

1. SCOPE

1.1 Scope. This drawing describes the requirements for a switching transformer, for use in military equipment.

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



2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

[MIL-PRF-27](#) - Transformers and Inductors (Audio, Power, and High-Power Pulse), General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

- [MIL-STD-130](#) - Identification Marking of U.S. Military Property.
- [MIL-STD-202](#) - Test Methods for Electronic and Electrical Component Parts.
- [MIL-STD-1276](#) - Leads for Electronic Component Parts.

HANDBOOKS

DEPARTMENT OF DEFENSE

[MIL-HDBK-454](#) - General Guidelines for Electronic Equipment.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Defense Automated Printing Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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2.2 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, which are DoD adopted, are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI-Z540.1-94 - Laboratories, Calibration, and Measuring and Test Equipment.
- ISO 10012-1 - Equipment, Quality Assurance Requirements for Measuring - Part 1: Meterological Confirmation System for Measuring Equipment.
- J-STD-004 - Soldering Fluxes, Requirements for.
- J-STD-005 - Soldering Pastes, Requirements for.
- J-STD-006 - Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications, Requirements for.

(Applications for copies should be addresses to the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036-8002.)

(DoD activities may obtain copies of American National Standards from the Defense Automated Printing Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094. The private sector and other Government agencies may purchase copies from The Institute for Interconnecting and Packaging Electronic Circuits (IPC), 2215 Sanders Road, Suite 200 South, Northbrook, IL 60062.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D 5948-96 - Compounds, Molding, Thermosetting.

(Application for copies of ASTM publications should be addressed to the American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA-MW1000-94 - Magnet Wire.

(Application for copies of NEMA publications should be addressed to National Electrical Manufacturers Association Customer Service, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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 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.

3.2 Certificate of compliance. A certificate of compliance shall be required from manufacturers requesting to be a suggested source of supply.

3.3 Mechanical.

3.3.1 Outline and dimensions. See [figure 1](#).

3.3.2 Construction. The device shall be designed to meet the requirements of [MIL-PRF-27](#). The device shall be potted in a molded plastic cup of diallyl phthalate in accordance with [ASTM D 5948-96](#). All materials shall meet the flammability requirements of paragraph [3.3.5](#) herein.

3.3.2.1 Weight. The weight shall not exceed 34 grams.

3.3.2.2 Potting. The potting material shall be such that it will not crack, peel, blister, outgas, or otherwise degrade when subjected to the environments specified herein, and shall be fungus inert (non-nutrient). See paragraphs [3.3.4](#) and [3.3.5](#).

3.3.2.3 Magnet wire. Magnet wire, when used, shall be selected to enable the part to meet the requirements of this specification. It is recommended that [NEMA-MW1000-94](#) to be considered for magnet wire. As a minimum, the magnet wire shall be derated as specified in [3.6](#).

3.3.2.4 Solder and soldering flux. Solder and soldering flux, when used shall be selected to enable the part meet the requirements of this specification. It is recommended that solder and soldering flux to be in accordance with [J-STD-004](#), [J-STD-005](#), and [J-STD-006](#).

3.3.2.5 Terminal leads. The device shall have 18 terminal pins located as specified on [figure 1](#). All pins shall be in accordance with [MIL-STD-1276](#), type LW(0.81)W-52-C2. Internal design shall incorporate antirotational features. All terminals shall be pre-tinned with solder.

3.3.2.6 Mounting. The device shall have 1 threaded insert for mounting and shall be as specified on [figure 1](#).

3.3.2.7 Core. The device's core shall be such that it will allow the device to meet all electrical, mechanical, and environmental requirements specified herein.

3.3.2.8 Coil winding data.

Winding No. 1:	1 strand X 55 turns of 30 AWG magnet wire (1-2)
Winding No. 2:	1 strand X 55 turns of 30 AWG magnet wire (2-3)
Winding No. 3:	1 strand X 7 turns of 30 AWG magnet wire (4-5)
Winding No. 4:	1 strand X 7 turns of 30 AWG magnet wire (5-6)
Winding No. 5:	1 strand X 36 turns of 30 AWG magnet wire (7-8)
Winding No. 6:	1 strand X 36 turns of 30 AWG magnet wire (8-9)
Winding No. 7:	1 strand X 36 turns of 30 AWG magnet wire (10-11)
Winding No. 8:	1 strand X 36 turns of 30 AWG magnet wire (11-12)
Winding No. 9:	1 strand X 36 turns of 30 AWG magnet wire (13-14)

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Winding No. 10: 1 strand X 36 turns of 30 AWG magnet wire (14-15)
 Winding No. 11: 1 strand X 36 turns of 30 AWG magnet wire (16-17)
 Winding No. 12: 1 strand X 36 turns of 30 AWG magnet wire (17-18)

Windings on the same layer shall be bifilar wound.

3.3.3 Marking. Parts or packages shall be marked with the manufacturer's name, symbol or CAGE code and the manufacturer's part number, as a minimum, in accordance with [MIL-STD-130](#).

3.3.4 Material. Unless otherwise specified, all parts, materials and processes shall be controlled by the supplier so that the same quality product shall be repeated form lot to lot. All flux shall be removed prior to potting.

3.3.5 Flammability. The devices shall meet the requirements of [MIL-PRF-27](#).

3.4 Electrical.

3.4.1 Electrical measurements. Not applicable.

3.4.2 Schematic and polarity. See [figure 2](#).

3.4.3 Electrical characteristics. The electrical characteristics shall be as specified in [3.4.3.1](#) through [3.4.3.5](#), inclusive. Unless otherwise specified, these requirements shall apply over the temperature range of -40°C to +125°C.

3.4.3.1 DC resistance. The DC resistance measured at, or corrected to +20°C, shall be as follows:

<u>Terminal No.</u>	<u>DCR (ohms)</u>	<u>Tolerance (percent)</u>
1-2	0.310	±20
2-3	0.310	±20
4-5	0.065	±20
5-6	0.065	±20
7-8	0.220	±20
8-9	0.220	±20
10-11	0.240	±20
11-12	0.240	±20
13-14	0.260	±20
14-15	0.260	±20
16-17	0.260	±20
17-18	0.260	±20

3.4.3.2 Turns ratio. The turns ratio shall be as shown below (N_P/N_S):

<u>Terminal No.</u>	<u>Turns ratio</u>	<u>Tolerance (percent)</u>
1-2:2-3	1.000	±1
1-2:4-5	7.857	±1
1-2:5-6	7.857	±1
1-2:7-8	1.527	±1
1-2:8-9	1.527	±1
1-2:10-11	1.527	±1
1-2:11-12	1.527	±1

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<u>Terminal No.</u>	<u>Turns ratio</u>	<u>Tolerance (percent)</u>
1-2:13-14	1.527	±1
1-2:14-15	1.527	±1
1-2:16-17	1.527	±1
1-2:17-18	1.527	±1

3.4.3.3 Excitation current. When measured at 24 V ac rms and 50 kHz (sinusoid), the excitation current at terminals 1-3 shall be 3 mA rms maximum at 25°C.

3.4.3.4 Insulation resistance. The insulation resistance between all windings, and between windings and insert, and between windings and case, shall be 10 kM ohms minimum after 40 seconds to 60 seconds electrification at 100 V dc. When measured at -40°C, insulation resistance shall be 1 kM ohm minimum.

3.4.3.5 Dielectric strength. With 500 V ac rms and 60 Hz applied for 15 seconds minimum between primary and secondary windings, or between primary windings and insert, or between primary windings and case, there shall be no evidence of arching, flashover, breakdown of insulation, leakage current in excess of 0.5 mA, or damage. With 375 V ac rms and 60 Hz applied for 15 seconds minimum between secondary windings, or between secondary windings and insert, or between secondary windings and case, there shall be no evidence of arching, flashover, breakdown of insulation, leakage of current in excess of 0.5 mA, or damage.

3.5 Environmental. The device shall be capable of withstanding the environmental requirements specified herein.

3.5.1 Temperature extremes.

3.5.1.1 Non-operational (storage). The device shall be capable of withstanding environmental temperatures ranging from -50°C to +155°C.

3.5.1.2 Continuous operation. The device shall operate as specified at environmental temperatures ranging from -40°C to +125°C.

3.5.1.3 Temperature rise. The temperature rise of the device at sea level shall be such that under burn-in conditions, the maximum internal temperature shall not exceed +155°C.

3.5.2 Vibration. The device shall meet all requirements herein during and after exposure to the levels and duration in accordance with [method 214 of MIL-STD-202](#), test condition I through test condition J as modified herein.

3.5.2.1 Mounting. Method of mounting shall be equivalent to the actual application and shall dynamically duplicate the directional orientation as specified on [figure 1](#).

3.5.2.2 Test duration. The test duration shall be three hours per axis.

3.5.2.3 Temperature. The temperature environment shall be +95°C ±5°C.

3.5.3 Shock. The device shall meet all requirements herein during and after exposure to the level and duration in accordance with [method 213 of MIL-STD-202](#), test condition C as modified herein.

3.5.3.1 Mounting. See [3.5.2.1](#).

3.5.3.2 Number of shocks. The number of shocks shall be 6 in each of 3 orthogonal axes (18 total).

3.5.3.3 Temperature. See [3.5.2.3](#).

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3.5.4 Thermal shock. The device shall meet all requirements herein during and after exposure to the thermal shock testing specified in [table II](#).

3.5.5 Altitude. The device shall be suitable for transportation and use (operating/non operating) up to 12,191 meters above sea level.

3.6 Derating. The magnet wire used shall be derated to 500 circular mils/amp as a minimum requirement.

3.7 Workmanship. The transformers shall be processed in such a manner as to be uniform in quality and free of defects that will affect life, serviceability, function or appearance.

4. VERIFICATION

4.1 Sampling and inspection. Unless otherwise specified, sampling and inspection procedures shall be performed in accordance with section 3 and section 4 of DSCC drawing 99002.

4.2 Conformance inspection. Testing of the devices shall consist of the following inspections:

- a. Screening.
- b. Lot acceptance.

4.3 Screening. Devices intended to be supplied to this drawing shall be 100 percent screened to requirements of [table I](#), in the order shown. Defective devices shall be removed from the lot. However, the entire lot shall be rejected if more than 10 percent are defective in any single screening test, or more than 20 percent in all tests. For lots of less than 10 pieces the lot shall be rejected if more than one device is defective in a single screening test or more than 2 devices in all tests.

4.3.1 Rejected lots. Rejected lots shall be dispositioned by the buyer to insure that proper steps are taken to remove any lot related problems, or to further screen the lot to remove defective devices.

4.4 Lot acceptance. Upon successful completion of the screening tests of [4.3](#), each lot of devices intended to be supplied to this drawing shall be subjected to, and pass the group B and group C testing as specified in [4.4.1](#) and [4.4.2](#) respectively. The inspection lot shall be established using the criteria of [MIL-PRF-27](#).

4.4.1 Group B testing. The device shall meet the requirements of [MIL-PRF-27](#).

4.4.1.1 Disposition of test samples. Group B test samples that pass the group B tests and are still within specified electrical tolerances may be shipped as deliverable devices provided the lot passes the group B and group C tests.

4.4.2 Group C testing. Unless otherwise specified on the order document, group C testing shall be performed as specified in [table II](#). The buyer may elect to waive the requirement for group C testing based upon the determination of similarity of the device specified by this drawing to devices qualified by the manufacturer within the past 2 years. Similarity shall be determined using the Appendix to [MIL-PRF-27](#) as a guide.

4.4.2.1 Disposition of test samples. After group C tests are successfully passed, the group C test samples shall be shipped to the buyer; however, the samples shall be clearly identified as such, and boxed separately from the group B test samples and other deliverable devices.

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4.4.3 Failure analysis. If any of the sample devices subjected to the lot acceptance tests fail during testing, a detailed failure analysis shall be conducted to establish the cause of failure and the corrective actions that would eliminate subsequent failures of a similar type.

4.5 Inspection system. The manufacturer shall have an inspection system in accordance with [ANSI-Z540.1-94](#), or [ISO 10012-1](#) or equivalent.

4.6 Reporting.

4.6.1 Screening test. A screening test report which includes attributes data, (see [table I](#) herein), shall accompany each shipment of devices to the buyer. Devices, which fail to meet the screening requirements, shall not be included in the shipment.

4.6.2 Lot acceptance testing. Upon completion of lot acceptance testing, [see 4.4](#), the manufacturer shall prepare a test report in a format acceptable to the buyer. In addition, the buyer shall be notified within 24 hours of any failures which occur during lot acceptance testing.

4.7 Process documentation and control. After initial qualification the manufacturer shall not change the device's design or materials without the prior approval of the buyer. Approval for such changes shall be obtained within 30 days upon notification. Failure to obtain approval may result in rejection and return of all devices produced to the new/revised design.

TABLE I. 100 percent screening.
 $T_A = +25^\circ\text{C} \pm 3^\circ\text{C}$, unless otherwise specified.

Test	Conditions	Data
Internal visual <u>1/</u>	Prior to potting, to supplier's approved procedures	Attributes
Electrical test I (after potting) <u>1/</u>	See 3.2 , all parameters	Attributes
Thermal shock	Method 107 of MIL-STD-202 , condition B, except 10 cycles	Attributes
Electrical test II <u>2/</u>	Reference 3.4.3.1 and 3.4.3.3 through 3.4.3.5 , inclusive	Attributes
Burn-in	Electrical circuit as specified on figure 3 , $T_A = +125^\circ\text{C}$ for 168 hours, minimum	Attributes
Electrical test III	Reference 3.4.3 , excluding 3.4.3.2	Attributes
External visual and mechanical examination	Inspect for: 1. Workmanship in accordance with MIL-HDBK-454 , requirement 9. 2. Compliance with dimensions on figure 1 .	Attributes

1/ Internal visual rejects and/or failures in electrical test I shall not be included in PDA calculation.

2/ This test may be discontinued if accumulated data is sufficient to prove that less than 1 percent of the devices tested fail as a result of the thermal shock test.

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TABLE II. Group C inspection.

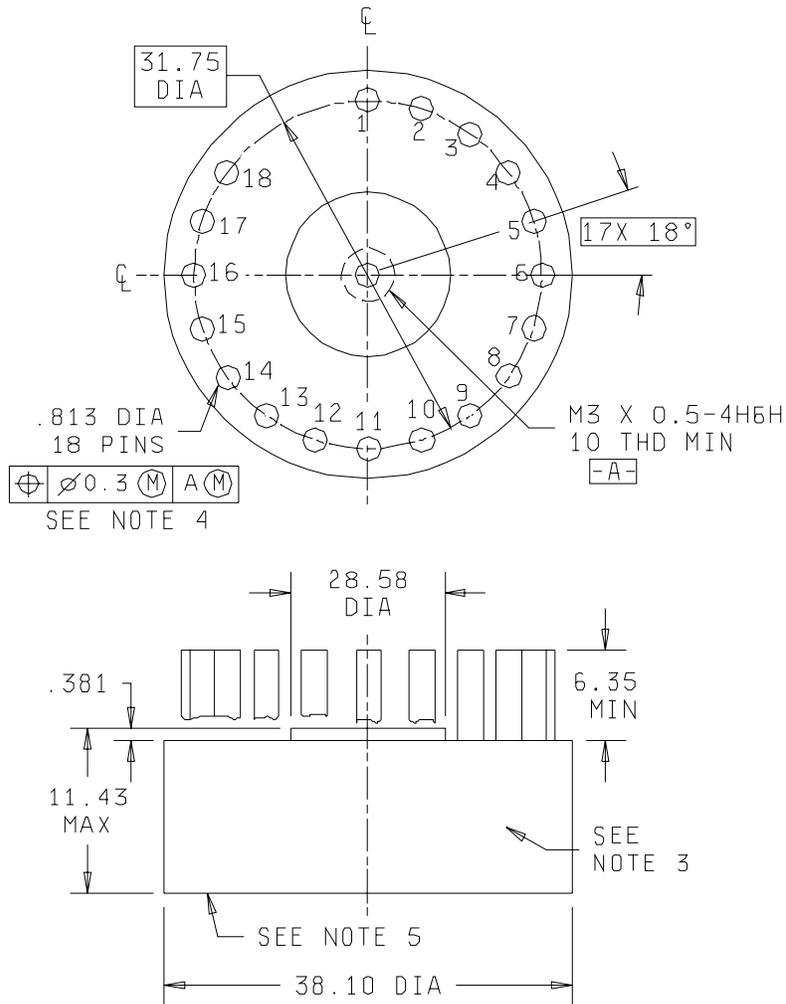
Sample size = 8
 $T_A = +25^{\circ}\text{C} \pm 3^{\circ}\text{C}$, unless otherwise specified

Test	Requirements	Acceptance Criteria
SUBGROUP I – All samples, no defects		
Thermal shock	Method 107 of MIL-STD-202, condition B, except 10 cycles	1/
Resistance to soldering heat	MIL-PRF-27, reference 4.8.5.2	As specified in 4.8.5.2
DC resistance	Reference 3.4.3.1	Within limits
Terminal strength	Method 211 of MIL-STD-202, condition A, 2 pounds	No loosening or rupturing of terminals
Electrical test	Reference 3.4.3, excluding 3.4.3.2	Within limits
SUBGROUP II – 5 samples from subgroup I, no defects		
Vibration	3.5.2, non-operating	1/
Shock	3.5.3, non-operating	1/
Thermal shock	Method 107 of MIL-STD-202, condition B, except 10 cycles, non-operating	1/
DC resistance	Reference 3.4.3.1	Within limits
Immersion	Method 104 of MIL-STD-202, condition A	1/
Moisture resistance	Method 106 of MIL-STD-202, without loading or polarization.	1/
Overload 2/	MIL-PRF-27, reference 3.24	As specified in 3.24
Visual inspection	Standard visual inspection (10 X maximum magnification)	1/
Electrical test	Reference 3.4.3, excluding 3.4.3.2	Within limits
SUBGROUP III – 2 samples of encapsulated units from table I (may be electrical rejects), or 2 samples from subgroup II. No defects.		
Flammability	MIL-PRF-27, reference 3.26	As specified in 3.26
SUBGROUP IV – 3 samples from subgroup I, no defects		
Life	Electrical circuit as specified on figure 3; 1,000 hours at +125°C	
Electrical test	Reference 3.4.3, excluding 3.4.3.2. Measure at 500, 750 and 1,000 hours.	Within limits

1/ No physical damage that affects the mechanical and/or electrical integrity of the device(s).

2/ Perform overload test within 6 hours of completion of the moisture resistance test.

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NOTES:

1. Dimensions are in millimeters.
2. Tolerances .XX = ±0.25, .XXX = ±0.127, angles ±0.5 degrees
3. Numbers for terminations 1 and 18, on this surface, above the respective terminations.
4. Hot solder dipped in accordance with 3.3.2.5 herein.
5. Part marking shall be on the surface.

FIGURE 1. Outline and dimensions

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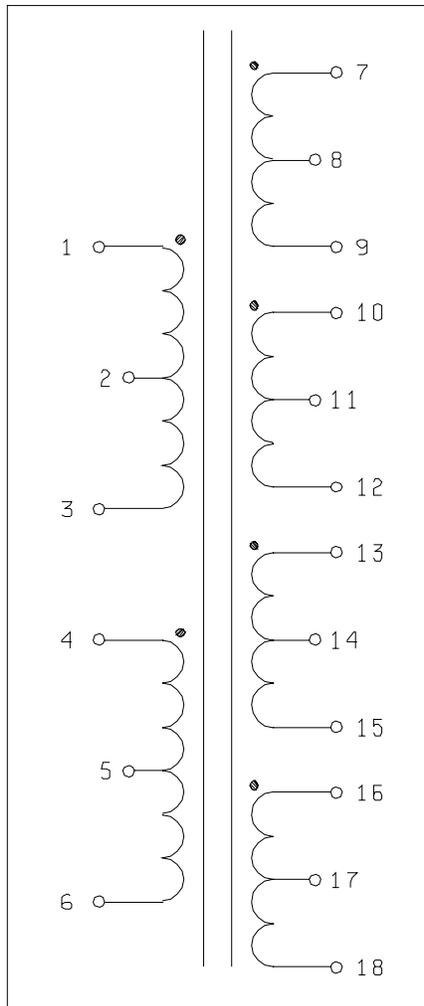
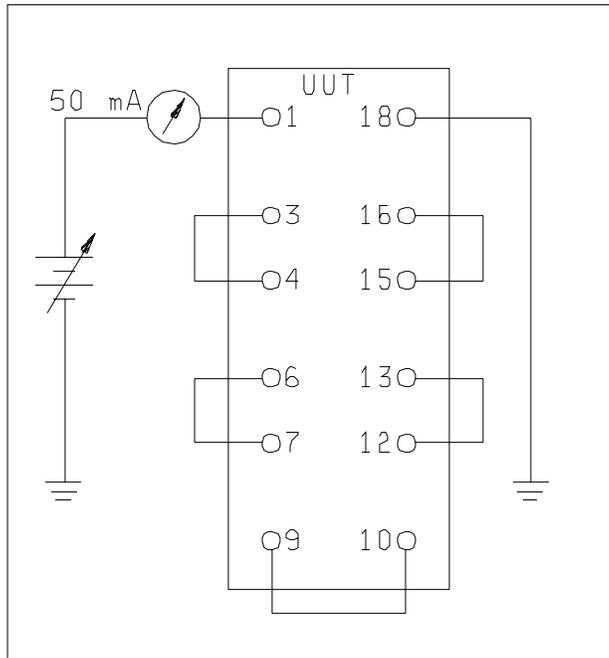


FIGURE 2. Schematic

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 037Z3</p>	<p>DWG NO. 99002</p>
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NOTE: Two or more devices may be connected in series.

FIGURE 3. Burn-in and life test circuit.

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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 actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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.

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.

6.3 Users of record. Coordination of this document for future revisions is coordinated only with the suggested sources of supply and the users of record of this document. Requests to be added as a recorded user of this drawing should be in writing to: Defense Supply Center, Columbus, ATTN: DSCC/VAM, 3990 East Broad Street, Columbus, OH 43213-1199 or by telephone (614) 692-0557 or DSN 850-0557.

6.4 Approved sources of supply. Suggested 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 Transformer@dla.mil, or by contacting Defense Supply Center, Columbus, ATTN: DSCC-VAT, Post Office Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-0557 or DSN 850-0557.

DSCC drawing PIN	Vendor similar designation or type number ^{1/}	Vendor CAGE	Vendor name and address
99002-01	1111	51435	EMS Development Corporation 95 Horse Block Road Yaphank, NY 11980

^{1/} CAUTION: Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

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