

The documentation and process conversion measures necessary to comply with this revision shall be completed by 24 November 2014

INCH-POUND

MIL-PRF-19500/757C  
8 October 2014  
SUPERSEDING  
MIL-PRF-19500/757B  
18 April 2014

## PERFORMANCE SPECIFICATION SHEET

\* TRANSISTOR, FIELD EFFECT RADIATION HARDENED,  
P-CHANNEL, SILICON, THROUGH HOLE AND SURFACE MOUNT, TYPES 2N7624 AND 2N7625  
QUALITY LEVELS 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 P-channel, enhancement-mode, radiation hardened (total dose and single event effects (SEE)), low-threshold logic level, MOSFET, transistor.
- \* 1.2 Package outlines. The device packages for this specification sheet are the TO-257AA and TO-276AA (SMD 5, U3) in accordance with [figure 1](#) and [figure 2](#) for all packaged device types.

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

Type	$P_T$ (1) $T_C = +25^\circ\text{C}$	$P_T$ $T_A = +25^\circ\text{C}$	$R_{\theta JC}$ (2)	$V_{DS}$	$V_{GS}$	$I_{D1}$ $T_C = +25^\circ\text{C}$ (3) (4)	$I_{D2}$ $T_C = +100^\circ\text{C}$ (3) (4)	$I_S$	$I_{DM}$ (5)	$T_J$ and $T_{STG}$
2N7625T3	W 75	W 1.56	$^\circ\text{C}/\text{W}$ 1.67	V dc -60	V dc $\pm 10$	A dc -20	A dc -17	A dc -20	A (pk) -80	$^\circ\text{C}$ -55 to +150
2N7624U3	W 57	W 1.00	$^\circ\text{C}/\text{W}$ 2.20	V dc -60	V dc $\pm 10$	A dc -22	A dc -14.9	A dc -22	A (pk) -88	

- (1) Derate linearly by 0.60 mW/ $^\circ\text{C}$  (2N7625T3) for  $T_C > +25^\circ\text{C}$ ; by 0.45 mW/ $^\circ\text{C}$  (2N7624U3) for  $T_C > +25^\circ\text{C}$ .
- (2) See [figure 3](#), thermal impedance curves.
- (3) The following formula derives the maximum theoretical  $I_D$  limit.  $I_D$  is limited by product design and construction (package, internal wires and pin diameter) to 20 A (T3), to 22 A (U3).

$$I_D = \sqrt{\frac{T_{JM} - T_C}{(R_{\theta JC}) \times (R_{DS(\text{on})} \text{ at } T_{JM})}}$$

- (4) See [figure 4](#), maximum drain current graph.
- (5)  $I_{DM} = 4 \times I_{D1}$  as calculated in note (3).

\* 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/>.

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

Type	Min $V_{(BR)}$ DSS $V_{GS} = 0 \text{ V}$ $I_D = 250 \mu\text{A}$ dc	$V_{GS}$ (th)1 $V_{DS} = V_{GS}$ $I_D = 250 \mu\text{A}$ dc	Max $I_{DSS1}$ $V_{GS} = 0 \text{ V}$ $V_{DS} = 80 \text{ percent}$ rated VDS	Max $I_{DS(on)}$ (1) $V_{GS} = 4.5 \text{ V}$ dc		$E_{AS}$	$I_{AS}$
				at $I_{D2}$	$T_J = +25^\circ\text{C}$		
2N7625	<u>V</u> dc -60	<u>V</u> dc Min -1.0 Max -2.0	<u><math>\mu\text{A}</math></u> dc -1.0	<u>Ohm</u> 0.072	<u>Ohm</u> 0.108	181	<u>A</u> dc -20
2N7624	<u>V</u> dc -60	<u>V</u> dc Min -1.0 Max -2.0	<u><math>\mu\text{A}</math></u> dc -1.0	<u>Ohm</u> 0.070	<u>Ohm</u> 0.103	79	<u>A</u> dc -22

(1) Pulsed (see 4.5.1).

- \* 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 6.6 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 from the lowest to the highest level are as follows: "TXV" and "S".
- \* 1.5.2 Radiation hardness assurance (RHA) designator. The RHA levels that are applicable for this specification sheet from lowest to highest are as follows: "R" and "F".
- \* 1.5.3 Device type. The designation system for the device types of transistors covered by this specification sheet are as follows.
- \* 1.5.3.1 First number and first letter symbols. The transistors of this specification sheet are identified by the first number and letter symbols "2N".
- \* 1.5.3.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet are as follows: "7624" and "7625".
- \* 1.5.4 Suffix characters. The following suffix letters are incorporated in the PIN for this specification sheet:

T3	Indicates a through-hole mount package similar to a TO-257AA (see <a href="#">figure 1</a> ).
U3	Indicates a 3 pad surface mount package similar to a TO-276AA (SMD-0.5) (see <a href="#">figure 2</a> ).

- \* 1.5.5 Lead finish. 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

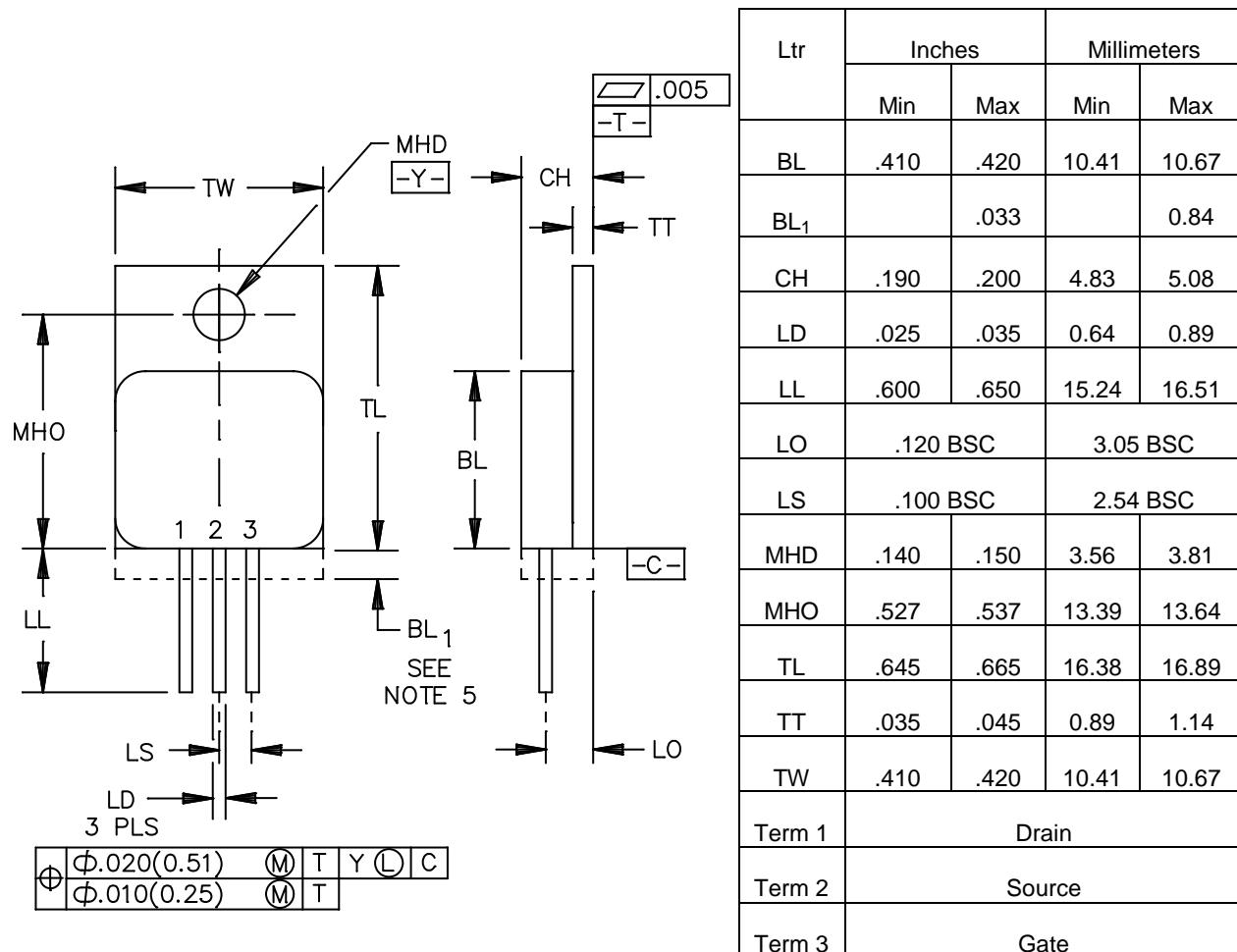
**MIL-STD-750** – Test Methods for Semiconductor Devices.

(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

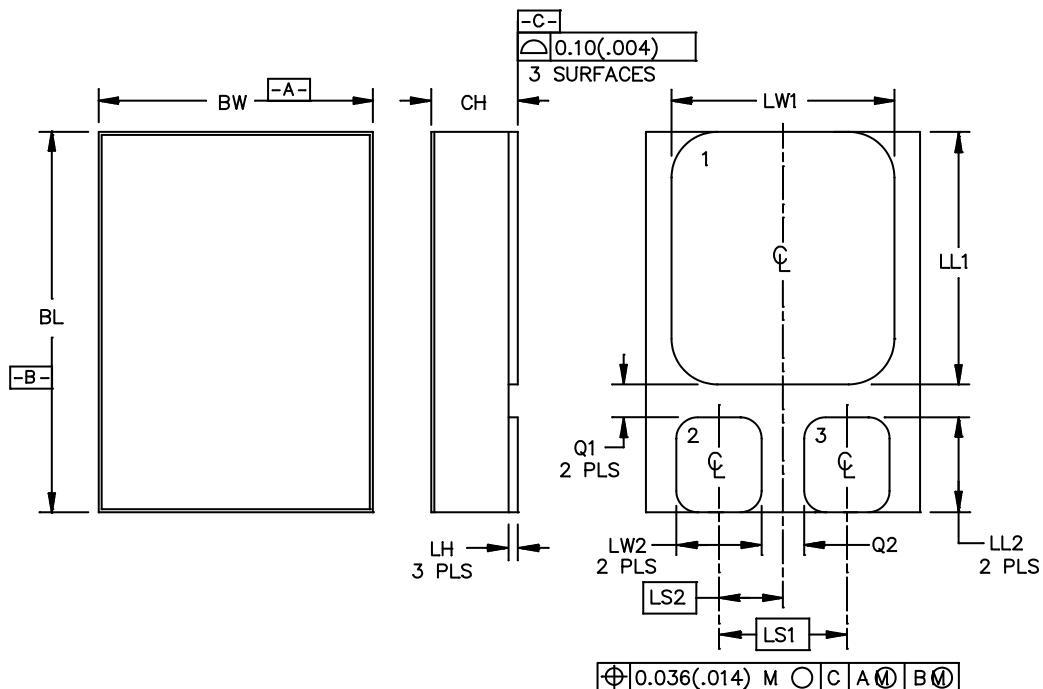
- \* 3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as specified herein.
- \* 3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list 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 herein. The device package style is either a TO-257AA in accordance with [figure 1](#) and [figure 2](#) for all device types. For 2N7625T3, methods used for electrical isolation of the terminals shall employ materials that contain a minimum of 90 percent Al<sub>2</sub>O<sub>3</sub> (ceramic).
- \* 3.4.1 Lead finish. 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).
- \* 3.4.2 Pin-out. The pin-out of the device shall be as shown on [figure 1](#) and [figure 2](#).



## NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. All terminals are isolated from the case.
4. This area is for the lead feed-thru eyelets (configuration is optional, but will not extend beyond this zone).
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 1. Dimensions and configuration, TO-257AA (T3).



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.395	.405	10.04	10.28
BW	.291	.301	7.40	7.64
CH		.124		3.15
LH	.010	.020	0.25	0.51
LW1	.281	.291	7.14	7.39
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	Drain			
TERM 2	Gate			
TERM 3	Source			

## NOTES:

1. Dimension are in inches.
2. Millimeters are given for information only.
3. The lid shall be electrically isolated from the drain, gate and source.
4. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

FIGURE 2. Dimensions and configuration TO-276AA, SMD-0.5 (U3).

\* 3.4.3 Internal construction. Multiple chip construction shall not be permitted to meet the requirements of this specification.

\* 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 and table I.

3.7 Workmanship. Transistors 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).

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.

4.2.1.1 SEE. Design capability shall be tested on the initial qualification and thereafter whenever a major die design or process change is introduced (see table III). End-point measurements shall be in accordance with table II.

\* 4.3 Screening (JANS and JANTXV levels 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 (see table E-IV of MIL-PRF-19500) (1) (2)	Measurement	
	JANS	JANTXV
(3)	Gate stress test (see <a href="#">4.3.1</a> )	Gate stress test (see <a href="#">4.3.1</a> )
(3)	Method 3470 of MIL-STD-750, $E_{AS}$ (see <a href="#">4.3.2</a> )	Method 3470 of MIL-STD-750, $E_{AS}$ (see <a href="#">4.3.2</a> )
(3) 3c	Method 3161 of MIL-STD-750, thermal impedance, (see <a href="#">4.3.3</a> )	Method 3161 of MIL-STD-750, thermal impedance, (see <a href="#">4.3.3</a> )
9	Subgroup 2 of <a href="#">table I</a> herein $I_{DSS1}$ , $I_{GSSF1}$ , $I_{GSSR1}$ as minimum	Not applicable
10	Method 1042 of MIL-STD-750, test condition B	Method 1042 of MIL-STD-750, test condition B
11	$I_{GSSF1}$ , $I_{GSSR1}$ , $I_{DSS1}$ , $r_{DS(ON)1}$ , $V_{GS(TH)1}$ Subgroup 2 of <a href="#">table I</a> herein.  $\Delta I_{GSSF1} = \pm 20$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 0.2$ $\mu$ A dc or $\pm 100$ percent of initial value, whichever is greater.	$I_{GSSF1}$ , $I_{GSSR1}$ , $I_{DSS1}$ , $r_{DS(ON)1}$ , $V_{GS(TH)1}$ Subgroup 2 of <a href="#">table I</a> herein.
12	Method 1042 of MIL-STD-750, test condition A	Method 1042 of MIL-STD-750, test condition A
13	Subgroups 2 and 3 of <a href="#">table I</a> herein $\Delta I_{GSSF1} = \pm 20$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 0.2$ $\mu$ A dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta r_{DS(ON)1} = \pm 20$ percent of initial value. $\Delta V_{GS(TH)1} = \pm 20$ percent of initial value.	Subgroup 2 of <a href="#">table I</a> herein $\Delta I_{GSSF1} = \pm 20$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 0.2$ $\mu$ A dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta r_{DS(ON)1} = \pm 20$ percent of initial value. $\Delta V_{GS(TH)1} = \pm 20$ percent of initial value.
* 17	For TO-257AA and U3 packages: Method 1081 of MIL-STD-750 (see <a href="#">4.3.4</a> ), Endpoints: Subgroup 2 of <a href="#">table I</a> herein	For TO-257AA and U3 packages: Method 1081 of MIL-STD-750 (see <a href="#">4.3.4</a> ), Endpoints: Subgroup 2 of <a href="#">table I</a> herein

- (1) At the end of the test program,  $I_{GSSF1}$ ,  $I_{GSSR1}$ , and  $I_{DSS1}$  are measured.
- (2) An out-of-family program to characterize  $I_{GSSF1}$ ,  $I_{GSSR1}$ ,  $I_{DSS1}$ , and  $V_{GS(TH)1}$  shall be invoked.
- (3) Shall be performed anytime after temperature cycling, screen 3a; JANTX and JANTXV levels do not need to be repeated in screening requirements.

4.3.1 Gate stress test. Apply  $V_{GS} = 15$  V minimum for  $t = 250$   $\mu$ s minimum.

4.3.2 Single pulse avalanche energy ( $E_{AS}$ ).

- a. Peak current ( $I_{AS}$ ) .....  $I_{D1}$ .
- b. Peak gate voltage ( $V_{GS}$ ) ..... -5 V dc (up to max rated  $V_{GS}$ ).
- c. Gate to source resistor ( $R_{GS}$ ) .....  $25 \leq R_{GS} \leq 200 \Omega$ .
- d. Initial case temperature ..... +25°C, +10°C, -5°C.
- e. Inductance: .....  $\left[ \frac{2E_{AS}}{(I_{D1})^2} \right] \left[ \frac{V_{BR} - V_{DD}}{V_{BR}} \right]$  mH minimum.
- f. Number of pulses to be applied ..... 1 pulse minimum.
- g. Supply voltage ( $V_{DD}$ ) ..... -25 V dc (up to max  $V_{DS}$ ).

4.3.3 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3161 of MIL-STD-750 using the guidelines in that method for determining  $I_M$ ,  $I_H$ ,  $t_H$ ,  $t_{SW}$ , (and  $V_H$  where appropriate). Measurement delay time ( $t_{MD}$ ) = 70  $\mu$ s max. See [table III](#), group E, subgroup 4 herein.

\* 4.3.4 Dielectric withstanding voltage.

- a. Magnitude of test voltage ..... 800 V dc (TO-257AA), 600V dc (U3).
- 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. Alternate flow is allowed for quality conformance inspection in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and [table I](#) herein. Electrical measurements (end-points) shall be in accordance with the inspections of [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 table E-VIA (JANS) and table E-VIB (JANTXV) of MIL-PRF-19500, and herein.

4.4.2.2 Quality level JANS (table E-VIA of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1051	Test condition G, 100 cycles.
B5	1042	Accelerated steady-state gate bias, condition B, $V_{GS}$ = rated $V_{GS}$ ; $T_A$ = +175°C, $t$ = 24 hours minimum; or $T_A$ = +150°C, $t$ = 48 hours minimum.
B5	1042	Accelerated steady-state reverse bias, condition A, $V_{DS}$ = rated $V_{DS}$ ; $T_A$ = +175°C, $t$ = 120 hours minimum; or $T_A$ = +150°C, $t$ = 240 hours minimum.

4.4.2.3 Quality level JANTXV (table E-VIB of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	1051	Test condition C, 25 cycles.
B3	1042	Accelerated steady-state gate bias, condition B, $V_{GS}$ = rated $V_{GS}$ ; $T_A$ = +175°C, $t$ = 24 hours minimum; or $T_A$ = +150°C, $t$ = 48 hours minimum; and accelerated steady-state reverse bias, condition A, $V_{DS}$ = rated $V_{DS}$ ; $T_A$ = +175°C, $t$ = 170 hours minimum; or $T_A$ = +150°C, $t$ = 340 hours minimum.

- \* 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 and as follows.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition A, weight = 10 lbs., $t$ = 10 s (applicable to TO-257AA only).
C5	3161	See 4.3.3, $R_{\theta JC}$ = (see 1.3).
C6	1042	Accelerated steady-state gate bias, condition B, $V_{GS}$ = rated $V_{GS}$ ; $T_A$ = +175°C, $t$ = 48 hours minimum; or $T_A$ = +150°C, $t$ = 96 hours minimum. and accelerated steady-state reverse bias, condition A, $V_{DS}$ = rated $V_{DS}$ ; $T_A$ = +175°C, $t$ = 500 hours minimum; or $T_A$ = +150°C, $t$ = 1,000 hours minimum.

4.4.4 Group D inspection. Group D inspection shall be conducted in accordance with table E-VIII of MIL-PRF-19500 and [table II](#) herein.

- \* 4.4.5 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-IX of MIL-PRF-19500 and as specified in [table III](#) herein.

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.

\* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance 2/	3161	See 4.3.3	$Z_{\theta JA}$			°C/W
Breakdown voltage drain to source	3407	$V_{GS} = 0$ , $I_D = -250 \mu A$ dc, bias condition C	$V_{(BR)DSS}$	-60		V dc
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$ , $I_D = -250 \mu A$ dc	$V_{GS(TH)1}$	-1.0	-2.0	V dc
Gate current	3411	$V_{GS} = -10$ V dc, bias condition C, $V_{DS} = 0$	$I_{GSSF1}$		-100	nA dc
Gate current	3411	$V_{GS} = +10$ V dc, bias condition C, $V_{DS} = 0$	$I_{GSSR1}$		+100	nA dc
Drain current	3413	$V_{GS} = 0$ , bias condition C, $V_{DS} = 80$ percent of rated $V_{DS}$	$I_{DSS1}$		-1.0	$\mu A$ dc
Static drain to source on-state resistance 2N7625T3 2N7624U3	3421	$V_{GS} = 4.5$ V dc, condition A, pulsed (see 4.5.1), $I_D = I_{D2}$	$r_{DS(ON)1}$		0.072 0.070	$\Omega$ $\Omega$
* Forward voltage	4011	$V_{GS} = 0$ , condition B, pulsed (see 4.5.1), $I_D = I_{D1}$	$V_{SD}$		-5.0	V (pk)
<u>Subgroup 3</u>						
High temperature operation:		$T_C = T_J = +125$ °C				
Gate current	3411	$V_{GS} = \pm 10$ V dc, bias condition C, $V_{DS} = 0$	$I_{GSS2}$		$\pm 200$	nA dc
Drain current	3413	$V_{GS} = 0$ , bias condition C, $V_{DS} = 80$ percent of rated $V_{DS}$	$I_{DSS2}$		-10	$\mu A$ dc
Static drain to source on-state resistance 2N7625T3 2N7624U3	3421	$V_{GS} = -4.5$ V dc, condition A, pulsed (see 4.5.1), $I_D = I_{D2}$	$r_{DS(ON)2}$		0.100 0.095	$\Omega$ $\Omega$

See footnotes at end of table.

\* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 3 - continued</u>						
Gate to source voltage (threshold)	3403	$V_{DS} = V_{GS}$ , $I_D = -250 \mu A$ dc	$V_{GS(TH)2}$	-0.5		V dc
Low temperature operation:		$T_C = T_J = -55^\circ C$				
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$ , $I_D = -250 \mu A$ dc	$V_{GS(TH)3}$		-3.0	V dc
<u>Subgroup 4</u>						
Forward transconductance 2N7625T3 2N7624U3	3475	$V_{DS} = -10 V$ dc, $I_D = I_{D2}$ , pulsed (see 4.5.1)	gFS	17	16	S S S
Gate series resistance	3402	Condition A	$R_G$		20	$\Omega$
<u>Subgroup 5</u>						
Safe operating area test	3474	$V_{DS} = 80$ percent of rated $V_{DS}$ (see 1.3) $t_P = 10$ ms, $I_D$ as specified in figure 5				
Electrical measurements		See table I, subgroup 2				
<u>Subgroups 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Gate charge	3471	Condition B, $I_D = I_{D1}$ , $V_{DS} = 50$ percent of rated $V_{DS}$				
On-state gate charge			$Q_{G(on)}$	36		nC
On gate to source charge			$Q_{GS1}$	10		nC
On gate to drain charge			$Q_{GD1}$	18		nC
Turn-off gate charge			$Q_{G(off)}$	36		nC

See footnotes at end of table.

\* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
<u>Subgroup 7 - continued</u>						
Off gate to source charge			Q <sub>GS2</sub>		10	nC
Off gate to drain charge			Q <sub>GD2</sub>		18	nC
* Reverse recovery time	3473	Condition A, $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq -50 \text{ V}$ , $I_D = I_{D1}$	t <sub>rr</sub>		110	ns

1/ For sampling plan, see [MIL-PRF-19500](#).  
2/ This test required for the following end-point measurements only:  
 Group B, subgroups 3 and 4 (JANS).  
 Group B, subgroups 2 and 3 (JANTXV).  
 Group C, subgroup 2 and 6.  
 Group E, subgroup 1.

TABLE II. Group D inspection.

Inspection 1/ 2/ 3/	MIL-STD-750		Symbol	Pre-irradiation limits		Post-irradiation limits		Post-irradiation limits		Unit		
	Method	Conditions		R and F		R		F				
				Min	Max	Min	Max	Min	Max			
<u>Subgroup 1</u> Not applicable												
<u>Subgroup 2</u> Steady-state total dose irradiation ( $V_{GS}$ bias) 4/	1019	$T_C = +25^\circ C$ $V_{GS} = -6 V; V_{DS} = 0$										
Steady-state total dose irradiation ( $V_{DS}$ bias) 4/	1019	$V_{GS} = 0; V_{DS} = 80$ percent of rated $V_{DS}$ (pre-irradiation)										
End-point electricals:												
Breakdown voltage, drain to source	3407	$V_{GS} = 0; I_D = -250 \mu A$ ; bias condition C	$V_{(BR)DSS}$	-60		-60		-60		V dc		
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}; I_D = -250 \mu A$	$V_{GS(th)1}$	-1.0	-2.0	-1.0	-2.0	-1.0	-2.0	V dc		
Gate current	3411	$V_{GS} = -10 V, V_{DS} = 0$ , bias condition C	$I_{GSSF1}$		-100		-100		-100	nA dc		
Gate current	3411	$V_{GS} = +10 V, V_{DS} = 0$ , bias condition C	$I_{GSSR1}$		100		100		100	nA dc		
Drain current	3413	$V_{GS} = 0$ , bias condition C; $V_{DS} = 80$ percent of rated $V_{DS}$ (pre-irradiation)	$I_{DSS}$		-1.0		-1.0		-1.0	$\mu A$ dc		
Static drain to source on-state voltage 2N7625T3 2N7624U3	3405	$V_{GS} = -4.5 V$ ; condition A, pulsed (see 4.5.1), $I_{D1}$ = $I_{D2}$	$V_{DS(on)}$		-1.258 -1.110		-1.258 -1.110		-1.258 -1.110	V dc V dc		
Forward voltage source drain diode	4011	$V_{GS} = 0; I_D = I_{D1}$ bias condition C	$V_{SD}$		-5.0		-5.0		-5.0	V dc		

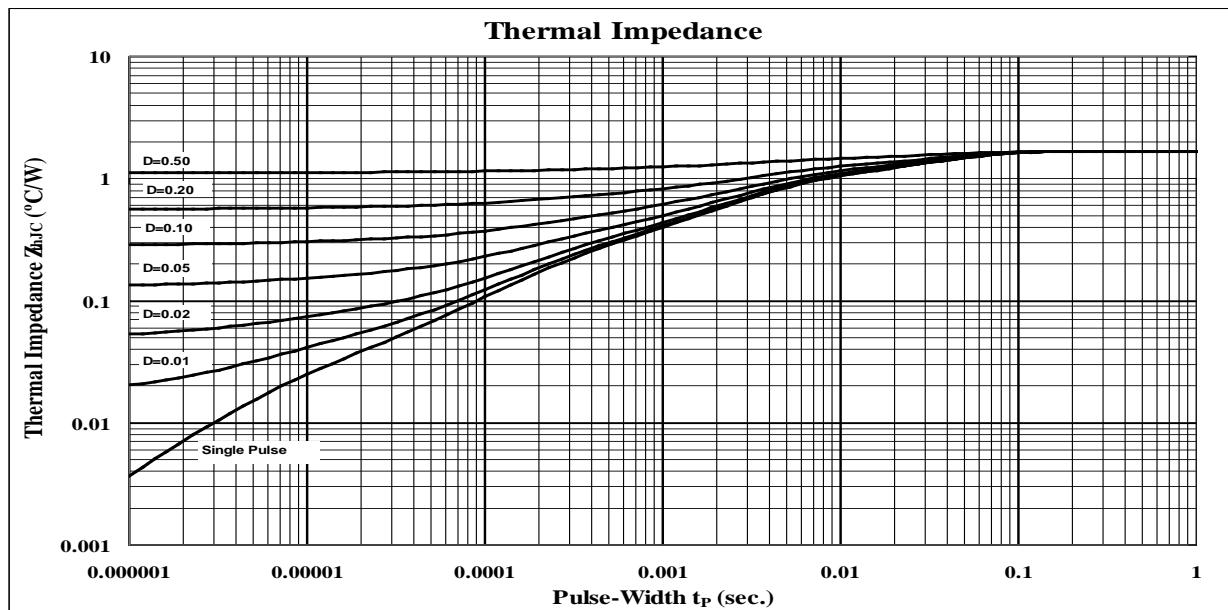
- 1/ For sampling plan see MIL-PRF-19500.
- 2/ Group D qualification may be performed prior to lot formation. Wafers qualified to these group D QCI requirements may be used for any other specification sheets utilizing the same die design.
- 3/ At the manufacturer's option, group D samples need not be subjected to the screening tests, and may be assembled in its qualified package or in any qualified package that the manufacturer has data to correlate the performance to the designated package.
- 4/ Separate samples shall be pulled for each bias.

TABLE III. Group E inspection (all quality levels) - for qualification or re-qualification only.

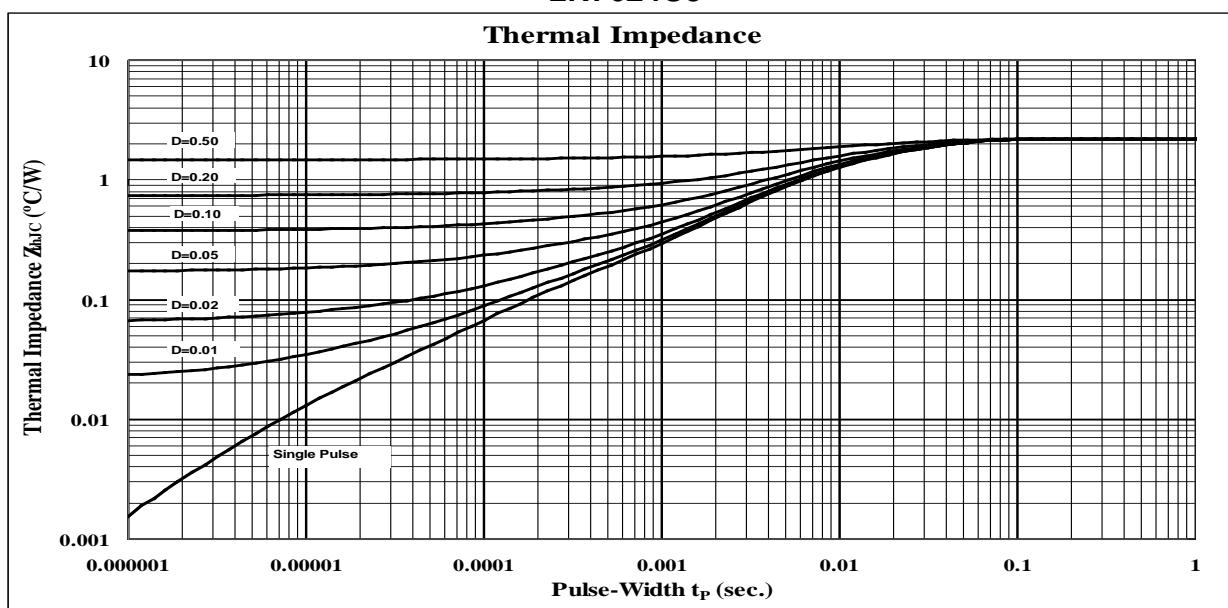
Inspection	MIL-STD-750		Sample plan
	Method	Conditions	
<u>Subgroup 1</u>			
Temperature cycling	1051	Condition G, 500 cycles	45 devices c = 0
Hermetic seal Fine leak Gross leak	1071	As applicable	
Electrical measurements		See <a href="#">table I</a> , subgroup 2	
<u>Subgroup 2 1/</u>			45 devices c = 0
Steady-state gate bias	1042	Condition B, 1,000 hours	
Electrical measurements		See <a href="#">table I</a> , subgroup 2	
Steady-state reverse bias	1042	Condition A, 1,000 hours	
Electrical measurements		See <a href="#">table I</a> , subgroup 2	
<u>Subgroup 3</u>			45 devices c = 0
Switching time test	3472	$I_D = I_{D1}$ , $V_{GS} = -5.0$ V dc, $R_G = 7.5\Omega$ , $V_{DD} = 50$ percent rated $V_{DS}$ Maximum limits: $t_{d(on)} = 32$ ns; $t_r = 250$ ns; $t_{d(off)} = 100$ ns; $t_f = 85$ ns	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves	3161	See MIL-PRF-19500	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 10</u>			22 devices c = 0
Commutating diode for safe operating area test procedure for measuring dv/dt during reverse recovery of power MOSFET transistors or insulated gate bipolar transistors	3476	Test conditions shall be derived by the manufacturer	

- 1/ A separate sample for each test shall be pulled.
- 2/ Group E qualification of SEE effect testing may be performed prior to lot formation. Qualification may be extended to other specification sheets utilizing the same structurally identical die design.
- 3/ The sampling plan applies to each bias condition.

## 2N7625T3



## 2N7624U3

FIGURE 3. Thermal impedance graph.

**2N7625T3**



**2N7624U3**

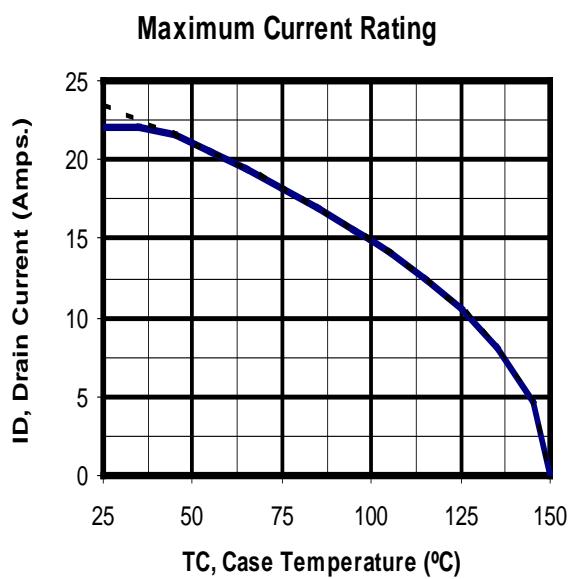
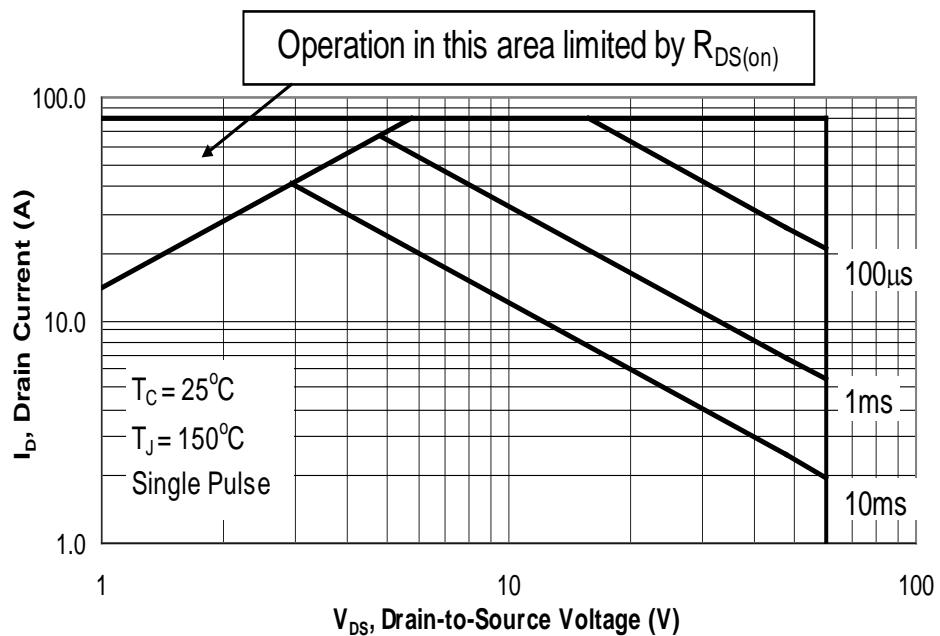
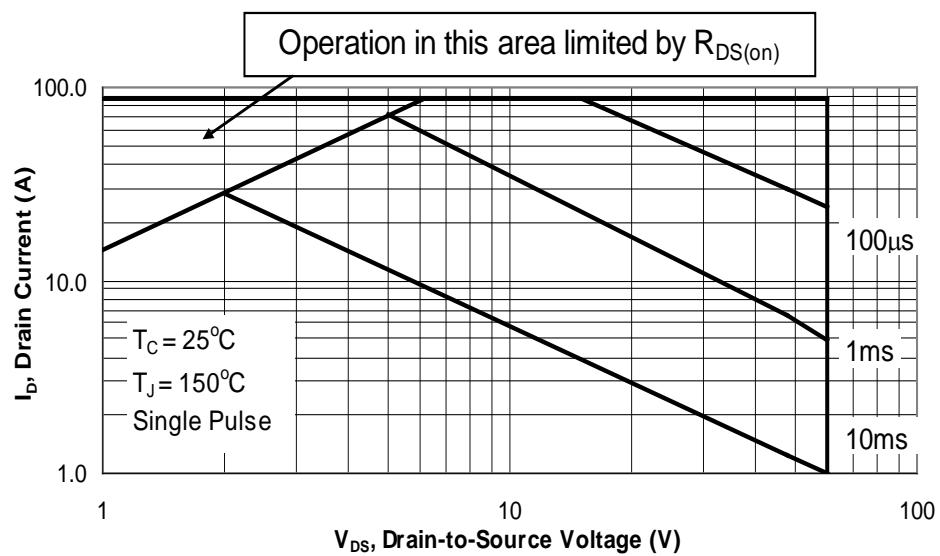


FIGURE 4. Derating drain current.

**2N7625T3****2N7624U3**FIGURE 5. Safe-operating-area graph.

## 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 Part or Identifying Number (PIN), see 1.5.
- e. For acquisition of RHA designated devices, table II, subgroup 1 testing of group D herein is optional. If subgroup 1 is desired, it should be specified in the contract.
- f. If specific SEE characterization conditions are desired (see section 6.5 and table IV), manufacturer's cage code should be specified in the contract or order.
- g. If SEE testing data is desired, it should be specified in the contract or order.

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 list.** The following table shows the generic P/N and its associated military P/N (without JAN and RHA prefix).

Generic P/N	Military P/N
IRHLYS797034CM	2N7625T3
IRHLNJ797034	2N7624U3

**6.5 Application data.**

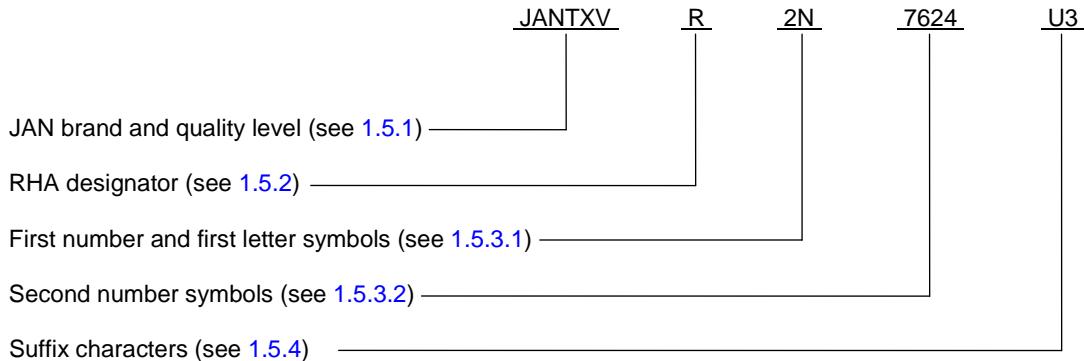
**6.5.1 Manufacturer specific irradiation data.** Each manufacturer qualified to this slash sheet has characterized its devices to the requirements of MIL-STD-750 method 1080 and as specified herein. Since each manufacturer's characterization conditions can be different and can vary by the version of method 1080 qualified to, the MIL-STD-750 method 1080 revision version date and conditions used by each manufacturer for characterization have been listed here (see table IV) for information only. SEE conditions and figures listed in section 6 are current as of the date of this specification sheet, please contact the manufacturer for the most recent conditions.

TABLE IV. Manufacturers characterization conditions.

Manufacturers CAGE	Inspection	MIL-STD-750		Sample plan
		Method	Conditions	
69210 (Applicable to devices with a date code of September 2009 and older)	SEE 1/	1080	See MIL-STD-750 method 1080	3 devices
	Electrical measurements		$I_{GSSF1}$ , $I_{GSSR1}$ , and $I_{DSS1}$ in accordance with table I, subgroup 2	
	SEE irradiation		Fluence = $3E5 \pm 20$ percent ions/cm <sup>2</sup> Flux = $2E3$ to $2E4$ ions/cm <sup>2</sup> /sec, temperature = $25^{\circ} \pm 5^{\circ}$ C  Surface LET = $38 \text{ MeV-cm}^2/\text{mg} \pm 5\%$ , range = $38 \mu\text{m} \pm 7.5\%$ , energy = $300 \text{ MeV} \pm 7.5\%$  In-situ bias conditions: $V_{DS} = -60 \text{ V}$ and $V_{GS} = 6 \text{ V}$ $V_{DS} = -40 \text{ V}$ and $V_{GS} = 7 \text{ V}$ (typical 3.75 MeV/nucleon at Texas A & M Cyclotron)  Surface LET = $61 \text{ MeV-cm}^2/\text{mg} \pm 5\%$ , range = $31 \mu\text{m} \pm 10\%$ , energy = $330 \text{ MeV} \pm 7.5\%$  In-situ bias conditions: $V_{DS} = -60 \text{ V}$ and $V_{GS} = 6 \text{ V}$ (typical 2.70 MeV/nucleon at Texas A & M Cyclotron)  Surface LET = $84 \text{ MeV-cm}^2/\text{mg} \pm 5\%$ , range = $28 \mu\text{m} \pm 7.5\%$ , energy = $350 \text{ MeV} \pm 7.5\%$  In-situ bias conditions: $V_{DS} = -60 \text{ V}$ and $V_{GS} = 5 \text{ V}$ (typical 1.89 MeV/nucleon at Texas A & M Cyclotron)	
	Electrical measurements		$I_{GSSF1}$ , $I_{GSSR1}$ , and $I_{DSS1}$ in accordance with table I, subgroup 2	
Upon qualification, all manufacturers will provide the verification test conditions to be added to this table.				

1/  $I_{GSSF1}$ ,  $I_{GSSR1}$ , and  $I_{DSS1}$  was examined before and following SEE irradiation to determine acceptability for each bias conditions. Other test conditions in accordance with table I, subgroup 2, may be performed at the manufacturer's option

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



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

PINs for devices in a TO-276AA package	PINs for devices in a TO-257AA package
JANTXVR2N7624U3	JANTXVR2N7625T3
JANSR2N7624U3	JANSR2N7625T3

6.8 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 previous issue.

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

Review activity:  
 Air Force - 99

Preparing activity:  
 DLA - CC  
 (Project 5961-2014-120)

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/>.