SCF-8839

SPECIFICATION

EPOXY RESIN COATING METALLIZED POLYPROPYLENE FILM CAPACITOR

1.SCOPE

This SPECIFICATION is applied to epoxy resin coating Metallized polypropylene film capacitors TYPE FPS5.

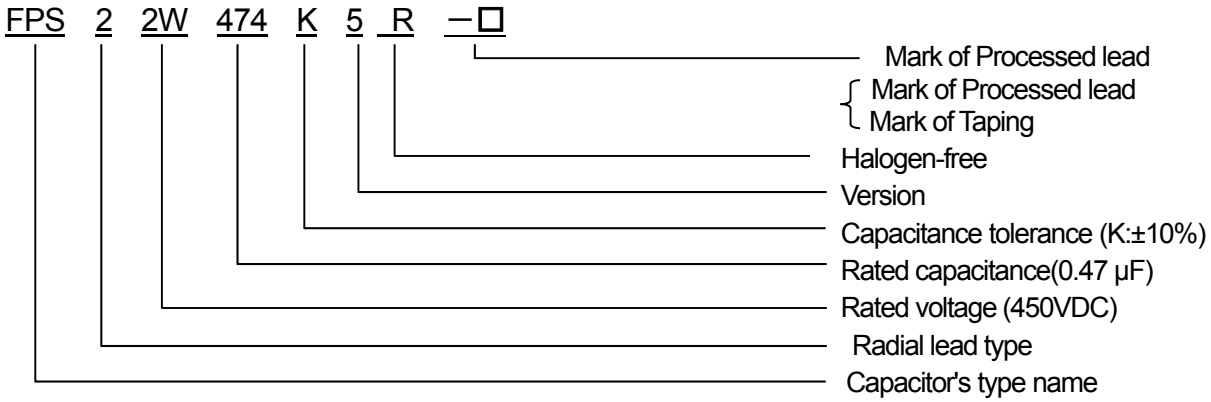
2.SPECIFICATION

2-1 Operating temperature	: -40 ～+85 ℃(+110℃) (Derate the operating voltage when operating temperature is higher than +85℃. Refer to the [THE RELATION BETWEEN MAX OPERATING VOLTAGE AND OPERATING TEMPERATURE].)
2-2 Rated Voltage	: 450VDC
2-3 Rated Capacitance	: 0.47～2.2μF
2-4 Capacitance tolerance	: ±10%(K)
2-5 Withstanding voltage	: Between terminals : Rated Voltage×1.4 (VDC) for 1min Between terminals and enclosure : Rated Voltage×2(VDC) for 1～5 sec
2-6 Insulation resistance	: 7500 Ω・F or more (100 VDC, 1min) Insulation resistance× Rated Capacitance=7500MΩ・μF or more Insulation resistance=7500/ Rated Capacitance(μF) MΩ or more
2-7 Dissipation factor	: 0.001 or less (1kHz)

3.CONSTRUCTION

3-1 Metallized polypropylene film capacitor
3-2 Non-inductive construction
3-3 Flame retardant epoxy resin coating
3-4 Radial lead type
3-5 Materials conform to RoHS
3-6 Halogen-Free Materials

4.TYPE DESIGNATION

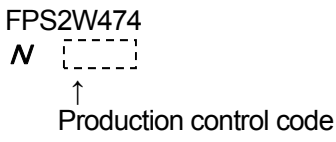


5.MARKING

Marking on the surface of capacitor is as follows.

① Type
② Rated voltage
③ Rated capacitance
④ Trade mark
⑤ Production control code

【 Example 】



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6. PART CODE, DIMENSIONS

Part code and Dimensions are shown in table-1.

7. PERFORMANCE

Performance, test methods and specifications are shown in Table-2.

8. PERMISSIBLE CURRENT

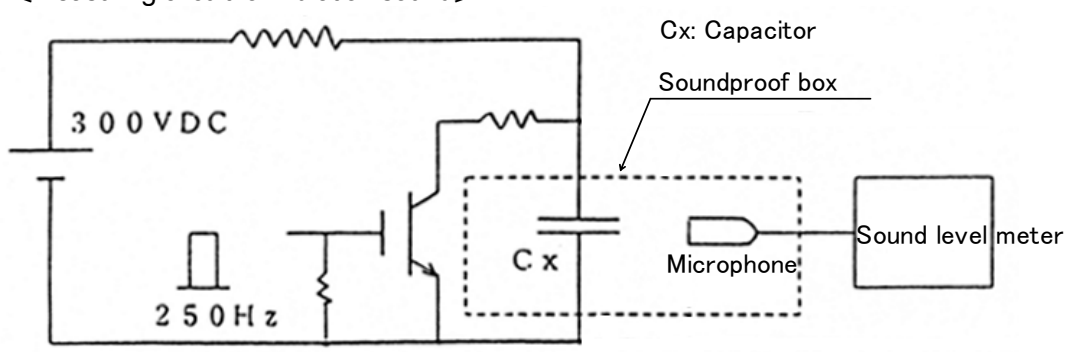
Permissible current (Peak value) is shown in Table-1(P3).
Permissible current (Effective value) is shown in [PERMISSIBLE CURRENTVS FREQUENCY]（P9）.

9. Vibration sound

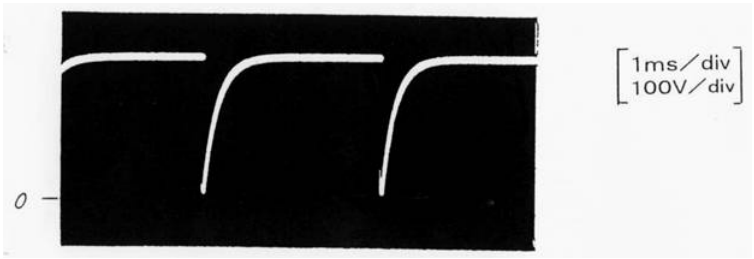
The sampling inspection is implemented by the undermentioned method, and it is delivered controlled lot of specified value (Table-3) or less.

◇Measuring method

〔Measuring circuit for vibration sound〕



〔Voltage waveform of capacitor〕



〔Table-3　Vibration sound value〕

Part code	Specified value (dB)
FPS22W474K5R	60
FPS22W684K5R	60
FPS22W105K5R	60
FPS22W155K5R	70
FPS22W225K5R	70

10.LOCATION OF MANUFACTURING

JAPAN

11.PROCESSED LEAD SPECIFICATIONS

Processed lead specifications are shown in [PROCESSED LEAD SPEC.].

12.TAPING SPECIFICATIONS

Taping Specifications are shown in [TAPING SPEC.].

13.PACKING SPECIFICATIONS

Packing specifications are shown in [CAPACITOR PACKING SPEC.(BULK)].

14.STRUCTURE

Structure is shown in [STRUCTURE AND MATERIAL DETAILS].

15.DIRECTIONS FOR USE

Directions for use are shown in [NOTABILIA FOR USE OF FILM CAPACIOTRS].

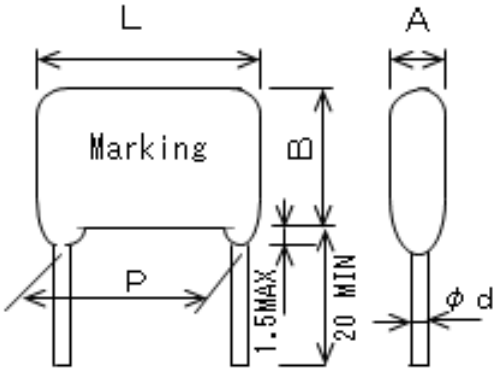
Table-1　PART CODE, DIMENTIONS

Part code	Rated Voltage (VDC)	Rated capacitance (μF)	Capacitance tolerance (%)	Dimensions (mm) A MAX	B MAX	L MAX	P ±0.75	φd ±0.05	Permissible current (Peak value) Iop (A)	QTY pcs/ Bag	Taping pcs/ Package
FPS22W474K5R - □	450	0.47	±10	4.7	9.8	12.5	10.0	0.6	7.7	200	600
FPS22W684K5R - □	450	0.68	±10	5.6	10.6	12.5	10.0	0.6	11.1	200	500
FPS22W105K5R - □	450	1.0	±10	6.7	11.8	12.5	10.0	0.6	16.3	200	400
FPS22W155K5R - □	450	1.5	±10	8.2	13.6	12.5	10.0	0.6	24.5	200	300
FPS22W225K5R - □	450	2.2	±10	9.9	15.4	12.5	10.0	0.8	36.0	100	300

-□ : Add to the case of lead processing
Put the Mark of processed lead or the Mark of taping.

【 Component Outline 】

Standard style (No "－□")



Enclosure: Flame retardant epoxy resin
Lead wire: φ0.6: Tin(Sn-3Cu) Plated CP Wire
φ0.8: Tin(Sn-3Cu) Plated Copper Wire

Table-2　PERFORMANCE（Test Method, Specification）

No.	Test 【Reference standard】		Test Method	Specification
1	Appearance 【JIS C 5101-16 4.1】		Visually identify	No visible damage Marking can be discriminated
	Dimension 【JIS C 5101-16 4.1】		Dimension measurement	Within specified dimension (Table-1)
2	Voltage Test	Between terminals	Rated voltage ×1.4(VDC) for 1min (Series resister is 2kΩ or more) 【JIS C 5101-16 4.2.1】	No flashover, No breakdown, However, instantaneous breakdown is allowed
		Between terminals and enclosure	Rated voltage × 2(VDC) for 1～5 sec 【JIS C 5101-16 4.2.1】	No flashover, No breakdown
3	Capacitance 【JIS C 5101-16 4.2.2】		1kHz ±10% Measured voltage 1Vrms or less	Within specified tolerance (Table-1)
4	tan δ 【JIS C 5101-16 4.2.3】		1kHz ±10% Measured voltage 1Vrms or less	0.001 or less
5	Insulation resistance Between terminals 【JIS C 5101-16 4.2.4】		Measurement： 100 ±15 V 60±5 sec	7500 Ω・F or more (Insulation resistance× Rated Capacitance =7500 MΩ・μF or more Insulation resistance =7500/(Rated Capacitance(μF)) MΩ or more)
6	Terminals strength, Resistance to soldering heat			
	6-1 Initial measurements		Capacitance： Measuring condition is same as No3	—
			tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	
	6-2 Terminals strength Tensile strength 【JIS C 5101-16 4.3】		【JIS C 5101-1 4.13.1】 10N 10±1 sec	No visible damage
	6-3 Terminals strength Flexural strength 【JIS C 5101-16 4.3】		【JIS C 5101-1 4.13.2】 5N, 2 times	
	6-4 Resistance to soldering heat 【JIS C 5101-16 4.4】		【JIS C 5101-1 4.14.2 a)】 Solder temperature: 260 ±5 ℃ Immersion time: 10±1 sec Immersion depth: 2 +0/-0.5 mm form the root of termination	No visible damage
	6-5 Final measurements		Capacitance： Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±3%
			tan δ ： Measuring condition is same as No4 (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.004

Table-2 (continued)

No.	Test 【Reference standard】	Test Method	Specification
7	Solderability	Solder: Sn-Ag3%-Cu0.5% Solder temp.: 245 ± 5℃ Immersion time: 2 ±0.5sec. Rosin density: Approx.25%	95% of the circumference of the surface up to the immersed part shall be covered with new solder
8	Rapid change of temperature		
	8-1 Initial measurements	Capacitance： Measuring condition is same as No3	—
		tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	—
	8-2 Rapid change of temperature 【JIS C 5101-16 4.6】	【JIS C 0025 Test Na】 Lower limit temperature： -40 ±2℃ for 30±1min Upper limit temperature： +110±2℃ for 30±1min 5 Cycles	No visible damage
	8-3 Final measurements	Capacitance： Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±3%
		tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.004
		Insulation resistance Measuring condition is same as No5	More than 50% of No5
9	Vibration, Bump		
	9-1 Initial measurements	Capacitance： Measuring condition is same as No3	—
		tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	
	9-2 Vibration 【JIS C 5101-16 4.7】	Vibration frequency：10～55～10 Hz Sweep rate ：1 octave / min. Amplitude 0.75mm or Acceleration 100 m/s^2 (The condition of whichever is looser) Duration：Total 6 hours (3 right angle directions in 2 hours steps)	No visible damage
	9-3 Bump 【JIS C 5101-16 4.8】	Waveform：Sine half wave Peak acceleration：400 m/ s^2 Action time：6 msec Times：1000 times	No visible damage
	9-4 Final measurements	Capacitance： Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±3%
		tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.004
		Insulation resistance Measuring condition is same as No5	More than 50% of No5

Table-2 (continued)

No.	Test 【Reference standard】	Test Method	Specification
10	Climatic sequence		
	10-1 Initial measurements	Capacitance： Measuring condition is same as No3	—
		tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	
	10-2 Climatic sequence 【JIS C 5101-16 4.10】	【JIS C 5101-1 4.21.2】 Upper temperature：+110±3℃ 16H 【JIS C 5101-1 4.21.3 Method 2】 High Temp: 55±2℃ 93±%RH 12H, Low Temp: 25±3℃95more%RH 12H : 1 cycle 【JIS C 5101-1 4.21.4 Test Aa】 Low Temp ：-40±3℃ 2H 【JIS C 5101-1 4.21.3 Method 2】 High Temp: 55±2℃ 93±%RH 12H, Low Temp: 25±3℃95more%RH 12H : 5 cycles	—
	10-3 Final measurements	Capacitance： Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±5%
		tan δ ： Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.005
		Insulation resistance Measuring condition is same as No5	More than 50% of No5
11	Damp heat (Steady state)		
	11-1 Initial measurements	Capacitance： Measuring condition is same as No3	—
		tan δ ： Measuring condition is same as No4. 1kHz±10%	
	11-2 Damp heat (Steady state) 【JIS C 5101-16 4.11】	【JIS C 5101-1 4.22】 Temperature：40±2℃ Humidity ：90～95% Duration ：500+24-0 H	—
	11-3 Voltage Test Between terminals 【JIS C 5101-16 4.11.2】	Rated voltage (VDC) for 1min	No flashover, No breakdown, However, instantaneous breakdown is allowed
	11-4 Final measurements	Capacitance： Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±5%
		tan δ ： Measuring condition is same as No4. 1kHz±10%	Increase of tan δ ≦0.005
		Insulation resistance Measuring condition is same as No5	More than 50% of No5

Table-2 (continued)

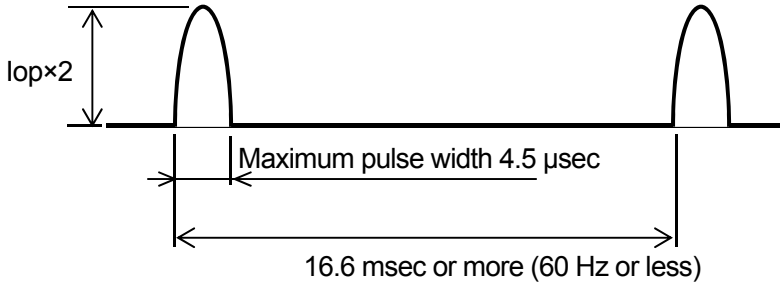
No.	Test 【Reference standard】	Test Method	Specification
12	Damp heat (Loading)		
	12-1 Initial measurements	Capacitance : Measuring condition is same as No3	—
		tan δ : Measuring condition is same as No4. 1kHz±10%	—
	12-2 Damp heat (Loading)	Temperature : 40±2℃ Humidity : 90～95% Test voltage : Rated voltage (VDC) Duration : 500+24-0 H	No visible damage
	12-3 Final measurements	Capacitance : Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±5%
		tan δ : Measuring condition is same as No4. 1kHz±10%	Increase of tan δ ≦0.005
		Insulation resistance Measuring condition is same as No5	900 Ω・F or more
13	Endurance test 1		
	13-1 Initial measurements	Capacitance : Measuring condition is same as No3	—
		tan δ : Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	—
	13-2 Endurance test 1	Temperature : +85±3℃ Test voltage : Rated voltage×1.11 (VDC) Duration : 1000 +48/-0 H	No visible damage
	13-3 Final measurements	Capacitance : Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±10%
		tan δ : Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.004
		Insulation resistance Measuring condition is same as No5	More than 50% of No5
14	Endurance test 2		
	14-1 Initial measurements	Capacitance : Measuring condition is same as No3	—
		tan δ : Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	—
	14-2 Endurance test 2	Temperature : +110±3℃ Test voltage : 380×1.11 (VDC) Duration : 1000 +48/-0 H	No visible damage
	14-3 Final measurements	Capacitance : Measuring condition is same as No3	Capacitance change from the initial ⊿c / C ≦ ±10%
		tan δ : Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.004
		Insulation resistance Measuring condition is same as No5	More than 50% of No5

Table-2 (continued)

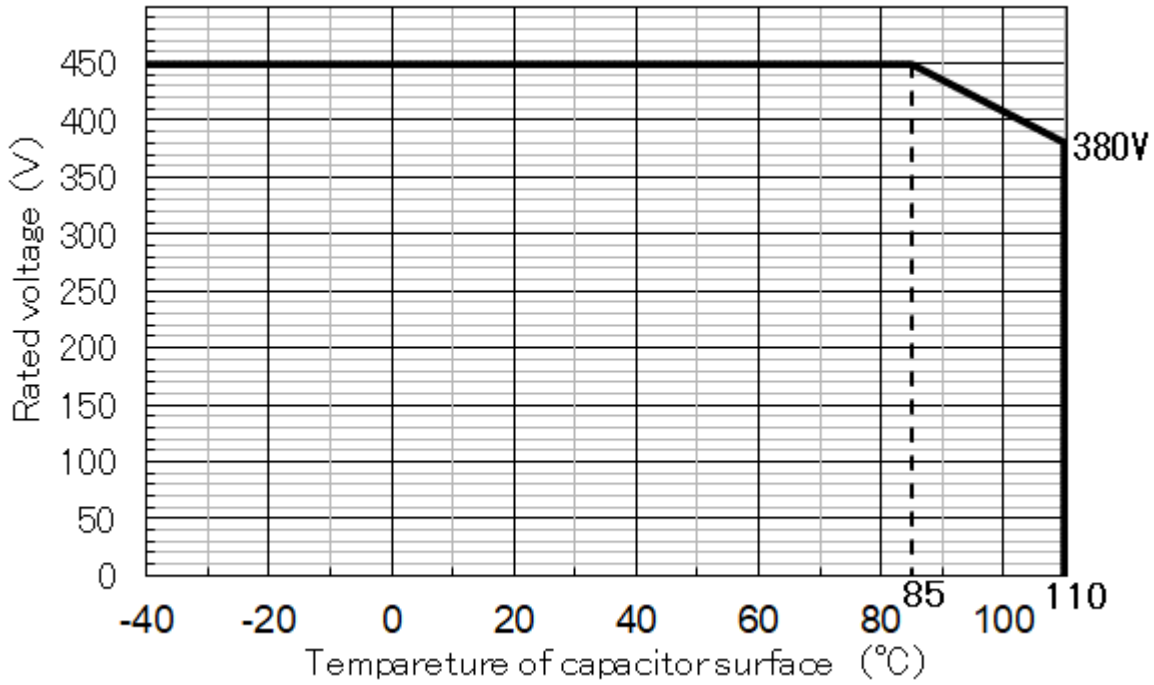
No.	Test 【Reference standard】	Test Method	Specification
15	Charge and discharge		
	15-1 Initial measurements	Capacitance : Measuring condition is same as No3	—
		tan δ : Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	—
	15-2 Charge and discharge	Cycle number: 10000 cycles Cycle interval: 60 times / sec or less Charge resistance : 250Ω Discharge current: The following current waveform	
	15-3 Final measurements	Capacitance : Measuring condition is same as No3	No visible damage Capacitance change from the initial ⊿c / C ≦ ±10%
		tan δ : Measuring condition is same as No4. (C>1μF: 1kHz±10%, C≦1μF:10kHz±10%)	Increase of tan δ ≦0.005
		Insulation resistance Measuring condition is same as No5	More than 50% of No5

Charge and discharge current waveform

Discharge current peak : Table-1, Permissible current (Peak value) Iop ×2

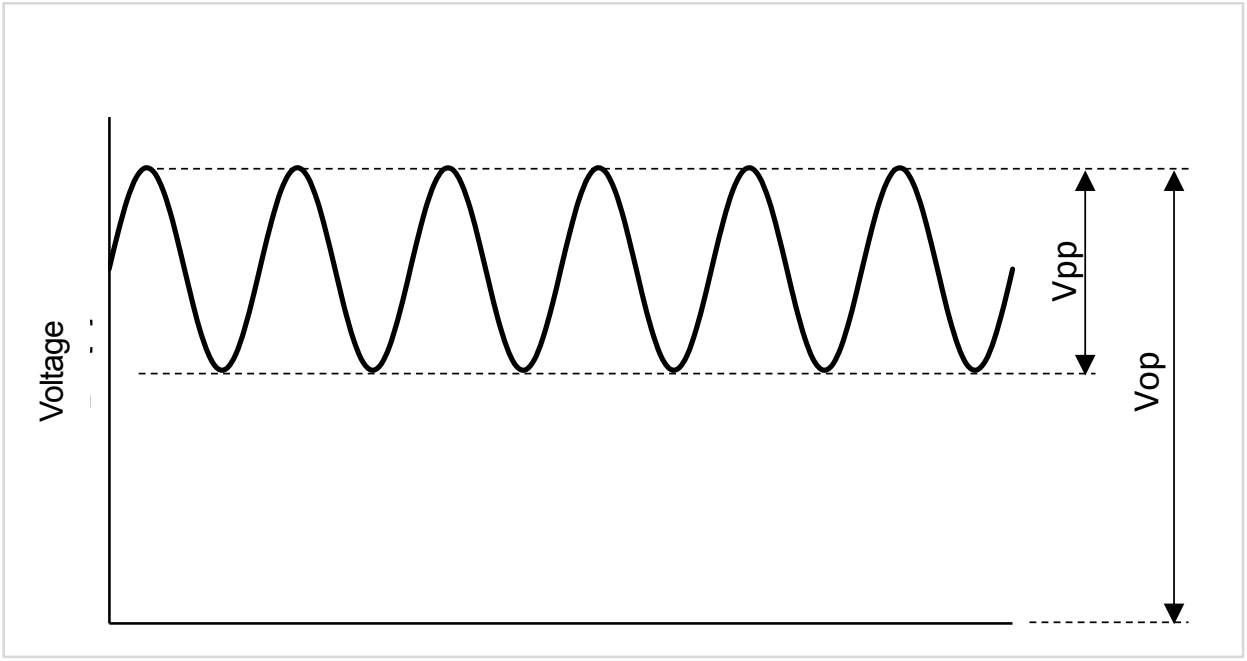


Max operating voltage VS Operating Temperature



Permissible Voltage fluctuation

Peak to peak voltage applied on the capacitor should be less than 200Vpp,
and zero to peak voltage should be less than Max operating voltage (Above)



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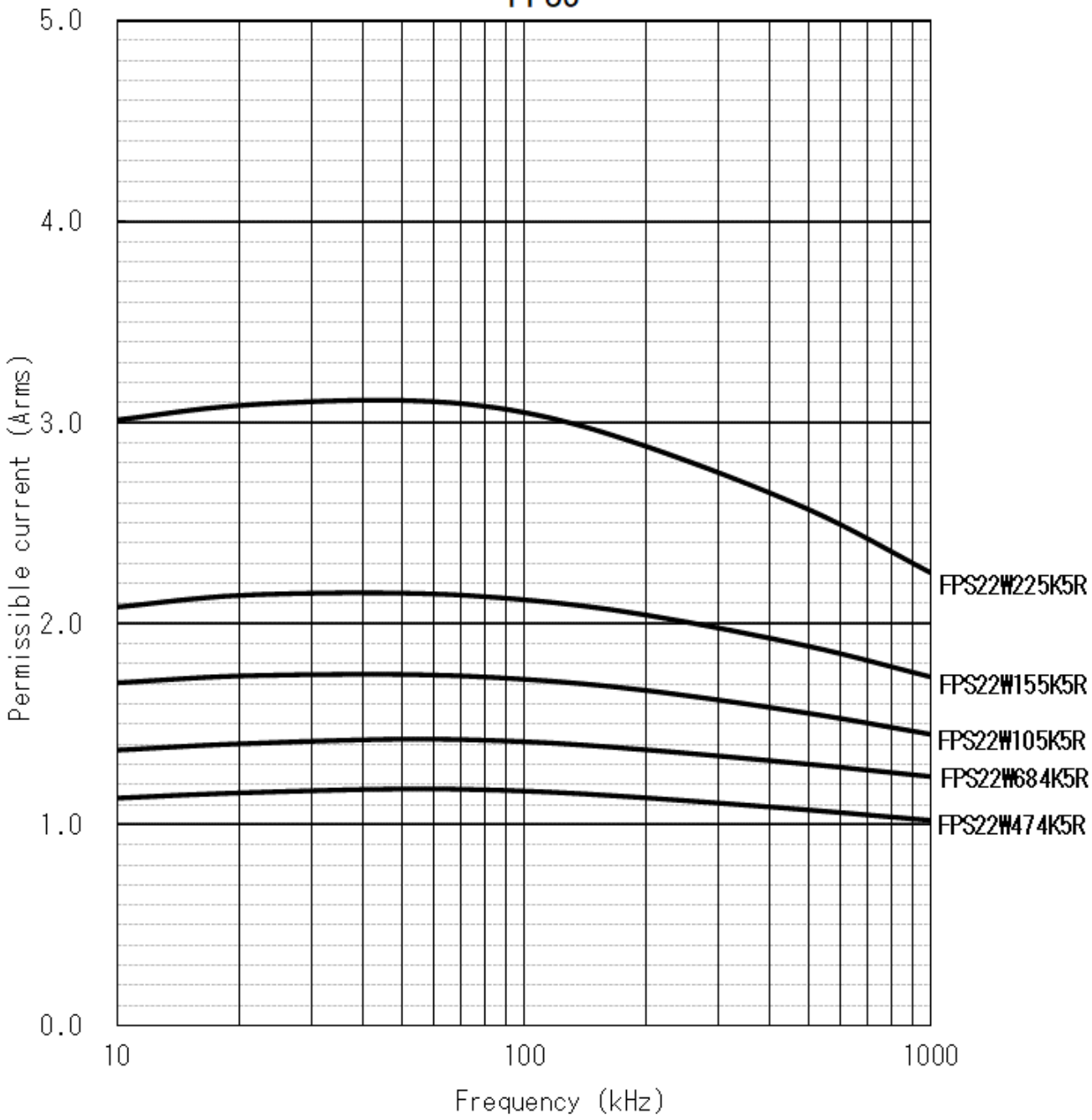
Permissible current(Effective value) VS Frequency

FPS5



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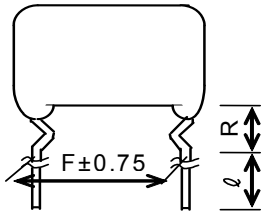
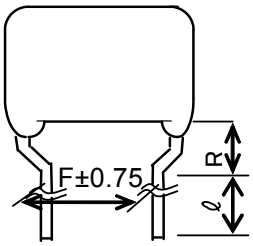
PROCESSED LEAD SPECIFICATIONS

・Formed lead Coverage

Lead processing	Mark of processed lead	Original lead pitch (㎜)	Lead pitch after formed	Style
Formed lead	-F	10.0, 15.0	Same as Original	No1
	-F5	10.0	5.0	No2
	-F7.5	10.0, 15.0	7.5	No2
	-F10	15.0	10.0	No2
	-F12.5	15.0	12.5	No2

・Style of processed lead

No	Style	Dimensions（mm）			Designation sample
		Diameter of lead	R	ℓ	
1	Formed to same pitch as original 	ϕ0.6	5.0Max	10Min	Designation −F Mark of processing
		ϕ0.8	6.0Max		
2	Formed to diferent pitch as original 	ϕ0.6	5.0Max	10Min	Lead pitch after formed ↓ Designation −F□ Mark of processing
		ϕ0.8	6.0Max		

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・Cut, Formed & cut Coverage

※ ◇ : The figure (lead length) is put.

Lead processing	Mark of processed lead	Original lead pitch (㎜)	Lead pitch after formed	Style
Cut	-C◇	10.0, 15.0, 22.5	—	No1
Formed & cut	-FC◇	10.0, 15.0, 22.5	Same as Original	No2
	-F5C◇	10.0	5.0	No3
	-F7.5C◇	10.0, 15.0	7.5	No3
	-F10C◇	15.0	10.0	No3
	-F12.5C◇	15.0	12.5	No3

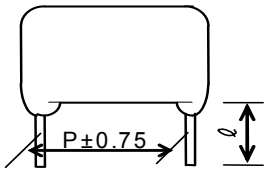
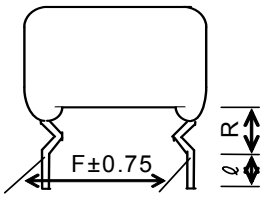
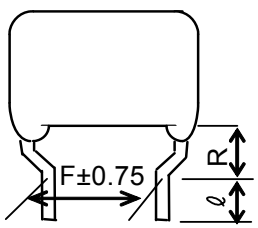
When the figure is not put, the lead length is assumed 4.5±0.5 mm

-C◇ : 4, 5

-FC◇ : 3.5, 4, 5

-F□C◇ : 3.5, 4, 5

・Style of processed lead

No	Style	Dimensions（mm）			Designation sample
		Diameter of lead	R	ℓ	
1	Cut 	ϕ0.6 ϕ0.8	—	4.5±0.5 ◇±0.5	Length of lead Designation — C◇ Mark of processing
2	Formed & cut to same pitch as original 	ϕ0.6	5.0Max	4.5±0.5 ◇±0.5	Length of leads Designation —FC◇ Mark of processing
		ϕ0.8	6.0Max		
3	Formed and cut to diferent pitch as original 	ϕ0.6	5.0Max	4.5±0.5 ◇±0.5	Lead pitch after formed Length of Leads Designation — F□C◇ Mark of processing
		ϕ0.8	6.0Max		

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TAPING SPEC.

1. Taping figure and dimensions
   Taping figure and dimensions are shown in [Taping table-1 Taping Coverage], [Taping table-2 Taping specifications], [Figure-4 Taping Figure] and [Taping table-3 Taping Dimensions].

2. Dropouts of capacitors
   After taping, the dropout of capacitors shall be as follows, and it is satisfied the quantity of one package.

Pitch (between capacitors)	Less than 25.4mm	: 3 pieces (continuous)
	25.4mm	: 2 pieces (continuous)
	Over 25.4mm	: 1 pieces (continuous)

3. End of taping
   It shall leave 3 blank or more (no taping capacitors) at the start and the end of taping.

4. Connection of taping
   Connection of taping（completion or cutting of staple tape）is connected by adhesive tape shown in figure-1 and figure-2.

Figure-1

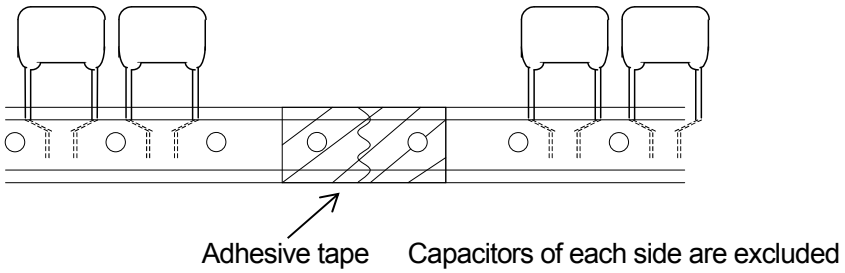
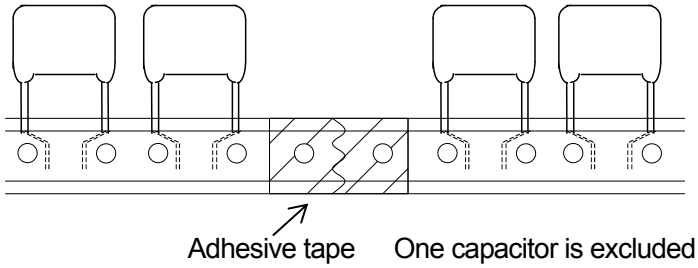
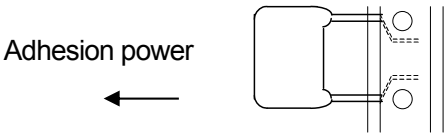


Figure-2



5. Adhesion power to pull capacitors
   Shown in figure-3, Adhesion power against pulling capacitors to right angle shall be 10N or more.

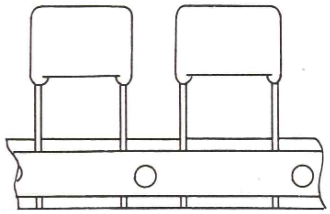
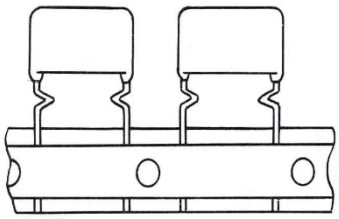
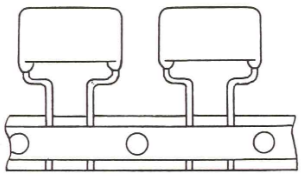
Figure-3



Taping table-1　Taping coverage

Taping	Mark of processed lead	Original lead pitch (㎜)	Lead pitch after taping	Style
Straight taping	-T	10.0, 15.0	Same as original	No1
Forming taping	-FT	10.0, 15.0	Same as original	No2
	-F5T	10.0, 15.0	5.0	No3
	-F7.5T	10.0, 15.0	7.5	No3
	-F10T	15.0	10.0	No3

Taping table-2 Taping specifications（Feed hole pitch：12.7㎜）

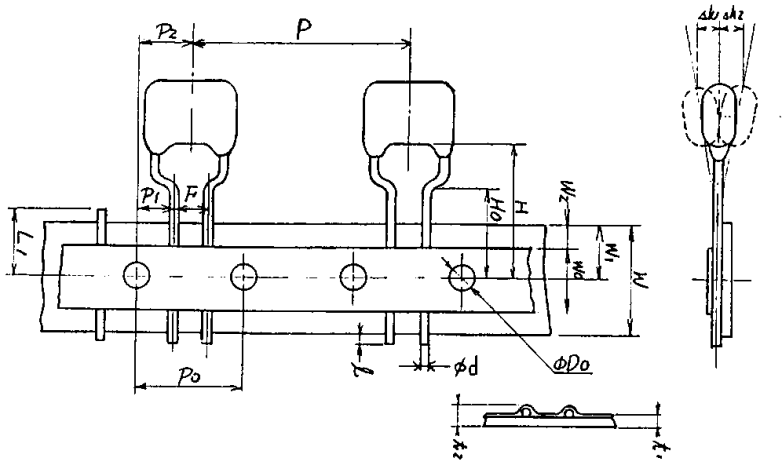
No	Style	Dimensions(㎜)				Designation sample
		Original lead pitch	Lead pitch after taping 0.8 ($F\pm_{0.2}$)	Between capacitors pitch (P)	Feed hole position deviation (P_1)	
1		10.0	10.0	25.4	1.35	Designation−T Mark of taping
		15.0	15.0	25.4	1.15	
2		10.0	10.0	25.4	1.35	Designation−FT Mark of forming taping
		15.0	15.0	25.4	1.15	
3		10.0	5.0	25.4	3.85	Lead pitch after formed ↓ Designation−F□T Mark of forming taping
		10.0	7.5	25.4	2.60	
		15.0	5.0	25.4	3.85	
		15.0	7.5	25.4	2.60	
		15.0	10.0	25.4	1.35	

※Figure-4 and Taping table-3 are representatives of taping

Taping table-2 No.3 Forming & taping (to 5mm Pitch)

Original lead pitch :10.0mm
Lead pitch after taping :5.0mm
Feed hole pitch :12.7mm

Figere-4 Taping Figure



Taping table-3

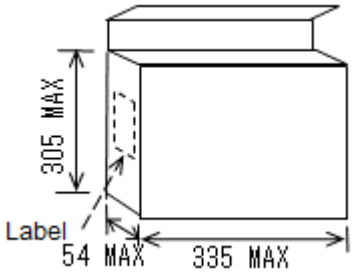
Item	Letter	Nominal value	Tolerance	Remarks
Pitch between capacitors	P	25.4	±1.0	
Feed hole pitch	P_0	12.7	±0.3	Accumulated pitch tolerance ±2 mm/20 pitch
Feed hole position deviation	P_1	3.85	±0.7	To be measured at the top of taping The length of between lead wire and feed hole
Feed hole position deviation	P_2	6.35	±1.3	The length of between capacitor and feed hole
Lead pitch	F	5.0	+0.8 −0.2	To be measured at the top of taping
Tape width	W	18.0	±0.5	The shape of leads on the tape is at our option.
Adhesive tape width	W_0	12.5	MIN	Adhesive tape shall not be out of the tape
Feed hole position	W_1	9.0	±0.5	
Adhesive tape deviation	W_2	3.0	MAX	Adhesive tape shall not be out of the tape
Bottom position of capacitor	H	20.5	±0.75	
Height of lead clinch	H_O	16.0	±0.5	The measurement position is under the clinch.
Feed hole diameter	D_0	ϕ4.0	±0.2	
Defect cutoff position	L_1	11.0	MAX	Cutting off or pulling out the lead wire
Lead wire protrusion	ℓ	0	MAX	Lead wire shall not be out of the tape
Tape thickness(over all)	t_1	0.6	±0.3	
Taping thickness	t_2	1.5	MAX	
Tilt of capacitor	Δh_1 Δh_2	2.0	MAX	The measurement position is the top of the capacitor.
Leading tape	3 blank or more			AMMO packing

TAPING PACKING SPEC.

Ⅰ. Inner Packing

AMMO pack radial taped is put into Inner box.
The dimensions of the Inner box are shown as follows.
The protector for the enclosed product is put in the Inner box.
The quantity into Inner box is shown in Table-1(P.3).

Inner box (Unit: mm)



The indication on Inner package

Following contents are indicated on the outside of the Inner box.

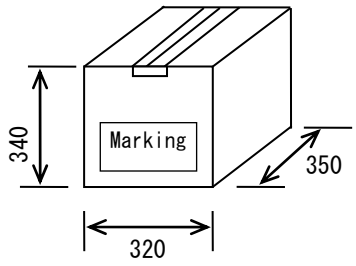
① Type name
② Rated voltage
③ Rated capacitance
④ Capacitance tolerance
⑤ Part code
⑥ Quantity
⑦ Lot No. (applied R to the end: RoHS-compliant & Halogen free)
⑧ Trade mark

The marking example is shown below.

C A P A C I T O R	TYPE F P S	SERIES
450 VDC FPS22W474K5R-F5T	0.47μF	CAP.TOL K
QUANTITY	600 PCS	LOT NO. 612038R
Nitsuko	990601 日通エエレクトロニクス株式会社	MADE IN JAPAN

Ⅱ. Outer-package

The Inner box are put into an outer package.
The outer package is sealed by tape.
The dimensions of outer-package are shown as follows.
The quantity in an outer-package is usually 6 Inner packages
(Except in the case of fraction)



In case of fraction, there is also the size as follows.
(Unit: mm, Dimensions are reference value)
320×350×175

Following contents are indicated on the outer package

① Part code
② Rated capacitance
③ Capacitance tolerance
④ Rated voltage
⑤ Lot №(applied R to the end: RoHS-compliant & Halogen free)
⑥ Quantity
⑦ Company name

The indication example is shown below.

<table>
<tr><td colspan="2">FPS22W474K5R-F5T</td><td rowspan="2">Inspected by
NTKE
10.09.16
Q.C</td></tr>
<tr><td>Cap.</td><td>Cap. Tol.</td></tr>
<tr><td>0.47μF</td><td>-10～+10%</td><td>CASE SIZE</td></tr>
<tr><td>Volt.</td><td>Lot№</td><td></td></tr>
<tr><td>450 VDC</td><td>612038R</td><td>PARTS No.</td></tr>
<tr><td colspan="2">QUANTITY</td><td></td></tr>
<tr><td colspan="2">3600 PCS</td><td>MADE IN JAPAN</td></tr>
<tr><td colspan="3">Nitsuko Electronics Corp.
6400 73040026</td></tr>
</table>

CAPACITOR PACKING SPEC.(Bulk)

1. Inner Packing

Capacitors are packed in a polyethylene bag.
The indication on the polyethylene bag is as follows.

① TYPE
② Rated Capacitance
③ Capacitance tolerance
④ Rated voltage
⑤ Packing quantity
⑥ LOT No (applied R to the end: RoHS-compliant & Halogen free)
⑦ Trade mark

The example is on the right.
The quantity is shown in Table-1(P3).

METALLIZED FILM CAPACITORS

FPS 0.47μF K 450W.V

LOT NO. OOOOOOR 200 PCS

Nitsuko Electronics Corp.
Nitsuko 日通エレクトロニクス. 株式会社.
RoHS MADE IN JAPAN

2. Packing

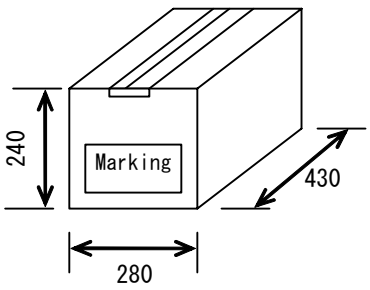
The polyethylene bags are packed in a box.
The box is sealed by tape.
The indication on the box is as follows.

① Part code
② Rated capacitance
③ Capacitance tolerance
④ Rated voltage
⑤ Lot No (applied R to the end: RoHS-compliant & Halogen free)
⑥ Quantity
⑦ Company name

The example is on the right.

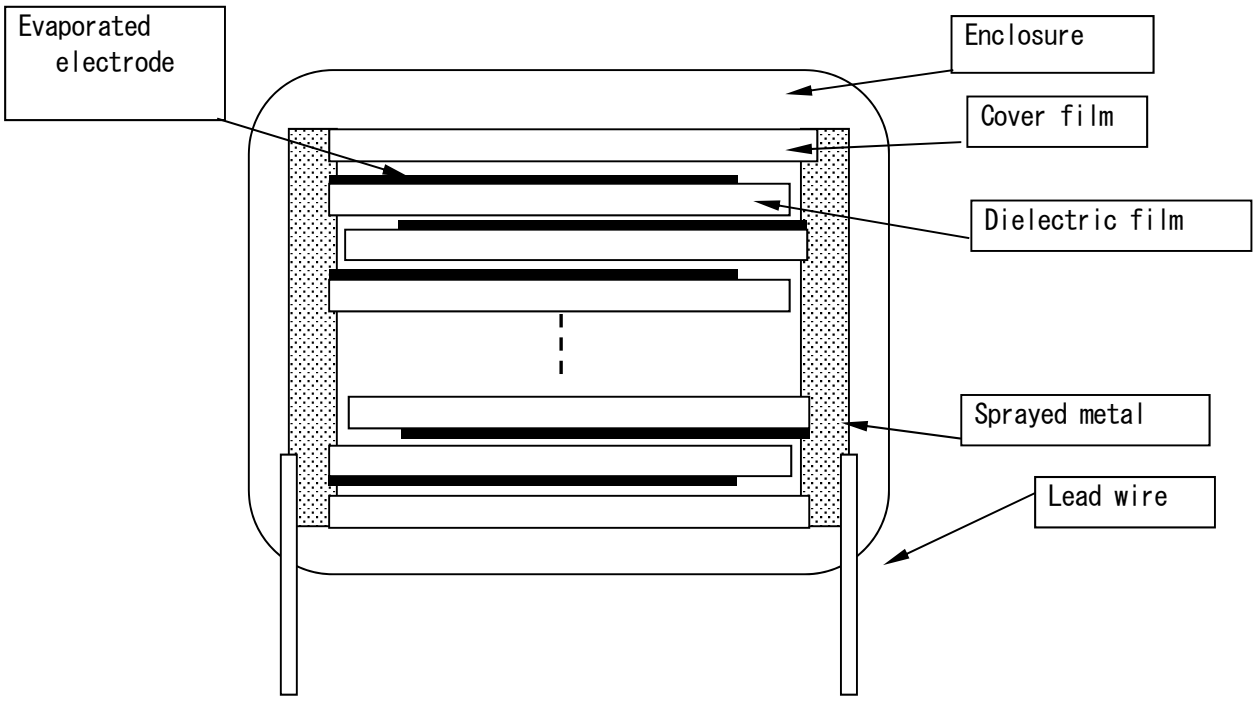
TYPE FPS22W474K5R		Inspected by NTKE 10.08.18 Q.C
Cap.	Cap. Tol.	
0.47μF	-10～+10%	
Volt.	Lot No	CASE SIZE
450 VDC	612038R	
QUANTITY		PARTS No.
10000 PCS		
Nitsuko Electronics Corp. 6400 73040026		MADE IN JAPAN

Dimensions of the box are as follows.
(Unit: mm, Dimensions are reference value.)



In case of fraction, there is also the size as follows or the packing will be correspond to the quantity.
(Unit: mm, Dimensions are reference value.)
160×220×160, 220×280×220, 220×300×140, 210×390×220

METALLIZED FILM CAPACITOR
STRUCTURE AND MATERIAL DETAILS
(F P S)



Material details (RoHS-compliant)

	Item	Materials
1	Dielectric film	Metallized polypropylene film
2	Cover film	Polyester film
3	Sprayed metal	Alloy of Sn
4	Lead wire	ϕ0.6 : Tin(Sn-3Cu) plated CP wire ϕ0.8 : Tin(Sn-3Cu) plated Copper wire
5	Impregnated resin	Low stickiness epoxy resin
6	Enclosure	Flame retardant epoxy resin (UL94 V-0)

NOTABILIA FOR USE OF FILM CAPACITORS

Make sure as follows before use to ensure the safety.

- **Make sure to require our specifications before use and if you have any further questions or concerns, please contact us.**
  Confirm your use condition that is within our specifications and this notabilia in use.
- **Film capacitor will emit smoke and take fire in the worst case because it uses flammable substance.**
- **If our products are used in life-threatening devices or equipment, please contact us without fail.**

Please check Guideline of notabilia for fixed plastic film capacitors for use in electronic equipment form Japan Electronics and Information Technology Industries Association (JEITA).

JEITA RCR-2350C Guideline of notabilia for fixed plastic film capacitors for use in electronic equipment

1. In designing devise circuits

1) Operating and installation environment and performance limits of capacitor
   - Confirm operating and installation environment, and use them within the performance in the catalogue and the specifications.

2) Operating environment
   - Avoid using the environments as follows

   a. It is wetted by the water, the salt water, and oil.
   b. It is exposed to direct rays of the sun.
   c. In ozone, and it is shined with radioactive rays or ultraviolet.
   d. In corrosive gas (H_2S, H_2SO_3, HNO_2, Cl_2, NH_3, etc)
   e. In case of over the performance in the catalogue and specifications of vibration and shock.

3) Operating temperature
   - Use the capacitors within the temperature range

   Operating temp. = ambient temp. + own temp. rise + Other temp. rise ≒ surface temp. of the capacitor

4) Confirmation of operating circuit (Primary side of power supply)
   - Safety performance classes of capacitors that are used at Primary side of power supply (across the line etc.) depend on standards. Select the suitable capacitor for its applied circuit.
   - Consult us, when the capacitor is applied noise immunity test that may apply high surge current to the capacitor that may cause damage to it.

5) Confirmation of operation circuit (Charge and discharge)
   - The abrupt charge and discharge of exceeding the specifications may cause damage to the characteristic performance of the capacitors or destruction to the capacitors. Consult us, if they will be used in the circuits that will be applied the abrupt charge and discharge frequently.
   - When the capacitors are applied the abrupt charge and discharge frequently at Withstanding voltage and Insulation resistance test, use series resistor (1kΩ or more) to do not over 1A. Do not use the capacitors that were had withstanding voltage test for the products that may be on the market.

6) Confirmation of operating circuit (Applied low voltage)
   - In case of applied voltage to the capacitor is low or the resister connected in series is large, it may not function the self-hearing performance and occasionally short-circuit.

7) Rated voltage
   - Use within the rated voltage specified.
     Do not apply the peak value (DC voltage + AC peak value) of surge and ripple voltage to a capacitor exceeding the rated voltage.
   - This product (DC capacitor) may be used in AC circuits. In that case, apply the voltage as follows (Table- 1).
     Do not use the capacitor at primary side of power supply.
     Some items can not be used in AC circuit (MDX, MDST3, FPS, FPD5, FPA, FPB(250VDC～630VDC) , FPT, etc).

Table-1

DC Rated voltage	AC voltage (50/60Hz)*1	
	Metallized polyester film capacitor MDS, MDD Series	Metallized polypropylene film capacitor FPF, FPD4 Series
50VDC	32VAC	-
63VDC	40VAC	-
100VDC	63VAC	-
250VDC	125VAC	125VAC
400, 450VDC	200VAC	200VAC
630VDC	250VAC	250VAC

*1 Permit +10% for voltage change

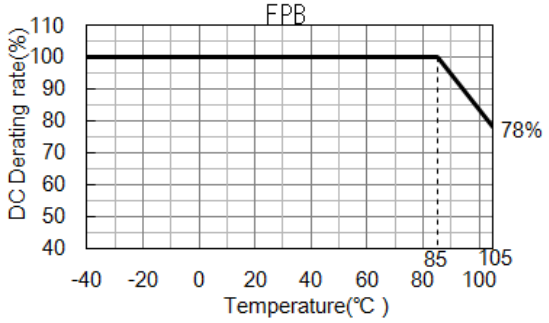
8) The relation between max operating voltage and operating temperature

・If it is used at high temperature(surface), derate the voltage as follows.

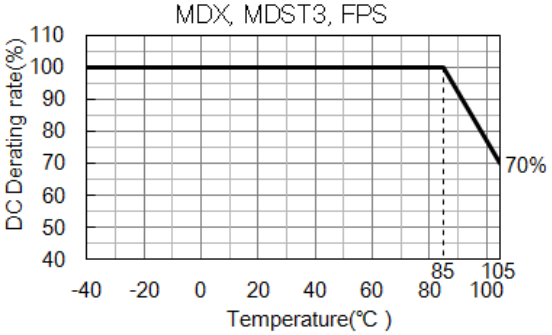
$$\text{Derating rate (\%)} = \frac{\text{Max operating voltage}}{\text{Rated voltage}} \times 100$$ (Temperature: Surface temp. of capacitor)

For DC

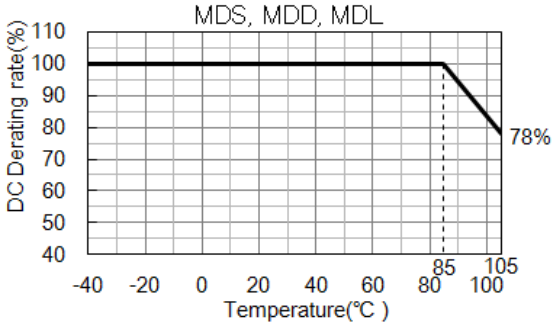
FPB



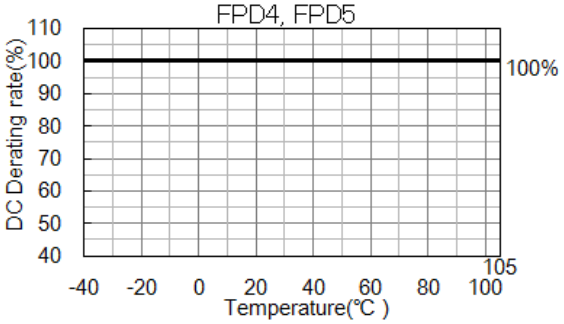
MDX, MDST3, FPS



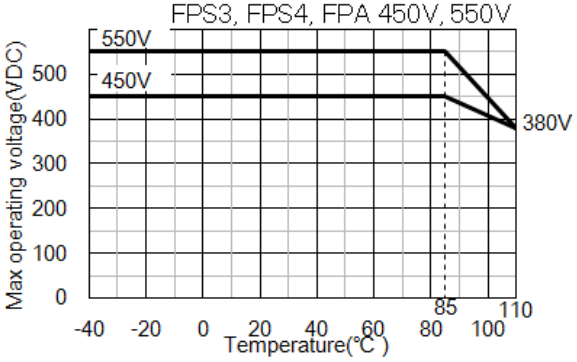
MDS, MDD, MDL



FPD4, FPD5

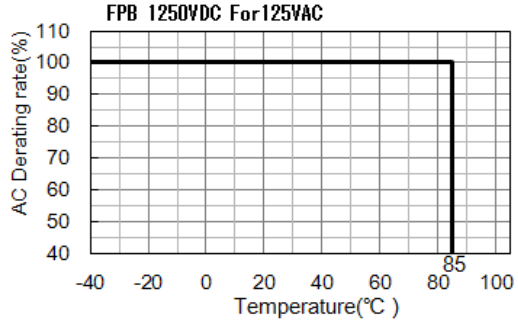


FPS3, FPS4, FPA 450V, 550V

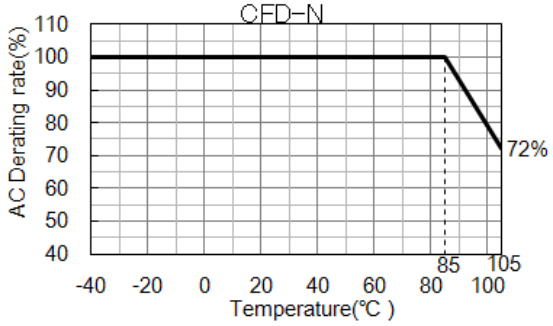


For AC

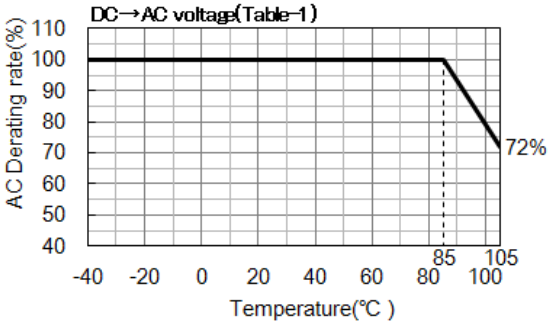
FPB 1250VDC For125VAC



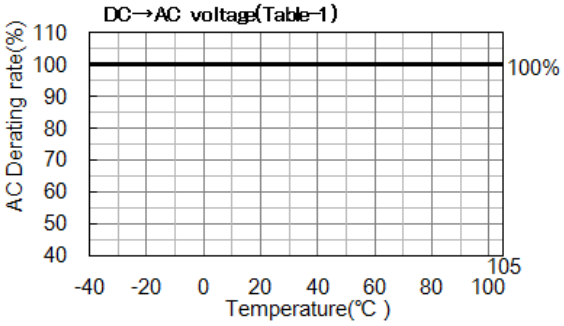
CFD-N



・MDD 1250VDC For 500VAC
・MDS、MDD For AC
DC→AC voltage(Table-1)

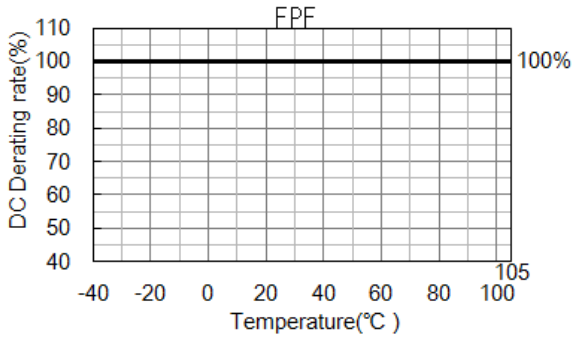


FPD4 For AC
DC→AC voltage(Table-1)

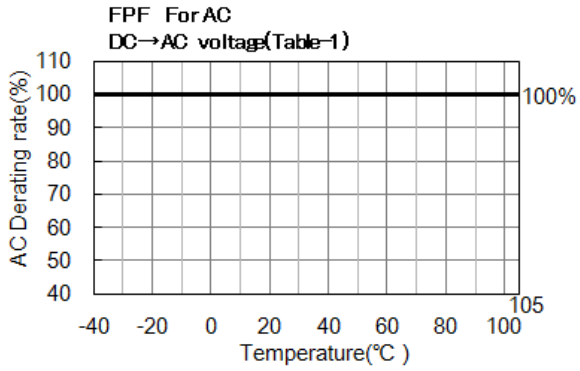


NOTABILIA FOR USE OF FILM CAPACITORS

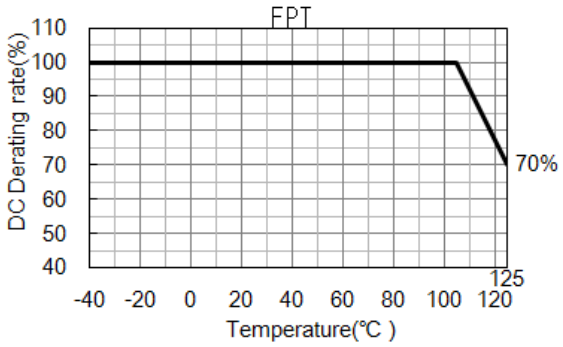
For DC



For AC



FPF series : Please derate the effective current at +100～105℃. (See One after another page)

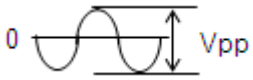


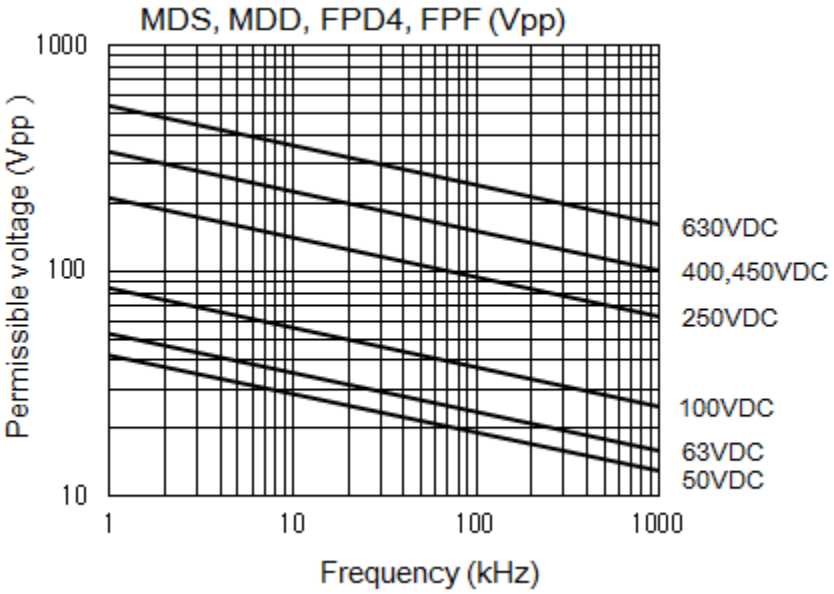
FPT series : Please derate the effective current at +120～125℃. (See One after another page)

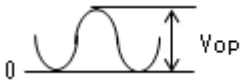
9) Using High frequency

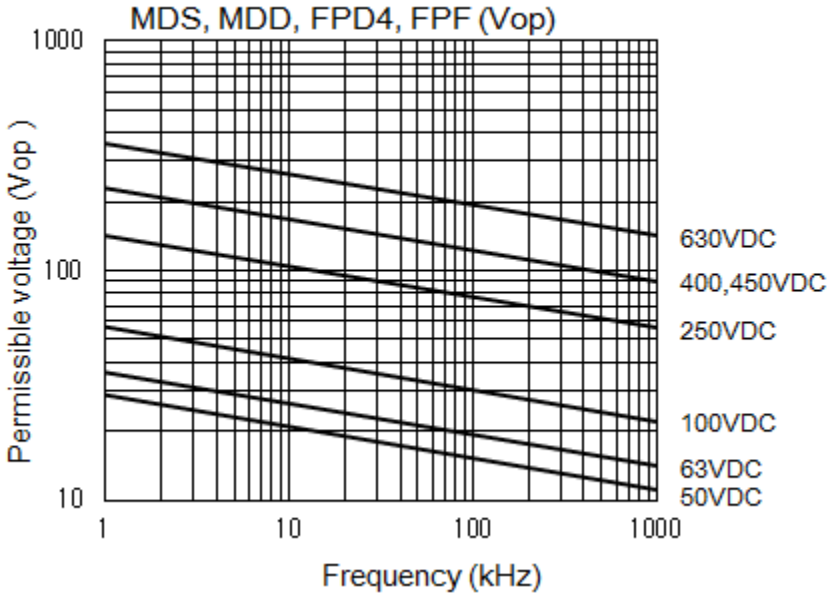
・When the voltage change of the high frequency is large, corona occurs and may lead to dielectric deterioration. In case of using high frequency, use capacitors within the limits of permissible voltage, permissible current, operating temperature and temperature rise as follows. Consult us, if they are close to or over the limits.

1. Permissible voltage







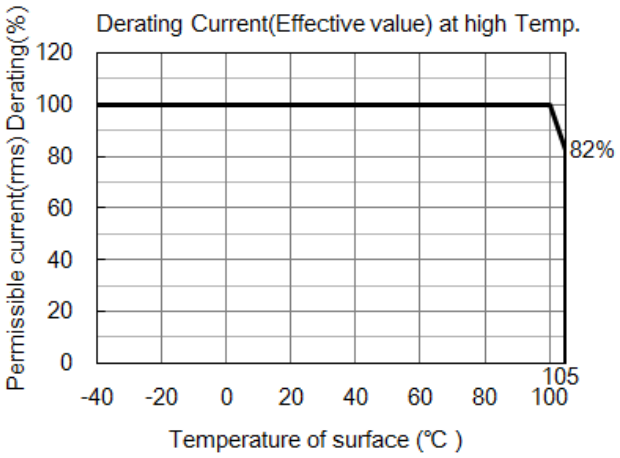


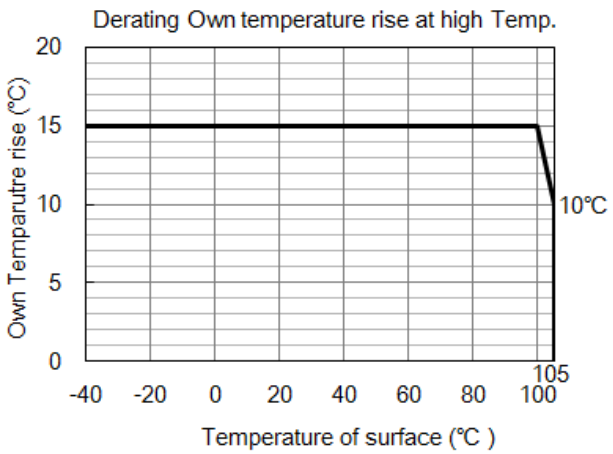
2. Operating temp. and Own temp. rise

・In case of using high frequency, use capacitors within the limits of operating temperature and Own temperature rise as follows because capacitors generate heat.

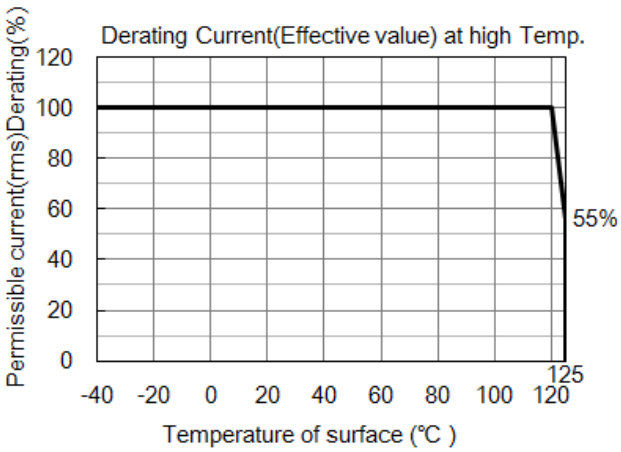
Item	Operating temp. (Surface temp.)	Own temperature rise
MDS, MDD, MDX, FPS, FPB	105℃MAX	10℃MAX
FPH, FPG	85℃MAX	10℃MAX
FPD4, FPD5	105℃MAX	10℃MAX
FPA,FPS3, FPS4	110℃MAX	10℃MAX

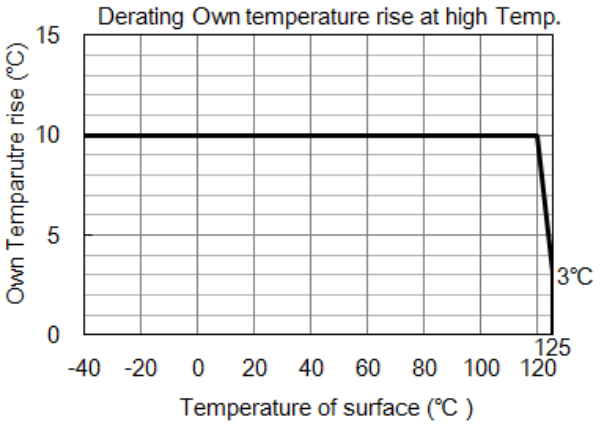
☆ FPF series as follows. Please derate the effective current at +100～105℃.





☆ FPT series as follows. Please derate the effective current at +120～125℃.



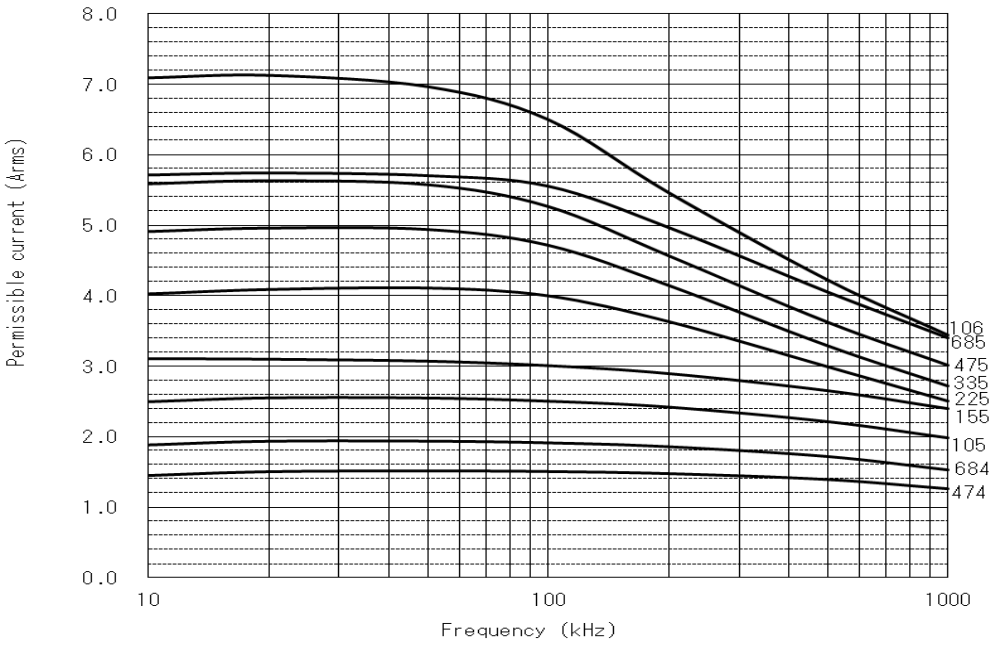


3. Permissible current

・Specified permissible current are Peak current and Effective current. Do not use capacitors under the condition of over the specified both current.
The peak current is mentioned in the ratings & dimensions table and the effective current is mentioned in the graph of permissible current depends on frequency. (In the high frequency use, permissible current is depends on the frequency. The example of Permissible current (Effective value) vs. Frequency is shown below.)
Please contact us about details of each item and rating.

【 Example of Permissible current (Effective value) vs. Frequency 】

Item : Resin coating metallized film capacitor (FPB series)
Rated voltage : 250V_{DC}



10) The hum of capacitors
・When the circuit is applied the voltage change abruptly, it may make hum.
Although hum does not spoil the characteristics of capacitors, consult us when the hum makes the problem.

11) Others
・When the board is designed, the hole spacing on the board adjust to the terminal spacing of a capacitor.
・The lead wire is also available the forming lead type.
・Avoid putting the heating parts around the capacitor and reverse side of the board (under the capacitor).
・Design after due consideration, the characteristics is change by the temperature and the frequency change.
・When you use the capacitor in long term at high temperature, the exterior color of the capacitor might be discolored.

2. Mounting instruction

1) Attachment
・Check the ratings (rated voltage and capacitance) before attachment.
・Do not transform the capacitor at the time of attaching.
・Check the pitch of capacitor and the hole pitch of the board.
・The strength of the clinching the lead wire of capacitor should not be too strong at the time of insert machine.
・Be careful of the shock of attaching, checking and centering by the insert machine.

2) Soldering
・Check the followings, when it is soldered by soldering iron.
a. The conditions of soldering (temperature, time) should be within the following.
Temperature of soldering iron : 350 ℃
Time of soldering: 3 sec or less for one lead
b. In case of lead forming before soldering because lead pitch is not same as the hole pitch, the body of capacitor should not be under the stress of processing.
c. If re-working or putting out is necessary, it should be done after the capacitor has returned to the normal temperature (30 ℃ or less).
Re-working is 1 time or less
d. The soldering iron should not touch the capacitor directly.

3) Flow soldering

・Check the following at the time of flow soldering

a. The capacitor should not be into solder, only the reverse side of the board (under the capacitor) shall be dipped into the solder.

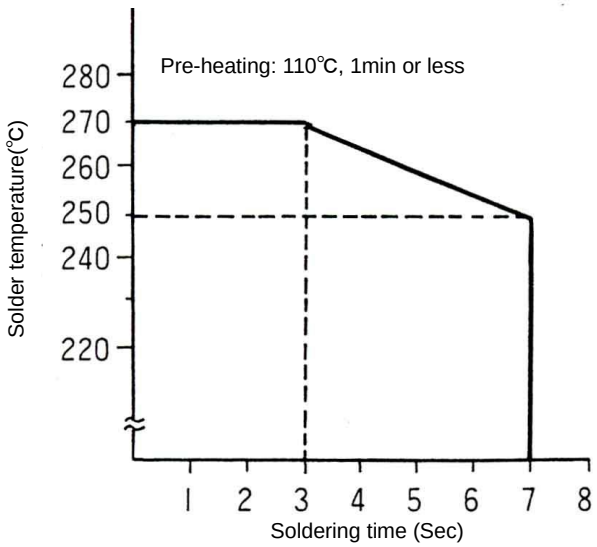
b. The flux should not attach except the lead.

c. Other parts should not be attached to the capacitor at the soldering.

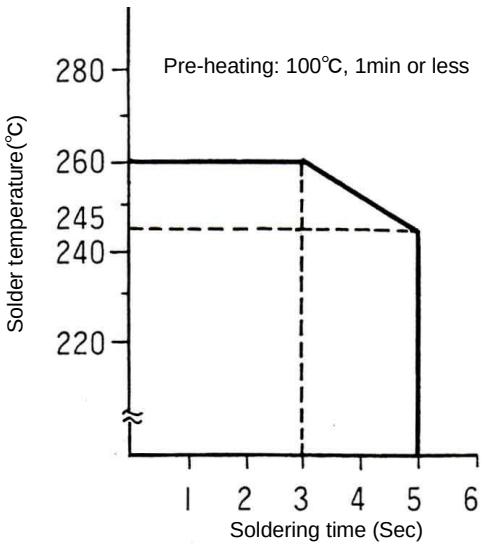
d. The conditions of soldering (pre-heating, solder temperature, immersion time) should be within the followings.

e. If re-working is necessary, it should be done after the capacitor has returned to the normal temperature (30 ℃ or less). Re-working is 2 times or less

Metallized polyester film capacitor



Metallized polypropylene film capacitor



4) Resistance to soldering heat (Metallized polypropylene film capacitor)

・We recommend using formed type for small volume PP products (confirm ratings & dimensions table) because Heat resistance of Polypropylene is lower than Polyester.

5) After soldering

・After the soldering, the capacitor should not be under the stress as follows.

a. Avoid inclining, pulling down and twisting the capacitors.

b. Avoid moving a board to hold the capacitor.

c. Avoid hitting the capacitor. In case of putting the board on another board, avoid hitting the capacitor by other part and the board.

6) Washing

・Consult us, when the capacitor is will be washed by the solvent of acidity and alkalinity.

・We recommend as follows.

Coating	Solvent	Conditions of washing
Resin coating type: MDS, MDD, FPD, MDX FPS, FPA, FPB, FPF, FPT etc	Alcoholic solvent	Dip or dip with ultrasonic in normal temperature solvent : Within 5min. or less

・After the cleaning, the capacitor should not keep in atmosphere of the solvent and closed container.

・Dry the capacitor and the board by hot air (maximum temperature or less) immediately after the cleaning.

7) In using adhesive or coating agent

・In using adhesive agent or coating agent, check the following.

a. The flux and stain should not be left between the capacitor and the board.

b. Before using adhesive agent or coating agent, dry the solvent enough.

c. The conditions of the adhesive agent and coating agent gluing should be within 150℃ and 2min. or less.

3. During operation

1) Precautions for during operation of equipment.

・Avoid touch to the capacitor directly.

・Avoid short circuit by the conductive substance between the leads.

・Avoid putting the conductive substance (solution of acidity and alkalinity) on the capacitor.

・Confirm installation environment.

Avoid the environments as follows

a. It is wetted by the water、the salt water, and oil.

b. It is exposed to direct rays of the sun.

c. In ozone, and it is shined with radioactive rays or ultraviolet.

d. In corrosive gas (H_2S, H_2SO_3, HNO_2, Cl_2, NH_3 etc)

e. In case of over specification of vibration and shock

4. In case of emergency

1) In case of emergency

・Turn off or plug off the equipment, when the equipment s should discharge smoke, fire or smell.

5. Storage and handling

1) The condition of storage

・Avoid keeping the capacitor in high temperature and humidity.
Keep in the temperature (5～35℃), humidity (75%RH or less)

・Avoid the condition of wetted by the water, oil, and the salt water.

・Avoid keeping the capacitor in corrosive gas (H_2S, H_2SO_3, HNO_2, Cl_2, NH_3 etc)

・Avoid keeping the capacitor in ozone, and avoid the condition be exposed to radioactive rays or ultraviolet.

2) Handling

・Do not apply excessive stress to the capacitors such as vibration, shock (like dropping) or other mechanical stress.

・Do not apply excessive mechanical stress to lead wire of the capacitors such as bending or tensile.

6. In case of rejection

1) In case of rejection

・In case of rejection, ask a specialist for the disposal of industrial wastes.

7. Others

1) The standpoint of a catalogue sheet

・Products specifications, materials and other points mentioned in the catalogue may be changed without notification.