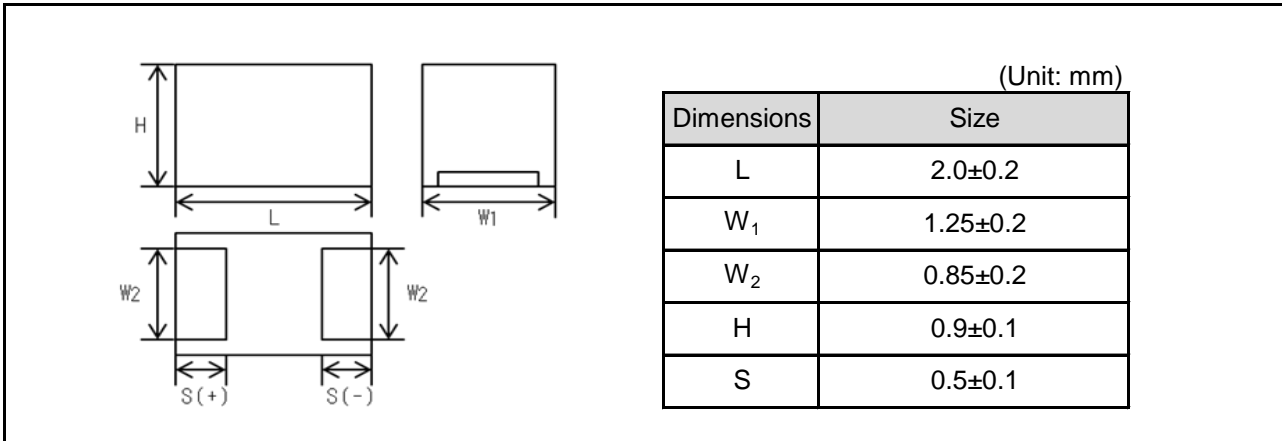


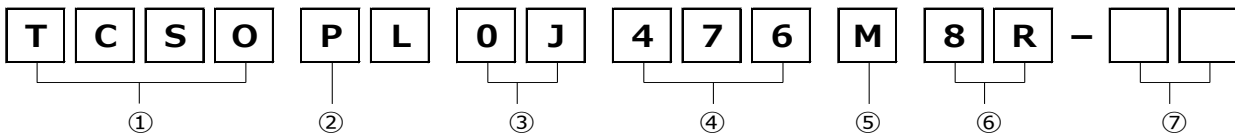
● Features

- 1) Conductive polymer used at the cathode for ultra-low ESR.
- 2) New package structure results in the largest capacitance.
- 3) Compact, low profile, ultra-high capacitance contributes 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  
TCSO

② Case style  
PL : 2012-2012(10)size

③ Rated voltage

CODE	Rated voltage(V)
0E	2.5
0G	4
0J	6.3
1A	10
1C	16
1D	20
1E	25
1V	35
1H	50

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

⑦ Discrimination code

● Rated table

Capacitance (μF)	Rated voltage (V.DC)								ESR(mΩ)
	2.5	4	6.3	10	16	20	25	35	
1 (105)									
1.5 (155)									
2.2 (225)									☆500
3.3 (335)									
4.7 (475)								☆300/500	
6.8 (685)									
10 (106)					150				
15 (156)									
22 (226)				200					
33 (336)									
47 (476)			150						
68 (686)			☆150/☆200						
100 (107)									

☆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
k	8
A	10
C	16
D	20
E	25
V	35
H	50

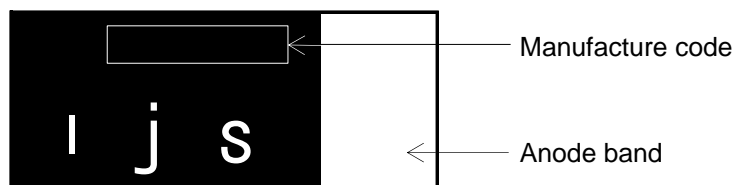
Capacitance Code	Nominal Capacitance (μF)	Capacitance Code	Nominal Capacitance (μF)
<u>E</u>	0.15	e	15
<u>N</u>	0.33	j	22
<u>S</u>	0.47	n	33
A	1.0	s	47
E	1.5	<u>w</u>	68
J	2.2	<u>a</u>	100
N	3.3	<u>e</u>	150
S	4.7	<u>j</u>	220
W	6.8	<u>n</u>	330
a	10	<u>s</u>	470

Visual typical example

voltage code and capacitance code are variable with parts number.

[TCSO series PL case]

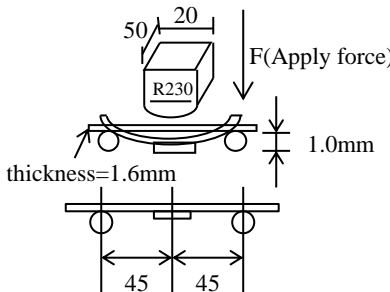
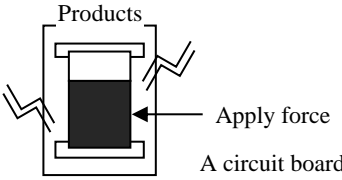
EX.)  $\frac{j}{(1)}$   $\frac{s}{(2)}$   
 (1) voltage code  
 (2) capacitance code



## ● Characteristics

Item	Performance		Test conditions (based on JIS C 5101-1 and JIS C 5101-3)															
Operating Temperature	-55°C~+105°C		Voltage reduction when temperature exceeds +85°C															
Maximum operating temperature with no voltage derating	+85°C																	
Rated voltage (V.DC)	Refer to " Standard list ".		at 85°C															
Category voltage (V.DC)	Refer to " Standard list ".		at 105°C															
Surge voltage (V.DC)	Refer to " Standard list ".		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,tanδ)	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															
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.	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 (tanδ)	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. <table border="1" data-bbox="922 1758 1391 1937"> <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. Initial value for ΔC/C shall be the value after mounted.		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 (tanδ)	Less than 300% of initial limit.																	

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
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+12/0h leave it at room temperature for over 24h and then measure the sample. Initial value for $\Delta C/C$ shall be the value after mounted.
	L.C.	Less than 300% of initial limit.	
	$\Delta C/C$	Within +30/-20% of initial value.	
	DF (tan $\delta$ )	Less than 300% of initial limit.	
Temperature Stability	Temp. : -55°C		As per 4.29 JIS C 5101-1 As per 4.13 JIS C 5101-3 Initial value for $\Delta C/C$ shall be the value after mounted.
	$\Delta C/C$	Within 0/-20% of initial value.	
	DF (tan $\delta$ )	Shall be satisfied the value on " Standard list "	
	L.C.	—	
	Temp. : +105°C		
	$\Delta C/C$	Within +50/0% of initial value.	
	DF (tan $\delta$ )	Shall be satisfied the value on " Standard list "	
	L.C.	Less than 1000% 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 1k $\Omega$ ever 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. Initial value for $\Delta C/C$ shall be the value after mounted.
	L.C.	Less than 200% of initial limit.	
	$\Delta C/C$	Within ±20% of initial value.	
	DF (tan $\delta$ )	Less than 200% 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 1000+72/0 h without discontinuation via the serial resistance of 3 $\Omega$ or less at a temperature of 85±2°C, leave the sample at room temperature / humidity for over 24h and measure the value. Initial value for $\Delta C/C$ shall be the value after mounted.
	L.C.	Less than 400% of initial limit.	
	$\Delta C/C$	Within ±20% of initial value.	
	DF (tan $\delta$ )	Less than 300% of initial limit.	

Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
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
	Appearance	There should be no significant abnormality.	A force is applied to the terminal until it bends to 1mm and by a prescribed tool maintains the condition for 5s.  
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 2N 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 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.
	Appearance	There should be no significant abnormality.	Amplitude : 1.5mm Time : 2h each in X and Y directions Mounting : The terminal is soldered on a print circuit board.

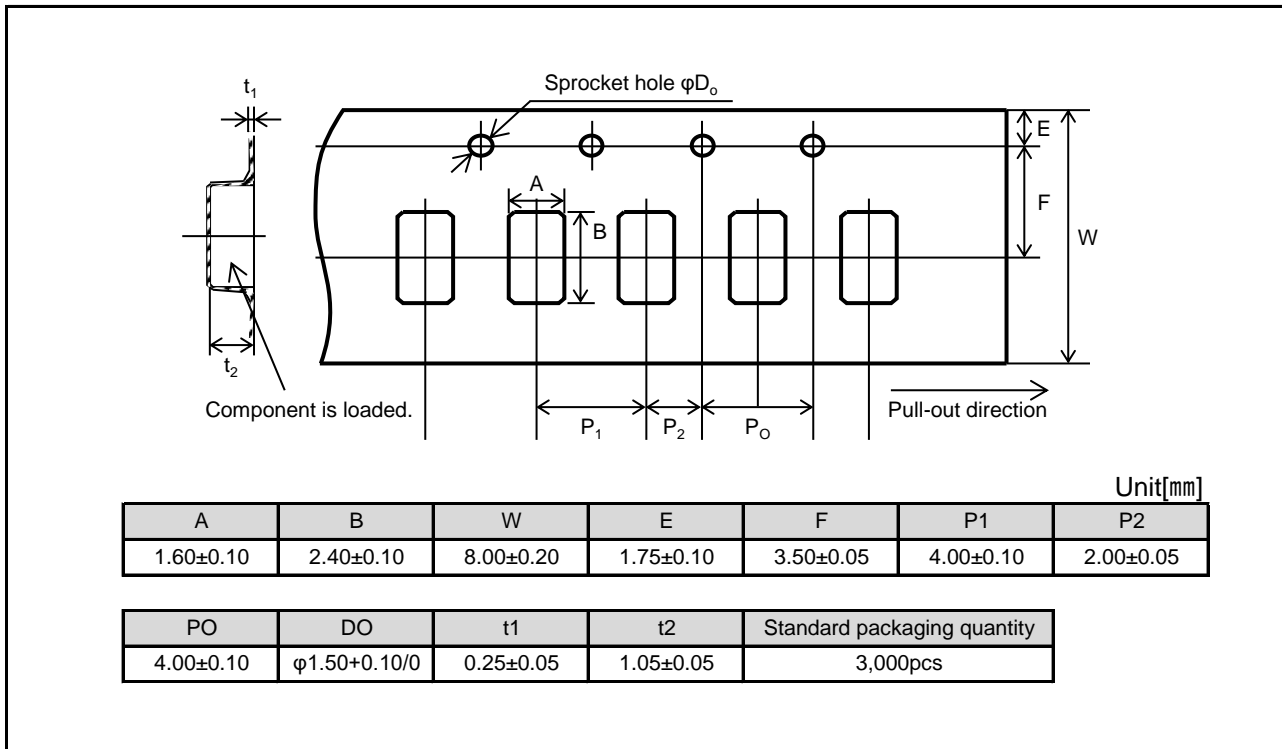
## ● Standard products list

Part No.	Rated voltage	Category voltage	Surge voltage	Cap.	Tolerance	Leakage current	tanδ			ESR	Max allowable ripple current
	85°C	105°C	85°C	120Hz		25°C 1WV 5min	-55°C	25°C	105°C		
	(V)	(V)	(V)	(μF)	(%)	(μA)	(%)	(%)	(%)	(mΩ)	(mArms)
TCSOPL0J476M8R-ZF1	6.3	5	8	47	±20	29.7	15	15	20	150	516
* TCSOPL0J686M8R-ZF1	6.3	5	8	68	±20	129.0	15	15	20	150	516
* TCSOPL0J686M8R-ZD1	6.3	5	8	68	±20	129.0	15	15	20	200	447
TCSOPL1A226M8R	10	8	13	22	±20	22.0	15	15	20	200	447
TCSOPL1C106M8R-ZF1	16	12.8	20	10	±20	48.0	10	10	15	150	516
* TCSOPL1E475M8R-ZM1	25	20	29	4.7	±20	11.8	10	10	15	300	365
TCSOPL1E475M8R-ZT1	25	20	29	4.7	±20	11.8	10	10	15	500	283
* TCSOPL1V225M8R-ZT1	35	25	40	2.2	±20	23.1	10	10	15	500	283

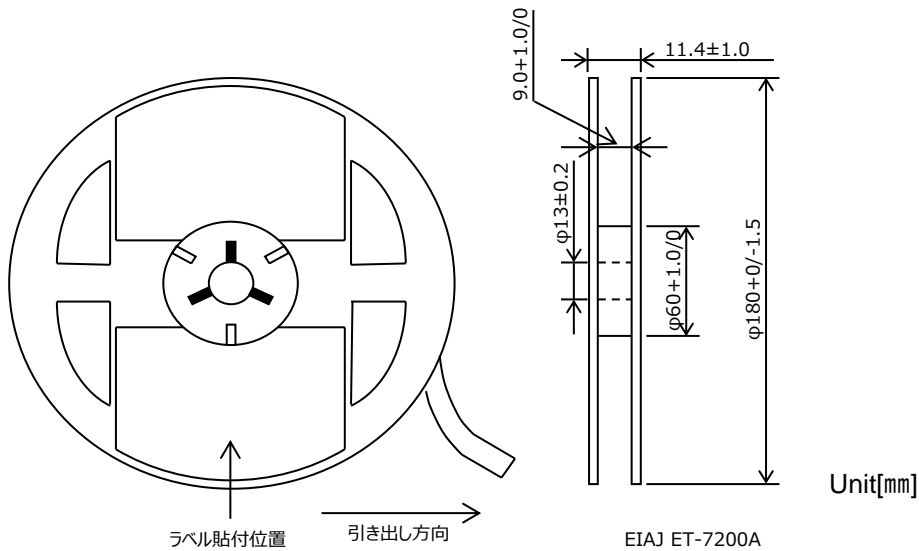
\* This specification has possibility of charge, due to underdevelopment product.

Please ask for latest specification to our sales.

●Packaging specifications

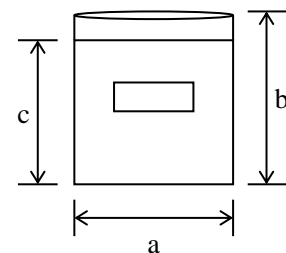


●Reel dimensions



●Damp proof package

- ①One 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.
- ②A desiccant is packed with a reel.
- ③The aluminum bag is heat-sealed.
- ④The label of the same as the label on the reel is placed on the aluminum bag.



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