

The documentation and process conversion measures necessary to comply with this revision shall be completed by 5 February 2004.  
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INCH POUND

MIL-PRF-19500/337H  
5 November 2003  
SUPERSEDING  
MIL-PRF-19500/337G  
6 August 1999

PERFORMANCE SPECIFICATION

\* SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING, TYPES 1N4153-1, 1N4153UB, 1N4153UR-1, 1N4153UBCA, 1N4153UBCC, 1N4153UBD, 1N4534, AND 1N4534UB, JAN, JANTX, JANTXV, 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, diffused, switching diodes. Four 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.

1.2 Physical dimensions. See figure 1 (DO-35, DO-34), figure 2 (DO-213AA), figure 3 (UB), and figure 4 (die).

\* 1.3 Maximum ratings.

VBR	VRWM	I <sub>o</sub> T <sub>A</sub> = 25°C	I <sub>FSM</sub> t <sub>p</sub> = 1 s	I <sub>FSM</sub> t <sub>p</sub> = 1 μ s	T <sub>J</sub> and T <sub>STG</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 dc</u> (1)	<u>V (pk)</u>	<u>mA</u>	<u>A (pk)</u>	<u>A (pk)</u>	<u>°C</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>
75	50	150 (2)	0.25	2.0	-65 to +175	70	250	100	150

- (1) This voltage may be exceeded for normal measuring intervals (< 1 minute) provided the current is limited to a maximum of 100 μA dc.
- (2) Derate at 1.0 mA dc/°C above T<sub>A</sub> = 25°C.

1.4 Primary electrical characteristics. T<sub>A</sub> = +25°C, unless otherwise indicated.

Limits	V <sub>F1</sub> I <sub>F</sub> = 100 μA dc	V <sub>F2</sub> I <sub>F</sub> = 250 μA dc	V <sub>F3</sub> I <sub>F</sub> = 1 mA dc	V <sub>F4</sub> I <sub>F</sub> = 2 mA dc	V <sub>F5</sub> I <sub>F</sub> = 10 mA dc	V <sub>F6</sub> I <sub>F</sub> = 20 mA dc
Min	0.490 V dc	0.530 V dc	0.590 V dc	0.620 V dc	0.700 V dc	0.740 V dc
Max	0.550 V dc	0.590 V dc	0.670 V dc	0.700 V dc	0.810 V dc	0.880 V dc

Limit	I <sub>R1</sub> V <sub>R</sub> = 50 V dc	I <sub>R2</sub> V <sub>R</sub> = 50 V dc T <sub>A</sub> = 150°C	C V <sub>R</sub> = 0 V dc f = 1 MHz	t <sub>rr</sub> I <sub>F</sub> = I <sub>R</sub> = 10 mA dc R <sub>L</sub> = 100 ohms, I <sub>RR</sub> = 1.0 mA dc
Max	50 nA dc	50 μA dc	2.0 pF	4 ns

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.

## 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.)

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.

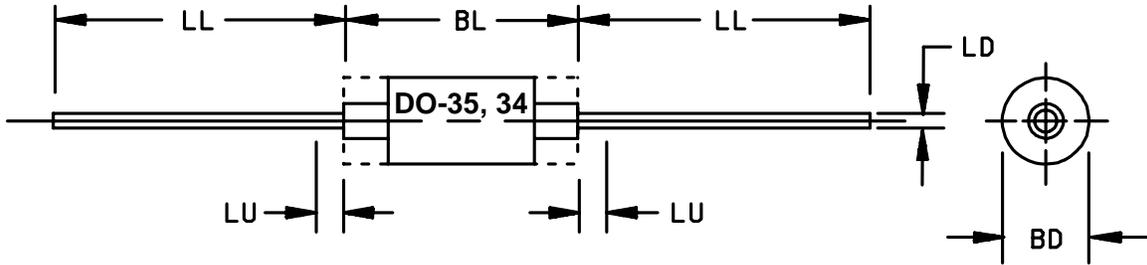
## 3. REQUIREMENTS

\* 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.

LS Lead spacing distance between device body and electrical/mechanical contact on lead.  
UB Hermetic unleaded 3 terminal (LCC, leadless chip carrier) package type.  
UB2 Hermetic unleaded 2 terminal (LCC, leadless chip carrier) package type.  
UR Unleaded round package type designation.  
 $V_{fr}$  Forward recovery voltage. Specified maximum forward voltage used to determine forward recovery time.

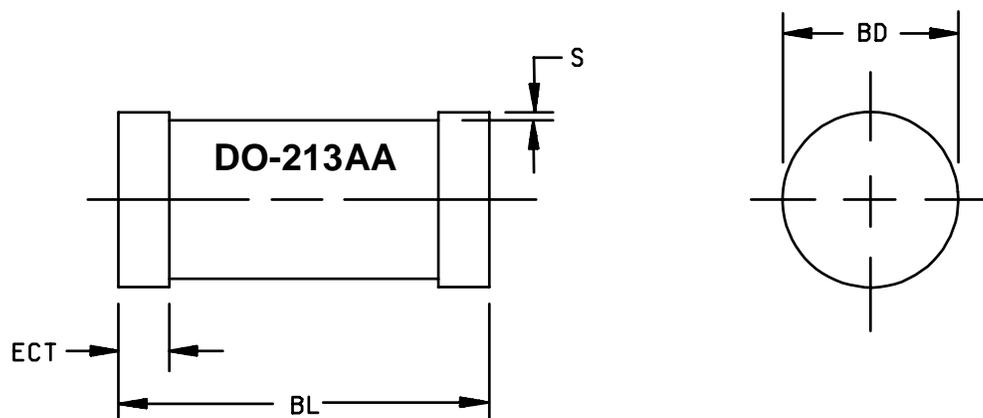


Types	Ltr	Dimensions				Notes
		Inches		Millimeters		
		Min	Max	Min	Max	
1N4153-1 (DO-35)	BD	.056	.075	1.42	1.91	3
	BL	.140	.180	3.56	4.57	3
	LD	.018	.022	0.46	0.56	4
	LL	1.000	1.500	25.40	38.10	
	LU		.050		1.27	4
1N4534 (DO-34)	BD	.050	.075	1.27	1.91	3
	BL	.080	.120	2.03	3.05	3
	LD	.018	.022	0.46	0.56	4
	LL	1.000	1.500	25.40	38.10	
	LU		.050		1.27	4

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Package contour optional within BD and length BL. Heat slugs if any, shall be included within this cylinder but shall not be subject to the minimum limit of BD.
4. Lead diameter not controlled in zones LL<sub>1</sub> to allow for flash, lead finish build-up, and minor irregularities other than heat slugs.
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

FIGURE 1. Physical dimensions 1N4153-1, 1N4534 (DO-35 and DO-34).



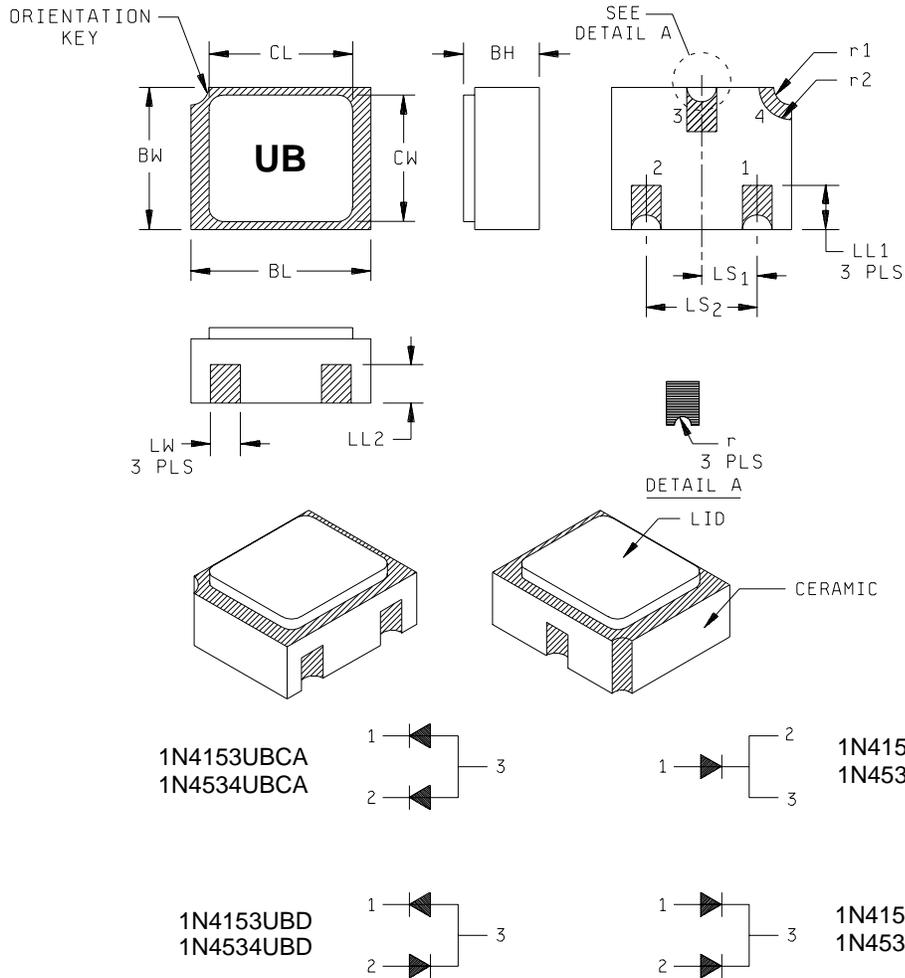
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.063	.067	1.60	1.70
BL	.130	.146	3.30	3.70
ECT	.016	.022	0.41	0.55
S	.001 min		0.03 min	

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 for 1N4153UR-1 (DO-213AA).

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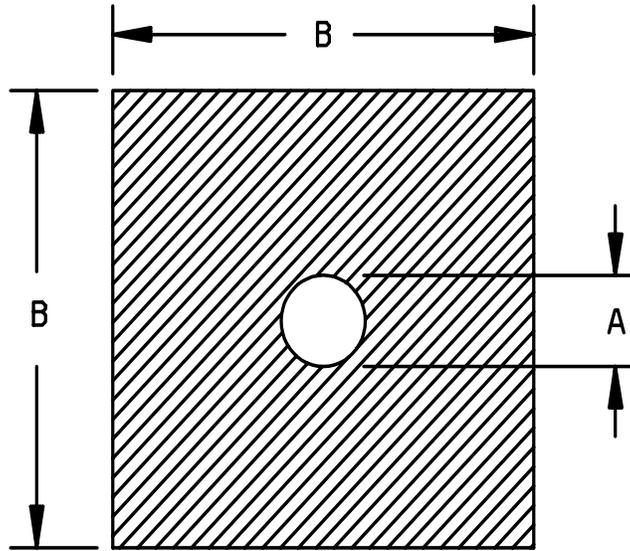


Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS1	.035	.040	0.89	1.02
BL	.115	.128	2.92	3.25	LS2	.071	.079	1.81	2.01
BW	.085	.108	2.16	2.74	LW	.016	.024	0.41	0.61
CL		.128		3.25	r		.008		0.20
CW		.108		2.74	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).



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.0059	.0061	.150	.155
B	.0130	.0170	.330	.430

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Element evaluation accomplished utilizing TO-5 package.
4. The physical characteristics of the die are:  
 Metallization:  
 Top (anode): Al.  
 Back (cathode): Au.  
 Al thickness: 25,000 Å minimum.  
 Gold thickness: 4,000 Å minimum.  
 Chip thickness: .010 inches (0.25 mm) ±.002 inches (0.05 mm).
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

FIGURE 4. Physical dimensions, JANHCA and JANKCA die.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and figure 1 (DO-35 and DO-34), figure 2 (DO-213AA), figure 3 (UB), and figure 4 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).

\* 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 J4153, JX4534 or JV4534. 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 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, II, and III).

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 that did not request the performance of table III tests, the tests specified in table III herein shall be performed by the first inspection lot of this revision to maintain qualification.

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4.2.2 JANHC and JANKC qualification. JANHC and JANKC qualification inspection shall be in accordance with MIL-PRF-19500.

4.3 Screening (JAN, JANTX, JANTXV, and JANS levels). 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		
	JANS level	JANTX and JANTXV levels	JAN level
3a	Temperature cycling	Temperature cycling	Temperature cycling (in accordance with MIL-PRF-19500, JANTX level)
(1) 3c	Thermal impedance (see 4.3.3)	Thermal impedance (see 4.3.3)	Thermal impedance (see 4.3.3)
9	$I_{R1}$ and $V_{F6}$	Not applicable	Not applicable
10	Method 1038 of MIL-STD-750, condition A	Method 1038 of MIL-STD-750, condition A, t = 48 hours	Not applicable
11	$I_{R1}$ ; $V_{F6}$ ; $\Delta I_{R1} \leq 100$ percent of initial value or 25 nA dc, whichever is greater; $\Delta V_{F6} \leq 25$ mV dc change from initial value	$I_{R1}$ and $V_{F6}$	Not applicable
12	See 4.3.2 and 4.5.2, t = 240 hours (min)	See 4.3.2 and 4.5.2	Not applicable
(2) (3) 13	Subgroups 2 and 3 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial value or 25 nA dc, whichever is greater; $\Delta V_{F6} \leq 25$ mV dc change from initial value.	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial value or 25 nA dc, whichever is greater; $\Delta V_{F6} \leq 25$ mV dc change from initial value.	Not applicable

(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)  $Z_{\theta JX}$  need not be performed at screen 13 if performed prior to screen 13.

\* (3) PDA  $\leq 5$  percent.

4.3.1 Screening (JANHC and JANKC). Screening of JANHC and JANKC die shall be in accordance with appendix G of MIL-PRF-19500. Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

\* 4.3.2 Power burn-in conditions. All devices shall be operated under one of the following conditions:  $T_A$  = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5.2).

Type	AC option $V_R = 50$ V(pk) $f = 50 - 60$ Hz, (see 4.5.2)	DC option
1N4153-1	$I_O = 150$ mA	$I_F = 150$ mA min
1N4534	$I_O = 150$ mA	$I_F = 150$ mA min

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

4.3.3 Thermal impedance ( $Z_{\Theta JX}$  measurements). Thermal impedance measurements shall be in accordance method 3101 MIL-STD-750, and as follows.

- a.  $I_H = 300 \text{ mA to } 500 \text{ mA}$ .
- b.  $t_H = 10 \text{ ms}$ .
- c.  $I_M = 1 \text{ mA to } 10 \text{ mA}$ .
- d.  $t_{MD} = 100 \mu\text{s maximum}$ .

The maximum limit for  $Z_{\Theta JX}$  under these test conditions is  $Z_{\Theta JX} = 70^\circ\text{C/W}$ .

4.3.3.1 For initial qualification or 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.

4.4 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 VIa (JANS) and 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. Delta measurements shall be in accordance with table II herein.

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B2	4066	Not applicable.
B3	1056	-55°C to +100°C, 25 cycles, n = 22, c = 0.
B3	1051	-55°C to +175°C, 100 cycles, n = 22, c = 0.
B4	1037	$I_O = 150 \text{ mA dc}$ ; $V_R = 50 \text{ V (pk)}$ ; $T_A = 25 \text{ }^\circ\text{C}$ ; $t_{on} = t_{off} = 3 \text{ minutes minimum for } 2,000 \text{ cycles}$ .
B5	1027	Option 1: Adjust $T_A$ or $I_O$ to obtain a minimum $T_J$ of +275°C, t = 96 hours. $I_O = 150 \text{ mA minimum}$ , $V_R = \text{rated } V_{RWM}$ , f = 50-60 Hz (see 4.5.1).
B5	1027	Option 2: Adjust $T_A$ or $I_O$ to obtain a minimum $T_J$ of +200°C, t = 1,000 hours. $I_O = 150 \text{ mA minimum}$ , $V_R = \text{rated } V_{RWM}$ , f = 50-60 Hz (see 4.5.1), n = 22, c = 0.

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
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).
B2	1056	$-55^\circ\text{C}$ to $+100^\circ\text{C}$ , 10 cycles, $n = 22$ , $c = 0$ .
B2	1051	$-55^\circ\text{C}$ to $+175^\circ\text{C}$ , 25 cycles, $n = 22$ , $c = 0$ .
B2	4066	Not applicable.
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.

\* 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, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	1056	$-55^\circ\text{C}$ to $+100^\circ\text{C}$ , 15 cycles, $n = 22$ , $c = 0$ .
C2	1051	$-55^\circ\text{C}$ to $+175^\circ\text{C}$ , 25 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	$R_{\theta JL}$ at $L = .375$ inch (9.52 mm) $\leq 250^\circ\text{C/W}$ , $R_{\theta JEC}$ at $L = 0$ lead length $\leq 100^\circ\text{C/W}$ , see 4.5.3. $R_{\theta JEC} = 100^\circ\text{C/W}$ (maximum) at zero lead length (for UR) $R_{\theta JSP} = 150^\circ\text{C/W}$ (maximum) (for UB) $+25^\circ\text{C} \leq T_R \leq +35^\circ\text{C}$ , $t_H \geq 25$ s in still air.
C6	1026	$V_{RWM} = 50$ V(pk), $I_O = 150$ mA, $T_A =$ room ambient as defined in the general requirements of MIL-STD-750, $f = 50$ -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 for pulse measurements shall be specified in section 4 of MIL-STD-750.

4.5.2 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.

\* 4.5.2.1 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 still sees the full  $P_t$ (minimum) and that the minimum applied voltage, where applicable, is maintained throughout the burn-in period.

4.5.3 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.

\* 4.5.4 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.  $I_H = 75 \text{ mA to } 300 \text{ mA}$ .
- b.  $t_H = 25 \text{ seconds minimum}$ .
- c.  $I_M = 1 \text{ mA to } 10 \text{ mA}$ .
- d.  $t_{MD} = 70 \mu\text{s maximum}$ .

\* 4.5.4.1 Lead spacing for leaded devices:  $LS = \text{lead spacing} = .375 \text{ inch } (9.53 \text{ mm})$  as defined on figure 5.

4.5.4.2 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.

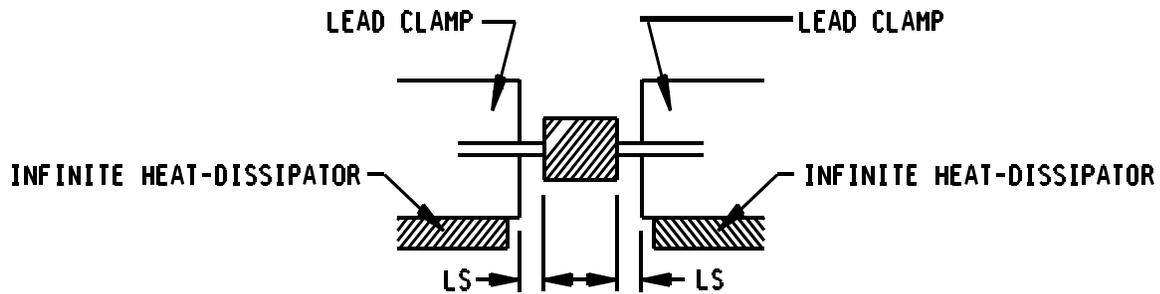


FIGURE 5. Mounting conditions.

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 4.3.3	Z <sub>ΘJX</sub>		70	°C/W
Forward voltage	4011	I <sub>F</sub> = 100 μA dc	V <sub>F1</sub>	0.49	0.55	V dc
Forward voltage	4011	I <sub>F</sub> = 250 μA dc	V <sub>F2</sub>	0.53	0.59	V dc
Forward voltage	4011	I <sub>F</sub> = 1 mA dc	V <sub>F3</sub>	0.59	0.67	V dc
Forward voltage	4011	I <sub>F</sub> = 2 mA dc	V <sub>F4</sub>	0.62	0.70	V dc
Forward voltage	4011	I <sub>F</sub> = 10 mA dc	V <sub>F5</sub>	0.70	0.81	V dc
Forward voltage	4011	I <sub>F</sub> = 20 mA dc	V <sub>F6</sub>	0.74	0.88	V dc
Reverse current	4016	DC method; V <sub>R</sub> = 50 V dc	I <sub>R1</sub>		50	nA dc
Breakdown voltage	4021	I <sub>R</sub> = 5 μA dc	V <sub>BR1</sub>	75		V 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>		50	μA dc
Low temperature operation:		T <sub>A</sub> = -55°C				
Breakdown voltage	4021	I <sub>R</sub> = 5 μA dc	V <sub>(BR)2</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), max	C		2.0	pF
Reverse recovery time	4031	Condition A; C ≥ 1 nF, R ≥ 1,000 Ω, I <sub>F</sub> = I <sub>R</sub> = 10 mA dc, i <sub>R(REC)</sub> = 1.0 mA R <sub>L</sub> = 100 Ω	t <sub>rr</sub>		4	ns

See footnote at end of table.

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TABLE I. Group A inspection - Continued.

Inspection <sup>1/</sup>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u> Not applicable	4066	$I_F = 150 \text{ mA dc}$ ; $T_A = 25^\circ\text{C}$ , $I_{FSM} = 2 \text{ A(pk)}$ , ten $1 \mu\text{s}$ surges, 1 surge/minute  See table I, subgroup 2 herein.				
<u>Subgroup 6</u> Surge current						
Electrical measurements						
<u>Subgroup 7</u> Not applicable						

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

TABLE II. Groups A, B, and C electrical and delta measurements. <sup>1/</sup> <sup>2/</sup>

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward current	4011	$I_F = 20 \text{ mA dc}$	$\Delta V_{F6}$	$\leq 25 \text{ mV dc}$ change from initial value		
2.	Reverse current	4016	DC method, $V_R = 50 \text{ V dc}$	$\Delta I_{R1}$	$\leq 100$ percent of initial value or $25 \text{ nA dc}$ , whichever is greater.		

<sup>1/</sup> The electrical measurements for table VIa (JANS) of MIL-PRF-19500 are as follows: Subgroups 4 and 5, see table II herein, steps 1 and 2.

<sup>2/</sup> The electrical measurements for table VII of MIL-PRF-19500 are as follows: Subgroup 6, see table II herein, steps 1 and 2 (JANS).

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

Inspection <u>1/</u>	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Thermal shock (glass strain)	1056	500 cycles minimum, -55°C to +100°C	
Temperature cycling	1051	500 cycles minimum, -55°C to +100°C	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 2</u>	1037		45 devices c = 0
Intermittent operating life		10,000 cycles	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 3</u>		Separate samples to be used for each test	3 devices, c = 0
DPA	2101	Cross section	
	2101	Scribe and break	
<u>Subgroup 4</u>			3 devices, c = 0
Thermal impedance curves		Each supplier shall submit their (typical) design thermal impedance curves. In addition, test conditions and $Z_{\Theta JX}$ limit shall be provided to the qualifying activity in the qualification report.	
<u>Subgroup 5</u>			22 devices, c = 0
Monitored mission temperature cycling	1055	Not required for UB suffix devices.	
<u>Subgroup 6</u>			3 devices c = 0
ESD	1020		
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 7</u>			22 devices c = 0
Soldering heat	2031	1 cycle	

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

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. Packaging requirements (see 5.1).
- d. Lead finish (see 3.4.1).
- e. Type designation and product assurance level.

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.

6.4 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHCA1N4153) will be identified on the QML.

JANC ordering information	
PIN	Manufacturer
	43611
1N4153 1N4534	JANHCA1N4153, JANKCA1N4153 JANHCA1N4534, JANKCA1N4534

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  
NASA - NA  
DLA - CC

Preparing activity  
DLA - CC

(Project 5961-2746)

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

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**

**INSTRUCTIONS**

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

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

<b>I RECOMMEND A CHANGE:</b>	<b>1. DOCUMENT NUMBER</b> MIL-PRF-19500/337H	<b>2. DOCUMENT DATE</b> 5 November 2003
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**3. DOCUMENT TITLE**  
 SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING, TYPES 1N4153-1, 1N4153UB, 1N4153UR-1, 1N4153UBCA, 1N4153UBCC, 1N4153UBD, 1N4534, AND 1N4534UB, JAN, JANTX, JANTXV, 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**

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

**8. PREPARING ACTIVITY**

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