

### Surface Mount Type

Series: **FP** Type: **V**

High temperature Lead-Free reflow (suffix : **A\***)



#### Features

- Endurance : 105 °C 2000 h
- Low ESR (30 % to 50 % less than FK series)
- Vibration-proof product (30G guaranteed) is available upon request ( $\phi 6.3 \leq$ )
- RoHS compliant

#### Specifications

Category temp. range	-55 °C to +105 °C						
Rated voltage range	6.3 V.DC to 50 V.DC						
Capacitance range	10 $\mu$ F to 1800 $\mu$ F						
Capacitance tolerance	$\pm 20$ % (120 Hz / +20 °C)						
Leakage current	$I \leq 0.01 CV$ or 3 ( $\mu$ A) After 2 minutes (Whichever is greater)						
Dissipation factor (tan $\delta$ )	Please see the attached characteristics list						
Characteristics at low temperature	Rated voltage (V.DC)	6.3	10	16	25	35	50
	Z (-25 °C) / Z (+20 °C)	2	2	2	2	2	2
	Z (-40 °C) / Z (+20 °C)	3	3	3	3	3	3
	Z (-55 °C) / Z (+20 °C)	4	4	4	3	3	3
(Impedance ratio at 120 Hz)							
Endurance	After applying rated working voltage for 2000 hours at +105 °C $\pm 2$ °C and then being stabilized at +20 °C, capacitors shall meet the following limits.						
	Capacitance change	Within $\pm 30$ % of the initial value					
	Dissipation factor (tan $\delta$ )	$\leq 200$ % of the initial limit					
	Leakage current	Within the initial limit					
Shelf life	After storage for 1000 hours at +105 °C $\pm 2$ °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in endurance. (With voltage treatment)						
Resistance to soldering heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.						
	Capacitance change	Within $\pm 10$ % of the initial value					
	Dissipation factor (tan $\delta$ )	Within the initial limit					
	Leakage current	Within the initial limit					
AEC-Q200	AEC-Q200 compliant						

#### Frequency correction factor for ripple current

Cap. ( $\mu$ F)	120	1 k	10 k	100 k to
10 to 470	0.65	0.85	0.95	1.00
560 to 1800	0.70	0.90	0.95	1.00

#### Marking

Example : 6.3 V.DC 22  $\mu$ F  
Marking color : BLACK

Negative polarity marking (-)  
 Capacitance ( $\mu$ F)  
 Series identification  
 Mark for Lead-Free products (Black dot)  
 Rated voltage code  
 Lot number

R.voltage code		Unit : V.DC	
j	6.3	E	25
A	10	V	35
C	16	H	50

#### Dimensions

( ) Reference size

Unit : mm

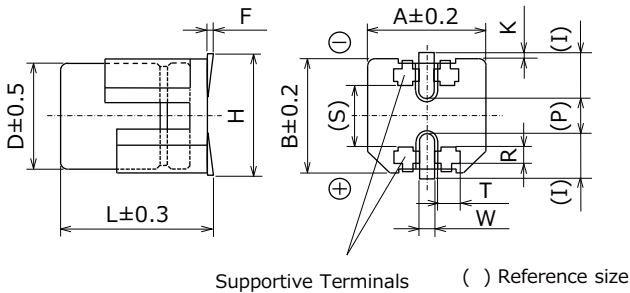
Size code	$\phi D$	L	A, B	H	I	W	P	K
B	4.0	5.8 $\pm$ 0.3	4.3	5.5 max.	1.8	0.65 $\pm$ 0.1	1.0	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
C	5.0	5.8 $\pm$ 0.3	5.3	6.5 max.	2.2	0.65 $\pm$ 0.1	1.5	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
D	6.3	5.8 $\pm$ 0.3	6.6	7.8 max.	2.6	0.65 $\pm$ 0.1	1.8	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
D8	6.3	7.7 $\pm$ 0.3	6.6	7.8 max.	2.6	0.65 $\pm$ 0.1	1.8	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
E	8.0	6.2 $\pm$ 0.3	8.3	9.5 max.	3.4	0.65 $\pm$ 0.1	2.2	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
F	8.0	10.2 $\pm$ 0.3	8.3	10.0 max.	3.4	0.90 $\pm$ 0.2	3.1	0.70 $\pm$ 0.2
G	10.0	10.2 $\pm$ 0.3	10.3	12.0 max.	3.5	0.90 $\pm$ 0.2	4.6	0.70 $\pm$ 0.2

\*The dimensions of the vibration-proof products, please refer to the page of the mounting specification.

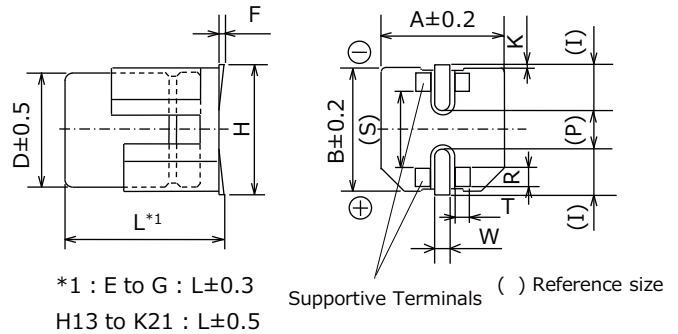
### Dimensions (Vibration-proof products)

\* The size and shape are different from standard products. Please inquire details of our company.

< Size code : D, D8 >



< Size code : E, F, G, H13, J16, K16, K21 >



\*1 : E to G : L±0.3  
H13 to K21 : L±0.5

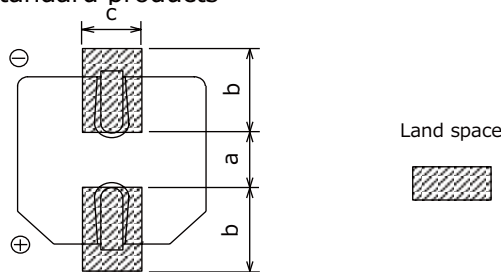
Unit : mm

Size code	φD	L	A, B	H max.	F	I	W	P	K	R	S	T
D	6.3	6.1	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 <sup>+0.15</sup> <sub>-0.20</sub>	1.1±0.2	3.3±0.2	1.05±0.2
D8	6.3	8.0	6.6	7.8	0 to +0.15	2.4	0.65±0.1	2.2	0.35 <sup>+0.15</sup> <sub>-0.20</sub>	1.1±0.2	3.3±0.2	1.05±0.2
E	8.0	6.5	8.3	9.5	0 to +0.15	3.4	0.7±0.1	2.2	0.35 <sup>+0.15</sup> <sub>-0.20</sub>	0.70±0.2	5.3±0.2	1.7±0.2
F	8.0	10.5	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3±0.2	1.3±0.2
G	10.0	10.5	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9±0.2	1.3±0.2
H13	12.5	13.8	13.5	15.0	-0.1 to +0.15	4.7	1.2±0.2	4.4	0.70±0.3	2.2±0.2	7.1±0.2	2.4±0.2
J16	16.0	16.8	17.0	19.0	-0.1 to +0.15	5.5	1.4±0.2	6.7	0.70±0.3	3.0±0.2	9.0±0.2	1.9±0.2
K16	18.0	16.8	19.0	21.0	-0.1 to +0.15	6.7	1.4±0.2	6.7	0.70±0.3	3.0±0.2	11.0±0.2	1.9±0.2
K21	18.0	21.8	19.0	21.0	-0.1 to +0.15	6.7	1.4±0.2	6.7	0.70±0.3	3.0±0.2	11.0±0.2	1.9±0.2

### Land / Pad pattern

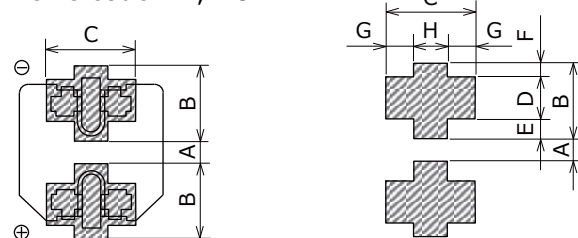
The circuit board land/pad pattern size for chip capacitors is specified in the following table. The land pitch influences installation strength and consider it.

#### ● Standard products

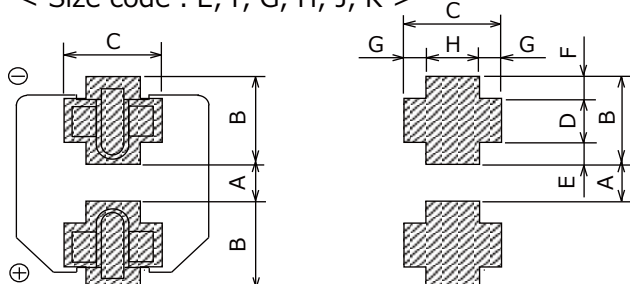


#### ● Vibration-proof products

< Size code : D, D8 >



< Size code : E, F, G, H, J, K >



(Table of board land size vs. capacitor size)

Size code	a	b	c
B (φ4)	1.0	2.5	1.6
C (φ5)	1.5	2.8	1.6
D (φ6.3)	1.8	3.2	1.6
D8 (φ6.3x7.7L)	1.8	3.2	1.6
E (φ8x6.2L)	2.2	4.0	1.6
F (φ8x10.2L)	3.1	4.0	2.0
G (φ10x10.2L)	4.6	4.1	2.0
H (φ12.5)	4.0	5.7	2.0
J (φ16)	6.0	6.5	2.5
K (φ18)	6.0	7.5	2.5

When size "a" is wide, back fillet can be made, decreasing fitting strength.

(Table of board land size vs. capacitor size)

Size code	A	B	C	D	E	F	G	H
D (φ6.3xL6.1)	1.2	3.6	3.2	2.0	0.95	0.65	1.0	1.2
D8 (φ6.3xL8.0)	1.2	3.6	3.2	2.0	0.95	0.65	1.0	1.2
E (φ8x6.5L)	1.8	4.2	5.0	1.3	1.5	1.4	1.5	2.0
F (φ8x10.5L)	2.7	4.0	4.7	1.3	1.0	1.7	1.1	2.5
G (φ10)	3.9	4.4	4.7	1.3	1.2	1.9	1.1	2.5
H (φ12.5)	3.9	6.0	6.9	2.8	1.3	1.9	2.2	2.5
J (φ16)	5.8	6.8	6.2	3.6	1.3	1.9	1.7	2.8
K (φ18)	5.8	7.3	6.2	3.6	1.8	1.9	1.7	2.8

When size "A" is wide, back fillet can be made, decreasing fitting strength.

\* Take mounting conditions, solderability and fitting strength into consideration when selecting parts for your company's design.

\* The vibration-proof capacitors of size φ6.3 has support terminals extending from the bottom side to the lead edge. Then, make sure to find appropriate soldering conditions to form fillet on the support terminals if required for appearance inspection.

### Characteristics list

Endurance : 105 °C 2000 h

Rated volt. (V.DC)	Cap. (±20 %) (μF)	Case size (mm)			Size code *1	Specification			Part No.		Reflow	Min. Packaging Q'ty
		φD	L			Ripple current *2 (mA r.m.s.)	ESR *3 (Ω)	tan δ *4	Standard	Vibration-proof		
			Standard	Vibration-proof								
6.3	22	4	5.8	—	B	160	0.85	0.26	EEFFP0J220AR	—	(5)	2000
	47	4	5.8	—	(B)	160	0.85	0.26	EEFFP0J470UAR	—	(5)	2000
		5	5.8	—	C	240	0.36	0.26	EEFFP0J470AR	—	(5)	1000
	100	5	5.8	—	(C)	240	0.36	0.26	EEFFPJ101UAR	—	(5)	1000
		6.3	5.8	6.1	D	300	0.26	0.26	EEFFP0J101AP	EEFFP0J101AV	(5)	1000
	220	6.3	5.8	6.1	D	300	0.26	0.26	EEFFP0J221AP	EEFFP0J221AV	(5)	1000
	330	6.3	7.7	8.0	D8	600	0.16	0.26	EEFFPJ331XAP	EEFFPJ331XAV	(5)	900
		8	6.2	6.5	E	500	0.18	0.26	EEFFP0J331AP	EEFFP0J331AV	(6)	1000
	470	8	10.2	10.5	F	850	0.08	0.26	EEFFP0J471AP	EEFFP0J471AV	(6)	500
	1000	8	10.2	10.5	F	850	0.08	0.26	EEFFP0J102AP	EEFFP0J102AV	(6)	500
1500	10	10.2	10.5	G	1190	0.06	0.26	EEFFP0J152AP	EEFFP0J152AV	(6)	500	
1800	10	10.2	10.5	(G)	850	0.08	0.26	EEFFPJ182UAP	EEFFPJ182UAV	(6)	500	
10	22	4	5.8	—	B	160	0.85	0.19	EEFFP1A220AR	—	(5)	2000
	33	4	5.8	—	(B)	160	0.85	0.19	EEFFPA330UAR	—	(5)	2000
		5	5.8	—	C	240	0.36	0.19	EEFFP1A330AR	—	(5)	1000
	150	6.3	5.8	6.1	D	300	0.26	0.19	EEFFP1A151AP	EEFFP1A151AV	(5)	1000
	220	6.3	7.7	8.0	D8	600	0.16	0.19	EEFFPA221XAP	EEFFPA221XAV	(5)	900
		8	6.2	6.5	E	500	0.18	0.19	EEFFP1A221AP	EEFFP1A221AV	(6)	1000
	330	8	10.2	10.5	F	850	0.08	0.19	EEFFP1A331AP	EEFFP1A331AV	(6)	500
	470	8	10.2	10.5	F	850	0.08	0.19	EEFFP1A471AP	EEFFP1A471AV	(6)	500
	680	8	10.2	10.5	F	850	0.08	0.19	EEFFP1A681AP	EEFFP1A681AV	(6)	500
	1000	10	10.2	10.5	G	1190	0.06	0.19	EEFFP1A102AP	EEFFP1A102AV	(6)	500
1200	10	10.2	10.5	(G)	850	0.08	0.19	EEFFPA122UAP	EEFFPA122UAV	(6)	500	
16	10	4	5.8	—	B	160	0.85	0.16	EEFFP1C100AR	—	(5)	2000
	22	4	5.8	—	(B)	160	0.85	0.16	EEFFPC220UAR	—	(5)	2000
		5	5.8	—	C	240	0.36	0.16	EEFFP1C220AR	—	(5)	1000
	47	5	5.8	—	(C)	240	0.36	0.16	EEFFPC470UAR	—	(5)	1000
		6.3	5.8	6.1	D	300	0.26	0.16	EEFFP1C470AP	EEFFP1C470AV	(5)	1000
	68	6.3	5.8	6.1	D	300	0.26	0.16	EEFFP1C680AP	EEFFP1C680AV	(5)	1000
	100	6.3	5.8	6.1	D	300	0.26	0.16	EEFFP1C101AP	EEFFP1C101AV	(5)	1000
		6.3	7.7	8.0	D8	600	0.16	0.16	EEFFPC101XAP	EEFFPC101XAV	(5)	900
	150	6.3	7.7	8.0	D8	600	0.16	0.16	EEFFPC151XAP	EEFFPC151XAV	(5)	900
	220	6.3	7.7	8.0	D8	600	0.16	0.16	EEFFPC221XAP	EEFFPC221XAV	(5)	900
		8	6.2	6.5	E	500	0.18	0.16	EEFFP1C221AP	EEFFP1C221AV	(6)	1000
	330	8	10.2	10.5	F	850	0.08	0.16	EEFFP1C331AP	EEFFP1C331AV	(6)	500
	470	8	10.2	10.5	F	850	0.08	0.16	EEFFP1C471AP	EEFFP1C471AV	(6)	500
680	10	10.2	10.5	G	1190	0.06	0.16	EEFFP1C681AP	EEFFP1C681AV	(6)	500	
820	10	10.2	10.5	(G)	850	0.08	0.16	EEFFPC821UAP	EEFFPC821UAV	(6)	500	
25	10	4	5.8	—	B	160	0.85	0.14	EEFFP1E100AR	—	(5)	2000
	22	5	5.8	—	C	240	0.36	0.14	EEFFP1E220AR	—	(5)	1000
		5	5.8	—	(C)	240	0.36	0.14	EEFFPE330UAR	—	(5)	1000
	33	6.3	5.8	6.1	D	300	0.26	0.14	EEFFP1E330AP	EEFFP1E330AV	(5)	1000
		47	6.3	5.8	6.1	D	300	0.26	0.14	EEFFP1E470AP	EEFFP1E470AV	(5)
	68	6.3	5.8	6.1	D	300	0.26	0.14	EEFFP1E680AP	EEFFP1E680AV	(5)	1000
		6.3	7.7	8.0	D8	600	0.16	0.14	EEFFPE101XAP	EEFFPE101XAV	(5)	900
	100	8	6.2	6.5	E	500	0.18	0.14	EEFFP1E101AP	EEFFP1E101AV	(6)	1000
		150	8	10.2	10.5	F	850	0.08	0.14	EEFFP1E151AP	EEFFP1E151AV	(6)
	220	8	10.2	10.5	F	850	0.08	0.14	EEFFP1E221AP	EEFFP1E221AV	(6)	500
	330	8	10.2	10.5	F	850	0.08	0.14	EEFFP1E331AP	EEFFP1E331AV	(6)	500
	470	10	10.2	10.5	G	1190	0.06	0.14	EEFFP1E471AP	EEFFP1E471AV	(6)	500
	560	10	10.2	10.5	(G)	850	0.08	0.14	EEFFPE561UAP	EEFFPE561UAV	(6)	500

\*1: Size code ( ): Miniaturization product \*2: Ripple current (100 kHz / +105 °C)

\*3: ESR (100 kHz / +20 °C)

\*4: tan δ (120 Hz / +20 °C)

• If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J → J, 1A → A, 1C → C, 1E → E

• Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

### Characteristics list

Endurance : 105 °C 2000 h

Rated volt. (V.DC)	Cap. (±20 %) (μF)	Case size (mm)			Size code *1	Specification			Part No.		Reflow	Min. Packaging Q'ty
		φD	L			Ripple current *2 (mA r.m.s.)	ESR*3 (Ω)	tan δ*4	Standard	Vibration-proof		Taping (pcs)
			Standard	Vibration -proof								
35	10	4	5.8	—	(B)	160	0.85	0.12	EEEEFPV100UAR	—	(5)	2000
	22	5	5.8	—	C	240	0.36	0.12	EEEEFP1V220AR	—	(5)	1000
	33	6.3	5.8	6.1	D	300	0.26	0.12	EEEEFP1V330AP	EEEEFP1V330AV	(5)	1000
	47	6.3	5.8	6.1	D	300	0.26	0.12	EEEEFP1V470AP	EEEEFP1V470AV	(5)	1000
	68	6.3	7.7	8.0	D8	600	0.16	0.12	EEEEFPV680XAP	EEEEFPV680XAV	(5)	900
	100	6.3	7.7	8.0	D8	600	0.16	0.12	EEEEFPV101XAP	EEEEFPV101XAV	(5)	900
		8	10.2	10.5	F	850	0.08	0.12	EEEEFP1V101AP	EEEEFP1V101AV	(6)	500
	150	8	10.2	10.5	F	850	0.08	0.12	EEEEFP1V151AP	EEEEFP1V151AV	(6)	500
	220	8	10.2	10.5	F	850	0.08	0.12	EEEEFP1V221AP	EEEEFP1V221AV	(6)	500
	330	10	10.2	10.5	G	1190	0.06	0.12	EEEEFP1V331AP	EEEEFP1V331AV	(6)	500
390	10	10.2	10.5	(G)	850	0.08	0.12	EEEEFPV391UAP	EEEEFPV391UAV	(6)	500	
50	100	8	10.2	10.5	F	670	0.18	0.10	EEEEFP1H101AP	EEEEFP1H101AV	(6)	500
	220	10	10.2	10.5	G	900	0.12	0.10	EEEEFP1H221AP	EEEEFP1H221AV	(6)	500

\*1: Size code ( ): Miniaturization product

\*2: Ripple current (100 kHz / +105 °C)

\*3: ESR (100 kHz / +20 °C)

\*4: tan δ (120 Hz / +20 °C)

• If Part number exceeds 12 digits, voltage code is abbreviated as follows; 1V → V

• Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

## Guidelines and precautions regarding the technical information and use of our products described in this online catalog.

- If you want to use our products described in this online catalog for applications requiring special qualities or reliability, or for applications where the failure or malfunction of the products may directly jeopardize human life or potentially cause personal injury (e.g. aircraft and aerospace equipment, traffic and transportation equipment, combustion equipment, medical equipment, accident prevention, anti-crime equipment, and/or safety equipment), it is necessary to verify whether the specifications of our products fit to such applications. Please ensure that you will ask and check with our inquiry desk as to whether the specifications of our products fit to such applications use before you use our products.
- The quality and performance of our products as described in this online catalog only apply to our products when used in isolation. Therefore, please ensure you evaluate and verify our products under the specific circumstances in which our products are assembled in your own products and in which our products will actually be used.
- If you use our products in equipment that requires a high degree of reliability, regardless of the application, it is recommended that you set up protection circuits and redundancy circuits in order to ensure safety of your equipment.
- The products and product specifications described in this online catalog are subject to change for improvement without prior notice. Therefore, please be sure to request and confirm the latest product specifications which explain the specifications of our products in detail, before you finalize the design of your applications, purchase, or use our products.
- The technical information in this online catalog provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.
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## <Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>

- The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.
- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

**We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.**

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[FP1V331AV](#) [EEE-FP1H101AV](#) [EEE-FP1V221AV](#) [EEE-FP0J331AV](#) [EEE-FPC101XAV](#) [EEE-FP1C221AV](#) [EEE-](#)  
[FP1E680AV](#) [EEE-FP1V330AV](#) [EEE-FP1C471AV](#) [EEE-FP1V470AV](#) [EEE-FP0J101AV](#) [EEE-FP1A151AV](#) [EEE-](#)  
[FP1E101AV](#) [EEE-FPE561UAV](#) [EEE-FPV101XAV](#) [EEE-FPA122UAV](#) [EEE-FP1C101AV](#) [EEE-FPC151XAV](#) [EEE-](#)  
[FP1V151AV](#) [EEE-FPJ331XAV](#) [EEE-FP0J471AV](#) [EEE-FP0J221AV](#) [EEE-FP1C331AV](#) [EEE-FP1A681AV](#) [EEE-](#)  
[FP1A471AV](#) [EEE-FP1E221AV](#) [EEE-FPE101XAV](#) [EEE-FP1E151AV](#) [EEE-FP1C470AV](#) [EEE-FPV680XAV](#) [EEE-](#)  
[FP0J152AV](#) [EEE-FP1H221AV](#) [EEE-FP1E470AV](#) [EEE-FP1C680AV](#)