

The documentation and process conversion measures necessary to comply with this revision shall be completed by 30 October 1999

INCH-POUND

MIL-PRF-19500/547B  
30 July 1999  
SUPERSEDING  
MIL-S-19500/547A  
20 January 1988

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, FIELD EFFECT TRANSISTOR, N-CHANNEL,  
SILICON TYPES 2N6660 AND 2N6661  
JAN, JANTX, JANTXV AND JANS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for a N-channel, enhancement-mode, low-threshold logic level, high frequency, high switching speed MOSFET, power transistor. Four levels of product assurance are provided for each encapsulated device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (TO-205AD).

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

Type	$P_T$ 1/ $T_C = +25^\circ\text{C}$	$P_T$ $T_A = +25^\circ\text{C}$	$V_{DS}$	$V_{DGR}$ 3/	$V_{GS}$	$I_{D1}$ 2/ $T_C = +25^\circ\text{C}$	$I_{D2}$ 2/ $T_C = +100^\circ\text{C}$	$I_S$	$I_{DM}$	$T_J$ and $T_{STG}$
	<u>W</u>	<u>mW</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u>A dc</u>	<u>A dc</u>	<u>A(pk)</u>	<u>°C</u> -65 to +150
2N6660	6.25	725	60	60	$\pm 20$	0.99	0.62	-0.99	3	
2N6661	6.25	725	90	90	$\pm 20$	0.86	0.54	-0.86	3	

1/ Derate linearly 0.05 W/°C for  $T_C > +25^\circ\text{C}$

2/ Derate above  $T_C = +25^\circ\text{C}$  according to the formula  $I_D = \sqrt{\frac{P(\text{rated})}{K}}$

where  $P(\text{rated}) = 150 - (T_C - 25) (0.05)$  watts;

$K = \max r_{DS(\text{on})}$  at  $T_J = +150^\circ\text{C}$ .

3/  $R_{GS} \leq 1 \text{ M ohm}$ .

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAC, 3990 East Broad St., Columbus, OH 43216-5000, by using the addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

1.4 Primary electrical characteristics at  $T_C = +25^\circ\text{C}$ .

Type	Min $V_{(BR)DSS}$ $V_{GS} = 0\text{ V}$ $I_D = 10\ \mu\text{A dc}$	$V_{GS(th)1}$ $V_{DS} \geq V_{GS}$ $I_D = 1.0\ \text{mA dc}$	Max $I_{DSS1}$ $V_{GS} = 0\text{ V}$	Max $r_{DS(on)1}$ / $V_{GS} = 10\ \text{V dc}$		$R_{\theta JC}$ Max
			$V_{DS} = 80\ \text{percent}$ of rated $V_{DS}$	$T_J = +25^\circ\text{C}$ at $I_{D1}$	$T_J = +150^\circ\text{C}$ at $I_{D2}$	
	<u>V dc</u>	<u>V dc</u> Min    Max	<u><math>\mu\text{A dc}</math></u>	<u>Ohm</u>	<u>Ohm</u>	<u><math>^\circ\text{C/W}</math></u>
2N6660	60	0.8    2.0	1.0	3.0	6.33	20
2N6661	90	0.8    2.0	1.0	4.0	8.44	20

1/ Pulsed (see 4.5.1).

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 documents cited in section 3 and 4 of this specification, whether or not they are listed.

2.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

MILITARY

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Automated Printing Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Associated specification. The individual item requirements shall be in accordance with MIL-PRF-19500 and as specified herein.

3.2 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.3 Interface requirements and physical dimensions. The interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and figure 1 (TO-205AD) herein.



## MIL-PRF-19500/547B

Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	0.305	0.335	7.75	8.51	
CH	0.240	0.260	6.10	6.60	
HD	0.335	0.370	8.51	9.40	
TW	0.028	0.034	0.71	0.86	2
TL	0.029	0.045	0.74	1.14	3
LD	0.016	0.021	0.41	0.53	7,8
LL	0.500	0.750	12.70	19.05	7,8
LC	0.200 TP		5.08 TP		6
LU	0.016	0.019	0.41	0.48	7,8
L <sub>1</sub>		0.050		1.27	7,8
L <sub>2</sub>	0.250		6.35		7,8
P	0.100		2.54		5
Q		0.050		1.27	4
R		0.010		0.25	9
α	45 TP		45 TP		6

## NOTES:

1. Dimensions are in inches. Metric equivalents are given for general information only.
2. Beyond radius (r) maximum, TW shall be held for a minimum length of 0.011 (0.028 mm).
3. Dimension TL measured from maximum HD.
4. Outline in this zone is not controlled.
5. Dimension CD shall not vary more than 0.010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane 0.054 + 0.001, - 0.000 (1.37 +0.03, -0.00 mm) below seating plane shall be within 0.007 (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
7. LU applies between L<sub>1</sub> and L<sub>2</sub>. LD applies between L<sub>2</sub> and L minimum. Diameter is uncontrolled in L<sub>1</sub> and beyond LL minimum.
8. All three leads.
9. Radius (r) applies to both inside corners of tab.
10. Drain is electrically connected to the case.

FIGURE 1. Physical dimensions(TO-205AD) Continued.

3.3.1 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).

3.3.2 Internal construction. Multiple chip construction shall not be permitted.

3.4 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.5 Electrostatic discharge protection. The devices covered by this specification require electrostatic protection.

3.5.1 Handling. MOS devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. The following handling practices shall be followed:

- a. Devices shall be handled on benches with conductive handling devices.
- b. Ground test equipment, tools, and personnel handling devices.
- c. Do not handle devices by the leads.
- d. Store devices in conductive foam or carriers.
- e. Avoid use of plastic, rubber, or silk in MOS areas.
- f. Maintain relative humidity above 50 percent if practical.
- g. Care shall be exercised, during test and troubleshooting, to apply not more than maximum rated voltage to any lead.
- h. Gate must be terminated to source,  $R \leq 100 \text{ k}$ , whenever bias voltage is to be applied drain to source.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I.

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I herein.

3.8 Qualification. Devices furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified manufacturer's list before contract award (see 4.2 and 6.3 ).

#### 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).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and herein. Alternate flow is allowed for qualification inspection in accordance with figure 4 of MIL-PRF-19500.

4.2.1 Group E inspection. Group E inspection shall be conducted in accordance with MIL-PRF-19500 and herein.

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with table 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 IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
3	Test condition G.	Test condition G.
1/	Method 3161 (see 4.5.3)	Method 3161 (see 4.5.3)
9	$I_{GSS1}$ , $I_{DSS1}$ , gate stress test (see 4.5.5), subgroup 2 of table I herein	Gate stress test (see 4.5.5), subgroup 2 of table I herein
10	Method 1042, test condition B	Method 1042, test condition B
11	Subgroup 2 of table I herein; $I_{GSS1}$ , $I_{DSS1}$ , $r_{DS(on)1}$ , $V_{GS(th)1}$ , $\Delta I_{GSS1} = \pm 10$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 1$ $\mu$ A dc or $\pm 100$ percent of initial value, whichever is greater.	Subgroup 2 of table I herein. $I_{GSS1}$ , $I_{DSS1}$ , $r_{DS(on)1}$ , $V_{GS(th)1}$
12	Method 1042, test condition A and test condition C. (see 4.3.1)	Method 1042, test condition A, (see 4.3.1)
13	Subgroups 2 and 3 of table I herein; $\Delta I_{GSS1} = \pm 10$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 1$ $\mu$ A dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta r_{DS(on)1} = \pm 20$ percent of initial value or $\pm 0.5$ ohm, whichever is greater. $\Delta V_{GS(th)1} = 4 \pm 10$ percent of initial value or $\pm 0.3$ V dc.	Subgroup 2 of table I herein; $\Delta I_{GSS1} = \pm 10$ nA dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 1$ $\mu$ A dc or $\pm 100$ percent of initial value, whichever is greater. $\Delta r_{DS(on)1} = \pm 20$ percent of initial value or $\pm 0.5$ ohm, whichever is greater. $\Delta V_{GS(th)1} = \pm 10$ percent of initial value or $\pm 0.3$ V dc.

1/ Shall be performed anytime before screen 9.

4.3.1 Power burn-in. Power burn-in conditions are as follows: MIL-STD-750, method 3161, condition C,  $T_A = +25^\circ\text{C}$ ,  $-5^\circ\text{C}$ ,  $+10^\circ\text{C}$ ,  $V_{DS} = 10$  V min.;  $I_D$  adjusted to meet a junction temperature of  $140^\circ\text{C}$ ,  $-0^\circ\text{C}$ ,  $+10^\circ\text{C}$ ,  $t = 240$  hours.

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 figure 4 of 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, subgroup 2 herein.

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4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa of MIL-PRF-19500 (JANS) and 4.4.2.1 herein. Electrical measurements (end-points) shall be in accordance with group A, subgroup 2 herein. Delta measurements shall be in accordance with table II herein. See 4.4.2.2 herein and table VIb of MIL-PRF-19500 for JAN, JANTX, and JANTXV group B testing. Electrical measurements (end-points) requirements shall be in accordance with group A, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

4.4.2.1 Group B inspection table VIa (JANS) of MIL-PRF-19500.

Subgroup	Method	Conditions
3	1051	Test condition G.
4	1042	Test condition D; 2,000 cycles. The heating cycle shall be 1 minute minimum. $V_{DS} = 10 \text{ V dc}$ , $P_T = \text{See 1.4 at } T_A = +25^\circ\text{C} \pm 3^\circ\text{C}$ .
5	1042	Accelerated steady-state operation life; test condition C; $T_A = +25^\circ\text{C}$ , $-5^\circ\text{C}$ , $+10^\circ\text{C}$ , $V_{DS} = 10 \text{ V min.}$ ; $I_D$ adjusted to meet a junction temperature of $140^\circ\text{C}$ , $-0^\circ\text{C}$ , $+10^\circ\text{C}$ , $t = 240 \text{ hours}$ .
5	2037	Bond strength (Al-Au die interconnects only); test condition A.
6	3161	See 4.5.2.

4.4.2.2 Group B inspection, table IVb (JAN, JANTX and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
2	1051	Test condition G, 25 cycles.
3	1027	$T_J = P_T (R_{\theta JA}) + P_T = V_{DS} I_D$ ; $V_{DS} = 15 \text{ V dc}$ ; $I_D \leq 0.05 \text{ A dc}$ ; $R_{\theta JA} = 170^\circ\text{C/W}$ ; $T_A = 30^\circ\text{C} \pm 5^\circ\text{C}$ .

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500 and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

Subgroup	Method	Condition
2	2036	Test condition E .
6	1026	$T_J = P_T (R_{\theta JA}) + P_T = V_{DS} I_D$ ; $V_{DS} = 15 \text{ V dc}$ ; $I_D \leq 0.05 \text{ A dc}$ ; $R_{\theta JA} = 170^\circ\text{C/W}$ ; $T_A = 30^\circ\text{C} \pm 5^\circ\text{C}$ .

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table IX of MIL-PRF-19500 and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein. A separate sample may be pulled for each test.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>	<u>Sampling plan</u>
E1	1051	Test condition G, 500 cycles Electrical measurements See table I, subgroup 2.	45 devices, c = 0
E2	1042	Test condition A, 1,000 hours. Electrical measurements See table I, subgroup 2.	45 devices, c = 0
E2	1042	Test condition B, 1,000 hours. Electrical measurements See table I, subgroup 2.	45 devices, c = 0
E3		Not applicable	
E4	3161	R <sub>θJC</sub> see 1.4 herein.	5 devices, c = 0
E5		Not applicable	

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.

4.5.2 Thermal impedance. Thermal impedance measurements shall be performed in accordance with method 3161 of MIL-STD 750.

R<sub>θJC</sub> (max) = 20 °C/W.

- I<sub>M</sub> measuring current .....10 mA.
- I<sub>M</sub> drain heating current.....0.41 A.
- t<sub>H</sub> heating time .....Steady state (see MIL-STD-750, method 3161 for definition).
- V<sub>H</sub> drain-source heating voltage.....10 V.
- t<sub>MD</sub> measurement time delay .....10 to 80 μs.
- t<sub>SW</sub> sample window time .....10 μs (max).

4.5.3 Thermal response (ΔV<sub>SD</sub> measurements). The ΔV<sub>SD</sub> measurements shall be performed in accordance with MIL-STD-750, method 3161. The V<sub>SD</sub> conditions (I<sub>H</sub> and V<sub>H</sub>) and maximum limit shall be derived by each vendor from the thermal response curves and shall be specified in the certificate of conformance prior to qualification. The following parameter measurements shall apply.

- I<sub>M</sub> measuring current .....10 mA.
- I<sub>M</sub> drain heating current.....0.41 A.
- T<sub>H</sub> heating time .....Steady state (see MIL-STD-750, method 3161 for definition).
- V<sub>H</sub> drain-source heating voltage.....10 V.
- t<sub>MD</sub> measurement time delay .....10 to 80 μs.
- t<sub>SW</sub> sample window time .....10 μs (max).

4.5.4 Unclamped inductive switching.

- a. Peak current ( $I_D$ ) (see 1.4 herein).
- b. Peak gate voltage ( $V_{GS}$ ) .....10 V.
- c. Gate to source resistor ( $R_{GS}$ ) ..... $25\Omega \leq R_{GS} \leq 200\Omega$ .
- d. Initial case temperature ( $T_C$ ) .....+25°C, +10°C, -5°C.
- e. Inductance (L).....100  $\mu$ H  $\pm$ 10 percent.
- f. Number of pulses to be applied .....1 pulse minimum.
- g. Pulse repetition rate .....None.

4.5.5 Gate stress test.

$V_{GS} = \pm 30$  V minimum.

$t = 250$   $\mu$ s minimum.

TABLE I. Group A inspection.

Inspection 1/  	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical Inspection	2071					
<u>Subgroup 2</u>						
Breakdown voltage, drain to Source	3407	Bias condition C, $V_{GS} = 0$ V; $I_D = 1.0$ $\mu$ A dc	$V_{(BR)DSS}$	60 90		
2N6660 2N6661						
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$ ; $I_D = -1.0$ mA dc	$V_{GS(th)1}$	0.8	2.0	V dc
Gate current	3411	Bias condition C; $V_{DS} = 0$ V; $V_{GS} = +20$ and $-20$ V dc	$I_{GSS1}$		$\pm 100$	nA dc
Drain current	3413	$V_{GS} = 0$ ; bias condition C; $V_{DS} = 80$ percent of rated $V_{DS}$ (see 1.3)	$I_{DSS1}$		1.0	$\mu$ A dc
Drain to source on-state voltage	3405	$V_{GS} = 10$ V dc; condition A; pulsed (see 4.5.1), $I_D = -1.0$ A dc	$V_{DS(on)1}$		3.0 4.0	V
2N6660 2N6661						
Drain to source on-state voltage	3405	$V_{GS} = 5$ V dc; condition A; pulsed (see 4.5.1), $I_D = 0.3$ A dc	$V_{DS(on)2}$		1.5 1.6	V
2N6660 2N6661						
Static drain to source on-state resistance	3421	$V_{GS} = 10$ V dc; condition A; pulsed (see 4.5.1); $I_D = 1.0$ A dc	$r_{DS(on)1}$		3.0 4.0	ohms
2N6660 2N6661						
Static drain to source on-state resistance	3421	$V_{GS} = 5$ V dc; condition A; pulsed (see 4.5.1); $I_D = 10.3$ A dc	$r_{DS(on)2}$		5.0 5.3	ohms
2N6660 2N6661						
Forward voltage (source drain diode)	4011	Pulsed (see 4.5.1); $V_{GS} = 0$ V	$V_{SD}$			V (pk)
2N6660 2N6661		$I_S = 0.99$ A dc $I_S = 0.86$ A dc		0.7 0.7	1.6 1.4	

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> continued						
Forward transconductance  2N6660 2N6661	3475	Pulsed (see 4.5.1), $V_{DS} = V_{GS} = 7.5$ V dc  $I_{D1} = 525$ m A dc $I_{D2} = 475$ m A dc	$g_{FS}$	170		ms
<u>Subgroup 3</u>						
High temperature operation:		$T_C = +125^\circ\text{C}$				
Gate current	3411	Bias condition C, $V_{DS} = 0$ V; $V_{GS} = +20$ V dc and $-20$ V dc	$I_{GSS2}$		$\pm 500$	nA dc
Drain current	3413	Bias condition C, $V_{GS} = 0$ V, $V_{DS} = -80$ percent of rated $V_{DS}$ (see 1.3)	$I_{DSS2}$		100	$\mu\text{A}$ dc
Drain to source on-state voltage  2N6660 2N6661	3405	$V_{GS} = 10$ V dc; condition A; pulsed (see 4.5.1), $I_D = 1$ A dc	$V_{DS(on)3}$		5.6 7.5	V
Static drain to source on-state resistance  2N6660 2N6661	3421	$V_{GS} = 10$ V dc; condition A; pulsed (see 4.5.1); $I_D = 1.0$ A dc	$r_{DS(on)3}$		5.6 7.5	ohms
Gate to source voltage(threshold)	3403	$V_{DS} \geq V_{GS}$ ; $I_D = -1.0$ mA dc	$V_{GS(th)2}$	0.3		V dc
Low temperature operation:		$T_C = -55^\circ\text{C}$				
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$ ; $I_D = 1.0$ mA	$V_{GS(th)3}$		2.5	V dc
<u>Subgroup 4</u>						
Switching time test	3472	$R_{gen} = 50 \Omega$ ; $R_{GS} = 50 \Omega$ ,				
Turn-on delay time		$V_{DD} = 25$ V dc; $I_D \cong 1$ A dc	$t_{d(on)}$		10	ns
Turn-off delay time		$V_{DD} = 25$ V dc; $I_D \cong 1$ A dc	$t_{d(off)}$		10	ns

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <sup>1/</sup>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> - Continued.						
Small signal common source short-circuit input capacitance	3431	$V_{DS} = 25 \text{ V dc}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$	$C_{iss}$		50	pF
Small signal common source short-circuit output capacitance		$V_{DS} = 25 \text{ V dc}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz},$	$C_{oss}$		40	pF
Small signal common source short-circuit reverse transfer capacitance	3433	$V_{DS} = 25 \text{ V dc}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$	$C_{rss}$		10	pF
<u>Subgroup 5</u>						
Safe operating area		See figure 2				
High voltage test		$V_{DS} = 80 \text{ percent of rated } V_{DS} \text{ (see 1.3)}$				
Electrical measurements		See table I, subgroup 2.				
<u>Subgroups 6 and 7</u>						
Not applicable						

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

TABLE II. Group B, C and E delta measurements. 1/ 2/ 3/ 4/

Step	Inspection 5/	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1.	Gate current	3411	Bias condition C; $V_{DS} = 0$ V $V_{GS} = +15$ V dc and $-15$ V dc	$\Delta I_{GSS}$	$\pm 10$ nA dc or 100 percent of initial value, whichever is greater.		
2.	Drain cutoff current	3413	Bias condition C; $V_{GS} = +15$ V dc and $-15$ V dc $V_{DS} = 60$ V for 2N6660 $V_{DS} = 90$ V for 2N6661	$\Delta I_{DSS}$	$\pm 1$ $\mu$ A dc or 100 percent of initial value, whichever is greater.		
3.	Small signal, drain to source on-state resistance	3423	$V_{GS} = 10$ V dc; condition A, pulsed (see 4.5.1); $I_D = 1.0$ A dc $f =$ kHz	$\Delta r_{DS(on)}$	$\pm 0.5$ ohm or $\pm 20$ percent of initial value, whichever is greater.		
4.	Gate to source voltage (threshold)	3403	$V_{DS} = V_{GS}$ ; $I_D = 1.0$ mA dc	$\Delta V_{GS(th)}$	$\pm 10$ percent of initial value or $\pm 0.3$ V dc, whichever is greater.		
5.	Thermal resistance	3161	See 4.5.2	$R_{\theta JC}$		20	$^{\circ}\text{C}/\text{W}$

1/ The delta measurements for table VIa (JANS) of MIL-PRF-19500 are as follows:

- a. Subgroup 3, see table II herein, step 1.
- b. Subgroup 4, see table II herein, step 5.

2/ The delta measurements for table VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500 are as follows:

- a. Subgroup 3, see table II herein, step 5.

3/ The delta measurements for table VII of MIL-PRF-19500 are as follows:

- a. Subgroup 6, see table II herein, step 5.

4/ The delta measurements for table IX of MIL-PRF-19500 are as follows:

- a. Subgroup 1, see table II herein, step 1.
- b. Subgroup 2, see table II herein, step 1.

5/ See MIL-PRF-19500 for sampling plan.

ACTIVE REGION

2N6660

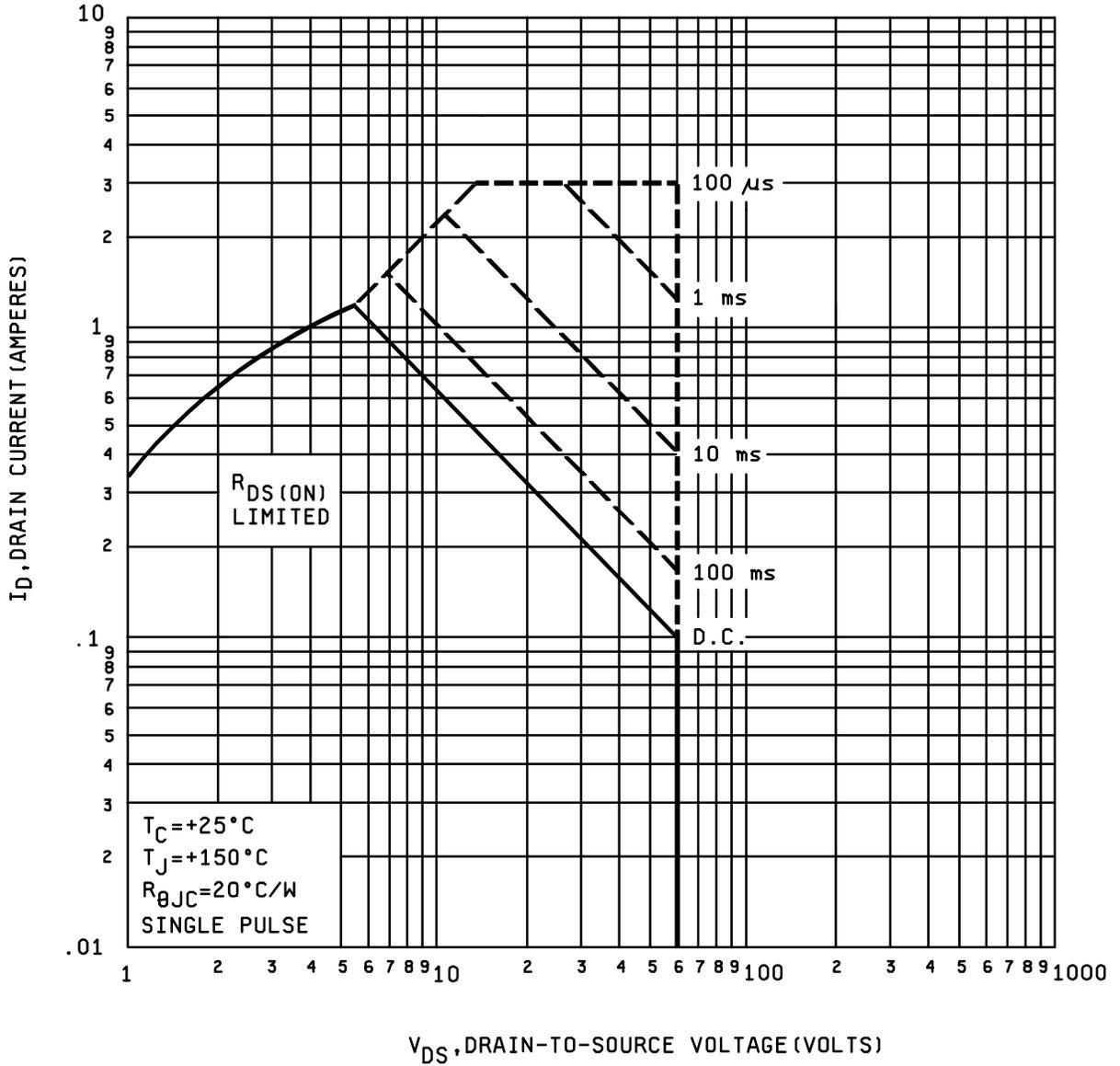


FIGURE 2. Maximum safe operating area.

ACTIVE REGION

2N6661

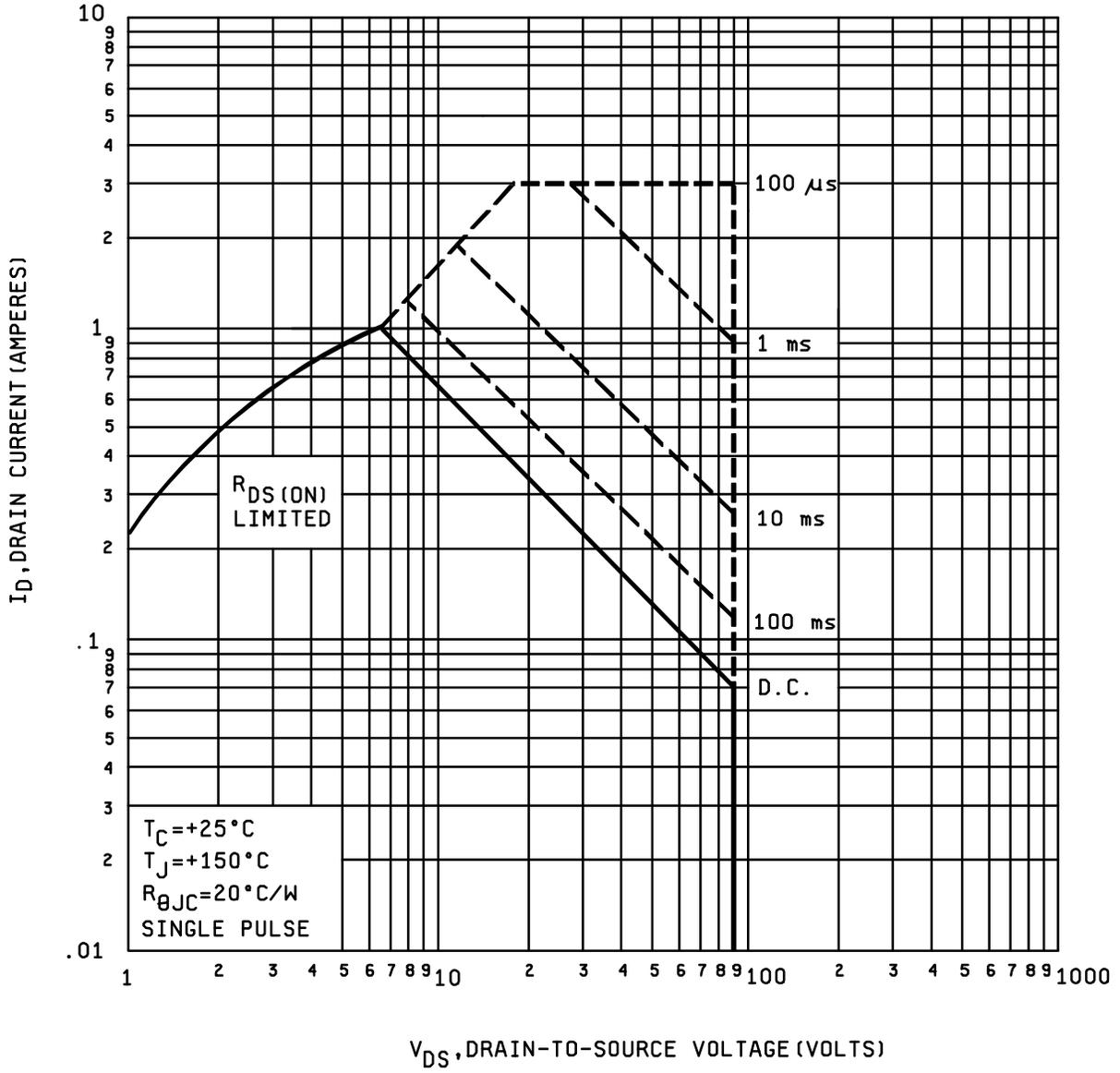


FIGURE 2. Maximum safe operating area continued.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' 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.)

6.1 Notes. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Issue of DODISS to be cited in the solicitation (see 2.2.1).
- b. The lead finish as specified (see 3.3.1).
- c. Type designation and quality assurance level.
- d. Packaging requirements (see 5.1).

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 Manufacturer's 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, DSCC-VQE, Columbus, OH 43216.

6.4 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - CR  
Navy - EC  
Air Force - 11  
DLA - CC

Preparing activity:

DLA - CC  
(Project 5961- 2080)

Review activities:

Navy - TD  
Air Force - 13, 19, 99

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**

**INSTRUCTIONS**

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>I RECOMMEND A CHANGE:</b>	<b>1. DOCUMENT NUMBER</b> MIL-PRF-19500/547B	<b>2. DOCUMENT DATE (YYMMDD)</b> 990730
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**3. DOCUMENT TITLE**  
SEMICONDUCTOR DEVICE, FIELD EFFECT TRANSISTOR, N-CHANNEL, SILICON TYPES 2N6660 AND 2N6661 JAN, JANTX, JANTXV AND JANS

**4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)**

**5. REASON FOR RECOMMENDATION**

<b>6. SUBMITTER</b>		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) Commercial DSN FAX EMAIL	7. DATE SUBMITTED (YYMMDD)

<b>8. PREPARING ACTIVITY</b>			
a. Point of contact: Alan Barone,	b. TELEPHONE Commercial 614-692-0510	DSN 850-0510	FAX 614-692-6939
c. ADDRESS : Defense Supply Center Columbus, ATTN: DSCC-VAC, 3990 East Broad Street, Columbus, OH 43216-5000		EMAIL alan_barone@dsccl.dla.mil	
<b>IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:</b> Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-68880			