Insulators and capacitors

Electricity is the flow of electrons in a circuit. That's why such circuits are called **electronic**. Like water in a pipe, electricity can be made to flow in only one direction in a circuit. Or its **polarity** can be switched back and forth, alternately changing the direction of flow.

We call that one-way flow **direct current**.

The rapidly switching two-way flow is called **alternating current**.

direct current - **dc**

alternating current - **ac**

Insulators

1. Rubber
2. Glass
3. Mica
4. Paper
5. Wood
6. Plastic
7. Ceramics
8. Air
9. Others

Many materials are composed of **atoms** with a firm grip on their electrons. If such atoms don't allow electrons to flow easily, we think of the materials as **insulators**.

Even the air we breathe is a poor **conductor**. Materials which are non-conductors are called insulators.

Copper wire, on the other hand, is a good conductor since copper atoms require very little electromotive pressure to make electrons flow.

Conductors

1. Copper
2. Steel
3. Others

Steel also is a good conductor but requires more push to get electrons to flow. It is not as good a conductor as copper.

Why don't electrons spill out of wall sockets ?

The electric company puts 120 **volts** pressure into copper wires to your house. We find the flow of electrons they have generated at **electrical outlets** or wall sockets.

Non-conductors vs. poor conductors

There are no true **non** conductors. What we call insulators really are **poor** conductors. With extremely high voltage pressure, so-called non-conductors can be made to carry an electron flow.

Air is an insulator between the two sides of an outlet. That prevents current flow. **But** air is not always an insulator.

When a force of millions of **volts** builds up between sky and ground, it's large enough to send a bolt of electrons along the cloud-to-Earth circuit. Every insulator has a **break down** voltage beyond which it will start to conduct electricity.

Storage cans for electricity

A capacitor is one component in an electronic circuit. Think of it as two conductors separated by an insulator.

The conductors are called **plates**. Their size and spacing determine the amount of electrons you can store in a capacitor. That is, what its **capacitance** is.

Farads

We label the amount of capacitance as **farads**. The more capacitance, the more farads. Electronic circuits normally require only tiny amounts of capacitance, below one farad.

Common values of capacitors are in millionths of a farad or **microfarads**. Even smaller amounts are **pica farads**.

microfarads - **μfd**
picafarads - **pf**

Roadblocks to dc

Electrons flow through a circuit from one capacitor plate to the other. If there is only a one-way flow, as in dc, the capacitor quickly is charged to full capacity and no more current flows. The capacitor is a roadblock to dc.

On the other hand, as the direction of electron movement switches back and forth, as in ac, current can continue to flow.

Capacitors permit ac current to flow while blocking the flow of dc current.