

FPCAP *Functional Polymer Aluminum Solid Electrolytic Capacitors*

Directions for use Precautions I

Critical Precautions on *FPCAP* itself

1. Polarity

The **FPCAP** has polarity. Consequently, never reverse the polarity when using. If polarity is reversed, an increased leakage current or a decreased in lifetime may result.

2. Applied Voltage

Never exceed the rated voltage even for an instant as it may cause a short circuit.

3. Sudden charge and discharge

Because sudden charge and discharge may create a short circuit or high leakage current, it should be minimized.

In this case, it is recommended to use a protection circuit in order to maintain high reliability.

Regardless, use a protection circuit when the current rush value is ten times higher than the permissible ripple current value and for circuits where the current rush value will exceed 10A.

Please make sure to insert a protection resistor of about 1k Ω for charge and discharge when measuring the leakage current.

4. Soldering

The soldering conditions must be kept within the permissible range prescribed in the catalog specification.

If the specification is not kept, there is the possibility of abnormal appearance and abnormal leakage current and reduced capacitance.

5. Installation on PC board

The design of PC board using the **FPCAP** must consider to the standard mounting specifications.

The **FPCAP** may not be able to be mounted on a PC board if there is insufficient space.

6. Directions for use in circuits

Since problems can be expected due to the leakage current fluctuations that occur during soldering and other processes, the **FPCAP** cannot be used in the following circuits.

- (1) High impedance voltage retention circuits
- (2) Coupling circuits
- (3) Time constant circuits
- (4) Circuits greatly affected by leakage current
- (5) Connecting two or more **FPCAPs** in series

Directions for use Precautions II

General Precautions at Designing, for Using and Handling

1. Circuit design precautions

- (1) Check the rated performance
After checking the operation and installation environments, design the circuit so that it falls within the rated performance range stipulated in the catalog specification.
- (2) Operating temperature and ripple current
 - a) Set the operating temperature so that it falls within the range stipulated in the catalog specification.
 - b) Do not supply current that exceeds the allowable ripple current in the catalog.
- (3) Leakage current
Even when the soldering conditions fall within the range of the catalog specification, the leakage current increases slightly.
It also increases slightly during high temperature, no-load, moisture-proof no-load, and temperature cycling tests with no voltage applied.
In cases such as these, leakage current will decrease by applying voltage in conditions below the maximum operating temperature.
- (4) Applied voltage Considerations
 - a) Make sure the sum of the peak DC voltage and ripple voltage values does not exceed the rated voltage.
 - b) When the DC voltage is low, set it so the negative ripple voltage peak value does not become a reverse voltage that exceeds 10% of the rated voltage.
 - c) Operate the **FPCAP** within 20% of the rated voltage for application of reverse voltage during the transient phenomena caused when the power is turned off or the source is switched. Operate it within 10% of the rated voltage when reverse voltage is applied continuously.
- (5) Reduction of failure stress
The main failure mode of the **FPCAP** is open mode primarily caused by electrostatic capacitance drop. Random short circuit mode failures primarily occur rarely.
The time it takes to reach the failure mode can be extended by using the **FPCAP** with reduced ambient temperature, ripple current and applied voltage.
- (6) Capacitor insulation
 - a) Insulation is not guaranteed.
 - b) Be sure to completely separate the case, negative electrode terminal and positive electrode terminal from adjacent components and PC board traces.
- (7) Operating environment
Do not use the **FPCAP** in the following environments.
 - a) Places where water or salt water can directly fall on it, and places where condensation may form.
 - b) Places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
 - c) Places exposed to ozone, ultraviolet rays and radiation.
 - d) Severe vibration or shock which exceeds the condition specified in the specification sheets.

Precautions

- (8) Assembly Conditions Considerations
In designing a circuit, the following matters should be checked before the **FPCAP** is mounted on the PC board.
- The pitch and diameter of PCB holes to which the **FPCAP** is mounted, shall be designed in conformance with the dimensional tolerance stipulated in the catalog specifications.
 - Do not locate any wire or circuit pattern over the pressure relief vent of the **FPCAP**.
- (9) PC board
Avoid locating heat-generating components around the **FPCAP** and on the underside of the PC board under the **FPCAP**.
- (10) Parallel connection
When used in parallel connection with another capacitor, carefully select the type of capacitor.
- (11) Other
- Electrical characteristics are affected by temperature and frequency fluctuations. Design circuits after checking the amount of fluctuation.
 - When mounting the **FPCAP** on a double-sided PC board, design the board so that extra PC board holes are not located underneath the **FPCAP**.

2. Mounting precautions

- (1) Things to know before mounting
- Do not reuse the **FPCAP** that has already been assembled in a device and energized. Excluding the **FPCAP** that has been removed for measuring electrical characteristics during a periodic inspection, they cannot be reused.
 - Leakage current may have increased if the part has been stored for a long period of time. In this case, use after voltage treatment and under the rated voltage.
- (2) Mounting-1
- Mount after checking the capacitance and the rated voltage.
 - Mount after checking the polarity.
 - Do not drop on the floor and do not use parts that have been dropped.
 - Do not deform and then mount.
- (3) Mounting-2
- Mount after checking the match between the lead pitch and the PC board holes pitch.
 - When an automatic insertion is used to clinch the lead wires, make sure it is set correctly.
 - Be careful of the shock force that can be produced automatic insertion equipment.
 - Do not apply excessive external force to the lead wires, the **FPCAP** itself, or the electrode terminals.
- (4) Soldering with a soldering iron
- Set the soldering conditions (temperature, time) so that they fall within the range stipulated in the catalog specification.
 - When the lead wire terminal must be processed because the terminal spacing and the PC board holes spacing do not match, process it before soldering so that no stress is applied to the **FPCAP** itself.
 - Do not subject the **FPCAP** itself to excessive stress when soldering with a soldering iron.
 - When a soldering iron is used to repair the **FPCAP** that has already been soldered once and needs to be removed, do it after the solder has been completely melted so that no stress is applied to the **FPCAP** terminals.
 - Do not let the tip of the soldering iron touch the **FPCAP** itself.
 - The value of leakage current after soldering may increase a little (from a few μA to several hundred μA) depending on the soldering condition (preheating and solder temperature and time, PC board material and thickness, etc.)
The leakage current can be reduced through self-repair by applying voltage.

Precautions

- (5) Flow soldering
 - a) Do not solder the **FPCAP** by submerging it in melted solder. Use the PC board to protect the **FPCAP** and only solder the opposite side of the board that the **FPCAP** is mounted on.
 - b) Set the soldering conditions (soldering temperature, terminal submersion time) so that they fall within the range stipulated in the catalog specification. The value of leakage current after soldering may increase slightly (from a few μA to several hundred μA) depending on the soldering conditions (preheating and solder temperature and time, PC board material and thickness, etc.). The leakage current can be reduced through self-repair by applying voltage.
 - c) Take care that flux does not adhere to any place other than the terminal.
 - d) When soldering, take care that other components do not fall over and touch the **FPCAP**.
 - e) Flow soldering under extremely abnormal conditions may reduce the electrostatic capacity of products before or after soldering.
- (6) Reflow soldering

Do not use reflow soldering for Radial lead type (Through Hole).
- (7) Handling after soldering
 - a) Do not tilt, bend or twist the **FPCAP** after it has been soldered on the PC board.
 - b) Do not use the **FPCAP** as a handle to move the PC board after it has been soldered to it.
 - c) Do not bump the **FPCAP** with objects after it has been soldered to the PC board. Make sure the **FPCAP** does not touch other PC boards or components.
 - d) Do not subject to excessive stress after it has been soldered to the PC board.
- (8) Washing the PC board

Check the following items before washing the PC board with these detergents; high quality alcohol-based cleaning fluid such as Pine- α ST-100S, clean thru 750H, 750L, 750K, or Techno Care FRW14 through 17; or detergents including substitute Freon such as AK-225AES and IPA.

 - a) Use immersion or ultrasonic wave to clean for a total of less than five minutes.
 - b) The temperature of the cleaning fluid should be less than 60°C.
 - c) Watch for contamination of the detergent (conductivity, pH, specific gravity, water content, etc.).
 - d) After cleaning do not store in a location subject to gases from the cleaning fluid or in an airtight container. Dry the PC board and the **FPCAP** using hot air (less than the maximum operating temperature). Note that when it is heated (heat run, dry, etc.), soon after cleaning, the sleeve (if included) may swell and shrink again.
 - e) Please contact our company for details about detergents and cleaning methods, and about detergents other than those listed above.
- (9) Fixatives and coatings
 - a) Select appropriate material for the **FPCAP** marking material and sealant.
In particular, make sure the fixative, coating and thinner do not contain acetone or toluene.
 - b) Before applying a fixative or coating, completely remove any flux residue and foreign matter from the area where the PC board and the **FPCAP** are to be joined together.
 - c) Allow any detergent to dry before applying the fixative or coating.
 - d) Please contact our company for fixative and coating heat curing conditions.

3. Precautions with completed board

- (1) Do not directly touch the **FPCAP** terminals.
- (2) Do not use electric conductors to cause a short circuit between the **FPCAP** terminals.
Do not subject the **FPCAP** to conductive solutions.
- (3) Check the installation environment of the board on which the **FPCAP** is mounted.
- (4) Age the board at conditions that fall below the capacitor ratings.
- (5) It is recommended that the board be used at room temperature and in ordinary humidity.
For details, refer to the Operating Precaution Guidelines for the EIAJRC-2367 Electronic device Solid aluminum Non-solid Capacitor.
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Precautions

4. If trouble should occur

- (1) In the event that a short circuit causes the current to become relatively small (less than approximately 3A for $\phi 10$ and less than approximately 1A for $\phi 6.3$), the **FPCAP** itself will generate a little heat, but the appearance will not be affected even when electricity is supplied continuously. However, if the circuit shorts, and current value exceeds the above mentioned values, the temperature inside the **FPCAP** will increase. When the temperature exceeds approximately 200°C the internal pressure is raised, and odorous gas is released. In this case, keep away from your face and hands.
- (2) If a short circuit occurs and odorous gas is released, either turn off the device's main power or unplug the power cord from the outlet.
- (3) If a short circuit should occur, it may take anywhere from a few seconds to a few minutes until an odorous gas develops, depending on the conditions. Design the device so that a power protection circuit works during this time period.
- (4) If the gas gets in your eyes, rinse them immediately. Gargle if it has been inhaled.
- (5) When the polymer or gas of the polymer reaches your skin, wash it off with soap.
- (6) The electrolyte, separator, rubber and tube used in the **FPCAP** are all combustible. When the current value is extraordinarily high during a short circuit, and assuming the worst possibility, the shorted-out section in the lead wire or inside the capacitor could create a spark, and cause the resin or tube to catch fire. Give consideration to the capacitors mounting method, mounting position, pattern design and such.

5. Storage conditions

Do not storage capacitors without load more than a year due to potential increased leakage current.

- (1) Do not store at high temperatures and high humidity. Store it in a location that is not subject to direct sunlight, has low temperature and humidity (generally, temperature between 15 and 35°C and a relative humidity between 45 and 75%).
- (2) Store in an airtight plastic bag to keep the leads in good condition.
- (3) To keep the leads in good condition, store lead-type the **FPCAP** for no more than one year.
- (4) Do not store in places where water, salt water or oil can directly fall on it, or places where condensation may form.
- (5) Do not store in places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
- (6) Do not store in places exposed to ozone, ultraviolet rays and radiation.

6. Disposal

Please treat the **FPCAP** as industrial waste when needing to dispose of the **FPCAP**.

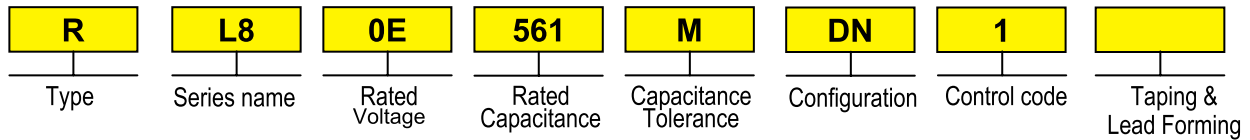
For details, refer to the Operating Precaution Guidelines for the EIAJ RCR-2367C.(Safety Application Guide for fixed aluminum electrolytic capacitors for use in electronic equipment.)

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FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

Type numbering system (Example: 2.5V, 560μF, L8)

Nichicon Part Number



FPCAP Part Number



Type & Classification

Type & Classification	Nichicon P/N Symbol	FPCAP P/N Symbol
Radial Lead Type	R	RE
SMD Type		ME

Series Name

Classification	Series
Radial Lead Type	NS
	R7
	R5
	NU
	L8
	S8
	E5
	HT
	F8
	NE
SMD Type	PS/PA
	FS
	SS/S A/SB
	HS/HA
	SL/SH

Rated Voltage

Voltage [V]	Nichicon P/N Symbol	FPCAP P/N Symbol
2.5	0E	2R5
4.0	0G	4R0
6.3	0J	6R3
10	1A	010
16	1C	016
20	1D	020
25	1E	025

Rated Capacitance

Capacitance [μF]	Symbol
10	100
22	220
100	101
220	221
1500	152

Capacitance Tolerance

Tolerances	Symbol
± 20%	M

Control code*

Endurance	Nichicon P/N Symbol	FPCAP P/N Symbol
5000hrs	ASQ	-5K
2000hrs	1	-

* In case of endurance

Taping & Lead Forming

Classification	Taping & Lead Forming	Case Size	Nichicon P/N Symbol	FPCAP P/N Symbol	
Radial Lead Type	Long lead (Bulk)	All	-	R	
	Cut lead (Bulk)	All	CG	CG	
	2.5mm pitch taping	φ5x7L, φ6.3x7L, φ6.3x8L	JT	JT	
			JX	J	
		3.5mm pitch taping	φ8	KX	K
				PX	P
5.0mm pitch taping	φ6.3 & φ8	PH	PH		
		φ10	GB	R	
			GS		
SMD Type	Taping	Height under 5.2mm	GB	R	
		Height over 5.7mm	GS		
	Bulk	All	-	N	