

CAPACITOR & CAPACITANCE - TYPES

Capacitor types

Listed by di-electric material.

- A 12 pF 20 kV fixed vacuum capacitor **Vacuum** : Two metal, usually copper, electrodes are separated by a vacuum. The insulating envelope is usually glass or ceramic. Typically of low capacitance - 10 - 1000 pF and high voltage, up to tens of kilovolts, they are most often used in radio transmitters and other high voltage power devices. Both fixed and variable types are available. Vacuum variable capacitors can have a minimum to maximum capacitance ratio of up to 100, allowing any tuned circuit to cover a full decade of frequency. Vacuum is the most perfect of dielectrics with a zero loss tangent. This allows very high powers to be transmitted without significant loss and consequent heating.
- **Air** : Air dielectric capacitors consist of metal plates separated by an air gap. The metal plates, of which there may be many interleaved, are most often made of aluminium or silver-plated brass. Nearly all air dielectric capacitors are variable and are used in radio tuning circuits.
- **Metallized plastic film**: Made from high quality polymer film (usually polycarbonate, polystyrene, polypropylene, polyester (Mylar), and for high quality capacitors polysulfone), and metal foil or a layer of metal deposited on

surface. They have good quality and stability, and are suitable for timer circuits. Suitable for high frequencies.

- **Mica:** Similar to metal film. Often high voltage. Suitable for high frequencies. Expensive. Excellent tolerance.
- **Paper:** Used for relatively high voltages. Now obsolete.
- **Glass:** Used for high voltages. Expensive. Stable temperature coefficient in a wide range of temperatures.
- **Ceramic:** Chips of alternating layers of metal and ceramic. Depending on their dielectric, whether Class 1 or Class 2, their degree of temperature/capacity dependence varies. They often have (especially the class 2) high dissipation factor, high frequency coefficient of dissipation, their capacity depends on applied voltage, and their capacity changes with aging. However they find massive use in common low-precision coupling and filtering applications. Suitable for high frequencies.
- **Aluminum electrolytic:** Polarized. Constructionally similar to metal film, but the electrodes are made of etched aluminium to acquire much larger surfaces. The dielectric is soaked with liquid electrolyte. They can achieve high capacities but suffer from poor tolerances, high instability, gradual loss of capacity especially when subjected to heat, and high leakage. Tend to lose capacity in low temperatures. Bad frequency characteristics make them unsuited for high-frequency applications. Special types with low equivalent

series resistance are available.

- **Tantalum electrolytic:** Similar to the aluminum electrolytic capacitor but with better frequency and temperature characteristics. High dielectric absorption. High leakage. Has much better performance at low temperatures.
- **OS-CON** (or OC-CON) capacitors are a polymerized organic semiconductor solid-electrolyte type that offer longer life at higher cost than standard electrolytics.
- **Supercapacitors:** Made from carbon aerogel, carbon nanotubes, or highly porous electrode materials. Extremely high capacity. Can be used in some applications instead of rechargeable batteries.
- **Gimmick capacitors** are capacitors made from two insulated wires that have been twisted together. Each wire forms a capacitor plate. Gimmick capacitors are also a form of variable capacitor. Small changes in capacitance (20 percent or less) are obtained by twisting and untwisting the two wires.
- **Varactors** or **varicap** capacitors are specialized, reverse-biased diodes whose capacitance varies with voltage. Used in phase-locked loops, amongst other applications.

Source: <http://www.juliantrubin.com/encyclopedia/electronics/capacitor.html>