

INCH-POUND

MIL-S-19500/201B
25 September 1989
~~SUPERSEDING~~
MIL-S-19500/201A
26 April 1962

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, GERMANIUM TYPE 1N277 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	V_{RM}	I_O 1/	I_F	$I_F(\text{surge})$
V(pk)	V(pk)	mA dc	mA	1/120 s
125	100	50	270	<u>a</u> 1

- 1/ Derate 0.77 mA dc/°C above $T_A = +25^\circ\text{C}$.
Operating ambient temperature: -65°C to $+75^\circ\text{C}$.
Storage temperature: -65°C to $+100^\circ\text{C}$.
Barometric pressure, reduced: 8 mmHg.

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-ES, 1507 Wilmington Pike, Dayton, OH 45444-5276, by using the self-addressed Standardization Document Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

FSC 5961

MIL-S-19500/2018

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

	V_F	V_{R1}	I_{R2}	I_{R3}	I_{R4}	I_R	I_R	V_F
	I_F = 5 mA dc	V_R = 10 V dc	V_R = 50 V dc	V_R = 100 V dc	V_R = 125 V pk	$V = 10 \text{ V dc}$	$V = 50 \text{ V dc}$	I_F = 100 mA dc
					AC method	$T_A = +75^{\circ}\text{C}$	$T_A = +75^{\circ}\text{C}$	
Min	0.3 V dc							
Max	0.5 V dc	10 $\mu\text{A dc}$	50 $\mu\text{A dc}$	400 $\mu\text{A dc}$	1.0 mA (pk)	75 $\mu\text{A dc}$	25 $\mu\text{A dc}$	1.0 V dc

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 specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be 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

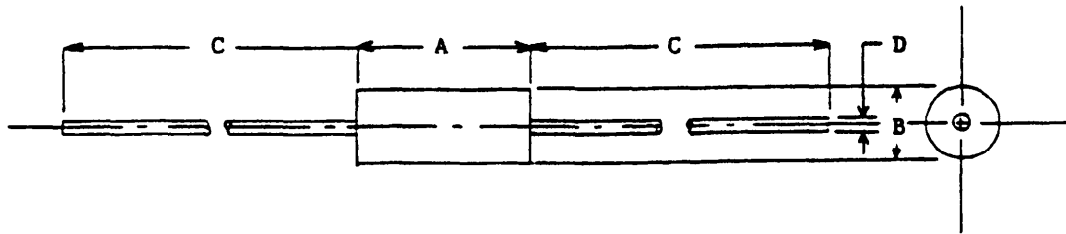
MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for associated detail specifications, specification sheets, or MS standards), the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

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



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.230	.300	5.84	7.62	4
B	.085	.130	2.16	3.30	
C	1.000	1.500	25.40	38.10	3
D	.018	.022	0.46	0.56	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 .15 (0.38 mm) of body length.
5. Metric equivalents are given for general information only.

FIGURE 1. Semiconductor device, diode, type 1N277 (DO-7).

MIL-S-19500/201B

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.

3.3.1 Lead material and finish. Lead finish 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 6.3).

3.4 Marking. Marking shall be in accordance with MIL-S-19500. 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.

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.

Screen (see table II of MIL-STD-19500)	Measurement
	JANTX and JANTXV levels
3	T_A = maximum rated storage temperature
10	Test condition C, T_A at 55°C, t = 48 hours minimum
11	I_{R1} and V_{F1}
12	See 4.3.1
13	Subgroup 2 of table I herein; ΔI_{R1} = 100 percent of initial reading or 5 μA whichever is greater. ΔV_{F1} = ± 10 percent of initial value.

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

Condition 1: See 4.5.3
 I_0 = 50 mA dc
 V_R = 100 V pk

Condition 2: I_F = 50 mA dc

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 IIb 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 measurement shall be as specified in section 4 of MIL-STD-750.

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 waveform of the specified average rectified current. The forward conduction angle of the rectified current shall be not greater than 180° nor less than 130° , and the power shall be equal to or greater than that of a half-sine waveform.

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 must 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 material and finish (see 3.3.1).

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Forward voltage	4011	$I_F = 5 \text{ mA dc}$ (see 4.5.1)	V_{F1}	0.3	0.5	V dc
Forward voltage	4011	$I_F = 100 \text{ mA dc}$ (see 4.5.1)	V_{F2}		1.0	V dc
Reverse current	4016	$V_R = 10 \text{ V dc}$	I_{R1}		10	$\mu\text{A dc}$
Reverse current	4016	$V_R = 50 \text{ V dc}$	I_{R2}		50	$\mu\text{A dc}$
Reverse current	4016	$V_R = 100 \text{ V dc}$	I_{R3}		400	$\mu\text{A dc}$
Peak reverse current at peak reverse voltage (ac method)	4016	$V_R = 125 \text{ V(pk)}$	i_r		1.0	mA(pk)
<u>Subgroup 3</u>		$T_A = +75^\circ\text{C}$				
Reverse current	4016	$V_R = 10 \text{ V dc}$	I_{R4}		75	$\mu\text{A dc}$
Reverse current	4016	$V_R = 50 \text{ V dc}$	I_{R5}		250	$\mu\text{A dc}$
<u>Subgroups 4 and 5</u>						
Not applicable						
<u>Subgroup 6</u>						
Surge current	4066	$I_0 = 50 \text{ mA dc};$ $i_f(\text{surge}) = 1.0;$ $t_p = 1/120 \text{ s};$ 10 surges at 1 per minute				
Electrical measurements		See table IV, steps 1, 2, 4, and 6				

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

TABLE IIb. Group B inspection for JAN, JANTX, and JANTXV.

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	
a. Fine leak		Test condition H
b. Gross leak		Test condition E
Electrical measurements		See table IV, steps 1, 2, 4, and 6
<u>Subgroup 3</u>		
Steady-state operation life	1027	$f = 60 \text{ Hz}$; $I_D = 50 \text{ mA dc}$; $V_R = 100 \text{ V(pk)}$; $t = 340 \text{ hours}$; $T_A = +25^\circ\text{C}$; see 4.5.3
Electrical measurements		See table IV, steps 1, 3, and 5
<u>Subgroup 4</u>		
Decap internal visual (design verification)	2075	Visual criteria in accordance with qualified design.
<u>Subgroup 5</u>		
Thermal resistance	4081	Qualifications 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, 3 and 5

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

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

Inspection <u>1/</u>	MIL-STD-750	
	Method	Conditions
<u>Subgroup 1</u>		
Physical dimensions	2066	
<u>Subgroup 2</u>		
Thermal shock (glass strain)	1056	Test condition A
Terminal strength	2036	Test condition A; 4 pounds; $t = 15 \pm 3$ 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, 4, and 6
<u>Subgroup 3</u>		
Shock	2016	Nonoperating at 1,500 g's; $t = 0.5$ ms; 5 blows each orientations X, Y, and Y ₂
Vibration, variable frequency	2056	
Constant acceleration	2006	Nonoperating at g's = 20,000 minimum, 1 minute in each orientation X ₁ , Y ₁ , and Y ₂
Electrical measurements		See table IV, steps 1, 2, 4, and 6
<u>Subgroup 4</u>		
Salt atmosphere (corrosion)	1041	
<u>Subgroup 5</u>		
Not applicable		
<u>Subgroup 6</u>		
Steady-state operation life	1026	$f = 60$ Hz; T_A at $+25^\circ\text{C}$; $I_0 = 50$ mA dc; V_R at 100 V pk; $t = 1,000$ hours; see 4.5.3
Electrical measurements		See table IV, steps 1, 3, and 5

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

TABLE IV. Groups A, B, and C electrical end-point measurements.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = 100 \text{ mA dc}$	V_{F2}		1.0	V dc
2.	Reverse current	4016	$V_R = 10 \text{ V dc}$	I_{R2}		10	$\mu\text{A dc}$
3.	Reverse current	4016	$V_R = 10 \text{ V dc}$	I_{R6}		15	$\mu\text{A dc}$
4.	Reverse current	4016	$V_R = 50 \text{ V dc}$	I_{R4}		50	$\mu\text{A dc}$
5.	Reverse current	4016	$V_R = 50 \text{ V dc}$	I_{R7}		75	$\mu\text{A dc}$
4.	Peak reverse current at peak reverse voltage	4016	$V_R = 125 \text{ V(pk)}$	i_r		1.0	mA(pk)

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.

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 17

Review activities:

Army - AR
Navy - SH
Air Force - 11, 85

User activities:

Army - MI, SM
Navy - AS, CG, MC, OS
Air Force - 19

Preparing activity:

Navy - EC

Agent:

DLA - ES

(Project 5961-1150)