MIL-S-19500/188A
9 October 1963
SUPERSEDING
MIL-S-19500/188
14 March 1961

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING,

TYPE JAN-1N251

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for a silicon semiconductor diode for use in switching circuitry.

1.2 Ratings.

	V_r	V_R	i_f	I_o (T_A = 25°C) 1/	i_f (surge 1 sec)	T_{op}	T_{stg}	Barometric pressure
	v	Vdc	ma	mAdc	ma	°C	°C	mm Hg
Minimum	---	---	---	---	---	-65	-65	15
Maximum	40	30	42	14	200	+100	+100	---

1/ T_A greater than 25°C, I_o will derate at 0.137 ma/°C.

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-750 - Test Methods for Semiconductor Devices.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General. Requirements for semiconductor diodes 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, and as follows:

V_{sig} . . . . . signal voltage, peak to peak value.

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

3.4 Performance characteristics. Performance characteristics shall be as specified in tables I, II, and III.

3.5 Marking. The following marking shall be placed on the device:

(a) "JAN" prefix. (Prefix 'J' may be used).
(b) Type designation.
(c) Polarity
(d) Qualification designation code (first letter 'C' may be omitted).
(e) Acceptance date and inspection lot identification.

3.5.1 The manufacturer, at his option, may include the following marking:

(a) Manufacturer's identification.
(b) Country of origin.

3.5.2 All the above marking, except polarity, shall be placed on the unit package.

4. QUALITY ASSURANCE PROVISIONS

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

4.2 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in tables I, II, and III.

4.3 Acceptance inspection. Acceptance inspection shall consist of groups A, B, and C.

4.3.1 Group A inspection. Group A inspection shall consist of the examinations and tests specified in table I.

4.3.2 Group B inspection. Group B inspection shall consist of the examinations and tests specified in table II.

4.3.3 Group C inspection. Group C inspection shall consist of the examinations and tests specified in table III.

4.3.4 Salt atmosphere (corrosion). The devices shall be examined for destructive corrosion and illegible marking.

4.4 Methods of examination and test. Methods of examination and test shall be as specified in tables I, II, and III, and as follows:

4.4.1 Inspection conditions. Unless otherwise specified herein, all inspections shall be made at an ambient temperature of 25°C.

4.4.2 Surge current. The specified I_O shall be applied to the semiconductor diode. This surge current shall be a square wave and its peak current shall be such that the total peak current shall equal 200 ma. One surge of 1-second duration shall be applied per minute for 480 surges (8 hours). On the following working day, 480 more surges shall be applied (8 hours). On the next working day, 240 more surges shall be applied (4 hours). This is a total of 1,200 surges (20 hours). At the option of the manufacturer, the 1,200 surges may be applied in a continuous 20-hour period.

4.4.3 Steady-state operation life. 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.

Table I. Group A Inspection.

Examination or test	MIL-STD-750		LTPD	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
Subgroup 1 Visual and mechanical examination	2071		10	2	---	---	---	---
Subgroup 2 Forward voltage	4011	I_F = 10 mAdc	5	4	V_F	---	1	Vdc
Reverse current	4016	V_R = 10 Vdc V_R = 30 Vdc			I_R	--- ---	0.10 100	uAdc uAdc
Capacitance	4001	V_R = 0 Vdc f = 1 Mc V_{sig} = 50 mv (max)			C	---	4.0	pf

Table I. Group A Inspection. (Cont'd).

Examination or test	MIL-STD-750		LTPD	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
Subgroup 2 (cont'd)								
Reverse current at peak reverse voltage	4016	v_R = 40 v (pk)			I_r	---	3	mAdc
Rectification efficiency	4041	Test cond. B; V_{in} = 2 Vac; R_L = 5000 ohms; C_L = 20 pf; f = 100 Mc			RE	35	---	%
Reverse recovery time	4031	Test cond. B; I_F = 10 mAdc I_R = 10 mAdc R_L = 100 ohms ± 2% C = 4 ± 1 pf			t_{rr}	---	30	nsec
High-temperature operation:		T_A = 100°C, min			---	---	---	---
Forward voltage	4011	I_F = 2 mAdc			V_F	---	1	Vdc
Reverse current	4016	V_R = 10 Vdc			I_R	---	10	uAdc

Table II Group B Inspection.

Examination or test	MIL-STD-750		LTPD	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
Subgroup 1			15	5				
Physical dimensions	2066				---	---	---	---
Subgroup 2			15	5				
Temperature cycling	1051	Test cond. B; T_A = -65 to +100°C			---	---	---	---
Moisture resistance 1/ 2/	1021				---	---	---	---
End points:								
Forward voltage	4011	I_F = 10 mAdc			V_F	---	1	Vdc
Reverse current	4016	V_R = 10 Vdc			I_R	---	0.15	uAdc
	4016	V_R = 30 Vdc			I_R	---	200	uAdc
Subgroup 3			15	5				
Shock	2016	v_R= 30v (pk) I_o = 14 mAdc 500 G, t = 1 msec; 3 blows each orientation X_1, Y_1, and Y_2			---	---	---	---
Vibration fatigue (nonoperating)	2046	10G			---	---	---	---
Vibration, variable frequency (operating)	2056	V_R = 30 Vdc 10G			---	---	---	---
Constant acceleration	2006	10,000G X_1, Y_1, and Y_2 orientations			---	---	---	---
End points: (Same as for subgroup 2)								

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

Examination or test	MIL-STD-750		LTPD	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
Subgroup 4 Surge current (see 4.5.2)	4066	I_o = 14 mAdc i_f(surge) = 200 ma	15	5	---	---	---	---
Terminal strength: Tension	2036	Test cond. A; 2 lbs t = 15 ± 3 sec			---	---	---	---
End points: (Same as for subgroup 2)								
Subgroup 5 2/ Salt atmosphere (corrosion)	1041		15	5	---	---	---	---
End points: (Same as for subgroup 2)								
Subgroup 6 Steady-state operation life (see 4.4.3)	1026	I_o = 14 mAdc min v_r = 30v (pk)	λ = 5	5	---	---	---	---
End points: Forward voltage	4011	I_F = 2 mAdc			V_F	---	1.1	Vdc
Reverse current	4016	V_R = 10 Vdc			I_R	---	0.4	uAdc
Reverse current	4016	V_R = 30 Vdc			I_R	---	200	uAdc
Subgroup 7 Storage life	---	500 hrs @ -65°C 500 hrs @ +100°C	λ = 5	5	---	---	---	---
End points: (Same as for subgroup 6)								

1/ Omit initial conditioning.
2/ Destructive test.

Table III. Group C Inspection.

Examination or test	MIL-STD-750		LTPD	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
Subgroup 1 1/ Barometric pressure, reduced (altitude operation)	1001	15 mm Hg t = 60 sec	15	5	---	---	---	---
Measurement during test: Reverse current	4016	V_R = 30 Vdc			I_R	---	100	uAdc

1/ This test shall be conducted on the initial lot and thereafter every six months.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall conform to Specification MIL-S-19500.

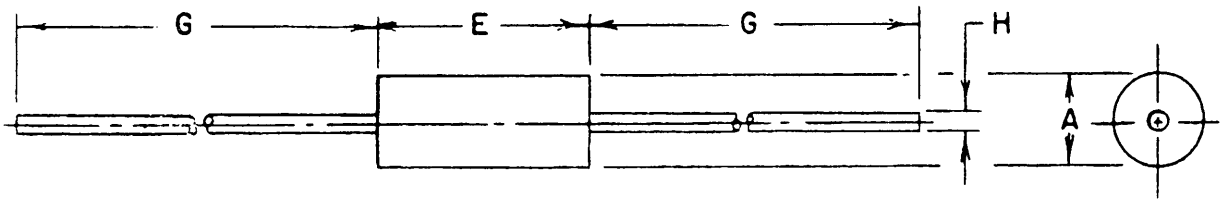
6. NOTES

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

Custodians:
Army - EI
Navy - Ships
Air Force - ASD

Preparing activity:
Navy - Ships

(Project 5960-1577)



REF	DIMENSIONS						
	INCHES			MILLIMETERS			NOTES
	MIN	NOM	MAX	MIN	NOM	MAX	
A	.075		.130	1.90		3.30	1 & 2
E	.195		.300	4.95		7.62	
G	1.000		1.500	25.40		38.10	
H	.019		.021	.48		.53	

NOTES:

1. The minimum case diameter shall be controlled over 50% of the body length and the maximum diameter shall not exceed the noted maximum diameter over the entire body length.

2. When a sleeve is used, the maximum diameter shall be 0.150; when no sleeve is used, the maximum diameter shall be 0.130.

Figure 1. *Semiconductor device, diode, type JAN-1N251.*