INCH-POUND

MIL-S-19500/282C
23 June 1992
SUPERSEDING
MIL-S-19500/282B
31 January 1973

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, SWITCHING
TYPE 1N4376
JAN AND JANTX

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 silicon, switching diodes. Two 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. T_A = 25°C.

V_R 1/	I_O	I_{FSM} tp = 1 sec	T_{op}	T_{STG}
V dc	mA dc	mA	C	C
10	50	150	-65 to +150	-65 to +200

1/ This voltage may be exceeded for normal measuring intervals (< 1 minute) provided the current is limited to a maximum of 5 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-EC, 1507 Wilmington Pike, Dayton, OH 45444-5276, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

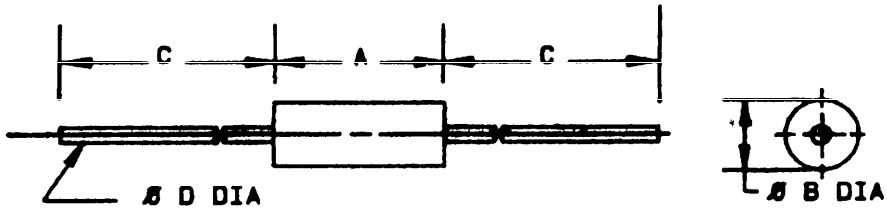
AMSC N/A FSC 5961

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

1.3 Primary electrical characteristics.

Limits	V_{F1} I_F = 50 mA dc	V_{F2} I_F = 20 mA dc	V_{F3} I_F = 10 mA dc	V_{F4} I_F = 1 mA dc	V_{F5} I_F = 0.1 mA dc	V_{F6} I_F = 0.01 mA dc	V_{BR} I_R = 5 µA dc
	V dc	V dc	V dc	V dc	V dc	V dc	V dc
Min	0.89	0.81	0.76	0.64	0.52	0.42	20
Max	1.1	0.95	0.88	0.74	0.61	0.50	---

Limits	I_{R1} V_R = 10 V dc	I_{R2} V_R = 10 V dc T_A = 150°C	t_{rr} $I_F = I_R$ = 10 mA dc, R_L = 100 ohms, Recover to 1 mA, Pulse rise time < = .25 ns, Detector rise time < = .1 ns	C V_R = 0 V dc, f = 1 MHz, V_{SIG} = 50 mV(p-p)
	nA dc	µA dc	ps	pF
Min	---	---	---	---
Max	100	100	750	1.0



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.230	.300	5.84	7.62	
ØB	.085	.107	2.16	2.72	5
C	1.000	1.500	25.40	38.10	
ØD	.018	.022	0.46	0.56	3, 4

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. The specified lead diameter applies in the zone between .050 (1.27 mm) and 1.000 (25.40 mm) from the body. Outside of this zone the lead diameter is not controlled.
4. Both leads shall be within the specified dimension.
5. The minimum body diameter shall be maintained over .15 (0.38 mm) inch of body length.

FIGURE 1. Physical dimensions for 1N4376.

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 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.

3.2 Abbreviations, symbols, and definitions. The 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 finish shall be solderable in accordance with MIL-S-19500, MIL-STD-750, and herein. Lead finish may be specified in the contract without affection the qualified status or the applicable JAN marking (see 6.4).

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 device but shall be retained on the initial container:

a. Country of origin.

b. Manufacturer's identification.

c. Lot identification code.

d. The "1N" portion of the type designation.

3.5 Polarity. The polarity shall be indicated with a contrasting color band to denote the cathode end. No color coding will be permitted.

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, and as specified herein.

4.3 Screening. 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-S-19500)	Measurements
	JANTX and JANTXV levels
9 and 10	Not required
11	V_{F2}, I_{R1}
12	See 4.3.1
13	Subgroup 2 of table I herein; delta V_{F2} = .25 mV of initial value. delta I_{R1} = 100% of initial value or 10 nA dc, whichever is greater.

4.3.1 Burn-in test. Power burn-in and steady-state operating life conditions. All devices shall be operating under one of the following conditions.

T_A = 25°C ±3°C
I_O = 50 mA
F = 60 Hz
V_R = 10 V(pk)

or

T_A = 25°C ±3°C
I_F = 75 mA

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500, and as specified herein.

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 IV (JAN and JANTXV) 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.

4.8 Methods of inspection. Methods of inspection shall be as specified in appropriate tables and as follows:

4.8.1 Life tests. This test shall be conducted with a half-sine waveform of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine waveform of the specified average rectifier current. The forward conduction angle of the rectified current shall not be greater than 180° nor less than 150°.

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 material and finish may be specified (see 3.3.1).

d. Product assurance level and type designator.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Forward voltage	4011	I_F = 50 mA	V_{F1}	.89	1.10	V dc
Forward voltage	4011	I_F = 20 mA	V_{F2}	.81	.95	V dc
Breakdown voltage	4021	I_R = 5 µA dc	V_{BR}	20		V dc
Reverse current	4016	DC method, V_R = 10 V dc	I_{R1}		100	nA dc
Forward voltage	4011	I_F = 10 mA	V_{F3}	.76	.88	V dc
Forward voltage	4011	I_F = 1 mA	V_{F4}	.64	.74	V dc
Forward voltage	4011	I_F = 0.1 mA	V_{F5}	.52	.61	V dc
Forward voltage	4011	I_F = 0.01 mA	V_{F6}	42	50	V dc
Subgroup 3						
High-temperature operation		T_A = +150°C				
Reverse current	4016	DC method V_R = 10 V dc	I_{R2}		100	µA dc
Subgroup 4						
Capacitance	4001	V_R = 0 V dc V_{SIG} = 50 mV(p-p) f = 1 MHz	C_{T1}		1.0	pF
Reverse recovery time	4031	Condition B C = 3 pF I_F = I_R = 10 mA dc R_L = 100Ω +5% I_{RR} = 1 mA dc t_r = .25 ns	t_{rr}		750	ps
Subgroup 5						
Not applicable						
Subgroup 6						
Not applicable						
Subgroup 7						
Not applicable						

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

TABLE II. Group B inspection.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection 1/	Small lot quality conformance inspection n/c 1/
	Method	Conditions		
Subgroup 1				
Solderability	2026			
Resistance to solvents	1022			
Subgroup 2				
Thermal shock (temperature cycling)	1051			
Hermetic seal Gross leak Fine leak	1071			
Electrical measurements		See table IV, steps 1 and 2		
Subgroup 3				
Steady-state operation life	1027	T_A = +25°C ±3°C V_{RWM} = rated V (pk) f = 60 Hz (see 4.8.1) I_O = 50 mA		
Electrical measurements		See table IV, steps 1, 3, and 4		
Subgroup 4				
Decap internal visual (design verification)	2075			
Subgroup 5				
Not applicable				
Subgroup 6				
High-temperature (nonoperating)	1032	T_A = +200°C		
Electrical measurements		See table IV, steps 1, 3, and 4		

1/ For sample plan numbers, see MIL-S-19500.

TABLE III. Group C inspection.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection 1/	Small lot quality conformance inspection n/c 1/
	Method	Conditions		
Subgroup 1				
Physical dimensions	2066	See figure 1		
Subgroup 2				
Thermal shock (glass strain)	1056			
Terminal strength 2/ (tension)	2036	Test condition A Weight = 4 lbs, t = 15 ±3 s		
Lead fatigue 2/		Test condition E		
Hermetic seal Gross leak Fine leak	1071			
Moisture resistance	1021			
Electrical measurements		See table IV, steps 1 and 2		
Subgroup 3				
Shock	2016			
Vibration, variable frequency	2056	Nonoperating		
Constant acceleration	2006			
Electrical measurements		See table IV, steps 1 and 2		
Subgroup 4				
Salt atmosphere (corrosion)	1041			
Subgroup 5				
Not applicable				

See footnotes at end of table.

TABLE III. Group C inspection.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection 1/	Small lot quality conformance inspection n/c 1/
	Method	Conditions		
Subgroup 6				
Steady-state operation life	1027	T_A = +25°C ±3°C V_{RWM} = rated V (pk) f = 60 Hz, (see 4.8.1) I_O = 50 mA		
Electrical measurements		See table IV, steps 1, 3, and 4		
Subgroup 7				
Not applicable				

1/ For sample plan numbers see MIL-S-19500.

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

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	I_F = 50 mA	V_{F1}	.89	1.10	V dc
2.	Reverse current	4016	DC method V_R = 10 V dc	I_{R1}		100	nA dc
3.	Reverse current	4016	DC method V_R = 10 V dc	I_{R2}		100	µA dc
4.	Capacitance	4001	V_R = 0 V dc V_{SIG} = 50 mV(p-p) f = 1 MHz	C_{T1}		1.0	pF

1/ Devices which exceed the group A limits for this test shall be rejected.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 17

Review activities:
Army - AR
Air Force = 70, 80, 85, 99

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

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5961-1293)