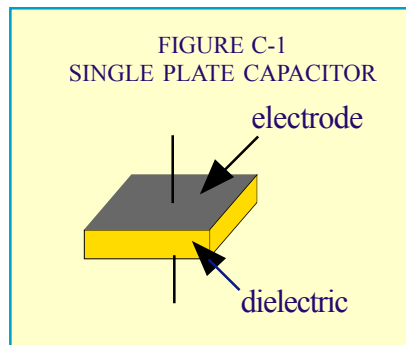


### C. THE BASIC CAPACITOR

The basic model of a capacitor is a single plate device consisting of two conductors, or electrodes, separated by a dielectric material, as illustrated in Figure C-1. The dielectric must be an insulator material, the properties of which largely determine the electrical behavior of the device.



The dielectrics are characterized by their ability to store electrical charge (the dielectric constant) and their intrinsic responses to an electric field, namely capacitance change, loss characteristics, insulation resistance, dielectric strength, as well as the aging rate and the temperature dependence of these properties.

TABLE C-1  
DIELECTRIC CONSTANTS FOR VARIOUS MATERIALS

Vacuum:	1.0
Air:	1.004
Mylar:	3
Paper:	4-6
Mica:	4-8
Glass:	3.7-19
Alumina ( $\text{Al}_2\text{O}_3$ ):	9
Titania ( $\text{TiO}_2$ ):	85-170, (varies with crystal axis)
Barium Titanate ( $\text{BaTiO}_3$ ):	1500
Formulated ceramics with discrete characteristics:	20-18,000

In general, capacitors utilize such dielectrics as air, (with a dielectric constant almost identical to a vacuum, and defined as 1) or naturally occurring dielectrics, such as mica, with a dielectric constant (K) of 4-8, or prepared materials, such as the ceramic groups, with K values ranging from K=9 to as high as K=18,000, as illustrated in Table C-1. Of the ceramic materials, those based on the titanates and niobates as the major constituent display the highest dielectric constant, can be formulated with suitable electrical characteristics, and are thus the basis of chip capacitor technology. All processes and other materials used in the manufacture of chip capacitors are oriented towards optimization of the electrical properties of these dielectrics.