1. Capacitance of capacitors

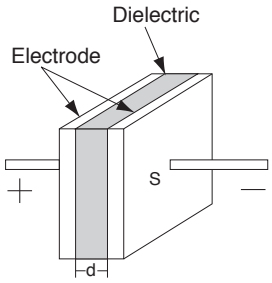


Fig1 Basic structure of capacitor

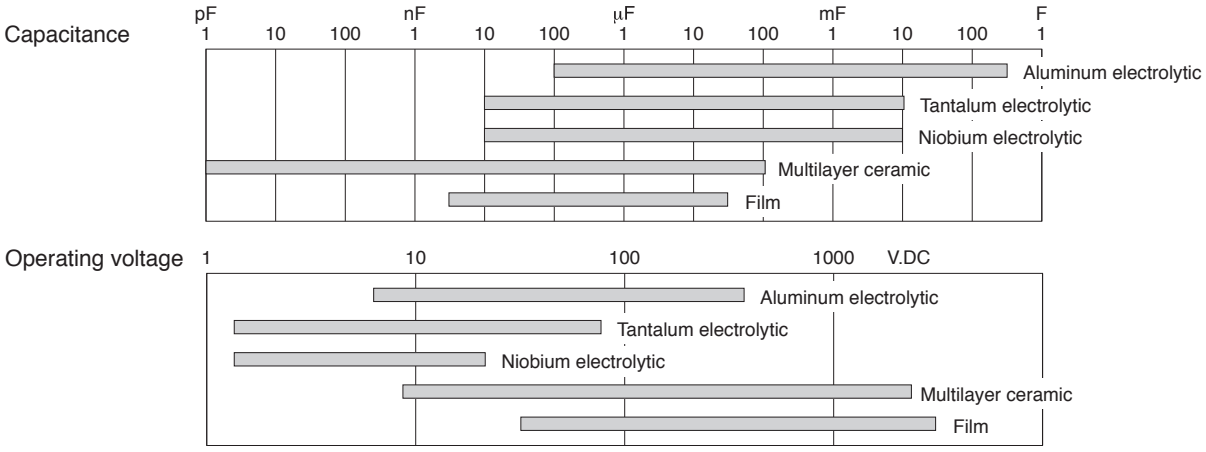
A capacitor is so designed that a dielectric is sandwiched between two electrodes as shown in Fig. 1. The capacitance (C) is expressed as:

$$C = \varepsilon \frac{S}{d} \qquad \varepsilon = \varepsilon_r \varepsilon_o$$

ε_r : specific dielectric constant. ε_o : dielectric constant of vacuum (8.85×10^{-12}F/m)

d : distance between electrodes (m). S : electrode surface (m^2)

2. Ranges of capacitance and operating voltage of various capacitors



3. Characteristics of various capacitors

	Aluminum	Film	Tantalum	Niobium	Ceramic
Dielectric	Aluminum oxide (Al_2O_3)	Polyester, polypropylene, etc.	Tantalum pentoxide (Ta_2O_5)	Niobium pentoxide (Nb_2O_5)	Based on barium titanate, etc.
Specific dielectric constant	8～10	2.1～3.1	27	41	1500～15000 (barium titanate)
Shape	Screw terminal type, Snap mount type, Radial type, chip type	Dip type (main power), For SMD. case type	Chip type (main power) Dip type	Chip type	Chip type (main power), dip type
Advantages	• Cheap • Small-size and large-capacity	• Good characteristics • Can be made for low- to high-voltage applications • High reliability	• Small and comparatively large capacitance • Semi-permanent service life	• Small and comparatively large capacitance • Semi-permanent service life	• Small-size (particularly multilayer types) • No polarity
Disadvantages	• Short service life in hot environment • Large capacitance tolerance • Polarity	• Large outside dimensions	• To be used with some voltage leeway • Polarity	• To be used with some voltage leeway • Polarity	• Great changes in capacitance due to changes in temperature and DC voltage