

The documentation and process conversion measures necessary to comply with this revision shall be completed by 4 February 2004.
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INCH POUND

MIL-PRF-19500/118F
4 November 2003
SUPERSEDING
MIL-PRF-19500/118E
23 April 1997

PERFORMANCE SPECIFICATION

* SEMICONDUCTOR DEVICE, DIODE, SILICON,
TYPES 1N483B, 1N485B, 1N486B, 1N5194, 1N5194UR, 1N5194US, 1N5195, 1N5195UR, 1N5195US,
1N5196, 1N5196UR, AND 1N5196US, JAN, JANTX, AND JANTXV

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 diodes. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1, figure 2 (DO-213AA), and figure 3 (see 3.4).

* 1.3 Maximum ratings.

Type (1)	V _{RM}	V _{RWM}	I _O (2)	I _O T _A = 150°C	I _{FSM} t _p = 1/120 s T _A = 25°C	T _J and T _{STG}
	V (pk)	V (pk)	mA	mA	A	°C
1N483B, 1N5194, 1N5194UR, 1N5194US	80	70	200	50	2	-65 to +175
1N485B, 1N5195, 1N5195UR, 1N5195US	180	180	200	50	2	-65 to +175
1N486B, 1N5196, 1N5196UR, 1N5196US	250	225	200	50	2	-65 to +175

(1) The electrical characteristics for UR and US suffix devices are identical to their corresponding leaded devices unless otherwise noted (applies only to the 1N5194, 1N5195, and 1N5196).

(2) Derate 1.2 mA/°C between 25°C and 150°C. Derate 2 mA/°C between 150°C and 175°C.

1.4 Primary electrical characteristics at T_A = +25°C, unless otherwise indicated.

Type (1)	V _{F1}	I _{R1} at V _{RWM}	I _{R3} at V _{RWM} T _A = 150°C
	V dc	nA dc	µA dc
1N483B, 1N5194, 1N5194UR, 1N5194US	1.0	25	5
1N485B, 1N5195, 1N5195UR, 1N5195US	1.0	25	5
1N486B, 1N5196, 1N5196UR, 1N5196US	1.0	25	5

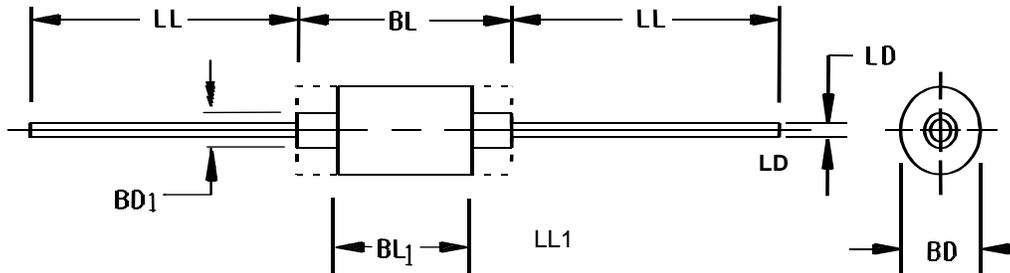
(1) The electrical characteristics for UR and US suffix devices are identical to their corresponding leaded devices unless otherwise noted (applies only to the 1N5194, 1N5195, and 1N5196).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, 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

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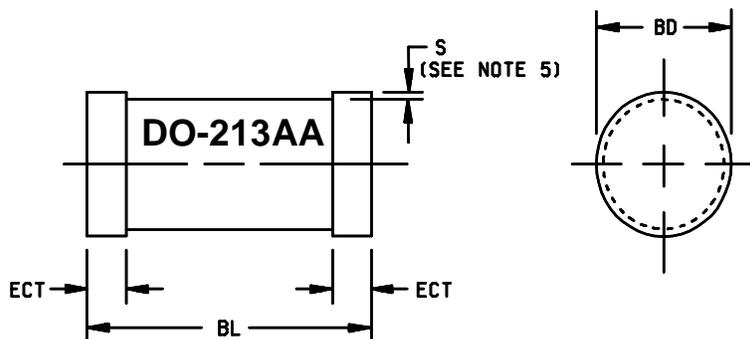


Type	Symbol	Dimensions				Notes
		Inches		Millimeters		
		Min	Max	Min	Max	
1N483B	BD	.085	.125	2.16	3.18	3
1N485B	BL	.230	.300	5.84	7.62	
1N486B	LD	.018	.022	0.46	0.56	2, 5
	LL	1.00	1.500	25.40	38.10	4, 5
1N5194 1N5195 1N5196	BD	.056	.094	1.42	2.39	
	BD1	.030		0.76		
	BL	.120	.180	3.05	4.57	
	BL1	.075		1.91		
	LD	.019	.021	0.48	0.53	2, 5
	LL	1.00	1.500	25.40	38.10	4, 5

NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. The specified lead diameter applies in the zone between .050 (1.27 mm) and 1.00 inch (25.4 mm) from the diode body. Outside this zone the lead diameter is not controlled.
3. The minimum body diameter shall be maintained over .15 inch (3.81 mm) of body length.
4. The leads shall be electrically insulated from the case.
5. Both leads.
6. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

FIGURE 1. Physical dimensions.

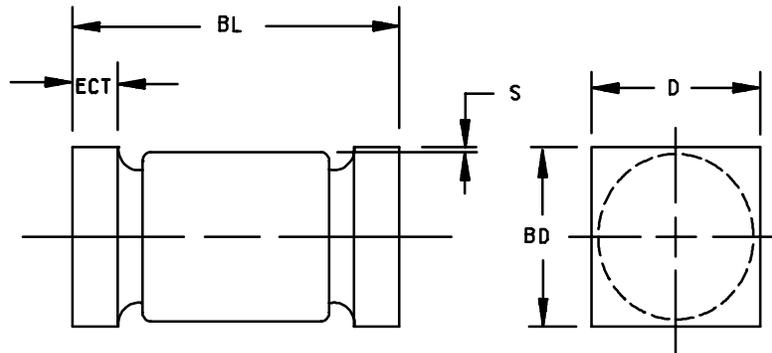


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.063	.067	1.60	1.70
BL	.130	.146	3.30	3.70
ECT	.016	.022	0.41	0.55
S	.001 Min		0.03 Min	

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensions are pre-solder dip.
4. Cathode marking to be either a color band or four dots spaced 90 degrees apart.
5. Minimum clearance of glass body to mounting surface on all orientations.
6. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

FIGURE 2. Physical dimensions 1N5194UR, 1N5195UR, and 1N5196UR (DO-213AA).



Symbol	Dimensions			
	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 Min		0.08 Min	

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensions are pre-solder dip.
4. Minimum clearance of glass body to mounting surface on all orientations.
5. Cathode marking to be either a color band or four dots spaced 90 degrees apart.
6. In accordance with ASME Y14.5M, diameters are equivalent to Φ symbology.

FIGURE 3. Physical dimensions 1N5194US, 1N5195US, and 1N5196US.

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

DEPARTMENT OF DEFENSE

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

* (Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

* 3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

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

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

3.4 Interface and physical dimensions. The interface requirements and dimensions shall be as specified in MIL-PRF-19500, and figures 1, 2, and 3 herein.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

* 3.4.2 Diode construction. All devices shall be metallurgically bonded, double plug construction in accordance with the requirements of MIL-PRF-19500. All glass diodes shall be designed with sufficient thermal compensation in the axial direction to optimize tensile and compressive stresses. Dimensional analysis is required of all materials used to achieve axial thermal compensation. Dimensional tolerances and corresponding Coefficient of Thermal Expansion (CTE) shall be documented on the DSCC Design and Construction Form 36D and shall be approved by the qualifying activity to maintain qualification. Dimensional tolerances shall be sufficiently tight enough to prevent excessive stresses due to the inherent CTE mismatch.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. Manufacturers identification and date code shall be marked on the devices. The polarity shall be indicated with a contrasting color band to denote the cathode end. No color coding will be permitted. Initial container package marking shall be in accordance with MIL-PRF-19500.

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

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

3.8 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).

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

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4.3 Screening (JAN, JANTX, and JANTXV levels only). Screening shall be in accordance with table IV of MIL-PRF-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JAN level	JANTX and JANTXV levels
3a	Temperature cycling in accordance with MIL-PRF-19500, TX level.	Temperature cycling
(1) 3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9	Not applicable	Not applicable
10	Not applicable	Method 1038 of MIL-STD-750, condition A, t = 48 hours
11	Not applicable	I_{R1} and V_{F1}
12	Not applicable	See 4.3.1
(2) (3) 13	Not applicable	Subgroup 2 of table I herein; $\Delta I_{R1} = 100$ percent of initial reading or 15 nA, whichever is greater; $\Delta V_{F1} = 25$ mV dc.

- (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) When thermal impedance is performed prior to screen 13, it is not required to be repeated in screen 13.
- (3) PDA \leq 5 percent.

4.3.1 Power burn-in conditions. All devices shall be operated under one of the following conditions: T_A = room ambient as defined in the general requirements of MIL-STD-750 (see 4.5).

Type (1) (2)	T_A = room ambient as defined in MIL-STD-750; $I_O = 200$ mA; $f = 60$ Hz.	T_A = room ambient as defined in MIL-STD-750.
1N483B, 1N5194, 1N5194UR, 1N5194US	$V_{RWM} = 70$ V(pk)	$I_F = 175$ mA
1N485B, 1N5195, 1N5195UR, 1N5195US	$V_{RWM} = 180$ V(pk)	$I_F = 175$ mA
1N486B, 1N5196, 1N5196UR, 1N5196US	$V_{RWM} = 225$ V(pk)	$I_F = 175$ mA

- (1) Derate at 1.2 mA/°C between +25°C and +150°C. Derate at 1.0 mA/°C above +150°C.
- (2) Electrical characteristics for UR and US suffix devices are identical to the corresponding leaded devices unless otherwise specified. (Applies only to the 1N5194, 1N5195, and 1N5196).

4.3.2 Thermal impedance $Z_{\Theta JX}$ measurements for screening. Thermal impedance $Z_{\Theta JX}$ measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum limit (not to exceed the table I, subgroup 2 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. When the process has exhibited control and capability, the capability data shall be used to establish the fixed screening limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot to be plotted on the applicable X bar R chart.

The maximum limit for $Z_{\Theta JX}$ under these test conditions is $Z_{\Theta JX} = 70^{\circ}\text{C/W}$.

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

4.4 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. Electrical measurements (end-points) shall be in accordance with the table I, subgroup 2 herein. The following test conditions shall be used for $Z_{\Theta JX}$ group A inspection:

- a. I_M measurement current- - - - - 1 mA - 10 mA.
- b. I_H forward heating current- - - - - .5 A - 1.0 A.
- c. t_H heating time - - - - - 10 ms.
- d. t_{MD} measurement delay time - - - 100 us (max).

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table VIb (JANTX and JANTXV) of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein except for the thermal impedance test.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1027	See 4.3.1.
B5	Not applicable.	

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein except for the thermal impedance test.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	1056	-55°C to +100°C, 15 cycles, n = 22, c = 0.
C2	2036	Tension: Test condition A, t = 15 seconds, weight = 10 pounds. Lead fatigue: Test condition E. Terminal strength and lead fatigue not applicable to UR devices.
C5	3101 or 4081	$R_{\theta JL}$ at L = .375 inch (9.52 mm) $\leq 250^\circ\text{C/W}$, $R_{\theta JEC}$ at L = 0 lead length $\leq 100^\circ\text{C/W}$, see 4.5.3. $R_{\theta JEC} = 100^\circ\text{C/W}$ (maximum) at zero lead length (for UR). $R_{\theta JSP} = 150^\circ\text{C/W}$ (maximum) (for UB). $+25^\circ\text{C} \leq T_R \leq +35^\circ\text{C}$, $t_H \geq 25\text{s}$ in still air.
C6	1026	See 4.3.1.

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 measurements shall be specified in section 4 of MIL-STD-750.

4.5.2 Burn-in life tests. AC tests shall be conducted with a half-sine wave of the peak voltage specified herein impressed across the diode in the reverse direction, followed by a half-sine waveform of the average rectified current specified herein. The forward conduction angle of the rectified current shall be not greater than 180 degrees nor less than 150 degrees.

4.5.2.1 Free air burn-in. Deliberate heat sinking, baffles to create an oven, or forced air cooling is prohibited unless otherwise approved by the qualifying activity. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the full Pt (minimum) and that the minimum applied voltage, where applicable, is maintained throughout the burn-in period.

4.5.3 Forward recovery voltage and time. Forward recovery time shall be measured as the time interval between zero time and the point where the pulse has decreased to 110 percent of the steady-state value of V_F when $I_F = 50\text{ mA dc}$. The maximum rise time of the response detector shall be 1 ns.

4.5.4 Decap internal visual scribe and break. Scratch glass at cavity area with diamond scribe. Carefully snap open. Using 30X magnification examine the area where die was in contact with the plugs, verify footprint for minimum of 15 percent metallurgical bonding area. In addition, a cross sectional view may be used to verify consistency of construction. A cross sectional view shall be used exclusively for construction verification and shall not be used to verify bond integrity.

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TABLE I. Group A inspection.

Inspection <u>1/</u> <u>2/</u>	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 4.3.2	$Z_{\theta JX}$		70	$^{\circ}\text{C}/\text{W}$
Forward voltage	4011	$I_F = 100 \text{ mA pk}$, (pulsed); $t_p = 8.5 \text{ ms}$ max. duty cycle, 2 percent .	V_{F1}	.8	1.0	V pk
Reverse current	4016		I_{R1}		25	nA dc
1N483B, 1N5194, 1N5194UR, 1N5194US		$V_R = 70 \text{ V (pk)}$			25	nA dc
1N485B, 1N5195, 1N5195UR, 1N5195US		$V_R = 180 \text{ V (pk)}$			25	nA dc
1N486B, 1N5196, 1N5196UR, 1N5196US		$V_R = 225 \text{ V (pk)}$				
1N483B, 1N5194, 1N5194UR, 1N5194US	4016	$V_R = 80 \text{ V (pk)}$	I_{R2}		1	$\mu\text{A dc}$
1N485B, 1N5195, 1N5195UR, 1N5195US		$V_R = 200 \text{ V (pk)}$			1	$\mu\text{A dc}$
1N486B, 1N5196, 1N5196UR, 1N5196US		$V_R = 250 \text{ V (pk)}$			1	$\mu\text{A dc}$
<u>Subgroup 3</u> High temperature operation		$T_A = 150^{\circ}\text{C}$				
Reverse current	4016		I_{R3}		5	$\mu\text{A dc}$
1N483B, 1N5194		$V_R = 70 \text{ V (pk)}$			5	$\mu\text{A dc}$
1N485B, 1N5195		$V_R = 180 \text{ V (pk)}$			5	$\mu\text{A dc}$
1N486B, 1N5196		$V_R = 225 \text{ V (pk)}$				
Low temperature operation		$T_A = -55^{\circ}\text{C}$				
Forward voltage	4011	$I_F = 100 \text{ mA pk}$, (Pulsed); $t_p = 8.5 \text{ ms}$ max. duty cycle, 2%.	V_{F2}		1.2	V pk
<u>Subgroups 4 and 5</u> Not applicable						
<u>Subgroup 6</u> Surge current	4066	$I_O = 200 \text{ mA dc}$, 10 surges at one per minute; $t_p = 1/120 \text{ s}$, $I_{FSM} = 2 \text{ A (pk)}$.				
Electrical measurements		See table I, subgroup 2				

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

2/ Electrical characteristics are for all package styles.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

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

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.2.1).
- c. Packaging requirements (see 5.1).
- d. Lead finish (see 3.4.1).
- e. Type designation and product assurance level.

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 Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000 or e-mail vqe.chief@dla.mil.

6.4 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 11
DLA - CC

Preparing activity
DLA - CC

(Project 5961-2824)

Review activities:
Army - AR, MI
Navy - AS, MC
Air Force - 19, 99
NASA - NA

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-19500/118F	2. DOCUMENT DATE 4 November 2003
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3. **DOCUMENT** SEMICONDUCTOR DEVICE, DIODE, SILICON, TYPES 1N483B, 1N485B, 1N486B, 1N5194, 1N5194UR, 1N5194US, 1N5195, 1N5195UR, 1N5195US, 1N5196, 1N5196UR, AND 1N5196US, JAN, JANTX, AND JANTXV

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)	7. DATE SUBMITTED	
	COMMERCIAL DSN FAX EMAIL		

8. PREPARING ACTIVITY

a. Point of Contact Alan Barone	b. TELEPHONE			
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	614-692-0510	850-0510	614-692-6939	alan.barone@dla.mil
c. ADDRESS Defense Supply Center, Columbus ATTN: DSCC-VAC P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888			