

## PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, DUAL SCHOTTKY CENTER TAP  
POWER RECTIFIER, SURFACE MOUNTED,  
TYPES 1N6843U3, 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 silicon, dual Schottky power rectifier in a surface mount package. Four levels of product assurance are provided for each device types as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (U3, similar to SMD.5).

1.3 Maximum ratings.

Type	$V_{RWM}$	$I_O$ (1) $T_C = +25\text{ }^\circ\text{C}$	$I_{FSM}$ $T_C = +25\text{ }^\circ\text{C}$ $t_p = 8.3\text{ ms}$	$C_J$ at 5 V	$T_{STG}$	$T_J$
	<u>V</u>	<u>A dc</u>	<u>A (pk)</u>	<u>pF</u>	<u>°C</u>	<u>°C</u>
1N6843	100	10	200	300	-65 to +150	-65 to +150

(1) Derate linearly at 80 mA/°C from  $T_j = T_C = +25^\circ\text{C}$  to + 150°C.

1.4 Primary electrical characteristics.  $R_{\theta JC} = 2.8^\circ\text{C/W}$  maximum on each leg.

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 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.

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

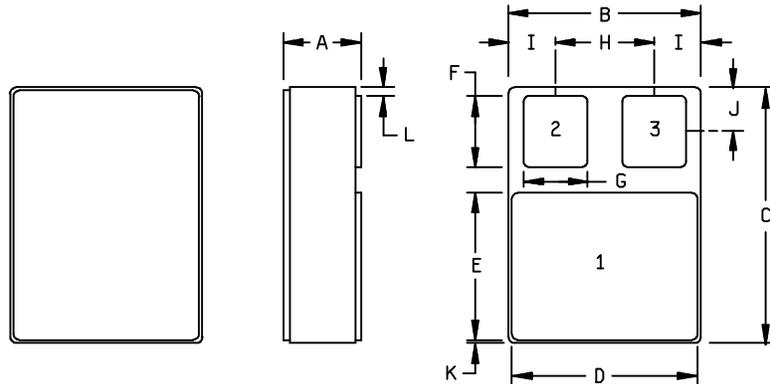
3.2 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

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

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and on figure 1 (U3) herein. The US government 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.

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

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



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	2.82	3.10	0.111	0.122
B	7.39	7.65	0.291	0.301
C	10.03	10.29	0.395	0.405
D	7.14	7.39	0.281	0.291
E	5.59	5.84	0.220	0.230
F	2.92	3.18	0.115	0.125
G	2.29	2.54	0.090	0.100
H	3.68	3.94	0.125	0.135
I	1.85 TYP.		0.073 TYP.	
J	2.11 TYP.		0.083 TYP.	
K	0.13 TYP.		0.005 TYP.	
L	0.38 TYP.		0.015 TYP.	

NOTES:

1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. Terminal 1 is common cathode.
4. Terminal 2 is anode 1.
5. Terminal 3 is anode 2.

SCHMATIC

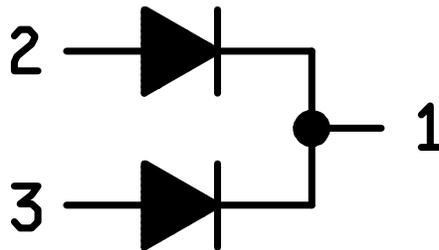


FIGURE 1. Physical dimensions and configuration (U3, similar to SMD.5).

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 Tables I and III herein.

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 MIL-PRF-19500 (table IV) 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	
	JANS level	JANTX and JANTXV levels
3c (1)	Method 3101 (see 4.3.2),	Method 3101 (see 4.3.2)
9 and 10	Not applicable	Not applicable
11	$V_{F2}$ and $I_{R1}$	$V_{F2}$ and $I_{R1}$
12	Condition A. See 4.3.1, t = 240 hours	Condition A. See 4.3.1, t = 48 hours
13	Subgroups 2 and 3 of table I herein; $\Delta V_{F2} = \pm 50$ mV, $\Delta I_{R1} = 100$ percent of initial value or 25 $\mu$ A, whichever is greater.	Subgroup 2 of table I herein; $\Delta V_{F2} = \pm 50$ mV, $\Delta I_{R1} = 100$ percent of initial value or 25 $\mu$ A, whichever is greater.

(1) Shall be performed anytime after screen 3.

4.3.1 Power burn-in conditions. Burn-in conditions are as follows:

MIL-STD-750 method 1038, test condition A.  $T_J = + 125$  °C- 150°C;  $V_R = 80$  percent of rated  $V_{RWM}$  dc

4.3.2 Thermal impedance ( $Z_{\theta JX}$  measurements) The  $Z_{\theta JX}$  measurements shall be performed in accordance with MIL-STD-750, method 3101. The maximum limit and conditions for  $Z_{\theta JX}$  in screening (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 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 SPC 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.

4.4 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 table V of MIL-PRF-19500, and table I herein. Electrical measurements (end points) and delta requirements shall be in accordance with Table I subgroup 2 herein. The following test conditions shall be used for  $Z_{\theta JX}$  , group A inspection:

- a.  $I_M$  measurement current ..... 10 mA
- b.  $I_H$  forward heating current ..... 5-10 A
- c.  $t_H$  heating time ..... 10 ms
- d.  $t_{MD}$  measurement delay time ..... 100  $\mu$ s maximum.

The maximum limit for  $Z_{\theta JX}$  under these test conditions are  $Z_{\theta JX}( \max ) = 2.7^{\circ}\text{C}/\text{W}$ .

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb ( JANTX, and JANTXV), and as follows. Electrical measurements (end points) shall be in accordance with Table I subgroup 2 herein. Delta requirements shall be in accordance with Table III herein.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	4066	$I_{FSM} = 200 \text{ A}$ ; 1 surge of 8.3 ms superimposed on $I_O$ . Condition A, $T_A = 25^{\circ}\text{C}$ ; $VR = 0$ ; $IO = 10\text{A}$ continuous half-wave.
B4	1037	Condition for intermittent operation life for each diode is as follows: $I_F$ or $I_O = 1 \text{ A}$ ( minimum ) $\Delta T_J = 85^{\circ}\text{C}$ , $+ 15^{\circ}\text{C}$ , $- 5^{\circ}\text{C}$ for 2,000 cycles minimum.
B5	1038	Condition for steady - state operation life ( accelerated ) is as follows: Condition B, $T_J = +150^{\circ}\text{C}$ , $T_A \leq 100^{\circ}\text{C}$ , 240 hrs.
B6		Limit for thermal resistance is $2.80^{\circ}\text{C}/\text{W}$ per side.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	4066	$I_{FSM} = 200$ A; 1 surge of 8.3 ms superimposed on $I_O$ . Condition A, $T_A = 25^\circ\text{C}$ ; $V_R = 0$ ; $I_O = 10$ A continuous half-wave.
B3	1037	Condition for intermittent operation life for each diode are as follows:  $I_F$ or $I_O = 1$ A ( minimum); $\Delta T_J = 85^\circ\text{C}, + 15^\circ\text{C}, - 5^\circ\text{C}$ for 2,000 cycles minimum.
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. Delta requirements shall be in accordance with Table III 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>
C3		Conditions for constant acceleration are as follows: $X_1, Y_1, Z_1$ and $Z_2$ axis.
C5		Limit for thermal resistance is $R_{\theta JC} = 2.80$ °C/W maximum.
C6	1037	$I_F$ or $I_O = 1$ A ( minimum ); $\Delta T_J = 85^\circ\text{C}, + 15^\circ\text{C}, - 5^\circ\text{C}$ for 6,000 cycles minimum.

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 Thermal resistance. Thermal resistance shall be measured as follow in accordance with method 3101.

- a.  $I_M$  10 mA
- b.  $I_H$  5:10 A
- c.  $t_{MD}$  100  $\mu\text{s}$  maximum.
- d.  $R_{\theta JC}$  2.80 °C/W

TABLE I. Group A inspection.

Inspection <u>1/ 2/</u>	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 <u>3/</u>	3101	See 4.4.1	$Z_{\theta JX}$		2.70	°C/W
Forward voltage	4011					
		$I_{FM} = 3 \text{ A (dc) pulsed (see 4.5.1)}$	$V_{F1}$		0.75	V dc
		$I_{FM} = 5 \text{ A (dc) pulsed (see 4.5.1)}$	$V_{F2}$		0.80	V dc
		$I_{FM} = 10 \text{ A (dc) pulsed (see 4.5.1)}$	$V_{F3}$		0.93	V dc
Reverse current leakage	4016	DC method, ( see 4.5.1.) $V_R = 100 \text{ V dc}$	$I_{R1}$		50	uA dc
1N6843						
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +100^\circ\text{C}$				
Reverse current leakage	4016	DC method, pulsed (see 4.5.1) $V_R = 100 \text{ V dc}$	$I_{R2}$		5	mA dc
1N6843						
Forward voltage	4011	$I_F = 5 \text{ A pulsed (see 4.5.1)}$	$V_{F4}$		0.65	V dc
Forward voltage	4011	$T_A = -55 \text{ C}$ Pulsed (see 4.5.1), $I_F = 5 \text{ A (dc)}$	$V_{F5}$		0.90	V dc

See footnotes at end of table.

TABLE I. Group A inspection. continued 1/ 3/

Inspection <u>1/</u> <u>2/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> Junction Capacitance	4001	$V_R = 5 \text{ V dc}$ ; $f = 1 \text{ MHz}$ , $V_{SIG} = 50 \text{ mV (p-p)}$ (max)	CJ		300	pF
<u>Subgroup 5</u> Dielectric withstand	1016	$V_R = 600 \text{ V dc}$ ; From lid to bottom case. All terminals shorted.	DWV		10	$\mu\text{A}$
<u>Subgroup 6 and 7</u> Not Applicable						

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

2/ All measurements are for each side.

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. Condition G	
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	1038	t = 1,000 hours, $T_J = +125\text{ }^\circ\text{C}$ ; $V_R = 80\%$ of rated VRWM	
Electrical measurements		See table III, steps 1 and 2	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			5 devices, c = 0
Thermal resistance	3101	See 4.5.2, $R_{\theta JC} = 2.80\text{ }^\circ\text{C/W}$	
<u>Subgroup 5</u>			5 devices, c = 0
Surge	4066	Condition A, $T_A = +25\text{ }^\circ\text{C}$ $I_{FSM} = 200\text{ A}$ , 1 surge of 8.3 ms superimposed on $I_O$ . $V_R = 0$ ;	
Electrical measurements		$I_O = 10\text{ A}$ pk half sine wave, continuous See table III, steps 1 and 2	

TABLE III. Groups B, C, and E, delta measurements 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = 5$ A (pk) pulsed (see 4.5.1)	$\Delta V_{F2}$		$\pm 50$	mV
2.	Reverse current leakage	4016	DC method $V_R = V_{RWM}$ pulsed (see 4.5.1)	$\Delta I_{R1}$		25 $\mu$ A or 100 % of initial reading, which ever is greater.	

1/ The electrical measurements for table VIa (JANS) of MIL-PRF-19500 are as follows:

- a. Subgroup 3, see table III herein, steps 1 and 2.
- b. Subgroup 4, see table III herein, steps 1 and 2.
- c. Subgroup 5, see table III herein, steps 1 and 2.

2/ The electrical measurements for table VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500 are as follows:

- a. Subgroup 2, see table III herein, steps 1 and 2.
- b. Subgroup 3, see table III herein, steps 1 and 2.
- c. Subgroup 6, see table III herein, steps 1 and 2.

3/ The electrical measurements for table VII of MIL-PRF-19500 are as follows:

- a. Subgroups 2 and 3, see table III herein, steps 1 and 2 for all levels.
- b. Subgroup 6, see table III herein, steps 1 and 2 for all levels.

## 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 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.

## 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. 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 2.1.1).
- c. Packaging requirements (see 5.1).
- d. Type designation and quality 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) 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:  
Navy - EC  
Air Force - 11  
NASA - NA  
DLA - CC

Preparing activity:  
DLA - CC  
  
(Project 5961-2302)

**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.

<b>I RECOMMEND A CHANGE:</b>	1. DOCUMENT NUMBER MIL-PRF-19500/681	2. DOCUMENT DATE 000710
------------------------------	---	----------------------------

**3. DOCUMENT TITLE**  
SEMICONDUCTOR DEVICE, DIODE, SILICON, DUAL SCHOTTKY CENTER TAP POWER RECTIFIER, SURFACE MOUNTED, TYPES 1N6843U3, 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**

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-VAC, 3990 East Broad Street, Columbus, OH 43213-1199	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			