

Please observe the following guidelines when using aluminum electrolytic capacitors. (Hereafter "Capacitors")

## Circuit Diagram

- 1) Please use according to the values noted in the catalogue or the specification sheet when considering the application and use of the capacitors.
- 2) Please use according to the temperature range and rated ripple current as noted in the catalogue or the specification sheet.
  - a) Life time of electrolytic capacitors depends on the ambient temperature.  
Generally the life time would be doubled as the temperature decreased by 10 degrees.  
It is recommended that capacitors be used at a lower temperature than that of the maximum warranty as possible.
  - b) Capacitors should be used at current values within the rated ripple current.  
If capacitor bears excessive ripple current, heat generation acutely increases, therefore decreasing capacitance or even damage the capacitor. Please refer to the rated ripple current of each series.
- 3) Please choose the capacitor that matches the lifetime of the intended circuit design.
- 4) Regular capacitors have polarity. If electrical current is applied in the opposite direction to a capacitors polarity, the result could be a short circuit or destruction of the capacitor.  
Bi-polar capacitors should be used in circuit where polarity is occasionally reversed, or where polarity is unknown. (except AC)
- 5) In circuits where frequent charge and discharge are common, capacitance decrease as the internal overheat causes damage to capacitors. In such circuits, please use charge and discharge proof capacitors.
- 6) Do not apply DC-voltage exceeding rated voltage of the capacitors.
- 7) The exterior sleeve of a capacitor is not guaranteed as an insulator.  
Do not use the capacitor where insulation is required.  
The aluminum case of a capacitor is not insulated from a cathode lead wire.
- 8) Do not use in the following environments.
  - a) In the environments of splashed water, salt water, and oil on the capacitors.
  - b) In the presence of poisonous gas. (Hydrogen sulfide, Sulfurous acid, Chlorine, Ammonia, etc)
  - c) In the environments of applied ozone, ultraviolet rays and radial rays.
  - d) Where vibration or shock exceeds the allowable values as noted in the catalogue or specification sheet.
- 9) Please design after confirming the following points concerning the application and use.
  - a) Please match the leads space with the holes space of the circuit board.
  - b) It is recommended at least 3mm of space around the pressure relief vent.
  - c) Avoid placing to printed wire above the pressure relief vent.
  - d) Make a hole on a circuit board if the top of an aluminum case is positioned below the circuit board at short distance.  
The hole is to make the passage of gas from a safety vent when the vent opens.
- 10) Avoid having the printed wire under the capacitor.

- 11) Avoid placing other parts near or on the opposite side of the circuit board from the capacitor which gives off heat.
- 12) As for the land pattern of surface mount type capacitors, please refer to the values noted in the catalogue or specification sheet.
- 13) Please design after confirming these other following points.
  - a) The performance of the capacitor will vary as the temperature or frequency varies.
  - b) If capacitor is mounted to the double sided circuit board, avoid placing through holes under capacitors.
  - c) Please consider the balance of the current when using two or more capacitors in parallel.
  - d) Please consider the balance of the voltage when using two or more capacitors in series.

## Mounting

- 1) Do not use a capacitor that has been inserted and connected to a current.  
Except for capacitors that have been removed to check the electrical properties during periodical checks, do not reuse.
- 2) In case the capacitor has re-striking-voltage, please discharge through 1kΩ resistor.
- 3) In case the leakage current increases with long term storage, please apply the rated voltage to the capacitor for 30 minutes through 1kΩ of protective series resistors.
- 4) Please mount capacitor after confirmation of following rates : rated capacitance, rated voltage.
- 5) Please mount after confirming the polarity of capacitor.
- 6) Do not drop or use dropped pieces.
- 7) Be careful not to deform the capacitor during installation.
- 8) Be careful not to puncture the aluminum case of a capacitor with excessive impact.
- 9) When mounting capacitors to the circuit board, please use capacitors that the lead space equal the hole space of the circuit board.
- 10) When mounting capacitors with automatic inserting machines, do not apply excessive force to the lead wire or terminals.
- 11) When mounting capacitors with automatic inserting machines, do not apply excessive force to the body of capacitors.
- 12) Please confirm the following points when you solder with a soldering iron.
  - a) Follow the criteria of soldering condition including time and temperature noted in a catalogue or a specification.
  - b) Process the shape of lead wires before soldering when the lead wire space of a capacitor does not match the through hole space of a circuit board. Avoid the stress to the body of the capacitor.
  - c) Melt solder enough to rework a capacitor with a soldering iron after removing it from a circuit board.  
Insufficiency of melting solder causes physical stress to lead wires.
  - d) Do not touch the body of a capacitor with the tip of a soldering iron.

- 13) Please confirm the following points when you perform flow soldering.
  - a) Do not soak a capacitor in melt solder. Perform flow soldering only on the opposite side of a circuit board where no capacitor is placed.
  - b) Follow the instruction in a catalogue or a specification with regard to the soldering condition; preheat, soldering temperature, and soaking time.
  - c) Avoid the attachment of flux to the body of a capacitor except lead wires.
  - d) Do not locate a capacitor where metal lead wires of the other components contact with the capacitor.
  
- 14) Please confirm the following points when you perform reflow soldering.
  - a) Follow the specifications for pre-heat, reflow time and peak temperature as noted in the catalogue or specification sheet.
  - b) The absorption coefficient of infrared rays depends on the color and material of a capacitor.  
Avoid heating too much to a capacitor by an infrared heater.
  
- 15) After mounting the circuit board, do not apply the following mechanical stress.
  - a) Do not apply excessive force to the lead wires or terminals.
  - b) Do not tilt or bring down the capacitor.
  - c) Do not pick up circuit board by holding the mounted capacitor.
  - d) Do not jolt the capacitor. When stacking circuit boards, make sure the capacitor does not come into contact with any other parts.
  
- 16) In principle, aluminum electrolytic capacitors are not designed to withstand to the cleaning solvent.  
If cleaning of a board is necessary, select capacitor designed to withstand cleaning process, and observe the cleaning conditions specified in the catalogue or in the manufacturer's specification.  
Do not clean the capacitors using solvent, unless so specified in catalogue or manufacturer's specification.  
Use of one of the following chemicals for cleaning may damage the capacitor.
  - a) Solvent containing halogen ions : Damage due to electrolysis of elements
  - b) Alkaline solvent : Corrosion of the aluminum case
  - c) Xylene : Degradation of sealing rubber
  - d) Acetone : Disappear of markings.
  - e) Terpene, petro-based solvents : Degradation of sealing rubber
  
- 17) When cleaning solvent proof capacitors, please confirm the following points.
  - a) Please manage the pollution of the cleaning solvent. (conductivity, pH, specific gravity, content of water, etc)
  - b) Do not keep in the environments of cleaning solvents or airtight containers, after cleaning the capacitors.  
Please dry the circuit board and capacitors in a hot blast stove within upper category temperature or less.
  
- 18) When using polymer adhesives, select adhesives without halogenated solvents, nor chloroprene.
  
- 19) Please confirm the following when using coating agents and polymer adhesives.
  - a) When adhesion or coating is performed after cleaning, air dry should be made immediately remove cleaning solvent between capacitors and circuit board.
  - b) Avoid the treatment that cover the seal of the capacitor, such as coating agents and use of polymer adhesive.

## During operation or use

- 1) Do not directly touch the capacitor.
- 2) Do not short two lead wires with any conductive material.  
Do not spray acid or alkali conductive solution to a capacitor.

- 3) Confirm the following concerning the operating environments.
  - a) In the environments of splashed water, salt water, and oil on the capacitors.
  - b) Where a capacitor is exposed to direct sunshine.
  - c) In the environments of applied ozone, ultraviolet rays and radial rays.
  - d) Where vibration or shock exceeds the allowable values as noted in the catalogue or specification sheet.

## Maintenance • Inspection

- 1) For industrial use, please periodically check the capacitor.
- 2) When checking, inspect the following points.
  - a) Outside appearance.
  - b) Electrical performance. (Leakage current, Capacitance, Tangent of loss angle, etc)

## In case a problem occurs

- 1) While using the application, if you see gas, turn off the main power supply to the set or remove the plug from the outlet.
- 2) When working with a pressure relief vent, high temperature gas spouts out, therefore, do not bring the face close to the capacitor.
- 3) In case spouted gas got into the eye, immediately wash with the water.  
In case you breath spouted gas, immediately rinse out your mouth.

## Storage conditions

- 1) Do not store at high temperatures or in high humidity. Please store indoors between 5°C and 35°C at 75% relative humidity or below. Product is safekeeping for less than 1 year after shipment.
- 2) Do not store where it can come into contact with water, oil, or salt water.
- 3) Do not store in an environment with poisonous gas. (Hydrogen sulfide, Sulfurous acid, Chlorine, Ammonia, etc)
- 4) Do not store in an environment that applies ozone, ultraviolet rays, radial rays.

## Scrap of capacitors

Please follow these guidelines when scrapping the capacitors.

- a) Burn after putting a hole in the capacitor or crush the capacitor.
- b) If you do not burn it, please arrange for a professional waste management firm to bury or use other method to scrap.

This guide to use aluminum electrolytic capacitors conform to technical report EIAJ RCR-2367B "Guideline of notabilia for fixed aluminum electrolytic capacitors for use in electronic equipment".

Please refer to this technical report for additional details.