

Notices

■ Applicable Laws and Regulations

- This product satisfies the requirements of the RoHS Directive (2011/65/EU) (related to the specified hazardous substances contained in electrical and electronic equipment).
- The ozone-depleting chemicals regulated by the Montreal Protocol are not intentionally used in the materials used in our manufacturing processes.
- PBBs (Poly-Brominated Biphenyls)/PBDEs (Poly-Brominated Diphenyl ethers)
The above specified brominated flame retardants are not intentionally used.
- When exporting this product, observe the export procedures specified in export control laws such as the Foreign Exchange and Foreign Trade Control Law.

■ Limited applications

- This product is intended to be used for general-purpose standard applications for general electronic equipment (such as AV equipment, household appliances, business or office equipment, information or communications equipment, etc.)
- If this product is being examined for possible use in applications where higher reliability or safety is required, in cases where a malfunction of this product may endanger life or property, then the delivery specifications meeting the application requirements must be agreed to and exchanged.

Items to be observed

<1> The purpose of these specifications is to ensure the quality of components as individual components.
Before use, check and evaluate their operation when mounted on your products.
<2> Do not use our components outside of the corresponding specifications.

■ When using this capacitor in a product where safety is critical

We take great care in the quality of this product. However, performance may deteriorate and short-circuiting or open-circuiting may occur if it will be used in transportation equipment (e.g. trains, cars, traffic lights), medical equipment, airborne equipment, aerospace equipment, electric heating appliances, combustion/gas equipment, rotating equipment, disaster/crime prevention equipment, or other equipment where a defect in this component may cause the loss of human life or other significant damage. Ensure that the target equipment has a failsafe design and is provided with the following systems to guarantee adequate safety.

- (1) * Ensure the safety of the whole system by installing a protection circuit and a protection device.
- (2) Redundant circuits, etc. to maintain the safety of the entire system so that a single independent failure will not lead to unsafe conditions.

■ Conditions of use:

This product is intended to be used in electronic equipment for general-purpose standard applications and is not designed for use in any special environments.
When this capacitor is used in a special environment or under special conditions, its performance may be affected.
Before use, verify the performance and reliability of the capacitor.

⚠ Application Guidelines

1. Circuit design

1.1 Product Life

Electric Double-Layer Capacitors (Gold Capacitors, hereafter referred to as capacitors) have a limited life.

The life of an electric double layer capacitor is limited. Its capacitance will decrease and its internal resistance will increase over time.

The life of a capacitor greatly depends on the ambient temperature, humidity, applied voltage and discharging currents. Capacitor life can be extended when these parameters are set well below the ratings.

The guaranteed durability of electric double-layer capacitors is between 1000 hours at 70 °C and 2000 hours at 85 °C, depending on product series. Generally, it is 1000 hours at 70 °C. The life of the capacitor is guaranteed to be 16000 hours at a normal temperature (30 °C) by applying the acceleration double for every 10 °C. Please choose the product that is suitable for the reliability that you need.

If your application incorporates this capacitor over a long period of time, then check it periodically and replace it when necessary.

1.2 Polarity and voltage

Capacitors have polarities.

Do not apply a reverse or AC voltage. If a reversed voltage is applied to a capacitor for a long period of time, then its life will be reduced and critical failures such as electrolyte leakage might occur.

Do not apply an over-voltage (a voltage exceeding the rated voltage).

If voltage exceeding the rating is applied to the capacitor for a long time, then its life will be reduced and critical failures such as electrolyte leakage or physical damage due to gas generated by electrochemical reaction or explosion might occur.

1.3 Circuits through which ripple currents pass

When using a capacitor in a circuit through which ripple currents pass, please note following matters.

- (1) The internal resistance of electric double-layer capacitors is higher than that of electrolytic capacitors. Electric double-layer capacitors may generate heat due to ripple currents.
- (2) Please do not exceed the maximum operating voltage when the voltage changes from ripple.
- (3) Because internal resistance is high, the gold capacitor is not basically suitable for the absorption of ripple current.

1.4 Ambient temperature and product life

Capacitor life is affected by usage temperatures. Generally speaking, capacitor life is approximately doubled when the temperature is decreased by 10 °C. Therefore, lower the usage temperature as much as possible. Using capacitors beyond the guaranteed range might cause rapid deterioration of their characteristics and cause them to break down. The temperature referred to here includes the ambient temperature within the equipment, the heat produced by heat generating devices (power transistor, resistors, etc.), self-heating due to ripple currents, etc. Take all of these factors into consideration when checking the capacitor's temperature.

Do not place any heat generating devices on the back of the capacitors. Life acceleration can be calculated with the following equation :

$$L_2 = L_1 \times 2^{\frac{T_1 - T_2}{10}}$$

L₁ : Life at temperature T₁ °C (h)

L₂ : Life at temperature T₂ °C (h)

T₁ : Category s upper limit temperature

T₂ : Ambient temperature to calculate the life + heat generation due to ripple current (°C)

- * Humidity also affects the capacitor's life. When using capacitors outside the following conditions, please contact us. A temperature at +55 °C and a relative humidity of 90 % to 95% for 500 hours.

1.5 Voltage drop

Pay particular attention to the instantaneous working current and the voltage drop due to the capacitor's internal resistance when used in backup mode. The discharging current level is different depending on the capacitor's internal resistance. Use a capacitor with a discharging current below what is specified by the corresponding capacitor.

Series	Max. Discharging Current				
	0.047 F or less	0.1 to 0.33 F	0.47 to 1.5 F	3.3 to 4.7 F	10 to 70 F
SG/SD/SE/NF/F	200 μA	300 μA	1 mA	—	—
RF (-40 °C, -25 °C)	—	300 μA, 3 mA	1 mA, 20 mA	—	—
RG (-40 °C, -25 °C)	—	300 μA, 1 mA	1 mA, 20 mA	—	—
HZ/HW	—	—	—	300 mA	1 A

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

1.6 Series connection

When connecting capacitors in series, add a bleeder resistor in parallel with each capacitor by taking the leakage current into consideration so that the balance of voltages is not disrupted.

1.7 Electrolyte is used in the products

Electrolyte is used in the capacitors. Therefore, misuse can result in rapid deterioration of characteristics and functions of each product. Electrolyte leakage will damage printed circuit boards and can affect their performance, characteristics, and functions.

1.8 External sleeve

The external sleeve is not electrical insulation, and thus capacitors should not be used in an environment that requires electrical insulation. The sleeve is covered only for showing ratings.

2. Mounting

2.1 Heat stress at the soldering

When soldering a capacitor to a printed circuit board, excessive heat stress could cause the deterioration of the capacitor's electrical characteristics. For example the integrity of the seal can be compromised causing the electrolyte to leak, and short circuits could occur in addition to and failure of the appearance.

Please observe the following guidelines.

(1) Manual soldering

Do not touch the capacitor body with a soldering iron. Solder the capacitor using a soldering tip temperature of 350 °C or less for 4 seconds or less. Solder a the capacitor three times or less at intervals of 15 seconds or more.

(2) Flow soldering

1) Do not dip the body of the products into a soldering bath.

2) Keep the product's surface temperature at or below 100 °C for no more than 60 seconds (the peak 105 °C) when soldering. Please refer to the chart at right to set soldering temperature and time. It is recommended to check the product temperature before you use.

3) The terminals of the NF/F/RF type are designed so the bottom of the product floats from the PWB. This is to protect against heat stress during soldering. Do not touch the bottom of the product directly to the PWB.

(3) Other heat stress

1) Keep the product's surface temperature at or below 100 °C for no more than 60 seconds (the peak 105 °C) when applying heat to bake the PWB or fixing resin, etc. The capacitor voltage must be 0.3 V or less.

2) Do not use a product more than once after it has been mounted on the PWB. Excessive heat stress is applied when detaching it from the PWB. Please observe "(1)Manual soldering" when you adjusting it.

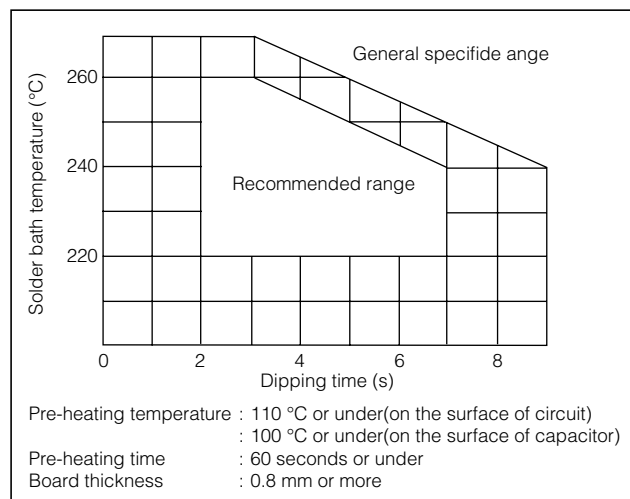
3) Be sure that excessive heat stress is not applied to the Gold capacitor when other parts in its surroundings of the Gold capacitor are detached or adjusted.

(4) Others

1) The lead wires and terminals are plated for solderability. Rasping or filing lead wires or terminals might damage the plating layer and degrade the solderability.

2) Do not apply a large mechanical force to the lead wires or terminals. Otherwise, they may break or come off or the capacitor characteristics may be damaged.

3) There is a possibility that the sealing performance of the product is deteriorated if a coating material that contains an organic solvent is used.



2.2 Circuit Design

Do not set wiring pattern directly under the mounted capacitor, and pass between terminals. If the electrolyte leaks, short circuit might occur and tracking or migrations are anticipated. If a capacitor is directly touching a PWB, then the bottom of the capacitor and the circuit pattern may short-circuit. On PWBs, blowing flux or solder may cause the capacitor's external sleeve to break or shrink, potentially affecting the internal structure. In addition, please refer to application guidelines for the aluminum electrolytic capacitor.

2.3 Residual voltage

Gold Capacitors can hold a large charge and could have residual voltage. Therefore, some electronic components with a low withstand voltage, such as semi-conductors, might be damaged.

2.4 Circuit board cleaning

Apply the following conditions for flux cleaning after soldering. (Excepted for NF,F and RF series)

Temperature : 60 °C or less

Duraiton : 5 minutes or less

Rinse sufficiently and dry the boards.

[Recommended cleaning solvents include]

Pine Alpha ST-100s, Sunelec B-12, DK be-clear CW-5790, Aqua Cleaner 210SEP, Cold Cleaner P3-375, Cclear-th-ru 750H, Clean-thru 750L, Clean-thru 710M, Techno Cleaner219, Techno Care FRW-17, Techno Care FRW-1, Techno Care FRV1

- Consult with us if you are using a solvent other than any of those listed above or Deionized water.
- The uses of ozone depleting cleaning agents is not recommended in the interest protecting the environment.

3. Precautions for using equipment

Avoid using mounting equipment in environments where :

- (1) Capacitors are exposed to water, salt water or oil.
- (2) Capacitors are exposed to direct sunlight.
- (3) Capacitors are exposed to high temperature and humidity where water can condense on the capacitor surface.
- (4) Capacitors are subject to various active gases.
- (5) Capacitors are exposed to acidic or alkaline environments.
- (6) Capacitors are subject to high-frequency induction.
- (7) Capacitors are subject to excessive vibrations or mechanical impact.

A brown excretion might be caused around the sealing, depending on the conditions of use. This excretion is insulation and does not have influence on the electrical characteristics.

4. Maintenance Precautions

Periodically check capacitors used in industrial equipment. When checking and maintaining capacitors, turn off the equipment and discharge the capacitors beforehand. Do not apply stress to the capacitor lead terminals.

Periodically check the following items.

- 1) Significant appearance abnormalities (deformation, electrolyte leakage, etc.)
- 2) Electrical characteristics (described in the catalog or delivery specifications)

If any abnormalities are found, then replace the capacitors or take appropriate actions.

5. Emergency procedures

If the capacitors generate heat, then smoke may come out of the exterior resin. Under these conditions turn off the equipment immediately and stop using it.

Do not place your face or hands close to the capacitor, burns might be caused.

6. Storage

Do not store capacitors in a high-temperature or high-humidity environment. Store capacitors at a room temperature of 5 to 35 °C and a relative humidity of 85 % or less. (Recommended storage term: 1year or less.) Store capacitors in their packaging as long as possible. Avoid storing capacitors under the following conditions.

- (1) Exposed to water, high temperatures or humidity, or when condensation can occurs.
- (2) Exposed to oil or in environments filled with gaseous oil contents.
- (3) Exposed to salt water or environments filled with saline substances.
- (4) In environments filled with harmful gases
(hydrogen disulfide, sulfurous acid, nitrous acid, chlorine, bromine, bromomethane, etc.)
- (5) In environments filled with harmful alkaline gases such as ammonia.
- (6) Exposed to acid or alkaline solvents.
- (7) Exposed to direct sunlight, ozone, ultraviolet or radial rays.
- (8) Exposed to vibration or mechanical impact.

7. Discarding

Dispose of capacitors as industrial waste. They are comprised of various metals and resin.

The precautions for the use of Electric Double Layer Capacitors (Gold Capacitors) follow the "Precautionary guidelines for the use of fixed Electric Double Layer Capacitors for electronic equipment", RCR-2370C issued by EIAJ in July 2008. Please refer to the above guidelines for details.