

The documentation and process conversion measures necessary to comply with this revision shall be completed by 12 July 1998

INCH-POUND

MIL-PRF-19500/469B  
 12 April 1998  
 SUPERSEDING  
 MIL-S-19500/469A  
 21 October 1993

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, SILICON, HIGH-POWER, SINGLE PHASE,  
 FULL WAVE BRIDGE RECTIFIER TYPES M19500/469-01, -02, -03, -04, -05  
 JAN, JANTX, AND JANTXV

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for silicon, single phase, full wave bridge rectifiers, intended for use in applications at frequencies of 1 kHz or less. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1.

1.3 Maximum ratings.

M19500/469-	$V_{RWM}$	Bridge 1/ $I_{O1}$ at $T_C = +55^\circ\text{C}$	Bridge 2/ $I_{O2}$ at $T_C = +100^\circ\text{C}$	$i_{f(\text{surge})}$ $I_O = 10 \text{ A dc}$ $T_C = +55^\circ\text{C}$ $t_p = 8.3 \text{ ms}$	Barometric pressure reduced
	<u>V (pk)</u>	<u>A dc</u>	<u>A dc</u>	<u>A (pk)</u>	<u>mmHg</u>
01	200	10	6	100	8
02	400	10	6	100	8
03	600	10	6	100	8
04	800	10	6	100	33
05	1,000	10	6	100	33

1/ Derate from 10 A dc at +55°C to 6 A dc at +100°C (88 mA dc/°C)  $t_{rr} = 2.5 \mu\text{s}$  at  $I_F = 0.5 \text{ A}$ ,  $I_R = 1.0 \text{ A}$ ,  $I_{rec} = 0.25 \text{ A}$ .

2/ Derate from 6 A dc at +100°C to 0 A dc at +150°C (120 mA dc/°C).

Operating temperature: -65°C to +150°C.

Storage ambient temperature: -65°C to +150°C.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification 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 documents cited in sections 3 and 4 of this specification, 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 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).

#### SPECIFICATION

##### DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

#### STANDARD

##### MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications or 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 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Associated specification. The individual item performance requirements shall be in accordance with MIL-PRF-19500, and as specified herein.

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows:

n - - - - - number of diodes per leg

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions for the purpose of interchangeability shall be as specified in MIL-PRF-19500 and on figure 1 herein.

3.4.1 Internal construction. The rectifier bridge shall consist of a metal and plastic encased assembly of single or parallel discrete diodes. Each discrete diode shall be a glass-to-metal, ceramic-to-metal, or fused metal oxide-to-metal hermetically sealed package. The silicon die in each discrete diode shall be metallurgically constructed. The completed assembly of diodes and other internal structures shall be encapsulated in a plastic material which polymerizes to a rigid condition by virtue of a chemical cross-linking mechanism. The rectifier bridge shall be free of voids either visible or as evidenced by failure to pass the environment test specified. Only those discrete diodes which have met these requirements shall be used in the rectifier bridge. Discrete diodes shall be manufactured and tested by the rectifier bridge manufacturer. Parallel diodes may be utilized in construction of this device.

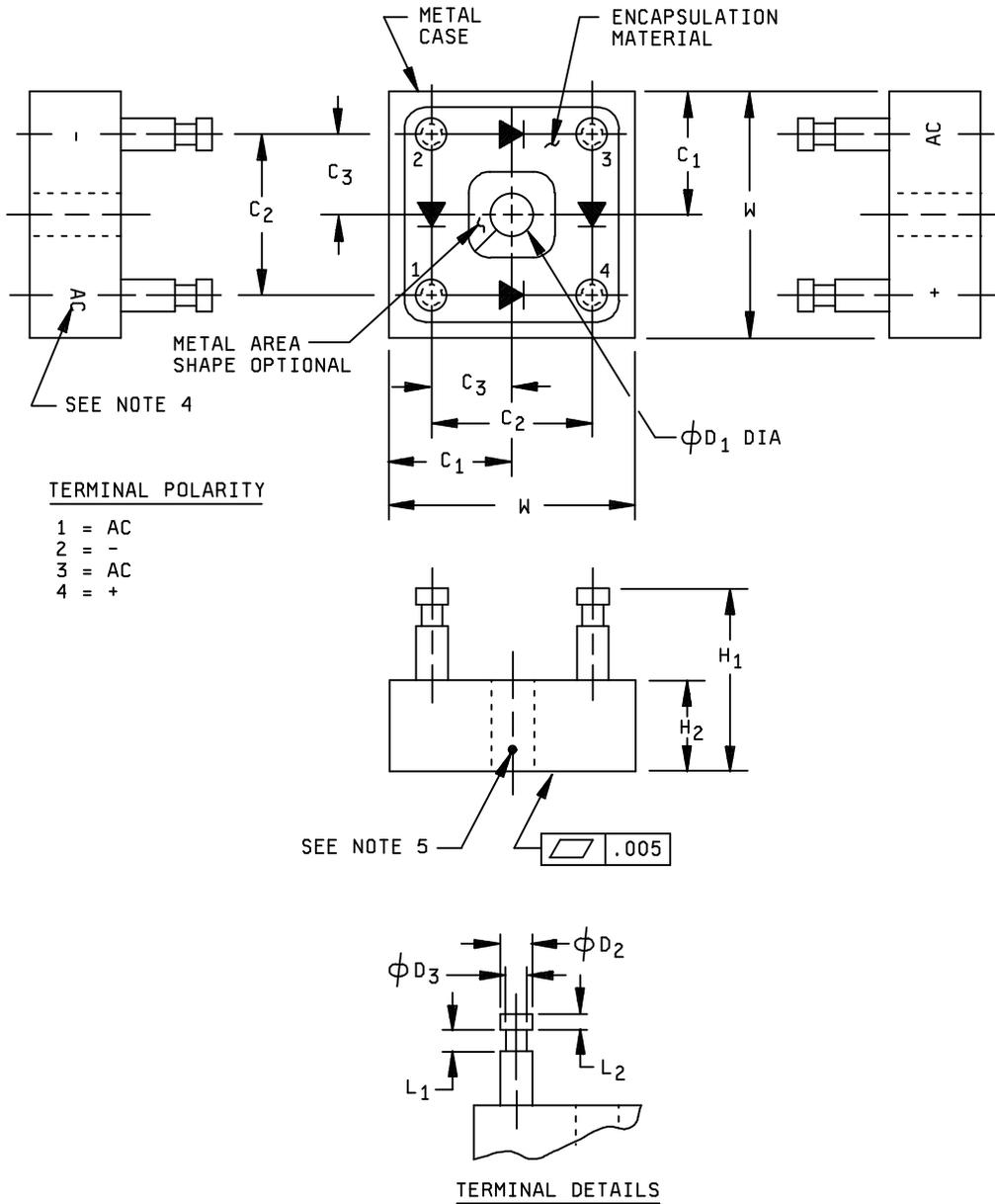


FIGURE 1. Physical dimensions.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
C <sub>1</sub>	.367	.375	9.32	9.53
C <sub>2</sub>	.350	.450	8.89	11.43
C <sub>3</sub>	.173	.225	4.45	5.72
φD <sub>1</sub>	.139	.149	3.53	3.78
φD <sub>2</sub>	.091	.101	2.31	2.57
φD <sub>3</sub>	.066	.076	1.68	1.93
H <sub>1</sub>	---	.570	---	14.48
H <sub>2</sub>	---	.370	---	9.40
L <sub>1</sub>	.088	.098	2.24	2.49
L <sub>2</sub>	.020	.030	0.51	0.76
L <sub>3</sub>	.100	.125	2.54	3.18
W	.735	.750	18.67	19.05

## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Polarity shall be marked on the bridge body adjacent to terminals. Terminal numbers are for reference and do not have to be marked on the bridge; however, terminal (1) shall be indicated by a mechanical index such as a line or flattened corner, visible from the top (terminal surface) of the device.
4. Point at which T<sub>C</sub> is read shall be in metal part of case as shown on drawing.

FIGURE 1. Physical dimensions - Continued.

3.4.2 Terminal finish. Lead finish shall be solderable in accordance with MIL-PRF-19500 and MIL-STD-750. Where a choice of terminal finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4.3 Parallel diode construction. For bridge design that employs more than one diode per leg and  $n$  equals the number of diodes per leg, the following matching conditions must be approved by the qualifying activity.

- a. Individual diode  $V_F$  matching at least the minimum rated room temperature  $I_O$ . The  $V_F$  must be to within 20 mV on each diode.
- b. Thermal impedance matching.
- c. Similar diode families types must be utilized.
- d. Care must be utilized in the design to ensure similar lead lengths and uniform heat paths, so that all diodes in each leg are at similar temperatures.

3.5 Marking. Devices shall be marked as specified in MIL-PRF-19500.

3.5.1 Polarity. Polarity shall be as marked on figure 1.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in 4.4.2 and 4.4.3.

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3)
- c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

4.3 Screening (JANTX level only). Screening shall be in accordance with MIL-PRF-19500 (Appendix E, table IV), and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

4.3.1 Discrete diode screening. 100 percent of the internal discrete diodes shall be subjected to the following.

Screen (see appendix E, table IV of MIL-PRF-19500)	Measurement
	JANTX and JANTXV levels
1/	Thermal impedance (see 4.5.7)
9	Not applicable
11	$I_{R1}$ and $V_{F1}$
12	See 4.3.1.1
13 2/	Subgroup 2 of table I herein. $\Delta V_{F1} = \pm 0.1$ V dc; $\Delta I_{R1} = 100$ percent of initial value or $\pm 250$ nA dc, whichever is greater.

- 1/ Shall be performed anytime before screen 3.  
2/ Except thermal impedance, if already performed.

4.3.1.1 Power burn-in conditions. Power burn-in conditions are as follows MIL-STD-750, method 1038, test condition B,  $T_A$  = room ambient as defined in the general requirements and mounting conditions of MIL-STD-750 (see 4.5),  $V_{RWM}$  = rated  $V_{RWM}$  (see 1.3),  $I_O = 3$  A dc,  $f = 60$  Hz. See 4.5.1 for mounting conditions.

4.3.2 Assembly screening. 100 percent of the completed assemblies shall be subjected to the following.

Screen (see appendix E, table IV of MIL-PRF-19500)	Measurement
	JANTX level
	MIL-STD-750, method 1061, condition F
End point electricals 1/	Subgroup 2 of table I herein.
Dielectric withstanding voltage	See 4.5.1

- 1/ Except thermal impedance.

4.4 Conformance inspection. Conformance inspection shall be performed on the finished rectifier assemblies in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with appendix E, table V of MIL-PRF-19500 and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table VIb (JANTX) of MIL-PRF-19500, and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.2.1 Group B inspection, appendix E, table VIb of MIL-PRF-19500.

Subgroup	Method	Conditions
B2	1051	Condition F, 25 cycles.
B2	1071	Not applicable
B3	1027	$I_0 = 0$ A dc; $T_A = +150^\circ\text{C}$ ; $V_{RWM} = \text{rated } V_{RWM}$ (see 1.3), $f = 60$ Hz, sampling plan = 10.
B5		Operational thermal cycling, (see 4.5.8).
B5	3105	Junction temperature test (see 4.5.4).
B6		Not applicable.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.3.1 Group C inspection, appendix E, table VII of MIL-PRF-19500.

Subgroup	Method	Conditions
C2	1056	Not applicable.
C2	2036	Test condition A, 6 pounds, $t = 30$ seconds.
C2	2036	Test condition D1, $t = 10$ seconds, 16 inch-pounds.
C2	1071	Not applicable.
C5	1001	Pressure = 8 mm Hg (469-01 through 03); 33 mm Hg (469-04, 05), $I_R = 2.0$ $\mu\text{A}$ dc maximum, $V_R = \text{rated } V_{RWM}$ (see 1.3), (applied between all terminals to the case); sampling plan = 15, $c = 0$ .
C6	1026	$I_0 = 0$ A dc; $T_A = 150^\circ\text{C}$ ; $V_{RWM} = \text{rated } V_{RWM}$ (see 1.3), $f = 60$ Hz.
C7	4066	$V_{RWM} = 0$ V, bridge $I_0 = 10$ A dc (entire bridge biased); $T_C = 55^\circ\text{C} + 10^\circ\text{C}, - 0^\circ\text{C}$ ; IFSM = 100 A (pk) (each device per bridge leg); $t_p = 8.3$ ms; 10 surges per leg at maximum 1 minute intervals; sampling plan = 10.  Alternate condition: Each leg may be biased separately to $I_0 = 5$ A dc per leg. All other conditions the same as above.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables as follows.

4.5.1 Mounting.

4.5.1.1 Mounting conditions. The diodes shall be suspended by the leads with at least 6 inches of no. 22 or smaller wire between each lead and the power source. The connecting wires may be soldered to the leads, or MS27491-20 contacts may be used. Other clips may be used provided they have equal or less mass than the MS27491-20 contact. No forced air shall be permitted and the diodes shall be shielded from drafts.

4.5.1.2 Alternate mounting conditions. At the option of the manufacturer, other chip or heat sink mounting configurations may be utilized provided that  $I_0$  is adjusted such that the junction temperature of each diode is maintained at least  $120^\circ\text{C}$  above the specified ambient temperature of  $25^\circ\text{C}$ .

4.5.2 Dielectric withstanding voltage. This test shall be performed with the metal case of the assembly connected to ground and all four terminals connected to the high potential side of a DC power supply or a scope display test set. The voltage applied between the terminals and the case, shall be 2,800 volts, and shall be held at that level for 10 seconds. Any discontinuity or dynamic instability of the trace, or a breakdown current in excess of 10  $\mu$ A dc, shall be cause rejection.

4.5.3 Junction temperature test. This test shall be performed in accordance with method 3105 of MIL-STD-750. The maximum junction temperature for any diode in the bridge at the below specified conditions shall be 175°C maximum. The test conditions shall be as follows:

$$T_C = 55^\circ\text{C}, I_O = 10 \text{ A dc}, I_{\text{ref}} = 10 \text{ mA dc or } T_C = 100^\circ\text{C}, I_O = 6 \text{ A dc}, I_{\text{ref}} = 10 \text{ mA dc.}$$

4.5.4 Reverse-recovery time and trace. See MIL-STD-750, method.

4.5.5 Scope display evaluation. The reverse breakdown characteristics shall tested per method 4023 of MIL-STD-750. The test conditions shall be as follows: Vertical sensitivity: 5 to 20  $\mu$ A/division; horizontal sensitivity: 50 to 200 V/division. Reverse current over the knee shall be at least 50  $\mu$ A. Each device shall exhibit a sharp knee characteristic and any discontinuity or dynamic instability of the trace shall be cause for rejection."

4.5.6 Thermal response.  $\Delta V_F$  measurement shall be performed in accordance with method 3101 of MIL-STD-750. The following parameters shall apply:

- a. Measurement current ( $I_M$ ) ..... 10 mA.
- b. Heating current ( $I_H$ ) ..... 3 A minimum.
- c. Heating time ( $t_H$ ) ..... 10 ms.
- d. Measurement time delay ( $t_{MD}$ ) ..... 100  $\mu$ s maximum.

The maximum limit for  $Z_{\theta X}$  under these test conditions is 1.5  $^\circ\text{C}/\text{W}$ .

4.5.7 Operational thermal cycling. This test shall be performed by connecting a three phase 60 Hz sine wave input of 10 to 20 volts rms to the ac terminals of the bridge. The resistive load shall be made variable in order to maintain a rated bridge output current of 10 amperes. Bridge case temperature shall be maintained at 55°C except during the cooling cycle when case temperature shall be permitted to drop 20°C maximum. Life-test duration shall be 2,000 cycles with a heating time of 8 minutes, +2, -0 minutes and a cooling time  $\geq$  2 minutes.

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Forward voltage <u>2/</u>	4011	$I_F = 15.7 \text{ A dc (pk)}$ $t_p = 8.3 \text{ ms};$ duty cycle $\leq 2$ percent	$V_{F1}$		1.35	V (pk)
Reverse current <u>2/</u>	4016	DC method; $V_R = \text{rated}$ $V_{RWM}$ (see 1.3)	$I_{R1}$			
Bridge leg					20	$\mu\text{A dc}$
Breakdown voltage <u>2/</u>	4021	$I_R = 50 \mu\text{A dc}$	$V_{(BR)1}$			
M19500/469-01				200		V dc
M19500/469-02				400		V dc
M19500/469-03				600		V dc
M19500/469-04				800		V dc
M19500/469-05				1,000		V dc
Thermal impedance	3101	See 4.5.7	$Z_{\theta JX}$		1.5	$^{\circ}\text{C/W}$
<u>Subgroup 3</u>						
High temperature operation:		$T_C = 100^{\circ}\text{C}$				
Breakdown voltage <u>2/</u>	4021	$I_R = 50 \mu\text{A dc}$	$V_{(BR)1}$			
M19500/469-01				200		V dc
M19500/469-02				400		V dc
M19500/469-03				600		V dc
M19500/469-04				800		V dc
M19500/469-05				1,000		V dc
Reverse current/leg	4016	DC method; $V_R = \text{rated } V_{RWM}$ (see 1.3)	$I_{R2}$		125	$\mu\text{A dc}$
Low temperature operation:		$T_A = -65^{\circ}\text{C}$				
Forward voltage /leg	4011	$I_F = 15.7 \text{ A (pk)};$ $t_p = 8.3 \text{ ms}$	$V_{F2}$		1.5	V (pk)

See notes at end of table.

TABLE I. Group A inspection. Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> Dielectric withstanding voltage	4031	See 4.5.3	$t_{rr}$		2.5	$\mu s$
Reverse recovery time		Condition B, $I_F = 0.5$ A, $I_R = 1.0$ A, $I_{rec} = 0.25$ A				
<u>Subgroups 5 and 6</u> Not applicable						
<u>Subgroup 7</u> Scope display evaluation	4023	See 4.5.6, sample size: 116 devices, c = 0				

1/ For sampling plan, see MIL-PRF-19500.

2/ Applies to each discrete diode and each bridge leg.

TABLE II. Groups B and C electrical measurements. 1/ 2/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	Pulse width = 8.3 ms maximum, duty cycle $\leq$ 2 percent maximum; $I_F = 15.7$ A dc	$V_{F1}$		1.35	V dc
2.	Reverse current	4016	DC method; $V_R =$ rated $V_{RWM}$ (see 1.3)	$I_{R1}$		2.0	$\mu$ A dc
3.	Forward voltage	4011	Pulse width = 8.3 ms maximum; duty cycle $\leq$ 2 percent maximum; $I_F = 15.7$ A dc	$\Delta V_{F1}$		$\pm 0.1$	V dc
4.	Reverse current	4016	DC method; $V_R =$ rated $V_{RWM}$ (see 1.3)	$\Delta I_{R1}$		$\pm 250$	nA dc

1/ The electrical measurements for appendix E, table VIb (JANTX) of MIL-PRF-19500 are as follows:

- a. Subgroup 2, see table II herein, steps 1 and 2.
- b. Subgroup 3, see table II herein, steps 1 and 2.
- c. Subgroup 5, see table II herein, steps 1 and 2.
- d. Subgroup 6, see table II herein, steps 1 and 2.

2/ The electrical measurements for appendix E, table VII of MIL-PRF-19500 are as follows:

- a. Subgroup 2, see table II herein, steps 1 and 2.
- b. Subgroup 5, see table II herein, steps 1 and 2.
- c. Subgroup 6, see table II herein, step 1.

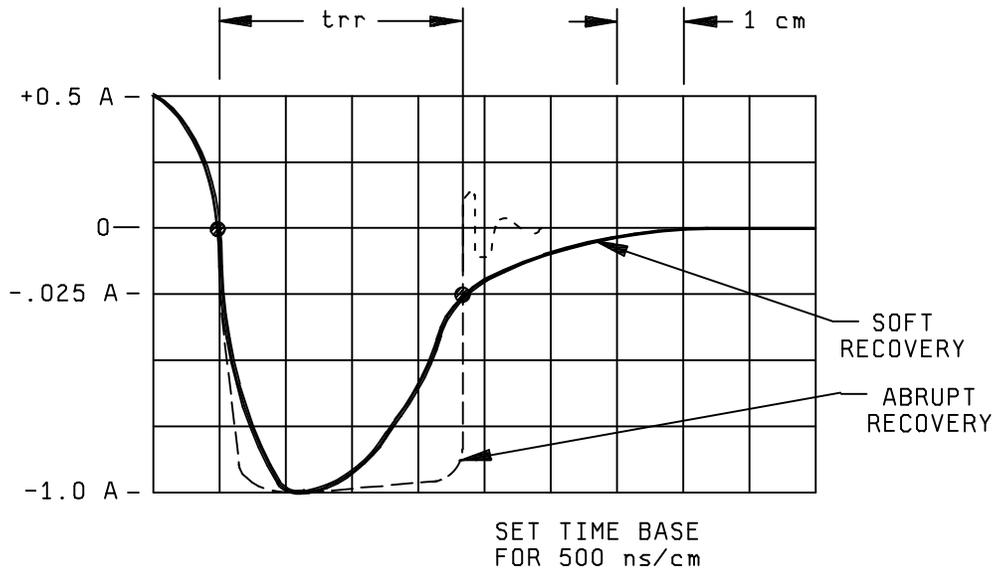


FIGURE 2. Reverse recovery test circuit and characteristic waveform.

1. Purpose: To verify that  $T_J \leq +175^\circ\text{C}$  at maximum rated current and specified case temperature.
2. Test circuit:

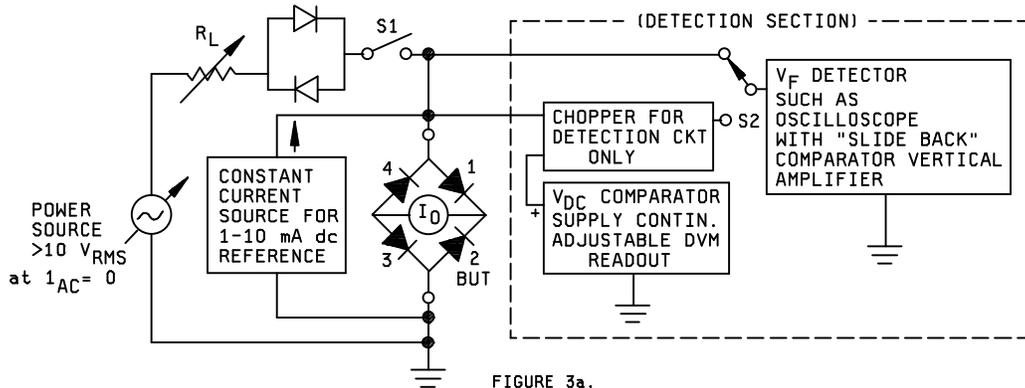


FIGURE 3a.

Procedure:

- a. With  $S_1$  open, and B.U.T. at  $175^\circ\text{C}$ , read  $V_{F1}$  at reference current.
- b. With device held at a case temperature, close  $S_1$  and adjust power source and  $R_L$  for maximum rate  $I_{0(\text{ave.})}$ . Establish thermal equilibrium.
- c. Observe  $V_{F2}$  in accordance with figure 3c using the same reference current ( $\pm 1$  percent) as in a.
- d. With  $S_2$  "up" locate the correct position for reading  $V_{F2}$  (see figure 3b).
- e. With  $S_2$  "down", adjust comparator supply to line up  $V_{F2}$  with comparator trace (see figure 3c).
- f. Read  $V_{F2}$  on digital voltmeter.
- g. Acceptance criterion:
- h.  $V_{F2}$  shall be  $\geq V_{F1}$ . (Indicated  $T_J \leq 175^\circ\text{C}$ ).

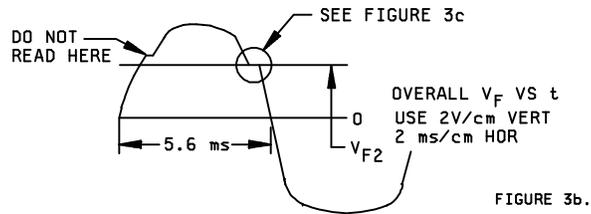


FIGURE 3b.

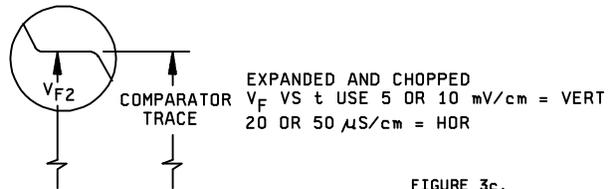


FIGURE 3c.

FIGURE 3. Junction temperature test for bridge rectifier.

5. PACKAGING

5.1 Packaging. Packaging shall prevent mechanical damage of the devices during shipping and handling and shall not be detrimental to the device. When actual packaging of material 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 Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

5.2 Marking. Unless otherwise specified (see 6.2), marking shall be in accordance with MIL-PRF-19500.

6. NOTES

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

6.1 Notes. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. See MIL-PRF-19500.

6.3 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:  
Army - CR  
Navy - EC  
Air Force - 17  
NASA - NA

Preparing activity:  
DLA - CC  
(Project 5961-1775)

Review activities:  
Army - AR  
Navy - AS, CG, MC  
Air Force - 19, 85, 99

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**

**INSTRUCTIONS**

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>I RECOMMEND A CHANGE:</b>	<b>1. DOCUMENT NUMBER</b> MIL-PRF-19500/469B	<b>2. DOCUMENT DATE (YYMMDD)</b> 980412
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**3. DOCUMENT TITLE** SEMICONDUCTOR DEVICE, SILICON, HIGH-POWER, SINGLE PHASE, FULL WAVE BRIDGE RECTIFIER, PART NUMBERS M19500/469-01 THROUGH M19500/469-05 JAN, JANTX AND JANTXV

**4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)**

**5. REASON FOR RECOMMENDATION**

**6. SUBMITTER**

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) Commercial: DSN: FAX: EMAIL:	7. DATE SUBMITTED

**8. PREPARING ACTIVITY**

a. Point of contact: Alan Barone	b. TELEPHONE (Include Area Code) Commercial                      DSN                      FAX                      EMAIL (614)692-0510                      850-0510                      (614)692-6939                      alan_barone@dscclia.mil
c. ADDRESS: Defense Supply Center Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000	<b>IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:</b> Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340    DSN 289-2340