

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Correct the surge voltage values for -09 to -12	15-11-18	Michael A. Radecki
B	Added new ratings and a center lead length option.	21-04-02	Michael A. Radecki
C	Added new ratings and revised specifications.	21-09-14	Michael A. Radecki



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

Selected item drawing

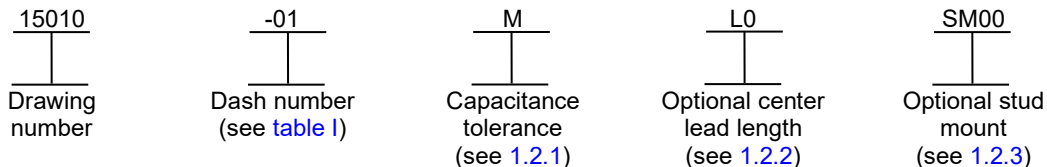
REV STATUS OF PAGES	REV	C	C	C	C	C	C	C	C	C								
	PAGES	1	2	3	4	5	6	7	8	9								

PMIC N/A	<b>PREPARED BY</b> John Bonitatibus		<b>DESIGN ACTIVITY</b> DLA LAND AND MARITIME COLUMBUS, OH 43218-3990						
Original date of drawing  15-10-30	<b>CHECKED BY</b> Andrew R. Ernst		<b>TITLE</b> CAPACITOR, TANTALUM, HYBRID, HERMETICALLY SEALED						
	<b>APPROVED BY</b> Michael A. Radecki								
	<b>SIZE</b> A	<b>CAGE CODE</b> 037Z3		<b>DWG NO.</b> <b>15010</b>					
	<b>SCALE</b> N/A		<b>REV</b> C		<b>PAGE</b> 1 <b>OF</b> 9				

## 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 center lead length. Optional center lead length is identified by a two character code as shown below. If left blank, the standard lead length will apply.

Symbol	Center lead length (Dimension L of figure 1) (in. (mm)) 1/
BLANK (standard)	.230 (5.84)
L0	.125 (3.18)
L1	.156 (3.96)
L2	.188 (4.78)
L3	.219 (5.56)
L4	.250 (6.35)
L5	.281 (7.14)
L6	.313 (7.95)

1/ The tolerance for the standard center lead length is ± .030 inch (0.76 mm). The tolerance for the optional center lead lengths (L(x)) is ± .010 inch (0.25 mm).

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

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)

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## 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-202-105	-	Method 105, Barometric Pressure (Reduced)
MIL-STD-202-106	-	Method 106, Moisture Resistance
MIL-STD-202-107	-	Method 107, Thermal Shock
MIL-STD-202-112	-	Method 112, Seal
MIL-STD-202-204	-	Method 204, Vibration, High Frequency
MIL-STD-202-210	-	Method 210, Resistance to Soldering Heat
MIL-STD-202-211	-	Method 211, Terminal Strength
MIL-STD-202-213	-	Method 213, Shock (Specified Pulse)
MIL-STD-202-214	-	Method 214, Random Vibration
MIL-STD-202-215	-	Method 215, Resistance to Solvents

(Copies of these documents are available online at <https://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 this document are available online at [www.IPC.org](http://www.IPC.org).)

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](#)).

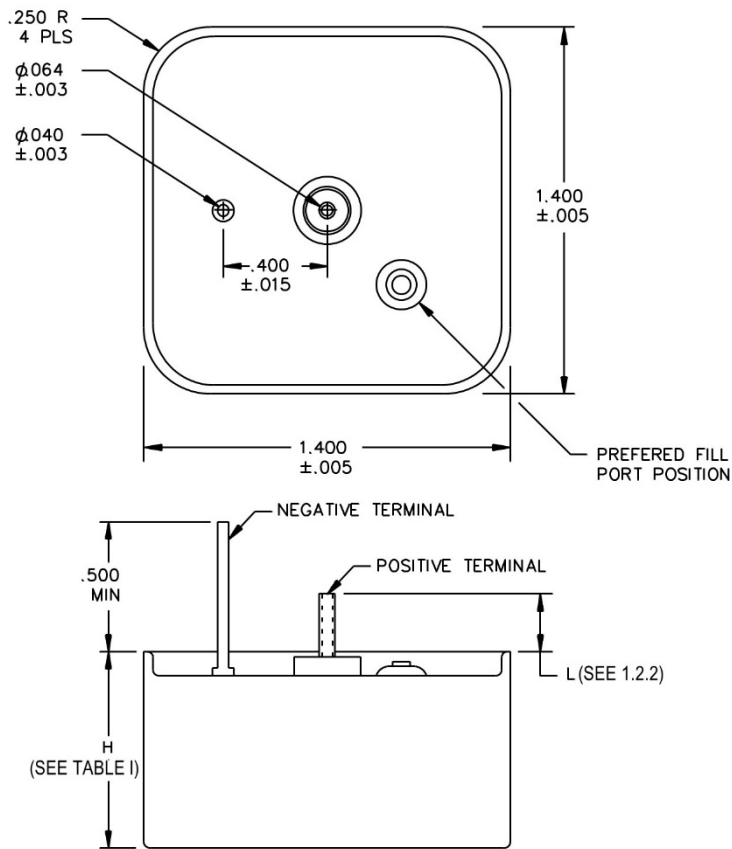
3.1.1 Case. The case shall be tantalum.

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 I](#).

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

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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.

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 I at -55°C to +85°C, or de-rated at +125°C.

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

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

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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 I](#)) 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 I](#) at 1 kHz and +25°C.

3.2.6 DC leakage (DCL). The maximum DCL shall be as specified in [table I](#) following 5 minutes at the working voltage (see [table I](#)) 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 I](#)).

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 I](#)).

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 [MIL-STD-202-213](#), 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 [MIL-STD-202-204](#), test condition D (20 g's), the capacitor shall not be visibly damaged and the electrical characteristics shall remain within specification.

3.3.3 Vibration, random. When tested in accordance with [MIL-STD-202-214](#), 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 [MIL-STD-202-106](#) at a polarization voltage of 6 V<sub>dc</sub>, 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 [MIL-STD-202-107](#), 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 [MIL-STD-202-105](#), 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 [MIL-STD-202-112](#), 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.

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3.6 Resistance to soldering heat. When tested in accordance with MIL-STD-202-210, 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 MIL-STD-202-211, 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 MIL-STD-202-215, 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.

#### 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.

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TABLE I. Electrical characteristics.

DLA Land and Maritime Drawing PIN 15010- 1/	Capacitance ( $\mu$ F)	Cap. tolerance	Surge voltage (V <sub>dc</sub> )	Max. DCL		Max ESR (Ohms)	Max. Weight (grams)	Height (dimension H) ( $\pm$ .015 in.)
				+25°C ( $\mu$ A)	+85°C (mA)			
10 V <sub>dc</sub> at +85°C				6 V <sub>dc</sub> 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
41 --	300,000	K, M	11	550	3.5	.010	160	.905
16 V <sub>dc</sub> at +85°C				9.6 V <sub>dc</sub> 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
42 --	200,000	K, M	17.6	550	3.5	.010	160	.905
25 V <sub>dc</sub> at +85°C				15 V <sub>dc</sub> at +125°C				
09 --	24,000	K, M	27.5	150	1.5	.030	55	.312
10 --	48,000	K, M	27.5	250	2.0	.020	80	.450
11 --	72,000	K, M	27.5	350	2.5	.015	108	.600
12 --	96,000	K, M	27.5	450	3.0	.012	134	.755
43 --	120,000	K, M	27.5	550	3.5	.010	160	.905
35 V <sub>dc</sub> at +85°C				21 V <sub>dc</sub> 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
44 --	80,000	K, M	38.5	550	3.5	.010	160	.905
50 V <sub>dc</sub> at +85°C				30 V <sub>dc</sub> at +125°C				
17 --	11,000	K, M	55	150	1.0	.050	55	.312
18 --	22,000	K, M	55	250	1.5	.025	80	.450
19 --	33,000	K, M	55	350	2.0	.017	108	.600
20 --	44,000	K, M	55	450	2.5	.015	134	.755
45 --	55,000	K, M	55	550	3.0	.012	160	.905
63 V <sub>dc</sub> at +85°C				38 V <sub>dc</sub> at +125°C				
21 --	4,700	K, M	69	100	1.0	.050	60	.312
22 --	9,400	K, M	69	150	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
46 --	22,700	K, M	69	300	3.0	.012	170	.905
80 V <sub>dc</sub> at +85°C				48 V <sub>dc</sub> at +125°C				
25 --	3,000	K, M	88	100	1.0	.055	60	.312
26 --	6,000	K, M	88	150	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
47 --	15,000	K, M	88	300	3.0	.012	170	.905
100 V <sub>dc</sub> at +85°C				60 V <sub>dc</sub> at +125°C				
29 --	2,200	K, M	110	100	1.0	.065	60	.312
30 --	4,400	K, M	110	150	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
48 --	11,000	K, M	110	300	3.0	.012	170	.905
110 V <sub>dc</sub> at +85°C				66 V <sub>dc</sub> at +125°C				
37 --	2,000	K, M	121	100	1.0	.085	60	.312
38 --	4,000	K, M	121	150	1.5	.040	86	.450
39 --	6,000	K, M	121	200	2.0	.027	115	.600
40 --	8,000	K, M	121	250	2.5	.020	150	.755
49 --	10,000	K, M	121	300	3.0	.015	175	.905

See footnote at end of table.

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TABLE I. Electrical characteristics.

DLA Land and Maritime Drawing PIN 15010- 1/	Capacitance (μF)	Cap. tolerance	Surge voltage (V <sub>dc</sub> )	Max. DCL		Max ESR (Ohms)	Max. Weight (grams)	Height (dimension H) (± .015 in.)
				+25°C (μA)	+85°C (mA)			
125 V <sub>dc</sub> at +85°C			75 V <sub>dc</sub> at +125°C					
33 --	1,500	K, M	137.5	50	0.2	.060	60	.312
34 --	3,000	K, M	137.5	75	0.3	.045	90	.450
35 --	4,500	K, M	137.5	100	0.4	.025	120	.600
36 --	6,000	K, M	137.5	125	0.5	.020	150	.755
50 --	7,500	K, M	137.5	150	0.6	.015	180	.905

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

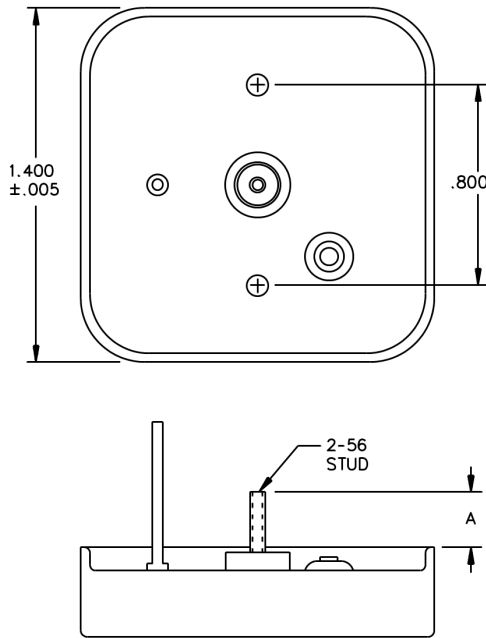


FIGURE 2. Optional stud mount.

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 DLA Land and Maritime CAGE code and 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. 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..

6.6 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](mailto: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](mailto: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	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 CAGE code and PIN to assure all performance requirements and tests are met.

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