

To: VIA Technology Co., Ltd.

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PRODUCT SPECIFICATION FOR APPROVAL

Product Description : Conductive Polymer Tantalum Solid Capacitor
Customer Part Number :
Product Part Number : TPE series (Rated temp.85°C Model)
Country of Origin : Japan, Indonesia
Applications : -

※ If you approve this specification, please fill in and sign the below and return 1copy to us.

Approval No	:	
Approval Date	:	
Executed by	:	_____
		(signature)
Title	:	
Dept.	:	

RoHS Compliant & Lead Free & Halogen* Free

* Halogen means Br and Cl.

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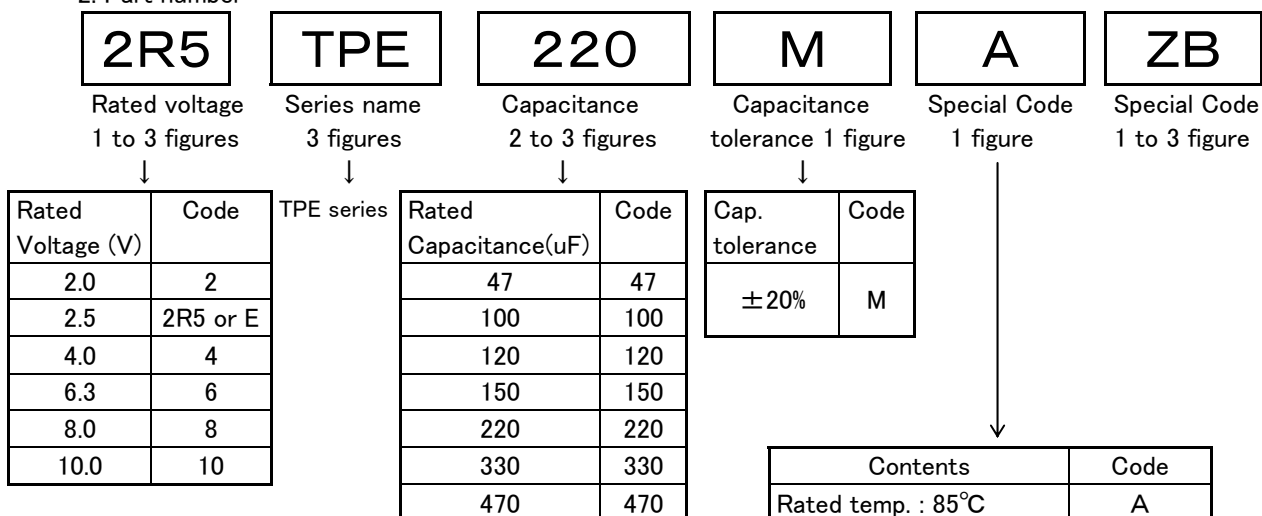
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1. Scope of application

These specifications specify the POSCAP (Conductive Polymer Tantalum Solid Capacitor).

2. Part number



3. Rating

3-1. Operating temperature (Category temperature range) -55 to +105°C

3-2. Rated, surge and category voltage, rated and category temperature

Rated voltage (V)	Rated temp. (°C)	Surge voltage (V)	Category voltage (V)	Category temp. (°C)
2.0	85	2.3	1.8	105
2.5	85	2.9	2.0	105
4.0	85	4.6	3.2	105
6.3	85	7.2	5.0	105
8.0	85	9.2	6.3	105
10.0	85	12.0	8.0	105

(i) Operating temp. \leq Rated temp.

The sum of DC voltage and the peak of ripple voltage must not exceed the rated voltage.

(ii) Rated temp. $<$ Operating temp. \leq Category temp.

The sum of DC voltage and the peak of ripple voltage must not exceed the category voltage.

3-3. Rated capacitance

Rated capacitance should be measured at 120Hz.

The values are shown in Table 1. (item 12)

3-4. Ripple Current

3-4-1. Maximum allowable ripple current (45°C, 100kHz to 500kHz) is shown in Table 1. (item 12)

3-4-2. Ripple current should be controlled so that surface temperature of a capacitor do not Exceed the category temperature.

4. Dimension

See dimensions in the item 14.

5. Electric and mechanical performance

Standard conditions

Temperature : 15 to 35°C
 Relative humidity : 45 to 75%
 Air pressure : 86 to 106kPa

5-1. Electric performance

5-1-1. Leakage current (μA / 5 minutes) Table 1 (item 12) *

* If the measurements are doubtful, these should be measured after treatment of the rated voltage for 30 minutes at 85°C.

5-1-2. Tolerance on rated capacitance
 (at 120Hz, +20°C) M; $\pm 20\%$

5-1-3. Dissipation Factor (DF)
 (at 120Hz, +20°C) Table 1 (item 12)

5-1-4. Equivalent series resistance (ESR)
 (at 100kHz, +20°C) Table 1 (item 12)

5-1-5. Temperature characteristics

Step	Temp. (°C)	Item	Characteristics
1	+20 \pm 2	Measure; Capacitance, DF (at 120Hz) Impedance ($Z_{20^\circ C}$, at 100kHz)	
2	+0 -55 -2	$Z/Z_{20^\circ C}$ $\Delta C/C_{20^\circ C}$	0.6 to 2.0 or less $\pm 20\%$ or less
3	Keep at +25 \pm 10°C for 15 minutes or more		
4	+2 +105 -0	$Z/Z_{20^\circ C}$	0.6 to 2.0 or less
5	+20 \pm 2	$\Delta C/C_{20^\circ C}$ DF	$\leq \pm 5\%$ of step 1 \leq The value of item 5-1-3

$Z/Z_{20^\circ C}$: Impedance ratio at 100kHz

$\Delta C/C_{20^\circ C}$: Capacitance change

5-1-6. Surge voltage test

The test shall be performed after Reflow soldering.

Keep it in a standard condition for 1-2 hours. And then the surge voltage specified in item 3-2 shall be charged once for 30 ± 5 seconds in 6 ± 0.5 minutes cycle and discharge for approximately 5 minutes and 30 seconds 1000 times at rated temperature.

Discharge resistance $1 \text{ k}\Omega$ shall be contacted to the capacitor.

Each characteristic value shall meet the standards shown below after test keeping it in a standard condition for 1-2 hours.

Connect protective resistance of $1 \text{ k}\Omega \pm 100\Omega$ which include all circuit resistance (internal resistance etc.).

Items	Specifications
Capacitance change	$\leq \pm 5\%$ of the initial capacitance
DF	\leq The value of item 5-1-3
Leakage current	\leq 3 times of the value of item 5-1-1
Visual examination	No visible damage

5-2. Mechanical performance

5-2-1. Vibration

Frequency : 10 to 55Hz (1 minutes interval / 10 → 55 → 10Hz)

Amplitude : 0.75 mm (Total excursion 1.5 mm)

Direction : X , Y , Z (Three axis)

Time : 2 hours / axis Total 6 hours

The capacitors should be mounted on printed circuit base board with soldering paste.

Soldering should be made by the reflow Conditions - [A] in the item18.

After the test, the capacitors should be capable of measuring in the capacitance without short or open trouble. ($\Delta C/C \leq \pm 5\%$)

5-2-2. Solderability

Temperature : $245^\circ\text{C} \pm 5^\circ\text{C}$

Time : 2 ± 0.5 seconds

Flux : Ethanol solution of rosin(25wt%)

*The dipped lead should be covered at least 95% with new solder.

5-2-3. Resistance to soldering heat

Solder paste should be applied to the printed circuit boards

and then the capacitors are mounted on board.

The capacitors are heated according to the reflow conditions - [A] in the item 18.

After the test finished, and the capacitors returned to the regular temperature they shall meet following specification.

Items	Specifications
Capacitance change	$\leq \pm 10\%$ of the initial capacitance
DF	\leq 2 times of the value of item 5-1-3
Leakage current	\leq 3 times of the value of item 5-1-1
Visual examination	No visible damage

5-3. Climatic performance

5-3-1. Damp heat (Steady state)

Temperature : $60 \pm 2^{\circ}\text{C}$

Relative humidity : 90 to 95%RH

Duration : 500^{+24}_{-0} hours

No load

After the test finished, and the capacitors returned to the regular temperature they shall meet following specification.

Items	Specifications
Capacitance change	$\leq +40\%(+50\% *1) , -20\%$ of the initial capacitance
DF	≤ 1.5 times of the value of item 5-1-3
Leakage current	≤ 3 times of the value of item 5-1-1

*1 : 2R5TPE220MAZB (MAPB,MAFB), 2R5TPE330MAZB,
2TPE330MAFB (MADGB) , 2TPE470MAJGB (MAFB)
ETPE330MAFB

5-3-2. Endurance

Rated temperature: 85°C ① Test at a temperature of 85°C Temperature : $85 \pm 2^{\circ}\text{C}$ Duration : 1000^{+48}_{-0} hoursDuration : 2000^{+48}_{-0} hours

(6TPE470MAZU, 6TPE330MAP)

Applied voltage : Rated voltage

② Test at a temperature of 105°C Temperature : $105 \pm 2^{\circ}\text{C}$ Duration : 1000^{+48}_{-0} hours

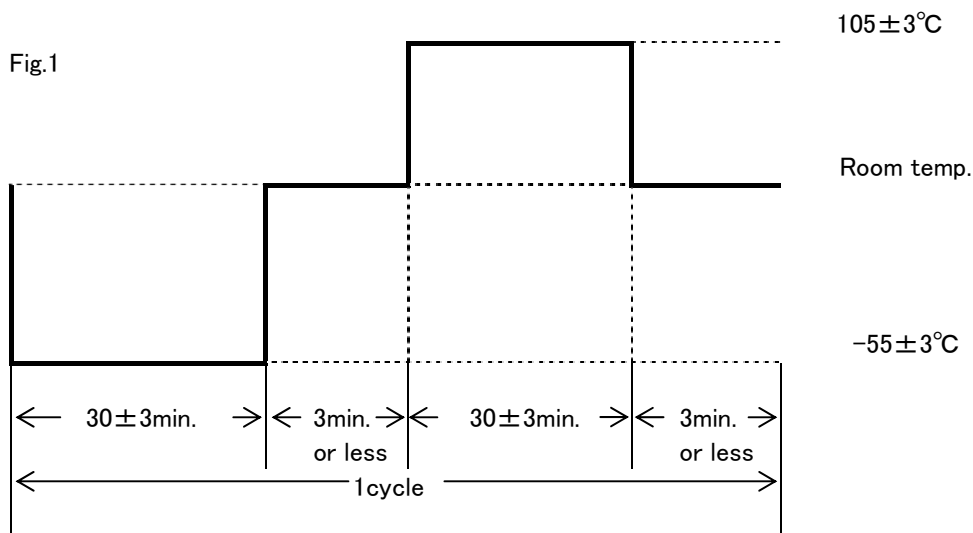
Applied voltage: Category voltage

After the test finished, and the capacitors returned to the regular temperature they shall meet following specification.

Items	Specifications
Capacitance change	$\leq \pm 20\%$ of the initial capacitance
DF	≤ 1.5 times of the value of item 5-1-3
Leakage current	\leq The value of item 5-1-1

5-3-3. Rapid change of temperature

Applied voltage : no load
 Cycle number : 5cycles
 Test diagram : Fig.1



* After 5 cycles, the capacitors shall meet following specification.

Items	Specifications
Capacitance change	≦ ±10% of the initial capacitance
DF	≦ 1.5 times of the value of item 5-1-3
Leakage current	≦ 3 times of the value of item 5-1-1

6. Failure rate level

0.5% Max./1000hours (Except for B2 size)
 1.0% Max./1000hours (B2 size)
 Confidence level : 60%
 Ambient Temperature : 85°C (Rated voltage applied)

Failure criterion

Items	Specification
Capacitance change	> ±30% of the initial capacitance
DF	> 3 times of the value of item 5-1-3
Leakage current	> 30 times of the value of item 5-1-1

7. Cleaning

Please contact us if you require details.

8. Production Location

- Panasonic Industrial Devices Saga Co., Ltd.
- SANYO JAYA COMPONENTS INDONESIA

9. Environmental consideration

9-1. RoHS Compliance

POSCAP do not use any of the following substances regulated by EU RoHS Directive, either the manufacturing process or raw materials (homogeneous materials),of POSCAP.

Restricted substances RoHS directive

- Lead (Pb) and it's compounds
- Cadmium (Cd) and it's compounds
- Mercury (Hg) and it's compounds
- Hexavalent chromium(Cr6+)
- Polybrominated biphenyls (PBBs)
- Polybromineted diphenyl ethers (PBDEs)

9-2. Lead-Free

All complete parts and homogenous materials of POSCAP are lead-free.

9-3. Halogen-free

Under this specification, the "halogen-free" means that homogeneous materials of compliant with the following conditions.

- Chlorine (Cl) concentration : $\leq 0.09\text{wt}\%$ (900ppm)
- Bromine (Br) concentration : $\leq 0.09\text{wt}\%$ (900ppm)
- Total concentration of chlorine(Cl)+bromine(Br) : $\leq 0.15\text{wt}\%$ (1500ppm)

Our company restrictions on halogens apply only to chlorine, bromine, and their compounds. No other halogen (fluorine, iodine, astatine) is regulated.

Homogeneous material:

A homogeneous material has uniform composition throughout and cannot be mechanically disjointed into different materials.

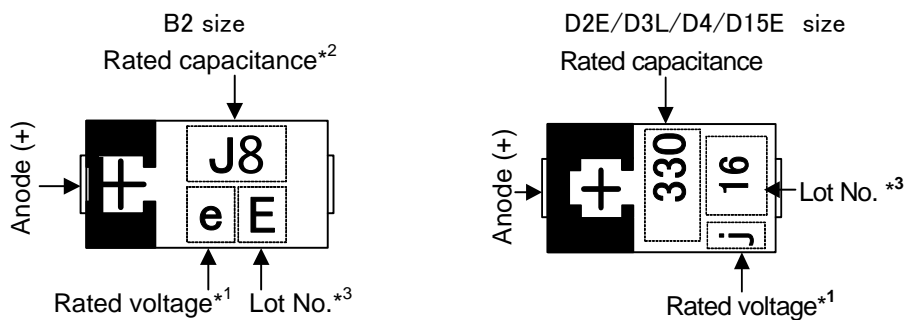
- A ink layer, coating layer or coat of paint that is printed or coated on the surface of plastic materials.
- A metallic thin-film formed on the surface of plastic or metallic material.
- A material (plastic, adhesive material, metallic material, ink, glass, paper, alloy etc.) which is made up of a homogeneous substance.

As for the packaging materials, they comply with EU94/62/EC Packaging and Waste Packaging Directive, which requires the total content of lead, cadmium, mercury and hexavalent chromium in the components of packaging materials to be 100 ppm or less.

9-4. Ozone layer destruction regulation

- POSCAP does not apply ozone layer destruction class I or class II substance.
- Ozone layer destruction class I or class II substance is not applied on manufacturing process of this product POSCAP.

10. Marking



*1 The rated voltage is as follows.

W.V.	2.0	2.5	4.0	6.3	8.0	10.0
Mark	d	e	g	j	k	A

*2 The rated capacitance is as follows. (B2 size)

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

*3 Lot. No. shows roughly manufacturing date.

11. Operating precautions

POSCAP is uniquely structured solid electrolytic capacitor.

Please note the following points in order to take full advantage of the POSCAP's performance and ensure the most stable quality possible.

11-1. Crucial Precautions

11-1-1. Polarity

POSCAP is a solid electrolytic capacitor with conductive polymer and it has polarities. Please, do not set it under reverse voltage. If it is used with the wrong polarities, increased leakage current or a decreased life span may result.

11-1-2. Prohibited circuits

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

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

11-1-3. Over voltage prohibited during design

Over voltage exceeding the rated voltage may not be applied even for an instant as it may cause a short circuit.

11-1-4. Sudden charge and discharge restricted

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

A protection circuit is recommended for when a sudden charge or discharge causes excessive rush current because this is main cause of short circuit and large leakage current.

Use protection circuits when the rush current value exceeds 20A.

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

11-1-5. Considerations when soldering

The soldering conditions are to be within the range prescribed in this delivery specification. If the specifications are not followed, there is the possibility of the appearance becoming defective when soldering is conducted under conditions that are harsher than those stipulated.

And, it doesn't cope with flow soldering and Hot Plate soldering.

11-1-6. Considerations when using in industrial equipment

To insure reliability when the POSCAP is used in industrial equipment, give wider margin of its capacitance, impedance and other characteristics.

11-1-7. Using in equipment regarding human life.

In case of using in equipment regarding human life

(e.g. Space equipment, aeronautic equipment and atomic equipment etc.), be sure to talk over the matter with us.

Don't use without recognition document from us.

11-2. Cautions of circuit designing

(1)Check the rated performance

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

(2)Operating temperature and ripple current

(a)Set the operating temperature so that it falls within the range stipulated in this specification.

(b)Do not supply current that exceeds the allowable ripple current.

When excessive ripple current is supplied, internal heat increases and reduces the POSCAP's life span.

(3)Leakage current

Even when the soldering conditions fall within the range of this specifications, leakage current increases a little on occasion. It also increases a little during high temperature storage, high humidity storage and temperature cycling with no voltage applied.

In cases such as these, leakage current will decrease by applying voltage under the condition of below the POSCAP's maximum operating temperature.

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

(4)Reduction of failure stress

When POSCAP is used within the rated voltage (WV), it shows a stable characteristic, but it may be damaged in a short circuit when an over voltage, for instance, is applied.

The time to reach the failure mode can be extended by using POSCAP with reduced ambient temperature, ripple current and applied voltage.

The failure rate is less than 0.5% / 1,000 hours in the confidence level of 60 % with the rated voltage applied at 85°C. (in the case of D2E/D3L/D4/D15E size)

On the other hand, in the case of B2 size, the failure rate is less than 1.0%/1,000h in the same conditions as D2E/D3L/D4/D15E size.

(5)Operating environment restrictions

Do not use the POSCAP in the following environments.

(a)Places where water, salt water or oil can directly fall on it and places where condensation may form.

(b)Places filled with noxious gas for capacitors (hydrogen sulfide, sulfurous acid, chlorine, ammonia, etc.).

(c)Places susceptible to ozone, ultraviolet rays and radiation.

(6)Land pattern

When mounting the POSCAP on the PC board, match the POSCAP's land pattern dimension. (item 13)

(7)Parallel connection

A large amount of ripple current may be applied to the POSCAP when it is used in parallel connection with another capacitor.

Carefully select the type of capacitor.

(8)Others

Design circuits after checking the following items.

Electrical characteristics are affected by temperature and frequency fluctuations.

Design circuits after checking the amount of fluctuation.

11-3. Storage

It is necessary to set up an environment to prevent a trouble at the time of soldering by the degradation of solder ability or moisture's getting into the molding resin when POSCAP are stored. Please make storage of POSCAP sealing up in the reel and storage bag at the time of delivery in the following environment. Also, set storage period as 18 months or shorter.

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

Place where POSCAP is not exposed by direct sunshine.

Please unseal them just before mounting and be conscious that they do not remain.

When remainder occurs reluctantly, return them to storage bag once again and, please seal the unsealing division by adhesive tape etc., including desiccants.

POSCAP should be used within the time period described in the following table, based on the floor life conditions.

Moisture sensitivity levels (IPC/JEDEC STANDARD J-STD-020D)

【1】Peak temperature 250°C lead free reflow (In the case of the reflow conditions 18-[A])

Level	Floor Life		Size Code
	Time	Conditions	
2a	4weeks	$\leq 30^{\circ}\text{C}/60\%RH$	D2E, D3L, D4, D15E
3	168 hours	$\leq 30^{\circ}\text{C}/60\%RH$	B2

【2】Peak temperature 260°C lead free reflow (In the case of the reflow conditions 18-[B])

Level	Floor Life		Size Code
	Time	Conditions	
3	168 hours	$\leq 30^{\circ}\text{C}/60\%RH$	B2, D2E, D3L, D4, D15E

12. Characteristics list

- Table 1 -

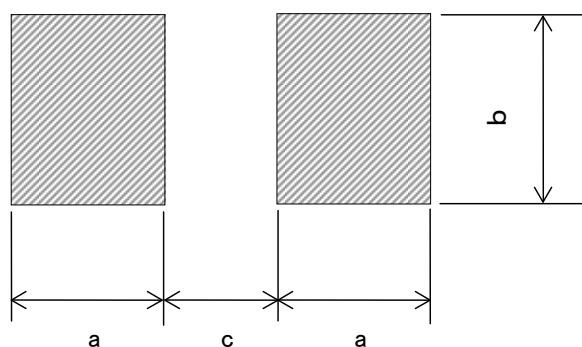
TPE series

Size Code	Part number	Rated Voltage (V) -55°C ≤ T ≤ 85°C	Category Voltage (V) 85°C < T ≤ 105°C	Rated Capacitance (μF)	DF (% max)	Leakage current (μA max) /5 min.	E.S.R. 100kHz (mΩ max)	Maximum allowable ripple current (mA rms) 100kHz to 500kHz
B2	10TPE47MAZB	10.0	8.0	47	8.0	47.0	35	1400
	8TPE100MAZB	8.0	6.3	100	8.0	80.0	35	1400
	6TPE220MAZB	6.3	5.0	220	10.0	138.6	35	1400
	6TPE220MAPB	6.3	5.0	220	10.0	138.6	25	1600
	6TPE150MAZB	6.3	5.0	150	8.0	94.5	35	1400
	6TPE150MAPB	6.3	5.0	150	8.0	94.5	25	1600
	6TPE120MAZB	6.3	5.0	120	8.0	75.6	35	1400
	6TPE100MAZB	6.3	5.0	100	8.0	63.0	35	1400
	4TPE220MAZB	4.0	3.2	220	8.0	88.0	35	1400
	4TPE150MAZB	4.0	3.2	150	8.0	60.0	35	1400
	2R5TPE330MAZB	2.5	2.0	330	8.0	82.5	35	1400
	ETPE330MAFB	2.5	2.0	330	8.0	165.0	15	2700
	2R5TPE220MAZB	2.5	2.0	220	8.0	55.0	35	1400
	2R5TPE220MAPB	2.5	2.0	220	8.0	55.0	25	1600
	2R5TPE220MAFB	2.5	2.0	220	8.0	110.0	15	2000
	2TPE470MAFB	2.0	1.8	470	10.0	188.0	15	2300
	2TPE470MAJGB	2.0	1.8	470	10.0	188.0	11/300kHz*1	2300
	2TPE330MAFB	2.0	1.8	330	8.0	132.0	15	2000
2TPE330MADGB	2.0	1.8	330	8.0	132.0	13/300kHz*1	2000	
D2E	6TPE330MAP	6.3	5.0	330	10.0	207.9	25	2400
	6TPE220MAP	6.3	5.0	220	10.0	138.6	25	2400
D3L	6TPE330MAL	6.3	5.0	330	10.0	207.9	25	2400
	6TPE330MA9EL	6.3	5.0	330	10.0	207.9	9/500kHz *2	3900
D4	6TPE330MAA	6.3	5.0	330	10.0	207.9	10	4400
D15E	6TPE470MAZU	6.3	5.0	470	10.0	296.1	35	1700

*1: Production ESR measurement is performed at 100kHz.
300kHz ESR is guaranteed by taking correlation data between 100kHz ESR value and 300kHz ESR value.

*2: Production ESR measurement is performed at 100kHz.
500kHz ESR is guaranteed by taking correlation data between 100kHz ESR value and 500kHz ESR value.

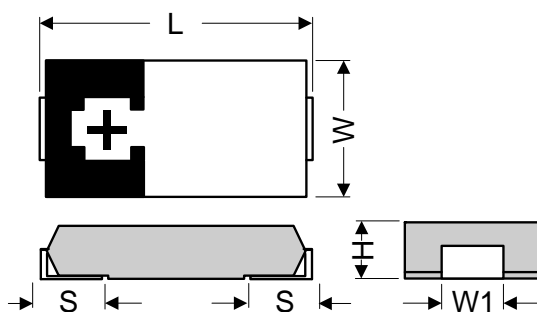
13. Recommended land pattern dimensions



(unit; mm)

Size Code	a	b	c
B2	1.6	2.7	1.4
D2E, D3L, D4, D15E	2.4	2.9	3.7

14. Dimensions



(unit; mm)

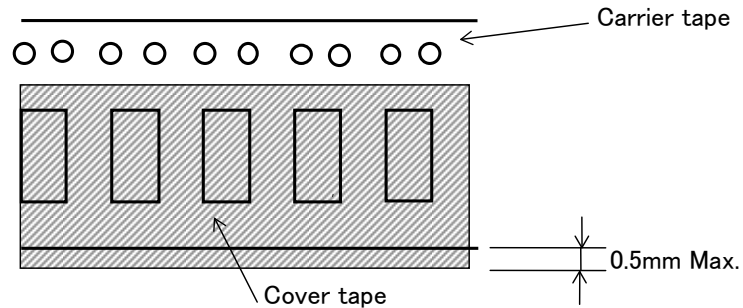
Size Code	L *1	W (± 0.2)	H *2	S (± 0.2)	W1 (± 0.1)
B2	3.5	2.8	1.9	0.8	2.2
D2E	7.3	4.3	1.8	1.3	2.4
D3L	7.3	4.3	2.8	1.3	2.4
D4	7.3	4.3	3.8	1.3	2.4
D15E	7.3	4.3	1.4	1.1	2.4

* 1 B2 size(± 0.2), D2E/D3L/D4/D15E size(± 0.3)* 2 B2/D2E/D15E size(± 0.1), D3L/D4 size(± 0.2)

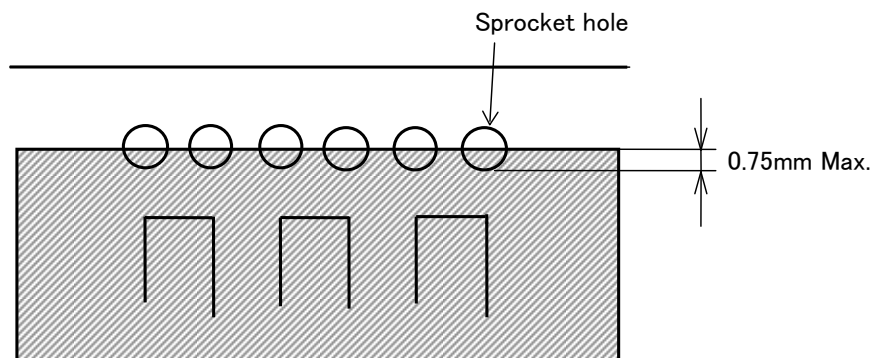
15. Taping and reel specification

15-1. Deviations of cover tape

15-1-1. When cover tape extends beyond the edge of carrier tape, distance shall be within 0.5mm.



15-1-2. When cover tape covers a tape of sprocket hole, the distance shall be within 0.75mm.



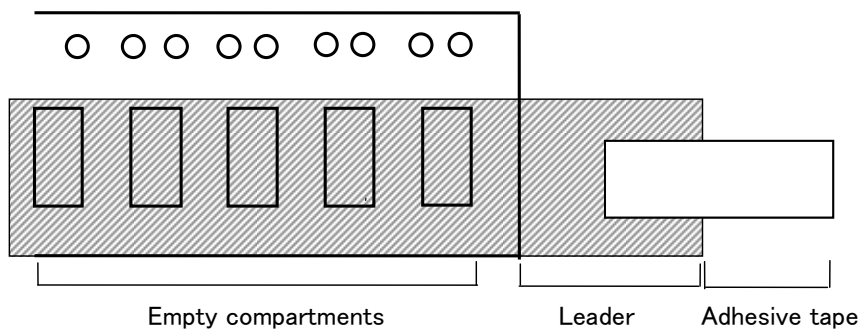
15-2. Carrier tape

15-2-1. At the start of the carrier tape there shall be minimum of 40mm empty compartments.

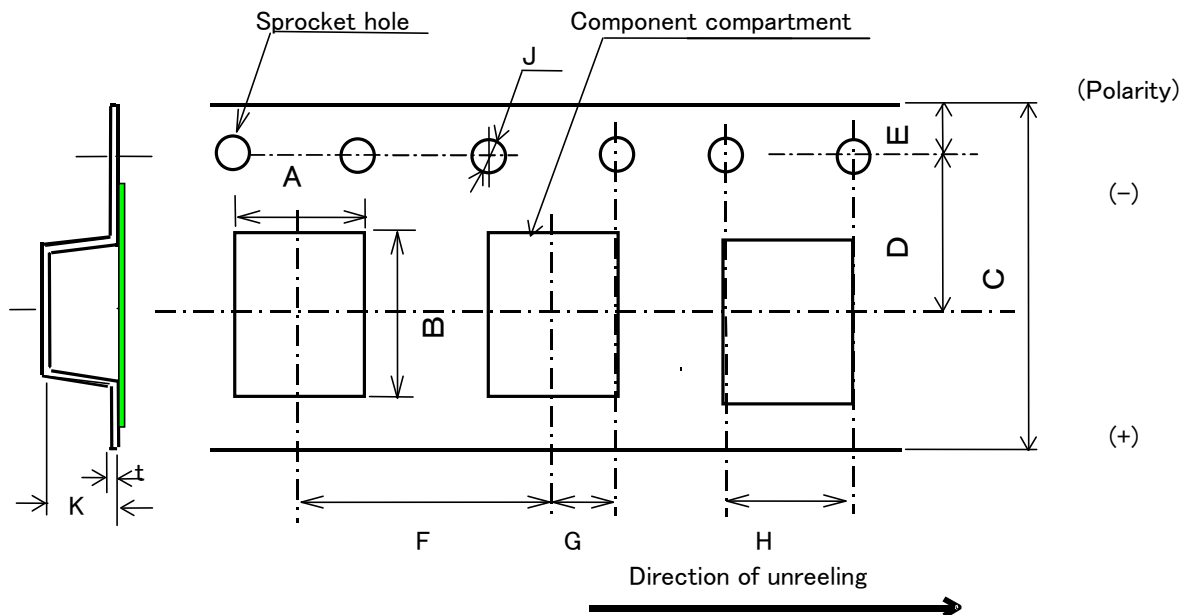
15-2-2. At the hub end there shall be a minimum of 40mm empty compartments.

15-2-3. There shall be a leader of 400mm long or more.

15-2-4. The leader shall be fixed by an adhesive tape of about 100mm (50 to 100mm) length for ϕ 330 reel, 50mm (25 to 50mm) length for ϕ 180 reel.



15-3. Dimensions of carrier tape



(unit; mm)

Size Code	A	B	C	D	E	F	G	H	J	K	t
	±0.1	±0.1	±0.3	±0.1	±0.1	±0.1	±0.1	±0.1	-0 +0.1	±0.2	±0.1
B2	3.3	3.8	8.0	3.5	1.75	4.0	2.0	4.0	φ 1.5	2.1	0.25
D2E	4.5	7.5	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	2.4	0.3
D3L	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	3.2	0.3
D4	4.5	7.7	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	4.2	0.3
D15E	4.7	7.8	12.0	5.5	1.75	8.0	2.0	4.0	φ 1.5	1.7	0.3

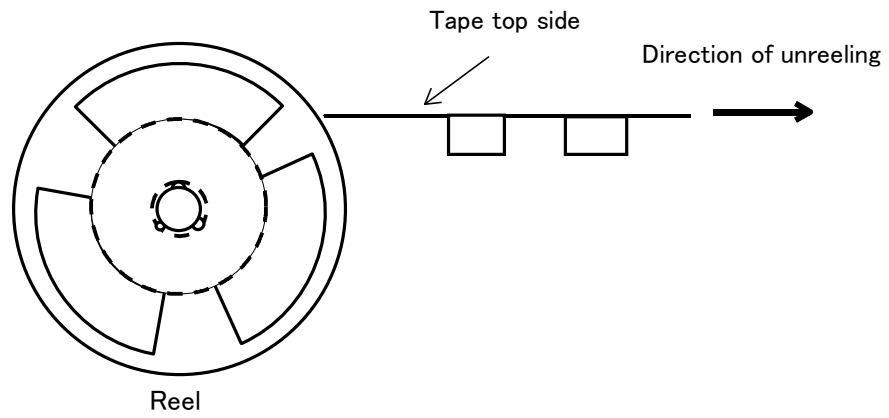
- Dimension A and B are the measures of compartment's inside bottom.
- The (+)polarity of the chip is placed on right side towards the unreeling direction.

15-4. Dimensions of the top cover tape

- Width of cover tape : 9.5±0.2mm (Except for B2 size)
- : 5.5±0.2mm (B2 size)

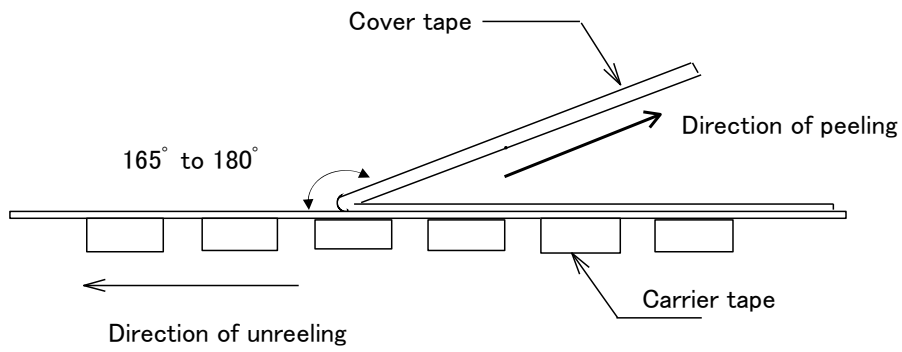
15-5. Reel

Carrier tape shall be reeled with it's bottom side being oriented towards the center of reel.
The trailer shall be put into a slit at the hub.

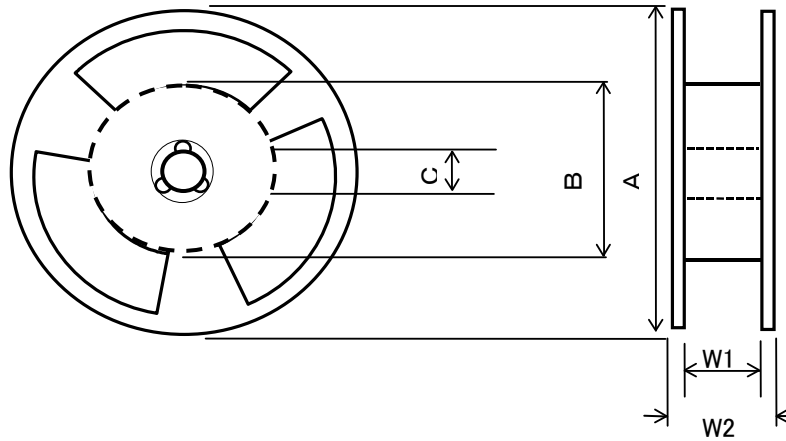


15-6. Peel force of cover tape

Peel force : 0.1 to 0.7 N
Peel speed : 300mm/min



15-7. Reel Dimensions



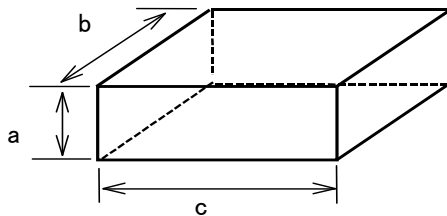
(unit; mm)

A	B	C	W1	W2
$\phi 180 \pm \frac{0}{3}$ *	$\phi 60 \pm 2$	$\phi 13 \pm 0.2$	9.0 ± 0.5	11.4 ± 1.0
$\phi 330 \pm 2$	$\phi 80 \pm 2$	$\phi 13 \pm 0.2$	13.5 ± 0.5	17.5 ± 1.0

* : $\phi 180$ reel is used for only B2 size.

16. Dimension of packing box

Reels in the shipping carton are packed in storage bag one by one with desiccants.



(unit; mm)

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

Maximum stacking quantity is 10 boxes

17. Maximum packing quantities in packing box

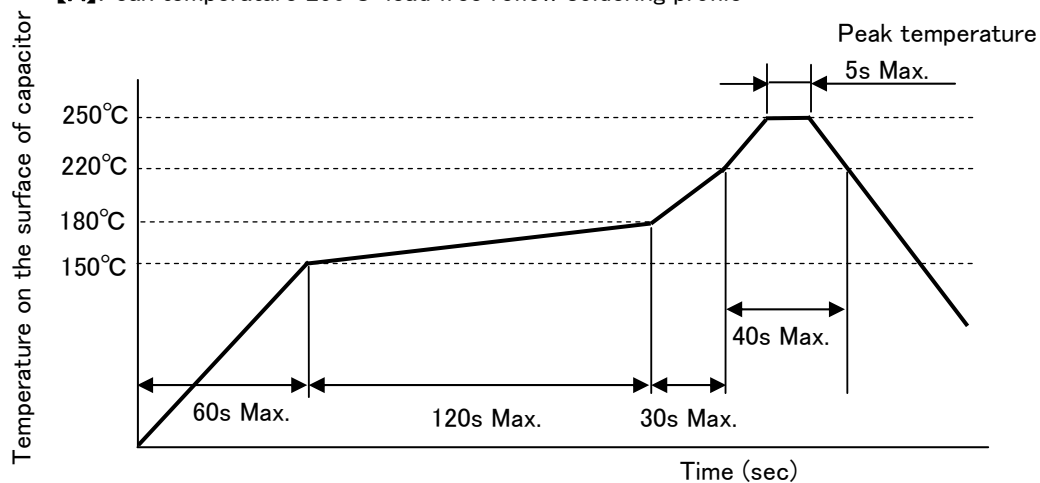
(unit: Pieces)

Size Code	Pieces/reel ($\phi 180$)	Pieces/reel ($\phi 330$)	Pieces/packing box
B2	2,000	-	10,000
D2E	-	3,000	15,000
D3L	-	2,500	12,500
D4	-	2,000	10,000
D15E	-	4,000	20,000

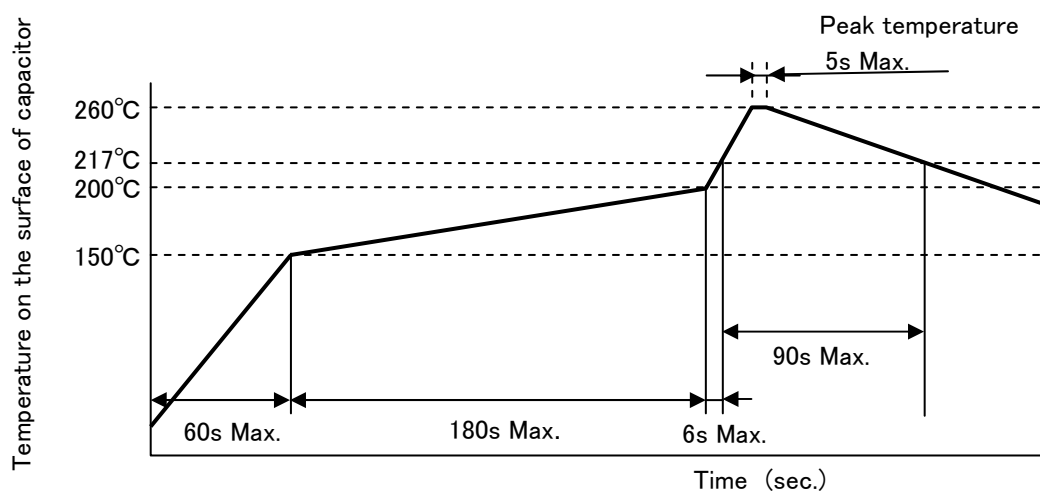
18. Recommendable reflow soldering temperature profile

The times of reflow soldering : twice (Max.)

[A]Peak temperature 250°C lead free reflow soldering profile



[B]Peak temperature 260°C lead free reflow soldering profile



19. Soldering with a soldering iron

Tip of soldering iron : 350°C Max.

Power of a soldering iron : 30W Max.

Working time : 3sec.Max.

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