

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Added Approved Source of Supply. Added Test Tab and Note 6 to Fig. 1. Corrected Table 1.	2 October 2006	Michael A. Radecki
B	Add Vishay Israel capacitors.	17 March 2009	Michael A. Radecki
C	Add Weibull as an option.	2 Dec 2009	Michael A. Radecki
D	Update part number and processing requirements	14 Sep 2010	Michael A. Radecki
E	Removed 2 sources of supply and updated throughout.	6 January 2017	

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3
 DLA LAND AND MARITIME
 COLUMBUS, OHIO 43218-3990



Prepared in accordance with [ASME Y14.100](#)

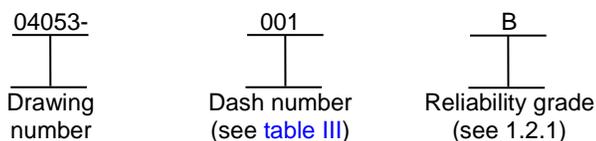
Selected item drawing

REV STATUS OF PAGES	REV	E	E	E	E	E	E	E	E	E	E								
	PAGES	1	2	3	4	5	6	7	8	9									
PMIC N/A	PREPARED BY Michael A. Radecki						DESIGN ACTIVITY DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OH												
Original date of drawing 24 January 2006	CHECKED BY Patrick G. Kyne						TITLE CAPACITOR, FIXED, FUSED TANTALUM CHIP, NON-WEIBULL GRADED AND WEIBULL GRADED												
	APPROVED BY Michael A. Radecki																		
	SIZE A	CODE IDENT. NO. 037Z3						DWG NO. 04053											
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1. SCOPE

1.1 Scope. This drawing describes the complete requirements for fused tantalum chip capacitors.

1.2 Part or Identifying Number (PIN). The complete PIN is as follows:



1.2.1 Reliability Grade. The reliability grade is identified by a single letter as shown in table I.

TABLE I. Reliability grades.

Symbol	Reliability grade (% per 1,000 hours)
B	0.1
C	0.01
D	0.001
Z	non-Weibull graded

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-PRF-55365](#) - Capacitor, Fixed, Electrolytic (Tantalum), Chip, Established Reliability and Nonestablished Reliability, General Specification for

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-202-204](#) - Method 204, Vibration, High Frequency
[MIL-STD-202-208](#) - Method 208, Solderability
[MIL-STD-202-305](#) - Method 305, Capacitance
[MIL-STD-1285](#) - Marking of Electrical and Electronic Parts

(Copies of these documents are available online at <http://quicksearch.dla.mil/>.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. REQUIREMENTS

3.1 Item requirements. The individual requirements shall be in accordance with [MIL-PRF-55365](#), and as specified herein.

3.2 Interface and physical dimensions. The interface and physical dimensions shall be as specified herein (see [figure 1](#)).

3.2.1 Terminations. Chip capacitors shall have 100 micro-inch minimum solder plated terminations (see [figure 1](#)). The solder plated terminations shall be solderable when tested in accordance with [MIL-STD-202-208](#).

3.2.1.1 Pure tin. The use of pure tin, as an underplate or final finish is prohibited both internally and externally. Tin content of capacitor components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.3](#)).

3.2.2 Operating temperature range. The capacitors are rated for their given voltages from -55°C to +85°C. They are de-rated to 0.67 of their given voltages at +125°C. See [table III](#).

3.3 Electrical characteristics.

3.3.1 Capacitance. See [table III](#). Measured in accordance with [MIL-STD-202-305](#). Maximum dc bias shall be 2.2 volts for all ac measurements. The frequency of the ac voltage shall be 120 ± 5 Hz and the magnitude shall be limited to 1.0 volt rms.

3.3.2 Capacitance tolerance. ±20 percent.

3.3.3 Rated voltage. The rated voltage shall be in accordance with [table III](#). Above +85°C, voltage de-rating for temperature is required. De-rate linearly from rated voltage at +85°C to 0.67 x rated voltage at +125°C.

3.4 Surge current. Surge current testing shall be performed on a 100 percent basis after voltage aging or Weibull grading, as applicable, as shown in [table II](#). Capacitors shall be subjected to four consecutive cycles under the following conditions:

- a. Temperature: +25°C ± 5°C
- b. Applied voltage: Minimum of rated dc voltage ±2 percent from a power source having an energy storage bank of 10,000 µF (minimum) across the output of the terminals.
- c. Charge cycle: 4 seconds maximum.
- d. Discharge cycle: 4 seconds maximum to a voltage below 1 percent of rated voltage.
- e. The total dc resistance (excluding the capacitor) including the wiring, fixturing, and output impedance of the regulated power supply to each test position during the charging cycle shall be in accordance with [MIL-PRF-55365](#).
- f. On completion of the test, the capacitors shall meet the following requirements:
 - (1) DCL: See [table III](#).
 - (2) Cap.: Shall meet the capacitance tolerance as specified in [3.3.2](#).
 - (3) DF: See [table III](#).

3.5 Voltage Aging. Capacitors shall be subjected for a minimum of 10 hours at +85°C and 1.32 times rated voltage.

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3.6 Group A inspection. Group A inspection shall consist of the inspections specified in table II.

TABLE II. Group A inspection.

Inspection	MIL-PRF-55365 reference	04053 reference	Sampling Procedure
<u>Subgroup 1</u>			
Reflow conditioning	3.13, 4.7.10		100% inspection
Thermal shock (unmounted)	3.14, 4.7.11		
Voltage aging ^{1/}		3.5	
Weibull grading ^{2/}	3.23, 4.7.20		
Surge current		3.4	
<u>Subgroup 2</u>			
Visual Examination			13 samples 0 failures
Materials	3.4, 4.7.4		
Marking	3.26		
Workmanship	3.28		

^{1/} Non-Weibull graded capacitors only (reliability grade Z (see table I)).

^{2/} Weibull graded capacitors only (reliability grades B, C, and D (see table I)).

3.7 Additional tests. The following additional tests are available as optional tests and must be included in the ordering data (see 6.2c). Any of the tests may be requested to be performed at the option of the user and shall be negotiable with the manufacturer.

- a. Vibration, high frequency. The capacitors shall meet the requirements of MIL-PRF-55365 when tested in accordance with MIL-STD-202-204, test condition D.
- b. Solderability. Solderability shall be in accordance with MIL-PRF-55365.
- c. Surge Voltage. Surge voltage shall be in accordance with MIL-PRF-55365.
- d. Moisture resistance. Moisture resistance shall be in accordance with MIL-PRF-55365.
- e. Stability at low and high temperatures. Stability at low and high temperatures shall be in accordance with MIL-PRF-55365.
- f. Resistance to soldering heat. Resistance to soldering heat shall be in accordance with MIL-PRF-55365.
- g. Life. A minimum of dc rated voltage at +85°C or a minimum of derated voltage at +125°C for 2000 hours.

3.8 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

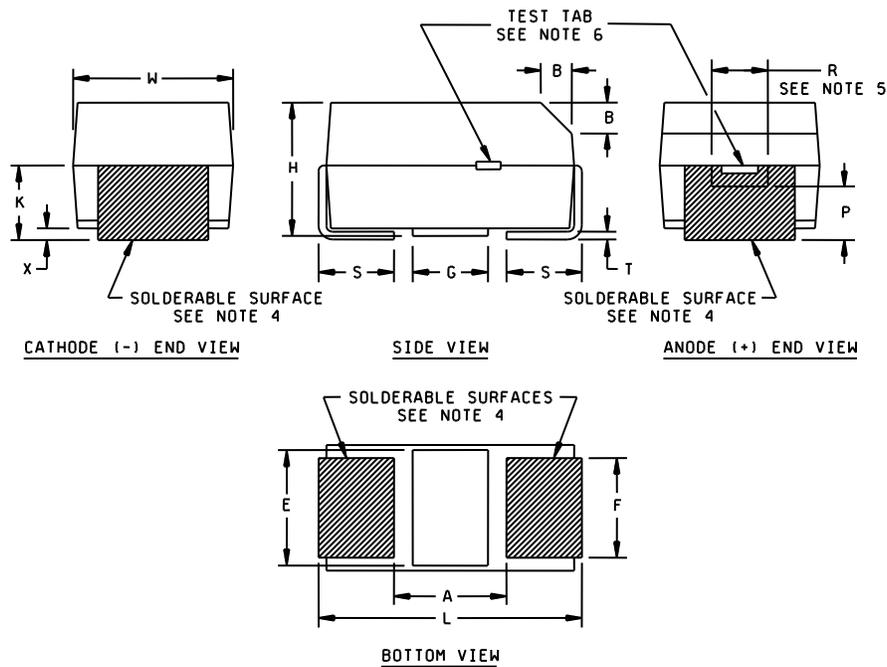
3.9 Manufacturer Eligibility. To be eligible for listing as a source of supply for non-Weibull graded parts listed herein, a manufacturer shall be listed on the MIL-PRF-55365 Qualified Products List for at least one part or perform the qualification inspection for one MIL-PRF-55365 style. To be eligible for listing as an approved source of supply for the Weibull graded parts listed herein, a manufacturer shall be listed on MIL-PRF-55365 Qualified Products List for at least one part at the Weibull reliability grade for which listing is sought.

3.10 Certificate of compliance. A certificate of compliance shall be required from manufacturers requesting to be an approved source of supply.

3.11 Marking. Marking shall be in accordance with MIL-PRF-55365, except the "JAN" or "J" brand does not apply and shall not be marked on the capacitor or any packaging. At the option of the manufacturer, the "J" may be replaced with a trademark or other manufacturer's identification.

3.12 Workmanship. Capacitors shall be uniform in quality and free from defects that will affect life, serviceability, or appearance.

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Case size	L	W	H	K ± 0.2	F ± 0.1	S ± 0.3	B (Ref) ± 0.15	X (Ref) ± 0.10	P (Ref)	R (Ref)	T (Ref)	A (Min)	G (Ref)	E (Ref)
B	3.5 ± 0.2	2.8 ± 0.2	1.9 ± 0.2	1.1	2.2	0.8	0.4	0.10	0.5	1.0	0.13	2.1	1.8	2.2
C	6.0 ± 0.3	3.2 ± 0.3	2.5 ± 0.3	1.4	2.2	1.3	0.5	0.10	0.9	1.0	0.13	3.1	2.8	2.4
D	7.3 ± 0.3	4.3 ± 0.3	2.8 ± 0.3	1.5	2.4	1.3	0.5	0.10	0.9	1.0	0.13	3.8	3.5	3.5
X	7.3 ± 0.3	4.3 ± 0.3	4.0 ± 0.3	2.3	2.4	1.3	0.5	0.10	1.7	1.0	0.13	3.8	3.5	3.5

NOTES:

1. Dimensions are in millimeters.
2. Inch equivalents are given for information only.
3. The anode (+) terminal shall be indicated by the bevel on the anode end and/or the polarity stripe.
4. Solderable surfaces are only those surfaces designated as such. Termination edges are not considered solderable.
5. Notch (R) at option of the manufacturer.
6. Test tab size and location at the option of the manufacturer.

mm	inches	mm	inches	mm	inches
0.1	.004	1.1	.043	2.4	.094
0.13	.005	1.3	.051	2.5	.098
0.15	.006	1.4	.055	2.8	.110
0.2	.008	1.5	.059	3.2	.126
0.3	.012	1.7	.067	3.5	.138
0.4	.016	1.8	.071	3.8	.150
0.5	.02	1.9	.075	4.0	.157
0.8	.031	2.1	.083	4.3	.169
0.9	.035	2.2	.087	6.0	.236
1.0	.04	2.3	.091	7.3	.287

FIGURE 1. Dimensions and configuration.

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TABLE III. Electrical characteristics.

1/ DSCC drawing 04053-	Capacitance (μF)	Case size	Max. DCL at +25°C (μA)	Max. DF at +25°C, 120 Hz (percent)	Max. ESR at +25°C, 100 kHz (ohms)
4 V _{dc} at +85°C (2.7 V _{dc} at +125°C)					
001-	68	C	2.7	6	1.6
002-	100	C	4	8	1.2
003-	150	D	6	8	.8
004-	220	D	8.8	8	.7
005-	330	D	13.2	8	.7
006-	330	X	13.2	8	.7
007-	470	X	18.8	8	.5
6 V _{dc} at +85°C (4 V _{dc} at +125°C)					
008-	4.7	B	.5	6	3.5
009-	6.8	B	.5	6	3.5
010-	10	B	.6	6	3.5
011-	15	C	.9	6	2
012-	22	B	1.3	6	3.5
013-	22	C	1.4	6	2
014-	33	C	2	6	2
015-	47	D	2.9	6	1
016-	47	C	2.9	6	1.6
017-	68	D	4.1	6	1
018-	68	C	4.1	6	1.2
019-	100	X	6	8	.9
020-	100	D	6	8	.8
021-	150	D	9	8	.7
022-	220	D	13.2	8	.7
023-	220	X	13.2	8	.7
024-	330	X	19.8	8	.5
10 V _{dc} at +85°C (7 V _{dc} at +125°C)					
025-	3.3	B	.5	6	3.5
026-	4.7	B	.5	6	3.5
027-	6.8	B	.7	6	3.5
028-	10	C	1	6	2
029-	15	B	1.5	6	3.5
030-	15	C	1.5	6	2
031-	22	C	2.2	6	2
032-	33	D	3.3	6	1
033-	33	C	3.3	6	1.6
034-	47	D	4.7	6	1
035-	47	C	4.7	6	1.2
036-	68	X	6.8	6	.9
037-	68	D	6.8	6	.8
038-	100	D	10	8	.7
039-	150	X	15	8	.7
040-	150	D	15	8	.7
041-	220	X	22	8	.5
16 V _{dc} at +85°C (10 V _{dc} at +125°C)					
042-	2.2	B	.5	6	3.5
043-	3.3	B	.5	6	3.5
044-	4.7	B	.8	6	3.5
045-	6.8	C	1.1	6	2
046-	10	B	1.6	6	3.5
047-	10	C	1.6	6	2
048-	15	C	2.4	6	2

See footnotes at end of table.

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TABLE III. Electrical characteristics - Continued.

^{1/} DSCC drawing 04053-	Capacitance (μF)	Case size	Max. DCL at +25°C (μA)	Max. DF at +25°C, 120 Hz (percent)	Max. ESR at +25°C, 100 kHz (ohms)
16 V_{dc} at +85°C (10 V_{dc} at +125°C) – continued.					
049-	22	D	3.6	6	1
050-	22	C	3.6	6	1.6
051-	33	D	5.3	6	1
052-	47	X	7.5	6	.9
053-	47	D	7.5	6	.8
054-	100	X	16	8	.7
20 V_{dc} at +85°C (13 V_{dc} at +125°C)					
055-	1.5	B	.5	6	5
056-	2.2	B	.5	6	3.5
057-	3.3	B	.7	6	3.5
058-	4.7	C	1	6	2
059-	6.8	C	1.4	6	2
060-	10	C	2	6	2
061-	15	D	3	6	1
062-	22	D	4.4	6	1
063-	33	X	6.6	6	.9
064-	47	X	9.4	6	.3
25 V_{dc} at +85°C (17 V_{dc} at +125°C)					
065-	.68	B	.5	4	6.5
066-	1	B	.5	4	5
067-	1.5	B	.5	6	5
068-	2.2	C	.6	6	3.5
069-	3.3	C	.9	6	2.5
070-	4.7	C	1.2	6	2.5
071-	6.8	C	1.7	6	2
072-	10	C	2.5	6	.6
073-	10	D	2.5	6	1.2
074-	15	D	3.8	6	1
075-	22	X	5.5	6	.9
076-	22	D	5.5	6	.8
35 V_{dc} at +85°C (23 V_{dc} at +125°C)					
077-	.47	B	.5	4	8
078-	.68	B	.5	4	6.5
079-	1	B	.5	4	5
080-	1.5	C	.5	6	4.5
081-	2.2	C	.8	6	3.5
082-	3.3	C	1.2	6	2.5
083-	4.7	D	1.7	6	1.5
084-	6.8	D	2.4	6	1.3
085-	10	X	3.5	6	1
086-	15	X	5.3	6	.9
087-	22	X	7.7	6	.3
50 V_{dc} at +85°C (33 V_{dc} at +125°C)					
088-	.15	B	.5	4	16
089-	.22	B	.5	4	14
090-	.33	B	.5	4	10
091-	.47	C	.5	4	8
092-	.68	C	.5	4	7
093-	1	C	.5	4	5.5
094-	1.5	C	.8	6	5
095-	2.2	D	1.1	6	2.5
096-	3.3	D	1.7	6	2

^{1/} Complete PIN shall include a symbol to indicate the reliability level (see 1.2.1).

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4. VERIFICATION

4.1 Qualification inspection. Qualification inspection is not required.

4.2 Conformance inspection.

4.2.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the group A inspection herein (see [table II](#)).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see [6.2](#)). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

6.1 Intended use. Capacitors conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. This drawing is intended exclusively to prevent the proliferation of unnecessary duplicate specifications, drawings, and stock catalog listings. When a military specification exists and the product covered by this drawing has been qualified for listing, this drawing becomes obsolete and will not be used for new design.

6.2 Ordering data. The contract or purchase order should specify the following:

- a. Complete PIN (see [1.2](#)).
- b. Requirements for packaging and packing.
- c. Requirements for additional testing per paragraph [3.7](#) (if any are required).

6.3 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to [ASTM-B545](#) (Standard Specification for Electrodeposited Coatings of Tin).

6.4 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

6.5 Users of record. Coordination of this document for future revisions is coordinated only with the approved source(s) of supply and the users of record of this document. Requests to be added as a recorded user of this drawing may be achieved online at: capacitorfilter@dla.mil or if in writing to: DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-4709 or DSN 850-4709.

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6.6 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. Assistance in the use of this drawing may be obtained online at capacitorfilter@dla.mil or by contacting DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-4709 or DSN 850-4709.

<u>Vendor</u>	<u>Vendor CAGE</u>	<u>Vendor name and address</u>	<u>Similar designation</u> 1/
A	31433	KEMET Electronics Corporation 2835 KEMET Way Simpsonville, SC 29681 Plant location: KEMET de Mexico, S.A. de C.V. Ave. Carlos Salazar y Blv. Manuel Cavazos Lerma No. 15 H. Matamoros, Tamps. C.P. 87380, Mexico	T496*****

1/ Parts must be purchased to the DSCC PIN to assure all performance requirements and tests are met.

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