# Vishay Sprague





### **PERFORMANCE CHARACTERISTICS**

Operating Temperature: - 55 °C to + 85 °C

(to + 125 °C with voltage derating)

Capacitance Tolerance: At 120 Hz, + 25 °C,  $\pm$  20 %,  $\pm$  10 % standard.  $\pm$  5 % available as special Dissipation Factor: At 120 Hz, + 25 °C. Dissipation factor,

**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.

### FEATURES

## Terminations: Tin/lead (SnPb), 100 % tin (Sn) Economy and high performance are combined in these radial-lead, solid-electrolyte TANTALEX<sup>®</sup> capacitors



RoHS

COMPLIANT

- 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 <u>www.vishay.com/doc?99912</u>

#### Note

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

### APPLICATIONS

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

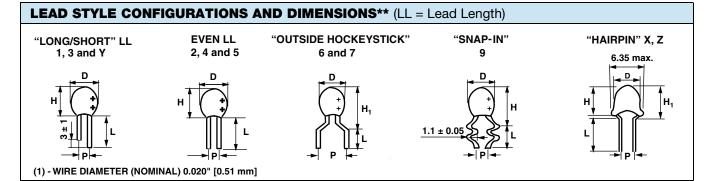
**At + 85 °C:** Leakage current shall not exceed 10 times the values listed in the Standard Ratings tables.

**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  $\Omega.$ 

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 %



AVAILABLE LEA	D ST	YLES AN	ND PA	CKAGING '	TYPES P	PER CAS	SE SIZE				
LEAD STYLE/CASE	1	2	3	4	5	6	7	9	х	Y	Z
Α		Bulk			Bulk		Bulk	Bulk	Bulk		Bulk
В	Bulk	V1 Reel			V1 Reel	Bulk	V1 Reel	V1 Reel	V1 Reel	Bulk	V1 Reel
С	V1	B1 Ammo			B1 Ammo	V1 Reel	B1 Ammo	B1 Ammo	B1 Ammo	V1	B1 Ammo
D		A1			A1	B1 Ammo	A1	A1	A1		A1
E			Bulk	Bulk/Reel		A1					
F			V1	Ammo							

Revision: 16-Mar-12

Document Number: 40020

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199D



199D



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DIMEN	SIONS	in inches	[millimet	ers]						
LEAD S	TYLE	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]	H₁ max.	L
Α	0.173 [4.40]		0.280 [7.11]						0.378 [9.61]	
В	0.197 [5.00]	0.100	0.300 [7.62]			0.125	0.748		0.398 [10.12]	0.240 ± 0.030
С	0.217 [5.50]	[2.54]	0.360 [9.14]	0.591	0.748	[3.18]	[19.0]	0.200	0.458 [11.64]	[6.1 ± 0.76]
D	0.236 [6.00]		0.400 [10.16]	[15.0]	[19.0]			[5.08]	0.498 [12.66]	
E	0.339 [8.60]	0.200	0.492 [12.50]			-	-		0.591 [15.00]	1 ± 0.122
F	0.378 [9.60]	[5.08]	0.650 [16.50]			-	-		0.748 [19.00]	[25.4 ± 3.1]

DIMENSIO	<b>DNS</b> in	inches	[millime	ters]									
LEAD STYLE	7, 9		7			9			Х,	z		х	z
CASE	D max.	P ± 0.024 [0.60]	H <sub>1</sub> max.	L ± 0.03 [0.76]	P ± 0.024 [0.60]	H <sub>1</sub> max.	L ± 0.03 [0.76]	D max.	H max.	H <sub>1</sub> max.	L ± 0.125	P ± 0.024	P ± 0.024
А	0.173 [4.40]		0.378 [9.61]			0.398 [10.11]		0.173 [4.40]	0.280 [7.11]	0.340 [8.64]			
В	0.197 [5.00]	0.25	0.398 [10.12]	0.240	0.200	0.418 [10.62]	0.240	0.197 [5.00]	0.300 [7.62]	0.360 [9.14]	0.750	0.100	0.125
с	0.217 [5.50]	[6.35]	0.458 [11.64]	[6.10]	[5.08]	0.478 [12.14]	[6.10]	0.217 [5.50]	0.360 [9.14]	0.420 [10.67]	[19.05]	[2.54]	[3.175]
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.

199D	475	X9	003	Α	1 (1)	V1	E3
MODEL	CAPACITANCE	CAPACITANCE TOLERANCE	DC VOLTAGE RATING AT + 85 °C I	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.	$X0 = \pm 20 \%$ $X9 = \pm 10 \%$ ** $X5 = \pm 5 \%$ ** 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

<sup>(1)</sup> See lead styles table.

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9D OBSOL	ETE VS. CUR	RENT 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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TANDARD RATINGS	

APACITANCE (μF)	CASE CODE	PART NUMBER	MAX. DCL AT + 25 °C (μΑ)	MAX. DF AT + 25 °C 120 Hz (%)
	3 Vpc AT	+ 85 °C, SURGE = 3.6 V; 2 V <sub>DC</sub> A		
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	Â	199D156(1)003A(2)(3)	0.5	8
22	В		0.6	8
		199D226(1)003B(2)(3)		
33	В	199D336(1)003B(2)(3)	1.0	8
47	С	199D476(1)003C(2)(3)	1.4	8
68	С	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 <sub>DC</sub>	AT + 85 °C, SURGE = 8 V; 4 V <sub>DC</sub> A	T + 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	В	199D106(1)6R3B(2)(3)	0.6	8
15	B	199D156(1)6R3B(2)(3)	0.9	8
22	C		1.3	8
		199D226(1)6R3C(2)(3)		
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 <sub>DC</sub> A	T + 85 °C, SURGE = 13 V; 7 V <sub>DC</sub> A	\T + 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	В	199D685(1)010B(2)(3)	0.6	6
10	В	199D106(1)010B(2)(3)	1.0	8
15	С	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
	E			10
150	F	199D157(1)010E(2)(3)	7.0	
220		199D227(1)010F(2)(3)	8.0 • T + 105 °O SUPOF - 10 V	10
		$+ 85 ^{\circ}\text{C}$ , SURGE = 20 V; 10 V <sub>DC</sub> A		
2.2	A	199D225(1)016A(2)(3)	0.5	6
3.3	A	199D335(1)016A(2)(3)	0.5	6
4.7	В	199D475(1)016B(2)(3)	0.7	6
6.8	В	199D685(1)016B(2)(3)	1.0	6
10	С	199D106(1)016C(2)(3)	1.5	8
15	С	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)		10
100	Г	1990107(1)0106(2)(3)	7.0	10

Note .

Part number definitions:

(1) For capacitance tolerance:  $X0 = \pm 20$  %,  $X9 = \pm 10$  % 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.

199D



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	STANDARD R	ATINGS			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		CASE CODE	PART NUMBER	AT + 25 °C	AT + 25 °C
3.3   B   199033(1)(020E)(2)   0.8   6     4.7   B   1990475(1)(020E)(3)   1.0   6     6.8   C   1990168(1)(020C)(3)   2.0   8     10   C   1990168(1)(020C)(3)   2.0   8     22   D   1990128(1)(020C)(3)   3.0   8     33   E   1990228(1)(020E)(3)   3.0   8     47   E   1990238(1)(020E)(3)   4.0   8     68   F   1990128(1)(020E)(3)   5.0   8     100   F   1990128(1)(020E)(3)   0.5   6     100   F   1990128(1)(020E)(3)   0.5   6     2.2   A   1990128(1)(020E)(3)   0.5   6     3.3   E   1990128(1)(020E)(3)   0.5   6     4.7   B   1990128(1)(020E)(3)   1.0   6     5.2   A   1990128(1)(020E)(2)   1.0   6     6.3   C   1990128(1)(020E)(2)   1.0   6     6.4   C   1990128(1)(020E)(2)   3.0   8     7 <th></th> <th>20 V A1</th> <th>+ 85 °C SUBGE - 26 V: 13 V /</th> <th></th> <th></th>		20 V A1	+ 85 °C SUBGE - 26 V: 13 V /		
	3.3				6
			() ()()		
15     D     199D156(1)020D(2)(3)     2.5     8       22     D     199D226(1)020D(2)(3)     3.0     8       33     E     199D236(1)020E(2)(3)     5.0     8       47     E     199D476(1)020E(2)(3)     6.0     8       100     F     199D167(1)020E(2)(3)     6.0     8       100     F     199D167(1)020E(2)(3)     0.5     6       1.5     A     199D125(1)025A(2)(3)     0.5     6       3.3     B     199D125(1)025A(2)(3)     0.5     6       3.3     B     199D125(1)025A(2)(3)     0.5     6       3.3     B     199D126(1)025A(2)(3)     1.0     6       6.8     C     199D126(1)025C(2)(3)     3.0     8       15     D     199D126(1)025C(2)(3)     3.0     8       33     E     199D126(1)025C(2)(3)     3.0     8       47     E     199D126(1)025C(2)(3)     3.0     8       33     E     199D126(1)025C(2)(3)     0.5     4 </td <td></td> <td></td> <td></td> <td></td> <td></td>					
$  \begin{array}{ccccccccccccccccccccccccccccccccccc$					
47   E   1990568(10207E)(2)   5.0   8     100   F   199056(10207E)(2)   6.0   8     100   A   1990167(10207E)(2)   6.0   8     1.0   A   1990167(1025A2)(2)   0.5   6     2.2   A   1990167(1025A2)(2)   0.5   6     3.3   B   1990235(1025A2)(2)   0.8   6     4.7   B   1990261(1025C2)(2)   1.5   6     10   C   1990161(1025C2)(2)   3.0   8     15   D   1990256(1025C2)(2)   3.0   8     22   D   1990160(1025C2)(2)   3.0   8     33   E   1990226(1025C2)(2)   5.0   8     47   E   1990122(1025C2)(2)   5.0   8     68   F   1990560(1025C2)(2)   5.0   8     10   A   1990124(1025A2)(2)   0.5   4     0.15   A   1990124(1025A2)(2)   0.5   4     0.22   A   1990124(1025A2)(2)   0.5   4     0.33 <td< td=""><td>22</td><td>D</td><td>199D226(1)020D(2)(3)</td><td>3.0</td><td>8</td></td<>	22	D	199D226(1)020D(2)(3)	3.0	8
68     F     199D107(1)020F(2)(3)     6.0     8       10     25 V <sub>DC</sub> AT + 85 °C, SURGE = 38 V; 17 V <sub>DC</sub> AT + 125 °C, SURGE = 21 V       1.0     A     199D105(1)025A(2)(3)     0.5     6       1.5     A     199D125(1)025A(2)(3)     0.5     6       2.2     A     199D225(1)025A(2)(3)     0.5     6       3.3     B     199D35(1)025B(2)(3)     1.0     6       6.8     C     199D168(1)025C(2)(3)     2.5     8       15     D     199D168(1)025C(2)(3)     4.0     8       22     D     199D268(1)025C(2)(3)     4.0     8       33     E     199D368(1)025C(2)(3)     6.0     8       47     E     199D368(1)025C(2)(3)     6.0     8       33     E     199D368(1)025C(2)(3)     6.0     8       47     E     199D264(1)025C(2)(3)     6.0     8       48     F     199D264(1)025C(2)(3)     6.5     4       0.10     A     199D16(1)025C(2)(3)     0.5     4	33	E	199D336(1)020E(2)(3)	4.0	8
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			199D476(1)020E(2)(3)	5.0	
100     10     A     1990705(1)025A2(2)3     0.5     4       1.0     A     1990705(1)025A2(2)3     0.5     6       2.2     A     1990705(1)025A2(2)3     0.5     6       3.3     B     1990705(1)025A2(2)3     0.5     6       4.7     B     1990705(1)025A2(2)3     1.5     6       6.8     C     199080(1)025C2(2)3     1.5     6       10     C     1990106(1)025C2(2)3     3.0     8       15     D     1990105(1)025D2(2)3     3.0     8       22     D     1990105(1)025D2(2)3     3.0     8       33     E     1990236(1)025D2(2)3     5.0     8       47     E     1990126(1)025D2(2)3     5.0     8       68     F     1990266(1)025D2(2)3     5.0     8       10     A     1990105(1)025A2(2)3     0.5     4       0.15     A     1990105(1)025A2(2)3     0.5     4       0.15     A     1990126(1)025A2(2)3     0.5     4					
	100				10
1.5   A   199D155(1)025A(2)(6)   0.5   6     2.2   A   199D235(1)025A(2)(6)   0.5   6     3.3   B   199D35(1)025B(2)(6)   0.8   6     4.7   B   199D475(1)025B(2)(6)   1.0   6     6.8   C   199D165(1)025D(2)(6)   2.5   8     10   C   199D165(1)025D(2)(6)   3.0   8     22   D   199D26(1)025D(2)(6)   4.0   8     33   E   199D336(1)025E(2)(3)   6.0   8     47   E   199D476(1)025E(2)(3)   7.0   8     70   A   199D164(1)035A(2)(3)   0.5   4     0.10   A   199D164(1)035A(2)(3)   0.5   4     0.15   A   199D164(1)035A(2)(3)   0.5   4     0.22   A   199D164(1)035A(2)(3)   0.5   4     0.33   A   199D264(1)035A(2)(3)   0.5   4     0.47   A   199D264(1)035A(2)(3)   0.5   4     0.48   B   199D264(1)035A(2)(3)   0.5   4					
2.2   A   199D225(1)025A(2)(3)   0.5   6     3.3   B   199DA75(1)025B(2)(3)   1.0   6     4.7   B   199DA75(1)025B(2)(3)   1.5   6     10   C   199DB65(1)025C(2)(3)   2.5   8     15   D   199D166(1)025D(2)(3)   3.0   8     22   D   199D236(1)025D(2)(3)   4.0   8     33   E   199DA76(1)025E(2)(3)   6.0   8     47   E   199DA76(1)025E(2)(3)   6.0   8     68   F   199DA76(1)025E(2)(3)   0.5   4     0.10   A   199D164(1)035A(2)(3)   0.5   4     0.22   A   199D164(1)035A(2)(3)   0.5   4     0.33   A   199D176(1)035A(2)(3)   0.5   4     0.47   A   199D474(1)035A(2)(3)   0.5   4     0.47   A   199D474(1)035A(2)(3)   0.5   4     0.47   A   199D475(1)035A(2)(3)   0.5   4     0.48   B   199D166(1)035A(2)(3)   0.5   6			() ()()		
3.3   B   1990336(1)025B(2)(3)   0.8   6     4.7   B   1990457(1)025B(2)(3)   1.0   6     6.8   C   1990166(1)025C(2)(3)   2.5   8     15   D   1990156(1)025C(2)(3)   3.0   8     22   D   1990262(1)025C(2)(3)   3.0   8     33   E   1990236(1)025E(2)(3)   6.0   8     47   E   1990236(1)025F(2)(3)   6.0   8     68   F   1990266(1)025F(2)(3)   0.5   4     0.10   A   1990154(1)025A(2)(3)   0.5   4     0.15   A   1990154(1)025A(2)(3)   0.5   4     0.22   A   1990234(1)025A(2)(3)   0.5   4     0.33   A   1990234(2)(3)   0.5   4     0.47   A   199024(1)035A(2)(3)   0.5   4     1.5   A   1990156(1)035A(2)(3)   0.5   4     0.47   A   1990156(1)035A(2)(3)   0.5   4     1.6   B   1990156(1)035A(2)(3)   0.5   4			() ()()		
4.7   B   199D475(1)025B(2)(3)   1.0   6     6.8   C   199D106(1)025C(2)(3)   2.5   8     15   D   199D106(1)025C(2)(3)   3.0   8     22   D   199D228(1)025D(2)(3)   4.0   8     33   E   199D336(1)025E(2)(3)   5.0   8     47   E   199D268(1)025C(2)(3)   6.0   8     47   E   199D268(1)025C(2)(3)   6.0   8     68   F   199D268(1)025C(2)(3)   6.0   8     7   E   199D164(1)035A(2)(3)   0.5   4     0.10   A   199D164(1)035A(2)(3)   0.5   4     0.13   A   199D224(1)035A(2)(3)   0.5   4     0.47   A   199D474(1)035A(2)(3)   0.5   4     0.48   A   199D474(1)035A(2)(3)   0.5   4     0.48   A   199D105(1)035A(2)(3)   0.5   4     0.48   B   199D105(1)035A(2)(3)   0.5   4     1.5   A   199D475(1)035C(2)(3)   0.5   6					6
6.8     C     199D685(1)025C(2)(3)     1.5     6       10     C     199D166(1)025C(2)(3)     3.0     8       15     D     199D156(1)025C(2)(3)     3.0     8       22     D     199D25C(2)(3)     5.0     8       33     E     199D336(1)025E(2)(3)     5.0     8       47     E     199D476(1)025C(2)(3)     5.0     8       68     F     199D466(1)025F(2)(3)     0.5     4       0.10     A     199D140(1)035A(2)(3)     0.5     4       0.15     A     199D154(1)035A(2)(3)     0.5     4       0.33     A     199D334(1)035A(2)(3)     0.5     4       0.47     A     199D154(1)035A(2)(3)     0.5     4       1.0     A     199D135(1)035A(2)(3)     0.5     4       1.5     A     199D135(1)035A(2)(3)     0.5     4       1.6     B     199D135(1)035A(2)(3)     0.5     6       1.8     B     199D135(1)035A(2)(3)     0.5     6 <td></td> <td></td> <td></td> <td></td> <td></td>					
			199D475(1)025B(2)(3)		
16     D     1990166(1)025D(2)(3)     3.0     8       22     D     199026(1)025D(2)(3)     4.0     8       33     E     199036(1)025E(2)(3)     5.0     8       47     E     1990476(1)025E(2)(3)     6.0     8       68     F     1990468(1)025E(2)(3)     6.0     8       0.10     A     1990147(1)035A(2)(3)     0.5     4       0.15     A     1990154(1)035A(2)(3)     0.5     4       0.33     A     1990154(1)035A(2)(3)     0.5     4       0.47     A     1990154(1)035A(2)(3)     0.5     4       0.48     A     1990154(1)035A(2)(3)     0.5     4       0.48     A     1990154(1)035A(2)(3)     0.5     4       1.0     A     1990155(1)035A(2)(3)     0.5     6       1.18     B     1990125(1)035B(2)(3)     0.7     6       3.3     B     1990136(1)035D(2)(3)     1.5     6       4.7     C     1990147(1)035A(2)(3)     0.5     4 <td></td> <td></td> <td></td> <td></td> <td></td>					
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       0.10     A     199D144(1)035A(2)(3)     0.5     4       0.15     A     199D124(1)035A(2)(3)     0.5     4       0.22     A     199D24(1)035A(2)(3)     0.5     4       0.33     A     199D24(1)035A(2)(3)     0.5     4       0.47     A     199D24(1)035A(2)(3)     0.5     4       0.47     A     199D254(1)035A(2)(3)     0.5     4       1.0     A     199D155(1)035A(2)(3)     0.5     4       1.5     A     199D155(1)035A(2)(3)     0.7     6       2.2     B     199D155(1)035A(2)(3)     0.7     6       3.3     B     199D255(1)035D(2)(3)     1.5     6       6.8     D     199D256(1)035D(2)(3)     3.5     8					
33     E     199D36(1)025E(2)(3)     6.0     8       47     E     199D476(1)025E(2)(3)     7.0     8       0.10     A     199D1686(1)025F(2)(3)     7.0     8       0.10     A     199D154(1)035A(2)(3)     0.5     4       0.15     A     199D154(1)035A(2)(3)     0.5     4       0.22     A     199D34(1)035A(2)(3)     0.5     4       0.33     A     199D34(1)035A(2)(3)     0.5     4       0.47     A     199D34(1)035A(2)(3)     0.5     4       1.0     A     199D155(1)035A(2)(3)     0.5     4       1.5     A     199D165(1)035A(2)(3)     0.5     4       1.6     B     199D155(1)035A(2)(3)     0.5     4       1.7     A     199D155(1)035A(2)(3)     0.5     4       1.8     B     199D125(1)035B(2)(3)     0.7     6       2.2     B     199D126(1)035D(2)(3)     2.3     6       1.6     D     199D126(1)035D(2)(3)     2.3     6 <td></td> <td></td> <td></td> <td></td> <td></td>					
47     E     199D476(1)(225E(2)(3)     7.0     8       68     F     199D668(1)(225E(2)(3)     7.0     8       0.10     A     199D104(1)(035A(2)(3)     0.5     4       0.15     A     199D104(1)(035A(2)(3)     0.5     4       0.22     A     199D24(1)(035A(2)(3)     0.5     4       0.33     A     199D334(1)(035A(2)(3)     0.5     4       0.47     A     199D476(1)(035A(2)(3)     0.5     4       0.48     A     199D474(1)(035A(2)(3)     0.5     4       0.47     A     199D475(1)(035A(2)(3)     0.5     4       1.0     A     199D155(1)(035A(2)(3)     0.5     4       1.5     A     199D155(1)(035A(2)(3)     0.7     6       2.2     B     199D125(1)(035B(2)(3)     1.0     6       3.3     B     199D125(1)(035B(2)(3)     1.5     6       6.8     D     199D426(1)(035F(2)(3)     3.5     8       15     E     199D126(1)(035F(2)(3)     5.0					
68     F     199D686(1)025F(2)(3)     7.0     8       35 V <sub>DC</sub> AT + 85 °C, SURGE = 46 V; 23 V <sub>DC</sub> AT + 125 °C, SURGE = 28 V       0.10     A     199D134(1)035A(2)(3)     0.5     4       0.22     A     199D134(1)035A(2)(3)     0.5     4       0.33     A     199D234(1)035A(2)(3)     0.5     4       0.47     A     199D244(1)035A(2)(3)     0.5     4       0.68     A     199D684(1)035A(2)(3)     0.5     4       1.0     A     199D135(1)035A(2)(3)     0.5     4       1.5     A     199D135(1)035A(2)(3)     0.5     6       1.8     B     199D135(1)035A(2)(3)     0.7     6       2.2     B     199D125(1)035B(2)(3)     0.7     6       3.3     B     199D252(1)035B(2)(3)     1.0     6       4.7     C     199D476(1)035C(2)(3)     2.3     6       10     D     199D1685(1)035E(2)(3)     5.0     8       15     E     199D125(1)035E(2)(3)     5.0     8					
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$					
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     199D234(1)035A(2)(3)     0.5     4       0.33     A     199D234(1)035A(2)(3)     0.5     4       0.47     A     199D474(1)035A(2)(3)     0.5     4       0.68     A     199D64(1)035A(2)(3)     0.5     4       1.0     A     199D155(1)035A(2)(3)     0.5     6       1.8     B     199D155(1)035A(2)(3)     0.7     6       2.2     B     199D235(1)035B(2)(3)     1.0     6       4.7     C     199D475(1)035D(2)(3)     1.5     6       6.8     D     199D166(1)035D(2)(3)     3.5     8       10     D     199D165(1)035D(2)(3)     3.5     8       22     E     199D136(1)035E(2)(3)     5.0     8       33     F     199D236(1)035E(2)(3)     5.0     8       47     F     199D2476(1)035E(2)(3)     5.0     8 </td <td></td> <td>35 V<sub>DC</sub> A1</td> <td></td> <td></td> <td>-</td>		35 V <sub>DC</sub> A1			-
0.15   A   199D124(1)035A(2)(3)   0.5   4     0.22   A   199D224(1)035A(2)(3)   0.5   4     0.33   A   199D34(1)035A(2)(3)   0.5   4     0.47   A   199D34(1)035A(2)(3)   0.5   4     0.68   A   199D68(1)035A(2)(3)   0.5   4     1.0   A   199D165(1)035A(2)(3)   0.5   4     1.5   A   199D165(1)035A(2)(3)   0.5   4     1.6   B   199D165(1)035A(2)(3)   0.5   4     1.7   A   199D165(1)035A(2)(3)   0.5   6     1.8   B   199D185(1)035B(2)(3)   0.7   6     2.2   B   199D255(1)035B(2)(3)   1.0   6     4.7   C   199D476(1)035C(2)(3)   1.5   6     6.8   D   199D166(1)035E(2)(3)   3.5   8     15   E   199D126(1)035E(2)(3)   5.0   8     22   E   199D126(1)035E(2)(3)   6.0   8     47   F   199D136(1)035E(2)(3)   0.5   4	0.10				4
0.22   A   199D24(1)035A(2)(3)   0.5   4     0.33   A   199D34(1)035A(2)(3)   0.5   4     0.47   A   199D474(1)035A(2)(3)   0.5   4     0.68   A   199D474(1)035A(2)(3)   0.5   4     1.0   A   199D155(1)035A(2)(3)   0.5   4     1.5   A   199D155(1)035A(2)(3)   0.5   6     1.8   B   199D125(1)035B(2)(3)   0.7   6     3.3   B   199D25(2)(035B(2)(3)   1.0   6     4.77   C   199D475(1)035D(2)(3)   2.3   6     10   D   199D166(1)035D(2)(3)   3.5   8     15   E   199D156(1)035B(2)(3)   4.0   8     22   E   199D247(1)035C(2)(3)   5.0   8     33   F   199D247(1)035C(2)(3)   5.0   8     33   F   199D247(1)035C(2)(3)   6.0   8     47   F   199D247(1)05OA(2)(3)   0.5   4     0.10   A   199D146(1)05OA(2)(3)   0.5   4		А	() ()()	0.5	4
	0.22				
	0.33	А	199D334(1)035A(2)(3)	0.5	4
1.0A199D105(1)035A(2)(3)0.541.5A199D155(1)035A(2)(3)0.561.8B199D155(1)035B(2)(3)0.762.2B199D255(1)035B(2)(3)0.763.3B199D335(1)035B(2)(3)1.064.7C199D475(1)035C(2)(3)1.566.8D199D685(1)035D(2)(3)2.3610D199D106(1)035D(2)(3)3.5815E199D156(1)035E(2)(3)4.0822E199D226(1)035E(2)(3)5.0833F199D336(1)035F(2)(3)6.0847F199D476(1)035F(2)(3)7.0850 V <sub>DC</sub> AT + 85 °C, SURGE = 65 V; 33 V <sub>DC</sub> AT + 125 °C, SURGE = 40 V50 V <sub>DC</sub> AT + 85 °C, SURGE = 65 V; 33 V <sub>DC</sub> AT + 125 °C, SURGE = 40 V0.10A199D104(1)050A(2)(3)0.540.15A199D124(1)050A(2)(3)0.540.15A199D334(1)050A(2)(3)0.540.33A199D334(1)050A(2)(3)0.540.47A199D474(1)050A(2)(3)0.540.68A199D135(1)050C(2)(3)0.541.5C199D155(1)050C(2)(3)0.541.5C199D155(1)050C(2)(3)0.541.5C199D155(1)050C(2)(3)1.163.3D199D455(1)050C(2)(3)1.564.7D<	0.47		199D474(1)035A(2)(3)		
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   199D25(1)035B(2)(3)   0.7   6     3.3   B   199D35(1)035B(2)(3)   0.7   6     3.3   B   199D35(1)035B(2)(3)   1.0   6     4.7   C   199D475(1)035C(2)(3)   2.3   6     10   D   199D106(1)035D(2)(3)   3.5   8     15   E   199D26(1)035E(2)(3)   4.0   8     22   E   199D26(1)035F(2)(3)   5.0   8     33   F   199D36(1)035F(2)(3)   6.0   8     33   F   199D476(1)035F(2)(3)   7.0   8     50 Vpc AT + 85 °C, SURGE = 65 V; 33 Vpc AT + 125 °C, SURGE = 40 V     0.10   A   199D154(1)050A(2)(3)   0.5   4     0.15   A   199D154(1)050A(2)(3)   0.5   4     0.15   A   199D154(1)050A(2)(3)   0.5   4     0.47   A   199D247(1)050A(2)(3)   0.5   4     0.47			199D684(1)035A(2)(3)		
1.8B199D185(1)035B(2)(3)0.762.2B199D225(1)035B(2)(3)0.763.3B199D235(1)035B(2)(3)1.064.7C199D475(1)035C(2)(3)1.566.8D199D865(1)035D(2)(3)3.5810D199D106(1)035D(2)(3)3.5815E199D156(1)035E(2)(3)4.0822E199D226(1)035E(2)(3)6.0833F199D36(1)035F(2)(3)6.0847F199D476(1)035F(2)(3)7.08 <b>50 V</b> <sub>DC</sub> AT + 85 °C, SURGE = 65 V; 33 V <sub>DC</sub> AT + 125 °C, SURGE = 40 V0.10A199D104(1)050A(2)(3)0.540.15A199D154(1)050A(2)(3)0.540.22A199D1224(1)050A(2)(3)0.540.33A199D34(1)050A(2)(3)0.540.47A199D476(1)050A(2)(3)0.540.47A199D684(1)050A(2)(3)0.540.68A199D684(1)050A(2)(3)0.541.0B199D155(1)050C(2)(3)0.541.5C199D125(1)050C(2)(3)0.541.5C199D125(1)050C(2)(3)1.163.3D199D235(1)050C(2)(3)1.564.7D199D25(1)050C(2)(3)1.564.7D199D45(1)050C(2)(3)3.061.0F199D65(1)050F(2)(3) </td <td></td> <td></td> <td></td> <td></td> <td></td>					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
$  \begin{array}{ccccccccccccccccccccccccccccccccccc$					
6.8D199D685(1)035D(2)(3)2.3610D199D106(1)035D(2)(3)3.5815E199D156(1)035E(2)(3)4.0822E199D226(1)035E(2)(3)5.0833F199D336(1)035F(2)(3)6.0847F199D476(1)035F(2)(3)7.08 <b>50 VDC AT + 85 °C, SURGE = 65 V; 33 VDC AT + 125 °C, SURGE = 40 V00 VDC AT + 85 °C, SURGE = 65 V; 33 VDC AT + 125 °C, SURGE = 40 V</b> 0.10A199D104(1)050A(2)(3)0.540.15A199D124(1)050A(2)(3)0.540.22A199D224(1)050A(2)(3)0.540.33A199D334(1)050A(2)(3)0.540.47A199D474(1)050A(2)(3)0.540.68A199D68(1)050F(2)(3)0.541.0B199D155(1)050C(2)(3)0.541.5C199D155(1)050C(2)(3)0.541.6B199D105(1)050C(2)(3)1.163.3D199D335(1)050C(2)(3)1.564.7D199D475(1)050C(2)(3)1.564.7D199D475(1)050C(2)(3)3.066.8F199D685(1)050F(2)(3)3.0610F199D166(1)050F(2)(3)5.08					
15E199D156(1)035E(2)(3)4.0822E199D226(1)035E(2)(3)5.0833F199D336(1)035E(2)(3)6.0847F199D476(1)035F(2)(3)7.0850 $V_{DC} AT + 85 °C, SURGE = 65 V; 33 V_{DC} AT + 125 °C, SURGE = 40 V0.10A199D104(1)050A(2)(3)0.540.15A199D154(1)050A(2)(3)0.540.22A199D224(1)050A(2)(3)0.540.33A199D334(1)050A(2)(3)0.540.477A199D474(1)050A(2)(3)0.540.68A199D684(1)050A(2)(3)0.541.0B199D105(1)050B(2)(3)0.541.5C199D155(1)050C(2)(3)0.762.2C199D25(1)050C(2)(3)1.163.3D199D335(1)050P(2)(3)1.564.7D199D475(1)050P(2)(3)3.066.8F199D685(1)050F(2)(3)3.0610F199D16(1)050F(2)(3)4.0815F199D165(1)050F(2)(3)4.08$					
22E $199D226(1)035E(2)(3)$ 5.0833F $199D336(1)035F(2)(3)$ 6.0847F $199D476(1)035F(2)(3)$ 7.0850 V <sub>DC</sub> AT + 85 °C, SURGE = 65 V; 33 V <sub>DC</sub> AT + 125 °C, SURGE = 40 V0.10A $199D104(1)050A(2)(3)$ 0.540.15A $199D154(1)050A(2)(3)$ 0.540.22A $199D224(1)050A(2)(3)$ 0.540.33A $199D334(1)050A(2)(3)$ 0.540.47A $199D474(1)050A(2)(3)$ 0.540.68A $199D684(1)050A(2)(3)$ 0.541.0B $199D155(1)050C(2)(3)$ 0.541.5C $199D155(1)050C(2)(3)$ 0.762.2C $199D25(1)050C(2)(3)$ 1.163.3D $199D335(1)050D(2)(3)$ 1.564.7D $199D475(1)050F(2)(3)$ 3.066.8F $199D166(1)050F(2)(3)$ 4.0810F $199D166(1)050F(2)(3)$ 4.0815F $199D156(1)050F(2)(3)$ 5.08					
33F199D336(1)035F(2)(3)6.0847F199D476(1)035F(2)(3)7.0850 $V_{DC}$ AT + 85 °C, SURGE = 65 V; 33 $V_{DC}$ AT + 125 °C, SURGE = 40 V0.10A199D104(1)050A(2)(3)0.540.15A199D154(1)050A(2)(3)0.540.22A199D224(1)050A(2)(3)0.540.33A199D334(1)050A(2)(3)0.540.47A199D474(1)050A(2)(3)0.540.68A199D684(1)050A(2)(3)0.541.0B199D105(1)050B(2)(3)0.541.5C199D155(1)050C(2)(3)0.762.2C199D125(1)050C(2)(3)1.163.3D199D335(1)050D(2)(3)1.564.7D199D475(1)050D(2)(3)2.064.7D199D475(1)050F(2)(3)3.065.5F199D685(1)050F(2)(3)3.08		Ē			
47F199D476(1)035F(2)(3)7.0850 V <sub>DC</sub> AT + 85 °C, SURGE = 65 V; 33 V <sub>DC</sub> AT + 125 °C, SURGE = 40 V0.10A199D104(1)050A(2)(3)0.540.15A199D154(1)050A(2)(3)0.540.22A199D224(1)050A(2)(3)0.540.33A199D34(1)050A(2)(3)0.540.47A199D474(1)050A(2)(3)0.540.68A199D684(1)050A(2)(3)0.541.0B199D105(1)050E(2)(3)0.541.5C199D155(1)050C(2)(3)0.762.2C199D225(1)050C(2)(3)1.163.3D199D35(1)05DD(2)(3)2.064.7D199D475(1)05DP(2)(3)3.064.7D199D685(1)05DF(2)(3)3.0610F199D106(1)050F(2)(3)4.0815F199D156(1)050F(2)(3)5.08					
50 $V_{DC} AT + 85 °C, SURGE = 65 V; 33 V_{DC} AT + 125 °C, SURGE = 40 V0.10A199D104(1)050A(2)(3)0.540.15A199D154(1)050A(2)(3)0.540.22A199D224(1)050A(2)(3)0.540.33A199D334(1)050A(2)(3)0.540.47A199D474(1)050A(2)(3)0.540.68A199D684(1)050A(2)(3)0.541.0B199D105(1)050B(2)(3)0.541.5C199D155(1)050C(2)(3)0.762.2C199D225(1)050C(2)(3)1.163.3D199D335(1)050D(2)(3)1.564.7D199D475(1)050D(2)(3)2.066.8F199D685(1)050F(2)(3)3.0610F199D16(1)050F(2)(3)4.0815F199D156(1)050F(2)(3)5.08$		F	199D476(1)035F(2)(3)	7.0	
		50 V <sub>DC</sub> A1		AT + 125 °C, SURGE = 40 V	
		A	199D104(1)050A(2)(3)	0.5	
			., .,,		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
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		A			
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		D C			
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					р б
4.7D199D475(1)050D(2)(3)2.066.8F199D685(1)050F(2)(3)3.0610F199D106(1)050F(2)(3)4.0815F199D156(1)050F(2)(3)5.08					6
6.8F199D685(1)050F(2)(3)3.0610F199D106(1)050F(2)(3)4.0815F199D156(1)050F(2)(3)5.08		D			6
10 F 199D106(1)050F(2)(3) 4.0 8 15 F 199D156(1)050F(2)(3) 5.0 8		F			õ
15 F 199D156(1)050F(2)(3) 5.0 8		F			ě 8
22 F 199D226(1)050F(2)(3) 6.0 8					8
	22	F	199D226(1)050F(2)(3)	6.0	8

Note •

Part number definitions:

(1) For capacitance tolerance:  $X0 = \pm 20$  %,  $X9 = \pm 10$  % 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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Vishay Spra

STANDARD REEL	PACKAGING SPECI	FICATIONS PER EIA	RS-468 in inches [mill	limeters]				
	M/ 0.0354 + 0.030 - 0.020 [8.99 + 0.762 - 0.508] ADHESIVE TAPE CARRIER TAPE → SI		0.012	0.020				
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	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	Α	В	С	D	E	F
Quantity per box bulk	10	00	50	00	1(	00
Quantity per box ammopack	2500	2000	1500	1000	50	00
Quantity per reel		10	00		50	00



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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.