

The documentation and process conversion measures necessary to comply with this revision shall be completed by 5 October 2012.

INCH-POUND
MIL-PRF-19500/193F
w/AMENDMENT 1
5 July 2012
SUPERSEDING
MIL-PRF-19500/193F
2 November 2009

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, RECTIFIER
TYPES 1N457, 1N458, AND 1N459, JAN

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 silicon diode rectifiers. One level of product assurance is provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See [figure 1](#) (DO-7, 35).

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

Type (1)	V_{RM}	V_{RWM}	I_O $T_A = +25^\circ\text{C}(1)$	T_J	T_{STG}	I_F
	<u>V (pk)</u>	<u>V (pk)</u>	<u>mA dc</u>	<u>°C</u>	<u>°C</u>	<u>mA</u>
1N457	70	60	150	-65 to +150	-65 to +175	225
1N458	150	125	150			165
1N459	200	175	150			120

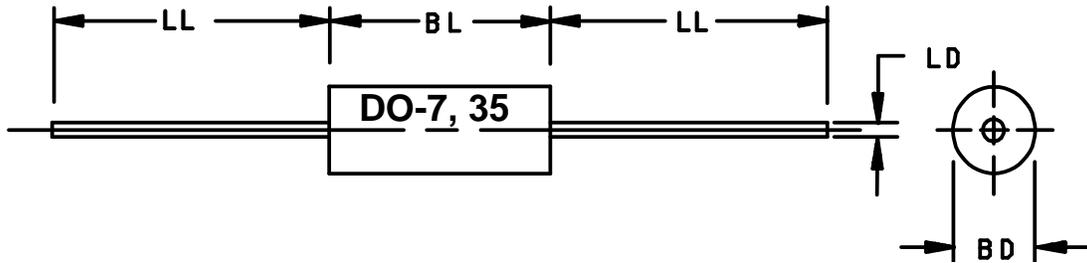
(1) Derate I_O linearly to 0.0 mA dc at +150°C.

1.4 Primary electrical characteristics: $T_A = +25^\circ\text{C}$, unless otherwise indicated.

Type	V_{F1}	I_{R1} at V_{RWM}	I_{R2} at V_{RWM} $T_A = +150^\circ\text{C}$
	<u>V dc</u>	<u>nA dc</u>	<u>μA dc</u>
1N457	1.0	25	5
1N458	1.0	25	5
1N459	1.0	25	5

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, 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>.

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Types	Ltr	Dimensions			
		Inches		Millimeters	
		Min	Max	Min	Max
(DO-35)	BD	.056	.075	1.42	1.90
	BL	.140	.180	3.56	4.57
	LD	.018	.022	0.46	0.56
	LL	1.000	1.500	25.40	38.10
(DO-7)	BD	.085	.130	2.16	3.30
	BL	.230	.300	5.84	7.62
	LD	.018	.023	0.46	0.58
	LL	1.000	1.500	25.40	38.10

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 Φ x symbology.

TYPES 1N457, 1N458, AND 1N459

FIGURE 1. Physical dimensions.

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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.

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.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on [figure 1](#).

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.

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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. No color coding will be permitted for part numbering.

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. Conformance inspection (see 4.3).

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.

4.2.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3131 or 4081 of MIL-STD-750 using the guidelines in that method for determining I_M , I_H , t_H , t_{SW} (V_C and V_H where appropriate). Measurement delay time (t_{MD}) = 70 μ s max. The thermal impedance limit used in table I, subgroup 2 shall be set statistically by the supplier.

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

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4.3.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and [table I](#) herein. Electrical measurements (end-points) shall be in accordance with the [table I](#), group A, subgroup 2 herein.

4.3.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIb (JAN) of MIL-PRF-19500 and as specified in [4.3.2.1](#). Electrical measurements (end-points) shall be in accordance with the [table I](#), group A, subgroup 2 herein.

4.3.2.1 Group B inspection, table E-VIb (JAN) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	1056	0°C to +100°C, 10 cycles.
B2	1051	-55°C to +175°C.
B2	2005	I _F = 100 mA, axial tensile stress = 8 lbs, T _A = +150°C.
B3	1027	I _O = 150mA (min), V _R = V _{RWM} (min), f = 50-60 Hz, T _J = 150°C (min), adjust I _O or T _A to obtain a min T _J of +150°C (min) (see 4.4.1).
B6	1032	T _A = +175°C.

4.3.3 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 the [table I](#), group A, subgroup 2 herein (except for thermal impedance).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Tension: Test condition A; weight = 10 lbs; t = 15 seconds Lead fatigue: Test condition E, weight = 16 oz
C5	4081	L = .375 inch (9.53 mm), R _{ΘJL} = 250°C/W maximum; R _{ΘJEC} = 100°C/W; (see 4.3.5), 22 devices, c = 0.
C6	1027	I _O = 150mA (min), V _R = V _{RWM} (min), f = 50-60 Hz, T _J = 150°C (min), adjust I _O or T _A to obtain a min T _J of +150°C (min) (see 4.4.1).

4.3.4 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.

4.3.5 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.

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

4.4.1 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.

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

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TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance	3101	See 4.2.2. Not required for end-point electricals.	Z _{θJX}			°C/W
Forward voltage 1N457 1N458 1N459	4011	I _F = 100 mA, t _p = 8.5 ms, max. duty cycle 2 percent, (pulsed, se 4.4.2)	V _{F1}		1.0	V dc
Reverse current 1N457 1N458 1N459	4016	DC method V _R = 60 V V _R = 125 V V _R = 175 V	I _{R1}		25 25 25	nA dc nA dc nA dc
Reverse current 1N457 1N458 1N459	4016	DC method V _R = 70 V dc V _R = 150 V dc V _R = 200 V dc	I _{R2}		1 1 1	μA dc μA dc μA dc
<u>Subgroup 3</u>						
High temperature operation		T _A = +150°C				
Reverse current 1N457 1N458 1N459	4016	DC method V _R = 60 V dc V _R = 125 V dc V _R = 175 V dc	I _{R3}		5 5 5	μA dc μA dc μA dc
Low temperature operation		T _A = -55°C				
Forward voltage	4011	I _F = 100mA dc pulsed	V _{F2}		1.2	V dc
<u>Subgroups 4, 5, and 6</u>						
Not applicable						

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

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TABLE II. Group E inspection (all quality levels) - for qualification or re-qualification 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 only. Fine and gross leak required for UB.	
Electrical measurement		See table I , subgroup 2.	
<u>Subgroup 2</u>			n = 45
Intermittent operating life	1037	10,000 cycles.	
Electrical measurements		See table I , subgroup 2.	
<u>Subgroup 4</u>			n = 22, c = 0
Thermal impedance curves			
<u>Subgroup 5</u>			n = 45
Not applicable			
<u>Subgroup 6</u>			n = 45
ESD	1020		
<u>Subgroup 9</u>			n = 45
Resistance to glass cracking	1057	Test condition B. Test until failure occurs or to a maximum of 25 cycles, whichever comes first.	
<u>Subgroup 10</u>			n = 22, c = 0
Monitored mission temperature cycling	1055		
Electrical measurements		See table I , subgroup 2.	

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 DLA Land and Maritime, 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 Amendment notations. The margins of this specification are marked with asterisks to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

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Custodians:
Army - CR
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2012-026)

Review activities:
Army - AR, MI, SM

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