

TANTALUM CAPACITORS

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TCML Series

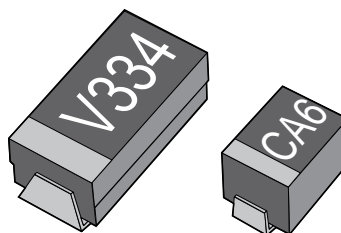
DESCRIPTION

Miniaturization of electronic devices (communication devices, audio devices, and AV devices, etc.) has more and more accelerated in recent years. The ultraminiature-size model (2012) meets the customers' needs for high-density packaging, taking full advantage of our technologies for miniaturization and capacity-increase in tantalum capacitor production.

FEATURES

- Compact packaging in the volume reduced to one third (P case : 2012) of conventional size (A case : 3216) .
- A maximum height of 1.2 mm allows designing a flat device.
- Capacitance ranges from 0.22 μ F to 10 μ F, and rated voltage ranges from 4 V to 16 V.

PACKAGES



TCML Series

■PRODUCT LINEUP

Model name	Rated voltage (V)	Rated capacitance (μF)	tanδ(%)	Leakage current (μA)	Case size
TA-4R0TCML1R0M-PR	4	1	8	0.50	P
TA-4R0TCML1R5M-PR	4	1.5	8	0.50	P
TA-4R0TCML2R2M-PR	4	2.2	8	0.50	P
TA-4R0TCML3R3M-PR	4	3.3	8	0.50	P
TA-4R0TCML4R7M-PR	4	4.7	8	0.50	P
TA-4R0TCML6R8M-PR	4	6.8	8	0.50	P
TA-4R0TCML100M-PR	4	10	8	0.50	P
TA-6R3TCMLR68M-PR	6.3	0.68	8	0.50	P
TA-6R3TCML1R0M-PR	6.3	1	8	0.50	P
TA-6R3TCML1R5M-PR	6.3	1.5	8	0.50	P
TA-6R3TCML2R2M-PR	6.3	2.2	8	0.50	P
TA-6R3TCML3R3M-PR	6.3	3.3	8	0.50	P
TA-6R3TCML4R7M-PR	6.3	4.7	8	0.50	P
TA-6R3TCML100M-PR	6.3	10	8	0.63	P
TA-010TCMLR47M-PR	10	0.47	8	0.50	P
TA-010TCMLR68M-PR	10	0.68	8	0.50	P
TA-010TCML1R0M-PR	10	1	8	0.50	P
TA-010TCML1R5M-PR	10	1.5	8	0.50	P
TA-010TCML2R2M-PR	10	2.2	8	0.50	P
TA-016TCMLR22M-PR	16	0.22	8	0.50	P
TA-016TCMLR33M-PR	16	0.33	8	0.50	P
TA-016TCMLR47M-PR	16	0.47	8	0.50	P
TA-016TCMLR68M-PR	16	0.68	8	0.50	P
TA-016TCML1R0M-PR	16	1	8	0.50	P

PRINCIPAL CHARACTERISTICS

Parameter		Test method (JIS-C-5101-1, 3)	Value		Unit
			Min.	Max.	
Category temperature range		—	-55	+125	°C
Maximum temperature at rated voltage		—	—	+85	°C
Rated voltage range		120 Hz	4	16	V
Capacitance range			0.22	10	μF
Rated capacitance allowable error			-20	+20	%
Tangent of loss angle (tanδ)			—	8	%
Leakage current		Apply a rated voltage through 1000 Ω protection resistor connected in series, and measure leakage current in 5 min.	—	Either 0.01 CV or 0.5 μA, whichever is greater.	μA
Heat resistance against soldering	Appearance	After preheating in 150 °C Celsius for 2 min, expose to the heat under the following conditions : • Immerse in soldering bath at 260 °C ± 5 °C, for 10 s ± 1 s, or • Perform reflow soldering at 260 °C ± 5 °C, for 10 s ± 1 s.	No fault such as a crack is found on external package.		—
	Capacitance		Lower than initial value by 10.	Higher than initial value by 10.	%
	tanδ		—	150, less than rated initial value.	%
	Leakage current		—	Rated initial value	—
Quick change of temperature	Capacitance	Place under 5 cycles of temperature change between -55 °C and +125 °C.	Lower than initial value by 10.	Higher than initial value by 10.	%
	tanδ		—	150 of rated initial value.	%
	Leakage current		—	Rated initial value	—
High temperature and humidity (steady-state)	Capacitance	Place under a circumstance of 60 degrees Celsius, 90% to 95% RH for 500 h with no load. Measurement must be taken after placing under room temperature and humidity for 1 h to 2 h.	Lower than initial value by 20.	Higher than initial value by 20.	%
	tanδ		—	150 of rated initial value.	%
	Leakage current		—	Rated initial value	—

(Continued)

TCML Series

(Continued)

Parameter		Test method (JIS-C-5101-1, 3)	Value		Unit
			Min.	Max.	
Durability	Capacitance	Apply rated voltage at 85 °C, and apply specified derating voltage at 125 °C for 2000 h. Power supply impedance shall be 3 Ω or lower.	Lower than initial value by 20.	Higher than initial value by 20.	%
	tanδ		—	150 of rated initial value.	%
	Leakage current		—	125 of rated initial value.	%
Failure rate after soldering		After heat resistance test against soldering, perform durability test under 85 °C.	—	1% / 1000 h (60%CL)	—

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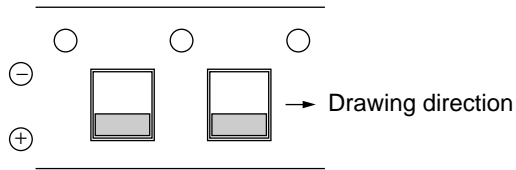
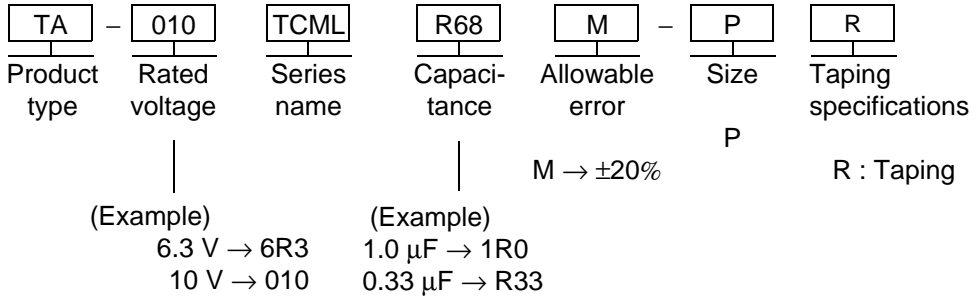
■ SERIES LIST

C (μF) \ WV	4 V (0 G)	6.3 V (0 J)	10 V (1 A)	16 V (1 C)
0.22				P
0.33				P
0.47			P	P
0.68		P	P	P
1.0	P	P	P	P
1.5	P	P	P	
2.2	P	P	P	
3.3	P	P		
4.7	P	P		
6.8	P			
10.0	P	P		
15.0				

TCML Series

■ PART NUMBER DESIGNATION

Indication example) P case, 10 V/0.68 μ F



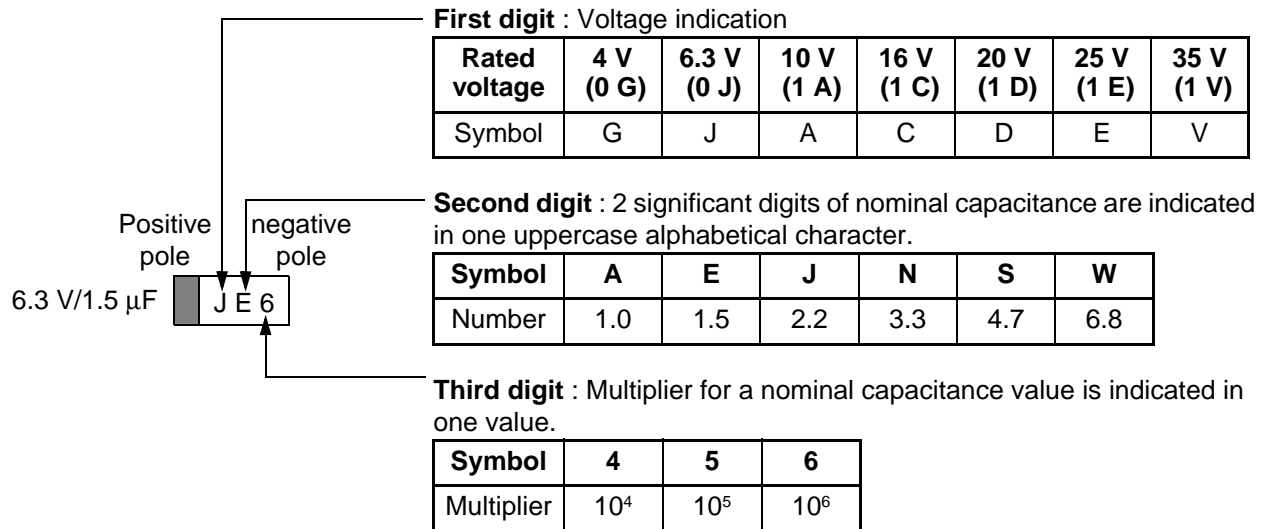
Specify "R" if a positive pole is on the right side against drawing direction. (A positive pole is on the other side of sending holes.)

MARKING AND POLARITY INDICATION

(Polarity of (+) is indicated by a stripe.)

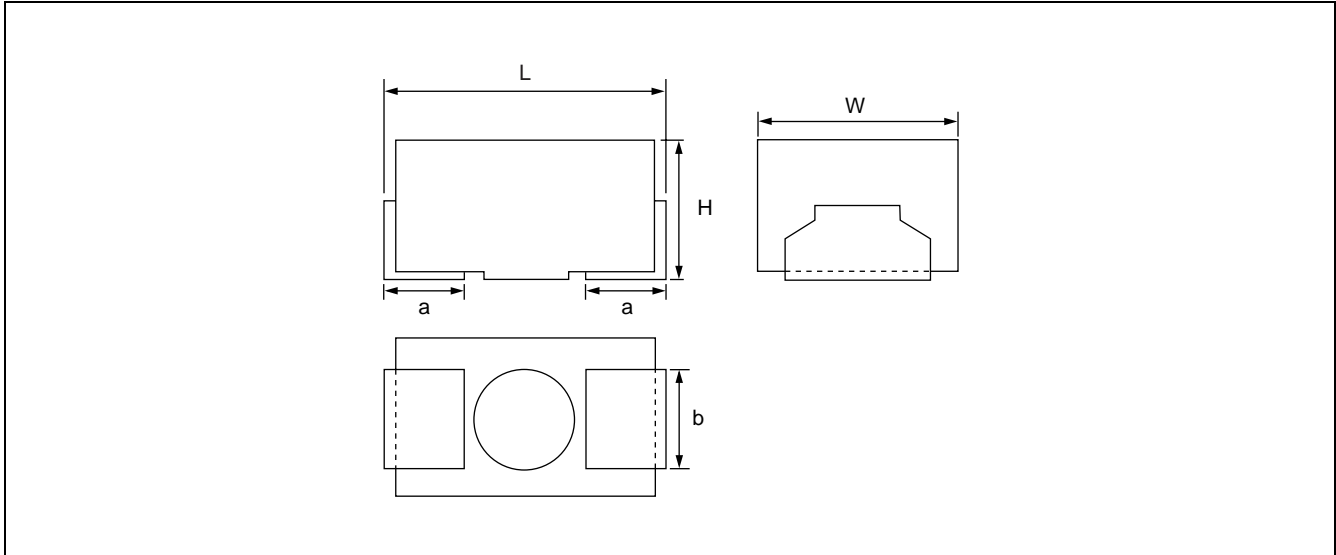
Rated voltage and capacitance (picofarad : pF) are indicated by symbols.

(Indication example)



TCML Series

PACKAGE DIMENSION



Unit : mm

	L	W	H	a	b
P	2.0 ± 0.2	1.25 ± 0.2	1.2 (Max.)	0.6 ± 0.2	0.9 ± 0.2

OTHER REQUIREMENTS

(1) Surge voltage and reduction voltage

(Rated voltage and reduction voltage by temperature)

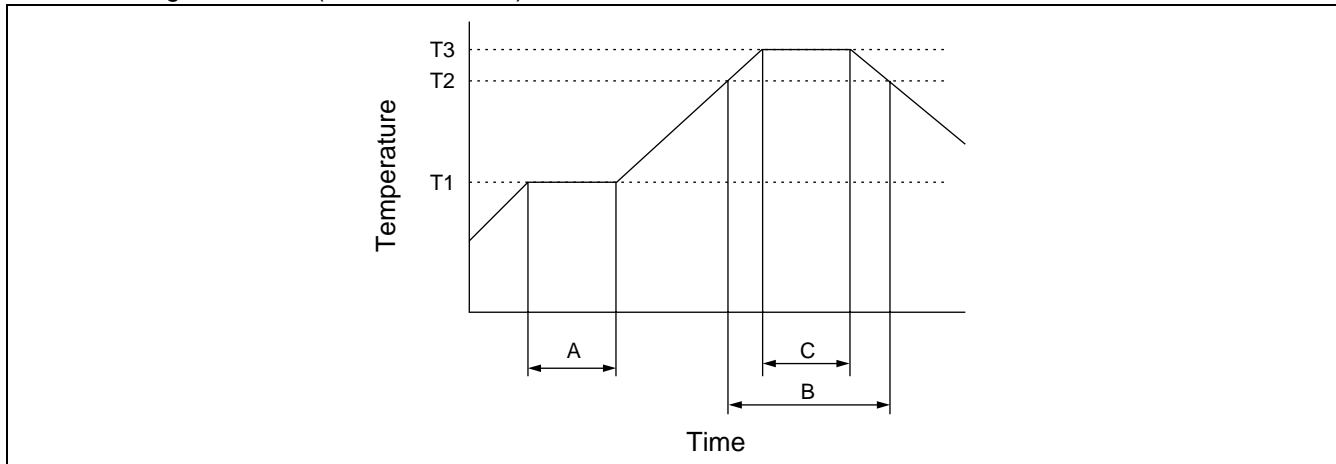
85 °C	Rated voltage	4 V	6.3 V	10 V	16 V
	Surge voltage	5 V	8 V	13 V	20 V
125 °C	Reduction voltage	2.5 V	4 V	6.3 V	10 V
	Surge voltage	3.2 V	5 V	8 V	13 V

(2) Storage conditions

20 °C \pm 15 °C, 65% \pm 20% RH, no longer than 2 years.

RECOMMENDED MOUNTING CONDITIONS

- Soldering conditions (reflow, flow, iron)



1. Reflow

- Reflow (peak) temperature
 - T1 : 150 °C to 160 °C
 - T2 : 210 °C
 - T3 : 230 °C (240 °C at maximum)
- Reflow time
 - A : 30 s to 120 s
 - B : 30 s to 40 s
 - C : 15 s to 25 s
- Number of times of reflow soldering processes
 - Twice or less.
- Flux
 - Use of rosin-type flux with low chlorine (0.2 wt% chlorine or less) is recommended.

2. Flow

- Flow temperature and time : 250 °C, 5 s
 - (preheating at 150 °C to 160 °C, for 15 s to 120 s is recommended)
- Number of flow soldering processes : 1
- Flux : Use of rosin-type flux with low chlorine (0.2 wt% chlorine or less) is recommended.

3. Iron soldering

- Soldering temperature, time : 350 °C, 3 s to 6 s
 - (with iron power of 30 W. Preheating : Preheating similar to flow soldering is recommended.)
- Number of iron soldering processes : 3 or less.
- Flux : Use of rosin-type flux with low chlorine (0.2 wt% chlorine or less) is recommended.

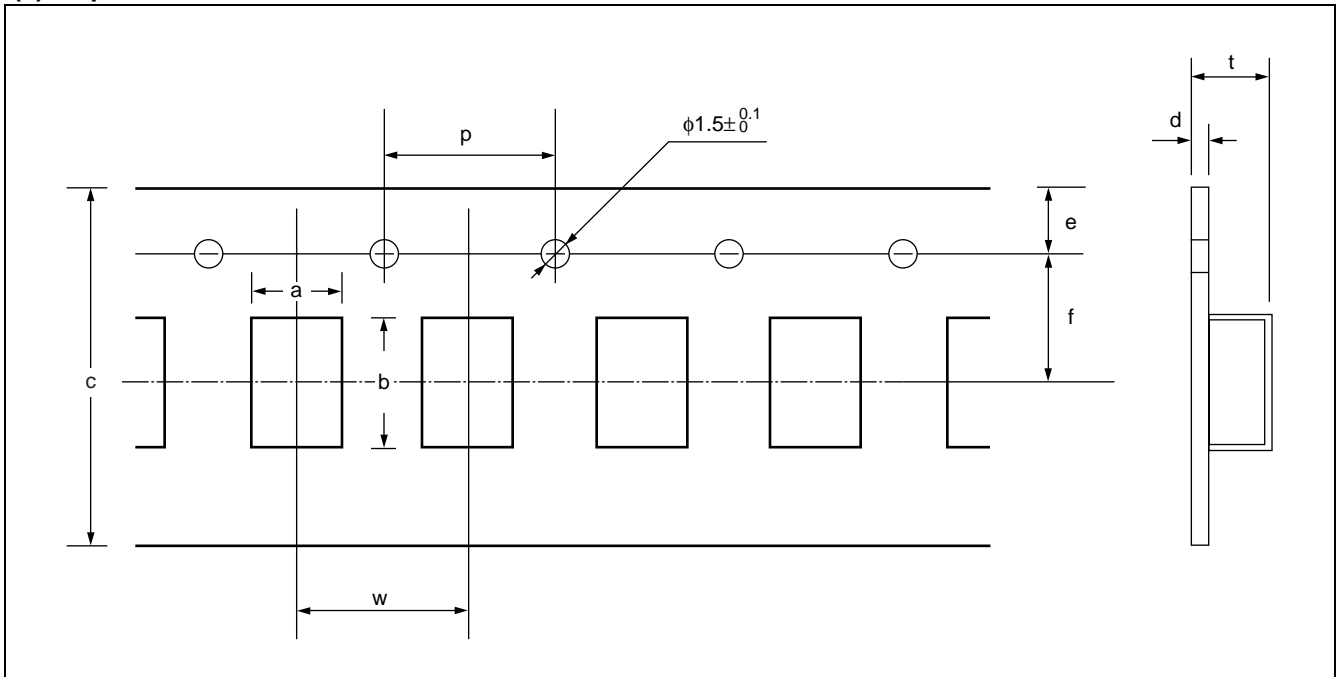
Quick heating of a capacitor after long-term storage, which took up moisture, causes high-pressure inside the product by vaporization of moist and may result in cracks on external resin. Pre-baking at 60 °C to 120 °C for 12 h to 72 h removes the moist and prevents such cracks.

■ RECOMMENDED CLEANSING CONDITIONS

- Avoid ultrasonic cleansing in principle. Bubble cleansing is recommended. If ultrasonic cleansing is unavoidable, cleansing in under one minute is recommended to avoid cavitation.
- Use non-chlorine type or alcoholic organic solvent that is easily dryable and residue-free (e.g. isopropyl alcohol, toluene, benzene, etc.) for cleansing.
- Soaking a capacitor in solvent may erase a stamp. Soaking must be within 20 min. No limitation is applicable if stamp is not taken in account. For similar reason, vapor-phase cleansing must be done within 10 min.
- Use of the following solvents, that cause swelling or dissolving on external resin, are not allowed : ester-family methoxy-butyl acetate, amide-family N, N-dimethylformamide (DMF) , polyhydric alcohol dielectric diethylene glycol, and monobutyl ether.

PACKING

(1) Tape Dimension



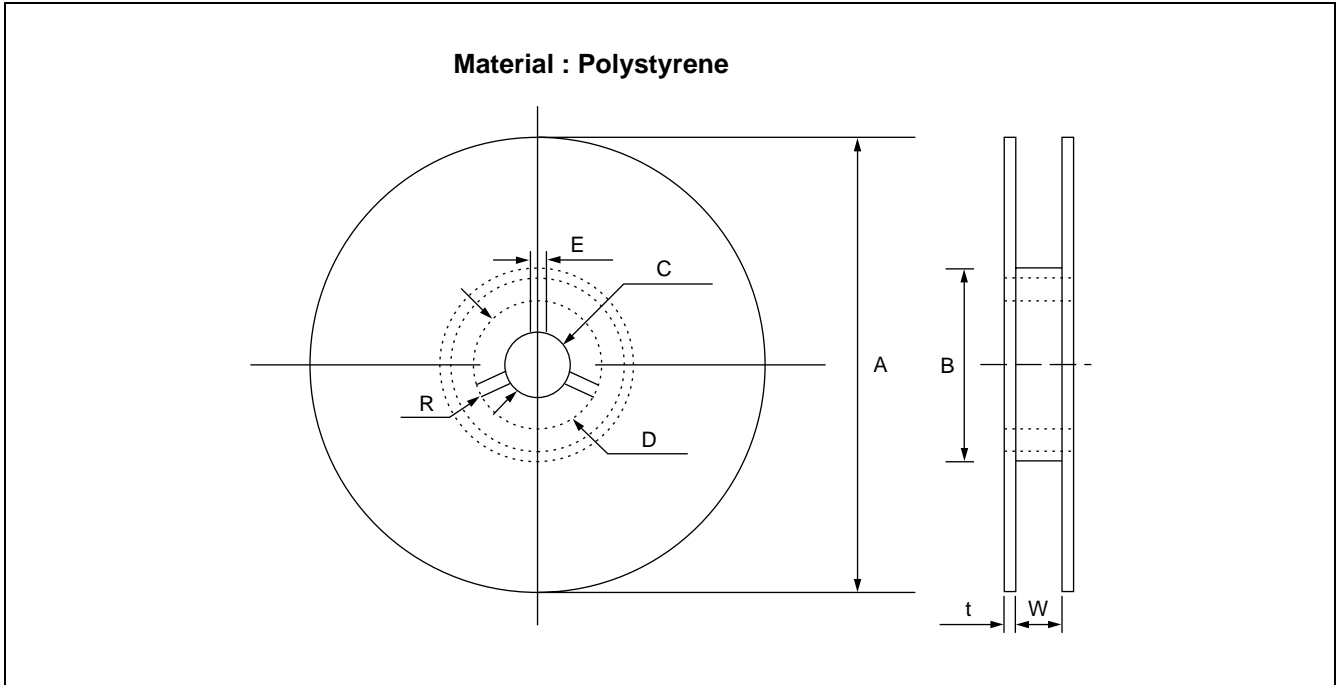
Unit : mm

Case size	a	b	c	e	f	t	p	w	d
P	1.4 ± 0.1	2.2 ± 0.1	8 ± 0.3	1.75 ± 0.1	3.5 ± 0.1	1.55 ± 0.1	4 ± 0.1	4 ± 0.1	0.2

("a" and "b" are inside diameters.)

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(2) Reel Dimension



Unit : mm

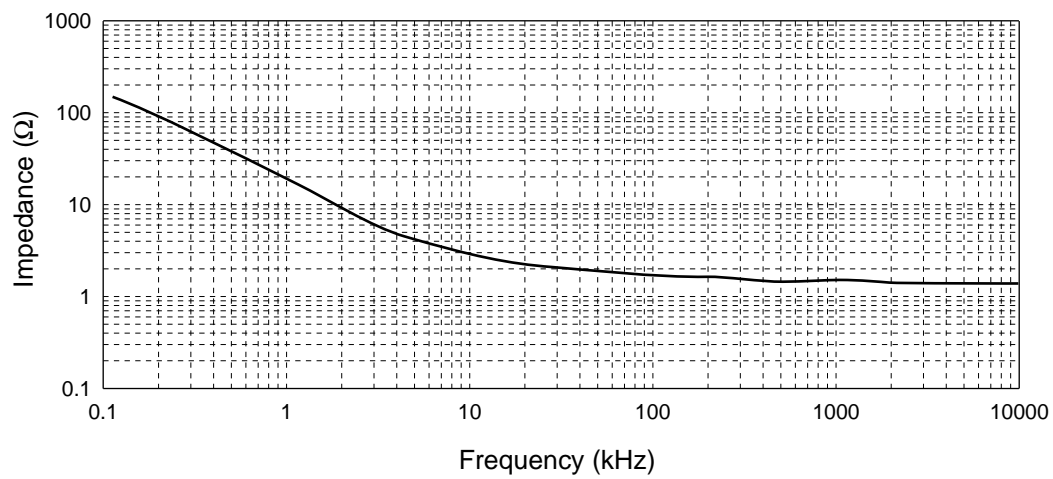
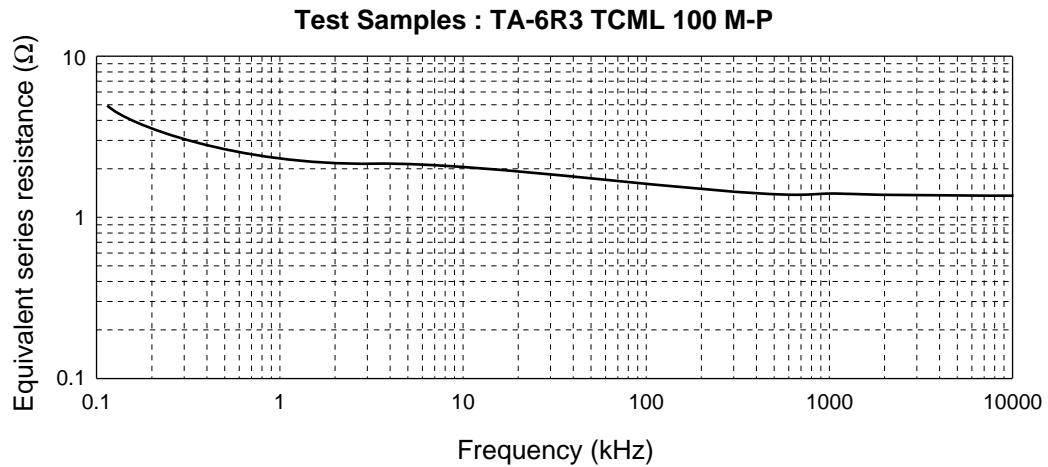
Case size	A	B	C	D	E	W	t	R
P	$180 \pm \begin{smallmatrix} 0 \\ 3.0 \end{smallmatrix}$	$60 \pm \begin{smallmatrix} 1.0 \\ 0 \end{smallmatrix}$	13 ± 0.2	21 ± 0.8	2 ± 0.5	9 ± 0.3	2 ± 0.5	1

(3) Carrier Tape Packaging Unit

Case size	Quantity (capacitors/reel)
P	3000

APPENDIX (Typ. value)

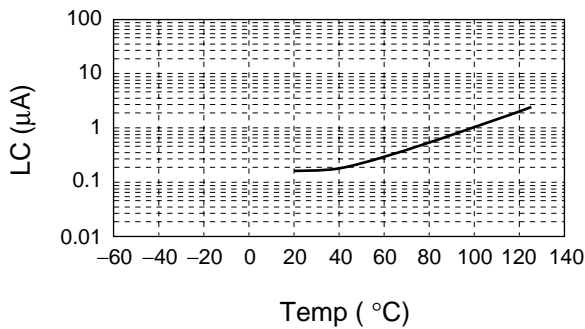
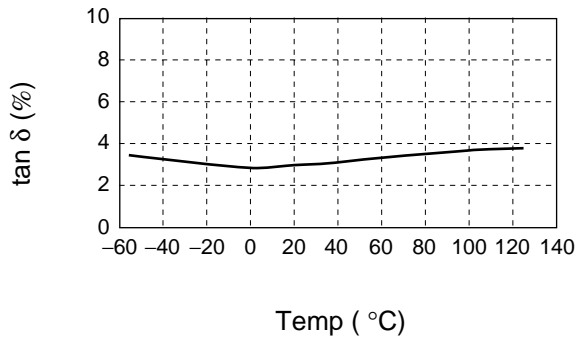
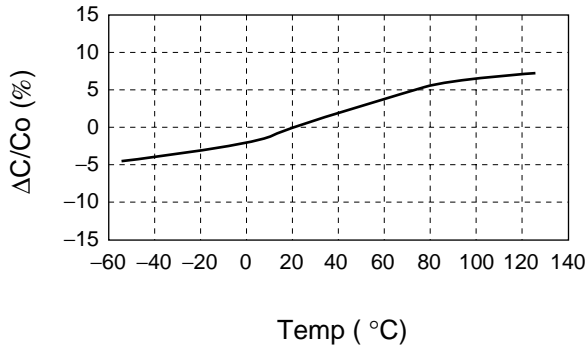
- Frequency characteristics



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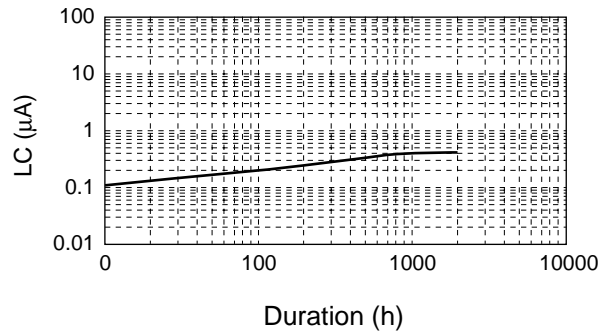
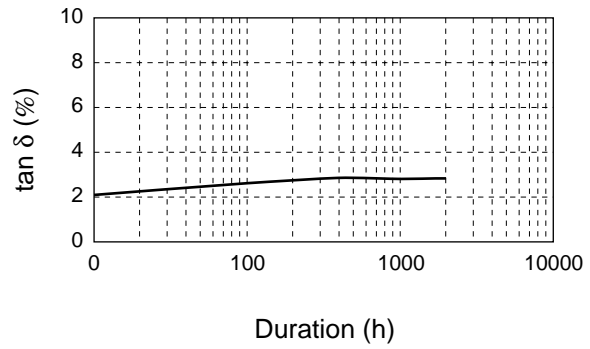
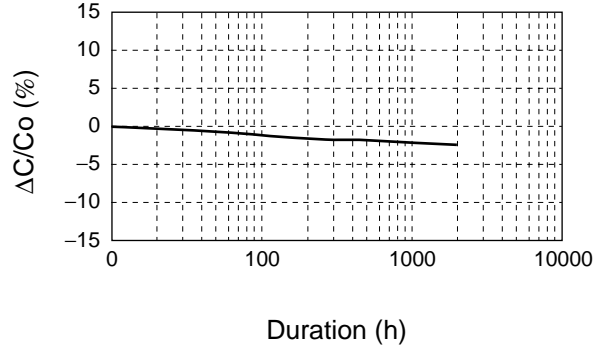
- High/low temperature stability

Test Samples : TA-6R3 TCML 100 M-P



- Loaded conditions at elevated temperature (85 degrees Celsius)

Test Samples : TA-6R3 TCML 100 M-P



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