

The documentation and process conversion measures necessary to comply with this revision shall be completed by 16 June 2010.

INCH-POUND

MIL-PRF-19500/682A
 16 March 2010
 SUPERSEDING
 MIL-PRF19500/682
 22 November 2000

* PERFORMANCE SPECIFICATION SHEET

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.

* 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. 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, $T_C = +25^\circ\text{C}$.

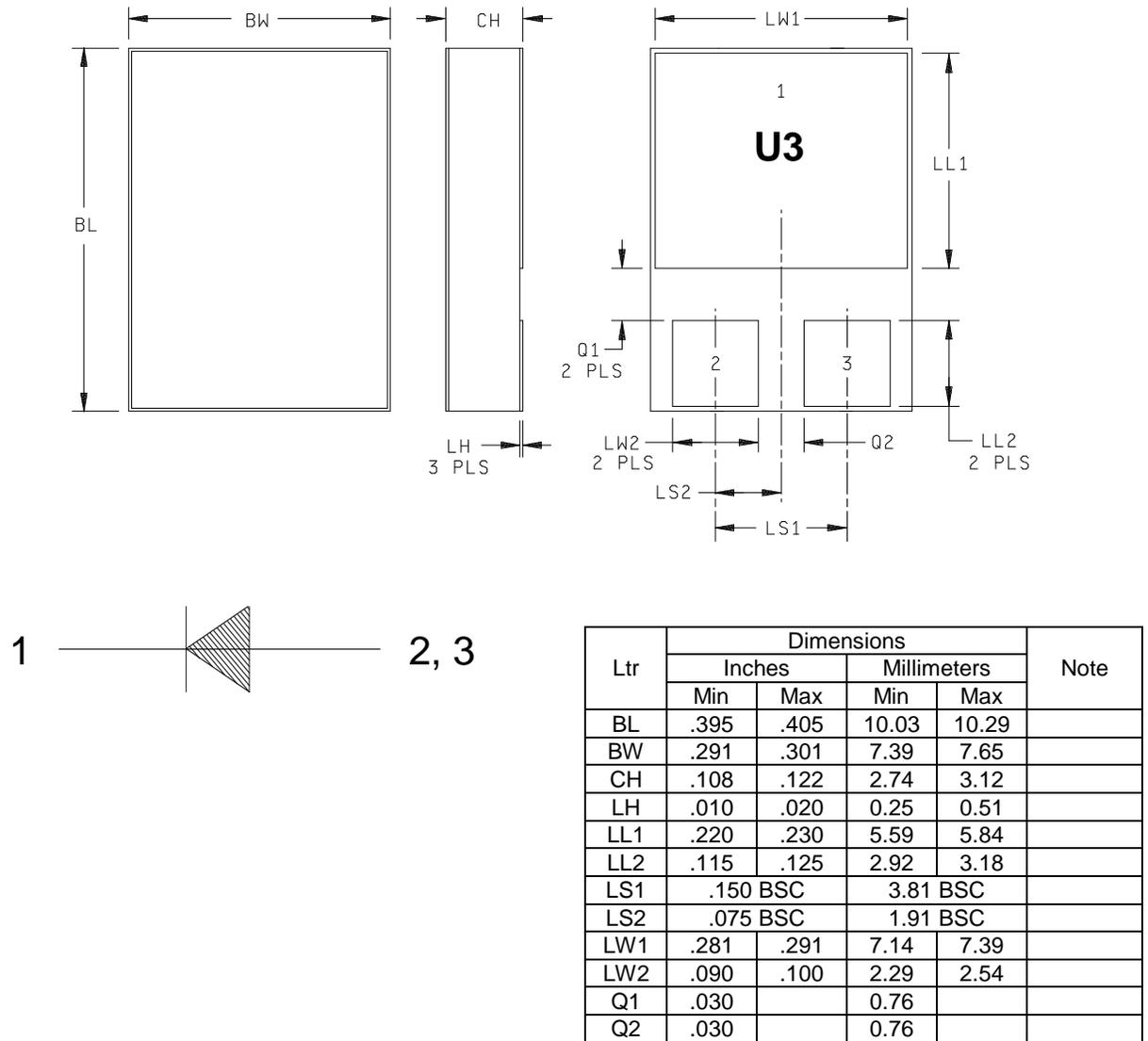
Column 1	Column 2	Column 3	Column 4	Column 5
Types	V_{RWM}	I_O (1) $T_C = +100^\circ\text{C}$	I_{FSM} $t_p = 8.3 \text{ ms}$ $T_C = +25^\circ\text{C}$	T_{STG} and T_J
	V dc	A dc	A (pk)	$^\circ\text{C}$
1N6845U3	45	30	400	-65 to +150

(1) Derate linearly at 400 mA/ $^\circ\text{C}$ from $T_J = T_C = +125^\circ\text{C}$ to + 150 $^\circ\text{C}$. See figure 2.

1.4 Primary electrical characteristics. $R_{\theta JC} = 2.0^\circ\text{C/W}$ maximum, C_J at 10 V dc = 800 pF.

* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to 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 <https://assist.daps.dla.mil>.

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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 Φ 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 <https://assist.daps.dla.mil/quicksearch/> or <https://assist.daps.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 finish is desired, it shall be specified in the acquisition document (see 6.2).

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 tables I and II 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 (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, $t_p = 8.3$ ms, $I_O = 0$, $V_{RWM} = 0$, $I_{FSM} =$ see 1.3 herein	Method 4066 of MIL-STD-750, condition A, one pulse, $t_p = 8.3$ ms, $I_O = 0$, $V_{RWM} = 0$, $I_{FSM} =$ see 1.3 herein
(2) 3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
3d	Avalanche energy test (see 4.3.3)	Avalanche energy test (see 4.3.3)
4, 5, 8	Required	Required
9, 10	Not applicable	Not applicable
11	V_{F1} and I_{R1}	V_{F1} and I_{R1}
12	See 4.3.1 240 hours	See 4.3.1 48 hours
13	Subgroup 2 and 3, of table I herein, V_{F1} and I_{R1} ; $\Delta V_{F2} = \leq 50$ mV (pk); $\Delta I_{R1} = \pm 100$ percent from the initial value or ± 50 uA, whichever is greater	Subgroup 2, of table I herein; V_{F1} and I_{R1} ; $\Delta V_{F2} = \leq 50$ mV (pk); $\Delta I_{R1} = \pm 100$ percent from the initial value or ± 50 uA, whichever is greater

(1) Surge shall precede thermal impedance.

(2) Thermal impedance and surge shall be performed any time after screen 3a and before screen 13.

* 4.3.1 High temperature reverse bias. Reverse bias conditions are as follows: Method 1038 of MIL-STD-750, test condition A, $V_R = 36$ V dc; $T_J = +125^\circ\text{C}$.

* 4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 of MIL-STD-750 using the guidelines in that method for determining I_M , I_H , t_H , and t_{MD} . Measurement delay time (t_{MD}) = 70 μs max. See table III, subgroup 4 herein.

* 4.3.3 Avalanche energy test. The avalanche energy test is to be performed with method 4064 of MIL-STD-750, using the circuit as shown on figure 3 or equivalent. The Schottky rectifier under test must be capable of absorbing the reverse energy, as follows: $I_{AS} = 1$ A, $V_{RWM} = 45$ V minimum, $L = 150$ μH .

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 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	$\Delta T_J = +85^\circ\text{C}$, $I_F = 2$ A minimum for 2,000 cycles.
B5	1038	Condition A, $V_R = 36$ V dc, $T_J = +125^\circ\text{C}$, $t = 340$ hours min; heat sinking allowed. This test shall be extended to 1000 hours on each JANS wafer lot.

* 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	$\Delta T_J = +85^\circ\text{C}$, $I_F = 2$ 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.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Not applicable.
C5	4081	Limit for thermal resistance for 1N6845U3 is 2.0°C/W .
C6	1037	$\Delta T_J = +85^\circ\text{C}$, $I_F = 2$ A minimum for 6,000 cycles.
* C6	1038	Condition A, $V_R = 36$ V dc, $T_J = +125^\circ\text{C}$, $t = 1,000$ hours minimum (required for TX, TXV only) (heat sinking allowed) .

* 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. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein except $Z_{\Theta JX}$ need not be performed after group E subgroup 2.

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.

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* TABLE I. Group A inspection.

Inspection 1/ <u>Subgroup 1</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance	3101	See 4.3.2	Z _{θJX}		1.9	°C/W
Forward voltage	4011	I _F = 10 A (pk), pulsed test (see 4.5.1)	V _{F1}		.65	V dc
Forward voltage	4011	I _F = 20 A (pk), pulsed test (see 4.5.1)	V _{F2}		.72	V dc
Forward voltage	4011	I _F = 40 A (pk), pulsed test (see 4.5.1)	V _{F3}		.86	V dc
Reverse current	4016	V _R = 45 V, DC method, pulsed test (see 4.5.1)	I _{R1}		100	μA dc
<u>Subgroup 3</u>						
High temperature operation:		T _C = +100°C				
Forward voltage		I _F = 10 A (pk), pulsed test (see 4.5.1)	V _{F4}		.55	V dc
Forward voltage		I _F = 20 A (pk), pulsed test (see 4.5.1)	V _{F5}		.67	V dc
Reverse current	4016	V _R = 45 V, DC method, pulsed test (see 4.5.1)	I _{R2}		10.0	mA dc
Low temperature operation:		T _C = -55°C	V _{F6}			
Forward voltage	4011	I _F = 10 A (pk), pulsed test (see 4.5.1)			.78	V dc
<u>Subgroup 4</u>						
Capacitance	4001	V _R = 5 V dc, f = 1 MHz, V _{SIG} = 50 mV (p-p)	C _J		800	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 1.3, column 4 herein, ten surges each diode, 60 seconds between surges, (see 4.5.1)	I _{FSM}			
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	μA
Scope display evaluation	4023	Stable only				
Electrical measurements		See table I, subgroup 2 herein				

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

TABLE II. Groups B, C, and E delta requirements. 1/ 2/ 3/ 4/ 5/ 6/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage 1N6845U3	4011	$I_F = 20$ A (pk), pulsed (see 4.5.1)	ΔV_{F2}	± 50 mV dc from initial reading.		
2.	Reverse current	4016	$V_R = 45$ V dc	ΔI_{R1}			
3.	Thermal impedance	4081	See 4.3.2	$Z_{\Theta JX}$		1.9	$^{\circ}\text{C/W}$

1/ Each individual diode.

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

a. Subgroup 4, see table II herein, steps 1, 2, and 3.

b. Subgroup 5, see table II herein, steps 1 and 2.

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

a. Subgroup 2, see table II herein, steps 1, 2, and 3.

b. Subgroup 3, see table II herein, steps 1, 2, and 3.

c. Subgroup 6, see table II herein, steps 1 and 2.

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

a. Subgroups 2 and 3, see table II herein, steps 1, 2, and 3 for all levels.

b. Subgroup 6, see table II herein, steps 1, 2, and 3 for all levels.

5/ Devices which exceed the table I limits for this test shall not be accepted.

6/ The electrical measurements for table E-IX of MIL-PRF-19500 are as follows:

a. Subgroup 1, see table II herein, steps 1, 2, and 3.

b. Subgroup 2, see table II herein, steps 1 and 2.

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* 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 = 12, c = 0
Temperature cycling (air to air)	1051	Test condition G, 500 cycles, -55°C to +150°C.	
Hermetic seal	1071		
Electrical measurements		See table I, subgroup 2 herein.	
<u>Subgroup 2</u>			n = 12, c = 0
Life test	1048	t = 1,000 hours, T _J = +125°C, V _R = 36 V dc.	
Electrical measurements		See table I, subgroup 2 herein.	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500.	
<u>Subgroup 6</u>			n = 3
ESD	1020		
<u>Subgroup 10</u>	4066		n = 5, c = 0
Surge			
1N6845U3		Condition A, T _A = +25°C, I _{FSM} = 400 A, 100 surges of 8.3 ms superimposed on I _O . V _R = 0; I _O = 0 A pk half sine wave, continuous.	
Electrical measurements		See table I subgroup 2 (V _F and I _R only).	

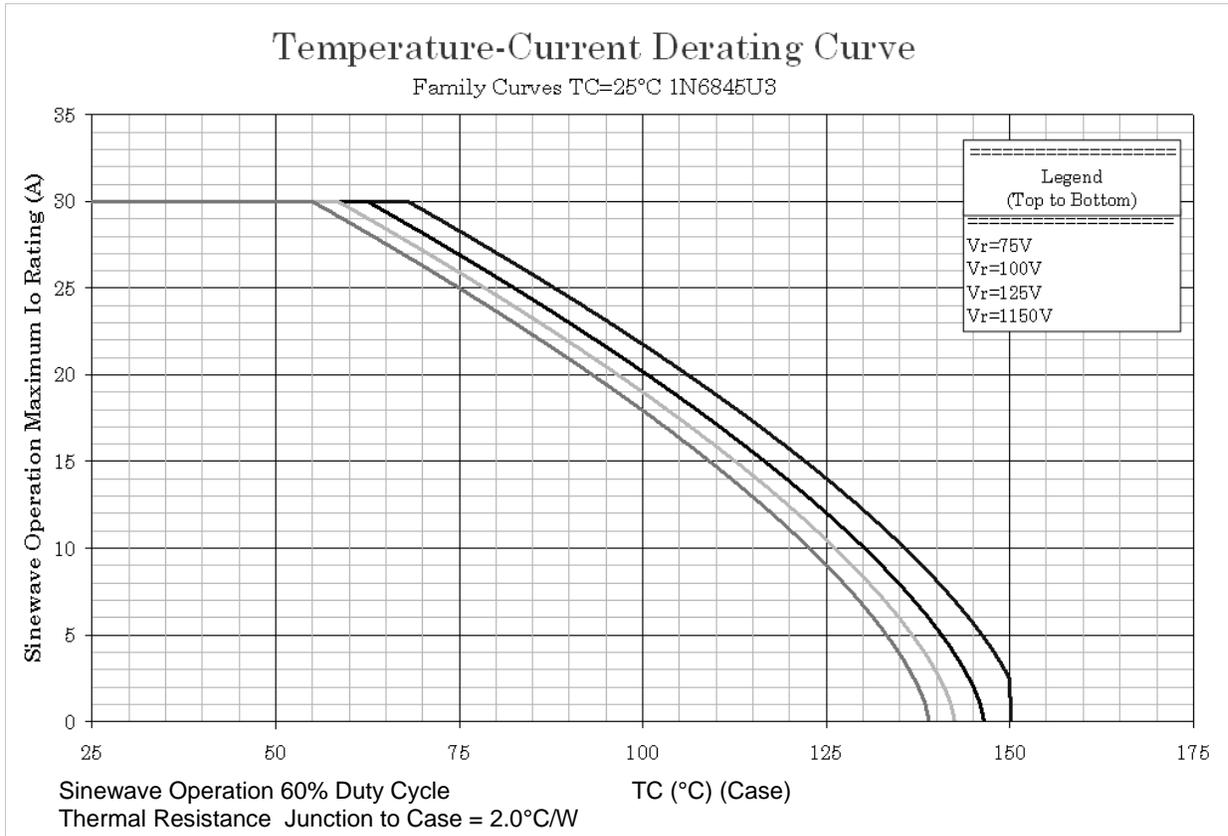
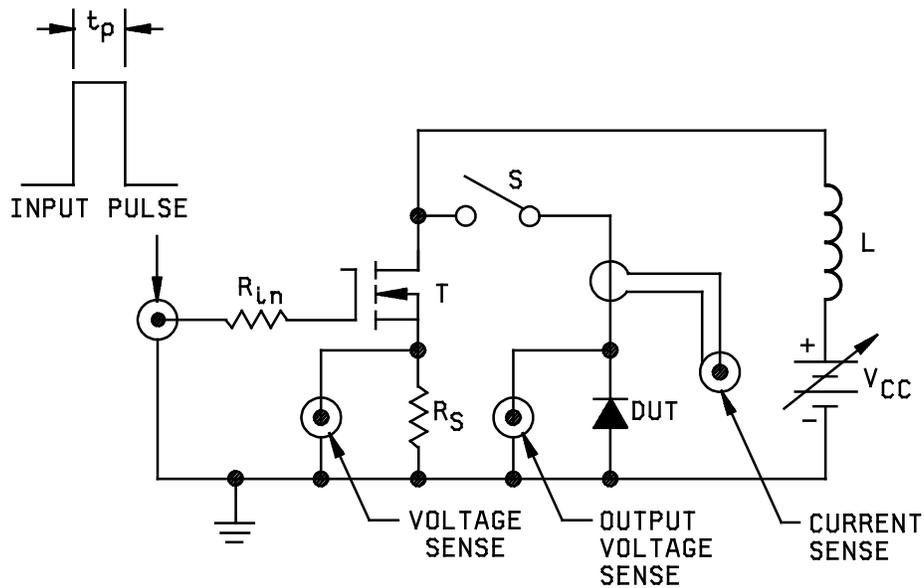


FIGURE 2. Temperature-current derating curve.



Input pulse $R_{in} = 50$ ohms, 1 watt
 $V_G = 10$ Volts, $R_S = 0.1$ ohms, 1 watt
 $Z_G = 50$ ohms
 $L = 150 \mu\text{H}$
 $P.W. \approx 30 \mu\text{s}$
 Duty cycle ≤ 1 percent, $T = \text{IRF350/2N6768}$ or equivalent

Procedure:

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

* FIGURE 3. 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 Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail 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.daps.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 - 85
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

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