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 35 VDC
- 0.22µF to 68µF
- Operating temperature range : - 55°C to + 125°C
- High stability and reliability
- Tested in accordance with MIL-PRF-49137
- Utilize high CV technology to extend the range of capacitance values in each size
- 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 ± 20% for ratings 0.1µF and above, and + 40, - 20% for ratings below 0.1µF. 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 1,000Ω resistor for 5 minutes, DC leakage (µA) 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

SHA	1.0	35	C7	A*	M
MODEL	CAPACITANCE IN µF	DC VOLTAGE RATING AT + 85°C	CASE CODE	LEAD CONFIGURATION	CAPACITANCE TOLERANCE
			C = Polar N = Nonpolar	A = Axial R = Radial	E = +40, -20% M = ± 20% K = ± 10% J = ± 5%

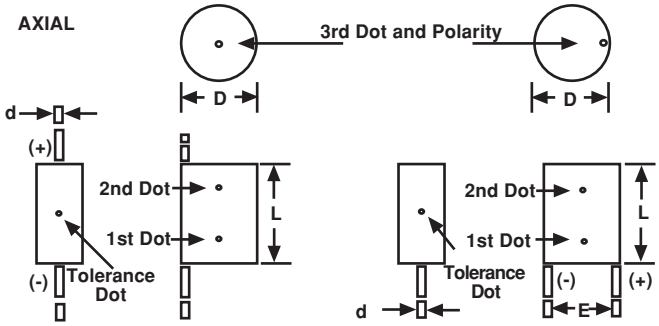
Example of Part Number Code: SHA1.0-35C7AM

*To complete part number in rating tables, add A or R.
Change suffix if special capacitance tolerance is required.

For technical questions, contact tantalum@vishay.com
Document Number: 43004
Revision 13-Jun-02

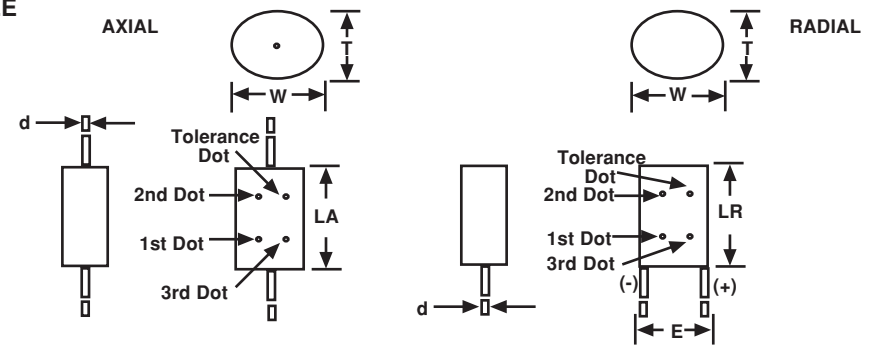
DIMENSIONS in inches [millimeters]

POLAR STYLE



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]

NON POLAR STYLE



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]

Subminiature, Leaded Solid Tantalum Capacitors
Polar or Non-polar

STANDARD RATINGS - POLAR CAPACITORS

CAPACITANCE (µF)	MAX DF (%)	MAX. DCL @ + 25°C (µA)	CASE CODE	PART NUMBER
		2 WVDC @ + 85°C		
3.3	10	0.5	C1	SHA3.3-2C1*M
15	10	0.5	C5	SHA15-2C5*M
22	10	1.0	C6	SHA22-2C6*M
68	10	1.5	C8	SHA68-2C8*M
		3 WVDC @ + 85°C		
2.2	10	0.5	C1	SHA2.2-3C1*M
3.3	10	0.5	C2	SHA3.3-3C2*M
4.7	10	0.5	C3	SHA4.7-3C3*M
6.8	10	0.5	C4	SHA6.8-3C4*M
10	10	0.5	C5	SHA10-3C5*M
15	10	1.0	C6	SHA15-3C6*M
22	10	1.0	C7	SHA22-3C7*M
47	10	1.5	C8	SHA47-3C8*M
68	10	5.0	C9	SHA68-3C9*M
		4 WVDC @ + 85°C		
1.5	8	0.5	C1	SHA1.5-4C1*M
2.2	8	0.5	C2	SHA2.2-4C2*M
3.3	8	0.5	C3	SHA3.3-4C3*M
4.7	8	0.5	C4	SHA4.7-4C4*M
6.8	8	0.5	C5	SHA6.8-4C5*M
10	8	1.0	C6	SHA10-4C6*M
15	8	1.0	C7	SHA15-4C7*M
33	8	1.5	C8	SHA33-4C8*M
47	8	5.0	C9	SHA47-4C9*M
		6 WVDC @ + 85°C		
1.0	6	0.5	C1	SHA1.0-6C1*M
1.5	6	0.5	C2	SHA1.5-6C2*M
2.2	6	0.5	C3	SHA2.2-6C3*M
3.3	6	0.5	C4	SHA3.3-6C4*M
4.7	6	0.5	C5	SHA4.7-6C5*M
6.8	6	1.0	C6	SHA6.8-6C6*M
10	6	1.0	C7	SHA10-6C7*M
22	6	1.5	C8	SHA22-6C8*M
33	6	5.0	C9	SHA33-6C9*M
		10 WVDC @ + 85°C		
0.68	6	0.5	C1	SHA.68-10C1*M
1.0	6	0.5	C2	SHA1.0-10C2*M
1.5	6	0.5	C3	SHA1.5-10C3*M
2.2	6	0.5	C4	SHA2.2-10C4*M
3.3	6	0.5	C5	SHA3.3-10C5*M
4.7	6	1.0	C6	SHA4.7-10C6*M
6.8	6	1.0	C7	SHA6.8-10C7*M
15	6	1.5	C8	SHA15-10C8*M
22	8	5.0	C9	SHA22-10C9*M

*Add A for axial, R for radial

STANDARD RATINGS - POLAR CAPACITORS

CAPACITANCE	MAX (µF)	MAX. DCL DF (%)	CASE @ + 25°C (µF)	PART NUMBER CODE
15 WVDC @ + 85°C				
0.47	6	0.5	C1	SHA.47-15C1*M
0.68	6	0.5	C1	SHA.68-15C1*M
1.0	6	0.5	C3	SHA1.0-15C3*M
1.5	6	0.5	C4	SHA1.5-15C4*M
2.2	6	0.5	C5	SHA2.2-15C5*M
3.3	6	1.0	C6	SHA3.3-15C6*M
4.7	6	1.0	C7	SHA4.7-15C7*M
15	8	5.0	C9	SHA15-15C9*M
20 WVDC @ + 85°C				
0.33	6	0.5	C1	SHA.33-20C1*M
0.47	6	0.5	C2	SHA.47-20C2*M
0.68	6	0.5	C3	SHA.68-20C3*M
1.0	6	0.5	C4	SHA1.0-20C4*M
1.5	6	0.5	C5	SHA1.5-20C5*M
2.2	6	1.0	C6	SHA2.2-20C6*M
3.3	6	1.0	C7	SHA3.3-20C7*M
10	8	5.0	C9	SHA10-20C9*M
25 WVDC @ + 85°C				
2.2	6	1.0	C7	SHA2.2-25C7*M
3.3	6	1.5	C8	SHA3.3-25C8*M
6.8	8	5.0	C9	SHA6.8-25C9*M
35 WVDC @ + 85°C				
0.22	6	0.5	C1	SHA.22-35C1*M
0.33	6	0.5	C2	SHA.33-35C2*M
0.47	6	0.5	C3	SHA.47-35C3*M
0.68	6	0.5	C4	SHA.68-35C4*M
1.0	6	0.5	C5	SHA1.0-35C5*M
1.5	6	0.5	C6	SHA1.5-35C6*M
1.5	6	1.0	C7	SHA1.5-35C7*M
2.2	6	1.5	C8	SHA2.2-35C8*M

*Add A for axial, R for radial

STANDARD RATINGS - NON-POLAR CAPACITORS

CAPACITANCE	MAX (µF)	MAX. DCL DF (%)	CASE @ + 25°C (µF)	PART NUMBER CODE
2 WVDC @ + 85°C				
3.3	10	0.5	N2	SHA3.3-2N2*M
6.8	10	0.5	N3	SHA6.8-2N3*M
15	10	1.0	N4	SHA15-2N4*M
47	10	2.5	N5	SHA47-2N5*M
4 WVDC @ + 85°C				
2.2	8	0.5	N2	SHA2.2-4N2*M
4.7	8	0.5	N3	SHA4.7-4N3*M
10	8	1.0	N4	SHA10-4N4*M
33	8	2.5	N5	SHA33-4N5*M

* Add A for axial, R for radial

Subminiature, Leaded Solid Tantalum Capacitors
Polar or Non-polar

STANDARD RATINGS - NON-POLAR CAPACITORS

CAPACITANCE	MAX (µF)	MAX. DCL DF (%)	CASE @ + 25°C (µF)	PART NUMBER CODE
6 WVDC @ + 85°C				
1.5	6	0.5	N2	SHA1.5-6N2*M
3.3	6	1.0	N3	SHA3.3-6N3*M
6.8	6	1.0	N4	SHA6.8-6N4*M
22	6	2.5	N5	SHA22-6N5*M
10 WVDC @ + 85°C				
1.0	6	0.5	N2	SHA1.0-10N2*M
2.2	6	1.0	N3	SHA2.2-10N3*M
4.7	6	1.5	N4	SHA4.7-10N4*M
15	6	2.5	N5	SHA15-10N5*M
15 WVDC @ + 85°C				
0.68	6	0.5	N2	SHA.68-15N2*M
1.5	6	1.0	N3	SHA1.5-15N3*M
3.3	6	1.5	N4	SHA3.3-15N4*M
10	6	2.5	N5	SHA10-15N5*M
20 WVDC @ + 85°C				
0.47	6	0.5	N2	SHA.47-20N2*M
1.0	6	1.0	N3	SHA1.0-20N3*M
2.2	6	1.5	N4	SHA2.2-20N4*M
6.8	6	2.5	N5	SHA6.8-20N5*M
35 WVDC @ + 85°C				
0.33	6	0.5	N2	SHA.33-35N2*M
0.68	6	1.0	N3	SHA.68-35N3*M
1.5	6	1.5	N4	SHA1.5-35N4*M

* Add A for axial, R for radial

MARKING

SHA Capacitors case sizes N4 and N5 are print marked:

- Capacitance is in picofarads
- 1st and 2nd digits are significant figures
- 3rd digit indicates the number of zeros.

Capacitance Tolerance	Color	Tolerance
Is indicated by a dot on the	Gold	± 5%
side of the case.	Silver	± 10%
Black dot is omitted.	None	± 20%
	None	+ 40%/- 20%

The positive lead is indicated by a color dot of red epoxy on the unit.
Radial lead style is marked with brown epoxy on the top.
Axial lead style is marked with brown epoxy on the cathode end.

All other case sizes are have color dot marking:

Capacitance	Color	Digit
In picofarads, indicated by 3 dots.	Black	0
1st and 2nd dot give	Brown	1
the significant digits.	Red	2
3rd dot indicates the number	Orange	3
of zeros.	Yellow	4
Color dot location is shown on	Green	5
the dimensional sketches.	Blue	6
Black dot is omitted on black sleeve.	Violet	7
	Grey	8
	White	9

e.g. Yellow-Violet-Green = 4,700,000 pf
= 4.7 µF

For technical questions, contact tantalum@vishay.com

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.

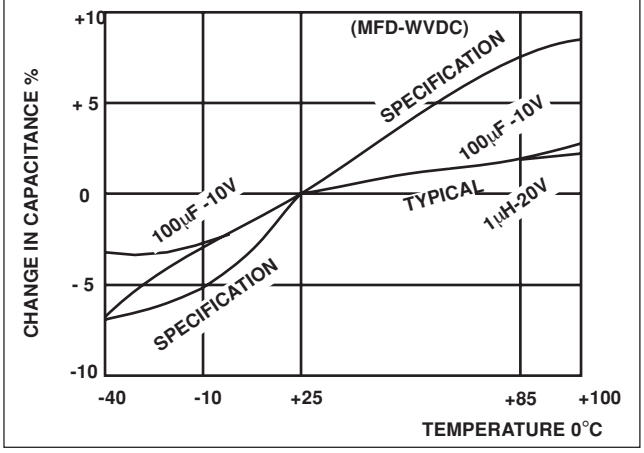
Surge Voltage: (per MIL-PRF-49317) After 1,000 cycles at 85°C and 1.3 x WVDC; capacitance shall be within +/-10% of initial limit, DF and leakage within initial limits.

Resistance to Soldering Heat: (per Method 210 0f 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.

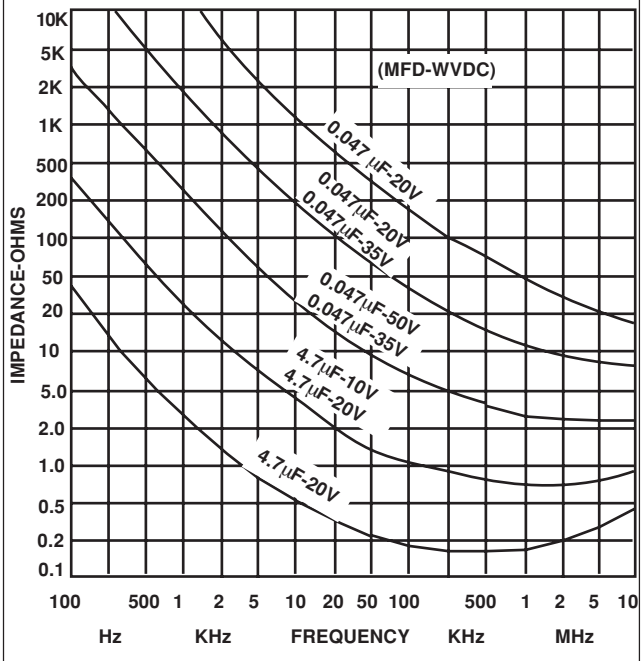
Solderability: (per Method 208 of MIL-STD-202) After dipping leads in 235°C molten solder to within .125" of the body of the unit, the solder shall cover 95% of the lead surface.

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.

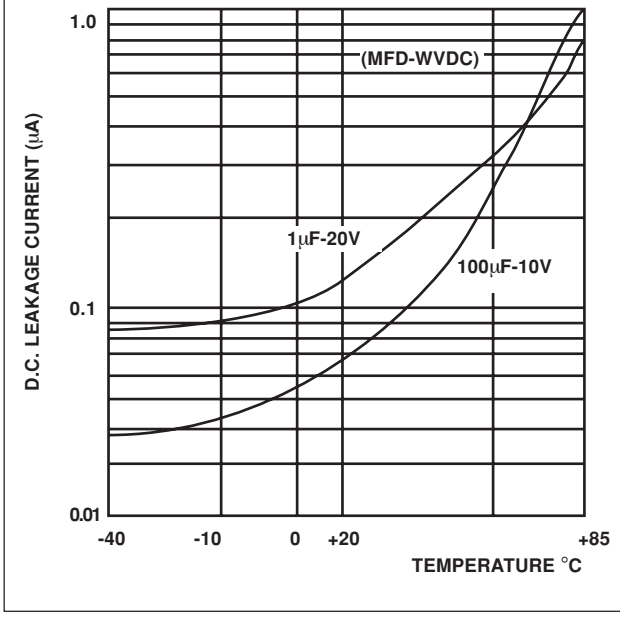
CAPACITANCE VS. TEMPERATURE



IMPEDANCE vs. FREQUENCY



LEAKAGE CURRENT - TEMPERATURE



Disclaimer

All product specifications and data are subject to change without notice.

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 herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

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.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.