

The documentation and process conversion measures necessary to comply with this revision shall be completed by 18 January 2002.

INCH-POUND

MIL-PRF-19500/477D  
 18 October 2001  
 SUPERSEDING  
 MIL-PRF-19500/477C  
 13 January 1999

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, FAST RECOVERY, POWER RECTIFIER,  
 TYPES 1N5802, 1N5804, 1N5806, 1N5807, 1N5809, AND 1N5811,  
 1N5802US, 1N5804US, 1N5806US, 1N5807US, 1N5809US, AND 1N5811US  
 JAN, JANTX, JANTXV, JANJ, JANS, JANHC, AND JANKC

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, fast recovery, power rectifier diodes. Five levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for each unencapsulated device type.

1.2 Physical dimensions. See figures 1 through 10.

1.3 Maximum ratings. Unless otherwise specified,  $T_A = +25^\circ\text{C}$ .

1.3.1 Ratings applicable to all Part or Identifying Numbers (PIN).

$T_{\text{STG}} = -65^\circ\text{C}$  to  $+175^\circ\text{C}$ .

$T_{\text{op}} = -65^\circ\text{C}$  to  $+175^\circ\text{C}$ .

$T_{\text{J(max)}} = +200^\circ\text{C}$ .

1.3.2 Ratings applicable to individual types.

Types	$V_{\text{RWM}}$	$I_{\text{O1}}$ $T_L = +75^\circ\text{C}$ $L = .375$ in. (9.52 mm) (1)	$I_{\text{O2}}$ $T_A = +55^\circ\text{C}$ (2)	$I_{\text{FSM}}$ at $+25^\circ\text{C}$ Operating at $I_{\text{O2}}$ $t_p = 8.3$ ms	$t_{\text{rr}}$	$R_{\theta\text{JL}}$ at $L = .375$ in. (9.52 mm)	$R_{\theta\text{JEC}}$ (3)
1N5802, 1N5802US	50	2.5 A (4)	1.0 A (5)	35 A(pk)	25 ns	36°C/W	20°C/W
1N5804, 1N5804US	100	2.5 A (4)	1.0 A (5)	35 A(pk)	25 ns	36°C/W	20°C/W
1N5806, 1N5806US	150	2.5 A (4)	1.0 A (5)	35 A(pk)	25 ns	36°C/W	20°C/W
1N5807, 1N5807US	50	6.0 A (6)	3.0 A (7)	125 A(pk)	30 ns	22°C/W	10°C/W
1N5809, 1N5809US	100	6.0 A (6)	3.0 A (7)	125 A(pk)	30 ns	22°C/W	10°C/W
1N5811, 1N5811US	150	6.0 A (6)	3.0 A (7)	125 A(pk)	30 ns	22°C/W	10°C/W

See notes on next page.

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

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FSC 5961

1.3.2 Ratings applicable to individual types - Continued.

- (1)  $T_{EC} = T_L$  at  $L = 0$  or  $T_{end\ tab}$  for US suffix devices.
- (2) This rating is typical for PC boards where thermal resistance from mounting point to ambient is sufficiently controlled where  $T_{OP}$  and  $T_{J(max)}$  in paragraph 1.3 are not exceeded.
- (3) US suffix devices only.
- (4) Derate at 25 mA/°C for  $T_L$  above +75°C.
- (5) Derate at 8.33 mA/°C for  $T_A$  above +55°C.
- (6) Derate at 60 mA/°C for  $T_L$  above +75°C.
- (7) Derate at 25 mA/°C for  $T_A$  above +55°C.

1.4 Primary electrical characteristics. Unless otherwise specified,  $T_A = +25^\circ\text{C}$ .

Types	$V_{BR}$	$I_{R1}$ at $V_R = V_{RWM}$	$I_{R2}$ at $V_R = V_{RWM}$
		$T_A = +25^\circ\text{C}$	$T_A = +100^\circ\text{C}$
	<u>(V dc)</u>	<u>μA dc</u>	<u>μA dc</u>
1N5802, 1N5802US	60	1.0	50
1N5804, 1N5804US	110	1.0	50
1N5806, 1N5806US	160	1.0	50
1N5807, 1N5807US	60	5.0	150
1N5809, 1N5809US	110	5.0	150
1N5811, 1N5811US	160	5.0	150

## 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

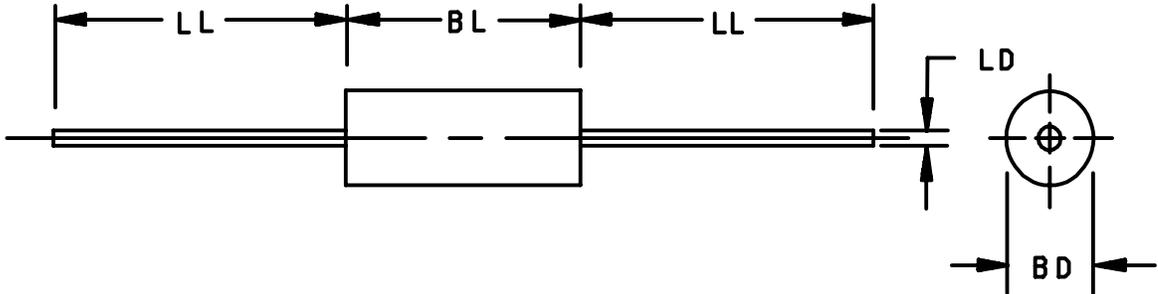
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

## STANDARD

## DEPARTMENT OF DEFENSE

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

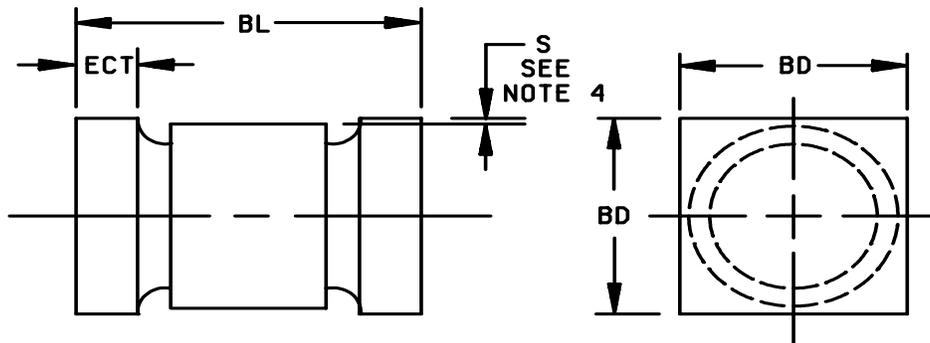


Ltr.	Dimensions								Notes
	1N5802, 1N5804, 1N5806				1N5807, 1N5809, 1N5811				
	Inches		Millimeters		Inches		Millimeters		
	Min	Max	Min	Max	Min	Max	Min	Max	
BD	.065	.085	1.65	2.16	.115	.165	2.92	4.19	4
BL	.125	.250	3.18	6.35	.130	.300	3.30	7.62	3
LD	.027	.032	0.69	0.81	.037	.042	0.94	1.07	3
LL	.700	1.30	17.78	33.02	.900	1.30	22.86	33.02	

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimension LD shall include the sections of the lead over which the diameter is uncontrolled. This uncontrolled area is defined as the zone between the edge of the diode body and extending .050 inch (1.27 mm) onto the leads.
4. Dimension BD shall be measured at the largest diameter.
5. In accordance with ANSI Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 1. Physical dimensions.

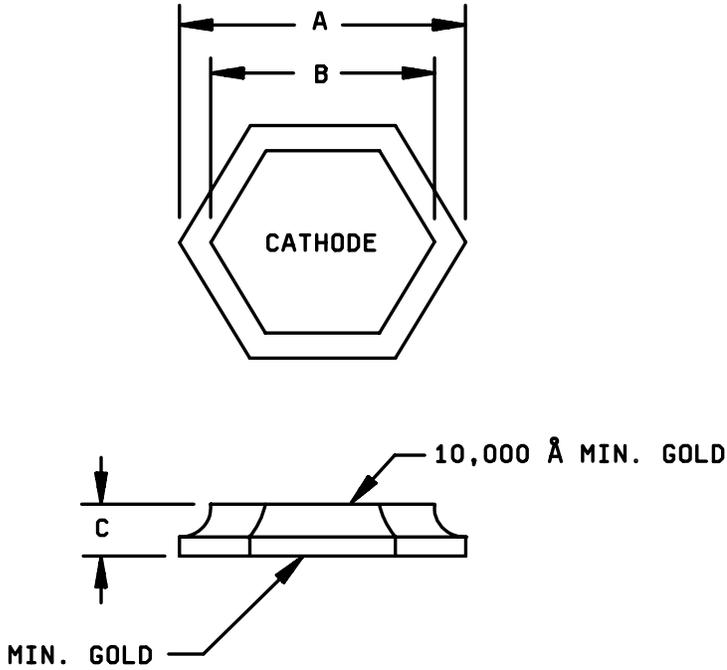


Ltr.	Dimensions								Notes
	D-5A 1N5802US, 1N5804US, 1N5806US				D-5B 1N5807US, 1N5809US, 1N5811US				
	Inches		Millimeters		Inches		Millimeters		
	Min	Max	Min	Max	Min	Max	Min	Max	
BD	.091	.103	2.31	2.62	.137	.148	3.48	3.76	
BL	.168	.200	4.27	5.08	.200	.225	5.08	5.72	
ECT	.019	.028	0.48	0.71	.019	.028	0.48	0.71	
S	.003		0.80		.003		0.80		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Gap not controlled, shape of body and gap not controlled.
4. Dimensions are pre-solder dip.
5. Cathode marking to be either in color band, three dots spaced equally, or a color dot on the face of the end tab.
6. Color dots will be .020 inch (0.51 mm) diameter minimum and those on the face of the end tab shall not lie within .020 inch (0.51 mm) of the mounting surface.
7. In accordance with ANSI Y14.5M, diameters are equivalent to  $\phi$ x symbology.

FIGURE 2. Physical dimensions of surface mount family.



Ltr.	Dimensions								Notes
	1N5802, 1N5804, 1N5806				1N5807, 1N5809, 1N5811				
	Inches		Millimeters		Inches		Millimeters		
	Min	Max	Min	Max	Min	Max	Min	Max	
A	.047	.053	1.19	1.35	.085	.091	2.16	2.31	
B	.033	.037	0.84	0.94	.072	.076	1.83	1.93	
C	.007	.011	0.18	0.28	.007	.011	0.18	0.28	

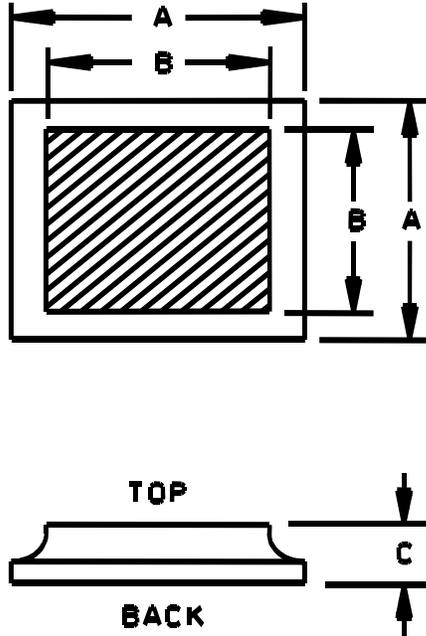
Metallization:

Top: (Anode). . . . . 10,000 Å Gold min.  
 Back (Cathode). . . . . 4,000 Å Gold min.

NOTES:

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

FIGURE 3. JANC (A-version) die dimensions.



Ltr.	Dimensions								Notes
	1N5802, 1N5804, 1N5806				1N5807, 1N5809, 1N5811				
	Inches		Millimeters		Inches		Millimeters		
A	.031	.037	0.79	0.94	.062	.068	1.57	1.73	
B	.017	.023	0.43	0.58	.050	.056	1.27	1.42	
C	.008	.012	0.20	0.30	.008	.012	0.20	0.30	

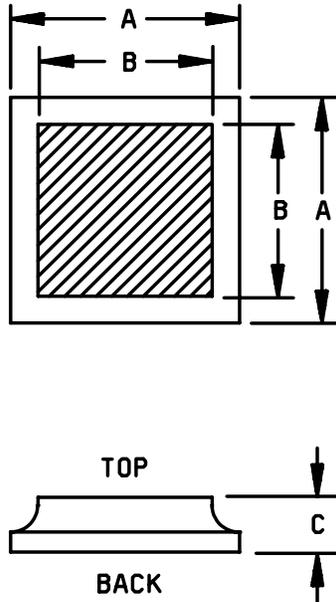
Metallization:

Top: (Anode). . . . . Aluminum  
 Back (Cathode). . . . . Gold

NOTES:

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

FIGURE 4. JANC (B-version) die dimensions.



Ltr.	Dimensions								Notes
	1N5802, 1N5804, 1N5806				1N5807, 1N5809, 1N5811				
	Inches		Millimeters		Inches		Millimeters		
	Min	Max	Min	Max	Min	Max	Min	Max	
A	.031	.037	0.79	0.94	.062	.068	1.57	1.73	
B	.017	.023	0.43	0.58	.050	.056	1.27	1.42	
C	.008	.012	0.20	0.30	.008	.012	0.20	0.30	

DESIGN DATA

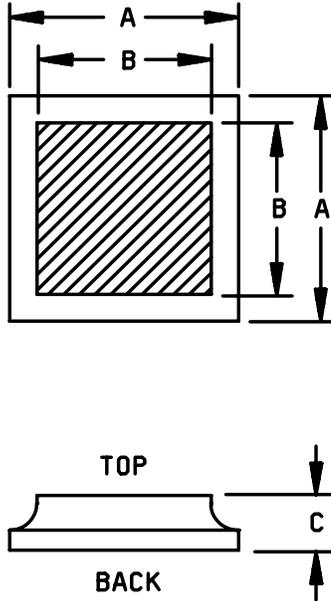
Metallization:

Top: (Anode)..... Aluminum  
 Back (Cathode)..... Silver

NOTES:

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

FIGURE 5. JANC (C-version) die dimensions.



Ltr.	Dimensions								Notes
	1N5802, 1N5804, 1N5806				1N5807, 1N5809, 1N5811				
	Inches		Millimeters		Inches		Millimeters		
	Min	Max	Min	Max	Min	Max	Min	Max	
A	.031	.037	0.79	0.94	.062	.068	1.57	1.73	
B	.017	.023	0.43	0.58	.050	.056	1.27	1.42	
C	.008	.012	0.20	0.30	.008	.012	0.20	0.30	

DESIGN DATA

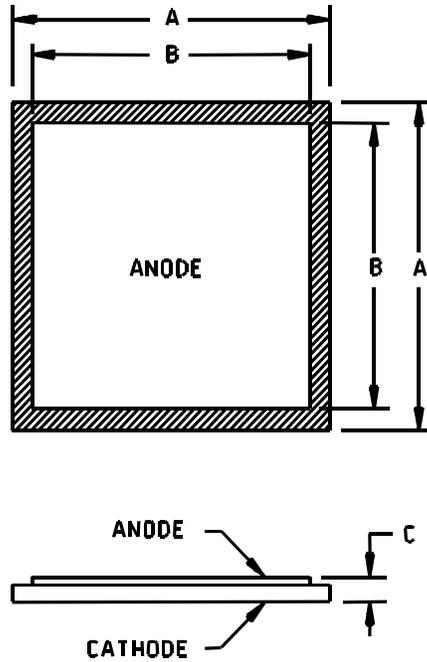
Metallization:

Top: (Anode)..... Silver  
 Back (Cathode)..... Silver

NOTES:

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

FIGURE 6. JANC (D-version) die dimensions.



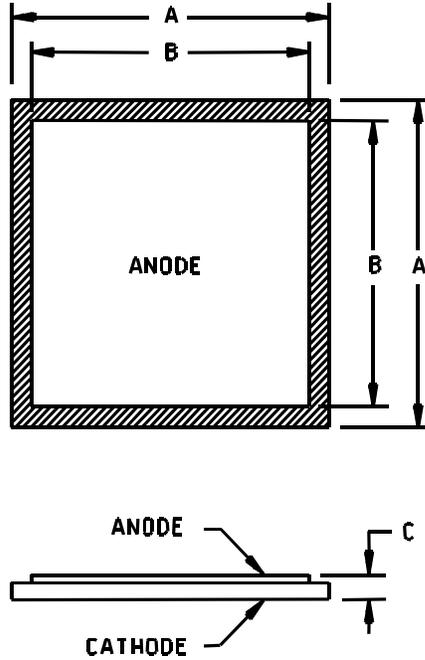
1N5802, 1N5804, 1N5806

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.039	.043	1.00	1.09
B	.031	.035	0.79	0.89
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Anode is aluminum at 45,000 Å minimum.
4. Cathode is gold at 2500 Å minimum.

FIGURE 7. JANC (E-version) die dimensions.



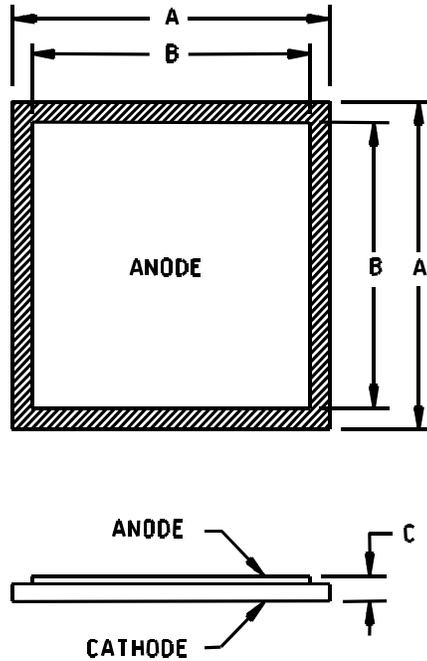
1N5807, 1N5809, 1N5811

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.066	.070	1.68	1.78
B	.057	.061	1.45	1.55
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Anode is aluminum at 60,000 Å minimum.
4. Cathode is gold at 2500 Å minimum.

FIGURE 8. JANC (E-version) die dimensions.



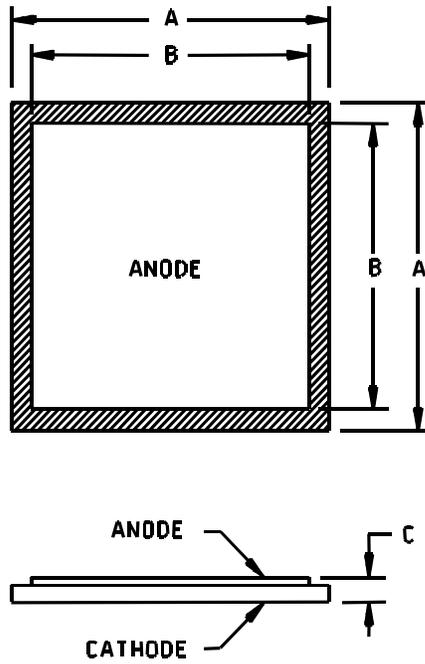
1N5802, 1N5804, 1N5806

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.039	.043	1.00	1.09
B	.031	.035	0.79	0.89
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Anode is aluminum at 45,000 Å minimum.
4. Cathode is silver at 2500 Å minimum.

FIGURE 9. JANC (F-version) die dimensions.



1N5807, 1N5809, 1N5811

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.066	.070	1.68	1.78
B	.057	.061	1.45	1.55
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Anode is aluminum at 60,000 Å minimum.
4. Cathode is silver at 2500 Å minimum.

FIGURE 10. JANC (F-version) die dimensions.

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.

### 3. REQUIREMENTS

3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

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

- $V_{fr}$  . . . . . Forward recovery voltage.
- $I_{(BR)}$  . . . . . Current for testing breakdown voltage.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified MIL-PRF-19500, and figures 1 through 10 herein.

3.4.1 Diode construction. These devices shall be constructed utilizing non-cavity double plug construction with high temperature metallurgical bonding between both sides of the silicon die and terminal pins (see MIL-PRF-19500). Metallurgical bond shall be in accordance with the requirements of category I in MIL-PRF-19500. US version devices shall be structurally identical to the non-surface mount devices except for lead terminations.

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

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

3.5.1 Marking of US version. For US version only, all marking may be omitted from the device except for the cathode marking. All marking which is omitted from the body of the device shall appear on the label of the initial container.

3.5.2 Polarity. The polarity shall be indicated with a contrasting color band to denote the cathode end. Alternately for surface mount (US) devices, a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used. No color coding will be permitted.

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.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

### 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) and tables I, II and III.

MIL-PRF-19500/477D

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500. For JANJ level, see 3.3.1 through 3.3.1.3 of MIL-PRF-19500. Supplier imposed requirements shall be documented in the QM plan and must be submitted to the qualifying activity for approval. Radiation characterization may be submitted in the QM plan at the option of the manufacturer.

4.2.1 JANHC and JANKC die. Qualification shall be in accordance with appendix H of MIL-PRF-19500 and herein.

4.3 Screening (JANS, JANJ, JANTXV and JANTX levels only). Screening shall be in accordance with Table IV of MIL-PRF-19500, and as specified herein. Specified electrical measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	JANS Level	JANJ Level	JANTXV and JANTX Level
1a	Required	Not required	Not required
1b	Required	Required	Required (JANTXV only)
2	Not required	Not required	Not required
3a (1) 3c	Required Thermal impedance (see 4.5.2)	Required Thermal impedance (see 4.5.2)	Required Thermal impedance (see 4.5.2)
4	Not applicable	Not applicable	Not applicable
5	Not applicable	Not applicable	Not applicable
6	Not applicable	Not applicable	Not applicable
7a	Not applicable	Not applicable	Not applicable
7b	Required	Required	Required
8	Required	Not required	Not required
9	$I_{R1}$ and $V_{FM1}$	$I_{R1}$ and $V_{FM1}$	Not required
10	Method 1038 of MIL-STD-750 condition A	Method 1038 of MIL-STD-750 condition A	Method 1038 of MIL-STD-750 condition A
11	Required $I_{R1}$ and $V_{FM1}$ ; $\Delta I_R \pm 100$ percent of initial reading or $\pm 150$ nA dc (1N5802, 1N5804, 1N5806) or $\pm 500$ nA dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM1} \leq \pm 0.05$ V dc.	Required $I_{R1}$ and $V_{FM1}$	Required $I_{R1}$ and $V_{FM1}$
12	Required See 4.3.1	Required $t = 240$ hrs. See 4.3.1	Required See 4.3.1
(2) 13	Subgroups 2 and 3 of table I herein; $\Delta I_R \leq 100$ percent of initial reading or $\pm 150$ nA dc (1N5802, 1N5804, 1N5806) or $\pm 500$ nA dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM1} \leq \pm 0.05$ V dc. Scope display evaluation (see 4.5.3)	Subgroups 2 and 3 of table I herein; $\Delta I_R \leq 100$ percent of initial reading or $\pm 150$ nA dc (1N5802, 1N5804, 1N5806) or $\pm 500$ nA dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM1} \leq \pm 0.05$ V dc. Scope display evaluation (see 4.5.3)	Subgroup 2 of table I herein; $\Delta I_{R1} \pm 100$ percent of initial reading or $\pm 250$ nA dc (1N5802, 1N5804, 1N5806) or $\pm 1 \mu A$ dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM1} \leq \pm 0.05$ V dc. Scope display evaluation (see 4.5.3).
14a	Not applicable	Not applicable	Not applicable
14b	Optional (2)	Optional (2)	Optional (2)
15	Required	Not required	Not required
16	Required	Required	Not required
17	Not required	Required subgroup 2 of table I herein Verify polarity	Not required

(1) Thermal impedance shall be performed any time after sealing provided temperature cycling is performed in accordance with MIL-PRF-19500, screen 3 prior to this thermal test.

(2)  $Z_{\theta JX}$  is not required in screen 13, if already previously performed.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: With the written approval of the qualifying activity and the preparing activity, an alternate burn-in flow may be used ( $I_O$  or  $I_F$ ). A study illustrating equivalence with ACOL testing will be required (see 4.3.1.1).

- a.  $T_A = 50^\circ\text{C}$  maximum.
- b.  $I_O = 1.0$  A minimum (1N5802, 1N5802US, 1N5804, 1N5804US, 1N5806, 1N5806US).
- c.  $I_O = 3.0$  A minimum (1N5807, 1N5807US, 1N5809, 1N5809US, 1N5811, 1N5811US).
- d.  $V_R = \text{rated } V_{RWM}$  (see 1.3.2),  $f = 50\text{-}60$  Hz.

4.3.1.1 Mounting conditions. Any clips or heat sink mounting configurations may be utilized provided that  $I_O$  is increased so that the junction temperature of each diode is  $T_J = +135^\circ\text{C}$  minimum for burn-in and  $T_J = +150^\circ\text{C}$  for life tests.

4.3.2 Screening (JANHNC and JANKC). Screening of die shall be in accordance with appendix H of MIL-PRF-19500. As a minimum, die shall be 100-percent probed to ensure compliance with group A, subgroup 2. Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein. If alternate screening is being performed in accordance with E.5.3.1d of MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of group A1 and A2 inspection only (table VIb, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with 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 table VIa (JANS) and table VIb (JAN, JANJ, JANTX, and JANTXV) of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein; except,  $Z_{\theta JX}$  need not to be performed. See table III herein for delta limits when applicable.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B4	1037	$I_O = I_O$ rated dc minimum (see 1.3); $I_{O2} = I_{O2}$ rated (see 1.3); $V_R = \text{rated } V_{RWM}$ (see 4.5.5); 2,000 cycles.
B5	1027	$I_O = I_O$ rated dc minimum (see 1.3.2); $T_A = +100^\circ\text{C}$ max. apply $V_R = \text{rated } V_{RWM}$ (see 1.3.2 and 4.5.5) adjust $T_A$ and $I_O$ to achieve $T_J = +275^\circ\text{C}$ minimum; $f = 50\text{-}60$ Hz.
	or	$I_O = I_O$ rated minimum (see 1.3.2); $T_A = +50^\circ\text{C}$ max. apply $V_R = \text{rated } V_{RWM}$ (see 1.3.2 and 4.5.5); adjust $T_A$ and $I_O$ to achieve $T_J = +275^\circ\text{C}$ minimum for 1,000 hours at double the sample size.; $f = 50\text{-}60$ Hz.
B6	3101 or 4081	$+25^\circ\text{C} \leq T_A \leq +35^\circ\text{C}$ (recorded before test is performed); $R_{\theta JL}$ (maximum) $\leq 38^\circ\text{C/W}$ ; (see 1.3.2) $L = .375$ inch (9.53 mm). For surface mount devices (UL and US versions), $R_{\theta JEC} \leq 7^\circ\text{C/W}$ .

4.4.2.2 Group B inspection, table VIb (JAN, JANTX, and JANTXV of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1027	$I_O = I_{O2}$ rated (1 A dc) minimum (see 1.3.2); $T_A = +50^\circ\text{C}$ max. adjust $T_A$ and $I_O$ to achieve the required $T_J$ apply $V_R =$ rated $V_{RWM}$ (see 1.3), $f = 50\text{-}60$ Hz (see 4.5.6).

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein; except,  $Z_{\theta JX}$  need not be performed. See table III herein for delta limits when applicable.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	NOTE: Not applicable for US types. Tension: condition A, 4 pounds - 1N5802, 1N5804, 1N5806. 5 pounds - 1N5807, 1N5809, 1N5811 Fatigue: Condition E, 2 pounds.
C6	1027	$I_O = I_{O2}$ rated (1 A dc) minimum; $T_A = +50^\circ\text{C}$ max. adjust $T_A$ and $I_O$ to achieve the required $T_J$ apply $V_R =$ rated $V_{RWM}$ (see 1.3), $f = 50\text{-}60$ Hz (see 4.5.6).

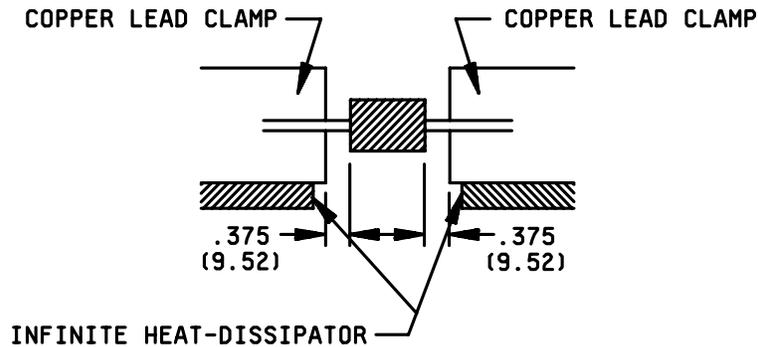
4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in appendix E, table IX of MIL-PRF-19500 and as specified herein.

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

4.5.1 Thermal resistance. Thermal resistance shall be measured in accordance with method 3101 or 4081 of MIL-STD-750. Read and record data in accordance with group E herein shall be included in the qualification report. Forced moving air or draft shall not be permitted across the device during test. The maximum limit for  $R_{\theta JL}$  or  $R_{\theta JEC}$  under these test conditions shall be as specified in 1.3.2. The following conditions shall apply:

<u>1N5802, 1N5804, 1N5806</u>	<u>1N5807, 1N5809, 1N5811</u>
a. $I_H = 2.0$ A dc minimum	2.0 A dc minimum
b. $t_H =$ thermal equilibrium.	thermal equilibrium.
c. $I_M = 10$ mA	10 mA
d. $t_{MD} = 250$ $\mu\text{s}$ maximum	250 $\mu\text{s}$ maximum

The device shall be allowed to reach thermal equilibrium at current  $I_H$  before the measurement shall be made. Lead spacing:  $L = .375$  inch (9.52 mm) for leaded devices;  $L = 0$  (endcap mount) for -US devices (see figure 11).

FIGURE 11. Mounting arrangement.

4.5.2 Thermal impedance. Thermal impedance  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum limit for  $Z_{\theta JX}$  in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical process control and applied in screening of all subsequent lots. This limit shall not exceed the group A, subgroup 2 limit. The following conditions shall apply:

- a.  $I_H = 5$  A minimum.
- b.  $t_H = 10$  ms.
- c.  $I_M = 1$  mA to 10 mA.
- d.  $t_{MD} = 100$   $\mu$ s maximum.

4.5.2.1 For initial qualification and requalification. Read and record data ( $Z_{\theta JX}$ ) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum) prior to shipment. Twenty-two samples shall be serialized and provided to the qualifying activity for test correlation.

4.5.3 Scope display evaluation. Scope display evaluation shall be stable in accordance with method 4023 of MIL-STD-750, condition A. Scope display may be performed on ATE (automatic test equipment) for screening only with the approval of the qualifying activity. Scope display in group A shall be performed on a scope.

4.5.4 Peak reverse power test. This test shall be measured in the circuit of figure 12, or equivalent. A 20 microsecond half-sine waveform of current shall be used and peak reverse power shall be determined by the product of peak reverse voltage and peak reverse current.

4.5.5 Burn-in and life tests. These tests shall be conducted with a half-sine waveform of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine waveform of the specified average rectified current. The forward conduction angle of the rectified current shall be neither greater than 180 degrees, nor less than 150 degrees.

4.5.6 Mounting conditions. Any clips or heat sink mounting configurations may be utilized provided that  $I_O$  is adjusted such that the junction temperature of each diode is maintained at  $T_J = 135^\circ\text{C}$  minimum for burn-in and  $T_J = 150^\circ\text{C}$  minimum for life testing.

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u> Visual and mechanical examination	2071					
<u>Subgroup 2</u> Thermal impedance <u>2/</u> 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US 1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US	3101	See 4.5.2	$Z_{\theta JX}$		4.5	°C/W
Forward voltage 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US 1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US	4011	Duty cycle $\leq$ 2 percent (pulsed); $t_p = 8.3$ ms (max)  $I_{FM} = 1.0$ A(pk)  $I_{FM} = 4.0$ A(pk)	$V_{FM1}$		0.875	V (pk)
Forward voltage 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US 1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US	4011	Duty cycle $\leq$ 2 percent (pulsed); $t_p = 8.3$ ms (max)  $I_{FM} = 2.5$ A(pk)  $I_{FM} = 6.0$ A(pk)	$V_{FM2}$		0.975	V (pk)
Reverse current 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US 1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US	4016	DC method  $V_R = 50$ V dc $V_R = 100$ V dc $V_R = 150$ V dc  $V_R = 50$ V dc $V_R = 100$ V dc $V_R = 150$ V dc	$I_{R1}$		1.0 1.0 1.0  5.0 5.0 5.0	$\mu$ A dc $\mu$ A dc $\mu$ A dc  $\mu$ A dc $\mu$ A dc $\mu$ A dc

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> – Continued						
Breakdown voltage 1N5802, 1N5802US 1N5807, 1N5807US  1N5804, 1N5804US 1N5809, 1N5809US  1N5806, 1N5806US 1N5811, 1N5811US	4021	$I_{(BR)} = 100 \mu\text{A dc}$	$V_{(BR)1}$	60  110  160		V dc  V dc  V dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +100^\circ\text{C}$				
Reverse current 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US  1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		DC method  $V_R = 50 \text{ V dc}$ $V_R = 100 \text{ V dc}$ $V_R = 150 \text{ V dc}$  $V_R = 50 \text{ V dc}$ $V_R = 100 \text{ V dc}$ $V_R = 150 \text{ V dc}$	$I_{R2}$		50 50 50  150 150 150	$\mu\text{A dc}$ $\mu\text{A dc}$ $\mu\text{A dc}$  $\mu\text{A dc}$ $\mu\text{A dc}$ $\mu\text{A dc}$
Forward voltage 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US  1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US	4011	Duty cycle $\leq 2$ percent (pulsed); $t_p = 8.3 \text{ ms (max)}$  $I_{FM} = 1.0 \text{ A(pk)}$  $I_{FM} = 4.0 \text{ A(pk)}$	$V_{FM3}$		0.800	V (pk)
Low-temperature operation:		$T_A = -65^\circ\text{C}$				
Forward voltage 1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US  1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US	4011	Duty cycle $\leq 2$ percent (pulsed); $t_p = 8.3 \text{ ms (max)}$  $I_{FM} = 1.0 \text{ A(pk)}$  $I_{FM} = 4.0 \text{ A(pk)}$	$V_{FM4}$		1.075	V (pk)

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Breakdown voltage	4021	$I_{(BR)} = 100 \mu\text{A dc}$	$V_{(BR)2}$			
1N5802, 1N5802US				50		V dc
1N5807, 1N5807US				100		V dc
1N5804, 1N5804US				150		V dc
1N5809, 1N5809US						
1N5806, 1N5806US						
1N5811, 1N5811US						
<u>Subgroup 4</u>						
Reverse recovery time	4031	Condition B	$t_{rr}$			
1N5802, 1N5802US		$I_F = I_R = 0.5 \text{ A}$			25	ns
1N5804, 1N5804US		$I_{RM} (\text{REC}) = 0.5 \text{ A(pk)}$				
1N5806, 1N5806US		$di/dt = 65 \text{ A}/\mu\text{s} (\text{min})$				
1N5807, 1N5807US		$I_F = I_R = 1.0 \text{ A}$			30	ns
1N5809, 1N5809US		$I_{RM} (\text{REC}) = 0.1 \text{ A(pk)}$				
1N5811, 1N5811US		$di/dt = 100 \text{ A}/\mu\text{s} (\text{min})$				
Capacitance	4001	$V_R = 10 \text{ V}; f = 1 \text{ Mhz};$ $V_{sig} = 50 \text{ mV (p-p)}$	$C_J$			
1N5802, 1N5802US					25	pF
1N5804, 1N5804US						
1N5806, 1N5806US						
1N5807, 1N5807US					60	pF
1N5809, 1N5809US						
1N5811, 1N5811US						
Forward recovery voltage	4026	$t_r = 8 \text{ ns}$	$V_{FRM}$		2.2	V (pk)
1N5802, 1N5802US		$I_{FM} = 250 \text{ mA}$				
1N5804, 1N5804US						
1N5806, 1N5806US						
1N5807, 1N5807US		$I_{FM} = 500 \text{ mA}$				
1N5809, 1N5809US						
1N5811, 1N5811US						
Forward recovery time	4026	$t_p \geq 20 \text{ ns}, t_r = 8 \text{ ns},$ the test is measured at $V_{FR} = 1.1 \times V_F$	$t_{fr}$		15	ns
1N5802, 1N5802US		$I_{FM} = 250 \text{ mA}$				
1N5804, 1N5804US						
1N5806, 1N5806US						
1N5807, 1N5807US		$I_{FM} = 500 \text{ mA}$				
1N5809, 1N5809US						
1N5811, 1N5811US						

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <sup>1/</sup>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> - Continued						
Scope display	4023	See 4.5.3, n = 116, c = 0				
<u>Subgroup 5</u>						
Not applicable						
<u>Subgroup 6</u>						
Surge	4066	$I_{FSM}$ = rated (see 1.3); 10 surges of 8.3 ms each at 1 minute intervals superimposed on $I_O = I_{O2}$ rated (see 1.3); $V_{RSM}$ = rated (see 1.3); $T_A = + 25^\circ\text{C}$ .				
<u>Subgroup 7</u>						
Not applicable						

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

<sup>2/</sup> Not applicable to JANHC and JANKC devices.

TABLE II. Group E inspection (all quality levels) for qualification only.

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			32 devices c = 0
Thermal shock (glass strain)	1056	500 cycles; condition A	
Hermetic seal	1071		
Electrical measurement		See table I, group A, subgroup 2, except $Z_{\theta JX}$ need not to be performed.	
<u>Subgroup 2</u>			32 devices c = 0
Blocking life	1048	t = 1,000 hours; $T_A = +150^\circ\text{C}$ ; $V_R$ DC = 80 - 85 percent rated $V_{RWM}$ (see 1.3.2)	
Electrical measurement		See table I, group A, subgroup 2, except $Z_{\theta JX}$ need not to be performed.	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			22 devices c = 0
Thermal resistance, junction to lead	3101 or 4081	See 4.5.1	
<u>Subgroups 5 and 6</u>			
Not applicable			

TABLE III. Groups A, B, and C electrical measurements. 1/ 2/ 3/ 4/

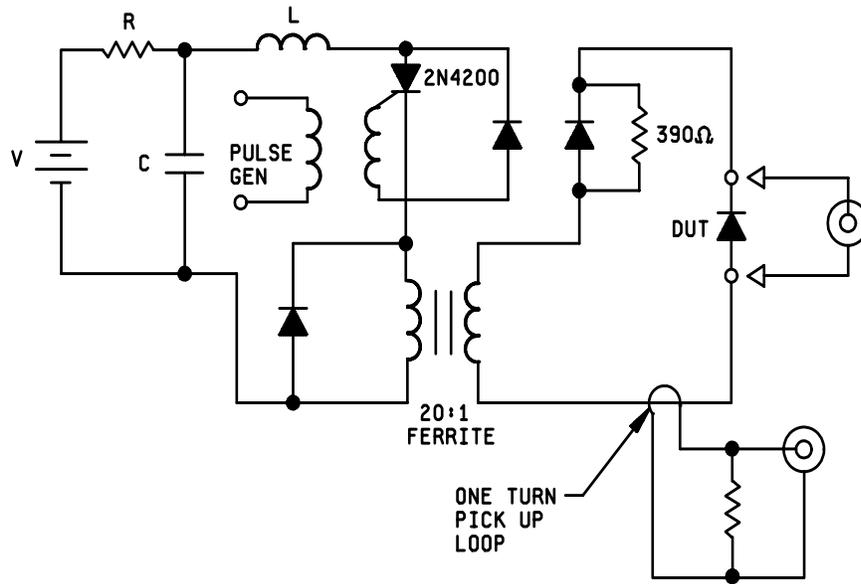
Step	Inspection	MIL-STD-750		Symbol	Limit	Unit
		Method	Conditions			
1	Forward voltage  1N5802,1N5804,1N5806 1N5807,1N5809,1N5811	4011	Duty cycle $\leq$ 2 percent (pulsed); $t_p = 8.3$ ms (max)  $I_{FM} = 1.0$ A(pk) $I_{FM} = 4.0$ A(pk)	$\Delta V_{F1}$	$\pm 50$ mV dc change from of initial value	
2	Reverse current 1N5802,1N5802US 1N5804,1N5804US 1N5806,1N5806US  1N5807,1N5807US 1N5809,1N5809US 1N5811,1N5811US	4016	DC method $V_R = 50$ V dc $V_R = 100$ V dc $V_R = 150$ V dc  $V_R = 50$ V dc $V_R = 100$ V dc $V_R = 150$ V dc	$\Delta I_{R1}$	100 percent or $\pm 150$ nA dc change from initial reading, whichever is greater.  100 percent or $\pm 500$ nA dc change from initial reading, whichever is greater.	

1/ Devices which exceed the group A limits for this test shall not be accepted.

2/ The delta measurements for group B, table VIa (JANS) of MIL-PRF-19500 are as follows: Subgroups 4 and 5, see table III herein, steps 1 and 2.

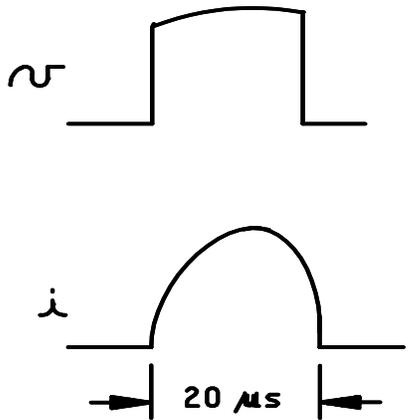
3/ The delta measurements for group B, table VIb (JAN, JANTX, JANTXV, and JANJ) of MIL-PRF-19500 are as follows: Subgroup 3, see table III herein, steps 1 and 2.

4/ The delta measurements for group C, table VII of MIL-PRF-19500 are as follows: Subgroup 6, see table III herein, steps 1 and 2.



NOTES:

1. L - 13T #22 pm 1 inch (25.4 mm) diameter form (air core).
2. C - 1 to 10  $\mu\text{fd}$  to give a 20  $\mu\text{s}$  pulse width.
3. V - adjustable to 200 volts for power desired in D.U.T.



TYPICAL WAVE FORMS

FIGURE 12. Peak reverse power measurement circuit and waveform.

## 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 that may be helpful, but is not mandatory.)

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

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation and if required, the specific issue of individual documents referenced (see 2.2.1).
- c. The lead finish as specified (see 3.4.2).
- d. Type designation and quality assurance level.
- e. Packaging requirements (see 5.1).
- f. For die acquisition, the JANHC or JANKC letter version shall be specified (see figures 3, 4, 5, 6, 7, 8, 9 and 10).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturer's List QML No.19500 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC-VQE, P.O. Box 3990, Columbus, OH 43216-5000.

6.4 Suppliers of die. The qualified die suppliers with the applicable letter version (example; JANHCA1N5802) will be identified on the QML.

JANC ordering information						
PIN	Manufacturer					
	14552	12969	12969	12969	33178	
1N5802	JANHCA1N5802 JANKCA1N5802	JANHCB1N5802 JANKCB1N5802	JANHCC1N5802 JANKCC1N5802	JANHCD1N5802 JANKCD1N5802	JANHCE1N5802 JANKCE1N5802	JANHCF1N5802 JANKCF1N5802
1N5804	JANHCA1N5804 JANKCA1N5804	JANHCB1N5804 JANKCB1N5804	JANHCC1N5804 JANKCC1N5804	JANHCD1N5804 JANKCD1N5804	JANHCE1N5804 JANKCE1N5804	JANHCF1N5804 JANKCF1N5804
1N5806	JANHCA1N5806 JANKCA1N5806	JANHCB1N5806 JANKCB1N5806	JANHCC1N5806 JANKCC1N5806	JANHCD1N5806 JANKCD1N5806	JANHCE1N5806 JANKCE1N5806	JANHCF1N5906 JANKCF1N5806
1N5807	JANHCA1N5807 JANKCA1N5807	JANHCB1N5807 JANKCB1N5807	JANHCC1N5807 JANKCC1N5807	JANHCD1N5807 JANKCD1N5807	JANHCE1N5807 JANKCE1N5807	JANHCF1N5807 JANKCF1N5807
1N5809	JANHCA1N5809 JANKCA1N5809	JANHCB1N5809 JANKCB1N5809	JANHCC1N5809 JANKCC1N5809	JANHCD1N5809 JANKCD1N5809	JANHCE1N5809 JANKCE1N5809	JANHCF1N5809 JANKCF1N5809
1N5811	JANHCA1N5811 JANKCA1N5811	JANHCB1N5811 JANKCB1N5811	JANHCC1N5811 JANKCC1N5811	JANHCD1N5811 JANKCD1N5811	JANHCE1N5811 JANKCE1N5811	JANHCF1N5811 JANKCF1N5811

6.5 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 - NW  
 Air Force - 11  
 NASA - NA  
 DLA - CC

Preparing activity:  
 DLA - CC  
 (Project 5961-2438)

Review activities:  
 Army - AR, AV, MI, SM  
 Navy - AS, CG, MC  
 Air Force - 19, 99

