# BASIC ELECTRONICS

The branch of science that deals with study of flow of electrons in semiconductor, vacuum, gas is called electrons.

Electronics is derived from the word electron and mechanics, electron mechanics which means electrons in motion under the influence of applied electric field .

The device which controls the flow of electrons is called electronic devices.

Electronics have various branches include, digital electronics , analog electronics ,microelectronics, nanoelectronics, optoelectronics, integrated circuit and semiconductor device.

Electronic devices are playing a major role in everyday life. The various electronics devices we use in everyday life include computers, calculators, mobile phones, ATM, pen drive, TV, Digital camera, microwave oven etc.

Electronic components

An electronic component is any component in an electronic system either active or passive.

| **Active electronic components** | **Passive electronic components** |
|---|---|
| • Active electronic components are those components that depends on external electric supply for its activation or operation. Ex:- diodes, transistors.<br><br>• Diodes and transistors Operates with minimum 0.7 voltage for Silicon. | • Passive electronic components are those components that does not depends on the external electric supply to operate. Ex:-Resistors, Inductors and Capacitors.<br><br>• The value of resistors in ohm, Inductors in henry and capacitors in farad will remain same even if external electric supply is applied. |

Let’s discuss about the passive components.

Passive electronic components

**Resistors**

Resistor is a passive electronic component that limits the flow of electric current.

It is measured in resistance. The unit of resistance is ohm( Ω).

A resistor generates electrical resistance which is represented as R in the circuit. Note a resistor is a electrical component and resistance is electrical parameter.

Resistors are divided into three groups:-

1. Fixed Resistors

2. Variable Resistors

3. Dependent Resistors

**Fixed Resistors**

Resistor is called a fixed resistor as its value remains same regardless of the voltage across it. It limits the current flow from one end to the other end as per its value, higher the resistance value lower the current flow across it.

The materials used in fixed resistors differ.

Electrical symbol of fixed resistor

Different types of fixed resistors:-

1. Carbon-composition Resistor

A carbon composition resistor is a type of fixed resistor that limits or reduces the electric current in a circuit. It is made of a solid cylindrical body of carbon mixed with clay or resin.

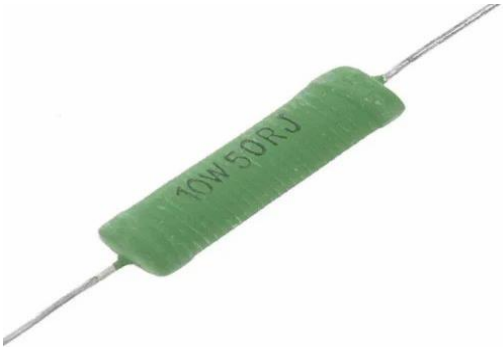
Carbon Composition Resistor

Applications:-It is widely used in DC power supplies.

2. Wire wound Resistor

A wire wound resistor is a type of fixed resistor that limits or restricts current flow in a circuit. Wire wound resistors are constructed using a conductive wire. The conductive wire is then wound around a non-conductive core.

The conductive wire can be made of varying alloys and thickness to control the resistance value.




Wire wound resistor

Applications:-Computers,electronic equipments etc.

3. Thin-film Resistor

Thin film resistors are a type of fixed resistor that possess a thin resistive layer sat on top of a ceramic base.

Thin film resistor

Application:- Radio receivers, computers etc.

4. Metal glaze resistor

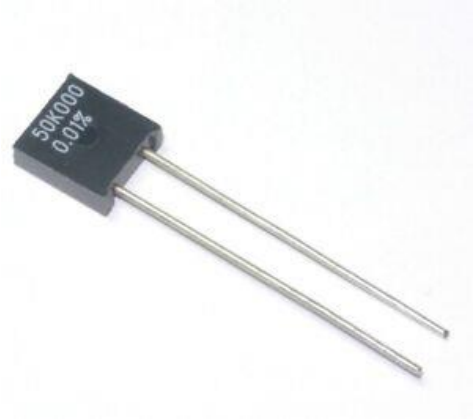
   The metal glaze resistor is a type of fixed resistor, which uses glass powder and metal particles mixture to limit the flow of electric current to certain level.

Metal glaze resistor

Application:-Household electrical appliances.

5. Foil resistor

   The foil resistor is type of fixed resistor that has high accurate and stable component used to restrict the electric current flow to certain level.
   The foil is made of an alloy of usually Nichrome (Nickel and Chromium) with additives.




Foil resistor

Application:-audio components, eletronic appliances etc

6. Sand cast Resistor
   The sand cast resistor is a type of fixed resistor,in which the molten metal is mixed with the sand mold that used to limit the flow of electric current.


Sand cast resistor

Application:-

7. Thick film resistor

   Thick film resistor is a type of fixed resistor that has thick film resistive layer over a ceramic base. The thick resistive layer is a mixture of glass and metal oxides.

Thick film resistor

Applications:- filter circuits, bridge circuits, and less noise analog signal circuits.

8. Precision Wire resistor

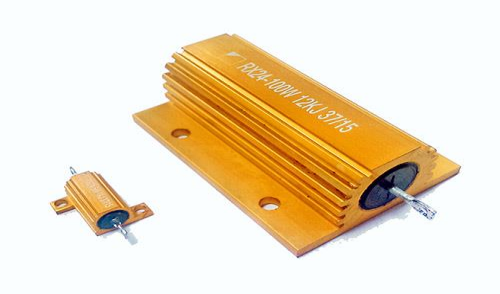
A wire precision resistor is a type of fixed resistor that is designed to provide precise and accurate resistance values.


Precision Wire resistor

Application:- T.V. receivers, voltmeters, multimeters etc.

9. Power Wire resistor

Power wire resistor is a type of fixed resistor,that is designed to dissipate large amount of power.



Power wire resistor

Applications:- power generation & distribution, control systems, power systems, and high-voltage applications.

**Variable Resistors**

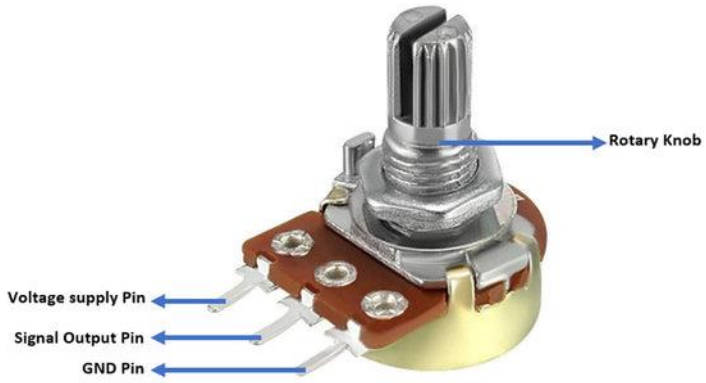
Variable resistor is a type of resistor whose resistance can be adjusted. Its resistance can varied from minimum to maximum resistance value in ohm.

Electrical symbol of variable resistor

Types of variable resistance:-

Potentiometer

A potentiometer is a three terminal variable resistor in which the resistance is manually adjusted by the knob. The element has two terminals attached to its ends and a third terminal attached to a movable wiper.




Potentiometer

Applications:-fan regulator circuit, radio and television (TV) receiver for volume control etc.

Trimpot

A trimmer potentiometer, also known as a **trim pot**, is a type of variable **resistor** or adjustable potentiometer that can adjust, tune, and calibrate circuits.

Trimpot

Application:- volume control knobs in radios, tuning circuits etc.

Rheostat

Rheostat is a type of variable resistor that is used to control a current by varying the resistance. It has two terminals, out of which one is fixed and the other one is a

moving terminal. Some rheostats have three terminals just like potentiometer, although only two terminals are used.

Rheostat

It is made up of a resistive element, typically a coil of wire, and a contact point that can be moved along the length of the element. By varying the position of the contact point, the resistance between the two points can be varied, which in turn will control the amount of current flowing.

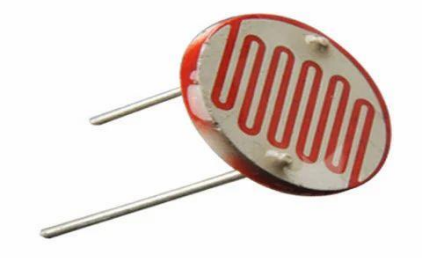
Applications:- variable resistive load, dimming device in lighting circuits etc.

**Dependent Resistors**

Depend on light(LDR)

An Light Dependent Resistance(LDR) is a variable resistor that has a (variable) resistance that changes with the light intensity that falls upon it. Its resistance decreases under the light and increases under the dark.

It is also called photoresistor.



Light Dependent Resistor

Electrical symbol of LDR

Applications:- Street lights, Light intensity meters etc.

Depend on temperature(PTC & NTC)

PTC stands for "Positive Temperature Coefficient". PTC thermistors are resistors with a positive temperature coefficient, which means that the resistance increases with increasing temperature.


PTC

Applications:-self-regulating heaters.

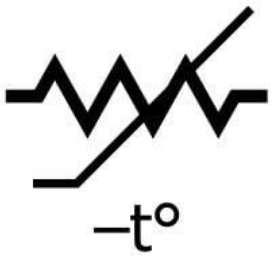
NTC

NTC stands for "Negative Temperature Coefficient". NTC thermistors are resistors with a negative temperature coefficient, which means that the resistance decreases with increasing temperature.

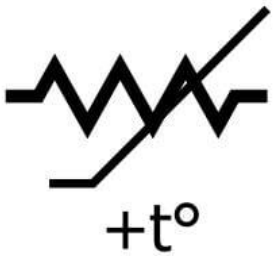

NTC

Applications:-temperature protection devices.

Electrical symbol




NTC




PTC

Depend on voltage(VDR)

A varistor is a voltage dependent resistor (VDR). The resistance of a varistor is variable and depends on the voltage applied. Their resistance decreases when the voltage increases.

Voltage dependent resistor

Applications:-cable TV surge protectors,telephone line,electronic equipment protection etc.