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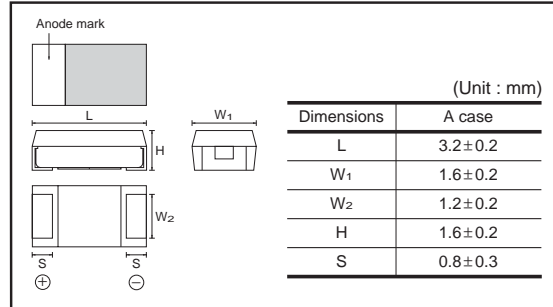
# Chip tantalum capacitors

## TCO Series A Case

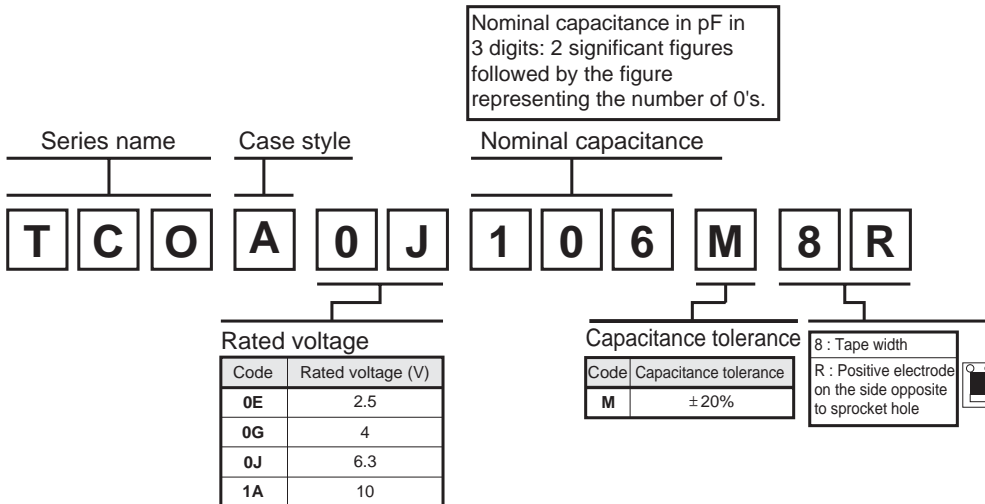
### ●Features (A)

- 1) Conductive polymer used for the cathode material.
- 2) Ultra-low ESR.  
(1/10 compared with the conventional type)
- 3) Screening by thermal shock.

### ●Dimensions (Unit : mm)



### ●Part No. Explanation



### ●Rated Table. Marking

#### TCO Series A Case

	μF	Rated voltage (V.DC)			
		2.5 0E	4 0G	6.3 0J	10 1A
A	1.0				
E	1.5				
J	2.2				
N	3.3				A
S	4.7			A	A
W	6.8		A	A	A
a	10	A	A	A	A
e	15	A	A	A	
j	22	A	A	A	
n	33	A	A		
s	47	A	A		
w	68	* A			

\* Under development

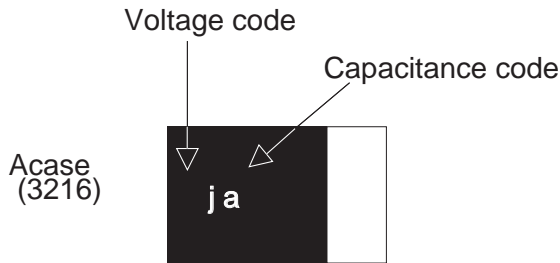
● Marking

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

Voltage Code	Rated DC Voltage (V)
e	2.5
g	4
j	6.3
A	10

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
n	33
s	47



● 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 5.2 8 13	at 85°C	
DC Leakage current	3μA or 0.1CV whichever is greater Shown in " Standard list "	Rated voltage for 5min	
Capacitance tolerance	±20% Shall be satisfied allowance range.	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 "	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 "	Measuring frequency : 100±10kHz Measuring voltage : 0.5Vrms or less	
Resistance to Soldering heat	Appearance	Dip in the solder bath Solder temp : 240±5°C Duration : 10±0.5s Repetition : 1 After the specimens, leave it at room temperature for over 24h and then measure the sample.	
	L.C.		Less than 300% of initial limit
	ΔC / C		Within±20% of initial value
	tan δ		Less than 300% of initial limit

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)															
Temperature cycle	Appearance	There should be no significant abnormality.	Repetition : 5 cycles (1 cycle : steps 1 to 4) without discontinuation. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th></th> <th>Temp.</th> <th>Time</th> </tr> </thead> <tbody> <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>105±2°C</td> <td>30±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±3°C	30±3min	2	Room temp.	3min.or less	3	105±2°C	30±3min	4	Room temp.	3min.or less
		Temp.		Time														
	1	-55±3°C		30±3min														
	2	Room temp.		3min.or less														
3	105±2°C	30±3min																
4	Room temp.	3min.or less																
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	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±24h leave it at room temperature for over 24h and then measure the sample.															
	L.C	Less than 300% of initial limit																
	ΔC / C	+30% / -20%																
	Df (tan δ)	Less than 300% of initial limit																
Temperature Stability	Temp.	-55°C																
	ΔC / C	Within 0/-20% of initial value																
	Df (tan δ)	Shall be satisfied the voltage on " Standard list "																
	L.C	-																
	Temp.	+105°C																
	ΔC / C	Within +50/0% of initial value																
	Df (tan δ)	Shall be satisfied the voltage on " Standard list "																
	L.C	Less than 1CV																
Surge voltage	Appearance	There should be no significant abnormality.	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 limit																
	ΔC / C	Within±20% of initial value																
	Df (tan δ)	Less than 200% of initial limit																

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Loading at High temperature	Appearance	There should be nonsignificant abnormality.	After applying the rated voltage for 1000 <sup>+72</sup> 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 over 24h and measure the value.
	L.C	Less than 400% of initial limit	
	ΔC / C	Within ± 20% of initial value	
	Df (tan δ)	300% of initial limit less than	
Terminal strength	Capacitance	The measured value should be stable.	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 nonsignificant abnormality.	
		<p>(Unit : mm) F (Apply force) thickness=1.6mm 45 45</p>	
Adhesiveness		The terminal should not come off.	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>product C105 VMA Apply force a circuit board</p>	
Dimensions		Refer to "External dimensions"	Measure using a caliper of JISB 7507 Class 2 or higher grade.
Resistance to solvents		The indication should be clear	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.	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 : Rosin25% IPA75%
Vibration	Capacitance	Measure value should not fluctuate during the measurement.	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 no significant abnormality.	

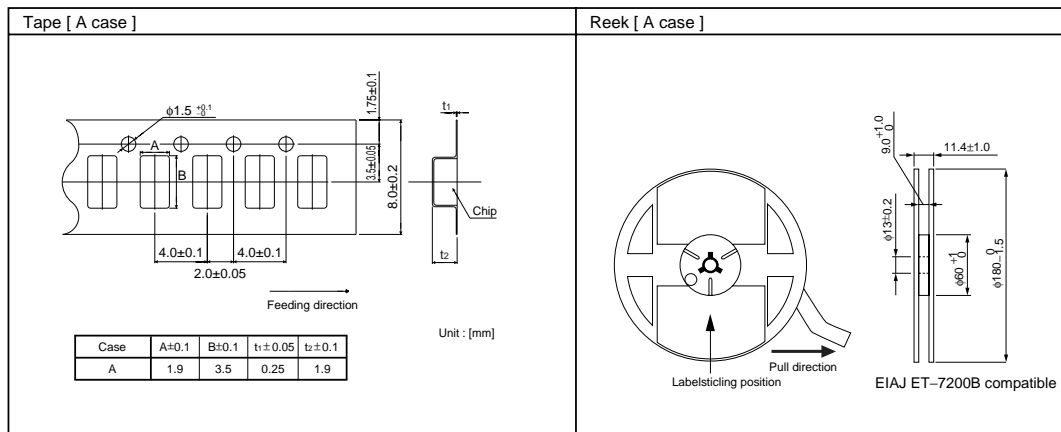
●Standard list, TCO series

< A case : 3216 size >

Part No.	Rated Voltage 85°C (V)	Category Voltage 105°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	
TCO A 0E 106 □	2.5	2.0	3.2	10	±20	3.0	6	6	9	200
TCO A 0E 156 □				15		3.8				
TCO A 0E 226 □				22		5.5				
TCO A 0E 336 □				33		8.3				
TCO A 0E 476 □				47		11.7				
TCO A 0G 685 □	4	3.2	5.2	6.8	±20	3.0	6	6	9	300
TCO A 0G 106 □				10		4.0				
TCO A 0G 156 □				15		6.0				
TCO A 0G 226 □				22		8.8				
TCO A 0G 336 □				33		13.2				
TCO A 0G 476 □	47	18.8								
TCO A 0J 475 □	6.3	5	8	4.7	±20	3.0	6	6	9	300
TCO A 0J 685 □				6.8		4.3				
TCO A 0J 106 □				10		6.3				
TCO A 0J 156 □				15		9.5				
TCO A 0J 226 □				22		13.9				
TCO A 1A 335 □	10	8	13	3.3	±20	3.3	6	6	9	300
TCO A 1A 475 □				4.7		4.7				
TCO A 1A 685 □				6.8		6.8				
TCO A 1A 106 □				10		10.0				

□=Tolerance(M : ±20%)

●Packaging specifications

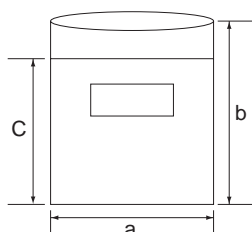


●Packaging style

Case code	package	Packaging style		Symbol	Basic ordering units
A	Taping	plastic taping	φ180mmReel	R	2,000pcs

●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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