The documentation and process conversion measures necessary to comply with this document shall be completed by 6 October 2012.

INCH-POUND
MIL-PRF-19500/116S
6 July 2012
SUPERSEDING
MIL-PRF-19500/116R
w/AMENDMENT 2
15 July 2010

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING, TYPES 1N4148-1, 1N4148UR-1, 1N4148UB, 1N4148UBCA, 1N4148UBCC, 1N4148UBCCC, 1N4148UBD, 1N4148UBCD, 1N4148UB2, 1N4148UB2R, 1N914, 1N914UR, 1N4531, AND 1N4531UR, JAN, JANTX, JANTXV, JANHC, AND JANKC

JANS1N4148-1 (see 6.4). Device types 1N914 and 1N4531 are inactive for new design.

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

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

1. SCOPE

1.1 Scope. This specification covers the performance requirements for switching diodes. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for each unencapsulated device type.

* 1.2 Physical dimensions. See figures 1 (DO-35, DO-34), 2 (DO-213AA), 3 (UB), 4 (UB2), 5 (UBC), and 6 and 7 (die).

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

Type	V_{BR}	V_{RWM}	$I_{O(PCB)}$ T_A = 75°C (1)	I_{FSM} t_p = 8.3ms	T_{STG} & T_J	$R_{\Theta JL}$ L = .375 inch (9.53 mm) (2)	$R_{\Theta JEC}$ (UR) (2)	$R_{\Theta JA(PCB)}$ (2) (3) (4)	$R_{\Theta JSP}$ (UB) (2) (4)
	V dc	V (pk)	mA	A (pk)	°C	°C/W	°C/W	°C/W	°C/W
1N4148-1 1N4148UR-1	100	75	200	2	-65 to +175	250		325	
							100		
1N4148UB, 1N4148UB2, 1N4148UB2R, 1N4148UBCA, 1N4148UBCC, 1N4148UBD, 1N4148UBCCC, 1N4148UBCD					-65 to +200			325	120
1N4531 1N4531UR					-65 to +175	250		325	
							100		
1N914 1N914UR						250		325	
							100		

(1) For temperature-current derating curves, see figures 8 and 9.
(2) See figures 10, 11, and 12 for thermal impedance curves.
(3) T_A = +75°C for both axial and metal electrode leadless face diodes (MELF) (UR) on printed circuit board (PCB), PCB = FR4 - .0625 inch (1.59 mm) 1-layer 1-Oz Cu, horizontal, in still air; pads for (UR) = .061 inch (1.55 mm) x.105 inch (2.67 mm); pads for axial = .092 inch (2.34 mm) diameter, strip = .030 inch (0.76 mm) x 1 inch (25.4 mm) long, lead length L ≤ 0.187 inch (≤ 4.75 mm); $R_{\Theta JA}$ with a defined PCB thermal resistance condition included, is measured at I_O = 200 mA dc.
(4) $R_{\Theta JSP}$ refers to thermal resistance from junction to the solder pads of the UB package.

* 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 .

1.4 Primary electrical characteristics at T_A = +25°C, unless otherwise indicated.

Type (1)	V_{F1}		V_{F2}		I_{R1} at V_R = 20 V dc	I_{R2} at V_R = 75 V dc
	I_F mA dc	V dc	I_F mA dc	V dc	nA dc	nA dc
1N4148-1	10	0.8	100	1.2	25	500
1N914	10	0.8	50	1.2	25	500
1N4531	10	0.8	100	1.2	25	500

Type (1)	I_{R3} at V_R = 20 V dc T_A = 150°C	I_{R4} at V_R = 75 V dc T_A = 150°C	t_{fr} at V_{fr} = 5.0 V dc (pk) and I_F = 50 mA dc	t_{rr}
	µA dc	µA dc	ns	ns
1N4148-1	35	75	20	5
1N914	35	75	20	5
1N4531	35	75	20	5

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

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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, 4, or 5 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

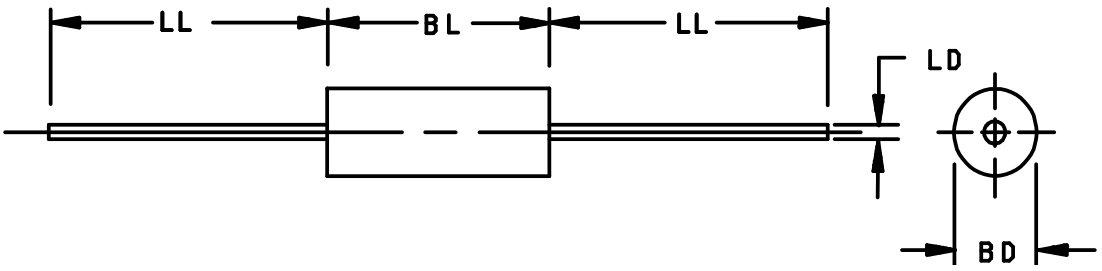
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Copies of these documents are available online at https://assist.dla.mil/quicksearch/ or https://assist.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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.

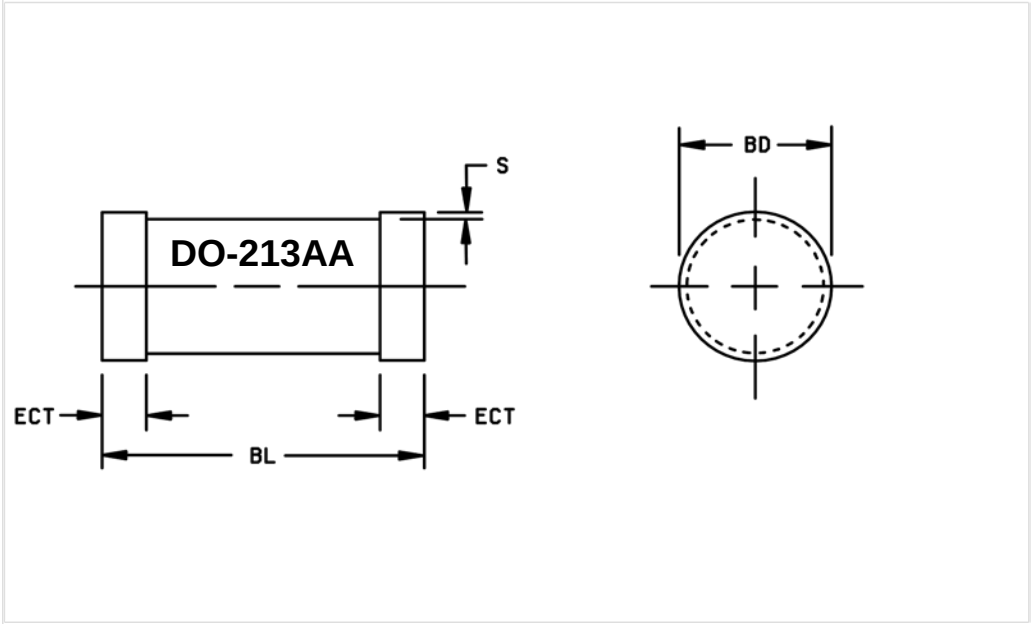


Types	Ltr	Dimensions			
		Inches		Millimeters	
		Min	Max	Min	Max
1N4148-1	BD	.056	.075	1.42	1.91
1N914	BL	.140	.180	3.56	4.57
	LD	.018	.022	0.46	0.56
(DO-35)	LL	1.000	1.500	25.40	38.10
1N4531	BD	.050	.075	1.27	1.90
	BL	.080	.120	2.03	3.05
(DO-34)	LD	.018	.022	0.46	0.56
	LL	1.000	1.500	25.40	38.10

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

TYPES 1N4148-1, 1N914, AND 1N4531.

FIGURE 1. Physical dimensions.

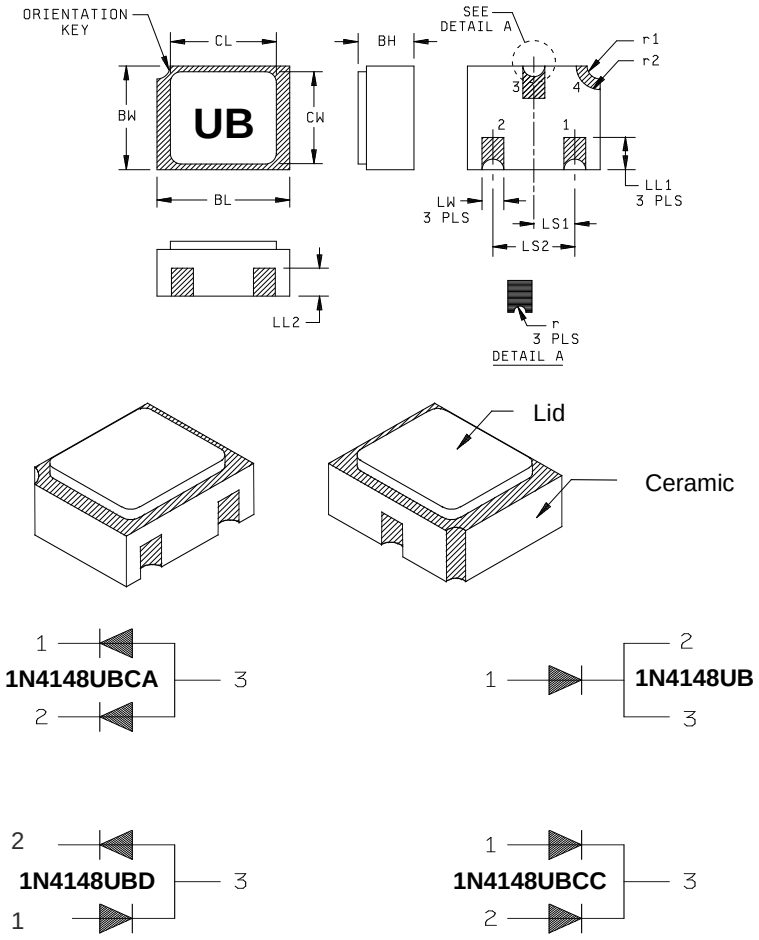


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.063	.067	1.60	1.70
BL	.130	.146	3.30	3.71
ECT	.016	.022	0.41	0.56
S	.001		0.03	

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimensions are pre-solder dip.
3. Referencing to dimension S, minimum clearance of glass body to mounting surface on all orientations.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

TYPES 1N914UR, 1N4148UR-1, AND 1N4531UR.

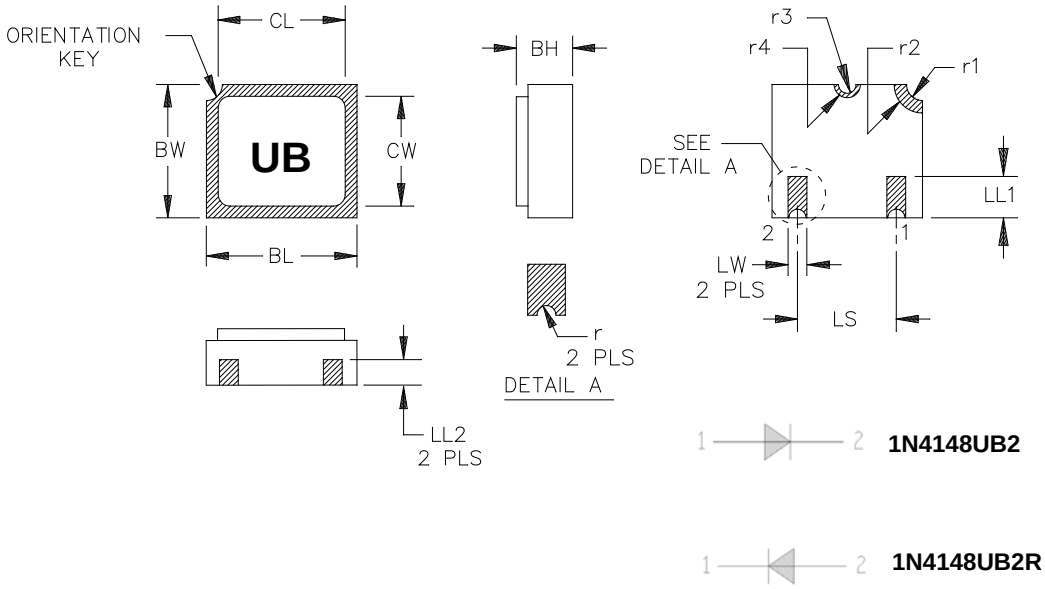
FIGURE 2. Physical dimensions (DO-213AA).



Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS_1	.035	.039	0.89	0.99
BL	.115	.128	2.92	3.25	LS_2	.071	.079	1.80	2.01
BW	.085	.108	2.16	2.74	LW	.016	.024	0.41	0.61
CL		.128		3.25	R		.008		0.20
CW		.108		2.74	r1		.012		0.31
LL1	.022	.038	0.56	0.97	r2		.022		0.56
LL2	.017	.035	0.43	0.89					

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

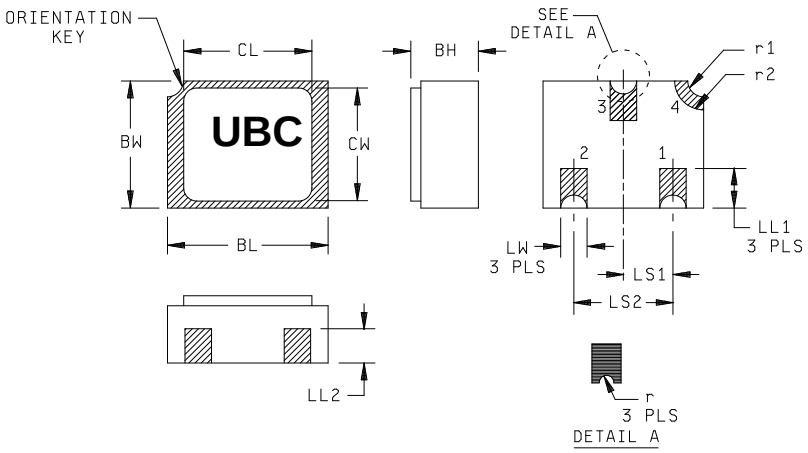
FIGURE 3. Physical dimensions, surface mount (UB versions).

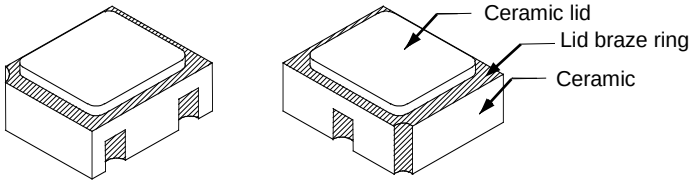


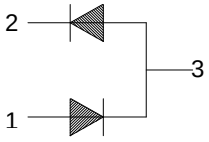
Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.046	.056	1.17	1.42	LS	.071	.079	1.80	2.01
BL	.115	.128	2.92	3.25	LW	.016	.024	0.41	0.61
BW	.085	.108	2.16	2.74	r	.008 TYP		0.20 TYP	
CL		.128		3.25	r1	.012 TYP		0.31 TYP	
CW		.108		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		0.31 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. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

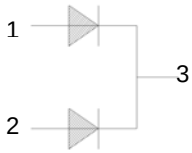
FIGURE 4. Physical dimensions, surface mount (2 pin UB versions).







1N4148UBCD



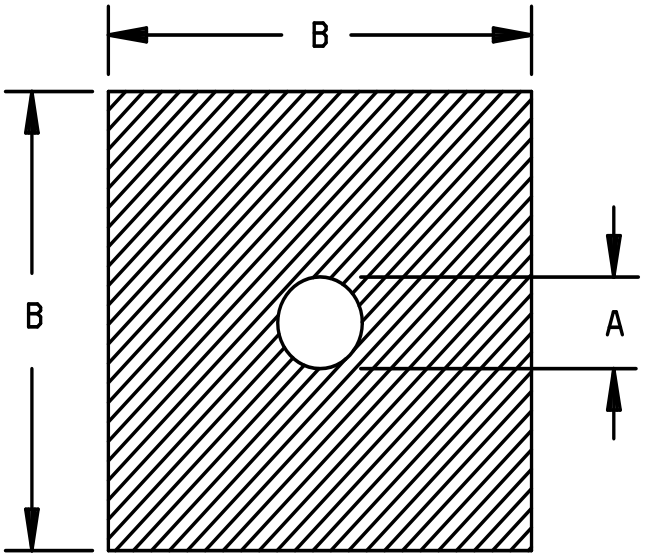
1N4148UBCCC

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BH	.046	.071	1.17	1.80
BL	.115	.128	2.92	3.25
BW	.085	.108	2.16	2.74
CL		.128		3.25
CW		.108		2.74
LL1	.022	.038	0.56	0.96
LL2	.017	.035	0.43	0.89

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
LS_1	.036	.040	0.91	1.02
LS_2	.071	.079	1.81	2.01
LW	.016	.024	0.41	0.61
r		.008		.203
r1		.012		.305
r2		.022		.559

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Hatched areas on package denote metallized areas.
3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.
4. Pin 4 is connected to lid braze ring.

FIGURE 5. Physical dimensions, surface mount (UBC version, ceramic lid).

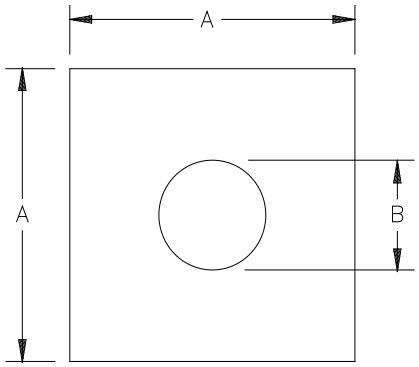


Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.0059	.0061	.150	.155
B	.0130	.0170	.330	.432

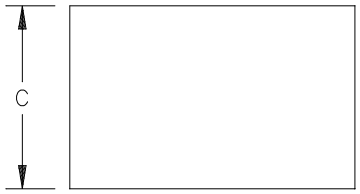
NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Element evaluation accomplished utilizing TO-5 package.
3. The physical characteristics of the die are:

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, JANHCA and JANKCA die.



BACKSIDE IS CATHODE



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.014	.018	.360	.460
B	.005	.007	.120	.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 7. 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 (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows.

SP Solder pad on UB devices.
V_{fr} Forward recovery voltage. Specified maximum forward voltage used to determine forward recovery time.

* 3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figures 1 (axial leads), 2 (DO-213AA), 3 (UB), 4 (UB2), 5 (UBC), and 6 and 7 (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. All devices (except UB version) shall be metallurgically bonded, double plug construction in accordance with the requirements of MIL-PRF-19500. All glass diodes shall be designed with sufficient thermal compensation in the axial direction to optimize tensile and compressive stresses. Dimensional analysis is required of all materials used to achieve axial thermal compensation. Dimensional tolerances and corresponding coefficient of thermal expansion (CTE) shall be documented on the DSCC Design and construction Form 36D and shall be approved by the qualifying activity to maintain qualification. Dimensional tolerances shall be sufficiently tight enough to prevent excessive stresses due to the inherent CTE mismatch. The UB devices shall be eutectically mounted and wire bonded in a ceramic package. The UR version shall be structurally identical to the axial leaded versions except for end-cap lead attachment.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. 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, and JANTXV can be abbreviated as J, JX, and JV, respectively. The part number may be reduced to J4148, JX4148, or JV4148. No color coding shall be permitted for part numbering.

3.5.1 UR devices. For 'UR' version devices only, all marking, except polarity, may be omitted from the body, but shall be retained on the initial container. Polarity marking of 'UR' devices shall consist as a minimum, a band or three contrasting dots around the periphery of the cathode. At the option of the manufacturer, UR surface mount devices may include laser marking on an end-cap, to include part number and lot date code for all levels. The prefixes JAN, JANTX, or JANTXV may be abbreviated as J, JX, or JV, respectively. (Example: The part number may be reduced to JV4148).

3.5.2 UB devices. 'UB' devices do not require polarity marking.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I. Electrical characteristics for surface mount versions are identical to the corresponding axial leaded versions unless otherwise specified.

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.

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

Screening (see table E-IV of MIL-PRF-19500)	JANTXV and JANTX level
(1) 3c	Thermal impedance (see 4.3.3)
9	Not required
10	Method 1038 of MIL-STD-750, condition A
(2) 11	I_{R1} and V_{F1}
12	See 4.3.2
(3) (4) 13	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial value or 15 nA dc, whichever is greater; $\Delta V_{F1} \leq 25$ mV dc

(1) Thermal impedance shall be performed any time after sealing provided temperature cycling is performed in accordance with MIL-PRF-19500, screen 3 prior to this thermal test.
(2) Test within 24 hours after removal from test.
(3) When thermal impedance is performed prior to screen 13, it is not required to be repeated in screen 13.
(4) PDA ≤ 5 percent.

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

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

4.3.2 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.3): Method 1038 of MIL-STD-750, condition B. V_R = rated V_{RWM}; f = 50 - 60 Hz; I_O = 200 mA dc or I_F = 200 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. t_{MD} shall be 70 μs maximum, t_H shall be 10 ms maximum. See group E, subgroup 4 of table II herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of MIL-PRF-19500, table I herein, and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and 4.4.2.1 herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2.

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

Subgroup	Method	Conditions
B2	1056	0°C to +100°C, 10 cycles.
B2	1051	-55°C to +175°C, 45 cycles, including screening.
B2	2005	I_F = 100 mA, axial tensile stress = 8 lbs, T_A = +150°C; (not applicable to UR or UB package).
B3	1027	V(pk) = rated V_{RWM}; f = 50 - 60 Hz; I_O = 200 mA dc minimum; adjust T_A or I_O to obtain a minimum T_J of +150°C. (See 4.5.3.)
B4	2101	Decap analysis; scribe and break (not applicable for UB).
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.

4.4.3.1 Group C inspection, table E-VII of MIL-PRF-19500.

Subgroup	Method	Conditions
C2	1056	0°C to +100°C, 10 cycles.
C2	1051	-55°C to +175°C, 45 cycles including screening.
C2	2036	Tension - test condition A; weight = 10 pounds, t = 15 s; lead fatigue = condition E (not applicable to 'UR' and 'UB' suffix types).
C5	4081	L = .375 inch (9.53 mm), $R_{\Theta JL}$ = 250°C/W maximum; $R_{\Theta JEC}$ = 100°C/W; $R_{\Theta JA}$ = 325°C/W; (see 4.3.3), 22 devices, c = 0.
C6	1026	1,000 hours minimum, V(pk) = rated V_{RWM}; f = 50 - 60 Hz; I_O = 200 mA dc minimum; adjust T_A or I_O to obtain a minimum T_J of +150°C. (See 4.5.3.)

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 Forward recovery voltage and time. Forward recovery shall be measured as the time interval between zero time and the point where the pulse has decreased to 110 percent of the steady-state value of V_F when I_F = 50 mA dc. The maximum rise time of the response detector shall be 1 ns.

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

4.5.3 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.

TABLE I. Group A inspection.

Inspection 1/ 2/ 3/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Thermal impedance	3101	See 4.3.3	$Z_{\Theta JX}$			°C/W
Forward voltage	4011	I_F = 10 mA dc (pulsed, see 4.5.2)	V_{F1}		0.8	V dc
Breakdown voltage	4021	I_R = 100 μA dc	V_{BR1}	100		V dc
Reverse current	4016	DC method, V_R = 20 V dc	I_{R1}		25	nA dc
Reverse current	4016	DC method, V_R = 75 V dc	I_{R2}		500	nA dc
Forward voltage 1N914 1N4148-1, 1N4531	4011	 I_F = 50 mA dc (pulsed, see 4.5.2) I_F = 100 mA dc (pulsed, see 4.5.2)	V_{F2}		 1.2 1.2	 V dc V dc
Subgroup 3						
High temperature operation:		T_A = +150°C				
Reverse current	4016	DC method, V_R = 20 V dc	I_{R3}		35	μA dc
Reverse current	4016	DC method, V_R = 75 V dc	I_{R4}		75	μA dc
Forward voltage	4011	I_F = 10 mA dc (pulsed, see 4.5.2)	V_{F3}		0.8	V dc
Low temperature operation:		T_A = -55°C				
Forward voltage 1N914 1N4148-1, 1N4531	4011	 I_F = 50 mA dc (pulsed, see 4.5.2) I_F = 100 mA dc (pulsed, see 4.5.2)	V_{F4}		 1.3 1.3	 V dc V dc
Subgroup 4						
Capacitance	4001	V_R = 0 V dc, f = 1 MHz, V_{sig} = 50 mV_{p-p} maximum	C_1		4.0	pF
Capacitance	4001	V_R = 1.5 V dc, f = 1 MHz, V_{sig} = 50 mV_{p-p} maximum	C_2		2.8	pF

See footnotes at end of table.

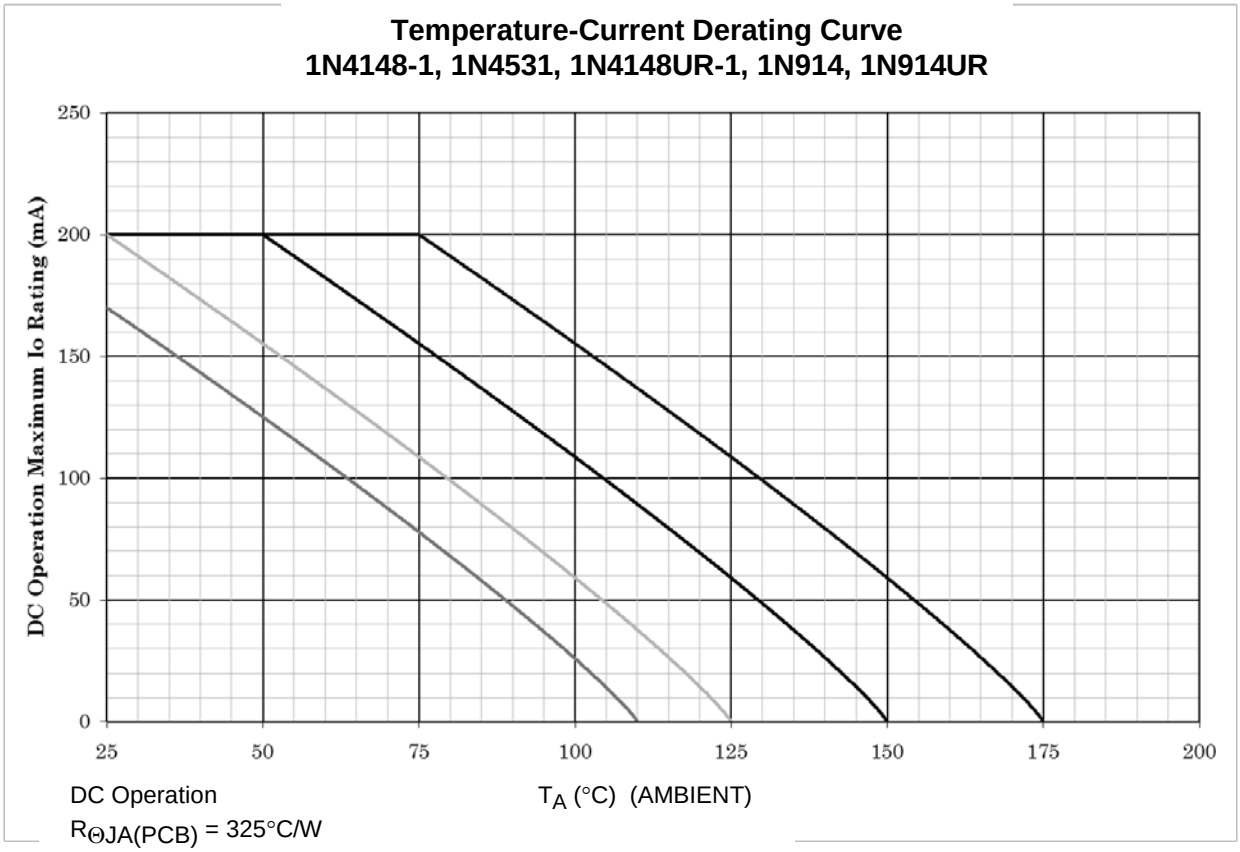
TABLE I. Group A inspection - Continued.

Inspection 1/ 2/ 3/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - Continued						
Reverse recovery time	4031	Condition A, C ≥ 1 nF, $I_F = I_R$ = 10 mA dc, R_L = 100Ω ±5 percent, $I_{R(REC)}$ = 1.0 mA dc, R ≥ 1,000 Ω	t_{rr}		5	ns
Scope display evaluation	4023	Method 4023 of MIL-STD-750, figures 4023-3, 4023-7, 4023 -9,4023 -10 only				
Subgroup 5						
Not applicable						
Subgroup 6						
Surge current	4066	Condition A (sine wave), $I_{F(surge)}$ = 2 A(pk), I_O = 0, V_{RM} = 0, 10 surges, 8.3 ms width each, one surge per minute, T_A = +25°C or Condition B (square wave), $I_{F(surge)}$ = 4 A (pk), 10 surges, 1μs width each, duty factor = 0.0055 percent, T_A = 25°C				
Electrical measurements		See table I, subgroup 2				
Subgroup 7						
Forward recovery voltage and time	4026	I_F = 50 mA dc (see 4.5.1)	V_{peak} t_{fr}		5.0 20	V (pk) ns

1/ For sampling plan, see MIL-PRF-19500.
2/ UB-suffix devices are to have each diode tested individually.
3/ 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.

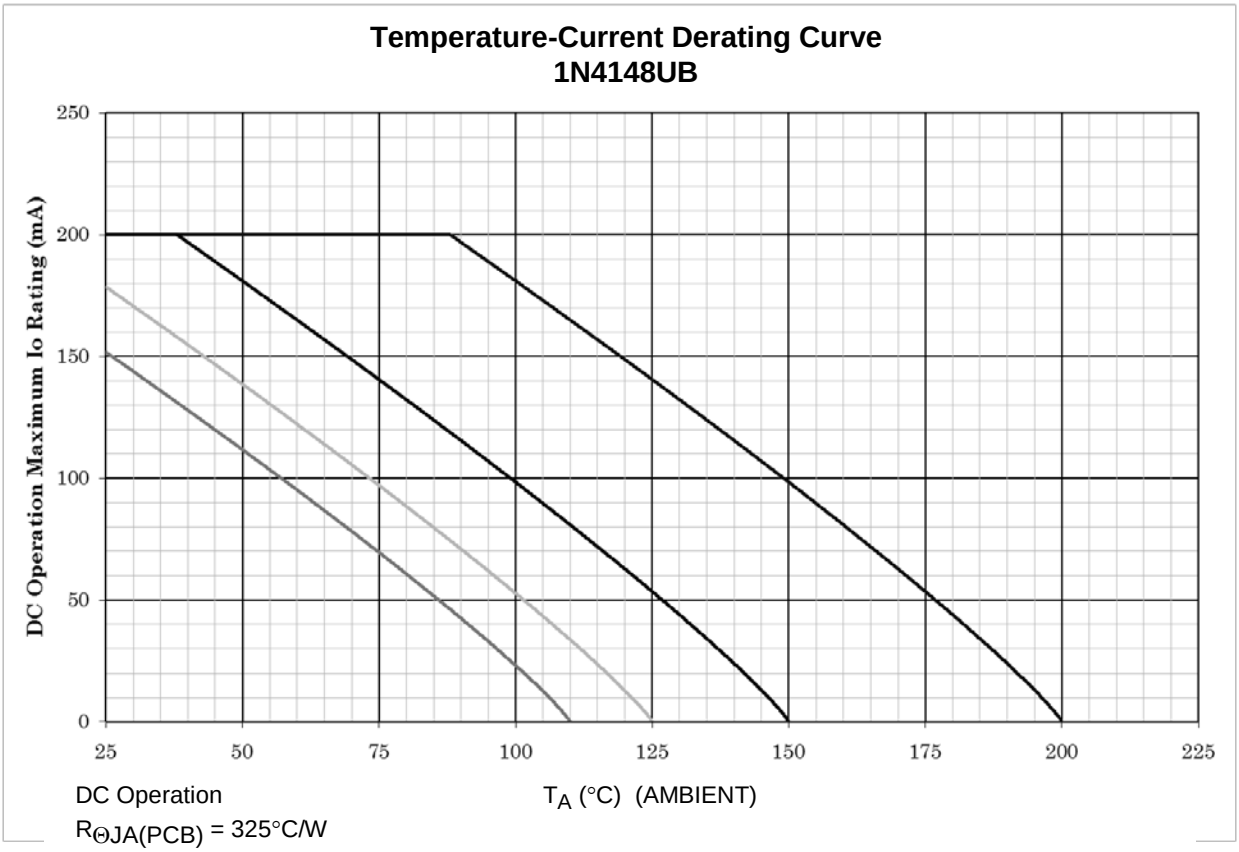
Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
Subgroup 1			n = 45, c = 0
Thermal shock (glass strain)	1056	100 cycles 0°C to +100°C	
Temperature cycling	1051	500 cycles, -65°C to +175°C	
Hermetic seal	1071	Fine and gross leak required for UB suffix devices. Gross leak only for non-UB parts.	
Electrical measurement		See table I, subgroup 2	
Subgroup 2			n = 45, c = 0
Intermittent operating life	1037	10,000 cycles; I_f = 300 mA dc, T_{on} = T_{off} = 1 minute.	
Electrical measurements		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			11 devices
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 suffix devices	
Subgroup 9			
Monitored mission temperature cycling	1055	Not required for UB suffix devices	n = 22, c = 0
Electrical measurements		See table I, subgroup 2	



NOTES:

1. This is the true inverse of the worst case thermal resistance value. 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 temperature (T_J ≤ +175°C) 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 8. Temperature-current derating graph.

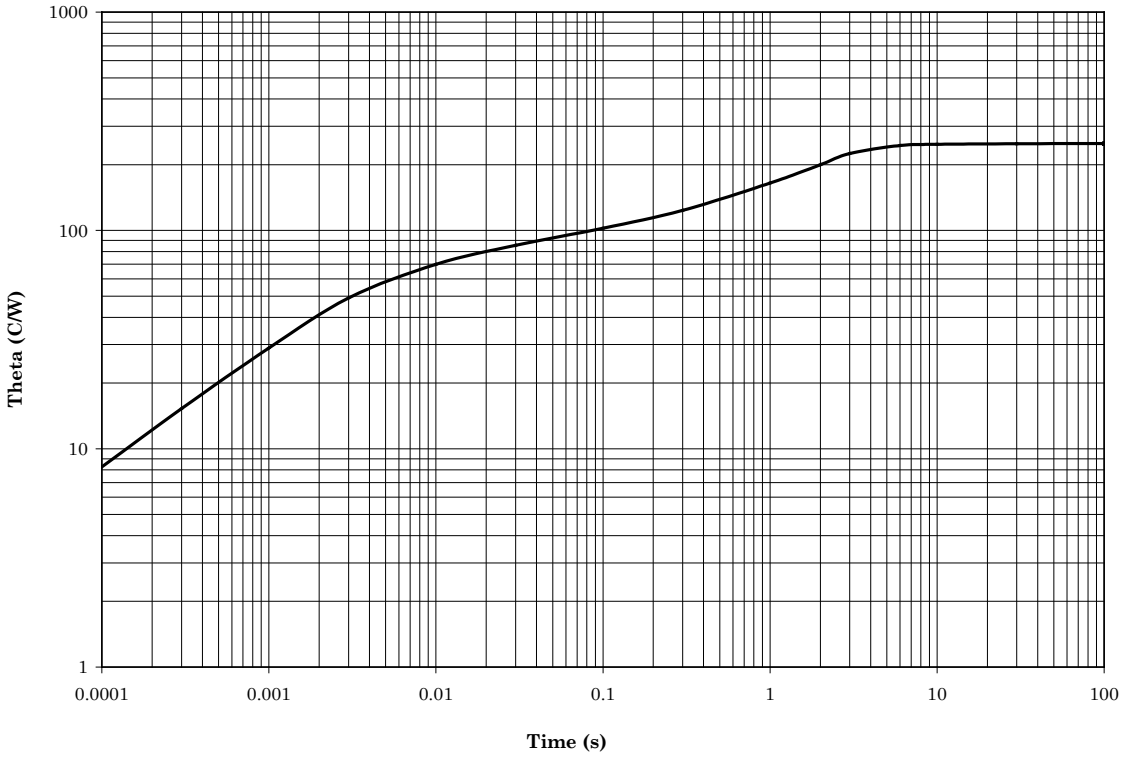


NOTES:

1. This is the true inverse of the worst case thermal resistance value. 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 temperature (T_J ≤ +200°C) 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 graph.

Maximum Thermal Impedance Plots
1N4148-1, 1N4531, 1N914 DO-35 Axial T_L = 25°C

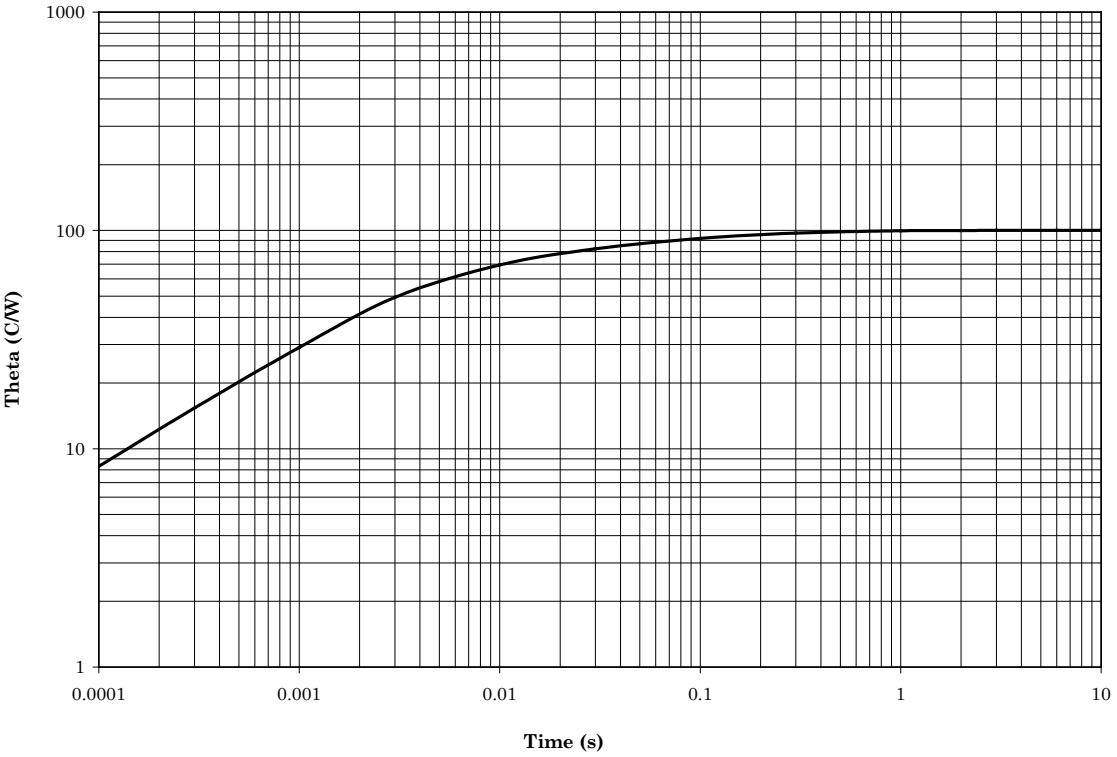


$R_{\Theta JL}$ = 250°C/W

NOTE: $Z_{\Theta JX}$ = 70°C/W maximum at t_H = 10 ms.

* FIGURE 10. Thermal impedance (axial leads).

Maximum Thermal Impedance Plots
1N4148UR-1, 1N4531UR, 1N914UR DO-213AA T_{EC} = 25°C

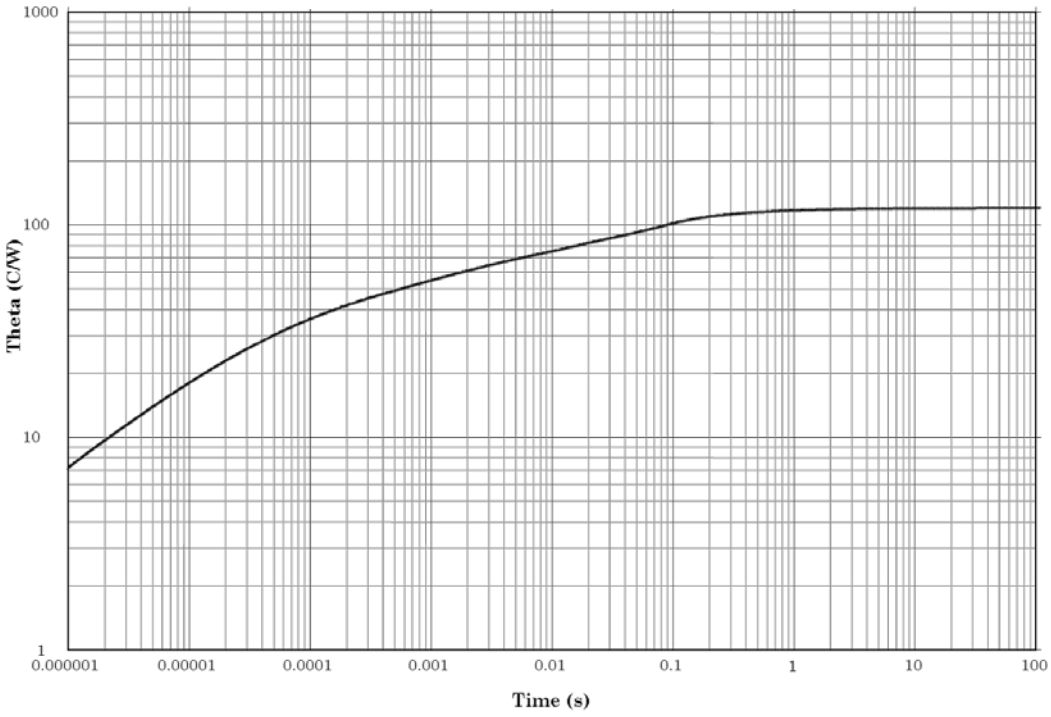


$R_{\Theta JEC}$ = 100°C/W

NOTE: $Z_{\Theta JX}$ = 70°C/W maximum at t_H = 10 ms.

* FIGURE 11. Thermal impedance (MELF surface mount).

Maximum Thermal Impedance Plots
1N4148UB Versions, T_{SP} = 25°C



$R_{\Theta JSP}$ = 120°C/W

* NOTE: $Z_{\Theta JX}$ = 75°C/W maximum at t_H = 10ms.

* FIGURE 12. 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. Lead finish (see 3.4.1).

c. Packaging requirements (see 5.1).

d. Product assurance level and type designator.

e. Destructive physical analysis when requested.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. 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. JANS1N4148-1 is prohibited and will no longer be built nor qualified. Devices in stock are acceptable provided the date code does not exceed 9208. A PIN for PIN replacement table follows, and these devices are directly interchangeable. The 1N4148 design is unsuitable for space flight applications. The JANS1N6642 will be used in place of the JANS1N4148-1. The 1N6638US, 1N6642US, and 1N6643US are directly substitutable for the 1N6638U, 1N6642U, and 1N6643U.

Non-preferred PIN	Preferred PIN
JANS1N4148-1	JANS1N6642
JANS1N4148UR-1	JANS1N6642US
JANS1N6638U	JANS1N6638US
JANS1N6642U	JANS1N6642US
JANS1N6643U	JANS1N6643US

* 6.5 Suppliers of die. The qualified die suppliers with the applicable letter version (e.g., JANHCA1N4148) will be identified on the QML.

JANC ordering information		
PIN	Manufacturer	
	43611	52GC4
1N4148	JANHCA1N4148, JANKCA1N4148	JANHCB1N4148, JANKCB1N4148

6.6 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.

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

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

Preparing activity:
DLA - CC

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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 .