

The documentation and process conversion measures necessary to comply with this document shall be completed by 9 April 2015

INCH-POUND

MIL-PRF-19500/681D
9 January 2015
SUPERSEDING
MIL-PRF-19500/681C
25 September 2013

PERFORMANCE SPECIFICATION SHEET

* RECTIFIER, SEMICONDUCTOR DEVICE, SILICON, SCHOTTKY, DUAL, CENTER TAP,
FOR POWER APPLICATIONS, SURFACE MOUNT, TYPE 1N6843,
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 dual power rectifier diodes for use in high frequency switching power supplies and resonant power converters in a surface mount package. 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 outlines. The device package outline is a TO-276AA in accordance with [figure 1](#) for all encapsulated device types.

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	Column 8
Type	V_{RWM}	I_O (1) (2) $T_C = +25^\circ\text{C}$	I_{FSM} (2) $t_p = 8.3 \text{ ms}$, $T_C = +25^\circ\text{C}$	$R_{\theta JC}$ (2)	$R_{\theta JC}$ (3)	T_{STG} and T_J	C_J at 5 V
	V dc	A dc	A (pk)	$^\circ\text{C/W}$	$^\circ\text{C/W}$	$^\circ\text{C}$	pF
1N6843CCU3	100	15	100	3.5	1.75	-65 to +150	275

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

(2) Each leg.

(3) Entire package.

* 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/>.



1.4 Primary electrical characteristics. $R_{\theta JC} = 1.75^{\circ}\text{C/W}$ maximum for entire package. $R_{\theta JA} = 40^{\circ}\text{C/W}$ maximum each leg. $R_{\theta JC} = 3.5^{\circ}\text{C/W}$ maximum each leg, see [figure 3](#).

* 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 "6843".

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

CCU3	Indicates a metal lidded 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

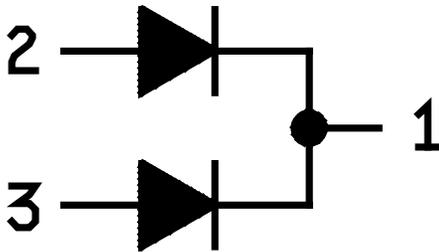
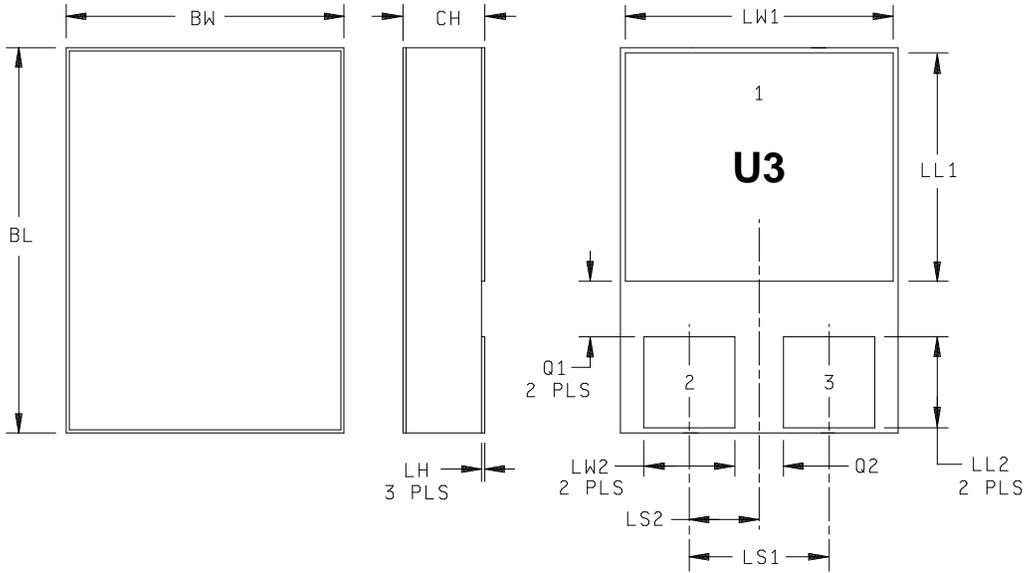
[MIL-STD-750](#) – Test Methods for Semiconductor Devices.

* (Copies of these documents are available online at <http://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.

3. REQUIREMENTS

- * 3.1 General. The individual item requirements shall be as specified in [MIL-PRF-19500](#) and as specified 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. The device package style is a TO-276AA in accordance with [figure 1](#) herein.
 - 3.4.1 Polarity. Polarity and terminal configuration shall be in accordance with [figure 1](#).
 - * 3.4.2 Lead finish. The lead finishes applicable to this specification sheet are listed on QML-19500. 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](#)).
 - 3.5 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](#).
- * 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.



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 Φ x symbology.

FIGURE 1. Physical dimensions.

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.

* 4.3 Screening of encapsulated devices. 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	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	Method 3101 of MIL-STD-750, thermal impedance (see 4.3.2)	Method 3101 of MIL-STD-750, thermal impedance (see 4.3.2)
3d	Method 4064 of MIL-STD-750, inductive avalanche energy test (see 4.3.3)	Method 4064 of MIL-STD-750, inductive avalanche 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 ± 10 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 ± 10 uA whichever is greater.
17	For TO-276AA packages: Method 1081 of MIL-STD-750 (see 4.3.4), Endpoints: Subgroup 2 of table I herein	For TO-276AA packages: Method 1081 of MIL-STD-750 (see 4.3.4), Endpoints: Subgroup 2 of table I herein

- (1) Thermal impedance and surge shall be performed any time 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 μ s max. See [table III](#), group E, subgroup 4 herein.

* 4.3.3 Inductive avalanche energy test. The inductive avalanche energy test is to be performed in accordance with method 4064 of [MIL-STD-750](#) 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, $L = 100$ μ H.

* 4.3.4 Dielectric withstanding voltage.

- 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.

* 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](#).

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	$\Delta T_C = +85^\circ\text{C}$, $I_F = 2$ A.
B5	1038	Condition A, $V_R = 80$ V dc, $T_J = +125\text{C}$, $t = 240$ hrs min; (heat sinking allowed).

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	$\Delta T_C = +85^\circ\text{C}$ minimum, $I_F = 2$ A.

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* 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](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Not applicable.
* C5	3101	Limit for thermal resistance is 3.5°C/W for each leg.
C6	1037	$\Delta T_C = +85^\circ\text{C}$, minimum, $I_F = 2$ A.

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.

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 <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 _{θJX}			°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 = 30 A (pk)	V _{F1} V _{F2} V _{F3}	0.77 1.03 1.27		V V V
Reverse current	4016	V _R = 100 V, DC method	I _{R1}	0.010		mA dc
<u>Subgroup 3</u>						
High temperature operation:		T _C = +125 °C				
Forward voltage		Pulsed test (see 4.5.1) I _F = 5 A (pk) I _F = 15 A (pk) I _F = 30 A (pk)	V _{F4} V _{F5} V _{F6}	0.60 0.77 0.95		V V V
Reverse current	4016	V _R = 100 V, DC method	I _{R2}	5.0		mA
Low temperature operation:		T _C = -55°C				
Forward voltage	4011	Condition B. Pulsed test (see 4.5.1) I _F = 5 A (pk) I _F = 15 A (pk) I _F = 30 A (pk)	V _{F7} V _{F8} V _{F9}	0.86 1.18 1.43		V V V
<u>Subgroup 4</u>						
Junction capacitance	4001	V _R = 5 V dc, f = 1 MHz, V _{SIG} = 50 mV (p-p)	C _J	275		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	μ 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/ 6/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	Condition B. $I_F = 15$ A (pk) pulsed (see 4.5.1)	ΔV_{F2}	± 50 mV dc from initial reading.		
2.	Reverse current	4016	$V_r = 100$ V	ΔI_{R1}	± 100 percent from initial reading or ± 10 uA whichever is greater.		

1/ For each leg.

2/ The delta measurements for table E-VIA (JANS) of MIL-PRF-19500 are subgroups 4 and 5, see table II herein, both steps.

3/ The delta measurements for table E-VIB (JAN, JANTX and JANTXV) of MIL-PRF-19500 are subgroups 3 and 6, see table II herein, both steps.

4/ The delta measurements for table E-VII of MIL-PRF-19500 are subgroup 6, see table II herein, both steps for all levels.

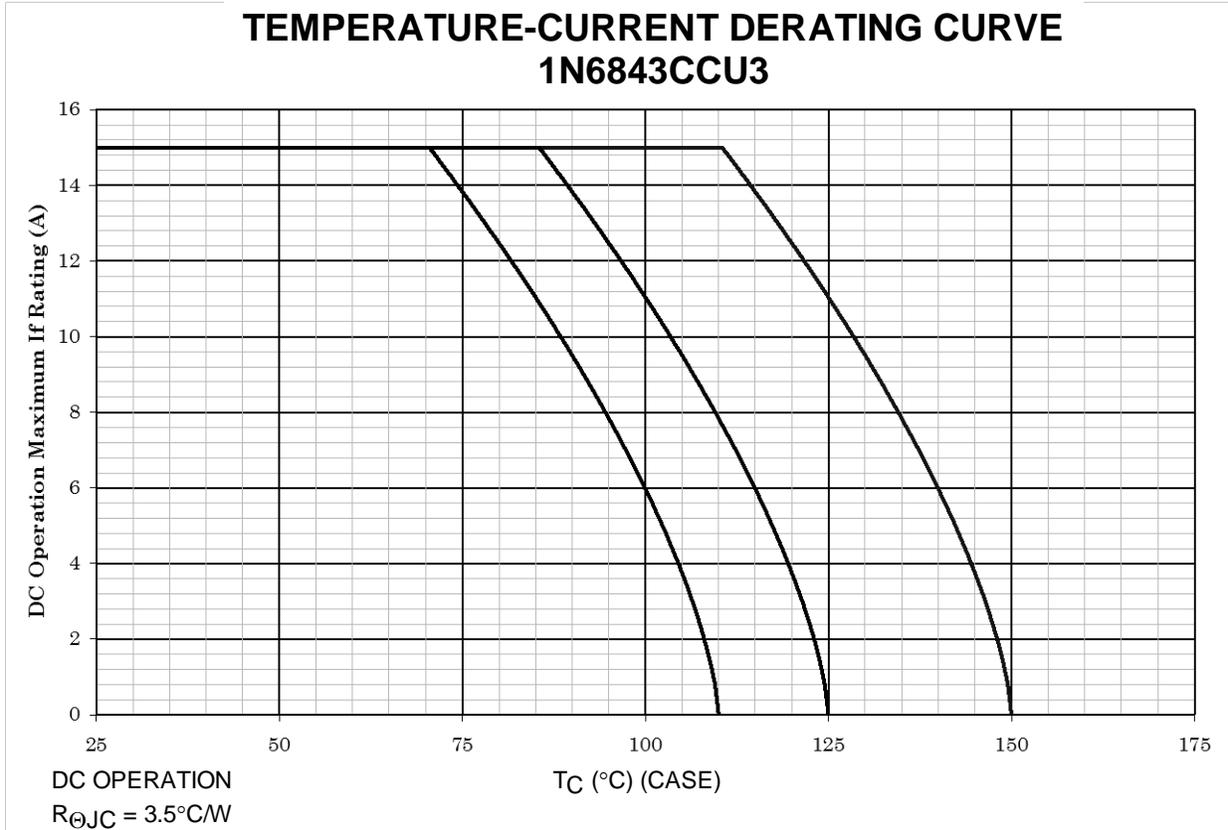
5/ Devices which exceed the table I limits for this test shall not be accepted.

6/ The delta measurements for table E-IX of MIL-PRF-19500 are subgroups 1 and 2, see table II herein, both steps.

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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 = 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 table I , subgroup 2, and table II .	
<u>Subgroup 2</u>			n = 45, c = 0
Life test	1048	t = 1,000 hours, T _C = +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 4</u>			
Thermal impedance curves		See MIL-PRF-19500 .	
<u>Subgroup 7</u>			n = 5, c = 0
Surge	4066	Condition A, T _A = +25°C I _{FSM} = 100 A, 10 surges of 8.3 ms superimposed on I _O . V _R = 0; I _O = 10 A pk half sine wave, continuous, performed on each leg.	
Electrical measurements		See table I , subgroup 2 (except thermal impedance).	



NOTES:

1. All devices are capable of operating at $\leq T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate current for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq 150^{\circ}\text{C}$) and current rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 125^{\circ}\text{C}$, where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at $T_J \leq 125^{\circ}\text{C}$, and 110°C to show current rating where most users want to limit T_J in their application.

FIGURE 2. Temperature-current derating curve (for each leg).

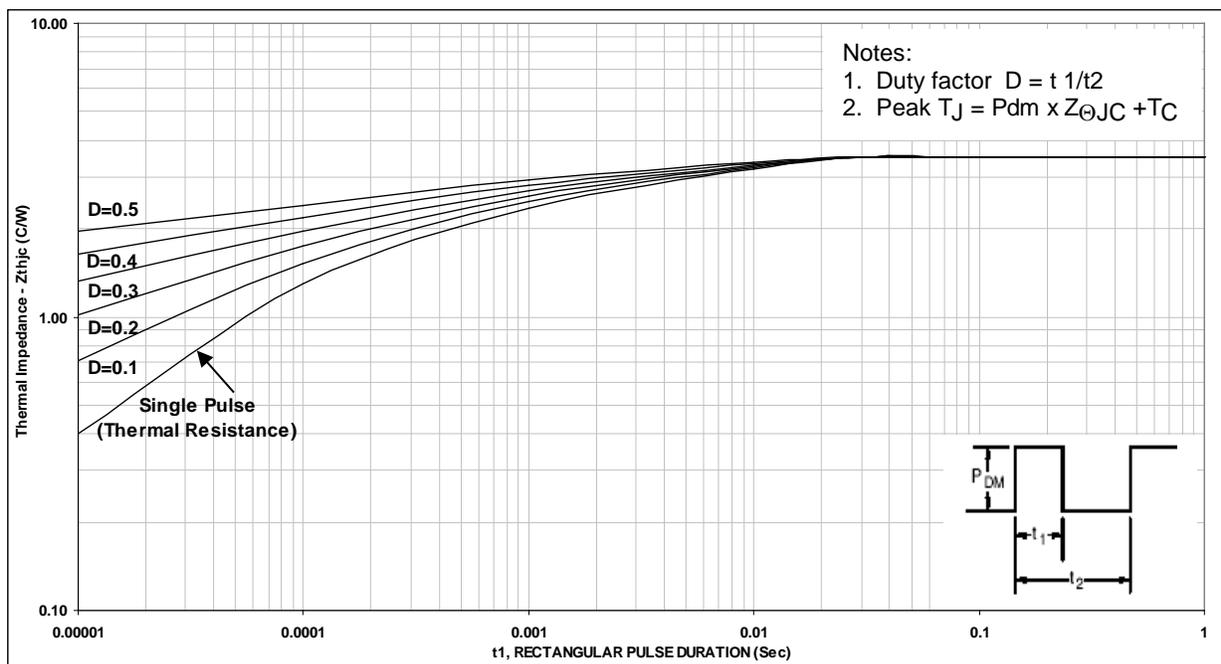
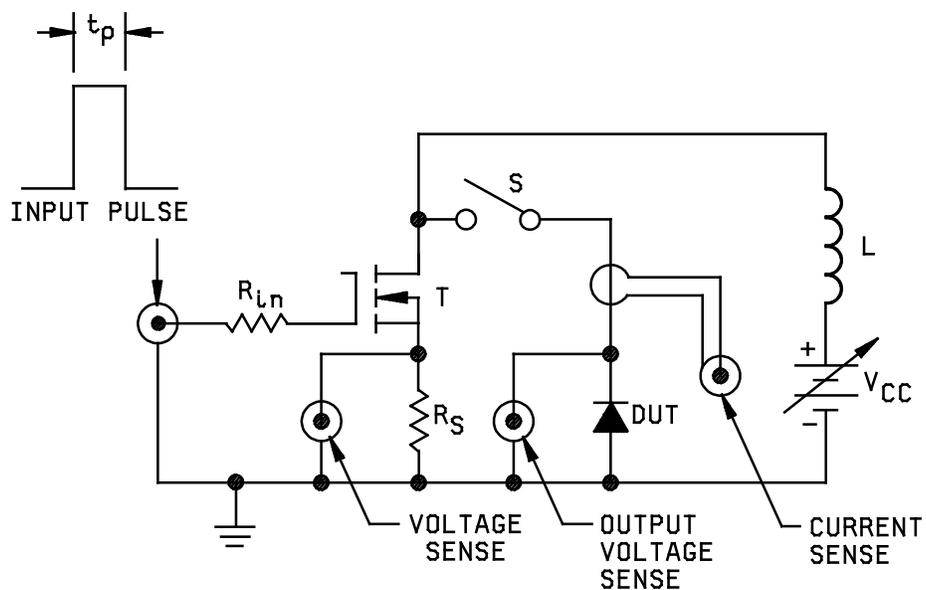


FIGURE 3. Thermal impedance (for each leg).



Input pulse $R_{in} = 50$ ohms, 1 watt
 $V_G = 10$ Volts, $R_S = 0.1$ ohms, 1 watt
 $Z_G = 50$ ohms
 $L = 100\mu\text{H}$
 $\text{P.W.} \approx 30 \mu\text{s}$
 Duty cycle ≤ 1 percent, T = 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.)

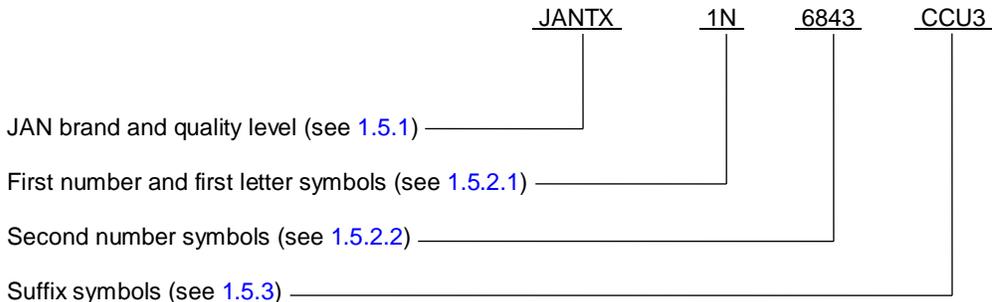
6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

* 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 3.4.2).
- d. The complete PIN, see 1.5.

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://assist.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 (without JAN brand) available on this specification sheet.

1N6843CCU3	TX1N6843CCU3	TXV1N6843CCU3	S1N6843U3
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6.6 Cross reference substitution list. A PIN for PIN replacement table follows and these devices are directly interchangeable. The 1N6843CCU3 is directly substitutable for the 1N6843.

Non-preferred PIN	Preferred PIN
30CLJQ100 1N6843 1N6843U3	JANS, JANTXV, JANTX, JAN1N6843CCU3 JANS, JANTXV, JANTX, JAN1N6843CCU3 JANS, JANTXV, JANTX, JAN1N6843CCU3

6.7 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 5961-2015-005)

Review activities:
 Army - MI

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/>.