

The documentation and process conversion measures necessary to comply with this revision shall be completed by 13 December 2013.

INCH-POUND

MIL-PRF-19500/679C  
 13 September 2013  
 SUPERSEDING  
 MIL-PRF-19500/679B  
 12 December 2007

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY,  
 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 silicon, Schottky power rectifier diodes for use in high frequency switching applications. Four levels of product assurance are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Physical dimensions. See [figure 1](#) (U3).

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

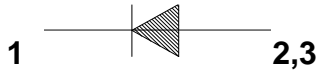
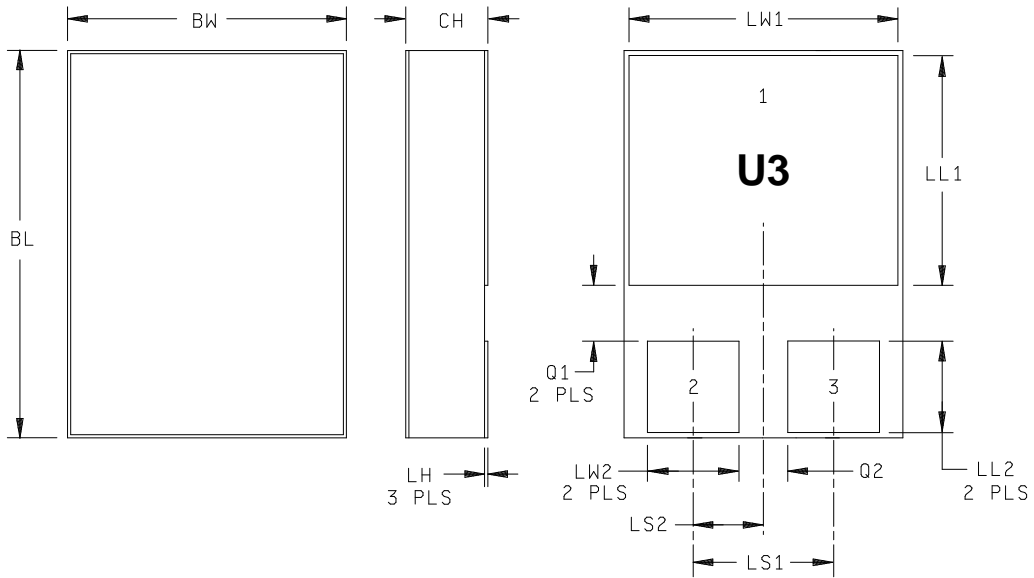
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Type	VRWM	$I_O$ (1) $T_C = +125^\circ\text{C}$	IFSM $t_p = 8.3 \text{ ms}$ , $T_C = +25^\circ\text{C}$	$R_{\theta JC}$	$T_{STG}$ & $T_J$	$C_J$ at 5 V
	V dc	A dc	A (pk)	$^\circ\text{C/W}$	$^\circ\text{C}$	pF
1N6844U3	100	15	250	2.0	-65 to +150	600

(1) See temperature-current derating curves in [figure 2](#).

1.4 Primary electrical characteristics.  $R_{\theta JC} = 2.0^\circ\text{C/W}$  maximum for entire package (see [figure 3](#)),  $R_{\theta JA} = 40^\circ\text{C/W}$  maximum.

\* Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to [Semiconductor@dla.mil](mailto:Semiconductor@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

MIL-PRF-19500/679C



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.395	.405	10.03	10.29
BW	.291	.301	7.39	7.65
CH	.112	.124	2.84	3.15
LH	.010	.020	0.25	0.51
LL1	.220	.230	5.59	5.84
LL2	.115	.125	2.92	3.18
LS1	.150 BSC		3.81 BSC	
LS2	.075 BSC		1.91 BSC	
LW1	.281	.291	7.14	7.39
LW2	.090	.100	2.29	2.54
Q1	.030		0.76	
Q2	.030		0.76	

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.

## 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://quicksearch.dla.mil/> or <https://assist.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

\* 2.3 Order of precedence. Unless otherwise noted herein or in the contract, 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 and physical dimensions shall be as specified in [MIL-PRF-19500](#), and on [figure 1](#) 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 Polarity. Polarity and terminal configuration shall be in accordance with [figure 1](#).

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in [1.3](#), [1.4](#), and [table I](#) herein.

3.6 Electrical test requirements. The electrical test requirements shall be as specified in [table I](#) herein.

3.7 Marking. Marking shall be in accordance with [MIL-PRF-19500](#) and 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 and tables I and II herein).

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 III tests, the tests specified in table III herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

\* 4.3 Screening (JANS, JANTXV, and JANTX levels). Screening shall be in accordance with table E-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 E-IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) (2) 3b	Method 4066 of MIL-STD-750, condition A, one pulse, $I_O = 0$ , $V_{RWM} = 0$ , see 1.3 herein, column 4.	Method 4066 of MIL-STD-750, condition A, one pulse, $I_O = 0$ , $V_{RWM} = 0$ , see 1.3 herein, column 4.
(1) 3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
3d	Peak reverse energy test (see 4.3.3)	Peak reverse energy test (see 4.3.3)
9, 10	Not applicable	Not applicable
11	$V_{F2}$ and $I_{R1}$	$V_{F2}$ and $I_{R1}$
12	See 4.3.1	See 4.3.1
13	Subgroup 2 and 3, of table I herein, $V_{F2}$ and $I_{R1}$ , excluding thermal impedance; $\Delta V_{F2} = \pm 50$ mV (pk); $\Delta I_{R1} = \pm 100$ percent from the initial value or $\pm 25$ uA whichever is greater.	Subgroup 2, of table I herein excluding thermal impedance; $V_{F2}$ and $I_{R1}$ ; $\Delta V_{F2} = \pm 50$ mV (pk); $\Delta I_{R1} = \pm 100$ percent from the initial value or $\pm 25$ uA whichever is greater.

- \* (1) Shall be performed anytime after temperature cycling, screen 3a. JANTX and JANTXV levels do not need to be repeated in screening requirements.
- (2) Surge shall precede thermal impedance.

4.3.1 Power burn-in conditions. Burn-in conditions are as follows: Method 1038 of MIL-STD-750, test condition A.  $T_J = +125^\circ\text{C}$ ;  $V_R = 80$  V dc.

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 of MIL-STD-750 using the guidelines in that method for determining  $I_M$ ,  $I_H$ ,  $t_H$ ,  $t_{MD}$  (and  $V_C$  where appropriate). Measurement delay time ( $t_{MD}$ ) = 70  $\mu\text{s}$  max. See table III, group E, subgroup 4 herein.

4.3.3 Peak reverse energy test. The peak reverse energy test is to be performed using the circuit as shown on figure 4 or equivalent. The Schottky rectifier under test must be capable of absorbing the reverse energy, as follows:  $I_{RM} = 1$  A,  $V_{RSM} = 100$  V minimum,  $L = 100$   $\mu\text{H}$ . (See figure 4 herein.)

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 appendix E, table E-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 II](#) herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in tables E-VIA (JANS) and E-VIB (JAN, JANTX, and JANTXV) of [MIL-PRF-19500](#) and as follows. Electrical measurements (end-points) shall be in accordance with [table I](#), subgroup 2, forward voltage test ( $V_{F1}$ ) and reverse leakage test ( $I_{R1}$ ) herein. Delta measurements shall be in accordance with [table II](#) herein.

4.4.2.1 Group B inspection, table E-VIA (JANS) of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B4	1037	$\Delta T_C = +85^\circ\text{C}$ , $I_F = 2$ A minimum for 2,000 cycles.
B5	1038	Condition A, $V_R = 80$ V dc, $T_J = +125^\circ\text{C}$ minimum, $t = 240$ hours minimum; (heat sinking allowed).
B6	4081	Limit for thermal resistance is $2.0^\circ\text{C/W}$ .

4.4.2.2 Group B inspection, table E-VIB (JAN, JANTX, and JANTXV) of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1037	$\Delta T_C = +85^\circ\text{C}$ minimum, $I_F = 2$ A minimum for 2,000 cycles.

\* 4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of [MIL-PRF-19500](#). Electrical measurements (end-points) shall be in accordance with [table I](#), subgroup 2, forward voltage test ( $V_{F1}$ ) and reverse leakage test ( $I_{R1}$ ) herein. Delta measurements shall be in accordance with [table II](#) herein.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Not applicable.
* C5	4081	Limit for thermal resistance is $2.0^\circ\text{C/W}$ .
C6	1037	$\Delta T_C = +85^\circ\text{C}$ , minimum, $I_F = 2$ A minimum for 6,000 cycles.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table E-IX of [MIL-PRF-19500](#), and [table III](#) herein. Delta measurements shall be in accordance with [table II](#) herein.

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](#).

MIL-PRF-19500/679C

\* TABLE I. Group A inspection.

Inspection 1/	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 2/	3101	See 4.3.2	Z <sub>ΘJX</sub>			°C/W
Forward voltage	4011	Pulsed test (see 4.5.1)				
		I <sub>F</sub> = 5 A (pk)	V <sub>F1</sub>	0.70		V
		I <sub>F</sub> = 15 A (pk)	V <sub>F2</sub>	0.90		V
		I <sub>F</sub> = 20 A (pk)	V <sub>F3</sub>	1.00		V
Reverse current	4016	V <sub>R</sub> = 100 V, DC method	I <sub>R1</sub>		0.100	mA dc
<u>Subgroup 3</u>						
High temperature operation:		T <sub>C</sub> = +125 °C				
Forward voltage		Pulsed test (see 4.5.1)				
		I <sub>F</sub> = 5 A (pk)	V <sub>F4</sub>	0.58		V
		I <sub>F</sub> = 15 A (pk)	V <sub>F5</sub>	0.72		V
Reverse current	4016	V <sub>R</sub> = 100 V, DC method	I <sub>R2</sub>		15.0	mA
Low temperature operation:		T <sub>C</sub> = -55°C				
Forward voltage	4011	Pulsed test (see 4.5.1)				
		I <sub>F</sub> = 5 A (pk)	V <sub>F6</sub>	0.85		V
<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)	C <sub>J</sub>		600	pF
<u>Subgroup 5</u>						
Not applicable						

See footnotes at end of table.

\* TABLE I. Group A inspection – Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u>						
Surge	4066	See column 4 of 1.3, ten surges each leg, 1 min between surges, (see 4.5.1)				
Electrical measurements		See table I, subgroup 2 herein				
<u>Subgroup 7</u>						
Dielectric withstanding voltage	1016	$V_R = 500$ V dc; all leads shorted; measure from leads to case	DWV		10	$\mu$ A
Scope display evaluation	4023	Stable only				
Electrical measurements		See table I, subgroup 2 herein.				

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

\* 2/ This test required for the following end-point measurements only:  
 Group B, subgroups 3 and 5 (JANS).  
 Group B, subgroups 2 and 3 (JAN, JANTX, and JANTXV).  
 Group C, subgroup 2 and 6.  
 Group E, subgroup 1.

TABLE II. Groups B, C and E delta requirements. 1/ 2/ 3/ 4/ 5/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = 15 \text{ A (pk)}$ pulsed (see 4.5.1)	$\Delta V_{F2}$	±50 mV dc from initial reading.		
2.	Reverse current	4016	$V_r = 100 \text{ V}$	$\Delta I_{R1}$	±100 percent from initial reading or ±25uA whichever is greater.		
3.	Thermal impedance	3101	See 4.3.2	$Z_{\theta JX}$			

- 1/ The electrical measurements for table E-VIA (JANS) of MIL-PRF-19500 are as follows:
- Subgroup 4, see table II herein, steps 1, 2, and 3.
  - Subgroup 5, see table II herein, steps 1 and 2.
- 2/ The electrical measurements for table E-VIB (JAN, JANTX and JANTXV) of MIL-PRF-19500 are as follows:
- Subgroup 2, see table II herein, steps 1 and 2.
  - Subgroup 3, see table II herein, steps 1, 2, and 3.
  - Subgroup 6, see table II herein, steps 1 and 2.
- 3/ The electrical measurements for table E-VII of MIL-PRF-19500 are as follows:
- Subgroups 2 and 3, see table II herein, steps 1 and 2 for all levels.
  - Subgroup 6, see table II herein, steps 1, 2, and 3 for all levels.
- 4/ Devices which exceed the table I limits for this test shall not be accepted.
- 5/ The electrical measurements for table E-IX of MIL-PRF-19500 are as follows:
- Subgroup 1, see table III herein, steps 1, 2, and 3.
  - Subgroup 2, see table III herein, steps 1 and 2.



MIL-PRF-19500/679C

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

Inspection	MIL-STD-750		Qualification
	Method	Conditions	
<u>Subgroup 1</u>			n = 45, c = 0
Temperature cycling (air to air)	1051	Test condition G, 500 cycles, -55°C to +150°C	
Hermetic seal	1071		
Electrical measurements		See <a href="#">table I</a> , subgroup 2 and <a href="#">table II</a>	
<u>Subgroup 2</u>			n = 45, c = 0
Life test	1048	t = 1,000 hours, T <sub>J</sub> = +125°C, V <sub>R</sub> = 80 percent rated voltage (see <a href="#">1.3</a> , column 2 herein)	
Electrical measurements		See <a href="#">table I</a> subgroup 2 and <a href="#">table II</a>	
<u>Subgroup 3</u>			n = 5, c = 0
Surge	4066	Condition A, T <sub>A</sub> = +25°C I <sub>FSM</sub> = 250 A, 10 surges of 8.3 ms superimposed on I <sub>O</sub> . V <sub>R</sub> = 0; I <sub>O</sub> = 10 A pk half sine wave, continuous	
Electrical measurements		See <a href="#">table I</a> , subgroup 2	
<u>Subgroup 4</u>			
Thermal impedance curves		See <a href="#">MIL-PRF-19500</a>	

### TEMPERATURE-CURRENT DERATING CURVE 1N6844U3

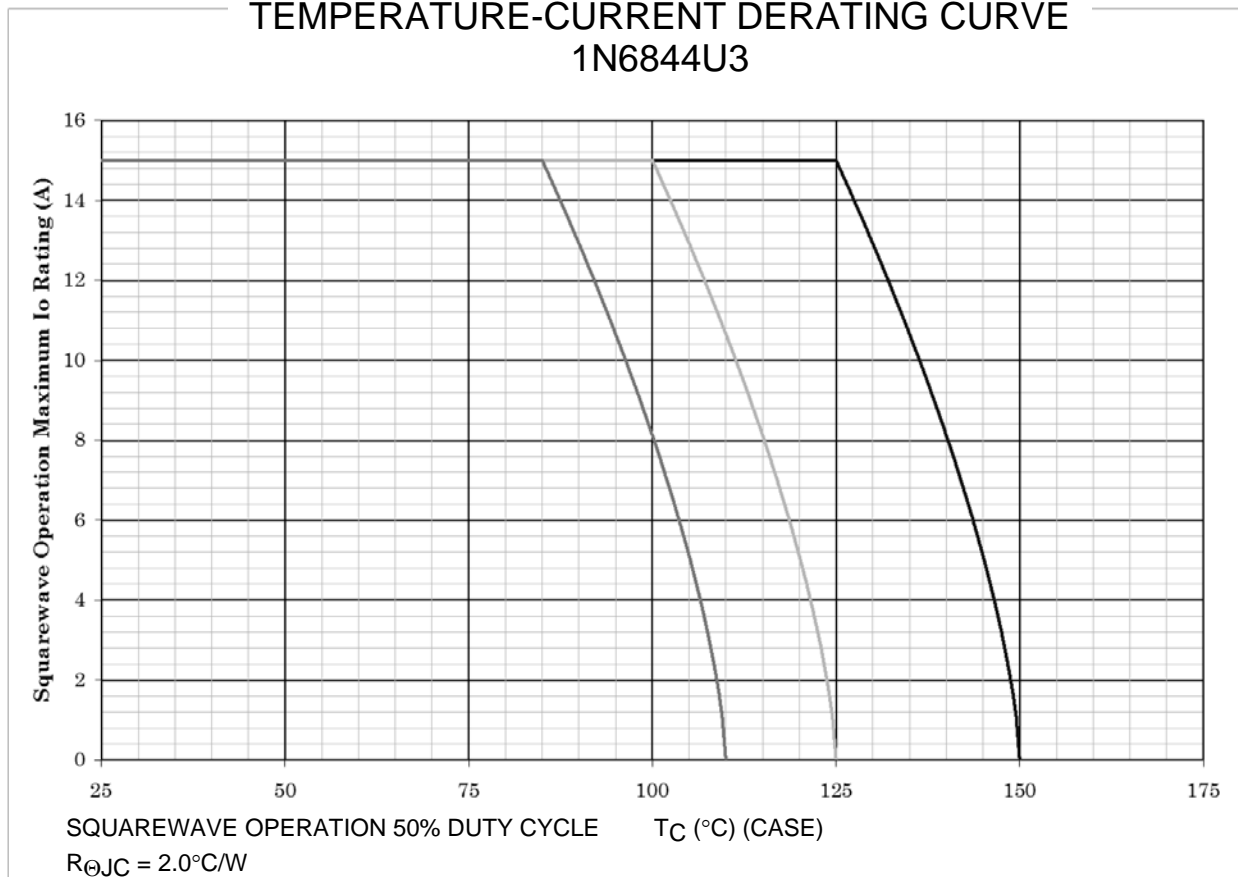


FIGURE 2. Temperature-current derating curve.

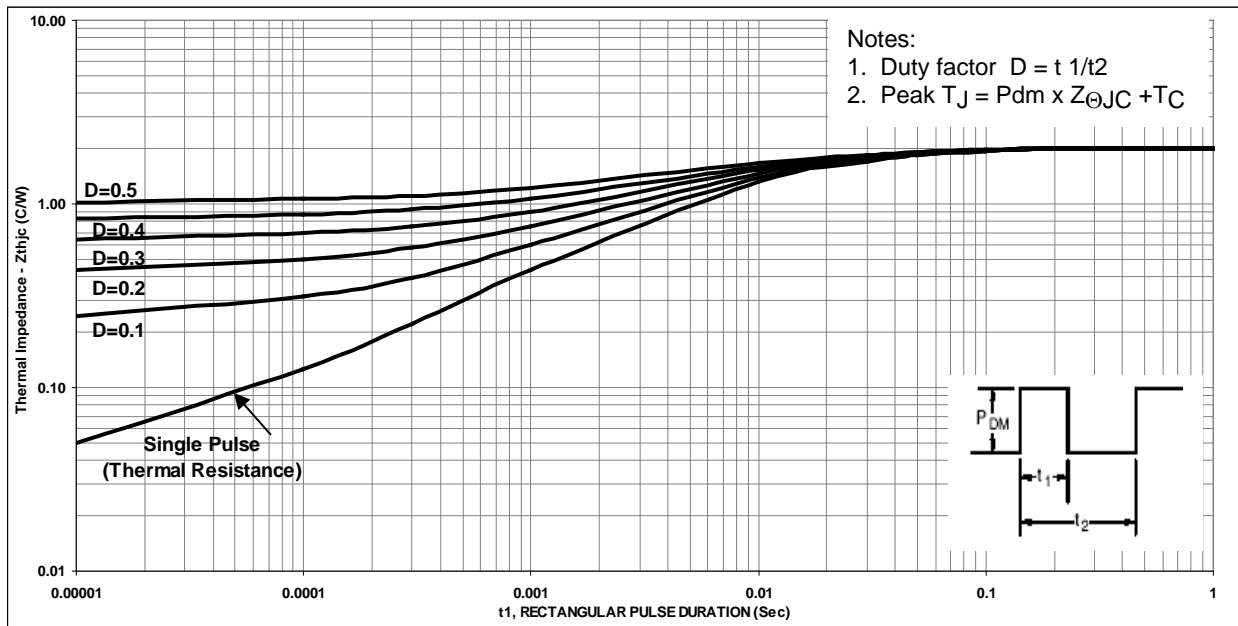
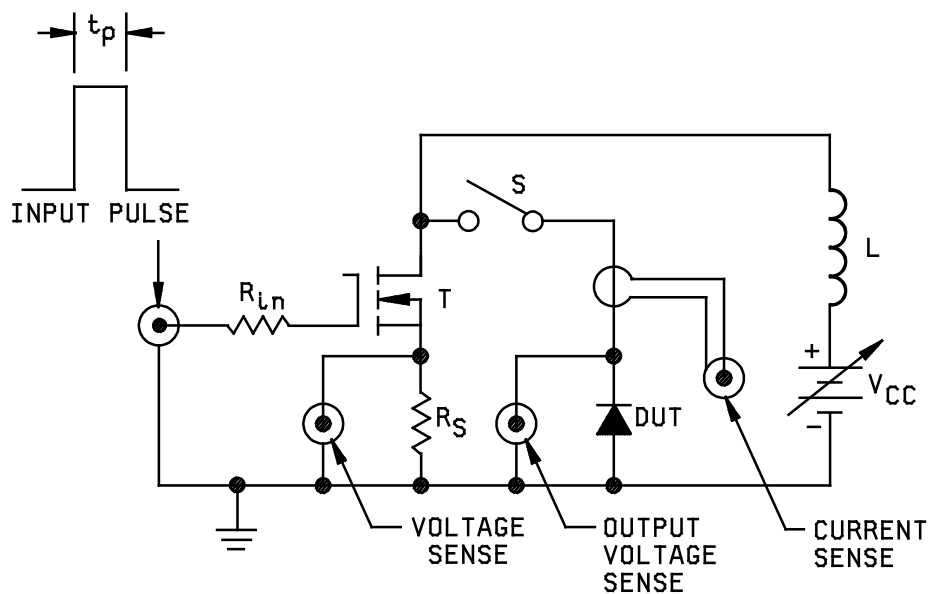


FIGURE 3. Thermal impedance.



Input pulse  $R_{in} = 50$  ohms, 1 watt  
 $V_G = 10$  Volts,  $R_S = 0.1$  ohms, 1 watt  
 $Z_G = 50$  ohms  
 $L = 100\mu\text{H}$   
 $P.W. \approx 30 \mu\text{s}$   
 Duty cycle  $\leq 1$  percent,  $T = \text{IRF250/2N6766}$  or equivalent

Procedure:

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

FIGURE 4. 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 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. The notes specified in MIL-PRF-19500 are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

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 DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail [vqe.chief@dla.mil](mailto:vqe.chief@dla.mil). An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

6.4 Cross reference substitution list. A PIN for PIN replacement table follows and these devices are directly interchangeable. The 1N6844U3 is directly substitutable for the 1N6844 and is the preferred part number.

Non-preferred PIN	Preferred PIN
15LJQ100 1N6844 1N6844U3	JANS, JANTXV, JANTX, JAN1N6844U3 JANS, JANTXV, JANTX, JAN1N6844U3 JANS, JANTXV, JANTX, JAN1N6844U3

6.5 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 - 85  
NASA - NA  
DLA - CC

Preparing activity:  
DLA - CC

(Project 5961-2013-029)

Review activities:

Army - MI  
Air Force - 99

\* 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 <https://assist.dla.mil/>.