

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED



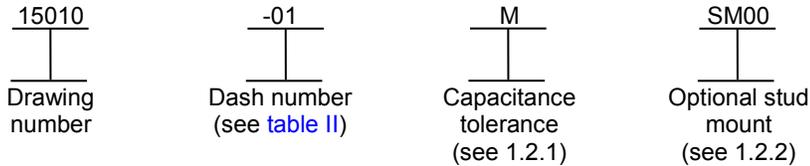
Prepared in accordance with [ASME Y14.100](#)

REV STATUS OF PAGES	REV																			
	PAGES	1	2	3	4	5	6	7	8											
PMIC N/A	PREPARED BY John Bonitatibus								DESIGN ACTIVITY DLA LAND AND MARITIME COLUMBUS, OH 43218-3990											
Original date of drawing 30 October 2015	CHECKED BY Andrew R. Ernst								TITLE CAPACITOR, TANTALUM, HYBRID, HERMETICALLY SEALED											
	APPROVED BY Michael A. Radecki																			
	SIZE A	CODE IDENT. NO. 037Z3								DWG NO. 15010										
	SCALE N/A		REV						PAGE 1 OF 8											

1. SCOPE

1.1 Scope. This drawing describes the specific electrical, mechanical, and environmental requirements and specifications for tantalum hybrid capacitors, hermetically sealed in welded tantalum case with glass to metal anode terminal.

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



1.2.1 Capacitance tolerance. Capacitance tolerance is identified by a single letter: K = ±10 percent, M = ±20 percent.

1.2.2 Optional stud mount. Optional stud mount (see [figure 2](#)) is identified by a four character code as shown in table I. If stud mounting is not required, leave this location blank.

TABLE I. Optional stud mount.

Symbol	Stud length (Dimension A of figure 2) (inches (mm))
SM00	.21 (5.33)
SM01	.27 (6.86)
SM02	.40 (10.16)
SM03	.15 (3.81)
SM04	.18 (4.57)
SM05	.35 (8.89)

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.

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 STANDARDS

[MIL-STD-202](#) - Test Methods for Electronic and Electrical Components Parts

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

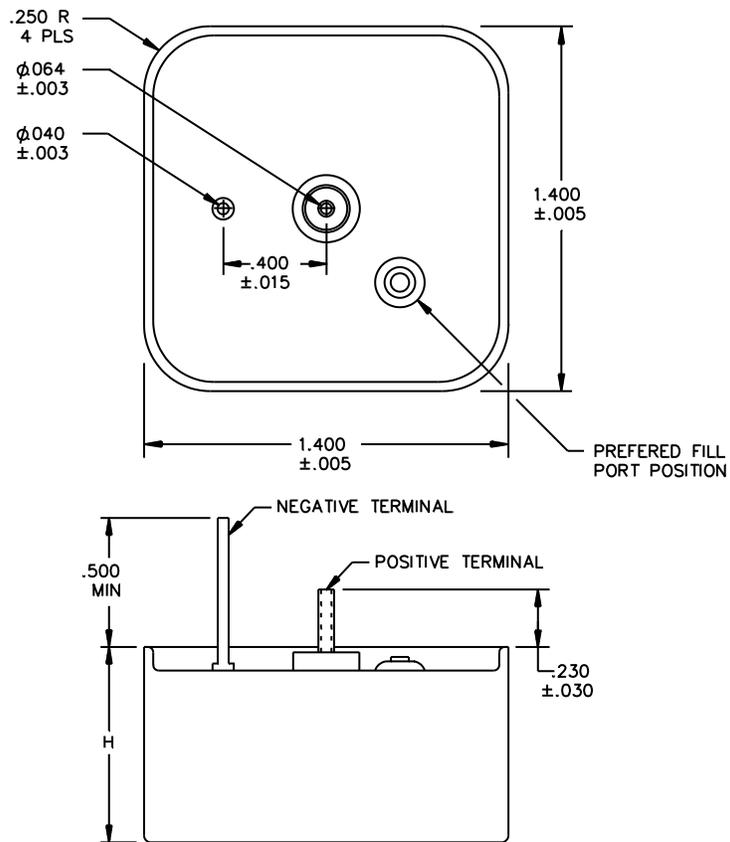
2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

ASSOCIATION CONNECTING ELECTRONIC INDUSTRIES (IPC)

IPC/JEDEC [J-STD-002](#) - Solderability Tests for Component Leads, Terminations, Lugs, Terminals and Wires

(Copies of these documents are available online at www.IPC.org.)

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NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.

FIGURE 1. Case dimensions and configuration.

2.4 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.

3. REQUIREMENTS

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

3.1.1 Case. The case shall be tantalum.

3.1.2 Capacitor element. The capacitor shall utilize sintered tantalum anodes and ruthenium oxide coated cathodes operating in aqueous with additives electrolyte.

3.1.3 Weight. See [table II](#).

3.1.4 Operating temperature. -55°C to +85°C or +125°C with voltage de-rating (see [table II](#)).

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3.1.5 Storage temperature. -62°C to +130°C.

3.1.6 Terminations. The terminations shall be solder coated with 63/37 Sn/Pb.

3.1.7 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 Electrical characteristics.

3.2.1 Rated voltage. The rated voltage shall be as specified in table II at -55°C to +85°C, or de-rated at +125°C.

3.2.2 Capacitance. Capacitance shall be as specified in table II when measured at 120 Hz and +25°C.

3.2.3 Capacitance tolerance. The capacitance tolerance shall be as specified in table II.

3.2.4 Surge voltage. The capacitor shall not be visually damaged and the electrical characteristics shall remain within specification when tested in accordance with the following:

- a. Test temperature: +85°C.
- b. Number of cycles: 1000.
- c. Procedure: Each cycle shall consist of a 30 second surge voltage (see table II) application followed by a 330 second discharge period. The capacitor shall be charged and discharged through a 1000 ohm resistor.
- d. Examination after test. The capacitor shall not be visually damaged and the electrical characteristics shall remain within specification.

3.2.5 Equivalent series resistance (ESR). The maximum ESR shall be as specified in table II at 1 kHz and +25°C.

3.2.6 DC leakage (DCL). The maximum DCL shall be as specified in table II following 5 minutes at the working voltage (see table II) and at +25°C.

3.2.7 Life at +85°C. The capacitor shall meet all electrical specifications when tested in accordance with the following:

- a. Test temperature: +85°C.
- b. Test duration: 2,000 hours.
- c. Test voltage: Rated (see table II).

3.2.8 Life at +125°C. The capacitor shall meet all electrical specifications when tested in accordance with the following:

- a. Test temperature: +125°C.
- b. Test duration: 2,000 hours.
- c. Test voltage: De-rated (see table II).

3.3 Environmental requirements. During environmental testing, the capacitor shall be rigidly clamped to the test fixture with the leads upright.

3.3.1 Shock (specified pulse). When tested in accordance with method 213 of MIL-STD-202, test condition G (50 g's), the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

3.3.2 Vibration, high frequency. When tested in accordance with method 204 of MIL-STD-202, test condition D (20 g's), the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

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3.3.3 Vibration, random. When tested in accordance with [method 214 of MIL-STD-202](#), test condition II, letter E (19.64 g's, rms), the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

3.3.4 Moisture resistance. When tested in accordance with [method 106 of MIL-STD-202](#) at a polarization voltage of 6 V_{dc}, the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

3.3.5 Thermal shock. When tested in accordance with [method 107 of MIL-STD-202](#), test condition A, the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

3.3.6 Barometric pressure (reduced). When tested in accordance with [method 105 of MIL-STD-202](#), test condition D (100,000 feet), the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

3.4 Seal. When tested in accordance with [method 112 of MIL-STD-202](#), condition C, procedure IIIa, the capacitor shall not leak electrolyte or vent any gas.

3.5 Solderability. When tested in accordance with [J-STD-002](#), the terminations shall be solderable.

3.6 Resistance to soldering heat. When tested in accordance with [method 210 of MIL-STD-202](#), test condition B (+260°C for 10 seconds), the capacitor shall not be visibly damaged and the electrical characteristics shall not be affected.

3.7 Terminal strength. When tested in accordance with [method 211 or MIL-STD-202](#), the capacitor shall not be visibly damaged and the electrical characteristics shall not be affected. The following details and exceptions shall apply:

- a. Test condition: A.
- b. Applied force: 5 pounds.
- c. Duration of applied force: 30 seconds.

3.8 Resistance to solvents. When tested in accordance with [method 215 of MIL-STD-202](#), the capacitor markings shall remain legible.

3.9 Fungus resistance. The capacitor materials shall not support fungus growth and shall not be a nutrient to fungus.

3.10 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.

3.11 Manufacturer eligibility. To be eligible for listing as an approved source of supply a manufacturer shall perform all testing specified herein on a sample of parts agreed upon by the manufacturer and DLA Land and Maritime-VA.

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

3.13 Marking. Capacitors shall be permanently marked with the PIN as specified herein (see [1.2](#)), the manufacturer's name and Commercial and Government Entity (CAGE) code, and serial number and date / lot code.

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

4. VERIFICATION

4.1 Qualification inspection. Qualification inspection is not required.

4.2 Conformance inspections.

4.2.1 Inspection of product for delivery. Inspection of product for delivery shall consist of dc leakage, capacitance, and ESR before being shipped.

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TABLE II. Electrical characteristics.

DLA Land and Maritime Drawing PIN 15010- 1/	Capacitance (μ F)	Cap. tolerance	Surge voltage (V_{dc})	Max. DCL		Max ESR (Ohms)	Max. Weight (grams)	Height (dimension H) (\pm .015 in.)
				+25°C (μ A)	+85°C (mA)			
10 V_{dc} at +85°C				6 V_{dc} at +125°C				
01 --	60,000	K, M	11	150	1.5	.030	55	.312
02 --	120,000	K, M	11	250	2.0	.020	80	.450
03 --	180,000	K, M	11	350	2.5	.015	108	.600
04 --	240,000	K, M	11	450	3.0	.012	134	.755
16 V_{dc} at +85°C				9.6 V_{dc} at +125°C				
05 --	40,000	K, M	17.6	150	1.5	.030	55	.312
06 --	80,000	K, M	17.6	250	2.0	.020	80	.450
07 --	120,000	K, M	17.6	350	2.5	.015	108	.600
08 --	160,000	K, M	17.6	450	3.0	.012	134	.755
25 V_{dc} at +85°C				15 V_{dc} at +125°C				
09 --	24,000	K, M	21	150	1.5	.030	55	.312
10 --	48,000	K, M	21	250	2.0	.020	80	.450
11 --	72,000	K, M	21	350	2.5	.015	108	.600
12 --	96,000	K, M	21	450	3.0	.012	134	.755
35 V_{dc} at +85°C				21 V_{dc} at +125°C				
13 --	16,000	K, M	38.5	150	1.5	.040	55	.312
14 --	32,000	K, M	38.5	250	2.0	.020	80	.450
15 --	48,000	K, M	38.5	350	2.5	.015	108	.600
16 --	64,000	K, M	38.5	450	3.0	.012	134	.755
50 V_{dc} at +85°C				30 V_{dc} at +125°C				
17 --	11,000	K, M	55	100	1.0	.050	55	.312
18 --	22,000	K, M	55	100	1.5	.025	80	.450
19 --	33,000	K, M	55	200	2.0	.017	108	.600
20 --	44,000	K, M	55	250	2.5	.015	134	.755
63 V_{dc} at +85°C				38 V_{dc} at +125°C				
21 --	4,700	K, M	69	100	1.0	.050	60	.312
22 --	9,400	K, M	69	100	1.5	.025	86	.450
23 --	14,000	K, M	69	200	2.0	.017	115	.600
24 --	18,000	K, M	69	250	2.5	.015	145	.755
80 V_{dc} at +85°C				48 V_{dc} at +125°C				
25 --	3,000	K, M	88	100	1.0	.055	60	.312
26 --	6,000	K, M	88	100	1.5	.027	86	.450
27 --	9,000	K, M	88	200	2.0	.018	115	.600
28 --	12,000	K, M	88	250	2.5	.015	145	.755
100 V_{dc} at +85°C				60 V_{dc} at +125°C				
29 --	2,200	K, M	110	100	1.0	.065	60	.312
30 --	4,400	K, M	110	100	1.5	.030	86	.450
31 --	6,600	K, M	110	200	2.0	.020	115	.600
32 --	8,800	K, M	110	250	2.5	.015	145	.755
125 V_{dc} at +85°C				75 V_{dc} at +125°C				
33 --	1,500	K, M	137.5	100	1.0	.100	60	.312
34 --	3,000	K, M	137.5	100	1.5	.050	90	.450
35 --	4,500	K, M	137.5	200	2.0	.035	122	.600
36 --	6,000	K, M	137.5	250	2.5	.025	155	.755

1/ Complete PIN shall include symbols to indicate capacitance tolerance and optional stud mounting, if applicable (see 1.2).

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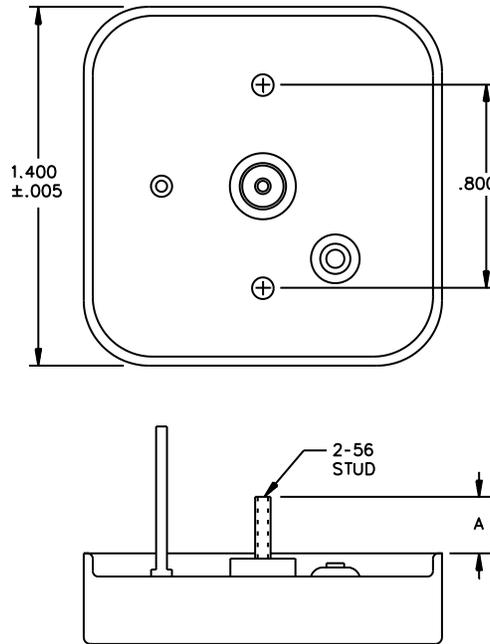


FIGURE 2. Optional stud mount.

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 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. Hybrid capacitors covered by this drawing are intended mainly for use in defense electronic systems, avionics, and weapon systems.

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 conformance inspection data or certificate of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- c. Requirements for packaging and packing.
- d. Requirements for notification of change of product to procuring activity, if applicable.

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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 Replaceability. Capacitors covered by this drawing will replace the same commercial device covered by contractor prepared specification or drawing.

6.5 Changes from previous issue. Not applicable.

6.6 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.

6.7 Approved source(s) of supply. Approved source(s) 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 1/</u>
A	06MN5	Evans Capacitor Company 72 Boyd Avenue East Providence, RI 02914-1202	TDD*****SM**

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

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