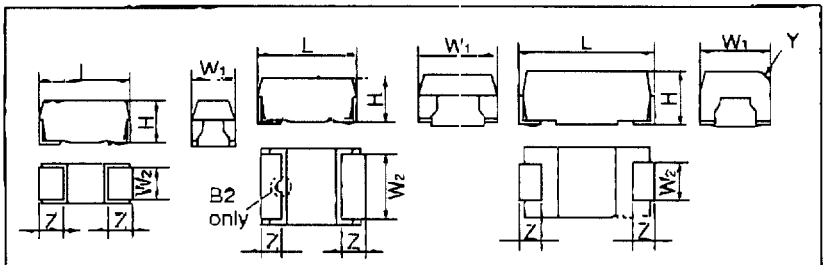
R Series Tantalum Chip Capacitors

DIMENSIONS [mm]



[A2, A cases] [B3, B2 cases] [B, C, D and D2 cases]

Case Code	L	W_1	W_2	H	Z	Y
A2	3.2±0.2	1.6±0.2	1.2±0.1	1.2 MAX.	0.8±0.2	
A	3.2±0.2	1.6±0.2	1.2±0.1	1.6±0.2	0.8±0.2	
B3	3.5±0.2	2.8±0.2	2.2±0.1	1.2 MAX.	0.8±0.2	
B2	3.5±0.2	2.8±0.2	2.3±0.1	1.9±0.2	0.8±0.2	
B	4.7±0.3	2.6±0.3	1.4±0.1	2.1±0.3	0.8±0.2	0.4C
C	6.0±0.3	3.2±0.3	2.2±0.1	2.5±0.3	1.3±0.2	0.4C
D2	5.8±0.3	4.6±0.3	2.4±0.1	3.2±0.3	1.3±0.2	
D	7.3±0.3	4.3±0.3	2.4±0.1	2.8±0.3	1.3±0.2	0.5C

(STANDARD C-V Value REFERENCE BY CASE CODE)

μF \ DC rated voltage (Vdc)	4	6.3	10	16	20	25	35	50
0.010								
0.015								
0.022								
0.033								
0.047							A	
0.068							A	
0.10							A	A
0.15							A	A
0.22							A	B2
0.33							A	B2
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	D D2
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							

PERFORMANCE CHARACTERISTICS

Operating temperature range
−55 to +125°C with proper voltage derating as shown in following table.

DC working voltage and surge voltage

Rated voltage		2.5	4	6.3	10	16	20	25	35	50	V
Working	at 85°C	2.5	4	6.3	10	16	20	25	35	50	V
	at 125°C	1.6	2.5	4	6.3	10	13	16	22	32	V
Surge	at 85°C	3.3	5.2	8	13	20	26	33	46	65	V

Capacitance (at 20°C, 120 Hz)
Range 0.047 μF to 470 μF
Tolerance ± 20%, (±10%)

Capacitance change with temperature
Not to exceed −12% at −55°C, +12% at 85°C and +15% at 125°C

Tangent of loss angle (at 20°C, 120 Hz)
(STANDARD)
0.047 μF to 4.7 μF less than 0.04
6.8 μF to 68 μF less than 0.06
(EXTENDED)**
2.5 Vdc to 10 Vdc less than 0.08
16 Vdc to 35 Vdc less than 0.06

DC leakage current (at 20°C)
0.01 C·V* μA or 0.5 μA whichever is greater

Damp heat (90 to 95% RH at 40°C, 56 days (1344 h))
Capacitance change ±5% (±12%)***
Tangent of loss angle 150% of initial requirements
DC Leakage current initial requirements

Endurance (at 85°C, DC rated voltage, 2000 h)
Capacitance change ±10% (±12%)***
Tangent of loss angle initial requirements
DC Leakage current 125% of initial requirements

Resistance to soldering heat
(solder reflow at 260°C, 10 sec.
or solder dip at 260°C, 5 sec.)
Capacitance change +5% (+12%)***
Leakage current initial requirements
Tangent of loss angle initial requirements

NEC obtained IEC Qualification Approval on R series Standard Ratings on September, 1987.

* : Product of capacitance in μF and voltage in V

** : Refer to standard ratings. about tangent of lose angle of the following items
2.5V/15 μF, 22 μF, 4V/10 μF, 15 μF, 22 μF, 6.3 V/15 μF products in A2 case.
2.5V/47 μF, 68 μF, 4V/33 μF, 47 μF, 6.3V/22 μF, 33 μF products in A case.
2.5V/47 μF, 68 μF, 4V/33 μF, 47 μF, 6.3V/22 μF, 33 μF, 47 μF, 10V/22 μF products in B3 case
2.5V/150 μF, 4V/100 μF, 6.3V/68 μF products in B2 case
2.5V/220 μF, 470 μF, 4V/150 μF, 220 μF, 6.3V/100 μF, 150 μF, 220 μF products in C case
2.5V/330 μF, 4V/220 μF, 6.3V/150 μF, 10V/100 μF products in D2 case
2.5V/470 μF, 4V/330 μF, 6.3V/220 μF, 10V/150 μF, 16V/100 μF products in D case

*** : Capacitance change of ± 12% applies to
2.5V/4.7 μF to 22 μF, 4V/4.7 μF to 22 μF, 6.3V/3.3 μF to 15 μF, 10V/2.2 μF to 10 μF, 16V/1.5 μF, 2.2 μF, 20V/1 μF, 1.5 μF products in A2 case, 2.5V/15 μF to 47 μF, 4V/10 μF to 47 μF, 6.3V/6.8 μF to 33 μF, 10V/4.7 μF to 10 μF, 16V/3.3 μF to 6.8 μF, 20V/2.2 μF to 4.7 μF, 25V/1.5 μF, 2.2 μF, 35V/1 μF, 1.5 μF products in A case, 2.5V/33 μF to 150 μF,

Discription

NEC's tantulum capacitors offer the designer advanced technological design and excellent performance characteristics for filtering, by-passing, 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 non-existent in solid electrolyte tantalums.

A process used further to improve the reliability of the 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 based on the fact that solid electrolyte tantalum capacitors do not conform to the exponential distribution of time orderd failures, but, instead exhibit a constantly decreasing failure rate.

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

CHIP TANTALUM CAPACITORS

Conventional Type							
Series	Operating Temperature Range(°C)	DC Rated Voltage Range(V)	Capacitance Range(μF)	Capacitance Tolerance (%)	DC Leakage Current (μA)	Tangent of loss angle	Features
R	−55 to +125	(STANDARD) 4 to 50	(STANDARD) 0.047 to 68	±20 ±10	0.01 CV* 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) 0.1 to 470	±20 ±10	0.01 CV* 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	Miniaturized
SVS	−55 to +125	2.5 to 16	0.33 to 10	±20	0.01 CV* or 0.5 whichever is greater	0.1, 0.2 (*3)	Ultra miniaturized
SVH	−55 to +125	10 to 35	0.1 to 33	±20 ±10	0.01 CV* or 0.5 whichever is greater	0.1 to 4.7 μF : 0.04 6.8 to 33 μF : 0.06	Higher performance
SVF	−55 to +125	10 to 50	1 to 47	±20 ±10	0.01 CV* or 0.5 whichever is greater	1 to 4.7 μF : 0.04 6.8 to 47 μF : 0.06	Fuse built-in
SVZ	−55 to +125	4 to 10	10 to 330	±20	0.01 CV* or 0.5 whichever is greater	0.08 to 0.14 (*4)	Low ESR
NeoCapacitor (Functional Polymer Tantalum Capacitors)							
PSL	−55 to +105	4 to 10	3.3 to 330	±20	0.1 CV* or 3 whichever is greater	0.09 to 0.50 (*5)	Ultra-low ESR
PSN	−55 to +85	4 to 16	3.3 to 220	±20	0.1 CV* or 3 whichever is greater	0.09 to 0.50 (*5)	Low ESR

(*):Product of capacitance in μF and voltage in V.
(*2):Refer to Standard Ratings on page 9,10
(*3):Refer to Standard Ratings on page 12
(*4):Refer to Standard Ratings on page 20
(*5):Refer to Standard Ratings on page 25

(R SERIES EXTENDED C-V Value REFERENCE BY CASE CODE)

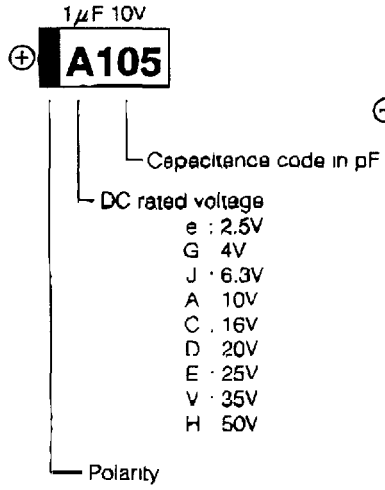
DC rated voltage / μF	2.5	4	6.3	10	16	20	25	35
0.10						A2		
0.15						A2		
0.22						A2		
0.33						A2		
0.47						A2		A
0.68					A2	A2	A	A
1.0				A2	A2	A2,A	A	A
1.5			A2	A2	A2	A2,A	A	A,B2.B
2.2		A2	A2	A2	A2,A	A	A,B2	B2,B
3.3		A2	A2	A2,A	A	A,B2	B2,B	B2
4.7	A2	A2	A2,A	A2,A	A,B2	A,B2,B	B2	C
6.8	A2	A2,A	A2,A	A,B2	A,B3,B2,B	B2	C	C
10	A2	A2,A	A2,A,B2	A2,A,B3,B2,B	B2	B2,C	C	D2.D
15	A2,A	A2,A,B2	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	B2,C	B2,C,D2,D	C,D2,D	D			
100	B2	B2,C,D2,D	B2,C,D2,D	C,D2,D	D			
150	B2	C,D2,D	C,D2,D	D				
220	C	C,D2,D	C,D	D				
330	D2	C,D	D					
470	C,D	D						

4V/100 μF, 6.3V/68 μF, 100 μF, 10V/4.7 μF products in B2 case, 2.5V/220 μF, 470 μF, 4V/150 μF to 330 μF, 6.3V/100 μF, 10V/68 μF, 16V/47 μF products in C case, 2.5V/330 μF, 4V/220 μF, 6.3V/150 μF, 10V/100 μF products in D2 case, 2.5V/470 μF, 4V/330 μF, 470 μF, 6.3V/220 μF, 330 μF, 10V/150 μF, 220 μF,16V/100 μF products in D case.
Capacitance change of ±15% applies to all products of B3 case.

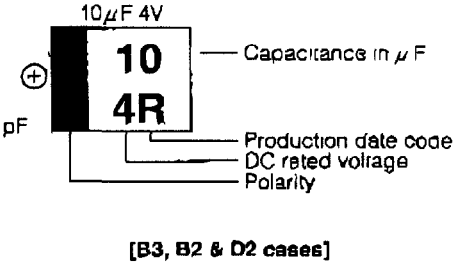
See page 21, 22 for taping specification.

MARKINGS

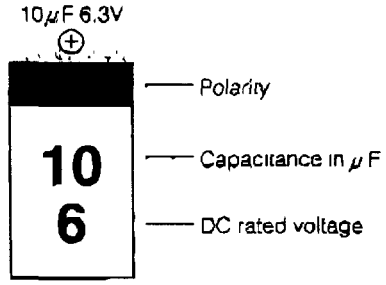
The standard marking shows capacitance, DC rated voltage, and polarity.



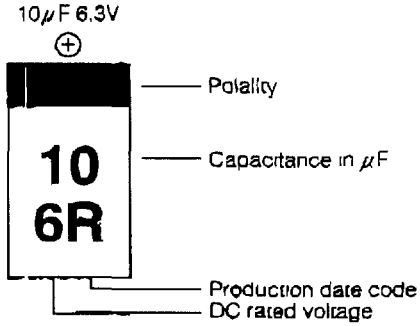
[A2, A cases]



[B3, B2 & D2 cases]



[B case]



[C, D cases]

[Marking of production date code]

Y \ M	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1999	a	b	c	d	e	f	g	h	j	k	l	m
2000	n	p	q	r	s	t	u	v	w	x	y	z
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

NOTE : Production date code will resume for begining in 2003.

PART NUMBER SYSTEM

- **Bulk**

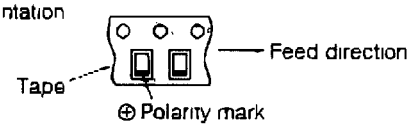
NR A 475 M 04

- 04 — DC rated voltage in volts
- M — Capacitance tolerance: M ±20%, K ±10%
- 475 — Capacitance (pF): First two digits represent significant figures. Third digit specifies number of zeros to follow.
- A — Case code: U A2 case, A A case, W B3 case, S B2 case, B B case, C C case, T D2 case, D D case
- NR — NEC R Series

- **Tape & Reel**

NR A 475 M 04 R 8

- 8 — Tape width (8 mm: U, A, W, S 12 mm B, C, T, D)
- R — Tape & Reel
  - R: Reel diameter 180 mm (7.09 inch)
    Orientation



  - P: Reel diameter 330 mm (13 inch)
    Orientation