

The documentation and process conversion measures necessary to comply with this revision shall be completed by 21 September 1998

METRIC

MIL-PRF-19500/620C
 21 June 1998
 SUPERSEDING
 MIL-S-19500/620B
 22 July 1994

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, HERMETIC, DIODE, SILICON, RECTIFIER,
 SCHOTTKY BARRIER, TYPES 1N5822 AND 1N5822US
 JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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

1. SCOPE

1.1 Scope. This specification covers the performance requirements for silicon, Schottky barrier rectifier diodes. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500, and two levels of product assurance for die (element evaluation).

1.2 Physical dimensions. See figures 1, 2, and 3 (JANC die) dimensions.

1.3 Maximum ratings.

Types	V_{RWM} 1/	I_{O1} 2/	I_{FSM}	T_{STG}	T_J
	<u>V(pk)</u>	<u>A dc</u>	<u>A(pk)</u>	<u>°C</u>	<u>°C</u>
1N5822, 1N5822US	40	3.0	80	-65 to +150	-65 to +125

1/ Derate linearly at 1.2 V/°C above T_L or $T_{EC} = +90$ °C where T_L is at $L = 9.52$ mm (.375 inch).

2/ Derate linearly at 43 mA/°C above T_L or $T_{EC} = +55$ °C where T_L is at $L = 9.52$ mm (.375 inch).

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

Types	Max V_{FM1} $I_{FM} = 1.0$ A	Max V_{FM2} $I_{FM} = 3.0$ A	Max V_{FM3} $I_{FM} = 9.4$ A	Max I_{RM} $V_{RM} = 40$ V dc pulsed method (see 4.5.1)		Max $R_{\theta JL}$ or $R_{\theta JEC}$ 9.52 mm (3.75 inch) lead length or end cap	Max $Z_{\theta JX}$
				$T_J = +25$ °C I_{RM1}	$T_J = +100$ °C I_{RM2}		
	<u>V (pk)</u>	<u>V (pk)</u>	<u>V (pk)</u>	<u>mA</u>	<u>mA</u>	<u>°C/W</u>	<u>°C/W</u>
1N5822	0.40	0.50	0.70	0.10	12.5	30	3.0
1N5822US	0.40	0.50	0.70	0.10	12.5	10	3.0

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5961

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

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

STANDARD

MILITARY

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available 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 (except for related associated specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

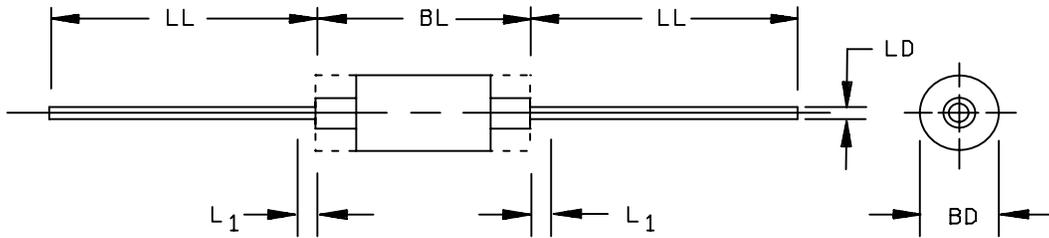
3. REQUIREMENTS

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

3.2 Associated specification. The individual item performance requirements shall be in accordance with MIL-PRF-19500, and as specified herein.

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions for the purpose of interchangeability shall be as specified on figures 1, 2, and 3 herein. Plastic packages are prohibited. The US Government's preferred system of measurement is the metric SI system. However, since this item was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.

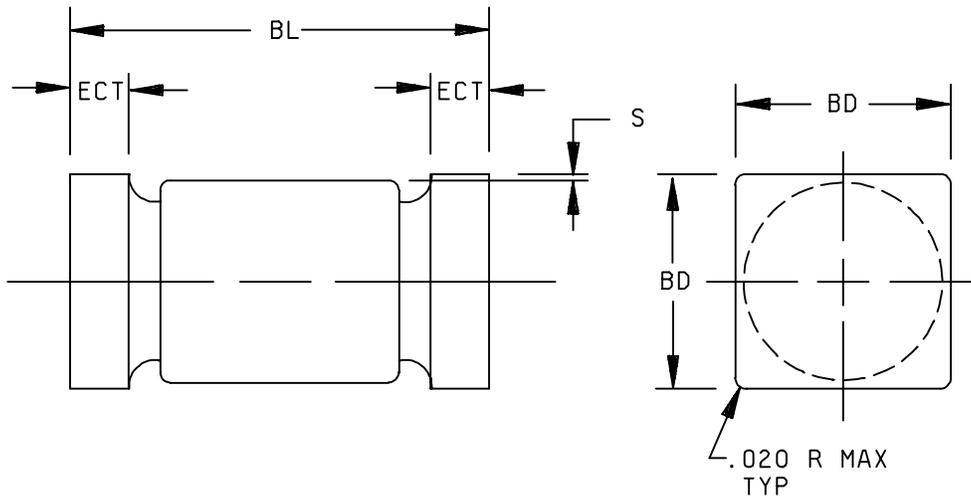


Symbol	Dimensions				Notes
	Millimeters		Inches		
	Min	Max	Min	Max	
LD	0.91	1.07	.036	.042	
BD	2.92	3.68	.115	.145	3
BL	3.30	4.95	.130	.195	
LL	22.86	33.02	.900	1.300	
L ₁		0.76		.030	4

NOTES:

1. Dimensions are in millimeters.
2. Inch-pound equivalents are given for general information only.
3. Symbol BD shall be measured at the largest diameter.
4. Lead diameter is not controlled in this zone to allow for flash, lead finish build-up, and mirror irregularities other than heat slugs.

FIGURE 1. Physical dimensions of 1N5822.

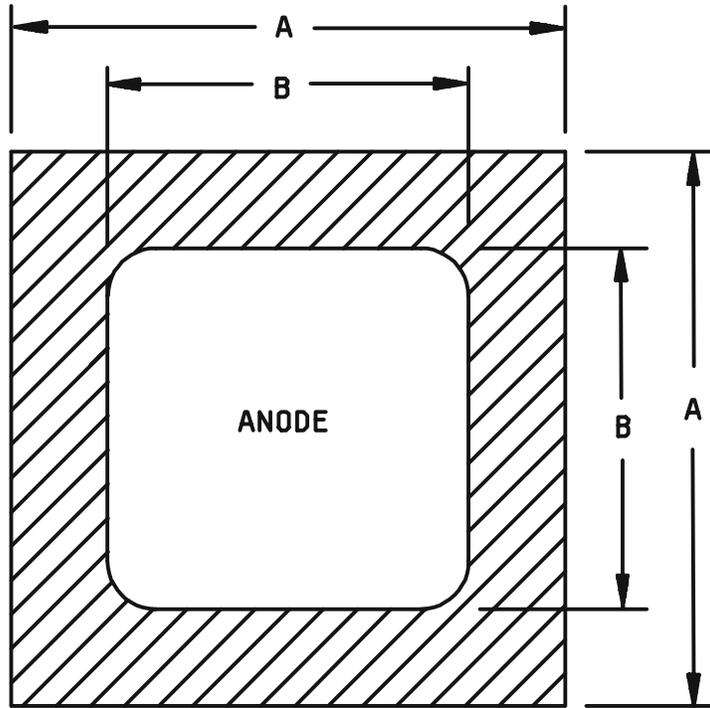


Symbol	Dimensions			
	Millimeters		Inches	
	Min	Max	Min	Max
BL	5.08	5.72	.200	.225
BD	3.48	3.76	.137	.148
ECT	0.48	0.71	.019	.028
S	0.08		.003	

NOTES:

1. Dimensions are in millimeters.
2. Inch-pound equivalents are given for general information only.

FIGURE 2. Physical dimensions of surface mount family, 1N5822US (D-5B).



Symbol	Dimensions			
	Millimeters		Inches	
	Min	Max	Min	Max
A	1.57	1.63	.062	.064
B	1.32	1.37	.052	.054

Design data

Metallization:

Top: (Anode) AL

Back: (Cathode). Au

AL thickness 25,000 A minimum.

Gold thickness 4,000 A minimum.

Chip thickness 0.254 mm (10 mils) ± .051 (± 2 mils).

FIGURE 3. JANC (A-version) die dimensions.

3.4.1 Lead material and finish. Lead material shall be copper clad steel with a minimum of 70 percent copper by weight. Lead finish shall be in accordance with MIL-PRF-19500 and MIL-STD-750. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.4.2 Diode construction. These devices shall be constructed in a manner and using materials which enable the diodes to meet the applicable requirements of MIL-PRF-19500 and this document.

3.4.2.1 Surface mount. The surface mount (US) version shall be considered structurally identical to the non surface mount version except for lead attach.

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

3.5.1 Marking for surface mount (US) devices. Surface mount (US) suffix parts are to be marked with the polarity identification. Initial container package marking will be in accordance with MIL-PRF-19500.

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

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in 4.4.2 and 4.4.3.

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).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

4.2.1 Construction verification. Cross sectional photos from three devices shall be submitted in the qualification report.

4.2.2 JANHC and JANKC die devices. Qualification for these devices shall be in accordance with MIL-PRF-19500. This testing may be performed on a TO-5 package in lieu of the axial leaded package.

4.3 Screening (JAN, JANTX, JANTXV, and JANS levels only). Screening shall be in accordance with of MIL-PRF-19500 (appendix E, table IV), 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 IV of MIL-PRF-19500)	Measurement		
	JANS level	JANTX and JANTXV levels	JAN level
3a	Temperature cycling	Temperature cycling	Temperature cycling in accordance with JANTX level MIL-PRF-1900.
3c 1/	Thermal impedance (see 4.5.3)	Thermal impedance (see 4.5.3)	Thermal impedance (see 4.5.3)
9	I_{R1} and V_{FM2}	Not applicable	Not applicable
10 2/	$T_A = +90^\circ\text{C}$; $V_{RWM} = 40 \text{ V (pk)}$; $I_O = 0$, half sine wave, $f = 60 \text{ Hz}$	$T_A = +90^\circ\text{C}$; $V_{RWM} = 40 \text{ V (pk)}$; $I_O = 0$, half sine wave, $f = 60 \text{ Hz}$	Not applicable
11	$\Delta I_{R1} \leq 100$ percent of initial reading or .05 mA, whichever is greater. $\Delta V_{FM2} \leq \pm 50 \text{ mV dc}$.	I_{R1} and V_{FM2}	Not applicable
12	See 4.3.2	See 4.3.2, $t = 48$ hours	Not applicable
13	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial reading or .05 mA, whichever is greater, $\Delta V_{FM2} \leq \pm 50 \text{ mV dc}$.	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial reading or .05 mA, whichever is greater, $\Delta V_{FM2} \leq \pm 50 \text{ mV dc}$.	Not applicable

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 impedance.

2/ Junction temperature (T_J) is not to exceed $+100^\circ\text{C}$ with $V_{RWM} = 40 \text{ V (pk)}$. T_J is affected by the device mounting thermal resistance when parasitic power is generated by the temperature dependent leakage current. Until this leakage becomes significant near thermal runaway, T_J remains approximately equal to T_A or T_L for $I_O = 0$.

4.3.1 Screening (JANHC or JANKC). Screening of die shall be in accordance with appendix G of MIL-PRF-19500.

4.3.2 Burn-in conditions. Burn-in conditions are as follows: $I_F = 3 \text{ A dc}$ minimum. T_A = room ambient as defined in the general requirements of MIL-STD-750. Mounting and test conditions in accordance with MIL-STD-750, method 1038, test condition B.

4.3.2.1 Mounting. Devices may be mounted using any convenient method including the temporary attachment of leads on US suffix devices, provided that the parts are burned-in at $T_J = +110^\circ\text{C} \pm 15^\circ\text{C}$.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 appendix E, table V, and table I herein. The following test conditions shall be used for $Z_{\theta JX}$, group A inspection:

- a. I_M measurement current 1 mA to 10 mA.
- b. I_H forward heating current 10 A to 20 A.
- c. t_H heating time 10 ms.
- d. t_{MD} measurement delay time 100 μ s maximum.

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 VIa and VIb (JANS, JAN, JANTX, and JANTXV) of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table I, group A, subgroup 2 herein.

4.4.2.1 Group B inspection, appendix E, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
3	4066	$I_{FSM} = 80$ A (pk), condition A 2, $I_O = 3$ A dc; T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5); 5 surges of 8.3 ms each at 1 minute intervals.
4	1036	$I_F = 3.0$ A dc; T_A = room ambient as defined in the general requirements of MIL-STD-750; $t_{on} = t_{off} = 3$ minutes minimum for 2,000 cycles. $f = 50 - 60$ Hz. $V_{RWM} = 40$ V (pk).
5	1027	$T_A = +75^\circ\text{C} \pm 25^\circ\text{C}$; $I_F = 3.0$ A dc (minimum) with I_F adjusted to achieve an average lot. $T_J = +125^\circ\text{C} +0^\circ\text{C}, -10^\circ\text{C}$.
6	3101	$R_{\theta JL} = 30^\circ\text{C}/\text{W}$; $L = 9.52$ mm (.375 inch) lead length (non-surface mount). $R_{\theta JEC} = 10^\circ\text{C}/\text{W}$ (surface mount).

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
2	4066	$I_{FSM} = 80$ A (pk), condition A 2, $I_O = 3$ A dc; T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5); 5 surges of 8.3 ms each at 1 minute intervals.
3	1027	$I_O = 3$ A dc; $f = 50-60$ Hz; $V_{RWM} = 40$ V (pk). $T_L \leq +55^\circ\text{C}$, lead length = 9.52 mm (.375 inch) In accordance with 4.5.2.
4	2075	

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 VII of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, group A, subgroup 2 herein.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
2	2036	Tension: Test condition A; weight = 20 pounds; t = 15 s. Lead fatigue: Test condition E; weight 1 pounds. NOTE: Both tension and lead fatigue are not applicable for US devices.
6	1026	$I_O = 3 \text{ A dc}$; $T_A = \text{room ambient as defined in the general requirements of MIL-STD-750 (see 4.5)}$; $f = 50\text{-}60 \text{ Hz}$; $V_{RWM} = 40 \text{ V (pk)}$. $T_L \leq \pm 55^\circ\text{C}$, lead length = 9.52 mm (.375 inch).

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with MIL-PRF-19500 and the conditions for subgroup testing in table II herein. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

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

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in 4.3.2.1 of MIL-STD-750.

4.5.2 Steady-state operation life. This test shall be conducted with a half-sine wave 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 not be greater than 180° nor less than 150° .

4.5.3 Thermal impedance. Thermal impedance $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750, method 3101. Read and record data ($Z_{\theta JX}$) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum) prior to shipment. Twenty-two samples shall be serialized and provided to the qualifying activity for test correlation. The maximum upper control limit for $Z_{\theta JX}$ in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical process control (SPC). When three successive sealing lots have exhibited control, the data from these three lots will be used to establish a fixed screening limit, (not to exceed the group A, subgroup 2 limit). Once a fixed limit has been established, monitor all future sealing lots using a three-piece sample from each production lot to be plotted on the applicable X, R chart.

4.5.3.1 For initial qualification and requalification. Read and record data ($Z_{\theta JX}$) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum) prior to shipment. Twenty-two samples shall be specialized and provided to the qualifying activity for test correlation.

TABLE I. Group A inspection.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance	3101	See 4.5.3	$Z_{\theta JX}$		3.0	°C/W
Forward voltage	4011	$I_{FM} = 1.0$ A (pk) pulse method (see 4.5.1)	V_{FM1}		0.40	V
	4011	$I_{FM} = 3.0$ A (pk) pulse method (see 4.5.1)	V_{FM2}		0.50	V
	4011	$I_{FM} = 9.4$ A (pk) pulse method (see 4.5.1)	V_{FM3}		0.70	V
Reverse current leakage	4016	$V_{RM} = 40$ V (pk) pulse method (see 4.5.1)	I_{RM1}		0.10	mA
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +100^\circ\text{C}$				
Reverse current leakage	4016	$V_{RM} = 40$ V (pk) pulse method (see 4.5.1)	I_{RM2}		12.5	mA
Forward voltage	4011	$I_F = 3.0$ A (pk) pulse method (see 4.5.1)	V_{FM4}		0.47	V
Low temperature operation:		$T_A = -55^\circ\text{C}$				
Reverse current leakage	4016	$V_{RM} = 40$ V (pk) pulse method (see 4.5.1)	I_{RM3}		0.40	mA
Forward voltage	4011	$I_F = 3.0$ A (pk) pulse method (see 4.5.1)	V_{FM5}		0.62	V

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

TABLE II. Group E inspection (all quality levels) for qualification only. 1/

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			
Thermal shock (temperature cycling)	1051	500 cycles	22 devices c = 0
Hermetic seal	1071	Test condition E	
Electrical measurement		See table I, group A, subgroup 2 herein.	
<u>Subgroup 2</u>			
Steady-state reverse bias	1038	Test condition A, 1,000 hours, see 4.3, screen 10	22 devices c = 0
Electrical measurement		See table I, group A, subgroup 2 herein	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			
Thermal resistance, (forward voltage drop diode method)	4081 or 3101	$R_{\theta JL} = 30^{\circ}\text{C/W}$ maximum at 9.52 mm (.375 inch) lead length; $R_{\theta JEC} = 10^{\circ}\text{C/W}$ maximum; method 3101 in accordance with 4.5.3 except $I_H = 3\text{ A}$ and $T_H = 20\text{ s}$ (minimum)	22 devices c = 0
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			
Not applicable			

1/ For initial design and process change verification only (one time testing).

5. PACKAGING

5.1 Packaging. Packaging shall prevent mechanical damage of the devices during shipping and handling and shall not be detrimental to the device. When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

5.2 Marking. Unless otherwise specified (see 6.2), marking shall be in accordance with MIL-PRF-19500.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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

6.2 Acquisition requirements. See MIL- PRF-19500.

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 Products List QPL 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, DSCC - VQE, 3990 E. Broad Street, Columbus, OH 43216.

6.4 Suppliers of die. The qualified die suppliers with the applicable letter version (e.g., JANHCA1N5822) will be identified on the QPL.

JANC ordering information		
PIN	Manufacturer	
	55801	
1N5822	JANHCA1N5822 JANKCA1N5822	

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

Custodians:
 Army - CR
 Navy - EC
 Air Force - 17
 NASA - NA

Preparing activity:
 DLA - CC
 (Project 5961-1852)

Review activities:
 Army - AR, MI, SM
 Navy - AS, CG, MC
 Air Force - 19, 85, 99

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/620C	2. DOCUMENT DATE (YYMMDD) 980621
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3. DOCUMENT TITLE SEMICONDUCTOR DEVICE, HERMETIC, DIODE, SILICON, RECTIFIER, SCHOTTKY BARRIER, TYPES 1N5822 AND 1N5822US JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC
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4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) Commercial DSN FAX EMAIL	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY	
a. Point of contact: Alan Barone	b. TELEPHONE Commercial DSN FAX EMAIL 614-692-0510 850-0510 614-692-6939 alan_barone@dsccl.dla.mil
c. ADDRESS: Defense Supply Center Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 DSN 289-2340