The documentation and process conversion measures necessary to comply with this revision shall be completed by 30 June 2003.

INCH-POUND

MIL-PRF-19500/477E
30 December 2002
SUPERSEDING
MIL-PRF-19500/477D
18 October 2001

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, ULTRAFAST 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 6.

1.3 Maximum ratings. Unless otherwise specified, T_A = +25°C.

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

T_{STG} = $T_{J(max)}$ =-65°C to +175°C; (sinewave operation includes package limitation).

*1.3.2 Ratings applicable to individual types.

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Types	V_{RWM}	I_{O1} T_L = +75°C L = .375 in. (9.52 mm) (1)	I_{O2} T_A = +55°C (2)	I_{FSM} at +25°C Operating at I_{O2} t_p = 8.3 ms	t_{rr}	$R_{\theta JL}$ at L = .375 in. (9.52 mm)	$R_{\theta JEC}$ (3)	$Z_{\theta JX}$
1N5802, 1N5802US	50	2.5 A (4)	1.0 A (5)	35 A(pk)	25 ns	36°C/W	20°C/W	4.5°C/W
1N5804, 1N5804US	100	2.5 A (4)	1.0 A (5)	35 A(pk)	25 ns	36°C/W	20°C/W	4.5°C/W
1N5806, 1N5806US	150	2.5 A (4)	1.0 A (5)	35 A(pk)	25 ns	36°C/W	20°C/W	4.5°C/W
1N5807, 1N5807US	50	6.0 A (6)	3.0 A (7)	125 A(pk)	30 ns	22°C/W	10°C/W	1.5°C/W
1N5809, 1N5809US	100	6.0 A (6)	3.0 A (7)	125 A(pk)	30 ns	22°C/W	10°C/W	1.5°C/W
1N5811, 1N5811US	150	6.0 A (6)	3.0 A (7)	125 A(pk)	30 ns	22°C/W	10°C/W	1.5°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.

AMSC N/A 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 1.3.1 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°C.

Types	V_{BR}	I_{R1} at $V_R = V_{RWM}$ T_A = +25°C	I_{R2} at $V_R = V_{RWM}$ T_A = +100°C
	(V dc)	µA dc	µA dc
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

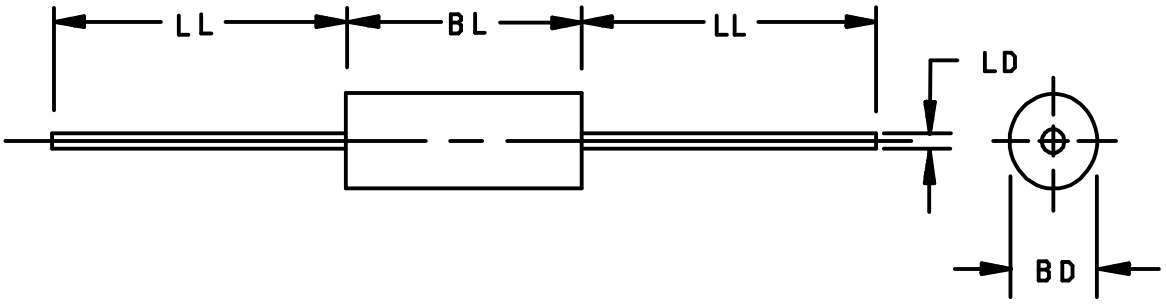
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

DEPARTMENT OF DEFENSE

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

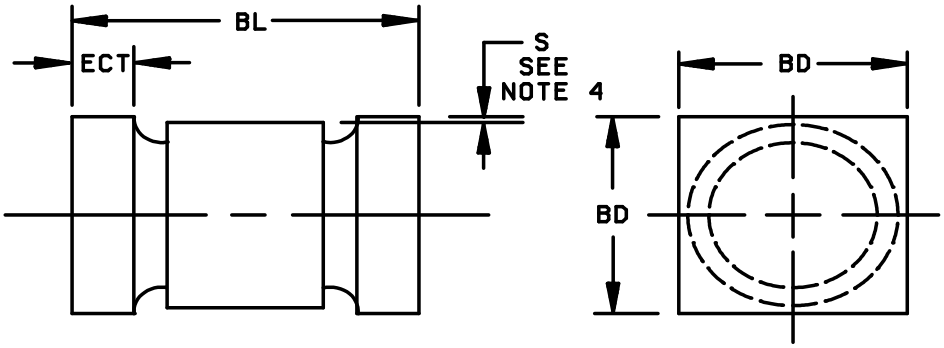
(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)



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 ASME Y14.5M, diameters are equivalent to ϕx symbology.

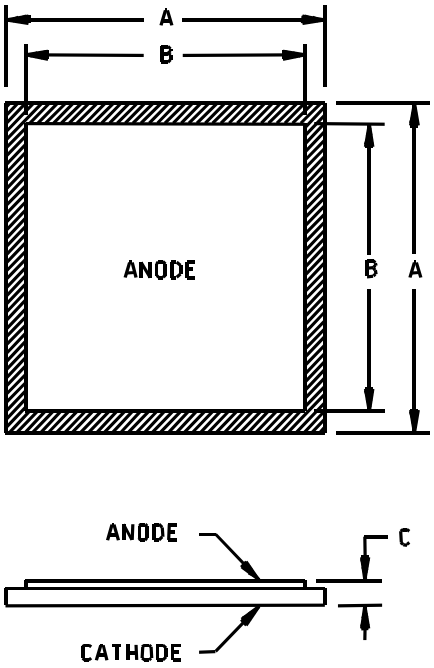
FIGURE 1. Physical dimensions.



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 ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Physical dimensions of surface mount family.

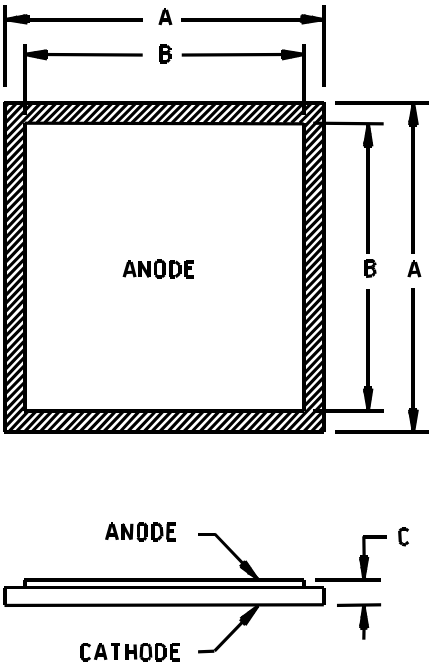


1N5802, 1N5804, 1N5806

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 3. JANC (E-version) die dimensions.

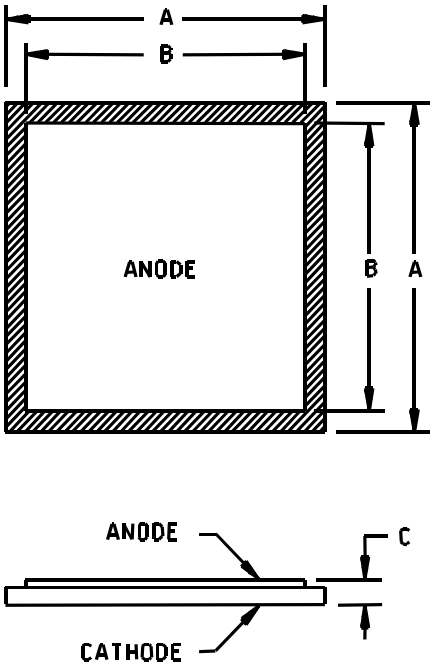


1N5807, 1N5809, 1N5811

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 55,000 Å minimum.
4. Cathode is gold at 5,000 Å minimum.

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

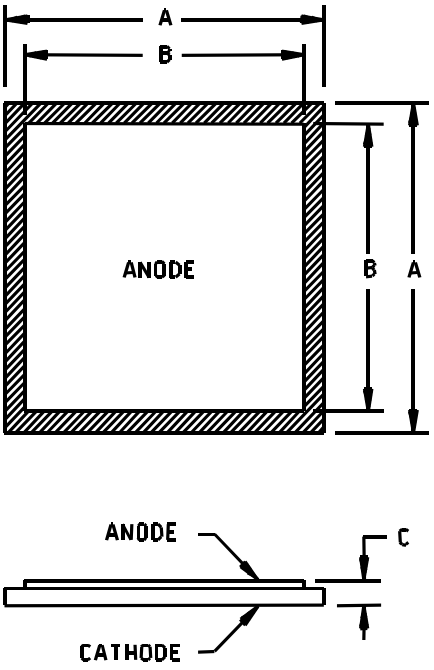


1N5802, 1N5804, 1N5806

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 5. 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 6. 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 individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

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.
* EC End cap.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and figures 1 through 6 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 or end cap finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. When solder alloy is used for finish the maximum lead temperature is limited to 175°C maximum. Where a choice of 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.

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	Required	Required	Required
(1) 3c	Thermal impedance (see 4.5.2)	Thermal impedance (see 4.5.2)	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}; ΔI_R ± 100 percent of initial reading or ±150 nA dc(1N5802, 1N5804, 1N5806) or ±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 ± 150 nA dc (1N5802, 1N5804, 1N5806) or ± 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 ± 150 nA dc (1N5802, 1N5804, 1N5806) or ± 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;ΔI_{R1} ± 100 percent of initial reading or ± 250 nA dc (1N5802, 1N5804, 1N5806) or ± 1 µA 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: These tests shall be conducted with a half-sine waveform as described in 4.5.5. 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. See 4.5.5 herein.

b. V_R = rated V_{RWM} (see 1.3.2), f = 50-60 Hz.

- Burn-in set up. Place a single device in your burn-in/life test rack. Adjust power (or current) until the part reaches T_J = 135°C minimum. This is the minimum power/current which must be applied to each device. Use method 3100 to measure T_J. Additional heat generated by self-heating is allowed but shall not cause any device to exceed the maximum temperature rating.

* 4.3.1.1 Delta T_J rise. Io is adjusted such that the junction rise above ambient shall be delta TJ = 100°C min. for each diode and the junction temperature of each diode is maintained at TJ = 135°C min for burn-in and TJ = 150°C min for life testing. The delta TJ rise is intended to be achieved by device current and not by external or self-heating. (Tj – Ta) $\geq$ 100°C. Deliberate heat sinking or forced air-cooling is prohibited unless otherwise approved by the qualifying activity. Ambient temperature shall be controlled to prevent TJ from exceeding rated TJ. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the full P_t (minimum) and that the minimum applied voltage, where applicable, is maintained through out the burn-in period.

4.3.2 Screening (JANHC 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 table I, 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.

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, subgroup 2 herein. See table III herein for delta limits when applicable.

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

	Subgroup	Method	Condition
	B3	1056	Thermal shock, 0°C to +100°C, 10 cycles.
	B3	1051	Temperature cycling, -55°C to +175°C, 20 cycles.
	B4	1037	$I_O = I_{O2}$ rated minimum (see 1.3.2); V_R = rated V_{RWM} (see 1.3.2 and 4.5.5); 2,000 cycles.
*	B5	1027	$I_O = I_{O2}$ rated minimum (see col. 4 of 1.3.2); apply V_R = rated V_{RWM} (see col. 2 of 1.3.2, and 4.5.5) adjust I_O to achieve T_J minimum; f = 50-60 Hz.
*			Option 1: T_A = + 30°C max. ; T_J = 225°C minimum; n = 45, c = 0 t = 216 hours (see 4.3.1.2).
*		or	Option 2: T_A = + 30°C max. ; T_J = 200°C minimum; n = 45, c = 0 t = 1,000 hours.
	B6	3101 or 4081	$R_{\theta JL}$ and $R_{\theta JEC}$ (maximum) (see cols. 7 and 8 of 1.3.2 and 4.5.1 herein).

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

	Subgroup	Method	Condition
	B2	1056	Thermal shock, 0°C to +100°C, 10 cycles.
	B2	1051	Temperature cycling, -55°C to +175°C, 20 cycles.
*	B3	1027	$I_O = I_{O2}$ rated minimum (see col. 4 of 1.3.2); adjust I_O to achieve the required T_J apply V_R = rated V_{RWM} (see col. 2 of 1.3.2), f = 50-60 Hz (see 4.3.1.1).

* 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, subgroup 2 herein. See table III herein for delta limits when applicable.

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

Subgroup	Method	Condition
C2	1056	Thermal shock, 0°C to +100°C, 10 cycles.
C2	1051	Temperature cycling, -55°C to +175°C, 20 cycles.
C2	2036	NOTE: Not applicable for US types. Tension: Condition A, 4 pounds, t = 15s - 1N5802, 1N5804, 1N5806. 5 pounds - 1N5807, 1N5809, 1N5811 Fatigue: Condition E, 2 pounds,
C6	1027	$I_O = I_{O2}$ rated minimum (see col. 4 of 1.3.2); adjust I_O to achieve the required T_J apply V_R = rated V_{RWM} (see col. 2 of 1.3.2), f = 50-60 Hz (see 4.3.1.1).

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.

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:

a. I_H = 2.0 A dc minimum.

b. $t_{H =}$ thermal equilibrium.

c. I_M = 10 mA.

d. t_{MD} = 250 µs 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 7).

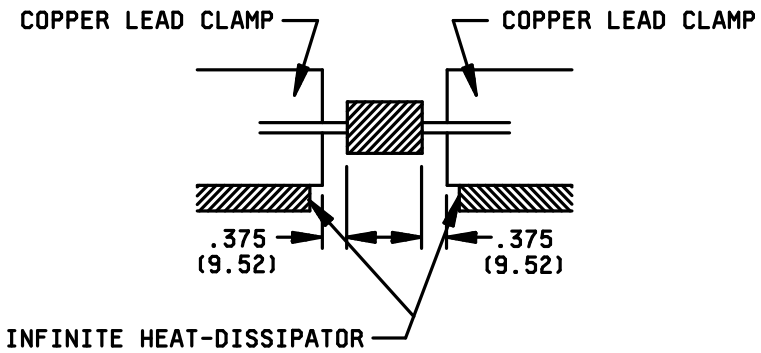


FIGURE 7. Mounting arrangement.

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 table I, 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 µs 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 table I shall be performed on a scope. The reverse current (I_{BR}) over the knee shall be 500 μA peak.

* 4.5.4 Peak reverse power test. 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. A 20 microsecond square waveform may also be used with the approval of the qualifying activity.

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.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Thermal impedance 2/	3101	See 4.5.2	$Z_{\theta JX}$			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US					4.5	°C/W
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US					1.5	°C/W
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed); t_p = 8.3 ms (max)	V_{FM1}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		I_{FM} = 1.0 A(pk)			0.875	V (pk)
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		I_{FM} = 4.0 A(pk)			0.875	V (pk)
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed); t_p = 8.3 ms (max)	V_{FM2}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		I_{FM} = 2.5 A(pk)			0.975	V (pk)
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		I_{FM} = 6.0 A(pk)			0.925	V(pk)
Reverse current	4016	DC method	I_{R1}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		V_R = 50 V dc V_R = 100 V dc V_R = 150 V dc			1.0 1.0 1.0	µA dc µA dc µA dc
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		V_R = 50 V dc V_R = 100 V dc V_R = 150 V dc			5.0 5.0 5.0	µA dc µA dc µA dc

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 2 – Continued						
Breakdown voltage	4021	$I_{(BR)}$ = 100 µA dc	$V_{(BR)1}$			
1N5802, 1N5802US 1N5807, 1N5807US				60		V dc
1N5804, 1N5804US 1N5809, 1N5809US				110		V dc
1N5806, 1N5806US 1N5811, 1N5811US				160		V dc
Subgroup 3						
High temperature operation:		T_A = +100°C				
Reverse current		DC method	I_{R2}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		V_R = 50 V dc V_R = 100 V dc V_R = 150 V dc			50 50 50	µA dc µA dc µA dc
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		V_R = 50 V dc V_R = 100 V dc V_R = 150 V dc			150 150 150	µA dc µA dc µA dc
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed); t_p = 8.3 ms (max)	V_{FM3}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		I_{FM} = 1.0 A(pk)			0.800	V (pk)
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		I_{FM} = 4.0 A(pk)			0.800	V (pk)
Low-temperature operation:		T_A = -65°C				
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed); t_p = 8.3 ms (max)	V_{FM4}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		I_{FM} = 1.0 A(pk)			1.075	V (pk)
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		I_{FM} = 4.0 A(pk)			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 µA dc	$V_{(BR)2}$			
1N5802, 1N5802US 1N5807, 1N5807US				50		V dc
1N5804, 1N5804US 1N5809, 1N5809US				100		V dc
1N5806, 1N5806US 1N5811, 1N5811US				150		V dc
Subgroup 4						
Reverse recovery time	4031	Condition B	t_{rr}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		$I_F = I_R$ = 0.5 A I_{RM} (REC) = 0.5 A(pk) di/dt = 65 A/µs (min)			25	ns
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		$I_F = I_R$ = 1.0 A I_{RM} (REC) = 0.1 A(pk) di/dt = 100 A/µs (min)			30	ns
Capacitance	4001	V_R = 10 V; f = 1 Mhz; V_{sig} = 50 mV (p-p)	C_J			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US					25	pF
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US					60	pF
Forward recovery voltage	4026	t_r = 8 ns	V_{FRM}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		I_{FM} = 250 mA			2.2	V (pk)
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		I_{FM} = 500 mA			2.2	V (pk)
Forward recovery time	4026	$t_p \geq 20$ ns, t_r = 8 ns, the test is measured at $V_{FR} = 1.1 \times V_F$	t_{fr}			
1N5802, 1N5802US 1N5804, 1N5804US 1N5806, 1N5806US		I_{FM} = 250 mA			15	ns
1N5807, 1N5807US 1N5809, 1N5809US 1N5811, 1N5811US		I_{FM} = 500 mA			15	ns

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - Continued						
Scope display evaluation	4023	See 4.5.3, n = 116, c = 0				
Subgroup 5						
Not applicable						
Subgroup 6						
Forward surge	4066	I_{FSM} = rated (see 1.3.2); 10 surges of 8.3 ms each at 1 minute intervals superimposed on $I_O = I_{O2}$ rated (see 1.3.2); V_{RWM} = rated (see 1.3.2); T_A = + 25°C.				
* Electrical measurements		See table I, subgroup 2.				
Subgroup 7						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500.
2/ Not applicable to JANHC and JANKC devices.

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

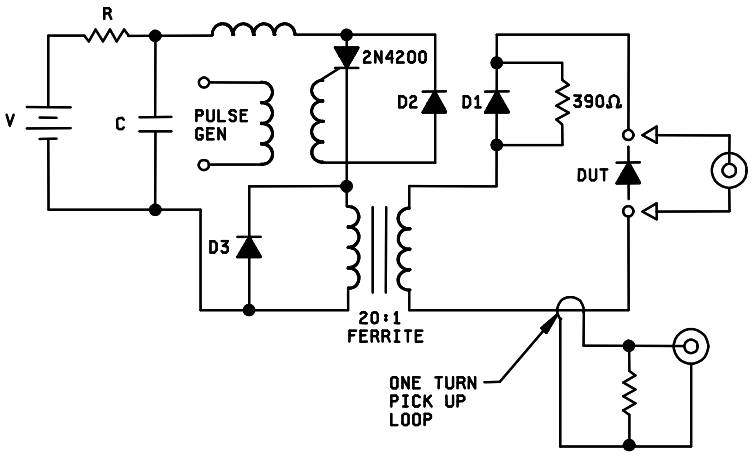
Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
* Subgroup 1			45 devices c = 0
Thermal shock (liquid to liquid)	1056	500 cycles, condition A, -65°C to +175°C.	
Temperature cycling (air to air)	1051	-65°C to +175°C, 500 cycles.	
Hermetic seal	1071		
Electrical measurement		See table I, subgroup 2.	
* Subgroup 2			22 devices c = 0
Blocking life	1048	t = 1,000 hours; T_A = +150°C; V_R DC = 80 - 85 percent rated V_{RWM} (see 1.3.2)	
Electrical measurement		See table I, subgroup 2, except $Z_{\theta JX}$ need not to be performed.	
Subgroup 3			
Not applicable			
Subgroup 4			22 devices c = 0
Thermal resistance, junction to lead	3101 or 4081	See 4.5.1	
Subgroup 5			
Not applicable			
Subgroup 6			22 devices c = 0
Forward surge	4066	Condition A, I_{FSM} = rated (see 1.3.2); 10 surges of 8.3 ms each at 1 minute intervals superimposed on $I_O = I_{O2}$ rated (see 1.3.2); V_{RWM} = rated (see 1.3.2); T_A = + 25°C.	
Electrical measurement		See table I, subgroup 2.	
* Subgroup 7 1/			
Peak reverse power		See 4.5.4 and figure 8 herein. Peak reverse power, (P_{RM})= shall be characterized by the supplier and this data shall be available to the Government. Test shall be performed on each sublot.	
Electrical measurement		During the P_{RM} test, the voltage (V_{BR}) shall be monitored to verify it has not collapsed. Any collapse in V_{BR} during or after the P_{RM} test or rise in leakage current (I_R) after the test that exceeds I_{R1} in Group A shall be considered a failure to that level of applied P_{RM}. Progressively higher levels of P_{RM} shall be applied until failure occurs on all devices within the chosen sample size to characterize each sublot.	

1/ The sample size for this step stress requirement shall be determined by the supplier. A statistically significant sample size is required.

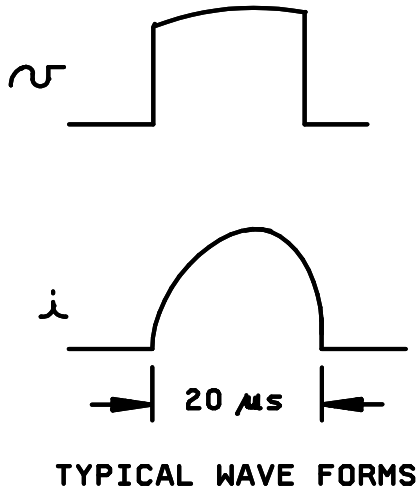
TABLE III. Groups A, B, and C delta measurements. 1/ 2/ 3/ 4/

Step	Inspection	MIL-STD-750		Symbol	Limit	Unit
		Method	Conditions			
1	Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed); t_p = 8.3 ms (max)	ΔV_{FM1}		
	1N5802,1N5804,1N5806 1N5807,1N5809,1N5811		I_{FM} = 1.0 A(pk) I_{FM} = 4.0 A(pk)		± 50 mV dc change from of initial value	
2	Reverse current	4016	DC method	ΔI_{R1}		
	1N5802,1N5802US 1N5804,1N5804US 1N5806,1N5806US		V_R = 50 V dc V_R = 100 V dc V_R = 150 V dc		100 percent or ±150 nA dc change from initial reading, whichever is greater.	
	1N5807,1N5807US 1N5809,1N5809US 1N5811,1N5811US		V_R = 50 V dc V_R = 100 V dc V_R = 150 V dc		100 percent or ±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:
L = 13T H22 on 1" diameter form (air core).
C ~ 1 to 10 µfd to give 20 µs pulse width.
V - Adjustable to 200 volts for power desired in DUT.
D1 - 3 kV; 600 Ma (1N3647 or equivalent).
D2, D3 - 600 V; 3A (1N5552 or equivalent).
* Values not stated are determined at the time of test.



TYPICAL WAVE FORMS

FIGURE 8. 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; JANHCE1N5802) will be identified on the QML.

JANC ordering information		
PIN	Manufacturer	
	43611	
1N5802	JANHCE1N5802 JANKCE1N5802	JANHCF1N5802 JANKCF1N5802
1N5804	JANHCE1N5804 JANKCE1N5804	JANHCF1N5804 JANKCF1N5804
1N5806	JANHCE1N5806 JANKCE1N5806	JANHCF1N5906 JANKCF1N5806
1N5807	JANHCE1N5807 JANKCE1N5807	JANHCF1N5807 JANKCF1N5807
1N5809	JANHCE1N5809 JANKCE1N5809	JANHCF1N5809 JANKCF1N5809
1N5811	JANHCE1N5811 JANKCE1N5811	JANHCF1N5811 JANKCF1N5811

6.5 Changes from previous issue. The margins of this revision are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA
DLA - CC

Review activities:
Army - AR, AV, MI, SM
Navy - AS, MC
Air Force - 19, 71, 99

Preparing activity:
DLA - CC

(Project 5961-2660)

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.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/477E	2. DOCUMENT DATE 30 December 2002

3. **DOCUMENT TITLE**
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

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 Commercial 614-692-0510 DSN 850-0510 FAX 614-692-6939 EMAIL alan.barone@dscc.dla.mil
c. ADDRESS Defense Supply Center, Columbus ATTN: DSCC-VAC, P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888