The documentation and process conversion measures necessary to comply with this revision shall be completed by 9 April 2004.

INCH-POUND

MIL-PRF-19500/590F
9 January 2004
SUPERSEDING
MIL-PRF-19500/590E
30 December 2002

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, ULTRAFAST RECOVERY, POWER RECTIFIER, 1N6626 THROUGH 1N6631, 1N6626U THROUGH 1N6631U, 1N6626US THROUGH 1N6631US, 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 a silicon, ultrafast recovery, semiconductor power rectifier diode. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figures 1 (similar to DO-41) and 2 (surface mount).

1.3 Maximum ratings. Unless otherwise specified, T_A = +25°C.

1.3.1 Ratings applicable to all types. Ratings applicable to all part or identifying numbers (PIN). T_{STG} = T_J = -65°C to +175°C.

1.3.2 Ratings applicable to individual types.

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10
Types	V_{RWM}	$I_{F(AV)1}$ at $T_{L\ =}$ +75°C L = .375 inch (9.52 mm) (1) (2) (3)	I_O $I_{F(AV)2}$ (1) (4) (5)	I_{FSM} at t_p = 8.3 ms	Barometric pressure	t_{rr1} (6)	$R_{\theta JL}$ at L = .375 (9.52 mm)	$R_{\theta JEC}$ at L = 0 (0.00 mm)	$Z_{\theta JX}$
	V dc	A	A dc	A(pk)	mm Hg	ns	°C/W	°C/W	°C/W
1N6626, U, US	200	4.0	2.0	75	8	30	22	10	1.5
1N6627, U, US	400	4.0	2.0	75	8	30	22	10	1.5
1N6628, U, US	600	4.0	2.0	75	8	30	22	10	1.5
1N6629, U, US	800	3.0	1.4	75	33	50	22	10	1.5
1N6630, U, US	900	3.0	1.4	75	33	50	22	10	1.5
1N6631, U, US	1,000	2.0	1.4	60	33	60	22	10	1.5

See notes on next page.

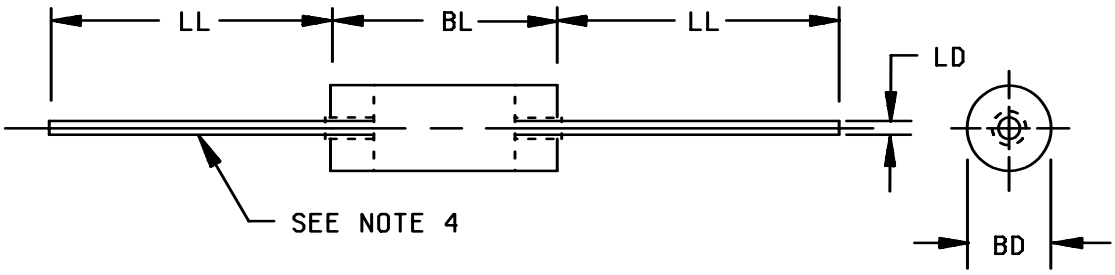
* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43216-5000, or emailed to alan.barone@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

1.3.2 Maximum ratings - Continued.

(1) Average current with a half sine wave including reverse voltage amplitude equal to the magnitude of full rated $V_{RWM.}$
(2) Derate linearly at 1.0 percent/°C for T_L > +75°C.
(3) These rated currents apply to U or US suffix types when the maximum temperature of the end caps (mounting surface) is +110 °C; derate at 1.5 percent/°C above T_{EC} > +110°C.
(4) Derate linearly at 0.67 percent/°C for T_A greater than + 25°C.
(5) This I_O rating is typical for PC boards where thermal resistance from mounting point to ambient is sufficiently controlled where $T_{J(max)}$ in 1.3 is not exceeded.
(6) The reverse recovery time, method 4031 of MIL-STD-750 condition B, T_J = +125°C shall not exceed three times the +25°C limit.

1.4 Primary electrical characteristics. Unless otherwise noted, T_A = + 25°C.

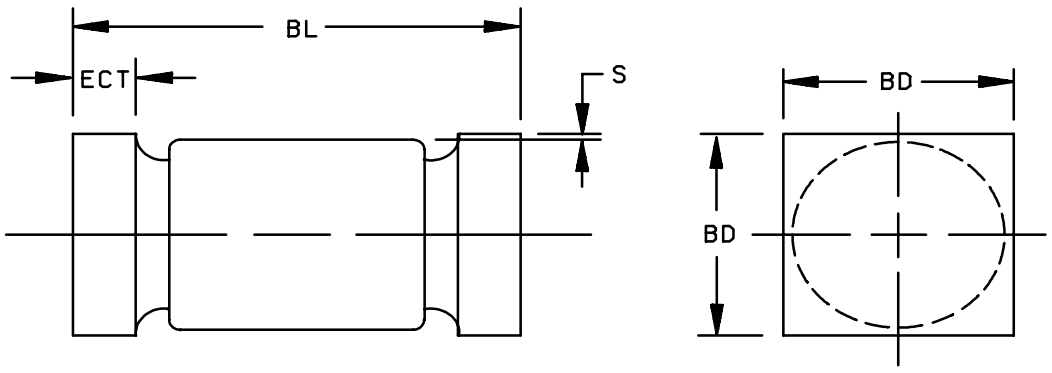
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
Types	I_{R1} at T_J = +25°C	I_{R2} at T_J = +150°C	$I_{RM(REC)}$ at 2 A, 100A/µs	C_T at V_R = +10 V	V_{FM1} at I_F = (col. 3 of 1.3)	V_{FM2} at I_F = (col. 4 of 1.3)
	µA	µA	A pk	pF	V	V
1N6626, U, US	2.0	500	3.5	40	1.5	1.35
1N6627, U, US	2.0	500	3.5	40	1.5	1.35
1N6628, U, US	2.0	500	3.5	40	1.5	1.35
1N6629, U, US	2.0	500	4.2	40	1.7	1.40
1N6630, U, US	2.0	500	4.2	40	1.7	1.40
1N6631, U, US	4.0	600	5.0	40	1.95	1.60



Ltr	Dimensions				
	Inches		Millimeters		
	Min	Max	Min	Max	Notes
BD	.115	.137	2.92	3.50	4
BL	.130	.300	3.30	7.62	3
LD	.037	.042	0.94	1.07	3
LL	.900	1.300	22.86	33.02	

NOTES:
1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. Dimension BL shall include the sections of the lead over which the diameter is uncontrolled. This uncontrolled area is defined as the zone between the edge of the diode body and extending .050 inch (1.27 mm) onto the leads.
4. Dimension BD shall be measured at the largest diameter.
5. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions (similar to DO-41).



Dimensions				
Ltr	1N6626U, US through 1N6631U, US			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.200	.225	5.08	5.72
BD	.137	.148	3.48	3.76
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:
1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Physical dimension of surface mount.

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.

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://assist.daps.dla.mil/quicksearch/ or www.dodssp.dap.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. 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. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows:

EC ..... End-cap.
$I_{RM(REC)}$ ..... Peak reverse recovery current.
T_{CVF} ..... Temperature coefficient of forward voltage.
V_{FRM} ..... Forward recovery voltage.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and on figures 1 (similar to DO-41) and 2 (surface mount) herein.

3.4.1 Lead finish. Unless otherwise specified, lead or end cap finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. When solder alloy is used for finish the maximum lead temperature is limited to 175°C maximum. Where a choice of finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4.2 Diode construction. These devices shall be constructed utilizing non-cavity double plug construction with high temperature metallurgical bonding between both sides of the silicon die and terminal pins (see MIL-PRF-19500). Metallurgical bond shall be in accordance with the requirements of category I in MIL-PRF-19500. U and US version devices shall be structurally identical to the non-surface mount devices except for lead terminations. The US version shall be structurally identical to the U version.

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

3.5.1 Marking for U and US devices. For U and US version devices only, all marking may be omitted from the device except for the cathode marking. All marking which is omitted from the body of the device shall appear on the label of the initial container.

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

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

3.8 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I herein.

3.9 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, II, and III).

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 qualification shall be performed herein for qualification or requalification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table II tests, the tests specified in table II herein shall be performed by the first inspection lot to this revision to maintain qualification.

* 4.3 Screening (JANS, JANTX, and JANTXV levels). Screening shall be in accordance with table 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 (see table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTXV and JANTX level
1a 1b	Required Required	Not required Required (JANTXV only)
2	Optional	Optional
3a (1) 3c	Required Thermal impedance (see 4.3.1)	Required Thermal impedance (see 4.3.1)
4	Not applicable	Not applicable
5	Not applicable	Not applicable
6	Not applicable	Not applicable
7a 7b	Not applicable Optional	Not applicable Optional
8	Required	Not required
9	Required I_{R1} and V_{FM1}	Not required
10	Method 1038 of MIL-STD-750, condition A	Method 1038 of MIL-STD-750, condition A
11	I_{R1} and V_{FM1}, ΔI_{R1} = ±400 nA dc (±800 nA dc for 1N6631) or 100 percent of initial reading; whichever is greater. $\Delta V_{FM1} \leq \pm$ 0.05 V dc	I_{R1} and V_{FM1}
12	Required, see 4.3.2	Required, see 4.3.2
(2) 13	Subgroups 2 and 3 of table I herein: ΔI_{R1} = ±400 nA dc (±800 nA dc for 1N6631) or 100 percent of initial reading; whichever is greater. ΔV_{FM1} = ±0.05 V dc. Scope display evaluation, method 4023 of MIL-STD-750, see 4.5.4.	Subgroup 2 of table I herein: ΔI_{R1} = ±400 nA dc (±800 nA dc for 1N6631) or 100 percent of initial reading; whichever is greater. ΔV_{FM1} = ±0.05 V dc. Scope display evaluation, method 4023 of MIL-STD-750, see 4.5.4.
14a 14b	Not applicable Required	Not applicable Required
15	Required	Not required
16	Required	Not required

(1) Thermal impedance shall be performed any time after sealing provided temperature cycling is performed in accordance with MIL-PRF-19500, screen 3 prior to this thermal test.
(2) $Z_{\theta JX}$ is not required in screen 13, if already previously performed.

* 4.3.1 Thermal impedance $Z_{\theta JX}$ measurements for screening. The $Z_{\theta JX}$ measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum screen limit shall be developed by the supplier using statistical methods and it shall not exceed table I, subgroup 2.

* 4.3.1.1 Thermal impedance ($Z_{\theta JX}$ measurements) for initial qualification or requalification. The $Z_{\theta JX}$ measurements shall be performed in accordance with method 3101 of MIL-STD-750 and readings recorded. $Z_{\theta JX}$ shall be supplied on one lot (500 pieces minimum and a thermal response curve shall be submitted.) Twenty-two of these samples shall be serialized and provided to the qualifying activity for correlation prior to shipment of parts. Measurements conditions shall be in accordance with 4.4.1.

* 4.3.2 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.3, 4.5.3.1) adjust I_O to achieve the required T_J: Use method 3100 of MIL-STD-750 to measure T_J.

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. The following test conditions shall be used for $Z_{\theta JX}$, table I inspection: $Z_{\theta JX}$ = 1.5°C/W.

a. I_H = 5 A minimum.

b. t_H = 10 ms.

c. I_M = 10 mA.

d. t_{MD} = 100 μs maximum.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in tables VIa (JANS) and VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500 and 4.4.2.1 and 4.4.2.2 herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table III herein.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500. For B5, if a failure occurs, resubmission shall be at the test conditions of the original sample.

	Subgroup	Method	Condition
	B3	1056	0°C to +100°C, 25 cycles.
	B3	1051	-55°C to +175°C, 100 cycles.
	B3	4066	I_{FSM} = rated I_{FSM} (see 1.3, col. 5); 10 surges of 8.3 ms each at 1 minute intervals, I_O = 0, V_{RWM} = 0.
	B4	1037	I_O = I_O rated minimum (see 1.3, col. 4); V_R = rated V_{RWM} (see 1.3, col. 2 and 4.5.3); 2,000 cycles.
	B5	1027	I_O = I_O rated minimum (see 1.3, col. 4); apply V_R = rated V_{RWM} (see 1.3, col. 2 and 4.5.3) adjust I_O to achieve T_J minimum; f = 50-60 Hz; n = 45, c = 0.
			Option 1: T_A = + 30°C max. ; T_J = 225°C minimum; t = 216 hours
		or	Option 2: T_A = + 30°C max. ; T_J = 200°C minimum; t = 1,000 hours
*	B6	3101 or 4081	+25°C ≤ T_A ≤ +35°C (recorded before test is performed); $R_{\theta JL}$ (maximum) ≤ 22°C/W; L = .375 inch (9.53 mm). For surface mount devices (U and US version), $R_{\theta JEC}$ ≤ 10°C/W.
*	B7		Peak reverse power, see 4.5.7 herein. P_{RM} ≥ 500 W. Test shall be performed on each sublot; sampling plan n = 10, c = 0, end-points, see 4.4.2.

4.4.2.2 Group B inspection, table VIb (JAN, JANTX and JANTXV of MIL-PRF-19500).

Subgroup	Method	Condition
B2	1056	0°C to +100°C, 10 cycles.
B2	1051	-55°C to +175°C 25 cycles.
B3	1027	$I_O = I_O$ (rated see 1.3, col. 4) minimum, adjust I_O to achieve the required T_J. Apply V_R = rated V_{RWM} (see 1.3, col. 2), f = 50-60 Hz (see 4.5.3.1).

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. See table III for delta limits when applicable.

4.4.3.1 Group C inspection, table VII of MIL-PRF-19500.

Subgroup	Method	Condition
C2	1056	-0°C to +100°C, 10 cycles.
C2	1051	-55°C to +175°C, 25 cycles.
C2	2036	Tension: Test condition A; weight = 20 pounds; t = 30 seconds. Lead fatigue: Test condition E; weight 2 pounds. NOTE: Both tension and lead fatigue are not applicable for U or US devices.
C6	1027	$I_O = I_O$ (rated see 1.3, col. 4) min. adjust I_O to achieve the required T_J. Apply V_R = rated V_{RWM} (see 1.3, col. 2), f = 50-60 Hz (see 4.5.3.1).

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table IX of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. See table III for delta limits when applicable.

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

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Inspection conditions. Unless otherwise specified, all inspections shall be conducted at T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5).

4.5.3 Burn-in and life tests. These tests shall be conducted with a half-sine waveform of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine waveform of the specified average rectified current. The forward conduction angle of the rectified current shall be neither greater than 180 degrees, nor less than 150 degrees.

* 4.5.3.1 Free air burn-in. Deliberate heat sinking, baffles to create an oven, forced air-cooling or heating is prohibited unless otherwise approved by the qualifying activity. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the full P_t (minimum) and that the minimum applied voltage, where applicable, is maintained through out the burn-in period. T_J = 125°C minimum for screening and T_J = 150°C for 4.4.2 and 4.4.3 life tests.

4.5.4 Scope display evaluation. Scope display evaluation shall be stable in accordance with method 4023 of MIL-STD-750. Scope display may be performed on ATE (automatic test equipment) for screening only with the approval of the qualifying activity. Scope display in table I, subgroup 4 shall be performed on a scope. Reverse current (I_{BR}) over the knee shall be 500 μA peak.

4.5.5 Thermal resistance. Thermal resistance shall be measured in accordance with method 3101 of MIL-STD-750. The reference point shall be the lead temperature at .375 inch (9.52 mm) from the body of the device. L = 0 (end-cap mount) for surface mounted devices.

a. I_H = 2.0 A dc minimum.

b. $t_{H =}$ thermal equilibrium.

c. I_M = 10 mA.

d. t_{MD} = 100 μs maximum.

4.5.6 Reverse recovery time.

4.5.6.1 Low current reverse recovery time (see figure 3). The low current reverse recovery time shall be 0.5 A forward current to 1.0 A reverse current. The reverse recovery time is defined as the time the rectifier begins to conduct in the reverse direction (crosses I = 0) until the reverse current decays to -0.25 A. The point of contact on the leads shall be no less than .375 inch (9.52 mm) from the diode body.

4.5.6.2 High current reverse recovery time. The high current reverse recovery time shall be measured in the circuit of figure 4 or equivalent. A pulse of forward current for the DUT is provided through S_1 and controlled by V_3, R_{L1} and the timing input pulse V_1. The duration of pulse, t_1, should be sufficient to fully establish the stored charge associated with the specified I_F; it is suggested to be between 10 and 30 microseconds. The reverse voltage (V_4) to the DUT is applied through S_2 at a rate determined by the rise time, t_2 and magnitude of the input pulse, V_2, which is applied slightly before the end of t_1. The negative supply, V_4, is to be specified. It should be sufficiently low to prevent the peak voltage, $V_{RM(REC)}$, from exceeding the rated reverse voltage, V_{RWM} , of the device under test. For most repeatable measurement, 30 V is recommended. The point of contact on the leads shall be no less than .375 inch (9.52 mm) from the body.

4.5.7 Peak reverse power test (see figure 5). A 20 microsecond half-sine waveform of current shall be used and peak reverse power shall be determined by the product of peak reverse voltage and peak reverse current. A 20 microsecond square waveform may also be used with the approval of the qualifying activity.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Thermal impedance	3101	See 4.3.1	$Z_{\theta JX}$		1.5	°C/W
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed) (see 4.5.1) t_p = 8.3 ms (max).	V_{FM1}			
1N6626, U, US		I_{FM} = 4.0 A dc			1.5	V dc
1N6627, U, US		I_{FM} = 4.0 A dc			1.5	V dc
1N6628, U, US		I_{FM} = 4.0 A dc			1.5	V dc
1N6629, U, US		I_{FM} = 3.0 A dc			1.7	V dc
1N6630, U, US		I_{FM} = 3.0 A dc			1.7	V dc
1N6631, U, US		I_{FM} = 2.0 A dc			1.95	V dc
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed) (see 4.5.1) t_p = 8.3 ms (max).	V_{FM2}			
1N6626, U, US		I_{FM} = 2.0 A dc			1.35	V dc
1N6627, U, US		I_{FM} = 2.0 A dc			1.35	V dc
1N6628, U, US		I_{FM} = 2.0 A dc			1.35	V dc
1N6629, U, US		I_{FM} = 1.4 A dc			1.40	V dc
1N6630, U, US		I_{FM} = 1.4 A dc			1.40	V dc
1N6631, U, US		I_{FM} = 1.4 A dc			1.60	V dc
Reverse current leakage	4016	DC method; V_{RM} = rated V_{RM} (col. 2 of 1.3); pulsed (see 4.5.1)	I_{R1}		Col. 2 of 1.4	μA
Breakdown voltage	4022	I_R = 50 μA dc pulsed (see 4.5.1)	$V_{(BR1)}$	110 percent of col. 2 of 1.3		

See footnote at end of table.

TABLE I. Group A inspection – Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 3						
High temperature operation		T_A = +150°C				
Reverse current leakage	4016	V_{RM} = rated V_{RM} (col. 2 of 1.3) (pk); pulsed (see 4.5.1)	I_{R2}		Col. 3 of 1.4	µA dc
Low temperature operation:		T_A = -65°C				
Forward voltage	4011	I_{FM3} = 50 percent of $I_{F(AV1)}$ (pk) (col. 3 of 1.3); pulsed (see 4.5.1)	V_{FM3}		110 percent of col. 6 of 1.4	V
Breakdown voltage		I_R = 50 µA dc pulsed (see 4.5.1)	$V_{(BR2)}$	Col. 2 of 1.3		V
Subgroup 4						
Forward recovery voltage	4026	I_F =1 A; t_r = 12 ns	V_{FRM}			V
1N6626, U, US					8	
1N6627, U, US					8	
1N6628, U, US					8	
1N6629, U, US					12	
1N6630, U, US					12	
1N6631, U, US					20	
Capacitance	4001	V_R = 10 V dc, f = 0.1 to 1 MHz	C_T		40	pF

See footnote at end of table.

TABLE I. Group A inspection – Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - Continued						
Low current reverse recovery time	4031	See 4.5.6.1 condition B, and figure 3 herein.	t_{rr1}			ns
1N6626, U, US					30	
1N6627, U, US					30	
1N6628, U, US					30	
1N6629, U, US					50	
1N6630, U, US					50	
1N6631, U, US					60	
High current reverse recovery time	4031	Condition D. See 4.5.6.2, I_F = 2A, di/dt = 100 A/μs, and figure 4 herein.	t_{rr2}			ns
1N6626, U, US					45	
1N6627, U, US					45	
1N6628, U, US					45	
1N6629, U, US					60	
1N6630, U, US					60	
1N6631, U, US					80	
Peak recovery current		See figure 5.	$I_{RM(REC)}$			A
1N6626, U, US					3.5	
1N6627, U, US					3.5	
1N6628, U, US					3.5	
1N6629, U, US					4.2	
1N6630, U, US					4.2	
1N6631, U, US					5.0	
Scope display	4023	Stable only (see 4.5.4), n = 116, c = 0				

See footnote at end of table.

TABLE I. Group A inspection – Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 5						
Not applicable						
Subgroup 6						
Forward surge	4066	I_{FSM} = rated I_{FSM} (col. 5 of 1.3) 10 surges of 8.3 ms each at 1 minute intervals. I_O = 0, V_{RWM} = 0, T_A = +25°C				
Electrical measurement		See table I, subgroup 2.				
Subgroup 7						
Not applicable						

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

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

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
* Subgroup 1			45 devices c = 0
Thermal shock (glass strain)	1056	20 cycles, condition D except low temperature shall be achieved using liquid nitrogen (-195°C) Visual for cracked glass.	
Temperature cycling	1051	500 cycles, -65°C to +175°C.	
Hermetic seal gross leak	1071		
Electrical measurement		See table I, subgroup 2.	
Subgroup 2			22 devices c = 0
Blocking life	1048	T_A = +150°C; t = 1,000 hours +65, -0 hours; DC = 80 - 85 percent rated V_R	
Electrical measurement		See table I, subgroup 2.	
* Subgroup 3			3 devices, c = 0
Decap analysis	2101	Cross section and scribe and break. Separate samples shall be used for each test.	
* Subgroup 4			N/A
Thermal impedance curves		Each supplier shall submit their (typical) maximum design thermal impedance curves. In addition, the optimal test conditions and $Z_{\theta JX}$ limit shall be provided to the qualifying activity in the qualification report.	
Subgroup 5			22 devices c = 0
Barometric pressure (reduced) 1/	1001	1N6626 through 1N6628 at 8 mm Hg 1N6629 through 1N6631 at 33 mm Hg	
Subgroup 6			n = 3, c = 0
ESD	1020		
* Subgroup 7			n = 45
Soldering heat	2031	One cycle. For procedures on fixturing and dipping surface mounted devices see test method 2026 of MIL-STD-750.	
Electrical measurement		See table I, subgroup 2.	

See footnotes at end of table.

* TABLE II. Group E inspection (all quality levels) for qualification and requalification only – Continued.

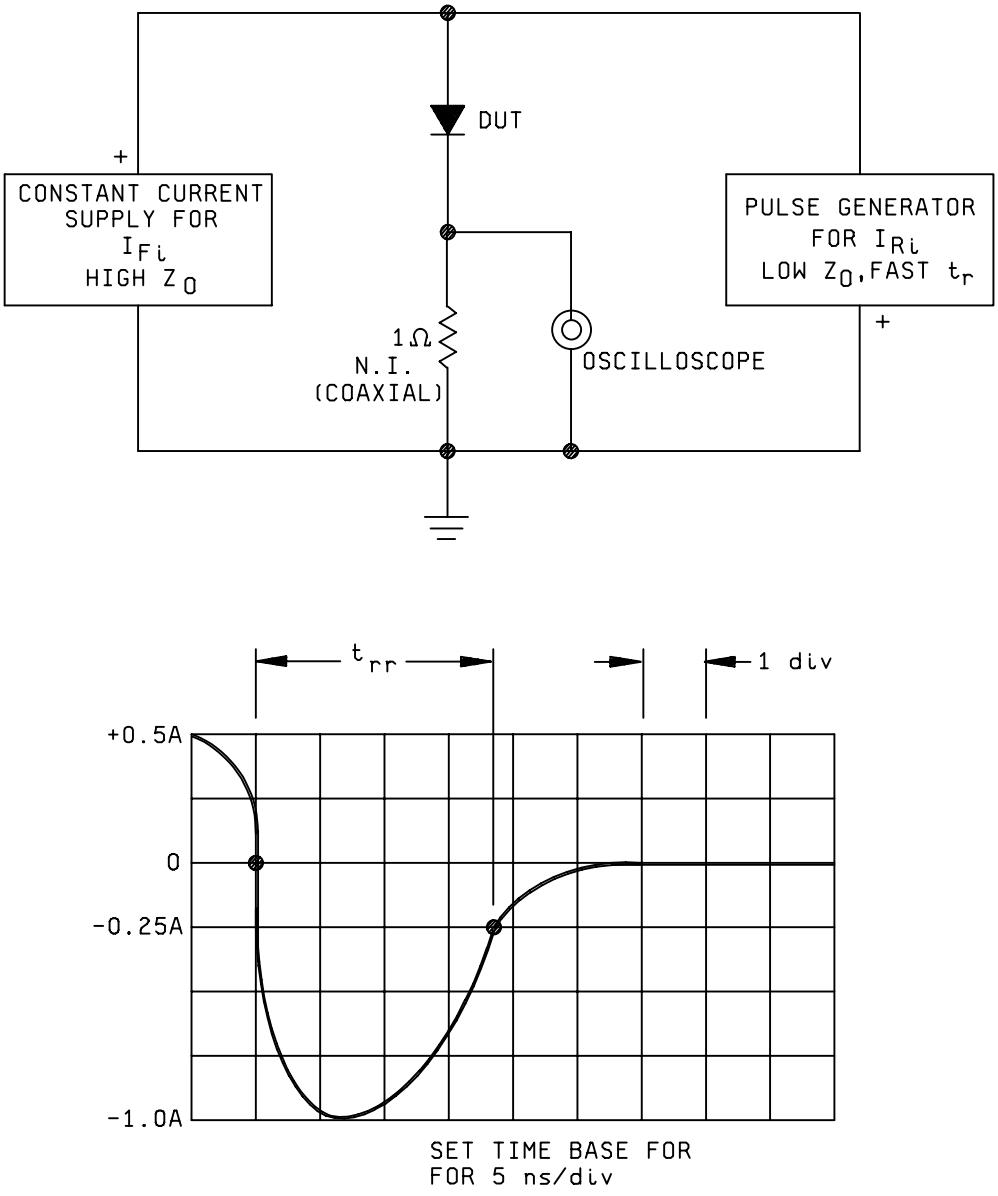
Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
Subgroup 8 2/			
Peak reverse power		See 4.5.7 and figure 5 herein. Peak reverse power (P_{RM}) = shall be characterized by the supplier and this data shall be available to the Government. Test shall be performed on each sublot.	
Electrical measurement		During the P_{RM} test, the voltage (V_{BR}) shall be monitored to verify it has not collapsed. Any collapse in V_{BR} during or after the P_{RM} test or rise in leakage current (I_R) after the test that exceeds I_{R1} in table I shall be considered a failure to that level of applied P_{RM}. Progressively higher levels of P_{RM} shall be applied until failure occurs on all devices within the chosen sample size to characterize each sublot.	
Subgroup 9 1/			n = 45
Resistance to glass cracking	1057	Test condition B Step stress to destruction by increasing cycles or up to a maximum of 25 cycles.	
Subgroup 10			22 devices c = 0
Forward surge	4066	Condition A, I_{FSM} = rated I_{FSM} (see 1.3, col. 5); 10 surges of 8.3 ms each at 1 minute intervals, I_O = 0, V_{RWM} = 0.	
Electrical measurement		See table I, subgroup 2.	

1/ Also applies to U and US suffix versions.
2/ The sample size for this step stress requirement shall be determined by the supplier. A statistically significant sample size is required.

TABLE III. Groups B, C, and E delta measurements. 1/ 2/ 3/

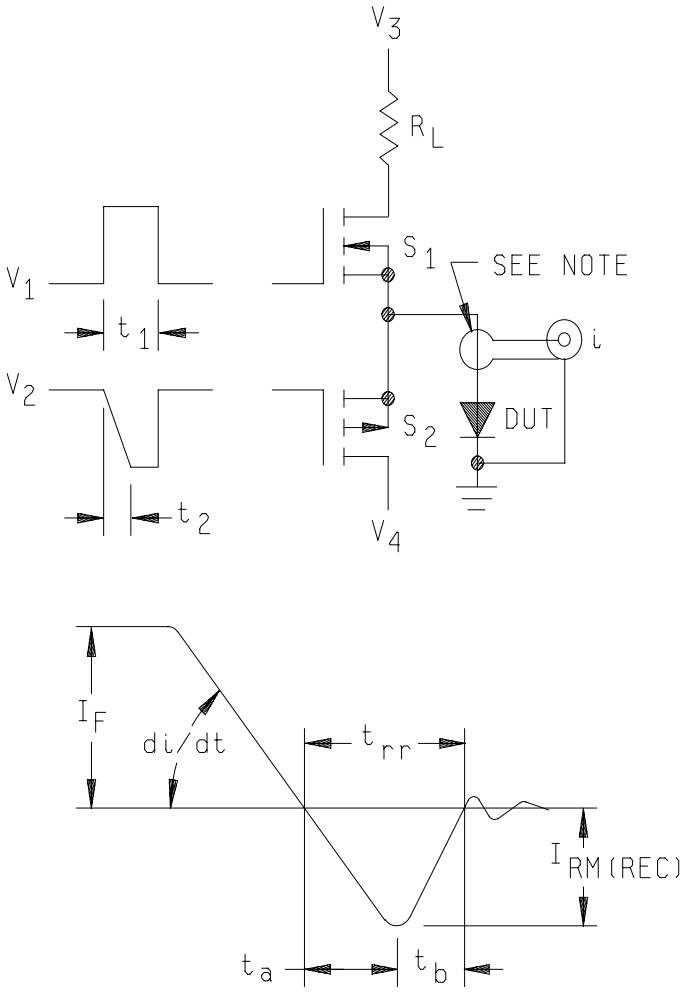
Step	Inspection	MIL-STD-750		Symbol	Limits 3/		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage change	4011	I_{FM} = col. 4 of 1.3, pulsed (see 4.5.1)	ΔV_{FM1}	± 50 mV change from previous measured value		
2.	Reverse current change 4/ 1N6626 through 1N6631	4016	V_{RM} = col. 2 of 1.3	ΔI_{R1}		+2	μA

1/ The delta measurements for table VIa (JANS) of MIL-PRF-19500 are as follows: Subgroup 5, see table III herein, steps 1 and 2.
2/ The delta measurements for table IX of MIL-PRF-19500 are as follows: Subgroup 1, see table III herein, steps 1 and 2.
3/ See 1.4 herein.
4/ Also applies to U and US suffix versions.



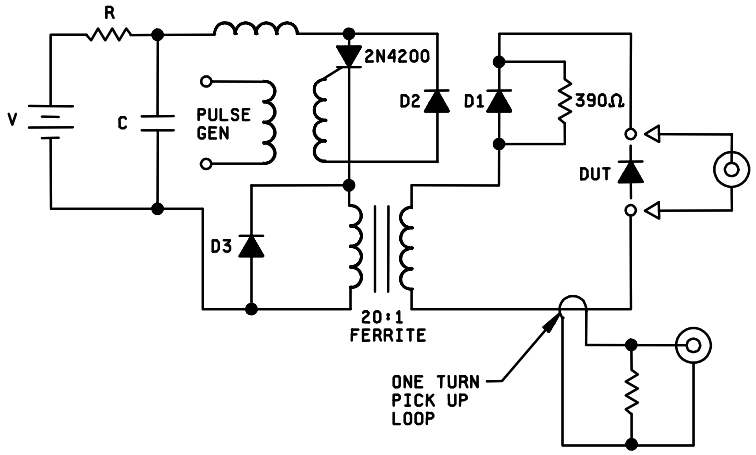
NOTES:
1. Oscilloscope: Rise time ≤ 3 ns; input impedance = 1 MΩ; 22 pF.
2. Pulse generator: Rise time ≤ 8 ns; source impedance = 10 Ω.

FIGURE 3. Reverse recovery time test circuit and characteristic waveform.

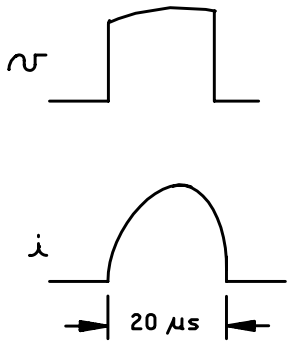


NOTE: Current sensing transformer; alternatively a low inductance resistor may be used, from the cathode to ground, for current vs time measurements.

FIGURE 4. High current reverse recovery test circuit and waveform.



NOTES:
L = 13T H22 on 1 inch diameter form (air core).
C ~ 1 to 10 μfd to give 20 μs pulse width.
V - Adjustable to 200 volts for power desired in DUT.
D1 - 3 kV; 600 mA (1N3647 or equivalent).
D2, D3 - 600 V; 3A (1N5552 or equivalent).
Values not stated are determined at the time of test.



TYPICAL WAVEFORMS

FIGURE 5. Peak reverse power measurement circuit and waveform.

5. PACKAGING

* 5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual 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.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

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 No. 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 Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000 or e-mail vqe.chief@dla.mil.

6.4 Substitution of devices. The US version is substitutable for the U version and the U version is substitutable for the US version.

6.5 Changes from previous issue. The margins of this specification are marked with asterisks 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 - 11
NASA - NA
DLA - CC

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

Preparing activity:
DLA - CC

(Project 5961-2756)

* 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 www.dodssp.daps.mil .