

## Conductive Polymer Capacitors General Catalog



Conductive Polymer  
Aluminum Electrolytic Capacitors

**SP-Cap**™



Conductive Polymer Tantalum Solid Capacitors

**POSCAP**™



Conductive Polymer Hybrid  
Aluminum Electrolytic Capacitors

**Hybrid**



Conductive Polymer Aluminum Solid Capacitors

**OS-CON**™

# Electrolytic capacitors with conductive polymer to meet the needs of all electronic equipments in the world



SP-Cap™



POSCAP™



OS-CON™



Hybrid

SP-Cap, POSCAP, OS-CON, Hybrid use high conductive polymer to achieve low Equivalent Series Resistance(ESR), excellent noise reduction capability and ideal frequency. Each capacitor has long service lifetime, high reliability and high heat resistance.

## Features

### Low ESR by using conductive polymer

- Suitable as a decoupling capacitor to remove noises, because its impedance has ideal frequency characteristics.
- Suitable as a smoothing capacitor for switching power supply or a backup capacitor for CPU because it allows large ripple current.
- Suitable as a backup capacitor for the circuits that consumes large current at a high speed.

### Long lifetime

- SP-Cap / POSCAP 105 °C 2000 h, Hybrid 125 °C 4000 h / 145 °C 2000 h
- (OS-CON) Special series includes 1000 h guarantee at 85 °C 85 %RH, and is suitable for industrial equipment.

### Super low ESR

- SP-Cap 3 mΩ max. • POSCAP 5 mΩ max.

### Small size / Low profile

- SP-Cap Height 1.0 mm max.
  - POSCAP L2.0xW1.25xH0.9 mm
- Contribute to the miniaturization of the equipment

### Superior temperature characteristics

- ESR has stable characteristics at when operating between -55 °C and 105 °C (some up to 145 °C), suitable for applications used at low temperatures (under 0 °C).

### Rush current resistance characteristics

- (POSCAP) The rush current is guaranteed at 20 A.

### Wide capacitance range

- SP-Cap <10 μF to 560 μF> • POSCAP <2.7 μF to 1500 μF>
- OS-CON <3.3 μF to 2700 μF> • Hybrid <10 μF to 470 μF>

### High voltage / High reliability

- SP-Cap (35 V.DC) , POSCAP (35 V.DC) , OS-CON (100 V.DC) , Hybrid (80 V.DC) High voltage and high reliability products which are available for special purpose such as industrial equipment etc.

### Environmental responsibility

- All models are PVC-free, compliant with RoHS and ELV directives, easy to use in environmental view point.

## Applications

Noise removing, backup and bypass capacitors for digital equipment, cellular phone, personal computers, home appliance, automotive electric equipment, industrial equipment, etc.

## PRECAUTIONS

- The contents of this catalog are current as of March 2018. They may change without prior notice. When ordering products, please be sure to request a delivery specifications form and read it carefully.
- Products described herein are not intended for applications requiring extremely high reliability (for example, those in which extensive human injury or property damage may occur such as life-support systems and automotive or aircraft control systems).
- The performance, characteristics, and features of the products described in this catalog are based on the products working alone under prescribed conditions. Data listed here is not intended as a guarantee of performance when working as part of any other product or device. In order to detect problems and situations that cannot be predicted beforehand by evaluation of supplied data, please always perform necessary performance evaluations with these devices as part of the product that they will be used in.
- When using the products listed in this catalog, please always be sure to try to prevent any possible accidents or injury by designing products in a careful and safe manner. If you have any questions concerning the use of these products, please contact any of our sales representatives.
- For any products listed in this catalog that may constitute restricted trade goods under overseas exchange or service trade laws, permission to deliver according to law may be required before importing.
- The unauthorized duplication from this catalog is forbidden firmly.

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**SP-Cap™**

**POSCAP™**

**OS-CON™**

**Hybrid**

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# Environmental responsibility

## Automotive & Industrial Systems Company, Panasonic Corporation

### Principle

The Automotive & Industrial Systems Company Group, Panasonic Corporation, Fulfills both environmental contribution and business growth, takes care of biodiversity, and contributes to create harmonization of environment, economy and society and to achieve a sustainable society.

### RoHS compliance

All capacitors comply with RoHS directive (2011/65/EU).

Restricted Substance

Restricted substances of RoHS directive
Cadmium(Cd) and it's compounds
Lead(Pb) and it's compounds
Mercury(Hg) and it's compounds
Hexavalent chromium(Cr <sup>+6</sup> )
Polybrominated biphenyls(PBBs)
Polybromineted diphenyl ethers(PBDEs)

### Lead-free stance

All complete parts and homogenous materials of capacitors are lead-free.(JEITA, PHASE3)

## ISO/IATF(ISO/TS) Certified

### (1) Quality Approval

Factory	Site	Applicable standard	Organization	Certificate number	Acquisition years
Uji factory	Kyoto	ISO 9001:2008	JQA	JQA-2524	1998.7.31
		ISO/TS 16949	JQA	JQA-AU0162-14	2016.9.13
Yamaguchi factory	Yamaguchi	ISO 9001:2008	JQA	JQA-2524	1998.7.31
		ISO/TS 16949:2009	JQA	JQA-AU0162-1	2007.2.23
Panasonic Industrial Devices Saga Co., Ltd. (Former:SAGA SANYO Industries Co., Ltd.)	Saga	ISO 9001:2008	JQA	JQA-2524	1998.7.31
		ISO/TS 16949:2009	JQA	JQA-AU0162-10	2006.7.31
PIDSG	Singapore	ISO 9001:2015	BSI	FM 612824	1994.12.8
PICID (Fomer:SJC)	Indonesia	ISO 9001:2015	SGS	ID17/03853	2006.3.26
		ISO/TS 16949:2009	SGS	ID17/03885	2011.3.1

As of February 2018

### (2) Environment Approval

Factory	Site	Applicable standard	Organization	Certificate number	Acquisition years
Uji factory	Kyoto	ISO 14001:2015	JACO	EC10J0027	1996.12.26
Yamaguchi factory	Yamaguchi	ISO 14001:2015	JACO	EC10J0027	1997.12.22
Panasonic Industrial Devices Saga Co., Ltd. (Former:SAGA SANYO Industries Co., Ltd.)	Saga	ISO 14001:2015	JACO	EC10J0027	1998.3.10
PIDSG	Singapore	ISO 14001:2004	AJA	AJA98/1151	1998.4.9
PICID (Fomer:SJC)	Indonesia	ISO 14001:2015	SGS	16/03617	2010.2.15
		ISO 14001:2015	SGS	17/04090	2011.11.4

As of February 2018

# Notices / Items to be observed

## Notices

### Applicable laws and regulations

- This product complies with the RoHS Directive (Restriction of the use of certain Hazardous substances in electrical and electronic equipment (DIRECTIVE 2011/65/EU).
- No Ozone Depleting Chemicals (ODC's), controlled under the Montreal Protocol Agreement, are used in producing this product.
- We do not use PBBs or PBDEs as brominated flame retardants.
- Export procedure which followed export related regulations, such as foreign exchange and a foreign trade method, on the occasion of export of this product.

### Limited applications

- This capacitor is designed to be used for electronics circuits such as audio/visual equipment, home appliances, computers and other office equipment, optical equipment, measuring equipment.
- High reliability and safety are required [ be / a possibility that incorrect operation of this product may do harm to a human life or property ] more. When use is considered by the use, the delivery specifications which suited the use separately need to be exchanged.

## Items to be observed

- This specification guarantees the quality and performance of the product as individual components.  
Before use, check and evaluate their compatibility with installed in your products.
- Do not use the products beyond the specifications described in this document.

### When using this capacitor in a product where safety is critical

- Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other signification damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/gas equipment, rotating rotating equipment, and disaster/crime prevention equipment.
  - The system is equipped with a protection circuit and protection device.
  - The system is equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault.

### Conditions of use

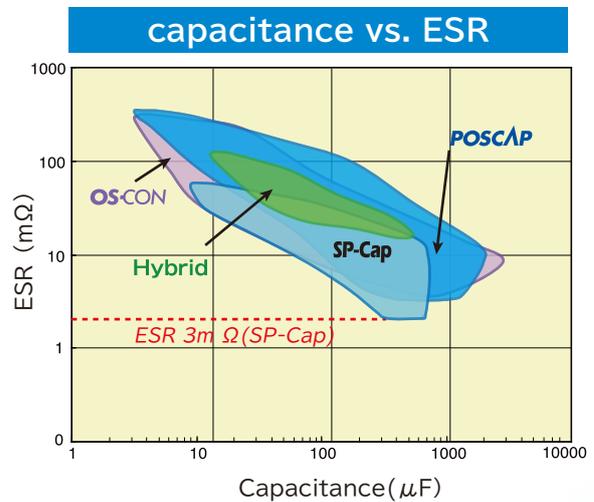
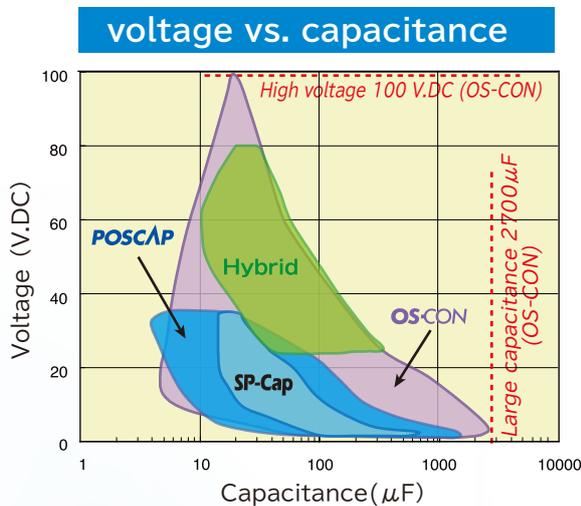
- Before using the products, carefully check the effects on their quality and performance, and determined whether or not they can be used. These products are designed and manufactured for general-purpose and standard use in general electronic equipment. These products are not intended for use in the following special conditions.
  - (1) In liquid, such as Water, Oil, Chemicals, or Organic solvent.
  - (2) In direct sunlight, outdoors, or in dust.
  - (3) In vapor, such as dew condensation water of resistive element, or water leakage, salty air, or air with a high concentration corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>x</sub>.
  - (4) In an environment where strong static electricity or electromagnetic waves exist.
  - (5) Mounting or placing heat-generating components or inflammables, such as vinyl-coated wires, near these products.
  - (6) Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin and other material.
  - (7) Using solvent, water or water-soluble cleaner for flux cleaning agent after soldering.  
(In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues)
  - (8) Using in the atmosphere which strays Acid or alkaline.
  - (9) Using in the atmosphere which there are excessive vibration and shock.
- Please arrange circuit design for preventing impulse or transitional voltage.  
Do not apply voltage, which exceeds the full rated voltage when the capacitors receive impulse voltage, instantaneous high voltage, high pulse voltage etc.
- Electrolyte is used in the products. Therefore, misuse can result in rapid deterioration of characteristics and functions of each product. Electrolyte leakage damages printed circuit and affects performance, characteristics, and functions of customer system.

# Total Solutions

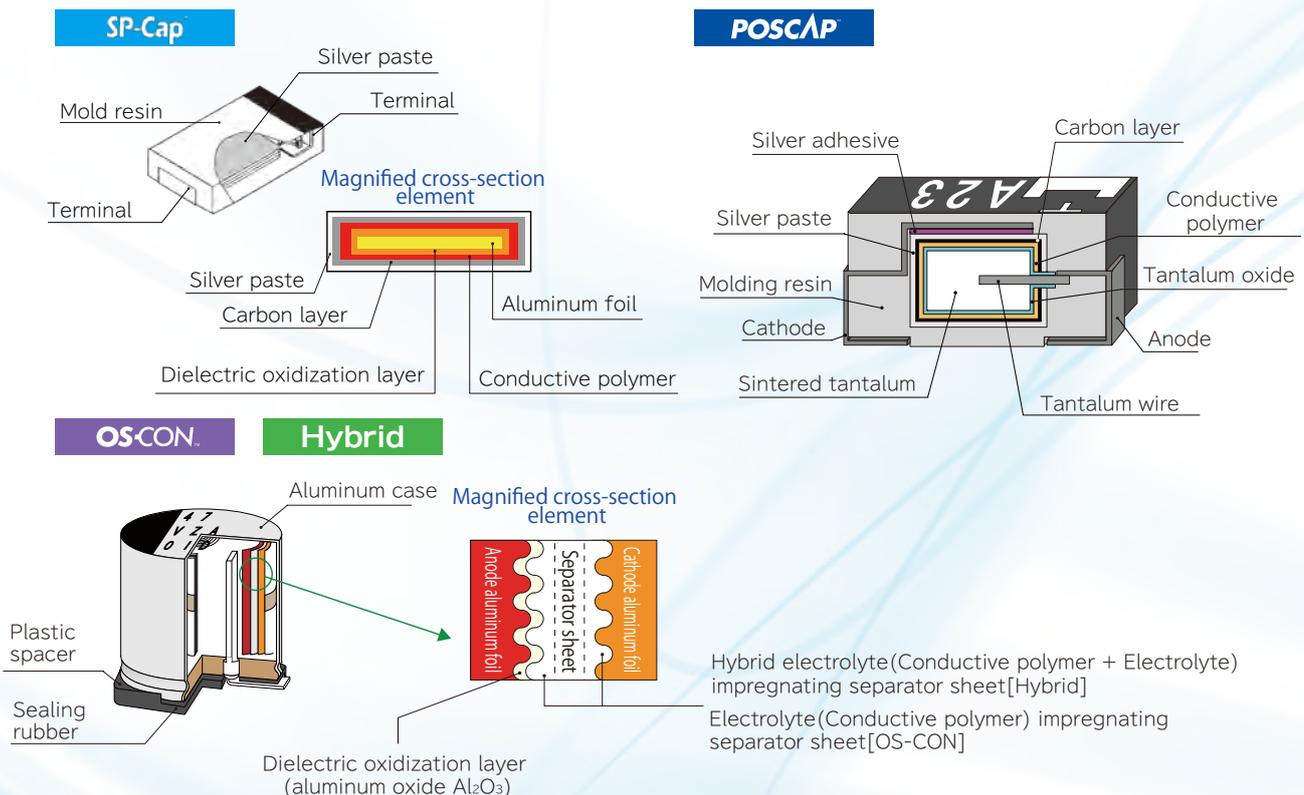
## Features

<b>SP-Cap</b>	<b>POSCAP</b>	<b>OS-CON</b>	<b>Hybrid</b>
Conductive Polymer Aluminum Electrolytic Capacitors (Stack Type)	Conductive Polymer Tantalum Solid Capacitors (Sintered type)	Conductive Polymer Aluminum Solid Capacitors (Wounf Type)	Conductive Polymer Hybrid Aluminum Electrolytic Capacitors (Wounf Type)Conductive Polymer+Electrolyte
<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Super Low ESR</div> <div style="border: 1px solid black; padding: 2px;">Low profile</div> <div style="border: 1px solid black; padding: 2px;">Large capacitance</div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Super small size</div> <div style="border: 1px solid black; padding: 2px;">Low ESR</div> <div style="border: 1px solid black; padding: 2px;">Large capacitance</div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Low ESR</div> <div style="border: 1px solid black; padding: 2px;">High voltage</div> <div style="border: 1px solid black; padding: 2px;">Large capacitance</div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">Low ESR</div> <div style="border: 1px solid black; padding: 2px;">High voltage</div> <div style="border: 1px solid black; padding: 2px;">High reliability</div> </div>

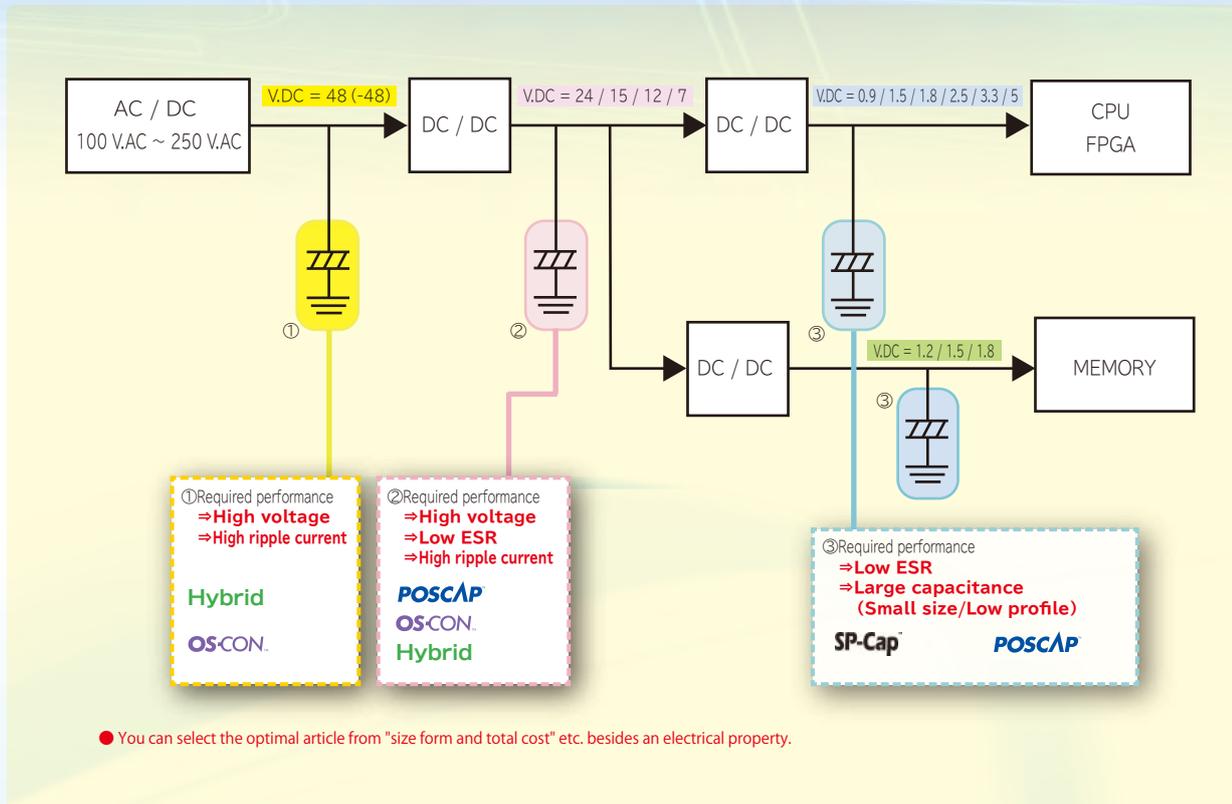
## Characteristics Portfolio Full coverage of the capacitor conductive market



## Basic structure



## Examples of common use case four conductive products



## Application

Main market	SP-Cap	POSCAP	OS-CON.	Hybrid
Note PC	●	●		
Desk top PC			●	●
Audio/Visual	●	●	●	●
Server	●	●	●	●
Communications infrastructure	●	●	●	●
Smart phone Tablet	●	●		
Automotive		●*		●
Home appliance			●	●
Industry	Industrial equipment		●	●
	Industrial robot		●	●
	Drone etc.	●	●	



※This product is not intended for use in any driving application or any other critical functions that affect passenger safety (e.g. Powertrain, ABS, Engine ECU, Airbag, etc.)  
If the intended use of TA/TV series products is for use in other automotive related applications, please contact our sales team. All requests are subject to approval.

Voltage & Capacitance ■ SP-Cap ■ POSCAP

Series (ESR mΩ) <Size> (Ripple Ar.m.s.)

V <sub>DC</sub> / μF	3.9	4.7	5.6	6.8	8.2	10	15	22	33	47	56	68	82
2.0													
2.5										TPU [S09] (150) (0.51)			
4.0												TPU [S09] (150) (0.51) TPH [A09] (150) (0.51) TPB [B2] (70) (1.1)	SX [D] (9) (6.3)
6.3						TPU [S09] (250) (0.4)		TPU [S09] (150) (0.51)		TPU [S09] (150) (0.51) TPH [A09] (150) (0.51) TA [B2] (70) (1.1) TPC [B1] (55/70) (1.1/1.0)		CS [D] (15) (5.1) SR [D] (9) (6.3) LR [D] (9) (6.3) TA [B2] (70) (1.1) TPB [B2] (70) (1.1)	
8.0								TPC [B1] (70) (1.0)		TPG [B1G] (70) (1)			
10	TPU [S09] (300) (0.36)								TPH [A09] (150) (0.51) TPB [B2] (70) (1.1)	CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)		CT [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	
12.5						TPC [B1] (80) (0.8) TQC [B2] (100) (0.8)	TPC [B1] (80) (0.8)			TPG [B1G] (70) (1)			
16							CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [B2] (90) (1.0)	CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	CT [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [D15] (70) (1.8) TQC [B2] (90) (1.0) TQC [D12] (40) (1.8) TQC [D2] (70) (1.4)		CT [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [D2] (55/40) (1.45/1.8)	CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [D2] (50) (1.5)
20							TQC [B2] (100) (0.8) CS [D] (40) (3.2) TQS [B15] (100) (1.0)	CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	CT [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [B2] (90) (1.0) TQC [D2] (60) (1.4)	CT [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [D15] (55) (1.5) TQC [D2] (55) (1.45)		CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [D3] (70) (1.4)
25		TQC [B2] (100) (0.8)					CS [D] (40) (3.2) TQS [B15] (100) (1.0)	CS [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	CT [D] (40) (3.2) CX [D] (40) (3.2) HX [D] (40) (3.2)	CX [D] (40) (3.2) HX [D] (40) (3.2) TQC [D2] (60) (1.4)			TQC [D3] (70) (1.4)
35	TQC [B2] (400) (0.5)			TQS [B15] (150) (0.9)			CS [D] (40) (3.2) TQC [D2] (120) (1.0)	CT [D] (40) (3.2) CX [D] (40) (3.2)	CX [D] (40) (3.2)				

Size code	SP-Cap D <sub>x</sub> W <sub>x</sub> H	(unit : mm)	POSCAP D <sub>x</sub> W <sub>x</sub> H
D	7.3×4.3×1.0 max.	SR, LR	S09 2.0×1.25×0.9
	7.3×4.3×1.1	CS, SS, LS	A09 3.2×1.6×0.9
	7.3×4.3×1.4	CT, ST, LT	A14 3.2×1.6×1.4
	7.3×4.3×1.9	CX, SX, GX, LX, GX-L	

V <sub>DC</sub>	μF	100	120	150	180	220	270	330	390	470	560	680	1000	1500
2.0					SX [D] (9) (6.3)	CX [D] (15) (5.1)	CX [D] (12) (5.6)	CX [D] (15/12) (5.1/3.6)	CX [D] (15) (5.1)	CX [D] (15) (5.1)	CX [D] (15) (5.1)			
2.5														
4.0														
6.3														
8.0														
10														
12.5														
16														
20														
25														
35														

(unit : mm)

B09	3.5×2.8×0.9	D12	7.3×4.3×1.15	D3L	7.3×4.3×2.8
B1, B1G, B1S	3.5×2.8×1.1	D15, D15E	7.3×4.3×1.4	D4	7.3×4.3×3.8
B15G	3.5×2.8×1.4	D2E	7.3×4.3×1.8		
B2, B2S	3.5×2.8×1.9	D2	7.3×4.3×1.9		

# Voltage (More than 16V.DC) & Capacitance

SMD type

Series	<Size>
(ESR mΩ)	(Ripple Ar.m.s.)

Product of 105 °C ■ OS-CON ■ Hybrid

V.DC	μF	3.3	10	15	18	22	27	33	39	47	56	68	82	100
16		SVP [A5] (260) (0.66)		SVP [B6] (120) (1.02)		SVPS [B6] (90) (1.06)		SVPB [C5] (40) (1.67)	SVPA [C6] (35) (2.04)	SVPG [B45] (25) (3.2)	SVP [E7] (45) (1.89)	SVPC [C6] (30) (2.2)	SVPA [E7] (30) (2.76)	SVPC [C6] (24) (2.46)
						SVP [B6] (90) (1.06)			SVPA [C6] (24) (2.46)			SVPC [C6] (25) (2.44)	SVPS [E7] (30) (2.76)	SVPS [F8] (35) (2.67)
20			SVPA [B6] (40) (1.7)	SVPB [C5] (45) (2.0)		SVPA [C6] (35) (2.04)	SVP [C6] (60) (1.45)	SVPG [B45] (27) (3.0)		SVPA [E7] (33) (2.63)	SVPF [B6] (30) (2.8)	SVP [F8] (40) (2.4)		SVP [E12] (24) (3.32)
			SVP [B6] (120) (1.02)			SVPS [C6] (35) (2.0)		SVP [E7] (45) (1.89)		SVPS [E7] (45) (1.89)	SVP [F8] (40) (2.4)			
25			SVPS [E7] (60) (1.5)	SVPG [B45] (30) (2.8)			SVPF [B6] (40) (2.45)	ZA [C] (80) (0.9)		SVPF [C6] (30) (2.8)	SVPF [C6] (30) (2.8)		SVPF [E7] (28) (3.0)	SVPF [E7] (24) (3.2)
											ZA [D1] (50) (1.3)			ZA [D8] (30) (2.0)
35						SVPF [C6] (35) (2.6)	ZA [D1] (60) (1.3)		SVPF [E7] (30) (2.8)	ZA [D1] (60) (1.3)			SVPF [E12] (20) (4.0)	
						ZA [C] (100) (0.9)								
50			SVPF [C6] (40) (2.5)		SVPF [E7] (35) (2.7)	ZA [D1] (80) (1.1)		ZA [D8] (40) (1.6)	SVPF [E12] (25) (3.8)			SVPF [F12] (20) (4.3)		ZA [G] (28) (2.0)
			ZA [C] (120) (0.75)									ZA [F] (30) (1.8)		
63						ZA [D8] (80) (1.5)		ZA [F] (40) (1.7)				ZA [G] (30) (1.8)		
						ZA [F] (45) (1.55)		ZA [G] (36) (1.7)						
80														

Product of 125 °C

V.DC	μF	6.8	8.2	10	12	15	18	22	27	33	39	47	56	68
16											SVQP [C6] (50) (0.512)			
20								SVQP [C6] (60) (0.459)					SVQP [E7] (45) (0.598)	SVF [B6] (30) (0.88)
								SVPD [E7] (48) (0.58)	SVF [B6] (40) (0.77)	SVPK [B6] (35) (0.82)	SVPD [F8] (45) (0.664)	SVF [C6] (30) (0.88)	SVF [C6] (30) (0.88)	ZK [D] (50) (1.08)
25				SVPD [C6] (65) (0.474)						ZC [C] (80) (0.55)		SVPD [E12] (30) (0.943)	ZC [D] (50) (0.9)	
												ZK [C] (80) (0.66)		
35				SVPD [E7] (70) (0.4)			SVPD [F8] (60) (0.55)	SVF [C6] (35) (0.82)		ZK [C] (100) (0.66)	SVF [E7] (30) (0.88)	SVPK [C6] (27) (0.93)	ZK [D] (60) (1.08)	ZC [D8] (35) (1.4)
								SVPK [B6] (35) (0.82)				SVPD [F12] (30) (1.15)		
50							SVF [E7] (35) (0.85)	SVPK [C6] (35) (0.82)		SVPK [E7] (35) (0.85)	SVF [E12] (25) (1.2)			SVF [F12] (20) (1.35)
				SVF [C6] (40) (0.79)				ZC [D] (80) (0.75)		ZC [D8] (40) (1.1)				SVPK [E12] (25) (1.2)
63				ZC [C] (120) (0.5)										ZC [F] (30) (1.25)
				ZC [D] (120) (0.7)			SVX [E7] (60) (0.34)	ZC [D8] (80) (0.9)		SVX [E12] (25) (0.93)	SVX [E12] (25) (0.93)		ZC [G] (30) (1.4)	SVX [F12] (25) (1.03)
80									ZC [F] (45) (1.05)	SVX [E12] (35) (0.78)	ZC [G] (36) (1.36)		SVX [F12] (28) (0.98)	ZC [G] (30) (1.4)
										SVX [F8] (55) (0.66)			ZC [G] (36) (1.36)	
100		SVX [E7] (60) (0.34)												
						SVX [F8] (60) (0.68)	SVX [F12] (30) (0.94)	SVX [F12] (30) (0.94)						

Product of 145 °C

V.DC	μF	33	56	68	100	150	220	270	330
25							ZE [F] (27) (0.7)		ZE [G] (20) (0.9)
35								ZE [G] (20) (0.9)	
50				ZE [F] (30) (0.6)	ZE [G] (28) (0.8)				
63		ZE [F] (40) (0.6)	ZE [G] (30) (0.8)						

Size code

OS-CON

(unit : mm)

B45	φ 5×L4.5	C6	φ 6.3×L6.0	E7	φ 8×L7.0	F8	φ 10×L8.0
B6	φ 5×L6.0	C10	φ 6.3×L10.0	E12	φ 8×L12.0	F12	φ 10×L12.7

V.DC	μF	120	150	180	220	270	330	390	470	560	1000
16		SVPC [E7] (27) (2.9)	SVPC [E7] (22) (3.22)	SVPF [C6] (22) (3.3)		SVPG [C8] (10) (5.08)	SVP [F12] (16) (4.72)		SVPE [F12] (10) (6.1)	SVPF [E12] (14) (4.95)	SVPF [F12] (12) (5.4)
			SVP [F8] (30) (3.02)	SVPA [F8] (29) (3.43)		SVPG [C10] (8) (5.8)					
				SVPS [F8] (29) (3.43)		SVPF [E7] (22) (3.3)					
				SVPE [C10] (11) (4.46)		SVPC [E12] (16) (4.07)					
20		SVPF [C6] (25) (3.2)	SVP [F12] (20) (4.32)	SVPF [E7] (25) (3.2)				SVPF [E12] (14) (4.95)		SVPF [F12] (12) (5.4)	
25				SVPF [E12] (16) (4.65)	ZA [F] (27) (2.3)		SVPF [F12] (14) (5.0)				
35		SVPF [F12] (18) (4.4)	ZA [F] (27) (2.3)			ZA [G] (20) (2.5)	ZA [G] (20) (2.5)				
50											
63											
80											

V.DC	μF	82	100	120	150	180	220	270	330	390	470	560	1000
16		SVF [B6] (27) (0.94)				SVF [C6] (22) (1.04)		SVF [E7] (22) (1.04)				SVF [E12] (14) (1.56)	SVF [F12] (12) (1.7)
		SVPD [E7] (40) (0.67)											
20		SVQP [E7] (40) (0.67)											
				SVF [C6] (25) (1.01)		SVF [E7] (25) (1.01)					SVF [E12] (14) (1.56)		SVF [F12] (12) (1.7)
25		SVF [E7] (28) (0.94)	SVF [E7] (24) (1.01)	SVPK [E7] (24) (1.01)	ZK [D8] (30) (1.68)	SVF [E12] (16) (1.47)	ZC [F] (27) (1.6)	SVPK [E12] (16) (1.47)	SVF [F12] (14) (1.58)			SVPK [F12] (14) (1.59)	
		SVPK [C6] (25) (0.96)	ZC [D8] (30) (1.4)					ZK [F] (27) (1.92)	ZC [G] (20) (2.0)			ZK [G] (20) (2.8)	
35		SVPD [F12] (28) (1.202)											
		SVF [E12] (20) (1.26)	ZK [D8] (35) (1.68)	SVF [F12] (18) (1.39)	ZC [F] (27) (1.6)	SVPK [E12] (20) (1.26)	ZC [G] (20) (2.0)	SVPK [F12] (18) (1.39)					
50		SVPK [E7] (25) (0.96)				ZK [F] (27) (1.92)							
			ZC [G] (28) (1.6)	SVPK [F12] (20) (1.35)									
63													
80													
100													

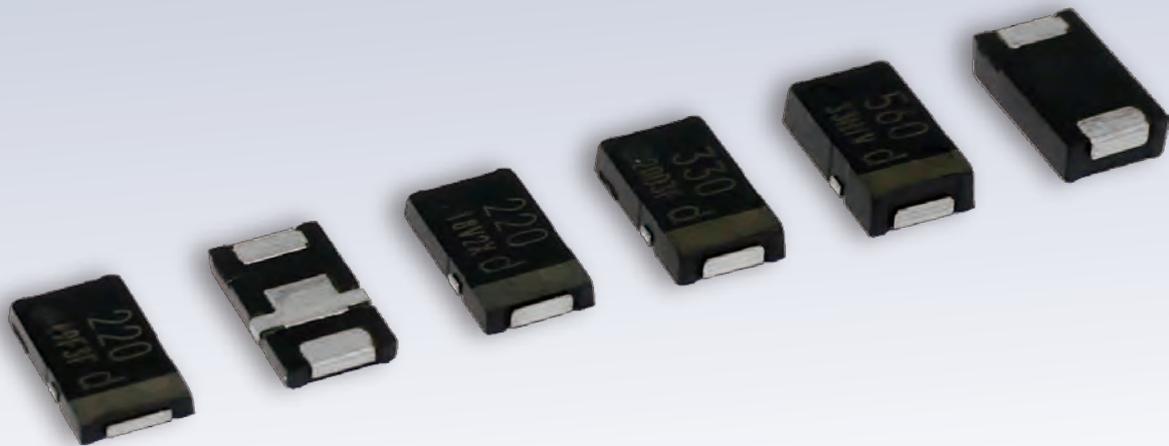
Hybrid

C	φ 5×L5.8	D8	φ 6.3×L7.7	G	φ 10×L10.2
D	φ 6.3×L5.8	F	φ 8×L10.2		

(unit : mm)

Conductive Polymer Aluminum  
Electrolytic Capacitors

# SP-Cap™



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P16 Mountings specifications / Packing specifications

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P17 SP-Cap Line-up

P18 Series system diagram

P19 Products list

**Surface mount type**  
P21 CS/CT/CX

P23 SX

P25 GX/GX-L

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P27 SR/LR/SS/LS/ST/LT

P29 CY/SY

P31 HX

**POSCAP™**

**OS-CON™**

**Hybrid**

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Packing specifications

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## ⚠ Application Guidelines

### 1. Circuit design

#### 1-1 Prohibited circuits for use

Do not use **SP-Cap** with the following circuit.

- (1) Time constant circuits (2) Coupling circuits (3) 2 or more **SP-Cap's** connected serially
- (4) Circuits which are greatly affected by leakage current (5) High-impedance voltage retention circuits

#### 1-2 Voltage & polarity

Application of over-voltage and reverse voltage described below can cause to increase in leakage current and short circuits.

Applied voltage, refers to voltage value including peak value of transitional instantaneous voltage and peak value of ripple voltage, not just steady line voltage.

Design your circuit so that peak voltage does not exceed stipulated voltage.

[Over-Voltage]

Do not apply over-voltage in excess of rated voltage. Do not apply voltage, which exceeds full rated voltage when **SP-Cap** receives impulse voltage, instantaneous high voltage, high pulse voltage etc.

[Reverse-Voltage]

Do not apply reverse-voltage

#### 1-3 Ripple current

Use **SP-Cap** within stipulated permitted ripple current.

When excessive ripple current is applied to **SP-Cap**, it causes increase in leakage current and short circuits due to self-heating.

Even when using **SP-Cap** under permissible ripple current, reverse voltage may occur if DC bias voltage is low.

#### 1-4 Leakage current

There is a risk of leakage current increase even if the following use environments are within the stipulated range.

However, even if leakage current increase **SP-Cap** self-repairing function will reduce leakage current in most cases when a voltage is applied.

- (1) After re-flow
- (2) Shelf conditions such as high temperature with no load, high temperature high humidity with no load and sudden temperature changes.

#### 1-5 Temperature

- (1) Use at or under the rated (guaranteed) temperature.

Operation at temperatures exceeding specifications causes large changes in the **SP-Cap** electrical properties, and deterioration than can potentially lead to failure.

When calculating the operating temperature of the **SP-Cap**, be sure to include not only the ambient temperature and internal temperature of the unit, but also radiation from heat generating elements inside the unit (power transistors, resistors, etc.), possibly be applied unexpected temperature through via and pattern of PCB board, and self-heating due to ripple current.

- (2) Specified ESR is a value at the time of shipping from factory. ESR may change upon use conditions.

#### 1-6 Failure rate

The majority of failure modes are short circuits or increase in leakage current.

The main factors of failure are mechanical stress, heat stress and electric stress due to re-flow and heat from temperature environment.

Even within stipulated limits, it is possible to lower failure rate by reducing use conditions such as temperature and voltage. Please be sure to have ample margin in your design.

[Expected Failure Rate]

- (1) Data based on our reliability tests: 8.2 Fit or less (Based on applied rated voltage at 105 °C)
- (2) Market failure rate: 0.13 Fit or less (Based on c=0, Reliability standard : 60 %)

#### 1-7 Mounting area consideration

Isolate surface of PCB under mounted **SP-Cap**.

Mounting specifications/ Packing specifications	Selection guide
Line-up	
Series system diagram	
Products list	Surface mount type
CS,CT,CX	
SX	
GX,GX-L	
LX	
SR,LR,SS, LS,ST,LT	
CY,SY	
HX	

<b>POSCAP™</b>	
Guidelines and Precautions	
Mounting specifications/ Packing specifications	Selection guide
Surface mount type	

<b>OS-CON™</b>	
Guidelines and Precautions	
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Guidelines and Precautions	
Mounting specifications/ Packing specifications	Selection guide
Surface mount type	

<b>Hybrid</b>	
Guidelines and Precautions	
Mounting specifications/ Packing specifications	Selection guide
Surface mount type	

## 2. Mounting

### 2-1 When mounting

- (1) Check **SP-Cap** ratings (capacitance and voltage) before mounting.
- (2) Check **SP-Cap** polarity before mounting.
- (3) Check land size for **SP-Cap** before mounting.
- (4) When using a mouter, if the pressure for mounting is too high, then current leak may increase, short-circuiting may occur, or **SP-Cap** may break down or come off.

### 2-2 Soldering

- (1) Reflow soldering  
Be performed by one of following methods.
  - (a) Ambient heat conduction reflow (IR / Hot-air) Refer to the page of "Mounting Specifications".
  - (b) Vapor phase reflow (but only allowable for CX, CT, SX, ST, GX, LX, LT and HX series).  
Contact Panasonic for details of allowable vapor phase reflow condition.
- (2) Wave soldering and dip soldering  
Please remind SP-Cap is NOT compatible.
- (3) Hand soldering  
Excessive force stress to **SP-Cap** should be avoided Conditions :  
Tip temperature of soldering iron : 350 °C max.  
Exposure time : 10 s max.  
※Once removed from printed circuit board for any reason, do not use **SP-Cap** again.

### 2-3 Land size

Refer to the land size of "Mounting specifications" for appropriate design dimensions.  
Circuit board design requires examination of the most suitable dimensions taking conditions such as circuit board, parts and reflow into consideration.

### 2-4 Mechanical stress

Do not apply excessive force to **SP-Cap** this can damage the electrodes and badly affect **SP-Cap** mount ability.  
It can also cause increase of leakage current, separation of the lead wire and element, and damage to **SP-Cap** body, all of which can badly affect electrical performance of **SP-Cap**.

### 2-5 Circuit board cleaning

**SP-Cap** should be cleaned after soldering in accordance with the following conditions.

Temperature : Less than 60 °C

Time : Within 5 min

Be sure to sufficiently wash and dry (20 min at 100 °C) a board afterward.

[Recommended Cleaning Solvents]

Pine Alpha ST-100S, Clean-thru 750H / 750L / 710M, Aqua Cleaner 210SEP, Sunelec B-12

DK Beclear CW-5790, Techno Cleaner 219, Cold Cleaner P3-375, Telpene Cleaner EC-7R

Technocare FRW-17 / FRW-1 / FRV-1, AXREL 32, IPA (Isopropyl alcohol)

- (1) Consult our factory when performing processes with cleaning solvents other than those listed above or deionized water.
- (2) The use of ozone depleting cleaning agents are not recommended for protecting environment.
- (3) In case of using ultrasonic cleaning, the terminals may be broken. Therefore, please test before using in mass production.

## 3.Storage

**SP-Cap** should be stored in moisture proof environment. Storage conditions before and after opening moisture proof packaging as follows.

(If these conditions are exceeded, a package may absorb moisture and there is a risk of damage to exterior due to heat stress during mounting.)

[Environment of Storage]

Temperature: 5 °C to 30 °C without direct sunlight

Humidity : Less than 70 %

Maximum storage term before opening a package (2 years after manufactured)

Maximum storage condition after opening a package (7 days after opening)

**SP-Cap** should be all used within the storage term after opening a package.

Selection guide	Line-up
	Series system diagram
	Products list
Surface mount type	CS, CT, CX
	SX
	GX, GX-L
	LX
	SR, LR, SS, LS, ST, LT
	CY, SY
	HX

# Guidelines and Precautions

## 4. Transportation

Take sufficient care during handling because excessive vibration, or shock can cause reliability of **SP-Cap** to decrease.

## 5. Emergency procedures

If a **SP-Cap** is overheated, a resin case may emit smoke. If this occurs, immediately switch off the unit's main power supply to stop operation. Keep your face and hands away from **SP-Cap** until temperature is low enough to cause the **SP-Cap** to ignite and burn.

## 6. Discarding

Since **SP-Cap** are composed of various metals and resins, treat them as industrial waste when arranging for their disposal.

The precautions for the use of functional polymer aluminum electrolytic capacitors follow the "Precautionary guidelines for the use of fixed aluminum electrolytic capacitors for electronic equipment", RCR-2367B issued by EIAJ in March 2002. Please refer to the above guidelines for details.  
This document is subject to change without notice.

## Intellectual property right

We, Panasonic Group are providing products and service that customers can use without anxiety, and are working positively on protection of our products under intellectual property rights.  
Representative patents relating to **SP-Cap** are as follows:

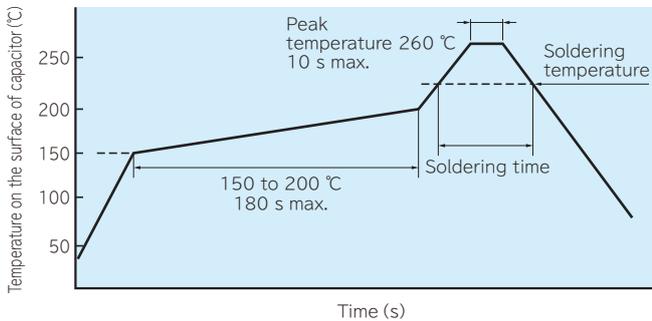
US Patent No. 7136276

# Mounting specifications / Packing specifications

Selection guide	Line-up
	Series system diagram
Products list	
Surface mount type	CS, CT, CX
	SX
	GX, GX-L
	LX
	SR, LR, SS, LS, ST, LT
	CY, SY
HX	

## Recommendable reflow soldering

### Recommendable reflow soldering



Soldering temperature and Soldering time

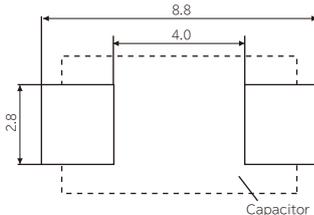
Temperature	Time
≧ 255 °C	30 s max.
≧ 230 °C	130 s max.
≧ 217 °C	150 s max.

SP-Cap recommended profile condition of the IPC/J-STD-020D standard

Reflow cycle : 3 max.

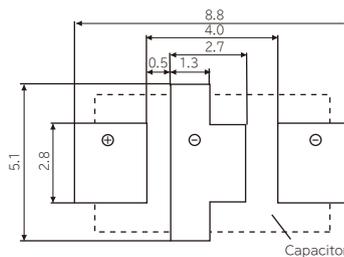
## Land Pattern

### Typical land pattern: 2-Terminals For standard terminal (C\*, S\*, G\* Series)

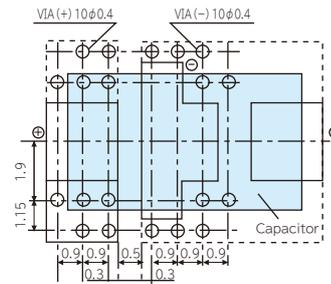


(unit: mm)

### Typical land pattern: 3-Terminals For Low ESL terminal (L\*, GX-L Series)

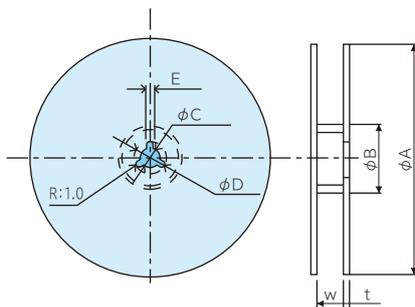


For Low ESL terminal (L\*, GX-L Series)



## Packaging Specifications

### Reel Dimensions

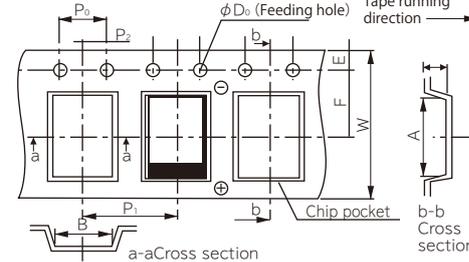


(unit: mm)

Reel	φA	φB	φC	φD	φE	W	t
φ330	330	80	13±0.5	21±0.8	2±0.5	14	3

### Embossed Taping

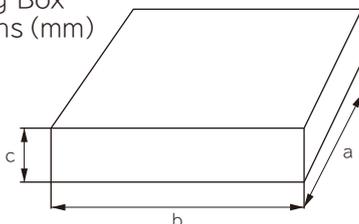
12 mm tape



(unit: mm)

A±0.2	B±0.2	W±0.3	F±0.1	E±0.1	P1±0.1
7.6	4.5	12.0	5.5	1.75	8.0
t±0.2 (Series)					
P2±0.1	P0±0.1	φD0±0.1	*R/*S	*T/*X	*Y
2.0	4.0	1.5	1.5	2.4	3.5

### Packaging Box Dimensions (mm)



(unit: mm)

Reel	a	b	c
φ330	400 max.	400 max.	135 max.

# Line-up

Series	Page	Part No.	Features	Low profile	Low ESR	Low ESL	High voltage	High Temperature	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)
CX	21 to 22	EEFCX----	Standard				●		-55 to 105	2 to 35	12 to 40	15 to 560
CT	21 to 22	EEFCT----		●			●		-55 to 105	4 to 35	15 to 40	15 to 180
CS	21 to 22	EEFCS----		●			●		-55 to 105	4 to 35	15 to 40	10 to 120
<b>UPGRADE</b> SX	23 to 24	EEFSX----	Low ESR		●				-55 to 105	2 to 6.3	4.5 to 9	82 to 560
<b>UPGRADE</b> GX	25	EEFGX----	Super low ESR/High ripple current		●	●			-55 to 105	2 to 2.5	3	330 to 560
LX	26	EEFLX----	Low ESR/Low ESL		●	●			-55 to 105	2 to 2.5	4.5 to 6	330 to 560
ST	27 to 28	EEFST----	Low profile/Low ESR	●	●				-55 to 105	2 to 2.5	6	270 to 330
LT	27 to 28	EEFLT----	Low profile/Low ESR/Low ESL	●	●	●			-55 to 105	2 to 2.5	6	270 to 330
SS	27 to 28	EEFSS----	Low profile/Low ESR	●	●				-55 to 105	2 to 2.5	6	180 to 220
LS	27 to 28	EEFLS----	Low profile/Low ESR/Low ESL	●	●	●			-55 to 105	2 to 2.5	6	180 to 220
SR	27 to 28	EEFSR----	Low profile(1 mm max.)	●	●				-55 to 105	2 to 6.3	4.5 to 9	68 to 220
LR	27 to 28	EEFLR----	Low profile(1 mm max.)/Low ESL	●	●	●			-55 to 105	2 to 6.3	4.5 to 9	68 to 220
CY	29 to 30	ECGCY---	Guaranteed at 85°C Height 3.0 mm max.		●				-55 to 85	4, 6.3	15	330 to 470
SY	29 to 30	ECGSY---	Guaranteed at 85°C Height 3.0mm max.		●				-55 to 85	4, 6.3	9	330 to 470
HX	31 to 32	EEFHX----	Guaranteed at 125 °C		●		●	●	-55 to 125	2 to 25	4.5 to 40	15 to 560

Selection guide

Surface mount type

Catalog Deletion and EOL models

Selection guide

Surface mount typ

Radial lead type

## Hybrid

Selection guide

Surface mount type

# Series system diagram

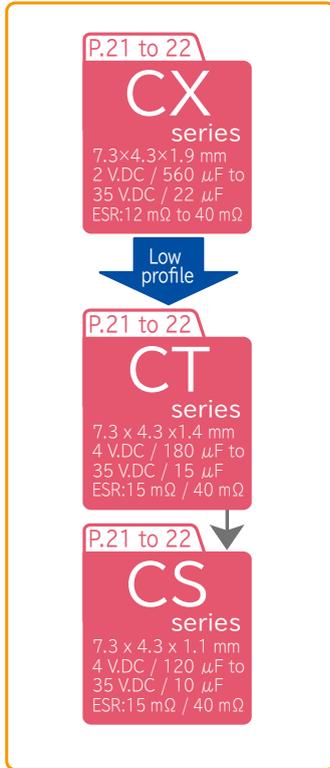
2 terminals

3 terminals

Standard / High Voltage

Low ESR

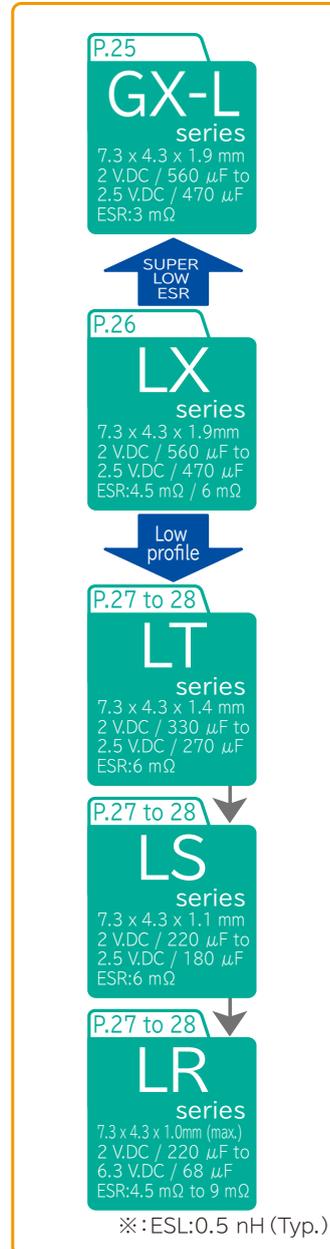
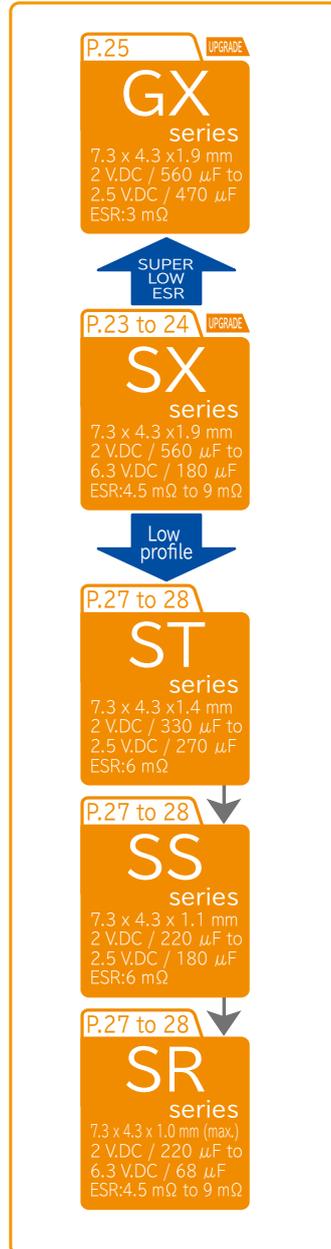
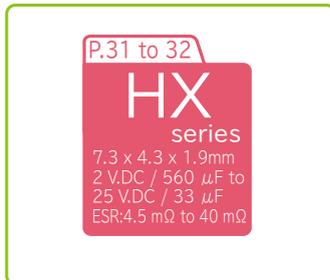
Low ESR / Low ESL<sup>\*</sup>



Guaranteed at 85°C



Guaranteed at 125 °C



<b>SP-Cap™</b>	
Guidelines and Precautions	
Mounting specifications/ Packing specifications	
Selection guide	Line-up
	<b>Series system diagram</b>
Products list	
Surface mount type	CS, CT, CX
	SX
	GX, GX-L
	LX
	SR, LR, SS, LS, ST, LT
	CY, SY
HX	

<b>POSCAP</b>	
Guidelines and Precautions	
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Surface mount type	
Selection guide	

Catalog Deletion and EOL models	
<b>OS-CON™</b>	
Guidelines and Precautions	
Mounting specifications/ Packing specifications	

Selection guide	
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Surface mount type	
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Radial lead type	
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<b>Hybrid</b>	
Guidelines and Precautions	
Mounting specifications/ Packing specifications	
Selection guide	

Surface mount type	
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# Products list

Size · ESR Matrix list

Size code (ESR mΩ)

V.DC	μF	10	15	22	33	47	56	68	82	100
	2.0									
2.5										
4.0									SX(9)	SX(9)
6.3								CS(15)		CT(15)
								SR(9)		CX(15)
								LR(9)		
10						CS(40)		CT(40)		CX(40)
						CX(40)		CX(40)		HX(40)
						HX(40)		HX(40)		
16		CS(40)	CS(40)	CS(40)	CT(40)			CX(40)		
		CX(40)	CX(40)	CX(40)	CX(40)			HX(40)		
		HX(40)	HX(40)	HX(40)	HX(40)					
20	CS(40)	CS(40)	CS(40)	CT(40)	CT(40)	CX(40)				
			CX(40)	CX(40)	CX(40)	HX(40)				
			HX(40)	HX(40)	HX(40)					
25	CS(40)	CS(40)	CT(40)	CX(40)						
		CX(40)	CX(40)	HX(40)						
		HX(40)	HX(40)							
35	CS(40)	CT(40)	CX(40)							
		CX(40)								

Selection guide	Line-up
	Series system diagram
	<b>Products list</b>

Surface mount type	CS, CT, CX
	SX
	GX, GX-L
	LX
	SR, LR, SS, LS, ST, LT
	CY, SY
HX	

V.DC	μF	120	150	180	220	270	330	390	470	560
		2.0			SX(9)	CX(15)	CX(12)	CX(15/12)	CX(15)	CX(15)
				SX(9)	SX(9/6/4.5)	SX(9/6/4.5)	SX(9/6/4.5)	SX(9/6/4.5)	SX(9/6/4.5)	SX(4.5)
				SR(6/4.5)			GX(3)		GX(3)	GX(3)
				LR(6/4.5)			LX(6/4.5)		GX-L(3)	GX-L(3)
				SS(6)			ST(6)		LX(6/4.5)	LX(6/4.5)
				LS(6)			LT(6)		HX(15/9/6/4.5)	HX(15/4.5)
2.5		SX(9)	SX(9)	CX(15)	SX(7)	CX(15)	CX(15)	CX(15)		
				SR(6/4.5)	SX(9/7)	ST(6)	SX(9/6/4.5)	SX(9/6/4.5)	SX(9/6/4.5)	
				LR(6/4.5)		LT(6)	GX(3)		GX(3)	
				SS(6)			LX(6/4.5)		GX-L(3)	
				LS(6)			HX(15/9/6/4.5)		LX(6/4.5)	
									HX(15/9/6/4.5)	
4.0		CS(15)	CX(15)	CT(15)	CX(15/12)	CX(15)	CX(15)		CY(15)	
		SR(9)	SX(9/7)	CX(15/12)	SX(9)	SX(9)	SX(9/6)		SY(9)	
		LR(9)		SX(9)						
6.3		CX(15)	CX(15/12)	CX(15)	CX(15)		CY(15)			
		SX(7)	SX(9)	SX(9)	SX(9)		SY(9)			
10										
16										
20										
25										
35										

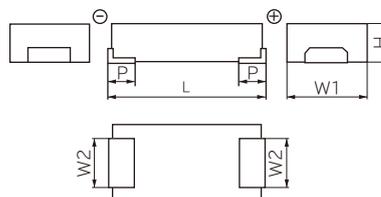
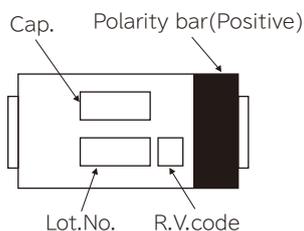


- High voltage (35 V.DC max.)
- High ripple current (5600 mAr.m.s. max.)
- Low profile (Height 1.1 mm)
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications			
	CS	CT	CX	
Series	CS	CT	CX	
Category temperature range	-55 °C to 105 °C			
Rated voltage range	4 V.DC to 35 V.DC		2 V.DC to 35 V.DC	
Rated capacitance range	10 μF to 120 μF	15 μF to 180 μF	15 μF to 560 μF	
Capacitance tolerance	±20 % (120 Hz/20 °C)			
Leakage current	I ≤ 0.1 CV(μA)[2 V.DC to 6.3 V.DC, 2 minutes], I ≤ 0.3 CV(μA)[10 V.DC to 35 V.DC, 2 minutes]			
Dissipation factor(tan δ)	≤ 0.06 (120 Hz/20 °C)			
Surge voltage(V.DC)	Rated voltage × 1.25[2 V.DC to 16 V.DC], × 1.15[20 V.DC to 35 V.DC] (15 °C to 35 °C)			
Endurance	+105°C, 2000 h, rated voltage applied			
	Capacitance change	Within ±20% of the initial value		
	tan δ	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit[2 V.DC to 6.3 V.DC], ≤ Within the initial limit[10 V.DC to 35 V.DC]		
Damp heat (Steady state)	+60°C, 90%, 500h, No-applied voltage			
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC	4 V.DC, 10 V.DC to 35 V.DC	6.3 V.DC
		+70 %, -20 %	+60 %, -20 %	+50 %, -20 %
	tan δ	≤ 2 times of the initial limit		
	DC leakage current	Within the initial limit[2 V.DC to 6.3 V.DC],		
≤ 3 times of the initial limit[10 V.DC to 35 V.DC]				

## ● Marking and dimensions



(Unit : mm)

Rated voltage(V.DC)	2	2.5	4	6.3	10
Code	d	e	g	j	A
Rated voltage(V.DC)	16	20	25	35	
Code	C	D	E	V	

Series	L ±0.2	W1 ±0.2	W2 ±0.1	H ±0.1	P ±0.3
CS	7.3	4.3	2.4	1.1	1.3
CT	7.3	4.3	2.4	1.4	1.3
CX	7.3	4.3	2.4	1.9	1.3

## ● Characteristics list

Series	Rated voltage (V.DC)	Capacitance (μF)	Case size (mm)			Specifications		Part number	Min. Packaging Q'ty ※3 (pcs)	
			L	W	H	Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)			
CS	4	120	7.3	4.3	1.1	5100	15	EEFCS0G121R	3500	
	6.3	68	7.3	4.3	1.1	5100	15	EEFCS0J680R	3500	
	10	47	7.3	4.3	1.1	3200	40	EEFCS1A470R	3500	
	16	15	7.3	4.3	1.1	3200	40	EEFCS1C150R	3500	
		22	7.3	4.3	1.1	3200	40	EEFCS1C220R	3500	
		33	7.3	4.3	1.1	3200	40	EEFCS1C330R	3500	
	20	10	7.3	4.3	1.1	3200	40	EEFCS1D100R	3500	
		15	7.3	4.3	1.1	3200	40	EEFCS1D150R	3500	
		22	7.3	4.3	1.1	3200	40	EEFCS1D220R	3500	
	25	10	7.3	4.3	1.1	3200	40	EEFCS1E100R	3500	
		15	7.3	4.3	1.1	3200	40	EEFCS1E150R	3500	
	35	10	7.3	4.3	1.1	3200	40	EEFCS1V100R	3500	
CT	4	180	7.3	4.3	1.4	5100	15	EEFCT0G181R	3500	
	6.3	100	7.3	4.3	1.4	5100	15	EEFCT0J101R	3500	
	10	68	7.3	4.3	1.4	3200	40	EEFCT1A680R	3500	
	16	47	7.3	4.3	1.4	3200	40	EEFCT1C470R	3500	
		33	7.3	4.3	1.4	3200	40	EEFCT1D330R	3500	
	20	47	7.3	4.3	1.4	3200	40	EEFCT1D470R	3500	
		22	7.3	4.3	1.4	3200	40	EEFCT1E220R	3500	
	35	15	7.3	4.3	1.4	3200	40	EEFCT1V150R	3500	
CX	2	220	7.3	4.3	1.9	5100	15	EEFCX0D221R	3500	
		270	7.3	4.3	1.9	5600	12	EEFCX0D271XR	3500	
		330	7.3	4.3	1.9	5100	15	EEFCX0D331R	3500	
			7.3	4.3	1.9	5600	12	EEFCX0D331XR	3500	
		390	7.3	4.3	1.9	5100	15	EEFCX0D391R	3500	
		470	7.3	4.3	1.9	5100	15	EEFCX0D471R	3500	
	2.5	560	7.3	4.3	1.9	5100	15	EEFCX0D561R	3500	
		220	7.3	4.3	1.9	5100	15	EEFCX0E221R	3500	
		330	7.3	4.3	1.9	5100	15	EEFCX0E331R	3500	
		390	7.3	4.3	1.9	5100	15	EEFCX0E391R	3500	
	4	470	7.3	4.3	1.9	5100	15	EEFCX0E471R	3500	
		150	7.3	4.3	1.9	5100	15	EEFCX0G151R	3500	
		180	7.3	4.3	1.9	5100	15	EEFCX0G181R	3500	
			7.3	4.3	1.9	5600	12	EEFCX0G181XR	3500	
		220	7.3	4.3	1.9	5100	15	EEFCX0G221R	3500	
			7.3	4.3	1.9	5600	12	EEFCX0G221XR	3500	
		270	7.3	4.3	1.9	5100	15	EEFCX0G271R	3500	
		330	7.3	4.3	1.9	5100	15	EEFCX0G331R	3500	
		6.3	100	7.3	4.3	1.9	5100	15	EEFCX0J101R	3500
			120	7.3	4.3	1.9	5100	15	EEFCX0J121R	3500
			150	7.3	4.3	1.9	5100	15	EEFCX0J151R	3500
				7.3	4.3	1.9	5600	12	EEFCX0J151XR	3500
	180		7.3	4.3	1.9	5100	15	EEFCX0J181R	3500	
	220		7.3	4.3	1.9	5100	15	EEFCX0J221R	3500	
	10	47	7.3	4.3	1.9	3200	40	EEFCX1A470R	3500	
		68	7.3	4.3	1.9	3200	40	EEFCX1A680R	3500	
		100	7.3	4.3	1.9	3200	40	EEFCX1A101R	3500	
	16	15	7.3	4.3	1.9	3200	40	EEFCX1C150R	3500	
		22	7.3	4.3	1.9	3200	40	EEFCX1C220R	3500	
		33	7.3	4.3	1.9	3200	40	EEFCX1C330R	3500	
		47	7.3	4.3	1.9	3200	40	EEFCX1C470R	3500	
		68	7.3	4.3	1.9	3200	40	EEFCX1C680R	3500	
		20	22	7.3	4.3	1.9	3200	40	EEFCX1D220R	3500
	33		7.3	4.3	1.9	3200	40	EEFCX1D330R	3500	
	47		7.3	4.3	1.9	3200	40	EEFCX1D470R	3500	
	56		7.3	4.3	1.9	3200	40	EEFCX1D560R	3500	
	15		7.3	4.3	1.9	3200	40	EEFCX1E150R	3500	
	22		7.3	4.3	1.9	3200	40	EEFCX1E220R	3500	
	25	33	7.3	4.3	1.9	3200	40	EEFCX1E330R	3500	
		15	7.3	4.3	1.9	3200	40	EEFCX1V150R	3500	
		22	7.3	4.3	1.9	3200	40	EEFCX1V220R	3500	

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: Please contact us when 500 pcs packing is necessary

◆Please refer to the P16 in this catalog for "Reflow conditions" and "Taping specifications".

## ● Temperature coefficient of Ripple current

	Temp.	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2 V.DC to 6.3 V.DC	Coefficient	1.0	0.7	0.25
10 V.DC to 35 V.DC		1.0	0.8	0.5

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Large capacitance (560 μF max.)
- High ripple current (8500 mAr.m.s. max.)
- Low ESR (4.5 mΩ to 9 mΩ max.)
- RoHS compliance, Halogen free

● Specifications

Items	Specifications	
Series	SX	
Category temperature range	-55 °C to 105 °C	
Rated voltage range	2 V.DC to 6.3 V.DC	
Rated capacitance range	82 μF to 560 μF	
Capacitance tolerance	±20 % (120 Hz/20 °C)	
Leakage current	$I \leq 0.1 CV(\mu A)$ [2 minutes]	
Dissipation factor(tan δ)	$\leq 0.06$ (120 Hz/20 °C)	
Surge voltage(V.DC)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance	+105 °C, 2000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	$\leq 2$ times of the initial limit
	DC leakage current	$\leq 3$ times of the initial limit
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage	
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC: +70 %, -20 % 4 V.DC: +60 %, -20 % 6.3 V.DC: +50 %, -20 %
	tan δ	$\leq 2$ times of the initial limit
	DC leakage current	Within the initial limit

● Marking and dimensions

(Unit : mm)

Rated voltage(V.DC)	2	2.5	4	6.3
Code	d	e	g	j

Series	L ±0.2	W1 ±0.2	W2 ±0.1	H ±0.1	P ±0.3
SX	7.3	4.3	2.4	1.9	1.3

Guidelines and Precautions  
 Mounting specifications/  
 Packing specifications  
 Line-up  
 Series system diagram  
 Products list  
 CS,CT,CX  
**SX**  
 GX,GX-L  
 LX  
 SR,LR,SS,LS,ST,LT  
 CY,SY  
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 Guidelines and Precautions  
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 Surface mount type  
 Catalog Deletion and EOL models  
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 Guidelines and Precautions  
 Mounting specifications/  
 Packing specifications  
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 Surface mount typ  
 Radial lead type  
**Hybrid**  
 Guidelines and Precautions  
 Mounting specifications/  
 Packing specifications  
 Selection guide  
 Surface mount type

## ● Characteristics list

Series	Rated voltage (V.DC)	Capacitance (μF)	Case size (mm)			Specifications		Part number	Min. Packaging Q' ty ※3 (pcs)	
			L	W	H	Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)			
SX	2	180	7.3	4.3	1.9	6300	9	EEFSX0D181ER	3500	
		220	7.3	4.3	1.9	6300	9	EEFSX0D221ER	3500	
		270	7.3	4.3	1.9	6300	9	EEFSX0D271ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D271XE	3500	
		330	7.3	4.3	1.9	8500	4.5	EEFSX0D271E4	3500	
			7.3	4.3	1.9	6300	9	EEFSX0D331ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D331XE	3500	
		390	7.3	4.3	1.9	8500	4.5	EEFSX0D331E4	3500	
			7.3	4.3	1.9	6300	9	EEFSX0D391ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D391XE	3500	
		470	7.3	4.3	1.9	8500	4.5	EEFSX0D391E4	3500	
			7.3	4.3	1.9	6300	9	EEFSX0D471ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D471XE	3500	
		560	7.3	4.3	1.9	8500	4.5	EEFSX0D471E4	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0D561E4	3500	
			150	7.3	4.3	1.9	6300	9	EEFSX0E151ER	3500
		2.5	180	7.3	4.3	1.9	6300	9	EEFSX0E181ER	3500
			220	7.3	4.3	1.9	6300	9	EEFSX0E221ER	3500
	7.3			4.3	1.9	7000	7	EEFSX0E221E7	3500	
	270		7.3	4.3	1.9	7000	7	EEFSX0E271E7	3500	
			7.3	4.3	1.9	6300	9	EEFSX0E331ER	3500	
	330		7.3	4.3	1.9	7500	6	EEFSX0E331XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0E331E4	3500	
			7.3	4.3	1.9	6300	9	EEFSX0E391ER	3500	
	390		7.3	4.3	1.9	7500	6	EEFSX0E391XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0E391E4	3500	
			7.3	4.3	1.9	6300	9	EEFSX0E471ER	3500	
	470		7.3	4.3	1.9	7500	6	EEFSX0E471XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0E471E4	3500	
			82	7.3	4.3	1.9	6300	9	EEFSX0G820ER	3500
	4		100	7.3	4.3	1.9	6300	9	EEFSX0G101ER	3500
			150	7.3	4.3	1.9	6300	9	EEFSX0G151ER	3500
				7.3	4.3	1.9	7000	7	EEFSX0G151E7	3500
			180	7.3	4.3	1.9	6300	9	EEFSX0G181ER	3500
		220	7.3	4.3	1.9	6300	9	EEFSX0G221ER	3500	
		270	7.3	4.3	1.9	6300	9	EEFSX0G271ER	3500	
NEW 330		7.3	4.3	1.9	6300	9	EEFSX0G331ER	3500		
		7.3	4.3	1.9	7500	6	EEFSX0G331XE	3500		
6.3		120	7.3	4.3	1.9	7000	7	EEFSX0J121E7	3500	
		150	7.3	4.3	1.9	6300	9	EEFSX0J151ER	3500	
	180	7.3	4.3	1.9	6300	9	EEFSX0J181ER	3500		
	NEW 220	7.3	4.3	1.9	6300	9	EEFSX0J221ER	3500		

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: Please contact us when 500 pcs packing is necessary

◆Please refer to the P16 in this catalog for "Reflow conditions" and "Taping specifications".

## ● Temperature coefficient of Ripple current

Temp.	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
Coefficient	1.0	0.7	0.25

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Large capacitance (560  $\mu$ F max.)
- Low ESL (3 terminals : 50% less than 2-terminals) [Suffix : L]
- RoHS compliance, Halogen free
- Super low ESR (3 m $\Omega$  max.)
- High ripple current (10200 mAr.m.s. max.)

Specifications

Items	Specifications	
Series	GX	
Category temperature range	-55 °C to 105 °C	
Rated voltage range	2 V.DC to 2.5 V.DC	
Rated capacitance range	330 $\mu$ F to 560 $\mu$ F	
Capacitance tolerance	$\pm 20$ % (120 Hz/+20 °C)	
Leakage current	$I \leq 0.1 CV(\mu A)$ [2 minutes]	
Dissipation factor(tan $\delta$ )	$\leq 0.06$ (120 Hz/+20 °C)	
Surge voltage(V.DC)	Rated voltage $\times 1.25$ (15 °C to 35 °C)	
Endurance	+105 °C, 2000 h, rated voltage applied	
	Capacitance change	Within $\pm 20$ % of the initial value
	tan $\delta$	$\leq 2$ times of the initial limit
	DC leakage current	$\leq 3$ times of the initial limit
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage	
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC +70 %, -20 %
	tan $\delta$	$\leq 2$ times of the initial limit
	DC leakage current	Within the initial limit

Marking and dimensions

Rated voltage(V.DC)	2	2.5
Code	d	e

2 terminals

3 terminals

Series	L $\pm 0.2$	W1 $\pm 0.2$	W2 $\pm 0.1$	H $\pm 0.1$	P $\pm 0.3$
GX	7.3	4.3	2.4	1.9	1.3

Series	L $\pm 0.2$	W1 $\pm 0.2$	W2 $\pm 0.1$	H $\pm 0.1$	P1 $\pm 0.3$	P2 $\pm 0.1$	P3 $\pm 0.2$	P4 $\pm 0.2$
GX-L	7.3	4.3	2.4	1.9	1.3	1.1	0.7	1.4

(Unit : mm)

Characteristics list

Series	Rated voltage (V.DC)	Capacitance ( $\mu$ F)	Case size (mm)			Specifications		The number of terminals		Part number	Min. Packaging Q'ty $\times 3$ (pcs)
			L	W	H	Ripple current $\times 1$ (mAr.m.s.)	ESR $\times 2$ (m $\Omega$ max.)	2	3		
GX	2	330	7.3	4.3	1.9	10200	3	○		EEFGX0D331R	3500
		470	7.3	4.3	1.9	10200	3	○		EEFGX0D471R	3500
			7.3	4.3	1.9	10200	3		○	EEFGX0D471L	3500
		560	7.3	4.3	1.9	10200	3	○		EEFGX0D561R	3500
	7.3		4.3	1.9	10200	3		○	EEFGX0D561L	3500	
	2.5	330	7.3	4.3	1.9	10200	3	○		EEFGX0E331R	3500
470		7.3	4.3	1.9	10200	3	○		EEFGX0E471R	3500	
			7.3	4.3	1.9	10200	3		○	EEFGX0E471L	3500

$\times 1$  : Ripple current (100 kHz/ +45 °C)  $\times 2$  : ESR (100 kHz/+20 °C)  $\times 3$  : Please contact us when 500 pcs packing is necessary  
 ◆Please refer to the P16 in this catalog for "Reflow conditions" and "Taping specifications".

Temperature coefficient of Ripple current

Temp.	$T \leq 45$ °C	$45$ °C < $T \leq 85$ °C	$85$ °C < $T \leq 105$ °C
Coefficient	1.0	0.7	0.25

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Large capacitance (560  $\mu$ F max.)
- Low ESL (3 terminals : 50% less than 2 terminals)
- RoHS compliance, Halogen free
- Low ESR (4.5 m $\Omega$ , 6 m $\Omega$  max.)
- High ripple current (8500 mAr.m.s. max.)

## Specifications

Items	Specifications	
Series	LX	
Category temperature range	-55 °C to 105 °C	
Rated voltage range	2 V.DC to 2.5 V.DC	
Rated capacitance range	330 $\mu$ F to 560 $\mu$ F	
Capacitance tolerance	$\pm 20$ % (120 Hz/+20 °C)	
Leakage current	$I \leq 0.1 CV(\mu A)$ [2 minutes]	
Dissipation factor(tan $\delta$ )	$\leq 0.06$ (120 Hz/+20 °C)	
Surge voltage(V.DC)	Rated voltage $\times 1.25$ (15 °C to 35 °C)	
Endurance	+105 °C, 2000 h, rated voltage applied	
	Capacitance change	Within $\pm 20$ % of the initial value
	tan $\delta$	$\leq 2$ times of the initial limit
	DC leakage current	$\leq 3$ times of the initial limit
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage	
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC +70 %, -20 %
	tan $\delta$	$\leq 2$ times of the initial limit
	DC leakage current	Within the initial limit

## Marking and dimensions

(Unit : mm)

Rated voltage(V.DC)	2	2.5
Code	d	e

Series	L $\pm 0.2$	W1 $\pm 0.2$	W2 $\pm 0.1$	H $\pm 0.1$	P1 $\pm 0.3$	P2 $\pm 0.1$	P3 $\pm 0.2$	P4 $\pm 0.2$
LX	7.3	4.3	2.4	1.9	1.3	1.1	0.7	1.4

## Characteristics list

Series	Rated voltage (V.DC)	Capacitance ( $\mu$ F)	Case size (mm)			Specifications		Part number	Min. Packaging Q' ty $\times 3$ (pcs)
			L	W	H	Ripple current $\times 1$ (mAr.m.s.)	ESR $\times 2$ (m $\Omega$ max.)		
LX	2	330	7.3	4.3	1.9	7500	6	EEFLX0D331R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0D331R4	3500
		470	7.3	4.3	1.9	7500	6	EEFLX0D471R	3500
			7.3	4.3	1.9	8500	4.5	EEFLX0D471R4	3500
	560	7.3	4.3	1.9	7500	6	EEFLX0D561R	3500	
									8500
		330	7.3	4.3	1.9	7500	6	EEFLX0E331R	
			7.3	4.3	1.9	8500	4.5	EEFLX0E331R4	3500
470	7.3	4.3	1.9	7500	6	EEFLX0E471R	3500		
								8500	4.5

$\times 1$ :Ripple current (100 kHz/ +45 °C)  $\times 2$ :ESR (100 kHz/+20 °C)  $\times 3$ :Please contact us when 500 pcs packing is necessary

$\blacklozenge$ Please refer to the P16 in this catalog for "Reflow conditions" and "Taping specifications".

## Temperature coefficient of Ripple current

Temp.	$T \leq 45$ °C	$45$ °C $< T \leq 85$ °C	$85$ °C $< T \leq 105$ °C
Coefficient	1.0	0.7	0.25

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



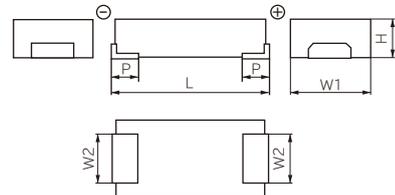
- Low profile ( Height 1.0 mm max.)
- Low ESL (3 terminals : 50% less than 2 terminals)
- RoHS compliance, Halogen free
- Low ESR (4.5 mΩ to 9 mΩ)
- High ripple current (8500 mAr.m.s. max.)

## ● Specifications

Items	Specifications						
	SR	LR	SS	LS	ST	LT	
Series	SR	LR	SS	LS	ST	LT	
Category temperature range	-55 °C to 105 °C						
Rated voltage range	2 V.DC to 6.3 V.DC		2 V.DC to 2.5 V.DC				
Rated capacitance range	68 μF to 220 μF		180 μF to 220 μF		270 μF to 330 μF		
Capacitance tolerance	±20 % (120 Hz/+20 °C)						
Leakage current	$I \leq 0.1 CV(\mu A)$ [2 minutes]						
Dissipation factor(tan δ)	$\leq 0.06$ (120 Hz/+20 °C)						
Surge voltage(V.DC)	Rated voltage × 1.25 (15 °C to 35 °C)						
Endurance	+105 °C, 2000 h, rated voltage applied						
	Capacitance change	Within ±20 % of the initial value					
	tan δ	$\leq 2$ times of the initial limit					
	DC leakage current	$\leq 3$ times of the initial limit					
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage						
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC		4 V.DC		6.3 V.DC	
	tan δ	+70 %, -20 %		+60 %, -20 %		+50 %, -20 %	
	DC leakage current	Within the initial limit					

## ● Marking and dimensions

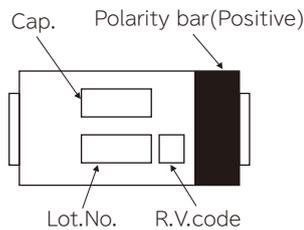
### 2 terminals



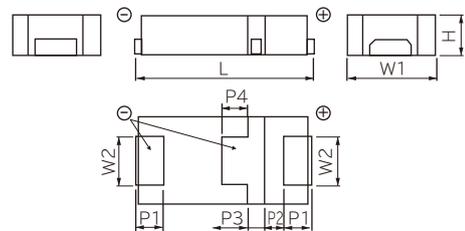
(Unit : mm)

Series	L ±0.2	W1 ±0.2	W2 ±0.1	H ±0.1	P ±0.3
SR	7.3	4.3	2.4	1.0 <sup>※1</sup>	1.3
SS	7.3	4.3	2.4	1.1	1.3
ST	7.3	4.3	2.4	1.4	1.3

※1 Maximum



### 3 terminals



(Unit : mm)

Rated voltage(V.DC)	2	2.5	4	6.3
Code	d	e	g	j

Series	L ±0.2	W1 ±0.2	W2 ±0.1	H ±0.1	p1 ±0.3	p2 ±0.1	p3 ±0.2	p4 ±0.2
LR	7.3	4.3	2.4	1.0 <sup>※1</sup>	1.3	1.1	0.7	1.4
LS	7.3	4.3	2.4	1.1	1.3	1.1	0.7	1.4
LT	7.3	4.3	2.4	1.4	1.3	1.1	0.7	1.4

※1 Maximum

## ● Characteristics list

Series	Rated voltage (V.DC)	Capacitance (μF)	Case size (mm)			Specifications		The number of terminals		Part number	Min. Packaging Q'ty ※3 (pcs)
			L	W	H	Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	2	3		
SR	2	220	7.3	4.3	1.0 max.	7500	6	○		EEFSR0D221R	3500
			7.3	4.3	1.0 max.	8500	4.5	○		EEFSR0D221R4	3500
	2.5	180	7.3	4.3	1.0 max.	7500	6	○		EEFSR0E181R	3500
			7.3	4.3	1.0 max.	8500	4.5	○		EEFSR0E181R4	3500
	4	120	7.3	4.3	1.0 max.	6300	9	○		EEFSR0G121R	3500
6.3	68	7.3	4.3	1.0 max.	6300	9	○		EEFSR0J680R	3500	
LR	2	220	7.3	4.3	1.0 max.	7500	6		○	EEFLR0D221R	3500
			7.3	4.3	1.0 max.	8500	4.5		○	EEFLR0D221R4	3500
	2.5	180	7.3	4.3	1.0 max.	7500	6		○	EEFLR0E181R	3500
			7.3	4.3	1.0 max.	8500	4.5		○	EEFLR0E181R4	3500
	4	120	7.3	4.3	1.0 max.	6300	9		○	EEFLR0G121R	3500
6.3	68	7.3	4.3	1.0 max.	6300	9		○	EEFLR0J680R	3500	
SS	2	220	7.3	4.3	1.1	7500	6		○	EEFSS0D221R	3500
	2.5	180	7.3	4.3	1.1	7500	6		○	EEFSS0E181R	3500
LS	2	220	7.3	4.3	1.1	7500	6		○	EEFLS0D221R	3500
	2.5	180	7.3	4.3	1.1	7500	6		○	EEFLS0E181R	3500
ST	2	330	7.3	4.3	1.4	7500	6		○	EEFST0D331R	3500
	2.5	270	7.3	4.3	1.4	7500	6		○	EEFST0E271R	3500
LT	2	330	7.3	4.3	1.4	7500	6		○	EEFLT0D331R	3500
	2.5	270	7.3	4.3	1.4	7500	6		○	EEFLT0E271R	3500

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: Please contact us when 500 pcs packing is necessary

◆Please refer to the P16 in this catalog for "Reflow conditions" and "Taping specifications".

## ● Temperature coefficient of Ripple current

Temp.	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
Coefficient	1.0	0.7	0.25

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

## Hybrid

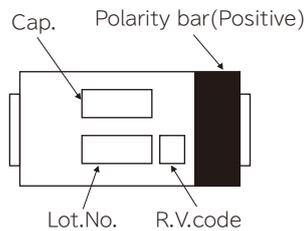


- Endurance 85 °C 2000 h
- High ripple current (5100 mAr.m.s. to 6300 mAr.m.s. max.)
- Product height (3.0 mm max.)
- RoHS compliance, Halogen free

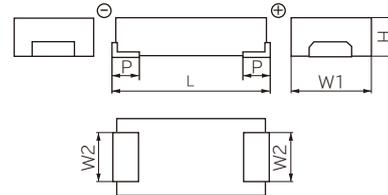
● Specifications

Items	Specifications		
Series	CY, SY		
Category temperature range	-55 °C to 85 °C		
Rated voltage range	4 V.DC, 6.3 V.DC		
Rated capacitance range	330 μF to 470 μF		
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	$I \leq 0.1 CV(\mu A)$ [4 V.DC, 6.3 V.DC, 2 minutes]		
Dissipation factor(tan δ)	$\leq 0.06$ (120 Hz/+20 °C)		
Surge voltage(V.DC)	Rated voltage × 1.25 [4 V.DC, 6.3 V.DC] (15 °C to 35 °C)		
Endurance	+85 °C, 2000 h, rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	$\leq 2$ times of the initial limit	
	DC leakage current	$\leq 3$ times of the initial limit	
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage		
	Capacitance change of initial measurd value	4 V.DC	6.3 V.DC
		+60 %, -20 %	+50 %, -20 %
	tan δ	$\leq 2$ times of the initial limit	
	DC leakage current	Within the initial limit	

● Marking and dimensions



Rated voltage(V.DC)	4	6.3
Code	g	j



(Unit : mm)

Series	L ±0.2	W1 ±0.2	W2 ±0.1	H ±0.2	P ±0.3
CY/SY	7.3	4.3	2.4	2.8	1.3

※Externals of figure are the reference.

● 特性一覧表

◆Reflow ※3 〈Standard〉

Series	Rated voltage (V.DC)	Capacitance (μF)	Case size (mm)			Specifications		Part number	Min. Packaging Q'ty ※4 (pcs)
			L	W	H	Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)		
CY	4	470	7.3	4.3	2.8	5100	15	ECGCY0G471R	2000
	6.3	330	7.3	4.3	2.8	5100	15	ECGCY0J331R	2000
SY	4	470	7.3	4.3	2.8	6300	9	ECGSY0G471R	2000
	6.3	330	7.3	4.3	2.8	6300	9	ECGSY0J331R	2000

※1: Ripple current (100 kHz/ +45°C )

※2: ESR (100 kHz/+20 °C)

※3: Please refer to the page of "Mounting Specifications".

※4: Please contact us when 500 pcs packing is necessary.

● Temperature coefficient of Ripple current

Temp.	T ≤ 45 °C	45 °C < T ≤ 65 °C	65 °C < T ≤ 85 °C
Coefficient	1.0	0.7	0.25

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Endurance 125 °C 1000 h
- Low ESR(4.5 mΩ max.)
- High voltage & Large capacitance (2 V.DC / 560 μF to 25 V.DC / 33 μF)
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications		
Series	HX		
Category temperature range	-55 °C to 125 °C		
Rated voltage range	2 V.DC to 2.5 V.DC, 10 V.DC to 25 V.DC		
Category voltage range	1.6 V.DC to 2 V.DC, 8 V.DC to 20 V.DC		
Rated capacitance range	15 μF to 560 μF		
Capacitance tolerance	±20 % (120 Hz/20 °C)		
Leakage current	$I \leq 0.1 \text{ CV}(\mu\text{A})$ [2 V.DC, 2.5 V.DC, 2 minutes], $I \leq 0.3 \text{ CV}(\mu\text{A})$ [10 V.DC to 25 V.DC, 2 minutes]		
Dissipation factor(tan δ)	$\leq 0.1$ (120 Hz/20 °C)		
Surge voltage(V.DC)	Rated voltage × 1.25 [2 V.DC to 16 V.DC], × 1.15 [20 V.DC to 25 V.DC] (15 °C to 35 °C)		
Endurance	+125 °C, 1000 h, Category voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	$\leq 2$ times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage		
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC +70 %, -20 %	10 V.DC to 25 V.DC +60 %, -20 %
	tan δ	$\leq 2$ times of the initial limit	
	DC leakage current	Within the initial limit [2 V.DC, 2.5 V.DC], $\leq 300$ % of the initial limit [10 V.DC to 25 V.DC]	

## ● Marking and dimensions

(Unit : mm)

Rated voltage(V.DC)	2	2.5	10	16	20	25
Code	d	e	A	C	D	E

Series	L ±0.2	W1 ±0.2	W2 ±0.1	H ±0.1	P ±0.3
HX	7.3	4.3	2.4	1.9	1.3

## ● Characteristics list

Series	Rated voltage [105 °C] (V.DC)	Category voltage [125 °C] (V.DC)	Capacitance (μF)	Case size (mm)			Specifications		Part number	Min. Packaging Q'ty ※3 (pcs)		
				L	W	H	Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)				
HX	2	1.6	470	7.3	4.3	1.9	5100	15	EEFH0D471R	3500		
				7.3	4.3	1.9	6300	9	EEFH0D471R9	3500		
				7.3	4.3	1.9	7500	6	EEFH0D471R6	3500		
				7.3	4.3	1.9	8500	4.5	EEFH0D471R4	3500		
			560	7.3	4.3	1.9	5100	15	EEFH0D561R	3500		
				7.3	4.3	1.9	8500	4.5	EEFH0D561R4	3500		
			2.5	2	330	7.3	4.3	1.9	5100	15	EEFH0E331R	3500
						7.3	4.3	1.9	6300	9	EEFH0E331R9	3500
						7.3	4.3	1.9	7500	6	EEFH0E331R6	3500
						7.3	4.3	1.9	8500	4.5	EEFH0E331R4	3500
	470	7.3			4.3	1.9	5100	15	EEFH0E471R	3500		
		7.3			4.3	1.9	6300	9	EEFH0E471R9	3500		
		7.3			4.3	1.9	7500	6	EEFH0E471R6	3500		
		7.3			4.3	1.9	8500	4.5	EEFH0E471R4	3500		
	10	8			47	7.3	4.3	1.9	3200	40	EEFH1A470R	3500
					68	7.3	4.3	1.9	3200	40	EEFH1A680R	3500
			100	7.3	4.3	1.9	3200	40	EEFH1A101R	3500		
	16	12.8	15	7.3	4.3	1.9	3200	40	EEFH1C150R	3500		
			22	7.3	4.3	1.9	3200	40	EEFH1C220R	3500		
			33	7.3	4.3	1.9	3200	40	EEFH1C330R	3500		
			47	7.3	4.3	1.9	3200	40	EEFH1C470R	3500		
			68	7.3	4.3	1.9	3200	40	EEFH1C680R	3500		
	20	16	22	7.3	4.3	1.9	3200	40	EEFH1D220R	3500		
			33	7.3	4.3	1.9	3200	40	EEFH1D330R	3500		
			47	7.3	4.3	1.9	3200	40	EEFH1D470R	3500		
			56	7.3	4.3	1.9	3200	40	EEFH1D560R	3500		
	25	20	15	7.3	4.3	1.9	3200	40	EEFH1E150R	3500		
			22	7.3	4.3	1.9	3200	40	EEFH1E220R	3500		
33			7.3	4.3	1.9	3200	40	EEFH1E330R	3500			

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: Please contact us when 500 pcs packing is necessary

◆Please refer to the P16 in this catalog for "Reflow conditions" and "Taping specifications".

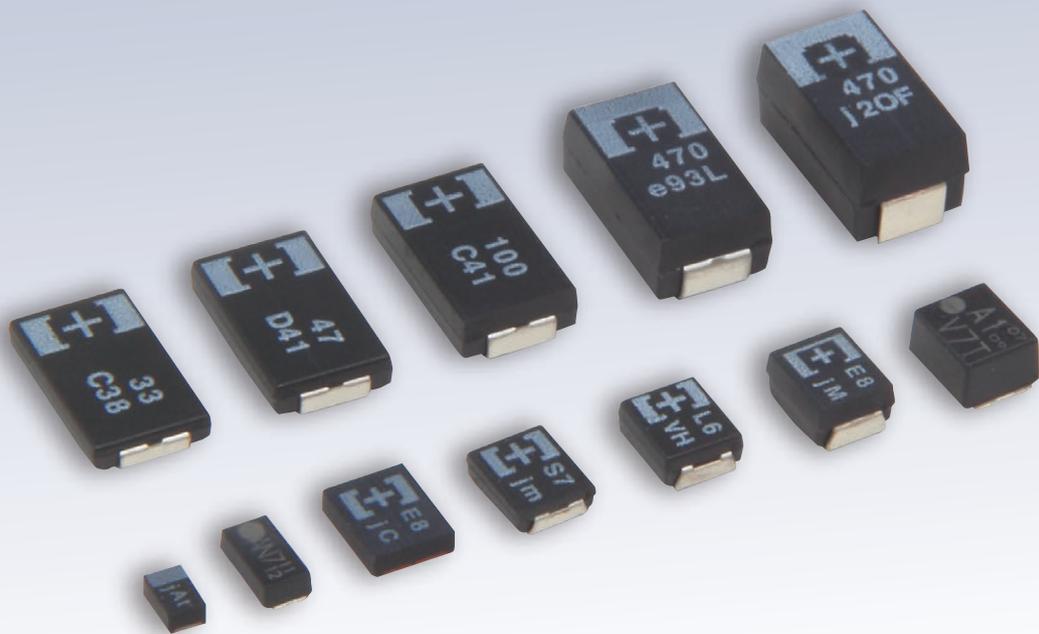
## ● Temperature coefficient of Ripple current

Temp.		T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C	105 °C < T ≤ 125 °C
2 V.DC to 2.5 V.DC	Coefficient	1.0	0.7	0.25	0.25
10 V.DC to 25 V.DC		1.0	0.8	0.5	0.25

Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

Conductive Polymer Tantalum  
Solid Capacitors

# POSCAP™



SP-Cap™

導電性高分子タンタル固体電解コンデンサ

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OS-CON™

Hybrid

## ⚠ Application Guidelines

### 1. Circuit design

#### 1-1 Prohibited circuits

Since problems can be expected, **POSCAP** cannot be used on the following circuits

- (1) High impedance voltage retention circuits
- (2) Coupling circuits
- (3) Time constant circuits
- (4) Circuits greatly affected by leakage current
- (5) The circuit in which two or more **POSCAP** are connected in a series so as to raise the endurance voltage.

#### 1-2 Failure and life-span

The failure rate is 0.5 %\* / 1000 h (Confidence level : 60 %) based on JIS C 5003.

The mainly failure modes are as follows.

※B2 size or less : 1.0 %

##### 1-2-1 Contingency failure

The main causes of failure are thermal stresses cause by the soldering or thermal use environment, along with heat stresses, electrical stresses or mechanical stresses. The most common failure mode is a short circuit. In case a short circuit occurs, ensure safety by fully considering the followings.

- (1) If **POSCAP** emit smoke, turn off the main power of the equipment. In this case, keep your face and hands away from the area.
- (2) It may take a few seconds to a few minutes before **POSCAP** emits smoke by the situation. Increase safety by using a protective circuit.
- (3) If the smoke comes into eyes, rinse immediately. If the smoke is inhaled, gargle immediately.
- (4) In case a large current continues to flow after a short circuit, in the worst case, the shorted-out section may ignite. For safety, install a redundant circuit or a protective circuit, etc.

##### 1-2-2 Wear-out failure (lifetime)

When lifetime exceeded the specified guarantee time of Endurance and Damp heat, electrolyte might insulate and cause electric characteristic changed. This is called an open circuit. The electric characteristics of capacitance and ESR may possibly change within the specified range in specifications when it is used under the condition of the rated voltage, electric and mechanical performance. Please note it when design.

#### 1-3 Reduction of failure stress

When **POSCAP** is used within the rated voltage, it shows a stable characteristic, but it may be damaged in a short circuit when an overvoltage, for instance, is applied. The time to reach the failure mode can be extended by using **POSCAP** with reduced environment temperature, ripple current and applied voltage.

Failure rate

In the case of the endurance which is 105 °C 2000 h.

0.5 %/1000 h (Environment temp. : 105 °C, Rated voltage or Category voltage applied)

In the case of the endurance which is 105 °C 1000 h or 125 °C 1000 h.

1.0 %/1000 h (Environment temp. : 105 °C, Rated voltage or Category voltage applied)

In the case of the endurance which is 85 °C 1000 h.

1.0 %/1000 h (Environment temp. : 85 °C, Rated voltage applied)

#### 1-4 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 this delivery specification.

#### 1-5 Operating temperature and ripple current

- (a) Set the operating temperature so that it falls within the range stipulated in this delivery specification.
- (b) Do not apply current that exceeds the allowable ripple current. Ripple current should be controlled so that surface temperature of a capacitor do not exceed the rated temperature.  
(For questions regarding TQC series, please contact us.)
- (c) Specified ESR is a value at the time of shipping from factory. ESR may change upon use conditions.

#### 1-6 Leakage current

Even when the soldering conditions fall within the range of this delivery specifications, leakage current increases a little on occasion. It also increases a little during high temperature storage, high humidity storage and temperature cycling with no voltage applied. In cases such as these, leakage current will decrease by applying voltage under the condition of below the **POSCAP**'s maximum operating temperature.

The speed at which the leakage current is restored is increased by applying voltage when the **POSCAP**'s temperature is close to the maximum operating temperature.

#### 1-7 Rapid charge and discharge limitation

Rapid charge and discharge are restricted (for maintainance of high-proof reliability).

A protective circuit is recommended for when a rapid charge or discharge causes excessive rush current since this is main cause of short circuit and large leakage current. Use a protective circuits in case the rush current value exceeds 20 A\*

Be sure to insert a protection resistor of about 1 kΩ for charge and discharge when measuring the leakage current.

※TPU series : 10 A

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## 2. Mounting

### 2-1 Protect circuit

The failure mode of **POSCAP** is the short mode. When it breaks down, short electric current flows to it. **POSCAP** gives off heat by this short current.

Do the following consideration in design fully for the safety because it has a bad influence on the part around **POSCAP** due to this heat.

- A protective circuit and a protective device are set up, so as to make the system safer.
- A diffuse circuit and so on is set up, so as to make the system safer such as that a machine may not break down as to the single trouble.

### 2-2 Considerations when soldering

The soldering conditions are to be within the range prescribed in this delivery specification.

If the specifications are not followed, there is the possibility of degradation of electric characteristic and lifetime when soldering is conducted under conditions that are harsher than those stipulated.

### 2-3 Others

**POSCAP**'s Electrical characteristics are affected by temperature and frequency fluctuations. Design circuits after checking the amount of fluctuation.

## 3.Storage

It is necessary to set an environment to prevent a trouble at the time of soldering by the degradation of solder ability or moisture's getting into the molding resin when **POSCAP** are stored.

Please make storage of **POSCAP** sealing up in the reel and storage bag at the time of delivery in the following environment. Also, set storage period as 18 months or shorter.

Room temperature and room humidity (generally : 15 to 35 °C, 45 to 75 % RH ) are desirable.

Place where **POSCAP** is not exposed by direct sunshine.

Please unseal storage bag just before mounting and be conscious that **POSCAP** in the storage bag is used up. When remainder unfortunately occurs, return them to the storage bag once again and, please seal the unsealed part by adhesive tape etc., including desiccants. Moreover, once and use it in time the storage bag is opened, store **POSCAP** according to the table's Floor Life "Time" and "conditions".

Floor life	
Time	Conditions
4 weeks	≦ 30 °C/60 %Rh
168 hours	≦ 30 °C/60 %Rh
48 hours	≦ 30 °C/60 %Rh

**POSCAP** is not compatible with JEDEC J-STD-020, J-STD-033

## Intellectual property right

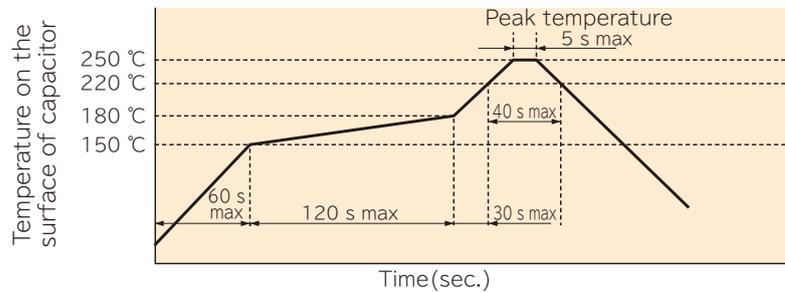
We, Panasonic Group are providing the product and service that customers can use without anxiety, and are working positively on the protection of our products under intellectual property rights. Representative patents relating to **POSCAP** are as follows:

US Patent No. 6168639, 6313979, 6858800, 6891717, 7158368, 7326260, 8081421, 8149569, 8456804, 8559166

## Recommended soldering condition

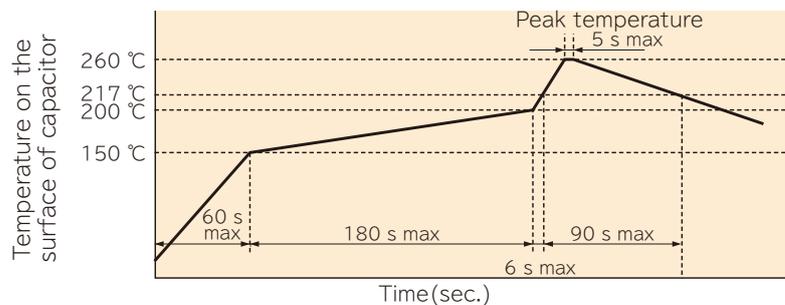
### Peak temperature 250 °C lead free reflow soldering profile

The cycles of reflow soldering: Twice (max)



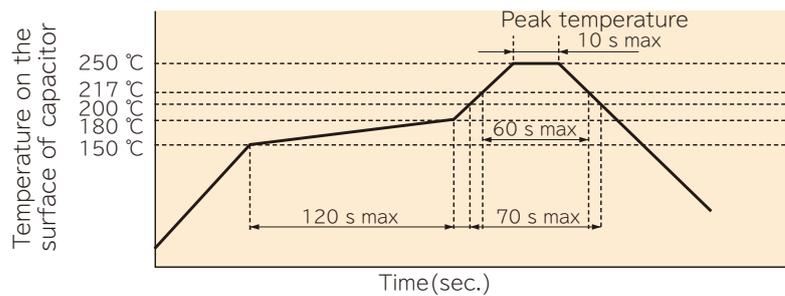
### Peak temperature 260 °C lead free reflow soldering profile

This reflow is limited at moisture sensitive level.  
Please contact us separately concerning about detail.  
The cycles of reflow soldering: Twice (max)



### TQC series

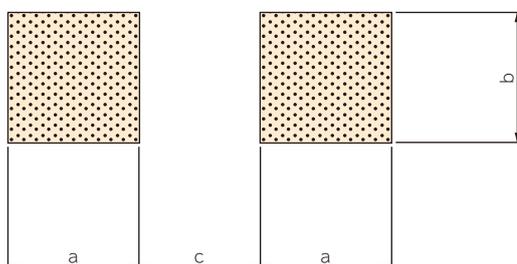
The cycles of reflow soldering: Twice (max)



### Soldering with a soldering iron

Tip of a soldering iron: 350 °C max (TQC serie: 400 °C max) Power of a soldering iron: 30 W max  
Working time: 3 sec. max (TQC serie: 5 sec max)  
(Do not let the tip of soldering iron touch the POSCAP itself. Do not subject the POSCAP itself to excessive stress when soldering)

## Land/Pad Pattern



(unit:mm)

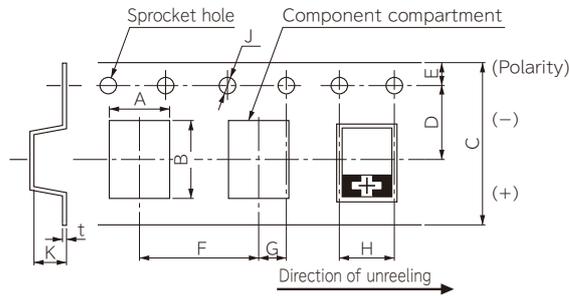
Size code	a	b	c	Size code	a	b	c
S09	1.0	0.9	0.6	D12	2.4	2.9	3.7
A09	1.6	1.4	1.0	D15	2.4	2.9	3.7
A14	1.6	1.4	1.0	D15E	2.4	2.9	3.7
B09	1.6	2.7	1.4	D2E	2.4	2.9	3.7
B1	1.6	2.7	1.4	D2	2.4	2.9	3.7
B1G	1.6	2.7	1.4	D3L	2.4	2.9	3.7
B1S	1.6	2.7	1.4	D4	2.4	2.9	3.7
B15G	1.6	2.7	1.4				
B2	1.6	2.7	1.4				
B2S	1.6	2.7	1.4				

# Packing specifications

\*We supply only embossed tapping type

## Packing specifications

### Dimension of carrier tape

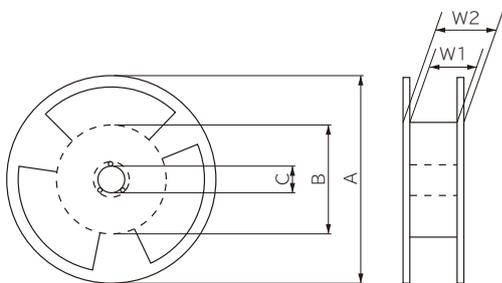


(unit:mm)

Size code	A ±0.1	B ±0.1	C ±0.3	D ±0.05	E ±0.1	F ±0.1	G ±0.05	H ±0.1	J $^{+0.1}_{-0}$	K ±0.1	t ±0.05
S09	1.65	2.4	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.3	0.25
A09	2.05	3.65	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.3	0.25
A14	2.05	3.65	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.7	0.25
B09	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.4	0.25
B1	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.4	0.25
B1G	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.7	0.25
B1S	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.7	0.25
B15G	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	1.7	0.25
B2	3.3	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	2.1	0.25
B2S	3.25	4.0	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	2.1	0.25
D12	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	1.7	0.3
D15	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	2.4	0.3
D15E	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	1.7	0.3
D2E	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	2.4	0.3
D2	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	2.4	0.3
D3L	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	3.2	0.3
D4	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	4.2	0.3

- Dimension A and B are the measure of compartment's inside bottom.
- The (+) Polarity of the chip is placed on right side towards the unreeling direction.
- Dimension of the topcover tape Thickness of cover tape: 62±10 μm Width of cover tape: 9.5±0.2 mm 5.5±0.2 mm (φ 180reel)

### Reel dimension



(unit:mm)

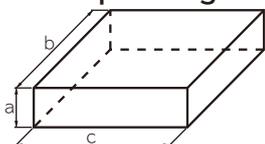
A	B	C	W1	W2
φ 330±2	φ 80±2	φ 13±0.2	13.5±0.5	17.5±1.0
φ 180 $^{+0}_{-3}$	φ 60±2	φ 13±0.2	9±0.5	11.4±1.0

### Minimum packing quantity and weight

Size code	Quantity(pcs./Reel, φ 180)	Typical weight(g)	Size code	Quantity(pcs./Reel, φ 330)	Typical weight(g)
S09	3000	200	D12	4500	1200
A09	3000	200	D15	3000	1000
A14	2500	200	D15E	4000	1000
B09	3000	200	D2E	3000	1000
B1	3000	200	D2	3000	1000
B1G	2500	200	D3L	2500	1100
B1S	2500	200	D4	2000	1200
B15G	2500	200			
B2	2000	200			
B2S	2000	200			

※Small order quantity (500 pcs/reel) is available with TPE, TPF and TQC series. Please contact our sales representative if you prefer it.

### Dimension of packing case



(unit:mm)

Reel size	φ 180	φ 330
a	90	120
b	240	360
c	240	360

### Units per packing case

Size code	Pieces/case	Size code	Pieces/case
S09	15000	D12	22500
A09	15000	D15	15000
A14	12500	D15E	20000
B09	15000	D2E	15000
B1	15000	D2	15000
B1G	12500	D3L	12500
B1S	12500	D4	10000
B15G	12500		
B2	10000		
B2S	10000		

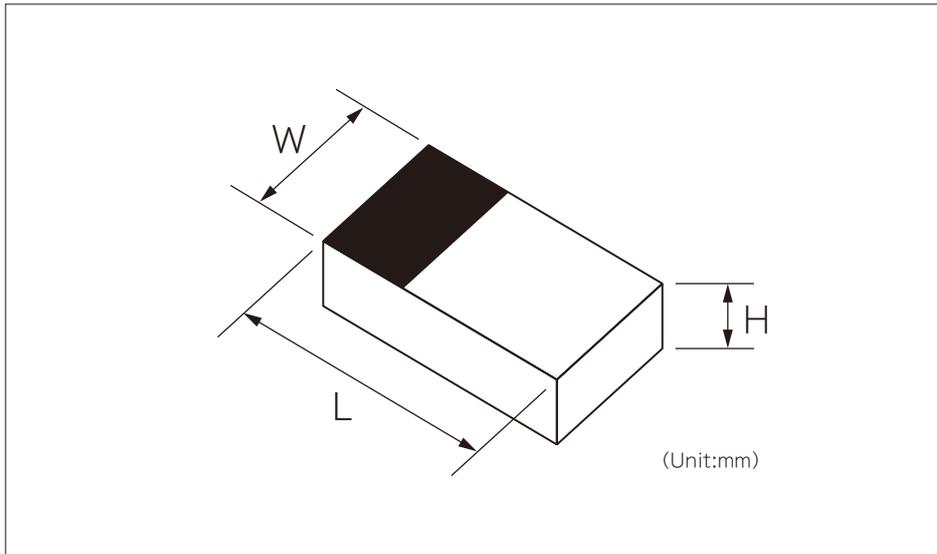
# Line-up

Guidelines and Precautions
Mounting specifications/ Packing specifications
Selection guide
Surface mount type
<b>POSCAP™</b>
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<b>Line-up</b>
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TPU
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TPG
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Catalog Deletion and EOL models
<b>OS-CON™</b>
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Selection guide
Surface mount type

Series	Page	Features	Small size/low profile	Large capacitance	Low ESR	For automotive	High voltage	Guaranteed at 125 °C	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm)		
														L	W	H
TPU	45	Small size Low profile Face down terminal	●						-55 to 85	2.5 to 10	150 to 300	4.7 to 100	S09	2.0	1.25	0.9
									-55 to 85	6.3	100	150	B09	3.5	2.8	0.9
TPH	46	Small size Low profile Face down terminal	●		●				-55 to 85	6.3 to 10	100 to 150	33 to 100	A09	3.2	1.6	0.9
									-55 to 105	2.5 to 6.3	150	47 to 100	A09	3.2	1.6	0.9
									-55 to 85	2.5 to 6.3	70	100 to 220	A14	3.2	1.6	1.4
TPG	47	Small size Low profile Large capacitance	●	●					-55 to 105	2.5 to 12.5	35 to 70	33 to 220	B1G	3.5	2.8	1.1
									-55 to 105	2.5 to 6.3	30 to 70	150 to 220	B15G	3.5	2.8	1.4
TPSF	48	Low ESR / Small size Large capacitance Face down terminal	●	●	●				-55 to 105	2.0 to 2.5	6 to 9	270	B2S	3.5	2.8	1.9
UPGRADE TPE	49 to 52	Low ESR			●				-55 to 105	2.0 to 10	11 to 35	47 to 470	B2	3.5	2.8	1.9
									-55 to 105	6.3	35	470	D15E	7.3	4.3	1.4
									-55 to 105	2.5 to 10	7 to 25	68 to 470	D2E	7.3	4.3	1.8
									-55 to 105	2.5 to 10	9 to 25	220 to 680	D3L	7.3	4.3	2.8
									-55 to 105	2.5 to 10	10 to 25	330 to 1500	D4	7.3	4.3	3.8
TPF	53	Low ESR Large capacitance			●	●			-55 to 105	2.0	6	220 to 330	D2E	7.3	4.3	1.8
									-55 to 105	2.5 to 10	5 to 15	150 to 680	D3L	7.3	4.3	2.8
									-55 to 105	2.5 to 6.3	5 to 10	470 to 1000	D4	7.3	4.3	3.8
TQS	54	High voltage					●		-55 to 105	16 to 35	70 to 150	6.8 to 3.3	B1S	3.5	2.8	1.1
UPGRADE TQC	55 to 56	High voltage					●		-55 to 105	35	300	2.7	B15	3.5	2.8	1.4
									-55 to 105	16 to 35	90 to 400	3.9 to 33	B2	3.5	2.8	1.9
									-55 to 105	16	40	33	D12	7.3	4.3	1.15
									-55 to 105	16 to 25	55 to 70	22 to 47	D15	7.3	4.3	1.4
									-55 to 105	16 to 35	40 to 150	10 to 150	D2	7.3	4.3	1.9
									-55 to 105	16 to 25	50 to 70	68 to 150	D3L	7.3	4.3	2.8

Series	Page	Features	Small size/Low profile	Large capacitance	Low ESR	For automotive	High voltage	Guaranteed at 125 °C	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm)			
														L	W	H	
TA	57	High reliability				●			-55 to 105	4.0 to 10	70	47 to 100	B2	3.5	2.8	1.9	
									-55 to 105	2.5 to 10	9 to 25	68 to 470	D2E	7.3	4.3	1.8	
										-55 to 105	2.5 to 10	15 to 25	150 to 680	D3L	7.3	4.3	2.8
TV	58	High reliability Guaranteed at 125 °C				●	●		-55 to 125	6.3 to 10	25	68 to 150	D2E	7.3	4.3	1.8	
									-55 to 125	10	25	150	D3L	7.3	4.3	2.8	
TH	59	Guaranteed at 125 °C					●		-55 to 125	2.5 to 6.3	15 to 25	150 to 330	D2E	7.3	4.3	1.8	
									-55 to 125	2.5 to 10	40 to 45	68 to 220	D2	7.3	4.3	1.9	
										-55 to 125	4.0 to 6.3	40	220 to 330	D3L	7.3	4.3	2.8
										-55 to 125	6.3 to 10	35 to 40	220 to 470	D4	7.3	4.3	3.8
TPB	60	Standard							-55 to 105	4.0 to 10	70	33 to 68	B2	3.5	2.8	1.9	
									-55 to 105	4.0 to 10	40	150 to 330	D3L	7.3	4.3	2.8	
									-55 to 105	6.3 to 10	35 to 40	220 to 470	D4	7.3	4.3	3.8	
TC	61 to 62	Guaranteed at 125 °C					●		-55 to 125	4.0 to 6.3	15 to 25	100 to 330	D2E	7.3	4.3	1.8	
									-55 to 125	2.5 to 10	5 to 25	150 to 680	D3L	7.3	4.3	2.8	
									-55 to 125	2.5 to 10	5 to 25	330 to 1000	D4	7.3	4.3	3.8	
TPC	63 to 64	Low profile	●						-55 to 105	6.3 to 12.5	55 to 80	10 to 47	B1	3.5	2.8	1.1	
									-55 to 105	6.3 to 10	40 to 45	68 to 330	D2	7.3	4.3	1.9	





L×W×H (Unit:mm)

S09 size	A09 size	A14 size	B09 size	B1 size	B1G size	B1S size	B15G size
2.0×1.25×0.9	3.2×1.6×0.9	3.2×1.6×1.4	3.5×2.8×0.9	3.5×2.8×1.1	3.5×2.8×1.1	3.5×2.8×1.1	3.5×2.8×1.4
P.45	P.46	P.46	P.45	P.63-64	P.47	P.54	P.47
<b>TPU</b>	<b>TPH</b>	<b>TPH</b>	<b>TPU</b>	<b>TPC</b>	<b>TPG</b>	<b>TQS</b>	<b>TPG</b>
2.5 V.DC to 10 V.DC 4.7 μF to 100 μF	2.5 V.DC to 10 V.DC 33 μF to 100 μF	2.5 V.DC to 6.3 V.DC 100 μF to 220 μF	6.3 V.DC 150 μF	6.3 V.DC to 12.5 V.DC 10 μF to 47 μF	2.5 V.DC to 12.5 V.DC 33 μF to 220 μF	16 V.DC to 35 V.DC 6.8 μF to 33 μF	2.5 V.DC to 6.3 V.DC 150 μF to 220 μF

L×W×H (Unit:mm)

B2 size	B2S size	D12 size	D15 size	D15E size	D2E size	D2 size	D3L size		D4 size
3.5×2.8×1.9	3.5×2.8×1.9	7.3×4.3×1.15	7.3×4.3×1.4	7.3×4.3×1.4	7.3×4.3×1.8	7.3×4.3×1.9	7.3×4.3×2.8		7.3×4.3×3.8
P.49-50	P.48	P.56	P.56	P.51-52	P.51-52	P.56	P.51-52	P.58	P.51-52
<b>TPE</b>	<b>TPSF</b>	<b>TQC</b>	<b>TQC</b>	<b>TPE</b>	<b>TPE</b>	<b>TQC</b>	<b>TPE</b>	<b>TV</b>	<b>TPE</b>
2.0 V.DC to 10 V.DC 47 μF to 470 μF	2.0 V.DC to 2.5 V.DC 270 μF	16 V.DC 33 μF	16 V.DC to 25 V.DC 22 μF to 47 μF	6.3 V.DC 470 μF	2.5 V.DC to 10 V.DC 68 μF to 470 μF	16 V.DC to 35 V.DC 10 μF to 150 μF	2.5 V.DC to 10 V.DC 220 μF to 680 μF	10 V.DC 150 μF	2.5 V.DC to 10 V.DC 330 μF to 1500 μF
P.57					P.53	P.63-64	P.53	P.56	P.53
<b>TA</b>					<b>TPF</b>	<b>TPC</b>	<b>TPF</b>	<b>TQC</b>	<b>TPF</b>
4.0 V.DC to 10 V.DC 47 μF to 100 μF					2.0 V.DC 220 μF to 330 μF	6.3 V.DC to 10 V.DC 68 μF to 330 μF	2.5 V.DC to 10 V.DC 150 μF to 680 μF	16 V.DC to 25 V.DC 68 μF to 150 μF	2.5 V.DC to 6.3 V.DC 470 μF to 1000 μF
P.55					P.57	P.59	P.57	P.60	P.60
<b>TQC</b>					<b>TA</b>	<b>TH</b>	<b>TA</b>	<b>TPB</b>	<b>TPB</b>
16 V.DC to 35 V.DC 3.9 μF to 33 μF					2.5 V.DC to 10 V.DC 68 μF to 470 μF	2.5 V.DC to 10 V.DC 68 μF to 220 μF	2.5 V.DC to 10 V.DC 150 μF to 680 μF	4.0 V.DC to 10 V.DC 150 μF to 330 μF	6.3 V.DC to 10 V.DC 220 μF to 470 μF
P.60					P.58		P.59	P.61-62	P.59
<b>TPB</b>					<b>TV</b>		<b>TH</b>	<b>TC</b>	<b>TH</b>
4.0 V.DC to 10 V.DC 33 μF to 68 μF					6.3 V.DC to 10 V.DC 68 μF to 150 μF		4.0 V.DC to 6.3 V.DC 220 μF to 330 μF	2.5 V.DC to 10 V.DC 150 μF to 680 μF	6.3 V.DC to 10 V.DC 220 μF to 470 μF
					P.59				P.61-62
					<b>TH</b>				<b>TC</b>
					2.5 V.DC to 6.3 V.DC 150 μF to 330 μF				2.5 V.DC to 10 V.DC 330 μF to 1000 μF
					P.61-62				
					<b>TC</b>				
					4.0 V.DC to 6.3 V.DC 100 μF to 330 μF				

The size of each photo is nearly to full scale.

## Size · ESR Matrix list

Size code (ESR mΩ)

V.DC	Series	μF	3.9	4.7	5.6	6.8	8.2	10	15	22	33	47	68	
Surface mount type	2.0	TPSF												
		TPE												
		TPF												
	2.5	TPU											S09 (150)	
		TPH												
		TPG												
		TPSF												
		TPE												
		TPF												
		TA												
		TH												
		TC												
4.0		TPU												S09 (150)
	TPH												A09 (150)	
	TPG													
	TPE													
	TPF													
	TA													
	TPB												B2 (70)	
	TH													
	TC													
	6.3	TPU							S09 (250)		S09 (150)		S09 (150)	
TPH												A09 (150)		
TPG														
TPE														
TPF														
TA												B2 (70)	B2 (70)	
TV													B2 (70)	
TPB													B2 (70)	
TPC													B1 (70,55)	
TH														
8.0	TPG											B1G (70)		
	TPE													
	TPC									B1 (70)				
Surface mount typ	TPU		S09 (300)											
	TPH										A09 (150)			
	TPG											B1G (70)		
	TPE											B2 (35)	D2E (25)	
	TPF													
	TA											B2 (70)	D2E (25)	
	TV												D2E (25)	
	TPB											B2 (70)	B2 (70)	
	TPC													D2 (45)
	TH													D2 (45)
Radial lead type	TPG											B1G (70)		
	TPC							B1 (80)	B1 (80)					
	TQC							B2 (100)	B2 (90)		B2 (90)	D15 (55)	D2 (50)	
16	TQS										D12 (40)	D2 (55,40)		
											D2 (70)			
20	TQC						B2 (100)			B2 (90)	D2 (60)	D15 (55)		
												D2 (55)		
25	TQC				B2 (100)				B2 (100)	D15 (70)	D2 (60)		D3L (70)	
	TQS								D2 (90,45)	D2 (60,45)				
35	TQC	B2 (400)						B1S (100)		D2 (120)	D2 (150)			
	TQS					B1S (150)								

## Case size

(単位: mm)

	S09	A09	A14	B09	B1	B1G	B1S	B15G	B2	B2S	D12	D15	D15E	D2E	D2	D3L	D4
L	2.0	3.2	3.2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	7.3	7.3	7.3	7.3	7.3	7.3	7.3
W	1.25	1.6	1.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	4.3	4.3	4.3	4.3	4.3	4.3	4.3
H	0.9	0.9	1.4	0.9	1.1	1.1	1.1	1.4	1.9	1.9	1.15	1.4	1.4	1.8	1.9	2.8	3.8

VDC	Series	100	120	150	220	270	330	470	680	1000	1500
2.0	TPSF					B2S (9 / 6)					
	TPE						B2 (15,13)	B2 (15,11)			
	TPF				D2E (6)		D2E (6)				
2.5	TPU	S09 (150)									
	TPH	A09 (150)			A14 (70)						
	TPG				B1G (70)						
	TPSF				B15G (30)						
	TPE				B2 (35,25,21,15) D2E (25,18,15,9)		B2 (35,15,9) D2E (25,18,15,12,9,7)	D2E (18,15,12,9,7)	D3L (15,12)	D4 (15)	D4 (15,12)
	TPF						D3L (7)	D3L (10,7,6)	D3L (10,7,6)	D4 (6,5)	
	TA				D2E (25,15,9)		D2E (25,18,15)	D2E (25,15)	D3L (25,15)		
	TH				D2 (45)		D2E (25,18,15)				
	TC								D3L (15,12,10) D4 (5)	D4 (15,6,5)	
	4.0	TPU									
TPH				A14 (70)							
TPG					B15G (70)						
TPE		B2 (35)		B2 (35)	B2 (35)		D2E (25,18)	D3L (25,18,15,12)			
TPF							D3L (12)	D3L (10)	D4 (10)		
TA		B2 (70)			D2E (25,18)			D3L (25,18)			
TPB							D3L (40)				
TH					D2E (25,18,15)		D3L (40)				
TC				D2E (18)	D2E (25,18,15)		D2E (25,18)	D3L (25,18,15,12,10)	D4 (10)		
6.3		TPU			B09 (100)						
	TPH	A09 (100) A14 (70)									
	TPG	B1G (70,55,35)		B15G (70,35)							
	TPE	B2 (35,25) D2E (25,18)	B2 (35)	B2 (35,25) D2E (25,18,15)	B2 (35) D2E (25,18)		D2E (25) D3L (25,18,15,9)	D15E (35) D4 (25,18)	D4 (25,18)		
	TPF						D4 (10)				
	TA				D3L (12,9,5)		D3L (9)	D4 (10)			
	TV			D2E (25)	D2E (25,18)		D3L (25)				
	TPB				D3L (40)		D3L (40)	D4 (35)			
	TPC	D2 (45)		D2 (40)			D4 (40)	D2 (40)			
	TH			D2E (25,18) D2 (40)	D3L (40)		D4 (40)	D4 (35)			
8.0	TPG										
	TPE	B2 (35)									
	TPC			D2 (40)							
	TPU										
	TPH										
	TPG										
	TPE				D3L (25,18)		D4 (25)				
	TPF				D3L (15)						
	TA				D3L (25)	D3L (25)					
	TV				D3L (25)						
10	TPB				D3L (40)	D3L (40)		D4 (35)			
	TPC	D2 (45)						D4 (40)			
	TH				D4 (40)			D4 (35)			
	TC	D2E (25,18)		D2E (25,18,15)	D2E (25,18)		D3L (25,18,15,9)	D4 (25,18,10)	D4 (25,18)		
	TPG										
	TPC										
	TPU										
	TPH										
	TPG										
	TPE										
12.5	TPF										
	TA										
	TV										
16	TPB										
	TPC										
	TH										
20	TPG										
	TPC										
	TH										
25	TPU										
	TPH										
	TPG										
35	TPF										
	TA										
	TV										

# Surface mount type TPU Series



- Small size, Low profile (L2.0xW1.25xH0.9 mm)
- Face down terminal type
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	S09	B09
Category temperature range	-55 °C to +85 °C	
Rated voltage range	2.5 V.DC to 10 V.DC	6.3 V.DC
Category voltage range	2.5 V.DC to 10 V.DC	6.3 V.DC
Rated capacitance range	4.7 μF to 100 μF	150 μF
Capacitance tolerance	±20 % (120 Hz /+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

## Marking and dimensions

**S09 Size**

**B09 Size**

(unit : mm)

Size code	L ±0.1 ※1	W ±0.1 ※1	H ±0.1	S ±0.1 ※1	W1 ±0.1
S09	2.0	1.25	0.9	0.5	0.9
B09	3.5	2.8	0.9	0.8	2.2

※1 ±0.2: B09

R. Voltage (V.DC)	2.5	4.0	6.3	10.0
Code	e	g	j	A

**S09 size**

R. Cap. (μF)	4.7	10	22	47	68	100
Code	s	A	J	S	W	A

**B09 size**

R. Cap. (μF)	150
Code	E8

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
TPU	2.5	85	2.5	85	47	2.0	1.25	0.9	S09	510	150	0.10	23.5	2R5TPU47MSI	3000	
		85	2.5	85	100	2.0	1.25	0.9		510	150	0.10	50.0	ETPU100MSI	3000	
	4	85	4	85	68	2.0	1.25	0.9		510	150	0.10	54.4	4TPU68MSI	3000	
		85	6.3	85	10	2.0	1.25	0.9		400	250	0.10	6.3	6TPU10MSI	3000	
	6.3	85	6.3	85	22	2.0	1.25	0.9		510	150	0.10	27.7	6TPU22MSI	3000	
		85	6.3	85	47	2.0	1.25	0.9		510	150	0.10	59.2	6TPU47MSI	3000	
		85	6.3	85	150	3.5	2.8	0.9		B09	670	100	0.10	94.5	6TPU150MBI	3000
		10	85	10	85	4.7	2.0	1.25		0.9	S09	360	300	0.10	4.7	10TPU4R7MSI

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes

◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



TPU
<b>TPH</b>
TPG
TPSF
TPE
TPF
TQS
TQC
TA
TV
TH
TPB
TC
TPC

- Small size, Low profile (L3.2xW1.6xH0.9 mm)

- Face down terminal type
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	A09	A14
Category temperature range	-55 °C to +105 °C / -55 °C to +85 °C (Rated temp. 85 °C)	
Rated voltage range	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Category voltage range	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Rated capacitance range	33 μF to 100 μF	100 μF to 220 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+105 °C, 1000 h rated voltage applied ※Rated temp, 85 °C Products: 85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+50 %, -20 % of the initial value (ETPH220MABC) Within+40 %, -20 % of the initial value (Except for above model)
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

## Marking and dimensions

A09/A14 Size

A09 Size (6TPH100MAEA)

(unit : mm)

Size code	L ±0.2	W ±0.2	H ±0.1	S ±0.2	W1 ±0.1
A09	3.2	1.6	0.9	0.8	1.2
A14	3.2	1.6	1.4	0.8	1.2

R. Voltage (V.DC)	2.5	4.0	6.3	10
Code	e	g	j	A

R. Cap. (μF)	33	47	68	100	150	220
Code	N7	S7	W7	A8	E8	J8

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
TPH	2.5	105	2.5	105	100	3.2	1.6	0.9	A09	510	150	0.10	25.0	ETPH100MHA	3000
		85	2.5	85	220	3.2	1.6	1.4	A14	740	70	0.10	110.0	ETPH220MABC	2500
	4	105	4	105	68	3.2	1.6	0.9	A09	510	150	0.10	27.2	4TPH68MHA	3000
		85	4	85	150	3.2	1.6	1.4	A14	740	70	0.10	120.0	4TPH150MABC	2500
	6.3	105	6.3	105	47	3.2	1.6	0.9	A09	510	150	0.10	29.6	6TPH47MHA	3000
		85	6.3	85	100	3.2	1.6	0.9		670	100	0.10	63.0	6TPH100MAEA	3000
		85	6.3	85	100	3.2	1.6	1.4	A14	740	70	0.10	126.0	6TPH100MABC	2500
	10	85	10	85	33	3.2	1.6	0.9	A09	510	150	0.10	33.0	ATPH33MAHA	3000

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes

◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TPG Series



- Small size, Low profile (L3.5xW2.8xH1.1 mm)
- Large capacitance (220 μF max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	B1G	B15G
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2.5 V.DC to 12.5 V.DC	2.5 V.DC to 6.3 V.DC
Category voltage range	2 V.DC to 10 V.DC	2.5 V.DC to 5 V.DC
Rated capacitance range	33 μF to 220 μF	150 μF to 220 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≦ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≦ 1.5 times of the initial limit
	DC leakage current	≦ 3 times of the initial limit

## Marking and dimensions

(unit : mm)

Size code	L +0.3/-0.1	W +0.3/-0.1	H ±0.1	S ±0.2	W1 ±0.1
B1G	3.5	2.8	1.1	0.8	2.2
B15G	3.5	2.8	1.4	0.8	2.2

R. Voltage (V.DC)	2.5	4.0	6.3	8.0	10.0	12.5
Code	e	g	j	k	A	B

R. Cap. (μF)	33	47	100	150	220
Code	N7	S7	A8	E8	J8

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard			
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)		
TPG	2.5	85	2	105	220	3.5	2.8	1.1	B1G	1000	70	0.10	55.0	2R5TPG220M	2500		
										1400	30/300kHz	0.10	110.0	2R5TPG220MUG	2500		
		4	85	3.2		105	100	3.5	2.8	1.4	B15G	1000	70	0.10	88.0	4TPG220M	2500
												1100	70	0.10	63.0	6TPG100M	2500
	6.3	85	5	105	100	3.5	2.8	1.1	B1G	1000	70	0.10	63.0	6TPG100MG	2500		
										1200	35/300kHz	0.10	126.0	6TPG100MZGD	2500		
		85	5	105		150	3.5	2.8	1.4	B15G	1000	70	0.10	94.5	6TPG150M	2500	
											1200	35/300kHz	0.10	189.0	6TPG150MZG	2500	
	8	85	6.3	105	47	3.5	2.8	1.1	B1G	1000	70	0.10	37.6	8TPG47M	2500		
										1000	70	0.10	47.0	10TPG47M	2500		
		10	85	8		105	3.5	2.8	1.1	B1G	1000	70	0.10	47.0	10TPG47M	2500	
											1000	70	0.10	41.3	12TPG33M	2500	
12.5	85	10	105	33	3.5	2.8	1.1	B1G	1000	70	0.10	41.3	12TPG33M	2500			

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes  
 ◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Super low ESR (6 mΩ max.)
- Super low ESL (0.7 nH)
- Face down terminal type
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	B2S	
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2 V.DC to 2.5 V.DC	
Category voltage range	2 V.DC to 2.5 V.DC	
Rated capacitance range	270 μF	
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+105 °C, 1000 h rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

## Marking and dimensions

(unit : mm)

Size code	L ±0.2	W ±0.2	H ±0.1	S ±0.3	W1 ±0.1
B2S	3.5	2.8	1.9	0.8	2.2

R. Voltage (V.DC)	2.0	2.5	R. Cap. (μF)	270
Code	d	e	Code	L8

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
TPSF	2	105	2	105	270	3.5	2.8	1.9	B2S	3200	6/500kHz	0.08	108.0	2TPSF270M6E	2000
		105	2	105		3.5	2.8	1.9		2400	9/300kHz	0.08	108.0	2TPSF270M9G	2000
	2.5	105	2.5	105		3.5	2.8	1.9		3200	6/500kHz	0.08	135.0	ETPSF270M6E	2000

- ※1: Ripple current (100 kHz/ +45 °C)
- ※2: ESR (100 kHz/+20 °C)
- ※3: tan δ (120 Hz/+20 °C)
- ※4: After 5 minutes
- ◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TPE Series UPGRADE B size



- Small size (L3.5xW2.8xH1.9 mm) ■ RoHS compliance, Halogen free
- Low ESR (15 mΩ)

## ● Specifications

Items	Specifications	
Size code	B2	
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2 V.DC to 10 V.DC	
Category voltage range	1.8 V.DC to 8 V.DC	
Rated capacitance range	47 μF to 470 μF	
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage x1.15	
Endurance	+105 °C, 1000 h rated voltage applied ※Rated temp, 85 °C Products : 85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≦ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +50 %, -20 % (2R5TPE220MAZB (MAPB,MAFB), 2R5TPE330MAZB, 2TPE330MAFB (MADGB), 2TPE470MAJGB (MAFB), 2TPE330MFB, ETPE330MAFB (MA9GB))
	tan δ	≦ 1.5 times of the initial limit (Except for above model)
	DC leakage current	≦ 3 times of the initial limit

## ● Marking and dimensions

Diagram labels: R.Cap. code, Polarity marking (+), R. Voltage code, Lot. No., L, W, H, S, W1.

(unit : mm)

Size code	L ±0.2	W ±0.2	H ±0.1	S ±0.2	W1 ±0.1
B2	3.5	2.8	1.9	0.8	2.2

R. Voltage (V.DC)	2.0	2.5	4.0	6.3	8.0	10.0
Code	d	e	g	j	k	A

R. Cap. (μF)	47	100	120	150	220	330	470
Code	S7	A8	C8	E8	J8	N8	S8

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
TPE	2	105	2	105	330	3.5	2.8	1.9	B2	2000	15	0.08	132.0	2TPE330MFB	2000	
		85	1.8	105		3.5	2.8	1.9		2000	15	0.08	132.0	2TPE330MAFB	2000	
		85	1.8	105		3.5	2.8	1.9		2000	13/300 kHz	0.08	132.0	2TPE330MADGB	2000	
		85	1.8	105	470	3.5	2.8	1.9		2300	15	0.10	188.0	2TPE470MAFB	2000	
		85	1.8	105		3.5	2.8	1.9		2300	11/300 kHz	0.10	188.0	2TPE470MAJGB	2000	
	2.5	85	2	105	220	3.5	2.8	1.9		2000	15	0.08	110.0	2R5TPE220MAFB	2000	
		105	2.5	105		3.5	2.8	1.9		1800	15/300 kHz	0.08	110.0	2R5TPE220MFGB	2000	
		105	2.5	105		3.5	2.8	1.9		1700	21	0.08	55.0	2R5TPE220MLB	2000	
		85	2	105	3.5	2.8	1.9	1600		25	0.08	55.0	2R5TPE220MAPB	2000		
		105	2.5	105	3.5	2.8	1.9	1400		35	0.08	55.0	2R5TPE220MZB	2000		
		85	2	105	3.5	2.8	1.9	1400		35	0.08	55.0	2R5TPE220MAZB	2000		
		85	2	105	330	3.5	2.8	1.9		1400	35	0.08	82.5	2R5TPE330MAZB	2000	
		NEW 85	2	105		3.5	2.8	1.9		3200	9/300 kHz	0.08	165.0	ETPE330MA9GB	2000	
		NEW 105	2	105		3.5	2.8	1.9		3200	9/300 kHz	0.08	165.0	ETPE330M9GB	2000	
		NEW 85	2	105		3.5	2.8	1.9		2700	15	0.08	165.0	ETPE330MAFB	2000	
		NEW 105	2	105	3.5	2.8	1.9	2700		15	0.08	165.0	ETPE330MFB	2000		
		4	105	4	105	100	3.5	2.8		1.9	1400	35	0.08	40.0	4TPE100MZB	2000
			85	3.2	105	150	3.5	2.8		1.9	1400	35	0.08	60.0	4TPE150MAZB	2000
	85		3.2	105	220	3.5	2.8	1.9		1400	35	0.08	88.0	4TPE220MAZB	2000	
	6.3	105	6.3	105	100	3.5	2.8	1.9		1600	25	0.08	63.0	6TPE100MPB	2000	
		85	5	105		3.5	2.8	1.9		1400	35	0.08	63.0	6TPE100MAZB	2000	
		105	6.3	105		3.5	2.8	1.9		1400	35	0.08	63.0	6TPE100MZB	2000	
		85	5	105	120	3.5	2.8	1.9		1400	35	0.08	75.6	6TPE120MAZB	2000	
		85	5	105	150	3.5	2.8	1.9		1600	25	0.08	94.5	6TPE150MAPB	2000	
		85	5	105		3.5	2.8	1.9		1400	35	0.08	94.5	6TPE150MAZB	2000	
		85	5	105	220	3.5	2.8	1.9		1400	35	0.10	138.6	6TPE220MAZB	2000	
		NEW 85	5	105		3.5	2.8	1.9		1600	25	0.10	138.6	6TPE220MAPB	2000	
		8	85	6.3	105	100	3.5	2.8		1.9	1400	35	0.08	80.0	8TPE100MAZB	2000
	10	85	8	105	47	3.5	2.8	1.9		1400	35	0.08	47.0	10TPE47MAZB	2000	

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 5 minutes

◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

※: Small order quantity (500 pcs/reel) is available with TPE series. Please contact our sales representative if you prefer it.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TPE Series D size



- Low profile (Height 1.5 mm)
- Low ESR(7 mΩ)
- Large capacitance(1500 μF max.)
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications			
	D15E	D2E	D3L	D4
Size code	D15E	D2E	D3L	D4
Category temperature range	-55 °C to +105 °C			
Rated voltage range	6.3 V.DC	2.5 V.DC to 10 V.DC		
Category voltage range	5 V.DC	2.5 V.DC to 10 V.DC		
Rated capacitance range	470 μF	68 μF to 470 μF	220 μF to 680 μF	330 μF to 1500 μF
Capacitance tolerance	±20(120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Surge voltage(V.DC)	Rated voltage x1.15			
Endurance	+105 °C, 2000 h, rated voltage applied ※Rated temp, 85 °C products:85 °C, 1000 h, rated voltage applied6TPE330MAP, 6TPE470MAZU:85 °C, 2000 h			
	Capacitance change	Within±20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage			
	Capacitance change	Within+50 %, -20 %(2R5TPE220M(I, F, 9), 2R5TPE330M(I, F, C, 9, 7), 2R5TPE470M(I, F, C, 9, 7), 2R5TPE1000M(F, C)		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		

## ● Marking and dimensions

(unit : mm)

Size code	L ±0.3	W ±0.2	H ±0.2※1	S ±0.2	W1 ±0.1
D15E	7.3	4.3	1.4	1.1	2.4
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

※1 ±0.1 : D2E, D15E

R. Voltage (V.DC)	2.5	4.0	6.3	10.0
Code	e	g	j	A

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
TPE	2.5	105	2.5	105	220	7.3	4.3	1.8	D2E	3900	9	0.10	55.0	2R5TPE220M9	3000	
						7.3	4.3	1.8		3100	15	0.10	55.0	2R5TPE220MF	3000	
						7.3	4.3	1.8		2800	18	0.10	55.0	2R5TPE220MI	3000	
						7.3	4.3	1.8		2400	25	0.10	55.0	2R5TPE220M	3000	
		7.3	4.3	1.8	330	4400	7	0.10	82.5	2R5TPE330M7	3000					
		7.3	4.3	1.8		3900	9	0.10	82.5	2R5TPE330M9	3000					
		7.3	4.3	1.8		3500	12	0.10	82.5	2R5TPE330MC	3000					
		7.3	4.3	1.8		3100	15	0.10	82.5	2R5TPE330MF	3000					
		7.3	4.3	1.8	470	2800	18	0.10	82.5	2R5TPE330MI	3000					
		7.3	4.3	1.8		2400	25	0.10	82.5	2R5TPE330M	3000					
		7.3	4.3	1.8		4400	7	0.10	117.5	2R5TPE470M7	3000					
		7.3	4.3	1.8		3900	9	0.10	117.5	2R5TPE470M9	3000					
		7.3	4.3	1.8	680	3500	12	0.10	117.5	2R5TPE470MC	3000					
		7.3	4.3	1.8		3100	15	0.10	117.5	2R5TPE470MF	3000					
		7.3	4.3	1.8		2800	18	0.10	117.5	2R5TPE470MI	3000					
		7.3	4.3	2.8		D3L	3500	12	0.10	170.0	2R5TPE680MCL	2500				
		7.3	4.3	2.8	3100		15	0.10	170.0	2R5TPE680MFL	2500					
		7.3	4.3	3.8	1000	D4	3900	15	0.15	250.0	2R5TPE1000MF	2000				
		7.3	4.3	3.8			4400	12	0.15	375.0	2R5TPE1500MC	2000				
		7.3	4.3	3.8		1500	3900	15	0.15	375.0	2R5TPE1500MF	2000				
	7.3	4.3	3.8	2800			18	0.10	60.0	4TPE150MI	3000					
	4	105	4	105	150	D2E	7.3	4.3	1.8	2800	18	0.10	60.0	4TPE150MI	3000	
							7.3	4.3	1.8	3100	15	0.10	88.0	4TPE220MF	3000	
							7.3	4.3	1.8	2800	18	0.10	88.0	4TPE220MI	3000	
							7.3	4.3	1.8	2400	25	0.10	88.0	4TPE220M	3000	
			7.3	4.3	1.8	330	2800	18	0.10	132.0	4TPE330MI	3000				
			7.3	4.3	1.8		2400	25	0.10	132.0	4TPE330M	3000				
			7.3	4.3	2.8		470	3500	12	0.10	188.0	4TPE470MCL	2500			
			7.3	4.3	2.8			3100	15	0.10	188.0	4TPE470MFL	2500			
			7.3	4.3	2.8	D3L	2800	18	0.10	188.0	4TPE470MIL	2500				
			7.3	4.3	2.8		2400	25	0.10	188.0	4TPE470ML	2500				
		7.3	4.3	1.8	100		2800	18	0.10	63.0	6TPE100MI	3000				
		7.3	4.3	1.8			2400	25	0.10	63.0	6TPE100M	3000				
		6.3	105	6.3	105	150	D2E	7.3	4.3	1.8	3100	15	0.10	94.5	6TPE150MF	3000
								7.3	4.3	1.8	2800	18	0.10	94.5	6TPE150MI	3000
								7.3	4.3	1.8	2400	25	0.10	94.5	6TPE150M	3000
								7.3	4.3	1.8	220	2800	18	0.10	138.6	6TPE220MI
				7.3	4.3	1.8	2400	25	0.10	138.6		6TPE220M	3000			
				7.3	4.3	1.8	330	2400	25	0.10	138.6	6TPE220MAP	3000			
				7.3	4.3	1.8		2400	25	0.10	207.9	6TPE330MAP	3000			
7.3				4.3	2.8	D3L		2400	25	0.10	207.9	6TPE330MAL	2500			
7.3	4.3			2.8	3900			9/500 kHz	0.10	207.9	6TPE330MA9EL	2500				
7.3	4.3			2.8	D4	3100	15	0.10	207.9	6TPE330MFL	2500					
7.3	4.3		2.8	2800		18	0.10	207.9	6TPE330MIL	2500						
7.3	4.3		2.8	2400		25	0.10	207.9	6TPE330ML	2500						
7.3	4.3		3.8	D4		4400	10	0.10	207.9	6TPE330MAA	2000					
7.3	4.3		1.4	D15E	1700	35	0.10	296.1	6TPE470MAZU	4000						
7.3	4.3		3.8		D4	3500	18	0.15	296.1	6TPE470MI	2000					
7.3	4.3		3.8	3000		25	0.15	296.1	6TPE470M	2000						
7.3	4.3		3.8	680		3500	18	0.15	428.4	6TPE680MI	2000					
7.3	4.3		3.8			3000	25	0.15	428.4	6TPE680M	2000					
10	105		10	105	68	D2E	7.3	4.3	1.8	2400	25	0.10	68.0	10TPE68M	3000	
							7.3	4.3	2.8	D3L	2800	18	0.10	220.0	10TPE220MIL	2500
		7.3					4.3	2.8	2400		25	0.10	220.0	10TPE220ML	2500	
		7.3					4.3	3.8	D4	3000	25	0.10	330.0	10TPE330M	2000	

※1:Ripple current (100 kHz/ +45 °C) ※2:ESR (100 kHz/+20 °C) ※3:tan δ (120 Hz/+20 °C) ※4:After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

※:Small order quantity (500 pcs/reel) is available with TPE series. Please contact our sales representative if you prefer it.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TPF Series



- Low ESR (5 mΩ)
- Large capacitance (1000 μF max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications		
	D2E	D3L	D4
Size code	D2E	D3L	D4
Category temperature range	-55 °C to +105 °C		
Rated voltage range	2 V.DC	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Category voltage range	2 V.DC	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Rated capacitance range	220 μF to 330 μF	150 μF to 680 μF	470 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage(V.DC)	Rated voltage x1.15		
Endurance	+105 °C, 2000 h, rated voltage applied		
	Capacitance change	Within±20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage		
	Capacitance change	Within+50 %, -20 % of the initial value(2TPF220M6, 2TPF330M6, ETPF1000M6H(5H))	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	≤ 3 times of the initial limit	

## Marking and dimensions

(unit : mm)

Size code	L ±0.3	W ±0.2	H ±0.2※1	S ±0.2	W1 ±0.1
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

※1 ±0.1: D2E

R. Voltage (V.DC)	2.0	2.5	4.0	6.3	10.0
Code	d	e	g	j	A

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard			
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)		
TPF	2	105	2	105	220	7.3	4.3	1.8	D2E	4700	6	0.10	88.0	2TPF220M6	3000		
										4700	6	0.10	132.0	2TPF330M6	3000		
	2.5	105	2.5	105	330	7.3	4.3	2.8	D3L	4400	7	0.10	82.5	2R5TPF330M7L	2500		
										4400	6	0.10	117.5	2R5TPF470M6L	2500		
		470	105	2.5	105	470	7.3	4.3	2.8	D3L	4400	7	0.10	117.5	2R5TPF470M7L	2500	
											4400	10	0.10	117.5	2R5TPF470ML	2500	
			680	105	2.5	105	680	7.3	4.3	3.8	D4	6100	5	0.10	117.5	ETPF470M5H	2000
												4400	6	0.10	170.0	2R5TPF680M6L	2500
				105	2.5	105	680	7.3	4.3	2.8	D3L	4400	7	0.10	170.0	2R5TPF680M7L	2500
												4400	10	0.10	170.0	2R5TPF680ML	2500
		4	105	2.5	105	1000	7.3	4.3	3.8	D4	6100	5	0.10	170.0	ETPF680M5H	2000	
											6100	5	0.10	250.0	ETPF1000M5H	2000	
	105		2.5	105	1000	7.3	4.3	3.8	D4	5600	6	0.10	250.0	ETPF1000M6H	2000		
										4000	12	0.10	132.0	4TPF330ML	2500		
	105		4	105	470	470	7.3	4.3	2.8	D3L	4400	10	0.10	188.0	4TPF470ML	2500	
											4400	10	0.10	272.0	4TPF680MAH	2000	
	6.3		105	6.3	105	220	7.3	4.3	2.8	D3L	6100	5	0.10	138.6	6TPF220M5L	2500	
											4600	9	0.10	138.6	6TPF220M9L	2500	
		105	6.3	105	330	470	7.3	4.3	2.8	D3L	4000	12	0.10	138.6	6TPF220ML	2500	
											3900	9	0.10	207.9	6TPF330M9L	2500	
105		6.3	105	470	470	7.3	4.3	3.8	D4	4400	10	0.10	296.1	6TPF470MAH	2000		
										3600	15	0.10	150.0	10TPF150ML	2500		

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes

◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

※: Small order quantity (500 pcs/reel) is available with TPF series. Please contact our sales representative if you prefer it.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- High voltage (35 V.DC max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	B1S	
Category temperature range	-55 °C to +105 °C	
Rated voltage range	16 V.DC to 35 V.DC	
Category voltage range	16 V.DC to 35 V.DC	
Rated capacitance range	6.8 μF to 33 μF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+105 °C, 1000 h, rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

## Marking and dimensions

(unit : mm)

Size code	L ±0.2	W ±0.2	H ±0.1	S ±0.3	W1 ±0.1
B1S	3.5	2.8	1.1	0.8	2.2

R. Voltage (V.DC)	16	25	35
Code	C	E	V

R. Cap. (μF)	6.8	10	33
Code	W6	A7	N7

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
TQS	16	105	16	105	33	3.5	2.8	1.1	B1S	1500	70	0.1	52.8	16TQS33MBD	2500
	25	105	25	105	10	3.5	2.8	1.1		1000	100	0.1	25	25TQS10MED	2500
	35	105	35	105	6.8	3.5	2.8	1.1		900	150	0.1	23.8	35TQS6R8MHD	2500

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

TPU
TPH
TPG
TPSF
TPE
TPF
<b>TQS</b>
TQC
TA
TV
TH
TPB
TC
TPC



- High voltage (35 V.DC max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	B2	
Category temperature range	-55 °C to +105 °C	
Rated voltage range	16 V.DC to 35 V.DC	
Category voltage range	16 V.DC to 35 V.DC	
Rated capacitance range	3.9 μF to 33 μF	
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+105 °C, 2000 h(16TQC33MYFB: 1000 h), rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

## Marking and dimensions

R. Capacitance code

Polarity marking (+)

Lot. No.

R. Voltage code

Dimensions: L, W, H, S, W1

(unit : mm)

Size code	L ±0.2	W ±0.2	H ±0.1	S ±0.2	W1 ±0.1
B2	3.5	2.8	1.9	0.8	2.2

R. Voltage (V.DC)	16	20	25	35
Code	C	D	E	V

R. Cap. (μF)	2.7	3.9	5.6	8.2	10	15	22	33
Code	L6	Q6	U6	Y6	A7	E7	J7	N7

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
TQC	16	105	16	105	10	3.5	2.8	1.9	B2	800	100	0.10	48.0	16TQC10M	2000
						3.5	2.8	1.9		1000	90	0.10	72.0	16TQC15M	2000
						3.5	2.8	1.9		1000	90	0.10	158.4	16TQC33MYFB	2000
	20	105	20	105	8.2	3.5	2.8	1.9		800	100	0.10	49.2	20TQC8R2M	2000
						3.5	2.8	1.9		1000	90	0.10	132.0	20TQC22MYFB	2000
						3.5	2.8	1.9		800	100	0.10	42.0	25TQC5R6M	2000
	900	100	0.10	112.5	25TQC15MYFB					2000					
	35	105	35	105	3.9	3.5	2.8	1.9		500	400	0.10	40.9	35TQC3R9MYF	2000

※1: Ripple current (100 kHz/ +105 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

※: Small order quantity (500 pcs/reel) is available with TQC series. Please contact our sales representative if you prefer it.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



Surface mount type	TPU
	TPH
	TPG
	TPSF
	TPE
	TPF
	TQS
	<b>TQC</b>
	TA
	TV
	TH
	TPB
	TC
	TPC

- High voltage (35 V.DC max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications			
	D12	D15	D2	D3L
Size code	D12	D15	D2	D3L
Category temperature range	-55 °C to +105 °C			
Rated voltage range	16 V.DC	16 V.DC to 25 V.DC	16 V.DC to 35 V.DC	16 V.DC to 25 V.DC
Category voltage range	16 V.DC	16 V.DC to 25 V.DC	16 V.DC to 35 V.DC	16 V.DC to 25 V.DC
Rated capacitance range	33 μF	22 μF to 47 μF	10 μF to 150 μF	68 μF to 150 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Surge voltage(V.DC)	Rated voltage x1.15			
Endurance	+105 °C, 2000 h, rated voltage applied			
	Capacitance change	Within±20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage			
	Capacitance change	Within+40 %, -20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		

## Marking and dimensions

Size code	L ±0.2 ※1	W ±0.2	H ±0.1 ※2	S ±0.2	W1 ±0.1
D12	7.3	4.3	1.15	1.3	2.4
D15	7.3	4.3	1.4	1.3	2.4
D2	7.3	4.3	1.9	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4

※1 D3L size (±0.3) ※2 D12 size (±0.05), D3L size (±0.2)

R. Voltage (V.DC)	16	20	25	35
Code	C	D	E	V

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
TQC	16	105	16	105	33	7.3	4.3	1.15	D12	1800	40	0.10	52.8	16TQC33MYFS	4500	
						7.3	4.3	1.9	D2	1400	70	0.10	52.8	16TQC33MYFD	3000	
		47	7.3	4.3		1.4	D15	1500	55	0.10	75.2	16TQC47MYFT	3000			
			7.3	4.3		1.9		1800	40	0.10	75.2	16TQC47MW	3000			
		68	7.3	4.3		1.9	D2	1450	55	0.10	75.2	16TQC47MYFD	3000			
			1500	50		0.10		108.8	16TQC68MYF	3000						
		100	7.3	4.3	1.9	D3L	1800	50	0.10	160.0	16TQC100MYF	3000				
			7.3	4.3	2.8		1800	50	0.10	240.0	16TQC150MYF	2500				
		20	105	16	105	150	7.3	4.3	1.9	D2	1500	70	0.15	240.0	1CTQC15173F1	3000
							7.3	4.3	1.9		1400	60	0.10	66.0	20TQC33MYFD	3000
			47	7.3	4.3	1.9	D15	1450	55	0.10	94.0	20TQC47MYF	3000			
				7.3	4.3	1.4		1500	55	0.10	94.0	20TQC47MYFT	3000			
	100		7.3	4.3	1.9	D2	1250	100	0.10	200.0	20TQC100MD2	3000				
			7.3	4.3	2.8		D3L	1700	55	0.10	200.0	20TQC100MYF	2500			
	25	105	25	105	15	7.3	4.3	1.9	D2	1500	45	0.10	38.0	25TQC15MV	3000	
						7.3	4.3	1.9		1000	90	0.10	38.0	25TQC15MYFD	3000	
		22	7.3	4.3	1.9	D2	1500	45	0.10	55.0	25TQC22MV	3000				
			7.3	4.3	1.9		1400	60	0.10	55.0	25TQC22MYFD	3000				
		33	7.3	4.3	1.4	D15	1400	70	0.10	55.0	25TQC22MYFT	3000				
			7.3	4.3	1.9		D2	1400	60	0.10	82.5	25TQC33MYF	3000			
		68	7.3	4.3	2.8	D3L	1400	70	0.10	170.0	25TQC68MYF	2500				
			7.3	4.3	1.9		1000	120	0.10	35.0	35TQC10M	3000				
	35	105	35	105	10	7.3	4.3	1.9	D2	1000	120	0.10	35.0	35TQC10MYF	3000	
						7.3	4.3	1.9		900	150	0.10	52.5	35TQC15MYF	3000	

※1: Ripple current (100 kHz/ +105 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

※: Small order quantity (500 pcs/reel) is available with TQC series. Please contact our sales representative if you prefer it.

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TA Series



- Guaranteed at 85 °C85 %RH
- RoHS compliance, Halogen free

◆This product is not intended for use in any driving application or any other critical functions that affect passenger safety (e.g. Powertrain, ABS, Engine ECU, Airbag, etc.)  
If the intended use of TA/TV series products is for use in other automotive related applications, please contact our sales team. All requests are subject to approval.

## Specifications

Items	Specifications		
Size code	B2	D2E	D3L
Category temperature range	-55 °C to +105 °C		
Rated voltage range	4 V.DC to 10 V.DC	2.5 V.DC to 10 V.DC	
Category voltage range	4 V.DC to 10 V.DC	2.5 V.DC to 10 V.DC	
Rated capacitance range	47 μF to 100 μF	68 μF to 470 μF	150 μF to 680 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage(V.DC)	Rated voltage x1.15		
Endurance	+105 °C, 2000 h, (B2 size : 1000 h)rated voltage applied		
	Capacitance change	Within±20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	+85 °C, 85 to 90 %RH, 500 h, rated voltage applied		
	Capacitance change	Within +50 %, -20 % of the initial value(2R5TAE470M(F), 2R5TAE330M(F, I), 2R5TAE220M(F, 9))	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	

## Marking and dimensions

D2E, D3L Size

R. Capacitance

Polarity marking (+)

Lot. No.

R. Voltage code

B2 Size

R. Capacitance code

Polarity marking (+)

Lot. No.

R. Voltage code

(unit : mm)

Size code	L ±0.3 ※1	W ±0.2	H ±0.2 ※2	S ±0.2	W1 ±0.1
B2	3.5	2.8	1.9	0.8	2.2
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4

※1 ±0.2: B2 ※2 ±0.1: B2, D2E

R. Voltage (V.DC)	2.5	4.0	6.3	10.0
Code	e	g	j	A

B2 size

R. Cap. (μF)	47	68	100
Code	S7	W7	A8

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging (Qty) (pcs)
TA	2.5	105	2.5	105	220	7.3	4.3	1.8	D2E	3900	9	0.10	110.0	2R5TAE220M9	3000
										3100	15	0.10	55.0	2R5TAE220MF	3000
										2400	25	0.10	55.0	2R5TAE220M	3000
		330	3100	15	0.10	82.5	2R5TAE330MF	3000							
			2800	18	0.10	82.5	2R5TAE330MI	3000							
			2400	25	0.10	82.5	2R5TAE330M	3000							
		470	3100	15	0.10	117.5	2R5TAE470MF	3000							
			2400	25	0.10	117.5	2R5TAE470M	3000							
			680	3100	15	0.10	170.0	2R5TAE680MFL		2500					
		2400		25	0.10	170.0	2R5TAE680ML	2500							
	4	105		4	105	100	3.5	2.8	1.9	B2	1100	70	0.08	40.0	4TAB100M
			2800								18	0.10	88.0	4TAE220MI	3000
		220	2400	25	0.10	88.0	4TAE220M	3000							
			470	2800	18	0.10	188.0	4TAE470MIL	2500						
	2400	25		0.10	188.0	4TAE470ML	2500								
	6.3	105	6.3	105	47	3.5	2.8	1.9	B2	1100	70	0.08	29.6	6TAB47M	2000
										1100	70	0.08	42.8	6TAB68M	2000
			2400	25	0.10	94.5	6TAE150M	3000							
			220	2800	18	0.10	138.6	6TAE220MI		3000					
		2400		25	0.10	138.6	6TAE220M	3000							
330		2400	25	0.10	207.9	6TAE330ML	2500								
		10	105	10	105	47	3.5	2.8	B2	1100	70	0.08	47.0	10TAB47M	2000
										2400	25	0.10	68.0	10TAE68M	3000
	150		2400	25	0.10	150.0	10TAE150ML	2500							
220			7.3	4.3	2.8	D3L	2400	25	0.10	220.0	10TAE220ML	2500			

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes  
◆Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.  
Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Guaranteed at 85 °C 85 %RH
- RoHS compliance, Halogen free
- Guaranteed at 125 °C

◆ This product is not intended for use in any driving application or any other critical functions that affect passenger safety (e.g. Powertrain, ABS, Engine ECU, Airbag, etc.)  
If the intended use of TA/TV series products is for use in other automotive related applications, please contact our sales team. All requests are subject to approval.

## Specifications

Items	Specifications	
Size code	D2E	D3L
Category temperature range	-55 °C to +125 °C	
Rated voltage range	6.3 V.DC to 10 V.DC	10 V.DC
Category voltage range	4 V.DC to 6.3 V.DC	6.3 V.DC
Rated capacitance range	68 μF to 150 μF	150 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+125 °C, 1000 h, category voltage applied (105 °C 2000 h, rated voltage applied)	
	temp	125 °C
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 2 times of the initial limit
	DC leakage current	≤ 2 times of the initial limit
Damp heat (Steady state)	+85 °C, 85 % to 90 %, 500 h, rated voltage applied	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit

## Marking and dimensions

(unit : mm)

Size code	L ±0.3	W ±0.2※1	H ±0.2	S ±0.2	W1 ±0.1
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4

※1 ±0.1 : D2E

R. Voltage (V.DC)	6.3	10.0
Code	j	A

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
TV	6.3	105	4	125	150	7.3	4.3	1.8	D2E	2400	25	0.10	94.5	6TVE150M	3000
										2400	25	0.10	68.0	10TVE68M	3000
	10	105	6.3	125	150	7.3	4.3	2.8	D3L	2400	25	0.10	150.0	10TVE150ML	2500

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 5 minutes

◆ Please refer to the P37 to 38 in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TH Series



- Guaranteed at 125 °C 1000 h
- RoHS compliance, Halogen free

## Specifications

Items	Specifications			
	D2E	D2	D3L	D4
Size code	D2E	D2	D3L	D4
Category temperature range	-55 °C to +125 °C			
Rated voltage range	2.5 V.DC to 6.3 V.DC	2.5 V.DC to 10 V.DC	4 V.DC to 6.3 V.DC	6.3 V.DC to 10 V.DC
Category voltage range	1.6 V.DC ~ 4 V.DC	1.6 V.DC to 6.3 V.DC	2.5 V.DC to 4 V.DC	4 V.DC to 6.3 V.DC
Rated capacitance range	150 μF to 330 μF	68 μF to 220 μF	220 μF to 330 μF	220 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Surge voltage(V.DC)	Rated voltage x1.15			
Endurance	+125 °C, 1000 h, Category temperature range voltage applied			
	Capacitance change	Within±20 % of the initial value		
	tan δ	≤ 2 times of the initial limit		
	DC leakage current	≤ 2 times of the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage			
	Capacitance change	Within+40 %, -20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		

## Marking and dimensions

**D2E, D3L Size**

**D2, D4 Size**

(unit : mm)

Size code	L ±0.3	W ±0.2	H ±0.2※1	S ±0.2	W1 ±0.1
D2E	7.3	4.3	1.8	1.3	2.4
D2	7.3	4.3	1.9	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

※1 ±0.2: D2 ※2 ±0.2: D3L, D4

R. Voltage (V.DC)	2.5	4.0	6.3	10.0
Code	e	g	j	A

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging (Qty) (pcs)
THB	4	105	2.5	125	330	7.3	4.3	2.8	D3L	2000	40	0.10	132.0	4THB330ML	2500
										2000	40	0.10	138.6	6THB220ML	2500
	6.3	105	4	125	330	7.3	4.3	3.8	D4	3000	40	0.10	207.9	6THB330M	2000
										3000	35	0.15	296.1	6THB470M	2000
	10	105	6.3	125	220	7.3	4.3	3.8	D4	3000	40	0.10	220.0	10THB220M	2000
										3000	35	0.10	330.0	10THB330M	2000
THC	2.5	105	1.6	125	220	7.3	4.3	1.9	D2	1700	45	0.10	55.0	2R5THC220M	3000
										1900	40	0.10	94.5	6THC150M	3000
										1700	45	0.10	68.0	10THC68M	3000
THE	2.5	105	1.6	125	330	7.3	4.3	1.8	D2E	3100	15	0.10	82.5	2R5THE330MF	3000
										2800	18	0.10	82.5	2R5THE330MI	3000
										2400	25	0.10	82.5	2R5THE330M	3000
	4	105	2.5	125	220	7.3	4.3	1.8	D2E	3100	15	0.10	88.0	4THE220MF	3000
										2800	18	0.10	88.0	4THE220MI	3000
	6.3	105	2.5	125	220	7.3	4.3	1.8	D2E	2400	25	0.10	88.0	4THE220M	3000
										2800	18	0.10	94.5	6THE150MI	3000
	6.3	105	4	125	150	7.3	4.3	1.8	D2E	2400	25	0.10	94.5	6THE150M	3000
										2400	25	0.10	94.5	6THE150M	3000

※1: Ripple current (100 kHz/ +45 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".  
Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.  
Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Standard
- RoHS compliance, Halogen free

## Specifications

Items	Specifications		
	B2	D3L	D4
Size code	B2	D3L	D4
Category temperature range	-55 °C to +105 °C		
Rated voltage range	4 V.DC to 10 V.DC		6.3 V.DC to 10 V.DC
Category voltage range	4 V.DC to 10 V.DC		6.3 V.DC to 10 V.DC
Rated capacitance range	33 μF to 68 μF	150 μF to 330 μF	220 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage(V.DC)	Rated voltage x1.15		
Endurance	+105 °C 2000 h, (B2 size:1000 h) rated voltage applied *Rated temp. 85 °C 1000 h rated voltage applied		
	Capacitance change	Within±20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage		
	Capacitance change	Within+40 %, -20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	≤ 3 times of the initial limit	

## Marking and dimensions

**B2 Size**

**D3L Size**

**D4 Size**

(unit : mm)

Size code	L ±0.2	W ±0.2	H ±0.1	S ±0.2	W1 ±0.1
B2	3.5	2.8	1.9	0.8	2.2
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

R. Voltage (V.DC)	4.0	6.3	10
Code	g	j	A

**B2 size**

R. Cap. (μF)	33	47	68
Code	N7	S7	W7

## Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
TPB	4	105	4	105	68	3.5	2.8	1.9	B2	1100	70	0.08	27.2	4TPB68M	2000	
						7.3	4.3	2.8	D3L	2000	40	0.10	132.0	4TPB330ML	2500	
		6.3	105	6.3	105	68	3.5	2.8	1.9	B2	1100	70	0.08	42.8	6TPB68M	2000
							7.3	4.3	2.8	D3L	2000	40	0.10	138.6	6TPB220ML	2500
			105	6.3	105	220	7.3	4.3	2.8	D3L	2000	40	0.10	207.9	6TPB330MAL	2500
							7.3	4.3	2.8	D3L	2000	40	0.10	207.9	6TPB330ML	2500
	10	105	6.3	105	330	7.3	4.3	2.8	D3L	2000	40	0.10	207.9	6TPB330ML	2500	
						7.3	4.3	3.8	D4	3000	40	0.10	207.9	6TPB330M	2000	
		105	6.3	105	470	7.3	4.3	3.8	D4	3000	35	0.15	296.1	6TPB470M	2000	
						7.3	4.3	3.8	D4	3000	35	0.15	296.1	6TPB470M	2000	
	10	105	10	105	33	3.5	2.8	1.9	B2	1100	70	0.08	33.0	10TPB33M	2000	
						3.5	2.8	1.9	B2	1100	70	0.08	47.0	10TPB47M	2000	
		105	10	105	150	7.3	4.3	2.8	D3L	2000	40	0.10	150.0	10TPB150ML	2500	
						7.3	4.3	2.8	D3L	2000	40	0.10	220.0	10TPB220ML	2500	
		105	10	105	220	7.3	4.3	3.8	D4	3000	40	0.10	220.0	10TPB220M	2000	
						7.3	4.3	3.8	D4	3000	35	0.10	330.0	10TPB330M	2000	

※1:Ripple current (100 kHz/ +45 °C) ※2:ESR (100 kHz/+20 °C) ※3:tan δ (120 Hz/+20 °C) ※4:After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TC Series



- Guaranteed at 125°C
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications		
	D2E	D3L	D4
Size code	D2E	D3L	D4
Category temperature range	-55 °C to +125 °C		
Rated voltage range	4 V.DC to 6.3 V.DC	2.5 V.DC to 10 V.DC	
Category voltage range	3.2 V.DC to 5 V.DC	2 V.DC to 8 V.DC	
Rated capacitance range	100 μF to 330 μF	150 μF to 680 μF	330 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Surge voltage(V.DC)	Rated voltage x1.15		
Endurance	+125 °C, 1000 h, Category temperature range voltage applied		
	Capacitance change	Within±20 % of the initial value	
	tan δ	≦ 2 times of the initial limit	
	DC leakage current	≦ 2 times of the initial limit	
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage		
	Capacitance change	Within+50 %, -20 % of the initial value (ETCF1000M6H (5H))	
	tan δ	≦ 1.5 times of the initial limit	
	DC leakage current	≦ 3 times of the initial limit	

## ● Marking and dimensions

(unit : mm)

Size code	L ±0.3	W ±0.2	H ±0.2※1	S ±0.2	W1 ±0.1
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

※1 ±0.1 : D2E

R. Voltage (V.DC)	2.5	4.0	6.3	10.0
Code	e	g	j	A

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
TCE	2.5	105	2	125	680	7.3	4.3	2.8	D3L	3500	12	0.10	170.0	ETCE680MCL	2500	
		105	2	125		7.3	4.3	2.8		3100	15	0.10	170.0	ETCE680MFL	2500	
		105	2	125	1000	7.3	4.3	3.8	D4	3900	15	0.15	250.0	ETCE1000MF	2000	
	4	105	3.2	125	150	7.3	4.3	1.8	D2E	2800	18	0.10	60.0	4TCE150MI	3000	
		105	3.2	125		7.3	4.3	1.8		3100	15	0.10	88.0	4TCE220MF	3000	
		105	3.2	125	220	7.3	4.3	1.8	2800	18	0.10	88.0	4TCE220MI	3000		
		105	3.2	125		7.3	4.3	1.8	2400	25	0.10	88.0	4TCE220M	3000		
		105	3.2	125	330	7.3	4.3	1.8	2800	18	0.10	132.0	4TCE330MI	3000		
		105	3.2	125		7.3	4.3	1.8	2400	25	0.10	132.0	4TCE330M	3000		
		105	3.2	125	470	7.3	4.3	2.8	D3L	3500	12	0.10	188.0	4TCE470MCL	2500	
		105	3.2	125		7.3	4.3	2.8		3100	15	0.10	188.0	4TCE470MFL	2500	
		105	3.2	125		7.3	4.3	2.8		2800	18	0.10	188.0	4TCE470MIL	2500	
		105	3.2	125		7.3	4.3	2.8		2400	25	0.10	188.0	4TCE470ML	2500	
		6.3	105	5	125	100	7.3	4.3	1.8	D2E	2800	18	0.10	63.0	6TCE100MI	3000
			105	5	125		7.3	4.3	1.8		2400	25	0.10	63.0	6TCE100M	3000
	105		5	125	150	7.3	4.3	1.8	3100	15	0.10	94.5	6TCE150MF	3000		
	105		5	125		7.3	4.3	1.8	2800	18	0.10	94.5	6TCE150MI	3000		
	105		5	125	220	7.3	4.3	1.8	2400	25	0.10	94.5	6TCE150M	3000		
	105		5	125		7.3	4.3	1.8	2800	18	0.10	138.6	6TCE220MI	3000		
	105		5	125	330	7.3	4.3	1.8	2400	25	0.10	138.6	6TCE220M	3000		
	105		5	125		7.3	4.3	2.8	3100	15	0.10	207.9	6TCE330MFL	2500		
	105		5	125	470	7.3	4.3	2.8	D3L	2800	18	0.10	207.9	6TCE330MIL	2500	
	105		5	125		7.3	4.3	2.8		2400	25	0.10	207.9	6TCE330ML	2500	
	105		5	125	680	7.3	4.3	3.8	D4	3500	18	0.15	296.1	6TCE470MI	2000	
	105		5	125		7.3	4.3	3.8		3000	25	0.15	296.1	6TCE470M	2000	
	105		5	125	680	7.3	4.3	3.8	3500	18	0.15	428.4	6TCE680MI	2000		
	105	5	125	7.3		4.3	3.8	3000	25	0.15	428.4	6TCE680M	2000			
	10	105	8	125	220	7.3	4.3	2.8	D3L	2800	18	0.10	220.0	10TCE220MIL	2500	
105		8	125	7.3		4.3	2.8	2400		25	0.10	220.0	10TCE220ML	2500		
105		8	125	330	7.3	4.3	3.8	D4	3000	25	0.10	330.0	10TCE330M	2000		
TCF	2.5	105	2	125	680	7.3	4.3	2.8	D3L	4400	6	0.10	170.0	ETCF680M6L	2500	
		105	2	125		7.3	4.3	2.8		4400	7	0.10	170.0	ETCF680M7L	2500	
		105	2	125		7.3	4.3	2.8		4400	10	0.10	170.0	ETCF680ML	2500	
		105	2	125	1000	7.3	4.3	3.8	D4	6100	5	0.10	170.0	ETCF680M5H	2000	
		105	2	125		7.3	4.3	3.8		6100	5	0.10	250.0	ETCF1000M5H	2000	
		105	2	125		7.3	4.3	3.8		5600	6	0.10	250.0	ETCF1000M6H	2000	
	4	105	3.2	125	330	7.3	4.3	2.8	D3L	4000	12	0.10	132.0	4TCF330ML	2500	
		105	3.2	125	470	7.3	4.3	2.8		4400	10	0.10	188.0	4TCF470ML	2500	
		105	3.2	125	680	7.3	4.3	3.8		D4	4400	10	0.10	272.0	4TCF680MAH	2000
	6.3	105	5	125	220	7.3	4.3	2.8	D3L	6100	5	0.10	138.6	6TCF220M5L	2500	
		105	5	125		7.3	4.3	2.8		4600	9	0.10	138.6	6TCF220M9L	2500	
		105	5	125	330	7.3	4.3	2.8	D3L	4000	12	0.10	138.6	6TCF220ML	2500	
		105	5	125		7.3	4.3	2.8		3900	9	0.10	207.9	6TCF330M9L	2500	
		105	5	125		470	7.3	4.3		3.8	D4	4400	10	0.10	296.1	6TCF470MAH
	10	105	8	125	150	7.3	4.3	2.8	D3L	3600	15	0.10	150.0	10TCF150ML	2500	

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use.

Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type TPC Series



- Low profile (Height 1.1mm)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	B1	D2
Category temperature range	-55 °C to +105 °C	
Rated voltage range	6.3 V.DC to 12.5 V.DC	6.3 V.DC to 10 V.DC
Category voltage range	5 V.DC to 10 V.DC	6.3 V.DC to 10 V.DC
Rated capacitance range	10 μF to 47 μF	68 μF to 330 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage x1.15	
Endurance	+105 °C 2000 h, (B1 size:1000 h) rated voltage applied *Rated temp. 85 °C 1000 h rated voltage applied	
	Capacitance change	Within±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within+40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

## Marking and dimensions

**B1 Size**

**D2 Size**

(unit : mm)

Size code	L ±0.2※1	W ±0.2	H ±0.1※2	S ±0.2	W1 ±0.1
B1	3.5	2.8	1.1	0.8	2.2
D2	7.3	4.3	1.9	1.3	2.4

R. Voltage (V.DC)	6.3	8.0	10	12.5
Code	j	k	A	B

**B1size**

R. Cap. (μF)	10	15	22	33	47
Code	A7	E7	J7	N7	S7

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
TPC	6.3	85	5	105	47	3.5	2.8	1.1	B1	1100	55	0.10	29.6	6TPC47M	3000
		85	5	105		3.5	2.8	1.1		1000	70	0.10	29.6	6TPC47MB	3000
		105	6.3	105	100	D2	7.3	4.3	1.9	1700	45	0.10	63.0	6TPC100M	3000
		105	6.3	105	150		7.3	4.3	1.9	1900	40	0.10	94.5	6TPC150M	3000
		85	5	105	330		7.3	4.3	1.9	1900	40	0.10	207.9	6TPC330MA	3000
	8	85	6.3	105	22	B1	3.5	2.8	1.1	1000	70	0.10	17.6	8TPC22M	3000
		105	8	105	150		7.3	4.3	1.9	1900	40	0.10	120.0	8TPC150M	3000
	10	105	10	105	68	D2	7.3	4.3	1.9	1700	45	0.10	68.0	10TPC68M	3000
		105	10	105	100		7.3	4.3	1.9	1700	45	0.10	100	10TPC100M	3000
	12.5	85	10	105	10	B1	3.5	2.8	1.1	800	80	0.10	12.5	12TPC10M	3000
		85	10	105	15		3.5	2.8	1.1	800	80	0.10	18.8	12TPC15M	3000

※1: Ripple current (100 kHz/ +45 °C)

※2: ESR (100 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 5 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

## Catalog Deletion and EOL Models

### ●Catalog Deletion Models

The following table is a list of our items which have been deleted from our catalogs.

If you are using any of the following models on the deleted list,

please substitute them with the suggested alternative model as soon as possible.

Our company continue to supply them to customers who have already used them, for the time being.

Series	Size code	Models for deletion	Year of deletion	Alternative model	Series	Size code	Models for deletion	Year of deletion	Alternative model	
TPB	B2	8TPB47M	2009	10TPB47M	TPE	D3L	2R5TPE680ML	2012	2R5TPE680MFL	
		6TPB100MA	2009	6TPE100MAZB			2R5TPE680MIL	2011	2R5TPE680MFL	
		6TPB100MAV	2009	6TPE100MAZB		D4	4TPE680M	2011	6TPE680MI	
		6TPB47M	2009	6TPC47MB			4TPE680MI	2012	6TPE680MI	
		4TPB100M	2009	4TPE100MZB			4TPE680MF	2012	4TPF680MAH	
		2R5TPB220MA	2009	2R5TPE220MZB			2R5TPE1000M	2011	2R5TPE1000MF	
		2R5TPB100M	2012	4TPE100MZB			2R5TPE1000MI	2012	2R5TPE1000MF	
		D3L	10TPB100ML	2010			10TPC100M	D3L	6TPF330M5EL	2014
	6TPB150ML		2009	6TPC150M	4TPF470M5EL	2014	-			
	4TPB470ML		2009	4TPE470ML	TPG	B1G	10TPG33M	2011	10TPC33MB	
	4TPB220ML		2009	4TPE220M		B15G	6TPG220MZG	2014	-	
	2R5TPB330ML		2009	2R5TPE330M	TPL	D12T	All models	2013	-	
	10TPB100M		2008	10TPC100M		D15T	All models	2013	-	
	6TPB150M	2008	6TPC150M	D2T		All models	2013	-		
D3	4TPB220M	2008	4TPE220M	TPLF	D2T	All models	2013	-		
	D4	4TPB680M	2009	6TPE680MI	TPSF	B1S	ETPSF200M9ED	2014	-	
		4TPB470M	2009	4TPE470ML		B2S	11TPSF62MAIG	2012	-	
		2R5TPB1000M	2009	2R5TPE1000MF	TPH	A14	ETPH220MAZC	2013	-	
	2R5TPB680M	2009	2R5TPE680MFL	TPU	S09	2R5TPU22MSI	2011	6TPU22MSI		
	TPC	B1	10TPC33MB			2013	12TPG33M	4TPU15MSI	2011	6TPU22MSI
6TPC33M			2012			6TPC47MB	4TPU33MSI	2011	6TPU47MSI	
4TPC47M			2012			6TPC47MB	6TPU33MSK	2013	6TPU47MSI	
2R5TPC56M			2012			6TPB68M	4TPU47MSK	2013	6TPU47MSI	
4TPC220M		2009	4TPE220M			S11	2R5TPU68MSK	2013	4TPU68MSI	
4TPC150M		2009	4TPE150MI		A09		10TPU33MAI	2011	ATPH33MAHA	
2R5TPC330M		2009	2R5TPE330M				6TPU47MAI	2011	6TPH47MHA	
B2		6TPE100MZB	2011				6TPE100MPB	4TPU68MAI	2011	4TPH68MHA
		4TPE150MUB	2013			4TPE150MAZB	2R5TPU100MAI	2011	ETPH100MHA	
		2R5TPE220MIB	2012	2R5TPE220MFGB	TH	D2	4THC220M	2013	4THE220M	
	2R5TPE220MDGB	2013	2R5TPE220MFGB	D3L		10THB100ML	2010	-		
	2R5TPE150MZB	2011	2R5TPE220MZB			D4	2R5THB330ML	2010	-	
	2TPE330MIB	2011	2TPE330MFB	TQC	C	4THB680M	2013	-		
2TPE330MAFGB	2011	2TPE330MAFB	D2			25TQC10M	2011	25TQC15MYFD		
TPE	D2E	4TPE150M				2011	4TPE150MI	20TQC15M	2011	25TQC15MYFD
		2R5TPE470M				2011	2R5TPE470MI	16TQC22M	2011	25TQC22MYFD
		2TPE470M9			2011	2R5TPE470M9	25TQC15M	2012	25TQC15MYFD	
		2TPE470M7			2011	2R5TPE470M7	25TQC22M	2012	25TQC22MYFD	
	2TPE470M6	2011			2R5TPF470M6L	20TQC22M	2012	25TQC22MYFD		
	2TPE330M9	2011			2R5TPE330M9	20TQC22MYFD	2015	25TQC22MYFD		
	2TPE330M7	2011			2R5TPE330M7	20TQC47MY	2012	20TQC47MYF		
	2TPE330M6	2011			2TPF330M6	16TQC33M	2012	16TQC33MYFD		
2R5TPE220MC	2012	2R5TPE220M9			16TQC47M	2012	16TQC47MYFD			
2R5TPE220M7	2012	2R5TPE330M7	16TQC68MY		2012	16TQC68MYF				
D3	D3	25TQC33M	2012		25TQC33MYF	D3L	25TQC33M	2012	25TQC33MYF	
		20TQC47M	2012		20TQC47MYF		20TQC47M	2012	20TQC47MYF	
		16TQC68M	2012	16TQC68MYF	16TQC68M		2012	16TQC68MYF		
		16TQC100M	2012	16TQC100MYF	D3		16TQC100M	2012	16TQC100MYF	
		35TQC2R7MYF	2016	35TQS6R8MHD			B15	35TQC2R7MYF	2016	35TQS6R8MHD

● EOL Models

The following table is a list of the End-Of-Life (EOL) models.

Sales of these items will end as soon as we run out of its stock.

We would like to express our appreciation for your business over the years with these products and we hope the new, alternative parts will continue to serve your needs.

Thank you very much.

Series	Size code	Models for deletion	Year of deletion	Alternative model	Series	Size code	Models for deletion	Year of deletion	Alternative model
TPA	C	10TPA33M	2012/9	10TPB33M	TPE	B2	2R5TPE220MPB	2012/9	2R5TPE220MLB
		6TPA47M	2012/9	10TPB47M			8TPE100MPC2	2012/9	10TPF150ML
	D3	10TPA100M	2012/9	10TPC100M		6TPE150MPC2	2012/9	6TPE150M	
		6TPA150M	2012/9	6TPC150M		6TPE150MIC2	2012/9	6TPE150MI	
		4TPA220M	2012/9	4TPE220M		4TPE220MPC2	2012/9	4TPE220MI	
TPB	B2	8TPB33M	2012/9	10TPB33M		C2	4TPE220MIC2	2012/9	4TPE220MI
		4TPB150MA	2012/9	4TPE150MAZB			4TPE220MFC2	2012/9	4TPE220MF
		4TPB100MV	2012/9	4TPE100MZB			2R5TPE330MIC2	2012/9	2R5TPE330MF
	C	10TPB220MC	2009/10	-			2R5TPE330MFC2	2012/9	2R5TPE330MF
		10TPB68MC	2012/9	10TPC68M			2R5TPE330MCC2	2012/9	2R5TPE330MC
		10TPB47MC	2012/9	10TPC68M			2R5TPE330M9C2	2012/9	2R5TPE330M9
		8TPB82MC	2012/9	8TPE100MAZB			10TPE180MGC	2012/9	10TPE220ML
		6TPB150MC	2012/9	6TPE150M			10TPE150MGC	2012/9	10TPE220ML
		6TPB100MC	2012/9	6TPG100MG			6TPE220MPC	2012/9	6TPE220M
	D3L	4TPB220MC	2012/9	4TPE220MI			6TPE220MIC	2012/9	6TPE220MI
		4TPB150MC	2012/9	6TPE150M		C3	6TPE150MPC	2012/9	6TPE150M
		2R5TPB220MC	2012/9	4TPE220MI			4TPE220MPC	2012/9	4TPE220MI
		16TPB47ML	2003/6	16TQC47MYFD			4TPE220MIC	2012/9	4TPE220MI
		2R5TPB680ML	2012/9	2R5TPE680MFL			2R5TPE330MPC	2012/9	2R5TPE330MF
		2R5TPB470ML	2012/9	2R5TPE470MI			2R5TPE330MIC	2012/9	2R5TPE330MF
16TPB47M	2003/6	16TQC47MYFD	2R5TPE330MFC	2012/9	2R5TPE330MF				
TPC	C1	2R5TPB330M	2012/9	2R5TPE330M	TPF	D2E	2TPF470M6	2012/9	2R5TPF470M6L
		8TPC33M	2012/9	12TPG33M	TPG	B1G	6TPG68MG	2012/9	6TPG100M
		6TPC100MC	2012/9	6TPG100MG			4TPG150M	2012/9	6TPG150M
		6TPC68M	2012/9	6TPG100MG	TPL	D2T	2R5TPL330M7	2011/7	-
		4TPC100M	2012/9	6TPG100MG			2R5TPL220MC	2012/9	-
	D2	4TPC56M	2012/9	-	TPLF	D2T	2TPLF560M6	2011/7	-
		2R5TPC82M	2012/9	-			2TPLF470M7	2012/9	-
		16TPC33M	2003/6	16TQC33MYFD	TPSF	B2S	2TPSF270MC	2012/9	2TPSF270M9G
		2R5TPC220M	2012/9	2R5TPE220M			2TPSF270M9	2012/9	2TPSF270M9G
		TPD	D4D	10TPD150M	2007/10	10TPF150ML	TPU	S08	6TPU10M
6TPD470M	2012/3			6TPF470MAH	4TPU15M	2012/9			6TPU22MSI
6TPD330M	2007/10			6TPF330M9L	2R5TPU22M	2012/9			6TPU22MSI
6TPD220M	2007/10			6TPF220ML	S11	6TPU22MSK		2012/9	6TPU22MSI
4TPD680M	2012/3			4TPF680MAH		4TPU33MSK		2012/9	6TPU47MSI
4TPD470M	2007/10			4TPF470ML		2R5TPU47MSK		2012/9	2R5TPU47MSI
4TPD330M	2007/10			4TPF330ML	B09	8TPU33MBI		2012/9	ATPH33MAHA
2R5TPD1000M	2012/3			ETPF1000M6H		6TPU47MBI		2012/9	6TPH47MHA
2R5TPD1000M8	2012/3			ETPF1000M6H		4TPU68MBI		2012/9	4TPH68MHA
2R5TPD1000M6	2012/3			ETPF1000M6H	TH	D3L	2R5THB470ML	2012/9	6THB470M
2R5TPD1000M5	2012/3			ETPF1000M5H		D4	2R5THB1000M	2012/9	-
2R5TPD680M	2007/10			2R5TPF680ML			2R5THB680M	2012/9	-
2R5TPD680M8	2007/10			2R5TPF680M7L		D4D	6THD330M	2012/3	6TPF330M9L
2R5TPD680M6	2012/3			2R5TPF680M6L			4THD470M	2012/9	-
2R5TPD680M5	2012/3			ETPF680M5H			2R5THD680M	2012/3	2R5TPF680M6L
2R5TPD470M	2007/10		2R5TPF470ML	TR	TR series	-	TA series		
2R5TPD470M8	2007/10		2R5TPF470M7L	APA	D2A	APA series	2006/4	-	
2R5TPD470M6	2012/3		2R5TPF470M6L	APB	D1	APB series	2006/4	-	
2R5TPD470M5	2012/3		ETPF470M5H	APC	D2	APC series	2009/6	-	
				APD	D1	APD series	2009/6	-	

Conductive Polymer Aluminum  
Solid Capacitors

# OS-CON™



SP-Cap™

POSCAP™

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## ⚠ Application Guidelines

### 1. Circuit design

#### 1-1 Prohibited circuits

- (a) Leakage current of the **OS-CON** may increase in the following conditions.
    - (1) Soldering
    - (2) When voltage is not applied: high temperature no-load test, high temperature and high humidity no-load test, rapidly changing temperature test, etc.
  - (b) Avoid the use of the **OS-CON** in the following type of circuits because leakage current may increase.
    - (1) High-impedance circuits
    - (2) Coupling circuits
    - (3) Time constant circuits
    - (4) Other circuits that are significantly affected by leakage current
- ※ If you plan to use 2 or more **OS-CONs** in a series connection, please contact us before use

#### 1-2 Failure and life-span

The failure rate is 0.5 % /1000 h (Confidence level: 60 %) based on JIS C 5003.  
The prospective failure is not zero. The mainly failure modes are as follows.

##### 1-2-1 Contingency failure

The most common failure mode is a short circuit. Mainly caused by the soldering or operating temperature environment, along with heat stresses, electrical stresses or mechanical stresses as follows.

- (1) Applying voltage over the rated voltage.
- (2) Applying reverse voltage
- (3) Excessive mechanical stress
- (4) Applying rush current by sudden charge or discharge out of the specification.
  - (a) The following phenomenon is seen when short-current is applied to the **OS-CON**.
    - (1) When current is relatively low ( $\phi$  10: approx 1 A or less,  $\phi$  8: approx 0.5 A or less,  $\phi$  6.3: approx 0.2 A or less) The **OS-CON** becomes heated, but no effects are visible even when the current is continuously carried.
    - (2) When the short circuit currents exceed the mentioned value above.
      - After internal temperature increase, sealing rubber may be turned over.
      - In some cases, odorous gas may be produced.
    - (b) In case a short circuit occurs, ensure safety by fully considering the followings.
      - (1) If odorous gas is released, turn off the main power of the equipment.
        - In this case, keep your face and hands away from the area.
      - (2) Though it depends on the conditions, it takes seconds to minutes before odorant gas generates.
        - Protective circuit should operate in this period.
      - (3) If the gas comes into eyes, rinse immediately. If the gas is inhaled, gargle immediately.
      - (4) Do not lick the electrolyte. If the electrolyte touches skin, wash it off with soap immediately.
      - (5) The **OS-CON** contains combustible substances. In case a large current continues to flow after a short circuit, in the worst case, the shorted-out section may ignite. For safety, install a redundant circuit or a protective circuit, etc.

##### 1-2-2 Wear-out failure (life time)

When life time span exceeded the specified guarantee time of endurance and damp heat, electrolyte might insulate and cause electric characteristic changed. This is called an open circuit.  
The electric characteristics of capacitance and ESR may possibly change within the specified range in specifications even if it is used under the condition of the rated voltage, electric and mechanical performance. Please note it when designing.

### 1-3 Leakage current

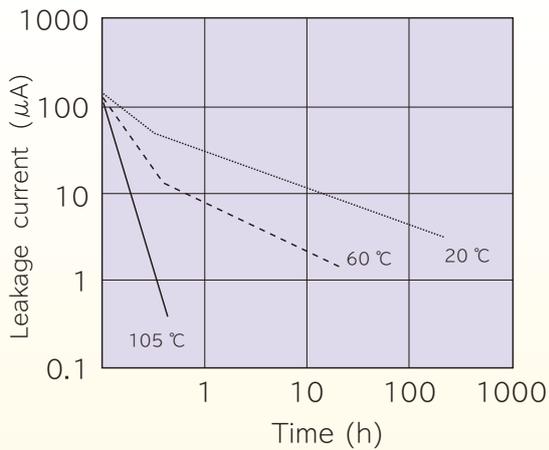
Mechanical stress may cause OS-CON's leakage current increased.

In such a case, leakage current will gradually decrease by applying voltage (within the category voltage and the upper limit of category temperature).

Then, self-healing speed of leakage current is faster when it is near to the upper limit of category temperature and the category voltage.

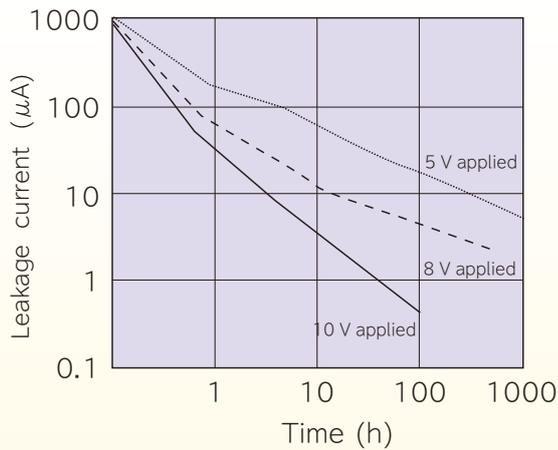
#### OS-CON

leakage current restoration characteristics  
16 V.DC/10 μF (16 V.DC applied)



#### OS-CON

leakage current restoration characteristics  
10 V.DC/33 μF (Ambient temperature:65 °C)  
(Measured voltage:10 V)



※To make the recovery of LC values easy to show, samples that LC values have been increased on purpose are used in the test.

### 1-4 Rapid charge and discharge limitation

Allowance of a large rush current to flow due to rapid charge and discharge may result in short circuit or large leakage current. The protection circuit, to maintain high reliability, is recommended when rush current to flow to the OS-CON is in the following cases.

- (a) Products which 10 times of allowable ripple current is less than 10 A: It is when 10 A or over of rush current is applied.
- (b) Products which 10 times of allowable ripple current is 10 A or over: It is when rush current, which the figure is over 10 times of allowable ripple current, is applied.

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SVP	
SEK	Radial lead type
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Hybrid	
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## 2. Mounting

### 2-1 Soldering with a soldering iron

- (a) When lead terminals for radial lead type must be processed because the lead pitch and the PCB holes do not match, process them without any stresses to the **OS-CON** before soldering.
- (b) Solder without any excessive stresses to the **OS-CON** itself.
- (c) When the **OS-CON** has been soldered once and needs to be removed, remove it after the solder has been completely melted.
- (d) Do not let the tip of the soldering iron touch (a) the **OS-CON** itself.

### 2-2 Flow soldering

- (a) Do not apply flow soldering to **OS-CON** SMD type.
- (b) Do not solder the **OS-CON** itself by submerging it in melted solder.
- (c) Solder the opposite side that the **OS-CON** is mounted on.
- (d) Note that flux does not adhere to anywhere except the lead terminal.
- (e) Note that other components do not fall over and touch the **OS-CON** when soldering.

### 2-3 Reflow soldering

- (a) Do not apply reflow soldering to **OS-CON** Radial Lead type.
- (b) Please contact us for setting VPS conditions.

### 2-4 Capacitor handling after soldering

- Do not subject the **OS-CON** to excessive stress as follows.
- (a) Do not tilt, bend or twist the **OS-CON**.
  - (b) Do not move the PCB with holding the **OS-CON** itself.
  - (c) Do not hit the **OS-CON** with objects.
  - (d) When stacking PCBs, make sure that the **OS-CON** does not touch other PCBs or components.

### 2-5 Circuit board cleaning

Check the following items before washing PC board with these detergents: high quality alcohol-based cleaning fluid such as Pine- $\alpha$  ST-100S, clean thru 750H, 750L, 710M, 750K or Techno Care FRW 14 through 17 or detergents including substitute freon as AK-225AES or IPA.

- (a) Use immersion or ultrasonic waves to clean within 2 minutes.
- (b) The temperature of the cleaning fluid should be less than 60 °C.
- (c) Watch the contamination of the detergent (a) such as conductivity, pH, specific gravity, water content, etc.
- (d) Do not store the **OS-CON** in a location subject to gases from the cleaning fluid or in an airtight container after cleaning.
- (e) Dry the PCB or **OS-CON** with hot air that should be less than the upper category temperature.
- (f) Please note that indication may disappear when rubbing print side after washing depending on a cleaner.
- (g) Please contact us for details about detergents, cleaning methods and detergents other than those listed above.

### 2-6 Fixatives and coating materials

- (a) Select the appropriate covering and sealant materials for the **OS-CON**. In particular, don't use acetone in the fixative, coating agent and diluent.
- (b) Before applying the fixative or coating, completely remove any flux residue and foreign matter from the area where the board and the **OS-CON** will be jointed together.
- (c) Allow any detergent to dry before applying the fixative or coating.
- (d) Please contact us for the fixative and coating heat curing conditions.

### 2-7 Capacitor insulation

Be sure to completely separate the case, negative lead terminal, positive lead terminal and PC board patterns with each other due to the following reasons.

- (a) Insulation is not guaranteed at a part of resin on the surface of a case.
- (b) It offers inconstant resistance between a case and a negative lead terminal and it isn't insulated.

### 3.Storage

Open the bags just before mounting and use up all products once opened,  
 For keeping a good solderability, store the **OS-CON** as follows.

※ Due to the feature of the plating material of the lead terminal, it may rarely become dull color during the specified period as follow, but it will not affect the solderability.

		Before unsealing	After unsealing
SMD type※1		Within 24 months after shipment	Within 30 days from opening (packaged with carrier tape)
Radial lead type	Bag packing product	Within 30 months after shipment	Within 7 days from opening
	Taping product	Within 24 months after shipment	

※1 The JEDEC J-STD-020 standard is not applicable

### Intellectual property right

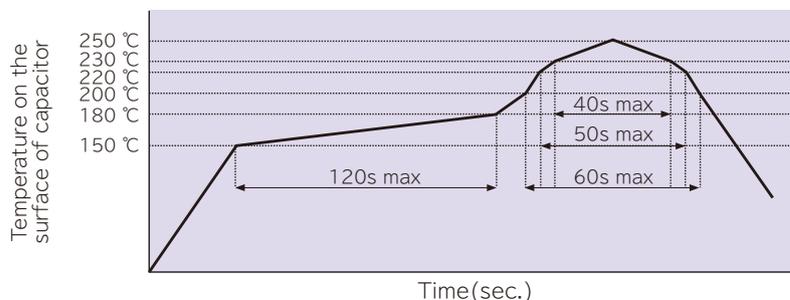
We, Panasonic Group are providing the product and service that customers can use without anxiety, and are working positively on the protection of our products under intellectual property rights.  
 Representative patents relating to **OS-CON** are as follows:

US Patent No. 6310765, 6508846, 7158367

Recommendable reflow soldering

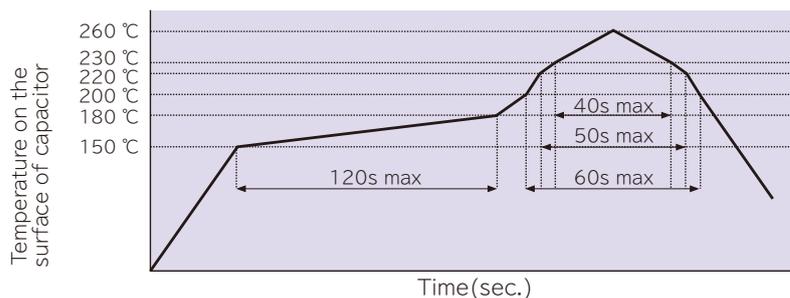
Peak temperature 250 °C lead free reflow soldering profile

The cycles of reflow soldering: 2 max.



Peak temperature 260 °C lead free reflow soldering profile

The cycles of reflow soldering: 1 max.



Soldering with a soldering iron

Tip of a soldering iron: 400±10 °C  
Working time: 5 sec. max

Flow soldering

	Temperature	Time	Flow number
Preheating	120 °C or less (ambient temperature)	120 sec. or less	1 time
Soldering condition	260 °C + 5 °C or less	10 + 1 sec. or less	2 times or less ※1

※1. When soldering 2 times, total immersion time should be 10 + 1 sec. or less.

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POSCAP

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SVPK

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SVPF

SVPA

SVPC

SVPB

SVPD

SVPS

SVPE

SVQP

SVP

Surface mount type

SEK

SEF

SEPG

SXE

SEPF

SEPC

SEQP

SEP

Radial lead type

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Hybrid

Guidelines and Precautions

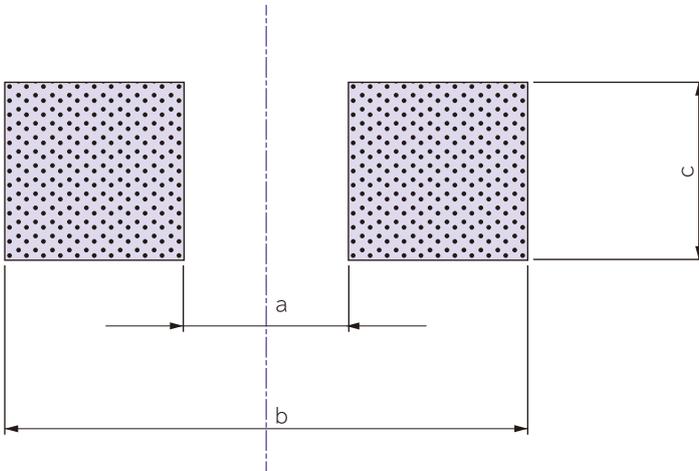
Mounting specifications/  
Packing specifications

Selection guide

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Surface mount type

Land/Pad Pattern



(unit : mm)

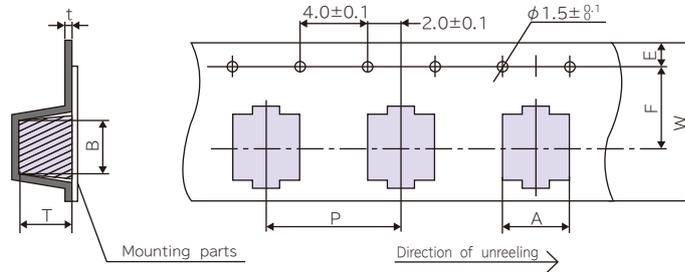
Size code	a	b	c
A5	1.0	6.2	1.6
B45	1.4	7.4	1.6
B6	1.4	7.4	1.6
C5	2.1	9.1	1.6
C55	2.1	9.1	1.6
C6	2.1	9.1	1.6
C8	2.1	9.1	1.6
C10	2.1	9.1	1.6
E7	2.8	11.1	1.9
E12	2.8	11.1	1.9
F8	4.3	13.1	1.9
F12	4.3	13.1	1.9

## Packing specifications

### ■ Surface mount type

#### 1. Taping

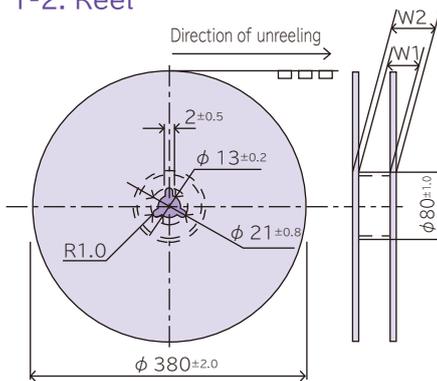
##### 1-1. Carrier tape



(unit : mm)

Dimension Size code	A±0.2	B±0.2	W±0.3	F±0.1	E±0.1	P±0.1	t±0.1	T±0.2
A5	4.7	4.7	12.0	5.5	1.75	8.0	0.4	5.8
B45	5.6	5.6	16.0	7.5	1.75	8.0	0.4	4.8
B6	5.6	5.6	16.0	7.5	1.75	8.0	0.4	6.2
C5	6.9	6.9	16.0	7.5	1.75	12.0	0.4	5.3
C55	6.9	6.9	16.0	7.5	1.75	12.0	0.4	6.2
C6	6.9	6.9	16.0	7.5	1.75	12.0	0.4	6.2
C8	7.0	7.0	16.0	7.5	1.75	12.0	0.5	8.2
C10	7.0	7.0	24.0	11.5	1.75	16.0	0.5	10.5
E7	8.6	8.6	24.0	11.5	1.75	12.0	0.4	7.2
E12	8.6	8.6	24.0	11.5	1.75	16.0	0.5	12.3
F8	10.7	10.7	24.0	11.5	1.75	16.0	0.4	8.2
F12	10.7	10.7	24.0	11.5	1.75	16.0	0.4	13.0

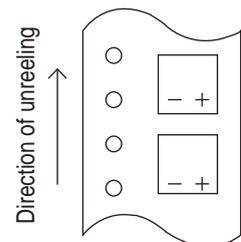
##### 1-2. Reel



(単位:mm)

Size code	W1±0.5	W2±1.0
A5	13.0	17.5
B6, B45, C5, C55, C6, C8	17.0	21.5
C10, E7, F8, E12, F12	25.0	29.5

##### 1-3. Polarity



#### 2. Minimum packing quantity and weight

Size code	Quantity(pcs./Reel, φ 380)	Typical weight(g)
A5	2000	700
B45	2500	900
B6	1500	800
C5	1300	800
C55	1000	800
C6	1000	800
C8	900	800
C10	500	700
E7	1000	1100
E12	400	800
F8	500	1000
F12	400	1000

# Packing specifications

## Packing specifications

### Specifications for radial lead type

#### 1. Lead terminal process

##### 1-1. Applications

※ The following table is a standard specification. Please contact us separately concerning specifications except for that mentioned below. Because of a limit on the length of a model name, the part of process name changes to +S from +TSS, +D from +TS, +3 from +C3. Please contact us for details.

Series	Size code	Bag-packed products (lead terminal cutting)		Taping
		Not processed	Straight cut	
SEP, SEQP, SEPC, SEPF, SXE, SEPG, SEK, SEF	B9, C55, C6, C9, C10, E7, E9, E12	○	+C3	+TSS (+S)
	E13	○	+C3	+TS (+D)
	F8, F13	○	+C3	+T

##### 1-2. Lead terminal cutting

Lead terminal cutting code	Process names	Size code (φD)	Dimensions (unit : mm)										
+C3 (+3)	Straight cut	B9 (φ 5)	<table border="1" style="margin-left: 20px;"> <tr> <td>C3</td> <td>L 3.5</td> </tr> </table>	C3	L 3.5								
		C3		L 3.5									
C55, C6, C9, C10 (φ 6.3) E7, E9, E12, E13 (φ 8) F8, F13 (φ 10)													
			<table border="1"> <thead> <tr> <th>Size code</th> <th>B9</th> <th>C55, C6, C9, C10</th> <th>E7, E9, E12, E13</th> <th>F8, F13</th> </tr> </thead> <tbody> <tr> <td>F</td> <td>2.0</td> <td>2.5</td> <td>3.5</td> <td>5.0</td> </tr> </tbody> </table>	Size code	B9	C55, C6, C9, C10	E7, E9, E12, E13	F8, F13	F	2.0	2.5	3.5	5.0
Size code	B9	C55, C6, C9, C10	E7, E9, E12, E13	F8, F13									
F	2.0	2.5	3.5	5.0									

##### 1-3. Lead terminal taping

Taping code	F	Size code (φD)	Taping
+T	F=5.0 mm	F8, F13 (φ 10)	
+TS (+D)	F=3.5 mm	E13 (φ 8)	
+TSS (+S)	F=2.0 mm F=2.5 mm F=3.5 mm	B9 (φ 5) C55, C6, C9, C10 (φ 6.3) E7, E9, E12 (φ 8)	

(unit : mm)

Code	F	P	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	Δh	W	W <sub>0</sub>	W <sub>1</sub>	W <sub>2</sub>	H	φD <sub>0</sub>	t	l	L	
Tolerance	$\pm 0.2$	$\pm 1.0$	$\pm 0.2$	$\pm 0.5$	$\pm 1.0$	$\pm 1.0$	$\pm 0.5$	min.	$\pm 0.5$	max	$\pm 0.75$	$\pm 0.2$	$\pm 0.3$	max	max	
+T	φ 10	5.0	12.7	12.7	3.85	6.35	0	18.0	9.5	9.0	2.5	18.5	4.0	0.6	0	11.0
+TS (+D)	φ 8	3.5	12.7	12.7	4.60	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0	0.6	0	11.0
+TSS (+S)	φ 5	2.0	12.7	12.7	5.35	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0	0.6	0	11.0
	φ 6.3	2.5	12.7	12.7	5.10	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0	0.6	0	11.0
	φ 8	3.5	12.7	12.7	4.60	6.35	0	18.0	9.5	9.0	2.5	17.5	4.0	0.6	0	11.0

#### 2. Minimum packing quantity and weight

Size code	Case size	Processed type discrete lead terminals		Zig-zag pack taping type		Size code	Case size	Processed type discrete lead terminals		Zig-zag pack taping type	
		Quantity (pcs./Bag)	Typical weight (g)	Quantity (pcs./Box)	Typical weight (g)			Quantity (pcs./Bag)	Typical weight (g)	Quantity (pcs./Box)	Typical weight (g)
B9	φ 5	500	180	2000	1000	E9	φ 8	200	130	1000	900
C55	φ 6.3	500	150	1500	650	E12	φ 8	200	200	1000	980
C6	φ 6.3	500	160	1500	700	E13	φ 8	200	160	1000	1060
C9	φ 6.3	500	240	1500	1000	F8	φ 10	200	180	500	890
C10	φ 6.3	500	※	1500	※	F13	φ 10	200	280	500	940
E7	φ 8	200	110	1000	820						

※ Please contact us.

## SMD type

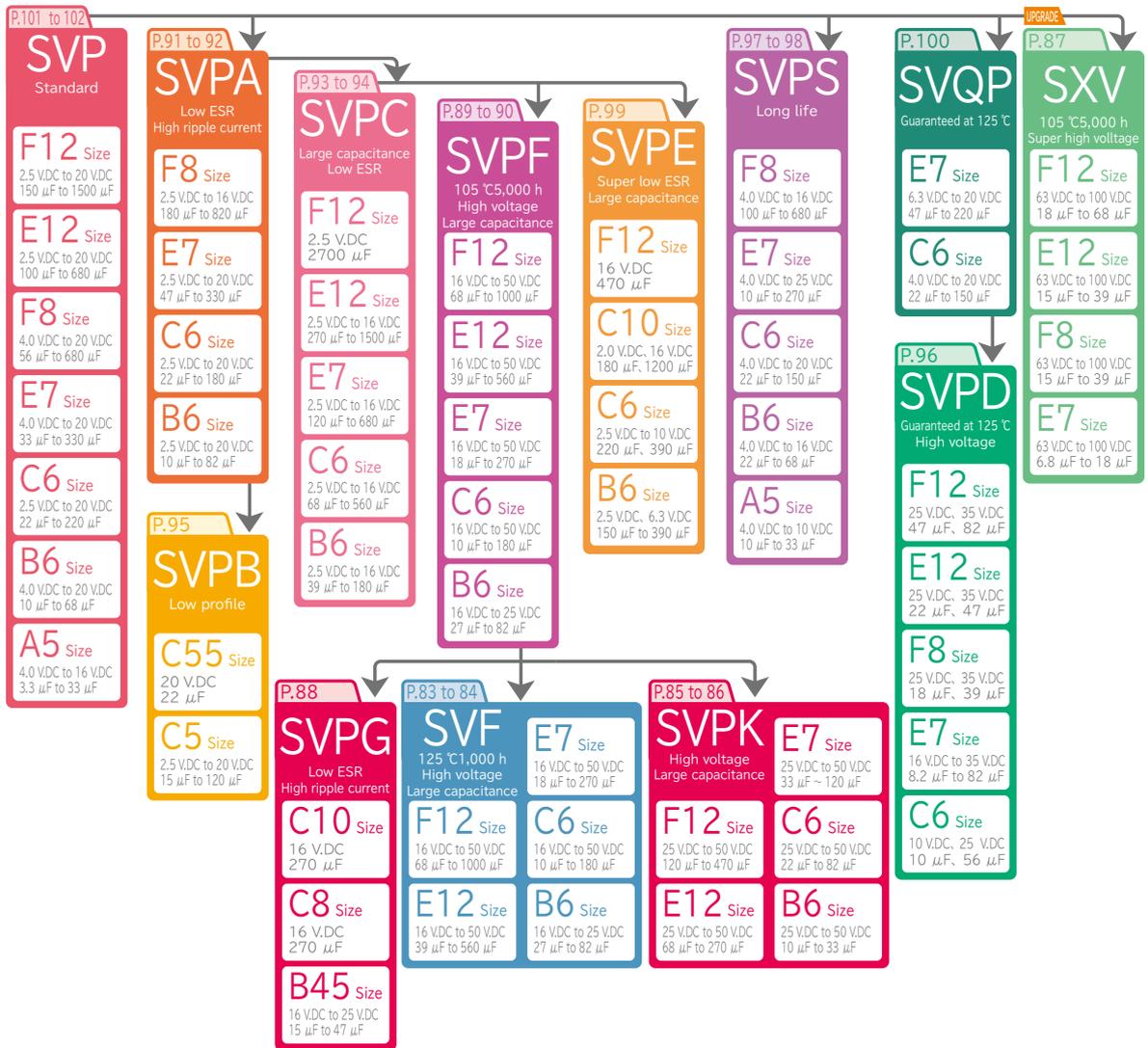
Series	Page	Features	Small size/low profile	Large capacitance	Low ESR	High voltage	Long life/high reliability	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Marking color	Size code	Size (mm)	
														φD	L
SVF	83 to 84	High voltage Large capacitance 125 °C 1000 h	●	●	●	●	●	-55 to 125	16 to 25	27 to 40	27 to 82	Purple	B6	5.0	5.9
								-55 to 125	16 to 50	22 to 40	10 to 180	Purple	C6	6.3	5.9
								-55 to 125	16 to 50	22 to 35	18 to 270	Purple	E7	8.0	6.9
								-55 to 125	16 to 50	14 to 25	39 to 560	Purple	E12	8.0	11.9
								-55 to 125	16 to 50	12 to 20	68 to 1000	Purple	F12	10.0	12.6
SVPK	85 to 86	High voltage Large capacitance 125 °C 1000 h	●	●	●	●	●	-55 to 125	25 to 50	35 to 80	10 to 33	Purple	B6	5.0	5.9
								-55 to 125	25 to 50	25 to 35	22 to 82	Purple	C6	6.3	5.9
								-55 to 125	25 to 50	24 to 35	33 to 120	Purple	E7	8.0	6.9
								-55 to 125	25 to 50	16 to 25	68 to 270	Purple	E12	8.0	11.9
								-55 to 125	25 to 50	14 to 20	120 to 470	Purple	F12	10.0	12.6
SXV	87	Super high voltage 125 °C 1000 h	●	●	●	●	●	-55 to 125	63 to 100	60	6.8 to 18	Purple	E7	8.0	6.9
								-55 to 125	63 to 100	50 to 60	15 to 39	Purple	F8	10.0	7.9
								-55 to 125	63 to 100	25 to 40	15 to 39	Purple	E12	8.0	11.9
SVPG	88	Low ESR High ripple current 105 °C 5000 h	●	●	●	●	●	-55 to 105	16 to 25	25 to 30	15 to 47	Purple	B45	5.0	4.4
								-55 to 105	16	8	270	Purple	C10	6.3	9.9
								-55 to 105	16 to 25	27 to 40	27 to 82	Purple	B6	5.0	5.9
SVPF	89 to 90	High voltage Large capacitance 105 °C 5000 h	●	●	●	●	●	-55 to 105	16 to 25	27 to 40	27 to 82	Purple	B6	5.0	5.9
								-55 to 105	16 to 50	22 to 40	10 to 180	Purple	C6	6.3	5.9
								-55 to 105	16 to 50	22 to 35	18 to 270	Purple	E7	8.0	6.9
								-55 to 105	16 to 50	14 to 25	39~560	Purple	E12	8.0	11.9
								-55 to 105	16 to 50	12 to 20	68 to 1000	Purple	F12	10.0	12.6
SVPA	91 to 92	Low ESR High ripple current	●	●	●	●	●	-55 to 105	2.5 to 20	30 to 40	10 to 82	Purple	B6	5.0	5.9
								-55 to 105	2.5 to 20	20 to 35	22 to 180	Purple	C6	6.3	5.9
								-55 to 105	2.5 to 20	20 to 33	47 to 330	Purple	E7	8.0	6.9
								-55 to 105	2.5 to 16	19 to 29	180 to 820	Purple	F8	10.0	7.9
SVPC	93 to 94	Low ESR Large capacitance	●	●	●	●	●	-55 to 105	2.5 to 16	19 to 35	39 to 180	Purple	B6	5.0	5.9
								-55 to 105	2.5 to 16	15 to 30	68 to 560	Purple	C6	6.3	5.9
								-55 to 105	2.5 to 16	19 to 27	120 to 680	Purple	E7	8.0	6.9
								-55 to 105	2.5 to 16	9 to 16	270 to 1500	Purple	E12	8.0	11.9
								-55 to 105	2.5	12	2700	Purple	F12	10.0	12.6
SVPB	95	Low profile	●	●	●	●	●	-55 to 105	2.5 to 20	40 to 45	15 to 120	Purple	C5	6.3	4.9
								-55 to 105	20	35	22	Purple	C55	6.3	5.4
SVPD	96	Guaranteed at 125 °C High voltage 85 °C 85 % RH	●	●	●	●	●	-55 to 125	10 to 25	45 to 65	10 to 56	Purple	C6	6.3	5.9
								-55 to 125	16 to 35	40 to 70	8.2 to 82	Purple	E7	8.0	6.9
								-55 to 125	25 to 35	45 to 60	18 to 39	Purple	F8	10.0	7.9
								-55 to 125	25 to 35	30 to 50	22 to 47	Purple	E12	8.0	11.9
								-55 to 125	25 to 35	28 to 30	47 to 82	Purple	F12	10.0	12.6
SVPS	97 to 98	Long life	●	●	●	●	●	-55 to 105	4.0 to 10	200 to 220	10 to 33	Purple	A5	4.0	5.4
								-55 to 105	4.0 to 16	30 to 90	22 to 68	Purple	B6	5.0	5.9
								-55 to 105	4.0 to 20	22 to 60	22 to 150	Purple	C6	6.3	5.9
								-55 to 105	4.0 to 25	22 to 60	10 to 270	Purple	E7	8.0	6.9
								-55 to 105	4.0 to 16	20 to 35	100 to 680	Purple	F8	10.0	7.9
SVPE	99	Super low ESR Large capacitance	●	●	●	●	●	-55 to 105	2.5 to 6.3	10 to 15	150 to 390	Purple	B6	5.0	5.9
								-55 to 105	2.5 to 10	10 to 20	220 to 390	Purple	C6	6.3	5.9
								-55 to 105	2.0 to 16	8 to 11	180 to 1200	Purple	C10	6.3	9.9
								-55 to 105	16	10	470	Purple	F12	10.0	12.6
SVQP	100	Guaranteed at 125 °C	●	●	●	●	●	-55 to 125	4.0 to 20	40 to 60	22 to 150	Purple	C6	6.3	5.9
								-55 to 125	6.3 to 20	35 to 45	47 to 220	Purple	E7	8.0	6.9
SVP	101 to 102	Standard	●	●	●	●	●	-55 to 105	4.0 to 16	200 to 260	3.3 to 33	Purple	A5	4.0	5.4
								-55 to 105	4.0 to 20	60 to 120	10 to 68	Purple	B6	5.0	5.9
								-55 to 105	2.5 to 20	23 to 60	22 to 220	Purple	C6	6.3	5.9
								-55 to 105	4.0 to 20	35 to 45	33 to 330	Purple	E7	8.0	6.9
								-55 to 105	4.0 to 20	25 to 40	56 to 680	Purple	F8	10.0	7.9
								-55 to 105	2.5 to 20	13 to 24	100 to 680	Purple	E12	8.0	11.9
								-55 to 105	2.5 to 20	12 to 20	150 to 1500	Purple	F12	10.0	12.6

Radial lead type

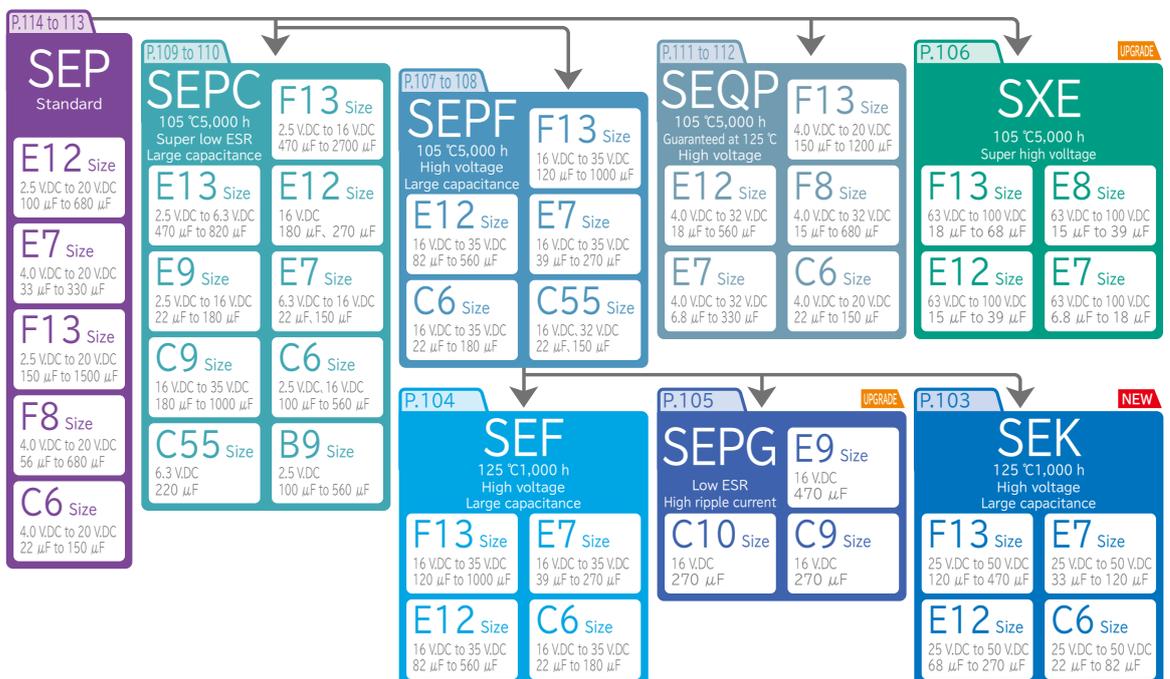
Series	Page	Features	Small size/Low profile	Large capacitance	Low ESR	High voltage	Long life/High reliability	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Marking color	Size code	Size (mm)	
														φD	L
NEW SEK	103	High voltage Large capacitance 125 °C 1000 h		●		●	●	-55 to 125	25 to 50	25 to 35	22 to 82	Purple	C6	6.3	5.9
								-55 to 125	25 to 50	24 to 35	33 to 120	Purple	E7	8.0	6.9
								-55 to 125	25 to 50	16 to 25	68 to 270	Purple	E12	8.0	11.9
								-55 to 125	25 to 50	14 to 20	120 to 470	Purple	F13	10.0	12.9
SEF	104	High voltage Large capacitance 125 °C 1000 h		●		●	●	-55 to 125	16 to 35	22 to 35	22 to 180	Purple	C6	6.3	5.9
								-55 to 125	16 to 35	22 to 30	39 to 270	Purple	E7	8.0	6.9
								-55 to 125	16 to 35	14 to 20	82 to 560	Purple	E12	8.0	11.9
								-55 to 125	16 to 35	12 to 18	120 to 1000	Purple	F13	10.0	12.9
UPGRADE SEPG	105	Low ESR High ripple current 105 °C 5000 h			●	●	-55 to 105	16	10	270	Purple	C9	6.3	8.9	
							-55 to 105	16	8	270	Purple	C10	6.3	9.9	
							-55 to 105	16	8	470	Purple	E9	8.0	8.9	
UPGRADE SXE	106	Super high voltage 125 °C 1000 h				●	●	-55 to 125	63 to 100	60	6.8 to 18	Purple	E7	8.0	6.9
								-55 to 125	63 to 100	50 to 60	15 to 39	Purple	F8	10.0	7.9
								-55 to 125	63 to 100	25 to 40	15 to 39	Purple	E12	8.0	11.9
								-55 to 125	63 to 100	25 to 30	18 to 68	Purple	F13	10.0	12.9
SEPF	107 to 108	Small size / Low profile High voltage Large capacitance 105 °C 5000 h	●	●		●	●	-55 to 105	16 to 32	30 to 35	22 to 150	Purple	C55	6.3	5.4
								-55 to 105	16 to 35	22 to 35	22 to 180	Purple	C6	6.3	5.9
								-55 to 105	16 to 35	22 to 30	39 to 270	Purple	E7	8.0	6.9
								-55 to 105	16 to 35	14 to 20	82 to 560	Purple	E12	8.0	11.9
								-55 to 105	16 to 35	12 to 18	120 to 1000	Purple	F13	10.0	12.9
SEPC	109 to 110	Super low ESR Large capacitance Small size / Low profile 105 °C 5000 h	●	●	●	●	-55 to 105	2.5	7	100 to 560	Purple	B9	5.0	8.9	
							-55 to 105	6.3	18	220	Purple	C55	6.3	5.4	
							-55 to 105	2.5 to 16	10 to 24	100 to 560	Purple	C6	6.3	5.9	
							-55 to 105	2.5 to 16	7 to 10	100 to 820	Purple	C9	6.3	8.9	
							-55 to 105	2.5 to 16	8 to 22	150 to 1000	Purple	E7	8.0	6.9	
							-55 to 105	2.5 to 16	5 to 10	180 to 1000	Purple	E9	8.0	8.9	
							-55 to 105	16	11 to 16	180 to 270	Purple	E12	8.0	11.9	
							-55 to 105	2.5 to 6.3	7 to 8	470 to 820	Purple	E13	8.0	12.9	
-55 to 105	2.5 to 16	7 to 10	470 to 2700	Purple	F13	10.0	12.9								
SEQP	111 to 112	Guaranteed at 125 °C R. voltage 32 V.DC max.				●	●	-55 to 125	4.0 to 20	40 to 60	22 to 150	Purple	C6	6.3	5.9
								-55 to 125	4.0 to 32	35 to 100	6.8 to 330	Purple	E7	8.0	6.9
								-55 to 125	4.0 to 32	25 to 80	15 to 680	Purple	F8	10.0	7.9
								-55 to 125	4.0 to 32	13 to 50	18 to 560	Purple	E12	8.0	11.9
								-55 to 125	4.0 to 20	12 to 20	150 to 1200	Purple	F13	10.0	12.9
SEP	113 to 114	Standard						-55 to 105	4.0 to 20	40 to 60	22 to 150	Purple	C6	6.3	5.9
								-55 to 105	4.0 to 20	35 to 45	33 to 330	Purple	E7	8.0	6.9
								-55 to 105	4.0 to 20	25 to 40	56 to 680	Purple	F8	10.0	7.9
								-55 to 105	2.5 to 20	13 to 24	100 to 680	Purple	E12	8.0	11.9
								-55 to 105	2.5 to 20	12 to 20	150 to 1500	Purple	F12	10.0	12.9

# Series system diagram

## SMD type



## Radial lead type



Guidelines and Precautions	Surface mount type
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Surface mount type	
Guidelines and Precautions	Surface mount type
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Products list	Surface mount type
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SVPK	Surface mount type
SXV	
SVPG	Surface mount type
SVPF	
SVPA	Surface mount type
SVPC	
SVPB	Surface mount type
SVPD	
SVPS	Surface mount type
SVPE	
SVQP	Surface mount type
SVP	
SEK	Surface mount type
SEF	
SEPG	Surface mount type
SXE	
SEPF	Surface mount type
SEPC	
SEQP	Surface mount type
SEP	
Hybrid	Surface mount type
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Surface mount type	Surface mount type
Surface mount type	

SMD type

(unit : mm)											
A5 size	B45 size	B6 size	C5 size	C55 size	C6 size	C8 size	C10 size	E7 size	E12 size	F8 size	F12 size
P.97 to 98 SVPS P.101 to 102 SVP	P.88 SVPG	P.83 to 84 SVF P.85 to 86 SVPK P.89 to 90 SVPF P.91 to 92 SVPA P.93 to 94 SVPC P.97 to 98 SVPS P.99 SVPE P.101 to 102 SVP	P.95 SVPB	P.95 SVPB	P.83 to 84 SVF P.85 to 86 SVPK P.89 to 90 SVPF P.91 to 92 SVPA P.93 to 94 SVPC P.96 SVPD P.97 to 98 SVPS P.99 SVPE P.100 SVQP P.101 to 102 SVP	P.88 SVPG	P.88 SVPG P.99 SVPE	P.83 to 84 SVF P.85 to 86 SVPK P.87 SXV P.89 to 90 SVPF P.91 to 92 SVPA P.93 to 94 SVPC P.96 SVPD P.96 SVPD P.97 to 98 SVPS P.99 SVPE P.100 SVQP P.101 to 102 SVP	P.83 to 84 SVF P.85 to 86 SVPK P.87 SXV P.89 to 90 SVPF P.91 to 92 SVPA P.93 to 94 SVPC P.96 SVPD P.96 SVPD P.101 to 102 SVP	P.87 SXV P.91 to 92 SVPA P.96 SVPD P.96 SVPD P.101 to 102 SVP	P.83 to 84 SVF P.85 to 86 SVPK P.87 SXV P.89 to 90 SVPF P.91 to 92 SVPA P.93 to 94 SVPC P.96 SVPD P.96 SVPD P.101 to 102 SVP

※ Profile of case size are all indicated in maximum values.

Radial lead type

B9 size	C55 size	C6 size	C6 size	C9 size	C10 size	E7 size	E7 size	E9 size	E12 size	E12 size	E13 size	F8 size	F8 size	F13 size	F13 size
P.109 to 110 SEPC	P.107 to 108 SEPF P.109 to 110 SEPC	P.104 SEF P.107 to 108 SEPF P.109 to 110 SEPC	P.111 to 112 SEQP P.113 to 114 SEP	P.105 SEPG	P.105 SEPG	P.104 SEF P.106 SXE P.107 to 108 SEPF P.109 to 110 SEPC	P.111 to 112 SEQP P.113 to 114 SEP	P.105 SEPG	P.104 SEF P.106 SXE P.107 to 108 SEPF	P.109 to 110 SEPC P.106 SXE P.109 to 110 SEPC P.111 to 112 SEQP P.113 to 114 SEP	P.109 to 110 SEPC	P.106 SXE	P.111 to 112 SEQP P.106 SXE P.109 to 110 SEPC P.111 to 112 SEQP P.113 to 114 SEP	P.104 SEF P.106 SXE P.107 to 108 SEPF	P.109 to 110 SEPC P.111 to 112 SEQP P.113 to 114 SEP

※ Profile of case size are all indicated in maximum values.



Size·ESR Matrix list / SMD type

V,DC	Series	100	120	150	180	220	270	330	390	470	560	680	820	1000	1200	1500	2700	
2.0	SVPE																	
	SVPA				C6 (20)			E7 (20)					F8 (19)		C10 (8)			
	SVPB		C5 (40)															
2.5	SVPC				B6 (30,24,19)													
	SVPE						B6 (10)	B6 (15,10)	C6 (25,15) B6 (10) C6 (10)		C6 (16)	E7 (20)	E12 (9)				E12 (10)	F12 (12)
	SVP					C6 (23)							E12 (13) F8 (20)				F12 (12)	
4.0	SVPA			C6 (22)														
	SVPB	C5 (40)																
	SVPC			B6 (30,23,20)					C6 (27,21,15)				E7 (22) E12 (9)				E12 (12)	E12 (12)
6.3	SVPS			C6 (22)														
	SVQP						E7 (22)											
	SVP			C6 (40) C6 (40)				E7 (35)										F12 (12)
10	SVPA			C6 (22)			E7 (22)			F8 (20)								
	SVPB																	
	SVPC	B6 (30,25)	B6 (21)					C6 (17)	E7 (22)									E12 (12)
16	SVPE			B6 (12)	B6 (15)	B6 (15) C6 (10)												
	SVPS			C6 (22)						F8 (20)								
	SVQP						E7 (22)											
20	SVPA									F8 (25)								
	SVPB																	
	SVPC			E7 (30)						F8 (24)								
25	SVPA																	
	SVPB																	
	SVPC																	
35	SVPA																	
	SVPB																	
	SVPC																	
50	SVPA																	
	SVPB																	
	SVPC																	
63	SVPA																	
	SVPB																	
	SVPC																	
80	SVPA																	
	SVPB																	
	SVPC																	
100	SVPA																	
	SVPB																	
	SVPC																	

※ESR(100 kHz / +20°C)

Size·ESR Matrix list / Radial lead type

V,DC	Series	220	270	330	390	470	560	680	820	1000	1200	1500	2700
2.5	SEPC			B9 (7)	C6 (10)	B9 (7)	B9 (7) C6 (10)		C9 (7)	E9 (7)			F13 (10)
	SEP						C9 (7) E9 (8)		E9 (5,7) E13 (7)				
	SEPC						C9 (7) E9 (7)		E12 (13) E13 (7)				F13 (12)
4.0	SEQP												
	SEP			E7 (35)					F8 (25)				F13 (12)
	SEPC			E7 (35)					E12 (13) F8 (25)				F13 (12)
6.3	SEPC												
	SEQP												
	SEP												
10	SEPC												
	SEQP												
	SEP												
16	SEPG												
	SEPC												
	SEPF												
20	SEPC												
	SEPF												
	SEQP												
25	SEPC												
	SEPF												
	SEQP												
35	SEPC												
	SEPF												
	SEQP												
50	SEPC												
	SEPF												
	SEQP												
63	SEPC												
	SEPF												
	SEQP												
80	SEPC												
	SEPF												
	SEQP												
100	SEPC												
	SEPF												
	SEQP												

※ESR(100 kHz to 300 kHz / +20°C)

<b>SVF</b>
SVPK
SXV
SVPG
SVPF
SVPA
SVPC
SVPB
SVPD
SVPS
SVPE
SVQP
SVP
SEK
SEF
SEPG
SXE
SEPF
SEPC
SEQP
SEP

# Surface mount type SVF Series



- High voltage (50 V.DC max)
- 125 °C 1000 h
- Large capacitance (1000 μF max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications				
Size code	B6	C6	E7	E12	F12
Category temperature range	-55 °C to +125 °C				
Rated voltage range	16 V.DC to 25 V.DC		16 V.DC to 50 V.DC		
Rated capacitance range	27 μF to 82 μF	10 μF to 180 μF	18 μF to 270 μF	39 μF to 560 μF	68 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+125 °C, 1000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Standard(Reel size: φ 380)	
			φD	L		Ripple current ※1 (mAr.m.s.)	Allowable ripple current※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVF	16	82	5.0	5.9	B6	940	3000	27	0.12	262	16SVF82M	1500
		180	6.3	5.9	C6	1040	3300	22	0.12	576	16SVF180M	1000
		270	8.0	6.9	E7	1040	3300	22	0.12	864	16SVF270M	1000
		560	8.0	11.9	E12	1560	4950	14	0.12	1792	16SVF560M	400
		1000	10.0	12.6	F12	1700	5400	12	0.12	3200	16SVF1000M	400
	20	56	5.0	5.9	B6	880	2800	30	0.12	224	20SVF56M	1500
		120	6.3	5.9	C6	1010	3200	25	0.12	480	20SVF120M	1000
		180	8.0	6.9	E7	1010	3200	25	0.12	720	20SVF180M	1000
		390	8.0	11.9	E12	1560	4950	14	0.12	1560	20SVF390M	400
		560	10.0	12.6	F12	1700	5400	12	0.12	2240	20SVF560M	400
	25	27	5.0	5.9	B6	770	2450	40	0.12	135	25SVF27M	1500
		47	6.3	5.9	C6	880	2800	30	0.12	235	25SVF47M	1000
		56	6.3	5.9		880	2800	30	0.12	280	25SVF56M	1000
		82	8.0	6.9	E7	940	3000	28	0.12	410	25SVF82M	1000
		100	8.0	6.9		1010	3200	24	0.12	500	25SVF100M	1000
		180	8.0	11.9		E12	1470	4650	16	0.12	900	25SVF180M
		330	10.0	12.6	F12	1580	5000	14	0.12	1650	25SVF330M	400
	35	22	6.3	5.9	C6	820	2600	35	0.12	154	35SVF22M	1000
		39	8.0	6.9	E7	880	2800	30	0.12	273	35SVF39M	1000
		82	8.0	11.9	E12	1260	4000	20	0.12	574	35SVF82M	400
		120	10.0	12.6	F12	1390	4400	18	0.12	840	35SVF120M	400
	50	10	6.3	5.9	C6	790	2500	40	0.12	100	50SVF10M	1000
		18	8.0	6.9	E7	850	2700	35	0.12	180	50SVF18M	1000
		39	8.0	11.9	E12	1200	3800	25	0.12	390	50SVF39M	400
		68	10.0	12.6	F12	1350	4300	20	0.12	680	50SVF68M	400

※1:Ripple current (100 kHz/ +105 °C < Tx < +125 °C) /Allowable ripple current (100 kHz/ Tx < +105 °C)

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4:After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type SVPK Series



- High voltage (50 V.DC max.)
- RoHS compliance, Halogen free
- 125 °C 1000 h

## Specifications

Items	Specifications				
Size code	B6	C6	E7	E12	F12
Category temperature range	-55 °C to +125 °C				
Rated voltage range	25 V.DC to 50 V.DC				
Rated capacitance range	10 μF to 30 μF	22 μF to 82 μF	33 μF to 120 μF	68 μF to 270 μF	120 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+125 °C, 1000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Standard(Reel size: φ 380)	
			φD	L		Ripple current ※1 (mAr.m.s.)	Allowable ripple current※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPK	25	33	5.0	5.9	B6	820	2600	35	0.12	165	25SVPK33M	1500
		82	6.3	5.9	C6	960	3060	25	0.12	410	25SVPK82M	1000
		120	8.0	6.9	E7	1010	3200	24	0.12	600	25SVPK120M	1000
		270	8.0	11.9	E12	1470	4650	16	0.12	1350	25SVPK270M	400
		470	10.0	12.6	F12	1590	5000	14	0.12	2350	25SVPK470M	400
	35	22	5.0	5.9	B6	820	2600	35	0.12	154	35SVPK22M	1500
		47	6.3	5.9	C6	930	2950	27	0.12	329	35SVPK47M	1000
		82	8.0	6.9	E7	960	3060	25	0.12	574	35SVPK82M	1000
		180	8.0	11.9	E12	1260	4000	20	0.12	1260	35SVPK180M	400
		330	10.0	12.6	F12	1390	4400	18	0.12	2310	35SVPK330M	400
	50	10	5.0	5.9	B6	550	1750	80	0.12	100	50SVPK10M	1500
		22	6.3	5.9	C6	820	2600	35	0.12	220	50SVPK22M	1000
		33	8.0	6.9	E7	850	2700	35	0.12	330	50SVPK33M	1000
		68	8.0	11.9	E12	1200	3800	25	0.12	680	50SVPK68M	400
		120	10.0	12.6	F12	1350	4300	20	0.12	1200	50SVPK120M	400

※1:Ripple current (100 kHz/ +105 °C < Tx < +125 °C) /Allowable ripple current (100 kHz/ Tx < +105 °C)

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4:After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type

# SXV Series

UPGRADE



- Super high voltage (100 V.DC max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications			
	E7	F8	E12	F12
Size code	E7	F8	E12	F12
Category temperature range	-55 °C to +125 °C			
Rated voltage range	63 V.DC to 100 V.DC			
Rated capacitance range	6.8 μF to 18 μF	15 μF to 39 μF	15 μF to 39 μF	18 μF to 68 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+125 °C, 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

## Marking and dimensions

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

(unit : mm)

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : φ 380)	
			φD	L		Ripple current ※1 (mA r.m.s.)	Allowable ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SXV	63	NEW 18	8.0	6.9	E7	340	1100	60	0.12	56	63SXV18M	1000
		33	8.0	11.9	E12	930	2950	25	0.12	104	63SXV33M	400
		NEW 39	8.0	11.9	E12	930	2950	25	0.12	122	63SXV39M	400
		NEW 39	10.0	7.9	F8	690	2190	50	0.12	122	63SXV39MX	500
		NEW 68	10.0	12.6	F12	1030	3280	25	0.12	214	63SXV68M	400
		NEW 12	8.0	6.9	E7	340	1100	60	0.12	48	80SXV12M	1000
	80	NEW 27	8.0	11.9	E12	780	2490	35	0.12	108	80SXV27M	400
		NEW 27	10.0	7.9	F8	660	2080	55	0.12	108	80SXV27MX	500
		NEW 47	10.0	12.6	F12	980	3100	28	0.12	188	80SXV47M	400
	100	NEW 6.8	8.0	6.9	E7	340	1100	60	0.12	34	100SXV6R8M	1000
		NEW 15	10.0	7.9	F8	630	2000	60	0.12	75	100SXV15MX	500
			8.0	11.9	E12	730	2350	40	0.12	75	100SXV15M	400
NEW 18		10.0	12.6	F12	940	3000	30	0.12	90	100SXV18M	400	
NEW 22	10.0	12.6	940		3000	30	0.12	110	100SXV22M	400		

※1: Ripple current (100 kHz / +105 °C < Tx < 125 °C), Allowable ripple current (100 kHz / Tx < 105 °C)  
 ※2: ESR (100 kHz to 300 kHz / +20 °C)  
 ※3: tan δ (120 Hz / +20 °C)  
 ※4: After 2 minutes  
 ◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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- Low profile (Height 4.5 mm max.)
- RoHS compliance, Halogen free
- Low ESR (8 mΩ max.)

## Specifications

Items	Specifications		
	B45	C8	C10
Size code	B45	C8	C10
Category temperature range	-55 °C to +105 °C		
Rated voltage range	16 V.DC to 25 V.DC	16 V.DC	
Rated capacitance range	15 μF to 47 μF	270 μF	
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Endurance	+105 °C, 5000 h, rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 150 % of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 150 % of the initial limit	
	DC leakage current	Within the initial limit (after voltage processing)	

## Marking and dimensions

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B45	5.0	4.4	5.3	5.3	6.0	0.6 to 0.8	1.4
C8	6.3	7.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C10	6.3	9.9	6.6	6.6	7.3	0.6 to 0.8	2.1

(unit : mm)

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard (Reel size: φ 380)	
			φD	L		Rated ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPG	16	47	5.0	4.4	B45	3200	25	0.12	150	16SVPG47M	2500
			6.3	7.9	C8	5080	10	0.12	864	16SVPG270MX	900
		6.3	9.9	C10	5800	8	0.12	864	16SVPG270M	500	
	20	33	5.0	4.4	B45	3000	27	0.12	132	20SVPG33M	2500
	25	15	5.0	4.4		2800	30	0.12	75	25SVPG15M	2500

※1: Rated ripple current (100 kHz/ +105 °C)

※2: ESR (100 kHz to 300 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type SVPF Series



- High voltage (50 V.DC max.)
- 105 °C 5000 h
- Large capacitance (1000 μF max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications				
Size code	B6	C6	E7	E12	F12
Category temperature range	-55 °C to +105 °C				
Rated voltage range	16 V.DC to 25 V.DC		16 V.DC to 50 V.DC		
Rated capacitance range	27 μF to 82 μF	10 μF to 180 μF	18 μF to 270 μF	39 μF to 560 μF	68 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+105 °C, 5000 h, rated voltage applied				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard(Reel size: φ 380)	
			φD	L		Rated ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPF	16	82	5.0	5.9	B6	3000	27	0.12	262	16SVPF82M	1500
		180	6.3	5.9	C6	3300	22	0.12	576	16SVPF180M	1000
		270	8.0	6.9	E7	3300	22	0.12	864	16SVPF270M	1000
		560	8.0	11.9	E12	4950	14	0.12	1792	16SVPF560M	400
		1000	10.0	12.6	F12	5400	12	0.12	3200	16SVPF1000M	400
	20	56	5.0	5.9	B6	2800	30	0.12	224	20SVPF56MX	1500
		120	6.3	5.9	C6	3200	25	0.12	480	20SVPF120M	1000
		180	8.0	6.9	E7	3200	25	0.12	720	20SVPF180M	1000
		390	8.0	11.9	E12	4950	14	0.12	1560	20SVPF390M	400
		560	10.0	12.6	F12	5400	12	0.12	2240	20SVPF560M	400
	25	27	5.0	5.9	B6	2450	40	0.12	135	25SVPF27MX	1500
		47	6.3	5.9	C6	2800	30	0.12	235	25SVPF47M	1000
		56	6.3	5.9		2800	30	0.12	280	25SVPF56M	1000
		82	8.0	6.9	E7	3000	28	0.12	410	25SVPF82M	1000
		100	8.0	6.9		3200	24	0.12	500	25SVPF100M	1000
		180	8.0	11.9		E12	4650	16	0.12	900	25SVPF180M
		330	10.0	12.6	F12	5000	14	0.12	1650	25SVPF330M	400
	35	22	6.3	5.9	C6	2600	35	0.12	154	35SVPF22M	1000
		39	8.0	6.9	E7	2800	30	0.12	273	35SVPF39M	1000
		82	8.0	11.9	E12	4000	20	0.12	574	35SVPF82M	400
		120	10.0	12.6	F12	4400	18	0.12	840	35SVPF120M	400
	50	10	6.3	5.9	C6	2500	40	0.12	100	50SVPF10M	1000
		18	8.0	6.9	E7	2700	35	0.12	180	50SVPF18M	1000
		39	8.0	11.9	E12	3800	25	0.12	390	50SVPF39M	400
		68	10.0	12.6	F12	4300	20	0.12	680	50SVPF68M	400

※1:Rated ripple current(100 kHz/ +105 °C )

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4:After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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# Surface mount type SVPA Series



- Low ESR (18 mΩ max.)
- High ripple (4240 mA.r.m.s.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications			
	B6	C6	E7	F8
Size code	B6	C6	E7	F8
Category temperature range	-55 °C to +105 °C			
Rated voltage range	2.5 V.DC to 20 V.DC			2.5 V.DC to 16 V.DC
Rated capacitance range	10 μF to 82 μF	22 μF to 180 μF	47 μF to 330 μF	180 μF to 820 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Endurance	+105 °C, 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

## Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard(Reel size: φ 380)	
			φD	L		Ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPA	2.5	82	5.0	5.9	B6	1970	30	0.12	300	2R5SVPA82MAA	1500
		180	6.3	5.9	C6	2690	20	0.12	300	2R5SVPA180MAA	1000
		330	8.0	6.9	E7	3370	20	0.12	500	2R5SVPA330MAA	1000
		820	10.0	7.9	F8	4240	19	0.12	500	2R5SVPA820M	500
	4	68	5.0	5.9	B6	1970	30	0.12	300	4SVPA68MAA	1500
		150	6.3	5.9	C6	2570	22	0.12	300	4SVPA150MAA	1000
		270	8.0	6.9	E7	3220	22	0.12	500	4SVPA270MAA	1000
		680	10.0	7.9	F8	4130	20	0.12	544	4SVPA680M	500
	6.3	47	5.0	5.9	B6	1970	30	0.12	300	6SVPA47MAA	1500
		120	6.3	5.9	C6	2570	22	0.12	300	6SVPA120MAA	1000
		220	8.0	6.9	E7	3220	22	0.12	500	6SVPA220MAA	1000
		470	10.0	7.9	F8	4130	20	0.12	592	6SVPA470M	500
	10	68	6.3	5.9	C6	2200	30	0.12	300	10SVPA68MAA	1000
		150	8.0	6.9	E7	2760	30	0.12	500	10SVPA150MAA	1000
		330	10.0	7.9	F8	3770	24	0.12	660	10SVPA330M	500
	16	39	6.3	5.9	C6	2040	35	0.12	300	16SVPA39MAA	1000
			6.3	5.9		2460	24	0.12	300	16SVPA39MAAY	1000
		82	8.0	6.9	E7	2760	30	0.12	262	16SVPA82MAA	1000
		180	10.0	7.9	F8	3430	29	0.12	576	16SVPA180M	500
	20	10	5.0	5.9	B6	1700	40	0.12	80	20SVPA10M	1500
22		6.3	5.9	C6	2040	35	0.12	88	20SVPA22M	1000	
47		8.0	6.9	E7	2630	33	0.12	188	20SVPA47M	1000	

※1:Ripple current (100 kHz/ +105 °C )

※2:ESR (100 Hz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4: After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type SVPC Series



- LowESR(9 mΩ max.)
- Large capacitance (2700 μF max.)
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications				
	B6	C6	E7	E12	F12
Size code	B6	C6	E7	E12	F12
Category temperature range	-55 °C to +105 °C				
Rated voltage range	2.5 V.DC to 16 V.DC				2.5 V.DC
Rated capacitance range	39 μF to 180 μF	68 μF to 560 μF	120 μF to 680 μF	270 μF to 1500 μF	2700 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+105 °C, 2000 h, rated voltage applied				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 150 % times of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## ● Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Standard(Reel size: φ 380)		
			φD	L		Rated ripple current ※1 (mAr.m.s.)	ESR		tan δ ※2	LC ※3 (μA)	Part number	Min. Packaging Qty (pcs)	
							100 kHz/20 °C (mΩ max.)	300 kHz/20 °C (mΩ max.)					
SVPC	2.5	180	5.0	5.9	B6	1970	30	26	0.12	300	2R5SVPC180M	1500	
			5.0	5.9		2200	24	20	0.12	300	2R5SVPC180MY	1500	
			5.0	5.9		2800	19	16	0.12	300	2R5SVPC180MV	1500	
		390	6.3	5.9	C6	2410	25	22	0.12	300	2R5SVPC390M	1000	
			6.3	5.9		3160	15	13	0.12	300	2R5SVPC390MV	1000	
			6.3	5.9		3500	16	14	0.12	300	2R5SVPC560M	1000	
		680	8.0	6.9	E7	3370	20	17	0.12	500	2R5SVPC680M	1000	
			8.0	11.9		E12	5380	9	8	0.15	500	2R5SVPC820M	400
			8.0	11.9			5150	10	9	0.15	750	2R5SVPC1500M	400
	2700	10.0	12.6	F12	5070	12	10	0.15	1350	2R5SVPC2700M	400		
	4.0	150	5.0	5.9	B6	1970	30	26	0.12	300	4SVPC150M	1500	
			5.0	5.9		2240	23	20	0.12	300	4SVPC150MY	1500	
			5.0	5.9		2730	20	17	0.12	300	4SVPC150MV	1500	
		330	6.3	5.9	C6	2320	27	23	0.12	300	4SVPC330M	1000	
			6.3	5.9		2630	21	18	0.12	300	4SVPC330MY	1000	
			6.3	5.9		3160	15	13	0.12	300	4SVPC330MV	1000	
		560	8.0	6.9	E7	3220	22	19	0.12	500	4SVPC560M	1000	
			8.0	11.9		E12	5380	9	8	0.15	500	4SVPC560MX	400
			8.0	11.9			4700	12	10	0.15	960	4SVPC1200M	400
	1500	8.0	11.9	E12	4700	12	10	0.15	1200	4SVPC1500M	400		
	6.3	100	5.0	5.9	B6	1970	30	26	0.12	300	6SVPC100M	1500	
			5.0	5.9		2150	25	21	0.12	300	6SVPC100MY	1500	
		120	5.0	5.9	C6	2660	21	18	0.12	300	6SVPC120MV	1500	
			6.3	5.9		2320	27	23	0.12	300	6SVPC220M	1000	
		220	6.3	5.9	C6	3160	15	13	0.12	300	6SVPC220MV	1000	
			6.3	5.9		3390	17	15	0.12	415	6SVPC330M	1000	
		390	8.0	6.9	E7	3220	22	19	0.12	491	6SVPC390M	1000	
		820	8.0	11.9	E12	4700	12	10	0.15	1033	6SVPC820M	400	
	10	68	5.0	5.9	B6	1970	30	26	0.12	300	10SVPC68M	1500	
			5.0	5.9		2540	23	20	0.12	300	10SVPC68MV	1500	
120		6.3	5.9	C6	2320	27	23	0.12	300	10SVPC120M	1000		
		6.3	5.9		2600	22	19	0.12	300	10SVPC120MV	1000		
270		8.0	6.9	E7	3220	22	19	0.12	500	10SVPC270M	1000		
330		8.0	6.9		3460	19	17	0.12	660	10SVPC330M	1000		
16	39	5.0	5.9	B6	1820	35	30	0.12	300	16SVPC39M	1500		
		5.0	5.9		2350	27	23	0.12	300	16SVPC39MV	1500		
	68	6.3	5.9	C6	2200	30	26	0.12	300	16SVPC68M	1000		
		6.3	5.9		2440	25	22	0.12	300	16SVPC68MV	1000		
	100	6.3	5.9	E7	2490	24	23	0.12	300	16SVPC100M	1000		
	120	8.0	6.9		2900	27	23	0.12	500	16SVPC120M	1000		
	150	8.0	6.9	E7	3220	22	21	0.12	500	16SVPC150M	1000		
	270	8.0	11.9	E12	4070	16	14	0.15	864	16SVPC270M	400		

※1:Rated ripple current (100 kHz/ +105 °C) ※2:tan δ (120 Hz/+20 °C) ※3:After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type SVPB Series



- Low profile (Height 5 mm max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	C5	C55
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2.5 V.DC to 20 V.DC	20 V.DC
Rated capacitance range	15 μF to 120 μF	22 μF
Capacitance tolerance	±20(120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Endurance	+105 °C, 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value (±30 % for C5 size)
	tan δ	≤ 150 % of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 150 % of the initial limit
	DC leakage current	Within the initial limit (after voltage processing)

## Marking and dimensions

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
C5	6.3	4.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C55	6.3	5.4	6.6	6.6	7.3	0.6 to 0.8	2.1

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard(Reel size : φ 380)	
			φD	L		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPB	2.5	120	6.3	4.9	C5	1670	40	0.12	120	2R5SVPB120M	1300
	4	100	6.3	4.9		1670	40	0.12	160	4SVPB100M	1300
	6.3	82	6.3	4.9		1670	40	0.12	207	6SVPB82M	1300
	10	56	6.3	4.9		1670	40	0.12	224	10SVPB56M	1300
	16	33	6.3	4.9		1670	40	0.12	211	16SVPB33M	1300
	20	15	6.3	4.9	C55	2000	45	0.12	120	20SVPB15M	1300
	22	6.3	5.4	2000		35	0.12	88	20SVPB22M	1000	

※1 : Ripple current (100 kHz/+105 °C)  
 ※2 : 2 ESR (100 kHz to 300 kHz/+20 °C)  
 ※3 : tan δ (120 Hz/+20 °C)  
 ※4 : After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- 125 °C 2000 h
- Guaranteed at 85 °C 85 %
- RoHS compliance, Halogen free

## Specifications

Items	Specifications				
Size code	C6	E7	F8	E12	F12
Category temperature range	-55 °C to +125 °C				
Rated voltage range	10 V.DC to 25 V.DC	16 V.DC to 35 V.DC	25 V.DC to 35 V.DC		
Rated capacitance range	10 μF to 56 μF	8.2 μF to 82 μF	18 μF to 39 μF	22 μF to 47 μF	47 μF to 82 μF
Capacitance tolerance	±20(120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+125 °C, 2000 h, rated voltage applied				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+85 °C, 85 % to 90 %, 1000 h, rated voltage applied				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## Marking and dimensions

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

(unit : mm)

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Standard(Reel size : φ 380)	
			φD	L		Rated ripple current ※1 (mAr.m.s.)	Allowable ripple current※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPD	10	56	6.3	5.9	C6	538	1700	45	0.12	112	10SVPD56M	1000
	16	82	8.0	6.9	E7	670	2120	40	0.12	262	16SVPD82M	1000
	25	10	6.3	5.9	C6	474	1500	65	0.10	50	25SVPD10M	1000
		22	8.0	6.9	E7	580	1835	48	0.10	110	25SVPD22M	1000
		39	10.0	7.9	F8	664	2100	45	0.10	195	25SVPD39M	500
		47	8.0	11.9	E12	943	2980	30	0.12	235	25SVPD47M	400
		82	10.0	12.6	F12	1202	3800	28	0.12	410	25SVPD82M	400
		35	8.2	8.0	6.9	E7	400	1300	70	0.10	57	35SVPD8R2M
	18		10.0	7.9	F8	550	1800	60	0.10	126	35SVPD18M	500
	22		8.0	11.9	E12	700	2300	50	0.12	154	35SVPD22M	400
	47		10.0	12.6	F12	1150	3650	30	0.12	329	35SVPD47M	400

※1: Rated ripple current (100 kHz/105 °C < Tx ≤ 125 °C) / Allowable ripple current (100 kHz/ Tx ≤ 105 °C) ※2: ESR (100 kHz~300 kHz/+20 °C)  
 ※3: tan δ (120 Hz/+20 °C) ※4: After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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# Surface mount type SVPS Series



- 105 °C 5000 h
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications				
	A5	B6	C6	E7	F8
Size code	A5	B6	C6	E7	F8
Category temperature range	-55 °C to +105 °C				
Rated voltage range	4 V.DC to 10 V.DC	4 V.DC to 16 V.DC	4 V.DC to 20 V.DC	4 V.DC to 25 V.DC	4 V.DC to 16 V.DC
Rated capacitance range	10 μF to 33 μF	22 μF to 68 μF	22 μF to 150 μF	10 μF to 270 μF	100 μF to 680 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+105 °C, 5000 h, rated voltage applied (25 V.DC → 20 V.DC applied)				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## ● Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
A5	4.0	5.4	4.3	4.3	5.0	0.6 to 0.8	1.0
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard(Reel size: φ 380)	
			φD	L		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVPS	4	33	4.0	5.4	A5	740	200	0.15	66	4SVPS33M	2000
		68	5.0	5.9	B6	1970	30	0.12	300	4SVPS68M	1500
		150	6.3	5.9	C6	2570	22	0.12	300	4SVPS150M	1000
		270	8.0	6.9	E7	3220	22	0.12	500	4SVPS270M	1000
		680	10.0	7.9	F8	4130	20	0.12	544	4SVPS680M	500
	6.3	22	4.0	5.4	A5	740	200	0.12	69.3	6SVPS22M	2000
		47	5.0	5.9	B6	1970	30	0.12	300	6SVPS47M	1500
		120	6.3	5.9	C6	2570	22	0.12	300	6SVPS120M	1000
		220	8.0	6.9	E7	3220	22	0.12	500	6SVPS220M	1000
		470	10.0	7.9	F8	4130	20	0.12	592	6SVPS470M	500
	10	10	4.0	5.4	A5	700	220	0.10	50	10SVPS10M	2000
		15	4.0	5.4		740	200	0.10	75	10SVPS15M	2000
		33	5.0	5.9	B6	1100	70	0.12	165	10SVPS33M	1500
		68	6.3	5.9	C6	2200	30	0.12	300	10SVPS68M	1000
		150	8.0	6.9	E7	2760	30	0.12	500	10SVPS150MX	1000
			10.0	7.9	F8	3020	30	0.12	300	10SVPS150M	500
	330	10.0	7.9	3770		24	0.12	660	10SVPS330M	500	
	16	22	5.0	5.9	B6	1060	90	0.10	176	16SVPS22M	1500
		39	6.3	5.9	C6	2460	24	0.12	300	16SVPS39M	1000
		82	8.0	6.9	E7	2760	30	0.12	262	16SVPS82M	1000
		100	10.0	7.9	F8	2670	35	0.12	320	16SVPS100M	500
		180	10.0	7.9		3430	29	0.12	576	16SVPS180M	500
	20	22	6.3	5.9	C6	1450	60	0.10	88	20SVPS22M	1000
		47	8.0	6.9	E7	1890	45	0.12	188	20SVPS47M	1000
	25	10	8.0	6.9		1500	60	0.10	125	25SVPS10M	1000

※1:Ripple current (100 kHz/ +105 °C)

:The surface temperature of aluminum case top must not exceed 105 °C. A rise in temperature due to self-heating by ripple current should be factored in.

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4:After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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# Surface mount type SVPE Series



- Super low ESR(8 mΩ max.)
- RoHS compliance, Halogen free
- Large capacitance (1200 μF max.)

## Specifications

Items	Specifications			
Size code	B6	C6	C10	F12
Category temperature range	-55 °C to +105 °C			
Rated voltage range	2.5 V.DC to 6.3 V.DC	2.5 V.DC to 10 V.DC	2 V.DC to 16 V.DC	16 V.DC
Rated capacitance range	150 μF to 390 μF	220 μF to 390 μF	180 μF to 1200 μF	470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Endurance	+105 °C, 2000 h, rated voltage applied			
	Capacitance change	Within±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage			
	Capacitance change	Within±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

## Marking and dimensions

Size code	φD ±0.5	L <sup>+0.1</sup> <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C10	6.3	9.9	6.6	6.6	7.3	0.6 to 0.8	2.1
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

(unit : mm)

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard(Reel size : φ 380)		
			φD	L		Rated ripple current ※1 (mA r.m.s.)	ESR		tan δ ※2	LC ※3 (μA)	Part number	Min. Packaging Qty (pcs)
						100 kHz/20 °C (mΩ max.)	300 kHz/20 °C (mΩ max.)					
SVPE	2	1200	6.3	9.9	C10	5230	8	8	0.12	500	2SVPE1200M	500
						2.5	270	5.0	5.9	B6	3860	10
	3150	15	13	0.12	500						2R5SVPE330M	1500
	330	5.0	5.9	3860	10		9	0.12	500	2R5SVPE330MY	1500	
	390	5.0	5.9	3860	10		9	0.12	700	2R5SVPE390MX	1500	
	6.3	150	5.0	5.9	B6	3900	10	9	0.12	500	2R5SVPE390M	1000
						3520	12	10	0.12	500	6SVPE150M	1500
		180	5.0	5.9	3150	15	13	0.12	500	6SVPE180M	1500	
		220	5.0	5.9	3150	15	13	0.12	500	6SVPE220MW	1500	
	10	220	6.3	5.9	C6	3900	10	9	0.12	500	6SVPE220M	1000
						2700	20	18	0.12	500	10SVPE220M	1000
	16	180	6.3	9.9	C10	4460	11	10	0.12	576	16SVPE180M	500
6100						10	9	0.12	1504	16SVPE470M	400	

※1 : Rated ripple current (100 kHz/ +105 °C) ※2 : tan δ (120 Hz/+20 °C) ※3 : After 2 minutes  
 ◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- 125 °C 1000 h
- RoHS compliance, Halogen free

## Specifications

Items	Specifications	
Size code	C6	E7
Category temperature range	-55 °C to +125 °C	
Rated voltage range	4 V.DC to 20 V.DC	6.3 V.DC to 20 V.DC
Rated capacitance range	22 μF to 150 μF	47 μF to 220 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Endurance	+125 °C, 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 200 % of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 150 % of the initial limit
	DC leakage current	Within the initial limit (after voltage processing)

## Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Standard (Reel size : φ 380)	
			φD	L		Ripple current ※1 (mA r.m.s.)	Allowable ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)
SVQP	4	150	6.3	5.9	C6	572	1810	40	0.12	300	4SVQP150M	1000
		82	6.3	5.9		538	1700	45	0.12	258	6SVQP82M	1000
		100	6.3	5.9		572	1810	40	0.12	315	6SVQP100M	1000
		220	8.0	6.9	E7	810	2560	35	0.12	693	6SVQP220M	1000
	6.3	56	6.3	5.9	C6	538	1700	45	0.12	280	10SVQP56M	1000
		120	8.0	6.9	E7	810	2560	35	0.12	600	10SVQP120M	1000
		150	8.0	6.9		810	2560	35	0.12	750	10SVQP150M	1000
	16	39	6.3	5.9	C6	512	1620	50	0.10	312	16SVQP39M	1000
		82	8.0	6.9	E7	670	2120	40	0.12	656	16SVQP82M	1000
	20	22	6.3	5.9	C6	459	1450	60	0.10	220	20SVQP22M	1000
		47	8.3	6.9	E7	598	1890	45	0.12	470	20SVQP47M	1000

※1: Ripple current (100 kHz / +105 °C < Tx < 125 °C), Allowable ripple current (100 kHz / Tx < 105 °C)

※2: ESR (100 kHz to 300 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 2 minutes

◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type SVP Series



- Standard
- RoHS compliance, Halogen free
- Wealth models

## ● Specifications

Items	Specifications						
	A5	B6	C6	E7	F8	E12	F12
Size code	A5	B6	C6	E7	F8	E12	F12
Category temperature range	-55 °C to +105 °C						
Rated voltage range(V.DC)	4 to 16	4 to 20	2.5 to 20	4 to 20		2.5 to 20	
Rated capacitance range(μF)	3.3 to 33	10 to 68	22 to 220	33 to 330	56 to 680	100 to 680	150 to 1500
Capacitance tolerance	±20 % (120 Hz/+20 °C)						
Leakage current	Please see the attached characteristics list						
Dissipation factor(tan δ)	Please see the attached characteristics list						
Endurance	+105 °C, 2000 h, rated voltage applied						
	Capacitance change	Within ±20 % of the initial value					
	tan δ	≤ 150 % of the initial limit					
	DC leakage current	Within the initial limit					
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage						
	Capacitance change	Within ±20 % of the initial value					
	tan δ	≤ 150 % of the initial limit					
	DC leakage current	Within the initial limit (after voltage processing)					

## ● Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L <sup>+0.1</sup> / <sub>-0.4</sub>	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
A5	4.0	5.4	4.3	4.3	5.0	0.6 to 0.8	1.0
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Standard(Reel size: φ 380)		
			φD	L		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	Part number	Min. Packaging Qty (pcs)	
SVP	2.5	220	6.3	5.9	C6	2390	23	0.12	110	2R5SVP220M	1000	
		680	8.0	11.9	E12	4520	13	0.15	340	2R5SVP680M	400	
		1500	10.0	12.6	F12	5440	12	0.18	750	2R5SVP1500M	400	
	4	33	4.0	5.4	A5	740	200	0.15	66	4SVP33M	2000	
		39	5.0	5.9	B6	1100	70	0.12	78	4SVP39M	1500	
		68	5.0	5.9		1400	60	0.12	136	4SVP68M	1500	
		150	6.3	5.9	C6	1810	40	0.12	120	4SVP150MX	1000	
		330	8.0	6.9	E7	2560	35	0.12	264	4SVP330M	1000	
		560	8.0	11.9	E12	4520	13	0.15	448	4SVP560M	400	
		680	10.0	7.9	F8	3700	25	0.12	544	4SVP680M	500	
		1200	10.0	12.6	F12	5440	12	0.18	960	4SVP1200M	400	
		6.3	22	4.0	5.4	A5	740	200	0.12	69.3	6SVP22M	2000
	47		5.0	5.9	B6	1100	70	0.12	148	6SVP47M	1500	
	82		6.3	5.9	C6	1700	45	0.12	103	6SVP82M	1000	
	100		6.3	5.9		1810	40	0.12	126	6SVP100M	1000	
	120		6.3	5.9		2780	17	0.12	151	6SVP120MV	1000	
	10		220	8.0	6.9	E7	2560	35	0.12	277	6SVP220MX	1000
			330	10.0	7.9	F8	3700	25	0.12	416	6SVP330M	500
				10.0	7.9		3700	25	0.12	592	6SVP470MX	500
			470	8.0	11.9	E12	4210	15	0.15	592	6SVP470M	400
			820	10.0	12.6	F12	5440	12	0.15	775	6SVP820M	400
			4.7	4.0	5.4	A5	670	240	0.08	23.5	10SVP4R7M	2000
			6.8	4.0	5.4		670	240	0.09	34	10SVP6R8M	2000
		10	4.0	5.4	700		220	0.10	50	10SVP10M	2000	
	15	4.0	5.4	740	200		0.10	75	10SVP15M	2000		
	16	33	5.0	5.9	B6	1100	70	0.12	165	10SVP33M	1500	
		47	6.3	5.9	C6	1620	50	0.12	94	10SVP47M	1000	
		56	6.3	5.9		1700	45	0.12	112	10SVP56M	1000	
		120	8.0	6.9	E7	2560	35	0.12	240	10SVP120M	1000	
		150	8.0	6.9	F8	2560	35	0.12	300	10SVP150MX	1000	
			10.0	7.9		3020	30	0.12	300	10SVP150M	500	
		270	10.0	7.9	3700	25	0.12	540	10SVP270M	500		
		330	10.0	7.9	E12	3700	25	0.12	660	10SVP330MX	500	
			8.0	11.9		3950	17	0.15	660	10SVP330M	400	
		560	10.0	12.6	F12	5230	13	0.15	840	10SVP560M	400	
	20	3.3	4.0	5.4	A5	660	260	0.07	26.4	16SVP3R3M	2000	
		15	5.0	5.9	B6	1020	120	0.10	120	16SVP15M	1500	
		22	5.0	5.9		1060	90	0.10	176	16SVP22M	1500	
		39	6.3	5.9	C6	1620	50	0.10	125	16SVP39M	1000	
		56	8.0	6.9	E7	1890	45	0.12	179	16SVP56M	1000	
		82	8.0	6.9		2120	40	0.12	262	16SVP82M	1000	
		100	10.0	7.9		2670	35	0.12	320	16SVP100M	500	
		150	10.0	7.9	F8	3020	30	0.12	480	16SVP150M	500	
		180	10.0	7.9		3020	30	0.12	576	16SVP180MX	500	
		330	8.0	11.9	E12	3640	20	0.15	576	16SVP180M	400	
			10.0	12.6	F12	4720	16	0.15	792	16SVP330M	400	
		20	10	5.0	5.9	B6	1020	120	0.10	100	20SVP10M	1500
	22		6.3	5.9	C6	1450	60	0.10	88	20SVP22M	1000	
	27		6.3	5.9		1450	60	0.10	108	20SVP27M	1000	
	33		8.0	6.9	E7	1890	45	0.12	132	20SVP33M	1000	
47	8.0		6.9	1890		45	0.12	188	20SVP47M	1000		
56	10.0		7.9	F8	2400	40	0.12	224	20SVP56M	500		
68	10.0		7.9		2400	40	0.12	272	20SVP68M	500		
100	8.0		11.9	E12	3320	24	0.15	400	20SVP100M	400		
150	10.0		12.6	F12	4320	20	0.15	600	20SVP150M	400		

※1: Ripple current (100 kHz/+105 °C) ※2: 2 ESR (100 kHz to 300 kHz/+20 °C) ※3: tan δ (120 Hz/+20 °C) ※4: After 2 minutes  
 ◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Radial lead type

# SEK Series

NEW



- High voltage (50 V.DC max.)
- RoHS compliance, Halogen free
- 125 °C 1000 h

## Specifications

Items	Specifications			
	C6	E7	E12	F13
Size code	C6	E7	E12	F13
Category temperature range	-55 °C to +125 °C			
Rated voltage range	25 V.DC to 50 V.DC			
Rated capacitance range	22 μF to 82 μF	33 μF to 120 μF	68 μF to 270 μF	120 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan δ)	Please see the attached characteristics list			
Endurance	+125 °C, 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

## Marking and dimensions

Size code	φD ±0.5	L max	F ±0.5	φd ±0.05
C6	6.3	6.0	2.5	0.5
E7	8.0	7.0	3.5	0.5
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Part number
			φD	L		Ripple current ※1 (mA r.m.s.)	Allowable ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SEK	25	82	6.3	6.0	C6	960	3060	25	0.12	410	25SEK82M
		120	8.0	7.0	E7	1010	3200	24	0.12	600	25SEK120M
		270	8.0	12.0	E12	1470	4650	16	0.12	1350	25SEK270M
		470	10.0	13.0	F13	1590	5000	14	0.12	2350	25SEK470M
	35	47	6.3	6.0	C6	930	2950	27	0.12	329	35SEK47M
		82	8.0	7.0	E7	960	3060	25	0.12	574	35SEK82M
		180	8.0	12.0	E12	1260	4000	20	0.12	1260	35SEK180M
		330	10.0	13.0	F13	1390	4400	18	0.12	2310	35SEK330M
	50	22	6.3	6.0	C6	820	2600	35	0.12	220	50SEK22M
		33	8.0	7.0	E7	850	2700	35	0.12	330	50SEK33M
		68	8.0	12.0	E12	1200	3800	25	0.12	680	50SEK68M
		120	10.0	13.0	F13	1350	4300	20	0.12	1200	50SEK120M

※1: Ripple current (100 kHz/ +105 °C < Tx < +125 °C) / Allowable ripple current (100 kHz/ Tx < +105 °C)

※2: ESR (100 kHz to 300 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 2 minutes

◆Please refer to each page in this catalog for "Flow conditions" and "Taping specifications".

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- High voltage (35 V.DC max.)
- RoHS compliance, Halogen free
- Large capacitance (1000  $\mu$ F max.)

## Specifications

Items	Specifications			
Size code	C6	E7	E12	F13
Category temperature range	-55 °C to +125 °C			
Rated voltage range	16 V.DC to 35 V.DC			
Rated capacitance range	22 $\mu$ F to 180 $\mu$ F	39 $\mu$ F to 270 $\mu$ F	82 $\mu$ F to 560 $\mu$ F	120 $\mu$ F to 1000 $\mu$ F
Capacitance tolerance	$\pm$ 20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor(tan $\delta$ )	Please see the attached characteristics list			
Endurance	+125 °C, 1000 h, rated voltage applied			
	Capacitance change	Within $\pm$ 20 % of the initial value		
	tan $\delta$	$\leq$ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage			
	Capacitance change	Within $\pm$ 20 % of the initial value		
	tan $\delta$	$\leq$ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

## Marking and dimensions

Size code	$\phi$ D $\pm$ 0.5	L max	F $\pm$ 0.5	$\phi$ d $\pm$ 0.05
C6	6.3	6.0	2.5	0.5
E7	8.0	7.0	3.5	0.5
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance ( $\mu$ F)	Case size (mm)		Size code	Specifications					Part number
			$\phi$ D	L		Ripple current $\times$ 1 (mAr.m.s.)	Allowable ripple current $\times$ 1 (mAr.m.s.)	ESR $\times$ 2 (m $\Omega$ max.)	tan $\delta$ $\times$ 3	LC $\times$ 4 ( $\mu$ A)	
SEF	16	180	6.3	6.0	C6	1040	3300	22	0.12	576	16SEF180M
		270	8.0	7.0	E7	1040	3300	22	0.12	864	16SEF270M
		560	8.0	12.0	E12	1560	4950	14	0.12	1792	16SEF560M
		1000	10.0	13.0	F13	1700	5400	12	0.12	3200	16SEF1000M
	20	120	6.3	6.0	C6	1010	3200	25	0.12	480	20SEF120M
		180	8.0	7.0	E7	1010	3200	25	0.12	720	20SEF180M
		390	8.0	12.0	E12	1560	4950	14	0.12	1560	20SEF390M
		560	10.0	13.0	F13	1700	5400	12	0.12	2240	20SEF560M
	25	56	6.3	6.0	C6	880	2800	30	0.12	280	25SEF56M
		82	8.0	7.0	E7	940	3000	28	0.12	410	25SEF82M
		180	8.0	12.0	E12	1470	4650	16	0.12	900	25SEF180M
		330	10.0	13.0	F13	1580	5000	14	0.12	1650	25SEF330M
	35	22	6.3	6.0	C6	820	2600	35	0.12	154	35SEF22M
		39	8.0	7.0	E7	880	2800	30	0.12	273	35SEF39M
		82	8.0	12.0	E12	1260	4000	20	0.12	574	35SEF82M
		120	10.0	13.0	F13	1390	4400	18	0.12	840	35SEF120M

$\times$ 1: Ripple current (100 kHz/ +105 °C < Tx < +125 °C) / Allowable ripple current (100 kHz/ Tx < +105 °C)  $\times$ 2: ESR (100 kHz to 300 kHz/+20 °C)

$\times$ 3: tan  $\delta$  (120 Hz/+20 °C)  $\times$ 4: After 2 minutes

◆ Please refer to each page in this catalog for "Flow conditions" and "Taping specifications"

## Frequency correction factor for ripple current

Frequency	120 Hz $\leq$ f < 1 kHz	1 kHz $\leq$ f < 10 kHz	10 kHz $\leq$ f < 100 kHz	100 kHz $\leq$ f $\leq$ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Radial lead type **SEPG** Series UPGRADE



- High ripple current (5800 mA.r.m.s.)
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications		
Size code	C9	C10	E9
Category temperature range	-55 °C to +105 °C		
Rated voltage range	16 V.DC		
Rated capacitance range	270 μF		470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor(tan δ)	Please see the attached characteristics list		
Endurance	+105 °C, 5000 h, rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 150 % of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 150 % of the initial limit	
	DC leakage current	Within the initial limit (after voltage processing)	

## ● Marking and dimensions

Size code	φD ±0.5	L max	F ±0.5	φd ±0.05
C9	6.3	9.0	2.5	0.6
C10	6.3	10.0	2.5	0.5
E9	8.0	9.0	3.5	0.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Part number
			φD	L		Ripple current ※1 (mA.r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SEPG	16	270	6.3	8.9	C9	5040	10	0.12	864	16SEPG270W
			6.3	10.0	C10	5800	8	0.12	864	16SEPG270M
	NEW	470	8.0	8.9	E9	5400	8	0.12	1504	16SEPG470M

※1 : Ripple current (100 kHz/ +105 °C)  
 ※2 : ESR (100 kHz/+20 °C)  
 ※3 : tan δ (120 Hz/+20 °C)  
 ※4 : After 2 minutes  
 ◆Please refer to each page in this catalog for "Flow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



- Super high voltage (100 V.DC max.)
- RoHS compliance, Halogen free

## Specifications

Items	Specifications			
Size code	E7	F8	E12	F13
Category temperature range	-55 °C to +125 °C			
Rated voltage range	63 V.DC to 100 V.DC			
Rated capacitance range	6.8 μF to 18 μF	15 μF to 39 μF	15 μF to 39 μF	18 μF to 68 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Endurance	+125 °C, 1000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 200 % of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 150 % of the initial limit		
	DC leakage current	Within the initial limit (after voltage processing)		

## Marking and dimensions

Size code	φD ±0.5	L max	F ±0.5	φd ±0.05
E7	8.0	7.0	3.5	0.45
F8	10.0	8.0	5.0	0.50
E12	8.0	12.0	3.5	0.60
F13	10.0	13.0	5.0	0.60

(unit : mm)

## Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Part number
			φD	L		Ripple current ※1 (mAr.m.s.)	Allowable ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SXE	63	NEW 18	8.0	7.0	E7	340	1100	60	0.12	56	63SXE18M
		33	8.0	12.0	E12	930	2950	25	0.12	104	63SXE33M
		39	8.0	12.0	E12	930	2950	25	0.12	122	63SXE39M
		NEW 68	10.0	8.0	F8	690	2190	50	0.12	122	63SXE39MX
		NEW 68	10.0	13.0	F13	1030	3280	25	0.12	214	63SXE68M
		NEW 12	8.0	7.0	E7	340	1100	60	0.12	48	80SXE12M
	80	NEW 27	8.0	12.0	E12	780	2490	35	0.12	108	80SXE27M
		NEW 27	10.0	8.0	F8	660	2080	55	0.12	108	80SXE27MX
		NEW 47	10.0	13.0	F13	980	3100	28	0.12	188	80SXE47M
	100	NEW 6.8	8.0	7.0	E7	340	1100	60	0.12	34	100SXE6R8M
		NEW 15	10.0	8.0	F8	630	2000	60	0.12	75	100SXE15MX
			8.0	12.0	E12	730	2350	40	0.12	75	100SXE15M
NEW 18		10.0	13.0	F13	940	3000	30	0.12	90	100SXE18M	
NEW 22		10.0	13.0		940	3000	30	0.12	110	100SXE22M	

※1: Ripple current (100 kHz / +105 °C < Tx < 125 °C). Allowable ripple current (100 kHz / Tx < 105 °C)

※2: ESR (100 kHz to 300 kHz / +20 °C) ※3: tan δ (120 Hz / +20 °C) ※4: After 2 minutes

◆ Please refer to the P73 to 76 in this catalog for "Flow conditions" and "Taping specifications".

## Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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Radial lead type

# SEPF Series



- High voltage (35 V.DC max.)
- RoHS compliance, Halogen free
- Large capacitance (1000 μF max.)

## Specifications

Items	Specifications				
	C55	C6	E7	E12	F13
Size code	C55	C6	E7	E12	F13
Category temperature range	-55 °C to +105 °C				
Rated voltage range	16 V.DC to 32 V.DC		16 V.DC to 35V.DC		
Rated capacitance range	22 μF to 150 μF	22 μF to 180 μF	39 μF to 270 μF	82 μF to 560 μF	120 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+105 °C, 5000 h, rated voltage applied				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## Marking and dimensions

Technical drawing showing side and end views of a radial lead capacitor. Dimensions include diameter  $\phi D \pm 0.5$ , lead diameter  $\phi d \pm 0.05$ , and lengths  $L$ ,  $15\text{min.}$ ,  $4\text{min.}$ , and  $19\text{min.}$ . Marking details include polarity marking (-), Lot. No., Series, R. Capacitance, and R. Voltage.

Size code	$\phi D \pm 0.5$	L max	F $\pm 0.5$	$\phi d \pm 0.05$
C55	6.3	5.5	2.5	0.45
C6	6.3	6.0	2.5	0.5
E7	8.0	7.0	3.5	0.5*
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

※ 32SEPF68Ml±0.6±0.05

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Part number
			φD	L		Rated ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SEPF	16	150	6.3	5.5	C55	2590	30	0.12	480	16SEPF150M
		180	6.3	6.0	C6	3300	22	0.12	576	16SEPF180M
		270	8.0	7.0	E7	3300	22	0.12	864	16SEPF270M
		560	8.0	12.0	E12	4950	14	0.12	1792	16SEPF560M
		1000	10.0	13.0	F13	5400	12	0.12	3200	16SEPF1000M
	20	120	6.3	6.0	C6	3200	25	0.12	480	20SEPF120M
		180	8.0	7.0	E7	3200	25	0.12	720	20SEPF180M
		390	8.0	12.0	E12	4950	14	0.12	1560	20SEPF390M
		560	10.0	13.0	F13	5400	12	0.12	2240	20SEPF560M
	25	56	6.3	6.0	C6	2800	30	0.12	280	25SEPF56M
		82	8.0	7.0	E7	3000	28	0.12	410	25SEPF82M
		180	8.0	12.0	E12	4650	16	0.12	900	25SEPF180M
		330	10.0	13.0	F13	5000	14	0.12	1650	25SEPF330M
	32	22	6.3	5.5	C55	2400	35	0.12	140	32SEPF22M
		68	8.0	7.0	E7	3200	25	0.10	435	32SEPF68M
	35	22	6.3	6.0	C6	2600	35	0.12	154	35SEPF22M
		39	8.0	7.0	E7	2800	30	0.12	273	35SEPF39M
		82	8.0	12.0	E12	4000	20	0.12	574	35SEPF82M
		120	10.0	13.0	F13	4400	18	0.12	840	35SEPF120M

※1:Rated ripple current (100 kHz/ +105 °C)

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4:After 2 minutes

◆ Please refer to each page in this catalog for "Flow conditions" and "Taping specifications".

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.



Selection guide	Line-up
	Series system diagram
	Products list

Surface mount type	SVF
	SVPK
	SXV
	SVPG
	SVPF
	SVPA
	SVPC
	SVPB
	SVPD
	SVPS

Radial lead type	SEK
	SEF
	SEPG
	SXE
	SEPF
	<b>SEPC</b>
	SEQP
	SEP

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Part number
			φD	L		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SEPC	2.5	100	5.0	9.0	B9	4180	7	0.10	500	2SEPC100MZ
		330	5.0	9.0		4180	7	0.10	500	2SEPC330MZ
		390	6.3	6.0	C6	3900	10	0.12	500	2SEPC390M
		470	5.0	9.0	B9	4180	7	0.10	500	2SEPC470MZ
		560	5.0	9.0		4180	7	0.10	500	2SEPC560MZ
			6.3	6.0	C6	3900	10	0.12	500	2SEPC560M
			6.3	9.0	C9	5600	7	0.10	500	2SEPC560MW
		8.0	9.0	E9	4700	8	0.10	280	2SEPC560MX	
		820	6.3	9.0	C9	5600	7	0.10	500	2SEPC820MW
			8.0	7.0	E7	5300	8	0.10	500	2SEPC820MD
			8.0	9.0	E9	6100	7	0.10	500	2SEPC820MX
			8.0	9.0		7200	5	0.10	500	2SEPC820MY
	8.0	13.0	E13	6100	7	0.10	500	2R5SEPC820M		
	1000	8.0	9.0	E9	6100	7	0.10	500	2SEPC1000MX	
	2700	10.0	13.0	F13	5560	10	0.10	1350	2SEPC2700M	
	4	560	6.3	9.0	C9	5600	7	0.10	500	4SEPC560MW
			8.0	9.0	E9	6100	7	0.10	500	4SEPC560MX
			8.0	13.0	E13	6100	7	0.10	500	4SEPC560M
		680	8.0	13.0		6100	7	0.10	544	4SEPC680M
		820	10.0	13.0	F13	6640	7	0.10	656	4SEPC820M
	6.3	220	6.3	5.5	C55	2980	18	0.12	280	6SEPC220M
			6.3	9.0	C9	5600	7	0.10	592	6SEPC470MW
			8.0	9.0	E9	5700	8	0.10	592	6SEPC470MX
		470	8.0	13.0	E13	5700	8	0.10	592	6SEPC470M
			560	6.3	9.0	C9	5600	7	0.10	705
		8.0		9.0	E9	6100	7	0.10	705	6SEPC560MX
		680	10.0	13.0	F13	6640	7	0.10	857	6SEPC680M
		1000	8.0	7.0	E7	3530	18	0.10	1260	6SEPC1000MD
	1500	10.0	13.0	F13	5560	10	0.10	1890	6SEPC1500M	
	10	270	8.0	7.0	E7	3220	22	0.12	500	10SEPC270MD
	16	100	6.3	6.0	C6	2490	24	0.10	320	16SEPC100M
			6.3	9.0	C9	4680	10	0.10	500	16SEPC100MW
150		8.0	7.0	E7	3220	22	0.12	500	16SEPC150MD	
		8.0	9.0	E9	5000	10	0.10	576	16SEPC180MX	
180		8.0	12.0	E12	4360	16	0.10	576	16SEPC180M	
		220	8.0	7.0	E7	4150	13	0.10	500	16SEPC220MD
270		8.0	9.0	E9	5000	10	0.10	864	16SEPC270MX	
		8.0	12.0	E12	5000	11	0.10	864	16SEPC270M	
470		10.0	13.0	F13	6100	10	0.10	1504	16SEPC470M	

※1:Ripple current (100 kHz/ +105 °C)

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4:After 2 minutes

◆ Please refer to each page in this catalog for "Flow conditions" and "Taping specifications".

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Radial lead type

# SEQP Series



- High voltage (32 V.DC max.)
- RoHS compliance, Halogen free
- 125 °C 1000 h

## Specifications

Items	Specifications				
	C6	E7	F8	E12	F13
Size code	C6	E7	F8	E12	F13
Category temperature range	-55 °C ~ +125 °C				
Rated voltage range	4 V.DC to 20 V.DC		4 V.DC to 32 V.DC		4 V.DC to 20 V.DC
Rated capacitance range	22 μF to 150 μF	6.8 μF to 330 μF	15 μF to 680 μF	18 μF to 560 μF	150 μF to 1200 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+125 °C, 1000 h/+105 °C, 5000 h, rated voltage applied				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## Marking and dimensions

Size code	(unit : mm)			
	φD ±0.5	L max	F ±0.5	φd ±0.05
C6	6.3	6.0	2.5	0.45
E7	8.0	7.0	3.5	0.45
F8	10.0	8.0	5.0	0.5
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications					Part number
			φD	L		Ripple current ※1 (mAr.m.s.)	Allowable ripple current ※1 (mAr.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SEQP	4	150	6.3	6.0	C6	572	1810	40	0.12	300	4SEQP150M
		330	8.0	7.0	E7	810	2560	35	0.12	660	4SEQP330M
		560	8.0	12.0	E12	1430	4520	13	0.15	448	4SEQP560M
		680	10.0	8.0	F8	1170	3700	25	0.12	544	4SEQP680M
		1200	10.0	13.0	F13	1721	5440	12	0.18	960	4SEQP1200M
	6.3	82	6.3	6.0	C6	537	1700	45	0.12	258	6SEQP82M
		150	8.0	7.0	E7	810	2560	35	0.12	472	6SEQP150M
		330	10.0	8.0	F8	1170	3700	25	0.12	416	6SEQP330M
		470	8.0	12.0	E12	1332	4210	15	0.15	592	6SEQP470M
		820	10.0	13.0	F13	1721	5440	12	0.15	775	6SEQP820M
	10	56	6.3	6.0	C6	537	1700	45	0.12	280	10SEQP56M
		120	8.0	7.0	E7	810	2560	35	0.12	600	10SEQP120M
		270	10.0	8.0	F8	1170	3700	25	0.12	540	10SEQP270M
		330	8.0	12.0	E12	1250	3950	17	0.15	660	10SEQP330M
		560	10.0	13.0	F13	1655	5230	13	0.15	840	10SEQP560M
	16	39	6.3	6.0	C6	512	1620	50	0.10	312	16SEQP39M
		82	8.0	7.0	E7	670	2120	40	0.12	656	16SEQP82M
		150	10.0	8.0	F8	955	3020	30	0.12	480	16SEQP150M
		180	8.0	12.0	E12	1151	3640	20	0.15	576	16SEQP180M
		330	10.0	13.0	F13	1493	4720	16	0.15	792	16SEQP330M
	20	22	6.3	6.0	C6	458	1450	60	0.10	220	20SEQP22M
		47	8.0	7.0	E7	598	1890	45	0.12	470	20SEQP47M
		68	10.0	8.0	F8	759	2400	40	0.12	272	20SEQP68M
		100	8.0	12.0	E12	1050	3320	24	0.15	400	20SEQP100M
		150	10.0	13.0	F13	1367	4320	20	0.15	600	20SEQP150M
	32	6.8	8.0	7.0	E7	440	1400	100	0.10	44	32SEQP6R8M
		15	10.0	8.0	F8	560	1800	80	0.10	96	32SEQP15M
		18	8.0	12.0	E12	790	2500	50	0.12	115	32SEQP18M

※1: Ripple current (100 kHz/ +105 °C < Tx < +125 °C) /Allowable ripple current (100 kHz/ Tx < +105 °C)

※2: ESR (100 kHz to 300 kHz/+20 °C)

※3: tan δ (120 Hz/+20 °C)

※4: After 2 minutes

◆Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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# Radial lead type

# SEP Series



- Standard
- 105 °C 3000 h
- RoHS compliance, Halogen free

## ● Specifications

Items	Specifications				
Size code	C6	E7	F8	E12	F13
Category temperature range	-55 °C to +105 °C				
Rated voltage range	4 V.DC to 20 V.DC			2.5 V.DC to 20 V.DC	
Rated capacitance range	22 μF to 150 μF	33 μF to 330 μF	56 μF to 680 μF	100 μF to 680 μF	150 μF to 1500 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	Please see the attached characteristics list				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Endurance	+105 °C, 3000 h, rated voltage applied (2.5 V.DC 2000 h applied)				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit			
Damp heat (Steady state)	+60 °C, 90 % to 95 %, 1000 h, No-applied voltage				
	Capacitance change	Within ±20 % of the initial value			
	tan δ	≤ 150 % of the initial limit			
	DC leakage current	Within the initial limit (after voltage processing)			

## ● Marking and dimensions

(unit : mm)

Size code	φD ±0.5	L max	F ±0.5	φd ±0.05
C6	6.3	6.0	2.5	0.45
E7	8.0	7.0	3.5	0.45
F8	10.0	8.0	5.0	0.5
E12	8.0	12.0	3.5	0.6
F13	10.0	13.0	5.0	0.6

## ● Characteristics list

Series	Rated voltage (V.DC)	Rated capacitance (μF)	Case size (mm)		Size code	Specifications				Part number
			φD	L		Ripple current ※1 (mA r.m.s.)	ESR ※2 (mΩ max.)	tan δ ※3	LC ※4 (μA)	
SEP	2.5	680	8.0	12.0	E12	4520	13	0.15	340	2R5SEP680M
		1500	10.0	13.0	F13	5440	12	0.18	750	2R5SEP1500M
	4	100	6.3	6.0	C6	1810	40	0.12	200	4SEP100M
		150	6.3	6.0		1810	40	0.12	300	4SEP150M
		220	8.0	7.0	E7	2560	35	0.12	440	4SEP220M
		330	8.0	7.0		2560	35	0.12	660	4SEP330M
		470	10.0	8.0	F8	3700	25	0.12	376	4SEP470M
		560	8.0	12.0	E12	4520	13	0.15	448	4SEP560M
		680	10.0	8.0	F8	3700	25	0.12	544	4SEP680M
		1200	10.0	13.0	F13	5440	12	0.18	960	4SEP1200M
		6.3	82	6.3	6.0	C6	1700	45	0.12	258
	150		8.0	7.0	E7	2560	35	0.12	472	6SEP150M
	330		10.0	8.0	F8	3700	25	0.12	416	6SEP330M
	470		8.0	12.0	E12	4210	15	0.15	592	6SEP470M
	820		10.0	13.0	F13	5440	12	0.15	775	6SEP820M
	10	56	6.3	6.0	C6	1700	45	0.12	280	10SEP56M
		120	8.0	7.0	E7	2560	35	0.12	600	10SEP120M
		270	10.0	8.0	F8	3700	25	0.12	540	10SEP270M
		330	8.0	12.0	E12	3950	17	0.15	660	10SEP330M
		560	10.0	13.0	F13	5230	13	0.15	840	10SEP560M
	16	39	6.3	6.0	C6	1620	50	0.10	312	16SEP39M
		82	8.0	7.0	E7	2120	40	0.12	656	16SEP82M
		150	10.0	8.0	F8	3020	30	0.12	480	16SEP150M
		180	8.0	12.0	E12	3640	20	0.15	576	16SEP180M
		330	10.0	13.0	F13	4720	16	0.15	792	16SEP330M
	20	22	6.3	6.0	C6	1450	60	0.10	220	20SEP22M
		33	8.0	7.0	E7	1890	45	0.12	330	20SEP33M
		47	8.0	7.0		1890	45	0.12	470	20SEP47M
		56	10.0	8.0	F8	2400	40	0.12	224	20SEP56M
		68	10.0	8.0		2400	40	0.12	272	20SEP68M
100		10.0	8.0	2570		35	0.12	400	20SEP100MX	
		8.0	12.0	E12	3320	24	0.15	400	20SEP100M	
150		10.0	13.0	F13	4320	20	0.15	600	20SEP150M	

※1:Ripple current (100 kHz/ +105 °C )

※2:ESR (100 kHz to 300 kHz/+20 °C)

※3:tan δ (120 Hz/+20 °C)

※4: After 2 minutes

◆Please refer to each page in this catalog for "Flow conditions" and "Taping specifications".

## ● Frequency correction factor for ripple current

Frequency	120 Hz ≤ f < 1 kHz	1 kHz ≤ f < 10 kHz	10 kHz ≤ f < 100 kHz	100 kHz ≤ f ≤ 500 kHz
Coefficient	0.05	0.3	0.7	1

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Conductive Polymer Hybrid Aluminum  
Electrolytic Capacitors

# Hybrid



SP-Cap™

POSCAP™

OS-CON™

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# Guidelines and Precautions

## ⚠ Application Guidelines

### 1. Circuit Design

#### 1-1 Operating Temperature and Frequency

Electrical parameters for electrolytic capacitors are normally specified at 20 °C temperature and 120 Hz frequency. These parameters vary with changes in temperature and frequency. Circuit designers should take these changes into consideration.

- (1) Effects of operating temperature on electrical parameters
  - (a) At higher temperatures, leakage current and capacitance increase while equivalent series resistance (ESR) decreases.
  - (b) At lower temperatures, leakage current and capacitance decrease while equivalent series resistance (ESR) increases.
- (2) Effects of frequency on electrical parameters
  - (a) At higher frequency capacitance and impedance decrease while  $\tan \delta$  increases.
  - (b) At lower frequency, heat generated by ripple current will rise due to an increase in equivalent series resistance (ESR).

#### 1-2 Operating Temperature and Life Expectancy

- (1) Expected life is affected by operating temperature. Generally, each 10 °C reduction in temperature will double the expected life. Use capacitors at the lowest possible temperature below the upper category temperature.
- (2) If operating temperatures exceed the upper category limit, rapid deterioration of electrical parameter will occur and irreversible damage will result.  
Check for the maximum capacitor operating temperatures including ambient temperature, internal capacitor temperature rise due to ripple current, and the effects of radiated heat from power transistors, IC's or resistors. Avoid placing components, which could conduct heat to the capacitor from the back side of the circuit board.
- (3) The formula for calculating expected life at lower operating temperatures is as follows ;

$$L_2 = L_1 \times 2^{\frac{T_1 - T_2}{10}}$$

$L_1$ : Guaranteed life (h) at temperature,  $T_1$  °C

$L_2$ : Expected life (h) at temperature,  $T_2$  °C

$T_1$ : Upper category temperature + temperature rise due to rated ripple current (°C)

$T_2$ : Actual operating temperature, ambient temperature + temperature rise due to ripple current heating (°C)

- (4) Using the capacitor beyond the estimated lifetime will result in short circuit, electrolyte leak, vent open, and large deterioration of characteristics. The lifetime cannot go above 15 years due to aging of sealing rubber.

#### 1-3 Common Application Conditions to Avoid

The following misapplication load conditions will cause rapid deterioration of a capacitor's electrical parameters. In addition, rapid heating and gas generation within the capacitor can occur, causing the pressure relief vent to operate and resultant leakage of electrolyte. Under extreme conditions, explosion and fire ignition could result. The leaked electrolyte is combustible and electrically conductive.

- (1) Reverse Voltage  
DC capacitors have polarity. Therefore, please do not apply the reverse voltage. Verify correct polarity before insertion.
- (2) Charge / Discharge Applications  
Standard capacitors are not suitable for use in repeating charge/discharge applications. For charge/discharge applications, consult us with your actual application condition.  
For rush current, please do not exceed 100 A.
- (3) ON-OFF circuit  
Do not use capacitors in circuit where ON-OFF switching is repeated more than 10000 times/per day. In case of applying to the theses ON-OFF circuit, consult with us about circuit condition and so on.
- (4) Over voltage  
Do not apply voltages exceeding the maximum specified rated voltage. Voltages up to the surge voltage rating are acceptable for short periods of time. Ensure that the sum of the DC voltage and the superimposed AC ripple voltage does not exceed the rated voltage.
- (5) Ripple Current  
Do not apply ripple currents exceeding the maximum specified value. For high ripple current applications, use a capacitor designed for high ripple currents. In addition, consult us if the applied ripple current is to be higher than the maximum specified value. Ensure that rated ripple currents that superimposed on low DC bias voltages do not cause reverse voltage conditions. Even if it is within a rated ripple current, in case the practical use is over the pre described endurance life time, it causes the increase of deterioration of ESR characteristic and the internal generation heat by ripple current. Due to this, there is some possibility of vent open, bulging of sleeve and rubber, electrolyte leakage, and shot circuit, explosion and ignition in the worst case.

#### 1-4 Using Two or More Capacitors in Parallel

The circuit resistance can closely approximate the series resistance of the capacitor, causing an imbalance of ripple current loads within the capacitors. Careful wiring methods can minimize the possible application of an excessive ripple current to a capacitor. Moreover, please do not use it in series.

#### 1-5 Capacitor Mounting Considerations

- (1) Double-Sided Circuit Boards  
Avoid wiring pattern runs, which pass between the mounted capacitor and the circuit board.

**(2) Clearance for Case Mounted Pressure Relief ( $\geq \phi$  10 mm)**

Capacitors with case mounted pressure relief require sufficient clearance to allow for proper pressure relief operation. The minimum clearance are dependent on capacitor diameters as follows.

- $\geq \phi$  10 mm : 2 mm minimum

**(3) Wiring Near the Pressure Relief ( $\geq \phi$  10 mm)**

Avoid locating high voltage or high current wiring or circuit board paths above the pressure relief .

Flammable, high temperature gas that exceeds 100°C may be released which could dissolve the wire insulation and ignite.

**(4) Circuit Board Patterns Under the Capacitor**

Avoid circuit board runs under the capacitor, as an electrical short can occur due to an electrolyte leakage.

**1-6 Electrical Isolation of the Capacitor**

Completely isolate the capacitor as follows.

- Between the cathode and the case and between the anode terminal and other circuit paths.

**1-7 Capacitor Sleeve**

The laminate coating is intended for marking and identification purposes and is not meant to electrically insulate the capacitor.

**2. Capacitor Handling Techniques****2-1 Considerations Before Using**

- (1) Capacitors have a finite life. Do not reuse or recycle capacitors from used equipment.
- (2) Transient recovery voltage may be generated in the capacitor due to dielectric absorption.  
If required, this voltage can be discharged with a resistor with a value of about 1 k $\Omega$ .
- (3) Capacitors stored for a long period of time may exhibit an increase in leakage current.  
This can be corrected by gradually applying rated voltage in series with a resistor of approximately 1 k $\Omega$ .
- (4) If capacitors are dropped, they can be damaged mechanically or electrically. Avoid using dropped capacitors.
- (5) Dented or crushed capacitors should not be used.  
The seal integrity can be damaged and loss of electrolyte/ shortened life can result.

**2-2 Capacitor Insertion**

- (1) Verify the correct capacitance and rated voltage of the capacitor.
- (2) Verify the correct polarity of the capacitor before insertion.
- (3) Verify the correct terminal dimension and land pattern size before mount to avoid stress on the terminals.
- (4) Excessive mounting pressure can cause high leakage current, short circuit, or disconnection.

**2-3 Reflow Soldering**

- (1) Surface-mount type capacitor are exclusively for reflow soldering.  
When reflow solder is used an ambient heat condition system such as the simultaneous use of infrared and hot-air is recommended.
- (2) Observe proper soldering conditions (temperature, time, etc.). Do not exceed the specified limits.  
※The Temperature on Capacitor top shall be measured by using thermal couple that is fixed firmly by epoxy glue.
- (3) In case of use in 2 times reflow, 2nd reflow must be done when the capacitor's temperature return back to normal level.
- (4) In our recommended reflow condition , the case discoloration and the case swelling might be slightly generated.  
But please acknowledge that these two phenomena do not influence the reliability of the product.
- (5) The crack on top marking might be occurred by reflow heat stress.  
But please acknowledge that it does not influence the reliability of the product.
- (6) VPS (Vapor Phase Soldering) reflow can cause significant characteristics change and/ or mounting failure due to deformation by acute temperature rise.  
VPS is acceptable provided that the process does not exceed recommended reflow profile and temperature rise is less than 3 deg/sec.  
Please contact Panasonic for detailed conditions.
- (7) The vibration-proof capacitors of size  $\Phi$ 6.3 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. However, even if sufficient solder fillets are not observed, the reliability of vibration-proof will not be lowered because the support terminals on the bottom side enhance the solder joint to PCB.

**2-4 Manual Soldering**

- (1) Observe temperature and time soldering specifications or do not exceed temperature of 350 °C for 3 seconds or less.
- (2) If a soldered capacitor must be removed and reinserted, avoid excessive stress on the capacitor leads.
- (3) Avoid physical contacts between the tip of the soldering iron and capacitors to prevent or capacitor failure.

**2-5 Capacitor Handling after Soldering**

- (1) Avoid moving the capacitor after soldering to prevent excessive stress on the lead wires where they enter the seal.
- (2) Do not use the capacitor as a handle when moving the circuit board assembly.
- (3) Avoid striking the capacitor after assembly to prevent failure due to excessive shock.

## 2-6 Circuit Board Cleaning

- (1) Circuit boards can be immersed or ultrasonically cleaned using suitable cleaning solvents for up to 5 minutes and up to 60 °C maximum temperatures. The boards should be thoroughly rinsed and dried. The use of ozone depleting cleaning agents is not recommended for the purpose of protecting our environment.
- (2) Avoid using the following solvent groups unless specifically allowed in the specification ;
  - (a) Halogenated cleaning solvents : except for solvent resistant capacitor types, halogenated solvents can permeate the seal and cause internal capacitor corrosion and failure.  
For solvent resistant capacitors, carefully follow the temperature and time requirements based on the specification. 1-1-1 trichloroethane should never be used on any aluminum electrolytic capacitor.
  - (b) Alkaline solvents : could react and dissolve the aluminum case.
  - (c) Petroleum based solvents : deterioration of the rubber seal could result.
  - (d) Xylene : deterioration of the rubber seal could result.
  - (e) Acetone : removal of the ink markings on the vinyl sleeve could result.
- (3) A thorough drying after cleaning is required to remove residual cleaning solvents that may be trapped between the capacitor and the circuit board. Avoid drying temperatures, which exceed the Upper category temperature of the capacitor.
- (4) Monitor the contamination levels of the cleaning solvents during use in terms of electrical conductivity, pH, specific gravity, or water content.  
Chlorine levels can rise with contamination and adversely affect the performance of the capacitor.
- (5) Depending on the cleaning method, the marking on a capacitor may be erased or blurred.  
Please consult us if you are not certain about acceptable cleaning solvents or cleaning methods.

## 2-7 Mounting Adhesives and Coating Agents

When using mounting adhesives or coating agents to control humidity, avoid using materials containing halogenated solvents.  
Also, avoid the use of chloroprene based polymers.  
Harden on dry adhesive or coating agents well lest the solvent should be left.  
After applying adhesives or coatings, dry thoroughly to prevent residual solvents from being trapped between the capacitor and the circuit board.

## 2-8 Fumigation

In exporting electronic appliances with aluminum electrolytic capacitors, in some cases fumigation treatment using such halogen compound as methyl bromide is conducted for wooden boxes.  
If such boxes are not dried well, the halogen left in the box is dispersed while transported and enters in the capacitors inside.  
This possibly causes electrical corrosion of the capacitors. Therefore, after performing fumigation and drying make sure that no halogen is left.  
Don't perform fumigation treatment to the whole electronic appliances packed in a box.

## 3. Precautions for using capacitors

### 3-1 Environmental Conditions

- Capacitors should not be stored or used in the following environments.
- (1) Exposure to temperatures above the upper category or below the lower category temperature of the capacitor.
  - (2) Direct contact with water, salt water, or oil.
  - (3) High humidity conditions where water could condense on the capacitor.
  - (4) Exposure to toxic gases such as hydrogen sulfide, sulfuric acid, nitric acid, chlorine, Chlorine compound, Bromine, Bromine compound or ammonia.
  - (5) Exposure to ozone, radiation, or ultraviolet rays.
  - (6) Vibration and shock conditions exceeding specified requirements.

### 3-2 Electrical Precautions

- (1) Avoid touching the terminals of a capacitor as a possible electric shock could result.  
The exposed aluminum case is not insulated and could also cause electric shock if touched.
- (2) Avoid short circuiting the area between the capacitor terminals with conductive materials including liquids such as acids or alkaline solutions.
- (3) A low-molecular-weight-siloxane which is included in a silicon material shall causes abnormal electrical characteristics.

## 4. Emergency Procedures

- (1) If the pressure relief of the capacitor operates, immediately turn off the equipment and disconnect from the power source.  
This will minimize an additional damage caused by the vaporizing electrolyte.
- (2) Avoid contact with the escaping electrolyte gas, which can exceed 100 °C temperatures.  
If electrolyte or gas enters the eye, immediately flush the eye with large amounts of water.  
If electrolyte or gas is ingested by mouth, gargle with water.  
If electrolyte contacts the skin, wash with soap and water.

## 5. Long Term Storage

Leakage current of a capacitor increases with long storage times. The aluminum oxide film deteriorates as a function of temperature and time.  
If used without reconditioning, an abnormally high current will be required to restore the oxide film.  
This surge current could cause the circuit or the capacitor to fail.  
Expiration date is 42 months from outgoing inspection date.  
For storage condition, keep room temperature (5 °C to 35 °C) and humidity (45 % to 85 %) where direct sunshine doesn't reach.

### 5-1 Environmental Conditions

Outside the scope of the environment that are described in the specifications or, Do not use or store under the following environments.

- (1) Exposure to temperatures above the upper category or below the lower category temperature of the capacitor.
- (2) Direct contact with water, salt water, or oil.
- (3) High humidity conditions where water could condense on the capacitor.
- (4) Exposure to toxic gases such as hydrogen sulfide, sulfuric acid, nitric acid, chlorine, Chlorine compound, Bromine, Bromine compound or ammonia.
- (5) Exposure to ozone, radiation, or ultraviolet rays.
- (6) Vibration and shock conditions exceeding specified requirements.

## 6. Capacitor Disposal

When disposing capacitors, use one of the following methods.

- (1) Incinerate after crushing the capacitor or puncturing the can wall (to prevent explosion due to internal pressure rise).
- (2) Dispose as solid waste.

NOTE : Local laws may have specific disposal requirements which must be followed.

The precautions in using aluminum electrolytic capacitors follow the "Safety application guide for the use in fixed aluminum electrolytic capacitors for electronic equipment", RCR-2367D issued by JEITA in October 2017.  
Please refer to the above application guide for details.

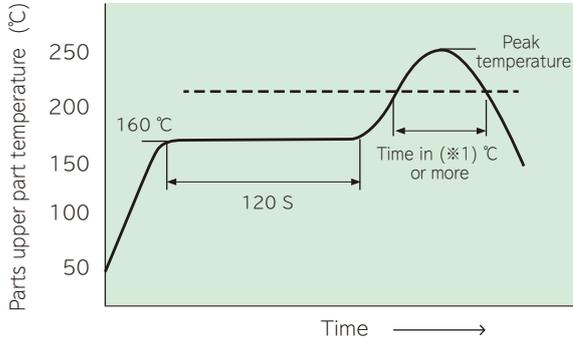
## Intellectual property right

We, Panasonic Group are providing the product and service that customers can use without anxiety, and are working positively on the protection of our products under intellectual property rights.  
Representative patents relating to **Conductive Polymer Hybrid Aluminum Electrolytic Capacitors** are as follows:

US Patent No. RE45994, 7497879, 7621970, 9208954  
JP Patent No. 5360250  
EP Patent No. 1808875

## Reflow guaranteed condition

### RoHS compliant



Size code	C, D, D8	F, G	
Peak temperature	260 °C (255 °C)	245 °C	260 °C
Time in peak temperature	≥ 250 °C 5 s (10 s)	≥ 240 °C 10 s	≥ 250 °C 5 s
Time in (※1) °C or more	≥ 230 °C 30 s	≥ 230 °C 30 s	≥ 230 °C 30 s
	≥ 217 °C 40 s	≥ 217 °C 40 s	≥ 217 °C 40 s
	≥ 200 °C 70 s	≥ 200 °C 70 s	≥ 200 °C 70 s
Time of reflow	2 times	2 times	1 time

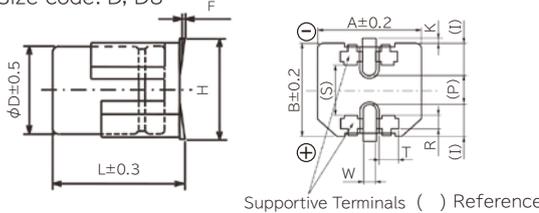
※For reflow, use a thermal condition system such as infrared radiation (IR) or hot blast.  
 ※Panasonic have several series available for pure Tin terminal and ZVEI reflow based on J-STD-020D (JEDEC). (Please contact sales for details.)

## Dimensions (Vibration-proof products)

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

### ● Size code: D, D8

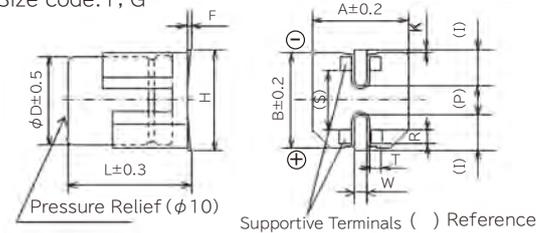
(Unit : mm)



Size code	φ D	L	A, B	H max.	F	I	W
D	6.3	6.1	6.6	7.8	0~+0.15	2.4	0.65±0.1
D8	6.3	8.0	6.6	7.8	0~+0.15	2.4	0.65±0.1
F	8.0	10.5	8.3	10.0	0~+0.15	3.4	1.2±0.2
G	10.0	10.5	10.3	12.0	0~+0.15	3.5	1.2±0.2

### ● Size code: F, G

(Unit : mm)



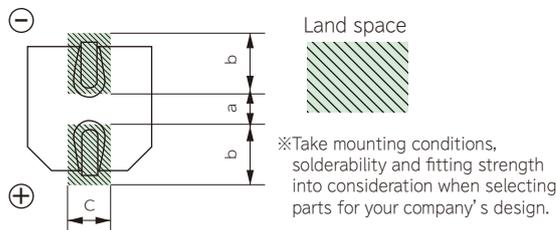
Size code	P	K	R	S	T
D	2.2	0.35 <sup>+0.15</sup> <sub>-0.20</sub>	0.85	3.7	1.05
D8	2.2	0.35 <sup>+0.15</sup> <sub>-0.20</sub>	0.85	3.7	1.05
F	3.1	0.7±0.2	0.7±0.2	5.3±0.2	1.3±0.2
G	4.6	0.7±0.2	0.7±0.2	6.9±0.2	1.3±0.2

## 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

(Unit : mm)



Size code	a	b	c
C (φ 5×L5.8)	1.5	2.8	1.6
D (φ 6.3×L5.8)	1.8	3.2	1.6
D8 (φ 6.3×L7.7)	1.8	3.2	1.6
F (φ 8×L10.2)	3.1	4.0	2.0
G (φ 10×L10.2)	4.6	4.1	2.0

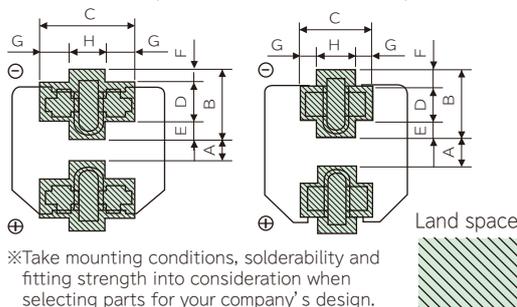
When size "a" is wide, back fillet can be made, decreasing fitting strength.

### ■ Vibration-proof products

#### ● Size code: D, D8

#### ● Size code: F, G

(Unit : mm)



Size code	A	B	C	D	E	F	G	H
D (φ 6.3×L6.1)	1.2	3.6	3.2	2.0	0.95	0.65	1.0	1.2
D8 (φ 6.3×L8.0)	1.2	3.6	3.2	2.0	0.95	0.65	1.0	1.2
F (φ 8×L10.5)	2.7	4.0	4.7	1.3	1.0	1.7	1.1	2.5
G (φ 10×L10.5)	3.9	4.4	4.7	1.3	1.2	1.9	1.1	2.5

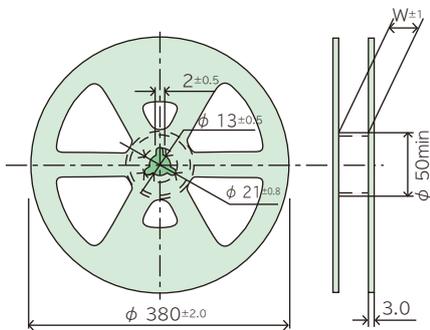
When size "A" is wide, back fillet can be made, decreasing fitting strength.

※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.

# Packing specifications

## Packaging Specifications

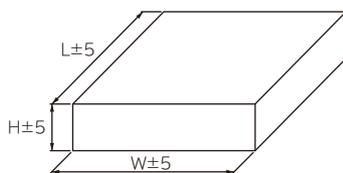
### Reel Dimensions (not to scale)



(Unit : mm)

Size code	W
C	14.0
D, D8	18.0
F, G	26.0

### Dimensions of Outer Carton Box



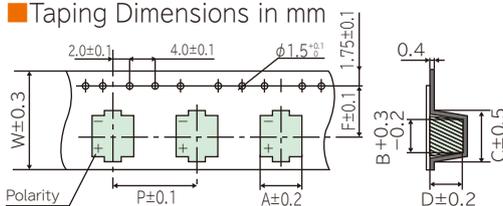
(Unit : mm)

Size code	H	W,L
C	220	395
D, D8	250	395
F, G	220	395

### Min. Packing Quantity

Size code	Min. Packing Qty pcs.
C, D	1000
D8	900
F, G	500

### Taping Dimensions in mm



(Unit : mm)

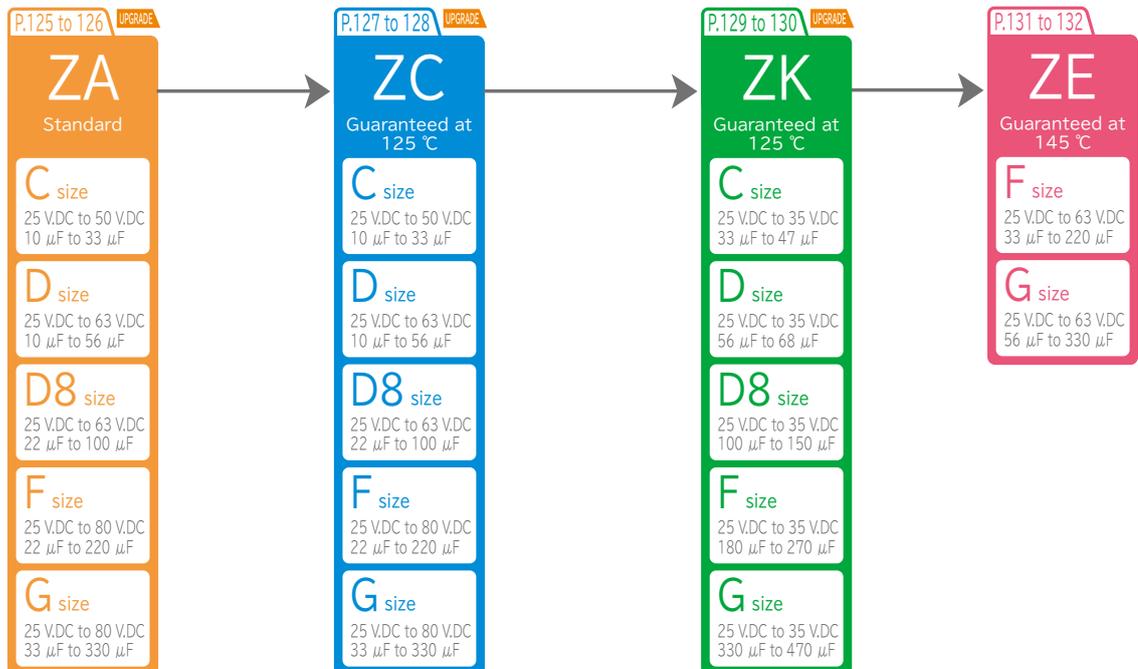
Size code	A	B	C	D	P	F	W
C	5.7	5.7	8.0	6.4	12.0	5.5	12.0
D	7.0	7.0	9.0	6.4	12.0	7.5	16.0
D8	7.0	7.0	9.0	8.4	12.0	7.5	16.0
F	8.7	8.7	12.5	11.0	16.0	11.5	24.0
G	10.7	10.7	14.5	11.0	16.0	11.5	24.0

※Ask factory for technical specifications.

# Line-up

Series	Page	Part No.	Features	Small size	Low profile	Low ESR	Long life	Category temperature range (°C)
UPGRADE ZA	125 to 126	EEHZA---	Low ESR High ripple current Long life 105 °C 10,000 h	●		●	●	-55 to 105
UPGRADE ZC	127 to 128	EEHZC---	Low ESR High ripple current Long life 125 °C 4,000 h	●		●	●	-55 to 125
UPGRADE ZK	129 to 130	EEHZK---	High capacitance High ripple current Long life 125 °C 4,000 h	●		●	●	-55 to 125
ZE	131 to 132	EEHZE---	High voltage / High ripple current Long life / 145 °C 2,000 h			●	●	-55 to 145

# Series system diagram



- Guidelines and Precautions
- Mounting specifications/Packing specifications
- Selection guide
- Surface mount type
- POSCAP™
- Guidelines and Precautions
- Mounting specifications/Packing specifications
- Selection guide
- Surface mount type
- Catalog Deletion and EOL models
- OS-CON™
- Guidelines and Precautions
- Mounting specifications/Packing specifications
- Selection guide
- Surface mount type
- Radial lead type
- Hybrid
- Guidelines and Precautions
- Mounting specifications/Packing specifications
- Line-up
- Series system diagram
- Products list
- ZA
- ZC
- ZK
- ZE
- Surface mount type

Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm)		Page	Series
				φD	L		
25 to 50	80 to 120	10 to 33	C	5	5.8	125 to 126	ZA
25 to 63	50 to 120	10 to 56	D	6.3	5.8		
	30 to 80	22 to 100	D8	6.3	7.7		
25 to 80	27 to 45	22 to 220	F	8	10.2		
	20 to 36	33 to 330	G	10	10.2		
25 to 50	80 to 120	10 to 33	C	5	5.8	127 to 128	ZC
25 to 63	50 to 120	10 to 56	D	6.3	5.8		
	30 to 80	22 to 100	D8	6.3	7.7		
25 to 80	27 to 45	22 to 220	F	8	10.2		
	20 to 36	33 to 330	G	10	10.2		
25 to 35	80 to 100	33 to 47	C	5	5.8	129 to 130	ZK
	50 to 60	56 to 68	D	6.3	5.8		
	30 to 35	100 to 150	D8	6.3	7.7		
	27	180 to 270	F	8	10.2		
	20	330 to 470	G	10	10.2		
25 to 63	27 to 40	33 to 220	F	8	10.2	131 to 132	ZE
	20 to 30	56 to 330	G	10	10.2		

# Products list

Size · ESR Matrix list

Size code (ESR mΩ)

V.DC	Series	μF															
		10	22	27	33	47	56	68	100	120	150	180	220	270	330	470	
25	ZA				C (80)		D (50)		D8 (30)				F (27)		G (20)		
	ZC				C (80)		D (50)		D8 (30)				F (27)		G (20)		
	ZK					C (80)		D (50)			D8 (30)			F (27)		G (20)	
	ZE												F (27)		G (20)		
35	ZA		C (100)	D (60)		D (60)		D8 (35)			F (27)				G (20)		
	ZC		C (100)			D (60)		D8 (35)			F (27)				G (20)		
	ZK				C (100)		D (60)		D8 (35)			F (27)			G (20)		
	ZE										F (27)				G (20)		
50	ZA	C (120)	D (80)		D8 (40)			F (30)	G (28)								
	ZC	C (120)	D (80)		D8 (40)			F (30)	G (28)	G (28)							
	ZE							F (30)	G (28)								
63	ZA	D (120)	D8 (80)		F (40)			G (30)									
	ZC	D (120)	D8 (80)		F (40)			G (30)	G (30)								
	ZE				F (40)			G (30)									
80	ZA		F (45)		G (36)												
	ZC		F (45)		G (36)	G (36)											

Size code

(unit : mm)

C	φ 5 x L5.8	F	φ 8 x L10.2
D	φ 6.3 x L5.8	G	φ 10 x L10.2
D8	φ 6.3 x L7.7		

# Surface mount type ZA Series

UPGRADE

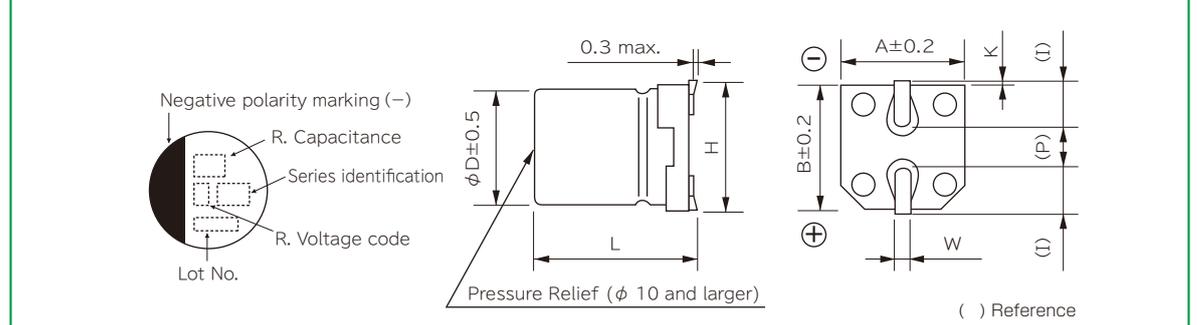


- Endurance: 10000 h at 105 °C
- High voltage (80 V.DC max.)
- AEC-Q200 compliant
- Low ESR and High ripple current (70 % over; Lower ESR than current V-FP)
- Vibration-proof products is available upon request. (φ6.3 mm and larger)
- RoHS compliant

## Specifications

Items	Specifications				
	C	D	D8	F	G
Size code	C	D	D8	F	G
Category temperature range	-55 °C to +105 °C				
Rated voltage range	25 V.DC to 50 V.DC		25 V.DC to 63 V.DC		25 V.DC to 80 V.DC
Rated capacitance range	10 μF to 33 μF	10 μF to 56 μF	22 μF to 100 μF	22 μF to 220 μF	33 μF to 330 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	I ≤ 0.01 CV or 3 (μA) After 2 minutes (Whichever is greater)				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Surge voltage(V.DC)	Rated voltage × 1.25 (15 °C to 35 °C)				
Endurance	+105 °C, 10000 h, apply the rated ripple current without exceeding the rated voltage				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
ESR after Endurance (Ω/100 kHz) (-40 °C)	Size Code				
	C	D	D8	F	G
	2.0	1.4	0.8	0.4	0.3
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)				
Damp Heat (Load)	+85 °C, 85 % to 90 %, 2000 h, rated voltage applied				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 200 % of the initial limit			
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.				
	Capacitance change	Within ±10 % of the initial value			
	tan δ	Within the initial limit			
DC leakage current	Within the initial limit				

## Marking and dimensions



R. Voltage (V.DC)	25	35	50	63	80
Code	E	V	H	J	K

Size code	(Unit : mm)							
	D	L	A,B	H	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	0.35 <sup>+0.15</sup> <sub>-0.20</sub>
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

※The dimensions of the vibration-proof products, please refer to the page of the mounting specification

## ● Characteristics list

Series	Rated voltage (V.DC)	Capacitance (±20%) (μF)	Case size (mm)		Size code	Specifications			Part number		Min. Packaging Qty
			φD	L		Ripple Current ※1 (mAr.m.s.)	ESR ※2 (mΩ)	tan δ ※3	Standard Product	Vibration-proof product	
ZA	25	33	5	5.8	C	900	80	0.14	EEHZA1E330R	—	1000
		56	6.3	5.8	D	1300	50	0.14	EEHZA1E560P	NEW EEHZA1E560V	1000
		100	6.3	7.7	D8	2000	30	0.14	EEHZA1E101XP	NEW EEHZA1E101XV	900
		220	8	10.2	F	2300	27	0.14	EEHZA1E221P	EEHZA1E221V	500
		330	10	10.2	G	2500	20	0.14	EEHZA1E331P	EEHZA1E331V	500
	35	22	5	5.8	C	900	100	0.12	EEHZA1V220R	—	1000
		27	6.3	5.8	D	1300	60	0.12	EEHZA1V270P	NEW EEHZA1V270V	1000
		47	6.3	5.8		1300	60	0.12	EEHZA1V470P	NEW EEHZA1V470V	1000
		68	6.3	7.7	D8	2000	35	0.12	EEHZA1V680XP	NEW EEHZA1V680XV	900
		150	8	10.2	F	2300	27	0.12	EEHZA1V151P	EEHZA1V151V	500
		270	10	10.2	G	2500	20	0.12	EEHZA1V271P	EEHZA1V271V	500
	50	10	5	5.8	C	750	120	0.10	EEHZA1H100R	—	1000
		22	6.3	5.8	D	1100	80	0.10	EEHZA1H220P	NEW EEHZA1H220V	1000
		33	6.3	7.7	D8	1600	40	0.10	EEHZA1H330XP	NEW EEHZA1H330XV	900
		68	8	10.2	F	1800	30	0.10	EEHZA1H680P	EEHZA1H680V	500
		100	10	10.2	G	2000	28	0.10	EEHZA1H101P	EEHZA1H101V	500
	63	10	6.3	5.8	D	1000	120	0.08	EEHZA1J100P	NEW EEHZA1J100V	1000
		22	6.3	7.7	D8	1500	80	0.08	EEHZA1J220XP	NEW EEHZA1J220XV	900
		33	8	10.2	F	1700	40	0.08	EEHZA1J330P	EEHZA1J330V	500
		56	10	10.2	G	1800	30	0.08	EEHZA1J560P	EEHZA1J560V	500
	80	22	8	10.2	F	1550	45	0.08	EEHZA1K220P	EEHZA1K220V	500
		33	10	10.2	G	1700	36	0.08	EEHZA1K330P	EEHZA1K330V	500

※1:Ripple current (100 kHz/ +105 °C) ※2:ESR (100 kHz/+20 °C) ※3:tan δ (120 Hz/ +20 °C)

◆Please refer to the P121 to 122 in this catalog for "Reflow conditions" and "Taping specifications".

## ● Frequency correction factor for ripple current

Rated capacitance(μF)	Frequency	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance(μF)	Frequency	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance(μF)	Frequency	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance(μF)	Frequency	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type ZC Series

UPGRADE

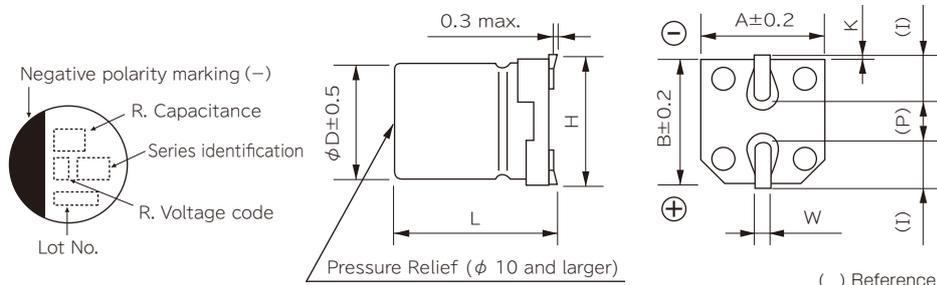


- Endurance: 4000 h at 125 °C (High temperature / Long life)
- High-withstand voltage (80 V.DC max.), Low LC (0.01 CV or 3 μA)
- AEC-Q200 compliant
- Low ESR and High ripple current (85 % over, Lower ESR than current V-TP)
- Vibration-proof products is available upon request. (φ6.3 mm and larger)
- RoHS compliant

## Specifications

Items	Specifications				
	C	D	D8	F	G
Size code	C	D	D8	F	G
Category temperature range	-55 °C to +125 °C				
Rated voltage range	25 V.DC to 50 V.DC	25 V.DC to 63 V.DC		25 V.DC to 80 V.DC	
Rated capacitance range	10 μF to 33 μF	10 μF to 56 μF	22 μF to 100 μF	22 μF to 220 μF	33 μF to 330 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	I ≤ 0.01 CV or 3 (μA) After 2 minutes (Whichever is greater)				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Surge voltage(V.DC)	Rated voltage × 1.25 (15 °C to 35 °C)				
Endurance 1	125 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 200 % of the initial limit			
Endurance 2	+125 °C, 3000 h, apply the rated ripple current without exceeding the rated voltage				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 300 % of the initial limit			
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)				
	DC leakage current	Within the initial limit			
Damp Heat (Load)	+85 °C, 85 % to 90 %, 2000 h, rated voltage applied				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 200 % of the initial limit			
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.				
	Capacitance change	Within ±10 % of the initial value			
	tan δ	Within the initial limit			
DC leakage current	Within the initial limit				

## Marking and dimensions



(Unit : mm)

R. Voltage (V.DC)	25	35	50	63	80
Code	E	V	H	J	K

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

※The dimensions of the vibration-proof products, please refer to the page of the mounting specification

## ● Characteristics list

Endurance 1: 125 °C 4000 hours  
Endurance 2: 125 °C 3000 hours

Series	Rated voltage (V.DC)	Capacitance (±20%) (μF)	Case size (mm)		Size code	Specifications				Part number		Min. Packaging Qty	
			φD	L		Ripple Current ※1 (mA r.m.s.)		ESR ※2 (mΩ)	tan δ ※3	Standard Product	Vibration-proof product		Taping (pcs)
						Endurance 1	Endurance 2						
ZC	25	33	5	5.8	C	550	—	80	0.14	EEHZC1E330R	—	1000	
		56	6.3	5.8	D	900	—	50	0.14	EEHZC1E560P	NEW EEHZC1E560V	1000	
		100	6.3	7.7	D8	1400	—	30	0.14	EEHZC1E101XP	NEW EEHZC1E101XV	900	
		220	8	10.2	F	1600	1900	27	0.14	EEHZC1E221P	EEHZC1E221V	500	
		330	10	10.2	G	2000	2900	20	0.14	EEHZC1E331P	EEHZC1E331V	500	
	35	22	5	5.8	C	550	—	100	0.12	EEHZC1V220R	—	1000	
		47	6.3	5.8	D	900	—	60	0.12	EEHZC1V470P	NEW EEHZC1V470V	1000	
		68	6.3	7.7	D8	1400	—	35	0.12	EEHZC1V680XP	NEW EEHZC1V680XV	900	
		150	8	10.2	F	1600	1900	27	0.12	EEHZC1V151P	EEHZC1V151V	500	
		270	10	10.2	G	2000	2800	20	0.12	EEHZC1V271P	EEHZC1V271V	500	
	50	10	5	5.8	C	500	—	120	0.10	EEHZC1H100R	—	1000	
		22	6.3	5.8	D	750	—	80	0.10	EEHZC1H220P	NEW EEHZC1H220V	1000	
		33	6.3	7.7	D8	1100	—	40	0.10	EEHZC1H330XP	NEW EEHZC1H330XV	900	
		68	8	10.2	F	1250	—	30	0.10	EEHZC1H680P	EEHZC1H680V	500	
		100	10	10.2	G	1600	—	28	0.10	EEHZC1H101P	EEHZC1H101V	500	
		120	10	10.2	G	1600	—	28	0.10	EEHZC1H121P	EEHZC1H121V	500	
	63	10	6.3	5.8	D	700	—	120	0.08	EEHZC1J100P	NEW EEHZC1J100V	1000	
		22	6.3	7.7	D8	900	—	80	0.08	EEHZC1J220XP	NEW EEHZC1J220XV	900	
		33	8	10.2	F	1100	—	40	0.08	EEHZC1J330P	EEHZC1J330V	500	
		56	10	10.2	G	1400	—	30	0.08	EEHZC1J560P	EEHZC1J560V	500	
		68	10	10.2	G	1400	—	30	0.08	EEHZC1J680P	EEHZC1J680V	500	
	80	22	8	10.2	F	1050	—	45	0.08	EEHZC1K220P	EEHZC1K220V	500	
		33	10	10.2	G	1360	—	36	0.08	EEHZC1K330P	EEHZC1K330V	500	
		47	10	10.2	G	1360	—	36	0.08	EEHZC1K470P	EEHZC1K470V	500	

※1: Ripple current (100 kHz/ +125 °C) ※2: ESR (100 kHz/+20 °C) ※3: tan δ (120 Hz/ +20 °C)

◆Please refer to the P121 to 122 in this catalog for "Reflow conditions" and "Taping specifications".

## ● Frequency correction factor for ripple current

Rated capacitance(μF)	Frequency	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance(μF)	Frequency	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance(μF)	Frequency	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance(μF)	Frequency	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

## ● After endurance ESR (100 kHz, -40 °C)

Size code	C	D	D8	F	G
ESR (Ω)	2.0	1.4	0.8	0.4	0.3

Design and Specifications are each subject to change without notice. Ask factory for the current technical Specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type ZK Series

UPGRADE



- High capacitance and High ripple current compared with ZC series
- Endurance : 4000 h at 125 °C (High temperature / Long life)
- Low ESR (85 % over, Lower ESR than Current V-TP), Low LC (0.01 CV or 3 μF)
- Equivalent to conductive polymer type Aluminum Electrolytic Capacitor (There are little characteristics change by temperature and frequency)
- Vibration-proof product is available upon request. (φ6.3 mm and larger)
- AEC-Q200 compliant
- RoHS directive compliant

## Specifications

Items	Specifications				
	C	D	D8	F	G
Size code	C	D	D8	F	G
Category temperature range	-55 °C to +125 °C				
Rated voltage range	25 V.DC to 35 V.DC				
Rated capacitance range	33 μF to 47 μF	56 μF to 68 μF	100 μF to 150 μF	180 μF to 270 μF	330 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)				
Leakage current	I ≤ 0.01 CV or 3 (μA) After 2 minutes (whichever is greater)				
Dissipation factor(tan δ)	Please see the attached characteristics list				
Surge voltage(V.DC)	Rated voltage × 1.25 (15 °C to 35 °C)				
Endurance	125 °C, 4000 h, apply the rated ripple current without exceeding the rated voltage				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 200 % of the initial limit			
	DC leakage current	Within the initial limit			
ESR after Endurance (Ω/100 kHz) (-40 °C)	Size Code				
	C	D	D8	F	G
	2.0	1.4	0.8	0.4	0.3
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)				
Damp Heat (Load)	85 °C, 85 % to 90 %, 2000 h, rated voltage applied				
	Capacitance change	Within ±30 % of the initial value			
	tan δ	≤ 200 % of the initial limit			
	E.S.R.	≤ 200 % of the initial limit			
DC leakage current	Within the initial limit				
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.				
	Capacitance change	Within ±10 % of the initial value			
	tan δ	Within the initial limit			
DC leakage current	Within the initial limit				

## Marking and dimensions

( ) Reference

(Unit : mm)

R. Voltage (V.DC)	25	35
Code	E	V

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

※The dimensions of the vibration-proof products, please refer to the page of the mounting specification

Selection guide	Line-up
	Series system diagram
	Products list
Surface mount type	Z A
	Z C
	Z K
	Z E

## ● Characteristics list

Series	Rated voltage (V.DC)	Capacitance (±20%) (μF)	Case size (mm)		Size code	Specifications			Part number		Min. Packaging Qty
			φD	L		Ripple Current ※1 (mA r.m.s.)	ESR ※2 (mΩ)	tan δ ※3	Standard Product	Vibration-proof product	
ZK	25	47	5.0	5.8	C	660	80	0.14	EEHZK1E470R	—	1000
		68	6.3	5.8	D	1080	50	0.14	EEHZK1E680P	NEW EEHZK1E680V	1000
		150	6.3	7.7	D8	1680	30	0.14	EEHZK1E151XP	NEW EEHZK1E151XV	900
		270	8.0	10.2	F	1920	27	0.14	EEHZK1E271P	EEHZK1E271V	500
		470	10.0	10.2	G	2800	20	0.14	EEHZK1E471P	EEHZK1E471V	500
	35	33	5.0	5.8	C	660	100	0.12	EEHZK1V330R	—	1000
		56	6.3	5.8	D	1080	60	0.12	EEHZK1V560P	NEW EEHZK1V560V	1000
		100	6.3	7.7	D8	1680	35	0.12	EEHZK1V101XP	NEW EEHZK1V101XV	900
		180	8.0	10.2	F	1920	27	0.12	EEHZK1V181P	EEHZK1V181V	500
		330	10.0	10.2	G	2800	20	0.12	EEHZK1V331P	EEHZK1V331V	500

※1:Ripple current (100 kHz/ +125 °C) ※2:ESR (100 kHz/+20 °C) ※3:tan δ (120 Hz/ +20 °C)

◆Please refer to the P121 to 122 in this catalog for "Reflow conditions" and "Taping specifications".

## ● Frequency correction factor for ripple current

Rated capacitance(μF)	Frequency	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 100 μF		0.15	0.20	0.25	0.30
100 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance(μF)	Frequency	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 100 μF		0.40	0.45	0.55	0.60
100 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance(μF)	Frequency	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 100 μF		0.70	0.75	0.80	0.80
100 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance(μF)	Frequency	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 100 μF		0.85	0.90	1.00	1.00
100 μF ≤ C		0.85	0.90	1.00	1.00

Design and Specifications are each subject to change without notice. Ask factory for the current technical Specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

# Surface mount type ZE Series



- Endurance: 2000 h at 145 °C (High temperature / Long life)
- Low ESR and High ripple current (85 % over, Lower ESR than Current V-TP)
- High-withstand voltage (25 V to 63V), Low LC (0.01 CV or 3μF)
- Equivalent to conductive polymer type Aluminum Electrolytic Capacitor (There are little characteristics change by temperature and frequency)
- Vibration-proof product is available upon request. (φ8 mm and larger)
- AEC-Q200 compliant
- RoHS directive compliant

## ● Specifications

Items	Specifications	
Size code	F	G
Category temperature range	-55 °C to +145 °C	
Rated voltage range	25 V.DC to 63 V.DC	
Rated capacitance range	33 μF to 220 μF	56 μF to 330 μF
Capacitance tolerance	±20 % (120 Hz/+20 °C)	
Leakage current	I ≤ 0.01 CV or 3 (μA) After 2 minutes (Whichever is greater)	
Dissipation factor(tan δ)	Please see the attached characteristics list	
Surge voltage(V.DC)	Rated voltage × 1.25 (15 °C to 35 °C)	
Endurance 1	The capacitor shall be subjected to application of the D.C. voltage with full rated ripple current at +145 °C for 2000 hours. After stabilizing at room temperature(+15 to 35 °C), the capacitor shall not exceed the specified limits. (The sum of DC voltage and ripple peak voltage shall not exceed the rated voltage.)	
Capacitance change	±30 % of initial measured value	
tan δ	≤ 200 % initial specified value	
E.S.R.	≤ 200 % initial specified value	
DC leakage current	≤ initial specified value	
Endurance 2	The capacitor shall be subjected to application of the D.C. voltage with full rated ripple current at +135 °C for 4000 hours. After stabilizing at room temperature(+15 to 35 °C), the capacitor shall not exceed the specified limits. (The sum of DC voltage and ripple peak voltage shall not exceed the rated voltage.)	
Capacitance change	±30 % of initial measured value	
tan δ	≤ 200 % initial specified value	
E.S.R.	≤ 200 % initial specified value	
DC leakage current	≤ initial specified value	
Shelf Life	After storage for 1000 hours at +145 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)	
Damp Heat (Load)	After applying rated working voltage for 2000 hours at +85°C±2°C / 85% to 90%RH and then being stabilized at +20°C, Capacitors shall meet the following limits.	
Capacitance change	±30 % of initial measured value	
tan δ	≤ 200 % initial specified value	
E.S.R.	≤ 200 % initial specified value	
DC leakage current	≤ initial specified value	
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
Capacitance change	±10 % of initial measured value	
tan δ	≤ initial specified value	
DC leakage current	≤ initial specified value	

## ● Marking and dimensions

(Unit : mm)

R. Voltage (V.DC)	25	35	50	63				
Code	E	V	H	J				
Size code	D	L	A,B	H	I	W	P	K
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

※The dimensions of the vibration-proof products, please refer to the page of the mounting specification

## ● Characteristics list

Endurance 1: 145 °C 2000 hours  
Endurance 2: 135 °C 4000 hours

Series	Rated voltage (V.DC)	Capacitance (±20%) (μF)	Case size (mm)		Size code	Specifications				Part number		Min. Packaging Q'ty	
			φD	L		Ripple Current ※1 (mA r.m.s.)		ESR ※2 (mΩ)	tan δ ※3	Standard Product	Vibration-proof product		Taping (pcs)
						Endurance 1	Endurance 2						
ZE	25	220	8	10.2	F	700	1600	27	0.14	EEHZE1E221P	EEHZE1E221V	500	
		330	10	10.2	G	900	2000	20	0.14	EEHZE1E331P	EEHZE1E331V	500	
	35	150	8	10.2	F	700	1600	27	0.12	EEHZE1V151P	EEHZE1V151V	500	
		270	10	10.2	G	900	2000	20	0.12	EEHZE1V271P	EEHZE1V271V	500	
	50	68	8	10.2	F	600	1250	30	0.10	EEHZE1H680P	EEHZE1H680V	500	
		100	10	10.2	G	800	1600	28	0.10	EEHZE1H101P	EEHZE1H101V	500	
	63	33	8	10.2	F	600	1100	40	0.08	EEHZE1J330P	EEHZE1J330V	500	
		56	10	10.2	G	800	1400	30	0.08	EEHZE1J560P	EEHZE1J560V	500	

※1: Ripple current (100 kHz/ +145 °C (Endurance 1) or +135 °C (Endurance 2) )

※2: ESR (100 kHz/+20 °C)

※3: tan δ (120 Hz/ +20 °C)

◆Please refer to the P121 to 122 in this catalog for "Reflow conditions" and "Taping specifications"

## ● Frequency correction factor for ripple current

Rated capacitance (μF)	Frequency	100 Hz ≤ f < 200 Hz	200 Hz ≤ f < 300 Hz	300 Hz ≤ f < 500 Hz	500 Hz ≤ f < 1 kHz
C < 47 μF	Correction factor	0.10	0.10	0.15	0.20
47 μF ≤ C < 150 μF		0.15	0.20	0.25	0.30
150 μF ≤ C		0.15	0.25	0.25	0.30

Rated capacitance (μF)	Frequency	1 kHz ≤ f < 2 kHz	2 kHz ≤ f < 3 kHz	3 kHz ≤ f < 5 kHz	5 kHz ≤ f < 10 kHz
C < 47 μF	Correction factor	0.30	0.40	0.45	0.50
47 μF ≤ C < 150 μF		0.40	0.45	0.55	0.60
150 μF ≤ C		0.45	0.50	0.60	0.65

Rated capacitance (μF)	Frequency	10 kHz ≤ f < 15 kHz	15 kHz ≤ f < 20 kHz	20 kHz ≤ f < 30 kHz	30 kHz ≤ f < 40 kHz
C < 47 μF	Correction factor	0.60	0.65	0.70	0.75
47 μF ≤ C < 150 μF		0.70	0.75	0.80	0.80
150 μF ≤ C		0.75	0.80	0.85	0.85

Rated capacitance (μF)	Frequency	40 kHz ≤ f < 50 kHz	50 kHz ≤ f < 100 kHz	100 kHz ≤ f < 500 kHz	500 kHz ≤ f
C < 47 μF	Correction factor	0.80	0.85	1.00	1.05
47 μF ≤ C < 150 μF		0.85	0.90	1.00	1.00
150 μF ≤ C		0.85	0.90	1.00	1.00

## ● After endurance ESR (100 kHz, -40 °C)

Size code	F	G
ESR (Ω)	0.4	0.3

Design and Specifications are each subject to change without notice. Ask factory for the current technical Specifications before purchase and/or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.

## Safety Precautions

When using our products, no matter what sort of equipment they might be used for,  
be sure to confirm the applications and environmental conditions with our specifications in advance.

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