A device that stores electrical energy

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In a way, a capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both store electrical energy. If you have read How Batteries Work, then you know that a battery has two terminals. Inside the battery, chemical reactions produce electrons on one terminal and the other terminal absorbs them when you create a circuit. A capacitor is much simpler than a battery, as it can''t produce new electrons -- it only stores them. A capacitor is so-called because it has the "capacity" to store energy.

In this article, we''ll learn exactly what a capacitor is, what it does and how it''s used in electronics. We''ll also look at the history of the capacitor and how several people helped shape its progress.

Capacitors can be manufactured to serve any purpose, from the smallest plastic capacitor in your calculator, to an ultra capacitor that can power a commuter bus. Here are some of the various types of capacitors and how they are used.

Inside a capacitor, the terminals connect to two metal plates separated by a non-conducting substance, or dielectric. You can easily make a capacitor from two pieces of aluminum foil and a piece of paper (and some electrical clips). It won''t be a particularly good capacitor in terms of its storage capacity, but it will work.

In theory, the dielectric can be any non-conductive substance. However, for practical applications, specific materials are used that best suit the capacitor''s function. Mica, ceramic, cellulose, porcelain, Mylar, Teflon and even air are some of the non-conductive materials used. The dielectric dictates what kind of capacitor it is and for what it is best suited. Depending on the size and type of dielectric, some capacitors are better for high-frequency uses, while some are better for high-voltage applications.

When you connect a capacitor to a battery, here''s what happens:

Once it''s charged, the capacitor has the same voltage as the battery (1.5 volts on the battery means 1.5 volts on the capacitor). For a small capacitor, the capacity is small. But large capacitors can hold quite a charge. You can find capacitors as big as soda cans that hold enough charge to light a flashlight for a minute or more.

Even nature shows the capacitor at work in the form of lightning. One plate is the cloud, the other plate is the ground and the lightning is the charge releasing between these two "plates." Obviously, a capacitor that large can hold a huge charge!

Here you have a battery, a light bulb and a capacitor. If the capacitor is pretty big, what you will notice is that, when you connect the battery, the light bulb will light up as current flows from the battery to the capacitor to charge it up. The bulb will get progressively dimmer and finally go out once the capacitor reaches its capacity.

If you then remove the battery and replace it with a wire, current will flow from one plate of the capacitor to the other. The bulb will light initially and then dim as the capacitor discharges, until it is completely out.

In the next section, we"ll learn more about capacitance and take a detailed look at the different ways that capacitors are used.

A capacitor"s storage potential, or capacitance, is measured in units called farads. A 1-farad capacitor can store one coulomb (coo-lomb) of charge at 1 volt. A coulomb is 6.25e18 (6.25 * 10^18, or 6.25 billion billion) electrons. One amp represents a rate of electron flow of 1 coulomb of electrons per second, so a 1-farad capacitor can hold 1 amp-second of electrons at 1 volt.

A 1-farad capacitor would typically be pretty big. It might be as big as a can of tuna or a 1-liter soda bottle, depending on the voltage it can handle. For this reason, capacitors are typically measured in microfarads (millionths of a farad).