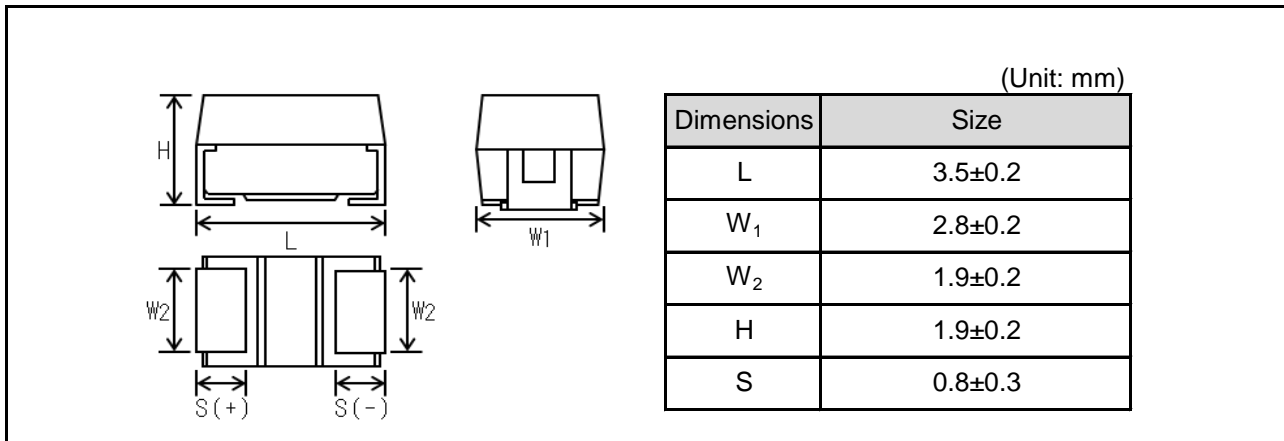


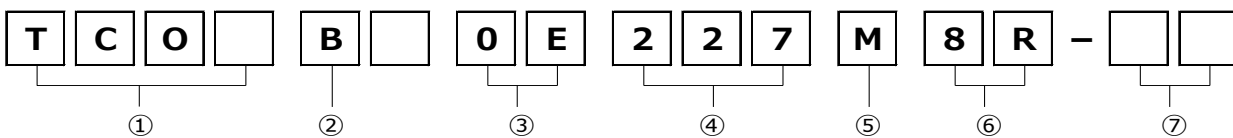
### ● Features

- 1) Conductive polymer used at the cathode for ultra-low ESR.
- 2) Conductive polymer has a self-healing function that prevents failure, resulting in safe, high reliability operating.
- 3) Screening by thermal shock.

### ● Dimensions



### ● Part No. Explanation



① Series name  
TCO

② Case style  
B : 3528-3528(21)size

③ Rated voltage

CODE	Rated voltage(V)
0E	2.5
0G	4
0J	6.3
1A	10
1B	13
1C	16
1D	20
1E	25
1V	35

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 ( $\mu\text{F}$ )	Rated voltage (V.DC)								ESR(m $\Omega$ )
	2.5	4	6.3	10	16	20	25	35	
4.7 (475)									
6.8 (685)									
10 (106)									☆150
15 (156)							100		
22 (226)							90		
33 (336)				150	☆70/100				
47 (476)				150					
68 (686)									
100 (107)			35/45						
150 (157)			35/45						
220 (227)	35		35/45						
330 (337)	☆25/ 35/45								
470 (477)									

☆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 ( $\mu\text{F}$ )	Capacitance Code	Nominal Capacitance ( $\mu\text{F}$ )
<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

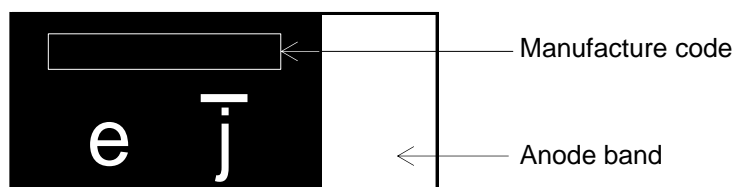
Visual typical example

voltage code and capacitance code are variable with parts number.

[TCO series B case]

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

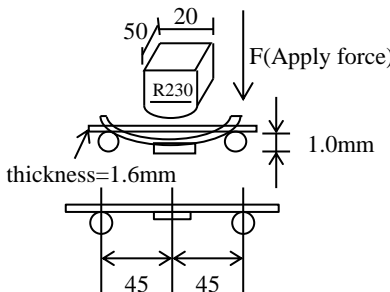
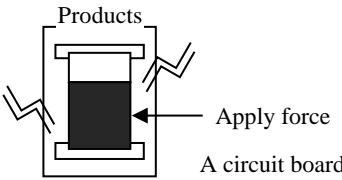
(1) voltage code  
(2) capacitance code



## ● Characteristics

Item	Performance		Test conditions (based on JIS C 5101-1 and JIS C 5101-3)															
Operating Temperature	-55°C~+105°C																	
Maximum operating temperature with no voltage derating	+105°C																	
Rated voltage (V.DC)	Refer to " Standard list ".		at 105°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 150% of initial limit.																
	ΔC/C	Within ±20% of initial value.																
	DF (tanδ)	Less than 150% 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 500% of initial limit.																	
ΔC/C	Within ±20% of initial value.																	
DF (tanδ)	Less than 150% 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 $60\pm 2^{\circ}\text{C}$ and 90~95%(Relative Humidity) , 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 150% of initial limit.	
	$\Delta C/C$	Within +30/-20% of initial value.	
	DF (tan $\delta$ )	Less than 150% of initial limit.	
Temperature Stability	Temp. : $-55^{\circ}\text{C}$		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. : $+105^{\circ}\text{C}$		
	$\Delta C/C$	Within +80/0% 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 $5\pm 0.5$ min. for $30\pm 5$ s. each time in the atmospheric condition of $85\pm 2^{\circ}\text{C}$ . 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 initial limit.	
	$\Delta C/C$	Within $\pm 20\%$ of initial value.	
	DF (tan $\delta$ )	Less than 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 $105\pm 2^{\circ}\text{C}$ , 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 200% of initial limit.	
	$\Delta C/C$	Within $\pm 20\%$ of initial value.	
	DF (tan $\delta$ )	Less than 150% of initial limit.	

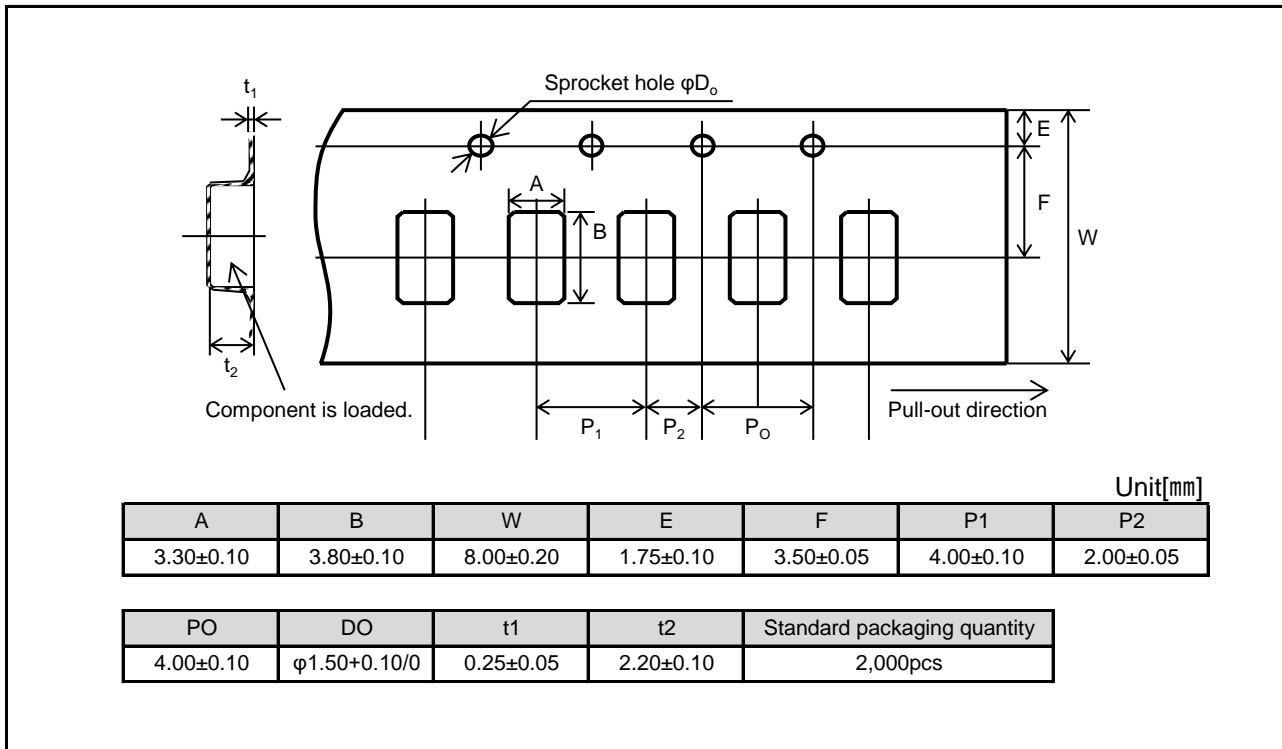
Item		Performance	Test conditions (based on JIS C 5101-1 and JIS C 5101-3)
Terminal strength	Capacitance	The measured value should be stable.	As per 4.35 JIS C 5101-1 As per 4.9 JIS C 5101-3
	Appearance	There should be no significant abnormality.	A force is applied to the terminal until it bends to 1mm and by a prescribed tool maintains the  
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

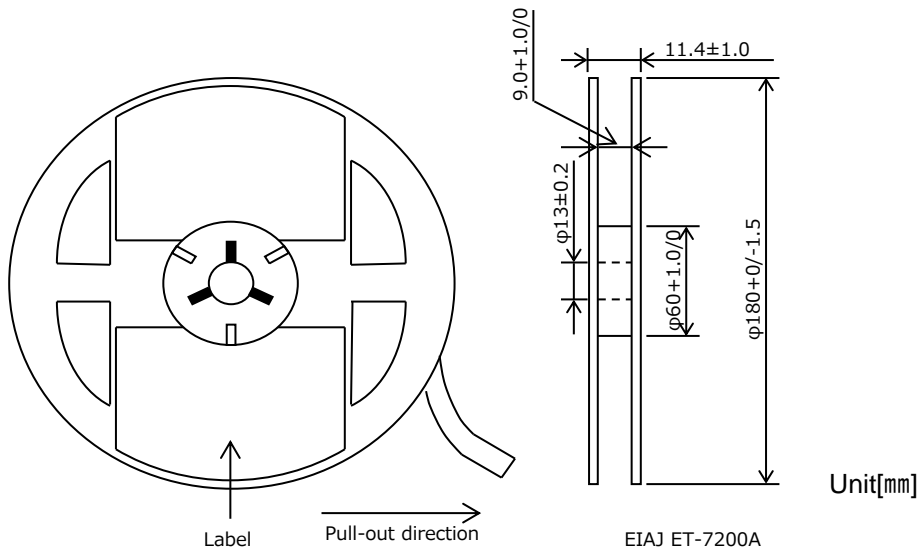
Part No.	Rated voltage 105°C	Category voltage 105°C	Surge voltage 85°C	Cap. 120Hz	Tolerance	Leakage current 25°C 1WV 5min	tanδ 120Hz			ESR 100kHz (mΩ)	Max allowable ripple current ≤45°C 100kHz (mArms)
	(V)	(V)	(V)	(μF)	(%)	(μA)	-55°C	25°C	105°C		
TCOB0E227M8R-EN1	2.5	2.5	3.2	220	±20	55.0	8	8	12	35	1,900
* TCOB0E337M8R-EK1	2.5	2.5	3.2	330	±20	82.5	30	15	20	25	2,300
TCOB0E337M8R-EN2	2.5	2.5	3.2	330	±20	82.5	30	15	20	35	1,900
TCOB0E337M8R-ES2	2.5	2.5	3.2	330	±20	82.5	30	15	20	45	1,700
TCOB0J107M8R-EN1	6.3	6.3	8	100	±20	63.0	8	8	12	35	1,900
TCOB0J107M8R-ES1	6.3	6.3	8	100	±20	63.0	8	8	12	45	1,700
TCOB0J157M8R-EN1	6.3	6.3	8	150	±20	94.5	30	15	20	35	1,900
TCOB0J157M8R-ES2	6.3	6.3	8	150	±20	94.5	30	15	20	45	1,700
TCOB0J227M8R-EN1	6.3	6.3	8	220	±20	139.0	30	15	20	35	1,900
TCOB0J227M8R-ES1	6.3	6.3	8	220	±20	139.0	30	15	20	45	1,700
TCOB1A336M8R	10	10	13	33	±20	33.0	8	8	12	150	900
TCOB1A476M8R	10	10	13	47	±20	47.0	8	8	12	150	900
* TCOB1C336M8R-EW1	16	16	20	33	±20	159.0	10	10	15	70	1,300
TCOB1C336M8R	16	16	20	33	±20	159.0	10	10	15	100	1,100
TCOB1E156M8R	25	25	29	15	±20	113.0	10	10	20	100	1,100
TCOB1E226M8R-EB1	25	25	29	22	±20	55.0	10	10	20	90	1,200
* TCOB1V106M8R-EF1	35	35	40	10	±20	105.0	10	10	20	150	900

\* This specification has possibility of change, due to underdevelopment product.  
Please ask for latest specification to our sales.

●Packaging specifications

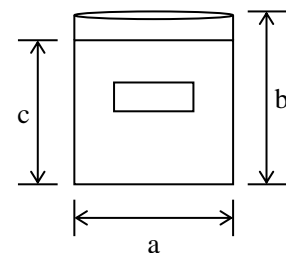


●Reel dimensions



●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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