



Introduction to Electric Circuits: Concepts and Types

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Description

Electric circuits are closed-loop or lines that connect electrical components to form a network through which electrons can flow. This path is built of electrical cables and is powered by an external source, such as a battery. The beginning of the point where electrons begin to flow is referred as the source, and the end of the point where electrons leave the electrical circuit is referred as the return.

The electric circuit made up of the combination of active and passive elements such as resistors, inductors, capacitors, diodes and transistors. In a closed-loop circuit, electrical current travels from the source (such as a battery), to the load (such as a light bulb), and then back to the source through conducting materials like wires and cables.

The first component of electric circuit is source such as battery, solar cell etc., and the second component is a device.

Types of Electric Circuits

- Series circuit
- Parallel circuit
- Open circuit
- Short circuit
- Series circuit

Series circuit is the circuit which two components share a common node and carry the same current. For all series circuits, there are three essential correlations between resistance, current, and voltage.

The total resistance is equal to the sum of all individual resistances in the series circuit.

$$R_t = R_1 + R_2 + R_3$$

The total voltage is equal to the sum of all the individual voltage drops in the series circuit.

$$E_T = E_1 + E_2 + E_3 \dots$$

The total current is the same as the current through any resistance of the circuit.

$$I_T = I_1 = I_2 = I_3 \dots$$

Parallel circuit

In a parallel circuit, the current is divided into branches so that just a portion of it flows through each branch. On the other hand, the basic principle of a "parallel" connection is that all components are connected across one another's leads. In a purely parallel circuit, there are never more than two sets of electrically common points. There are various paths for current to travel, but all components share a single voltage.

Open circuit

An open circuit is defined as an electric circuit in which no current flows through it. Current can only flow in a circuit if it finds a continuous path known as a "closed circuit". If the break occurs anywhere in the circuit then it acts as an open circuit.

The two terminals are disconnected in an open circuit. As a result, the continuity of the circuit is interrupted. While current cannot flow through the circuit, there is a voltage drop between two points in the circuit.

The current is inversely proportional to the voltage across the resistor.

Short circuit

A short circuit occurs when an electrical device is damaged due to a poor connection or a damaged wire or when there is low resistance connection between two conductors that supply power to a circuit. It will cause high voltages and over current flow

Short circuit due to ground fault: A ground fault is a sort of defect in which the stray electrical current passes unintentionally to the earth (ground). So the circuit is "short" in this case because it has bypassed the circuit wiring, a ground fault is technically a sort of short circuit.

Common short circuit: When a "hot" wire carrying live current touches a neutral wire, either directly or through arcing, the current jumps from the live wire to the neutral one, causing an electrical short circuit.

Conclusion

In conclusion, electric circuits are the backbone of modern electronics and technology. They are fundamental to the operation of many devices, from simple lighting circuits to complex computing systems. Circuit design and analysis are essential skills for engineers and technicians working in electronics and related fields. As technology continues to evolve, so too do electric circuits, with new materials, devices, and applications constantly being developed. However, the principles and fundamentals of electric circuits remain the same, and a solid understanding of these concepts is crucial for anyone working in electronics or related fields.