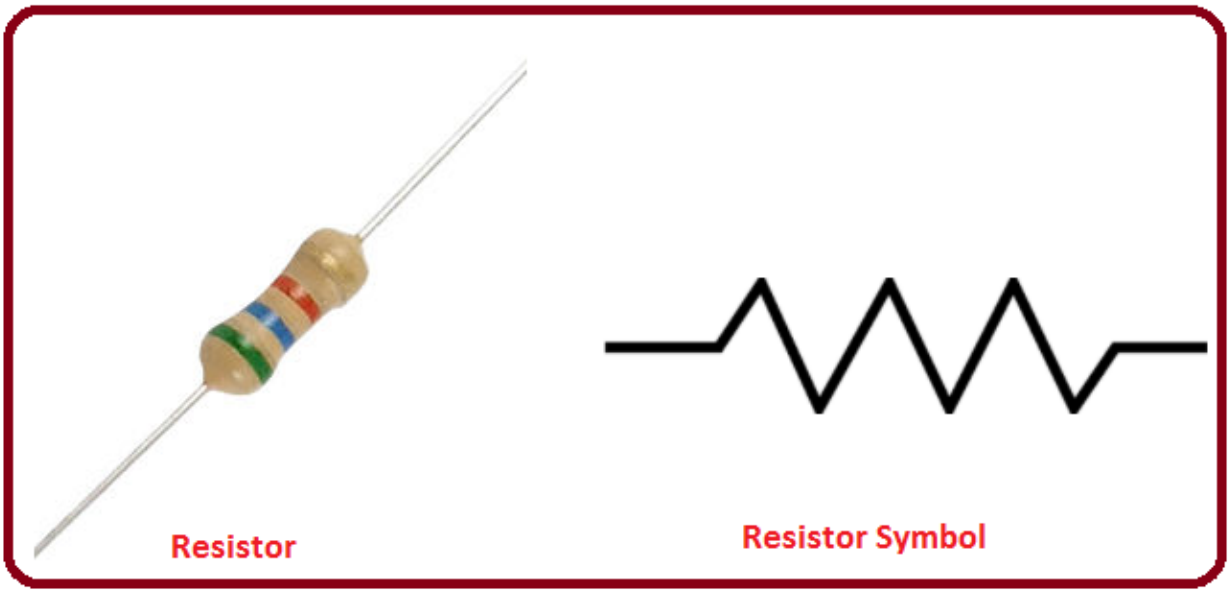
Electronic components are the building blocks of any electronic system, from a simple flashlight to a complex smartphone. They are generally classified into two main categories: **Active** and **Passive**.

Passive Components

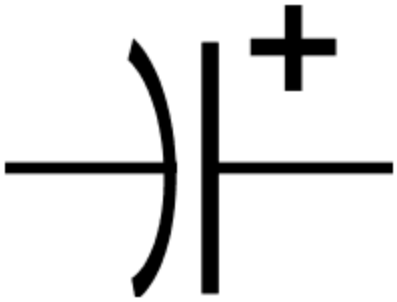
Passive components do not require an external power source to operate and cannot amplify signals; they only consume, store, or release energy.

- **Resistors:** Control the flow of electric current by providing resistance.



  - **Function:** Used to limit current, divide voltage, and protect other components.
  - **Types:** Fixed, variable (potentiometers), and specialized types like thermistors (temperature-sensitive).
- **Capacitors:** Store electrical energy in an electric field.

Capacitor



Capacitor Symbol

- **Function:** Useful for filtering noise from power supplies, creating time delays, and coupling or decoupling signals.
- **Types:** Polarized (electrolytic) and non-polarized (ceramic, polyester).

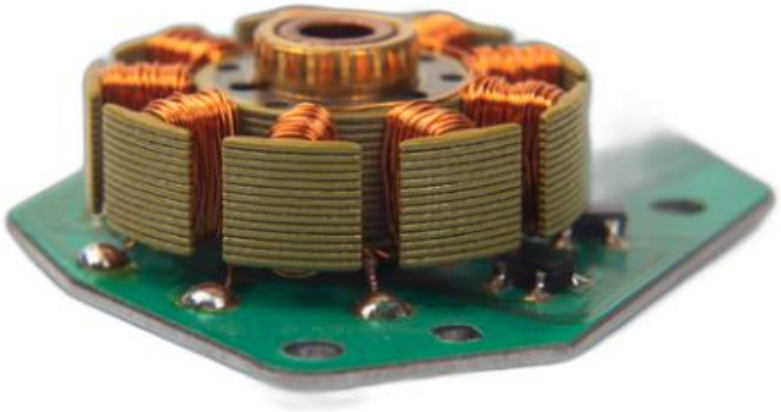
- **Inductors (Coils):** Store energy in a magnetic field when current flows through them.

Inductor

Inductor Symbol

- **Function:** Oppose changes in current and are primarily used in filters, chokes to block high-frequency noise, and power conversion circuits.

- **Transformers:** Transfer electrical energy between two or more circuits through electromagnetic induction.

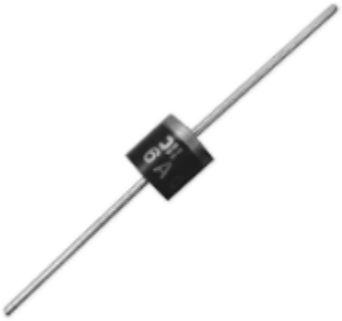


- **Function:** Primarily used to step up or step down AC voltage levels.

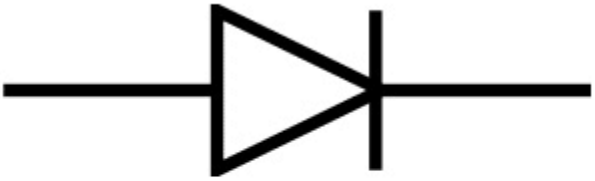
Active Components

Active components rely on an external power source and are capable of controlling electron flow, which allows them to amplify or switch signals.

- **Diodes:** Act as a one-way valve for electric current.



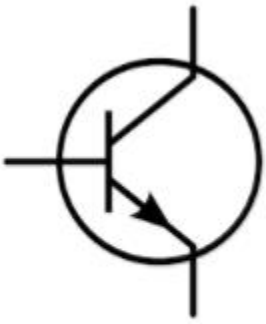
Diode



Diode Symbol

  - **Function:** Essential for rectification (converting AC to DC) and protecting circuits from reverse voltage.
  - **Common Types:** Light Emitting Diodes (LEDs) (emit light) and Zener diodes (regulate voltage).
- **Transistors:** The building blocks of modern electronics that can either amplify signals or act as a switch.

Transistor



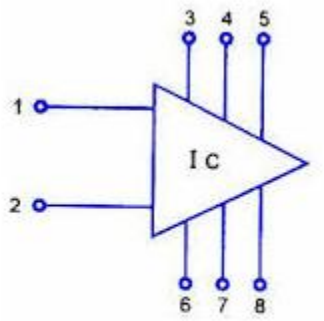
Transistor Symbol

  - **Types:** Bipolar Junction Transistors (BJT) and Field-Effect Transistors (FET/MOSFET).

- **Usage:** They are used in everything from simple radio amplifiers to the billions of gates inside a computer processor.

- **Integrated Circuits (ICs):** Miniature circuits that combine thousands or billions of components like transistors and resistors onto a single silicon chip.

IC



IC Symbol

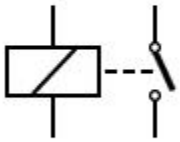
- **Examples:** Microprocessors, memory chips, and voltage regulators.

Supplementary Components:-

- **Switches:** Manually or electronically connect or disconnect the conducting path in a circuit.

- **Relays:** Electromechanical or solid-state switches operated by an electrical signal, often used to control high-power circuits with low-power signals.

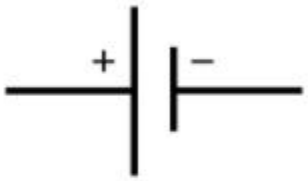
Relay



Relay Symbol

- **Batteries:** Convert stored chemical energy into electrical energy to provide portable power.

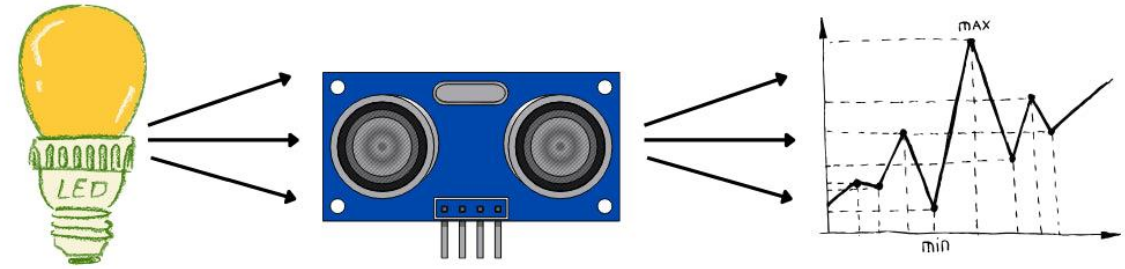
Battery



Battery Symbol

- **Sensors:** Detect environmental changes (like temperature or light) and convert them into electrical signals.

What is a Sensor?



Changes in Environment

Sensor

Electrical Signal