

# Panasonic

INDUSTRY

2019

Conductive Polymer Tantalum  
Solid Capacitors

Products Catalog

# POSCAP

2019.10



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

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

**<Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>**

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

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

## 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 and (EU)2015/863)).
- No Ozone Depleting Chemicals(ODC's), controlled under the Montreal Protocol Agreement, are used in producing this product.  
We do not use PBBs or PBDEs as brominated flame retardants.
- Export procedure which followed export related regulations, such as foreign exchange and a foreign trade method, on the occasion of export of this product.
- These products are not dangerous goods on the transportation as identified by UN(United Nations) numbers or UN classification.

### ■ 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.

### ■ Intellectual property rights and licenses

- The technical information in this specification provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.

## Items to be observed

### ■ For specification

- This specification guarantees the quality and performance of the product as individual components. The durability differs depending on the environment and the conditions of usage. Before use, check and evaluate their compatibility with actual conditions when installed in the products. When safety requirements cannot be satisfied in your technical examination, inform us immediately.
- Do not use the products beyond the specifications described in this document.

### ■ Upon application to products where safety is regarded as important

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.

- (1) The system is equipped with a protection circuit and protection device.
- (2) The system is equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault.

### ■ Conditions of use

- Before using the products, carefully check the effects on their quality and performance, and determined whether or not they can be used. These products are designed and manufactured for general-purpose and standard use in general electronic equipment. These products are not intended for use in the following special conditions.
  - (1) In liquid, such as Water, Oil, Chemicals, or Organic solvent.
  - (2) In direct sunlight, outdoors, or in dust.
  - (3) In vapor, such as dew condensation water of resistive element, or water leakage, salty air, or air with a high concentration corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>x</sub>.
  - (4) In an environment where strong static electricity or electromagnetic waves exist.
  - (5) Mounting or placing heat-generating components or inflammables, such as vinyl-coated wires, near these products.
  - (6) Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin and other material.
  - (7) Using solvent, water or water-soluble cleaner for flux cleaning agent after soldering. (In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues)
  - (8) Using in the atmosphere where strays acid or alkaline.
  - (9) Using in the atmosphere where 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.

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  - (3) In vapor, such as dew condensation water of resistive element, or water leakage, salty air, or air with a high concentration corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>x</sub>.
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  - (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) Coupling circuit
- (3) Time constant circuits
- (4) Circuits greatly affected by leakage current
- (5) The circuit in which two or more POSCAP are connected in a series so as to raise the endurance voltage.

#### 1.2 Failure and life-span

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

The mainly failure modes are as follows.

\* B2 size or less : 1.0 %

##### 1.2-1 Contingency failure

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

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

- (1) Set the operating temperature so that it falls within the range stipulated in this delivery specification.
- (2) 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.)
- (3) Specified ESR is a value at the time of shipping from factory. ESR may change upon use conditions.

### 1.6 Leakage current

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

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

### 1.7 Rapid charge and discharge limitation

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

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

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

\* 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 of unopened as 18 months or shorter after shipment from factory.
  - 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 use up POSCAP in the storage bag.

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

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

### \* Intellectual property right

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

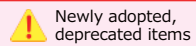
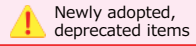
Representative patents relating to POSCAP are as follows:

US Patent No.6508800, No.6891717, No.7158368, No.7326260号, No.8081421, No.8149569, No.8456804, No.8559166

### Line up

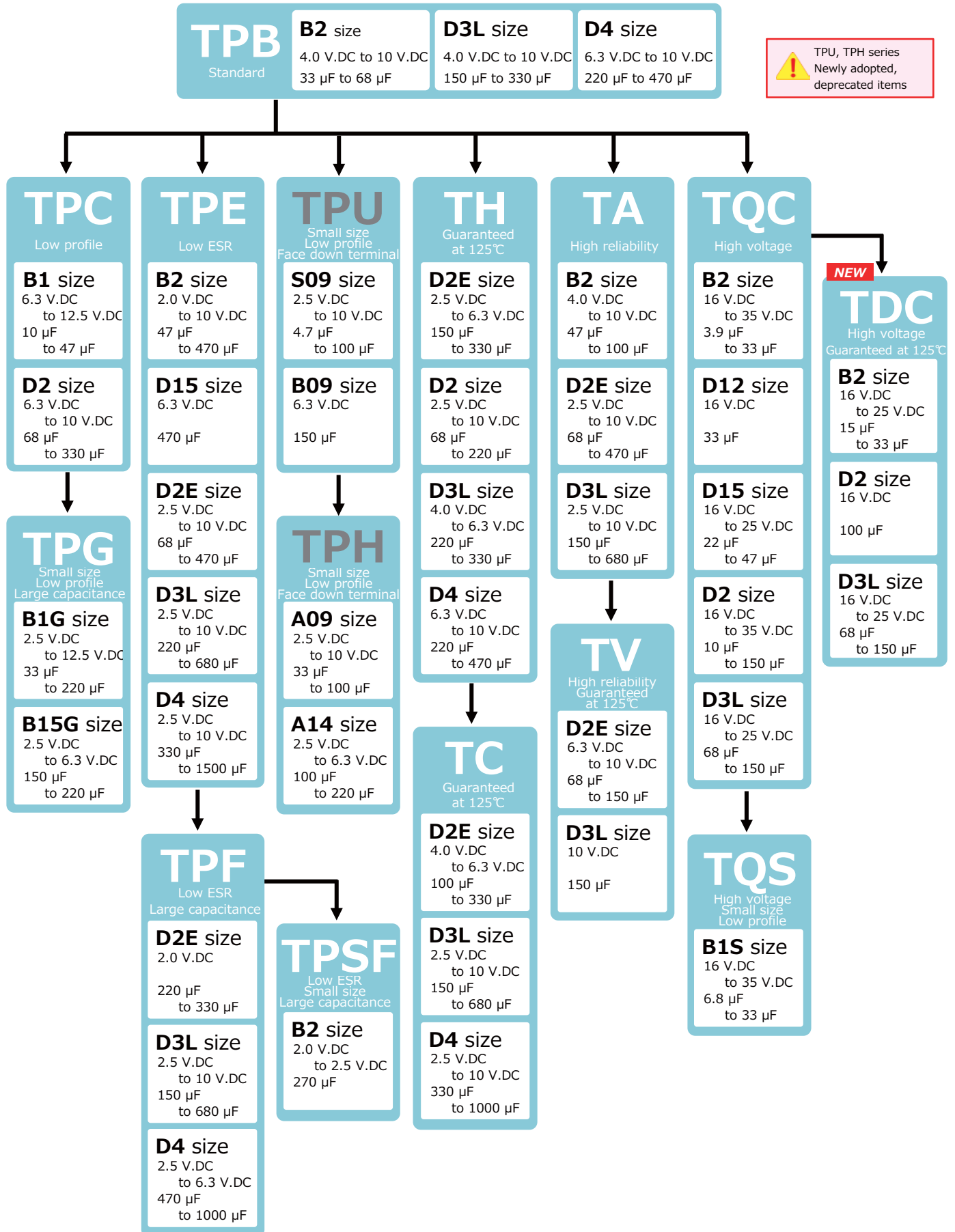
| Series | Features  | Small size/Low profile | Large capacitance | Low ESR | High reliability | High voltage | Guaranteed at 125°C | Category temp. range (°C) | Rated voltage (V.DC) | ESR (mΩ)  | Capacitance (μF) | Size code | Size (mm) |     |      |
|--------|---|------------------------|-------------------|---------|------------------|--------------|---------------------|---------------------------|----------------------|-----------|------------------|-----------|-----------|-----|------|
|        |   |                        |                   |         |                  |              |                     |                           |                      |           |                  |           | L         | W   | H    |
| TPG    | Small size<br>Low profile<br>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<br>Large capacitance<br>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<br>Large capacitance                                  |                        |                   | ●       | ●                |              |                     | -55 to 105                | 2.0                  | 6         | 220 to 330       | D2E       | 7.3       | 4.3 | 1.8  |
|        |   |                        |                   |         |                  |              |                     | -55 to 105                | 2.5 to 10            | 5 to 15   | 150 to 680       | D3L       | 7.3       | 4.3 | 2.8  |
|        |   |                        |                   |         |                  |              |                     | -55 to 105                | 2.5 to 6.3           | 5 to 10   | 470 to 1000      | D4        | 7.3       | 4.3 | 3.8  |
| TQS    | High voltage<br>Small size/Low profile                        | ●                      |                   |         |                  | ●            |                     | -55 to 105                | 16 to 35             | 70 to 150 | 6.8 to 33        | B1S       | 3.5       | 2.8 | 1.1  |
| TQC    | High voltage  |                        |                   |         |                  |              | ●                   | -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  |
| TA     | High reliability  |                        |                   |         |                  |              | ●                   | -55 to 105                | 4.0 to 10            | 70        | 47 to 100        | B2        | 3.5       | 2.8 | 1.9  |
|        |   |                        |                   |         |                  |              |                     | -55 to 105                | 2.5 to 10            | 9 to 25   | 68 to 470        | D2E       | 7.3       | 4.3 | 1.8  |
|        |   |                        |                   |         |                  |              |                     | -55 to 105                | 2.5 to 10            | 15 to 25  | 150 to 680       | D3L       | 7.3       | 4.3 | 2.8  |
| TV     | High reliability<br>Guaranteed at 125°C                       |                        |                   |         |                  |              | ●                   | -55 to 125                | 6.3 to 10            | 25        | 68 to 150        | D2E       | 7.3       | 4.3 | 1.8  |
|        |   |                        |                   |         |                  |              |                     | -55 to 125                | 10                   | 25        | 150              | D3L       | 7.3       | 4.3 | 2.8  |

### Line up

| Series            | Features   | Small size/Low profile | Large capacitance | Low ESR | High reliability | High voltage | Guaranteed at 125°C | Category temp. range (°C) | Rated voltage (V.DC) | ESR (mΩ)   | Capacitance (μF) | Size code | Size (mm) |      |     |
|-------------------|--|------------------------|-------------------|---------|------------------|--------------|---------------------|---------------------------|----------------------|------------|------------------|-----------|-----------|------|-----|
|                   |  |                        |                   |         |                  |              |                     |                           |                      |            |                  |           | L         | W    | H   |
| 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 |
| 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 |
| <b>NEW</b><br>TDC | High voltage<br>Guaranteed at 125°C  |                        |                   |         |                  |              | ● ●                 | -55 to 125                | 16 to 25             | 90 to 100  | 15 to 33         | B2        | 3.5       | 2.8  | 1.9 |
|                   |  |                        |                   |         |                  |              |                     | -55 to 125                | 16                   | 50         | 100              | D2        | 7.3       | 4.3  | 1.9 |
|                   |  |                        |                   |         |                  |              |                     | -55 to 125                | 16 to 25             | 50 to 70   | 68 to 150        | D3L       | 7.3       | 4.3  | 2.8 |
| 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 |
| TPU               | <br>Small size<br>Low profile<br>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               | <br>Small size<br>Low profile<br>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 |



### Diagram



### Explanation of part numbers

#### ◇ Part number system

**2R5**

Rated voltage  
1 to 3 figures

| Rated voltage | Code     |
|---------------|----------|
| 2.0           | 2        |
| 2.5           | 2R5 or E |
| 4.0           | 4        |
| 6.3           | 6        |
| 8.0           | 8        |
| 10.0          | 10       |
| 11.0          | 11       |
| 12.5          | 12       |
| 16.0          | 16 or 1C |
| 20.0          | 20       |
| 25.0          | 25       |
| 35.0          | 35       |

**TPB**

Series name  
3 to 4 figures

| Series | Code |
|--------|------|
| TPB    | TPB  |
| TPC    | TPC  |
| TPE    | TPE  |
| TPF    | TPF  |
| TPG    | TPG  |
| TPH    | TPH  |
| TPSF   | TPSF |
| TPU    | TPU  |
| TAB    | TAB  |
| TAE    | TAE  |
| THB    | THB  |
| THC    | THC  |
| THE    | THE  |
| TQC    | TQC  |
| TQS    | TQS  |
| TVE    | TVE  |
| TCE    | TCE  |
| TCF    | TCF  |
| TDC    | TDC  |

**330**

Rated cap.  
2 to 4 figures

| Rated cap. | Code |
|------------|------|
| 2.7        | 2R7  |
| 3.9        | 3R9  |
| 4.7        | 4R7  |
| 5.6        | 5R6  |
| 6.8        | 6R8  |
| 8.2        | 8R2  |
| 10         | 10   |
| 15         | 15   |
| 22         | 22   |
| 33         | 33   |
| 47         | 47   |
| 56         | 56   |
| 68         | 68   |
| 82         | 82   |
| 100        | 100  |
| 120        | 120  |
| 150        | 150  |
| 220        | 220  |
| 270        | 270  |
| 330        | 330  |
| 470        | 470  |
| 680        | 680  |
| 1000       | 1000 |
| 1500       | 1500 |

**M**

Cap. tolerance  
1 figure

| Cap. tolerance | Code |
|----------------|------|
| ±20%           | M    |

**L**

Special code  
0 to 4 figures



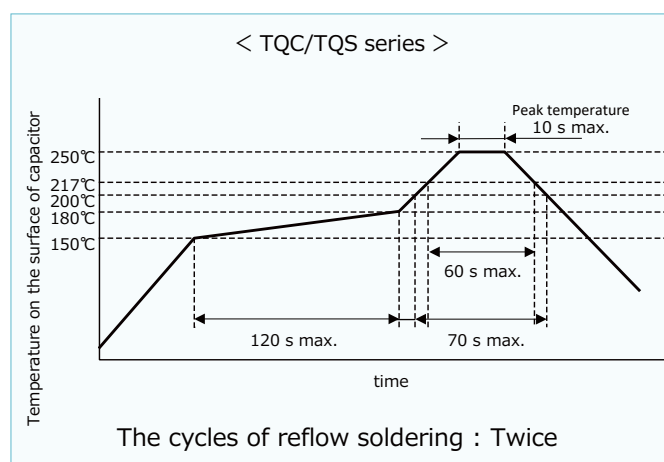
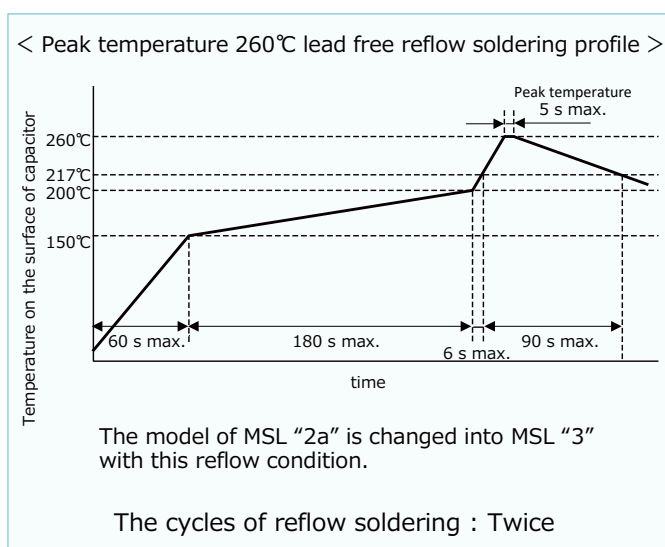
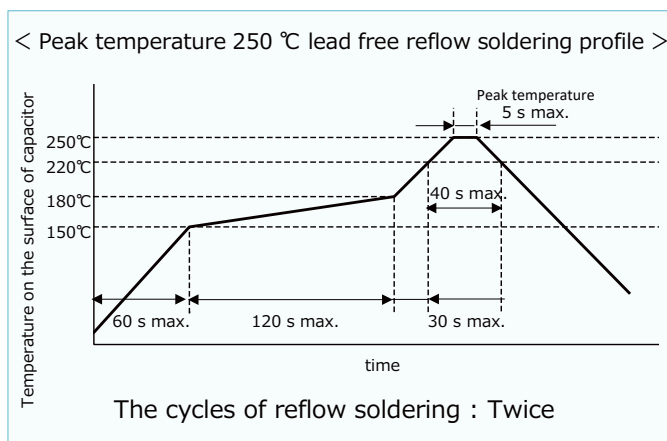
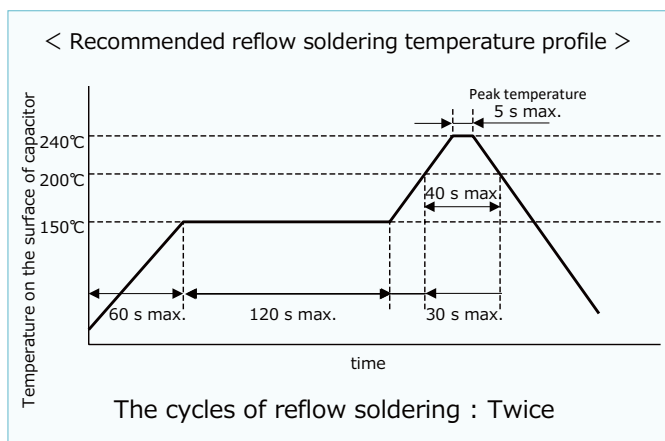
S09/B09 (TPU), A09/A14 (TPH)  
is not a recommended product.

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

| Standard                             |                         | Code   |
|--------------------------------------|-------------------------|--------|
| TPF series                           |                         |        |
| D3L                                  | ESR 9 mΩ max.           | 9L     |
|                                      | ESR 7 mΩ max.           | 7L     |
|                                      | ESR 6 mΩ max.           | 6L     |
|                                      | ESR 5 mΩ max.           | 5L     |
| D4                                   | ESR 10 mΩ max.          | AH     |
|                                      | ESR 6 mΩ max.           | 6H     |
|                                      | ESR 5 mΩ max.           | 5H     |
| TPU series                           |                         |        |
| S09                                  |                         | SI     |
| B09                                  |                         | BI     |
| TQC / TDC series                     |                         |        |
| Capacitance enlarged type            |                         | YF     |
| Capacitance enlarged type (B2 size)  |                         | YFB    |
| Capacitance enlarged type (D12 size) |                         | YFS    |
| Capacitance enlarged type (D15 size) |                         | YFT    |
| Capacitance enlarged type (D2 size)  |                         | YFD/D3 |
| TPU series                           |                         |        |
|                                      | ESR 70 mΩ max.          | BD     |
|                                      | ESR 100 mΩ max.         | ED     |
|                                      | ESR 150 mΩ max.         | HD     |
| All series                           |                         |        |
|                                      | ESR 55 mΩ max.          | G      |
|                                      | ESR 45 mΩ max.          | V      |
|                                      | ESR 40 mΩ max.          | W      |
|                                      | ESR 35 mΩ max.          | Z      |
|                                      | ESR 18 mΩ max.          | I      |
|                                      | ESR 15 mΩ max.          | F      |
|                                      | ESR 12 mΩ max.          | C      |
|                                      | ESR 9 mΩ max.           | 9      |
|                                      | ESR 7 mΩ max.           | 7      |
|                                      | ESR 6 mΩ max.           | 6      |
|                                      | ESR 5 mΩ max.           | 5      |
|                                      | ESR 35 mΩ / 300kHz max. | ZG     |
|                                      | ESR 30 mΩ / 300kHz max. | UG     |
|                                      | ESR 9 mΩ / 300kHz max.  | 9G     |
|                                      | ESR 6 mΩ / 500kHz max.  | 6E     |
|                                      | ESR 4 mΩ / 500kHz max.  | 4E     |

### Mounting specifications

#### ◇ Recommendable reflow soldering



#### ● Soldering with a soldering iron

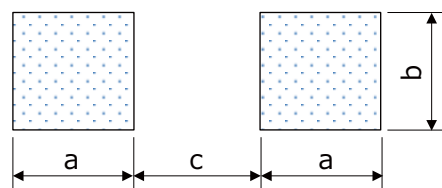
Tip of a soldering iron : 350 °C max (TQC/TQS series : 400 °C max.)

Power of a soldering iron : 30 W max.

Working time : 3 sec. max. (TQC/TQS series : 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



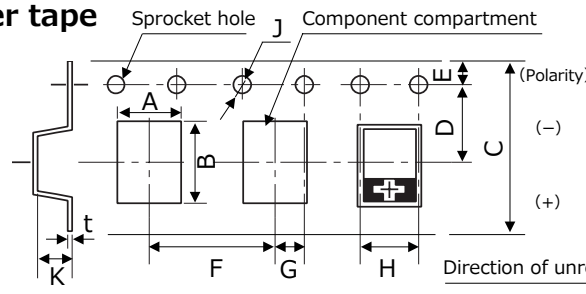
Unit : mm

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

S09/B09 (TPU), A09/A14 (TPH) is not a recommended product.

### Packing specifications

#### Dimension of carrier tape

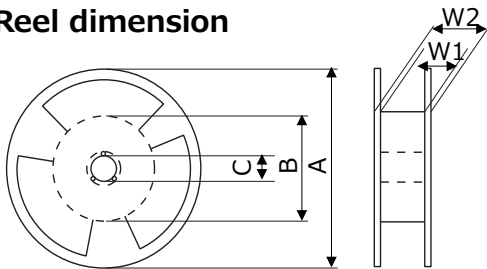


**!** S09/B09 (TPU), A09/A14 (TPH) is not a recommended product.

| Size code | Unit (mm) |       |       |        |       |       |        |       |                                |       |        |  |
|-----------|-----------|-------|-------|--------|-------|-------|--------|-------|--------------------------------|-------|--------|--|
|           | 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 <sup>+0.1</sup> <sub>0</sub> | 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   |  |
| B1S       | 3.25      | 3.9   | 8.0   | 3.5    | 1.75  | 4.0   | 2.0    | 4.0   | φ1.5                           | 1.7   | 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   |  |
| 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 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 <sub>-3</sub> | φ60±2 | φ13.0±0.2 | 9.0±0.5  | 11.4±1.0 |

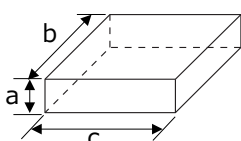
#### Minimum packing quantity and weight

| 〈φ180〉    |                  |                    |
|-----------|------------------|--------------------|
| Size code | Qty. (pcs./Reel) | Typical weight (g) |
| S09, A09  | 3000             | 200                |
| A14       | 2500             | 200                |
| B09, B1   | 3000             | 200                |
| B1S, B1G  | 2500             | 200                |
| B15G      | 2500             | 200                |
| B2, B2S   | 2000             | 200                |

| 〈φ330〉    |                  |                    |
|-----------|------------------|--------------------|
| Size code | Qty. (pcs./Reel) | 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, ITPF and TQC series.  
Please contact our sales representative if you prefer it.

#### Dimension of packing case



| Reel size | Unit (mm) |      |
|-----------|-----------|------|
|           | 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       |
| B1S, B1G  | 12500       | D2E, D2   | 15000       |
| B15G      | 12500       | D3L       | 12500       |
| B2, B2S   | 10000       | D4        | 10000       |

## Surface Mount Type

TPG series



**POSCAP**

### Features

- Small size, Low profile (L 3.5 × W 2.8 × H 1.1 mm)
- Large capacitance (220 μF max.)
- RoHS compliance, Halogen free

### Specifications

| Size code                 | B1G   | B15G                                     |
|---------------------------|---|--|
| Category temp. range      | -55 °C to +105 °C                               |  |
| Rated volt. range         | 2.5 V.DC to 12.5 V.DC                           | 2.5 V.DC to 6.3 V.DC                     |
| Category volt. range      | 2.0 V.DC to 10 V.DC                             | 2.0 V.DC to 5.0 V.DC                     |
| Rated cap. 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        |
|                           | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |
|                           | 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 |
|                           | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |
|                           | Leakage current                                 | ≤ 3 times of the initial limit           |

### Marking

Polarity marking(+)      Rated Capacitance code

Rated Voltage code      Lot. No.

| R. voltage code |     | Unit : V.DC |      |
|-----------------|-----|-------------|------|
| e               | 2.5 | j           | 6.3  |
| g               | 4.0 | k           | 8.0  |
|                 |     | A           | 10   |
|                 |     | B           | 12.5 |

| R. capacitance code |    | Unit : μF |     |
|---------------------|----|-----------|-----|
| N7                  | 33 | A8        | 100 |
| S7                  | 47 | E8        | 150 |
|                     |    | J8        | 220 |

### Dimensions (not to scale)

| Size code | L <sup>+0.3/-0.1</sup> | W <sup>+0.3/-0.1</sup> | 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

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard     |                           | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|--------------|---------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current <sup>*1</sup> (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (μA) | Part number  | Min. packaging q'ty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 2.5                | 85               | 2.0                   | 105                 | 220             | 3.5            | 2.8 | 1.1 | B1G       | 1000                                     | 70                          | 0.10                | 55                    | 2R5TPG220M   | 2500                      | 3                  | 3                  |
|                    | 85               | 2.0                   | 105                 |                 | 3.5            | 2.8 | 1.4 | B15G      | 1400                                     | 30/300 kHz                  | 0.10                | 110                   | 2R5TPG220MUG | 2500                      |                    |                    |
| 4.0                | 85               | 3.2                   | 105                 | 220             | 3.5            | 2.8 | 1.4 | B15G      | 1000                                     | 70                          | 0.10                | 88                    | 4TPG220M     | 2500                      |                    |                    |
|                    | 85               | 5.0                   | 105                 |                 | 3.5            | 2.8 | 1.1 | B1G       | 1000                                     | 70                          | 0.10                | 63                    | 6TPG100M     | 2500                      |                    |                    |
| 6.3                | 85               | 5.0                   | 105                 | 100             | 3.5            | 2.8 | 1.1 | B1G       | 1100                                     | 55                          | 0.10                | 63                    | 6TPG100MG    | 2500                      |                    |                    |
|                    | 85               | 5.0                   | 105                 |                 | 3.5            | 2.8 | 1.1 | B1G       | 1200                                     | 35/300 kHz                  | 0.10                | 126                   | 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                   | 6TPG150MZG   | 2500                      |                    |                    |
| 8.0                | 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 | B1G       | 1000                                     | 70                          | 0.10                | 47                    | 10TPG47M     | 2500                      |                    |                    |
| 12.5               | 85               | 10                    | 105                 | 33              | 3.5            | 2.8 | 1.1 | B1G       | 1000                                     | 70                          | 0.10                | 41.3                  | 12TPG33M     | 2500                      |                    |                    |

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

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



## Surface Mount Type TPSF series



**POSCAP**

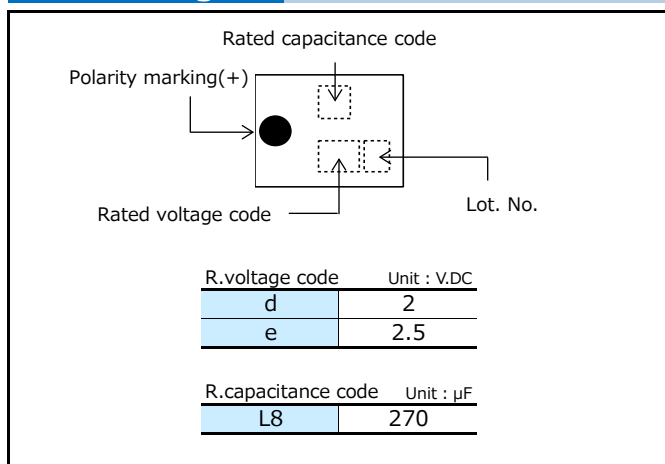
### Features

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

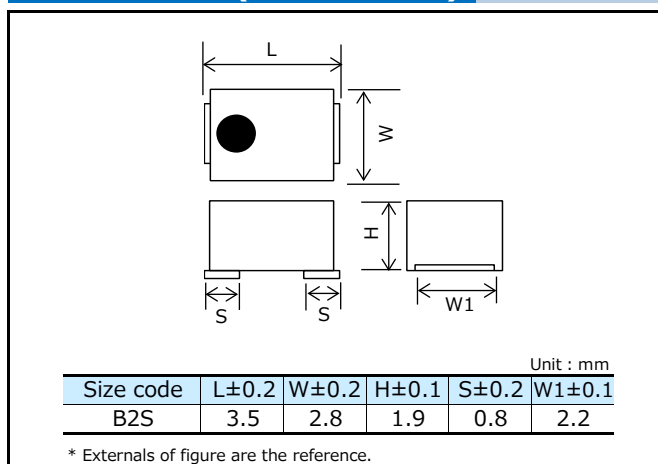
### Specifications

|                             |   |  |
|-----------------------------|---|--|
| Size code                   | B2S   |  |
| Category temp. range        | -55 °C to +105 °C                               |  |
| Rated volt. range           | 2.0 V.DC to 2.5 V.DC                            |  |
| Category volt. range        | 2.0 V.DC to 2.5 V.DC                            |  |
| Rated cap. 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        |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |
|                             | Leakage current                                 | Within the initial limit                 |
| Damp heat<br>(Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage |  |
|                             | Capacitance change                              | Within +40 %, -20 % of the initial value |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |
|                             | Leakage current                                 | ≤ 3 times of the initial limit           |

### Marking



### Dimensions (not to scale)



### Characteristics list

| Rated volt.<br>(V.DC) | Rated temp.<br>(°C) | Cate-<br>gory<br>volt.<br>(V.DC) | Cate-<br>gory<br>temp.<br>(°C) | Rated<br>cap.<br>(μF) | Case size<br>(mm) |     |     | Size<br>code | Specifications                   |                                |                     |                          | Standard    |                                    | Floor life<br>level      |                          |
|-----------------------|---------------------|----------------------------------|--------------------------------|-----------------------|-------------------|-----|-----|--------------|----------------------------------|--------------------------------|---------------------|--------------------------|-------------|------------------------------------|--------------------------|--------------------------|
|                       |                     |                                  |                                |                       | L                 | W   | H   |              | Ripple<br>current<br>(mA r.m.s.) | ESR* <sup>2</sup><br>(mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup><br>(μA) | Part number | Min.<br>packaging<br>q'ty<br>(pcs) | Reflow<br>temp<br>≤260°C | Reflow<br>temp<br>≤250°C |
| 2.0                   | 105                 | 2.0                              | 105                            | 270                   | 3.5               | 2.8 | 1.9 | B2S          | 3200                             | 6/500 kHz                      | 0.08                | 108.0                    | 2TPSF270M6E | 2000                               | 5                        | 5                        |
|                       |                     |                                  |                                |                       |                   |     |     |              | 2400                             | 9/300 kHz                      | 0.08                | 108.0                    | 2TPSF270M9G | 2000                               | 3                        | 3                        |
| 2.5                   | 105                 | 2.5                              | 105                            |                       | 3.5               | 2.8 | 1.9 |              | 3200                             | 6/500 kHz                      | 0.08                | 135.0                    | ETPSF270M6E | 2000                               |                          |                          |

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

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

## Surface Mount Type

TPE series B size

POSCAP



### Features

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

### Specifications

|                           |  |  |
|---------------------------|--|--|
| Size code                 | B2   |  |
| Category temp. range      | -55 °C to +105 °C  |  |
| Rated volt. range         | 2.0 V.DC to 10 V.DC  |  |
| Category volt. range      | 1.8 V.DC to 8 V.DC   |  |
| Rated cap. 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  |
|                           | Dissipation factor(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 +50 %, -20 % of the initial value<br>(2R5TPE220MAZB (MAPB, MAFB), 2R5TPE330MAZB, 2TPE330MAFB (MADGB), 2TPE470MAJGB (MAFB), 2TPE330MFB, ETPE330MAFB (MA9GB)) |
|                           |  | Within +40 %, -20 % of the initial value (Except for above model)  |
|                           | Dissipation factor(tan δ)  | ≤ 1.5 times of the initial limit   |
|                           | Leakage current  | ≤ 3 times of the initial limit   |

### Marking

Rated capacitance code

Polarity marking(+)

Rated voltage code

Lot No.

| R. voltage code |     | Unit : V.DC |     |
|-----------------|-----|-------------|-----|
| d               | 2.0 | g           | 4.0 |
| e               | 2.5 | j           | 6.3 |
|                 |     | k           | 8.0 |
|                 |     | A           | 10  |

| R. capacitance code |     | Unit : μF |     |
|---------------------|-----|-----------|-----|
| S7                  | 47  | E8        | 150 |
| A8                  | 100 | J8        | 220 |
| C8                  | 120 | N8        | 330 |
|                     |     | S8        | 470 |

### 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

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |      | Size code | Specifications                           |                             |                     |                       | Standard      |                          | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|------|-----------|--|-----------------------------|---------------------|-----------------------|---------------|--------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H    |           | Ripple current* <sup>1</sup> (mA r.m.s.) | ESR* <sup>2</sup> (mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup> (μA) | Part number   | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 2.0                | 105              | 2.0                   | 105                 | 330             | 3.5            | 2.8 | 1.9  | B2        | 2000                                     | 15                          | 0.08                | 132.0                 | 2TPE330MFB    | 2000                     | 3                  | 3                  |
|                    | 85               | 1.8                   | 105                 |                 | 3.5            | 2.8 | 1.9  |           | 2000                                     | 15                          | 0.08                | 132.0                 | 2TPE330MAFB   | 2000                     |                    |                    |
|                    | 85               | 1.8                   | 105                 |                 | 3.5            | 2.8 | 1.9  |           | 2000                                     | 13/300kHz                   | 0.10                | 132.0                 | 2TPE330MADGB  | 2000                     |                    |                    |
|                    | 85               | 1.8                   | 105                 | 470             | 3.5            | 2.8 | 1.9  |           | 2300                                     | 15                          | 0.10                | 188.0                 | 2TPE470MAFB   | 2000                     |                    |                    |
|                    | 85               | 1.8                   | 105                 |                 | 3.5            | 2.8 | 1.9  |           | 2300                                     | 11/300kHz                   | 0.08                | 188.0                 | 2TPE470MAJGB  | 2000                     |                    |                    |
| 2.5                | 85               | 2.0                   | 105                 | 220             | 3.5            | 2.8 | 1.9  |           | 2000                                     | 15                          | 0.08                | 110.0                 | 2R5TPE220MAFB | 2000                     |                    |                    |
|                    | 105              | 2.5                   | 105                 |                 | 3.5            | 2.8 | 1.9  |           | 1800                                     | 15/300kHz                   | 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          |                          |                    |                    |
|                    | 85               | 2.0                   | 105                 |                 | 3.5            | 2.8 | 1.9  | 3200      | 9/300kHz                                 | 0.08                        | 165.0               | ETPE330MA9GB          | 2000          |                          |                    |                    |
|                    | 105              | 2.5                   | 105                 |                 | 3.5            | 2.8 | 1.9  | 3200      | 9/300kHz                                 | 0.08                        | 165.0               | ETPE330M9GB           | 2000          |                          |                    |                    |
|                    | 85               | 2.0                   | 105                 |                 | 3.5            | 2.8 | 1.9  | 2700      | 15                                       | 0.08                        | 165.0               | ETPE330MAFB           | 2000          |                          |                    |                    |
| 4.0                | 105              | 4.0                   | 105                 | 100             | 3.5            | 2.8 | 1.9  | 2700      | 15                                       | 0.08                        | 165.0               | ETPE330MFB            | 2000          |                          |                    |                    |
|                    | 85               | 3.2                   | 105                 |                 | 150            | 3.5 | 2.8  | 1.9       | 1400                                     | 35                          | 0.08                | 40.0                  | 4TPE100MZB    | 2000                     |                    |                    |
|                    | 85               | 3.2                   | 105                 | 220             | 3.5            | 2.8 | 1.9  | 1400      | 35                                       | 0.08                        | 60.0                | 4TPE150MAZB           | 2000          |                          |                    |                    |
|                    | 85               | 3.2                   | 105                 | 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          |                          |                    |                    |
|                    | 105              | 6.3                   | 105                 |                 | 3.5            | 2.8 | 1.9  | 1400      | 35                                       | 0.08                        | 63.0                | 6TPE100MZB            | 2000          |                          |                    |                    |
|                    | 85               | 5.0                   | 105                 | 120             | 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                 | 150             | 3.5            | 2.8 | 1.9  | 1400      | 35                                       | 0.08                        | 94.5                | 6TPE150MAZB           | 2000          |                          |                    |                    |
|                    | 85               | 5.0                   | 105                 |                 | 3.5            | 2.8 | 1.9  | 1400      | 35                                       | 0.10                        | 138.6               | 6TPE220MAZB           | 2000          |                          |                    |                    |
|                    | 85               | 5.0                   | 105                 |                 | 3.5            | 2.8 | 1.9  | 1600      | 25                                       | 0.10                        | 138.6               | 6TPE220MAPB           | 2000          |                          |                    |                    |
| 8.0                | 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", "Taping specifications" and "Floor life level".

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

## Surface Mount Type

TPE series D size



**POSCAP**

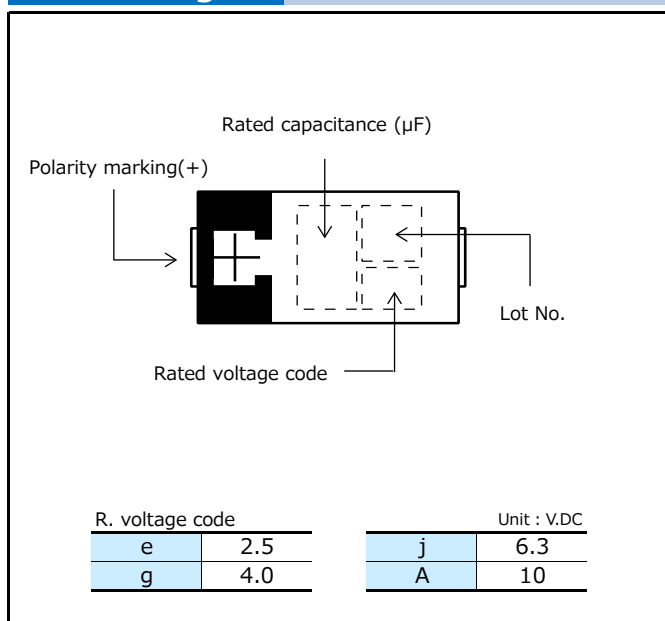
### Features

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

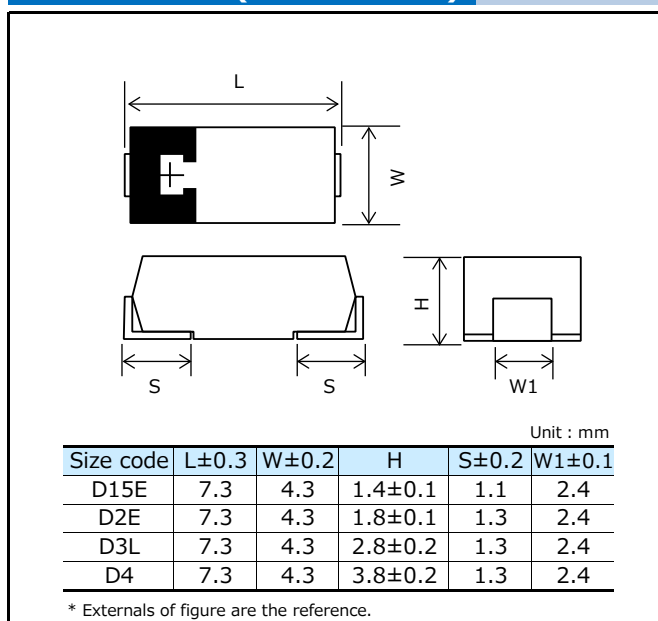
### Specifications

| Size code                 | D15E   | D2E  | D3L              | D4                |
|---------------------------|--|--|------------------|-------------------|
| Category temp. range      | -55 °C to +105 °C  |  |                  |                   |
| Rated volt. range         | 6.3 V.DC   | 2.5 V.DC to 10 V.DC  |                  |                   |
| Category volt. range      | 5.0 V.DC   | 2.5 V.DC to 10 V.DC  |                  |                   |
| Rated cap. 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<br>Rated temp, +85 °C Products : +85 °C 1000 h, rated voltage applied<br>6TPE330MAP, 6TPE470MAZU : +85 °C 2000 h, rated voltage applied |  |                  |                   |
|                           | Capacitance change   | Within ±20 % of the initial value  |                  |                   |
|                           | Dissipation factor(tan δ)  | ≤ 1.5 times of the initial limit   |                  |                   |
|                           | 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<br>(2R5TPE220M (I, F, 9), 2R5TPE330M (I, F, C, 9, 7),<br>2R5TPE470M (I, F, C, 9, 7), 2R5TPE1000MF, 2R5TPE1500M (F, C))<br>Within +40 %, -20 % of the initial value (Except for above model) |                  |                   |
|                           | Dissipation factor(tan δ)  | ≤ 1.5 times of the initial limit   |                  |                   |
|                           | Leakage current  | ≤ 3 times of the initial limit   |                  |                   |

### Marking



### Dimensions (not to scale)



## Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |      | Size code | Specifications                           |                             |                     |                       | Standard    |                          | Floor life level   |                    |              |      |   |  |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|------|-----------|--|-----------------------------|---------------------|-----------------------|-------------|--------------------------|--------------------|--------------------|--------------|------|---|--|
|                    |                  |                       |                     |                 | L              | W   | H    |           | Ripple* <sup>1</sup> current (mA r.m.s.) | ESR* <sup>2</sup> (mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup> (μA) | Part number | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |              |      |   |  |
| 2.5                | 105              | 2.5                   | 105                 | 220             | 7.3            | 4.3 | 1.8  | D2E       | 3900                                     | 9                           | 0.10                | 55.0                  | 2R5TPE220M9 | 3000                     | 3                  |                    |              |      |   |  |
|                    | 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             |                    |                    | 2500         |      |   |  |
|                    | 105              | 2.5                   | 105                 | 1000            | 7.3            | 4.3 | 3.8  |           | D4                                       | 3100                        | 15                  | 0.10                  | 170.0       | 2R5TPE680MFL             |                    |                    | 2500         |      |   |  |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 3.8  |           |  | 3900                        | 15                  | 0.15                  | 250.0       | 2R5TPE1000MF             |                    |                    | 2000         |      |   |  |
|                    | 4.0              | 105                   | 2.5                 | 105             | 1500           | 7.3 | 4.3  |           | 3.8                                      | D2E                         | 4400                | 12                    | 0.15        | 375.0                    |                    |                    | 2R5TPE1500MC | 2000 | - |  |
|                    |                  | 105                   | 2.5                 | 105             |                | 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  | 2800      | 18                                       |                             | 0.10                | 60.0                  | 4TPE150MI   | 3000                     |                    |                    |              |      |   |  |
| 105                |                  | 4.0                   | 105                 |                 | 7.3            | 4.3 | 1.8  | 3100      | 15                                       |                             | 0.10                | 88.0                  | 4TPE220MF   | 3000                     |                    |                    |              |      |   |  |
| 105                |                  | 4.0                   | 105                 | 220             | 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        |                          |                    |                    |              |      |   |  |
| 6.3                | 105              | 6.3                   | 105                 | 100             | 7.3            | 4.3 | 1.8  | D2E       | 2800                                     | 18                          | 0.10                | 63.0                  | 6TPE100MI   | 3000                     | 3                  |                    |              |      |   |  |
|                    | 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                 |                 | 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                        | 9/500kHz            | 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                 | 470             | 7.3            | 4.3 | 2.8  |           | D4                                       | 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                 |                 | 7.3            | 4.3 | 3.8  |           |  | D15E                        | 4400                | 10                    | 0.10        | 207.9                    |                    |                    | 6TPE330MAA   | 2000 |   |  |
|                    | 85               | 5.0                   | 105                 |                 | 7.3            | 4.3 | 1.4  |           |  | 1700                        | 35                  | 0.10                  | 296.1       | 6TPE470MAZU              |                    |                    | 4000         |      |   |  |
|                    | 105              | 6.3                   | 105                 | 680             | 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                 |                 | 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         |      |   |  |
| 10                 | 105              | 10                    | 105                 | 68              | 7.3            | 4.3 | 1.8  | D2E       | 2400                                     | 25                          | 0.10                | 68.0                  | 10TPE68M    | 3000                     | -                  |                    |              |      |   |  |
|                    | 105              | 10                    | 105                 | 220             | 7.3            | 4.3 | 2.8  | D3L       | 2800                                     | 18                          | 0.10                | 220.0                 | 10TPE220MIL | 2500                     |                    |                    |              |      |   |  |
|                    | 105              | 10                    | 105                 |                 | 7.3            | 4.3 | 2.8  |           | 2400                                     | 25                          | 0.10                | 220.0                 | 10TPE220ML  | 2500                     |                    |                    |              |      |   |  |
|                    | 105              | 10                    | 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", "Taping specifications" and "Floor life level".

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



## Surface Mount Type TPF series



# POSCAP

### Features

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

### Specifications

| Size code                 | D2E   | D3L  | D4                   |
|---------------------------|---|--|----------------------|
| Category temp. range      | -55 °C to +105 °C                               |  |                      |
| Rated volt. range         | 2.0 V.DC  | 2.5 V.DC to 10 V.DC  | 2.5 V.DC to 6.3 V.DC |
| Category volt. range      | 2.0 V.DC  | 2.5 V.DC to 10 V.DC  | 2.5 V.DC to 6.3 V.DC |
| Rated cap. 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  |                      |
|                           | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit   |                      |
|                           | 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<br>(2TPF220M6, 2TPF330M6, ETPF1000M6H (5H)) |                      |
|                           | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit   |                      |
|                           | Leakage current                                 | ≤ 3 times of the initial limit   |                      |

### Marking

Rated capacitance (μF)

Polarity marking(+)

Lot No.

Rated voltage code

| R. voltage code |     | Unit : V.DC |     |
|-----------------|-----|-------------|-----|
| d               | 2.0 | g           | 4.0 |
| e               | 2.5 | j           | 6.3 |

| Unit : V.DC |    |
|-------------|----|
| A           | 10 |

### Dimensions (not to scale)

| Size code | Unit : mm |       |         |       |        |
|-----------|-----------|-------|---------|-------|--------|
|           | L±0.3     | W±0.2 | H       | S±0.2 | W1±0.1 |
| D2E       | 7.3       | 4.3   | 1.8±0.1 | 1.3   | 2.4    |
| D3L       | 7.3       | 4.3   | 2.8±0.2 | 1.3   | 2.4    |
| D4        | 7.3       | 4.3   | 3.8±0.2 | 1.3   | 2.4    |

\* Externals of figure are the reference.

### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard     |                           | Floor life level   |                    |      |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|--------------|---------------------------|--------------------|--------------------|------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current <sup>*1</sup> (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (μA) | Part number  | Min. packaging q'ty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |      |
| 2.0                | 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                      | 3                  | 2a                 |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | 4400                                     | 6                           | 0.10                | 117.5                 | 2R5TPF470M6L | 2500                      |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | 4400                                     | 7                           | 0.10                | 117.5                 | 2R5TPF470M7L | 2500                      |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | 4400                                     | 10                          | 0.10                | 117.5                 | 2R5TPF470ML  | 2500                      |                    |                    |      |
|                    | 105              | 2.5                   | 105                 | 680             | 7.3            | 4.3 | 3.8 | D4        | 6100                                     | 5                           | 0.10                | 117.5                 | ETPF470M5H   | 2000                      |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | D3L                                      | 4400                        | 6                   | 0.10                  | 170.0        | 2R5TPF680M6L              |                    |                    | 2500 |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           |  | 4400                        | 7                   | 0.10                  | 170.0        | 2R5TPF680M7L              |                    |                    | 2500 |
|                    | 105              | 2.5                   | 105                 | 1000            | 7.3            | 4.3 | 3.8 | D4        | 6100                                     | 5                           | 0.10                | 170.0                 | ETPF680M5H   | 2000                      |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 3.8 |           | 6100                                     | 5                           | 0.10                | 250.0                 | ETPF1000M5H  | 2000                      |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 3.8 |           | 5600                                     | 6                           | 0.10                | 250.0                 | ETPF1000M6H  | 2000                      |                    |                    |      |
| 4.0                | 105              | 4.0                   | 105                 | 330             | 7.3            | 4.3 | 2.8 | D3L       | 4000                                     | 12                          | 0.10                | 132.0                 | 4TPF330ML    | 2500                      |                    |                    |      |
|                    | 105              | 4.0                   | 105                 | 470             | 7.3            | 4.3 | 2.8 |           | 4400                                     | 10                          | 0.10                | 188.0                 | 4TPF470ML    | 2500                      |                    |                    |      |
|                    | 105              | 4.0                   | 105                 | 680             | 7.3            | 4.3 | 3.8 | D4        | 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                      |                    |                    |      |
|                    | 105              | 6.3                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | 4600                                     | 9                           | 0.10                | 138.6                 | 6TPF220M9L   | 2500                      |                    |                    |      |
|                    | 105              | 6.3                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | 4000                                     | 12                          | 0.10                | 138.6                 | 6TPF220ML    | 2500                      |                    |                    |      |
|                    | 105              | 6.3                   | 105                 | 330             | 7.3            | 4.3 | 2.8 |           | 3900                                     | 9                           | 0.10                | 207.9                 | 6TPF330M9L   | 2500                      |                    |                    |      |
|                    | 105              | 6.3                   | 105                 | 470             | 7.3            | 4.3 | 3.8 | D4        | 4400                                     | 10                          | 0.10                | 296.1                 | 6TPF470MAH   | 2000                      |                    |                    |      |
| 10                 | 105              | 10                    | 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", "Taping specifications" and "Floor life level".

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

## Surface Mount Type TQS series



**POSCAP**

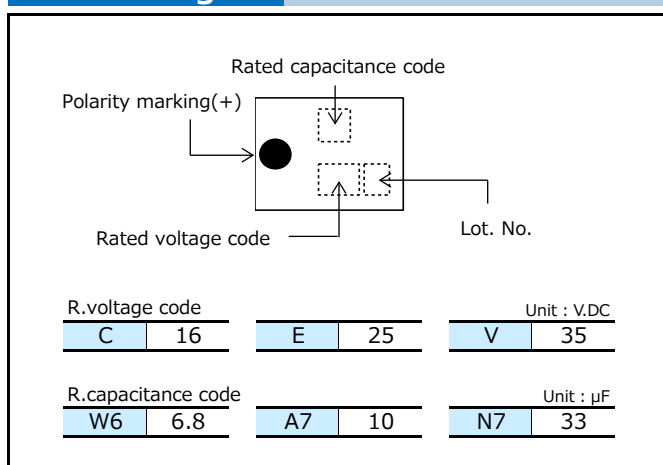
### Features

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

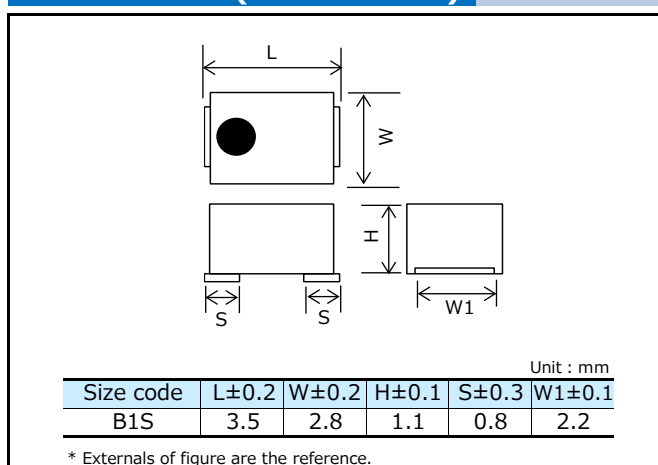
### Specifications

|                             |   |  |
|-----------------------------|---|--|
| Size code                   | B1S   |  |
| Category temp. range        | -55 °C to +105 °C                               |  |
| Rated volt. range           | 16 V.DC to 35 V.DC                              |  |
| Category volt. range        | 16 V.DC to 35 V.DC                              |  |
| Rated cap. range            | 6.8 μF to 33 μF                                 |  |
| Capacitance tolerance       | ±20 % (120 Hz / +20 °C)                         |  |
| Leakage current             | Please see the attached characteristics list    |  |
| Dissipation factor(tan δ)   | Please see the attached characteristics list    |  |
| Surge voltage (V.DC)        | Rated voltage × 1.15                            |  |
| Endurance                   | +105 °C 1000 h rated voltage applied            |  |
|                             | Capacitance change                              | Within ±20 % of the initial value        |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |
|                             | Leakage current                                 | Within the initial limit                 |
| Damp heat<br>(Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage |  |
|                             | Capacitance change                              | Within +40 %, -20 % of the initial value |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |
|                             | Leakage current                                 | ≤ 3 times of the initial limit           |

### Marking



### Dimensions (not to scale)



### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard    |                           | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|-------------|---------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current <sup>*1</sup> (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (μA) | Part number | Min. packaging q'ty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 16                 | 105              | 16                    | 105                 | 33              | 3.5            | 2.8 | 1.1 | B1S       | 1500                                     | 70                          | 0.10                | 52.8                  | 16TQS33MBD  | 2500                      | -                  | 3                  |
| 25                 | 105              | 25                    | 105                 | 10              | 3.5            | 2.8 | 1.1 |           | 1000                                     | 100                         | 0.10                | 25.0                  | 25TQS10MED  | 2500                      |                    |                    |
| 35                 | 105              | 35                    | 105                 | 6.8             | 3.5            | 2.8 | 1.1 |           | 900                                      | 150                         | 0.10                | 23.8                  | 35TQS6R8MHD | 2500                      |                    |                    |

\*1: Ripple current (100 kHz / +45 °C)

\*2: ESR (100 kHz / +20 °C)

\*3: tan δ (120 Hz / +20 °C)

\*4: After 5 minutes

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

## Surface Mount Type

TQC series B size



**POSCAP**

### Features

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

### Specifications

|                           |  |  |
|---------------------------|--|--|
| Size code                 | B2   |  |
| Category temp. range      | -55 °C to +105 °C  |  |
| Rated volt. range         | 16 V.DC to 35 V.DC   |  |
| Category volt. range      | 16 V.DC to 35 V.DC   |  |
| Rated cap. range          | 3.9 µF to 33 µF  |  |
| Capacitance tolerance     | ±20 % (120 Hz / +20 °C)                                      |  |
| Leakage current           | Please see the attached characteristics list                 |  |
| Dissipation factor(tan δ) | Please see the attached characteristics list                 |  |
| Surge voltage (V.DC)      | Rated voltage × 1.15   |  |
| Endurance                 | +105 °C 2000 h (16TQC33MYFB : 1000 h), rated voltage applied |  |
|                           | Capacitance change   | Within ±20 % of the initial value        |
|                           | Dissipation factor(tan δ)                                    | ≤ 1.5 times of the initial limit         |
|                           | 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 |
|                           | Dissipation factor(tan δ)                                    | ≤ 1.5 times of the initial limit         |
|                           | Leakage current  | ≤ 3 times of the initial limit           |

### Marking

Rated voltage code

|   |    |   |    |
|---|----|---|----|
| C | 16 | E | 25 |
| D | 20 | V | 35 |

Unit : V.DC

Rated capacitance code

|    |     |    |     |    |    |
|----|-----|----|-----|----|----|
| L6 | 2.7 | Y6 | 8.2 | J7 | 22 |
| Q6 | 3.9 | A7 | 10  | N7 | 33 |
| U6 | 5.6 | E7 | 15  |    |    |

Unit : µF

### 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

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (µF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard    |                           | Floor life level    |                     |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|-------------|---------------------------|---------------------|---------------------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple <sup>*1</sup> current (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (µA) | Part number | Min. packaging q'ty (pcs) | Reflow temp. ≈260°C | Reflow temp. ≈250°C |
| 16                 | 105              | 16                    | 105                 | 10              | 3.5            | 2.8 | 1.9 | B2        | 800                                      | 100                         | 0.10                | 48.0                  | 16TQC10M    | 2000                      | -                   | 3                   |
|                    | 105              | 16                    | 105                 | 15              | 3.5            | 2.8 | 1.9 |           | 1000                                     | 90                          | 0.10                | 72.0                  | 16TQC15M    | 2000                      |                     |                     |
|                    | 105              | 16                    | 105                 | 22              | 3.5            | 2.8 | 1.9 |           | 1000                                     | 90                          | 0.10                | 35.2                  | 16TQC22MYFB | 2000                      |                     |                     |
|                    | 105              | 16                    | 105                 | 33              | 3.5            | 2.8 | 1.9 |           | 1000                                     | 90                          | 0.10                | 158.4                 | 16TQC33MYFB | 2000                      |                     |                     |
| 20                 | 105              | 20                    | 105                 | 8.2             | 3.5            | 2.8 | 1.9 |           | 800                                      | 100                         | 0.10                | 49.2                  | 20TQC8R2M   | 2000                      |                     |                     |
|                    | 105              | 20                    | 105                 | 22              | 3.5            | 2.8 | 1.9 |           | 1100                                     | 90                          | 0.10                | 132.0                 | 20TQC22MYFB | 2000                      |                     |                     |
|                    | 105              | 25                    | 105                 | 5.6             | 3.5            | 2.8 | 1.9 |           | 800                                      | 100                         | 0.10                | 42.0                  | 25TQC5R6M   | 2000                      |                     |                     |
| 25                 | 105              | 25                    | 105                 | 15              | 3.5            | 2.8 | 1.9 |           | 900                                      | 100                         | 0.10                | 112.5                 | 25TQC15MYFB | 2000                      |                     |                     |
|                    | 105              | 35                    | 105                 | 3.9             | 3.5            | 2.8 | 1.9 |           | 500                                      | 400                         | 0.10                | 40.9                  | 35TQC3R9MYF | 2000                      |                     |                     |

- \*1: Ripple current (100 kHz / +105 °C) \*2: ESR (100 kHz / +20 °C) \*3: tan δ (120 Hz / +20 °C) \*4: After 5 minutes  
 ◆ Please refer to each page in this catalog for "Reflow conditions", "Taping specifications" and "Floor life level".  
 ◆ Small order quantity (500 pcs/reel) is available with TQC series. Please contact our sales representative if you prefer it.

## Surface Mount Type TQC series D size



# POSCAP

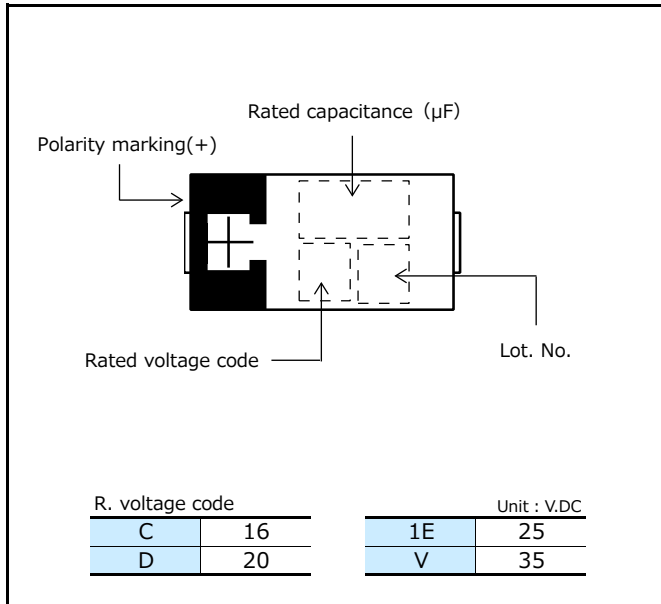
### Features

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

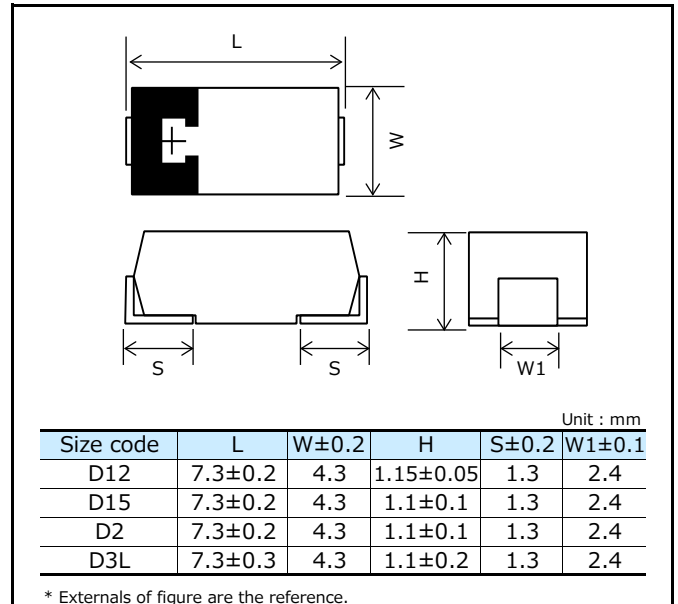
### Specifications

| Size code                   | D12   | D15                                      | D2                 | D3L                |
|-----------------------------|---|--|--------------------|--------------------|
| Category temp. range        | -55 °C to +105 °C                               |  |                    |                    |
| Rated volt. 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 volt. 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 cap. range            | 33 µF   | 22 µF to 47 µF                           | 10 µF to 150 µF    | 68 µF to 150 µF    |
| Capacitance tolerance       | ±20 % (120 Hz / +20 °C)                         |  |                    |                    |
| Leakage current             | Please see the attached characteristics list    |  |                    |                    |
| Dissipation factor(tan δ)   | Please see the attached characteristics list    |  |                    |                    |
| Surge voltage (V.DC)        | Rated voltage × 1.15                            |  |                    |                    |
| Endurance                   | +105 °C 1000 h rated voltage applied            |  |                    |                    |
|                             | Capacitance change                              | Within ±20 % of the initial value        |                    |                    |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |                    |                    |
|                             | Leakage current                                 | Within the initial limit                 |                    |                    |
| Damp heat<br>(Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage |  |                    |                    |
|                             | Capacitance change                              | Within +40 %, -20 % of the initial value |                    |                    |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |                    |                    |
|                             | Leakage current                                 | ≤ 3 times of the initial limit           |                    |                    |

### Marking



### Dimensions (not to scale)





### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |      | Size code | Specifications                           |                             |                     |                       | Standard     |                           | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|------|-----------|--|-----------------------------|---------------------|-----------------------|--------------|---------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H    |           | Ripple current* <sup>1</sup> (mA r.m.s.) | ESR* <sup>2</sup> (mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup> (μA) | Part number  | Min. packaging q'ty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 16                 | 105              | 16                    | 105                 | 33              | 7.3            | 4.3 | ##   | D12       | 1800                                     | 40                          | 0.10                | 52.8                  | 16TQC33MYFS  | 4500                      | -                  | 3                  |
|                    | 105              | 16                    | 105                 |                 | 7.3            | 4.3 | 1.9  | D2        | 1400                                     | 70                          | 0.10                | 52.8                  | 16TQC33MYFD  | 3000                      |                    |                    |
|                    | 105              | 16                    | 105                 | 47              | 7.3            | 4.3 | 1.4  | D15       | 1500                                     | 55                          | 0.10                | 75.2                  | 16TQC47MYFT  | 3000                      |                    |                    |
|                    | 105              | 16                    | 105                 |                 | 7.3            | 4.3 | 1.9  | D2        | 1800                                     | 40                          | 0.10                | 75.2                  | 16TQC47MW    | 3000                      |                    |                    |
|                    | 105              | 16                    | 105                 |                 | 7.3            | 4.3 | 1.9  |           | 1450                                     | 55                          | 0.10                | 75.2                  | 16TQC47MYFD  | 3000                      |                    |                    |
|                    | 105              | 16                    | 105                 | 68              | 7.3            | 4.3 | 1.9  | D2        | 1500                                     | 50                          | 0.10                | 108.8                 | 16TQC68MYF   | 3000                      |                    |                    |
|                    | 105              | 16                    | 105                 | 100             | 7.3            | 4.3 | 1.9  |           | 1800                                     | 50                          | 0.10                | 160.0                 | 16TQC100MYF  | 3000                      |                    |                    |
|                    | 105              | 16                    | 105                 | 150             | 7.3            | 4.3 | 2.8  | D3L       | 1800                                     | 50                          | 0.10                | 240.0                 | 16TQC150MYF  | 2500                      |                    |                    |
|                    | 105              | 16                    | 105                 | 150             | 7.3            | 4.3 | 1.9  | D2        | 1500                                     | 70                          | 0.15                | 240.0                 | 1CTQC15173F1 | 3000                      |                    |                    |
| 105                | 16               | 105                   | 150                 | 7.3             | 4.3            | 1.9 | 1400 |           | 60                                       | 0.10                        | 66.0                | 20TQC33MYFD           | 3000         |                           |                    |                    |
| 20                 | 105              | 20                    | 105                 | 33              | 7.3            | 4.3 | 1.9  | D2        | 1400                                     | 60                          | 0.10                | 66.0                  | 20TQC33MYFD  | 3000                      |                    |                    |
|                    | 105              | 20                    | 105                 | 47              | 7.3            | 4.3 | 1.9  |           | 1450                                     | 55                          | 0.10                | 94.0                  | 20TQC47MYF   | 3000                      |                    |                    |
|                    | 105              | 20                    | 105                 |                 | 100            | 7.3 | 4.3  | 1.4       | D15                                      | 1500                        | 55                  | 0.10                  | 94.0         | 20TQC47MYFT               | 3000               |                    |
|                    | 105              | 20                    | 105                 | 7.3             |                | 4.3 | 1.9  | D2        | 1250                                     | 100                         | 0.15                | 200.0                 | 20TQC100MD2  | 3000                      |                    |                    |
|                    | 105              | 20                    | 105                 | 7.3             |                | 4.3 | 2.8  | D3L       | 1700                                     | 55                          | 0.10                | 200.0                 | 20TQC100MYF  | 2500                      |                    |                    |
| 25                 | 105              | 25                    | 105                 | 15              | 7.3            | 4.3 | 1.9  | D2        | 1500                                     | 45                          | 0.10                | 38.0                  | 25TQC15MV    | 3000                      |                    |                    |
|                    | 105              | 25                    | 105                 |                 | 7.3            | 4.3 | 1.9  |           | 1000                                     | 90                          | 0.10                | 38.0                  | 25TQC15MYFD  | 3000                      |                    |                    |
|                    | 105              | 25                    | 105                 | 22              | 7.3            | 4.3 | 1.9  |           | 1500                                     | 45                          | 0.10                | 55.0                  | 25TQC22MV    | 3000                      |                    |                    |
|                    | 105              | 25                    | 105                 |                 | 7.3            | 4.3 | 1.9  | 1400      | 60                                       | 0.10                        | 55.0                | 25TQC22MYFD           | 3000         |                           |                    |                    |
|                    | 105              | 25                    | 105                 |                 | 7.3            | 4.3 | 1.4  | D15       | 1400                                     | 70                          | 0.10                | 55.0                  | 25TQC22MYFT  | 3000                      |                    |                    |
|                    | 105              | 25                    | 105                 | 33              | 7.3            | 4.3 | 1.9  | D2        | 1400                                     | 60                          | 0.10                | 82.5                  | 25TQC33MYF   | 3000                      |                    |                    |
|                    | 105              | 25                    | 105                 | 68              | 7.3            | 4.3 | 2.8  | D3L       | 1400                                     | 70                          | 0.10                | 170.0                 | 25TQC68MYF   | 2500                      |                    |                    |
| 35                 | 105              | 35                    | 105                 | 10              | 7.3            | 4.3 | 1.9  | D2        | 1000                                     | 120                         | 0.10                | 35.0                  | 35TQC10M     | 3000                      |                    |                    |
|                    | 105              | 35                    | 105                 |                 | 7.3            | 4.3 | 1.9  |           | 1000                                     | 120                         | 0.10                | 35.0                  | 35TQC10MYF   | 3000                      |                    |                    |
|                    | 105              | 35                    | 105                 | 15              | 7.3            | 4.3 | 1.9  |           | 900                                      | 150                         | 0.10                | 52.5                  | 35TQC15MYF   | 3000                      |                    |                    |

\*1: Ripple current (100 kHz / +105 °C)

\*2: ESR (100 kHz / +20 °C)

\*3: tan δ (120 Hz / +20 °C)

\*4: After 5 minutes

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

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

## Surface Mount Type

### TA series



**POSCAP**

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

### Features

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

### Specifications

| Size code                 | B2  | D2E   | D3L              |
|---------------------------|---|---|------------------|
| Category temp. range      | -55 °C to +105 °C   |   |                  |
| Rated volt. range         | 4.0 V.DC to 10 V.DC                                       | 2.5 V.DC to 10 V.DC   |                  |
| Category volt. range      | 4.0 V.DC to 10 V.DC                                       | 2.5 V.DC to 10 V.DC   |                  |
| Rated cap. range          | 47 µF to 100 µF   | 68 µF to 470 µF   | 150 µF to 680 µF |
| Capacitance tolerance     | ±20 % (120 Hz / +20 °C)                                   |   |                  |
| Leakage current           | Please see the attached characteristics list              |   |                  |
| Dissipation factor(tan δ) | Please see the attached characteristics list              |   |                  |
| Surge voltage (V.DC)      | Rated voltage × 1.15                                      |   |                  |
| Endurance                 | +105 °C 2000 h (B2 size : 1000 h) , rated voltage applied |   |                  |
|                           | Capacitance change  | Within ±20 % of the initial value   |                  |
|                           | Dissipation factor(tan δ)                                 | ≤ 1.5 times of the initial limit  |                  |
|                           | 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<br>(2R5TAE470M (F), 2R5TAE330M (I, F), 2R5TAE220M (F, 9))<br>Within +40 %, -20 % of the initial value (Except for above model) |                  |
|                           | Dissipation factor(tan δ)                                 | ≤ 1.5 times of the initial limit  |                  |
|                           | Leakage current   | Within the initial limit  |                  |

### Marking

< B2 size >

< D2E, D3L size >

|   |     |
|---|-----|
| e | 2.5 |
| g | 4   |

|   |     |
|---|-----|
| j | 6.3 |
| A | 10  |

|    |    |
|----|----|
| S7 | 47 |
| W7 | 68 |

|    |     |
|----|-----|
| A8 | 100 |
|----|-----|

### Dimensions (not to scale)

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

\* Externals of figure are the reference.

### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (µF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard    |                          | Floor life level   |                    |      |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|-------------|--------------------------|--------------------|--------------------|------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current* <sup>1</sup> (mA r.m.s.) | ESR* <sup>2</sup> (mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup> (µA) | Part number | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |      |
| 2.5                | 105              | 2.5                   | 105                 | 220             | 7.3            | 4.3 | 1.8 | D2E       | 3900                                     | 9                           | 0.10                | 110.0                 | 2R5TAE220M9 | 3000                     | 3                  | 3                  |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 1.8 |           | 3100                                     | 15                          | 0.10                | 55.0                  | 2R5TAE220MF | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 1.8 |           | 2400                                     | 25                          | 0.10                | 55.0                  | 2R5TAE220M  | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 | 330             | 7.3            | 4.3 | 1.8 |           | 3100                                     | 15                          | 0.10                | 82.5                  | 2R5TAE330MF | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 1.8 |           | 2800                                     | 18                          | 0.10                | 82.5                  | 2R5TAE330MI | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 1.8 |           | 2400                                     | 25                          | 0.10                | 82.5                  | 2R5TAE330M  | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 | 470             | 7.3            | 4.3 | 1.8 |           | 3100                                     | 15                          | 0.10                | 117.5                 | 2R5TAE470MF | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 1.8 |           | 2400                                     | 25                          | 0.10                | 117.5                 | 2R5TAE470M  | 3000                     |                    |                    |      |
|                    | 105              | 2.5                   | 105                 | 680             | 7.3            | 4.3 | 2.8 |           | D3L                                      | 3100                        | 15                  | 0.10                  | 170.0       | 2R5TAE680MFL             |                    |                    | 2500 |
|                    | 105              | 2.5                   | 105                 |                 | 7.3            | 4.3 | 2.8 |           | D3L                                      | 2400                        | 25                  | 0.10                  | 170.0       | 2R5TAE680ML              |                    |                    | 2500 |
| 4.0                | 105              | 4.0                   | 105                 | 100             | 3.8            | 2.8 | 1.9 | B2        | 1100                                     | 70                          | 0.08                | 40.0                  | 4TAB100M    | 2000                     | 3                  | 3                  |      |
|                    | 105              | 4.0                   | 105                 | 220             | 7.3            | 4.3 | 1.8 | D2E       | 2800                                     | 18                          | 0.10                | 88.0                  | 4TAE220MI   | 3000                     |                    |                    |      |
|                    | 105              | 4.0                   | 105                 |                 | 7.3            | 4.3 | 1.8 | D2E       | 2400                                     | 25                          | 0.10                | 88.0                  | 4TAE220M    | 3000                     |                    |                    |      |
|                    | 105              | 4.0                   | 105                 | 470             | 7.3            | 4.3 | 2.8 | D3L       | 2800                                     | 18                          | 0.10                | 188.0                 | 4TAE470MIL  | 2500                     |                    |                    |      |
|                    | 105              | 4.0                   | 105                 |                 | 7.3            | 4.3 | 2.8 | D3L       | 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                     | 3                  | 3                  |      |
|                    | 105              | 6.3                   | 105                 | 68              | 3.5            | 2.8 | 1.9 | B2        | 1100                                     | 70                          | 0.08                | 42.8                  | 6TAB68M     | 2000                     |                    |                    |      |
|                    | 105              | 6.3                   | 105                 | 150             | 7.3            | 4.3 | 1.8 | D2E       | 2400                                     | 25                          | 0.10                | 94.5                  | 6TAE150M    | 3000                     |                    |                    |      |
|                    | 105              | 6.3                   | 105                 | 220             | 7.3            | 4.3 | 1.8 |           | 2800                                     | 18                          | 0.10                | 138.6                 | 6TAE220MI   | 3000                     |                    |                    |      |
|                    | 105              | 6.3                   | 105                 |                 | 7.3            | 4.3 | 1.8 |           | 2400                                     | 25                          | 0.10                | 138.6                 | 6TAE220M    | 3000                     |                    |                    |      |
|                    | 105              | 6.3                   | 105                 | 330             | 7.3            | 4.3 | 2.8 |           | D3L                                      | 2400                        | 25                  | 0.10                  | 207.9       | 6TAE330ML                |                    |                    | 2500 |
| 10                 | 105              | 10                    | 105                 | 47              | 3.5            | 2.8 | 1.9 | B2        | 1100                                     | 70                          | 0.08                | 47.0                  | 10TAB47M    | 2000                     | 3                  | 3                  |      |
|                    | 105              | 10                    | 105                 | 68              | 7.3            | 4.3 | 1.8 | D2E       | 2400                                     | 25                          | 0.10                | 68.0                  | 10TAE68M    | 3000                     |                    |                    |      |
|                    | 105              | 10                    | 105                 | 150             | 7.3            | 4.3 | 2.8 | D3L       | 2400                                     | 25                          | 0.10                | 150.0                 | 10TAE150ML  | 2500                     |                    |                    |      |
|                    | 105              | 10                    | 105                 | 220             | 7.3            | 4.3 | 2.8 |           | 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", "Taping specifications" and "Floor life level".

## Surface Mount Type TV series



**POSCAP**

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

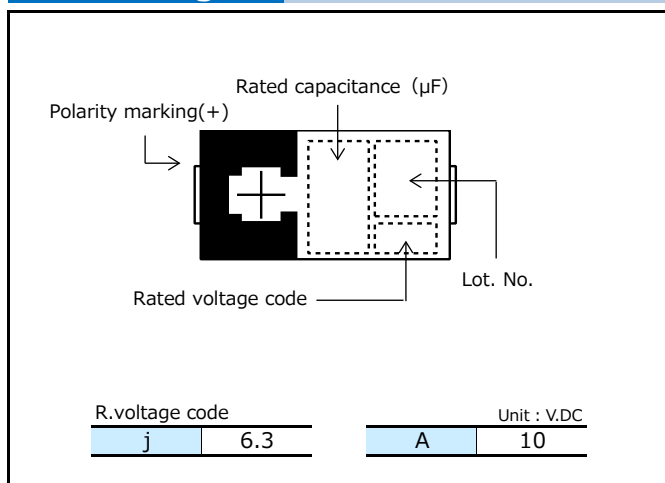
### Features

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

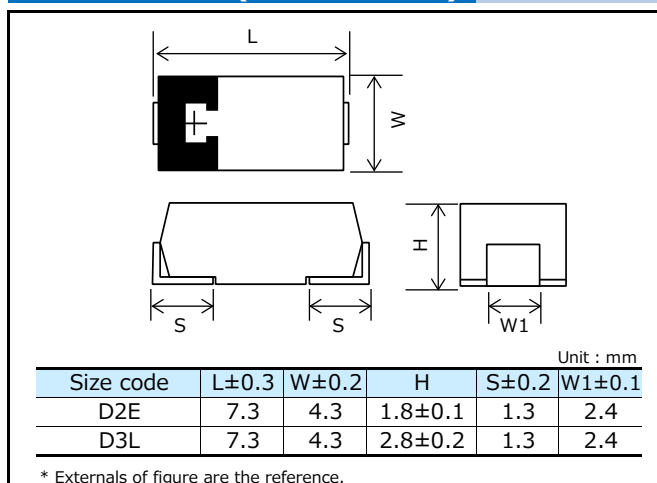
### Specifications

| Size code                 | D2E  | D3L                                      |
|---------------------------|--|--|
| Category temp. range      | -55 °C to +125 °C  |  |
| Rated volt. range         | 6.3 V.DC to 10 V.DC  | 10 V.DC                                  |
| Category volt. range      | 4.0 V.DC to 6.3 V.DC   | 6.3 V.DC                                 |
| Rated cap. 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) |  |
|                           | Temperature  | 125 °C                                   |
|                           | Capacitance change   | Within ±20% of the initial value         |
|                           | Dissipation factor(tan δ)  | ≤ 2 times of the initial limit           |
|                           | Leakage current  | ≤ 2 times of the initial limit           |
| Damp heat (Steady State)  | +85 °C, 85 % to 90 %, 500 h, rated voltage applied                               |  |
|                           | Capacitance change   | Within +40 %, -20 % of the initial value |
|                           | Dissipation factor(tan δ)  | ≤ 1.5 times of the initial limit         |
|                           | Leakage current  | Within the initial limit                 |

### Marking



### Dimensions (not to scale)



### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard    |                           | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|-------------|---------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current <sup>*1</sup> (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (μA) | Part number | Min. packaging q'ty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 6.3                | 105              | 4.0                   | 125                 | 150             | 7.3            | 4.3 | 1.8 | D2E       | 2400                                     | 25                          | 0.10                | 94.5                  | 6TVE150M    | 3000                      | 5                  | 3                  |
|                    |                  |                       |                     |                 |                |     |     |           | 2400                                     | 25                          | 0.10                | 68.0                  |             |                           |                    |                    |
| 10                 | 105              | 6.3                   | 125                 | 150             | 7.3            | 4.3 | 2.8 | D3L       | 2400                                     | 25                          | 0.10                | 150.0                 | 10TVE150ML  | 2500                      |                    |                    |

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

## Surface Mount Type TH series



**POSCAP**

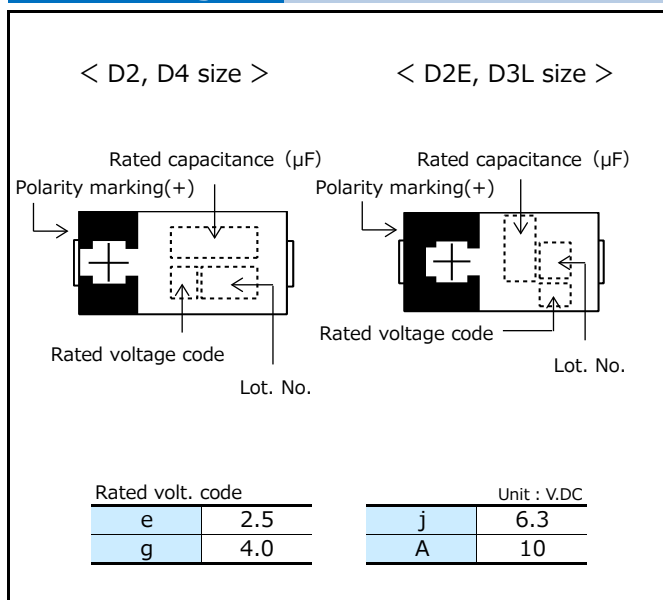
### Features

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

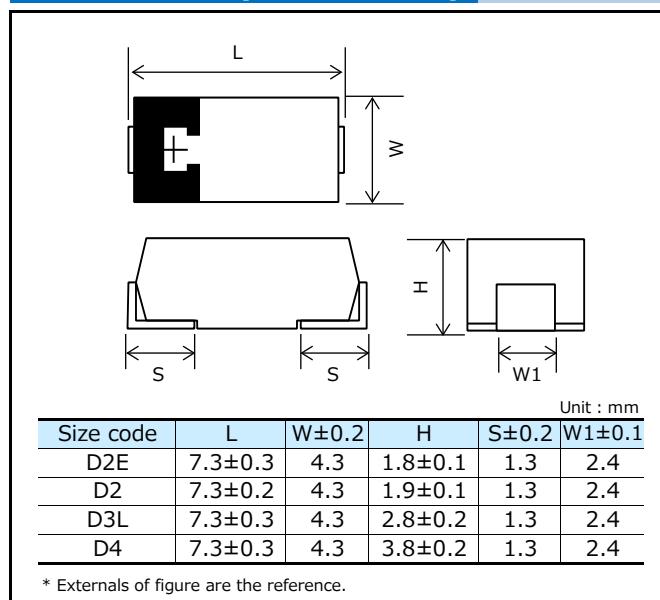
### Specifications

| Size code                   | D2E   | D2                                       | D3L                  | D4                   |
|-----------------------------|---|--|----------------------|----------------------|
| Category temp. range        | -55 °C to +125 °C                               |  |                      |                      |
| Rated volt. range           | 2.5 V.DC to 6.3 V.DC                            | 2.5 V.DC to 10 V.DC                      | 4.0 V.DC to 6.3 V.DC | 6.3 V.DC to 10 V.DC  |
| Category volt. 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 cap. 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 1000 h, category voltage applied        |  |                      |                      |
|                             | Capacitance change                              | Within ±20 % of the initial value        |                      |                      |
|                             | Dissipation factor(tan δ)                       | ≤ 2 times of the initial limit           |                      |                      |
|                             | Leakage current                                 | ≤ 2 times of the initial limit           |                      |                      |
| Damp heat<br>(Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage |  |                      |                      |
|                             | Capacitance change                              | Within +40 %, -20 % of the initial value |                      |                      |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |                      |                      |
|                             | Leakage current                                 | ≤ 3 times of the initial limit           |                      |                      |

### Marking



### Dimensions (not to scale)



### Characteristics list

| Series | Rated volt.<br>(V.DC) | Rated temp.<br>(°C) | Category volt.<br>(V.DC) | Category temp.<br>(°C) | Rated cap.<br>(μF) | Case size<br>(mm) |     |     | Size code | Specifications                                 |                                |                     |                          | Standard    |                                    | Floor life level         |                          |
|--------|-----------------------|---------------------|--------------------------|------------------------|--------------------|-------------------|-----|-----|-----------|--|--------------------------------|---------------------|--------------------------|-------------|------------------------------------|--------------------------|--------------------------|
|        |                       |                     |                          |                        |                    | L                 | W   | H   |           | Ripple* <sup>1</sup><br>current<br>(mA r.m.s.) | ESR* <sup>2</sup><br>(mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup><br>(μA) | Part number | Min.<br>packaging<br>q'ty<br>(pcs) | Reflow<br>temp<br>≤260°C | Reflow<br>temp<br>≤250°C |
| THB    | 4.0                   | 105                 | 2.5                      | 125                    | 330                | 7.3               | 4.3 | 2.8 | D3L       | 2000   | 40                             | 0.10                | 132.0                    | 4THB330ML   | 2500                               | -                        | 5                        |
|        |                       |                     |                          |                        |                    |                   |     |     |           | 2000   | 40                             | 0.10                | 138.6                    | 6THB220ML   | 2500                               |                          |                          |
|        | 6.3                   | 105                 | 4.0                      | 125                    | 220                | 7.3               | 4.3 | 2.8 | D3L       | 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 | D4        | 3000   | 40                             | 0.10                | 220.0                    | 10THB220M   | 2000                               |                          |                          |
|        |                       |                     |                          |                        |                    |                   |     |     |           | 3000   | 35                             | 0.10                | 330.0                    | 10THB330M   | 2000                               |                          |                          |
| THC    | 2.5                   | 105                 | 1.6                      | 125                    | 220                | 7.3               | 4.3 | 1.9 | D2        | 1700   | 45                             | 0.10                | 55.0                     | 2R5THC220M  | 3000                               |                          |                          |
|        |                       |                     |                          |                        |                    |                   |     |     |           | 1900   | 40                             | 0.10                | 94.5                     | 6THC150M    | 3000                               |                          |                          |
|        | 10                    | 105                 | 6.3                      | 125                    | 68                 | 7.3               | 4.3 | 1.9 | 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 |           | 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 |           | 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", "Taping specifications" and "Floor life level".



## Surface Mount Type TPB series



**POSCAP**

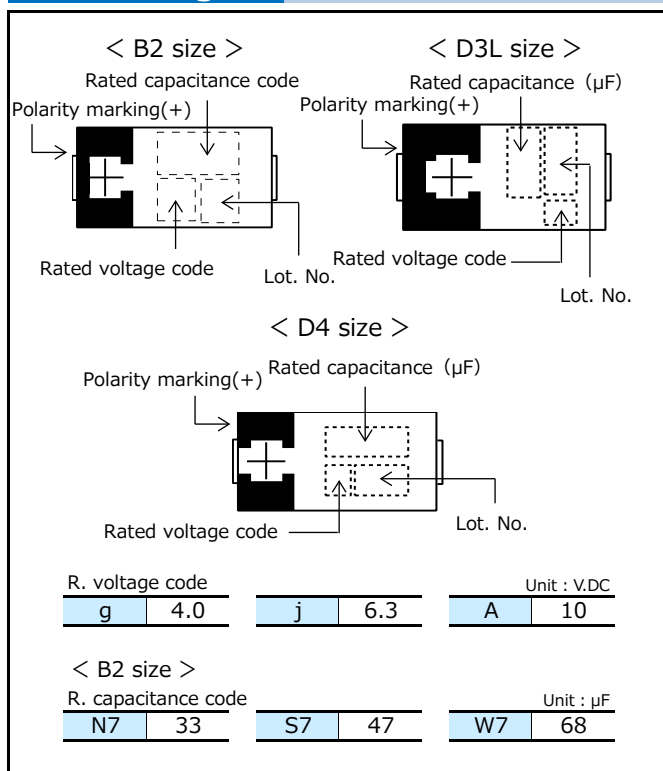
### Features

- Standard
- RoHS compliance, Halogen free

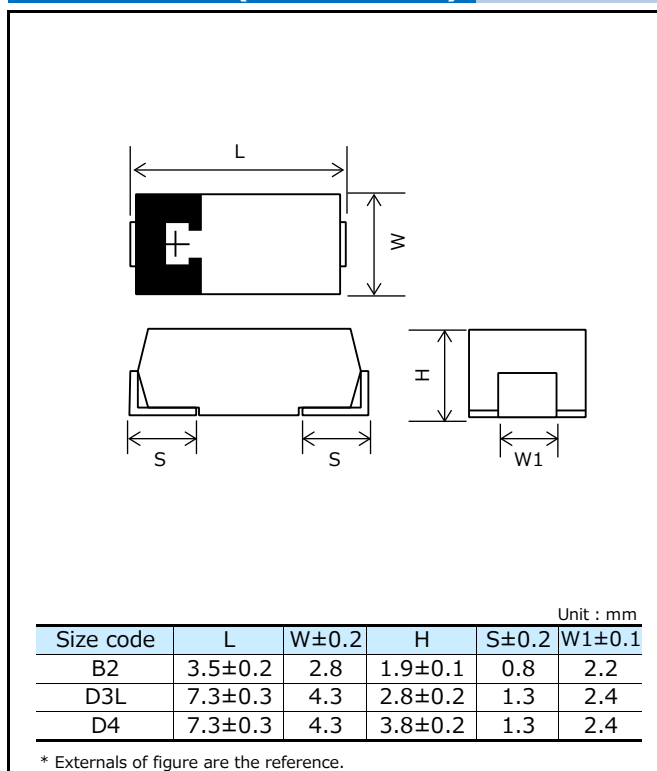
### Specifications

| Size code                   | B2   | D3L   | D4                  |
|-----------------------------|--|---|---------------------|
| Category temp. range        | -55 °C to +105 °C  |   |                     |
| Rated volt. range           | 4.0 V.DC to 10 V.DC                                      |   | 6.3 V.DC to 10 V.DC |
| Category volt. range        | 4.0 V.DC to 10 V.DC                                      |   | 6.3 V.DC to 10 V.DC |
| Rated cap. 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 2000 h, (B2 size : 1000 h) rated voltage applied |   |                     |
|                             | Rated temp. +85 °C 1000 h rated voltage applied          |   |                     |
|                             | Capacitance change                                       | Within ±20 % of the initial value                                 |                     |
|                             | Dissipation factor(tan δ)                                | ≤ 1.5 times of the initial limit                                  |                     |
| Damp heat<br>(Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage          |   |                     |
|                             | Capacitance change                                       | Within +40 %, -20 % of the initial value (Except for above model) |                     |
|                             | Dissipation factor(tan δ)                                | ≤ 1.5 times of the initial limit                                  |                     |
|                             | Leakage current  | ≤ 3 times of the initial limit                                    |                     |

### Marking



### Dimensions (not to scale)



### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |      | Size code | Specifications                           |                             |                     |                       | Standard    |                          | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|------|-----------|--|-----------------------------|---------------------|-----------------------|-------------|--------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H    |           | Ripple current <sup>*1</sup> (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (μA) | Part number | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 4.0                | 105              | 4.0                   | 105                 | 68              | 3.5            | 2.8 | 1.9  | B2        | 1100                                     | 70                          | 0.08                | 27.2                  | 4TPB68M     | 2000                     |                    | 3                  |
|                    | 105              | 4.0                   | 105                 | 330             | 7.3            | 4.3 | 2.8  | D3L       | 2000                                     | 40                          | 0.10                | 132                   | 4TPB330ML   | 2500                     |                    | 2a                 |
| 6.3                | 105              | 6.3                   | 105                 | 33              | 3.5            | 2.8 | 1.9  | B2        | 1100                                     | 70                          | 0.08                | 20.7                  | 6TPB33M     | 2000                     |                    | 3                  |
|                    | 105              | 6.3                   | 105                 | 68              | 3.5            | 2.8 | 1.9  |           | 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                     |                    | 2a                 |
|                    | 85               | 5.0                   | 105                 | 330             | 7.3            | 4.3 | 2.8  |           | 2000                                     | 40                          | 0.10                | 207.9                 | 6TPB330MAL  | 2500                     |                    |                    |
|                    | 105              | 6.3                   | 105                 |                 | 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                  | 105             | 33             | 3.5 | 2.8  | 1.9       | B2                                       | 1100                        | 70                  | 0.08                  | 33.0        | 10TPB33M                 |                    | 2000               |
| 105                |                  | 10                    | 105                 | 47              | 3.5            | 2.8 | 1.9  | 1100      |  | 70                          | 0.08                | 47.0                  | 10TPB47M    | 2000                     |                    |                    |
| 105                |                  | 10                    | 105                 | 150             | 7.3            | 4.3 | 2.8  | D3L       | 2000                                     | 40                          | 0.10                | 150.0                 | 10TPB150ML  | 2500                     | 2a                 |                    |
| 105                |                  | 10                    | 105                 | 220             | 7.3            | 4.3 | 2.8  |           | 2000                                     | 40                          | 0.10                | 220.0                 | 10TPB220ML  | 2500                     |                    | -                  |
| 105                |                  | 10                    | 105                 |                 | 7.3            | 4.3 | 3.8  | D4        | 3000                                     | 40                          | 0.10                | 220.0                 | 10TPB220M   | 2000                     | 3                  |                    |
| 105                |                  | 10                    | 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", "Taping specifications" and "Floor life level".

## Surface Mount Type TC series



**POSCAP**

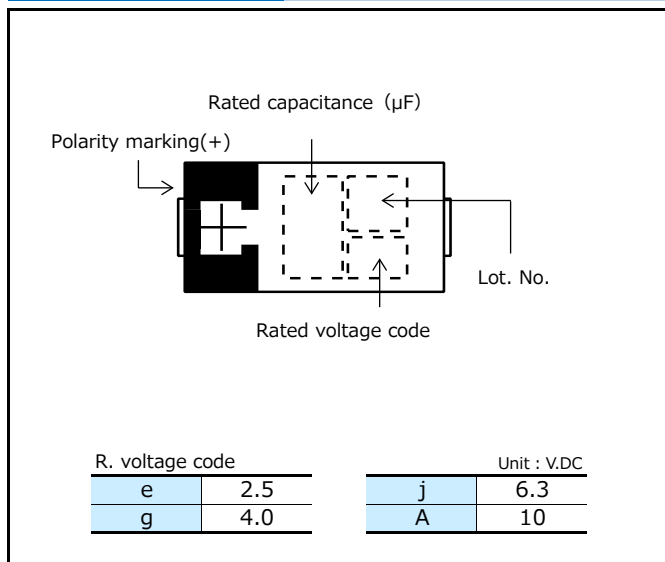
### Features

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

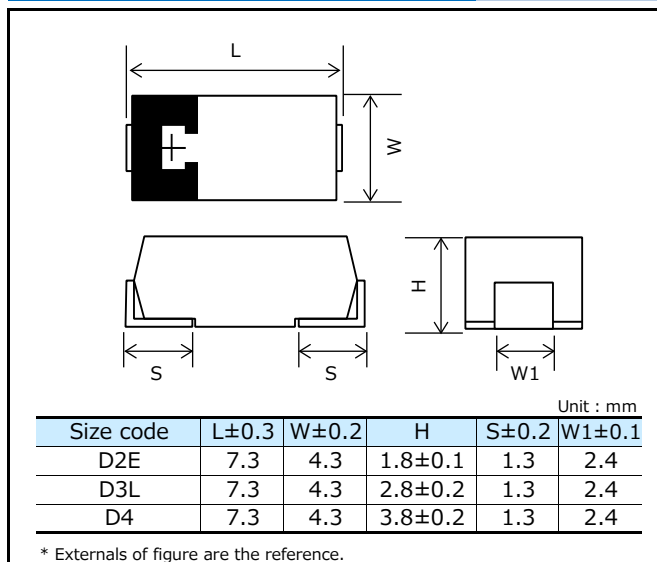
### Specifications

| Size code                 | D2E   | D3L  | D4                |
|---------------------------|---|--|-------------------|
| Category temp. range      | -55 °C to +125 °C                               |  |                   |
| Rated volt. range         | 4.0 V.DC to 6.3 V.DC                            | 2.5 V.DC to 10 V.DC  |                   |
| Category volt. range      | 3.2 V.DC to 5.0 V.DC                            | 2.0 V.DC to 8.0 V.DC                                       |                   |
| Rated cap. 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 voltage applied        |  |                   |
|                           | Capacitance change                              | Within ±20 % of the initial value                          |                   |
|                           | Dissipation factor(tan δ)                       | ≤ 2 times of the initial limit                             |                   |
|                           | 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)) |                   |
|                           | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit                           |                   |
|                           | Leakage current                                 | ≤ 3 times of the initial limit                             |                   |

### Marking



### Dimensions (not to scale)



## Characteristics list

| Series | Rated volt.<br>(V.DC) | Rated temp.<br>(°C) | Category volt.<br>(V.DC) | Category temp.<br>(°C) | Rated cap.<br>(μF) | Case size<br>(mm) |     |      | Size code | Specifications                                 |                                |                     |                          | Standard    |                                    | Floor life level         |                          |             |            |      |
|--------|-----------------------|---------------------|--------------------------|------------------------|--------------------|-------------------|-----|------|-----------|--|--------------------------------|---------------------|--------------------------|-------------|------------------------------------|--------------------------|--------------------------|-------------|------------|------|
|        |                       |                     |                          |                        |                    | L                 | W   | H    |           | Ripple* <sup>1</sup><br>current<br>(mA r.m.s.) | ESR* <sup>2</sup><br>(mΩ max.) | tan δ* <sup>3</sup> | LC* <sup>4</sup><br>(μA) | Part number | Min.<br>packaging<br>q'ty<br>(pcs) | Reflow<br>temp<br>≤260°C | Reflow<br>temp<br>≤250°C |             |            |      |
| TCE    | 2.5                   | 105                 | 2.0                      | 125                    | 680                | 7.3               | 4.3 | 2.8  | D3L       | 3500   | 12                             | 0.10                | 170.0                    | ETCE680MCL  | 2500                               | 3                        |                          |             |            |      |
|        |                       | 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       |      |
|        | 4.0                   | 105                 | 3.2                      | 125                    | 150                | 7.3               | 4.3 | 1.8  | D2E       | 2800   | 18                             | 0.10                | 60.0                     | 4TCE150MI   | 3000                               |                          |                          |             |            |      |
|        |                       |                     |                          |                        |                    | 7.3               | 4.3 | 1.8  |           | 3100   | 15                             | 0.10                | 88.0                     | 4TCE220MF   | 3000                               |                          |                          |             |            |      |
|        |                       |                     | 220                      | 7.3                    |                    | 4.3               | 1.8 | 2800 |           | 18   | 0.10                           | 88.0                | 4TCE220MI                | 3000        |                                    |                          |                          |             |            |      |
|        |                       |                     |                          | 7.3                    |                    | 4.3               | 1.8 | 2400 |           | 25   | 0.10                           | 88.0                | 4TCE220M                 | 3000        |                                    |                          |                          |             |            |      |
|        |                       | 330                 | 105                      | 3.2                    | 125                | 470               | 7.3 | 4.3  | 1.8       | D3L  | 2800                           | 18                  | 0.10                     | 132.0       | 4TCE330MI                          |                          |                          | 3000        |            |      |
|        |                       |                     |                          |                        |                    |                   | 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 |
|        |                       |                     |                          |                        |                    |                   |     | 7.3  | 4.3       |  | 2.8                            |                     | 3100                     | 15          | 0.10                               |                          |                          | 188.0       | 4TCE470MFL | 2500 |
|        |                       | 105                 | 3.2                      | 125                    | 470                | 7.3               |     | 4.3  | 2.8       | D3L  | 2800                           |                     | 18                       | 0.10        | 188.0                              |                          |                          | 4TCE470MIL  | 2500       |      |
|        |                       |                     |                          |                        |                    | 7.3               |     | 4.3  | 2.8       |  | 2400                           |                     | 25                       | 0.10        | 188.0                              |                          |                          | 4TCE470ML   | 2500       |      |
|        |                       | 6.3                 | 105                      | 5.0                    |                    | 125               | 100 | 7.3  | 4.3       |  | 1.8                            | D2E                 | 2800                     | 18          | 0.10                               |                          |                          | 63.0        | 6TCE100MI  | 3000 |
|        |                       |                     |                          |                        |                    |                   |     | 7.3  | 4.3       |  | 1.8                            |                     | 2400                     | 25          | 0.10                               |                          |                          | 63.0        | 6TCE100M   | 3000 |
|        | 150                   |                     |                          | 7.3                    | 4.3                | 1.8               |     | 3100 | 15        | 0.10   | 94.5                           |                     | 6TCE150MF                | 3000        |                                    |                          |                          |             |            |      |
|        |                       |                     |                          | 7.3                    | 4.3                | 1.8               |     | 2800 | 18        | 0.10   | 94.5                           |                     | 6TCE150MI                | 3000        |                                    |                          |                          |             |            |      |
|        | 220                   |                     | 105                      | 5.0                    | 125                | 150               | 7.3 | 4.3  | 1.8       | D2E  | 2400                           | 25                  | 0.15                     | 94.5        | 6TCE150M                           |                          |                          | 3000        |            |      |
|        |                       |                     |                          |                        |                    |                   | 7.3 | 4.3  | 1.8       |  | 2800                           | 18                  | 0.15                     | 138.6       | 6TCE220MI                          |                          |                          | 3000        |            |      |
|        |                       |                     | 105                      | 5.0                    | 125                |                   | 220 | 7.3  | 4.3       |  | 1.8                            | D3L                 | 2400                     | 25          | 0.15                               |                          |                          | 138.6       | 6TCE220M   | 3000 |
|        |                       |                     |                          |                        |                    |                   |     | 7.3  | 4.3       |  | 2.8                            |                     | 3100                     | 15          | 0.10                               |                          |                          | 207.9       | 6TCE330MFL | 2500 |
|        | 105                   |                     | 5.0                      | 125                    | 330                | 7.3               |     | 4.3  | 2.8       | D3L  | 2800                           |                     | 18                       | 0.10        | 207.9                              |                          |                          | 6TCE330MIL  | 2500       |      |
|        |                       |                     |                          |                        |                    | 7.3               |     | 4.3  | 2.8       |  | 2400                           |                     | 25                       | 0.10        | 207.9                              |                          |                          | 6TCE330ML   | 2500       |      |
|        | 105                   |                     | 5.0                      | 125                    |                    | 470               | 7.3 | 4.3  | 3.8       |  | D4                             | 3500                | 18                       | 0.15        | 296.1                              |                          |                          | 6TCE470MI   | 2000       |      |
|        |                       |                     |                          |                        |                    |                   | 7.3 | 4.3  | 3.8       |  |                                | 3000                | 25                       | 0.15        | 296.1                              |                          |                          | 6TCE470M    | 2000       |      |
|        |                       | 105                 | 5.0                      | 125                    | 680                |                   | 7.3 | 4.3  | 3.8       | D4   |                                | 3500                | 18                       | 0.15        | 428.4                              |                          |                          | 6TCE680MI   | 2000       |      |
|        |                       |                     |                          |                        |                    |                   | 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       |      |
|        |                       |                     |                          |                        |                    |                   | 7.3 | 4.3  | 2.8       |  |                                | 2400                | 25                       | 0.10        | 220.0                              |                          |                          | 10TCE220ML  | 2500       |      |
|        |                       | 105                 | 8.0                      | 125                    | 330                | 220               | 7.3 | 4.3  | 3.8       | D4   | 3000                           | 25                  | 0.10                     | 330.0       | 10TCE330M                          |                          |                          | 2000        |            |      |
| 7.3    |                       |                     |                          |                        |                    |                   | 4.3 | 2.8  | 4400      |  | 6                              | 0.10                | 170.0                    | ETCF680M6L  | 2500                               |                          |                          |             |            |      |
| 105    |                       |                     | 2.0                      | 125                    |                    |                   | 680 | 7.3  | 4.3       |  | 2.8                            | D3L                 | 4400                     | 7           | 0.10                               | 170.0                    | ETCF680M7L               | 2500        |            |      |
|        |                       |                     |                          |                        |                    |                   |     | 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        |                                    |                          |                          |             |            |      |
|        |                       |                     |                          | 7.3                    | 4.3                | 3.8               |     |      | 6100      | 5  | 0.10                           | 250.0               | ETCF1000M5H              | 2000        |                                    |                          |                          |             |            |      |
| 105    | 2.0                   | 125                 |                          | 1000                   | 7.3                | 4.3               |     | 3.8  | D4        | 5600   | 6                              | 0.10                | 250.0                    | ETCF1000M6H | 2000                               |                          |                          |             |            |      |
|        |                       |                     |                          |                        | 7.3                | 4.3               |     | 3.8  |           | 4000   | 12                             | 0.10                | 132.0                    | 4TCF330ML   | 2500                               |                          |                          |             |            |      |
| 4.0    | 105                   | 3.2                 |                          |                        | 125                | 330               | 7.3 | 4.3  | 2.8       | D3L  | 4400                           | 10                  | 0.10                     | 188.0       | 4TCF470ML                          | 2500                     |                          |             |            |      |
|        |                       |                     |                          |                        |                    |                   | 7.3 | 4.3  | 2.8       |  | 4400                           | 10                  | 0.10                     | 272.0       | 4TCF680MAH                         | 2000                     |                          |             |            |      |
|        | 105                   | 3.2                 | 125                      |                        | 680                |                   | 7.3 | 4.3  | 3.8       | D4   | 4400                           | 10                  | 0.10                     | 272.0       | 4TCF680MAH                         | 2000                     |                          |             |            |      |
| 6.3    | 105                   | 5.0                 | 125                      |                        | 220                | 7.3               | 4.3 | 2.8  | D3L       | 6100   | 5                              | 0.10                | 138.6                    | 6TCF220M5L  | 2500                               |                          |                          |             |            |      |
|        |                       |                     |                          | 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  |           | D3L  | 4000                           | 12                  | 0.10                     | 138.6       | 6TCF220ML                          | 2500                     |                          |             |            |      |
|        |                       |                     |                          |                        |                    | 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                   | 8.0                 | 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", "Taping specifications" and "Floor life level".

## Surface Mount Type TDC series

**NEW**



**POSCAP**

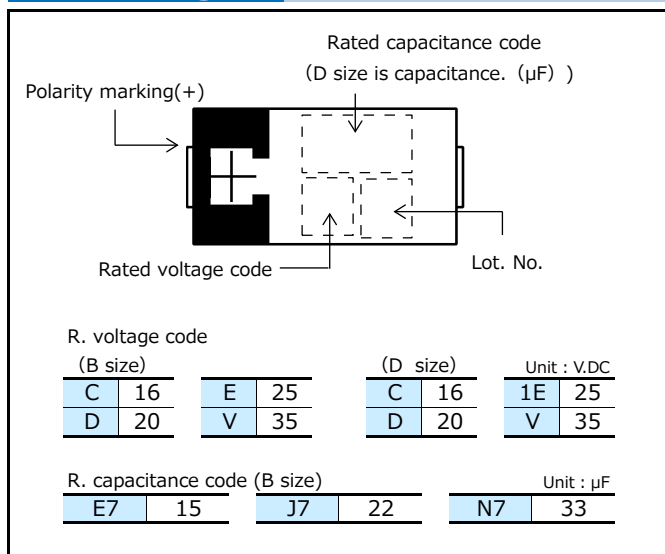
### Features

- 125 °C 1000 h
- High voltage (25 V.DC max.)
- RoHS compliance, Halogen free

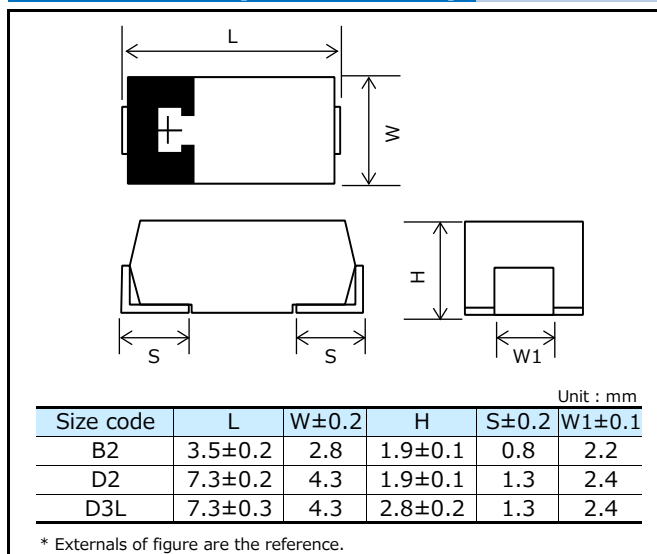
### Specifications

| Size code                   | B2  | D2                                       | D3L                  |
|-----------------------------|---|--|----------------------|
| Category temp. range        | -55 °C to +125 °C                               |  |                      |
| Rated volt. range           | 16 V.DC to 25 V.DC                              | 16 V.DC                                  | 16 V.DC to 25 V.DC   |
| Category volt. range        | 12.8 V.DC to 20 V.DC                            | 12.8 V.DC                                | 12.8 V.DC to 20 V.DC |
| Rated cap. range            | 15 μF to 33 μF                                  | 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                   | +125 °C 1000 h, category voltage applied        |  |                      |
|                             | Capacitance change                              | Within ±20 % of the initial value        |                      |
|                             | Dissipation factor(tan δ)                       | ≤ 2 times of the initial limit           |                      |
|                             | Leakage current                                 | ≤ 2 times of the initial limit           |                      |
| Damp heat<br>(Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage |  |                      |
|                             | Capacitance change                              | Within +40 %, -20 % of the initial value |                      |
|                             | Dissipation factor(tan δ)                       | ≤ 1.5 times of the initial limit         |                      |
|                             | Leakage current                                 | ≤ 3 times of the initial limit           |                      |

### Marking



### Dimensions (not to scale)



### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |     | Size code | Specifications               |                 |         |           | Standard    |                           | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|------------------------------|-----------------|---------|-----------|-------------|---------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current*1 (mA r.m.s.) | ESR*2 (mΩ max.) | tan δ*3 | LC*4 (μA) | Part number | Min. packaging q'ty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 16                 | 105              | 12.8                  | 125                 | 33              | 3.5            | 2.8 | 1.9 | B2        | 1000                         | 90              | 0.10    | 158.4     | 16TDC33MYFB | 2000                      | -                  | 3                  |
|                    | 105              | 12.8                  | 125                 | 100             | 7.3            | 4.3 | 1.9 | D2        | 1800                         | 50              | 0.10    | 160.0     | 16TDC100MYF | 3000                      |                    |                    |
|                    | 105              | 12.8                  | 125                 | 150             | 7.3            | 4.3 | 2.8 | D3L       | 1800                         | 50              | 0.10    | 240.0     | 16TDC150MYF | 2500                      |                    |                    |
| 20                 | 105              | 16                    | 125                 | 22              | 3.5            | 2.8 | 1.9 | B2        | 1000                         | 90              | 0.10    | 132.0     | 20TDC22MYFB | 2000                      |                    |                    |
|                    | 105              | 16                    | 125                 | 100             | 7.3            | 4.3 | 2.8 | D3L       | 1700                         | 55              | 0.10    | 200.0     | 20TDC100MYF | 2500                      |                    |                    |
| 25                 | 105              | 20                    | 125                 | 15              | 3.5            | 2.8 | 1.9 | B2        | 900                          | 100             | 0.10    | 112.5     | 25TDC15MYFB | 2000                      |                    |                    |
|                    | 105              | 20                    | 125                 | 68              | 7.3            | 4.3 | 2.8 | D3L       | 1400                         | 70              | 0.10    | 170.0     | 25TDC68MYF  | 2500                      |                    |                    |

\*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", "Taping specifications" and "Floor life level".

## Surface Mount Type TPC series



**POSCAP**

### Features

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

### Specifications

| Size code                 | B1  | D2                                       |
|---------------------------|---|--|
| Category temp. range      | -55 °C to +105 °C   |  |
| Rated volt. range         | 6.3 V.DC to 12.5 V.DC                                     | 6.3 V.DC to 10 V.DC                      |
| Category volt. range      | 5.0 V.DC to 10 V.DC                                       | 6.3 V.DC to 10 V.DC                      |
| Rated cap. 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 2000 h (B1 size : 1000 h) , rated voltage applied |  |
|                           | Rated temp. +85 °C 1000 h rated voltage applied           |  |
|                           | Capacitance change  | Within ±20 % of the initial value        |
|                           | Dissipation factor(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 |
|                           | Dissipation factor(tan δ)                                 | ≤ 1.5 times of the initial limit         |
|                           | Leakage current   | ≤ 3 times of the initial limit           |

### Marking

< B1 size >

Rated capacitance code

Polarity marking(+)

Rated voltage code

Lot No.

< D2 size >

Rated capacitance (µF)

Polarity marking(+)

Rated voltage code

Lot No.

| R. voltage code |     |
|-----------------|-----|
| j               | 6.3 |
| k               | 8.0 |

| Unit : V.DC |      |
|-------------|------|
| A           | 10   |
| B           | 12.5 |

| < B1 size >         |    |
|---------------------|----|
| R. capacitance code |    |
| A7                  | 10 |
| E7                  | 15 |

| Unit : µF |    |
|-----------|----|
| J7        | 22 |
| N7        | 33 |

| Unit : µF |    |
|-----------|----|
| S7        | 47 |

### Dimensions (not to scale)

| Size code | Unit : mm |       |       |       |        |
|-----------|-----------|-------|-------|-------|--------|
|           | L±0.2     | W±0.2 | H±0.1 | S±0.2 | W1±0.1 |
| B1        | 3.5       | 4.3   | 1.1   | 0.8   | 2.2    |
| D2        | 7.3       | 4.3   | 1.9   | 1.3   | 2.4    |

\* Externals of figure are the reference.



### Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) |     |     | Size code | Specifications                           |                             |                     |                       | Standard    |                          | Floor life level   |                    |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|-------------|--------------------------|--------------------|--------------------|
|                    |                  |                       |                     |                 | L              | W   | H   |           | Ripple current <sup>*1</sup> (mA r.m.s.) | ESR <sup>*2</sup> (mΩ max.) | tan δ <sup>*3</sup> | LC <sup>*4</sup> (μA) | Part number | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 6.3                | 85               | 5.0                   | 105                 | 47              | 3.5            | 2.8 | 1.1 | B1        | 1100                                     | 55                          | 0.10                | 29.6                  | 6TPC47M     | 3000                     | 3                  | 3                  |
|                    | 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 |           | 1900                                     | 40                          | 0.10                | 207.9                 | 6TPC330MA   | 3000                     |                    |                    |
| 8.0                | 85               | 6.3                   | 105                 | 22              | 3.5            | 2.8 | 1.1 | B1        | 1000                                     | 70                          | 0.10                | 17.6                  | 8TPC22M     | 3000                     | 3                  | 3                  |
|                    | 105              | 8.0                   | 105                 | 150             | 7.3            | 4.3 | 1.9 | D2        | 1900                                     | 40                          | 0.10                | 120.0                 | 8TPC150M    | 3000                     |                    |                    |
| 10                 | 105              | 10                    | 105                 | 68              | 7.3            | 4.3 | 1.9 |           | 1700                                     | 45                          | 0.10                | 68.0                  | 10TPC68M    | 3000                     | 2a                 |                    |
|                    | 105              | 10                    | 105                 | 100             | 7.3            | 4.3 | 1.9 |           | 1700                                     | 45                          | 0.10                | 100.0                 | 10TPC100M   | 3000                     |                    |                    |
| 12.5               | 85               | 10                    | 105                 | 10              | 3.5            | 2.8 | 1.1 | B1        | 800                                      | 80                          | 0.10                | 12.5                  | 12TPC10M    | 3000                     | 3                  |                    |
|                    | 85               | 10                    | 105                 | 15              | 3.5            | 2.8 | 1.1 |           | 800                                      | 80                          | 0.10                | 18.8                  | 12TPC15M    | 3000                     |                    |                    |

\*1: Ripple current (100 kHz / +45 °C)

\*2: ESR (100 kHz / +20 °C)

\*3: tan δ (120 Hz / +20 °C)

\*4: After 5 minutes

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

## Surface Mount Type

## POSCAP

Series : TPU

**!** This series is not a recommended product.  
Not recommended for new design.



### 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 | R. Voltage (V.DC)   | 2.5 | 4.0          | 6.3 | 10.0 |
| Code                | e   | g           | j   | A    | Code                | e   | g            | j   | A    |
| S09 Size            |     |             |     |      | B09 Size            |     |              |     |      |
| R. Cap. (μF)        | 4.7 | 10          | 22  | 47   | 68                  | 100 | R. Cap. (μF) | 150 |      |
| Code                | s   | A           | J   | S    | W                   | A   | 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

\*1 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    |                          | Floor life         |                    |
|--------|----------------------|------------------|-------------------------|---------------------|------------------------|----------------|------|-----|-----------|------------------------------|-----------------|---------|-----------|-------------|--------------------------|--------------------|--------------------|
|        |                      |                  |                         |                     |                        | 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) | Reflow Temp ≤260°C | Reflow Temp ≤250°C |
| TPU    | 2.5                  | 85               | 2.5                     | 85                  | 47                     | 2.0            | 1.25 | 0.9 | S09       | 510                          | 150             | 0.10    | 23.5      | 2R5TPU47MSI | 3000                     | -                  | 3                  |
|        |                      | 85               | 2.5                     | 85                  | 100                    | 2.0            | 1.25 | 0.9 |           | 510                          | 150             | 0.10    | 50.0      | ETPU100MSI  | 3000                     |                    |                    |
|        | 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        |                          |                    |                    |
|        | 6.3                  | 85               | 6.3                     | 85                  | 150                    | 3.5            | 2.8  | 0.9 | B09       | 670                          | 100             | 0.10    | 94.5      | 6TPU150MBI  | 3000                     | 3                  |                    |
|        |                      | 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**

**⚠** This series is not a recommended product.  
Not recommended for new design.

### 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<br>* 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)<br>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    |                          | Floor life         |                    |
|--------|----------------------|------------------|-------------------------|---------------------|------------------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|-------------|--------------------------|--------------------|--------------------|
|        |                      |                  |                         |                     |                        | L              | W   | H   |           | Ripple current (mA r.m.s.) <sup>*1</sup> | ESR (mΩ max.) <sup>*2</sup> | tan δ <sup>*3</sup> | LC (μA) <sup>*4</sup> | Part number | Min. Packaging Qty (pcs) | Reflow Temp ≤260°C | Reflow Temp ≤250°C |
| TPH    | 2.5                  | 105              | 2.5                     | 105                 | 100                    | 3.2            | 1.6 | 0.9 | A09       | 510                                      | 150                         | 0.10                | 25.0                  | ETPH100MHA  | 3000                     | 3                  | 3                  |
|        |                      | 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".

# Catalog Deletion Models

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

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

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

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

| Series   | Size code   | Models for deletion | Year of deletion | Alternative model | Series     | Size code   | Models for deletion | Year of deletion | Alternative model |             |
|----------|-------------|---------------------|------------------|-------------------|------------|-------------|---------------------|------------------|-------------------|-------------|
| TPB      | B2          | 2R5TPB100M          | 2012             | 4TPE100MZB        | TPG        | B1G         | 10TPG33M            | 2011             | 12TPG33M          |             |
|          |             | 2R5TPB220MA         | 2009             | 2R5TPE220MZB      | TPSF       | B2S         | 11TPSF62MAIG        | 2012             | –                 |             |
|          |             | 4TPB100M            | 2009             | 4TPE100MZB        | TPH        | A09         | ETPH100MHA          | 2018             | –                 |             |
|          |             | 8TPB47M             | 2009             | 10TPB47M          |            |             | 4TPH68MHA           | 2018             | –                 |             |
|          |             | 6TPB47M             | 2009             | 6TPE47MB          |            |             | 6TPH47MHA           | 2018             | –                 |             |
|          |             | 6TPB100MA           | 2009             | 6TPE100MAZB       |            |             | 6TPH100MAEA         | 2018             | –                 |             |
|          | 6TPB100MAV  | 2009                | 6TPE100MAZB      | ATPH33MAHA        |            |             | 2018                | –                |                   |             |
|          | 2R5TPB330ML | 2009                | 2R5TPE330M       | ETPH220MABC       |            |             | 2018                | –                |                   |             |
|          | D3L         | 4TPB220ML           | 2009             | 4TPE220M          | A14        | ETPH220MAZC | 2013                | –                |                   |             |
|          |             | 4TPB470ML           | 2009             | 4TPE470ML         |            | 4TPH150MABC | 2018                | –                |                   |             |
|          |             | 6TPB150ML           | 2009             | 6TPC150M          |            | 6TPH100MABC | 2018                | –                |                   |             |
|          |             | 10TPB100ML          | 2010             | 10TPC100M         |            | 2R5TPU22MSI | 2011                | –                |                   |             |
|          | D3          | 4TPB220M            | 2008             | 4TPE220M          | TPU        | S09         | 2R5TPU47MSI         | 2018             | –                 |             |
|          |             | 6TPB150M            | 2008             | 6TPC150M          |            |             | ETPU100MSI          | 2018             | –                 |             |
|          |             | 10TPB100M           | 2008             | 10TPC100M         |            |             | 4TPU68MSI           | 2018             | –                 |             |
|          |             | 2R5TPB680M          | 2009             | 2R5TPE680MFL      |            |             | 6TPU10MSI           | 2018             | –                 |             |
|          | D4          | 2R5TPB1000M         | 2009             | 2R5TPE1000MF      |            |             | 6TPU22MSI           | 2018             | –                 |             |
|          |             | 4TPB470M            | 2009             | 4TPE470ML         |            |             | 6TPU47MSI           | 2018             | –                 |             |
| 4TPB680M |             | 2009                | 6TPE680MI        | 10TPU4R7MSI       |            |             | 2018                | –                |                   |             |
| TPC      | B1          | 2R5TPC56M           | 2012             | 6TPB68M           |            |             | A09                 | 2R5TPU100MAI     | 2011              | –           |
|          |             | 4TPC47M             | 2012             | 6TPC47MB          |            |             |                     | 4TPU68MAI        | 2011              | –           |
|          |             | 6TPC33M             | 2012             | 6TPC47MB          |            |             |                     | 6TPU47MAI        | 2011              | –           |
|          |             | 10TPC33MB           | 2013             | 12TPG33M          | 10TPU33MAI | 2011        |                     | –                |                   |             |
|          | D2          | 2R5TPC330M          | 2009             | 2R5TPE330M        | B09        | 6TPU150MBI  |                     | 2018             | –                 |             |
|          |             | 4TPC150M            | 2009             | 4TPE150MI         | TH         | D2          | 4THC220M            | 2013             | 4THE220M          |             |
|          |             | 4TPC220M            | 2009             | 4TPE220M          | D3L        | 2R5THB330ML | 2010                | –                |                   |             |
| TPE      | B2          | 2TPE330MIB          | 2011             | 2TPE330MFB        | D4         | 10THB100ML  | 2010                | –                |                   |             |
|          |             | 2TPE330MAFGB        | 2011             | 2TPE330MAFB       |            | 4THB680M    | 2013                | –                |                   |             |
|          |             | 2R5TPE150MZB        | 2011             | 2R5TPE220MZB      |            | TQC         | C                   | 16TQC22M         | 2011              | 20TQC22MYFD |
|          |             | 2R5TPE220MIB        | 2012             | 2R5TPE220MFGB     | 20TQC15M   |             |                     | 2011             | 25TQC15MYFD       |             |
|          | 4TPE150MUB  | 2013                | 4TPE150MAZB      | 25TQC10M          | 2011       |             |                     | 25TQC15MYFD      |                   |             |
|          | D2E         | 2R5TPE220MC         | 2012             | 2R5TPE220M9       | D2         |             | 16TQC33M            | 2012             | 16TQC33MYFD       |             |
|          |             | 2R5TPE220M7         | 2012             | 2R5TPE330M7       |            |             | 16TQC47M            | 2012             | 16TQC47MYFD       |             |
|          |             | 2R5TPE470M          | 2011             | 2R5TPE470MI       |            |             | 16TQC68MY           | 2012             | 16TQC68MYF        |             |
|          |             | 4TPE150M            | 2011             | 4TPE150MI         |            |             | 20TQC22M            | 2012             | 25TQC22MYFD       |             |
|          | D3L         | 2R5TPE680ML         | 2012             | 2R5TPE680MFL      |            |             | 20TQC22MYFD         | 2015             | 25TQC22MYFD       |             |
|          |             | 2R5TPE680MIL        | 2011             | 2R5TPE680MFL      |            |             | 20TQC47MY           | 2012             | 20TQC47MYF        |             |
|          | D4          | 2R5TPE1000M         | 2011             | 2R5TPE1000MF      |            |             | 25TQC15M            | 2012             | 25TQC15MYFD       |             |
|          |             | 2R5TPE1000MI        | 2012             | 2R5TPE1000MF      |            |             | 25TQC22M            | 2012             | 25TQC22MYFD       |             |
|          |             | 4TPE680M            | 2011             | 6TPE680MI         |            |             | D3L                 | 16TQC68M         | 2012              | 16TQC68MYF  |
|          |             | 4TPE680MI           | 2012             | 6TPE680MI         |            |             |                     | 20TQC47M         | 2012              | 20TQC47MYF  |
|          |             | 4TPE680MF           | 2012             | 4TPF680MAH        | 25TQC33M   |             |                     | 2012             | 25TQC33MYF        |             |
|          |             |                     |                  |                   |            |             | 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          | 6TPA47M             | 2012/9           | 10TPB47M          | TPE         | B2            | 2R5TPE220MPB        | 2012/9           | 2R5TPE220MLB      |
|            |            | 10TPA33M            | 2012/9           | 10TPB33M          |             |               | 2R5TPE220MDGB       | 2013             | 2R5TPE220MFGB     |
|            | D3         | 4TPA220M            | 2012/9           | 4TPE220M          |             | 2R5TPE330MFC2 | 2012/9              | 2R5TPE330MF      |                   |
|            |            | 6TPA150M            | 2012/9           | 6TPC150M          |             | 2R5TPE330MIC2 | 2012/9              | 2R5TPE330MF      |                   |
|            |            | 10TPA100M           | 2012/9           | 10TPC100M         |             | 2R5TPE330MCC2 | 2012/9              | 2R5TPE330MC      |                   |
| TPB        | B2         | 4TPB100MV           | 2012/9           | 4TPE100MZB        |             | 2R5TPE330M9C2 | 2012/9              | 2R5TPE330M9      |                   |
|            |            | 4TPB150MA           | 2012/9           | 4TPE150MAZB       |             | 4TPE220MFC2   | 2012/9              | 4TPE220MF        |                   |
|            |            | 8TPB33M             | 2012/9           | 10TPB33M          |             | 4TPE220MIC2   | 2012/9              | 4TPE220MI        |                   |
|            | C          | 2R5TPB220MC         | 2012/9           | 4TPE220MI         |             | 4TPE220MPC2   | 2012/9              | 4TPE220MI        |                   |
|            |            | 4TPB150MC           | 2012/9           | 6TPE150M          |             | 6TPE150MIC2   | 2012/9              | 6TPE150MI        |                   |
|            |            | 4TPB220MC           | 2012/9           | 4TPE220MI         |             | 6TPE150MPC2   | 2012/9              | 6TPE150M         |                   |
|            |            | 6TPB100MC           | 2012/9           | 6TPG100MG         |             | 8TPE100MPC2   | 2012/9              | 10TPPF150ML      |                   |
|            |            | 6TPB150MC           | 2012/9           | 6TPE150M          |             | 2R5TPE330MFC  | 2012/9              | 2R5TPE330MF      |                   |
|            |            | 8TPB82MC            | 2012/9           | 8TPE100MAZB       |             | 2R5TPE330MIC  | 2012/9              | 2R5TPE330MF      |                   |
|            |            | 10TPB47MC           | 2012/9           | 10TPC68M          |             | 2R5TPE330MPC  | 2012/9              | 2R5TPE330MF      |                   |
|            |            | 10TPB68MC           | 2012/9           | 10TPC68M          | 4TPE220MIC  | 2012/9        | 4TPE220MI           |                  |                   |
|            |            | 10TPB220MC          | 2009/10          | -                 | 4TPE220MPC  | 2012/9        | 4TPE220MI           |                  |                   |
|            |            | 2R5TPB470ML         | 2012/9           | 2R5TPE470MI       | 6TPE150MPC  | 2012/9        | 6TPE150M            |                  |                   |
|            | D3L        | 2R5TPB680ML         | 2012/9           | 2R5TPE680MFL      | 6TPE220MIC  | 2012/9        | 6TPE220MI           |                  |                   |
| 16TPB47ML  |            | 2003/6              | 16TQC47MYFD      | 6TPE220MPC        | 2012/9      | 6TPE220M      |                     |                  |                   |
| 2R5TPB330M |            | 2012/9              | 2R5TPE330M       | 10TPE150MGC       | 2012/9      | 10TPE220ML    |                     |                  |                   |
| D3         | 16TPB47M   | 2003/6              | 16TQC47MYFD      | 10TPE180MGC       | 2012/9      | 10TPE220ML    |                     |                  |                   |
|            | C1         | 2R5TPC82M           | 2012/9           | -                 | D2E         | 2TPE330M6     | 2011                | 2TPF330M6        |                   |
| 4TPC56M    |            | 2012/9              | -                | 2TPE330M7         |             | 2011          | 2R5TPE330M7         |                  |                   |
| 4TPC100M   |            | 2012/9              | 6TPG100MG        | 2TPE330M9         |             | 2011          | 2R5TPE330M9         |                  |                   |
| 6TPC68M    |            | 2012/9              | 6TPG100MG        | 2TPE470M6         |             | 2011          | 2R5TPF470M6L        |                  |                   |
| 6TPC100MC  |            | 2012/9              | 6TPG100MG        | 2TPE470M7         |             | 2011          | 2R5TPE470M7         |                  |                   |
| 8TPC33M    |            | 2012/9              | 12TPG33M         | 2TPE470M9         |             | 2011          | 2R5TPE470M9         |                  |                   |
| D2         | 2R5TPC220M | 2012/9              | 2R5TPE220M       | TPF               | D2E         | 2TPF470M6     | 2012/9              | 2R5TPF470M6L     |                   |
|            | 16TPC33M   | 2003/6              | 16TQC33MYFD      | D3L               | 4TPF470M5EL | 2014          | -                   |                  |                   |
| TPD        | D4D        | 2R5TPD470M          | 2007/10          | 2R5TPF470ML       | TPG         | B1G           | 4TPG150M            | 2012/9           | 6TPG150M          |
|            |            | 2R5TPD470M5         | 2012/3           | ETPF470M5H        |             | B15G          | 6TPG68MG            | 2012/9           | 6TPG100M          |
|            |            | 2R5TPD470M6         | 2012/3           | 2R5TPF470M6L      | TPL         | D2T           | 6TPG220MZG          | 2014             | -                 |
|            |            | 2R5TPD470M8         | 2007/10          | 2R5TPF470M7L      |             | D2T           | 2R5TPL220MC         | 2012/9           | -                 |
|            |            | 2R5TPD680M          | 2007/10          | 2R5TPF680ML       |             | D2T           | 2R5TPL330M7         | 2011/7           | -                 |
|            |            | 2R5TPD680M5         | 2012/3           | ETPF680M5H        |             | All models    | All models          | 2013             | -                 |
|            |            | 2R5TPD680M6         | 2012/3           | 2R5TPF680M6L      | D12T        | All models    | 2013                | -                |                   |
|            |            | 2R5TPD680M8         | 2007/10          | 2R5TPF680M7L      | D15T        | All models    | 2013                | -                |                   |
|            |            | 2R5TPD1000M         | 2012/3           | ETPF1000M6H       | TPLF        | D2T           | 2TPLF470M7          | 2012/9           | -                 |
|            |            | 2R5TPD1000M8        | 2012/3           | ETPF1000M6H       |             | D2T           | 2TPLF560M6          | 2011/7           | -                 |
|            |            | 2R5TPD1000M6        | 2012/3           | ETPF1000M6H       | All models  | All models    | 2013                | -                |                   |
|            |            | 2R5TPD1000M5        | 2012/3           | ETPF1000M5H       | TPSF        | B2S           | 2TPSF270MC          | 2012/9           | 2TPSF270M9G       |
|            |            | 4TPD330M            | 2007/10          | 4TPF330ML         |             | B1S           | 2TPSF270M9          | 2012/9           | 2TPSF270M9G       |
|            |            | 4TPD470M            | 2007/10          | 4TPF470ML         | TH          | D3L           | ETPSF200M9ED        | 2014             | -                 |
|            | 4TPD680M   | 2012/3              | 4TPF680MAH       | D4                |             | 2R5THB470ML   | 2012/9              | 6THB470M         |                   |
|            | 6TPD220M   | 2007/10             | 6TPF220ML        | D4D               | 2R5THB680M  | 2012/9        | -                   |                  |                   |
|            | 6TPD330M   | 2007/10             | 6TPF330M9L       |                   | 2R5THB1000M | 2012/9        | -                   |                  |                   |
|            | 6TPD470M   | 2012/3              | 6TPF470MAH       |                   | 2R5THD680M  | 2012/3        | 2R5TPF680M6L        |                  |                   |
|            | 10TPD150M  | 2007/10             | 10TPF150ML       | 4THD470M          | 2012/9      | -             |                     |                  |                   |
|            | TPU        | S08                 | 2R5TPU22M        | 2012/9            | -           | 6THD330M      | 2012/3              | 6TPF330M9L       |                   |
| 4TPU15M    |            |                     | 2012/9           | -                 | TR          | TR series     | -                   | TA series        |                   |
| 6TPU10M    |            |                     | 2012/9           | -                 | APA         | D2A           | APA series          | 2006/4           | -                 |
| S09        |            | 4TPU15MSI           | 2011             | -                 | APB         | D1            | APB series          | 2006/4           | -                 |
|            |            | 4TPU33MSI           | 2011             | -                 | APC         | D2            | APC series          | 2009/6           | -                 |
| S11        |            | 2R5TPU47MSK         | 2012/9           | -                 | APD         | D1            | APD series          | 2009/6           | -                 |
|            |            | 2R5TPU68MSK         | 2013             | -                 | TQC         | B15           | 35TQC2R7MYF         | 2016             | 35TQS6R8MHHD      |
|            |            | 4TPU33MSK           | 2012/9           | -                 |             |               |                     |                  |                   |
|            |            | 4TPU47MSK           | 2013             | -                 |             |               |                     |                  |                   |
|            |            | 6TPU22MSK           | 2012/9           | -                 |             |               |                     |                  |                   |
|            |            | 6TPU33MSK           | 2013             | -                 |             |               |                     |                  |                   |
| B09        |            | 4TPU68MBI           | 2012/9           | -                 |             |               |                     |                  |                   |
|            |            | 6TPU47MBI           | 2012/9           | -                 |             |               |                     |                  |                   |
|            |            | 8TPU33MBI           | 2012/9           | -                 |             |               |                     |                  |                   |

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