

1.1 BASIC ELECTRICAL COMPONENT

What is an Electric Circuit?

An Electric Circuit is a closed path for transmitting an electric current through the medium of electrical and magnetic fields. The flow of electrons across the loop constitutes the electric current. Electrons enter the circuit through the 'Source' which can be a battery or a generator. The source provides energy to the electrons, by setting up an electrical field which provides the electromotive force.

The electrons leave the circuit through the load, to the earth ground, thus completing a closed path. The load or output can be any simple home appliance like television, lamp, refrigerator, or can be a complex load such as that on a hydroelectric power generating station.

A simple electric circuit consists of a source (such as a battery), wires as conducting medium and a load (such as a light bulb). The battery provides required energy for flow of electrons, to the light bulb.

Basic Circuit Elements

As mentioned above in the introduction, a circuit is an interconnection of elements. These elements are classified into active or passive elements, based on their capability to generate energy.

Active Circuit Elements

Active Elements are those which can generate energy. Examples include batteries, generators, operational amplifiers and diodes. Note that in an electrical circuit, the source elements are the most significant active elements.

An energy source, whether a voltage or current source, is of 2 types – Independent and Dependent sources. Example of an Independent source is the battery which provides a constant voltage to the circuit, irrespective of the current flowing through the terminals.

Example of a dependent source is a transistor, which provides current to the circuit, depending upon the voltage applied to it. Another example is an Operational Amplifier, which provides voltage, depending upon the differential input voltage applied to its terminals.

Passive circuit Elements

Passive Elements can be defined as elements which can control the flow of electrons through them. They either increase or decrease the voltage. Here are some examples of passive elements.

Resistor: A resistor opposes the flow of current through it. For a linear circuit, Ohm's law is applicable, which states that voltage across the resistor is directly proportional to the current flowing through it, the proportional constant being the resistance.

Inductor: An inductor stores energy in form of the electromagnetic field. The voltage across an inductor is proportional to the rate of change of current flowing through it.

Capacitor: A capacitor stores energy in form of the electrostatic field. The voltage across a capacitor is proportional to the charge.

Inductor

An **inductor** is a passive electronic component which is capable of storing electrical energy in the form of magnetic energy. Basically, it uses a conductor that is wound into a coil, and when electricity flows into the coil from the left to the right, this will generate a magnetic field in the clockwise direction

Capacitor

A **capacitor** is a passive two-terminal electrical component that stores potential energy in an electric field. The effect of a capacitor is known as capacitance. ...Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy.

