MIL-S-19500/254A(EL)

6 February 1968
SUPERSEDING
MIL-S-19500/254(SigC)
4 September 1962

SEMICONDUCTOR DEVICE, DIODE, SILICON
TYPES 1N1147 and 1N1149

1. SCOPE

1.1 Scope.- This specification covers the detail requirements for silicon, semiconductor diodes for use particularly as high-voltage rectifier devices in compatible equipment circuits. (See 6.2 herein.)

1.2 Outline and dimensions.- See Figure 1 herein.

1.3 Operating characteristics and ratings.- (At T_A = +25°C, unless otherwise specified. See 3.4 herein.)

Operating temperature: -65° to +125°C
Storage temperature: -65° to +150°C
Operating altitude (barom. press.)- maximum, without derating [1/]:

1N1147	1N1149
40,000 ft. approx.	30,000 ft. approx.

[1/] For higher altitude, derate maximum permissible peak reverse voltage in accordance with Figure 2 herein.

	v_r	V_R (at:T_A=+125°C)	V_R (at:T_C=+100°C)	I_o (at:T_C=+100°C)	i_f(surge) (at: 1/120 sec)
	Max.	Max.	Max.	Max.	Max.
	Kvdc	Kvdc	KVac(rms)	mAdc	a
1N1147	14.4	12	8.4	45	10
1N1149	19.2	16	11.2	45	10

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, 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
MIL-STD-750	Test Methods For Semiconductor Devices

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency 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 diodes shall be in accordance with Specification MIL-S-19500 and as otherwise 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 diodes shall be of the design, construction, and physical dimensions specified in Figure 1.

3.3.1 Terminal arrangement.- The terminal arrangement on the diodes shall be as indicated in Figure 1.

3.3.2 Operating position.- The diodes shall be capable of proper operation in any position.

3.4 Performance characteristics.- The diode performance characteristics shall be as specified in Tables I and II herein (see 4.2 herein). Except where specifically differentiated for respective diode types (see 1.3 and Tables I and II herein), the performance requirements, including characteristics, ratings, and test conditions, apply equally to both diode types covered herein.

3.5 Marking.- Except as otherwise specified herein, marking shall be in accordance with Specification MIL-S-19500. If any specification-requirements waiver has been granted, the product-identification marking shall consist of the classification type designation only. The "manufacturer's identification" and "country of origin" may, at option of the manufacturer, be omitted from being marked directly on the semiconductor device covered herein.

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

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 Quality Conformance inspection shall be in accordance with Specification MIL-S-19500, Quality Assurance Provisions, and as otherwise specified herein (see 4.2.2 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 Table I and II herein shall apply for all of the tests, combined, in the subgroup.

4.2.2 Sample size for subgroups.- The sample size shall be selected by the manufacturer and shall be within the Max. Acc. No. limit (from "0" Acceptance Number to that specified in Tables I and II herein) relative to the particular subgroup LTPD.

4.2.3 Disposition of sample units.- Sample units that have been subjected to Group B, Subgroup 4 test shall not be delivered on the contract or order. Sample units that have been subjected to and have passed Group B, Subgroups 1, 2, 3, 5, 6, and 7 tests, these tests to be considered non-destructive, 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 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.

4.3 Particular examination and test procedures.-

4.3.1 Interval for End-Point test measurements.- All applicable End-Point Test measurements shall be performed, after sample units have been subjected to required physical-mechanical or environmental test(s), in accordance with the following time-delay limitations:

(a) For Qualification inspection: within 24 hours.

(b) For Quality Conformance inspection: within 96 hours.

4.3.2 Mechanical damage resulting from test.- Except for intentionally deforming, mutilating, or dismembering mechanical-stress tests to which samples are subjected, there shall be no evidence of mechanical damage to any sample unit as a result of any of the Groups A, B, or C tests.

Table I. Group A inspection.

Test Method per MIL-STD-750	Examination or test 1/	Conditions	LTPD	Max. Acc. No.	Symbol	Limits Min.	Limits Max.	Unit
	Subgroup 1		5	3				
2071	Visual and mechanical examination	---			---	---	---	---
	Subgroup 2		5	3				
4011	Forward voltage:	I_F=0.3Adc						
	1N1147				V_F	---	45	Vdc
	1N1149				V_F	---	45	Vdc
4016	Reverse current (at peak reverse voltage):							
	1N1147	v_r=14.4Kvdc			I_R	---	100	uAdc
	1N1149	v_r=19.2Kvdc			I_R	---	100	uAdc
2/	High-temperature operation:	T_A=+125°C						
4016	Reverse current:							
	1N1147	V_R=12Kvdc			I_R	---	100	uAdc
	1N1149	V_R=16Kvdc			I_R	---	100	uAdc

1/ See 3.4 herein.

2/ Test measurement shall be made after thermal equilibrium has been reached at the temperature specified.

Table II. Group B inspection.

Test Method per MIL-STD-750	Examination or test 1/	Conditions	LTPD	Max. Acc. No.	Symbol	Limits Min.	Limits Max.	Unit
	Subgroup 1		10	4				
2066	Physical dimensions	---			---	---	---	---
	Subgroup 2		10	4				
1051	Temperature cycling	Test Cond. F			---	---	---	---
1056	Thermal shock (glass strain)	Test Cond. B			---	---	---	---
1021	Moisture resistance	No initial conditioning			---	---	---	---
	End-point tests:							
	Group A, Subgroup 2, test and limits apply							
	Subgroup 3		10	4				
2016	Shock	G=500 5 blows of 1 msec ea. in orientations X1, Y1, Z1 (total = 15 blows)			---	---	---	---
2006	Constant acceleration (centrifugal)	G=500 Orientations X1, Z1			---	---	---	---
2046	Vibration fatigue	non-operating G = 10			---	---	---	---

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

Test Method per MIL-STD-750	Examination or test 1/	Conditions	LTPD	Max. Acc. No.	Symbol	Limits Min.	Limits Max.	Unit
	Subgroup 3 (Cont'd)							
2056	Vibration, variable frequency	G = 10						
	End-point tests: Group A, Subgroup 2, tests and limits apply							
	Subgroup 4		10	4				
1001	Barometric pressure, reduced (altitude operation):	Pressure = 33mmHg						
4016	Reverse current:							
	1N1147	V_R=5Kvdc			---	---	---	---
	1N1149	V_R=5Kvdc			---	---	---	---
1001	Barometric pressure, reduced (altitude operation):							
	1N1147	Pressure=140mmHg						
	1N1149	Pressure=225mmHg						
4016	Reverse current:							
	1N1147	V_R=12Kvdc			---	---	---	---
	1N1149	V_R=16Kvdc			---	---	---	---
1046	Salt spray (corrosion)	Test Cond. A			---	---	---	---
		5% salt solution			---	---	---	---
	End-point tests: Group A, Subgroup 2, tests and limits apply							

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

Test Method per MIL-STD-750	Examination or test 1/	Conditions	LTPD	Max. Acc. No.	Symbol	Limits Min.	Limits Max.	Unit
	Subgroup 5		10	4				
4066	Surge current	T_C=+100°C i_f(surge)=10a 10 surges ea. of 1/120 sec. duration at 1 minute intervals Vac = 0 I_o = 0			---	---	---	---
	Subgroup 6		λ=10	---				
1031	High-temperature life (non-operating)	T_{stg}=+150°C, min			---	---	---	---
	End-point tests: Group A, Subgroup 2, tests and limits apply							
	Subgroup 7		λ=10	---				
1026	Steady state operation life:	T_C=+100°C f = 60cps						
	1N1147	V_R=8.4 Kvac I_o = 45mAdc			---	---	---	---
	1N1149	V_R=11.2 Kvac I_o=45 mAdc			---	---	---	---
	End-point tests: Group A, Subgroup 2, tests and limits apply							

1/ See 3.4 and 4.3.1 herein.

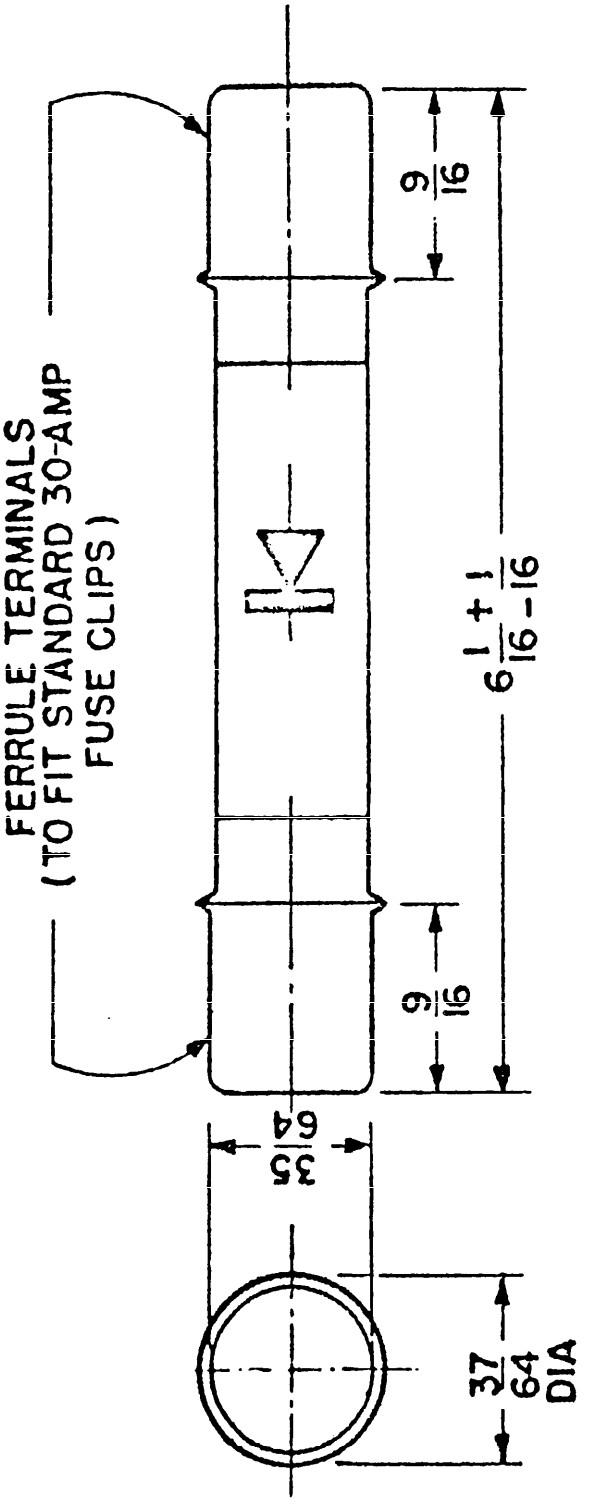

Figure 1. Outline and dimensions.

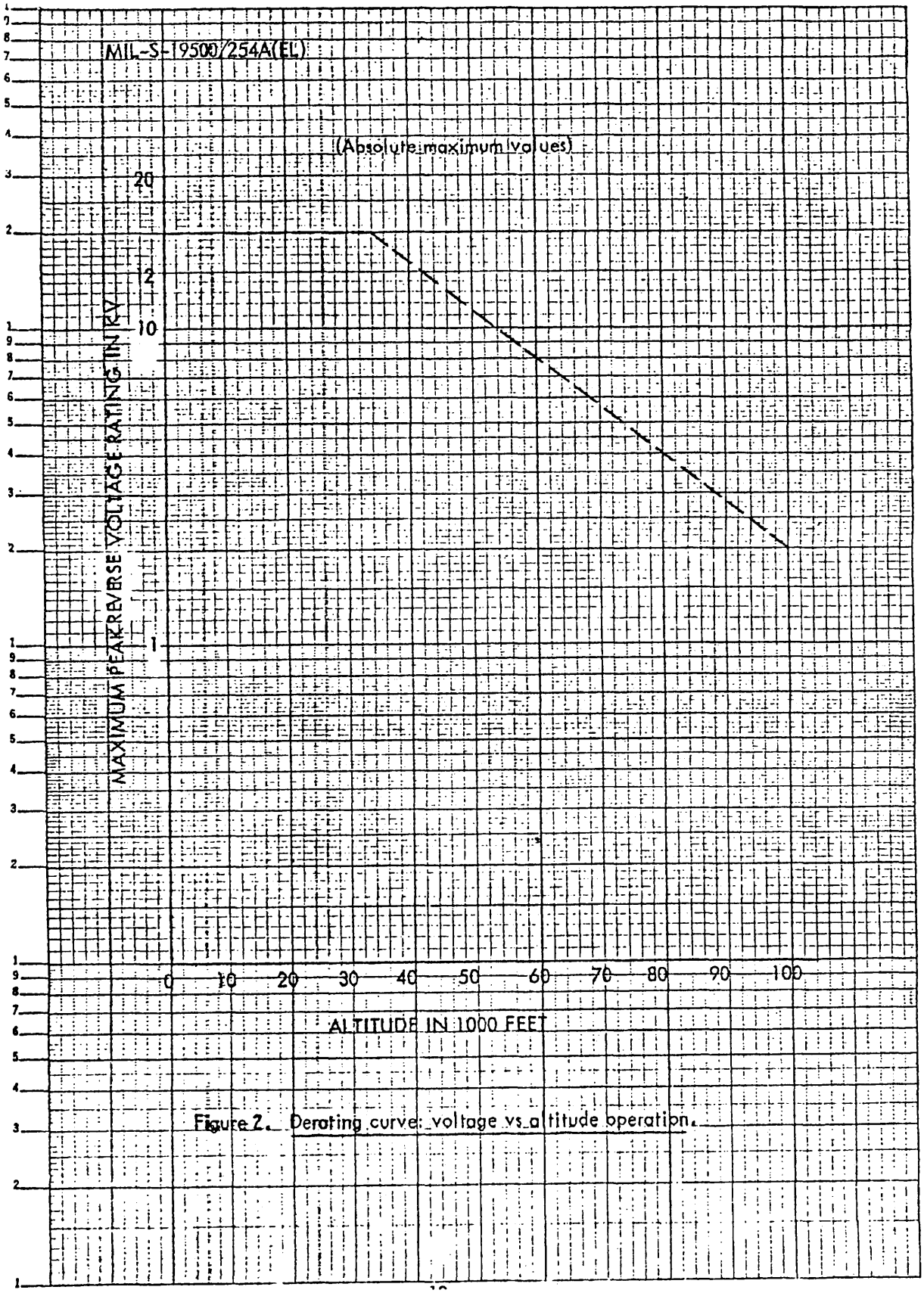

Figure 2. Derating curve: voltage vs altitude operation.

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 additions or exceptions, are applicable to this specification.

6.2 Application guidance.-

a. The revised requirements in this document issue do not affect replaceability between the diodes covered herein and the diodes covered in the previous issue of this document.

b. To insure proper equipment-circuit application, particular attention should be given to the differential voltage-and-current ratings and performance pertinent to the individual diode types covered herein.

6.3 Qualification.- With respect to products requiring qualification, awards will be made 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, 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 Commanding General, U. S. Army Electronics Command, Fort Monmouth, New Jersey 07703, Attention: AMSEL-PP-EM-2.

6.5 Revision (document) changes.- Revision-letter symbols are not used in this document revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:
Army-EL

Preparing activity:
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Project No. 5961-A126

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.

SPECIFICATION

ORGANIZATION	CITY AND STATE

CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

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