MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, VIDEO DETECTOR

TYPES 1N358A, 1N358AR, 1N358AM, AND 1N358AMR

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 coaxial tripolar silicon semiconductor diode types: 1N358A (forward polarity); 1N358AR (reverse polarity); 1N358AM (matched forward pair); and 1N358AMR (matched forward and reverse), for use as a broadband video detector from S- to X-band. Ratings and characteristics as specified herein are applicable to all types.

1.2 Ratings and characteristics.

	R_V	M
	ohms	db
Minimum	4500	30
Maximum	18000	--

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.

FSC 5960

DRAWINGS

Armed Services Electro-Standards Agency

108-JAN - Burnout Tester for Crystal Rectifier 1N21B, 1N23E. 1N23C, 1N23CR, 1N26, 1N28, 1N53, and 1N78.

Defense Electronics Supply Center

B65017 - Assembly, Tri-polar Crystal Holder

(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

R_V --- Video resistance

R_A --- Equivalent noise resistance

M --- Figure of merit

R_L --- Load resistance

TSS --- Tangential signal sensitivity

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 and II.

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

(a) Country of origin.

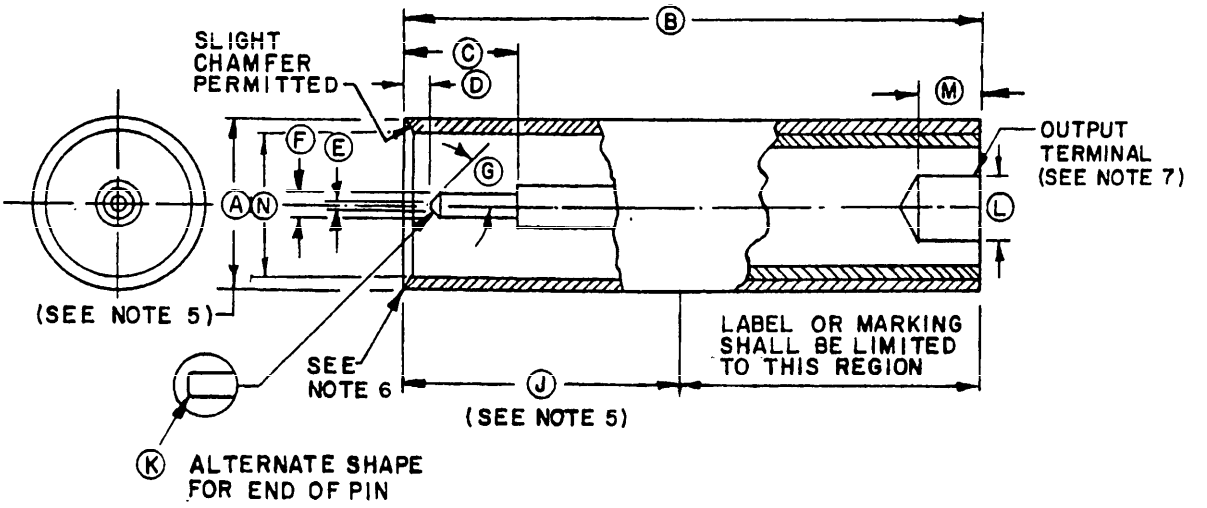
(b) Manufacturer's identification.

3.5.1 The 'M' suffix for matched diodes shall be omitted in the type designation on each device. Matched diodes meeting the requirements of this specification shall be packaged with a statement to that effect.

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 this test shall be performed in accordance with MIL-STD-750, Method 4146.

4. QUALITY ASSURANCE PROVISIONS

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



DIMENSIONS				
LTR	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.215	.220	5.46	5.59
B	.734	.766	18.64	19.46
C	.147		3.73	
D	.011	.028	.28	.71
E	.007	.017	.18	.43
F	.031	.033	.78	.84
G	42°	48°	42°	48°
J	.406		10.31	
K	.007	.017	.18	.43
L	.071	.081	1.80	2.06
M	.047	.081	1.18	2.03
N	.179	.189	4.55	4.80

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

FIGURE 1. Semiconductor device, diode, types 1N358A, 1N358AR, 1N358AM, and 1N358AMR.

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

P = 5 μW max.
f = 12.4 Gc ± 1%
R_L = 10,500 ohms

4.2.1 The diode holder specified in Drawing BC5017 or the equivalent, shall be used for all electrical test measurements.

4.3 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in tables I and II, except the matched pair requirements in subgroup 2, table I. Qualification testing of either polarity is sufficient to obtain qualification approval of both polarities.

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

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.

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

4.5.1 High-temperature operation. The semiconductor shall be placed in the test holder. With test conditions for figure of merit (M) as specified in table 1, subgroup 2, raise the ambient temperature to 70° C and maintain for at least 15 minutes and until thermal equilibrium has been reached. The figure of merit shall then be determined and shall be 24 minimum. The temperature shall then be returned to 25° C ± 3° C at which time the figure of merit shall be 30 minimum.

4.5.2 Matched pair, "M" suffix (forward polarity). The matched forward pair (M suffix) shall consist of two diodes, tested to requirements of subgroup 2, table I, having the cathode connected to the center conductor.

4.5.3 Matched pair, "MR" suffix (forward and reverse polarity). The matched forward and reverse pair (MR suffix) shall consist of two diodes, tested to requirements of subgroup 2, table I: one diode having the cathode connected to the center conductor (forward polarity) and the second diode having the anode connected to the center conductor (reverse polarity).

TABLE I. Group A inspection

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 1			7				
Visual and mechanical examination	2071			---	---	---	---
Video resistance	4131	DC method		R_V	4500	18000	ohms
Output voltage		P = 10 μW max; R_L = open circuit		E_O	30	---	mV
Figure of merit	4111			M	30	---	---

TABLE I. Group A inspection - Continued

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 2			7				
Matched pair requirements: (see 4.5.2 and 4.5.3)							
Video resistance	4131	DC method		ΔR_V	---	20	%
Figure of merit	4111	P = 5 μW max; f = 6.75 Gc R_A = 1200 ohms R_L = 10.5 K ohms		Δ M	---	20	%

TABLE II. Group B inspection.

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 1			7				
Physical dimensions	2066	Dim. A, C, D and F		---	---	---	---
		Dim. B and J, note 3 (Dim. E, G and K and note 2 are for qualification only, see fig. 1)	20	---	---	---	---
Subgroup 2			20				
Thermal shock (temperature cycling)	1051	Test cond F; $T_{(high)} = +70\ ^{+5°}_{-0}$ C		---	---	---	---
Immersion	1011	Test cond. A, 1 cycle; T = 40° C max.		---	---	---	---
End points:							
Video resistance	4131	DC method		R_V	4,000	20,000	ohms
Figure of merit	4111			M	30	---	---
Tangential signal sensitivity		Bandwidth = 7 mc; tp = 1.0 μsec					
TSS (1)		f_1 = 3 Gc		TSS(1)	45	---	-dbm
TSS (2)		f_2 = 6.75 Gc		TSS(2)	45	---	-dbm
TSS (3)		f_3 = 12.4 Gc		TSS(3)	45	---	-dbm
Subgroup 3			20				
Burnout by repetitive pulsing	4141	t = 1 minute; e_o = 1.5 v; R_g = 50 ohms; t_p = 1.0 μsec; PRF = 800 - 1200 pps		---	---	---	---

TABLE II. Group B inspection - Continued

Examination or test	MIL-STD-750		LTPD	Symbol	Limits		
	Method	Details			Min	Max	Unit
Subgroup 3 - Cont							
End points:							
(Same as for subgroup 2)							
Subgroup 4			20				
Shock	2016	Nonoperating; 500 G; t ≅ 0.5 msec; 5 blows in each orientation: X_1, Y_1, and Y_2		---	---	---	---
Vibration, variable frequency	2056	Nonoperating		---	---	---	---
Constant acceleration	2006	Nonoperating; 5000 G; X_1, Y_1, and Y_2 orientations		---	---	---	---
End points:							
(Same as for subgroup 2)							
Subgroup 5			20				
High-temperature operation (see 4.5.1)		$T_A = 70\ ^{+5}_{-0}$°C		M	24	---	---
End points:							
(Same as for subgroup 2)							
Subgroup 6			$\lambda = 20$				
High temperature life (nonoperating)	1031	$T_A = 70\ ^{+5}_{-0}$°C		---	---	---	---
End points:							
(Same as for subgroup 2)							

5. PREPARATION FOR DELIVERY

5.1 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.

Custodians:
Army - EL
Navy - SH
Air Force - 11

Preparing activity:
Navy - SH

(Project 5960-2093)

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

User activities:
Army - MI, SM
Navy - WP, MC, CG
Air Force - 14, 19