The documentation and process conversion measures necessary to comply with this document shall be completed by 30 September 2016.

INCH-POUND

MIL-PRF-19500/609L
30 June 2016
SUPERSEDING
MIL-PRF-19500/609K
30 June 2014

PERFORMANCE SPECIFICATION SHEET

* SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING,
AXIAL LEADED AND SURFACE MOUNT PACKAGES,
TYPES 1N6639, 1N6640, 1N6641, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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

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

1. SCOPE

* 1.1 Scope. This specification covers the performance requirements for controlled forward voltage switching diodes. Four levels of product assurance (JAN, JANTX, JANTXV, and JANS) 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 in accordance with figure 1, US in accordance with figure 2, and UB in accordance with figure 3 The dimensions and topography for JANHC and JANKC unencapsulated die are as follows: The A version die in accordance with figure 4, and B version in accordance with figure 5.

* 1.3 Maximum ratings. T_A = +25°C (unless otherwise specified).

Types	V_{BR}	V_{RWM}	$I_{O(PCB)}$ T_A=75°C (1) (2)	I_{FSM} t_p = 1/120 s	$R_{\theta JL}$ L = .375 inch (9.53 mm) (1) (2)	$R_{\theta JEC}$ L = 0 (1)	$R_{\theta JA(PCB)}$ (1)	$R_{\theta JSP}$ (1)	T_J, T_{STG}
	V (pk)	V (pk)	mA	A (pk)	°C/W	°C/W	°C/W	°C/W	°C
1N6639	100	75	300	2.5	150		250		-65 to +175
1N6639US	100	75	300	2.5		40	250		-65 to +175
1N6639UB	100	75	300	2.5			325	100	-65 to +200
1N6640	75	50	300	2.5	150		250		-65 to +175
1N6640US	75	50	300	2.5		40	250		-65 to +175
1N6640UB	75	50	300	2.5			325	100	-65 to +200
1N6641	75	50	300	2.5	150		250		-65 to +175
1N6641US	75	50	300	2.5		40	250		-65 to +175
1N6641UB	75	50	300	2.5			325	100	-65 to +200

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 . 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.

AMSC N/A

FSC 5961

* 1.3 Maximum ratings – Continued.

(1) See figure 6 for temperature-current derating curve.
(2) See figure 7, figure 8, figure 9 and figure 10 for thermal impedance curves. T_A = +75°C for both axial and Metal Electrode Leadless Face diodes (MELF) (US) on printed circuit board (PCB), PCB = FR4 - .0625 inch (1.59 mm) 1-layer 1-Oz Cu, horizontal, in still air, pads for (US) = .061 inch (1.55 mm) x .105 inch (2.67 mm); pads for axial = .092 inch (2.34 mm) diameter, strip = 0.030 inch (0.76 mm) x 1 inch (25.4 mm) long, lead length L ≤ .187 inch (≤ 4.75 mm); $R_{\theta JA}$ with a defined PCB thermal resistance condition included, is measured at I_O = 300mA.

1.4 Primary electrical characteristics. Unless otherwise specified, primary electrical characteristics at T_A = +25°C.

Types (1)	V_{F4} I_F = 200 mA (pulsed)	V_{F5} I_F = 500 mA (pulsed)	I_{R1} at T_A = +25°C $V_R = V_{RWM}$	I_{R2} at T_A = +150°C $V_R = V_{RWM}$	t_{fr} I_F = 200 mA	t_{rr} $I_{RM} = I_F$ = 10 mA	C_{T1} V_R = 0
	V dc	V dc	nA dc	µA dc	ns	ns	pF
1N6639, 1N6639US		1.2	100	90	10	4.0	2.5
1N6640, 1N6640US	1.0		100	90	10	4.0	2.5
1N6641, 1N6641US	1.1		100	90	10	5.0	3.0

* (1) For the corresponding part numbers 1N6639, 1N6640, and 1N6641 the following UB, UBCC, UBCA, and UBD types are included.

* 1.5 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-19500, and as specified herein. See 6.6 for PIN construction example, 6.7 for a list of available PINs, and 6.4 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 base quality level "JAN", "JANTX" "JANTXV", and "JANS".

* 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 of diodes covered by this specification sheet are as follows.

* 1.5.2.1 First number and first letter symbols. The semiconductors of this specification sheet use the first number and letter symbols "1N".

* 1.5.2.2 Second number symbols. The second number symbols for the semiconductors covered by this specification sheet are as follows: "6639", "6640", and "6641".

* 1.5.3 Suffix symbols. The following suffix letters are incorporated in the PIN in the order listed in the table as applicable:

	A blank first suffix symbol indicates an axial through-hole mount package (see figure 1).
US	Indicates a surface mount, square endcap, package (see figure 2).
UB	Indicates a 4 pad surface mount package. The metal lid is connected to pad 4 (see figure 3).
UBCA	Indicates a 4 pad surface mount package. The metal lid is connected to pad 4 (see figure 3).
UBCC	Indicates a 4 pad surface mount package. The metal lid is connected to pad 4 (see figure 3).
UBD	Indicates a 4 pad surface mount package. The metal lid is connected to pad 4 (see figure 3).

* 1.5.4 Lead finish. The lead finishes applicable to this specification sheet are listed on QML-19500.

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

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

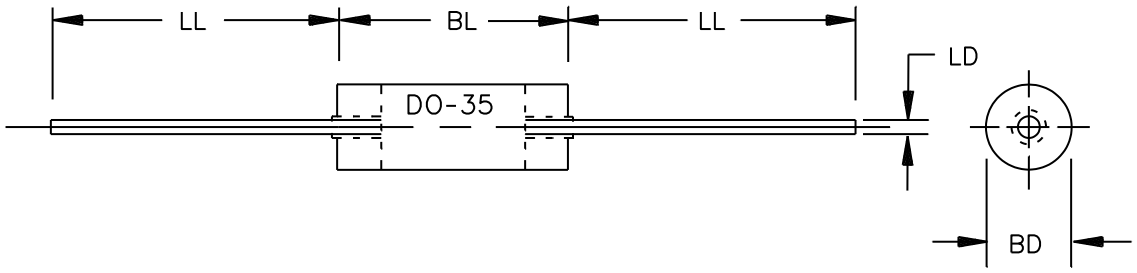
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

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.

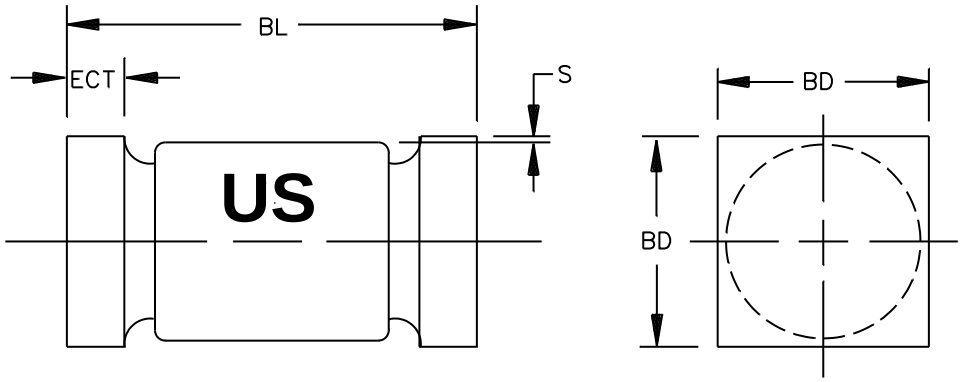


Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.056	.080	1.42	2.03	3, 4
BL	.130	.180	3.30	4.57	4
LD	.018	.022	0.46	0.56	5
LL	1.00	1.50	25.40	38.10	

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimension BD shall be measured at the largest diameter.
4. The minimum dimension of BD shall apply over at least .065 inch (1.65 mm) of dimension BL.
5. The specified lead diameter applies in the zone between .050 inch (1.27 mm) from the diode body to the end of the lead. Outside of this zone lead shall not exceed BD.
6. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

Types 1N6639, 1N6640, and 1N6641.

FIGURE 1. Physical dimensions (DO-35).

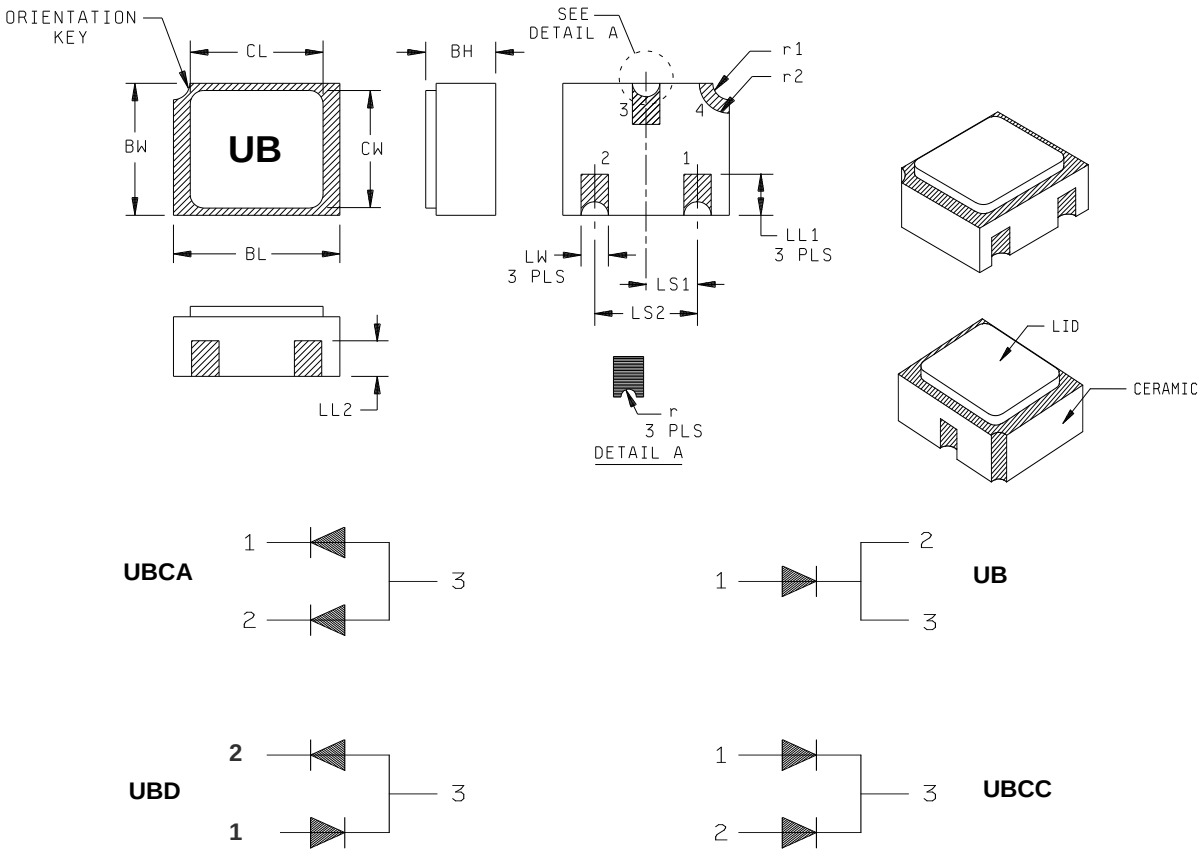


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.070	.085	1.78	2.16
BL	.165	.195	4.19	4.95
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

Types 1N6639US, 1N6640US, and 1N6641US.

FIGURE 2. Physical dimensions of surface mount family.

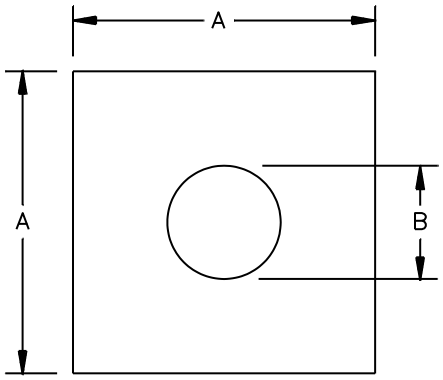


Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS1	.035	.039	0.89	0.99
BL	.115	.128	2.92	3.25	LS2	.071	.079	1.80	2.01
BW	.085	.108	2.16	2.74	LW	.016	.024	0.41	0.61
CL		.128		3.25	r		.008		0.20
CW		.108		2.74	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. Dimensions are pre-solder dip.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

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



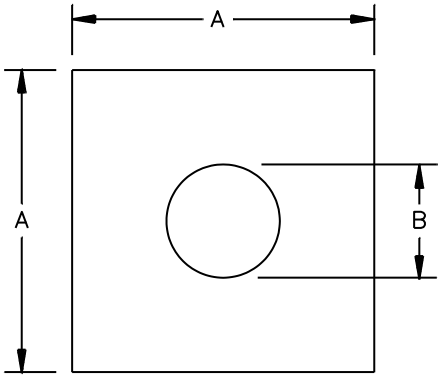
BACKSIDE IS CATHODE

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.014	.018	0.360	0.460
B	.005	.007	0.120	0.180
C	.008	.012	0.20	0.30

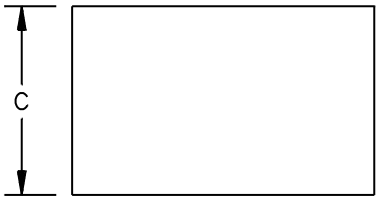
NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Element evaluation accomplished utilizing TO-5 package.
3. The physical characteristics of the die are:

Metallization:
Top (anode): Al
Back (cathode): Au
Al thickness: 25,000 Å minimum.
Gold thickness: 4,000 Å minimum.
Chip thickness: .010 inch (0.25 mm) ±.002 inch (0.05 mm).

FIGURE 4. Physical dimensions JANHCA and JANKCA die.



BACKSIDE IS CATHODE



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.0130	.0170	0.330	0.432
B	.0059	.0061	0.150	0.155
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).

FIGURE 5. Physical dimensions, JANHCB and JANKCB die.

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.

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

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. These devices shall be constructed in a manner and using materials which enable the diodes to meet the applicable requirements of MIL-PRF-19500 and this document.

a. All devices except ‘UB’ and versions shall be of metallurgically bonded, thermally matched, non-cavity, double-plug construction in accordance with the requirements of category I (see MIL-PRF-19500).

b. The 'US' version shall be structurally identical to the non-‘US’ versions except for end-cap lead attachment.

c. The ‘UB’ devices shall be eutectically mounted and wire bonded in a ceramic package.

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

3.6 Electrical test requirements. The electrical test requirements shall be as specified in table I herein.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500. Manufacturer’s identification and date code shall be marked on the devices. Initial container package marking shall be in accordance with MIL-PRF-19500. The polarity shall be indicated with a contrasting color band to denote the cathode end. The prefixes JAN, JANTX, JANTXV, and JANS may be abbreviated as J, JX, JV, and JS respectively. The part number may be reduced to J6639, JX6639, JV6639, or JS6639. No color coding shall be permitted for part numbering.

3.7.1 US devices. For ‘US’ version devices only, all marking, except polarity (and serial number for JANS) may be omitted from the body, but shall be retained on the initial container. ‘US’ devices shall be marked with a cathode band as a minimum. For ‘US’ devices, a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used.

* 3.7.2 UB devices. ‘UB’ packages do not require polarity marking.

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).

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 (JANS, JANTXV, and JANTX levels only). 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.

Screen	Measurement	
	JANS level	JANTXV and JANTX level
2	Not required	Not required
3b (1) 3c	Not applicable Thermal impedance (see 4.3.3)	Not applicable Thermal impedance (see 4.3.3)
4	Not applicable	Not applicable
5	Not applicable for axial leaded devices	Not applicable
6	Not applicable	Not applicable
9	I_{R1}	Not applicable
10	Method 1038 of MIL-STD-750, condition A	Method 1038 of MIL-STD-750, condition A
11	V_{F4} (1N6640, 1N6641) or V_{F5} (1N6639), I_{R1}; and $V_{(BR)}$; ΔI_{R1} ±15 nA dc or 100 percent of initial value whichever is greater	V_{F4} (1N6640, 1N6641) or V_{F5} (1N6639) and I_{R1}
12	Required, see 4.3.2	Required, see 4.3.2
13	Subgroups 2 and 3 of table I herein; ΔI_{R1} ≤ 100 percent of initial reading or 15 nA dc, whichever is greater; ΔV_{F4} ≤ ±0.030 V dc for 1N6640, 1N6641), ΔV_{F5} ≤ ±0.030 V dc for 1N6639, (scope display, see 4.5.3)	Subgroup 2 of table I herein; ΔI_{R1} ≤100 percent of initial reading or 15 nA dc, whichever is greater; ΔV_{F4} ≤ ±0.030 V dc for 1N6640, 1N6641), ΔV_{F5} ≤ ±0.030 V dc for 1N6639, (scope display, see 4.5.3)

(1) Thermal impedance shall be performed any time after screen 3; JANTX and JANTXV levels do not need to be repeated in screening requirements.

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. Power burn-in conditions are as follows (see 4.5.1): Method 1038 of MIL-STD-750, condition B. V_R = rated V_{RWM}; f = 50 - 60 Hz; I_O = 300 mA dc or I_F = 300 mA dc minimum. T_A = 75°C maximum. The maximum current density of small die shall be submitted to the qualifying activity for approval. Alternate mounting conditions 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, and mounting conditions) may be used. 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. Measurement delay time (t_{MD}) = 70 μs max, t_H shall be 10 ms maximum. The thermal impedance limit shall comply with the thermal impedance graphs in figure, 7, figure 8, figure 9 and figure 10 (less than or equal to the curve value at the same t_H time) and shall be less than the process determined statistical maximum limit as outlined in method 3101 or 4081 of MIL-STD-750, as applicable. See group E, subgroup 4 of table II herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500.

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 tables E-VIA (JANS) and E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and 4.4.2.1 and 4.4.2.2 herein. Read and record the change in thermal impedance. The accept criteria is a maximum change of 10 percent for group B, subgroups 3 and 4 for JANS, or group B, subgroup 2 for JANTX or JANTXV.

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

Subgroup	Method	Conditions
B3	1056	0°C to 100°C, 25 cycles.
B3	1051	-55°C to 175°C, 100 cycles.
B3	2101	Decap analysis; scribe and break only
B4	1037	t_{on} = t_{off} = 1 minute minimum; I_O = 300 mA pulsed; in lieu of ac conditions, a dc condition of I_F = 300 mA may be used.
B5	1027	I_O = 300 mA minimum, V_R = rated V_{RWM}, f = 50 - 60 Hz (see 4.5.1). Option 1: Adjust I_O or T_A to obtain a minimum T_J of +225°C, t = 216 hours, n = 45, c = 0. Option 2: Adjust I_O or T_A to obtain a minimum T_J of 175°C, t = 1,000 hours, n = 45, c = 0.

4.4.2.2 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 'US' suffix sample for life test.

Subgroup	Method	Conditions
B2	1056	0°C to + 100°C, 10 cycles.
B2	1051	-55°C to +175°C, 45 cycles including screening.
B3	1027	$V_{(pk)}$ = rated V_{RWM}; f = 50 - 60 Hz; I_O = 300 mA dc minimum; adjust T_A or I_O to obtain a minimum T_J of +150°C. (See 4.5.1)
B4	2101	Decap analysis; scribe and break only
B6	1032	T_A = +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-V of MIL-PRF-19500.

Subgroup	Method	Condition
C2	1056	0°C to + 100°C, 10 cycles.
C2	1051	-55°C to + 175°C, 45 cycles including screening.
* C2	2036	Axial devices - Tension: Condition A, 6 pounds, t = 15 s. Fatigue: Condition E. NOTE**:** Not applicable to US or UB versions.
C2	2038	US devices - Condition B, 6 pounds, t = 15s.
C5	4081	L = .375 inch (9.53 mm), $R_{\theta JL}$ = 150°C/W maximum; $R_{\theta JEC}$ = 40°C/W; (see 4.3.3).
C6	1026	1,000 hours minimum, $V_{(pk)}$ = rated V_{RWM}; f = 50 - 60 Hz; I_O = 300 mA dc minimum; adjust T_A or I_O to obtain a minimum T_J of +150°C. (See 4.5.1)

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table E-IX of MIL-PRF-19500 and table II 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 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, maintained through-out the burn-in period. Method 3100 of MIL-STD-750 shall be used to measure T_J.

4.5.2 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 = 200 mA dc. The maximum rise time of the response detector shall be 1 ns. The maximum forward recovery voltage (V_{fr}) during the forward recovery interval shall also be measured.

4.5.3 Scope display evaluation. Scope display evaluation shall be stable in accordance with method 4023 of MIL-STD-750. Scope display may be performed on automatic test equipment for screening only with the approval of the qualifying activity. Scope display in table I herein shall be performed on an oscilloscope. Reverse current (I_{BR}) over the knee shall be 100 μA peak.

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

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
* Thermal impedance 2/	3101	See 4.3.3	$Z_{\theta JX}$			°C/W
Forward voltage 1N6640, 1N6640US	4011	(Condition B) I_F = 1 mA dc pulsed (see 4.5.4)	V_{F1}	 0.540	 0.620	 V dc
Forward voltage 1N6640, 1N6640US	4011	(Condition B) I_F = 50 mA dc pulsed (see 4.5.4)	V_{F2}	 0.760	 0.860	 V dc
Forward voltage 1N6640, 1N6640US	4011	(Condition B) I_F = 100 mA dc pulsed (see 4.5.4)	V_{F3}	 0.820	 0.920	 V dc
Forward voltage	4011	(Condition B) I_F = 200 mA dc pulsed (see 4.5.4)	V_{F4}			
1N6640, 1N6640US 1N6641, 1N6641US				0.870 0.870	1.00 1.10	V dc V dc
Forward voltage 1N6639, 1N6639US	4011	(Condition B) I_F = 500 mA dc pulsed (see 4.5.4)	V_{F5}		 1.20	 V dc
Breakdown voltage 1N6639, 1N6639US 1N6640, 1N6640US 1N6641, 1N6641US	4021	$I_{(BR)}$ = 10 μA dc	V_{BR}	 100 75 75		 V dc V dc V dc
Reverse current 1N6639, 1N6639US 1N6640, 1N6640US 1N6641, 1N6641US	4016	DC method; V_R = 75 V dc V_R = 50 V dc V_R = 50 V dc	I_{R1}		 100 100 100	 nA dc nA dc nA dc
Subgroup 3						
High temperature operation:		T_A = +150°C				
Reverse current 1N6639, 1N6639US 1N6640, 1N6640US 1N6641, 1N6641US	4016	DC method V_R = 75 V dc V_R = 50 V dc V_R = 50 V dc	I_{R2}		 90 90 90	 μA dc μA dc μA dc

See footnotes at end of table.

* TABLE I. Group A inspection Continued.

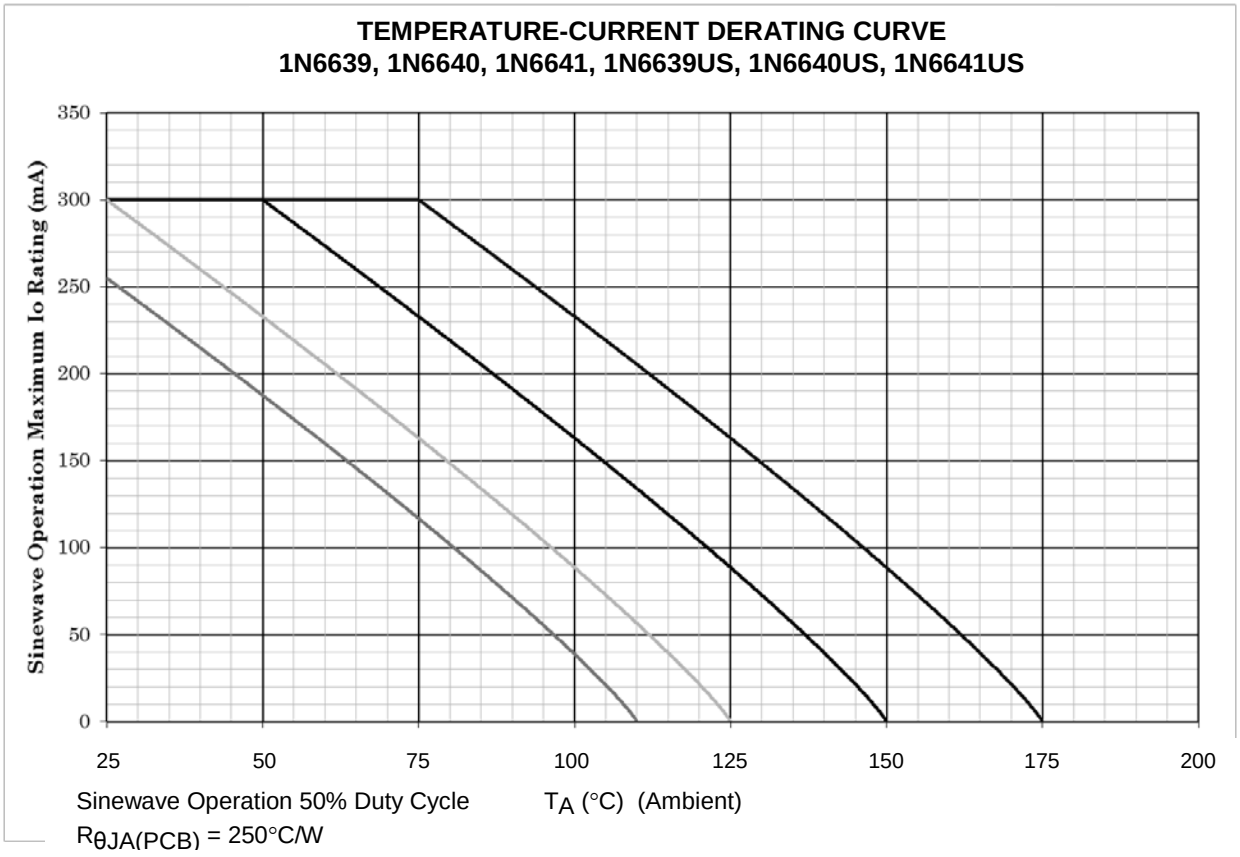
Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 3 continued						
Low-temperature operation:		T_A = -55°C				
Forward voltage	4011	(Condition B) Pulsed	V_{F6}			
1N6639, 1N6639US		I_F = 500 mA pulsed (see 4.5.4)			1.3	V dc
1N6640, 1N6640US		I_F = 200 mA pulsed (see 4.5.4)			1.1	V dc
1N6641, 1N6641US		I_F = 200 mA pulsed (see 4.5.4)			1.2	V dc
Subgroup 4						
Capacitance	4001	V_R = 0 V dc; V_{sig} = 50 mV(p-p), f = 1 MHz	C_{T1}			
1N6639, 1N6639US					2.5	pF
1N6640, 1N6640US					2.5	pF
1N6641, 1N6641US					3.0	pF
Reverse recovery time	4031	Condition A, I_F = I_{RM} = 10 mA dc	t_{rr}			
1N6639, 1N6639US					4.0	ns
1N6640, 1N6640US					4.0	ns
1N6641, 1N6641US					5.0	ns
Scope display	4023	See method 4023 of MIL-STD-750, Figure 4023-3, -7, -9, -10 only				
Subgroup 5						
Not applicable						
Subgroup 6						
Surge current	4066	Test condition A, I_{FSM} = 2.5 A(pk) ten surges at 1 per minute (max), surge duration of 1/120 seconds				
Electrical measurements		See table I, subgroup 2 herein				
Subgroup 7						
Forward recovery voltage and time	4026	I_F = 200 mA dc (see 4.5.2)	V_{fr}		5.0	V(pk)
			t_{fr}		10.0	ns

1/ For sampling plan, see MIL-PRF-19500.
2/ 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.

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

	Inspection	MIL-STD-750		Qualification inspection
		Method	Conditions	
	Subgroup 1			n = 45, c = 0
	Thermal shock (glass strain) 1/	1056	20 cycles, condition D except low temperature shall be achieved using liquid nitrogen (-195°C). A visual inspection for cracked glass shall be performed.	
	Temperature cycling 1/	1051	-65°C to +175°C, 500 cycles.	
*	Hermetic seal	1071	Gross leak only. Fine and gross for “UB” devices.	
	Electrical measurement		See table I, subgroup 2.	
	Subgroup 2			n = 45, c = 0
	Intermittent operation life	1037	10,000 cycles; I_F = 300 mA dc, T_{on} = T_{off} = 1 minute.	
	Electrical measurement		See table I, subgroup 2.	
	Subgroup 4			
*	Thermal impedance curves		See MIL-PRF-19500. For UB package only, $R_{\theta JSP}$ can be calculated but shall be measured once in the same package with a similar die size to confirm calculations (may apply to multiple specification sheets).	
	Subgroup 5			
	Not applicable			
	Subgroup 6			n = 11
	ESD	1020		
	Subgroup 8			n = 45
*	Resistance to glass cracking	1057	Test condition B. Test until failure occurs or to a maximum of 25 cycles, whichever comes first. Not required for UB devices.	
	Subgroup 10			n = 22, c = 0
*	Potted environment test	1054	Not required for UB packages	

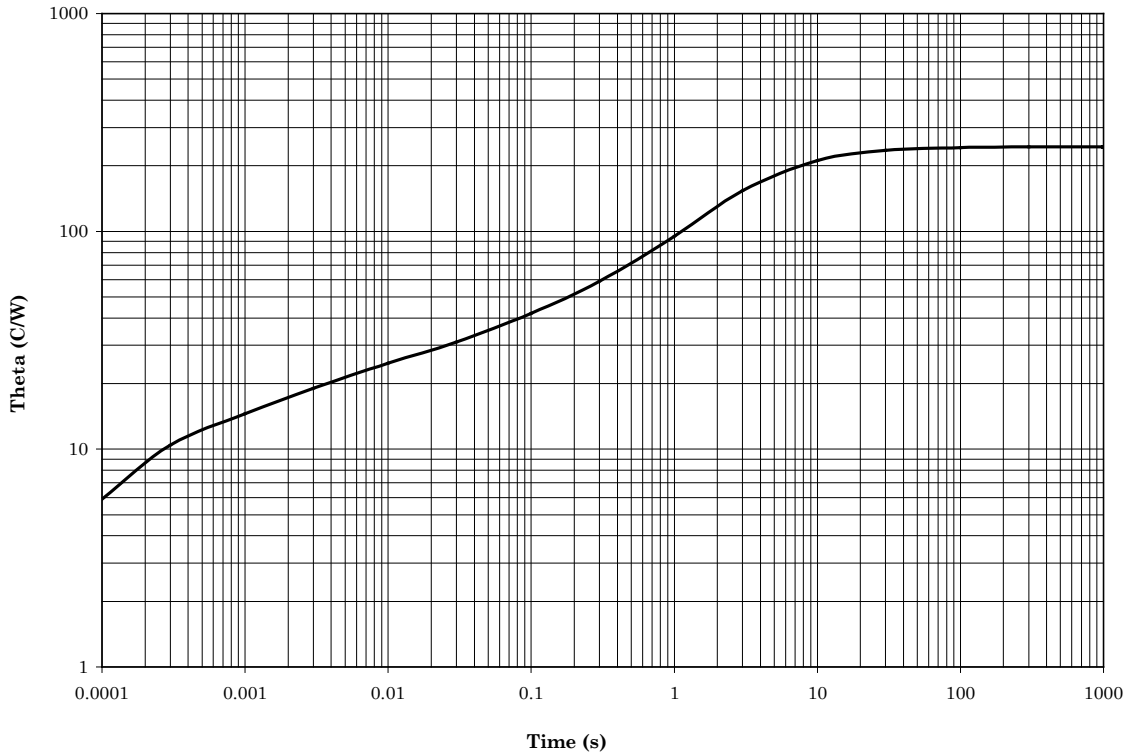
1/ Separate samples may be used for each test.



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

FIGURE 6. Temperature current derating.

MAXIMUM THERMAL IMPEDANCE PLOTS
AXIAL OR 'US' PARTS, T_A = 55°C

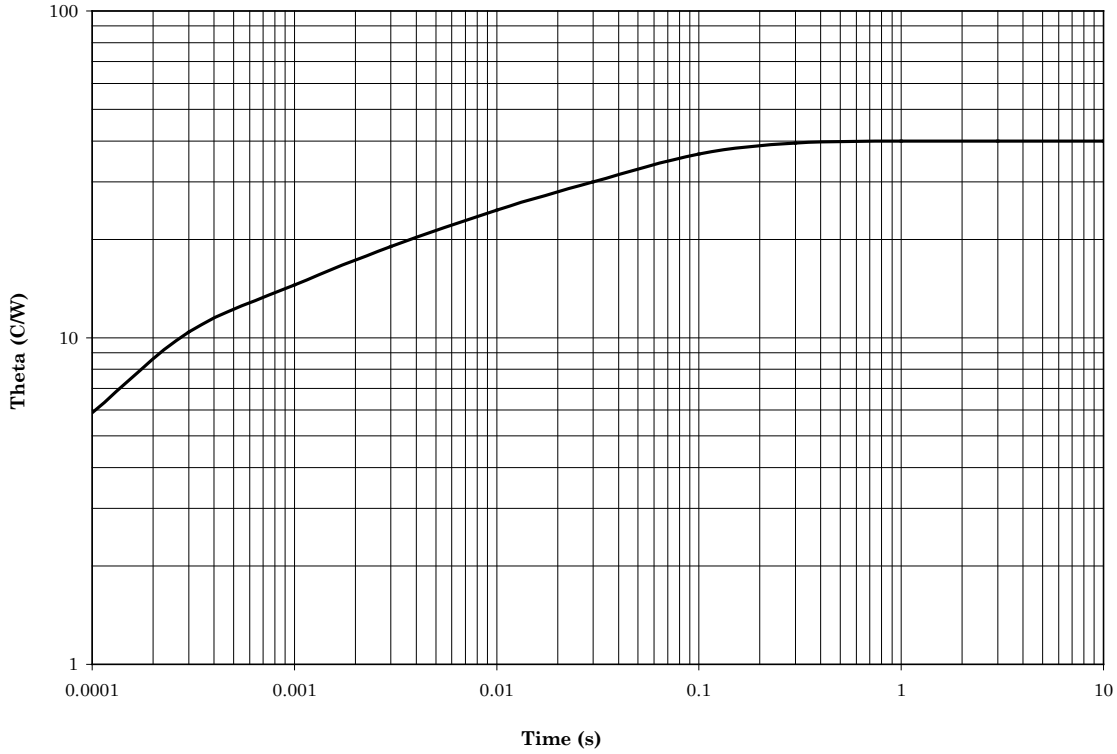


$R_{\theta JA}$ = 250°C/W

NOTE: $Z_{\theta JX}$ = 25°C/W maximum at t_H = 10ms.

FIGURE 7. Thermal impedance - all glass devices.

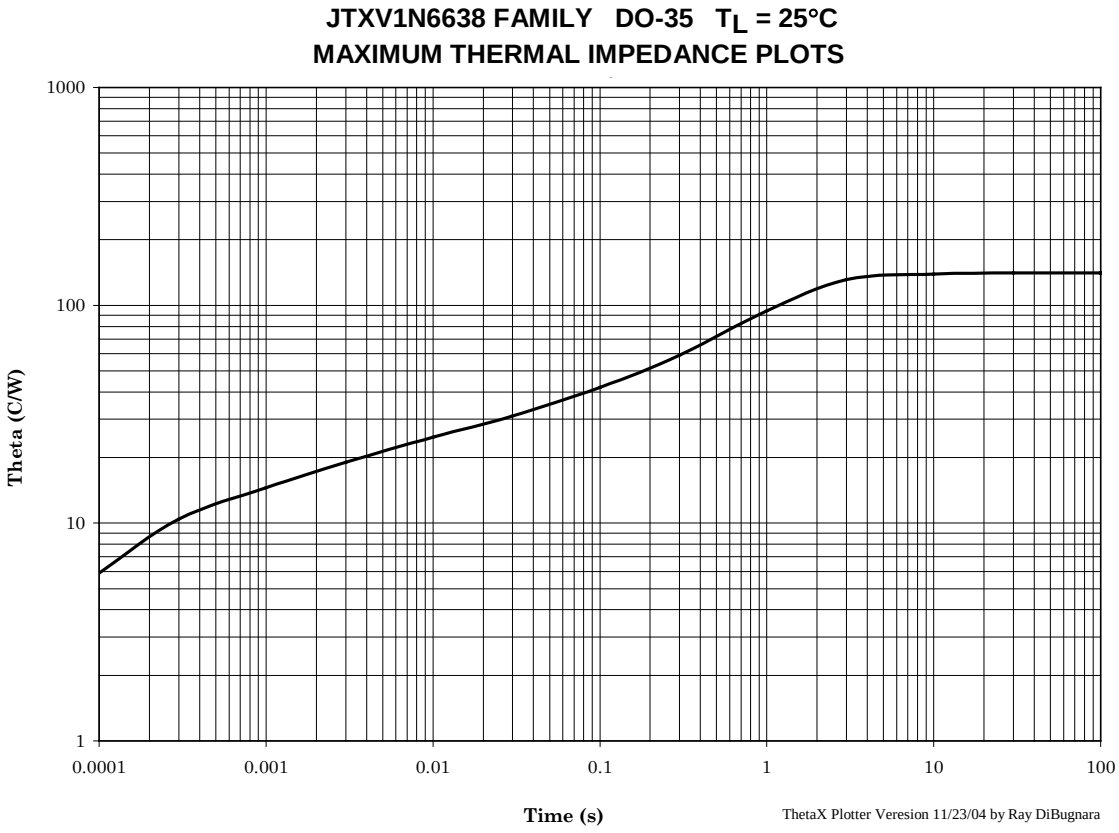
MAXIMUM THERMAL IMPEDANCE PLOTS
'US' PARTS, T_{EC} = 25°C



$R_{\theta JEC}$ = 40°C/W

NOTE: $Z_{\theta JX}$ = 25°C/W maximum at t_H = 10ms.

FIGURE 8. Thermal impedance - all 'US' devices.

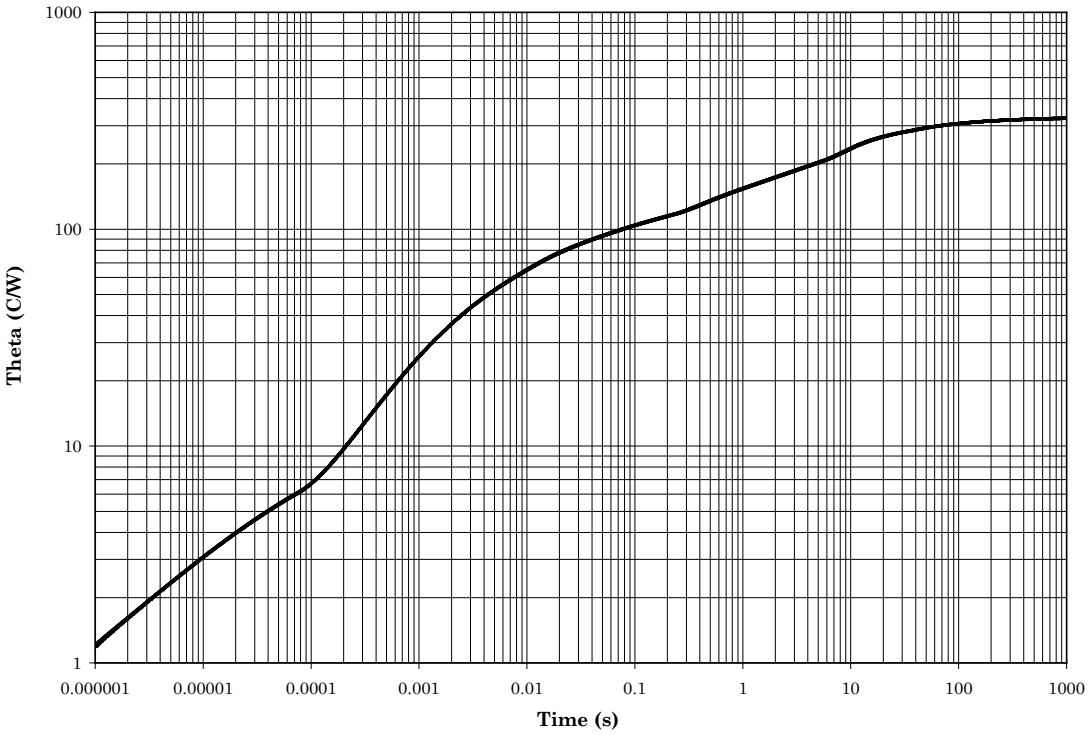


$R_{\theta JL}$ = 150°C/W

NOTE: $Z_{\theta JX}$ = 25°C/W maximum at t_H = 10ms.

FIGURE 9. Thermal impedance - all axial lead devices.

Maximum Thermal Impedance Plots
UB Package on FR-4 PCB, T_A = 25°C



$R_{\theta JA(PCB)}$ = 325°C/W

NOTE: $Z_{\theta JX}$ = 65°C/W maximum at t_H = 10ms.

* FIGURE 10. Thermal impedance - UB devices.

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. Lead finish (see 3.4.1).

c. Serialization (see 4.3).

d. Packaging requirements (see 5.1).

e. The complete PIN, see 1.5 and 6.6.

f. 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 . 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. The 1N4150 design is unsuitable for space flight applications and is therefore prohibited and will no longer be built nor qualified to JANS. JANS1N4150-1 is prohibited and will no longer be built nor qualified. Devices in stock are acceptable provided the date code does not exceed 9412 (the date of implementation of MIL-S-19500/231F). A PIN for PIN replacement table follows, and these devices are directly interchangeable. The JANS1N6640 will be used in place of the JANS1N4150-1.

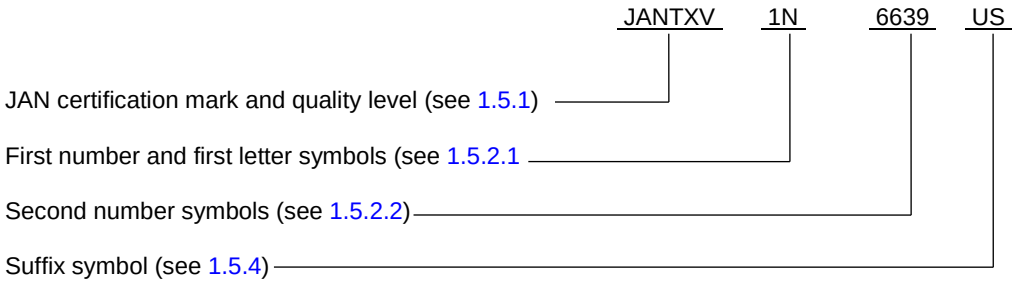
Non-preferred PIN	Preferred PIN
JANS1N4150-1 JANS1N4150UR-1	JANS1N6640 JANS1N6640US

* 6.5 Suppliers of die. The qualified die suppliers with the applicable letter version (e.g., JANHCB1N6639) will be identified on the QML.

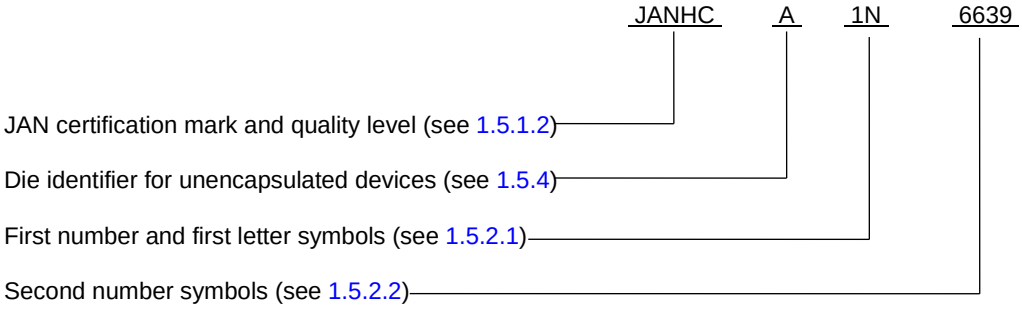
JANHC and JANKC ordering information		
PIN	Manufacturer	
	52GC4	43611
1N6639 1N6640 1N6641	JANHCA1N6639, 6640, and 6641 JANKCA1N6639, 6640, and 6641	JANHCB1N6639, 6640, and 6641 JANKCB1N6639, 6640, and 6641

* 6.6 PIN construction example.

* 6.6.1 Encapsulated devices 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.



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

PINs for types1N6639, 1N6640, and 1N6641			
JAN1N6639	JANTX1N6639	JANTXV1N6639	JANS1N6639
JAN1N6640	JANTX1N6640	JANTXV1N6640	JANS1N6640
JAN1N6641	JANTX1N6641	JANTXV1N6641	JANS1N6641
JAN1N6639US	JANTX1N6639US	JANTXV1N6639US	JANS1N6639US
JAN1N6640US	JANTX1N6640US	JANTXV1N6640US	JANS1N6640US
JAN1N6641US	JANTX1N6641US	JANTXV1N6641US	JANS1N6641US
JAN1N6639UB (1)	JANTX1N6639UB (1)	JANTXV1N6639UB (1)	JANS1N6639UB (1)
JAN1N6640UB (1)	JANTX1N6640UB (1)	JANTXV1N6640UB (1)	JANS1N6640UB (1)
JAN1N6641UB (1)	JANTX1N6641UB (1)	JANTXV1N6641UB (1)	JANS1N6641UB (1)

* (1) UB represent the four different configurations of “UBCC”, “UBCA”, and “UBD” for the 1N6639, 1N6641, and 1N6641 devices.

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 last previous issue.

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

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

Preparing activity:
DLA - CC

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