

MILITARY SPECIFICATION  
 SEMICONDUCTOR DEVICES, SILICON, HIGH VOLTAGE RECTIFIER  
 TYPES 1N1731A, 1N1733A, AND 1N1734A

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 silicon, semiconductor diodes for use in high-voltage rectifier circuits.

1.2 Absolute maximum ratings at +25°C

Type	$V_R$	$V_R$	$V_{RM}(wkg)$	$i_F$	$I_O \frac{1}{/}$	$i_r$ (surge) 1/120-sec; $T_A$ 100°C
	$v(pk)$	$Vdc$	$v(pk)$	$a$	$mAdc$	$a$
1N1731A	1800	1500	1500	1.05	350	6.0
1N1733A	3600	3000	3000	1.05	350	6.0
1N1734A	6000	5000	5000	1.05	350	6.0

1/ For ambient temperature above 25°C derate 2.0 mA/°C.

TEMPERATURE RANGE (OPERATING):  $T_A = -65^\circ C$  to  $+150^\circ C$

TEMPERATURE RANGE (NONOPERATING):  $T_A = -65^\circ C$  to  $+200^\circ C$

BAROMETRIC PRESSURE REDUCED (ALTITUDE OPERATION) 15 mm Hg., min.

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.

STANDARD

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.)

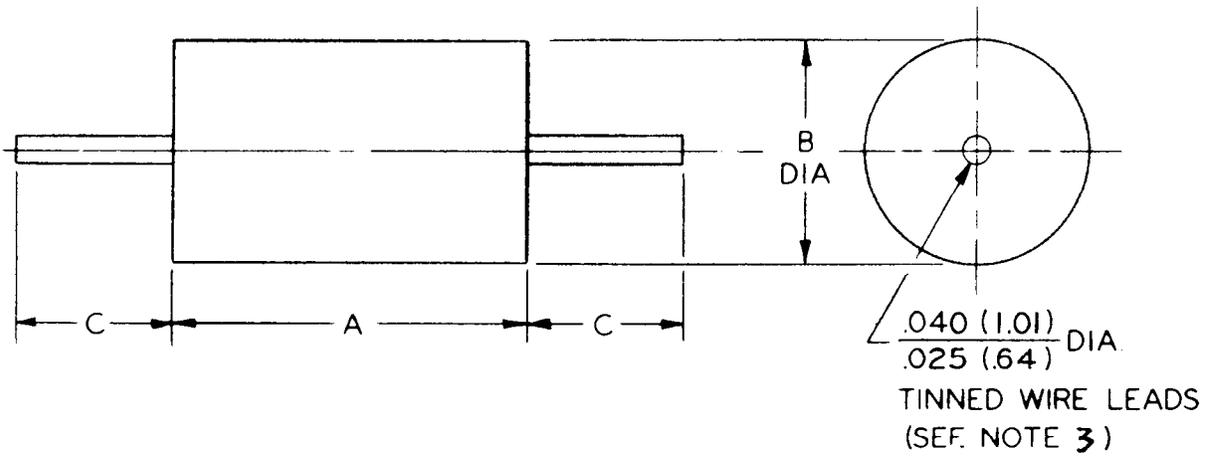
3. REQUIREMENTS

3.1 General. Requirements 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:

$V_{RM}(wkg)$ ----- Working peak reverse voltage (maximum peak total value)

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



TYPE	DIMENSIONS				
	LTR	INCHES		MILLIMETERS	
		MIN	MAX	MIN	MAX
1N1731A	A	.470	.530	11.94	13.46
	B	.345	.405	8.77	10.28
	C	1.250	1.375	31.75	34.92
1N1733A	A	.970	1.030	24.64	26.16
	B	.345	.405	8.77	10.28
	C	1.250	1.375	31.75	34.92
1N1734A	A	.970	1.030	24.64	26.16
	B	.345	.530	8.77	13.46
	C	1.250	1.375	31.75	34.92

NOTES:

1. Dimensions are in inches.
2. Metric dimensions are shown for general information only and are based upon 1 inch = 25.4 mm.
3. Gold plated leads may be substituted when specified in contract or order providing gold plated units conform to Table II Subgroup 5.

Figure 1. Semiconductor devices, diode, types 1N1731A, 1N1733A, 1N1734A.

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.
- (b) Qualification designating code.
- (c) Type designation.
- (d) Acceptance date and inspection lot identification.
- (e) Polarity marking (contrasting color band to indicate cathode end).
- (f) Graphic polarity symbol.

3.5.1 The manufacturer at his option may omit the following markings:

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

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

3.5.3 Salt spray (corrosion). The devices shall be examined for destructive corrosion and illegible marking.

#### 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, and shall be on a subplot basis.

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.

4.4 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 temperature ( $T_A$ ) of 25°C.

4.4.2 Duty cycle requirements. This test shall be conducted with a half-sine wave at 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.

4.4.3 Pulse technique. The pulse width and duty cycle shall be selected so that doubling or halving the pulse width shall produce a minimum change in measured value. This is done to avoid errors caused by device heating during measurement of static or dynamic parameters.

Table I. Group A inspection.

Examination or test	MIL-STD-750		L T P D	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
<u>Subgroup 1</u>			10	5				
Visual and mechanical examination	2071							
<u>Subgroup 2</u>			5	4				
Forward voltage	4011	Pulse (see 4.4.3)			$V_F$			
1N1731A		$I_F = 400 \text{ mA dc}$				0.8	3	vdc
1N1733A		$I_F = 400 \text{ mA dc}$				2.4	6	vdc
1N1734A		$I_F = 400 \text{ mA dc}$				4.0	8	vdc
Reverse current	4016				$I_R$			
1N1731A		$V_R = 1500 \text{ V dc}$				---	1	$\mu\text{A dc}$
1N1733A		$V_R = 3000 \text{ V dc}$				---	1	$\mu\text{A dc}$
1N1734A		$V_R = 5000 \text{ V dc}$				---	1	$\mu\text{A dc}$
Reverse current at peak reverse voltage	4016				$i_r$			
1N1731A		$v_r = 1800 \text{ v (peak)}$				---	100	$\mu\text{a (pk)}$
1N1733A		$v_r = 3600 \text{ v (peak)}$				---	100	$\mu\text{a (pk)}$
1N1734A		$v_r = 6000 \text{ v (peak)}$				---	100	$\mu\text{a (pk)}$
Reverse current <sup>1/</sup>	4016	$T_A = 150^\circ\text{C min}$			$I_R$			
1N1731A		$V_R = 1500 \text{ V dc}$				---	12	$\mu\text{A dc}$
1N1733A		$V_R = 3000 \text{ V dc}$				---	12	$\mu\text{A dc}$
1N1734A		$V_R = 5000 \text{ V dc}$				---	12	$\mu\text{A dc}$

<sup>1/</sup> Measurement shall be made after thermal equilibrium has been reached at the temperature specified.

Table II. Group B inspection.

Examination or test	MIL-STD-750		L T P D	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
<u>Subgroup 1</u>			10	5				
Physical dimensions	2006	See figure 1				---	---	---
<u>Subgroup 2</u> <sup>1/</sup>			10	5				
Solderability	2026					---	---	---
Temperature cycling	1051	Test cond. C; 10 cycles				---	---	---
Thermal shock (glass strain)	1056	Test cond. B				---	---	---
Moisture resistance	1021	Omit initial conditioning				---	---	---
End points:								
Forward voltage	4011	Pulse (see 4.4.3)			$V_F$			
1N1731A		$I_F = 400 \text{ mA dc}$				0.8	3	vdc
1N1733A		$I_F = 400 \text{ mA dc}$				2.4	6	vdc
1N1734A		$I_F = 400 \text{ mA dc}$				4.0	8	vdc
Reverse current	4016				$I_R$			
1N1731A		$V_R = 1500 \text{ V dc}$				---	2	$\mu\text{A dc}$
1N1733A		$V_R = 3000 \text{ V dc}$				---	2	$\mu\text{A dc}$
1N1734A		$V_R = 5000 \text{ V dc}$				---	2	$\mu\text{A dc}$

Table II. Group B inspection. - Continued.

Examination or test	MIL-STD-750		L T P D	Min Rej No.	Symbol	Limits		
	Method	Details				Min	Max	Unit
<u>Subgroup 3</u>								
Shock	2016	Nonoperating; 500 G peak; t = 1 msec 3 shocks each orientation X <sub>1</sub> , Y <sub>1</sub> ; total 6 shocks	10	5		---	---	---
Vibration fatigue	2046	Nonoperating; 10 G; orientations X <sub>1</sub> , Y <sub>1</sub> only				---	---	---
Vibration, variable frequency	2056	Nonoperating; 20 G; orientations X <sub>1</sub> , Y <sub>1</sub> only				---	---	---
Constant acceleration	2006	Nonoperating; 10,000 G each orientation X <sub>1</sub> , Y <sub>1</sub>				---	---	---
End points: (Same as subgroup 2, except I <sub>R</sub> = 1 uAdc max)								
<u>Subgroup 4</u> 1/								
Terminal strength (lead fatigue)	2036	Test cond E	10	5		---	---	---
End points: (Same as subgroup 2)								
<u>Subgroup 5</u> 1/								
Salt spray (corrosion)	1046	Test cond B; (see 3.5.3)	10	5		---	---	---
End points: (Same as subgroup 2)								
<u>Subgroup 6</u>								
Surge current	4066	T <sub>A</sub> = 100°C T <sub>en</sub> 1/120-sec surges; 1 surge/minute superim- posed on I <sub>o</sub> = 200 mAdc i <sub>f</sub> (surge) = 6a				---	---	---
End points: (Same as subgroup 2)								
<u>Subgroup 7</u> 2/								
Steady state operation life	1026	(See 4.4.2) f = 60 cps v <sub>r</sub> = 1500 v(peak) I <sub>o</sub> = 350 mAdc v <sub>r</sub> = 3000 v(peak) I <sub>o</sub> = 350 mAdc v <sub>r</sub> = 5000 v(peak) I <sub>o</sub> = 350 mAdc	λ = 10	5		---	---	---
1N1731A								
1N1733A								
1N1734A								
End points: (Same as subgroup 2)								

Table II. Group B inspection. - Continued.

Examination or test	MIL-STD-750		L T P D	Min Rej No.	Symbol	Limits	
	Method	Details				Min	Max
<u>Subgroup 8</u> High temperature life (nonoperating) End points: (Same as subgroup 2)	1031	$T_A = 200^\circ\text{C}$	$\lambda = 10$	5		---	--

<sup>1/</sup> Destructive test.

<sup>2/</sup> End point tests to be made at 340, 670 and 1000 hours.

Table III. Group C inspection.

Examination or test	MIL-STD-750		L T P D	Min Rej No.	Symbol	Li	
	Method	Details				Min	Ma
<u>Subgroup 1</u> <sup>1/</sup> Barometric pressure reduced (altitude operation)	1001	Pressure = 15 mm Hg $t = 60$ sec min.	10	?		---	---
Measurement during test Reverse current 1N1731A 1N1733A 1N1734A	4016	$V_R = 1500$ Vdc $V_R = 3000$ Vdc $V_R = 5000$ Vdc			$I_R$	---	2 2 2

<sup>1/</sup> This test shall be conducted during qualification and thereafter every six months.

#### 5. PREPARATION FOR DELIVERY

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

#### 6. NOTES

6.1 **Notes.** In addition to the note specified herein, the notes specified in Specification MIL-S-19500 are applicable to this specification.

#### Custodians:

Army - EL  
 Navy - Ships  
 Air Force - 11

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#### Reviewers:

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Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current DODISS.

#### Users:

Army - EL, MU, MI  
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