The documentation and process conversion measures necessary to comply with this revision shall be completed by 30 November 2004.

INCH-POUND

MIL-PRF-19500/604B
30 July 2004
SUPERSEDING
MIL-PRF-19500/604A
21 June 1999

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, FIELD EFFECT RADIATION HARDENED (TOTAL DOSE CHARACTERIZATION ONLY) TRANSISTORS, N-CHANNEL, SILICON, TYPES 2N7272, 2N7275, 2N7278, AND 2N7281, JANTXVM, D, AND R, AND JANSM, D, AND R

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 an N-channel, enhancement-mode, MOSFET, radiation hardened (total dose characterization only), power transistor. Two levels of product assurance are provided for each device type specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1, similar to TO-205AF.

* 1.3 Maximum ratings. $T_A = +25°C$ unless otherwise specified.

Type	P_T (1) T_C = +25°C	V_{DS}	V_{DG}	V_{GS}	I_{D1} (2) (3) T_C = +25°C	I_{D2} T_C = +100°C	I_S (2)	I_{DM}	T_J and T_{STG}	V_{ISO} 70,000 feet altitude
	W	V dc	V dc	V dc	A dc	A dc	A dc	A (pk)	°C	V dc
2N7272	25	100	100	±20	8.0	5.0	8.0	24	-55	
2N7275	25	200	200	±20	5.0	3.0	5.0	15	to	
2N7278	25	250	250	±20	4.0	2.0	4.0	12	+150	250
2N7281	25	500	500	±20	2.0	1.0	2.0	6		500

(1) Derate linearly 0.2°C/W for $T_C > +25°C$.
(2) The following formula derives the maximum theoretical I_D limit. I_D is limited by package and internal wires and may be limited by pin diameter:

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

(3) See figure 2, maximum drain current graphs.

* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dscc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://www.dodssp.daps.mil/.

1.4 Primary electrical characteristics at T_C = +25°C.

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 I_D = 1.0 mA dc	$V_{GS(th)1}$ V_{DS} = V_{GS} I_D = 1.0 mA dc		Max I_{DSS1} V_{GS} = 0 V_{DS} = 80 percent of rated V_{DS}	Max $r_{DS(on)}$ (1) V_{GS} = 10 V dc		$R_{\theta JC}$ max	I_{AS} = I_{DM}	E_{AS} at I_{AS}
					T_J = +25°C at I_{D2}	T_J = +125°C at I_{D2}			
		V dc							
	V dc	Min	Max	µA dc	ohm	ohm	°C/W	A(pk)	mJ
2N7272	100	2.0	4.0	25	0.18	0.36	5.00	24	29
2N7275	200	2.0	4.0	25	0.50	1.10	5.00	15	11
2N7278	250	2.0	4.0	25	0.70	1.68	5.00	12	7
2N7281	500	2.0	4.0	25	2.50	6.50	5.00	6	2

(1) Pulsed (see 4.5.1).

2. APPLICABLE DOCUMENTS

* 2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

* 2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

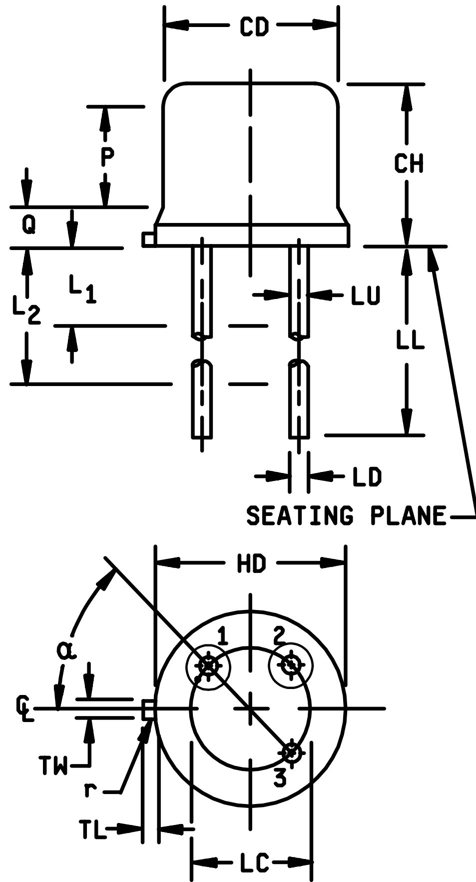
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

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

* (Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://www.dodssp.dap.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. 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.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
CD	.315	.335	8.01	8.50
CH	.160	.180	4.07	4.57
HD	.350	.370	8.89	9.39
LC	.190	.210	4.83	5.33
LD	.016	.023	0.41	0.58
LL	.500	.560	12.7	14.22
LU	.016	.021	0.41	0.53
L1		.050		1.27
L2		.250		6.35
P		.100		2.54
Q		.040		1.02
r		.010		0.018
TL	.029	.045	0.74	1.14
TW	.028	.034	0.72	0.86
α	45° TP		45° TP	
Term 1	Source			
Term 2	Gate			
Term 3	Drain			

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Terminals 1 and 2 are isolated from case, terminal 3 is butt welded to stem base.
4. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

* FIGURE 1. Dimensions and configuration (similar to TO-205).

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 manufacturers 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 and as follows.

I_{AS} - Rated avalanche current, nonrepetitive
nC - nano coulomb

* 3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1.

* 3.4.1 Lead material and finish. Lead material shall be Kovar or Alloy 52; a copper core or plated core is permitted. Lead finish shall be solderable in accordance with MIL-PRF-19500 and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition requirement (see 6.2).

* 3.4.2 Internal construction. Multiple chip construction is not permitted to meet the requirements of this specification.

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

3.5.1 Handling. MOS devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. However, the following handling practices are recommended (see 3.5).

a. Devices should 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 should be exercised during test and troubleshooting to apply not more than maximum rated voltage to any lead.

h. Gate must be terminated to source, $R \leq 100$ kΩ, whenever bias voltage is to be applied drain to source.

* 3.6 Marking. Marking shall be in accordance with MIL-PRF-19500. At the option of the manufacturer, marking of the country of origin may be omitted from the body of the transistor, but shall be retained on the initial container.

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

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

* 3.9 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

* 4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Screening (see 4.3).

c. Conformance inspection (see 4.4 and tables I and II).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500, and as specified herein. Alternate flow is allowed for qualification inspection in accordance with MIL-PRF-19500.

* 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 shall be performed on the first inspection lot of this revision to maintain qualification.

* 4.3 Screening (JANTXV and JANS 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) (1) (2)	Measurement	
	JANS level	JANTXV levels
(3)	Gate stress test (see 4.3.1)	Gate stress test (see 4.3.1)
(3)	Method 3470 of MIL-STD-750, (see 4.3.2)	Method 3470 of MIL-STD-750, (see 4.3.2)
(3) 3c	Method 3161 of MIL-STD-750, (see 4.3.3)	Method 3161 of MIL-STD-750, (see 4.3.3)
9	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, subgroup 2 of table I herein	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}, $R_{DS(on)}$, $V_{GS(TH)}$ Subgroup 2 of table I herein; ΔI_{GSSF1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±25 µA dc or ±100 percent of initial value, whichever is greater.	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, $R_{DS(on)}$, $V_{GS(th)}$ Subgroup 2 of table I herein
12	Method 1042 of MIL-STD-750, test condition A	Method 1042 of MIL-STD-750, test condition A or T_A = +175°C and t = 48 hours min (4)
13	Subgroups 2 and 3 of table I herein; ΔI_{GSSF1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±25 µA dc or ±100 percent of initial value, whichever is greater. $\Delta R_{DS(on)1}$ = ±20 percent of initial value. $\Delta V_{GS(th)1}$ = ±20 percent of initial value.	Subgroups 2 and 3 of table I herein. ΔI_{GSSF1} = ±20 nA dc or 100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or 100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±25 µA dc or 100 percent of initial value, whichever is greater. $\Delta R_{DS(on)1}$ = ±20 percent of initial value. $\Delta V_{GS(th)1}$ = ±20 percent of initial value.

(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 before screen 9.
(4) Use of this accelerated screening option requires a 1,000-hour life test in accordance with the applicable group E, subgroup 2 life test, and end-points specified herein to be provided to the qualifying activity for review and acceptance.

* 4.3.1 Gate stress test. Apply V_{GS} = -30 V minimum for t = 250 μs minimum.

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

a. $I_{AS} = I_{DM}$.

b. L = .1 mH.

c. $E_{AS} = 1/2\ L I_{AS}^2$.

d. Initial junction temperature = +25°C,+10°C, -5°C.

* 4.3.3 Thermal response (ΔV_{SD} measurement). The delta V_{SD} measurement shall be performed in accordance with method 3161 of MIL-STD-750. The delta V_{SD} conditions (I_H and V_H) and maximum limit shall be derived by each vendor from the thermal response curves (see figure 3). The following parameter measurements shall apply:

a. Measuring current (I_M) ....10 mA.

b. Heating time (t_H) ....10 ms.

c. Measurement time delay (t_{MD}) ....30 to 60 μs.

d. Sample window time (t_{SW}) ....10 μs maximum.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein. 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 appendix E of MIL-PRF-19500 and table I herein. (End-point electrical measurements shall be in accordance with table I, subgroup 2 herein.)

* 4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in tables VIa (JANS) and VIb (JANTXV) of MIL-PRF-19500 and herein. Electrical measurements (end-points) shall be in accordance with the applicable inspections of table I, subgroup 2 herein.

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

	Subgroup	Method	Condition
	B3	1051	Condition G, 100 cycles.
	B4	1042	Condition D, 2,000 cycles. No heat sink or forced air cooling on the device shall be permitted during the on cycle. t_{on} = 30 seconds minimum.
*	B4		Electrical measurements: In addition to table I, subgroup 2, ΔV_{SD} shall be measured in accordance with 4.3.3.
*	B5	1042	Condition A; V_{DS} = 100 percent of rated; T_A = +175°C, t = 120 hours, or T_A = +150°C, t = 240 hours minimum.
	B5	1042	Condition B; V_{GS} = 100 percent of rated; T_A = +175°C; t = 24 hours minimum.
*	B5	2037	Bond strength, test condition A.
	B6	3161	See 4.5.2.

* 4.4.2.2 Group B inspection, table VIb (JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
B2	1051	Test condition G, 25 cycles.
B3	1042	The heating cycle shall be 30 seconds minimum.
B5		Not applicable.
B6		Not applicable.

* 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.

	Subgroup	Method	Condition
	C2	2036	Terminal strength, test condition E, weight = 8 oz., 3 arcs.
*	C5	3161	See 4.5.2.
	C6	1042	Test condition D, 6,000 cycles; heating cycle = 30 sec. min.

4.4.4 Group D Inspection. Group D inspection shall be conducted in accordance with 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 IX of MIL-PRF-19500 and as specified in table III herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 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 measurements shall be as specified in section 4 of MIL-STD-750.

4.5.2 Thermal resistance. Thermal resistance measurements shall be performed in accordance with method 3161 of MIL-STD-750. The maximum limit of $R_{\theta JC(max)}$ = 5.00°C/W. The following parameter measurements shall apply:

a. Measuring current (I_M) ....10 mA.

b. Drain heating current (I_H) ....1 A.

c. Heating time (t_H) ....Steady-state (see method 3161 of MIL-STD-750 for definition).

d. Drain-source heating voltage (V_H) ....25 V.

e. Measurement time delay (t_{MD}) ....30 to 60 µs.

f. Sample window time (t_{SW}) ....10 µs maximum.

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
* Thermal impedance	3161	See 4.3.3	ΔV_{SD}		See 4.3.3	
Breakdown voltage, drain to source	3407	V_{GS} = 0; I_D = 1 mA dc, bias condition C	$V_{(BR)DSS}$			
2N7272				100		V dc
2N7275				200		V dc
2N7278				250		V dc
2N7281				500		V dc
Gate to source voltage (threshold)	3403	V_{DS} = V_{GS}, I_D = 1 mA dc	$V_{GS(th)1}$	2.0	4.0	V dc
Gate current	3411	V_{GS} = +20 V dc bias condition C, V_{DS} = 0	I_{GSSF1}		+100	nA dc
Gate current	3411	V_{GS} = -20 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}		25	µa dc
Static drain to source on state resistance	3421	V_{GS} = 10 V dc, condition A, pulsed (see 4.5.1), Id = Id2	$r_{DS(on)1}$			
2N7272					0.18	Ω
2N7275					0.50	Ω
2N7278					0.70	Ω
2N7281					2.50	Ω
Static drain to source on state resistance	3421	V_{GS} = 10 V dc, condition A, pulsed (see 4.5.1), Id = Id1	$r_{DS(on)2}$			
2N7272					0.189	Ω
2N7275					0.525	Ω
2N7278					0.735	Ω
2N7281					2.630	Ω
Forward voltage	4011	Pulsed (see 4.5.1), Id = Id1; V_{GS} = 0	V_{SD}		1.8	V dc
Subgroup 3						
High temperature operation		T_C = T_J = +125°C				
Reverse gate current	3411	V_{GS} = +20 and -20 V dc, bias condition C, V_{DS} = 0	I_{GSS2}		±200	nA dc
Drain current	3413	V_{GS} = 0, bias condition C; V_{DS} = 100 percent of rated V_{DS}	I_{DSS2}		1.0	mA dc
Drain current		V_{DS} = 80 percent of rated V_{DS}	I_{DSS3}		0.25	mA dc

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 3 - Continued.						
Static drain to source on state resistance	3421	V_{GS} = 10 V dc, pulsed (see 4.5.1), Id = Id2	$r_{DS(on)3}$			
2N7272					0.36	Ω
2N7275					1.10	Ω
2N7278					1.68	Ω
2N7281					6.50	Ω
Gate to source voltage (threshold)	3403	V_{DS} = V_{GS}, I_D = 1 mA dc	$V_{GS(th)2}$	1.0		V dc
Low temperature operation		T_C = T_J = -55°C				
Gate to source voltage (threshold)	3403	V_{DS} = V_{GS}, I_D = 1 mA dc	$V_{GS(th)3}$		5.0	V dc
Subgroup 4						
Switching time test	3472	I_D = I_{D1}, V_{GS} = 10 V dc, R_G = 25Ω, V_{DD} = 50 percent of rated V_{DS}				
Turn-on delay time			$t_{d(on)}$			
2N7272					35	ns
2N7275					35	ns
2N7278					35	ns
2N7281					46	ns
Rise time			t_r			
2N7272					210	ns
2N7275					140	ns
2N7278					85	ns
2N7281					58	ns
Turn-off delay time			$t_{d(off)}$			
2N7272					200	ns
2N7275					172	ns
2N7278					195	ns
2N7281					208	ns
Fall time			t_f			
2N7272					145	ns
2N7275					80	ns
2N7278					75	ns
2N7281					54	ns
Subgroup 5						
Safe operating area test	3474	See figure 4; t_p = 10 ms minimum, V_{DS} = 80 percent of max rated V_{DS} ($V_{DS} \leq 200$)				
Electrical measurements		See table I, subgroup 2 herein.				
Subgroup 6						
Not applicable						

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 7						
Gate charge	3471	Condition A or B				
On-state gate charge		$I_D = I_{D1}$; $V_{GS} \leq 20V$; $I_{GS1} = I_{GS2}$	$Q_{g(on)}$			
2N7272					76	nC
2N7275					60	nC
2N7278					62	nC
2N7281					64	nC
Gate to source charge			Q_{gs}			
2N7272					13	nC
2N7275					12	nC
2N7278					12	nC
2N7281					12	nC
Gate to drain charge			Q_{gd}			
2N7272					38	nC
2N7275					29	nC
2N7278					30	nC
2N7281					32	nC
Reverse recovery time	3473	di/dt = 100 A/µs, $V_{DD} \leq 30$ V, Id = Id1	t_{rr}			
2N7272					450	ns
2N7275					600	ns
2N7278					800	ns
2N7281					900	ns

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

TABLE II. Group D inspection.

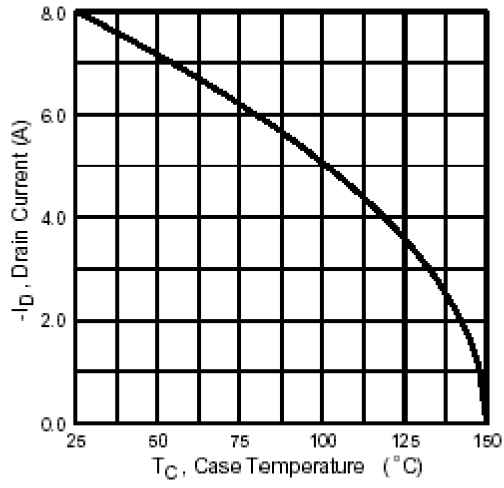
Inspection 1/ 2/ 3/	MIL-STD-750 Method	MIL-STD-750 Conditions	Symbol	Pre-irradiation limits M, D, and R Min	Pre-irradiation limits M, D, and R Max	Post-irradiation limits M, D, and R Min	Post-irradiation limits M, D, and R Max	Unit
Subgroup 1								
Not applicable								
Subgroup 2		T_C = + 25°C						
Steady-state total dose irradiation	1019	2/ 3/						
End-point electricals								
Breakdown voltage, drain to source	3407	V_{GS} = 0; I_D = 1 mA; bias condition C	$V_{(BR)DSS}$					
2N7272				100		100		V dc
2N7275				200		200		V dc
2N7278				250		250		V dc
2N7281				500		500		V dc
Gate to source voltage (threshold)	3403	V_{DS} = $V_{GS;}$ I_D = 1 mA	$V_{GS(th)1}$	2	4	2	4	V dc
Gate current	3411	V_{GS} = 20 V; V_{DS} = 0; bias condition C	I_{GSSF1}		100		100	nA dc
Gate Current	3411	V_{GS} = -20 V; V_{DS} = 0, bias condition C	I_{GSSR1}		-100		-100	nA dc
Drain current	3413	V_{GS} = 0; V_{DS} = 80 percent of rated V_{DS} (preirradiation); bias condition C	I_{DSS1}		25		25	μA dc
Static drain to source on-state resistance	3421	V_{GS} = 10 V, condition A, pulsed, see 4.5.1; I_D = I_{D2}	$R_{DS(on)1}$					
2N7272					0.180		0.180	Ω
2N7275					0.500		0.500	Ω
2N7278					0.700		0.700	Ω
2N7281					2.50		2.50	Ω
Drain to source on-state voltage	3405	V_{GS} = 10 V, condition A, pulsed, see 4.5.1; I_D = I_{D1}	$V_{DS(on)}$					
2N7272					1.51		1.51	V dc
2N7275					2.63		2.63	V dc
2N7278					2.94		2.94	V dc
2N7281					5.25		5.25	V dc

1/ For sampling plan see MIL-PRF-19500.
2/ Inspection requires all subgroup 2 (group D) measurements after exposure to both of the following insitu bias conditions: V_{GS} = 10 V; V_{DS} = 0; V_{GS} = 0 V; V_{DS} = 80 percent of rated V_{DS}.
3/ Each bias condition requires a separate total dose sample.

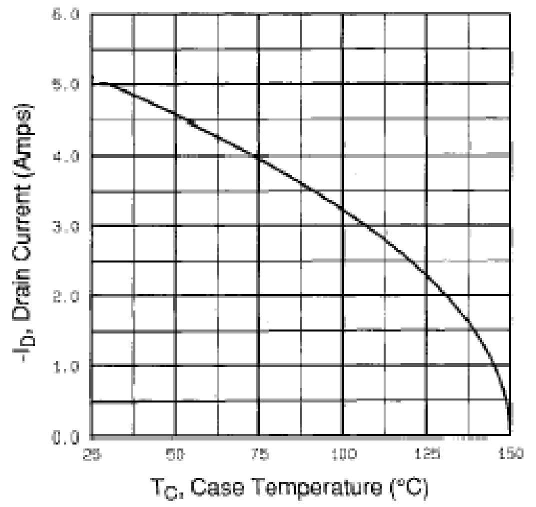
* TABLE III. Group E inspection (all quality levels) for qualification or re-qualification only.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
Subgroup 1			12 devices c = 0
Temperature cycling	1051	-55°C to +150°C, 500 cycles	
Hermetic seal Fine leak Gross leak	1071	 Test conditions G or H Test conditions C or D	
Electrical measurements		Table I, subgroup 2 herein.	
Subgroup 2 1/			12 devices c = 0
Steady-state reverse bias	1042	Condition A, 1,000 hours.	
Electrical measurements		Table I, subgroup 2 herein.	
Steady-state gate bias	1042	Condition B, 1,000 hours.	
Electrical measurements		Table I, subgroup 2 herein.	
Subgroup 3			3 devices c = 0
DPA	2102		
Subgroup 4			Sample size N/A
Thermal impedance curves		Each supplier shall submit their qual-lot average and design maximum thermal impedance curves. In addition, the optimal test conditions and $Z_{\theta JX}$ limit shall be provided to the qualifying activity in the qualification report	
Subgroup 5			15 devices c = 0
Barometric pressure 2N7278 2N7281	1001		
Subgroup 6			3 devices
ESD	1020	Not required for devices classified as ESD class 1.	
Subgroup 8			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	

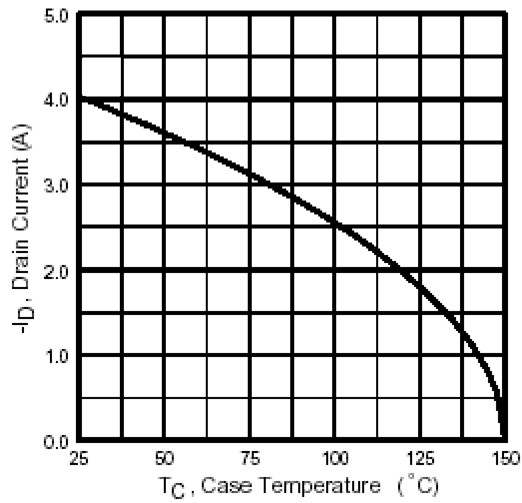
1/ A separate sample for each test shall be pulled.



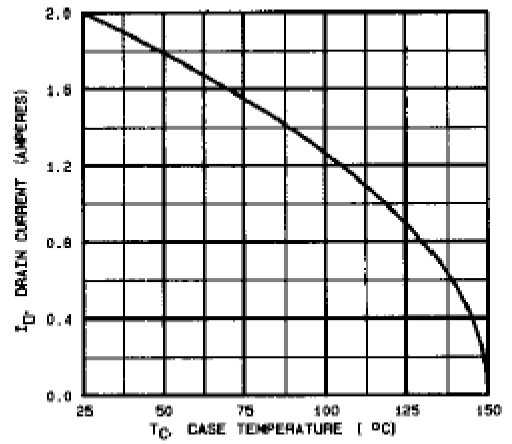
2N7272



2N7275

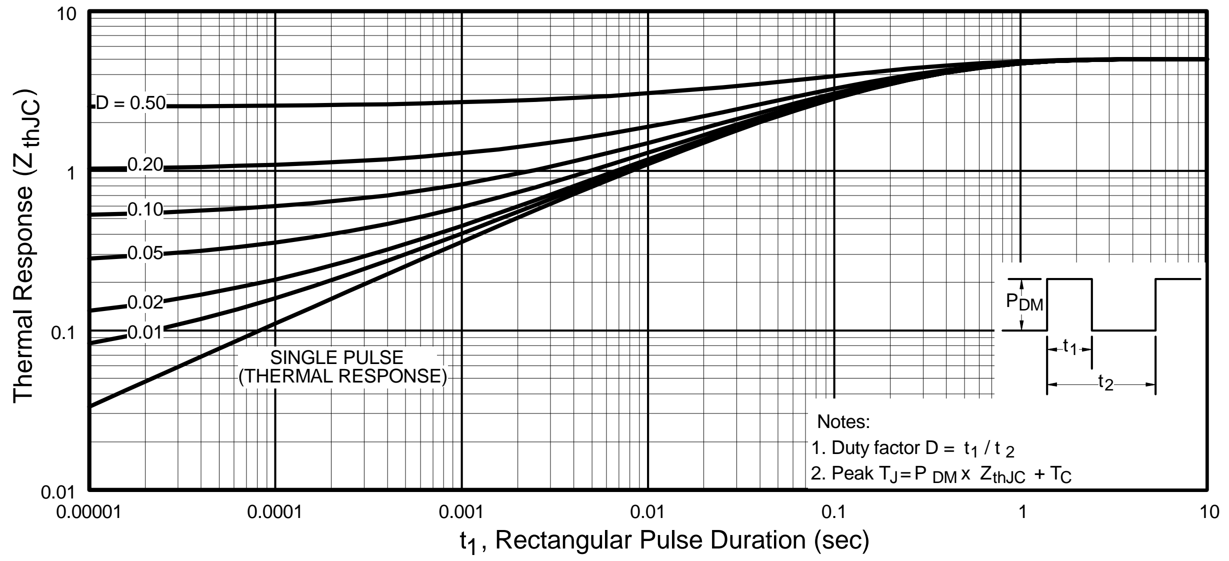


2N7278

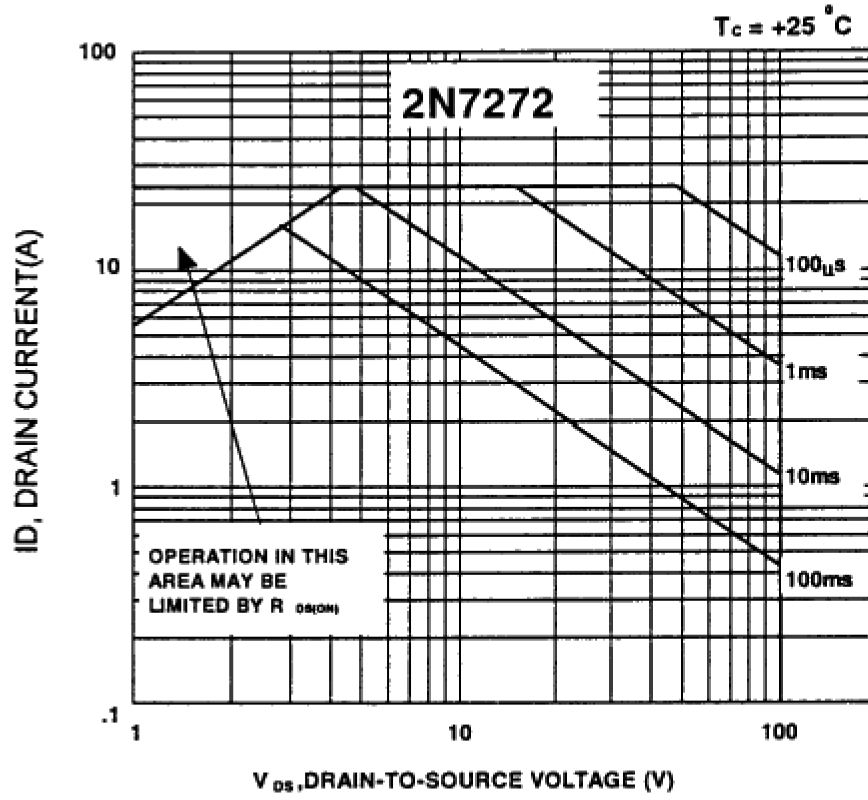


2N7281

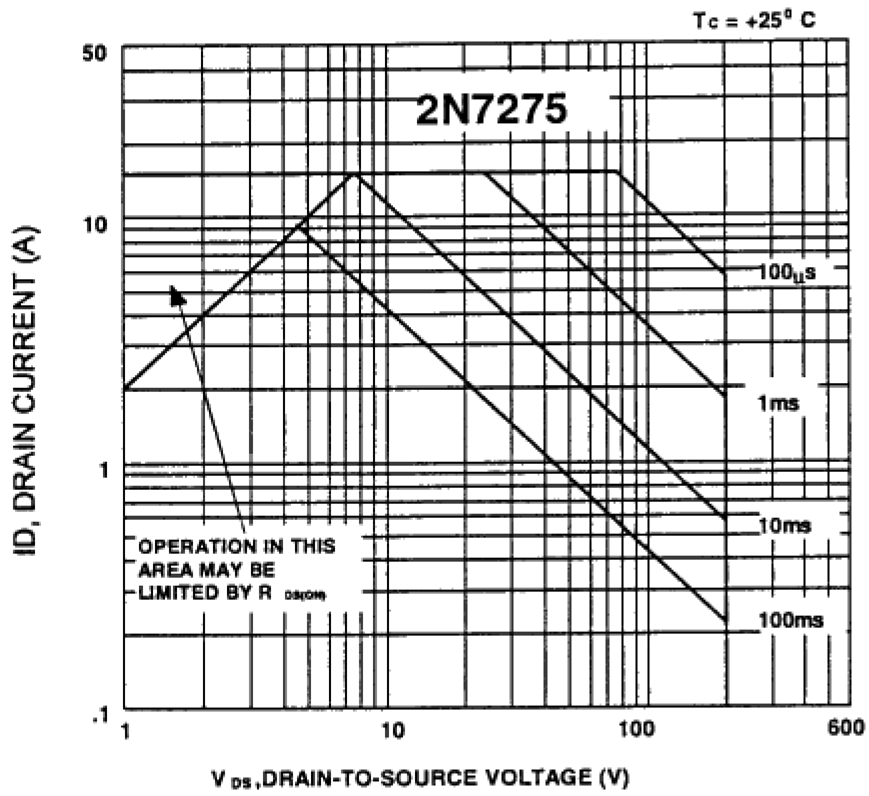
* FIGURE 2. Maximum drain current vs case temperature graphs.



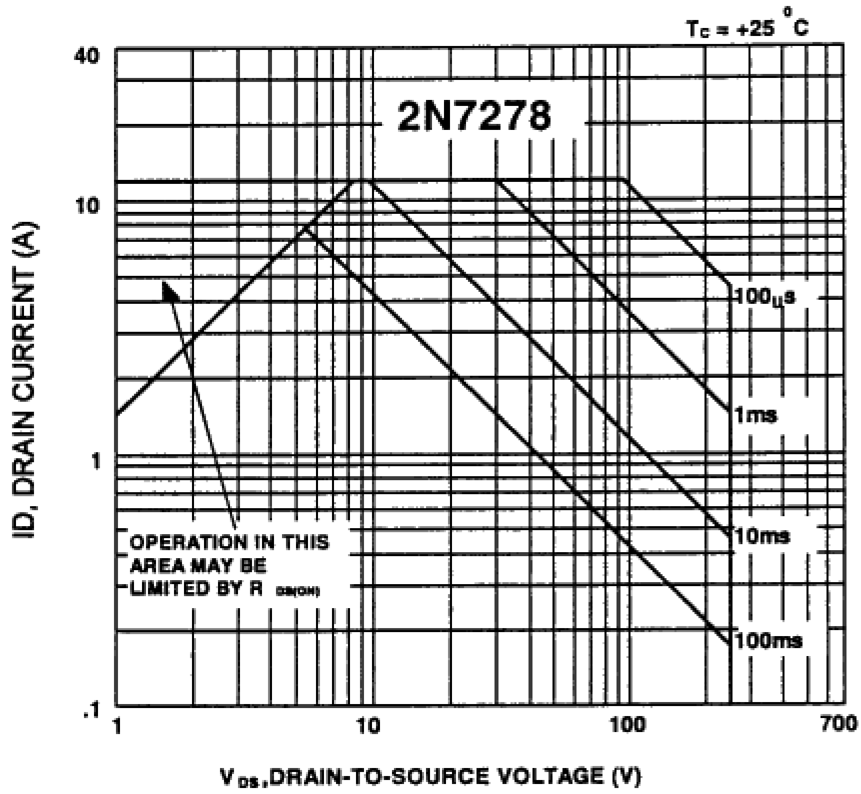
* FIGURE 3. Thermal response curves.



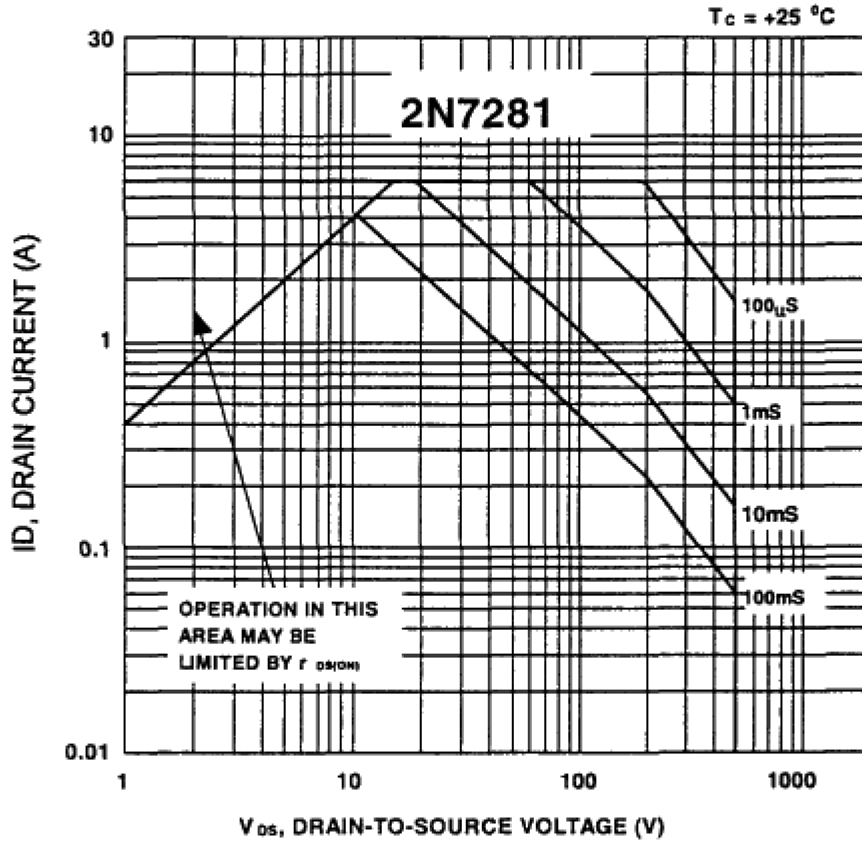
* FIGURE 4. Safe operating area graphs.



* FIGURE 4. Safe operating area graphs - Continued.



* FIGURE 4. Safe operating area graphs - Continued.



* FIGURE 4. Safe operating area graphs - 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 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.)

* 6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

* 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 material and finish (see 3.4.1).

d. Type designation and product assurance level.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil.

* 6.4 Substitution information. Devices covered by this specification are substitutable for the manufacturer's and user's Part or Identifying Number (PIN). This information in no way implies that manufacturer's PIN's are suitable for the military PIN.

Preferred types military PIN	Commercial types
2N7272	FRL130 (1)
2N7275	FRL230 (1)
2N7278	FRL234 (1)
2N7281	FRL430 (1)

(1) FRLxxxM, FRLxxxD FRLxxxR, 3 k, 10 k, 100 k RAD(Si)

* 6.5 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 - 11
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2845)

Review activities:
Army - AV, MI
Navy - TD
Air Force - 19, 70

* 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 http://www.dodssp.daps.mil/ .