ALUMINUM ELECTROLYTIC CAPACITORS

TECHNICAL NOTE

1.General Description of Aluminum Electrolytic Capacitors

1-1 The Principle of Capacitor

The principle of capacitance can be presented by the principle drawing as Fig.1-1.

When a voltage is applied between the metal electrodes placed opposite on the surfaces of a dielectric. electric charge can be stored proportional to the voltage.

Q=CV

Q: Quantity of electricity(C)

V: Voltage (V)

C: Capacitance (F)

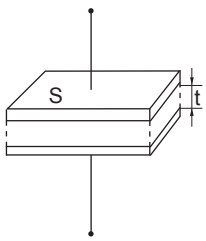

Fig. 1-1

C. called the capacitance of capacitor, is expressed by the following expression with the electrode area S [m²], the electrode spacing t [m] and the dielectric constant of dielectric" ε " :

$$C[F]= \varepsilon_0 \cdot \varepsilon \cdot S/t$$

ε_0: Dielectric constant in vacuum (=8.85x10^{-12} F/M)

The dielectric constant of an aluminum oxide film is 7 to 8. Larger capacitances can be obtained by enlarging the electrode area S or reducing t.

Table 1-1 shows the dielectric constants of typical dielectrics used in the capacitor. In many cases, capacitor names are determined by the dielectric material used, for example, aluminum electrolytic capacitor, tantalum capacitor, etc.

Table 1

Dielectric	Dielectric Constant	Dielectric	Dielectric Constant
Aluminum oxide film	7 to 8	Porcelain(ceramic)	10 to 120
Mylar	3.2	Polystyrene	2.5
Mica	6 to 8	Tantalum oxide film	10 to 20

Although the aluminum electrolytic capacitor is small, it has a large capacitance. It is because the electrode area is roughened by electrochemical etching, enlarging the electrode area and also because the dielectric is very thin.

The schematic cross section of the aluminum electrolytic capacitor is as in Fig. 1-2

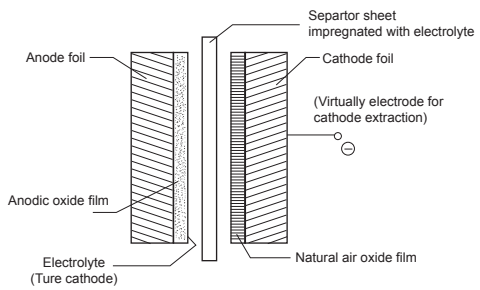

Fig. 1-2

1. 铝电解电容器的基本概要

1-1. 电容器的基本原理

电容器的基本原理可以用图1-1来描述

当在两个正对的金属电极上施加电压时，电荷将据电压的大小被储存起来

Q=CV

Q:电量(C)

V:电压(V)

C:电容量(F)

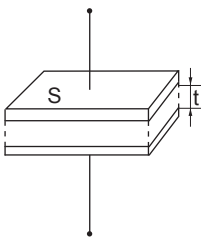

图 1-1

C:电容器的电容量，可以由电极面积S[m²]，介质厚度t[m]以及相对介电常数 ε 来表示

$$C[F]= \varepsilon_0 \cdot \varepsilon \cdot S/t$$

ε_0:介质在真空状态下的介电常数(=8.85x10^{-12} F/M)

铝氧化膜的相对介电常数为7~8，要想获得更大的容量，可以通过增加表面积S或者减少其厚度t来获得。

表1-1列出了电容器中常用的几种典型的介质的相对介电常数，在很多情况下，电容器的命名通常是根据介质所使用的材料来决定的，例如：铝电解电容器、钽电容器等。

表. 1-1

介质	相对介电常数	介质	相对介电常数
铝氧化膜	7 ~ 8	陶瓷	10~120
薄膜树脂	3.2	聚苯乙烯	2.5
云母	6 ~ 8	钽氧化膜	10 ~20

虽然铝电解电容器非常小，但它具有相对较大的电容量，因为其通过电化学腐蚀后，电极箔的表面积被扩大了，并且它的介质氧化膜非常薄。

图1-2形象地描述了铝电解电容器的基本组成。

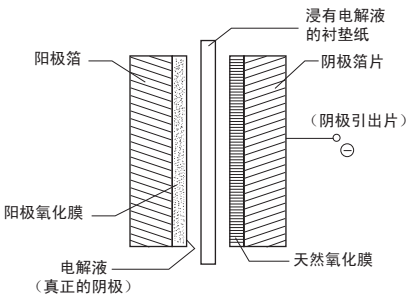

图 1-2