

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Revised paragraph 3.24. Added new PINs. Added new source.	23 August 2011	Michael A. Radecki
B	Added new PINs.	3 July 2012	Michael A. Radecki
C	Corrected the lead diameter tolerance in figure 1 and added new PINs.	9 September 2013	Michael A. Radecki

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3
HAS CHANGED NAMES TO:
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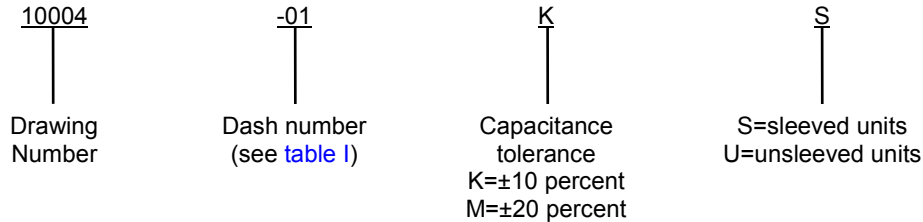
Prepared in accordance with [ASME Y14.100](#)

REV STATUS OF PAGES	REV	C	C	C	C	C	C	C	C	C	C						
	PAGES	1	2	3	4	5	6	7	8	9	10						
PMIC N/A	PREPARED BY Ken Bernier							DESIGN ACTIVITY DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OH									
Original date of drawing 15 October 2009	CHECKED BY Ken Bernier							TITLE CAPACITORS, FIXED, ELECTROLYTIC (NONSOLID ELECTROLYTE), TANTALUM (POLARIZED SLUG)									
	APPROVED BY Michael A. Radecki																
	SIZE A	CODE IDENT. NO. 037Z3						DWG NO. 10004									
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1. SCOPE

1.1 Scope. This drawing describes the complete requirements for tantalum electrolytic (nonsolid) electrolyte, fixed capacitors, in tantalum cases, insulated and uninsulated.

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



2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this drawing. This section does not include documents cited in other sections of this drawing 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 drawing, whether or not they are listed here.

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 (see [6.2](#)).

DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-PRF-39006](#) - Capacitors, Fixed, Electrolytic (Non-Solid Electrolyte), Tantalum Established Reliability, General Specification for

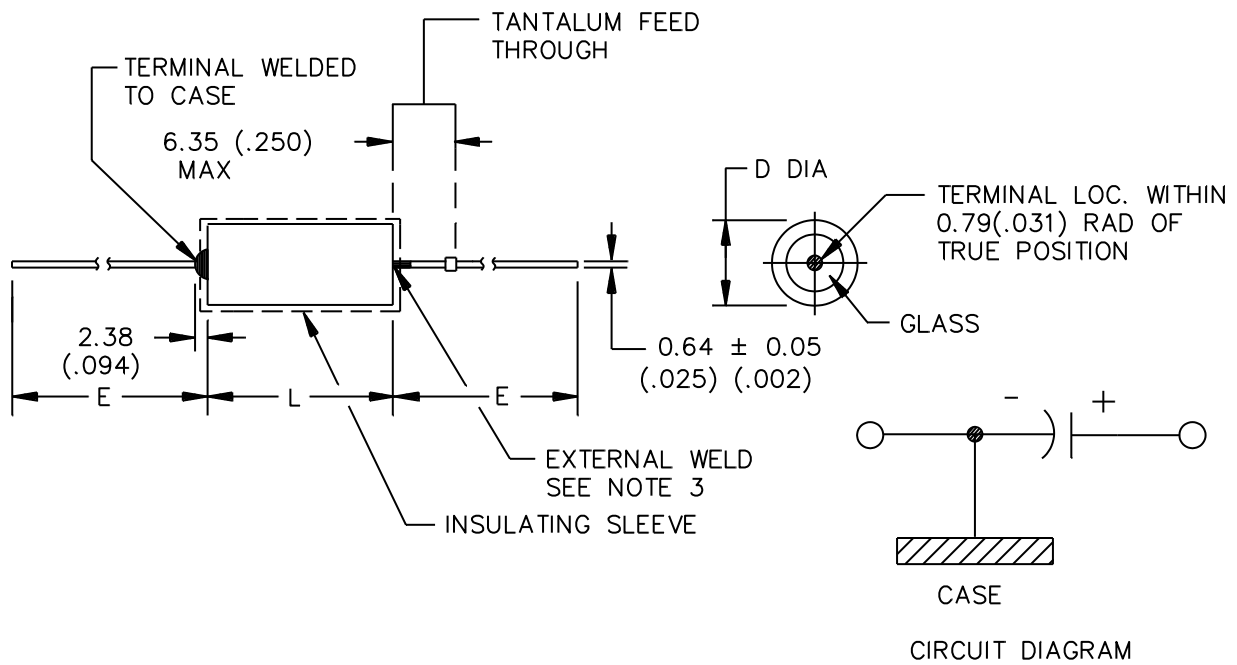
DEPARTMENT OF DEFENCE STANDARDS

[MIL-STD-202](#) - Electronic and Electrical Components, Test Methods for.
[MIL-STD-790](#) - Standard Practice for Established Reliability and High Reliability Qualified Products List (QPL) Systems for Electrical, Electronic, and Fiber Optic Parts Specifications.
[MIL-STD-1276](#) - Leads for Electronic Component Parts.
[MIL-STD-1285](#) - Marking of Electrical and Electronic Parts.

(Copies of these documents are available online at <http://quicksearch.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, 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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Case size	Dimensions mm (inches)			
	Basic case		Insulated case	
	L +0.79 (.031) -0.41 (.016)	D ±0.41 (.016)	D Max	E ±6.35 (.250)
T1	11.51 (.453)	4.78 (.188)	5.56 (.219)	38.10 (1.500)
T2	16.28 (.641)	7.14 (.281)	7.92 (.312)	57.15 (2.250)
T3	19.46 (.766)	9.52 (.375)	10.31 (.406)	57.15 (2.250)
T4	26.97 (1.062)	9.52 (.375)	10.31 (.406)	57.15 (2.250)
L2	25.60 (1.008)	7.14 (.281)	7.92 (.312)	57.15 (2.250)

NOTES:

1. Dimensions are in millimeters.
2. Inches are in parentheses.
3. The weld shall not be enclosed in the end seal.

FIGURE 1. Dimensions and configuration.

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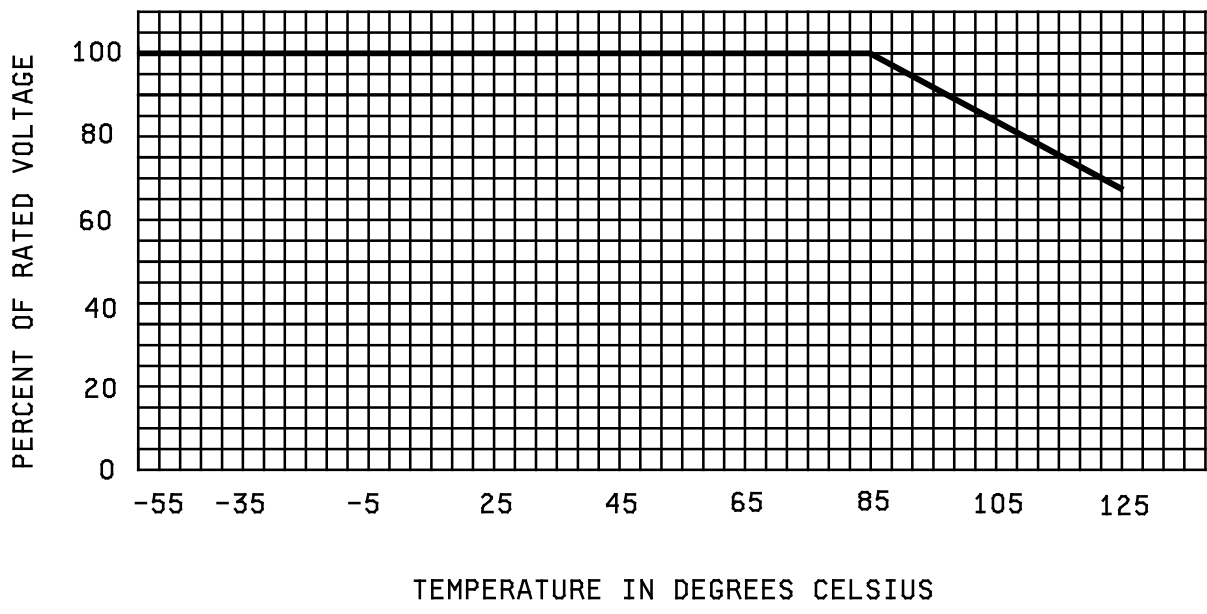


FIGURE 2. Voltage derating with temperature.

3. REQUIREMENTS

3.1 Design and physical dimensions. The design and physical dimensions shall be as specified herein (see [figure 1](#)).

3.1.1 Terminals. All terminals shall be permanently secured internally and externally, as applicable. All external joints shall be welded. Terminals shall be tin-lead coated with a minimum lead content of 3 percent and conform to type N32, N51, or N52 as specified in [MIL-STD-1276](#). The length and diameter of the terminals shall be as specified in [figure 1](#).

3.1.2 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](#)).

3.1.3 Case. The case shall be made of tantalum.

3.1.4 Sleeving (when applicable). Shrink fitted insulation shall be used for the sleeving, and it shall lap over the ends of the capacitor body.

3.1.5 Capacitor element. The capacitor element shall consist of an anode of a sintered tantalum slug.

3.1.6 Rated temperature. The capacitor is rated for its given voltage from -55°C to +85°C. It is derated to two thirds of its given voltage at +125°C. See [figure 2](#) for voltage derating with temperature.

3.2 Electrical characteristics. The electrical characteristics shall be as shown in [table I](#) and [table II](#).

3.3 Seal. When the capacitors are tested as specified in [MIL-PRF-39006](#), there shall be no evidence of leakage.

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3.4 Shock. The capacitors shall meet the requirements of MIL-PRF-39006 when tested in accordance with test condition I, [method 213 of MIL-STD-202](#).

3.5 Vibration, high frequency. The capacitors shall meet the requirements of MIL-PRF-39006 when tested in accordance with test condition D, [method 204 of MIL-STD-202](#).

3.6 Thermal shock. Thermal shock shall be in accordance with MIL-PRF-39006 when tested for 30 cycles.

3.7 Salt atmosphere (corrosion). Salt atmosphere shall be in accordance with MIL-PRF-39006.

3.8 Solderability. Solderability shall be in accordance with MIL-PRF-39006.

3.9 Terminal strength. Terminal strength shall be in accordance with MIL-PRF-39006.

3.10 Surge voltage. Surge voltage shall be in accordance with MIL-PRF-39006 and [table II](#) of this drawing.

3.11 Moisture resistance. Moisture resistance shall be in accordance with MIL-PRF-39006.

3.12 Dielectric withstanding voltage. Dielectric withstanding voltage shall be in accordance with MIL-PRF-39006.

3.13 Insulation resistance. Insulation resistance shall be in accordance with MIL-PRF-39006.

3.14 Low temperature storage. Low temperature storage shall be in accordance with MIL-PRF-39006.

3.15 Stability at high and low temperature. Stability at high and low temperature shall be in accordance with MIL-PRF-39006.

3.16 Reverse voltage. There shall be no continuous reverse voltage. Transient reverse voltage surges are acceptable under the following conditions:

- a. The peak reverse voltage is equal to or less than 1.5 volts and the product of the peak current times the duration of the reverse transient is 0.05 ampere-second or less.
- b. The repetition rate of the reverse voltage surges is less than 10 Hz.

3.17 Life. The capacitors shall be capable of withstanding a 2,000 hour life test at +85°C at rated voltage, or a 1,000 hour life test at +125°C test at derated voltage. After the test, the capacitors shall meet the following requirements:

- a. DC leakage at (+85°C and +125°C) shall not exceed 125 percent of the specified value (see [table I](#)).
- b. DC leakage at (+25°C) shall not exceed the specified value (see [table I](#)).
- c. Capacitance shall be within +10, -20 percent of initial value.
- d. ESR shall not exceed 200 percent of the specified value (see [table I](#)).
- e. Dielectric withstanding voltage in accordance with MIL-PRF-39006.
- f. Insulation resistance in accordance with MIL-PRF-39006.
- g. Visual examination shall show no damage, obliteration of marking, or leakage of electrolyte.

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3.18 AC ripple life. AC ripple life shall be in accordance with MIL-PRF-39006 and shall not exceed the specified value (see table I and table III).

3.18.1 AC ripple current multipliers vs. frequency, temperature, and applied voltage. See table III.

3.19 Impedance. Impedance shall be in accordance with MIL-PRF-39006 and shall not exceed the specified value (see table I).

3.20 Barometric pressure (reduced). Barometric pressure shall be in accordance with MIL-PRF-39006.

3.21 Resistance to solvents. Resistance to solvents shall be in accordance with MIL-PRF-39006.

3.22 Resistance to soldering heat. Resistance to soldering heat shall be in accordance with MIL-PRF-39006.

3.23 Marking. Marking shall be in accordance with MIL-STD-1285, except the PIN shall be as specified in 1.2 with the manufacturers name or CAGE code, date code, lot symbol, capacitance (in μF), and rated voltage.

3.24 Manufacturer Eligibility. To be eligible to be listed as an approved source of supply, a manufacturer shall be listed on the MIL-PRF-39006 Qualified Products List for at least one style or perform all testing specified herein on a sample of parts agreed upon by the manufacturer and DLA Land and Maritime – VAT.

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

3.26 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable 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.

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

4. VERIFICATION

4.1 Product assurance program. The product assurance program specified in MIL-PRF-39006 and maintained in accordance with MIL-STD-790 is not applicable to this document.

4.2 Qualification inspection. Qualification inspection is not applicable to this document.

4.3 Failure rate qualification. The failure rate qualification specified in MIL-PRF-39006 is not applicable to this document.

4.4 Quality conformance inspections.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the group A and group B inspections of MIL-PRF-39006.

4.4.2 Certification. The acquiring activity, at its discretion, may accept a certificate of compliance with group B requirements in lieu of performing group B tests (see 6.2c). Group B tests are per MIL-PRF-39006 except as defined in paragraph 3.17. Note, per 3.17, 1000 hour life testing @ +125°C may be substituted for 2,000 hour +85° life testing.

4.5 Visual and mechanical examination. Capacitors shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with applicable requirements of MIL-PRF-39006.

4.6 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use their own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth herein where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

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TABLE I. Electrical characteristics.

DSCC drawing 10004- 1/	Cap. (µF) at +25°C and 120 Hz	Case size	Max ESR Ohms 120 Hz	Max DCL µA		Max impedance ohms at -55°C 120 Hz	Maximum capacitance change in percent			AC ripple +85°C 40 KHz mA rms 2/
				+25°C	+85°C and +125°C		-55°C	+85°C	+125°C	
10 V dc at +85°C				7 V dc at +125°C		Surge (+85°C) 11.5 V dc				
01 --	4700	T3	0.35	16	100	3.5	-80	+10	+20	4000
02 --	10000	T4	0.25	25	150	3	-85	+20	+35	5000
16 V dc at +85°C				11 V dc at +125°C		Surge (+85°C) 18.4 V dc				
03 --	3300	T3	0.35	16	100	3.5	-80	+10	+15	4000
04 --	6000	T4	0.30	25	150	3	-80	+15	+20	4500
25 V dc at +85°C				15 V dc at +125°C		Surge (+85°C) 28.8 V dc				
19 --	1000	T2	0.8	7.5	75	7	-70	+6	+10	2250
05 --	4000	T4	0.35	25	125	5	-80	+15	+20	4250
30 V dc at +85°C				20 V dc at +125°C		Surge (+85°C) 34.5 V dc				
06 --	3300	T4	0.35	25	125	4	-80	+20	+25	2750
35 V dc at +85°C				22 V dc at +125°C		Surge (+85°C) 40.3 V dc				
07 --	2800	T4	0.35	25	125	4.5	-80	+20	+30	4000
50 V dc at +85°C				30 V dc at +125°C		Surge (+85°C) 57.5 V dc				
20 --	470	T2	0.9	5	50	12	-60	+8	+12	2000
25 --	680	T2	0.9	7.5	75	12	-70	+20	+20	2250
08 --	1500	T4	0.45	15	110	6	-70	+20	+20	3500
15 --	2200	T4	0.6	25	125	4.5	-80	+25	+30	3000
60 V dc at 85°C				40 V dc at 125°C		Surge (85°C) 69 V dc				
21 --	330	T2	0.9	5	50	12	-45	+10	+15	2000
26 --	470	T2	1.0	7.5	75	12	-65	+20	+20	2000
27 --	560	T2	1.0	7.5	75	12	-65	+25	+25	2000
09 --	1000	T4	0.5	20	120	5.5	-40	+10	+15	3500
16 --	1200	T4	0.5	20	200	6	-70	+15	+20	3500
28 --	1800	T4	0.5	25	250	6	-75	+25	+25	3000
75 V dc at +85°C				50 V dc at +125°C		Surge (+85°C) 86.3 V dc				
10 --	180	T2	1.5	5	25	30	-35	+15	+20	2000
22 --	220	T2	1.0	5	50	16	-40	+10	+15	1750
29 --	330	T2	1.5	7.5	75	16	-60	+25	+25	1750
11 --	470	T3	0.6	25	100	10	-45	+10	+25	3000
12 --	750	T4	0.5	20	120	6.5	-35	+10	+15	3500
17 --	940	T4	0.5	20	200	8	-60	+12	+20	3500
30 --	1200	T4	0.8	25	250	8	-75	+25	+25	2750
100 V dc at +85°C				65 V dc at +125°C		Surge (+85°C) 115 V dc				
23 --	150	T2	1.2	7.5	75	20	-30	+10	+15	1750
13 --	400	T4	0.7	10	120	15	-40	+6	+12	3000
18 --	470	T4	0.7	25	250	10	-50	+10	+20	3500
125 V dc at +85°C				85 V dc at +125°C		Surge (+85°C) 144 V dc				
14 --	240	T4	0.80	15	150	20	-35	+6	+12	2500
24 --	330	T4	0.80	25	250	15	-55	+8	+12	2500

1/ The complete PIN number shall include symbols to indicate capacitance tolerance and sleeved or unsleeved units (see 1.2).

2/ For ripple current limits at various temperatures, voltages, and frequencies see table III.

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TABLE II. Voltage.

Voltage		
Rated (+85°C) Volts, dc.	Derated (+125°C) Volts, dc.	Surge (+85°C) Volts, dc.
25	15	28.8
30	20	34.5
50	30	57.5
60	40	69.0
75	50	86.3
100	65	115.0
125	85	144.0

TABLE III. Ripple current multipliers vs. Frequency, temperature and applied voltage. 1/ 2/

Frequency of applied ripple current		120 Hz				800 Hz				1 kHz			
Ambient still air temperature in °C		≤+55	+85	+105	+125	≤+55	+85	+105	+125	≤+55	+85	+105	+125
% of	100%	.60	.39	-	-	.71	.43	-	-	.72	.45	-	-
+85°C	90%	.60	.46	-	-	.71	.55	-	-	.72	.55	-	-
rated	80%	.60	.52	.35	-	.71	.62	.42	-	.72	.62	.42	-
peak	70%	.60	.58	.44	-	.71	.69	.52	-	.72	.70	.52	-
voltage	66-2/3%	.60	.60	.46	.27	.71	.71	.55	.32	.72	.72	.55	.32
Frequency of applied ripple current		10 kHz				40 kHz				100 kHz			
Ambient still air temperature in °C		≤+55	+85	+105	+125	≤+55	+85	+105	+125	≤+55	+85	+105	+125
% of	100%	.88	.55	-	-	1.0	.63	-	-	1.1	.69	-	-
+85°C	90%	.88	.67	-	-	1.0	.77	-	-	1.1	.85	-	-
rated	80%	.88	.76	.52	-	1.0	.87	.59	-	1.1	.96	.65	-
peak	70%	.88	.85	.64	-	1.0	.97	.73	-	1.1	1.07	.80	-
voltage	66-2/3%	.88	.88	.68	.40	1.0	1.0	.77	.45	1.1	1.1	.85	.50

1/ At +125°C, the rated voltage of the capacitors decreases to 66 2/3 of the +85°C rated voltage.

2/ The peak of the applied ac ripple voltage plus the applied dc voltage must not exceed the dc voltage rating of the capacitors.

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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

(This section contains information of a general or explanatory nature, which may be helpful, but is not mandatory.)

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 delivery of one copy of the quality conformance inspection data or certificate of compliance that parts have passed quality conformance inspection with each shipment of parts by the manufacturer.
- c. Whether the manufacturer performs the group B inspections, or provides a certificate of compliance with group B inspections.
- d. Requirements for packaging and packing.

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 manufacturer. Tin whiskers may occur anytime from a day to years after manufacturer 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 on tin whiskers. Alloys of 3 percent by mass, have been 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 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.

6.5 Changes from previous issue. The margins of this drawing 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.

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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. For assistance in the use of this drawing, contact DLA Land and Maritime, ATTN: VAT, P. O. Box 3990, Columbus, OH 43218-3990, by e-mail to capacitorfilter@dla.mil, or by telephone (614) 692-4709 or DSN 850-4709.

<u>1/</u> DSCC drawing 10004-	VISHAY Vendor A Similar Type	EVANS CAPACITOR Vendor B Similar Type
01 --	STE4700-10T3MI	
02 --	STE10000-10T4MI	
03 --	STE3300-16T3MI	
04 --	STE6000-16T4MI	
05 --	STE4000-25T4MI	
06 --	STE3300-30T4MI	
07 --	STE2800-35T4MI	
08 --	STE1500-50T4MI	HC2D050152
09 --	STE1000-60T4MI	
10 --	STE180-75T2MI	
11 --	STE470-75T3MI	
12 --	STE750-75T4MI	
13 --	STE400-100T4MI	
14 --	STE240-125T4MI	HC2D125241
15 --	STE2200-50T4MI	HC3D050222
16 --		HC2D060122
17 --		HC2D075941
18 --		HC2D100471
19 --		HC2B025102
20 --		HC2B050471
21 --		HC2B060331
22 --		HC2B075221
23 --		HC2B100151
24 --		HC2D125331
25 --		HC3B050681
26 --		HC3B060471
27 --		HC3B060561
28 --		HC3D060182
29 --		HC3B075331
30 --		HC3D075122

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

<u>Vendor</u>	<u>Vendor CAGE</u>	<u>Vendor name and address</u>
A	05079	Vishay Intertechnology Inc 2813 West Road Bennington, VT 05201-5017
B	06MN5	Evans Capacitor Company 72 Boyd Avenue East Providence, RI 02914-1202

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