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INCH-POUND

MIL-PRF-19500/565B
21 May 1999
SUPERSEDING
MIL-S-19500/565A
7 October 1987

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, FIELD EFFECT TRANSISTOR, P-CHANNEL, SILICON TYPES 2N6895, 2N6896, 2N6897, AND 2N6898 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 P-channel, enhancement-mode, 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 figures 1 and 2, TO-205AF (formerly TO-39) for 2N6895, TO-204AA for 2N6896 and 2N6897; and TO-204AE for 2N6898 (formerly TO – 3).

1.3 Maximum ratings. Unless otherwise specified, T_A = +25°C.

Type	P_T 1/ T_C = +25°C	P_T T_A = +25°C	V_{DS}	V_{DG}	V_{GS}	I_{D1} 2/ T_C = +25°C	I_{D2} 2/ T_C = +100°C	I_S	I_{DM}	T_J and T_{STG}
	W	W	V dc	V dc	V dc	A dc	A dc	A dc	A(pk)	°C
			100	100	±20					-55 to +150
2N6895	8.33	0.6				1.16	0.74	1.16	5	
2N6896	60	4				6.0	3.8	6.0	20	
2N6897	100	4				12	7.6	12	30	
2N6898	150	4				25	15.8	25	60	

1/ Derate linearly T_C > +25°C – 2N6895 (0.067 W/°C), 2N6896 (0.48 W/°C), 2N6897 (0.8 W/°C), 2N6898 (1.2 W/°C).

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

where P(rated) = P_T – (T_C = -25) (W/°C) watts;

K = max $r_{DS(on)}$ at T_J =+150°C.

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-VAT, 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.

AMSC N/A FSC 5961

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

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 V I_D = -1.0 mA dc	$V_{GS(th)1}$ $V_{DS} \geq V_{GS}$ I_D = -1.0 mA dc	Max I_{DSS1} V_{GS} = 0 V	Max $r_{DS(on)}$ 1/ V_{GS} = -10 V dc		RΘJC
			V_{DS} = 80 percent of rated V_{DS}	T_J = +25°C at I_{D1}	T_J = +150°C at I_{D2}	
	V dc	V dc	µA dc	Ohm	Ohm	°C/W
	-100	Min -2.0, Max -4.0	-1.0			
2N6895				3.65	6.15	15.0
2N6896				0.6	1.67	2.083
2N6897				0.3	0.69	1.25
2N6898				0.2	0.24	0.83

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 federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, 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

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

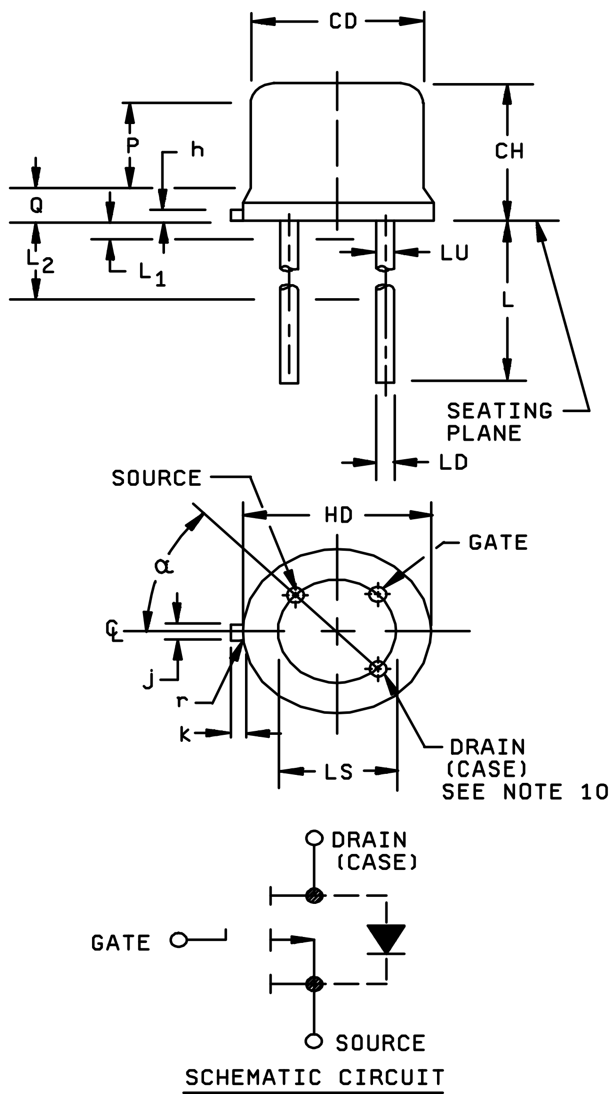


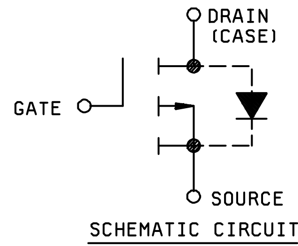
FIGURE 1. Physical dimensions for 2N6895 (TO-205AF).

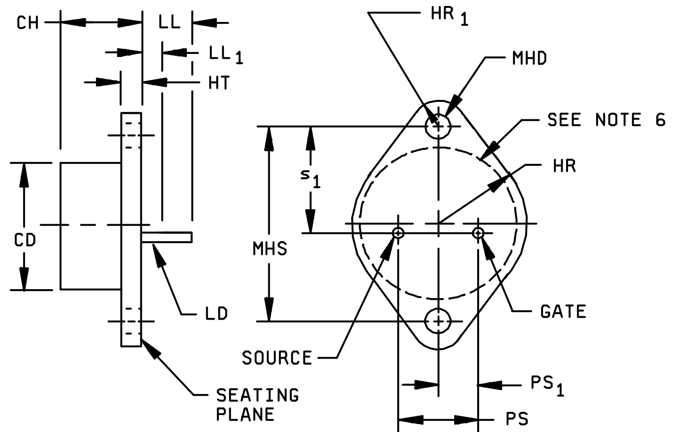
Ltr	1/ Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.160	.180	4.07	4.57	
HD	.335	.370	8.51	9.40	
h	.009	.041	0.23	1.04	
j	.028	.034	0.71	0.86	2
k	.029	.045	0.74	1.14	3
LD	.016	.021	0.41	0.53	7,8
LL	.500	.750	12.70	19.05	7,8
LS	.200 TP		5.08 TP		6
LU	.016	.019	0.41	0.48	7,8
L_1		.050		1.27	7,8
L_2	.250		6.35		7,8
P	.100		2.54		5
Q		.050		1.27	4
r		.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, j shall be held for a minimum length of 0.011 (0.028 mm).
3. Dimension k 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. The device may be measured by direct methods.
7. LU applies between L_1 and L_2. LD applies between L_2 and L minimum. Diameter is uncontrolled in L_1 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 for 2N6895 (TO – 205AF) Continued.

Symbol	1/ Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	
CH	.250	.360	6.35	9.14	
HR	.495	.525	12.57	13.34	
HR_1	.131	.188	3.33	4.78	
HT	.060	.135	1.52	3.43	
LD	.038	.043	0.97	1.09	
LL	.312	.500	7.92	12.70	
LL_1		.050		1.27	
MHD	.151	.161	3.84	4.09	
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	3, 5
PS_1	.205	.225	5.21	5.72	3, 5
s_1	.655	.675	16.64	17.15	





NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. These dimensions should be measured at points 0.050 inch (1.27 mm) and 0.055 inch (1.40 mm) below seating plane. Measurement will be made at the seating plane.
4. The seating plane of the header shall be flat within 0.001 inch (0.03 mm) concave to 0.004 inch (0.10 mm) convex inside a 0.930 inch (23.62 mm) diameter circle on the center of the header and flat within 0.001 inch (0.03 mm) concave to 0.006 inch (0.15 mm) convex overall.
5. Mounting holes shall be deburred on the seating plane side.
6. Drain is electrically connected to the case.

FIGURE 2. Physical dimensions of transistor 2N6896,2N6897, 2N6898 (TO-204AA and TO-204).

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

C - Coulomb.

3.3 Interface requirements and physical dimensions. The Interface requirements and physical dimensions shall be as specified in MIL-PRF-19500, MIL-HDBK-6100 and figures 1 and 2, TO-205AF (formerly TO-39) for 2N6895, TO-204AA for 2N6896 and 2N6897; and TO-204AE for 2N6898 herein.

3.3.1 Lead material and finish. Lead material shall be Kovar, Alloy 52 for T0-205AF, and a copper core or plated core is permitted 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. At the option of the manufacturer, marking of country of origin may be omitted from the body of the transistor, but shall be retained on the initial container.

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, $R \leq 100$ 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 4.4.2 and 4.4.3.

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 (QML) before contract award (see 4.2 and 6.2).

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 table II 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.

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/ 2/	Method 3470 (see 4.5.4)	Method 3470 (see 4.5.4)
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}, $r_{DS(on)1}$, $V_{GS(th)1}$, $\Delta I_{GSS1} = \pm$ 20 nA dc or ±100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm$ .2 µA dc or ±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
13	Subgroups 2 and 3 of table I herein; $\Delta I_{GSS1} = \pm$ 20 nA dc or ±100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm$ .2 µA dc or ±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 table I herein; $\Delta I_{GSS1} = \pm$ 20 nA dc or ±100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm$ .2 µA dc or ±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.

1/ Shall be performed anytime before screen 9.
2/ Method 3470 is optional if performed as a sample in group A, subgroup 5.

4.3.1 Power burn-in. Power burn-in conditions are as follows: MIL-STD-750, method 3161, condition C, T_A = +25°C, -5°C, +10°C, V_{DS} = 10 V min.; I_D adjusted to meet a junction temperature of 140°C, - 5°C, + 10°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 II herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and herein. Electrical measurements (end-points) shall be in accordance with the inspections of 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. 2N6895, V_{DS} = -10 V dc, P_T = 4 W at T_A = +25°C ± 3°C. 2N6897, 2N6898, V_{DS} = -20 V dc, P_T = 0.6 W at T_A = +25°C ± 3°C.
5	1042	Accelerated steady-state operation life; test condition C; T_A = + 25°C, - 5°C, + 10°C, V_{DS} = 10 V min.; I_D adjusted to meet a junction temperature of 140°C, - 0°C, + 10°C, t = 240 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 VIb (JANTX and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
2	1051	Test condition G, 25 cycles.
3	1042	Test condition D, 2,000 cycles. The heating cycle shall be 1 minute minimum.

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 the inspections of table II herein.

Subgroup	Method	Condition
2	2036	Test condition E .
6	1042	Test condition D, 6,000 cycles. The heating cycle shall be 1 minute minimum.

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 the inspections of table II herein. 1/

Subgroup	Method	Condition	Sampling plan
E1	1051	Test Condition G, 500 cycles Electrical measurements See table II, steps 1, 2, 3, 4, 5, 6, and 7.	45 devices, c = 0
E2	1042	Test condition A, 1,000 hours. Electrical measurements See table II, steps 1, 2, 3, 4, 5, 6, and 7.	45 devices, c = 0
E2	1042	Test condition B, 1,000 hours. Electrical measurements See table II, steps 1, 2, 3, 4, 5, 6, and 7.	45 devices, c = 0
E3		Not applicable	
E4	3161	$R_{\theta JC}$ see 1.4	5 devices, c = 0
E5		Not applicable	

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

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. $R_{\Theta JC(max)}$ = (2N6895 = 15.0°C/W, 2N6896 = 2.083°C/W, 2N6897 = 1.25°C/W, 2N6898 = 0.83°C/W. t_H = Steady-state (see MIL-STD-750, method 3161 for definition).

	2N6895	2N6896	2N6897	2N6898
I_M	10 mA	10 mA	10 mA	10 mA
I_H	0.6 A	2 A	3.5 A	4 A
V_H	10 V	20 V	20 V	25 V
t_{MD}	10 – 80 µs	10 – 80 µs	10 – 80 µs	10 – 80 µs
t_{SW}	10 µs max.	10 µs max.	10 µs max.	10 µs max.

4.5.3 Thermal response (ΔV_{SD} measurements). The ΔV_{SD} measurements shall be performed in accordance with MIL-STD-750, method 3161. The ΔV_{SD} conditions (I_H and V_H) and maximum limit shall be derived by each vendor from the thermal response curves (see figure 3) and shall be specified in the certificate of conformance prior to qualification. The following parameter measurements shall apply.

	2N6895	2N6896	2N6897	2N6898
I_M	10 mA	10 mA	10 mA	10 mA
I_H	0.6 A	2 A	3.5 A	4 A
V_H	10 V	20 V	20 V	25 V
t_{MD}	10 – 80 µs	10 – 80 µs	10 – 80 µs	10 – 80 µs
t_{SW}	10 µs max.	10 µs max.	10 µs max.	10 µs max.

4.5.4 Unclamped inductive switching.

a. Peak current (I_D)

2N6895	1 A
2N6896	2.7 A
2N6897	5 A
2N6898	5.9 A

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 µH ±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} = - 30 V minimum.
t = 250 µs minimum.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical inspection	2071					
Subgroup 2						
Breakdown voltage, drain to source	3407	Bias condition C, V_{GS} = 0 V; I_D = -1.0 mA dc	$V_{(BR)DSS}$	-100		
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$; I_D = -0.25 mA dc	$V_{GS(th)1}$	-2.0	-4.0	V dc
Gate current	3411	Bias condition C; V_{DS} = 0 V; V_{GS} = +20 and -20 V dc	I_{GSS1}		±100	nA dc
Drain current	3413	V_{GS} = 0; bias condition C; V_{DS} = -80 V	I_{DSS1}		-1.0	µA dc
Static drain to source on-state resistance	3421	V_{GS} = -10 V dc; condition A; pulsed (see 4.5.1)	$r_{DS(on)1}$			ohms
2N6895		I_D = -0.74 A dc			3.65	
2N6896		I_D = -3.8 A dc			0.6	
2N6897		I_D = -7.6 A dc			0.3	
2N6898		I_D = -15.8 A dc			0.2	
Drain to source on-state voltage	3405	V_{GS} = 10 V dc; condition A; pulsed (see 4.5.1)	$V_{DS(on)1}$			V
2N6895		I_D = -1.16 A dc			-6.0	
2N6896		I_D = -6.0 A dc			-6.0	
2N6897		I_D = -12.0 A dc			-4.8	
2N6898		I_D = -25.0 A dc			-6.0	
Forward voltage (source drain diode)	4011	Pulsed (see 4.5.1); V_{GS} = 0 V	V_{SD}	-0.8	-1.6	V
2N6895		I_S = -1.16 A dc				
2N6896		I_S = -6.0 A dc				
2N6897		I_S = -12.0 A dc				
2N6898		I_S = -25.0 A dc				

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 2 continued						
Forward transconductance	3475	Pulsed (see 4.5.1), I_D = rated I_{D2} =(see 1.3).	g_{fs}			s
2N6895				0.2		
2N6896				1.0		
2N6897				2.0		
2N6898				4.0		
Subgroup 3						
High temperature operation:		$T_C = T_J = +125°C$				
Gate to source voltage(threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = -0.25 mA dc	$V_{GS(th)2}$	-1.0		V dc
Gate current	3411	Bias condition C, V_{DS} = 0 V; V_{GS} = +20 V dc and -20 V dc	I_{GSS2}		±200	nA dc
Drain current	3413	Bias condition C, V_{GS} = 0 V, V_{DS} = -80 V	I_{DSS2}		- 50	µA dc
Static drain to source on-state resistance	3421	V_{GS} = -10 V dc, Pulsed (see 4.5.1)	$r_{DS(on)2}$			ohms
2N6895		I_D = - 0.74 A dc			5.66	
2N6896		I_D = - 3.8 A dc			0.96	
2N6897		I_D = - 7.6 A dc			0.465	
2N6898		I_D = - 15.8 A dc			0.24	
Low temperature operation:		$T_C = T_J = -55°C$				
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = -0.25 mA	$V_{GS(th)3}$		-5.0	V dc
Subgroup 4						
Switching time test	3472	I_D = rated I_{D2} (see 1.3); V_{GS} = 10 V dc; R_{gen} =15 Ω R_{GS} =15 Ω, V_{DD} = 50 percent of rated V_{DS} (see 1.3);				
Turn-on delay time		V_{DD} = -50 V dc	$t_{d(on)}$			ns
2N6895		I_D = - 0.74 V dc			25	
2N6896		I_D = - 3.8 V dc			60	
2N6897		I_D = - 7.6 V dc			60	
2N6898		I_D = - 15.8 V dc			50	

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/ 4/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Rise time		V_{DD} = -50 V dc	t_r			ns
2N6895		I_D = - 0.74 V dc			45	
2N6896		I_D = - 3.8 V dc			100	
2N6897		I_D = - 7.6 V dc			175	
2N6898		I_D = - 15.8 V dc			250	
Subgroup 4 - Continued.						
Turn-off delay time		V_{DD} = -50 V dc	$t_{d(off)}$			ns
2N6895		I_D = - 0.74 V dc			45	
2N6896		I_D = - 3.8 V dc			150	
2N6897		I_D = - 7.6 V dc			275	
2N6898		I_D = - 15.8 V dc			400	
Fall time		V_{DD} = -50 V dc	t_f			ns
2N6895		I_D = - 0.74 V dc			50	
2N6896		I_D = - 3.8 V dc			100	
2N6897		I_D = - 7.6 V dc			175	
2N6898		I_D = - 15.8 V dc			250	
Subgroup 5						
Safe operating area		See figure 4.				
High voltage test		V_{DS} = 80 percent of rated V_{DS} (see 1.3)				
Electrical measurements		See table III, steps 1, 2, 3, 4, 5, 6, and 7				
Subgroup 6						
Not applicable						
Subgroup 7						
Gate charge	3471	Condition A or B				
Test 1						
On-state gate charge			$Q_{g(on)}$			nC
2N6895				2.2	4.7	
2N6896				13	24	
2N6897				31	58	
2N6898				50	117	

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 7 - Continued.						
Test 2			Q_{gs}			nC
Gate to source charge						
2N6895				0.4	1.2	
2N6896				1.1	5.5	
2N6897				3	13	
2N6898				6	25	
Test 3						
Gate to drain charge			Q_{gd}			nC
2N6895				0.9	2.9	
2N6896				5.5	14.5	
2N6897				14	36	
2N6898				26	69	
Reverse recovery time	3473	V_{DD} = ≤ 30 V; di/dt =100A/µs I_F = 4 A	t_{rr}			ns
2N6895					340	
2N6896					375	
2N6897					500	
2N6898					750	

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

TABLE II. Group A, B, C and E electrical measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1.	Breakdown voltage drain to source	3407	Bias condition C; I_D = - 1.0 mA dc, V_{GS} = 0 V	$V_{(BR)DSS}$	- 100		V dc
2.	Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$; I_D = -0.25 mA dc	$V_{GS(th)1}$	-2.0	-4.0	V dc
3.	Gate current	3411	Bias condition C; V_{GS} = + 20 Vdc and -20 V dc; V_{DS} = 0 V	I_{GSS1}		-100	nA dc
4.	Drain current	3413	Bias condition C; V_{DS} = -80 V dc; V_{GS} = 0 V	I_{DSS1}		-50	µA dc
5.	Static drain to source “on”- state resistance	3421	V_{GS} = -10 V dc; condition A, pulsed (see 4.5.1)	$r_{DS(on)1}$			Ohm
	2N6895		I_D = - 0.74 V dc			3.65	
	2N6896		I_D = - 3.8 V dc			0.6	
	2N6897		I_D = - 7.6 V dc			0.3	
	2N6898		I_D = - 15.8 V dc			0.2	
6.	Drain to source “on”- state voltage	3405	V_{GS} = -10 V dc; condition A, pulsed (see 4.5.1)	$V_{DS(on)}$			
	2N6895		I_D = - 1.16 V dc			-6.0	
	2N6896		I_D = - 6.0 V dc			-6.0	
	2N6897		I_D = - 12.0 V dc			-4.8	
	2N6898		I_D = - 25.0 V dc			-6.0	
7.	Forward voltage (source drain diode)	4011	Pulsed (see 4.5.1), V_{GS} = 0	V_{SD}	-0.8	-1.6	V
	2N6895		I_S = -1.16 A dc				
	2N6896		I_S = -6.04.0 A dc				
	2N6897		I_S = -12.0 A dc				
	2N6898		I_S = -25.0 A dc				
8.	Thermal response	3161	See 4.5.3	ΔV_{SD}			

1/ The electrical measurements for appendix E, table VIa (JANS) of MIL-PRF-19500 are as follows:
a. Subgroup 3, see table II herein, steps 1, 2, 3, 4, 5, 6, and 7.
b. Subgroup 4, see table II herein, steps 1, 2, 3, 4, 5, 6, 7, and 8.
c. Subgroup 5, see table II herein, steps 1, 2, 3, 4, 5, 6, and 7.

2/ The electrical measurements for appendix E, table VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows:
a. Subgroup 2, see table II herein, steps 1, 2, 3, 4, 5, 6 and 7.
b. Subgroups 3 and 6, see table II herein, steps 1, 2, 3, 4, 5, 6, 7 and 8.

3/ The electrical measurements for appendix E, table VII of MIL-PRF-19500 are as follows:
a. Subgroups 2 and 3, see table II herein, steps 1, 2, 3, 4, 5, 6 and 7.
b. Subgroup 6, see table II herein, steps 1, 2, 3, 4, 5, 6, 7 and 8.

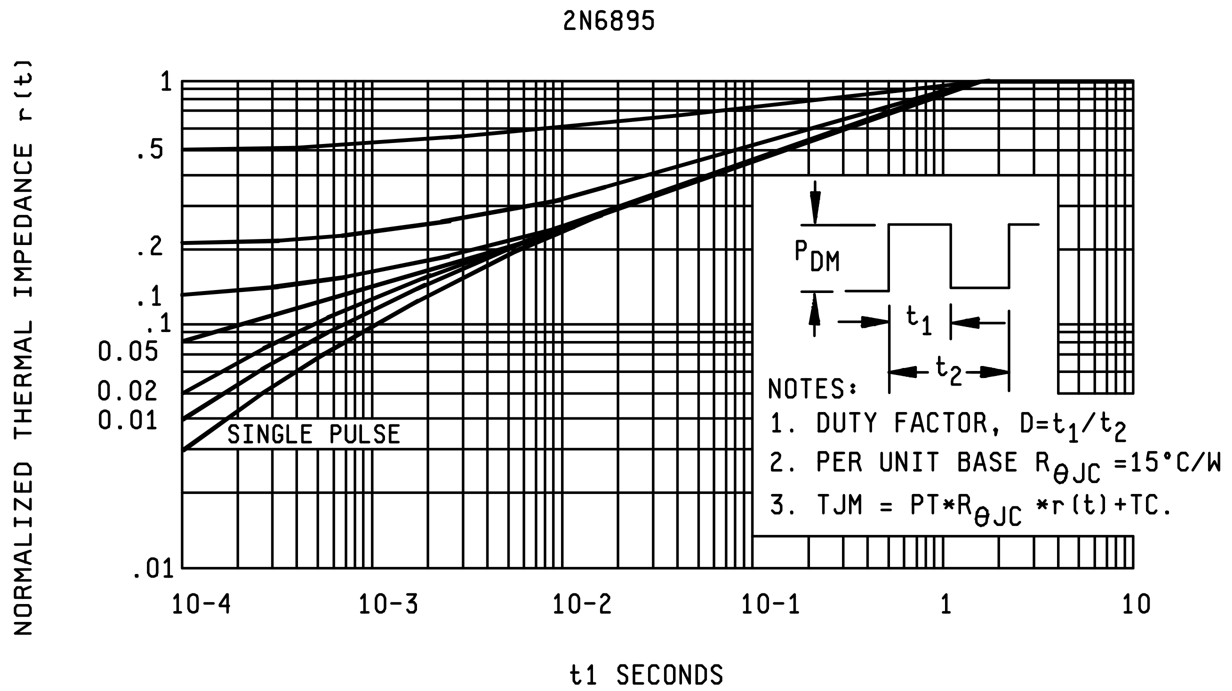


FIGURE 3. Transient thermal response.

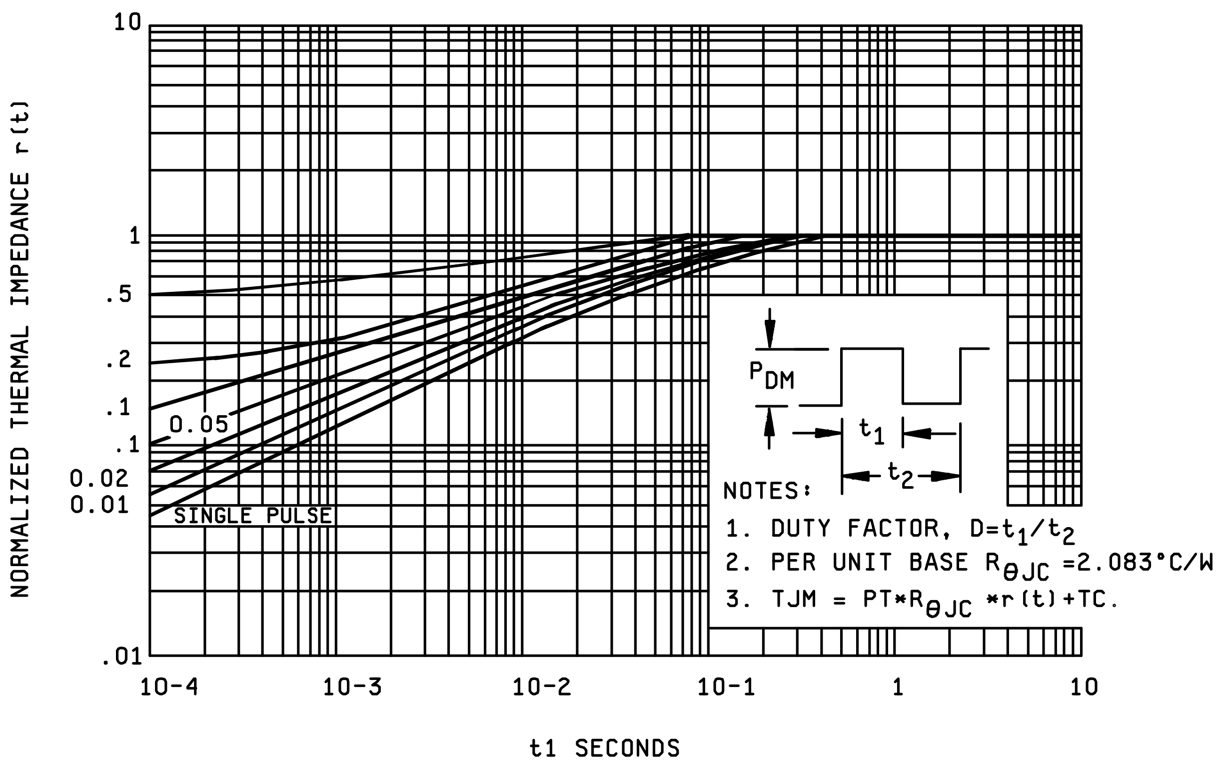


FIGURE 3. Transient thermal response - Continued.

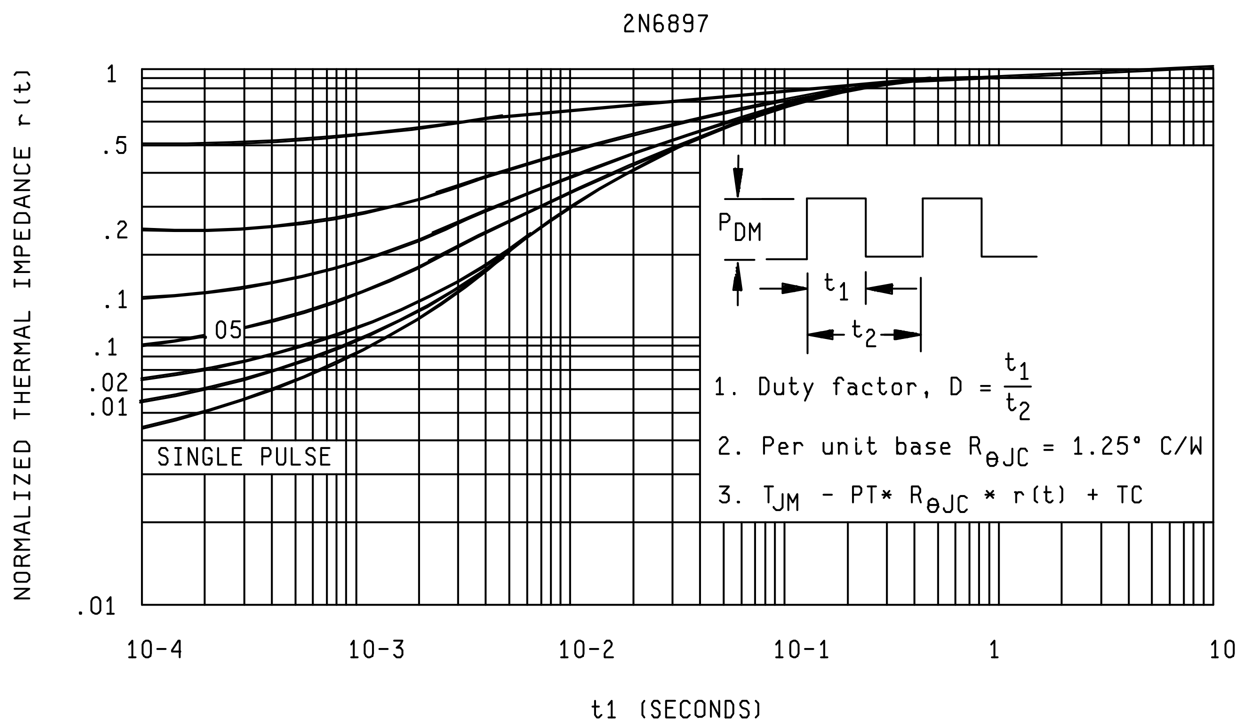


FIGURE 3. Transient thermal response - Continued.

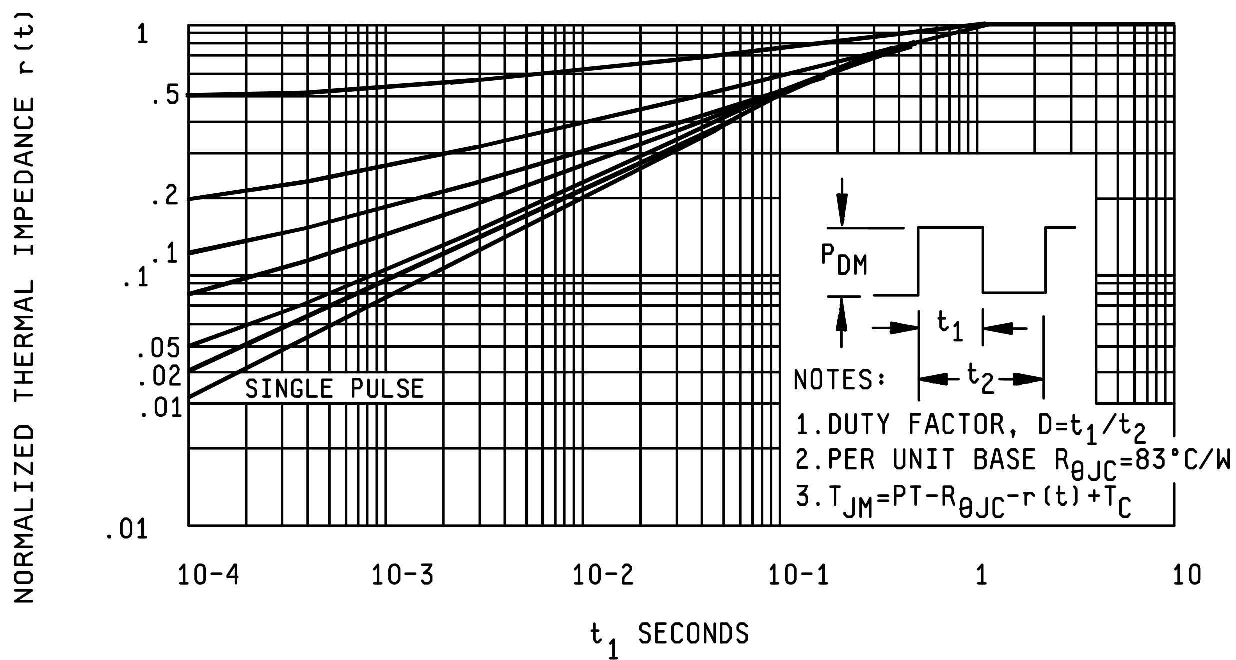


FIGURE 3. Transient thermal response - Continued.

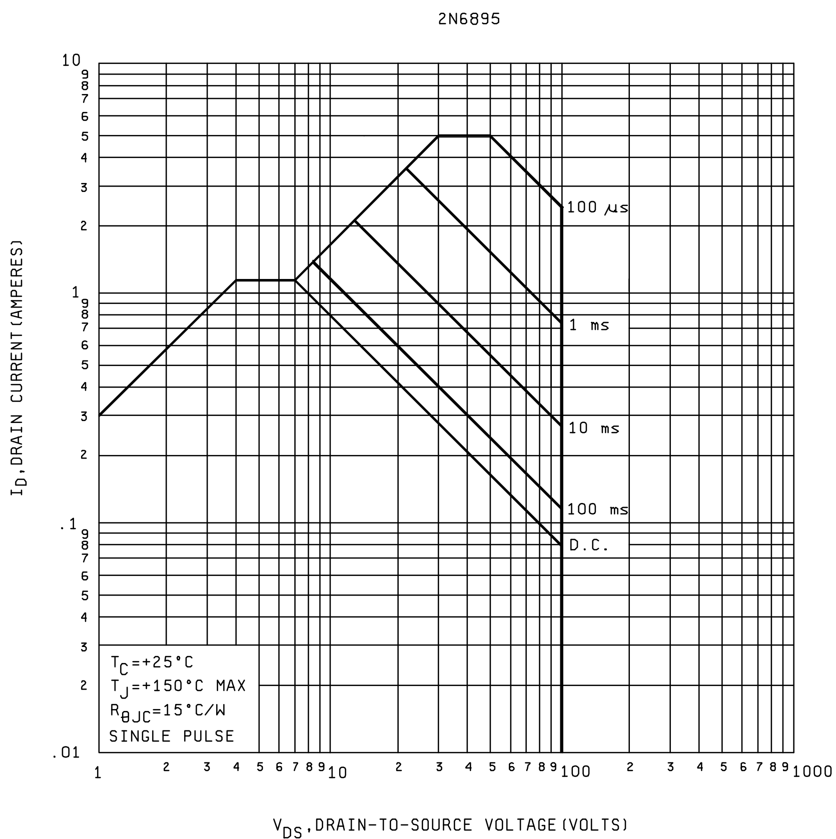


FIGURE 4. Maximum safe operating area.

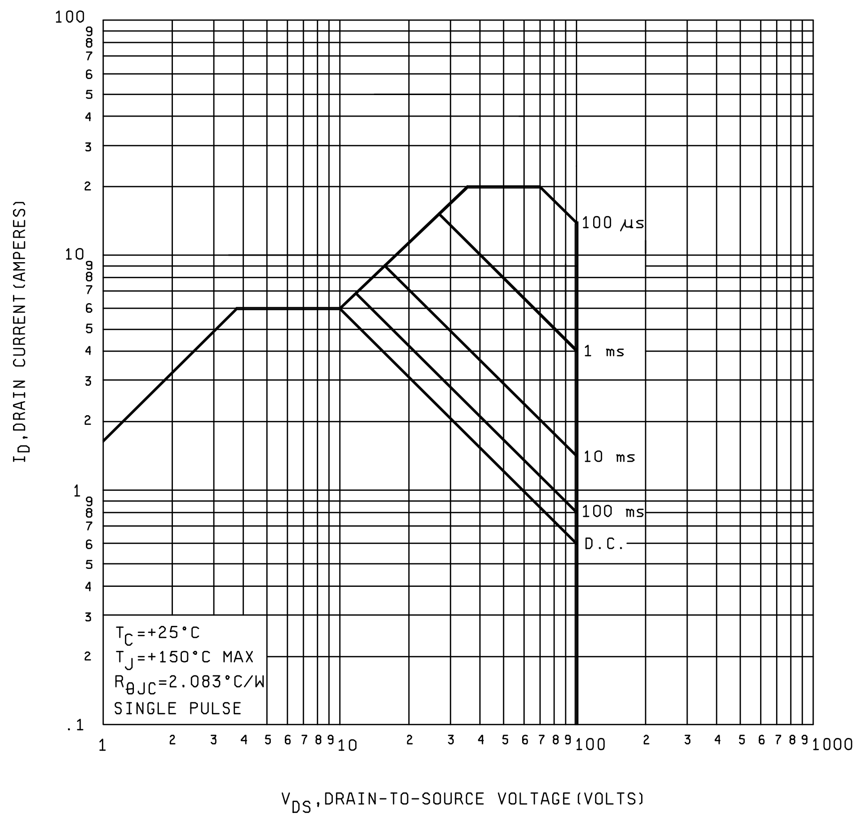


FIGURE 4. Maximum safe operating area – Continued.

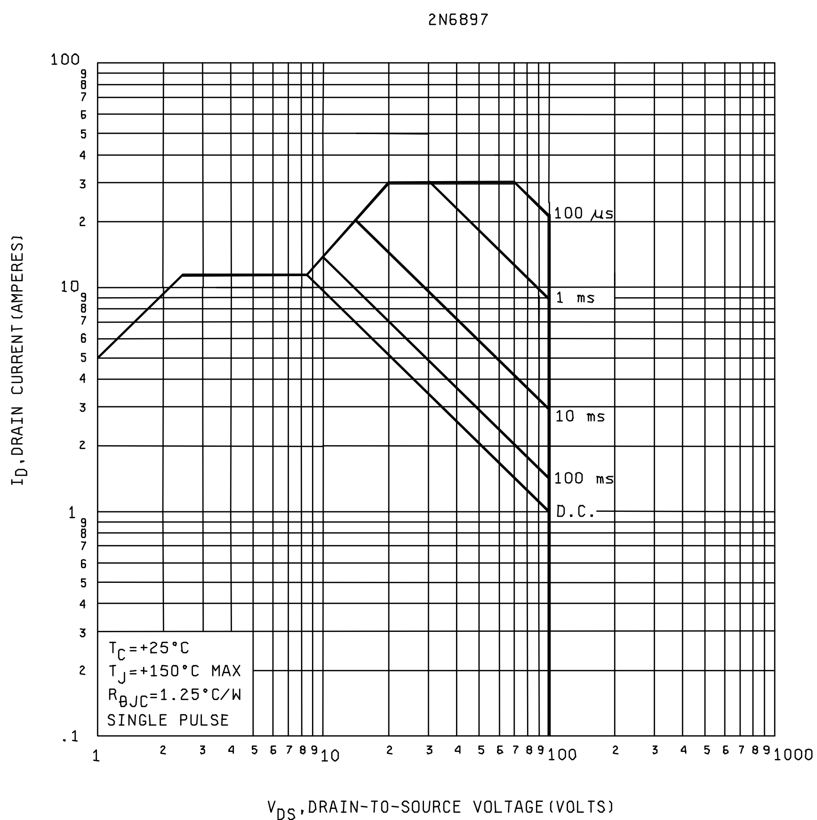


FIGURE 4. Maximum safe operating area – Continued.

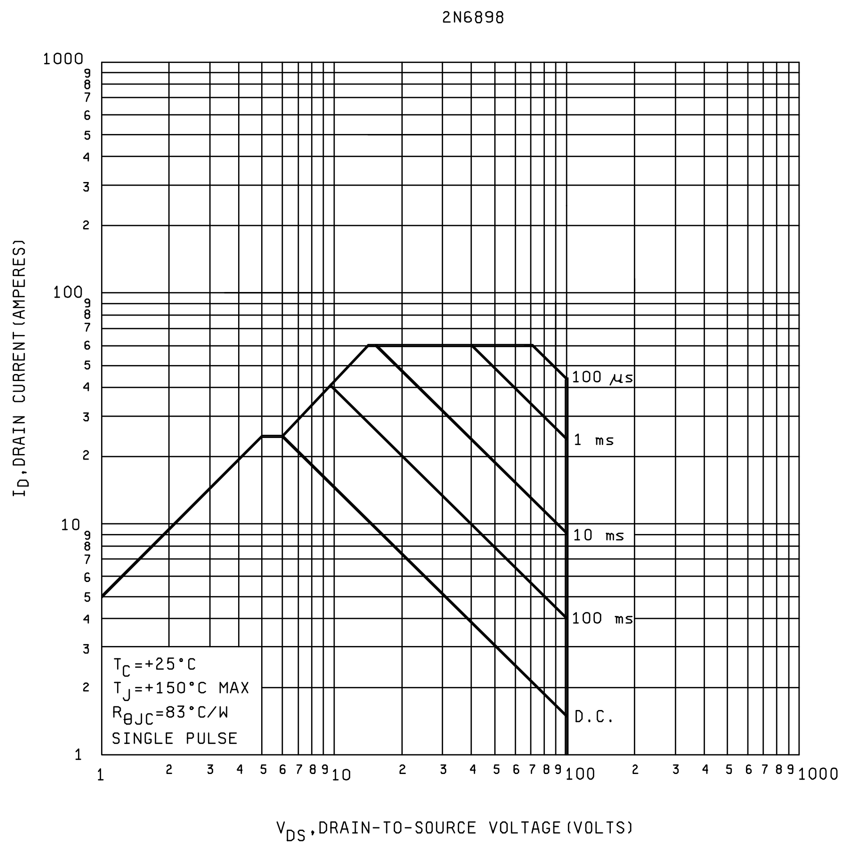


FIGURE 4. Maximum safe operating area – Continued.

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.

5.2 The requirements for packaging shall be in accordance with MIL-PRF-19500.

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 2.1.1 and 2.2).

b. The lead finish as specified (see 3.4.1).

c. For die acquisition, specify the JANHC or JANKC letter version (see figure 2).

d. Type designation and quality 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 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
NASA - NA

Review activities:
Army - AR, MI, SM
Navy - AS, CG, MC
Air Force - 13, 19, 85, 99

Preparing activity:
DLA - CC

(Project 5961- 2084)

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.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-PRF-19500/565B	**2. DOCUMENT DATE (YYMMDD)** 990521

3. DOCUMENT TITLE
SEMICONDUCTOR DEVICE, FIELD EFFECT TRANSISTOR, P-CHANNEL, SILICON TYPES 2N6895, 2N6896, 2N6897, AND 2N6898 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

6. SUBMITTER

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)

8. PREPARING ACTIVITY

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