

The documentation and process conversion measures necessary to comply with this revision shall be completed by 14 July 2016.

INCH-POUND

MIL-PRF-19500/114J
14 April 2016
SUPERSEDING
MIL-PRF-19500/114H
w/AMENDMENT 2
14 August 2013

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, VOLTAGE REGULATOR,
CASE MOUNT THROUGH HOLE PACKAGE, STANDARD AND REVERSE POLARITY,
TYPES 1N2804 THROUGH 1N2811, 1N2813, 1N2814, 1N2816, 1N2818 THROUGH 1N2820,
1N2822 THROUGH 1N2827, 1N2829, 1N2831 THROUGH 1N2838, 1N2840 THROUGH 1N2846,
AND 1N4557 THROUGH 1N4562, QUALITY LEVELS 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. The specification covers the performance requirements for 50 watt silicon voltage regulator diodes. All of the diodes described by this specification sheet are a modified version of the diode which have a nominal voltage tolerance of ± 5 percent over the basic numbered (non-suffix) device. The non-suffix devices are not an option for this specification sheet. Forty-two devices, each with standard (B types) and reverse (RB types) polarity are addressed by this specification. Four levels of product assurance (JAN, JANTX, JANTXV, and JANS) are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Package outlines. The device package outline is a TO-204AA (formerly modified TO-3) in accordance with [figure 1](#) for all encapsulated device types.

1.3 Maximum ratings. Unless otherwise specified $T_C = 25^\circ\text{C}$. Maximum ratings are as shown in [columns 3, 7, and 9](#) of the [characteristics and test ratings](#) table herein and as follows:

- a. $P_T = 50\text{ W}$ at the case temperature $(T_C) \geq +75^\circ$; derate at $0.5\text{ W}/^\circ\text{C}$ at $T_C \geq +75^\circ\text{C}$.
- b. $-65^\circ\text{C} \leq T_J \leq +175^\circ\text{C}$; $-65^\circ\text{C} \leq T_{STG} \leq +200^\circ\text{C}$.
- c. Thermal resistance $(R_{\theta JC}) = 2.0^\circ\text{C}/\text{W}$ maximum.

1.4 Primary electrical characteristics. Primary electrical characteristics are as shown in [columns 1, 8, 11, and 12](#) of the [characteristics and test ratings](#) table herein.

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.dla.mil>.



1.5 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.4](#) for PIN construction example, [6.5](#) for a list of available PINs, and [6.6](#) for supersession information.

1.5.1 JAN certification mark and quality level. The quality level designator, if applicable, is in accordance with [MIL-PRF-19500](#). The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JAN", "JANTX", "JANTXV", and "JANS".

1.5.2 Device type. The designation system for the devices covered by this specification sheet is as follows.

1.5.2.1 First number and first letter symbols. The devices of this specification sheet use the first number and letter symbols "1N".

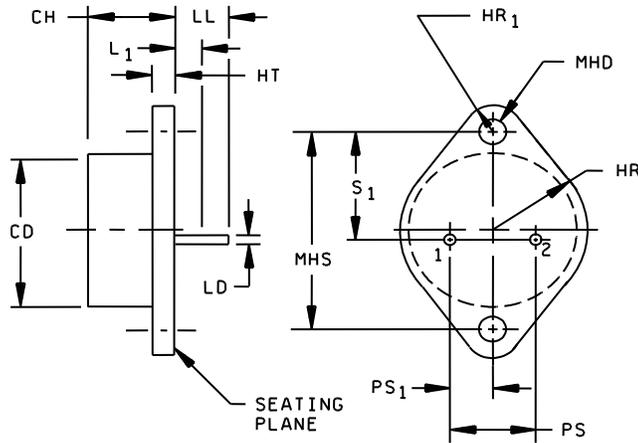
1.5.2.2 Second number symbols. The second number symbols for the devices covered by this specification sheet are as follows:

4557	2804	2810	2819	2826	2834	2841
4558	2805	2811	2820	2827	2835	2842
4559	2806	2813	2822	2829	2836	2843
4560	2807	2814	2823	2831	2837	2844
4561	2808	2816	2824	2832	2838	2845
4562	2809	2818	2825	2833	2840	2846

1.5.3 Suffix symbols. The following suffix symbol(s) are incorporated into the PINs for this specification sheet. All devices covered by this specification sheet use a suffix symbol or symbols as follows.

B	Indicates a modified version of the diode which have a nominal voltage tolerance of ± 5 percent over the basic numbered (non-suffix) device.
RB	Indicates reverse polarity packaging of the modified version of the diode.

1.5.4 Lead finish. The lead finishes applicable to this specification sheet are listed on [QPDSIS-19500](#).



Symbol	Dimension				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	
CH	.270	.380	6.86	9.65	
HR	.495	.525	12.57	13.34	
HR ₁	.131	.188	3.33	4.78	
HT	.060	.135	1.52	3.43	
LD	.048	.053	1.22	1.35	
LL	.312	.500	7.92	12.70	
L ₁		.050		1.27	
MHD	.151	.165	3.84	4.19	
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	2
PS ₁	.205	.225	5.21	5.72	2
S ₁	.655	.675	16.64	17.15	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. These dimensions should be measured at points .050 inch (1.27 mm) +.005 inch (+0.13 mm) –.000 inch (–0.00 mm) below seating plane.
3. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
4. Pins 1 and 2 are internally connected with a jumper.
5. See 3.4.2 for the polarity of the terminals.
6. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

FIGURE 1. Physical dimensions TO-204AA (formerly modified TO-3).

2. APPLICABLE DOCUMENTS.

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 and 4 of this specification, whether or not they are listed.

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.

(Copies of these documents are available online at <http://quicksearch.dla.mil>.)

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 manufacturer's 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 6.7.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and herein. Current density of internal conductors shall be as specified in MIL-PRF-19500.

3.4.1 Lead finish. 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 acquisition document (see 6.2).

3.4.2 Polarity. Standard polarity devices (B types) shall have the anode connected to the case. Reversed polarity devices (RB types) shall have the cathode connected to the case. The two terminals (pins 1 and 2 of figure 1) shall be connected with a jumper internally.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. The PIN shall be in accordance with 1.5.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.7 Maximum and primary test ratings. The maximum and primary test ratings for voltage regulator diodes shall be as specified in 1.3 and table IV herein.

3.8 Electrical test requirements. The electrical test requirements shall be as specified in table I.

3.9 Workmanship. 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, II, and III).

4.1.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-PRF-19500, and as specified herein. Lot accumulation period shall be 6 months in lieu of 6 weeks.

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table III herein tests, the tests specified in table III herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.3 Screening (quality levels JANTX, JANTXV, and JANS 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.

Screen	Measurement	
	Quality level JANS	Quality levels JANTX and JANTXV
3c (1)	Thermal impedance, see 4.3.2	Thermal impedance, see 4.3.2
9	I_{R1} and V_Z (for devices with $V_{Z(nom)} \geq 10$ V dc; see column 1 of table IV herein)	Not applicable
11	I_{R1} and V_Z ; $\Delta I_{R1} = 100$ percent of initial value or $2 \mu A$ dc, whichever is greater; $\Delta V_Z = \pm 1$ percent of initial value (for devices with $V_{Z(nom)} \geq 10$ V dc; see column 1 of table IV herein)	I_{R1} and V_Z
12	See 4.3.1	See 4.3.1
13	Subgroup 2 (except forward voltage test) and subgroup 3 of table I herein; $\Delta I_{R1} = 100$ percent of initial value or $2 \mu A$ dc, whichever is greater, $\Delta V_Z = \pm 1$ percent of initial value	Subgroup 2 (except forward voltage test) of table I herein; $\Delta I_{R1} = 100$ percent of initial value or $2 \mu A$ dc, whichever is greater, $\Delta V_Z = \pm 1$ percent of initial value

(1) This test shall be performed anytime after temperature cycling (screen 3a). JANTX and JANTXV levels do not need to be repeated in screening requirements.

4.3.1 Power burn-in conditions. The power burn-in conditions shall be as follows: $I_Z = I_{ZT}$ (column 4 of table IV herein) at $T_J = 150^\circ\text{C}$ minimum.

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 of MIL-STD-750, as applicable, using the guidelines in that method for determining I_M , I_H , t_H , t_{SW} (V_C and V_H where appropriate).

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I herein. Group A inspection shall be performed on each subplot. End-point electrical measurements shall be in accordance with table I, subgroup 2 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table E-VIA (for quality level JANS) or table E-VIB (for quality levels JAN, JANTX, and JANTXV) of MIL-PRF-19500 and herein. Delta electrical measurements shall be in accordance with table II herein.

4.4.2.1 Quality level JANS (see table E-VIA of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B4	1037	6,000 cycles. See 4.5.1 and MIL-PRF-19500.
B5	1027	$I_Z =$ column 7 (I_{ZM}) of table IV 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	$R_{\theta JC} = 2.0^\circ\text{C/W}$ maximum. 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 Quality levels JAN, JANTX, and JANTXV (see table E-VIB of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	4066	$I_{ZSM} =$ column 9 of table IV. Subgroup 2 (except forward voltage test) and subgroup 3 of table I herein; $\Delta I_{R1} = 100$ percent of initial value or $2 \mu\text{A}$ dc, whichever is greater, $\Delta V_Z = \pm 1$ percent of initial value.
B3	1027	$I_Z =$ column 4 (I_{ZT}) of table IV herein, adjust T_A , mounting, or both to achieve $T_J = +150^\circ\text{C}$ minimum.
B3	1037	2,000 cycles. See 4.5.1 (separate samples may be used).
B5	4081	$R_{\theta JC} = 2.0^\circ\text{C/W}$ maximum. 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.

4.4.3 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. Delta electrical measurements shall be in accordance with table II herein.

Subgroup	Method	Condition
C5		Not applicable.
C6	1027	$I_Z = \text{column 4 } (I_{ZT}) \text{ of table IV}$ herein. Adjust T_A , mounting, or both to achieve $T_J = +150^\circ\text{C}$ minimum
C6	1037	6,000 cycles. See 4.5.1 (separate samples may be used).
C8	4071	Temperature coefficient of breakdown voltage (see 4.5.5). $I_Z = \text{column 4 } (I_{ZT}) \text{ of table IV}$. $T_{\text{ref}} = 25^\circ\text{C} \pm 3^\circ\text{C}$; $T_{\text{test}} = T_{\text{ref}} + 100^\circ\text{C}$ each subplot. α_{VZ} (see column 12 of table IV herein) = percent/ $^\circ\text{C}$. The sample plan shall be $n = 22$ devices, $c = 0$, JAN, JANTX, and JANTXV levels only.
C9		Voltage regulation (see 4.5.6), each subplot, $V_{Z(\text{reg})}$ (see column 8 of table IV herein). The sample plan shall be $n = 22$ devices, $c = 0$.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows. Unless otherwise specified herein, all inspections shall be made at a T_C of $25^\circ\text{C} \pm 3^\circ\text{C}$.

4.5.1 DC intermittent operation life. The DC intermittent operation life test shall be performed in accordance with test method 1037 of MIL-STD-750, except that the procedure shall be as follows: 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 $+85^\circ\text{C} + 15^\circ\text{C}$, -5°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_{ZT} may be used to achieve heating. The test duration shall be the specified number of cycles specified (see 4.4.2.1, 4.4.2.2, and 4.4.3). 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 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.

4.5.2 Maximum zener surge current (I_{ZSM}). The maximum zener surge current test shall be performed in accordance with condition B of test method 4066 of MIL-STD-750. I_{ZSM} (see column 9 of table IV) shall be applied in the reverse direction and shall be superimposed on I_{ZT} (see column 4 of table IV) 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 a one-half sine wave with the same effective (rms) current.

4.5.3 Regulator voltage (V_Z). The regulator voltage test shall be performed in accordance with test method 4022 of MIL-STD-750. I_{ZT} (see column 4 of table IV) shall be applied until thermal equilibrium is obtained.

4.5.4 Reverse current (I_R). The reverse current leakage test shall be performed in accordance with the DC method of test method 4016 of MIL-STD-750. The specified reverse voltage shall be applied between the case and pins 1 and 2 separately and the reverse current measured at each of pins 1 and 2.

4.5.5 Temperature coefficient of regulator voltage (α_{V_Z}). The temperature coefficient of regulator voltage test shall be performed in accordance with test method 4071 of MIL-STD-750. The device shall be temperature stabilized with current applied prior to reading regulator voltage at the specified case temperatures (see column 12 of table IV).

4.5.6 Voltage regulation ($V_{Z(\text{reg})}$). A current at 10 percent of I_{ZM} (see column 7 of table IV) shall be maintained until thermal equilibrium is obtained and V_Z shall be noted. The current shall then be increased to a level of 50 percent of I_{ZM} and maintained at this level until thermal equilibrium is obtained, at which time the voltage change shall not exceed $V_{Z(\text{reg})}$ (see column 8 of table IV).

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 Inspection	2071					
<u>Subgroup 2</u> Forward voltage	4011	Condition A; $I_F = 10$ A dc	V_F		1.5	V dc
Reverse current (see 4.5.4)	4016	DC method $V_R =$ column 10 of table IV herein;	I_{R1}		Col. 11	μ A dc
Breakdown voltage (regulator voltage) (see 4.5.3)	4022	$I_{ZT} =$ column 4 of table IV herein <u>3/</u>	V_Z	Col. 2	Col. 3	V dc
<u>Subgroup 3</u> High temperature operation:		$T_A = +150^\circ\text{C}$				
Reverse current (see 4.5.4)	4016	DC method $V_R =$ column 10 of table IV herein;	I_{R2}		Col. 13	μ A dc
<u>Subgroup 4</u> Small-signal reverse breakdown impedance	4051	$I_{ZT} =$ column 4 of table IV herein; <u>3/</u> $I_{sig} = 10$ percent of I_{ZT}	Z_{ZT}		Col. 5	ohms
Small-signal knee impedance	4051	$I_{ZK} = 5$ mA dc; $I_{sig} = 10$ percent of I_{ZT}	Z_{ZK}		Col. 6	ohms
<u>Subgroup 5</u> Not applicable						
<u>Subgroup 6</u> Surge current (see 4.5.2)	4066	JANS level only Condition B; $I_{ZSM} =$ column 9 of table IV				
End point electrical measurements		See table I, subgroup 2 herein				
<u>Subgroup 7</u> Voltage regulation (see 4.5.6)		JANS level only, $n = 22$, $c = 0$	$V_{Z(reg)}$		Col. 8	V dc
Temperature coefficient of regulator voltage (see 4.5.5)	4071	$I_Z =$ column 4 of table IV herein; $T_{ref} = 25^\circ\text{C} \pm 3^\circ\text{C}$; $T_{test} = T_{ref} + 100^\circ\text{C}$	α_{vz}		Col. 12	%/ $^\circ\text{C}$

1/ For JANS, all devices required by the specified sampling plan shall be subjected to subgroups 2, 3, and 4 combined.

2/ Column references are for table IV herein.

3/ During this test, the T_C of the diode shall be equal to $25^\circ\text{C} \pm 3^\circ\text{C}$.

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

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Forward voltage	4011	Condition A; I _F = 10 A dc	ΔV_F 3/		±50 mV dc change from previously measured value.	

- 1/ The delta electrical measurements for group B inspection for quality level JANS (table E-VIA of MIL-PRF-19500) shall be as follows:
- In addition to the measurements specified for subgroup 3, the measurements of step 1 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 4, the measurements of step 1 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 5, the measurements of steps 1 of this table shall also be taken.
- 2/ The delta electrical measurements for group C inspection (table E-VII of MIL-PRF-19500) shall be as follows:
- In addition to the measurements specified for subgroup 2, the measurements of step 1 (quality level JANS only) of this table shall also be taken.
 - In addition to the measurements specified for subgroup 3, the measurements of step 1 (quality level JANS only) of this table shall also be taken.
 - In addition to the measurements specified for subgroup 6, the measurements of step 1 (all quality levels) of this table shall also be taken.
- 3/ Devices which exceed the group A limits for this test shall not be accepted.

TABLE III. Group E inspection (all quality levels) for qualification and requalification only.

Inspection 1/	MIL-STD-750		Qualification inspection
	Method	Conditions	
<u>Subgroup 1</u>			n = 45, c = 0
Thermal shock	1056		
Hermetic seal	1071		
End-point electrical measurements		See table I, subgroup 2 herein.	
<u>Subgroup 2</u>			n = 45, c = 0
Intermittent operation life	1037	6,000 cycles, see 4.5.1.	
End-point electrical measurements		See table I, subgroup 2 herein.	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500.	
<u>Subgroup 5 and 6</u>			
Not applicable			

TABLE IV. Characteristics and test ratings.

	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
Device type <u>1/</u>	V _Z Nom	V _Z Min	V _Z Max	I _{ZT} <u>2/</u>	Z _Z	Z _K	I _{ZM} <u>2/</u>	V _{Z(reg)}	I _{ZSM} <u>2/</u>	V _R	I _{R1}	α _{VZ}	I _{R2} T _A = 150°C
	Volts	Volts	Volts	mA dc	ohms	ohms	mA dc	volts	A dc	volts	μA dc	%/°C	μA dc
1N4557	3.9	3.70	4.09	3,200	0.16	400	10,000	0.66	40.0	0.5	150	-.050	<u>3/</u>
1N4558	4.3	4.08	4.51	2,900	0.16	500	9,000	0.58	38.0	0.5	150	-.035	<u>3/</u>
1N4559	4.7	4.46	4.93	2,650	0.12	600	8,000	0.40	35.0	1.0	100	±.015	<u>3/</u>
1N4560	5.1	4.84	5.35	2,450	0.12	650	7,500	0.36	32.0	1.0	20	.035	<u>3/</u>
1N4561	5.6	5.32	5.88	2,250	0.12	900	7,000	0.34	30.0	1.0	20	.050	<u>3/</u>
													<u>3/</u>
1N4562	6.2	5.89	6.51	2,000	0.14	1,000	6,500	0.36	25.0	2.0	20	.055	<u>3/</u>
1N2804	6.8	6.46	7.14	1,850	0.2	70	7,000	0.4	37.0	4.5	150	.057	1,000
1N2805	7.5	7.13	7.87	1,700	0.3	70	6,360	0.5	33.0	5.0	100	.067	750
1N2806	8.2	7.79	8.61	1,500	0.4	70	5,800	0.6	29.0	5.4	50	.070	500
1N2807	9.1	8.65	9.55	1,370	0.5	70	5,240	0.7	26.5	6.1	25	.075	400
1N2808	10	9.50	10.50	1,200	0.6	80	4,760	0.9	24.0	6.7	25	.081	300
1N2809	11	10.45	11.55	1,100	0.8	80	4,330	1.0	21.5	8.4	10	.085	200
1N2810	12	11.40	12.60	1,000	1.0	80	3,970	1.1	20.0	9.1	10	.079	200
1N2811	13	12.35	13.65	960	1.1	80	3,750	1.2	18.5	9.9	10	.080	200
1N2813	15	14.25	15.75	830	1.4	80	3,170	1.5	15.5	11.4	10	.082	200
1N2814	16	15.20	16.80	780	1.6	80	2,970	1.6	14.75	12.2	10	.083	200
1N2816	18	17.10	18.90	700	2.0	80	2,640	1.9	12.75	13.7	10	.085	200
1N2818	20	19.00	21.00	630	2.4	80	2,380	2.3	11.75	15.2	10	.086	200
1N2819	22	20.90	23.10	570	2.5	80	2,160	2.5	10.5	16.7	10	.087	200
1N2820	24	22.80	25.20	520	2.6	80	1,980	2.6	9.75	18.2	10	.088	200

See footnotes at end of table.

TABLE IV. Characteristics and test ratings – Continued.

Device type <u>1/</u>	Col 1 V _Z Nom	Col 2 V _Z Min	Col 3 V _Z Max	Col 4 I _{ZT} <u>2/</u>	Col 5 Z _Z ohms	Col 6 Z _K ohms	Col 7 I _{ZM} <u>2/</u>	Col 8 V _{Z(reg)} Volts	Col 9 I _{ZSM} <u>2/</u>	Col 10 V _R Volts	Col 11 I _{R1} μA dc	Col 12 α _{VZ} %/°C	Col 13 I _{R2} μA dc T _A = 150°C
	Volts	Volts	Volts	mA dc	ohms	ohms	mA dc	Volts	A dc	Volts	μA dc	%/°C	μA dc
1N2822	27	25.65	28.35	460	2.8	90	1,760	2.9	8.25	20.6	10	.090	200
1N2823	30	28.50	31.50	420	3.0	90	1,590	3.0	7.75	22.8	10	.091	200
1N2824	33	31.35	34.65	380	3.2	90	1,440	3.2	7.25	25.1	10	.092	200
1N2825	36	34.20	37.80	350	3.5	90	1,320	3.4	6.5	27.4	10	.093	200
1N2826	39	37.10	40.90	320	4.0	90	1,220	3.6	5.88	29.7	10	.094	200
1N2827	43	40.90	45.10	290	4.5	90	1,000	3.8	5.38	32.7	10	.095	200
1N2829	47	44.65	49.35	270	5.0	100	1,020	4.0	4.90	35.8	10	.095	200
1N2831	51	48.45	53.55	245	5.2	100	930	4.4	4.63	38.8	10	.096	200
1N2832	56	53.20	58.80	220	6.0	110	850	4.75	4.13	42.6	10	.096	200
1N2833	62	58.90	65.10	200	7.0	120	770	5.0	3.68	47.1	10	.097	200
1N2834	68	64.60	71.40	180	8	140	700	5.5	3.35	51.7	10	.097	200
1N2835	75	71.25	78.75	170	9	150	640	5.75	3.00	56.0	10	.098	200
1N2836	82	77.90	86.10	150	11	160	580	6.25	2.75	62.2	10	.098	200
1N2837	91	86.45	95.55	140	15	180	530	6.75	2.35	69.2	10	.099	200
1N2838	100	95.0	105.0	120	20	200	480	7.5	2.25	76.0	10	.100	200
1N2840	110	104.5	115.5	110	30	220	430	9.0	2.05	83.6	10	.100	200
1N2841	120	114.0	126.0	100	40	240	400	9.5	1.88	91.2	10	.100	200
1N2842	130	123.5	136.5	95	50	275	370	10.0	1.73	98.8	10	.100	200
1N2843	150	142.5	157.5	85	75	400	320	12.0	1.50	114.0	10	.100	200
1N2844	160	152.0	168.0	80	80	450	300	13.0	1.43	121.6	10	.100	200
1N2845	180	171.0	189.0	68	90	525	260	14.5	1.25	136.8	10	.100	200
1N2846	200	190.0	210.0	65	100	600	240	16.0	1.10	152.0	10	.100	200

1/ The device type includes a suffix symbol "B" or "RB". See 1.5.3 for a description of the suffix symbols.

2/ Unless otherwise specified herein, all inspections shall be made at T_C of 25°C ±3°C.

3/ This test is not applicable for devices 1N4557B, RB through 1N4562B, RB.

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 sheet.)

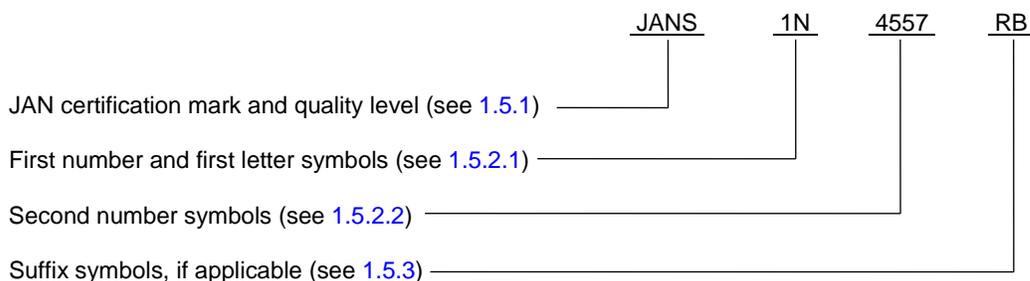
6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

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. The complete PIN, see [1.5](#) and 6.4.

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.dla.mil>.

6.4 PIN construction example. The PINs for encapsulated devices are constructed using the following form.



6.5 List of PINs. The following is a list of possible PINs available on this specification sheet. The reverse polarity devices, suffix "RB" PINs, are not listed below.

JAN1N4557B	JANTX1N4557B	JANTXV1N4557B	JANS1N4557B
JAN1N4558B	JANTX1N4558B	JANTXV1N4558B	JANS1N4558B
JAN1N4559B	JANTX1N4559B	JANTXV1N4559B	JANS1N4559B
JAN1N4560B	JANTX1N4560B	JANTXV1N4560B	JANS1N4560B
JAN1N4561B	JANTX1N4561B	JANTXV1N4561B	JANS1N4561B
JAN1N4562B	JANTX1N4562B	JANTXV1N4562B	JANS1N4562B
JAN1N2804B	JANTX1N2804B	JANTXV1N2804B	JANS1N2804B
JAN1N2805B	JANTX1N2805B	JANTXV1N2805B	JANS1N2805B
JAN1N2806B	JANTX1N2806B	JANTXV1N2806B	JANS1N2806B
JAN1N2807B	JANTX1N2807B	JANTXV1N2807B	JANS1N2807B
JAN1N2808B	JANTX1N2808B	JANTXV1N2808B	JANS1N2808B
JAN1N2809B	JANTX1N2809B	JANTXV1N2809B	JANS1N2809B
JAN1N2810B	JANTX1N2810B	JANTXV1N2810B	JANS1N2810B
JAN1N2811B	JANTX1N2811B	JANTXV1N2811B	JANS1N2811B
JAN1N2813B	JANTX1N2813B	JANTXV1N2813B	JANS1N2813B
JAN1N2814B	JANTX1N2814B	JANTXV1N2814B	JANS1N2814B
JAN1N2816B	JANTX1N2816B	JANTXV1N2816B	JANS1N2816B
JAN1N2818B	JANTX1N2818B	JANTXV1N2818B	JANS1N2818B
JAN1N2819B	JANTX1N2819B	JANTXV1N2819B	JANS1N2819B
JAN1N2820B	JANTX1N2820B	JANTXV1N2820B	JANS1N2820B
JAN1N2822B	JANTX1N2822B	JANTXV1N2822B	JANS1N2822B
JAN1N2823B	JANTX1N2823B	JANTXV1N2823B	JANS1N2823B
JAN1N2824B	JANTX1N2824B	JANTXV1N2824B	JANS1N2824B
JAN1N2825B	JANTX1N2825B	JANTXV1N2825B	JANS1N2825B
JAN1N2826B	JANTX1N2826B	JANTXV1N2826B	JANS1N2826B
JAN1N2827B	JANTX1N2827B	JANTXV1N2827B	JANS1N2827B
JAN1N2829B	JANTX1N2829B	JANTXV1N2829B	JANS1N2829B
JAN1N2831B	JANTX1N2831B	JANTXV1N2831B	JANS1N2831B
JAN1N2832B	JANTX1N2832B	JANTXV1N2832B	JANS1N2832B
JAN1N2833B	JANTX1N2833B	JANTXV1N2833B	JANS1N2833B
JAN1N2834B	JANTX1N2834B	JANTXV1N2834B	JANS1N2834B
JAN1N2835B	JANTX1N2835B	JANTXV1N2835B	JANS1N2835B
JAN1N2836B	JANTX1N2836B	JANTXV1N2836B	JANS1N2836B
JAN1N2837B	JANTX1N2837B	JANTXV1N2837B	JANS1N2837B
JAN1N2838B	JANTX1N2838B	JANTXV1N2838B	JANS1N2838B
JAN1N2840B	JANTX1N2840B	JANTXV1N2840B	JANS1N2840B
JAN1N2841B	JANTX1N2841B	JANTXV1N2841B	JANS1N2841B
JAN1N2842B	JANTX1N2842B	JANTXV1N2842B	JANS1N2842B
JAN1N2843B	JANTX1N2843B	JANTXV1N2843B	JANS1N2843B
JAN1N2844B	JANTX1N2844B	JANTXV1N2844B	JANS1N2844B
JAN1N2845B	JANTX1N2845B	JANTXV1N2845B	JANS1N2845B
JAN1N2846B	JANTX1N2846B	JANTXV1N2846B	JANS1N2846B

6.6 Supersession information.

6.6.1 Re-identification of previous duplicate currents I_Z to currents I_{ZM} and I_{ZT} . Previous revisions of this specification used the symbol I_Z in two different columns of table IV. In MIL-PRF-19500/114G (dated 20 September 2007) and earlier revisions, current I_Z was used in columns 4 and 7. These were re-identified as I_{ZT} (column 4) and I_{ZM} (column 7) with the issuance of MIL-PRF-19500/114H; dated 9 September 2011.

6.7 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.

α_{VZ}	Temperature coefficient.
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_Z	Zener current.
I_{ZK}	Regulator or reference current, dc near breakdown knee.
I_{ZM}	Maximum zener current.
I_{ZSM}	Maximum zener surge current.
I_{ZT}	Zener test current.
P_T	Total power dissipation, all terminals.
$R_{\theta JC}$	Thermal resistance, junction to case.
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	Impedance.
Z_{ZT}	Zener test impedance.
Z_{ZK}	Knee impedance.

6.8 Request for new types and configurations. Requests for new device types or configurations for inclusions in this specification sheet should be submitted to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990 or by electronic mail at "Semiconductor@dla.mil" or by facsimile (614) 693-1642 or DSN 850-6939.

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

Army – CR
Navy – EC
Air Force – 85
DLA – CC

Preparing activity:

DLA – CC

(Project 5961-2016-011)

Review activities:

Army – AR, MI, MR, SM
Navy – AS, MC, SH
Air Force – 19

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.dla.mil>.