The documentation and process conversion measures necessary to comply with this revision shall be completed by 4 September 2012.

INCH-POUND

MIL-PRF-19500/590J
4 June 2012
SUPERSEDING
MIL-PRF-19500/590H
4 December 2008

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} = -65°C to +175°C. T_J = +150°C maximum.

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_{OL} at T_L = +75°C (1) (2) (3)	I_{O2} at T_A=+25°C (1) (4) (5)	I_{FSM} at t_p= 8.3 ms	Baro-metric pressure	t_{rr} (6)	$R_{\theta JL}$ at L = .375 inch (9.52 mm) (7)	$R_{\theta JEC}$	$R_{\theta JX}$
	V dc	A	A	A(pk)	mm Hg	ns	°C/W	°C/W	°C/W
1N6626, U, US	200	2.3	1.75	75	8	30	22	6.5	50
1N6627, U, US	400	2.3	1.75	75	8	30	22	6.5	50
1N6628, U, US	600	2.3	1.75	75	8	30	22	6.5	50
1N6629, U, US	800	1.8	1.40	75	33	50	22	6.5	50
1N6630, U, US	900	1.8	1.40	75	33	50	22	6.5	50
1N6631, U, US	1,000	1.8	1.40	60	33	60	22	6.5	50

See notes on next page.

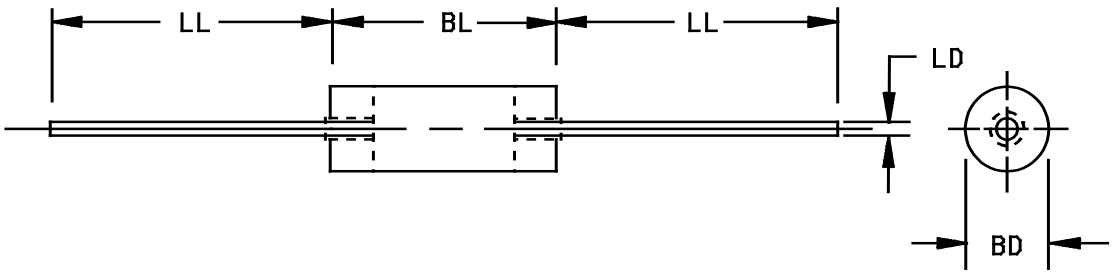
* Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the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

1.3.2 Maximum ratings - Continued.

(1) Average current with a half-sine wave including reverse voltage amplitude equal to the magnitude of the full rated V_{RWM}.
(2) Derate linearly 1.33 percent/°C for T_L > +75°C.
(3) These rated currents also apply to U or US suffix types when the maximum temperature of the end-caps (mounting surface) is +110°C; derate linearly 2.5 percent/°C above T_{EC} > +110°C.
(4) Derate linearly 0.80 percent/°C for T_A > +25°C.
(5) The 1.4 amp rating at +25°C ambient is for thermal (PC boards or other) mounting methods where thermal resistance from mounting point to ambient is still sufficiently controlled where $T_{J(MAX)}$ in 1.3.1 is not exceeded. This equates to $R_{\theta JX} \leq 50$ºC/W as shown. Also see application notes in 6.5.1 for the worst-case 1N6631.
(6) The reverse recovery time (method 4031 of MIL-STD-750, condition B) at T_J = +125°C shall not exceed three times the +25°C limit. Exceeding T_J = +125°C may change reverse recovery times at +25°C to higher levels as indicated in accelerated life testing in 4.4.2.1 B5 for JANS or other life testing in 4.4.2.2 B3 and 4.4.3.1 C6.
(7) See figures 3 and 4 for thermal impedance curves.

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

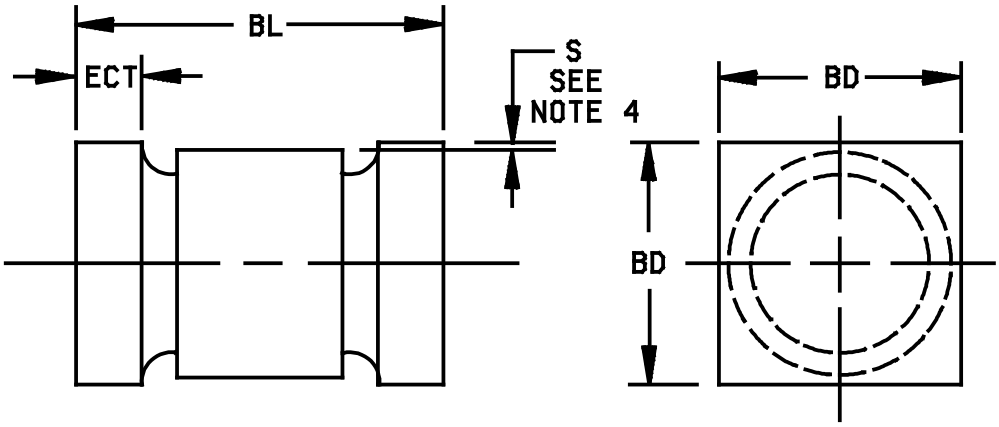
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6		Col. 7	
Types	I_{R1} at T_J = +25°C	I_{R2} at T_J = +150°C	$I_{RM(REC)}$ at 2 A, 100 A/µs	C_T at V_R = +10 V	V_{FM1} at I_{F1}		V_{FM2} at I_{F2}	
					V_{FM1}	I_{F1}	V_{FM2}	I_{F2}
	µA	µA	A pk	pF	V	A	V	A
1N6626, U, US	2.0	500	3.5	40	1.5	4.0	1.35	2.0
1N6627, U, US	2.0	500	3.5	40	1.5	4.0	1.35	2.0
1N6628, U, US	2.0	500	3.5	40	1.5	4.0	1.35	2.0
1N6629, U, US	2.0	500	4.2	40	1.7	3.0	1.40	1.4
1N6630, U, US	2.0	500	4.2	40	1.7	3.0	1.40	1.4
1N6631, U, US	4.0	600	5.0	40	1.95	2.0	1.60	1.4



Ltr	Dimensions				
	Inches		Millimeters		
	Min	Max	Min	Max	Notes
BD	.115	.137	2.92	3.48	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. Millimeters are given for general information only.
3. The BL dimension shall include the entire body including slugs and 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. Millimeters are given for general information only.
3. Dimensions are pre-solder dip.
4. The “S” dimension is the minimum clearance of glass body to mounting surface on all orientations.
5. 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 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 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 that were not performed in the prior revision shall be performed on the first inspection lot to this revision to maintain qualification.

* 4.3 Screening (JANS, JANTX, and JANTXV levels). Screening shall be in accordance with appendix E, 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 (see appendix E, table E-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 (3) 14b	Not applicable Required	Not applicable Required
15	Required	Not required
16	Required	Not required

* (1) Shall be performed anytime after temperature cycling, screen 3a; JANTX and JANTXV levels do not need to be repeated in screen 13.
(2) $Z_{\theta JX}$ is not required in screen 13, if already previously performed.
(3) For glass diodes, the hermetic seal (gross leak) may be performed any time after temperature cycling.

4.3.1 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 as applicable of MIL-STD-750 using the guidelines in that method for determining I_M, I_H, t_H, and K factor where appropriate). Measurement delay time (t_{MD}) = 70 μs max. See group E, subgroup 4and figures 3 and 4 herein.

4.3.2 Free air power burn-in conditions. Power burn-in conditions are as follows (see 4.5.3.1): T_A = +55°C maximum. Test conditions in accordance with method 1038 of MIL-STD-750, condition B. Adjust I_O or T_A to achieve the required T_J. Use method 3100 of MIL-STD-750 to measure T_J. T_J = +115°C minimum and +150°C maximum. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, T_J, mounting conditions) may be used for JANTX and JANTXV quality levels. A justification demonstrating equivalence is required. In addition, the manufacturing site's burn-in data and performance history will be essential criteria for burn-in modification approval.

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.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, tables E-VIA (JANS) and E-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, appendix E, table E-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 1.3.2, col. 5); ten10 surges of 8.3 ms each at 1 minute intervals, $I_O = 0$, $V_{RWM} = 0$.
B4	1037	$I_O = I_{O2}$ rated minimum (see 1.3.2, col. 4); V_R = rated V_{RWM} (see 1.3.2, col. 2 and 4.5.3); 2,000 cycles.
B5	1027	$I_O = I_{O2}$ rated minimum (see 1.3.2, col. 4 and 4.5.3); adjust T_A and or I_O to achieve T_J = +150°C minimum; f = 50 - 60 Hz; n = 45, c = 0; t = 1,000 hours. T_A = +55°C max. . Temporary leads may be added for surface mount devices. For irradiated devices, include trr as an end-point measurement. Delta trr shall not exceed 60 percent of initial reading. With approval of the qualifying activity, alternate life test criteria (hours, bias condition, T_J, mounting conditions) may be used.
B6	4081	$R_{\theta JL}$ (maximum) $\leq$ 22°C/W; L = .375 inch (9.53 mm). (See 4.3.1.) For surface mount devices (US version), $R_{\theta JEC} \leq$ 6.5°C/W.
B8	4065	Peak reverse power, $P_{RM} \geq$ 318 W for square wave in accordance with method 4065 of MIL-STD-750 ($P_{RM} \geq$ 500 W for half-sine wave). 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, appendix E, table E- 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	$I_O = I_{O2}$ (rated see 1.3.2, col. 4) minimum, adjust I_O to achieve the required T_J of +125°C minimum. Apply V_R = rated V_{RWM} (see 1.3.2, col. 2), f = 50 - 60 Hz (see 4.5.3.1). For irradiated devices, include trr as an end-point measurement. Delta trr shall not exceed 25 percent of initial reading.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-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, appendix E, table E-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: Tension is applicable but lead fatigue is not applicable for U and US devices (see figure 5 herein). Suitable fixtures may be used to pull the end-caps in a manner which does not aid construction. References to axial lead may be interpreted as end-cap with fixtures used for mounting.
	C5	4081	$R_{\theta JL}$ (maximum) ≤ 22°C/W; L = .375 inch (9.53 mm). (See 4.3.1.) For surface mount devices (US version), $R_{\theta JEC}$ ≤ 6.5°C/W.
	C6	1027	$I_O = I_{O2}$ (rated see 1.3.2, col. 4) minimum. adjust I_O to achieve the required T_J of +125°C minimum. Apply V_R = rated V_{RWM} (see 1.3.2, col. 2), f = 50 - 60 Hz (see 4.5.3.1). For irradiated devices, include t_{rr} as an end-point measurement. Delta trr shall not exceed 25 percent of initial reading.

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 E-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 and life tests. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the full I_O (minimum) and that the minimum applied voltage, where applicable, is maintained through out the burn-in period. Use method 3100 of MIL-STD-750 to measure T_J. T_J = +115°C minimum to +150°C maximum for screening and T_J = +125°C minimum for 4.4.3.1 life tests. Accelerated life test shall be T_J = +150°C minimum.

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 Reverse recovery time.

4.5.5.1 Low current reverse recovery time (see figure 6). The low current reverse recovery time shall be 0.5 A forward current to 1.0 A reverse current in the circuit of figure 5 or equivalent. 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.

4.5.5.2 High current reverse recovery time. The high current reverse recovery time shall be measured in the circuit of figure 7 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.

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	$Z_{\theta JX}$			°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_R = rated V_{RWM} (col. 2 of 1.3.2); 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 1.3.2		

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_R = rated V_{RWM} (col. 2 of 1.3.2); 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_{F1} (col. 6 of 1.4); 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 1.3.2		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 4.5.5.1 condition B, and figure 5 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 4.5.5.2, I_F = 2 A, di/dt = 100 A/μs, and figure 6 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			$I_{RM(REC)}$			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 evaluation	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 1.3.2) ten 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 and table III, steps 1 and 2.	
Subgroup 2			45 devices c = 0
Blocking life	1048	T_A = +150°C; t = 1,000 hours +65, -0 hours; dc = 80 to 85 percent rated V_R	
Electrical measurement		See table I, subgroup 2.	
Subgroup 4			N/A
Thermal impedance curves		See MIL-PRF-19500.	
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.	

See footnotes at end of table.

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

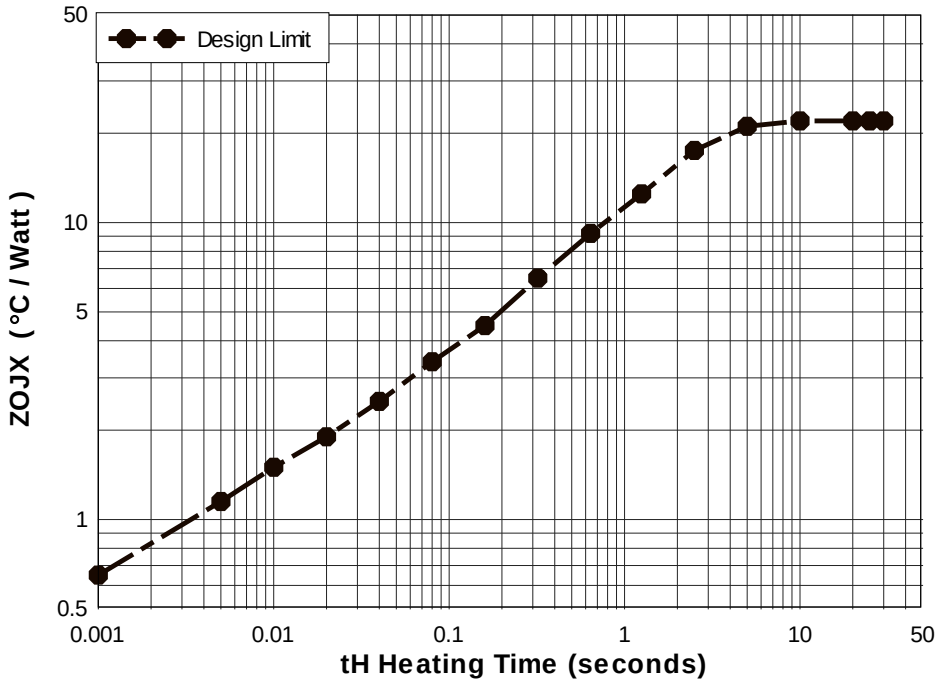
Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
Subgroup 8 2/			
Peak reverse power	4065	Peak reverse power (P_{RM}) = shall be characterized by the supplier and this data shall be available to the Government. Test shall be performed on each sublot.	
Electrical measurement		During the P_{RM} 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/			45 devices
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 1.3.2, col. 5); ten 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, and E delta measurements. 1/ 2/ 3/ 4/ 5/ 6/

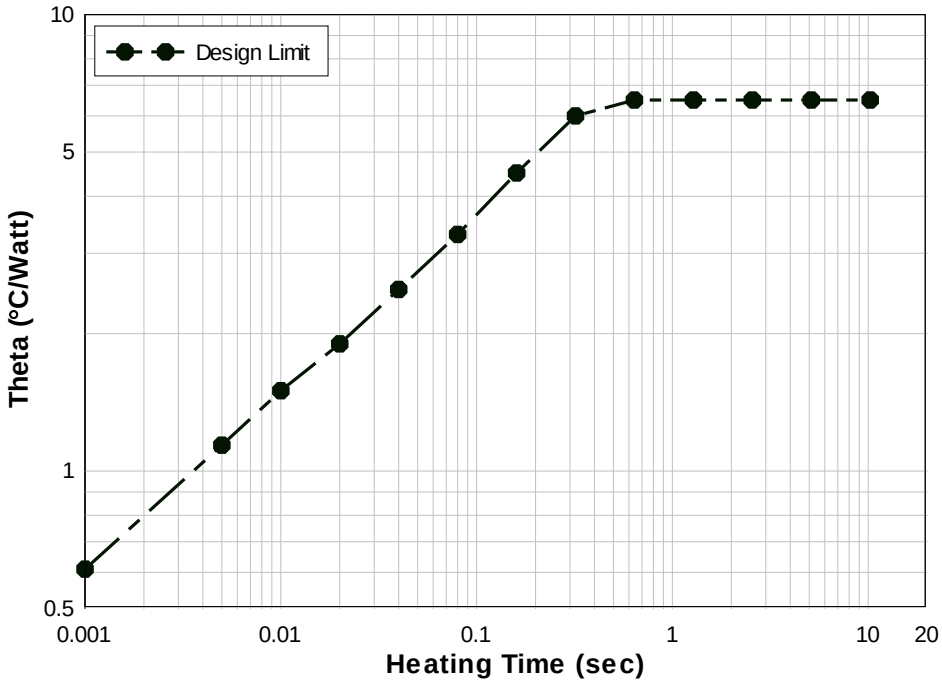
Step	Inspection	MIL-STD-750		Symbol	Limits 4/		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage change	4011	I_{FM} = col. 5 of 1.4, pulsed (see 4.5.1)	ΔV_{FM1}	±50 mV change from previous measured value		
2.	Reverse current change 1N6626 through 1N6631	4016	V_{RM} = col. 2 of 1.3	ΔI_{R1}		+2	µA

1/ The delta measurements for group B, table E-VIA (JANS) of MIL-PRF-19500 are as follows: Subgroup 5, see table III herein, steps 1 and 2.
2/ The delta electrical measurements for group B, table E-VIB (JAN, JANTX and JANTXV) of MIL-PRF-19500 are as follows: subgroup 2, see table III herein, steps 1 and 2.
3/ The delta measurements for group E, table E-IX of MIL-PRF-19500 are as follows: Subgroup 1, see table III herein, steps 1 and 2.
4/ See 1.4 herein.
5/ Devices which exceed table I, subgroup 2 (group A) limits for this test shall not be accepted.
6/ Also applies to U and US suffix versions.



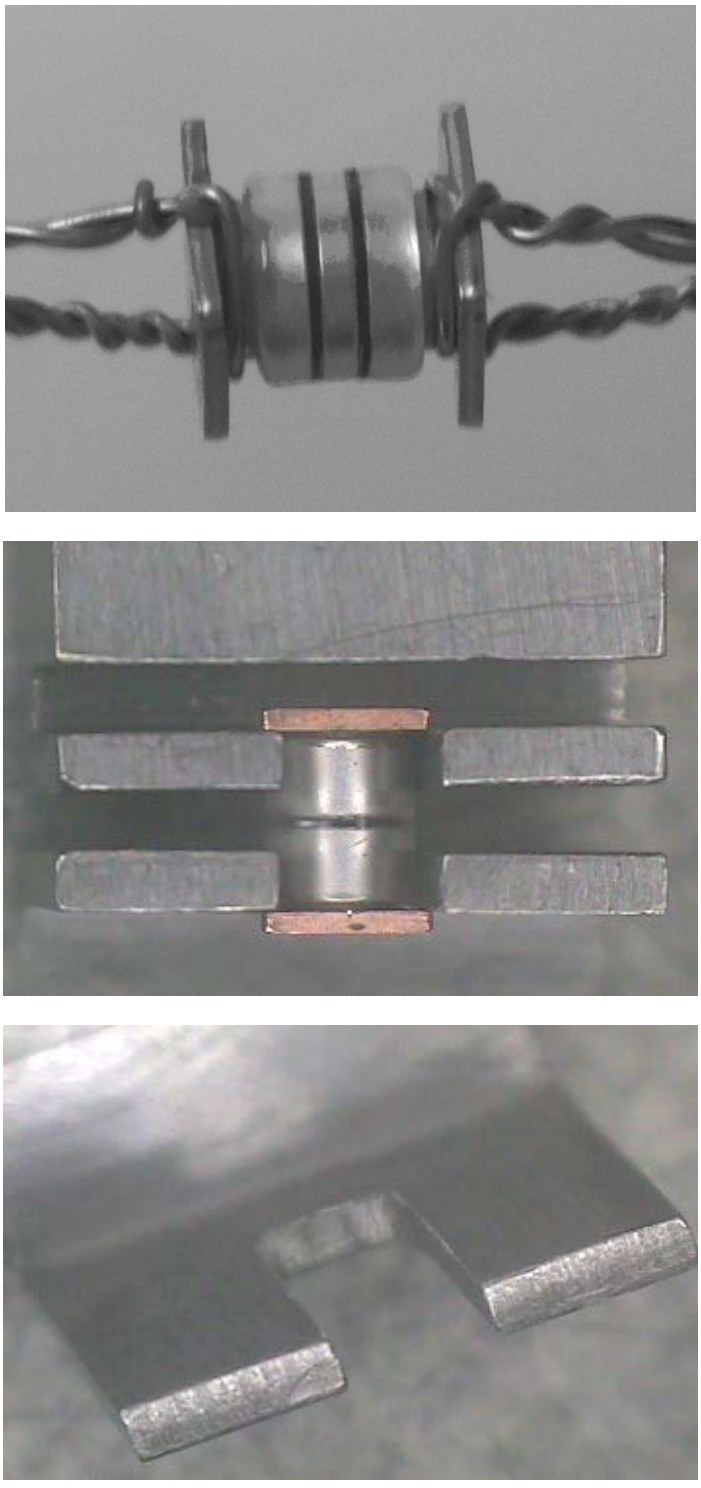
$Z_{\theta X}$ = 1.5ºC/W at 10 ms
$R_{\theta JEC}$ = 22ºC/W

FIGURE 3. Axial thermal impedance curve.

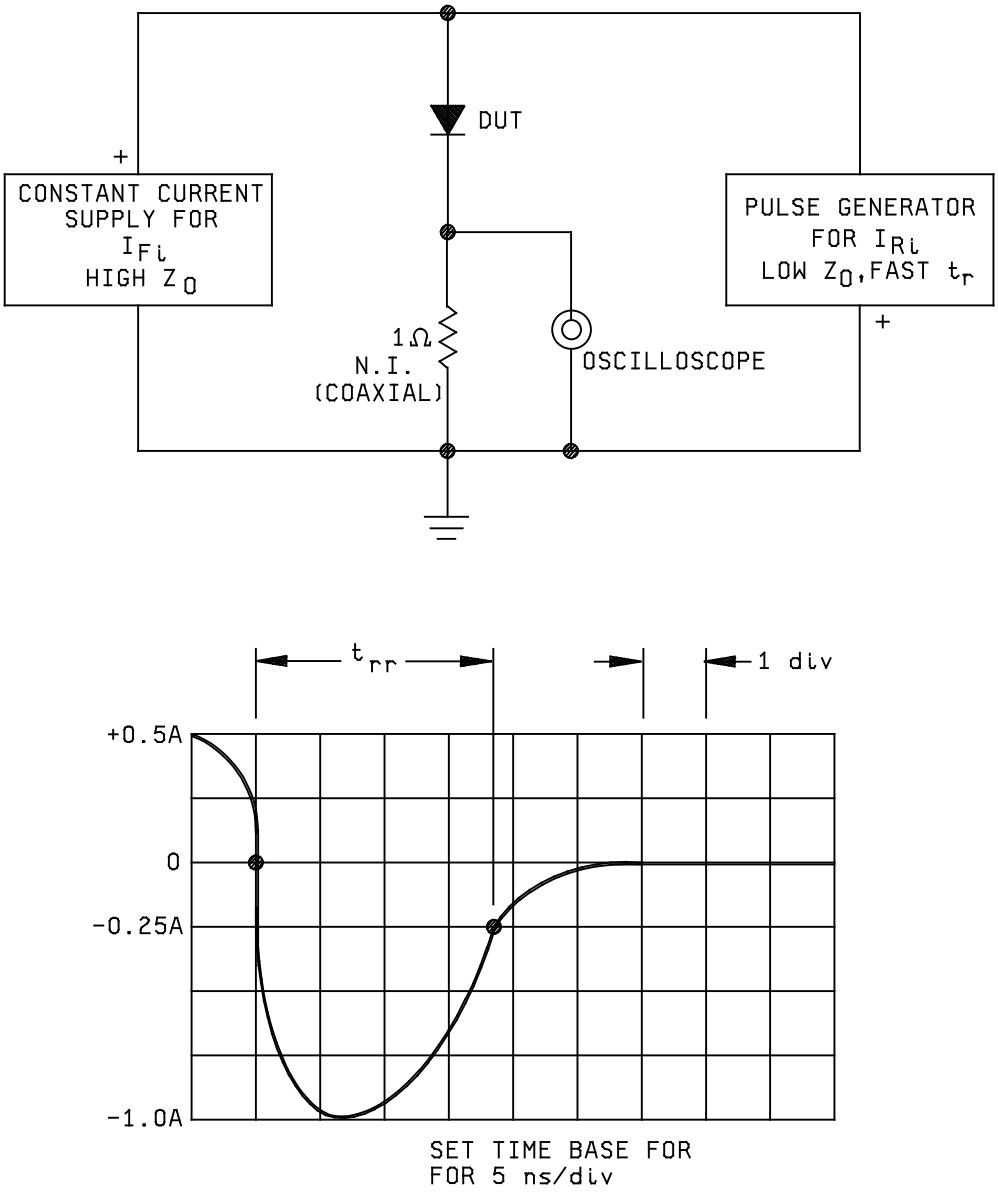


$Z_{\theta X}$ = 1.5°C/W at 10 ms
$R_{\theta JEC}$ = 6.5°C/W

FIGURE 4. Surface mount thermal impedance.



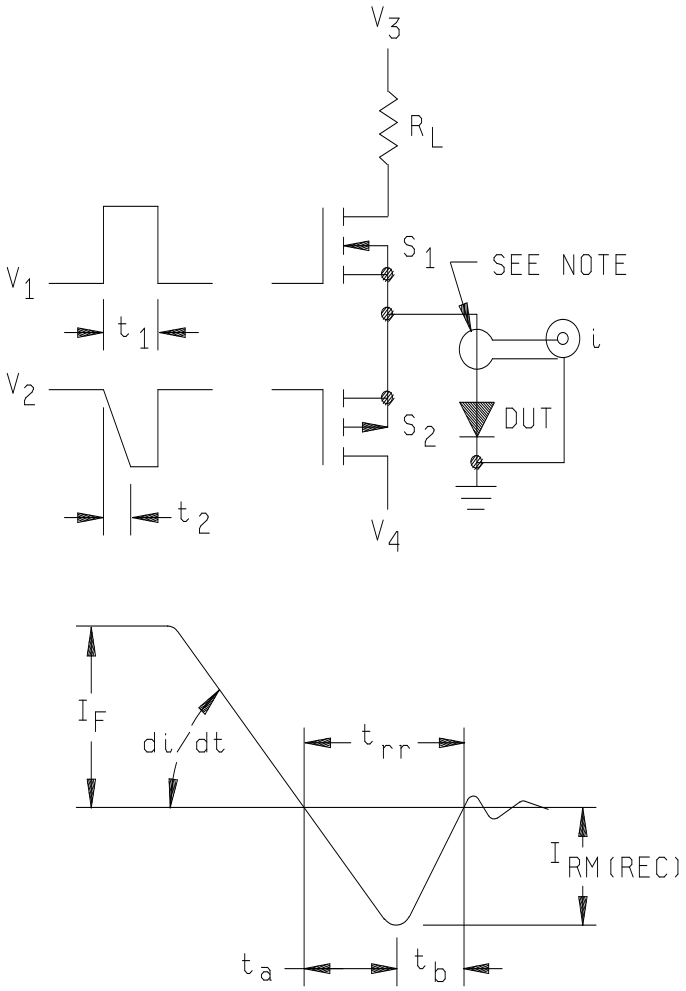
* FIGURE 5. US terminal strength mounting.



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 6. Low current 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 7. High current reverse recovery test 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 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 of devices. The US version is substitutable for the U version and the U version is substitutable for the US version.

6.5 Application data.

6.5.1 Half-sine-wave application for the worst-case (highest voltage) 1N6631. For a PCB mounting with FR4 material where the full 1.4 Amp I_O rating (half-sine wave) is used at a T_J of +150ºC and ambient temperature of 25ºC as shown on the first page ratings, the following steps guide the user in what the PCB pad size will need to be with 1 oz, 2 oz, and 3 oz copper. For axial-leaded, the lead length for mounting will be 0.187 inch (4.76 mm) or less from body to entry point on PCB surface.

a. Use the I_O versus Po curve on figure 8 to look up 1.4 amp (X-axis) and follow up to T_J = +150ºC between the two lower curves for 2.48 watts.

b. Calculate maximum thermal resistance needed (150ºC to 25ºC) / 2.48 W = 50ºC/W.

c. Look up thermal resistance of 50ºC/W on Y-axis using a thermal resistance versus pad area plot on one of the three curves on figure 9 for different weights of copper cladding and then intersect curve horizontally to get answer. These curves assume still air, horizontal position.

d. In this example, the answer is: 1 oz PCB = 0.6 in^2 (1.52 mm^2), 2 oz PCB = 0.32 in^2 (8.13 mm^2), 3 oz PCB = 0.21 in^2 (5.33 mm^2) for each pad.

e. Add a conservative guard-band to the pad size (larger) to keep T_J below +150ºC.

6.5.2 Square-wave application with 1N6626 to 1N6631. For a PCB mounting example with FR4 material to support a 0.7 amp I_O square-wave switching at a 0.50 duty factor (50 percent duty cycle) at T_J = +125ºC and ambient temperature of 55ºC, the following steps guide the user in what the PCB pad size will need to be with 1 oz, 2 oz, and 3 oz copper.

a. Find size of copper pads on standard FR4 PCB to support operation at 0.7 amp I_O square wave switching at a 0.50 duty factor (50 percent duty cycle) at T_J = 125ºC with T_A = 55ºC.

b. Calculate peak I_F = 0.7A / 0.50 duty factor = 1.4 amps.

c. Use the V_F versus I_F curve in figure 10 to look up I_F = 1.4 A (Y-axis) and follow across to the T_J = 125ºC curve for V_F = 1.42 V.

d. Calculate power = I_F x V_F x duty factor = 1.4 x 1.42 x 0.50 = 0.994 watts.

e. Calculate maximum thermal resistance needed (+125ºC to 55ºC) / 0.994 W = 70ºC/W.

f. Look up thermal resistance of 70ºC/W on the Y-axis using a thermal resistance versus pad area plot on one of the three curves on figure 9 for different weights of copper cladding and then intersect curve horizontally to get answer. Curves assume still air, horizontal position.

g. In this example, the answer is: 1oz PCB = 0.20 in^2 (5.08 mm^2), 2oz PCB = 0.11 in^2 (2.79 mm^2), 3oz PCB = 0.08 in^2 (2.03 mm^2) for each pad.

h. A conservative pad guard-band is optional since T_J is only +125ºC. NOTE: Multilayer PCBs, forced air cooling will improve performance. Closed confinement of the PCB will do the opposite. Please use sound thermal management.

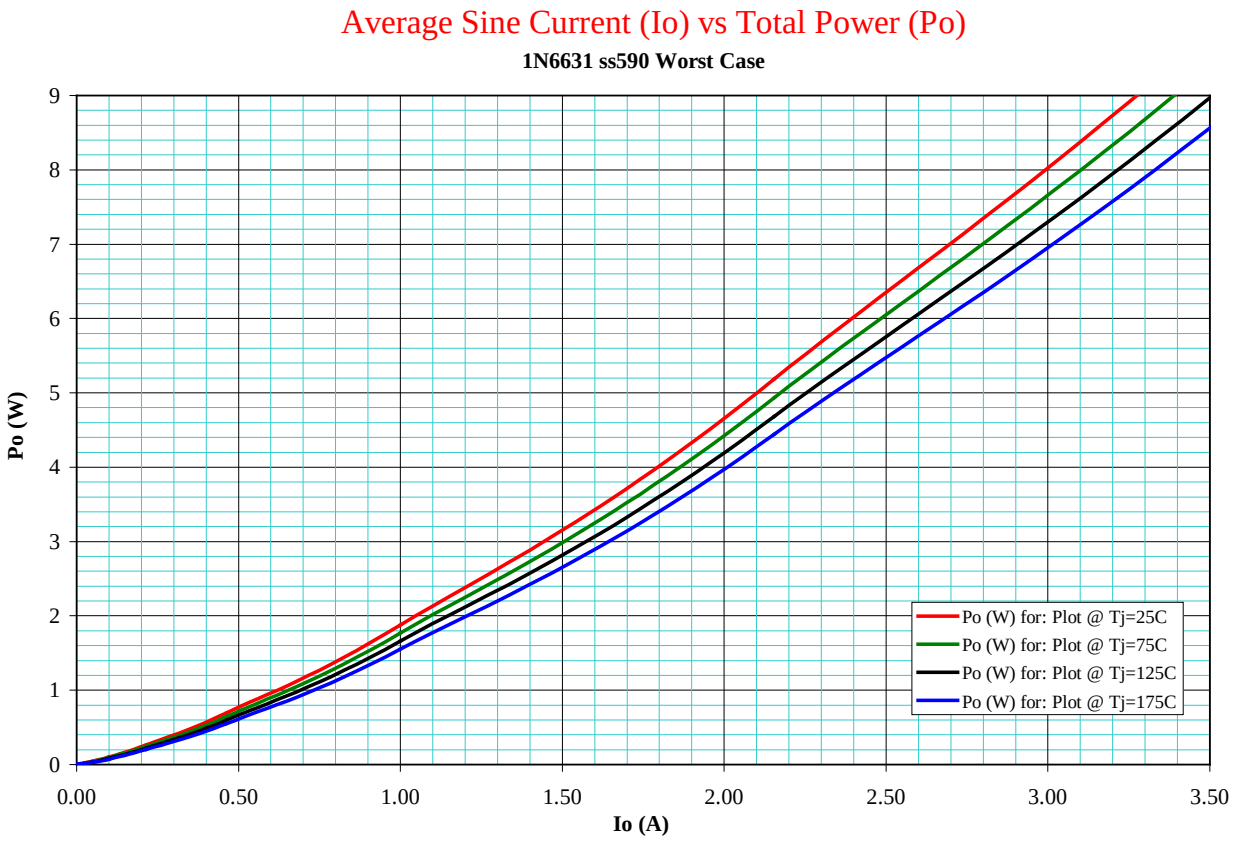


FIGURE 8. Rectifier power versus I_O (Average forward current for 1N6626 through 1N6631.

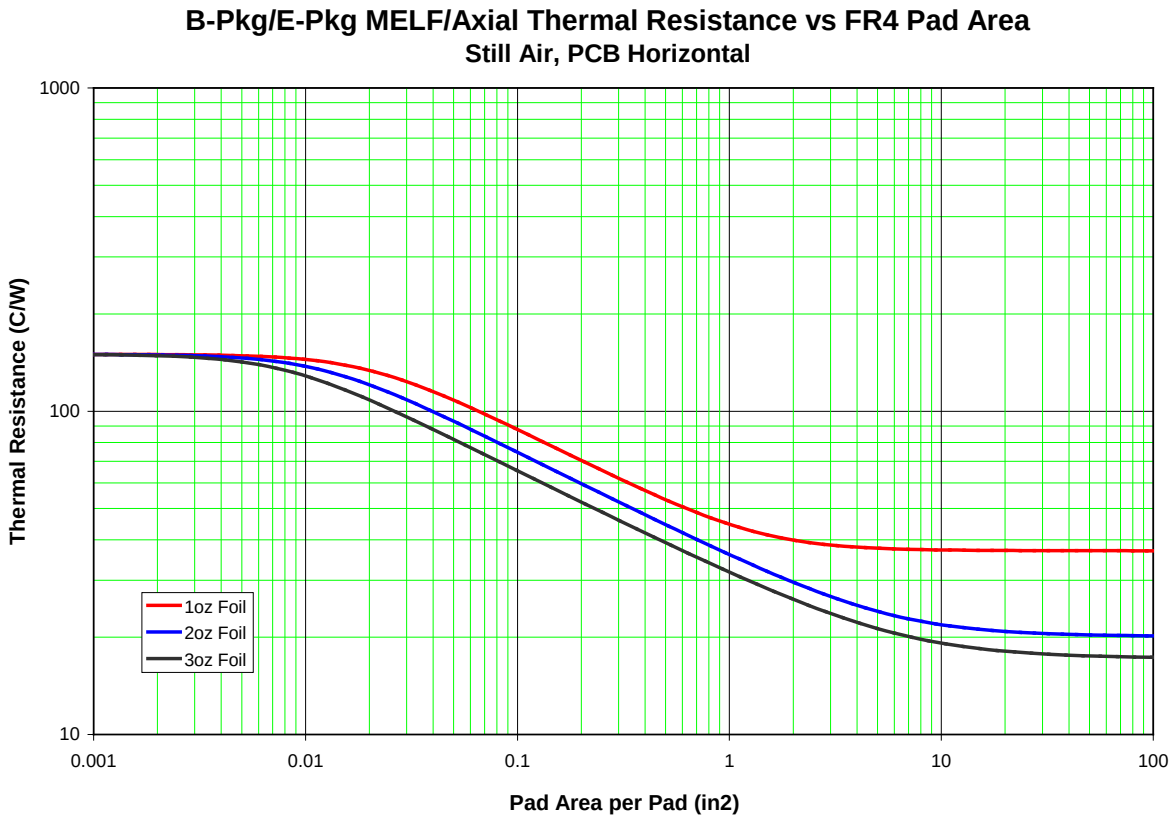


FIGURE 9. Thermal resistance versus pad area (for each pad) with 1, 2, and 3 oz Copper for 1N6626 through 1N6631.

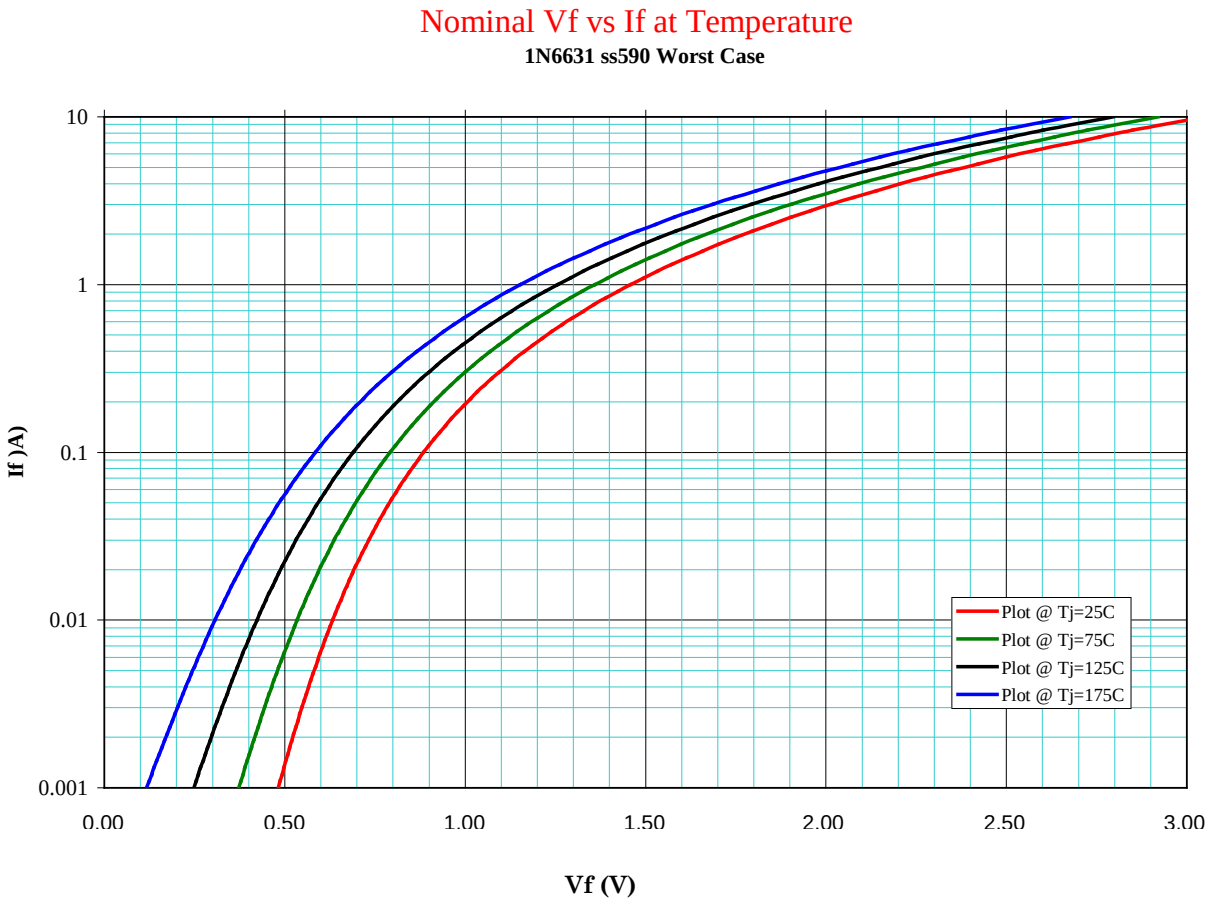


FIGURE 10. Forward voltage versus forward current for 1N6626 through 1N6631.

6.6 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 - 85
NASA - NA
DLA - CC

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

Preparing activity:
DLA - CC

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