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Capacitors Energy Stored

Capacitor - Energy Stored

The work done in establishing the electric field in a capacitor, and hence the amount of energy stored - can be expressed as

$W = 1/2\ C\ V^2$ (1)

where

W = energy stored - or work done in establishing the electric field (joules, J)

C = capacitance *(farad, F, μF)*

V = potential difference (voltage, V)

Capacitor - Power Generated

Since power is energy dissipated in time - the potential power generated by a capacitor can be expressed as

$P = dW / dt$ (2)

where

P = potential power (watts, W)

dt = dissipation time (s)

Example - Capacitor, energy stored and power generated

The energy stored in a *10 μF* capacitor charged to *230 V* can be calculated as

$W = 1/2\ (10\ 10^{-6}\ F)\ (230\ V)^2$

$= \underline{0.26}\ J$

in theory - if this energy is dissipated within *5 μs* the potential power generated can be calculated as

$P = (0.26\ Joules) / (5\ 10^{-6}\ s)$

$= \underline{52000}\ W$

$= \underline{52}\ kW$

Be aware that in any real circuit, discharge starts at a peak value and declines. The energy dissipated is a very rough average power over the discharge pulse.

Capacitor - Time to Discharge at Constant Power Load

The time to discharge a capacitor at constant power load can be expressed as

$dt = 1/2\ C\ (V_s^2 - V_f^2) / P$ (3)

where

dt = discharge time (s)

V_s = *start voltage (V)*

V_f = *final voltage (V)*