

Notices

■ Applicable Laws and Regulations

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

■ Limited applications

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

Items to be observed

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

■ For specifications

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

■ Conditions of use

- Before using the products, carefully check the effects on their quality and performance, and determined whether or not they can be used. These products are designed and manufactured for general-purpose and standard use in general electronic equipment. These products are not intended for use in the following special conditions.
 - (1) In liquid, such as Water, Oil, Chemicals, or Organic solvent.
 - (2) In direct sunlight, outdoors, or in dust.
 - (3) In vapor, such as dew condensation water of resistive element, or water leakage, salty air, or air with a high concentration corrosive gas, such as Cl₂, H₂S, NH₃, SO₂, or NO_x.
 - (4) In an environment where strong static electricity or electromagnetic waves exist.
 - (5) Mounting or placing heat-generating components or inflammables, such as vinyl-coated wires, near these products.
 - (6) Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin and other material.
 - (7) Using solvent, water or water-soluble cleaner for flux cleaning agent after soldering. (In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues)
 - (8) Using in the atmosphere which strays Acid or alkaline.
 - (9) Using in the atmosphere which there are excessive vibration and shock.
- Please arrange circuit design for preventing impulse or transitional voltage. Do not apply voltage, which exceeds the full rated voltage when the capacitors receive impulse voltage, instantaneous high voltage, high pulse voltage etc.
- Our products there is a product are using an electrolyte solution. Therefore, misuse can result in rapid deterioration of characteristics and functions of each product. Electrolyte leakage damages printed circuit and affects performance, characteristics, and functions of customer system.

⚠ Guidelines and precautions (POSCAP)

1. Circuit design

1.1 Prohibited circuits

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

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

1.2 Failure and life-span

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

The mainly failure modes are as follows.

* B2 size or less : 1.0 %

1.2-1 Contingency failure

The main causes of failure are thermal stresses cause by the soldering or thermal use environment, along with heat stresses, electrical stresses or mechanical stresses. The most common failure mode is a short circuit.

In case a short circuit occurs, ensure safety by fully considering the followings.

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

1.2-2 Wear-out failure (lifetime)

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

1.3 Reduction of failure stress

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

Failure rate

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

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

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

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

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

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

1.4 Check the rated performance

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

1.5 Operating temperature and ripple current

- (a) Set the operating temperature so that it falls within the range stipulated in this delivery specification.
- (b) Do not apply current that exceeds the allowable ripple current. Ripple current should be controlled so that surface temperature of a capacitor do not exceed the rated temperature.
(For questions regarding TQC series, please contact us.)

1.6 Leakage current

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

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

1.7 Rapid charge and discharge limitation

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

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

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

*When TH series use under the ambient temperature more than 105 °C : 10 A

TPU series : 10 A

2. Mounting

2.1 Protect circuit

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

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

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

2.2 Considerations when soldering

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

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

2.3 Others

POSCAP's Electrical characteristics are affected by temperature and frequency fluctuations.

Design circuits after checking the amount of fluctuation.

3. Storage

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

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

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

Place where POSCAP is not exposed by direct sunshine.

Please unseal storage bag just before mounting and be conscious that POSCAP in the storage bag is used up.

When remainder unfortunately occurs, return them to the storage bag once again and, please seal the unsealed part by adhesive tape etc., including desiccants. Moreover, once and use it in time the storage bag is opened, store POSCAP according to the table's Floor Life "Time" and "conditions".

MSL	Floor life	
	Time	Conditions
2a	4 weeks	≤ 30 °C/60 %Rh
3	168 hours	≤ 30 °C/60 %Rh
5	48 hours	≤ 30 °C/60 %Rh

(Conform to IPC/JEDEC J-STD-020)

◇ Intellectual property right

We, Panasonic Group are providing the product and service that customers can use without anxiety, and are working positively on the protection of our products under intellectual property rights.

Representative patents relating to POSCAP are as follows:

US Patent Nos. 6168639 and 6313979

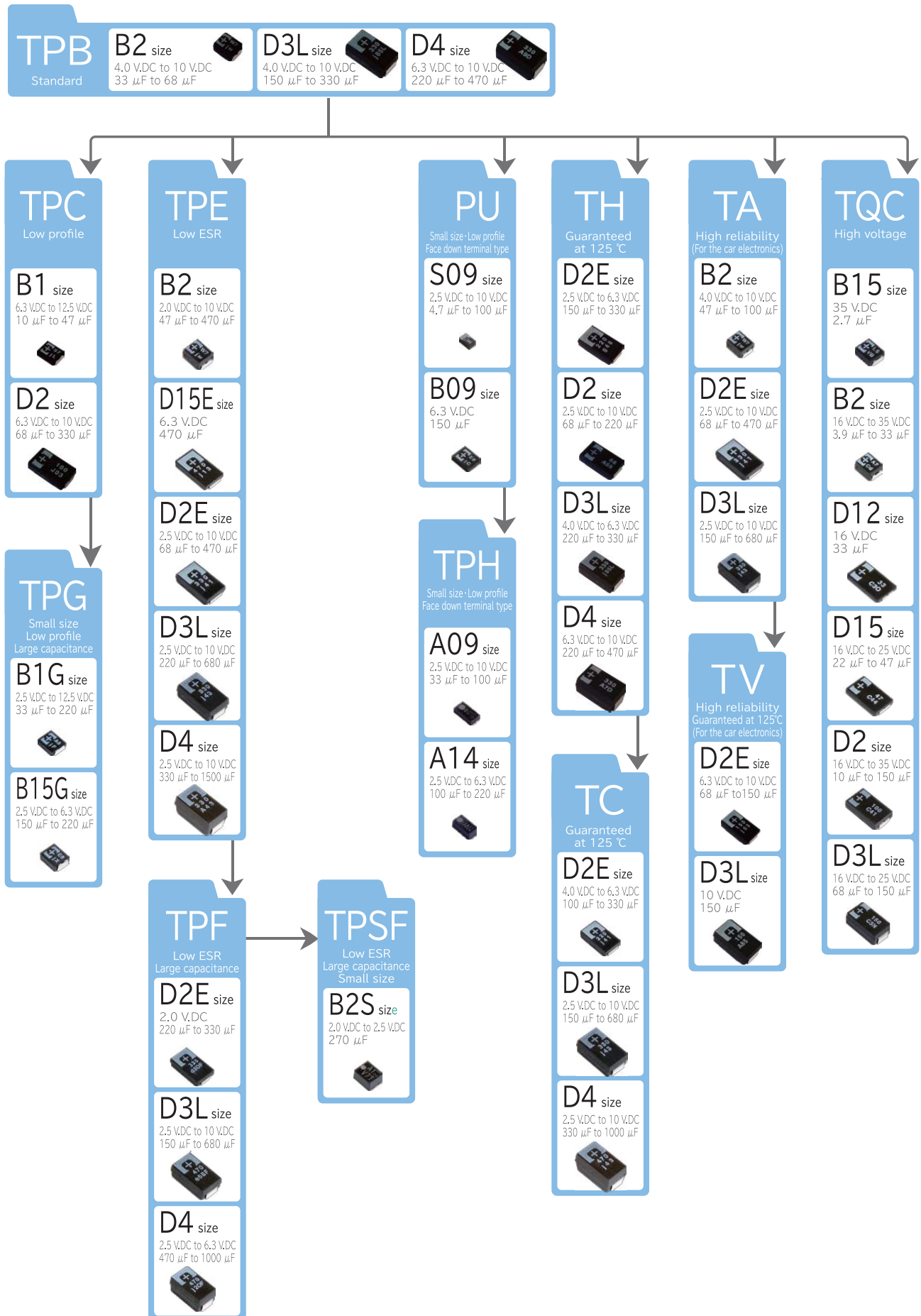
Line up

Series	Features	Small size/low profile	Large capacitance	Low ESR	For automotive	High voltage	Guaranteed at 125 °C	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm)		
													L	W	H
TPU	Small size Low profile Face down terminal	●						-55 to 85	2.5 to 10	150 to 300	4.7 to 100	S09	2.0	1.25	0.9
								-55 to 85	6.3	100	150	B09	3.5	2.8	0.9
TPH	Small size Low profile Face down terminal	●		●				-55 to 85	6.3 to 10	100 to 150	33 to 100	A09	3.2	1.6	0.9
								-55 to 105	2.5 to 6.3	150	47 to 100	A09	3.2	1.6	0.9
								-55 to 85	2.5 to 6.3	70	100 to 220	A14	3.2	1.6	1.4
TPG	Small size Low profile Large capacitance	●	●					-55 to 105	2.5 to 12.5	35 to 70	33 to 220	B1G	3.5	2.8	1.1
								-55 to 105	2.5 to 6.3	30 to 70	150 to 220	B15G	3.5	2.8	1.4
TPSF	Low ESR / Small size Large capacitance Face down terminal	●	●	●				-55 to 105	2.0 to 2.5	6 to 9	270	B2S	3.5	2.8	1.9
TPE	Low ESR				●			-55 to 105	2.0 to 10	11 to 35	47 to 470	B2	3.5	2.8	1.9
								-55 to 105	6.3	35	470	D15E	7.3	4.3	1.4
								-55 to 105	2.5 to 10	7 to 25	68 to 470	D2E	7.3	4.3	1.8
								-55 to 105	2.5 to 10	9 to 25	220 to 680	D3L	7.3	4.3	2.8
								-55 to 105	2.5 to 10	10 to 25	330 to 1500	D4	7.3	4.3	3.8
TPF	Low ESR Large capacitance	●	●					-55 to 105	2.0	6	220 to 330	D2E	7.3	4.3	1.8
								-55 to 105	2.5 to 10	5 to 15	150 to 680	D3L	7.3	4.3	2.8
								-55 to 105	2.5 to 6.3	5 to 10	470 to 1000	D4	7.3	4.3	3.8
TA	High reliability (for the car electronics)					●		-55 to 105	4.0 to 10	70	47 to 100	B2	3.5	2.8	1.9
								-55 to 105	2.5 to 10	9 to 25	68 to 470	D2E	7.3	4.3	1.8
								-55 to 105	2.5 to 10	15 to 25	150 to 680	D3L	7.3	4.3	2.8
TV	High reliability Guaranteed at 125 °C (for the car electronics)					●	●	-55 to 125	6.3 to 10	25	6 to 150	D2E	7.3	4.3	1.8
								-55 to 125	10	25	150	D3L	7.3	4.3	2.8

Line up

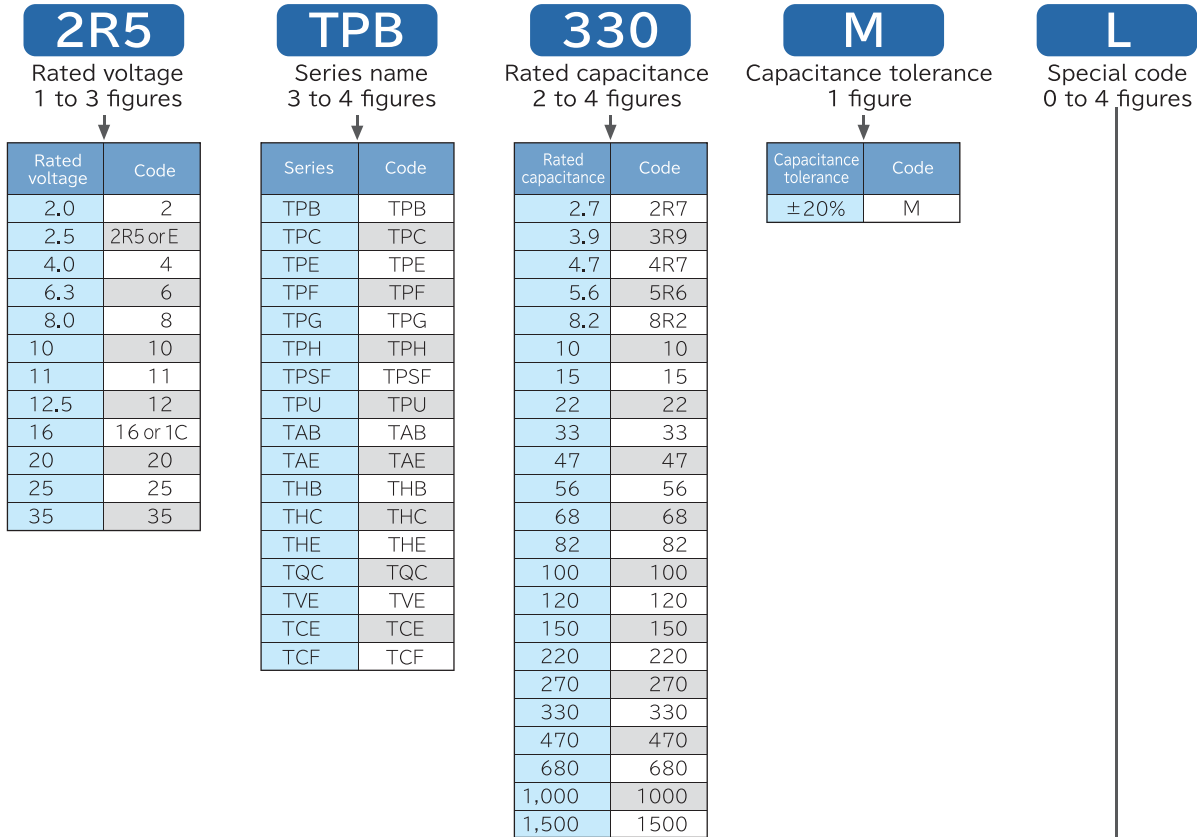
Series	Features	Small size/Low profile	Large capacitance	Low ESR	For automotive	High voltage	Guaranteed at 125 °C	Category temperature range (°C)	Rated voltage (V.DC)	ESR (mΩ)	Capacitance (μF)	Size code	Size (mm)		
													L	W	H
TQC	High voltage					●		-55 to 105	35	300	2.7	B15	3.5	2.8	1.4
								-55 to 105	16 to 35	90 to 400	3.9 to 33	B2	3.5	2.8	1.9
								-55 to 105	16	40	33	D12	7.3	4.3	1.15
								-55 to 105	16 to 25	55 to 70	22 to 47	D15	7.3	4.3	1.4
								-55 to 105	16 to 35	40 to 150	10 to 150	D2	7.3	4.3	1.9
								-55 to 105	16 to 25	50 to 70	68 to 150	D3L	7.3	4.3	2.8
TPB	Standard							-55 to 105	4.0 to 10	70	33 to 68	B2	3.5	2.8	1.9
								-55 to 105	4.0 to 10	40	150 to 330	D3L	7.3	4.3	2.8
								-55 to 105	6.3 to 10	35 to 40	220 to 470	D4	7.3	4.3	3.8
TPC	Low profile	●						-55 to 105	6.3 to 12.5	55 to 80	10 to 47	B1	3.5	2.8	1.1
								-55 to 105	6.3 to 10	40 to 45	68 to 330	D2	7.3	4.3	1.9
TH	Guaranteed at 125 °C					●		-55 to 125	2.5 to 6.3	15 to 25	150 to 330	D2E	7.3	4.3	1.8
								-55 to 125	2.5 to 10	40 to 45	68 to 220	D2	7.3	4.3	1.9
								-55 to 125	4.0 to 6.3	40	220 to 330	D3L	7.3	4.3	2.8
								-55 to 125	6.3 to 10	35 to 40	220 to 470	D4	7.3	4.3	3.8
TC	Guaranteed at 125 °C					●		-55 to 125	4.0 to 6.3	15 to 25	100 to 330	D2E	7.3	4.3	1.8
								-55 to 125	2.5 to 10	5 to 25	150 to 680	D3L	7.3	4.3	2.8
								-55 to 125	2.5 to 10	5 to 25	330 to 1000	D4	7.3	4.3	3.8

Diagram



Explanation of part numbers

Part number system



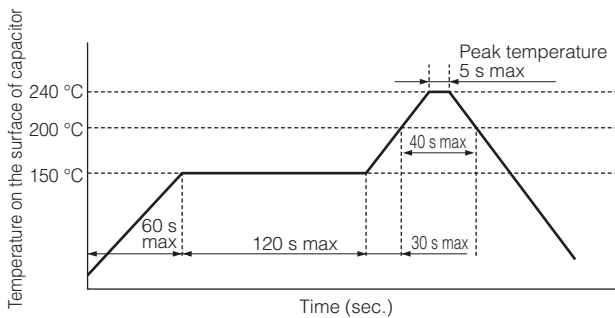
Standard		Code
TPE series		
B2 size	ESR 35mΩ max	ZB
	ESR 25mΩ max	PB
	ESR 21mΩ max	LB
	ESR 15mΩ max	FB
	ESR 15mΩ/300kHz max	FGB
	ESR 35mΩ max 85°C	AZB
	ESR 25mΩ max 85°C	APB
	ESR 15mΩ max 85°C	AFB
	ESR 13mΩ/300kHz max 85°C	ADGB
	ESR 11mΩ/300kHz max 85°C	AJGB
D15E size	ESR 35mΩ max 85°C	AZU
D2E size	ESR 25mΩ max 85°C	AP
D3L size	ESR 25mΩ max	L
	ESR 18mΩ max	IL
	ESR 15mΩ max	FL
	ESR 12mΩ max	CL
	ESR 10mΩ max	AL
	ESR 25mΩ max 85°C	AL
	ESR 9mΩ/500kHz max 85°C	A9EL
TPG series		
B1G size	ESR 35mΩ/300kHz max	ZGD
TPH series		
A09 size	ESR 150mΩ max	AHA
	ESR 100mΩ max	AEA
A14 size	ESR 70mΩ max	ABC
TPB series		
D3L size		L
TPC series		
85°C		A
B1 size		B

Standard		Code
TPF series		
D3L size	ESR 9mΩ max	9L
	ESR 7mΩ max	7L
	ESR 6mΩ max	6L
	ESR 5mΩ max	5L
D4 size	ESR 10mΩ max	AH
	ESR 6mΩ max	6H
	ESR 5mΩ max	5H
TPU series		
S09 size		SI
B09 size		BI
TQC series		
Capacitance enlarged type		YF
Capacitance enlarged type(B size)		YFB
Capacitance enlarged type(D12 size)		YFS
Capacitance enlarged type(D15 size)		YFT
Capacitance enlarged type(D2 size)		YFD
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 7mΩ max		7
ESR 6mΩ max		6
ESR 5mΩ max		5
ESR 35mΩ/300kHz max		ZG
ESR 30mΩ/300kHz max		UG
ESR 9mΩ/300kHz max		9G
ESR 6mΩ/500kHz max		6E
ESR 4mΩ/500kHz max		4E

Mounting specifications

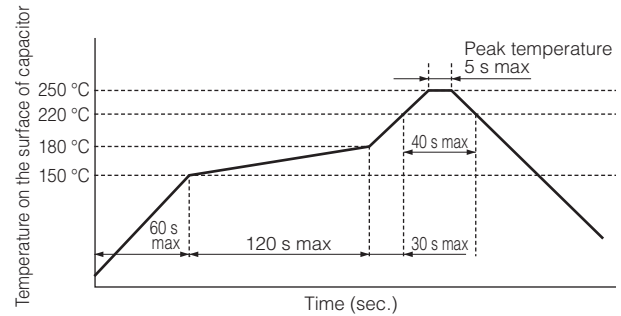
- Recommendable reflow soldering

<Recommended reflow soldering temperature profile>



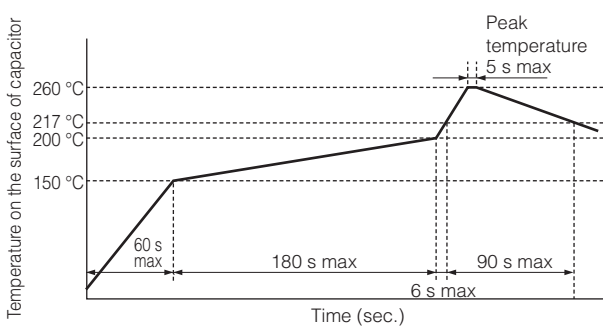
The cycles of reflow soldering : Twice (max)

<Peak temperature 250 °C lead free reflow soldering profile>



The cycles of reflow soldering : Twice (max)

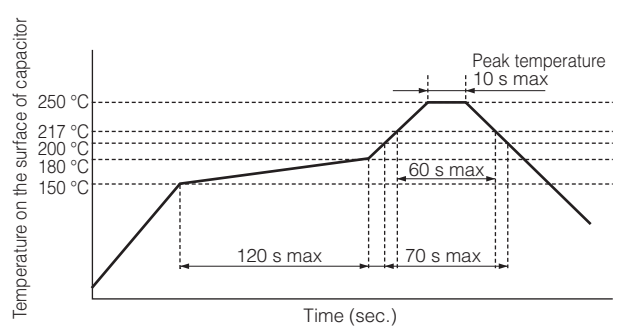
<Peak temperature 260 °C lead free reflow soldering profile>



The model of MSL "2a" is changed into MSL "3" with this reflow condition.

The cycles of reflow soldering : Twice (max)

<TQC series>



The cycles of reflow soldering : Twice (max)

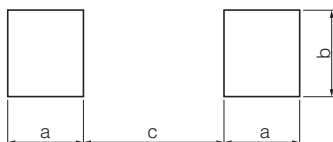
- Soldering with a soldering iron

Tip of a soldering iron : 350 °C max (TQC serie : 400 °C max) Power of a soldering iron : 30 W max

Working time : 3 sec. max (TQC serie : 5 sec max)

(Do not let the tip of soldering iron touch the POSCAP itself. Do not subject the POSCAP itself to excessive stress when soldering.)

Land Pattern

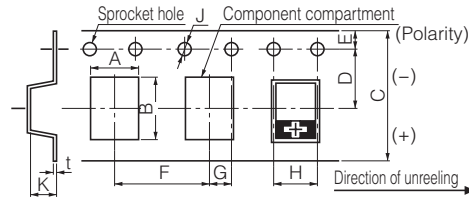


Unit : mm

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

Packing specifications

● Dimension of carrier tape

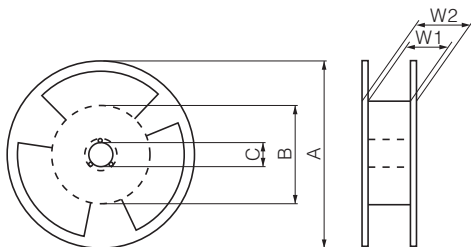


Unit : mm

Size code	A±0.1	B±0.1	C±0.3	D±0.05	E±0.1	F±0.1	G±0.05	H±0.1	J ^{+0.1} ₀	K±0.1	t±0.05
S09	1.65	2.4	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.3	0.25
A09	2.05	3.65	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.3	0.25
A14	2.05	3.65	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.7	0.25
B09	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.4	0.25
B1	3.2	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.4	0.25
B1G	3.25	3.9	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	1.7	0.25
B15	3.3	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	2.1	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	0.25
B2S	3.25	4.0	8.0	3.5	1.75	4.0	2.0	4.0	φ1.5	2.1	0.25
D12	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	1.7	0.3
D15	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.4	0.3
D15E	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	1.7	0.3
D2E	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	2.4	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
D4	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ1.5	4.2	0.3

- Dimension A and B are the measure of compartment's inside bottom.
- The (+) Polarity of the chip is placed on right side towards the unreeling direction.
- Dimension of the topcover tape Thickness of cover tape : 62±10 μm Width of cover tape : 9.5±0.2 mm 5.5±0.2 mm (φ180 reel)

● Reel dimension



Unit : mm

A	B	C	W1	W2
φ330±2	φ80±2	φ13.0±0.2	13.5±0.5	17.5±1.0
φ180 ⁰ ₋₃	φ60±2	φ13.0±0.2	9.0±0.5	11.4±1.0

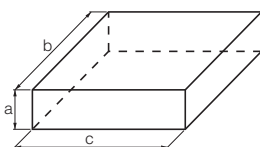
● Minimum packing quantity and weight

Size code	Quantity (pcs./Reel, φ180)	Typical weight (g)
S09, A09	3000	200
A14	2500	200
B09, B1	3000	200
B1G	2500	200
B15	2000	160
B15G	2500	200
B2, B2S	2000	200

Size code	Quantity (pcs./Reel, φ330)	Typical weight (g)
D12	4500	1200
D15	3000	1000
D15E	4000	1000
D2E, D2	3000	1000
D3L	2500	1100
D4	2000	1200

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

● Dimension of packing case



Unit : mm

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

● Units per packing case

Size code	Pieces/case	Size code	Pieces/case
S09, A09	15000	D12	22500
A14	12500	D15	15000
B09, B1	15000	D15E	20000
B1G	12500	D2E, D2	15000
B15	10000	D3L	12500
B15G	12500	D4	10000
B2, B2S	10000		

Surface Mount Type

POSCAP

Series : TPU



Features

- Small size, Low profile (L2.0 × W 1.25 × H 0.9 mm)
- Face down terminal type
- RoHS compliance, Halogen free

Specifications

Size code	S09	B09
Category temperature range	-55 °C to +85 °C	
Rated voltage range	2.5 V.DC to 10 V.DC	6.3 V.DC
Category voltage range	2.5 V.DC to 10 V.DC	6.3 V.DC
Rated capacitance range	4.7 μF to 100 μF	150 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

Marking

S09 Size		B09 Size	
Polarity marking(+)	R.Cap. code	Polarity marking(+)	R.Cap. code
R. Voltage code	Lot. No.	R. Voltage code	Lot. No.

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

S09 Size	
R. Cap. (μF)	4.7 10 22 47 68 100
Code	s A J S W A

B09 Size	
R. Cap. (μF)	150
Code	E8

Dimensions (not to scale)

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

Unit : mm

* Externals of figure are the reference. *1 ±0.2 : B09

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard		
						L	W	H		Ripple*1 (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Mn. Packaging Qty (pcs)	
TPU	2.5	85	2.5	85	47	2.0	1.25	0.9	S09	510	150	0.10	23.5	2R5TPU47MSI	3000	
		85	2.5	85	100	2.0	1.25	0.9		510	150	0.10	50.0	ETPU100MSI	3000	
	6.3	85	4.0	85	68	2.0	1.25	0.9		510	150	0.10	54.4	4TPU68MSI	3000	
		85	6.3	85	10	2.0	1.25	0.9		400	250	0.10	6.3	6TPU10MSI	3000	
		85	6.3	85	22	2.0	1.25	0.9		510	150	0.10	27.7	6TPU22MSI	3000	
		85	6.3	85	47	2.0	1.25	0.9		510	150	0.10	59.2	6TPU47MSI	3000	
		85	6.3	85	150	3.5	2.8	0.9		B09	670	100	0.10	94.5	6TPU150MBI	3000
		85	6.3	85	4.7	2.0	1.25	0.9		S09	360	300	0.10	4.7	10TPU4R7MSI	3000

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

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

Surface Mount Type

POSCAP

Series : TPH



Features

- Small size, Low profile (L3.2 × W 1.6 × H 0.9 mm)
- Face down terminal type
- RoHS compliance, Halogen free

Specifications

Size code	A09	A14
Category temperature range	-55 °C to +105 °C / -55 °C to +85 °C (Rated temp. +85 °C)	
Rated voltage range	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Category voltage range	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Rated capacitance range	33 µF to 100 µF	100 µF to 220 µF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+105 °C, 1000 h rated voltage applied * Rated temp, +85 °C Products : +85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +50 %, -20 % of the initial value (ETPH220MABC) Within +40 %, -20 % of the initial value (Except for above model)
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

Marking

A09/A14 Size

A09 Size (6TPH100MAEA)

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

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

Dimensions (not to scale)

A09/A14 Size

A09 Size (6TPH100MAEA)

Unit : mm

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

* Externals of figure are the reference.

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (µF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple current (mAr.m.s.)	ESR *2 (mΩ max.)	tan δ *3	LC *4 (µA)	Part number	Min. Packaging Qty (pcs)
TPH	2.5	105	2.5	105	100	3.2	1.6	0.9	A09	510	150	0.10	25.0	ETPH100MHA	3000
		85	2.5	85	220	3.2	1.6	1.4	A14	740	70	0.10	110.0	ETPH220MABC	2500
	4	105	4.0	105	68	3.2	1.6	0.9	A09	510	150	0.10	27.2	4TPH68MHA	3000
		85	4.0	85	150	3.2	1.6	1.4	A14	740	70	0.10	120.0	4TPH150MABC	2500
	6.3	105	6.3	105	47	3.2	1.6	0.9	A09	510	150	0.10	29.6	6TPH47MHA	3000
		85	6.3	85	100	3.2	1.6	0.9		670	100	0.10	63.0	6TPH100MAEA	3000
		85	6.3	85	100	3.2	1.6	1.4		A14	740	70	0.10	126.0	6TPH100MABC
	10	85	10.0	85	33	3.2	1.6	0.9	A09	510	150	0.10	33.0	ATPH33MAHA	3000

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

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

Surface Mount Type

POSCAP



Series : TPG

Features

- Small size, Low profile (L3.5 × W 2.8 × H 1.1 mm)
- Large capacitance (220 μF max.)
- RoHS compliance, Halogen free

Specifications

Size code	B1G	B15G
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2.5 V.DC to 12.5 V.DC	2.5 V.DC to 6.3 V.DC
Category voltage range	2.0 V.DC to 10.0 V.DC	2.0 V.DC to 5.0 V.DC
Rated capacitance range	33 μF to 220 μF	150 μF to 220 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+85 °C, 1000 h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

Marking

R. Voltage (V.DC)	2.5	4.0	6.3	8.0	10.0	12.5
Code	e	g	j	k	A	B
R. Cap. (μF)	33	47	100	150	220	
Code	N7	S7	A8	E8	J8	

Dimensions (not to scale)

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

Unit : mm

* Externals of figure are the reference.

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Mn. Packaging Qty (pcs)
TPG	2.5	85	2.0	105	220	3.5	2.8	1.1	B1G	1000	70	0.10	55.0	2R5TPG220M	2500
		85	2.0	105		3.5	2.8	1.4	B15G	1400	30/300 kHz	0.10	110.0	2R5TPG220MUG	2500
	4	85	3.2	105	220	3.5	2.8	1.4	B15G	1000	70	0.10	88.0	4TPG220M	2500
		85	5.0	105		100	3.5	2.8	1.1	B1G	1000	70	0.10	63.0	6TPG100M
	6.3	85	5.0	105	100		3.5	2.8	1.1	B1G	1100	55	0.10	63.0	6TPG100MG
		85	5.0	105		3.5	2.8	1.1	B1G	1200	35/300 kHz	0.10	126.0	6TPG100MZGD	2500
		85	5.0	105	150	3.5	2.8	1.4	B15G	1000	70	0.10	94.5	6TPG150M	2500
		85	5.0	105		3.5	2.8	1.4	B15G	1200	35/300 kHz	0.10	189.0	6TPG150MZG	2500
	8	85	6.3	105	47	3.5	2.8	1.1	B1G	1000	70	0.10	37.6	8TPG47M	2500
	10	85	8.0	105	47	3.5	2.8	1.1		1000	70	0.10	47.0	10TPG47M	2500
	12.5	85	10.0	105	33	3.5	2.8	1.1	B1G	1000	70	0.10	41.3	12TPG33M	2500

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

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

Surface Mount Type

POSCAP



Series : **TPSF**

Features

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

Specifications

Size code	B2S	
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2.0 V.DC to 2.5 V.DC	
Category voltage range	2.0 V.DC to 2.5 V.DC	
Rated capacitance range	270 μF	
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+105 °C, 1000 h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

Marking

R. Voltage (V.DC)	2.0	2.5
Code	d	e

R. Cap. (μF)	270
Code	L8

Dimensions (not to scale)

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

Unit : mm

* Externals of figure are the reference.

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Qty (pcs)
TPSF	2	105	2.0	105	270	3.5	2.8	1.9	B2S	3200	6/500 kHz	0.08	108	2TPSF270M6E	2000
		105	2.0	105		3.5	2.8	1.9		2400	9/300 kHz	0.08	108	2TPSF270M9G	2000
	2.5	105	2.5	105	270	3.5	2.8	1.9		3200	6/500 kHz	0.08	135	ETPSF270M6E	2000

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

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

Surface Mount Type

POSCAP



Series : **TPE**

Size : **B**

Features

- Small size (L 3.5×W 2.8×H 1.9 mm)
- Low ESR (15 mΩ)
- RoHS compliance, Halogen free

Specifications

Size code	B2	
Category temperature range	-55 °C to +105 °C	
Rated voltage range	2.0 V.DC to 10 V.DC	
Category voltage range	1.8 V.DC to 8.0 V.DC	
Rated capacitance range	47 μF to 470 μF	
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+105 °C, 1000 h rated voltage applied	
	* Rated temp, +85 °C Products : +85 °C, 1000 h, rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
Damp heat (Steady State)	DC leakage current	Within the initial limit
	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +50 %, -20 % of the initial value (2R5TPE220MAZB (MAPB, MAFB), 2R5TPE330MAZB, 2TPE330MAFB (MADGB), 2TPE470MAJGB (MAFB), 2TPE330MFB)
		Within +40 %, -20 % of the initial value (Except for above model)
	tan δ	≤ 1.5 times of the initial limit
DC leakage current	≤ 3 times of the initial limit	

Marking

R. Voltage (V.DC)	2.0	2.5	4.0	6.3	8.0	10.0	
Code	d	e	g	j	k	A	
R. Cap. (μF)	47	100	120	150	220	330	470
Code	S7	A8	C8	E8	J8	N8	S8

Dimensions (not to scale)

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

Unit : mm

* Externals of figure are the reference.

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple *1 (mAr.m.s.)	ESR *2 (mΩ max.)	tan δ *3	LC *4 (μA)	Part number	Min. Packaging Qty (pcs)
TPE	2	105	2.0	105	330	3.5	2.8	1.9	B2	2000	15	0.08	132.0	2TPE330MFB	2000
		85	1.8	105		3.5	2.8	1.9		2000	15	0.08	132.0	2TPE330MAFB	2000
		85	1.8	105		470	3.5	2.8		1.9	2000	13/300 kHz	0.10	132.0	2TPE330MADGB
		85	1.8	105	3.5		2.8	1.9		2300	15	0.10	188.0	2TPE470MAFB	2000
		85	1.8	105	220	3.5	2.8	1.9		2300	11/300 kHz	0.08	188.0	2TPE470MAJGB	2000
	85	2.0	105	3.5		2.8	1.9	2000		15	0.08	110.0	2R5TPE220MAFB	2000	
	105	2.5	105	3.5		2.8	1.9	1800		15/300 kHz	0.08	110.0	2R5TPE220MFGB	2000	
	105	2.5	105	3.5		2.8	1.9	1700		21	0.08	55.0	2R5TPE220MLB	2000	
	85	2.0	105	3.5		2.8	1.9	1600		25	0.08	55.0	2R5TPE220MAPB	2000	
	105	2.5	105	3.5		2.8	1.9	1400		35	0.08	55.0	2R5TPE220MZB	2000	
	85	2.0	105	3.5		2.8	1.9	1400		35	0.08	55.0	2R5TPE220MAZB	2000	
	85	2.0	105	330	3.5	2.8	1.9	1400		35	0.08	82.5	2R5TPE330MAZB	2000	
	105	4.0	105	100	3.5	2.8	1.9	1400		35	0.08	40.0	4TPE100MZB	2000	
	85	3.2	105	150	3.5	2.8	1.9	1400		35	0.08	60.0	4TPE150MAZB	2000	
	85	3.2	105	220	3.5	2.8	1.9	1400		35	0.08	88.0	4TPE220MAZB	2000	
	6.3	105	6.3	105	100	3.5	2.8	1.9		1600	25	0.08	63.0	6TPE100MPB	2000
		85	5.0	105		3.5	2.8	1.9		1400	35	0.08	63.0	6TPE100MAZB	2000
		85	5.0	105	150	3.5	2.8	1.9		1400	35	0.08	75.6	6TPE120MAZB	2000
		85	5.0	105		3.5	2.8	1.9		1600	25	0.08	94.5	6TPE150MAPB	2000
		85	5.0	105		3.5	2.8	1.9		1400	35	0.08	94.5	6TPE150MAZB	2000
		85	5.0	105		220	3.5	2.8		1.9	1400	35	0.10	138.6	6TPE220MAZB
	8	85	6.3	105	100	3.5	2.8	1.9		1400	35	0.08	80.0	8TPE100MAZB	2000
	10	85	8.0	105	47	3.5	2.8	1.9		1400	35	0.08	47.0	10TPE47MAZB	2000

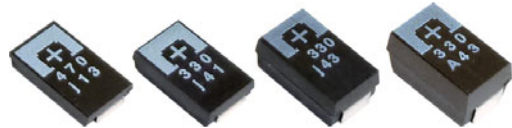
*1 Ripple current (100 kHz/ +45 °C), *2 ESR (100 kHz/+20 °C) *3 tan δ (120 Hz/+20 °C) *4 After 5 minutes
 ◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

Surface Mount Type

POSCAP

Series : **TPE**

Size : **D**



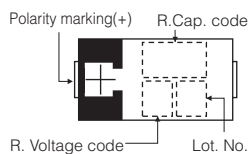
Features

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

Specifications

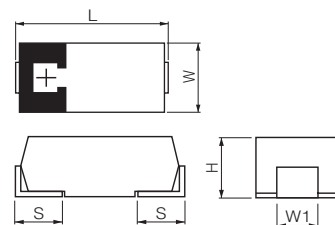
Size code	D15E	D2E	D3L	D4
Category temperature range	-55 °C to +105 °C			
Rated voltage range	6.3 V.DC	2.5 V.DC to 10 V.DC		
Category voltage range	5.0 V.DC	2.5 V.DC to 10 V.DC		
Rated capacitance range	470 μF	68 μF to 470 μF	220 μF to 680 μF	330 μF to 1500 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Surge voltage (V.DC)	Rated voltage × 1.15			
Endurance	+105 °C, 2000 h rated voltage applied * Rated temp, +85 °C Products : +85 °C, 1000 h, rated voltage applied 6TPE330MAP, 6TPE470MAZU : +85 °C, 2000 h,			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage			
	Capacitance change	Within +50 %, -20 % of the initial value (2R5TPE220M (I, F, 9), 2R5TPE330M (I, F, C, 9, 7), 2R5TPE470M (I, F, C, 9, 7), 2R5TPE1000MF, 2R5TPE1500M (F, C))		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		

Marking



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

Dimensions (not to scale)



Unit : mm

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

* Externals of figure are the reference.

* 1 ±0.1 :D15E, D2E

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 current (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Mn. Packaging Qty (pcs)
TPE	2.5	105	2.5	105	220	7.3	4.3	1.8	D2E	3900	9	0.10	55.0	2R5TPE220M9	3000
		105	2.5	105		7.3	4.3	1.8		3100	15	0.10	55.0	2R5TPE220MF	3000
		105	2.5	105		7.3	4.3	1.8		2800	18	0.10	55.0	2R5TPE220MI	3000
		105	2.5	105		7.3	4.3	1.8		2400	25	0.10	55.0	2R5TPE220M	3000
		105	2.5	105	330	7.3	4.3	1.8		4400	7	0.10	82.5	2R5TPE330M7	3000
		105	2.5	105		7.3	4.3	1.8		3900	9	0.10	82.5	2R5TPE330M9	3000
		105	2.5	105		7.3	4.3	1.8		3500	12	0.10	82.5	2R5TPE330MC	3000
		105	2.5	105		7.3	4.3	1.8		3100	15	0.10	82.5	2R5TPE330MF	3000
		105	2.5	105	470	7.3	4.3	1.8		2800	18	0.10	82.5	2R5TPE330MI	3000
		105	2.5	105		7.3	4.3	1.8		2400	25	0.10	82.5	2R5TPE330M	3000
		105	2.5	105		7.3	4.3	1.8		4400	7	0.10	117.5	2R5TPE470M7	3000
		105	2.5	105		7.3	4.3	1.8		3900	9	0.10	117.5	2R5TPE470M9	3000
		105	2.5	105	680	7.3	4.3	1.8		3500	12	0.10	117.5	2R5TPE470MC	3000
		105	2.5	105		7.3	4.3	1.8		3100	15	0.10	117.5	2R5TPE470MF	3000
		105	2.5	105		7.3	4.3	1.8		2800	18	0.10	117.5	2R5TPE470MI	3000
		105	2.5	105		7.3	4.3	2.8		D3L	3500	12	0.10	170.0	2R5TPE680MCL
		105	2.5	105	7.3	4.3	2.8	3100			15	0.10	170.0	2R5TPE680MFL	2500
		105	2.5	105	1000	7.3	4.3	3.8		D4	3900	15	0.15	250.0	2R5TPE1000MF
	105	2.5	105	1500	7.3	4.3	3.8	4400	12		0.15	375.0	2R5TPE1500MC	2000	
	105	2.5	105	1500	7.3	4.3	3.8	3900	15	0.15	375.0	2R5TPE1500MF	2000		
	105	4.0	105		150	7.3	4.3	1.8	D2E	2800	18	0.10	60.0	4TPE150MI	3000
	105	4.0	105	220	7.3	4.3	1.8	3100		15	0.10	88.0	4TPE220MF	3000	
	105	4.0	105		7.3	4.3	1.8	2800		18	0.10	88.0	4TPE220MI	3000	
	105	4.0	105	7.3	4.3	1.8	2400	25		0.10	88.0	4TPE220M	3000		
	105	4.0	105	330	7.3	4.3	1.8	2800		18	0.10	132.0	4TPE330MI	3000	
	105	4.0	105		7.3	4.3	1.8	2400		25	0.10	132.0	4TPE330M	3000	
	105	4.0	105	470	7.3	4.3	2.8	D3L		3500	12	0.10	188.0	4TPE470MCL	2500
	105	4.0	105		7.3	4.3	2.8			3100	15	0.10	188.0	4TPE470MFL	2500
	105	4.0	105	7.3	4.3	2.8	2800			18	0.10	188.0	4TPE470MIL	2500	
	105	4.0	105	7.3	4.3	2.8	2400			25	0.10	188.0	4TPE470ML	2500	
	105	6.3	105	100	7.3	4.3	1.8	D2E		2800	18	0.10	63.0	6TPE100MI	3000
	105	6.3	105		7.3	4.3	1.8			2400	25	0.10	63.0	6TPE100M	3000
	105	6.3	105	150	7.3	4.3	1.8		3100	15	0.10	94.5	6TPE150MF	3000	
	105	6.3	105		7.3	4.3	1.8		2800	18	0.10	94.5	6TPE150MI	3000	
	105	6.3	105	220	7.3	4.3	1.8		2400	25	0.10	94.5	6TPE150M	3000	
	105	6.3	105		7.3	4.3	1.8		2800	18	0.10	138.6	6TPE220MI	3000	
105	6.3	105	220	7.3	4.3	1.8	2400		25	0.10	138.6	6TPE220M	3000		
85	5.0	105		7.3	4.3	1.8	2400		25	0.10	138.6	6TPE220MAP	3000		
85	5.0	105	330	7.3	4.3	1.8	D3L		2400	25	0.10	207.9	6TPE330MAP	3000	
85	5.0	105		7.3	4.3	2.8			2400	25	0.10	207.9	6TPE330MAL	2500	
85	5.0	105		7.3	4.3	2.8			3900	9/500 Hz	0.10	207.9	6TPE330MA9EL	2500	
105	6.3	105		7.3	4.3	2.8			3100	15	0.10	207.9	6TPE330MFL	2500	
105	6.3	105	330	7.3	4.3	2.8	2800	18	0.10	207.9	6TPE330MIL	2500			
105	6.3	105		7.3	4.3	2.8	2400	25	0.10	207.9	6TPE330ML	2500			
85	5.0	105	470	7.3	4.3	3.8	D4	4400	10	0.10	207.9	6TPE330MAA	2000		
85	5.0	105		7.3	4.3	1.4		D15E	1700	35	0.10	296.1	6TPE470MAZU	4000	
105	6.3	105	470	7.3	4.3	3.8	D4	3500	18	0.15	296.1	6TPE470MI	2000		
105	6.3	105		7.3	4.3	3.8		3000	25	0.15	296.1	6TPE470M	2000		
105	6.3	105	680	7.3	4.3	3.8		3500	18	0.15	428.4	6TPE680MI	2000		
105	6.3	105		7.3	4.3	3.8		3000	25	0.15	428.4	6TPE680M	2000		
105	10.0	105	68	7.3	4.3	1.8	D2E	2400	25	0.10	68.0	10TPE68M	3000		
105	10.0	105	220	7.3	4.3	2.8	D3L	2800	18	0.10	220.0	10TPE220MIL	2500		
105	10.0	105		7.3	4.3	2.8		2400	25	0.10	220.0	10TPE220ML	2500		
105	10.0	105	330	7.3	4.3	3.8	D4	3000	25	0.10	330.0	10TPE330M	2000		

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

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

Surface Mount Type

POSCAP

Series : TPF



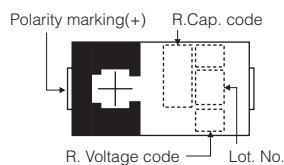
Features

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

Specifications

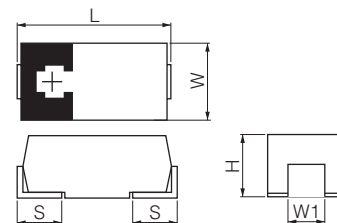
Size code	D2E	D3L	D4
Category temperature range	-55 °C to +105 °C		
Rated voltage range	2.0 V.DC	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Category voltage range	2.0 V.DC	2.5 V.DC to 10 V.DC	2.5 V.DC to 6.3 V.DC
Rated capacitance range	220 μF to 330 μF	150 μF to 680 μF	470 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V.DC)	Rated voltage × 1.15		
Endurance	+105 °C, 2000 h rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage		
	Capacitance change	Within +50 %, -20 % of the initial value (2TPF220M6, 2TPF330M6, ETPF1000M6H (5H))	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	≤ 3 times of the initial limit	

Marking



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

Dimensions (not to scale)



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

* Externals of figure are the reference.
* 1 ±0.1 :D2E

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard			
						L	W	H		Ripple *1 current (mA r.m.s.)	ESR *2 (mΩ max.)	tan δ *3	LC *4 (μA)	Part number	Mn. Packaging Qty (pcs)		
TPF	2	105	2.0	105	220	7.3	4.3	1.8	D2E	4700	6	0.10	88.0	2TPF220M6	3000		
		105	2.0	105	330	7.3	4.3	1.8		4700	6	0.10	132.0	2TPF330M6	3000		
	2.5	105	2.5	105	470	7.3	4.3	2.8	D3L	4400	7	0.10	82.5	2R5TPF330M7L	2500		
										4400	6	0.10	117.5	2R5TPF470M6L	2500		
			4400	7		0.10	117.5	2R5TPF470M7L		2500							
			4400	10		0.10	117.5	2R5TPF470ML		2500							
		105	2.5	105	680	7.3	4.3	2.8	D4	6100	5	0.10	117.5	ETPF470M5H	2000		
										4400	6	0.10	170.0	2R5TPF680M6L	2500		
										4400	7	0.10	170.0	2R5TPF680M7L	2500		
										4400	10	0.10	170.0	2R5TPF680ML	2500		
			105	2.5		105	1000	7.3	4.3	3.8	D4	6100	5	0.10	170.0	ETPF680M5H	2000
												6100	5	0.10	250.0	ETPF1000M5H	2000
												5600	6	0.10	250.0	ETPF1000M6H	2000
	4	105	4.0	105	330	7.3	4.3	2.8	D3L	4000	12	0.10	132.0	4TPF330ML	2500		
										4400	10	0.10	188.0	4TPF470ML	2500		
										4400	10	0.10	272.0	4TPF680MAH	2000		
	6.3	105	6.3	105	220	7.3	4.3	2.8	D3L	6100	5	0.10	138.6	6TPF220M5L	2500		
										4600	9	0.10	138.6	6TPF220M9L	2500		
										4000	12	0.10	138.6	6TPF220ML	2500		
3900										9	0.10	207.9	6TPF330M9L	2500			
4400										10	0.10	296.1	6TPF470MAH	2000			
10	105	10.0	105	150	7.3	4.3	2.8	D3L	3600	15	0.10	150.0	10TPF150ML	2500			

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

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

Surface Mount Type

POSCAP

Series : TA



Features

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

Specifications

Size code	B2	D2E	D3L
Category temperature range	-55 °C to +105 °C		
Rated voltage range	4 V.DC to 10 V.DC	2.5 V.DC to 10 V.DC	
Category voltage range	4 V.DC to 10 V.DC	2.5 V.DC to 10 V.DC	
Rated capacitance range	47µF to 100 µF	68 µF to 470 µF	150 µF to 680 µF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V.DC)	Rated voltage × 1.15		
Endurance	+105 °C, 2000 h, (B2 size : 1000 h) rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady State)	+85 °C, 85 % to 90 %, 500 h, rated voltage applied		
	Capacitance change	Within +50 %, -20 % of the initial value (2R5TAE470M(F), 2R5TAE330M(F, I), 2R5TAE220M(F, 9))	
	tan δ	Within +40 %, -20 % of the initial value (Except for above model)	
	DC leakage current	Within the initial limit	

Marking

D2E, D3L Size		B2 Size																			
Polarity marking(+)	R.Cap. code	Polarity marking(+)	R.Cap. code																		
R. Voltage code	Lot. No.	R. Voltage code	Lot. No.																		
<table border="1"> <tr> <th>R. Voltage (V.DC)</th> <td>2.5</td> <td>4.0</td> <td>6.3</td> <td>10.0</td> </tr> <tr> <th>Code</th> <td>e</td> <td>g</td> <td>j</td> <td>A</td> </tr> </table>		R. Voltage (V.DC)	2.5	4.0	6.3	10.0	Code	e	g	j	A	<table border="1"> <tr> <th>R. Cap. (µF)</th> <td>47</td> <td>68</td> <td>100</td> </tr> <tr> <th>Code</th> <td>S7</td> <td>W7</td> <td>A8</td> </tr> </table>		R. Cap. (µF)	47	68	100	Code	S7	W7	A8
R. Voltage (V.DC)	2.5	4.0	6.3	10.0																	
Code	e	g	j	A																	
R. Cap. (µF)	47	68	100																		
Code	S7	W7	A8																		

Dimensions (not to scale)

Unit : mm					
Size Code	L±0.3*1	W±0.2	H±0.2*2	S±0.2	W1±0.1
B2	3.5	2.8	1.9	0.8	2.2
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4

*1 Externals of figure are the reference.
 * 1 ±0.2 : B2
 * 2 ±0.1 : B2, D2E

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (µF)	Case size (mm)			Size code	Specifications				Standard									
						L	W	H		Ripple*1 current (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Part number	Min. Packaging Qty (pcs)								
TA	2.5	105	2.5	105	220	7.3	4.3	1.8	D2E	3900	9	0.10	110.0	2R5TAE220M9	3000								
										3100	15	0.10	55.0	2R5TAE220MF	3000								
										2400	25	0.10	55.0	2R5TAE220M	3000								
		3100	15	0.10	82.5	2R5TAE330MF	3000																
		2800	18	0.10	82.5	2R5TAE330MI	3000																
		2400	25	0.10	82.5	2R5TAE330M	3000																
		D3L	3100	15	0.10	117.5	2R5TAE470MF	3000															
			2400	25	0.10	117.5	2R5TAE470M	3000															
			3100	15	0.10	170.0	2R5TAE680MFL	2500															
			2400	25	0.10	170.0	2R5TAE680ML	2500															
			4	105	4.0	105	100	3.8	2.8	1.9	B2	1100	70	0.08	40.0	4TAB100M	2000						
												2800	18	0.10	88.0	4TAE220MI	3000						
	2400	25										0.10	88.0	4TAE220M	3000								
	D3L	105		4.0	105	470	7.3	4.3	2.8	D3L	2800	18	0.10	188.0	4TAE470MIL	2500							
											2400	25	0.10	188.0	4TAE470ML	2500							
											2400	25	0.10	188.0	4TAE470ML	2500							
	6.3	105	6.3	105	47	3.5	2.8	1.9	B2	1100	70	0.08	29.6	6TAB47M	2000								
										1100	70	0.08	42.8	6TAB68M	2000								
										2400	25	0.10	94.5	6TAE150M	3000								
			D2E	105	6.3	105	150	7.3	4.3	1.8	D2E	2800	18	0.10	138.6	6TAE220MI	3000						
												2400	25	0.10	138.6	6TAE220M	3000						
												2400	25	0.10	138.6	6TAE220M	3000						
		10	105	6.3	105	330	7.3	4.3	2.8	D3L	2400	25	0.10	207.9	6TAE330ML	2500							
											105	10.0	105	47	3.5	2.8	1.9	B2	1100	70	0.08	47.0	10TAB47M
105																			10.0	105	68	7.3	4.3
			105	10.0	105	150	7.3	4.3	2.8	D3L													
105											10.0	105	220	7.3	4.3	2.8	D3L	2400	25	0.10	220.0	10TAE220ML	2500

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

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

Surface Mount Type

POSCAP



Series : TV

Features

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

Specifications

Size code	D2E	D3L	
Category temperature range	-55 °C to +125 °C		
Rated voltage range	6.3 V.DC to 10 V.DC	10 V.DC	
Category voltage range	4.0 V.DC to 6.3 V.DC	6.3 V.DC	
Rated capacitance range	68 μF to 150 μF	150 μF	
Capacitance tolerance	±20 % (120 Hz / + 20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V.DC)	Rated voltage × 1.15		
Endurance	+125 °C, 1000 h, category voltage applied (+105 °C 2000 h, rated voltage applied)		
	temp.	125 °C	105 °C
	Capacitance change	Within ±20 % of the initial value	Within ±20 % of the initial value
	tan δ	≤ 2 times of the initial limit	≤ 1.5 times of the initial limit
Damp heat (Steady State)	DC leakage current	≤ 2 times of the initial limit	Within the initial limit
	+85 °C, 85 % to 90 %, 500 h, rated voltage applied		
	Capacitance change	Within +40 %, -20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
DC leakage current	Within the initial limit		

Marking

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

Dimensions (not to scale)

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

Unit : mm

*1 Externals of figure are the reference. *1 ±0.1 : D2E

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 current (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Qty (pcs)
TV	6.3	105	4.0	125	150	7.3	4.3	1.8	D2E	2400	25	0.10	94.5	6TVE150M	3000
										2400	25	0.10	68.0	10TVE68M	3000
	10	105	6.3	125	68	7.3	4.3	1.8	D3L	2400	25	0.10	150.0	10TVE150ML	2500

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

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

Surface Mount Type

POSCAP



Series : **TQC**

Size : **B**

Features

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

Specifications

Size code	B15	B2
Category temperature range	-55 °C to +105 °C	
Rated voltage range	35 V.DC	16 V.DC to 35 V.DC
Category voltage range	35 V.DC	16 V.DC to 35 V.DC
Rated capacitance range	2.7 μF	3.9 μF to 33 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+105 °C, 2000 h (16TQC33MYFB : 1000 h), rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

Marking

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

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

Dimensions (not to scale)

Size code	L±0.2	W±0.2	H±0.1	S±0.2	W1±0.1
B15	3.5	2.8	1.4	0.8	2.2
B2	3.5	2.8	1.9	0.8	2.2

Unit : mm

* Externals of figure are the reference.

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Qty (pcs)
TQC	16	105	16.0	105	10	3.5	2.8	1.9	B2	800	100	0.10	48.0	16TQC10M	2000
		105	16.0	105	15	3.5	2.8	1.9		1000	90	0.10	72.0	16TQC15M	2000
		105	16.0	105	33	3.5	2.8	1.9		1000	90	0.10	158.4	16TQC33MYFB	2000
	20	105	20.0	105	8.2	3.5	2.8	1.9	B2	800	100	0.10	49.2	20TQC8R2M	2000
		105	20.0	105	22	3.5	2.8	1.9		1100	90	0.10	132.0	20TQC22MYFB	2000
	25	105	25.0	105	5.6	3.5	2.8	1.9	B2	800	100	0.10	42.0	25TQC5R6M	2000
		105	25.0	105	15	3.5	2.8	1.9		900	100	0.10	112.5	25TQC15MYFB	2000
	35	105	35.0	105	2.7	3.5	2.8	1.4	B15	800	300	0.10	47.3	35TQC2R7MYF	2000
		105	35.0	105	3.9	3.5	2.8	1.9	B2	500	400	0.10	40.9	35TQC3R9MYF	2000

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

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

Surface Mount Type

POSCAP



Series : **TQC**

Size : **D**

Features

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

Specifications

Size code	D12	D15	D2	D3L
Category temperature range	-55 °C to +105 °C			
Rated voltage range	16 V.DC	16 V.DC to 25 V.DC	16 V.DC to 35 V.DC	16 V.DC to 25 V.DC
Category voltage range	16 V.DC	16 V.DC to 25 V.DC	16 V.DC to 35 V.DC	16 V.DC to 25 V.DC
Rated capacitance range	33 µF	22 µF to 47 µF	10 µF to 100 µF	68 µF to 150 µF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Surge voltage (V.DC)	Rated voltage × 1.15			
Endurance	+105 °C, 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	Within the initial limit		
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage			
	Capacitance change	Within +40 %, -20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		

Marking

R. Voltage (V.DC)	16	20	25	35
Code	C	D	1E	V

Dimensions (not to scale)

Size code	Unit : mm				
	L±0.2 ^{*1}	W±0.2	H±0.1 ^{*2}	S±0.2	W1±0.1
D12	7.3	4.3	1.15	1.3	2.4
D15	7.3	4.3	1.4	1.3	2.4
D2	7.3	4.3	1.9	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4

* 1 ±0.3 : D3L
* 2 ±0.05 : D12, ±0.2 : D3L

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (µF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple ^{*1} current (mAr.m.s.)	ESR ^{*2} (mΩ max.)	tan δ ^{*3}	LC ^{*4} (µA)	Part number	Mn. Packaging Qty (pcs)
TQC	16	105	16.0	105	33	7.3	4.3	1.15	D12	1800	40	0.10	52.8	16TQC33MYFS	4500
						7.3	4.3	1.9	D2	1400	70	0.10	52.8	16TQC33MYFD	3000
			47	7.3	4.3	1.4	D15	1500	55	0.10	75.2	16TQC47MYFT	3000		
				7.3	4.3	1.9	D2	1800	40	0.10	75.2	16TQC47MW	3000		
		68	7.3	4.3	1.9	D2	1450	55	0.10	75.2	16TQC47MYFD	3000			
			7.3	4.3	1.9	D2	1500	50	0.10	108.8	16TQC68MYF	3000			
			7.3	4.3	1.9	D2	1800	50	0.10	160.0	16TQC100MYF	3000			
			7.3	4.3	2.8	D3L	1800	50	0.10	240.0	16TQC150MYF	2500			
	20	105	20.0	105	33	7.3	4.3	1.9	D2	1500	70	0.15	240.0	1CTQC15173F1	3000
						7.3	4.3	1.9	D2	1400	60	0.10	66.0	20TQC33MYFD	3000
			47	7.3	4.3	1.9	D2	1450	55	0.10	94.0	20TQC47MYF	3000		
				7.3	4.3	1.4	D15	1500	55	0.10	94.0	20TQC47MYFT	3000		
		100	7.3	4.3	2.8	D3L	1700	55	0.10	200.0	20TQC100MYF	2500			
			7.3	4.3	1.9	D2	1500	45	0.10	38.0	25TQC15MV	3000			
			7.3	4.3	1.9	D2	1000	90	0.10	38.0	25TQC15MYFD	3000			
			7.3	4.3	1.9	D2	1500	45	0.10	55.0	25TQC22MV	3000			
	25	105	25.0	105	15	7.3	4.3	1.9	D2	1400	60	0.10	55.0	25TQC22MYFD	3000
						7.3	4.3	1.9	D2	1500	45	0.10	55.0	25TQC22MYFT	3000
			22	7.3	4.3	1.9	D15	1400	70	0.10	55.0	25TQC22MYFT	3000		
				7.3	4.3	1.4	D15	1400	70	0.10	55.0	25TQC22MYFT	3000		
		33	7.3	4.3	1.9	D2	1400	60	0.10	82.5	25TQC33MYF	3000			
			7.3	4.3	2.8	D3L	1400	70	0.10	170.0	25TQC68MYF	2500			
			7.3	4.3	1.9	D2	1000	120	0.10	35.0	35TQC10M	3000			
			7.3	4.3	1.9	D2	1000	120	0.10	35.0	35TQC10MYF	3000			
35	105	35.0	105	10	7.3	4.3	1.9	D2	900	150	0.10	52.5	35TQC15MYF	3000	
					7.3	4.3	1.9	D2	900	150	0.10	52.5	35TQC15MYF	3000	
	15	7.3	4.3	1.9	D2	900	150	0.10	52.5	35TQC15MYF	3000				
		7.3	4.3	1.9	D2	900	150	0.10	52.5	35TQC15MYF	3000				

*1 Ripple current (100 kHz/ +105 °C), *2 ESR (100 kHz/+20 °C) *3 tan δ (120 Hz/+20 °C) *4 After 5 minutes
◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

Surface Mount Type

POSCAP

Series : TPB



Features

- Standard
- RoHS compliance, Halogen free

Specifications

Size code	B2	D3L	D4
Category temperature range	-55 °C to +105 °C		
Rated voltage range	4 V.DC to 10 V.DC		6.3 V.DC to 10 V.DC
Category voltage range	4 V.DC to 10 V.DC		6.3 V.DC to 10 V.DC
Rated capacitance range	33 μF to 68 μF	150 μF to 330 μF	220 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V.DC)	Rated voltage × 1.15		
Endurance	+105 °C 2000h, (B2 size : 1000h) rated voltage applied * Rated temp. +85 °C 1000h rated voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	Within the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage		
	Capacitance change	Within +40 %, -20 % of the initial value	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	≤ 3 times of the initial limit	

Marking

B2 Size

D4 Size

D3L Size

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

R. Cap. (μF)	33	47	68
Code	N7	S7	W7

Dimensions (not to scale)

Unit : mm

Size code	L±0.3*1	W±0.2	H±0.2*2	S±0.2	W1±0.1
B2	3.5	2.8	1.9	0.8	2.2
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4

* Externals of figure are the reference.
* 1 ±0.2 : B2 * 2 ±0.1 : B2

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 (mAr.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (μA)	Part number	Min. Packaging Qty (pcs)
TPB	4.0	105	4.0	105	68	3.5	2.8	1.9	B2	1100	70	0.08	27.2	4TPB68M	2000
		105	4.0	105	330	7.3	4.3	2.8	D3L	2000	40	0.10	132.0	4TPB330ML	2500
	6.3	105	6.3	105	68	3.5	2.8	1.9	B2	1100	70	0.08	42.8	6TPB68M	2000
		105	6.3	105	220	7.3	4.3	2.8	D3L	2000	40	0.10	138.6	6TPB220ML	2500
		85	5.0	105		7.3	4.3	2.8		2000	40	0.10	207.9	6TPB330MAL	2500
		105	6.3	105	330	7.3	4.3	2.8	D4	2000	40	0.10	207.9	6TPB330ML	2500
		105	6.3	105		7.3	4.3	3.8		3000	40	0.10	207.9	6TPB330M	2000
		105	6.3	105	470	7.3	4.3	3.8		3000	35	0.15	296.1	6TPB470M	2000
	10	105	10.0	105	33	3.5	2.8	1.9	B2	1100	70	0.08	33.0	10TPB33M	2000
		105	10.0	105	47	3.5	2.8	1.9		1100	70	0.08	47.0	10TPB47M	2000
		105	10.0	105	150	7.3	4.3	2.8	D3L	2000	40	0.10	150.0	10TPB150ML	2500
		105	10.0	105	220	7.3	4.3	2.8		2000	40	0.10	220.0	10TPB220ML	2500
		105	10.0	105		7.3	4.3	3.8	D4	3000	40	0.10	220.0	10TPB220M	2000
		105	10.0	105	330	7.3	4.3	3.8		3000	35	0.10	330.0	10TPB330M	2000

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

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

Surface Mount Type

POSCAP

Series : TPC



Features

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

Specifications

Size code	B1	D2
Category temperature range	-55 °C to +105 °C	
Rated voltage range	6.3 V.DC to 12.5 V.DC	6.3 V.DC to 10 V.DC
Category voltage range	5.0 V.DC to 10.0 V.DC	6.3 V.DC to 10 V.DC
Rated capacitance range	10 µF to 47 µF	68 µF to 330 µF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)	
Leakage current	Please see the attached characteristics list	
Dissipation factor (tan δ)	Please see the attached characteristics list	
Surge voltage (V.DC)	Rated voltage × 1.15	
Endurance	+105 °C 2000h, (B1 size : 1000h) rated voltage applied * Rated temp. +85 °C 1000h rated voltage applied	
	Capacitance change	Within ±20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage	
	Capacitance change	Within +40 %, -20 % of the initial value
	tan δ	≤ 1.5 times of the initial limit
	DC leakage current	≤ 3 times of the initial limit

Marking

B1 Size		D2 Size			
R. Voltage (V.DC)	6.3	8.0	10.0	12.5	
Code	j	k	A	B	
B1 Size					
R. Cap. (µF)	10	15	22	33	47
Code	A7	E7	J7	N7	S7

Dimensions (not to scale)

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

Unit : mm

* Externals of figure are the reference.

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (µF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple*1 current (mA r.m.s.)	ESR*2 (mΩ max.)	tan δ*3	LC*4 (µA)	Part number	Min. Packaging Qty (pcs)
TPC	6.3	85	5.0	105	47	3.5	2.8	1.1	B1	1100	55	0.10	29.6	6TPC47M	3000
		85	5.0	105		3.5	2.8	1.1		1000	70	0.10	29.6	6TPC47MB	3000
		105	6.3	105	100	7.3	4.3	1.9	D2	1700	45	0.10	63.0	6TPC100M	3000
		105	6.3	105	150	7.3	4.3	1.9		1900	40	0.10	94.5	6TPC150M	3000
		85	5.0	105	330	7.3	4.3	1.9		D2	1900	40	0.10	207.9	6TPC330MA
	8.0	85	6.3	105	22	3.5	2.8	1.1	B1	1000	70	0.10	17.6	8TPC22M	3000
		105	8.0	105	150	7.3	4.3	1.9	D2	1900	40	0.10	120.0	8TPC150M	3000
		105	10.0	105	68	7.3	4.3	1.9	D2	1700	45	0.10	68.0	10TPC68M	3000
	10	105	10.0	105	100	7.3	4.3	1.9	D2	1700	45	0.10	100.0	10TPC100M	3000
		85	10.0	105	10	3.5	2.8	1.1	B1	800	80	0.10	12.5	12TPC10M	3000
85	10.0	105	15	3.5	2.8	1.1	B1	800	80	0.10	18.8	12TPC15M	3000		

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

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

Surface Mount Type

POSCAP



Series : TH

Features

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

Specifications

Size code	D2E	D2	D3L	D4
Category temperature range	-55 °C to +125 °C			
Rated voltage range	2.5 V.DC to 6.3 V.DC	2.5 V.DC to 10 V.DC	4 V.DC to 6.3 V.DC	6.3 V.DC to 10 V.DC
Category voltage range	1.6 V.DC to 4.0 V.DC	1.6 V.DC to 6.3 V.DC	2.5 V.DC to 4.0 V.DC	4.0 V.DC to 6.3 V.DC
Rated capacitance range	150 μF to 330 μF	68 μF to 220 μF	220 μF to 330 μF	220 μF to 470 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)			
Leakage current	Please see the attached characteristics list			
Dissipation factor (tan δ)	Please see the attached characteristics list			
Surge voltage (V.DC)	Rated voltage × 1.15			
Endurance	+125 °C 1000h, category voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	tan δ	≤ 2 times of the initial limit		
	DC leakage current	≤ 2 times of the initial limit		
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage			
	Capacitance change	Within +40 %, -20 % of the initial value		
	tan δ	≤ 1.5 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit		

Marking

D2E, D3L Size

D2, D4 Size

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

Dimensions (not to scale)

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

* Externals of figure are the reference. * 1 ±0.2 : D2 * 2 ±0.2 : D3L, D4

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard			
						L	W	H		Ripple *1 (mAr.m.s.)	ESR *2 (mΩ max.)	tan δ *3	LC *4 (μA)	Part number	Mn. Packaging Qty (pcs)		
THB	4.0	105	2.5	125	330	7.3	4.3	2.8	D3L	2000	40	0.10	132.0	4THB330ML	2500		
										2000	40	0.10	138.6	6THB220ML	2500		
	6.3	105	4.0	125	330	7.3	4.3	3.8		D4	3000	40	0.10	207.9	6THB330M	2000	
											3000	35	0.10	296.1	6THB470M	2000	
	10	105	6.3	125	220	7.3	4.3	3.8			D2	3000	40	0.10	220.0	10THB220M	2000
												3000	35	0.10	330.0	10THB330M	2000
THC	2.5	105	1.6	125	220	7.3	4.3	1.9	D2E			1700	45	0.10	55.0	2R5THC220M	3000
												1900	40	0.10	94.5	6THC150M	3000
										1700		45	0.10	68.0	10THC68M	3000	
THE	2.5	105	1.6	125	330	7.3	4.3	1.8		D2E		3100	15	0.10	82.5	2R5THE330MF	3000
											2800	18	0.10	82.5	2R5THE330MI	3000	
											2400	25	0.10	82.5	2R5THE330M	3000	
	4.0	105	2.5	125	220	7.3	4.3	1.8	D2E		3100	15	0.10	88.0	4THE220MF	3000	
											2800	18	0.10	88.0	4THE220MI	3000	
											2400	25	0.10	88.0	4THE220M	3000	
	6.3	105	4.0	125	150	7.3	4.3	1.8		D2E	2800	18	0.10	94.5	6THE150MI	3000	
											2400	25	0.10	94.5	6THE150M	3000	

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

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

Surface Mount Type

POSCAP

Series : TC



Features

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

Specifications

Size code	D2E	D3L	D4
Category temperature range	-55 °C to +125 °C		
Rated voltage range	4 V.DC to 6.3 V.DC	2.5 V.DC to 10 V.DC	
Category voltage range	3.2 V.DC to 5.0 V.DC	2.0 V.DC to 8.0 V.DC	
Rated capacitance range	100 μF to 330 μF	150 μF to 680 μF	330 μF to 1000 μF
Capacitance tolerance	±20 % (120 Hz / + 20 °C)		
Leakage current	Please see the attached characteristics list		
Dissipation factor (tan δ)	Please see the attached characteristics list		
Surge voltage (V.DC)	Rated voltage × 1.15		
Endurance	+125 °C, 1000 h Category temperature range voltage applied		
	Capacitance change	Within ±20 % of the initial value	
	tan δ	≤ 2 times of the initial limit	
	DC leakage current	≤ 2 times of the initial limit	
Damp heat (Steady State)	+60 °C, 90 % to 95 %, 500 h, No-applied voltage		
	Capacitance change	Within +50 %, -20 % of the initial value (ETCF1000M6H (5H))	
	tan δ	≤ 1.5 times of the initial limit	
	DC leakage current	≤ 3 times of the initial limit	

Marking

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

Dimensions (not to scale)

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

* Externals of figure are the reference.
* 1 ±0.1 : D2E

Characteristics list

Series	Rated voltage (V.DC)	Rated temp. (°C)	Category voltage (V.DC)	Category temp. (°C)	Rated capacitance (μF)	Case size (mm)			Size code	Specifications				Standard	
						L	W	H		Ripple* ¹ current (mAr.m.s.)	ESR* ² (mΩ max.)	tan δ* ³	LC* ⁴ (μA)	Part number	Min. Packaging Qty (pcs)
TCE	2.5	105	2.0	125	680	7.3	4.3	2.8	D3L	3500	12	0.10	170.0	ETCE680MCL	2500
		105	2.0	125		7.3	4.3	2.8		3100	15	0.10	170.0	ETCE680MFL	2500
		105	2.0	125	1000	7.3	4.3	3.8	D4	3900	15	0.15	250.0	ETCE1000MF	2000
	4	105	3.2	125	150	7.3	4.3	1.8	D2E	2800	18	0.10	60.0	4TCE150MI	3000
		105	3.2	125		7.3	4.3	1.8		3100	15	0.10	88.0	4TCE220MF	3000
		105	3.2	125	220	7.3	4.3	1.8		2800	18	0.10	88.0	4TCE220MI	3000
		105	3.2	125		7.3	4.3	1.8		2400	25	0.10	88.0	4TCE220M	3000
		105	3.2	125	330	7.3	4.3	1.8	2800	18	0.10	132.0	4TCE330MI	3000	
		105	3.2	125		7.3	4.3	1.8	2400	25	0.10	132.0	4TCE330M	3000	
		105	3.2	125	470	7.3	4.3	2.8	D3L	3500	12	0.10	188.0	4TCE470MCL	2500
		105	3.2	125		7.3	4.3	2.8		3100	15	0.10	188.0	4TCE470MFL	2500
		105	3.2	125		7.3	4.3	2.8		2800	18	0.10	188.0	4TCE470MIL	2500
		6.3	105	5.0	125	100	7.3	4.3	1.8	D2E	2800	18	0.10	63.0	6TCE100MI
	105		5.0	125	7.3		4.3	1.8	2400		25	0.10	63.0	6TCE100M	3000
	105		5.0	125	150	7.3	4.3	1.8	3100		15	0.10	94.5	6TCE150MF	3000
	105		5.0	125		7.3	4.3	1.8	2800		18	0.10	94.5	6TCE150MI	3000
	105		5.0	125	220	7.3	4.3	1.8	2400		25	0.15	94.5	6TCE150M	3000
	105		5.0	125		7.3	4.3	1.8	2800		18	0.15	138.6	6TCE220MI	3000
	105		5.0	125	330	7.3	4.3	2.8	D3L	2400	25	0.15	138.6	6TCE220M	3000
	105		5.0	125		7.3	4.3	2.8		3100	15	0.10	207.9	6TCE330MFL	2500
105	5.0		125	7.3	4.3	2.8	2800	18		0.10	207.9	6TCE330MIL	2500		
470	105		5.0	125	470	7.3	4.3	3.8	D4	2400	25	0.10	207.9	6TCE330ML	2500
	105		5.0	125		7.3	4.3	3.8		3500	18	0.15	296.1	6TCE470MI	2000
	105		5.0	125	680	7.3	4.3	3.8	3000	25	0.15	296.1	6TCE470M	2000	
	105		5.0	125		7.3	4.3	3.8	3500	18	0.15	428.4	6TCE680MI	2000	
	105	5.0	125	680	7.3	4.3	3.8	3000	25	0.15	428.4	6TCE680M	2000		
	105	5.0	125		7.3	4.3	3.8	3000	25	0.15	428.4	6TCE680M	2000		
10	105	8.0	125	220	7.3	4.3	2.8	D3L	2800	18	0.10	220.0	10TCE220MIL	2500	
	105	8.0	125		7.3	4.3	2.8		2400	25	0.10	220.0	10TCE220ML	2500	
	105	8.0	125	330	7.3	4.3	3.8	D4	3000	25	0.10	330.0	10TCE330M	2000	
TCF	2.5	105	2.0	125	680	7.3	4.3	2.8	D3L	4400	6	0.10	170.0	ETCF680M6L	2500
		105	2.0	125		7.3	4.3	2.8		4400	7	0.10	170.0	ETCF680M7L	2500
		105	2.0	125		7.3	4.3	2.8		4400	10	0.10	170.0	ETCF680ML	2500
		105	2.0	125	1000	7.3	4.3	3.8	D4	6100	5	0.10	170.0	ETCF680M5H	2000
		105	2.0	125		7.3	4.3	3.8		6100	5	0.10	250.0	ETCF1000M5H	2000
		105	2.0	125		7.3	4.3	3.8		5600	6	0.10	250.0	ETCF1000M6H	2000
	4	105	3.2	125	330	7.3	4.3	2.8	D3L	4000	12	0.10	132.0	4TCF330ML	2500
		105	3.2	125	470	7.3	4.3	2.8		4400	10	0.10	188.0	4TCF470ML	2500
		105	3.2	125	680	7.3	4.3	3.8		D4	4400	10	0.10	272.0	4TCF680MAH
	6.3	105	5.0	125	220	7.3	4.3	2.8	D3L	6100	5	0.10	138.6	6TCF220M5L	2500
		105	5.0	125		7.3	4.3	2.8		4600	9	0.10	138.6	6TCF220M9L	2500
		105	5.0	125	330	7.3	4.3	2.8		4000	12	0.10	138.6	6TCF220ML	2500
		105	5.0	125		7.3	4.3	2.8		3900	9	0.10	207.9	6TCF330M9L	2500
	105	5.0	125	470	7.3	4.3	3.8	D4	4400	10	0.10	296.1	6TCF470MAH	2000	
	10	105	10.0	125	150	7.3	4.3	2.8	D3L	3600	15	0.10	150.0	10TCF150ML	2500

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

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

Deletion models

The following table is a list of our items which have been deleted from our catalogs. If you are using any of the following models on the deleted list, please substitute them with the suggested alternative model as soon as possible. Our company continue to supply them to customers who have already used them, for the time being.

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

EOL models

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

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

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

Thank you very much.

Series	Size code	Models for deletion	Year of deletion	Alternative model	Series	Size code	Models for deletion	Year of deletion	Alternative model
TPA	C	10TPA33M	2012/9	10TPB33M	TPE	B2	2R5TPE220MPB	2012/9	2R5TPE220MLB
		6TPA47M	2012/9	10TPB47M			8TPE100MPC2	2012/9	10TPF150ML
	D3	10TPA100M	2012/9	10TPC100M			6TPE150MPC2	2012/9	6TPE150M
		6TPA150M	2012/9	6TPC150M			6TPE150MIC2	2012/9	6TPE150MI
		4TPA220M	2012/9	4TPE220M			4TPE220MPC2	2012/9	4TPE220MI
TPB	B2	8TPB33M	2012/9	10TPB33M			4TPE220MIC2	2012/9	4TPE220MI
		4TPB150MA	2012/9	4TPE150MAZB			4TPE220MFC2	2012/9	4TPE220MF
		4TPB100MV	2012/9	4TPE100MZB			2R5TPE330MIC2	2012/9	2R5TPE330MF
	C	10TPB220MC	2009/10	-			2R5TPE330MFC2	2012/9	2R5TPE330MF
		10TPB68MC	2012/9	10TPC68M			2R5TPE330MCC2	2012/9	2R5TPE330MC
		10TPB47MC	2012/9	10TPC68M		2R5TPE330M9C2	2012/9	2R5TPE330M9	
		8TPB82MC	2012/9	8TPE100MAZB		C3	10TPE180MGC	2012/9	10TPE220ML
		6TPB150MC	2012/9	6TPE150M			10TPE150MGC	2012/9	10TPE220ML
		6TPB100MC	2012/9	6TPG100MG			6TPE220MPC	2012/9	6TPE220M
		4TPB220MC	2012/9	4TPE220MI			6TPE220MIC	2012/9	6TPE220MI
4TPB150MC	2012/9	6TPE150M	6TPE150MPC	2012/9	6TPE150M				
2R5TPB220MC	2012/9	4TPE220MI	4TPE220MPC	2012/9	4TPE220MI				
D3L	16TPB47ML	2003/6	16TQC47MYFD	4TPE220MIC	2012/9		4TPE220MI		
	2R5TPB680ML	2012/9	2R5TPE680MFL	2R5TPE330MPC	2012/9		2R5TPE330MF		
	2R5TPB470ML	2012/9	2R5TPE470MI	2R5TPE330MIC	2012/9		2R5TPE330MF		
D3	16TPB47M	2003/6	16TQC47MYFD	2R5TPE330MFC	2012/9		2R5TPE330MF		
	2R5TPB330M	2012/9	2R5TPE330M	TPF	D2E	2TPF470M6	2012/9	2R5TPF470M6L	
TPC	C1	8TPC33M	2012/9	12TPG33M	TPG	B1G	6TPG68MG	2012/9	6TPG100M
		6TPC100MC	2012/9	6TPG100MG	4TPG150M		2012/9	6TPG150M	
		6TPC68M	2012/9	6TPG100MG	TPL	D2T	2R5TPL330M7	2011/7	-
		4TPC100M	2012/9	6TPG100MG			2R5TPL220MC	2012/9	-
		4TPC56M	2012/9	-	TPLF	D2T	2TPLF560M6	2011/7	-
		2R5TPC82M	2012/9	-			2TPLF470M7	2012/9	-
	D2	16TPC33M	2003/6	16TQC33MYFD	TPSF	B2S	2TPSF270MC	2012/9	2TPSF270M9G
		2R5TPC220M	2012/9	2R5TPE220M			2TPSF270M9	2012/9	2TPSF270M9G
TPD	D4D	10TPD150M	2007/10	10TPF150ML	TPU	S08	6TPU10M	2012/9	6TPU10MSI
		6TPD470M	2012/3	6TPF470MAH			4TPU15M	2012/9	6TPU22MSI
		6TPD330M	2007/10	6TPF330M9L			2R5TPU22M	2012/9	6TPU22MSI
		6TPD220M	2007/10	6TPF220ML		S11	6TPU22MSK	2012/9	6TPU22MSI
		4TPD680M	2012/3	4TPF680MAH			4TPU33MSK	2012/9	6TPU47MSI
		4TPD470M	2007/10	4TPF470ML		2R5TPU47MSK	2012/9	2R5TPU47MSI	
		4TPD330M	2007/10	4TPF330ML		B09	8TPU33MBI	2012/9	ATPH33MAHA
		2R5TPD1000M	2012/3	ETPF1000M6H			6TPU47MBI	2012/9	6TPH47MHA
		2R5TPD1000M8	2012/3	ETPF1000M6H			4TPU68MBI	2012/9	4TPH68MHA
		2R5TPD1000M6	2012/3	ETPF1000M6H		TH	D3L	2R5THB470ML	2012/9
	2R5TPD1000M5	2012/3	ETPF1000M5H	2R5THB1000M	2012/9			-	
	2R5TPD680M	2007/10	2R5TPF680ML	D4	2R5THB680M		2012/9	-	
	2R5TPD680M8	2007/10	2R5TPF680M7L		D4D		6THD330M	2012/3	6TPF330M9L
	2R5TPD680M6	2012/3	2R5TPF680M6L	4THD470M			2012/9	-	
	2R5TPD680M5	2012/3	ETPF680M5H	2R5THD680M			2012/3	2R5TPF680M6L	
	2R5TPD470M	2007/10	2R5TPF470ML	TR			TR series	-	TA series
	2R5TPD470M8	2007/10	2R5TPF470M7L	APA	D2A	APA series	2006/4	-	
	2R5TPD470M6	2012/3	2R5TPF470M6L	APB	D1	APB series	2006/4	-	
	2R5TPD470M5	2012/3	ETPF470M5H	APC	D2	APC series	2009/6	-	
				APD	D1	APD series	2009/6	-	

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