



Conductive Polymer Capacitors

CONDUCTIVE POLYMER CHARACTERISTICS																					
ITEM	CONDITIONS	SPECIFICATION																			
Rotational temperature test	Capacitors are placed in an oven with a specific temperature regulation. The specific regulation is: +25 °C (3 min), -55 °C (30 min), +25 °C (3 min), +105 °C (30 min), +25 °C (3 min), and it is called a cycle. The test totals 50 cycles. The capacitor is then subjected to standard atmospheric conditions for four hours, after which measurements are made.	Capacitance change	Within ± 20 % of initial value																		
		tan δ	Within specified value																		
		Leakage current	Within specified value																		
		Physical	Unbroken and undamaged																		
High-temperature endurance life test	1. Capacitors are placed in an oven with rated voltage applied for 2000 h (+72 h / -0 h) at 105 °C. 2. The capacitors are subjected to standard atmospheric conditions for four hours, after which measurements are made.	Capacitance change	Within ± 20 % of initial value																		
		tan δ	Less than 150 % of specified value																		
		ESR	Less than 150 % of specified value																		
		Leakage current	Within specified value																		
		Physical	Unbroken and undamaged																		
Moisture resistance	Capacitors are exposed for 1000 h (+48 h / -0 h) in an atmosphere of 90 % RH to 95 % RH at 60 °C, ± 3 °C. The capacitors are then subjected to standard atmospheric conditions for four hours, after which measurements are made.	Capacitance change	Within ± 20 % of initial value																		
		tan δ	Less than 150 % of specified value																		
		ESR	Less than 150 % of specified value																		
		Leakage current	Within specified value																		
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Vibration test	1. Fix capacitors at a point 4 mm or less from the body. For capacitors of 12.5 mm or more in diameter or 25 mm or more in length, use a separate fixture 2. Direction and during of vibration: Three orthogonal directions for two hours each (total of six hours) 3. Frequency: 10 Hz to 55 Hz reciprocation for 1 minute 4. Total amplitude: 1.5 mm	Capacitance change	Within ± 10 % of initial value																		
		tan δ	Within specified value																		
		ESR	Within specified value																		
		Leakage current	Within specified value																		
		Physical	Unbroken and undamaged																		
Resistance to soldering heat test	Approved to reflow soldering profile according to JEDEC® J-STD-020D standard Peak temperature (T _{peak}) = 260 °C Maximum time above T _{peak} minus 5 °C = 40 s For further details, please see specific datasheet.	Capacitance change	Within ± 10 % of initial value																		
		tan δ	Less than 130 % of specified value																		
		ESR	Less than 150 % of specified value																		
		Leakage current	Within specified value																		
		Physical	Unbroken and undamaged																		
Surge voltage test	Capacitors are subjected to 1000 cycles at 15 °C to 35 °C. 1 kΩ protective series resistors each consist of charge periods of 30 s, ± 5 s, followed by discharge periods of approximately 5.5 minutes.	Capacitance change	Within ± 20 % of initial value																		
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Mechanical characteristics test	Bending test: Apply pressure in the direction of the arrow at a rate of about 0.5 mm/s until the bent width reaches 2 mm; hold for 60 s. Test board "B," as specified in JIS C 0051: 2002, is used. If the land area differs, it is specified clearly in the next item.		Without mechanical damage such as breaks. Electrical characteristics shall be satisfied. If there are electrodes on both surfaces, the above requirements will be satisfied on whichever surface it may be fixed on.																																
Solderability test	After the lead wire is fully immersed in the solder for 2 s, ± 0.5 s, at a temperature of 245 °C, ± 5 °C, the solder coating must be more than 95 %.																																		
Thermal shock test	Capacitors are placed in an oven with a specific temperature regulation. The specific regulation is -55 °C, ± 3 °C, (30 min) to +105 °C, ± 3 °C, (30 min), and it is called a cycle. The test totals 100 cycles.																																		
Failure rate level	Examination of resistance to solder heat. Test temperature: 105 °C, ± 3 °C Applied voltage: apply DC voltage equal to rated voltage Confidence level: 60 %																																		
Coating case	The color of the case coating will turn light khaki from colorless with long durations in high temperatures. Should there be any concern with the changing color of the case coating, please consult with us.																																		
Soldering pad	Recommended pad pattern and size		<table border="1"> <thead> <tr> <th>CASE SIZE</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>0506</td> <td>1.4</td> <td>3.0</td> <td>1.6</td> </tr> <tr> <td>0606</td> <td>1.9</td> <td>3.5</td> <td>1.6</td> </tr> <tr> <td>0608</td> <td>1.9</td> <td>3.5</td> <td>1.6</td> </tr> <tr> <td>0807</td> <td>3.0</td> <td>3.5</td> <td>2.5</td> </tr> <tr> <td>0812</td> <td>3.0</td> <td>3.5</td> <td>2.5</td> </tr> <tr> <td>1008</td> <td>4.0</td> <td>4.0</td> <td>2.5</td> </tr> <tr> <td>1013</td> <td>4.0</td> <td>4.0</td> <td>2.5</td> </tr> </tbody> </table>	CASE SIZE	a	b	c	0506	1.4	3.0	1.6	0606	1.9	3.5	1.6	0608	1.9	3.5	1.6	0807	3.0	3.5	2.5	0812	3.0	3.5	2.5	1008	4.0	4.0	2.5	1013	4.0	4.0	2.5
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Standards	Satisfies characteristic JIS C 5101-25																																		



PRECAUTIONS AND GUIDELINES FOR CONDUCTIVE POLYMER ALUMINUM CAPACITORS

Conductive polymer capacitors are specially structured solid aluminum electrolytic capacitors that use highly conductive polymer electrolytic material. Please read the following content in order to get most performance and stable quality by using conductive polymer capacitor series products.

(1) Guidelines for Circuit Design

1. Polarity

A conductive polymer capacitor 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 exceeding the rated voltage of the capacitor or reverse voltage. If a voltage exceeding the capacitor's voltage rating is applied, the capacitor may be damaged as leakage current increases. Using capacitors at the recommended working voltage prolongs capacitor life. The surge voltage rating is the maximum DC over-voltage to which the capacitors may be subjected for short periods.

3. Ripple Current

The combined value of DC voltage and the peak AC voltage should 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 ambient room temperature will ensure longer life.

5. Leakage Current

The initial leakage current should 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 conductive polymer capacitors 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 for designs where rush currents exceed 10 A.

7. Condition of Use

Conductive polymer capacitors should not be used / exposed to the following conditions.

- Water, saltwater spray, oil or fumes, high humidity, or humidity condensation.
- Ambient conditions that include hazardous gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or bromine gas, ammonia, etc.
- Ozone, ultraviolet rays, and radiation.
- Severe vibration or physical shock that exceeds the conditions in specification sheets.

8. Consideration to Circuit Design

- Please make sure the application and mounting conditions that the capacitor will be used in meet the conditions specified in the catalog. If the conditions are beyond the conditions specified in the catalog, please contact us.
- Do not design a circuit board so that heat-generating components are placed near conductive polymer capacitors or the reverse side of the PCB. A cooling system is recommended.
- Operating temperature, applied voltage, and ripple current should be within specification. The ambient temperature should not exceed the operating temperature and applied ripple current should not exceed the allowable ripple current specified in the specification.
- Performances of electrical characteristics of conductive polymer capacitors are affected by variations in operating temperature and frequency. Consider these variations when designing the circuit.
- When two or more capacitors are connected in parallel, consider the current balance that flows through the capacitors.
- 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.
- For the appropriate capacitor for circuits that repeat rapid charge and discharge, please consult us.
- The 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 us.
- 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

- Conductive polymer capacitors cannot be re-used once the capacitor has been assembled in the set and power applied.
- Conductive polymer capacitors may have electrical potential between positive and negative terminals, please discharge through a 1 k Ω resistor before use. Leakage current of conductive polymer capacitors may be increased after storage for a long period of time. In this case, we recommend that the conductive polymer capacitor be applied with DC rated voltage through a resistor of 1 k Ω in series for one hour at 60 °C to 70 °C, and then discharged through a resistor of 1 k Ω . When the capacitors have been assembled in the board, use a volt regulator to input voltage gradually to the rated volt of the board.

- c. Please confirm the rated voltage before mounting.
- d. Please confirm the polarity before mounting.
- e. Do not use the conductive polymer capacitor if dropped on the hard floor.
- f. Do not damage the conductive polymer capacitor while mounting.
- g. Conductive polymer capacitors should be mounted so that the hold spacing on the PCB matches the lead pitch of the capacitors.
- h. During the auto-insertion process and parts inspection, excessive force and shock should be avoided.
- i. Do not apply excessive external force to the lead terminal or the conductive polymer capacitor itself.

2. Soldering

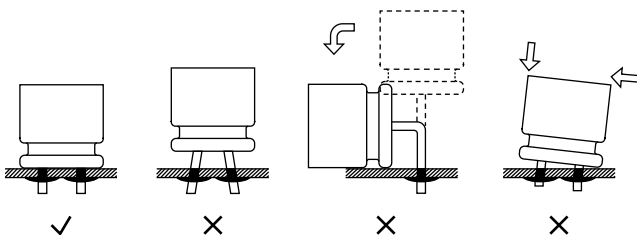
- a. Be careful of temperature and time when soldering. Dip or flow soldering of the capacitors should be limited to less than 260 °C and 10 s. Do not dip the conductive polymer capacitor's body into melted solder.
- b. High humidity will affect the solder ability of lead wire and terminals. High temperatures will reduce long-term operating life.
- c. Except for SMD types, reflow soldering cannot be used for any type of organic conductive polymer aluminum electrolytic capacitor. When using the SMD type of conductive polymer capacitor, please check the reflow profile. The temperature and duration should not exceed the specified temperature and duration in the specification. If the temperature or duration is higher than the value specified, please consult us before usage.
- d. Defective mounting on the PCB and improper external strength applied on the lead wires or case body after soldering (see below drawings) may damage the inside structure of the capacitor and may cause short circuit, high leakage current, or leakage problems.

-Good soldering.

-Hole-to-hole spacing on the board differs from the lead spacing of lead wires.

-Lead wires are bent after soldering.

-Case body doesn't stand vertical on the board after soldering. Do not bend or twist the capacitor's body after soldering.



3. Cleaning Circuit Boards After Soldering

Halogenated solvent cleaning is not available for conductive polymer capacitors. 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 us.

(3) Maintenance Inspection

Periodic inspection is necessary for using conductive polymer capacitors with industrial equipment. The following items should be checked:

1. Appearance: bulge, damage, etc.
2. Electrical characteristics: capacitance, dissipation factor, leakage current, and other specified items listed in the specifications.

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

(4) Storage

1. Conductive polymer capacitors should not be stored in high-temperature or high-humidity conditions. The suitable condition is 5 °C to 35 °C and less than 75 % in relative humidity indoors.
2. Do not store conductive polymer capacitors in damp conditions such as water, brine, or oil.
3. Do not store conductive polymer capacitors where exposed to hazardous gas such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.
4. Do not store conductive polymer capacitors where exposed to ozone, ultraviolet rays, or radiation.
5. Do not expose conductive polymer capacitors 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 conductive polymer capacitors as follows.

SERIES NAME	BEFORE UNSEAL	AFTER UNSEAL
180 CPS, 181 CPL	Within 1 year after delivery (unopened condition)	Within 30 days from opening

Note

- It is not applied to a regulation of JEDEC J-STD-020 (Rev. C).

(5) Estimation of Life Time

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

L_r = estimated lifetime (hours)

L_0 = base lifetime specified at maximum operating temperature with applied DC voltage (hours)

T_0 = rated maximum operating temperature (°C)

T_r = actual ambient temperature (°C)

Please note that:

1. Maximum life is 15 years
2. Ripple current in the application should be less than or equal to ripple current specified in the catalog



(6) Disposal

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

(7) Environmental Consideration

Vishay has already received ISO 14000 certification. Cadmium (Cd), lead (Pb), mercury (Hg), hexavalent chromium (Cr+6), PBB, and PBDE have never been used in the capacitors. If you need "halogen-free" products, please consult with us.

For further details, please refer to:

IEC 60384-4- Fixed Capacitors for Use in Electronic Equipment – Part 4: Sectional Specification – Aluminium Electrolytic Capacitors with Solid (MnO₂) and Non-Solid Electrolyte (established in January 1995, revised in March 2007)

and

EIAJ RCR-2367B- Guideline of Notabilia for Fixed Aluminium Electrolytic Capacitors for Use in Electronic Equipment [Technical Standardization Committee on Passive Components (established in March 1995, revised in March 2002)].