

The documentation and process conversion measures necessary to comply with this revision shall be completed by 19 October 2007.

INCH-POUND
MIL-PRF-19500/118H
19 July 2007
SUPERSEDING
MIL-PRF-19500/118G
22 June 2006

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON,
TYPES 1N483B, 1N485B, 1N486B, 1N5194, 1N5194UR, 1N5194US, 1N5195, 1N5195UR,
1N5195US, 1N5196, 1N5196UR, AND 1N5196US, JAN, JANTX, AND JANTXV

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.

Types 1N483B, 1N485B, 1N486B are inactive for new design. See 6.4.

1. SCOPE

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

1.2 Physical dimensions. See figure 1, figure 2 (DO-213AA), and figure 3.

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

Type (1)	V_{RM}	V_{RWM}	I_O (1) (2) $T_A = 75^{\circ}\text{C}$	I_O $T_A = 150^{\circ}\text{C}$	I_{FSM} $t_p = 1/120 \text{ s}$ $T_A = 25^{\circ}\text{C}$	T_J and T_{STG}	$R_{\theta JL}$ $L =$.375 inch (9.53 mm)	$R_{\theta JEC}$ $LD = 0$	$R_{\theta JA}(\text{PCB})$
1N483B 1N5194 1N5194UR 1N5194US	<u>V (pk)</u> 80	<u>V (pk)</u> 70	<u>mA</u> 200	<u>mA</u> 50	<u>A</u> 2	<u>$^{\circ}\text{C}$</u> -65 to +175	<u>$^{\circ}\text{C/W}$</u> 250 250	<u>$^{\circ}\text{C/W}$</u> 100 40	<u>$^{\circ}\text{C/W}$</u> 275
1N485B 1N5195 1N5195UR 1N5195US	200	180					250 250	100 40	
1N486B 1N5196 1N5196UR 1N5196US	250	225					250 250	100 40	

- (1) The electrical characteristics for UR and US suffix devices are identical to their corresponding leaded devices unless otherwise noted (applies only to the 1N5194, 1N5195, and 1N5196).
(2) Derate 1.2 mA/ $^{\circ}\text{C}$ between 25°C and 150°C . Derate 2 mA/ $^{\circ}\text{C}$ between 150°C and 175°C (see figure 4).

* 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@dsc.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 at $T_A = +25^\circ\text{C}$, unless otherwise indicated.

Type	V_{F1}	I_{R1} at V_{RWM}	I_{R3} at V_{RWM} $T_A = 150^\circ\text{C}$	$Z_{\Theta JX}$
	<u>V dc</u>	<u>nA dc</u>	<u>$\mu\text{A dc}$</u>	<u>$^\circ\text{C/W}$</u>
1N483B, 1N5194, 1N5194UR, 1N5194US	1.0	25	5	70
1N485B, 1N5195, 1N5195UR, 1N5195US	1.0	25	5	
1N486B, 1N5196, 1N5196UR, 1N5196US	1.0	25	5	

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.)

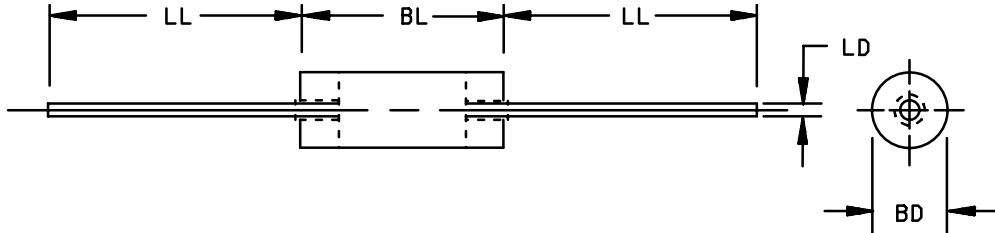
2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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 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.

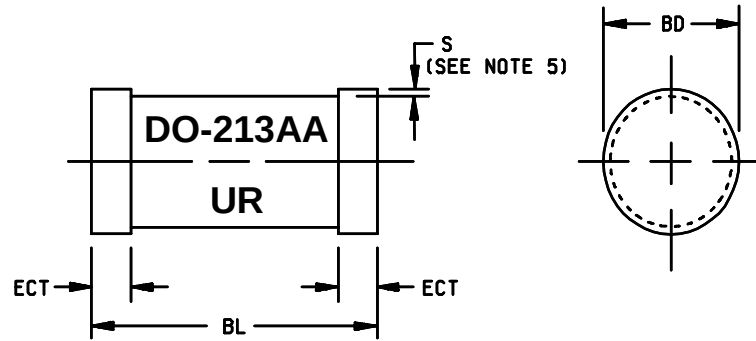


Type	Symbol	Dimensions				Notes
		Inches		Millimeters		
		Min	Max	Min	Max	
1N483B	BD	.055	.107	1.40	2.72	3
1N485B	BL	.120	.300	3.05	7.62	
1N486B	LD	.018	.022	0.46	0.56	2, 5
(DO-7/35)	LL	1.00	1.500	25.40	38.10	4, 5
1N5194	BD	.056	.075	1.42	1.90	
1N5195	BL	.120	.180	3.56	4.57	
1N5196	LD	.018	.022	0.46	0.56	2, 5
(DO-35)	LL	1.00	1.500	25.40	38.10	4, 5

NOTES:

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

* FIGURE 1. Physical dimensions (DO-7, DO-35).

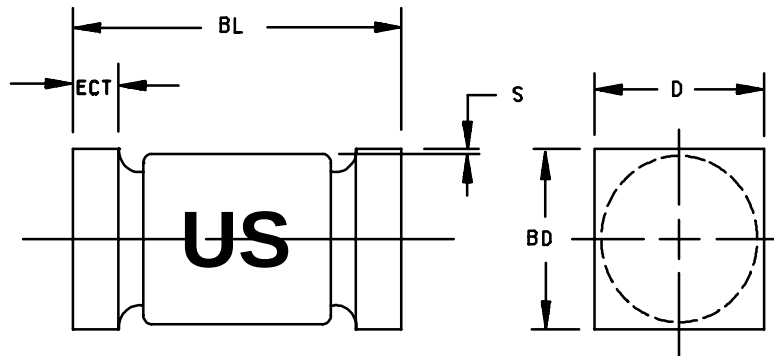


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.063	.067	1.60	1.70
BL	.130	.146	3.30	3.71
ECT	.016	.022	0.41	0.56
S	.001		0.03	

NOTES:

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

FIGURE 2. Physical dimensions 1N5194UR, 1N5195UR, and 1N5196UR (DO-213AA).



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.091	.103	2.31	2.62
BL	.168	.200	4.27	5.08
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:

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

FIGURE 3. Physical dimensions 1N5194US, 1N5195US, and 1N5196US.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500 and on figures 1, 2, and 3 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 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 UR and US versions shall be structurally identical to the axial leaded versions except for end-cap lead attachment. The 'US' version shall be metallurgically bonded, thermally matched, non-cavity, double-plug construction in accordance with the requirements of category I (see MIL-PRF-19500).

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 J5194, JX5194, or JV5194. No color coding shall be permitted for part numbering.

3.5.1 UR and US devices. For 'UR' and 'US' 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' and 'US' devices shall consist, as a minimum, a band or three contrasting dots spaced equally around the periphery of the cathode.

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

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

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

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 and requalification 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.

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* 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 4.3.2)
9	Not required
10	Method 1038 of MIL-STD-750, condition A
(2) 11	I_{R1} and V_{F1}
12	See 4.3.1
(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) $PDA \leq 5$ percent.

* 4.3.1 Free air 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; $I_{O(min)} = 200$ mA dc. 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, 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.

4.3.1.1 JAN testing. JAN level product will 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 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 of MIL-STD-750 using the guidelines in that method for determining I_M , I_H , t_H , t_{SW} . Measurement delay time (t_{MD}) = 70 μ s max. The thermal impedance limit used in screen 3c and table I, subgroup 2 shall be set statistically by the supplier.

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 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.

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* 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' or 'US' suffix sample for life test.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
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, $T_A = +150^\circ\text{C}$; (not applicable to 'UR' or 'US' package).
* B3	1027	T_A = room ambient as defined in 4.5 of MIL-STD-750, $V_{(pk)} = \text{rated } V_{RWM}$; $f = 50 - 60$ Hz (see 4.5.1); $I_O = 200$ mA dc minimum; adjust T_A or I_O to obtain a minimum T_J of $+150^\circ\text{C}$ (see 4.5.1).
B4	2101	Decap analysis; scribe and break only.
B6	1032	$T_A = +175^\circ\text{C}$.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of MIL-PRF-19500, and as follows. 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.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
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 'US' suffix types).
C5	4081	$L = .375$ inch (9.53 mm), $R_{\theta JL} = 250^\circ\text{C/W}$ maximum; $R_{\theta JEC} = 100^\circ\text{C/W}$; (see 4.4.5), 22 devices, $c = 0$.
C6	1026	1,000 hours minimum, $V_{(pk)} = \text{rated } V_{RWM}$; $f = 50 - 60$ Hz; $I_O = 200$ mA dc minimum; adjust T_A or I_O to obtain a minimum T_J of $+150^\circ\text{C}$ (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.

4.4.5 Thermal impedance ($Z_{\Theta JX}$ measurements). Thermal impedance measurements shall be in accordance with method 3101 of MIL-STD-750, and as follows.

- a. I_H = 500 mA to 1,000 mA.
- b. t_H = 10 ms.
- c. I_M = 1 mA to 10 mA.
- d. t_{MD} = 70 μ s maximum.

4.4.6 Thermal resistance. Thermal resistance measurement shall be performed in accordance with method 3101 or 4081 of MIL-STD-750. Read and record data and information shall be included in the qualification report. Forced moving air or draft shall not be permitted across the devices during test. See 1.3 for maximum limits. The following conditions shall apply:

- a. I_H = 75 mA to 300 mA.
- b. t_H = 25 seconds minimum.
- c. I_M = 1 mA to 10 mA.
- d. t_{MD} = 70 μ s maximum.

LS = lead spacing = .375 inch (9.53 mm) as defined on figure 5.

LS = 0 for 'UR' and "US" versions.

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 is still subject to the full P_t (minimum) 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 .

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

TABLE I. Group A inspection.

Inspection <u>1/ 2/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u> Visual and mechanical examination	2071					
<u>Subgroup 2</u> Thermal impedance	3101	See 4.3.2	Z θ JX		70	°C /W
Forward voltage	4011	I _F = 100 mA pk, t _p = 8.5 ms, max. duty cycle 2 percent, (pulsed, see 4.5.2)	V _{F1}	.8	1.0	V pk
Reverse current	4016					
1N483B, 1N5194, 1N5194UR, 1N5194US 1N485B, 1N5195, 1N5195UR, 1N5195US 1N486B, 1N5196, 1N5196UR, 1N5196US		V _R = 70 V (pk) V _R = 180 V (pk) V _R = 225 V (pk)	I _{R1}		25 25 25	nA dc nA dc nA dc
1N483B, 1N5194, 1N5194UR, 1N5194US 1N485B, 1N5195, 1N5195UR, 1N5195US 1N486B, 1N5196, 1N5196UR, 1N5196US	4016	V _R = 80 V (pk) V _R = 200 V (pk) V _R = 250 V (pk)	I _{R2}		1 1 1	μA dc μA dc μA dc
<u>Subgroup 3</u> High temperature operation		T _A = 150°C	I _{R3}			
Reverse current	4016	V _R = 70 V (pk) V _R = 180 V (pk) V _R = 225 V (pk)			5 5 5	μA dc μA dc μA dc
Low temperature operation	4011	T _A = -55°C				
Forward voltage		I _F = 100 mA pk, t _p = 8.5 ms, max. duty cycle 2 percent, (pulsed, see 4.5.2)	V _{F2}		1.2	V pk
<u>Subgroup 4</u> Not applicable						
<u>Subgroup 5</u> Scope display evaluation	4023	Method 4023 of MIL-STD-750, Figure 4023-3, -7, -9, -10 only				

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u> <u>2/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u>						
Surge current	4066	$I_O = 200$ mA dc, 10 surges at one per minute; $t_p = 1/120$ s, $I_{FSM} = 2$ A (pk).				
Electrical measurements		See table I, subgroup 2				

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

2/ Electrical characteristics for all surface mount versions are identical to the corresponding axial leaded versions unless otherwise specified.

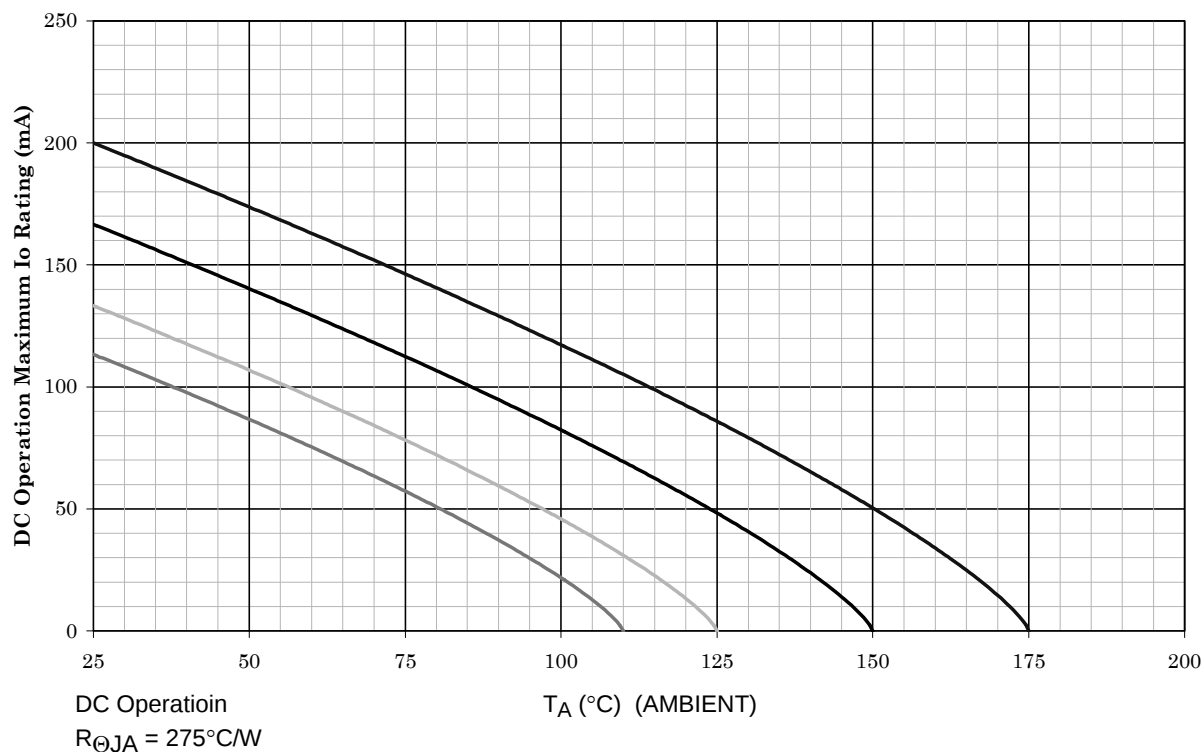
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* TABLE II. Group E inspection (all quality levels) for qualification and requalification only.

Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
<u>Subgroup 1</u>			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	Gross leak.	
Electrical measurement		See table I, subgroup 2	
<u>Subgroup 2</u>			
Intermittent operating life	1037	10,000 cycles	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			
ESD	1020		n = 3
<u>Subgroup 9</u>			
Resistance to glass cracking	1057	Test condition B. Test until failure occurs or to a maximum of 25 cycles, whichever comes first.	n = 45
<u>Subgroup 10</u>			n = 22, c = 0
Monitored mission temperature cycling	1055		
Electrical measurements		See table I, subgroup 2	

TEMPERATURE-CURRENT DERATING CURVE

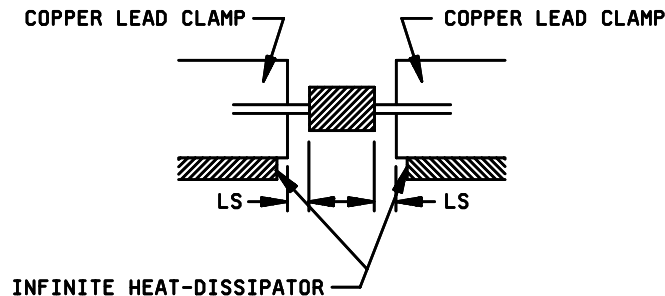
ALL PARTS



NOTES:

1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at $\leq T_J$ 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 ($T_J \leq 175^\circ\text{C}$) and power/current rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 150^\circ\text{C}$, where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at $T_J \leq, 125^\circ\text{C}$, and 110°C to show power/current rating where most users want to limit T_J in their application.

FIGURE 4. Temperature-current derating graph.

FIGURE 5. Mounting arrangement.

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

6.4 Substitutibility. Types 1N483B, 1N485B, 1N486B are inactive for new design. Types 1N5194, 1N5195, and 1N5196 are interchangeable and are preferred.

6.5 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
DLA - CC
NASA - NA

Preparing activity:

DLA - CC

(Project 5961-2007-031)

Review activities:

Army - AR, MI
Navy - AS, MC
Air Force - 19

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