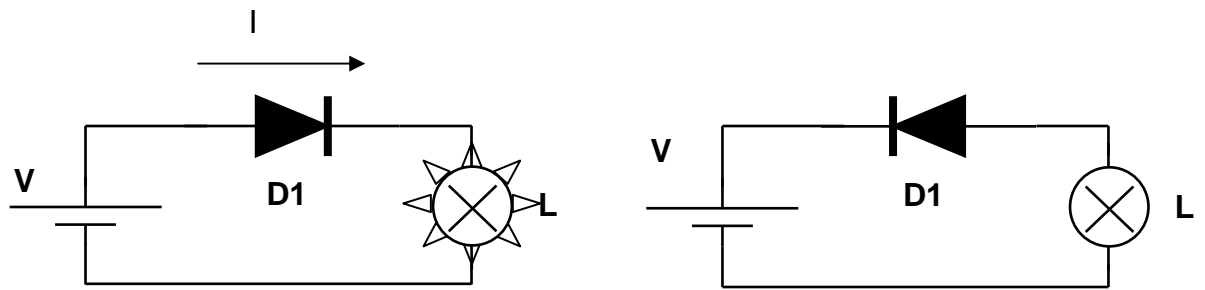
## Diodes

Diodes: Component that allow the current to flow only in one direction.

Construction by a P-N semiconductor junction

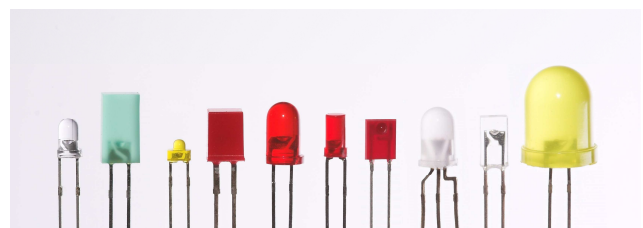
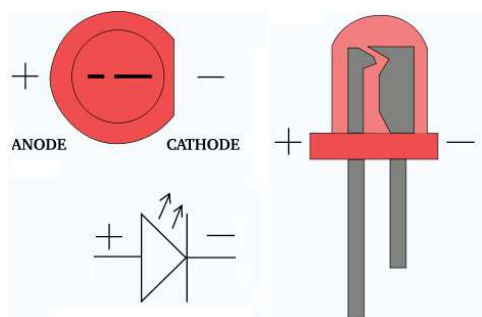


Performing



Voltage at diode terminals: between 0,2V – 0,8V. Normally 0,6V

Special Diode. LED (Light Emitter Diode)



Voltage at LED terminals: 2V

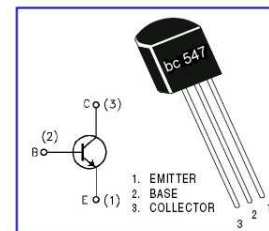
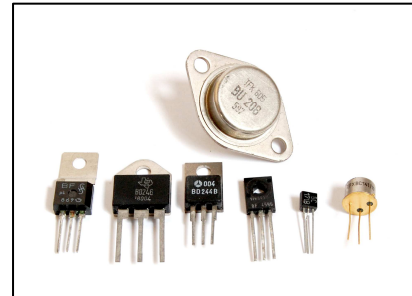
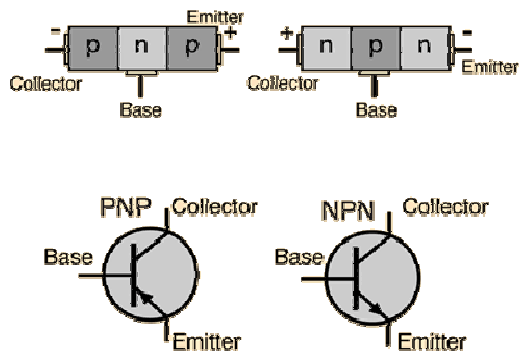
Applications: Automatic switch, rectifier, protection, ...

Circuits: Half-wave rectifier and Stand-by light.

## Transistor

\* Transistor. Is a component with 3 leads. One lead (Base) controls the current flow between the other 2 leads (Collector and Emitter).

Construction and Symbol:

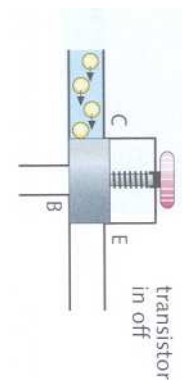


### 3 performing states of the transistor:

- Transistor in OFF state (Cut)

$$I_B = 0 \rightarrow I_C = 0 \rightarrow I_E = 0$$

It performs as an open switch between C and E



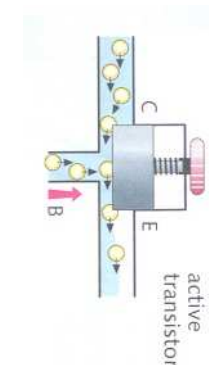
- Transistor in Active Region or Amplification

It performs as an amplifier

$$I_B = \text{some enough value} \neq 0$$

$$I_C = \beta \cdot I_B$$

$$I_E = I_C + I_B$$

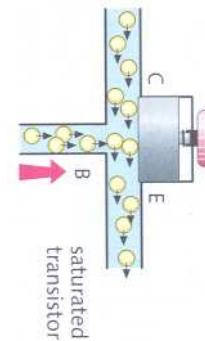


- Transistor in Saturation

$I_B$  is high  $\rightarrow I_C = \text{Max.} \rightarrow I_E = \text{Max.}$

It performs as a closed switch between C and E

Although  $I_B \uparrow \rightarrow I_C = \text{Max.} \rightarrow I_E = \text{Max.}$



Basic Circuit of a transistor performing in the 3 modes.

