

The documentation and process conversion measures necessary to comply with this revision shall be completed by 11 March 2004.

INCH-POUND  
MIL-PRF-19500/231H  
11 December 2003  
SUPERSEDING  
MIL-PRF-19500/231G  
28 March 1997

\* PERFORMANCE SPECIFICATION SHEET

\* SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING, TYPES 1N3600, 1N3600UB, 1N3600UBCA, 1N3600UBCC, 1N3600UBD, 1N4150-1, 1N4150UR-1, 1N4150UB, 1N4150UBCA, 1N4150UBCC, AND 1N4150UBD, JAN, JANTX, AND JANTXV

JANS1N4150-1 is superseded by MIL-PRF-19500/609 JANS1N6640 (see 6.4 and 6.4.1).

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, switching diodes. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (similar to DO-7 and DO-35), figure 2 (DO-213AA), and figure 3 (UB).

\* 1.3 Maximum ratings.

Type	V <sub>BR</sub>	V <sub>RWM</sub>	I <sub>o</sub> T <sub>A</sub> = 25°C	I <sub>FSM</sub> t <sub>p</sub> = 1μs	T <sub>STG</sub>	T <sub>J</sub>	Z <sub>θJX</sub>	R <sub>θJL</sub> L = 3/8 inch	R <sub>θJEC</sub> (UR)	R <sub>θJSP</sub> (UB)
	<u>V<sub>dc</sub></u>	<u>V (pk)</u>	<u>mA</u>	<u>A (pk)</u>	<u>°C</u>	<u>°C</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>
1N4150-1, 1N4150UR-1	75	50	200 (1)	4.0	-65 to +200	-65 to +200	70	250	100	150
1N4150UB, 1N4150UBCA, 1N4150UBCC, 1N4150UBD			200 (1)	4.0						
1N3600			200 (2)	4.0					250	150
1N3600UB, 1N3600UBCA, 1N3600UBCC, 1N3600UBD						-65 to +175				

(1) Derate at 1.6 mA dc/°C above T<sub>L</sub> = +75°C for axial lead L = .375 inch (9.52 mm) or derate 2.22 mA dc/°C above T<sub>EC</sub> = 110°C for UR suffix devices.

(2) Derate at 2.0 mA dc/°C above T<sub>L</sub> = +75°C for axial lead L = .375 inch (9.52 mm) or derate 3.1 mA dc/°C above T<sub>EC</sub> = 110°C for UR suffix devices.

\* 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 [alan.barone@dla.mil](mailto:alan.barone@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at [www.dodssp.daps.mil](http://www.dodssp.daps.mil).

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1.4 Primary electrical characteristics at  $T_A = +25^\circ\text{C}$ , unless otherwise indicated.

Limits	$V_{F1}$ $I_F = 1 \text{ mA dc}$	$V_{F2}$ $I_F = 10 \text{ mA dc}$	$V_{F3}$ $I_F = 50 \text{ mA dc}$ (pulsed)	$V_{F4}$ $I_F = 100 \text{ mA dc}$ (pulsed)	$V_{F5}$ $I_F = 200 \text{ mA dc}$ (pulsed)	$I_{R1}$ at $V_R = 50 \text{ V dc}$ (pulsed)
	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u><math>\mu\text{A dc}</math></u>
Minimum	0.540	0.660	0.760	0.820	0.870	
Maximum	0.620	0.740	0.860	0.920	1.000	0.1

Limits	$I_{R2}$ $V_R = 50 \text{ V dc } T_A = +150^\circ\text{C}$	C $V_R = 0; f = 1 \text{ Mhz};$ ac signals = 50 mV(p-p)	$t_{rr1}$ $I_F = I_R = 10 \text{ to } 100 \text{ mA dc}$ $R_L = 100 \text{ ohms}$
	<u><math>\mu\text{A dc}</math></u>	<u>pf</u>	<u>ns</u>
Minimum			
Maximum	100	2.5	4

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

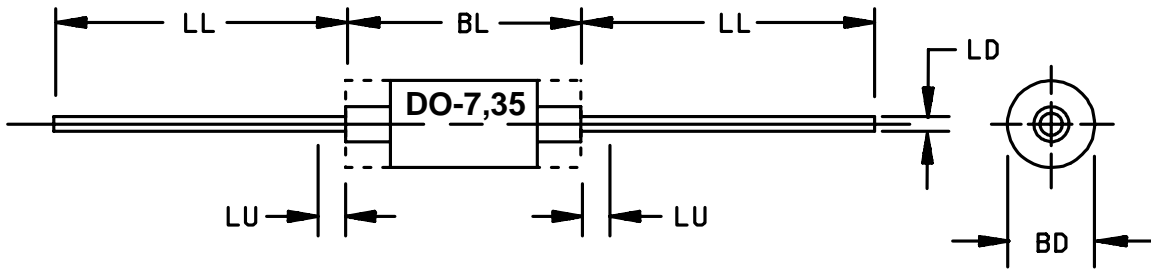
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

\* 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.

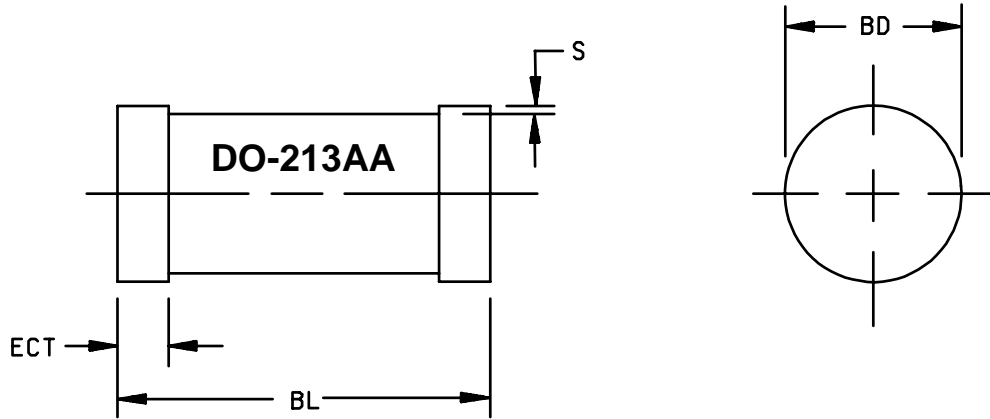


Types	Symbol	Dimensions				Notes
		Inches		Millimeters		
		Min	Max	Min	Max	
1N3600 (DO-7)	BD	.056	.107	1.42	1.91	2, 3
	BL	.140	.300	3.56	4.57	
	LD	.018	.022	0.46	0.56	5
	LL	1.000	1.500	25.40	38.10	3
	LU		.050		1.27	5
1N4150-1 (DO-35)	BD	.056	.075	1.98	2.72	2, 3
	BL	.140	.180	4.96	7.62	
	LD	.018	.022	0.46	0.56	5
	LL	1.000	1.500	25.40	38.10	3
	LU		.050		1.27	5

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. The maximum diameter of dimension BD shall apply over full length of dimension BL.
3. The minimum diameter of dimension BD shall apply over at least .075 inch (1.91 mm) of dimension BL.
4. Ferrule is optional for dimension BL.
5. The specified lead diameter applies in the zone between .050 inch (1.27 mm) and 1.00 inch (25.4 mm) from the diode body to the end of the lead. Within LU, lead diameter may vary to allow for flash, lead finish build-up, and minor irregularities other than heat slugs. Outside of this zone the lead diameter shall not exceed diameter BD.
6. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

\* FIGURE 1. Physical dimensions (types 1N3600 and 1N4150-1) (similar to DO-7 and DO-35).



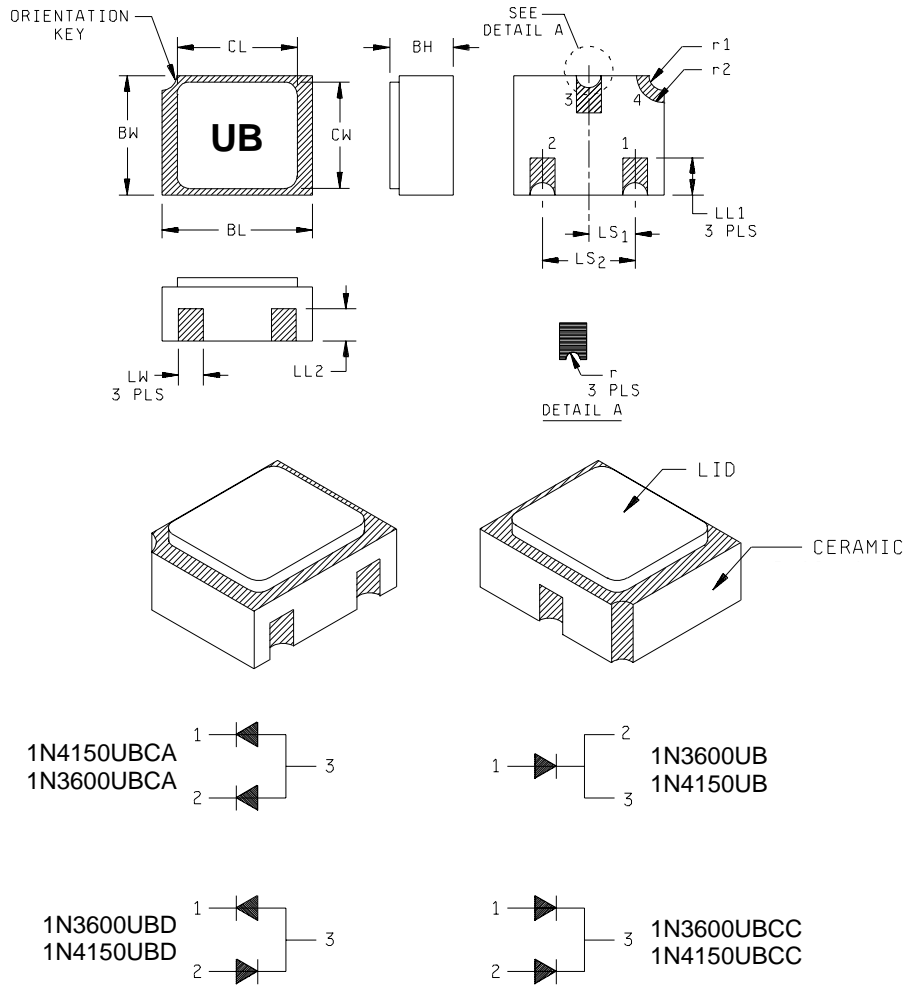
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.063	.067	1.60	1.70
ECT	.016	.022	0.41	0.55
BL	.130	.146	3.30	3.70
S	.001 min		0.03 min	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimensions are pre-solder dip.
4. Referencing to dimension S, minimum clearance of glass body to mounting surface on all orientations.
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

\* FIGURE 2. Physical dimensions and configuration for 1N4150UR-1 (DO-213AA).

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Symbol	Dimensions				Note	Symbol	Dimensions				Note
	Inches		Millimeters				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
BH	.046	.056	1.17	1.42		LS1	.035	.040	0.89	1.02	
BL	.115	.128	2.92	3.25		LS2	.071	.079	1.81	2.01	
BW	.085	.108	2.16	2.74		LW	.016	.024	0.41	0.61	
CL		.128		3.25		r		.008		0.20	
CW		.108		2.74		r1		.012		0.31	
LL1	.022	.038	0.56	0.96		r2		.022		0.56	
LL2	.017	.035	0.43	0.89							

NOTES:

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

FIGURE 3. Physical dimensions, surface mount (UB version).

### 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 manufacturers list 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

$I_{BR}$  Current for testing reverse breakdown voltage.

UB Hermetic unleaded 3 terminal (LCC, Leadless Chip Carrier) package type.

$V_{fr}$  Forward recovery voltage. Specified maximum forward voltage used to determine forward recovery time.

\* 3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and figure 1 (DO-7 and DO-35), figure 2 (DO-213AA), and figure 3 (UB) herein. The UR version devices shall be structurally identical to the leaded devices, except for lead termination.

3.4.1 Lead finish. 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). When a solder alloy is used for lead finish, the lead temperature shall be limited to 175°C maximum.

\* 3.4.2 Diode construction. All devices (except UB version) shall be metallurgically bonded, double plug construction in accordance with the requirements of MIL-PRF-19500. All glass diodes shall be designed with sufficient thermal compensation in the axial direction to optimize tensile and compressive stresses. Dimensional analysis is required of all materials used to achieve axial thermal compensation. Dimensional tolerances and corresponding coefficient of thermal expansion (CTE) shall be documented on the DSCC Design and Construction Form 36D and shall be approved by the qualifying activity to maintain qualification. Dimensional tolerances shall be sufficiently tight enough to prevent excessive stresses due to the inherent CTE mismatch. The UB devices shall be eutectically mounted and wire bonded in a ceramic package.

\* 3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. Manufacturers identification and date code shall be marked on the devices. The polarity shall be indicated with a contrasting color band to denote the cathode end. No color coding will be permitted. Initial container package marking shall be in accordance with MIL-PRF-19500.

3.5.1 UR devices. For surface mount (UR) devices, a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used.

\* 3.5.2 UB devices. The part number may be reduced to J4150, JX4150, or JV4150. Manufacturers identification and date code shall be marked on the devices. UB package does not require polarity marking.

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

\* 3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I herein.

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 and II).

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 inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the associated 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 of this revision to maintain qualification.

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

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JAN level	JANTX and JANTXV levels
3a	Temperature cycling (in accordance with MIL-PRF-19500, JANTX level)	Temperature cycling in accordance with MIL-PRF-19500.
(1) 3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9	Not applicable	Not applicable
(2) 10	Not applicable	Method 1038 of MIL-STD-750, condition A, t = 48 hours
11	Not applicable	$I_{R1}$ and $V_{F5}$
12	Not applicable	Method 1038 of MIL-STD-750, condition B, t = 48 hours (min) see 4.3.1
(3) (4) 13	Not applicable	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial value or 40 nA dc, whichever is greater; $\Delta V_{F5} \leq 25$ mV dc change from initial value.

- (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) Test within 24 hours after removal from test.
- (3)  $Z_{\theta JX}$  need not be performed at screen 13 if performed prior to screen 13.
- (4)  $PDA \leq 5$  percent.

\* 4.3.1 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.2):

Type	AC option, $V_R = 50$ V(pk) $f = 50 - 60$ Hz, (see 4.5.1)	DC option
1N3600	$I_O = 200$ mA	$I_F = 200$ mA
1N4150	$I_O = 200$ mA	$I_F = 200$ mA

Option: Adjust  $I_O$  or  $I_F$  to achieve  $T_J = 125^\circ\text{C}$  minimum for 96 hours.

4.3.2 Thermal impedance ( $Z_{\theta JX}$  measurements). The  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum limit (not to exceed the table I, subgroup 2 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. When the process has exhibited control and capability, the capability data shall be used to establish the fixed screening limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot to be plotted on the applicable X bar R chart. If a lot exhibits an out of control condition, the entire lot shall be removed from the line and held for engineering evaluation and disposition.

4.3.2.1 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 devices 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.

4.4 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. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table VIb (JANTX and JANTXV) of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein except for the thermal impedance test.



\* 4.4.2.1 Group B inspection, table VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	1056	-55°C to +100°C, 15 cycles, n = 22, c = 0.
B2	1051	-55°C to +175°C, 25 cycles, n = 22, c = 0.
B2	2005	$I_F = 100$ mA, axial tensile stress = 8 lbs, $T_A = +150^\circ\text{C}$ ; (not applicable to UR or UB package). (This test shall be performed as the first test of subgroup 2).
B3	1027	See 4.5.2; $V_R = 50$ V(pk); $f = 50$ -60 Hz; $I_O = I_O$ rated minimum (see 1.3), adjust $I_O$ or $T_A$ to achieve $T_J = 150^\circ\text{C}$ minimum.
B4	2075	See 4.5.4.
B5	3101 or 4081	$R_{\theta JL} = 250^\circ\text{C/W}$ , .375 inch (9.52 mm) lead length (non-surface mount). $R_{\theta JC} = 100^\circ\text{C/W}$ (UR), $R_{\theta JC} = 150^\circ\text{C/W}$ (UB).

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 the applicable steps of table III herein.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	1056	-55°C to +100°C, 15 cycles, n = 22, c = 0.
C2	1051	-55°C to +175°C, 20 cycles, n = 22, c = 0.
C2	2036	Tension: Test condition A, t = 15 seconds, weight = 10 pounds. Lead fatigue: Test condition E. Terminal strength and lead fatigue not applicable to UB or UR devices.
C5	3101 or 4081	$R_{\theta JL} = 250^\circ\text{C/W}$ (maximum) (see 4.5.5). $R_{\theta JEC} = 100^\circ\text{C/W}$ (maximum) at zero lead length (for UR). $R_{\theta JSP} = 150^\circ\text{C/W}$ (maximum) (for UB).
C6	1026	$V_{RWM} = 50$ V(pk), $I_O = 150$ mA, $T_A = +30^\circ\text{C} \pm 5^\circ\text{C}$ , $f = 50$ -60 Hz (see 4.5.2).

\* 4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table IX of MIL-PRF-19500, and table III herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

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

\* 4.5.1 Pulse measurements. Conditions of pulsed measurements shall be as specified in section 4 of MIL-STD-750.

\* 4.5.2 Free air burn-in. Deliberate heat sinking, baffles to create an oven, or forced air cooling is prohibited unless otherwise approved by the qualifying activity. The use of a current limiting or ballast resistor is permitted provided that each device under test (DUT) still sees the full  $P_t$  (minimum) and that the minimum applied voltage, where applicable, is maintained throughout the burn-in period.

4.5.2.1 Burn-in life tests. AC tests shall be conducted with a half-sine wave of the peak voltage specified herein impressed across the diode in the reverse direction, followed by a half-sine waveform of the average rectified current specified herein. The forward conduction angle of the rectified current shall be not greater than 180 degrees nor less than 150 degrees.

4.5.3 Forward recovery voltage and time. Forward recovery time shall be measured as the time interval between zero time and the point where the pulse has decreased to 110 percent of the steady-state value of  $V_F$  when  $I_F$  = as specified in table I, subgroup 7. The maximum rise time of the response detector shall be 1 ns.

4.5.4 Decap internal visual scribe and break (not applicable to UB package). Scratch glass at cavity area with diamond scribe. Carefully snap open. Using 30X magnification examine the area where die was in contact with the plugs, verify footprint for minimum of 15 percent metallurgical bonding area. In addition, a cross sectional view may be used to verify consistency of construction. A cross sectional view shall be used exclusively for construction verification and shall not be used to verify bond integrity. The UB package shall employ the manufacturers' normal delidding procedures.

4.5.5 Thermal resistance. Thermal resistance measurement shall be performed in accordance with method 3101 or 4081 of MIL-STD-750. Forced moving air or draft shall not be permitted across the devices during test. The maximum limit for  $R_{\theta JL}$ ,  $R_{\theta EC}$ , and  $R_{\theta SP}$  shall be as as specified in 1.3. The following conditions shall apply:

- a.  $I_H$  = 75 mA to 300 mA.
- b.  $t_H$  = 25 seconds minimum.
- c.  $I_M$  = 1 mA to 10 mA.
- d.  $t_{MD}$  = 70  $\mu$ s maximum.

4.5.5.1 Lead spacing for leaded devices: LS = Lead spacing = .375 inch (9.53 mm) as defined on figure 4.

4.5.5.2 Temperature reference ( $T_r$ ) unleaded devices (UB, UR suffix). The temperature reference point shall be the hottest portion of the external surface. As an alternate, the temperature of a stream of liquid used to cool the device during the test may be used as the temperature reference point.

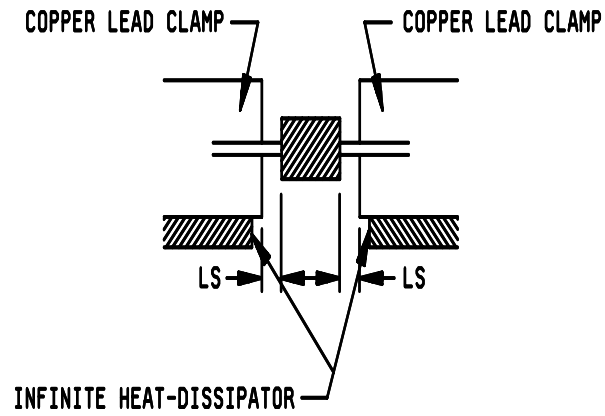


FIGURE 4. Mounting conditions.

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\* 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 4.3.2	Z <sub>ΘJX</sub>		70	°C/W
Forward voltage	4011	I <sub>F</sub> = 1 mA dc	V <sub>F1</sub>	0.540	0.620	V dc
Forward voltage	4011	I <sub>F</sub> = 10mA dc	V <sub>F2</sub>	0.660	0.740	V dc
Forward voltage	4011	I <sub>F</sub> = 50 mA dc (pulsed)	V <sub>F3</sub>	0.760	0.860	V dc
Forward voltage	4011	I <sub>F</sub> = 100 mA dc (pulsed)	V <sub>F4</sub>	0.820	0.920	V dc
Forward voltage	4011	I <sub>F</sub> = 200 mA dc (pulsed)	V <sub>F5</sub>	0.870	1.000	V dc
Breakdown voltage	4021	I <sub>(BR)</sub> = 10 μA dc	V <sub>BR1</sub>	75		V dc
Reverse current	4016	DC method; V <sub>R</sub> = 50 V dc	I <sub>R1</sub>		0.10	μA dc
<u>Subgroup 3</u>						
High temperature operation:		T <sub>A</sub> = +150°C				
Reverse current	4016	DC method, V <sub>R</sub> = 50 V dc	I <sub>R2</sub>		100	μA dc
Low temperature operation:		T <sub>A</sub> = -55°C				
Breakdown voltage	4021	I <sub>R</sub> = 5 μA dc	V <sub>BR2</sub>	75		V dc
<u>Subgroup 4</u>						
Junction capacitance	4001	V <sub>R</sub> = 0 V dc, f = 1 MHz, V <sub>sig</sub> = 50 mV (pk to pk), maximum	C		2.5	pF
Reverse recovery time	4031	Condition A; I <sub>F</sub> = I <sub>RM</sub> = 10 to 100 mA dc; R <sub>L</sub> = 100 Ω; C ≥ 1 nF; R ≥ 1,000 Ω; I <sub>R(REC)</sub> = 10 percent I <sub>RM</sub>	t <sub>rr1</sub>		4	ns
<u>Subgroup 5</u>						
Not applicable						

See footnote at end of table.

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TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u> Surge	4066	$I_O = 200 \text{ mA dc}; T_A = 25^\circ\text{C},$ $I_{FSM} = 4 \text{ A(pk)}, \text{ ten } 1 \mu\text{s surges},$ 1 surge/minute				
<u>Subgroup 7</u> Forward recovery voltage and time	4026	$I_F = 200\text{mA dc};$ $t_r = 0.44 \text{ ns}; (\text{see } 4.5.3)$	$V_{fr}$ $T_{fr}$		5 10	V(pk) ns

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

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

Inspection <sup>1/</sup>	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Thermal shock (glass strain)	1056	100 cycles minimum, -55°C to +100°C	
Temperature cycling	1051	500 cycles minimum, -55°C to +175°C	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 2</u>			45 devices c = 0
Intermittent operating life	1037	10,000 cycles	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 3</u>			3 devices, c = 0
DPA	2101	Cross section; scribe and break. Separate samples to be used for each test	
<u>Subgroup 4</u>			
Thermal impedance curves		Each supplier shall submit their (typical) design thermal impedance curves. In addition, test conditions and Z <sub>θJX</sub> limit shall be provided to the qualifying activity in the qualification report.	
<u>Subgroup 5</u>			3 devices, c = 0
ESD	1020		
<u>Subgroup 6</u>			22 devices c = 0
Resistance to glass cracking <sup>2/</sup> <sup>3/</sup>	1057	Cool down after solder immersion is permitted. Test until failure occurs on all devices within the chosen sample or to a maximum of 25 cycles, whichever comes first	
Electrical measurements		See table I, subgroup 2	
Monitored mission temperature cycling	1055	Not required for UB suffix devices.	
<u>Subgroup 7</u>			22 devices c = 0
Soldering heat	2031	1 cycle	

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

<sup>2/</sup> Step stress characterization shall be performed and this data shall be available to the Government. Test until failure occurs on all devices within the chosen sample or to a maximum of 25 cycles.

<sup>3/</sup> 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, C, and E electrical measurements. 1/ 2/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = 200 \text{ mA dc}$ (pulsed)	$V_{F5}$	0.870	1.000	V dc
2.	Reverse current	4016	DC method; $V_R = 50 \text{ V dc}$	$I_{R1}$		0.10	$\mu\text{A dc}$
3.	Thermal impedance	3101	see 4.3.2	$Z_{\Theta JX}$		70	$^{\circ}\text{C/W}$

1/ The electrical measurements for table VIb of MIL-PRF-19500 are as follows:  
Subgroups 2, 3, and 6, see table III herein, steps 1, 2, and 3.

2/ The electrical measurements for table VII of MIL-PRF-19500 are as follows: Subgroups  
2 and 6, see table III herein, steps 1, 2, and 3.

## 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](mailto:vqe.chief@dla.mil).

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6.4 Substitution information. The JANS1N6640 (MIL-PRF-19500/609) supersedes the JANS1N4150-1. Existing stock of JANS1N4150-1 may be used until exhausted. The 1N4150 is inactive for new design and is replaced by the 1N4150-1.

6.4.1 Cross reference supersession list. JANS level will no longer be built to this specification and in no case be produced after 28 June 1997. Devices required for space flight applications are found on MIL-PRF-19500/609. A PIN for PIN replacement table follows, and these devices are directly interchangeable:

JANS non-preferred PIN	JANS preferred PIN
1N4150-1	1N6640

6.5 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  
DLA - CC

Preparing activity:  
DLA - CC

(Project 5961-2745)

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

\* 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 [www.dodssp.daps.mil](http://www.dodssp.daps.mil).