

INCH-POUND

The documentation and process conversion measures necessary to comply with this document shall be completed by 9 June 2020.

MIL-PRF-19500/679D
9 February 2020
SUPERSEDING
MIL-PRF-19500/679C
13 September 2013

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, SCHOTTKY,
TYPE 1N6844U3, QUALITY LEVELS 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 (JAN, JANTX, JANTXV, and JANS) are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Package outline. The device package outline is a TO-276AA (SMD-0.5) in accordance with [figure 1](#) for all encapsulated device types.

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

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

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

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

AMSC N/A



1.5 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.4](#) for PIN construction example and [6.5](#) for a list of available PINs.

1.5.1 JAN certification mark and quality level. The quality level designators for encapsulated devices that are applicable for this specification sheet are "JAN", "JANTX", "JANTXV" and "JANS".

1.5.2 Device type. The designation system for the device types of power rectifiers covered by this specification sheet are as follows.

1.5.2.1 First number and first letter symbols. The power rectifiers of this specification sheet use the first number and letter symbols "1N".

1.5.2.2 Second number symbols. The second number symbols for the power rectifiers covered by this specification sheet are "6844".

1.5.3 Suffix symbols. The following suffix symbols are incorporated in the PIN for this specification sheet:

U3	Indicates a metal lid 3 pad surface mount package similar to a TO-276AA (SMD-0.5) (see figure 1).
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1.5.4 Lead finish designator. The lead finishes applicable to this specification sheet are listed on [QML-19500](#).

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 of 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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

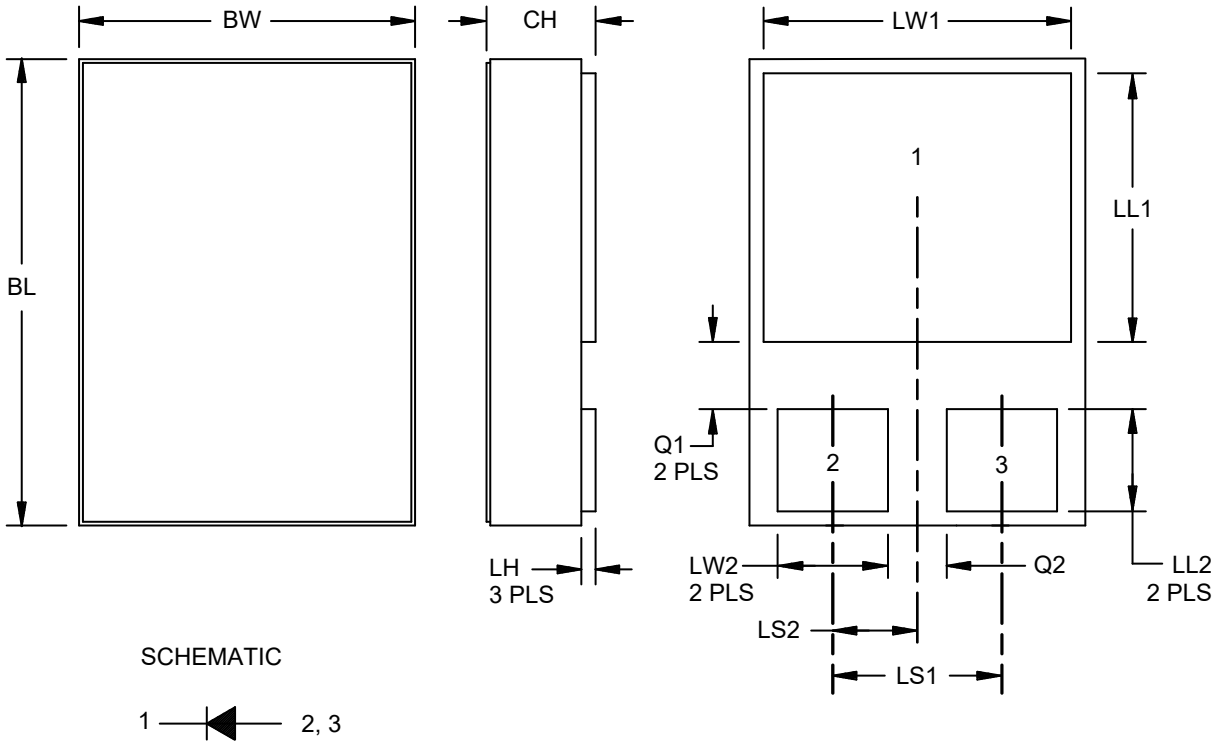
[MIL-PRF-19500](#) – Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-750](#) – Test Methods for Semiconductor Devices.

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

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.



Symbol	Dimensions				Symbol	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BL	.395	.405	10.03	10.29	LS1	.150 BSC		3.81 BSC	
BW	.291	.301	7.39	7.65	LS2	.075 BSC		1.91 BSC	
CH	.108	.124	2.74	3.15	LW1	.281	.291	7.14	7.39
LH	.010	.020	0.25	0.51	LW2	.090	.100	2.29	2.54
LL1	.220	.230	5.59	5.84	Q1	.030		0.76	
LL2	.115	.125	2.92	3.18	Q2	.030		0.76	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Terminal 1 is cathode. Terminals 2 and 3 are common anode.
3. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions of TO-276AA package.

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 requirements and physical dimensions. The interface requirements 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 [tables I](#) and [II](#) herein.

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

3.8 Workmanship. Power rectifiers 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 (quality levels JANS, JANTXV, and JANTX only). 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	Measurement	
	JANS level	JANTX and JANTXV levels
(1) (2) 3b	Surge current (see 4.3.4)	Surge current (see 4.3.4)
(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 ± 25 μ A 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 ± 25 μ A whichever is greater.
17	Dielectric withstanding voltage (see 4.3.5)	Dielectric withstanding voltage (see 4.3.5)

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

4.3.1 Power burn-in conditions. Power burn-in shall be performed in accordance with condition A of method 1038 of MIL-STD-750. The following details shall apply: $T_J = +125$ °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). 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 device under test must be capable of absorbing the reverse energy, as follows: $I_{RM} = 1$ A, $V_{RSM} = 100$ V minimum, $L = 100$ μ H.

4.3.4 Surge current. The surge current test shall be performed in accordance with condition A of method 4066 of MIL-STD-750. The following details shall apply: One pulse, $I_O = 0$, $V_{RWM} = 0$, $I_{FSM} =$ column 4 of 1.3 herein.

4.3.5 Dielectric withstanding voltage. The test for dielectric withstanding voltage shall be performed in accordance with method 1081 of [MIL-STD-750](#). The following details shall apply:

- a. Magnitude of test voltage 600V dc.
- b. Duration of application of test voltage 15 seconds (min).
- c. Points of application of test voltage All leads to case (bunch connection).
- d. Method of connection Mechanical.
- e. Kilovolt-ampere rating of high voltage source 1,200 V/1.0 mA (min).
- f. Maximum leakage current..... 1.0 mA.
- g. Voltage ramp up time 500 V/second.

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. Delta electrical 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 tests and conditions specified for subgroup testing in 4.4.2.1 for quality level JANS and 4.4.2.2 for quality levels JAN, JANTX, and JANTXV. 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 electrical measurements shall be in accordance with [table II](#) herein.

4.4.2.1 Quality level JANS (see table E-VIA of [MIL-PRF-19500](#)).

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

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1037	$I_F = 2$ A minimum; $\Delta T_C = +85$ °C minimum.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the tests and 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 electrical 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 °C/W.
C6	1037	$\Delta T_C = +85$ °C, minimum, $I_F = 2$ A minimum.

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 electrical 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.

TABLE I. Group A inspection.

Inspection <u>1/</u>	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 <u>2/</u>	3101	See 4.3.2	$Z_{\theta JX}$			°C/W
Forward voltage	4011	Condition B, pulsed test (see 4.5.1) $I_F = 5$ A (pk) $I_F = 15$ A (pk) $I_F = 20$ A (pk)	V_{F1} V_{F2} V_{F3}	0.70 0.90 1.00		V V V
Reverse current	4016	Condition A, $V_R = 100$ V	I_{R1}	0.100		mA dc
<u>Subgroup 3</u>						
High temperature operation:		$T_C = +125$ °C				
Forward voltage	4011	Condition B, pulsed test (see 4.5.1) $I_F = 5$ A (pk) $I_F = 15$ A (pk)	V_{F4} V_{F5}	0.58 0.72		V V
Reverse current	4016	Condition A, $V_R = 100$ V	I_{R2}	15.0		mA
Low temperature operation:		$T_C = -55$ °C				
Forward voltage	4011	Condition B, pulsed test (see 4.5.1) $I_F = 5$ A (pk),	V_{F6}	0.85		V
<u>Subgroup 4</u>						
Junction capacitance	4001	$V_R = 5$ V dc, $f = 1$ MHz, $V_{SIG} = 50$ mV (p-p)	C_J	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	Condition A, see column 4 of 1.3, ten surges, 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	I _{RES}		10	μ A
Scope display evaluation	4023	Condition A, 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. Delta electrical measurements for groups B, C and E. 1/ 2/ 3/ 4/ 5/

Step	Inspection	MIL-STD-750		Symbol	Limits		Units
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	Condition B, $I_F = 15 \text{ A (pk)}$ pulsed (see 4.5.1)	ΔV_{F2}	$\pm 50 \text{ mV dc}$ from initial reading.		°C/W
2.	Reverse current	4016	Condition A, $V_R = 100 \text{ V}$	ΔI_{R1}	± 100 percent from initial reading or $\pm 25 \mu\text{A}$, whichever is greater.		
3.	Thermal impedance	3101	See 4.3.2	$Z_{\theta JX}$			

- 1/ The delta electrical measurements for group B inspection for quality level JANS (table E-VIA of MIL-PRF-19500) are as follows:
- In addition to the measurements specified for subgroup 4, the measurements of steps 1, 2 and 3 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 5, the measurements of steps 1 and 2 of this table shall also be taken.
- 2/ The delta electrical measurements for group B inspection for quality levels JAN, JANTX, JANTXV (table E-VIB of MIL-PRF-19500) are as follows:
- In addition to the measurements specified for subgroup 2, the measurements of steps 1 and 2 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 3, the measurements of steps 1, 2 and 3 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 6, the measurements of steps 1 and 2 of this table shall also be taken.
- 3/ The delta electrical measurements for group C inspection (table E-VII of MIL-PRF-19500) are as follows:
- In addition to the measurements specified for subgroups 2 and 3, the measurements of steps 1 and 2 of this table shall also be taken for all quality levels.
 - In addition to the measurements specified for subgroup 6, the measurements of steps 1, 2 and 3 of this table shall also be taken for all quality levels.
- 4/ The delta electrical measurements for group E inspection (table E-IX of MIL-PRF-19500 and table III herein) are as follows:
- In addition to the measurements specified for subgroup 1, the measurements of steps 1, 2 and 3 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 2, the measurements of steps 1 and 2 of this table shall also be taken.
- 5/ Devices which exceed the table I limits for these tests shall not be accepted.

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

Inspection	MIL-STD-750		Sample plan
	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	Fine and gross leak.	
Electrical measurements		See table I , subgroup 2 and table II .	
<u>Subgroup 2</u>			n = 45, c = 0
Life test	1048	t = 1,000 hours, T _J = +125 °C, V _R = 80 percent rated voltage (see 1.3 , column 2 herein).	
Electrical measurements		See table I subgroup 2 and table II .	
<u>Subgroup 3</u>			n = 5, c = 0
Surge	4066	Condition A, T _A = +25 °C, I _{FSM} = 250 A, 10 surges of 8.3 ms superimposed on I _o . V _R = 0; I _o = 10 A pk half sine wave, continuous.	
Electrical measurements		See table I , subgroup 2.	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500 .	

TEMPERATURE-CURRENT DERATING CURVE 1N6844U3

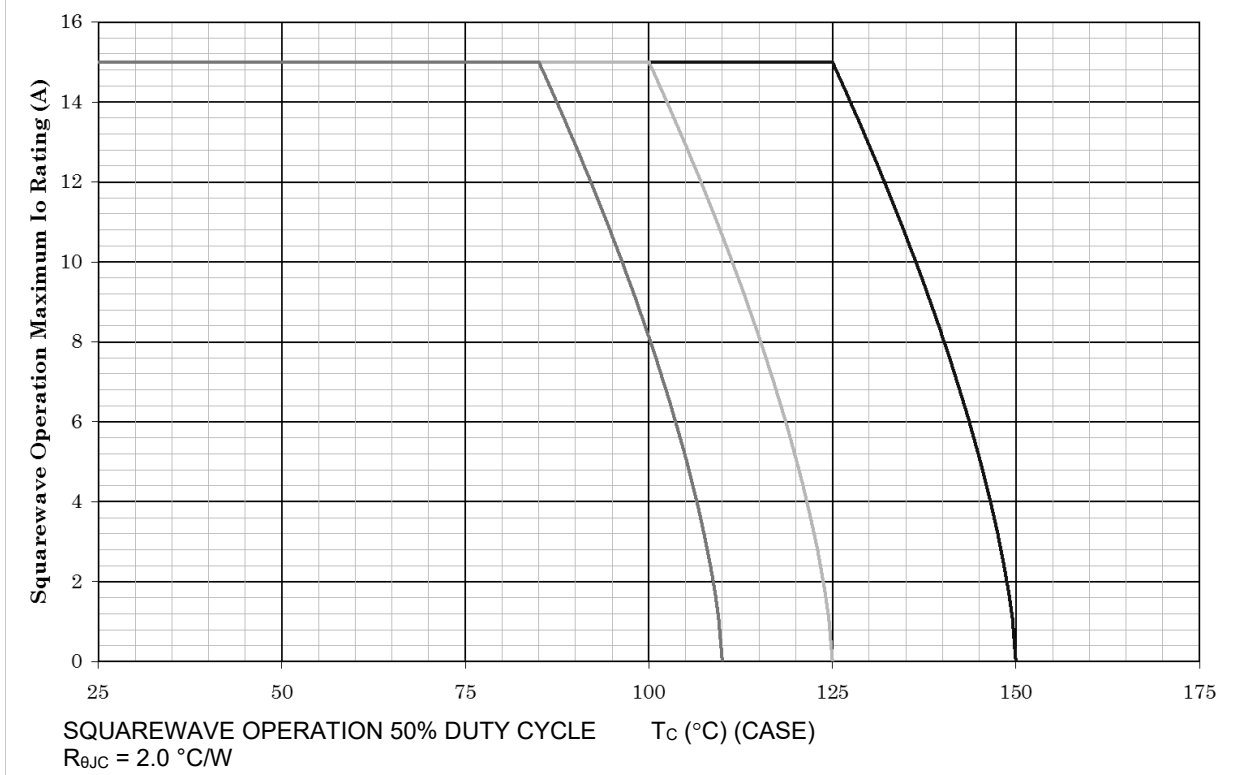


FIGURE 2. Temperature-current derating curve.

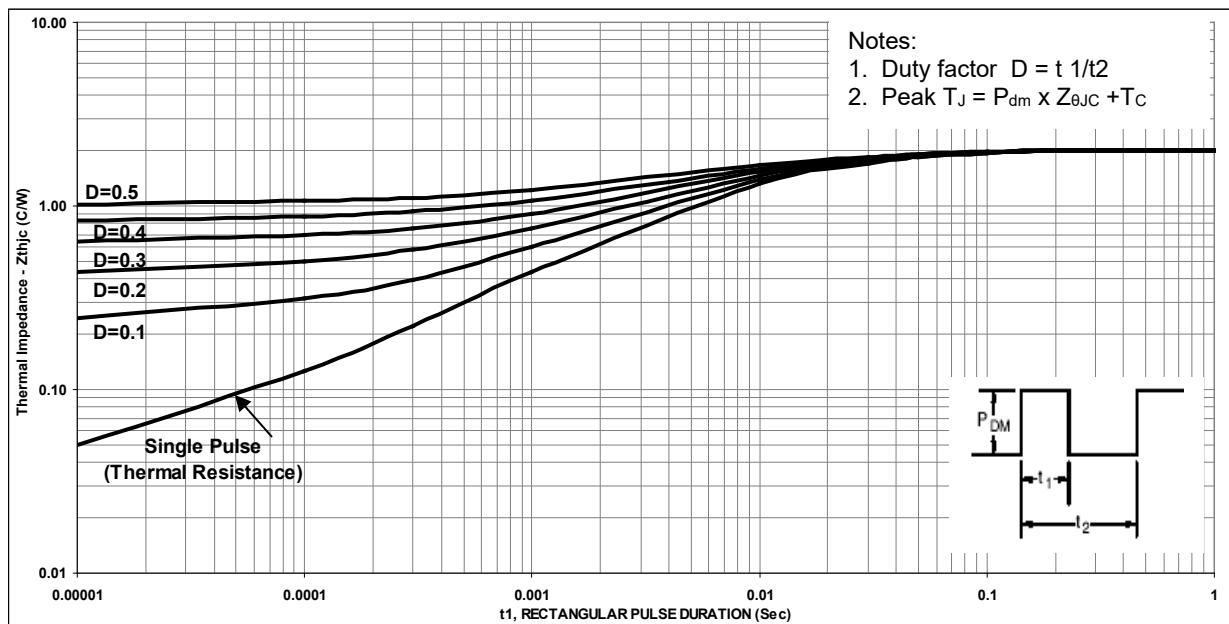
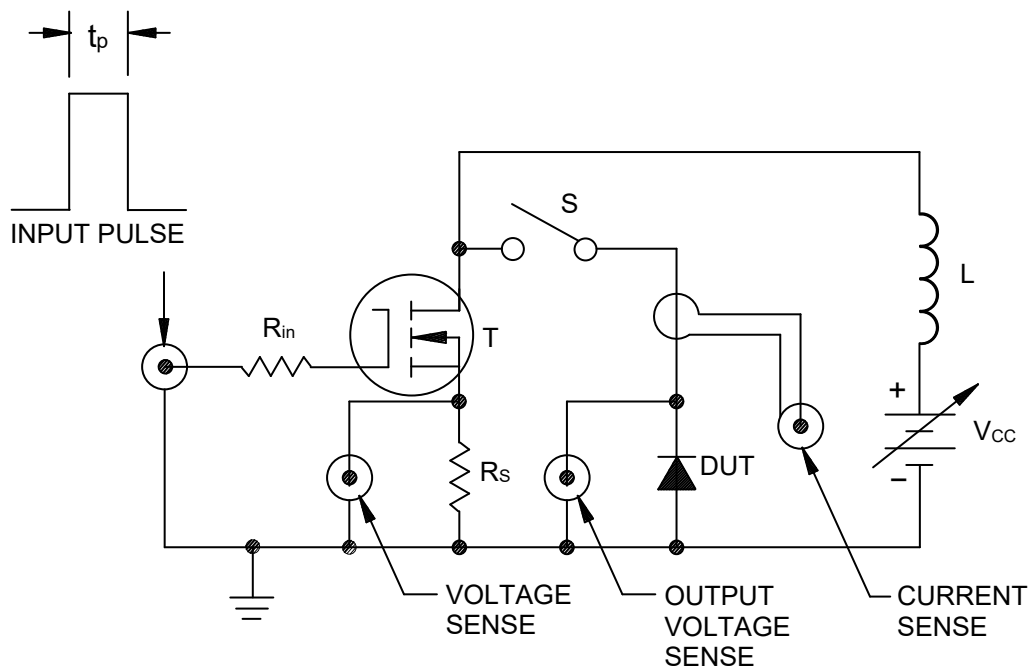


FIGURE 3. Thermal impedance.



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 ≤ 1 percent, T = 2N6766 (IRF250 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.)

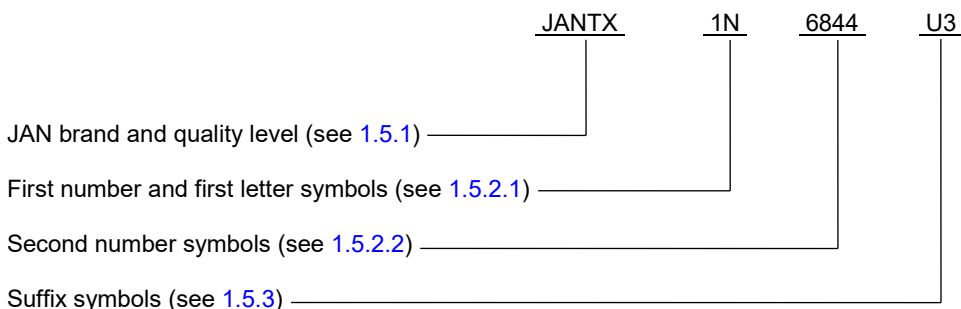
6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

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. The complete PIN, see 1.5 and 6.5.

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. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://qpldocs.dla.mil>.

6.4 PIN construction example. The PINs for encapsulated devices are constructed using the following form:



6.5 List of PINs. The following is a list of possible PINs available on this specification sheet.

Base quality level	Quality level "TX"	Quality level "TXV"	Quality level "S"
JAN1N6844U3	JANTX1N6844U3	JANTXV1N6844U3	JANS1N6844U3

6.6 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	JANS, JANTXV, JANTX, JAN1N6844U3
1N6844	JANS, JANTXV, JANTX, JAN1N6844U3
1N6844U3	JANS, JANTXV, JANTX, JAN1N6844U3

6.7 Request for new types and configurations. Requests for new device types or configurations for inclusions in this specification sheet should be submitted to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990 or by electronic mail at Semiconductor@dla.mil or by facsimile (614) 692-6939 or DSN 850-6939.

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
 Army – CR
 Navy – EC
 Air Force – 85
 NASA – NA
 DLA – CC

Preparing activity:
 DLA – CC
 (Project 5961-2020-009)

Review activities:
 Army – MI
 Air Force – 19

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>.