

The documentation and process conversion measures necessary to comply with this document shall be completed by 5 December 2016.

INCH-POUND  
MIL-PRF-19500/231R  
w/AMENDMENT 2  
6 September 2016  
SUPERSEDING  
MIL-PRF-19500/231R  
w/AMENDMENT 1  
9 February 2016

\* SEMICONDUCTOR DEVICE, DIODE, SWITCHING, SILICON,  
TYPES 1N4150 AND 1N3600, QUALITY LEVELS JAN, JANTX, JANTXV, JANHC AND JANKC

JANS1N4150-1 is superseded by MIL-PRF-19500/609 JANS1N6640 (see 6.4). The DO-7 version of the 1N3600 is inactive for new design.

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 controlled forward voltage switching diodes. Three levels of product assurance (JAN, JANTX, and JANTXV) are provided for each device type as specified in [MIL-PRF-19500](#). Two levels of product assurance (JANHC and JANKC) are provided for unencapsulated devices.

\* 1.2 Package outlines and die topography. The device packages for the encapsulated device types are as follows: DO-35 and DO-7 in accordance with [figure 1](#), surface mount version UR (DO-213AA) in accordance with [figure 2](#), surface mount version UB in accordance with [figure 3](#), and the dimensions and topography for JANHC and JANKC unencapsulated die in accordance with [figure 4](#).

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

Type	$V_{BR}$ Min	$V_{RWM}$	$I_O(\text{PCB})$ (1) (2)	$I_{FSM}$ $t_p = 8.3\text{ms}$	$T_{STG}$ & $T_J$ (1)	$R_{\theta JL}$ (axial) (3)	$R_{\theta JEC}$ (UR) (3)	$R_{\theta JA}(\text{PCB})$ (2) (3) (4)	$R_{\theta JSP}$ (UB) (3) (4)
	$V_{dc}$	$V_{(pk)}$	$\text{mA}$	$A_{(pk)}$	$^{\circ}\text{C}$	$^{\circ}\text{C/W}$	$^{\circ}\text{C/W}$	$^{\circ}\text{C/W}$	$^{\circ}\text{C/W}$
1N4150-1 1N4150UR-1	75	50	200	2	-65 to +175	250		325	
					100		325		
1N4150UB 1N4150UBCA 1N4150UBCC 1N4150UBD					-55 to +200			325	120
1N3600					-55 to +175	250		325	

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to [Semiconductor@dla.mil](mailto:Semiconductor@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.



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1.3 Maximum ratings - Continued.

- (1) For temperature-current derating curves, see [figures 5](#) and [6](#).
- (2)  $T_A = +75^\circ\text{C}$  for both axial and metal electrode leadless face diodes (MELF) (UR) on printed circuit board (PCB), PCB = FR4 - .0625 inch (1.59 mm) 1-layer 1-Oz Cu, horizontal, in still air; pads for (UR) = .061 inch (1.55 mm) x .105 inch (2.67 mm); pads for axial = .092 inch (2.34 mm) diameter, strip = .030 inch (0.76 mm) x 1 inch (25.4 mm) long, lead length  $L \leq .187$  inch ( $\leq 4.75$  mm);  $R_{\theta JA}$  with a defined PCB thermal resistance condition included, is measured at  $I_O = 200$  mA dc.
- (3) For axial leaded devices  $L = .375$  inch (9.53 mm). See [figure 7](#), [figure 8](#), and [figure 9](#) for thermal impedance curves.
- (4)  $R_{\theta JSP}$  refers to thermal resistance from junction to the solder pads of the UB package.

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

Limits (1)	$V_{F1}$ $I_F = 1$ mA dc	$V_{F2}$ $I_F = 10$ mA dc	$V_{F3}$ $I_F = 50$ mA dc (pulsed)	$V_{F4}$ $I_F = 100$ mA dc (pulsed)	$V_{F5}$ $I_F = 200$ mA dc (pulsed)	$I_{R1}$ at $V_R = 50$ 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 (1)	$I_{R2}$ $V_R = 50$ V dc $T_A = +150^\circ\text{C}$	C $V_R = 0$ ; $f = 1$ Mhz; ac signals = 50 mV(p-p)	$t_{rr1}$ $I_F = I_R = 10$ to 100 mA dc $R_L = 100$ ohms
	<u><math>\mu\text{A dc}</math></u>	<u>pf</u>	<u>ns</u>
Minimum			
Maximum	100	2.5	4

- (1) Primary electrical characteristics for surface mount devices are equivalent to the corresponding non-surface mount devices unless otherwise specified.

1.5 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.4](#) for PIN construction example, [6.5](#) for a list of available PINs, and [6.6](#) for supersession information.

1.5.1 JAN certification mark and quality level.

1.5.1.1 Quality level designators for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: The quality level "JAN" "JANTX" and "JANTXV".

1.5.1.2 Quality level designators for unencapsulated devices (die). The quality level designators for unencapsulated devices (die) that are applicable for this specification sheet from the lowest to the highest level are as follows: "JANHC" and "JANKC".

1.5.2 Device type. The designation system for the device types covered by this specification sheet are as follows.

1.5.3.1 First number and first letter symbols. The diodes of this specification sheet use the first number and letter symbols "1N".

1.5.3.2 Second number symbols. The second number symbols for the diodes covered by this specification sheet are as follows: "4150" and "3600".

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\* 1.5.4 Suffix symbols. The following suffix letters are incorporated in the PIN as applicable:

-1	Indicates an axial through-hole mount (DO-35) package (see <a href="#">figure 1</a> ).
	A blank first suffix symbol indicates an axial through-hole mount (DO-7) package (see <a href="#">figure 1</a> ).
UR-1	Indicates a surface mount, round endcap package (see <a href="#">figure 2</a> ).
UB	Indicates a surface mount, small leadless chip carrier package (see <a href="#">figure 3</a> ).

1.5.5 Lead finish. The lead finishes applicable to this specification sheet are listed on [QML-19500](#).

1.5.6 Die identifiers for unencapsulated devices (manufacturers and critical interface identifiers). The manufacturer die identifiers that are applicable for this specification sheet is "A".

## 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 of 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 cited in the solicitation or contract.

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-PRF-19500](#) - Semiconductor Devices, General Specification for.

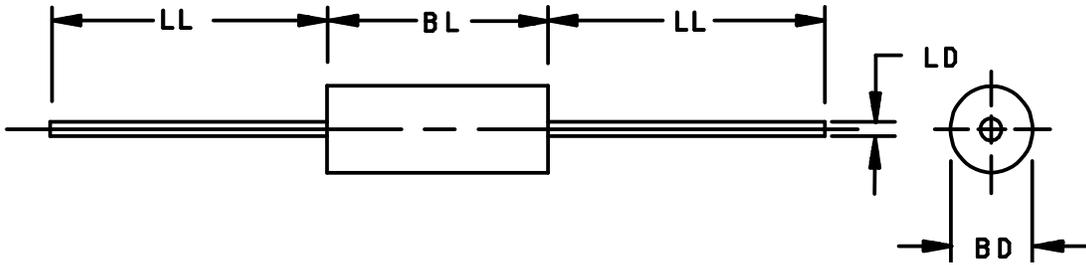
#### DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-750](#) - Test Methods for Semiconductor Devices.

(Copies of these documents are available online at <http://quicksearch.dla.mil>.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, 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.

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

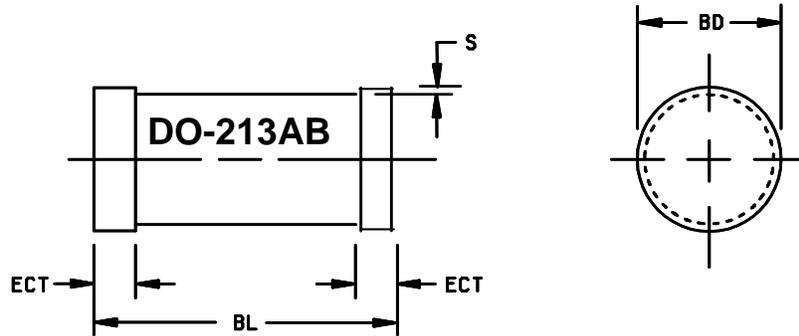
NOTES:

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.

TYPES 1N4150-1, 1N3600

FIGURE 1. Physical dimensions.

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Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.063	.067	1.60	1.70
BL	.130	.146	3.30	3.71
ECT	.016	.022	0.41	0.56
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, 1N4150UR-1 (DO-213AA).

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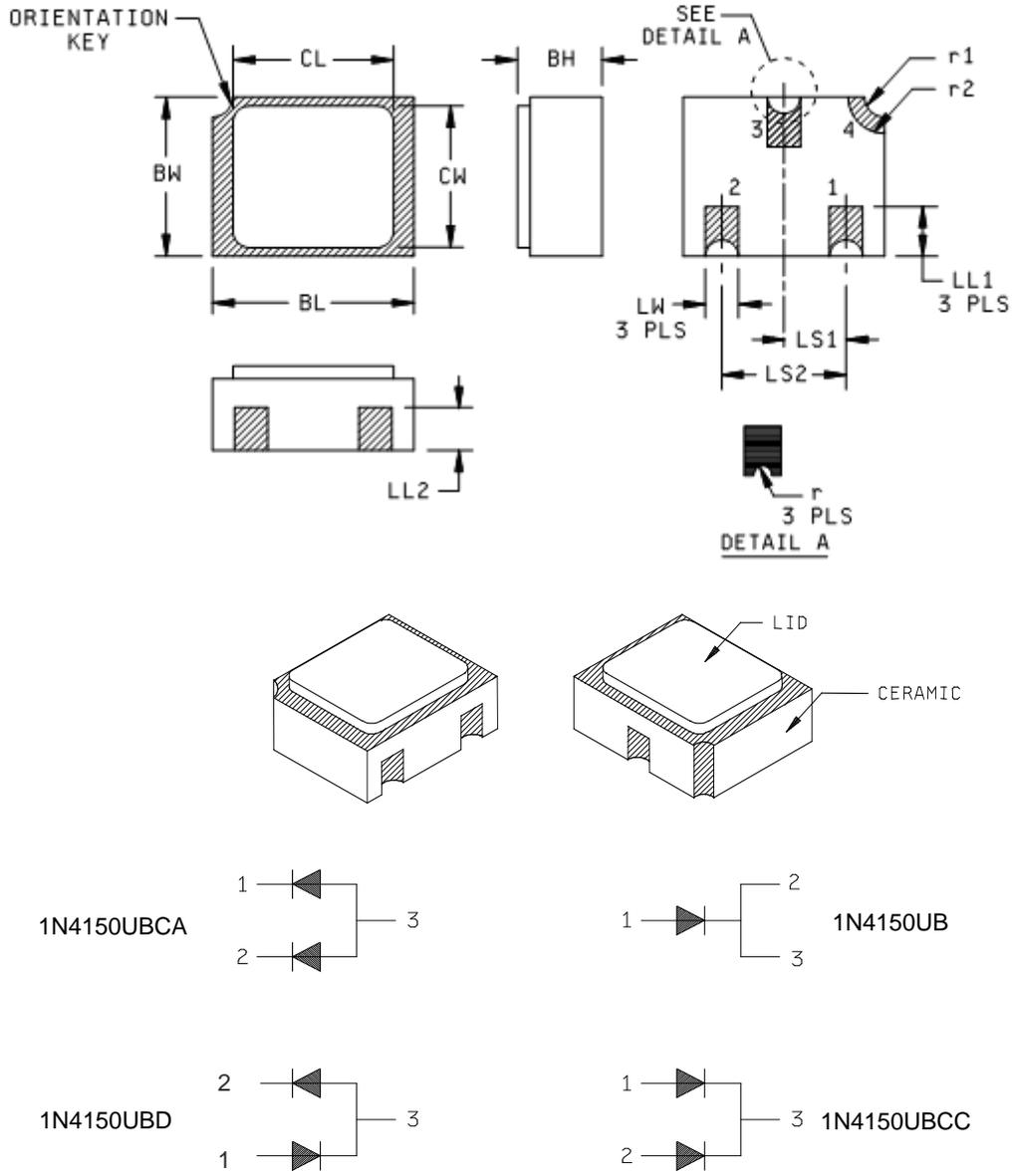


FIGURE 3. Physical dimensions, surface mount (UB version).

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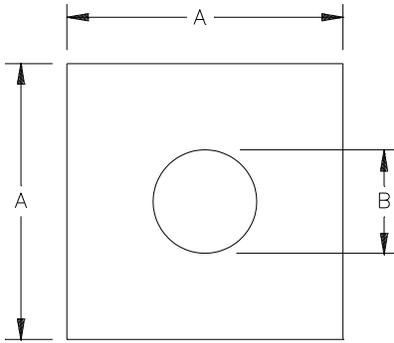
Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS1	.035	.039	0.89	0.99
BL	.115	.128	2.92	3.25	LS2	.071	.079	1.80	2.01
BW	.085	.108	2.16	2.74	LW	.016	.024	0.41	0.61
CL		.128		3.25	r		.008		0.20
CW		.108		2.74	r1		.012		0.31
LL1	.022	.038	0.56	0.97	r2		.022		0.56
LL2	.017	.035	0.43	0.89					

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Ceramic package only.
3. Hatched areas on package denote metallized areas. Pad 4 = shielding, connected to the lid.
4. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

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

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BACKSIDE IS CATHODE



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.014	.018	.360	.460
B	.005	.007	.127	.180
C	.008	.012	0.20	0.30

NOTES:

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

FIGURE 4. Physical dimensions, JANHCA and JANKCA die.

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### 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 (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.

SP Solder pad on UB devices.

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

3.4 Interface requirements and physical dimensions. Interface requirements and physical dimensions shall be as specified in [MIL-PRF-19500](#), and on [figure 1](#) (axial leads), [figure 2](#) (DO-213AA), [figure 3](#) (UB), and [figure 4](#) (JANH and JANKC).

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. The 'UR' version shall be structurally identical to the axial leaded versions except for end-cap lead attachment.

3.5 Marking. Marking shall be in accordance with [MIL-PRF-19500](#).

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 as specified in [table I](#) herein.

3.8 Workmanship. Switching diode 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](#)).

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

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

4.2.2 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 specification sheet that did not require the performance of table II tests, the tests specified in table II herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

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

Screening	JANTXV and JANTX level
(1) 3c	Thermal impedance (see 4.3.3)
9	Not required
10	Method 1038 of MIL-STD-750, condition A
(2) 11	$I_{R1}$ and $V_{F2}$
12	See 4.3.2
(3) (4) 13	Subgroup 2 of table I herein; $\Delta I_{R1} = 100$ percent of initial value or 25 nA dc, whichever is greater; $\Delta V_{F2} = 25$ mV dc.

- (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) When thermal impedance is performed prior to screen 13, it is not required to be repeated in screen 13.
- (4) PDA  $\leq 5$  percent.

4.3.1 Screening (JANHC and JANKC). Screening of JANHC and JANKC die shall be in accordance with MIL-PRF-19500 "Discrete Semiconductor Die/Chip Lot Acceptance". Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

4.3.2 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.2): Method 1038 of MIL-STD-750, condition B.  $V_R =$  rated  $V_{RWM}$ ;  $f = 50 - 60$  Hz;  $I_{O(min)} = I_{O(PCB)}$  or  $I_F = I_{O(PCB)}$ . The maximum current density of small die shall be submitted to the qualifying activity for approval. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, mounting conditions, etc.) may be used for JANTX and JANTXV quality levels. A justification demonstrating equivalence is required. In addition, the manufacturing site's burn-in data and performance history will be essential criteria for burn-in modification approval.

4.3.3 Thermal impedance measurements. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 of MIL-STD-750, as applicable, using the guidelines in that method for determining  $I_H$  and  $I_M$ .  $t_{MD}$  shall be 70  $\mu$ s maximum,  $t_H$  shall be 10 ms maximum. See group E, subgroup 4 of table II herein.

4.3.4 JAN testing. JAN level product will have temperature cycling and thermal impedance testing performed in accordance with MIL-PRF-19500, JANTX level screening level requirements. Electrical testing shall be in accordance with table I, subgroup 2 herein.

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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 table E-V of [MIL-PRF-19500](#), [table I](#) herein, and as specified 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 conditions specified for subgroup testing in table E-VIB (JAN, JANTX, and JANTXV) of [MIL-PRF-19500](#) and 4.4.2.1 herein.

4.4.2.1 Group B inspection, table E-VIB (JAN, JANTX, and JANTXV) of [MIL-PRF-19500](#). Leaded samples from the same lot may be used in lieu of 'UR' suffix sample for life test.

<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, 45 cycles, including screening.
B2	2005	I <sub>F</sub> = 100 mA, axial tensile stress = 8 lbs, T <sub>A</sub> = +150°C; (not applicable to 'UR' or 'UB' package).
B3	1027	V <sub>(pk)</sub> = rated V <sub>RWM</sub> ; f = 50 - 60 Hz; I <sub>O</sub> = 200 mA dc minimum; adjust T <sub>A</sub> or I <sub>O</sub> to obtain a minimum T <sub>J</sub> of +150°C. See <a href="#">4.5.2</a> .
B4	2075	UB devices
B4	2101	Glass devices, Decap analysis; scribe and break (not applicable for UB devices).
B6	1032	T <sub>A</sub> = +175°C.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of [MIL-PRF-19500](#), and as follows.

4.4.3.1 Group C inspection, table E-VII of [MIL-PRF-19500](#).

<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, 45 cycles including screening.
C2	2036	Tension - test condition A; weight = 10 pounds, t = 15 s; lead fatigue = condition E (not applicable to 'UR' and 'UB' suffix types).
C5	4081	L = .375 inch (9.53 mm), R <sub>θJL</sub> = 250°C/W maximum; R <sub>θJEC</sub> = 100°C/W; R <sub>θJSP</sub> = 120°C/W; (see <a href="#">4.3.2</a> ), 22 devices, c = 0.
C6	1026	1,000 hours minimum, V <sub>(pk)</sub> = rated V <sub>RWM</sub> ; f = 50 - 60 Hz; I <sub>O</sub> = 200 mA dc minimum; adjust T <sub>A</sub> or I <sub>O</sub> to obtain a minimum T <sub>J</sub> of +150°C. See <a href="#">4.5.2</a> .

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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 E-IX of [MIL-PRF-19500](#), and [table II](#) 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 as specified in section 4 of [MIL-STD-750](#).

4.5.2 Free air power burn-in and life tests. 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. Method 3100 of [MIL-STD-750](#) shall be used to measure  $T_J$ .

4.5.3 Forward recovery voltage and time. Forward recovery 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  $I_F = 200$  mA dc. The maximum rise time of the response detector shall be 1 ns.

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\* TABLE I. Group A inspection.

Inspection <u>1/</u> <u>2/</u> <u>3/</u>	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 <u>4/</u>	3101	See 4.3.3	$Z_{\theta JX}$			°C/W
Forward voltage	4011	$I_F = 1$ mA dc (pulsed, see 4.5.1) Condition B	$V_{F1}$	0.540	0.620	V dc
	4011	$I_F = 10$ mA dc (pulsed, see 4.5.1) Condition B	$V_{F2}$	0.660	0.740	V dc
	4011	$I_F = 50$ mA dc (pulsed, see 4.5.1) Condition B	$V_{F3}$	0.760	0.860	V dc
	4011	$I_F = 100$ mA dc (pulsed, see 4.5.1) Condition B	$V_{F4}$	0.820	0.920	V dc
	4011	$I_F = 200$ mA dc (pulsed, see 4.5.1) Condition B	$V_{F5}$	0.870	1.000	V dc
Breakdown voltage	4021	$I_{BR} = 10$ $\mu$ A dc	$V_{BR1}$	75		V dc
Reverse current	4016	DC method; $V_R = 50$ V dc	$I_{R1}$		0.10	$\mu$ A dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +150^\circ\text{C}$				
Reverse current	4016	DC method, $V_R = 50$ V dc	$I_{R2}$		100	$\mu$ A dc
Low temperature operation:		$T_A = -55^\circ\text{C}$				
Breakdown voltage	4021	$I_R = 5$ $\mu$ A dc	$V_{BR2}$	75		V dc
<u>Subgroup 4</u>						
Capacitance	4001	$V_R = 0$ V dc, $f = 1$ MHz, $V_{sig} = 50$ mV (pk to pk), maximum	C		2.5	pF
Reverse recovery time	4031	Condition A, $I_F = I_{RM} = 10$ mA dc	$t_{rr1}$		4	ns
Scope display evaluation	4023	See method 4023 of MIL-STD-750, figures 4023-3, 4023-7, 4023-9, 4023-10 only				

See footnotes on next page.

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\* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u> <u>2/</u> <u>3/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u> Not applicable						
<u>Subgroup 6</u> Surge current	4066	Condition A (sine wave), $I_{F(\text{surge})} = 2 \text{ A(pk)}$ , $I_O = 0$ , $V_{RM} = 0$ , 10 surges, 8.3 ms width each, one surge per minute, $T_A = +25^\circ\text{C}$  or Condition B (square wave), $I_{F(\text{surge})} = 4 \text{ A (pk)}$ , 10 surges, $1\mu\text{s}$ width each, duty factor = 0.0055 percent, $T_A = 25^\circ\text{C}$				
<u>Subgroup 7</u> * Forward recovery voltage and time	4026	$I_F = 200 \text{ mA dc}$ ; $t_r = 1 \text{ ns}$ ; (see 4.5.3)	$V_{FRM}$ $t_{fr}$	5 10	V(pk) ns	

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

2/ UBCA, UBCC, and UBD devices are to have each diode tested individually.

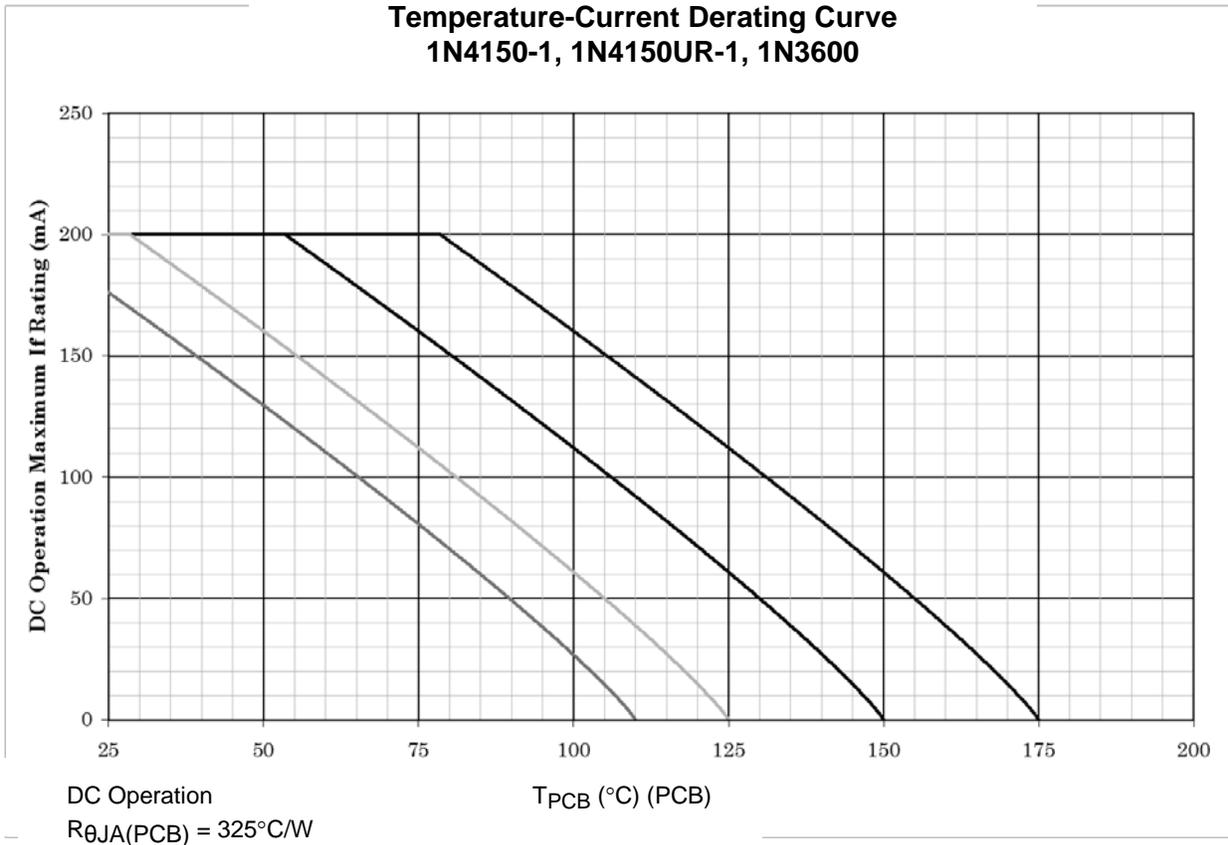
3/ Electrical characteristics for all surface mount versions are identical to the corresponding axial leaded versions unless otherwise specified.

- \* 4/ This test required for the following end-point measurements only:  
Group B, subgroups 3, 4 and 5 (JANS).  
Group B, subgroups 2 and 3 (JAN, JANTX, JANTXV).  
Group C, subgroups 2 and 6.  
Group E, subgroup 1.

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

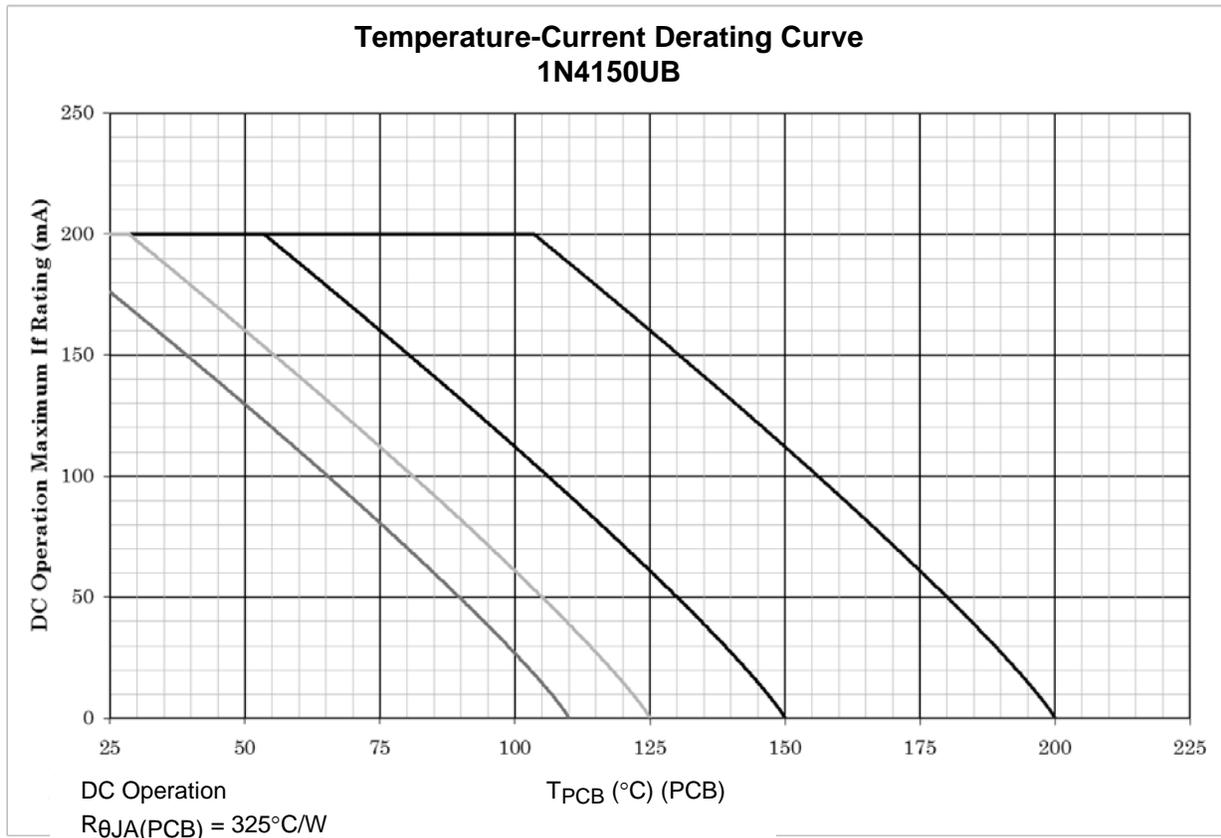
Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
<u>Subgroup 1</u>			n = 45, c = 0
Thermal shock (glass strain)	1056	100 cycles 0°C to 100°C.	
Temperature cycling	1051	500 cycles, -65°C to +175°C.	
Hermetic seal	1071	Gross leak only. Fine and gross leak required for UB.	
Electrical measurement		See <a href="#">table I</a> , subgroup 2.	
<u>Subgroup 2</u>			n = 45, c = 0
Intermittent operating life	1037	10,000 cycles.	
Electrical measurements		See <a href="#">table I</a> , subgroup 2.	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves		See <a href="#">MIL-PRF-19500</a> .	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			
* ESD	1020		
<u>Subgroup 8</u>			n = 45
Resistance to glass cracking	1057	Test condition B. Test until failure occurs or to a maximum of 25 cycles, whichever comes first.	
<u>Subgroup 9</u>			n = 22, c = 0
Monitored mission temperature cycling	1055	Not required for UB suffix devices.	
Electrical measurements		See <a href="#">table I</a> , subgroup 2.	



NOTES:

1. All devices are capable of operating at  $\leq T_J$  specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum  $T_J$  allowed.
2. Derate design curve constrained by the maximum junction temperature ( $T_J \leq +175^{\circ}\text{C}$ ) and current rating specified. (See 1.3.)
3. Derate design curve chosen at  $T_J \leq 150^{\circ}\text{C}$ , where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at  $T_J \leq 125^{\circ}\text{C}$ , and  $110^{\circ}\text{C}$  to show current rating where most users want to limit  $T_J$  in their application.

FIGURE 5. Temperature-current derating graph (all devices).

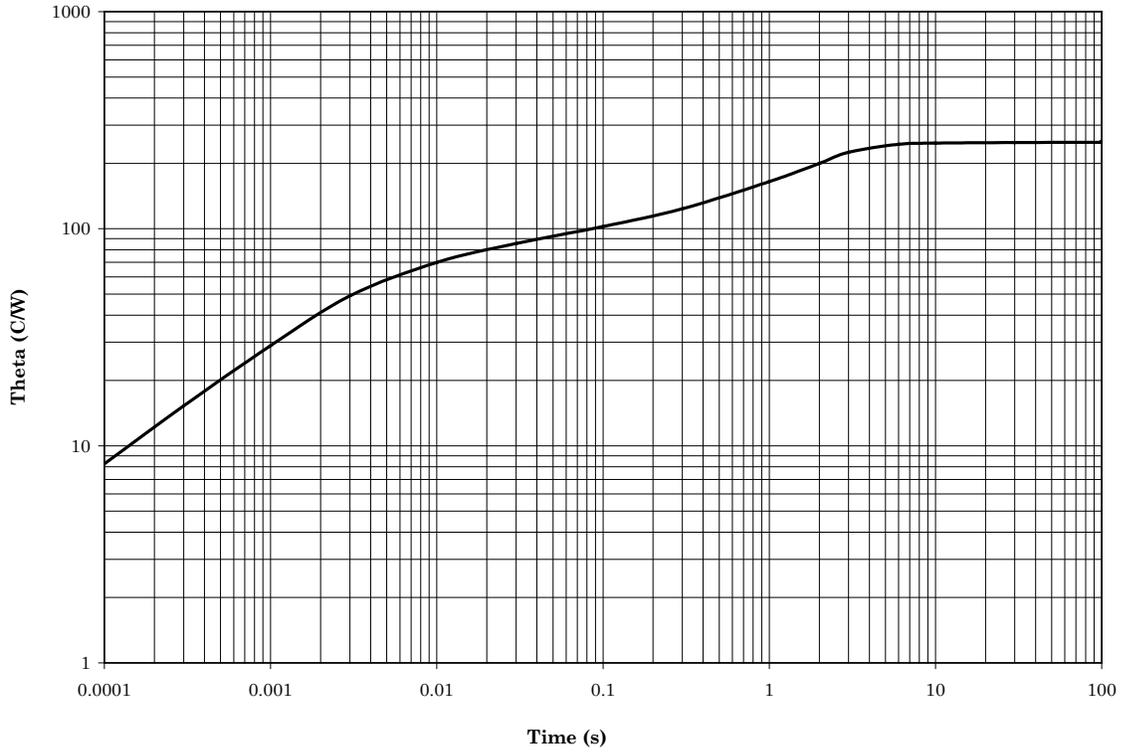


NOTES:

1. All devices are capable of operating at  $\leq T_J$  specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum  $T_J$  allowed.
2. Derate design curve constrained by the maximum junction temperature ( $T_J \leq 200^{\circ}\text{C}$ ) and current rating specified. (See 1.3.)
3. Derate design curve chosen at  $T_J \leq 150^{\circ}\text{C}$ , where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at  $T_J \leq 125^{\circ}\text{C}$ , and  $110^{\circ}\text{C}$  to show current rating where most users want to limit  $T_J$  in their application.

FIGURE 6. Temperature-current derating graph (all devices).

**1N4150-1, 1N3600 DO-35 Axial  $T_L = 25^\circ\text{C}$   
MAXIMUM THERMAL IMPEDANCE PLOTS**

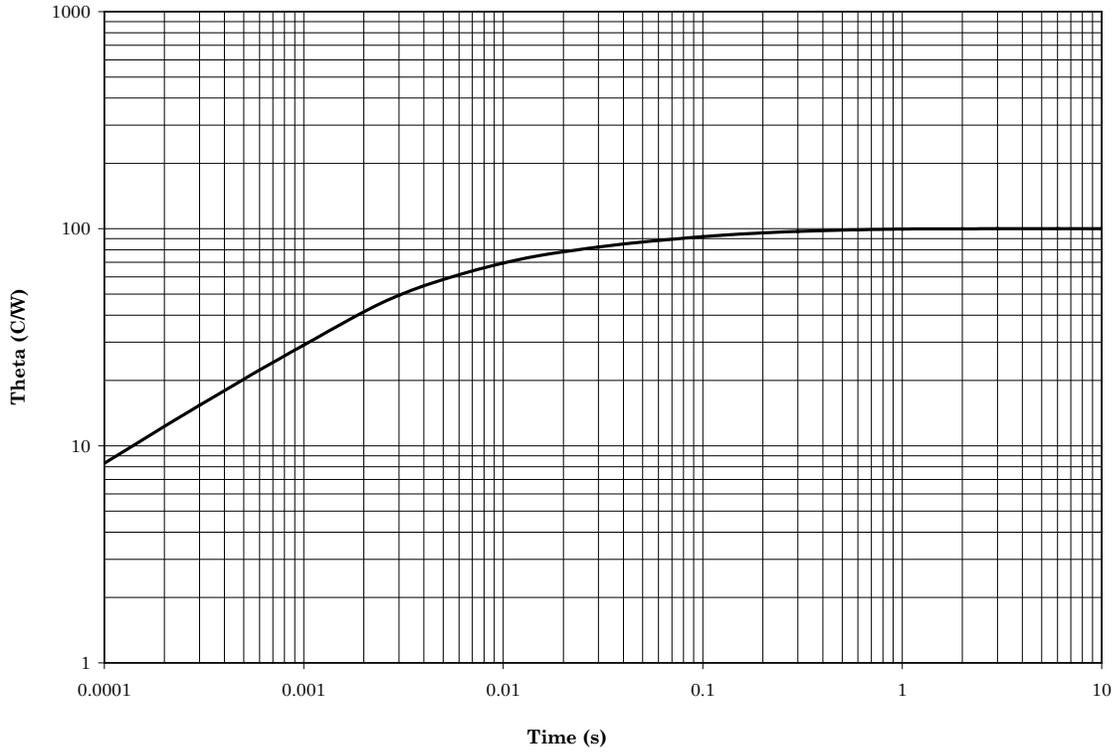


$R_{\theta JL} = 250^\circ\text{C/W}$

NOTE:  $Z_{\theta JX} = 70^\circ\text{C/W}$  maximum at  $t_H = 10\text{ms}$ .

FIGURE 7. Thermal impedance (axial leads).

**1N4150UR-1 DO-213AA  $T_{EC} = 25^{\circ}\text{C}$   
Maximum Thermal Impedance Plots**

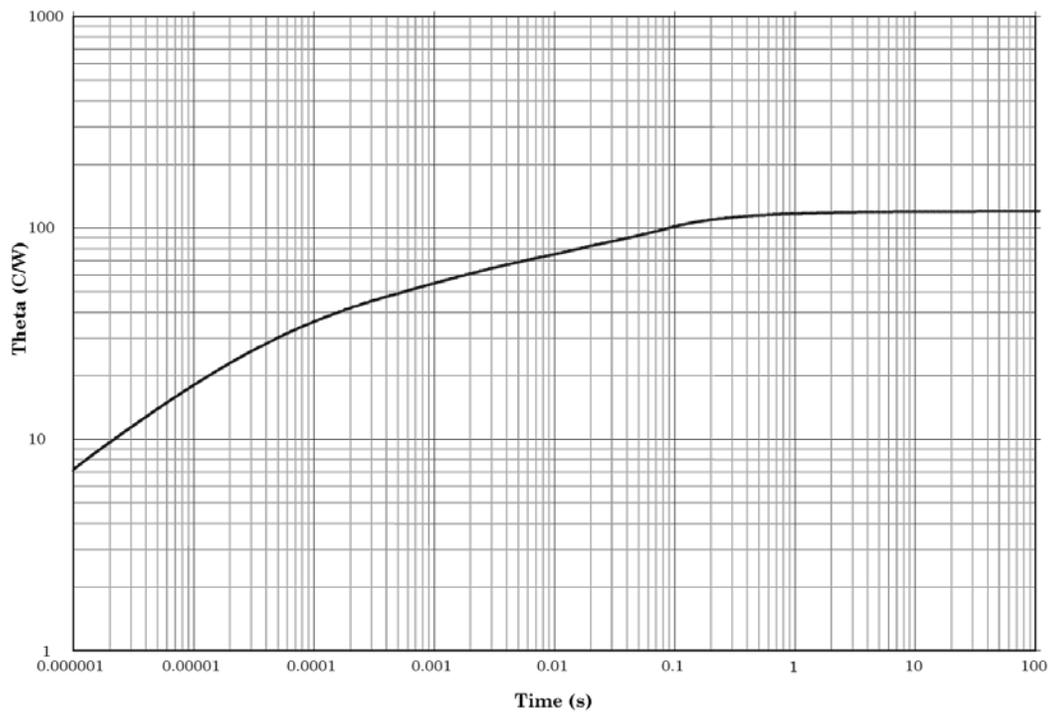


$R_{\theta JEC} = 100^{\circ}\text{C/W}$

NOTE:  $Z_{\theta JX} = 70^{\circ}\text{C/W}$  maximum at  $t_H = 10\text{ms}$ .

FIGURE 8. Thermal impedance (MELF surface mount).

**1N4150UB, T<sub>SP</sub> = 25°C**  
**Maximum Thermal Impedance Plots**



$R_{\theta JSP} = 120^{\circ}\text{C/W}$

NOTE:  $Z_{\theta JX} = 90^{\circ}\text{C/W}$  maximum at  $t_H = 10\text{ms}$ .

FIGURE 9. Thermal impedance (UB versions).

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When 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. The notes specified in MIL-PRF-19500 are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

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. The complete (PIN), see 1.5 and 6.6.
- e. Destructive physical analysis when requested.

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 DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail [vqe.chief@dla.mil](mailto:vqe.chief@dla.mil). An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

6.4 Cross reference substitution list. JANS1N4150-1 is prohibited and will no longer be built or qualified. Devices in stock are acceptable provided the date code does not exceed 9412. A PIN for PIN replacement table follows, and these devices are directly interchangeable. The 1N4150 design is unsuitable for space flight applications. The JANS1N6640 will be used in place of the JANS1N4150-1.

Non-preferred PIN	Preferred PIN
JANS1N4150-1 JANS1N4150UR-1	JANS1N6640 JANS1N6640US

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6.4.1 Substitutability of dash-one parts. Dash-one devices are a direct substitute for non-dash-one devices and are preferred. The following table shows the direct substitutability.

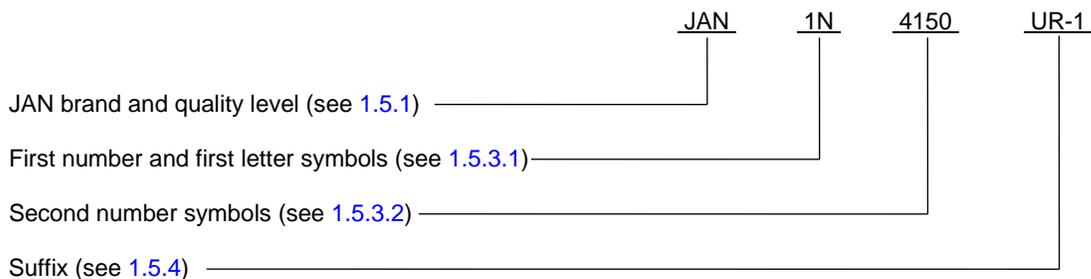
Superseded PIN	Superseding PIN
1N3600	1N4150-1
1N4150	1N4150-1

6.5 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHCA1N4150) will be identified on the QML.

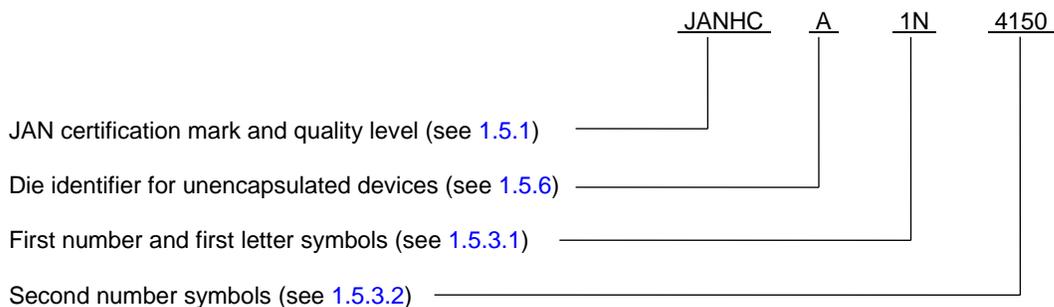
JANHC and JANKC ordering information	
PIN	Manufacturer
	52GC4
1N4150	JANHCA1N4150 JANKCA1N4150
1N3600	JANHCA1N3600 JANKCA1N3600

\* 6.6 PIN construction example.

6.6.1 PIN construction example. The PINs for encapsulated devices are constructed using the following form.



6.6.2 Unencapsulated devices. The PINs for un-encapsulated devices are constructed using the following form.



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6.7 List of PINs. The following is a list of possible PINs available on this specification sheet.

PINs for devices of the base quality level	PINs for devices of the "TX" quality level	PINs for devices of the "TXV" quality level	PINs for devices of the "HC" and "KC" quality levels
JAN1N4150-1	JANTX1N4150-1	JANTXV1N4150-1	JANHCA1N4150
JAN1N4150UR-1	JANTX1N4150UR-1	JANTXV1N4150UR-1	JANKCA1N4150
JAN1N4150UB	JANTX1N4150UB	JANTXV1N4150UB	JANHCA1N3600
JAN1N4150UBCA	JANTX1N4150UBCA	JANTXV1N4150UBCA	JANKCA1N3600
JAN1N4150UBCC	JANTX1N4150UBCC	JANTXV1N4150UBCC	
JAN1N4150UBD	JANTX1N4150UBD	JANTXV1N4150UBD	
JAN1N3600	JANTX1N3600	JANTXV1N3600	

6.8 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 previous issue.

Custodians:  
Army - CR  
Navy - EC  
Air Force - 85  
NASA - NA  
DLA - CC

Preparing activity:  
DLA - CC  
  
(Project 5961-2016-105)

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 <https://assist.dla.mil>.