

Guidelines and Precautions for Use

For using aluminum electrolytic capacitors (hereafter "capacitor/capacitors"), please pay attention to the guidelines listed below.

For circuit design

- 1) Please make sure that the operating condition and the mounting condition are within the rated value which is described in the catalog or the specification.
- 2) Please make sure that the operating temperature and the operating ripple current are within the rated value which is described in the catalog or the specification.
 - a) The operating temperature affects the lifetime of the capacitor. Generally speaking, the expected lifetime of the capacitor is 2times longer by each 10degC reduction. Please use the capacitor within the upper limit of the category temperature.
 - b) Do not apply an excessive ripple current (higher than the rated ripple current) to the capacitor. An excessive ripple current may cause abnormal heating which leads to a damage or a shortening lifetime of the capacitor. Please use the capacitor within the rated ripple current described in the catalog or the specification.
- 3) Please choose a capacitor which meets the designed lifetime of the application.
- 4) The capacitor has a polarity. Do not apply a reverse voltage or an alternating current voltage to the capacitor. Please use the bi-polar capacitor for the circuit which polarity may change or be unstable. Do not use the bi-polar capacitor in an alternating current circuit.
- 5) Do not use the general-purpose capacitor for the circuit which has a repeat of a rapid charge and discharge. Please contact us if the capacitor is exposed in a repeat of a rapid charge and discharge.
- 6) Do not apply an excessive voltage (higher than the rated voltage) to the capacitor.
- 7) The exterior sleeve of the capacitor is not insulated. Do not place the capacitor where insulation is required. The case of the capacitor is not insulated. Please make sure that the case of the capacitor is insulated from the circuit pattern and the lead-wires.
- 8) Do not use the capacitor in the environments listed below.
 - a) In the environment where the capacitor is exposed in water, salt water, oil or where condensation may occur.
 - b) In the environment where poisonous gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc) is filled in atmosphere.
 - c) In the environment where ozone, ultra-violet, radiation are irradiated.
 - d) In the environment where the capacitor is exposed in the vibration or physical shock which is severer than the range defined in the catalog or the specification.
- 9) For mounting the capacitor, please follow the guidelines listed below.
 - a) Please make sure that the hole space of the circuit board matches the lead-wire space of the capacitor.
 - b) Please make sure that the space above the pressure relief vent is greater than the value listed below.

Case Diameter	Space
$\phi 6.3$ to $\phi 16$	2mm or more
$\phi 18$	3mm or more
 - c) Please make sure that the circuit wires or the circuit pattern is not located above the pressure relief vent.
 - d) If the distance between the top of the capacitor and the circuit board above the capacitor is shorter than the listed in 9.b, please make a hole in the board in order to relieve a gas from the pressure relief vent.
- 10) Design the circuit pattern so that the sealing rubber will not be placed on it.

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- 11) Do not place heat-generating devices around the capacitor.
Do not place heat-generating devices on the other side of the capacitor.
- 12) Please refer to "surface mount type recommended land pattern" in the catalog or the specification.
- 13) For circuit design, please follow the guidelines listed below.
 - a) Temperature and/or the frequency of a ripple current affect the electrical characteristics of the capacitor.
Please consider the variation of the electrical characteristics for the circuit design.
 - b) For mounting the capacitor on a double-sided circuit board, do not place the capacitor on excessive holes of the circuit board.
 - c) When the multiple capacitors are connected in parallel, please consider the current balance for the capacitors.
 - d) When the multiple capacitors are connected in series, please put resistors (voltage divider) in parallel to keep the voltage balance for the capacitors.

Mounting

- 1) Do not reuse the capacitor which has been mounted and electrically loaded on the circuit board.
- 2) A transient recovery voltage may occur in the capacitor. In this case, please discharge the capacitor through a 1k ohm resistor.
- 3) A high leakage current may occur after the capacitor stores for a long period.
Please apply voltage to the capacitor through a 1k ohm resistor.
- 4) Please check the rated capacitance and the rated voltage of the capacitor before mounting on the circuit board.
- 5) Please check the polarity of the capacitor before mounting on the circuit board.
- 6) Do not drop the capacitor on the floor. Do not use the capacitor which has been dropped on the floor.
- 7) Do not deform the capacitor.
- 8) Do not apply a force which causes a break of the case of the capacitor.
- 9) Please make sure that the hole space of the circuit board matches the lead-wire space of the capacitor.
- 10) Please adjust the clinch force of an automatic insertion machine in order to avoid excessive stress to the lead-wires of the capacitor.
- 11) Do not apply an excessive impact to the capacitor by the suction nozzle of an automatic insertion machine or a chip moulder also the impacts by a component checker or a centering operation.
- 12) For soldering by a soldering iron, please check the guidelines listed below.
 - a) Please make sure that the soldering condition (temperature and duration) is within the range defined in the catalog or the specification.
 - b) If the hole space of the circuit board does not match the space of the lead-wires of the capacitor, please apply a lead-wire forming before soldering. Do not apply an excessive stress to the capacitor when applying a lead-wire forming.
 - c) Do not reuse the capacitor which has been mounted on a circuit board.
 - d) Do not let the tip of a soldering iron contact on the body of the capacitor.

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- 13) For flow soldering, please follow the guidelines listed below.
 - a) Do not soak the body of the capacitor in a melted solder. Please make sure that the soldering is performed on the other side of the capacitor.
 - b) Please make sure that the soldering conditions (preheating, solder temperature, soak duration) are within the range defined in the catalog or the specification.
 - c) Do not leave flux on the body of the capacitor.
 - d) Do not let the metallic lead-wires of the other components contact on the capacitor.
- 14) For reflow soldering, please follow the guidelines listed below.
 - a) Please make sure that the soldering conditions (preheating, solder temperature, duration) are within the range defined in the catalog or the specification.
 - b) Do not apply excessive heating to the capacitor when using an infrared heater. The color or/and the material of the capacitor affect the absorption of infrared ray.
 - c) Cracks of the ink (for indicating the cathode polarity) may occur, however the cracks do not affect the reliability of the capacitor.
- 15) Do not apply any mechanical stress listed below to the capacitor after mounting on the circuit board.
 - a) Do not tilt, lean, twist the capacitor.
 - b) Do not use the capacitor as a grip for moving a circuit board manually.
 - c) Do not hit the capacitor. When stacking circuit boards, do not let the capacitor contact a circuit board or the other components.
- 16) For washing a printed circuit board. Do not wash the capacitor with a halogen-containing solvent. The solvent-proof capacitor must be used when washing is required. Please make sure that the washing condition is within the range defined in the catalog or the specification. The capacitor may fail due to a type of washing solvent. Please pay attention to the risks listed below.
 - a) A halogen-containing solvent may cause electrochemical corrosion in the capacitor.
 - b) An alkali-containing solvent may cause corrosion (dissolution) of the aluminum case of the capacitor.
 - c) Xylene may cause degradation of the sealing rubber.
 - d) Acetone may cause a loss of the ink.
 - e) A terpene/petroleum-containing solvents may cause degradation of the sealing rubber.
- 17) For washing the solvent-proof capacitor, please follow the guidelines listed below.
 - a) Please control the conductivity, pH, specific gravity, moisture content, etc of a washing solvent.
 - b) Do not store the capacitor where a washing solvent is vaporized or in an airtight enclosure. Do not dry the capacitor or the circuit board by heat higher than the upper limit of the operating temperature.
- 18) Do not use a glue and/or a coating material including halogen.
- 19) For using a glue and/or a coating material, please follow the guidelines listed below.
 - a) Do not leave flux or a stain between the capacitor and the circuit board.
 - b) Please dry out a washing solvent before using a glue and/or a coating material. Do not cover the sealing rubber of the capacitor by a glue and/or a coating material.
 - c) Please make sure that the thermal curing condition for a glue and/or a coating material is within the rated value which is described in the catalog or the specification.

During use in application

- 1) Do not touch the capacitor.
- 2) Do not make a short-circuit between the lead-wires by a conductive material. Do not expose the capacitor in a liquid/conductive solution.

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- 3) For mounting the circuit board, please follow the guideline listed below. Do not use the device in the following environmental conditions:
 - a) In the environment where the capacitor is exposed in water or oil.
 - b) In the environment where the capacitor is exposed in direct sunlight.
 - c) In the environment where the capacitor is exposed in ozone, ultraviolet ray, or radiation.
 - d) In the environment where poisonous gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc) is filled in atmosphere.
 - e) In the environment where the capacitor is exposed in the vibration or physical shock which is severer than the range defined in the catalog or the specification.

Maintenance

- 1) For industrial applications, please perform periodical inspections.
- 2) In periodical inspection, please check the points listed below.
 - a) Appearance (open-vent, a leakage of the electrolyte)
 - b) Electrical characteristics (leakage current, capacitance, dissipation factor, and the other items defined in the catalog or the specification)

In case of a problem

- 1) If the safety-vent of the capacitor is opened and a gas relive from it, please turn off the main power supply of the application or plug off the power code from an outlet.
- 2) A high temperature gas over +100degC may come from the safety-vent of the capacitor. Leave the body from the capacitor. If a gas from the capacitor happen to coming into the eyes, please wash the eyes with water immediately. If a gas from the capacitor happen to coming into the mouth, please gargle the mouth with water immediately. Do not lick the electrolyte of the capacitor. If the electrolyte of the capacitor is touched on the skin, please rinse it out with a soap and water.

Storage conditions

- 1) Do not store the capacitor in high temperatures and/or in high humidity. Please store the capacitor at room temperature between 5 and 35degC in relative humidity below 75%. Please use the capacitor within one year after the shipment.
- 2) Do not store the capacitor in the environment where it is exposed in water, oil, or salt water.
- 3) Do not store in the environment where poisonous gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc) is filled in atmosphere.
- 4) Do not store in the environment where the capacitor is exposed in ozone, ultraviolet ray, or radiation.

Scrap of capacitors

For scraping the capacitor, please follow the guideline listed below.

- a) Please make a hole in the capacitor or crush the capacitor before burning it.
- b) If not, please ask waste-disposal specialist to take care of them, such as burying in the ground.

AEC-Q200 Compatibility

AEC("Automotive Electronics Council") is an organization for standardizing specifications for reliability testing and qualification. AEC was established by automotive manufacturers and electronic component manufacturers in U.S. Testing data for qualification compliant to AEC-Q200 (reliability testing standard for passive components) is available upon request.

For details, please contact us.

For important notice of using the aluminum electrolytic capacitors, we observe the guidelines of EIAJ RCR-2367C "Safety Application Guide for fixed aluminum electrolytic capacitors for use in electronic equipment". Please read carefully the guideline for details.