Capacitors

Full Line Product Guide 2011.8

SANYO

Aluminum Solid Capacitors with Conductive Polymer

OS-CON

Tantalum Solid Capacitors with Conductive Polymer

POSCAP

www.edc.sanyo.com

Solid electrolytic capacitors with conductive polymer to meet the needs of all electronic equipments in the world

OS-CON and **POSCAP** use high conductive polymer to achieve low Equivalent Series Resistance (ESR), excellent noise reduction capability and ideal frequency characteristics. **POSCAP** uses sintered Tantalum for the Anode, therefore it achieves the lowest ESR level despite its low profile. In addition, 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.

Pb-free compliance

- All models are completely Pb-free and RoHS compliant.

Long lifetime

- (**OS-CON**) Some special series have 50,000h service lifetime at 85℃, and suitable for long-term-operating industrial equipments.
- (**POSCAP**) 2,000h lifetime at 105℃

Superior temperature characteristics

- Its ESR has stable characteristics at when operating between -55℃ and 105℃ (some up to 125℃), suitable for applications used at low temperatures (under 0℃).

Rush current resistance characteristics

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

Wide capacitance range

《 **OS-CON** (3.3 to 2,700μF), **POSCAP** (4.7 to 1,500μF)》

- An array of various series covers wide capacitance range.

High voltage, high reliability

- The products of the highest rated voltage 35V or high reliability can be used for automotive electric equipments and industrial equipments.

Applications

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

PRECAUTIONS

- The contents of this catalog are current as of August 2011. 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.
- Unauthorized duplication of this catalog in part or in whole is forbidden.
- Please understand that we cannot be held responsible for any damages to the industrial properties of any third party that arise from the use or application of the products listed in this catalog, with the exception of those items directly related to method of construction.

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OS-CON

POSCAP

※ Red letters : New series Yellow letters : Update

Application table

Personal computer / Peripheral

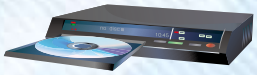
- Notebook PC
- Desktop PC
- Tablet PC
- Printer / Scanner
- Server
- LCD Monitor
- Copy
- Graphic board
- Router etc.

OS-CON	Small size・Low profile	High capacitance	Low ESR	High voltage	Long life・High reliability	Standard	Page
SVPF	●	●		●	●		34 to 35
SVPE		●	●				36 to 37
SVPC		●	●				42 to 43
SVPB	●						44 to 45
SVPA			●				46 to 47
SVQP					●		48 to 49
SVP						●	50 to 51
SEPF	●	●		●	●		52 to 53
SEPC	●	●	●		●		54 to 55
SEP						●	58 to 59

POSCAP	Small size・Low profile	High capacitance	Low ESR	Low ESL	High voltage・High reliability	Standard	Page
TPSF	●	●	●				89
TPC	●						90 to 91
TPE			●				92 to 95
TPB						●	96 to 97
TPL			●	●			98 to 99
TPLF			●	●			98 to 99
TPF		●	●				100 to 101
TQC					●		106 to 107

Audio / Visual

- 3D/LED/PDP/LCD-TV
- Blu-ray recorder / player
- DVD recorder / player
- Projector
- Audio
- Portable media player
- Portable audio player etc.



OS-CON	Small size・Low profile	High capacitance	Low ESR	High voltage	Long life・High reliability	Standard	Page
SVPF	●	●		●	●		34 to 35
SVPE		●	●				36 to 37
SVPS					●		38 to 39
SVPC		●	●				42 to 43
SVPB	●						44 to 45
SVPA			●				46 to 47
SVP						●	50 to 51
SEPF	●	●		●	●		52 to 53
SEP						●	58 to 59

POSCAP	Small size・Low profile	High capacitance	Low ESR	Low ESL	High voltage・High reliability	Standard	Page
TPU	●						86
TPSF	●	●	●				89
TPC	●						90 to 91
TPE			●				92 to 95
TPF		●	●				100 to 101
TQC					●		106 to 107

Car electronics

- Car navigation
- Car audio
- Car electronics etc.

OS-CON	Small size・Low profile	High capacitance	Low ESR	High voltage	Long life・High reliability	Standard	Page
SVPD				●	●		40 to 41
SVQP					●		48 to 49
SVP						●	50 to 51

POSCAP	Small size・Low profile	High capacitance	Low ESR	Low ESL	High voltage・High reliability	Standard	Page
TA					●		102
TV					●		103

Information technology

- POS system
- Card reader
- IP telephone
- Wireless
- Ubiquitous etc.

OS-CON	Small size・Low profile	High capacitance	Low ESR	High voltage	Long life・High reliability	Standard	Page
SVPF	●	●		●	●		34 to 35
SVPE		●	●				36 to 37
SVPS					●		38 to 39
SVPC		●	●				42 to 43
SVPB	●						44 to 45

POSCAP	Small size・Low profile	High capacitance	Low ESR	Low ESL	High voltage・High reliability	Standard	Page
TPB						●	96 to 97
TQC					●		106 to 107

Cellular phone / Smart phone

POSCAP	Small size · Low profile	High capacitance	Low ESR	Low ESL	High voltage·High reliability	Standard	Page
TPU	●						86
TPG	●	●					88
TPC	●						90 to 91
TPE			●				92 to 95

PDA / Ele. dictionary

POSCAP	Small size · Low profile	High capacitance	Low ESR	Low ESL	High voltage·High reliability	Standard	Page
TPU	●						86
TPH	●		●				87
TPG	●	●					88
TPC	●						90 to 91
TPE			●				92 to 95
TQC					●		106 to 107

Game

●Game machine
●Portable game etc.

OS-CON	Small size · Low profile	High capacitance	Low ESR	High voltage	Long life · High reliability	Standard	Page
SVPF	●	●		●	●		34 to 35
SVPE		●	●				36 to 37
SVPC		●	●				42 to 43
SVPA			●				46 to 47

POSCAP	Small size · Low profile	High capacitance	Low ESR	Low ESL	High voltage·High reliability	Standard	Page
TPU	●						86
TPH	●		●				87
TPSF	●	●	●				89
TPE			●				92 to 95
TPF		●	●				100 to 101

DSC

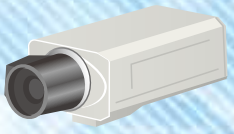
●Digital video camera

OS-CON	Small size · Low profile	High capacitance	Low ESR	High voltage	Long life · High reliability	Standard	Page
SVP						●	50 to 51

POSCAP	Small size · Low profile	High capacitance	Low ESR	Low ESL	High voltage·High reliability	Standard	Page
TPU	●						86
TPH	●		●				87
TPG	●	●					88
TPC	●						90 to 91
TPE			●				92 to 95

Factory / Enterprise

●Factory appliance
●Security
●Money changer
●LED Indicate-machine
●Enterprise camera etc.



OS-CON	Small size · Low profile	High capacitance	Low ESR	High voltage	Long life · High reliability	Standard	Page
SVPF	●	●		●	●		34 to 35
SVPE		●	●				36 to 37
SVPS					●		38 to 39
SVPD				●	●		40 to 41
SVPC		●	●				42 to 43
SVPA			●				46 to 47
SVQP					●		48 to 49
SVP						●	50 to 51
SEPF	●	●		●	●		52 to 53
SEQP				●	●		56 to 57
SEP						●	58 to 59

POSCAP	Small size · Low profile	High capacitance	Low ESR	Low ESL	High voltage·High reliability	Standard	Page
TPE			●				92 to 95
TPB						●	96 to 97
TA					●		102
TH					●		104 to 105
TQC					●		106 to 107

※ Red letters : New series Yellow letters : Update

Please take note of the following points in order to make the best use of SANYO capacitor's performance.
Please use the capacitor within the range of specified performance after confirming each capacitor's usage environment and circuit condition.
Please choose the capacitor that matches the lifetime of the intended circuit design.
The performance of the capacitor is changed by the temperature or frequency. Therefore, please consider these variations when designing the circuit.
Please buy SANYO capacitors from our official distributors. Otherwise there is no SANYO warranty.

Line-up

Aluminum Solid Capacitors with Conductive Polymer OS-CON
Tantalum Solid Capacitors with Conductive Polymer POSCAP

Considerations when using in industrial equipment

To when capacitor is used in industrial equipment, allow wider margin of capacitance, impedance and other characteristics.

Polarity

SANYO capacitors have polarity.
Please confirm the polarity prior to use.If it is used with the reverse polarities, leakage current, shorter lifetime or a short circuit may result.
There is no bi-polar model of **OS-CON** and **POSCAP**.

Rating and category

The definition of rating and category is as follows.

- Rated temperature:
  The maximum ambient temperature at which the rated voltage may be continuously applied.
- Rated voltage:
  The maximum direct voltage or peak value of pulse voltage which may be applied continuously to a capacitor at any temperature between the lower category temperature and the rated temperature.
- Category temperature range:
  The range of ambient temperatures for which the capacitor has been designed to operate continuously; this is given by the lower and upper category temperature.
- Category voltage:
  The maximum voltage which may be applied continuously to a capacitor at its upper limit of category temperature.

Operating temperature and ripple current

- Set the operating temperature so that it falls within the range stipulated in this delivery specification.
- Do not apply current that exceeds the allowable ripple current.When excessive ripple current is applied, internal heat increases and reduces the lifetime.
- In case the capacitor is used under the condition out of the specified frequency, ripple current shall not exceed the value revised by the frequency coefficient.

Parallel connection

Ripple current may be flowed to the capacitor that has lower impedance when different kind of capacitors are used in parallel.
Please be very careful of choosing models.
Please consider the balance of electric current when more than two capacitors are connected in parallel.

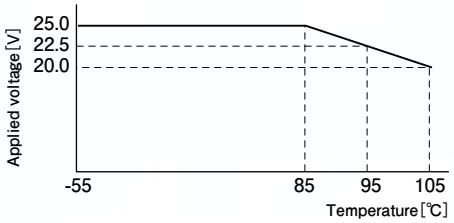
Applied voltage for designing

Do not apply voltages exceeding the full rated voltage.
If such voltage is applied, it may cause short circuit even though it is just a moment.

- 90% and below of the rated voltage or category voltage of **POSCAP** is recommended. If the rated voltage is 10V or over except for TQC series, 80% and below of the rated voltage or category voltage is recommended.
- Please refer to the following table for applied voltage of **OS-CON**.
- The sum of the DC voltage plus the peak AC voltage shall not exceed the rated voltage or category voltage.
- The sum of the DC voltage plus the negative peak AC voltage shall not allow reverse voltage.
- Do not apply reverse voltage.

Please contact us when there is a concern that circuit operation may cause reverse voltage.

	Operating environmental temperature	Applied voltage
25V products except for SVPF, SVPD, SEPF	below 85℃	Less than the rated voltage
	above 85℃	Applied the voltage shown in right figure
Other than those above	—	Less than the rated voltage



Operating environment restrictions

Do not use the capacitor in the following environments.

- Places where water, salt water or oil can directly fall on it and pleces where dew condensation may form
- Places with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc)
- Places susceptible to ozone, ultraviolet rays and radiation
- Places where vibration or shock exceeds the allowable value as specified in the catalog or specification sheet
- Places under direct sunlight

Land pattern

Please design hole space and hole diameter of circuit board for capacitor radial lead type,
or land patterns for capacitor SMD type with consideration of the product dimension specified in the catalog or specification sheet and the size tolerance.
Avoid locating heat-generating components around the capacitor and on the underside of the PC board.
When capacitor is mounted to the double sided circuit board, avoid placing through holes under the capacitor.
Avoid having the printed wire under the capacitor.

Soldering

- The soldering conditions as soldering iron, flow soldering, reflow soldering should be under the range prescribed in specifications.
- If the specifications are not followed, there is a possibility of the cosmetic defection, the intensive increase of leakage current or the capacitance reduction.
- Soldering heat stress to capacitor varies depending on temperature, duration time, mounting condition such as size, material and component quantity of PC board. Please check the heat durability in your actual soldering condition.

Things to be noted before mounting

- Do not reuse capacitors that have been assembled in a set and energized.
- Leakage current may increase when capacitors are stored for long term. In this case, we recommend you to apply the rated voltage for 1 hour at 60℃ to 70℃ with a resistor load of 1kΩ.
- In case the capacitor has re-striking-voltage, please apply the rated voltage to the capacitor through a resistor load of 1kΩ.

Mounting 1

- Please mount capacitors after confirming the polarity.
- Please mount capacitors after confirming its rated capacitance and rated voltage.
- When mounting capacitors to the circuit board, please use capacitors with the lead space matching the hole space of the circuit board.
- Do not drop capacitors or use capacitors dropped beforehand.
- Be careful not to deform the capacitor during installation.

Mounting 2

- When an automatic inserter is used to clinch the capacitor lead terminal, make sure it is not set too strongly.
- Be careful of the shock force that can be produced by absorbers, product chckers and centers on automatic inserters and installers.
- Do not apply excessive external force to the lead terminal or the capacitor itself.

Storage conditions

It is necessary to maintain a good storage environment in order to prevent the problem when soldering due to the degradation of solderability or moisturization of molding resin.

- When storing the reel in the storage bag, please ensure that the storage bag is fully sealed.※
- Do not store in high temperature and high humidity environment.
- For duration of storage, refer to the respective "Guidelines and precautions for use" of each capacitor.
- Do not store in damp conditions such as with water, salt water, or oil, and dew condensation.
- Do not store in places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc).
- Do not store in places susceptible to ozone, ultraviolet rays and radiation.
- Please unseal storage bag just before mounting and be conscious that the capacitors are used up.
  Refer to the respective "Guidelines and precautions for use" of each capacitor when some remain by necessity.

※ Only for capacitors packed by laminate bag.

Disposal of capacitors

Capacitor comprises solid organic compounds, various metals, resin, rubber, etc. Treat it as industrial waste when disposing of it.
In case of disposing of a large amount of SANYO capacitor, SANYO can dispose on your behalf.

SANYO Electric Co., Environment

The Sanyo Group regard "Environment" as the axis of all our business activities,
make innovations, and aim at “No. 1 Green Innovation Company in the Electronics Industry,”.
We promote the earth-conscious activities on our capacitor business.

RoHS compliance

All SANYO capacitors comply with RoHS directive (2002/95/EC).

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(Cr6+)
Polybrominated biphenyls(PBBs)
Polybromineted diphenyl ethers(PBDEs)

Lead-free stance

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

Halogen-free stance

Almost all SANYO capacitors already comply with halogen-free requirements. Please contact us for details.

The difinition of halogen-free for SANYO capacitors is about element or compound of chlorine(Cl) and bromine(Br) out of halogen family except fluorine, iodine and astatine, and satisfy the following conditions as homogeneous materials.※

The content percentage of chlorine(Cl)	0.09wt% (900ppm) below
The content percentage of bromine(Br)	0.09wt% (900ppm) below
The total content percentage of chlorine(Cl) and bromine(Br)	0.15wt% (1,500ppm) below

※Homogeneous material : the material that cannot be mechanically decomposed.

(Example)
- plastic composed of homogeneous material, adhesives, metallic material, ink, glass, paper, alloyed metal, etc.
- ink layer printed or coated on plastic material, coating layer, film of paint etc.
- thin metallic film formed on the surface of plastic material or metallic material

Aluminum Solid Capacitors with Conductive Polymer

OS-CON™

Series integration

Since the following models of the SVP and SVQP series have been integrated into models with a higher voltage rating, please consider these higher voltage rating models for new adoption or model changes.
Also, SANYO has announced the end of life of aluminum solid capacitors with organic semiconductive electrolyte. We encourage users to migrate to aluminum solid capacitors with conductive polymer.

Aluminum Solid Capacitors with conductive Polymer

Series	Size code	Applicable model	Alternative model
SVP	A5	6SVP15M	10SVP15M
		4SVP22M	6SVP22M
	B6	10SVP22M	16SVP22M
		6SVP33M	10SVP33M
	C6	6SVP56M	10SVP56M
		4SVP82M	6SVP82M
	E7	10SVP82M	16SVP82M
		6SVP120M	10SVP120M
		6SVP150M	10SVP150MX
		4SVP150M	10SVP150MX
		4SVP220M	6SVP220MX
	F8	4SVP470M	6SVP470MX
SVQP	E7	6SVQP150M	10SVQP150M
		4SVQP220M	6SVQP220M

Aluminum Solid Capacitors with Organic Semiconductive Electrolyte

SF	All size	EOL
SP		
SC		
SA		
SL		
SH		
SS		

OS-CON

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OS-CON

Aluminum Solid Capacitors with Conductive Polymer

※ Yellow letters : Update

OS-CON Line-up

Aluminum Solid Capacitors with Conductive Polymer

Classification	Series	Page	Features	Small size・Low profile	High capacitance	Low ESR	High voltage	Long life・High reliability	Size code	Category temperature range(℃)	Rated voltage range (V.DC)	Capacitance range(μF)	Marking color
Surface mount type	**SVPF**	34 to 35	Small size・Low profile High voltage High capacitance 105℃ 5,000h	●	●		●	●	B6	−55 to +105	16 to 25	27 to 82	Purple
									C6	−55 to +105	16 to 35	22 to 180	
									E7	−55 to +105	16 to 35	39 to 270	
									E12	−55 to +105	16 to 35	82 to 560	
									F12	−55 to +105	16 to 35	120 to 1,000	
	SVPE	36 to 37	Super low ESR High capacitance		●	●			B6	−55 to +105	2.5 to 6.3	150 to 330	Purple
									C6	−55 to +105	2.5 to 6.3	220 to 390	
									C10	−55 to +105	2.0 to 1.6	180 to 1,200	
									F12	−55 to +105	16	470	
	SVPS	38 to 39	Long life					●	A5	−55 to +105	4.0 to 10	10 to 33	Purple
									B6	−55 to +105	4.0 to 16	22 to 68	
									C6	−55 to +105	4.0 to 20	22 to 150	
									E7	−55 to +105	4.0 to 25	10 to 270	
									F8	−55 to +105	4.0 to 16	100 to 680	
	SVPD	40 to 41	Guaranteed at 125℃ Rated 35V max. 85℃85% RH				●	●	C6	−55 to +125	10 to 25	10 to 56	Purple
									E7	−55 to +125	16 to 35	8.2 to 82	
									F8	−55 to +125	25 to 35	18 to 39	
									E12	−55 to +125	25 to 35	22 to 47	
									F12	−55 to +125	25 to 35	47 to 82	
	SVPC	42 to 43	Super low ESR High capacitance		●	●			B6	−55 to +105	2.5 to 16	39 to 180	Purple
									C6	−55 to +105	2.5 to 16	68 to 560	
									E7	−55 to +105	2.5 to 16	120 to 680	
									E12	−55 to +105	2.5 to 16	270 to 1,500	
									F12	−55 to +105	2.5	2,700	
	SVPB	44 to 45	Low profile	●					C5	−55 to +105	2.5 to 20	15 to 120	Purple
									C55	−55 to +105	20	22	
	SVPA	46 to 47	Low ESR Large ripple current			●			B6	−55 to +105	2.5 to 20	10 to 82	Purple
									C6	−55 to +105	2.5 to 20	22 to 180	
									E7	−55 to +105	2.5 to 20	47 to 330	
									F8	−55 to +105	2.5 to 16	180 to 820	
	SVQP	48 to 49	Guaranteed at 125℃					●	C6	−55 to +125	4.0 to 20	22 to 150	Purple
									E7	−55 to +125	6.3 to 20	47 to 220	
	SVP	50 to 51	Standard						A5	−55 to +105	4.0 to 16	3.3 to 33	Purple
									B6	−55 to +105	4.0 to 20	10 to 68	
									C6※1	−55 to +105	2.5 to 25	6.8 to 220	
									E7※1	−55 to +105	4.0 to 25	10 to 330	
									F8※1	−55 to +105	4.0 to 25	22 to 680	
									E12※1	−55 to +105	2.5 to 25	33 to 680	
									F12※1	−55 to +105	2.5 to 25	56 to 1,500	

※1 The surge voltage of 25V products is 25V.
Please consider 25V products of SVPD series or SVPF series (whose surge voltage is 29V) in placing a new order.

Classification	Series	Page	Features	Small size・Low profile	High capacitance	Low ESR	High voltage	Long life・High reliability	Size code	Category temperature range(℃)	Rated voltage range (V.DC)	Capacitance range(μF)	Marking color
Radial lead type	**SEPF**	52 to 53	Small size·Low profile High voltage High capacitance 105℃ 5,000h	●	●		●	●	C55	−55 to +105	16 to 32	22 to 150	Purple
									C6	−55 to +105	16 to 35	22 to 180	
									E7	−55 to +105	16 to 35	39 to 270	
									E12	−55 to +105	16 to 35	82 to 560	
									F13	−55 to +105	16 to 35	120 to 1,000	
	SEPC	54 to 55	Super low ESR High capacitance Small size Low profile 105℃ 5,000h	●	●	●		●	B9	−55 to +105	2.5	100 to 560	Purple
									C55	−55 to +105	6.3	220	
									C6	−55 to +105	2.5 to 16	100 to 390	
									C9	−55 to +105	2.5 to 16	100 to 820	
									E7	−55 to +105	2.5 to 16	150 to 820	
									E9	−55 to +105	2.5 to 16	180 to 1,000	
									E12	−55 to +105	16	180 to 270	
									E13	−55 to +105	2.5 to 6.3	470 to 820	
									F13	−55 to +105	2.5 to 16	470 to 2,700	
	SEQP	56 to 57	105℃ 5,000h Guaranteed at 125℃ Rated 32V max.				●	●	C6	−55 to +125	4.0 to 20	22 to 150	Purple
									E7	−55 to +125	4.0 to 32	6.8 to 330	
									F8	−55 to +125	4.0 to 32	15 to 680	
									E12	−55 to +125	4.0 to 32	18 to 560	
									F13	−55 to +125	4.0 to 20	150 to 1,200	
	SEP	58 to 59	Standard						C6※1	−55 to +105	4.0 to 25	6.8 to 150	Purple
									E7※1	−55 to +105	4.0 to 25	10 to 330	
									F8※1	−55 to +105	4.0 to 25	22 to 680	
									E12※1	−55 to +105	2.5 to 25	33 to 680	
									F13※1	−55 to +105	2.5 to 25	56 to 1,500	

※1 The surge voltage of 25V products is 25V. Please consider SEPF series 25V Products (whose surge voltage is 29V) in placing a new order.

⚠Precautions for circuit designing

Crucial precautions Important

1 Prohibited circuits

(a) OS-CON leakage current may become larger as 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 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.

2 Failure and life-span

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

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 OS-CON.

(1) When current is relatively low
(ϕ10: approx 1A or less, ϕ8: approx 0.5A or less, ϕ6.3: approx 0.2A or less)
OS-CON becomes heated, but no effects are visible even when the current is continously 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 is 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 info 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) 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.

2-2. Wear-out failure (lifetime)

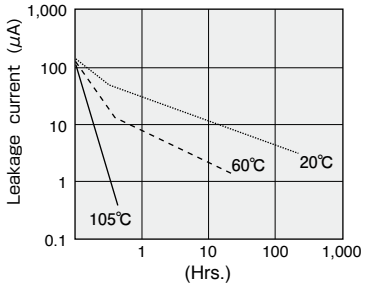
When lifetime span exceeded the specified guarantee time of Endurance and Damp heat, electrolyte might insulate and cause electric characteristic changed. This is called an open circuit.
The electric characteristics of capacitance and ESR may possibly change within the specified range in specifications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

Other precautions

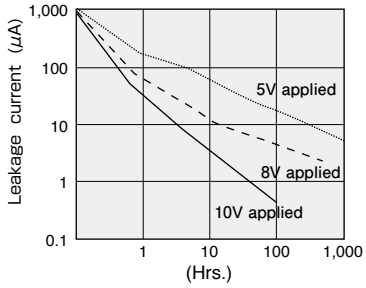
1 Leakage current

Mechanical stress may cause **OS-CON** 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
16V/10μF (16V DC applied)



OS-CON
leakage current restoration characteristics
10V/33μF (Ambient temperature:65℃)
(Measured voltage:10V)



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

2 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 **OS-CON** is in the following cases.

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

3 Soldering with a soldering iron

(a) When the lead terminal for radial lead type must be processed because the lead pitch and the PCB holes in spacing do not match, process it without any stresses to **OS-CON** before soldering.
(b) Solder without any excessive stresses to **OS-CON** itself.
(c) When an **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 the **OS-CON** itself.

4 Flow soldering

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

5 Reflow soldering

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

6 Handling after soldering

Do not subject the **OS-CON** to excessive stress as follows.
(a) Do not tilt, bend or twist **OS-CON**.
(b) Do not move the PCB with holding **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.

7 Cleaning PCB

Check the following items before washing PC board with these detergents: high quality alcohol-based cleaning fluid such as Pine-α 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) Watch the contamination of the detergent 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 jpper 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.

8 Fixatives and coating materials

(a) Select the appropriate covering and sealant materials for OS-CONs. In particular, make sure the fixative, coating and thinner do not contain acetone.
(b) Before applying a fixative or coating, completely remove any flux residue and foreign matter from the area where the board and OS-CON will be jointed together.
(c) Allow any detergent to dry before applying a fixative or coating.
(d) Please contact us for fixative and coating heat curing conditions.

9 Storage conditions

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

		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.

10 Capacitor insulation

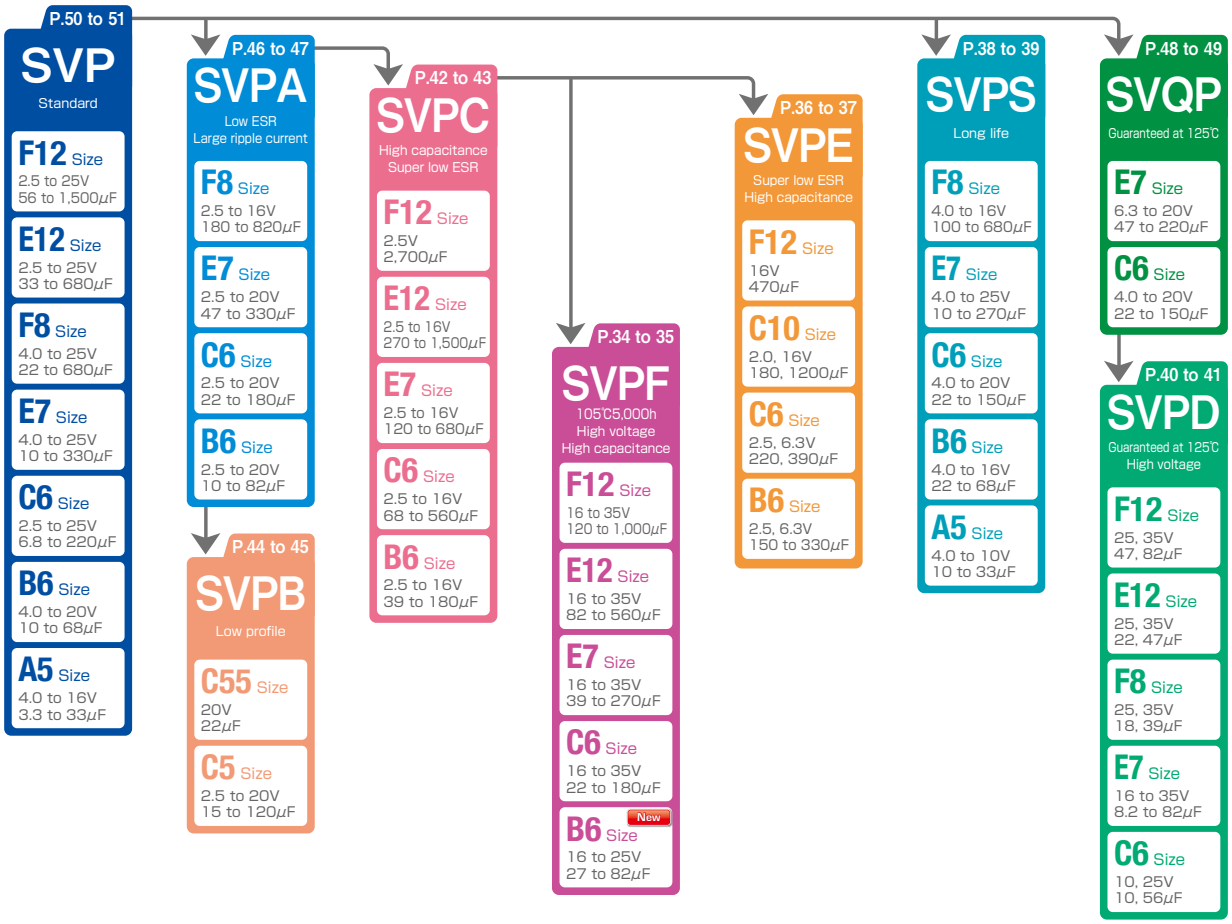
Be sure to completely separate the case, negative lead terminal, positive lead terminal and PC board patterns with each other due to the following reasons.

(a) Insulation in the marking sleeve and the laminate resin is not guaranteed.
(b) The space between the case and the negative electrode terminal is not insulated and has some resistance.

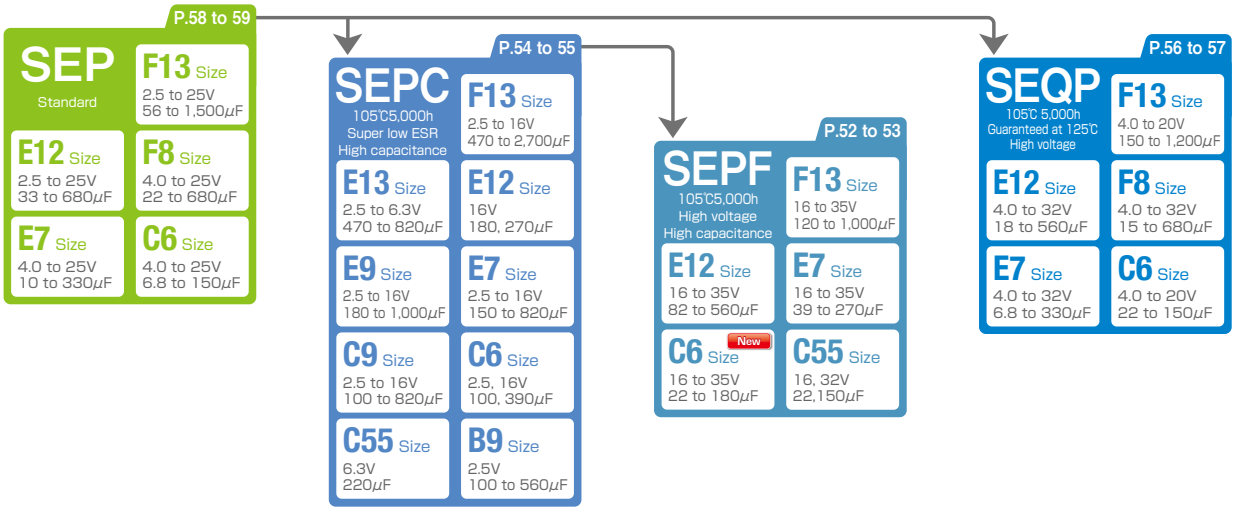
Series system diagram

Aluminum Solid Capacitors with Conductive Polymer

SMD type



Radial lead type

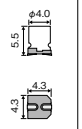
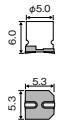
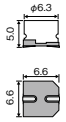
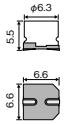
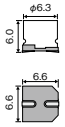
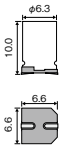
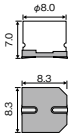
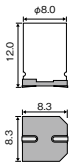
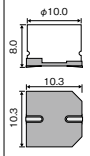
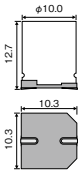


Case Size (Unit:mm)

	A5	B6	B9	C5	C55	C6	C9	C10	E7	E9	E12	E13	F8	F12	F13
D(ϕ)	4.0	5.0	5.0	6.3	6.3	6.3	6.3	6.3	8.0	8.0	8.0	8.0	10.0	10.0	10.0
L	5.5	6.0	9.0	5.0	5.5	6.0	9.0	10.0	7.0	9.0	12.0	13.0	8.0	12.7	13.0

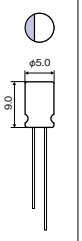
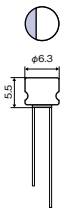
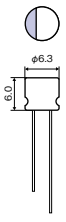
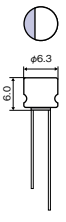
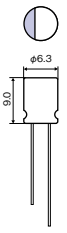
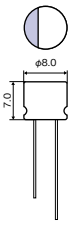
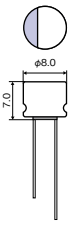
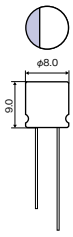
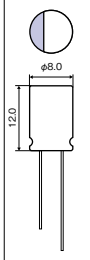
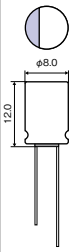
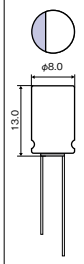
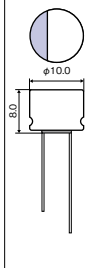
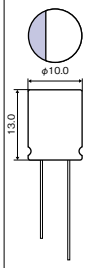
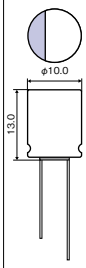
SMD type

(Unit:mm)

A5 Size	B6 Size	C5 Size	C55 Size	C6 Size	C10 Size	E7 Size	E12 Size	F8 Size	F12 Size
									
P.38 to 39 SVPS	P.34 to 35 SVPF New	P.44 to 45 SVPB	P.44 to 45 SVPB	P.34 to 35 SVPF	P.36 to 37 SVPE	P.34 to 35 SVPF	P.34 to 35 SVPF	P.38 to 39 SVPS	P.34 to 35 SVPF
P.50 to 51 SVP	P.36 to 37 SVPE			P.36 to 37 SVPE		P.38 to 39 SVPS	P.40 to 41 SVPD	P.40 to 41 SVPD	P.36 to 37 SVPE
	P.38 to 39 SVPS			P.38 to 39 SVPS		P.40 to 41 SVPD	P.42 to 43 SVPC	P.46 to 47 SVPA	P.40 to 41 SVPD
	P.42 to 43 SVPC			P.40 to 41 SVPD		P.42 to 43 SVPC	P.50 to 51 SVP	P.50 to 51 SVP	P.42 to 43 SVPC
	P.46 to 47 SVPA			P.42 to 43 SVPC		P.46 to 47 SVPA			P.50 to 51 SVP
	P.50 to 51 SVP			P.46 to 47 SVPA		P.48 to 49 SVQP			
				P.48 to 49 SVQP		P.50 to 51 SVP			
				P.50 to 51 SVP					

※ Profile of case size are all indicated in maximum values.
※ For products the height within 5mm, please contact us directly.

Radial lead type

B9 Size	C55 Size	C6 Size	C6 Size	C9 Size	E7 Size	E7 Size	E9 Size	E12 Size	E12 Size	E13 Size	F8 Size	F13 Size	F13 Size
													
P.54 to 55 SEPC	P.52 to 53 SEPF	P.52 to 53 SEPF New	P.56 to 57 SEQP	P.54 to 55 SEPC	P.52 to 53 SEPF	P.56 to 57 SEQP	P.54 to 55 SEPC	P.52 to 53 SEPF	P.54 to 55 SEPC	P.54 to 55 SEPC	P.56 to 57 SEQP	P.52 to 53 SEPF	P.54 to 55 SEPC
	P.54 to 55 SEPC	P.54 to 55 SEPC	P.58 to 59 SEP		P.54 to 55 SEPC	P.58 to 59 SEP			P.56 to 57 SEQP		P.58 to 59 SEP		P.56 to 57 SEQP
									P.58 to 59 SEP				P.58 to 59 SEP

※ Profile of case size are all indicated in maximum values.
※ For products the height within 5mm, please contact us directly.

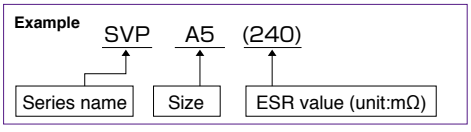
Products list

Aluminum Solid Capacitors with Conductive Polymer

Size·ESR Matrix list / SMD type

μF \ V	2.0	2.5	4.0		6.3		10	
3.3								
4.7							SVP A5(240)	
6.8							SVP A5(240)	
8.2								
10							SVPS A5(220) SVP A5(220)	
15							SVPS A5(200)	SVP A5(200)
18								
22					SVPS A5(200) SVP A5(200)			
27								
33			SVPS A5(200)	SVP A5(200)			SVPS B6(70)	SVP B6(70)
39			SVP B6(70)					
47					SVPS B6(30) SVPA B6(30)	SVP B6(70)	SVP C6(50)	
56							SVPD C6(45) SVPB C5(40)	SVQP C6(45) SVP C6(45)
68			SVPS B6(30) SVPA B6(30)	SVP B6(60)			SVPS C6(30) SVPC B6(30)	SVPC B6(23) SVPA C6(30)
82		SVPA B6(30)			SVPB C5(40) SVQP C6(45) SVP C6(45)			
100			SVPB C5(40)		SVPC B6(30) SVPC B6(25)	SVQP C6(40) SVP C6(40)		
120		SVPB C5(40)			SVPS C6(22) SVPC B6(21)	SVPA C6(22) SVP C6(17)	SVPC C6(27) SVPC C6(22)	SVQP E7(35) SVP E7(35)
150			SVPS C6(22) SVPC B6(30) SVPC B6(23) SVPC B6(20)	SVPA C6(22) SVQP C6(40) SVP C6(40)	SVPE B6(12)		SVPS E7(30) SVPS F8(30) SVPA E7(30) SVQP E7(35)	SVP E7(35) SVP F8(30)
180		SVPC B6(30) SVPC B6(24) SVPC B6(19) SVPA C6(20)			SVPE B6(15)			
220		SVP C6(23)			SVPE C6(10) SVPS E7(22) SVPC C6(27) SVPC C6(15)	SVPA E7(22) SVQP E7(35) SVP E7(35) SVP F8(25)		
270		SVPE B6(10)	SVPS E7(22)	SVPA E7(22)			SVPC E7(22)	SVP F8(25)
330		SVPE B6(10) SVPE B6(15) SVPA E7(20)	SVPC C6(27) SVPC C6(21)	SVPC C6(15) SVP E7(35)	SVPC C6(17) SVP F8(25)		SVPS F8(24) SVPA F8(24)	SVP F8(25) SVP E12(17)
390		SVPE C6(10) SVPC C6(25) SVPC C6(15)			SVPC E7(22)			
470					SVPS F8(20) SVPA F8(20)	SVP F8(25) SVP E12(15)		
560		SVPC C6(16)	SVPC E7(22) SVPC E12(9)	SVP E12(13)			SVP F12(13)	
680		SVPC E7(20) SVP E12(13)	SVPS F8(20) SVPA F8(20)	SVP F8(25)				
820		SVPC E12(9) SVPA F8(19)			SVPC E12(12) SVP F12(12)			
1,000								
1,200	SVPE C10(8)		SVPC E12(12)	SVP F12(12)				
1,500		SVPC E12(10) SVP F12(12)	SVPC E12(12)					
2,700		SVPC F12(12)						

How to read the lists in P18 to 21
- The name, sizes and ESR values of each series are found where the voltage (V) and capacitance (μF) intersect each other. (Refer to the example.)
- Please confirm the details in the list of each series from P34 to P59.
- There are two or more same series names in a cell, which part number is different each, so please check the characteristics list of the series.



Size·ESR Matrix list / SMD type

16		20		25	35	V / μF
SVP A5(260)						3.3
						4.7
				SVP C6(80)		6.8
					SVPD E7(70)	8.2
		SVPA B6(40) SVP B6(120)		SVPS E7(60) SVPD C6(65) SVP E7(60)		10
SVP B6(120)		SVPB C5(45)				15
					SVPD F8(60)	18
SVPS B6(90) SVP B6(90)		SVPS C6(60) SVPB C55(35) SVPA C6(35)	SVQP C6(60) SVP C6(60)	SVPD E7(48) SVP F8(50)	SVPD E12(50) SVPF C6(35)	22
		SVP C6(60)		SVPF B6(40)		27
SVPB C5(40)		SVP E7(45)		SVP E12(30)		33
SVPS C6(24) SVPC B6(35) SVPC B6(27) SVPA C6(35)	SVPA C6(24) SVQP C6(50) SVP C6(50)			SVPD F8(45)	SVPF E7(30)	39
		SVPS E7(45) SVPA E7(33)	SVQP E7(45) SVP E7(45)	SVPF C6(30) SVPD E12(30)	SVPD F12(30)	47
SVP E7(45)		SVP F8(40)	SVPF B6(30)	SVPF C6(30) SVP F12(28)		56
SVPC C6(30) SVPC C6(25)		SVP F8(40)				68
SVPS E7(30) SVPD E7(40) SVPA E7(30)	SVQP E7(40) SVP E7(40) SVPF B6(27)			SVPF E7(28) SVPD F12(28)	SVPF E12(20)	82
SVPS F8(35) SVPC C6(24)	SVP F8(35)	SVP E12(24)				100
SVPC E7(27)		SVPF C6(25)			SVPF F12(18)	120
SVPC E7(22) SVP F8(30)		SVP F12(20)				150
SVPF C6(22) SVPE C10(11) SVPS F8(29) SVPA F8(29) SVP F8(30)	SVP E12(20)	SVPF E7(25)		SVPF E12(16)		180
						220
SVPF E7(22) SVPC E12(16)						270
SVP F12(16)				SVPF F12(14)		330
		SVPF E12(14)				390
SVPE F12(10)						470
SVPF E12(14)		SVPF F12(12)				560
						680
						820
SVPF F12(12)						1,000
						1,200
						1,500
						2,700

Standard sizes (unit : mm)

A5	φ4.0×L5.5	C6	φ6.3×L6.0	F8	φ10.0×L8.0
B6	φ5.0×L6.0	C10	φ6.3×L10.0	E12	φ8.0×L12.0
C5	φ6.3×L5.0	E7	φ8.0×L7.0	F12	φ10.0×L12.7
C55	φ6.3×L5.5				

※ Red letters : New models

Products list

Aluminum Solid Capacitors with Conductive Polymer

Size·ESR Matrix list / Radial lead type

V / μF	2.5	4.0	6.3	10
6.8				
10				
15				
18				
22				
33				
39				
47				
56				SEQP C6(45) SEP C6(45)
68				
82			SEQP C6(45) SEP C6(45)	
100	SEPC B9(7)	SEP C6(40)		
120				SEQP E7(35) SEP E7(35)
150		SEQP C6(40) SEP C6(40)	SEQP E7(35) SEP E7(35)	
180				
220		SEP E7(35)	SEPC C55(18)	
270				SEPC E7(22) SEQP F8(25) SEP F8(25)
330	SEPC B9(7) SEPC C9(7)	SEQP E7(35) SEP E7(35)	SEQP F8(25) SEP F8(25)	SEQP E12(17) SEP E12(17)
390	SEPC C6(10)			
470	SEPC B9(7)	SEP F8(25)	SEPC C9(7) SEPC E9(8) SEPC E13(8) SEQP E12(15) SEP E12(15)	
560	SEPC B9(7) SEPC C9(7) SEPC E9(8)	SEPC C9(7) SEPC E9(7) SEPC E13(7) SEQP E12(13) SEP E12(13)	SEPC C9(7) SEPC E9(7)	SEQP F13(13) SEP F13(13)
680	SEP E12(13)	SEPC E13(7) SEQP F8(25) SEP F8(25)	SEPC F13(7)	
820	SEPC C9(7) SEPC E7(8) SEPC E9(5) SEPC E9(7) SEPC E13(7)	SEPC F13(7)	SEQP F13(12) SEP F13(12)	
1,000	SEPC E9(7)			
1,200		SEQP F13(12) SEP F13(12)		
1,500	SEP F13(12)		SEPC F13(10)	
2,700	SEPC F13(10)			

Standard sizes (unit : mm)

C55	φ6.3×L5.5	E7	φ8.0×L7.0	E12	φ8.0×L12.0
C6	φ6.3×L6.0	F8	φ10.0×L8.0	E13	φ8.0×L13.0
B9	φ5.0×L9.0	E9	φ8.0×L9.0	F13	φ10.0×L13.0
C9	φ6.3×L9.0				

Size·ESR Matrix list / Radial lead type

16	20	25	32	35	V / μF
		SEP C6(80)	SEQP E7(100)		6.8
		SEP E7(60)			10
			SEQP F8(80)		15
			SEQP E12(50)		18
	SEQP C6(60) SEP C6(60)	SEP F8(50)	SEPF C55(35)	SEPF C6(35)	22
	SEP E7(45)	SEP E12(30)			33
SEQP C6(50) SEP C6(50)				SEPF E7(30)	39
	SEQP E7(45) SEP E7(45)				47
	SEP F8(40)	SEP F13(28) SEPF C6(30)			56
	SEQP F8(40) SEP F8(40)		SEPF E7(25)		68
SEQP E7(40) SEP E7(40)		SEPF E7(28)		SEPF E12(20)	82
SEPC C6(24) SEPC C9(10)	SEQP E12(24) SEP F8(35) SEP E12(24)				100
	SEPF C6(25)			SEPF E13(18)	120
SEPF C55(30) SEPC E7(22) SEQP F8(30) SEP F8(30)	SEQP F13(20) SEP F13(20)				150
SEQP E12(20) SEPC E9(10) SEPC E12(16) SEP E12(20) SEPF C6(22)	SEPF E7(25)	SEPF E12(16)			180
SEPC E7(13)					220
SEPF E7(22) SEPC E12(11) SEPC E9(10)					270
SEQP F13(16) SEP F13(16)		SEPF F13(14)			330
	SEPF E12(14)				390
SEPC F13(10)					470
SEPF E12(14)	SEPF F13(12)				560
					680
					820
SEPF F13(12)					1,000
					1,200
					1,500
					2,700

※ Red letters : New models

Specifications for SMD type

1. Part number system

1	6	S	V	P	3	R	3	M

Rated voltage

Example

Rated volt.	Code
2.0	2
2.5	2R5
4.0	4
6.3	6
10	10
16	16
20	20
25	25
35	35

Series name

SVP
SVQP
SVPA
SVPB
SVPC
SVPD
SVPS
SVPE
SVPF

Rated capacitance

Example

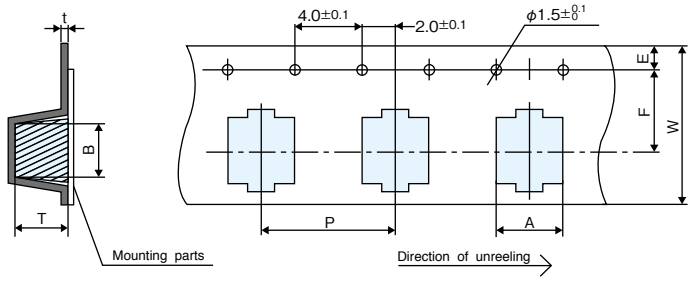
Rated cap.(μF)	Code
3.3	3R3
4.7	4R7
10	10
22	22
100	100
220	220
470	470
1,500	1500

Capacitance tolerance

Cap. tolerance	Code
±20%	M

2. Taping

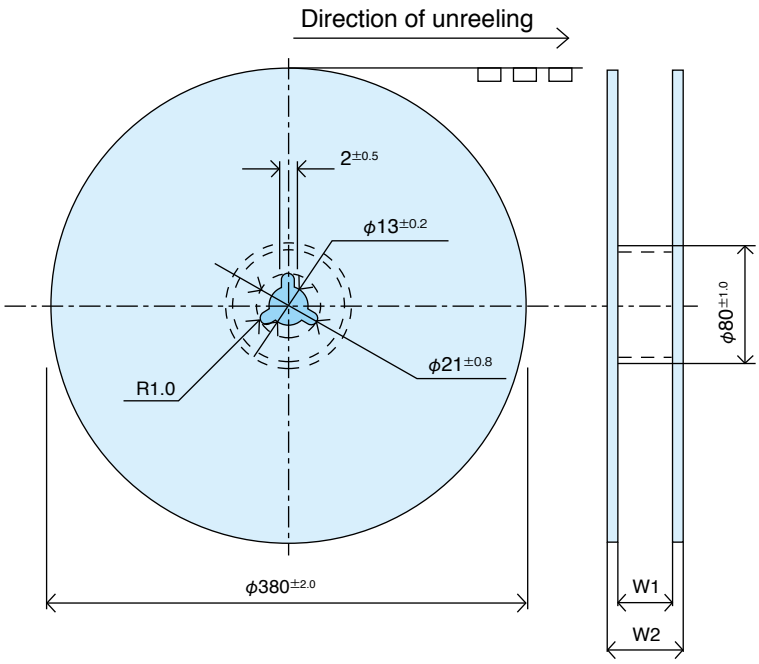
2-1. Carrier tape



(unit : mm)

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

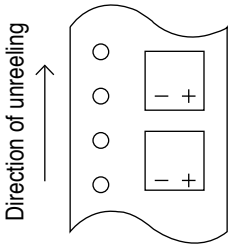
2-2. Reel



(unit : mm)

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

2-3. Polarity



3. Minimum packing quantity

Taping type

Size code	pcs./Reel (φ380)
A5	2,000
B6	1,500
C5	1,300
C55	1,000
C6	1,000
C10	500
E7	1,000
F8	500
E12	400
F12	400

Specifications for radial lead type

1. Part number system

1 6	S E P C	4 7 0	M +	T
Rated voltage	Series name	Rated capacitance	Capacitance tolerance	Taping or forming of terminal code

Example

Rated volt.	Code
2.5	2R5※1
4.0	4
6.3	6
10	10
16	16
20	20
25	25
32	32

SEP
SEQP
SEPC
SEPF

Example

Rated cap.(μF)	Code
6.8	6R8
10	10
22	22
100	100
220	220
470	470
1,000	1000
2,700	2700

Cap. tolerance	Code
±20%	M

Taping or lead terminal wire process code
None suffix for regular length lead type products

※1 Code 2 is used for 2.5V products of B9,C6,C9,E7,E9 and F13 size in SEPC series.

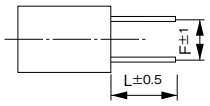
2. Lead terminal process

2-1. 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	B9,C55,C6,C9,E7,E9,E12	○	+C3	+TSS (+S)
	E13	○	+C3	+TS(+D)
	F8,F13	○	+C3	+T

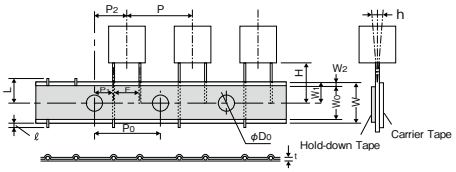
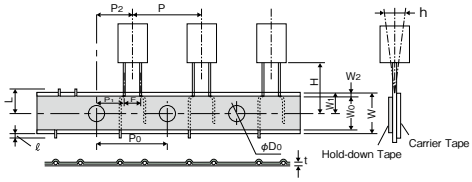
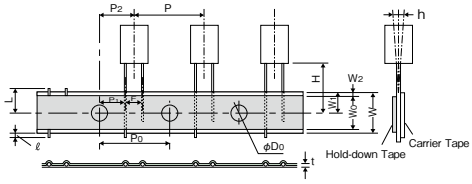
2-2. Lead terminal cutting

Lead terminal cutting code	Process names	Size code (φD)	Dimensions (unit : mm)
+C3 (+3)	Straight cut	B9(φ5) C55 ,C6, C9(φ6.3) E7, E9, E12, E13(φ8) F8, F13(φ10)	

	C3
L	3.5

Size code	B9	C45, C55, C6, C9	E7, E9, E12, E13	F8, F13
F	2.0	2.5	3.5	5.0

2-3. Lead terminal taping

Taping code	F	Size code (φD)	Taping
+T	F=5.0mm	F8, F13(φ10)	
+TS (+D)	F=3.5mm	E13(φ8)	
+TSS (+S)	F=2.0mm F=2.5mm F=3.5mm	B9(φ5) C55, C6, C9(φ6.3) E7, E9, E12(φ8)	

(unit : mm)

Code		F	P	P0	P1	P2	Δh	W	W0	W1	W2	H	φD0	t	ℓ	L
Tolerance		+0.8 −0.2	±1.0	±0.2	±0.5	±1.0	±1.0	±0.5	min.	±0.5	max	±0.75	±0.2	±0.3	max	max
+T	φ10	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)	φ8	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)	φ5	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
	φ6.3	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
	φ8	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

3. Minimum packing quantity

Processed type discrete lead terminals

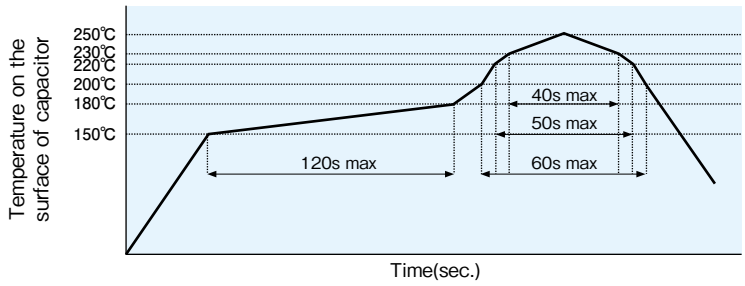
Size code	Case size	pcs./Bag
B9	φ 5	500
C55, C6, C9	φ 6.3	500
E7, E9, E12, E13	φ 8	200
F8, F13	φ10	200

Zig-zag pack taping type

Size code	Case size	pcs./Box
B9	φ 5	2,000
C55, C6, C9	φ 6.3	1,500
E7, E9, E12, E13	φ 8	1,000
F8, F13	φ10	500

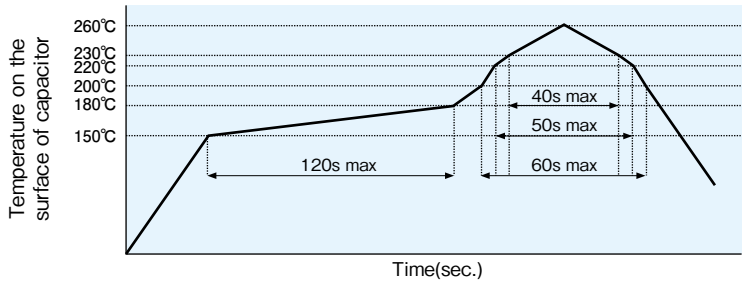
Peak temperature 250℃ lead free reflow soldering profile

The cycles of reflow soldering: Twice (max)



Peak temperature 260℃ lead free reflow soldering profile

The cycles of reflow soldering: Once (max)



Soldering with a soldering iron

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

Flow soldering

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

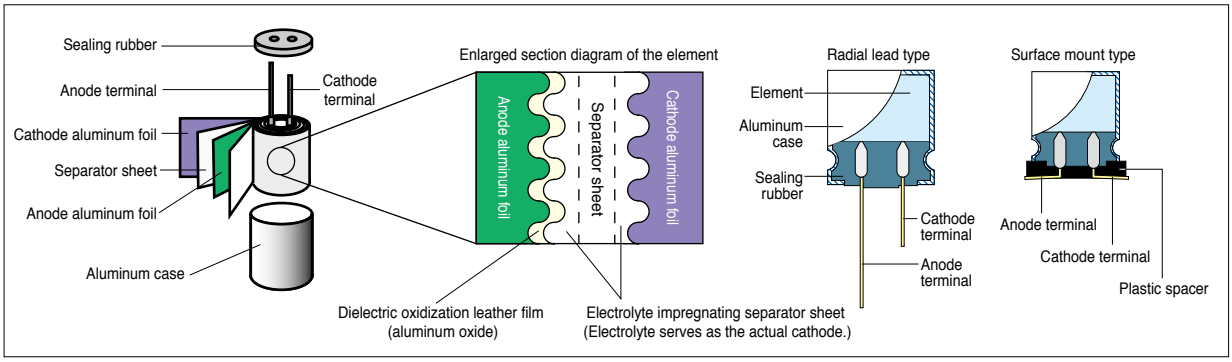
※1. When soldering 2 times, total immersion time should be 10 + 1 sec. or less.

1. Basic structure of OS-CON

OS-CON has a basic construction similar to an aluminum electrolytic capacitor.
A distinctive difference lies in electrolyte.

Aluminum electrolytic capacitor	Separator sheet impregnated with electrolytic solution.	Liquid electrolyte
OS-CON	Separator sheet impregnated with conductive polymer.	Solid electrolyte

1-1. Basic construction



Characteristics between OS-CON and aluminum electrolytic capacitor due to a difference in electrolyte

	Aluminum electrolytic capacitor	OS-CON
Conductivity	3(mS/cm)	3,000(mS/cm)
	· Difficult to lower ESR due to low conductivity · ESR augments, in particular, in low temperature conditions	· The highest electronic conductivity, realizing super low ESR. · ESR is stable in low temperature conditions
Reliability, lifespan	· Liquid electrolyte is evaporable at high temperature · Static capacitance is on the decline at high temperature · Limited lifespan resulting from dry-up · Major fluctuations in temperature characteristics	· Little evaporation due to solid electrolyte · Little decrease in static capacitance · Long lifespan even at high temperature · Very minor fluctuations in temperature characteristics
Temperature coefficient (for lifespan)	2 times by 10℃ reduction	10 times by 20℃ reduction
	105℃/2,000h→85℃/8,000h	105℃/2,000h→85℃/20,000h

2. OS-CON Manufacturing Method

【Radial lead type】

- Aluminum etching foil
- Forming
- Foil slitter
- Winding
- Forming and carbonization
- impregnation and polymerization
- Rubber sealing (curl)
- Marking
- Aging and Inspection
- Packing and Shipping

Lead wire Separator Sheet

Conductive polymer

Rubber·Case

【Surface mount type】

- Aluminum etching foil
- Forming
- Foil slitter
- Winding
- Forming and carbonization
- impregnation and polymerization
- Rubber sealing (curl)
- Aging and Inspection
- Forming and Marking
- Packing and Shipping

Lead wire Separator Sheet

Conductive polymer

Rubber·Case

Plastic Spacer

1. OS-CON Electrical characteristics

1-1. Frequency characteristics

Fig.A Impedance frequency characteristics (OS-CON vs other types)

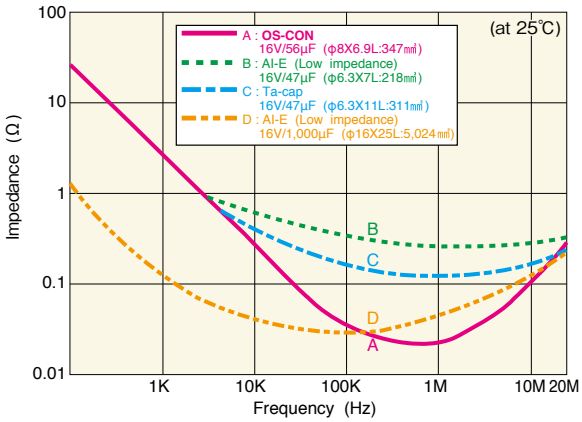
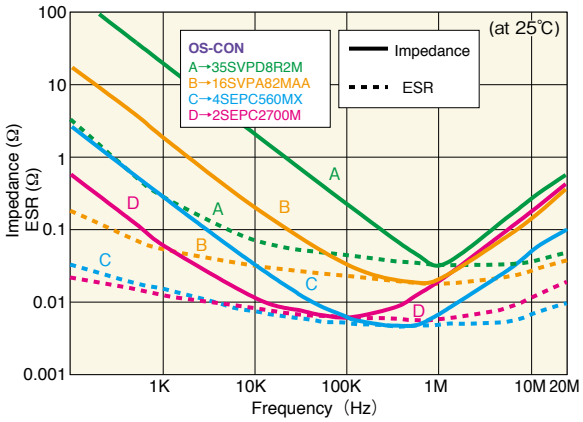


Fig.B Impedance & ESR frequency characteristics (several OS-CON models)



OS-CON is an electrolytic capacitor that has excellent frequency characteristics. It improves ESR greatly, and provides the excellent frequency characteristics because **OS-CON** use a high conductive polymer as electrolyte.
Fig.A: The **OS-CON**'s frequency characteristic shows a nearly ideal curve. When compared at 100kHz, **OS-CON** 56μF, and low impedance aluminum electrolytic capacitor 1,000μF nearly have the same feature.
Fig.B: The resonance point of the **OS-CON** is at 100kHz to 10MHz. The ESR is an extremely small value approximately 5mΩ at 100kHz of 560μF.

1-2. Characteristics at high temperature and low temperature

Fig.A ESR temperature characteristics (OS-CON vs other types)

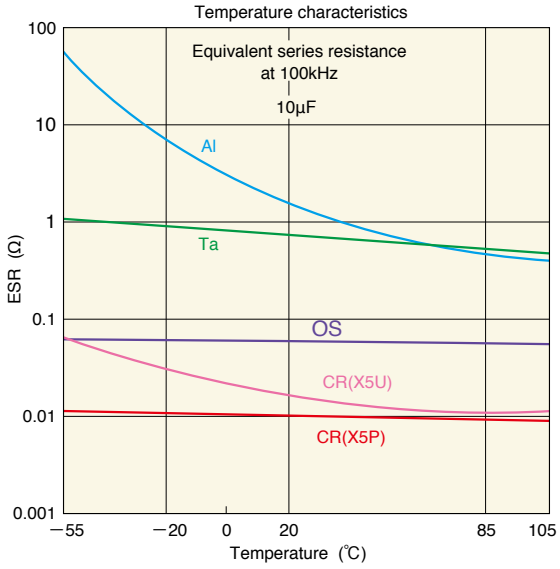
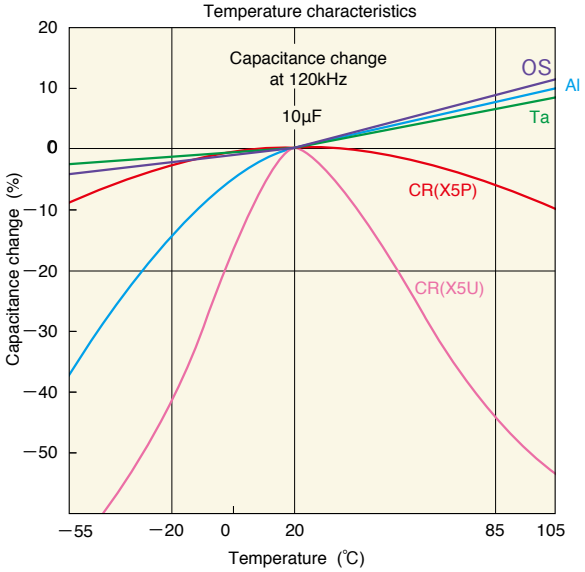


Fig.B Capacitance temperature characteristics (OS-CON vs other types)

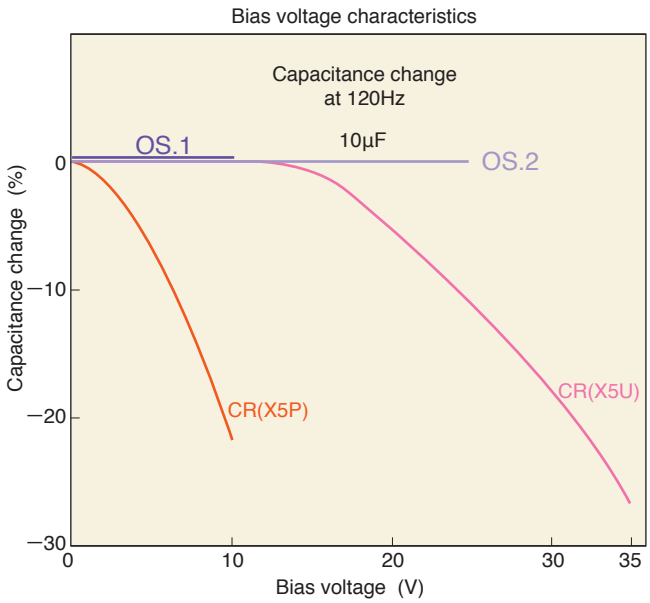


OS-CON's Characteristics at high temperature and low temperature is that it features little change in temperature for the ESR.
What ESR changes a little against temperature means that noise clearing ability changes a little against temperature as well. The **OS-CON** is suitable for outdoor apparatus.

OS =**OS-CON** — Purple
Al =AL-E. Cap — Blue
Ta =Tantalum Cap. — Green
CR(X5P) =Cera Cap. (X5P Type) — Red
CR(X5U) =Cera Cap. (X5U Type) — Pink

1-3. Bias characteristics

(a) Capacitance



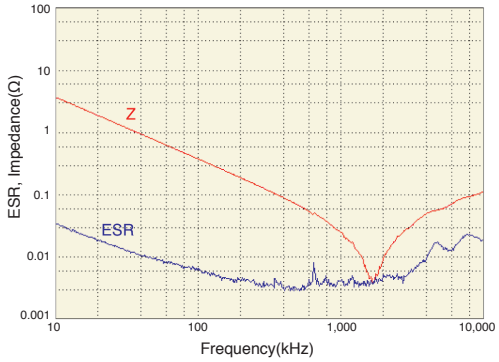
OS.1 =**OS-CON(10SVP10M)**—— Purple
OS.2 =**OS-CON(25SVPD10M)**– Light Purple
CR(X5P) =Cera Cap. ———— Red
(X5P Type ; 10V/10μF)
CR(X5U) =Cera Cap. ———— Pink
(X5U Type ; 50V/10μF)

When voltage is applied to ceramic capacitors, they show a bias characteristics where static capacitance is reduced. Our **OS-CON** product, however, will show no reduction in capacitance for applied voltage within its rating.

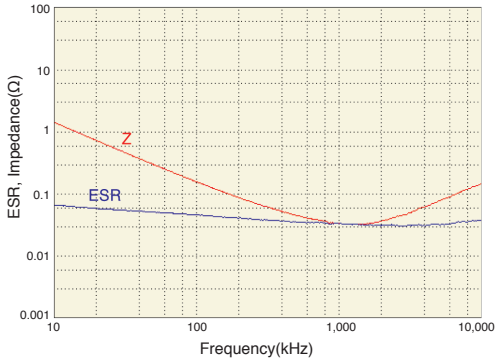
(b) Impedance, ESR

Bias characteristics of OS-CON & ceramic capacitors

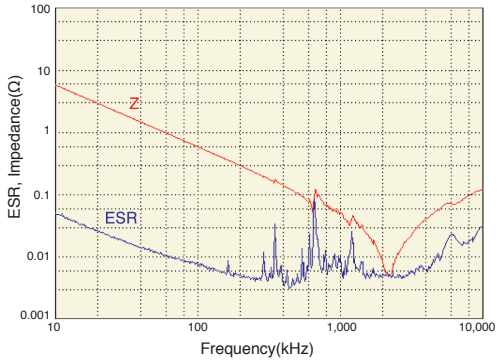
Multi-layer ceramic capacitor (25V/4.7μF)
0V bias



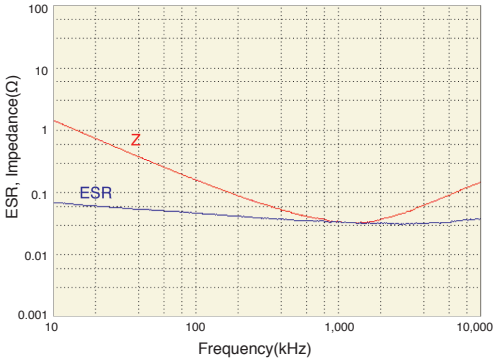
OS-CON (25SVPD10M)
0V bias



Multi-layer ceramic capacitor (25V/4.7μF)
20V bias

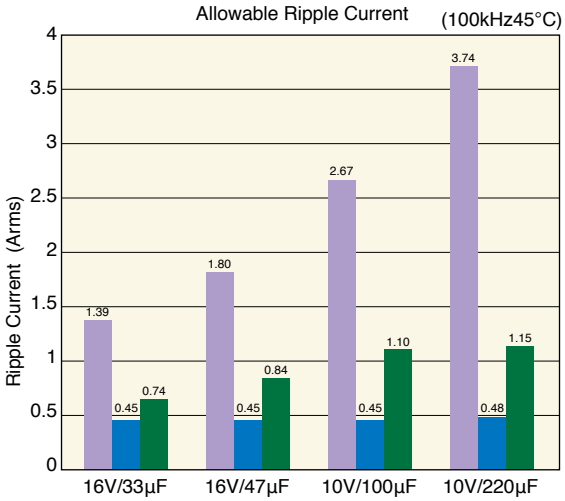


OS-CON (25SVPD10M)
20V bias



ESR & impedance of ceramic capacitors change largely between 300kHz to 1MHz.
As for **OS-CON**, neither ESR nor impedance changes.

1-4. Allowable Ripple Current



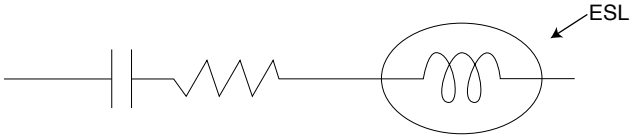
OS-CON (SVP series) —— Light Purple
AI-E. Cap. (Low Impedance) —— Blue
Ta.Cap. (Low ESR) —————— Green
※Samples of SVP series are approximate models.

When selecting smoothing capacitors for power supply, the allowable ripple current of the capacitor is one of criterion.
The allowable value of ripple current is decided by the generated heat of the capacitor, this heating is due to the ESR. Since a large ESR capacitor generates larger heat value, it can not make the flow of ripple current greater.
Compared to other electrolytic capacitors, ESR of **OS-CON** is so small that it can allow far more ripple currents.

1-5. ESL Characteristics

OS-CON is a capacitor of high performance with low ESR and large capacitance.
Recently in circuit technologies, the constituent of ESL is important in the domain of the high frequency with that of electronic equipment.

(a) Eqivalent series circuit of capacitor



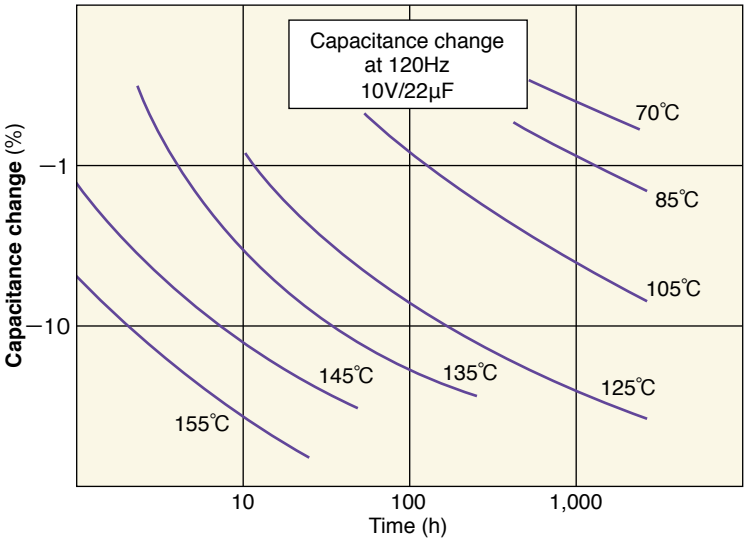
(b)Approximate ESL values of SEPC series

(unit:nH)

Size Code	at 10 MHz	at 40 MHz
C6	2.6	2.5
C9	2.2	2.1
E9	2.7	2.6
E12	4.3	4.1
E13	4.3	4.1
F13	6.0	5.8

※Measuring position: root of lead terminal
※Measuring method: Based on JEITA RC-2003
※All values on left figure are not guaranteed but reference. Please contact SANYO for details of measurement.

1. Temperature acceleration test (Endurance)



The decrease in capacitance of **OS-CON** depends on temperature. The left figure shows the speed of capacitance decrease at each temperature. This graph indicates that temperature coefficient of **OS-CON** lifetime is 10 times by 20℃ reduction.
Compare with this, aluminum capacitor lifetime is 2 times by 10℃ reduction.

Estimation of life time

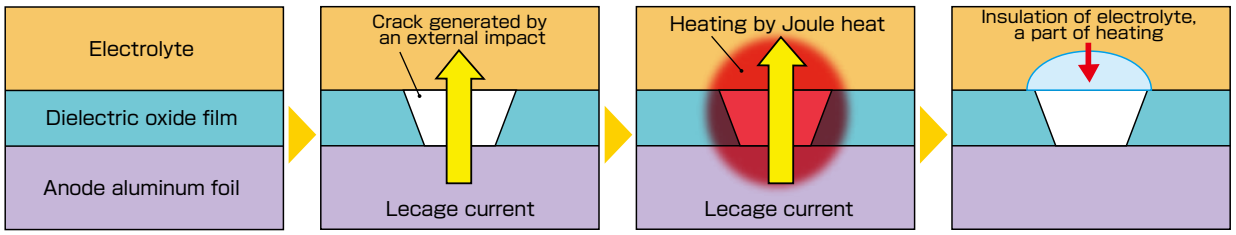
OS-CON	Aluminum electrolytic capacitor
105℃ → 2,000h	105℃ → 2,000h
95℃ → 6,324h	95℃ → 4,000h
85℃ → 20,000h	85℃ → 8,000h
75℃ → 63,245h	75℃ → 16,000h

※Guarantee temperature of **OS-CON** is 105℃, except for SEQP, SVQP and SVPD series.
※Time is an estimate, not guaranteed.

Even if **OS-CON** and an aluminum electrolytic capacitor are guaranteed on 2,000 hours at 105℃, The life span results in differences as temperature drops.
OS-CON has a longer life span compared with an aluminum electrolytic capacitor.

2. Self-Healing Mechanism

The dielectric substance of the **OS-CON** is an oxide film that has non-conductivity formed on the surface of an anode aluminum foil. Since the oxide film is solid and thin film, leakage current may temporary increase if microcrack generates by external impact (mechanical, heat, electricity etc.). (figure (b)) At this time, Joule heat is generated by the leakage current flows as figure (c), and the electrolyte causes partially insulation because of the heat. (figure (d)) The leakage current of the crack part is suppressed due to this function. This is called a self-healing.



3. Reliability presumption of life for the OS-CON

The capacitance of **OS-CON** is getting smaller as time goes by on Endurance.
This means wear-failure of **OS-CON** is open mode, which is a main failure factor.
The life time is different by each operating temperature and self-heating by ripple current.
The following formula outline could make it possible to estimate the presumptive lifetime of **OS-CON** at ambient temperature Tx (℃).
The result of the following page estimation is not guaranteed but presumptive values based on actual measurement. The estimated life-span is limited up to 15 years.

3-1. Calculation formula of estimated life expectancy

$$Lx = Lo \times 10^{\frac{To-Tx}{20}}$$

Lx : Life expectance (h) in actual use (temperature Tx)
Lo : Guaranteed (h) at maximum temperature in use
To : Maximum operating temperature (℃)
Tx : Temperature in actual use (ambient temperature of **OS-CON**) (℃)
Please contact us about the presumptive lifetime of **OS-CON** used at the ambient temperature of 125℃ (SVQP,SVPD,SEQP series), when the heat-proof characteristics of sealing rubber have to be factored in.

※The estimated life expectancy of conductive polymer electrolyte type can be calculated without consideration of self-heating under application of the ripple current
※SVPS series: Self-heating temperature by allowance ripple current (℃)

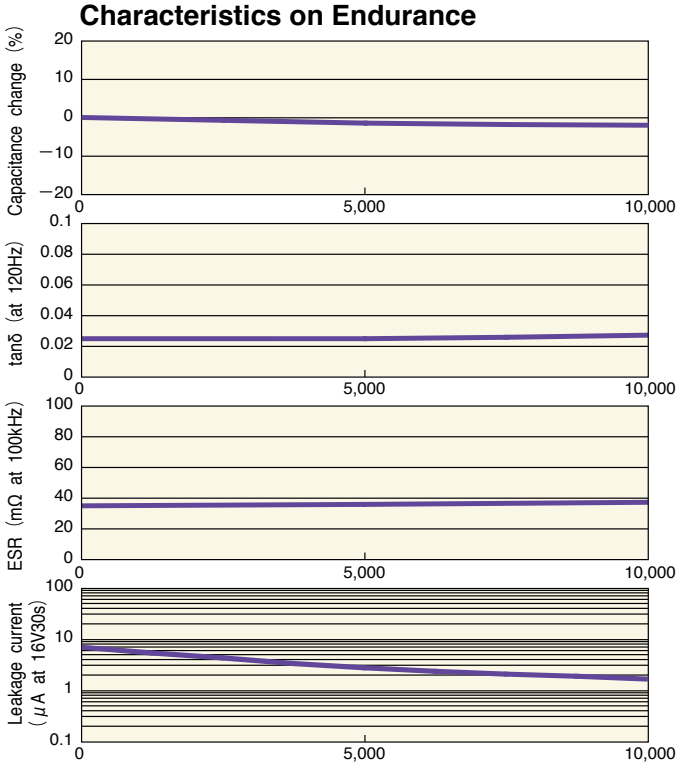
The self-heating temperature under application of the rated ripple current

series	size	Self-heating
SVP, SVPA, SVPC, SVPS※	Except for A5, B6	approx. 20℃
SVP, SVPA, SVPC, SVPS※	A5,B6	approx. 10℃
SVPB, SVPE, SVPF, SEP, SEPC, SEPF	All	approx. 20℃
SVQP, SEQP, SVPD	All	approx. 2℃

4. Conductive polymer type (16SVP39M)

4-1. Endurance (105°C, 16V applied)

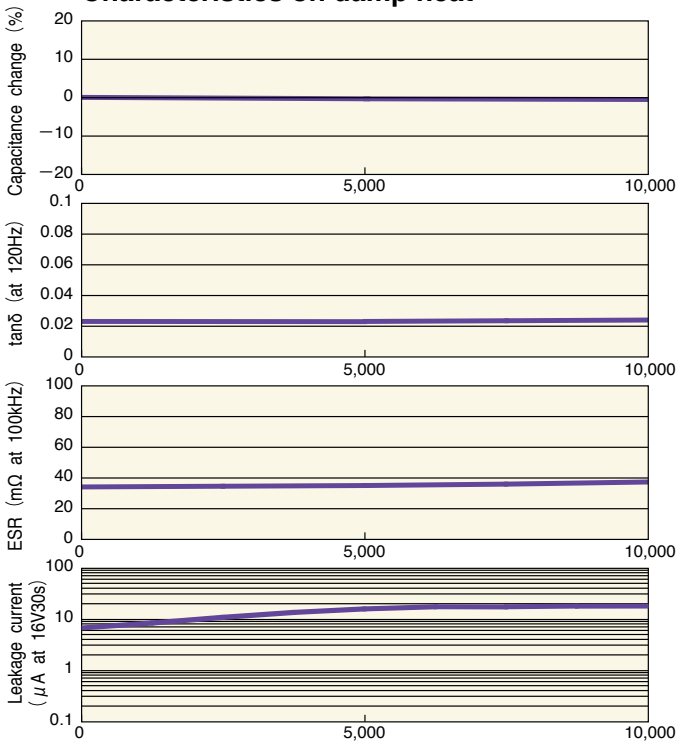
Characteristics on Endurance



Little change in characteristics can be seen after 10,000 hours because of adoption of conductive polymer that excels in thermal stability.

4-2. Damp heat (60°C90% RH, without load)

Characteristics on damp heat



Little change in characteristics can be seen after 10,000h hours in a high temperature and damp heat environment because of the excellent thermal stability of conductive polymer.

Surface mount type

SVPF Series

Update

RoHS compliance
High capacitance · High voltage
105℃ 5,000h

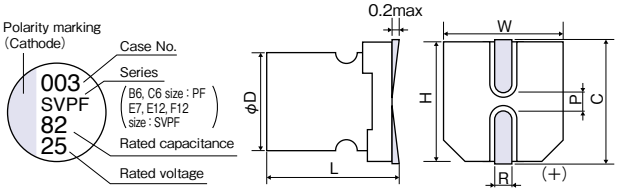
SVPF is the high voltage version of the SVPC series.
Ideal for use in high voltage lines such as the input side of DC/DC converters.
This product can support lead free-reflow.※2

Specifications

Items	Condition		Specifications		
Rated voltage (V)	–		16	20	25
Surge voltage (V)	Room temperature		18	23	29
Category temperature range (℃)	–		−55 to +105		
Capacitance tolerance (%)	120Hz/20℃		M : ±20		
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list		
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list		
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list		
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25		
		+105℃ Z/Z20℃	0.75 to 1.25		
Endurance	105℃, 5,000h, Rated voltage applied	△C/C	Within ±20% of the initial value		
		DF	Within 1.5 times of the initial limit		
		ESR	Within 1.5 times of the initial limit		
		LC	Within the initial limit		
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value		
		DF	Within 1.5 times of the initial limit		
		ESR	Within 1.5 times of the initial limit		
		LC	Within the initial limit (after voltage processing)		
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value		
		DF	Within 1.3 times of the initial limit		
		ESR	Within 1.3 times of the initial limit		
		LC	Within the initial limit (after voltage processing)		

※1 When measured values are questionable, measure after voltage processing mentioned below.
Voltage processing: Apply voltage for 120 minutes at 105℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions



(unit : mm)

Size code	φD ±0.5	L +0.1 −0.4	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 0.9	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

Size list

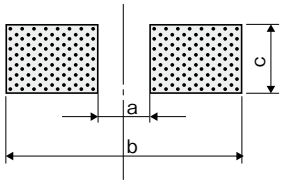
RV : Rated voltage

μF \ RV	16	20	25	35
22				C6
27			B6	
39				E7
47			C6	
56		B6	C6	
82	B6		E7	E12
120		C6		F12
180	C6	E7	E12	
270	E7			
330			F12	
390		E12		
560	E12	F12		
1000	F12			

SVPF series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR(mΩ) (max) 100kHz to 300kHz / 20℃	Allowable ripple current 100kHz(mArms)	DF (% max)	Leakage current (μA)(max) After 2 minutes
B6	25SVPF27MX	25	27	40	2450	12	135
	20SVPF56MX	20	56	30	2800	12	224
	16SVPF82M	16	82	27	3000	12	262
C6	35SVPF22M	35	22	35	2600	12	154
	25SVPF47M	25	47	30	2800	12	235
	25SVPF56M	25	56	30	2800	12	280
	20SVPF120M	20	120	25	3200	12	480
	16SVPF180M	16	180	22	3300	12	576
E7	35SVPF39M	35	39	30	2800	12	273
	25SVPF82M	25	82	28	3000	12	410
	20SVPF180M	20	180	25	3200	12	720
	16SVPF270M	16	270	22	3300	12	864
E12	35SVPF82M	35	82	20	4000	12	574
	25SVPF180M	25	180	16	4650	12	900
	20SVPF390M	20	390	14	4950	12	1560
	16SVPF560M	16	560	14	4950	12	1792
F12	35SVPF120M	35	120	18	4400	12	840
	25SVPF330M	25	330	14	5000	12	1650
	20SVPF560M	20	560	12	5400	12	2240
	16SVPF1000M	16	1000	12	5400	12	3200

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
B6	1.4	7.4	1.6
C6	2.1	9.1	1.6
E7	2.8	11.1	1.9
E12	2.8	11.1	1.9
F12	4.3	13.1	1.9

Frequency coefficient for ripple current

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

※ Red letters : New models Yellow letters : 2,000h⇒5,000h

Surface mount type

SVPE Series

- RoHS compliance
- Super low ESR
- High capacitance

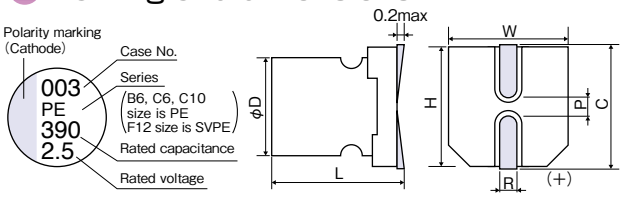
The SVPE series were designed to have even lower ESR than the SVPC series.
Adopt this series to reduce the size of equipment and circuits.
This product can support lead free-reflow.※2

Specifications

Items	Condition		Specifications			
Rated voltage (V)	–		2.0	2.5	6.3	16
Surge voltage (V)	Room temperature		2.6	3.3	8.2	18
Category temperature range (℃)	–		−55 to +105			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25			
		+105℃ Z/Z20℃	0.75 to 1.25			
Endurance	105℃, 2,000h, Rated voltage applied	△C/C	Within ±20% of the initial value			
		DF	Within 1.5 times of the initial limit			
		ESR	Within 1.5 times of the initial limit			
		LC	Within the initial limit			
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value			
		DF	Within 1.5 times of the initial limit			
		ESR	Within 1.5 times of the initial limit			
		LC	Within the initial limit (after voltage processing)			
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value (±15% for 2.5V)			
		DF	Within 1.3 times of the initial limit			
		ESR	Within 1.3 times of the initial limit			
		LC	Within the initial limit (after voltage processing)			

※1 When measured values are questionable, measure after voltage processing mentioned below.
Voltage processing: Apply voltage for 120 minutes at 105℃.
※2 Please refer to page14 for reflow soldering conditions.

Marking and dimensions



(unit : mm)

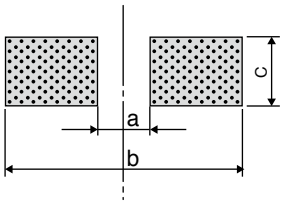
Size code	φD ±0.5	L +0.1 −0.4	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
C10	6.3	9.9	6.6	6.6	7.3	0.6 to 0.8	2.1
F12	10.0	12.6	10.3	10.3	11.0	0.8 to 1.1	4.6

SVPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max)		Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
				100kHz/20℃	300kHz/20℃※1			
B6	6SVPE180M	6.3	180	15	13	3150	12	500
	6SVPE150M	6.3	150	12	10	3520	12	500
	2R5SVPE330M	2.5	330	15	13	3150	12	500
	2R5SVPE330MY	2.5	330	10	9	3860	12	500
	2R5SVPE270M	2.5	270	10	9	3860	12	500
C6	6SVPE220M	6.3	220	10	9	3900	12	500
	2R5SVPE390M	2.5	390	10	9	3900	12	500
C10	16SVPE180M	16	180	11	10	4460	12	576
	2SVPE1200M	2.0	1200	8	8	5230	12	500
F12	16SVPE470M	16	470	10	9	6100	12	1504

※1 The ESR value at 300kHz is a reference one.

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
B6	1.4	7.4	1.6
C6	2.1	9.1	1.6
C10	2.1	9.1	1.6
F12	4.3	13.1	1.9

Frequency coefficient for ripple current

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

Size list

RV:Rated voltage

μF \ RV	2.0	2.5	6.3	16
150			B6	
180			B6	C10
220			C6	
270		B6		
330		B6		
390		C6		
470				F12
1200	C10			

Surface mount type

SVPS Series

RoHS compliance
Long life

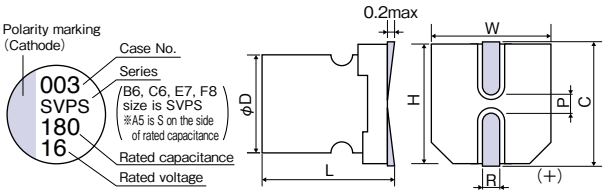
The SVPS series is designed to have a longer life span than the SVP series.
Recommended for products such as flat-screen TVs where extended life performance would be beneficial.
Lead free-reflow is supported.※2

Specifications

Items	Condition		Specifications					
Rated voltage (V)	–		4.0	6.3	10	16	20	25
Surge voltage (V)	Room temperature		5.2	8.2	12	18	23	25
Category temperature range (℃)	–		−55 to +105					
Capacitance tolerance (%)	120Hz/20℃		M : ±20					
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list					
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25					
		+105℃ Z/Z20℃	0.75 to 1.25					
Endurance	105℃, 5,000h, Rated voltage applied (25V → 20V applied)	△C/C	Within ±20% of the initial value					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit					
Damp heat(Steady state)	60℃, 90 to 95% RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value					
		DF	Within 1.3 times of the initial limit					
		ESR	Within 1.3 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					

※1 When measured values are questionable, measure after voltage processing mentioned below.
Voltage processing: Apply voltage for 120 minutes at 105℃. The voltage to be applied is the rated voltage for 4.0-20V products, and 20V for 25V products.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions



(unit : mm)

Size code	φD ±0.5	L +0.1 −0.4	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

Size list

RV : Rated voltage

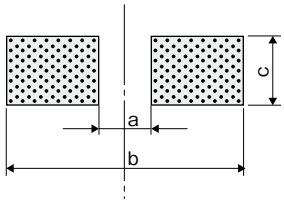
μF \ RV	4.0	6.3	10	16	20	25
10			A5			E7
15			A5			
22		A5		B6	C6	
33	A5		B6			
39				C6		
47		B6			E7	
68	B6		C6			
82				E7		
100				F8		
120		C6				
150	C6		E7、F8			
180				F8		
220		E7				
270	E7					
330			F8			
470		F8				
680	F8					

SVPS series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR(mΩ) (max) 100kHz to 300kHz / 20℃	Allowable ripple current 100kHz(mArms)※1	DF (% max)	Leakage current (μA)(max) After 2 minutes
A5	10SVPS10M	10	10	220	700	10	50
	10SVPS15M	10	15	200	740	10	75
	6SVPS22M	6.3	22	200	740	12	69.3
	4SVPS33M	4.0	33	200	740	15	66
B6	16SVPS22M	16	22	90	1060	10	176
	10SVPS33M	10	33	70	1100	12	165
	6SVPS47M	6.3	47	30	1970	12	300
	4SVPS68M	4.0	68	30	1970	12	300
C6	20SVPS22M	20	22	60	1450	10	88
	16SVPS39M	16	39	24	2460	12	300
	10SVPS68M	10	68	30	2200	12	300
	6SVPS120M	6.3	120	22	2570	12	300
	4SVPS150M	4.0	150	22	2570	12	300
E7	25SVPS10M	25	10	60	1500	10	125
	20SVPS47M	20	47	45	1890	12	188
	16SVPS82M	16	82	30	2760	12	262
	10SVPS150MX	10	150	30	2760	12	500
	6SVPS220M	6.3	220	22	3220	12	500
	4SVPS270M	4.0	270	22	3220	12	500
F8	16SVPS100M	16	100	35	2670	12	320
	16SVPS180M	16	180	29	3430	12	576
	10SVPS150M	10	150	30	3020	12	300
	10SVPS330M	10	330	24	3770	12	660
	6SVPS470M	6.3	470	20	4130	12	592
	4SVPS680M	4.0	680	20	4130	12	544

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

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
A5	1.0	6.2	1.6
B6	1.4	7.4	1.6
C6	2.1	9.1	1.6
E7	2.8	11.1	1.9
F8	4.3	13.1	1.9

Frequency coefficient for ripple current

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

Surface mount type SVPD Series

- RoHS compliance
- Guaranteed at 125℃ · Rated 35V max.
- 85℃ 85% guaranteed

The SVPD series is a high reliability product that improves upon the SVQP series.
Adding up to 35V in the product lineup, it not only guarantees operation at 125℃ max as the SVQP series does, but also guarantees 85℃ 85% performance. Suitable for use in electrical circuitry in products such as vehicle-mounted equipment and industrial equipment. This product can support lead free-reflow.※2

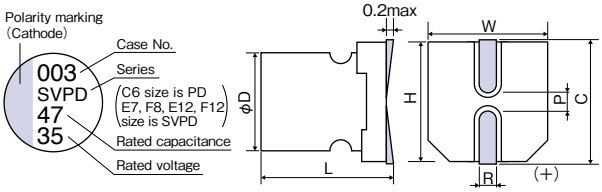
Specifications

Items	Condition		Specifications			
Rated voltage (V)	–		10	16	25	35
Surge voltage (V)	125℃		12	18	29	40
Category temperature range (℃)	–		−55 to +125			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25			
		+125℃ Z/Z20℃	0.75 to 1.25			
Endurance	125℃, 2,000h, Rated voltage applied	△C/C	Within ±20% of the initial value			
		DF	Within 2 times of the initial limit			
		ESR	Within 2 times of the initial limit			
		LC	Within the initial limit			
Damp heat(Steady state)	85℃, 85 to 95%RH, 1,000h, Rated voltage applied	△C/C	Within ±20% of the initial value			
		DF	Within 2 times of the initial limit			
		ESR	Within 2 times of the initial limit			
		LC	Within the initial limit			
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value			
		DF	Within 1.3 times of the initial limit			
		ESR	Within 1.3 times of the initial limit			
		LC	Within the initial limit (after voltage processing)			

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 125℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions

(unit : mm)



Size code	φD ±0.5	L +0.1 −0.4	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

Size list

RV : Rated voltage

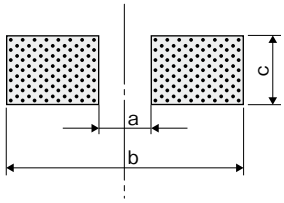
μF \ RV	10	16	25	35
8.2				E7
10			C6	
18				F8
22			E7	E12
39			F8	
47			E12	F12
56	C6			
82		E7	F12	

SVPD series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) 105℃<Tx ≤ 125℃※1	Allowable ripple current 100kHz (mArms) Tx ≤ 105℃※1	DF (% max)	Leakage current (μA)(max) After 2 minutes
C6	25SVPD10M	25	10	65	474	1500	10	50
	10SVPD56M	10	56	45	538	1700	12	112
E7	35SVPD8R2M	35	8.2	70	400	1300	10	57
	25SVPD22M	25	22	48	580	1835	10	110
	16SVPD82M	16	82	40	670	2120	12	262
F8	35SVPD18M	35	18	60	550	1800	10	126
	25SVPD39M	25	39	45	664	2100	10	195
E12	35SVPD22M	35	22	50	700	2300	12	154
	25SVPD47M	25	47	30	943	2980	12	235
F12	35SVPD47M	35	47	30	1150	3650	12	329
	25SVPD82M	25	82	28	1202	3800	12	410

※1 Tx : Ambient temperature

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
C6	2.1	9.1	1.6
E7	2.8	11.1	1.9
F8	4.3	13.1	1.9
E12	2.8	11.1	1.9
F12	4.3	13.1	1.9

Frequency coefficient for ripple current

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

Surface mount type SVPC Series

- RoHS compliance
- High capacitance
- Super low ESR

The SVPC series was designed as the larger capacitance version of the SVPA series.
Adopt this series to reduce the size of equipment and circuits.
This product can support lead free-reflow.※2

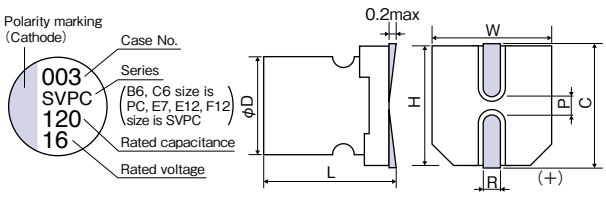
Specifications

Items	Condition		Specifications				
Rated voltage (V)	–		2.5	4.0	6.3	10	16
Surge voltage (V)	Room temperature		3.3	5.2	8.2	12	18
Category temperature range (℃)	–		−55 to +105				
Capacitance tolerance (%)	120Hz/20℃		M : ±20				
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list				
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list				
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25				
		+105℃ Z/Z20℃	0.75 to 1.25				
Endurance	105℃, 2,000h, Rated voltage applied	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit				
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit (after voltage processing)				
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value (±15% for 2.5V 4.0V)				
		DF	Within 1.3 times of the initial limit				
		ESR	Within 1.3 times of the initial limit				
		LC	Within the initial limit (after voltage processing)				

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions

(unit : mm)



Size code	φD ±0.5	L +0.1 −0.4	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

Size list

RV : Rated voltage

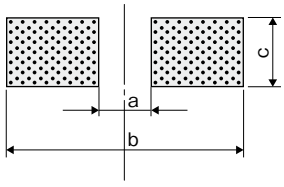
μF \ RV	2.5	4.0	6.3	10	16
39					B6
68				B6	C6
100			B6		C6
120			B6	C6	E7
150		B6			E7
180	B6				
220			C6		
270				E7	E12
330		C6	C6		
390	C6		E7		
560	C6	E7,E12			
680	E7				
820	E12		E12		
1,200		E12			
1,500	E12	E12			
2,700	F12				

SVPC series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max)		Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
				100kHz/20℃	300kHz/20℃※1			
B6	16SVPC39M	16	39	35	30	1820	12	300
	16SVPC39MV	16	39	27	23	2350	12	300
	10SVPC68M	10	68	30	26	1970	12	300
	10SVPC68MV	10	68	23	20	2540	12	300
	6SVPC100M	6.3	100	30	26	1970	12	300
	6SVPC100MY	6.3	100	25	21	2150	12	300
	6SVPC120MV	6.3	120	21	18	2660	12	300
	4SVPC150M	4.0	150	30	26	1970	12	300
	4SVPC150MY	4.0	150	23	20	2240	12	300
	4SVPC150MV	4.0	150	20	17	2730	12	300
	2R5SVPC180M	2.5	180	30	26	1970	12	300
	2R5SVPC180MY	2.5	180	24	20	2200	12	300
	2R5SVPC180MV	2.5	180	19	16	2800	12	300
C6	16SVPC68M	16	68	30	26	2200	12	300
	16SVPC68MV	16	68	25	22	2440	12	300
	16SVPC100M	16	100	24	23	2490	12	300
	10SVPC120M	10	120	27	23	2320	12	300
	10SVPC120MV	10	120	22	19	2600	12	300
	6SVPC220M	6.3	220	27	23	2320	12	300
	6SVPC220MV	6.3	220	15	13	3160	12	300
	6SVPC330M	6.3	330	17	15	3390	12	415
	4SVPC330M	4.0	330	27	23	2320	12	300
	4SVPC330MY	4.0	330	21	18	2630	12	300
	4SVPC330MV	4.0	330	15	13	3160	12	300
	2R5SVPC390M	2.5	390	25	22	2410	12	300
	2R5SVPC390MV	2.5	390	15	13	3160	12	300
	2R5SVPC560M	2.5	560	16	14	3500	12	300
E7	16SVPC120M	16	120	27	23	2900	12	500
	16SVPC150M	16	150	22	21	3220	12	500
	10SVPC270M	10	270	22	19	3220	12	500
	6SVPC390M	6.3	390	22	19	3220	12	491
	4SVPC560M	4.0	560	22	19	3220	12	500
	2R5SVPC680M	2.5	680	20	17	3370	12	500
E12	16SVPC270M	16	270	16	14	4070	15	864
	6SVPC820M	6.3	820	12	10	4700	15	1033
	4SVPC560MX	4.0	560	9	8	5380	15	500
	4SVPC1200M	4.0	1200	12	10	4700	15	960
	4SVPC1500M	4.0	1500	12	10	4700	15	1200
	2R5SVPC820M	2.5	820	9	8	5380	15	500
	2R5SVPC1500M	2.5	1500	10	9	5150	15	750
F12	2R5SVPC2700M	2.5	2700	12	10	5070	15	1350

※1 The ESR value in 300kHz is a reference one.

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
B6	1.4	7.4	1.6
C6	2.1	9.1	1.6
E7	2.8	11.1	1.9
E12	2.8	11.1	1.9
F12	4.3	13.1	1.9

Frequency coefficient for ripple current

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

Surface mount type

SVPB Series

RoHS compliance
Low profile

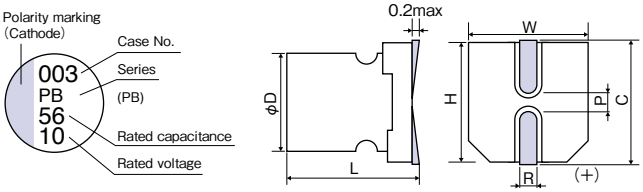
SVPB series was designed as the lower profile version of the SVPA series.
Suitable for miniaturizing devices and circuits.
This product can support lead free-reflow.※2

Specifications

Items	Condition		Specifications					
Rated voltage (V)	–		2.5	4.0	6.3	10	16	20
Surge voltage (V)	Room temperature		3.3	5.2	8.2	12	18	23
Category temperature range (℃)	–		−55 to +105					
Capacitance tolerance (%)	120Hz/20℃		M : ±20					
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list					
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25					
		+105℃ Z/Z20℃	0.75 to 1.25					
Endurance	105℃, 1,000h, Rated voltage applied	△C/C	Within ±20% of the initial value(±30% for C5 size)					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit					
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value (±20% for C5 size)					
		DF	Within 1.3 times of the initial limit					
		ESR	Within 1.3 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 125℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions



(unit : mm)

Size code	φD ±0.5	L +0.1 −0.4	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

Size list

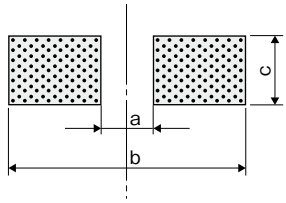
RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10	16	20
15						C5
22						C55
33					C5	
56				C5		
82			C5			
100		C5				
120	C5					

SVPB series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
C5	20SVPB15M	20	15	45	2000	12	120
	16SVPB33M	16	33	40	1670	12	211
	10SVPB56M	10	56	40	1670	12	224
	6SVPB82M	6.3	82	40	1670	12	207
	4SVPB100M	4.0	100	40	1670	12	160
	2R5SVPB120M	2.5	120	40	1670	12	120
C55	20SVPB22M	20	22	35	2000	12	88

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
C5	2.1	9.1	1.6
C55	2.1	9.1	1.6

Frequency coefficient for ripple current

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

Surface mount type

SVPA Series

- RoHS compliance
- Low ESR
- Large ripple current

SVPA was designed as the low ESR version of the SVP series.
Suitable for miniaturizing devices and circuits.
This product can support lead free-reflow.※2

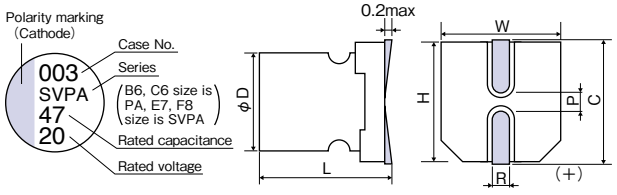
Specifications

Items	Condition		Specifications					
Rated voltage (V)	–		2.5	4.0	6.3	10	16	20
Surge voltage (V)	Room temperature		3.3	5.2	8.2	12	18	23
Category temperature range (℃)	–		−55 to +105					
Capacitance tolerance (%)	120Hz/20℃		M : ±20					
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list					
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25					
		+105℃ Z/Z20℃	0.75 to 1.25					
Endurance	105℃, 2,000h, Rated voltage applied	△C/C	Within ±20% of the initial value					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit					
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value					
		DF	Within 1.3 times of the initial limit					
		ESR	Within 1.3 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions

(unit : mm)



Size code	φD ±0.5	L +0.1 −0.4	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

Size list

RV : Rated voltage

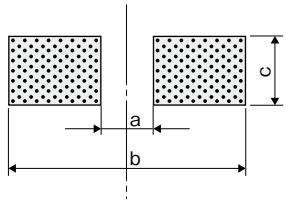
μF \ RV	2.5	4.0	6.3	10	16	20
10						B6
22						C6
39					C6	
47			B6			E7
68		B6		C6		
82	B6				E7	
120			C6			
150		C6		E7		
180	C6				F8	
220			E7			
270		E7				
330	E7			F8		
470			F8			
680		F8				
820	F8					

SVPA series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max)		Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
				100kHz/20℃	300kHz/20℃※1			
B6	20SVPA10M	20	10	40	35	1700	12	80
	6SVPA47MAA	6.3	47	30	26	1970	12	300
	4SVPA68MAA	4.0	68	30	26	1970	12	300
	2R5SVPA82MAA	2.5	82	30	26	1970	12	300
C6	20SVPA22M	20	22	35	31	2040	12	88
	16SVPA39MAA	16	39	35	31	2040	12	300
	16SVPA39MAAY	16	39	24	20	2460	12	300
	10SVPA68MAA	10	68	30	26	2200	12	300
	6SVPA120MAA	6.3	120	22	19	2570	12	300
	4SVPA150MAA	4.0	150	22	19	2570	12	300
	2R5SVPA180MAA	2.5	180	20	18	2690	12	300
E7	20SVPA47M	20	47	33	29	2630	12	188
	16SVPA82MAA	16	82	30	25	2760	12	262
	10SVPA150MAA	10	150	30	25	2760	12	500
	6SVPA220MAA	6.3	220	22	19	3220	12	500
	4SVPA270MAA	4.0	270	22	19	3220	12	500
	2R5SVPA330MAA	2.5	330	20	18	3370	12	500
F8	16SVPA180M	16	180	29	28	3430	12	576
	10SVPA330M	10	330	24	23	3770	12	660
	6SVPA470M	6.3	470	20	19	4130	12	592
	4SVPA680M	4.0	680	20	19	4130	12	544
	2R5SVPA820M	2.5	820	19	18	4240	12	500

※1 The ESR value at 300kHz is a reference one.

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
B6	1.4	7.4	1.6
C6	2.1	9.1	1.6
E7	2.8	11.1	1.9
F8	4.3	13.1	1.9

Frequency coefficient for ripple current

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

Surface mount type SVQP Series

RoHS compliance
Guaranteed at 125℃

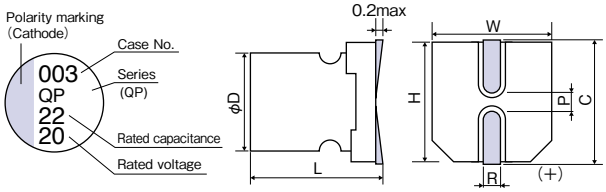
SVQP was designed as the higher thermal resistance version of the SVP series.
This series would be ideal for enhancing the reliability of your products.
This product can support lead free-reflow.※2

Specifications

Items	Condition		Specifications				
Rated voltage (V)	–		4.0	6.3	10	16	20
Surge voltage (V)	Room temperature		5.2	8.2	12	18	23
Category temperature range (℃)	–		−55 to +125				
Capacitance tolerance (%)	120Hz/20℃		M : ±20				
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list				
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list				
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25				
		+125℃ Z/Z20℃	0.75 to 1.25				
Endurance	125℃, 1,000h, Rated voltage applied	△C/C	Within ±20% of the initial value				
		DF	Within 2 times of the initial limit				
		ESR	Within 2 times of the initial limit				
		LC	Within the initial limit				
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit (after voltage processing)				
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value				
		DF	Within 1.3 times of the initial limit				
		ESR	Within 1.3 times of the initial limit				
		LC	Within the initial limit (after voltage processing)				

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 125℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions



(unit : mm)

Size code	φD ±0.5	L +0.1 −0.4	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

Size list

RV : Rated voltage

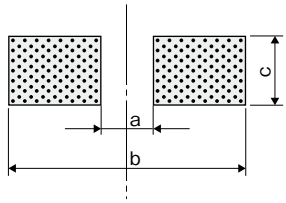
μF \ RV	4.0	6.3	10	16	20
22					C6
39				C6	
47					E7
56			C6		
82		C6		E7	
100		C6			
120			E7		
150	C6		E7		
220		E7			

SVQP series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR(mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) 105℃ < Tx ≤ 125℃※1	Allowable ripple current 100kHz (mArms) Tx ≤ 105℃※1	DF (% max)	Leakage current (μA)(max) After 2 minutes
C6	20SVQP22M	20	22	60	459	1450	10	220
	16SVQP39M	16	39	50	512	1620	10	312
	10SVQP56M	10	56	45	538	1700	12	280
	6SVQP82M	6.3	82	45	538	1700	12	258
	6SVQP100M	6.3	100	40	572	1810	12	315
	4SVQP150M	4.0	150	40	572	1810	12	300
E7	20SVQP47M	20	47	45	598	1890	12	470
	16SVQP82M	16	82	40	670	2120	12	656
	10SVQP120M	10	120	35	810	2560	12	600
	10SVQP150M	10	150	35	810	2560	12	750
	6SVQP220M	6.3	220	35	810	2560	12	693

※1 Tx : Ambient temperature

Recommended land pattern dimension of PWB



(unit : mm)

Size code	a	b	c
C6	2.1	9.1	1.6
E7	2.8	11.1	1.9

Frequency coefficient for ripple current

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

Surface mount type

SVP Series

RoHS compliance
Standard

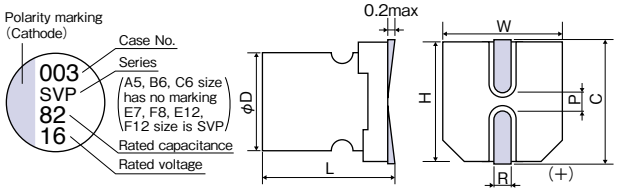
SVP sets the standard for our SMD version of the OS-CON product line.
Recommended for your SMD needs in switching power supplies.
This product can support lead free-reflow.※2

Specifications

Items	Condition		Specifications						
Rated voltage (V)	–		2.5	4.0	6.3	10	16	20	25
Surge voltage (V)	Room temperature		3.3	5.2	8.2	12	18	23	25
Category temperature range (℃)	–		−55 to +105						
Capacitance tolerance (%)	120Hz/20℃		M : ±20						
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list						
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list						
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list						
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25						
		+105℃ Z/Z20℃	0.75 to 1.25						
Endurance	105℃, 2,000h, Rated voltage applied (25V → 20V applied)	△C/C	Within ±20% of the initial value						
		DF	Within 1.5 times of the initial limit						
		ESR	Within 1.5 times of the initial limit						
		LC	Within the initial limit						
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No applied voltage	△C/C	Within ±20% of the initial value						
		DF	Within 1.5 times of the initial limit						
		ESR	Within 1.5 times of the initial limit						
		LC	Within the initial limit (after voltage processing)						
Resistance to soldering heat※2	VPS (230℃ X 75s)	△C/C	Within ±10% of the initial value						
		DF	Within 1.3 times of the initial limit						
		ESR	Within 1.3 times of the initial limit						
		LC	Within the initial limit (after voltage processing)						

※1 In case of some problems for measured values, measure after applying rated voltage for 2.5 to 20V products or 20V for 25V products for 120 minutes at 105℃.
※2 Please refer to page 14 for reflow soldering conditions.

Marking and dimensions



(unit : mm)

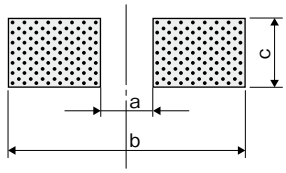
Size code	φD ±0.5	L +0.1 −0.4	W ±0.2	H ±0.2	C ±0.2	R	P ±0.2
A5	4.0	5.4	4.3	4.3	5.0	0.6 to 0.8	1.0
B6	5.0	5.9	5.3	5.3	6.0	0.6 to 0.8	1.4
C6	6.3	5.9	6.6	6.6	7.3	0.6 to 0.8	2.1
E7	8.0	6.9	8.3	8.3	9.0	0.6 to 0.8	3.2
F8	10.0	7.9	10.3	10.3	11.0	0.6 to 0.8	4.6
E12	8.0	11.9	8.3	8.3	9.0	0.8 to 1.1	3.2
F12	10.0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

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10	16	20	25
3.3					A5		
4.7				A5			
6.8				A5			C6
10				A5		B6	E7
15				A5	B6		
22			A5		B6	C6	F8
27						C6	
33		A5		B6		E7	E12
39		B6			C6		
47			B6	C6		E7	
56				C6	E7	F8	F12
68		B6				F8	
82			C6		E7		
100			C6		F8	E12	
120			C6	E7			
150		C6		E7,F8	F8	F12	
180					F8,E12		
220	C6		E7,F8				
270				F8			
330		E7	F8	F8,E12	F12		
470			F8,E12				
560		E12		F12			
680	E12	F8					
820			F12				
1,200		F12					
1,500	F12						

Recommended land pattern dimension of PWB



(unit : mm)

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

SVP series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR(mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
A5	16SVP3R3M	16	3.3	260	660	7	26.4
	10SVP4R7M	10	4.7	240	670	8	23.5
	10SVP6R8M	10	6.8	240	670	9	34
	10SVP10M	10	10	220	700	10	50
	10SVP15M	10	15	200	740	10	75
	6SVP22M	6.3	22	200	740	12	69.3
	4SVP33M	4.0	33	200	740	15	66
B6	20SVP10M	20	10	120	1020	10	100
	16SVP15M	16	15	120	1020	10	120
	16SVP22M	16	22	90	1060	10	176
	10SVP33M	10	33	70	1100	12	165
	6SVP47M	6.3	47	70	1100	12	148
	4SVP39M	4.0	39	70	1100	12	78
	4SVP68M	4.0	68	60	1400	12	136
C6	25SVP6R8M※1	25	6.8	80	1200	10	85
	20SVP22M	20	22	60	1450	10	88
	20SVP27M	20	27	60	1450	10	108
	16SVP39M	16	39	50	1620	10	125
	10SVP47M	10	47	50	1620	12	94
	10SVP56M	10	56	45	1700	12	112
	6SVP82M	6.3	82	45	1700	12	103
	6SVP100M	6.3	100	40	1810	12	126
	6SVP120MV	6.3	120	17	2780	12	151
	4SVP150MX	4.0	150	40	1810	12	120
	2R5SVP220M	2.5	220	23	2390	12	110
E7	25SVP10M※1	25	10	60	1500	10	125
	20SVP33M	20	33	45	1890	12	132
	20SVP47M	20	47	45	1890	12	188
	16SVP56M	16	56	45	1890	12	179
	16SVP82M	16	82	40	2120	12	262
	10SVP120M	10	120	35	2560	12	240
	10SVP150MX	10	150	35	2560	12	300
	6SVP220MX	6.3	220	35	2560	12	277
	4SVP330M	4.0	330	35	2560	12	264
F8	25SVP22M※1	25	22	50	2000	10	275
	20SVP56M	20	56	40	2400	12	224
	20SVP68M	20	68	40	2400	12	272
	16SVP100M	16	100	35	2670	12	320
	16SVP150M	16	150	30	3020	12	480
	16SVP180MX	16	180	30	3020	12	576
	10SVP150M	10	150	30	3020	12	300
	10SVP270M	10	270	25	3700	12	540
	10SVP330MX	10	330	25	3700	12	660
	6SVP220M	6.3	220	25	3700	12	277
	6SVP330M	6.3	330	25	3700	12	416
	6SVP470MX	6.3	470	25	3700	12	592
	4SVP680M	4.0	680	25	3700	12	544
E12	25SVP33M※1	25	33	30	2980	12	413
	20SVP100M	20	100	24	3320	15	400
	16SVP180M	16	180	20	3640	15	576
	10SVP330M	10	330	17	3950	15	660
	6SVP470M	6.3	470	15	4210	15	592
	4SVP560M	4.0	560	13	4520	15	448
	2R5SVP680M	2.5	680	13	4520	15	340
F12	25SVP56M※1	25	56	28	3800	12	700
	20SVP150M	20	150	20	4320	15	600
	16SVP330M	16	330	16	4720	15	792
	10SVP560M	10	560	13	5230	15	840
	6SVP820M	6.3	820	12	5440	15	775
	4SVP1200M	4.0	1200	12	5440	18	960
	2R5SVP1500M	2.5	1500	12	5440	18	750

※1 The surge voltage of 25V products is 25V. Please consider SVPD series 25V products (whose surge voltage is 29V) in placing a new order.

Frequency coefficient for ripple current

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

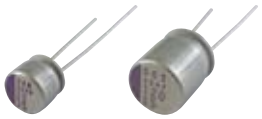
Radial lead type

SEPF Series

Update

- RoHS compliance
- High voltage・High capacitance
- 105℃ 5,000h

SEPF is designed as the high voltage version of SEPC series.
Ideal for use in high voltage lines such as the input side of DC/DC converters.
Lead free-flow is supported.※2

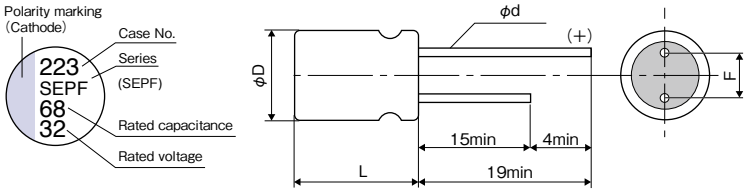


Specifications

Items	Condition		Specifications				
Rated voltage (V)	–		16	20	25	32	35
Surge voltage (V)	Room temperature		18	23	29	37	40
Category temperature range (℃)	–		−55 to +105				
Capacitance tolerance (%)	120Hz/20℃		M : ±20				
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list				
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list				
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25				
		+105℃ Z/Z20℃	0.75 to 1.25				
Endurance	105℃, 5,000h, Rated voltage applied	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit				
Damp heat(Steady state)	60℃, 90%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit (after voltage processing)				
Resistance to soldering heat※2	Flow method (260±5℃ X 10s)	△C/C	Within ±5% of the initial value				
		DF	Within the initial limit				
		ESR	Within the initial limit				
		LC	Within the initial limit (after voltage processing)				

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105℃.
※2 Please refer to page 13 for flow soldering conditions.

Marking and dimensions



Size list

RV : Rated voltage

μF \ RV	16	20	25	32	35
22				C55	C6
39				E7	E7
56			C6		
68				E7	
82			E7		E12
120		C6			F13
150	C55		E12		
180	C6	E7			
270	E7		F13		
330			F13		
390		E12			
560	E12	F13			
1,000	F13				

(unit : mm)

Size code	φD ±0.5	L max	F	φd ±0.05
C55	6.3	5.5	2.5±0.5	0.45
C6	6.3	6.0	2.5±0.5	0.5
E7	8.0	7.0	3.5±0.5	0.5※3
E12	8.0	12.0	3.5±0.5	0.6
F13	10.0	13.0	5.0±0.5	0.6

※3 32SEPF68M is 0.6±0.05

SEPF series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
C55	32SEPF22M	32	22	35	2400	12	140
	16SEPF150M	16	150	30	2590	12	480
C6	35SEPF22M	35	22	35	2600	12	154
	25SEPF56M	25	56	30	2800	12	280
	20SEPF120M	20	120	25	3200	12	480
	16SEPF180M	16	180	22	3300	12	576
E7	35SEPF39M	35	39	30	2800	12	273
	32SEPF68M	32	68	25	3200	10	435
	25SEPF82M	25	82	28	3000	12	410
	20SEPF180M	20	180	25	3200	12	720
	16SEPF270M	16	270	22	3300	12	864
E12	35SEPF82M	35	82	20	4000	12	574
	25SEPF180M	25	180	16	4650	12	900
	20SEPF390M	20	390	14	4950	12	1560
	16SEPF560M	16	560	14	4950	12	1792
F13	35SEPF120M	35	120	18	4400	12	840
	25SEPF330M	25	330	14	5000	12	1650
	20SEPF560M	20	560	12	5400	12	2240
	16SEPF1000M	16	1000	12	5400	12	3200

Frequency coefficient for ripple current

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

※ Red letters : New models Yellow letters : 2,000h⇒5,000h

Radial lead type SEPC Series

Update

- RoHS compliance
- Small size • Low profile • Super low ESR
- High capacitance • 105℃ 5,000h

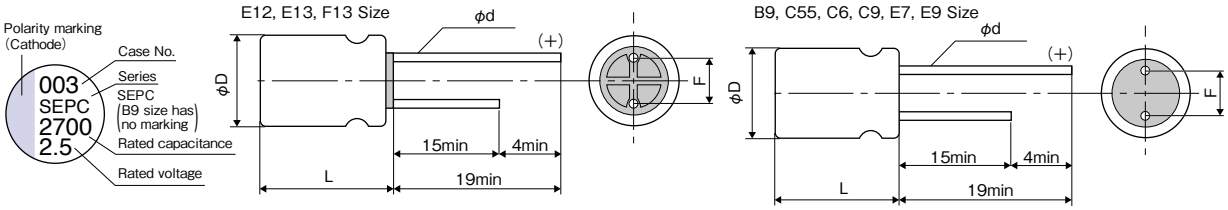
SEPC is designed to have even lower ESR than the SEP series.
Suitable for use on computer and peripheral products such as motherboards, servers and VGAs. Lead free-flow is supported.※2

Specifications

Items	Condition		Specifications				
Rated voltage (V)	–		2.5	4.0	6.3	10	16
Surge voltage (V)	Room temperature		3.3	5.2	8.2	12	18
Category temperature range (℃)	–		−55 to +105				
Capacitance tolerance (%)	120Hz/20℃		M : ±20				
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list				
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list				
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25				
		+105℃ Z/Z20℃	0.75 to 1.25				
Endurance	105℃, 5,000h, Rated voltage applied	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit				
Damp heat(Steady state)	60℃, 90%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value				
		DF	Within 1.5 times of the initial limit				
		ESR	Within 1.5 times of the initial limit				
		LC	Within the initial limit (after voltage processing)				
Resistance to soldering heat※2	Flow method (260±5℃ X 10s)	△C/C	Within ±5% of the initial value				
		DF	Within the initial limit				
		ESR	Within the initial limit				
		LC	Within the initial limit (after voltage processing)				

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105℃.
※2 Please refer to page 13 for flow soldering conditions.

Marking and dimensions



B9, C55, C6, C9, E7, E9 size flat rubber is used.

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10	16
100	B9				C6, C9
150					E7
180					E9, E12
220			C55		E7
270				E7	E9, E12
330	B9, C9				
390	C6				
470	B9		C9, E9, E13		F13
560	B9, C9, E9	C9, E9, E13	C9, E9		
680		E13	F13		
820	C9,E7, E9, E13	F13			
1,000	E9				
1,500			F13		
2,700	F13				

(unit : mm)

Size code	φD ±0.5	L max	F	φd ±0.05
B9	5.0	9.0	2.0±0.5	0.6
C55	6.3	5.5	2.5±0.5	0.45
C6	6.3	6.0	2.5±0.5	0.45※3
C9	6.3	9.0	2.5±0.5	0.6
E7	8.0	7.0	3.5±0.5	0.6※4
E9	8.0	9.0	3.5±0.5	0.6
E12	8.0	12.0	3.5±0.5	0.6
E13	8.0	13.0	3.5±0.5	0.6
F13	10.0	13.0	5.0±0.5	0.6

※3 2SEPC390M : 0.5±0.05
※4 16SEPC150MD,10SEPC270MD : 0.45±0.05

SEPC series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR (mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
B9	2SEPC100MZ	2.5	100	7	4180	10	500
	2SEPC330MZ	2.5	330	7	4180	10	500
	2SEPC470MZ	2.5	470	7	4180	10	500
	2SEPC560MZ	2.5	560	7	4180	10	500
C55	6SEPC220M	6.3	220	18	2980	12	280
C6	16SEPC100M	16	100	24	2490	10	320
	2SEPC390M	2.5	390	10	3900	12	500
C9	16SEPC100MW	16	100	10	4680	10	500
	6SEPC470MW	6.3	470	7	5600	10	592
	6SEPC560MW	6.3	560	7	5600	10	705
	4SEPC560MW	4.0	560	7	5600	10	500
	2SEPC330MW	2.5	330	7	5600	10	500
	2SEPC560MW	2.5	560	7	5600	10	500
	2SEPC820MW	2.5	820	7	5600	10	500
E7	16SEPC220MD	16	220	13	4150	10	500
	16SEPC150MD	16	150	22	3220	12	500
	10SEPC270MD	10	270	22	3220	12	500
	2SEPC820MD	2.5	820	8	5300	10	500
E9	16SEPC180MX	16	180	10	5000	10	576
	16SEPC270MX	16	270	10	5000	10	864
	6SEPC470MX	6.3	470	8	5700	10	592
	6SEPC560MX	6.3	560	7	6100	10	705
	4SEPC560MX	4.0	560	7	6100	10	500
	2SEPC560MX	2.5	560	8	4700	10	280
	2SEPC820MX	2.5	820	7	6100	10	500
	2SEPC820MY	2.5	820	5	7200	10	500
	2SEPC1000MX	2.5	1000	7	6100	10	500
E12	16SEPC180M	16	180	16	4360	10	576
	16SEPC270M	16	270	11	5000	10	864
E13	6SEPC470M	6.3	470	8	5700	10	592
	4SEPC560M	4.0	560	7	6100	10	500
	4SEPC680M	4.0	680	7	6100	10	544
	2R5SEPC820M	2.5	820	7	6100	10	500
F13	16SEPC470M	16	470	10	6100	10	1504
	6SEPC680M	6.3	680	7	6640	10	857
	6SEPC1500M	6.3	1500	10	5560	10	1890
	4SEPC820M	4.0	820	7	6640	10	656
	2SEPC2700M	2.5	2700	10	5560	10	1350

Frequency coefficient for ripple current

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

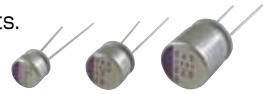
※ Yellow letters : 2,000h⇒5,000h

Radial lead type

SEQP Series

- RoHS compliance
- 105℃ 5,000h・High voltage
- Guaranteed at 125℃

Improving upon the SEP series, the SEQP series has greater heat tolerance (125℃) and offers 32V versions in its product line. Recommended to use in creating higher reliability products. The 32V versions are ideal for 16 to 24V lines such as in industrial equipment. 5,000h performance is guaranteed at a 105℃ environment. Lead free-flow is supported.※2



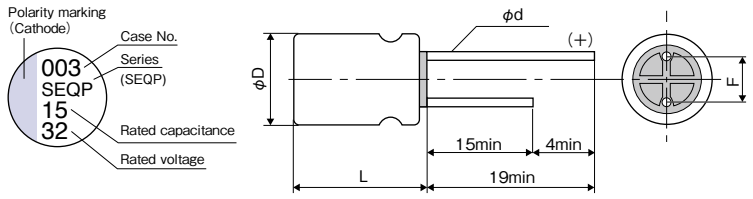
Specifications

Items	Condition		Specifications					
Rated voltage (V)	–		4.0	6.3	10	16	20	32
Surge voltage (V)	Room temperature		5.2	8.4	12	18	23	37
Category temperature range (℃)	–		−55 to +125					
Capacitance tolerance (%)	120Hz/20℃		M : ±20					
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list					
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25					
		+125℃ Z/Z20℃	0.75 to 1.25					
Endurance	125℃, 1,000h, 105℃, 5,000h, Rated voltage applied	△C/C	Within ±20% of the initial value					
		DF	Within 2 times of the initial limit					
		ESR	Within 2 times of the initial limit					
		LC	Within the initial limit					
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value					
		DF	Within 1.5 times of the initial limit					
		ESR	Within 1.5 times of the initial limit					
		LC	Within the initial limit (after voltage processing)					
Resistance to soldering heat※2	Flow method (260±5℃ X 10s)	△C/C	Within ±5% of the initial value					
		DF	Within the initial limit					
		ESR	Within the initial limit					
		LC	Within the initial limit (after voltage processing)					

※1 In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 125℃.
※2 Please refer to page 13 for flow soldering conditions.

Marking and dimensions

(unit : mm)



Size code	φD ±0.5	L max	F	φd ±0.05
C6	6.3	6.0	2.5 ±0.5	0.45
E7	8.0	7.0	3.5 ±0.5	0.45
F8	10.0	8.0	5.0±0.5	0.50
E12	8.0	12.0	3.5±0.5	0.60
F13	10.0	13.0	5.0±0.5	0.60

Size list

RV : Rated voltage

μF \ RV	4.0	6.3	10	16	20	32
6.8						E7
15						F8
18						E12
22					C6	
39				C6		
47					E7	
56			C6			
68					F8	
82		C6		E7		
100					E12	
120			E7			
150	C6	E7		F8	F13	
180				E12		
270			F8			
330	E7	F8	E12	F13		
470		E12				
560	E12		F13			
680	F8					
820		F13				
1,200	F13					

SEQP series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR(mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) 105℃ < Tx ≤ 125℃※1	Allowable ripple current 100kHz (mArms) Tx ≤ 105℃※1	DF (% max)	Leakage current (μA)(max) After 2 minutes
C6	20SEQP22M	20	22	60	458	1450	10	220
	16SEQP39M	16	39	50	512	1620	10	312
	10SEQP56M	10	56	45	537	1700	12	280
	6SEQP82M	6.3	82	45	537	1700	12	258
	4SEQP150M	4.0	150	40	572	1810	12	300
E7	32SEQP6R8M	32	6.8	100	440	1400	10	44
	20SEQP47M	20	47	45	598	1890	12	470
	16SEQP82M	16	82	40	670	2120	12	656
	10SEQP120M	10	120	35	810	2560	12	600
	6SEQP150M	6.3	150	35	810	2560	12	472
	4SEQP330M	4.0	330	35	810	2560	12	660
F8	32SEQP15M	32	15	80	560	1800	10	96
	20SEQP68M	20	68	40	759	2400	12	272
	16SEQP150M	16	150	30	955	3020	12	480
	10SEQP270M	10	270	25	1170	3700	12	540
	6SEQP330M	6.3	330	25	1170	3700	12	416
	4SEQP680M	4.0	680	25	1170	3700	12	544
E12	32SEQP18M	32	18	50	790	2500	12	115
	20SEQP100M	20	100	24	1050	3320	15	400
	16SEQP180M	16	180	20	1151	3640	15	576
	10SEQP330M	10	330	17	1250	3950	15	660
	6SEQP470M	6.3	470	15	1332	4210	15	592
	4SEQP560M	4.0	560	13	1430	4520	15	448
F13	20SEQP150M	20	150	20	1367	4320	15	600
	16SEQP330M	16	330	16	1493	4720	15	792
	10SEQP560M	10	560	13	1655	5230	15	840
	6SEQP820M	6.3	820	12	1721	5440	15	775
	4SEQP1200M	4.0	1200	12	1721	5440	18	960

※1 Tx : Ambient temperature

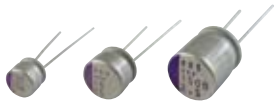
Frequency coefficient for ripple current

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

Radial lead type SEP Series

RoHS compliance
Standard
Guaranteed at 105℃ 3,000h

SEP series is a radial lead version of SVP series using conductive polymer.
Lead free-flow is supported.※2

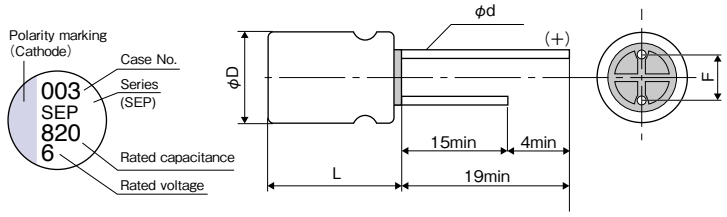


Specifications

Items	Condition		Specifications						
Rated voltage (V)	–		2.5	4.0	6.3	10	16	20	25
Surge voltage (V)	Room temperature		3.3	5.2	8.2	12	18	23	25
Category temperature range (℃)	–		−55 to +105						
Capacitance tolerance (%)	120Hz/20℃		M : ±20						
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list						
Leakage current※1	Rated voltage applied, after 2 minutes		Please see the attached characteristics list						
Equivalent series resistance (ESR)	100kHz to 300kHz/20℃		Please see the attached characteristics list						
Characteristics of impedance ratio at high temp. and low temp.	Based the value at 100kHz, +20℃	−55℃ Z/Z20℃	0.75 to 1.25						
		+105℃ Z/Z20℃	0.75 to 1.25						
Endurance	105℃, 3,000h, Rated voltage applied (2.5V → 2,000h) (25V → 20V applied)	△C/C	Within ±20% of the initial value						
		DF	Within 1.5 times of the initial limit						
		ESR	Within 1.5 times of the initial limit						
		LC	Within the initial limit						
Damp heat(Steady state)	60℃, 90 to 95%RH, 1,000h, No-applied voltage	△C/C	Within ±20% of the initial value						
		DF	Within 1.5 times of the initial limit						
		ESR	Within 1.5 times of the initial limit						
		LC	Within the initial limit (after voltage processing)						
Resistance to soldering heat※2	Flow method (260±5℃ X 10s)	△C/C	Within ±5% of the initial value						
		DF	Within the initial limit						
		ESR	Within the initial limit						
		LC	Within the initial limit (after voltage processing)						

※1 In case of some problems for measured values, measure after applying rated voltage for 2.5 to 20V products or temperature derating voltage for 25V products for 120 minutes at 105℃.
※2 Please refer to page 13 for flow soldering conditions.

Marking and dimensions



(unit : mm)

Size code	φD ±0.5	L max	F	φd ±0.05
C6	6.3	6.0	2.5 ±0.5	0.45
E7	8.0	7.0	3.5 ±0.5	0.45
F8	10.0	8.0	5.0 ±0.5	0.50
E12	8.0	12.0	3.5 ±0.5	0.60
F13	10.0	13.0	5.0 ±0.5	0.60

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10	16	20	25
6.8							C6
10							E7
22						C6	F8
33						E7	E12
39					C6		
47						E7	
56				C6		F8	F13
68						F8	
82			C6		E7		
100		C6				F8,E12	
120				E7			
150		C6	E7		F8	F13	
180					E12		
220		E7					
270				F8			
330		E7	F8	E12	F13		
470		F8	E12				
560		E12		F13			
680	E12	F8					
820			F13				
1,200		F13					
1,500	F13						

SEP series characteristics list

Size code	Part number	Rated voltage (V)	Rated capacitance (μF)	ESR(mΩ) (max) 100kHz to 300kHz/20℃	Rated ripple current 100kHz (mArms) at 105℃	DF (% max)	Leakage current (μA)(max) After 2 minutes
C6	25SEP6R8M※1	25	6.8	80	1200	10	170
	20SEP22M	20	22	60	1450	10	220
	16SEP39M	16	39	50	1620	10	312
	10SEP56M	10	56	45	1700	12	280
	6SEP82M	6.3	82	45	1700	12	258
	4SEP100M	4.0	100	40	1810	12	200
	4SEP150M	4.0	150	40	1810	12	300
E7	25SEP10M※1	25	10	60	1500	10	250
	20SEP33M	20	33	45	1890	12	330
	20SEP47M	20	47	45	1890	12	470
	16SEP82M	16	82	40	2120	12	656
	10SEP120M	10	120	35	2560	12	600
	6SEP150M	6.3	150	35	2560	12	472
	4SEP220M	4.0	220	35	2560	12	440
	4SEP330M	4.0	330	35	2560	12	660
F8	25SEP22M※1	25	22	50	2000	10	275
	20SEP56M	20	56	40	2400	12	224
	20SEP68M	20	68	40	2400	12	272
	20SEP100MX	20	100	35	2570	12	400
	16SEP150M	16	150	30	3020	12	480
	10SEP270M	10	270	25	3700	12	540
	6SEP330M	6.3	330	25	3700	12	416
	4SEP470M	4.0	470	25	3700	12	376
	4SEP680M	4.0	680	25	3700	12	544
E12	25SEP33M※1	25	33	30	2980	12	413
	20SEP100M	20	100	24	3320	15	400
	16SEP180M	16	180	20	3640	15	576
	10SEP330M	10	330	17	3950	15	660
	6SEP470M	6.3	470	15	4210	15	592
	4SEP560M	4.0	560	13	4520	15	448
	2R5SEP680M	2.5	680	13	4520	15	340
F13	25SEP56M※1	25	56	28	3800	12	700
	20SEP150M	20	150	20	4320	15	600
	16SEP330M	16	330	16	4720	15	792
	10SEP560M	10	560	13	5230	15	840
	6SEP820M	6.3	820	12	5440	15	775
	4SEP1200M	4.0	1200	12	5440	18	960
	2R5SEP1500M	2.5	1500	12	5440	18	750

※1 The surge voltage of 25V products is 25V. Please consider SEPF series 25V products (whose surge voltage is 29V) in placing a new order.

Frequency coefficient for ripple current

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

Tantalum Solid Capacitors with Conductive Polymer

POSCAP™

Series integration

①The following applicable model are deleted from each of the series of characteristics list.
Because the models are integrated into the following alternative models.
Our company continue the supply to the customer who has already used it, at the moment.
Please choose our recommendatory models, when you design new products.

Applicable model			Alternative model			
Series	Size Code	Part number	Series	Size Code	Part number	Page
TPB	C	10TPB68MC	TPC	D2	10TPC68M	90
	C	8TPB82MC	TPE	B2	8TPE100MAZB	92
TPC	C1	8TPC33M	TPC	B1	10TPC33MB	90
	C1	6TPC100MC	TPG	B1G	6TPG100MG	88
	C1	6TPC68M	TPG	B1G	6TPG100MG	88
	C1	4TPC100M	TPG	B1G	6TPG100MG	88
TPD	D4D	6TPD470M	TPF	D4	6TPF470MAH	100
	D4D	4TPD680M	TPF	D4	4TPF680MAH	100
	D4D	2R5TPD1000M	TPF	D4	ETPF1000M6H	100
	D4D	2R5TPD1000M8	TPF	D4	ETPF1000M6H	100
	D4D	2R5TPD1000M6	TPF	D4	ETPF1000M6H	100
	D4D	2R5TPD1000M5	TPF	D4	ETPF1000M5H	100
	D4D	2R5TPD680M6	TPF	D3L	2R5TPF680M6L	100
	D4D	2R5TPD680M5	TPF	D4	ETPF680M5H	100
	D4D	2R5TPD470M6	TPF	D3L	2R5TPF470M6L	100
	D4D	2R5TPD470M5	TPF	D4	ETPF470M5H	100
TPE	B2	6TPE100MZB	TPE	B2	6TPE100MPB	92
	B2	2R5TPE150MZB	TPE	B2	2R5TPE220MZB	92
	B2	2TPE330MIB	TPE	B2	2TPE330MFB	92
	B2	2TPE330MAFGB	TPE	B2	2TPE330MAFB	92
	C2	8TPE100MPC2	TPF	D3L	10TPF150ML	100
	C2	6TPE150MPC2	TPE	D2E	6TPE150M	92
	C2	6TPE150MIC2	TPE	D2E	6TPE150MI	92
	C2	4TPE220MIC2	TPE	D2E	4TPE220MI	92
	C2	4TPE220MFC2	TPE	D2E	4TPE220MF	92
	C2	2R5TPE330MFC2	TPE	D2E	2R5TPE330MF	92
	C2	2R5TPE330MCC2	TPE	D2E	2R5TPE330MC	92
	C2	2R5TPE330M9C2	TPE	D2E	2R5TPE330M9	92
	C3	10TPE180MGC	TPE	D3L	10TPE220ML	92
	C3	10TPE150MGC	TPE	D3L	10TPE220ML	92
	C3	6TPE220MPC	TPE	D2E	6TPE220M	92
	C3	6TPE220MIC	TPE	D2E	6TPE220MI	92
	D2E	4TPE150M	TPE	D2E	4TPE150MI	92

Applicable model			Alternative model			
Series	Size Code	Part number	Series	Size Code	Part number	Page
TPE	D2E	2R5TPE470M	TPE	D2E	2R5TPE470MI	92
	D2E	2TPE470M9	TPF	D3L	2R5TPF470M6L	100
	D2E	2TPE470M7	TPF	D3L	2R5TPF470M6L	100
	D2E	2TPE470M6	TPF	D3L	2R5TPF470M6L	100
	D2E	2TPE330M9	TPF	D2E	2TPF330M6	100
	D2E	2TPE330M7	TPF	D2E	2TPF330M6	100
	D2E	2TPE330M6	TPF	D2E	2TPF330M6	100
	D3L	2R5TPE680MIL	TPE	D3L	2R5TPE680MFL	92
	D4	4TPE680M	TPE	D4	4TPE680MI	92
	D4	2R5TPE1000M	TPE	D4	2R5TPE1000MI	92
TPG	B1G	10TPG33M	TPC	B1	10TPC33MB	90
TPL	D2T	2R5TPL470MC	TPL	D2T	2R5TPL470M9	98
	D2T	2R5TPL330MC	TPL	D2T	2R5TPL330M9	98
TPLF	D2T	2TPLF330M5/M6/M7	TPLF	D2T	ETPLF330M5/M6	98
	D2T	2TPLF220M6/M7	TPLF	D2T	ETPLF330M6	98
TPU	S09	2R5TPU22MSI	TPU	S09	6TPU22MSI	86
	S09	4TPU15MSI	TPU	S09	6TPU22MSI	86
	S09	4TPU33MSI	TPU	S09	6TPU47MSI	86
	A09	10TPU33MAI	TPH	A09	ATPH33MAHA	87
	A09	6TPU47MAI	TPH	A09	6TPH47MHA	87
	A09	4TPU68MAI	TPH	A09	4TPH68MHA	87
	A09	2R5TPU100MAI	TPH	A09	ETPH100MHA	87
TH	D4D	6THD330M	Please ask our sales office			
	D4D	2R5THD680M	Please ask our sales office			
TQC	C	25TQC10M	TQC	D2	25TQC15M	106
	C	20TQC15M	TQC	D2	25TQC15M	106
	C	16TQC22M	TQC	D2	20TQC22M	106
	D2	20TQC47MY	TQC	D2	20TQC47MYF	106
	D2	16TQC68MY	TQC	D2	16TQC68MYF	106
	D3L	25TQC33M	TQC	D2	25TQC33MYF	106
	D3L	20TQC47M	TQC	D2	20TQC47MYF	106
	D3L	16TQC68M	TQC	D2	16TQC68MYF	106

② The following model are deleted from each of the series characteristics list.
Because the models are integrated, the development are discontinued.

Deletion model		
Series	Size Code	Part number
TPL	D2T	2R5TPL330M7
TPLF	D2T	2TPLF560M6

Intellectual property right

We, SANYO Electric 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.

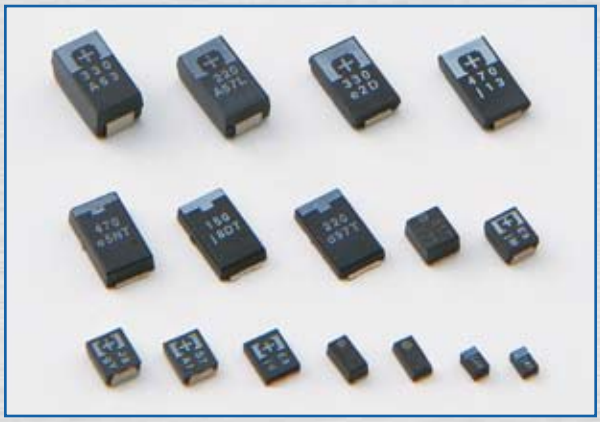
Representative patents relating to POSCAP are as follows:

(TPB, TPC, TPD, TPE, TPF, TPG, TPH, TPL, TPLF, TPSF, TPU, TA, TV, TH series)
U.S. Patent Nos. 6168639 and 6313979

(TPL and TPLF series)
U.S. Patent No. 7136276

POSCAP

INDEX



POSCAP

Tantalum Solid Capacitors with Conductive Polymer

※ Red letters : New series Yellow letters : Update

Tantalum Solid Capacitors with Conductive Polymer

Classification	Series	Page	Features	Small size・Low profile	High capacitance	Low ESR	Low ESL	High voltage・High reliability	Size code	Category temperature range(℃)	Rated voltage range (V.DC)	Capacitance range(μF)	L×W (mm)	H (mm)
SMD type	TPU	86	Small size Low profile Face down terminal	●					S09	−55 to +85	2.5 to 10	4.7 to 100	2.0×1.25	0.9
									S11	−55 to +85	2.5 to 6.3	33 to 68	2.0×1.25	1.1
									B09	−55 to +85	6.3	150	3.5×2.8	0.9
	New TPH	87	Small size Low ESR Face down terminal	●		●			A09	−55 to +85	2.5 to 10	33 to 100	3.2×1.6	0.9
									A14	−55 to +85	2.5 to 6.3	100 to 220	3.2×1.6	1.4
	TPG	88	Small size Low profile High capacitance	●	●				B1G	−55 to +105	2.5 to12.5	33 to 220	3.5×2.8	1.1
									B15G	−55 to +105	4.0 to 6.3	150 to 220	3.5×2.8	1.4
	TPSF	89	Low ESR・Small size High capacitance Face down terminal	●	●	●			B2S	−55 to +105	2.0 to 11	62 to 270	3.5×2.8	1.9
	TPC	90 to 91	Low profile	●					B1	−55 to +105	2.5 to12.5	10 to 56	3.5×2.8	1.1
									D2	−55 to +105	6.3 to 10	68 to 330	7.3×4.3	1.9
	TPE	92 to 95	Low ESR			●			B2	−55 to +105	2.0 to 10	47 to 470	3.5×2.8	1.9
									D15E	−55 to +105	6.3	470	7.3×4.3	1.4
									D2E	−55 to +105	2.5 to 10	68 to 470	7.3×4.3	1.8
									D3L	−55 to +105	2.5 to 10	220 to 680	7.3×4.3	2.8
									D4	−55 to +105	2.5 to 10	330 to 1,500	7.3×4.3	3.8
	TPB	96 to 97	Standard						B2	−55 to +105	2.5 to 10	33 to 100	3.5×2.8	1.9
									D3L	−55 to +105	4.0 to 10	150 to 330	7.3×4.3	2.8
									D4	−55 to +105	6.3 to 10	220 to 470	7.3×4.3	3.8

Classification	Series	Page	Features	Small size · Low profile	High capacitance	Low ESR	Low ESL	High voltage · High reliability	Size code	Category temperature range(℃)	Rated voltage range (V.DC)	Capacitance range(μF)	L×W (mm)	H (mm)
SMD type	TPL TPLF	98 to 99	Low ESR Low ESL Face down terminal			●	●		D12T	−55 to +105	2.0 to 6.3	100 to 220	7.3×4.3	1.1
									D15T	−55 to +105	1.8 to 6.3	150 to 470	7.3×4.3	1.4
									D2T	−55 to +105	2.0 to 2.5	220 to 560	7.3×4.3	1.8
	TPF	100 to 101	Low ESR High capacitance		●	●			D2E	−55 to +105	2.0	220 to 330	7.3×4.3	1.8
									D3L	−55 to +105	2.5 to 10	150 to 680	7.3×4.3	2.8
									D4	−55 to +105	2.5 to 6.3	470 to 1,000	7.3×4.3	3.8
	TA	102	High reliability (for the car electronics)					●	B2	−55 to +105	4.0 to 10	47 to 100	3.5×2.8	1.9
									D2E	−55 to +105	2.5 to 10	68 to 470	7.3×4.3	1.8
									D3L	−55 to +105	2.5 to 10	150 to 680	7.3×4.3	2.8
	New TV	103	High reliability Guaranteed at 125℃ (for the car electronics)					●	D2E	−55 to +125	6.3 to 10	68 to 150	7.3×4.3	1.8
									D3L	−55 to +125	10	150	7.3×4.3	2.8
	TH	104 to 105	Guaranteed at 125℃					●	D2E	−55 to +125	2.5 to 6.3	150 to 330	7.3×4.3	1.8
									D2	−55 to +125	2.5 to 10	68 to 220	7.3×4.3	1.9
									D3L	−55 to +125	4.0 to 6.3	220 to 330	7.3×4.3	2.8
									D4	−55 to +125	4.0 to 10	220 to 680	7.3×4.3	3.8
	TQC	106 to 107	High voltage					●	B2	−55 to +105	16 to 25	5.6 to 15	3.5×2.8	1.9
									D2	−55 to +105	16 to 35	10 to 100	7.3×4.3	1.9
									D3L	−55 to +105	16	150	7.3×4.3	2.8
									D3	−55 to +105	16	100	7.3×4.3	3.1

POSCAP is uniquely structured solid electrolytic capacitor. Please note the following points in order to take full advantage of the **POSCAP**'s performance and ensure the most stable quality. (The crucial precautions is described to page 4 to 6)

Circuit designing cautions

1 Check the rated performance

After checking the operation and installation environments,
design the circuit so that it falls within the rated performance range stipulated in this delivery specification.

2 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. When excessive ripple current is applied, internal heat increases and reduces the **POSCAP**'s lifetime.

3 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.

4 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.

5 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 20A※.
Be sure to insert a protection resistor of about 1kΩ for charge and discharge when measuring the leakage current.

※ When TH series use under the ambient temperature more than 105℃ : 10A, TPU series : 10A

6 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.

7 Failure and life-span

The failure rate is 0.5% ∗ / 1,000h (Confidence level:60%) based on JIS C 5003.
The mainly failure modes are as follows. ∗ B2 size or less: 1.0%

7-1. 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.

7-2. 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.

8 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℃ 2,000h.
0.5%/1,000h (Environment temp. : 105℃, Rated voltage or Category voltage applied)
In the case of the endurance which is 105℃ 1,000h or 125℃ 1,000h.
1.0%/1,000h (Environment temp. : 105℃, Rated voltage or Category voltage applied)
In the case of the endurance which is 85℃ 1,000h.
1.0%/1,000h (Environment temp. : 85℃, Rated voltage applied)

9 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 that those stipulated.

10 Others

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

Compensation coefficient of maximum allowable ripple current

The value multiplying ripple current value in a characteristic list and following coefficient is the maximum allowable ripple current.
(For questions regarding TQC series, please contact us.)

■ **Frequency compensation coefficient**

	120Hz ≤ f < 1kHz	1kHz ≤ f < 10kHz	10kHz ≤ f < 100kHz	100kHz ≤ f < 1MHz
22μF ≤ C ≤ 100μF	0.20	0.60	0.85	1.00
100μF < C ≤ 330μF	0.25	0.70	0.85	1.00
330μF < C ≤ 1,000μF	0.30	0.75	0.90	1.00

■ **Temperature compensation coefficient**

	Case size code	
	S09, S11, A09, A14, B09, B1, B1G, B15G, B2, B2S, D12T, D15T, D2, D15E, D2E, D2T, D3L, D3, D4(THD)	D4
T ≤ 45℃	1.00	1.00
45℃ < T ≤ 85℃	0.70	0.50
※85℃ < T ≤ 105℃	0.25	0.25

T :Environment temperature ※THseries :85℃ < T ≤ 125℃

Storage conditions

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 refer to page 6. about the general storage conditions)

The storage period is 18 months or shorter after shipment from factories,
under the condition that the storage bag is unopened.

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"

MSL	Floor life		Applications scope	
	Time	Conditions	Size code	Series
2a	4 weeks	≤ 30℃／60%RH	D12T,D15T,D2E,D2,D2T, D15E,D3L,D3,D4	TPB,TPC,TPE,TPD TH※ ,TPL,TPLF
3	168 hours	≤ 30℃／60%RH	S09,S11,A09,A14,B09, B1,B1G,B15G,B2,B2S	TPB,TPC,TPE,TPG,TPH,TV※, TPSF,TPU,TA,TQC(ALL sizes)
5	48 hours	≤ 30℃／60%RH	D2E,D2,D3L,D4	TH,TV

(Conform to IPC/JEDEC J-STD-020C) ※Use at 105℃ or less

NOTE:The model of MSL "2a" is changed into MSL "3" with the 260℃ reflow soldering.

Tantalum Solid Capacitors with Conductive Polymer

P.96 to 97
TPB
Standard
- D4 size: 6.3 to 10V, 220 to 470μF
- D3L size: 4.0 to 10V, 150 to 330μF
- B2 size: 2.5 to 10V, 33 to 100μF

P.90 to 91
TPC
Low profile
- D2 size: 6.3 to 10V, 68 to 330μF
- B1 size: 2.5 to 12.5V, 10 to 56μF

P.92 to 95
TPE
Low ESR
- D4 size: 2.5 to 10V, 330 to 1,500μF
- D3L size: 2.5 to 10V, 220 to 680μF
- D2E size: 2.5 to 10V, 68 to 470μF
- D15E size: New — 6.3V, 470μF
- B2 size: 2.0 to 10V, 47 to 470μF

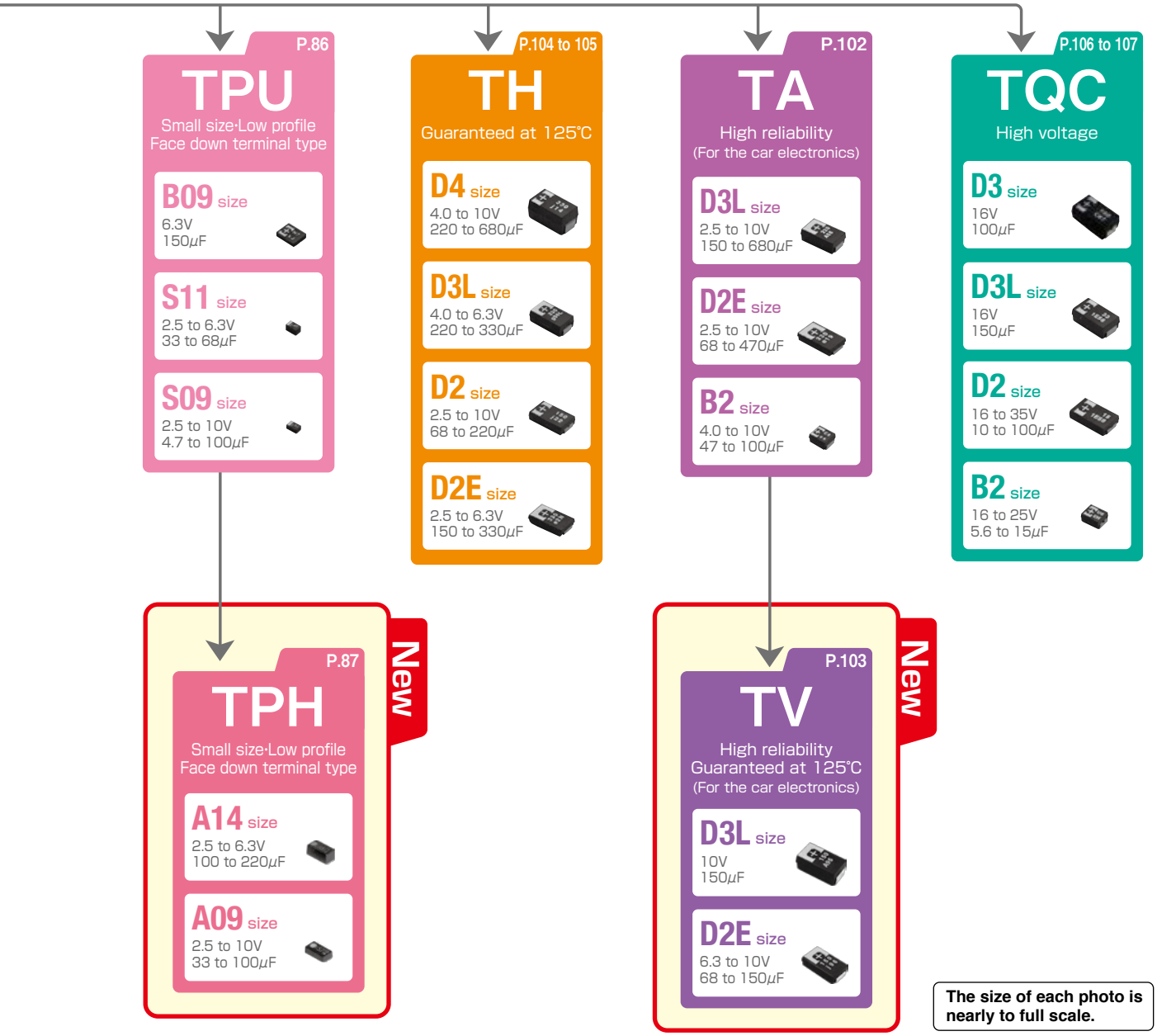
P.98 to 99
TPL
Low ESR·Low ESL
Face down terminal type
- D2T size: 2.5V, 330 to 470μF
- D15T size: 1.8 to 6.3V, 150 to 470μF
- D12T size: 2.0 to 6.3V, 100 to 220μF

P.98 to 99
TPLF
Low ESR·Low ESL
Face down terminal type
- D2T size: 2.0 to 2.5V, 220 to 560μF

P.88
TPG
Small size
High capacitance
- B15G size: 4.0 to 6.3V, 150 to 220μF
- B1G size: 2.5 to 12.5V, 33 to 220μF

P.100 to 101
TPF
Low ESR
High capacitance
- D4 size: 2.5 to 6.3V, 470 to 1,000μF
- D3L size: 2.5 to 10V, 150 to 680μF
- D2E size: 2.0V, 220 to 330μF

P.89
TPSF
Low ESR
High capacitance
Small size
- B2S size: 2.0 to 11V, 62 to 270μF



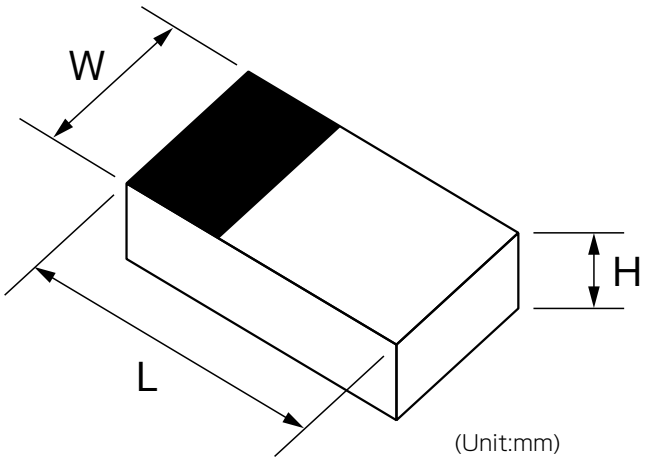
The size of each photo is nearly to full scale.

Case size

(Unit:mm)

	S09	S11	A09	A14	B09	B1	B1G	B15G	B2	B2S	D12T	D15E	D15T	D2E	D2T	D2	D3L	D3	D4
L	2.0	2.0	3.2	3.2	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	7.3	7.3
W	1.25	1.25	1.6	1.6	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	4.3	4.3
H	0.9	1.1	0.9	1.4	0.9	1.1	1.1	1.4	1.9	1.9	1.1	1.4	1.4	1.8	1.8	1.9	2.8	3.1	3.8

Tantalum Solid Capacitors with Conductive Polymer



(Unit:mm)

(Unit:mm)

S09 size

L2.0×W1.25×H0.9

P.86

TPU
2.5 to 10V
4.7 to 100μF

S11 size

L2.0×W1.25×H1.1

P.86

TPU
2.5 to 6.3V
33 to 68μF

A09 size

L3.2×W1.6×H0.9

P.87

TPH
2.5 to 10V
33 to 100μF
New

A14 size

L3.2×W1.6×H1.4

P.87

TPH
2.5 to 6.3V
100 to 220μF
New

B09 size

L3.5×W2.8×H0.9

P.86

TPU
6.3V
150μF

B1 size

L3.5×W2.8×H1.1

P.90 to 91

TPC
2.5 to 12.5V
10 to 56μF

B1G size

L3.5×W2.8×H1.1

P.88

TPG
2.5 to 12.5V
33 to 220μF

B15G size

L3.5×W2.8×H1.4

P.88

TPG
4.0 to 6.3V
150 to 220μF

B2 size

L3.5×W2.8×H1.9

P.92 to 95

TPE
2.0 to 10V
47 to 470μF

P.96 to 97

TPB
2.5 to 10V
33 to 100μF

P.102

TA
4.0 to 10V
47 to 100μF

P.106 to 107

TQC
16 to 25V
5.6 to 15μF

B2S size

L3.5×W2.8×H1.9

P.89

TPSF
2.0 to 11V
62 to 270μF

(Unit:mm)

D12T size

L7.3×W4.3×H1.1

P.98 to 99

TPL
2.0 to 6.3V
100 to 220μF

D15E size

L7.3×W4.3×H1.4

P.92 to 95

TPE
6.3V
470μF
New

D15T size

L7.3×W4.3×H1.4

P.98 to 99

TPL
1.8 to 6.3V
150 to 470μF

D2T size

L7.3×W4.3×H1.8

P.98 to 99

TPL
2.5V
330 to 470μF

P.98 to 99

TPLF
2.0 to 2.5V
220 to 560μF

D2E size

L7.3×W4.3×H1.8

P.92 to 95

TPE
2.5 to 10V
68 to 470μF

P.100 to 101

TPF
2.0V
220 to 330μF

P.102

TA
2.5 to 10V
68 to 470μF

P.103

TV
6.3 to 10V
6.8 to 150μF
New

P.104 to 105

TH
2.5 to 6.3V
150 to 330μF

D2 size

L7.3×W4.3×H1.9

P.90 to 91

TPC
6.3 to 10V
68 to 330μF

P.104 to 105

TH
2.5 to 10V
68 to 220μF

P.106 to 107

TQC
16 to 35V
10 to 100μF

D3L size

L7.3×W4.3×H2.8

P.92 to 95

TPE
2.5 to 10V
220 to 680μF

P.96 to 97

TPB
4.0 to 10V
150 to 330μF

P.100 to 101

TPF
2.5 to 10V
150 to 680μF

P.102

TA
2.5 to 10V
150 to 680μF

P.103

TV
10V
150μF
New

P.104 to 105

TH
4.0 to 6.3V
220 to 330μF

P.106 to 107

TQC
16V
150μF

D3 size

L7.3×W4.3×H3.1

P.106 to 107

TQC
16V
100μF

D4 size

L7.3×W4.3×H3.8

P.92 to 95

TPE
2.5 to 10V
330 to 1,500μF

P.96 to 97

TPB
6.3 to 10V
220 to 470μF

P.100 to 101

TPF
2.5 to 6.3V
470 to 1,000μF

P.104 to 105

TH
4.0 to 10V
220 to 680μF

The size of each photo is nearly to full scale.

Tantalum Solid Capacitors with Conductive Polymer

Case size (Unit:mm)

	S09	S11	A09	A14	B09	B1	B1G	B15G	B2	B2S	D12T	D15E	D15T	D2E	D2T	D2	D3L	D3	D4
L	2.0	2.0	3.2	3.2	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	7.3	7.3
W	1.25	1.25	1.6	1.6	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	4.3	4.3
H	0.9	1.1	0.9	1.4	0.9	1.1	1.1	1.4	1.9	1.9	1.1	1.4	1.4	1.8	1.8	1.9	2.8	3.1	3.8

WV	μF / Series	4.7	5.6	8.2	10	15	22	33	47	56	62	68	82
1.8V	TPL												
2V	TPE												
	TPF												
	TPL												
	TPLF												
	TPSF												
2.5V	TPB												
	TPC									B1(70)			
	TPE												
	TPE												
	TPE												
	TPF												
	TPF												
	TPG												
	TPG												
	TPH												
	TPL												
	TPL												
	TPLF												
	TPU								S09(150)			S11(150)	
4V	TPB											B2(70)	
	TPC								B1(70)				
	TPE												
	TPE												
	TPF												
	TPG												
	TPH											A09(150)	
	TPL												
	TPU								S11(150)			S09(150)	
6.3V	TPB											B2(70)	
	TPB												
	TPC							B1(70)	B1(70,55)				
	TPC												
	TPE												
	TPE												
	TPE												
	TPE												
	TPF												
	TPG												
	TPH												
	TPH								A09(150)				
	TPL												
	TPU				S09(250)		S09(150)	S11(150)	S09(150)				
8V	TPC						B1(70)						
	TPE												
	TPG								B1G(70)				
10V	TPB							B2(70)					
	TPB								B2(70)				
	TPC							B1(70)				D2(45)	
	TPE								B2(35)			D2E(25)	
	TPF												
	TPG								B1G(70)				
	TPH							A09(150)					
	TPU	S09(300)											
11V	TPSF										B2S(18)		
12.5V	TPC				B1(80)	B1(80)							
	TPG							B1G(70)					
16V	TQC				B2(100)	B2(90)		D2(70)	D2(70,40)			D2(50)	
	TQC												
20V	TQC			B2(100)			D2(80)		D2(55)				
	TQC												
25V	TQC		B2(100)			D2(90,45)	D2(90,45)	D2(60)					
35V	TQC				D2(120)								

★Under development ∗1(F:15, I:18, M:25) ∗2(C:12, F:15, I:18, M:25) ∗3(7, 9, C:12, F:15, I:18, M:25)
∗4(5, 6, 8, 10)

·Symbols in table: Case size
·( ): ESR specification(mΩmax.)

WV	μF / Series	100	120	150	220	270	330	470	560	680	1,000	1,500
1.8V	TPL							D15T(7)★				
2V	TPE						B2(15,13)	B2(11)★				
	TPF				D2E(6)		D2E(6)					
	TPL				D12T(25)							
	TPLF				D2T(5)			D2T(6,5,4)	D2T(5,4)			
	TPSF					B2S(9,6)						
2.5V	TPB	B2(70)										
	TPC											
	TPE				D2E(∗3)		D2E(∗3)	D2E(18,15,12)		D3L(25,15,12)	D4(18,15)	D4(15,12)
	TPE			B2(35)	B2(35,25,21)		B2(35)	D2E(9,7)				
	TPE				B2(18,15,13)		B2(9)★					
	TPF						D3L(7)	D3L(10,7,6)		D3L(10,7,6)	D4(6,5)	
	TPF							D4(5)★		D4(5)★		
	TPG				B1G(70)							
	TPG				B15G(30)							
	TPH	A09(150)			A14(70)★							
	TPL						D2T(9,8)	D2T(9,8,7)				
	TPL				D15T(18)		D15T(15,9)					
	TPLF						D2T(6,5)★					
	TPU	S09(150)										
4V	TPB						D3L(40)					
	TPC											
	TPE			D2E(18)	D2E(∗1)		D2E(25,18)	D3L(∗2)		D4(18,15)		
	TPE	B2(35)		B2(35,30)	B2(35)							
	TPF						D3L(12)	D3L(10)		D4(10)		
	TPG				B15G(70)							
	TPH			A14(70)★								
	TPL			D12T(25)	D15T(20)							
	TPU											
6.3V	TPB				D3L(40)		D3L(40)					
	TPB						D4(40)	D4(35)				
	TPC											
	TPC	D2(45)		D2(40)			D2(40)					
	TPE	D2E(25,18)		D2E(∗1)	D2E(25,18)		D2E(25)	D4(25,18)		D4(25,18)		
	TPE				B2(25)★		D3L(∗1)					
	TPE						D4(10)★					
	TPE	B2(35,25)	B2(35)	B2(35,25)	B2(35)			D15E(35)★				
	TPF				D3L(12.9★.5★)		D3L(9)	D4(10)				
	TPG	B1G(70,55)		B15G(70,35)								
	TPH	A09(100)★										
	TPH	A14(70)★										
	TPL	D12T(25)		D15T(25)	D15T(25)							
	TPU			B09(100)								
8V	TPC			D2(40)								
	TPE	B2(35)										
	TPG											
10V	TPB				D4(40)		D4(35)					
	TPB			D3L(40)	D3L(40)							
	TPC	D2(45)										
	TPE				D3L(25,18)		D4(25)					
	TPF			D3L(15)								
	TPG											
	TPH											
	TPU											
11V	TPSF											
12.5V	TPC											
	TPG											
16V	TQC	D2(50)		D3L(50)								
	TQC	D3(50)										
20V	TQC											
	TQC											
25V	TQC											
35V	TQC											

Tantalum Solid Capacitors with Conductive Polymer

Part number system

2R5 Rated voltage 1 to 3 figures

Rated voltage	Code
1.8	X
2.0	2
2.5	2R5orE
4.0	4
6.3	6
8.0	8
10	10
11	11
12.5	12
16	16
20	20
25	25
35	35

TPB Series name 3 to 4 figures

Series	Code
TPB	TPB
TPC	TPC
TPE	TPE
TPF	TPF
TPG	TPG
TPH	TPH
TPL	TPL
TPLF	TPLF
TPSF	TPSF
TPU	TPU
TAB	TAB
TAE	TAE
THB	THB
THC	THC
THE	THE
TQC	TQC
TVE	TVE

330 Rated capacitance 2 to 4 figures

Rated capacitance	Code
4.7	4R7
5.6	5R6
8.2	8R2
10	10
15	15
22	22
33	33
47	47
56	56
62	62
68	68
82	82
100	100
120	120
150	150
220	220
270	270
330	330
470	470
560	560
680	680
1,000	1000
1,500	1500

M Capacitance tolerance 1 figure

Capacitance tolerance	Code
±20%	M

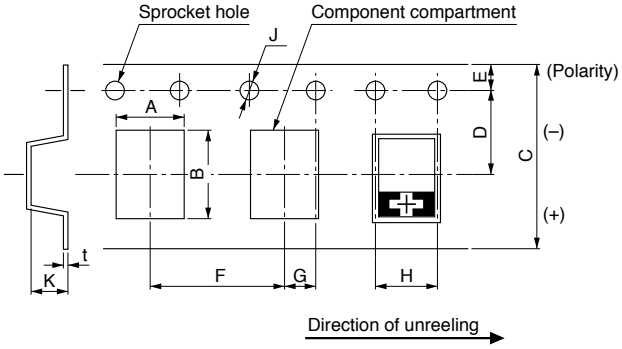
L Special code 0 to 4 figures

Standard		Code
TPE series		
B2 size	ESR 35mΩ max	ZB
	ESR 30mΩ max	UB
	ESR 25mΩ max	PB
	ESR 21mΩ max	LB
	ESR 18mΩ max	IB
	ESR 15mΩ max	FB
	ESR 15mΩ/300kHz max	FGB
	ESR 13mΩ/300kHz max	DGB
	ESR 35mΩ max 85℃	AZB
	ESR 30mΩ max 85℃	AUB
	ESR 25mΩ max 85℃	APB
	ESR 15mΩ max 85℃	AFB
	ESR 15mΩ/300kHz max 85℃	AFGB
	ESR 13mΩ/300kHz max 85℃	ADGB
D15E size	ESR 35mΩ max 85℃	AZU
D2E size	ESR 25mΩ max 85℃	AP
D3L size	ESR 25mΩ max	L
	ESR 18mΩ max	IL
	ESR 15mΩ max	FL
	ESR 12mΩ max	CL
TPH series		
A09 size	ESR 150mΩ max	AHA
	ESR 100mΩ max	AEA
A14 size	ESR 70mΩ max	ABC

Standard		Code
TPB series		
D3L size		L
TPC series		
85℃		A
B1 size		B
TPF series		
D3L size	ESR 9mΩ max	9L
	ESR 7mΩ max	7L
	ESR 6mΩ max	6L
TPL series		
D12T size		D
D15T size	ESR 25mΩ max	U
	ESR 20mΩ max	KU
	ESR 18mΩ max	IU
	ESR 15mΩ max	FU
TPSF series		
B2S size	ESR 18mΩ/300kHz max 85℃	AIG
TPU series		
S09 size		SI
S11 size		SK
B09 size		BI
TQC series		
Capacitance enlarged type		Y
All series		
ESR 55mΩ max		G
ESR 45mΩ max		V
ESR 40mΩ max		W
ESR 35mΩ max		Z
ESR 18mΩ max		I
ESR 15mΩ max		F
ESR 12mΩ max		C
ESR 9mΩ max		9
ESR 8mΩ max		8
ESR 6mΩ max		6
ESR 5mΩ max		5
ESR 9mΩ/300kHz max		9G
ESR 6mΩ/500kHz max		6E

*We supply only embossed taping type.

Dimension of carrier tape

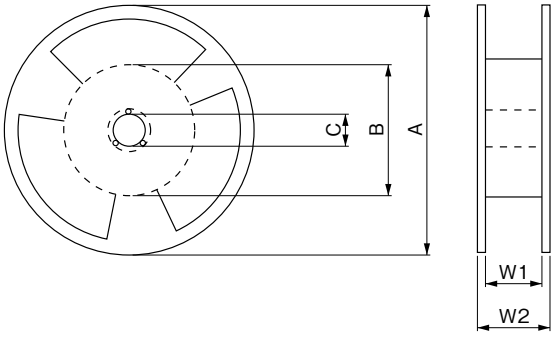


(unit:mm)

Size code	A ±0.1	B ±0.1	C ±0.3	D ±0.1	E ±0.1	F ±0.1	G ±0.1	H ±0.1	J $^{+0.1}_{-0}$	K ±0.2	t ±0.1
S09	1.65	2.4	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.3	0.25
S11	1.65	2.4	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.3	0.25
A09	2.05	3.65	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.3	0.25
A14	2.05	3.65	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.7	0.25
B09	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.4	0.2
B1	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.4	0.2
B1G	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.7	0.25
B15G	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.7	0.25
B2	3.3	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	2.1	0.2
B2S	3.25	4.0	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	2.1	0.25
D2E	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.4	0.3
D2T	4.5	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.4	0.3
D15E	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	1.7	0.3
D15T	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	1.7	0.3
D12T	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	1.7	0.3
D2	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.4	0.3
D3L	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	3.2	0.3
D3	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	3.5	0.3
D4	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	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±10μm
  Width of cover tape: 9.5±0.2mm
  5.5±0.2mm (φ180reel)

Reel dimension



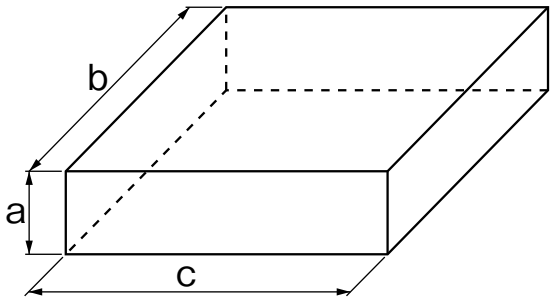
(unit:mm)

A	B	C	W1	W2
φ330±2	φ80±2	φ13±0.2	13.5±0.5	17.5±1.0
φ180 $^{+0}_{-3}$	φ60±2	φ13±0.2	9±0.5	11.4±1.0

Packing quantities

Size code	Pieces/reel (φ180)	Pieces/reel (φ330)	Size code	Pieces/reel (φ180)	Pieces/reel (φ330)
S09	3,000	–	D2E	–	3,000
S11	3,000	–	D2T	–	3,000
A09	3,000	–	D15E	–	4,000
A14	2,500	–	D15T	–	4,000
B09	3,000	–	D12T	–	4,000
B1	3,000	–	D2	–	3,000
B1G	2,500	–	D3L	–	2,500
B15G	2,500	–	D3	–	2,500
B2	2,000	–	D4	–	2,000
B2S	2,000	–			

Dimension of packing case



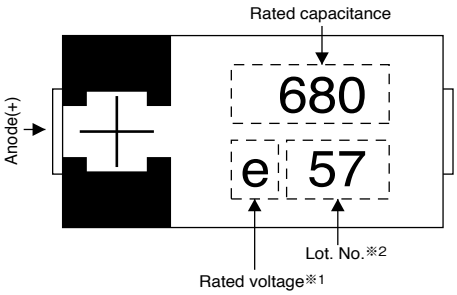
(unit:mm)

Reel size	φ180	φ330
a	90	120
b	240	360
c	240	360

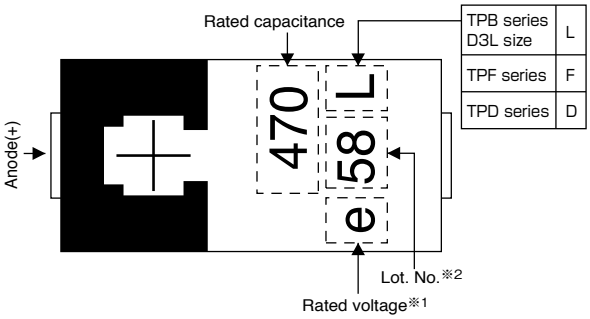
Units per packing case

Size code	Pieces/case	Size code	Pieces/case
S09	15,000	D2E	15,000
S11	15,000	D2T	15,000
A09	15,000	D15E	20,000
A14	12,500	D15T	20,000
B09	15,000	D12T	20,000
B1	15,000	D2	15,000
B1G	12,500	D3L	12,500
B15G	12,500	D3	12,500
B2	10,000	D4	10,000
B2S	10,000		

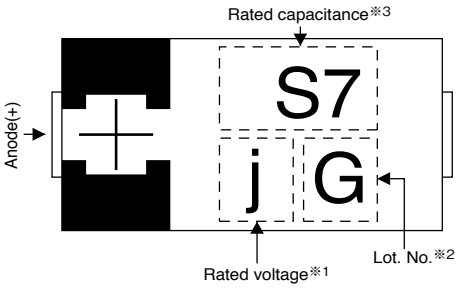
●D2, D4 size (TPB, TPC, TH series)
●D2, D3, D3L size (TQC series)



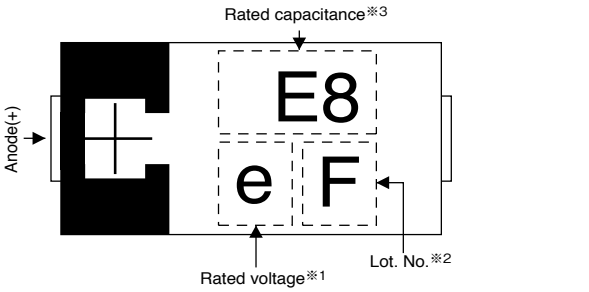
●D15E, D2E, D3L size (TPB, TPE, TPF series)
●D4 size (TPE series)



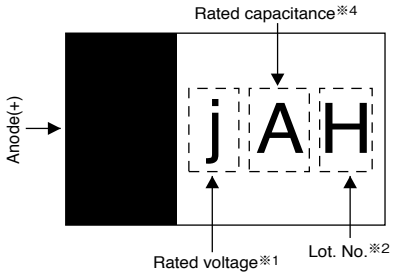
●B09, B1, B1G, B15G, B2 size
(TPB, TPC, TPG, TPU, TQC series)



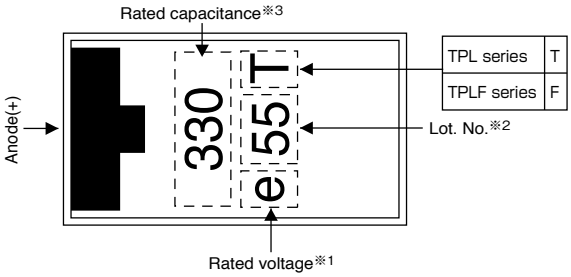
●B2 size (TPE series)



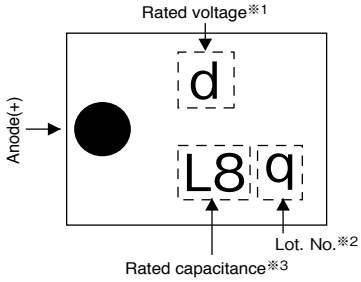
●S09, S11 size (TPU series)



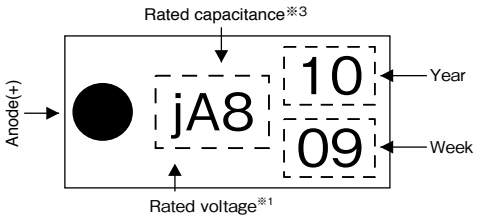
●D2T, D15T, D12T size (TPL, TPLF series)



●B2S size (TPSF series)



●A09, A14 size (TPH series)



※1 The rated voltage is as follows.

R.V.	2.0	2.5	3.15	4.0	6.3	8.0	10	11	12.5	16	20	25	35
Mark	d	e	f	g	j	k	A	A1	B	C	D	1E(or E)	V

※2 Lot.No.shows roughly manufacturing date.

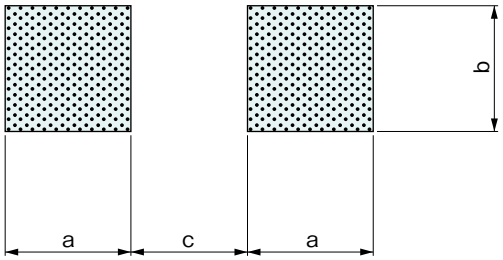
※3 The rated capacitance is as follows.

Capacitance (μF)	5.6	8.2	10	15	22	33	47	56	62	68	100	120	150	220	270	330
Mark	U6	Y6	A7	E7	J7	N7	S7	U7	V7	W7	A8	C8	E8	J8	L8	N8

※4 The rated capacitance is as follows.(S09,S11,A09)

R. Cap. (μF)	4.7	10	15	22	33	47	68	100
Mark	s	A	E	J	N	S	W	A

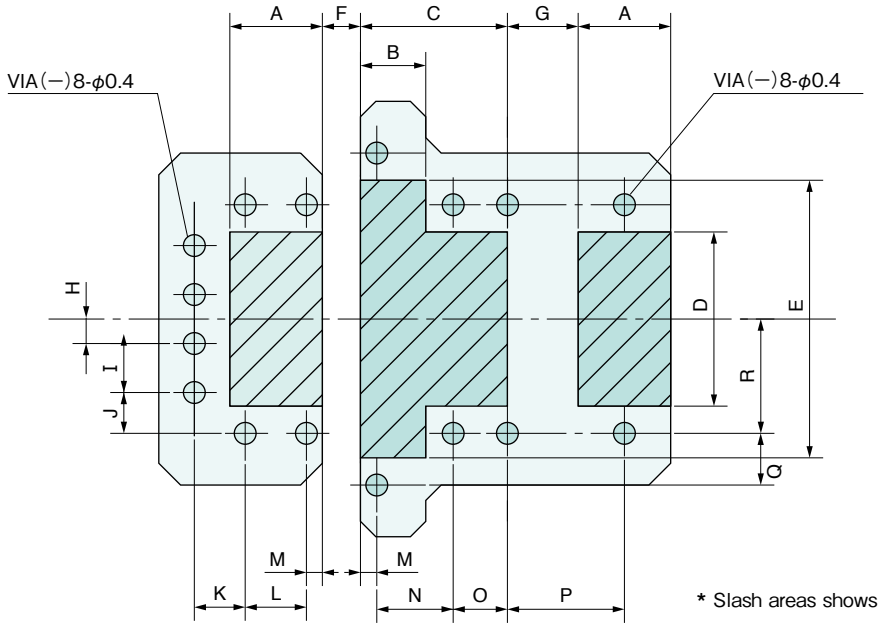
Except for TPL/TPLF series



(unit:mm)

Size code	a	b	c
S09	1.0	0.9	0.6
S11	1.0	0.9	0.6
A09	1.6	1.2	1.2
A14	1.6	1.2	1.2
B09	1.6	2.7	1.4
B1	1.6	2.7	1.4
B1G	1.6	2.7	1.4
B15G	1.6	2.7	1.4
B2	1.6	2.7	1.4
B2S	1.6	2.7	1.4
D15E	2.4	2.9	3.7
D2E	2.4	2.9	3.7
D2	2.4	2.9	3.7
D3L	2.4	2.9	3.7
D3	2.4	2.9	3.7
D4	2.4	2.9	3.7

TPL/TPLF series



* Slash areas shows solder pads

(1) Three-pad design for three-terminal model (TPL/TPLF series)

(unit:mm)

Size code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
D2T D15T D12T	1.7	1.2	2.7	3.2	5.1	0.7	1.3	0.45	0.9	0.75	0.9	1.1	0.3	1.4	1.0	2.15	0.95	2.1

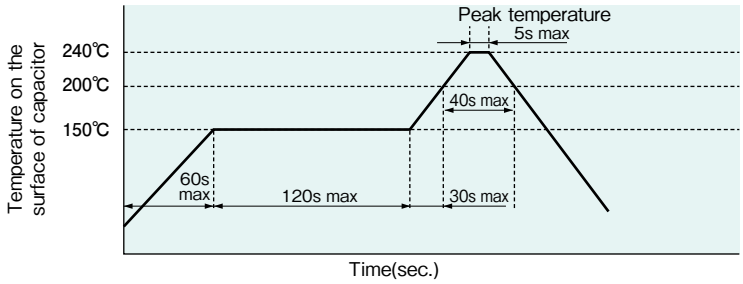
(2) Common three-pad design for POSCAP D-size two-terminal model

(unit:mm)

Size code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
D common	2.2	1.2	2.7	2.9	5.1	0.5	1.0	0.45	0.9	0.75	1.4	1.1	0.3	1.4	1.0	2.15	0.95	2.1

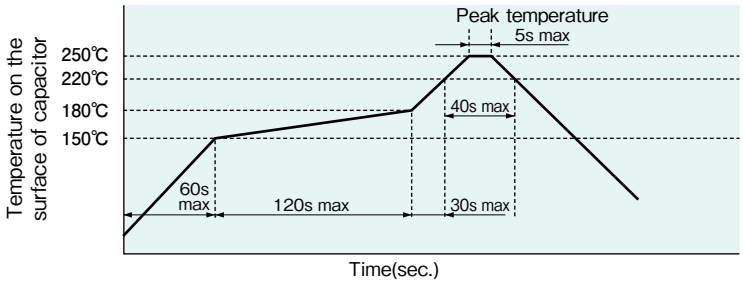
Recommended reflow soldering temperature profile

The cycles of reflow soldering: Twice (max)



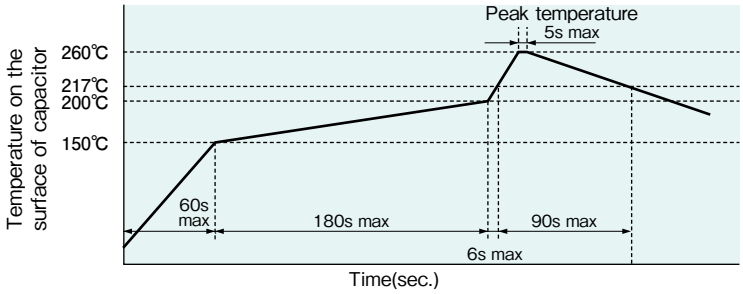
Peak temperature 250℃ lead free reflow soldering profile

The cycles of reflow soldering: Twice (max)



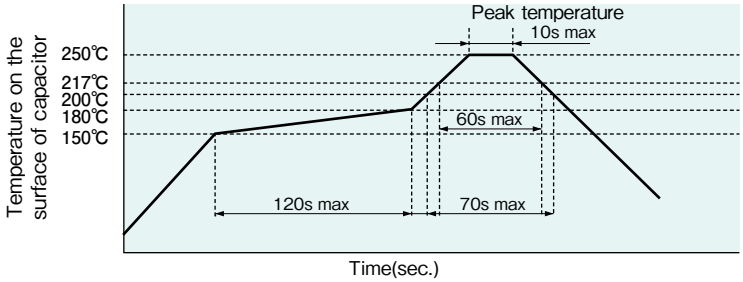
Peak temperature 260℃ lead free reflow soldering profile

The model of MSL"2a" is changed into MSL "3" with this reflow condition.(See page 65)
The cycles of reflow soldering: Twice (max)



TQC series

The cycles of reflow soldering: Twice (max)



Soldering with a soldering iron

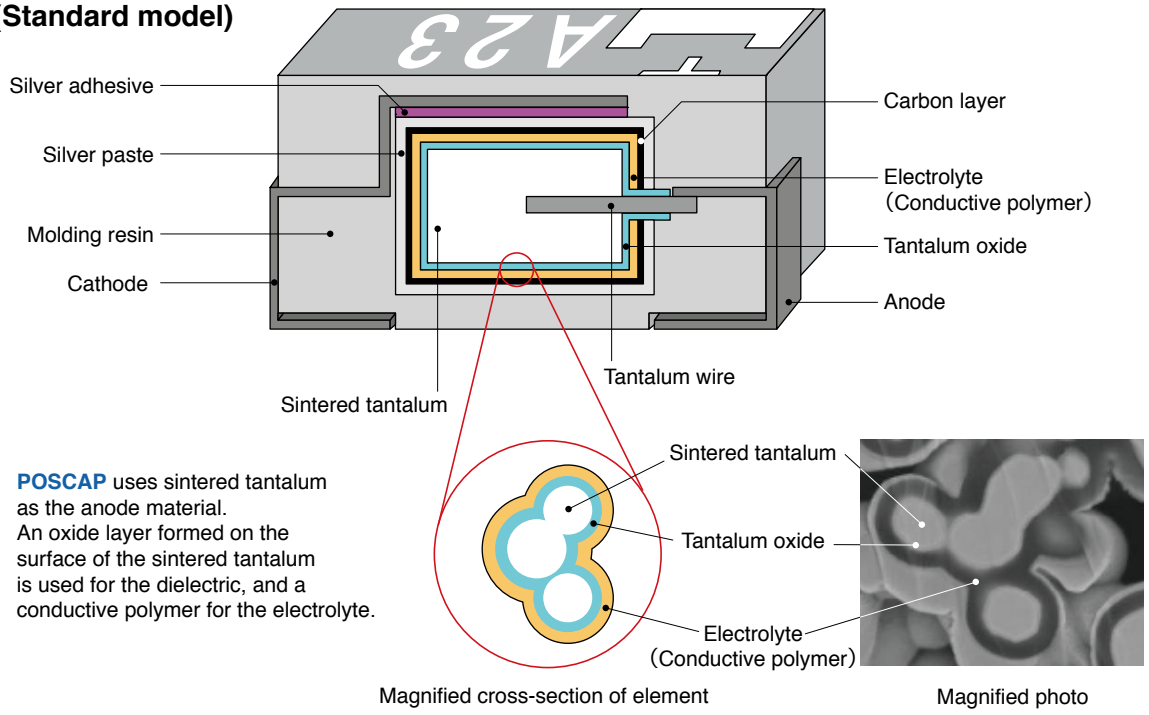
Tip of a soldering iron: 350℃ max (TQC serise: 400℃ max)　Power of a soldering iron: 30W max
Working time: 3sec. max (TQC serise: 5sec max)
(Do not let the tip of soldering iron touch the POSCAP itself. Do not subject the POSCAP itself to excessive stress when soldering.)

1. Basic structure of POSCAP

The electrolytes make the difference in structure between the **POSCAP** and the standard tantalum capacitor.

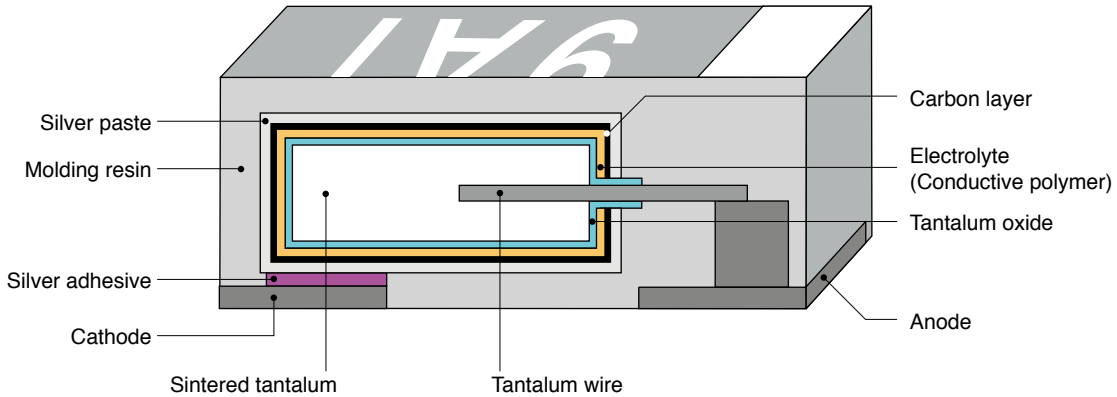
Capacitor	Electrolyte
Tantalum capacitor	Manganese dioxide
POSCAP	Conductive polymer

(Standard model)



POSCAP uses sintered tantalum as the anode material.
An oxide layer formed on the surface of the sintered tantalum is used for the dielectric, and a conductive polymer for the electrolyte.

(Face down terminals model)



- The sintered tantalum has a porous structure, it makes a large surface area, which enables to have large capacitance.
- The conductive polymer used for the electrolyte is high in electric conductivity and enables the low ESR.

1. POSCAP Electrical characteristics

1-1. Frequency characteristics

Fig.A Impedance frequency characteristics (POSCAP vs other type)

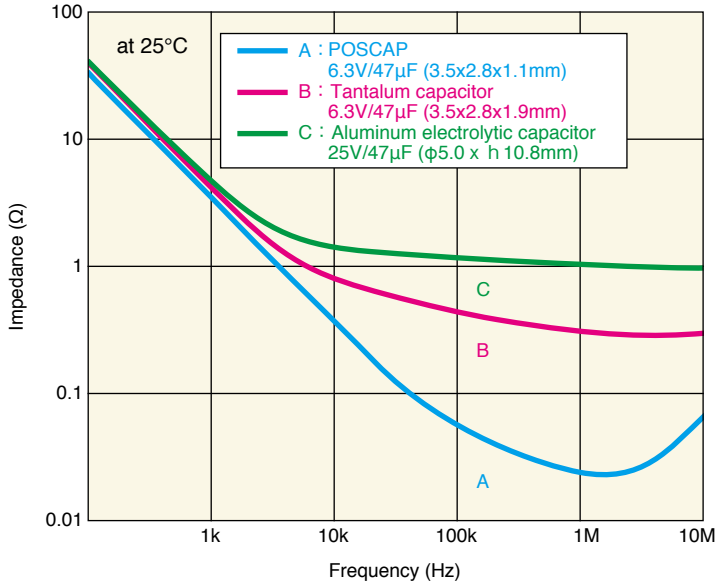
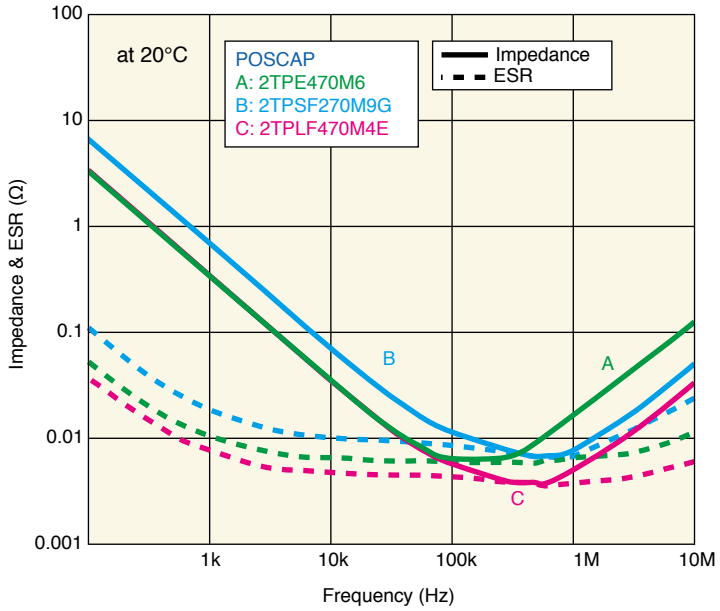


Fig.B Impedance & ESR frequency characteristics (Several POSCAP models)



The greatest characteristic of POSCAP is the excellent frequency characteristics.
Using a high conductive polymer for the electrolyte greatly improves the ESR characteristics and enables the POSCAP to perform at the higher frequency levels.
Fig. A: Compares the POSCAP to an aluminum electrolytic and a tantalum capacitor.
The POSCAP's impedance is remarkably lower than the other capacitors at the periphery of the resonance frequency.
Fig. B: Compares the impedance and ESR frequency characteristics of three different POSCAP series.
The TPLF series has a low ESL characteristic which brings it to high resonance frequency, it makes impedance be much lower in the range of high - frequency wave.

1-2. Characteristics at high and low temperatures

Fig.A ESR temperature characteristics (POSCAP vs Ceramic capacitor)

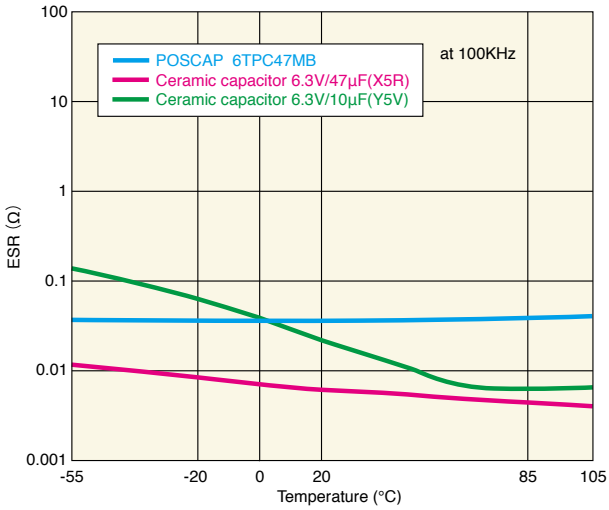
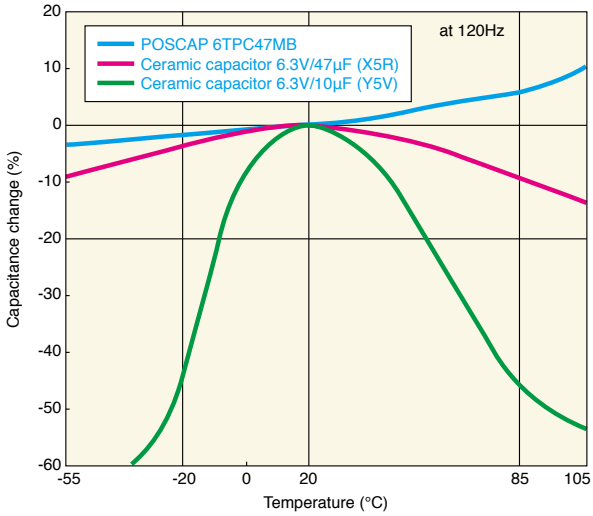


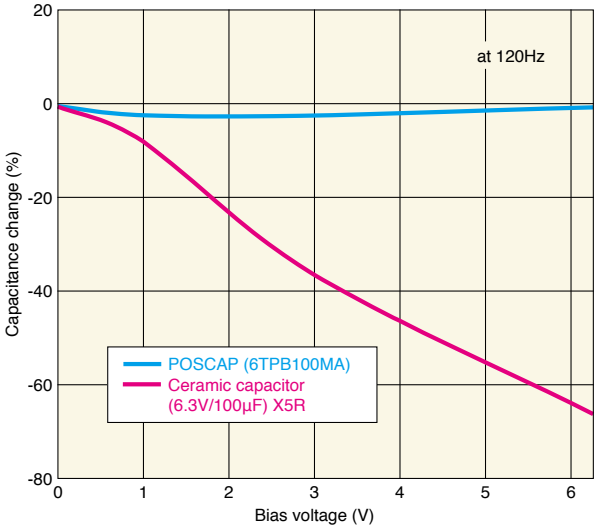
Fig.B Capacitance temperature characteristics (POSCAP vs Ceramic capacitor)



The POSCAP has a characteristics of low and high temperature, which is little change against temperature for the ESR.
The stability of ESR's temperature characteristics means the noise-clearing ability is little change against temperature.
The POSCAP is suitable for outdoor equipment which requires the temperature characteristic flexibility.

1-3. Bias characteristics

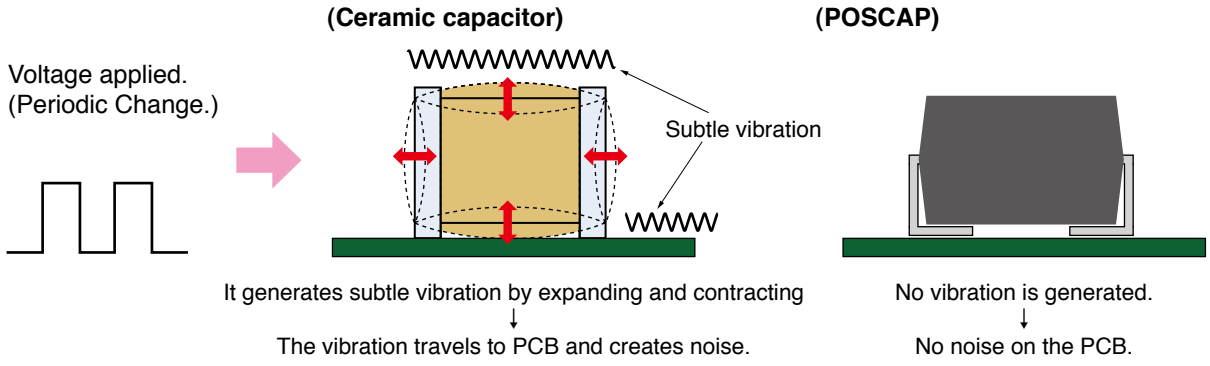
Comparison of bias characteristics (POSCAP vs Ceramic capacitor)



The ceramic capacitor has bias characteristics, which makes the capacitance decrease when voltage is applied to it. However, POSCAPs will show no reduction in capacitance for applied voltage, as long as the applied voltage is within its rating. Therefore, you will be able to design without worrying about capacitance changing when voltage is applied.

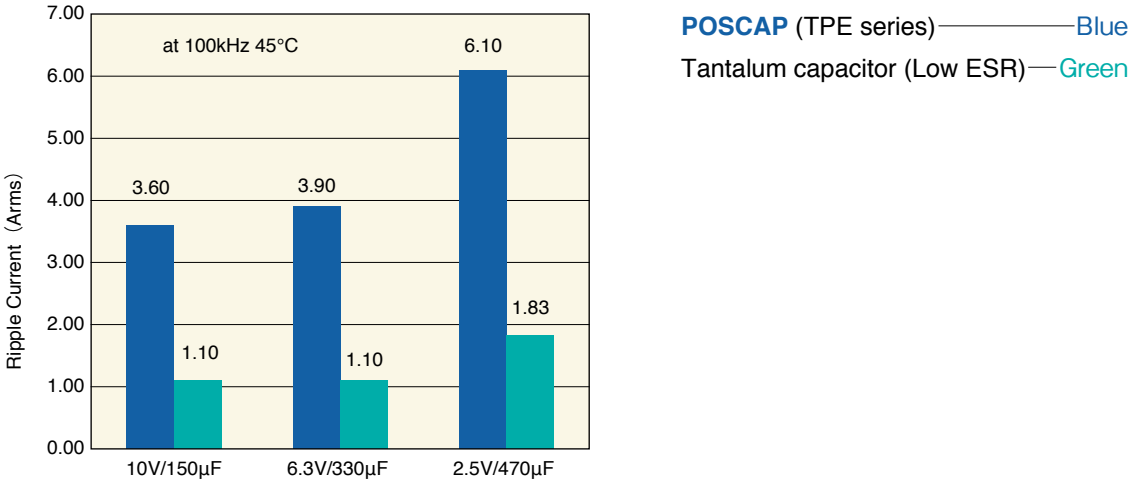
1-4. Piezoelectric effect of the capacitor

When variable voltage is applied to ceramic capacitors that uses dielectrics with piezoelectric characteristics (e.g. barium titanate), the voltage will cause vibration due to the elasticity in the dielectric.
If the cyclic change is within the audio-frequency (20Hz to 20kHz), the vibration from the capacitor travels to the PCB and it could generate noise inside the equipment.
This may be an unwanted effect depending on the product you are developing. Our **POSCAP**'s dielectric layer is composed of tantalum oxide which does not have piezoelectric characteristics. Silence is thus assured by use of our product.



1-5. Allowable ripple current

Comparison of allowable ripple current (**POSCAP** vs Tantalum capacitor)

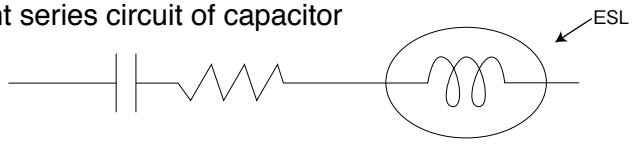


The allowable ripple current of a capacitor is an important characterisitc when selecting a smoothing capacitor for a power supply.
The allowable value of ripple current is decided by the generated heat of the capacitor.
This generated heat is relevant to the ESR value.
Since a large ESR capacitor generates a larger value of heat, it inhibits the ripple current value.
Because the ESR of the **POSCAP** is so small, it can reach a high ripple current rating compared to other electrolytic capacitors.

1-6. ESL characteristics

POSCAP is a high performing capacitor with low ESR and large capacitance.
In recent circuit technologies for electronic equipment, the ESL value is important when considering performance in the high frequency range.

(a) Eqivalent series circuit of capacitor



(b) Approximate ESL value of **POSCAP**

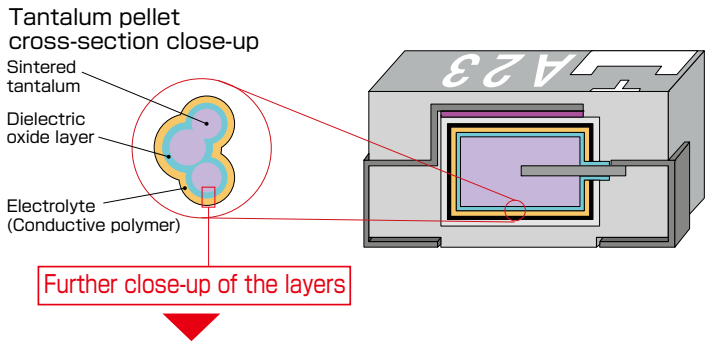
(unit: nH)

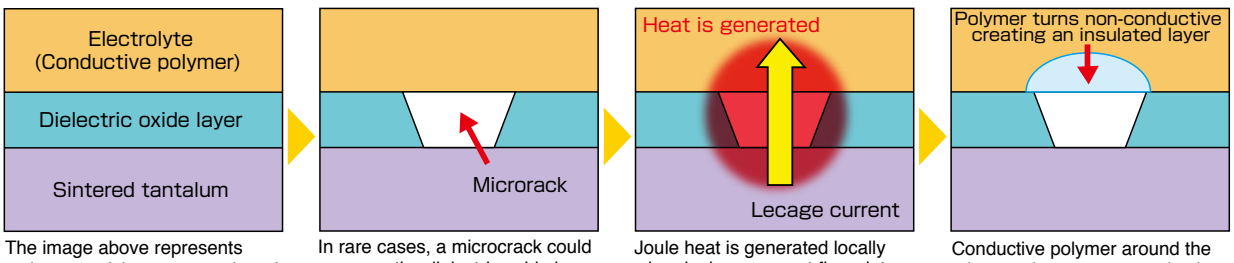
Size Code	at 10 MHz	Size Code	at 10 MHz
B1	1.2	D2T	0.5/0.8
B2	1.3	D2E	1.8
B2S	0.7	D2	2.0
D12T	1.0	D3L	2.3
D15T	0.9	D3	2.4
D15E	2.0	D4	2.5

※Measuring method and position
: Based on JEITA RC-2002
※All values on the left figure are not guaranteed but reference.
Please contact SANYO for details of measurement.

1-7. Self-Healing Mechanism

Conductive polymer is used as an electrolyte in our **POSCAP**s. As an organic material, conductive polymer becomes non-conductive and acts as an insulator against leakage current at a relatively low temperature of approximately 300°C. As seen in the explanation below, this characteristic is used to suppress leakage current when there is microcrack in the dielectric oxide layer. We call this capability "self-healing mechanism." In addition to this characteristic, this conductive polymer has enough heat resistance to endure reflow soldering process and it is able to retain high specific electric conductivity even after going through such process.





The image above represents a close-up of the cross-section of the layerswithin the core of a **POSCAP**, which consists of sintered tantalum, dielectric oxide layer and an electrolyte (conductive polymer).

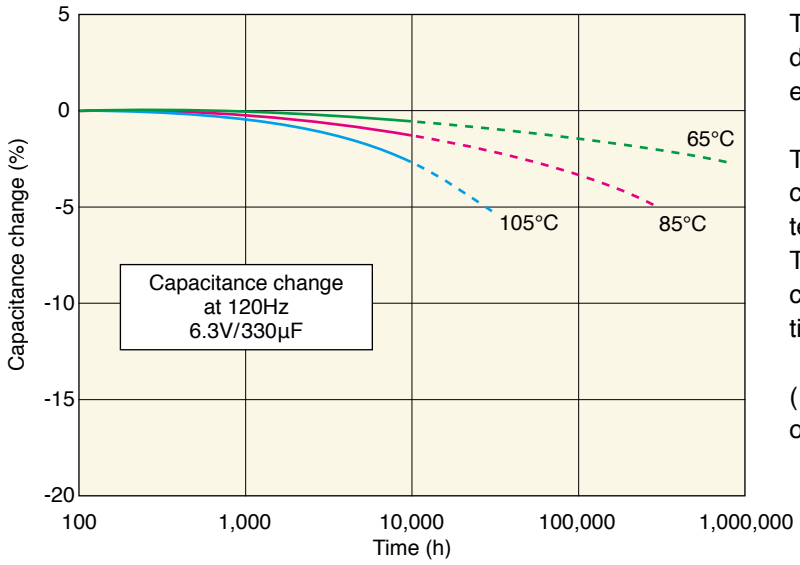
In rare cases, a microcrack could occur on the dielectric oxide layer by stress caused by rapid temperature change during the reflow soldering process or when excessive voltage is applied to the capacitor.

Joule heat is generated locally when leakage current flows into the microcrack as voltage is applied.

Conductive polymer around the microcrack turns non-conductive and creates an insulated layer at a relatively-low temperature of approximately 300°C caused by Joule heat. It is at this point that the insulator suppresses the leakage current. This is called "self-healing mechanism" or "self-recovery function."

With this "self-healing mechanism" **POSCAP** is able to minimize stress induced failures and achieve high reliability.

1. Temperature accelaration test (Endurance)



The **POSCAP** capacitance level decreases during a long term endurance test.

The left figure shows time variation of capacitance decrease at each temperature.
This graph indicates that temperature coefficient of **POSCAP**'s life time is 10 times by 20°C reduction.※

(※ Please contact SANYO for details of TPU and TQC series.)

POSCAP	Aluminum electrolytic capacitor
105°C ⇒ 2,000h	105°C ⇒ 2,000h
85°C ⇒ 20,000h	85°C ⇒ 8,000h
65°C ⇒ 200,000h	65°C ⇒ 32,000h

※The following life time are not guaranteed but presumptive values.

Even if **POSCAP** and an aluminum electrolytic capacitor are guaranteed on 2,000 hours at 105°C, the life span results in big differences as temperature drops. (See left chart) **POSCAP** has a remarkably longer life span compared with an aluminum electrolytic capacitor.

2. Presumption of life for the POSCAP

As time increases during the endurance test, the capacitance of the **POSCAP** gets smaller.
This means the eventual failure mode of **POSCAP** is open. The **POSCAP**'s cathode material is made of an organic matter (conductive polymer).
The life time is different by each operating temperature and self - heating by ripple current.
The following formula outline could make it possible to estimate the presumptive lifetime of **POSCAP** at ambient temperature Tx (°C).
The result of the following calculating formula estimation is not guaranteed but presumptive value based on actual measurement.
(Please contact SANYO as to TQC series)

2-1. Calculating formula for the presumtion of life

$$Lx = Lo \times 10^{\frac{To-Tx}{20}}$$

Lx：Life expectance in actual use (temperature Tx) (h)

Lo：Guaranteed life at maximum temperature in use (h)

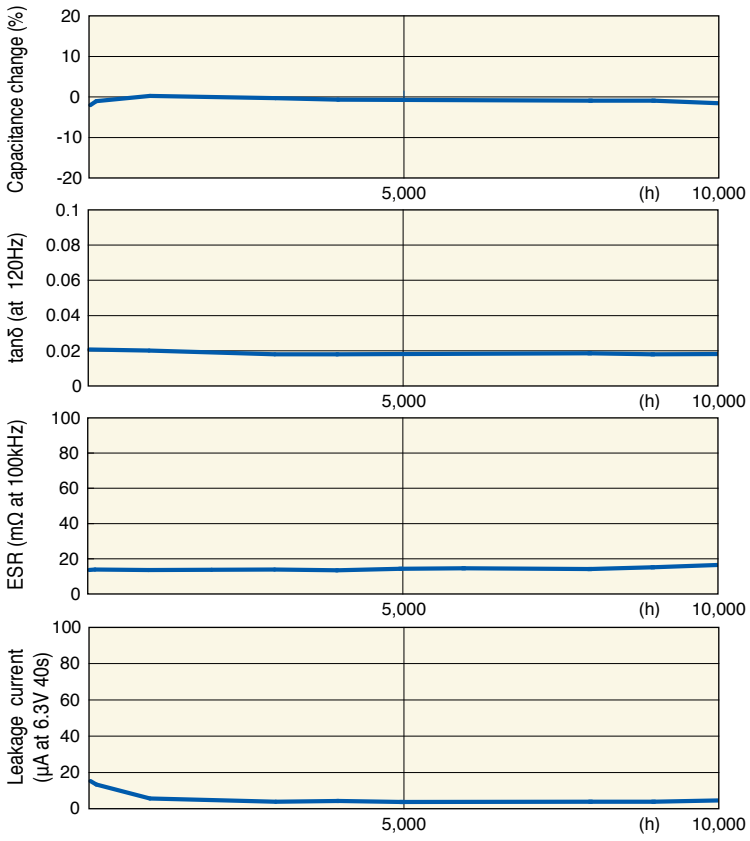
To：Maximum operating temperature (°C)

Tx：Temperature in actual use (temperature of **POSCAP**) (°C)

3. Reliability test (6TPE330ML)

3-1. Endurance (105°C, 6.3V applied)

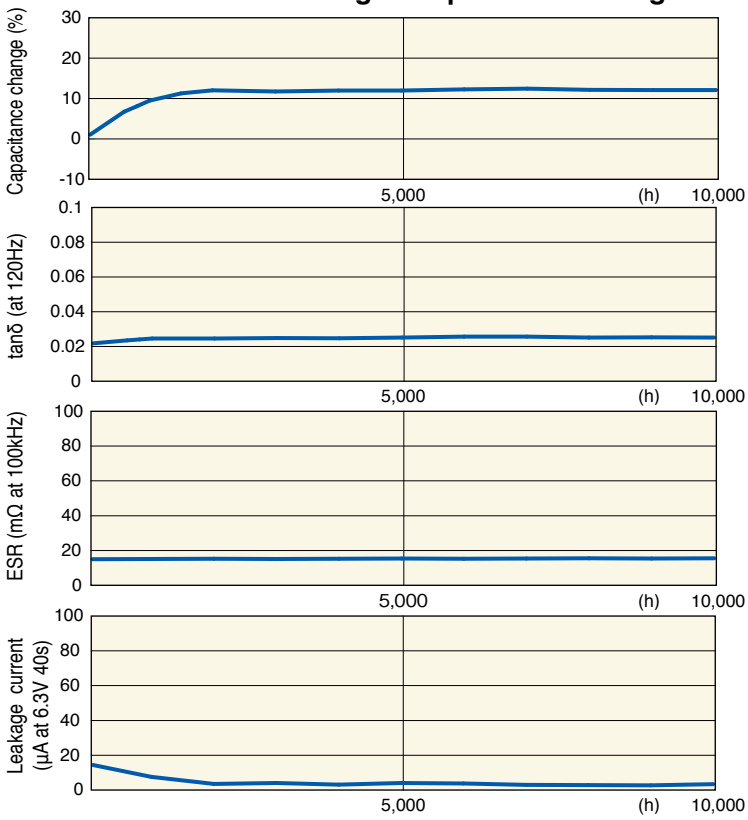
Characteristics of Endurance



The data to the left shows the results of an endurance.
The conductive polymer of the **POSCAP** capacitor is excellent for heat stability as there is little change in the characteristics after 10,000 hours.

3-2. High temperature and high humidity (60°C90%RH, No voltage)

Characteristics of high temperature and high humidity



To the left are the results of a high temperature and high humidity test for **POSCAP**.

Due to moisture absorption there is a slight increase of capacitance in the initial characteristics, but there is little change of after 10,000 hours.

TPU Series

Update

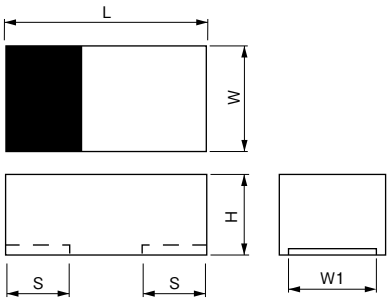
- RoHS compliance
- Small size・Low profile
- Face down terminal type

TPU series is designed with size-sensitive applications in mind by using a face down terminal structure.

Specifications

Items	Condition		Specifications			
Rated voltage (V)	–		2.5	4.0	6.3	10
Surge voltage (V)	–		2.9	4.6	7.2	12
Category temperature range (℃)	–		−55 to +85			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Rated capacitance range (μF)	120Hz/20℃		4.7 to 150			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0			
		+85℃ Z/Z20℃	0.6 to 2.0			
Endurance	85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value			
		DF	≤ 1.5 times of the initial limit			
		LC	Within the initial limit			
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+40%,−20% of the initial value			
		DF	≤ 1.5 times of the initial limit			
		LC	≤ 3 times of the initial limit			
Surge	85℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C	Within±5% of the initial value			
		DF	Within the initial limit			
		LC	≤ 3 times of the initial limit			

Dimensions



(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
S11	2.0	1.25	1.1	0.5	0.9
B09	3.5	2.8	0.9	0.8	2.2

※1 ±0.2:A09,B09

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10
4.7				S09
10			S09	
22			S09	
33			S11	
47	S09	S11	S09	
68	S11	S09		
100	S09			
150			B09	

TPU series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
S09	10TPU4R7MSI	10	85	4.7	10	85	10.0	4.7	300	360	—	3
	6TPU47MSI	6.3	85	47	6.3	85	10.0	59.2	150	510	—	3
	6TPU22MSI	6.3	85	22	6.3	85	10.0	27.7	150	510	—	3
	6TPU10MSI	6.3	85	10	6.3	85	10.0	6.3	250	400	—	3
	4TPU68MSI	4.0	85	68	4.0	85	10.0	54.4	150	510	—	3
	ETPU100MSI	2.5	85	100	2.5	85	10.0	50.0	150	510	—	3
	2R5TPU47MSI	2.5	85	47	2.5	85	10.0	23.5	150	510	—	3
S11	6TPU33MSK	6.3	85	33	6.3	85	10.0	41.6	150	510	—	3
	4TPU47MSK	4.0	85	47	4.0	85	10.0	37.6	150	510	—	3
	2R5TPU68MSK	2.5	85	68	2.5	85	10.0	34.0	150	510	—	3
B09	6TPU150MBI	6.3	85	150	6.3	85	10.0	94.5	100	670	3	3

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

※ Red letters : New models

TPH Series

New

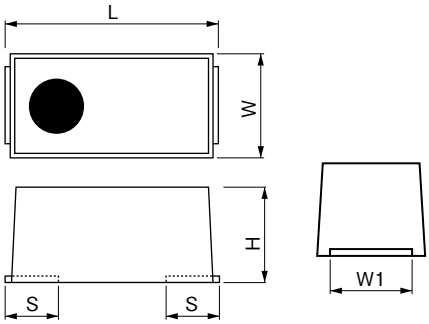
- RoHS compliance
- Small size・Low ESR
- Face down terminal type

TPH series is designed to save space by its face down terminal structure and respond to lower ESR needs.

Specifications

Items	Condition		Specifications			
Rated voltage (V)	–		2.5	4.0	6.3	10
Surge voltage (V)	–		2.9	4.6	7.2	12
Category temperature range (℃)	–		−55 to +105			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Rated capacitance range (μF)	120Hz/20℃		33 to 220			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0			
		+85℃ Z/Z20℃	0.6 to 2.0			
Endurance	105℃, 1,000h rated voltage applied ※Rated temp, 85℃ Products: 85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value			
		DF	≤ 1.5 times of the initial limit			
		LC	Within the initial limit			
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+50%,−20% of the initial value(ETPH220MABC)			
		△C/C	Within+40%,−20% of the initial value(Except for above model)			
		DF	≤ 1.5 times of the initial limit			
		LC	≤ 3 times of the initial limit			
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied ※Rated temp, 85℃ Products:85℃	△C/C	Within±5% of the initial value			
		DF	Within the initial limit			
		LC	≤ 3 times of the initial limit			

Dimensions



(unit: mm)

Size code	L ±0.3	W ±0.2	H ±0.2	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

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10
33				A09
47			A09	
68		A09		
100	A09		A14,A09	
150		A14		
220	A14			

TPH series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
A09	ATPH33MAHA※2	10	85	33	10	85	10.0	33.0	150	510	3	3
	6TPH100MAEA※2	6.3	85	100	5.0	85	10.0	63.0	100	670	3	3
	6TPH47MHA	6.3	105	47	6.3	105	10.0	29.6	150	510	3	3
	4TPH68MHA	4.0	105	68	4.0	105	10.0	27.2	150	510	3	3
	ETPH100MHA	2.5	105	100	2.5	105	10.0	25.0	150	510	3	3
A14	6TPH100MABC※2	6.3	85	100	6.3	85	10.0	126.0	70	740	3	3
	4TPH150MABC※2	4.0	85	150	4.0	85	10.0	120.0	70	740	3	3
	ETPH220MABC※2	2.5	85	220	2.5	85	10.0	110.0	70	740	3	3

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current. ※1 100k to 500kHz,45℃ ※2 Under development

TPG Series

Update

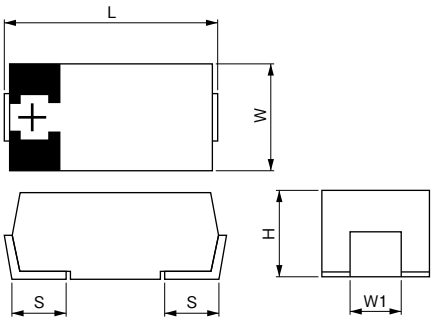
- RoHS compliance
- Small size
- High capacitance

TPG series is designed to be small, have a low-profile and high capacitance .
Suitable for the space sensitive electronic devices.

Specifications

Items	Condition			Specifications					
Rated voltage (V)	–			2.5	4.0	6.3	8.0	10	12.5
Surge voltage (V)	–			2.9	4.6	7.2	9.2	12	14
Category temperature range (℃)	–			−55 to +105					
Capacitance tolerance (%)	120Hz/20℃			M : ±20					
Rated capacitance range (μF)	120Hz/20℃			33 to 220					
Dissipation Factor (DF)	120Hz/20℃			Please see the attached characteristics list					
Leakage current	Rated voltage applied, after 5 minutes			Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz/20℃			Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃	Z/Z20℃	0.6 to 2.0					
		+105℃	Z/Z20℃	0.6 to 2.0					
Endurance	85℃, 1,000h rated voltage applied	△C/C		Within±20% of the initial value					
		DF		≤ 1.5 times of the initial limit					
		LC		Within the initial limit					
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C		Within+40%,−20% of the initial value					
		DF		≤ 1.5 times of the initial limit					
		LC		≤ 3 times of the initial limit					
Surge	85℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C		Within±5% of the initial value					
		DF		Within the initial limit					
		LC		≤ 3 times of the initial limit					

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

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	8.0	10	12.5
33						B1G
47				B1G	B1G	
100			B1G			
150			B15G			
220	B1G,B15G	B15G				

TPG series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
B1G	12TPG33M	12.5	85	33	10	105	10.0	41.3	70	1000	3	3
	10TPG47M	10	85	47	8.0	105	10.0	47.0	70	1000	3	3
	8TPG47M	8.0	85	47	6.4	105	10.0	37.6	70	1000	3	3
	6TPG100M	6.3	85	100	5.0	105	10.0	63.0	70	1000	3	3
	6TPG100MG	6.3	85	100	5.0	105	10.0	63.0	55	1100	3	3
	2R5TPG220M	2.5	85	220	2.0	105	10.0	55.0	70	1000	3	3
B15G	6TPG150M	6.3	85	150	5.0	105	10.0	94.5	70	1000	3	3
	6TPG150MZG	6.3	85	150	5.0	105	10.0	189.0	35/300kHz	1200	3	3
	4TPG220M	4.0	85	220	3.2	105	10.0	88.0	70	1000	3	3
	2R5TPG220MUG	2.5	85	220	2.5	105	10.0	110.0	30/300kHz	1400	3	3

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

※ Red letters : New models

TPSF Series

Update

- RoHS compliance
- Low ESR・Small size・High capacitance
- Face down terminal type

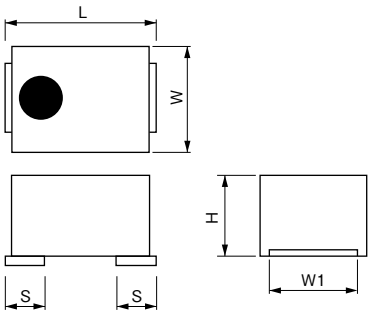
TPSF series achieved small size, high capacitance and low ESR.

Specifications

Items	Condition		Specifications	
Rated voltage (V)	–		2.0	11
Surge voltage (V)	–		2.3	13
Category temperature range (℃)	–		−55 to +105	
Capacitance tolerance (%)	120Hz/20℃		M : ±20	
Rated capacitance range (μF)	120Hz/20℃		62 to 270	
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list	
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list	
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list	
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0	
		+105℃ Z/Z20℃	0.6 to 2.0	
Endurance	105℃, 1,000h, rated voltage applied ※Rated temp, 85℃ Products: 85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value	
		DF	≤ 1.5 times of the initial limit	
		LC	Within the initial limit	
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+40%,−20% of the initial value	
		DF	≤ 1.5 times of the initial limit	
		LC	≤ 3 times of the initial limit	
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied ※Rated temp, 85℃ Products:85℃	△C/C	Within±5% of the initial value	
		DF	Within the initial limit	
		LC	≤ 3 times of the initial limit	

Dimensions

(unit: mm)



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

Size list

RV : Rated voltage

μF \ RV	2.0	11
62		B2S
270	B2S	

TPSF series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	ESL (nHmax) *Tipical value	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
B2S	11TPSF62MAIG	11	85	62	10	105	8.0	136.4	18/300kHz	0.7	1800	3	3
	2TPSF270M9G	2.0	105	270	2.0	105	8.0	108	9/300kHz	0.7	2400	3	3
	2TPSF270M6E	2.0	105	270	2.0	105	8.0	108	6/500kHz	0.7	3200	5	5

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

※ Red letters : New models

TPC Series

Update

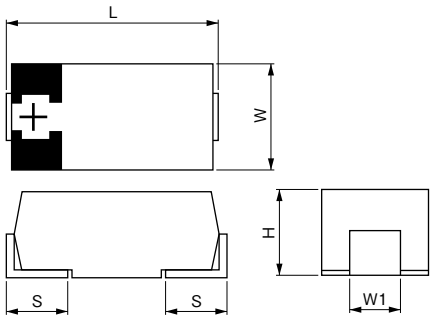
RoHS compliance
Low profile

TPC series has low profile and low ESR.
TPC series is ideal for designing thinner and smaller products.
B1 size is miniaturized, low profile version of TPC series.

Specifications

Items	Condition		Specifications					
Rated voltage (V)	–		2.5	4.0	6.3	8.0	10	12.5
Surge voltage (V)	–		2.9	4.6	7.2	9.2	12	14
Category temperature range (℃)	–		−55 to +105					
Capacitance tolerance (%)	120Hz/20℃		M : ±20					
Rated capacitance range (μF)	120Hz/20℃		10 to 330					
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list					
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0					
		+105℃ Z/Z20℃	0.6 to 2.0					
Endurance	105℃, 2,000h, rated voltage applied ※Rated temp. 85℃ products: 85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value					
		DF	≤ 1.5 times of the initial limit					
		LC	Within the initial limit					
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+40%,−20% of the initial value					
		DF	≤ 1.5 times of the initial limit					
		LC	≤ 3 times of the initial limit					
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied ※Rated temp. 85℃ products : 85℃	△C/C	Within±5% of the initial value					
		DF	Within the initial limit					
		LC	≤ 3 times of the initial limit					

Dimensions



(unit: mm)

Size code	L ±0.2	W ±0.2	H ±0.1	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

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	8.0	10	12.5
10						B1
15						B1
22				B1		
33			B1		B1	
47		B1	B1			
56	B1					
68					D2	
100			D2		D2	
150			D2	D2		
330			D2			

TPC series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL	
											Reflow temp. ≤ 260℃	Reflow temp. ≤ 250℃
B1	12TPC15M	12.5	85	15	10	105	10.0	18.8	80	800	3	3
	12TPC10M	12.5	85	10	10	105	10.0	12.5	80	800	3	3
	10TPC33MB	10	85	33	8.0	105	10.0	33.0	70	1000	3	3
	8TPC22M	8.0	85	22	6.3	105	10.0	17.6	70	1000	3	3
	6TPC47MB	6.3	85	47	5.0	105	10.0	29.6	70	1000	3	3
	6TPC47M	6.3	85	47	5.0	105	10.0	29.6	55	1100	3	3
	6TPC33M	6.3	85	33	5.0	105	10.0	20.8	70	1000	3	3
	4TPC47M	4.0	85	47	3.2	105	10.0	18.8	70	1000	3	3
	2R5TPC56M	2.5	85	56	2.0	105	10.0	14.0	70	1000	3	3
D2	10TPC100M	10	105	100	10	105	10.0	100.0	45	1700	3	2a
	10TPC68M	10	105	68	10	105	10.0	68.0	45	1700	3	2a
	8TPC150M	8.0	105	150	8.0	105	10.0	120.0	40	1900	3	2a
	6TPC330MA	6.3	85	330	5.0	105	10.0	207.9	40	1900	3	2a
	6TPC150M	6.3	105	150	6.3	105	10.0	94.5	40	1900	3	2a
	6TPC100M	6.3	105	100	6.3	105	10.0	63.0	45	1700	3	2a

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

※ Red letters : New models

TPE Series

Update

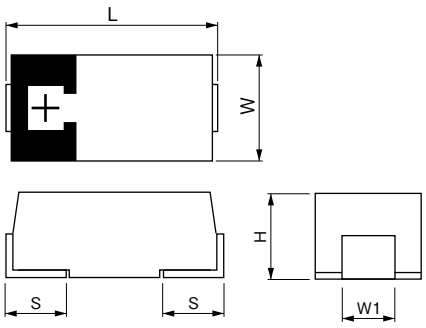
- RoHS compliance
- Low ESR (B2,C2,C3 size)

TPE series has low ESR and can aid in creating thinner and smaller products.
This page focuses on the smaller packages within the series.

Specifications

Items	Condition		Specifications					
Rated voltage (V)	–		2.0	2.5	4.0	6.3	8.0	10
Surge voltage (V)	–		2.3	2.9	4.6	7.2	9.2	12
Category temperature range (℃)	–		−55 to +105					
Capacitance tolerance (%)	120Hz/20℃		M : ±20					
Rated capacitance range (μF)	120Hz/20℃		47 to 470					
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list					
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list					
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0					
		+105℃ Z/Z20℃	0.6 to 2.0					
Endurance	105℃, 1,000h rated voltage applied ※Rated temp. 85℃ products: 85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value					
		DF	≤ 1.5 times of the initial limit					
		LC	Within the initial limit					
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+50%, −20%〈2R5TPE220MDGB(MAZB,MAPB,MAFB), 2R5TPE330MAZB,2TPE330MFB(MAFB,MADGB) ETPE330MA9GB,2TPE470MAJGB〉					
			Within+40%, −20% of the initial value (Except for the above model)					
		DF	≤ 1.5 times of the initial limit					
		LC	≤ 3 times of the initial limit					
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance,surge voltage applied ※Rated temp 85℃ products:85℃	△C/C	Within±5% of the initial value					
		DF	Within the initial limit					
		LC	≤ 3 times of the initial limit					

Dimensions



(unit: mm)

Size code	L ±0.2	W ±0.2	H ±0.1※1	S ±0.2	W1 ±0.1
B2	3.5	2.8	1.9	0.8	2.2

※1 ±0.2:C3

Size list

RV : Rated voltage

μF \ RV	2.0	2.5	4.0	6.3	8.0	10
47						B2
100			B2	B2	B2	
120				B2		
150			B2	B2		
220		B2	B2	B2		
330	B2	B2				
470	B2					

POSCAP
POSCAP Line-up
Guidelines and precautions for use
Selection guide
Series system diagram
Image of case size
Products list
Explanation of part numbers
Packing specifications
Technical data
Marking
Recommended land pattern dimension
Recommended soldering condition
Fundamental structure
Characteristics
Reliability
Surface mount type
TPU
TPH
TPG
TPSF
TPC
TPE
TPB
TPL・TPLF
TPF
TA
TV
TH
TQC

TPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
B2	10TPE47MAZB	10	85	47	8.0	105	8.0	47.0	35	1400	3	3
	8TPE100MAZB	8.0	85	100	6.3	105	8.0	80.0	35	1400	3	3
	6TPE220MAZB	6.3	85	220	5.0	105	10.0	138.6	35	1400	3	3
	6TPE220MAPB※2	6.3	85	220	5.0	105	10.0	138.6	25	1400	3	3
	6TPE150MAZB	6.3	85	150	5.0	105	8.0	94.5	35	1400	3	3
	6TPE150MAPB	6.3	85	150	5.0	105	8.0	94.5	25	1600	3	3
	6TPE120MAZB	6.3	85	120	5.0	105	8.0	75.6	35	1400	3	3
	6TPE100MPB	6.3	105	100	6.3	105	8.0	63.0	25	1600	3	3
	6TPE100MAZB	6.3	85	100	5.0	105	8.0	63.0	35	1400	3	3
	4TPE220MAZB	4.0	85	220	3.2	105	8.0	88.0	35	1400	3	3
	4TPE150MAZB	4.0	85	150	3.2	105	8.0	60.0	35	1400	3	3
	4TPE150MAUB	4.0	85	150	3.2	105	8.0	60.0	30	1500	3	3
	4TPE100MZB	4.0	105	100	4.0	105	8.0	40.0	35	1400	3	3
	2R5TPE330MAZB	2.5	85	330	2.0	105	8.0	82.5	35	1400	3	3
	ETPE330MA9GB※2	2.5	85	330	2.0	105	8.0	165.0	9/300kHz	3200	3	3
	2R5TPE220MZB	2.5	105	220	2.5	105	8.0	55.0	35	1400	3	3
	2R5TPE220MLB	2.5	105	220	2.5	105	8.0	55.0	21	1700	3	3
	2R5TPE220MIB	2.5	105	220	2.5	105	8.0	110.0	18	1800	3	3
	2R5TPE220MFGB	2.5	105	220	2.5	105	8.0	110.0	15/300kHz	1800	3	3
	2R5TPE220MDGB	2.5	105	220	2.5	105	8.0	110.0	13/300kHz	2000	3	3
	2R5TPE220MAZB	2.5	85	220	2.0	105	8.0	55.0	35	1400	3	3
	2R5TPE220MAPB	2.5	85	220	2.0	105	8.0	55.0	25	1600	3	3
	2R5TPE220MAFB	2.5	85	220	2.0	105	8.0	110.0	15	2000	3	3
	2TPE470MAJGB※2	2.0	85	470	1.8	105	10.0	188.0	11/300kHz	2300	3	3
	2TPE330MFB	2.0	105	330	2.0	105	8.0	132.0	15	2000	3	3
	2TPE330MAFB	2.0	85	330	1.8	105	8.0	132.0	15	2000	3	3
	2TPE330MADGB	2.0	85	330	1.8	105	8.0	132.0	13/300kHz	2000	3	3

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current. ※1 100k to 500kHz,45℃ ※2 Under development

※ Red letters : New models Yellow letters : Update

TPE Series

Update

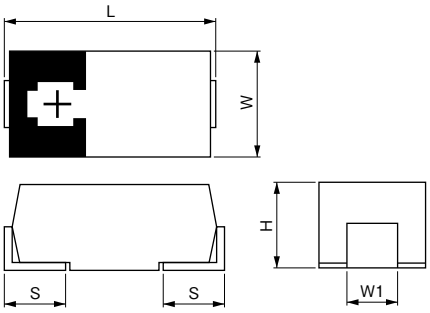
- RoHS compliance
- Low ESR

TPE series has low ESR and can aid in creating thinner and smaller products.

Specifications

Items	Condition			Specifications			
Rated voltage (V)	–			2.5	4.0	6.3	10
Surge voltage (V)	–			2.9	4.6	7.2	12
Category temperature range (℃)	–			−55 to +105			
Capacitance tolerance (%)	120Hz/20℃			M : ±20			
Rated capacitance range (μF)	120Hz/20℃			68 to 1,500			
Dissipation Factor (DF)	120Hz/20℃			Please see the attached characteristics list			
Leakage current	Rated voltage applied, after 5 minutes			Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/20℃			Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃	Z/Z20℃	0.6 to 2.0			
		+105℃	Z/Z20℃	0.6 to 2.0			
Endurance	105℃, 2,000h, rated voltage applied ※Rated temp. 85℃ products: 85℃, 1,000h, rated voltage applied 6TPE330MAP,6TPE470MAZU:85℃,2,000h	△C/C		Within±20% of the initial value			
		DF		≤ 1.5 times of the initial limit			
		LC		Within the initial limit			
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C		Within+50%, −20% of the initial value 〈2R5TPE470M (I,F,C,9,7), 2R5TPE330M (I,F,C,9,7), 2R5TPE220M (I,F,C,9,7), 2R5TPE1000M (I,F), 2R5TPE1500M (F,C)〉			
				Within+40%, −20% of the initial value (Except for the above model)			
		DF		≤ 1.5 times of the initial limit			
		LC		≤ 3 times of the initial limit			
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied ※Rated temp. 85℃ products:85℃	△C/C		Within±5% of the initial value			
		DF		Within the initial limit			
		LC		≤ 3 times of the initial limit			

Dimensions



Size list

RV : Rated voltage

μF \ RV	2.0	2.5	4.0	6.3	10
68					D2E
100				D2E	
150			D2E	D2E	
220		D2E	D2E	D2E	D3L
330		D2E	D2E	D2E,D3L,D4	D4
470		D2E	D3L	D4,D15E	
680		D3L	D4	D4	
1,000		D4			
1,500		D4			

(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

TPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
D15E	6TPE470MAZU※2	6.3	85	470	5.0	105	10.0	296.1	35	1700	3	2a
D2E	10TPE68M	10	105	68	10	105	10.0	68.0	25	2400	3	2a
	6TPE330MAP	6.3	85	330	5.0	105	10.0	207.9	25	2400	3	2a
	6TPE220MAP	6.3	85	220	5.0	105	10.0	138.6	25	2400	3	2a
	6TPE220M	6.3	105	220	6.3	105	10.0	138.6	25	2400	3	2a
	6TPE220MI	6.3	105	220	6.3	105	10.0	138.6	18	2800	3	2a
	6TPE150M	6.3	105	150	6.3	105	10.0	94.5	25	2400	3	2a
	6TPE150MI	6.3	105	150	6.3	105	10.0	94.5	18	2800	3	2a

TPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL	
											Reflow temp. ≤ 260℃	Reflow temp. ≤ 250℃
D2E	6TPE150MF	6.3	105	150	6.3	105	10.0	94.5	15	3100	3	2a
	6TPE100M	6.3	105	100	6.3	105	10.0	63.0	25	2400	3	2a
	6TPE100MI	6.3	105	100	6.3	105	10.0	63.0	18	2800	3	2a
	4TPE330M	4.0	105	330	4.0	105	10.0	132.0	25	2400	3	2a
	4TPE330MI	4.0	105	330	4.0	105	10.0	132.0	18	2800	3	2a
	4TPE220M	4.0	105	220	4.0	105	10.0	88.0	25	2400	3	2a
	4TPE220MI	4.0	105	220	4.0	105	10.0	88.0	18	2800	3	2a
	4TPE220MF	4.0	105	220	4.0	105	10.0	88.0	15	3100	3	2a
	4TPE150MI	4.0	105	150	4.0	105	10.0	60.0	18	2800	3	2a
	2R5TPE470MI	2.5	105	470	2.5	105	10.0	117.5	18	2800	3	2a
	2R5TPE470MF	2.5	105	470	2.5	105	10.0	117.5	15	3100	3	2a
	2R5TPE470MC	2.5	105	470	2.5	105	10.0	117.5	12	3500	3	2a
	2R5TPE470M9	2.5	105	470	2.5	105	10.0	117.5	9	3900	3	2a
	2R5TPE470M7	2.5	105	470	2.5	105	10.0	117.5	7	4400	3	2a
	2R5TPE330M	2.5	105	330	2.5	105	10.0	82.5	25	2400	3	2a
	2R5TPE330MI	2.5	105	330	2.5	105	10.0	82.5	18	2800	3	2a
	2R5TPE330MF	2.5	105	330	2.5	105	10.0	82.5	15	3100	3	2a
	2R5TPE330MC	2.5	105	330	2.5	105	10.0	82.5	12	3500	3	2a
	2R5TPE330M9	2.5	105	330	2.5	105	10.0	82.5	9	3900	3	2a
	2R5TPE330M7	2.5	105	330	2.5	105	10.0	82.5	7	4400	3	2a
	2R5TPE220M	2.5	105	220	2.5	105	10.0	55.0	25	2400	3	2a
	2R5TPE220MI	2.5	105	220	2.5	105	10.0	55.0	18	2800	3	2a
	2R5TPE220MF	2.5	105	220	2.5	105	10.0	55.0	15	3100	3	2a
	2R5TPE220MC	2.5	105	220	2.5	105	10.0	55.0	12	3500	3	2a
	2R5TPE220M9	2.5	105	220	2.5	105	10.0	55.0	9	3900	3	2a
	2R5TPE220M7	2.5	105	220	2.5	105	10.0	55.0	7	4400	3	2a
D3L	10TPE220ML	10	105	220	10	105	10.0	220.0	25	2400	—	2a
	10TPE220MIL	10	105	220	10	105	10.0	220.0	18	2800	—	2a
	6TPE330ML	6.3	105	330	6.3	105	10.0	207.9	25	2400	3	2a
	6TPE330MIL	6.3	105	330	6.3	105	10.0	207.9	18	2800	3	2a
	6TPE330MFL	6.3	105	330	6.3	105	10.0	207.9	15	3100	3	2a
	4TPE470ML	4.0	105	470	4.0	105	10.0	188.0	25	2400	3	2a
	4TPE470MIL	4.0	105	470	4.0	105	10.0	188.0	18	2800	3	2a
	4TPE470MFL	4.0	105	470	4.0	105	10.0	188.0	15	3100	3	2a
	4TPE470MCL	4.0	105	470	4.0	105	10.0	188.0	12	3500	3	2a
	2R5TPE680ML	2.5	105	680	2.5	105	10.0	170.0	25	2400	3	2a
	2R5TPE680MFL	2.5	105	680	2.5	105	10.0	170.0	15	3100	3	2a
	2R5TPE680MCL	2.5	105	680	2.5	105	10.0	170.0	12	3500	3	2a
D4	10TPE330M	10	105	330	10	105	10.0	330.0	25	3000	—	2a
	6TPE680M	6.3	105	680	6.3	105	15.0	428.4	25	3000	3	2a
	6TPE680MI	6.3	105	680	6.3	105	15.0	428.4	18	3500	3	2a
	6TPE470M	6.3	105	470	6.3	105	15.0	296.1	25	3000	3	2a
	6TPE470MI	6.3	105	470	6.3	105	15.0	296.1	18	3500	3	2a
	6TPE330MAA	6.3	85	330	5.0	105	10.0	207.9	10	4400	3	2a
	4TPE680MI	4.0	105	680	4.0	105	15.0	272.0	18	3500	3	2a
	4TPE680MF	4.0	105	680	4.0	105	15.0	272.0	15	3900	3	2a
	2R5TPE1000MI	2.5	105	1000	2.5	105	15.0	250.0	18	3500	3	2a
	2R5TPE1000MF	2.5	105	1000	2.5	105	15.0	250.0	15	3900	3	2a
	2R5TPE1500MF	2.5	105	1500	2.5	105	15.0	375.0	15	3900	—	2a
	2R5TPE1500MC	2.5	105	1500	2.5	105	15.0	375.0	12	4400	—	2a

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current. ※1 100k to 500kHz,45℃ ※2 Under development

※ Red letters : New models Yellow letters : Update

TPB Series

Update

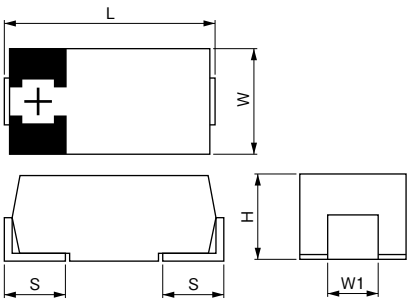
RoHS compliance
Standard

TPB series are the standard products corresponding to the diversification of the needs.
B2 size is the miniaturized version of TPB series.

Specifications

Items	Condition		Specifications			
Rated voltage (V)	–		2.5	4.0	6.3	10
Surge voltage (V)	–		2.9	4.6	7.2	12
Category temperature range (℃)	–		−55 to +105			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Rated capacitance range (μF)	120Hz/20℃		33 to 470			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/+20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/20℃	−55℃ Z/Z20℃	0.6 to 2.0			
		+105℃ Z/Z20℃	0.6 to 2.0			
Endurance	105℃, 2,000h B2 size :105℃, 1,000h, Rated voltage applied ※Rated temp. 85℃ products: 85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value			
		DF	≤ 1.5 times of the initial limit			
		LC	Within the initial limit			
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+40%,−20% of the initial value			
		DF	≤ 1.5 times of the initial limit			
		LC	≤ 3 times of the initial limit			
Surge	105℃, 1,000 cycles, 1kΩdischarge resistance, surge voltage applied ※Rated temp. 85℃ products:85℃	△C/C	Within±5% of the initial value			
		DF	Within the initial limit			
		LC	≤ 3 times of the initial limit			

Dimensions



(unit: mm)

Size code	L ±0.2※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
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

※1 ±0.3:D3L,D4
※2 ±0.1:B2

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	8.0	10.0
33					B2
47					B2
68		B2	B2		
100	B2				
150					D3L
220			D3L		D3L,D4
330		D3L	D3L,D4		D4
470			D4		

TPB series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
B2	10TPB47M	10	105	47	10	105	8.0	47.0	70	1100	3	3
	10TPB33M	10	105	33	10	105	8.0	33.0	70	1100	3	3
	6TPB68M	6.3	105	68	6.3	105	8.0	42.8	70	1100	3	3
	4TPB68M	4.0	105	68	4.0	105	8.0	27.2	70	1100	3	3
	2R5TPB100M	2.5	105	100	2.5	105	8.0	25.0	70	1100	3	3
D3L	10TPB220ML	10	105	220	10	105	10.0	220.0	40	2000	—	2a
	10TPB150ML	10	105	150	10	105	10.0	150.0	40	2000	3	2a
	6TPB330ML	6.3	105	330	6.3	105	10.0	207.9	40	2000	3	2a
	6TPB330MAL	6.3	85	330	5.0	105	10.0	207.9	40	2000	3	2a
	6TPB220ML	6.3	105	220	6.3	105	10.0	138.6	40	2000	3	2a
	4TPB330ML	4.0	105	330	4.0	105	10.0	132.0	40	2000	3	2a
D4	10TPB330M	10	105	330	10	105	10.0	330.0	35	3000	—	2a
	10TPB220M	10	105	220	10	105	10.0	220.0	40	3000	3	2a
	6TPB470M	6.3	105	470	6.3	105	15.0	296.1	35	3000	3	2a
	6TPB330M	6.3	105	330	6.3	105	10.0	207.9	40	3000	3	2a

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

※ Red letters : New models

TPL・TPLF Series

Update

- RoHS compliance
- Low ESR・Low ESL
- Face down terminal type

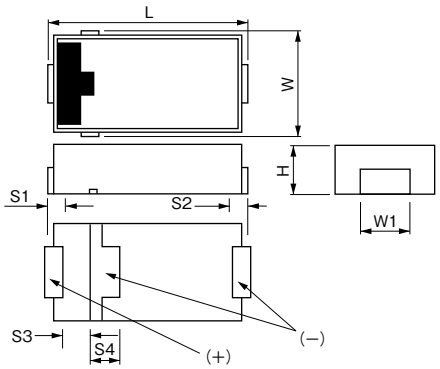
TPL series is designed with an unique face down terminal structure to achieve low ESL and low ESR performance.

(back)

Specifications

Items	Condition		Specifications				
Rated voltage (V)	–		1.8	2.0	2.5	4.0	6.3
Surge voltage (V)	–		2.1	2.3	2.9	4.6	7.2
Category temperature range (℃)	–		−55 to +105				
Capacitance tolerance (%)	120Hz/20℃		M : ±20				
Rated capacitance range (μF)	120Hz/20℃		100 to 560				
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list				
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list				
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0				
		+105℃ Z/Z20℃	0.6 to 2.0				
Endurance	105℃, 2,000h,rated voltage applied (2R5TPL330M9U, XTPL470M7U:1,000h) ※Rated temp, 85℃ products:85℃, 1,000h, rated voltage applied	△C/C	Within±20% of the initial value				
		DF	≤ 1.5 times of the initial limit				
		LC	Within the initial limit				
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+50%,−20% of the initial value				
		DF	≤ 1.5 times of the initial limit				
		LC	≤ 3 times of the initial limit				
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C	Within±5% of the initial value				
		DF	Within the initial limit				
		LC	≤ 3 times of the initial limit				

Dimensions



Size list

RV : Rated voltage

μF \ RV	1.8	2.0	2.5	4.0	6.3
100					D12T
150				D12T	D15T
220		D12T,D2T	D15T	D15T	D15T
330			D15T,D2T		
470	D15T	D2T	D2T		
560		D2T			

(unit: mm)

Size code	L ±0.3	W ±0.2	H ±0.1	S1/S2 ±0.2	S3 ±0.1	S4 ±0.2	W1 ±0.1
D12T	7.3	4.3	1.1	1.1	1.1	2.3	2.8
D15T	7.3	4.3	1.4	1.1	1.1	2.3	2.8
D2T	7.3	4.3	1.8	1.1	1.1	2.3	2.8

TPL series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	ESL (nHmax) *Tipical value	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
D12T	6TPL100MD	6.3	105	100	6.3	105	10.0	126.0	25	1.0	2100	3	2a
	4TPL150MD	4.0	105	150	4.0	105	10.0	120.0	25	1.0	2100	3	2a
	2TPL220MD	2.0	105	220	2.0	105	10.0	88.0	25	1.0	2100	3	2a
D15T	6TPL220MAU	6.3	85	220	5.0	105	10.0	277.2	25	0.9	2100	3	2a
	6TPL150MU	6.3	105	150	6.3	105	10.0	189.0	25	0.9	2100	3	2a
	4TPL220MKU	4.0	105	220	4.0	105	10.0	176.0	20	0.9	2400	3	2a
	2R5TPL330MFU	2.5	105	330	2.5	105	10.0	165.0	15	0.9	2800	3	2a
	2R5TPL330M9U	2.5	105	330	2.5	105	10.0	165.0	9	0.9	3600	3	2a
	2R5TPL220MIU	2.5	105	220	2.5	105	10.0	110.0	18	0.9	2500	3	2a
	XTPL470M7U※2	1.8	105	470	1.8	105	10.0	169.2	7	0.9	1000	3	2a
D2T	2R5TPL470M9	2.5	105	470	2.5	105	10.0	117.5	9	0.8	3900	3	2a
	2R5TPL470M8	2.5	105	470	2.5	105	10.0	235.0	8	0.8	4100	3	2a
	2R5TPL470M7	2.5	105	470	2.5	105	10.0	235.0	7	0.8	4400	3	2a
	2R5TPL330M9	2.5	105	330	2.5	105	10.0	82.5	9	0.8	3900	3	2a
	2R5TPL330M8	2.5	105	330	2.5	105	10.0	165.0	8	0.8	4100	3	2a

※1 100k to 500kHz,45℃ ※2 Under development

TPLF series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	ESL (nHmax) *Tipical value	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
D2T	ETPLF330M6※2	2.5	105	330	2.5	105	10.0	165.0	6	0.5	4700	3	2a
	ETPLF330M5※2	2.5	105	330	2.5	105	10.0	165.0	5	0.5	5200	3	2a
	2TPLF560M5	2.0	105	560	2.0	105	10.0	224.0	5	0.5	5200	3	2a
	2TPLF560M4E	2.0	105	560	2.0	105	10.0	224.0	4/500kHz	0.5	5200	3	2a
	2TPLF470M6	2.0	105	470	2.0	105	10.0	188.0	6	0.5	4700	3	2a
	2TPLF470M5	2.0	105	470	2.0	105	10.0	188.0	5	0.5	5200	3	2a
	2TPLF470M4E	2.0	105	470	2.0	105	10.0	188.0	4/500kHz	0.5	5200	3	2a
	2TPLF220M5	2.0	105	220	2.0	105	10.0	88.0	5	0.5	5200	3	2a

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current. ※1 100k to 500kHz,45℃ ※2 Under development

※ Red letters : New models

TPF Series

Update

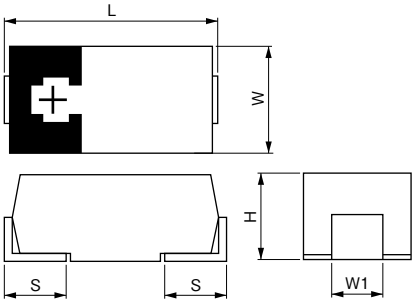
- RoHS compliance
- Low ESR
- High capacitance

TPF series achieves low ESR and high capacitance in the standard form.

Specifications

Items	Condition		Specifications				
Rated voltage (V)	–		2.0	2.5	4.0	6.3	10
Surge voltage (V)	–		2.3	2.9	4.6	7.2	12
Category temperature range (℃)	–		−55 to +105				
Capacitance tolerance (%)	120Hz/20℃		M : ±20				
Rated capacitance range (μF)	120Hz/20℃		150 to 1000				
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list				
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list				
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0				
		+105℃ Z/Z20℃	0.6 to 2.0				
Endurance	105℃, 2,000h, rated voltage applied	△C/C	Within±20% of the initial value				
		DF	≤ 1.5 times of the initial limit				
		LC	Within the initial limit				
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+50%,−20% of the initial value(2TPF220M6,2TPF330M6,ETPF1000M6H(5H))				
			Within+40%, −20% of the initial value (Except for the above model)				
		DF	≤ 1.5 times of the initial limit				
		LC	≤ 3 times of the initial limit				
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C	Within±5% of the initial value				
		DF	Within the initial limit				
		LC	≤ 3 times of the initial limit				

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

Size list

RV : Rated voltage

μF \ RV	2.0	2.5	4.0	6.3	10.0
150					D3L
220	D2E			D3L	
330	D2E	D3L	D3L	D3L	
470		D4,D3L	D3L	D4	
680		D4,D3L	D4		
1,000		D4			

TPF series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
D2E	2TPF330M6	2.0	105	330	2.0	105	10.0	132.0	6	4400	—	2a
	2TPF220M6	2.0	105	220	2.0	105	10.0	88.0	6	4400	—	2a
D3L	10TPF150ML	10	105	150	10	105	10.0	150.0	15	3600	—	2a
	6TPF330M9L	6.3	105	330	6.3	105	10.0	207.9	9	3900	3	2a
	6TPF220ML	6.3	105	220	6.3	105	10.0	138.6	12	4000	3	2a
	6TPF220M9L※2	6.3	105	220	6.3	105	10.0	138.6	9	3900	3	2a
	6TPF220M5L※2	6.3	105	220	6.3	105	10.0	138.6	5	4400	3	2a
	4TPF470ML	4.0	105	470	4.0	105	10.0	188.0	10	4400	3	2a
	4TPF330ML	4.0	105	330	4.0	105	10.0	132.0	12	4000	3	2a
	2R5TPF680ML	2.5	105	680	2.5	105	10.0	170.0	10	4400	3	2a
	2R5TPF680M7L	2.5	105	680	2.5	105	10.0	170.0	7	4400	3	2a
	2R5TPF680M6L	2.5	105	680	2.5	105	10.0	170.0	6	4400	3	2a
	2R5TPF470ML	2.5	105	470	2.5	105	10.0	117.5	10	4400	3	2a
	2R5TPF470M7L	2.5	105	470	2.5	105	10.0	117.5	7	4400	3	2a
	2R5TPF470M6L	2.5	105	470	2.5	105	10.0	117.5	6	4400	3	2a
	2R5TPF330M7L	2.5	105	330	2.5	105	10.0	82.5	7	4400	3	2a
D4	6TPF470MAH	6.3	105	470	6.3	105	10.0	296.1	10	4400	3	2a
	4TPF680MAH	4.0	105	680	4.0	105	10.0	272.0	10	4400	3	2a
	ETPF1000M6H	2.5	105	1000	2.5	105	10.0	250.0	6	5600	3	2a
	ETPF1000M5H	2.5	105	1000	2.5	105	10.0	250.0	5	6100	3	2a
	ETPF680M5H※2	2.5	105	680	2.5	105	10.0	170.0	5	6100	3	2a
	ETPF470M5H※2	2.5	105	470	2.5	105	10.0	117.5	5	6100	3	2a

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current. ※1 100k to 500kHz,45℃ ※2 Under development

※ Red letters : New models

TA Series

Update

- RoHS compliance
- High reliability
- (For the car electronics)

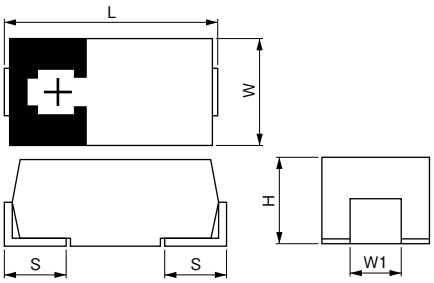
TA series is designed for automotive use with improved humidity-resistance and high thermal tolerance.
They are produced in a "ISO/TS16949" certified factory.

Specifications

Items	Condition		Specifications			
Rated voltage (V)	—		2.5	4.0	6.3	10
Surge voltage (V)	—		2.9	4.6	7.2	12
Category temperature range (℃)	—		−55 to +105			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Rated capacitance range (μF)	120Hz/20℃		47 to 680			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0			
		+105℃ Z/Z20℃	0.6 to 2.0			
Endurance	105℃, 2,000h, (B2 size : 1,000h) rated voltage applied	△C/C	Within±20% of the initial value			
		DF	≤ 1.5 times of the initial limit			
		LC	Within the initial limit			
Damp heat(Load)	85℃, 85 to 90%RH, 500h, rated voltage applied	△C/C	Within+40%,−20% of the initial value ※1			
		DF	≤ 1.5 times of the initial limit			
		LC	≤ 1.5 times of the initial limit			
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C	Within±5% of the initial value			
		DF	Within the initial limit			
		LC	≤ 3 times of the initial limit			

※1 Within +50%, −20% of the initial value(2R5TAE470M(F), 2R5TAE330M(F, I), 2R5TAE220M(F,9))

Dimensions



(unit: mm)

Size code	L ±0.3※2	W ±0.2	H ±0.2※1	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 ±0.1:D2E,B2 ※2 ±0.2:B2

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3	10
47			B2	B2
68			B2	D2E
100		B2		
150			D2E	D3L
220	D2E	D2E	D2E	D3L
330	D2E		D3L	
470	D2E	D3L		
680	D3L			

TA series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
B2	1OTAB47M	10	105	47	10	105	8.0	47.0	70	1100	3	3
	6TAB68M	6.3	105	68	6.3	105	8.0	42.8	70	1100	3	3
	6TAB47M	6.3	105	47	6.3	105	8.0	29.6	70	1100	3	3
	4TAB100M	4.0	105	100	4.0	105	8.0	40.0	70	1100	3	3
D2E	1OTAE68M	10	105	68	10	105	10.0	68.0	25	2400	3	3
	6TAE220M	6.3	105	220	6.3	105	10.0	138.6	25	2400	3	3
	6TAE220MI	6.3	105	220	6.3	105	10.0	138.6	18	2800	3	3
	6TAE150M	6.3	105	150	6.3	105	10.0	94.5	25	2400	3	3
	4TAE220M	4.0	105	220	4.0	105	10.0	88.0	25	2400	3	3
	4TAE220MI	4.0	105	220	4.0	105	10.0	88.0	18	2800	3	3
	2R5TAE470M	2.5	105	470	2.5	105	10.0	117.5	25	2400	3	3
	2R5TAE470MF	2.5	105	470	2.5	105	10.0	117.5	15	3100	3	3
	2R5TAE330M	2.5	105	330	2.5	105	10.0	82.5	25	2400	3	3
	2R5TAE330MI	2.5	105	330	2.5	105	10.0	82.5	18	2800	3	3
	2R5TAE330MF	2.5	105	330	2.5	105	10.0	82.5	15	3100	3	3
	2R5TAE220M	2.5	105	220	2.5	105	10.0	55.0	25	2400	3	3
	2R5TAE220MF	2.5	105	220	2.5	105	10.0	55.0	15	3100	3	3
	2R5TAE220M9	2.5	105	220	2.5	105	10.0	110.0	9	3900	3	3
D3L	1OTAE220ML	10	105	220	10	105	10.0	220.0	25	2400	3	3
	1OTAE150ML	10	105	150	10	105	10.0	150.0	25	2400	3	3
	6TAE330ML	6.3	105	330	6.3	105	10.0	207.9	25	2400	3	3
	4TAE470ML	4.0	105	470	4.0	105	10.0	188.0	25	2400	3	3
	4TAE470MIL	4.0	105	470	4.0	105	10.0	188.0	18	2800	3	3
	2R5TAE680ML	2.5	105	680	2.5	105	10.0	170.0	25	2400	3	3
	2R5TAE680MFL	2.5	105	680	2.5	105	10.0	170.0	15	3100	3	3

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

※ Red letters : New models

TV Series

New

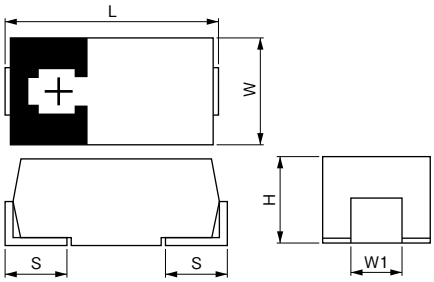
- RoHS compliance
- High reliability (For the car electronics)
- Guaranteed at 125℃

TV series improves upon the TA series with higher thermal resistance achieving 125℃ guaranteed performance.
They are produced in a "ISO/TS16949" certified factory.

Specifications

Items	Condition		Specifications	
Rated voltage (V)	—		6.3	10
Surge voltage (V)	—		7.2	12
Category temperature range (℃)	—		−55 to +125	
Capacitance tolerance (%)	120Hz/20℃		M : ±20	
Rated capacitance range (μF)	120Hz/20℃		68 to 150	
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list	
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list	
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list	
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0	
		+105℃ Z/Z20℃	0.6 to 2.0	
Endurance	125℃, 1,000h, category voltage applied (105℃ 2,000h, rated voltage applied)	temp	125	105
		△C/C	Within±20% of the initial value	Within±20% of the initial value
		DF	≤ 2 times of the initial limit	≤ 1.5 times of the initial limit
		LC	≤ 2 times of the initial limit	Within the initial limit
Damp heat(Load)	85℃, 85 to 90%RH, 500h, rated voltage applied	△C/C	Within+40%,−20% of the initial value	
		DF	≤ 1.5 times of the initial limit	
		LC	≤ 1.5 times of the initial limit	
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C	Within±5% of the initial value	
		DF	Within the initial limit	
		LC	≤ 3 times of the initial limit	

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

※1 ±0.1:D2E

Size list

RV : Rated voltage

μF \ RV	6.3	10
68		D2E
150	D2E	D3L

TV series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Use temp. ≤ 125℃	MSL Use temp. ≤ 105℃
D2E	10TVE68M	10	105	68	6.3	125	10.0	68.0	25	2400	5	3
	6TVE150M	6.3	105	150	4.0	125	10.0	94.5	25	2400	5	3
D3L	10TVE150ML	10	105	150	6.3	125	10.0	150.0	25	2400	5	3

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

TH Series

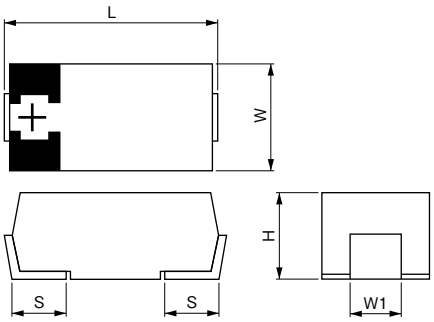
RoHS compliance
Guaranteed at 125℃

TH series is guaranteed to operate in high temperature environment up to 125℃ .
It is most suitable for industrial equipment requiring higher reliability.

Specifications

Items	Condition		Specifications									
Series	–		THB			THC				THE		
Rated voltage (V)	–		4.0	6.3	10	2.5	4.0	6.3	10	2.5	4.0	6.3
Surge voltage (V)	–		4.6	7.2	12	2.9	4.6	7.2	12	2.9	4.6	7.2
Category temperature range (℃)	–		−55 to +125									
Capacitance tolerance (%)	120Hz/20℃		M : ±20									
Rated capacitance range (μF)	120Hz/20℃		220 to 680			68 to 220				150 to 330		
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list									
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list									
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list									
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	0.6 to 2.0									
		+125℃ Z/Z20℃	0.6 to 2.0									
Endurance	125℃, 1,000h, category voltage applied	△C/C	Within±20% of the initial value									
		DF	≤ 2 times of the initial limit									
		LC	≤ 2 times of the initial limit									
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within+40%,−20% of the initial value									
		DF	≤ 1.5 times of the initial limit									
		LC	≤ 3 times of the initial limit									
Surge	105℃, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	△C/C	Within±5% of the initial value									
		DF	Within the initial limit									
		LC	≤ 3 times of the initial limit									

Dimensions



(unit: mm)

Size code	L ±0.3※1	W ±0.2	H ±0.1※2	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

Size list

RV : Rated voltage

μF	Series \ RV	2.5	4.0	6.3	10
68	THC				D2
150	THC			D2	
	THE			D2E	
220	THB			D3L	D4
	THC	D2	D2		
	THE		D2E		
330	THB		D3L	D4	D4
	THE	D2E			
470	THB			D4	
680	THB		D4		

TH series characteristics list

Series	Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL	
												Reflow temp. ≤ 260℃	Reflow temp. ≤ 250℃
THB	D3L	6THB220ML	6.3	105	220	4.0	125	10.0	138.6	40	2000	—	5
		4THB330ML	4.0	105	330	2.5	125	10.0	132.0	40	2000	—	5
	D4	10THB330M	10	105	330	6.3	125	10.0	330.0	35	3000	—	5
		10THB220M	10	105	220	6.3	125	10.0	220.0	40	3000	—	5
		6THB470M	6.3	105	470	4.0	125	15.0	296.1	35	3000	—	5
		6THB330M	6.3	105	330	4.0	125	10.0	207.9	40	3000	—	5
		4THB680M	4.0	105	680	2.5	125	15.0	272.0	35	3000	—	5
THC	D2	10THC68M	10	105	68	6.3	125	10.0	68.0	45	1700	—	5
		6THC150M	6.3	105	150	4.0	125	10.0	94.5	40	1900	—	5
		4THC220M	4.0	105	220	2.5	125	10.0	88.0	40	1900	—	5
		2R5THC220M	2.5	105	220	1.6	125	10.0	55.0	45	1700	—	5
THE	D2E	6THE150M	6.3	105	150	4.0	125	10.0	94.5	25	2400	—	5
		6THE150MI	6.3	105	150	4.0	125	10.0	94.5	18	2800	—	5
		4THE220M	4.0	105	220	2.5	125	10.0	88.0	25	2400	—	5
		4THE220MI	4.0	105	220	2.5	125	10.0	88.0	18	2800	—	5
		4THE220MF	4.0	105	220	2.5	125	10.0	88.0	15	3100	—	5
		2R5THE330M	2.5	105	330	1.6	125	10.0	82.5	25	2400	—	5
		2R5THE330MI	2.5	105	330	1.6	125	10.0	82.5	18	2800	—	5
		2R5THE330MF	2.5	105	330	1.6	125	10.0	82.5	15	3100	—	5

Please refer to page 65 for the compensation coefficient of maximum allowable ripple current.

※1 100k to 500kHz,45℃

TQC Series

Update

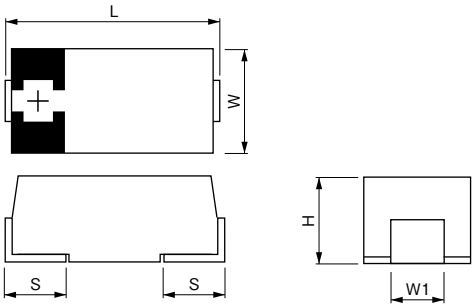
RoHS compliance
High voltage

TQC series is perfect for high voltage, low ESR and low profile applications. It is most suitable to be used as a bypass capacitor on a 12V motor driver or on the input side of a DC/DC converter.

Specifications

Items	Condition		Specifications			
Rated voltage (V)	–		16	20	25	35
Surge voltage (V)	–		20	23	29	40
Category temperature range (℃)	–		−55 to +105			
Capacitance tolerance (%)	120Hz/20℃		M : ±20			
Rated capacitance range (μF)	120Hz/20℃		5.6 to 100			
Dissipation Factor (DF)	120Hz/20℃		Please see the attached characteristics list			
Leakage current	Rated voltage applied, after 5 minutes		Please see the attached characteristics list			
Equivalent series resistance (ESR)	100kHz/20℃		Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20℃	−55℃ Z/Z20℃	1.0 to 2.0			
		+105℃ Z/Z20℃	0.6 to 1.0			
Endurance	105℃, 2,000h Rated voltage applied	△C/C	Within ±20% of the initial value			
		DF	Within 1.5 times of the initial limit			
		LC	Within the initial limit			
Damp heat (Steady State)	60℃, 90 to 95%RH, 500h, No-applied voltage	△C/C	Within +40%,−20% of the initial value			
		DF	Within 1.5 times of the initial limit			
		LC	Within 3 times of the initial limit			
Surge	15 to 35℃, 1,000 cycies, 1kΩ discharge resistance, surge voltage applied	△C/C	Within ±5% of the initial value			
		DF	Within the initial limit			
		LC	Within 3 times of the initial limit			

Dimensions



(unit: mm)

Size code	L ±0.2※1	W ±0.2	H ±0.1※2	S ±0.2	W1 ±0.1
B2	3.5	2.8	1.9	0.8	2.2
D2	7.3	4.3	1.9	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4
D3	7.3	4.3	3.1	1.3	2.4

※1 ±0.3:D3L ※2 ±0.2:C,D3L,D3

Size list

RV : Rated voltage

μF \ RV	16	20	25	35
5.6			B2	
8.2		B2		
10	B2			D2
15	B2		D2	
22		D2	D2	
33	D2		D2	
47	D2	D2		
68	D2			
100	D2,D3			
150	D3L			

TQC series characteristics list

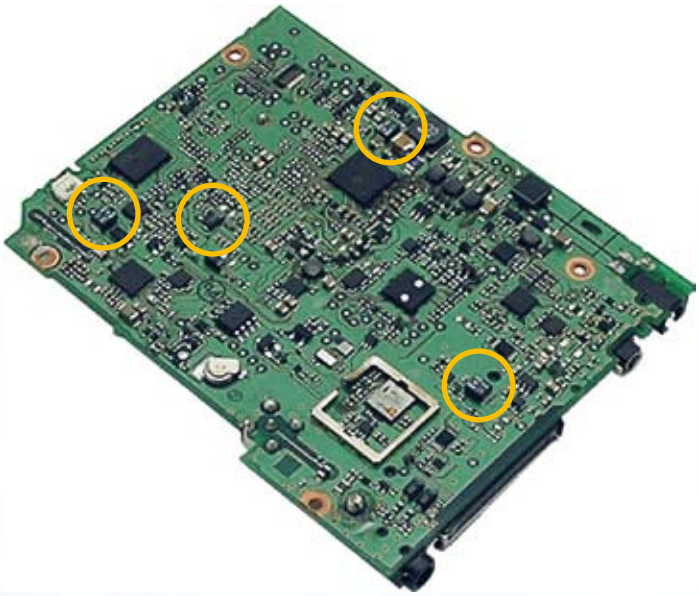
Size code	Part number	Rated voltage (V)	Rated temperature (℃)	Rated capacitance (μF)	Category voltage (V)	Category temperature (℃)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20℃	Maximum allowable ripple current (mArms) 100kHz※1	MSL Reflow temp. ≤ 260℃	MSL Reflow temp. ≤ 250℃
B2	25TQC5R6M	25	105	5.6	25	105	10.0	42.0	100	800	—	3
	20TQC8R2M	20	105	8.2	20	105	10.0	49.2	100	800	—	3
	16TQC15M	16	105	15	16	105	10.0	72.0	90	1000	—	3
	16TQC10M	16	105	10	16	105	10.0	48.0	100	800	—	3
D2	35TQC10M	35	105	10	35	105	10.0	35.0	120	1000	—	3
	25TQC33MYF	25	105	33	25	105	10.0	82.5	60	1400	—	3
	25TQC22M	25	105	22	25	105	10.0	55.0	90	1000※2	—	3
	25TQC22MV	25	105	22	25	105	10.0	55.0	45	1500※2	—	3
	25TQC15M	25	105	15	25	105	10.0	38.0	90	1000※2	—	3
	25TQC15MV	25	105	15	25	105	10.0	38.0	45	1500※2	—	3
	20TQC47MYF	20	105	47	20	105	10.0	94.0	55	1450	—	3
	20TQC22M	20	105	22	20	105	10.0	44.0	80	1300	—	3
	16TQC100MYF	16	105	100	16	105	10.0	160.0	50	1500	—	3
	16TQC68MYF	16	105	68	16	105	10.0	108.8	50	1500	—	3
	16TQC47M	16	105	47	16	105	10.0	75.2	70	1400	—	3
	16TQC47MW	16	105	47	16	105	10.0	75.2	40	1800	—	3
	16TQC33M	16	105	33	16	105	10.0	52.8	70	1400	—	3
D3L	16TQC150MYF	16	105	150	16	105	10.0	240.0	50	1800	—	3
D3	16TQC100M	16	105	100	16	105	10.0	160.0	50	1800	—	3

※1 100k to 500kHz,105℃　※2 100k to 300kHz,105℃

※ Red letters : New models

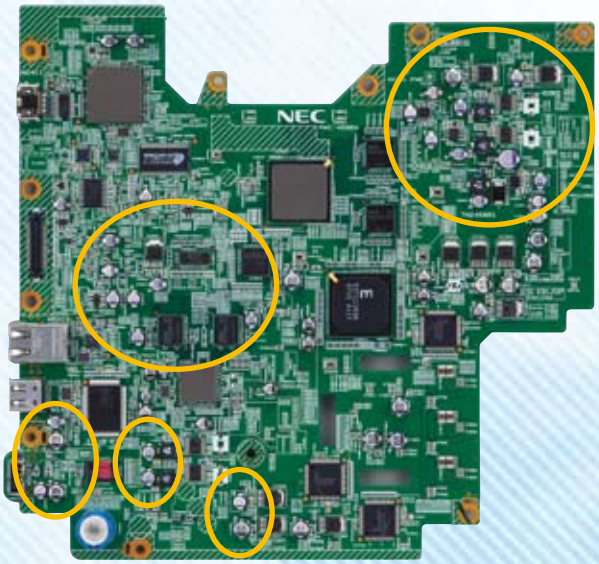
SANYO Electric Co., Ltd.　Portable Car Navigation

The adopted model		Number
POSCAP	2R5TPU100MAI	1
	6TPB100MA	3



NEC Display Solutions, Ltd.　Projector

The adopted model		Number
OS-CON	25SVPD22M	1
	6SVPC100MY	24



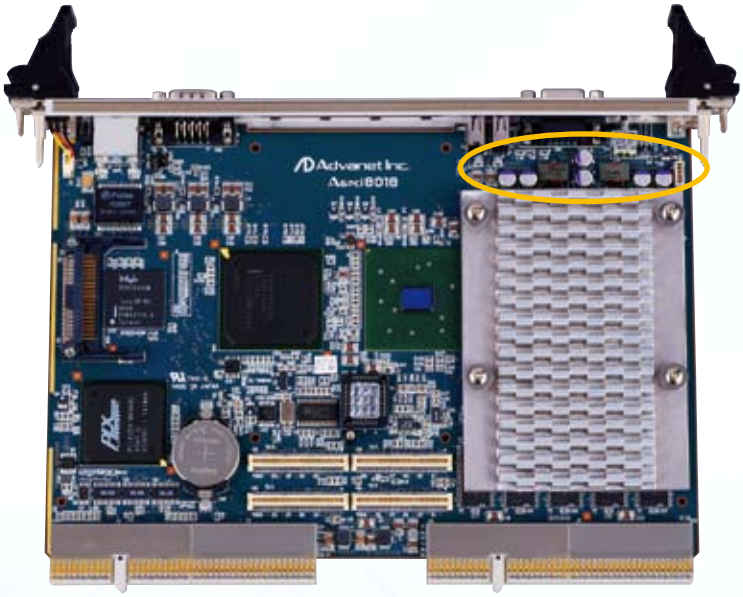
Nipron Co., Ltd.　Fanless Power Supply

The adopted model		Number
OS-CON	35SVPD8R2M	4
	16SVQP82M	3
	10SVQP150M	4
	6SVQP220M	2

Usable at a high temperature(up to 125℃).
Space-saving. Ripple current allowable at high temperature.

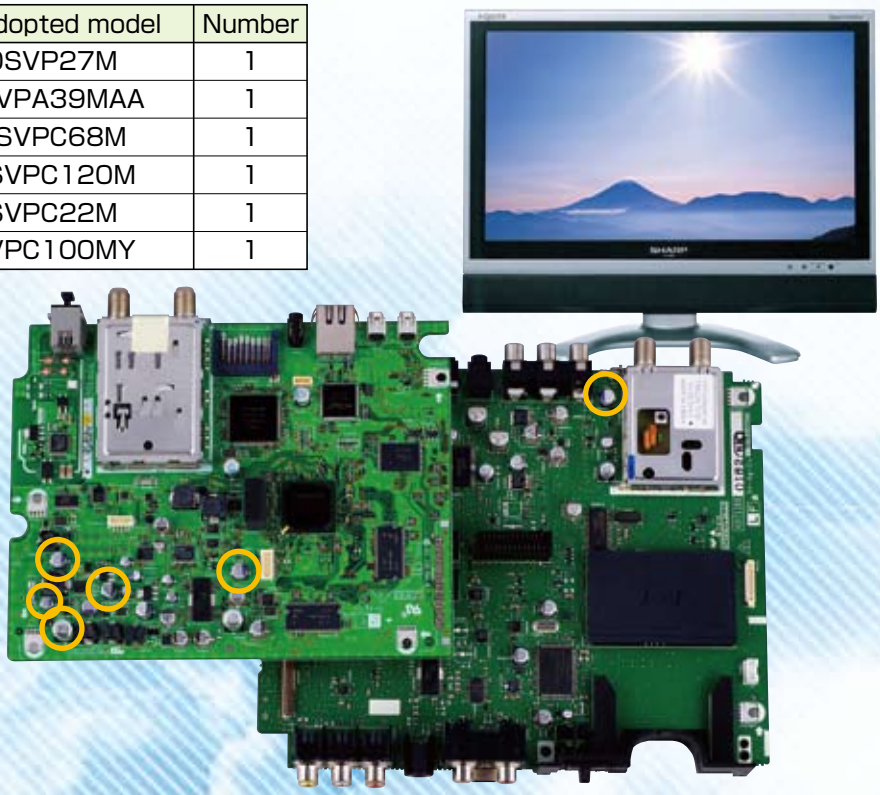
ADVANET Inc.　Compact PCI bus CPU board

The adopted model		Number
OS-CON	6SVPD220M	2
	2R5SVPC390M	4



Sharp Corporation　LCD Television

The adopted model		Number
OS-CON	20SVP27M	1
	16SVPA39MAA	1
	16SVPC68M	1
	10SVPC120M	1
	6SVPC22M	1
	6SVPC100MY	1



O2Micro OZ8150 Evaluation board

Single DC-DC SMPS controller with integrated drivers and 5V/100mA LDO

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
4.5 to 24	1 to 5.5	15	250

The adopted model		Number
POSCAP	6TPE220M	1

《 Applications 》

・Power Supplies for Notebook Peripherals and POL

O2Micro OZ8153/OZ8155 Evaluation board

Dual DC-DC SMPS controller with integrated drivers and 5V/100mA LDO

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
5.5 to 24	1 to 5.5	15	250

The adopted model		Number
POSCAP	6TPE150MI	2

《 Applications 》

・Power Supplies for Notebook CPU and Peripherals

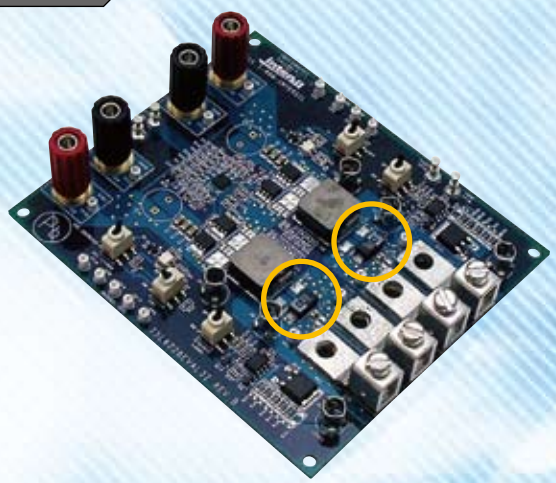
Intersil ISL6228EVAL3Z Evaluation board

High-performance dual-output buck controller for notebook applications.

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
3.3 to 25	0.6 to 5	8	270, 300

The adopted model		Number
POSCAP	6TPF330M9L	2



《 Applications 》

・PCI express graphical processing unit
・VRM
・Network adaptor

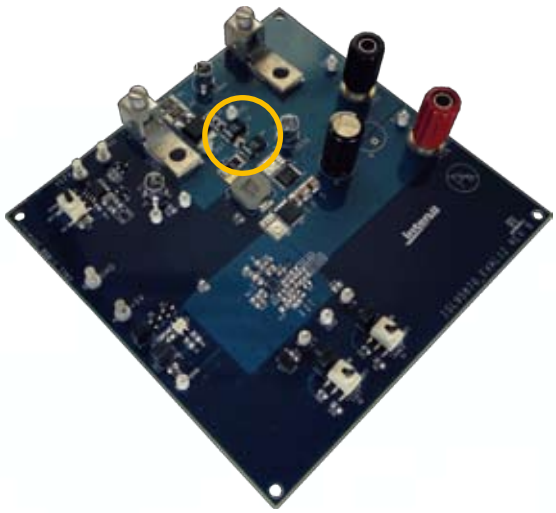
Intersil　ISL95870 evaluation board

The ISL95870 is a PWM DC/DC controller with VID inputs for portable GPU core-voltage regulator.

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
3.3 to 25	0.5 to 3.3	1.8	300

The adopted model		Number
POSCAP	2TPLF470M5	2



《 Applications 》

- Mobile PC Graphical Processing Unit VCC Rail
- Mobile PC I/O Controller Hub (ICH) VCC Rail
- Mobile PC Memory Controller Hub (GMCH) VCC Rail

Linear Technology　LTC3743EUFD Demo Circuit

The LT®3743 is a fixed frequency synchronous step-down DC/DC controller designed to drive high current LEDs.

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
12	4.5	60	430

The adopted model		Number
POSCAP	6TPD470M	6

《 Applications 》

- DLP Projectors
- High Power Architectural Lighting
- Laser Diodes

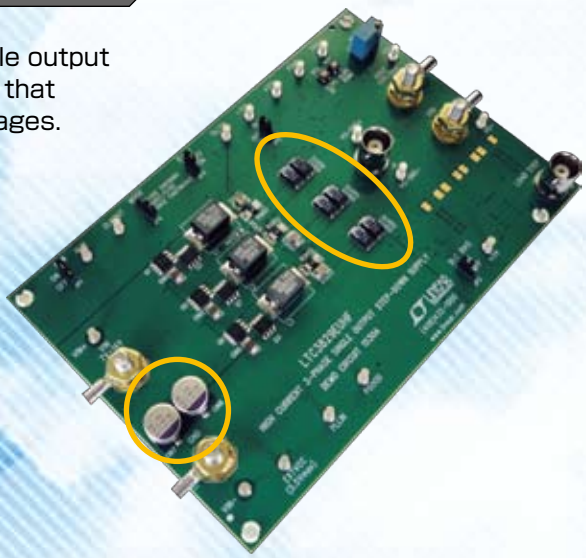
Linear Technology LTC3829EUHF Demo Circuit

The LTC®3829 is a high performance 3-phase single output synchronous step-down DC/DC switching controller that drives all N-channel synchronous power MOSFET stages.

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
12	4.5	60	430

The adopted model		Number
OS-CON	16SVP180MX	2
POSCAP	2R5TPE330M9	6



《 Applications 》

- Notebook and Palmtop Computers
- Telecom Systems
- Portable Instruments
- DC Power Distribution Systems

MAXIM　MAX17409 Evaluation kit

1-phase Quick-PWM™ step-down VID power-supply controller for high-performance graphics processors

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
7 to 24	0.3375 to 1.1250	14	300

The adopted model		Number
POSCAP	2TPE470M9	1

《 Applications 》

- 2- to 4-Li+ Cells Battery to Processor Core Supply Converters
- Graphics Core (GPU) Power Supplies
- Notebooks/Desktops/Servers
- Voltage-Positioned Step-Down Converters

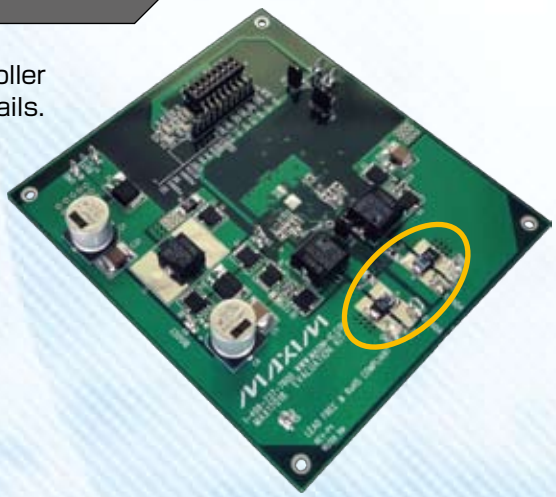
MAXIM　MAX17018 Evaluation Kit

The MAX17018 is an external FET dual buck controller with integrated booster that can supply up to four rails.

《 Use conditions 》

Vin(V)	Vout(V)	Iout(V)	fo(kHz)
2.5 to 42	5/3.3	5	300

The adopted model		Number
POSCAP	10TPC100M	1
	10TPF150ML	1



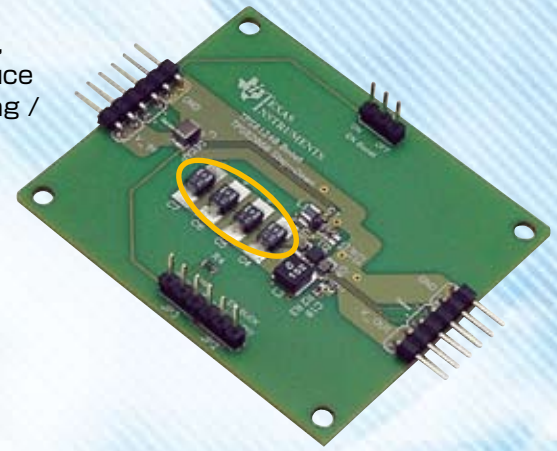
《 Applications 》

- Automotive
- Industrial

Texas Instruments　TPS61240/TPS62060 Evaluation board (Setup for wireless data card application)

As combined (high efficiency) Boost/ Buck solution, the actual purpose for data card application to reduce the capacitance requirement/ application downsizing / supporting energy efficiently for GSM pulses.

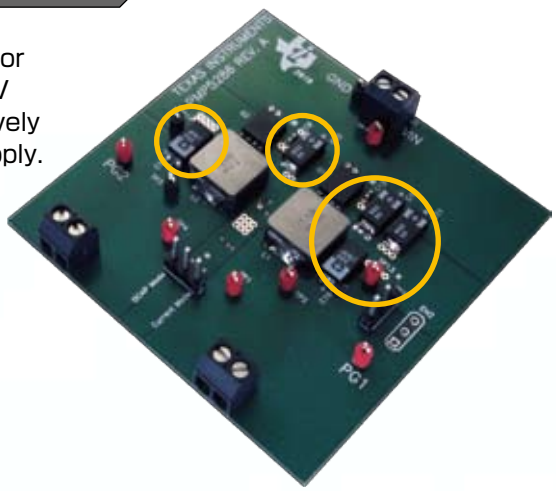
The adopted model		Number
POSCAP	6TPG150M	4



《 Applications 》

- Portable USB peripherals
- Personal Communication Devices
- Stereo Audio applications

Texas Instruments TPS51220A Evaluation board



The TPS51220A is a dual synchronous buck regulator controller with two LDOs. It is optimized for 5-V/3.3-V system controller, enabling designers to cost effectively complete 2-cell to 4-cell notebook system power supply.

《 Use conditions 》

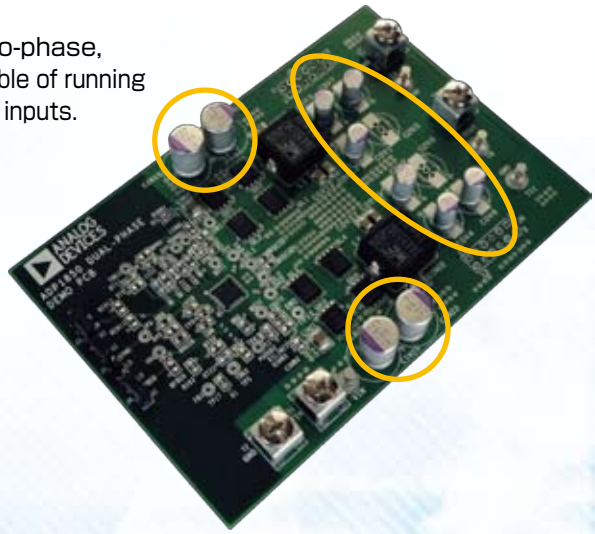
Vin(V)	Vout(V)	Iout(V)	fo(kHz)
9 to 12.6	5/3.3	15/10	300

The adopted model		Number
POSCAP	6TPF330M9L	2
	16TQC68M	3

《 Applications 》

- System Rails for Notebook Computer
- Point of Load in LCD TV, MFP

ANALOG DEVICES ADP1850 evaluation board



The ADP1850 is a configurable dual output or two-phase, single output dc-to-dc synchronous buck controller capable of running from commonly used 3.3 V to 12 V (up to 20 V) voltage inputs.

《 Use conditions 》

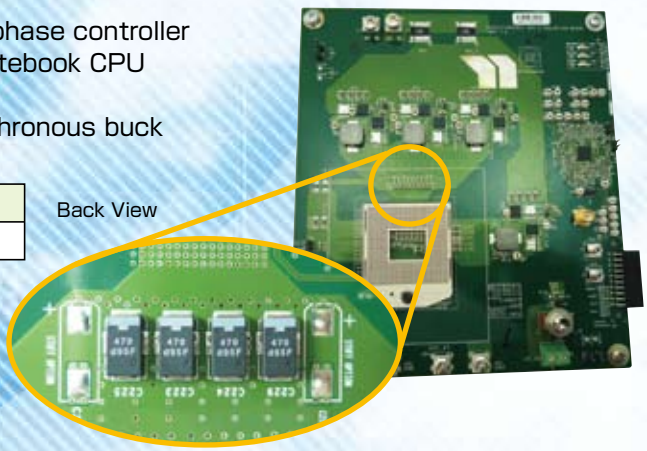
Vin(V)	Vout(V)	Iout(V)	fo(kHz)
10 to 15	1.09	50	300

The adopted model		Number
OS-CON	16SEP180M	4
	2SEPC560MZ	6

《 Applications 》

- Point-of-load power supplies
- Telecom base station and networking
- Consumer
- Industrial and instrumentation
- Healthcare and medical

ON Semiconductor NCP6131/NCP5911 Evaluation board



- The NCP6131 is dual output three plus one phase controller with single SVID interface for desktop and notebook CPU applications.
- The NCP5911 is a IMVP7.0 compatible synchronous buck MOSFET drivers.

The adopted model		Number
POSCAP	2TPLF470M6	4

《 Applications 》

- Desktop and Notebook Processors

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