



**DEFENSE LOGISTICS AGENCY
WEAPONS SUPPORT
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October 7, 2026

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Initial Draft of Performance Specification Sheet MIL-PRF-19500/609 Rev M with Amendment 2; Project Number 5961-2027-001.

The initial draft of the subject document, dated October 7, 2026, is now available for viewing and downloading from the ASSIST or DLA Weapons Support (Columbus) -VA websites using following URLs:

<https://assist.dla.mil>

or

<https://landandmaritimeapps.dla.mil/programs/milspec/default.aspx>

The initial draft of the subject document was generated to modify the minimum height of the UBC ceramic lidded package from .055 inch to 0.050 inch. Highlighting has been used to allow for easy recognition of changes.

Device types covered by MIL-PRF-19500/609 includes 1N6639, 1N6640, and 1N6641

If this document is of interest to you, please provide your concurrence or comments to this Center by the date indicated on the ASSIST or DLA Weapons Support electronic mail notification and not 30 days from the date of this letter or the date on the draft document. Late comments will be held for the next coordination of the document. Comments from military departments must be identified as either "Essential" or "Suggested". Essential comments must be justified with supporting data. Military review activities should forward comments to their custodians or this office, as applicable, in sufficient time to allow for consolidating the department reply. If no response is received from your activity in the allotted coordination cycle, concurrence will be assumed.

The point of contact for this action is Mr. David Corbett, DLA Weapons Support (Columbus), ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990. Mr. Corbett can also be reached by phone at 614-693-0168 or by e-mail david.corbett@dlamail.mil.

Sincerely,

MUHAMMAD AKBAR
Chief,
Active Devices Branch

The documentation and process conversion measures necessary to comply with this document shall be completed by **90 days from date**.

INCH-POUND

MIL-PRF-19500/609M
w/AMENDMENT 2
DRAFT
SUPERSEDING
MIL-PRF-19500/609M
w/AMENDMENT 1
9 September 2026

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING,
AXIAL LEADED AND SURFACE MOUNT PACKAGES,
TYPES 1N6639, 1N6640, 1N6641, QUALITY LEVELS 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: Modified DO-204AH (formerly DO-35) in accordance with [figure 1](#), US in accordance with [figure 2](#), UB and UBC in accordance with [figure 3](#), and UD in accordance with [figure 4](#). The dimensions and topography for JANHC and JANKC unencapsulated die are as follows: The A and B version die in accordance with [figure 5](#), and C version in accordance with [figure 6](#).

1.3 Maximum ratings. $T_A = +25^{\circ}\text{C}$ (unless otherwise specified).

Types	V_{BR}	V_{RWM}	$I_{O(PCB)}$ $T_A=75^{\circ}\text{C}$ (1) (2)	I_{FSM} $t_P =$ 1/120 s	$R_{\theta JL}$ (3) (4)	$R_{\theta JEC}$ (3) (4)	$R_{\theta JA(PCB)}$ (4)	$R_{\theta JSP}$ (5)	T_J, T_{STG}
	V (pk)	V (pk)	mA	A (pk)	$^{\circ}\text{C/W}$	$^{\circ}\text{C/W}$	$^{\circ}\text{C/W}$	$^{\circ}\text{C/W}$	$^{\circ}\text{C}$
1N6639	100	75	300	2.5	150		250		-65 to +175
1N6639US	100	75	300	2.5		40	250		-65 to +175
1N6639UB, UBC	100	75	300	2.5			325	100	-65 to +200
1N6639UD	100	75	300	2.5			325	80	-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, UBC	75	50	300	2.5			325	100	-65 to +200
1N6640UD	75	50	300	2.5			325	80	-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, UBC	75	50	300	2.5			325	100	-65 to +200
1N6641UD	75	50	300	2.5			325	80	-65 to +200

See notes at end.

Comments, suggestions, or questions on this document should be addressed to DLA Weapons Support,
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

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1.3 Maximum ratings – Continued.

- (1) See [figure 7](#) for temperature-current derating curve.
- (2) $T_A = +75^{\circ}\text{C}$ 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 $L \leq .187$ inch (≤ 4.75 mm); $R_{\theta JA}$ with a defined PCB thermal resistance condition included, is measured at $I_O = 300\text{mA}$.
- (3) For axial leaded packages, $L = .375$ in. (9.52 mm), for US packages $L = 0$.
- (4) See [figures 8, 9, 10, 11](#) and [12](#) for thermal impedance curves.
- (5) $R_{\theta JSP}$ refers to thermal resistance from junction to the solder pads of the UB, UBC, and UD package.

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

Types (1)	V_{F4} $I_F =$ 200 mA (pulsed)	V_{F5} $I_F =$ 500 mA (pulsed)	I_{R1} at $T_A = +25^{\circ}\text{C}$ $V_R = V_{RWM}$	I_{R2} at $T_A = +150^{\circ}\text{C}$ $V_R = V_{RWM}$	tfr $I_F =$ 200 mA	trr $I_{RM} = I_F =$ 10 mA	C_{T1} $V_R = 0$
	<u>V dc</u>	<u>V dc</u>	<u>nA dc</u>	<u>$\mu\text{A dc}$</u>	<u>ns</u>	<u>ns</u>	<u>pF</u>
1N6639		1.2	100	90	10	4.0	2.5
1N6640	1.0		100	90	10	4.0	2.5
1N6641	1.1		100	90	10	5.0	3.0

- (1) Includes types with package styles UB, UBC, UD and US.

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 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 as applicable.

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1.5.3.1 Package designator for glass round body devices. The suffix symbols (or lack thereof) that designate the package outline for the glass round body devices covered by this specification sheet are as follows.

	A blank first suffix symbol indicates a DO-204AH axial through-hole mount package (see figure 1).
US	Indicates a surface mount, square endcap, package (see figure 2).

1.5.3.2 Package designator for bottom pad surface mount packages. The following suffix symbols are used to identify the package outline for the bottom pad surface mount devices covered by this specification sheet are as follows:

UB	Indicates a 4 pad, metal lid surface mount package. The metal lid is connected to pad 4 (see figure 3).
UBC	Indicates a 4 pad, ceramic lid surface mount package (see figure 3).
UD	Indicates a 2 terminal, 3 pad surface mount package (see figure 4).

1.5.3.3 Internal circuit schematic suffix designators (UB and UBC only). The suffix symbols that designate the internal circuit schematic (see schematic on [figure 3](#)) of the UB and UBC surface mount packages are as follows:

	A blank suffix symbol indicates a unidirectional, single diode circuit.
CA	Indicates dual diode with a common anode pin.
CC	Indicates a dual diode with a common cathode pin.
D	Indicates a dual diode doubler.

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", "B", and "C".

2. APPLICABLE PUBLICATION

2.1 General. The publications listed in this section are specified in sections 3 and 4 of this specification. This section does not include publications 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 publications cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government publications.

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 publications are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

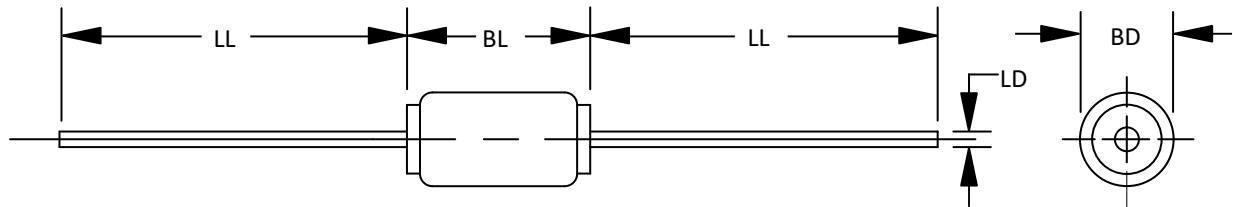
DEPARTMENT OF DEFENSE STANDARDS

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

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

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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.



Types 1N6639, 1N6640, and 1N6641

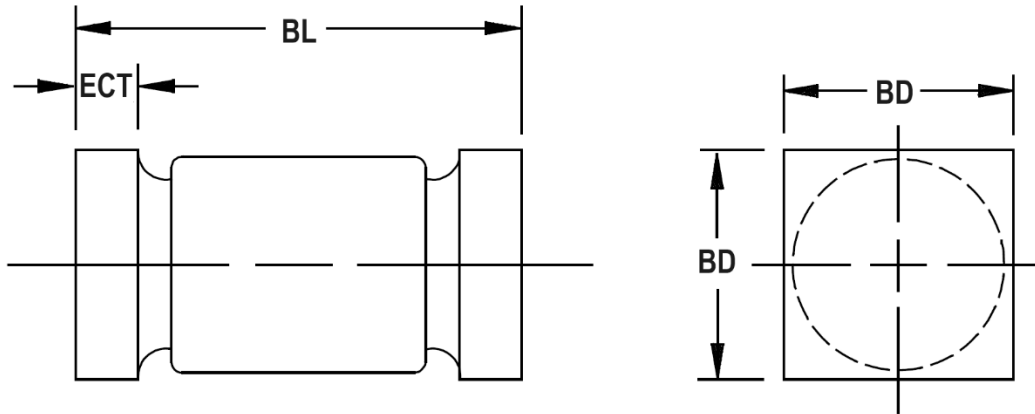
Symbol	Dimensions				Notes
	in	in	mm	mm	
	Min	Max	Min	Max	
BD	.056	.080	1.42	2.03	2, 3
BL	.130	.180	3.30	4.57	3
LD	.018	.022	0.46	0.56	4
LL	1.00	1.50	25.40	38.10	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimension BD shall be measured at the largest diameter.
3. The minimum dimension of BD shall apply over at least .065 inch (1.65 mm) of dimension BL.
4. The specified lead diameter dimension of LD 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.

FIGURE 1. Physical dimensions modified DO-204AH (formerly DO-35) package.

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Types 1N6639US, 1N6640US, and 1N6641US

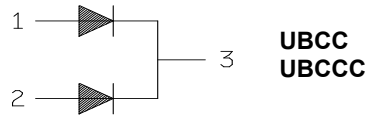
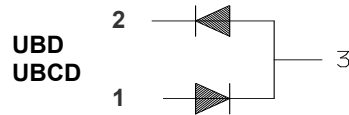
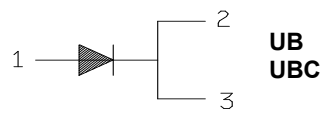
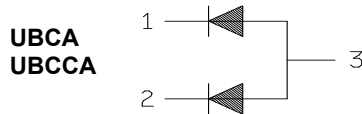
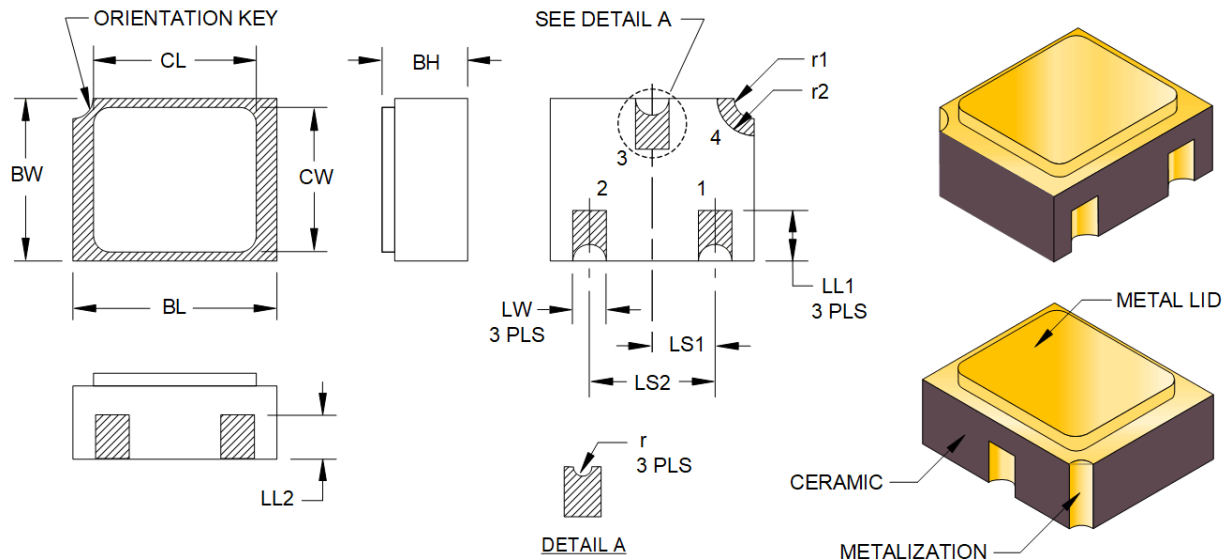
Symbol	Dimensions			
	in	in	mm	mm
	Min	Max	Min	Max
BD	.070	.085	1.78	2.16
BL	.165	.195	4.19	4.95
ECT	.019	.028	0.48	0.71

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimensions are pre-solder dip.

FIGURE 2. Physical dimensions of glass round body US surface mount package.

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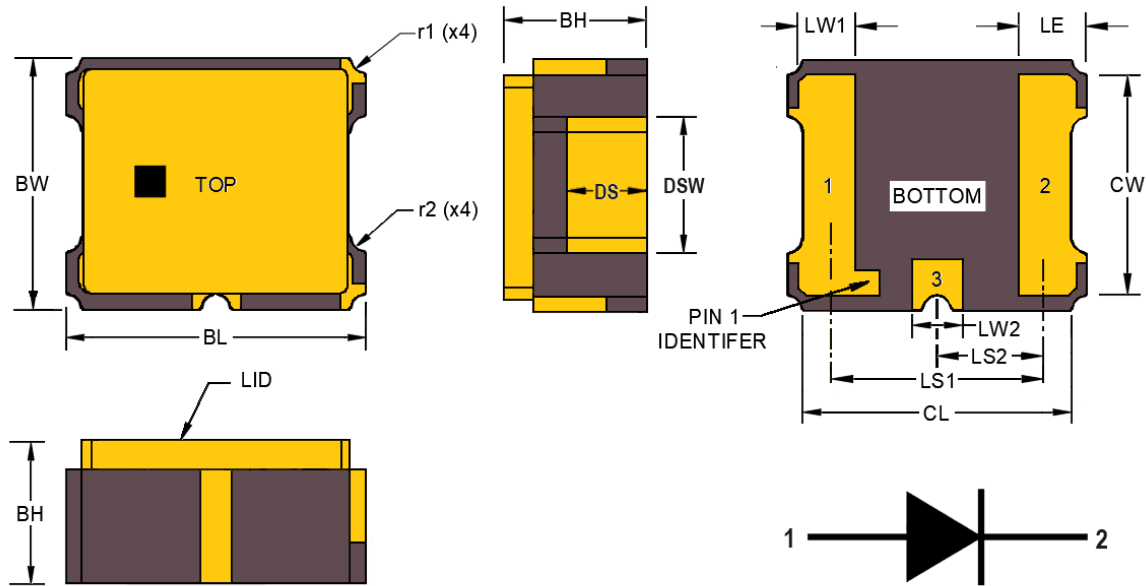
Symbol	Dimensions				Symbol	Dimensions			
	in Min	in Max	mm Min	mm Max		in Min	in Max	mm Min	mm Max
BH (3)	.040	.056	1.02	1.42	LL2	.017	.035	0.43	0.89
BH (4)	~~.055~~	.069	~~1.40~~	1.75	LS1	.035	.040	0.89	1.02
	.050		1.27		LS2	.071	.079	1.80	2.01
BL	.115	.128	2.92	3.25	LW	.016	.024	0.41	0.61
BW	.085	.108	2.16	2.74	r		.008		0.20
CL		.128		3.25	r1		.012		0.31
CW		.108		2.74	r2		.022		0.56
LL1	.022	.038	0.56	0.97					

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Hatched areas on package denote metallized areas.
3. UB metal lid only. Pad 4 is connected to the lid braze ring for shielding.
4. UBC ceramic lid only. Pad 4 is connected to the surface braze ring.
5. Dimensions are pre-solder dip.

FIGURE 3. Physical dimensions for UB and UBC surface mount package.

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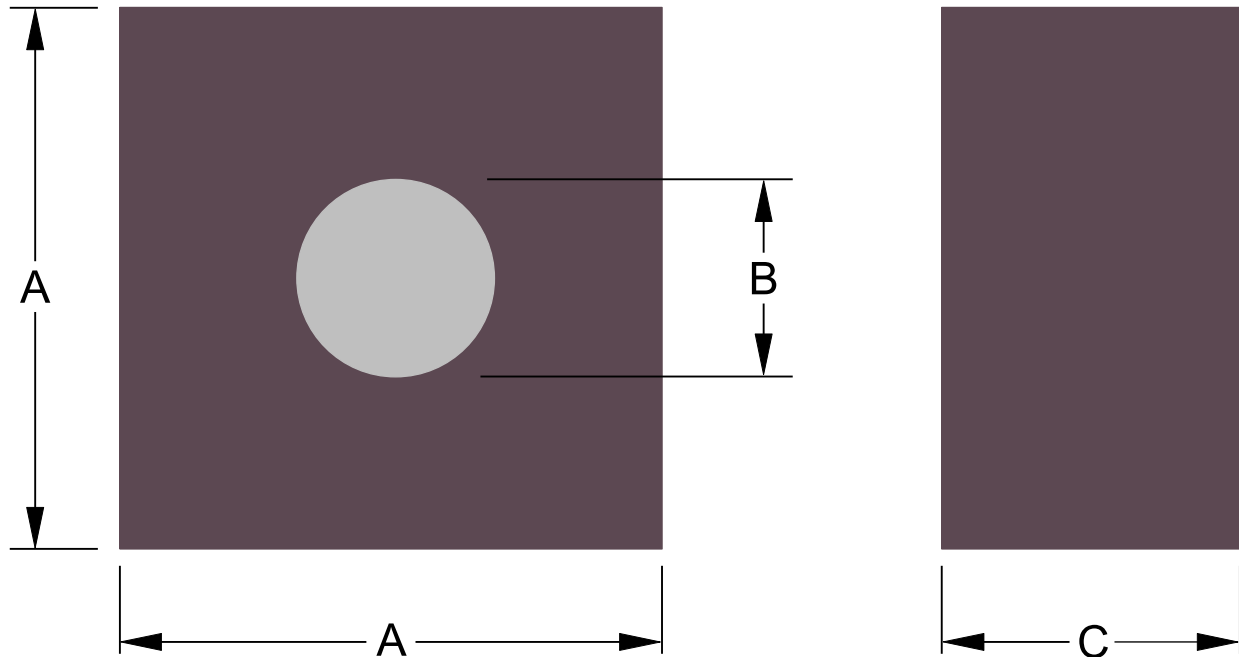


Symbol	Inches	Inches	mm	mm	Symbol	Inches	Inches	mm	mm
	Min	Max	Min	Max		Min	Max	Min	Max
BH	0.078	0.092	1.979	2.329	LE	0.021	0.033	0.540	0.840
BL	0.112	0.128	2.850	3.250	LS1	0.085	0.093	2.160	2.360
BW	0.092	0.108	2.340	2.740	LS2	0.043	0.047	1.080	1.180
CL	0.103	0.113	2.620	2.880	LW1	0.019	0.027	0.490	0.690
CW	0.083	0.093	2.120	2.360	LW2	0.019	0.021	0.490	0.530
DS	0.028	0.034	0.720	0.880	r1		0.006		0.150
DSW	0.051	0.057	1.330	1.430	r2		0.006		0.150

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Pad 3 is connected to the lid braze ring for shielding.
3. Cathode marked with a square.
4. Pads 1 and 2 layout is equivalent to those for 1N6639US, 1N6640US, and 1N6641US.
5. Diode outline shown in ISO third angle projection.

FIGURE 4. Physical dimensions of UD surface mount package.



Dimensions for JANHCA and JANKCA die

Letter	Inches	Inches	mm	mm
	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

Dimensions for JANHCB and JANKCB die

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.013	.017	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 or other suitable package.
3. The metallization characteristics of the die are as follows:

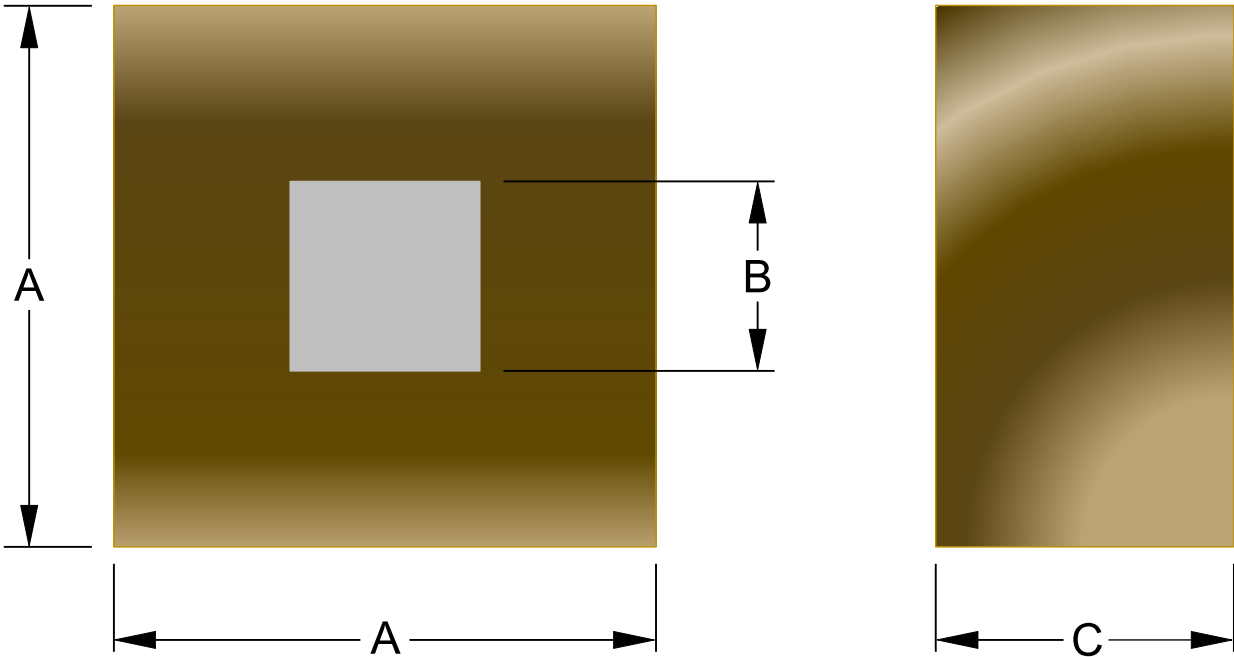
Metallization for JANHCA and JANKCA die

Top (anode): Al
Al thickness: 25,000 Å minimum.
Back (cathode): Au
Au thickness: 4,000 Å nominal.

Metallization for JANHCB and JANKCB die

Top (anode): Al
Al thickness: 25,000 Å minimum.
Back (cathode): Au
Au thickness: 4,000 Å nominal.

FIGURE 5. Physical dimensions for JANHCA, JANKCA, JANHCB and JANKCB die.



Letter	Dimensions			
	in	in	mm	mm
	Min	Max	Min	Max
A	.015	.019	0.381	0.483
B	.004	.006	0.102	0.152
C	.006	.010	0.152	0.254

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Element evaluation accomplished utilizing a TO-39 or other suitable package.
3. The metallization characteristics of the die are as follows:
 - Top metal (anode): Al-Si
 - Back metal (cathode): Au
 - Al-Si thickness: 14,400 Å minimum.
 - Au thickness: 5,800 Å minimum.

FIGURE 6. Physical dimensions JANHCC and JANKCC 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 QML-19500 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, 2, 3, 4, 5 and 6 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. Axial leaded and US version devices 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 axial leaded versions except for end-cap lead attachment.
- c. The 'UB', 'UBC', and 'UD' devices shall have the die eutectically mounted and wire bonded in a ceramic package.

3.5 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. All marking which is omitted from the body of the device, except for polarity and serial numbers, shall appear on the initial container. The prefixes JAN, JANTX, JANTXV, and JANS may be abbreviated as J, JX, JV, and JS respectively. (Example: The PIN for an axial leaded device 1N6639 may be reduced to J6639, JX6639, JV6639, or JS6639.) No color coding shall be permitted for part identification.

3.5.1 Axial leaded devices. For axial leaded versions only, the polarity shall be indicated with a contrasting color band to denote the cathode end.

3.5.2 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' version devices shall be marked with a cathode band as a minimum. For 'US' version devices, a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used.

3.5.3 UB and UBC devices. The 'UB' and 'UBC' version devices do not require polarity marking.

3.5.4 UD devices. The 'UD' devices shall mark the cathode with a square symbol on the lid.

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. 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.

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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).
- d. Element evaluation of un-encapsulated die (see 4.6).

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	Measurements for JANS level	Measurements for JANTXV and JANTX level
2	Not required	Not required
3b (1) 3c	Not applicable Thermal impedance (see 4.3.2)	Not applicable Thermal impedance (see 4.3.2)
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 $V_{(BR)}$; $\Delta I_{R1} \pm 15$ nA dc or 100 percent of initial value whichever is greater	V_{F4} (1N6640, 1N6641) or V_{F5} (1N6639) and I_{R1}
12	Method 1038 of MIL-STD-750, condition B, see 4.3.1	Method 1038 of MIL-STD-750, condition B, see 4.3.2
13	Subgroups 2 and 3 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial reading or 15 nA dc, whichever is greater; $\Delta V_{F4} \leq \pm 0.030$ V dc for 1N6640, 1N6641), $\Delta V_{F5} \leq \pm 0.030$ V dc for 1N6639, Scope display evaluation, see 4.5.4	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial reading or 15 nA dc, whichever is greater; $\Delta V_{F4} \leq \pm 0.030$ V dc for 1N6640, 1N6641), $\Delta V_{F5} \leq \pm 0.030$ V dc for 1N6639, Scope display evaluation, see 4.5.4

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

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4.3.1 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.2): V_R = rated V_{RWM} ; f = 50 to 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.

4.3.2 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 . The thermal impedance limit shall comply with the thermal impedance graphs in figures 8, 9, 10, 11 and 12 (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 Quality level JANS (table E-VIA of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B3	1056	0°C to 100°C, 25 cycles. (Not applicable for UB, UBC, and UD suffix devices.)
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} , $f = 50$ to 60 Hz (see 4.5.2). 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, $n = 45$, $c = 0$.

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4.4.2.2 Quality level JAN, JANTX, and JANTXV (table E-VIB of [MIL-PRF-19500](#)). Axial leaded samples from the same lot may be used in lieu of 'US' suffix sample for life test.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B2	1056	0°C to + 100°C, 10 cycles. (Not applicable for UB, UBC, and UD suffix devices.)
B2	1051	-55°C to +175°C, 45 cycles including screening.
B3	1027	$V_{pk} = \text{rated } V_{RWM}$; $f = 50 \text{ to } 60 \text{ Hz}$; $I_O = 300 \text{ mA dc minimum}$; adjust T_A or I_O to obtain a minimum T_J of +150°C. (See 4.5.2)
B4	2101	Decap analysis; scribe and break only.
B6	1032	$T_A = +175^\circ\text{C}$.

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.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	1056	0°C to + 100°C, 10 cycles. (Not applicable for UB, UBC, and UD suffix devices.)
C2	1051	-55°C to + 175°C, 45 cycles including screening.
C2	2036	Axial devices - Tension: Condition A, 6 pounds (2.72 Kilograms), $t = 15 \text{ s}$. Fatigue: Condition E. NOTE: Not applicable to UB, UBC, UD or US versions.
C2	2038	US devices - Condition B, 6 pounds (2.72 Kilograms), $t = 15\text{s}$.
C5	4081	$L = .375 \text{ inch (9.53 mm)}$, $R_{\theta JL} = 150^\circ\text{C/W maximum}$; $R_{\theta JEC} = 40^\circ\text{C/W}$; (see 4.3.2).
C6	1026	1,000 hours minimum, $V_{pk} = \text{rated } V_{RWM}$; $f = 50 \text{ to } 60 \text{ Hz}$; $I_O = 300 \text{ mA dc minimum}$; adjust T_A or I_O to obtain a minimum T_J of +150°C. (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 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 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, maintained through-out 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 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.

4.5.4 Scope display evaluation. The reverse characteristics shall be inspected and evaluated in accordance with condition A of method 4023 of [MIL-STD-750](#). Reverse current (I_{BR}) over the knee shall be 100 μ A peak. Each device shall be evaluated only for the following 4 commonly observed faults: drift, unstable (jitter), snap back collapsing $V_{(BR)}$ and floater. Any instance of any of these 4 faults in the trace shall be cause for rejection.

4.6 Element evaluation of un-encapsulated die. The element evaluation of unencapsulated die shall be in accordance with appendix G of [MIL-PRF-19500](#). As a minimum, die shall be 100-percent probed to ensure compliance with [table I](#), subgroup 2. Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

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TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
External visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance <u>2/</u>	3101	See 4.3.2	$Z_{\theta JX}$			°C/W
Forward voltage 1N6640 <u>3/</u>	4011	(Condition B) $I_F = 1 \text{ mA dc pulsed (see 4.5.1)}$	V_{F1}	0.540	0.620	V dc
Forward voltage 1N6640 <u>3/</u>	4011	(Condition B) $I_F = 50 \text{ mA dc pulsed (see 4.5.1)}$	V_{F2}	0.760	0.860	V dc
Forward voltage 1N6640 <u>3/</u>	4011	(Condition B) $I_F = 100 \text{ mA dc pulsed (see 4.5.1)}$	V_{F3}	0.820	0.920	V dc
Forward voltage 1N6640 <u>3/</u> 1N6641 <u>3/</u>	4011	(Condition B) $I_F = 200 \text{ mA dc pulsed (see 4.5.1)}$	V_{F4}	0.870 0.870	1.00 1.10	V dc V dc
Forward voltage 1N6639 <u>3/</u>	4011	(Condition B) $I_F = 500 \text{ mA dc pulsed (see 4.5.1)}$	V_{F5}		1.20	V dc
Breakdown voltage 1N6639 <u>3/</u> 1N6640 <u>3/</u> 1N6641 <u>3/</u>	4021	$I_{(BR)} = 10 \text{ } \mu\text{A dc}$	V_{BR}	100 75 75		V dc V dc V dc
Reverse current 1N6639 <u>3/</u> 1N6640 <u>3/</u> 1N6641 <u>3/</u>	4016	Condition A or B, DC method; $V_R = 75 \text{ V dc}$ $V_R = 50 \text{ V dc}$ $V_R = 50 \text{ V dc}$	I_{R1}		100 100 100	nA dc nA dc nA dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +150^\circ\text{C}$				
Reverse current 1N6639 <u>3/</u> 1N6640 <u>3/</u> 1N6641 <u>3/</u>	4016	Condition A or B, DC method $V_R = 75 \text{ V dc}$ $V_R = 50 \text{ V dc}$ $V_R = 50 \text{ V dc}$	I_{R2}		90 90 90	$\mu\text{A dc}$ $\mu\text{A dc}$ $\mu\text{A dc}$

See footnotes at end of table.

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TABLE I. Group A inspection Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit	Limit	Unit
	Method	Conditions		Min	Max	
<u>Subgroup 3</u> – continued						
Low-temperature operation:		T _A = -55°C				
Forward voltage	4011	(Condition B) Pulsed I _F = 500 mA pulsed (see 4.5.1) I _F = 200 mA pulsed (see 4.5.1) I _F = 200 mA pulsed (see 4.5.1)	V _{F6}			
1N6639 <u>3/</u>					1.3	V dc
1N6640 <u>3/</u>					1.1	V dc
1N6641 <u>3/</u>					1.2	V dc
<u>Subgroup 4</u>						
Capacitance	4001	V _R = 0 V dc; V _{sig} = 50 mV(p-p), f = 1 MHz	C _{T1}			
1N6639 <u>3/</u>					2.5	pF
1N6640 <u>3/</u>					2.5	pF
1N6641 <u>3/</u>					3.0	pF
Reverse recovery time	4031	Condition A, I _F = I _{RM} = 10 mA dc	t _{rr}			
1N6639 <u>3/</u>					4.0	ns
1N6640 <u>3/</u>					4.0	ns
1N6641 <u>3/</u>					5.0	ns
Scope display	4023	See 4.5.4				
<u>Subgroup 5</u>						
Not applicable						
<u>Subgroup 6</u>						
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				
<u>Subgroup 7</u>						
Forward recovery voltage and time	4026	I _F = 200 mA dc (see 4.5.3)	V _{fr} t _{fr}		5.0 10.0	V(pk) 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.

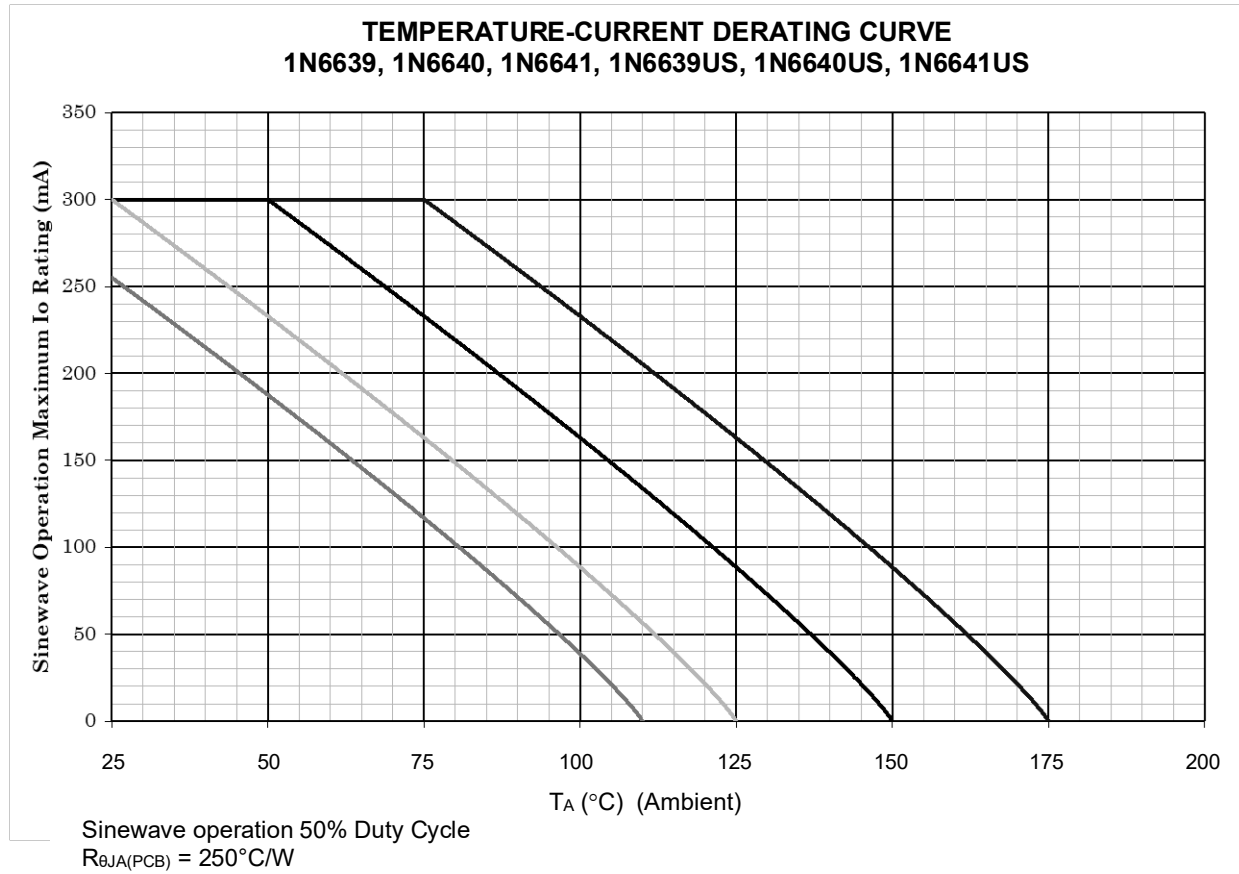
3/ Includes types with package styles UB, UBC, UD, and US.

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

Inspection	MIL-STD-750		Sample plan
	Method	Conditions	
<u>Subgroup 1</u>			n = 45, c = 0
Thermal shock (glass strain) <u>1/</u>	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. Not applicable for UB, UBC, and UD suffix devices.	
Temperature cycling <u>1/</u>	1051	-65°C to +175°C, 500 cycles.	
Hermetic seal	1071	Gross leak only for axial leaded and US. Fine and gross leak for UB, UBC, and UD devices.	
Electrical measurement		See table I , subgroup 2.	
<u>Subgroup 2</u>			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.	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500 . For UB, UBC, and UD package only, R _{θJSP} can be calculated but shall be measured once in the same package with a similar die size to confirm calculations.	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			n = 11
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. Not required for UB, UBC, and UD devices.	
<u>Subgroup 10</u>			n = 22, c = 0
Potted environment test	1054	Not required for UB, UBC, and UD packages	

1/ Separate samples may be used for each test.

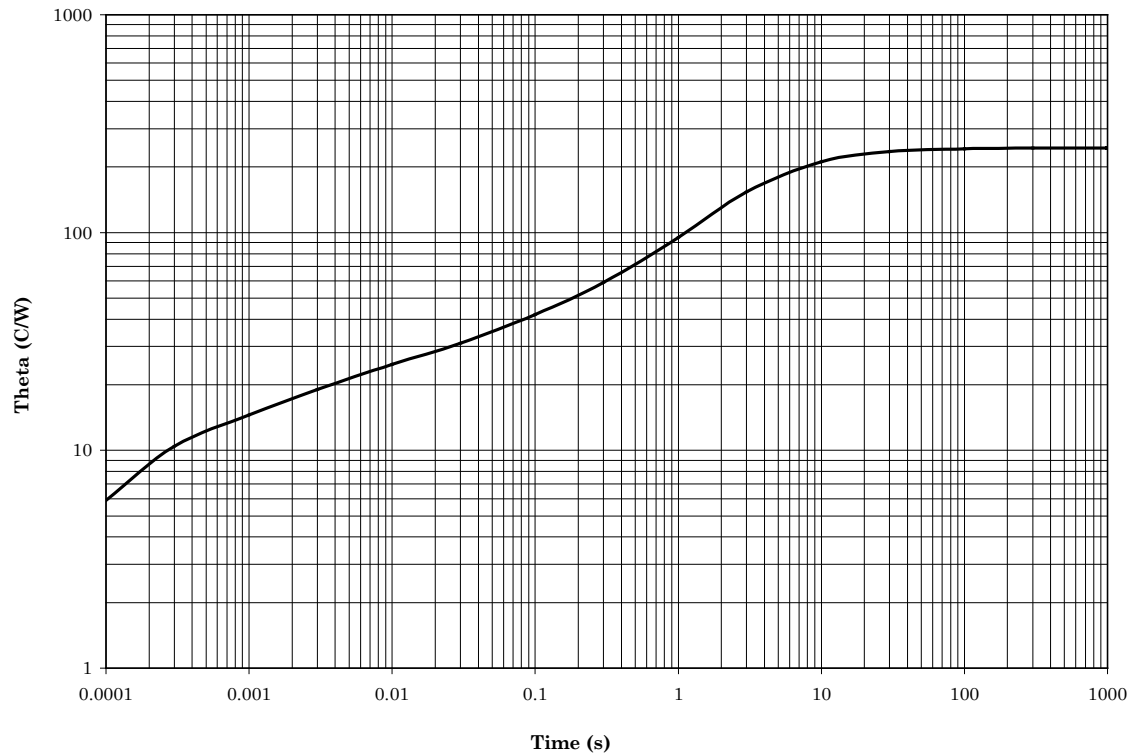


NOTES:

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 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 $T_J \leq 150^{\circ}\text{C}$, where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at $T_J \leq 125^{\circ}\text{C}$, and 110°C to show power rating where most users want to limit T_J in their application.

FIGURE 7. Temperature current derating.

**MAXIMUM THERMAL IMPEDANCE PLOTS
AXIAL OR 'US' DEVICES, $T_A = 55^\circ\text{C}$**

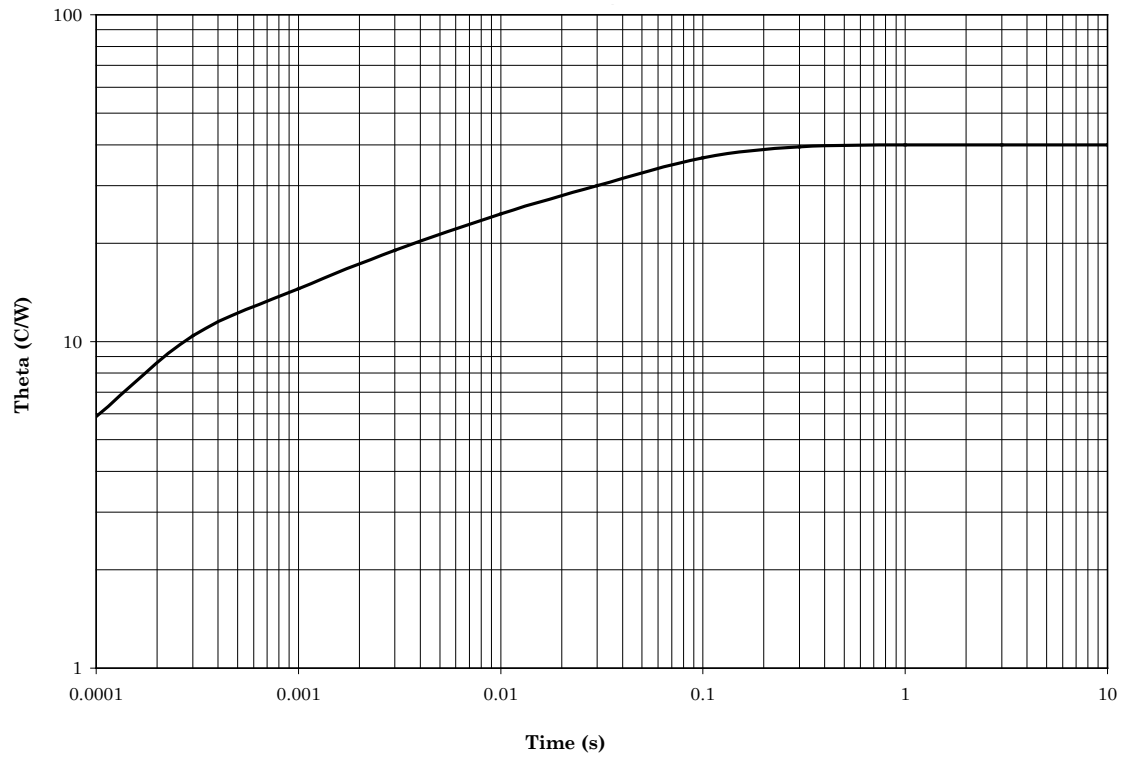


NOTES:

1. $R_{\theta JA} = 250^\circ\text{C/W}$
2. $Z_{\theta JX} = 25^\circ\text{C/W}$ maximum at $t_H = 10\text{ms}$.

FIGURE 8. Thermal impedance for all glass devices.

**MAXIMUM THERMAL IMPEDANCE PLOTS
US DEVICES, $T_{EC} = 25^{\circ}\text{C}$**

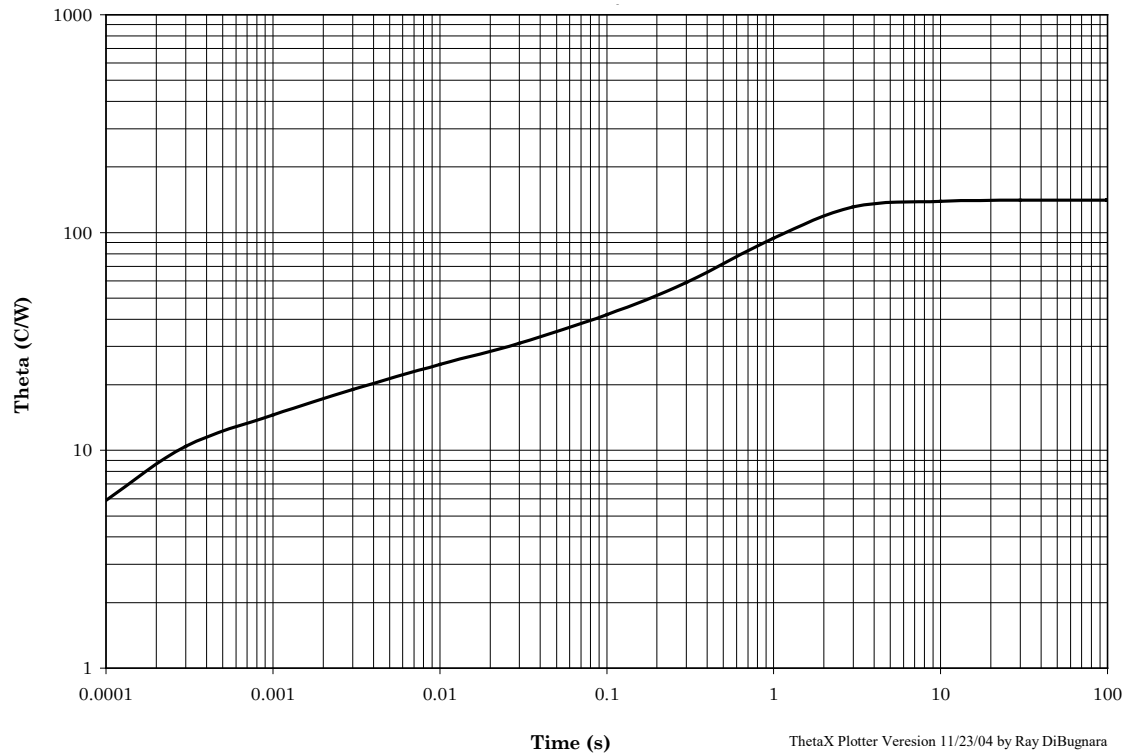


NOTES:

1. $R_{\theta JEC} = 40^{\circ}\text{C/W}$
2. $Z_{\theta JX} = 25^{\circ}\text{C/W}$ maximum at $t_H = 10\text{ms}$.

FIGURE 9. Thermal impedance for all US devices.

MAXIMUM THERMAL IMPEDANCE PLOTS
DO-204AH Package, $T_L = 25^\circ\text{C}$

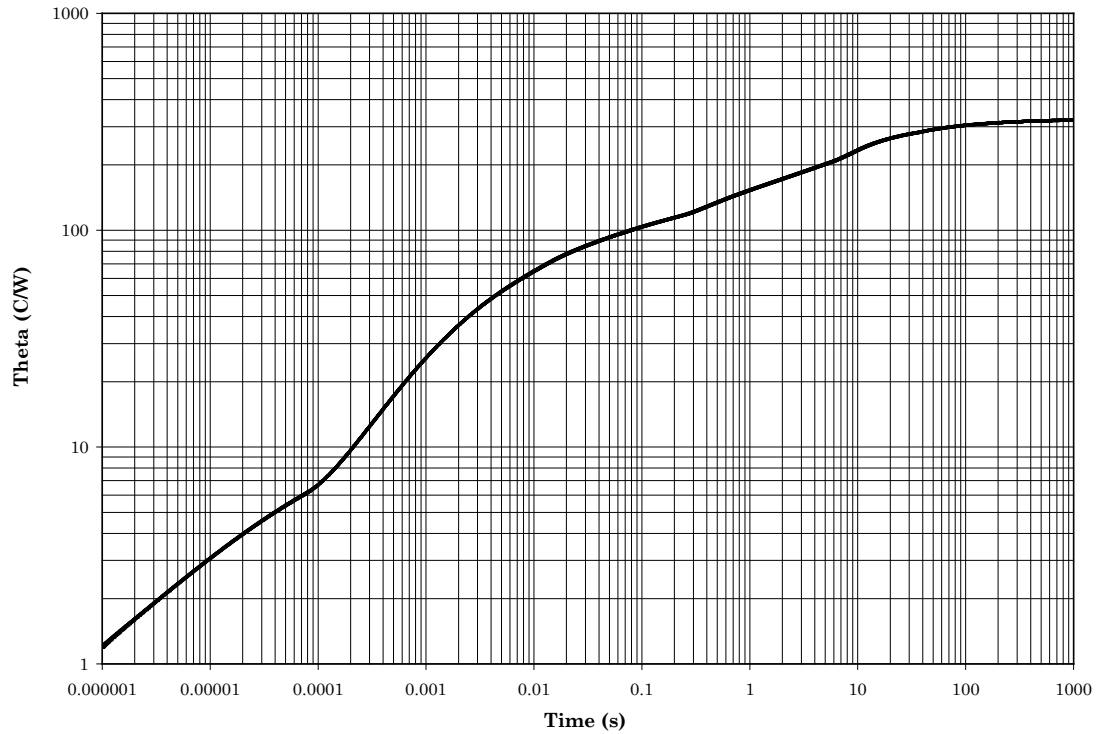


NOTES:

1. $R_{\theta JL} = 150^\circ\text{C/W}$
2. $Z_{\theta JX} = 25^\circ\text{C/W}$ maximum at $t_H = 10\text{ms}$.

FIGURE 10. Thermal impedance for all axial leaded devices.

**MAXIMUM THERMAL IMPEDANCE PLOTS
UB and UBC Package on FR-4 PCB, $T_A = 25^\circ\text{C}$**

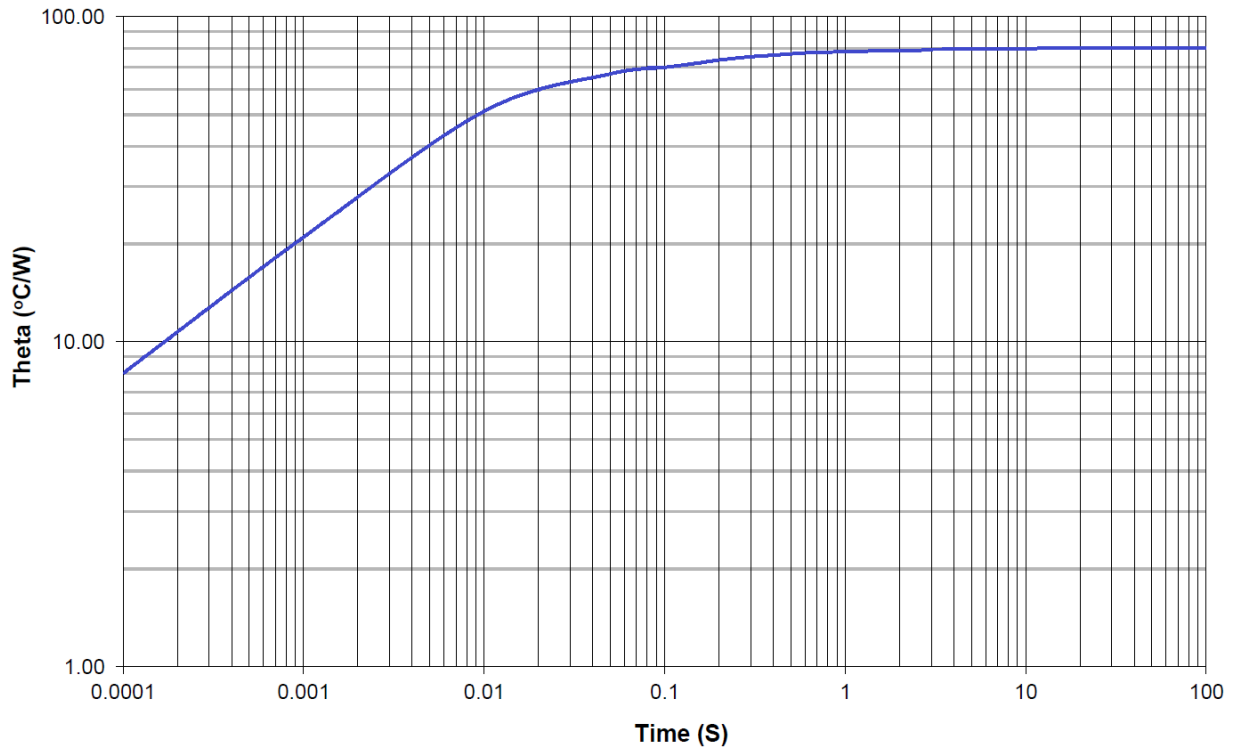


NOTES:

1. $R_{\theta JA(PCB)} = 325^\circ\text{C/W}$
2. $Z_{\theta JX} = 65^\circ\text{C/W}$ maximum at $t_H = 10\text{ms}$.

FIGURE 11. Thermal impedance for all UB and UBC devices.

MAXIMUM THERMAL IMPEDANCE PLOTS
UD Package, $T_{SP} = 25^{\circ}\text{C}$



NOTES:

1. $R_{\theta JSP} = 80^{\circ}\text{C/W}$
2. $Z_{\theta JX} = 51^{\circ}\text{C/W}$ maximum at $t_H = 10\text{ms}$.

FIGURE 12. Thermal impedance for all UD 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.

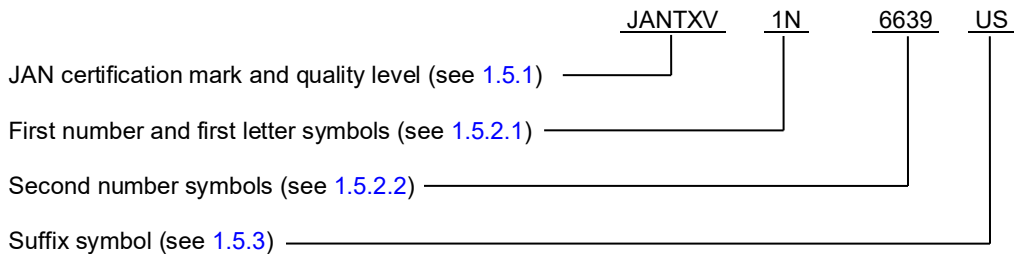
6.2 Acquisition requirements. Acquisition documents should specify the following:

- 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 6.4.
- 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 Weapons Support, 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://qpldocs.dla.mil>.

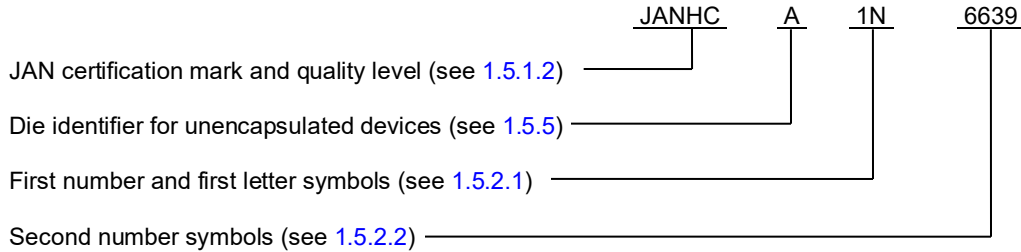
6.4 PIN construction example.

6.4.1 Encapsulated devices The PINs for encapsulated devices are constructed using the following form.



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



6.5 List of PINs.

6.5.1 List of PINs for encapsulated devices. The following is a list of possible PINs available on this specification sheet for encapsulated devices.

PINs for types 1N6639, 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)
JAN1N6639UBC (1)	JANTX1N6639UBC (1)	JANTXV1N6639UBC (1)	JANS1N6639UBC (1)
JAN1N6640UBC (1)	JANTX1N6640UBC (1)	JANTXV1N6640UBC (1)	JANS1N6640UBC (1)
JAN1N6641UBC (1)	JANTX1N6641UBC (1)	JANTXV1N6641UBC (1)	JANS1N6641UBC (1)
JAN1N6639UD	JANTX1N6639UD	JANTXV1N6639UD	JANS1N6639UD
JAN1N6640UD	JANTX1N6640UD	JANTXV1N6640UD	JANS1N6640UD
JAN1N6641UD	JANTX1N6641UD	JANTXV1N6641UD	JANS1N6641UD

(1) UB and UBC represent the four different Internal circuit schematic configurations (see 1.5.3.3) available for the 1N6639, 1N6640, and 1N6641 devices.

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6.5.2 List of PINs for unencapsulated devices. The following is a list of possible PINs available on this specification sheet for unencapsulated die. The qualified JANHC and JANKC suppliers with the applicable letter version (example, JANHCA1N6639) will be identified on the QML.

JANHCA1N6639	JANKCA1N6639	JANHCB1N6639	JANKCB1N6639	JANHCC1N6639	JANKCC1N6639
JANHCA1N6640	JANKCA1N6640	JANHCB1N6640	JANKCB1N6640	JANHCC1N6640	JANKCC1N6640
JANHCA1N6641	JANKCA1N6641	JANHCB1N6641	JANKCB1N6641	JANHCC1N6641	JANKCC1N6641

6.6 Supersession information.

6.6.1 Discussion. Legacy device type JANS1N4150 devices of MIL-S-19500/231 were found to be unsuitable for space flight applications. The updated design, device type JANS1N4150-1 and surface mount version JANS1N4150UR-1 were also found to be unsuitable for space flight applications and have not been in production or qualified since the early 1990s. Device type JANS1N4150-1 in stock may be used provided the date code does not exceed 9412, the date of implementation of MIL-S-19500/231F.

6.6.2 Obsolete PINs. Device types JANS1N4150, JANS1N4150-1 and 1N4150UR-1 are inactive for new design.

6.6.3 Cross reference substitution list. A PIN for PIN replacement table follows, and these devices are directly interchangeable.

Replacement PIN as specified within MIL-PRF-19500/609E, dated 24 August 2005	Superseded PIN as specified within MIL-S-19500/231H, dated 1 November 2005	Replacement PIN as specified within MIL S 19500/609A, dated 25 January 1992	Superseded PIN as specified within MIL-S-19500/231F, dated 23 September 1993
Preferred PIN	Non-preferred PIN	Preferred PIN	Non-preferred PIN
JANS1N6640		JANS1N6640	JANS1N4150-1
JANS1N6640US	1N4150UR-1		

6.6.4 Solder pad layout. The active terminals of the UD package of this specification sheet uses the same size solder pad layout as device types 1N6639US, 1N6640US, and 1N6641US.

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

PIN	JANHC and JANKC ordering information	JANHC and JANKC ordering information	JANHC and JANKC ordering information
	Manufacturer	Manufacturer	Manufacturer
	52GC4	43611	52GC4
1N6639	JANHCA1N6639, JANKCA1N6639	JANHCB1N6639, JANKCB1N6639	JANHCC1N6639, JANKCC1N6639
1N6640	JANHCA1N6640, JANKCA1N6640	JANHCB1N6640, JANKCB1N6640	JANHCC1N6640, JANKCC1N6640
1N6641	JANHCA1N6641, JANKCA1N6641	JANHCB1N6641, JANKCB1N6641	JANHCC1N6641, JANKCC1N6641

6.8 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. 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.

CONCLUDING MATERIAL

Custodians:

Army – CR
Navy – SH
Air Force – 85
DLA – CC
NASA – NA

Preparing activity:
DLA – CC

(Project **5961-2027-001**)

Review activities:

Army – AR, MI, SM
Navy – AS, MC
Air Force – 19, 71

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>.