Solid-Electrolyte TANTALEX® Capacitors, Resin-Coated, Radial-Lead



FEATURES

- Terminations: Tin/lead (SnPb), 100 % tin (Sn)
- Economy and high performance are combined in these radial-lead, solid-electrolyte TANTALEX® capacitors
- Rugged, reliable capacitors featuring low leakage current and low dissipation factor
- Six miniature case sizes and five lead styles. All case sizes are available in standard tape and reel packaging per EIA-468
- Standard ratings include replacements for Type 196D capacitors
- Lead (Pb)-free capacitors have "L" in body marking
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free Available

RoHS* COMPLIANT

Note

* Lead (Pb)-containing terminations are not RoHS-compliant. Exemptions may apply.

APPLICATIONS

Suitable for a broad range of consumer, commercial and industrial equipment

PERFORMANCE CHARACTERISTICS

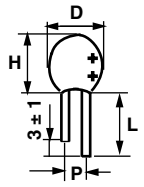
Operating Temperature: - 55 °C to + 85 °C
(to + 125 °C with voltage derating)
Capacitance Tolerance: At 120 Hz, + 25 °C, ± 20 %, ± 10 % standard. ± 5 % available as special
Dissipation Factor: At 120 Hz, + 25 °C. Dissipation factor, shall not exceed the values listed in the Standard Ratings tables.
DC Leakage Current (DCL Max.):
At + 25 °C: Leakage current shall not exceed the values listed in the Standard Ratings tables.

At + 85 °C: Leakage current shall not exceed 10 times the values listed in the Standard Ratings tables.
At + 125 °C: Leakage shall not exceed 15 times the values listed in the Standard Ratings tables.
Life Test: Capacitors shall withstand rated DC voltage applied at + 85 °C for 1000 h with a circuit resistance not greater than 3 Ω.
Following the life test:

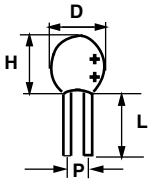
1. DCL shall not exceed 125 % of the initial requirements
2. Dissipation Factor shall meet the initial requirement
3. Change in capacitance shall not exceed ± 10 %

LEAD STYLE CONFIGURATIONS AND DIMENSIONS** (LL = Lead Length)

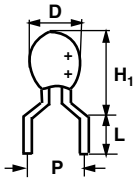
"LONG/SHORT" LL
1, 3 and Y



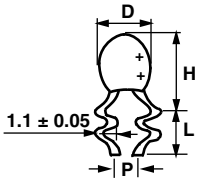
EVEN LL
2, 4 and 5



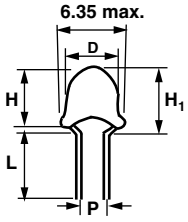
"OUTSIDE HOCKEYSTICK"
6 and 7



"SNAP-IN"
9



"HAIRPIN" X, Z



(1) - WIRE DIAMETER (NOMINAL) 0.020" [0.51 mm]

AVAILABLE LEAD STYLES AND PACKAGING TYPES PER CASE SIZE

LEAD STYLE/CASE	1	2	3	4	5	6	7	9	X	Y	Z
A	Bulk V1	Bulk V1 Reel B1 Ammo A1			Bulk V1 Reel B1 Ammo A1	Bulk V1 Reel B1 Ammo A1	Bulk V1 Reel B1 Ammo A1	Bulk V1 Reel B1 Ammo A1	Bulk V1 Reel B1 Ammo A1	Bulk V1	Bulk V1 Reel B1 Ammo A1
B											
C											
D											
E			Bulk V1	Bulk/Reel Ammo							
F											

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DIMENSIONS in inches [millimeters]

LEAD STYLE		1, 2, 3, 4		1, 2, 3	2, 4	5, Y		6		
CASE	D max.	P ± 0.024 [0.60]	H max.	L min.	L ± 0.118 [3.0]	P ± 0.03 [0.76]	L ± 0.118 [3.0]	P ± 0.024 [0.60]	H_1 max.	L
A	0.173 [4.40]	0.100 [2.54]	0.280 [7.11]	0.591 [15.0]	0.748 [19.0]	0.125 [3.18]	0.748 [19.0]	0.200 [5.08]	0.378 [9.61]	0.240 ± 0.030 [6.1 ± 0.76]
B	0.197 [5.00]		0.300 [7.62]						0.398 [10.12]	
C	0.217 [5.50]		0.360 [9.14]						0.458 [11.64]	
D	0.236 [6.00]		0.400 [10.16]						0.498 [12.66]	
E	0.339 [8.60]	0.200 [5.08]	0.492 [12.50]			-	-		0.591 [15.00]	1 ± 0.122 [25.4 ± 3.1]
F	0.378 [9.60]		0.650 [16.50]			-	-		0.748 [19.00]	

DIMENSIONS in inches [millimeters]

LEAD STYLE	7, 9	7			9			X, Z				X	Z
CASE	D max.	P ± 0.024 [0.60]	H_1 max.	L ± 0.03 [0.76]	P ± 0.024 [0.60]	H_1 max.	L ± 0.03 [0.76]	D max.	H max.	H_1 max.	L ± 0.125	P ± 0.024	P ± 0.024
A	0.173 [4.40]	0.25 [6.35]	0.378 [9.61]	0.240 [6.10]	0.200 [5.08]	0.398 [10.11]	0.240 [6.10]	0.173 [4.40]	0.280 [7.11]	0.340 [8.64]	0.750 [19.05]	0.100 [2.54]	0.125 [3.175]
B	0.197 [5.00]		0.398 [10.12]			0.418 [10.62]		0.197 [5.00]	0.300 [7.62]	0.360 [9.14]			
C	0.217 [5.50]		0.458 [11.64]			0.478 [12.14]		0.217 [5.50]	0.360 [9.14]	0.420 [10.67]			
D	0.236 [6.00]		0.498 [12.66]			0.518 [13.16]		0.236 [6.00]	0.400 [10.16]	0.460 [11.68]			

Note

- Lead space measured within 0.05" [1.27 mm] of the body of the capacitor or from the bottom of the crimp.

ORDERING INFORMATION

199D	475	X9	003	A	1 (1)	V1	E3
MODEL	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING AT + 85 °C	CASE CODE	LEAD STYLE	PACKAGING	RoHS COMPLIANT
	This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow.	X0 = ± 20 % X9 = ± 10 % ** X5 = ± 5 % ** Special Order	This is expressed in V. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 V).	See Ratings and Case Codes table.		V1 = Bulk B1 = Tape and reel A1 = Ammo	E3 = 100 % tin termination (RoHS compliant) Blank = Tin/lead termination

Note

(1) See lead styles table.

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199D OBSOLETE VS. CURRENT ORDERING CROSS REFERENCE		
OBSOLETE	**NEW**	**DESCRIPTION**
A1	1V1	0.100 SP, UNEVEN STRAIGHT LL, BULK CASES A - D
A1	3V1	0.200 SP, UNEVEN STRAIGHT LL, BULK, CASES E, F
A1	2V1	0.100 SP, EVEN STRAIGHT LL, BULK, CASES A - D
A6	2B1	0.100 SP, EVEN STRAIGHT LL, REEL POSITIVE LEADER, CASES A - D
A6	2A1	0.100 SP, EVEN STRAIGHT LL, AMMO, CASES A - D
A1	4V1	0.200 SP, EVEN STRAIGHT LL, BULK, CASES E, F
A6	4B1	0.200 SP, EVEN STRAIGHT LL, REEL POSITIVE LEADER, CASES E, F
A6	4A1	0.200 SP, EVEN STRAIGHT LL, AMMO, CASES E, F
A2	5V1	0.125 SP, EVEN STRAIGHT LL, BULK, CASES A - D
A7	5B1	0.125 SP, EVEN STRAIGHT LL, REEL POSITIVE LEADER, CASES A - D
A7	5A1	0.125 SP, EVEN STRAIGHT LL, AMMO, CASES A - D
A2	YV1	0.125 SP, UNEVEN STRAIGHT LL, BULK, CASES A - D
B1	XV1	0.100 SP, HAIRPIN LL, BULK CASES A - D
B6	XB1	0.100 SP, HAIRPIN LL, REEL POSITIVE LEADER, CASES A - D
B6	XA1	0.100 SP, HAIRPIN LL, AMMO, CASES A - D
B2	ZV1	0.125 SP, HAIRPIN LL, BULK, CASES A - D
B7	ZB1	0.125 SP, HAIRPIN LL, REEL POSITIVE LEADER, CASES A - D
B7	ZA1	0.125 SP, HAIRPIN LL, AMMO, CASES A - D
E2	6V1	0.200 SP, HOCKEY STICK LL, BULK, CASES A - F
E7	6B1	0.200 SP, HOCKEY STICK LL, REEL POSITIVE LEADER, CASES A - F
E7	6A1	0.200 SP, HOCKEY STICK LL, AMMO, CASES A - F
E3	7V1	0.250 SP, HOCKEY STICK LL, BULK, CASES A - D
E8	7B1	0.250 SP, HOCKEY STICK LL, REEL POSITIVE LEADER, CASES A - D
E8	7A1	0.250 SP, HOCKEY STICK LL, AMMO, CASES A - D
E4		OBSOLETE
G2	9V1	0.200 SP, SNAP-IN LL, BULK, CASES A - D
G7	9B1	0.200 SP, SNAP-IN LL, REEL POSITIVE LEADER, CASES A - D
G7	9A1	0.200 SP, SNAP-IN LL, AMMO, CASES A - D

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STANDARD RATINGS

CAPACITANCE (µF)	CASE CODE	PART NUMBER	MAX. DCL AT + 25 °C (µA)	MAX. DF AT + 25 °C 120 Hz (%)
3 V_{DC} AT + 85 °C, SURGE = 3.6 V; 2 V_{DC} AT + 125 °C, SURGE = 2.4 V				
4.7	A	199D475(1)003A(2)(3)	0.5	6
6.8	A	199D685(1)003A(2)(3)	0.5	6
10	A	199D106(1)003A(2)(3)	0.5	8
15	A	199D156(1)003A(2)(3)	0.5	8
22	B	199D226(1)003B(2)(3)	0.6	8
33	B	199D336(1)003B(2)(3)	1.0	8
47	C	199D476(1)003C(2)(3)	1.4	8
68	C	199D686(1)003C(2)(3)	2.0	8
100	D	199D107(1)003D(2)(3)	3.0	10
150	D	199D157(1)003D(2)(3)	4.0	10
220	E	199D227(1)003E(2)(3)	5.0	10
330	E	199D337(1)003E(2)(3)	6.0	10
470	F	199D477(1)003F(2)(3)	8.0	10
680	F	199D687(1)003F(2)(3)	10.0	10
6.3 V_{DC} AT + 85 °C, SURGE = 8 V; 4 V_{DC} AT + 125 °C, SURGE = 5 V				
4.7	A	199D475(1)6R3A(2)(3)	0.5	6
6.8	A	199D685(1)6R3A(2)(3)	0.5	6
10	B	199D106(1)6R3B(2)(3)	0.6	8
15	B	199D156(1)6R3B(2)(3)	0.9	8
22	C	199D226(1)6R3C(2)(3)	1.3	8
33	C	199D336(1)6R3C(2)(3)	2.0	8
47	D	199D476(1)6R3D(2)(3)	2.9	8
68	D	199D686(1)6R3D(2)(3)	4.0	8
100	D	199D107(1)6R3D(2)(3)	5.0	10
150	E	199D157(1)6R3E(2)(3)	6.0	10
220	E	199D227(1)6R3E(2)(3)	7.0	10
330	F	199D337(1)6R3F(2)(3)	8.0	10
10 V_{DC} AT + 85 °C, SURGE = 13 V; 7 V_{DC} AT + 125 °C, SURGE = 9 V				
3.3	A	199D335(1)010A(2)(3)	0.5	6
4.7	A	199D475(1)010A(2)(3)	0.5	6
6.8	B	199D685(1)010B(2)(3)	0.6	6
10	B	199D106(1)010B(2)(3)	1.0	8
15	C	199D156(1)010C(2)(3)	1.5	8
22	C	199D226(1)010C(2)(3)	2.0	8
33	D	199D336(1)010D(2)(3)	3.0	8
39	D	199D339(1)010D(2)(3)	3.9	8
47	D	199D476(1)010D(2)(3)	4.0	8
68	D	199D686(1)010D(2)(3)	5.0	8
100	E	199D107(1)010E(2)(3)	6.0	10
150	E	199D157(1)010E(2)(3)	7.0	10
220	F	199D227(1)010F(2)(3)	8.0	10
16 V_{DC} AT + 85 °C, SURGE = 20 V; 10 V_{DC} AT + 125 °C, SURGE = 12 V				
2.2	A	199D225(1)016A(2)(3)	0.5	6
3.3	A	199D335(1)016A(2)(3)	0.5	6
4.7	B	199D475(1)016B(2)(3)	0.7	6
6.8	B	199D685(1)016B(2)(3)	1.0	6
10	C	199D106(1)016C(2)(3)	1.5	8
15	C	199D156(1)016C(2)(3)	2.4	8
22	D	199D226(1)016D(2)(3)	3.5	8
33	D	199D336(1)016D(2)(3)	4.0	8
47	E	199D476(1)016E(2)(3)	5.0	8
68	E	199D686(1)016E(2)(3)	6.0	8
100	F	199D107(1)016F(2)(3)	7.0	10
150	F	199D157(1)016F(2)(3)	8.0	10

Note

- Part number definitions:
  (1) For capacitance tolerance: X0 = ± 20 %, X9 = ± 10 % or X5 = 5 %
  (2) To specify Lead Style/Spacing/Packaging insert the last three characters in the part number. Use the appropriate code shown in the Current Ordering Cross Reference table and explained in the Ordering Information and Lead Styles table.
  (3) E3 = RoHS compliant 100 % tin leads. Blank or no suffix = Standard tin/lead termination.

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STANDARD RATINGS

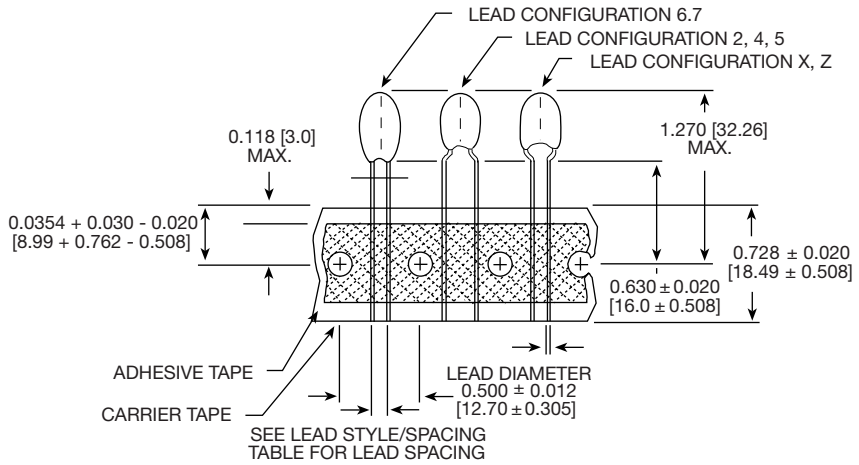
CAPACITANCE (µF)	CASE CODE	PART NUMBER	MAX. DCL AT + 25 °C (µA)	MAX. DF AT + 25 °C 120 Hz (%)
20 V_{DC} AT + 85 °C, SURGE = 26 V; 13 V_{DC} AT + 125 °C, SURGE = 16 V				
3.3	B	199D335(1)020B(2)(3)	0.8	6
4.7	B	199D475(1)020B(2)(3)	1.0	6
6.8	C	199D685(1)020C(2)(3)	1.5	6
10	C	199D106(1)020C(2)(3)	2.0	8
15	D	199D156(1)020D(2)(3)	2.5	8
22	D	199D226(1)020D(2)(3)	3.0	8
33	E	199D336(1)020E(2)(3)	4.0	8
47	E	199D476(1)020E(2)(3)	5.0	8
68	F	199D686(1)020F(2)(3)	6.0	8
100	F	199D107(1)020F(2)(3)	7.0	10
25 V_{DC} AT + 85 °C, SURGE = 33 V; 17 V_{DC} AT + 125 °C, SURGE = 21 V				
1.0	A	199D105(1)025A(2)(3)	0.5	4
1.5	A	199D155(1)025A(2)(3)	0.5	6
2.2	A	199D225(1)025A(2)(3)	0.5	6
3.3	B	199D335(1)025B(2)(3)	0.8	6
4.7	B	199D475(1)025B(2)(3)	1.0	6
6.8	C	199D685(1)025C(2)(3)	1.5	6
10	C	199D106(1)025C(2)(3)	2.5	8
15	D	199D156(1)025D(2)(3)	3.0	8
22	D	199D226(1)025D(2)(3)	4.0	8
33	E	199D336(1)025E(2)(3)	5.0	8
47	E	199D476(1)025E(2)(3)	6.0	8
68	F	199D686(1)025F(2)(3)	7.0	8
35 V_{DC} AT + 85 °C, SURGE = 46 V; 23 V_{DC} AT + 125 °C, SURGE = 28 V				
0.10	A	199D104(1)035A(2)(3)	0.5	4
0.15	A	199D154(1)035A(2)(3)	0.5	4
0.22	A	199D224(1)035A(2)(3)	0.5	4
0.33	A	199D334(1)035A(2)(3)	0.5	4
0.47	A	199D474(1)035A(2)(3)	0.5	4
0.68	A	199D684(1)035A(2)(3)	0.5	4
1.0	A	199D105(1)035A(2)(3)	0.5	4
1.5	A	199D155(1)035A(2)(3)	0.5	6
1.8	B	199D185(1)035B(2)(3)	0.7	6
2.2	B	199D225(1)035B(2)(3)	0.7	6
3.3	B	199D335(1)035B(2)(3)	1.0	6
4.7	C	199D475(1)035C(2)(3)	1.5	6
6.8	D	199D685(1)035D(2)(3)	2.3	6
10	D	199D106(1)035D(2)(3)	3.5	8
15	E	199D156(1)035E(2)(3)	4.0	8
22	E	199D226(1)035E(2)(3)	5.0	8
33	F	199D336(1)035F(2)(3)	6.0	8
47	F	199D476(1)035F(2)(3)	7.0	8
50 V_{DC} AT + 85 °C, SURGE = 65 V; 33 V_{DC} AT + 125 °C, SURGE = 40 V				
0.10	A	199D104(1)050A(2)(3)	0.5	4
0.15	A	199D154(1)050A(2)(3)	0.5	4
0.22	A	199D224(1)050A(2)(3)	0.5	4
0.33	A	199D334(1)050A(2)(3)	0.5	4
0.47	A	199D474(1)050A(2)(3)	0.5	4
0.68	A	199D684(1)050A(2)(3)	0.5	4
1.0	B	199D105(1)050B(2)(3)	0.5	4
1.5	C	199D155(1)050C(2)(3)	0.7	6
2.2	C	199D225(1)050C(2)(3)	1.1	6
3.3	D	199D335(1)050D(2)(3)	1.5	6
4.7	D	199D475(1)050D(2)(3)	2.0	6
6.8	F	199D685(1)050F(2)(3)	3.0	6
10	F	199D106(1)050F(2)(3)	4.0	8
15	F	199D156(1)050F(2)(3)	5.0	8
22	F	199D226(1)050F(2)(3)	6.0	8

Note

- Part number definitions:
  (1) For capacitance tolerance: X0 = ± 20 %, X9 = ± 10 % or X5 = 5 %
  (2) To specify Lead Style/Spacing/Packaging insert the last three characters in the part number. Use the appropriate code shown in the Current Ordering Cross Reference table and explained in the Ordering Information and Lead Styles table.
  (3) E3 = RoHS compliant 100 % tin leads. Blank or no suffix = Standard tin/lead termination.

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STANDARD REEL PACKAGING SPECIFICATIONS PER EIA-468 in inches [millimeters]



CASE CODE	OBSOLETE	LEAD STYLE	LEAD SPACING	LL MIN. (BULK)
A, B, C, D	A1, A6	1V1 (Bulk), 2B1 (T and R)	0.100 + 0.024/- 0.016 [2.54 + 0.60/- 0.40]	0.187 [4.7]
A, B, C, D	B1, B6	XV1 (Bulk), XB1 (T and R)	0.100 + 0.024/- 0.016 [2.54 + 0.60/- 0.40]	0.187 [4.7]
A, B, C, D, E, F	E2, E7	6V1 (Bulk), 6B1 (T and R)	0.200 + 0.024/- 0.016 [5.08 + 0.06/- 0.40]	0.187 [4.7]

Note

- Lead space measured within 0.05" [1.27 mm] of the body of the capacitor, or from the bottom of the crimp. Lead Style “A” may be supplied with 0.59" [15 mm] anode lead and 0.47" [12 mm] cathode lead.

Tape and Reel Packaging: Type 199D radial-leaded tantalum capacitors, all lead styles exept 1, 3 and Y are available taped and reeled per EIA-468.

CASE CODE	A	B	C	D	E	F
Quantity per box bulk	1000		500		100	
Quantity per box ammopack	2500	2000	1500	1000	500	
Quantity per reel	1000				500	

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