

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY,
POWER RECTIFIER, COMMON CATHODE OR COMMON ANODE CENTER TAP,
TYPES 1N6785 AND 1N6785R JAN, JANTX, JANTXV AND JANS

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 a silicon, Schottky, 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 figure 1 (TO-257AA).

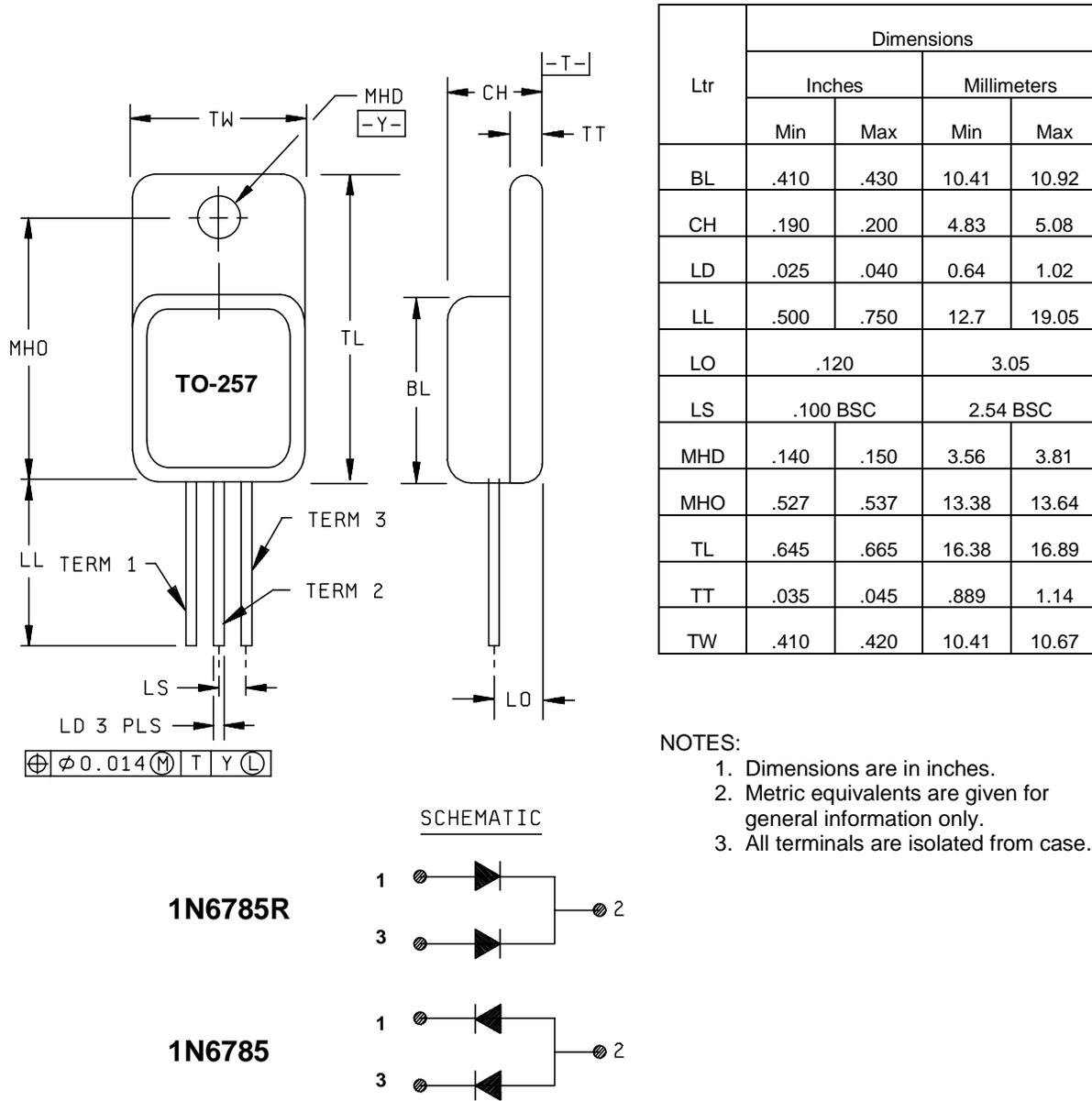
1.3 Maximum ratings.

Type	V _R (1)	V _{RWM} (1)	I _O (1) (2) (3)	I _{FSM} (1)	C _J (1)	T _{STG} and T _J
			T _J = T _C = +100°C	T _C = +25°C t _p = 8.3 ms	at 5 V	
	<u>V</u>	<u>V</u>	<u>A dc</u>	<u>A(pk)</u>	<u>pF</u>	<u>°C</u>
1N6785, 1N6785R	45	45	15	300	2,000	-65 to +150

- (1) Each individual diode.
- (2) Derate linearly at 300 mA/°C from T_J = T_C = +100°C to +150°C. 300 mA/°C times 50°C = 15 A, the device rating.
- (3) Total package current is limited to 30 A dc.

1.4 Primary electrical characteristics. R_{θJC} = 1.65°C/W maximum, R_{θJA} = 40°C/W maximum, each individual diode.

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-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



- NOTES:
1. Dimensions are in inches.
 2. Metric equivalents are given for general information only.
 3. All terminals are isolated from case.

FIGURE 1. Physical dimensions and configuration (T0-257AA).

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 requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

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 and physical dimensions shall be as specified in MIL-PRF-19500 and on figure 1 (TO-257AA) herein. Methods used for electrical isolation of the terminal feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic). Examples of such construction techniques are metallized ceramic eyelets or ceramic walled packages

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

3.4.2 Polarity. Polarity and terminal configuration shall be in accordance with figure 1 herein.

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3.

3.6 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

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

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.

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with appendix E, 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 appendix E, table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3c	Method 3101 (see 4.3.2), peak reverse energy test (see 4.3.3)	Method 3101 (see 4.3.2), peak reverse energy test (see 4.3.3)
9 and 10	Not applicable	Not applicable
11	V_{F2} and I_{R1}	V_{F2} and I_{R1}
12	See 4.3.1, $t = 240$ hours	See 4.3.1, $t = 48$ hours
13	Subgroups 2 and 3 of table herein; $\Delta V_{F2} = \pm 50$ mV; $\Delta I_{R1} = 100$ percent of initial value or ± 250 μ A dc, whichever is greater.	Subgroup 2 of table herein; $\Delta V_{F2} = \pm 50$ mV; $\Delta I_{R1} = 100$ percent of initial value or ± 250 μ A dc, whichever is greater.

(1) Shall be performed anytime after screen 3.

4.3.1 Power burn-in conditions. Burn-in conditions are as follows: Method 1038 of MIL-STD-750, test condition A. $T_C = +125^\circ\text{C}$; $V_R = 36$ V dc.

4.3.2 Thermal impedance $Z_{\theta JX}$ measurements for screening. The $Z_{\theta JX}$ measurements shall be performed in accordance with method 3101 of MIL-STD-750. Test each die separately. The maximum limit and conditions for $Z_{\theta JX}$ in screening (appendix E, table IV of MIL-PRF-19500) shall be derived by each vendor by means of process control of actual measurements which characterizes the die attach process. When three lot date codes have exhibited control, the data from these three lots will be used to establish a fixed screening limit (not to exceed the group A limit). Once a fixed limit has been established, monitor all future sealing lots using a sample from each lot to be plotted on the applicable statistical process chart.

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 MIL-STD-750. Method 3101 (read and record date $Z_{\theta JX}$) derived conditions limits and thermal response curve shall be supplied to the qualifying activity on the qualification lot prior to qualification approval.

4.3.3 Peak reverse energy test. The peak reverse energy test is to be performed using the circuit as shown on figure 2 or equivalent. The Schottky rectifier under test must be capable of absorbing the reverse energy, as follows: $I_{RM} = 2$ A minimum, $V_{RSM} = 54$ V minimum, $L = 260$ μ H.

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 appendix E, table V of MIL-PRF-19500, and table I herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table III herein. The following test conditions shall be used for $Z_{\theta JX}$, group A inspection:

- a. I_M measure current..... 10 mA.
- b. I_H forward heating current 15 - 50 A.
- c. t_M heating time 50 ms.
- d. t_{MS} measurement delay time 100 μ s minimum.

The maximum limit for $Z_{\theta JX}$ under these test conditions are $Z_{\theta JX}(\max) = 1.55^\circ\text{C/W}$.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table VIa (JANS) and VIb (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 III herein.

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

- a. Subgroup 4: Condition for intermittent operation life for each diode are as follows: I_F or $I_O = 2$ A (minimum); $\Delta T_J \geq 85^\circ\text{C}$, $+15^\circ\text{C}$, -5°C for 2,000 cycles minimum.
- b. Subgroups 5: Condition for steady-state operation life (accelerated) is as follows: Method 1038, condition A, $T_J = T_C = +150^\circ\text{C}$, $V_R = 36$ V dc.
- c. Subgroup 6: Limit for thermal resistance is $R_{\theta JC} = 1.65^\circ\text{C/W}$ maximum for each die.

4.4.2.2 Group B inspection, appendix E, table VIb (JANTX and JANTXV) of MIL-PRF-19500. Subgroup 3: Condition for intermittent operation life for each diode are as follows: I_F or $I_O = 2$ A (minimum); $\Delta T_J \geq 85^\circ\text{C}$, $+15^\circ\text{C}$, -5°C for 2,000 cycles minimum.

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, and as follows. Electrical measurements (end points) and delta requirements shall be in accordance with the applicable steps of table III herein.

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

- a. Subgroup 2: Condition for terminal strength are as follows: Tension: Test condition A, weight = 10 lbs, $t = 15$ seconds.
- b. Subgroup 3: Condition for constant acceleration are as follows: X_1 , Y_1 , Z_1 , and Z_2 axis.
- c. Subgroup 6: I_F or $I_O = 2$ A (minimum); $\Delta T_J \geq 85^\circ\text{C}$, $+15^\circ\text{C}$, -5°C for 6,000 cycles minimum.

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

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

4.5.2 Thermal resistance. Thermal resistance shall be measured as follows in accordance with method 3101 or 5081 of MIL-STD-750. Each diode leg shall be measured.

- a. I_M 10 mA.
- b. I_H 15 - 50 A.
- c. t_{Md} 100 μs maximum.
- d. $R_{\theta JC}$ 1.65°C/W .

TABLE I. Group A inspection. 1/ 2/

Inspection	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance 3/	3101	See 4.4.1	Z _{θJX}		1.55	°C/W
Forward voltage	4011	I _F = 5 A (pk) pulsed (see 4.5.1)	V _{F1}		0.55	V dc
		I _F = 15 A (pk) pulsed (see 4.5.1)	V _{F2}		0.75	V dc
		I _F = 30 A (pk) pulsed (see 4.5.1)	V _{F3}		1.0	V dc
Reverse current	4016	DC method, V _R = 45 V dc, (see 4.5.1)	I _{R1}		1.0	mA dc
<u>Subgroup 3</u>						
High temperature operation:		T _A = +125°C				
Reverse current leakage	4016	DC method, pulsed (see 4.5.1)				
		V _R = 45 V (pk)	I _{R2}		40	mA dc
Low temperature operation:		T _A = -55°C				
Forward voltage	4011	Pulsed (see 4.5.1) I _F = 15 A (pk)	V _{F4}		0.8	V dc
<u>Subgroup 4</u>						
Junction capacitance	4001	V _R = 5 V dc; f = 1 MHz V _{SIG} = 50 mV (p-p) (max)	C _J		2,000	pF
<u>Subgroup 5</u>						
Dielectric withstanding voltage	1016	V _R = 500 V dc; All leads shorted; V measure from leads to case; Sample is n = 116, c = 0.	DWV		10	μA
<u>Subgroup 6 and 7</u>						
Not applicable						

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

2/ Each individual diode.

3/ If 4.4.1 test conditions are performed in 100 percent screening, this test need not be performed in group A.

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

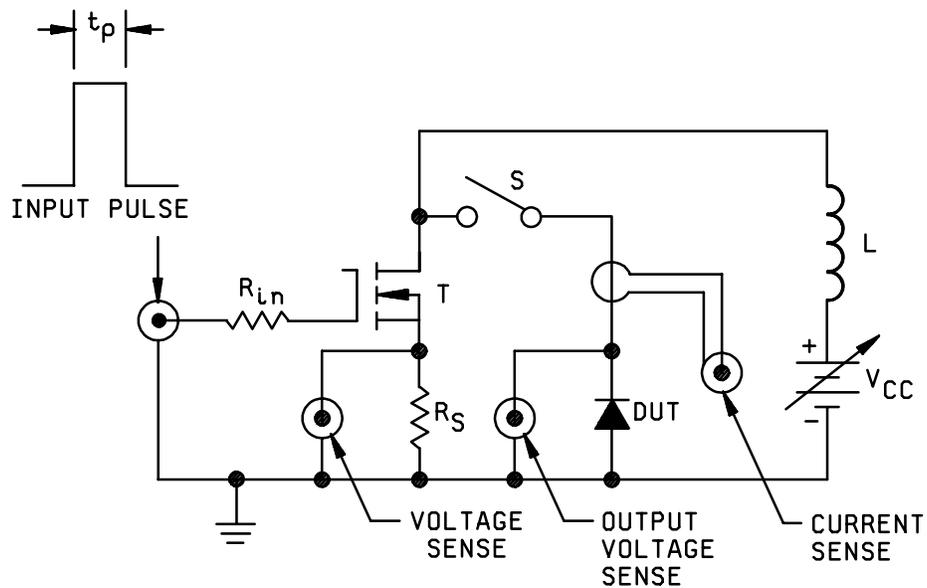
Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
<u>Subgroup 1</u>			38 devices, c = 0
Thermal shock (temperature cycling)	1051	500 cycles	
Hermetic seal	1071		
Electrical measurements		See table III, steps 1, 2, and 5	
<u>Subgroup 2</u>			38 devices, c = 0
Steady-state blocking life	1048	t = 1,000 hours, T _C = +125°C; V _R = 36	
Electrical measurements		See table III, steps 1 and 2	
<u>Subgroup 3</u>			
Not applicable			10 devices, c = 0
<u>Subgroup 4</u>			
Thermal resistance	3101	See 4.5.2, R _{θJC} = 1.65°C/W	
<u>Subgroup 5</u> ^{1/}			22 devices, c = 0
Surge	4066	Condition B; T _A = +25°C; I _{FSM} = 300 A, 100 surges	
Electrical measurements		See table III, steps 1 and 2.	

^{1/} For each diode.

TABLE III. Groups A, B, C, and E electrical end-point measurements. 1/ 2/ 3/ 4/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = 15$ A (pk), pulsed (see 4.5.1)	V_{F2}		0.75	V dc
2.	Reverse current leakage	4016	$V_R = 45$ V dc, pulsed (see 4.5.1) DC method	I_{R1}		1.0	mA dc
3.	Forward voltage	4011	$I_F = 15$ A (pk), pulsed (see 4.5.1)	ΔV_{F2}	± 50 mV dc from initial reading.		
4.	Reverse current	4016	$V_R = 45$ V dc, pulsed (see 4.5.1) DC method	ΔI_{R1}	± 250 μ A dc or 100 percent from initial reading, whichever is greater.		
5.	Thermal impedance	3101	See 4.4.1	$Z_{\theta JX}$		1.55	°C/W

- 1/ Each individual diode.
- 2/ The electrical measurements for appendix E, table VIa (JANS) of MIL-PRF-19500 are as follows:
- Subgroup 3, see table III herein, steps 1 and 2.
 - Subgroup 4, see table III herein, steps 1, 2, 3, 4, and 5.
 - Subgroup 5, see table III herein, steps 1, 2, 3, and 4.
- 3/ The electrical measurements for appendix E, table VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows:
- Subgroup 2, see table III herein, steps 1 and 2.
 - Subgroup 3, see table III herein, steps 1, 2, and 5.
 - Subgroup 6, see table III herein, steps 1 and 2.
- 4/ The electrical measurements for appendix E, table VII of MIL-PRF-19500 are as follows:
- Subgroups 2 and 3, see table III herein, steps 1 and 2 for all levels.
 - Subgroup 6, see table III herein, steps 1, 2, and 5 for all levels.



Input pulse
 $V_G = 10$ Volts
 $R_G = 50$ ohms
 P.W. $\approx 30 \mu\text{s}$
 Duty cycle ≤ 1 percent

$R_{in} = 50$ ohms, 1 watt
 $R_s = 0.1$ ohms, 1 watt
 $V_{CC} \approx 10$ volts
 $L = 260 \mu\text{H}$
 $T = \text{IRF130/2N6756}$ or equivalent

PROCEDURES:

1. With S open, adjust pulse width to test current of 2 amps across R_s .
2. Close S, verify test current with current sense.
3. Read peak output voltage (see 4.3.3).

FIGURE 2. Peak reverse energy test circuit.

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. The acquisition requirements are as specified in 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 Manufacturers' List (QML) 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.

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA
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Preparing activity:
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(Project 5961-2467)

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-19500/656	2. DOCUMENT DATE 16 August 2001
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3. **DOCUMENT TITLE** SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY, POWER RECTIFIER, COMMON CATHODE OR COMMON ANODE CENTER TAP, TYPES 1N6785 AND 1N6785R JAN, JANTX, JANTXV AND JANS

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

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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