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-RS-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

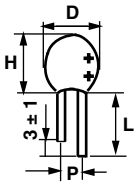
Operating Temperature: - 55 °C to + 85 °C
(to + 125 °C with voltage derating)
Capacitance Tolerance: At 120 Hz, + 25 °C, ± 20 %, ± 10 % standard. ± 5 % available as special
Dissipation Factor: At 120 Hz, + 25 °C. Dissipation factor, shall not exceed the values listed in the Standard Ratings tables.
DC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

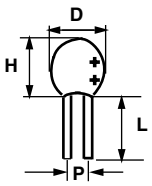
1. DCL shall not exceed 125 % of the initial requirements
2. Dissipation Factor shall meet the initial requirement
3. Change in capacitance shall not exceed ± 10 %

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

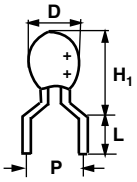
"LONG/SHORT" LL
1, 3 and Y



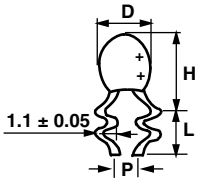
EVEN LL
2, 4 and 5



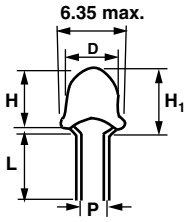
"OUTSIDE HOCKEYSTICK"
6 and 7



"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											

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.

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

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.

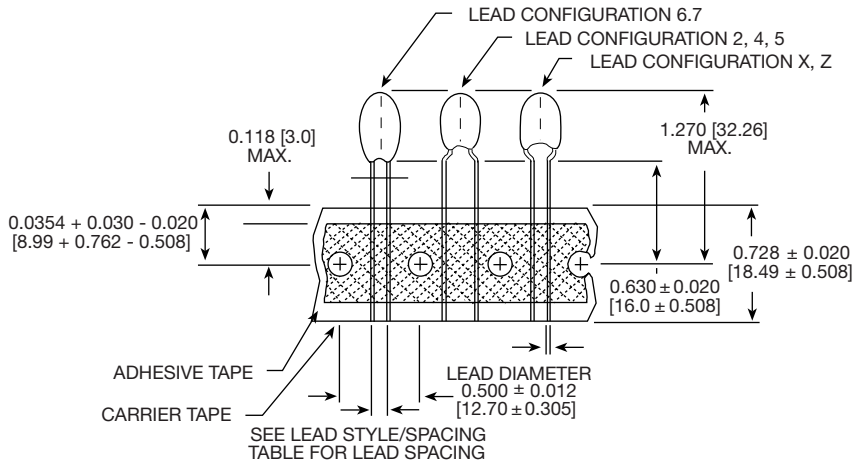
STANDARD RATINGS

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.

STANDARD REEL PACKAGING SPECIFICATIONS PER EIA RS-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	

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.