

Capacitors and Capacitor Circuits

Capacitors and Capacitor Circuits

1. Introduction

- A capacitor is a component that stores energy in an electric field.
- It consists of two conductive plates separated by an insulating dielectric.

2. Capacitor Basics

- **Capacitance:** the ability to store charge, measured in farads.
- Capacitance increases with plate area and decreases with plate separation.
- The dielectric material affects the stored charge.

3. Charging and Discharging

- A capacitor charges through a resistor following an exponential curve.
- **Time constant:** equals resistance multiplied by capacitance, setting the charge rate.
- It blocks steady DC but allows changing AC signals to pass.

4. Capacitor Networks

- **Parallel capacitors:** total capacitance equals the sum of values.
- **Series capacitors:** reciprocal of total equals the sum of reciprocals.
- Series connections share charge while parallel share voltage.

5. Applications

- Smoothing and filtering in power supplies.
- Coupling and decoupling signals in amplifiers.
- Timing circuits and energy storage.