



Diode



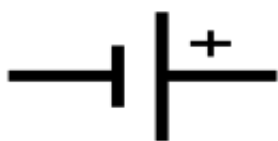
Capacitor



Inductor



Resistor



DC voltage
source



AC voltage
source



And gate



Nand gate



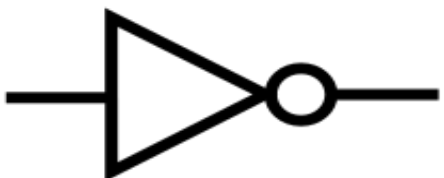
Or gate



Nor gate



Xor gate



Inverter
(Not gate)

Electronics components are categorized into two

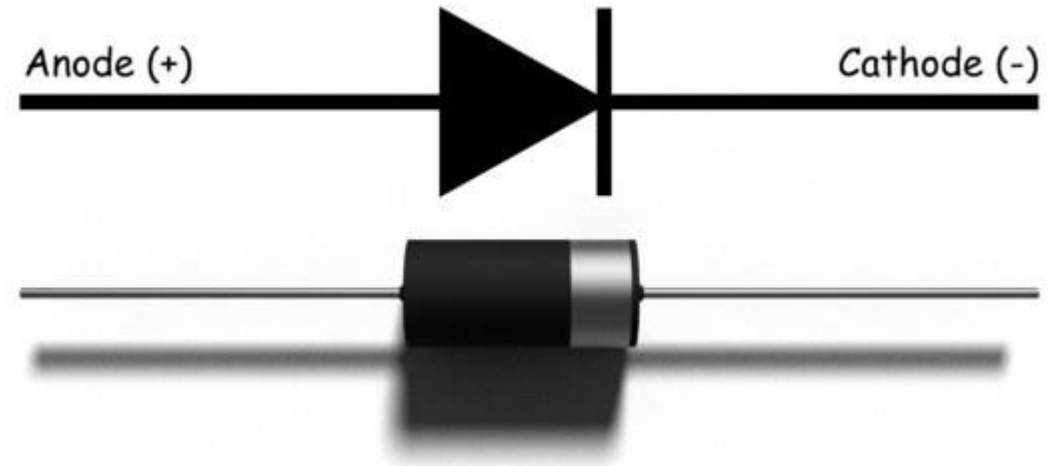
1. Active components

- diode
- Transistor
- Triac
- Diac
- Varactor

1. Passive components

- Resistor
- Capacitor
- Inductor

1. A **diode** is defined as a two-terminal electronic component that only conducts current in one direction (so long as it is operated within a specified voltage level). An ideal diode will have zero resistance in one direction, and infinite resistance in the reverse direction.
2. Diode is made from silicon or germanium



Types of Diodes

- 1.Light Emitting Diode
- 2.Laser diode
- 3.Avalanche diode
- 4.Zener diode
- 5.Schottky diode
- 6.Photodiode
- 7.PN junction diode

TYPES OF DIODES



Junction Diode



Zener Diode



Tunnel Diode



Schottky Diode



Varactor Diode



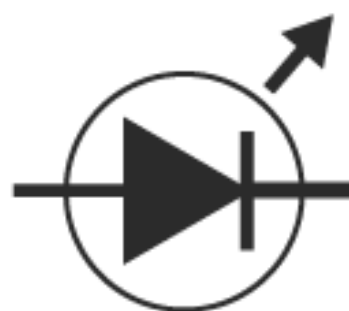
Diac



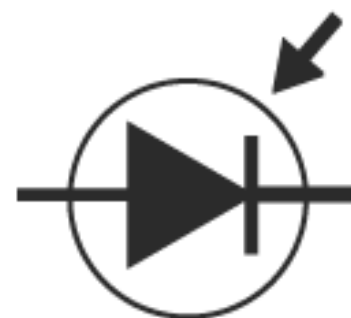
Triac



SCR



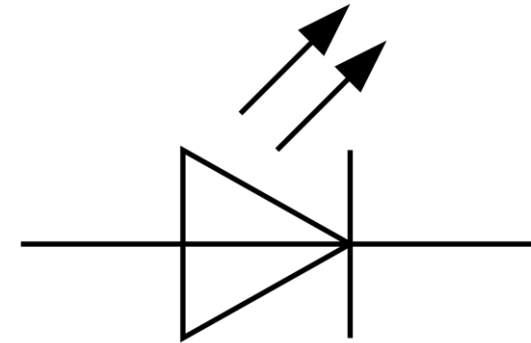
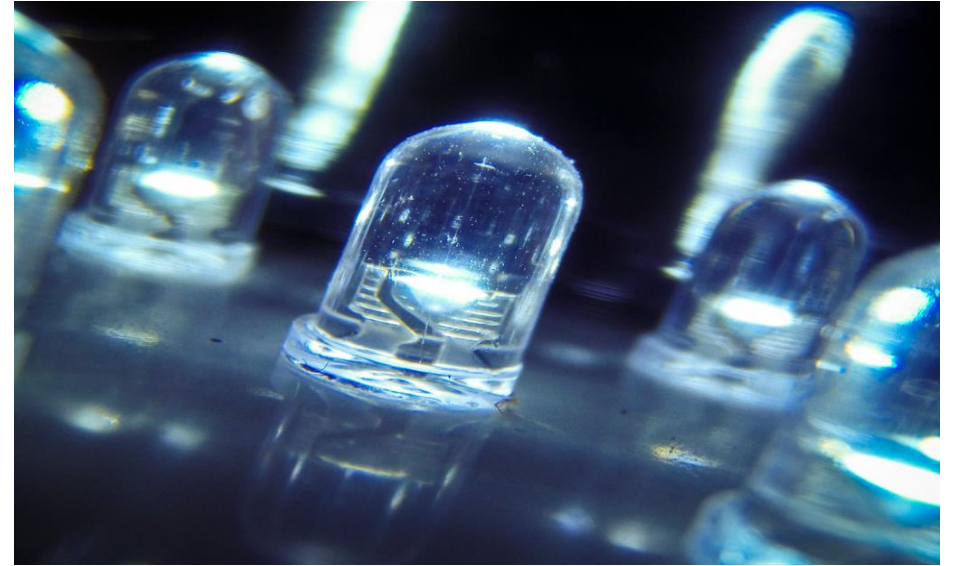
Light Emitting Diode (LED)

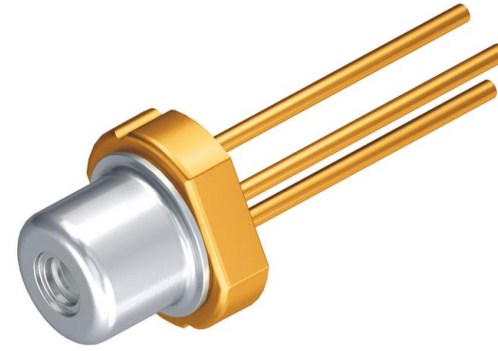


Photodiode

Light Emitting Diode (LED)

When an electric current between the electrodes passes through this diode, light is produced. In other words, light is generated when a sufficient amount of forwarding current passes through it. In many diodes, this light generated is not visible as there are frequency levels that do not allow visibility. LEDs are available in different colors. There are tricolor LEDs that can emit three colors at a time. Light color depends on the energy gap of the semiconductor used.





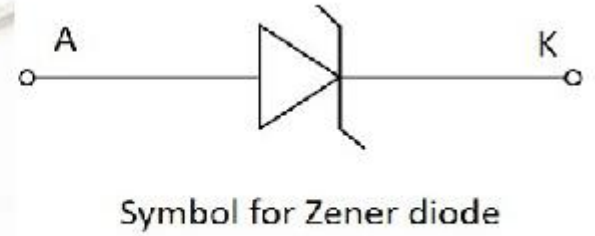
Laser Diode

It is a different type of diode as it produces coherent light. It is highly used in CD drives, DVDs and laser devices. These are costly when compared to LEDs and are cheaper when compared to other laser generators. Limited life is the only drawback of these diodes.



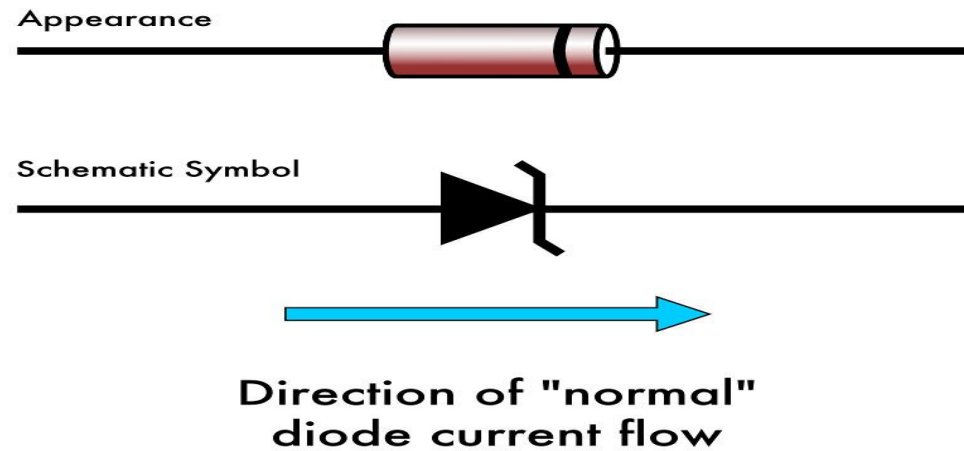
Avalanche Diode

This diode belongs to a reverse bias type and operates using the avalanche effect. When voltage drop is constant and is independent of current, the [breakdown of avalanche](#) takes place. They exhibit high levels of sensitivity and hence are used for photo detection.



Zener Diode

It is the most useful type of diode as it can provide a stable reference voltage. These are operated in reverse bias and break down on the arrival of a certain voltage. If current passing through the resistor is limited, a stable voltage is generated. Zener diodes are widely used in power supplies to provide a reference voltage.



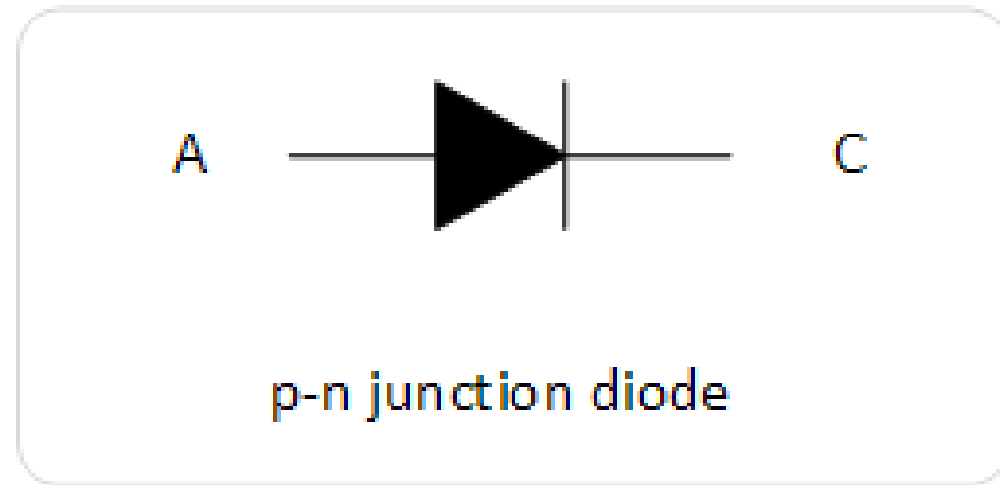
Schottky Diode

It has a lower forward voltage than other silicon PN junction diodes. The drop will be seen where there is low current and at that stage, voltage ranges between 0.15 and 0.4 volts. These are constructed differently in order to obtain that performance. Schottky diodes are highly used in rectifier applications.



Photodiode

A photo-diode can identify even a small amount of current flow resulting from the light. These are very helpful in the detection of the light. This is a reverse bias diode and used in solar cells and photometers. They are even used to generate electricity.



P-N Junction Diode

The P-N junction diode is also known as rectifier diodes. These diodes are used for the rectification process and are made up of semiconductor material. The P-N junction diode includes two layers of semiconductors. One layer of the semiconductor material is doped with P-type material and the other layer with N-type material. The combination of these both P and N-type layers form a junction known as the P-N junction. Hence, the name P-N junction diode.

Following are the applications and uses of the diode:

- Diodes as a rectifier
- Diodes in the clipping circuit
- Diodes in clamping circuits
- Diodes in logical gates
- Diodes in reverse current protection

What is a transistor? A transistor is a type of [semiconductor](#) device that can be used to conduct and insulate electric current or voltage. A transistor basically acts as a switch and an amplifier. In simple words, we can say that a transistor is a miniature device that is used to control or regulate the flow of electronic signals.



Bipolar Junction Transistor (BJT)

The three terminals of BJT are the base, emitter and collector. A very small current flowing between the base and emitter can control a larger flow of current between the collector and emitter terminal.

Furthermore, there are two types of BJT, and they include:

- N-P-N Transistor: In this transistor, we will find one p-type material that is present between two n-type materials. N-P-N transistor is basically used to amplify weak signals to strong signals. In an NPN transistor, the electrons move from the emitter to the collector region, resulting in the formation of current in the transistor. This transistor is widely used in the circuit.

- P-N-P Transistor: It is a type of BJT where one n-type material is introduced or placed between two p-type materials. In such a configuration, the device will control the flow of current. PNP transistor consists of 2 crystal diodes which are connected in series. The right side and left side of the diodes are known as the collector-base diode and emitter-base diode, respectively.

Field Effect Transistor (FET)

For FET, the three terminals are Gate, Source and Drain. The voltage at the gate terminal can control a current between the source and the drain. FET is a unipolar transistor in which N-channel FET or P-channel FET are used for conduction. The main applications of FETs are in low noise amplifiers, buffer amplifiers and analogue switches.

Advantages of Transistor

- Lower cost and smaller in size.
- Smaller mechanical sensitivity.
- Low operating voltage.
- Extremely long life.
- No power consumption.
- Fast switching.
- Better efficiency circuits can be developed.
- Used to develop a single integrated circuit.

Limitations of Transistors

Transistors have a few limitations, and they are as follows:

- Transistors lack higher electron mobility.
- Transistors can be easily damaged when electrical and thermal events arise. For example, electrostatic discharge in handling.
- Transistors are affected by cosmic rays and radiation.

Other Types

Apart from these, there are many other types of transistors which include MOSFET, JFET, insulated-gate bipolar transistor, thin-film transistor, high electron mobility transistor, inverted-T field-effect transistor (ITFET), fast-reverse epitaxial diode field-effect transistor (FREDFET), Schottky transistor, tunnel field-effect transistor, organic field-effect transistor (OFET), diffusion transistor, etc.

Passive components

What Is a Capacitor?

A **capacitor** is a device in which electrical energy can be stored. It is an arrangement of two conductors, generally carrying charges of equal magnitudes and opposite signs, and separated by an insulating medium. The non-conductive region can either be an electric insulator or vacuum, such as glass, paper or air, or a semi-conductor called a dielectric. Capacitors vary in shape and size, and they have many important applications in electronics.



What Are Capacitors Used for?

- Storing electric potential energy such as batteries.
- Filtering out unwanted frequency signals
- Delaying voltage changes when coupled with resistors.
- Used as a sensing device.
- Used in the audio system of the vehicle.
- Used to separate AC and DC.

Types of Capacitors

- **Parallel Plate Capacitor**
- **Spherical Capacitor**
- **Cylindrical Capacitor**

What is Resistor?

Resistor is defined as

A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

The main purpose of resistor is to reduce the current flow and to lower the voltage in any particular portion of the circuit. It is made of copper wires which are coiled around a ceramic rod and the outer part of the resistor is coated with an insulating paint.

Q1

What is a resistor?

Resistor is a passive two terminals electrical component used for limiting or regulating the flow of electricity in a circuit.

Q2

What is the SI unit of resistor?

The SI unit of resistor is Ohm.

Q3

What are the two types of resistors?

Two types of resistors are:

- Linear resistor
- Non-linear resistor

Q4

What are various types of non-linear resistors?

Different types of non-linear resistors are:

- Thermistors
- Varistors
- Photo resistors

Q5

Which type of resistor is used in photographic devices?

In the photographic devices, photoresistors are used.

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What Is an Inductor?

An inductor is a passive component that is used in most power electronic circuits to store energy in the form of magnetic energy when electricity is applied to it. One of the key properties of an inductor is that it impedes or opposes any change in the amount of current flowing through it. Whenever the current across the inductor changes, it either acquires charge or loses the charge in order to equalize the current passing through it. The inductor is also called a choke, a reactor or just a coil.



Different Types of Inductors

Depending on the type of material used, inductors can be classified as follows:

1. Iron Core Inductor

2. Air Core Inductor

3. Iron Powder Inductor

4. Ferrite Core Inductor, which is divided into:

- Soft Ferrite
- Hard Ferrite

Application of inductor

- 1.Filters:** Inductors are used with capacitors and resistors to create filters for analog circuits and signal processing.
- 2.Sensors:** Contact-less sensors rely on inductors for reliability and ease of operation.
- 3.Transformers:** Combining inductors with a shared magnetic path forms a transformer.
- 4.Motors:** Inductors play a role in motor circuits.
- 5.Energy Storage:** Inductors are used for energy storage

1

What is the value of the power factor for a pure inductor?

For a pure inductor, the power factor is zero.

Q2

What is self-induction?

The phenomenon in which an emf is induced in a coil due to the change of current through the coil itself is known as self-induction.

Q3

What is mutual induction?

The phenomenon in which a change of current in one coil induces an emf in another neighbouring coil is called mutual induction.

Q4

When is emf induced in a circuit?

An emf is induced in a circuit whenever there is a change in the magnetic flux passing through it.