KEMET APPROVED FAILURE RATE LEVELS — MIL-C-39003/H (GRADED)

STYLE	DESCRIPTION	KEMET SERIES	APPROVED FAILURE RATE LEVEL*
CSR09	Polar-Subminiature	T222	D (0.001%/k hrs.)
CSR13*	Polar-Standard MIL Case	T212	D (0.001%/k hrs.)
CSS13**	Polar-Standard MIL Case	T216	C (0.01%/k hrs.)
CSR21	Polar-Standard Low ESR MIL Case	T262	D (0.001%/k hrs.)
CSR23*	Polar-Extended Range	T242	D (0.001%/k hrs.)

*Not approved to 'D' Failure Rate Level on all voltages and capacitance values.
**MIL-C-39003/10 for space applications.

STYLE	DESCRIPTION	KEMET SERIES	APPROVED FAILURE RATE LEVEL*
CSR33*	Polar-Extended Range Low Leakage	T252	D (0.001%/k hrs.)
CSS33**	Polar-Extended Range Low Leakage	T256	C (0.01%/k hrs.)
CSR91*	Non-Polar	T213	D (0.001%/k hrs.)

*Not approved to 'D' Failure Rate Level on all voltages and capacitance values.
**MIL-C-39003/10 for space applications.

PERFORMANCE CHARACTERISTICS

- CAPACITANCE/VOLTAGE RANGE: .0023-1200µF, 6-125 Volts.

- CAPACITANCE TOLERANCE: Available in standard EIA values with ±20%, ±10% and ±5% tolerances.

- DISSIPATION FACTOR: Maximum DF limits are shown in corresponding series part number listings on pages 7-41. See Application Notes Section, page 76 for additional description.

- DC LEAKAGE CURRENT: Each corresponding part number table lists maximum leakage current for each capacitor on pages 7-41. See Application Notes Section, page 76 for additional description.

- RATED VOLTAGE; WORKING VOLTAGE; SURGE VOLTAGE; REVERSE VOLTAGE: See Application Notes Section, Pages 76 & 77 for description.

- IMPEDANCE and ESR: See Application Notes Section, pages 77 & 78 for description. Reference ESR values are shown for commercial hermetically sealed capacitors on page 19.

- AC 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. For additional description see page 78.

Standard Case Size	Watts	T222
A	.09	.070
B	.100	.090
C	.125	—
D	.180	—

Maximum Power Dissipation: 25°C Ambient

- ENVIRONMENTAL CONSIDERATIONS:
  A. Shock Test: MIL-STD-202, Method 213
  B. Thermal Shock, MIL-STD-202, Method 107, Condition B.
  C. Moisture Resistance: MIL-STD-202, Method 106.
  D. Solderability: MIL-STD-202, Method 208

For additional Environmental Test Information see pages 80, 81 and 82.

- LEAD MATERIAL: Standard leads are solder-coated nickel per MIL-STD-1276.

- INSULATING SLEEVES: The standard insulating material used in transparent high temperature plastic, having 2000 volt dielectric strength, excellent dimensional stability and chemical and cold flow resistance.

- LEAD TAPE and REEL: Reeling per specification RS-296. See pages 71 and 73 for additional information.

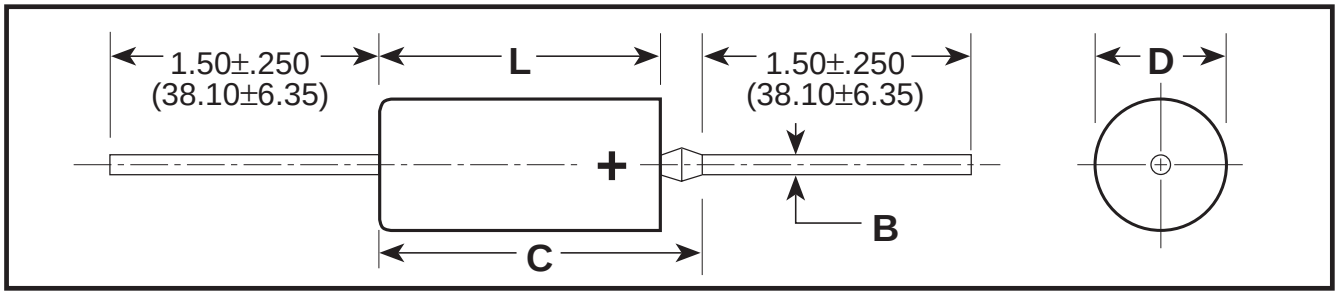
KEMET standard hermetic sealed T110 Series are desirable for use in high humidity environments. They are ruggedly built, designed for miniaturized circuitry, and are especially suited for coupling, bypass, filtering and R-C timing circuits. They exhibit excellent stability, extremely low DC leakage current, dissipation factor, and ESR/impedance over a wide temperature and frequency range.

Available in standard EIA capacitance values from .0047-330 µF in ±20%, ±10%, and ±5% tolerances and working voltages from 6-125 VDC.

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to page 27.

Included in the following Series table is a complete listing of CSR13 qualified MIL-C-39003 capacitors. KEMET is approved to manufacture the S (0.001%/k hrs.) Exponential & D (0.001%/k hrs.) Graded failure rate levels.

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS — INCHES & (MILLIMETERS)

CASE SIZE	UNINSULATED D ±0.005 ±(.13)	UNINSULATED L ±0.031 ±(.79)	INSULATED D ±0.010 ±(.25)	INSULATED L ±0.031 ±(.79)	B ±0.002 ±(.05)	C MAX.
A	0.125 (3.18)	0.250 (6.35)	0.135 (3.43)	0.286 (7.26)	0.020 (.51)	0.422 (10.72)
B	0.175 (4.45)	0.438 (11.13)	0.185 (4.70)	0.474 (12.04)	0.020 (.51)	0.610 (15.49)
C	0.279 (7.09)	0.650 (16.51)	0.289 (7.34)	0.686 (17.42)	0.025 (.64)	0.822 (20.88)
D	0.341 (8.66)	0.750 (19.05)	0.351 (8.92)	0.786 (19.96)	0.025 (.64)	0.922 (23.42)

ORDERING INFORMATION*

T XXX A 105 K 050 A S C

TANTALUM

SERIES
T110, T212 (CSR13)
T111, T213 (CSR91)
T140, T242 (CSR23)

CASE SIZE
A / B / C / D

PICOFARAD CODE
First two digits represent significant figures.
Third digit specifies number of zeros to follow.

CAPACITANCE TOLERANCE
M — ±20% K — ±10% J — ±5%

VOLTAGE
At 85°C

SPECIFICATION
All capacitors are sleeved unless specified.

LEAD MATERIAL
S — Standard

FAILURE RATE**

GRADED	EXPONENTIAL
A — Not Applicable	M — 1%/k hrs.
B — 0.1%/k hrs.	P — 0.1%/k hrs.
C — 0.01%/k hrs.	R — 0.01%/k hrs.
D — 0.001%/k hrs.	S — 0.001%/k hrs.

****Failure Rates apply only to military products.**

****Part Number Example: T110A105K050AS (14 digits - no spaces)**
***For Military Ordering Information, see page 4.**

MARKING INFORMATION

Marking: Unless otherwise specified by special order, standard marking of T110 Series capacitor consists of the following:

A, B, C & D CASES

+K 10%	Polarity, Manufacturer's Identification and Capacitance Tol.
R56 µF	Normal Capacitance — (µF) ("R" indicates decimal)
100V	Voltage
9912XY	Date Code (e.g.: 9912XY)

*** For Military Marking, see page 4.**

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
6 VOLT RATING AT 85°C — 4 VOLT RATING AT 125°C													
2.2	A	5,10,20	T110A225(1)006AS	0.3	4								
2.7	A	5,10,20	T110A275(1)006AS	0.3	4								
3.3	A	5,10,20	T110A335(1)006AS	0.3	4								
3.9	A	5,10,20	T110A395(1)006AS	0.3	4								
4.7	A	5,10,20	T110A475(1)006AS	0.3	4								
5.6	A	5	T110A565J006AS	0.3	4	5001	5201	5401	5601	6001	7001	8001	T212A565J006(2)S
5.6	A	10	T110A565K006AS	0.3	4	2241	2481	2721	2961	6002	7002	8002	T212A565K006(2)S
5.6	A	20	T110A565M006AS	0.3	4								
6.8	**A**	**5**	**T110A685J006AS**	**0.3**	**6**	**5002**	**5202**	**5402**	**5602**	**6003**	**7003**	**8003**	**T212A685J006(2)S**
6.8	**A**	**10**	**T110A685K006AS**	**0.3**	**6**	**2242**	**2482**	**2722**	**2962**	**6004**	**7004**	**8004**	**T212A685K006(2)S**
6.8	**A**	**20**	**T110A685M006AS**	**0.3**	**6**	**2243**	**2483**	**2723**	**2963**	**6005**	**7005**	**8005**	**T212A685M006(2)S**
8.2	B	5,10,20	T110B825(1)006AS	0.3	6								
10.0	B	5,10,20	T110B106(1)006AS	0.3	6								
12.0	B	5,10,20	T110B126(1)006AS	0.5	6								
15.0	B	5,10,20	T110B156(1)006AS	0.9	6								
18.0	B	5,10,20	T110B186(1)006AS	0.9	6								
22.0	B	5,10,20	T110B226(1)006AS	0.9	6								
27.0	B	5,10,20	T110B276(1)006AS	0.9	6								
33.0	B	5,10,20	T110B336(1)006AS	0.9	6								
39.0	B	5,10,20	T110B396(1)006AS	0.9	6								
47.0	**B**	**5**	**T110B476J006AS**	**1.5**	**6**	**5003**	**5203**	**5403**	**5603**	**6006**	**7006**	**8006**	**T212B476J006(2)S**
47.0	**B**	**10**	**T110B476K006AS**	**1.5**	**6**	**2244**	**2484**	**2724**	**2964**	**6007**	**7007**	**8007**	**T212B476K006(2)S**
47.0	**B**	**20**	**T110B476M006AS**	**1.5**	**6**	**2245**	**2485**	**2725**	**2965**	**6008**	**7008**	**8008**	**T212B476M006(2)S**
56.0	**B**	**5**	**T110B566J006AS**	**1.5**	**6**	**5004**	**5204**	**5404**	**5604**	**6009**	**7009**	**8009**	**T212B566J006(2)S**
56.0	**B**	**10**	**T110B566K006AS**	**1.5**	**6**	**2246**	**2486**	**2726**	**2966**	**6010**	**7010**	**8010**	**T212B566K006(2)S**
56.0	**B**	**20**	**T110B566M006AS**	**1.5**	**6**								
68.0	C	5,10,20	T110C686(1)006AS	3.0	6								
82.0	C	5,10,20	T110C826(1)006AS	3.0	6								
100.0	C	5,10,20	T110C107(1)006AS	3.0	6								
120.0	C	5,10,20	T110C127(1)006AS	3.0	6								
150.0	C	5	T110C157J006AS	4.5	6	5005	5205	5405	5605	6011	7011	8011	T212C157J006(2)S
150.0	C	10	T110C157K006AS	4.5	6	2247	2487	2727	2967	6012	7012	8012	T212C157K006(2)S
150.0	C	20	T110C157M006AS	4.5	6	2248	2488	2728	2968	6013	7013	8013	T212C157M006(2)S
180.0	C	5	T110C187J006AS	5.5	6	5006	5206	5406	5606	6014	7014	8014	T212C187J006(2)S
180.0	C	10	T110C187K006AS	5.5	6	2249	2489	2729	2969	6015	7015	8015	T212C187K006(2)S
180.0	C	20	T110C187M006AS	5.5	6								
220.0	D	5,10,20	T110D227(1)006AS	6.0	8								
270.0	D	5	T110D277J006AS	6.0	8	5007	5207	5407	5607	6016	7016	8016	T212D277J006(2)S
270.0	D	10	T110D277K006AS	6.0	8	2250	2490	2730	2970	6017	7017	8017	T212D277K006(2)S
270.0	D	20	T110D277M006AS	6.0	8								
330.0	**D**	**5**	**T110D337J006AS**	**7.5**	**8**	**5008**	**5208**	**5408**	**5608**	**6018**	**7018**	**8018**	**T212D337J006(2)S**
330.0	**D**	**10**	**T110D337K006AS**	**7.5**	**8**	**2251**	**2491**	**2731**	**2971**	**6019**	**7019**	**8019**	**T212D337K006(2)S**
330.0	**D**	**20**	**T110D337M006AS**	**7.5**	**8**	**2252**	**2492**	**2732**	**2972**	**6020**	**7020**	**8020**	**T212D337M006(2)S**
10 VOLT RATING AT 85°C — 7 VOLT RATING AT 125°C													
1.0	A	5,10,20	T110A105(1)010AS	0.3	3								
1.2	A	5,10,20	T110A125(1)010AS	0.3	4								
1.5	A	5,10,20	T110A155(1)010AS	0.3	4								
1.8	A	5,10,20	T110A185(1)010AS	0.3	4								
2.2	A	5,10,20	T110A225(1)010AS	0.3	4								
2.7	A	5,10,20	T110A275(1)010AS	0.3	4								
3.3	A	5,10,20	T110A335(1)010AS	0.3	4								
3.9	A	5	T110A395J 010AS	0.3	4	5009	5209	5409	5609	6021	7021	8021	T212A395J010(2)S
3.9	A	10	T110A395K 010AS	0.3	4	2253	2493	2733	2973	6022	7022	8022	T212A395K010(2)S
3.9	A	20	T110A395M 010AS	0.3	4								
4.7	**A**	**5**	**T110A475J 010AS**	**0.4**	**4**	**5010**	**5210**	**5410**	**5610**	**6023**	**7023**	**8023**	**T212A475J010(2)S**
4.7	**A**	**10**	**T110A475K 010AS**	**0.4**	**4**	**2254**	**2494**	**2734**	**2974**	**6024**	**7024**	**8024**	**T212A475K010(2)S**
4.7	**A**	**20**	**T110A475M010AS**	**0.4**	**4**	**2255**	**2495**	**2735**	**2975**	**6025**	**7025**	**8025**	**T212A475M010(2)S**

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110			MIL-PRF-39003 (CSR13) CAPACITORS							
						DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.)							
						MIL-PRF-39003/1H EXPONENTIAL				MIL-PRF-39003/1H GRADED			
			KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	M (1.0)	P (0.1)	R (0.01)	S (0.001)	B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
10 VOLT RATING AT 85°C — 7 VOLT RATING AT 125°C (Cont'd)													
5.6	B	5,10,20	T110B565(1)010AS	0.4	4								
6.8	B	5,10,20	T110B685(1)010AS	1.0	6								
8.2	B	5,10,20	T110B825(1)010AS	1.0	6								
10.0	B	5,10,20	T110B106(1)010AS	1.0	6								
12.0	B	5,10,20	T110B126(1)010AS	1.0	6								
15.0	B	5,10,20	T110B156(1)010AS	1.0	6								
18.0	B	5,10,20	T110B186(1)010AS	1.0	6								
22.0	B	5,10,20	T110B226(1)010AS	2.0	6								
27.0	B	5	T110B276J010AS	2.0	6	5011	5211	5411	5611	6026	7026	8026	T212B276J010(2)S
27.0	B	10	T110B276K010AS	2.0	6	2256	2496	2736	2976	6027	7027	8027	T212B276K010(2)S
27.0	B	20	T110B276M010AS	2.0	6								
33.0	**B**	**5**	**T110B336J010AS**	**2.0**	**6**	**5012**	**5212**	**5412**	**5612**	**6028**	**7028**	**8028**	**T212B336J010(2)S**
33.0	**B**	**10**	**T110B336K010AS**	**2.0**	**6**	**2257**	**2497**	**2737**	**2977**	**6029**	**7029**	**8029**	**T212B336K010(2)S**
33.0	**B**	**20**	**T110B336M010AS**	**2.0**	**6**	**2258**	**2498**	**2738**	**2978**	**6030**	**7030**	**8030**	**T212B336M010(2)S**
39.0	**B**	**5**	**T110B396J010AS**	**2.0**	**6**	**5013**	**5213**	**5413**	**5613**	**6031**	**7031**	**8031**	**T212B396J010(2)S**
39.0	**B**	**10**	**T110B396K010AS**	**2.0**	**6**	**2259**	**2499**	**2739**	**2979**	**6032**	**7032**	**8032**	**T212B396K010(2)S**
39.0	**B**	**20**	**T110B396M010AS**	**2.0**	**6**								
47.0	C	5,10,20	T110C476(1)010AS	3.0	6								
56.0	C	5,10,20	T110C566(1)010AS	3.0	6								
68.0	C	5,10,20	T110C686(1)010AS	3.0	6								
82.0	C	5	T110C826J010AS	3.0	6	5014	5214	5414	5614	6033	7033	8033	T212C826J010(2)S
82.0	C	10	T110C826K010AS	3.0	6	2260	2500	2740	2980	6034	7034	8034	T212C826K010(2)S
82.0	C	20	T110C826M010AS	3.0	6								
100.0	**C**	**5**	**T110C107J010AS**	**5.0**	**6**	**5015**	**5215**	**5415**	**5615**	**6035**	**7035**	**8035**	**T212C107J010(2)S**
100.0	**C**	**10**	**T110C107K010AS**	**5.0**	**6**	**2261**	**2501**	**2741**	**2981**	**6036**	**7036**	**8036**	**T212C107K010(2)S**
100.0	**C**	**20**	**T110C107M010AS**	**5.0**	**6**	**2262**	**2502**	**2742**	**2982**	**6037**	**7037**	**8037**	**T212C107M010(2)S**
120.0	C	5	T110C127J010AS	6.0	6	5016	5216	5416	5616	6038	7038	8038	T212C127J010(2)S
120.0	C	10	T110C127K010AS	6.0	6	2263	2503	2743	2983	6039	7039	8039	T212C127K010(2)S
120.0	C	20	T110C127M010AS	6.0	6								
150.0	D	5,10,20	T110D157(1)010AS	9.0	6								
180.0	D	5	T110D187J010AS	9.0	6	5017	5217	5417	5617	6040	7040	8040	T212D187J010(2)S
180.0	D	10	T110D187K010AS	9.0	6	2264	2504	2744	2984	6041	7041	8041	T212D187K010(2)S
180.0	D	20	T110D187M010AS	9.0	6								
220.0	**D**	**5**	**T110D227J010AS**	**10.0**	**8**	**5018**	**5218**	**5418**	**5618**	**6042**	**7042**	**8042**	**T212D227J010(2)S**
220.0	**D**	**10**	**T110D227K010AS**	**10.0**	**8**	**2265**	**2505**	**2745**	**2985**	**6043**	**7043**	**8043**	**T212D227K010(2)S**
220.0	**D**	**20**	**T110D227M010AS**	**10.0**	**8**	**2266**	**2506**	**2746**	**2986**	**6044**	**7044**	**8044**	**T212D227M010(2)S**
15 VOLT RATING AT 85°C — 10 VOLT RATING AT 125°C													
0.33	A	5,10,20	T110A334(1)015AS	0.3	3								
0.39	A	5,10,20	T110A394(1)015AS	0.3	3								
0.47	A	5,10,20	T110A474(1)015AS	0.3	3								
0.56	A	5,10,20	T110A564(1)015AS	0.3	3								
0.68	A	5,10,20	T110A684(1)015AS	0.3	3								
0.82	A	5,10,20	T110A824(1)015AS	0.3	3								
1.0	A	5,10,20	T110A105(1)015AS	0.3	3								
1.2	A	5,10,20	T110A125(1)015AS	0.3	4								
1.5	A	5,10,20	T110A155(1)015AS	0.3	4								
1.8	A	5,10,20	T110A185(1)015AS	0.3	4								
2.2	A	5,10,20	T110A225(1)015AS	0.3	4								
2.7	A	5	T110A275J015AS	0.3	4	5019	5219	5419	5619	6045	7045	8045	T212A275J015(2)S
2.7	A	10	T110A275K015AS	0.3	4	2267	2507	2747	2987	6046	7046	8046	T212A275K015(2)S
2.7	A	20	T110A275M015AS	0.3	4								
3.3	**A**	**5**	**T110A335J015AS**	**0.4**	**4**	**5020**	**5220**	**5420**	**5620**	**6047**	**7047**	**8047**	**T212A335J015(2)S**
3.3	**A**	**10**	**T110A335K015AS**	**0.4**	**4**	**2268**	**2508**	**2748**	**2988**	**6048**	**7048**	**8048**	**T212A335K015(2)S**
3.3	**A**	**20**	**T110A335M015AS**	**0.4**	**4**	**2269**	**2509**	**2749**	**2989**	**6049**	**7049**	**8049**	**T212A335M015(2)S**
3.9	B	5,10,20	T110B395(1)015AS	0.4	4								
4.7	B	5,10,20	T110B475(1)015AS	0.7	4								
5.6	B	5,10,20	T110B565(1)015AS	0.7	4								

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
15 VOLT RATING AT 85°C — 10 VOLT RATING AT 125°C (Cont'd)													
6.8	B	5,10,20	T110B685(1)015AS	0.7	6								
8.2	B	5,10,20	T110B825(1)015AS	0.7	6								
10.0	B	5,10,20	T110B106(1)015AS	1.0	6								
12.0	B	5,10,20	T110B126(1)015AS	1.0	6								
15.0	B	5,10,20	T110B156(1)015AS	2.0	6								
18.0	B	5	T110B186J015AS	2.0	6	5021	5221	5421	5621	6050	7050	8050	T212B186J015(2)S
18.0	B	10	T110B186K015AS	2.0	6	2270	2510	2750	2990	6051	7051	8051	T212B186K015(2)S
18.0	B	20	T110B186M015AS	2.0	6								
22.0	**B**	**5**	**T110B226J015AS**	**2.0**	**6**	**5022**	**5222**	**5422**	**5622**	**6052**	**7052**	**8052**	**T212B226J015(2)S**
22.0	**B**	**10**	**T110B226K015AS**	**2.0**	**6**	**2271**	**2511**	**2751**	**2991**	**6053**	**7053**	**8053**	**T212B226K015(2)S**
22.0	**B**	**20**	**T110B226M015AS**	**2.0**	**6**	**2272**	**2512**	**2752**	**2992**	**6054**	**7054**	**8054**	**T212B226M015(2)S**
27.0	C	5,10,20	T110C276(1)015AS	3.0	6								
33.0	C	5,10,20	T110C336(1)015AS	3.0	6								
39.0	C	5,10,20	T110C396(1)015AS	3.0	6								
47.0	C	5,10,20	T110C476(1)015AS	4.0	6								
56.0	C	5	T110C566J015AS	4.0	6	5023	5223	5423	5623	6055	7055	8055	T212C566J015(2)S
56.0	C	10	T110C566K015AS	4.0	6	2273	2513	2753	2993	6056	7056	8056	T212C566K015(2)S
56.0	C	20	T110C566M015AS	4.0	6								
68.0	**C**	**5**	**T110C686J015AS**	**5.0**	**6**	**5024**	**5224**	**5424**	**5624**	**6057**	**7057**	**8057**	**T212C686J015(2)S**
68.0	**C**	**10**	**T110C686K015AS**	**5.0**	**6**	**2274**	**2514**	**2754**	**2994**	**6058**	**7058**	**8058**	**T212C686K015(2)S**
68.0	**C**	**20**	**T110C686M015AS**	**5.0**	**6**	**2275**	**2515**	**2755**	**2995**	**6059**	**7059**	**8059**	**T212C686M015(2)S**
82.0	D	5,10,20	T110D826(1)015AS	6.0	6								
100.0	D	5,10,20	T110D107(1)015AS	6.0	6								
120.0	D	5	T110D127J015AS	6.0	6	5025	5225	5425	5625	6060	7060	8060	T212D127J015(2)S
120.0	D	10	T110D127K015AS	6.0	6	2276	2516	2756	2996	6061	7061	8061	T212D127K015(2)S
120.0	D	20	T110D127M015AS	6.0	6								
150.0	**D**	**5**	**T110D157J015AS**	**8.0**	**6**	**5026**	**5226**	**5426**	**5626**	**6062**	**7062**	**8062**	**T212D157J015(2)S**
150.0	**D**	**10**	**T110D157K015AS**	**8.0**	**6**	**2277**	**2517**	**2757**	**2997**	**6063**	**7063**	**8063**	**T212D157K015(2)S**
150.0	**D**	**20**	**T110D157M015AS**	**8.0**	**6**	**2278**	**2518**	**2758**	**2998**	**6064**	**7064**	**8064**	**T212D157M015(2)S**
20 VOLT RATING AT 85°C — 13 VOLT RATING AT 125°C													
0.047	A	5,10,20	T110A473(1)020AS	0.1	3								
0.056	A	5,10,20	T110A563(1)020AS	0.1	3								
0.068	A	5,10,20	T110A683(1)020AS	0.1	3								
0.082	A	5,10,20	T110A823(1)020AS	0.1	3								
0.1	A	5,10,20	T110A104(1)020AS	0.3	3								
0.12	A	5,10,20	T110A124(1)020AS	0.3	3								
0.15	A	5,10,20	T110A154(1)020AS	0.3	3								
0.18	A	5,10,20	T110A184(1)020AS	0.3	3								
0.22	A	5,10,20	T110A224(1)020AS	0.3	3								
0.27	A	5,10,20	T110A274(1)020AS	0.3	3								
0.33	A	5,10,20	T110A334(1)020AS	0.3	3								
0.39	A	5,10,20	T110A394(1)020AS	0.3	3								
0.47	A	5,10,20	T110A474(1)020AS	0.3	3								
0.56	A	5,10,20	T110A564(1)020AS	0.3	3								
0.68	A	5,10,20	T110A684(1)020AS	0.3	3								
0.82	A	5,10,20	T110A824(1)020AS	0.3	3								
1.0	A	5,10,20	T110A105(1)020AS	0.3	3								
1.2	A	5	T110A125J020AS	0.3	4	5027	5227	5427	5627	6065	7065	8065	T212A125J020(2)S
1.2	A	10	T110A125K020AS	0.3	4	2279	2519	2759	2999	6066	7066	8066	T212A125K020(2)S
1.2	A	20	T110A125M020AS	0.3	4								
1.5	**A**	**5**	**T110A155J020AS**	**0.3**	**4**	**5028**	**5228**	**5428**	**5628**	**6067**	**7067**	**8067**	**T212A155J020(2)S**
1.5	**A**	**10**	**T110A155K020AS**	**0.3**	**4**	**2280**	**2520**	**2760**	**3000**	**6068**	**7068**	**8068**	**T212A155K020(2)S**
1.5	**A**	**20**	**T110A155M020AS**	**0.3**	**4**	**2281**	**2521**	**2761**	**3001**	**6069**	**7069**	**8069**	**T212A155M020(2)S**
1.8	A	5	T110A185J020AS	0.3	4	5029	5229	5429	5629	6070	7070	8070	T212A185J020(2)S
1.8	A	10	T110A185K020AS	0.3	4	2282	2522	2762	3002	6071	7071	8071	T212A185K020(2)S
1.8	A	20	T110A185M020AS	0.3	4								
2.2	**A**	**5**	**T110A225J020AS**	**0.4**	**4**	**5010**	**5230**	**5430**	**5630**	**6072**	**7072**	**8072**	**T212A225J020(2)S**
2.2	**A**	**10**	**T110A225K020AS**	**0.4**	**4**	**2283**	**2523**	**2763**	**3003**	**6073**	**7073**	**8073**	**T212A225K020(2)S**
2.2	**A**	**20**	**T110A225M020AS**	**0.4**	**4**	**2284**	**2524**	**2764**	**3004**	**6074**	**7074**	**8074**	**T212A225M020(2)S**

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS — DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) — MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
20 VOLT RATING AT 85°C — 13 VOLT RATING AT 125°C (Cont'd)													
2.7	B	5,10,20	T110B275(1)020AS	0.5	4								
3.3	B	5,10,20	T110B335(1)020AS	1.0	4								
3.9	B	5,10,20	T110B395(1)020AS	1.0	4								
4.7	B	5,10,20	T110B475(1)020AS	1.0	4								
5.6	B	5,10,20	T110B565(1)020AS	1.0	4								
6.8	B	5,10,20	T110B685(1)020AS	1.0	4								
8.2	B	5	T110B825J020AS	1.0	6	5031	5231	5431	5631	6075	7075	8075	T212B825J020(2)S
8.2	B	10	T110B825K020AS	1.0	6	2285	2525	2765	3005	6076	7076	8076	T212B825K020(2)S
8.2	B	20	T110B825M020AS	1.0	6								
10.0	**B**	**5**	**T110B106J020AS**	**1.0**	**6**	**5032**	**5232**	**5432**	**5632**	**6077**	**7077**	**8077**	**T212B106J020(2)S**
10.0	**B**	**10**	**T110B106K020AS**	**1.0**	**6**	**2286**	**2526**	**2766**	**3006**	**6078**	**7078**	**8078**	**T212B106K020(2)S**
10.0	**B**	**20**	**T110B106M020AS**	**1.0**	**6**	**2287**	**2527**	**2767**	**3007**	**6079**	**7079**	**8079**	**T212B106M020(2)S**
12.0	B	5	T110B126J020AS	1.0	6	5033	5233	5433	5633	6080	7080	8080	T212B126J020(2)S
12.0	B	10	T110B126K020AS	1.0	6	2288	2528	2768	3008	6081	7081	8081	T212B126K020(2)S
12.0	B	20	T110B126M020AS	1.0	6								
15.0	**B**	**5**	**T110B156J020AS**	**2.0**	**6**	**5034**	**5234**	**5434**	**5634**	**6082**	**7082**	**8082**	**T212B156J020(2)S**
15.0	**B**	**10**	**T110B156K020AS**	**2.0**	**6**	**2289**	**2529**	**2769**	**3009**	**6083**	**7083**	**8083**	**T212B156K020(2)S**
15.0	**B**	**20**	**T110B156M020AS**	**2.0**	**6**	**2290**	**2530**	**2770**	**3010**	**6084**	**7084**	**8084**	**T212B156M020(2)S**
18.0	C	5,10,20	T110C186(1)020AS	2.0	6								
22.0	C	5,10,20	T110C226(1)020AS	2.5	6								
27.0	C	5	T110C276J020AS	2.5	6	5035	5235	5435	5635	6085	7085	8085	T212C276J020(2)S
27.0	C	10	T110C276K020AS	2.5	6	2291	2531	2771	3011	6086	7086	8086	T212C276K020(2)S
27.0	C	20	T110C276M020AS	2.5	6								
33.0	C	5	T110C336J020AS	3.0	6	5036	5236	5436	5636	6087	7087	8087	T212C336J020(2)S
33.0	C	10	T110C336K020AS	3.0	6	2292	2532	2772	3012	6088	7088	8088	T212C336K020(2)S
33.0	C	20	T110C336M020AS	3.0	6	2293	2533	2773	3013	6089	7089	8089	T212C336M020(2)S
39.0	C	5	T110C396J020AS	3.0	6	5037	5237	5437	5637	6090	7090	8090	T212C396J020(2)S
39.0	C	10	T110C396K020AS	3.0	6	2294	2534	2774	3014	6091	7091	8091	T212C396K020(2)S
39.0	C	20	T110C396M020AS	3.0	6								
47.0	**C**	**5**	**T110C476J020AS**	**4.5**	**6**	**5038**	**5238**	**5438**	**5638**	**6092**	**7092**	**8092**	**T212C476J020(2)S**
47.0	**C**	**10**	**T110C476K020AS**	**4.5**	**6**	**2295**	**2535**	**2775**	**3015**	**6093**	**7093**	**8093**	**T212C476K020(2)S**
47.0	**C**	**20**	**T110C476M020AS**	**4.5**	**6**	**2296**	**2536**	**2776**	**3016**	**6094**	**7094**	**8094**	**T212C476M020(2)S**
56.0	D	5	T110D566J020AS	5.5	6	5039	5239	5439	5639	6095	7095	8095	T212D566J020(2)S
56.0	D	10	T110D566K020AS	5.5	6	2297	2537	2777	3017	6096	7096	8096	T212D566K020(2)S
56.0	D	20	T110D566M020AS	5.5	6								
68.0	D	5	T110D686J020AS	6.0	6	5040	5240	5440	5640	6097	7097	8097	T212D686J020(2)S
68.0	D	10	T110D686K020AS	6.0	6	2298	2538	2778	3018	6098	7098	8098	T212D686K020(2)S
68.0	D	20	T110D686M020AS	6.0	6	2299	2539	2779	3019	6099	7099	8099	T212D686M020(2)S
82.0	D	5	T110D826J020AS	6.0	6	5041	5241	5441	5641	6100	7100	8100	T212D826J020(2)S
82.0	D	10	T110D826K020AS	6.0	6	2300	2540	2780	3020	6101	7101	8101	T212D826K020(2)S
82.0	D	20	T110D826M020AS	6.0	6								
100.0	**D**	**5**	**T110D107J020AS**	**10.0**	**6**	**5042**	**5242**	**5442**	**5642**	**6102**	**7102**	**8102**	**T212D107J020(2)S**
100.0	**D**	**10**	**T110D107K020AS**	**10.0**	**6**	**2301**	**2541**	**2781**	**3021**	**6103**	**7103**	**8103**	**T212D107K020(2)S**
100.0	**D**	**20**	**T110D107M020AS**	**10.0**	**6**	**2302**	**2542**	**2782**	**3022**	**6104**	**7104**	**8104**	**T212D107M020(2)S**
35 VOLT RATING AT 85°C — 23 VOLT RATING AT 125°C													
0.0047	A	5,10,20	T110A472(1)035AS	0.1	3								
0.0056	A	5,10,20	T110A562(1)035AS	0.1	3								
0.0068	A	5,10,20	T110A682(1)035AS	0.1	3								
0.0082	A	5,10,20	T110A822(1)035AS	0.1	3								
0.01	A	5,10,20	T110A103(1)035AS	0.1	3								
0.012	A	5,10,20	T110A123(1)035AS	0.1	3								
0.015	A	5,10,20	T110A153(1)035AS	0.1	3								
0.018	A	5,10,20	T110A183(1)035AS	0.1	3								
0.022	A	5,10,20	T110A223(1)035AS	0.1	3								
0.027	A	5,10,20	T110A273(1)035AS	0.1	3								
0.033	A	5,10,20	T110A333(1)035AS	0.1	3								
0.039	A	5,10,20	T110A393(1)035AS	0.1	3								
0.047	A	5,10,20	T110A473(1)035AS	0.1	3								
0.056	A	5,10,20	T110A563(1)035AS	0.1	3								

(1) To complete T110 Series part number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
35 VOLT RATING AT 85°C — 23 VOLT RATING AT 125° (Cont'd)													
0.068	A	5,10,20	T110A683(1)035AS	0.1	3								
0.082	A	5,10,20	T110A823(1)035AS	0.1	3								
0.1	**A**	**5,10,20**	**T110A104(1)035AS**	**0.5**	**3**								
0.12	A	5,10,20	T110A124(1)035AS	0.5	3								
0.15	A	5,10,20	T110A154(1)035AS	0.5	3								
0.18	A	5,10,20	T110A184(1)035AS	0.5	3								
0.22	**A**	**5,10,20**	**T110A224(1)035AS**	**0.5**	**3**								
0.27	A	5,10,20	T110A274(1)035AS	0.5	3								
0.33	**A**	**5,10,20**	**T110A334(1)035AS**	**0.5**	**3**								
0.39	A	5,10,20	T110A394(1)035AS	0.5	3								
0.47	A	5,10,20	T110A474(1)035AS	0.5	3								
0.56	A	5,10,20	T110A564(1)035AS	0.5	3								
0.68	**A**	**5,10,20**	**T110A684(1)035AS**	**0.5**	**3**								
0.82	A	5,10,20	T110A824(1)035AS	0.5	3								
1.0	**A**	**5,10,20**	**T110A105(1)035AS**	**0.5**	**3**								
1.2	B	5,10,20	T110B125(1)035AS	0.5	4								
1.5	B	5,10,20	T110B155(1)035AS	0.5	4								
1.8	B	5,10,20	T110B185(1)035AS	0.5	4								
2.2	B	5,10,20	T110B225(1)035AS	1.0	4								
2.7	B	5,10,20	T110B275(1)035AS	1.0	4								
3.3	**B**	**5,10,20**	**T110B335(1)035AS**	**1.0**	**4**								
3.9	B	5,10,20	T110B395(1)035AS	1.0	4								
4.7	**B**	**5,10,20**	**T110B475(1)035AS**	**1.0**	**4**								
5.6	B	5	T110B565J035AS	1.0	4	5043	5243	5443	5643	6105	7105	8105	T212B565J035(2)S
5.6	B	10	T110B565K035AS	1.0	4	2303	2543	2783	3023	6106	7106	8106	T212B565K035(2)S
5.6	B	20	T110B565M035AS	1.0	4								
6.8	**B**	**5**	**T110B685J035AS**	**1.5**	**4**	**5044**	**5244**	**5444**	**5644**	**6107**	**7107**	**8107**	**T212B685J035(2)S**
6.8	**B**	**10**	**T110B685K035AS**	**1.5**	**4**	**2304**	**2544**	**2784**	**3024**	**6108**	**7108**	**8108**	**T212B685K035(2)S**
6.8	**B**	**20**	**T110B685M035AS**	**1.5**	**4**	**2305**	**2545**	**2785**	**3025**	**6109**	**7109**	**8109**	**T212B685M035(2)S**
8.2	C	5,10,20	T110C825(1)035AS	3.0	4								
10.0	C	5,10,20	T110C106(1)035AS	3.0	4								
12.0	C	5,10,20	T110C126(1)035AS	3.0	4								
15.0	C	5,10,20	T110C156(1)035AS	3.0	4								
18.0	C	5,10,20	T110C186(1)035AS	3.0	4								
22.0	**C**	**5**	**T110C226J035AS**	**4.0**	**4**	**5045**	**5245**	**5445**	**5645**	**6110**	**7110**	**8110**	**T212C226J035(2)S**
22.0	**C**	**10**	**T110C226K035AS**	**4.0**	**4**	**2306**	**2546**	**2786**	**3026**	**6111**	**7111**	**8111**	**T212C226K035(2)S**
22.0	**C**	**20**	**T110C226M035AS**	**4.0**	**4**	**2307**	**2547**	**2787**	**3027**	**6112**	**7112**	**8112**	**T212C226M035(2)S**
27.0	D	5	T110D276J035AS	4.5	4	5046	5246	5446	5646	6113	7113	8113	T212D276J035(2)S
27.0	D	10	T110D276K035AS	4.5	4	2308	2548	2788	3028	6114	7114	8114	T212D276K035(2)S
27.0	D	20	T110D276M035AS	4.5	4								
33.0	**D**	**5**	**T110D336J035AS**	**5.5**	**4**	**5047**	**5247**	**5447**	**5647**	**6115**	**7115**	**8115**	**T212D336J035(2)S**
33.0	**D**	**10**	**T110D336K035AS**	**5.5**	**4**	**2309**	**2549**	**2789**	**3029**	**6116**	**7116**	**8116**	**T212D336K035(2)S**
33.0	**D**	**20**	**T110D336M035AS**	**5.5**	**4**	**2310**	**2550**	**2790**	**3030**	**6117**	**7117**	**8117**	**T212D336M035(2)S**
39.0	D	5	T110D396J035AS	6.0	4	5048	5248	5448	5648	6118	7118	8118	T212D396J035(2)S
39.0	D	10	T110D396K035AS	6.0	4	2311	2551	2791	3031	6119	7119	8119	T212D396K035(2)S
39.0	D	20	T110D396M035AS	6.0	4								
47.0	**D**	**5**	**T110D476J035AS**	**8.0**	**4**	**5049**	**5249**	**5449**	**5649**	**6120**	**7120**	**8120**	**T212D476J035(2)S**
47.0	**D**	**10**	**T110D476K035AS**	**8.0**	**4**	**2312**	**2552**	**2792**	**3032**	**6121**	**7121**	**8121**	**T212D476K035(2)S**
47.0	**D**	**20**	**T110D476M035AS**	**8.0**	**4**	**2313**	**2553**	**2793**	**3033**	**6122**	**7122**	**8122**	**T212D476M035(2)S**
50 VOLT RATING AT 85°C — 33 VOLT RATING AT 125°													
0.0047	A	5	T110A472J050AS	0.1	2	5050	5250	5450	5650	6123	7123	8123	T212A472J050(2)S
0.0047	A	10	T110A472K050AS	0.1	2	2314	2554	2794	3034	6124	7124	8124	T212A472K050(2)S
0.0047	A	20	T110A472M050AS	0.1	2	2315	2555	2795	3035	6125	7125	8125	T212A472M050(2)S
0.0056	A	5	T110A562J050AS	0.1	2	5051	5251	5451	5651	6126	7126	8126	T212A562J050(2)S
0.0056	A	10	T110A562K050AS	0.1	2	2316	2556	2796	3036	6127	7127	8127	T212A562K050(2)S
0.0056	A	20	T110A562M050AS	0.1	2								
0.0068	A	5	T110A682J050AS	0.1	2	5052	5252	5452	5652	6128	7128	8128	T212A682J050(2)S
0.0068	A	10	T110A682K050AS	0.1	2	2317	2557	2797	3037	6129	7129	8129	T212A682K050(2)S
0.0068	A	20	T110A682M050AS	0.1	2	2318	2558	2798	3038	6130	7130	8130	T212A682M050(2)S

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
50 VOLT RATING AT 85°C — 33 VOLT RATING AT 125°C (Cont'd)													
0.0082	A	5	T110A822J050AS	0.1	2	5053	5253	5453	5653	6131	7131	8131	T212A822J050(2)S
0.0082	A	10	T110A822K050AS	0.1	2	2319	2559	2799	3039	6132	7132	8132	T212A822K050(2)S
0.0082	A	20	T110A822M050AS	0.1	2								
0.01	A	5	T110A103J050AS	0.1	2	5054	5254	5454	5654	6133	7133	8133	T212A103J050(2)S
0.01	A	10	T110A103K050AS	0.1	2	2320	2560	2800	3040	6134	7134	8134	T212A103K050(2)S
0.01	A	20	T110A103M050AS	0.1	2	2321	2561	2801	3041	6135	7135	8135	T212A103M050(2)S
0.012	A	5	T110A123J050AS	0.1	2	5055	5255	5455	5655	6136	7136	8136	T212A123J050(2)S
0.012	A	10	T110A123K050AS	0.1	2	2322	2562	2802	3042	6137	7137	8137	T212A123K050(2)S
0.012	A	20	T110A123M050AS	0.1	2								
0.015	A	5	T110A153J050AS	0.1	2	5056	5256	5456	5656	6138	7138	8138	T212A153J050(2)S
0.015	A	10	T110A153K050AS	0.1	2	2323	2563	2803	3043	6139	7139	8139	T212A153K050(2)S
0.015	A	20	T110A153M050AS	0.1	2	2324	2564	2804	3044	6140	7140	8140	T212A153M050(2)S
0.018	A	5	T110A183J050AS	0.1	2	5057	5257	5457	5657	6141	7141	8141	T212A183J050(2)S
0.018	A	10	T110A183K050AS	0.1	2	2325	2565	2805	3045	6142	7142	8142	T212A183K050(2)S
0.018	A	20	T110A183M050AS	0.1	2								
0.022	A	5	T110A223J050AS	0.1	2	5058	5258	5458	5658	6143	7143	8143	T212A223J050(2)S
0.022	A	10	T110A223K050AS	0.1	2	2326	2566	2806	3046	6144	7144	8144	T212A223K050(2)S
0.022	A	20	T110A223M050AS	0.1	2	2327	2567	2807	3047	6145	7145	8145	T212A223M050(2)S
0.027	A	5	T110A273J050AS	0.1	2	5059	5259	5459	5659	6146	7146	8146	T212A273J050(2)S
0.027	A	10	T110A273K050AS	0.1	2	2328	2568	2808	3048	6147	7147	8147	T212A273K050(2)S
0.027	A	20	T110A273M050AS	0.1	2								
0.033	A	5	T110A333J050AS	0.1	2	5060	5260	5460	5660	6148	7148	8148	T212A333J050(2)S
0.033	A	10	T110A333K050AS	0.1	2	2329	2569	2809	3049	6149	7149	8149	T212A333K050(2)S
0.033	A	20	T110A333M050AS	0.1	2	2330	2570	2810	3050	6150	7150	8150	T212A333M050(2)S
0.039	A	5	T110A393J050AS	0.1	2	5061	5261	5461	5661	6151	7151	8151	T212A393J050(2)S
0.039	A	10	T110A393K050AS	0.1	2	2331	2571	2811	3051	6152	7152	8152	T212A393K050(2)S
0.039	A	20	T110A393M050AS	0.1	2								
0.047	A	5	T110A473J050AS	0.1	2	5062	5262	5462	5662	6153	7153	8153	T212A473J050(2)S
0.047	A	10	T110A473K050AS	0.1	2	2332	2572	2812	3052	6154	7154	8154	T212A473K050(2)S
0.047	A	20	T110A473M050AS	0.1	2	2333	2573	2813	3053	6155	7155	8155	T212A473M050(2)S
0.056	A	5	T110A563J050AS	0.1	2	5063	5263	5463	5663	6156	7156	8156	T212A563J050(2)S
0.056	A	10	T110A563K050AS	0.1	2	2334	2574	2814	3054	6157	7157	8157	T212A563K050(2)S
0.056	A	20	T110A563M050AS	0.1	2								
0.068	A	5	T110A683J050AS	0.1	2	5064	5264	5464	5664	6158	7158	8158	T212A683J050(2)S
0.068	A	10	T110A683K050AS	0.1	2	2335	2575	2815	3055	6159	7159	8159	T212A683K050(2)S
0.068	A	20	T110A683M050AS	0.1	2	2336	2576	2816	3056	6160	7160	8160	T212A683M050(2)S
0.082	A	5	T110A823J050AS	0.1	2	5065	5265	5465	5665	6161	7161	8161	T212A823J050(2)S
0.082	A	10	T110A823K050AS	0.1	2	2337	2537	2837	3057	6162	7162	8162	T212A823K050(2)S
0.082	A	20	T110A823M050AS	0.1	2								
0.1	A	5	T110A104J050AS	0.3	2	5066	5266	5466	5666	6163	7163	8163	T212A104J050(2)S
0.1	A	10	T110A104K050AS	0.3	2	2338	2578	2818	3058	6164	7164	8164	T212A104K050(2)S
0.1	A	20	T110A104M050AS	0.3	2	2339	2579	2819	3059	6165	7165	8165	T212A104M050(2)S
0.12	A	5	T110A124J050AS	0.3	2	5067	5267	5467	5667	6166	7166	8166	T212A124J050(2)S
0.12	A	10	T110A124K050AS	0.3	2	2340	2580	2820	3060	6167	7167	8167	T212A124K050(2)S
0.12	A	20	T110A124M050AS	0.3	2								
0.15	A	5	T110A154J050AS	0.3	2	5068	5268	5468	5668	6168	7168	8168	T212A154J050(2)S
0.15	A	10	T110A154K050AS	0.3	2	2341	2581	2821	3061	6169	7169	8169	T212A154K050(2)S
0.15	A	20	T110A154M050AS	0.3	2	2342	2582	2822	3062	6170	7170	8170	T212A154M050(2)S
0.18	A	5	T110A184J050AS	0.3	2	5069	5269	5469	5669	6171	7171	8171	T212A184J050(2)S
0.18	A	10	T110A184K050AS	0.3	2	2343	2583	2823	3063	6172	7172	8172	T212A184K050(2)S
0.18	A	20	T110A184M050AS	0.3	2								
0.22	A	5	T110A224J050AS	0.3	2	5070	5270	5470	5670	6173	7173	8173	T212A224J050(2)S
0.22	A	10	T110A224K050AS	0.3	2	2344	2584	2824	3064	6174	7174	8174	T212A224K050(2)S
0.22	A	20	T110A224M050AS	0.3	2	2345	2585	2825	3065	6175	7175	8175	T212A224M050(2)S
0.27	A	5	T110A274J050AS	0.3	2	5071	5271	5471	5671	6176	7176	8176	T212A274J050(2)S
0.27	A	10	T110A274K050AS	0.3	2	2346	2586	2826	3066	6177	7177	8177	T212A274K050(2)S
0.27	A	20	T110A274M050AS	0.3	2								
0.33	A	5	T110A334J050AS	0.3	2	5072	5272	5472	5672	6178	7178	8178	T212A334J050(2)S
0.33	A	10	T110A334K050AS	0.3	2	2347	2587	2827	3067	6179	7179	8179	T212A334K050(2)S
0.33	A	20	T110A334M050AS	0.3	2	2348	2588	2828	3068	6180	7180	8180	T212A334M050(2)S
0.39	A	5	T110A394J050AS	0.3	2	5073	5273	5473	5673	6181	7181	8181	T212A394J050(2)S

(1) To complete T110 Series part number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
50 VOLT RATING AT 85°C — 33 VOLT RATING AT 125°C (Cont'd)													
0.39	A	10	T110A394K050AS	0.3	2	2349	2589	2829	3069	6182	7182	8182	T212A394K050(2)S
0.39	A	20	T110A394M050AS	0.3	2								
0.47	**A**	**5**	**T110A474J050AS**	**0.3**	**2**	**5074**	**5274**	**5474**	**5674**	**6183**	**7183**	**8183**	**T212A474J050(2)S**
0.47	**A**	**10**	**T110A474K050AS**	**0.3**	**2**	**2350**	**2590**	**2830**	**3070**	**6184**	**7184**	**8184**	**T212A474K050(2)S**
0.47	**A**	**20**	**T110A474M050AS**	**0.3**	**2**	**2351**	**2591**	**2831**	**3071**	**6185**	**7185**	**8185**	**T212A474M050(2)S**
0.56	A	5	T110A564J050AS	0.3	2	5075	5275	5475	5675	6186	7186	8186	T212A564J050(2)S
0.56	A	10	T110A564K050AS	0.3	2	2352	2592	2832	3072	6187	7187	8187	T212A564K050(2)S
0.56	A	20	T110A564M050AS	0.3	2								
0.68	**A**	**5**	**T110A684J050AS**	**0.3**	**2**	**5076**	**5276**	**5476**	**5676**	**6188**	**7188**	**8188**	**T212A684J050(2)S**
0.68	**A**	**10**	**T110A684K050AS**	**0.3**	**2**	**2353**	**2593**	**2833**	**3073**	**6189**	**7189**	**8189**	**T212A684K050(2)S**
0.68	**A**	**20**	**T110A684M050AS**	**0.3**	**2**	**2354**	**2594**	**2834**	**3074**	**6190**	**7190**	**8190**	**T212A684M050(2)S**
0.82	A	5	T110A824J050AS	0.3	2	5077	5277	5477	5677	6191	7191	8191	T212A824J050(2)S
0.82	A	10	T110A824K050AS	0.3	2	2355	2595	2835	3075	6192	7192	8192	T212A824K050(2)S
0.82	A	20	T110A824M050AS	0.3	2								
1.0	**A**	**5**	**T110A105J050AS**	**0.4**	**2**	**5078**	**5278**	**5478**	**5678**	**6193**	**7193**	**8193**	**T212A105J050(2)S**
1.0	**A**	**10**	**T110A105K050AS**	**0.4**	**2**	**2356**	**2596**	**2836**	**3076**	**6194**	**7194**	**8194**	**T212A105K050(2)S**
1.0	**A**	**20**	**T110A105M050AS**	**0.4**	**2**	**2357**	**2597**	**2837**	**3077**	**6195**	**7195**	**8195**	**T212A105M050(2)S**
1.2	B	5	T110B125J050AS	0.4	4	5079	5279	5479	5679	6196	7196	8196	T212B125J050(2)S
1.2	B	10	T110B125K050AS	0.4	4	2358	2598	2838	3078	6197	7197	8197	T212B125K050(2)S
1.2	B	20	T110B125M050AS	0.4	4								
1.5	B	5	T110B155J050AS	0.5	4	5080	5280	5480	5680	6198	7198	8198	T212B155J050(2)S
1.5	B	10	T110B155K050AS	0.5	4	2359	2599	2839	3079	6199	7199	8199	T212B155K050(2)S
1.5	B	20	T110B155M050AS	0.5	4	2360	2600	2840	3080	6200	7200	8200	T212B155M050(2)S
1.8	B	5	T110B185J050AS	0.5	4	5081	5281	5481	5681	6201	7201	8201	T212B185J050(2)S
1.8	B	10	T110B185K050AS	0.5	4	2361	2601	2841	3081	6202	7202	8202	T212B185K050(2)S
1.8	B	20	T110B185M050AS	0.5	4								
2.2	**B**	**5**	**T110B225J050AS**	**0.8**	**4**	**5082**	**5282**	**5482**	**5682**	**6203**	**7203**	**8203**	**T212B225J050(2)S**
2.2	**B**	**10**	**T110B225K050AS**	**0.8**	**4**	**2362**	**2602**	**2842**	**3082**	**6204**	**7204**	**8204**	**T212B225K050(2)S**
2.2	**B**	**20**	**T110B225M050AS**	**0.8**	**4**	**2363**	**2603**	**2843**	**3083**	**6205**	**7205**	**8205**	**T212B225M050(2)S**
2.7	B	5	T110B275J050AS	0.8	4	5083	5283	5483	5683	6206	7206	8206	T212B275J050(2)S
2.7	B	10	T110B275K050AS	0.8	4	2364	2604	2844	3084	6207	7207	8207	T212B275K050(2)S
2.7	B	20	T110B275M050AS	0.8	4								
3.3	B	5	T110B335J050AS	1.2	4	5084	5284	5484	5684	6208	7208	8208	T212B335J050(2)S
3.3	B	10	T110B335K050AS	1.2	4	2365	2605	2845	3085	6209	7209	8209	T212B335K050(2)S
3.3	B	20	T110B335M050AS	1.2	4	2366	2606	2846	3086	6210	7210	8210	T212B335M050(2)S
3.9	B	5	T110B395J050AS	1.5	4	5085	5285	5485	5685	6211	7211	8211	T212B395J050(2)S
3.9	B	10	T110B395K050AS	1.5	4	2367	2607	2847	3087	6212	7212	8212	T212B395K050(2)S
3.9	B	20	T110B395M050AS	1.5	4								
4.7	**B**	**5**	**T110B475J050AS**	**1.7**	**4**	**5086**	**5286**	**5486**	**5686**	**6213**	**7213**	**8213**	**T212B475J050(2)S**
4.7	**B**	**10**	**T110B475K050AS**	**1.7**	**4**	**2368**	**2608**	**2848**	**3088**	**6214**	**7214**	**8214**	**T212B475K050(2)S**
4.7	**B**	**20**	**T110B475M050AS**	**1.7**	**4**	**2369**	**2609**	**2849**	**3089**	**6215**	**7215**	**8215**	**T212B475M050(2)S**
5.6	C	5	T110C565J050AS	2.2	4	5087	5287	5487	5687	6216	7216	8216	T212C565J050(2)S
5.6	C	10	T110C565K050AS	2.2	4	2370	2610	2850	3090	6217	7217	8217	T212C565K050(2)S
5.6	C	20	T110C565M050AS	2.2	4								
6.8	C	5	T110C685J050AS	2.2	4	5088	5288	5488	5688	6218	7218	8218	T212C685J050(2)S
6.8	C	10	T110C685K050AS	2.2	4	2371	2611	2851	3091	6219	7219	8219	T212C685K050(2)S
6.8	C	20	T110C685M050AS	2.2	4	2372	2612	2852	3092	6220	7220	8220	T212C685M050(2)S
8.2	C	5	T110C825J050AS	2.5	4	5089	5289	5489	5689	6221	7221	8221	T212C825J050(2)S
8.2	C	10	T110C825K050AS	2.5	4	2373	2613	2853	3093	6222	7222	8222	T212C825K050(2)S
8.2	C	20	T110C825M050AS	2.5	4								
10.0	C	5	T110C106J050AS	2.5	4	5090	5290	5490	5690	6223	7223	8223	T212C106J050(2)S
10.0	C	10	T110C106K050AS	2.5	4	2374	2614	2854	3094	6224	7224	8224	T212C106K050(2)S
10.0	C	20	T110C106M050AS	2.5	4	2375	2615	2855	3095	6225	7225	8225	T212C106M050(2)S
12.0	C	5	T110C126J050AS	3.0	4	5091	5291	5491	5691	6226	7226	8226	T212C126J050(2)S
12.0	C	10	T110C126K050AS	3.0	4	2376	2616	2856	3096	6227	7227	8227	T212C126K050(2)S
12.0	C	20	T110C126M050AS	3.0	4								
15.0	C	5	T110C156J050AS	4.0	4	5092	5292	5492	5692	6228	7228	8228	T212C156J050(2)S
15.0	C	10	T110C156K050AS	4.0	4	2377	2617	2857	3097	6229	729	8229	T212C156K050(2)S
15.0	C	20	T110C156M050AS	4.0	4	2378	2618	2858	3098	6230	7230	8230	T212C156M050(2)S
18.0	C	5	T110C186J050AS	4.5	4	5093	5293	5493	5693	6231	7231	8231	T212C186J050(2)S

(1) To complete T110 Series part number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part type and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS — DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) — MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
50 VOLT RATING AT 85°C — 33 VOLT RATING AT 125°C (Cont'd)													
18.0	C	10	T110C186K050AS	4.5	4	2379	2619	2859	3099	6232	7232	8232	T212C186K020(2)S
18.0	C	20	T110C186M050AS	4.5	4								
22.0	**D**	**5**	**T110D226J050AS**	**5.5**	**4**	**5094**	**5294**	**5494**	**5694**	**6233**	**7233**	**8233**	**T212D226J050(2)S**
22.0	**D**	**10**	**T110D226K050AS**	**5.5**	**4**	**2380**	**2620**	**2860**	**3100**	**6234**	**7234**	**8234**	**T212D226K050(2)S**
22.0	**D**	**20**	**T110D226M050AS**	**5.5**	**4**	**2381**	**2621**	**2861**	**3101**	**6235**	**7235**	**8235**	**T212D226M050(2)S**
60 VOLT RATING AT 85°C — 40 VOLT RATING AT 125°C													
0.0047	A	5,10,20	T110A472(1)060AS	0.3	3								
0.0056	A	5,10,20	T110A562(1)060AS	0.3	3								
0.0068	A	5,10,20	T110A682(1)060AS	0.3	3								
0.0082	A	5,10,20	T110A822(1)060AS	0.3	3								
0.01	A	5,10,20	T110A103(1)060AS	0.3	3								
0.012	A	5,10,20	T110A123(1)060AS	0.3	3								
0.015	A	5,10,20	T110A153(1)060AS	0.3	3								
0.018	A	5,10,20	T110A183(1)060AS	0.3	3								
0.022	A	5,10,20	T110A223(1)060AS	0.3	3								
0.027	A	5,10,20	T110A273(1)060AS	0.3	3								
0.033	A	5,10,20	T110A333(1)060AS	0.3	3								
0.039	A	5,10,20	T110A393(1)060AS	0.3	3								
0.047	A	5,10,20	T110A473(1)060AS	0.3	3								
0.056	A	5,10,20	T110A563(1)060AS	0.3	3								
0.068	A	5,10,20	T110A683(1)060AS	0.3	3								
0.082	A	5,10,20	T110A823(1)060AS	0.3	3								
0.1	A	5,10,20	T110A104(1)060AS	0.5	3								
0.12	A	5,10,20	T110A124(1)060AS	0.5	3								
0.15	A	5,10,20	T110A154(1)060AS	0.5	3								
0.18	A	5,10,20	T110A184(1)060AS	0.5	3								
0.22	A	5,10,20	T110A224(1)060AS	0.5	3								
0.27	A	5,10,20	T110A274(1)060AS	0.5	3								
0.33	A	5,10,20	T110A334(1)060AS	0.5	3								
0.39	A	5,10,20	T110A394(1)060AS	0.5	3								
0.47	A	5,10,20	T110A474(1)060AS	0.5	3								
0.56	A	5,10,20	T110A564(1)060AS	0.5	3								
0.68	A	5,10,20	T110A684(1)060AS	0.5	3								
0.82	B	5,10,20	T110B824(1)060AS	0.5	3								
1.0	B	5,10,20	T110B105(1)060AS	0.5	3								
1.2	B	5,10,20	T110B125(1)060AS	0.5	4								
1.5	B	5,10,20	T110B155(1)060AS	0.5	4								
1.8	B	5,10,20	T110B185(1)060AS	0.5	4								
2.2	B	5,10,20	T110B225(1)060AS	1.0	4								
2.7	B	5,10,20	T110B275(1)060AS	1.0	4								
3.3	B	5,10,20	T110B335(1)060AS	1.5	4								
3.9	B	5,10,20	T110B395(1)060AS	1.5	4								
4.7	C	5,10,20	T110C475(1)060AS	2.0	4								
5.6	C	5,10,20	T110C565(1)060AS	2.0	4								
6.8	C	5,10,20	T110C685(1)060AS	3.0	4								
8.2	C	5,10,20	T110C825(1)060AS	4.0	4								
10.0	C	5,10,20	T110C106(1)060AS	5.0	4								
12.0	C	5,10,20	T110C126(1)060AS	5.0	4								
15.0	D	5,10,20	T110D156(1)060AS	4.0	4								
18.0	D	5,10,20	T110D186(1)060AS	5.0	4								
22.0	D	5,10,20	T110D226(1)060AS	6.0	4								
75 VOLT RATING AT 85°C — 50 VOLT RATING AT 125°C													
0.0047	A	5,10,20	T110A472(1)075AS	0.3	2								
0.0056	A	5,10,20	T110A562(1)075AS	0.3	2								
0.0068	A	5,10,20	T110A682(1)075AS	0.3	2								
0.0082	A	5,10,20	T110A822(1)075AS	0.3	2								
0.01	A	5,10,20	T110A103(1)075AS	0.3	2								

(1) To complete T110 Series part number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
75 VOLT RATING AT 85°C — 50 VOLT RATING AT 125°C (Cont'd)													
0.012	A	5,10,20	T110A123(1)075AS	0.3	2								
0.015	A	5,10,20	T110A153(1)075AS	0.3	2								
0.018	A	5,10,20	T110A183(1)075AS	0.3	2								
0.022	A	5,10,20	T110A223(1)075AS	0.3	2								
0.027	A	5,10,20	T110A273(1)075AS	0.3	2								
0.033	A	5,10,20	T110A333(1)075AS	0.3	2								
0.039	A	5,10,20	T110A393(1)075AS	0.3	2								
0.047	A	5,10,20	T110A473(1)075AS	0.3	2								
0.056	A	5,10,20	T110A563(1)075AS	0.3	2								
0.068	A	5,10,20	T110A683(1)075AS	0.3	2								
0.082	A	5,10,20	T110A823(1)075AS	0.3	2								
0.1	A	5	T110A104J075AS	0.3	2	5095	5295	5495	5695	6236	7236	8236	T212A104J075(2)S
0.1	A	10	T110A104K075AS	0.3	2	2382	2622	2862	3102	6237	7237	8237	T212A104K075(2)S
0.1	A	20	T110A104M075AS	0.3	2	2383	2623	2863	3103	6238	7238	8238	T212A104M075(2)S
0.12	A	5	T110A124J075AS	0.3	2	5096	5296	5496	5696	6239	7239	8239	T212A124J075(2)S
0.12	A	10	T110A124K075AS	0.3	2	2384	2624	2864	3104	6240	7240	8240	T212A124K075(2)S
0.12	A	20	T110A124M075AS	0.3	2								
0.15	A	5	T110A154J075AS	0.3	2	5097	5297	5497	5697	6241	7241	8241	T212A154J075(2)S
0.15	A	10	T110A154K075AS	0.3	2	2385	2625	2865	3105	6242	7242	8242	T212A154K075(2)S
0.15	A	20	T110A154M075AS	0.3	2	2386	2626	2866	3106	6243	7243	8243	T212A154M075(2)S
0.18	A	5	T110A184J075AS	0.3	2	5098	5298	5498	5698	6244	7244	8244	T212A184J075(2)S
0.18	A	10	T110A184K075AS	0.3	2	2387	2627	2867	3107	6245	7245	8245	T212A184K075(2)S
0.18	A	20	T110A184M075AS	0.3	2								
0.22	A	5	T110A224J075AS	0.3	2	5099	5299	5499	5699	6246	7246	8246	T212A224J075(2)S
0.22	A	10	T110A224K075AS	0.3	2	2388	2628	2868	3108	6247	7247	8247	T212A224K075(2)S
0.22	A	20	T110A224M075AS	0.3	2	2389	2629	2869	3109	6248	7248	8248	T212A224M075(2)S
0.27	A	5	T110A274J075AS	0.3	2	5100	5300	5500	5700	6249	7249	8249	T212A274J075(2)S
0.27	A	10	T110A274K075AS	0.3	2	2390	2630	2870	3110	6250	7250	8250	T212A274K075(2)S
0.27	A	20	T110A274M075AS	0.3	2								
0.33	A	5	T110A334J075AS	0.3	2	5101	5301	5501	5701	6251	7251	8251	T212A334J075(2)S
0.33	A	10	T110A334K075AS	0.3	2	2391	2631	2871	3111	6252	7252	8252	T212A334K075(2)S
0.33	A	20	T110A334M075AS	0.3	2	2392	2632	2872	3112	6253	7253	8253	T212A334M075(2)S
0.39	A	5	T110A394J075AS	0.3	2	5102	5302	5502	5702	6254	7254	8254	T212A394J075(2)S
0.39	A	10	T110A394K075AS	0.3	2	2393	2633	2873	3113	6255	7255	8255	T212A394K075(2)S
0.39	A	20	T110A394M075AS	0.3	2								
0.47	A	5	T110A474J075AS	0.3	2	5103	5303	5503	5703	6256	7256	8256	T212A474J075(2)S
0.47	A	10	T110A474K075AS	0.3	2	2394	2634	2874	3114	6257	7257	8257	T212A474K075(2)S
0.47	A	20	T110A474M075AS	0.3	2	2395	2635	2875	3115	6258	7258	8258	T212A474M075(2)S
0.56	A	5	T110A564J075AS	0.3	2	5104	5304	5504	5704	6259	7259	8259	T212A564J075(2)S
0.56	A	10	T110A564K075AS	0.3	2	2396	2636	2876	3116	6260	7260	8260	T212A564K075(2)S
0.56	A	20	T110A564M075AS	0.3	2								
0.68	A	5	T110A684J075AS	0.3	2	5105	5305	5505	5705	6261	7261	8261	T212A684J075(2)S
0.68	A	10	T110A684K075AS	0.3	2	2397	2637	2877	3117	6262	7262	8262	T212A684K075(2)S
0.68	A	20	T110A684M075AS	0.3	2	2398	2638	2878	3118	6263	7263	8263	T212A684M075(2)S
0.82	B	5	T110B824J075AS	0.3	2	5106	5306	5506	5706	6264	7264	8264	T212B824J075(2)S
0.82	B	10	T110B824K075AS	0.3	2	2399	2639	2879	3119	6265	7265	8265	T212B824K075(2)S
0.82	B	20	T110B824M075AS	0.3	2								
1.0	B	5	T110B105J075AS	0.3	2	5107	5307	5507	5707	6266	7266	8266	T212B105J075(2)S
1.0	B	10	T110B105K075AS	0.3	2	2400	2640	2880	3120	6267	7267	8267	T212B105K075(2)S
1.0	B	20	T110B105M075AS	0.3	2	2401	2641	2881	3121	6268	7268	8268	T212B105M075(2)S
1.2	B	5	T110B125J075AS	0.3	4	5108	5308	5508	5708	6269	7269	8269	T212B125J075(2)S
1.2	B	10	T110B125K075AS	0.3	4	2402	2642	2882	3122	6270	7270	8270	T212B125K075(2)S
1.2	B	20	T110B125M075AS	0.3	4								
1.5	B	5	T110B155J075AS	0.6	4	5109	5309	5509	5709	6271	7271	8271	T212B155J075(2)S
1.5	B	10	T110B155K075AS	0.6	4	2403	2643	2883	3123	6272	7272	8272	T212B155K075(2)S
1.5	B	20	T110B155M075AS	0.6	4	2404	2644	2884	3124	6273	7273	8273	T212B155M075(2)S
1.8	B	5	T110B185J075AS	0.7	4	5110	5310	5510	5710	6274	7274	8274	T212B185J075(2)S
1.8	B	10	T110B185K075AS	0.7	4	2405	2645	2885	3125	6275	7275	8275	T212B185K075(2)S
1.8	B	20	T110B185M075AS	0.7	4								
2.2	B	5	T110B225J075AS	0.8	4	5111	5311	5511	5711	6276	7276	8276	T212B225J075(2)S
2.2	B	10	T110B225K075AS	0.8	4	2406	2646	2886	3126	6277	7277	8277	T212B225K075(2)S

(1) To complete T110 Series part number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110			MIL-PRF-39003 (CSR13) CAPACITORS							
						DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.)							
						MIL-PRF-39003/1H EXPONENTIAL				MIL-PRF-39003/1H GRADED			
			KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	M (1.0)	P (0.1)	R (0.01)	S (0.001)	B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
75 VOLT RATING AT 85°C — 50 VOLT RATING AT 125°C (Cont'd)													
2.2	B	20	T110B225M075AS	0.8	4	2407	2647	2887	3127	6278	7278	8278	T212B225M075(2)S
2.7	B	5	T110B275J075AS	1.0	4	5112	5312	5512	5712	6279	7279	8279	T212B275J075(2)S
2.7	B	10	T110B275K075AS	1.0	4	2408	2648	2888	3128	6280	7280	8280	T212B275K075(2)S
2.7	B	20	T110B275M075AS	1.2	4								
3.3	B	5	T110B335J075AS	1.2	4	5113	5313	5513	5713	6281	7281	8281	T212B335J075(2)S
3.3	B	10	T110B335K075AS	1.2	4	2409	2649	2889	3129	6282	7282	8282	T212B335K075(2)S
3.3	B	20	T110B335M075AS	1.2	4	2410	2650	2890	3130	6283	7283	8283	T212B335M075(2)S
3.9	B	5	T110B395J075AS	1.5	4	5114	5314	5514	5714	6284	7284	8284	T212B395J075(2)S
3.9	B	10	T110B395K075AS	1.5	4	2411	2651	2891	3131	6285	7285	8285	T212B395K075(2)S
3.9	B	20	T110B395M075AS	1.5	4								
4.7	C	5	T110C475J075AS	3.0	4	5115	5315	5515	5715	6286	7286	8286	T212C475J075(2)S
4.7	C	10	T110C475K075AS	3.0	4	2412	2652	2892	3132	6287	7287	8287	T212C475K075(2)S
4.7	C	20	T110C475M075AS	3.0	4	2413	2653	2893	3133	6288	7288	8288	T212C475M075(2)S
5.6	C	5	T110C565J075AS	3.0	4	5116	5316	5516	5716	6289	7289	8289	T212C565J075(2)S
5.6	C	10	T110C565K075AS	3.0	4	2414	2654	2894	3134	6290	7290	8290	T212C565K075(2)S
5.6	C	20	T110C565M075AS	3.0	4								
6.8	C	5	T110C685J075AS	5.0	4	5117	5317	5517	5717	6291	7291	8291	T212C685J075(2)S
6.8	C	10	T110C685K075AS	5.0	4	2415	2655	2895	3135	6292	7292	8292	T212C685K075(2)S
6.8	C	20	T110C685M075AS	5.0	4	2416	2656	2896	3136	6293	7293	8293	T212C685M075(2)S
8.2	C	5	T110C825J075AS	5.0	4	5118	5318	5518	5718	6294	7294	8294	T212C825J075(2)S
8.2	C	10	T110C825K075AS	5.0	4	2417	2657	2897	3137	6295	7295	8295	T212C825K075(2)S
8.2	C	20	T110C825M075AS	5.0	4								
10.0	C	5	T110C106J075AS	5.0	4	5119	5319	5519	5719	6296	7296	8296	T212C106J075(2)S
10.0	C	10	T110C106K075AS	5.0	4	2418	2658	2898	3138	6297	7297	8297	T212C106K075(2)S
10.0	C	20	T110C106M075AS	5.0	4	2419	2659	2899	3139	6298	7298	8298	T212C106M075(2)S
12.0	D	5	T110D126J075AS	5.0	4	5120	5320	5520	5720	6299	7299	8299	T212D126J075(2)S
12.0	D	10	T110D126K075AS	5.0	4	2420	2660	2900	3140	6300	7300	8300	T212D126K075(2)S
12.0	D	20	T110D126M075AS	5.0	4								
15.0	D	5	T110D156J075AS	7.0	4	5121	5321	5521	5721	6301	7301	8301	T212D156J075(2)S
15.0	D	10	T110D156K075AS	7.0	4	2421	2661	2901	3141	6302	7302	8302	T212D156K075(2)S
15.0	D	20	T110D156M075AS	7.0	4	2422	2662	2902	3142	6303	7303	8303	T212D156M075(2)S
100 VOLT RATING AT 85°C — 67 VOLT RATING AT 125°													
0.0047	A	5	T110A472J100AS	0.3	2	5122	5322	5522	5722	6304	7304	*	T212A472J100(2)S
0.0047	A	10	T110A472K100AS	0.3	2	2423	2663	2903	3143	6305	7305	*	T212A472K100(2)S
0.0047	A	20	T110A472M100AS	0.3	2	2424	2664	2904	3144	6306	7306	*	T212A472M100(2)S
0.0056	A	5	T110A562J100AS	0.3	2	5123	5323	5523	5723	6307	7307	*	T212A562J100(2)S
0.0056	A	10	T110A562K100AS	0.3	2	2425	2665	2905	3145	6308	7308	*	T212A562K100(2)S
0.0056	A	20	T110A562M100AS	0.3	2								
0.0068	A	5	T110A682J100AS	0.3	2	5124	5324	5524	5724	6309	7309	*	T212A682J100(2)S
0.0068	A	10	T110A682K100AS	0.3	2	2426	2666	2906	3146	6310	7310	*	T212A682K100(2)S
0.0068	A	20	T110A682M100AS	0.3	2	2427	2667	2907	3147	6311	7311	*	T212A682M100(2)S
0.0082	A	5	T110A822J100AS	0.3	2	5125	5325	5525	5725	6312	7312	*	T212A822J100(2)S
0.0082	A	10	T110A822K100AS	0.3	2	2428	2668	2908	3148	6313	7313	*	T212A822K100(2)S
0.0082	A	20	T110A822M100AS	0.3	2								
0.01	A	5	T110A103J100AS	0.3	2	5126	5326	5526	5726	6314	7314	*	T212A103J100(2)S
0.01	A	10	T110A103K100AS	0.3	2	2429	2669	2909	3149	6315	7315	*	T212A103K100(2)S
0.01	A	20	T110A103M100AS	0.3	2	2430	2670	2910	3150	6316	7316	*	T212A103M100(2)S
0.012	A	5	T110A123J100AS	0.3	2	5127	5327	5527	5727	6317	7317	*	T212A123J100(2)S
0.012	A	10	T110A123K100AS	0.3	2	2431	2671	2911	3151	6318	7318	*	T212A123K100(2)S
0.012	A	20	T110A123M100AS	0.3	2								
0.015	A	5	T110A153J100AS	0.3	2	5128	5328	5528	5728	6319	7319	*	T212A153J100(2)S
0.015	A	10	T110A153K100AS	0.3	2	2432	2672	2912	3152	6320	7320	*	T212A153K100(2)S
0.015	A	20	T110A153M100AS	0.3	2	2433	2673	2913	3153	6321	7321	*	T212A153M100(2)S
0.018	A	5	T110A183J100AS	0.3	2	5129	5329	5529	5729	6322	7322	*	T212A183J100(2)S
0.018	A	10	T110A183K100AS	0.3	2	2434	2674	2914	3154	6323	7323	*	T212A183K100(2)S
0.018	A	20	T110A183M100AS	0.3	2								
0.022	A	5	T110A223J100AS	0.3	2	5130	5330	5530	5730	6324	7324	*	T212A223J100(2)S
0.022	A	10	T110A223K100AS	0.3	2	2435	2675	2915	3155	6325	7325	*	T212A223K100(2)S

(1) To complete T110 Series part number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.
*Note: D Failure Rate — Not QPL for -8304 thru -8401.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
100 VOLT RATING AT 85°C — 67 VOLT RATING AT 125°C (Cont'd)													
0.022	A	20	T110A223M100AS	0.3	2	2436	2676	2916	3156	6326	7326	*	T212A223M100(2)S
0.027	A	5	T110A273J100AS	0.3	2	5131	5331	5531	5731	6327	7327	*	T212A273J100(2)S
0.027	A	10	T110A273K100AS	0.3	2	2437	2677	2917	3157	6328	7328	*	T212A273K100(2)S
0.027	A	20	T110A273M100AS	0.3	2								
0.033	A	5	T110A333J100AS	0.3	2	5132	5332	5532	5732	6329	7329	*	T212A333J100(2)S
0.033	A	10	T110A333K100AS	0.3	2	2438	2678	2918	3158	6330	7330	*	T212A333K100(2)S
0.033	A	20	T110A333M100AS	0.3	2	2439	2679	2919	3159	6331	7331	*	T212A333M100(2)S
0.039	A	5	T110A393J100AS	0.3	2	5133	5333	5533	5733	6332	7332	*	T212A393J100(2)S
0.039	A	10	T110A393K100AS	0.3	2	2440	2680	2920	3160	6333	7333	*	T212A393K100(2)S
0.039	A	20	T110A393M100AS	0.3	2								
0.047	A	5	T110A473J100AS	0.3	2	5134	5334	5534	5734	6334	7334	*	T212A473J100(2)S
0.047	A	10	T110A473K100AS	0.3	2	2441	2681	2921	3161	6335	7335	*	T212A473K100(2)S
0.047	A	20	T110A473M100AS	0.3	2	2442	2682	2922	3162	6336	7336	*	T212A473M100(2)S
0.056	A	5	T110A563J100AS	0.3	2	5135	5335	5535	5735	6337	7337	*	T212A563J100(2)S
0.056	A	10	T110A563K100AS	0.3	2	2443	2683	2923	3163	6338	7338	*	T212A563K100(2)S
0.056	A	20	T110A563M100AS	0.3	2								
0.068	A	5	T110A683J100AS	0.3	2	5136	5336	5536	5736	6339	7339	*	T212A683J100(2)S
0.068	A	10	T110A683K100AS	0.3	2	2444	2684	2924	3164	6340	7340	*	T212A683K100(2)S
0.068	A	20	T110A683M100AS	0.3	2	2445	2685	2925	3165	6341	7341	*	T212A683M100(2)S
0.082	A	5	T110A823J100AS	0.3	2	5137	5337	5537	5737	6342	7342	*	T212A823J100(2)S
0.082	A	10	T110A823K100AS	0.3	2	2446	2686	2926	3166	6343	7343	*	T212A823K100(2)S
0.082	A	20	T110A823M100AS	0.3	2								
0.1	A	5	T110A104J100AS	0.3	2	5138	5338	5538	5738	6344	7344	*	T212A104J100(2)S
0.1	A	10	T110A104K100AS	0.3	2	2447	2687	2927	3167	6345	7345	*	T212A104K100(2)S
0.1	A	20	T110A104M100AS	0.3	2	2448	2688	2928	3168	6346	7346	*	T212A104M100(2)S
0.12	A	5	T110A124J100AS	0.3	2	5139	5339	5539	5739	6347	7347	*	T212A124J100(2)S
0.12	A	10	T110A124K100AS	0.3	2	2449	2689	2929	3169	6348	7348	*	T212A124K100(2)S
0.12	A	20	T110A124M100AS	0.3	2								
0.15	A	5	T110A154J100AS	0.3	2	5140	5340	5540	5740	6349	7349	*	T212A154J100(2)S
0.15	A	10	T110A154K100AS	0.3	2	2450	2690	2930	3170	6350	7350	*	T212A154K100(2)S
0.15	A	20	T110A154M100AS	0.3	2	2451	2691	2931	3171	6351	7351	*	T212A154M100(2)S
0.18	A	5	T110A184J100AS	0.3	2	5141	5341	5541	5741	6352	7352	*	T212A184J100(2)S
0.18	A	10	T110A184K100AS	0.3	2	2452	2692	2932	3172	6353	7353	*	T212A184K100(2)S
0.18	A	20	T110A184M100AS	0.3	2								
0.22	A	5	T110A224J100AS	0.3	2	5142	5342	5542	5742	6354	7354	*	T212A224J100(2)S
0.22	A	10	T110A224K100AS	0.3	2	2453	2693	2933	3173	6355	7355	*	T212A224K100(2)S
0.22	A	20	T110A224M100AS	0.3	2	2454	2694	2934	3174	6356	7356	*	T212A224M100(2)S
0.27	A	5	T110A274J100AS	0.3	2	5143	5343	5543	5743	6357	7357	*	T212A274J100(2)S
0.27	A	10	T110A274K100AS	0.3	2	2455	2695	2935	3175	6358	7358	*	T212A274K100(2)S
0.27	A	20	T110A274M100AS	0.3	2								
0.33	A	5	T110A334J100AS	0.3	2	5144	5344	5544	5744	6359	7359	*	T212A334J100(2)S
0.33	A	10	T110A334K100AS	0.3	2	2456	2696	2936	3176	6360	7360	*	T212A334K100(2)S
0.33	A	20	T110A334M100AS	0.3	2	2457	2697	2937	3177	6361	7361	*	T212A334M100(2)S
0.39	A	5	T110A394J100AS	0.3	2	5145	5345	5545	5745	6362	7362	*	T212A394J100(2)S
0.39	A	10	T110A394K100AS	0.3	2	2458	2698	2938	3178	6363	7363	*	T212A394K100(2)S
0.39	A	20	T110A394M100AS	0.3	2								
0.47	A	5	T110A474J100AS	0.3	2	5146	5346	5546	5746	6364	7364	*	T212A474J100(2)S
0.47	A	10	T110A474K100AS	0.3	2	2459	2699	2939	3179	6365	7365	*	T212A474K100(2)S
0.47	A	20	T110A474M100AS	0.3	2	2460	2700	2940	3180	6366	7366	*	T212A474M100(2)S
0.56	A	5	T110A564J100AS	0.3	2	5147	5347	5547	5747	6367	7367	*	T212A564J100(2)S
0.56	A	10	T110A564K100AS	0.3	2	2461	2701	2941	3181	6368	7368	*	T212A564K100(2)S
0.56	A	20	T110A564M100AS	0.3	2								
0.68	B	5	T110B684J100AS	0.3	2	5148	5348	5548	5748	6369	7369	*	T212B684J100(2)S
0.68	B	10	T110B684K100AS	0.3	2	2462	2702	2942	3182	6370	7370	*	T212B684K100(2)S
0.68	B	20	T110B684M100AS	0.3	2	2463	2703	2943	3183	6371	7371	*	T212B684M100(2)S
0.82	B	5	T110B824J100AS	0.4	2	5149	5349	5549	5749	6372	7372	*	T212B824J100(2)S
0.82	B	10	T110B824K100AS	0.4	2	2464	2704	2944	3184	6373	7373	*	T212B824K100(2)S
0.82	B	20	T110B824M100AS	0.4	2								
1.0	B	5	T110B105J100AS	0.5	2	5150	5350	5550	5750	6374	7374	*	T212B105J100(2)S
1.0	B	10	T110B105K100AS	0.5	2	2465	2705	2945	3185	6375	7375	*	T212B105K100(2)S
1.0	B	20	T110B105M100AS	0.5	2	2466	2706	2946	3186	6376	7376	*	T212B105M100(2)S

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.
*Note: D Failure Rate — Not QPL for -8304 thru -8401.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS — DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) — MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
100 VOLT RATING AT 85°C — 67 VOLT RATING AT 125°C (Cont'd)													
1.2	B	5	T110B125J100AS	0.5	3	5151	5351	5551	5751	6377	7377	*	T212B125J100(2)S
1.2	B	10	T110B125K100AS	0.5	3	2467	2707	2947	3187	6378	7378	*	T212B125K100(2)S
1.2	B	20	T110B125M100AS	0.5	3								
1.5	B	5	T110B155J100AS	0.7	3	5152	5352	5552	5752	6379	7379	*	T212B155J100(2)S
1.5	B	10	T110B155K100AS	0.7	3	2468	2708	2948	3188	6380	7380	*	T212B155K100(2)S
1.5	B	20	T110B155M100AS	0.7	3	2469	2709	2949	3189	6381	7381	*	T212B155M100(2)S
1.8	B	5	T110B185J100AS	0.7	3	5153	5353	5553	5753	6382	7382	*	T212B185J100(2)S
1.8	B	10	T110B185K100AS	0.7	3	2470	2710	2950	3190	6383	7383	*	T212B185K100(2)S
1.8	B	20	T110B185M100AS	0.7	3								
2.2	B	5	T110B225J100AS	0.9	3	5154	5354	5554	5754	6384	7384	*	T212B225J100(2)S
2.2	B	10	T110B225K100AS	0.9	3	2471	2711	2951	3191	6385	7385	*	T212B225K100(2)S
2.2	B	20	T110B225M100AS	0.9	3	2472	2712	2952	3192	6386	7386	*	T212B225M100(2)S
2.7	B	5	T110B275J100AS	1.1	3	5155	5355	5555	5755	6387	7387	*	T212B275J100(2)S
2.7	B	10	T110B275K100AS	1.1	3	2473	2713	2953	3193	6388	7388	*	T212B275K100(2)S
2.7	B	20	T110B275M100AS	1.1	3								
3.3	C	5	T110C335J100AS	1.5	3	5156	5356	5556	5756	6389	*	*	T212C335J100(2)S
3.3	C	10	T110C335K100AS	1.5	3	5157	5357	5557	5757	6390	*	*	T212C335K100(2)S
3.3	C	20	T110C335M100AS	1.5	3	5158	5358	5558	5758	6391	*	*	T212C335M100(2)S
3.9	C	5	T110C395J100AS	1.5	3	5159	5359	5559	5759	6392	*	*	T212C395J100(2)S
3.9	C	10	T110C395K100AS	1.5	3	5160	5360	5560	5760	6393	*	*	T212C395K100(2)S
4.7	C	5	T110C475J100AS	2.5	3	5161	5361	5561	5761	6394	*	*	T212C475J100(2)S
4.7	C	10	T110C475K100AS	2.5	3	5162	5362	5562	5762	6395	*	*	T212C475K100(2)S
4.7	C	20	T110C475M100AS	2.5	3	5163	5363	5563	5763	6396	*	*	T212C475M100(2)S
5.6	C	5	T110C565J100AS	2.5	3	5164	5364	5564	5764	6397	*	*	T212C565J100(2)S
5.6	C	10	T110C565K100AS	2.5	3	5165	5365	5565	5765	6398	*	*	T212C565K100(2)S
6.8	C	5	T110C685J100AS	2.5	3	5166	5366	5566	5766	6399	*	*	T212C685J100(2)S
6.8	C	10	T110C685K100AS	2.5	3	5167	5367	5567	5767	6400	*	*	T212C685K100(2)S
6.8	C	20	T110C685M100AS	2.5	3	5168	5368	5568	5768	6401	*	*	T212C685M100(2)S
8.2	D	5,10,20	T110D825(1)100AS	5.0	3								
10.0	D	5,10,20	T110D106(1)100AS	5.0	3								
125 VOLT RATING AT 85°C — 82 VOLT RATING AT 125°													
0.0047	A	5,10,20	T110A472(1)125AS	0.5	3								
0.0056	A	5,10,20	T110A562(1)125AS	0.5	3								
0.0068	A	5,10,20	T110A682(1)125AS	0.5	3								
0.0082	A	5,10,20	T110A822(1)125AS	0.5	3								
0.01	A	5,10,20	T110A103(1)125AS	0.5	3								
0.012	A	5,10,20	T110A123(1)125AS	0.5	3								
0.015	A	5,10,20	T110A153(1)125AS	0.5	3								
0.018	A	5,10,20	T110A183(1)125AS	0.5	3								
0.022	A	5,10,20	T110A223(1)125AS	0.5	3								
0.027	A	5,10,20	T110A273(1)125AS	0.5	3								
0.033	A	5,10,20	T110A333(1)125AS	0.5	3								
0.039	A	5,10,20	T110A393(1)125AS	1.5	3								
0.047	A	5,10,20	T110A473(1)125AS	1.5	3								
0.056	A	5,10,20	T110A563(1)125AS	1.5	3								
0.068	A	5,10,20	T110A683(1)125AS	1.5	3								
0.082	A	5,10,20	T110A823(1)125AS	1.5	3								
0.1	A	5,10,20	T110A104(1)125AS	1.5	3								
0.12	A	5,10,20	T110A124(1)125AS	1.5	3								
0.15	A	5,10,20	T110A154(1)125AS	1.5	3								
0.18	A	5,10,20	T110A184(1)125AS	1.5	3								
0.22	A	5,10,20	T110A224(1)125AS	1.5	3								
0.27	A	5,10,20	T110A274(1)125AS	1.5	3								
0.33	A	5,10,20	T110A334(1)125AS	1.5	3								
0.39	B	5,10,20	T110B394(1)125AS	1.5	3								
0.47	B	5,10,20	T110B474(1)125AS	1.5	3								
0.56	B	5,10,20	T110B564(1)125AS	1.5	3								
0.68	B	5,10,20	T110B684(1)125AS	1.5	3								
0.82	B	5,10,20	T110B824(1)125AS	1.5	3								

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.
*Note: C failure rate — Not QPL for 7389 thru 7401.
D failure rate — Not QPL for -8304 thru -8401.

RATINGS & PART NUMBER REFERENCE

CAPACITANCE µF	CASE SIZE	CAPACITANCE TOLERANCE ±%	KEMET T110 KEMET PART NUMBER	D.C. LEAKAGE µA@25°C MAX.	MAX. DISSIPATION FACTOR %@25°C, 120Hz	MIL-PRF-39003 (CSR13) CAPACITORS — DASH NUMBER REFERENCE FAILURE RATE LEVEL (%/1000 HRS.) — MIL-PRF-39003/1H EXPONENTIAL M (1.0)	P (0.1)	R (0.01)	S (0.001)	MIL-PRF-39003/1H GRADED B (0.1)	C (0.01)	D (0.001)	KEMET EQUIVALENT MILITARY PART NUMBER
125 VOLT RATING AT 85°C — 82 VOLT RATING AT 125°C													
1.0	B	5,10,20	T110B105(1)125AS	1.5	3								
1.2	B	5,10,20	T110B125(1)125AS	1.5	3								
1.5	B	5,10,20	T110B155(1)125AS	1.5	3								
1.8	B	5,10,20	T110B185(1)125AS	1.5	3								
2.2	B	5,10,20	T110B225(1)125AS	1.5	3								
2.7	C	5,10,20	T110C275(1)125AS	2.0	3								
3.3	C	5,10,20	T110C335(1)125AS	2.0	3								
3.9	C	5,10,20	T110C395(1)125AS	2.0	3								
4.7	C	5,10,20	T110C475(1)125AS	3.0	3								
5.6	C	5,10,20	T110C565(1)125AS	3.0	3								
6.8	C	5,10,20	T110C685(1)125AS	3.0	3								
8.2	D	5,10,20	T110D825(1)125AS	6.0	3								
10.0	D	5,10,20	T110D106(1)125AS	6.0	3								

(1) To complete T110 Series Part Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on Page 6.
(2) To complete the T212 Series Part Number, insert Failure Rate Symbol in the 13th Character.
Bold Face lines indicate popular part types and values.

T110/T140 Herm Seal ESR (OHMS) at 100 kHz @ +25°C

(The ESR values provided below are for reference only. No warranty, as stated on page 3 and reincorporated here, is made as to the accuracy of these values for any particular T110/T140 Series product.)

Cap. µF	6 Volt	10 Volt	15 Volt	20 Volt	30 Volt	35 Volt	50 Volt	60 Volt	75 Volt	100 Volt	125 Volt
0.10				37.0		26.0	26.0	26.0	26.0	25.0	25.0
0.12				37.0		26.0	26.0	26.0	26.0	25.0	25.0
0.15				32.0		21.0	21.0	21.0	21.0	20.0	20.0
0.18				32.0		21.0	21.0	21.0	21.0	20.0	20.0
0.22				27.0		17.0	17.0	17.0	17.0	16.0	16.0
0.27				25.0		17.0	17.0	17.0	17.0	16.0	16.0
0.33			28.0	22.0		15.0	15.0	15.0	15.0	14.0	14.0
0.39			28.0	22.0		15.0	15.0	15.0	15.0	14.0	14.0
0.47			26.0	20.0		13.0	13.0	13.0	13.0	12.0	12.0
0.56			26.0	18.0		13.0	13.0	13.0	13.0	12.0	12.0
0.68			24.0	16.0		10.0	10.0	10.0	10.0	9.0	9.0
0.82			24.0	16.0		10.0	10.0	10.0	10.0	9.0	9.0
1.00		20.0	17.0	10.0		8.0	8.0	8.0	8.0	7.0	7.0
1.20		20.0	17.0	10.0	9.0	8.0	8.0	8.0	8.0	7.0	7.0
1.50		14.0	10.0	9.0	8.0	6.0	5.0	5.0	5.0	4.0	4.0
1.80		14.0	10.0	9.0	8.0	6.0	5.0	5.0	5.0	4.0	4.0
2.20	14.0	13.0	8.0	7.0	6.0	5.0	3.5	3.5	3.5	3.0	3.0
2.70	14.0	13.0	8.0	7.0	6.0	5.0	3.5	3.5	3.5	3.0	3.0
3.30	13.0	10.0	6.0	5.5		4.0	3.0	3.0	3.0	2.5	2.5
3.90	13.0	10.0	6.0	5.5		4.0	3.0	3.0	3.0	2.5	2.5
4.70	10.0	8.0	5.0	4.5		3.0	2.5	2.5	2.5	2.0	2.0
5.60	10.0	8.0	5.0	4.5		3.0	2.5	2.5	2.5	2.0	2.0
6.80	8.0	6.0	4.0	3.6		2.5	2.0	2.0	2.0	1.5	1.5
8.20	8.0	6.0	4.0	3.6		2.5	2.0	2.0	2.0	1.5	1.5
10.0	6.0	5.0	3.2	2.9		2.0	1.6	1.6	1.6	1.0	1.0
12.0	6.0	5.0	3.2	2.9	2.5	2.0	1.6	1.6	1.6		
15.0	5.0	3.7	2.5	2.3	2.0	1.6	1.2	1.2	1.2		
18.0	5.0	3.7	2.5	2.3	2.0	1.6	1.2	1.2			
22.0	3.7	2.7	2.0	1.8		1.3	1.0	1.0			
27.0	3.7	2.7	2.0	1.8		1.3	1.0	1.0			
33.0	3.0	2.1	1.6	1.4	1.2	1.0	0.8	0.8			
39.0	3.0	2.1	1.6	1.4	1.2	1.0	0.8				
47.0	2.0	1.7	1.3	1.2	1.0	0.8	0.6				
56.0	2.0	1.7	1.3	1.2	1.0	0.8					
68.0	1.8	1.3	1.0	0.9	0.8	0.6					
82.0	1.8	1.3	1.0	0.9	0.8	0.6					
100.0	1.6	1.0	0.8	0.6	0.5	0.5					
120.0	1.6	1.0	0.8	0.6							
150.0	0.9	0.8	0.6	0.5							
180.0	0.9	0.8	0.6	0.5							
220.0	0.9	0.6	0.5								
270.0	0.9	0.6	0.5								
330.0	0.7	0.5	0.4								
390.0	0.7	0.5									
470.0	0.5	0.5									
560.0	0.5	0.5									
680.0	0.3										
820.0	0.3										
1000.0	0.12										
1200.0	0.12										

Tantalum Axial
Lead Tape and Reel Packaging

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

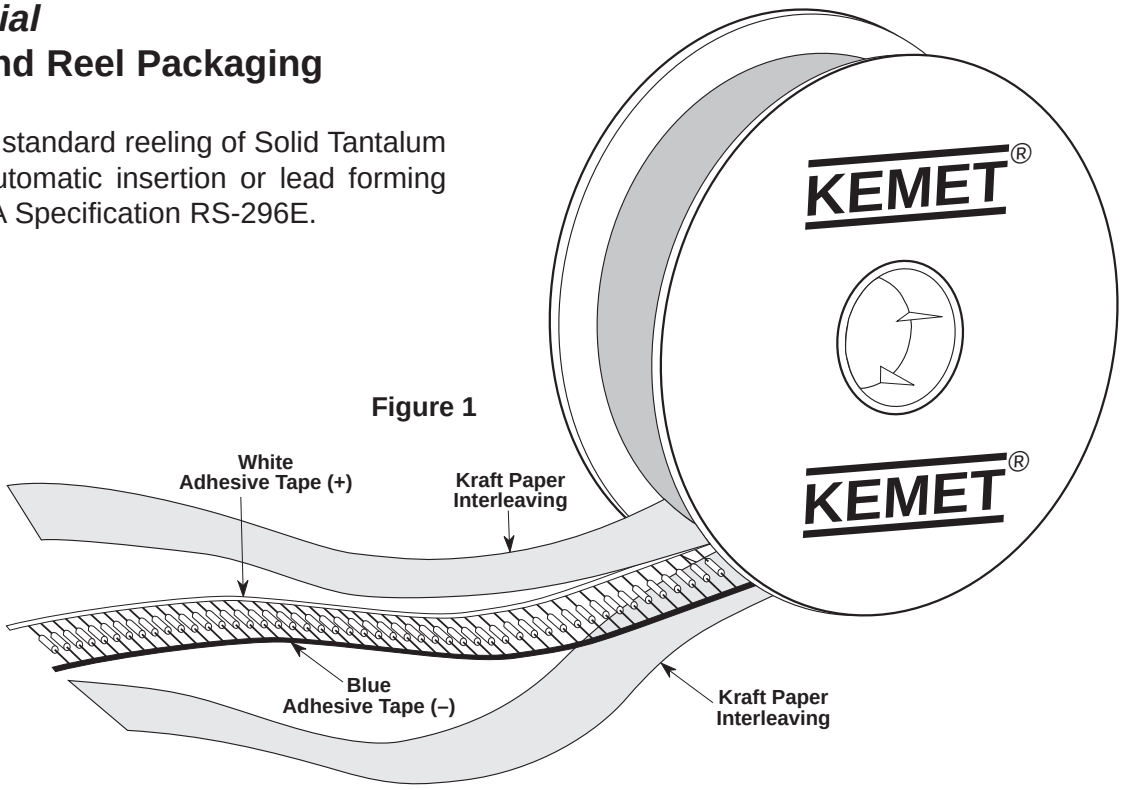


Figure 1

Figure 2

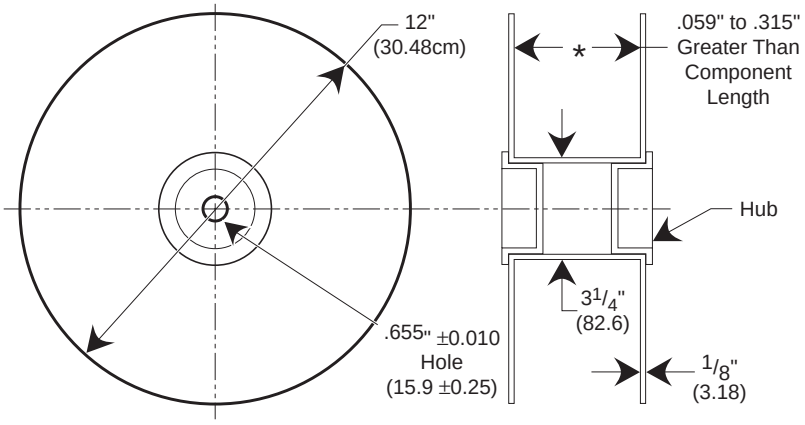


Figure 3

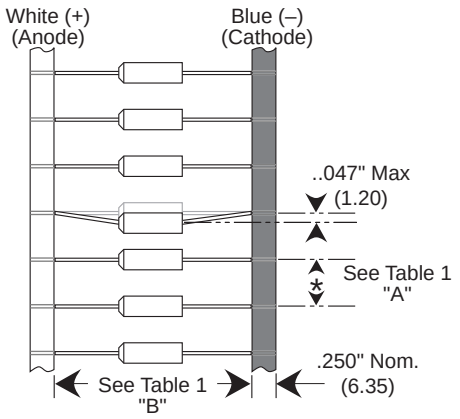


Table 1 Dimensions in Inches & (Millimeters)

COMPONENT BODY DIAMETER	COMPONENT PITCH "A"	INSIDE TAPE SPACING "B" ±1.5mm (0.059")		
	0.020" or (±0.5mm)	I	II	III
0" (0mm) to 0.197" (5mm)	0.200" or (5mm)	2.062"	2.500"	2.874"
0.197" (5.01mm) to 0.394" (10mm)	0.400" or (10mm)	(52.4mm)	(63.5mm)	(73mm)

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 ≤0.200" sizes and corrugated paper (70 lb. test minimum), single faced is inserted for component pitch ≥0.400" sizes. Capacitor lead length may extend only a maximum of .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. Standard reel quantities are shown on page 73.

KEMET offers Solid Tantalum Capacitors fully compatible for use with automatic insertion machines for radial-lead components. Aris Reeling meets all requirements of EIA Standard RS-468. KEMET capacitors are wound on a precision made ARIS Reel Package. ARIS Ammo Package is also available.

Tantalum Dipped Radial – ARIS Specification (Automatic Radial Insertion System)

Tantalum Dipped Tape and Reel Dimensions in Millimeters & (Inches)

Dimension	Symbol	Nominal mm (inch)	Tolerance mm (inch)	Dimension	Symbol	Nominal mm (inch)	Tolerance mm (inch)
Body Height (1)	A	17.0 (0.67)	Maximum	Component Pitch (5)	P	12.7 (.500)	± 1.0 (± .039)
Body Width (1)	A_1	10.2 (0.40)	Maximum	Sprocket Hole Pitch (2)	P_0	12.7 (.500)	± 0.3 (±.012)
Sprocket Hole Diameter	D_0	4.0 (.157)	± 0.3 (±.012)	Sprocket Hole Center to Lead Center (3) (4)	P_1	See Note Below	± 0.7 (±.028)
Lead Diameter	d	0.51 or 0.64 (.020) (.025)	± 0.05 (.002)	Sprocket Hole Center to Component (5) Center	P_2	See Note Below	
Lead Center (4)	F	See Note Below		Body Thickness	T_0	10.2 (.400)	Maximum
Component Base to Tape Center (4)	H	C-7301 C-7303 16.0 (.630) 18.0 (.709)	C-7301 C-7303 ±0.5 (±.020) Minimum	Total Tape Thickness	T	0.7 (0.28)	± .02 (.008)
Lead Standoff Height	H_0	C-7301 C-7303 16.0 (.630) 18.0 (.709)	C-7301 C-7303 ±0.5 (±.020) Minimum	Carrier Tape Width	W	18.0 (.709)	+ 1.0/-0.5 (+.039/-.020)
Component Height Above Tape Center	H_1	32.25 (1.270)	Maximum	Hold-Down Tape Width	W_0	15mm or 6mm (.561) (.236)	+ 1.0/-0.8 (+.039/-.031)
Component Alignment Front to Rear	Δ H	0	1.0 (.039)	Sprocket Hole Location	W_1	9.0 (.354)	+.075/-0.5 (+.030/-.020)
Cut Out Length	L	11.0 (.433)	Maximum	Hold-Down Tape Location	W_2	12mm (.472)	Maximum
Lead Protrusion	L_1	1.0 (.039)	Maximum				

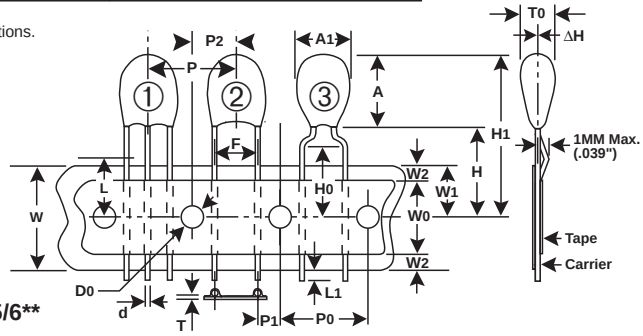
Notes: (1) See page 62 for T35X and page 69 for T39X specific dimensions.
(2) Cumulative pitch error ± 1.0mm (.039) maximum in 20 consecutive sprocket hole locations.
(3) Measured at bottom of standoff.
(4) P_1 and F measured at egress from carrier tape.
(5) P and P_2 measured at egress from carrier tape.

On polar devices, the positive (+) lead exits from container first.
* Lead spacings are 2.5mm (.098") center-to-center (T350 A-H)
** Lead spacings are 5.0mm (.197") center-to-center

F Dimensions:
0.100" ± .015
0.125" ± .015
0.200" ± .015
0.250" ± .015"
0.100 " ± .015 (3 leaded)

P1 Dimensions:
Lead Spacing
0.100" – 0.200 ± .028"
0.125" – 0.187 ± .028"
0.200" – 0.150 ± .028"
0.250" – 0.125 ± .028"
0.100" – 0.100 ± .028" (3 leaded)

① **T396/8***
② **T350/1***
③ **T352/3/4/5/6****



Tantalum Molded Radial – ARIS Specification (Automatic Radial Insertion System)

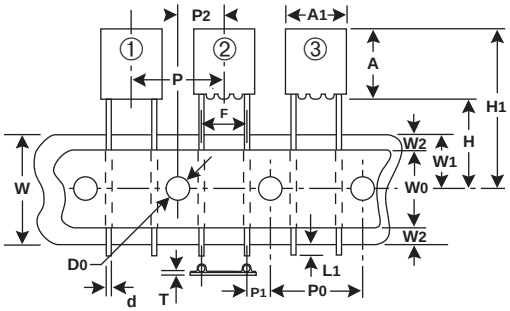
Tantalum Molded Tape and Reel Dimensions in Millimeters & (Inches)

Dimension	Symbol	Nominal mm (inch)	Tolerance mm (inch)	Dimension	Symbol	Nominal mm (inch)	Tolerance mm (inch)
Body Height (1)	A	10.50 (.413)	± .38 (±.015) Maximum	Component Pitch (5)	P	12.7 (.500)	± 1.0 (± .039)
Body Width (1)	A_1	15.24 (.600)	Maximum ± .38 ± (.015)	Sprocket Hole Pitch (3)	P_0	12.7 (.500)	± 0.3 (±.012)
Sprocket Hole Diameter	D_0	4.0 (.157)	± 0.3 (± .012)	Sprocket Hole Center to Lead Center (4) (5)	P_1	3.85 4.76 5.1 (.152) (.188) (.201)	± 0.7 (±.028)
Lead Diameter	d	0.51 or 0.64 (.020) (.025)	± 0.05 or ± .03 (± .001)	Sprocket Hole Center to Component Center	P_2	6.35 (.250)	± 1.3 (±.051)
Lead Center (5)	F	5.0 2.5 (.197) (.098)	+ 0.8/ - 0.2 (+ .032/ -.008)	Body Thickness	T_0	6.35 (.250)	± 1.3 Maximum
Component Base to Tape Center (2)(4)(6)	H	18.0 (.709)	Reference Only	Total Tape Thickness	T	0.7 (0.28)	± .02 (±.008)
Lead Standoff Height	H_0	N/A		Carrier Tape Width	W	18.0 (.709)	+ 1.0/-0.5 (+.039/-.020)
Component Height Above Tape Center	H_1	32.25 (1.270)	Maximum	Hold-Down Tape Width	W_0	15 or 6 (.561) (.236)	+ 1.0/-0.8 (+.039/.031)
Component Alignment Front to Rear	Δ H	0	± 2.0 (± .079)	Sprocket Hole Location	W_1	9.0 (.354)	+.075/-0.5 (+.030/-.020)
Cut Out Length	L	11.0 (.433)	Maximum	Hold-Down Tape Location	W_2	3.0 or 12.0 (.118) (.472)	Maximum
Lead Protrusion	L_1	2.0 (.079)	Maximum				

Notes: (1) See page 50 for T330, page 53 for T340 and page 59 for T35X specific dimensions.
(2) Reference Only
(3) Cumulative pitch error ± 1.0mm (.039") maximum in 20 consecutive sprocket hole locations.
(4) Measured at bottom of standoff.
(5) P, P1 and F measured at egress from carrier tape.
(6) H dimensions for T370 D and E 16.5mm ± 0.5mm (0.650" ± 0.020")

On polar devices, the positive (+) lead exits from container first.
* Lead spacings are 2.5mm (.098") center-to center
** Lead spacings are 5.0mm (.197") center-to-center.

① **T370**
② **T340****
③ **T330****



TANTALUM PACKAGING

KEMET(1) Number	Military Style	Military Specification	Case Size	Standard Bulk(2) Quantity	Standard Reel Quantity	Reel Size	Ammo Pack Quantity	Ammo Pack Spec.
T110/T212, T140/T242, T252, T262 (C & D)	CSR13 CSR23 CSR33 CSR21	MIL-C-39003/1 MIL-C-39003/3 MIL-C-39003/6 MIL-C-39003/9	A B C D	150/Box 75/Box 20/Tray 20/Tray	3500 2500 500 400	12" 12" 12" 12"	1500 1000 250 250	C-7293 Class I C-7442 Class II C-7443 Class III See Page 71 for class info.
T111/T213	CSR91	MIL-C-39003/4	A B C D	60/Box 30/Box 10/Card 10/Card	3000 2000 N/A N/A	12" 12" N/A N/A	N/A	N/A
T210, T216, T240, T256	CSS13 CSS33	MIL-C-39003/10 MIL-C-39003/10	A B C D	40/Tray 30/Tray 20/Tray 20/Tray	3500 2500 500 400	12" 12" 12" 12"	N/A N/A N/A N/A	N/A N/A N/A N/A
T222	CSR09	MIL-C-39003/2	A/B A B	50/Tray 300/Box 150/Box	N/A N/A	N/A N/A	N/A N/A	N/A
T322/T323	CX01, CX05	MIL-C-49137/1 & 5	A B C D E F	300 250 100 100 100 100	4500 4000 2500 2500 500 500	12" 12" 12" 12" 12" 12"	2000 2000 1000 1000 250 250	C-7293 Class I C-7442 Class II C-7443 Class III See Page 71
T330			A B C D	400 300 200 100	1000 1000 1000 N/A	12" 12" 12" N/A	1600 1200 1200 N/A	
T340			A B C D E F	300 300 200 100 50 100	1000 1000 1000 250 150 N/A	12" 12" 12" 12" 12" N/A	1600 1500 1500 450 N/A N/A	
T350, T351, T352, T353, T354, T355, T356			A B C D E F G H J K L, M	1000 1000 1000 1000 1000 500 500 500 100 100 100	1500 1500 1500 1000 1000 1000 1000 800 800 500 500	12" 12" 12" 12" 12" 12" 12" 12" 12" 12" 12"	2500 2500 2500 2000 2000 1500 1500 1500 800 800 500	

NOTE: (1) Each KEMET number in its section applies to all case sizes. (2) Standard packaging refers to number of pieces per bag, box, tray or vial.

TANTALUM PACKAGING (Continued)

KEMET(1) Number	Military Style	Military Specification	Case Size	Standard Bulk(2) Quantity	Standard Reel Quantity	Reel Size	Ammo Packs
T363	CX02	MIL-C-49137/2	A	1000	1500	12”	2500
			B	1000	1500	12”	2000
			C	500	500	12”	800
			D	500	500	12”	800
T368			C	500	500	12”	800
			D	500	500	12”	800
T369	CX12	MIL-C-49137/2	A	1000	1500	12”	2500
			B	1000	1500	12”	2000
T370			C	500	N/A	N/A	N/A
			D	500	1000	12”	N/A
			E	500	1000	12”	N/A
			F	250	N/A	N/A	N/A
T378	CX06	MIL-C-49137/6	D	200	1000	12”	N/A
			E	180	1000	12”	N/A
			F	50	N/A	N/A	N/A
T396, T398			A-B	1000	1500	12”	2000
			C	500	1500	12”	2000
			D-F	500	1000	12”	1500
			G	500	1000	12”	2000
			H	500	800	12”	2000
			J	250	800	12”	1600
			K	250	500	12”	800
			L-M	250	500	12”	500

NOTE: (1) Standard packaging refers to number of pieces per bag, box, tray or vial. (2) Quantity varies. For further details, please consult the factory.

INTRODUCTION

KEMET solid tantalum capacitors are identified by the initial "T," followed by a unique "Series" number; for example, T110, T322, T350, etc. Each Series denotes a general physical form and type of encapsulation, as well as limits on dimensions and certain electrical characteristics under standard conditions of 25°C, 50% relative humidity, and one atmosphere pressure. Specific requirements are set forth in the respective Product Series in this catalog. All Military products are 100% electrically screened for the parameters shown in the respective product section. For non-military product, all series are 100% screened for leakage, capacitance and dissipation factor. All Series are inspected to electrical limits using a minimum .1% AQL sampling plans, according to the Military Standard MIL-STD-105, even after 100% testing. This sampling plan, to the best of KEMET Electronics' knowledge, meets or exceeds the generally accepted industry standard for similar products. KEMET capacitors may also be supplied, with prior agreement, to meet specifications with requirements differing from those of KEMET catalogs. ***Reference ESR values are provided but are NOT 100% screened***

These Notes apply generally to all KEMET solid tantalum capacitors and illustrate typical performance under normal application conditions, except where noted. Certain Series will respond differently to various environmental conditions. For example, hermetically sealed series are relatively immune to humidity effects, while plastic-encased series are not. The intent of these Notes is not to delineate such differences but to provide generalized information concerning performance characteristics.

1. GENERAL APPLICATION CLASS

Solid tantalum capacitors are usually applied in circuits where the AC component is small compared to the DC component. Typical uses known to KEMET Electronics include blocking, by-passing, decoupling, and filtering. They are also used in timing circuits. If two of these polar capacitors are connected "back-to-back" (i.e., negative-to-negative or positive-to-positive), the pair may be used in AC applications (as a non-polar device).

2. STORAGE CONDITIONS

Capacitors may be stored without applied voltage over the operating temperature range specified in the catalogs for each Series. The range is from -55 to +125° C for all Series.

Tantalum capacitors do not lose capacitance from the "de-forming" effect as do liquid-electrolytic capacitors. Storage at high temperature may cause a small, temporary increase in leakage current (measured under standard conditions), but the original value is usually restored within a few minutes after application of rated voltage.

Series which are not hermetically sealed exhibit reversible changes in parameters with respect to relative humidity (RH). Capacitance increases with increasing humidity. The limiting change, reached upon establishment of equilibrium with the environment, is approximately -5% to +12% over the range from 25% to 95% RH, referred to the standard 50% RH. The amount of change is dependent upon size (capacitance and voltage rating, ie: CV product); small sizes might change no more than ±5%. Equilibrium at such extremes is seldom attained by plastic-cased capacitors, and the change in capacitance is consequently less. The rate of response to humidity changes increases with increasing temperature. Dissipation factor also increases with increasing RH. The limiting change, at equilibrium with 95% RH, is approximately 50%.

DC leakage current may rise upon exposure to a combination of high temperature and high humidity, but is normally restored by voltage conditioning under standard conditions. The increase will be greater than that experienced under temperature influence alone because of conduction through absorbed water.

Hermetically-sealed and non-hermetic Series may be affected by absorption of water on external insulating surfaces. The water film may also attract a layer of dust from the air, increasing the effect. The most sensitive parameter is leakage current.

3. POLARITY

These capacitors are inherently polar devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a polarity mark and the capacitor body may include an obvious geometrical shape. However, some Series contain two capacitors connected (negative-to-negative) to form "non-polar" capacitors. Rated voltage (see para. 8) may be applied to these Series in either direction.

4. OPERATING ENVIRONMENT

Most of the discussion under "Storage Conditions" will apply also when capacitors are operated within the applicable electrical ratings described below. The temporary increase in leakage current (at standard conditions) following elevated-temperature exposure is not observed, however, if the capacitors are operated with adequate DC voltage applied.

5. CAPACITANCE

Capacitance is measured at 120 Hz and 25° C with up to 1 volt rms applied. Note that, in either operation, peak AC plus DC bias must not exceed either rated voltage (normally polarized) or 15% of rated voltage in the reverse direction at 25°C. Measurement circuits are of high impedance, however, and under these conditions 1 volt rms may be applied even to 6 volt capacitors (23% peak reversal) without a DC bias. DC bias is thus normally not used, except when rated voltage is below 6 volts and the AC signal level exceeds 0.3 vrms. However, MIL-C-39003 provides for up to 2.2 volts DC.

DC bias causes a small reduction in capacitance, up to about 2% when full rated voltage is applied as bias. DF is also reduced by the presence of DC; rated voltage may cause a decrease in DF of about 0.2% (e.g., a decrease from 3.6 to 3.4% DF).

Capacitance changes very little below 1 kHz but decreases more noticeably at higher frequencies. Larger capacitance values decline more rapidly than small ratings. The effect of frequency upon capacitance is shown in Figure 1.

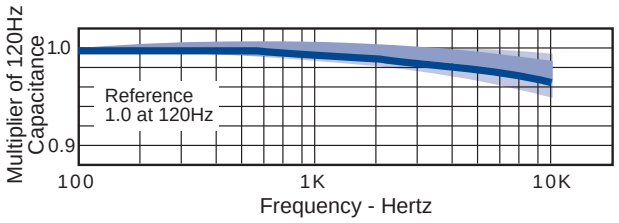


Figure 1. Normal Effect of Frequency upon Capacitance

Capacitance typically changes with temperature according to the curve of Figure 2.

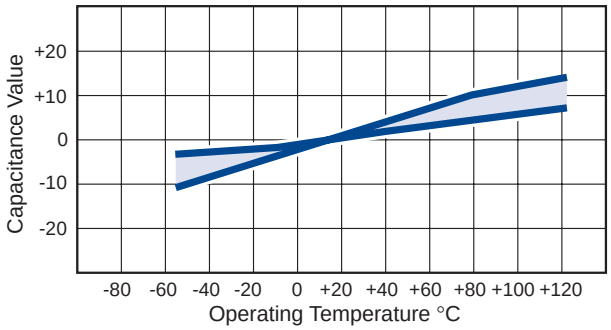


Figure 2. Typical Effect of Temperature upon Capacitance

6. DISSIPATION FACTOR (DF)

DF is measured at 120 Hz and 25° C with up to 1 volt rms applied. Note that, in either operation, peak AC plus DC bias must not exceed either rated voltage (normally polarized) or 15% of rated voltage in the reverse direction at 25°C. Measurement circuits are of high impedance, however, and under these conditions 1 volt rms may be applied even to 6 volt capacitors (23% peak reversal) without a DC bias. DC bias is thus normally not used, except when rated voltage is below 6 volts and the AC signal level exceeds 0.3 vrms. However, MIL-C-39003 provides for up to 2.2 volts DC.

Dissipation Factor (DF) is a useful low-frequency measure of the resistive component in capacitors. It is the ratio of the unavoidable resistance to the capacitive reactance, usually expressed in percent. DF increases with temperature above +25° C and may also increase at lower temperatures. Unfortunately, one general limit for DF cannot be specified for all capacitance/voltage combinations, nor can response to temperature be simply stated. Catalogs for the respective series list DF limits under various conditions.

Dissipation factor increases with increasing frequency as would be expected from the decreasing capacitive reactance. DF is not a very useful parameter above about 1 kHz. The DF of larger capacitance values increases more rapidly than that of smaller ratings. Figure 3 shows typical effect of frequency on DF.

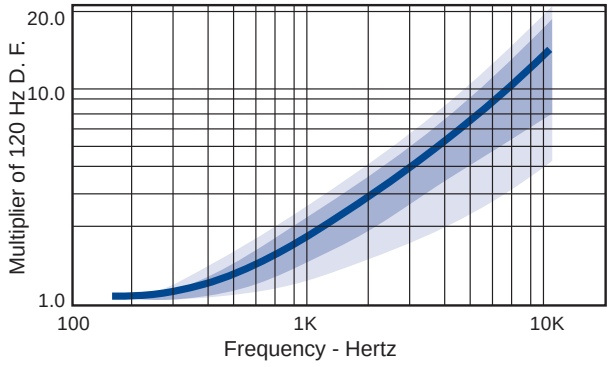


Figure 3. Normal Effect of Frequency upon Dissipation Factor

DC bias causes a small reduction in capacitance, up to about 2% when full rated voltage is applied, as bias. DF is also reduced by the presence of DC bias. Rated voltage may cause a decrease in DF of about 0.2% (e.g., a decrease from 3.6 to 3.4% DF).

DF is defined as $\frac{ESR}{X_c}$ and is also referred to occasionally, as tan d or "loss tangent." The "Quality Factor," Q, is the reciprocal of DF (DF is not expressed in percent in this calculation). Another expression, rarely used, is the "power factor," or $\frac{ESR}{Z}$. Power factor is cos u, while DF is ctn u.

7. DC LEAKAGE (DCL)

DC leakage is affected by voltage to a much larger extent, and this effect can frequently be used to advantage in circuits where only very low leakage currents can be tolerated. Typical response of DCL to applied voltage is illustrated in Figure 4.

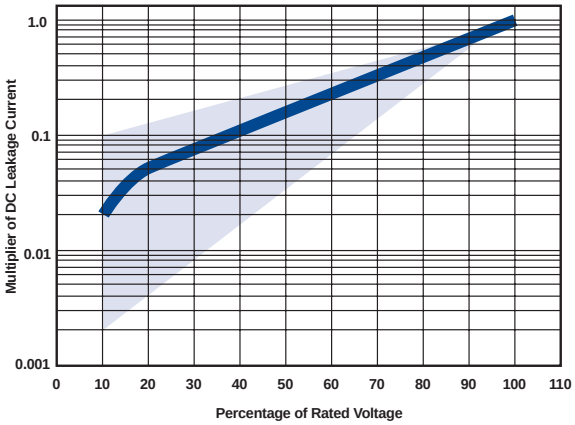


Figure 4. Typical Range of DC Leakage as a Function of Applied Voltage

DC leakage current (DCL) increases with increasing temperature according to the typical curve of Figure 5.

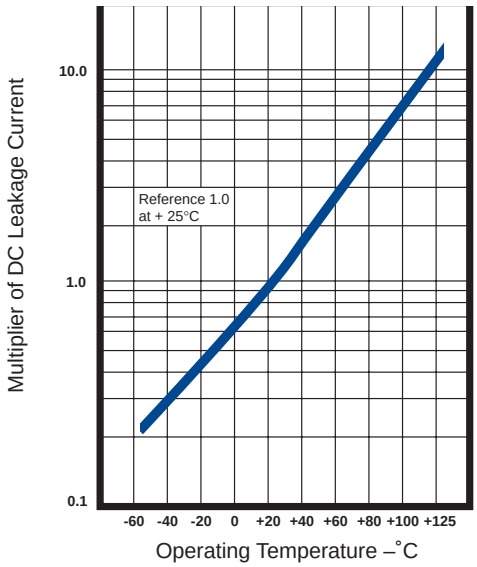


Figure 5. Typical Effect of Temperature upon DC Leakage Current

Leakage current is measured at a rated voltage through +85°C and may also be measured at +125°C with 2/3 of rated voltage applied.

8. RATED VOLTAGE

This term refers to the maximum continuous DC working voltage permissible at temperatures of +85° C or below. The lower operating temperature is specified as -55° C. Operation above +85° C is permissible, with reduced working voltage. Typical working voltage reduction is to 2/3 of rated voltage at +125° C.

9. WORKING VOLTAGE

This is the maximum recommended peak DC operating voltage for continuous duty at or below 85°C without DC voltage surges or AC ripple superimposed. No voltage derating is required below 85°C. Capacitors may be operated to 125°C with working voltage linearly derated to 2/3 of the 85°C rating at 125°C as shown in Figure 6.

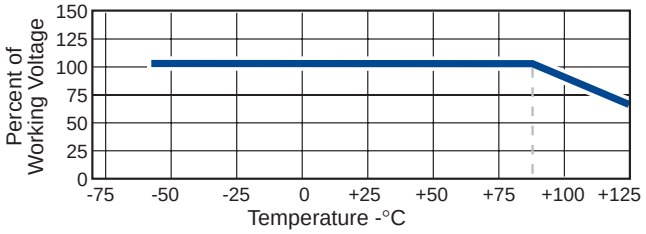


Figure 6. Working Voltage Change with Temperature

10. SURGE VOLTAGE

Surge voltage is defined as the maximum voltage to which the capacitor should be subjected under transient conditions, including peak AC ripple and all DC transients.

DC Working Voltage @ 85°C	2	3	4	6	10	15/16	20	25	35	50	60	75	100	125
Surge Voltage @ 85°C	2.6	4	5.3	8	13	20	26	33	46	65	78	98	130	140

TABLE 1 Surge Voltage Ratings

A typical surge voltage test is performed at +85°C with the applicable surge voltage per Table 1. The surge voltage is applied for 1000 cycles of 30 seconds on voltage through a 33 ohm series resistor and 30 seconds off voltage with the capacitor discharged through a 33 ohm resistor. Upon completing the test, the capacitors are allowed to stabilize at room temperature. Capacitance, DF, and DCL are then tested:

1. The DCL should not exceed the initial 25°C limit.
2. The capacitance should be within ±10% of initial value.
3. The DF should not exceed the initial 25°C limit.

11. REVERSE VOLTAGE

Although these are polar capacitors, some degree of transient voltage reversal is permissible, as seen below. The capacitors should not be operated continuously in reverse mode, even within these limits.

Temperature, °C.	Percentage of Rated Voltage
+25	15
+85	5
+125	1

TABLE 2 Reverse Voltage Ratings

12. EQUIVALENT SERIES RESISTANCE (ESR)

Equivalent Series Resistance (ESR) is the preferred high-frequency statement of the resistance unavoidably appearing in these capacitors. ESR is not a pure resistance, and it decreases with increasing frequency. Typical ESR limits are established in each specific product series. However, the ESR limits provided are for reference only, and are not necessarily the actual value that a particular Series product will attain.

Total impedance of the capacitor is the vector sum of capacitive reactance (X_C) and ESR, below resonance; above resonance total impedance is the vector sum of inductive reactance (X_L) and ESR.

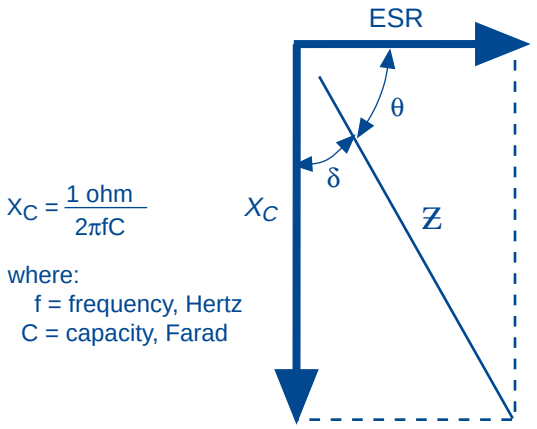


Figure 7a Total Impedance of the Capacitor Below Resonance

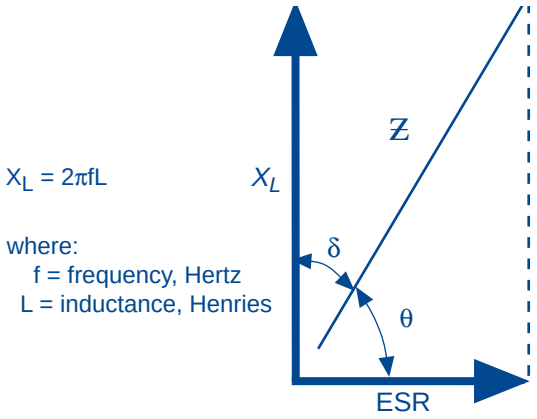


Figure 7b Total Impedance of the Capacitor Above Resonance

To understand the many elements of a capacitor, see Figure 8.

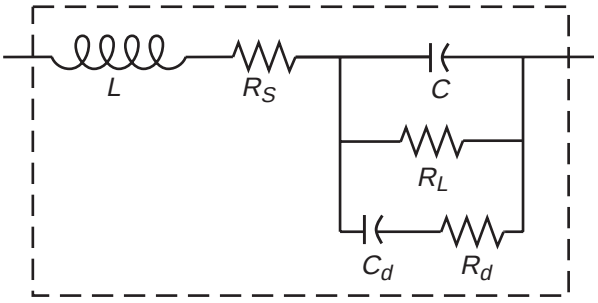


Figure 8. The Real Capacitor

A capacitor is a complex impedance consisting of many series and parallel elements, each adding to the complexity of the measurement system.

L — Represents lead wire and construction inductance. In most instances (especially in solid tantalum and

monolithic ceramic capacitors) it is insignificant at the basic measurement frequencies of 120 and 1000 Hz.

RS — Represents the actual ohmic series resistance in series with the capacitance. Lead wires and capacitor electrodes are contributing sources.

RL — Capacitor Leakage Resistance. Typically it can reach 50,000 megohms in a tantalum capacitor. It can exceed 1012 ohms in monolithic ceramics and in film capacitors.

Rd — The dielectric loss contributed by dielectric absorption and molecular polarization. It becomes very significant in high frequency measurements and applications. Its value varies with frequency.

Cd — The inherent dielectric absorption of the solid tantalum capacitor which typically equates to 1-2% of the applied voltage.

As frequency increases, X_c continues to decrease according to its equation above. There is unavoidable inductance as well as resistance in all capacitors, and at some point in frequency, the reactance ceases to be capacitive and becomes inductive. This frequency is called the self-resonant point. In solid tantalum capacitors, the resonance is damped by the ESR, and a smooth, rather than abrupt, transition from capacitive to inductive reactance (XL = 2pfL) follows.

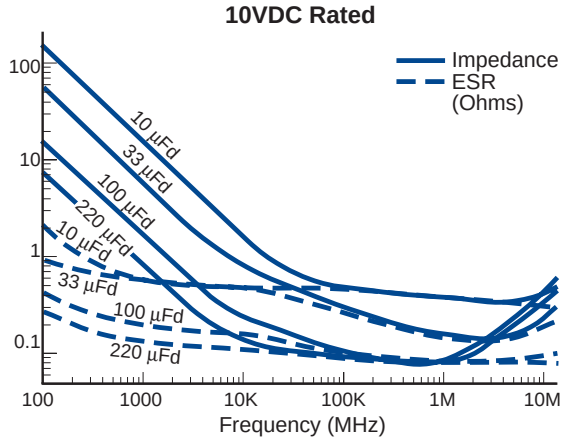


Figure 9. ESR and Impedance vs. Frequency

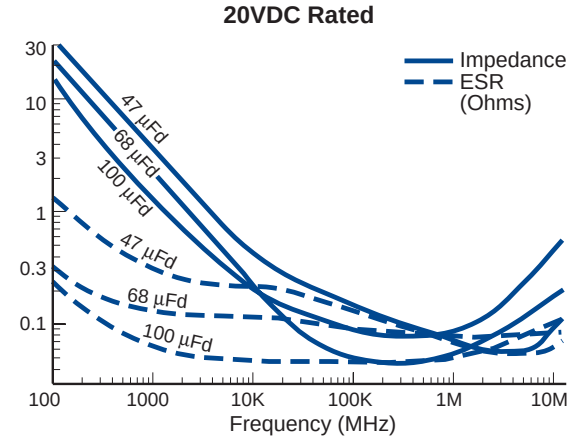


Figure 10. ESR and Impedance vs. Frequency

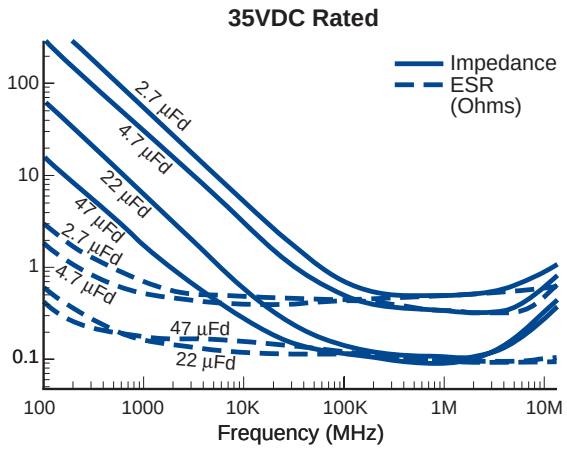


Figure 11a. ESR and Impedance vs. Frequency

Typical ESR and Z performance is given for representative capacitor ratings in Figures 9 through 11. Measured impedance will be affected by the length of lead wire included. Data for the curves were taken by including 1/2" of each lead wire in the measuring circuit.

Despite the fact that the reactance is entirely inductive above the self-resonance, these capacitors find use as decoupling devices above 10 MHz. Special designs have been developed for minimum inductance and are used above 100 MHz.

ESR and Z are also affected by temperature. At 100 kHz, ESR decreases with increasing temperature. The amount of change is influenced by the size of the capacitor and is generally more pronounced on smaller ratings.

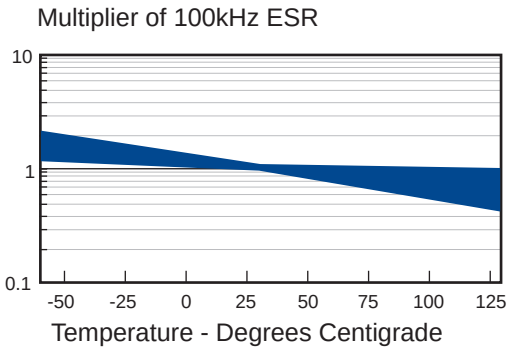


Figure 11b Typical Effect of Temperature on 100 kHz ESR

13. POWER DISSIPATION

Permissible power dissipation has been empirically established for all Series and is listed in each respective product section.

See pages 6-41 for herm seal, 42-50 for axial and radial molded, and 61-70 for tantalum dipped.

It is usually most convenient to translate the permissible power into an AC voltage rating. Assuming a sinusoidal waveform, the “ripple voltage” permissible may be calculated from the impedance and ESR data shown in the respective product section. However, three criteria must be observed:

1. Dissipated power must not exceed the limits specified for the Series.

2. The positive peak AC voltage plus the DC voltage must not exceed the maximum working voltage permitted at the ambient temperature.

3. The negative peak AC voltage, in combination with the DC voltage, must not exceed the permissible reverse voltage at the ambient temperature.

The rms ripple voltage limitation imposed by power dissipation is given by:

$$P = I^2R = \frac{E^2R}{Z^2}$$

where: I = rms ripple current (amperes)
E = rms ripple voltage (volts)
P = power (watts)
Z = impedance at specified frequency (ohms)
R = equivalent series resistance at specified frequency (ohms)

Maximum allowable rms ripple voltage may be determined as follows:

$$E(max) \text{ @ } 25°C = Z\frac{P(max)}{R}$$

E(max) = 85°C=0.9 E(max) @ 25°C
E(max) @ 125°C=0.4 E(max) @ 25°C
P(max) = maximum watts shown on Performance Characteristic pages 5, 42, 49, 58 and 61.

Permissible AC ripple current can be determined by the following:

$$I \text{ rms} = \sqrt{\frac{P(max)}{R}}$$

If two polar capacitors are connected back-to-back, [1] the pair may be operated on AC without need for DC bias. The first two criteria above must be observed. If DC is applied, the sum of DC and peak AC must not exceed, in either direction, the maximum working voltage specified for the ambient temperature.

[1] Some KEMET Series provide convenient assemblies of non-polar pairs. The two negative terminals are connected internally. It is also permissible to connect the two positive terminals to form a non-polar pair.

14. LONG-TERM STABILITY

Within the general class of electrolytic capacitors, solid tantalum capacitors offer unusual stability of the three important parameters: capacitance, dissipation factor, and leakage current. These solid-state devices are not subject to the effects of electrolysis, deforming or drying-out associated with liquid-electrolyte capacitors.

When stabilized for measurement at standard conditions, capacitance will typically change less than ±3% during a 10,000 hour life test +85° C. The same comparative change has been observed in shelf tests at +25° C extending for 50,000 hours. (Some of this change may stem from instrument or fixture error.)

Dissipation factor exhibits no typical trend. Data from 10,000 hour life tests at +85° C show that initial limits (at standard conditions) are not exceeded at the conclusion of these tests.

Leakage current is more variable than capacitance or DF; in fact, leakage current typically exhibits a logarithmic dependence in several respects. MIL-C-39003/1 permits leakage current (measured at standard conditions) to rise by a factor of four over 10,000 hour life tests. Typical behavior shows a lower rate of change, which may be negative or positive. Initial leakage currents are frequently so low (less than 0.1 nanoampere in the smallest CV capacitors, to about 10 microampere in the largest CV types) that changes of several orders of magnitude have no discernable effect on the usual circuit designs.

15. FAILURE MODE

Capacitor failure may be induced by exceeding the rated conditions of forward DC voltage, reverse DC voltage, surge voltage, surge current, power dissipation, or temperature. As with any practical device, these capacitors also possess an inherent, although low, failure rate when operated within the rated condition.

The dominant failure mode is by short-circuit. Minor parametric drifts (see Section 14 “Long-Term Stability”) are of no consequence in circuits suitable for solid tantalum capacitors. Catastrophic failure occurs as an avalanche in DC leakage current over a short (millisecond) time span. The failed capacitor, while called “short-circuited”, may exhibit a DC resistance of 10 to 104 ohm.

If a failed capacitor is in an unprotected low-impedance circuit, continued flow of current through the capacitor may obviously produce severe overheating. This heat may melt the internal solder (all Series) and the sealing solder used in hermetic Series. The short-circuit failure may thereby be converted to an open-circuit failure. If the circuit does not open promptly, the over-heated capacitor may damage the circuit board or nearby components. Protection against such occurrence is obtained by current-limiting devices or fuses provided by the circuit design.

Fortunately, the inherent failure rate of KEMET solid tantalum capacitors is low, and this failure rate may be further improved by circuit design. Statistical failure rates are provided for those capacitors with characters other than “A” in the next-to-last position of the part number. Relating circuit conditions to failure rate is aided by the guides in the section following.

16. RELIABILITY PREDICTION

Three important application conditions largely control failure rate: DC voltage, temperature, and circuit impedance. Estimates of the respective effects are provided by the nomograph in Figure 12 and Table 3 following. The nomograph related failure rate to voltage and temperature while the table relates failure rate to impedance. These estimates apply to steady-state DC conditions, and they assume usage within all other rated conditions.

Standard conditions, which produce a unity failure rate factor, are rated voltage, +85° C, and 0.1 ohm-per-volt circuit impedance. While voltage and temperature are straightforward there is sometimes difficulty in determining impedance. What is required is the circuit impedance seen by the capacitor. If several capacitors are connected in parallel, the impedance seen by each is lowered by the source of energy stored in the other capacitors. Energy is similarly stored in series inductors.

Failure rate is conventionally expressed in units of percent per thousand hours. As a sample calculation, suppose a particular batch of capacitors has a failure rate of 0.5% Khr under standard conditions. What would be predicted failure rate at 0.7 times rated voltage, +60° C and 0.8Ω/V? The nomograph gives a factor of 7 x 10-4, and the table gives a factor of 0.3. The failure rate estimate is then:

$0.5 \times 7 \times 10^{-4} \times 0.3 = 1.05 \times 10^{-4}$, or 0.0001% Khr

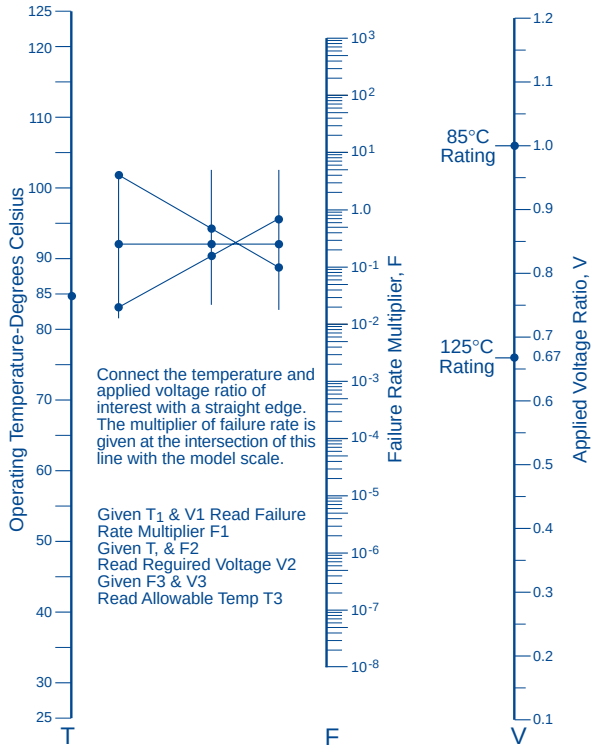


Figure 12. Reliability Nomograph

Circuit Impedance (ohms/volt)	Failure Rate Improvement (multiplying factors)
0.1	1.0
0.2	.8
0.4	.6
0.6	.4
0.8	.3
1.0	.2
2.0	.1
3 or greater	.07

TABLE 3 Relationship of Failure Rate to Impedance

Voltage "de-rating" is a common and useful approach to improved reliability. It can be pursued too far, however, when it leads to installation of higher voltage capacitors of much larger size. Inherent failure rate is roughly proportional to $CV^{1.6}$, where C is capacitance and V is rated voltage. The effect becomes particularly noticeable above 50-volt ratings. It is possible to lose more via higher inherent failure rate than is gained by voltage derating.

The relationships shown are more useful when the failure rate has been statistically determined for a given group of capacitors.

Failure rate is statistically determined for each production batch of KEMET High Reliability capacitors, as described in Specification GR500 Catalog F2956. As noted above, not all capacitance/voltage rate values are inherently equal in failure rate. GR500 capacitors are processed and subjected to 100% reliability testing as a homogeneous group of one capacitance/voltage value. Failure rate under standard conditions is available from 1 to 0.001% Khr, depending upon the capacitance/voltage value.

Several Series are qualified under U.S. military specification MIL-C-39003. Failure rates as low as 0.001%/Khr are available for all capacitance/voltage values in given groups under this test program. The specifications and their accompanying Qualified Products Lists should be consulted for details.

For Series not covered by military specifications, and internal sampling program is operated by KEMET Quality Assurance. The confidence level chosen for reporting the data is 60%. However, the cost of sampling each batch produced is overwhelmingly prohibitive, and no claim is made concerning knowledge of failure rate for any particular lot shipped. It is demonstrated that average failure rate for all commercial Series is between .1 and 1%/Khr at standard conditions and 60% confidence after 2,000 hours' testing, +85°C, and rated voltage and ≤ 1 ohm total series resistance.

17. SURGE CURRENT

All conventional reliability testing is conducted under steady-state DC voltage. Experience indicates that AC ripple, within the limits prescribed, has little effect on failure rate. Heavy surge currents are possible in some applications, however. Circuit impedance may be very low (below the standard 0.1 ohm/volt) or there may be driving inductance to cause voltage "ringing." Surge current may appear during turn-on of equipment, for example.

Failure rate under current-surge conditions may not be predictable from conventional life test data. A surge current test is utilized to ensure against a high frequency of such failures, and a description is available free of charge. The test has been adopted for all capacitors under MIL-C-39003/06/09/10 and KEMET's GR500 specifications.

18. ENVIRONMENTAL CONSIDERATION

It is not possible to foresee all the conditions to which capacitors may be subjected. Following is a list of standard tests which every Series will survive. Data may be available (upon request) under more severe stresses for certain Series.

- LIFE TEST 85°C OR 125°C, 2000 Hours: When subjected to 2000 hours at 85°C at full rated DC voltage, or 125°C at 2/3 of 85°C voltage, the capacitor shall meet the following requirements when tested at 25°C:

  The DCL shall be within 1.25 times the initial DCL limit.

  Capacitance shall be within ±10% of the initial measured value.

  The DF shall not exceed the initial limit.

- SHELF LIFE +85°, 2000 hours. Post test of capacitor shall meet the following requirements when tested at 25°C:

  The DCL shall be within 1.5 times the initial DCL limit.

  Capacitance shall be within ±10% of the initial measured value.

  The DF shall not exceed 1.5 times the initial limit.

- LEAD STRENGTH MIL-STD-202 Method 211: Pull test will be performed as in MIL-STD-202, Method 211. The following details and exceptions shall apply.
  a. Test condition letter—A
  b. The body of the capacitor will be securely clamped during test.

c. Applied force—3 pounds (1.4 kg).
d. Test Condition letter—C (M39003 Test Condition letter—D)
e. Applied Force—1 pound, 3 bends.

- VIBRATION; HIGH FREQUENCY: Per MIL-STD-202, Method 204, Condition D, 10 Hz to 2000 Hz.
  a. Mounting—Capacitors shall be mounted on a fixture by the body. Leads shall be supported by rigidly supported terminals.
  b. Electrical load conditions—During the test, the specified DC rated voltage shall be applied to the capacitors.
  c. Test condition letter—D (20 G).
  d. Duration and direction of motion—4 hours in each of two mutually perpendicular directions (total of 8 hours), one parallel and the other perpendicular to the axis.
  e. Measurements during vibration—During the last cycle, an electrical measurement shall be made to determine intermittent operation or open- or short-circuiting. Observations shall also be made to determine intermittent contact or arcing or open- or short-circuiting. Detecting equipment shall be sufficiently sensitive to detect any interruption with a duration of 0.5 ms, or greater.
  f. Examination after test—Capacitors shall be visually examined for evidence of mechanical damage.

- SHOCK TEST: Per MIL-STD-202, Method 213. The following details shall apply:
  a. Special mounting means—Capacitors shall be rigidly mounted on a mounting fixture by the body. When securing leads, care shall be taken to avoid pinching the heads.
  b. Test-condition letter—I (100 G peak). 6 ms. (sawtooth)
  c. Measurements and electrical loading during shock—During the test, observations shall be made to determine intermittent contact or arcing or open- or short-circuiting. Detecting equipment shall be sufficiently sensitive to detect any interruption with a duration of 0.5 ms. The DC rated voltage shall be applied to the capacitors during the test.
  d. Examinations after test—Capacitors shall be visually examined for evidence of arcing, breakdown, and mechanical damage.

- HUMIDITY LIFE TEST: Capacitors shall be capable of withstanding 1000 hours at 55°C with an ambient humidity of 90-95% RH with rated DC voltage applied. After the capacitors have stabilized for a period of 24 hours at 25°C, they shall meet the following limits:

  DCL shall not exceed 5 times the initial limit.

  Capacitance shall be within ±10% of the initial value.

  DF shall not exceed 2 times the initial limit.

- THERMAL SHOCK—MIL-STD-202, Method 107: Capacitors shall be subjected to thermal shock in accordance with MIL-STD-202, Method 107, Test Condition A. M39003 Components tested to MIL-STD-202, Method 107, Condition B. Measurements before and after cycling are required. Conditioning prior to the first cycle will be 15 minutes at the following standard inspection conditions:
  a. Relative Humidity—Less than 50%.
  b. Ambient Temperature—25°C ±5°C.
  c. Final measurements are made after stabilization at room temperature.

- MOISTURE RESISTANCE—MIL-STD-202, Method 106: Capacitors shall be tested in accordance with MIL-STD-202, Method 106 including the following details:
  a. Mounting—The capacitors shall be mounted by normal mounting means
  b. Initial Measurements
  c. Polarizing and Load Voltage—Not applicable
  d. Final measurements—After the final cycle and within 2 to 6 hours after removal of the capacitors from the humidity chamber, capacitance, dissipation factor, and DC leakage will be measured.

  DCL should not exceed the initial 25°C limit.

  Capacitance should be within ±10% of the initial measured value.

  DF should not exceed the initial 25°C limit.

- RESISTANCE TO SOLVENTS — MIL-STD-202, Method 215:

  Brushing required after test.

  DCL meets limit shown in respective Part Number Tables.

  Capacitance meets applicable tolerance.

  DF meets limits shown in respective Part Number Tables.

  No visible damage to case or marking.

- RESISTANCE TO SOLDERING HEAT — MIL-STD-202,

  Method 210, Test Condition.

  Letter B. (260° for 10 Sec.)

  Leads shall be immersed to within ¼ inch of the capacitor body. Capacitance, DF, and DCL should meet original limits shown in respective Part Number Tables.

- SOLDERABILITY — MIL-STD-202, Method 208;

  Number of terminations on each capacitor tested: 2.

  Depth of insertion in flux and solder to within .125" of capacitor body.

- FLAMMABILITY — The encapsulant for Molded and Conformal Coated Product meets or exceeds the following requirements:

  Underwriters Lab. UL 94V-0

  Oxygen Index per ASTM-D-2863

  28% min.

- STABILITY AT LOW AND HIGH TEMPERATURE

  -55°C to 125°C: Capacitors will be capable of withstanding extreme temperature testing at a succession of continuous steps at +25°C, -55°C, +25°C, +85°C, +125°C, +25°C, in the order stated. Capacitors shall be brought to thermal stability at each test

temperature. Capacitance, DF, and DCL are measured at each test temperature except that DCL is not measured at -55°C.

When measurements are made at the various steps, the electrical limits for each temperature shall not exceed the following limits.

Step 1,	+25°C,	DCL as indicated in original limit; capacitance within tolerance specified; DF as indicated in original limit shown in Part Number Tables.
Step 2,	-55°C,	Capacitance within ±10% of initial value; ESR, DF within limit shown in Part Number Tables.
Step 3,	+25°C,	DCL as indicated in original limit; capacitance within ±5% of initial value; ESR, DF within limit shown in Part Number Tables.
Step 4,	+85°C,	DCL shall not exceed 10 times original DCL limit at 25°C. Capacitance shall be within ±10% of the initial value. DF shall be within 125% of limits shown in Part Number Tables. ESR shall be within limits shown in Part Number Tables.
Step 5,	+125°C,	DCL shall not exceed 12.5 times the original limit at 25°C. Capacitance shall be within ±12% of initial value. DF shall be within 150% of limits shown in Part Number Tables. ESR shall be within limits shown in Part Number Tables.
Step 6,	+25°C,	DCL as indicated in original limit; capacitance within ±5% of initial value; ESR, DF as indicated in original limit shown in Part Number Tables.

Note: M39003 specifies Δ's and limits by individual slash sheet.

- DAMP HEAT, STEADY STATE: Meets requirements of IEC Publication 384-15, method IEC 68-2-3. Climatic category 55/125/56.

19. MOUNTING

All encapsulated Series fall into two general classes. The first is provided with leads extending from opposite ends of the body, generally along the principle axis of the body (“axial leads”). The second is provided with parallel leads extending from one side or face of the body (“radial leads”). With either type, mounting points are normally provided by the leads themselves.

Axial leads may be used for point-to-point wiring, but usually, the wires are bent at 90° from the capacitor axis for insertion through printed circuit (PC) boards. Axial capacitors supplied on reels for machine insertion will withstand the mechanical stresses of bending and inserting by all popular machines known to KEMET at this time. Most KEMET axial Series may be supplied on reels to feed such machines. Radial leads are intended to plug directly into holes of PC boards. Auto-machines will insert combatible radial capacitor designs, and most KEMET capacitors may be supplied in appropriate reeled forms (ARIS).

With either axial or radial types, attention should be paid to treatment of the capacitors during mounting and afterward under service conditions. Difficulty during mounting usually arises from lead damage or from overheating. Hand soldering technique or, more often, wave-solder machines cause the overheating. The internal cathode connection on most Series is made between solder and a silver-pigmented paint. If too much heat is applied, this solder may remelt and degrade the silver-solder interface or cause a direct short-circuit.

KEMET’s hermetically-sealed series has an internal space into which molten cathode solder may run, depriving the cathode connection and possibly flowing across the terminals to short-circuit the capacitor from the inside. It is also possible to remelt the solder which bonds the rim of the glass-metal seal, causing loss of hermeticity and possibly a short-circuit. Finally, solder at the exit point of the positive wire may be remelted with similar effect. This solder is a high-temperature alloy, however, and it is much less likely to be melted. (Re-dipping of lead wires is practiced by some users, introducing another hazard of remelting this solder).

Plastic-encased Series have only one site of solder, the internal cathode connection. The rate of heat transfer through the plastic is lower than through the metal can of hermetic Series, but conduction along the negative leadwire to remelt this solder is very similar. There is little internal void within plastic cases, so remelted solder tends to remain in its original location and solidify when heat is removed. Short-circuiting is very unlikely, but reliability of the internal connection may be compromised by leaching of silver from the paint into the molten solder. The latter effect degrades the cathode connection in hermetic parts as well.

All encased capacitors will pass the Resistance to Soldering Heat Test of MIL-STD-202, Method 210, Condition B. This test dips each leadwire into molten solder at +260° C for 10 seconds while the capacitor body is held vertically above the solder. KEMET capacitors will pass this test when the depth of immersion brings the capacitor body (or closest external solder joint, if it is closer as in some hermetic Series) to a minimum distance of 0.100 inches from the solder surface. 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.

Shown in Figure 13 is a recommended solder wave profile for both axial and radial leaded solid tantalum capacitors.

Optimum Solder Wave Profile

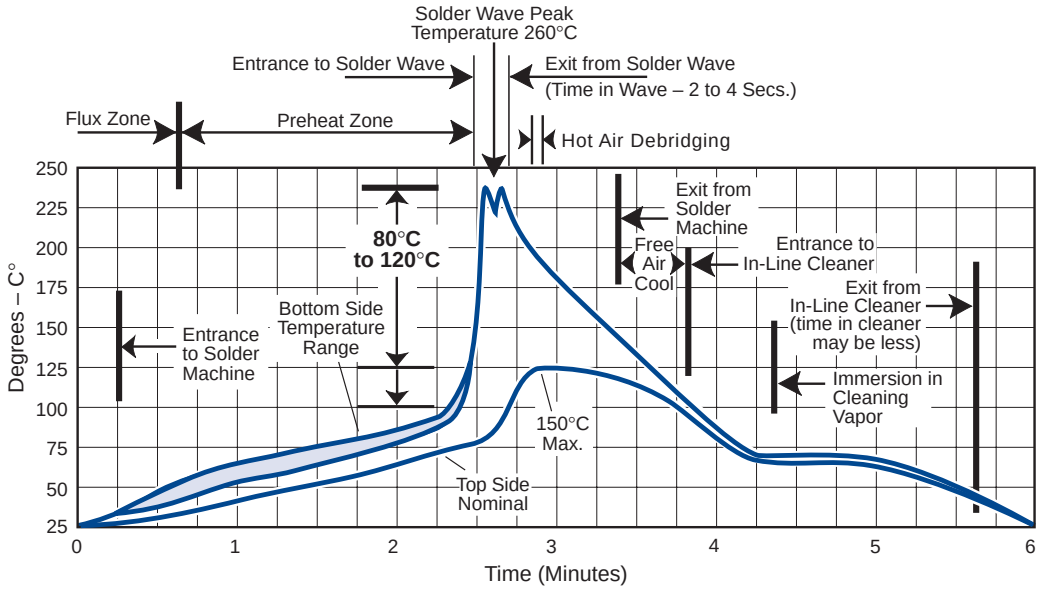


Figure 13.