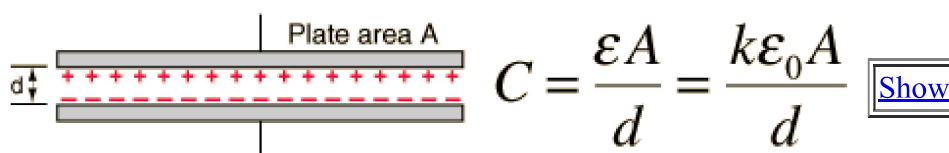


Parallel Plate Capacitor



The [capacitance](#) of flat, parallel metallic plates of area **A** and separation **d** is given by the expression above where:

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ F / m} = \text{permittivity of space and}$$

k = relative permittivity of the [dielectric](#) material between the plates.

k=1 for free space, k>1 for all media, approximately =1 for air.

The Farad, F, is the SI unit for capacitance, and from the [definition of capacitance](#) is seen to be equal to a Coulomb/Volt.

Any of the active parameters in the expression below can be calculated by clicking on it. Default values will be provided for any parameters left unspecified, but all parameters can be changed. After editing data, you must click on the desired parameter to calculate; values will not automatically be forced to be consistent.

$$\text{Capacitance} = \underline{k} \times \epsilon_0 \times \underline{\text{area}} / \underline{\text{separation}}$$

For parallel plates of area A = m² and separation d = m, with relative permittivity k= , the capacitance is

$$C = \text{ } \mu\text{F} = \text{ } \times 10^{\text{}} \text{ F} = \text{ } \text{ pF}$$

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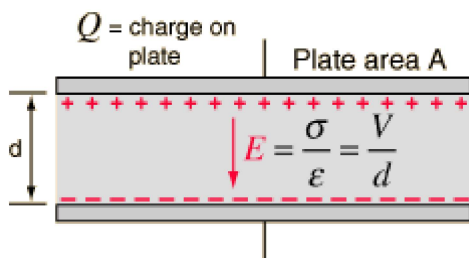
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Capacitance of Parallel Plates

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The [electric field](#) between two large parallel plates is given by

$$E = \frac{\sigma}{\epsilon} \quad \text{where } \sigma = \text{charge density}$$

$$\text{and } \sigma = \frac{Q}{A} \quad \epsilon = \text{permittivity}$$

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The [voltage](#) difference between the two plates can be expressed in terms of the [work](#) done on a positive test charge q when it moves from the positive to the negative plate.

$$V = \frac{\text{work done}}{\text{charge}} = \frac{Fd}{q} = Ed$$

It then follows from the definition of [capacitance](#) that

$$C = \frac{Q}{V} = \frac{Q}{Ed} = \frac{Q\epsilon}{\sigma d} = \frac{QA\epsilon}{Qd} = \frac{A\epsilon}{d}$$

[Calculation](#) [Effect of dielectric](#) [What is the dielectric constant?](#)