The documentation and process conversion measures necessary to comply with this document shall be completed by 29 April 2016.

INCH-POUND
MIL-PRF-19500/578P
29 January 2016
SUPERSEDING
MIL-PRF-19500/578N
20 May 2014
See 6.4

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING, TYPES 1N6638, 1N6642, 1N6643, 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 switching diodes. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

* 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, U and US in accordance with figure 2, UB in accordance with figure 3, and UB2 in accordance with figure 4. The dimensions and topography for JANHC and JANKC unencapsulated die are as follows: A version die in accordance with figure 5, B in accordance with figure 6, C in accordance with figure 7, and D in accordance with figure 8.

1.3 Maximum ratings. Unless otherwise specified T_A = +25°C.

Types	V_{BR}	V_{RWM}	$I_{O(PCB)}$ T_A=75° (1) (2)	I_{FSM} t_p = 1/120 s	$R_{\theta JL}$ L = .375 inch (9.53 mm) (1)	$R_{\theta JEC}$ L = 0 (1) (2)	$R_{\theta JA(PCB)}$ (2) (3)	$R_{\theta JSP}$ (1) (2) (4)	T_{STG} & T_J
	V (pk)	V (pk)	mA	A (pk)	°C/W	°C/W	°C/W	°C/W	°C
1N6638	150	125	300	2.5	150		250		-65 to +175
1N6638U, 1N6638US	150	125	300	2.5		40	250		-65 to +175
1N6638UB, UBCC, UBCA, UBD	150	125	300	2.5		40	325	100	-65 to +200
1N6642	100	75	300	2.5	150		250		-65 to +175
1N6642U, 1N6642US	100	75	300	2.5		40	250		-65 to +175
1N6642UB, UB2, UB2R, UBCA, UBD, and UBCC	100	75	300	2.5			325	100	-65 to +200
1N6643	75	50	300	2.5	150		250		-65 to +175
1N6643U, 1N6643US	75	50	300	2.5		40	250		-65 to +175
1N6643UB, UBCC, UBCA, UBD	150	125	300	2.5		40	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. Unless otherwise specified T_A = +25°C. Continued

(1) For temperature-current derating curves, see figures 9 and 10.
(2) See figures 11, 12, 14, and 15 for thermal impedance curves.
(3) T_A = +75°C for both axial and Metal Electrode Leadless Face diodes (MELF) (U, US) on printed circuit board (PCB), PCB = FR4 - .0625 inch (1.59 mm) 1-layer 1-Oz Cu, horizontal, in still air; pads for U, US = .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 ≤ .187 inch (≤ 4.75 mm); $R_{\theta JA}$ with a defined PCB thermal resistance condition included, is measured at I_O = 300 mA dc.
(4) $R_{\theta JSP}$ refers to thermal resistance from junction to the solder pads of the UB package.

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

Types (1)	V_{F1} I_F = 10 mA	V_{F2}	I_{R1} V_R = 20 V	I_{R2} V_R = V_{RWM}	I_{R3} V_R = 20 V T_A = +150°C	I_{R4} V_R = V_{RWM} T_A = +150°C	t_{fr} I_F = 200mA	t_{rr} I_{RM} = I_F = 10 mA	C_{T1} V_R = 0
	V dc	V dc	nA dc	nA dc	µA dc	µA dc	ns	ns	pF
1N6638, 1N6638U, 1N6638US	0.8	1.1 (2)	35	500	50	100	20	4.5	2.5
1N6642, 1N6642U, 1N6642US, 1N6642UB, 1N6642UB2, 1N6642UBCA, 1N6642UB2R, 1N6642UBD, 1N6642UBCC 1N6642UBE	0.8	1.2 (3)	25	500	50	100	20	5.0	5.0
1N6643, 1N6643U, 1N6643US	0.8	1.2 (3)	50	500	75	100	20	6.0	5.0

(1) Suffix "U" devices are structurally identical to the suffix "US" devices.
(2) I_F = 200 mA.
(3) I_F = 100 mA.

* 1.5 Part or Identifying Number (PIN). The PIN is in accordance with MIL-PRF-19500, and as specified herein. See 6.4 for supersession information, 6.5 for the suppliers of die, 6.6 for PIN construction example, and 6.7 for a list of available PINs.

* 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 diodes 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 diodes covered by this specification sheet are as follows: "6638", "6642", and "6643".

* 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 (1)	Indicates a surface mount, square endcap, package (see figure 2).
UB	Indicates a surface mount UB package (see figure 3).
UB2	Indicates a surface mount UB2 package (see figure 4).

(1) For this specification sheet, the suffix symbols "US" have superseded suffix symbol "U" to designate square endcap surface mount packages.

* 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”, "C", and “D”.

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

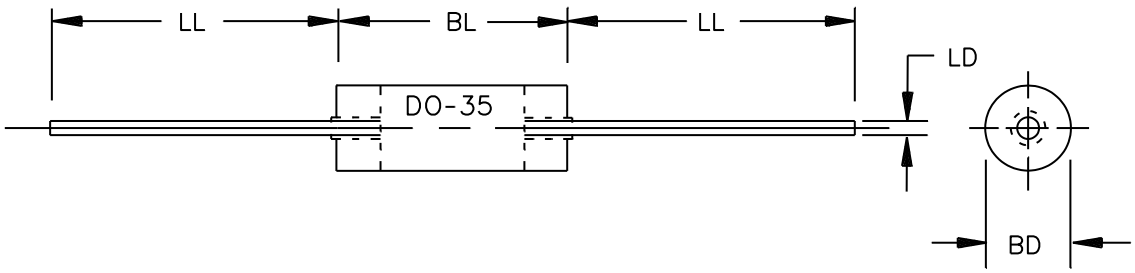
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

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.



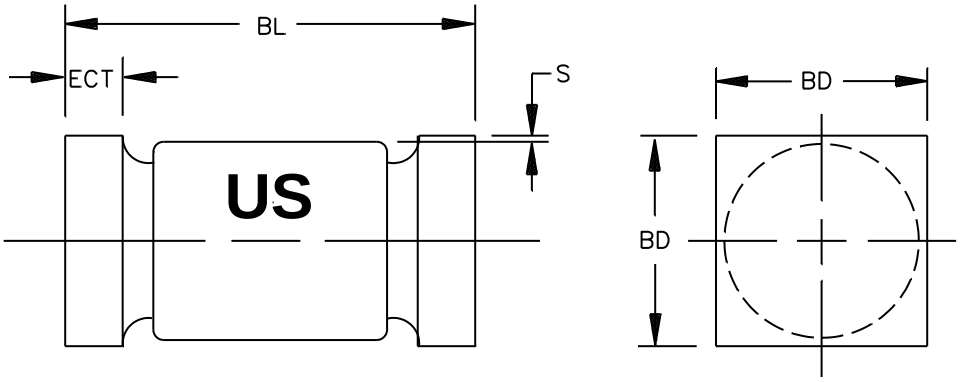
Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.056	.080	1.42	2.03	2
BL	.130	.180	3.30	4.57	
LD	.018	.022	0.46	0.56	3
LL	1.00	1.50	25.40	38.10	

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 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.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

TYPES 1N6638, 1N6642, AND 1N6643.

FIGURE 1. Physical dimensions (DO-35).

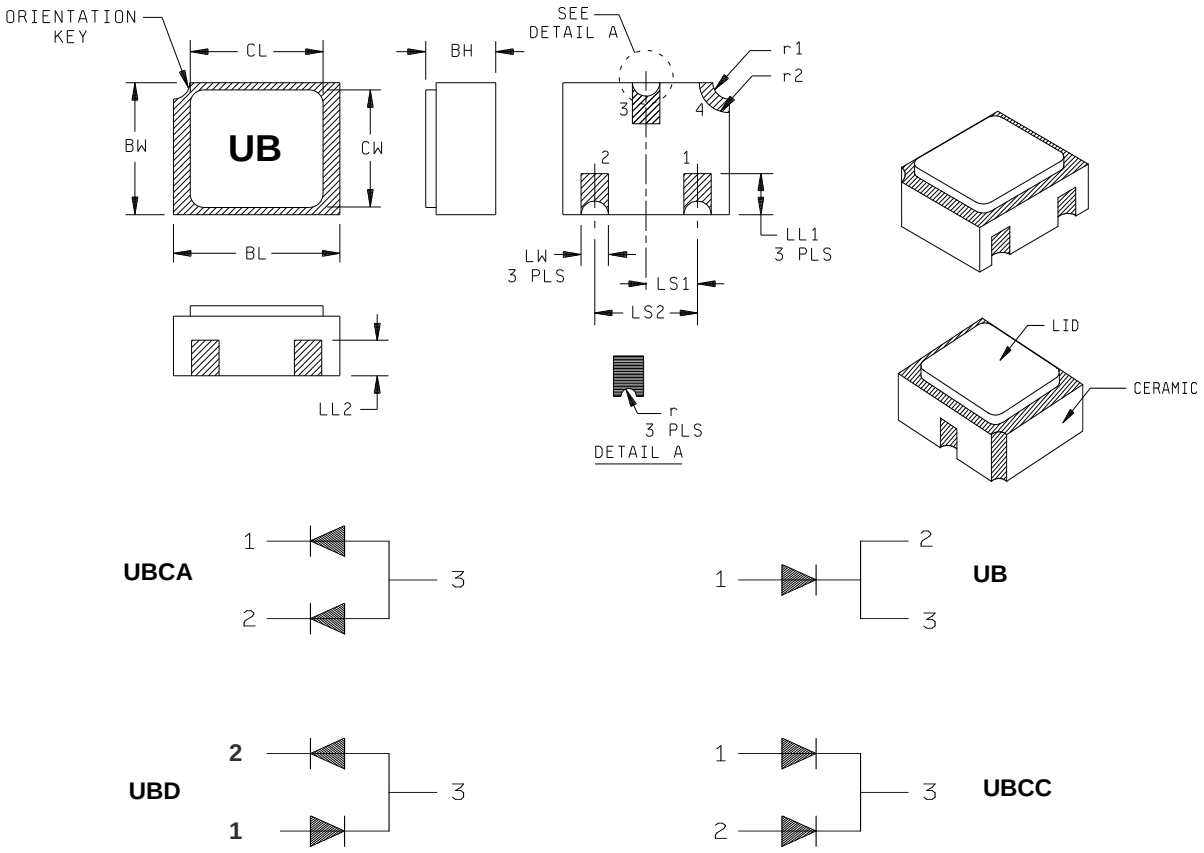


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.070	.085	1.78	2.16
BL	.165	.195	4.19	4.95
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimensions are pre-solder dip.
3. U-suffix parts are structurally identical to the US-suffix parts.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

TYPES 1N6638U, 1N6642U, AND 1N6643U, 1N6638US, 1N6642US, AND 1N6643US

FIGURE 2. Physical dimensions of surface mount family.

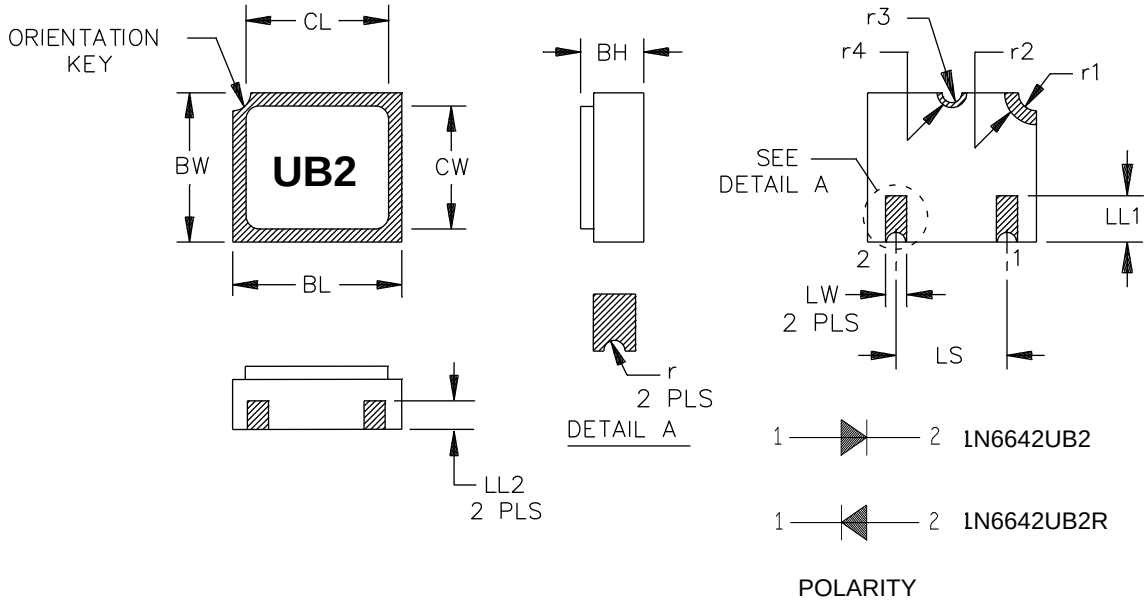


Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS1	.035	.039	0.89	0.99
BL	.115	.128	2.92	3.25	LS2	.071	.079	1.80	2.01
BW	.085	.108	2.16	2.74	LW	.016	.024	0.41	0.61
CL		.128		3.25	r		.008		0.20
CW		.108		2.74	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.

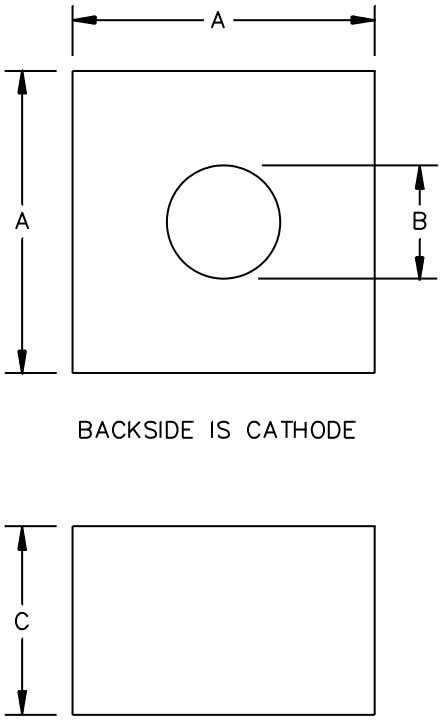
FIGURE 3. Physical dimensions, surface mount (UB version).



Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS	.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 TYP		0.20 TYP	
CL		.128		3.25	r1	.012 TYP		0.30 TYP	
CW		.108		2.74	r2	.022 TYP		0.56 TYP	
LL1	.022	.038	0.56	0.96	r3	.008 TYP		0.20 TYP	
LL2	.017	.035	0.43	0.89	r4	.012 TYP		0.30 TYP	

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 4. Physical dimensions, surface mount (2 pin UB2 version).



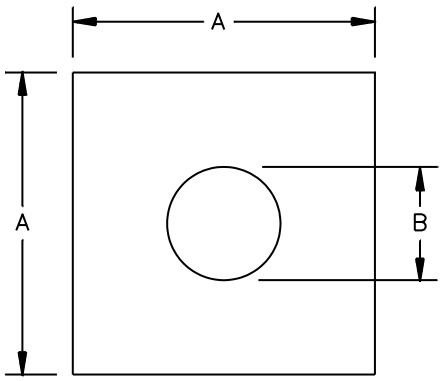
Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.014	.018	0.360	0.460
B	.005	.007	0.120	0.180
C	.008	.012	0.20	0.30

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 inches (0.25 mm) ±.002 inches (0.05 mm).

FIGURE 5. Physical dimensions JANHCA and JANKCA die.



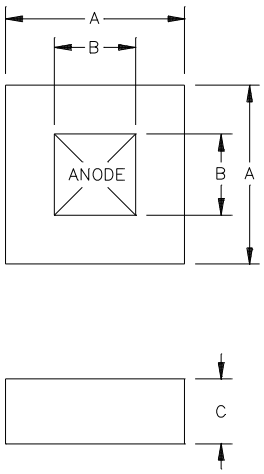
BACKSIDE IS CATHODE

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 6. Physical dimensions, JANHCB and JANKCB die.

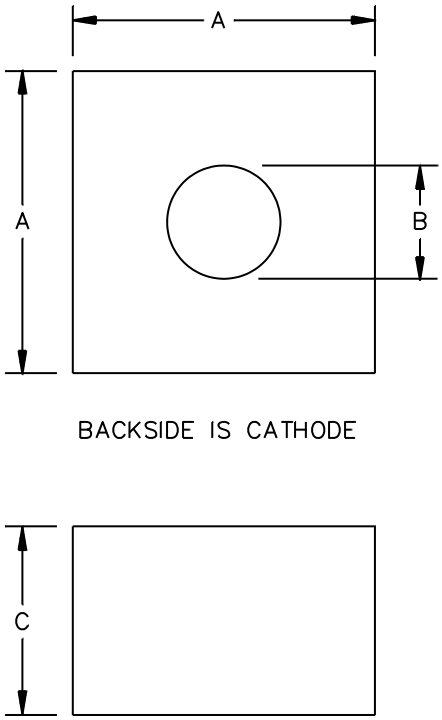


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.020	.024	0.500	0.600
B	.0095	.0105	0.238	0.263
C	.0078	.0082	0.197	0.208

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

Metallization:
Top (anode): Al
Back (cathode): Au
Al thickness: 30,000 Å minimum.
Gold thickness: 5,000 Å minimum.

FIGURE 7. Physical dimensions, JANHCC and JANKCC die.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.013	.017	0.330	0.432
B	.007	.009	0.178	0.229
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-39 package.
3. The physical characteristics of the die are:

Metallization:
Top (anode): Al
Back (cathode): Au
Al thickness: 34,000 Å minimum.
Gold thickness: 3,600 Å minimum.
Chip thickness: .010 inches (0.25 mm) ±.002 inches (0.05 mm).

* FIGURE 8. Physical dimensions, JANHCD and JANKCD 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 figure 1, figure 2, figure 3 (UB), figure 4 (UB2), figure 5(die), figure 6 (die), figure 7 (die), and figure 8 (die).

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 ‘UB2’ 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 ‘UB’ devices shall be eutectically mounted and wire bonded in a ceramic package.

c. The ‘U’ and 'US' version shall be structurally identical to the axial leaded versions except for end-cap lead attachment.

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 can be abbreviated as J, JX, JV, and JS respectively. The part number may be reduced to J6638, JX6638, JV6638, or JS6638. No color coding shall be permitted for part numbering.

3.7.1 Marking of U and US versions. ‘U’ and ‘US’ devices shall be marked with a cathode band as a minimum, or a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used. For ‘U’ and ‘US’ versions only, all marking may be omitted from the device except for the cathode marking. At the option of the manufacturer, ‘U’ and ‘US’ devices may include laser marking on an end-cap, to include part number and lot date code for all levels. JANS devices which are laser marked shall also include serialization. The prefixes JAN, JANTX, JANTXV, or JANS may be abbreviated as J, JX, JV, or JS, respectively. (For example: The part number may be reduced to JS6642). All marking which is omitted from the body of the device, except for polarity and serial numbers, shall appear on the initial container.

3.7.2 UB devices. ‘UB’ and ‘UB2’ packages do not require polarity marking.

3.8 Workmanship. 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.

* 4.3.1 Screening of encapsulated devices (quality levels JANS, JANTXV, and JANTX only). Screening of packaged devices 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	JANS level	JANTXV and JANTX level
2	Not required	Not required
3b (1) 3c	Not applicable Thermal impedance (see 4.3.1.2)	Not applicable Thermal impedance (see 4.3.1.2)
4	Not applicable	Not applicable
5	Not applicable for axial leaded parts	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_{F2}, I_{R1}, and $V_{BR;}$ ΔI_{R1} ±15 nA dc or 100 percent of initial value whichever is greater.	V_{F2} and I_{R1}
12	Required, see 4.3.1.1	Required, see 4.3.1.1
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. $\Delta V_{F2} \leq \pm 0.030$ V dc (scope display, see 4.5.3).	Subgroup 2 of table I herein; $\Delta I_{R1} \leq$ 100 percent of initial reading or 15 nA dc, whichever is greater. $\Delta V_{F2} \leq \pm 0.030$ V dc (scope display, see 4.5.3).

(1) Shall be performed anytime after temperature cycling, screen 3a; JANTX and JANTXV levels do not need to be repeated in screening requirements.

4.3.1.1 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(min) or $I_{F(min)}$ = $I_{O(PCB)}$. T_A = 75°C maximum. 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, and mounting conditions) 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.

* 4.3.1.2 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. 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 figures 11, 12, 13, 14, and 15 (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.

4.3.2 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.

4.4 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. (Not applicable for UB suffix parts.)
B3	1051	-55°C to +175°C, 100 cycles.
B4	1037	t_{on} = t_{off} = 1 minute minimum; 2,000 cycles; 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 U and US suffix sample for life test.

Subgroup	Method	Conditions
B2	1056	0°C to + 100°C, 10 cycles. (Not applicable for UB suffix parts.)
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.)
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. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

	Subgroup	Method	Conditions
	C2	1056	0°C to + 100°C, 10 cycles. (Not applicable for UB suffix parts.)
	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 for all types. (Does not apply to UB and UB2)
	C2	2038	US devices - Tension: Condition B, 6 pounds, t = 15 s.
	C5	4081	L = .375 inch (9.53 mm); $R_{\theta JL}$ = 150°C/W maximum; $R_{\theta JEC}$ = 40°C/W maximum (see 4.3.1.2).
	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, is 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 V_F 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/ 2/	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
	Subgroup 1						
	Visual and mechanical examination	2071					
	Subgroup 2						
	Thermal impedance	3101	See 4.3.1.2	$Z_{\theta JX}$			°C/W
*	Forward voltage	4011	I_F = 10 mA dc pulsed (see 4.5.4) (Condition B)	V_{F1}			
	1N6638					.8	V dc
	1N6642					.8	V dc
	1N6643					.8	V dc
*	Forward voltage	4011	(Condition B)	V_{F2}			
	1N6638		I_F = 200 mA pulsed (see 4.5.4)			1.1	V dc
	1N6642		I_F = 100 mA pulsed (see 4.5.4)			1.2	V dc
	1N6643		I_F = 100 mA pulsed (see 4.5.4)			1.2	V dc
	Breakdown voltage	4021	I_R = 100 µA dc				
	1N6638			V_{BR}	150		V dc
	1N6642				100		V dc
	1N6643				75		V dc
	Reverse current	4016	DC method; V_R = 20 V dc	I_{R1}			
	1N6638					35	nA dc
	1N6642					25	nA dc
	1N6643					50	nA dc
	Reverse current	4016	DC method	I_{R2}			
	1N6638		V_R = 125 V dc			500	nA dc
	1N6642		V_R = 75 V dc			500	nA dc
	1N6643		V_R = 50 V dc			500	nA dc
	Subgroup 3						
	High temperature operation		T_A = +150°C				
	Reverse current	4016	DC method, V_R = 20 V dc	I_{R3}			
	1N6638					50	µA dc
	1N6642					50	µA dc
	1N6643					75	µA dc

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

	Inspection 1/ 2/	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
	Subgroup 3 - continued						
	Reverse current	4016	DC method	I_{R4}			
	1N6638		V_R = 125 V dc			100	µA dc
	1N6642		V_R = 75 V dc			100	µA dc
	1N6643		V_R = 50 V dc			100	µA dc
	Forward voltage	4011	I_F = 10 mA dc pulsed (see 4.5.4) (Condition B)	V_{F3}			
*	1N6638					.65	V dc
	1N6642, 1N6643					.80	V dc
	Low temperature operation		T_A = -55°C				
*	Forward voltage	4011	Pulsed (Condition B)	V_{F4}			
	1N6638		I_F = 200 mA pulsed (see 4.5.4)			1.2	V dc
	1N6642		I_F = 100 mA pulsed (see 4.5.4)			1.2	V dc
	1N6643		I_F = 100 mA pulsed (see 4.5.4)			1.4	V dc
	Subgroup 4						
	Capacitance	4001	V_R = 0 V dc; V_{sig} = 50 mV(p-p) f = 1 MHz	C_{T1}			
	1N6638					2.5	pF
	1N6642					5.0	pF
	1N6643					5.0	pF
	Capacitance	4001	V_R = 1.5 V dc; V_{sig} = 50 mV(p-p) f = 1 MHz	C_{T2}			
	1N6638					2.0	pF
	1N6642					2.8	pF
	1N6643					2.8	pF

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

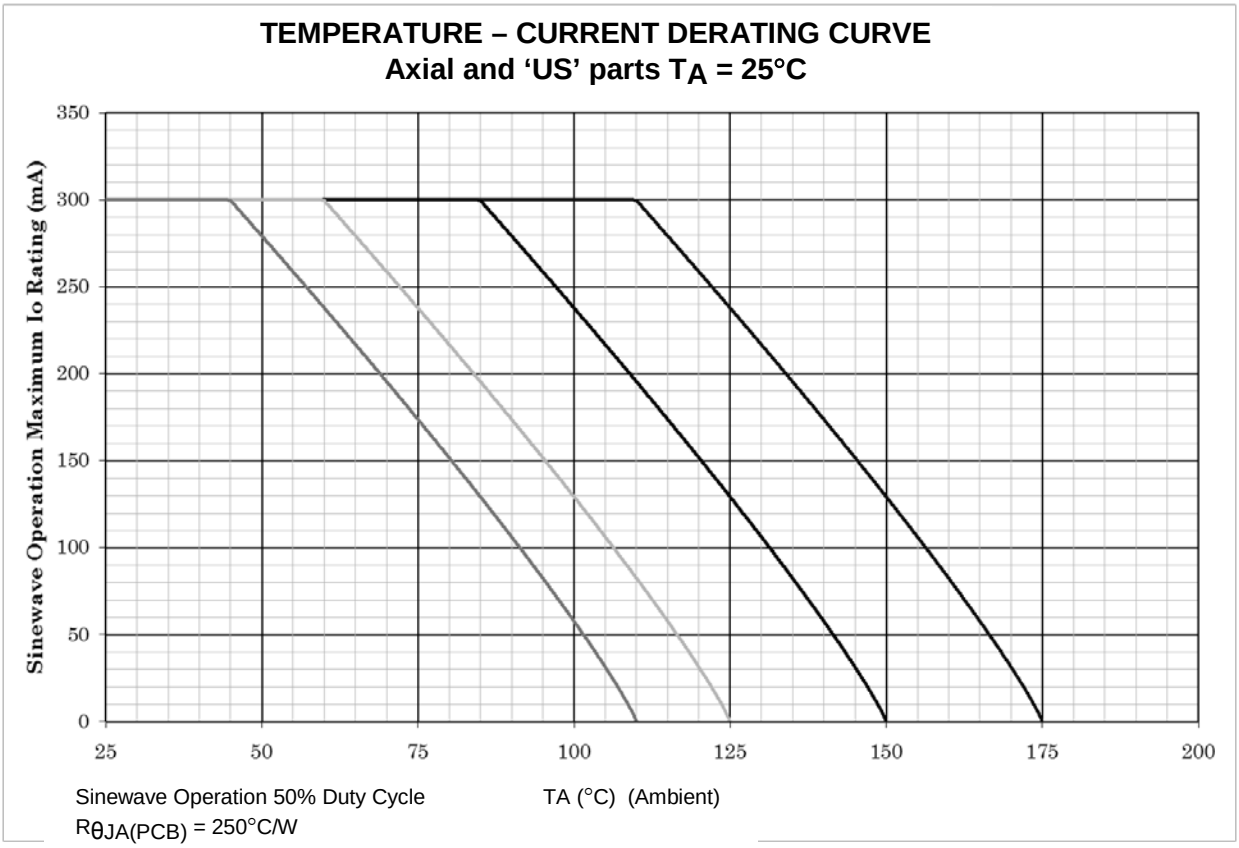
Inspection 1/ 2/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - continued						
Reverse recovery time	4031	Condition A, $I_F = I_R = 10$ mA dc	t_{rr}			
1N6638					4.5	ns
1N6642					5.0	ns
1N6643					6.0	ns
Scope display	4023	See method 4023 of MIL-STD-750, figures 4023-3, -7, -9, -10 only				
Subgroup 5						
Not applicable						
Subgroup 6	4066					
Surge current		Test Condition A, I_{FSM} = 2.5 A(pk) ten surges at one per minute (max), surge duration of 1/120 seconds				
Electrical measurements		See table I, subgroup 2				
Subgroup 7						
Forward recovery voltage and time	4026	I_F = 200 mA dc (see 4.5.2)	V_{fr} t_{fr}		5.0 20.0	V(pk) ns

1/ For sampling plan, see MIL-PRF-19500.
2/ Electrical characteristics for surface mount versions are identical to the corresponding axial leaded versions unless otherwise specified.

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

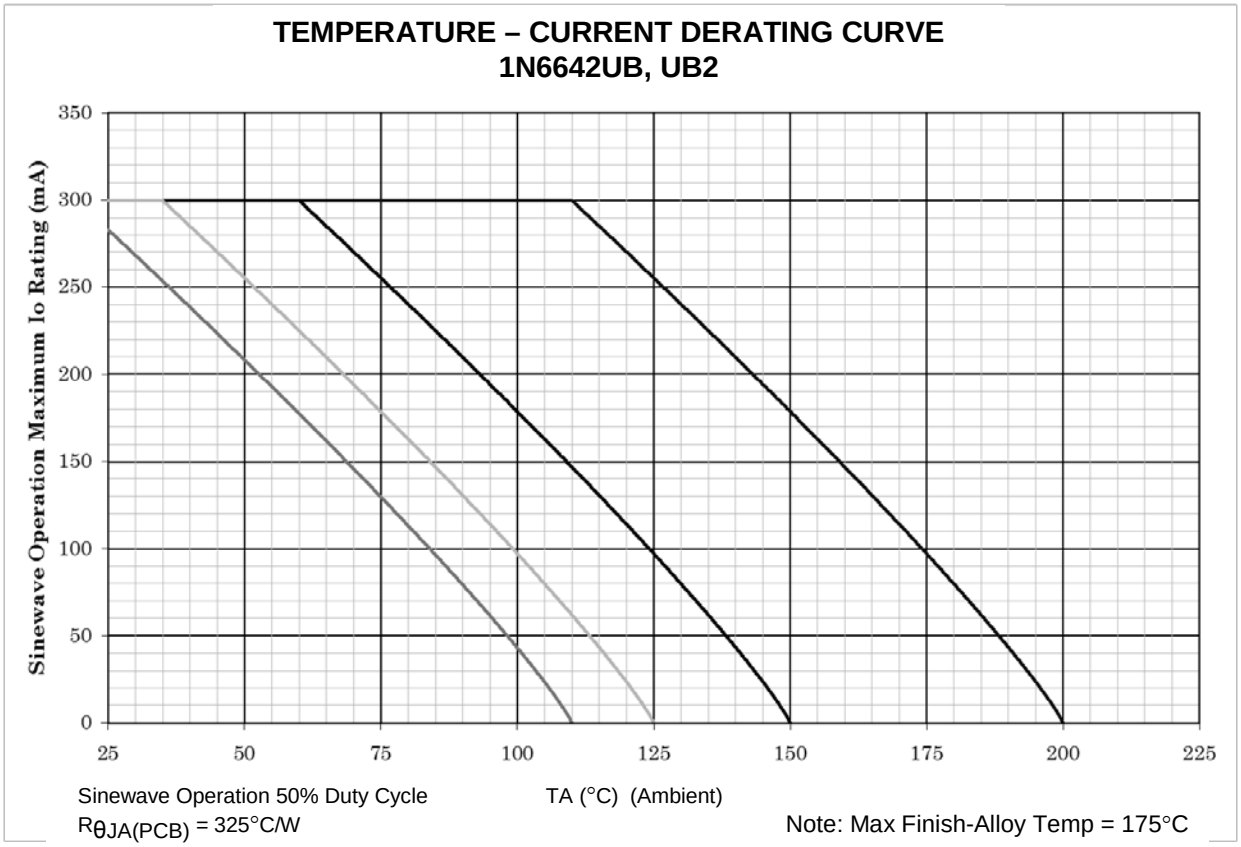
Inspection 1/	MIL-STD-750		Sample plan
	Method	Conditions	
Subgroup 1			n = 45, c = 0
Thermal shock (glass strain) 1/	1056	20 cycles, condition D except low temperature shall be achieved using liquid nitrogen (-195°C). A visual inspection for cracked glass shall be performed. (Not applicable for UB suffix parts.)	
Temperature cycling 1/	1051	-65°C to +175°C.	
Hermetic seal	1071	Gross leak only. Fine and gross for “UB” devices.	
Electrical tests		See table I, subgroup 2.	
Subgroup 2			n = 45, c = 0
Intermittent operation life	1037	10,000 cycles; $I_F = I_O$ = 300 mA dc, $t_{on} = t_{off}$ = 1 minute.	
Electrical end-points		See table I, subgroup 2.	
Subgroup 4			
Thermal resistance	4081	$R_{\theta JSP}$ 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).	n = 15, c = 0
Thermal impedance curves		See MIL-PRF-19500, table E-IX, group E, subgroup 4.	Sample size N/A
Subgroup 5			
Not applicable			
Subgroup 6			
ESD	1020		n = 11
Subgroup 8			
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.	n = 45
Subgroup 10			
Potted environment test	1054	Not required for UB packages	n = 22, c = 0

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 current rating where most users want to limit T_J in their application.

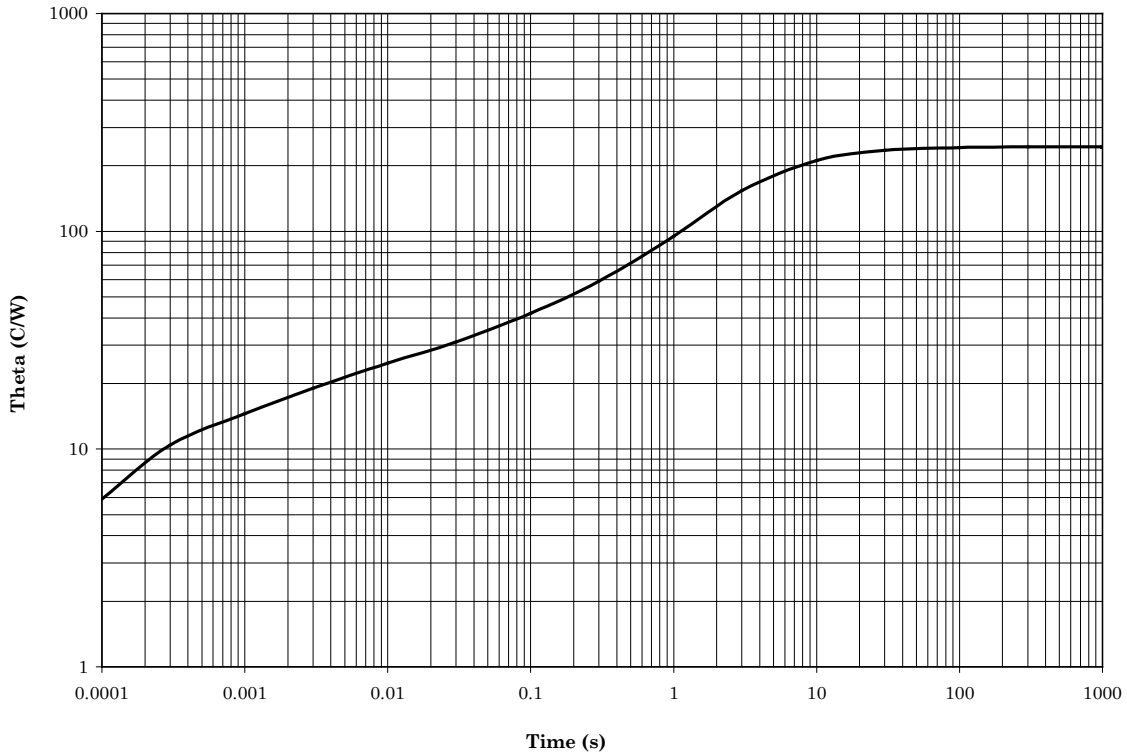
FIGURE 9. Temperature current derating.



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 current rating where most users want to limit T_J in their application.

FIGURE 10. Temperature current derating.

Maximum Thermal Impedance Plots
Axial, 'U', 'US' parts, T_A = 55°C

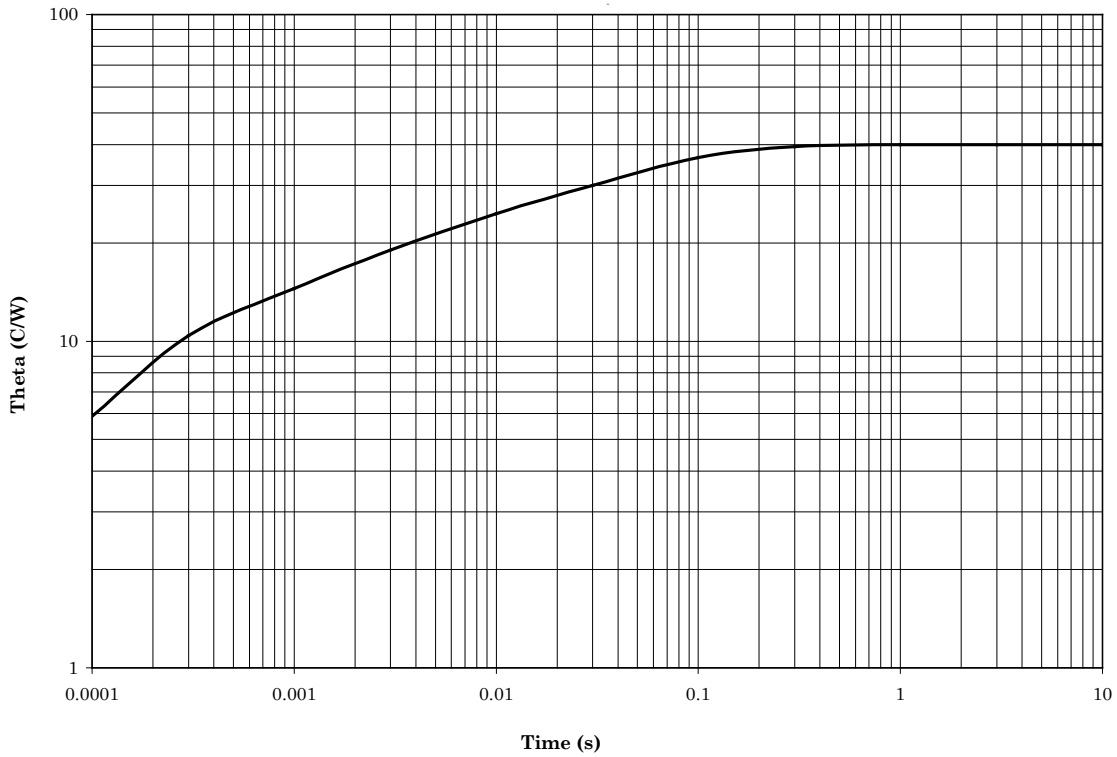


$R_{\theta JA(PCB)}$ = 250°C/W

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

FIGURE 11. Thermal impedance - all glass devices.

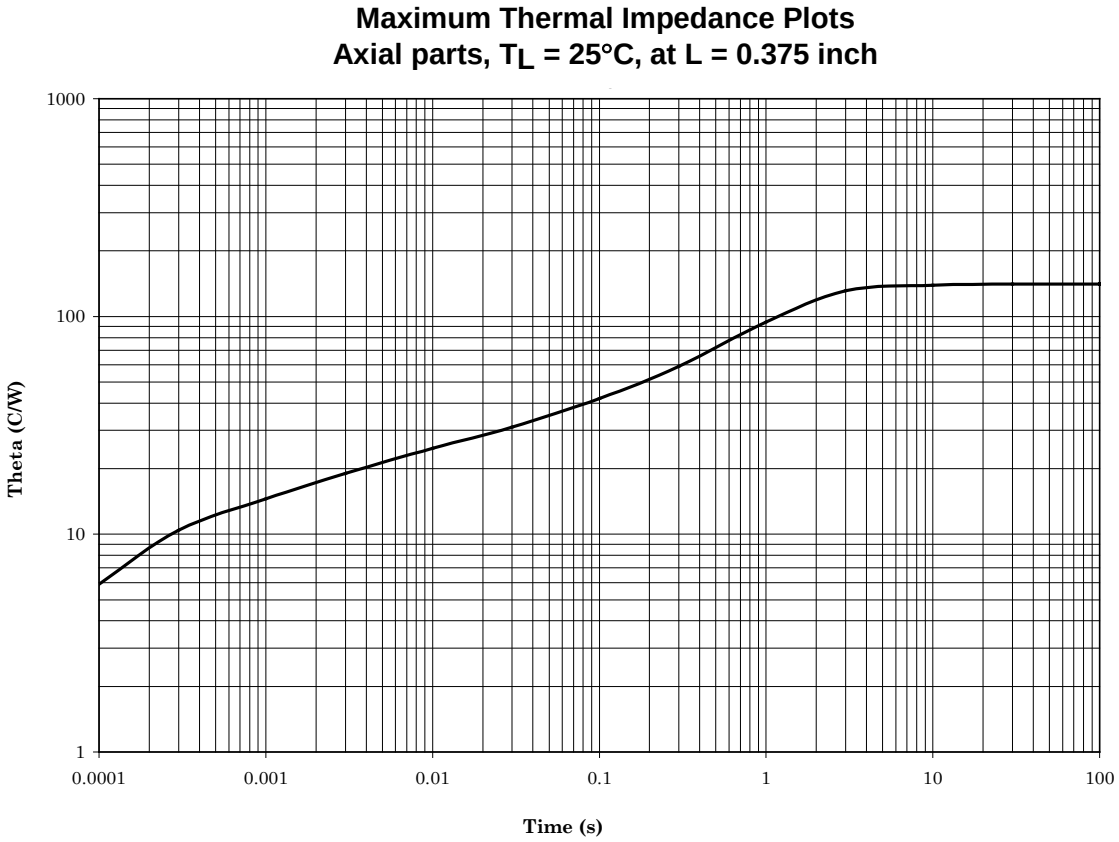
Maximum Thermal Impedance Plots
'U', 'US' parts, T_{EC} = 25°C



$R_{\theta JEC}$ = 40°C/W

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

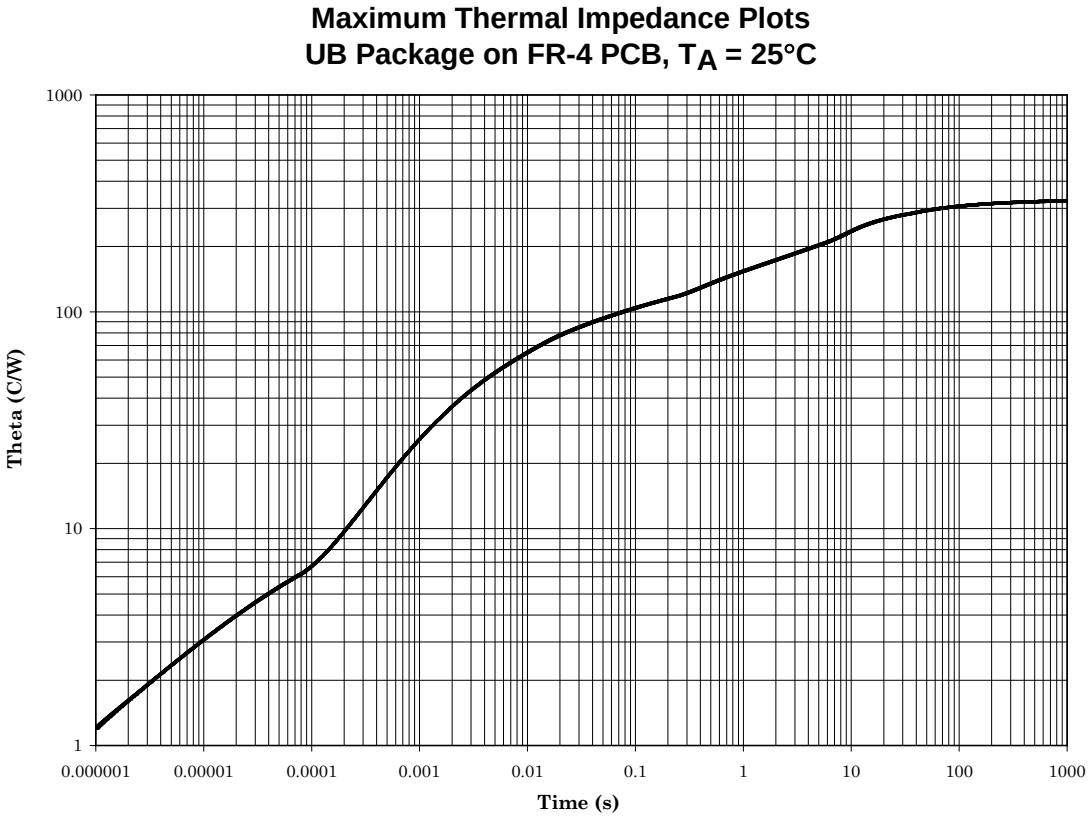
FIGURE 12. Thermal impedance - all U and US devices.



$R_{\theta JL}$ = 150°C/W

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

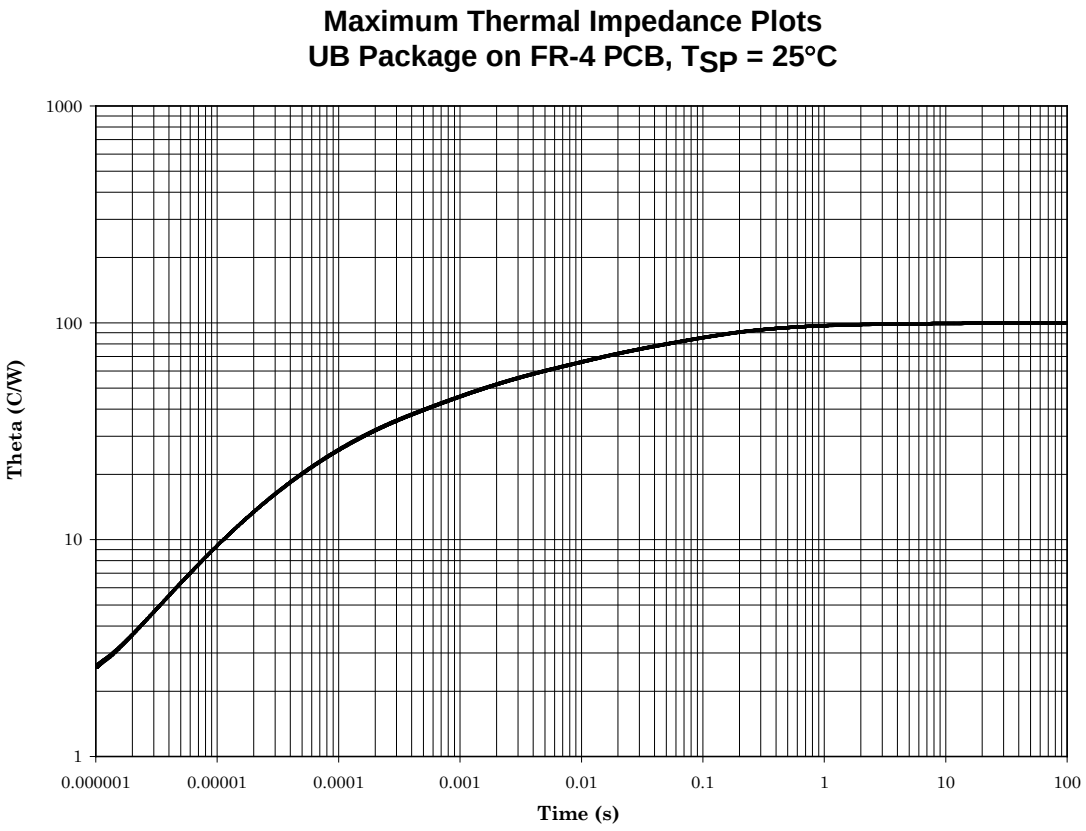
FIGURE 13. Thermal impedance (axial leads).



$R_{\theta JA(PCB)}$ = 325°C/W

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

FIGURE 14. Thermal impedance (UB versions).



$R_{\theta JSP}$ = 100°C/W

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

FIGURE 15. 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.

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 Supersession information and cross-reference data.

6.4.1 Superseded PINs. The PIN JANS1N4148-1 from MIL-PRF-19500/116 has been superseded by PIN JANS1N6642 of this specification sheet. Subsequently, PIN JANS1N4148UR-1 has been superseded by PIN JANS1N6642US. The design of types JANS1N4148-1 and JANS1N4148UR-1 have been classified unsuitable for space flight applications. See MIL-PRF-19500/116 for additional information regarding these superseded PINs.

6.4.2 Cross-reference of PINs with superseded suffix symbol. The PINs 1N6638US, 1N6642US, and 1N6643US are structurally identical and are a direct substitute for PINs 1N6638U, 1N6642U, and 1N6643U. PINs 1N6638U, 1N6642U, and 1N6643U are not to be used for new design. A PIN for PIN cross-reference chart is as follows:

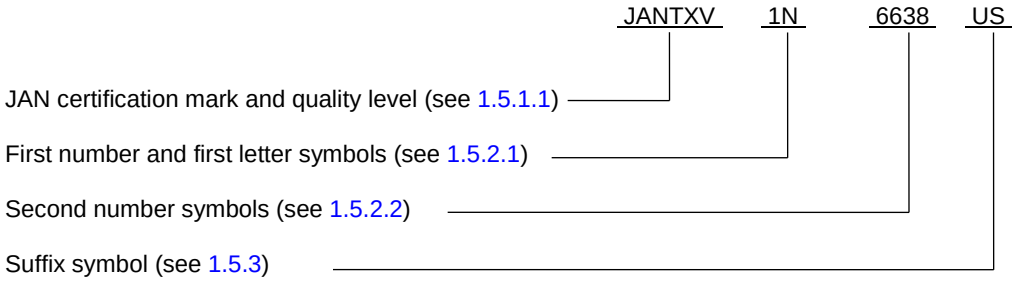
Superseded PIN	Superseding PIN
JANS1N6638U	JANS1N6638US
JANS1N6642U	JANS1N6642US
JANS1N6643U	JANS1N6643US

* 6.5 Suppliers of die. The qualified die suppliers with the applicable letter version (e.g., JANHCB1N6638) will be identified on the QML.

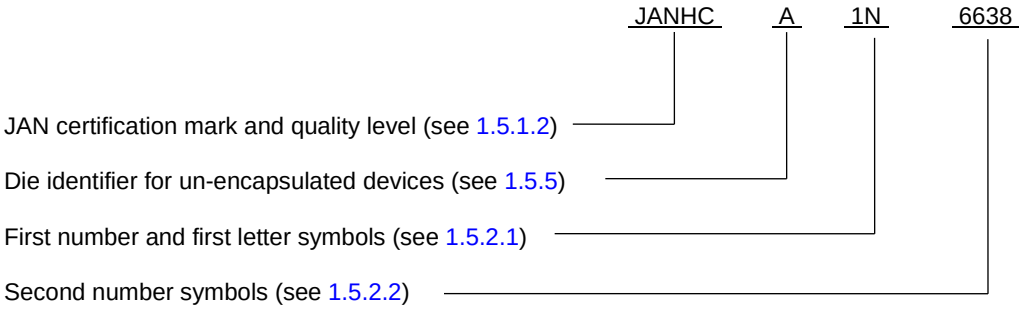
JANHC and JANKC ordering information				
PIN	Manufacturer			
	52GC4	43611	34156	13409
1N6638	JANHCA1N6638 JANKCA1N6638	JANHCB1N6638 JANKCB1N6638		JANHCD1N6638 JANKCD1N6638
1N6642	JANHCA1N6642 JANKCA1N6642	JANHCB1N6642 JANKCB1N6642	JANHCC1N6642 JANKCC1N6642	JANHCD1N6642 JANKCD1N6642
1N6643	JANHCA1N6643 JANKCA1N6643	JANHCB1N6643 JANKCB1N6643		JANHCD1N6643 JANKCD1N6643

* 6.6 PIN construction example.

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



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



* 6.7 List of PINs.

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

PINs for types1N6638, 1N6642, and 1N6643				
JAN1N6638	JAN1N6638U	JAN1N6638US	JAN1N6638UB	JAN1N6642UB2
JAN1N6642	JAN1N6642U	JAN1N6642US	JAN1N6642UB	JAN1N6642UB2R
JAN1N6643	JAN1N6643U	JAN1N6643US	JAN1N6643UB	JANTX1N6642UB2
JANTX1N6638	JANTX1N6638U	JANTX1N6638US	JANTX1N6638UB	JANTX1N6642UB2R
JANTX1N6642	JANTX1N6642U	JANTX1N6642US	JANTX1N6642UB	JANTXV1N6642UB2
JANTX1N6643	JANTX1N6643U	JANTX1N6643US	JANTX1N6643UB	JANTXV1N6642UB2R
JANTXV1N6638	JANTXV1N6638U	JANTXV1N6638US	JANTXV1N6638UB	JANS1N6642UB2
JANTXV1N6642	JANTXV1N6642U	JANTXV1N6642US	JANTXV1N6642UB	JANS1N6642UB2R
JANTXV1N6643	JANTXV1N6643U	JANTXV1N6643US	JANTXV1N6643UB	
JANS1N6638	JANS1N6638 U	JANS1N6638US	JANS1N6638UB	
JANS1N6642	JANS1N6642U	JANS1N6642US	JANS1N6642UB	
JANS1N6643	JANS1N6643U	JANS1N6643US	JANS1N6643UB	

* (1) UB represents the four different configurations of "UB", "UBCC", "UBCA", and "UBD" for the 1N6638, 1N6642, and 1N6643 devices.

* 6.7.2 PINs for unencapsulated devices (die). The following is a list of possible PINs for unencapsulated devices available on this specification sheet.

Quality level HC	Quality level HC w/ RHA	Quality level KC	Quality level KC w/ RHA
JANHCA1N6638	JANHCA1N6638	JANKCA1N6638	JANKCA1N6638
JANHCA1N6642	JANHCA1N6642	JANKCA1N6642	JANKCA1N6642
JANHCA1N6643	JANHCA1N6643	JANKCA1N6643	JANKCA1N6643
JANHCB1N6638	JANHCB1N6638	JANKCB1N6638	JANKCB1N6638
JANHCB1N6642	JANHCB1N6642	JANKCB1N6642	JANKCB1N6642
JANHCB1N6643	JANHCB1N6643	JANKCB1N6643	JANKCB1N6643
JANHCC1N6638	JANHCC1N6638	JANKCC1N6638	JANKCC1N6638
JANHCC1N6642	JANHCC1N6642	JANKCC1N6642	JANKCC1N6642
JANHCC1N6643	JANHCC1N6643	JANKCC1N6643	JANKCC1N6643
JANHCD1N6638	JANHCD1N6638	JANKCD1N6638	JANKCD1N6638
JANHCD1N6642	JANHCD1N6642	JANKCD1N6642	JANKCD1N6642
JANHCD1N6643	JANHCD1N6643	JANKCD1N6643	JANKCD1N6643

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

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

Preparing activity:
DLA - CC

(Project 5961-2016-012)

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