

# Chip tantalum capacitors

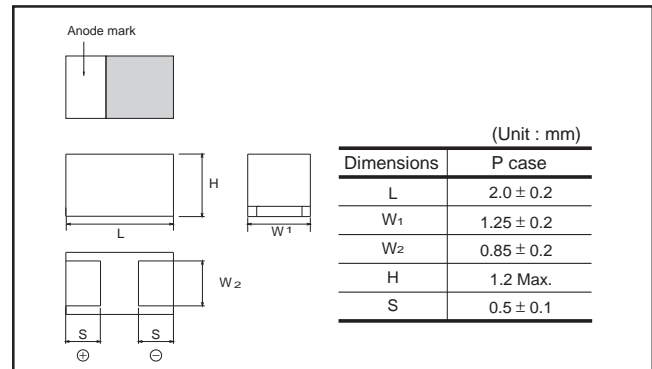
## (New bottom surface electrode type : Large capacitance)

### TCS Series P Case

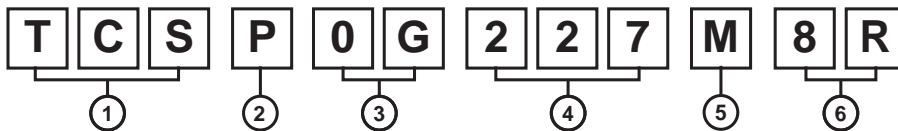
#### ●Features (P)

- 1) New package construction enables a higher capacitance than conventional products (TCT Series)
- 2) Thin, compact, high capacitance design contributes to smaller, thinner, high performance sets
- 3) Ideal for noise removal on power supply lines with limited space
- 4) Eco-friendly halogen-free products

#### ●Dimensions (Unit : mm)



#### ●Part No. Explanation



① Series name  
TCS

② Case style  
P

③ Rated voltage

Rated voltage (V)	2.5	4	6.3	10	16	20	25
CODE	0E	0G	0J	1A	1C	1D	1E

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 : Reel width : 8mm  
R : Positive electrode on the side opposite to sprocket hole

#### ● Rated table

(μF)	Rated voltage (V.DC)						
	2.5	4	6.3	10	16	20	25
10 (106)						P	*P
15 (156)							
22 (226)					*P		
33 (336)				*P	*P		
47 (476)				P			
68 (686)							
100 (107)			P				
150 (157)			*P				
220 (227)		P					
330 (337)	*P						

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 : A voltage code is shown as below table.
- (3) Capacitance value : A capacitance code is shown as below table.

Voltage Code	Rated DC Voltage (V)
e	2.5
g	4
j	6.3
A	10
C	16
D	20
E	25

Capacitance Code	Capacitance Value (μF)
a	10
e	15
j	22
n	33
s	47
w	68
ā	100
ē	150
j̄	220
n̄	330

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

[P case] note 1)  $\frac{g}{(1)}$   $\frac{j̄}{(2)}$

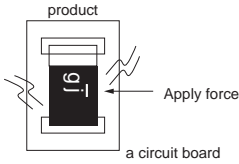


note 2) voltage code and capacitance code are variable with parts number

● **Characteristics**

Item	Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Operating Temperature	-55°C to +125°C	Voltage reduction when temperature exceeds +85°C
Maximum operating temperature with no voltage derating	+85°C	
Rated voltage (V.DC)	2.5 4 6.3 10 16 20 25 35	at 85°C
Category voltage (V.DC)	1.6 2.5 4 6.3 10 13 16 22	at 125°C
Surge voltage (V.DC)	3.2 5 8 13 20 26 32 44	at 85°C
DC Leakage current	Shall be satisfied the value 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 +1.5V.DC Measuring circuit : DC Equivalent series circuit
Tangent of loss angle (Df, tan δ)	Shall be satisfied the value 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 +1.5V.DC Measuring circuit : DC Equivalent series circuit
Impedance / ESR	Shall be satisfied the value 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.
	L.C.	Less than 200% of initial limit
	ΔC / C	Within ±30% of initial value
	Df (tan δ)	Less than 200% of initial limit
		As per 4.14 JIS C 5101-1 As per 4.6 JIS C 5101-3 Dip in the solder bath Solder temp : 260±10°C Duration : 5±0.5s Repetition : 1 After the specimens, leave it at room temperature for over 24h and then measure the sample.

Item	Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)															
Temperature cycle	Appearance	There should be no significant abnormality. The indications should be clear.															
	L.C.	Less than 200% of initial limit															
	$\Delta C / C$	Within $\pm 30\%$ of initial value															
	Df (tan $\delta$ )	Less than 200% of initial limit															
		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. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Temp.</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-55 \pm 3^\circ\text{C}</math></td> <td>30<math>\pm</math>3min.</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>3min. or less</td> </tr> <tr> <td>3</td> <td><math>125 \pm 2^\circ\text{C}</math></td> <td>30<math>\pm</math>3min.</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>3min. or less</td> </tr> </tbody> </table> After the specimens, leave it at room temperature for over 24h and then measure the sample.		Temp.	Time	1	$-55 \pm 3^\circ\text{C}$	30 $\pm$ 3min.	2	Room temp.	3min. or less	3	$125 \pm 2^\circ\text{C}$	30 $\pm$ 3min.	4	Room temp.	3min. or less
	Temp.	Time															
1	$-55 \pm 3^\circ\text{C}$	30 $\pm$ 3min.															
2	Room temp.	3min. or less															
3	$125 \pm 2^\circ\text{C}$	30 $\pm$ 3min.															
4	Room temp.	3min. or less															
Moisture resistance	Appearance	There should be no significant abnormality. The indications should be clear.															
	L.C.	Less than 200% of initial limit															
	$\Delta C / C$	Within $\pm 30\%$ of initial value															
	Df (tan $\delta$ )	Less than 200% of initial limit															
		As per 4.22 JIS C 5101-1 As per 4.12 JIS C 5101-3 After leaving the sample under such atmospheric condition that the temperature and humidity are $60 \pm 2^\circ\text{C}$ and 90 to 95% RH, respectively, for $500 \pm 12\text{h}$ leave it at room temperature for over 24h and then measure the sample.															
Temperature Stability	Temp.	$-55^\circ\text{C}$															
	$\Delta C / C$	Within 0/-30% of initial value															
	Df (tan $\delta$ )	Shall be satisfied the value on " Standard list "															
	L.C.	-															
	Temp.	$+85^\circ\text{C}$															
	$\Delta C / C$	Within +15/-5% of initial value															
	Df (tan $\delta$ )	Shall be satisfied the value on " Standard list "															
	L.C.	Less than 1000% of initial limit															
	Temp.	$+125^\circ\text{C}$															
	$\Delta C / C$	Within +20/-5% of initial value															
	Df (tan $\delta$ )	Shall be satisfied the value on " Standard list "															
	L.C.	Less than 1250% of initial limit															
Surge voltage	Appearance	There should be no significant abnormality. The indications should be clear.															
	L.C.	Less than 200% of initial limit															
	$\Delta C / C$	Within $\pm 30\%$ of initial value															
	Df (tan $\delta$ )	Less than 200% of initial limit															
		As per 4.26 JIS C 5101-1 As per 4.14 JIS C 5101-3 Apply the specified surge voltage via the serial resistance of $1\text{k}\Omega$ every $5 \pm 0.5\text{ min.}$ for $30 \pm 5\text{ s.}$ each time in the atmospheric condition of $85 \pm 2^\circ\text{C}$ . Repeat this procedure 1,000 times. After the specimens, leave it at room temperature for over 24h and then measure the sample.															
Loading at High temperature	Appearance	There should be no significant abnormality. The indications should be clear.															
	L.C.	Less than 200% of initial limit															
	$\Delta C / C$	Within $\pm 30\%$ of initial value															
	Df (tan $\delta$ )	Less than 200% of initial limit															
		As per 4.23 JIS C 5101-1 As per 4.15 JIS C 5101-3 After applying the rated voltage for $1000 + 36/0\text{ h}$ without discontinuation via the serial resistance of $3\Omega$ or less at a temperature of $85 \pm 2^\circ\text{C}$ , leave the sample at room temperature / humidity for over 24h and measure the value.															
Terminal strength	Capacitance	The measured value should be stable.															
	Appearance	There should be no significant abnormality.															
		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) <div style="text-align: center;"> <p>(Unit : mm)</p> <p>thickness=1.6mm</p> </div>															

Item	Performance	Test conditions (JIS C 5101-1 and JIS C 5101-3)
Adhesiveness	The terminal should not come off.	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. 
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	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.
Solderability	3/4 or more surface area of the solder coated terminal dipped in the soldering bath should be covered with the new solder.	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%
Vibration	Capacitance	Measure value should not fluctuate during the measurement.
	Appearance	There should be no significant abnormality.
		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.

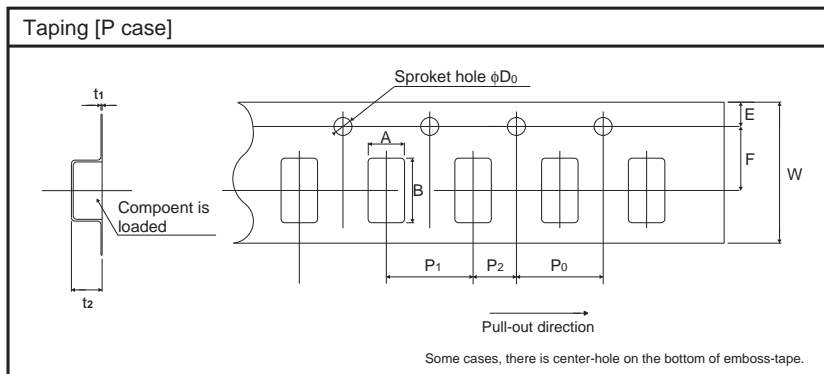
● Standard products list, TCS series P case

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 (%)			IMP 100kHz (Ω)
							-55°C	25°C 85°C	125°C	
* TCS P 0E 337 M8R	2.5	1.6	3.2	330	±20	83.0	80	40	60	3.0
TCS P 0G 227 M8R	4	2.5	5	220	±20	88.0	80	40	60	3.0
TCS P 0J 107 M8R	6.3	4	8	100	±20	63.0	80	40	60	3.0
* TCS P 0J 157 M8R	6.3	4	8	150	±20	95.0	80	40	60	3.0
* TCS P 1A 336 M8R	10	6.3	13	33	±20	17.0	60	30	40	4.0
TCS P 1A 476 M8R	10	6.3	13	47	±20	24.0	60	30	40	4.0
* TCS P 1C 226 M8R	16	10	20	22	±20	18.0	60	30	40	4.0
* TCS P 1C 336 M8R	16	10	20	33	±20	27.0	60	30	40	4.0
TCS P 1D 106 M8R	20	13	26	10	±20	10.0	30	20	30	6.0
* TCS P 1E 106 M8R	25	16	32	10	±20	13.0	30	20	30	6.0

\* =Under development

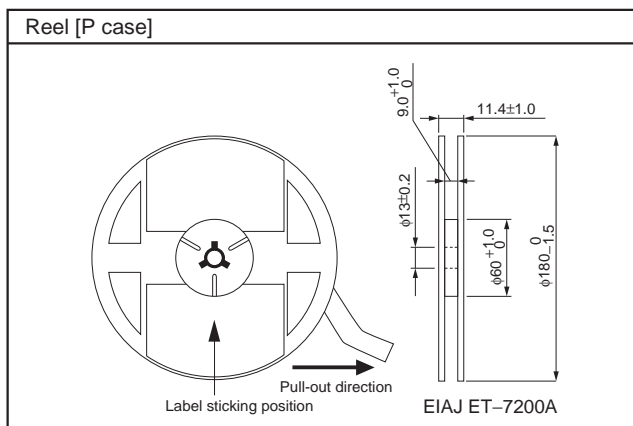
● Packaging specifications

Case code	A $\pm$ 0.1	B $\pm$ 0.1	W $\pm$ 0.2	E $\pm$ 0.1	F $\pm$ 0.05	P1 $\pm$ 0.1	P2 $\pm$ 0.05	P0 $\pm$ 0.1	D0 $\pm$ 0.05	t1 $\pm$ 0.05	t2 $\pm$ 0.1
P	1.55	2.30	8.00	1.75	3.50	4.00	2.00	4.00	$\phi$ 1.55	0.25	1.32



● Packaging style

Case code	Packaging	Packaging style		Symbol	Basic ordering units
P case	Taping	plastic taping	$\phi$ 180mm Reel	R	3,000pcs



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