INCH-POUND

MIL-S-19500/226B
11 JUNE 1990
SUPERSEDING
MIL-S-19500/226A
22 June 1966

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, GERMANIUM, SWITCHING TYPE 1N3666(1) 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_o	i_F	I_{FSM}
V (pk)	mA dc	ma	1/120 s
80	70	70	.25 A

Operating ambient temperature: -55°C to +100°C.
Storage temperature: -65°C to +100°C.
Barometric pressure, reduced: 8 mmHg.

1.4 Primary electrical characteristics. The diode should have salient characteristics at ambient temperature of +25° ±3°C, unless otherwise specified.

	V_F	I_S	V_{BR}	I_R
	I_F = 200 mA dc	V_R = 20 V dc	I_R = 500 mA dc	V_R = 20 V dc T_A = +70°C
Min.	0.5 V dc		80 V dc	
Max.	1.0 V dc	10 µa		150 µA 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.

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

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).

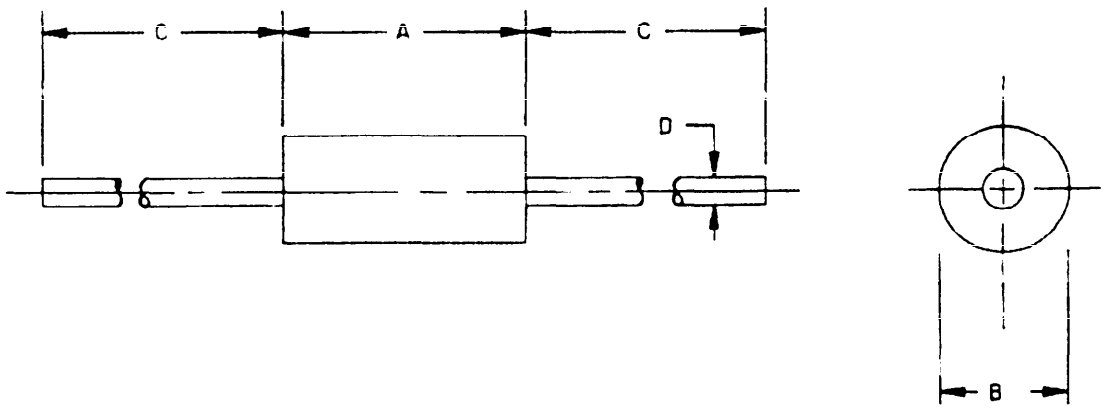
3.4 Marking. Marking shall be in accordance with MIL-S-19500, except at the option of the manufacturer, the following marking may be omitted from the body of the diode.

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	7.62	
B	.080	.125	2.16	3.30	4
C	1.000	1.500	25.40	38.10	3
D	.019	.021	.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 inpsection 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 1N3666(1) (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°C, t = 48 hrs. minimum
11	I_R and V_{F1}
12	See 4.3.1
13	Subgroup 2 of table I herein; ΔI_{R1} = 100% of initial reading or 5 μA whichever is greater, ΔV_{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°C ±3°C under one of the following conditions:

Condition 1: See 4.5.3
I_O = 70 mA dc
V_R = 50 V

Condition 2: See 4.5.3
I_F = 70 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 measurements shall be as specified in section 4 of MIL-STD-750.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750 Method	MIL-STD-750 Conditions	JAN, JANTX, JANTXV	Symbol	Limits Min	Limits Max	Unit
Subgroup 1							
Visual and mechanical	2071						
Subgroup 2							
Forward voltage	4011	I_F = 5 mA dc (see 4.5.1)		V_{F1}	0.3	0.4	V dc
Forward voltage	4011	I_F = 200 mA dc (see 4.5.1)		V_{F2}	0.5	1.0	V dc
Reverse current	4076	V_R = 20 V dc		I_{R1}		10	µA dc
Reverse current	4076	V_R = 50 V dc		I_{R2}		25	µA dc
Breakdown voltage	4021	I_R = 500 mA dc		B_V	80		V dc
Reverse current	4076	V_R = 20 V dc T_A at +70°C		I_3		150	µA dc
Subgroup 3							
Capacitance	4001	V_R = 10 V dc V_R = 1 V dc f = 1 MHz		C C		0.4 1.0	pF pF
Reverse recovery time	4031	I_F = 30 mA dc V_R = 10 V dc I_R = 0.5 mA dc R_L = 2,000Ω C_L = 10 pF		t_{rr}		0.3	µs
Forward recovery, see 4.5.4	4026	I_F = 10 mA dc		t_{fr}		.08	µs
Subgroup 4							
N/A							
Subgroup 5							
N/A							
Subgroup 6							
Surge current	4066	I_O = 70 mA dc $i_{f(surge)}$ = .25 A, t_p = 1/120 s 10(surges) at 1 per minute					
Electrical measurements		See table IV, steps 1, 2, and 3					

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

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

Inspection 1/	MIL-STD-750	
	Method	Conditions
Subgroup 1		
Solderability	2026	
Resistance to solvents	1022	
Subgroup 2		
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, 3, and 4.5.2
Subgroup 3		
Steady-state operation life	1027	f = 60 Hz, I_O = 70 mA dc, V_R = 50 V (pk) t = 340 hours, T_A = +25°C (see 4.5.3)
Electrical measurements		See table IV, steps 1, 2, 3, and 4.5.2
Subgroup 4		
Decap internal visual (design verification)	2075	Visual criteria in accordance with qualified design
Subgroup 5		Qualification only
Thermal resistance	4081	
Subgroup 6		
High-temperature life (nonoperating)	1032	T_A = +100°C, t = 340 hours
Electrical measurements		See table IV, steps 1, 2, 3, and 4.5.2

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

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

Inspection 1/	MIL-STD-750	
	Method	Conditions
Subgroup 1		
Physical dimensions	2066	See figure 1
Subgroup 2		
Thermal shock (glass strain)	1056	Test condition A
Terminal strength	2036	Test condition A, 4 lb, t = 15 ±3 s
Hermetic seal a. Fine leak b. Gross leak	1071	 Test condition H Test condition E
Moisture resistance	1021	
External visual	2071	
Electrical measurements		See table IV, steps 1, 2, 3, and 4.5.2
Subgroup 3		
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, and 4.5.2
Subgroup 4		
Salt atmosphere (corrosion)	1041	
Subgroup 5		
N/A		
Subgroup 6		
Steady-state operation life	1026	f = 60 Hz, T_A at 25°C I_O = 70 mA dc, V_R at 60 V_{pk} t = 1,000 hours (see 4.5.3)
Electrical measurements		See table IV, steps 1, 2, 3, and 4.5.2

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

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

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage 1/	4011	I_F = 200 mA dc	ΔV_F		0.2	V dc
2.	Reverse current	4076	V_R = 20 V dc	ΔI_{R1}		10	µA dc
3.	Capacitance	4001	V_R = 10 V dc	ΔC		0.1	pF

1/ 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 the 130°, and the power shall be equal to or greater than that of a half-sine wave.

4.5.4 Forward recovery time. In switching to the specified forward current, the voltage drop shall recover to 0.5 volt or less in the specified maximum time.

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.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 11

Review activities:
Army - AR
Air Force - 17, 85

User activities:
Army - SM
Navy - AS, CG, MC, OS
Air Force - 14, 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5961-1161-1)

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.
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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.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-S-19500/226B	2. DOCUMENT DATE (YYMMDD) 90/06/11

3. DOCUMENT TITLE
Semiconductor Device, Diode, Germanium, Switching Type 1N3666(1) 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

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

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c. ADDRESS (Include Zip Code) Commander, Defense Electronics Supply Center ATTN: DESC-ECT 1507 Wilmington Pike Dayton, OH 45444-5260	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	