



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

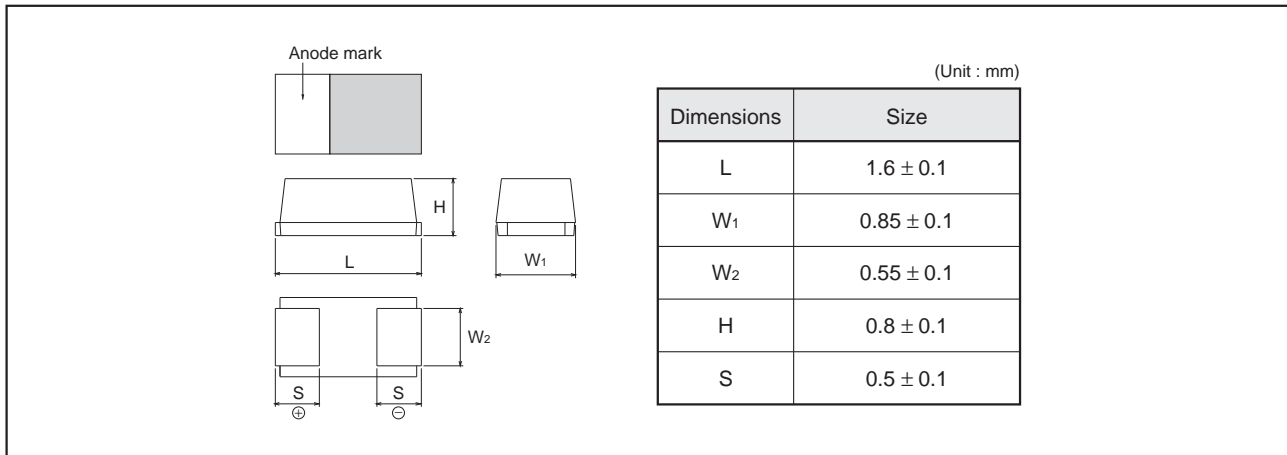
TCTO Series M Case

Datasheet

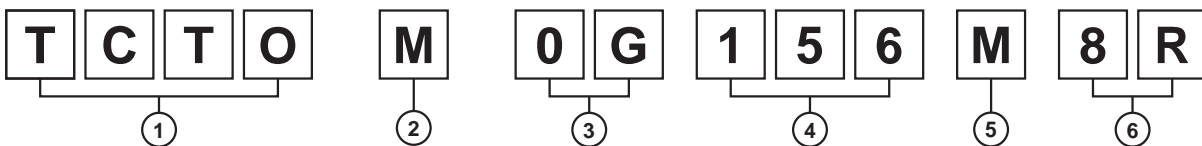
●Features

- 1) Conductive polymer used at the cathode for ultra-low ESR.
- 2) Bottom electrode configuration results in the largest capacitance.
- 3) Compact, low profile, ultra-high capacitance contribute to smaller, thinner sets with greater functionality.
- 4) Conductive polymer has a self-healing function that prevents failure, resulting in safe, high reliability operation.

●Dimensions



●Part No. Explanation



① Series name
TCTO

② Case style
M : 1608-09 (0603) size

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)

Capacitance (μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
2.2 (225)				500
3.3 (335)				500
4.7 (475)				500
6.8 (685)			☆500	
10 (106)		☆500	☆500	
15 (156)	☆500	☆500		
22 (226)	☆500			

☆ 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 : A capacitance code is shown as below table.

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

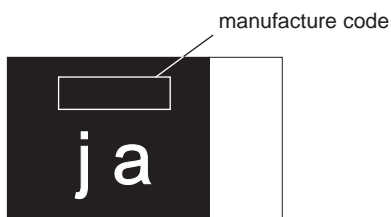
Capacitance Code	Nominal Capacitance (μF)
J	2.2
N	3.3
S	4.7
W	6.8
a	10
j	22

Visual typical example
voltage code and capacitance code are variable with parts number.

[M case]

EX.) $\frac{j}{(1)} \frac{a}{(2)}$

(1) voltage code (2) capacitance code



●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 (V.DC)		2.5 4 6.3 10	at 85°C															
Category voltage (V.DC)		2 3.2 5 8	at 105°C															
Surge voltage (V.DC)		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 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																
	Df (tan δ)	Less than 300% of initial limit																
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																
		<table border="1"> <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>			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																
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 40±2°C and 90 to 95% RH, respectively, for 500±12h leave it at room temperature for 24h and then measure the sample.															
	L.C.	Less than 300% of initial limit																
	ΔC / C	Within +30/-20% of initial value																
	Df (tan δ)	Less than 300% of initial limit																

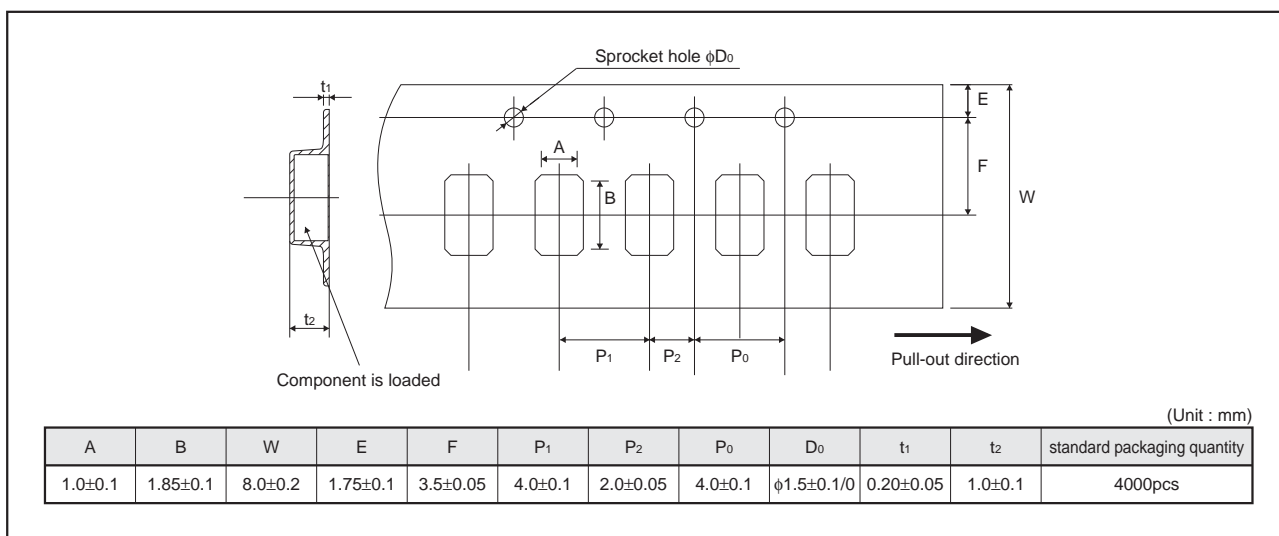
Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Temperature Stability	Temp.	-55°C	As per 4.29 JIS C 5101-1 As per 4.13 JIS C 5101-3
	$\Delta C / C$	Within 0/-20% of initial value	
	Df (tan δ)	Shall be satisfied the voltage on " Standard list "	
	L.C.	-	
	Temp.	+105°C	
	$\Delta C / C$	Within +50/0% of initial value	
	Df (tan δ)	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 δ)	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+72/0 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 δ)	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>
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.	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 products list

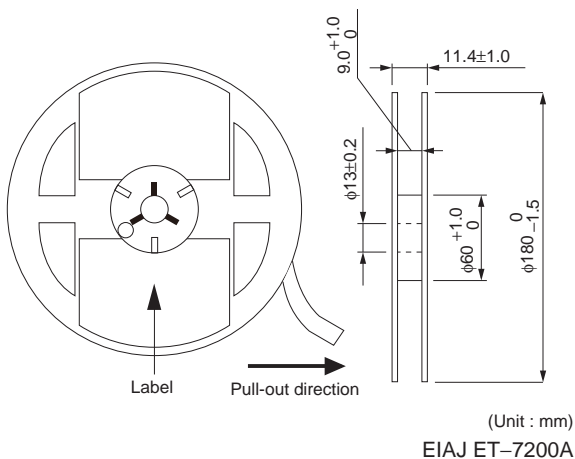
Part No.	Rated voltage 85°C (V)	Category voltage 125°C (V)	Surge voltage 85°C (V)	Cap. 120Hz (μF)	Tolerance (%)	Leakage current 25°C 1WV.5min (μA)	Df 120Hz (%)			ESR 100kHz (mΩ)
							-55°C	25°C 85°C	105°C	
* TCTO M 0E 156 M8R	2.5	2	3.2	15	± 20	3.8	8	8	12	500
* TCTO M 0E 226 M8R	2.5	2	3.2	22	± 20	5.5	8	8	12	500
* TCTO M 0G 106 M8R	4	3.2	5	10	± 20	4.0	8	8	12	500
* TCTO M 0G 156 M8R	4	3.2	5	15	± 20	6.0	8	8	12	500
* TCTO M 0J 685 M8R	6.3	5	8	6.8	± 20	4.3	6	6	9	500
* TCTO M 0J 106 M8R	6.3	5	8	10	± 20	6.3	8	8	12	500
TCTO M 1A 225 M8R	10	8	13	2.2	± 20	2.2	6	6	9	500
TCTO M 1A 335 M8R	10	8	13	3.3	± 20	3.3	6	6	9	500
TCTO M 1A 475 M8R	10	8	13	4.7	± 20	4.7	6	6	9	500

* = Under development

●Packaging specifications

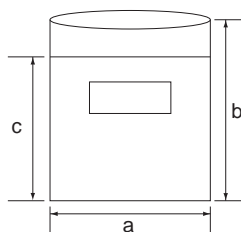


●Reel dimensions



●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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