

Subminiature, Leaded Solid Tantalum Capacitors Polar or Non-polar



FEATURES

- Subminiature package size and light weight
- Cylindrical case with axial or radial leads
- 2 to 50 VDC
- 0.001 μ F to 68 μ F
- Operating temperature range : - 55°C to + 125°C
- High stability and reliability
- Tested in accordance with MIL-PRF-49137
- Unique and comprehensive custom design capability

ELECTRICAL CHARACTERISTICS

Operating temperature range: - 55°C to + 125°C

Capacitance: Measured at 120 Hz and 25°C with a maximum of 2.2 VDC bias and 1.0 volt rms signal.

Capacitance Tolerance: Standard tolerance is $\pm 20\%$ for ratings 0.1 μ F and above, and + 40, - 20% for ratings below 0.1 μ F. Special tolerances are also available.

Dissipation Factor: When measured simultaneously with capacitance, DF shall not exceed the value shown in the ratings tables.

DC Leakage Current (DCL Max):

When measured with DC voltage applied through a 1,000 Ω resistor for 5 minutes, DC leakage (μ A) shall not exceed:

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 and 66% of rated voltage: Leakage current shall not exceed 15 times the values listed in the Standard Ratings Tables.

Operating Voltage: Full working voltage up to 85°C. From 85°C to 125°C working voltage derates linearly to 66% of the 85°C working voltage.

APPLICATIONS

- Hearing aids
- Portable communications
- Space/avionics
- Laptop computers.

MECHANICAL SPECIFICATIONS

Solder coated nickel leads (type N32 per MIL-STD-1276) are standard on all case sizes.

Leads are weldable and/or solderable.

Special leads are available on request (e.g. bare nickle, gold plated nickle or ribbon leads).

Lead length is 1 1/2" [38.1 mm] minimum on nonpolar parts.

On polar parts the negative lead is 1-1/4" [31.8mm] minimum and the positive lead is 1-1/2" [38.1mm] minimum.

ORDERING INFORMATION

HA MODEL	1.0 CAPACITANCE IN μ F	35 DC VOLTAGE RATING AT + 85°C	CZ CASE CODE	A* LEAD CONFIGURATION	M CAPACITANCE TOLERANCE
			C = Polar N = Nonpolar	A = Axial R = Radial	E = +40, -20% M = $\pm 20\%$ K = $\pm 10\%$ J = $\pm 5\%$
Example of Part Number Code: HA1.0-35C7AM					
* To complete part number in rating tables, add A or R. Change suffix if special capacitance tolerance is required.					

DIMENSIONS in inches [millimeters]							
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>POLAR STYLE</p> <p>AXIAL</p> </div> <div style="width: 45%;"> <p>RADIAL</p> </div> </div>							
CASE CODE	MAX L	MAX D	MAX E	E TOL ±	d		
C0	0.100 [2.54]	0.057 [1.45]	0.030 [0.76]	0.015 [0.38]	0.007 [0.18]		
C1	0.110 [2.80]	0.067 [1.70]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C2	0.125 [3.18]	0.067 [1.70]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C3	0.145 [3.68]	0.067 [1.70]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C4	0.160 [4.06]	0.070 [1.78]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C5	0.160 [4.06]	0.077 [1.96]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C6	0.190 [4.83]	0.077 [1.96]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C7	0.200 [5.08]	0.080 [2.03]	0.050 [1.27]	0.015 [0.38]	0.010 [0.25]		
C8	0.225 [5.72]	0.100 [2.54]	0.070 [1.78]	0.020 [0.51]	0.010 [0.25]		
C9	0.250 [6.35]	0.150 [3.81]	0.120 [3.05]	0.025 [0.64]	0.016 [0.41]		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>NON POLAR STYLE</p> <p>AXIAL</p> </div> <div style="width: 45%;"> <p>RADIAL</p> </div> </div>							
CASE CODE	MAX LA	MAX LR	MAX W	MAX T	E	E TOL ±	d
N1	0.175 [4.45]	0.135 [3.43]	0.120 [3.05]	0.070 [1.78]	0.100 [2.54]	0.020 [0.51]	0.010 [0.25]
N2	0.210 [5.33]	0.160 [4.06]	0.120 [3.05]	0.070 [1.78]	0.100 [2.54]	0.020 [0.51]	0.010 [0.25]
N3	0.240 [6.10]	0.200 [5.08]	0.140 [3.56]	0.080 [2.03]	0.100 [2.54]	0.020 [0.51]	0.010 [0.25]
N4	0.275 [6.99]	0.235 [5.97]	0.190 [4.83]	0.105 [2.67]	0.125 [3.18]	0.020 [0.51]	0.010 [0.25]
N5	0.310 [7.87]	0.270 [6.86]	0.290 [7.37]	0.155 [3.94]	0.200 [5.08]	0.025 [0.64]	0.016 [0.41]

STANDARD RATINGS - POLAR CAPACITORS

CAPACITANCE (μ F)	MAX DF (%)	MAX. DCL @ + 25°C (μ A)	CASE CODE	PART NUMBER
2 WVDC @ + 85°C				
0.47	10	0.5	C0	HA.47-2C0*M
1.5	10	0.5	C1	HA1.5-2C1*M
2.2	10	0.5	C2	HA2.2-2C2*M
3.3	10	0.5	C3	HA3.3-2C3*M
4.7	10	0.5	C4	HA4.7-2C4*M
6.8	10	0.5	C5	HA6.8-2C5*M
10	10	0.5	C6	HA10-2C6*M
15	10	0.5	C7	HA15-2C7*M
22	10	1.0	C8	HA22-2C8*M
68	10	1.5	C9	HA68-2C9*M
3 WVDC @ + 85°C				
1.0	10	0.5	C1	HA1.0-3C1*M
1.5	10	0.5	C2	HA1.5-3C2*M
2.2	10	0.5	C3	HA2.2-3C3*M
3.3	10	0.5	C4	HA3.3-3C4*M
4.7	10	0.5	C5	HA4.7-3C5*M
6.8	10	0.5	C6	HA6.8-3C6*M
10	10	0.5	C7	HA10-3C7*M
15	10	1.0	C8	HA15-3C8*M
47	10	1.5	C9	HA47-3C9*M
4 WVDC @ + 85°C				
0.33	10	0.5	C0	HA.33-4C0*M
0.68	8	0.5	C1	HA.68-4C1*M
1.0	8	0.5	C2	HA1.0-4C2*M
1.5	8	0.5	C3	HA1.5-4C3*M
2.2	8	0.5	C4	HA2.2-4C4*M
3.3	8	0.5	C5	HA3.3-4C5*M
4.7	8	0.5	C6	HA4.7-4C6*M
6.8	8	0.5	C7	HA6.8-4C7*M
10	8	1.0	C8	HA10-4C8*M
33	8	1.5	C9	HA33-4C9*M
6 WVDC @ + 85°C				
0.22	10	0.5	C0	HA.22-6C0*M
0.47	6	0.5	C1	HA.47-6C1*M
0.68	6	0.5	C2	TC.68-6C2*M
1.0	6	0.5	C3	HA1.0-6C3*M
1.5	6	0.5	C4	HA1.5-6C4*M
2.2	6	0.5	C5	HA2.2-6C5*M
3.3	6	0.5	C6	HA3.3-6C6*M
4.7	6	0.5	C7	HA4.7-6C7*M
6.8	6	1.0	C8	HA6.8-6C8*M
22	6	1.5	C9	HA22-6C9*M

* Add A for axial, R for radial

Subminiature, Leaded Solid Tantalum Capacitors
Polar or Non-polar

Vishay Sprague

STANDARD RATINGS - POLAR CAPACITORS				
CAPACITANCE (μF)	MAX DF (%)	MAX. DCL @ + 25°C (μA)	CASE CODE	PART NUMBER
10 WVDC @ + 85°C				
0.0010	10	0.5	C0	HA.0010-10C0*E
0.0010	10	0.5	C1	HA.0010-10C1*E
0.0015	10	0.5	C0	HA.0015-10C0*E
0.0015	10	0.5	C1	HA.0015-10C1*E
0.0022	10	0.5	C0	HA.0022-10C0*E
0.0022	10	0.5	C1	HA.0022-10C1*E
0.0033	10	0.5	C0	HA.0033-10C0*E
0.0033	10	0.5	C1	HA.0033-10C1*E
0.0047	10	0.5	C0	HA.0047-10C0*E
0.0047	10	0.5	C1	HA.0047-10C1*E
0.15	10	0.5	C0	HA.15-10C0*M
0.33	6	0.5	C1	HA.33-10C1*M
0.47	6	0.5	C2	HA.47-10C2*M
0.68	6	0.5	C3	HA.68-10C3*M
1.0	6	0.5	C4	HA1.0-10C4*M
1.5	6	0.5	C5	HA1.5-10C5*M
2.2	6	0.5	C6	HA2.2-10C6*M
3.3	6	0.5	C7	HA3.3-10C7*M
4.7	6	1.0	C8	HA4.7-10C8*M
15	6	1.5	C9	HA15-10C9*M
15 WVDC @ + 85°C				
0.10	10	0.5	C0	HA.10-15C0*M
0.22	6	0.5	C1	HA.22-15C1*M
0.33	6	0.5	C2	HA.33-15C2*M
0.47	6	0.5	C3	HA.47-15C3*M
0.68	6	0.5	C4	HA.68-15C4*M
1.0	6	0.5	C5	HA1.0-15C5*M
1.5	6	0.5	C6	HA1.5-15C6*M
2.2	6	0.5	C7	HA2.2-15C7*M
3.3	6	1.0	C8	HA3.3-15C8*M
10	6	1.5	C9	HA10-15C9*M
20 WVDC @ + 85°C				
0.0068	10	0.5	C0	HA.0068-0C0*E
0.0068	10	0.5	C1	HA.0068-0C1*E
0.010	10	0.5	C0	HA.010-20C0*E
0.015	10	0.5	C0	HA.015-20C0*E
0.022	10	0.5	C0	HA.022-20C0*E
0.033	10	0.5	C0	HA.033-20C0*E
0.047	10	0.5	C0	HA.047-20C0*E
0.068	10	0.5	C0	HA.068-20C0*E
0.15	6	0.5	C1	HA.15-20C1*M
0.22	6	0.5	C2	HA.22-20C2*M

*Add A for axial, R for radial

STANDARD RATINGS - POLAR CAPACITORS

CAPACITANCE (μ F)	MAX DF (%)	MAX. DCL @ + 25°C (μ A)	CASE CODE	PART NUMBER
20 WVDC @ + 85°C(Contd)				
0.33	6	0.5	C3	HA.33-20C3*M
0.47	6	0.5	C4	HA.47-20C4*M
0.68	6	0.5	C5	HA.68-20C5*M
1.0	6	0.5	C6	HA1.0-20C6*M
1.5	6	0.5	C7	HA1.5-20C7*M
2.2	6	1.0	C8	HA2.2-20C8*M
4.7	6	1.5	C9	HA4.7-20C9*M
6.8	6	1.5	C9	HA6.8-20C9*M
35 WVDC @ + 85°C				
0.010	6	0.5	C1	HA.010-35C1*E
0.015	6	0.5	C1	HA.015-35C1*E
0.022	6	0.5	C1	HA.022-35C1*E
0.033	6	0.5	C1	HA.033-35C1*E
0.047	6	0.5	C1	HA.047-35C1*E
0.068	6	0.5	C1	HA.068-35C1*E
0.10	6	0.5	C1	HA.10-35C1*M
0.15	6	0.5	C2	HA.15-35C2*M
0.22	6	0.5	C3	HA.22-35C3*M
0.33	6	0.5	C4	HA.33-35C4*M
0.47	6	0.5	C5	HA.47-35C5*M
0.68	6	0.5	C6	HA.68-35C6*M
1.0	6	0.5	C7	HA1.0-35C7*M
1.5	6	0.5	C8	HA1.5-35C8*M
3.3	6	1.5	C9	HA3.3-35C9*M
50 WVDC @ + 85°C				
0.10	6	0.5	C2	HA.10-50C2*M
0.15	6	0.5	C3	HA.15-50C3*M
0.22	6	0.5	C4	HA.22-50C4*M
0.33	6	0.5	C5	HA.33-50C5*M
0.47	6	0.5	C6	HA.47-50C6*M
0.68	6	0.5	C7	HA.68-50C7*M
1.0	6	1.0	C8	HA1.0-50C8*M
1.5	6	1.5	C9	HA1.5-50C9*M
2.2	6	1.5	C9	HA2.2-50C9*M

*Add A for axial, R for radial



STANDARD RATINGS - NON-POLAR CAPACITORS				
CAPACITANCE (μF)	MAX DF (%)	MAX. DCL @ + 25°C (μA)	CASE CODE	PART NUMBER
2 WVDC @ + 85°C				
1.0	10	0.5	N1	HA1.0-2N1*M
2.2	10	0.5	N2	HA2.2-2N2*M
4.7	10	0.5	N3	HA4.7-2N3*M
10	10	1.0	N4	HA10-2N4*M
33	10	1.5	N5	HA33-2N5*M
3 WVDC @ + 85°C				
0.68	10	0.5	N1	HA.68-3N1*M
1.5	10	0.5	N2	HA1.5-3N2*M
3.3	10	0.5	N3	HA3.3-3N3*M
6.8	10	1.0	N4	HA6.8-3N4*M
22	10	1.5	N5	HA22-3N5*M
4 WVDC @ + 85°C				
0.47	8	0.5	N1	HA.47-4N1*M
1.0	8	0.5	N2	HA1.0-4N2*M
2.2	8	0.5	N3	HA2.2-4N3*M
4.7	8	1.0	N4	HA4.7-4N4*M
15	8	1.5	N5	HA15-4N5*M
6 WVDC @ + 85°C				
0.33	6	0.5	N1	HA.33-6N1*M
0.68	6	0.5	N2	HA.68-6N2*M
1.5	6	0.5	N3	HA1.5-6N3*M
3.3	6	1.0	N4	HA3.3-6N4*M
10	6	1.5	N5	HA10-6N5*M
10 WVDC @ + 85°C				
0.22	6	0.5	N1	HA.22-10N1*M
0.47	6	0.5	N2	HA.47-10N2*M
1.0	6	0.5	N3	HA1.0-10N3*M
2.2	6	1.0	N4	HA2.2-10N4*M
6.8	6	1.5	N5	HA6.8-10N5*M
15 WVDC @ + 85°C				
0.15	6	0.5	N1	HA.15-15N1*M
0.33	6	0.5	N2	HA.33-15N2*M
0.68	6	0.5	N3	HA.68-15N3*M
1.5	6	1.0	N4	HA1.5-15N4*M
4.7	6	1.5	N5	HA4.7-15N5*M
20 WVDC @ + 85°C				
0.010	6	0.5	N1	HA.010-20N1*M
0.015	6	0.5	N1	HA.015-20N1*M
0.022	6	0.5	N1	HA.022-20N1*M

*Add A for axial, R for radial



STANDARD RATINGS - NON-POLAR CAPACITORS				
CAPACITANCE (μ F)	MAX DF (%)	MAX. DCL @ + 25°C (μ A)	CASE CODE	PART NUMBER
20 WVDC @ + 85°C(Contd.)				
0.033	6	0.5	N2	HA.033-20N2*M
0.047	6	0.5	N2	HA.047-20N2*M
0.068	6	0.5	N2	HA.068-20N2*M
0.10	6	0.5	N1	HA.10-20N1*M
0.22	6	0.5	N2	HA.22-20N2*M
0.47	6	0.5	N3	HA.47-20N3*M
1.0	6	1.0	N4	HA1.0-20N4*M
2.2	6	1.5	N5	H2.2-20N5*M
3.3	6	1.5	N5	HA3.3-20N5*M
35 WVDC @ + 85°C				
0.10	6	0.5	N2	HA.10-35N2*M
0.15	6	0.5	N2	HA.15-35N2*M
0.22	6	0.5	N3	HA.22-35N3*M
0.33	6	0.5	N3	HA.33-35N3*M
0.47	6	1.0	N4	HA.47-35N4*M
0.68	6	1.0	N4	HA.68-35N4*M
1.0	6	1.5	N5	HA1.0-35N5*M
1.5	6	1.5	N5	HA1.5-35N5*M
50 WVDC @ + 85°C				
0.068	6	0.5	N3	HA.068-50N3*M
0.15	6	0.5	N3	HA.15-50N3*M
0.33	6	1.0	N4	HA.33-50N4*M
0.68	6	1.5	N5	HA.68-50N5*M

*Add A for axial, R for radial

MARKING				
HA Capacitors case sizes N4 and N5 are print marked:		All other case sizes are have color dot marking:		
- Capacitance is in picofarads		Capacitance	Color	Digit
- 1st and 2nd digits are significant figures		In picofarads, indicated by 3 dots.	Black	0
- 3rd digit indicates the number of zeros.		1st and 2nd dot give the significant digits.	Brown	1
		3rd dot indicates the number of zeros.	Red	2
		Color dot location is shown on the dimensional sketches.	Orange	3
		Black dot is omitted on black sleeve.	Yellow	4
			Green	5
			Blue	6
			Violet	7
			Grey	8
			White	9
Capacitance Tolerance	Color	Tolerance		
Is indicated by a dot on the side of the case.	Gold	\pm 5%		
Black dot is omitted.	Silver	\pm 10%		
	None	\pm 20%		
	None	+ 40%/- 20%		
The positive lead is indicated by a color dot of red epoxy on the unit.		e.g. Yellow-Violet-Green = 4,700,000 pf = 4.7 μF		



PERFORMANCE AND RELIABILITY

The capacitors are tested in accordance with MIL-PRF-49137, with specific requirements as follows:

Temperature Stability: When tested per MIL-PRF-49137/6, capacitance shall be within +/-15% at -55°C and 85°C, and +/-10% at 25°C after exposure to temperature extremes. DF shall be within 200% of initial limit at -55°C, 150% of initial limit at 85°C, and meet the initial at 25°C. DCL shall be within 10 x initial limit at 85°C, and meet the initial limit at 25°C.

Moisture Resistance: (per Method 106 of MIL-STD-202) After 10 cycles of 24 hours at 25°C to 65°C and 80-98% RH; capacitance shall be within +/-15% of initial value, DF within 1.5 x initial limit and leakage within 3 x initial limit.

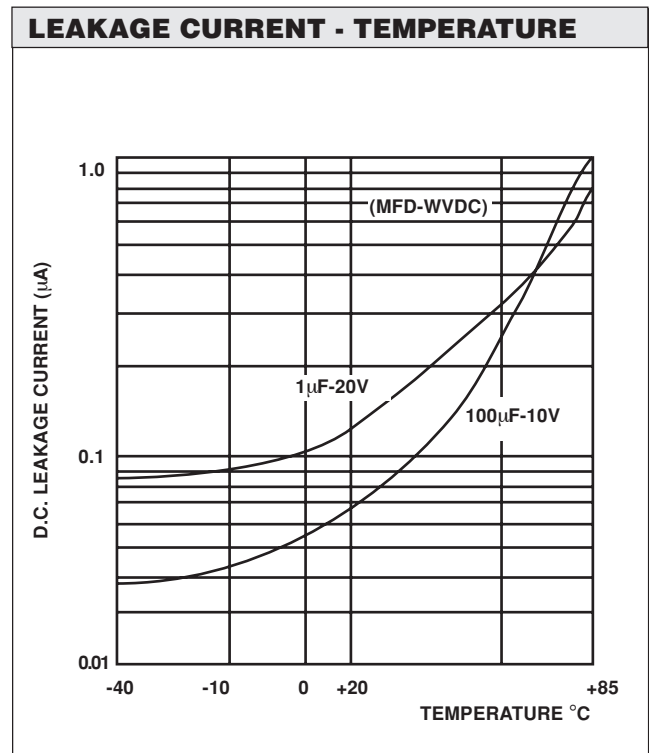
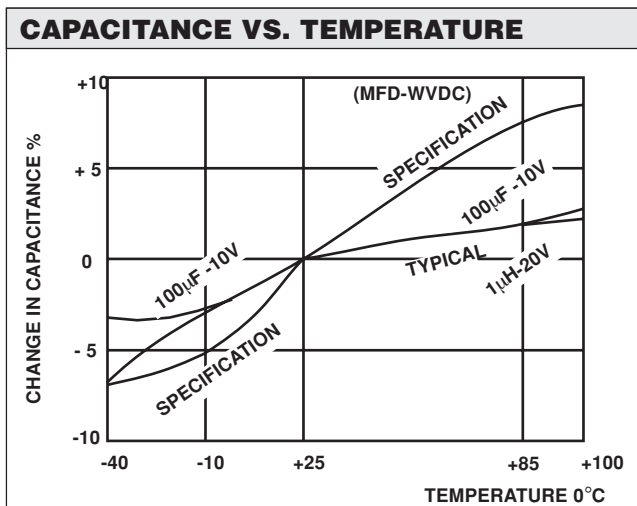
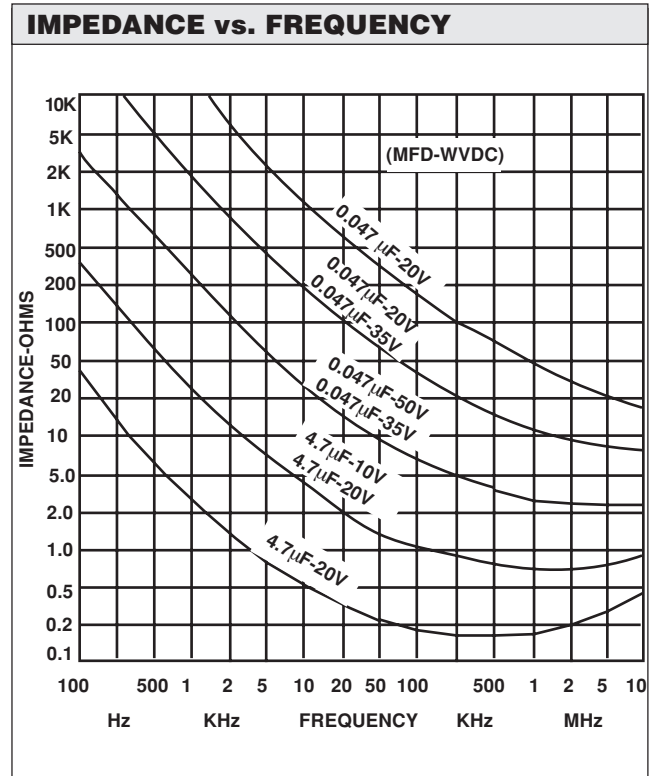
Life: (per Method 108 of MIL-STD-202) after 1,000 hours at 85°C and rated voltage; capacitance shall be within +/-10% of initial limit, DF within initial limits, and leakage within 200% of initial limit.

Surge Voltage: (per MIL-PRF-49317) After 1,000 cycles at 85°C and 1.3 x WVDC; capacitance shall be within +/-10% of initial limit, DF and leakage within initial limits.

Resistance to Soldering Heat: (per Method 210 Of MIL-STD-202, Condition B) After immersion in 260°C molten solder to within a 1/4" of the body of the unit, there shall be no evidence of mechanical or electrical degradation.

Solderability: (per Method 208 of MIL-STD-202) After dipping leads in 235°C molten solder to within .125" of the body of the unit, the solder shall cover 95% of the lead surface.

Terminal Strength: (per Method 211 of MIL-STD-202) After the following test there shall be no loosening of the terminals or permanent damage to the terminals. Test Condition A: (Pull Test) 0.010" leads withstand 1 pound, 0.016" leads 2 pounds and 0.007" leads 1/2 pound. Test Condition C: (Bend Test) All leads shall withstand 3-90° bends with a 1/2 pound applied force.





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