

The documentation and process conversion measures necessary to comply with this revision shall be completed by 23 May 2004.

INCH-POUND  
MIL-PRF-19500/679A  
23 February 2004  
SUPERSEDING  
MIL-PRF-19500/679  
24 July 2000

\* PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY  
POWER RECTIFIER, SURFACE MOUNTED,  
TYPE 1N6844U3, JAN, JANTX, JANTXV, AND JANS

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

\* The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-19500.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for a silicon, Schottky power rectifier in a ceramic surface mount package. Four levels of product assurance are provided as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (U3).

1.3 Maximum ratings.

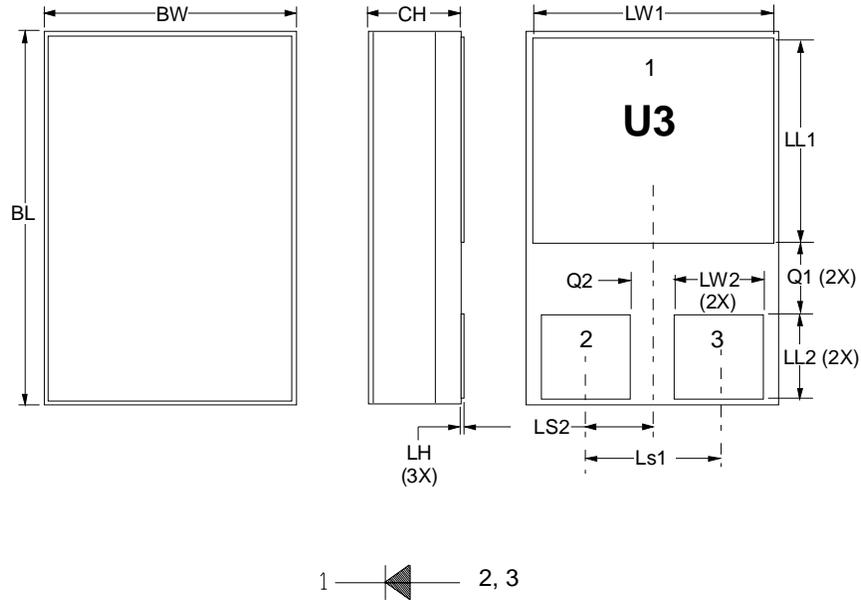
Type	$V_{RWM}$	$I_O$ (1) $T_C = +125^\circ\text{C}$	$I_{FSM}$ $T_C = +25^\circ\text{C}$ $T_p = 8.3 \text{ ms}$	$C_J$ at 5 V dc	$T_{STG} \& T_J$
	<u>V</u>	<u>A dc</u>	<u>A (pk)</u>	<u>pF</u>	<u>°C</u>
1N6844U3	100	15	250	600	-65 to +150

(1) Derate linearly at 600 mA/°C from  $T_J = T_C = +125^\circ\text{C}$  to  $+150^\circ\text{C}$ .

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

\* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43216-5000, or emailed to [Semiconductor@dsc.dla.mil](mailto:Semiconductor@dsc.dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://www.dodssp.daps.mil>.

MIL-PRF-19500/679A



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.395	.405	10.04	10.28
BW	.291	.301	7.40	7.64
CH	.1085	.1205	2.76	3.06
LH	.010	.020	0.25	0.51
LW1	.281	.291	7.14	7.41
LW2	.090	.100	2.29	2.54
LL1	.220	.230	5.59	5.84
LL2	.115	.125	2.93	3.17
LS1	.150 BSC		3.81 BSC	
LS2	.075 BSC		1.91 BSC	
Q1	.030		0.762	
Q2	.030		0.762	
TERM 1	Cathode			
TERM 2	Anode			
TERM 3	Anode			

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

\* FIGURE 1. Physical dimensions for U3 (TO-276AA).

## 2. APPLICABLE DOCUMENTS

\* 2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 of documents cited in sections 3, 4, or 5 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 cited in the solicitation or contract.

#### DEPARTMENT OF DEFENSE SPECIFICATIONS

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

#### DEPARTMENT OF DEFENSE STANDARDS

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

\* (Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://www.dodssp.daps.mil/> or 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, 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 manufacturers 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 and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1.

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 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.

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

3.7 Electrical test requirements. The electrical test requirements shall be as specified in table I, II, III.

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.

4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table II tests, the tests specified in table II herein shall be performed by the first inspection lot of this revision to maintain qualification.

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 table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3c	Method 3101 of MIL-STD-750 (see 4.3.2)	Method 3101 of MIL-STD-750 (see 4.3.2)
9	$V_{F2}$ and $I_{R1}$	Not applicable
10	MIL-STD-750, method 1038, test condition A; $t = 48$ hrs.	MIL-STD-750, method 1038, test condition A; $t = 48$ hrs.
11	$V_{F2}$ and $I_{R1}$	$V_{F2}$ and $I_{R1}$
12	Method 1038 of MIL-STD-750, test condition A. See 4.3.1, $t = 240$ hours	Method 1038 of MIL-STD-750, test condition A. See 4.3.1, $t = 48$ hours
13	Subgroup 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: Method 1038 of MIL-STD-750, test condition A.  $T_C = +125^\circ C$  to  $+150^\circ C$ ;  $V_R = 80$  percent of rated  $V_{RWM}$ .

\* 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 (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 herein). Once a fixed limit has been established, monitor all future sealing lots using a sample from each lot to be plotted on the applicable  $\bar{X}, R$  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 method 3101 of MIL-STD-750 (read and record data  $Z_{\theta JX}$ ) 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. Thermal impedance  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in tables VIa (JANS) and VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and 4.4.2.1 and 4.4.2.2 herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements 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	Condition A, $I_{FSM} = 250$ A superimposed on $I_O = 10$ A, 1 surge of 8.3 ms.
B4	1037	$I_F$ or $I_O = 2$ 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 B, $T_J = +150^\circ\text{C}, T_A = +100^\circ\text{C}, 240$ hrs.
B6	3101	Limit for thermal resistance is $2.0^\circ\text{C/W}$ .

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	4066	Condition A, $I_{FSM} = 250$ A superimposed on $I_O = 10$ A; 1 surge of 8.3 ms.
B3	1037	$I_F$ or $I_O = 2$ A (minimum); $\Delta T_J = +85^\circ\text{C}, +15^\circ\text{C}, -5^\circ\text{C}$ for 2,000 cycles minimum.
B5	3101	$R_{\theta JC} = 2.0^\circ\text{C/W}$ maximum.

\* 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 measurements shall be in accordance with table III herein.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Terminal strength is not applicable.
C6	1037	$I_F$ or $I_O = 2$ 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 and 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.  $I_H$  ..... 10 - 15 A.
- b.  $I_M$  ..... 10 mA.
- c.  $t_H$  ..... 10 ms.
- d.  $t_{MD}$  ..... 100  $\mu$ s maximum.
- e.  $R_{\theta JC}$  ..... 2.0°C/W.

## MIL-PRF-19500/679A

TABLE I. Group A inspection.

Inspection <sup>1/</sup>	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	3101	See 4.3.2	Z <sub>θJX</sub>	1.9		°C/W
Forward voltage	4011	I <sub>FM</sub> = 5 A (dc) pulsed (see 4.5.1)	V <sub>F1</sub>	0.70		V dc
Forward voltage	4011	I <sub>FM</sub> = 15 A (dc) pulsed (see 4.5.1)	V <sub>F2</sub>	0.90		V dc
Forward voltage	4011	I <sub>FM</sub> = 20 A (dc) pulsed (see 4.5.1)	V <sub>F3</sub>	1.0		V dc
Reverse current leakage 1N6844	4016	DC method, pulsed (see 4.5.1) V <sub>R</sub> = 100 V dc	I <sub>R1</sub>	50		μA dc
<u>Subgroup 3</u>						
High temperature operation:		T <sub>A</sub> = +125°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> = 5 A pulsed (see 4.5.1)	V <sub>F4</sub>	0.58		V dc
Forward voltage	4011	I <sub>F</sub> = 15 A pulsed (see 4.5.1)	V <sub>F5</sub>	0.72		V dc
Low temperature operation:		T <sub>A</sub> = -55°C				
Forward voltage	4011	Pulsed (see 4.5.1) I <sub>F</sub> = 5 A (dc)	V <sub>F6</sub>	0.85		V dc
<u>Subgroup 4</u>						
Junction capacitance	4001	V <sub>R</sub> = 5 V dc, f = 1 MHz, V <sub>SIG</sub> = 50 mV (p-p) (max)	C <sub>J</sub>	600		pF
<u>Subgroup 5</u>						
<u>Not applicable</u>						
<u>Subgroup 6</u>						
Surge	4066	Condition A, T <sub>A</sub> = +25°C I <sub>FSM</sub> = 250 A, 1 surge of 8.3 ms. V <sub>R</sub> = 0				
<u>Subgroup 7</u>						
Dielectric withstanding	1016	V <sub>R</sub> = 600 V dc, from lid to bottom of case. All terminals shorted.	I <sub>R3</sub>	10		μA dc

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

MIL-PRF-19500/679A

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

Inspection	MIL-STD-750		Qualification Inspection
	Method	Conditions	
<u>Subgroup 1</u>			38 devices, c = 0
Temperature cycling	1051	500 cycles. Condition G	
Hermetic seal			
Electrical measurements	1071	See table I, subgroup 2 and steps 1 and 2 of table III herein	
<u>Subgroup 2</u>			38 devices, c = 0
Steady-state blocking life	1038	t = 1,000 hours, T <sub>J</sub> = + 125°C; V <sub>R</sub> = 80 percent of rated V <sub>RWM</sub>	
Electrical measurements		See table I, subgroup 2 and steps 1 and 2 of table III herein	
<u>Subgroup 3</u>			3 devices, c = 0
DPA	2102		
<u>Subgroup 4</u>			5 devices, c = 0
Thermal resistance	3101	See 4.5.2, R <sub>θJC</sub> = 2. 0 °C/W	
<u>Subgroups 5</u>			
Not applicable			
<u>Subgroups 6</u>			3 devices, c = 0
ESD testing	1020		
<u>Subgroups 7</u>			
Not applicable			
<u>Subgroup 8</u>			
Surge	4066	Condition A, T <sub>A</sub> = +25°C I <sub>FSM</sub> = 250 A, 1 surge of 8.3 ms. V <sub>R</sub> = 0	
Electrical measurements		See table I, subgroup 2	

TABLE III. Groups B, C, and E delta measurement. 1/ 2/ 3/ 4/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Forward voltage	4011	$I_F = 10$ A (pk) pulsed (see 4.5.1)	$\Delta V_{F2}$		$\pm 50$	mV
2	Reverse current leakage	4016	Pulsed (see 4.5.1) DC method $V_R = V_{RWM}$	$\Delta I_{R1}$		25 $\mu$ A or 100 percent of initial reading, which ever is greater.	
3	Thermal impedence	3101	See 4.3.2	$Z_{\theta JX}$		1.9	$^{\circ}$ C/W

- 1/ The delta measurements for 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 delta measurements for table VIb (JAN, 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 delta measurements for 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.
- 4/ The delta measurements for table IX of MIL-PRF-19500 are as follows:
- Subgroups 1 and 2, see table III herein, steps 1 and 2 for all levels.
  - Subgroup 5, 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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. 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 should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- d. Product assurance level and type designator.

\* 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  
NASA - NA  
DLA - CC

Preparing activity:  
DLA - CC  
(Project 5961-2856)

\* NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://www.dodssp.daps.mil/>.