

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, MIXER
TYPES 1N1132 AND 1N1132R

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 a silicon semiconductor diode types 1N1132 (forward polarity) and 1N1132R (reverse polarity) for use as a mixer in the S-band through the X-band receiver. Ratings and characteristics as specified herein are applicable to both types.

1.2 Ratings and characteristics.

	$\bar{F}_0$	1/G	VSWR
	<u>db</u>	<u>ohms</u>	<u>ratio</u>
Minimum	---	100	---
Maximum	9.5	200	2.0

OPERATING AMBIENT TEMPERATURE: -65° to +70° C

STORAGE TEMPERATURE: -65° to +70° 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.

DRAWINGS

Defense Electronics Supply Center

B65017 - Assembly, Tri-polar Diode Holder.

C66054 - Burnout Test Adapter for Microwave Diode Type 1N26.

C66058 - Burnout Tester for Microwave Diodes 1N21B, 1N23B, 1N23C, 1N23CR, 1N26, 1N28, 1N53, and 1N78.

FSC 5961

(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 MIL-S-19500, and as specified herein.

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

e_o - - - - Open-circuit voltage of the pulse generator.
 F_i - - - - Average noise figure of IF amplifier.
 F_o - - - - Overall (receiver) average noise figure.
 $1/G$ - - - - IF conductance.
 L - - - - Conversion loss.
 N - - - - Output noise ratio (noise temperature ratio).
 R_G - - - - Internal resistance of the generator.
 R_R - - - - Reverse resistance.

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

3.3.1 Plating. The diode shall be plated as 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 specified in MIL-S-19500 may be omitted at the option of the manufacturer:

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

3.6 Burnout by single pulse. At the end of manufacturing processes and prior to selecting samples for testing, all diodes shall be subjected to 100 percent burnout by single pulse test, only once, and shall be performed in accordance with Method 4146 of MIL-STD-750 using Drawings B65017 (including shorting plug), C66054, and C66058 and $E = 90$ Vdc, minimum.

4. QUALITY ASSURANCE PROVISIONS

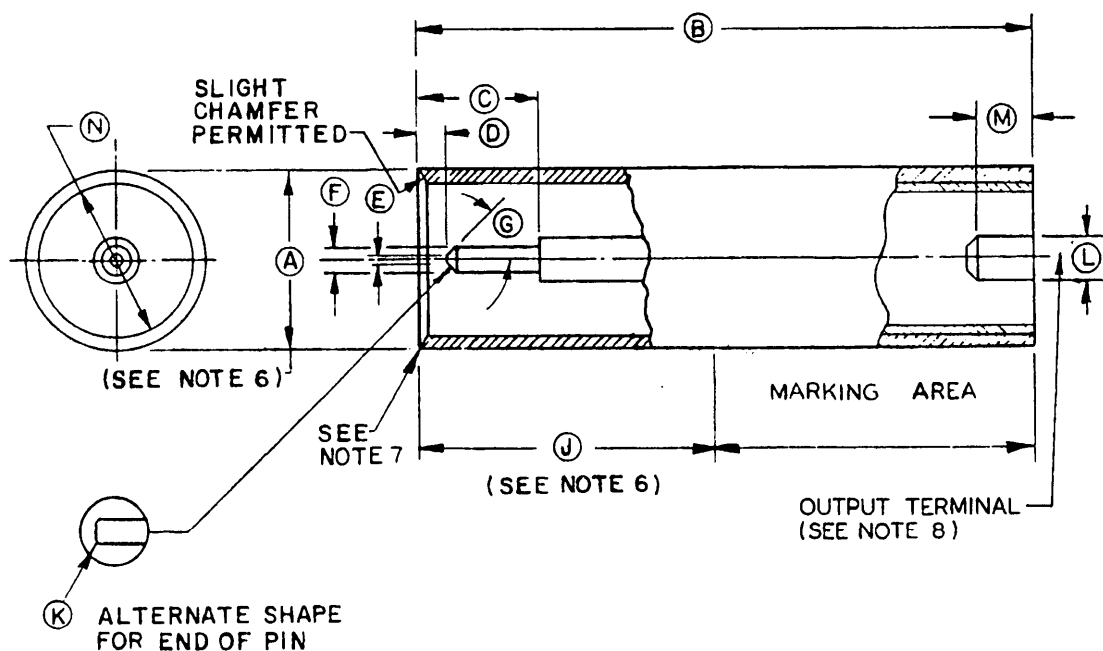
4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Test conditions. Unless otherwise specified herein, the test conditions, when applicable, shall be as follows:

$P = 1.0$ mW $\pm 5\%$
 $f = 6,750 \pm 5$ MHz
 $1/G = 150 \pm 10$ ohms; $\pm j0$ ohms
 $R_L = 100 \pm 1$ ohms
 $I_F = 0.75 \pm 0.5$ mAdc
 Drawings B65017, C66054, and C66058

4.2.1 The DC bias of 0.75 mAdc is established without the power applied.

4.3 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in tables I, II, and III. Qualification testing of either polarity is sufficient to obtain qualification approval of both polarities.



Ltr	Dimensions in inches with metric equivalents (mm) in parentheses (see note 2)	
	Minimum	Maximum
A	.215 (5.46)	.220 (5.59)
B	.734 (18.64)	.766 (19.46)
C	.147 (3.73)	— — —
D	.011 (.28)	.028 (.71)
E	.007 (.18)	.017 (.43)
F	.031 (.78)	.033 (.84)
G	42°	48°
J	.406 (10.31)	— — —
K	.007 (.18)	.017 (.43)
L	.071 (1.80)	.081 (2.06)
M	.048 (1.22)	.078 (1.98)
N	.179 (4.55)	.189 (4.80)

- NOTES:
1. All dimensions are in inches.
 2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
 3. Finish: .0002 inch (.005 mm) tin plate over nickel flash, or .0001 inch (.0025 mm) gold plate or .0001 inch (.0025 mm) silver plate.
 4. Axis of center conductor not to deviate from axis of outer conductor referred to its outside diameter more than .004 inch (.101 mm).
 5. Type 1N1132 (forward polarity) shall have the cathode connected to the center conductor (pin). Type 1N1132R (reverse polarity) shall have the anode connected to the center conductor (pin).
 6. Outside diameter, .215 inch (5.46 mm) to .220 inch (5.59 mm) applies for length of dimension J.
 7. This edge to be sharp and free from burrs.
 8. This end has a terminal insulated from the case which provides an RF bypass capacitance of approximately 7 μ fd.

FIGURE 1. Semiconductor device, diode, type 1N1132 and 1N1132R.

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

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

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

4.4.3 Group C inspection. Group C inspection shall consist of the examinations and tests specified in table III. This inspection shall be conducted on the initial lot, and thereafter every six months during production.

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

4.5.1 High-temperature operation. The semiconductor diode shall be placed in the holder (Dwg. B65017). The ambient temperature of the diode, with test conditions specified for the overall noise figure, shall be raised to $+ 70^{\circ}\text{C}$ and maintained at this temperature until equilibrium is reached. The $\bar{F}_O$ shall then be determined and shall be less than 11.5 db. The temperature shall then be returned to $25 \pm 3^{\circ}\text{C}$ at which time $\bar{F}_O$ shall be less than the specified limit.

4.5.2 Microwave parameters. The L, N, and $\bar{F}_O$ parameters may be determined by any suitable combination of measured parameters selected from among the following: L, N, $\bar{F}_i$ (actual), and $\bar{F}_O$ (actual). A measurement of either L or N, but not both, is required. $\bar{F}_O$ shall be determined for an assumed or actual intermediate-frequency noise figure ($\bar{F}_i$) of $1.5 \pm 0.25\text{ db}$.

4.5.3 Reverse resistance. The reverse resistance shall be measured using the circuit of figure 2.

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

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				
Voltage standing wave ratio	4136	Dwg. B65017; $f = 3,060 \pm 5\text{ MHz}$ $f = 6,750 \pm 5\text{ MHz}$ $f = 10,000 \pm 5\text{ MHz}$		VSWR VSWR VSWR	--- --- ---	2.0 2.0 2.0	--- --- ---
Overall noise figure (see 4.5.2)	4126	Test cond. A; $f = 6,750 \pm 5\text{ MHz}$		$\bar{F}_O$	---	9.5	db
IF conductance	4116	Dwg. B65017; $f = 6,750 \pm 5\text{ MHz}$		1/G	100	200	ohms
Reverse resistance (see 4.5.3)	---	(See figure 2)		R_R	100	---	Kohms

TABLE II. Group B inspection

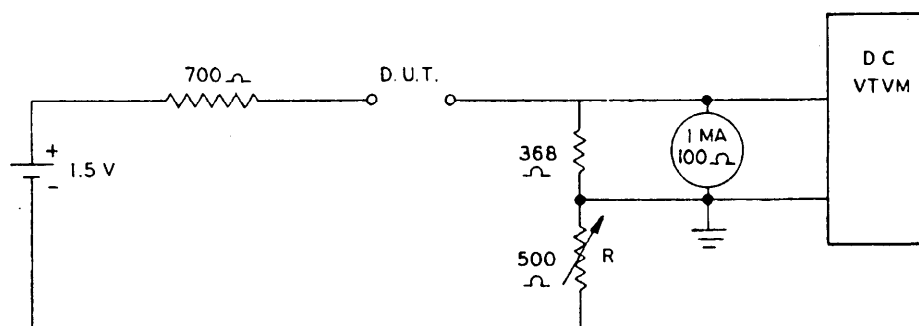
Examination or test	MIL-STD-750		L T P D	Symbol	Limits		
	Method	Details			Min	Max	Unit
<u>Subgroup 1</u>							
Physical dimensions	2066	(See figure 1)					
		Dim. A, C, L, M and N of Fig. 1.	7	---	---	---	---
		Dim. B, D, F and J of Fig. 1 (Dim. E, G, K and note 3 of Fig. 1 are for qualification only)	20	---	---	---	---
<u>Subgroup 2</u>							
Thermal shock (temperature cycling)	1051	Test cond. B; T(high) = + 70° C		---	---	---	---
Moisture resistance	1021	Omit initial conditioning		---	---	---	---
End points: (see 4.5.4)							
Overall noise figure (see 4.5.2)	4126	Test cond. A; f = 6,750 ± 5 MHz		$\overline{F}_O$	---	10.5	db
<u>Subgroup 3</u>							
Burnout by repetitive pulsing	4141	e _o = 5 v; R _G = 50 ohms; 60,000 pulses, min; t _p = 0.05 μsec; PRF optional		---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 4</u>							
Shock	2016	Nonoperating; 1500 G; t = 0.5 msec; 5 blows in each orientation: X ₁ , Y ₁ , and Y ₂		---	---	---	---
Vibration, variable frequency	2056	Nonoperating; 50 to 2,000 Hz		---	---	---	---
Constant acceleration	2006	Nonoperating; 10,000 G; X ₁ , Y ₁ , and Y ₂ orientations		---	---	---	---
End points: (Same as subgroup 2)							
<u>Subgroup 5</u>							
High-temperature operation: (see 4.5.1)		T _A = 70° C		---	---	---	---
Overall noise figure (see 4.5.2)	4126	Test cond. A; f = 6,750 ± 5 MHz $\overline{F}_i$ = 1.5 ± 0.25 db		$\overline{F}_O$	---	10.5	db

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 6</u> High-temperature life (nonoperating) End points: (Same as subgroup 2)	1031	$T_A = 70^\circ \text{C}$	$\lambda = 15$	---	---	---	---

TABLE III. Group C inspection

Examination or test	MIL-STD-750		L T P D	Symbol	Limits		
	Method	Details			Min	Max	Unit
<u>Subgroup 1</u> Overall noise figure (see 4.5.2)	4126	Test cond. A; $f = 3,060 \pm 5 \text{ MHz}$	20	$\overline{F}_O$	---	9.5	db
Overall noise figure (see 4.5.2)	4126	Test cond. A; $f = 10,000 \pm 5 \text{ MHz}$		$\overline{F}_O$	---	9.5	db



NOTES:

1. With short circuit in place of diode under test (D.U.T.) set R for full scale reading on 0-1 MA.
2. Using resistors in place of diode under test, of appropriate values for range being measured, read limits on 0-1 MA for values of 0-10 K ohms or on DC VTVM for values of 10 K to 1 megohm.

FIGURE 2. Forward and reverse resistance test circuit for 1N132 and 1N132R.

5. PREPARATION FOR DELIVERY

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

6. NOTES

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

Custodians:

Army - EL
Navy - SH
Air Force - 11

Preparing activity:

Air Force - 11

(Project 5961-0001-20)

Review activities:

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

User activities:

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