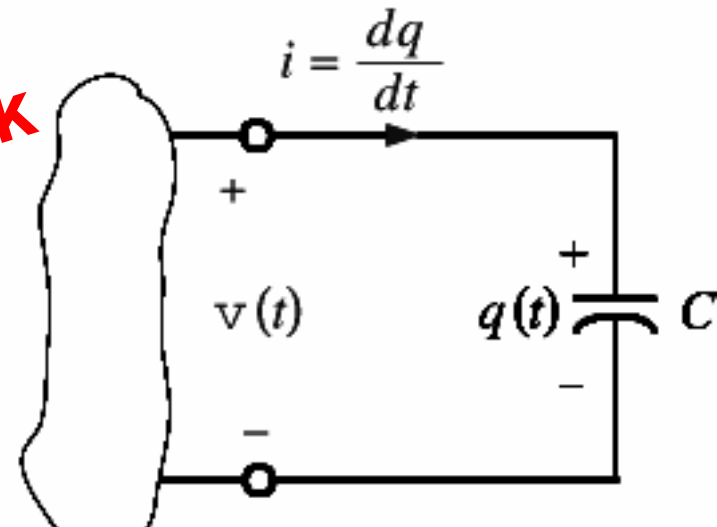
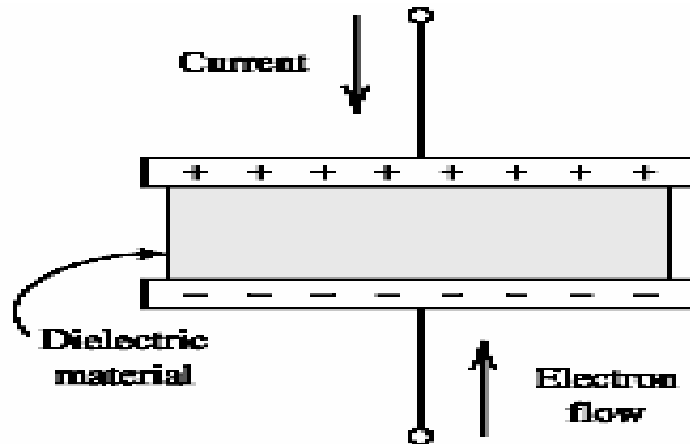


# Typical Capacitors



Circuit Representation

Passive Sign Convention



As current flows through a capacitor, charges of opposite sign collect on the respective plates

- Normal values of capacitance are small
- Microfarads ( $\mu\text{F}$ ) is common



# Capacitance

C is called the Capacitance of the device and has units of

$\frac{\text{charge}}{\text{voltage}}$

One Farad (F) is the capacitance of a device that can store one Coulomb of charge at one Volt

$$\text{Farad} = \frac{\text{Coulomb}}{\text{Volt}}$$

$$\Rightarrow C = \frac{Q}{V_C} \Rightarrow V_C = \frac{Q}{C} \Rightarrow Q = CV_C$$

Capacitors could be dangerous !!!

EXAMPLE

Voltage across a capacitor of 2 micro Farads holding 10mC of charge

$$V_C = \frac{1}{C} Q = \frac{1}{2 * 10^{-6}} 10 * 10^{-3} = 5000 \text{ V}$$



# Current - Voltage Relationships

Recall that:

$$q(t) = \int_{t_0}^t i(t) dt + q(t_0) \implies i(t) = \frac{dq(t)}{dt}$$

But

$$q = Cv$$

$$\implies i = C \frac{dv}{dt}$$

If  $v$  is constant

$$\rightarrow i = 0$$

DC or steady state behavior

A capacitor in steady state acts as an  
OPEN CIRCUIT

$$v(t) = \frac{1}{C} \int_{t_0}^t i(t) dt + v(t_0)$$

