

The documentation and process conversion measures necessary to comply with this revision shall be completed by 25 November 2011.

INCH-POUND

MIL-PRF-19500/124L
24 August 2011
SUPERSEDING
MIL-PRF-19500/124K
17 May 2010

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, VOLTAGE REGULATOR
TYPES 1N2970B THROUGH 1N2977B, 1N2979B, 1N2980B, 1N2982B, 1N2984B
THROUGH 1N2986B, 1N2988B THROUGH 1N2993B, 1N2995B, 1N2997B, 1N2999B
THROUGH 1N3005B, 1N3007B, 1N3008B, 1N3009B, 1N3011B, 1N3012B, 1N3014B, 1N3015B,
PLUS RB TYPES, 1N3993A THROUGH 1N3998A, AND RA TYPES, JAN, JANTX, JANTXV, AND JANS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and [MIL-PRF-19500](#).

1. SCOPE

1.1 Scope. This specification covers the performance requirements for 10 watt, silicon voltage regulator diodes: A and B type (standard polarity); RA and RB type (reverse polarity). Four levels of product assurance are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Physical dimensions. See [figure 1](#) (DO-4).

1.3 Maximum ratings. Maximum ratings are as shown in columns 4, 8, and 10 of the [test ratings table](#) herein and as follows:

$-65^{\circ}\text{C} \leq T_J \leq +175^{\circ}\text{C}$; $P_T = 10\text{ W}$ at $T_C = +55^{\circ}\text{C}$; derate at $.083\text{ W}/^{\circ}\text{C}$ above $+55^{\circ}\text{C}$.
 $-65^{\circ}\text{C} \leq T_{\text{STG}} \leq +200^{\circ}\text{C}$.

1.4 Primary electrical characteristics. Primary electrical characteristics are as shown in columns 2, 9, 12, and 14 of the [test ratings table](#) herein, and as follows:

Thermal resistance ($R_{\theta\text{JC}}$) = $12^{\circ}\text{C}/\text{W}$ maximum.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections [3](#), [4](#), or [5](#) of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections [3](#), [4](#), or [5](#) of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.daps.dla.mil>.

2.2 Government documents.

2.2.1 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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-19500 – Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-750 – Test Methods for Semiconductor Devices.

FEDERAL STANDARDS

FED-STD-H28 – Screw-Thread Standards for Federal Services.

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch> or <https://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list (QML) before contract award (see 4.2 and 6.3).

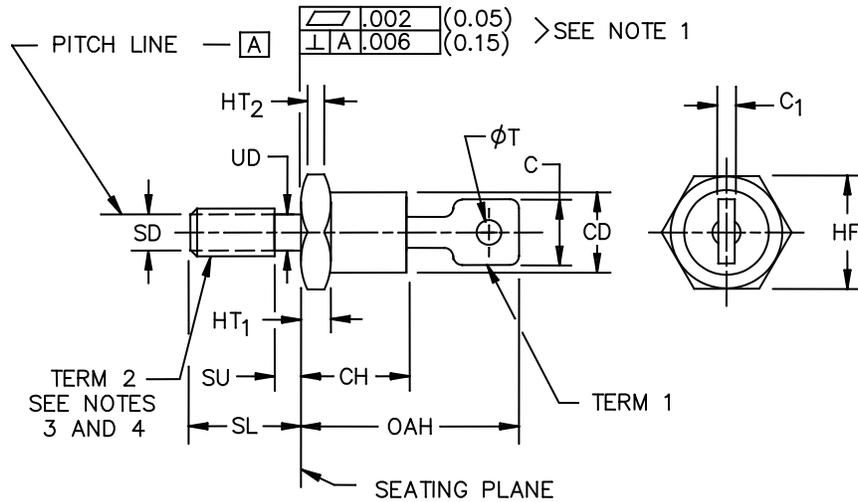
3.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500. The symbols used herein are listed in 6.5.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and herein on figure 1 (DO-4).

3.4.1 Lead finish. Unless otherwise specified, lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the contract (see 6.2).

3.4.2 Polarity. The polarity of device types shall be as follows:

- a. Device types 1N2970B through 1N3015B and 1N3993RA through 1N3998RA shall have the anode connected to the stud (term 2 of figure 1).
- b. Device types 1N2970RB through 1N3015RB and 1N3993A through 1N3998A shall have the cathode connected to the stud (term 2 of figure 1) (see 3.6).



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
C		.250		6.35	5
CD	.255	.424	6.48	10.77	6
CH	.300	.405	7.62	10.29	
C ₁	.012	.065	0.30	1.65	5
HF	.424	.437	10.77	11.1	6
HT ₁	.075	.175	1.91	4.45	7
HT ₂	.060	.175	1.52	4.45	7
OAH	.600	.800	15.24	20.32	
SD					
SL	.422	.453	10.72	11.51	
SU		.078		1.98	8
UD	.163	.189	4.14	4.80	
φT	.060	.095	1.52	2.41	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. See 3.4.2 for the polarity of the terminals.
3. Threads shall be 10-32 UNF-2A in accordance with FED-STD-H28. Maximum pitch diameter (SD) of plated threads shall be basic pitch diameter .1697 inch (4.31 mm).
4. Device shall not be damaged by a torque of 15 inch-pounds applied to a 10-32 UNF-2B nut assembled on thread.
5. The angular orientation and peripheral configuration of terminal 1 is undefined, however, the major surfaces over dimension C and C₁ shall be flat.
6. Dimension CD can not exceed dimension HF.
7. A chamfer or undercut on one or both ends of the hex portion is optional; minimum base diameter at seating plane .403 inch (10.24 mm).
8. Length of incomplete or undercut threads UD.
9. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 1. Physical dimensions (DO-4).

3.5 Marking. Devices shall be marked as specified in [MIL-PRF-19500](#).

3.6 Reverse polarity. Reverse polarity units (see [3.4.2.a](#) and [3.4.2.b](#)) shall be marked with an "R" preceding the "A" or "B" in the type designation, as applicable.

3.7 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3).
- c. Conformance inspection (see 4.4 and [tables I and II](#)).

4.2 Qualification inspection. Qualification inspection shall be in accordance with [MIL-PRF-19500](#).

4.3 Screening (JANS, JANTXV, AND JANTX levels only). Screening shall be in accordance with table E-IV of [MIL-PRF-19500](#), and as specified herein. The following measurements shall be made in accordance with [table I](#) herein. Devices that exceed the limits of [table I](#) herein shall not be acceptable.

Screening (see table E-IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTXV and JANTX level
9	I_{R1} and V_Z (for devices with $V_Z(\text{nom}) \geq 10$ V dc; see column 2 of table III herein)	Not applicable
11	I_{R1} and V_Z ; $\Delta I_{R1} = 100$ percent of initial value or 1 percent of column 12 of table III herein, whichever is greater, $\Delta V_Z = \pm 2.5$ percent of initial value (for devices with $V_Z(\text{nom}) \geq 10$ V dc, see column 2 of table III herein)	I_{R1} and V_Z
12	See 4.3.1	See 4.3.1
13	Subgroups 2, 3, and 4 of table I herein; $\Delta I_{R1} = 100$ percent of initial value or 1 percent of column 12 of table III herein, whichever is greater; $\Delta V_Z = \pm 2.5$ percent of initial value	Subgroup 2 of table I herein; $\Delta I_{R1} = 100$ percent of initial value or 1 percent of column 12 of table III herein, whichever is greater; $\Delta V_Z = \pm 2.5$ percent of initial value

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: $T_J = 165^\circ\text{C}$ minimum with I_Z not to exceed I_Z in column 15 of [table III](#) herein; $V_Z =$ column 2 of [table III](#) herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with [MIL-PRF-19500](#).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-IV of [MIL-PRF-19500](#) and [table I](#) herein. End-point electrical measurements shall be in accordance with the applicable steps of [table II](#) herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIa (JANS) and table E-VIb (JAN, JANTX, and JANTXV), of [MIL-PRF-19500](#), and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of [table II](#) herein.

4.4.2.1 Product quality level JANS (table E-VIa of [MIL-PRF-19500](#)).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	2026	Dwell time = 10 ± 1 s; immersion to cover flat portion of terminal only.
B4	1037	2,000 cycles. See 4.5.6 herein.
B5	1027	I_Z = column 15 of table III herein for 96 hours, $T_A = +125^\circ\text{C}$ or adjusted, as required, to give an average lot $T_J = +225^\circ\text{C}$. Option 1 – $T_J = +200^\circ\text{C}$, 336 hours. Option 2 – $T_J = +175^\circ\text{C}$, 1,000 hours.
B6	4081	$R_{\theta JC} = 12^\circ\text{C/W}$ maximum, $T_A = +25^\circ\text{C}$. For purposes of this test "junction to case" shall be used in lieu of "junction to lead" and " $R_{\theta JC}$ " shall be used in lieu of " $R_{\theta JL}$ ". The case shall be the reference point for calculation of junction to case thermal resistance ($R_{\theta JC}$). The mounting arrangement shall be with heat sink to case.

4.4.2.2 Product quality levels JAN, JANTX and JANTXV (table E-VIb of [MIL-PRF-19500](#)).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	4066	I_{ZSM} = column 10 of table III herein.
B3	1027	I_Z = column 15 of table III herein, adjust T_A , mounting, or both, to achieve $T_C = 150^\circ\text{C} \pm 5^\circ\text{C}$.
B3	1037	2,000 cycles. See 4.5.6 herein (separate samples may be used).
B5	4081	$R_{\theta JC} = 12^\circ\text{C/W}$ maximum; $T_A = +25^\circ\text{C}$. For purposes of this test, "junction to case" shall be used in lieu of "junction to lead" and " $R_{\theta JC}$ " shall be used in lieu of " $R_{\theta JL}$ ". The case shall be the reference point for calculation of junction to case thermal resistance ($R_{\theta JC}$). The mounting arrangement shall be with heat sink to case.
B6	1032	$T_A = +200^\circ\text{C}$.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Tension: Test condition A; 20 pounds; $t = 15 \pm 3$ s.
C2	2036	Torque (terminal): Test condition D ₁ ; 10 inch-ounces; $t = 15 \pm 3$ s.
C2	2036	Torque (stud): Test condition D ₂ ; 15 inch-pounds; $t = 30 \pm 3$ s.
C2	2036	Bending stress: Test condition F; 3 pounds; $t = 15 \pm 3$ s, method B.
C6	1027	I_Z = column 15 of table III herein, adjust T_A , mounting, or both, to achieve $T_C = 150^\circ\text{C} \pm 5^\circ\text{C}$.
C6	1037	6,000 cycles. See 4.5.6 herein (separate samples may be used).
C8	4071	22 devices, $c = 0$, JAN, JANTX, and JANTXV levels only. Temperature coefficient of breakdown voltage (see 4.5.3 and 4.5.4). I_Z = column 5 of table III herein, $T_A = +25^\circ\text{C}$; $T_2 = T_1 + 100^\circ\text{C}$; each subplot; αV_Z = percent/ $^\circ\text{C}$ column 14 of table III herein. Voltage regulation (see 4.5.2) each subplot. $V_{Z(\text{reg})} = V_{\text{dc}}$, column 9 of table III herein.

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

4.5.1 Surge current I_{ZSM} . The currents specified in column 10 of table III herein shall be applied in the reverse direction and shall be superimposed on the current (I_Z = column 5 of table III herein) a total of five surges at 1-minute intervals. Each individual surge shall be a one-half square wave pulse of 1/120-second duration or an equivalent one-half sine wave with the same effective (rms) current.

4.5.2 Voltage regulation $V_{Z(\text{reg})}$. A current at 10 percent of I_Z (column 8 of table III herein) shall be maintained until thermal equilibrium is obtained, and the V_Z shall then be increased to a level of 50 percent of I_Z (column 8 of table III herein) and maintained at this level for a period of time until thermal equilibrium is obtained at which time the voltage change shall not exceed column 9 of table III herein. During this test, the temperature shall be equal to $T_A = +25^\circ\text{C}$.

4.5.3 Regulator voltage. The I_Z test current (column 5 of table III herein) shall be applied until thermal equilibrium is obtained prior to reading the regulator voltage. During this test, the temperature shall be equal to $T_A = +25^\circ\text{C}$.

4.5.4 Temperature coefficient of regulator voltage (αV_Z). The device shall be temperature stabilized with current applied prior to reading regulator voltage at the specified case temperatures.

4.5.5 Inspection condition. Unless otherwise specified in MIL-PRF-19500 or herein, all inspections shall be made at temperature shall be equal to $T_A = +25^\circ\text{C}$.

4.5.6 DC intermittent operation life. A cycle shall consist of an "on" period, when forward current is applied suddenly, not gradually, to the device for the time necessary to achieve an increase (delta) case temperature of +85°C +15°C, -0°C followed by an "off" period, when the current is suddenly removed for cooling the case through a similar delta temperature. Auxiliary (forced) cooling is permitted during the "off" period only. Forward current and "on" time, within specific limits, and "off" time may be adjusted to achieve the delta case temperature. Heat sinks shall only be used if, and to the degree necessary, to maintain test samples within the desired delta temperature tolerance. The heating time shall be such that $30 \text{ s} \leq t_{\text{heating}} \leq 180 \text{ s}$. The forward current may be steady-state dc, full-wave rectified dc, or the equivalent half-sine wave dc, of the specified value. Alternately, I_Z may be used to achieve heating. The test duration shall be the specified number of cycles. Within the time interval of 50 cycles before and 500 cycles after the termination of the test, the sample units shall be removed from the specified test conditions and allowed to reach room ambient conditions. Specified end-point measurements for qualification and quality conformance inspections shall be completed within 96 hours after removal of sample units from the specified test conditions. Additional readings may be taken at the discretion of the manufacturer.

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits <u>2/</u>		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Forward voltage	4011	$I_F = 2 \text{ A dc}$	V_F		1.5	V dc
Reverse current	4016	$V_R =$ column 11 of table III herein, DC method	I_{R1}		Column 12	$\mu\text{A dc}$
Regulator voltage (see 4.5.3)	4022	$I_Z =$ column 5 of table III herein	V_Z	Column 3	Column 4	V dc
<u>Subgroup 3</u>						
High temperature operation		$T_A = 150^\circ\text{C}$				
Reverse current	4016	$V_R =$ column 11 of table III , DC method	I_{R2}		500	$\mu\text{A dc}$
<u>Subgroup 4</u>						
Small-signal reverse breakdown impedance	4051	$I_Z =$ column 5 of table III , $I_{\text{sig}} = 10$ of percent I_{ZT}	Z_Z		Column 6	ohms
Knee impedance		$I_{ZK} = 1 \text{ mA dc}$, $I_{\text{sig}} = 10$ percent of I_{ZK}	Z_{ZK}		Column 7	ohms

See footnotes at end of table.

TABLE I. Group A inspection – Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit <u>2/</u>		Unit
	Method	Conditions		Min	Max	
<u>Subgroups 5</u> Not applicable						
<u>Subgroup 6</u> Surge current (see 4.5.1)	4066	$T_C = +25^\circ\text{C}$; I_{ZSM} = column 10 of table III				
End-point electrical measurements		See table II , steps 1, 3, and 4				
<u>Subgroup 7</u> Voltage regulation (see 4.5.2)		JANS level only	$V_Z(\text{reg})$		Column 9	V dc
Temperature coefficient of breakdown voltage (see 4.5.4)		I_Z = column 5 of table III ; $T_A = +25^\circ\text{C}$; $T_2 = T_1 + 100^\circ\text{C}$	αV_Z		Column 14	%/ $^\circ\text{C}$

1/ For sampling plan, see [MIL-PRF-19500](#).

2/ Column references are to [table III](#) herein.

TABLE II. Groups B and C electrical and delta measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limits 4/		Unit
		Method	Conditions		Min	Max	
1	Reverse current	4016	DC method; V_R = column 11 of table III herein	I_{R1}		Column 12	$\mu\text{A dc}$
2	Reverse current	4016	DC method; V_R = column 11 of table III herein	I_{R3}		Column 13	$\mu\text{A dc}$
3	Breakdown voltage	4022	I_Z = column 5 of table III herein	V_Z	Column 3	Column 4	V dc
4	Small signal breakdown impedance	4051	I_Z = column 5 of table III , herein I_{sig} = 10 percent of I_Z	Z_Z		Column 6	ohms
5	Knee impedance	4051	I_{ZK} = 1 mA dc I_{sig} = 10 percent of I_{ZK}	Z_{ZK}		Column 7	ohms
6	Forward voltage	4011	I_F = 2.0 A dc	ΔV_F 5/		1.5	V dc

- 1/ The electrical measurements for table E-VIa (JANS) of [MIL-PRF-19500](#) shall be as follows:
- In addition to the measurements specified for subgroup 3, the measurements of steps 1, 3, 4, 5, and 6 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 4, the measurements of steps 1, 3, 4, 5, and 6 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 5, the measurements of steps 2, 3, 4, 5, and 6 of this table shall also be taken.
- 2/ The electrical measurements for table E-VIb (JANTX and JANTXV) of [MIL-PRF-19500](#) shall be as follows:
- In addition to the measurements specified for subgroup 2, the measurements of steps 1, 3, and 4 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 3, the measurements of steps 2, 3, and 4 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 6, the measurements of steps 2, 3, and 4 of this table shall also be taken.
- 3/ The electrical measurements for table E-VII of [MIL-PRF-19500](#) shall be as follows:
- In addition to the measurements specified for subgroup 2, the measurements of steps 1, 3, 4, 5, and 6 (JANS), or steps 1, 3, and 4 (JAN, JANTX, and JANTXV) of this table shall also be taken.
 - In addition to the measurements specified for subgroup 3, the measurements of steps 1, 3, 4, 5, and 6 (JANS), or steps 1, 3, and 4 (JAN, JANTX, and JANTXV) of this table shall also be taken.
 - In addition to the measurements specified for subgroup 6, the measurements of steps 2, 3, 4, 5, and 6 (JANS), or steps 2, 3, and 4 (JAN, JANTX, and JANTXV) of this table shall also be taken.
- 4/ Column references are to [table III](#) herein.
- 5/ Devices which exceed the group A limits for this test shall not be accepted.

TABLE III. Test ratings. 1/

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
Type	V _Z	V _Z	V _Z	I _{ZT}	Z _Z	Z _{ZK}	I _Z 2/	V _Z (reg)	I _{ZSM}	V _R	I _{R1}	I _{R3}	αV _Z	I _Z
				Test current	Impedance	Knee impedance	T _A = +25°C	Voltage reg	T _A = +25°C	Reverse voltage	Reverse current	Reverse current	Temp coefficient	Max dc current T _C = 150° +5, -0°C
	Nom	Min	Max	Max			Max dc		Max		dc Max	dc Max	Max	
	volts	volts	volts	mA	ohms	ohms	mA	volts	mA	volts	μA	μA	%/°C	mA
1N3993A	3.9	3.70	4.10	640	2.0	400	2,440	0.80	12,000	.5	100	200	-0.60	587
1N3994A	4.3	4.08	4.52	580	1.5	400	2,200	0.72	11,000	.5	100	200	-0.50	524
1N3995A	4.7	4.45	4.94	530	1.2	550	2,000	0.68	1,0000	1.0	50	100	+0.25	428
1N3996A	5.1	4.84	5.36	490	1.1	550	1,840	0.64	9,000	1.0	10	20	+0.30	391
1N3997A	5.6	5.32	5.88	445	1.0	600	1,680	0.60	8,000	1.0	10	20	+0.40	351
1N3998A	6.2	5.89	6.51	405	1.1	700	1,520	0.56	7,000	2.0	10	20	+0.45	315
1N2970B	6.8	6.46	7.14	370	1.2	500	1,500	0.4	7,500	5.2	150	300	+0.57	282
1N2971B	7.5	7.13	7.87	335	1.3	250	1,350	0.45	6,750	5.7	100	200	+0.67	252
1N2972B	8.2	7.79	8.61	305	1.5	250	1,180	0.5	5,900	6.2	50	100	+0.70	230
1N2973B	9.1	8.65	9.55	275	2.0	250	1,100	0.55	5,500	6.9	25	50	+0.75	206
1N2974B	10	9.50	10.50	250	3.0	250	980	0.6	4,900	7.6	25	50	+0.81	185
1N2975B	11	10.45	11.55	230	3.0	250	890	0.7	4,450	8.4	10	20	+0.85	168
1N2976B	12	11.40	12.60	210	3.0	250	820	0.8	4,100	9.1	10	20	+0.79	155
1N2977B	13	12.35	13.65	190	3.0	250	750	0.85	3,750	9.9	10	20	+0.80	142
1N2979B	15	14.25	15.75	170	3.0	250	640	1.0	3,200	11.4	10	20	+0.82	124
1N2980B	16	15.20	16.80	155	4.0	250	605	1.1	3,000	12.2	10	20	+0.83	116
1N2982B	18	17.10	18.90	140	4.0	250	525	1.25	2,600	13.7	10	20	+0.85	103
1N2984B	20	19.0	21.0	125	4.0	250	480	1.35	2,400	15.2	10	20	+0.86	92
1N2985B	22	20.9	23.1	115	5.0	250	435	1.5	2,180	16.7	10	20	+0.87	84
1N2986B	24	22.8	25.2	105	5.0	250	400	1.65	2,000	18.2	10	20	+0.88	77
1N2988B	27	25.7	28.3	95	7.0	250	340	1.92	1,700	20.6	10	20	+0.90	68
1N2989B	30	28.5	31.5	85	8.0	300	320	2.15	1,600	22.8	10	20	+0.91	61
1N2990B	33	31.4	34.6	75	9.0	300	300	2.30	1,500	25.1	10	20	+0.92	55

See footnotes at end of table.

TABLE III. Test ratings – Continued. 1/

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
Type	V _Z	V _Z	V _Z	I _{ZT}	Z _Z	Z _{ZK}	I _{ZM} 2/	V _Z (reg)	I _{ZSM}	V _R	I _{R1}	I _{R3}	αV _Z	I _Z
				Test current	Impedance	Knee impedance	T _A = +25°C	Voltage reg	T _A = +25°C	Reverse voltage	Reverse current	Reverse current dc max (after life test)	Temp coeff	Max dc current T _C = 150 +5, -0°C
	Nom volts	Min volts	Max volts	Max mA	Max ohms		dc Max mA		Max mA		dc Max volts	dc Max μA		Max %/°C
1N2991B	36	34.2	37.8	70	10.0	300	260	2.45	1,300	27.4	10	20	+0.93	51
1N2992B	39	37.1	40.9	65	11.0	300	240	2.55	1,200	29.7	10	20	+0.94	47
1N2993B	43	40.9	45.1	60	12.0	400	220	2.75	1,100	32.7	10	20	+0.95	42
1N2995B	47	44.7	49.3	55	14.0	400	200	3.0	1,000	35.8	10	20	+0.95	39
1N2997B	51	48.5	53.5	50	15.0	500	185	3.1	925	38.8	10	20	+0.96	36
1N2999B	56	53.2	58.8	45	16.0	500	170	3.3	850	42.6	10	20	+0.96	33
1N3000B	62	58.9	65.1	40	17	600	150	3.5	750	47.1	10	20	+0.97	29
1N3001B	68	64.6	71.4	37	18	600	137	3.8	685	51.7	10	20	+0.97	27
1N3002B	75	71.3	78.7	33	22	600	125	4.4	625	56.0	10	20	+0.98	24
1N3003B	82	77.9	86.1	30	25	700	115	4.7	575	62.2	10	20	+0.98	22
1N3004B	91	86.5	95.5	28	35	800	97	5.1	485	69.2	10	20	+0.99	20
1N3005B	100	95.0	105.0	25	40	900	91	6.1	450	76.0	10	20	+1.10	18
1N3007B	110	104.5	115.5	23	55	1,100	82	6.9	410	83.6	10	20	+1.10	16
1N3008B	120	114.0	126.0	20	75	1,200	77	7.9	380	91.2	10	20	+1.10	15
1N3009B	130	123.5	136.5	19	100	1,300	71	8.8	350	98.8	10	20	+1.10	14
1N3011B	150	142.5	157.5	17	175	1,500	62	11.0	310	114.0	10	20	+1.10	12
1N3012B	160	152.0	168.0	16	200	1,600	58	11.8	290	121.6	10	20	+1.10	11
1N3014B	180	171.0	189.0	14	260	1,850	52	13.8	260	136.8	10	20	+1.10	10
1N3015B	200	190.0	210.0	12	300	2,000	46	14.8	230	152.0	10	20	+1.10	9

1/ The test ratings are applicable to all devices.

2/ Derate I_Z linearly to 0.0 mA dc at +175°C, for T_C > +55°C.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in [MIL-PRF-19500](#) are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see [3.4.1](#)).
- d. Product assurance level and type designator.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML-19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.daps.dla.mil>.

6.4 Substitution information. Devices covered by this specification are substitutable for the manufacturer's and user's Part or Identifying Number (PIN). This information in no way implies that manufacturer's PINs are substitutable for the military PIN.

Preferred types military PIN	Superseded PIN	Commercial PIN
JAN, JANTX, JANTXV, JANS1N2970B	1N3999A	1N2970B
JAN, JANTX, JANTXV, JANS1N2970RB	1N3999RA	1N2970RB
JAN, JANTX, JANTXV, JANS1N2971B	1N4000A	1N2971B
JAN, JANTX, JANTXV, JANS1N2971RB	1N4000RA	1N2971RB

6.4.1 Obsolete part numbers. MIL-S-19500/272 for Part or Identifying Number (PIN) 1N3993A, RA through 1N4000A, RA are obsolete. PINs 1N3993A, RA through 1N3998A, RA have been incorporated into MIL-PRF-19500/124. PINs 1N3999A, RA and 1N4000A, RA have been deleted, as they are redundant to 1N2970RB, B and 1N2971RB, B respectively.

6.5 Symbols used in this specification sheet. The following symbols are used in this specification sheet. The definition associated with the symbol shall be as defined in [MIL-PRF-19500](#) or herein.

I _F	Forward current, DC value, no alternating component.
I _{R1}	Reverse current.
I _{R3}	Reverse current, dc max (after life test).
I _{sig}	Detector signal current.
I _{ZSM}	Surge current.
I _Z	Maximum dc current.
I _{ZK}	Regulator or reference current, dc near breakdown knee.
I _{ZM}	Regulator or reference current, dc maximum rated current.
I _{ZT}	Test current.
P _T	Total power dissipation, all terminals.
R _{θJC}	Thermal resistance.
T _A	Ambient or free air temperature.
T _C	Case temperature.
T _J	Junction temperature.
T _{STG}	Storage temperature.
V _F	Forward voltage.
V _R	Reverse voltage.
V _Z	Regulator voltage.
V _{Z(reg)}	Voltage regulation.
Z _Z	Impedance.
Z _{ZK}	Impedance, knee.

6.6 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
 Army – CR
 Navy – EC
 Air Force – 85
 NASA – NA
 DLA – CC

Preparing activity:
 DLA – CC

(Project 5961-2011-006)

Review activities:
 Army – AR, MI, SM
 Navy – AS, MC
 Air Force – 19, 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.daps.dla.mil>.