

The documentation and process conversion measures necessary to comply with this revision shall be completed by 7 July 2004.

INCH-POUND

MIL-PRF-19500/427K  
7 April 2004  
SUPERSEDING  
MIL-PRF-19500/427J  
30 December 2002

PERFORMANCE SPECIFICATION SHEET

\* SEMICONDUCTOR DEVICE, DIODE, SILICON, POWER RECTIFIER, TYPES 1N5614, 1N5616, 1N5618, 1N5620, 1N5622, 1N5614UL, 1N5616UL, 1N5618UL, 1N5620UL, 1N5622UL, 1N5614US, 1N5616US, 1N5618US, 1N5620US, 1N5622US, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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

\* The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-19500.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for silicon, hermetically sealed power rectifier diodes. Four levels of product assurance are provided for each encapsulated device as specified in MIL-PRF-19500. Two levels of product assurance are provided each unencapsulated device type.

1.2 Physical dimensions. See figures 1, (similar to DO-204; formerly DO-41), 2, 3 (surface mount), and 4, (JANHC and JANKC).

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

Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
Types	$V_R$	$V_{RWM}$	$I_O$		$I_{FSM}$ $T_A = +100^\circ\text{C}$	$T_J$ and $T_{STG}$	$t_{rr}$	$R_{\theta JL}$ (4)	$Z_{\theta JX}$
			$T_A = +55^\circ\text{C}$ (1) (2)	$T_A = +100^\circ\text{C}$ (2) (3)	$I_F = 750\text{ mA}$ $t_p = 8.3\text{ ms}$				
	<u>V dc</u>	<u>V(pk)</u>	<u>A</u>	<u>mA</u>	<u>A(pk)</u>	<u>°C</u>	<u>µs</u>	See figure 6	4.5 °C/W
1N5614, UL, US	200	200	1	750	30	-65	2		
1N5616, UL, US (5)	400	400	1	750	30		2		
1N5618, UL, US, (5)	600	600	1	750	30	to	2		
1N5620, UL, US, (5)	800	800	1	750	30		2		
1N5622, UL, US, (5)	1,000	1,000	1	750	30	+200	2		

(1) From 1 A at  $T_A = +55^\circ\text{C}$ , to 0.75 A at  $T_A = +100^\circ\text{C}$ , derate linearly at 5.56 mA/°C.

(2) For the 1 A rating at the  $+55^\circ\text{C}$  and the 750 mA rating at  $+100^\circ\text{C}$ , no special mounting, heat sinking, or forced air flow across exposed areas of the device is required.

\* (3) From 0.75 A at  $T_A = +100^\circ\text{C}$ , to 0 A at  $T_A = +200^\circ\text{C}$ , derate linearly at 7.5 mA/°C.

(4)  $R_{\theta JL} \leq 38^\circ\text{C/W}$  at  $L = .375\text{ inch}$  (9.53 mm) for UL and US suffix type devices,  $R_{\theta JEC} = 7.0^\circ\text{C/W}$ .

(5) Barometric pressure reduced: 1N5616 and 1N5618 = 8 mm Hg, 1N5620 and 1N5622 = 33 mm Hg.

\* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43216-5000, or emailed to [Semiconductor@dsccl.dla.mil](mailto:Semiconductor@dsccl.dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://www.dodssp.daps.mil>.

## 2. APPLICABLE DOCUMENTS

\* 2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 of documents cited in sections 3, 4, or 5 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 cited in the solicitation or contract.

#### \* DEPARTMENT OF DEFENSE SPECIFICATIONS

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

#### \* DEPARTMENT OF DEFENSE STANDARDS

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

\* (Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or [www.dodssp.dap.mil](http://www.dodssp.dap.mil) or 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, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

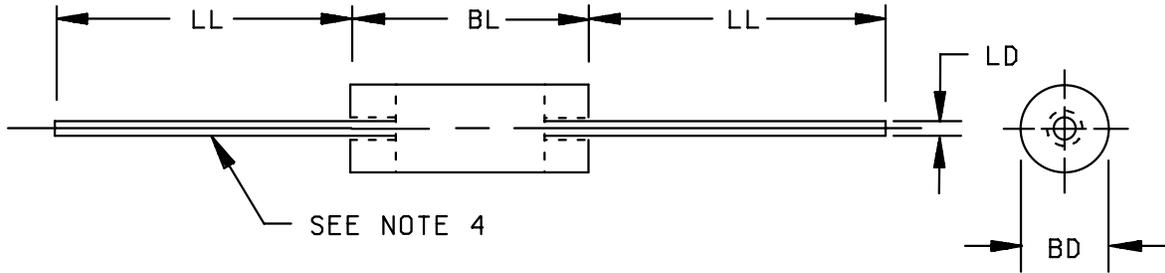
## 3. REQUIREMENTS

\* 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.

EC	End cap.
UL	Long-body unleaded or surface mounted diodes (square end-caps).
US	Short-body unleaded or surface mounted diodes (square end-caps).

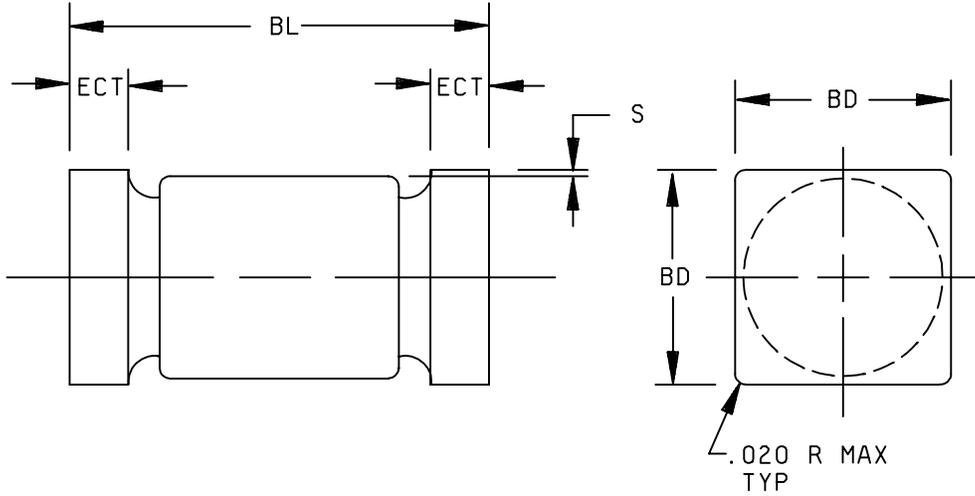


Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.065	.110	1.65	2.79	3
BL	.130	.225	3.30	5.72	4
LD	.026	.033	0.66	0.84	
LL	1.00	1.30	25.4	33.02	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimension BD shall be measured at the largest diameter.
4. The BL dimension shall include all uncontrolled areas of the device.
5. The shape of the body, within the bounds of the dimensions is optional.
6. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 1. Physical dimensions for axial leaded devices only (similar to DO-204, formerly DO-41).

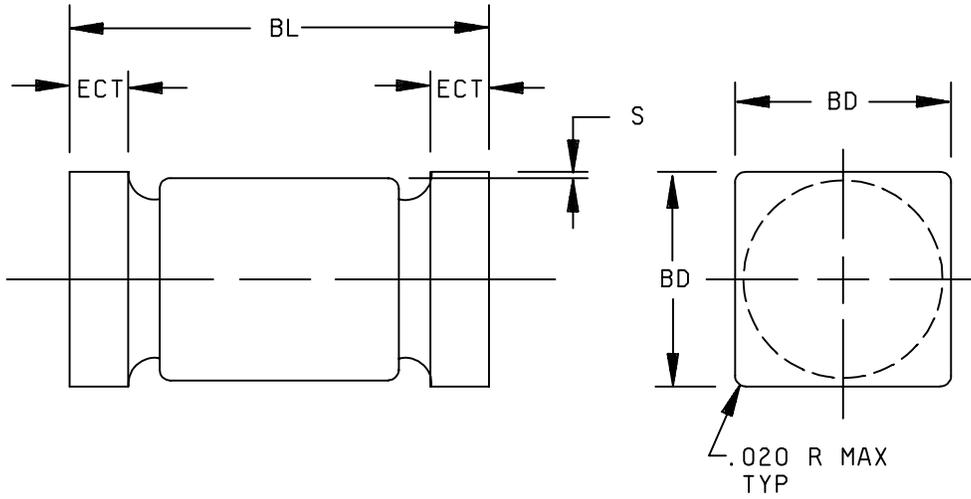


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.091	.125	2.31	3.18
BL	.168	.225	4.27	5.72
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 2. Physical dimensions types 1N5614UL, 1N5616UL, 1N5618UL, 1N5620UL, and 1N5622UL (surface mount devices).

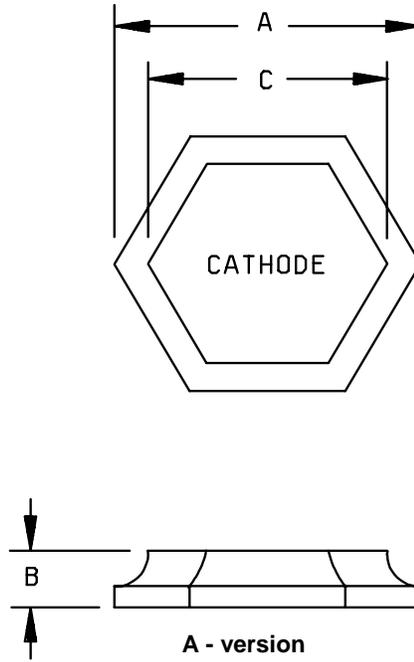


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.091	.103	2.31	2.62
BL	.168	.200	4.27	5.08
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi$ x symbology.

FIGURE 3. Physical dimensions types 1N5614US, 1N5616US, 1N5618US, 1N5620US, and 1N5622US (surface mount devices).



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.047	.053	1.19	1.35
B	.007	.011	0.18	0.28
C	.033	.037	0.84	0.94

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. The physical characteristics of the die are:  
 Top metal: Gold 10,000 Å minimum.  
 Back metal: Gold 4,000 Å minimum.
4. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi$ x symbology.

FIGURE 4. Physical dimension, JANHCA AND JANKCA die.

\* 3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and in figures 1, 2, 3, 4, and 5 herein.

3.4.1 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).

\* 3.4.2 Diode construction. These devices shall be metallurgically bonded-thermally-matched-noncavity-double plug construction, utilizing a category I bond, in accordance with MIL-PRF-19500, except for JANHC and JANKC. UL and US version devices shall be structurally identical to the nonsurface mount version devices except for lead configuration.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.5.1 Marking of UL and US version devices. For UL and US version devices only, all marking (except as stated in 3.6) may be omitted from the body, but shall be retained on the initial container.

3.6 Polarity. The polarity of all types shall be indicated with a contrasting color band to denote the cathode end. Alternatively, for UL and US suffix devices, a minimum of three contrasting color dots spaced around the periphery on the cathode end or a contrasting colorband may be used.

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

3.8 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I, herein.

3.9 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).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 Group E qualification. Group E qualification shall be performed herein for qualification or requalification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table II tests, the tests specified in table II herein shall be performed by the first inspection lot to this revision to maintain qualification.

4.2.2 JANHC and JANKC die. Qualification shall be in accordance with appendix G of MIL-PRF-19500 and as specified herein.

MIL-PRF-19500/427K

\* 4.3 Screening (JANTX, JANTXV and JANS levels only). Screening shall be in accordance with table IV of MIL-PRF-19500, appendix E, 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.

Screening (see table IV of MIL-PRF-19500)	JANS level	JANTXV and JANTX level
1a	Required	Not required
1b	Required	Required (JANTXV only)
2	Optional	Not required
3a (1) 3c	Required Thermal impedance (see 4.3.1 and 4.4.1)	Required Thermal impedance (see 4.3.1 and 4.4.1)
4	Not applicable	Not applicable
5	Not applicable	Not applicable
6	Not applicable	Not applicable
7a	Not applicable	Not applicable
7b	Optional	Optional
8	Required	Not required
9	$I_{R1}$ and $V_F$	Not required
10	Method 1038 of MIL-STD-750, condition A	Method 1038 of MIL-STD-750, condition A
11	$I_{R1}$ and $V_F$ , $\Delta I_{R1} \leq 100$ percent of initial reading or $\pm 100$ nA dc, whichever is greater. $\Delta V_F \leq \pm 0.1$ V dc.	$I_{R1}$ and $V_F$
12	Required, see 4.3.2	Required, see 4.3.2
(2) 13	Subgroups 2 and 3 of table I herein: $\Delta I_{R1} \leq 100$ percent of initial reading or $\pm 100$ nA dc, whichever is greater. $\Delta V_F \leq \pm 0.1$ V dc. Scope display evaluation (see 4.5.2)	Subgroup 2 of table I herein: $\Delta I_{R1} \leq 100$ percent of initial reading or $\pm 100$ nA dc, whichever is greater. $\Delta V_F \leq \pm 0.1$ V dc. Scope display evaluation (see 4.5.2)
14a (3) 14b	Not applicable Required	Not applicable Required
15	Required	Not required
16	Required	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.
- (3) For clear glass diodes, the hermetic seal (gross leak) may be performed at any time after temperature cycling.

\* 4.3.1 Thermal impedance  $Z_{\theta JX}$  measurements for screening. The  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum screen limit shall be developed by the supplier using statistical methods and it shall not exceed the table I, subgroup 2 herein. See 4.4.1 for test conditions.

4.3.1.1 Thermal impedance ( $Z_{\theta JX}$  measurements) for initial qualification or requalification. The  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750 (read and record date  $Z_{\theta JX}$ ).  $Z_{\theta JX}$  shall be supplied on one lot (500 pieces minimum and a thermal response curve shall be submitted.) Twenty-two of these samples shall be serialized and provided to the qualifying activity for correlation prior to shipment of parts. Measurements conditions shall be in accordance with 4.4.1.

\* 4.3.2 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.3, 4.5.3.1) adjust  $I_O$  to achieve the required  $T_J$ .

4.3.3 Screening (JANHNC and JANKC). Screening of die shall be in accordance with appendix G of MIL-PRF-19500. As a minimum, die shall be 100-percent probed to ensure compliance with group A, subgroup 2 of MIL-PRF-19500. 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 table V of MIL-PRF-19500, appendix E, and table I herein.  $Z_{\theta JX}$  measurements in table I, subgroup 2 shall be performed in accordance with method 3101 of MIL-STD-750.

- a.  $I_M$  measuring current: 10 mA.
- b.  $I_H$  forward heating current: 10 A.
- c.  $t_H$  heating time: 10 ms.
- d.  $t_{MD}$  measurement delay time: 100  $\mu$ s maximum.

The maximum limit for  $Z_{\theta JX}$  in table I, subgroup 2 is  $Z_{\theta JX}$  (maximum) = 4.5°C/W.

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 (JANTX and JANTXV) of MIL-PRF-19500, appendix E, and as follows. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, subgroup 2 herein. Delta measurements shall be as specified in table III herein. Leaded samples may be used in lieu of surface mount devices (UL and US version) for life tests.

MIL-PRF-19500/427K

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B3	1056	0°C to +100°C, 25 cycles.
B3	1051	-55°C to +175°C, 100 cycles.
*	B3	4066 I <sub>FSM</sub> = rated I <sub>FSM</sub> (see col. 5 of 1.3); 10 surges of 8.3 ms each at 1 minute intervals, superimposed on I <sub>O</sub> = 0, V <sub>RWM</sub> = 0.
B4	1037	I <sub>O</sub> = I <sub>O</sub> (rated) minimum; V <sub>R</sub> = rated V <sub>RWM</sub> (see 1.3). 2,000 cycles.
B5	1027	I <sub>O</sub> = I <sub>O2</sub> rated dc minimum (see 1.3, col. 4); apply V <sub>R</sub> = rated V <sub>RWM</sub> (see 1.3, col. 3 and 4.5.5) adjust I <sub>O</sub> to achieve T <sub>J</sub> minimum; f = 50-60 Hz.  Option 1: T <sub>A</sub> = + 30°C max. ; T <sub>J</sub> = 225°C minimum; t = 216 hours; n = 45, c = 0.  or Option 2: T <sub>A</sub> = + 75°C max. ; T <sub>J</sub> = 275°C minimum; t = 96 hours.
*	B6	3101 or 4081 R <sub>θJL</sub> (maximum) ≤ 38°C/W; L = .375 inch (9.53 mm). For surface mount devices(UL and US version), R <sub>θJEC</sub> ≤ 7°C/W.
*	B7	Peak reverse power, see 4.5.4 and figure 7 herein. P <sub>RM</sub> ≥ 500 W. Test shall be performed on each subplot; sampling plan n = 10, c = 0, end-points, see 4.4.2.

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B2	1056	0°C to +100°C, 10 cycles.
*	B2	1051 -55°C to +175°C, 25 cycles.
B3	1027	Adjust I <sub>O</sub> to achieve the required T <sub>J</sub> ; f = 50-60 Hz; apply V <sub>R</sub> = rated V <sub>RWM</sub> (see 1.3 and 4.5.3.1).
B5		Not applicable.

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, appendix E and as follows. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, subgroup 2 herein. Delta measurements shall be as specified in table III herein. Leaded samples may be used in lieu of surface mount devices (UL and US version) for life tests.

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	1056	0°C to +100°C, 10 cycles.
C2	1051	-55°C to +175°C, 25 cycles.
C2	2036	Tension: Test condition A, weight = 12 pounds. Lead fatigue: Test condition E, weight = 1 pound. NOTE: Neither tension nor lead fatigue are applicable to surface mount devices (UL and US version).
* C5	3101 or 4081	See 4.5.5.
C6	1026	Adjust $I_O$ to achieve the required $T_J$ ; $f = 50\text{-}60$ Hz; apply $V_R = \text{rated } V_{RWM}$ (see 1.3 (col. 3), and 4.5.3.1).
* C8	2031	$n = 22, c = 0$ . One cycle.

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

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

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

\* 4.5.2 Scope display evaluation. Scope display evaluation shall be sharp and stable in accordance with method 4023 of MIL-STD-750. 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, subgroup 4 shall be performed on a scope. Reverse current ( $I_{BR}$ ) over the knee shall be 500  $\mu\text{A}$  peak.

4.5.3 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.

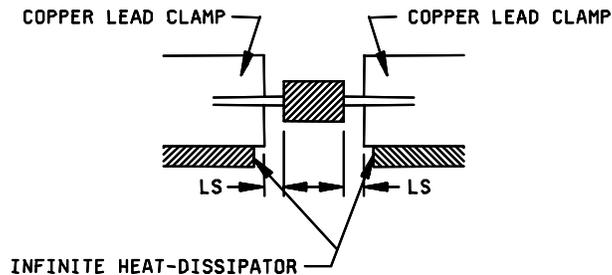
\* 4.5.3.1 Free air burn-in. Deliberate heat sinking, baffles to create an oven, forced air-cooling or heating is prohibited unless otherwise approved by the qualifying activity. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the full  $P_t$  (minimum) and that the minimum applied voltage, where applicable, is maintained through out the burn-in period.  $T_J = 135^\circ\text{C}$  minimum for 96 hours. Use method 3100 of MIL-STD-750 to measure  $T_J$ .

4.5.4 Peak reverse power test. This test shall be measured in the circuit of figure 7, 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 Thermal resistance. Thermal resistance measurement shall be in accordance with methods 3101 or 4081 of MIL-STD-750. Read and record data in accordance with group E and 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  $R_{\theta JL}$  under these test conditions shall be  $R_{\theta JL}(\max) = 38^{\circ}\text{C/W}$ , for surface mount  $R_{\theta JEC} = 7^{\circ}\text{C/W}$ . The following conditions shall apply:

- a.  $I_H = 5$  A dc minimum.
- b.  $t_H =$  thermal equilibrium.
- b.  $I_M = 1.0$  mA to 10 mA.
- d.  $t_{MD} = 100$   $\mu\text{s}$  maximum.

LS = lead spacing = .375 inch (9.53 mm) for non-surface mount devices and 0 inch for surface mount devices as defined on figure 6:



NOTES:

1. The lead temperature,  $T_L$  shall be measured on a lead at a point adjacent to the heat sink clamp (reference point).
2. The clamping force on each lead shall be  $4 \pm 0.5$  pounds.
3. The DUT shall be shielded from drafts.
4. The heat sink clamps shall be placed equal distance from each end of the diode body.
5. For surface mount devices, the end caps shall be clamped to the heat sinks.

FIGURE 6. Mounting conditions.

MIL-PRF-19500/427K

\* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u> Visual and mechanical inspection	2071					
<u>Subgroup 2</u> * Thermal impedance	3101	See 4.3.1	$Z_{\theta JX}$		4.5	°C/W
Forward voltage	4011	$I_F = 3$ A dc, pulsed (see 4.5.1) $t_p = 300$ $\mu$ s, 2 maximum duty cycle	$V_F$	0.8	1.3	V dc
Reverse current leakage	4016	DC method; $V_R =$ rated $V_R$ (see 1.3)	$I_{R1}$		0.5	$\mu$ A dc
* Breakdown voltage	4021	$I_R = 50$ $\mu$ A dc	$V_{BR}$			
1N5614, UL, US				200		V dc
1N5616, UL, US				400		V dc
1N5618, UL, US				600		V dc
1N5620, UL, US				800		V dc
1N5622, UL, US				1,000		V dc
<u>Subgroup 3</u> High temperature operation:		$T_A = +100^\circ\text{C}$				
* Reverse current leakage	4016	DC method; $V_R =$ rated $V_R$ (see 1.3)	$I_{R2}$		25	$\mu$ A dc
<u>Subgroup 4</u> Reverse recovery time	4031	Condition B1	$t_{rr}$		2	$\mu$ s
Scope display	4023	See 4.5.2; $n = 116$ , $c = 0$				
<u>Subgroup 5</u> Not applicable						

See footnote at end of table.

MIL-PRF-19500/427K

\* TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u> Forward surge	4066	I <sub>FSM</sub> = 30 A (pk); 10 surges of 8.3 ms each at 1 minute intervals, superimposed on I <sub>O</sub> = 750 mA dc; V <sub>RWM</sub> = rated V <sub>RWM</sub> (see 1.3); T <sub>A</sub> = +100°C.				
Electrical end-points						
<u>Subgroup 7</u> Not applicable		See table I, subgroup 2				

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

MIL-PRF-19500/427K

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

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Thermal shock	1056	20 cycles, condition D except low temperature shall be achieved using liquid nitrogen (-195°C) Perform a visual for cracked glass.	
Temperature cycling	1051	500 cycles, condition C, -65°C to +200°C.	
Hermetic seal gross leak	1071		
Electrical measurement		See table I, subgroup 2	
<u>Subgroup 2</u>			22 devices c = 0
Steady state dc blocking life	1048	T <sub>A</sub> = +150°C; t = 1,000 hours +65, -0 hours; dc = 80 - 85 percent rated V <sub>R</sub>	
Electrical measurement		See table I, subgroup 2.	
<u>Subgroup 3</u>			3 devices c = 0
DPA (decap analysis)	2101	Cross section and scribe and break. Separate samples shall be used for each test.	
<u>Subgroup 4</u>			
Thermal impedance curves		Each supplier shall submit their (typical) maximum design thermal impedance curves. In addition, optional test conditions and Z <sub>θJX</sub> limit shall be provided to the qualifying activity in the qualification report.	
<u>Subgroup 5</u>			22 devices c = 0
Barometric pressure (reduced)	1001	1N5616 and 1N5618 at 8 mm Hg 1N5620 and 1N5622 at 33 mm Hg	

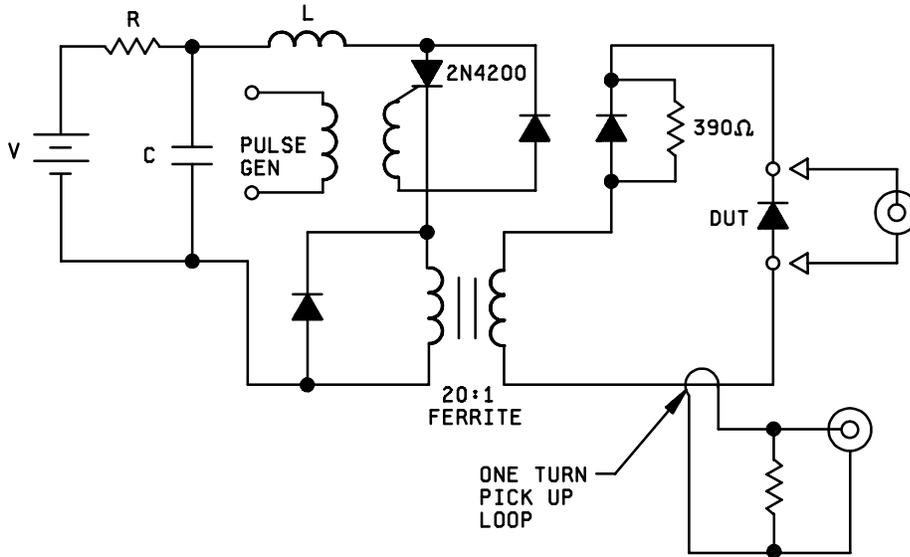
\* TABLE II. Group E inspection (all quality levels) for qualification and requalification only - Continued.

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
* <u>Subgroup 8</u> Peak reverse power  Electrical measurement		See 4.5.4 and figure 7 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 subplot.  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 table I, herein 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 subplot.	n = 45
<u>Subgroup 9</u> Resistance to glass cracking	1057	Step stress to destruction by increasing cycles or up to a maximum of 25 cycles.	
* <u>Subgroup 10</u> Forward surge  Electrical measurement	4066	$I_{FSM}$ = rated (see col. 5 of 1.3.); 10 surges of 8.3 ms each at 1 minute intervals superimposed on $I_O = I_{O2}$ rated (see col. 4 of 1.3); $V_{RWM}$ = rated (see col. 3 of 1.3.); $T_A = + 25^\circ\text{C}$ .  See table I, subgroup 2.	22 devices c = 0

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

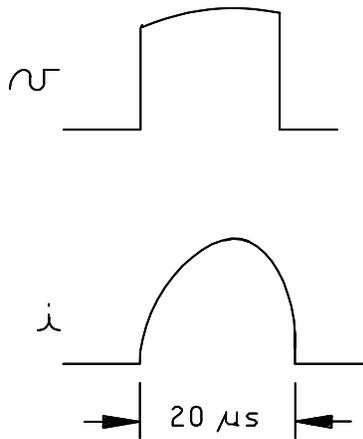
Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Reverse current leakage change	4016	DC method	$\Delta I_{R1}$ 4/		For JANTX and JANTXV, $\leq 250$ nA dc or 100 percent, whichever is greater, For JANS $\leq 100$ nA dc or 100 percent, whichever is greater.	
2.	Forward voltage change	4011	$I_F = 3$ A dc; pulsed (see 4.5.1)	$\Delta V_{F1}$ 4/		$\pm 50$ mV dc maximum change from previous measured value.	

- 1/ The delta measurements for table VIa (JANS) of MIL-PRF-19500, appendix E, of are as follows:
- Subgroup 3, see table III herein, step 2.
  - Subgroup 4, see table III herein, step 2.
  - Subgroup 5, see table III herein, steps 1 and 2.
- 2/ The delta measurements for table VIb (JANTX and JANTXV) of MIL-PRF-19500, appendix E are as follows:
- Subgroup 3, see table III herein, step 1.
  - Subgroup 6, see table III herein, step 1.
- 3/ The delta measurements for table VII of MIL-PRF-19500, appendix E, are as follows:
- Subgroup 2, see table III herein, steps 1 and 2 (JANS).
  - Subgroup 6, see table III herein, steps 1 and 2 (JANS), step 1 (JANTX and JANTXV).
- 4/ Devices which exceed the table I limits for this test shall not be accepted.



NOTES:

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



TYPICAL WAVE FORMS

FIGURE 7. Peak reverse power measurement circuit and waveforms.

## 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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

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

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

\* 6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- d. Product assurance level and type designator.

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 Manufacturers List (QML 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 or e-mail vqe.chief@dla.mil.

6.4 Suppliers of die. The qualified die suppliers with the applicable letter version (e.g., JANHCA1N5614) will be identified on the QML.

JANHC and JANKC ordering information	
PIN	Manufacturer
	14552
1N5614	JANHCA1N5614 JANKCA1N5614
1N5616	JANHCA1N5616 JANKCA1N5616
1N5618	JANHCA1N5618 JANKCA1N5618
1N5620	JANHCA1N5620 JANKCA1N5620
1N5622	JANHCA1N5622 JANKCA1N5622

6.5 Supersession data. The following MIL-PRF-19500/427 types supersede MIL-PRF-19500/228, MIL-PRF-19500/286, and MIL-PRF-19500/365 types, which are inactive for new design:

Preferred	Replaces	Replaces	Replaces
427	228	286	365
1N5614	1N3611	1N4245	1N4383
1N5616	1N3612	1N4246	1N4384
1N5618	1N3613	1N4247	1N4385
1N5620	1N3614	1N4248	1N4585
1N5622	1N3957	1N4249	1N4586

6.6 Changes from previous issue. The margins of this specification 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

Preparing activity:  
 DLA - CC  
 (Project 5961-2738)

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

\* NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://www.dodssp.daps.mil>.