

REVISIONS			
LT	DESCRIPTION	DATE	APPROVED

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

Source control drawing

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PMIC N/A	PREPARED BY Andrew R. Ernst	DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OH
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Original date of drawing 19 November 2009	CHECKED BY Andrew R. Ernst	TITLE RESISTOR, VARIABLE, SURFACE MOUNT, 4MM, MULTITURN TRIMMER, 1/4 WATT
	APPROVED BY Michael A. Radecki	

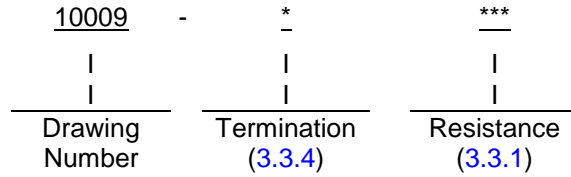
SIZE A	CODE IDENT. NO. 037Z3	DWG NO. 10009
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1. SCOPE

1.1 Scope. This drawing describes the requirements for a variable, surface mount, non-wirewound resistor.

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



2. APPLICABLE DOCUMENTS

2.1 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-22097](#) - Resistors, Variable, Non-wirewound, (Adjustment Type), General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

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

[MIL-STD-1285](#) - Marking of Electrical and Electronic Parts.

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

2.2 Order of precedence. Unless otherwise noted herein or in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), 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 Item requirements. The individual item requirements shall be in accordance with [MIL-PRF-22097](#) and as specified herein.

3.2 Interface, and physical dimensions. The resistor shall meet the interface, and physical dimensions as specified in [MIL-PRF-22097](#) and herein (see [figure 1](#)).

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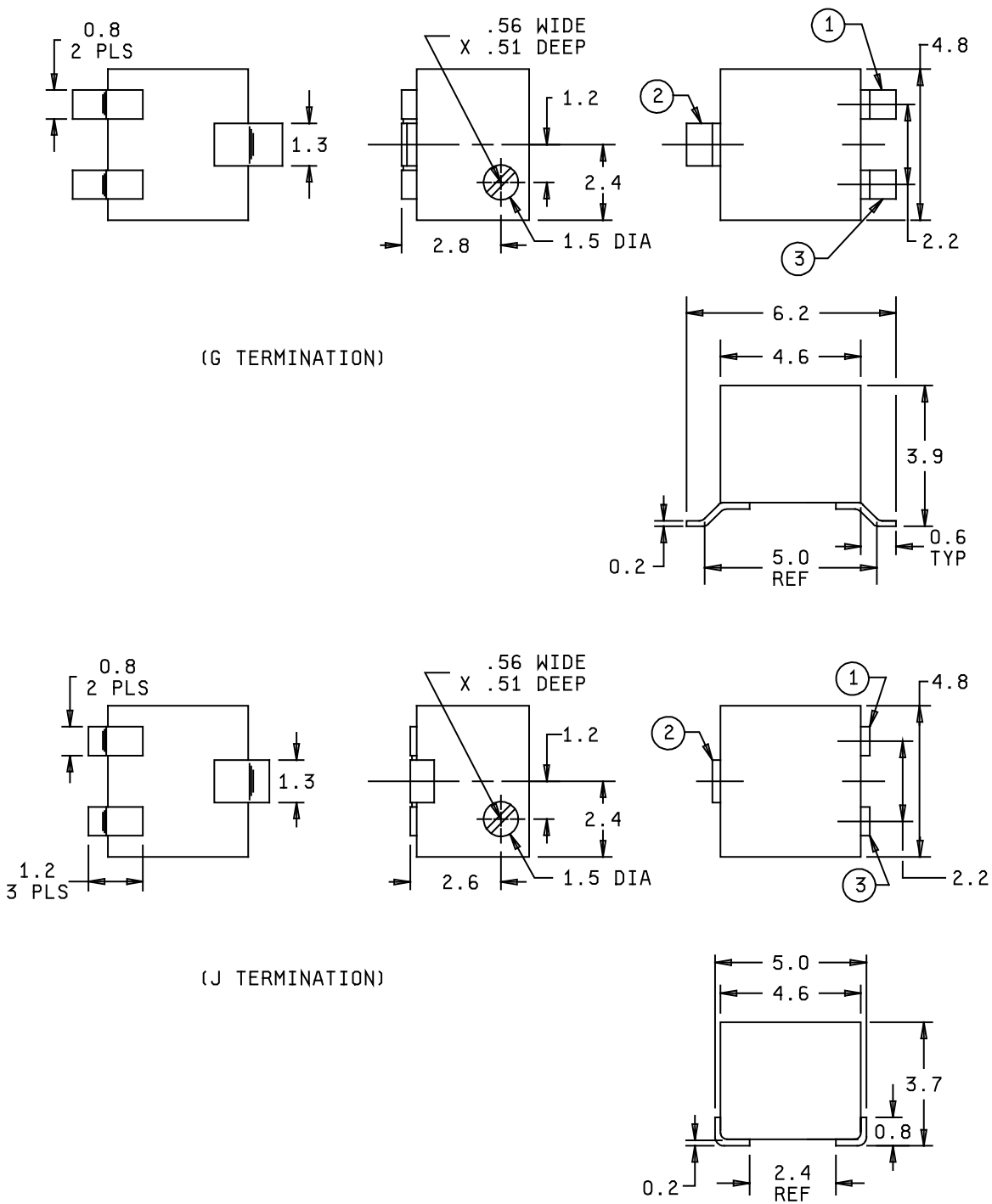
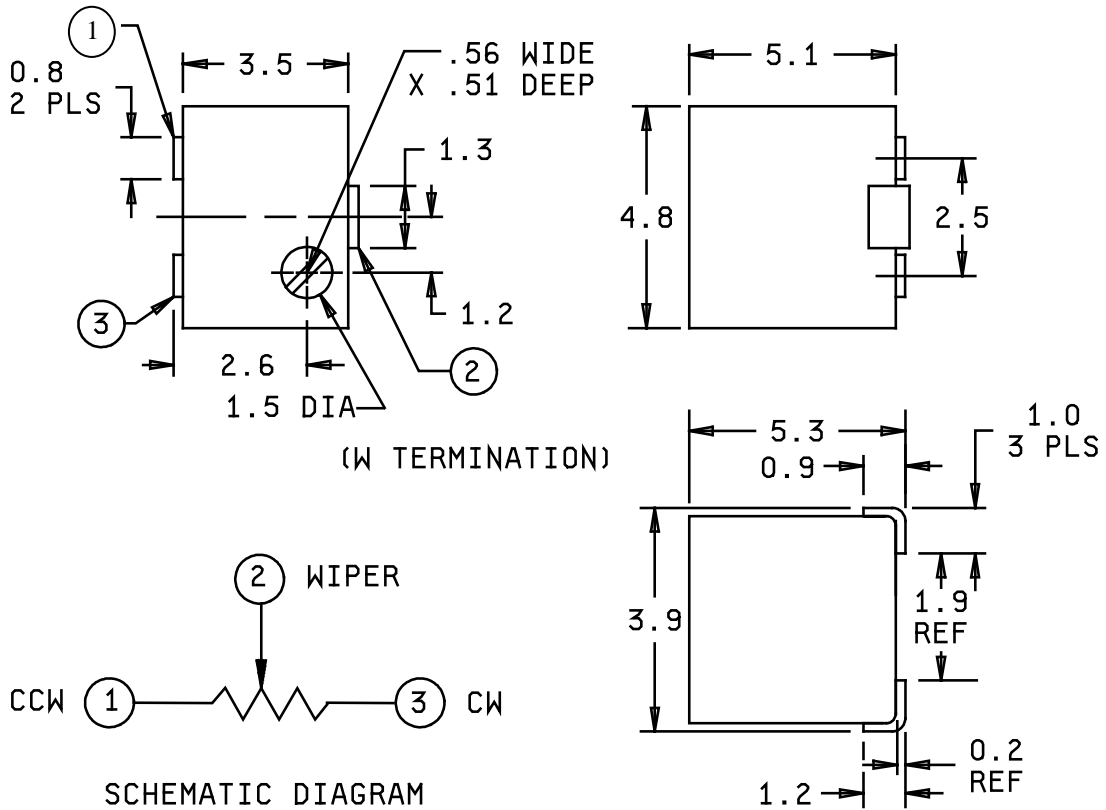


FIGURE 1. Surface mount trimmer.

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mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches
0.20	.008	0.90	.035	1.90	.075	2.80	.110	4.80	.190
0.51	.020	1.00	.039	2.20	.088	3.50	.138	5.00	.195
0.56	.022	1.20	.047	2.40	.095	3.70	.146	5.10	.200
0.60	.023	1.30	.051	2.50	.100	3.90	.154	5.30	.209
0.80	.032	1.50	.060	2.60	.102	4.60	.180	6.20	.244

NOTES:

1. Dimensions are in millimeters.
2. Inches are given for information only.
3. Unless otherwise specified, tolerance is ± 0.3 mm (0.012 inch).

FIGURE 1. Surface mount trimmer – Continued.

3.3 Electrical characteristics.

3.3.1 Resistance range. The resistance range shall be from 10 ohms to 2 megohms. Nominal resistance values are as specified in [table I](#).

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TABLE I. Nominal resistance value and resistance value designation.

Nominal resistance value	Resistance value designation	Nominal resistance value	Resistance value designation
<u>Ohms</u>		<u>Ohms</u>	
10	100	10,000	103
20	200	20,000	203
50	500	50,000	503
100	101	100,000	104
200	201	200,000	204
500	501	500,000	504
1,000	102	1,000,000	105
2,000	202	2,000,000	205
5,000	502		

3.3.2 Resistance tolerance. The resistance tolerance shall be ± 10 percent.

3.3.3 Power rating. The power rating shall be 250 milliwatts at $+85^{\circ}\text{C}$. For operation at temperatures higher than $+85^{\circ}\text{C}$, derate in accordance with [figure 2](#).

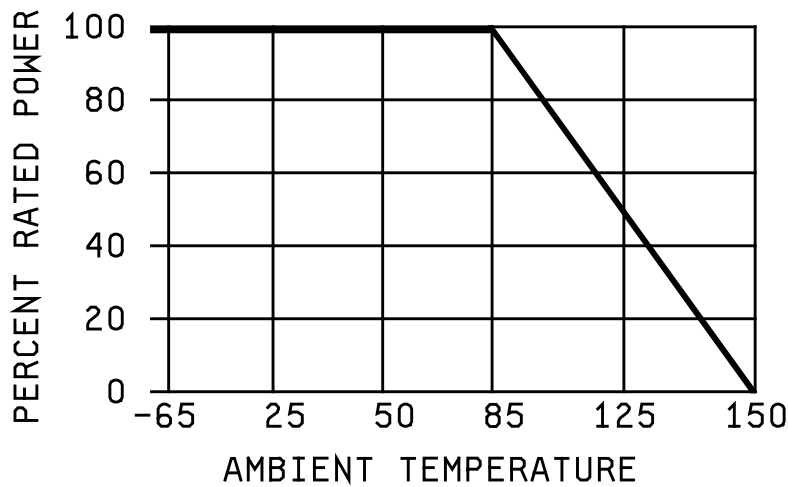


FIGURE 2. Derating curve.

3.3.4 Termination. Resistors are available in J, G, and W terminations in accordance with [figure 1](#).

3.3.5 Pure tin. The use of pure tin, as an underplate or final finish is prohibited both internally and externally. Tin content of resistor 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](#)).

3.3.6 Voltage. The maximum voltage shall be 300 volts.

3.3.7 End resistance. The maximum end resistance shall be 1 percent of the resistance value or 2 ohm, whichever is greater.

3.3.8 Contact resistance variation. The contact resistance variation shall be ± 1 percent of the resistance value or 3 ohms, whichever is greater.

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- 3.3.9 Temperature range. The temperature range shall be -65°C to +150°C.
- 3.3.10 Temperature coefficient. The temperature coefficient shall be ±100 ppm/°C maximum.
- 3.3.11 Insulation resistance. The insulation resistance shall be 100 megohms minimum.
- 3.3.12 Electrical continuity. Electrical continuity shall be continuous for full mechanical range.
- 3.3.13 Resolution. The resolution shall be essentially infinite.
- 3.3.14 Dielectric strength. When resistors are tested as specified in 4.4, there shall be no evidence of mechanical damage, arcing, or breakdown. The leakage current shall not exceed 1 milliampere.
- 3.4 Mechanical characteristics.
- 3.4.1 Actual electrical travel. The actual electrical travel shall be 11 turns nominal.
- 3.4.2 Shaft torque. The maximum shaft torque shall be 180 gm-cm maximum.
- 3.4.3 Rotational life. When resistors are tested as specified in 4.5, the change in total resistance shall not exceed ±3 percent or 3 ohms, whichever is greater. There shall be no evidence of mechanical damage.
- 3.4.4 Resistance to soldering heat. When resistors are tested as specified in 4.6, there shall be no evidence of mechanical damage. The change in resistance shall not exceed 1 percent.
- 3.4.5 Solderability. When resistors are tested as specified in 4.7, there shall be no evidence of mechanical damage.
- 3.5 Environmental characteristics. Environmental characteristics shall be in accordance with MIL-PRF-22097, characteristic F.
- 3.6 Marking. Resistors shall be marked with the PIN assigned herein (see 1.2), and manufacturer's CAGE code (or logo), in accordance with MIL-STD-1285.
- 3.7 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.
- 3.8 Manufacturer eligibility. To be eligible for listing as a approved source of supply, a manufacturer shall be listed on the MIL-PRF-22097 Qualified Products List for at least one part, or perform the group A and group B inspections specified herein on a sample agreed upon by the manufacturer and DSCC-VA.
- 3.8.1 Certificate of compliance. A certificate of compliance shall be required from manufacturers requesting to be listed as an approved source of supply.
- 3.9 Workmanship. Resistors shall be uniform in quality and free from defects that will affect life, serviceability, or appearance.
4. VERIFICATION
- 4.1 Qualification inspection. Qualification inspection is not applicable to this document.
- 4.2 Conformance inspection.
- 4.2.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A and group B inspection of MIL-PRF-22097 (see 6.5).
- 4.2.2 Certification. The acquiring activity may accept a certificate of compliance in lieu of group B inspection (see 6.2d).
- 4.3 Inspection of packaging. Inspection of packaging shall be in accordance with MIL-PRF-22097.

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4.4 Dielectric strength. Dielectric strength shall be in accordance with [MIL-PRF-22097](#). The following details and exceptions shall apply:

- a. 600 V rms: Sea level.
- b. 250 V rms: 80,000 feet.

4.5 Rotational life. Rotational life shall be in accordance with [MIL-PRF-22097](#). The following detail and exception shall apply: 200 cycles.

4.6 Resistance to soldering heat. The requirements for resistance to soldering heat shall be as follows:

- a. Measure total resistance (R_{T1}).
- b. Subject units to 215°C for 3 minutes. (Using boiling FC-70 fluorinated vapors as temperature medium.)
- c. After a minimum of 3 hours, measure total resistance (R_{T2}).
- d. Calculate total resistance shift (TRS) by using the following formula:

$$TRS = \frac{R_{T2} - R_{T1}}{R_{T1}} \times 100$$

- e. This test will be performed before the leads are trimmed and formed into the surface mount terminals.

4.7 Solderability. The requirements for solderability shall be as follows:

- a. Steam age in accordance with [MIL-STD-202](#), method 208, 8 hours.
- b. Apply solder paste of a composition of 60 percent tin, 40 percent lead, to the middle of the terminal. A sufficient amount of paste is a bead that will cover the entire terminal with a minimum of .005 inch (0.13 mm) thickness on the mounting surface.
- c. The entire unit shall then be immersed at a rate of 1 ±.250 inch (25.4 ±6.35 mm) per second into boiling fluorinated vapors (FC-70) at 215°C ±5°C for 30 seconds, and then removed at a rate 1 ±.250 inch per second.
- d. After dipping, clean the flux from the terminal with isopropyl alcohol.
- e. Examine the terminals under 10X magnification.
- f. The terminal mounting area shall be coated with at 95 percent, by a continuous new solder coating, with pin holes and voids not concentrated in any one area and do not exceed 5 percent of total mounting area.

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 that may be helpful, but is not mandatory.)

6.1 Intended use. Resistors 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 the OEM application, described herein are intended to be used in surface mount applications.

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

- a. Complete PIN (see 1.2).
- b. Requirements for delivery: One copy of the conformance inspection data or certification of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- c. Requirements for packaging and packing.
- d. Whether the manufacturer performs the group B tests or provides certification of compliance with group B requirements. If purchase order makes no reference to group B screening the manufacturer will provide a certification of compliance (see 4.2.2).

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 Date code caution note. The approved source of supply's vendor part number used 100% pure tin (see 6.3) on terminals (DSCC drawing 92021, now cancelled) and was not compliant since August 2000. They are now in compliance with this drawing. More details are available from the approved source for any resistor with the vendor's part number and date code before 945C.

6.5 Critical user parameters. For critical user parameters required during the soldering and board cleaning processing, see manufacturing application notes.

6.6 User of record. Coordination of this document for future revisions is coordinated only with the approved source 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 resistor@dla.mil or in writing to: DSCC-VAT, Post Office Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-0552 or DSN 850-0552.

6.7 Approved source of supply. Approved source of supply is listed herein. Additional sources will be added as they become available. Assistance in the use of this drawing may be obtained online at resistor@dla.mil or contact DSCC-VAT, Post Office Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-0552 or DSN 850-0552.

DSCC drawing PIN	Vendors similar designation or type number ^{1/}	Vendor CAGE	Vendor's name and address
10009-****	3224-FL4 (see 6.4)	32997	Bourns, Incorporated 1200 Columbia Avenue Riverside, CA 92507-2114

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

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