

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, FORWARD-VOLTAGE REGULATOR

TYPE 1N816

This specification is mandatory 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, forward-voltage regulator, with a nominal forward-voltage drop of 0.64 Vdc at 1 mAdc and with the following ratings and characteristics.

1.2 Ratings and characteristics:

v_f	$V_{RM}(wkg)$	$I_o \frac{1}{}$	$I_f(\text{surge})$ 1/120 sec
<u>v(pk)</u>	<u>v(pk)</u>	<u>mAdc</u>	<u>ma</u>
10	6	150	500

$\frac{1}{}$ Derate I_o linearly to 0.0 mAdc at 175° C

OPERATING AMBIENT TEMPERATURE: -65° C to +150° C

STORAGE TEMPERATURE: -65° C to +175° 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 the 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.

FSC 5960

(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 shall be in accordance with MIL-S-19500, and as specified herein.

3.2 Abbreviations and symbols. The abbreviations and symbols used herein are defined in MIL-S-19500.

3.3 Design and construction. The semiconductor diodes 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 and II.

3.5 Marking. The following marking specified in MIL-S-19500 may be omitted at the option of the manufacturer:

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

3.5.1 Polarity. The polarity shall be indicated with a contrasting color band to denote the cathode end.

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 consist of the examinations and tests specified in tables I and II.

4.3 Quality conformance inspection. Quality conformance inspection shall consist of the examinations and tests specified in groups A and B.

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

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

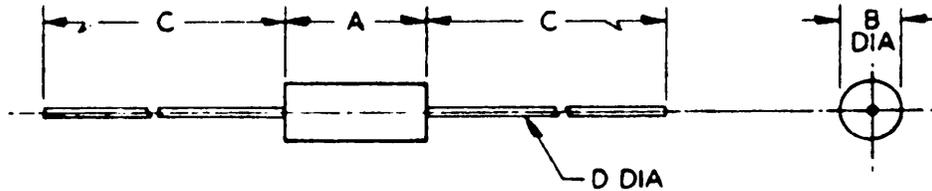
4.6 Methods of examination and test. Methods of examination and test shall be as specified in tables I and II, and as follows.

4.6.1 Steady state operation life. This test may be conducted with a half-sine wave form of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine wave form of the specified average rectifier 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.

4.6.2 End points, high-temperature life. The markings shall be legible after the test.

4.6.3 Delta reverse-current limits, post-life test. Maximum delta reverse current shall be determined from table III. Diodes shall be divided into cell groups or individually identified by initial reverse current readings prior to start of the life test. At the completion of the life test, the reverse current shall be re-measured. The diodes shall be considered a failure when: (a) I_R is greater than 100 nAdc, (b) I_R increased upward by 3 cells, or (c) I_R decreased downward by 2 cells or more.

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



LTR	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN	MAX	MIN	MAX	
A	.230	.300	5.84	7.62	
B	.092	.130	2.34	3.30	4
C	1.000	1.500	25.40	38.10	
D	.018	.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 or tinned leads may be supplied providing units conform to subgroups 2 and 4 of Group B inspection.
3. Both leads shall be within the specified dimension.
4. The minimum body diameter shall be maintained over .15 (.38mm) inch of body length.
5. See 3.5 for marking requirements.
6. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 1. Semiconductor device, diode, type 1N816.

4.6.5 Surge current i (surge). The surge current (i (surge) = 500 ma) shall be applied in the forward direction and shall be superimposed on the current ($I_0 = 150 \text{ mAdc}$) a total of ten surges at 1 minute intervals. Each individual surge shall be a 1-2 square wave pulse of 1-120 second duration or an equivalent 1/2 sine wave with the same effective (rms) current.

TABLE I. Group A inspection

Examination or test	MIL-STD-750		L T P D	Symbol	Limits		
	Method	Details			Min	Max	Unit
<u>Subgroup 1</u>			5				
Visual and mechanical examination	2071			---	---	---	---
<u>Subgroup 2</u>			5				
Forward voltage	4011	$I_F = 1.0 \text{ mAdc}$		V_F	0.576	0.704	Vdc
Forward voltage	4011	$I_F = 100 \text{ mAdc}$		V_F	---	1.0	Vdc
Dynamic resistance	---	$I_F = 1.0 \text{ mAdc};$ $I_{AC} = 0.1 \text{ mA(rms)};$ $f = 60 \text{ cps}$		R	---	50	ohms
Reverse current at peak reverse voltage	4016	$v_R = 10 \text{ v(pk)}$		i_R	---	10	$\mu\text{a(pk)}$
Reverse current	4016	$V_R = 6 \text{ Vdc}$		I_R	---	100	nAdc
Reverse current	4016	$V_R = 6 \text{ Vdc}$ $T_A = 150^{+5}_{-0} \text{ }^\circ\text{C}$		I_R	---	10	μAdc

TABLE II. Group B inspection

Examination or test	MIL-STD-750		L T P D	Symbol	Limits		
	Method	Details			Min	Max	Unit
<u>Subgroup 1</u>			10				
Physical dimensions	2066	(See figure 1)		---	---	---	---
<u>Subgroup 2</u>			10				
Solderability	2026	Immersion depth to within 9/10 inch of body		---	---	---	---
Thermal shock (temperature cycling)	1051	Test cond. F		---	---	---	---
Thermal shock (glass strain)	1056	Test cond. A		---	---	---	---
Tensile strength (lead)	2030	Test cond. A - lbs; t = 15 - 3 sec		---	---	---	---

TABLE II. Group B Inspection - Continued

Examination or test	MIL-STD-750		L T P D	Symbol	Limits		
	Method	Details			Min	Max	Unit
<u>Subgroup 2 - Continued</u>							
Moisture resistance	1021	Omit initial conditioning		---	---	---	---
End points: (See 4.6.4.)							
Forward voltage	4011	$I_F = 1.0 \text{ mAdc}$		V_F	0.576	0.704	Vdc
Forward voltage	4011	$I_F = 100 \text{ mAdc}$		V_F	---	1.0	Vdc
Reverse current	4016	$V_R = 6 \text{ Vdc}$		I_R	---	100	nAdc
Dynamic resistance	---	$I_F = 1.0 \text{ mAdc};$ $I_{AC} = 0.1 \text{ mA(rms)};$ $f = 60 \text{ cps}$		R	---	50	ohms
<u>Subgroup 3</u>							
10							
Shock	2016	Nonoperating; 1500 G; $t = 0.5 \text{ msec}; 5 \text{ blows in}$ each orientation: X_1 , Y_1 , and Y_2		---	---	---	---
Vibration fatigue	2046	Nonoperating; X_1 and Y_1 orientation		---	---	---	---
Vibration, variable frequency	2056	Nonoperating		---	---	---	---
Constant acceleration	2006	Nonoperating; 20,000 G; X_1 , Y_1 and Y_2 orientations		---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 4</u>							
10							
Terminal strength: Lead fatigue	2036	Test cond. E		---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 5</u>							
10							
Surge current (see 4.6.5)	4066			---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 6</u>							
10							
Salt atmosphere (corrosion)	1041			---	---	---	---
<u>Subgroup 7</u>							
A = 10							
High-temperature life (nonoperating) (see 4.6.2)	1031	$T_A = 175 \begin{smallmatrix} +5 \\ -0 \end{smallmatrix} ^\circ \text{C}$		---	---	---	---

TABLE II. Group B inspection - Continued

Examination or test	MIL-STD-750		L T P D	Symbol	Limits		
	Method	Details			Min	Max	Unit
<u>Subgroup 1 - Continued</u>							
End points: (See 4.6.4.)							
Forward voltage	4011	$I_F = 1.0 \text{ mAdc}$		V_F	0.576	0.704	Vdc
Forward voltage	4011	$I_F = 100 \text{ mAdc}$		V_F	---	1.0	Vdc
Reverse current (see 4.6.3)	4016	$V_R = 6 \text{ Vdc}$		ΔI_R	---	(See table III.)	nAdc
Dynamic resistance	---	$I_F = 1.0 \text{ mAdc};$ $I_{AC} = 0.1 \text{ mA(rms)};$ $f = 60 \text{ cps}$		R	---	50	ohms
<u>Subgroup 8</u>							
Steady state operation life (see 4.6.1)	1026	$I_0 = 150 \text{ mAdc}$	$\lambda = 5$	---	---	---	---
End points: (Same as subgroup 1)							

TABLE III. Delta reverse-current limits, post-life test.

Cell number	Initial value of I_R at $V_R = 6 \text{ Vdc}$ (nAdc)	Final value of I_R (nAdc) at $V_R = 6 \text{ Vdc}$						
		0 - 15	16 - 30	31 - 45	46 - 60	61 - 75	76 - 100	101 -
1	0 - 15	A	A	A	(R)	(R)	(R)	(R)
2	16 - 30	A	A	A	A	(R)	(R)	(R)
3	31 - 45	(R)	A	A	A	A	(R)	(R)
4	46 - 60	(R)	(R)	A	A	A	A	(R)
5	61 - 75	(R)	(R)	(R)	A	A	A	(R)
6	76 - 100	(R)	(R)	(R)	(R)	A	A	(R)

A = Accept (R) = Reject

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery. Preparation for delivery shall be in accordance with MIL-S-19500.

6. NOTES

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

6.2 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - EL
Navy - SH
Air Force - 11

Preparing activity:

Navy - SH

(Project 5960-2146)

Review activities:

Army - EL, MU
Navy - SH
Air Force - 11, 17, 85

User activities:

Army - EL, MI, SM
Navy - WP, MC, CG
Air Force - 14, 19