

Overview

The KEMET standard MIL case hermetically sealed T245 Series (Extended Capacitance Range) is compact, ruggedly built and designed for miniaturized circuitry. The capacitors are especially well-suited for coupling, bypass filtering

and RC timing circuits. The T245 Series exhibits excellent stability, low DC leakage current, dissipation factor, and ESR/impedance over a wide temperature and frequency range.

Benefits

- Internal construction solder to resist up to 221°C
- Operating temperature range of -55°C to +125°C
- Qualified to MIL-PRF-39003 (CSR23 Style)
- Failure rate options: Graded – B, C, D, and G and Exponential - M, P, R, and S
- Capacitance values of 1.2 μ F to 1,000 μ F
- Tolerances of $\pm 10\%$ and $\pm 20\%$
- Voltage rating of 6 VDC – 50 VDC
- Surge current options D, E, and F
- Taped and reeled per EIA Specification RS-296
- Marking per MIL-STD-1285
- Case sizes: A, B, C, D



Applications

Typical applications include coupling, bypass, filtering and RC timing circuits in miniaturized circuitry.

Ordering Information

T	245	A	105	K	050	A	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 C D	First two digits represent significant figures. Third digit specifies number of zeros.	K = $\pm 10\%$ M = $\pm 20\%$	006 = 6 010 = 10 015 = 15 020 = 20 035 = 35 050 = 50	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	Blank = Sleeved/Bulk 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 All capacitors are sleeved unless specified.

Ordering Information – (CSR23 Style)

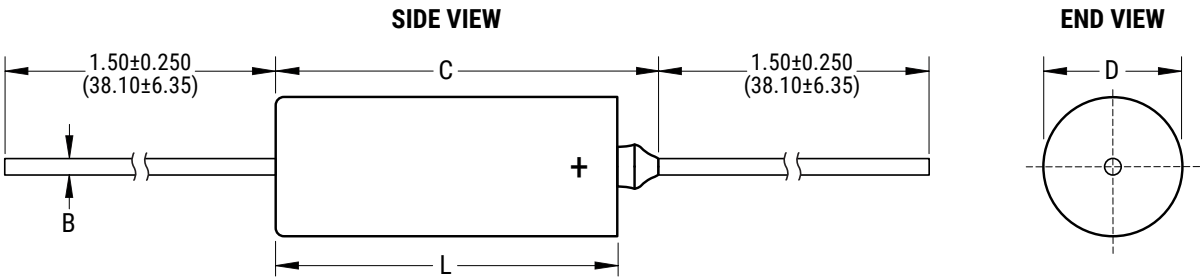
M39003	/03	3075	E
Capacitor Class	Slash	Dash Number	Surge Option
Military specification number	Specification sheet number	Failure rate level	D = C-4250 E = C-4251 F = C-4252 H = No C-Spec

Orders should be entered by the military specification number, including the dash number and surge option letter (D, E, F, or H).

Performance Characteristics

Item	Performance Characteristics
Operating Temperature	-55°C to 125°C
Rated Capacitance Range	1.2 – 1,000 μ F at 120 Hz/25°C
Capacitance Tolerance	K Tolerance (10%), M Tolerance (20%)
Rated Voltage Range	6 – 50 V
DF (120 Hz at 25°C)	Refer to Part Number Electrical Specification Table
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, CSR23 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 ±0.002 ±(0.05)	C Maximum
	D ±0.005 ±(0.13)	L ±0.031 ±(0.79)	D ±0.010 ±(0.25)	L ±0.031 ±(0.79)		
A	0.125 (3.18)	0.250 (6.35)	0.135 (3.43)	0.286 (7.26)	0.020 (0.51)	0.422 (10.72)
B	0.175 (4.45)	0.438 (11.13)	0.185 (4.70)	0.474 (12.04)	0.020 (0.51)	0.610 (15.49)
C	0.279 (7.09)	0.650 (16.51)	0.289 (7.34)	0.686 (17.42)	0.025 (0.64)	0.822 (20.88)
D	0.341 (8.66)	0.750 (19.05)	0.351 (8.92)	0.786 (19.96)	0.025 (0.64)	0.922 (23.42)

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 (CSR23) Capacitors							
						Dash Number Reference							
						Failure Rate Level (%/1,000 hours)							
						MIL-PRF-39003/3J				MIL-PRF-39003/3J			
						Exponential				Graded			
(V) 85°C	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	10.0	A	T245A106K006(1)S	0.9	6	0101-	0201-	0301-	0401-	5001-	2001-	3001-	4001-
6	10.0	A	T245A106M006(1)S	0.9	6	0102-	0202-	0302-	0402-	5002-	2002-	3002-	4002-
6	12.0	A	T245A126K006(1)S	1.0	6	0103-	0203-	0303-	0403-	5003-	2003-	3003-	4003-
6	100.0	B	T245B107K006(1)S	6.0	6	0104-	0204-	0304-	0404-	5004-	2004-	3004-	4004-
6	100.0	B	T245B107M006(1)S	6.0	6	0105-	0205-	0305-	0405-	5005-	2005-	3005-	4005-
6	330.0	C	T245C337K006(1)S	10.0	8	0106-	0206-	0306-	0406-	5006-	2006-	3006-	4006-
6	330.0	C	T245C337M006(1)S	10.0	8	0107-	0207-	0307-	0407-	5007-	2007-	3007-	4007-
6	390.0	C	T245C397K006(1)S	10.0	10	0108-	0208-	0308-	0408-	5008-	2008-	3008-	4008-
6	470.0	C	T245C477K006(1)S	10.0	10	0109-	0209-	0309-	0409-	5009-	2009-	3009-	4009-
6	470.0	C	T245C477M006(1)S	10.0	10	0110-	0210-	0310-	0410-	5010-	2010-	3010-	4010-
6	680.0	D	T245D687K006(1)S	20.0	10	0111-	0211-	0311-	0411-	5011-	2011-	3011-	4011-
6	680.0	D	T245D687M006(1)S	20.0	10	0112-	0212-	0312-	0412-	5012-	2012-	3012-	4012-
6	820.0	D	T245D827K006(1)S	20.0	10	0113-	0213-	0313-	0413-	5013-	2013-	3013-	4013-
6	1000.0	D	T245D108K006(1)S	20.0	10	0114-	0214-	0314-	0414-	5014-	2014-	3014-	4014-
6	1000.0	D	T245D108M006(1)S	20.0	10	0115-	0215-	0315-	0415-	5015-	2015-	3015-	4015-
10	6.8	A	T245A685K010(1)S	1.0	6	0116-	0216-	0316-	0416-	5016-	2016-	3016-	4016-
10	6.8	A	T245A685M010(1)S	1.0	6	0117-	0217-	0317-	0417-	5017-	2017-	3017-	4017-
10	8.2	A	T245A825K010(1)S	1.2	6	0118-	0218-	0318-	0418-	5018-	2018-	3018-	4018-
10	47.0	B	T245B476K010(1)S	4.0	6	0119-	0219-	0319-	0419-	5019-	2019-	3019-	4019-
10	47.0	B	T245B476M010(1)S	4.0	6	0120-	0220-	0320-	0420-	5020-	2020-	3020-	4020-
10	56.0	B	T245B566K010(1)S	5.0	6	0121-	0221-	0321-	0421-	5021-	2021-	3021-	4021-
10	68.0	B	T245B686K010(1)S	6.0	6	0122-	0222-	0322-	0422-	5022-	2022-	3022-	4022-
10	68.0	B	T245B686M010(1)S	6.0	6	0123-	0223-	0323-	0423-	5023-	2023-	3023-	4023-
10	82.0	B	T245B826K010(1)S	7.0	6	0124-	0224-	0324-	0424-	5024-	2024-	3024-	4024-
10	220.0	C	T245C227K010(1)S	12.0	8	0125-	0225-	0325-	0425-	5025-	2025-	3025-	4025-
10	220.0	C	T245C227M010(1)S	12.0	8	0126-	0226-	0326-	0426-	5026-	2026-	3026-	4026-
10	270.0	C	T245C277K010(1)S	13.0	8	0127-	0227-	0327-	0427-	5027-	2027-	3027-	4027-
10	390.0	D	T245D397K010(1)S	16.0	10	0128-	0228-	0328-	0428-	5028-	2028-	3028-	4028-
10	470.0	D	T245D477K010(1)S	16.0	10	0129-	0229-	0329-	0429-	5029-	2029-	3029-	4029-
10	470.0	D	T245D477M010(1)S	16.0	10	0130-	0230-	0330-	0430-	5030-	2030-	3030-	4030-
10	560.0	D	T245D567K010(1)S	20.0	10	0131-	0231-	0331-	0431-	5031-	2031-	3031-	4031-
15	4.7	A	T245A475K015(1)S	1	4	0132-	0232-	0332-	0432-	5032-	2032-	3032-	4032-
15	4.7	A	T245A475M015(1)S	1	4	0133-	0233-	0333-	0433-	5033-	2033-	3033-	4033-
15	5.6	A	T245A565K015(1)S	1.3	4	0134-	0234-	0334-	0434-	5034-	2034-	3034-	4034-
15	33.0	B	T245B336K015(1)S	5	6	0135-	0235-	0335-	0435-	5035-	2035-	3035-	4035-
15	33.0	B	T245B336M015(1)S	5	6	0136-	0236-	0336-	0436-	5036-	2036-	3036-	4036-
15	39.0	B	T245B396K015(1)S	5.3	6	0137-	0237-	0337-	0437-	5037-	2037-	3037-	4037-
15	150.0	C	T245C157K015(1)S	15	8	0138-	0238-	0338-	0438-	5038-	2038-	3038-	4038-
15	150.0	C	T245C157M015(1)S	15	8	0139-	0239-	0339-	0439-	5039-	2039-	3039-	4039-
15	180.0	C	T245C187K015(1)S	15	8	0140-	0240-	0340-	0440-	5040-	2040-	3040-	4040-
15	220.0	D	T245D227K015(1)S	20	8	0141-	0241-	0341-	0441-	5041-	2041-	3041-	4041-
15	220.0	D	T245D227M015(1)S	20	8	0142-	0242-	0342-	0442-	5042-	2042-	3042-	4042-
15	270.0	D	T245D277K015(1)S	20	8	0143-	0243-	0343-	0443-	5043-	2043-	3043-	4043-
15	330.0	D	T245D337K015(1)S	20	8	0144-	0244-	0344-	0444-	5044-	2044-	3044-	4044-
15	330.0	D	T245D337M015(1)S	20	8	0145-	0245-	0345-	0445-	5045-	2045-	3045-	4045-
20	2.7	A	T245A275K020(1)S	0.8	4	0146-	0246-	0346-	0446-	5046-	2046-	3046-	4046-
20	3.3	A	T245A335K020(1)S	1.0	4	0147-	0247-	0347-	0447-	5047-	2047-	3047-	4047-
20	3.3	A	T245A335M020(1)S	1.0	4	0148-	0248-	0348-	0448-	5048-	2048-	3048-	4048-
20	3.9	A	T245A395K020(1)S	1.2	4	0149-	0249-	0349-	0449-	5049-	2049-	3049-	4049-
20	18.0	B	T245B186K020(1)S	3.0	6	0150-	0250-	0350-	0450-	5050-	2050-	3050-	4050-
(V) 85°C	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 (CSR23) Capacitors							

(1) To complete KEMET Part Number (T245), 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.

Rated Voltage	Rated Capacitance	Case Size Code	KEMET Military Part Number	DC Leakage	DF % at 25°C	MIL-PRF-39003 (CSR23) Capacitors							
						Dash Number Reference							
						Failure Rate Level (%/1,000 hours)							
						MIL-PRF-39003/3J				MIL-PRF-39003/3J			
						Exponential				Graded			
(V) 85°C	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)
20	22.0	B	T245B226K020(1)S	3.0	6	0151-	0251-	0351-	0451-	5051-	2051-	3051-	4051-
20	22.0	B	T245B226M020(1)S	3.0	6	0152-	0252-	0352-	0452-	5052-	2052-	3052-	4052-
20	27.0	B	T245B276K020(1)S	4.0	6	0153-	0253-	0353-	0453-	5053-	2053-	3053-	4053-
20	56.0	C	T245C566K020(1)S	7.0	6	0154-	0254-	0354-	0454-	5054-	2054-	3054-	4054-
20	68.0	C	T245C686K020(1)S	8.0	6	0155-	0255-	0355-	0455-	5055-	2055-	3055-	4055-
20	68.0	C	T245C686M020(1)S	8.0	6	0156-	0256-	0356-	0456-	5056-	2056-	3056-	4056-
20	82.0	C	T245C826K020(1)S	10.0	6	0157-	0257-	0357-	0457-	5057-	2057-	3057-	4057-
20	100.0	C	T245C107K020(1)S	12.0	6	0158-	0258-	0358-	0458-	5058-	2058-	3058-	4058-
20	100.0	C	T245C107M020(1)S	12.0	6	0159-	0259-	0359-	0459-	5059-	2059-	3059-	4059-
20	120.0	C	T245C127K020(1)S	12.0	6	0160-	0260-	0360-	0460-	5060-	2060-	3060-	4060-
20	150.0	D	T245D157K020(1)S	15.0	8	0161-	0261-	0361-	0461-	5061-	2061-	3061-	4061-
20	150.0	D	T245D157M020(1)S	15.0	8	0162-	0262-	0362-	0462-	5062-	2062-	3062-	4062-
20	180.0	D	T245D187K020(1)S	15.0	8	0163-	0263-	0363-	0463-	5063-	2063-	3063-	4063-
35	1.8	A	T245A185K035(1)S	1.0	4	0164-	0264-	0364-	0464-	5064-	2064-	3064-	4064-
35	8.2	B	T245B825K035(1)S	3.0	4	0165-	0265-	0365-	0465-	5065-	2065-	3065-	4065-
35	10.0	B	T245B106K035(1)S	3.0	4	0166-	0266-	0366-	0466-	5066-	2066-	3066-	4066-
35	10.0	B	T245B106M035(1)S	3.0	4	0167-	0267-	0367-	0467-	5067-	2067-	3067-	4067-
35	33.0	C	T245C336K035(1)S	8.0	6	0168-	0268-	0368-	0468-	5068-	2068-	3068-	4068-
35	33.0	C	T245C336M035(1)S	8.0	6	0169-	0269-	0369-	0469-	5069-	2069-	3069-	4069-
35	39.0	C	T245C396K035(1)S	10.0	6	0170-	0270-	0370-	0470-	5070-	2070-	3070-	4070-
35	47.0	C	T245C476K035(1)S	10.0	6	0171-	0271-	0371-	0471-	5071-	2071-	3071-	4071-
35	47.0	C	T245C476M035(1)S	10.0	6	0172-	0272-	0372-	0472-	5072-	2072-	3072-	4072-
35	56.0	D	T245D566K035(1)S	12.0	6	0173-	0273-	0373-	0473-	5073-	2073-	3073-	4073-
35	68.0	D	T245D686K035(1)S	12.0	6	0174-	0274-	0374-	0474-	5074-	2074-	3074-	4074-
35	68.0	D	T245D686M035(1)S	12.0	6	0175-	0275-	0375-	0475-	5075-	2075-	3075-	4075-
50	1.2	A	T245A125K050(1)S	0.6	4	0176-	0276-	0376-	0476-	5076-	2076-	3076-	4076-
50	1.5	A	T245A155K050(1)S	0.8	4	0177-	0277-	0377-	0477-	5077-	2077-	3077-	4077-
50	1.5	A	T245A155M050(1)S	0.8	4	0178-	0278-	0378-	0478-	5078-	2078-	3078-	4078-
50	5.6	B	T245B565K050(1)S	2.5	4	0179-	0279-	0379-	0479-	5079-	2079-	3079-	4079-
50	6.8	B	T245B685K050(1)S	2.5	4	0180-	0280-	0380-	0480-	5080-	2080-	3080-	4080-
50	6.8	B	T245B685M050(1)S	2.5	4	0181-	0281-	0381-	0481-	5081-	2081-	3081-	4081-
50	22.0	C	T245C226K050(1)S	7.0	6	0182-	0282-	0382-	0482-	5082-	2082-	3082-	4082-
50	22.0	C	T245C226M050(1)S	7.0	6	0183-	0283-	0383-	0483-	5083-	2083-	3083-	4083-
50	27.0	C	T245C276K050(1)S	8.0	6	0184-	0284-	0384-	0484-	5084-	2084-	3084-	4084-
50	33.0	D	T245D336K050(1)S	10.0	6	0185-	0285-	0385-	0485-	5085-	2085-	3085-	4085-
50	33.0	D	T245D336M050(1)S	10.0	6	0186-	0286-	0386-	0486-	5086-	2086-	3086-	4086-
50	39.0	D	T245D396K050(1)S	10.0	6	0187-	0287-	0387-	0487-	5087-	2087-	3087-	4087-
(V) 85°C	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		KEMET Part Number	DC Leakage	DF % at 25°C	MIL-PRF-39003 (CSR23) Capacitors							

(1) To complete KEMET Part Number (T245), 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)

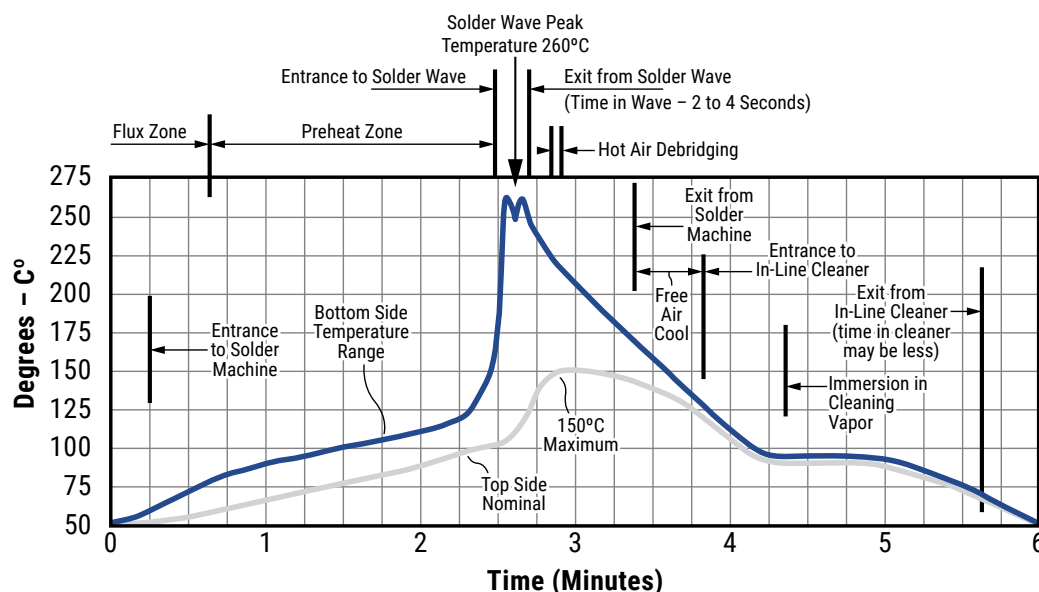
I = rms ripple current (amperes)

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

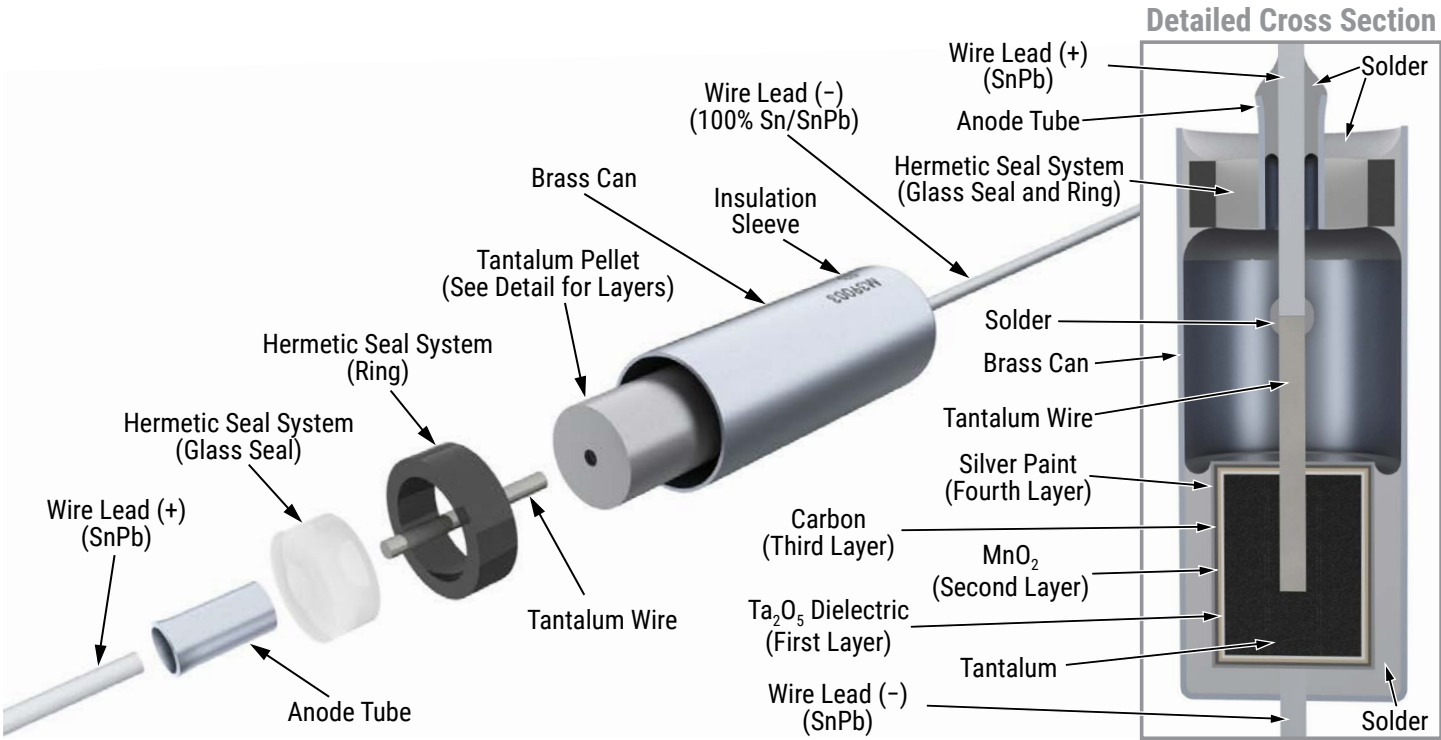
Optimum Solder Wave Profile



Mounting

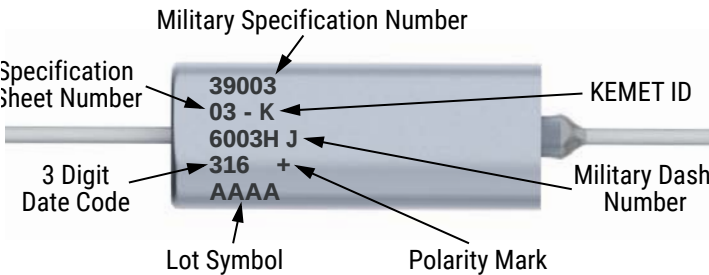
All encased capacitors will pass the Resistance to Soldering Heat Test of MIL-STD-202, Method 210, Condition C. This test simulates wave solder of topside board mount product. This demonstration of resistance to solder heat is in accordance with what is believed to be the industry standard. More severe 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

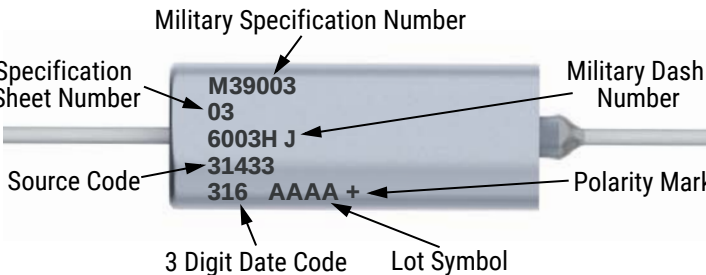


Capacitor Marking

A Case



B Case



Date Code	3 Digit	4 Digit
Year	9 = 2019 0 = 2020 1 = 2021 2 = 2022 3 = 2023	19 = 2019 20 = 2020 21 = 2021 22 = 2022 23 = 2023
Week	01 = 1 st week of the year to 52 = 52 nd 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.

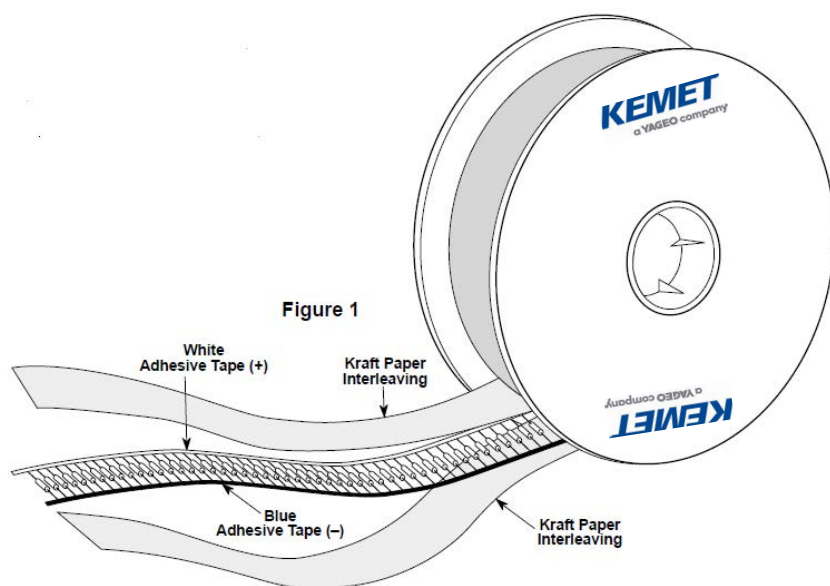


Table 2 – Packaging Quantity

Case Size	Standard Bulk Quantity	Standard Reel Quantity	Reel C-Spec	Ammo Pack Quantity	Ammo Pack C-Spec
A	150/Box	3,500	C-7200	1,500	C-7293
B	75/Box	2,500	C-7200	1,000	Class I
C	20/Tray	500	C-7200	250	C-7442
D	20/Tray	400	C-7200	250	Class II C-7443 Class III

Figure 2

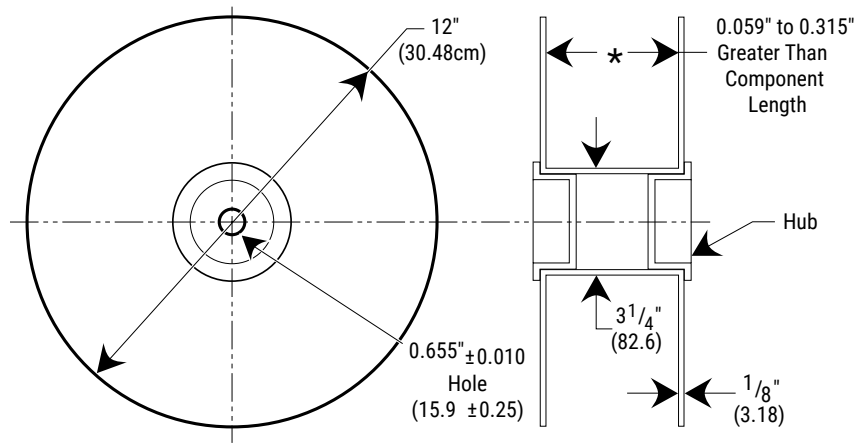


Figure 3

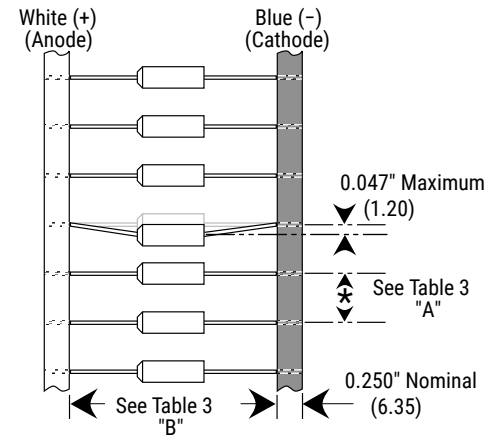


Table 3 – Tape Dimensions

Dimensions in Inches (& Millimeters)

BODY DIAMETER	A PITCH ±0.020 (0.5)	B INSIDE TAPE SPACING ±0.059 (1.5)		
		Class		
		I	II	III
≤ 0.197 (5.0)	0.200 (5.0)	2.063 (52.4)	2.500 (63.5)	2.874 (73)
0.198 (5.0) to 0.394 (10.0)	0.400 (10.0)			

Capacitors are reeled so that positive leads are oriented as shown in Figure 3. Kraft paper (50 lbs. test minimum) is inserted between the layers of capacitors wound on reels for component pitch ≤ 0.200" sizes and corrugated paper (70 lbs. test minimum), single faced is inserted for component pitch ≥ 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 ±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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