

Tantalum Solid Capacitors with Conductive Polymer

POSCAP

Series integration

- ① The 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	B2	4TPB150MA	TPE	B2	4TPE150MAZB	93
TPB	C	2R5TPB220MC	TPE	C2	4TPE220MIC2	93
TPB	C	4TPB150MC	TPE	C2	6TPE150MPC2	93
TPB	C	10TPB47MC	TPE	C	10TPB68MC	97
TPB	D3L	10TPB100ML	TPC	D2	10TPC100M	99
TPE	B2	2R5TPE220MPB	TPE	B2	2R5TPE220MLB	93
TPE	C2	2R5TPE330MIC2	TPE	C2	2R5TPE330MFC2	93
TPE	C2	4TPE220MPC2	TPE	C2	4TPE220MIC2	93
TPG	B1G	6TPG68M	TPG	B1G	6TPG100M	91

- ② The following model are deleted from characteristics list in each of the series pages. Because the following applicable models are integrated. Our company continue the supply to the customer who has already used it, at the moment. Please contact us, when you design new products.

Applicable model		
Series	Size Code	Part number
TPC	C1	2R5TPC82M
TPC	C1	4TPC56M
TH	D3L	2R5THB470ML
TH	D4D	4THD470M
TH	D4	2R5THB680M
TH	D4	2R5THB1000M

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:

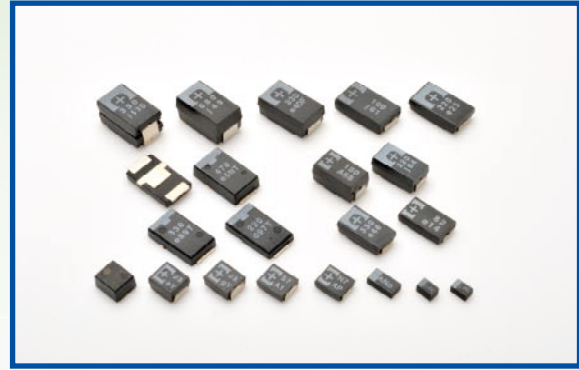
(TPB, TPC, TPD, TPE, TPF, TPG, TPL, TPLF, TPSF, TPU, TA and TH series)
U.S. Patent Nos. 6168639 and 6313979

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

Feature



OS-CON™



POSCAP™

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°C, and suitable for long-term-operating industrial equipments.
- (**POSCAP**) 2,000h lifetime at 105°C

■ Superior temperature characteristics

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

■ 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, cellular phone, personal computers, home appliance, automotive electric equipment, industrial equipment, etc.

PRECAUTIONS

- The contents of this catalog are current as of July 2010. 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.
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- 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.

Guidelines and precautions for use About the electronic part capacitor

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 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 polarities reverse in leakage current or a short circuit may result.

There is no bi-polar model of **OS-CON** and **POSCAP**.

Rated and category

The definition of rated 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 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 life span.
- 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.

POSCAP About TQC series please contact us.

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.

Guidelines and precautions for use About the electronic part capacitor

Applied voltage for designing

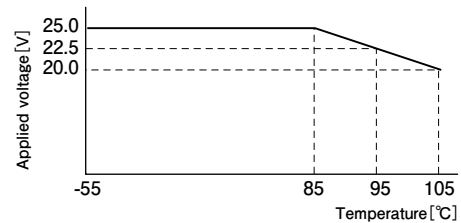
Do not apply voltages exceeding the full rated voltage.

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, 80% and below of the rated voltage or category voltage is recommended.
- Please refer to the following table for rated 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	85°C below	Less than the rated voltage
	85°C above	Applied the voltage shown right figure
All except for the 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 places where condensation may form
- Places with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc)
- Places susceptible to ozone, ultraviolet rays and radiation
- Where vibration or shock exceeds the allowable value as specified in the catalog or specification sheet
- Places the capacitor under direct sunlight

Land pattern

Please design capacitor SMD type and hole space and hole diameter of circuit board for capacitor radial lead type, or land patterns 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 capacitors.

Avoid having the printed wire under the capacitor.

Capacitor insulation (OS-CON)

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.

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

Guidelines and precautions for use About the electronic part capacitor

Considerations when 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 deflection, the intensive increase of leakage current or the capacitance reduction.
- Soldering heat stress to capacitor varies depending on temperature, duration time, mounting condition as size, material and component population 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°C to 70°C with a resistor load of 1kΩ.
- In case the capacitor has re-striking-voltage, please apply the rated voltage to the capacitor through 1kΩ resistor.

Mounting 1

- Please mount capacitor after confirming the polarity.
- Please mount capacitor 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 capacitor or use capacitor 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 to 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 not remain.

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 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

※It means a homogeneous material or 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 or film of paint
 - thin metallic film formed on the surface of plastic material or metallic material



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		TA	101
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Classification	Series	Page	Features	Small size - Low profile	High capacitance	Low ESR	Low ESL	High voltage - High reliability	Size code	Category temperature range(°C)	Rated voltage range (V.DC)	Capacitance range(μF)	L×W (mm)	H (mm)	
SMD type	TPSF <small>UP</small>	86	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	
	TPU	87	Small size Low profile Face down terminal	●					S09	-55 to +85	2.5 to 10	4.7 to 47	2.0×1.25	0.9	
									S11	-55 to +85	2.5 to 6.3	33 to 68	2.0×1.25	1.1	
									A09	-55 to +85	2.5 to 10	33 to 100	3.2×1.6	0.9	
									B09	-55 to +85	6.3	150	3.5×2.8	0.9	
	TPL TPLF <small>UP</small>	88 to 89	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	2.5 to 6.3	150 to 330	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	90	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
	TPG	91	Small size Low profile High capacitance		●	●				B1G	-55 to +105	2.5 to 12.5	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
	TPE <small>UP</small>	92 to 95	Low ESR						●	B2	-55 to +105	2.0 to 10	47 to 330	3.5×2.8	1.9
										C2	-55 to +105	2.5 to 8.0	100 to 330	6.0×3.2	1.8
										C3	-55 to +105	6.3 to 10	150 to 220	6.0×3.2	2.5
D2E										-55 to +105	2.0 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										

POSCAP Line-up



- Guidelines and precautions for use
- Series system diagram
- Image of case size
- Products list
- Explanation of part numbers
- Packing specifications
- Marking
- Recommended land pattern dimension
- Recommended soldering condition
- Fundamental structure
- Characteristics
- Reliability

- TPSF
- TPU
- TPL·TPLF
- TPF
- TPG
- TPE
- TPB
- TPC
- TPD
- TA
- TH
- TQC

Classification	Series	Page	Features						Size code	Category temperature range(°C)	Rated voltage range (V.DC)	Capacitance range(μF)	LxW (mm)	H (mm)
				Small size - Low profile	High capacitance	Low ESR	Low ESL	High voltage - High reliability						
SMD type	TPB	96 to 97	Standard					B2	-55 to +105	2.5 to 10	33 to 100	3.5x2.8	1.9	
								C	-55 to +105	8.0 to 10	68 to 82	6.0x3.2	2.8	
								D3L	-55 to +105	4.0 to 10	150 to 330	7.3x4.3	2.8	
								D4	-55 to +105	6.3 to 10	220 to 470	7.3x4.3	3.8	
	TPC	98 to 99	Low profile	●				B1	-55 to +105	2.5 to 12.5	10 to 56	3.5x2.8	1.1	
								C1	-55 to +105	4.0 to 8.0	33 to 100	6.0x3.2	1.4	
								D2	-55 to +105	6.3 to 10	68 to 330	7.3x4.3	1.9	
	TPD	100	Low ESR High capacitance		●	●		D4D	-55 to +105	2.5 to 6.3	470 to 1,000	7.3x4.3	3.6	
	TA	101	High reliability (for the car electronics)					B2	-55 to +105	4.0 to 10	47 to 100	3.5x2.8	1.9	
							●	D2E	-55 to +105	2.5 to 10	68 to 470	7.3x4.3	1.8	
								D3L	-55 to +105	2.5 to 10	150 to 680	7.3x4.3	2.8	
	TH	102 to 103	Guaranteed at 125°C					D2E	-55 to +125	2.5 to 6.3	150 to 330	7.3x4.3	1.8	
								D2	-55 to +125	2.5 to 10	68 to 220	7.3x4.3	1.9	
						●		D3L	-55 to +125	4.0 to 6.3	220 to 330	7.3x4.3	2.8	
								D4D	-55 to +125	2.5 to 6.3	330 to 680	7.3x4.3	3.8	
	TQC <small>UP</small>	104 to 105	High voltage					D4	-55 to +125	4.0 to 10	220 to 680	7.3x4.3	3.8	
								B2	-55 to +105	16 to 25	5.6 to 15	3.5x2.8	1.9	
							●	C	-55 to +105	16 to 25	10 to 22	6.0x3.2	2.8	
								D2	-55 to +105	16 to 35	10 to 68	7.3x4.3	1.9	
									D3L	-55 to +105	16 to 25	33 to 68	7.3x4.3	2.8
								D3	-55 to +105	16	100	7.3x4.3	3.1	

POSCAP Line-up



Guidelines and precautions for use

Series system diagram
Image of case size
Products list
Explanation of part numbers
Packing specifications

Marking
Recommended land pattern dimension
Recommended soldering condition
Fundamental structure
Characteristics
Reliability

- Tantalum Solid Capacitors with Conductive Polymer
- TPSF
 - TPU
 - TPL-TPLF
 - TPF
 - TPG
 - TPE
 - TPB
 - TPC
 - TPD
 - TA
 - TH
 - TQC

Guidelines and precautions for use



Tantalum Solid Capacitors with Conductive Polymer

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 possible. (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

- Set the operating temperature so that it falls within the range stipulated in this delivery specification.
- Do not supply current that exceeds the allowable ripple current. When excessive ripple current is supplied, internal heat increases and reduces the POSCAP's life span.

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, the POSCAP cannot be used on the following circuits.

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

5 Sudden charge and discharge restricted

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

A protection circuit is recommended for when a sudden charge or discharge causes excessive rush current since this is main cause of short circuit and large leakage current. Use protection 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°C : 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 protection circuit and a protection device are set up, and it is made safer as a system.

: A diffuse circuit and so on is set up, and a safe system is taken so 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 (with a 60% reliability standard) 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.

- POSCAP emit smoke, turn off the main power of the equipment. In this case, keep your face and hands away from the area.
- It may take a few seconds to a few minutes before the POSCAP emit smoke by the situation. Increase safety by using in conjunction with a protective circuit.
- If the smoke comes in contact with eyes, rinse immediately. If the smoke is inhaled, gargle immediately.
- 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 (life-span)

When life 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.

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 ambient temperature, ripple current and applied voltage.

Failure rate

- In the case of the endurance which is 105°C 2,000h.
0.5%/1,000h (Environment temp. : 105°C, Rated voltage or Category voltage applied)
- In the case of the endurance which is 105°C 1,000h or 125°C 1,000h.
1.0%/1,000h (Environment temp. : 105°C, Rated voltage or Category voltage applied)
- In the case of the endurance which is 85°C 1,000h.
1.0%/1,000h (Environment temp. : 85°C, 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 the appearance becoming defective when soldering is conducted under conditions that are harsher than those stipulated.

10 Others

Design circuits after checking the following items.
Electrical characteristics are affected by temperature and frequency fluctuations.
Design circuits after checking the amount of fluctuation.

Compensation coefficient of maximum allowable ripple current

It takes advantage in ripple current value of characteristics list and the following coefficient. (For questions regarding TQC series, please ask separately.)

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,B09, B1,B1G,B15G, B2, B2S, C, C1, C2, C3, D12T, D15T, D2, D2E, D2T, D3L, D3, D4(THD), D4D	D4
T ≤ 45°C	1.00	1.00
45°C < T ≤ 85°C	0.70	0.50
※85°C < T ≤ 105°C	0.25	0.25

T :Environment temperature ※THseries :85°C < T ≤ 125°C

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 is unopened the storage bag.

Please unseal storage bag just before mounting and be conscious that **POSCAP** not remain. When remainder unfortunately occurs, return them to storage bag once again and, please seal the unsealing part by adhesive tape etc., including desiccants. Moreover, once open the storage bag, it should be followed the table's Floor Life "Time" and "conditions"

MSL	Floor life		Applications scope	
	Time	Conditions	Size code	Series
2a	4 weeks	≤ 30°C / 60%RH	D12T, D15T, D2E, D2, D2T, D3L, D3, D4, D4D	TPB, TPC, TPE, TPD, TH※, TPL, TPLF
3	168 hours	≤ 30°C / 60%RH	S09, S11, A09, B09, B1, B1G, B15G, B2, B2S, C1, C3, C, C2	TPB, TPC, TPE, TPG, TPSF, TPU, TA, TQC (ALL sizes)
5	48 hours	≤ 30°C / 60%RH	D2E, D2, D3L, D4	TH

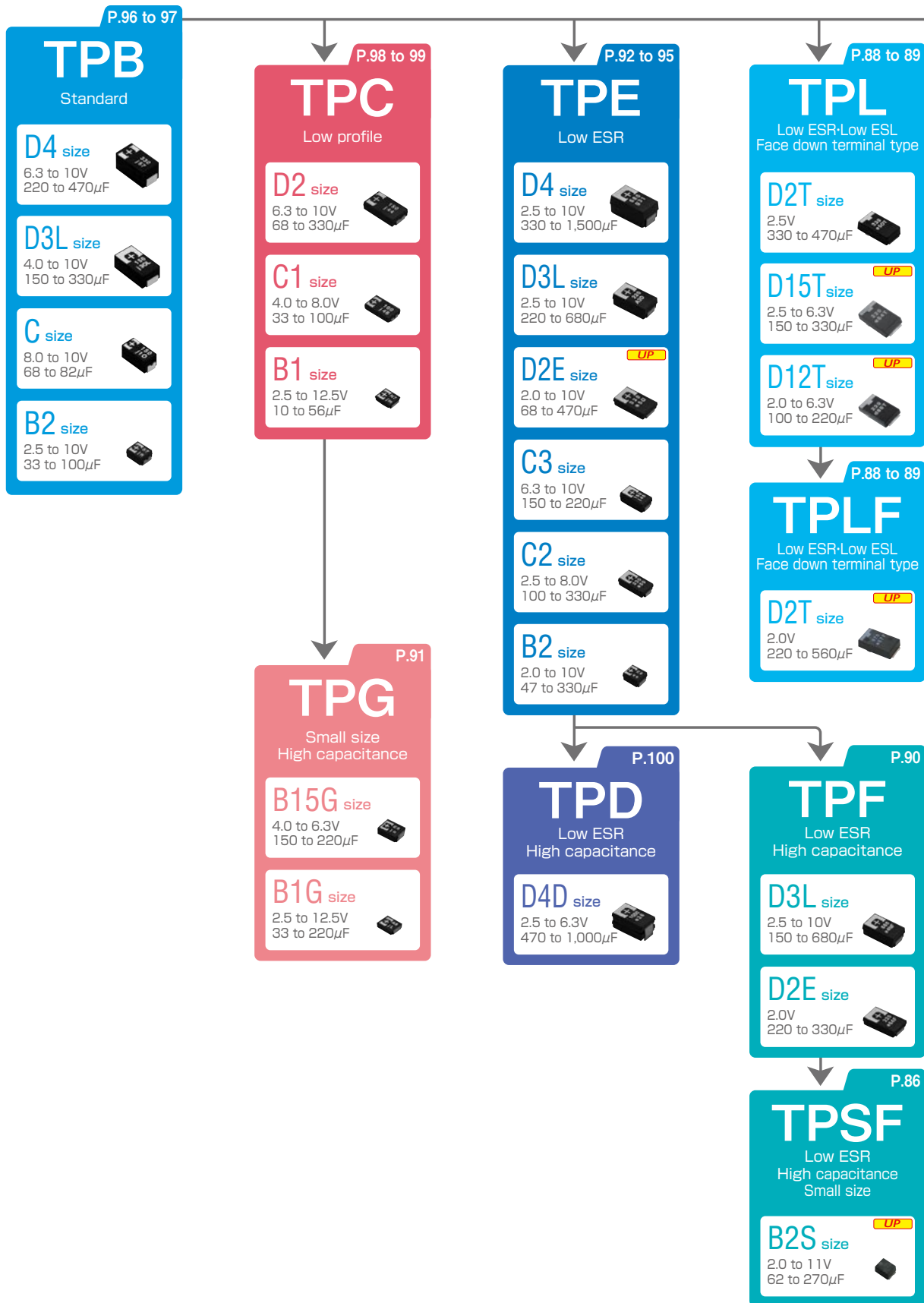
(Conform to IPC/JEDEC J-STD-020C) ※Use at 105°C or less

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

Series system diagram



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TPU

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TPF

TPG

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TPB

TPC

TPD

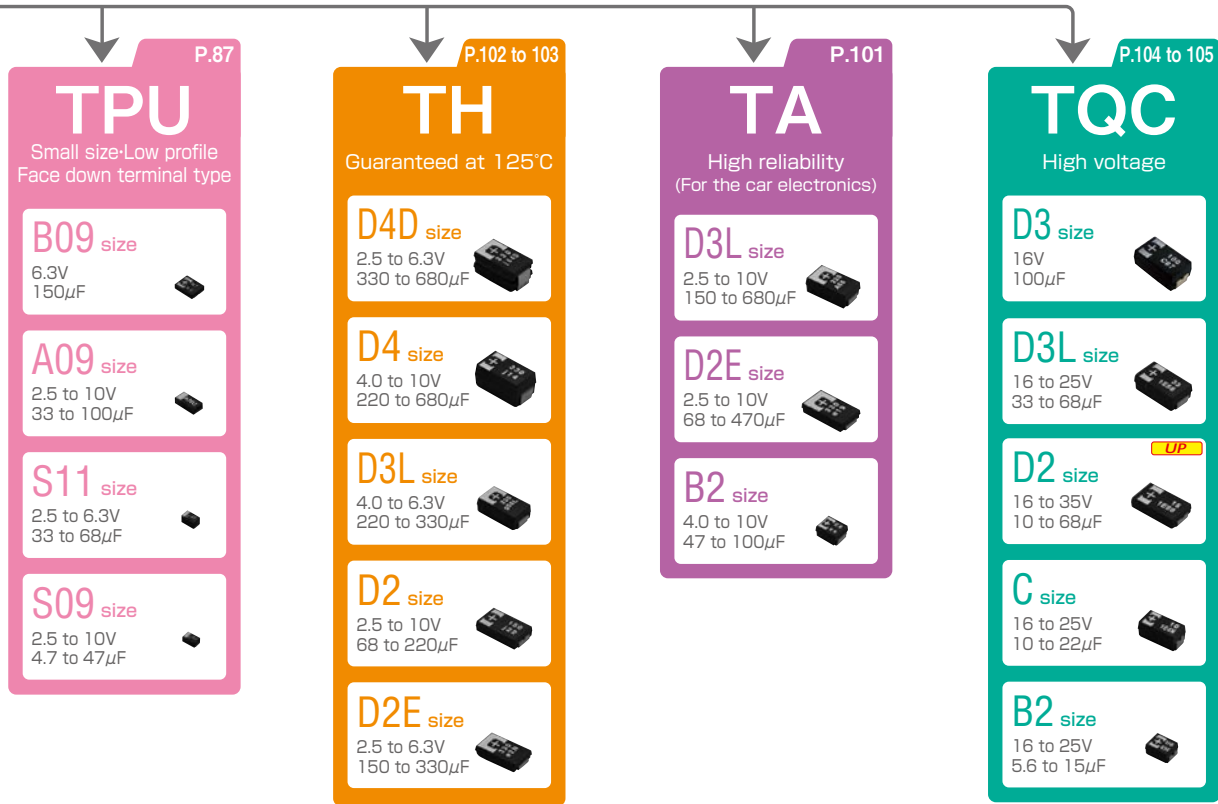
TA

TH

TQC

Tantalum Solid Capacitors with Conductive Polymer

Series system diagram



The size of each photo is nearly to full scale.

Case size

(Unit:mm)

	S09	S11	A09	B09	B1	B1G	B15G	B2	B2S	C1	C2	C3	C	D2E	D12T	D15T	D2T	D2	D3L	D3	D4D	D4
L	2.0	2.0	3.2	3.5	3.5	3.5	3.5	3.5	3.5	6.0	6.0	6.0	6.0	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	2.8	2.8	2.8	2.8	2.8	2.8	3.2	3.2	3.2	3.2	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	0.9	1.1	1.1	1.4	1.9	1.9	1.4	1.8	2.5	2.8	1.8	1.1	1.4	1.8	1.9	2.8	3.1	3.6	3.8

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TPB

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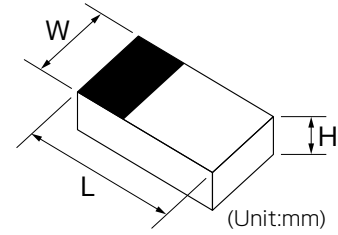
Image of case size













Tantalum Solid Capacitors with Conductive Polymer

(Unit:mm)

S09 size  L2.0xW1.25xH0.9 P.87 TPU 2.5 to 10V 4.7 to 47μF	S11 size  L2.0xW1.25xH1.1 P.87 TPU 2.5 to 6.3V 33 to 68μF	A09 size  L3.2xW1.6xH0.9 P.87 TPU 2.5 to 10V 33 to 100μF
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B09 size  L3.5xW2.8xH0.9 P.87 TPU 6.3V 150μF	B1 size  L3.5xW2.8xH1.1 P.98 to 99 TPC 2.5 to 12.5V 10 to 56μF	B1G size  L3.5xW2.8xH1.1 P.91 TPG 2.5 to 12.5V 33 to 220μF	B15G size  L3.5xW2.8xH1.4 P.91 TPG 4.0 to 6.3V 150 to 220μF	B2 size  L3.5xW2.8xH1.9 P.92 to 95 TPE 2.0 to 10V 47 to 330μF P.96 to 97 TPB 2.5 to 10V 33 to 100μF P.101 TA 4.0 to 10V 47 to 100μF P.104 to 105 TQC 16 to 25V 5.6 to 15μF	B2S size  L3.5xW2.8xH1.9 P.86 TPSF 2.0 to 11V 62 to 270μF Up
---	---	---	--	---	---

C1 size  L6.0xW3.2xH1.4 P.98 to 99 TPC 4.0 to 8.0V 33 to 100μF	C2 size  L6.0xW3.2xH1.8 P.92 to 95 TPE 2.5 to 8.0V 100 to 330μF	C3 size  L6.0xW3.2xH2.5 P.92 to 95 TPE 6.3 to 10V 150 to 220μF	C size  L6.0xW3.2xH2.8 P.96 to 97 TPB 8.0 to 10V 68 to 82μF P.104 to 105 TQC 16 to 25V 10 to 22μF
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 - TPF
 - TPG
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Image of case size

(Unit:mm)

D12T size	D15T size	D2T size	D2E size	D2 size	D3L size
 L7.3xW4.3xH1.1 P.88 to 89 TPL 2.0 to 6.3V 100 to 220μF <small>UP</small>	 L7.3xW4.3xH1.4 P.88 to 89 TPL 2.5 to 6.3V 150 to 330μF <small>UP</small>	 L7.3xW4.3xH1.8 P.88 to 89 TPL 2.5V 330 to 470μF P.88 to 89 TPLF 2.0V 220 to 560μF <small>UP</small>	 L7.3xW4.3xH1.8 P.90 TPF 2.0V 220 to 330μF P.92 to 95 TPE 2.0 to 10V 68 to 470μF <small>UP</small> P.101 TA 2.5 to 10V 68 to 470μF P.102 to 103 TH 2.5 to 6.3V 150 to 330μF	 L7.3xW4.3xH1.9 P.98 to 99 TPC 6.3 to 10V 68 to 330μF P.102 to 103 TH 2.5 to 10V 68 to 220μF P.104 to 105 TQC 16 to 35V 10 to 68μF <small>UP</small>	 L7.3xW4.3xH2.8 P.90 TPF 2.5 to 10V 150 to 680μF 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.101 TA 2.5 to 10V 150 to 680μF P.102 to 103 TH 4.0 to 6.3V 220 to 330μF P.104 to 105 TQC 16 to 25V 33 to 68μF

D3 size	D4D size	D4 size
 L7.3xW4.3xH3.1 P.104 to 105 TQC 16V 100μF	 L7.3xW4.3xH3.6 P.100 TPD 2.5 to 6.3V 470 to 1,000μF P.102 to 103 TH 2.5 to 6.3V 330 to 680μF	 L7.3xW4.3xH3.8 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.102 to 103 TH 4.0 to 10V 220 to 680μF

The size of each photo is nearly to full scale.

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★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	Series	μF											
		100	120	150	180	220	270	330	470	560	680	1,000	1,500
2V	TPE							B2(18)					
	TPE							B2(15,13)					
	TPE							D2E(9,7,6)	D2E(9,7,6)				
	TPF					D2E(6)		D2E(6)					
	TPL					D12T(25)★							
	TPLF					D2T(7,6)		D2T(7,6,5)	D2T(6,5,4)	D2T(6,5)★			
	TPSF						B2S(9)						
2.5V	TPB	B2(70)											
	TPC												
	TPD								D4D(6,5)		D4D(6,5)	D4D(*4)	
	TPE							C2(15,12,9)					
	TPE					D2E(*3)		D2E(*3)	D2E(*3)		D3L(*2)	D4(*1)	D4(15,12)
	TPE			B2(35)		B2(35,25,21)		B2(35)					
	TPE					B2(18,15,13)							
	TPF							D3L(7)	D3L(10,7,6)		D3L(10,7,6)		
	TPG												
	TPL								D2T(12,9,8,7★)	D2T(12,9,8,7★)			
	TPL												
TPU	A09(150)							D15T(15,9)					
4V	TPB												
	TPB							D3L(40)					
	TPC	C1(55)											
	TPD										D4D(10)		
	TPE			D2E(25,18)		D2E(*1)		D2E(25,18)	D3L(*2)		D4(*1)		
	TPE	B2(35)		B2(35,30)		B2(35)							
	TPE					C2(18,15)							
	TPF								D3L(12)	D3L(10)			
	TPG												
	TPL					D12T(25)★		D15T(20)					
TPU													
6.3V	TPB						D3L(40)	D3L(40)					
	TPB							D4(40)	D4(35)				
	TPC	C1(55)											
	TPC	D2(45)		D2(40)				D2(40)					
	TPD									D4D(10)			
	TPE	D2E(25,18)		D2E(25,18,15)		D2E(25,18)		D2E(25)	D4(25,18)		D4(25,18)		
	TPE								D3L(25,18,15)				
	TPE			C2(25,18)		C3(25,18)							
	TPE	B2(35,25)	B2(35)	B2(35,25)		B2(35)★							
	TPF							D3L(12)	D3L(9)				
	TPG	B1G(70,55)		B15G(70)									
TPL	D12T(25)★		D15T(25)		D15T(25)								
TPU			B09(100)										
8V	TPB												
	TPC			D2(40)									
	TPE	C2(25)											
	TPE	B2(35)											
TPG													
10V	TPB						D4(40)	D4(35)					
	TPB			D3L(40)		D3L(40)							
	TPC	D2(45)											
	TPE			C3(55)	C3(55)	D3L(25,18★)		D4(25)					
	TPF			D3L(15)									
	TPG												
	TPU												
11V	TPSF												
12.5V	TPC												
	TPG												
16V	TQC	D3(50)											
	TQC												
20V	TQC												
	TQC												
25V	TQC												
30V	TQC												

Explanation of part numbers



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Use the following example to define POSCAP part numbers.

2R5
Rated voltage
1 to 3 figures

Rated voltage	Code
2.0	2
2.5	2R5
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
TPD	TPD
TPE	TPE
TPF	TPF
TPG	TPG
TPL	TPL
TPLF	TPLF
TPSF	TPSF
TPU	TPU
TAB	TAB
TAE	TAE
THB	THB
THC	THC
THD	THD
THE	THE
TQC	TQC

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
150	150
220	220
270	270
330	330
470	470
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°C	AZB
	ESR 30mΩ max 85°C	AUB
	ESR 25mΩ max 85°C	APB
	ESR 15mΩ max 85°C	AFB
	ESR 15mΩ/300kHz max 85°C	AFGB
	ESR 13mΩ/300kHz max 85°C	ADGB
C2 size	ESR 25mΩ max	PC2
	ESR 18mΩ max	IC2
	ESR 15mΩ max	FC2
	ESR 12mΩ max	CC2
	ESR 9mΩ max	9C2
C3 size	ESR 55mΩ max	GC
	ESR 25mΩ max	PC
	ESR 18mΩ max	IC
D2E size	ESR 25mΩ max 85°C	AP
	ESR 25mΩ max	L
D3L size	ESR 18mΩ max	IL
	ESR 15mΩ max	FL
	ESR 12mΩ max	CL

	Standard	Code
TPB series		
	C size	C
	D3L size	L
TPC series		
	85°C	A
	B1 size	B
	C1 size	C
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°C	AIG
TPU series		
	S09 size	SI
	S11 size	SK
	A09 size	AI
	B09 size	BI
TQC series		
	D2 size/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

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TPL-TPLF

TPF

TPG

TPE

TPB

TPC

TPD

TA

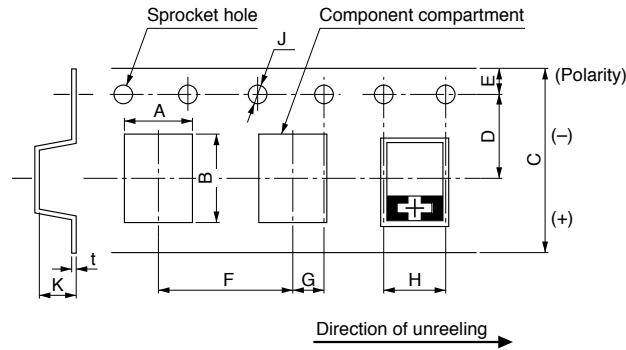
TH

TQC

Tantalum Solid Capacitors with Conductive Polymer

*We supply only embossed tapping type.

Dimension of carrier tape

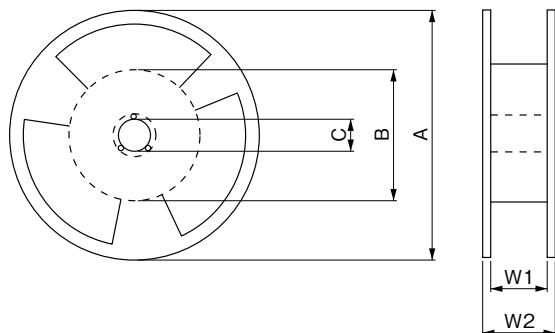


(unit:mm)

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
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
C1	3.7	6.4	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	1.7	0.3
C2	3.7	6.4	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.1	0.3
C3	3.7	6.4	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.9	0.3
C	3.7	6.4	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	3.2	0.3
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
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
D4D	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: $62 \pm 10 \mu\text{m}$
 Width of cover tape: $9.5 \pm 0.2 \text{mm}$
 $5.5 \pm 0.2 \text{mm}$ (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 specifications

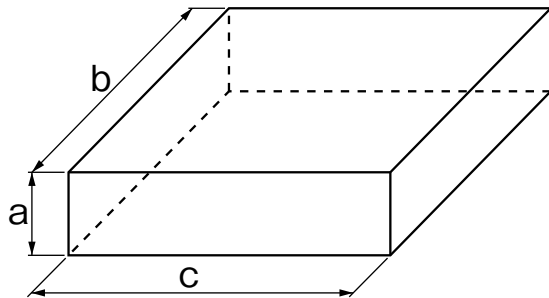


Tantalum Solid Capacitors with Conductive Polymer

Packing quantities

Size code	Pieces/reel ($\phi 180$)	Pieces/reel ($\phi 330$)	Size code	Pieces/reel ($\phi 180$)	Pieces/reel ($\phi 330$)
S09	3,000	–	C3	–	2,500
S11	3,000	–	C	–	2,500
A09	3,000	–	D2E	–	3,000
B09	3,000	–	D2T	–	3,000
B1	3,000	–	D15T	–	4,000
B1G	2,500	–	D12T	–	4,000
B15G	2,500	–	D2	–	3,000
B2	2,000	–	D3L	–	2,500
B2S	2,000	–	D3	–	2,500
C1	–	4,000	D4	–	2,000
C2	–	3,000	D4D	–	2,000

Dimension of packing case



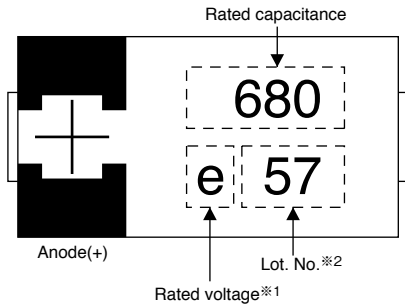
(unit:mm)

Reel size	$\phi 180$	$\phi 330$
a	90	120
b	240	360
c	240	360

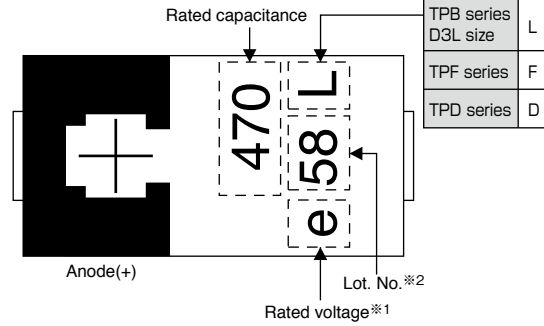
Units per packing case

Size code	Pieces/case	Size code	Pieces/case
S09	15,000	C3	12,500
S11	15,000	C	12,500
A09	15,000	D2E	15,000
B09	15,000	D2T	15,000
B1	15,000	D15T	20,000
B1G	12,500	D12T	20,000
B15G	12,500	D2	15,000
B2	10,000	D3L	12,500
B2S	10,000	D3	12,500
C1	20,000	D4	10,000
C2	15,000	D4D	10,000

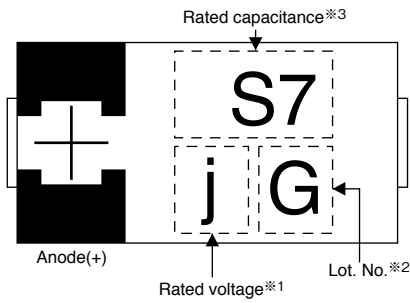
- C, C1, D2, D4 size (TPB, TPC, TH series)
- C, D2, D3, D3L size (TQC series)



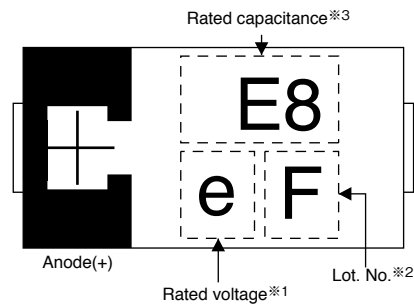
- C2, C3, D2E, D3L size (TPB, TPE, TPF series)
- D4, D4D size (TPD, TPE series)



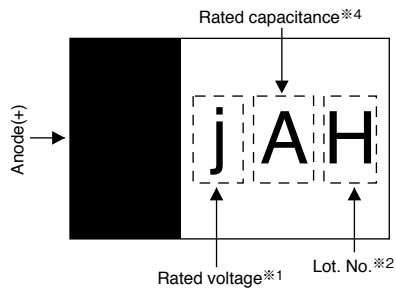
- B09, B1, B1G, B15G, B2 size (TPB, TPC, TPG, TPU, TQC series)



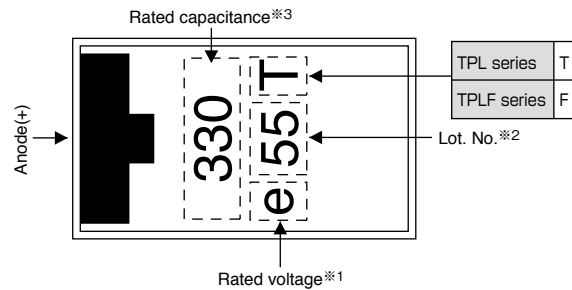
- B2 size (TPE series)



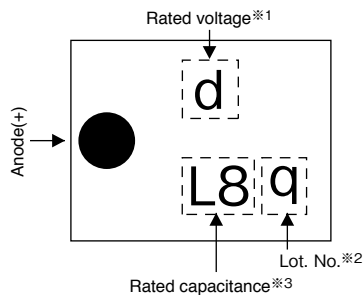
- S09, S11, A09 size (TPU series)



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



- B2S size (TPSF 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(orE)	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

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 Recommended soldering condition

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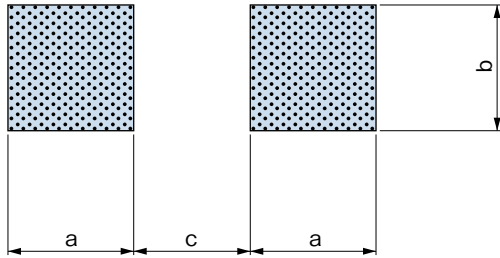
- TPSF
- TPU
- TPL-TPLF
- TPF
- TPG
- TPE
- TPB
- TPC
- TPD
- TA
- TH
- TQC

Recommended land pattern dimension



Tantalum Solid Capacitors with Conductive Polymer

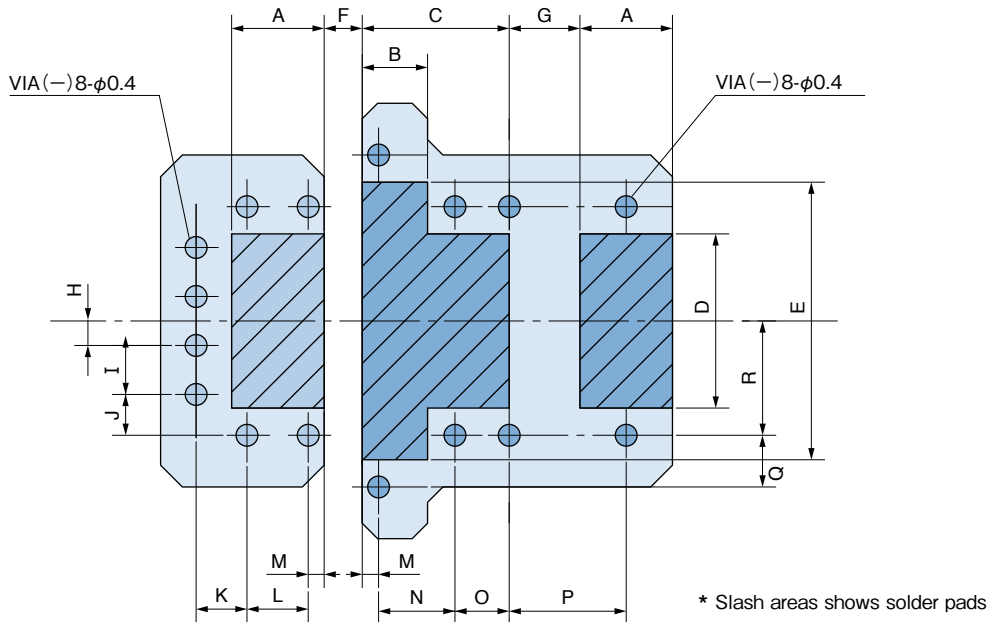
Except for TPL/TPLF series



(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
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
C1	2.4	2.3	2.4
C2	2.4	2.3	2.4
C3	2.4	2.3	2.4
C	2.4	2.3	2.4
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
D4D	2.4	2.9	3.7

TPL/TPLF series



(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	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
D12T																		

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

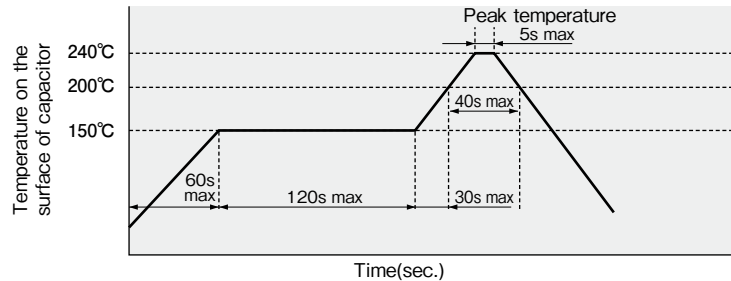
(unit:mm)

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 soldering condition

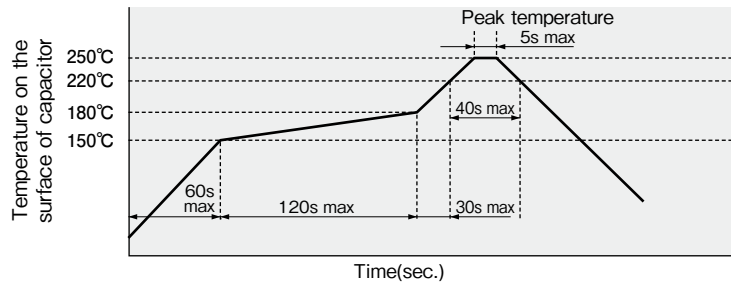
Recommended reflow soldering temperature profile

The cycles of reflow soldering: Twice (max)



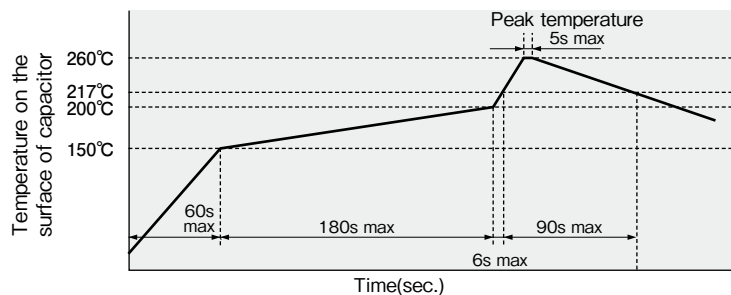
Peak temperature 250°C lead free reflow soldering profile

The cycles of reflow soldering: Twice (max)



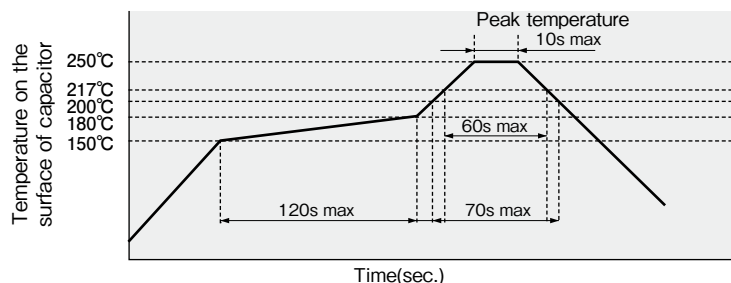
Peak temperature 260°C lead free reflow soldering profile

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°C max (TQC serie: 400°C max) Power of a soldering iron: 30W max
Working time: 3sec. max (TQC serie: 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.)

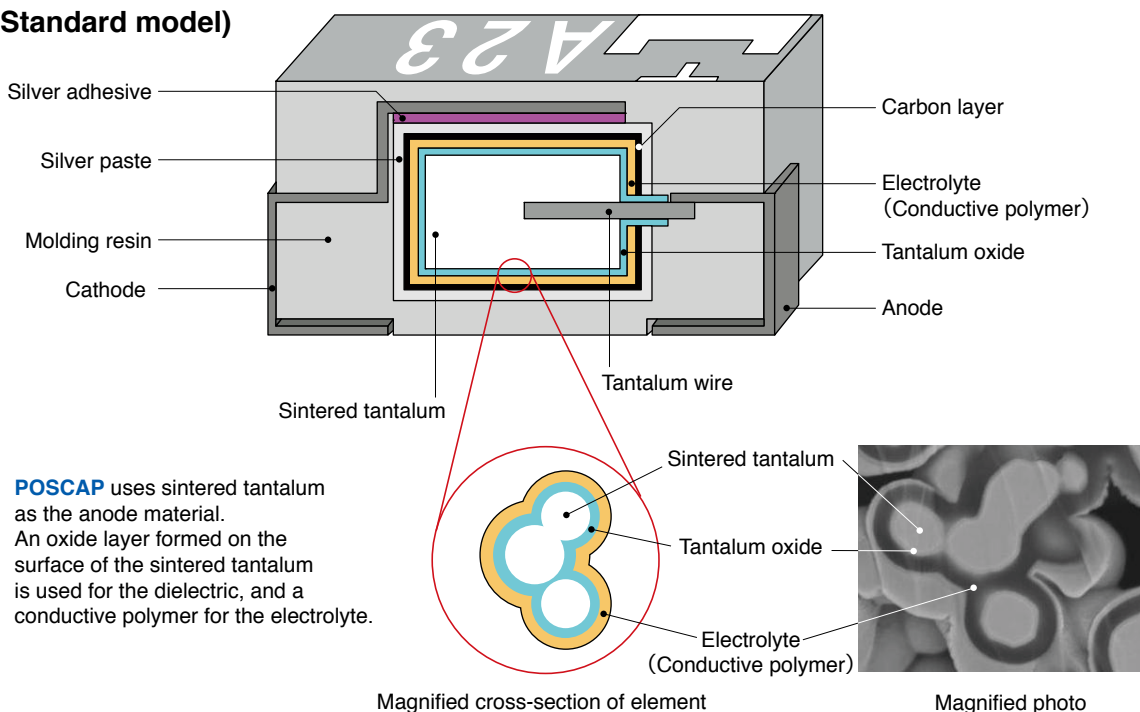


1. Basic structure of POSCAP

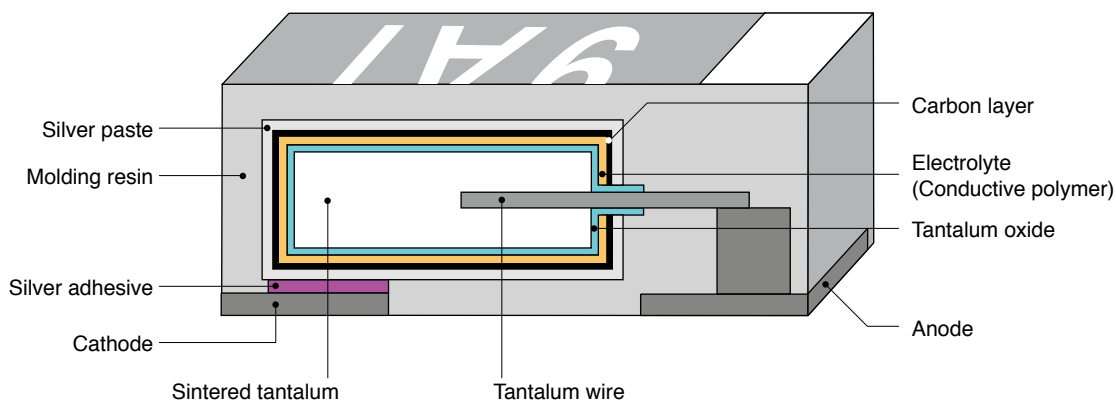
The electrolytes make the difference in structure between the **POSCAP** and the standard tantalum capacitor.

Capacitor	Electrolyte
Tantalum capacitor	Manganese dioxide
POSCAP	Conductive polymer

(Standard model)



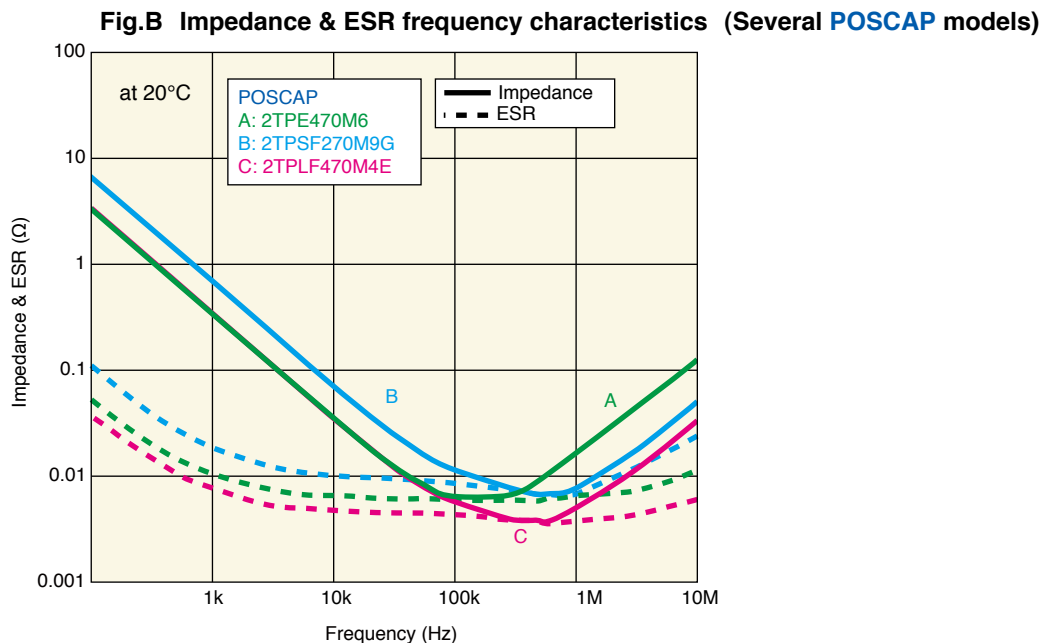
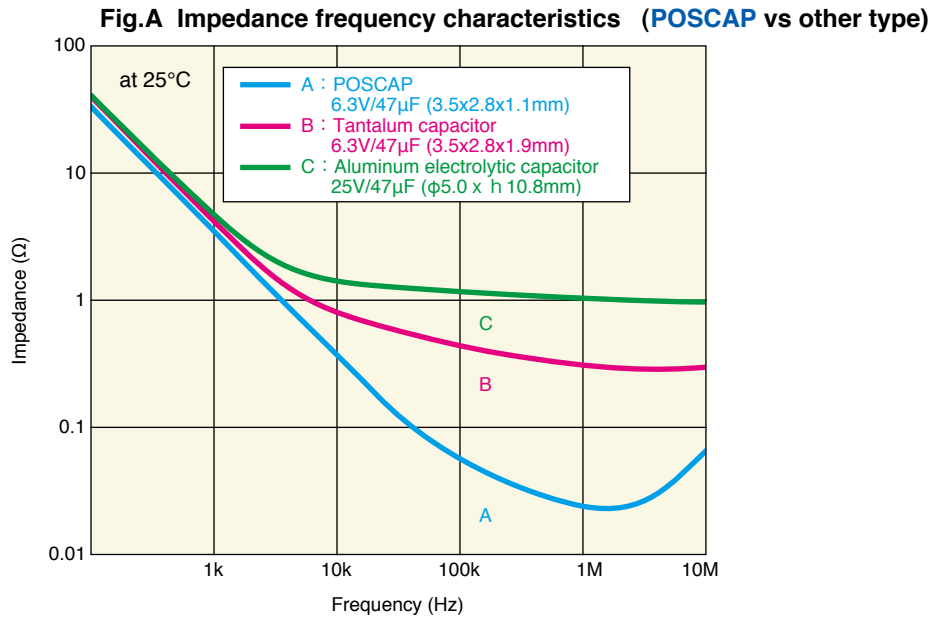
(Face down terminals model)



- 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



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)

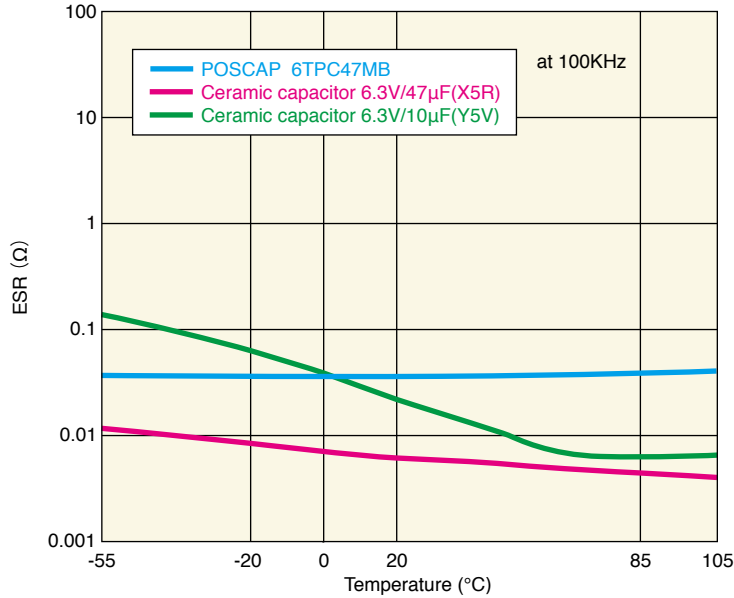
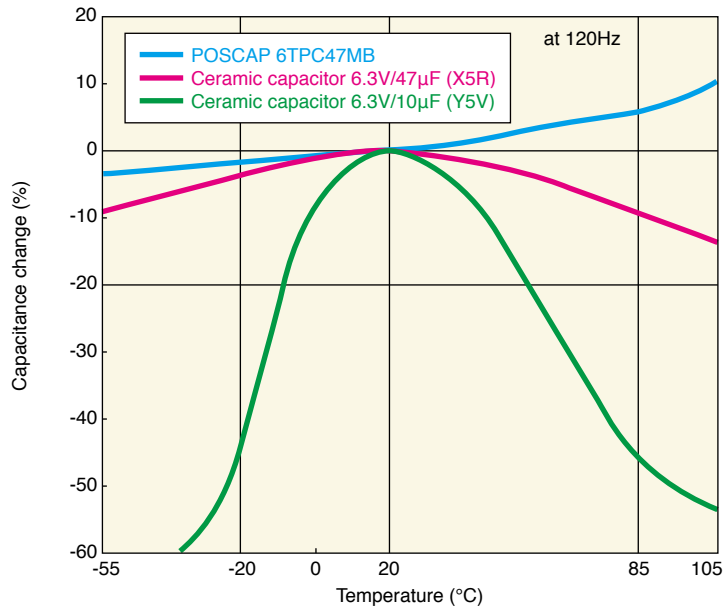


Fig.B Capacitance temperature characteristics (POSCAP vs Ceramic capacitor)

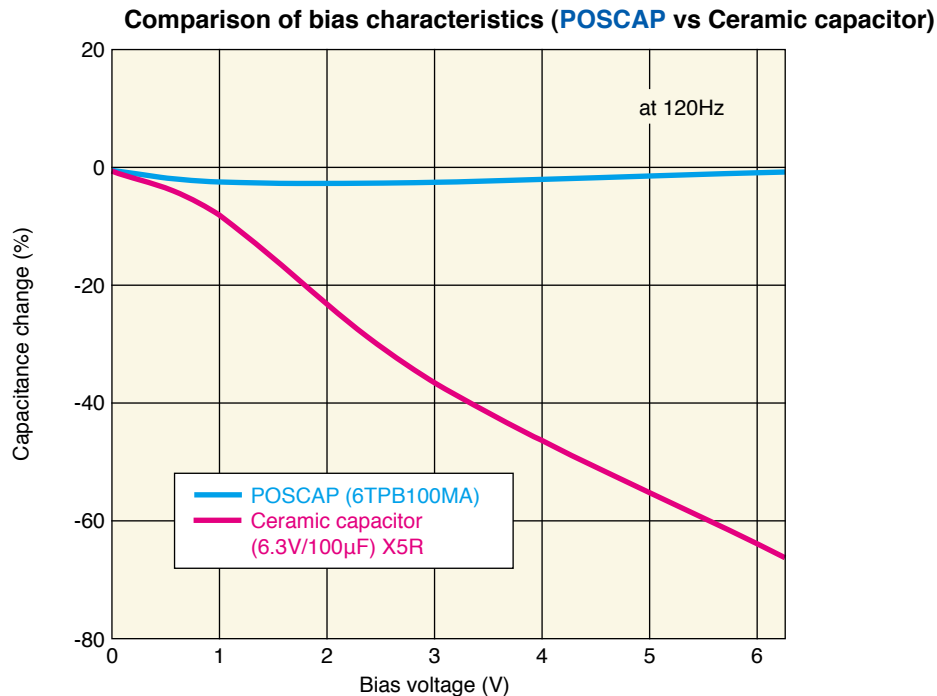


The POSCAP has a characteristics of low and high temperature, which is little change against temperature for the ESR.

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



The ceramic capacitor has a bias characteristics, which makes the capacitance decrease, when applying voltage to it.

However, the **POSCAP** will show no reduction in capacitance for applied voltage within its rating.

Therefore, without caring about change of capacitance when voltage is applied.

You would design for your products more freely.

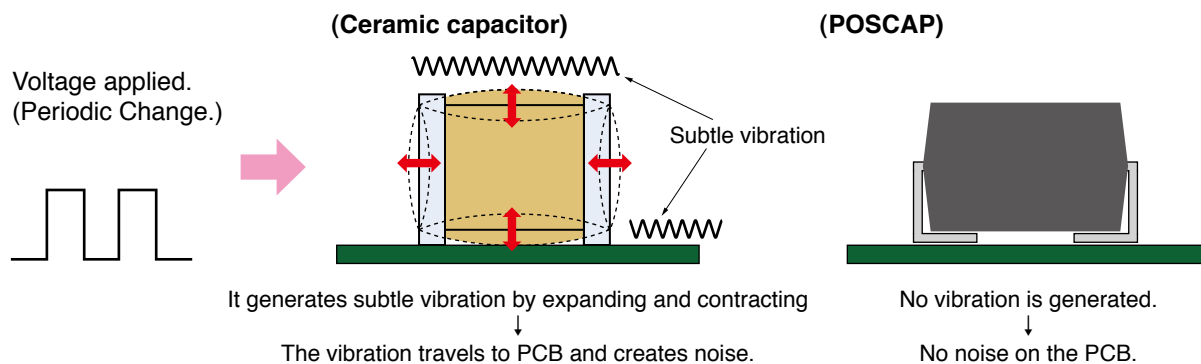
1-4. Piezoelectric effect of the capacitor

It would generate vibration of dielectric's elasticity, when periodically variable voltage is applied to, on the condition that ceramic capacitor is used with substance which has a piezoelectric characteristics (e.g. barium titanate).

If the cyclic change is within the audio-frequency (20Hz to 20kHz), it could generate noise inside the equipment. The subtle vibration from the capacitor travels to the PCB and creates noise.

Problems could may occur dependent on its use.

The **POSCAP** is composed of tantalum oxide films, which doesn't have a piezoelectric characteristics. Therefore, it will not generate any noise.



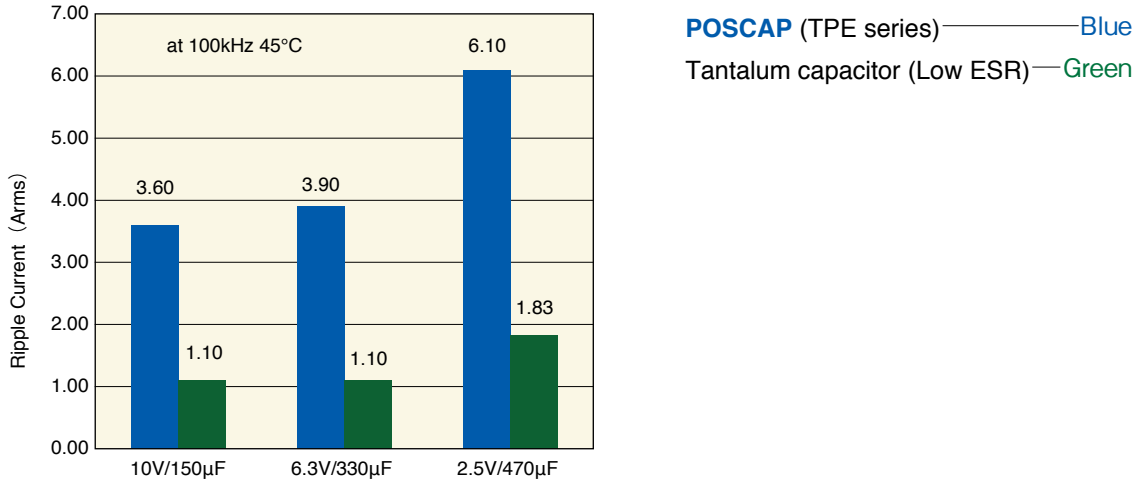
Characteristics



Tantalum Solid Capacitors with Conductive Polymer

1-5. Allowable ripple current

Comparison of allowable ripple current (POSCAP vs Tantalum capacitor)



The allowable ripple current of a capacitor is an important characteristic 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.

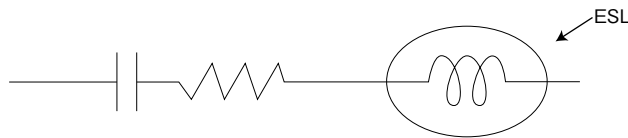
Because the ESR of the POSCAP is so small, it can reach a high ripple current rating compared to other electrolytic capacitors.

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) Equivalent series circuit of capacitor



(b) Approximate ESL value of POSCAP

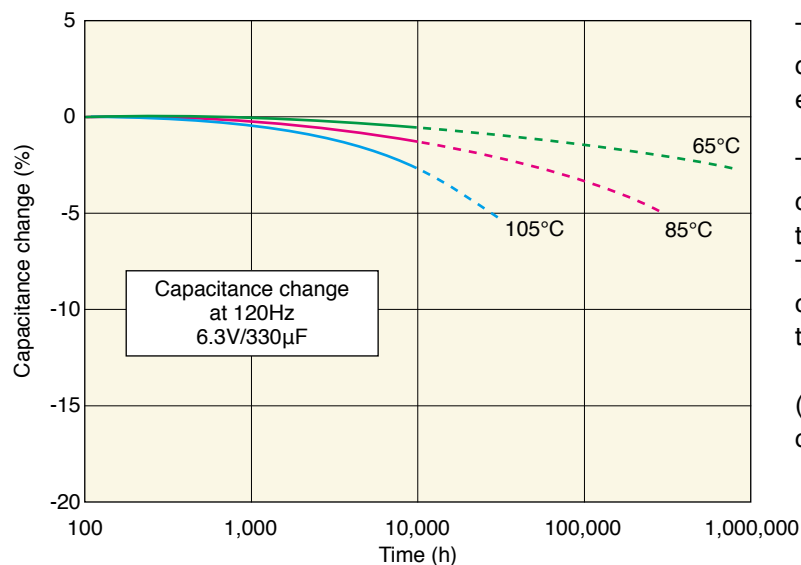
(unit: nH)

Size Code	at 10 MHz	Size Code	at 10 MHz
B1	1.2	D15T	0.9
B2	1.3	D2T	0.5/0.8
B2S	0.7	D2E	1.8
C1	1.9	D2	2.0
C2	1.8	D3L	2.3
C3	2.0	D4D	1.5
C	2.3	D4	2.5
D12T	1.0		

※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. Temperature acceleration 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.

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TPU

TPL-TPLF

TPF

TPG

TPE

TPB

TPC

TPD

TA

TH

TQC



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 presumption 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)

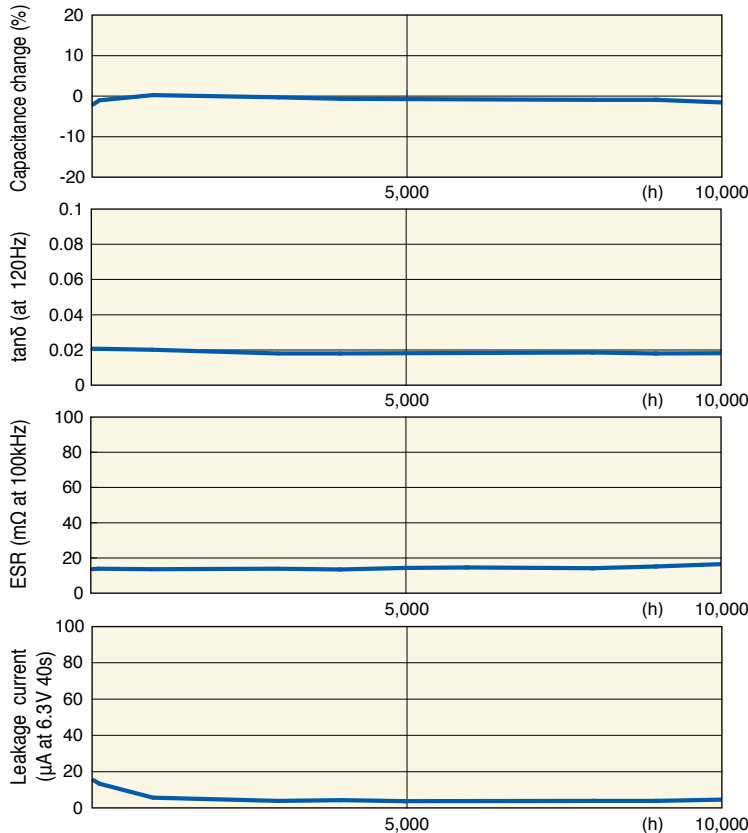
To : Maximum operating temperature (°C)

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.



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TPB

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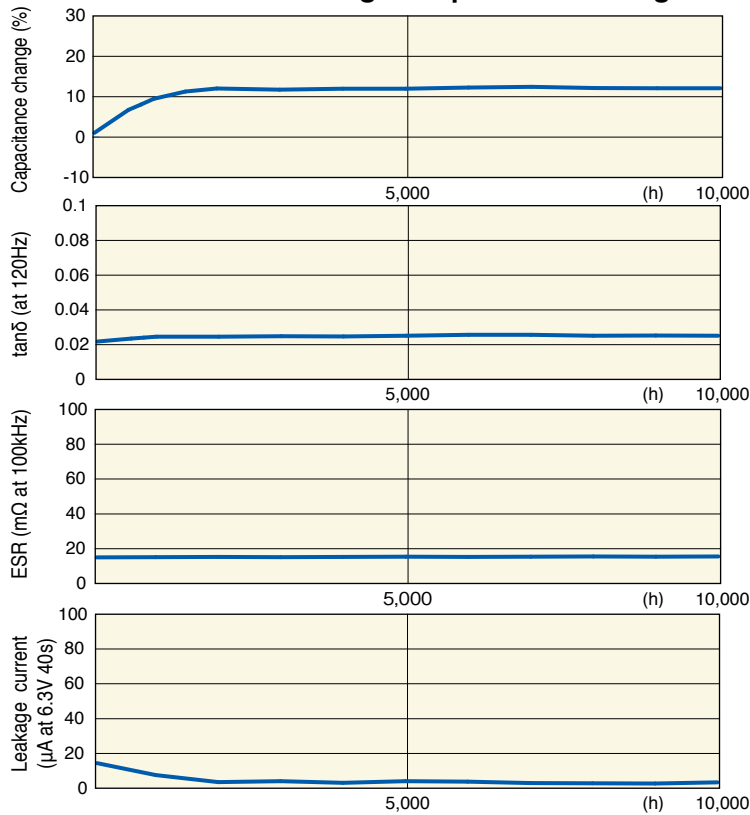
TA

TH

TQC

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.

POSCAP

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 - TPF
 - TPG
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 - TQC

Surface mount type

TPSF Series Up Grade

RoHS compliance

Low ESR · Small size · High capacitance

Face down terminal type

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



TPF

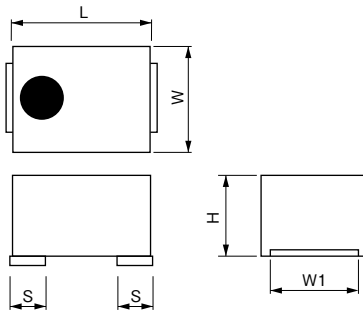
TPSF
Small size

Specifications

Items	Condition	Specifications	
Rated voltage (V)	—	2.0	11
Surge voltage (V)	—	2.3	13
Category temperature range (°C)	—	-55 to +105	
Capacitance tolerance (%)	120Hz/20°C	M : ±20	
Rated capacitance range (μF)	120Hz/20°C	62 to 270	
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list	
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C Z/Z _{20°C}	0.6 to 2.0
		+105°C Z/Z _{20°C}	0.6 to 2.0
Endurance	105°C, 1,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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 (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	ESL (nHmax) *Typical value	Maximum allowable ripple current (mA _{rms}) 100kHz ^{※1}	MSL	
												Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
B2S	11TPSF62MAIG ^{※2}	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

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

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

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Surface mount type

TPU Series

RoHS compliance

Small size · Low profile

Face down terminal type

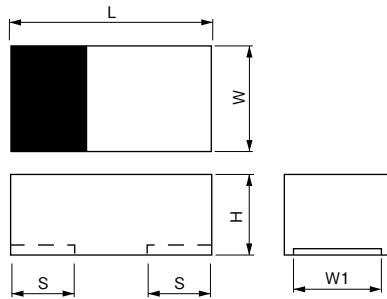
TPU series has a real advantage in size-sensitive applications using a face down terminal structure.



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 (°C)	—	-55 to +85			
Capacitance tolerance (%)	120Hz/20°C	M : ±20			
Rated capacitance range (μF)	120Hz/20°C	4.7 to 150			
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C Z/Z _{20°C}	0.6 to 2.0		
		+85°C Z/Z _{20°C}	0.6 to 2.0		
Endurance	85°C, 1,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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
A09	3.2	1.6	0.9	0.8	1.2
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	
15		S09		
22	S09		S09	
33		S09	S11	A09
47	S09	S11	A09	
68	S11	A09		
100	A09			
150			B09	

TPU series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA rms) 100kHz*1	MSL	
											Reflow temp. ≤260°C	Reflow temp. ≤250°C
S09	10TPU4R7MSI	10	85	4.7	10	85	10.0	4.7	300	360	—	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
	4TPU33MSI	4.0	85	33	4.0	85	10.0	26.4	150	510	—	3
	4TPU15MSI	4.0	85	15	4.0	85	10.0	6.0	250	400	—	3
	2R5TPU47MSI	2.5	85	47	2.5	85	10.0	23.5	150	510	—	3
	2R5TPU22MSI	2.5	85	22	2.5	85	10.0	5.5	250	400	—	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
A09	10TPU33MAI	10	85	33	10	85	10.0	33.0	150	510	3	3
	6TPU47MAI	6.3	85	47	6.3	85	10.0	29.6	150	510	3	3
	4TPU68MAI	4.0	85	68	4.0	85	10.0	27.2	150	510	3	3
	2R5TPU100MAI	2.5	85	100	2.5	85	10.0	25.0	150	510	3	3
B09	6TPU150MBI*2	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°C

*2 Under development

TPU

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TPU

TPL-TPLF

TPF

TPG

TPE

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TPD

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TH

TQC

Surface mount type

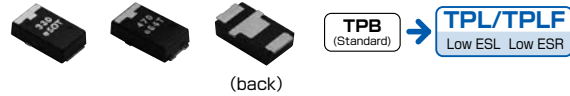
TPL·TPLF Series Up Grade

RoHS compliance

Low ESR · Low ESL

Face down terminal type

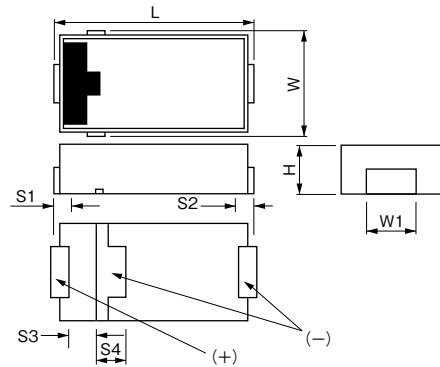
TPL series has a low ESL and low ESR advantage using an unique face down terminal structure.



Specifications

Items	Condition	Specifications			
Rated voltage (V)	—	2.0	2.5	4.0	6.3
Surge voltage (V)	—	2.3	2.9	4.6	7.2
Category temperature range (°C)	—	-55 to +105			
Capacitance tolerance (%)	120Hz/20°C	M : ±20			
Rated capacitance range (μF)	120Hz/20°C	100 to 560			
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0	
		+105°C	Z/Z _{20°C}	0.6 to 2.0	
Endurance	105°C, 2,000h*, rated voltage applied (* 2R5TPL330M9U:1,000h)	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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

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

T P L · T P L F

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■ TPL series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	ESL (nHmax) *Typical value	Maximum allowable ripple current (mA _{rms}) 100kHz ^{※1}	MSL	
												Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
D12T	6TPL100MD ^{※2}	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}	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
D2T	2R5TPL470MC	2.5	105	470	2.5	105	10.0	117.5	12	0.8	3400	3	2a
	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}	2.5	105	470	2.5	105	10.0	235.0	7	0.8	4400	3	2a
	2R5TPL330MC	2.5	105	330	2.5	105	10.0	82.5	12	0.8	3400	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
	2R5TPL330M7 ^{※2}	2.5	105	330	2.5	105	10.0	165.0	7	0.8	4400	3	2a

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

■ TPLF series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	ESL (nHmax) *Typical value	Maximum allowable ripple current (mA _{rms}) 100kHz ^{※1}	MSL	
												Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
D2T	2TPLF560M6 ^{※2}	2.0	105	560	2.0	105	10.0	224.0	6	0.5	4700	3	2a
	2TPLF560M5 ^{※2}	2.0	105	560	2.0	105	10.0	224.0	5	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
	2TPLF330M7	2.0	105	330	2.0	105	10.0	132.0	7	0.5	4400	3	2a
	2TPLF330M6	2.0	105	330	2.0	105	10.0	132.0	6	0.5	4700	3	2a
	2TPLF330M5	2.0	105	330	2.0	105	10.0	132.0	5	0.5	5200	3	2a
	2TPLF220M7	2.0	105	220	2.0	105	10.0	88.0	7	0.5	4400	3	2a
	2TPLF220M6	2.0	105	220	2.0	105	10.0	88.0	6	0.5	4700	3	2a

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

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

Surface mount type

TPF Series

RoHS compliance

Low ESR

High capacitance

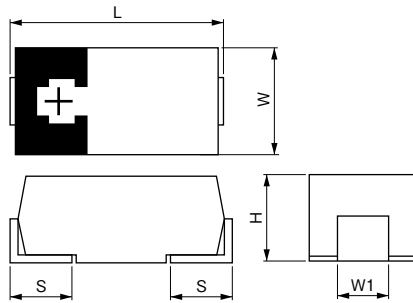
TPF series has low ESR and high capacitance at standard form.



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 (°C)	—	-55 to +105				
Capacitance tolerance (%)	120Hz/20°C	M : ±20				
Rated capacitance range (μF)	120Hz/20°C	150 to 680				
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0		
		+105°C	Z/Z _{20°C}	0.6 to 2.0		
Endurance	105°C, 2,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/C	Within+50%, -20% of the initial value(D2E size)			
		DF	Within+40%, -20% of the initial value (Except for the above model)			
		LC	≤ 1.5 times of the initial limit			
Surge	105°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/C	Within±5% of the initial value			
		DF	Within the initial limit			
		LC	≤ 3 times of the initial limit			

Dimensions



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

(unit: mm)

※1 ±0.1:D2E

Size list

RV : Rated voltage

RV \ μF	2.0	2.5	4.0	6.3	10.0
150					D3L
220	D2E			D3L	
330	D2E	D3L	D3L	D3L	
470		D3L	D3L		
680		D3L			

TPF series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA)rms 100kHz*1	MSL Reflow temp. ≤260°C	MSL Reflow temp. ≤250°C
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
	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

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

※1 100k to 500kHz, 45°C

TPF

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Tantalum Solid Capacitors with Conductive Polymer

Surface mount type

TPG Series

RoHS compliance

Small size

High capacitance

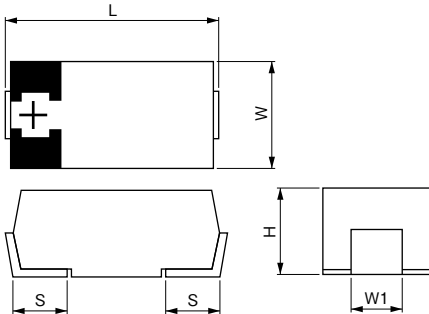
TPG series is high capacitance model of small and low-profile product. Suitable for the miniaturization design of the electronics device.



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 (°C)	—	-55 to +105					
Capacitance tolerance (%)	120Hz/20°C	M : ±20					
Rated capacitance range (μF)	120Hz/20°C	33 to 220					
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0			
		+105°C	Z/Z _{20°C}	0.6 to 2.0			
Endurance	85°C, 1,000h, rated voltage applied or 105°C, 1,000h, category voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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

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

TPG series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA _{rms}) 100kHz*1	MSL	
											Reflow temp. ≤260°C	Reflow temp. ≤250°C
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
	10TPG33M	10	85	33	8.0	105	10.0	33.0	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
	4TPG220M	4.0	85	220	3.2	105	10.0	88.0	70	1000	3	3

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

*1 100k to 500kHz, 45°C

TPG

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Surface mount type

TPE Series

Up Grade

RoHS compliance

Low ESR (B2,C2,C3 size)

This products is the miniaturized version of TPE series.



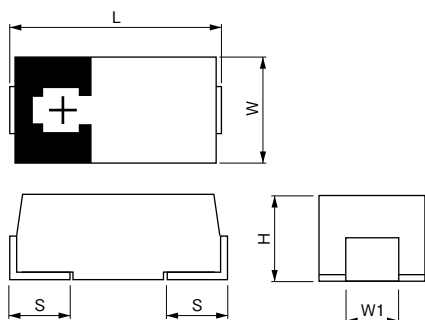
TPB
(Standard)

TPE
Low ESR

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 (°C)	—	-55 to +105					
Capacitance tolerance (%)	120Hz/20°C	M : ±20					
Rated capacitance range (μF)	120Hz/20°C	47 to 330					
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0			
		+105°C	Z/Z _{20°C}	0.6 to 2.0			
Endurance	105°C, 2,000h, (B2size : 1,000h) rated voltage applied ※Rated temp, 85°C products: 85°C, 1,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/C	Within+50%, -20% (2R5TPE220MDGB(MAZB,MAPB,MAFB), 2R5TPE330MAZB, 2TPE330MIB(MFB,MAFB,MAFGB,MADGB), 2R5TPE330MFC2(CC2,9C2))				
		DF	Within+40%, -20% of the initial value (Except for the above model)				
		LC	≤ 3 times of the initial limit				
Surge	105°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied ※Rated temp 85°C products: 85°C, 1,000 cycles	ΔC/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
C2	6.0	3.2	1.8	1.3	1.8
C3	6.0	3.2	2.5	1.3	1.8

※1 ±0.2:C3

Size list

RV : Rated voltage

RV \ μF	2.0	2.5	4.0	6.3	8.0	10
47						B2
100			B2	B2	B2,C2	
120				B2		
150		B2	B2	B2,C2		C3
180						C3
220		B2	B2,C2	B2,C3		
330	B2	B2,C2				

TPE

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■ TPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA rms) 100kHz※1	MSL	
											Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
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※2	6.3	85	220	5.0	105	8.0	138.6	35	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
	6TPE100MZB	6.3	105	100	6.3	105	8.0	63.0	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
	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
	2R5TPE150MZB	2.5	105	150	2.5	105	8.0	37.5	35	1400	3	3
	2TPE330MIB	2.0	105	330	2.0	105	8.0	132.0	18	1800	3	3
2TPE330MFB	2.0	105	330	2.0	105	8.0	132.0	15	2000	3	3	
2TPE330MAFGB	2.0	85	330	1.8	105	8.0	132.0	15/300kHz	1800	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	
C2	8TPE100MPC2	8.0	105	100	8.0	105	8.0	80.0	25	2200	3	3
	6TPE150MPC2	6.3	105	150	6.3	105	8.0	94.5	25	2200	3	3
	6TPE150MIC2	6.3	105	150	6.3	105	8.0	94.5	18	2600	3	3
	4TPE220MIC2	4.0	105	220	4.0	105	8.0	88.0	18	2600	3	3
	4TPE220MFC2	4.0	105	220	4.0	105	8.0	88.0	15	2900	3	3
	2R5TPE330MFC2	2.5	105	330	2.5	105	8.0	82.5	15	2900	3	3
	2R5TPE330MCC2	2.5	105	330	2.5	105	8.0	82.5	12	3300	3	3
	2R5TPE330M9C2	2.5	105	330	2.5	105	8.0	82.5	9	3700	3	3
C3	10TPE180MGC	10	105	180	10	105	10.0	180.0	55	1500	—	3
	10TPE150MGC	10	105	150	10	105	10.0	150.0	55	1500	—	3
	6TPE220MPC	6.3	105	220	6.3	105	8.0	138.6	25	2400	3	3
	6TPE220MIC	6.3	105	220	6.3	105	8.0	138.6	18	2800	3	3

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

※1 100k to 500kHz.45°C
 ※2 Under development

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Surface mount type

TPE Series

Up Grade

RoHS compliance

Low ESR (D2E, D3L, D4 size)

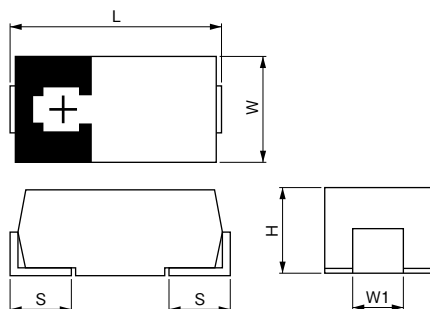
TPE series has low ESR and can aid in the miniaturization of many products.



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 (°C)	—	-55 to +105				
Capacitance tolerance (%)	120Hz/20°C	M: ±20				
Rated capacitance range (μF)	120Hz/20°C	68 to 1,500				
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0		
		+105°C	Z/Z _{20°C}	0.6 to 2.0		
Endurance	105°C, 2,000h, rated voltage applied *Rated temp. 85°C products: 85°C, 1,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied *6TPE330MAP, 6TPE220MAP:85°C	ΔC/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	D2E	D2E, D3L	D4
470	D2E	D2E	D3L	D4	D4	
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
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

TPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mArms) 100kHz*1	MSL	
											Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
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
	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

*1 ±0.1:D2E

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■ TPE series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA _{RMS}) 100kHz※1	MSL	
											Reflow temp. ≤260°C	Reflow temp. ≤250°C
D2E	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
	4TPE150M	4.0	105	150	4.0	105	10.0	60.0	25	2400	3	2a
	4TPE150MI	4.0	105	150	4.0	105	10.0	60.0	18	2800	3	2a
	2R5TPE470M	2.5	105	470	2.5	105	10.0	117.5	25	2400	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
	2TPE470M9	2.0	105	470	2.0	105	10.0	188.0	9	3900	—	3
2TPE470M7	2.0	105	470	2.0	105	10.0	188.0	7	4400	—	3	
2TPE470M6	2.0	105	470	2.0	105	10.0	188.0	6	4700	—	3	
2TPE330M9	2.0	105	330	2.0	105	10.0	132.0	9	3900	—	3	
2TPE330M7	2.0	105	330	2.0	105	10.0	132.0	7	4400	—	3	
2TPE330M6	2.0	105	330	2.0	105	10.0	132.0	6	4700	—	3	
D3L	10TPE220ML	10	105	220	10	105	10.0	220.0	25	2400	—	2a
	10TPE220ML※2	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
	2R5TPE680MIL	2.5	105	680	2.5	105	10.0	170.0	18	2800	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
	4TPE680M	4.0	105	680	4.0	105	15.0	272.0	25	3000	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
	2R5TPE1000M	2.5	105	1000	2.5	105	15.0	250.0	25	3000	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°C

※2 Under development

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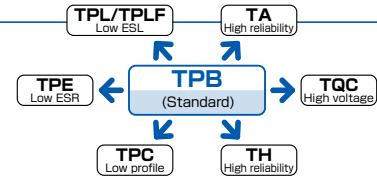
Surface mount type

TPB Series

RoHS compliance

Standard

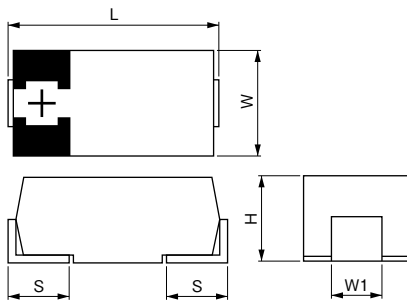
TPB series are the standard products corresponding to the diversification of the needs. B2 size is the miniaturized version of TPB series.



Specifications

Items	Condition	Specifications				
Rated voltage (V)	—	2.5	4.0	6.3	8.0	10
Surge voltage (V)	—	2.9	4.6	7.2	9.2	12
Category temperature range (°C)	—	-55 to +105				
Capacitance tolerance (%)	120Hz/20°C	M : ±20				
Rated capacitance range (μF)	120Hz/20°C	33 to 470				
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list				
Characteristics of impedance ratio at high temp. and low temp.	100kHz/20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0		
		+105°C	Z/Z _{20°C}	0.6 to 2.0		
Endurance	105°C, 2,000h B2 size : 105°C, 1,000h, Rated voltage applied *Rated temp. 85°C products: 85°C, 1,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied *4TPB150MA:85°C	ΔC/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	2.5	4.0	6.3	8.0	10.0
33					B2
47					B2
68		B2	B2		C
82				C	
100	B2				
150					D3L
220			D3L		D3L, D4
330		D3L	D3L, D4		D4
470			D4		

(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
C	6.0	3.2	2.8	1.3	1.8
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

TPB

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■ TPB series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA _{rms}) 100kHz※1	MSL	
											Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
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
C	10TPB68MC	10	105	68	10.0	105	8.0	68.0	55	1500	3	3
	8TPB82MC	8.0	105	82	8.0	105	8.0	65.6	45	1700	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
	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°C

TPB

POSCAP

POSCAP Line-up

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- TPF
- TPG
- TPE
- TPB**
- TPC
- TPD
- TA
- TH
- TQC

Surface mount type

TPC Series

RoHS compliance

Low profile

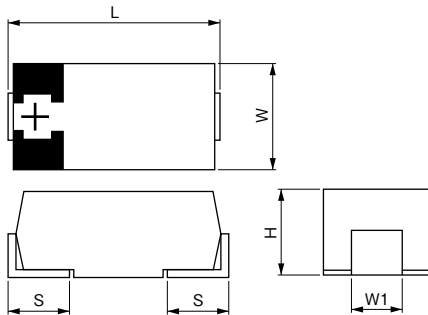
TPC series has low profile and low ESR.
 TPC series aids in the miniaturization of any products.
 B1 size is miniaturized, low profile version of TPC series.



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 (°C)	—	-55 to +105					
Capacitance tolerance (%)	120Hz/20°C	M: ±20					
Rated capacitance range (μF)	120Hz/20°C	10 to 330					
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list					
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0			
		+105°C	Z/Z _{20°C}	0.6 to 2.0			
Endurance	105°C, 2,000h, rated voltage applied C1 size: 1,000h *Rated temp. 85°C products: 85°C, 1,000h, rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied *Rated temp. 85°C products: 85°C	ΔC/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
C1	6.0	3.2	1.4	1.3	1.8
D2	7.3	4.3	1.9	1.3	2.4

Size list

RV : Rated voltage

RV \ μF	2.5	4.0	6.3	8.0	10	12.5
10						B1
15						B1
22				B1		
33			B1	C1	B1	
47		B1	B1			
56	B1					
68			C1		D2	
100		C1	D2, C1		D2	
150			D2	D2		
330			D2			

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■ TPC series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA _{RMS}) 100kHz※1	MSL	
											Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
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
	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
C1	8TPC33M	8.0	105	33	8.0	105	10.0	26.4	70	1200	3	3
	6TPC100MC	6.3	85	100	5.0	105	10.0	63.0	55	1300	3	3
	6TPC68M	6.3	105	68	6.3	105	10.0	42.8	55	1300	3	3
	4TPC100M	4.0	105	100	4.0	105	10.0	40.0	55	1300	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°C

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- TPD
- TA
- TH
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Surface mount type

TPD Series

RoHS compliance

Low ESR

High capacitance

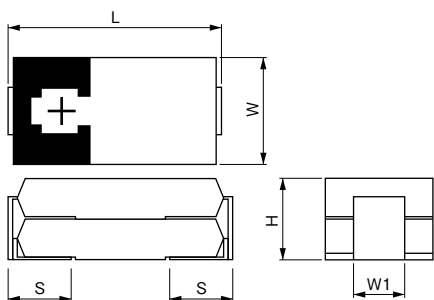
TPD series has low ESR and high capacitance. It is the most suitable for the high frequency and high current switching power supply applications.



Specifications

Items	Condition		Specifications		
Rated voltage (V)	-		2.5	4.0	6.3
Surge voltage (V)	-		2.9	4.6	7.2
Category temperature range (°C)	-		-55 to +105		
Capacitance tolerance (%)	120Hz/20°C		M : ±20		
Rated capacitance range (μF)	120Hz/20°C		470 to 1000		
Dissipation Factor (DF)	120Hz/20°C		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°C		Please see the attached characteristics list		
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0	
		+105°C	Z/Z _{20°C}	0.6 to 2.0	
Endurance	105°C, 2,000h, Rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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
D4D	7.3	4.3	3.6	1.3	2.4

Size list

RV : Rated voltage

μF \ RV	2.5	4.0	6.3
470	D4D		D4D
680	D4D	D4D	
1,000	D4D		

TPD series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mArms) 100kHz※1	MSL	
											Reflow temp. ≤260°C	Reflow temp. ≤250°C
D4D	6TPD470M	6.3	105	470	6.3	105	10.0	296.1	10	4400	3	2a
	4TPD680M	4.0	105	680	4.0	105	10.0	272.0	10	4400	3	2a
	2R5TPD1000M	2.5	105	1000	2.5	105	10.0	250.0	10	4400	3	2a
	2R5TPD1000M8	2.5	105	1000	2.5	105	10.0	250.0	8	4900	3	2a
	2R5TPD1000M6	2.5	105	1000	2.5	105	10.0	250.0	6	5600	3	2a
	2R5TPD1000M5	2.5	105	1000	2.5	105	10.0	250.0	5	6100	3	2a
	2R5TPD680M6	2.5	105	680	2.5	105	10.0	170.0	6	5600	3	2a
	2R5TPD680M5	2.5	105	680	2.5	105	10.0	170.0	5	6100	3	2a
	2R5TPD470M6	2.5	105	470	2.5	105	10.0	117.5	6	5600	3	2a
	2R5TPD470M5	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°C

TPD

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Surface mount type

TA Series

RoHS compliance

High reliability

(For the car electronics)

TA series are high reliability products, which are improved heat-resistance and humidity-resistance, suitable for the in-car electronics equipment. They are produced at factory which was certified according to "ISO/TS16949".

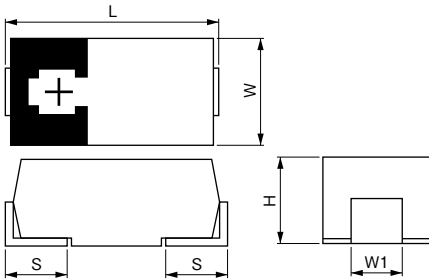


Specifications

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 (°C)	—	-55 to +105			
Capacitance tolerance (%)	120Hz/20°C	M: ±20			
Rated capacitance range (μF)	120Hz/20°C	47 to 680			
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}	0.6 to 2.0	
		+105°C	Z/Z _{20°C}	0.6 to 2.0	
Endurance	105°C, 2,000h, (B2 size : 1,000h) rated voltage applied	ΔC/C	Within ±20% of the initial value		
		DF	≤ 1.5 times of the initial limit		
		LC	Within the initial limit		
Damp heat (Load)	85°C, 85 to 90%RH, 500h, rated voltage applied	ΔC/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		
Damp heat (Steady state)	60°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/C	Within +40%, -20% of the initial value *1		
		DF	≤ 1.5 times of the initial limit		
		LC	≤ 3 times of the initial limit		
Surge	105°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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))

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 (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA Arms) 100kHz*1	MSL	
											Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
B2	10TAB47M	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	10TAE68M	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	
D3L	10TAE220ML	10	105	220	10	105	10.0	220.0	25	2400	3	3
	10TAE150ML	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°C

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Surface mount type

TH Series

RoHS compliance

Guaranteed at 125°C

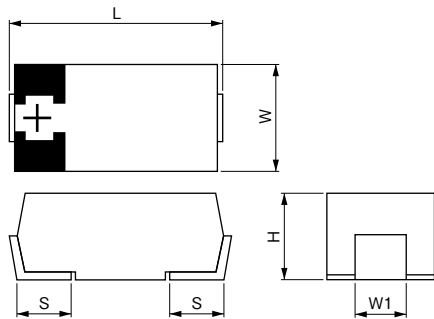
TH series has 125°C capability guaranteed. It is the most suitable for the high reliability industrial equipment.



Specifications

Items	Condition	Specifications												
		THB			THC			THD		THE				
Series	-	2.5	4.0	6.3	10	2.5	4.0	6.3	10	2.5	6.3	2.5	4.0	6.3
Rated voltage (V)	-	2.9	4.6	7.2	12	2.9	4.6	7.2	12	2.9	7.2	2.9	4.6	7.2
Surge voltage (V)	-	-55 to +125												
Category temperature range (°C)	-	M : ±20												
Capacitance tolerance (%)	120Hz/20°C	220 to 680			68 to 220			330 to 680		150 to 330				
Rated capacitance range (μF)	120Hz/20°C	Please see the attached characteristics list												
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list												
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z _{20°C}			0.6 to 2.0								
		+125°C	Z/Z _{20°C}			0.6 to 2.0								
Endurance	125°C, 1,000h, category voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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
D4D	7.3	4.3	3.6	1.3	2.4

※1 ±0.2:D2 ※2 ±0.2:D3L,D4,D4D

Size list

RV : Rated voltage

μF	Series	RV			
		2.5	4.0	6.3	10
68	THC				D2
	THE			D2E	
220	THB			D3L	D4
	THC	D2	D2		
330	THE		D2E		
	THB		D3L	D4	D4
470	THD			D4D	
	THE	D2E			
680	THB		D4		
	THD	D4D			

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■ TH series characteristics list

Series	Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA rms) 100kHz※1	MSL	
												Reflow temp. ≤ 260°C	Reflow temp. ≤ 250°C
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		
THD	D4D	6THD330M	6.3	105	330	4.0	125	10.0	207.9	10	4400	—	5
		2R5THD680M	2.5	105	680	1.6	125	10.0	170.0	10	4400	—	5

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

※1 100k to 500kHz,45°C

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Surface mount type

TQC Series

Up Grade

RoHS compliance

High voltage

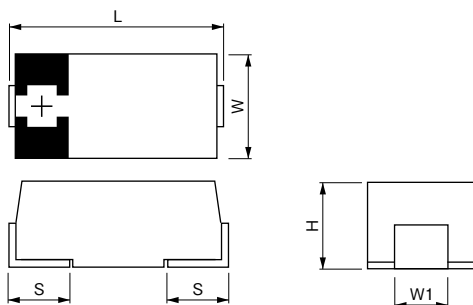
TQC series is perfect for high voltage, low ESR and low profile applications. It is the most suitable for pass-con of the motor driver by 12V, the input of the DCDC converter.



Specifications

Items	Condition	Specifications			
Rated voltage (V)	—	16	20	25	35
Surge voltage (V)	—	20	23	29	40
Category temperature range (°C)	—	-55 to +105			
Capacitance tolerance (%)	120Hz/20°C	M : ±20			
Rated capacitance range (μF)	120Hz/20°C	5.6 to 100			
Dissipation Factor (DF)	120Hz/20°C	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°C	Please see the attached characteristics list			
Characteristics of impedance ratio at high temp. and low temp.	100kHz/+20°C	-55°C	Z/Z20°C	1.0 to 2.0	
		+105°C	Z/Z20°C	0.6 to 1.0	
Endurance	105°C, 2,000h Rated voltage applied	ΔC/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°C, 90 to 95%RH, 500h, No-applied voltage	ΔC/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°C, 1,000 cycles, 1kΩ discharge resistance, surge voltage applied	ΔC/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
C	6.0	3.2	2.8	1.3	1.8
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		C	D2
15	B2	C	D2	
22	C	D2	D2	
33	D2		D3L	
47	D2	D2, D3L		
68	D2, D3L			
100	D3			

TQC

POSCAP

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TPSF

TPU

TPL·TPLF

TPF

TPG

TPE

TPB

TPC

TPD

TA

TH

TQC

Tantalum Solid Capacitors with Conductive Polymer

■ TQC series characteristics list

Size code	Part number	Rated voltage (V)	Rated temperature (°C)	Rated capacitance (μF)	Category voltage (V)	Category temperature (°C)	DF (% max)	LC (μA) max/5min.	ESR (mΩmax) 100kHz/20°C	Maximum allowable ripple current (mA)rms 100kHz ^{*1}	MSL	
											Reflow temp. ≤260°C	Reflow temp. ≤250°C
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
C	25TQC10M	25	105	10	25	105	10.0	25.0	95	900	—	3
	20TQC15M	20	105	15	20	105	10.0	30.0	80	1000	—	3
	16TQC22M	16	105	22	16	105	10.0	35.2	80	1000	—	3
D2	35TQC10M	35	105	10	35	105	10.0	35.0	120	1000	—	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
	20TQC47MY	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
	16TQC68MY	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	25TQC33M	25	105	33	25	105	10.0	82.5	60	1400	—	3
	20TQC47M	20	105	47	20	105	10.0	94.0	55	1450	—	3
	16TQC68M	16	105	68	16	105	10.0	108.8	50	1500	—	3
D3	16TQC100M	16	105	100	16	105	10.0	160.0	50	1800	—	3

*1 100k to 500kHz.105°C *2 100k to 300kHz.105°C

TQC

POSCAP

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