

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY  
 POWER RECTIFIER, SURFACE MOUNT  
 TYPE 1N6845U3, 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, schottky power rectifier in a surface mount package. Four levels of product assurance are provided as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1, surface mount (U3).

1.3 Maximum ratings. Unless otherwise specified,  $T_A = +25^\circ\text{C}$ .

Type	V <sub>RWM</sub>	I <sub>O</sub> (1) T <sub>C</sub> = +100 °C	I <sub>FSM</sub> T <sub>C</sub> = +25 °C T <sub>p</sub> = 8.3 ms	C <sub>J</sub> at 10 V dc	T <sub>STG</sub>	T <sub>J</sub>
	<u>V</u>	<u>A dc</u>	<u>A (pk)</u>	<u>pF</u>	<u>°C</u>	<u>°C</u>
1N6845	45	30	400	800	-65 to +150	-65 to +150

(1) Derate linearly at 400 mA/°C from  $T_J = T_C = +125^\circ\text{C}$  to + 150 °C.

1.4 Primary electrical characteristics.  $R_{\theta JC} = 2.0^\circ\text{C/W}$  maximum.

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.

## 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.

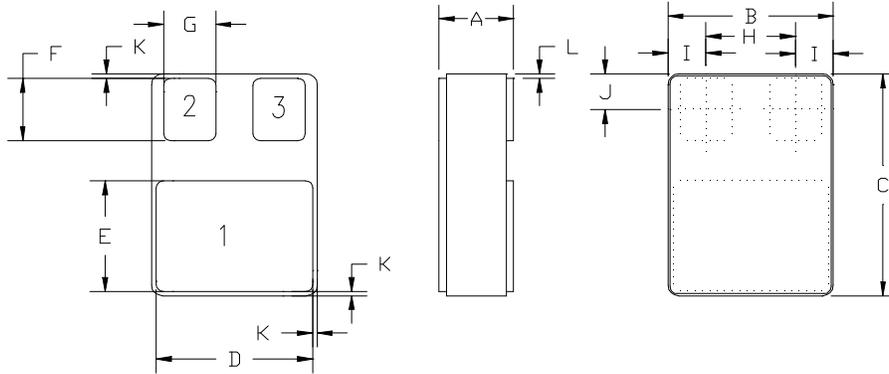
3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

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. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1.

3.4.1 Lead finish. Unless otherwise specified, 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 Polarity. Polarity and terminal configuration shall be in accordance with figure 1 herein.



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

NOTES:

1. Dimensions are in inches.
2. Millimeters equivalents are given for general information only.
3. Terminal 1 is connected to the cathode.
4. Terminals 2 and 3 are connected to the anode.

SCHEMATIC



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

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. At the option of the manufacturer, marking may be omitted from the body, but shall be retained on the initial container.

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. 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.

4.2.1 Group E inspection. Group E inspection shall be conducted in accordance with MIL-PRF-19500 and table II herein. End-point electrical measurements shall be in accordance with the applicable tests of table I, group A, subgroup 2 herein.

4.3 Screening (JANS, 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 appendix E, table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3c	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	Subgroup 2 and 3 of table herein; $\Delta V_{F2} = \pm 50$ mV, $\Delta I_{R1} = 100$ percent of initial value or 50 $\mu$ A, whichever is greater.	Subgroup 2 of table herein; $\Delta V_{F2} = \pm 50$ mV, $\Delta I_{R1} = 100$ percent of initial value or 50 $\mu$ 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: Method 1038 of MIL-STD-750, test condition A.  $T_J = + 125^\circ\text{C} - +150^\circ\text{C}$ ;  $V_R = 80$  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 method 3101 of MIL-STD-750. 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 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 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 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 ..... 10-30 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  $Z_{\theta JX} (max) = 1.9 \text{ }^\circ\text{C/W}$ .

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 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, appendix E, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	4066	A, $I_{FSM} = 400 \text{ A}$ superimposed on $I_O = 10\text{A}$ , 1 surge of 8.3 ms.
B4	1037	Condition for intermittent operation life for each diode is as follows: $I_F$ or $I_O = 2 \text{ A}$ (minimum) $\Delta T_J = 85 \text{ }^\circ\text{C}$ , + 15 $^\circ\text{C}$ , - 5 $^\circ\text{C}$ for 2,000 cycles minimum.
B5	1038	Condition B, $T_J(\text{max}) = +150 \text{ }^\circ\text{C}$ , $T_A = 100^\circ\text{C}$ .
B6		Limit for thermal resistance is 2.0 $^\circ\text{C/W}$ .

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	Condition A, $I_{FSM} = 400$ A superimposed on $I_O = 10$ A; 1 surge of 8.3 ms.
B3	1037	$I_F$ or $I_O = 2$ A (minimum); $\Delta T_J = 85$ °C, + 15 °C, - 5 °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 appendix E, 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>Conditions</u>
C3		Constant acceleration - $X_1$ , $Y_1$ , $Z_1$ and $Z_2$ axis.
C5		Limit for thermal resistance is $R_{\theta JC} = 2.0$ °C/W maximum.
C6	1037	$I_F$ or $I_O = 2$ A ( minimum ); $\Delta T_J = 85$ °C, + 15 °C, - 5 °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 of MIL-STD-750.

- a.  $I_M$ .....10 mA.
- b.  $I_H$ .....10 - 30 A.
- c.  $t_{MD}$ .....100  $\mu$ s maximum.
- d.  $R_{\theta JC}$ .....2.0 °C/W.

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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 <sub>θJX</sub>	1.9		°C/W
Forward voltage	4011					
		I <sub>FM</sub> = 10 A (dc) pulsed (see 4.5.1)	V <sub>F1</sub>	0.65		V dc
		I <sub>FM</sub> =20 A (dc) pulsed (see 4.5.1)	V <sub>F2</sub>	0.72		V dc
		I <sub>FM</sub> =40 A (dc) pulsed (see 4.5.1)	V <sub>F3</sub>	0.86		V dc
		DC method, pulsed ( see 4.5.1.)				
Reverse current leakage 1N6844	4016	V <sub>R</sub> =100 V dc	I <sub>R1</sub>	100		uA dc
<u>Subgroup 3</u> High temperature operation:		T <sub>A</sub> = +100°C				
Reverse current leakage 1N6844	4016	DC method, pulsed (see 4.5.1) V <sub>R</sub> =100 V dc	I <sub>R2</sub>	10		mA dc
Forward voltage	4011	I <sub>F</sub> = 10A pulsed (see 4.5.1) I <sub>F</sub> = 20A pulsed (see 4.5.1)	V <sub>F4</sub> V <sub>F5</sub>	0.55 0.67		V dc V dc
Forward voltage	4011	T <sub>A</sub> = -55°C Pulsed (see 4.5.1) I <sub>F</sub> = 10 A (dc)	V <sub>F6</sub>	0.78		V dc
<u>Subgroup 4</u> Junction capacitance	4001	V <sub>R</sub> = 10 V dc; f = 1 MHz, V <sub>SIG</sub> = 50 mV (p-p) (max)	C <sub>J</sub>	800		pF
<u>Subgroup 5</u> Dielectric withstanding voltage	1016	V <sub>R</sub> = 600 V dc; From lid to bottom case. All terminals shorted.	DWV	10		μA
<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 and 2	
<u>Subgroup 2</u>			38 devices, c = 0
Steady-state blocking life	1038	t = 1,000 hours, T <sub>J</sub> = + 125 °C; VR = 80 percent of rated V <sub>RWM</sub>	
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 <sub>θJC</sub> = 2. 0 °C/W	
<u>Subgroup 5</u>			5 devices, c = 0
Surge	4066	Condition A, T <sub>A</sub> = +25 °C I <sub>FSM</sub> =400 A, 1 surge of 8.3 ms VR = 0;	
Electrical measurements		See table III, steps 1 and 2	

TABLE III. Group A, B, C, and E, electrical end-point measurement 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Forward voltage	4011	$I_F = 20$ A (pk) pulsed (see 4.5.1)	$\Delta_{VF2}$		$\pm 50$	mV
2	Reverse current leakage	4016	pulsed (see 4.5.1) DC method $V_R = V_{RWM}$	$\Delta_{IR1}$		50 $\mu$ A or 100 % of initial reading, which ever is greater.	
3	Thermal impedance	3101	See 4.4.1	$Z_{\theta JX}$		1.9	$^{\circ}$ C/W

- 1/ 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, and 3.
  - Subgroup 5, see table III herein, steps 1, 2, and 3.
- 2/ 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 3.
  - Subgroup 6, see table III herein, steps 1 and 2.
- 3/ The electrical measurements for appendix E, table VII of MIL-PRF-19500 are as follows:
- Subgroup 2 and 3, see table III herein, steps 1 and 2 for all levels.
  - Subgroup 6, see table III herein, steps 1, 2 and 3 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 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:  
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## 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.
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**I RECOMMEND A CHANGE:**

1. DOCUMENT NUMBER  
MIL-PRF-19500/682

2. DOCUMENT DATE  
22 November 2000

3. DOCUMENT TITLE SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY POWER RECTIFIER, SURFACE MOUNT TYPE 1N6845U3, 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

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