

Precautions and Guidelines for Organic Conductive Polymer Aluminum Capacitors

Organic conductive polymer capacitor (OP-CAP) is specially structured solid aluminum electrolytic capacitor that uses highly conductive polymer electrolytic material.

Please read the following contents in order to get most performance and stable quality by using **OP-CAP** series products.

1. Guidelines for Circuit design

(1) Polarity

OP-CAP is a solid aluminum electrolytic capacitor with positive and negative electrodes. Make sure of the polarity. If it is used in reverse polarity, leakage current will increase and life span may decrease.

(2) Operating Voltage

Do not apply DC voltage, which not exceeds the rated voltage of the capacitor and shall not be reverse voltage. If a voltage exceeding the capacitor's voltage rating is applied, the capacitor may be damaged as leakage current increase. Using capacitors at recommended working voltage prolongs capacitor life.

(3) Ripple Current

The combined value of DC voltage and the peak AC voltage shall not exceed the rated voltage. The superimposition of a large ripple current increases the rate of heating within the capacitor. This may reduce the service life of the capacitor or damage the capacitor.

(4) Operating Temperature

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

(5) Leakage Current

The initial leakage current shall be within specified levels. Note that the leakage current may increase due to thermal stresses that occur during soldering, etc. Note that increased currents gradually decrease when voltage is applied.

(6) Charge and Discharge

Do not use **OP-CAP** in circuits where the capacitor is repetitively charged and discharged rapidly. Repetitively charging and discharging rapidly may reduce the capacitance or cause damage due to internal heating. Therefore, protection circuits are recommended to design when rush currents exceed 10A.

(7) Surge Voltage

The surge voltage rating is the maximum DC over-voltage to which the capacitors may be subjected of short periods not exceeding approximately 30 seconds at infrequent intervals of not more than 5.5minutes with 1K Ω limiting resistance. Unless otherwise specified, the rated surge voltages of the electrolytic capacitors are as follows:

Rated Voltage (V)	2.5	4	6.3	10	16	20	25	35
Surge Voltage (V)	3.3	5.2	8.2	11.5	18.4	23.0	29.0	40.0

(8) Condition of Use

- 1) **OP-CAP** shall not be exposed to water, saltwater spray, oil or fumes, high humidity or humidity condensation.
- 2) Ambient conditions that include hazardous gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or bromine gas, ammonia, etc.
- 3) Exposed to ozone, ultraviolet rays and radiation.
- 4) Severe vibration or physical shock that exceeds the condition in specification sheets.

(9) Consideration to Circuit Design

- 1) Please make sure the application and mounting conditions that the capacitor will be used are within the conditions specified in the catalog. If the conditions are beyond the conditions specified in the catalog, please contact Lelon.
- 2) Do not design a circuit board so that heat-generating components are placed near **OP-CAP** or reverse side of PC board. A cooling system is recommended.
- (3) Operating temperature, applied voltage and ripple current shall be within specification. The ambient temperature shall not exceed the operating temperature and applied ripple current shall not exceed the allowable ripple current specified in the specification.
- 4) Performances of electrical characteristics of **OP-CAP** are affected by variation of operating temperature and frequency. Consider this variation designing the circuit.
- 5) When two or more capacitors are connected in parallel, consider the current balance that flow through the capacitors.
- 6) If more than two capacitors are connected in series, make sure the applied voltage will be lower than the rated voltage and that voltage will be applied to each equally using a balancing resistor in parallel with each capacitor.
- 7) For appropriate choice of capacitors for circuit that repeat rapid charge and discharge, please consult Lelon.
- 8) Outer sleeve of the capacitor is not guaranteed as an electrical insulator. Do not use a standard sleeve on a capacitor that requires the electrical insulation. When the application requires special electrical insulation, please contact Lelon.
- 9) Do not lie down or twist the capacitor's body after the capacitor is soldered to the PCB.

2. Caution for Assembling Capacitors

(1) Mounting

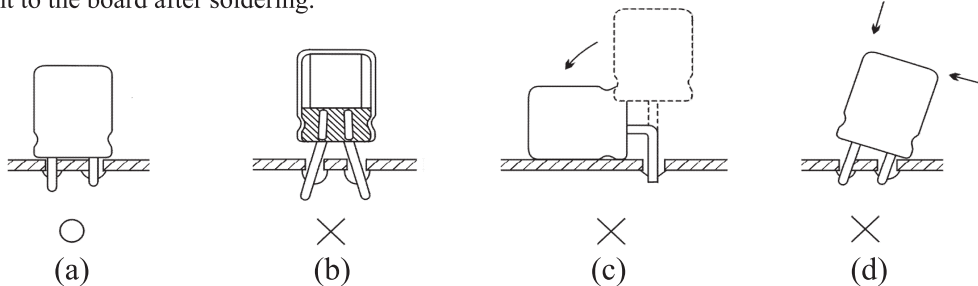
- 1) **OP-CAP** cannot be re-used once the capacitor has assembled in the set and power applied.
- 2) **OP-CAP** may have electrical potential between positive and negative terminal, please discharge through a $1K\Omega$ resistor before use.

Leakage current of **OP-CAP** may be increased after storage a long period of time. In this case, we recommend that the **OP-CAP** shall be applied with DC rated voltage through a resistor of $1K\Omega$ in series for 1 hour at $60^{\circ}\text{C}\sim 70^{\circ}\text{C}$, and then discharge through a resistor of $1K\Omega$. When the capacitors have been assembled in the board, use a volt regulator to input voltage gradually to the rated volt of the board.

- 3) Please confirm the rated voltage before mounting.
- 4) Please confirm the polarity before mounting.
- 5) Do not use the **OP-CAP** that once dropped on the hard floor.
- 6) Do not damage the **OP-CAP** while mounting.
- 7) **OP-CAP** shall be mounted that hold spacing on PCB matches the lead pitch of the capacitors.
- 8) During the auto-insertion process and parts inspection, capacitors shall avoid the excessive force and shock.
- 9) Do not apply excessive external force to the lead terminal and the **OP-CAP** itself.

(2) Soldering

- 1) Be careful of temperature and time when soldering. Dip of flow soldering of the capacitors should be limited at less than 260°C and 10 seconds. Do not dip **OP-CAP** capacitor's body into melted solder.
- 2) High humidity will affect the solder ability of lead wire and terminals. High temperature will reduce long-term operating life.
- 3) When using the SMD type of **OP-CAP**, please check the Reflow profile. The temperature and duration shall not exceed the specified temperature and duration in the specification. If the temperature or duration is higher than the value specified, please sure to consult Lelon.
- 4) Following defective soldering affect the inside characteristics, such as increasing leakage current, short circuit, broken or wound of lead wires, and leaking electrolyte. Do not bend or twist the **OP-CAP**' body after soldering on PCB.
 - (a) Exact soldering.
 - (b) Lead space on board differs from the original.
 - (c) Leads are greatly bent after soldering.
 - (d) Parts slant to the board after soldering.



(3) Cleaning Circuit Boards After Soldering

Halogenated solvent cleaning is not available for **OP-CAP**. IPA (Isopropyl Alcohol) is one of the most acceptable cleaning agents; it is necessary to maintain a flux content in the cleaning liquid at a maximum limit of 2 Wt. %. If you use other cleaning agents, please consult Lelon.

3. Maintenance Inspection

Periodical inspection is necessary for using **OP-CAP** with industrial equipment. The following items should be checked:

- (1) Appearance: bulge, damage, etc.
- (2) Electrical characteristic: Capacitance, dissipation factor, leakage current, and other specified items listed in specification.

Lelon recommend replacing the capacitors if the parts are out of specification.

4. Storage

- (1) **OP-CAP** should not be stored in high temperature or high humidity condition. The suitable condition is $5^{\circ}\text{C} \sim 35^{\circ}\text{C}$ and less than 75% in relative humidity indoor.
- (2) Do not store **OP-CAP** in damp conditions such as water, brine or oil.

- (3) Do not store **OP-CAP** that exposed to hazardous gas such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.
- (4) Do not store **OP-CAP** that exposed to ozone, ultraviolet rays or radiation.
- (5) Do not expose **OP-CAP** to acidic or alkaline solutions.
- (6) Open the bags just before mounting and use up all products once opened. For keeping a good solderability, store the **OP-CAP** as follows.

Series name	Before unseal	After unseal
OCV, OCVZ, OCVU	Within 1 year after delivery (Unopened condition)	Within 30 days from opening
OCR, OCRZ, OCRK, OCRU	Within 1 year after delivery (Unopened condition)	Within 7 days from opening

※ The JEDEC J-STD-020 Rev. C Standard is not applicable.

5. Estimation of life time

$$L_r = L_0 \times 10^{\frac{T_0 - T_r}{20}}$$

L_r: Estimated lifetime (hrs)

L₀: Base lifetime specified at maximum operating temperature with applied the DC voltage and the ripple current (hrs)

T₀: Rated maximum operating temperature (°C)

T_r: Actual ambient temperature (°C)

OP-CAP	Aluminum Electrolytic Capacitors
105°C ≥ 2,000 Hrs	105°C ≥ 2,000 Hrs
95°C ≥ 6,324 Hrs	95°C ≥ 4,000 Hrs
85°C ≥ 20,000 Hrs	85°C ≥ 8,000 Hrs
75°C ≥ 63,245 Hrs	75°C ≥ 16,000 Hrs

Please note that

- a) Maximum life is 15 years
- b) Ripple current in application should be less than or equal to ripple current specified in catalogue

6. Failure

The failure rate is 0.5% / 1000 hours (with a 60% confidence level) based on JIS C 5003.

7. Disposal

Please consult with a local industrial waste disposal specialist when disposing of aluminum electrolytic capacitors.

The above mentioned material according to EIAJ RCR-2367B-Guideline of notabilia for fix for use in electronic equipment [Technical Standardization Committee on Passive Components (established in March 1995, revised in March 2002)]. Please refer to the book for details.