INCH-POUND

MIL-PRF-19500/437H
25 March 2008
SUPERSEDING
MIL-PRF-19500/437G
12 July 2006

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, LOW-NOISE VOLTAGE REGULATOR, TYPES 1N5518B-1, 1N5518C-1, 1N5518D-1 THROUGH 1N5546B-1, 1N5546C-1, 1N5546D-1, 1N5518BUR-1, 1N5518CUR-1, 1N5518DUR-1 THROUGH 1N5546BUR-1, 1N5546CUR-1, 1N5546DUR-1, JAN, JANTX, JANTXV, 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 500 milliwatt, silicon, low-noise, voltage regulator diodes with voltage tolerances of 5 percent, 2 percent, and 1 percent. Three levels of product assurance are provided for each encapsulated device type as specified in MIL-PRF-19500, and two levels of product assurance for each unencapsulated device type die. For JANHC and JANKC quality levels (see 6.5).

1.2 Physical dimensions. See figures 1 (DO-35), 2 (DO-213AA), and 3 (JANHC and JANKC).

1.3 Maximum ratings. Maximum ratings are shown in 3.8 herein and as follows:

a. P_{TL} = 500 mW (DO-35) at T_L = +50°C, L = .375 inch (9.53 mm); both ends of case or diode body to heat sink at L = .375 inch (9.53 mm). (Derate I_Z to 0.0 mA dc at +175°C).

b. P_{TEC} = 500 mW (DO-213AA) at T_{EC} = +125°C. (Derate to 0 at +175°C).

c. P_{TPCB} = 400 mW, T_A = +55°C. (Derate to 0 at +175°C).

d. -65°C ≤ TJ ≤ +175°C; -65°C ≤ TSTG ≤ +175°C.

1.4 Primary electrical characteristics. Primary electrical characteristics are shown in 3.8 herein and as follows:

a. 3.3 V dc ≤ V_Z ≤ 33 V dc.

b. $R_{\Theta JL}$ = 250°C/W (see note 1) (maximum) at L = .375 inch (9.53 mm) (DO-35).

c. $R_{\Theta JEC}$ = 100°C/W (see note 1) (maximum) junction to end-caps (DO-213AA).

d. $R_{\Theta JA}$ = 300°C/W (see note 1). Junction to ambient including PCB (see note 2).

e. For derating, see figures 4, 5, and 6.

See notes on next page

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dscc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil .

1.4 Primary electrical characteristics - Continued.

(1) For thermal impedance curves, see figures 7, 8, and 9.
(2) T_A = +75°C for both axial and MELF (US) on printed circuit board (PCB), PCB = FR4 .0625 inch (1.59 mm) 1-layer 1-oz Cu, horizontal, still air, pads (US) = .05 inch (1.27 mm) x .087 inch (2.21 mm); pads (axial) = .092 inch (2.34 mm) diameter, strip = .030 inch (0.762 mm) x 1 inch (25.4 mm) long, axial lead length L ≤ .125 inch (≤ 3.18 mm); $R_{\Theta JA}$ with a defined thermal resistance condition included is measured at I_Z = as defined in test ratings herein.

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 http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil. or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. 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.

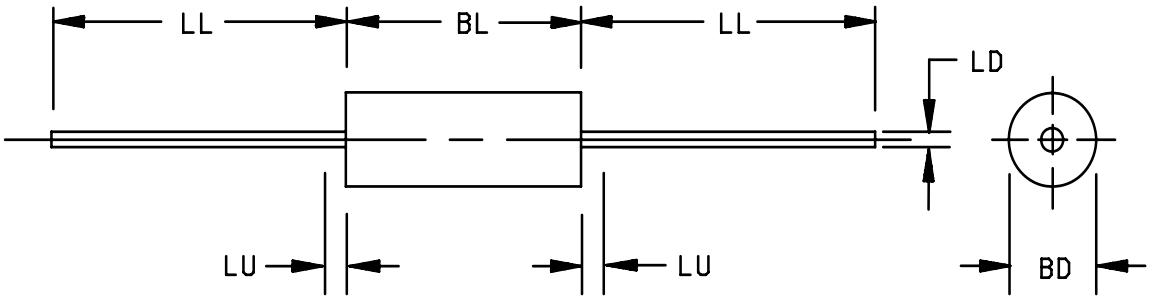
3. REQUIREMENTS

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 manufacturer's list (QML) before contract award (see 4.2 and 6.3).

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

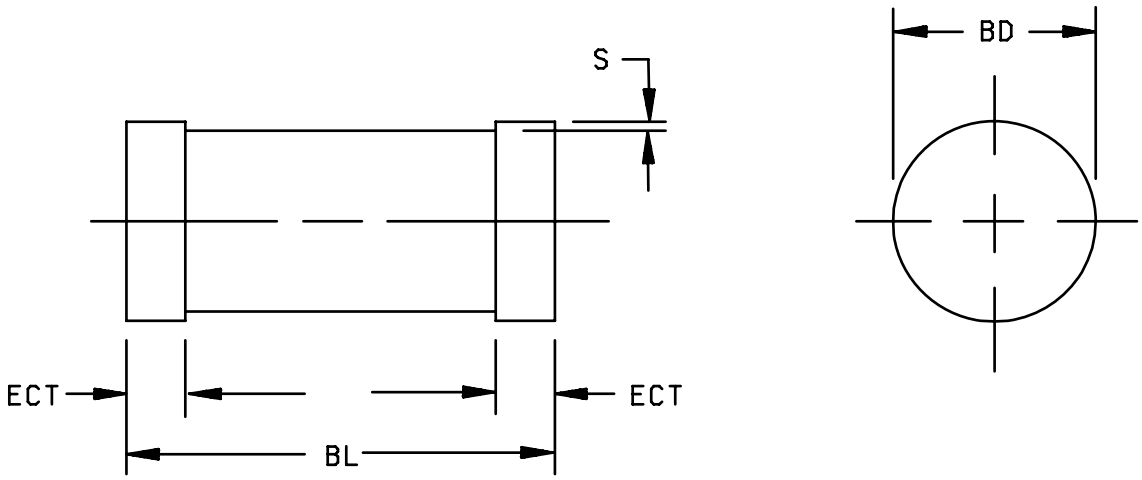
C	2 percent voltage tolerance devices.
D	1 percent voltage tolerance devices.
JANH	High reliability product assurance level for unencapsulated devices.
JANK	Space reliability product assurance level for unencapsulated devices.
PCB	Printed circuit board.
UR	Unleaded or surface mounted diodes with round end-caps.



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.055	.090	1.40	2.29	3
BL	.120	.200	3.05	5.08	3
LD	.018	.022	0.46	0.56	
LL	1.000	1.500	25.40	38.10	
LU		.050		1.27	4

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Package contour optional within BD and length BL. Heat slugs, if any, shall be included within this cylinder but shall not be subject to minimum limit of BD. The BL dimension shall include the entire body including slugs.
4. Within this zone lead, diameter may vary to allow for lead finishes and irregularities other than heat slugs.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

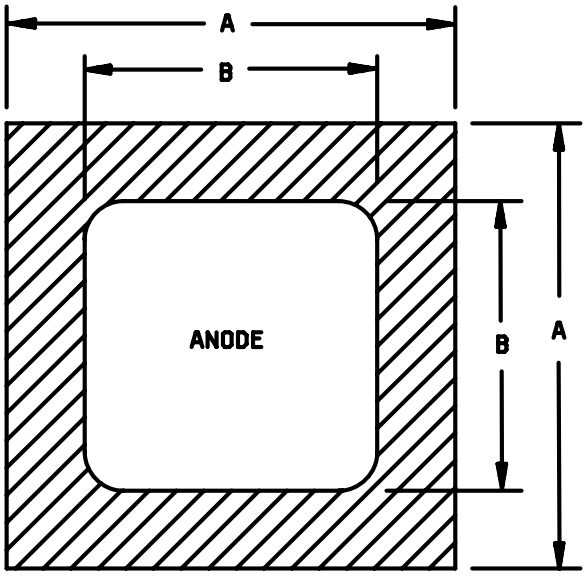
FIGURE 1. Physical dimensions types 1N5518B-1, C-1, and D-1 through 1N5546B-1, C-1, D-1 (DO-35).



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

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

FIGURE 2. Physical dimensions 1N5518BUR-1, CUR-1, and DUR-1 through 1N5546BUR-1, CUR-1, DUR-1 (DO-213AA).



BACKSIDE IS CATHODE

Ltr	JANHCA and JANKCA die dimensions				Ltr	JANHCB and JANKCB die dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	.021	.025	0.53	0.64	A	.024	.028	0.61	0.71
B	.013	.017	0.33	0.43	B	.017	.021	0.43	0.53

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. The JANHCA and JANKCA die thickness is .010 inch (0.25 mm) ±.002 inch (±0.05 mm). Anode metallization: Al, thickness = 25,000 Å minimum; cathode metallization: Thickness = 4,000 Å minimum.
4. The JANHCB and JANKCB die thickness is .010 inch (0.25 mm) ±.002 inch (±0.05 mm). Anode metallization: Al, thickness = 40,000 Å minimum; cathode metallization: Au, thickness = 5,000 Å minimum.
5. Circuit layout data: For zener operation, cathode must be operated positive with respect to anode.
6. Requirements in accordance with appendix G, MIL-PRF-19500, are performed in a TO-5 package (see 6.5).
7. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 3. Physical dimensions JANHC and JANKC die.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and figures 1 (DO-35), 2 (DO-213AA), and 3 (JANHC and JANKC) 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. All devices shall be in accordance with the requirements of MIL-PRF-19500.

3.4.2.1 Dash one construction. Dash one (-1) diodes shall be of metallurgically bonded double plug construction or straight through construction in accordance with the requirements of category I, II, or III (see MIL-PRF-19500).

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.5.1 Polarity. The polarity shall be indicated with a contrasting color band to denote the cathode end. Alternately, for surface mount (UR) devices, a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used. No color coding will be permitted.

3.5.2 Marking of UR suffix version devices. For UR suffix (surface mount) devices only, all marking (except polarity) may be omitted from the body of the device, but shall be retained on the initial container.

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

3.6.1 Selection of tight tolerance devices. The C and D suffix devices shall be selected from JAN, JANTX, or JANTXV devices which have successfully completed all applicable screening, table I, and groups B and C testing as 5 percent tolerance devices. All sublots of C and D suffix devices shall pass table I, subgroup 2 at the tightened tolerances. The T_L or T_{EC} for C and D suffix devices shall be maintained at 30°C ±2°C for V_Z correlation on tight tolerances.

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in 4.4.1, 4.4.2, and tables II and III.

3.8 Maximum and primary test ratings. Maximum test ratings for voltage regulator diodes are specified in table IV, columns 3, 4, and 10 herein. Primary electrical characteristics are in columns 1, 6, 8, and 9.

3.9 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 request 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.

4.2.1.1 JANHC and JANKC devices. JANHC and JANKC devices shall be qualified in accordance with appendix G, of MIL-PRF-19500 .

4.2.1.2 Sampling and inspection. Lot accumulation is 6 months in lieu of 6 weeks.

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

Screening table E-IV of MIL-PRF-19500	Measurement
	JANTX and JANTXV levels
3a	Temperature cycling
(1) 3c	Thermal impedance (see 4.3.2)
7a 7b	Not applicable Optional
9	Not applicable
11	I_{R1} and V_Z
12	See 4.3.3
(2) 13	$\Delta I_{R1} \leq$ 100 percent of initial reading or 10 nA dc, whichever is greater; $\Delta V_Z \leq \pm 2$ percent of initial reading subgroup 2 of table I herein.
14a (3) 14b	Not applicable Required
15	Not required
16	Not required

(1) Thermal impedance may 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) PDA = 5 percent for screen 13, applies to ΔI_{R1} and ΔV_Z. Thermal impedance ($Z_{\Theta JX}$) is not required in screen 13.
(3) For clear glass diodes, the hermetic seal (gross leak) may be performed at anytime after temperature cycling.

4.3.1 Screening (JANHC and JANKC). Screening of JANHC and JANKC die shall be in accordance with appendix G of MIL-PRF-19500 .

4.3.1.1 JAN testing. JAN level product will have temperature cycling and thermal impedance performed in accordance with MIL-PRF-19500, JANTX screening level requirements.

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 as applicable in MIL-STD-750 using the guidelines in that method for determining I_M, I_H, t_H, t_{MD} (and V_C where appropriate). Measurement delay time (t_{MD}) = 70 μs max.

4.3.3 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.4): T_A = 55°C maximum. Test conditions in accordance with method 1038 of MIL-STD-750, condition B. Adjust I_Z or T_A to achieve the required T_J. T_J = 125°C minimum. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, T_J, 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 shall be essential criteria for burn-in modification approval. Mounting condition see figure 10 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 appendix E, table E-V of MIL-PRF-19500 , and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VIb (JANTXV and JANTX) of MIL-PRF-19500 , and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with table III herein.

4.4.2.1 Group B inspection, appendix E, table E-VIb of MIL-PRF-19500.

Subgroup	Method	Conditions
B2	1056	0°C to +100°C, 10 cycles.
B2	1051	-55°C to +175°C, 25 cycles.
B3	1027	I_{ZM} = 50 percent of column 10 of table IV (minimum). Adjust I_Z or T_A to ensure a T_J= +150ºC (min).
B4	2101	Decap analysis scribe and break only.
B5		Not applicable
B6	1032	T_A = +175ºC.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VII of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with table III herein.

4.4.3.1 Group C inspection, appendix E, 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, 20 cycles.
C2	2036	Test condition A; 4 pounds; t = 15 seconds.
	2036	Test condition E.
C2	1071	Test condition E.
C3		Not applicable.
C5	4081	See 4.3.2.
C6	1026	I_{ZM} = 50 percent of column 10 of table IV (minimum). Adjust I_Z or T_A to ensure a T_J = +150ºC (min).
C8	4071	I_Z = column 11 of table IV, T_1 = +25°C ±5°C, T_2 = +125°C ±5°C, $\propto V_Z$ = column 8 of table IV, sampling plan = 22 devices, c = 0.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-IX of MIL-PRF-19500 and table II herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Surge current (I_{ZSM}). The peak currents shown in column 4 of table IV shall be applied in the reverse direction and these shall be superimposed on the current (I_Z = column 11 of table IV) a total of five surges at 1 minute intervals. Each individual surge shall be one-half square-wave-pulse of 8.3 ms duration or an equivalent one-half sinewave with the same effective rms current.

4.5.2 Regulator voltage measurements. The test current shall be applied until thermal equilibrium is attained (20 ±2 seconds) prior to reading the breakdown voltage. For this test, the diode shall be suspended by its leads with mounting clips whose inside edge is located at .375 inch (9.53 mm) from the body and the mounting clips shall be maintained at a temperature of +25°C +8°C, -2°C. This measurement may be performed after a shorter time following application of the test current than that which provides thermal equilibrium if correlation to stabilized readings can be established to the satisfaction of the Government.

4.5.3 Temperature coefficient of regulator voltage ($\propto V_Z$). The device shall be temperature stabilized with current applied prior to reading regulator voltage at the specified ambient temperature as specified in 4.4.3.1, subgroup C8.

4.5.4 Free air burn-in and life tests. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the $I_{Z(min)}$ described in 4.3.3 and that the minimum applied voltage, where applicable, is maintained through-out the burn-in period. Use method 3100 of MIL-STD-750 to measure T_J.

4.5.5 Noise density. Noise density shall be measured using a noise density test circuit as shown on figure 11. Place a low noise resistor, equivalent in value to the dynamic impedance of the diode under test, in the test clips and adjust test current (I_{ZT}) and measure output noise voltage. Remove resistor, insert diode under test in test clips, readjust test current to 250 μA dc and measure output noise voltage again. To obtain noise density (N_D), subtract rms resistor output noise voltage from rms diode output noise voltage and divide by product of overall system gain and square root of bandwidth. All measurements shall be made at +25°C.

4.5.6 Regulation factor. Breakdown voltage shall be measured at a low current, I_{ZL} as shown in column 13 of table IV. This voltage shall be subtracted from the breakdown voltage measured at I_Z in column 11 of table IV. The difference is the regulation factor (ΔV_Z) and shall be less than the maximum value shown in column 12 of table IV.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits 2/		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Forward voltage	4011	I_F = 200 mA dc	V_F		1.1	V dc
Reverse current	4016	DC method, V_R = column 5 of table IV	I_{R1}		Column 6	μA dc
Regulator voltage	4022	I_Z = column 11 of table IV (see 4.5.2)	V_Z	Column 1 -V_Z tol	Column 1 +V_Z tol	V dc
Regulation factor		I_Z = column 11, and I_{ZL} = column 13 of table IV (see 4.5.6)	ΔV_Z		Column 12	V dc
Thermal impedance	3101	(see 4.3.2)	$Z_{\Theta JX}$			°C/W
Subgroup 3						
High temperature operation:		T_A = +150°C				
Reverse current	4016	DC method; V_R = column 5 of table IV	I_{R2}		Column 2	μA dc
Subgroup 4						
Small-signal reverse breakdown impedance	4051	I_Z = column 11 I_{SIG} = 10 percent of I_Z	Z_{ZT}		Column 3	ohms
Noise density		I_Z = 250 μA dc (see 4.5.5)	N_D		Column 9	$\mu V/\sqrt{Hz}$
Subgroup 5						
Not applicable						
Subgroup 6						
Surge current	4066	See 4.5.1				
Electrical measurements		Table I, subgroup 2				

1/ For sampling plan, see MIL-PRF-19500.
2/ Column references are to table IV herein.

TABLE II. Group E inspection qualification and requalification (all product assurance levels).

Inspection 1/	MIL-STD-750		Qualification conformance inspection (sampling plan)
	Method	Conditions	
Subgroup 1			45 devices, c = 0
Temperature cycling	1051	500 cycles.	
Electrical measurements		See table III, steps 1, 3, 4, and 5.	
Subgroup 2			45 devices, c = 0
Steady-state dc intermittent life	1037	6,000 cycles. I_Z = column 10 (min) of table IV.	
Electrical measurements		See table III, steps 2, 3, 4, and 5. Provide read and record $\Delta Z_{\Theta JX}$ data to the qualifying activity.	
Subgroup 4			
Thermal impedance curves		See MIL-PRF-19500.	Sample size N/A
Subgroups 5 and 6			
Not applicable			
Subgroup 7			n = 45
Resistance to glass cracking	1057	Condition B. Cool down after solder immersion is permitted. Test until failure occurs on all devices or to a maximum of 25 cycles, whichever comes first.	

1/ A separate sample may be pulled for each test.

* TABLE III. Group A, B, C and E electrical and delta measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Reverse current	4016	DC method; V_R = column 5 of of table IV	I_{R1}		Column 6 of table IV	μA dc
2.	Reverse current	4016	DC method, V_R = column 5 of of table IV	I_{R3}		Column 7 of table IV	μA dc
3.	Regulator voltage	4022	IZ = column 11 of table IV (see 4.5.2)	V_Z	Column 1 of table IV $-V_Z$ tol	Column 1 of table IV $+ V_Z$ tol	V dc
4.	Small-signal breakdown impedance	4051	IZ = column 11 of table IV I_{sig} = 10 percent of I_Z (AC)	Z_{ZT}		Column 3 of table IV	ohms
5.	Thermal impedance	3101	See 4.3.2	$\Delta Z_{\Theta JX}$		10 percent of initial reading max.	°C/W

1/ The electrical measurements for appendix E, table E-VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows:
- a. Subgroup 2, see table III herein, steps 1, 3, 4, and 5.
- b. Subgroup 3, see table III herein, steps 2, 3, 4, and 5.
- c. Subgroup 6, see table III herein, steps 2, 3, and 4.

2/ The electrical measurements for appendix E, table E-VII of MIL-PRF-19500 are as follows:
- a. Subgroup 2 and 3, see table III herein, steps 1, 3, 4, and 5.
- b. Subgroup 6, see table III herein, steps 2, 3, 4, and 5.

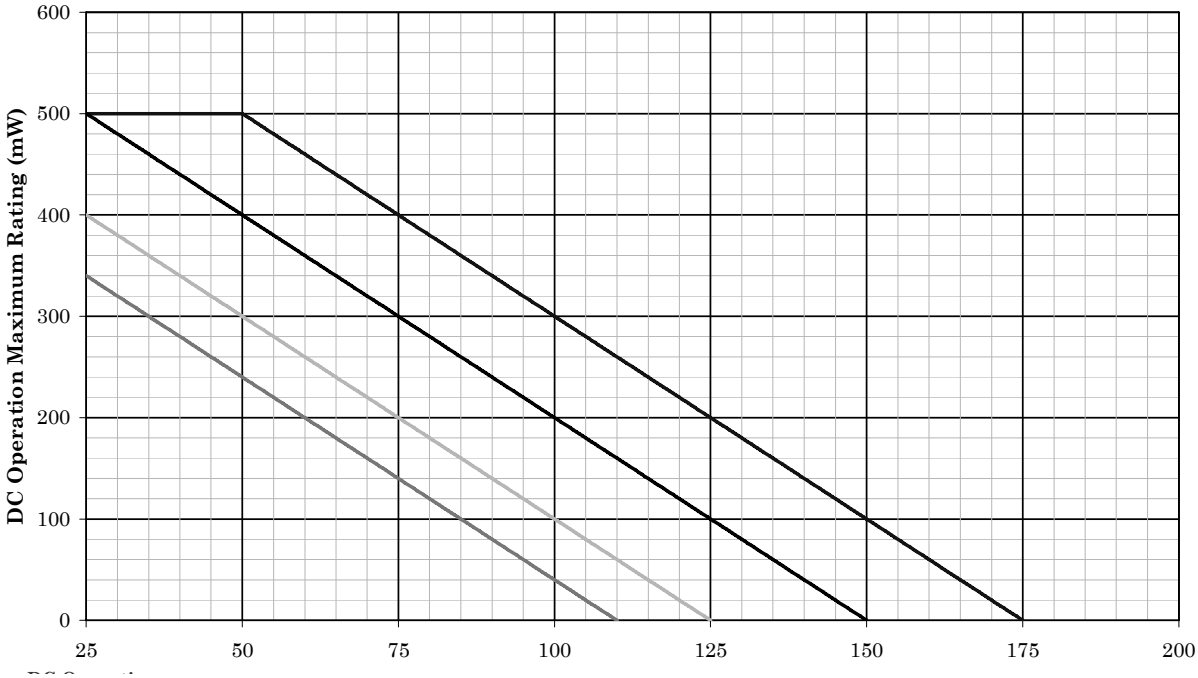
3/ The electrical measurements for appendix E, table E-IX of MIL-PRF-19500 are as follows:
- a. Subgroup 1 see table III herein, steps 1, 3, 4, and 5.
- b. Subgroup 2, see table III herein, steps 2, 3, 4, and 5.

TABLE IV. Test ratings.

Type	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13
	V_Z Nom 1/	I_{R2} T_A = 150°C	Z_{ZT}	I_{ZSM}	V_R	I_{R1}	I_{R3} (life test end points)	$\propto_{VZ}$ T_1 = +25°C T_2 = +125°C	N_D	I_{ZM}	I_Z test current	ΔV_Z	I_{ZL}
	V dc	µA dc	ohms	mA	V dc	µA dc	µA dc	%/°C	µV/√Hz	mA	mA	V dc	mA
1N5518B-1	3.3	10.0	26	1,600	1.0	5.0	10.0	-.07	0.5	115	20	0.90	2.0
1N5519B-1	3.6	6.0	24	1,500	1.0	3.0	6.0	-.065	0.5	105	20	0.90	2.0
1N5520B-1	3.9	4.0	22	1.250	1.0	1.0	2.0	-.060	0.5	98	20	0.85	2.0
1N5521B-1	4.3	6.0	18	1,100	1.5	3.0	6.0	-.055+.02	0.5	88	20	0.75	2.0
1N5522B-1	4.7	6.0	22	950	2.0	2.0	6.0	-.043+.025	0.5	81	10	0.60	1.0
1N5523B-1	5.1	6.0	26	750	2.5	2.0	6.0	-.03+.03	0.5	75	5.0	0.65	0.25
1N5524B-1	5.6	4.0	30	700	3.5	2.0	4.0	-.03+.045	1.0	68	3.0	0.30	0.25
1N5525B-1	6.2	4.0	30	650	5.0	1.0	4.0	+.05	1.0	61	1.0	0.20	0.01
1N5526B-1	6.8	5.0	30	650	6.2	1.0	5.0	+.052	1.0	56	1.0	0.10	0.01
1N5527B-1	7.5	5.0	35	650	6.8	0.5	1.0	+.058	2.0	51	1.0	0.05	0.01
1N5528B-1	8.2	5.0	40	650	7.5	0.5	1.0	+.062	4.0	46	1.0	0.05	0.01
1N5529B-1	9.1	5.0	45	650	8.2	1.0	1.0	+.068	4.0	42	1.0	0.05	0.01
1N5530B-1	10.0	5.0	60	650	9.1	0.05	0.5	+.075	4.0	38	1.0	0.10	0.01
1N5531B-1	11.0	5.0	80	590	9.9	0.05	0.5	+.075	5.0	35	1.0	0.20	0.01
1N5532B-1	12.0	5.0	90	540	10.8	0.05	0.1	+.08	10	32	1.0	0.20	0.01
1N5533B-1	13.0	5.0	90	500	11.7	0.01	0.05	+.08	15	29	1.0	0.20	0.01
1N5534B-1	14.0	5.0	100	464	12.6	0.01	0.05	+.082	20	27	1.0	0.20	0.01
1N5535B-1	15.0	5.0	100	433	13.5	0.01	0.05	+.082	20	25	1.0	0.20	0.01
1N5536B-1	16.0	5.0	100	406	14.4	0.01	0.05	+.083	20	24	1.0	0.20	0.01
1N5537B-1	17.0	5.0	100	382	15.3	0.01	0.05	+.085	20	22	1.0	0.20	0.01
1N5538B-1	18.0	5.0	100	361	16.2	0.01	0.05	+.085	20	21	1.0	0.20	0.01
1N5539B-1	19.0	5.0	100	342	17.1	0.01	0.05	+.086	20	20	1.0	0.20	0.01
1N5540B-1	20.0	5.0	100	325	18.0	0.01	0.05	+.086	20	19	1.0	0.20	0.01
1N5541B-1	22.0	5.0	100	295	19.8	0.01	0.05	+.087	25	17	1.0	0.25	0.01
1N5542B-1	24.0	5.0	100	271	21.6	0.01	0.05	+.088	30	16	1.0	0.30	0.01
1N5543B-1	25.0	5.0	100	260	22.4	0.01	0.05	+.09	35	15	1.0	0.35	0.01
1N5544B-1	28.0	5.0	100	240	25.2	0.01	0.05	+.091	40	14	1.0	0.40	0.01
1N5545B-1	30.0	5.0	100	216	27.0	0.01	0.05	+.091	45	13	1.0	0.45	0.01
1N5546B-1	33.0	5.0	100	197	29.7	0.01	0.05	+.092	50	12	1.0	0.50	0.01

1/ Voltage tolerance devices (examples: 1N5518B-1 are ±5 percent, 1N5518C-1 are ±2 percent, and 1N5518D-1 are ±1 percent tolerance).

TEMPERATURE-POWER DERATING CURVE
DO-35

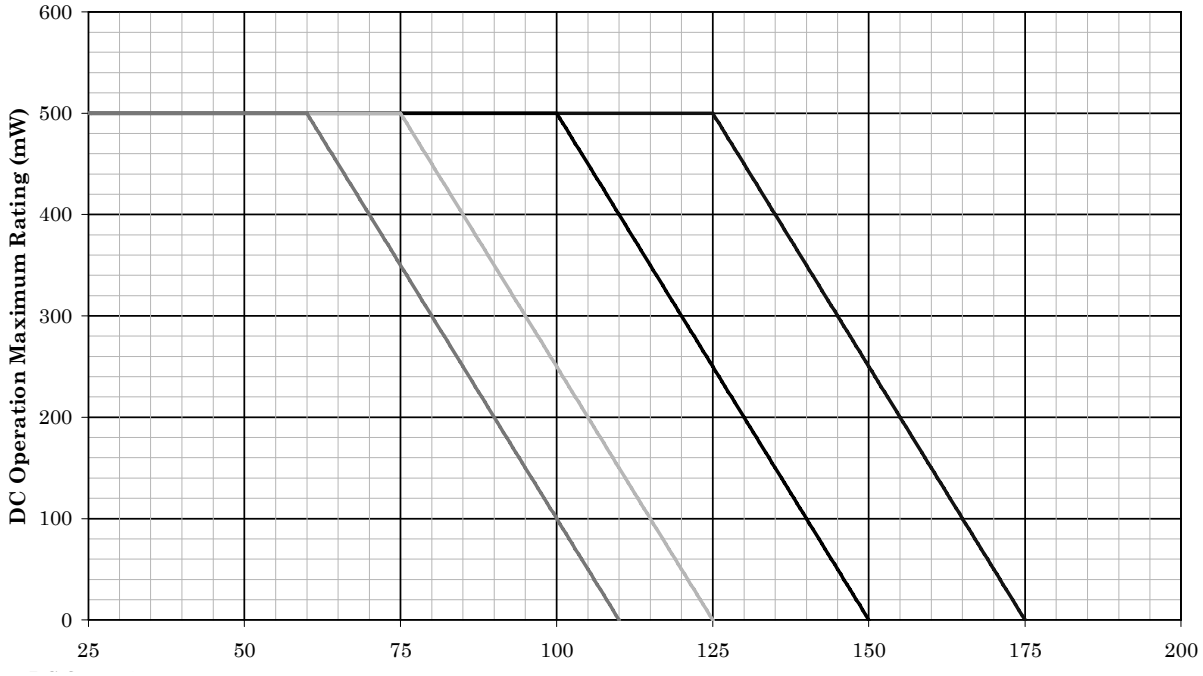


NOTES:

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

FIGURE 4. Temperature-power derating curve (DO-35).

TEMPERATURE-POWER DERATING CURVE
DO-213AA

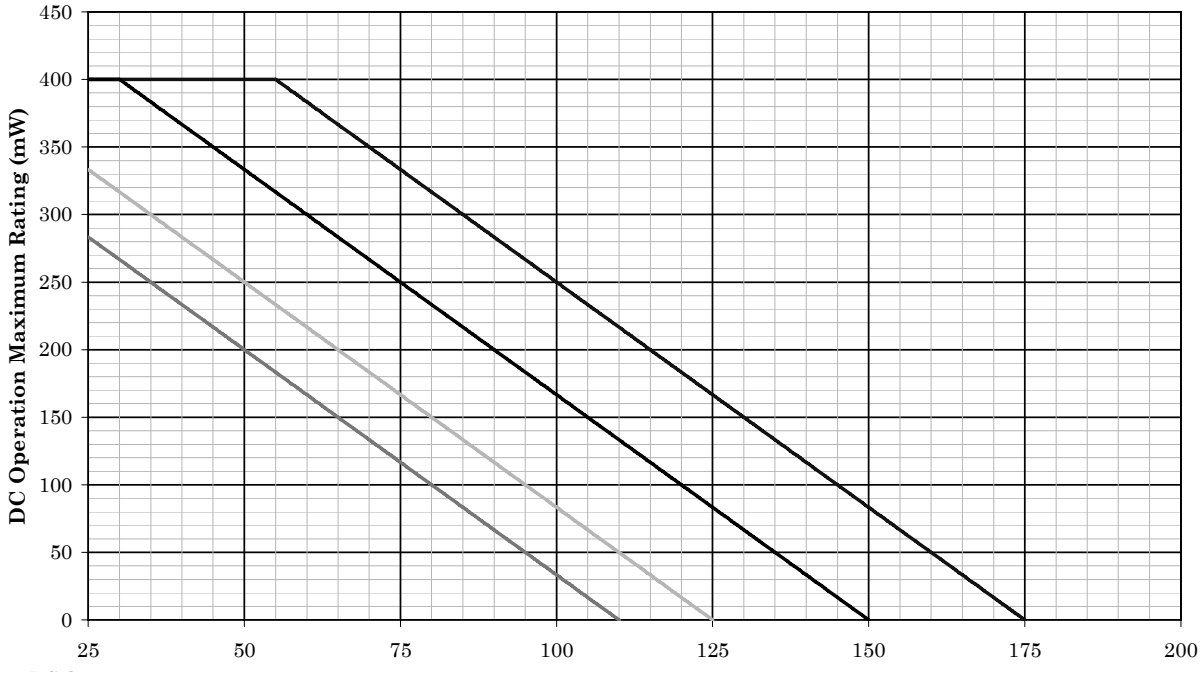


NOTES:

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

FIGURE 5. Temperature-power derating curve (DO-213AA).

TEMPERATURE-POWER DERATING CURVE
DO-35, DO-213AA

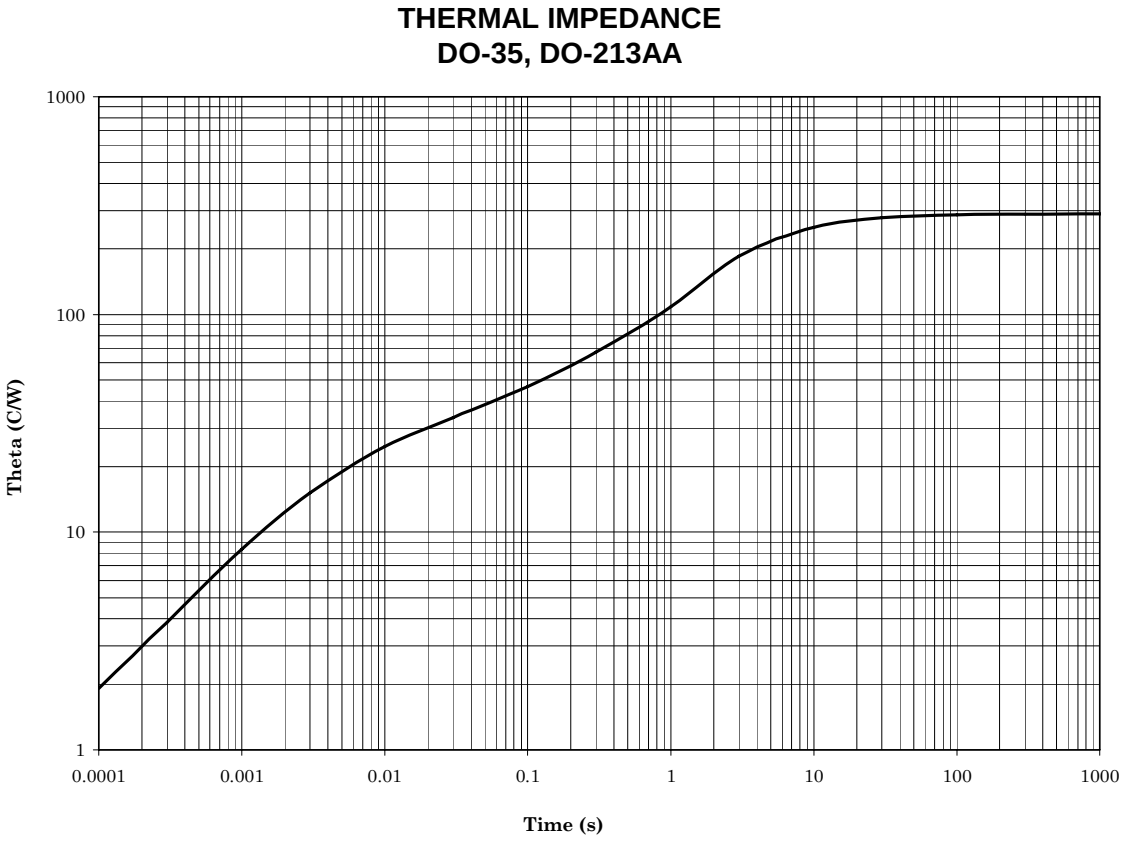


DC Operation
$R_{\Theta PCB}$ = 300°C/W

NOTES:

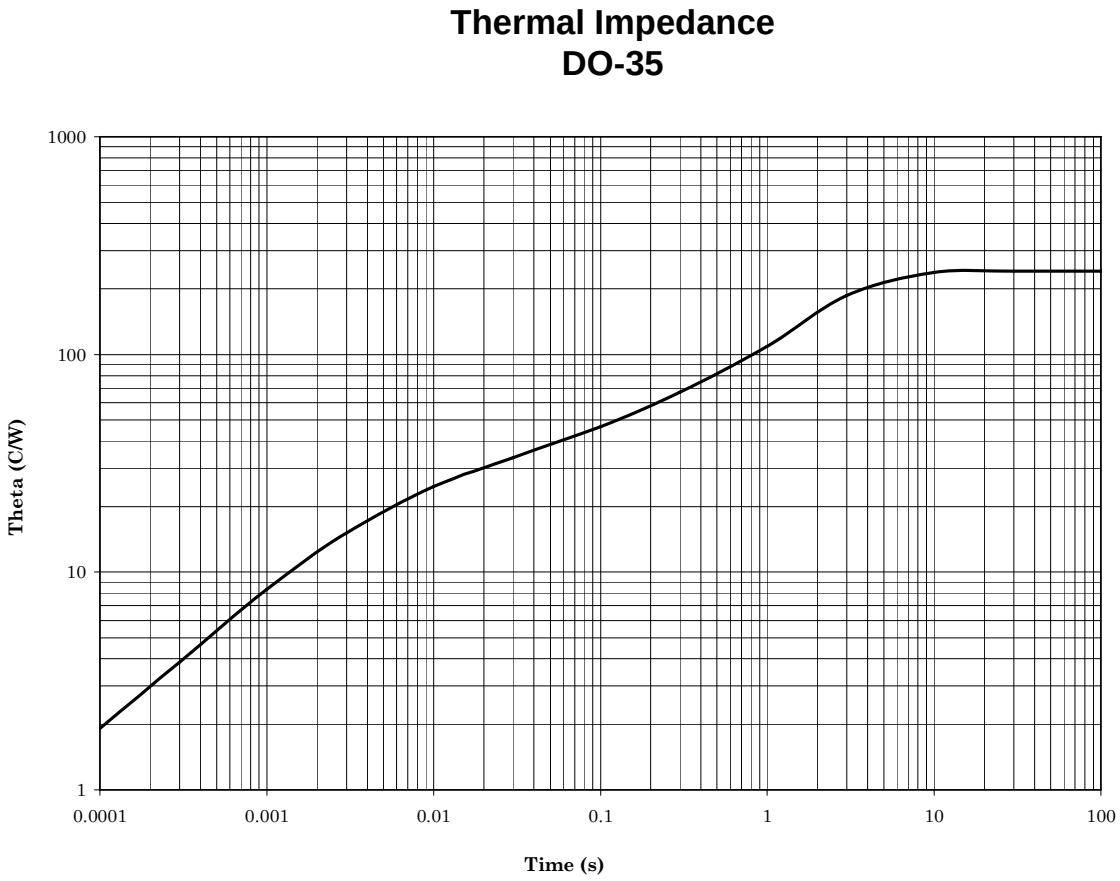
1. All devices are capable of operating at ≤ T_J specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature (T_J ≤ 175°C) and power rating specified. (See 1.3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

FIGURE 6. Temperature-power derating curve (DO-213AA, DO-35).



NOTE: Thermal resistance = 300°C/W. Maximum power rating = 400 mW at T_A = 55°C.

FIGURE 7. Thermal impedance (DO-213AA, DO-35 PCB mount).



NOTE: Thermal resistance = 250°C/W. Maximum power rating = 500 mW at T_J = 50°C.

FIGURE 8. Thermal impedance (DO-35).

NOTE: Thermal resistance = 100°C/W. Power rating = 500 mW at T_{EC} = 125°C.

FIGURE 9. Thermal impedance (DO-213) MELF.

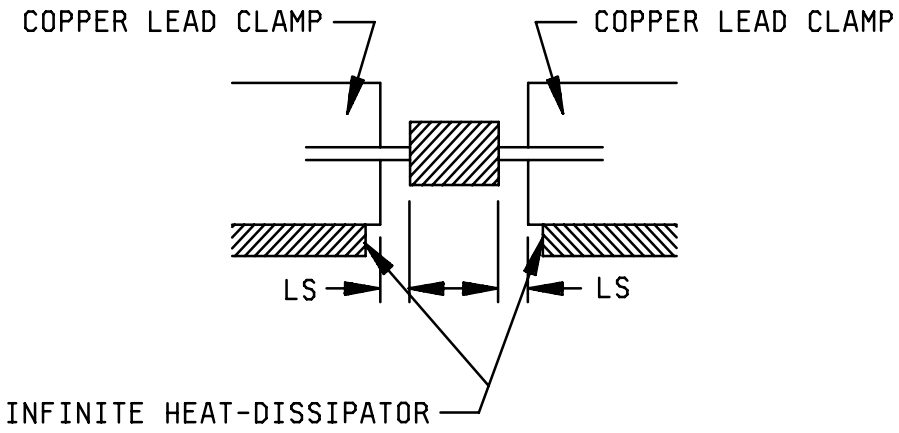
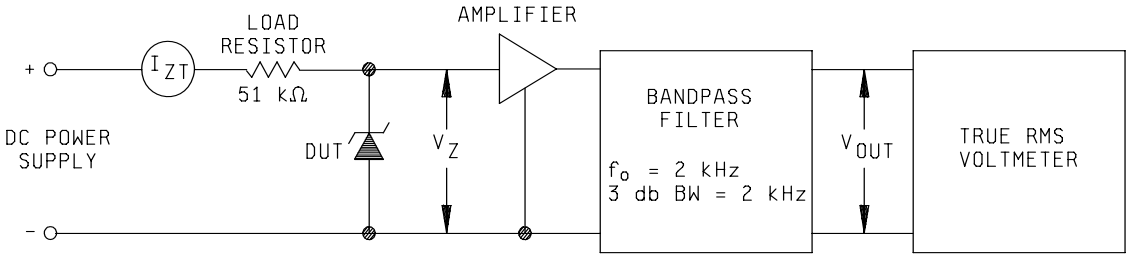


FIGURE 10. Mounting conditions.



NOTES:
1. Input voltage and lead resistance should be high so that zener can be driven from a constant current source.
2. Input impedance of band pass filter should be high compared with the dynamic impedance of the diode under test.
3. Filter bandwidth characteristics shall be as follows:
   a. f_o = 2,000 Hz
   b. Shape factor, -40 db to -3 db, approximately 2.
   c. Passband at the -3 db is 1,000 Hz ±50 Hz to 3,000 Hz ±150 Hz.
   d. Passband at the -40 db is 500 Hz ±50 Hz to 6,000 Hz ±600 Hz.

FIGURE 11. Circuit for determination of noise density.

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. Product assurance level and type designator.

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 Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil .

6.4 Substitutability of 2 percent and 1 percent tolerance devices. Devices of tighter tolerance are a direct one way substitute for the looser tolerance devices (example: JANTX1N5518D-1 substitutes for JANTX1N5518B-1).

* 6.4.1 Substitutability of dash-one parts. Non-dash-one devices have been deleted from this specification. Dash-one devices are a direct substitute for non dash-one devices and are preferred. The following table shows the direct substitutability.

Superseded PIN	Superseding PIN		Superseded PIN	Superseding PIN		Superseded PIN	Superseding PIN
1N5518B	1N5518B-1		1N5528B	1N5528B-1		1N5538B	1N5538B-1
1N5519B	1N5519B-1		1N5529B	1N5529B-1		1N5539B	1N5539B-1
1N5520B	1N5520B-1		1N5530B	1N5530B-1		1N5540B	1N5540B-1
1N5521B	1N5521B-1		1N5531B	1N5531B-1		1N5541B	1N5541B-1
1N5522B	1N5522B-1		1N5532B	1N5532B-1		1N5542B	1N5542B-1
1N5523B	1N5523B-1		1N5533B	1N5533B-1		1N5543B	1N5543B-1
1N5524B	1N5524B-1		1N5534B	1N5534B-1		1N5544B	1N5544B-1
1N5525B	1N5525B-1		1N5535B	1N5535B-1		1N5545B	1N5545B-1
1N5526B	1N5526B-1		1N5536B	1N5536B-1		1N5546B	1N5546B-1
1N5527B	1N5527B-1		1N5537B	1N5537B-1			

6.5 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example: JANHCA5518B) will be identified on the QPL.

JANHC and JANKC ordering information (1)					
PIN	Manufacturer CAGE		PIN	Manufacturer CAGE	
	43611	12954		43611	12954
1N5518B	A1N5518B	B1N5518B	1N5533B-1	A1N5533B	B1N5533B
1N5519B	A1N5519B	B1N5519B	1N5534B-1	A1N5534B	B1N5534B
1N5520B	A1N5520B	B1N5520B	1N5535B-1	A1N5535B	B1N5535B
1N5521B	A1N5521B	B1N5521B	1N5536B-1	A1N5536B	B1N5536B
1N5522B	A1N5522B	B1N5522B	1N5537B-1	A1N5537B	B1N5537B
1N5523B	A1N5523B	B1N5523B	1N5538B-1	A1N5538B	B1N5538B
1N5524B	A1N5524B	B1N5524B	1N5539B-1	A1N5539B	B1N5539B
1N5525B	A1N5525B	B1N5525B	1N5540B-1	A1N5540B	B1N5540B
1N5526B	A1N5526B	B1N5526B	1N5541B-1	A1N5541B	B1N5541B
1N5527B	A1N5527B	B1N5527B	1N5542B-1	A1N5542B	B1N5542B
1N5528B	A1N5528B	B1N5528B	1N5543B-1	A1N5543B	B1N5543B
1N5529B	A1N5529B	B1N5529B	1N5544B-1	A1N5544B	B1N5544B
1N5530B	A1N5530B	B1N5530B	1N5545B-1	A1N5545B	B1N5545B
1N5531B	A1N5531B	B1N5531B	1N5546B-1	A1N5546B	B1N5546B
1N5532B	A1N5532B	B1N5532B			

(1) C and D tolerance suffix are also applicable to JANHC and JANKC chips.

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 and relationship to the last previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA
DLA - CC

Review activities:
Air Force - 19, 99

Preparing activity:
DLA - CC

(Project 5961-2008-014)

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 http://assist.daps.dla.mil .