

MIL-S-19500/187A(SigC)
 14 September 1962
 SUPERSEDING
 MIL-S-19500/187(SigC)
 13 March 1961

MILITARY SPECIFICATION

SEMICONDUCTOR DIODE, SILICON, HIGH-VOLTAGE
 TYPE 1N2361

1. SCOPE

1.1 Scope. - This specification covers the detail requirements for silicon semiconductor diodes for use in high-voltage, rectifier circuits, and having the following particular characteristics. (See 3.2 herein.):

1.2 Performance. - See 3.4 herein.

1.3 Maximum ratings -

v_r	V_R	$I_a \frac{1}{}$ (at: $T_A = +125^\circ\text{C}$)	i (surge) (at 1/120 sec)	T_A (operating)	T_{stg}	Altitude
$\frac{\text{vdc}}{2300}$	$\frac{\text{Vdc}}{2000}$	$\frac{\text{mAdc}}{50}$	$\frac{\text{a}}{10}$	$\frac{^\circ\text{C}}{-65 \text{ to } +125}$	$\frac{^\circ\text{C}}{-65 \text{ to } +150}$	$\frac{\text{ft}}{40,000}$

$\frac{1}{I_o} = 400 \text{ mAdc}$ at $T_A = +25^\circ\text{C}$ (room ambient temperature).

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-S-19500

Semiconductor Devices, General Specification For

STANDARDS

MILITARY

MIL-STD-15

Electrical and Electronic Symbols

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Both the title and number or symbol should be stipulated when requesting copies.)

3. REQUIREMENTS

3.1 Requirements. - Requirements for the semiconductor diode shall be in accordance with Specification MIL-S-19500, and as specified herein.

3.2 Abbreviations and symbols. - The abbreviations and symbols used herein are defined in Specification MIL-S-19500.

3.3 Design and construction. - The semiconductor diode shall be of the design, construction, and physical dimensions specified in Figure 1 herein.

3.3.1 Operating position. - The semiconductor diode shall be capable of proper operation in any position.

3.3.2 Polarity indication. - The graphic symbol for polarity indication on the semiconductor diode shall be as designated in Military Standard MIL-STD-15.

3.4 Performance characteristics. - The semiconductor diode performance characteristics shall be as specified in Tables I and II herein.

3.5 Marking. - The semiconductor diodes shall be marked in accordance with Specification MIL-S-19500 and as follows. In instances where the diminutive size or lack of suitable surface area on the device would prevent a marking accomplishment readable by the unaided eye, 20/20 vision, at eight inches distance from the device, such marking may be omitted directly on the device. Where, in consideration of the above, adequate surface area is available for the marking of only a portion of the items required in Specification MIL-S-19500, the following items may be omitted from the marking accomplishment on the device, in the following preferred order: color-band type designation as applied for polarity indication, country of origin, manufacturer's identification. However, all required marking shall be placed on the unit package.

3.5.1 Type-designation marking.- Type designation marking of semiconductor diodes procured on Department of Army contracts, and which have passed Government inspection and comply with all requirements of this specification, shall consist of: "USA-manufacturer's qualification code letters-diode designation." The letters "JAN" or any abbreviation thereof shall not be used. If any specification waiver has been granted, the combination "USA-manufacturer's qualification code letters" shall not be used to complete the type-designation marking.

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- Except as otherwise specified herein, the responsibility for inspection, general procedures for acceptance, classification of inspection, and inspection conditions and methods of test shall be in accordance with Specification MIL-S-19500, Quality Assurance Provisions.

4.2 Qualification and acceptance inspection.- Qualification and acceptance inspection shall be in accordance with requirements in Specification MIL-S-19500, Quality Assurance Provisions, and as otherwise specified herein. Groups A and B inspection shall consist of the examinations and tests specified in Tables I and II, respectively, herein. Acceptance inspection shall include inspection of Preparation For Delivery (see 5.1 herein).

4.2.1 Specified LTPD for subgroups.- The LTPD specified for a subgroup in Tables I and II herein shall apply for all of the tests, combined, in the subgroup.

4.2.2 Acceptance Inspection sample size for subgroups.- The sample size, relative to an LTPD specified herein for a subgroup, shall be selected at option of the manufacturer.

4.3 Destructive tests.- The Group B, Subgroups 2, 3, 4, and 5 tests are considered destructive. However, the tests of Subgroups 2 and 3 can be considered non-destructive if sufficient evidence is presented to the inspection authority to that effect. Acceptable evidence, for example, would be repeating of all Subgroup 2 and 3 tests, ten times, without significant device degradation. The test repetition procedure need be done only once at inception of acceptance inspection, provided no change in design or of production techniques has been effected.

4.4 Disposition of sample units.- Sample units subjected to Group B, Subgroups 4 and 5 inspection shall not be delivered on the contract or order. Sample units that have been subjected to and have passed Group B, Subgroups 2, 3, 6 and 7 tests not listed as or determined to be destructive tests may be delivered on the contract or order provided that, after Group B inspection is terminated, those sample units are subjected to and pass Group A inspection. Defective sample units from any sample group that may have passed Group inspection shall not be delivered on the contract or order until the defect(s) has been remedied to the satisfaction of the Government.

Table I. Group A inspection.

Test Method per MIL-STD-750	Examination or test	Conditions	LTPD	Symbol	Limits		Unit
					Min.	Max.	
	<u>Subgroup 1</u>		5				
2071	Visual and mechanical examination	---		---	---	---	---
	<u>Subgroup 2</u>		5				
4011	Forward voltage drop	$I_F = 400 \text{ mA}$		V_F	---	2.0	Vdc
4016	Reverse Current	$V_R = 2000 \text{ Vdc}$		I_R	---	5	μAdc
4016	Peak Reverse Voltage	$v_r = 2300 \text{ Vdc}$		I_R	---	100	μAdc

Table II. Group B inspection.

Test Method per MIL-STD-750	Examination or test	Conditions	LTPD	Symbol	Limits		Unit
					Min.	Max.	
	<u>Subgroup 1</u>		10				
2066	Physical dimensions						
	<u>Subgroup 2</u>		10				
1051	Temperature cycling	Test Cond. B		---	---	---	---
1056	Thermal shock (glass in)	Test Cond. B		---	---	---	---
1021	Moisture resistance	No initial conditioning		---	---	---	---
	<u>End-point tests:</u>						
4011	Forward voltage drop	$I_F = 400 \text{ mAdc}$		V_F	---	2.2	Vdc
4016	Reverse current	$V_R = 2000 \text{ Vdc}$		I_R	---	10	μAdc
<u>1/</u>	High-temperature operation:	(See Subgroup 5, below)					
---	Reverse current	---		I_R	---	300	μAdc

Table II. Group B inspection (Cont'd).

Test Method per MIL-STD-750	Examination or test	Conditions	LTPD	Symbol	Limits	
					Min.	Max
	<u>Subgroup 3</u>		10			
2016	Shock	Non-operating G = 500 3 ea. blows of 1msec ea. in orientations X1, and Y1 or Y2 (total = 6 blows)				
2006	Constant acceleration (centrifuge)	G = 10,000 Orientations Y1, Y2, Z1		---	---	---
2046	Vibration fatigue	Non-operating G = 10 Orientations X1, and Y1 or Y2		---	---	---
2056	Vibration, variable frequency	G = 10 f = 100 to 1000 cps Orientations X1, and Y1 or Y2 (total 8 times over total period of 32 min.)		---	---	---
4066	Surge current	$I_o = 50 \text{ mAdc}$ $V_R = 1400 \text{ Vac}$ $T_A = +125^\circ\text{C min.}$ $i (\text{surge}) = 10 \text{ Adc}$ 5 surges of 1/120- sec ea.		---	---	---

End-point tests:

Same as for Subgroup 2,
above

Table II. Group B inspection -(Cont'd)

Test Method per MIL-STD-750	Examination or test	Conditions	LTPD	Symbol	Limits		Unit
					Min.	Max.	
<u>Subgroup 4</u>			20				
2036	Lead Fatigue	Test Cond. E Weight = 1 lb. <u>2/</u>					
2036	Tension	Test Cond. A 2 lb. weight Duration = 30 sec.					
<u>Subgroup 5</u>			10				
<u>1/</u>	High temperature operation:	$T_A = 125^\circ\text{C Min.}$					
4016	Reverse Current	$I_O = 50 \text{ mAdc}$ $V_R = 1400 \text{ Vac}$		I_R	---	200	μAdc
<u>1/</u>	Low temperature operation:	$T_A = -65^\circ\text{C max.}$					
4016	Peak Reverse Voltage	$V_R = 2000 \text{ Vdc}$		I_R	---	100	μAdc
4011	Forward Voltage Drop	$I_F = 400 \text{ mA}$		V_F	---	2.5	Vdc
1001	Barometric pressure, reduced (altitude operation)	Pressure = 140.7 mmHg, min		---	---	---	---
1046	Salt spray (corrosion)	Test Cond. A <u>3/</u>		---	---	---	---
<u>End-point tests:</u>							
Same as for Subgroup 2, above							
<u>Subgroup 6</u>			$\lambda = 10$				
1031	High-temperature life (non-operating)	$T_{stg} = +150^\circ\text{C min.}$		---	---	---	---
<u>End-point tests:</u>							
4011	Forward voltage drop	$I_F = 400 \text{ mAdc}$		V_F	---	2.2	Vdc
4016	Reverse current	$V_R = 2000 \text{ Vdc}$		I_R	---	10	μAdc

Table II. Group B inspection- (Cont'd).

Test Method per MIL-STD-750	Examination or test	Conditions	LTPD	Symbol	Limits	
					Min.	Max.
	<u>Subgroup 7</u>		$\lambda=10$			
1026	Steady state operation life:	$V_R = 1400 \text{ Vac}$ $I_o = 50 \text{ mAdc}$ $T_A = 125^\circ\text{C min}$ $f = 60 \text{ cps}$		---	---	---
	<u>End-point tests:</u>					
	Same as for Subgroup 6, above					

1/ Measurement shall be made after thermal equilibrium has been reached at the temperature specified.

2/ Rejects from prior electrical test samples from the same lot may be used for this test.

3/ Marking shall have remained legible at conclusion of this test.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery.- Preparation for delivery shall be in accordance with Specification MIL-S-19500.

6. NOTES

6.1 Notes.- The notes included in Specification MIL-S-19500, with the following exception, are applicable to this specification.

6.2 Qualification.- With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List (QPL)-19500, supplement (Army), whether or not such products have actually been so listed by that date. Information pertaining to qualification of products covered by this specification should be requested from the Chief, Standardization Engineering Division, U. S. Army Electronics Materiel Support Agency, Fort Monmouth, New Jersey, attention: SELMS-PSM-3.

NOTICE: When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any right or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

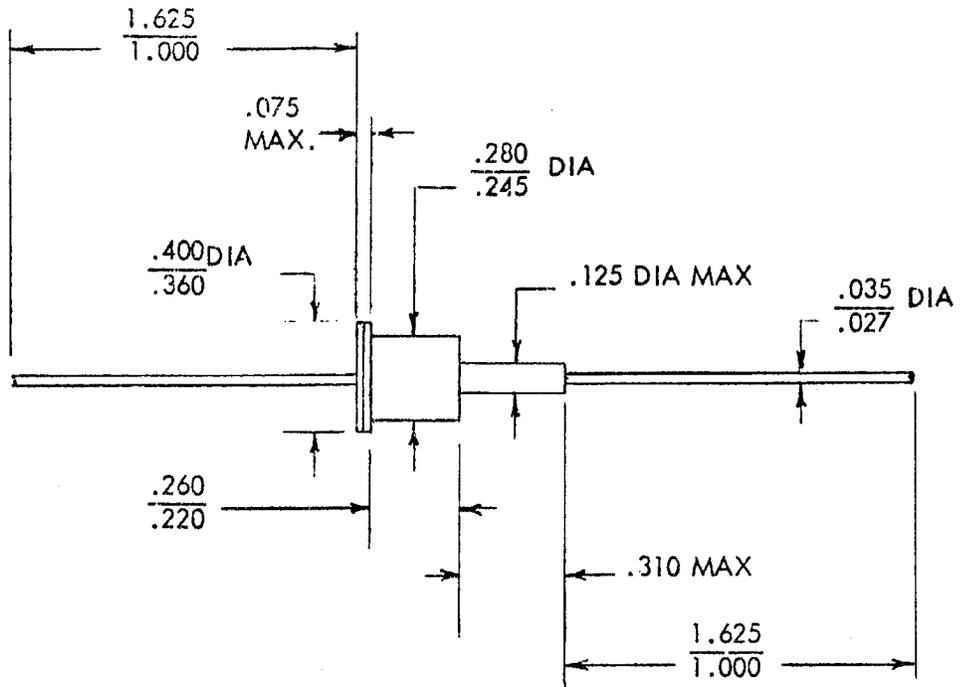


Figure 1. Outline and dimensions.