

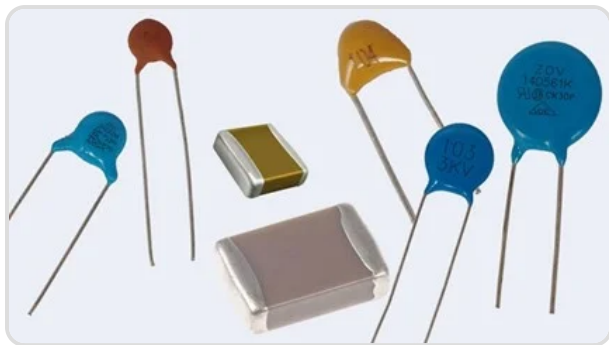
Electrolytic Capacitor vs Ceramic Capacitor

Electrolytic Capacitor



Commonly used for higher capacitance needs in power supply circuits.

Ceramic Capacitor



Preferred in high-frequency circuits and smaller applications.

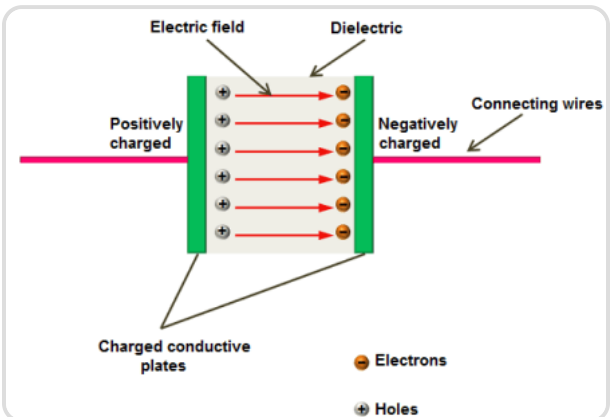
Property	Description
Capacitance Range	Typically 1 μF to 1 F
Voltage Rating	Low to medium (up to 450V)
Polarity	Polarized (has specific positive and negative terminals)
Applications	Power supplies, audio, and filtering

Property	Description
Capacitance Range	Typically pF to μF
Voltage Rating	Low to high (up to several kV)
Polarity	Non-polarized (can be connected in any direction)
Applications	Decoupling, bypassing, and timing circuits

Electrolytic Capacitor Overview

Capacitor Overview

Electrolytic capacitors are mainly used when high charge storage in a small volume is required. In these capacitors, the electrolyte acts as one of the electrodes. A basic capacitor consists of two conductive plates separated by a dielectric. This structure allows it to store electric charge.



Electrolytic Capacitor Definition

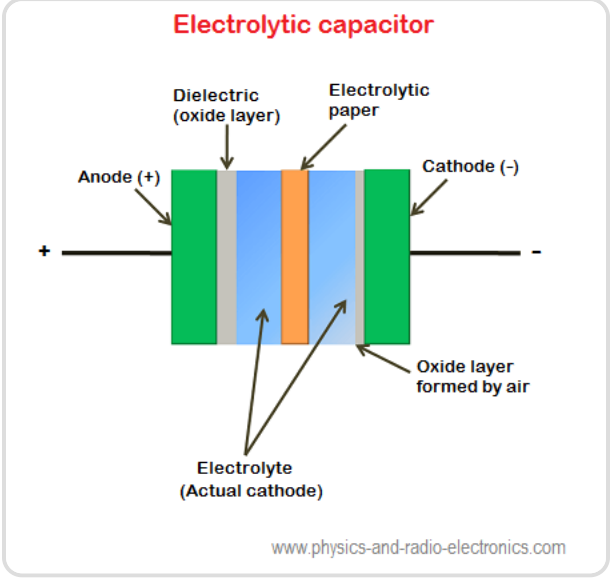
An electrolytic capacitor is a type of capacitor that uses an electrolyte to achieve a larger capacitance. Electrolytes are liquids that carry electric current via ions, including anions and cations.

Types of Electrolytic Capacitors

- Aluminum electrolytic capacitors
- Tantalum electrolytic capacitors
- Niobium electrolytic capacitors

Aluminum Electrolytic Capacitor

Constructed using two aluminum foils, an aluminum oxide layer, and an electrolyte-soaked paper, these capacitors provide high capacitance with thin dielectric layers and large electrode surface areas.



Capacitance Formula

The total capacitance of an electrolytic capacitor can be calculated with a series formula, where:

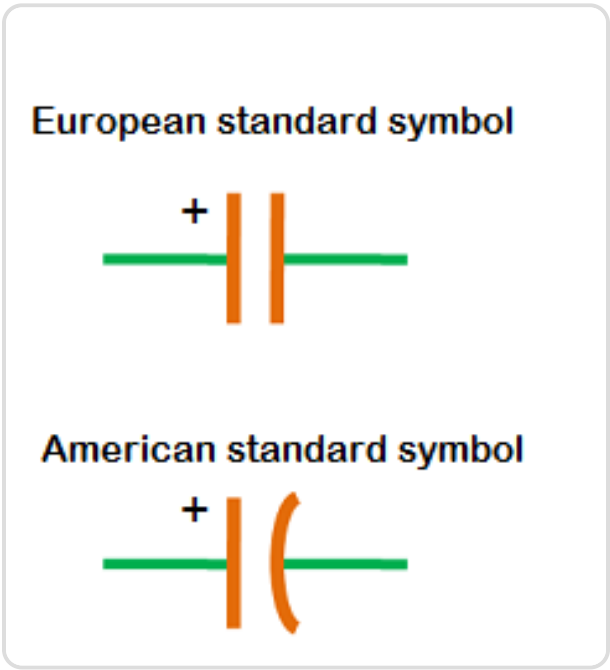
- CA = Capacitance of anode
- CK = Capacitance of cathode
- Cecap = Total capacitance

$$C_{ecap} = \frac{C_A.C_K}{C_A+ C_K}$$

Temperature Dependency

The capacitance of an electrolytic capacitor is temperature-sensitive, increasing with temperature. Most are polarized and must follow polarity markings.

Symbol of Electrolytic Capacitor



The symbol includes a plus or minus sign indicating polarity, which must be followed to avoid damage.

Advantages and Disadvantages

Advantages	Disadvantages
High charge storage	Large leakage current
Low cost	Short lifetime

Applications

- Filters
- Time constant circuits

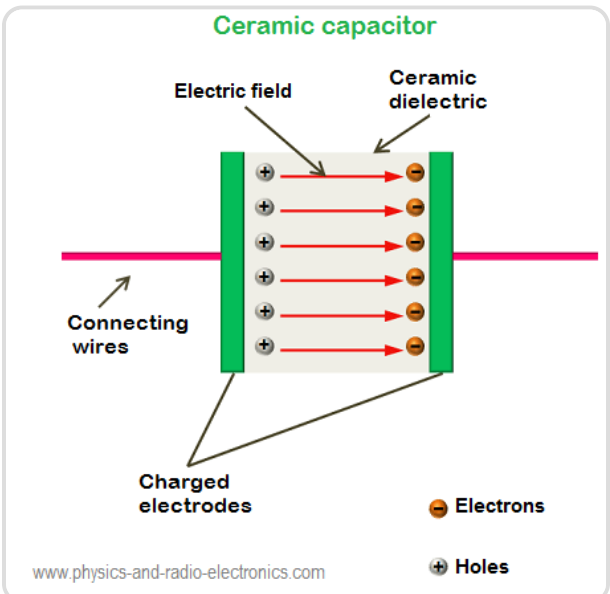
Ceramic Capacitor Overview

Ceramic Capacitors

Ceramic capacitors are widely used in electronic circuits for their small physical size and large charge storage. The technique used to store electric charge is similar across all capacitors, but the construction material differs.

Construction of Ceramic Capacitor

In ceramic capacitors, ceramic material serves as the dielectric, while conductive metals form the electrodes. Ceramic's insulating properties make it ideal for dielectric material.

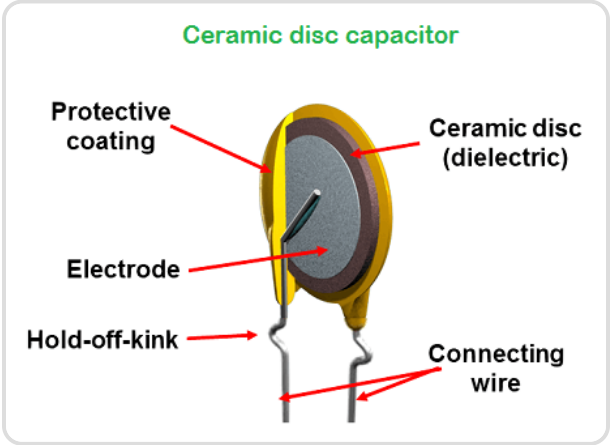


Different Shapes of Ceramic Capacitors

- Ceramic disc capacitor
- Ceramic tubular capacitor
- Multilayer ceramic capacitor (MLCC)

Ceramic Disc Capacitor

These capacitors are made by coating both sides of a ceramic disc with silver. A protective coating is applied for durability. Capacitance depends on the disc area and electrode spacing.

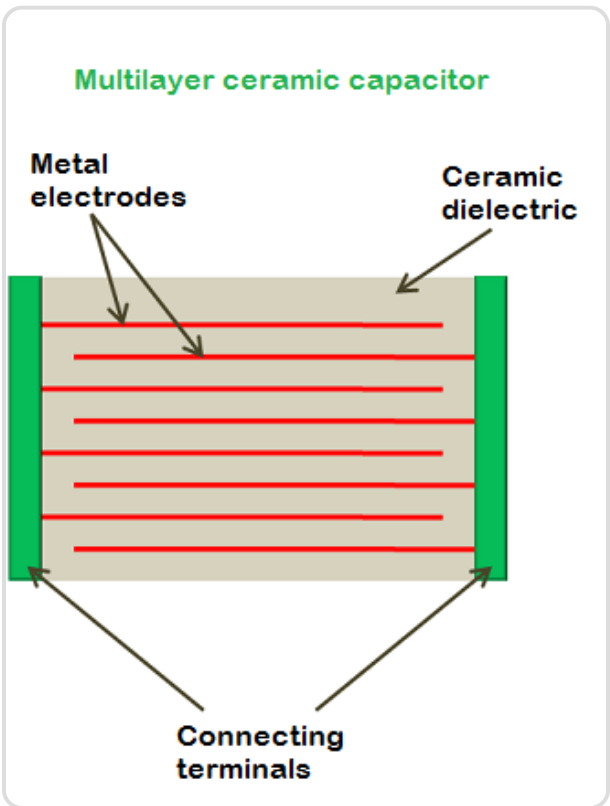


Ceramic Tubular Capacitor

This hollow cylindrical capacitor uses a ceramic material coated with silver ink as electrodes. It's effective for high-frequency applications.

Multilayer Ceramic Capacitor (MLCC)

MLCCs consist of alternating layers of ceramic and electrodes, enabling high capacitance in a small volume. Total capacitance equals the capacitance per layer times the number of layers.



Applications of Ceramic Capacitors

- Tone compensation
- Automatic volume control filtering
- Antenna coupling
- Resonant circuits
- Volume control RF bypass
- Lighting ballasts

Advantages of Ceramic Capacitors

- High stability
- Low losses
- High capacitance
- Small size

