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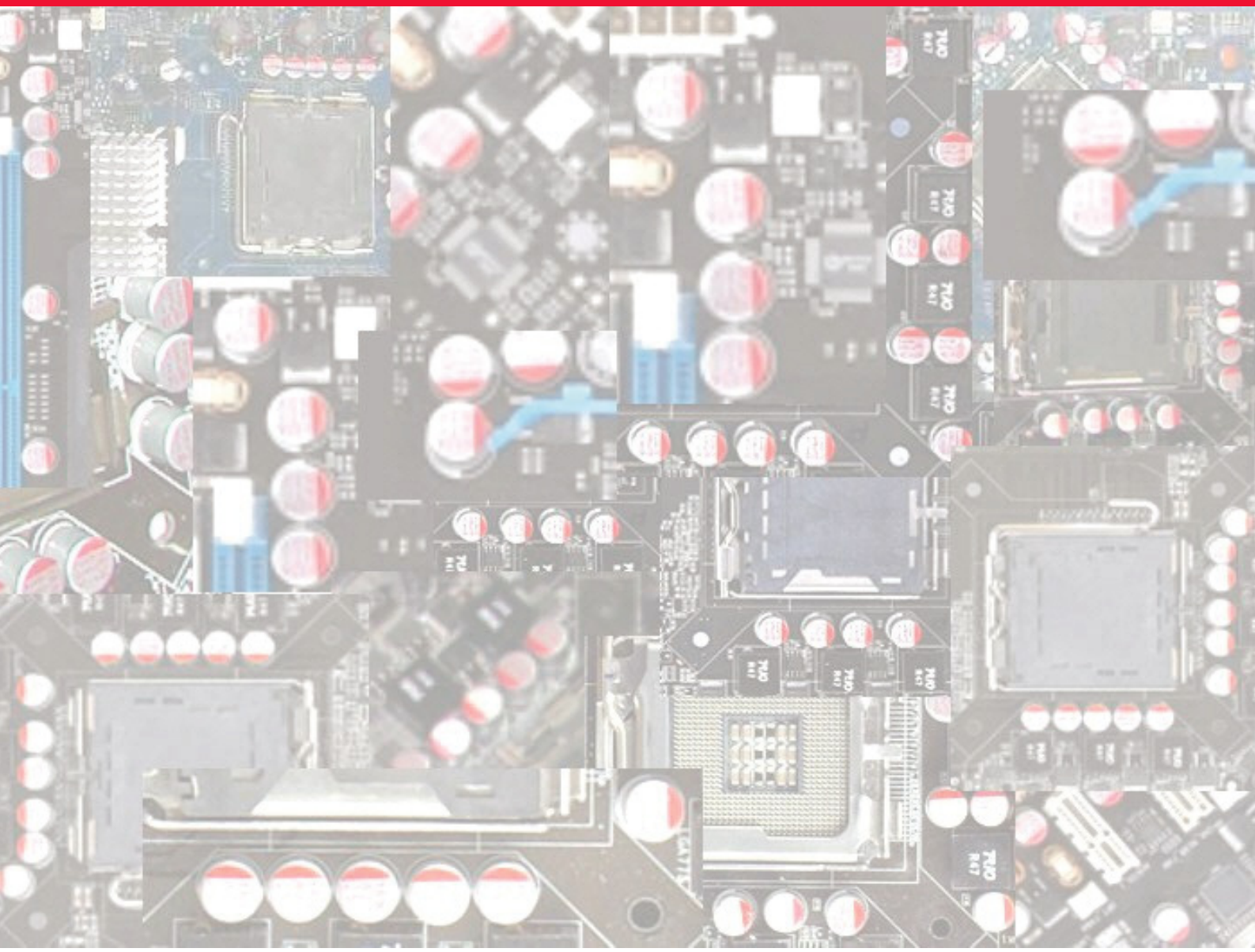
Aluminum Solid Electrolytic Capacitors with Functional Polymer

FPCAP
Functional Polymer Capacitors

Vol. 6, 2009



NICHICON CORPORATION / FPCAP ELECTRONICS (SUZHOU) CO., LTD.

CONTENTS

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 1kΩ 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 **FPCAP**s 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.

(8) Assembly Conditions Considerations
In designing a circuit, the following matters should be checked before the **FPCAP** is mounted on the PC board.
a) 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.
b) 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
a) Electrical characteristics are affected by temperature and frequency fluctuations. Design circuits after checking the amount of fluctuation.
b) 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
a) 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.
b) 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
a) Mount after checking the capacitance and the rated voltage.
b) Mount after checking the polarity.
c) Do not drop on the floor and do not use parts that have been dropped.
d) Do not deform and then mount.

(3) Mounting-2
a) Mount after checking the match between the lead pitch and the PC board holes pitch.
b) When an automatic insertion is used to clinch the lead wires, make sure it is set correctly.
c) Be careful of the shock force that can be produced automatic insertion equipment.
b) Do not apply excessive external force to the lead wires, the **FPCAP** itself, or the electrode terminals.

(4) Soldering with a soldering iron
a) Set the soldering conditions (temperature, time) so that they fall within the range stipulated in the catalog specification.
b) 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.
c) Do not subject the **FPCAP** itself to excessive stress when soldering with a soldering iron.
d) 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.
e) Do not let the tip of the soldering iron touch the **FPCAP** itself.
f) 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.

(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.

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 ϕ10 and less than approximately 1A for ϕ6.3), 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.)

Products List

Classification	Series	Note	Rated Voltage Range	Capacitance Range	Categorical Max. Temp. and Endurance	Pages
Radial Lead Type	NS	Standard	4.0 to 25V	10 to 1200μF	105ºC 2000Hrs	8
	R7	Low ESR	2.5 to 16V	68 to 1500μF	105ºC 2000Hrs	10
	R5	Ultra Low ESR	2.5 to 6.3V	390 to 1500μF	105ºC 2000Hrs	12
Upgrade!	NU	Large Capacitance	2.5 to 25V	10 to 2700μF	105ºC 2000/5000Hrs	14
Upgrade!	L8	Low ESR and Low Profile	2.5 to 16V	180 to 1500μF	105ºC 2000/5000Hrs	16
Upgrade!	S8	Low ESR/ESL and Low Profile	2.5 to 6.3V	330 to 820μF	105ºC 2000/5000Hrs	18
	E5	Low ESR and Low Profile	2.5 to 4V	560 to 820μF	105ºC 2000Hrs	20
	HT	High Temperature (125ºC)	6.3 to 20V	150 to 820μF	125ºC 1000Hrs	22
New!	F8	Low ESR/ESL and Low Profile	2.5 to 6.3V	100 to 560μF	105ºC 2000Hrs	24
New!	NE	Large Capacitance	2.5 to 16V	100 to 1200μF	105ºC 2000Hrs	26
SMD Type	PS/PA	Standard (φ6.3 / φ8 / φ10)	2.5 to 16V	39 to 1500μF	105ºC 2000Hrs	28
	FS	Large Capacitance (φ4 / φ5)	2.5 to 10V	10 to 180μF	105ºC 2000Hrs	30
	SS/SA/SB	Large Capacitance (φ6.3)	2.5 to 16V	100 to 560μF	105ºC 2000Hrs	32
	HS/HA	Large Capacitance (φ8)	2.5 to 16V	150 to 1500μF	105ºC 2000Hrs	34
	SL/SH	Low Profile (φ6.3)	2.5 to 16V	15 to 390μF	105ºC 2000Hrs	36

Green Products

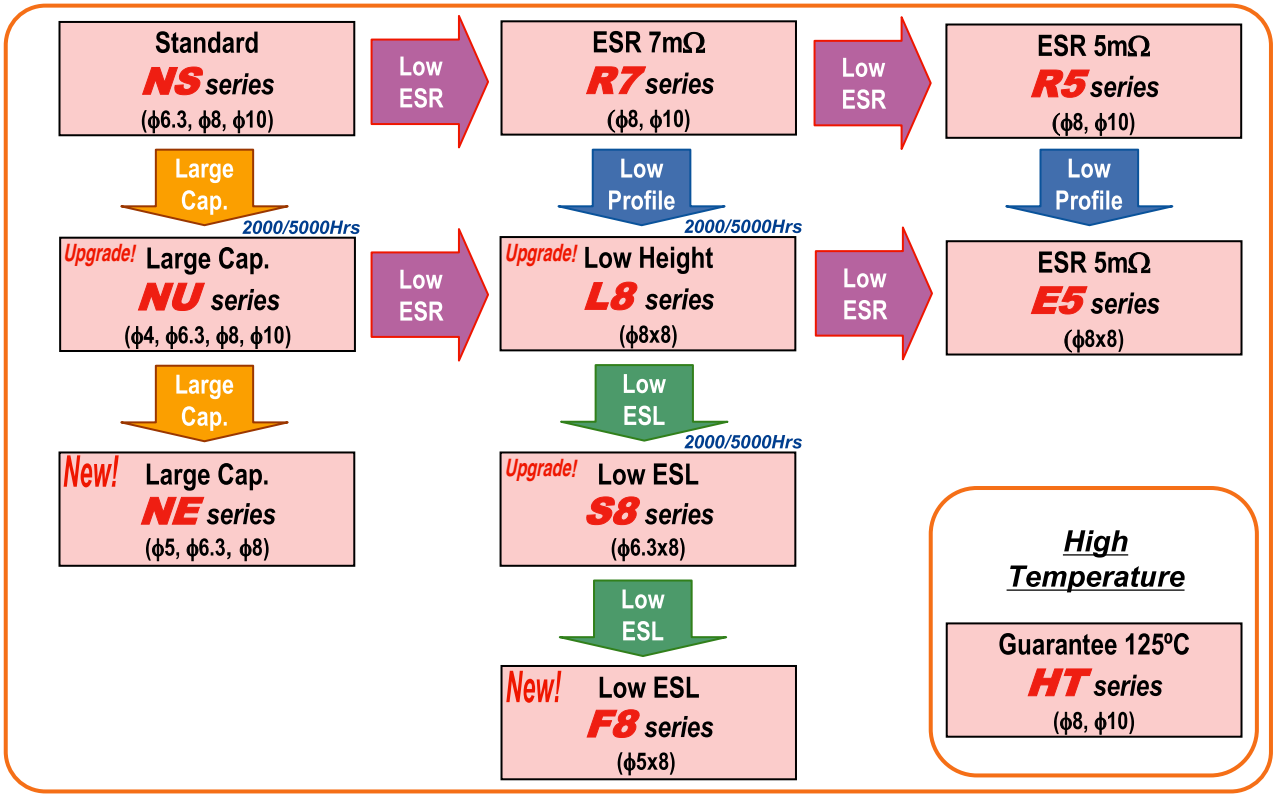
Corresponding to the environmental Requirement

Classification	Lead-free	RoHS compliance	Halogen-free
Radial Lead Type	○	○	○
SMD Type	○	○	○

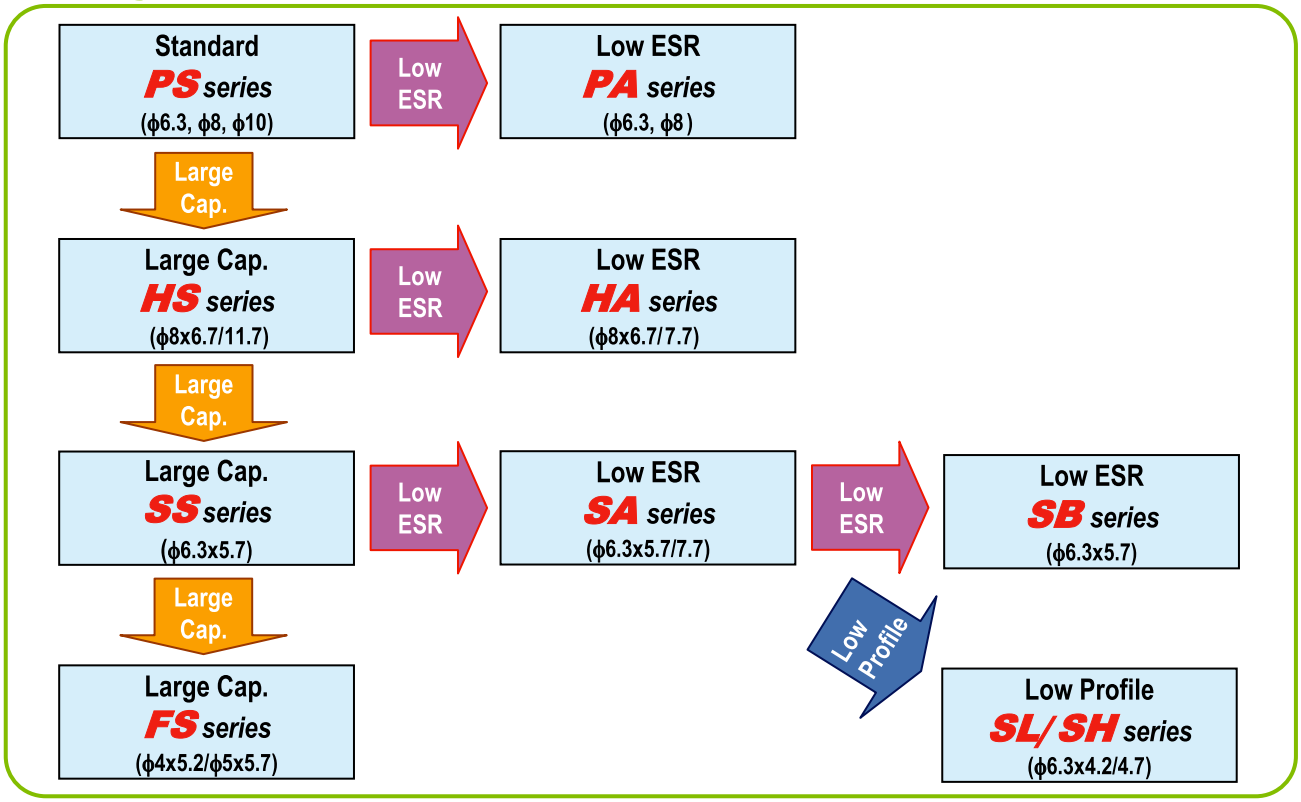
○ : Completed

System Diagram for FPCAP

Radial lead type



SMD type



FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

NS series

Low ESR

Lead-free | RoHS Compliance

Standard

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

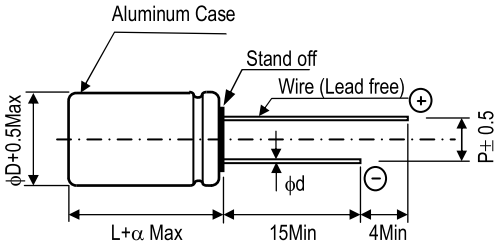
Items		Characteristics
		NS
Operating Temp. Range		-55 to +105°C
Rated Voltage Range		4.0 to 25V·DC
Capacitance Range		10 to 1200μF
Capacitance Tolerance		±20% (M)
Endurance	Condition	105°C 2000Hrs at rated voltage
	Capacitance	Within ±20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

Cap. [μF] \ R.V (S.V.) [V]	4.0 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	20 (23)	25 (28.7)
10						6.3×7
15					6.3×7	6.3×10
22				6.3×7	6.3×7	8×11.5
33			6.3×7	6.3×7	6.3×10	10×12.5
47		6.3×7		6.3×10	8×11.5	10×12.5
68			6.3×10	8×11.5	8×11.5	
100			8×11.5	8×11.5	10×12.5	
150		8×11.5		10×12.5		
180				8×11.5		
220		8×11.5	10×12.5			
330		10×12.5		10×12.5		
390		8×11.5				
470			10×12.5			
560	8×11.5					
680		10×12.5				
820	10×12.5	10×12.5				
1000		10×12.5				
1200	10×12.5					

●Dimensions



[Unit : mm]

φD×L	φd	P	α
6.3×7	0.45	2.5	1.0
6.3×10	0.5	2.5	1.0
8×11.5	0.6	3.5	1.5
10×12.5	0.6	5.0	1.5

●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number		Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
		NICHICON	FPCAP					
4.0	560	RNS0G561MDN1□□	FP-4R0RE561M-NS□□	336	0.08	10	5230	8 × 11.5
	820	RNS0G821MDN1□□	FP-4R0RE821M-NS□□	492	0.08	10	5500	10 × 12.5
	1200	RNS0G122MDN1□□	FP-4R0RE122M-NS□□	720	0.15	10	5500	10 × 12.5
6.3	47	RNS0J470MDS1□□	FP-6R3RE470M-NS□□	50	0.07	42	2050	6.3 × 7
	150	RNS0J151MDN1□□	FP-6R3RE151M-NS□□	142	0.07	21	3900	8 × 11.5
	220	RNS0J221MDN1□□	FP-6R3RE221M-NS□□	208	0.07	21	3900	8 × 11.5
	330	RNS0J331MDN1□□	FP-6R3RE331M-NS□□	312	0.07	10	5500	10 × 12.5
	390	RNS0J391MDN1□□	FP-6R3RE391M-NS□□	369	0.08	10	5230	8 × 11.5
	680	RNS0J681MDN1□□	FP-6R3RE681M-NS□□	643	0.08	10	5500	10 × 12.5
	820	RNS0J821MDN1□□	FP-6R3RE821M-NS□□	775	0.12	10	5500	10 × 12.5
	1000	RNS0J102MDN1□□	FP-6R3RE102M-NS□□	945	0.12	10	5500	10 × 12.5
10	33	RNS1A330MDS1□□	FP-010RE330M-NS□□	50	0.07	49	1900	6.3 × 7
	68	RNS1A680MDS1□□	FP-010RE680M-NS□□	102	0.07	35	2650	6.3 × 10
	100	RNS1A101MDN1□□	FP-010RE101M-NS□□	150	0.07	21	3900	8 × 11.5
	220	RNS1A221MDN1□□	FP-010RE221M-NS□□	330	0.07	10	5500	10 × 12.5
	470	RNS1A471MDN1□□	FP-010RE471M-NS□□	705	0.08	10	5500	10 × 12.5
16	22	RNS1C220MDS1□□	FP-016RE220M-NS□□	53	0.06	49	1900	6.3 × 7
	33	RNS1C330MDS1□□	FP-016RE330M-NS□□	79	0.06	49	1900	6.3 × 7
	47	RNS1C470MDS1□□	FP-016RE470M-NS□□	113	0.06	42	2400	6.3 × 10
	68	RNS1C680MDN1□□	FP-016RE680M-NS□□	163	0.06	25	3600	8 × 11.5
	100	RNS1C101MDN1□□	FP-016RE101M-NS□□	240	0.06	21	3900	8 × 11.5
	150	RNS1C151MDN1□□	FP-016RE151M-NS□□	360	0.06	10	5500	10 × 12.5
	180	RNS1C181MDN1□□	FP-016RE181M-NS□□	432	0.08	16	4700	8 × 11.5
	330	RNS1C331MDN1□□	FP-016RE331M-NS□□	792	0.08	10	5500	10 × 12.5
20	15	RNS1D150MDS1□□	FP-020RE150M-NS□□	50	0.06	63	1700	6.3 × 7
	22	RNS1D220MDS1□□	FP-020RE220M-NS□□	66	0.06	49	1900	6.3 × 7
	33	RNS1D330MDS1□□	FP-020RE330M-NS□□	99	0.06	49	2200	6.3 × 10
	47	RNS1D470MDN1□□	FP-020RE470M-NS□□	141	0.06	28	3400	8 × 11.5
	68	RNS1D680MDN1□□	FP-020RE680M-NS□□	204	0.06	25	3600	8 × 11.5
	100	RNS1D101MDN1□□	FP-020RE101M-NS□□	300	0.06	15	4500	10 × 12.5
25	10	RNS1E100MDS1□□	FP-025RE100M-NS□□	50	0.06	63	1700	6.3 × 7
	15	RNS1E150MDS1□□	FP-025RE150M-NS□□	75	0.06	49	2200	6.3 × 10
	22	RNS1E220MDN1□□	FP-025RE220M-NS□□	110	0.06	28	3400	8 × 11.5
	33	RNS1E330MDN1□□	FP-025RE330M-NS□□	165	0.06	20	3800	10 × 12.5
	47	RNS1E470MDN1□□	FP-025RE470M-NS□□	235	0.06	20	3800	10 × 12.5

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Part Number (EX) 16V, 100μF

R	NS	1C	101	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

CG: Cut lead (Bulk)
JX: φ6.3x10 2.5mm pitch taping
JT: φ6.3x7, 2.5mm pitch taping
KX: φ8, 3.5mm pitch taping
PX: φ6.3&φ8, 5.0mm pitch taping
PH: φ10, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

R7 series

Ultra Low ESR

Lead-free

RoHS Compliance

ESR 7mΩ

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

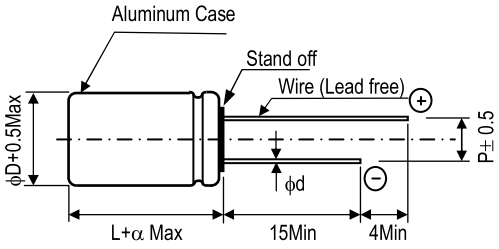
Items		Characteristics
		R7
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 16V·DC
Capacitance Range		68 to 1500μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
68					8×11.5
100				8×11.5	8×11.5
150			8×11.5		10×12.5
220			8×11.5	10×12.5	
330			10×12.5		10×12.5
390			8×11.5		
470				10×12.5	
560		8×11.5			
680	8×11.5		10×12.5	10×12.5	
820	8×11.5	10×12.5	10×12.5		
1000			10×12.5		
1200		10×12.5			
1500	10×12.5				

●Dimensions



[Unit : mm]

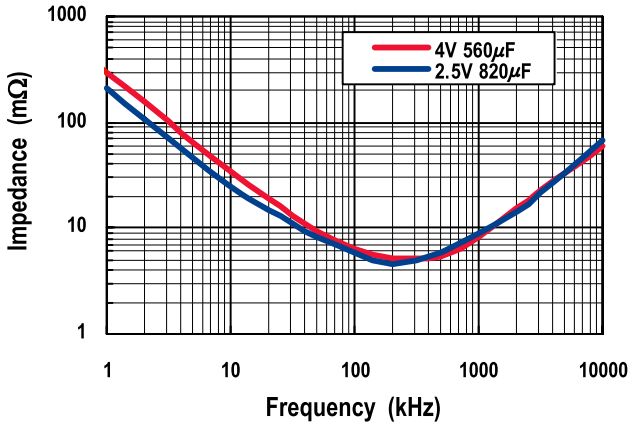
φD×L	φd	P	α
8×11.5	0.6	3.5	1.5
10×12.5	0.6	5.0	1.5

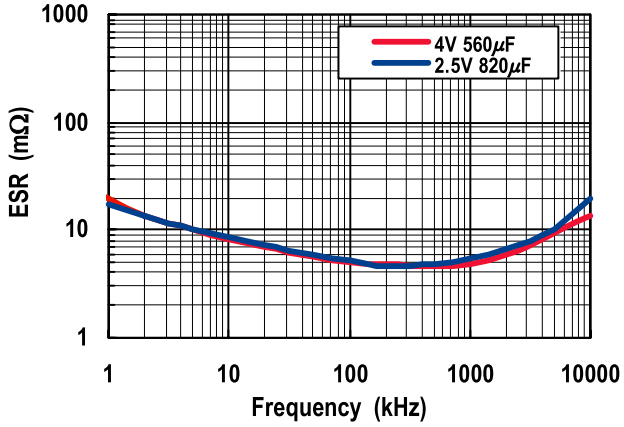
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	680	RR70E681MDN1□□	FP-2R5RE681M-R7□□	425	0.08	7	5600	8 × 11.5
	820	RR70E821MDN1□□	FP-2R5RE821M-R7□□	513	0.08	7	5600	8 × 11.5
	1500	RR70E152MDN1□□	FP-2R5RE152M-R7□□	938	0.08	7	6100	10 × 12.5
4.0	560	RR70G561MDN1□□	FP-4R0RE561M-R7□□	224	0.08	7	5600	8 × 11.5
	820	RR70G821MDN1□□	FP-4R0RE821M-R7□□	328	0.08	7	6100	10 × 12.5
	1200	RR70G122MDN1□□	FP-4R0RE122M-R7□□	960	0.15	7	6100	10 × 12.5
6.3	150	RR70J151MDN1□□	FP-6R3RE151M-R7□□	47	0.07	7	5600	8 × 11.5
	220	RR70J221MDN1□□	FP-6R3RE221M-R7□□	69	0.07	7	5600	8 × 11.5
	330	RR70J331MDN1□□	FP-6R3RE331M-R7□□	104	0.07	7	6100	10 × 12.5
	390	RR70J391MDN1□□	FP-6R3RE391M-R7□□	246	0.08	7	5600	8 × 11.5
	680	RR70J681MDN1□□	FP-6R3RE681M-R7□□	428	0.08	7	6100	10 × 12.5
	820	RR70J821MDN1□□	FP-6R3RE821M-R7□□	517	0.12	7	6100	10 × 12.5
	1000	RR70J102MDN1□□	FP-6R3RE102M-R7□□	630	0.12	7	6100	10 × 12.5
10	100	RR71A101MDN1□□	FP-010RE101M-R7□□	50	0.07	7	5600	8 × 11.5
	220	RR71A221MDN1□□	FP-010RE221M-R7□□	110	0.07	7	6100	10 × 12.5
	470	RR71A471MDN1□□	FP-010RE471M-R7□□	470	0.08	7	6100	10 × 12.5
	680	RR71A681MDN1□□	FP-010RE681M-R7□□	1360	0.10	7	6100	10 × 12.5
16	68	RR71C680MDN1□□	FP-016RE680M-R7□□	54	0.06	7	5600	8 × 11.5
	100	RR71C101MDN1□□	FP-016RE101M-R7□□	80	0.06	7	5600	8 × 11.5
	150	RR71C151MDN1□□	FP-016RE151M-R7□□	120	0.06	7	6100	10 × 12.5
	330	RR71C331MDN1□□	FP-016RE331M-R7□□	792	0.08	7	6100	10 × 12.5

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Frequency Characteristics





●Part Number (EX) 4V, 560μF

R	R7	0G	561	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

CG: Cut lead (Bulk)
KX: φ8, 3.5mm pitch taping
PX: φ8, 5.0mm pitch taping
PH: φ10, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

R5 series

Ultra Low ESR

Lead-free

RoHS Compliance

ESR 5mΩ

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

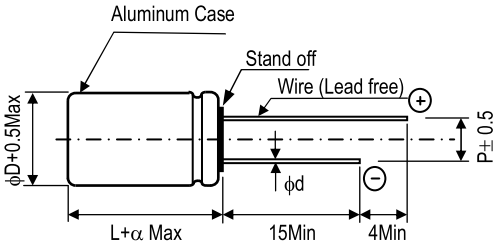
Items		Characteristics
		R5
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 6.3V·DC
Capacitance Range		390 to 1500μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)
390			8×11.5
470			
560	8×11.5	8×11.5	
680	8×11.5		10×12.5
820	8×11.5	10×12.5	10×12.5
1000	8×11.5		
1200		10×12.5	
1500	10×12.5		

●Dimensions



[Unit : mm]

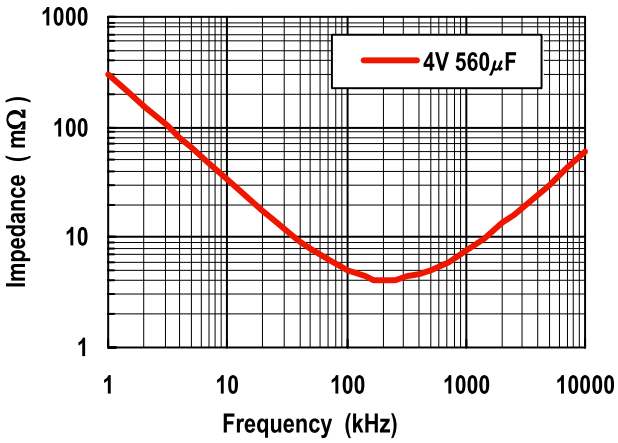
φD×L	φd	P	α
8×11.5	0.6	3.5	1.5
10×12.5	0.6	5.0	1.5

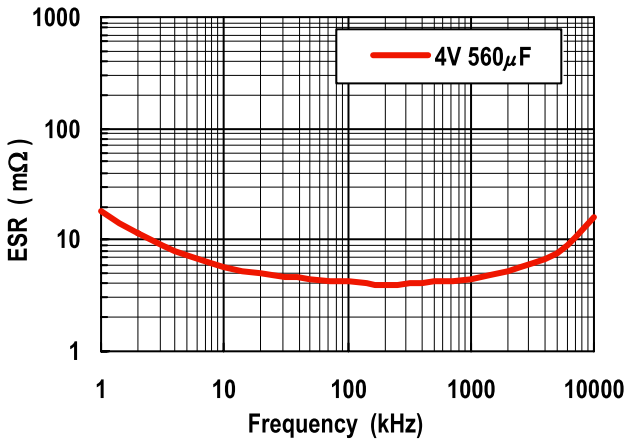
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number		Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
		NICHICON	FPCAP					
2.5	560	RR50E561MDN1□□	FP-2R5RE561M-R5□□	350	0.15	5	6630	8 × 11.5
	680	RR50E681MDN1□□	FP-2R5RE681M-R5□□	425	0.15	5	6630	8 × 11.5
	820	RR50E821MDN1□□	FP-2R5RE821M-R5□□	513	0.15	5	6630	8 × 11.5
	1000	RR50E102MDN1□□	FP-2R5RE102M-R5□□	625	0.15	5	6630	8 × 11.5
	1500	RR50E152MDN1□□	FP-2R5RE152M-R5□□	938	0.15	5	7220	10 × 12.5
4.0	560	RR50G561MDN1□□	FP-4R0RE561M-R5□□	560	0.15	5	6630	8 × 11.5
	820	RR50G821MDN1□□	FP-4R0RE821M-R5□□	820	0.15	5	7220	10 × 12.5
	1200	RR50G122MDN1□□	FP-4R0RE122M-R5□□	1200	0.15	5	7220	10 × 12.5
6.3	390	RR50J391MDN1□□	FP-6R3RE391M-R5□□	614	0.15	5	6630	8 × 11.5
	680	RR50J681MDN1□□	FP-6R3RE681M-R5□□	1071	0.15	5	7220	10 × 12.5
	820	RR50J821MDN1□□	FP-6R3RE821M-R5□□	1292	0.15	5	7220	10 × 12.5

* In case offsome doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Frequency Characteristics





●Part Number (EX) 4V, 560μF

R	R5	0G	561	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

CG: Cut lead (Bulk)
KX: φ8, 3.5mm pitch taping
PX: φ8, 5.0mm pitch taping
PH: φ10, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

NU series

Ultra Low ESR | Large Capacitance | Endurance 2000/5000hrs | Lead-free | RoHS Compliance

UPGRADE

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

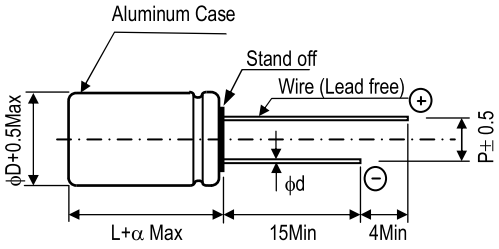
Items		Characteristics
		NU
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 25V·DC
Capacitance Range		10 to 2700μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000/5000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	25 (28.7)
10				4×5		
33						8×11.5
47						8×11.5
100					6.3×10	
180					8×11.5	
270					8×11.5	
330					8×11.5	
470			8×11.5		10×12.5	
680			8×11.5			
820		8×11.5	8×11.5			
1000		8×11.5	8×11.5			
1200		8×11.5				
1500	8×11.5		10×12.5			
1800		10×12.5				
2200		10×12.5				
2700	10×12.5					

●Dimensions



[Unit : mm]

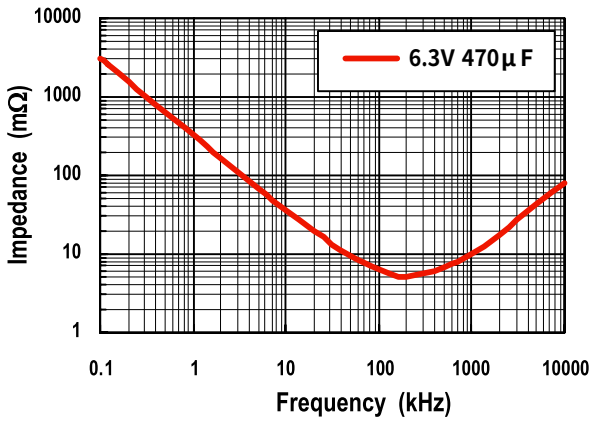
φD×L	φd	P	α
4×5	0.45	1.5	1.0
6.3×10	0.5	2.5	1.0
8×11.5	0.6	3.5	1.5
10×12.5	0.6	5.0	1.5

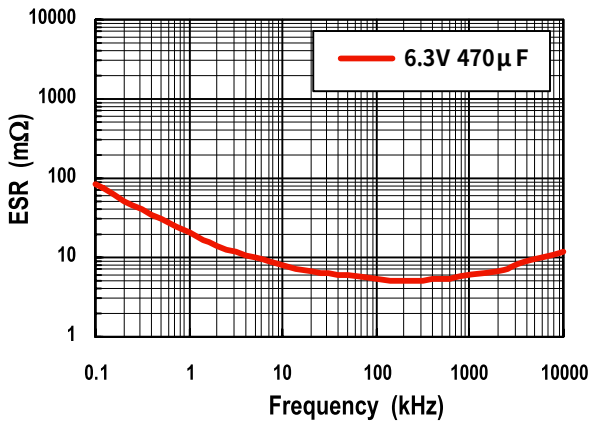
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	1500	RNU0E152MDN1□□	FP-2R5RE152M-NU□□	938	0.08	7	5700	8 x 11.5
	2700	RNU0E272MDN1□□	FP-2R5RE272M-NU□□	1350	0.08	7	6100	10 x 12.5
4.0	820	RNU0G821MDN1□□	FP-4R0RE821M-NU□□	656	0.08	7	5700	8 x 11.5
	1000	RNU0G102MDN1□□	FP-4R0RE102M-NU□□	800	0.08	7	5700	8 x 11.5
	1200	RNU0G122MDN1□□	FP-4R0RE122M-NU□□	960	0.08	7	5700	8 x 11.5
	1800	RNU0G182MDN1□□	FP-4R0RE182M-NU□□	1440	0.08	7	6100	10 x 12.5
	2200	RNU0G222MDN1□□	FP-4R0RE222M-NU□□	1760	0.08	7	6100	10 x 12.5
6.3	470	RNU0J471MDN1□□	FP-6R3RE471M-NU□□	592	0.08	7	5700	8 × 11.5
	680	RNU0J681MDN1□□	FP-6R3RE681M-NU□□	857	0.08	7	5700	8 x 11.5
	820	RNU0J821MDN1□□	FP-6R3RE821M-NU□□	1033	0.08	7	5700	8 x 11.5
	1000	RNU0J102MDN1□□	FP-6R3RE102M-NU□□	1260	0.08	7	5700	8 x 11.5
	1500	RNU0J152MDN1□□	FP-6R3RE152M-NU□□	1890	0.08	7	6100	10 x 12.5
10.0	10	RNU1A100MDS1□□	FP-010RE100M-NU□□	300	0.12	220	700	4 × 5
	** 10	RNU1A100MDSASQ□□	FP-010RE100M-NU□□-5K	300	0.12	220	700	4 × 5
16.0	100	RNU1C101MDS1□□	FP-016RE101M-NU□□	320	0.08	25	2820	6.3 x 10
	** 100	RNU1C101MDSASQ□□	FP-016RE101M-NU□□-5K	320	0.08	25	2820	6.3 x 10
	180	RNU1C181MDN1□□	FP-016RE181M-NU□□	576	0.08	8	5700	8 × 11.5
	270	RNU1C271MDN1□□	FP-016RE271M-NU□□	864	0.08	8	5000	8 × 11.5
	** 270	RNU1C271MDNASQ□□	FP-016RE271M-NU□□-5K	864	0.08	8	5000	8 × 11.5
	330	RNU1C331MDN1□□	FP-016RE331M-NU□□	1056	0.08	8	6100	8 × 11.5
	470	RNU1C471MDN1□□	FP-016RE471M-NU□□	1504	0.08	10	6100	10 × 12.5
25.0	33	RNU1E330MDN1□□	FP-025RE330M-NU□□	413	0.12	24	3600	8 × 11.5
	47	RNU1E470MDN1□□	FP-025RE470M-NU□□	588	0.12	24	3600	8 × 11.5

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.
** Endurance 5000hrs product.

●Frequency Characteristics





●Part Number (EX) 16V, 270μF, 5000hrs (Endurance)

R	NU	1C	271	M	DN	ASQ	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

ASQ : 5000hrs
1 : 2000hrs

CG: Cut lead (Bulk)
JX: φ6.3x10 2.5mm pitch taping
KX: φ8, 3.5mm pitch taping
PX: φ6.3&φ8, 5.0mm pitch taping
PH: φ10, 5.0mm pitch taping

nichicon

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

L8 series

Ultra Low ESR | Large Capacitance | Endurance 2000/5000hrs | Low Profile | Lead-free | RoHS Compliance

UPGRADE

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

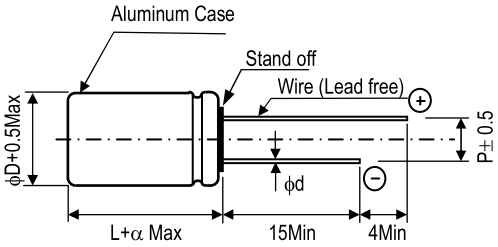
Items		Characteristics
		L8
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 16V·DC
Capacitance Range		180 to 1500μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000/5000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
180					8×8
220					8×8
270					8×8
470			8×8		
560	8×8	8×8	8×8		
680			8×8		
820	8×8	8×8	8×8		
1000	8×8		8×8		
1200	8×8				
1500	8×8				

●Dimensions



[Unit : mm]

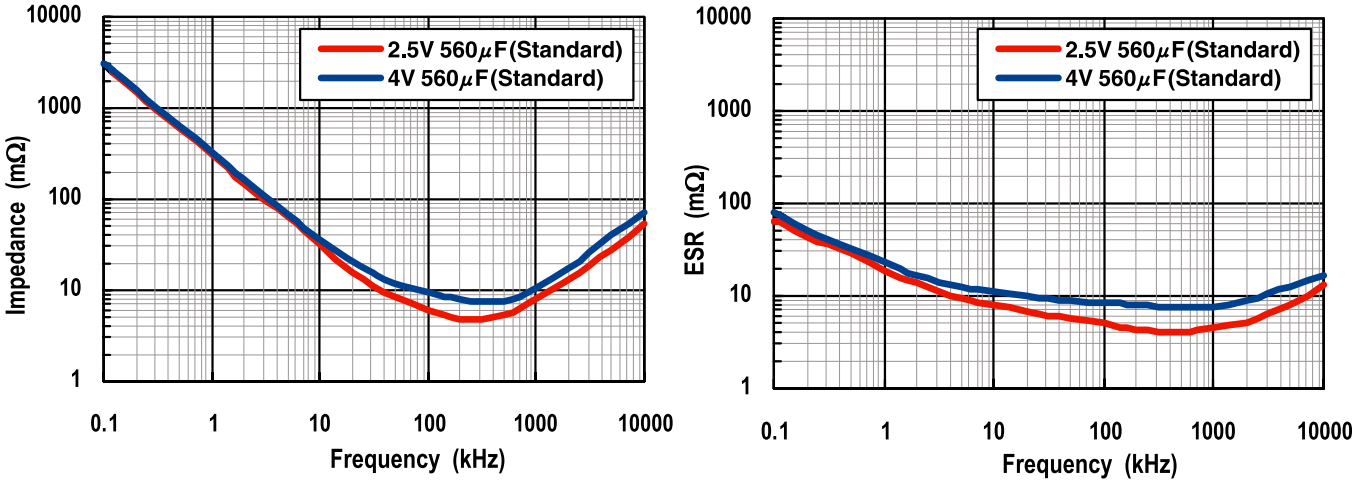
φD×L	φd	P	α
8×8	0.6	3.5	1.0

●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	560	RL80E561MDN1□□	FP-2R5RE561M-L8□□	500	0.12	6	6100	8 × 8
	** 560	RL80E561MDNASQ□□	FP-2R5RE561M-L8□□-5K	500	0.12	6	6100	8 × 8
	820	RL80E821MDN1□□	FP-2R5RE821M-L8□□	513	0.12	6	6100	8 × 8
	** 820	RL80E821MDNASQ□□	FP-2R5RE821M-L8□□-5K	513	0.12	6	6100	8 × 8
	1000	RL80E102MDN1□□	FP-2R5RE102M-L8□□	625	0.12	6	6100	8 × 8
	1200	RL80E122MDN1□□	FP-2R5RE122M-L8□□	750	0.12	7	6100	8 × 8
	1500	RL80E152MDN1□□	FP-2R5RE152M-L8□□	938	0.12	7	6100	8 × 8
4.0	560	RL80G561MDN1□□	FP-4R0RE561M-L8□□	560	0.12	6	6100	8 × 8
	** 560	RL80G561MDNASQ□□	FP-4R0RE561M-L8□□-5K	560	0.12	6	6100	8 × 8
	820	RL80G821MDN1□□	FP-4R0RE821M-L8□□	820	0.12	6	6100	8 × 8
6.3	470	RL80J471MDN1□□	FP-6R3RE471M-L8□□	592	0.12	8	5700	8 × 8
	** 470	RL80J471MDNASQ□□	FP-6R3RE571M-L8□□-5K	592	0.12	8	5700	8 × 8
	560	RL80J561MDN1□□	FP-6R3RE561M-L8□□	706	0.12	8	5700	8 × 8
	** 560	RL80J561MDNASQ□□	FP-6R3RE561M-L8□□-5K	706	0.12	8	5700	8 × 8
	680	RL80J681MDN1□□	FP-6R3RE681M-L8□□	857	0.12	8	5700	8 × 8
	820	RL80J821MDN1□□	FP-6R3RE821M-L8□□	1033	0.12	8	5700	8 × 8
	1000	RL80J102MDN1□□	FP-6R3RE102M-L8□□	1260	0.12	9	5700	8 × 8
16	180	RL81C181MDN1□□	FP-016RE181M-L8□□	576	0.12	12	5000	8 × 8
	220	RL81C221MDN1□□	FP-016RE221M-L8□□	704	0.12	12	5000	8 × 8
	270	RL81C271MDN1□□	FP-016RE271M-L8□□	864	0.12	12	5000	8 × 8

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.
** Endurance 5000hrs product.

●Frequency Characteristics



●Part Number (EX) 6.3V, 560μF, 5000hrs (Endurance)

R	L8	0J	561	M	DN	ASQ	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

ASQ : 5000hrs
1 : 2000hrs

CG: Cut lead (Bulk)
KX: φ8, 3.5mm pitch taping
PX: φ8, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

S8 series

Ultra Low ESR | Large Capacitance | Endurance 2000/5000hrs | Low ESL | Lead-free | RoHS Compliance

UPGRADE

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR and **Low ESL** at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

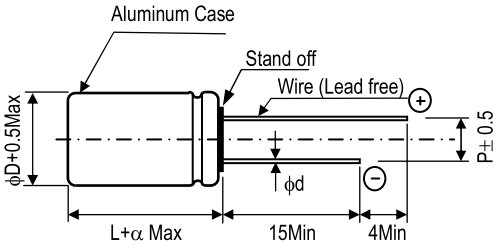
Items		Characteristics
		S8
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 6.3V·DC
Capacitance Range		330 to 820μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000/5000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)
330	6.3×8		6.3×8
470	6.3×8		6.3×8
560	6.3×8	6.3×8	6.3×8
820	6.3×8		

●Dimensions



[Unit : mm]

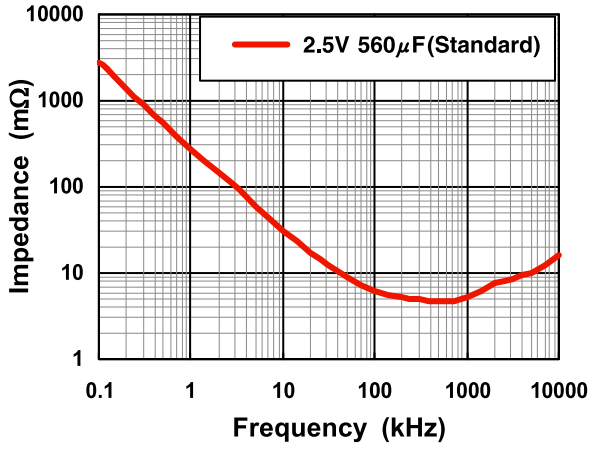
φD×L	φd	P	α
6.3×8	0.6	2.5	1.0

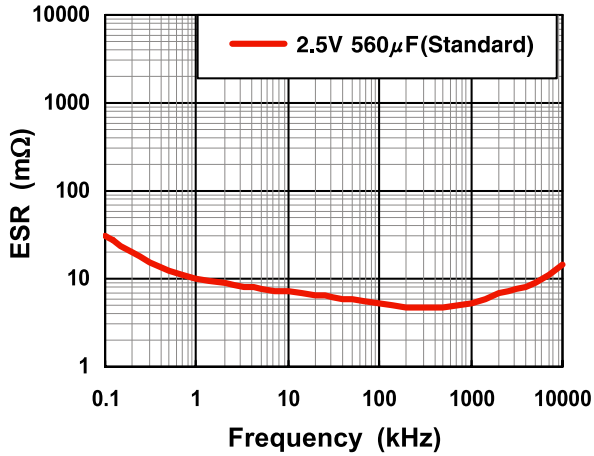
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	ESL (Typ.) (nH, 10MHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	330	RS80E331MDN1□□	FP-2R5RE331M-S8□□	500	0.10	7	2	5600	6.3 × 8
	** 330	RS80E331MDNASQ□□	FP-2R5RE331M-S8□□-5K	500	0.10	7	2	5600	6.3 × 8
	470	RS80E471MDN1□□	FP-2R5RE471M-S8□□	500	0.10	7	2	5600	6.3 × 8
	** 470	RS80E471MDNASQ□□	FP-2R5RE471M-S8□□-5K	500	0.10	7	2	5600	6.3 × 8
	560	RS80E561MDN1□□	FP-2R5RE561M-S8□□	500	0.10	7	2	5600	6.3 × 8
	** 560	RS80E561MDNASQ□□	FP-2R5RE561M-S8□□-5K	500	0.10	7	2	5600	6.3 × 8
	820	RS80E821MDN1□□	FP-2R5RE821M-S8□□	512	0.10	7	2	5600	6.3 × 8
	** 820	RS80E821MDNASQ□□	FP-2R5RE821M-S8□□-5K	512	0.10	7	2	5600	6.3 × 8
4.0	560	RS80G561MDN1□□	FP-4R0RE561M-S8□□	560	0.10	7	2	5000	6.3 × 8
	** 560	RS80G561MDNASQ□□	FP-4R0RE561M-S8□□-5K	560	0.10	7	2	5000	6.3 × 8
6.3	330	RS80J331MDN1□□	FP-6R3RE331M-S8□□	519	0.10	8	2	5000	6.3 × 8
	** 330	RS80J331MDNASQ□□	FP-6R3RE331M-S8□□-5K	519	0.10	8	2	5000	6.3 × 8
	470	RS80J471MDN1□□	FP-6R3RE471M-S8□□	740	0.10	8	2	5000	6.3 × 8
	** 470	RS80J471MDNASQ□□	FP-6R3RE471M-S8□□-5K	740	0.10	8	2	5000	6.3 × 8
	560	RS80J561MDN1□□	FP-6R3RE561M-S8□□	882	0.10	8	2	5000	6.3 × 8
	** 560	RS80J561MDNASQ□□	FP-6R3RE561M-S8□□-5K	882	0.10	8	2	5000	6.3 × 8

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.
** Endurance 5000hrs product.

●Frequency Characteristics





●Part Number (EX) 2.5V, 820μF, 5000hrs (Endurance)

R	S8	0E	821	M	DN	ASQ	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

(ASQ : 5000hrs
1 : 2000hrs)
(CG: Cut lead (Bulk)
PX: φ6.3, 5.0mm pitch taping)

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

E5 series

Ultra Low ESR | Low Profile | Large Capacitance | Lead-free | RoHS Compliance

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

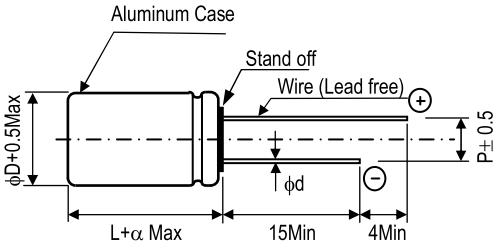
Items		Characteristics
		E5
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 4V·DC
Capacitance Range		560 to 820μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)
560	8×8	8×8	
820	8×8		

●Dimensions



[Unit : mm]

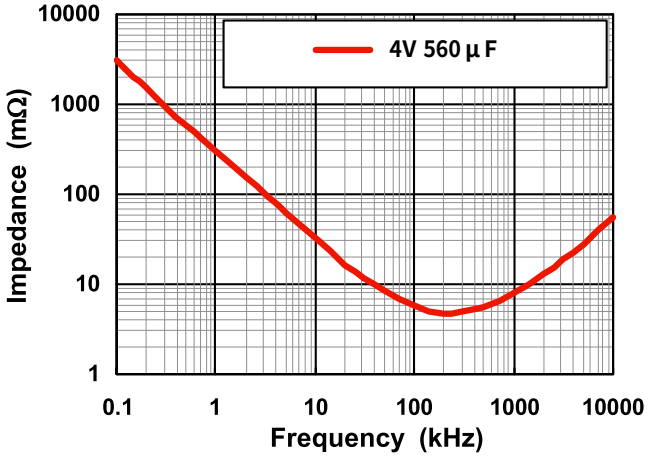
φD×L	φd	P	α
8×8	0.6	3.5	1.0

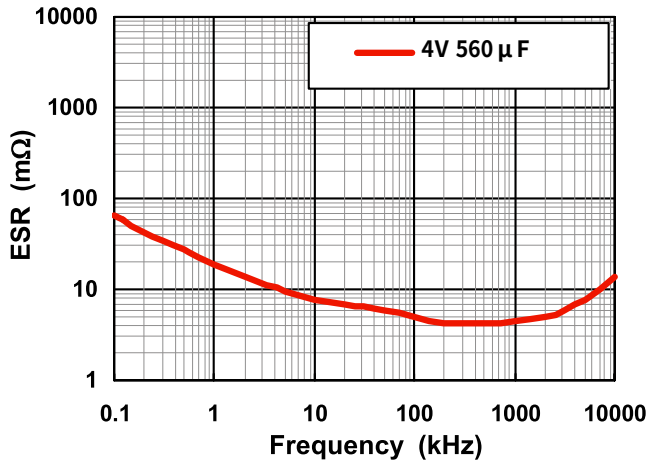
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	560	RE50E561MDN1□□	FP-2R5RE561M-E5□□	500	0.10	5	6300	8 × 8
	820	RE50E821MDN1□□	FP-2R5RE821M-E5□□	513	0.10	5	6300	8 × 8
4.0	560	RE50G561MDN1□□	FP-4R0RE561M-E5□□	560	0.10	5	6300	8 × 8

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Frequency Characteristics





●Part Number (EX) 4V, 560μF

R	E5	0G	561	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

CG: Cut lead (Bulk)
KX: φ8, 3.5mm pitch taping
PX: φ8, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

HT series

Low ESR | Guarantee 125ºC | Large Capacitance | Lead-free | RoHS Compliance

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Guaranteed at 125 degrees and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

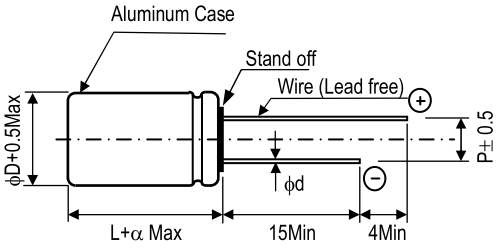
Items		Characteristics
		HT
Operating Temp. Range		- 55 to + 125°C
Rated Voltage Range		6.3 to 20V·DC
Capacitance Range		150 to 820µF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	125°C 1000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.5% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [µF]	4.0 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	20 (23)
150					10×12.5
220			8×11.5		
330			8×11.5	10×12.5	
560			10×12.5		
680		10×12.5			
820		10×12.5			

●Dimensions



[Unit : mm]

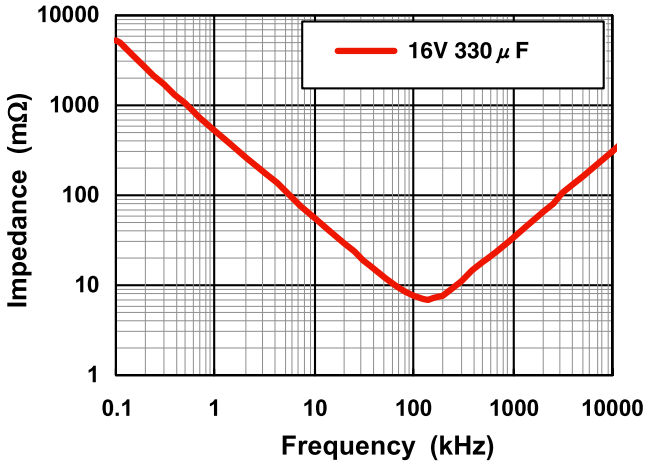
φD×L	φd	P	α
8×11.5	0.6	3.5	1.5
10×12.5	0.6	5.0	1.5

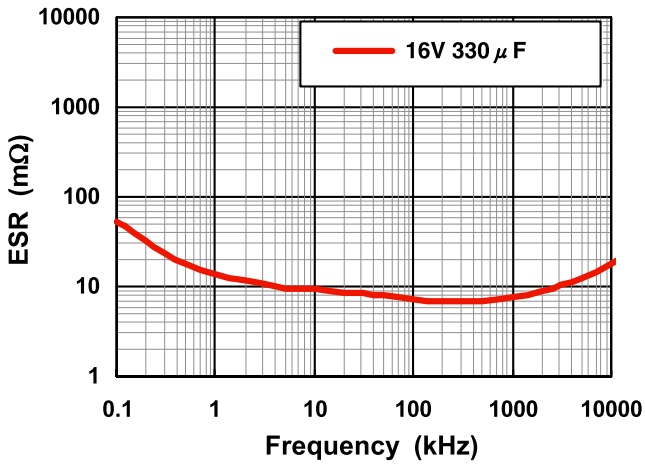
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current *1 (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current *2 105℃ or less	Rated Ripple Current *2 105℃ to 125℃	Case Size φD×L(mm)
6.3	680	RHT0J681MDN1□□	FP-6R3RE681M-HT□□	857	0.12	12	5450	1740	10 x 12.5
	820	RHT0J821MDN1□□	FP-6R3RE821M-HT□□	1033	0.12	12	5450	1740	10 × 12.5
10	220	RHT1A221MDN1□□	FP-010RE221M-HT□□	440	0.12	17	3950	1260	8 × 11.5
	330	RHT1A331MDN1□□	FP-010RE331M-HT□□	660	0.12	17	3950	1260	8 × 11.5
	560	RHT1A561MDN1□□	FP-010RE561M-HT□□	1120	0.12	13	5250	1680	10 × 12.5
16	330	RHT1C331MDN1□□	FP-016RE331M-HT□□	1056	0.12	16	4750	1520	10 × 12.5
20	150	RHT1D151MDN1□□	FP-020RE151M-HT□□	600	0.12	20	4350	1390	10 × 12.5

*1: In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.
*2: At ambient temperature

●Frequency Characteristics





●Part Number (EX) 16V, 330μF

R	HT	1C	331	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

CG: Cut lead (Bulk)
KX: φ8, 3.5mm pitch taping
PX: φ8, 5.0mm pitch taping
PH: φ10, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

F8 series

Ultra Low ESR | Large Capacitance | Low ESL | Lead-free | RoHS Compliance

NEW

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR and **Low ESL** at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

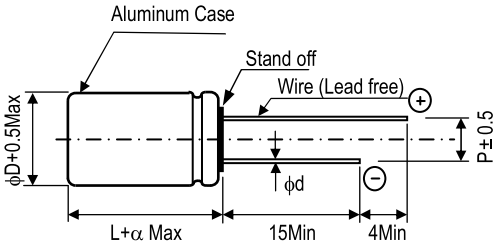
Items		Characteristics
		F8
Operating Temp. Range		- 55 to + 105°C
Rated Voltage Range		2.5 to 6.3V·DC
Capacitance Range		100 to 560µF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [µF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)
100	5×8		
270			5×8
330	5×8	5×8	
470	5×8		
560	5×8		

●Dimensions



[Unit : mm]

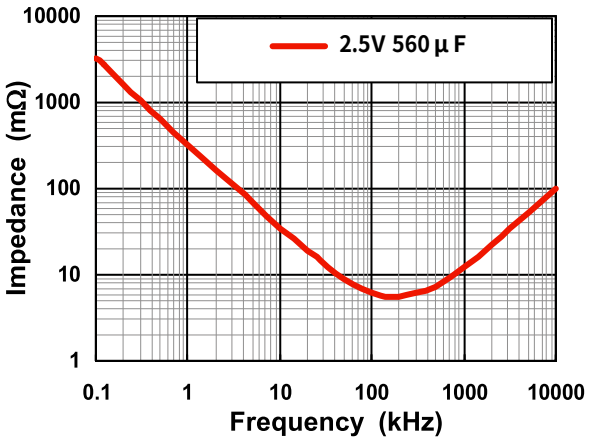
φD×L	φd	P	α
5×8	0.6	2.0	1.0

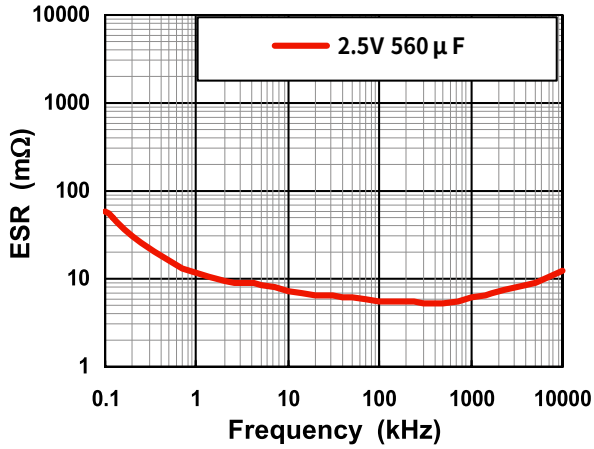
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number		Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	ESL (Typ.) (nH, 10MHz)	Rated Ripple Current (mA, r.m.s.)	Case Size ϕD×L(mm)
		NICHICON	FPCAP						
2.5	100	RF80E101MDN1□□	FP-2R5RE101M-F8□□	500	0.10	7	1.5	4200	5 × 8
	330	RF80E331MDN1□□	FP-2R5RE331M-F8□□	500	0.10	7	1.5	4200	5 × 8
	470	RF80E471MDN1□□	FP-2R5RE471M-F8□□	500	0.10	7	1.5	4200	5 × 8
	560	RF80E561MDN1□□	FP-2R5RE561M-F8□□	500	0.10	7	1.5	4200	5 × 8
4	330	RF80G331MDN1□□	FP-4R0RE331M-F8□□	500	0.10	8	1.5	4000	5 × 8
6.3	270	RF80J271MDN1□□	FP-6R3RE271M-F8□□	500	0.10	11	1.5	3700	5 × 8

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Frequency Characteristics





●Part Number (EX) 2.5V, 560μF

R	F8	0E	561	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

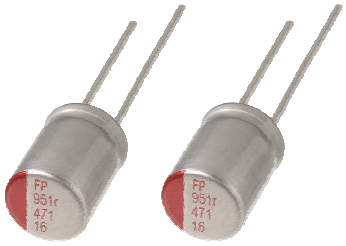
CG: Cut lead (Bulk)
JT: ϕ5x8, 2.5mm pitch taping
PX:ϕ5, 5.0mm pitch taping

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

NE series

Ultra Low ESR | Ultra Large Capacitance | Lead free | RoHS Compliance

NEW



●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

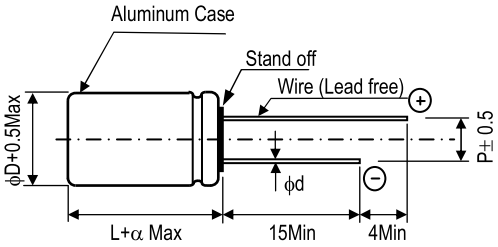
Items		Characteristics
		NE
Operating Temp. Range		-55 to +105°C
Rated Voltage Range		2.5 to 16V·DC
Capacitance Range		100 to 1200μF
Capacitance Tolerance		± 20% (M)
Endurance	Condition	105°C 2000Hrs at rated voltage
	Capacitance	Within ± 20% of the value before test
	Leakage Current	Not to exceed the value specified
	tan δ	Not to exceed 150% of the value specified
Failure Rate		0.1% / 1000Hrs. Max (60%CL)

●Size List

[φD×L]

R.V (S.V.) [V] / Cap. [μF]	2.5 (2.8)	6.3 (7.2)	10 (11.5)	16 (18.4)
100				**5×10**
220			**6.3×10**	
470				**8×11.5**
680	**8×6**			
1200		**8×9**		

●Dimensions



[Unit : mm]

φD×L	φd	P	α
5×10	0.5	2.0	1.0
6.3×10	0.5	2.5	1.0
8×6	0.6	3.5	1.0
8×9	0.6	3.5	1.0
8×11.5	0.6	3.5	1.5

●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	680	RNE0E681MDN1□□	FP-2R5RE681M-NE□□	500	0.10	8	4900	8 × 6
6.3	1200	RNE0J122MDN1□□	FP-6R3RE122M-NE□□	1512	0.08	10	5700	8 × 9
10	220	RNE1A221MDS1□□	FP-010RE221M-NE□□	440	0.08	30	2500	6.3 × 10
16	100	RNE1C101MDS1□□	FP-016RE101M-NE□□	320	0.08	35	2300	5 × 10
	470	RNE1C471MDN1□□	FP-016RE471M-NE□□	1504	0.08	12	5000	8 × 11.5

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Part Number (EX) 16V, 470μF

R	NE	1C	471	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Lead Forming

CG: Cut lead (Bulk)
JX: φ6.3x10 2.5mm pitch taping
JT: φ5x10, 2.5mm pitch taping
KX: φ8, 3.5mm pitch taping
PX: φ5&φ6.3&φ8, 5.0mm pitch taping

nichicon

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

PS & PA series

Low ESR | SMD | Lead-free | RoHS Compliance

Standard

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

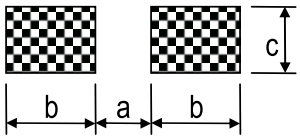
Items		Characteristic PS & PA
Operating temp. range		-55 to +105°C
Rated voltage range		2.5 to 16V·DC
Capacitance range		39 to 1500μF
Capacitance tolerance		±20% (M)
Endurance	Test condition	105°C, rated voltage 2000Hrs.
	Capacitance	Within ±20% of initial value before test
	Leakage current	Not to exceed the initial specified value
	ESR	Not to exceed 150% of initial specified value
	tan δ	Not to exceed 150% of initial specified value
Failure Rate		0.5% / 1000Hrs. Max (60%CL)

●Size List

( ) : PA series [φD×L]

Cap. [μF] \ R.V. (S.V.) [V]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
39					6.3×5.7 (6.3×5.7)
47				6.3×5.7	
56				6.3×5.7	8×6.7
68					
82			6.3×5.7		8×6.7
100		6.3×5.7			10×7.7
120				8×6.7	
150			8×6.7		10×7.7
180			8×6.7		8×11.7
220		8×6.7			8×11.7
270				10×7.7	
330		8×6.7	10×7.7	8×11.7	10×12.4
470		10×7.7	8×11.7		
560		8×11.7 (8×11.7)	8×11.7	10×12.4	
680	8×11.7		10×12.4		
820			10×12.4		
1000			10×12.4		
1200		10×12.4			
1500	10×12.4				

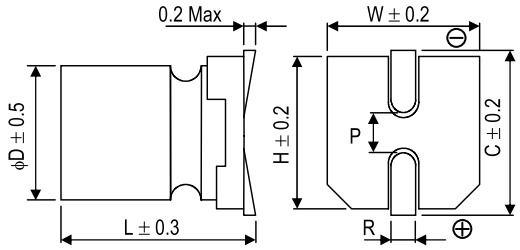
●Recommended land pattern



[Unit: mm]

φD	a	b	c
6.3	2.1	3.5	1.6
8	2.8	4.2	1.9
10	4.3	4.4	1.9

●Dimensions



[Unit: mm]

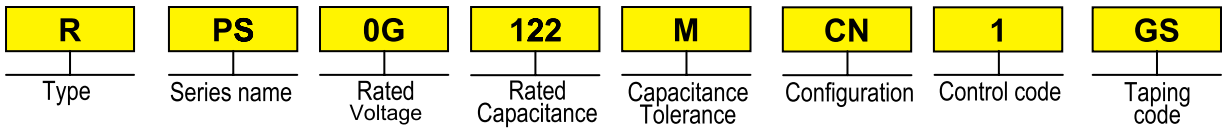
φD×L	W	H	C	R	P
6.3×5.7	6.5	6.5	7.2	0.5 to 0.9	2.1
8×6.7	8.3	8.3	9.0	0.8 to 1.1	3.2
8×11.7	8.3	8.3	9.0	0.8 to 1.1	3.2
10×7.7	10.3	10.3	11.0	0.8 to 1.1	4.6
10×12.4	10.3	10.3	11.0	0.8 to 1.1	4.6

●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number		Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
		NICHICON	FPCAP					
2.5	680	RPS0E681MCN1GS	FP-2R5ME681M-PSR	425	0.12	13	4500	8 × 11.7
	1500	RPS0E152MCN1GS	FP-2R5ME152M-PSR	938	0.12	10	5500	10 × 12.4
4.0	100	RPS0G101MCN1GS	FP-4R0ME101M-PSR	80	0.12	35	2200	6.3 × 5.7
	220	RPS0G221MCN1GS	FP-4R0ME221M-PSR	176	0.12	30	2700	8 × 6.7
	330	RPS0G331MCN1GS	FP-4R0ME331M-PSR	264	0.12	30	2700	8 × 6.7
	470	RPS0G471MCN1GS	FP-4R0ME471M-PSR	376	0.12	22	3800	10 × 7.7
	560	RPS0G561MCN1GS	FP-4R0ME561M-PSR	448	0.12	13	4500	8 × 11.7
	560	RPA0G561MCN1GS	FP-4R0ME561M-PAR	448	0.12	9	5400	8 × 11.7
	1200	RPS0G122MCN1GS	FP-4R0ME122M-PSR	960	0.12	12	5500	10 × 12.4
6.3	82	RPS0J820MCN1GS	FP-6R3ME820M-PSR	103	0.12	35	2200	6.3 × 5.7
	150	RPS0J151MCN1GS	FP-6R3ME151M-PSR	189	0.12	30	2600	8 × 6.7
	180	RPS0J181MCN1GS	FP-6R3ME181M-PSR	227	0.12	30	2600	8 × 6.7
	330	RPS0J331MCN1GS	FP-6R3ME331M-PSR	416	0.12	22	3600	10 × 7.7
	470	RPS0J471MCN1GS	FP-6R3ME471M-PSR	592	0.15	15	4300	8 × 11.7
	560	RPS0J561MCN1GS	FP-6R3ME561M-PSR	706	0.15	14	4400	8 × 11.7
	680	RPS0J681MCN1GS	FP-6R3ME681M-PSR	643	0.15	13	5200	10 × 12.4
	820	RPS0J821MCN1GS	FP-6R3ME821M-PSR	775	0.15	12	5500	10 × 12.4
	1000	RPS0J102MCN1GS	FP-6R3ME102M-PSR	945	0.15	12	5500	10 × 12.4
10	47	RPS1A470MCN1GS	FP-010ME470M-PSR	94	0.12	40	2100	6.3 × 5.7
	56	RPS1A560MCN1GS	FP-010ME560M-PSR	112	0.12	40	2100	6.3 × 5.7
	120	RPS1A121MCN1GS	FP-010ME121M-PSR	240	0.12	30	2600	8 × 6.7
	270	RPS1A271MCN1GS	FP-010ME271M-PSR	540	0.12	25	3500	10 × 7.7
	330	RPS1A331MCN1GS	FP-010ME331M-PSR	660	0.15	17	4000	8 × 11.7
	560	RPS1A561MCN1GS	FP-010ME561M-PSR	840	0.15	13	5300	10 × 12.4
16	39	RPS1C390MCN1GS	FP-016ME390M-PSR	125	0.10	45	2000	6.3 × 5.7
	39	RPA1C390MCN1GS	FP-016ME390M-PAR	125	0.10	24	2500	6.3 × 5.7
	56	RPS1C560MCN1GS	FP-016ME560M-PSR	179	0.10	40	2300	8 × 6.7
	82	RPS1C820MCN1GS	FP-016ME820M-PSR	262	0.10	40	2300	8 × 6.7
	100	RPS1C101MCN1GS	FP-016ME101M-PSR	320	0.10	30	3200	10 × 7.7
	150	RPS1C151MCN1GS	FP-016ME151M-PSR	480	0.10	30	3200	10 × 7.7
	180	RPS1C181MCN1GS	FP-016ME181M-PSR	576	0.12	20	3700	8 × 11.7
	220	RPS1C221MCN1GS	FP-016ME221M-PSR	704	0.12	20	3700	8 × 11.7
	330	RPS1C331MCN1GS	FP-016ME331M-PSR	792	0.12	16	4800	10 × 12.4

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Part Number (EX) 4V, 1200μF, PS series



FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

FS series

Large Capacitance | φ4 / φ5 | Low ESR
SMD | Lead-free | RoHS Compliance

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

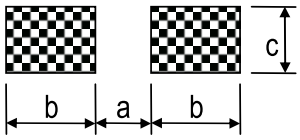
Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

Items		Characteristic
		FS
Operating temp. range		-55 to +105°C
Rated voltage range		2.5 to 10V·DC
Capacitance range		10 to 180μF
Capacitance tolerance		±20% (M)
Endurance	Test condition	105°C, rated voltage 2000Hrs.
	Capacitance	Within ±20% of initial value before test
	Leakage current	Not to exceed the initial specified value
	ESR	Not to exceed 150% of initial specified value
	tan δ	Not to exceed 150% of initial specified value
Failure Rate		0.5% / 1000Hrs. Max (60%CL)

●Recommended land pattern



[Unit: mm]

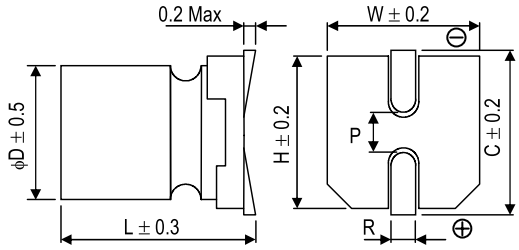
φD	a	b	c
4	1.0	2.6	1.6
5	1.4	3.0	1.6

●Size List

[φD×L]

R.V. (S.V.) [V] / Cap. [μF]	2.5 (2.8)	4.0 (4.6)	6.3 (7.2)	10 (11.5)
10				4×5.2
47			5×5.7	
68				5×5.7
100		5×5.7	5×5.7	
120			5×5.7	
150		5×5.7		
180	5×5.7			

●Dimensions



[Unit: mm]

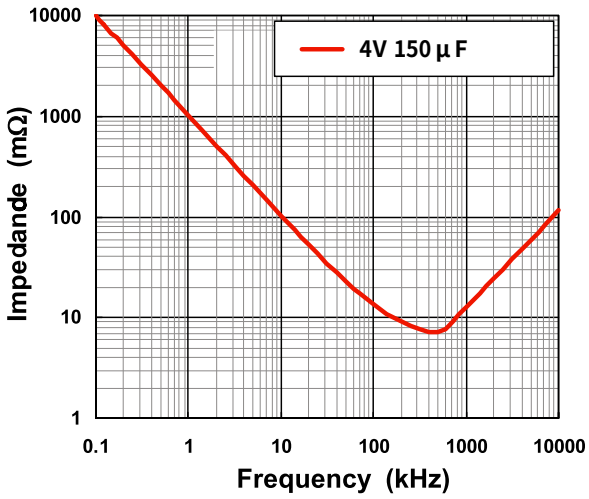
φD×L	W	H	C	R	P
4×5.2	4.3	4.3	5.1	0.5 to 0.9	1.0
5×5.7	5.3	5.3	5.9	0.5 to 0.9	1.4

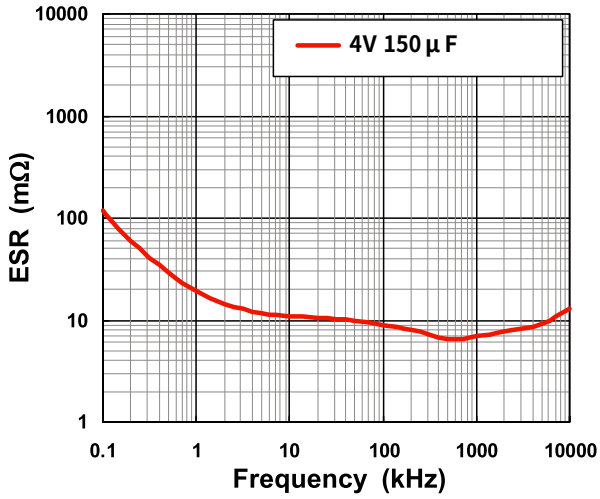
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	180	RFS0E181MCN1GS	FP-2R5ME181M-FSR	300	0.12	21	2670	5 × 5.7
4.0	100	RFS0G101MCN1GS	FP-4R0ME101M-FSR	300	0.12	22	2610	5 × 5.7
	150	RFS0G151MCN1GS	FP-4R0ME151M-FSR	300	0.12	22	2610	5 × 5.7
6.3	47	RFS0J470MCN1GS	FP-6R3ME470M-FSR	300	0.12	30	2000	5 × 5.7
	100	RFS0J101MCN1GS	FP-6R3ME101M-FSR	300	0.12	24	2500	5 × 5.7
	120	RFS0J121MCN1GS	FP-6R3ME121M-FSR	300	0.12	24	2500	5 × 5.7
10	10	RFS1A100MCN1GB	FP-010ME100M-FSR	100	0.12	220	700	4 × 5.2
	68	RFS1A680MCN1GS	FP-010ME680M-FSR	300	0.12	30	2000	5 × 5.7

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Frequency Characteristics





●Part Number (EX) 2.5V, 180μF, FS series

R	FS	0G	181	M	CN	1	GS
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Taping code

Taping code:
GB: Height under 5.2mm
GS: Height over 5.5mm

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

SS & SA & SB series

Large Capacitance | Low ESR | φ6.3
SMD | Lead-free | RoHS Compliance

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

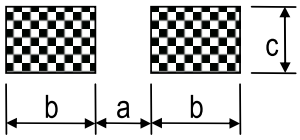
Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

Items		Characteristic
		SS & SA & SB
Operating temp. range		-55 to +105°C
Rated voltage range		2.5 to 16V·DC
Capacitance range		100 to 560μF
Capacitance tolerance		±20% (M)
Endurance	Test condition	105°C, rated voltage 2000Hrs.
	Capacitance	Within ±20% of initial value before test
	Leakage current	Not to exceed the initial specified value
	ESR	Not to exceed 150% of initial specified value
	tan δ	Not to exceed 150% of initial specified value
Failure Rate		0.5% / 1000Hrs. Max (60%CL)

●Recommended land pattern



[Unit: mm]

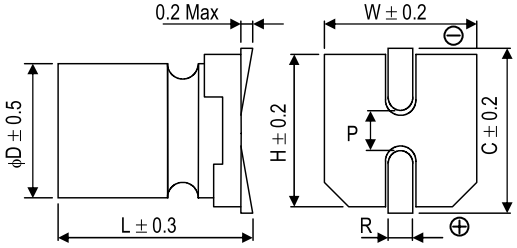
φD	a	b	c
6.3	2.1	3.5	1.6

●Size (ESR) List

[φD×L (mΩ)]

R.V. (S.V.) [V] / Cap. [μF]	2.5 (2.8)			4.0 (4.6)		6.3 (7.2)			10 (11.5)	16 (18.4)
	SS	SA	SB	SA	SB	SS	SA	SB	SA	SA
100						6.3x5.7 (25)				6.3x7.7 (24)
120									6.3x5.7 (18)	
220						6.3x5.7 (25)	6.3x5.7 (15)	6.3x5.7 (12)		
270							6.3x5.7 (14)			
330		6.3x5.7 (14)		6.3x5.7 (14)	6.3x5.7 (11)	6.3x5.7 (25)	6.3x5.7 (14)			
390		6.3x5.7 (14)	6.3x5.7 (10)	6.3x5.7 (14)						
470		6.3x5.7 (13)								
560	6.3x5.7 (25)	6.3x5.7 (13)	6.3x5.7 (10)							

●Dimensions



[Unit: mm]

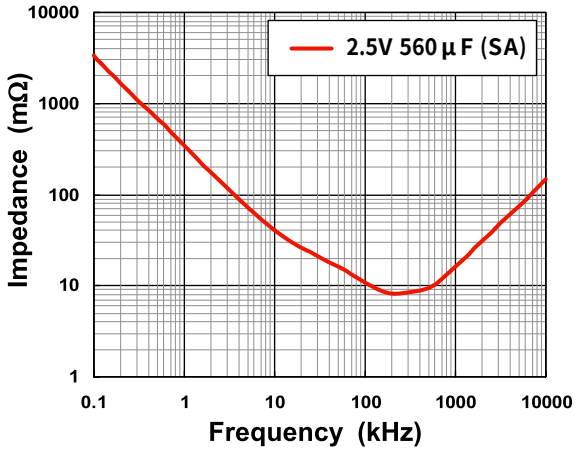
φD×L	W	H	C	R	P
6.3×5.7	6.5	6.5	7.2	0.5 to 0.9	2.1
6.3×7.7	6.5	6.5	7.2	0.5 to 0.9	2.1

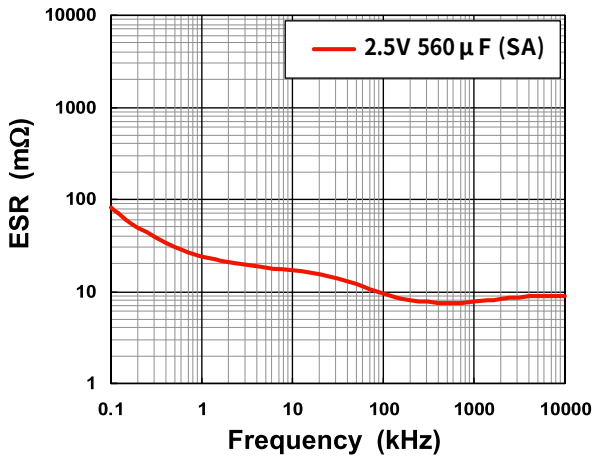
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number NICHICON	Part Number FPCAP	Leakage Current* (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
2.5	330	RSA0E331MCN1GS	FP-2R5ME331M-SAR	700	0.12	14	3160	6.3 × 5.7
	390	RSA0E391MCN1GS	FP-2R5ME391M-SAR	700	0.12	14	3160	6.3 × 5.7
	390	RSB0E391MCN1GS	FP-2R5ME391M-SBR	700	0.12	10	3650	6.3 × 5.7
	470	RSA0E471MCN1GS	FP-2R5ME471M-SAR	700	0.12	13	3600	6.3 × 5.7
	560	RSS0E561MCN1GS	FP-2R5ME561M-SSR	700	0.12	25	2500	6.3 × 5.7
	560	RSA0E561MCN1GS	FP-2R5ME561M-SAR	700	0.12	13	3600	6.3 × 5.7
	560	RSB0E561MCN1GS	FP-2R5ME561M-SBR	700	0.12	10	3800	6.3 × 5.7
4.0	330	RSA0G331MCN1GS	FP-4R0ME331M-SAR	700	0.12	14	3160	6.3 × 5.7
	330	RSB0G331MCN1GS	FP-4R0ME331M-SBR	700	0.12	11	3700	6.3 × 5.7
	390	RSA0G391MCN1GS	FP-4R0ME391M-SAR	700	0.12	14	3160	6.3 × 5.7
6.3	100	RSS0J101MCN1GS	FP-6R3ME101M-SSR	700	0.12	25	2500	6.3 × 5.7
	220	RSS0J221MCN1GS	FP-6R3ME221M-SSR	700	0.12	25	2500	6.3 × 5.7
	220	RSA0J221MCN1GS	FP-6R3ME221M-SAR	700	0.12	15	3100	6.3 × 5.7
	220	RSB0J221MCN1GS	FP-6R3ME221M-SBR	700	0.12	12	3500	6.3 × 5.7
	270	RSA0J271MCN1GS	FP-6R3ME271M-SAR	700	0.12	14	3160	6.3 × 5.7
	330	RSS0J331MCN1GS	FP-6R3ME331M-SSR	700	0.12	25	2500	6.3 × 5.7
	330	RSA0J331MCN1GS	FP-6R3ME331M-SAR	700	0.12	14	3160	6.3 × 5.7
10	120	RSA1A121MCN1GS	FP-010ME121M-SAR	700	0.12	18	2900	6.3 × 5.7
16	100	RSA1C101MCN1GS	FP-016ME101M-SAR	700	0.12	24	2700	6.3 × 7.7

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Frequency Characteristics





●Part Number (EX) 2.5V, 560μF, SS series

R	SS	0E	561	M	CN	1	GS
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Taping code

nichicon

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

HS & HA series

Large Capacitance | Low ESR | φ8
SMD | Lead-free | RoHS Compliance

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Long life and high reliability.

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

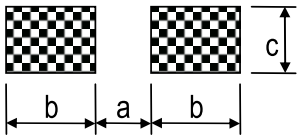
Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

Items		Characteristic HS & HA
Operating temp. range		-55 to +105°C
Rated voltage range		2.5 to 16V·DC
Capacitance range		150 to 1500μF
Capacitance tolerance		±20% (M)
Endurance	Test condition	105°C, rated voltage 2000Hrs.
	Capacitance	Within ±20% of initial value before test
	Leakage current	Not to exceed the initial specified value
	ESR	Not to exceed 150% of initial specified value
	tan δ	Not to exceed 150% of initial specified value
Failure Rate		0.5% / 1000Hrs. Max (60%CL)

●Recommended land pattern



[Unit: mm]

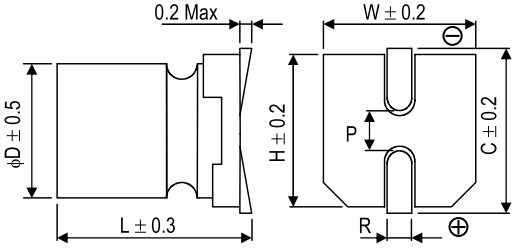
φD	a	b	c
8	2.8	4.2	1.9

●Size (ESR) List

[φD×L (mΩ)]

R.V. (S.V.) [V] / Cap. [μF]	2.5 (2.8)		4.0 (4.6)		6.3 (7.2)		10 (11.5)	16 (18.4)
	HS	HA	HS	HA	HS	HA	HS	HA
150							8x6.7 (25)	8x6.7 (22)
330						8x6.7 (9)		
390					8x6.7 (18)	8x6.7 (9)		
470						8x6.7 (9)		
560			8x6.7 (16)	8x6.7 (8)		8x7.7 (9)		
680		8x6.7 (8)		8x7.7 (8)				
820	8x11.7 (9)	8x6.7 (8)			8x11.7 (10)			
1000		8x7.7 (8)			8x11.7 (10)			
1200			8x11.7 (9)					
1500	8x11.7 (9)		8x11.7 (12)					

●Dimensions



[Unit: mm]

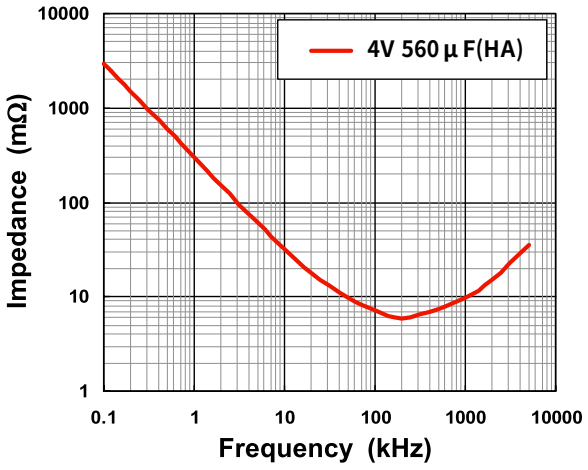
φD×L	W	H	C	R	P
8×6.7	8.3	8.3	9.0	0.8 to 1.1	3.2
8×7.7	8.3	8.3	9.0	0.8 to 1.1	3.2
8×11.7	8.3	8.3	9.0	0.8 to 1.1	3.2

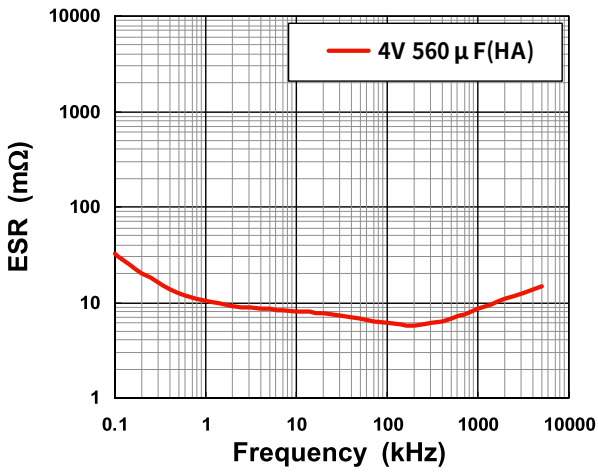
●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number		Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
		NICHICON	FPCAP					
2.5	680	RHA0E681MCN1GS	FP-2R5ME681M-HAR	700	0.12	8	4500	8 × 6.7
	820	RHS0E821MCN1GS	FP-2R5ME821M-HSR	700	0.12	9	5400	8 × 11.7
	820	RHA0E821MCN1GS	FP-2R5ME821M-HAR	700	0.12	8	4500	8 × 6.7
	1000	RHA0E102MCN1GS	FP-2R5ME102M-HAR	750	0.12	8	4500	8 × 7.7
	1500	RHS0E152MCN1GS	FP-2R5ME152M-HSR	1125	0.12	9	5400	8 × 11.7
4.0	560	RHS0G561MCN1GS	FP-4R0ME561M-HSR	700	0.12	16	3200	8 × 6.7
	560	RHA0G561MCN1GS	FP-4R0ME561M-HAR	700	0.12	8	4500	8 × 6.7
	680	RHA0G681MCN1GS	FP-4R0ME681M-HAR	816	0.12	8	4500	8 × 7.7
	1200	RHS0G122MCN1GS	FP-4R0ME122M-HSR	1440	0.12	9	5400	8 × 11.7
	1500	RHS0G152MCN1GS	FP-4R0ME152M-HSR	1800	0.12	12	5400	8 × 11.7
6.3	330	RHA0J331MCN1GS	FP-6R3ME331M-HAR	700	0.12	9	4500	8 × 6.7
	390	RHS0J391MCN1GS	FP-6R3ME391M-HSR	737	0.12	18	3200	8 × 6.7
	390	RHA0J391MCN1GS	FP-6R3ME391M-HAR	737	0.12	9	4500	8 × 6.7
	470	RHA0J471MCN1GS	FP-6R3ME471M-HAR	888	0.12	9	4500	8 × 6.7
	560	RHA0J561MCN1GS	FP-6R3ME561M-HAR	1058	0.12	9	4500	8 × 7.7
	820	RHS0J821MCN1GS	FP-6R3ME821M-HSR	1550	0.12	10	5150	8 × 11.7
	1000	RHS0J102MCN1GS	FP-6R3ME102M-HSR	1890	0.12	10	5150	8 × 11.7
10	150	RHS1A151MCN1GS	FP-010ME151M-HSR	700	0.12	25	3000	8 × 6.7
16	150	RHA1C151MCN1GS	FP-016ME151M-HAR	700	0.12	22	3220	8 × 6.7

* In case offsomefdoubt about measured values, measure after applying rated voltage for 120 minutes at 105 ℃.

●Frequency Characteristics





●Part Number (EX) 4V, 560μF, HA series

R	HA	0G	561	M	CN	1	GS
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Taping code

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

SL & SH series

Low Profile | 4.5mmMax 5.0mmMax | φ6.3
Large Capacitance | Lead-free | RoHS Compliance

●Features

By using Functional Polymer cathode, Frequency & Temp. characteristics are greatly improved.

- Low ESR at a high frequency range.
- High ripple current capability.
- Low profile type. (Height : 4.5mmMax. & 5mmMax.)

●Applications

- Switching Power Supply and DC/DC Converter.
- Buck up Power Supplies of CPU(VRM etc.)
- Miniature high Power Supply.

●Environmental Correspondence

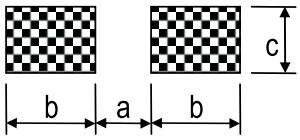
Any environmental hazardous substances are not used.

- The lead free of terminal plating (Sn 100%)

●Specifications

Items		Characteristic SL & SH
Operating temp. range		-55 to +105°C
Rated voltage range		2.5 to 16V·DC
Capacitance range		15 to 390μF
Capacitance tolerance		±20% (M)
Endurance	Test condition	105°C, rated voltage 2000Hrs.
	Capacitance	Within ±20% of initial value before test
	Leakage current	Not to exceed the initial specified value
	ESR	Not to exceed 150% of initial specified value
	tan δ	Not to exceed 150% of initial specified value
Failure Rate		0.5% / 1000Hrs. Max (60%CL)

●Recommended land pattern



[Unit: mm]

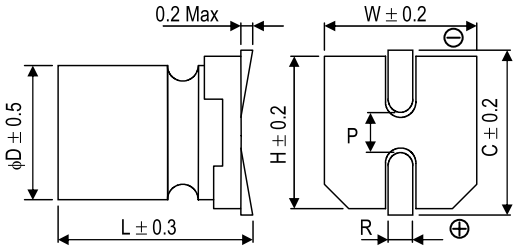
φD	a	b	c
6.3	2.1	3.5	1.6

●Size (ESR) List

[φD×L (mΩ)]

R.V. (S.V.) [V] / Cap. [μF]	2.5 (2.8) SL	2.5 (2.8) SH	6.3 (7.2) SL	6.3 (7.2) SH	16 (18.4) SL	16 (18.4) SH
15					6.3x4.2 (45)	
100	6.3x4.2 (16)		6.3x4.2 (18)			
150			6.3x4.2 (18)			
220	6.3x4.2 (16)		6.3x4.2 (18)			
270				6.3x4.7 (20)		
330	6.3x4.2 (16)					
390		6.3x4.7 (20)				

●Dimensions



[Unit: mm]

φD×L	W	H	C	R	P
6.3×4.2	6.5	6.5	7.2	0.5 to 0.9	2.1
6.3×4.7	6.5	6.5	7.2	0.5 to 0.9	2.1

●Part number & Specifications

Rated Voltage (V)	Rated Capacitance (μF, 120Hz)	Part Number		Leakage Current * (μA, 2 min)	tanδ (120Hz)	ESR (mΩ, 100kHz)	Rated Ripple Current (mA, r.m.s.)	Case Size φD×L(mm)
		NICHICON	FPCAP					
2.5	100	RSL0E101MCN1GB	FP-2R5ME101M-SLR	300	0.12	16	3500	6.3 × 4.2
	220	RSL0E221MCN1GB	FP-2R5ME221M-SLR	300	0.12	16	3500	6.3 × 4.2
	330	RSL0E331MCN1GB	FP-2R5ME331M-SLR	413	0.12	16	3500	6.3 × 4.2
	390	RSH0E391MCN1GB	FP-2R5ME391M-SHR	488	0.12	20	3000	6.3 × 4.7
6.3	100	RSL0J101MCN1GB	FP-6R3ME101M-SLR	315	0.12	18	3200	6.3 × 4.2
	150	RSL0J151MCN1GB	FP-6R3ME151M-SLR	473	0.12	18	3200	6.3 × 4.2
	220	RSL0J221MCN1GB	FP-6R3ME221M-SLR	693	0.12	18	3200	6.3 × 4.2
	270	RSH0J271MCN1GB	FP-6R3ME271M-SHR	851	0.12	20	3000	6.3 × 4.7
16	15	RSL1C150MCN1GB	FP-016ME150M-SLR	300	0.12	45	1900	6.3 × 4.2

* In case of some doubt about measured values, measure after applying rated voltage for 120 minutes at 105°C.

●Part Number (EX) 2.5V, 330μF, SL series

R	SL	0E	331	M	CN	1	GB
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Taping code

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

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

Nichicon Part Number

R	L8	0E	561	M	DN	1	
Type	Series name	Rated Voltage	Rated Capacitance	Capacitance Tolerance	Configuration	Control code	Taping & Lead Forming

FPCAP Part Number

FP	—	2R5	RE	561	M	—	L8	R	
Commodity Mark		Rated Voltage	Classification	Rated Capacitance	Capacitance Tolerance		Series name	Taping & Lead Forming	Control code

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/SA/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
		φ5x10L, φ6.3x10L	JX	J
	3.5mm pitch taping	φ8	KX	K
	5.0mm pitch taping	φ6.3 & φ8	PX	P
		φ10	PH	PH
SMD Type	Taping	Height under 5.2mm	GB	R
		Height over 5.7mm	GS	
	Bulk	All	-	N

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

Bulk Packing Quantity Unit

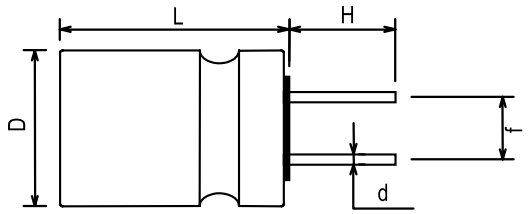
Components are packaged as per following package unit.

Packing Quantity

Size (dia)	Quantity (pcs)
φ4	200
φ5	200
φ6.3	200
φ8	100 or 200
φ10	100

Cut lead (Bulk) Dimensions

Lead Forming (Symbol: CG)
Nichicon P/N
: R□□□□□□□□M□□1 CG
FPCAP P/N
: FP-□□□RE□□□M-□□ CG



[Unit: mm]

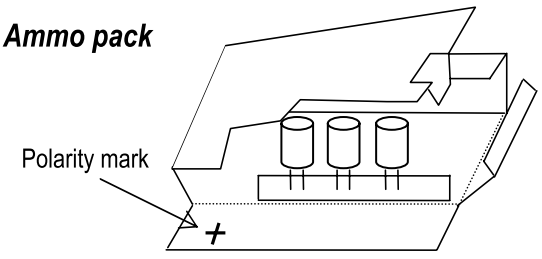
Item \ φDxL	4×5	5×8 / 5×10	6.3×7 / 6.3×8 / 6.3×10	8×6, 8×8, 8×9, 8×11.5	10×12.5
Lead Forming Symbol	CG	CG	CG	CG	CG
Lead wire diamete φd	0.45±0.05	0.45±0.05	0.45 / 0.6 / 0.5±0.05	0.6±0.05	0.6±0.05
Lead wire Length H	3.1±0.3	3.1±0.3	3.1±0.3	3.1±0.3	3.1±0.3
Lead wire interval f	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5	5.0±0.5

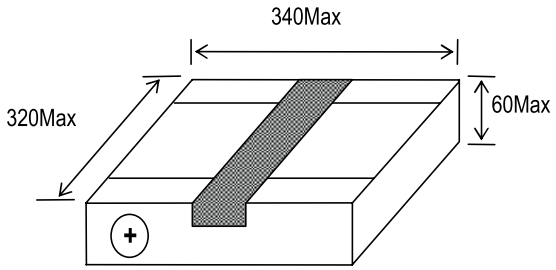
Ammo Pack Quantity Unit

Ammo Pack and Packing Quantity

Size (dia)	Quantity (pcs)
φ5	2000
φ6.3	2000
φ8	1000
φ10	500

Ammo pack



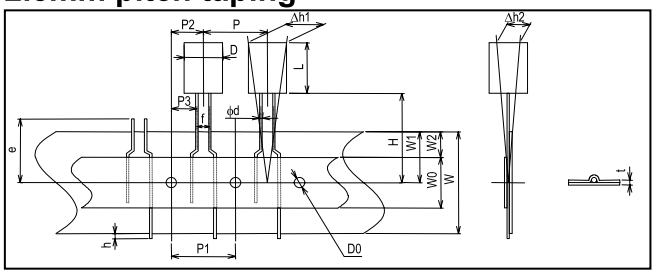


The lid of feeding side of the taping box shall be torn off at the perforation line.

Ammo Pack Taping Specifications (Radial lead type)

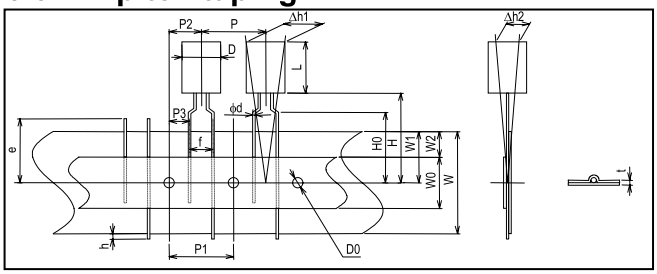
Dimensions

2.5mm pitch taping



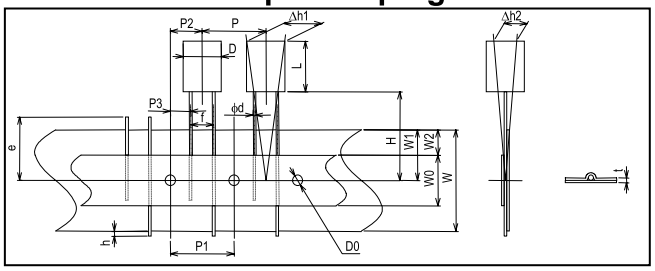
Lead Forming Symbol: JT and JX or J
Nichicon P/N
φ5×8, φ6.3×7 to 8 : R□□□□□□□□M□□1 JT
φ5×10, φ6.3×10 : R□□□□□□□□MDS1 JX
FPCAP P/N
φ5×8, φ6.3×7 to 8 : FP-□□□RE□□□M-□□JT
φ5×10, φ6.3×10 : FP-□□□RE□□□M-□□ J

5.0mm pitch taping



Lead Forming Symbol : PX or P
Nichicon P/N
φ5×8 to 10, φ6.3×8 to 10, φ8×6 to 11.5
: R□□□□□□□□M□□1 PX
FPCAP P/N
φ5×8 to 10, φ6.3×8 to 10, φ8×6 to 11.5
: FP-□□□RE□□□M-□□ P

3.5mm or 5.0mm pitch taping



Lead Forming Symbol : KX or K
Nichicon P/N
φ8×6 to 11.5 : R□□□□□□□□M□□1 KX
FPCAP P/N
φ8×6 to 11.5 : FP-□□□RE□□□M-□□ K
Lead Forming Symbol: PH
Nichicon P/N
φ10×12.5 : R□□□□□□□□M□□1 PH
FPCAP P/N
φ10×12.5 : FP-□□□RE□□□M-□□ PH

Specification Table

[Unit : mm]

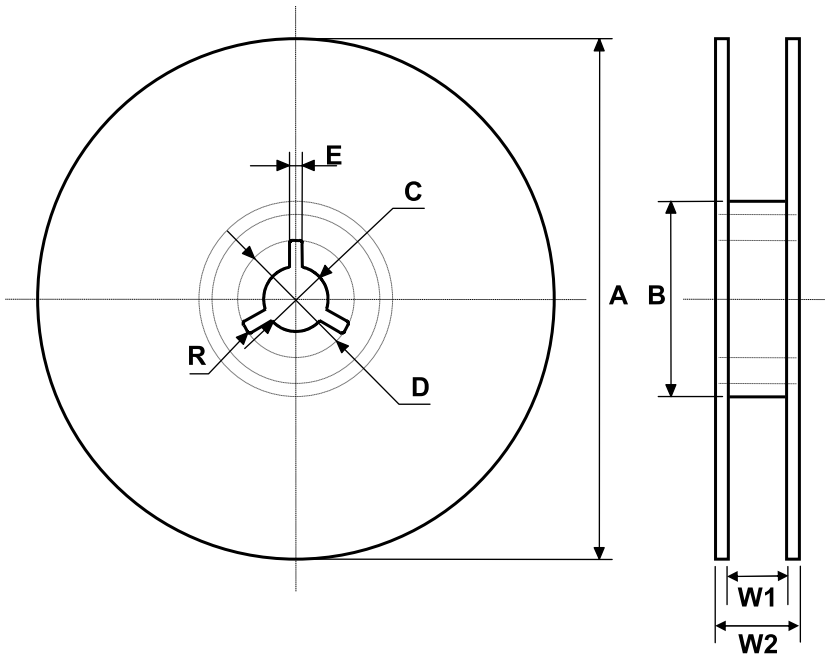
Item \ φDxL	5x8 , 5x10 , 6.3x7, 6.3x8 , 6.3x10		8x6 , 8x8 , 8x9 , 8x11.5		10x12.5
Lead Forming Symbol	JT / JX or J	PX or P	PX or P	KX or K	PH
Lead wire diameter φd	0.45 / 0.6 / 0.5 ±0.05	0.45 / 0.6 / 0.5 ±0.05	0.6±0.05	0.6±0.05	0.6±0.05
Lead wire interval f	2.5±0.5	5.0 +0.8/-0.2	5.0 +0.8/-0.2	3.5 +0.8/-0.2	5.0 +0.8/-0.2
Pitch between components P	12.7±1.0		12.7±1.0	12.7±1.0	12.7±1.0
Feed holes position gap P1	12.7±0.3		12.7±0.3	12.7±0.3	12.7±0.3
Feed holes position gap P2	6.35±1.0		6.35±1.0	6.35±0.5	6.35±0.5
Lead wire clinch height H0	-	16.0±0.5	16.0±0.5	-	-
Components height H	18.5±0.5	17.5±0.5	20.0±0.75	20.0±0.5	18.5±0.5
Base tape W	18.0 +1.0/-0.5		18.0 +1.0/-0.5	18.0 +1.0/-0.5	18.0 +1.0/-0.5
Feed holes position gap W1	9.0±0.5		9.0±0.5	9.0±0.5	9.0±0.5
Feed hole diameter D0	4.0±0.2		4.0±0.2	4.0±0.2	4.0±0.2
Components alignment Δh	2.0 max		2.0 max	2.0 max	2.0 max
Tape thickness t	0.7±0.2		0.7±0.2	0.7±0.2	0.7±0.2

Packaging Unit Quantity for a Reel (SMD type)

Components are packaged as per following package unit

Packing quantity

Case size(mm)	Quantity (pcs)
φ4×5.2L	2000
φ5×5.7L	1000
φ6.3×4.2L	1000
φ6.3×4.7L	1000
φ6.3×5.7L	1000
φ6.3×7.7L	1000
φ8×6.7L	1000
φ8×7.7L	900
φ8×11.7L	500
φ10×7.7L	500
φ10×12.4L	400



[Unit : mm]

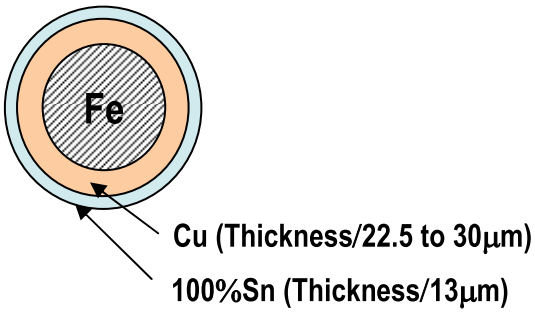
Size (dia)	A ±2.0	B ±1.0	C ±0.5	D ±1.0	E ±0.5	W1 ±0.8	W2 ±0.8	R
φ4/φ5	380	80	13.0	21	2.0	13.4	17.4	1.0
φ6.3	380	80	13.0	21	2.0	17.4	21.4	1.0
φ8/φ10	380	80	13.0	21	2.0	25.4	29.4	1.0

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

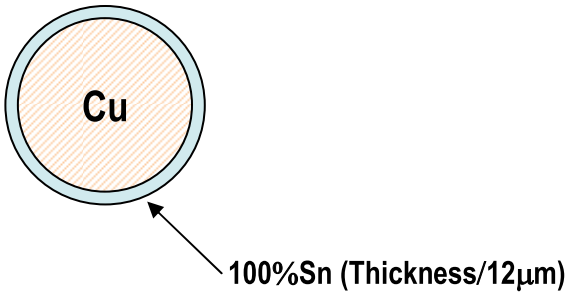
Lead-free Materials

Kind of Lead-free Terminal

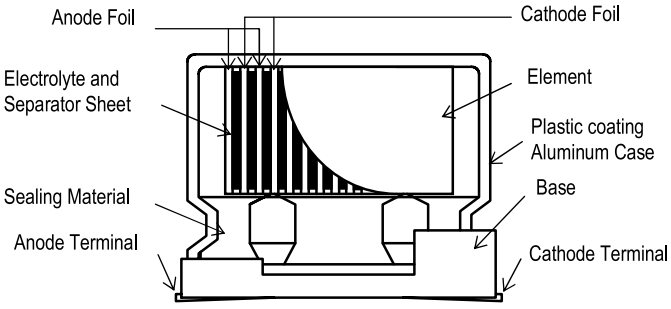
Lead-free Terminal (Fe Core)

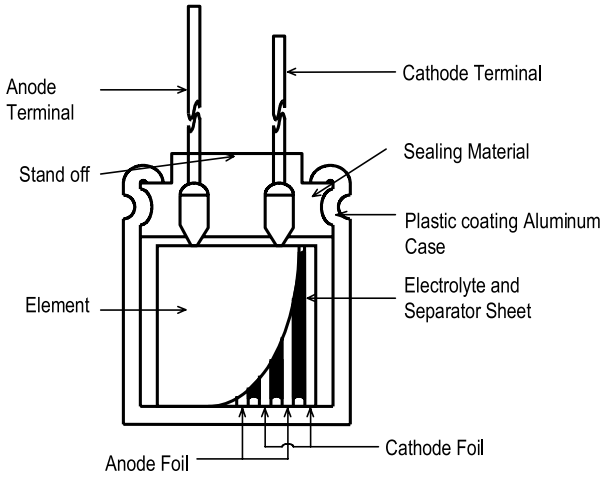


Lead-free lead Terminal (Cu Core)



Materials

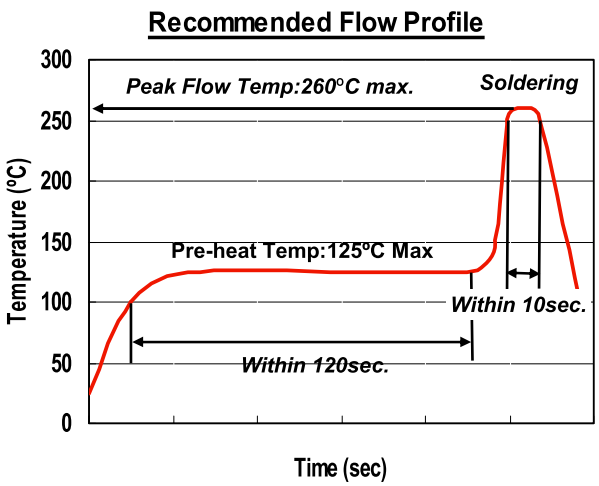


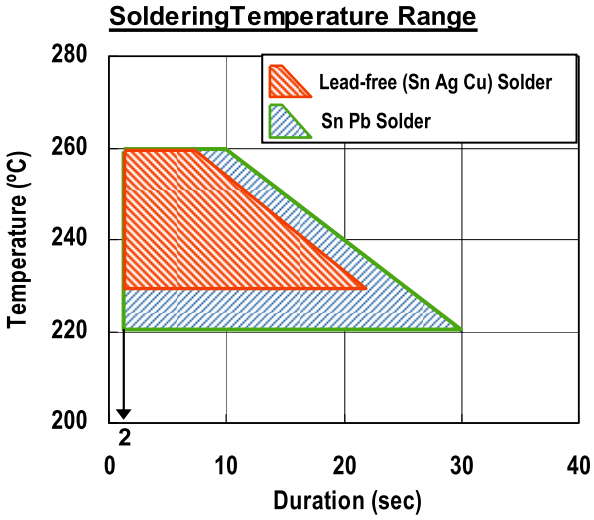


Composition Part	Materials	
	SMD type	Radial Lead type
Anode Foil	Aluminum	Aluminum
Cathode Foil	Aluminum	Aluminum
Separator Sheet	Synthetic Paper	Synthetic Paper
Electrolyte	Functional Polymer	Functional Polymer
Terminal	Copper Lead + Tin Plating	(1) Iron Lead + Copper Plating + Tin Plating (2) Copper Lead + Tin Plating
Aluminum Case	Aluminum + Plastic	Aluminum + Plastic
Sealing Material	Rubber	Rubber
Base	Plastic (Halogen-free)	-

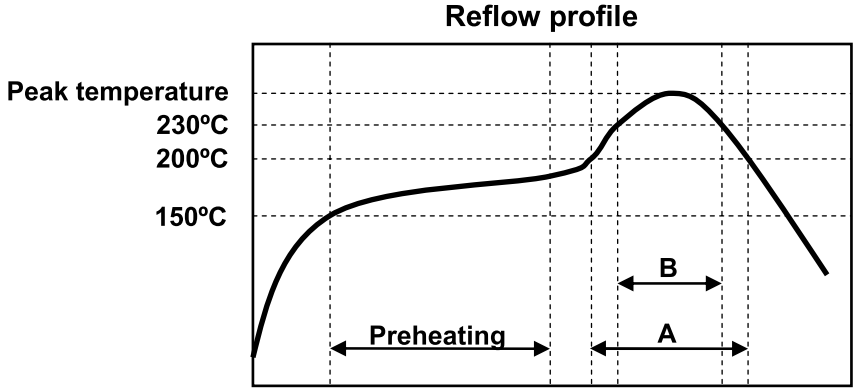
Soldering Profile on Lead-free and RoHS Compliance

Flow Soldering (Radial lead type)





Reflow Soldering (SMD type)

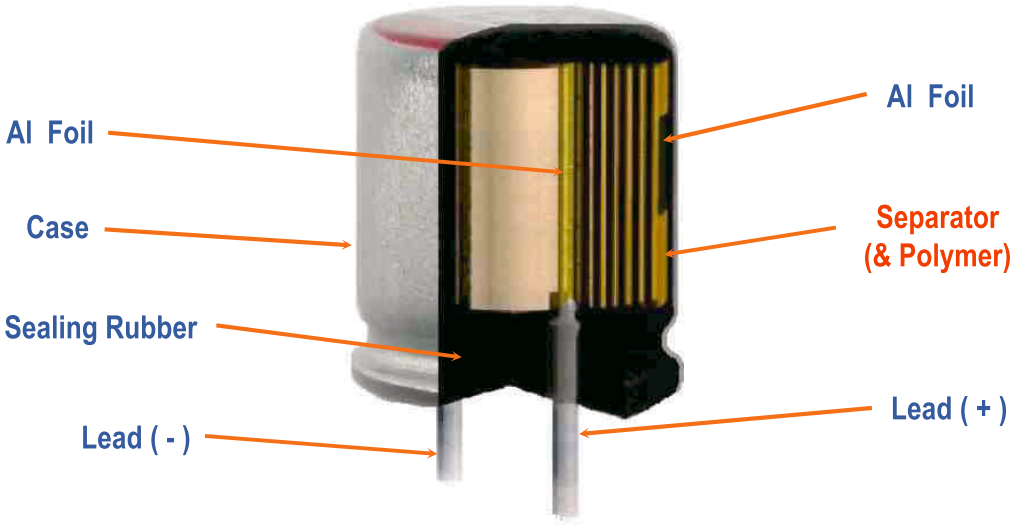


Item	Recommended Condition 1	Recommended Condition 2
Peak Temperature	260°C or less	250°C or less
Preheating	150°C to 180°C 90 seconds	150°C to 180°C 90 seconds
A	200°C and higher Within 60 seconds	200°C and higher Within 60 seconds
B	230°C and higher Within 40 seconds	230°C and higher Within 40 seconds
The number of reflow	Only 1 time	Twice or less

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

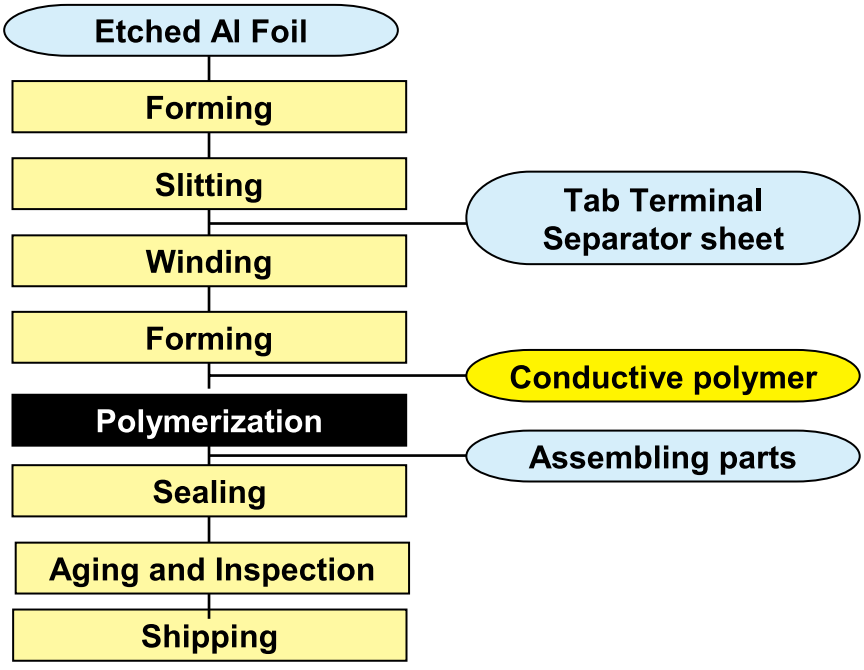
Construction and Characteristics of FPCAP

Construction of FPCAP

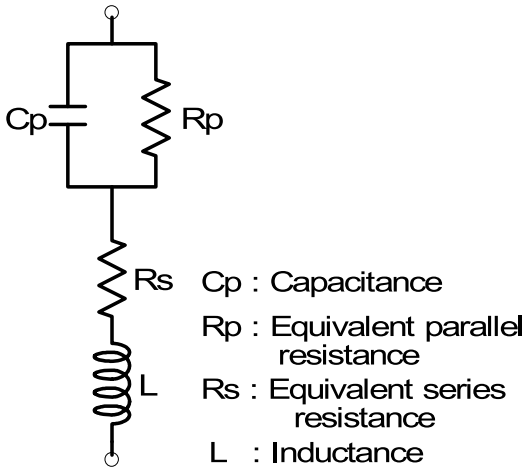


FPCAP is roughly the same construction as an aluminum electrolytic capacitor, and uses rolled aluminum foils in its capacitor element.

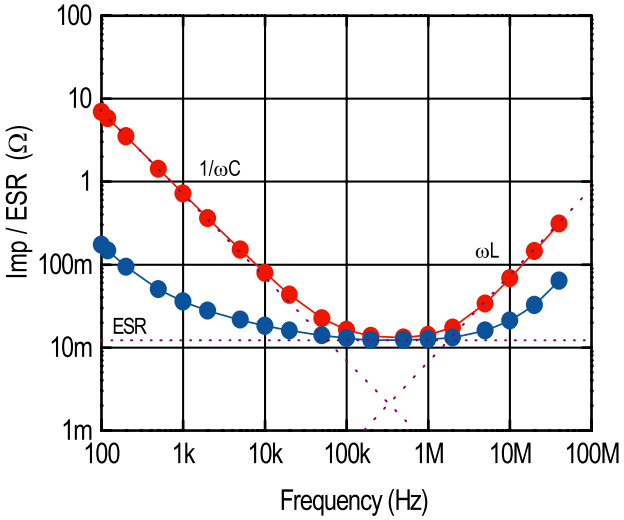
Manufacturing Process of FPCAP



Equivalent Circuit of Capacitor

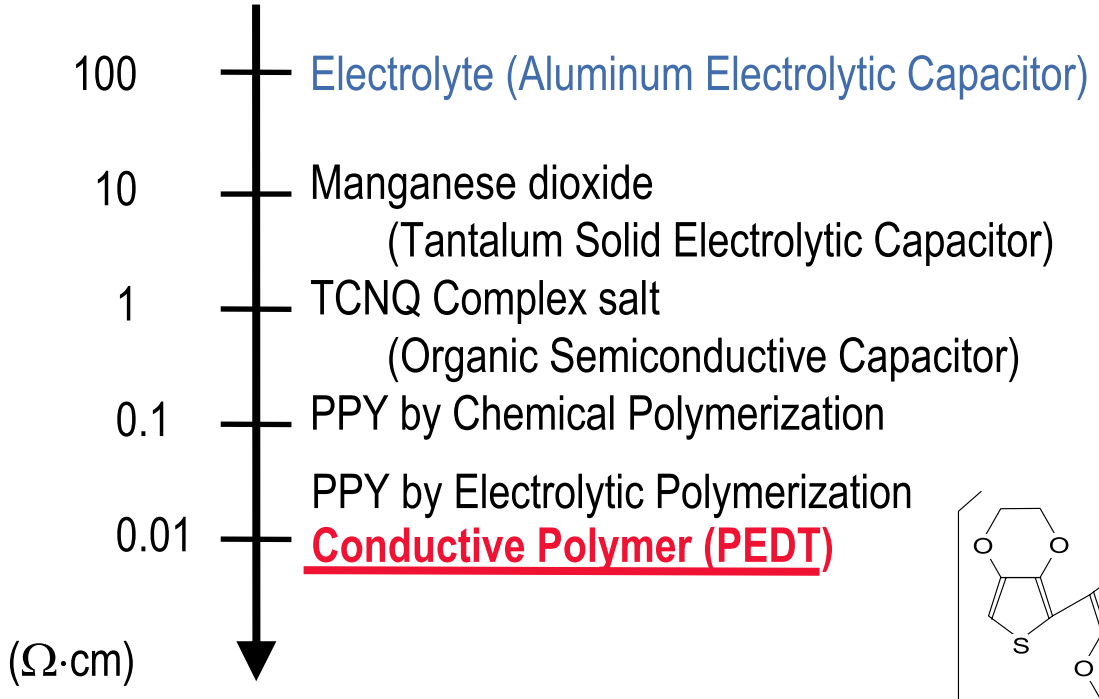


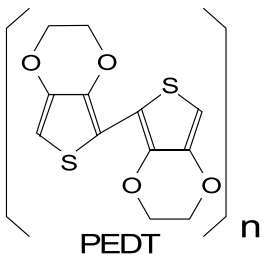
Cp : Capacitance
Rp : Equivalent parallel resistance
Rs : Equivalent series resistance
L : Inductance



$$|Z| = \sqrt{\left\{Rs + \frac{Rp}{(1+\omega^2 Cp^2 Rp^2)}\right\}^2 + \left\{\omega L - \frac{\omega Cp Rp^2}{(1+\omega^2 Cp^2 Rp^2)}\right\}^2}$$

Feature of Functional Polymer



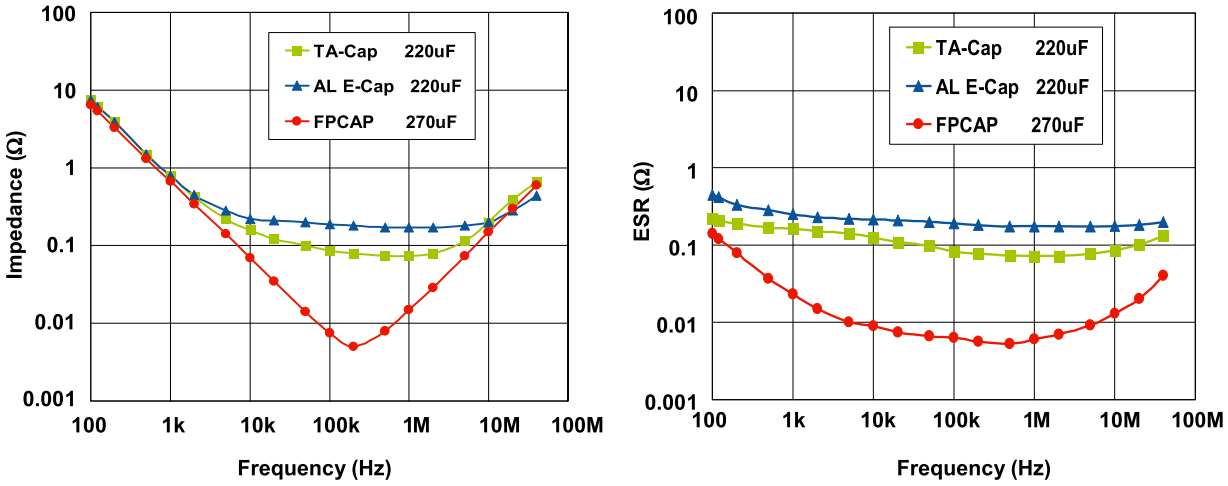


PEDT

FPCAP differs from the aluminum electrolytic capacitor in that in place of the electrolyte, functional polymer is impregnated.

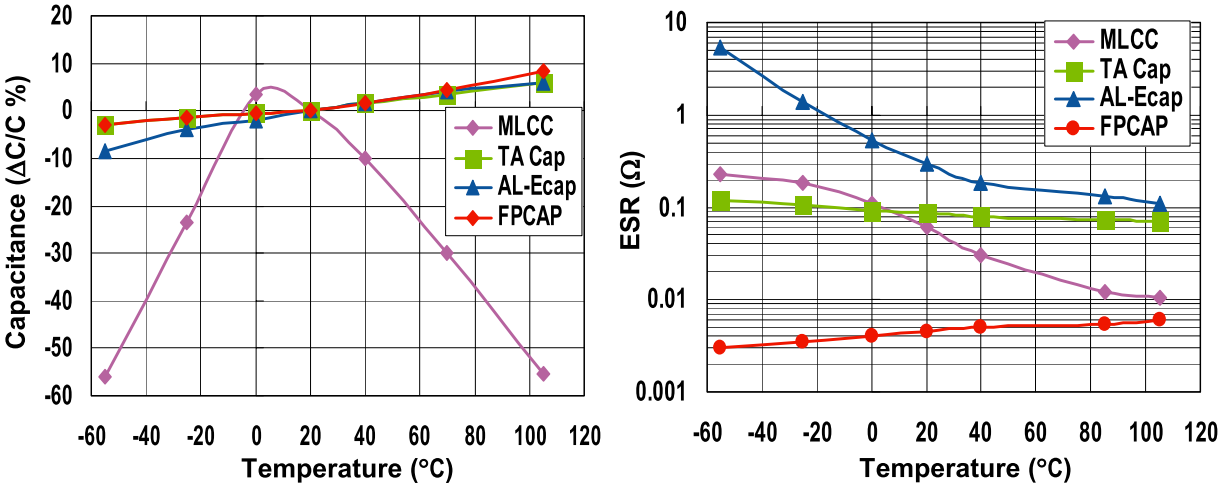
Typical Electrical Characteristics of Capacitors

Frequency Dependence



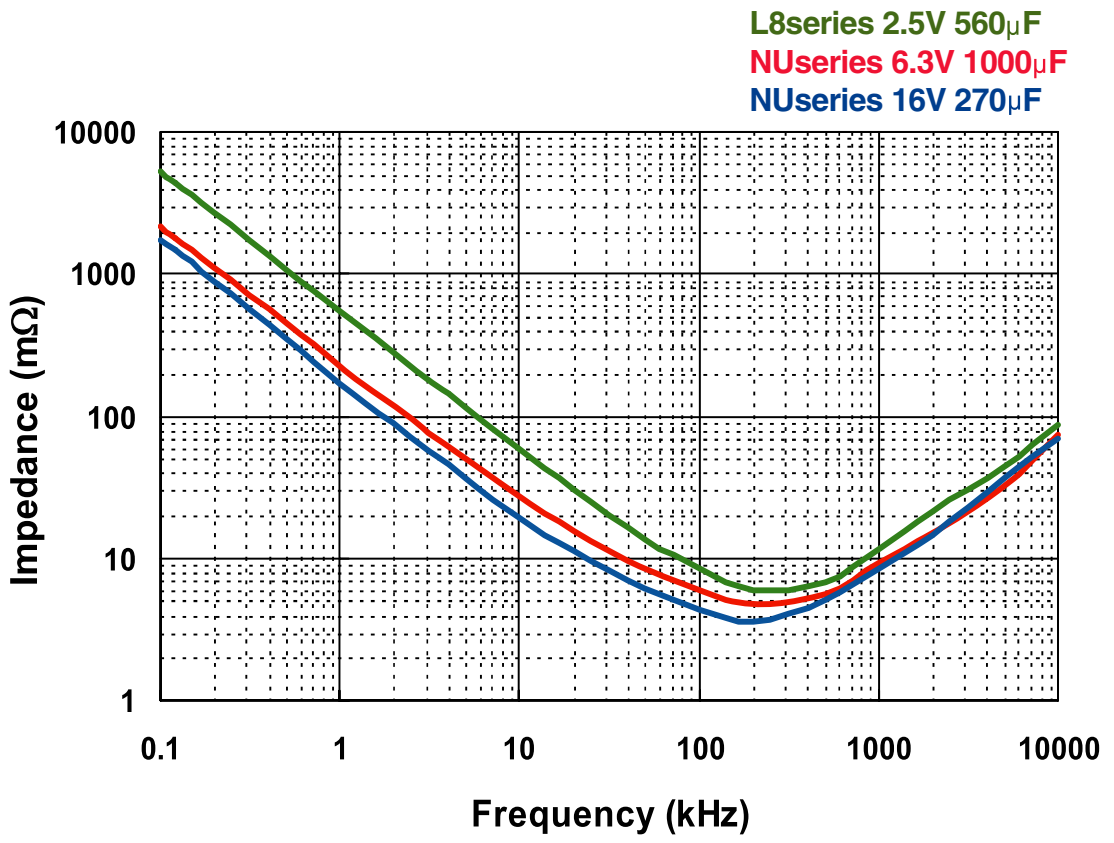
FPCAP is its excellent frequency characteristic nearly equal to that of film capacitor. Using the high conductivity of an Functional polymer with an electrolyte, and adopting the winding element for layer thinness of electrolyte, the ESR is greatly improved, obtaining the frequency characteristic nearly equal to the film capacitor.

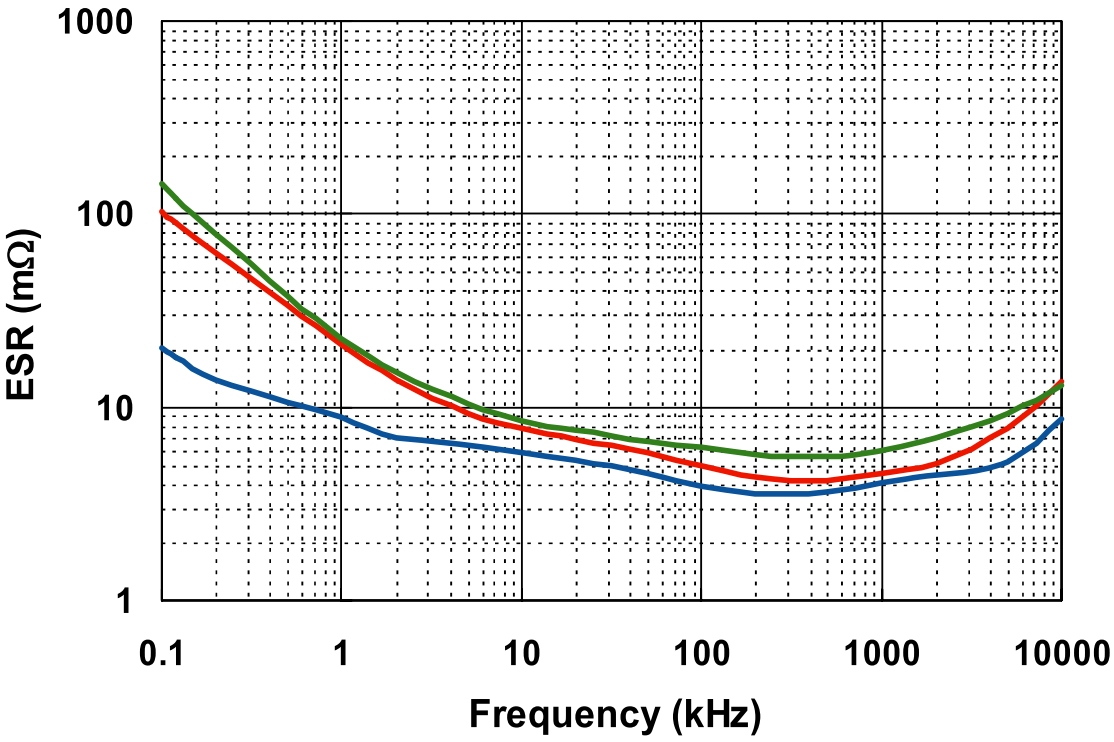
Typical Temperature Dependence of Capacitors



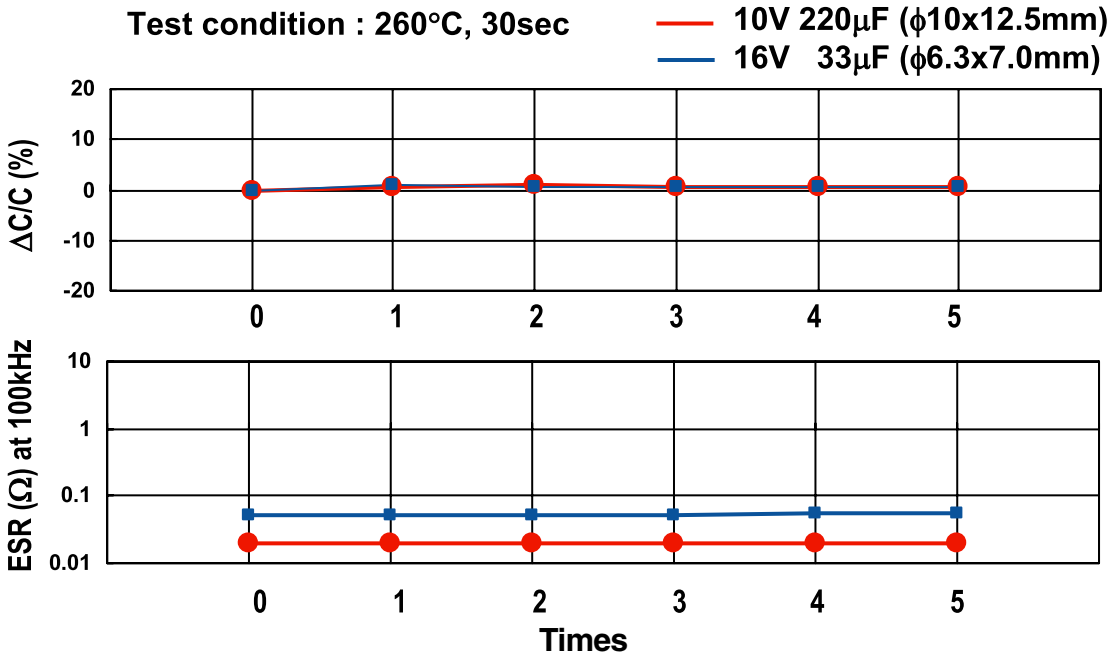
The temperature dependence of the **FPCAP** is that it features little change in temperature for the ESR.
Since ESR is dominant at high range of impedance (near resonance point), the ESR value greatly affects Noise clearing capacity.
What ESR changes little against temperature means that Noise clearing ability changes little against temperature as well.

Frequency Dependence

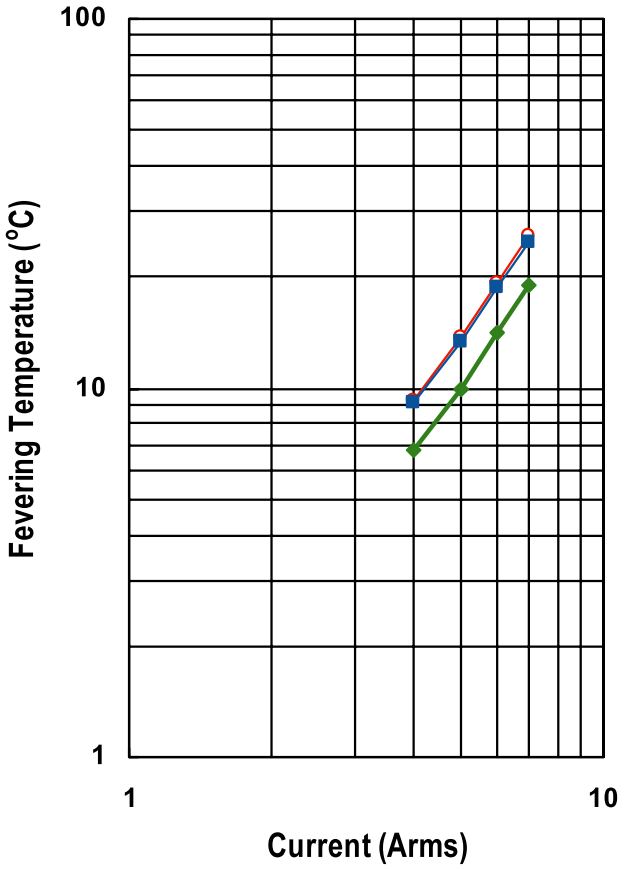




Resistance to Soldering Heat



Fevering Temperature by Ripple Current



L8series 2.5V 560µF
R7series 2.5V 820µF
R7series 4V 820µF

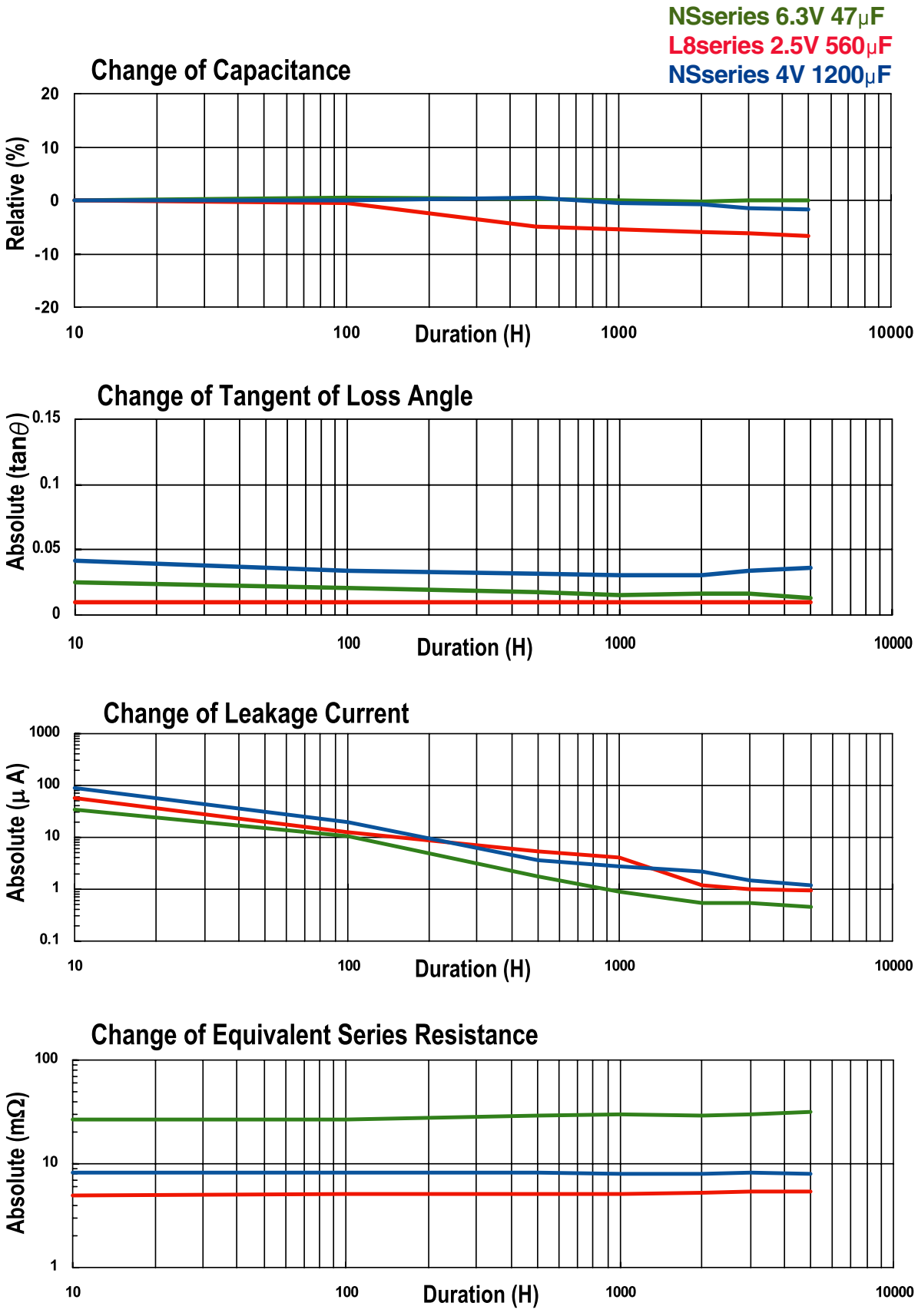
$I^2R = \Delta T \times \beta \times S = \Delta Tc \times \alpha \times \beta \times S$

$\Delta Tc = (I^2R) / (\alpha \times \beta \times S)$

$\log \Delta Tc = \log (I^2R) / (\alpha\beta S)$
$= \log I^2 + \log R - \log \alpha\beta S$
$= 2 \times \log I + (\log R - \log \alpha\beta S)$
$= 2 \times \log I + A$

Where,
I : Ripple Current (Arms)
R : ESR (Ω)
ΔT : Fevering Temp. at Outside Wall of Capacitor (°C)
ΔTc : Fevering Temp. at Inside of Capacitor (°C)
β : Heat Radiation coefficient (W/ °C×cm²)
S : Surface Aria of Aluminum Case(cm²)
α : Ratio of ΔTc/ ΔT

Reliability at 105°C



Calculation Formula of Lifetime

For FPCAP

In general, calculation formula of lifetime of capacitors is appeared as follows.
The calculation formula of lifetime on **FPCAP** is same as usual Aluminum capacitor.

$$L_X = L_0 \times 10^{(T_0 - T_X)/20}$$

Where,

L_X (Hrs) =Life expectance in actual use
L_0 (Hrs) =Life time
T_0 (105°C) =Maximum operating temperature (105°C)
T_X (°C) =Temperature of capacitor in actual use

On the other hand, temperature Tx adds the circumference temperature T as the capacitor temperature and the generating temperature ΔT by ripple current.

$$T_X = T + \Delta T$$

T (°C) = Ambient temperature
ΔT (°C) = generating temperature

Furthermore, the generating temperature ΔT by the ripple current is proportional to ripple current, and is shown by the following formula. When applying the maximum permissible ripple current to **FPCAP**, the generating temperature ΔT is higher about 5°C than outside temperature of capacitor. All large capacitance serve as this temperature in general.

$$\Delta T = (I / I_0)^2 \times \Delta T_0$$

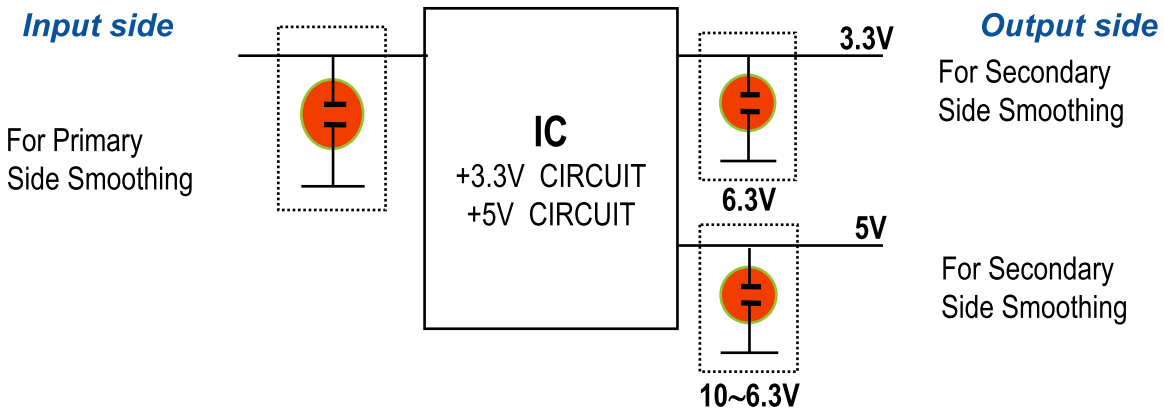
I (A rms) = Ripple current in actual use

I_0 (A rms) = Maximum permissible ripple current

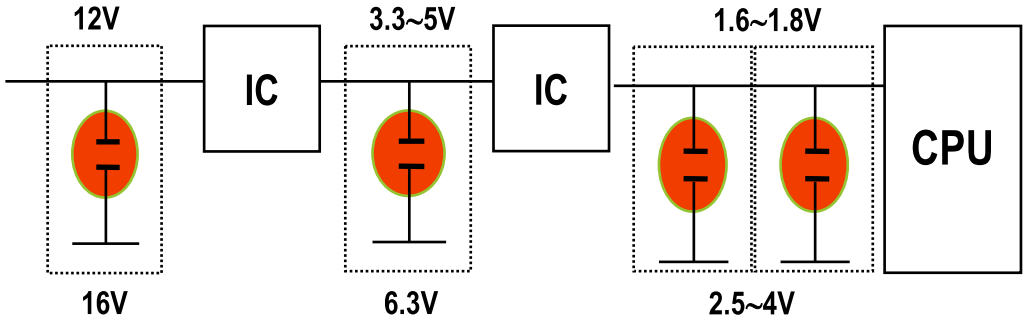
ΔT_0 (°C) = Generated temperature value by maximum permissible ripple current
[About 20 (°C)]

FPCAP Functional Polymer Aluminum Solid Electrolytic Capacitors

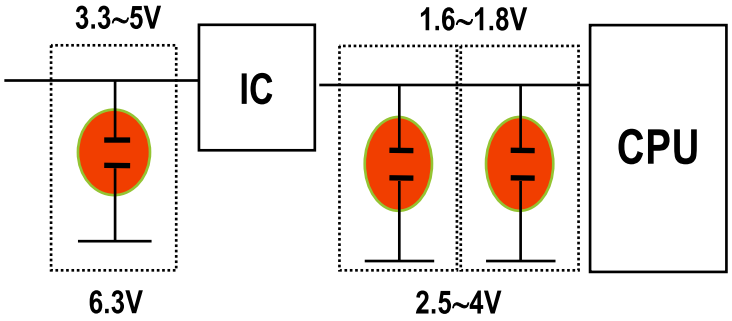
DC/DC Converter Primary, Secondary Side Smoothing



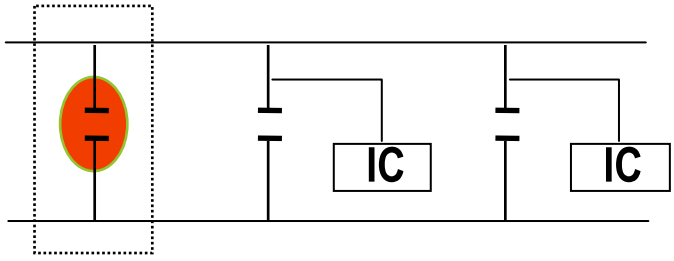
Back-up Capacitor for Variable Load (1)



Back-up Capacitor for Variable Load (2)

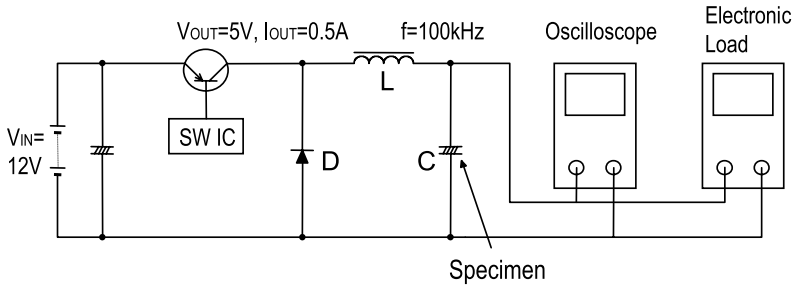


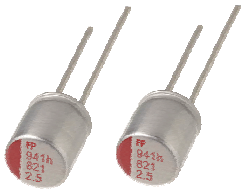
Noise Filters



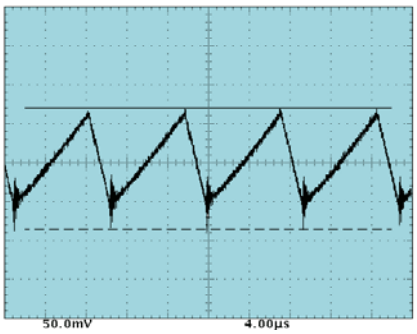
Ripple Removal Capability

We measured ripple voltage by oscilloscope for output capacitor change on the typical chopper type DC-DC converter. (described below)

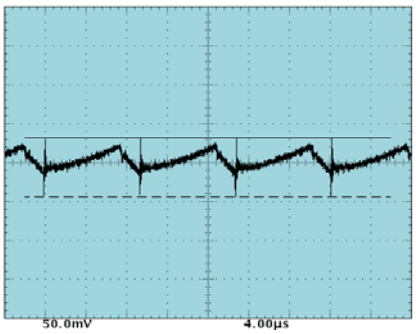




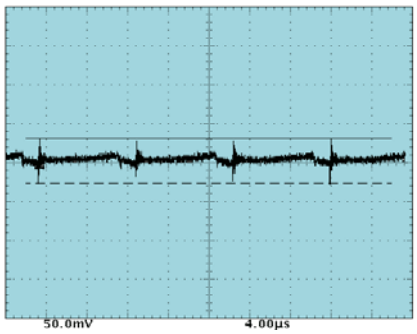
Comparison Between FPCAP and Other Capacitors with Same Capacitance



Low Z Aluminum Capacitor
16V100uF (ϕ6.3x11L)
ΔV=156mV



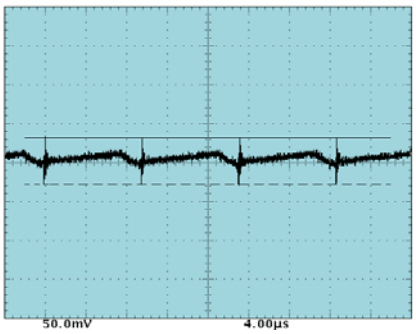
Low ESR Tantalum Capacitor
16V100uF (7.3x4.3x2.9)
ΔV=76mV



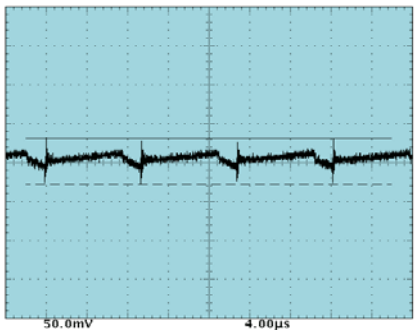
FPCAP
16V100uF (ϕ8x11.5L)
ΔV=58mV

Examination of Same Level Residual Ripple Voltage

To obtain same level of ripple voltage to **FPCAP**, Low Z Aluminum capacitor needs 16V3300uF, even Low ESR tantalum capacitor needs 4 pcs. of same capacitance.



Low Z Aluminum Capacitor
16V3300uF (ϕ16x25L)
ΔV=60mV



Low ESR Tantalum Capacitor
16V100uF (7.3x4.3x2.9) X4 pcs.
ΔV=59mV

Spice Model for Simulation Circuits with Computer

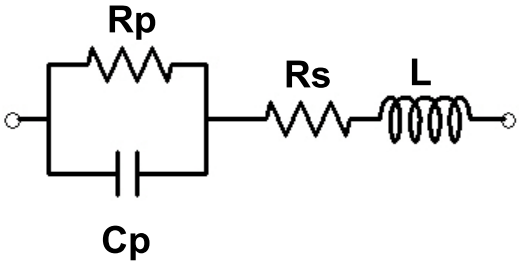
Spice Model of ***Radial lead type*** (L8 and S8 Series)

Part Number	Cp (μF)	Rs (mΩ)	L (nH)	LC (μA)	Rp (kΩ)
RL80E821MDN1	820	4.2	2.9	100	25
RL80G561MDN1	560	4.2	2.9	100	40
RL80J561MDN1	560	5.0	2.9	100	63
RS80E331MDN1	330	5.3	2.0	30	83
RS80E471MDN1	470	5.3	2.0	50	50
RS80E561MDN1	560	5.3	2.0	100	25

Typical ESL by Case Size

Classification	Case Size	ESL (nH,40MHz)
Radial lead type	ϕ6.3×8L (S8)	1.8 to 2.2
	ϕ6.3×10L	2.8 to 3.0
	ϕ8×8L (L8)	2.7 to 3.1
	ϕ8×11.5L	3.9 to 4.1
	ϕ8×11.5L (R7)	4.6 to 4.9
	ϕ10×12.5L	5.4 to 5.6
SMD type	ϕ4×5.2L	1.0 to 1.2
	ϕ6.3×5.7L	2.5 to 2.7
	ϕ8×11.7L	3.1 to 3.3
	ϕ10×12.4L	4.5 to 4.7

Equivalent Circuit of Capacitor



Cp : Capacitance
L : ESL
Rs : ESR
Rp : Insulation resistance
(≅Rated Voltage/LC)

$$|Z| = \sqrt{\left\{Rs + \frac{Rp}{(1+\omega^2 Cp^2 Rp^2)}\right\}^2 + \left\{\omega L - \frac{\omega Cp Rp^2}{(1+\omega^2 Cp^2 Rp^2)}\right\}^2}$$

* It is available to present the spice model of other parts for customers.

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