

When using aluminum electrolytic capacitors, pay strict attention to the following:

Polarized aluminum electrolytic capacitors.

If you should reverse the polarities of aluminum electrolytic capacitors, it would lead to short-circuited circuitry and may further result in an explosion if the unit is kept energized. We offer units of $\phi 8$ or more with safety vent design as the standard type in order to prevent possible accidents that may take place if the unit should be connected with its polarities. Small-size capacitors ($\phi 5 \sim \phi 6$) with safety vents are available upon request. It is advisable to use the non-polar capacitors for a DC circuit where the polarity is reversed.

Do not apply any over-voltage exceeding the rated voltage (surge voltage for a short period) to the capacitor.

When applying ripple current to the capacitor, be very careful not to allow the peak voltage value (a value obtained by adding the ripple voltage to the DC voltage) to exceed the rated voltage. Application of any voltage higher than the rated value would lead to shortened service life of the capacitor or would even destroy the unit in a short period. However, the unit may withstand extremely short application of surge voltage.

Ascertain the operating temperature range.

Use the electrolytic capacitors according to the specified operating temperature range. Usage at room temperature will ensure longer life.

Reverse voltage

The reverse voltage shall not exceed 2V. (The sum of DC voltage peak ripple voltage shall not exceed 2V.)

$\tan \delta$ /E.S.R.

The maximum value of $\tan \delta$ is specified in each table which is measured at 120Hz 20°C, unless otherwise specified. E.S.R. can be obtained from the following formula:

$$\text{E.S.R.} = \tan \delta / 2\pi \cdot f \cdot C$$

Where: f = measurement frequency in Hz

C = measurement capacitance value in F

Electrolytic capacitors are not suitable for circuits in which charge + discharge are frequently repeated.

If used in circuits, in which charge and discharge are frequently repeated, the capacitance value may drop, or the capacitor may be damaged. Please consult our engineering department for assistance with these applications.

Do not allow any higher ripple current than the rated value to flow through a capacitor.

If any ripple current higher than the rated value is to flow through a capacitor, excessive heat will be generated and the capacitance reduced with resultant shortened life. We offer high ripple resistant capacitors especially designed for use with high ripple current upon request.

Ripple current.

The capacitor should be used within specified permissible ripple current in each standard products table. (The sum of DC voltage and voltage should not exceed the rated DC working voltage.) The specified maximum permissible ripple current is defined at +85°C and 120Hz, unless otherwise specified. In other conditions of ambient temperature and frequency, ripple current multiplied by following multiplier can be applied as maximum permissible ripple current.

Temperature	40°C	60°C	70°C	85°C	105°C	
Multiplier	1.9	1.5	1.3	1.0	0.6	
Frequency	60Hz	120Hz	300Hz	1KHz	10KHz	100KHz
Multiplier	0.7	1.0	1.1	1.3	1.4	1.4

When you see a capacitor after prolonged storage.

An aluminum electrolytic capacitor which has been stored for a long period of time tends to give increased leakage current. Accordingly, whenever you use a capacitor that has been stored awhile, make sure to gradually increase the voltage to the rated value. Since the leakage current tends to be higher with higher storage atmosphere temperatures, store the units at a location with storage temperatures of -40 to +40°C which is not exposed to direct sunlight.

Be careful of temperature and time when soldering.

When soldering a printed circuit board with various components, care must be taken that the soldering temperature is not too high and that the dipping time is not too long. Otherwise, there will be adverse effects on the electrolytic capacitor. In the case of small sized electrolytic capacitors, nothing abnormal will occur if dipping is performed at less than 260°C for less than 10 seconds.