



Precautions for use

Our metallized film capacitor uses plastic film on dielectric. Thus, insulation, withstand voltage, heat resistance, the frequency characteristic, and so forth are excellent, and high reliability and safety are ensured. However, if the design was not built based on adequate knowledge of the characteristic depending on its use, it would possibly cause an accident. Here is explanation indicating specifically the attention at the use of the capacitor, so please make sure to read this material carefully as well as individual technical material and specifications before using, and to use it correctly. Besides, in the case you consider using our product in the equipment/ system (cars, rail vehicles, ships, airplanes, aerospace equipment, medical equipment, and so forth) that may directly threaten human life due to a breakdown or malfunction or that may bring negative impact on human body, please be sure to inform us in advance.

1. Film capacitor (Metallized film capacitor)

The metallized capacitor has many strong points, but it does not mean it can be applied to any cases. Please use “AC capacitor” for using in AC power supply circuit, and “Electromagnetic interference prevention fixed capacitor for power supply” especially when connected to power line, “High pulse capacitor (snubber capacitor)” for circuit used in high frequency range such as snubber circuit.

2. Failure mode

A metallized capacitor generally has the ability of self-healing. In the case insulation breakdown was caused since high surge voltage applied, there is a mechanism which can electrically cut off the part of insulation breakdown, and help it to do self-healing. However, self-healing does not occur in all cases. There is a case when internal current flows

excessively in low impedance circuit at self-healing, and insulation does not recover due to the damages on dielectric. In the worst case, there is a possibility of smoking and fire. This smoke and fire will blows out the flame and soot, and continues until the inside burns out as long as the voltage is applied.

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3.1 On circuit design

- Please use it within the range of rated performance specified in the delivery specification of the capacitor after checking use environment and installation environment. (Please confirm the following items in particular.)
- The rated voltage of film capacitor shows the use line voltage (for AC, 50/60Hz), so please use within the rated voltage. In addition, the rated voltage means the maximum applied voltage in our company.
- Please use the capacitor under the condition where the peak of both pulse voltage and rated voltage including various waveforms are at rated voltage (In the case of AC use, the peak value (maximum value) = $r.m.s \times \sqrt{2}$) which is applied in terminals or less.
- Electromagnetic interference prevention fixed capacitor (Across The Line Capacitor) is designed on the premise that it is used at commercial frequency (50/60Hz). Therefore, when using at other than 50/60Hz, please contact us in advance.
- A resistor equipped in a spark killer possibly would generate heat due to the impedance current of a capacitor in the case that power supply line is out of 50/60Hz such as 120Hz and 400Hz. Please contact us in advance for use of other than commercial frequency in order to avoid natural heat generation as well.
- Please confirm the temperature range is within



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prescribed range for use. In particular, the capacitor self-heats at the power supply with much high frequency components. Besides, please pay attention to radiant heat when there are exothermic parts nearby.

- Maximum temperature of capacitor use is specified at the temperature on the case surface. At the time, please design so that it does not exceed the maximum temperature in a status of holding self-heating due to harmonic and so forth.
- In the case that a resistor, power semiconductors and so forth partially receive the radiant heat, please be careful that the temperature of product surface including self-temperature rise does not exceed maximum temperature for use.
- Please build a design in which the value of self-temperature rise is 5deg or less for an electromagnetic interference prevention fixed capacitor and a spark killer, and 10deg or less for high pulse capacitor.
- With regards to electromagnetic interference prevention fixed capacitor, allowable current characteristics published by our company is the current characteristic which specified the temperature rise at the time of high frequency current application.

Therefore, it is not intended to assume the usage situation "high-frequency current is continuously applied". Please contact us if continuous high frequency current is applied.

- In the field of high-voltage electricity, high-frequency conduction noise may interfere among premise facilities, which may cause heat generation in the product. Please pay attention especially to products' heat in the line with three-phase 400 V line and motor load of several tens of kW at using.
- Please do not attach an inverter (power supply) to output side. Please contact us when the power

supply waveform is distorted or when used for a circuit whose frequency is different from the commercial frequency (50/60 Hz). In the case that the capacitor is used in phase control circuit and power supply circuit with large distortion, the sound called 'HUM(BUZZ)' can be heard due to minute mechanical vibration between the electrodes of the capacitor. However, nothing will influence on electric characteristics.

- There are those which have been "oil-impregnated" in our products. Although oil can seep out occasionally depending on the use environment, there will be no trouble in terms of performance. Please be careful if there are connectors or reed relay near to capacitors, bad connection can be caused.
- In the usage way (that current is limited by reactance of capacitor and) that a capacitor is connected in series with power supply such as a capacitive power supply, there would be a possibility to cause the deterioration of characteristic depending on installation environment. If you consider the use, please contact us in advance without fail.
- Please avoid using DC rated capacitor with AC circuit.
- If two or more capacitors are connected in series, parallel connection or star connection, please contact us in advance.
- In the continuous use at high humidity environment, a capacitor will possibly be caused to deteriorate in performance due to moisture absorption.
- If you consider the use to fulfill the purpose of loading in products required for high reliability, please contact us in advance.
- Please avoid using in the following cases as a special environment.
 - a. When sudden charge / discharge and large

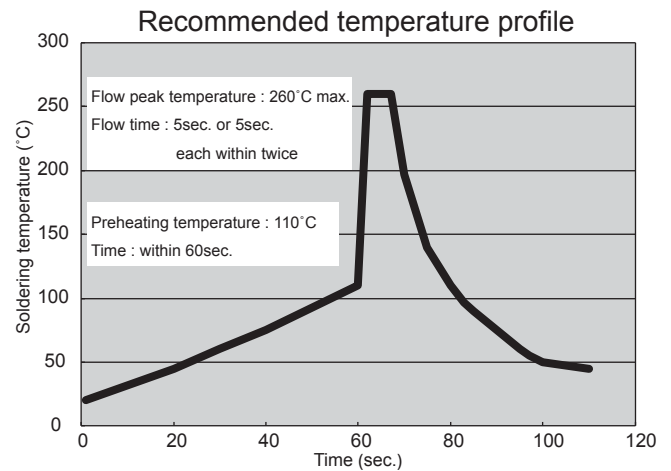


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- surge voltage are repeated;
- b. When vibration and impact is applied continuously;
- c. When got splashed with water, brine, oil and so forth;
- d. When use gas environment such as chlorine, ammonia, hydrogen sulfide and so forth;
- e. When use in the environment where ozone, ultraviolet radiation and radiation expose;
- f. Used more than altitude 2000 m (standard air pressure 80 kPa);

3.2 Notes for attachment to apparatus

- Please do not repeat voltage proof tests for a capacitor.
- Electric shock will occur if you touch capacitors' terminals while energizing. Furthermore, even after switching off the power, electric charges are stored in the capacitor, and if it touches it may cause electric shock. If you have to touch a capacitor, please discharge sufficiently with resistance (1W, 1 kΩ or so).
- Please do not short-circuit the terminals of the capacitor with a conductor while energizing. Due to rapid charging and discharging, the capacitor may deteriorate.
- At the time of attachment, please do not damage or put pressure by machine, tools (including soldering iron). (Even if there is visually no deterioration or change in appearance, there is a case that the inside is damaged.)
- When soldering, please do not apply the temperature more than prescribed. In particular, parts may be thermally deteriorated due to preheating
- Flow soldering condition (Temperature shows the soldering temperature.)



- ※ With regards to 5 seconds each for twice, it is necessary to implement the second time of 5 seconds after cooling down to normal temperature after the first time of 5 seconds.
- ※ When do flow soldering, please control capacitor surface temperature not to exceed each maximum use temperature.
- Reflow soldering condition
Our products are out of subjected.
- Heat-resisting condition of hand soldering
Soldering tip temperature 350°C and within 3 seconds
- When soldering on a land of printed wiring board, please measure and attach based on the design standard for users. If it not sufficient, the soldering part will occasionally deteriorate due to vibration at use, change in temperature and so forth, which will lead contact failure.
- Please do not re-use the product which has been removed after soldered and attached on printed wiring board once.
- Please do not fix (screw fixing, soldering etc.) under condition that the "pulling force" or "twisting force" are added to the lead wire
- When using lead wires of a capacitor by bending, please do not apply stress to the base of the lead wires.



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- For a product of a covered wire type, please do not apply external force which can cause the damage in inner connections and conductors.
- For cleaning process, please pay attention to the followings.
 - a. Although exterior is made of the material which is relatively durable for various of cleaning, there is a possibility of softening or swelling in 60 or more than 60°C cleaning. So, please check carefully before cleaning.
 - b. In ultrasonic cleaning or shower cleaning, display will possibly disappear depending on conditions, so please check the condition before done.
 - c. Please do not rub the surface nor apply mechanical force on it at the time of cleaning, or its display would possibly disappear.
 - d. Please do not rub the surface nor apply mechanical force on it after cleaning and before drying, or its display would possibly disappear.
- When fixing parts by adhesives, potting agents and so on, or when covering products with resin materials or embedding in it, please confirm in advance not to let the distortion affect the capacitor due to expansion/ contraction during curing and change in the use environment.
- Please confirm that there is no exterior damage (dissolution and swelling) due to solvent when utilising solvent type with adhesives and etc.
- Please fix products on the plane with a tightening torque which is 10kgf·cm or less, when fixing by screws the products with “mounting feet” for fixing on a board or others.

3.3 Storage and conditions (before use)

- Please do not keep products in such a place with direct rays, dust, a rapid temperature change, or corrosive gas, and in the high temperature and

high humidity because it is possibly to cause deterioration in characteristic.

- Please confirm the soldering and characteristic before use because oxidization of lead wire surface caused by long term storage can lead deterioration in soldering.

3.4 Wastage

- Please discard by the disposal plant and processing contractor who received the approval. This is because toxic gas will be generated after incinerating a capacitor.

3.5 Others

Regarding the items not mentioned in this paper, please refer to notes guidelines (RCR-2350) of latest edition for plastic film capacitor for fixing in electronic equipment issued by Japan Electronics and Information Technology Industries Association (JEITA).