The documentation and process conversion measures necessary to comply with this document shall be completed by 28 September 2014.

INCH-POUND

MIL-PRF-19500/585K
28 June 2014
SUPERSEDING
MIL-PRF-19500/585J
21 November 2010

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, ULTRA-FAST RECOVERY, POWER RECTIFIER, 1N6620 THROUGH 1N6625, 1N6620U THROUGH 1N6625U, 1N6620US THROUGH 1N6625US, 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, ultra-fast 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
Device type	V_{RWM}	$I_{O(L)}$ at T_L = +55°C L = .375 inch (9.52 mm) (1) (2) (3)	I_{O2} T_A = +25°C max (1) (4) (5)	I_{FSM} at t_p = 8.3 ms	Barometric pressure	t_{rr} (6)	$R_{\theta JL}$ at L = .375 inch (9.52 mm) (7)	$R_{\theta JEC}$ (8)	$R_{\theta JX}$
	V dc	A	A	A pk	mm Hg	ns	°C/W	°C/W	°C/W
1N6620, U, US	200	2.0	1.2	20	8	30	38	13	55
1N6621, U, US	400	2.0	1.2	20	8	30	38	13	55
1N6622, U, US	600	2.0	1.2	20	8	30	38	13	55
1N6623, U, US	800	1.5	1.0	20	33	50	38	13	55
1N6624, U, US	900	1.5	1.0	20	33	50	38	13	55
1N6625, U, US	1,000	1.5	1.0	15	33	60	38	13	55

See notes on next page.

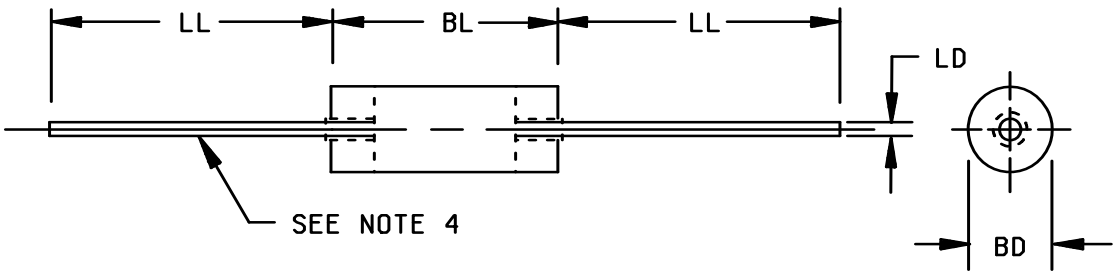
* Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dscc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using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

1.3.2 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 1.05 percent/°C for T_L > +55°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 A rating at +25°C ambient is for thermal mounting methods (PC boards or other) 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 $R_{\theta JX} \leq 55$ºC/W as shown. Also see application notes in 6.5.1 for the worst-case for 1N6625.
(6) The reverse recovery time (method 4031 of MIL-STD-750, condition B) at T_J = +125°C will 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, subgroup B5 for JANS, or other life testing in 4.4.2.2, subgroup B3, and 4.4.3.1, subgroup C6.
(7) See figure 3, thermal resistance curves for axial leaded devices only (no suffix).
(8) See figure 4, thermal resistance curves for surface mount devices only (U and US suffix).

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

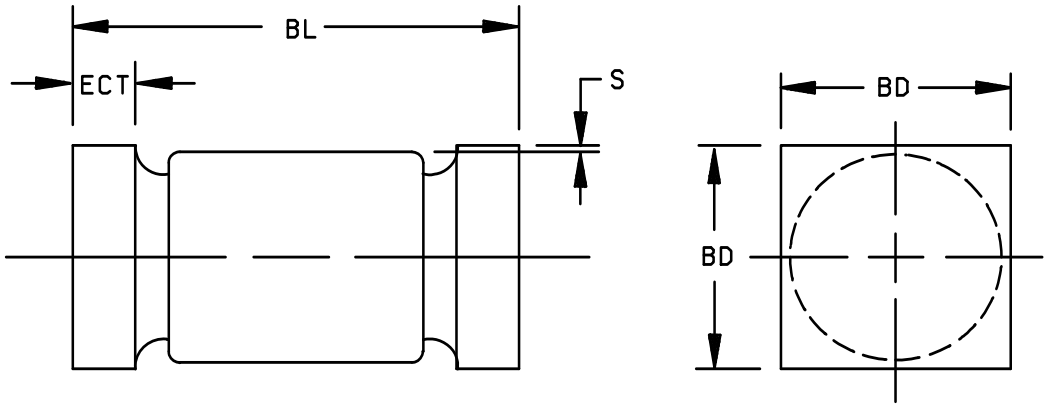
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
Device type	I_{R1} at T_J = +25°C	I_{R2} at T_J = +150°C	$I_{RM(REC)}$ at 2 A, 100 A/µs	C_T at V_R = 10 V	V_{FM1} at I_F = Col. 3	V_{FM2} at I_F = Col. 4
	µA	µA	A pk	pF	V	V
1N6620, U, US	0.5	150	3.5	10	1.60	1.40
1N6621, U, US	0.5	150	3.5	10	1.60	1.40
1N6622, U, US	0.5	150	3.5	10	1.60	1.40
1N6623, U, US	0.5	150	4.2	10	1.80	1.55
1N6624, U, US	0.5	150	4.2	10	1.80	1.55
1N6625, U, US	1.0	200	5.0	10	1.95	1.75



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.065	.085	1.65	2.16	4
BL	.125	.250	3.18	6.35	3
LD	.027	.032	0.69	0.81	3
LL	.700	1.30	17.78	33.02	

NOTES:
(1) Dimensions are in inches.
(2) Millimeters 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).



Ltr	Dimensions				Notes
	1N6620U,US through 1N6625U, US				
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.091	.103	2.31	2.62	
BL	.168	.200	4.27	5.08	
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) In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Physical dimensions of surface mount.

2. APPLICABLE DOCUMENTS

* 2.1 General. The documents listed in this section are specified in sections 3 or 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 or 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. 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 figure 1 (similar to DO-41) and figure 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 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

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

3.7 Marking. Devices shall be marked as specified in MIL-PRF-19500.

3.7.1 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.

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

* 3.9 Workmanship. Semiconductor devices, Diode, Silicon, Ultra-Fast Recovery, Power Rectifier 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 table I).

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 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 (see table E-IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTXV and JANTX level
(1) 3c	Thermal impedance (see 4.3.1)	Thermal impedance (see 4.3.1)
5	Not applicable	Not applicable
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}, $\Delta I_{R1} \leq$ 100 percent of initial reading or ±100 nA dc (± 200 nA dc for 1N6625), 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: $\Delta I_{R1} \leq$ 100 percent of initial reading or ±100 nA dc (±200 nA dc for 1N6625), whichever is greater. $\Delta V_{FM1} \leq \pm 0.05$ V dc. Scope display evaluation (see 4.5.4)	Subgroup 2 of table I herein: $\Delta I_{R1} \leq$ 100 percent of initial reading or ±100 nA dc (±200 nA dc for 1N6625), whichever is greater. $\Delta V_{FM1} \leq \pm 0.05$ V dc. Scope display evaluation (see 4.5.4)

(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. The thermal impedance measurements shall be performed in accordance with method 3101 as applicable of MIL-STD-750 using the guidelines in that method for determining I_M, I_H, t_H, and K factor. See table II, group E, subgroup 4 herein.

4.3.2 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.3, 4.5.3.1) T_A = +55ºC maximum. Test conditions in accordance with method 1038 of MIL-STD-750, condition B. Adjust I_O to achieve the required T_J. Use method 3100 of MIL-STD-750 to measure T_J. T_J = +115ºC minimum and +150ºC maximum.

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 table 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, 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	Test Condition A, I_{FSM} = rated I_{FSM} (see 1.3, col. 5); ten surges of 8.3 ms each at 1 minute intervals, superimposed on 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 col. 2 of 1.3, and 4.5.3); 2,000 cycles.
	B5	1027	I_O = I_O rated minimum (see 1.3, col. 4 and 4.5.3); adjust T_A and or I_O to achieve T_J = +150°C minimum. t = 1,000 hours. Temporary leads may be added for surface mount devices. n = 45, c = 0. For irradiated devices, include t_{rr} as an end-point measurement. Delta shall not exceed 60 percent of initial reading.
	B6	4081	See 4.5.5, +25°C ≤ T_A ≤ +35°C (recorded before test is performed); $R_{\theta JL}$ (maximum) ≤ 38°C/W; L = .375 inch (9.53 mm). For surface mount devices (U and US version), $R_{\theta JEC}$ = 13°C/W maximum.
	B8	4065	Peak reverse power, P_{RM} ≥ 318 W for square wave in accordance with method 4065 of MIL-STD-750 (P_{RM} ≥ 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, 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_O (rated, see col. 4 of 1.3) minimum; adjust I_O to achieve required T_J of +125°C minimum; apply V_R = rated V_{RWM} (see col. 2 of 1.3), f = 50 - 60 Hz (see 4.5.3.1). For irradiated devices, include t_{rr} as an end-point measurement. Delta 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 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, 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	Axial devices − Tension: Test condition A; weight = 12 pounds; t = 30 seconds. Lead fatigue: Test condition E; weight 2 pounds, t = 15 s. NOTE: Lead fatigue is not applicable for U or US devices.
*	C2	2038	US devices – Tension: Test condition A; weight = 12 pounds; t = 30 seconds.
	C5	4081	See 4.5.5, +25°C ≤ T_A ≤ +35°C (recorded before test is performed); $R_{\theta JL}$ (maximum) ≤ 38°C/W; L = .375 inch (9.53 mm). For surface mount devices (U and US version), $R_{\theta JEC}$ ≤ 13°C/W.
	C6	1027	I_O = I_O (rated see col. 4 of 1.3) minimum; adjust I_O to achieve T_J of +125°C minimum; apply V_R = rated V_{RWM} (see col. 2 of 1.3), f = 50 - 60 Hz (see 4.5.3.1). For irradiated devices, include t_{rr} as an end-point measurement. Delta 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. 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 = +115°C minimum and +150°C maximum for screening, and T_J = +125°C minimum for 4.4.2.2 and 4.4.3.1 life tests. Accelerated life test in 4.4.2.1 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 Thermal resistance. Thermal resistance measurement shall be performed in accordance with method 4081 of MIL-STD-750 using the guidelines in that method for determining I_M, I_H, and t_H. Measurement delay time t_{MD} = 100 μs max. See table E-IX of MIL-PRF-19500.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		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}			
1N6620, U, US		I_{FM} = 2.0 A dc			1.60	V
1N6621, U, US		I_{FM} = 2.0 A dc			1.60	V
1N6622, U, US		I_{FM} = 2.0 A dc			1.60	V
1N6623, U, US		I_{FM} = 1.5 A dc			1.80	V
1N6624, U, US		I_{FM} = 1.5 A dc			1.80	V
1N6625, U, US		I_{FM} = 1.5 A dc			1.95	V
Forward voltage	4011	Duty cycle ≤ 2 percent (pulsed) (see 4.5.1); t_p = 8.3 ms (max).	V_{FM2}			
1N6620, U, US		I_{FM} = 1.2 A dc			1.40	V
1N6621, U, US		I_{FM} = 1.2 A dc			1.40	V
1N6622, U, US		I_{FM} = 1.2 A dc			1.40	V
1N6623, U, US		I_{FM} = 1.0 A dc			1.55	V
1N6624, U, US		I_{FM} = 1.0 A dc			1.55	V
1N6625, U, US		I_{FM} = 1.0 A dc			1.75	V
Reverse current leakage	4016	V_{RM} = column 2 (peak) of 1.3; pulsed (see 4.5.1)	I_{R1}		Col. 2 of 1.4	µA
Breakdown voltage	4021	I_R = 50 µA dc; pulsed (see 4.5.1)	$V_{(BR)1}$	110 percent of col. 2 of 1.3		V
Subgroup 3						
High temperature operation:		T_A = +150°C				
Reverse current leakage	4016	V_{RM} = column 2 (peak); pulsed (see 4.5.1)	I_{R2}		Col. 3 of 1.4	µA
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	4021	I_R = 50 µA dc; pulsed (see 4.5.1)	$V_{(BR2)}$	Col. 2 of 1.3		V

See footnote at end of table.

TABLE I. Group A inspection. – Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 4						
Forward recovery voltage	4026	I_F = 0.5 A, t_r = 12 ns	V_{FRM}			V
1N6620, U, US					12	
1N6621, U, US					12	
1N6622, U, US					12	
1N6623, U, US					18	
1N6624, U, US					18	
1N6625, U, US					30	
Capacitance	4001	V_R = 10 V, f = 0.1 to 1 MHz	C_T			pF
1N6620, U, US					10	
1N6621, U, US					10	
1N6622, U, US					10	
1N6623, U, US					10	
1N6624, U, US					10	
1N6625, U, US					10	
Low current reverse recovery time	4031	Condition B. I_F = 0.5 A, I_{RM} = 1.0 A	t_{rr1}			ns
1N6620, U, US					30	
1N6621, U, US					30	
1N6622, U, US					30	
1N6623, U, US					50	
1N6624, U, US					50	
1N6625, U, US					60	
High current reverse recovery time	4031	Condition D. I_F = 2A, di/dt = 100 A/µs	t_{rr2}			ns
1N6620, U, US					45	
1N6621, U, US					45	
1N6622, U, US					45	
1N6623, U, US					60	
1N6624, U, US					60	
1N6625, U, US					80	
Peak recovery current			$I_{RM(REC)}$			A
1N6620, U, US					3.5	
1N6621, U, US					3.5	
1N6622, U, US					3.5	
1N6623, U, US					4.2	
1N6624, U, US					4.2	
1N6625, 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	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 5						
Not applicable						
Subgroup 6						
Forward surge	4066	Condition A. I_{FSM} = rated I_{FSM} (see 1.3, col. 5); ten surges of 8.3 ms each at 1 minute intervals, superimposed on 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 herein steps 1 and 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 4			N/A
Thermal impedance curves		See MIL-PRF-19500.	
Subgroup 5			22 devices c = 0
Barometric pressure (reduced) 1/	1001	1N6620 through 1N6622 at 8 mm Hg 1N6623 through 1N6625 at 33 mm Hg	

See footnotes at end of table.

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

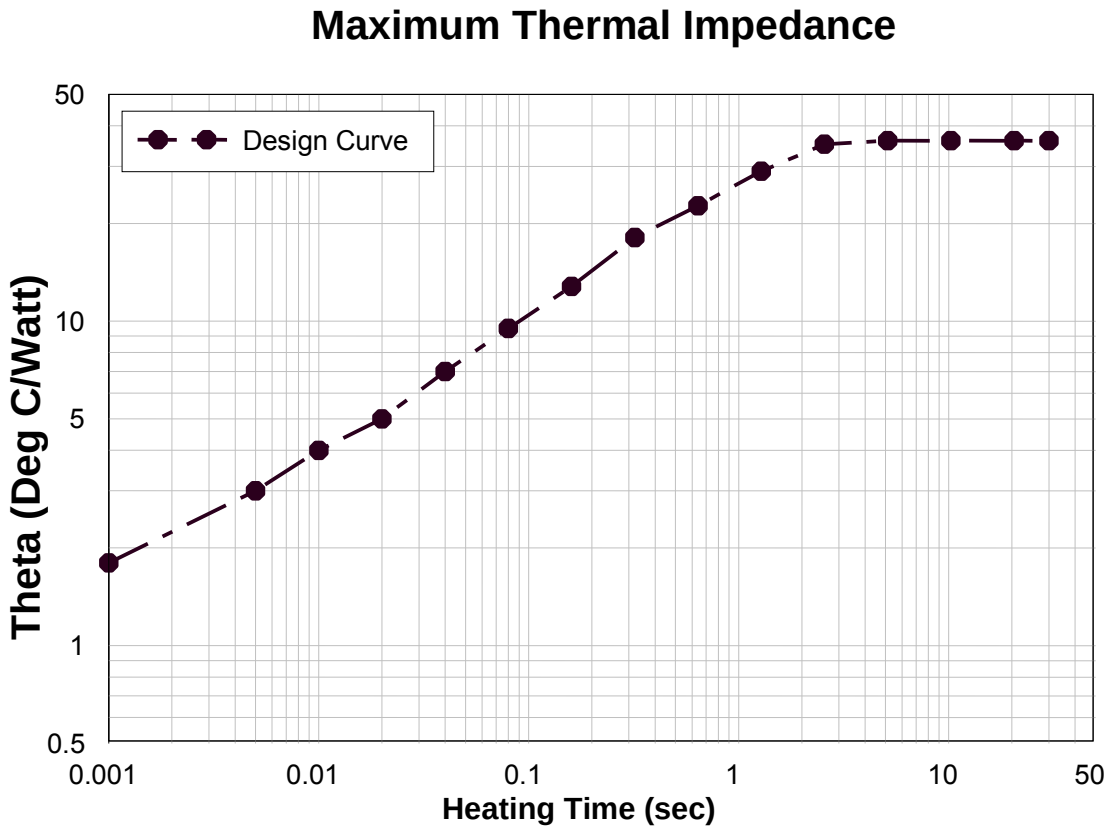
Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
Subgroup 8 2/			n = 45
Peak reverse power	4065	Peak reverse power (P_{RM}) = shall be characterized by the supplier and this data shall be available to the Government. Test shall be performed on each sublot.	
Electrical measurement		During the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

Step	Inspection	MIL-STD-750		Symbol	Limits		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 1N6620 through 1N6625	4016	V_{RM} = col. 2 of 1.3	ΔI_{R1}		+1	µA

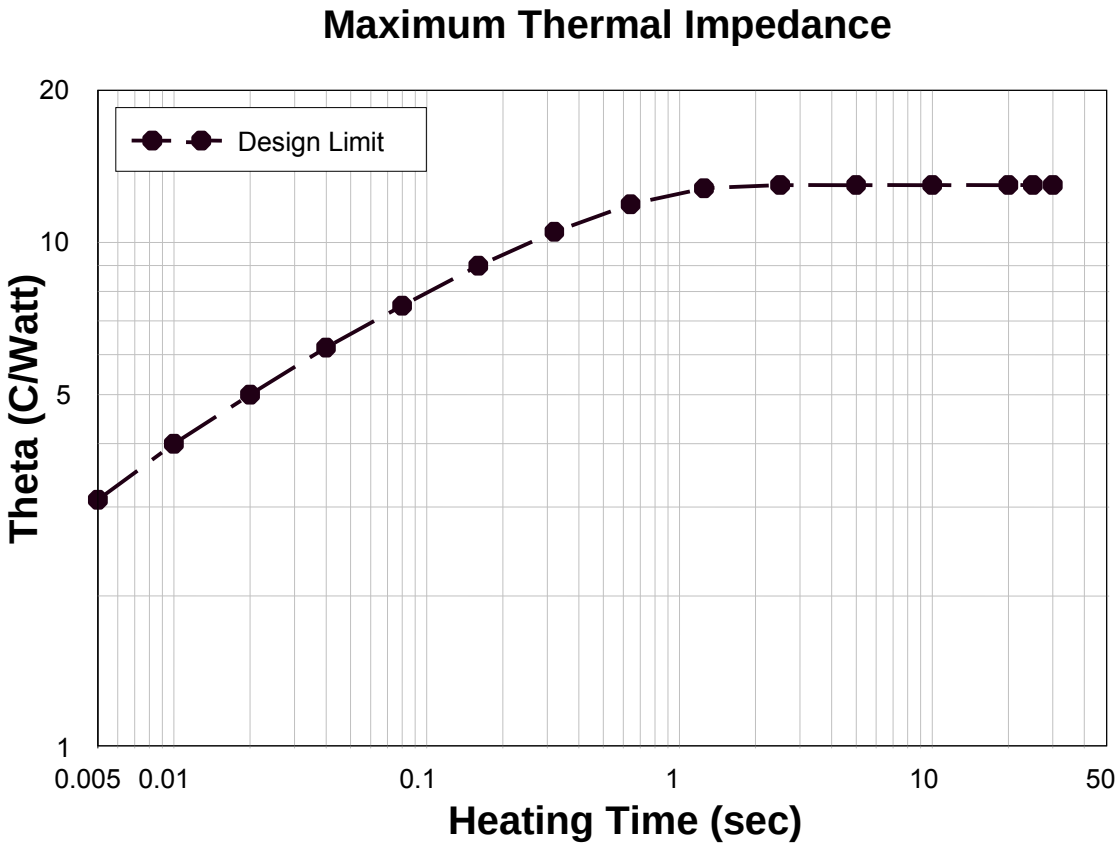
1/ Devices which exceed table I, subgroup 2 (group A) limits for this test shall not be accepted.
2/ The delta measurements for group B inspection, table E-VIA (JANS) of MIL-PRF-19500 are as follows: Subgroup 5, see table III herein, steps 1 and 2.
3/ The delta measurements for group B inspections in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



$Z_{\theta JX}$ = 4°C/W at 10 ms.

$R_{\theta JL}$ = 38°C/W

FIGURE 3. Thermal impedance curve for axial-leaded devices.



$Z_{\theta JX}$ = 4°C/W at 10 ms.

$R_{\theta JEC}$ = 13°C/W

FIGURE 4. Thermal impedance curve surface mount devices.

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. The complete Part or Identifying Number (PIN), see title and section 1.

* 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 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 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) 1N6625. For a PCB mounting with FR4 material where the full 1.0 amp I_O rating (half-sine wave) is used at a T_J of +150ºC and ambient temperature of +25ºC as shown in 1.3.2 herein, the following steps guide the user in what the PCB pad size will need to be with 1 ounce, 2 ounce, and 3 ounce copper. For axial-leaded, the lead length for mounting will be .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 6 to look up 1.0 amp (X-axis) and follow up to the T_J = +150ºC curve (lower) for 2.28 watts.

b. Calculate maximum thermal resistance needed (+150ºC to +25ºC) / 2.28 W = +55ºC/W.

c. Look up thermal resistance of +55ºC/W on Y-axis using a thermal resistance versus pad area plot on one of the three curves on figure 7 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 ounce PCB = 1.20 in^2 (30.38 mm^2), 2 ounce PCB = .65 in^2 (16.52 mm^2), 3 ounce PCB = .43 in^2 (10.92 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 1N6620 through 1N6625. For a PCB mounting example with FR4 material to support a 0.5 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 ounce, 2 ounce, and 3 ounce copper.

a. Find size of copper pads on standard FR4 PCB to support operation at 0.5 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 = 0.5A / 0.50 duty factor = 1 amp.

c. Use the V_F versus I_F curve in figure 8 to look up I_F = 1 A (Y-axis) and follow across to the T_J = +125ºC curve for V_F = 1.75 V.

d. Calculate power = I_F x V_F x duty factor = 1 x 1.75 x 0.50 = 0.875 watts.

e. Calculate maximum thermal resistance needed (125ºC to 55ºC) / 0.875 W = 80ºC/W.

f. Look up thermal resistance of 80ºC/W on the Y-axis using a thermal resistance versus pad area plot on one of the three curves on figure 6 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: 1 ounce PCB = .20 in^2 (5.08 mm^2), 2 ounce PCB = .12 in^2 (3.048 mm^2), 3 ounce PCB = .08 in^2 (2.032 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. Use sound thermal management.

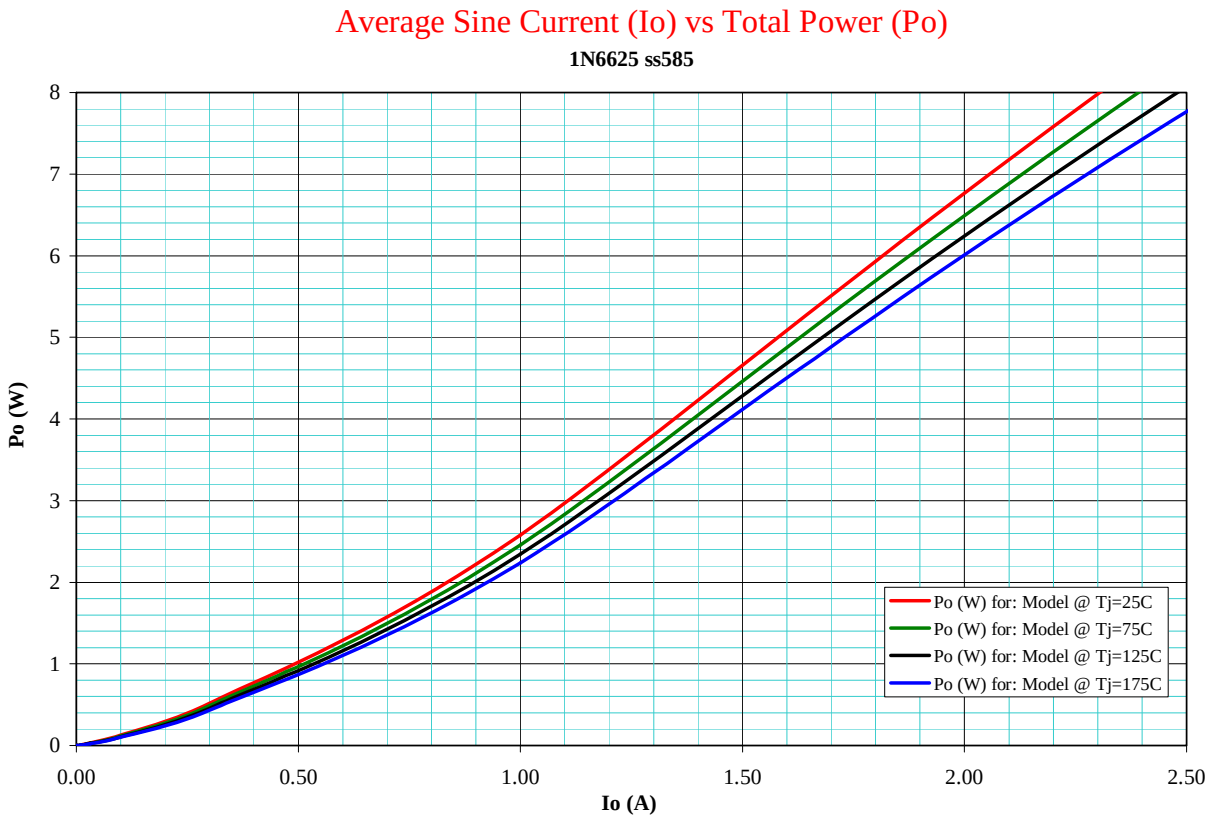


FIGURE 6. Rectifier power versus I_O (average forward current for 1N6620 through 1N6625).

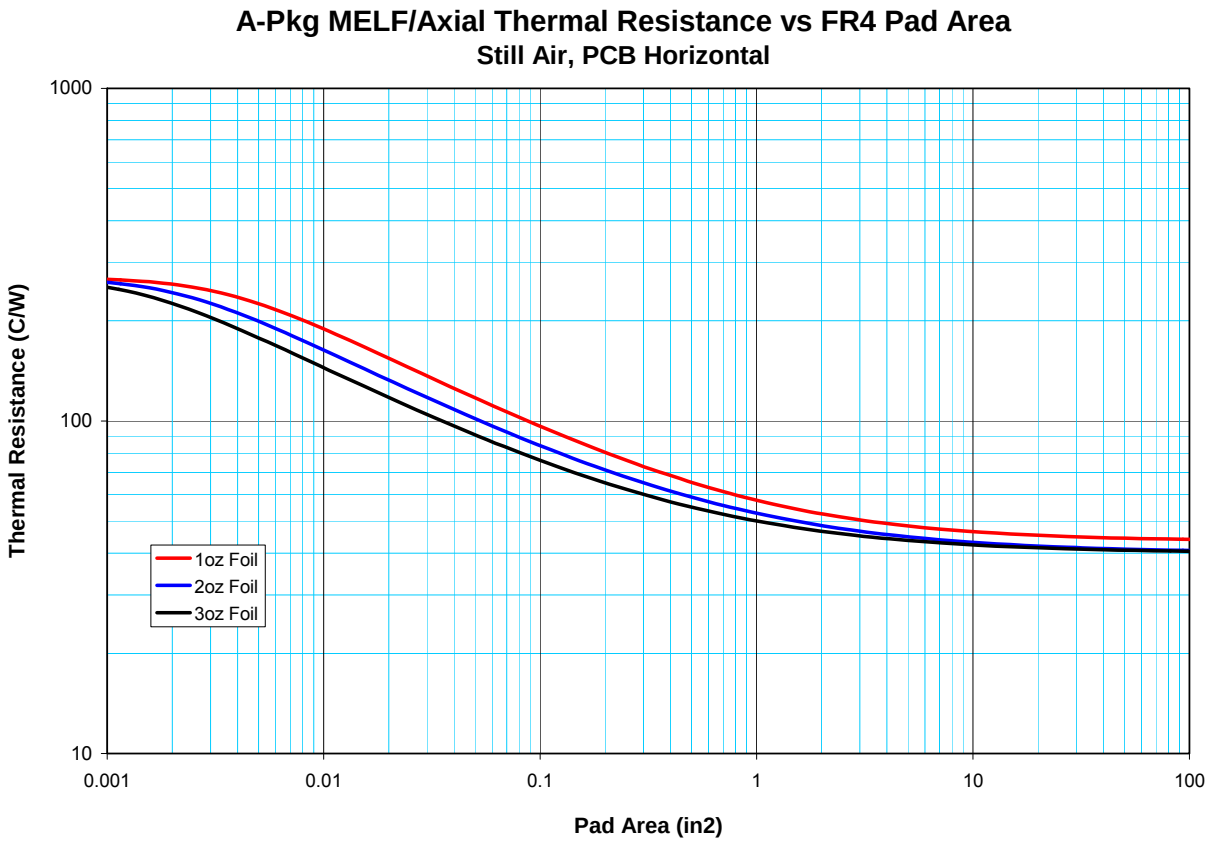


FIGURE 7. Thermal resistance versus pad area (for each pad) with 1, 2, and 3 ounce copper for 1N6620 through 1N6625.

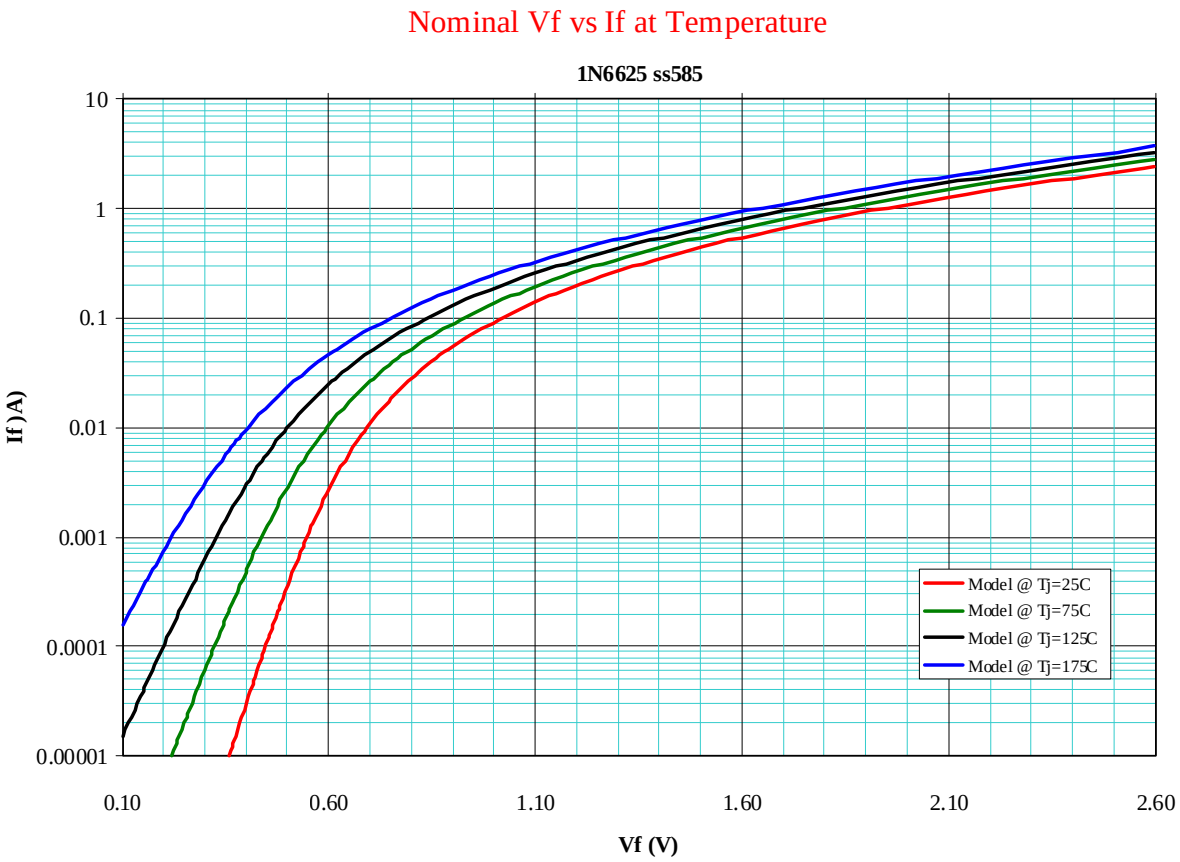


FIGURE 8. Forward voltage versus forward current for 1N6620 through 1N6625.

* 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 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, 99

Preparing activity:
DLA - CC

(Project 5961-2014-066)

* 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.