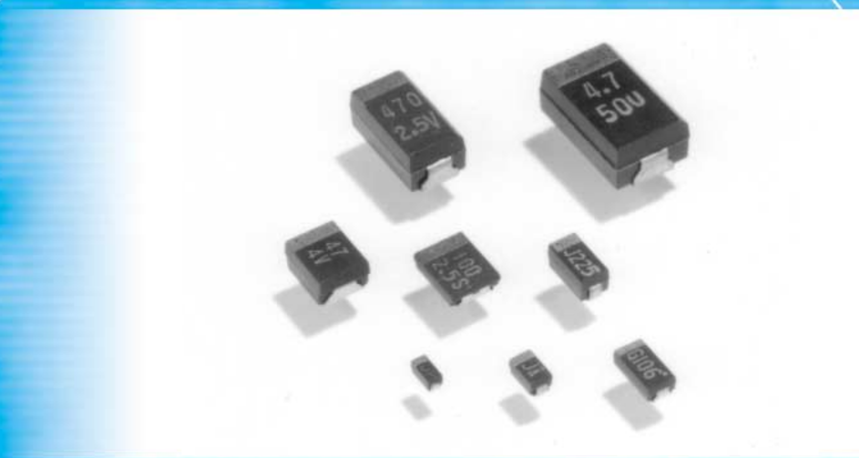
Devices thru Material Innovation

NEC/TOKIN

Vol. 02

Capacitors



CAPACITORS

Correct Use of Chip Tantalum Capacitors

Be sure to read this before using NEC TOKIN Tantalum Capacitors.

[Notes]

- Be sure to read "Notes on Using The Solid Tantalum Capacitor" (p33 - p43) and "Cautions" (p43) before commencing circuit design or using the capacitor.
- Confirm the usage conditions and rated performance of the capacitor before use.
- Ninety percent of the failure that occurs in this capacitor is caused by an increase in leakage current or short-circuiting. It is therefore important to make sufficient allowances for redundant wiring in the circuit design.

[Quality Grades]

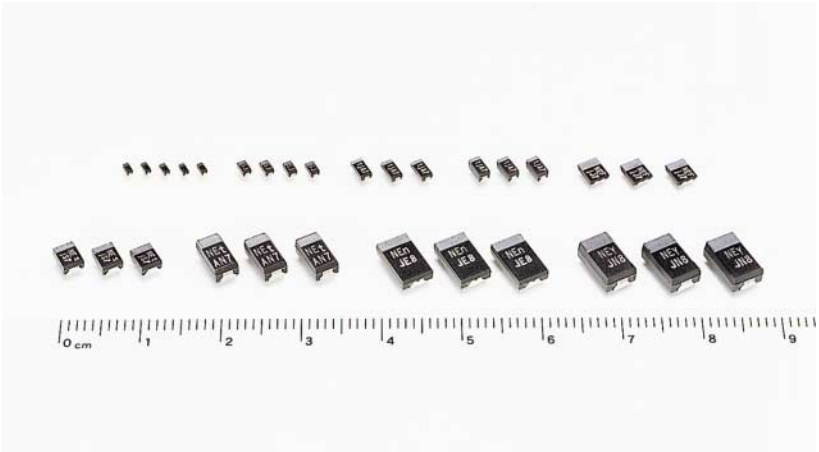
NEC TOKIN devices are classified into the following quality grades in accordance with their application (for details of the applications, see p43). The quality grade of all devices in this document is "standard"; the devices in this document cannot be used for "special" or "specific" quality grade applications. Customers who intend to use a product or products in this document for applications other than those specified under the "standard" quality grade must contact an NEC TOKIN sales representative in advance (see the reverse side of the cover for contact details).

- Standard: This quality grade is intended for applications in which failure or malfunction of the device is highly unlikely to cause harm to persons or damage to property, or be the source of any negative effects or problems in the wider community.
- Special: This quality grade is intended for special applications that have common requirements, such specific industrial fields. Devices with a "special" quality grade are designed, manufactured, and tested using a more stringent quality assurance program than that used for "standard" grade devices. There is a high possibility that failure or malfunction of the device when being used for applications in this category will cause harm to persons or damage to property, or create negative effects or problems in the wider community.
- Specific: Devices with a "specific" quality grade are designed, manufactured, and tested using a quality assurance program that is designated by the customer or that is created in accordance with the customer's specifications. There is an extremely high possibility that failure or malfunction of the device when being used for applications in this category will cause harm to persons or damage to property, or create serious problems in the wider community. Customers who use NEC TOKIN's products for these "specific" applications must conclude an individual quality agreement and/or development agreement with NEC TOKIN. A quality assurance program designated by the customer must also be determined in advance.

NEC TOKIN offers the latest technology

<Tantalum Capacitors>

<Conductive Polymer Tantalum Capacitors>
"NeoCapacitors"



NEC has been manufacturing solid electrolyte tantalum capacitors for more than 30 years. As a result of NEC's active research and development programs, NEC capacitors offer the designer the latest technology plus outstanding performance. NEC capacitors are used extensively in industrial, commercial, entertainment, and medical electronic equipment.
NEC has obtained ISO 9001 and QS9000 certificates of registration for capacitors.
NEC, in response to the wave of the worldwide environment protection consciousness, developed E/SV series by eliminating lead from the terminals.

The low-ESR conductive polymer tantalum capacitors are expected to meet an important market need; ther are suited for DC/DC converters, video cameras, personal handy phones, etc.
The business of manufacturing and sale of capacitors was divided and transferred to Tokin, as of April 1, 2002. Then Tokin changed its corporate name to "NEC TOKIN Corporation," which has charge of electronic components business within the NEC Group.

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TANTALUM CAPACITORS

Description

NEC TOKIN's tantulum capacitors offer the designer advanced technological design and excellent performance characteristics for filtering, bypassing, coupling, decoupling, blocking, and R C timing circuits. They are used extensively in industrial, commercial, entertainment, and medical electronic equipment.

The tantalum capacitor is inherently very reliable and there is significant evidence that this reliability improves with age–perhaps indefinitely. Capacitance loss with age and other problems often associated with liquid electrolytes are nonexistent in solid electrolyte tantalums.

A process used to further improve the reliability of tantalums is to burn them in at elevated voltages at 85°C for extended periods of time, thus eliminating high leakage and other undesirable characteristics. This process is done because solid electrolyte tantalum capacitors do not conform to the exponential distribution of time ordered failures, but instead exhibit a constantly decreasing failure rate.

If you specify NEC TOKIN tantalums, you can feel confident that you are getting the best available quality, reliability, and price.

CHIP TANTALUM CAPACITORS

Series	Operating Temperature Range (˚C)	DC Rated Voltage Range (V)	Capacitance Range (μF)	Capacitance Tolerance (%)	DC Leakage Current (μA)	Tangent of Loss Angle	Features
Conventional Type (Manganese Diocide Type)							
E/SV	–55 to +125	2.5 to 35	0.47 to 680	±20	0.01 CV(1) or 0.5 whichever is greater	2.5 Vdc to 10 Vdc(2) : 0.08 to 0.16 16 Vdc to 35 Vdc : 0.06, 0.10	Lead-free
R	–55 to +125	(Standard) 4 to 50	(Standard) 0.47 to 68	±20 ±10	0.01 CV(1) or 0.5 whichever is greater	0.047 to 4.7 μF : 0.04 6.8 to 68 μF : 0.06	Standard
		(Extended) 2.5 to 35	(Extended) 0.47 to 680	±20 ±10	0.01 CV(1) or 0.5 whichever is greater	2.5 Vdc to 10 Vdc(3) : 0.08 to 0.16 16 Vdc to 35 Vdc : 0.06, 0.10	Miniaturized
SV/S	–55 to +125	2.5 to 16	0.47 to 33	±20	0.01 CV(1) or 0.5 whichever is greater	0.1, 0.2 (4)	Ultra miniaturized
SV/Z	–55 to +125	4 to 10	10 to 330	±20	0.01 CV(1) or 0.5 whichever is greater	0.08 to 0.14 (5)	Low ESR
NeoCapacitor (Conductive Polymer Type)							
PS/L	–55 to +105	4 to 10	2.2 to 470	±20	0.1 CV(1) or 3, whichever is greater	0.09 to 0.50 (6)	Ultra-low ESR

Notes 1. Product of capacitance in μF and voltage in V.
2. Refer to Standard Ratings on page 8
3. Refer to Standard Ratings on pages 13, 14
4. Refer to Standard Ratings on page 16
5. Refer to Standard Ratings on page 24
6. Refer to Standard Ratings on pages 29, 30

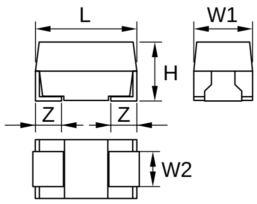
E/SV Series Tantalum Chip Capacitors

■ FEATURES

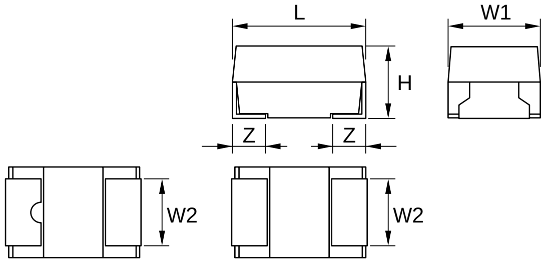
- Lead-free Type.
- Offer a range of small, high-capacity models.
- Succeed to the latest technology plus outstaning peformance.

■ DIMENSIONS [mm]

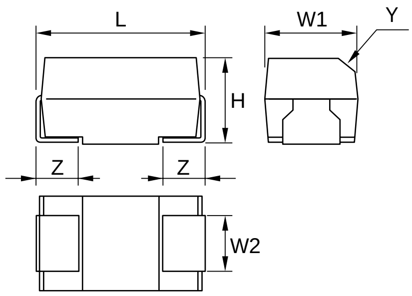
[J, P, A2, A cases]



[B3, B2 cases]



[C, D cases]



(Unit: mm)

Case Code	EIA code	L	W_1	W_2	H	Z	Y
J	–	1.6 ± 0.1	0.8 ± 0.1	0.6 ± 0.1	0.8 ± 0.1	0.3 ± 0.15	–
P	2012	2.0 ± 0.2	1.25 ± 0.2	0.9 ± 0.1	1.1 ± 0.1	0.5 ± 0.1	–
A2 (U)	3216L	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.2	–
A	3216	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.6 ± 0.2	0.8 ± 0.2	–
B3 (W)	3528L	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.2	–
B2 (S)	3528	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.9 ± 0.2	0.8 ± 0.2	–
C	6032	6.0 ± 0.2	3.2 ± 0.2	2.2 ± 0.1	2.5 ± 0.2	1.3 ± 0.2	0.4 C
D	7343	7.3 ± 0.2	4.3 ± 0.2	2.4 ± 0.1	2.8 ± 0.2	1.3 ± 0.2	0.4 C

■ STANDARD C-V VALUE REFERENCE BY CASE CODE

U_R / μF	2.5 V	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V
0.47					P	A2	A	A
0.68					P	A2	A	A
1.0				P	J, P	A2	A	A
1.5			P	J, P	A	A2		A
2.2			J	J, P	A2, A	A2, A	A	B2
3.3		P	J	P, A2	A2, A	A, B3		B2
4.7			J, P, A	P, A2, A	A2, A	A, B3, B2	B2	C
6.8		J	P, A2	A	A, B3	B2		C
10	J	J, P	P, A2, A	A2, A, B2	A, B3, B2	B2	C	D
15		P	A2, A	B3	B2	C		D
22	P, A2	P, A2, A	A2, A, B3, B2	A, B3, B2	B2, C	C, D	D	
33	P	A2, A	A, B3	B2	C	D		
47	A2, A	A, B3	A, B3, B2, C	B2, C	C, D	D		
68	A	B3	B2	C	D			
100	B3, B2	A, B3, B2	B2, C	C, D	D			
150	B2	B2	C	D				
220	B2	B2, C	C, D	D				
330	C	C	D					
470	C, D	D	D					
680		D						

■ PART NUMBER SYSTEM

[Bulk]

ESV P 1C 105 M

- M: Capacitance tolerance
  - M: ±20%
  - K: ±10%
- 105: Capacitance (pF)
  - First two digits represent significant figures.
  - Third digit specifies number of zeros to follow.
- 1C: DC rated voltage in volts
  - 0E: 2.5 V, 0G: 4 V, 0J: 6.3 V, 1A: 10 V,
  - 1C: 16 V, 1D: 20 V, 1E: 25 V, 1V: 35 V
- P: Case code
- ESV: E/SV Series

[Tape and Reel]

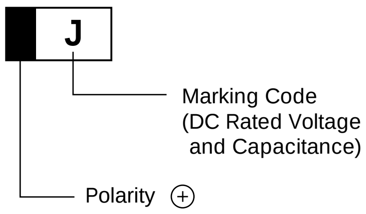
TE ESVP1C105M 8 R

- R: Packing Orientation
  - R: Cathode on the Side of Sproket Hole
- 8: Tape width
  - 8: 8 mm (J, P, A2, A, B3, B2 case)
  - 12: 12 mm (C, D case)
- ESVP1C105M: Part number of Bulk
- TE: Tape and Reel

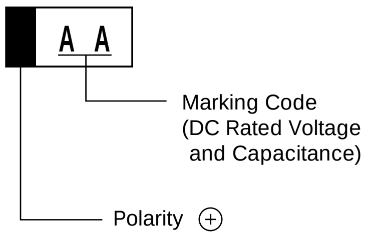
■ MARKINGS

The standard marking shows capacitance, DC rated voltage, and polarity.

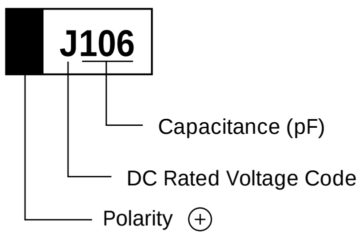
[J case] (ex. 4.7 μF / 6.3 V)



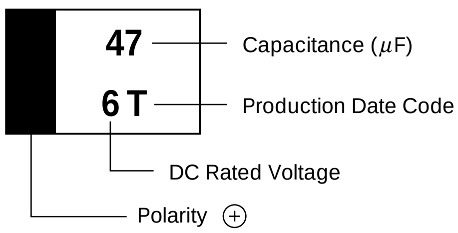
[P case] (ex. 1 μF / 10 V)



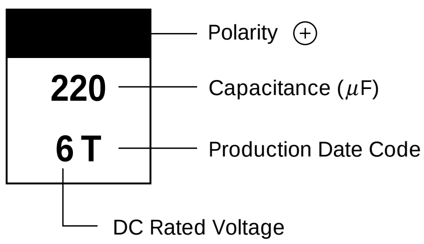
[A2, A cases] (ex. 10 μF / 6.3 V)



[B2, B cases] (ex. 47 μF / 6.3 V)



[C, D cases] (ex. 220 μF / 6.3 V)



[J case Marking Code]

U_R / μF	2.5 V	4 V	6.3 V	10 V	16 V
1.0					Ↄ
1.5				∀	
2.2			ſ	ᐊ	
3.3			ᒣ		
4.7			J		
6.8		G			
10	e	⅁			

[P case Marking Code]

U_R / μF	2.5 V	4 V	6.3 V	10 V	16 V
0.47					CS
0.68					CW
1				AA	CA
1.5			JE	AE	
2.2				AJ	
3.3		GN		AN	
4.7			JS	AS	
6.8			JW		
10		G$\overline{A}$	J$\overline{A}$		
15		G$\overline{E}$			
22	e$\overline{J}$	G$\overline{J}$			
33	e$\overline{N}$				

[DC Rated Voltage code]

Code	e	G	J	A	C	D	E	V
Rated Voltage	2.5 V	4 V	6.3 V	10 V	16 V	20 V	25 V	35V

[B3, B2, C, D cases Production date code]

Y / M	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2001	A	B	C	D	E	F	G	H	J	K	L	M
2002	N	P	Q	R	S	T	U	V	W	X	Y	Z
2003	a	b	c	d	e	f	g	h	j	k	l	m
2004	n	p	q	r	s	t	u	v	w	x	y	z

Note: Production date code will repeat beginning in 2005.

■ PERFORMANCE CHARACTERISTICS

ITEM	SPECIFICATIONS							
Operating Temperature	–55 to +125˚C							
Rated Voltage	2.5 V	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V
Working Voltage at 125˚C	1.6 V	2.5 V	4 V	6.3 V	10 V	13 V	16 V	22 V
Surge Voltage at 85˚C	3.3 V	5.2 V	8 V	13 V	20 V	26 V	33 V	46 V
Capacitance (at 20˚C, 120 Hz)	Range : 0.47 μF to 680 μF Tolerance : ±20% (±10%)							
Capacitance Change with Temperature	Not to exceed –20% (P, J cace) or –12% at –55˚C, +20% (P, J cace) or –12% at 85˚C, +20% (P, J cace) or –15% at 125˚C							
DC Leakage Current	0.01C • V (μA) or 0.5 μA, Whichever is Greater							
Tangent of Loss Angle	Refer to Standard Ratings							
Damp Heat (90 to 95%RH at 40˚C, 56 days (1344hrs.))	Capacitance Cange : ±5% to ±20% Tangent of Loss Angle : 150% of Initial Requirements DC Leakage Current : Initial Requirements							
Endurrance (at 85˚C, DC Rated Voltage, 2000hrs.)	Capacitance Cange : ±10% to ±22% Tangent of Loss Angle : Initial Requirements DC Leakage Current : 200% (P, J case) or 125% of Initial Requirements							
Resistance to Soldering Heat (solder reflow at 260˚C, 10 s or solder dip at 260˚C, 5 s)	Capacitance Cange : ±5% to ±20% Tangent of Loss Angle : Initial Requirements DC Leakage Current : Initial Requirements							

We obtained IEC Qualification Approval on R Series Standard Ratings in Seprember 1987.

■ STANDARD RATINGS

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Enduar
2.5	ESVJ0E106M	10	J	0.5	0.20	±20%	±20%
	ESVP0E226M	22	P	0.6	0.20	±20%	±20%
	ESVA20E226M	22	A2	0.6	0.12	± 5%	±10%
	ESVP0E336M	33	P	0.8	0.20	±20%	±20%
	ESVA20E476M	47	A2	1.2	0.12	± 5%	±10%
	ESVA0E476M	47	A	1.2	0.12	±12%	±12%
	ESVA0E686M	68	A	1.7	0.18	±12%	±12%
	ESVB30E107M	100	B3	2.5	0.18	± 5%	±10%
	ESVB20E107M	100	B2	2.5	0.08	±12%	±12%
	ESVB20E157M	150	B2	3.8	0.16	±12%	±12%
	ESVB20E227M	220	B2	5.5	0.18	±12%	±12%
	ESVC0E337M	330	C	8.3	0.16	±12%	±12%
	ESVC0E477M	470	C	11.8	0.18	±12%	±12%
	ESVD0E477M	470	D	11.8	0.14	±12%	±12%
4	ESVP0G335M	3.3	P	0.5	0.20	±20%	±20%
	ESVJ0G685M	6.8	J	0.5	0.20	±20%	±20%
	ESVJ0G106M	10	J	0.5	0.20	±20%	±20%
	ESVP0G106M	10	P	0.5	0.20	±20%	±20%
	ESVP0G156M	15	P	0.6	0.20	±20%	±20%
	ESVP0G226M	22	P	0.9	0.20	±20%	±20%
	ESVA20G226M	22	A2	0.9	0.12	±12%	±12%
	ESVA0G226M	22	A	0.9	0.08	±12%	±12%
	ESVA20G336M	33	A2	1.3	0.08	± 5%	±10%
	ESVA0G336M	33	A	1.3	0.10	±12%	±12%
	ESVA0G476M	47	A	1.9	0.12	±12%	±12%
	ESVB30G476M	47	B3	1.9	0.12	±15%	±15%
	ESVB30G686M	68	B3	2.7	0.15	±15%	±15%
	ESVB30G107M	100	B3	4.0	0.20	±15%	±15%
	ESVA0G107M	100	A	4.0	0.30	±20%	±20%
	ESVB20G107M	100	B2	4.0	0.12	±12%	±12%
	ESVB20G157M	150	B2	6.0	0.18	±12%	±12%
	ESVB20G227M	220	B2	8.8	0.18	±12%	±12%
	ESVC0G227M	220	C	8.8	0.12	±12%	±12%
	ESVC0G337M	330	C	13.2	0.14	±12%	±12%
	ESVD0G477M	470	D	18.8	0.16	±12%	±12%
	ESVD0G687M	680	D	27.2	0.24	±12%	±12%
6.3	ESVP0J155M	1.5	P	0.5	0.10	±20%	±20%
	ESVJ0J225M	2.2	J	0.5	0.20	±20%	±20%
	ESVJ0J335M	3.3	J	0.5	0.20	±20%	±20%
	ESVJ0J475M	4.7	J	0.5	0.20	±20%	±20%
	ESVP0J475M	4.7	P	0.5	0.20	±20%	±20%
	ESVA0J475M	4.7	A	0.5	0.08	± 5%	±10%
	ESVP0J685M	6.8	P	0.5	0.20	±20%	±20%
	ESVA20J685M	6.8	A2	0.5	0.08	±12%	±12%
	ESVP0J106M	10	P	0.6	0.20	±20%	±20%
	ESVA20J106M	10	A2	0.6	0.08	±12%	±12%
	ESVA0J106M	10	A	0.6	0.08	±12%	±12%
	ESVA20J156M	15	A2	0.9	0.12	±12%	±12%
	ESVA0J156M	15	A	0.9	0.08	±12%	±12%
	ESVA20J226M	22	A2	1.4	0.12	±12%	±12%
	ESVA0J226M	22	A	1.4	0.10	±12%	±12%
	ESVB30J226M	22	B3	1.4	0.12	±15%	±15%
	ESVB20J226M	22	B2	1.4	0.08	± 5%	±10%
	ESVA0J336M	33	A	2.1	0.12	±12%	±12%
	ESVB30J336M	33	B3	2.1	0.12	±15%	±15%
	ESVA0J476M	47	A	3.0	0.12	±12%	±12%
	ESVB30J476M	47	B3	3.0	0.12	±15%	±15%
	ESVB20J476M	47	B2	3.0	0.08	± 5%	±10%
	ESVC0J476M	47	C	3.0	0.08	± 5%	±10%

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Enduar
6.3	ESVB20J686M	68	B2	4.3	0.10	±12%	±12%
	ESVB20J107M	100	B2	6.3	0.12	±12%	±12%
	ESVC0J107M	100	C	6.3	0.10	±12%	±12%
	ESVC0J157M	150	C	9.5	0.10	±12%	±12%
	ESVC0J227M	220	C	13.9	0.14	±12%	±12%
	ESVD0J227M	220	D	13.9	0.12	±12%	±12%
	ESVD0J337M	330	D	20.8	0.14	±12%	±12%
	ESVD0J477M	470	D	29.6	0.20	±12%	±12%
10	ESVP1A105M	1.0	P	0.5	0.10	±20%	±20%
	ESVJ1A155M	1.5	J	0.5	0.20	±20%	±20%
	ESVP1A155M	1.5	P	0.5	0.20	±20%	±20%
	ESVJ1A225M	2.2	J	0.5	0.20	±20%	±20%
	ESVP1A225M	2.2	P	0.5	0.20	±20%	±20%
	ESVP1A335M	3.3	P	0.5	0.20	±20%	±20%
	ESVA21A335M	3.3	A2	0.5	0.08	±12%	±12%
	ESVP1A475M	4.7	P	0.5	0.20	±20%	±20%
	ESVA21A475M	4.7	A2	0.5	0.08	±12%	±12%
	ESVA1A475M	4.7	A	0.5	0.08	±12%	±12%
	ESVA1A685M	6.8	A	0.7	0.08	±12%	±12%
	ESVA21A106M	10	A2	1.0	0.08	±12%	±12%
	ESVA1A106M	10	A	1.0	0.08	±12%	±12%
	ESVB21A106M	10	B2	1.0	0.08	± 5%	±10%
	ESVB31A156M	15	B3	1.5	0.12	±15%	±15%
	ESVA1A226M	22	A	2.2	0.12	±12%	±12%
	ESVB31A226M	22	B3	2.2	0.12	±15%	±15%
	ESVB21A226M	22	B2	2.2	0.08	± 5%	±10%
	ESVB21A336M	33	B2	3.3	0.08	± 5%	±10%
	ESVB21A476M	47	B2	4.7	0.08	±12%	±12%
	ESVC1A476M	47	C	4.7	0.08	± 5%	±10%
	ESVC1A686M	68	C	6.8	0.08	±12%	±12%
	ESVC1A107M	100	C	10.0	0.10	±12%	±12%
	ESVD1A107M	100	D	10.0	0.08	± 5%	±10%
	ESVD1A157M	150	D	15.0	0.10	±12%	±12%
	ESVD1A227M	220	D	22.0	0.12	±12%	±12%
16	ESVP1C474M	0.47	P	0.5	0.10	±20%	±20%
	ESVP1C684M	0.68	P	0.5	0.10	±20%	±20%
	ESVJ1C105M	1.0	J	0.5	0.10	±20%	±20%
	ESVP1C105M	1.0	P	0.5	0.10	±20%	±20%
	ESVA1C155M	1.5	A	0.5	0.04	± 5%	±10%
	ESVA21C225M	2.2	A2	0.5	0.06	±12%	±12%
	ESVA1C225M	2.2	A	0.5	0.06	± 5%	±10%
	ESVA21C335M	3.3	A2	0.5	0.50	± 5%	±10%
	ESVA1C335M	3.3	A	0.5	0.06	±12%	±12%
	ESVA21C475M	4.7	A2	0.8	0.08	± 5%	±10%
	ESVA1C475M	4.7	A	0.8	0.06	±12%	±12%
	ESVA1C685M	6.8	A	1.1	0.06	±12%	±12%
	ESVB31C685M	6.8	B3	1.1	0.06	±15%	±15%
	ESVA1C106M	10	A	1.6	0.08	±12%	±12%
	ESVB31C106M	10	B3	1.6	0.08	±15%	±15%
	ESVB21C106M	10	B2	1.6	0.06	± 5%	±10%
	ESVB21C156M	15	B2	2.4	0.06	± 5%	±10%
	ESVB21C226M	22	B2	3.5	0.06	± 5%	±10%
	ESVC1C226M	22	C	3.5	0.06	± 5%	±10%
	ESVC1C336M	33	C	5.3	0.06	± 5%	±10%
	ESVC1C476M	47	C	7.5	0.06	±12%	±12%
	ESVD1C476M	47	D	7.5	0.06	± 5%	±10%
	ESVD1C686M	68	D	10.9	0.06	± 5%	±10%
	ESVD1C107M	100	D	16.0	0.10	±12%	±12%

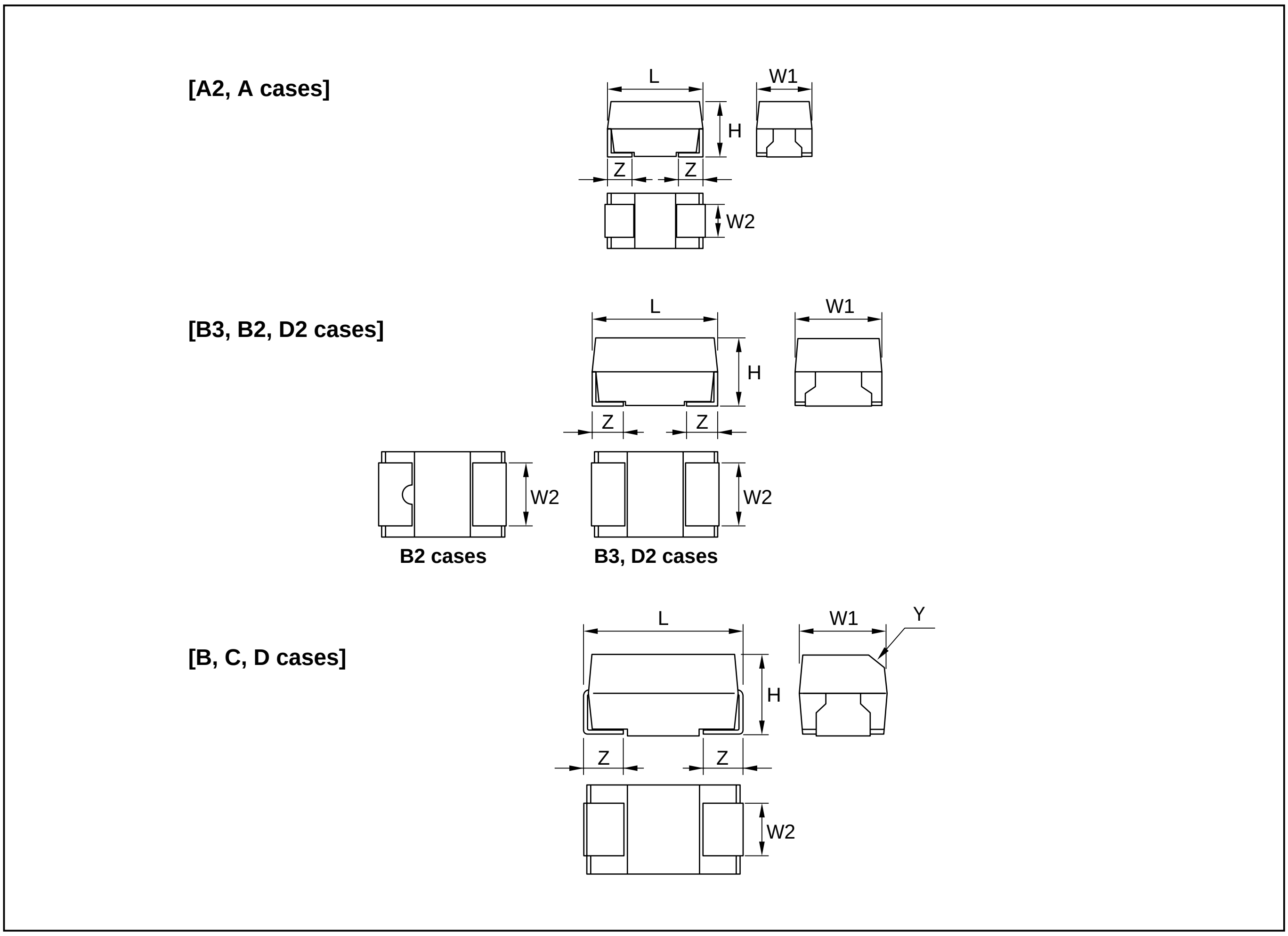
Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Enduar
20	ESVA21D474M	0.47	A2	0.5	0.06	± 5%	±10%
	ESVA21D684M	0.68	A2	0.5	0.06	± 5%	±10%
	ESVA21D105M	1.0	A2	0.5	0.06	±12%	±12%
	ESVA21D155M	1.5	A2	0.5	0.06	±12%	±12%
	ESVA21D225M	2.2	A2	0.5	0.06	±12%	±12%
	ESVA1D225M	2.2	A	0.5	0.06	±12%	±12%
	ESVA1D335M	3.3	A	0.7	0.06	±12%	±12%
	ESVB31D335M	3.3	B3	0.7	0.06	±15%	±15%
	ESVA1D475M	4.7	A	0.9	0.06	±12%	±12%
	ESVB31D475M	4.7	B3	0.9	0.06	±15%	±15%
	ESVB21D475M	4.7	B2	0.9	0.06	± 5%	±10%
	ESVB21D685M	6.8	B2	1.4	0.06	± 5%	±10%
	ESVB21D106M	10	B2	2.0	0.06	± 5%	±10%
	ESVC1D156M	15	C	3.0	0.06	± 5%	±10%
	ESVC1D226M	22	C	4.4	0.06	± 5%	±10%
	ESVD1D226M	22	D	4.4	0.06	± 5%	±10%
	ESVD1D336M	33	D	6.6	0.06	± 5%	±10%
	ESVD1D476M	47	D	9.4	0.06	± 5%	±10%
25	ESVA1E474M	0.47	A	0.5	0.04	± 5%	±10%
	ESVA1E684M	0.68	A	0.5	0.06	± 5%	±10%
	ESVA1E105M	1.0	A	0.5	0.06	± 5%	±10%
	ESVA1E225M	2.2	A	0.6	0.06	±12%	±12%
	ESVB21E475M	4.7	B2	1.2	0.06	± 5%	±10%
	ESVC1E106M	10	C	2.5	0.06	± 5%	±10%
	ESVD1E226M	22	D	5.5	0.06	± 5%	±10%
35	ESVA1V474M	0.47	A	0.5	0.06	± 5%	±10%
	ESVA1V684M	0.68	A	0.5	0.06	± 5%	±10%
	ESVA1V105M	1.0	A	0.5	0.06	±12%	±12%
	ESVA1V155M	1.5	A	0.5	0.06	±12%	±12%
	ESVB21V225M	2.2	B2	0.8	0.06	± 5%	±10%
	ESVB21V335M	3.3	B2	1.2	0.06	± 5%	±10%
	ESVC1V475M	4.7	C	1.6	0.06	± 5%	±10%
	ESVC1V685M	6.8	C	2.4	0.06	± 5%	±10%
	ESVD1V106M	10	D	3.5	0.06	± 5%	±10%
	ESVD1V156M	15	D	5.3	0.06	± 5%	±10%

R Series Tantalum Chip Capacitors

■ FEATURES

- Standard Type.
- This series are chaging the Lead-free Type Series (E/SV Series) gradually, keeping the performance characteristics. So please use the E/SV Series next time.

■ DIMENSIONS [mm]



(Unit: mm)

Case Code	EIA code	L	W_1	W_2	H	Z	Y
A2 (U)	3216L	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.2	–
A	3216	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.6 ± 0.2	0.8 ± 0.2	–
B3 (W)	3528L	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.2	–
B2 (S)	3528	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.9 ± 0.2	0.8 ± 0.2	–
B	–	4.7 ± 0.2	2.6 ± 0.2	1.4 ± 0.1	2.1 ± 0.2	0.8 ± 0.2	0.4 C
C	6032	6.0 ± 0.2	3.2 ± 0.2	2.2 ± 0.1	2.5 ± 0.2	1.3 ± 0.2	0.4 C
D2 (T)	5846	5.8 ± 0.2	4.6 ± 0.2	2.4 ± 0.1	3.2 ± 0.2	1.3 ± 0.2	–
D	7343	7.3 ± 0.2	4.3 ± 0.2	2.4 ± 0.1	2.8 ± 0.2	1.3 ± 0.2	0.4 C

■ STANDARD C-V VALUE REFERENCE BY CASE CODE

[STANDARD]

μF \ UR	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V	50 V
0.47						A	B2, B	B2
0.68					A		B2, B	C
1.0				A			B2, B	C
1.5			A	A		B2, B	C	C
2.2		A	A		B2, B		C	D
3.3	A	A		B2, B		C	C, D	D2, D
4.7	A		B2, B		C	C	D2, D	D
6.8		B2, B		C	C	D2, D	D2, D	
10	B2, B		C	C	D2, D	D2, D		
15		C	C	D2, D	D2, D			
22	C	C	D2, D	D2, D				
33	C	D2, D	D2, D					
47	D2, D	D2, D						
68	D2, D							

[EXTENDED]

μF \ UR	2.5 V	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V
0.47						A2		A
0.68					A2	A2	A	A
1.0				A2	A2	A2, A	A	A
1.5			A2	A2	A2	A2, A	A	A, B2, B
2.2		A2	A2	A2	A2, A	A	A, B2	B2, B
3.3		A2	A2	A2, A	A	A, B2	B2, B	B2
4.7	A2	A2	A2, A	A2, A	A, B2	A, B2, B	B2	C
6.8	A2	A2, A	A2, A	A, B2	A, B3, B2, B	B2	C	C
10	A2	A2, A	A2, A, B2	A2, A, B3, B2, B	A, B3, B2	B2, C	C	D2, D
15	A2, A	A2, A, B3	A2, A, B3, B2, B	B3, B2	B2, C	C	D2, D	D
22	A2, A	A2, A, B3, B2, B	A, B3, B2	B3, B2, C	B2, C	C, D2, D	D	
33	A, B3, B2	A, B3, B2	A, B3, B2, C	B2, C	C, D2, D	D2, D		
47	A, B3, B2	A, B3, B2, C	B3, B2, C	B2, C, D2, D	C, D2, D	D		
68	A, B3, B2	B3, B2, C	B2, C, D2, D	C, D2, D	D			
100	B3, B2	B3, B2, C, D2, D	C, D2, D	C, D2, D	D			
150	B2	B2, C, D2, D	C, D2, D	D				
220	B2, C	C, D2, D	C, D	D				
330	D2	C, D	D					
470	C, D	D	D					

■ PART NUMBER SYSTEM

[Bulk]

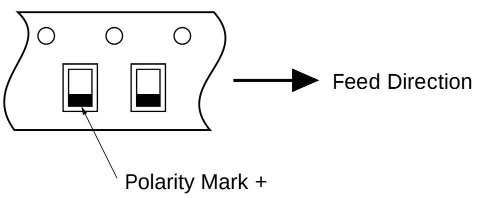
NR A 105 M 04

- 04 — DC Rated Voltage in Volt
- M — Capacitance tolerance (M: ±20%, K: ±10%)
- 105 — Capacitance (pF) (First two digits represent significant figures. Third digit specifies number of zeros to follow.)
- A — Case code
- NR — R Series

[Tape and Reel]

NRA105M04 R 8

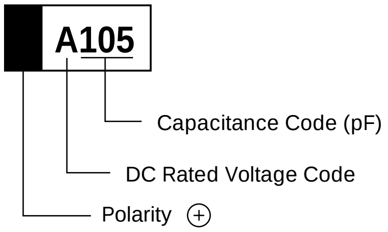
- NRA105M04 — Part number of Bulk
- 8 — Tape width (8: 8 mm (A2, A, B3, B2 case); 12: 12 mm (C, D2, D case))
- R — Tape and Reel Paking Orientation (R: Reel Diameter 180 mm (7.09 inches); P: Reel Diameter 330 mm (13 inches))



■ MARKINGS

The standard marking shows capacitance, DC rated voltage, and polarity.

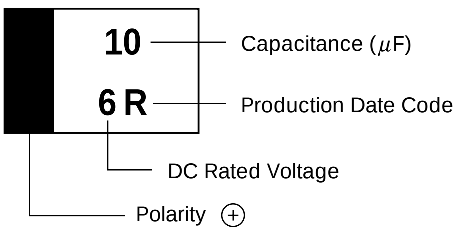
[A2, A cases] (ex. 1 μF / 10 V)



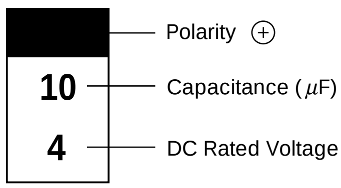
[DC Rated Voltage code]

Code	e	G	J	A	C	D	E	V	H
Rated Voltage	2.5 V	4 V	6.3 V	10 V	16 V	20 V	25 V	35V	50V

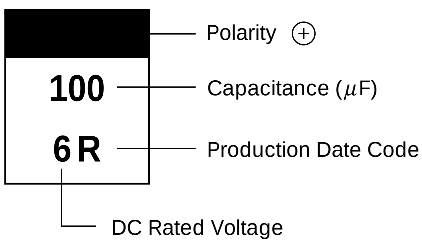
[B3, B2, and D2 cases] (ex. 10 μF / 6.3 V)



[B case] (ex. 10 μF / 4 V)



[C, D cases] (ex. 100 μF / 6.3 V)



[B3, B2, C, D cases production date code]

Y \ M	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2001	A	B	C	D	E	F	G	H	J	K	L	M
2002	N	P	Q	R	S	T	U	V	W	X	Y	Z
2003	a	b	c	d	e	f	g	h	j	k	l	m
2004	n	p	q	r	s	t	u	v	w	x	y	z

Note: Production date code will repeat beginning in 2005.

■ PERFORMANCE CHARACTERISTICS

ITEM	SPECIFICATIONS								
Operating Temperature	–55 to +125˚C								
Rated Voltage	2.5V	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V	50 V
Working Voltage at 125˚C	1.6 V	2.5 V	4 V	6.3 V	10 V	13 V	16 V	22 V	32 V
Surge Voltage at 85˚C	3.3 V	5.2 V	8 V	13 V	20 V	26 V	33 V	46 V	65 V
Capacitance (at 20˚C, 120 Hz)	Range : 0.47 μF to 680 μF Tolerance : ±20% (±10%)								
Capacitance Change with Temperature	Not to exceed –12% at –55˚C, +12% at 85˚C, +15% at 125˚C								
DC Leakage Current	0.01C • V (μA) or 0.5 μA, Whichever is Greater								
Tangent of Loss Angle	Refer to Standard Ratings								
Damp Heat (90 to 95%RH at 40˚C, 56 days (1344hrs.))	Capacitance Cange : ±5% to ±15% Tangent of Loss Angle : 150% of Initial Requirements DC Leakage Current : Initial Requirements								
Endurrance (at 85˚C, DC Rated Voltage, 2000hrs.)	Capacitance Cange : ±10% to ±15% Tangent of Loss Angle : Initial Requirements DC Leakage Current : 125% of Initial Requirements								
Resistance to Soldering Heat (solder reflow at 260˚C, 10 s or solder dip at 260˚C, 5 s)	Capacitance Cange : ±5% to ±15% Tangent of Loss Angle : Initial Requirements DC Leakage Current : Initial Requirements								

We obtained IEC Qualification Approval on R Series Standard Ratings in Seprember 1987.

■ STANDARD RATINGS

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Enduar
4	NRA335M04	3.3	A	0.5	0.04	± 5%	±10%
	NRA475M04	4.7	A	0.5	0.04	± 5%	±10%
	NRS106M04	10	B2	0.5	0.06	± 5%	±10%
	NRB106M04	10	B	0.5	0.06	± 5%	±10%
	NRC226M04	22	C	0.9	0.06	± 5%	±10%
	NRC336M04	33	C	1.3	0.06	± 5%	±10%
	NRT476M04	47	D2	1.9	0.06	± 5%	±10%
	NRD476M04	47	D	1.9	0.06	± 5%	±10%
	NRT686M04	68	D2	2.7	0.06	± 5%	±10%
	NRD686M04	68	D	2.7	0.06	± 5%	±10%
6.3	NRA225M06	2.2	A	0.5	0.04	± 5%	±10%
	NRA335M06	3.3	A	0.5	0.04	± 5%	±10%
	NRS685M06	6.8	B2	0.5	0.06	± 5%	±10%
	NRB685M06	6.8	B	0.5	0.06	± 5%	±10%
	NRC156M06	15	C	0.9	0.06	± 5%	±10%
	NRC226M06	22	C	1.4	0.06	± 5%	±10%
	NRT336M06	33	D2	2.1	0.06	± 5%	±10%
	NRD336M06	33	D	2.1	0.06	± 5%	±10%
	NRT476M06	47	D2	3.0	0.06	± 5%	±10%
	NRD476M06	47	D	3.0	0.06	± 5%	±10%
10	NRA155M10	1.5	A	0.5	0.04	± 5%	±10%
	NRA225M10	2.2	A	0.5	0.04	± 5%	±10%
	NRS475M10	4.7	B2	0.5	0.04	± 5%	±10%
	NRB475M10	4.7	B	0.5	0.04	± 5%	±10%
	NRC106M10	10	C	1.0	0.06	± 5%	±10%
	NRC156M10	15	C	1.5	0.06	± 5%	±10%
	NRT226M10	22	D2	2.2	0.06	± 5%	±10%
	NRD226M10	22	D	2.2	0.06	± 5%	±10%
	NRT336M10	33	D2	3.3	0.06	± 5%	±10%
	NRD336M10	33	D	3.3	0.06	± 5%	±10%
16	NRA105M16	1.0	A	0.5	0.04	± 5%	±10%
	NRA155M16	1.5	A	0.5	0.04	± 5%	±10%
	NRS335M16	3.3	B2	0.5	0.04	± 5%	±10%
	NRB335M16	3.3	B	0.5	0.04	± 5%	±10%
	NRC685M16	6.8	C	1.1	0.06	± 5%	±10%
	NRC106M16	10	C	1.6	0.06	± 5%	±10%
	NRT156M16	15	D2	2.4	0.06	± 5%	±10%
	NRD156M16	15	D	2.4	0.06	± 5%	±10%
	NRT226M16	22	D2	3.5	0.06	± 5%	±10%
	NRD226M16	22	D	3.5	0.06	± 5%	±10%

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Enduar
20	NRA684M20	0.68	A	0.5	0.04	± 5%	±10%
	NRS225M20	2.2	B2	0.5	0.04	± 5%	±10%
	NRB225M20	2.2	B	0.5	0.04	± 5%	±10%
	NRC475M20	4.7	C	0.9	0.04	± 5%	±10%
	NRC685M20	6.8	C	1.4	0.06	± 5%	±10%
	NRT106M20	10	D2	2.0	0.06	± 5%	±10%
	NRD106M20	10	D	2.0	0.06	± 5%	±10%
	NRT156M20	15	D2	3.0	0.06	± 5%	±10%
	NRD156M20	15	D	3.0	0.06	± 5%	±10%
25	NRA474M25	0.47	A	0.5	0.04	± 5%	±10%
	NRS155M25	1.5	B2	0.5	0.04	± 5%	±10%
	NRB155M25	1.5	B	0.5	0.04	± 5%	±10%
	NRC335M25	3.3	C	0.8	0.04	± 5%	±10%
	NRC475M25	4.7	C	1.2	0.04	± 5%	±10%
	NRT685M25	6.8	D2	1.7	0.06	± 5%	±10%
	NRD685M25	6.8	D	1.7	0.06	± 5%	±10%
	NRT106M25	10	D2	2.5	0.06	± 5%	±10%
	NRD106M25	10	D	2.5	0.06	± 5%	±10%
35	NRS474M35	0.47	B2	0.5	0.04	± 5%	±10%
	NRB474M35	0.47	B	0.5	0.04	± 5%	±10%
	NRS684M35	0.68	B2	0.5	0.04	± 5%	±10%
	NRB684M35	0.68	B	0.5	0.04	± 5%	±10%
	NRS105M35	1.0	B2	0.5	0.04	± 5%	±10%
	NRB105M35	1.0	B	0.5	0.04	± 5%	±10%
	NRC155M35	1.5	C	0.5	0.04	± 5%	±10%
	NRC225M35	2.2	C	0.8	0.04	± 5%	±10%
	NRC335M35	3.3	C	1.2	0.04	± 5%	±10%
	NRD335M35	3.3	D	1.2	0.04	± 5%	±10%
	NRT475M35	4.7	D2	1.6	0.04	± 5%	±10%
	NRD475M35	4.7	D	1.6	0.04	± 5%	±10%
	NRT685M35	6.8	D2	2.4	0.06	± 5%	±10%
	NRD685M35	6.8	D	2.4	0.06	± 5%	±10%
50	NRS474M50	0.47	B2	0.5	0.04	± 5%	±10%
	NRC684M50	0.68	C	0.5	0.04	± 5%	±10%
	NRC105M50	1.0	C	0.5	0.04	± 5%	±10%
	NRC155M50	1.5	C	0.8	0.04	± 5%	±10%
	NRD225M50	2.2	D	1.1	0.04	± 5%	±10%
	NRT335M50	3.3	D2	1.7	0.04	± 5%	±10%
	NRD335M50	3.3	D	1.7	0.04	± 5%	±10%
	NRD475M50	4.7	D	2.4	0.04	± 5%	±10%

■ EXTENDED CHIPS STANDARD RATINGS

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at EndUar
2.5	NRU475M02	4.7	A2	0.5	0.08	±12%	±12%
	NRU685M02	6.8	A2	0.5	0.08	±12%	±12%
	NRU106M02	10	A2	0.5	0.08	±12%	±12%
	NRU156M02	15	A2	0.5	0.12	±12%	±12%
	NRA156M02	15	A	0.5	0.08	±12%	±12%
	NRU226M02	22	A2	0.6	0.12	±12%	±12%
	NRA226M02	22	A	0.6	0.08	±12%	±12%
	NRA336M02	33	A	0.8	0.08	±12%	±12%
	NRW336M02	33	B3	0.8	0.08	±15%	±15%
	NRS336M02	33	B2	0.8	0.08	±12%	±12%
	NRA476M02	47	A	1.2	0.12	±12%	±12%
	NRW476M02	47	B3	1.2	0.12	±15%	±15%
	NRS476M02	47	B2	1.2	0.08	±12%	±12%
	NRA686M02	68	A	1.7	0.18	±12%	±12%
	NRW686M02	68	B3	1.7	0.20	±15%	±15%
	NRS686M02	68	B2	1.7	0.08	±12%	±12%
	NRW107M02	100	B3	2.5	0.18	±15%	±15%
	NRS107M02	100	B2	2.5	0.08	±12%	±12%
	NRS157M02	150	B2	3.8	0.16	±12%	±12%
	NRS227M02	220	B2	5.5	0.18	±12%	±12%
	NRC227M02	220	C	5.5	0.12	±12%	±12%
	NRT337M02	330	D2	8.3	0.14	±12%	±12%
	NRC477M02	470	C	11.8	0.18	±12%	±12%
	NRD477M02	470	D	11.8	0.14	±12%	±12%
4	NRU225M04	2.2	A2	0.5	0.08	± 5%	±10%
	NRU335M04	3.3	A2	0.5	0.08	± 5%	±10%
	NRU475M04	4.7	A2	0.5	0.08	±12%	±12%
	NRU685M04	6.8	A2	0.5	0.08	±12%	±12%
	NRA685M04	6.8	A	0.5	0.08	± 5%	±10%
	NRU106M04	10	A2	0.5	0.12	±12%	±12%
	NRA106M04	10	A	0.5	0.08	±12%	±12%
	NRU156M04	15	A2	0.6	0.12	±12%	±12%
	NRA156M04	15	A	0.6	0.08	±12%	±12%
	NRS156M04	15	B2	0.6	0.08	± 5%	±10%
	NRU226M04	22	A2	0.9	0.12	±12%	±12%
	NRA226M04	22	A	0.9	0.08	±12%	±12%
	NRW226M04	22	B3	0.9	0.08	±15%	±15%
	NRS226M04	22	B2	0.9	0.08	± 5%	±10%
	NRB226M04	22	B	0.9	0.08	± 5%	±10%
	NRA336M04	33	A	1.3	0.10	±12%	±12%
	NRW336M04	33	B3	1.3	0.12	±15%	±15%
	NRS336M04	33	B2	1.3	0.08	± 5%	±10%
	NRA476M04	47	A	1.9	0.12	±12%	±12%
	NRW476M04	47	B3	1.9	0.12	±15%	±15%
	NRS476M04	47	B2	1.9	0.08	± 5%	±10%
	NRC476M04	47	C	1.9	0.08	± 5%	±10%
	NRW686M04	68	B3	2.7	0.15	±15%	±15%
	NRS686M04	68	B2	2.7	0.08	± 5%	±10%
	NRC686M04	68	C	2.7	0.08	± 5%	±10%

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Endaur
4	NRW107M04	100	B3	4.0	0.20	±15%	±15%
	NRS107M04	100	B2	4.0	0.12	±12%	±12%
	NRC107M04	100	C	4.0	0.08	± 5%	±10%
	NRT107M04	100	D2	4.0	0.08	± 5%	±10%
	NRD107M04	100	D	4.0	0.08	± 5%	±10%
	NRS157M04	150	B2	6.0	0.18	±12%	±12%
	NRC157M04	150	C	6.0	0.10	±12%	±12%
	NRT157M04	150	D2	6.0	0.08	± 5%	±10%
	NRD157M04	150	D	6.0	0.08	± 5%	±10%
	NRC227M04	220	C	8.8	0.12	±12%	±12%
	NRT227M04	220	D2	8.8	0.12	±12%	±12%
	NRD227M04	220	D	8.8	0.08	± 5%	±10%
	NRC337M04	330	C	13.2	0.14	±12%	±12%
	NRD337M04	330	D	13.2	0.14	±12%	±12%
	NRD477M04	470	D	18.8	0.16	±12%	±12%
	NRD687M04	680	D	27.2	0.24	±12%	±12%
6.3	NRU155M06	1.5	A2	0.5	0.08	± 5%	±10%
	NRU225M06	2.2	A2	0.5	0.08	± 5%	±10%
	NRU335M06	3.3	A2	0.5	0.08	±12%	±12%
	NRU475M06	4.7	A2	0.5	0.08	±12%	±12%
	NRA475M06	4.7	A	0.5	0.08	± 5%	±10%
	NRU685M06	6.8	A2	0.5	0.08	±12%	±12%
	NRA685M06	6.8	A	0.5	0.08	±12%	±12%
	NRU106M06	10	A2	0.6	0.08	±12%	±12%
	NRA106M06	10	A	0.6	0.08	±12%	±12%
	NRS106M06	10	B2	0.6	0.08	± 5%	±10%
	NRU156M06	15	A2	0.9	0.12	±12%	±12%
	NRA156M06	15	A	0.9	0.08	±12%	±12%
	NRW156M06	15	B3	0.9	0.08	±15%	±15%
	NRS156M06	15	B2	0.9	0.08	± 5%	±10%
	NRB156M06	15	B	0.9	0.08	± 5%	±10%
	NRA226M06	22	A	1.4	0.10	±12%	±12%
	NRW226M06	22	B3	1.4	0.12	±15%	±15%
	NRS226M06	22	B2	1.4	0.08	± 5%	±10%
	NRA336M06	33	A	2.1	0.12	±12%	±12%
	NRW336M06	33	B3	2.1	0.12	±15%	±15%
	NRS336M06	33	B2	2.1	0.08	± 5%	±10%
	NRC336M06	33	C	2.1	0.08	± 5%	±10%
	NRW476M06	47	B3	3.0	0.12	±15%	±15%
	NRS476M06	47	B2	3.0	0.08	± 5%	±10%
	NRC476M06	47	C	3.0	0.08	± 5%	±10%
	NRS686M06	68	B2	4.3	0.10	±12%	±12%
	NRC686M06	68	C	4.3	0.08	± 5%	±10%
	NRT686M06	68	D2	4.3	0.08	± 5%	±10%
	NRD686M06	68	D	4.3	0.08	± 5%	±10%
	NRC107M06	100	C	6.3	0.10	±12%	±12%
	NRT107M06	100	D2	6.3	0.08	± 5%	±10%
	NRD107M06	100	D	6.3	0.08	± 5%	±10%
	NRC157M06	150	C	9.5	0.10	±12%	±12%
	NRT157M06	150	D2	9.5	0.10	±12%	±12%
	NRD157M06	150	D	9.5	0.08	± 5%	±10%
	NRC227M06	220	C	13.9	0.14	±12%	±12%
	NRD227M06	220	D	13.9	0.12	±12%	±12%
	NRD337M06	330	D	20.8	0.14	±12%	±12%
	NRD477M06	470	D	29.6	0.20	±12%	±12%

Rating (V)	Part Number	Capacitance (µF)	Case Code	DC Leakage Current (µA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Endaur
10	NRU105M10	1.0	A2	0.5	0.08	± 5%	±10%
	NRU155M10	1.5	A2	0.5	0.08	± 5%	±10%
	NRU225M10	2.2	A2	0.5	0.08	±12%	±12%
	NRU335M10	3.3	A2	0.5	0.08	±12%	±12%
	NRA335M10	3.3	A	0.5	0.08	± 5%	±10%
	NRU475M10	4.7	A2	0.5	0.08	±12%	±12%
	NRA475M10	4.7	A	0.5	0.08	±12%	±12%
	NRA685M10	6.8	A	0.7	0.08	±12%	±12%
	NRS685M10	6.8	B2	0.7	0.08	± 5%	±10%
	NRU106M10	10	A2	1.0	0.08	±12%	±12%
	NRA106M10	10	A	1.0	0.08	±12%	±12%
	NRW106M10	10	B3	1.0	0.08	±15%	±15%
	NRS106M10	10	B2	1.0	0.08	± 5%	±10%
	NRB106M10	10	B	1.0	0.08	± 5%	±10%
	NRW156M10	15	B3	1.5	0.12	±15%	±15%
	NRS156M10	15	B2	1.5	0.08	± 5%	±10%
	NRW226M10	22	B3	2.2	0.12	±15%	±15%
	NRS226M10	22	B2	2.2	0.08	± 5%	±10%
	NRC226M10	22	C	2.2	0.08	± 5%	±10%
	NRS336M10	33	B2	3.3	0.08	± 5%	±10%
	NRC336M10	33	C	3.3	0.08	± 5%	±10%
	NRS476M10	47	B2	4.7	0.08	±12%	±12%
	NRC476M10	47	C	4.7	0.08	± 5%	±10%
	NRT476M10	47	D2	4.7	0.08	± 5%	±10%
	NRD476M10	47	D	4.7	0.08	± 5%	±10%
	NRC686M10	68	C	6.8	0.08	±12%	±12%
	NRT686M10	68	D2	6.8	0.08	± 5%	±10%
	NRD686M10	68	D	6.8	0.08	± 5%	±10%
	NRC107M10	100	C	10.0	0.10	±12%	±12%
	NRT107M10	100	D2	10.0	0.10	±12%	±12%
	NRD107M10	100	D	10.0	0.08	± 5%	±10%
	NRD157M10	150	D	15.0	0.10	±12%	±12%
	NRD227M10	220	D	22.0	0.12	±12%	±12%
16	NRU684M16	0.68	A2	0.5	0.06	± 5%	±10%
	NRU105M16	1.0	A2	0.5	0.06	± 5%	±10%
	NRU155M16	1.5	A2	0.5	0.06	±12%	±12%
	NRU225M16	2.2	A2	0.5	0.06	±12%	±12%
	NRA225M16	2.2	A	0.5	0.06	± 5%	±10%
	NRA335M16	3.3	A	0.5	0.06	±12%	±12%
	NRA475M16	4.7	A	0.8	0.06	±12%	±12%
	NRS475M16	4.7	B2	0.8	0.06	± 5%	±10%
	NRA685M16	6.8	A	1.1	0.06	±12%	±12%
	NRW685M16	6.8	B3	1.1	0.06	±15%	±15%
	NRS685M16	6.8	B2	1.1	0.06	± 5%	±10%
	NRB685M16	6.8	B	1.1	0.06	± 5%	±10%
	NRA106M16	10	A	1.6	0.08	±12%	±12%
	NRW106M16	10	B3	1.6	0.08	±15%	±15%
	NRS106M16	10	B2	1.6	0.06	± 5%	±10%
	NRS156M16	15	B2	2.4	0.06	± 5%	±10%
	NRC156M16	15	C	2.4	0.06	± 5%	±10%
	NRS226M16	22	B2	3.5	0.06	± 5%	±10%
	NRC226M16	22	C	3.5	0.06	± 5%	±10%
	NRC336M16	33	C	5.3	0.06	± 5%	±10%
	NRT336M16	33	D2	5.3	0.06	± 5%	±10%
	NRD336M16	33	D	5.3	0.06	± 5%	±10%
	NRC476M16	47	C	7.5	0.06	±12%	±12%
	NRT476M16	47	D2	7.5	0.06	± 5%	±10%
	NRD476M16	47	D	7.5	0.06	± 5%	±10%
	NRD686M16	68	D	10.9	0.06	± 5%	±10%
	NRD107M16	100	D	16.0	0.10	±12%	±12%

Rating (V)	Part Number	Capacitance (µF)	Case Code	DC Leakage Current (µA)	Tangent of Loss Angle	Capacitance Chage	
						at Damp Heat at Resistance to Soldering Heat	at Enduar
20	NRU474M20	0.47	A2	0.5	0.06	± 5%	±10%
	NRU684M20	0.68	A2	0.5	0.06	± 5%	±10%
	NRU105M20	1.0	A2	0.5	0.06	±12%	±12%
	NRA105M20	1.0	A	0.5	0.06	± 5%	±10%
	NRU155M20	1.5	A2	0.5	0.06	±12%	±12%
	NRA155M20	1.5	A	0.5	0.06	± 5%	±10%
	NRA225M20	2.2	A	0.5	0.06	±12%	±12%
	NRA335M20	3.3	A	0.7	0.06	±12%	±12%
	NRS335M20	3.3	B2	0.7	0.06	± 5%	±10%
	NRA475M20	4.7	A	0.9	0.06	±12%	±12%
	NRS475M20	4.7	B2	0.9	0.06	± 5%	±10%
	NRB475M20	4.7	B	0.9	0.06	± 5%	±10%
	NRS685M20	6.8	B2	1.4	0.06	± 5%	±10%
	NRS106M20	10	B2	2.0	0.06	± 5%	±10%
	NRC106M20	10	C	2.0	0.06	± 5%	±10%
	NRC156M20	15	C	3.0	0.06	± 5%	±10%
	NRC226M20	22	C	4.4	0.06	± 5%	±10%
	NRT226M20	22	D2	4.4	0.06	± 5%	±10%
	NRD226M20	22	D	4.4	0.06	± 5%	±10%
	NRT336M20	33	D2	6.6	0.06	± 5%	±10%
	NRD336M20	33	D	6.6	0.06	± 5%	±10%
	NRD476M20	47	D	9.4	0.06	± 5%	±10%
25	NRA684M25	0.68	A	0.5	0.06	± 5%	±10%
	NRA105M25	1.0	A	0.5	0.06	± 5%	±10%
	NRA155M25	1.5	A	0.5	0.06	±12%	±12%
	NRA225M25	2.2	A	0.6	0.06	±12%	±12%
	NRS225M25	2.2	B2	0.6	0.06	± 5%	±10%
	NRS335M25	3.3	B2	0.8	0.06	± 5%	±10%
	NRB335M25	3.3	B	0.8	0.06	± 5%	±10%
	NRS475M25	4.7	B2	1.2	0.06	± 5%	±10%
	NRC685M25	6.8	C	1.7	0.06	± 5%	±10%
	NRC106M25	10	C	2.5	0.06	± 5%	±10%
	NRT156M25	15	D2	3.8	0.06	± 5%	±10%
	NRD156M25	15	D	3.8	0.06	± 5%	±10%
	NRD226M25	22	D	5.5	0.06	± 5%	±10%
35	NRA474M35	0.47	A	0.5	0.06	± 5%	±10%
	NRA684M35	0.68	A	0.5	0.06	± 5%	±10%
	NRA105M35	1.0	A	0.5	0.06	±12%	±12%
	NRA155M35	1.5	A	0.5	0.06	±12%	±12%
	NRS155M35	1.5	B2	0.5	0.06	± 5%	±10%
	NRB155M35	1.5	B	0.5	0.06	± 5%	±10%
	NRS225M35	2.2	B2	0.8	0.06	± 5%	±10%
	NRB225M35	2.2	B	0.8	0.06	± 5%	±10%
	NRS335M35	3.3	B2	1.2	0.06	± 5%	±10%
	NRC475M35	4.7	C	1.6	0.06	± 5%	±10%
	NRC685M35	6.8	C	2.4	0.06	± 5%	±10%
	NRT106M35	10	D2	3.5	0.06	± 5%	±10%
	NRD106M35	10	D	3.5	0.06	± 5%	±10%
	NRD156M35	15	D	5.3	0.06	± 5%	±10%

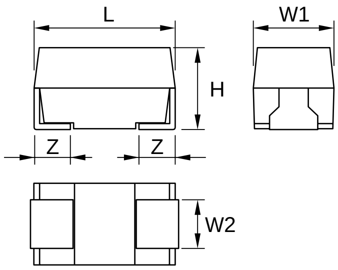
SV/S Series Tantalum Chip Capacitors
(Ultra-miniaturized)

■ FEATURES

- Ultla-miniaturized Type
- This series are chaging the Lead-free Type Series (E/SV Series) gradually, keeping the performance characteristics. So please use the E/SV Series next time.

■ DIMENSIONS [mm]

[J, P cases]



(Unit: mm)

Case Code	EIA code	L	W_1	W_2	H	Z
J	1608	1.6 ± 0.1	0.8 ± 0.1	0.6 ± 0.1	0.8 ± 0.1	0.3 ± 0.15
P	2012	2.0 ± 0.2	1.25 ± 0.2	0.9 ± 0.1	1.1 ± 0.1	0.5 ± 0.1

■ STANDARD C-V VALUE REFERENCE BY CASE CODE

U_R / μF	2.5 V	4 V	6.3 V	10 V	16 V
0.47					P
0.68				P	P
1.0			P	P	
1.5		P	P	J, P	
2.2	P	P	J, P	J, P	
3.3	P	P	J, P	P	
4.7	P	J, P	J, P	P	
6.8	P	J, P	P		
10	J, P	J, P	P		
15	P	P			
22	P	P			
33	P				

■ PART NUMBER SYSTEM

[Bulk]

SVS P 0J 106 M

- M: Capacitance Tolerance (M: ±20%)
- 106: Capacitance (pF) (First two digits represent significant figures. Third digit specifies number of zeros to follow.)
- 0J: DC rated voltage in volts (0E: 2.5 V, 0G: 4 V, 0J: 6.3 V, 1A: 10 V, 1C: 16 V)
- P: Case code
- SVS: SV/S Series

[Tape and Reel]

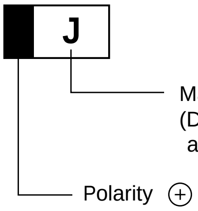
TE SVA1C105M 8 R

- R: Packing Orientation (R: Cathode on the Side of Sproket Hole)
- 8: Tape width (8: 8 mm)
- SVA1C105M: Part number of Bulk
- TE: Tape and Reel

■ MARKINGS

The standard marking shows capacitance, DC rated voltage, and polarity.

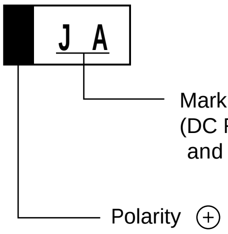
[J case] (ex. 4.7 μF / 6.3 V)



[J case Marking Code]

μF \ UR	2.5 V	4 V	6.3 V	10 V	16 V
1.0					Ↄ
1.5				∀	
2.2			ſ	ᗉ	
3.3			ᒧ		
4.7			J		
6.8		G			
10	e	⅁			

[P case] (ex. 1 μF / 6.3 V)



[P case Marking Code]

μF \ UR	2.5 V	4 V	6.3 V	10 V	16 V
0.47					CS
0.68				AW	CW
1			JA	AA	CA
1.5		GE	JE	AE	
2.2	eJ	GJ	JJ	AJ	
3.3	eN	GN	JN	AN	
4.7	eS	GS	JS	AS	
6.8	eW	GW	JW		
10	e$\bar{A}$	G$\bar{A}$	J$\bar{A}$		
15	e$\bar{E}$	G$\bar{E}$			
22	e$\bar{J}$	G$\bar{J}$			
33	e$\bar{N}$				

■ PERFORMANCE CHARACTERISTICS

ITEM	SPECIFICATIONS				
Operating Temperature	–55 to +125˚C				
Rated Voltage	2.5 V	4 V	6.3 V	10 V	16 V
Working Voltage at 125˚C	1.6 V	2.5 V	4 V	6.3 V	10 V
Surge Voltage at 85˚C	3.3 V	5.2 V	8 V	13 V	20 V
Capacitance (at 20˚C, 120 Hz)	Range : 0.47 µF to 33 µF Tolerance : ±20%				
Capacitance Change with Temperature	Not to exceed –20% at –55˚C, +20% at 85˚C, +20% at 125˚C				
DC Leakage Current	0.01C • V (µA) or 0.5 µA, Whichever is Greater				
Tangent of Loss Angle	Refer to Standard Ratings				
Damp Heat (90 to 95%RH at 40˚C, 56 days (1344hrs.))	Capacitance Cange : ±20% Tangent of Loss Angle : 150% of Initial Requirements DC Leakage Current : Initial Requirements				
Endurrance (at 85˚C, DC Rated Voltage, 2000hrs.)	Capacitance Cange : ±20% Tangent of Loss Angle : Initial Requirements DC Leakage Current : 200% of Initial Requirements				
Resistance to Soldering Heat (Full immersion in solder, 260˚C for 5 s)	Capacitance Cange : ±20% Tangent of Loss Angle : Initial Requirements DC Leakage Current : Initial Requirements				

We obtained IEC Qualification Approval on R Series Standard Ratings in Seprember 1987.

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle
2.5	SVSP0E225M	2.2	P	0.5	0.10
	SVSP0E335M	3.3	P	0.5	0.10
	SVSP0E475M	4.7	P	0.5	0.20
	SVSP0E685M	6.8	P	0.5	0.20
	SVSJ0E106M	10	J	0.5	0.20
	SVSP0E106M	10	P	0.5	0.20
	SVSP0E156M	15	P	0.5	0.20
	SVSP0E226M	22	P	0.6	0.20
	SVSP0E336M	33	P	0.8	0.20
4	SVSP0G155M	1.5	P	0.5	0.10
	SVSP0G225M	2.2	P	0.5	0.10
	SVSP0G335M	3.3	P	0.5	0.20
	SVSJ0G475M	4.7	J	0.5	0.20
	SVSP0G475M	4.7	P	0.5	0.20
	SVSJ0G685M	6.8	J	0.5	0.20
	SVSP0G685M	6.8	P	0.5	0.20
	SVSJ0G106M	10	J	0.5	0.20
	SVSP0G106M	10	P	0.5	0.20
	SVSP0G156M	15	P	0.6	0.20
	SVSP0G226M	22	P	0.9	0.20
6.3	SVSP0J105M	1.0	P	0.5	0.10
	SVSP0J155M	1.5	P	0.5	0.10
	SVSJ0J225M	2.2	J	0.5	0.20
	SVSP0J225M	2.2	P	0.5	0.20
	SVSJ0J335M	3.3	J	0.5	0.20
	SVSP0J335M	3.3	P	0.5	0.20
	SVSJ0J475M	4.7	J	0.5	0.20
	SVSP0J475M	4.7	P	0.5	0.20
	SVSP0J685M	6.8	P	0.5	0.20
	SVSP0J106M	10	P	0.6	0.20
10	SVSP1A684M	0.68	P	0.5	0.10
	SVSP1A105M	1.0	P	0.5	0.10
	SVSJ1A155M	1.5	J	0.5	0.20
	SVSP1A155M	1.5	P	0.5	0.20
	SVSJ1A225M	2.2	J	0.5	0.20
	SVSP1A225M	2.2	P	0.5	0.20
	SVSP1A335M	3.3	P	0.5	0.20
	SVSP1A475M	4.7	P	0.5	0.20
16	SVSP1C474M	0.47	P	0.5	0.10
	SVSP1C684M	0.68	P	0.5	0.10
	SVSJ1C105M	1.0	J	0.5	0.10
	SVSP1C105M	1.0	P	0.5	0.20

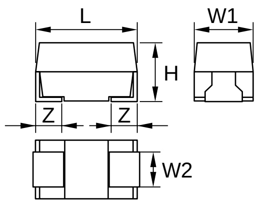
SV/Z Series Tantalum Chip Capacitors (Low−ESR Type)

■ FEATURES

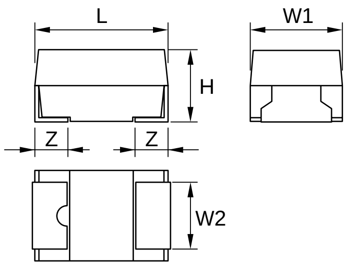
- Low-ESR Type.
- For decoupling with CPU, for absorbing the noise.
- Same Dimension as E/SV series

■ DIMENSIONS [mm]

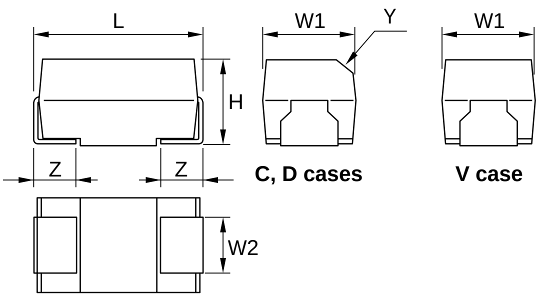
[A case]



[B2 case]



[C, V, D cases]



(Unit: mm)

Case Code	EIA code	L	W_1	W_2	H	Z	Y
A	3216	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.6 ± 0.2	0.8 ± 0.2	–
B2	3528	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.9 ± 0.2	0.8 ± 0.2	–
C	6032	6.0 ± 0.2	3.2 ± 0.2	2.2 ± 0.1	2.5 ± 0.2	1.3 ± 0.2	0.4 C
V	7343L	7.3 ± 0.2	4.3 ± 0.2	2.4 ± 0.1	1.9 ± 0.1	1.3 ± 0.2	–
D	7343	7.3 ± 0.2	4.3 ± 0.2	2.4 ± 0.1	2.8 ± 0.2	1.3 ± 0.2	0.4 C

■ STANDARD C-V VALUE REFERENCE BY CASE CODE

U_R / μF	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V
6.8						C 400	C 400
10		A 800	B2 600				D 300
15						D 250	D 300
22		B2 800	C 500			D 200	
33			C 400		D 200		
47			C 300	D 150	D2, D 150		
68				D 150			
100		C, D 150, 150	C, V, D 125, 150, 100	D 100			
150		C, D 125, 100	V, D 150, 100				
220	D 100	D 100	D 100				
330	D 100	D 100					

Number : ESR (mΩ)

■ PART NUMBER SYSTEM

[Bulk]

SVZ D 1A 107 M

- M: Capacitance Tolerance (M: ±20%)
- 107: Capacitance (pF) (First two digits represent significant figures. Third digit specifies number of zeros to follow.)
- 1A: DC rated voltage in volts (0G: 4 V, 0J: 6.3 V, 1A: 10 V, 1C: 16 V, 1D: 20 V, 1E: 25 V, 1V: 35 V)
- D: Case code
- SVZ: SV/Z Series

[Tape and Reel]

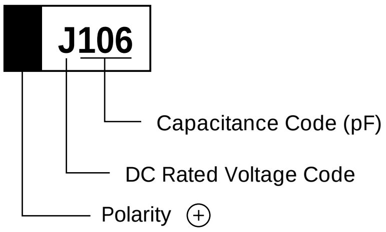
TE SVZD1A107M 12 R

- R: Packing Orientation (R: Cathode on the Side of Sproket Hole)
- 12: Tape width (8: 8 mm (A, B2 case), 12: 12 mm (C, V, D cases))
- SVZD1A107M: Part number of Bulk
- TE: Tape and Reel

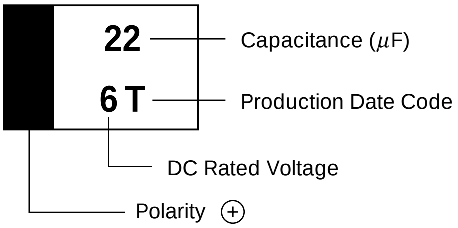
■ MARKINGS

The standard marking shows capacitance, DC rated voltage, and polarity.

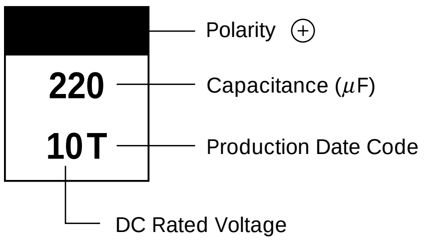
[A case] (ex. 10 μF / 6.3 V)



[B2 case] (ex. 22 μF / 6.3 V)



[C, V, D case] (ex. 220 μF / 10 V)



[DC Rated Voltage code]

Code	G	J	A	C	D	E	V
Rated Voltage	4 V	6.3 V	10 V	16 V	20 V	25 V	35V

[B2, C, V, D cases production date code]

Y \ M	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2001	A	B	C	D	E	F	G	H	J	K	L	M
2002	N	P	Q	R	S	T	U	V	W	X	Y	Z
2003	a	b	c	d	e	f	g	h	j	k	l	m
2004	n	p	q	r	s	t	u	v	w	x	y	z

Note: Production date code will repeat beginning in 2005.

■ PERFORMANCE CHARACTERISTICS

ITEM	SPECIFICATIONS						
Operating Temperature	–55 to +125˚C						
Rated Voltage	4 V	6.3 V	10 V	16 V	20 V	25 V	35 V
Working Voltage at 125˚C	2.5 V	4 V	6.3 V	10 V	13 V	16 V	22 V
Surge Voltage at 85˚C	5.2 V	8 V	13 V	20 V	26 V	33 V	46 V
Capacitance (at 20˚C, 120 Hz)	Range : 6.8 μF to 330 μF Tolerance : ±20%						
Capacitance Change with Temperature	Not to exceed –12% at –55˚C, +12% at 85˚C, +15% at 125˚C						
DC Leakage Current	0.01C • V (μA) or 0.5 μA, Whichever is Greater						
Tangent of Loss Angle	Refer to Standard Ratings						
Equivalent Series Resistance (at 20˚C, 100 kHz)	Refer to Standard Ratings						
Damp Heat (90 to 95%RH at 40˚C, 56 days (1344hrs.))	Capacitance Cange : ±5% to ±12% Tangent of Loss Angle : 150% of Initial Requirements DC Leakage Current : Initial Requirements						
Endurrance (at 85˚C, DC Rated Voltage, 2000hrs.)	Capacitance Cange : ±10% to ±12% Tangent of Loss Angle : Initial Requirements DC Leakage Current : 125% of Initial Requirements						
Resistance to Soldering Heat (solder reflow at 260˚C, 10 s or solder dip at 260˚C, 5 s)	Capacitance Cange : ±5% to ±12% Tangent of Loss Angle : Initial Requirements DC Leakage Current : Initial Requirements						

We obtained IEC Qualification Approval on R Series Standard Ratings in Seprember 1987.

■ STANDARD RATINGS

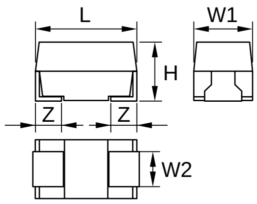
Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	ESR mΩ	Capacitance Chage	
							at Damp Heat at Resistance to Soldering Heat	at Enduar
4	SVZD0G227M	220	D	8.8	0.08	100	± 5%	±10%
	SVZD0G337M	330	D	13.2	0.14	100	±12%	±12%
6.3	SVZA0J106M	10	A	0.6	0.08	800	± 5%	±10%
	SVZB20J226M	22	B2	1.4	0.08	800	± 5%	±10%
	SVZC0J107M	100	C	6.3	0.10	150	± 5%	±10%
	SVZD0J107M	100	D	6.3	0.08	150	± 5%	±10%
	SVZC0J157M	150	C	9.5	0.10	125	± 5%	±10%
	SVZD0J157M	150	D	9.5	0.08	100	± 5%	±10%
	SVZD0J227M	220	D	13.9	0.12	100	±12%	±12%
	SVZD0J337M	330	D	20.8	0.14	100	±12%	±12%
10	SVZB21A106M	10	B2	1.0	0.08	600	± 5%	±10%
	SVZC1A226M	22	C	2.2	0.08	500	± 5%	±10%
	SVZC1A336M	33	C	3.3	0.08	400	± 5%	±10%
	SVZC1A476M	47	C	4.7	0.08	300	± 5%	±10%
	SVZC1A107M	100	C	10.0	0.10	125	± 5%	±10%
	SVZV1A107M	100	V	10.0	0.10	150	± 5%	±10%
	SVZD1A107M	100	D	10.0	0.08	100	± 5%	±10%
	SVZV1A157M	150	V	15.0	0.10	150	± 5%	±10%
	SVZD1A157M	150	D	15.0	0.10	100	±12%	±12%
	SVZD1A227M	220	D	22.0	0.12	100	±12%	±12%
16	SVZD1C476M	47	D	7.5	0.06	150	± 5%	±10%
	SVZD1C686M	68	D	10.9	0.06	150	± 5%	±10%
	SVZD1C107M	100	D	16.0	0.08	100	± 5%	±10%
20	SVZD1D336M	33	D	6.6	0.06	200	± 5%	±10%
	SVZD1D476M	47	D	9.4	0.06	150	± 5%	±10%
25	SVZC1E685M	6.8	C	1.7	0.06	400	± 5%	±10%
	SVZD1E156M	15	D	3.8	0.06	250	± 5%	±10%
	SVZD1E226M	22	D	5.5	0.06	200	± 5%	±10%
35	SVZC1V685M	6.8	C	2.4	0.06	400	± 5%	±10%
	SVZD1V106M	10	D	3.5	0.06	300	± 5%	±10%
	SVZD1V156M	15	D	5.3	0.06	300	± 5%	±10%

PS/L Series NeoCapacitors
CONDUCTIVE POLYMER TANTALUM CAPACITORS

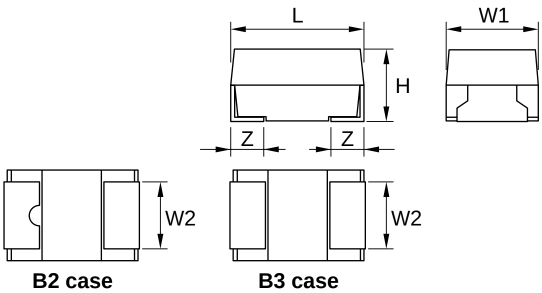
■ FEATURES
- Ultra-Low ESR
- Same Dimension as E/SV series

■ DIMENSIONS [mm]

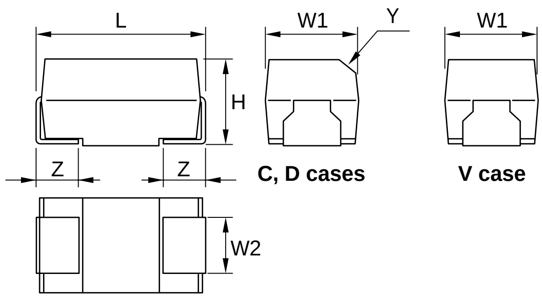
[J, P, A2, A cases]



[B3, B2 cases]



[C, V, D cases]



(Unit: mm)

Case Code	EIA code	L	W_1	W_2	H	Z	Y
J	–	1.6 ± 0.1	0.8 ± 0.1	0.6 ± 0.1	0.8 ± 0.1	0.3 ± 0.15	–
P	2012	2.0 ± 0.2	1.25 ± 0.2	0.9 ± 0.1	1.1 ± 0.1	0.5 ± 0.1	–
A2 (U)	3216L	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.2	–
A	3216	3.2 ± 0.2	1.6 ± 0.2	1.2 ± 0.1	1.6 ± 0.2	0.8 ± 0.2	–
B3 (W)	3528L	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.1 ± 0.1	0.8 ± 0.2	–
B2 (S)	3528	3.5 ± 0.2	2.8 ± 0.2	2.2 ± 0.1	1.9 ± 0.2	0.8 ± 0.2	–
C	6032	6.0 ± 0.2	3.2 ± 0.2	2.2 ± 0.1	2.5 ± 0.2	1.3 ± 0.2	0.4 C
V	7343L	7.3 ± 0.2	4.3 ± 0.2	2.4 ± 0.1	1.9 ± 0.1	1.3 ± 0.2	–
D	7343	7.3 ± 0.2	4.3 ± 0.2	2.4 ± 0.1	2.8 ± 0.2	1.3 ± 0.2	0.4 C

■ STANDARD C-V VALUE REFERENCE BY CASE CODE

U_R / μF	4 V	6.3 V	10 V
2.2		J	J
3.3		J, P	A
4.7		J, P	A2, A
6.8		P, A	A, B2
10	P, A	P, A2, A	A, B2
15		A, B2	B2, C
22	B2	A, B3, B2	B2, C
33	A	B3, B2	B2, C
47	A, B3	B2, C	C, V, D
68	C	B2, C	V, D
100	B2	B2, C	V, D
150	C	C, V, D	D
220	C, V, D	D	D
330	D	D	
470	D		

■ PART NUMBER SYSTEM

[Bulk]

PSL D 0J 337 M (25)

- (25): Special numbering for ESR (ex. (25) shows 25 mΩ)
- M: Capacitance Tolerance (M: ±20%)
- 337: Capacitance (pF) (First two digits represent significant figures. Third digit specifies number of zeros to follow.)
- 0J: DC rated voltage in volts (0G: 4 V, 0J: 6.3 V, 1A: 10 V)
- D: Case code
- PSL: PS/L Series

[Tape and Reel]

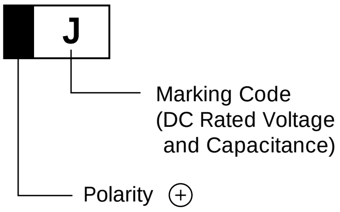
TE PSLD0J337M 12 R

- R: Packing Orientation (R: Cathode on the Side of Sproket Hole)
- 12: Tape width (8: 8 mm (J, P, A2, A, B3, B2 case) 12: 12 mm (C, V, D cases))
- PSLD0J337M: Part number of Bulk
- TE: Tape and Reel

■ MARKINGS

The standard marking shows capacitance, DC rated voltage, and polarity.

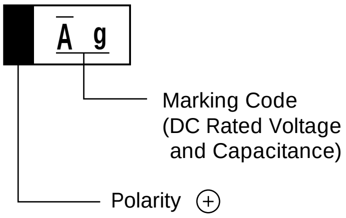
[J case] (ex. 4.7 µF / 6.3 V)



[J case Marking Code]

µF \ U_R	4 V	6.3 V	10 V
2.2		J	A
3.3		J	
4.7		J	
6.8			
10			

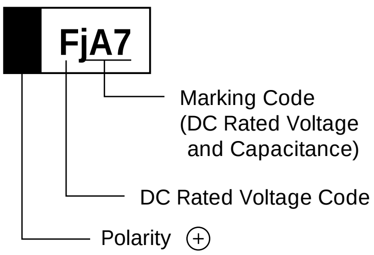
[P case] (ex. 10 µF / 4 V)



[P case Marking Code]

µF \ U_R	4 V	6.3 V	10 V
3.3		N j	
4.7		S j	
6.8		W j	
10	$\overline{\text{A}}$ g	$\overline{\text{A}}$ j	

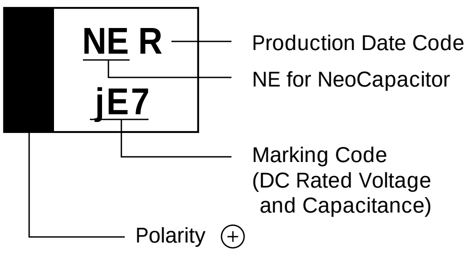
[A2, A cases] (ex. 10 µF / 6.3 V)



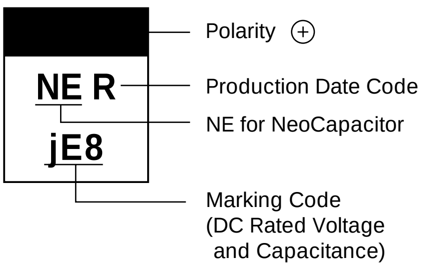
[A2, A, B3, B2, C, V, D cases Marking Code]

µF \ U_R		4 V	6.3 V	10 V
		g	j	A
3.3	N6			AN6
4.7	S6			AS6
6.8	W6			AW6
10	A7	gA7	jA7	AA7
15	W7		jE7	AE7
22	J7	gJ7	jJ7	AJ7
33	N7	gN7	jN7	AN7
47	S7	gS7	jS7	AS7
68	W7	gW7	jW7	AW7
100	A8	gA8	jA8	AA8
150	E8	gE8	jE8	AE8
220	J8	gJ8	jJ8	AJ8
330	N8	gN8	jN8	
470	S8	gS8		

[B3, B2 cases] (ex. 15 µF / 6.3 V)



[C, D cases] (ex. 150 µF / 6.3 V)



[A2, A, B3, B2, C, V, D cases production date code]

Y \ M	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2001	A	B	C	D	E	F	G	H	J	K	L	M
2002	N	P	Q	R	S	T	U	V	W	X	Y	Z
2003	a	b	c	d	e	f	g	h	j	k	l	m
2004	n	p	q	r	s	t	u	v	w	x	y	z

Note: Production date code will repeat beginning in 2005.

■ PERFORMANCE CHARACTERISTICS

ITEM	SPECIFICATIONS		
Operating Temperature	–55 to +105˚C		
Rated Voltage	4 V	6.3 V	10 V
Working Voltage at 105˚C	3.3 V	5 V	8 V
Surge Voltage at 85˚C	5.2 V	8 V	13 V
Capacitance (at 20˚C, 120 Hz)	Range : 2.2 µF to 470 µF Tolerance : ±20%		
Capacitance Change with Temperature	Not to exceed –20% at –55˚C, +15% at 105˚C		
DC Leakage Current	0.1C • V (µA) or 3 µA (J case 10 µA), Whichever is Greater		
Tangent of Loss Angle	Refer to Standard Ratings		
Equivalent Series Resistance (at 20˚C, 100 kHz)	Refer to Standard Ratings		
Damp Heat (90 to 95%RH at 40˚C, 56 days (1344hrs.))	Capacitance Cange : +30% to –20% Tangent of Loss Angle : 150% of Initial Requirements DC Leakage Current : Initial Requirements		
Endurrance (at 85˚C, DC Rated Voltage, 1000hrs.)	Capacitance Cange : ±20% Tangent of Loss Angle : 150% of Initial Requirements DC Leakage Current : Initial Requirements		
Resistance to Soldering Heat (solder reflow at 240˚C, 10 s)	Capacitance Cange : ±20% Tangent of Loss Angle : 130% of Initial Requirements DC Leakage Current : Initial Requirements		

We obtained IEC Qualification Approval on R Series Standard Ratings in Seprember 1987.

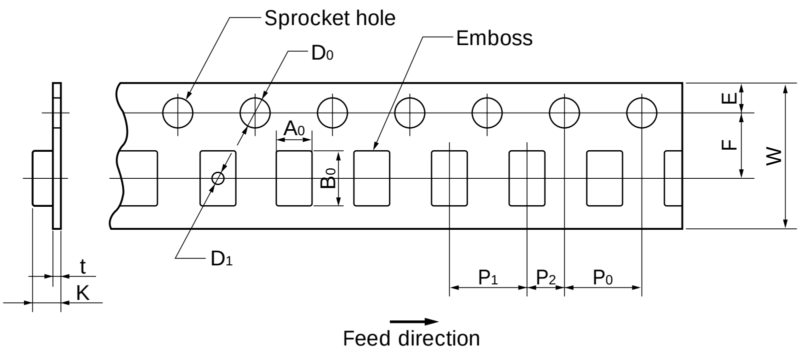
■ STANDARD RATINGS

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	ESR mΩ	Permissible Ripple Current mA rms.
4	PSLP0G106M	10	P	4.0	0.06	500	224
	PSLA0G106M	10	A	4.0	0.06	500	387
	PSLB20G226M	22	B2	8.8	0.08	300	532
	PSLA0G336M	33	A	13.2	0.06	500	387
	PSLA0G476M	47	A	18.8	0.06	200	612
	PSLB30G476M	47	B3	18.8	0.10	80	968
	PSLC0G686M	68	C	27.2	0.09	100	1049
	PSLB20G107M	100	B2	40.0	0.08	70	1102
	PSLB20G107M(45)	100	B2	40.0	0.08	45	1374
	PSLC0G157M	150	C	60.0	0.09	100	1049
	PSLC0G227M	220	C	88.0	0.09	55	1414
	PSLV0G227M	220	V	88.0	0.10	45	1667
	PSLV0G227M(25)	220	V	88.0	0.10	25	2236
	PSLD0G227M	220	D	88.0	0.10	55	1651
	PSLD0G227M(40)	220	D	88.0	0.10	40	1936
	PSLD0G227M(25)	220	D	88.0	0.10	25	2449
	PSLD0G337M	330	D	132	0.10	40	1936
	PSLD0G337M(25)	330	D	132	0.10	25	2449
	PSLD0G477M	470	D	188	0.10	25	2449
	PSLD0G477M(18)	470	D	188	0.10	18	2887
6.3	PSLJ0J225M	2.2	J	10.0	0.04	600	129
	PSLJ0J335M	3.3	J	10.0	0.04	600	129
	PSLP0J335M	3.3	P	3.0	0.06	500	224
	PSLJ0J475M	4.7	J	10.0	0.04	600	129
	PSLP0J475M	4.7	P	3.0	0.06	500	224
	PSLP0J685M	6.8	P	4.3	0.06	500	224
	PSLA0J685M	6.8	A	4.3	0.06	800	306
	PSLP0J106M	10	P	6.3	0.06	500	224
	PSLA20J106M	10	A2	6.3	0.06	500	346
	PSLA0J106M	10	A	6.3	0.06	500	387
	PSLA0J156M	15	A	9.5	0.06	500	387
	PSLB20J156M	15	B2	9.5	0.08	300	532
	PSLA0J226M	22	A	13.9	0.06	500	387
	PSLB30J226M	22	B3	13.9	0.10	80	968
	PSLB20J226M	22	B2	13.9	0.08	300	532
	PSLB30J336M	33	B3	20.8	0.10	80	968
	PSLB20J336M	33	B2	20.8	0.08	300	532
	PSLB20J476M	47	B2	29.6	0.08	200	652
	PSLB20J476M(70)	47	B2	29.6	0.08	70	1102
	PSLC0J476M	47	C	29.6	0.09	100	1049
	PSLB20J686M	68	B2	42.8	0.08	200	652
	PSLB20J686M(70)	68	B2	42.8	0.08	70	1102
	PSLC0J686M	68	C	42.8	0.09	100	1049
	PSLB20J107M	100	B2	63.0	0.08	70	1102
	PSLB20J107M(45)	100	B2	63.0	0.08	45	1374
	PSLC0J107M	100	C	63.0	0.09	100	1049
	PSLC0J157M	150	C	94.5	0.09	100	1049
	PSLC0J157M(55)	150	C	94.5	0.09	55	1414
	PSLV0J157M	150	V	94.5	0.10	45	1667
	PSLD0J157M	150	D	94.5	0.10	55	1651
	PSLD0J157M(40)	150	D	94.5	0.10	40	1936
	PSLD0J157M(25)	150	D	94.5	0.10	25	2449
	PSLD0J227M	220	D	139	0.10	55	1651
	PSLD0J227M(40)	220	D	139	0.10	40	1936
	PSLD0J337M	330	D	208	0.10	40	1936
	PSLD0J337M(25)	330	D	208	0.10	25	2449

Rating (V)	Part Number	Capacitance (μF)	Case Code	DC Leakage Current (μA)	Tangent of Loss Angle	ESR mΩ	Permissible Ripple Current mA rms.
10	PSLA1A335M	3.3	A	3.3	0.06	800	306
	PSLA21A475M	4.7	A2	4.7	0.06	500	346
	PSLA1A475M	4.7	A	4.7	0.06	800	306
	PSLA1A685M	6.8	A	6.8	0.06	800	306
	PSLB21A685M	6.8	B2	6.8	0.08	500	412
	PSLA1A106M	10	A	10.0	0.06	300	500
	PSLB21A106M	10	B2	10.0	0.08	300	532
	PSLB21A156	15	B2	15.0	0.08	300	532
	PSLC1A156M	15	C	15.0	0.09	200	742
	PSLB21A226	22	B2	22.0	0.08	300	532
	PSLC1A226M	22	C	22.0	0.09	150	856
	PSLB21A336	33	B2	33.0	0.08	200	652
	PSLC1A336M	33	C	33.0	0.09	100	1049
	PSLC1A476M	47	C	47.0	0.09	100	1049
	PSLV1A476M	47	V	47.0	0.10	60	1443
	PSLD1A476M	47	D	47.0	0.10	100	1225
	PSLV1A686M	68	V	68.0	0.10	60	1443
	PSLD1A686M	68	D	68.0	0.10	100	1225
	PSLV1A107M	100	V	100	0.10	45	1667
	PSLD1A107M	100	D	100	0.10	55	1651
	PSLD1A157M	150	D	150	0.10	55	1651
	PSLD1A157M(40)	150	D	150	0.10	40	1936
	PSLD1A227M	220	D	220	0.10	40	1936
	PSLD1A227M(25)	220	D	220	0.10	25	2449

TAPE AND REEL SPECIFICATIONS

Plastic Tape Carrier

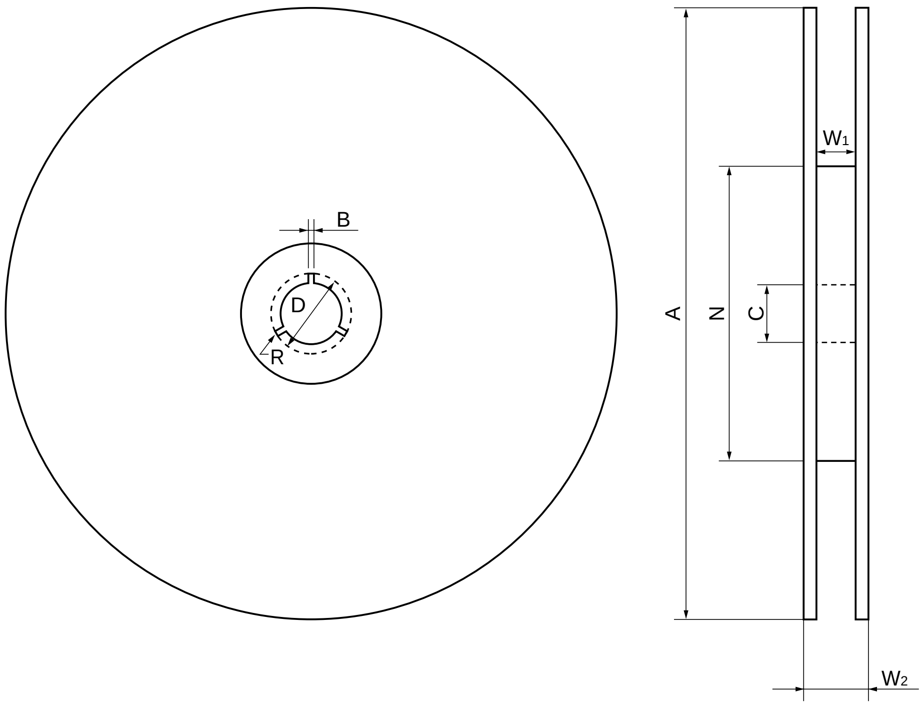


Unit: mm

Case Code	$A_0 \pm 0.2$	$B_0 \pm 0.2$	$K \pm 0.2$
J	1.0	1.8	1.1
P	1.4	2.2	1.4
A2 (U)	1.9	3.5	1.4
A	1.9	3.5	1.9
B3	3.2	3.8	1.4
B2 (S)	3.3	3.8	2.1
C	3.7	6.4	3.0
V	4.6	7.7	2.4
D	4.8	7.7	3.3

<table>
<tr><th>Case Code</th><th>$W \pm 0.3$</th><th>$F \pm 0.05$</th><th>$E \pm 0.1$</th><th>$P_1 \pm 0.1$</th><th>$P_2 \pm 0.05$</th><th>$P_0 \pm 0.1$</th><th>$D_0{}^{+0.1}_{0}$</th><th>D_1 min.</th><th>t</th></tr>
<tr><td>J</td><td rowspan="6">8</td><td rowspan="6">3.5</td><td rowspan="9">1.75</td><td rowspan="6">4</td><td rowspan="9">2</td><td rowspan="9">4</td><td rowspan="9">ϕ1.5</td><td>–</td><td rowspan="6">0.2</td></tr>
<tr><td>P</td><td>–</td></tr>
<tr><td>A2 (U)</td><td rowspan="4">ϕ1.0</td></tr>
<tr><td>A</td></tr>
<tr><td>B3 (W)</td></tr>
<tr><td>B2 (S)</td></tr>
<tr><td>C</td><td rowspan="3">12</td><td rowspan="3">5.5</td><td rowspan="3">8</td><td rowspan="3">ϕ1.5</td><td>0.3</td></tr>
<tr><td>V</td><td>0.4</td></tr>
<tr><td>D</td><td>0.3</td></tr>
</table>

REEL



Unit: mm

Tape Width	A ± 2	N Min.	C ± 0.5	D ± 0.5	B ± 0.5	W_1	W_2 Max.	R
8 mm	ϕ180	ϕ50	ϕ13	ϕ21	2	9.0 ± 0.3	11.4 ± 1.0	1
12 mm						13.0 ± 0.3	15.4 ± 1.0	
8 mm	ϕ330	ϕ80	ϕ13	ϕ21	2	9.5 ± 0.5	14.5 Max.	1
12 mm						13.5 ± 0.5	18.5 Max.	

Case Code	ϕ180 Reel	ϕ330 Reel
J	4000	–
P	3000	–
A2 (U)	3000	10,000
A	2000	9000
B3 (W)	3000	–
B2 (S)	2000	5000
V	1000	3000
C, D	500	2500

[Quantity Per Reel]

NOTES ON USING THE SOLID TANTALUM CAPACITORS

1. Circuit Design

(1) Reliability

The reliability of the solid tantalum capacitor is heavily influenced by environmental conditions such as temperature, humidity, shock, vibration, mechanical stresses, and electric stresses, including applied voltage, current, ripple current, transient current and voltage, and frequency. When using solid tantalum capacitors, therefore, provide enough margin so that the reliability of the capacitors is maintained.

Voltage and temperature are important parameters when estimating the reliability (field failure rate).

The field failure rate of a solid tantalum capacitor can be calculated by the following expression if emphasis is placed only on the voltage and temperature:

$$\lambda = \lambda_0 (V/V_0)^3 \times 2^{(T-T_0)/10}$$

Where

λ: estimated failure rate in actual working condition
temperature: T; voltage: V

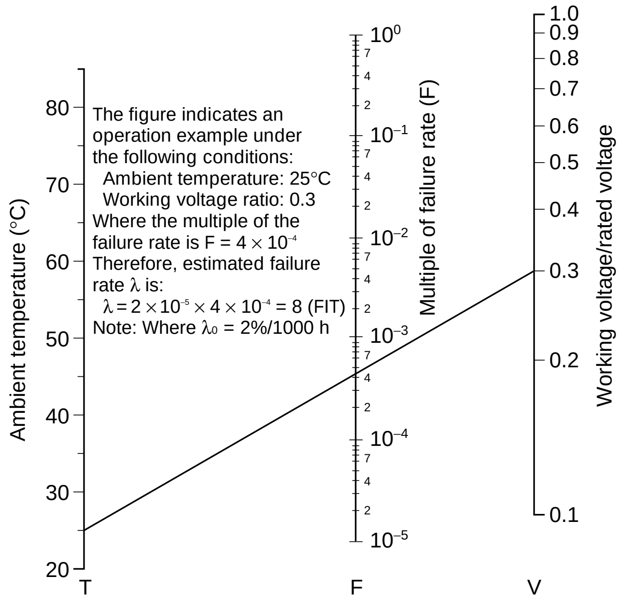
λ_0: failure rate under rated load (See table below.)
temperature: T_0; voltage: V_0

Failure rate level λ_0 of each series

Series	Failure rate level
PS/L	1%/1000 h
E/SV	1%/1000 h
R (standard)	1%/1000 h
R (extended)	1%/1000 h
SV/S	1%/1000 h
SV/Z	1%/1000 h

<Test conditions>

Temperature: 85°C
Voltage: rated voltage
R_S: 3 Ω



This figure graphically indicates $(V/V_0)^3 \times 2^{(T-T_0)/10}$ in the expression $\lambda = \lambda_0 (V/V_0)^3 \times 2^{(T-T_0)/10}$. By using this figure, the estimated failure rate can be easily calculated.

Connect the desired temperature and voltage ratio with a straight line (from the left most vertical axis in the figure to the right most axis) in the figure. The multiple of the failure rate can be obtained at the intersection of the line drawn and the middle vertical axis in the figure.

Therefore,

$$\lambda = \lambda_0 \times F$$

Where

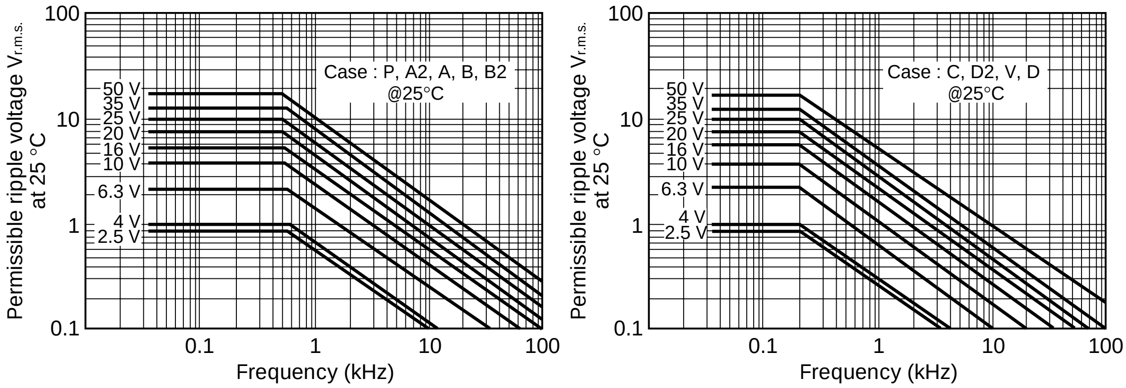
F: multiple of failure rate at given temperature and ratio of working voltage to rated voltage.

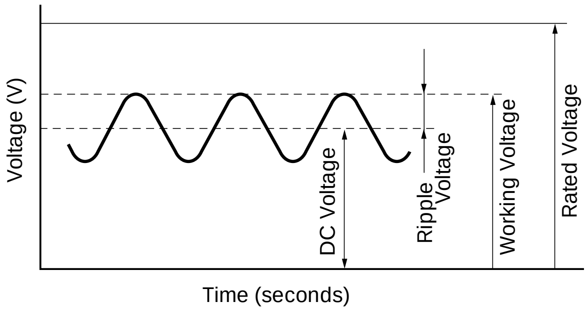
2. Ripple Voltage

(1) Keep the sum of the DC voltage and peak value of the ripple voltage within the rated voltage.

(2) If a ripple voltage is applied to the capacitor, the peak value of the ripple voltage must be kept within the values shown in the following figures:

Chips





Calculate the permissible ripple voltage at a temperature higher than that specified in these figures by using the following expressions:

$V_{r.m.s.}$ (at 50°C) = 0.7 × $V_{r.m.s.}$ (at 25°C)

$V_{r.m.s.}$ (at 85°C) = 0.5 × $V_{r.m.s.}$ (at 25°C)

$V_{r.m.s.}$ (at 125°C) = 0.3 × $V_{r.m.s.}$ (at 25°C)

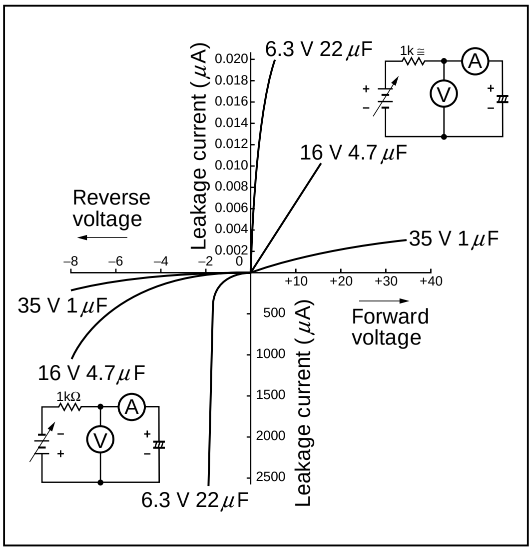
(3) Keep the negative peak value of the ripple voltage within the permissible reverse voltage value specified in the following section, Reverse Voltage.

3. Reverse Voltage

(1) Because the solid tantalum capacitor is of polar type, do not apply a reverse voltage to it. If reverse voltage cannot be avoided, it must be applied for a short time and must not exceed the following values:

25°C ...... 10% max. of rated voltage or 3 Vdc, whichever is smaller
85°C ...... 5% max. of rated voltage
125°C ...... 1% max. of rated voltage

(2) The figure on the right shows the relationship between current and reverse voltage.



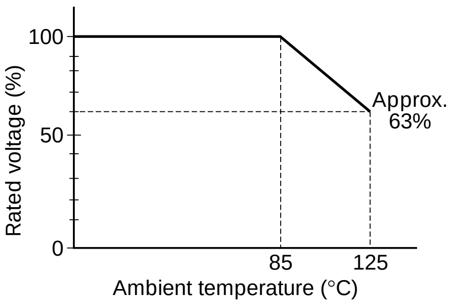
4. Applied Voltage

(1) For general applications, apply 70% or less of the rated voltage to the capacitor.
(2) When the capacitor is used in a power line or a low-impedance circuit, keep the applied voltage within 30% (50% max.) of the rated voltage to avoid the adverse influence of inrush current.
(3) Derated voltage at 85°C or more.
When using a Chip-type capacitor at a temperature of 85°C or higher, calculate reduced voltage U_T from the following expression. Note, however, that the ambient temperature must not exceed 125°C.

The rated voltage ratio is as shown in the figure on the right.

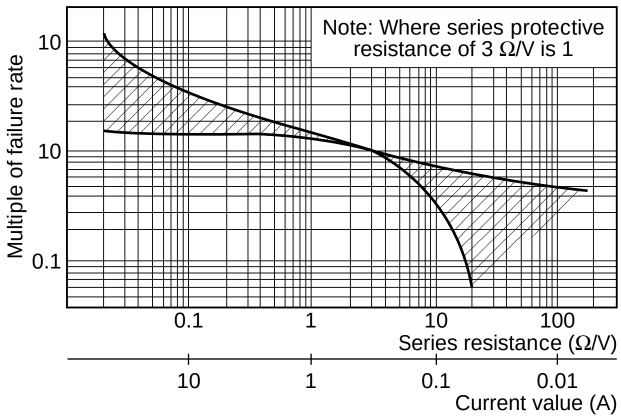
$$U_T = V_0 \frac{U_R - U_C}{40} (T-85)$$

Where
U_R: rated voltage (V)
U_C: derated voltage at 125°C
T: ambient temperature (°C)



5. Current (Series Resistance)

As shown in the figure on the right, reliability is increased by inserting a series resistance of at least 3Ω/V into circuits where current flow is momentary (switching circuits, charge/discharge circuits, etc). If the capacitor is in a low-impedance circuit, the voltage applied to the capacitor should be less than 1/2 to 1/3 of the DC rated voltage.



NOTES ON USING THE CHIP TANTALUM CAPACITORS, EXCLUDING NeoCapacitors

1. Mounting

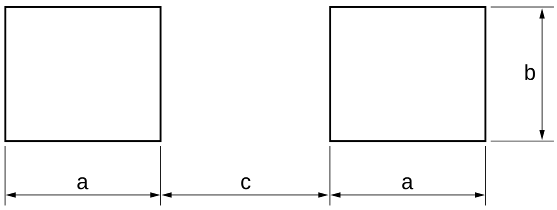
(1) Direct Soldering

Keep the following points in mind when soldering the capacitor by means of jet soldering or dip soldering:

(a) Temporarily fixing resin

Because chip tantalum capacitors are larger and subject to more force than chip multilayer ceramic capacitors or chip resistors, more resin is required to temporarily secure the solid tantalum capacitors. However, if too much resin is used, the resin adhering to the patterns on a printed circuit board may adversely affect the solderability.

(b) Pattern design



(mm)

Case	a	b	c
P	2.2	1.4	0.7
A2 (U), A	2.9	1.7	1.2
B3 (W), B2 (S)	3.0	2.8	1.6
B	3.3	1.9	2.4
C	4.1	2.3	2.4
D2	5.4	2.9	2.4
D	5.2	2.9	3.7

The above dimensions are for reference only. If the capacitor is to be mounted by this method, and if the pattern is too small, the solderability may be degraded.

(c) Temperature and time

Keep the peak temperature and time within the following values:

Solder temperature .... 260°C max.
Time .... 5 seconds max. (10 seconds max. for SVH)

Whenever possible, perform preheating (at 150°C max.) for a smooth temperature profile. To maintain reliability, mount the capacitor at low temperature and in a short time.

(d) Component layout

If many types of chip components are mounted on a printed circuit board that is to be soldered by means of jet soldering, solderability may not be uniform over the entire board, depending on the layout and density of the components on the board (also take into consideration generation of flux gas).

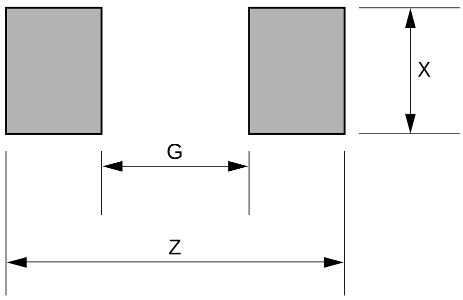
(e) Flux

Use resin-based flux. Do not use flux with strong acidity.

(2) Reflow Soldering

Keep the following points in mind when soldering the capacitor in a soldering oven or with a hot plate:

(a) Pattern design (in accordance with IEC1188)



(mm)

Case	G Max.	Z Min.	X Min.
J	0.7	2.5	1.0
P	0.5	2.6	1.2
A2 (U), A	1.1	3.8	1.5
B3 (W), B2 (S)	1.4	4.1	2.7
B	2.6	5.6	2.9
C	2.9	6.9	2.7
D2 (T)	2.7	6.7	2.9
D	4.1	8.2	2.9

The above dimensions are recommended. Note that if the pattern is too big, the component may not be mounted in place.

(b) Temperature and time

Keep the peak temperature and time within the following values:

Solder temperature .... 260°C max.
Time .... 10 seconds max.

Whenever possible, perform preheating (at 150°C max.) for a smooth temperature profile. To maintain reliability, mount the capacitor at low temperature and in a short time. The peak temperature and time shown above are applicable when the capacitor is to be soldered in a soldering oven or with a hot plate. When the capacitor is soldered by means of infrared reflow soldering, the internal temperature of the capacitor may rise beyond the surface temperature.

(3) Using a Soldering Iron

When soldering the capacitor with a soldering iron, controlling the temperature at the tip of the soldering iron is very difficult. However, it is recommended that the following temperature and time be observed to maintain the reliability of the capacitor:

Iron temperature .... 300°C max.
Time .... 3 seconds max.
Iron power .... 30 W max.

2. Cleaning

Generally, several organic solvents are used for flux cleaning of an electronic component after soldering. Many cleaning methods, such as immersion cleaning, rinse cleaning, brush cleaning, shower cleaning, vapor cleaning, and ultrasonic cleaning, are available; cleaning methods may be used alone or two or more may be used in combination. The temperature of the organic solvent may vary from room temperature to several 10°C, depending on the desired effect. If cleaning is carried out with emphasis placed only on the cleaning effect, however, the marking on the electronic component cleaned may be erased, the appearance of the component may be damaged, and, in the worst case, the component may be functionally damaged. It is therefore recommended that the R series solid tantalum capacitor be cleaned under the following conditions:

Recommended conditions of flux cleaning

(1) Cleaning solvent .... Chlorosen, isopropyl alcohol
(2) Cleaning method .... Shower cleaning, rinse cleaning, vapor cleaning
(3) Cleaning time .... 5 minutes max.

Note. Ultrasonic cleaning

This cleaning method is extremelys effective for eliminating dust generated by mechanical processes, but may pose problems depending on the condition. An experiment conducted by NEC TOKIN confirmed that the external terminals of the capacitor were cut when it was cleaned with some ultrasonic cleaning machines. The cause of this phenomenon is metal fatigue of the capacitor terminals due to ultrasonic cleaning. To prevent the terminal from being cut, decreasing the output power of the ultrasonic cleaning machine or shortening the cleaning time may be effective. However, it is difficult to specify the cleaning conditions because there are many factors involved, such as the conversion efficiency of the ultrasonic oscillator, transfer efficiency of the cleaning bath, difference in cleaning effect depending on the location in the cleaning bath, the size and quantity of the printed circuit boards to be cleaned, and the securing states of the components on the boards. It is therefore recommended that ultrasonic cleaning be avoided as much as possible.

If ultrasonic cleaning is essential, make sure through experiments that no abnormalities occur as a result of the cleaning. For further information, consult NEC TOKIN.

3. Other

(1) Do not subject the capacitor to excessive vibration and shock.

(2) The solderability of the capacitor may be degraded by humidity. Store the capacitor at room temperature (–5 to +40°C) and humidity (40 to 60% RH).

(3) Take care that no external force is applied to tape-packaged products (if the packaging material is deformed, the capacitor may not be automatically mounted by a chip mounter).

NOTES ON USING NeoCapacitors

1. Permissible Ripple Current

Permissible ripple current shall be derated as follows:

(1) Temperature Change

25˚C: Rating value
85˚C: 0.9 times rating value
105˚C: 0.4 times rating value

(2) Switching Frequency

100 kHz: rating value
500 kHz: 1.1 times rating value
1 MHz: 1.3 times rating value

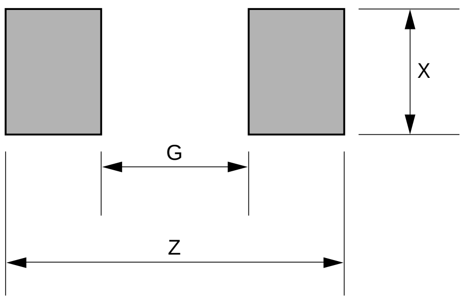
2. Mounting

This capacitor is designed to be surface mounted by means of reflow soldering.
(The conditions under which the capacitor should be soldered with a soldering iron are explained in (2) Using a Soldering Iron. Because the capacitor is not designed to be soldered by means of laser beam soldering, VPS, or flow soldering, the conditions for these soldering methods are not explained in this document.

(1) Reflow Soldering

Keep the following points in mind when soldering the capacitor in a soldering oven with a hot plate:

(a) Pattern design (in accordance with IEC1188)



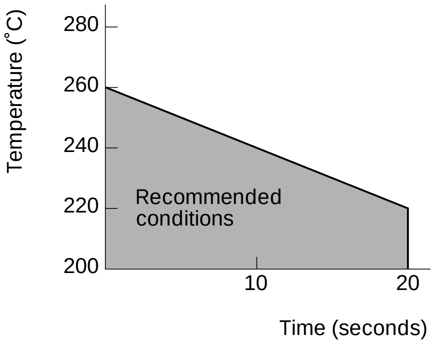
(mm)

Case	G Max.	Z Min.	X Min.
J	0.7	2.5	1.0
P	0.5	2.6	1.2
A2 (U), A	1.1	3.8	1.5
B3 (W), B2 (S)	1.4	4.1	2.7
C	2.9	6.9	2.7
V, D	4.1	8.2	2.9

The above dimensions are recommended. Note that if the pattern is too big, the component may not be mounted in place.

(b) Temperature and time

Keep the peak temperature and time within the following recommended conditions.



Whenever possible, perform preheating (at 150°C max.) for a smooth temperature profile. To maintain reliability, mount the capacitor at low temperature and in a short time. The peak temperature and time shown above are applicable when the capacitor is to be soldered in a soldering oven or with a hot plate. When the capacitor is soldered by means of infrared reflow soldering, the internal temperature of the capacitor may rise beyond the surface temperature.

(2) Using a Soldering Iron

When soldering the capacitor with a soldering iron, controlling the temperature at the tip of the soldering iron is very difficult. However, it is recommended that the following temperature and time be observed to maintain the reliability of the capacitor:

Iron temperature ... 300°C max.
Time .... 3 seconds max.
Iron power .... 30 W max.

3. Cleaning

Generally, several organic solvents are used for flux cleaning of an electronic component after soldering. Many cleaning methods, such as immersion cleaning, rinse cleaning, brush cleaning, shower cleaning, vapor cleaning, and ultrasonic cleaning, are available, whith may be used alone or in combination. The temperature of the organic solvent may vary from room temperature to several 10°C, depending on the desired effect. If cleaning is carried out with emphasis placed only on the cleaning effect, however, the marking on the electronic component cleaned may be erased, the appearance of the component may be damaged, and, in the worst case, the component may be functionally damaged. It is therefore recommended that the NeoCapacitor be cleaned under the following conditions:

[Recommended conditions of flux cleaning]

(1) Cleaning solvent .... Isopropyl alcohol
(2) Cleaning method .... Shower cleaning, rinse cleaning, vapor cleaning
(3) Cleaning time .... 5 minutes max.

Note: Ultrasonic cleaning

This cleaning method is extremely effective for eliminating dust generated by mechanical processes, but may pose problems, depending on the condition. An experiment conducted by NEC TOKIN confirmed that the external terminals of the capacitor were cut when it was cleaned with some ultrasonic cleaning machines. The cause of this phenomenon is metal fatigue of the capacitor terminals due to ultrasonic cleaning. To prevent the terminal from being cut, decreasing the output power of the ultrasonic cleaning machine or decreasing the cleaning time may be effective. However, it is difficult to specify safe cleaning conditions because there are many factors involved, such as the conversion efficiency of the ultrasonic oscillator, transfer efficiency of the cleaning bath, difference in cleaning effect depending on the location in the cleaning bath, the size and quantity of the printed circuit boards to be cleaned, and the securing states of the components on the boards. It is therefore recommended that ultrasonic cleaning be avoided as much as possible.
If ultrasonic cleaning is essential, make sure through experiments that no abnormalities occur as a result of the cleaning. For further information, contact NEC TOKIN.

4. Derating

Apply appropriate voltage to the capacitors according to the failure rate estimation. It is recommended that the applied voltage be less than 80 % of the rated voltage.

5. Other

(1) Do not subject the capacitor to excessive vibration and shock.

(2) The solderability of the capacitor may be degraded by humidity. Store the capacitor at room temperature (–5 to +40°C) and humidity (40 to 60% RH).

(3) Take care that no external force is applied to tape-packaged products (if the packaging material is deformed, the capacitor may not be automatically mounted by automatic insertion equipment).

NEC TOKIN Corporation

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