

INCH-POUND

MIL-S-19500/205B  
11 JUNE 1990  
SUPERSEDING  
MIL-S-19500/205A  
16 February 1966

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, GERMANIUM, LOW LEVEL,  
FORWARD-VOLTAGE-REFERENCE TYPE 1N3287 JAN, JANTX, AND JANTXV

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for a germanium semiconductor diode. Three levels of product assurance are provided for each device type as specified in MIL-S-19500.

1.2 Physical dimensions. See figure 1.

1.3 Maximum ratings.

$V_R$	$I_0$	$I_F$	$I_{FSM}$
V (pk)	mA dc	mA dc	1/120 s
6	50	100	0.5 A

Operating ambient temperature:  $-65^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$ .

Storage temperature:  $-65^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ .

Barometric pressure, reduced: 8 mmHg.

1.4 Primary electrical characteristics. The diode should have salient characteristics at ambient temperature of  $+25^{\circ} \pm 3^{\circ}\text{C}$ , unless otherwise specified.

	$V_F$	$I_R$	$I_R$
	$I_F = 1 \text{ mA dc}$	$V_R = 2 \text{ V dc}$	$V_R = 6 \text{ V (pk)}$
Min.	0.208 V dc		
Max.	0.312 V dc	10 $\mu\text{A}$	30 $\mu\text{A dc}$

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Electronics Supply Center, ATTN: DESC-ECT, 1507 Wilmington Pike, Dayton, OH 45444-5280 by using the self-addressed Standardization Document Proposal (DD Form 1426) appearing at the end of this document or by letter.

## 2. APPLICABLE DOCUMENTS

### 2.1 Government documents.

2.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

#### SPECIFICATION

##### MILITARY

MIL-S-19500 - Semiconductor Devices, General Specification for.

#### STANDARD

##### MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 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 Associated detail specification. The individual item requirements shall be in accordance with MIL-S-19500, and as specified herein.

3.2 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-S-19500.

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-S-19500, and figure 1 herein.

3.3.1 Lead material and finish. Lead material shall be dumet wire. Lead finish shall be tin plated or solder plated. Where a choice of lead material or finish is desired, it shall be specified in the contract or purchase order (see 6.2).

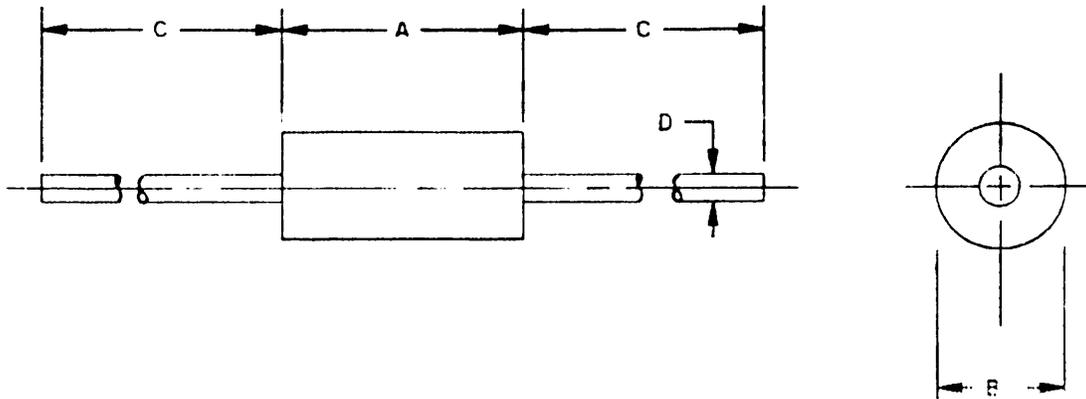
3.4 Marking. Marking shall be in accordance with MIL-S-19500, except at the option of the manufacturer, the following marking may be omitted from the body of the diode.

- A. Manufacturer's identification.
- B. Country of origin.
- C. The "1N" portion of the type designation.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-S-19500.



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
	A	.230	.300	5.84	
B	.085	.107	2.16	3.30	4
C	1.000	1.500	25.40	38.10	3
D	.019	.022	.46	.56	1,2,3

NOTES:

1. The specified lead diameter applies in the zone between .050 (1.27 mm) and 1.000 (25.40 mm) from the diode body. Outside of this zone the lead diameter is not controlled.
2. Gold plated, tinned, or solder plated leads may be supplied providing units conform to subgroups 2 and 4 of group B inspection and subgroup 1 of group C inspection.
3. Both leads shall be within the specified dimension.
4. The minimum body diameter shall be maintained over 0.15 (0.38 mm) of body length.
5. Metric equivalents are given for general information only.

FIGURE 1. Semiconductor device, diode, type 1N3287 (DO-7).

4.3 Screening (JANTX and JANTXV levels only). Screening shall be in accordance with MIL-S-19500 (table II), 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.

Measurements	
Screen (see table II of MIL-S-19500)	JANTX and JANTXV levels
3	$T_A$ = maximum rated storage temperature
10	Test condition C, $T_A$ at $55^\circ\text{C}$ , $t = 48$ hrs. minimum
11	$I_{R1}$ and $V_{F1}$
12	See 4.3.1
13	Subgroup 2 of table I herein; $\Delta I_{R1} = 100\%$ of initial reading or $5 \mu\text{A}$ whichever is greater, $\Delta V_{F1} = +10\%$ of initial value

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: All devices shall be operated at  $+25^\circ\text{C} \pm 3^\circ\text{C}$  under the following condition:

$I_F = 50$  mA dc  
See 4.5.3.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-S-19500, and table I herein. (End-point electrical measurements shall be in accordance with the applicable steps of table IV herein.)

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table IVb of MIL-S-19500, and table II herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table IV herein.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table V of MIL-S-19500, and table III herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table IV herein.

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

4.5.1 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/</u>	MIL-STD-750		JAN, JANTX, JANTXY	Symbol	Limits		Unit
	Method	Conditions			Min	Max	
<u>Subgroup 1</u>							
Visual and mechanical	2071						
<u>Subgroup 2</u>							
Forward voltage	4011	$I_F = 1 \text{ mA dc}$		V <sub>F1</sub>	0.208	0.312	V dc
Forward voltage	4011	$I_F = 100 \text{ mA dc}$		V <sub>F2</sub>		1.0	V dc
Reverse current	4016	$V_R = 2 \text{ V dc}$		I <sub>R1</sub>		10	$\mu\text{A dc}$
Reverse current	4016	$V_R = 6 \text{ V dc}$		I <sub>R2</sub>		30	$\mu\text{A dc}$
Dynamic resistance		$I_F = 1 \text{ mA dc}$ $I_{AC} = 0.1 \text{ mA (rms)}$ $f = 60 \text{ Hz}$		R <sub>D</sub>		60	ohms
<u>Subgroup 3</u>							
N/A							
<u>Subgroup 4</u>							
N/A							
<u>Subgroup 5</u>							
N/A							
<u>Subgroup 6</u>							
Surge current	4066	$I_0 = 50 \text{ mA dc}$ $i_f(\text{surge}) = .5 \text{ A, } t_p = 1/120 \text{ s}$ 10 surges at 1 per minute					
Electrical measurements		See table IV, steps 1, 2, 3, 4, 5					

1/ For sampling plan see MIL-S-19500.

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TABLE II Group B inspection for JAN, JANTX, and JANTXY.

Inspection <u>1/</u>	MIL-STD-750	
	Method	Conditions
<u>Subgroup 1</u>		
Solderability	2026	
Resistance to solvents	1022	
<u>Subgroup 2</u>		
Thermal shock (temperature cycling)	1051	Test condition A
Hermetic seal	1071	Test condition H
a. Fine leak b. Gross leak		Test condition E
Electrical measurements		See table IV, steps 1, 2, 3, 4, 5, and 4.5.2
<u>Subgroup 3</u>		
Steady-state operation life	1027	$I_F = 50 \text{ mA dc}$
Electrical measurements		See table IV, steps 1, 2, 5, 6, 7, and 4.5.2
<u>Subgroup 4</u>		
Decap internal visual (design verification)	2075	Visual criteria in accordance with qualified design
<u>Subgroup 5</u>		
Thermal resistance	4081	Qualification only
<u>Subgroup 6</u>		
High-temperature life (nonoperating)	1032	$T_A = +100^\circ\text{C}$ , $t = 340 \text{ hours}$
Electrical measurements		See table IV, steps 1, 2, 5, 6, 7, and 4.5.2

1/ For sampling plan see MIL-S-19500.

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TABLE III. Group C inspection (all quality levels).

Inspection <u>1/</u>	MIL-STD-750	
	Method	Conditions
<u>Subgroup 1</u>		
Physical dimensions	2066	See figure 1
<u>Subgroup 2</u>		
Thermal shock (glass strain <sup>1</sup> )	1056	Test condition A
Terminal strength	2036	Test condition A, 4 lb, $t = 15 \pm 3$ s
Hermetic seal	1071	
a. Fine leak		Test condition H
b. Gross leak		Test condition E
Moisture resistance	1021	
External visual	2071	
Electrical measurements		See table IV, steps 1, 2, 3, 4, 5, and 4.5.2
<u>Subgroup 3</u>		
Shock	2016	Nonoperating at 1500 g: $t = 0.5$ ms, 5 blows each orientation X, Y1, and Y2
Vibration, variable frequency	2056	
Constant acceleration	2066	Nonoperating: $g = 20,000$ min, 1 minute in each orientation X, Y1, and Y2
Electrical measurements		See table IV, steps 1, 2, 3, 4, 5, and 4.5.2
<u>Subgroup 4</u>		
Salt atmosphere (corrosion)	1041	
<u>Subgroup 5</u>		
N/A		
<u>Subgroup 6</u>		
Steady-state operation life	1026	$I_F = 50$ mA dc, $T_A$ at $25^\circ\text{C}$ $I_O = 50$ mA dc, $V_R$ at 80 V pk $t = 1,000$ hours
Electrical measurements		See table IV, steps 1, 2, 5, 6, 7, and 4.5.2

1/ For sampling plan see MIL-S-19500.

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TABLE IV. Groups A, B, and C electrical measurements.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage <sup>1/</sup>	4011	$I_F = 100 \text{ mA dc}$	$V_{F2}$		1.0	V dc
2.	Forward voltage <sup>1/</sup>	4011	$I_F = 1 \text{ mA dc}$	$V_{F1}$	0.208	0.312	V dc
3.	Reverse current	4016	$V_R = 2 \text{ V dc}$	$I_{R1}$		10	$\mu\text{A dc}$
4.	Reverse current	4016	$V_R = 6 \text{ V dc}$	$I_{R2}$		30	$\mu\text{A dc}$
5.	Dynamic resistance		$I_F = 1 \text{ mA dc}$ $I_{ac} = 0.1 \text{ mA (rms)}$ $f = 60 \text{ Hz}$	$R_D$		60	ohms
6.	Reverse current	4016	$V_R = 2 \text{ V dc}$	$I_{R3}$		15	$\mu\text{A dc}$
7.	Reverse current	4016	$V_R = 6 \text{ V dc}$	$I_{R4}$		40	$\mu\text{A dc}$

<sup>1/</sup> See 4.5.1.

4.5.2 Time limit for end-points. End-points for qualification and quality conformance inspection shall be completed within 96 hours after completion of the last test in the subgroup.

4.5.3 Power burn-in criteria. This test shall be conducted with a half-sine wave of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine wave form of the specified average rectified current. The forward conduction angle of the rectified current shall not be greater than 180° nor less than 130°, and the power shall be equal to or greater than that of a half-sine wave.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-S-19500.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Notes. The notes specified in MIL-S-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).
- c. Lead finish may be specified (see 3.3.1).

6.3 Substitution information. Devices covered by this specification are substitutable for the manufacturers' and users' Part or Identifying Number (PIN). This information in no way implies that manufacturers' PIN's are suitable as a substitute for the military PIN.

Military PIN	Manufacturers' CAGE code	Manufacturers' and users' PIN

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MIL-S-19500/205B

CONCLUDING MATERIAL

Custodians:

Army - EP  
Navy - EC  
Air Force - 11

User activity:

Navy - CG, MC

Preparing activity:

Navy - EC

Agent:

DLA - ES

(Project 5961-1161-2)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

**NOTE:** This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>I. RECOMMEND A CHANGE:</b>	1. DOCUMENT NUMBER MIL-S-19500/205B	2. DOCUMENT DATE (YYMMDD) 90/06/11
3. DOCUMENT TITLE Semiconductor Device, Diode, Germanium, Low Level, Forward-Voltage-Reference Type 1N3287, JAN, JANTX, and JANTXV		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
<b>6. SUBMITTER</b>		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	e. DATE SUBMITTED (YYMMDD)
<b>B. PREPARING ACTIVITY</b>		
a. NAME Mr. Alan Barone	b. TELEPHONE (Include Area Code) (1) Commercial (513) 296-6048 (2) AUTOVON 986-6048	
c. ADDRESS (Include Zip Code) Commander, Defense Electronics Supply Center Attn: DESC-ECT 1507 Wilmington Pike Dayton, OH 45444-5280	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	