

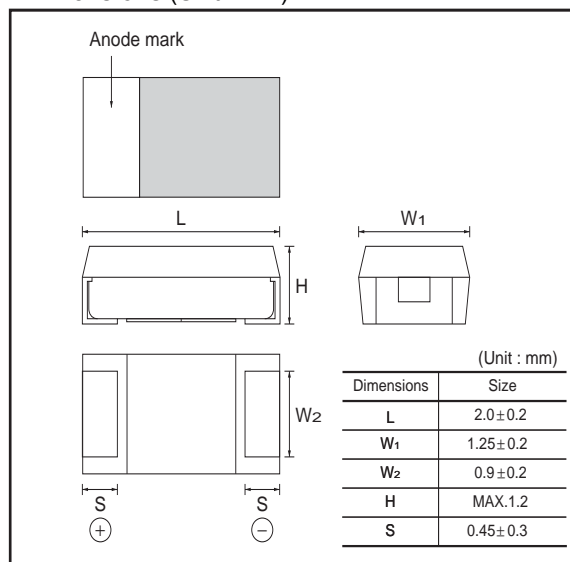
Chip tantalum capacitors (Fail-safe open structure type)

TCFG series P Case

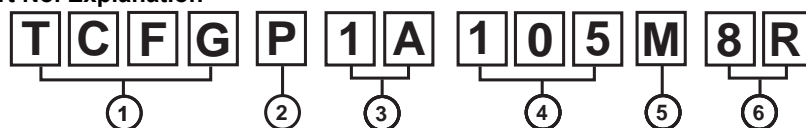
●Features

- 1) Safety design by open function built - in.
- 2) Wide capacitance range
- 3) Screening by thermal shock.

●Dimensions (Unit : mm)



●Part No. Explanation



① Series name
TCFG

② Case code
P

③ Rated Voltage

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

④ Capacitance
Nominal capacitance in pF in 3 digits : 2significant 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

●Capacitance range

(μF)	Rated voltage (V.DC)					
	4	6.3	10	16	20	25
1.0 (105)			P	P	P	P
1.5 (155)		P	P	P		
2.2 (225)	P	P	P	P		
3.3 (335)	P	P	P	P		
4.7 (475)	P	P	P			
6.8 (685)	P	P	P			
10 (106)	P	P	P			
15 (156)	P	P				
22 (226)	P					
33 (336)						
47 (476)						
68 (686)						

Remark) Case size codes (P) in the above show each size products line-up.

●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 Nominal capacitance

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

Capacitance Code	Nominal Capacitance (μF)
A	1.0
E	1.5
J	2.2
N	3.3
S	4.7
W	6.8
a	10
e	15
j	22

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

[P Case] note 1) $\begin{matrix} j & J \\ (1) & (2) \end{matrix}$

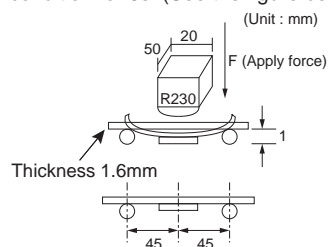
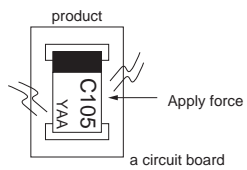


←manufacture code

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

●Characteristics

Item		Performance						Test conditions (based on JIS C5101-1 and JIS C5101-3)															
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)		4	6.3	10	16	20	25	at 85°C															
Category Voltage (V.DC)		2.5	4	6.3	10	13	16	at 125°C															
Surge Voltage		5	8	13	20	26	32	at 85°C															
DC leakage current		0.5μA or 0.01CV whichever is greater (Shown in "Standard list")						As per 4.9 JIS C 5101-1 As per 4.5.1 JIS C 5101-3 Voltage : Rated voltage for 1 min															
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, tanδ)		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, +1.5V.DC Measuring circuit : DC Equivalent series circuit															
Impedance		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 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.															
	L.C	Less than initial limit																					
	ΔC / C	Within ±10% of initial value																					
	tanδ	Less than 150% of initial limit																					
Fail-Safe open unit actuation		Within 320°C – 20s						Dip in the solder bath Solder temp : 320±5°C															
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. <table><tr><td>Step</td><td>Temp.</td><td>Time</td></tr><tr><td>1</td><td>-55±3°C</td><td>30±3min</td></tr><tr><td>2</td><td>Room temp.</td><td>3min. or less</td></tr><tr><td>3</td><td>125±2°C</td><td>30±3min</td></tr><tr><td>4</td><td>Room temp.</td><td>3min. or less</td></tr></table> After the specimens, leave it at room temperature for over 24h and then measure the sample.	Step	Temp.	Time	1	-55±3°C	30±3min	2	Room temp.	3min. or less	3	125±2°C	30±3min	4	Room temp.	3min. or less
	Step	Temp.	Time																				
	1	-55±3°C	30±3min																				
	2	Room temp.	3min. or less																				
3	125±2°C	30±3min																					
4	Room temp.	3min. or less																					
L.C	Less than initial limit																						
ΔC / C	1 to 10μF : within ±10% of initial value 15 to 22μF : within ±20% of initial value																						
tanδ	Less than 150% 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 After leaving the sample under such atmospheric condition that the temperature and humidity are 60±2°C and 90 to 95%RH, respectively, for 500±12h level it at room temperature for over 24h and then measure the sample.															
	L.C	Less than initial limit																					
	ΔC / C	Within ±20% of initial value																					
	tanδ	Less than 150% of initial limit																					

Item		Performance	Test conditions (based on JIS C5101-1 and JIS C5101-3)
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/-15% of initial value	
	$\tan \delta$	Shall be satisfied the voltage on "Standard list"	
	L.C	—	
	Temp.	+85°C	
	$\Delta C / C$	Within +15/0% of initial value	
	$\tan \delta$	Shall be satisfied the voltage on "Standard list"	
	L.C	Less than 1000% of initial limit	
	Temp.	+125°C	
	$\Delta C / C$	Within +20/0% of initial value	
	$\tan \delta$	Shall be satisfied the voltage on "Standard list"	
	L.C	Less than 1250% of initial limit	
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 via the serial resistance of 1k Ω every 5 \pm 0.5min. for 30 \pm 5 s. each time in the atmospheric condition of 85 \pm 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	Shall be satisfied the voltage on "Standard list"	
	$\Delta C / C$	Within \pm 10% of initial value	
	$\tan \delta$	Less than 150% 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+36/0h without discontinuation via the serial resistance of 3 Ω or less at a temperature of 85 \pm 2°C, leave the sample at room temperature/humidity for over 24h and measure the value.
	L.C	Less than initial limit	
	$\Delta C / C$	Within \pm 10% of initial value	
	$\tan \delta$	Less than 150% 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.	
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 \pm 1s after mounting the terminal on a circuit board. 

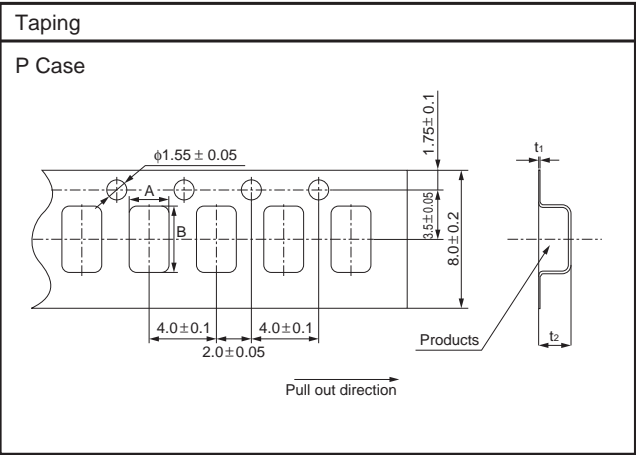
Item		Performance	Test conditions (based on JIS C5101-1 and JIS C5101-3)
Dimensions		Be based on "Dimensions"	Measure using a caliper of JIS B 7505 Class 2 or higher grade.
Resistance to solvents		The indication should be clear.	As per 4.32 JIS C 5101-1 As per 4.18 JIS C 5101-3 Dip in the isopropyl alcohol 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 1h. 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.	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.
	Appearance	There should be no significant abnormality.	

●Table 1 standard list, TCFG series P Case

Part No.	Rated Voltage @85°C (V)	Derated Voltage @125°C (V)	Surge Voltage @85°C (V)	Capacitance 120Hz (μF)	Tolerance (%)	Leakage current 25°C 1WV.60s (mA)	DF120Hz (%)			Impedance 100kHz (Ω)	Case code
							-55°C	25°C 85°C	125°C		
TCFG P 0G 225 M8R	4	2.5	5	2.2	±20	0.5	15	10	15	17.5	P
TCFG P 0G 335 M8R	4	2.5	5	3.3	±20	0.5	30	20	30	17.5	P
TCFG P 0G 475 M8R	4	2.5	5	4.7	±20	0.5	30	20	30	14.4	P
TCFG P 0G 685 M8R	4	2.5	5	6.8	±20	0.5	30	20	30	11.8	P
TCFG P 0G 106 M8R	4	2.5	5	10	±20	0.5	30	20	30	9.3	P
TCFG P 0G 156 M8R	4	2.5	5	15	±20	0.6	30	20	30	8.3	P
TCFG P 0G 226 M8R	4	2.5	5	22	±20	0.9	30	20	30	7.7	P
TCFG P 0J 155 M8R	6.3	4	8	1.5	±20	0.5	15	10	15	17.5	P
TCFG P 0J 225 M8R	6.3	4	8	2.2	±20	0.5	30	20	30	17.5	P
TCFG P 0J 335 M8R	6.3	4	8	3.3	±20	0.5	30	20	30	14.4	P
TCFG P 0J 475 M8R	6.3	4	8	4.7	±20	0.5	30	20	30	11.8	P
TCFG P 0J 685 M8R	6.3	4	8	6.8	±20	0.5	30	20	30	9.3	P
TCFG P 0J 106 M8R	6.3	4	8	10	±20	0.6	30	20	30	8.3	P
TCFG P 0J 156 M8R	6.3	4	8	15	±20	0.9	30	20	30	7.7	P
TCFG P 1A 105 M8R	10	6.3	13	1.0	±20	0.5	15	10	15	17.5	P
TCFG P 1A 155 M8R	10	6.3	13	1.5	±20	0.5	30	20	30	16.1	P
TCFG P 1A 225 M8R	10	6.3	13	2.2	±20	0.5	30	20	30	14.4	P
TCFG P 1A 335 M8R	10	6.3	13	3.3	±20	0.5	30	20	30	11.8	P
TCFG P 1A 475 M8R	10	6.3	13	4.7	±20	0.5	30	20	30	9.3	P
TCFG P 1A 685 M8R	10	6.3	13	6.8	±20	0.7	30	20	30	8.3	P
TCFG P 1A 106 M8R	10	6.3	13	10	±20	1.0	30	20	30	7.7	P
TCFG P 1C 105 M8R	16	10	20	1.0	±20	0.5	15	10	15	16.1	P
TCFG P 1C 155 M8R	16	10	20	1.5	±20	0.5	30	20	30	14.4	P
TCFG P 1C 225 M8R	16	10	20	2.2	±20	0.5	30	20	30	11.8	P
TCFG P 1C 335 M8R	16	10	20	3.3	±20	0.6	30	20	30	9.3	P
TCFG P 1D 105 M8R	20	13	26	1.0	±20	0.5	15	10	15	16.1	P
TCFG P 1E 105 M8R	25	16	32	1.0	±20	0.5	15	10	15	16.1	P

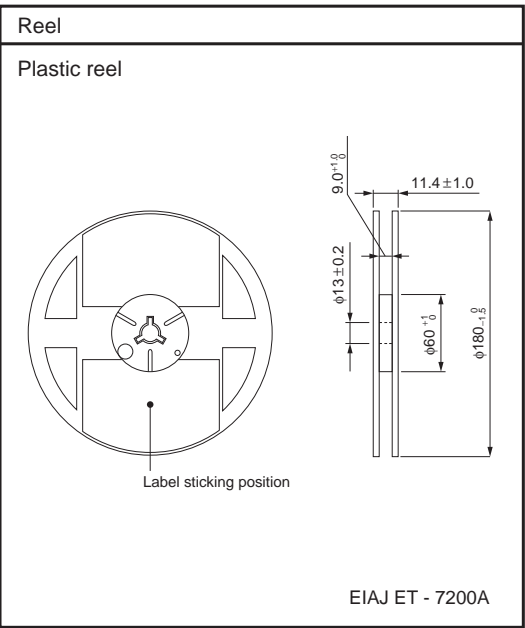
●Packaging specifications

Case code	A±0.1	B±0.1	t ₁ ±0.05	t ₂ ±0.1
P (2012)	1.55	2.3	0.25	1.32



●Packaging style

Case size	Packaging	Packaging style		Symbol	Basic ordering unit
P Case	Taping	Plastic taping	$\phi 180\text{mm}$ reel	8R	2,000



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