

## Overview

The KEMET T225 High Temperature Solder Series of solid tantalum capacitors is especially designed for miniaturization and employs a unique glass-to-metal compression end seal that has no protruding eyelet. This flush end seal construction ideally suits the T225 Series for all miniature high density packaging applications. The capacitors consist of a dry porous tantalum pellet, hermetically sealed in a solder coated metal case with solder coated alloy 52 and solder coated nickel.

The internal design of these devices, as well as the hermetic seal, includes high temperature solder (minimum melting point of 221°C). The content of tin in the solder does not exceed 97%. This assembly is especially suited for temperature conditions where solder may fail due to undesirable solder reflow.

The T225 series is approved to all ratings and failure rates of MIL-PRF-39003/2.

## Benefits

- Internal construction solder to resist up to 221°C
- Qualified to MIL-PRF-39003 (CSR09 Style)
- Failure rate options: Graded – B, C, D, and G, and Exponential – M, P, R, and S
- Surge current options D, E, and F
- Operating temperature range of -55°C to +125°C
- Capacitance values of 0.047  $\mu$ F to 18  $\mu$ F
- Tolerances of  $\pm 5\%$ , and  $\pm 10\%$
- Voltage rating of 6 – 75 VDC
- Case sizes: A and B
- Taped and reeled per EIA Specification RS-296
- Marking per MIL-STD-1285



## Applications

KEMET's T225 High Temperature Solder Series of solid tantalum capacitors is especially designed for miniaturization.

## Ordering Information

T	225	A	225	K	010	B	S	7200
Capacitor Class	Series	Case Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Failure Rate/Military Product Only	Termination Finish	Specification
T = Tantalum	Hermetically Sealed Axial High Temperature Solder	A B	First two digits represent significant figures. Third digit specifies number of zeros to follow.	J = ±5% K = ±10%	006 = 6 010 = 10 015 = 15 020 = 20 035 = 35 050 = 50 075 = 75	Graded: B = 0.1%/k hours C = 0.01%/k hours D = 0.001%/k hours G = 1.0%/k hours Exponential: M = 1%/k hours P = 0.1%/k hours R = 0.01%/k hours S = 0.001%/k hours	S = Standard	All capacitors are sleeved unless specified. 0100 = Without sleeve 7200 = Tape & Reel 7293 & 7443 = Ammo 4250 = 10 cycles, 25°C after Weibull 4251 = 10 cycles, -55 & 85°C after Weibull 4252 = 10 cycles, -55 & 85°C before Weibull

## Ordering Information – (CSR09 Style)

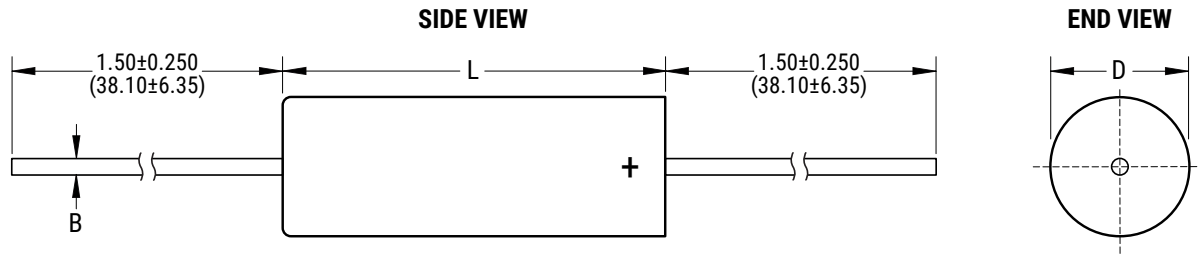
M39003	/02	3036	A
Capacitor Class	Slash	Dash Number	Surge Option
Military Specification Number	Specification Sheet Number	Failure Rate Level	A = C-4250 B = C-4251 C = C-4252 Blank - No surge

Orders should be entered by the military specification number, including the dash number and surge option letter (A, B or C).

## Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	0.047 – 18 µF at 120 Hz/25°C
Capacitance Tolerance	J Tolerance (5%), K Tolerance (10%)
Rated Voltage Range	6 – 75 V
DF (120 Hz at 25°C)	Refer to Part Number Electrical Specification Table
ESR and Impedance (100 kHz at 25°C)	Refer to Part Number Electrical Specification Table (for reference only)
Leakage Current	Refer to Part Number Electrical Specification Table (at rated voltage up to +85°C and 2/3 of rated voltage applied at 125°C)
Failure Rate (MIL-PRF-39003, CSR09 capacitors only)	Approved failure rate: Graded G (1.0%/k hours), B (0.1%/k hours), C (0.01%/k hours), D (0.001%/k hours) and Exponential M (1.0%/k hours), P (0.1%/k hours), R (0.01%/k hours), S (0.001%/k hours)

## Dimensions – Inches (Millimeters)



Case Size	Uninsulated		Insulated		B Wire Diameter
	D $\pm 0.005$ ( $\pm 0.13$ )	L	D	L	
A	0.085 (2.16)	$0.245 + 0.015 / - 0.010$ (6.22 + 0.38 / - 0.25)	$0.090 \pm 0.009$ (2.29 $\pm$ 0.23)	$0.250 + 0.031 / - 0.015$ (6.35 + 0.79 / - 0.38)	$0.016 + 0.005 / - 0.001$ (0.41 + 0.13 / - 0.03)
B	0.127 (3.23)	$0.375 \pm 0.015$ (9.53 $\pm$ 0.38)	$0.138 \pm 0.010$ (3.51 $\pm$ 0.25)	$0.390 \pm 0.015$ (9.91 $\pm$ 0.38)	$0.016 + 0.005 / - 0.001$ (0.41 + 0.13 / - 0.03)

**Table 1 – Ratings & Part Number Reference**

Rated Voltage	Rated Capacitance	Case Size Code	KEMET Military Part Number	DC Leakage	DF % at 25°C	MIL-PRF-39003 (CSR09) Capacitors							
						Dash Number Reference							
						Failure Rate Level (%/1,000 hours)							
						MIL-PRF-39003/2J				MIL-PRF-39003/2J			
						Exponential				Graded			
VDC	µF		(See below for part options)	µA at 25°C Max/5 Minutes	120 Hz Maximum	M (1.0)	P (0.1)	R (0.01)	S (0.001)	G (1)	B (0.1)	C (0.01)	D (0.001)
6	2.7	A	T225A275J006(1)S	0.6	6	1001-	1061-	1121-	1181-	5001-	2001-	3001-	4001-
6	2.7	A	T225A275K006(1)S	0.6	6	0001-	0061-	0121-	0181-	5002-	2002-	3002-	4002-
6	18.0	B	T225B186J006(1)S	1.4	6	1002-	1062-	1122-	1182-	5003-	2003-	3003-	4003-
6	18.0	B	T225B186K006(1)S	1.4	6	0002-	0062-	0122-	0182-	5004-	2004-	3004-	4004-
10	1.8	A	T225A185J010(1)S	0.6	6	1007-	1067-	1127-	1187-	5005-	2005-	3005-	4005-
10	1.8	A	T225A185K010(1)S	0.6	6	0007-	0067-	0127-	0187-	5006-	2006-	3006-	4006-
10	2.2	A	T225A225J010(1)S	0.6	6	1008-	1068-	1128-	1188-	5007-	2007-	3007-	4007-
10	2.2	A	T225A225K010(1)S	0.6	6	0008-	0068-	0128-	0188-	5008-	2008-	3008-	4008-
10	10.0	B	T225B106J010(1)S	2.0	6	1009-	1069-	1129-	1189-	5009-	2009-	3009-	4009-
10	10.0	B	T225B106K010(1)S	2.0	6	0009-	0069-	0129-	0189-	5010-	2010-	3010-	4010-
10	12.0	B	T225B126J010(1)S	2.0	6	1010-	1070-	1130-	1190-	5011-	2011-	3011-	4011-
10	12.0	B	T225B126K010(1)S	2.0	6	0010-	0070-	0130-	0190-	5012-	2012-	3012-	4012-
10	15.0	B	T225B156J010(1)S	2.0	6	1011-	1071-	1131-	1191-	5013-	2013-	3013-	4013-
10	15.0	B	T225B156K010(1)S	2.0	6	0011-	0071-	0131-	0191-	5014-	2014-	3014-	4014-
15	1.0	A	T225A105J015(1)S	0.6	6	1012-	1072-	1132-	1192-	5015-	2015-	3015-	4015-
15	1.0	A	T225A105K015(1)S	0.6	6	0012-	0072-	0132-	0192-	5016-	2016-	3016-	4016-
15	1.2	A	T225A125J015(1)S	0.6	6	1013-	1073-	1133-	1193-	5017-	2017-	3017-	4017-
15	1.2	A	T225A125K015(1)S	0.6	6	0013-	0073-	0133-	0193-	5018-	2018-	3018-	4018-
15	1.5	A	T225A155J015(1)S	0.6	6	1014-	1074-	1134-	1194-	5019-	2019-	3019-	4019-
15	1.5	A	T225A155K015(1)S	0.6	6	0014-	0074-	0134-	0194-	5020-	2020-	3020-	4020-
15	8.2	B	T225B825J015(1)S	1.8	6	1015-	1075-	1135-	1195-	5021-	2021-	3021-	4021-
15	8.2	B	T225B825K075(1)S	1.8	6	0015-	0075-	0135-	0195-	5022-	2022-	3022-	4022-
20	0.56	A	T225A564J020(1)S	0.6	3	1016-	1076-	1136-	1196-	5023-	2023-	3023-	4023-
20	0.56	A	T225A564K020(1)S	0.6	3	0016-	0076-	0136-	0196-	5024-	2024-	3024-	4024-
20	0.68	A	T225A684J020(1)S	0.6	3	1017-	1077-	1137-	1197-	5025-	2025-	3025-	4025-
20	0.68	A	T225A684K020(1)S	0.6	3	0017-	0077-	0137-	0197-	5026-	2026-	3026-	4026-
20	0.82	A	T225A824J020(1)S	0.6	3	1018-	1078-	1138-	1198-	5027-	2027-	3027-	4027-
20	0.82	A	T225A824K020(1)S	0.6	3	0018-	0078-	0138-	0198-	5028-	2028-	3028-	4028-
20	1.0	A	T225A105J020(1)S	0.6	3	1019-	1079-	1139-	1199-	5029-	2029-	3029-	4029-
20	1.0	A	T225A105K020(1)S	0.6	3	0019-	0079-	0139-	0199-	5030-	2030-	3030-	4030-
20	3.3	B	T225B335J020(1)S	1.0	3	1020-	1080-	1140-	1200-	5031-	2031-	3031-	4031-
20	3.3	B	T225B335K020(1)S	1.0	3	0020-	0080-	0140-	0200-	5032-	2032-	3032-	4032-
20	3.9	B	T225B395J020(1)S	2.0	3	1021-	1081-	1141-	1201-	5033-	2033-	3033-	4033-
20	3.9	B	T225B395K020(1)S	2.0	3	0021-	0081-	0141-	0201-	5034-	2034-	3034-	4034-
20	4.7	B	T225B475J020(1)S	2.0	3	1022-	1082-	1142-	1202-	5035-	2035-	3035-	4035-
20	4.7	B	T225B475K020(1)S	2.0	3	0022-	0082-	0142-	0202-	5036-	2036-	3036-	4036-
20	5.6	B	T225B565J020(1)S	2.0	3	1023-	1083-	1143-	1203-	5037-	2037-	3037-	4037-
20	5.6	B	T225B565K020(1)S	2.0	3	0023-	0083-	0143-	0203-	5038-	2038-	3038-	4038-
20	6.8	B	T225B685J020(1)S	2.0	3	1024-	1084-	1144-	1204-	5039-	2039-	3039-	4039-
20	6.8	B	T225B685K020(1)S	2.0	3	0024-	0084-	0144-	0204-	5040-	2040-	3040-	4040-
35	0.33	A	T225A334J035(1)S	0.6	3	1025-	1085-	1145-	1205-	5041-	2041-	3041-	4041-
35	0.33	A	T225A334K035(1)S	0.6	3	0025-	0085-	0145-	0205-	5042-	2042-	3042-	4042-
35	0.39	A	T225A394J035(1)S	0.6	3	1026-	1086-	1146-	1206-	5043-	2043-	3043-	4043-
35	0.39	A	T225A394K035(1)S	0.6	3	0026-	0086-	0146-	0206-	5044-	2044-	3044-	4044-
35	0.47	A	T225A474J035(1)S	0.6	3	1027-	1087-	1147-	1207-	5045-	2045-	3045-	4045-
35	0.47	A	T225A474K035(1)S	0.6	3	0027-	0087-	0147-	0207-	5046-	2046-	3046-	4046-
35	2.2	B	T225B225J035(1)S	1.4	3	1028-	1088-	1148-	1208-	5047-	2047-	3047-	4047-
35	2.2	B	T225B225K035(1)S	1.4	3	0028-	0088-	0148-	0208-	5048-	2048-	3048-	4048-
35	2.7	B	T225B275J035(1)S	1.4	3	1029-	1089-	1149-	1209-	5049-	2049-	3049-	4049-
35	2.7	B	T225B275K035(1)S	1.4	3	0029-	0089-	0149-	0209-	5050-	2050-	3050-	4050-
VDC	µF	Case Size Code	(see below for part options)	µA at 25°C Max/5 Minutes	120 Hz Maximum	M (1.0)	P (0.1)	R (0.01)	S (0.001)	G (1)	B (0.1)	C (0.01)	D (0.001)
Rated Voltage	Rated Capacitance	Case Size Code	KEMET Part Number	DC Leakage	DF % at 25°C	MIL-PRF-39003 (CSR09) Capacitors							

(1) To complete KEMET Part Number (T225), insert Graded failure rate: G for 1%/k hours, B for 0.1%/k hours, C for 0.01%/k hours, D for 0.001%/k hours or the exponential rate letter. Designates Reliability Level.

**Table 1 – Ratings & Part Number Reference cont'd**

Rated Voltage	Rated Capacitance	Case Size Code	KEMET Military Part Number	DC Leakage	DF % at 25°C	MIL-PRF-39003 (CSR09) Capacitors							
						Dash Number Reference							
						Failure Rate Level (%/1,000 hours)							
						MIL-PRF-39003/2J				MIL-PRF-39003/2J			
						Exponential				Graded			
VDC	µF		(See below for part options)	µA at 25°C Max/5 Minutes	120 Hz Maximum	M (1.0)	P (0.1)	R (0.01)	S (0.001)	G (1)	B (0.1)	C (0.01)	D (0.001)
50	0.22	A	T225A224J050(1)S	0.6	3	1030-	1090-	1150-	1210-	5051-	2051-	3051-	4051-
50	0.22	A	T225A224K050(1)S	0.6	3	0030-	0090-	0150-	0210-	5052-	2052-	3052-	4052-
50	0.27	A	T225A274J050(1)S	0.6	3	1031-	1091-	1151-	1211-	5053-	2053-	3053-	4053-
50	0.27	A	T225A274K050(1)S	0.6	3	0031-	0091-	0151-	0211-	5054-	2054-	3054-	4054-
50	1.5	B	T225B155J050(1)S	1.4	3	1032-	1092-	1152-	1212-	5055-	2055-	3055-	4055-
50	1.5	B	T225B155K050(1)S	1.4	3	0032-	0092-	0152-	0212-	5056-	2056-	3056-	4056-
50	1.8	B	T225B185J050(1)S	1.4	3	1033-	1093-	1153-	1213-	5057-	2057-	3057-	4057-
50	1.8	B	T225B185K050(1)S	1.4	3	0033-	0093-	0153-	0213-	5058-	2058-	3058-	4058-
75	0.047	A	T225A473J075(1)S	0.6	3	1034-	1094-	1154-	1214-	5059-	2059-	3059-	4059-
75	0.047	A	T225A473K075(1)S	0.6	3	0034-	0094-	0154-	0214-	5060-	2060-	3060-	4060-
75	0.056	A	T225A563J075(1)S	0.6	3	1035-	1095-	1155-	1215-	5061-	2061-	3061-	4061-
75	0.056	A	T225A563K075(1)S	0.6	3	0035-	0095-	0155-	0215-	5062-	2062-	3062-	4062-
75	0.068	A	T225A683J075(1)S	0.6	3	1036-	1096-	1156-	1216-	5063-	2063-	3063-	4063-
75	0.068	A	T225A683K075(1)S	0.6	3	0036-	0096-	0156-	0216-	5064-	2064-	3064-	4064-
75	0.082	A	T225A823J075(1)S	1.8	3	1037-	1097-	1157-	1217-	5065-	2065-	3065-	4065-
75	0.082	A	T225A823K075(1)S	1.8	3	0037-	0097-	0157-	0217-	5066-	2066-	3066-	4066-
75	0.10	A	T225A104J075(1)S	0.6	3	1038-	1098-	1158-	1218-	5067-	2067-	3067-	4067-
75	0.10	A	T225A104K075(1)S	0.6	3	0038-	0098-	0158-	0218-	5068-	2068-	3068-	4068-
75	0.12	A	T225A124J075(1)S	0.6	3	1039-	1099-	1159-	1219-	5069-	2069-	3069-	4069-
75	0.12	A	T225A124K075(1)S	0.6	3	0039-	0099-	0159-	0219-	5070-	2070-	3070-	4070-
75	0.15	A	T225A154J075(1)S	0.6	3	1040-	1100-	1160-	1220-	5071-	2071-	3071-	4071-
75	0.15	A	T225A154K075(1)S	0.6	3	0040-	0100-	0160-	0220-	5072-	2072-	3072-	4072-
75	0.18	A	T225A184J075(1)S	0.6	3	1041-	1101-	1161-	1221-	5073-	2073-	3073-	4073-
75	0.18	A	T225A184K075(1)S	0.6	3	0041-	0101-	0161-	0221-	5074-	2074-	3074-	4074-
75	0.22	B	T225B224J075(1)S	1.0	3	1042-	1102-	1162-	1222-	5075-	2075-	3075-	4075-
75	0.22	B	T225B224K075(1)S	1.0	3	0042-	0102-	0162-	0222-	5076-	2076-	3076-	4076-
75	0.27	B	T225B274J075(1)S	2.0	3	1043-	1103-	1163-	1223-	5077-	2077-	3077-	4077-
75	0.27	B	T225B274K075(1)S	2.0	3	0043-	0103-	0163-	0223-	5078-	2078-	3078-	4078-
75	0.33	B	T225B334J075(1)S	2.0	3	1044-	1104-	1164-	1224-	5079-	2079-	3079-	4079-
75	0.33	B	T225B334K075(1)S	2.0	3	0044-	0104-	0164-	0224-	5080-	2080-	3080-	4080-
75	0.39	B	T225B394J075(1)S	2.0	3	1045-	1105-	1165-	1225-	5081-	2081-	3081-	4081-
75	0.39	B	T225B394K075(1)S	2.0	3	0045-	0105-	0165-	0225-	5082-	2082-	3082-	4082-
75	0.47	B	T225B474J075(1)S	2.0	3	1046-	1106-	1166-	1226-	5083-	2083-	3083-	4083-
75	0.47	B	T225B474K075(1)S	2.0	3	0046-	0106-	0166-	0226-	5084-	2084-	3084-	4084-
75	0.56	B	T225B564J075(1)S	0.6	3	1047-	1107-	1167-	1227-	5085-	2085-	3085-	4085-
75	0.56	B	T225B564K075(1)S	0.6	3	0047-	0107-	0167-	0227-	5086-	2086-	3086-	4086-
75	0.68	B	T225B684J075(1)S	0.6	3	1048-	1108-	1168-	1228-	5087-	2087-	3087-	4087-
75	0.68	B	T225B684K075(1)S	0.6	3	0048-	0108-	0168-	0228-	5088-	2088-	3088-	4088-
75	0.82	B	T225B824J075(1)S	0.6	3	1049-	1109-	1169-	1229-	5089-	2089-	3089-	4089-
75	0.82	B	T225B824K075(1)S	0.6	3	0049-	0109-	0169-	0229-	5090-	2090-	3090-	4090-
75	1.0	B	T225B105J075(1)S	1.4	3	1050-	1110-	1170-	1230-	5091-	2091-	3091-	4091-
75	1.0	B	T225B105K075(1)S	1.4	3	0050-	0110-	0170-	0230-	5092-	2092-	3092-	4092-
75	1.2	B	T225B125J075(1)S	1.4	3	1051-	1111-	1171-	1231-	5093-	2093-	3093-	4093-
75	1.2	B	T225B125K075(1)S	1.4	3	0051-	0111-	0171-	0231-	5094-	2094-	3094-	4094-
VDC	µF	Case Size Code	(see below for part options)	µA at 25°C Max/5 Minutes	120 Hz Maximum	M (1.0)	P (0.1)	R (0.01)	S (0.001)	G (1)	B (0.1)	C (0.01)	D (0.001)
Rated Voltage	Rated Capacitance	Case Size Code	KEMET Part Number	DC Leakage	DF % at 25°C	MIL-PRF-39003 (CSR09) Capacitors							

(1) To complete KEMET Part Number (T225), insert Graded failure rate: G for 1%/k hours, B for 0.1%/k hours, C for 0.01%/k hours, D for 0.001%/k hours or the exponential rate letter. Designates Reliability Level.

## Ripple Current/Ripple Voltage

Permissible AC ripple voltage is related to the ESR of the capacitor and the power dissipation capabilities of a particular case size.

Thermal capacities for the various case sizes have been determined empirically and are listed below.

Temperature Compensation Multipliers for Maximum Power Dissipation		
T ≤ 25°C	T ≤ 85°C	T ≤ 125°C
1.00	0.90	0.40

*T = Environmental Temperature*

Permissible AC ripple current can be determined by the following:

$$I(max) = Z \sqrt{P_{max}/R}$$

*P max = maximum watts*

*R = ESR at specified frequency (ohms)*

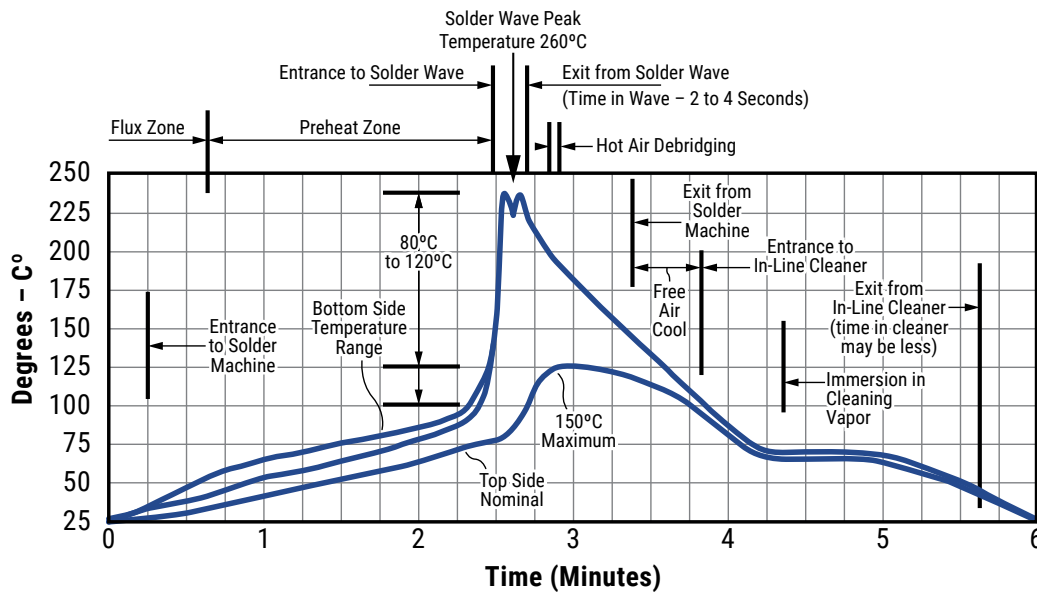
*I = rms ripple current (amperes)*

*Z = capacitor impedance in ohms at the specified frequency*

Case Size	Maximum Power Dissipation (P max)	T2XX
A	0.09	0.070
B	0.100	0.090
C	0.125	-
D	0.180	-

*Maximum Power Dissipation: 25°C Ambient*

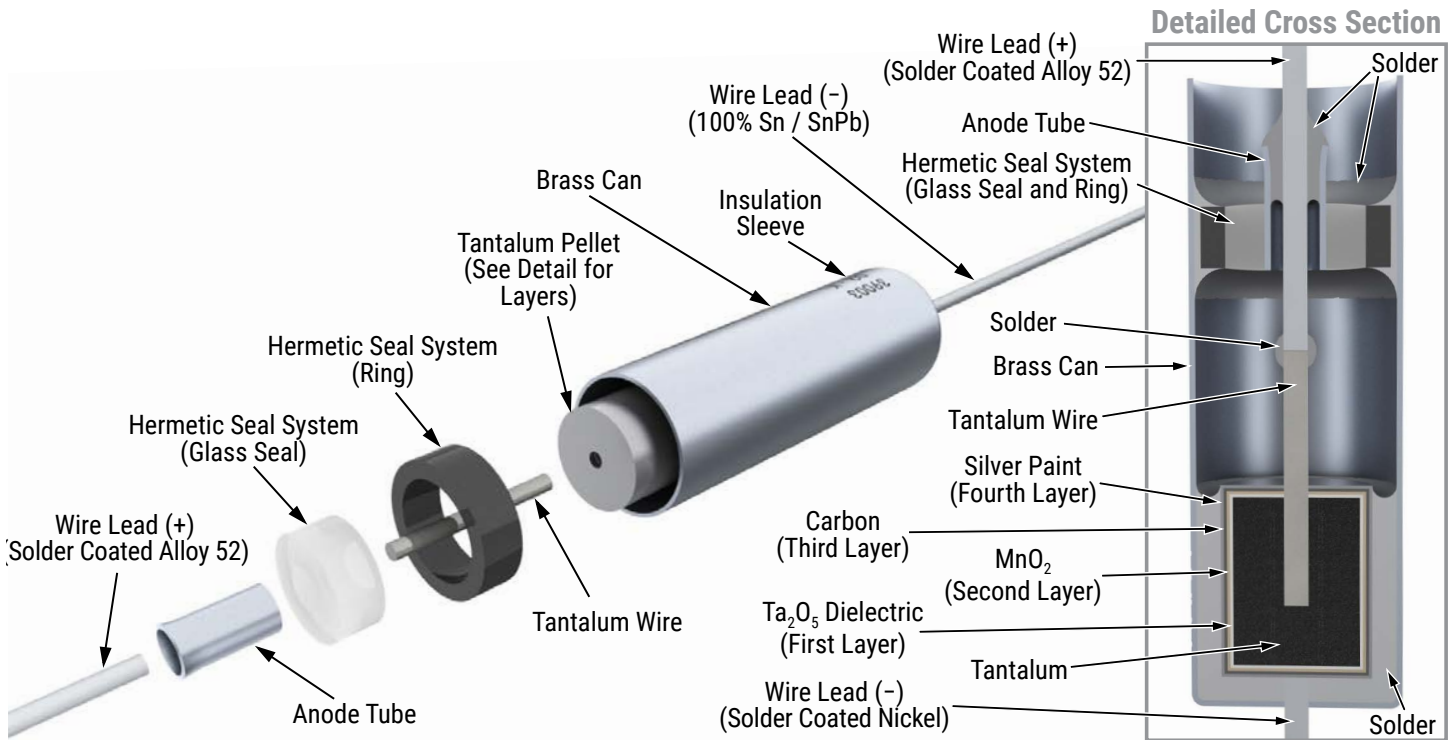
## Optimum Solder Wave Profile



## Mounting

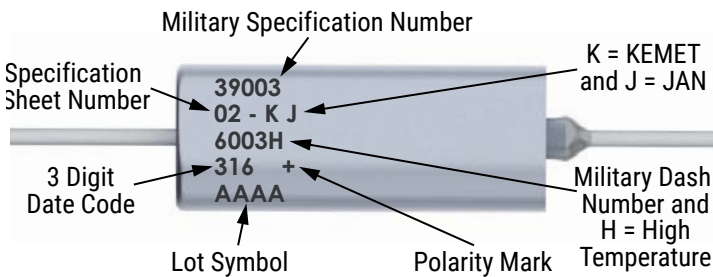
All encased capacitors will pass the Resistance to Soldering Heat Test of MIL-STD-202, Method 210, Condition C. This test simulates wave solder of topside board mount product. This demonstration of resistance to solder heat is in accordance with what is believed to be the industry standard. More severe treatment must be considered reflective of an improper soldering process. The above figure is a recommended solder wave profile for both axial and radial leaded solid tantalum capacitors.

## Construction

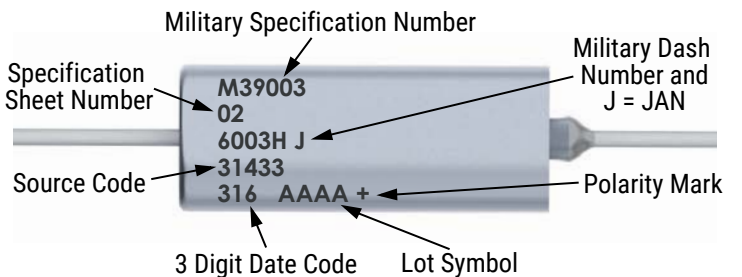


## Capacitor Marking

### A Case



### B Case



Date Code	3 Digit	4 Digit
Year	5 = 2015	15 = 2015
	6 = 2016	16 = 2016
	7 = 2017	17 = 2017
	8 = 2018	18 = 2018
	9 = 2019	19 = 2019
Week	01 = 1 <sup>st</sup> week of the year to 52 = 52 <sup>nd</sup> week of the year	

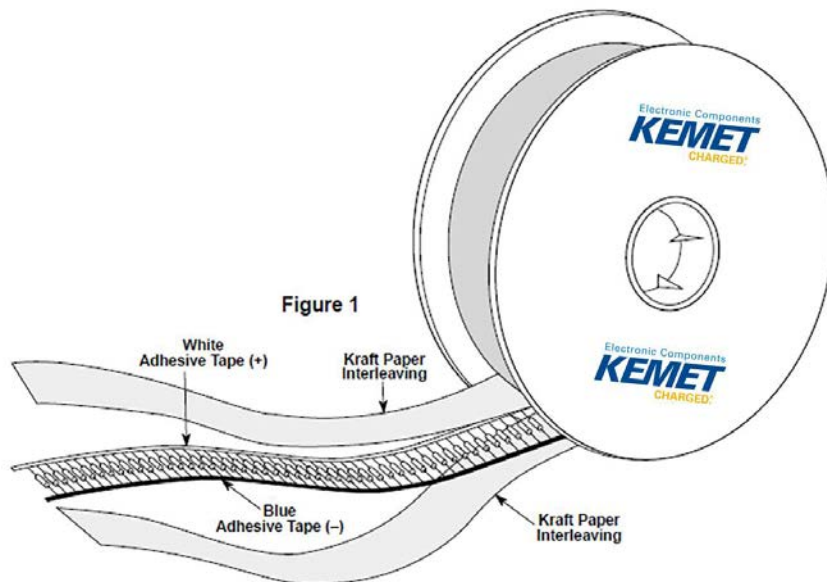


## Storage

Tantalum hermetically sealed capacitors should be stored in normal working environments. While the capacitors themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature – reels may soften or warp and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40°C and maximum storage humidity not exceed 60% relative humidity. Temperature fluctuations should be minimized to avoid condensation on the parts and atmospheres should be free of chlorine and sulphur bearing compounds. For optimized solderability capacitors stock should be used promptly, preferably within three years of receipt.

## Tape & Reel Packaging Information

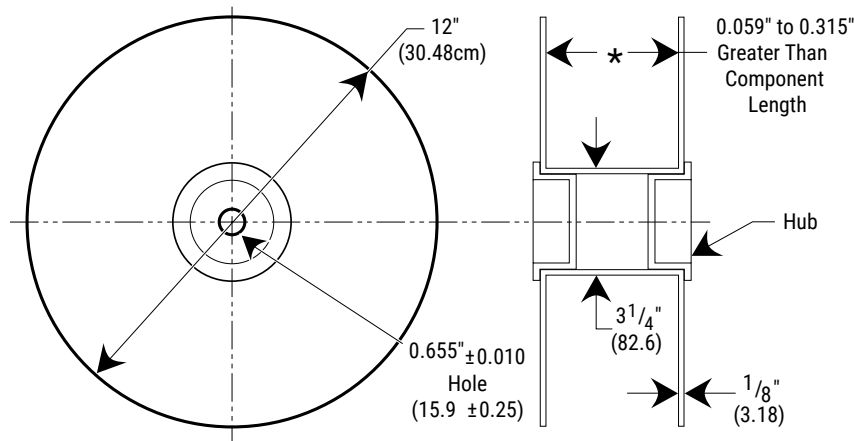
KEMET offers standard reeling of Solid Tantalum Capacitors for automatic insertion or lead forming machines per EIA Specification RS-296E.



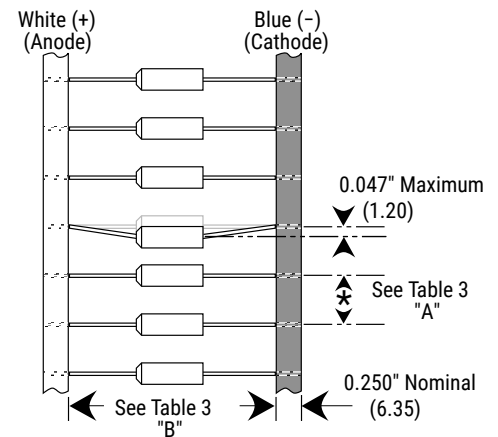
**Table 2 – Packaging Quantity**

Case Size	Standard Bulk Quantity
A/B	50/Tray
A	300/Box
B	150/Box

**Figure 2**



**Figure 3**



**Table 3 – Tape Dimensions**

Component Body Diameter	Component Pitch "A"	Inside Tape Spacing "B" ±1.5 mm (0.059")		
		I	II	III
0" (0 mm) to 0.197" (5 mm)	0.020" or (±0.5 mm)	2.062"	2.500"	2.874"
0.197" (5.01 mm) to 0.394" (10 mm)	0.400 or (10 mm)	(52.4 mm)	(63.5 mm)	(73 mm)

Capacitors are reeled so that positive leads are oriented as shown in Figure 3. Kraft paper (50lb. test minimum) is inserted between the layers of capacitors wound on reels for component pitch  $\leq 0.200$ " sizes and corrugated paper (70 lb. test minimum), single faced is inserted for component pitch  $\geq 0.400$ " sizes. Capacitor lead length may extend only a maximum of 0.031" (0.8 mm) beyond the tape's edges. Capacitors are centered in a row between the two tapes and will deviate only  $\pm 0.031$ " (0.79 mm) from the row center. Figures 1 and 2 show the KEMET standard chipboard tape reel. A minimum of 36" (91.5 cm) leader tape is provided at each end of the reeled capacitors. Universal splicing clips are used to connect the tape.

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