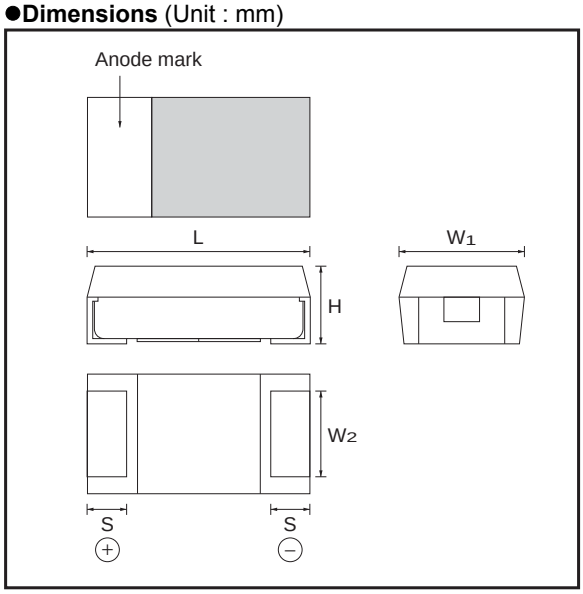
Chip tantalum capacitors (Fail-safe open structure type)

TCFG Series B Case

●Features

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

●Dimensions (Unit : mm)



Case code	L	W_1	W_2	H	S
B 3528-21(1411)	3.5±0.2	2.8±0.2	1.9±0.2	1.9±0.2	0.8±0.3

●Product No. Explanation

T	C	F	G	B	1	C	1	0	6	M	8	R
①				②	③		④			⑤	⑥	

① Series name
TCFG

② Case code
TCFG ····· B

③ Rated voltage

Rated voltage (V)	2.5	4	6.3	10	16	20	25
CODE	0E	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

TCFG series B Case

(μF)	Rated voltage (V)						
	2.5 0E	4 0G	6.3 0J	10 1A	16 1C	20 1D	25 1E
3.3 (335)					B	B	B
4.7 (475)				B	B	B ＊	B
6.8 (685)				B	B	B ＊	
10 (106)			B	B	B	B ＊	
15 (156)		B	B	B	B		
22 (226)		B	B	B	B		
33 (336)		B	B	B	B		
47 (476)		B	B	B			
68 (686)		B	B	B			
100 (107)		B	B	B			
150 (157)		B	B	B ＊			
220 (227)	B	B	B				

Remark) Case size codes (B) in the above show each size products line-up.
＊: Under development

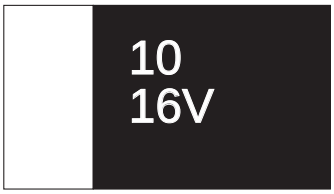
●Marking

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 A case, a voltage code is used as shown below.
③ Nominal capacitance

[B Case] note 1) Visual typical example (1) voltage code (2) capacitance code

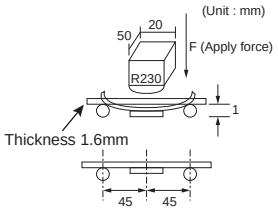
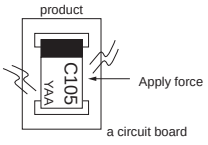
$\frac{10}{(1)}$ $\frac{16V}{(2)}$



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)		2.5 | 4 | 6.3 | 10 | 16 | 20 | 25	at 85°C
Category Voltage (V.DC)		1.6 | 2.5 | 4 | 6.3 | 10 | 13 | 16	at 125°C
Surge Voltage		3.2 | 5.0 | 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±5°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	TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 150% of initial limit TCFGB1A107M8R : Less than 150% of initial limit TCFGB1E475M8R : Less than 150% of initial limit Others : Less than initial limit	
	ΔC / C	TCFGB0G227M8R : Within ±15% of initial value TCFGB0J227M8R : Within ±15% of initial value TCFGB1A107M8R : Within ±15% of initial value TCFGB1E475M8R : Within ±10% of initial value Others : Within ± 5% of initial value	
	tanδ	3.3 to 33μF : Less than initial limit 47 to 150μF : Less than 150% of initial limit TCFGB0E227M8R : Less than 200% of initial limit TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 150% of initial limit TCFGB1A107M8R : Less than 150% of initial limit TCFGB1C336M8R : 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.	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. 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 After the specimens, leave it at room temperature for over 24h and then measure the sample.
	L.C	TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1E475M8R : Less than 150% of initial limit Others : Less than initial limit	
	ΔC / C	TCFGB0E227M8R : Within ±15% of initial value TCFGB0G227M8R : Within ±15% of initial value TCFGB0J227M8R : Within ±20% of initial value TCFGB1A107M8R : Within ±20% of initial value Others : Within ±10% of initial value	
	tanδ	3.3 to 33μF : Less than initial limit 47 to 150μF : Less than 150% of initial limit TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1C336M8R : 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	TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1E475M8R : Less than 150% of initial limit Others : Less than initial limit	
	ΔC / C	TCFGB0G227M8R : Within ±15% of initial value TCFGB0J227M8R : Within ±20% of initial value TCFGB1A107M8R : Within ±20% of initial value Others : Within ±10% of initial value	
	tanδ	3.3 to 33μF : Less than initial limit 47 to 150μF : Less than 150% of initial limit TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1C336M8R : 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
	ΔC / C	TCFGB0G227M8R : Within 0/-15% of initial value TCFGB0J227M8R : Within 0/-30% of initial value TCFGB1A107M8R : Within 0/-30% of initial value Others : Within 0/-12% of initial value	
	tanδ	Shall be satisfied the value on Table5	
	L.C	–	
	Temp.	+85°C	
	ΔC / C	TCFGB0G227M8R : Within +12/0% of initial value TCFGB0J227M8R : Within +15/0% of initial value TCFGB1A107M8R : Within +15/0% of initial value Others : Within +10/0% of initial value	
	tanδ	Shall be satisfied the value on Table5	
	L.C	Less than 1000% of intial limit	
	Temp.	+125°C	
	ΔC / C	TCFGB0J227M8R : Within +20/0% of initial value TCFGB1A107M8R : Within +20/0% of initial value TCFGB1C336M8R : Within +20/0% of initial value Others : Within +15/0% of initial value	
	tanδ	Shall be satisfied the value on Table5	
	L.C	Less than 1250% of initial limit	
Surge Voltage	Appearance	There should be no significant abnormality. The indications should be clear.	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 1kΩ every 5±0.5min. 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	TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1E475M8R : Less than 150% of initial limit Others : Less than initial limit	
	ΔC / C	TCFGB0E227M8R : Within ±12% of initial value TCFGB0G227M8R : Within ±15% of initial value TCFGB0J227M8R : Within ±20% of initial value TCFGB1A107M8R : Within ±20% of initial value Others : Within ±10% of initial value	
	tanδ	3.3 to 33μF : Less than initial limit 47 to 150μF : Less than 150% of initial limit TCFGB0G227M8R : Less than 200% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1C336M8R : Less than 150% of initial limit	
Loading at High temperature	Appearance	There should be no significant abnormality. The indications should be clear.	As per 4.23 JIS C 5101-1 As per 4.15 JIS C 5101-3 After applying the rated voltage for 2000+72/0h 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 1 to 2h and measure the value. After the specimens, leave it at room temperature for over 24h and then measure the sample.
	L.C	TCFGB0E227M8R : Less than 125% of initial limit TCFGB0G227M8R : Less than 150% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1E475M8R : Less than 150% of initial limit Others : Less than initial limit	
	ΔC / C	TCFGB0G227M8R : Within ±15% of initial value TCFGB0J227M8R : Within ±20% of initial value TCFGB1A107M8R : Within ±20% of initial value Others : Within ±10% of initial value	
	tanδ	3.3 to 33μF : Less than initial limit 47 to 100μF : Less than 150% of initial limit TCFGB0E227M8R : Less than 150% of initial limit TCFGB0G227M8R : Less than 200% of initial limit TCFGB0J227M8R : Less than 200% of initial limit TCFGB1A107M8R : Less than 200% of initial limit TCFGB1C336M8R : 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±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 "External 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.	

●Standard list, TCFG series B Cases

(B : 3528)

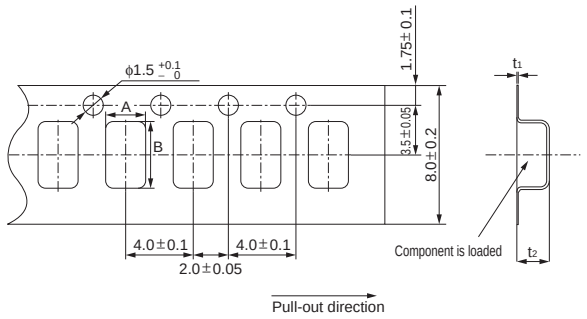
Part No.	Rated Voltage @85°C (V)	Derated Voltage @125°C (V)	Surge Voltage @85°C (V)	Capacitance 120Hz (µF)	Tolerance (%)	Leakage current 25°C 1WV.60s (µA)	DF 120Hz (%)			Impedance 100kHz	Case code
							−55°C	25°C 85°C	125°C	(Ω)	
TCFG B 0E 227 M8R	2.5	1.6	3.2	220	±20	5.5	34	18	22	1.5	B
TCFG B 0G 156 M8R	4	2.5	5	15	±20	0.6	12	8	10	3.0	B
TCFG B 0G 226 M8R	4	2.5	5	22	±20	0.9	12	8	10	3.0	B
TCFG B 0G 336 M8R	4	2.5	5	33	±20	1.3	12	8	10	2.5	B
TCFG B 0G 476 M8R	4	2.5	5	47	±20	1.9	14	10	12	2.0	B
TCFG B 0G 686 M8R	4	2.5	5	68	±20	2.7	14	10	12	1.9	B
TCFG B 0G 107 M8R	4	2.5	5	100	±20	4.0	30	12	16	1.6	B
TCFG B 0G 157 M8R	4	2.5	5	150	±20	6.3	34	18	22	1.3	B
TCFG B 0G 227 M8R	4	2.5	5	220	±20	8.8	40	20	30	1.3	B
TCFG B 0J 106 M8R	6.3	4	8	10	±20	0.6	12	8	10	3.0	B
TCFG B 0J 156 M8R	6.3	4	8	15	±20	0.9	12	8	10	3.0	B
TCFG B 0J 226 M8R	6.3	4	8	22	±20	1.4	12	8	10	2.5	B
TCFG B 0J 336 M8R	6.3	4	8	33	±20	2.1	12	8	10	2.0	B
TCFG B 0J 476 M8R	6.3	4	8	47	±20	3.0	14	10	12	1.9	B
TCFG B 0J 686 M8R	6.3	4	8	68	±20	4.3	30	12	16	1.6	B
TCFG B 0J 107 M8R	6.3	4	8	100	±20	6.3	30	12	16	1.5	B
TCFG B 0J 157 M8R	6.3	4	8	150	±20	9.5	34	18	22	1.5	B
TCFG B 0J 227 M8R	6.3	4	8	220	±20	70	60	30	45	1.3	B
TCFG B 1A 475 M8R	10	6.3	13	4.7	±20	0.5	10	6	8	3.0	B
TCFG B 1A 685 M8R	10	6.3	13	6.8	±20	0.7	12	8	10	3.0	B
TCFG B 1A 106 M8R	10	6.3	13	10	±20	1.0	12	8	10	3.0	B
TCFG B 1A 156 M8R	10	6.3	13	15	±20	1.5	12	8	10	2.5	B
TCFG B 1A 226 M8R	10	6.3	13	22	±20	2.2	12	8	10	2.0	B
TCFG B 1A 336 M8R	10	6.3	13	33	±20	3.3	14	10	12	1.9	B
TCFG B 1A 476 M8R	10	6.3	13	47	±20	4.7	14	10	12	1.6	B
TCFG B 1A 686 M8R	10	6.3	13	68	±20	6.8	22	12	14	1.5	B
TCFG B 1A 107 M8R	10	6.3	13	100	±20	20	40	20	30	1.5	B
TCFG B 1C 335 M8R	16	10	20	3.3	±20	0.5	10	6	8	4.2	B
TCFG B 1C 475 M8R	16	10	20	4.7	±20	0.8	10	6	8	3.0	B
TCFG B 1C 685 M8R	16	10	20	6.8	±20	1.1	10	6	8	3.0	B
TCFG B 1C 106 M8R	16	10	20	10	±20	1.6	10	6	8	2.5	B
TCFG B 1C 156 M8R	16	10	20	15	±20	2.4	10	6	8	2.0	B
TCFG B 1C 226 M8R	16	10	20	22	±20	3.5	10	6	8	1.9	B
TCFG B 1C 336 M8R	16	10	20	33	±20	5.3	16	14	16	1.9	B
TCFG B 1D 335 M8R	20	13	26	3.3	±20	0.66	10	6	8	4.2	B
TCFG B 1E 335 M8R	25	16	32	3.3	±20	0.83	10	6	8	4.2	B
TCFG B 1E 475 M8R	25	16	32	4.7	±20	1.2	10	6	8	3.0	B

●Packaging specifications

Case code	A±0.1	B±0.1	t_1±0.05	t_2±0.1
B (3528)	3.3	3.8	0.25	2.2

Taping

B case

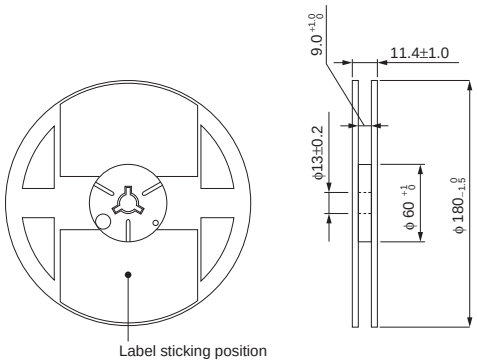


●Packaging style

Case code	Packaging	Packaging style		Symbol	Basic ordering unit
B Case	Taping	Plastic taping	ϕ180mm reel	R	2,000

Reel

Plastic reel



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