

The documentation and process conversion measures necessary to comply with this revision shall be completed by 18 Dec 92

INCH-POUND

MIL-S-19500/356D
19 June 1992
SUPERSEDING
MIL-S-19500/356C
8 July 1980

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, VOLTAGE REGULATOR
TYPES 1N4954 THROUGH 1N4996, 1N5968, 1N5969, AND 1N6632 THROUGH 1N6637,
1N4954US THROUGH 1N4996US, 1N5968US, 1N5969US, AND 1N6632US THROUGH 1N6637US
JANTX, JANTXV, JANS, AND JANC

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, voltage regulator diodes. Three levels of product assurance are provided for each device type as specified in MIL-S-19500, and one level of product assurance for die.

1.2 Physical dimensions. See figures 1, 2, and 3.

1.3 Maximum ratings. Maximum ratings are as shown in columns 4, 8, and 10 of table VI herein, and as follows:

$P_T = 5 \text{ W}$ at $T_L = 75^\circ\text{C}$, $L = 3/8$ inch (see figure 3 and 6.2), derate $50 \text{ mW}/^\circ\text{C}$ above $T_L = 75^\circ\text{C}$. 1/
 $P_T = 2.25 \text{ W}$ at $T_A = 25^\circ\text{C}$, derate $15 \text{ mW}/^\circ\text{C}$ above $T_A = 25^\circ\text{C}$.
 $-55^\circ\text{C} < T_{op} < +175^\circ\text{C}$ (ambient); $-65^\circ\text{C} < T_{STG} < +200^\circ\text{C}$ (ambient).
Barometric pressure reduced (high altitude operation): 8 mm Hg.

1.4 Primary electrical characteristics. Primary electrical characteristics are as shown in columns 2, 12, and 14 of table VI herein, and as follows:

$R_{\theta JL} = 20^\circ\text{C}/\text{W}$ (max) at $L = 3/8$ inch 1/
 $R_{\theta JEC} = 7^\circ\text{C}/\text{W}$ (max) (surface mount)
 $3.3 \text{ V dc} \leq V_Z \leq 390 \text{ V dc}$

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

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MIL-S-19500 - Semiconductor Devices, General Specification for.

1/ Does not apply to surface mount devices.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may of be use in improving this document should be addressed to: Commander, Defense Electronics Supply Center, DESC-ECT, 1507 Wilmington Pike, Dayton, OH 45444-5270, 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.

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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.)

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 are defined in MIL-S-19500, and as follows:

3.2.1 Symbols.

- US - - - - - Surface mount device (square end cap).
- T_{EC} - - - - - Temperature, end cap.

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-S-19500, and figures 1, 2, and 3 herein.

3.3.1 Construction. Devices shall metallurgically bonded-thermally matched-noncavity-double plug construction in accordance with MIL-S-19500, 3.3.1.1, and 3.3.1.2 herein. The "US" version shall be structurally identical to the axial lead type except for lead attachment.

3.3.1.1 Diodes with V_z ≥ 6.8 V dc. Diodes with V_z ≥ 6.8 V dc shall utilize category I metallurgical bonds (see MIL-S-19500).

3.3.1.2 Diodes with V_z < 6.8 V dc. Diodes with V_z < 6.8 V dc shall utilize category I or category III metallurgical bonds (see MIL-S-19500).

3.4 Marking. Marking shall be in accordance with MIL-S-19500. It is permissible to have the type designation on more than one line. At the option of the manufacturer, the following marking may be omitted:

- a. Country of origin.
- b. Manufacturer's identification.
- c. Lot identification code.
- d. "1N" portion of the type designation.

3.4.1 Marking of US version. For US version only, all marking (except see 3.5 below) may be omitted from the body, but shall be retained on the initial container.

3.5 Polarity. The polarity of all types shall be indicated with a contrasting color band to denote the cathode end. Alternatively, for U suffix devices, a minimum of three contrasting color dots spaced around the periphery on the cathode end may be used.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500 and as specified herein. Lot accumulation period shall be 6 months in lieu of 6 weeks. This applies to TX and TXV quality levels only.

4.2 Screening (all levels). Screening shall be in accordance with MIL-S-19500 (table II), and as specified herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table II of MIL-S-19500)	Measurements	
	JANS Level	JANTX and JANTXV Levels
1/	Thermal impedance, see 4.5.2	Thermal impedance, see 4.5.2
7	Hermetic seal, gross leak	Hermetic seal, gross leak
9	I_{R1} and V_Z	Not applicable
11	I_{R1} and V_Z ; ΔI_{R1} = 100% of initial reading or 250 nA, whichever is greater; ΔV_Z = $\pm 2.5\%$ of initial reading	I_{R1} and V_Z
12	See 4.2.2	See 4.2.2
13	Subgroups 2 and 3 of table I herein; ΔI_{R1} = 100% of initial reading or 250 nA, whichever is greater; ΔV_Z = $\pm 2.5\%$ of initial reading	Subgroup 2 of table I herein; ΔI_{R1} = 100% of initial reading or 250 nA, whichever is greater; ΔV_Z = $\pm 2.5\%$ of initial reading

1/ Shall be performed anytime after screen 3.

4.2.1 Screening (JANC). Screening of JANC die shall be in accordance with MIL-S-19500, appendix H. As a minimum, die shall be 100 percent probed in accordance with group A, subgroup 2.

4.2.2 Power burn-in conditions. Power burn-in conditions are as follows:

$$I_Z \geq 25\% \text{ of column 8 } (I_{ZM}) \text{ of table VI.}$$

The test current (I_Z) shall be adjusted to achieve a junction temperature of $T_J = +175 (+25, -30)^\circ\text{C}$. The diode shall be suspended in a free air ambient temperature equal to or greater than 25°C and equal to or less than 100°C . The mounting clips for leaded devices shall be a minimum of $3/8$ " from the device body; for "US" devices, the mounting clips shall contact the endcaps with $T_A = 125^\circ$ maximum.

$$T_J = P_T (R_{\theta JL}) + T_L \text{ or } T_J = P_T (R_{\theta J\text{endcap}}) + T_{\text{endcap}} \text{ ("US" devices)}$$

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4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-S-19500 and as specified herein.

4.3.1 Group E inspection. Group E inspection shall be conducted in accordance with MIL-S-19500 and group E inspection in table IV herein.

4.3.2 JANC devices. Qualification for JANC devices shall be via appendix H of MIL-S-19500.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500, and as specified herein. Group A inspection shall be performed on each subplot.

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 V herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table IVa (JANS) and table IVb (JANTX and JANTXV) of MIL-S-19500, and tables IIa and IIb herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table V 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 V herein.

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

4.5.1 Pulse measurements. Conditions for pulse measurements shall be as specified in section 4 of MIL-STD-750, unless otherwise specified herein.

4.5.2 Thermal impedance ($Z_{\theta JX}$ measurements). The $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750C, method 3101. Read and record data ($Z_{\theta JX}$) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum). Twenty-two of these samples shall be serialized and they shall be provided to the qualifying activity for test correlation prior to implementation date on this specification or prior to shipments as applicable.

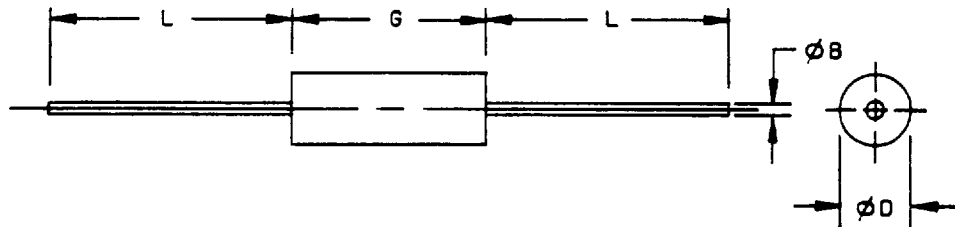
- a. I_H measurement current. 1 mA.
- b. I_H forward heating current. 40 A.
- c. t_H heating time 10 ms.
- d. t_{MD} measurement delay time. 100 μ s.

The maximum limit for $Z_{\theta JX}$ under these test conditions are $Z_{\theta JX(max)} = 1.5^\circ\text{C/W}$.

4.5.3 Regulator voltage (V_2). Regulator voltage shall be measured in accordance with MIL-STD-750C, method 4022, except that the test shall be performed by the pulse method with $t_p = 0.2$ to 300 ms. The thermal equilibrium requirement does not apply.

4.5.4 Voltage regulation (V_2 (reg)). The breakdown voltage shall be measured at $I_2 = 10\%$ of column 8 of table VI and at $I_2 = 50\%$ of column 8 of table VI. The difference between these voltages shall then be determined and shall not exceed column 9 of table VI. The voltage measurement at $I_2 = 10\%$ of column 5 of table VI shall be a pulse measurement in accordance with 4.5.1. The measurement at $I_2 = 50\%$ of column 8 of table VI shall be made after current has been applied for 30 ± 3 seconds. For this time interval, the device shall be suspended in free air by its leads with mounting clips with inside edge 0.375 to 0.50 inch from the body, and the point of connection shall be maintained at a temperature of $25 (+8, -2)^\circ\text{C}$. No forced air across the device shall be permitted. The ΔV_2 measurement may be performed after a shorter time interval following application of the test current if correlation can be established to the satisfaction of the Government.

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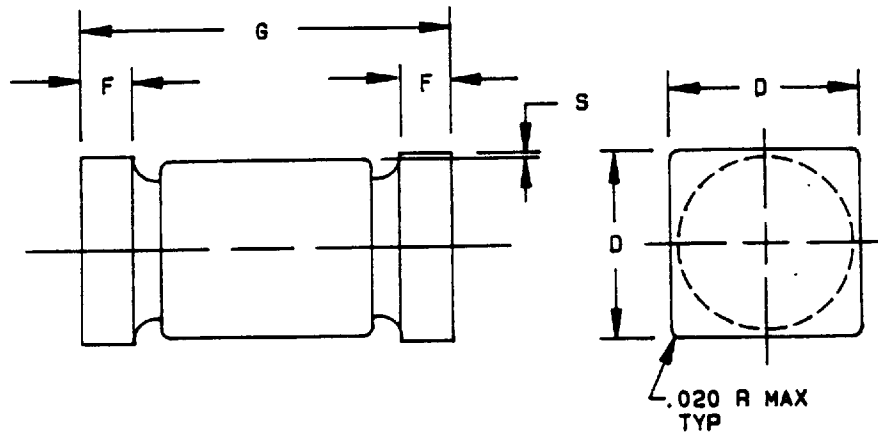
Dimensions					
Ltr	Inches		Millimeters		Notes
	Min	Max	Min	Max	
G	.140	.300	3.56	7.62	3
ØD	.090	.145	2.29	3.68	3
L	.900	1.500	22.86	38.10	
ØB	.036	.045	0.91	1.14	

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensions G and ØD include all components of the diode periphery except the sections of leads over which the diameter is controlled.

FIGURE 1. Semiconductor device, diode, silicon, voltage regulator, types 1N4954 through 1N4996, 1N5968, 1N5969, and 1N6632 through 1N6637.

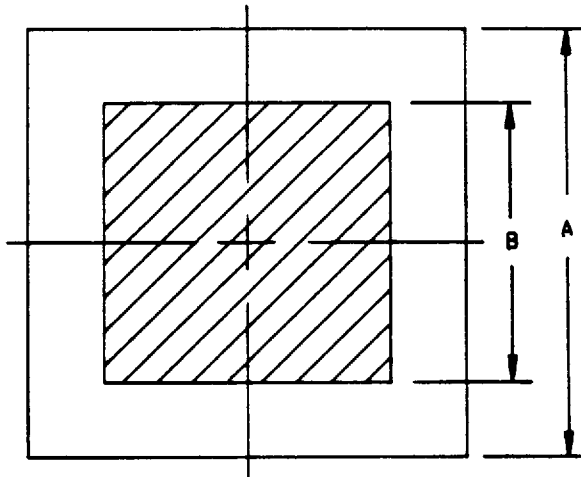
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Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
G	.200	.225	5.08	5.72
F	.019	.028	0.48	0.71
S	.003	---	0.08	---
D	.137	.148	3.48	3.76

FIGURE 2. Physical dimensions (surface mount devices).

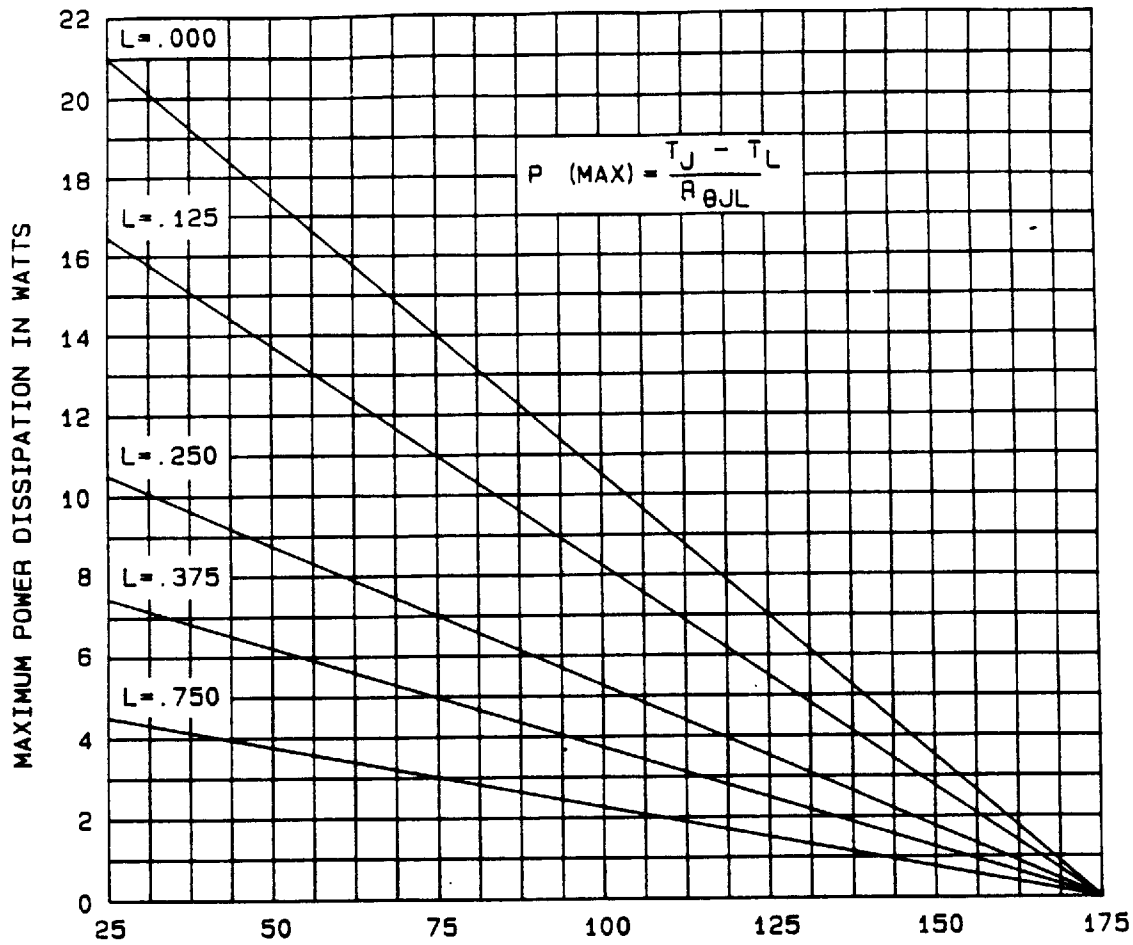
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Type	Dim A	Dim B
1N4954-1N4971	.063 SQ	.058 SQ
1N4972-1N4996	.065 SQ	.058 SQ

FIGURE 3. Physical dimensions (die).

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Maximum lead temperature in °C (T_L) at point "L" from body (for maximum operating junction temperature of 175°C with equal two-lead conditions).

L (see note 3)		R _{θJL}
Inches	mm	°C/W
.000	0.00	7
.125	3.18	9
.250	6.35	14
.375	9.52	20
.750	19.05	34

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Lead distance point L and thermal resistance data.
4. Includes surface mount devices.

FIGURE 4. Maximum power in watts versus lead temperature.

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TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance	3101	See 4.5.2	$Z_{\theta JX}$		1.5	°C/W
Forward voltage	4011	$I_F = 1 \text{ A dc}$	V_F		1.5	V dc
Reverse current	4016	DC method; $V_R =$ column 11 of table VI	I_{R1}		Column 12 of table VI	$\mu\text{A dc}$
Regulator voltage (pulsed) (see 4.5.1)	4022	$I_Z =$ column 5 of table VI; $0.2 \text{ ms} \leq t_p \leq 300 \text{ ms}$	V_Z	Column 3 of table VI	Column 4 of table VI	V dc
<u>Subgroup 3</u>						
High-temperature operation		$T_A = 150^\circ\text{C}$				
Reverse current	4016	DC method; $V_R =$ column 11 of table VI; pulsed (see 4.5.1)	I_{R2}		Column 15 of table VI	$\mu\text{A dc}$
<u>Subgroup 4</u>						
Small-signal reverse breakdown impedance	4051	$I_Z =$ column 5 of table VI $I_{\text{sig}} = 10\%$ of I_Z $I_{\text{sig}} = 0.5 \text{ mA dc}$ (1N5968 only)	Z_Z		Column 6 of table VI	ohms
Knee impedance	4051	$I_{ZK} =$ column 16 of table VI; $I_{\text{sig}} = 10\%$ of I_{ZK}	Z_{ZK}		Column 7 of table VI	ohms
<u>Subgroup 5</u>						
(Not applicable)						

See footnotes at end of table.

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TABLE I. Group A inspection - Continued.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u>		JANS level only				
Surge current	4066	I_{ZSM} = column 10 of table VI, 5 surges, 1 per minute, 1/120 second duration superimposed on I_2 = column 5 of table VI	I_{ZSM}			
End-point electrical measurements		See table V, steps 1, 4, and 5				
<u>Subgroup 7</u>						
(Not applicable)						
<u>Subgroup 8</u>						
Voltage regulation (see 4.5.4)		I_2 = 10 μ to 50 μ of column 8 of table VI	V_2 (reg)		Column 9 of table VI	V dc
Temperature coefficient of regulator voltage	4071	JANS level only I_2 = column 5 of table VI T_1 = 25 \pm 5C; T_2 = 120°C \leq T_2 \leq 130°C	αV_2		Column 14 of table VI	%/°C

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

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TABLE IIa. Group B inspection for JANS devices.

Inspection <u>1/</u>	MIL-STD-750	
	Method	Conditions
<u>Subgroup 1</u>		
Physical dimensions	2066	See figures 1, 2, and 3.
<u>Subgroup 2</u>		
Solderability	2026	Immersion depth to within 0.10 inch (0.3 mm) of body.
Resistance to solvents	1022	
<u>Subgroup 3</u>		
Thermal shock (liquid to liquid)	1051	25 cycles, condition A
Hermetic seal (gross leak) <u>2/</u>	1071	Test condition E
Electrical measurements		See table V, steps 1, 3, 4, 5, and 6
Decap internal visual (design verification)	2075	
<u>Subgroup 4</u>		
Intermittent operating life <u>3/</u>	1037	$I_2 = 40\%$ of column B of table VI; $L = 3/8$ inch, $t_{on} = t_{off} = 3$ minutes minimum for 2000 cycles. No heat sink or forced air cooling on the devices shall be permitted (see 3.2.2).
Electrical measurements		See table V, steps 1, 3, 4, 5, and 6
<u>Subgroup 5</u>		
Accelerated steady state operation life <u>3/</u>	1027	$I_2 = 40\%$ of column B of table VI for 96 $T_A = 125^\circ\text{C}$ or adjusted as required, to give an average lot $T_J = 275^\circ\text{C}$
Electrical measurements		See table V, steps 2, 3, 4, 5, and 6

See footnotes at end of table.

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TABLE IIa. Group B inspection for JANS devices - Continued.

Inspection <u>1/</u>	MIL-STD-750	
	Method	Conditions
<u>Subgroup 6</u>		
Thermal resistance	4081	$R_{\theta JEC} = 7^{\circ}\text{C/W}$ (surface mount), $R_{\theta JL} = 20^{\circ}\text{C/W}$ (max) at $L = 3/8"$; reference temperature (T_R) point at $L = 3/8"$; $L = 0$ (surface mount devices); $+25^{\circ}\text{C}$ $< T_R < +35^{\circ}\text{C}$; mtg arrangement, see 3.2.3
	or	
	3101	$R_{\theta JC} = 42^{\circ}\text{C/W}$ maximum; $R_{\theta JEC} = 20^{\circ}\text{C/W}$; $+25^{\circ}\text{C} < T_R < +35^{\circ}\text{C}$; reference temperature measuring point is the inside of the mounting clip. Mounting conditions shall be in accordance with 4.2.2.

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

2/ For non-transparent devices, hermetic seal shall be performed after electrical measurements.

3/ Leaded samples from the same lot may be used in lieu of the U suffix sample life test.

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TABLE IIb. Group B inspection for JANTX and JANTXV devices.

Inspection <u>1/</u>	MIL-STD-750	
	Method	Conditions
<u>Subgroup 1</u>		
Solderability	2026	
Resistance to solvents	1022	
<u>Subgroup 2</u>		
Thermal shock (liquid to liquid)	1056	
Surge current	4066	I_{ZSM} = column 10 of table VI, 5 surges, 1 per minute, 1/120 second duration superimposed on I_z = column 5 of table VI (mtg conditions to be as specified in MIL-STD-750, method 1026)
Hermetic seal (gross leak) <u>2/</u>	1071	Test condition E
Electrical measurements		See table V, steps 1, 4, and 5
<u>Subgroup 3</u> <u>3/</u>		
Steady-state operation life	1027	See 4.2.2
Electrical measurements		See table V, steps 2, 3, and 4
<u>Subgroup 4</u>		
Decap internal visual (design verification)	2075	
<u>Subgroup 5</u>		
Not applicable		
<u>Subgroup 6</u>		
High-temperature life (nonoperating)	1032	$T_A = 200^\circ\text{C}$
Electrical measurements		See table V, steps 2, 3, and 4

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

2/ For non-transparent devices, hermetic seal shall be performed after electrical measurements.

3/ Leaded samples from the same lot may be substituted for "US" devices.

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TABLE III. Group C inspection (all quality levels).

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Physical dimensions	2066	See figures 1, 2, and 3				
<u>Subgroup 2</u>						
Thermal shock (glass strain)	1056					
Terminal strength (leaded devices only)	2036	Test condition E				
Hermetic seal (gross leak) 2/	1071	Test condition E				
Moisture resistance	1021					
External visual	2071					
Electrical measurements		See table V, steps 1, 3, 4, 5, and 6 (JANS) and steps 1, 3, and 4 (JANTX and JANTXV)				
<u>Subgroup 3</u>						
Shock	2016					
Vibration, variable frequency	2056					
Electrical measurements		See table V, steps 1, 3, 4, 5, and 6 (JANS) and steps 1, 3, and 4 (JANTX and JANTXV)				
<u>Subgroup 4</u>						
Salt atmosphere (corrosion)	1041					
<u>Subgroup 5</u>						
Not applicable						

See footnotes at end of table.

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TABLE III. Group C inspection (all quality levels) - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u> <u>2/</u>						
Steady-state operation life	1026	See 4.2.1				
Electrical measurements		See table V, steps 1, 3, 4, 5, and 6 (JANS) and steps 2, 3, and 4 (JANTX and JANTXV)				
<u>Subgroup 7</u>		JANTX and JANTXV levels only				
Temperature coefficient of regulator voltage	4071	I_2 = column 5 of table VI $T_1 = 25 \pm 5^\circ\text{C}$, $T_2 = T_1 + 100^\circ\text{C}$ <u>3/</u>	αV_2		Column 14 of table VI	%/°C

1/ For sampling plan, see MIL-S-19500, (subgroups 1-6).

2/ Leaded samples from the same lot may be substituted for "US" devices.

3/ The sample plan for subgroup 7 is 22 devices, $c = 0$.

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TABLE IV. Group E inspection (all quality levels) for qualification only.

Inspection 1/	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			22 devices c = 0
Thermal shock	1056	500 cycles, condition A	
Electrical measurements		See table V, steps 1, 3, 4, and 6	
<u>Subgroup 2</u>			22 devices c = 0
Intermittent operation life	1037	$I_2 = 40\%$ of column 8 of table VI; $T_L = 95^\circ\text{C}$ min, $L = 3/8$ inch, $t_{on} = t_{off} = 3$ minutes minimum for 10,000 cycles. No heat sink or forced air cooling on the devices. shall be permitted (see 3.2.2).	
Electrical measurements		See table V, steps 2, 3, 4, 5, and 6	
<u>Subgroup 3</u>			
Destructive physical analysis		Photos of cross sections shall be submitted in the qualification report. Vendors shall retain duplicate photos.	
<u>Subgroup 4</u>			
Thermal resistance	3101 or 4081	$R_{\theta JL} = 20^\circ\text{C/W}$ (max) at $3/8$ " lead length. $+25^\circ\text{C} \leq T_R \leq +35^\circ\text{C}$ $R_{\theta Jendcap} = 7^\circ\text{C/W}$ (surface mount); $R_{\theta JL} = 20^\circ\text{C/W}$ (max) at $L = 3/8$ "; $R_{\theta JEC} = 7^\circ\text{C/W}$ (surface mount); reference temperature (T_R) point at $L = 3/8$ "; $L = 0$ (surface mount devices); $+25^\circ\text{C} < T_R < +35^\circ\text{C}$.	
<u>Subgroup 5</u>			
Barometric pressure (reduced)	1001		

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

2/ For non-transparent devices, hermetic seal shall be performed after electrical measurements.

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TABLE V. Groups A, B, C, and E electrical measurements.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Reverse current	4016	DC method; V_R = column 11 of table VI	I_{R1}		Column 12 of table VI	μA dc
2.	Reverse current	4016	DC method; V_R = column 11 of table VI	I_{R1}		Column 13 of table VI	μA dc
3.	Regulator voltage (see 4.5.3)	4022	I_Z = column 5 of table VI	V_Z	Column 3 of table VI	Column 4 of table VI	V dc
4.	Small signal break-down impedance	4051	I_Z = column 5 of table VI; I_{sig} = 10% of I_Z ; I_{sig} = 0.5 mA dc (1N5968 only)	Z_Z		Column 6 of table VI	ohms
5.	Knee impedance	4051	I_{ZK} = 1 mA dc; I_{sig} = 0.1 mA dc; I_{ZK} = 5 mA dc (1N5968 only)	Z_{ZK}		Column 7 of table VI	ohms
6.	Forward voltage	4011	I_F = 1.0 A dc, pulsed (see 4.5.1)	ΔV_F 1/		± 50 mV dc change from previous measured value	

1/ Devices which exceed the group A limits, for this test, shall not be accepted.

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TABLE VI. Test ratings for diodes, types 1N4954 through 1N4996, 1N5968, 1N5969, JANTX, JANTXV, and JANS.

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14	Col. 15	Col. 16
Type device 1/	V_Z Nom	V_Z Min	V_Z Max	I_Z $T_A = 25^\circ\text{C}$ test current	Z_Z Impedance	Z_K Knee Impedance	I_Z Max dc current $T_A = 25^\circ\text{C}$	V_Z (reg) Voltage regulation	I_{ZSM} $T_A = 100^\circ\text{C}$	V_R Reverse voltage	I_R Reverse current dc I_{R1}	I_R Reverse current dc I_{R1} post test	V_Z Temp. coefficient	I_R Reverse current dc $T_A = 150^\circ\text{C}$ I_{R2}	I_{ZK} test current
	V	V	V	mA	Ohms	Ohms	mA	V	A	V	μA	μA	μ/C	μA	mA
1N4632	3.3	3.14	3.46	380	3	500	1440	0.9	20.0	1.0	300	600	-0.75	2500	5.0
1N4633	3.6	3.42	3.78	350	2.5	500	1320	0.8	18.7	1.0	250	500	-0.70	1000	"
1N4634	3.9	3.71	4.09	320	2	500	1220	.75	17.6	1.0	175	350	-0.60	500	"
1N4635	4.3	4.09	4.51	290	2	500	1100	.70	16.4	1.0	25	50	-0.50	500	"
1N4636	4.7	4.47	4.93	260	2	450	1010	.60	15.3	1.0	20	40	$\pm .025$	500	"
1N4637	5.1	4.85	5.35	240	1.5	400	930	.50	14.4	1.0	5	10	$\pm .030$	500	"
1N4968	5.6	5.32	5.88	220	1	400	865	.4	20	4.28	5000	7000	.040	15000	"
1N4969	6.2	5.89	6.51	220	1	1000	765	.5	20	4.74	1000	1500	.040	4000	1.0
1N4954	6.8	6.46	7.14	175	1	1000	700	.7	40	5.2	150	300	.05	750	"
1N4955	7.5	7.13	7.87	175	1.5	800	630	.7	32	5.7	100	200	.06	500	"
1N4956	8.2	7.79	8.61	150	1.5	600	580	.7	24	6.2	50	100	.06	300	"
1N4957	9.1	8.65	9.55	150	2	400	520	.7	22	6.9	25	50	.06	200	"
1N4958	10	9.50	10.50	125	2	125	475	.8	20	7.6	25	50	.07	200	"
1N4959	11	10.45	11.55	125	2.5	130	430	.8	19	8.4	10	20	.07	150	"
1N4960	12	11.40	12.60	100	2.5	140	395	.8	18	9.1	10	20	.07	150	"
1N4961	13	12.35	13.65	100	3	145	365	.9	16	9.9	10	20	.08	150	"
1N4962	15	14.25	15.75	75	3.5	150	315	1.0	12	11.4	5.0	10	.08	100	"
1N4963	16	15.20	16.80	75	3.5	155	294	1.1	10	12.2	5.0	10	.08	"	"
1N4964	18	17.10	18.90	65	4	160	264	1.2	9.0	13.7	5.0	10	.085	"	"
1N4965	20	19.0	21.0	65	4.5	165	237	1.5	8.0	15.2	2	4	.085	"	"
1N4966	22	20.9	23.1	50	5	170	216	1.8	7.0	16.7	"	"	.085	"	"
1N4967	24	22.8	25.2	50	5	175	198	2.0	6.5	18.2	"	"	.09	"	"
1N4968	27	25.7	28.3	50	6	180	176	2.0	6.0	20.6	"	"	.09	"	"
1N4969	30	28.5	31.5	40	8	190	158	2.5	5.5	22.8	"	"	.09	"	"
1N4970	33	31.4	34.6	40	10	200	144	2.8	5.0	25.1	"	"	.095	"	"
1N4971	36	34.2	37.8	30	11	220	132	3.0	4.5	27.4	"	"	"	"	"

See footnote at end of table.

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TABLE VI. Test ratings for diodes, types 1N4954 through 1N4996, 1N5968, 1N5969, JANIX, JANIXV, and JANS - Continued.

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14	Col. 15	Col. 16
Type device 1/	V _Z Nom	V _Z Min	V _Z Max	I _Z T _A = 25°C test current	Z _Z Imped- ance	Z _K Knee Imped- ance	I _Z Max dc current T _A = 25°C	V _Z (reg) Voltage regula- tion	I _{ZSM} T _A = 100°C	V _R Reverse voltage	I _R Reverse current dc I _{R1}	I _R Reverse current dc I _{R1} post test	V _Z Temp. coeffi- cient	I _R Reverse current dc I _{R2} = 150°C	I _{TK} test current
	V	V	V	mA	Ohms	Ohms	mA	V	A	V	μA	μA	μ/°C	μA	mA
1N4972	39	37.1	40.9	30	14	230	122	3.0	4.0	29.7	2	4	.095	100	1.0
1N4973	43	40.9	45.1	30	20	240	110	3.3	3.5	32.7	"	"	"	"	"
1N4974	47	44.7	49.3	25	25	250	100	3.5	3.2	35.8	"	"	"	"	"
1N4975	51	48.5	53.5	25	27	270	92	4.0	3.0	38.8	"	"	"	"	"
1N4976	56	53.2	58.8	20	35	320	84	4.4	2.8	42.6	"	"	"	"	"
1N4977	62	58.9	65.1	20	42	400	76	5.0	2.5	47.1	"	"	.100	"	"
1N4978	68	64.6	71.4	20	50	500	70	5.5	2.2	51.7	"	"	"	"	"
1N4979	75	71.3	78.7	20	55	620	63	6.0	2.0	56	"	"	"	"	"
1N4980	82	77.9	86.1	15	80	720	58	6.6	1.8	62.2	"	"	"	"	"
1N4981	91	86.5	95.5	15	90	760	52.5	7.5	1.6	69.2	"	"	"	"	"
1N4982	100	95.0	105	12	110	800	47.5	8.0	1.4	76.0	"	"	"	"	"
1N4983	110	104.5	115.5	12	125	1000	43	9.0	1.2	83.6	"	"	"	"	"
1N4984	120	114	126	10	170	1150	39.5	10	1.0	91.2	"	"	"	"	"
1N4985	130	123.5	136.5	10	190	1250	36.6	11	.8	98.8	"	"	.105	"	"
1N4986	150	142.5	157.5	8	330	1500	31.6	13	.75	114.0	"	"	.105	"	"
1N4987	160	152	168	8	350	1650	29.4	14	.70	121.6	"	"	.105	"	"
1N4988	180	171	189	5	450	1750	26.4	16	.60	136.8	"	"	.110	"	"
1N4989	200	190	210	"	500	1850	23.6	18	.50	152.0	"	"	.110	"	"
1N4990	220	209	231	"	550	2000	21.6	19	.50	167	"	"	.115	"	"
1N4991	240	228	252	"	650	2050	19.8	22	.40	182	"	"	.115	"	"
1N4992	270	257	283	"	800	2100	17.5	25	.35	206	"	"	.120	"	"
1N4993	300	285	315	4	950	2150	15.6	28	.30	228	"	"	"	"	"
1N4994	330	314	346	4	1175	2200	14.4	32	.25	251	"	"	"	"	"
1N4995	360	342	378	3	1400	2300	13	35	.22	274	"	"	"	"	"
1N4996	390	371	409	3	1800	2500	12	40	.20	297	"	"	"	"	"

1/ Ratings apply to all case outlines, unless otherwise specified.

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4.5.5 Temperature coefficient of regulator voltage (αV_2). The device shall be temperature stabilized with current applied prior to reading regulator voltage at the specified ambient temperature.

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 Application data. Device power capability may be determined from figure 4 which shows maximum power dissipation versus lead temperature as a function of lead distance L from the device body.

6.3 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this 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 formation material and finish may be specified (see 3.3.1).
- d. Project assurance level and type designation.

6.4 Suppliers of JANC die. The qualified JANC suppliers with the applicable letter version (example JANCA7218) will be identified on the QPL.

JANC ordering information		
	Manufacturer	
PIN	12969	
1N4954	A4954	
thru	thru	
1N4996	A4996	

6.5 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.

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CONCLUDING MATERIAL

Custodians:

- Army - ER
- Navy - EC
- Air Force - 17
- NASA - NA

Review activities:

- Army - AR, AV, MI
- Navy - SH
- Air Force - 85
- DLA - ES

User activities:

- Army - SM
- Navy - AS, CG, MC, OS
- Air Force - 13, 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5961-1211)