

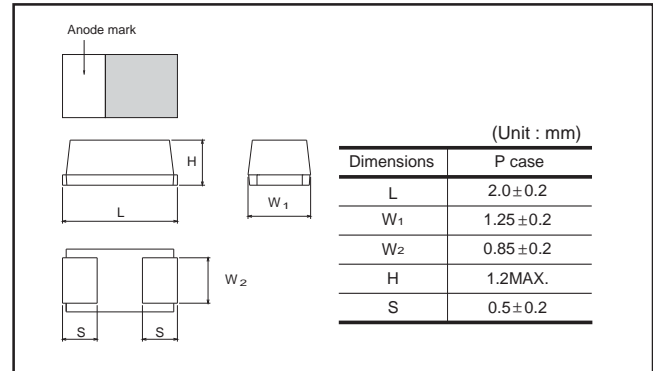
# Conductive polymer chip tantalum capacitors ( Bottom surface electrode type : Large capacitance)

## TCTO Series P Case

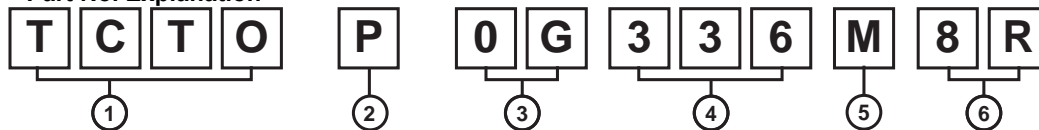
### ●Features (P)

- 1) Conductive polymer used for the cathode material.
- 2) Ultra low ESR
- 3) Small package, but big capacitance
- 4) Screening by thermal shock

### ●Dimensions (Unit : mm)



### ●Part No. Explanation



① Series name  
TCTO

② Case style  
P

③ Rated voltage

Rated voltage (V)	2.5	4	6.3	10
CODE	0E	0G	0J	1A

④ Nominal capacitance

Nominal capacitance in pF in 3 digits:  
2 significant figures followed by the figure  
representing the number of 0's.

⑤ Capacitance tolerance

M : ±20%

⑥ Taping

8 : Tape width

R : Positive electrode on the side opposite to sprocket hole

\* This specification has possibility of charge, due to underdevelopment product.  
Please ask for latest specification to our sales.

● Rated table

(ESR : mΩ)

(μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
1.0 (105)				
1.5 (155)				
2.2 (225)				
3.3 (335)				* 500
4.7 (475)				* 500
6.8 (685)				* 500
10 (106)				500
15 (156)				* 500
22 (226)			* 500	
33 (336)		* 500	* 500	
47 (476)	* 500	* 500		
68 (686)	* 500			
100 (107)				

Remark) Case size codes (P) in the above show products line-up.  
\* Under development

● Marking

The indications listed below should be given on the surface of a capacitor.

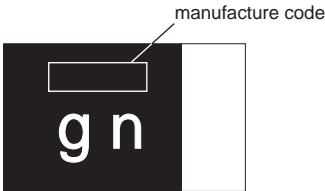
(1) Polarity : The polarity should be shown by □ bar. (on the anode side)

(2) Rated DC voltage : Due to the small size of P case, a voltage code is used as shown below.

(3) Visual typical example (1) voltage code (2) capacitance code

Voltage Code	Rated DC Voltage (V)	Capacitance Code	Nominal Capacitance (μF)
e	2.5	N	3.3
g	4	S	4.7
j	6.3	W	6.8
A	10	a	10
		e	15
		j	22
		n	33
		s	47
		w	68

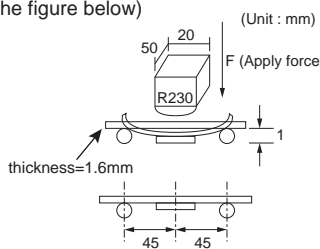
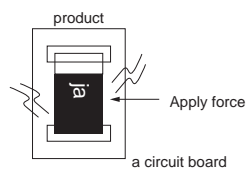
[Pcase]      note 1)     $\frac{g}{(1)}$      $\frac{n}{(2)}$



note 2) voltage code and capacitance code are variable with parts number

## ● Characteristics

Item		Performance					Test conditions (based on JIS C 5101-1 and JIS C 5101-3)	
Operating Temperature		-55°C to +105°C					Voltage reduction when temperature exceeds +85°C	
Maximum operating temperature with no voltage derating		+85°C						
Rated voltage (VDC)		2.5	4	6.3	10			at 85°C
Category voltage (VDC)		2	3.2	5	8			at 105°C
Surge voltage (VDC)		3.2	5.0	8	13			at 85°C
DC Leakage current		Shall be satisfied the voltage on " Standard list "					As per 4.9 JIS C 5101-1 As per 4.5.1 JIS C 5101-3 Voltage : Rated voltage for 5min	
Capacitance tolerance		Shall be satisfied allowance range. ±20%					As per 4.7 JIS C 5101-1 As per 4.5.2 JIS C 5101-3 Measuring frequency : 120±12Hz Measuring voltage : 0.5Vrms +1.5 to 2V.DC Measuring circuit : DC Equivalent series circuit	
Tangent of loss angle (Df, tan δ)		Shall be satisfied the voltage on " Standard list "					As per 4.8 JIS C 5101-1 As per 4.5.3 JIS C 5101-3 Measuring frequency : 120±12Hz Measuring voltage : 0.5Vrms +1.5 to 2V.DC Measuring circuit : DC Equivalent series circuit	
ESR		Shall be satisfied the voltage on " Standard list "					As per 4.10 JIS C 5101-1 As per 4.5.4 JIS C 5101-3 Measuring frequency : 100±10kHz Measuring voltage : 0.5Vrms or less Measuring circuit : DC Equivalent series circuit	
Resistance to Soldering heat	Appearance	There should be no significant abnormality. The indications should be clear.					As per 4.14 JIS C 5101-1 As per 4.6 JIS C 5101-3 Dip in the solder bath	
	L.C.	Less than 300% of initial limit					Solder temp : 240±5°C	
	ΔC / C	Within ±20% of initial value					Duration : 10±0.5s	
	Df (tan δ)	Less than 300% of initial limit					Repetition : 1 After the specimens, leave it at room temperature for over 24h and then measure the sample.	
Temperature cycle	Appearance	There should be no significant abnormality. The indications should be clear.					As per 4.16 JIS C 5101-1 As per 4.10 JIS C 5101-3 Repetition : 5 cycles (1 cycle : steps 1 to 4) without discontinuation.	
	L.C.	Less than 1000% of initial limit						
	ΔC / C	Within ±20% of initial value						
	Df (tan δ)	Less than 300% of initial limit						
Moisture resistance	Appearance	There should be no significant abnormality. The indications should be clear.					As per 4.22 JIS C 5101-1 As per 4.12 JIS C 5101-3	
	L.C.	Less than 300% of initial limit					After leaving the sample under such atmospheric condition that the temperature and humidity are 40±2°C and 90 to 95% RH, respectively, for 500±12h leave it at room temperature for 24h and then measure the sample.	
	ΔC / C	Within +30/-20% of initial value						
	Df (tan δ)	Less than 300% of initial limit						

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Temperature Stability	Temp.	-55°C	As per 4.29 JIS C 5101-1 As per 4.13 JIS C 5101-3
	$\Delta C / C$	Within 0/-20% of initial value	
	Df (tan $\delta$ )	Shall be satisfied the voltage on " Standard list "	
	L.C.	-	
	Temp.	+105°C	
	$\Delta C / C$	Within +50/0% of initial value	
	Df (tan $\delta$ )	Shall be satisfied the voltage on " Standard list "	
	L.C.	Less than 1,000% of initial value	
Surge voltage	Appearance	There should be no significant abnormality.	As per 4.26 JIS C 5101-1 As per 4.14 JIS C 5101-3 Apply the specified surge voltage every 5±0.5 min. for 30±5 s. each time in the atmospheric condition of 85±2°C. Repeat this procedure 1,000 times. After the specimens, leave it at room temperature for over 24h and then measure the sample.
	L.C.	Less than 200% of initial value	
	$\Delta C / C$	Within ±20% of initial value	
	Df (tan $\delta$ )	Less than 200% of initial limit	
Loading at High temperature	Appearance	There should be no significant abnormality.	As per 4.23 JIS C 5101-1 As per 4.15 JIS C 5101-3 After applying the rated voltage for 1000+36/0 h without discontinuation via the serial resistance of 3Ω or less at a temperature of 85±2°C, leave the sample at room temperature / humidity for 24h and measure the value.
	L.C.	Less than 400% of initial limit	
	$\Delta C / C$	Within ±20% of initial value	
	Df (tan $\delta$ )	Less than 300% of initial limit	
Terminal strength	Capacitance	The measured value should be stable.	As per 4.35 JIS C 5101-1 As per 4.9 JIS C 5101-3 A force is applied to the terminal until it bends to 1mm and by a prescribed tool maintain the condition for 5s. (See the figure below)
	Appearance	There should be no significant abnormality.	
			 <p>(Unit : mm)</p> <p>50 20</p> <p>R230</p> <p>F (Apply force)</p> <p>1</p> <p>thickness=1.6mm</p> <p>45 45</p>
Adhesiveness		The terminal should not come off.	<p>As per 4.34 JIS C 5101-1 As per 4.8 JIS C 5101-3 Apply force of 5N in the two directions shown in the figure below for 10±1s after mounting the terminal on a circuit board.</p>  <p>product</p> <p>Apply force</p> <p>a circuit board</p>
Dimensions		Refer to "External dimensions"	Measure using a caliper of JIS B 7507 Class 2 or higher grade.
Resistance to solvents		The indication should be clear	<p>As per 4.32 JIS C 5101-1 As per 4.18 JIS C 5101-3 Dip in the isopropyl alcohol for 30±5s, at room temperature.</p>
Solderability		3/4 or more surface area of the solder coated terminal dipped in the soldering bath should be covered with the new solder.	<p>As per 4.15.2 JIS C 5101-1 As per 4.7 JIS C 5101-3 Dip speed=25±2.5mm / s Pre-treatment (accelerated aging): Leave the sample on the boiling distilled water for 1 h. Solder temp. : 245±5°C Duration : 3±0.5s Solder : M705 Flux : Rosin 25% IPA 75%</p>
Vibration	Capacitance	Measure value should not fluctuate during the measurement.	<p>As per 4.17 JIS C 5101-1 Frequency : 10 to 55 to 10Hz/min. Amplitude : 1.5mm Time : 2h each in X and Y directions Mounting : The terminal is soldered on a print circuit board.</p>
	Appearance	There should be no significant abnormality.	

### ● Standard products list, TCTO series P case

Part No.	Rated voltage 85°C (V)	Category voltage 125°C (V)	Surge voltage 85°C (V)	Cap. 120Hz (μF)	Tolerance (%)	Leakage current 25°C 1WV.5min (μA)	Df 120Hz (%)			ESR 100kHz (mΩ)
							-55°C	25°C 85°C	105°C	
* TCTO P 0E 476 □	2.5	2	3.2	47	± 20	11.8	15	15	20	500
* TCTO P 0E 686 □	2.5	2	3.2	68	± 20	17.0	15	15	20	500
* TCTO P 0G 336 □	4	3.2	5	33	± 20	13.2	15	15	20	500
* TCTO P 0G 476 □	4	3.2	5	47	± 20	18.8	15	15	20	500
* TCTO P 0J 226 □	6.3	5	8	22	± 20	13.9	15	15	20	500
* TCTO P 0J 336 □	6.3	5	8	33	± 20	20.8	15	15	20	500
* TCTO P 1A 335 □	10	8	13	3.3	± 20	3.3	10	10	15	500
* TCTO P 1A 475 □	10	8	13	4.7	± 20	4.7	10	10	15	500
* TCTO P 1A 685 □	10	8	13	6.8	± 20	6.8	10	10	15	500
TCTO P 1A 106 □	10	8	13	10	± 20	10.0	15	15	20	500
* TCTO P 1A 156 □	10	8	13	15	± 20	15.0	15	15	20	500

□=Tolerance(M : ± 20%)

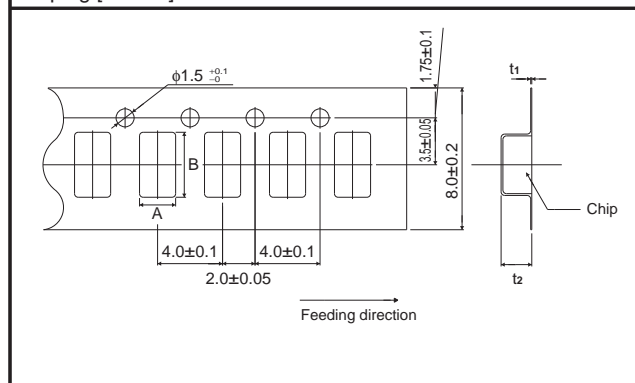
\*=Under development

### ● Packaging specifications

(Unit : mm)

Case code	A±0.1	B±0.1	t1±0.05	t2±0.1
P	1.55	2.3	0.25	1.32

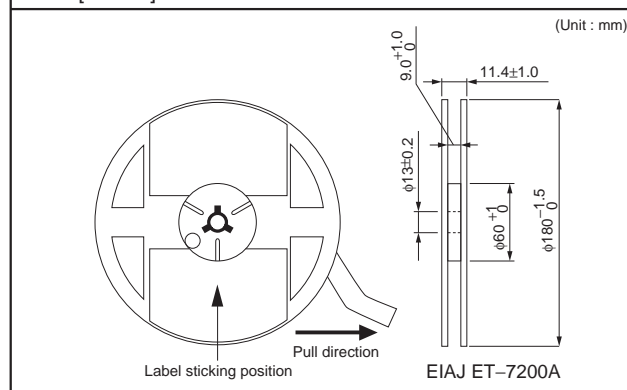
Taping [P case]



### ● Packaging style

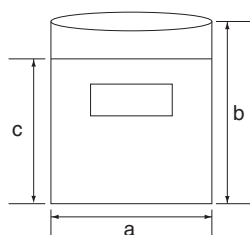
Case code	Packaging	Packaging style	Symbol	Basic ordering units
P case	Taping	plastic taping	φ180mm Reel	8R

Reel [P case]



### ● Damp proof package

- ① One reel is packed in aluminum bag.  
The size of aluminum bag is 240(a) x 250(b)mm.  
The size up to 230(c)mm is to zipper.
- ② A desiccant is packed with a reel.
- ③ The aluminum bag is heat-sealed.
- ④ The label of the same as the label on the reel is placed on the aluminum bag.



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