

The documentation and process conversion measures necessary to comply with this revision shall be completed by 1 June 2013.

INCH-POUND

MIL-PRF-19500/555L
17 April 2013
SUPERSEDING
MIL-PRF-19500/555K
11 February 2010

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, FIELD EFFECT TRANSISTOR, N-CHANNEL, SILICON,
TYPES 2N6788, 2N6788U, 2N6790, 2N6790U, 2N6792, 2N6792U, 2N6794, AND 2N6794U,
JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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, power transistor. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for each unencapsulated device type.

1.2 Physical dimensions. See figures 1 (TO-205AF), 2 (LCC), and figures 3, 4, 5, 6, and 7 for JANHC and JANKC (die) dimensions.

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

Type	P_T $T_A = +25^\circ\text{C}$	V_{DS}	V_{DG}	V_{GS}	V_{DS} and V_{DG} 70,000 ft. altitude
	<u>W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	
2N6788, 2N6788U	0.8	100	100	± 20	
2N6790, 2N6790U	0.8	200	200	± 20	
2N6792, 2N6792U	0.8	400	400	± 20	300
2N6794, 2N6794U	0.8	500	500	± 20	300

Type	P_T (1) $T_C = +25^\circ\text{C}$	$R_{\theta JC}$ (2)	I_{D1} (3) (4) $T_C = +25^\circ\text{C}$	I_{D2} $T_C = +100^\circ\text{C}$	I_s	I_{DM} (5)	T_J and T_{STG}
	<u>W</u>	<u>$^\circ\text{C/W}$</u>	<u>A dc</u>	<u>A dc</u>	<u>A dc</u>	<u>A (pk)</u>	<u>$^\circ\text{C}$</u>
2N6788	20	6.25	6.0	3.5	6.0	24	-55° to +150°
2N6790	20	6.25	3.5	2.25	3.5	14	
2N6792	20	6.25	2.0	1.25	2.0	8	
2N6794	20	6.25	1.5	1.0	1.5	6	
2N6788U	14	8.93	4.5	2.8	4.5	18	
2N6790U	14	8.93	2.8	1.8	2.8	11	
2N6792U	14	8.93	1.8	1.13	1.8	7.2	
2N6794U	14	8.93	1.4	0.88	1.4	5.6	

See notes on next page.

* Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

1.3 Maximum ratings. Continued.

- (1) Derate linearly 0.16 W/°C for $T_C > +25^\circ\text{C}$ for "non-U" suffix versions, 0.11 W/°C for $T_C > +25^\circ\text{C}$ for "U" suffix versions.
- (2) See figure 8, thermal impedance curves.
- (3) The following formula derives the maximum theoretical I_D limit. I_D is also limited by package and internal wires and may be limited due to pin diameter.

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

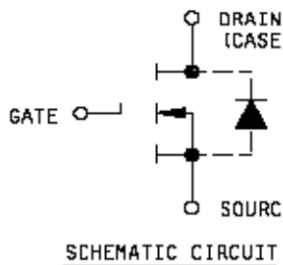
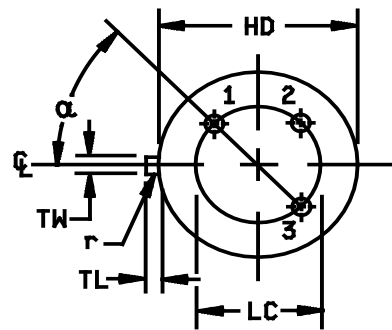
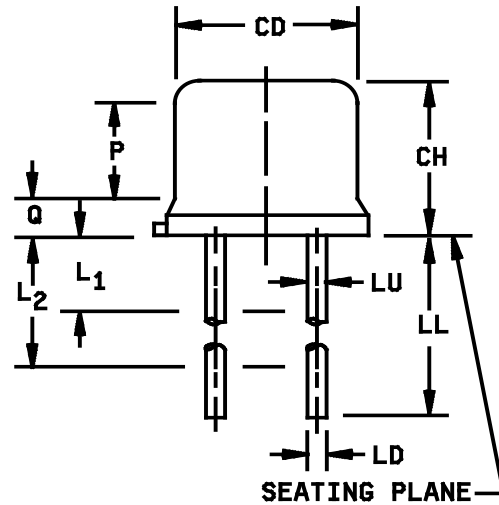
- (4) See figure 9, maximum drain current graph.
- (5) $I_{DM} = 4 I_{D1}$; I_{D1} as calculated in footnote (3).

1.4 Unless otherwise specified, primary electrical characteristics at $T_C = +25^\circ\text{C}$.

Type	Min $V_{(BR)DSS}$ $V_{GS} = 0$ $I_D = 1.0 \text{ mA dc}$	$V_{GS(th)1}$ $V_{DS} \geq V_{GS}$ $I_D = 0.25 \text{ mA}$	Max I_{DSS1} $V_{GS} = 0$ V_{DS} = 80 percent of rated V_{DS}	Max $r_{DS(on)}$ (1) $V_{GS} = 10 \text{ V dc}$ $I_D = I_{D2}$	
				$T_J = +25^\circ\text{C}$	$T_J = +150^\circ\text{C}$
	<u>V dc</u>	<u>V dc</u> <u>Min</u> <u>Max</u>	<u>$\mu\text{A dc}$</u>	<u>Ohms</u>	<u>Ohms</u>
2N6788, 2N6788U	100	2.0 4.0	25	0.30	0.60
2N6790, 2N6790U	200	2.0 4.0	25	0.80	1.80
2N6792, 2N6792U	400	2.0 4.0	25	1.80	4.50
2N6794, 2N6794U	500	2.0 4.0	25	3.00	7.50

(1) Pulsed (see 4.5.1).

Symbol	Dimensions				Note
	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	
LC	.200 TP		5.08 TP		6
LD	.016	.021	0.41	0.53	7,8
LL	.500	.750	12.70	19.05	7,8,12
LU	.016	.019	0.41	0.48	7,8
L1		.050		1.27	7,8
L2	.250		6.35		7,8
P	.100		2.54		
Q		.050		1.27	5
TL	.029	.045	0.74	1.14	3,4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
α	45° TP		45° TP		6



NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TL shall be held for a minimum length of .011 inch (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
7. Dimension LU applies between L₁ and L₂. Dimension LD applies between L₂ and LL minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
12. Lead 1 = source, lead 2 = gate, lead 3 = drain.

FIGURE 1. Physical dimensions (similar to TO-205AF) 2N6788, 2N6790, 2N6792, and 2N6794.

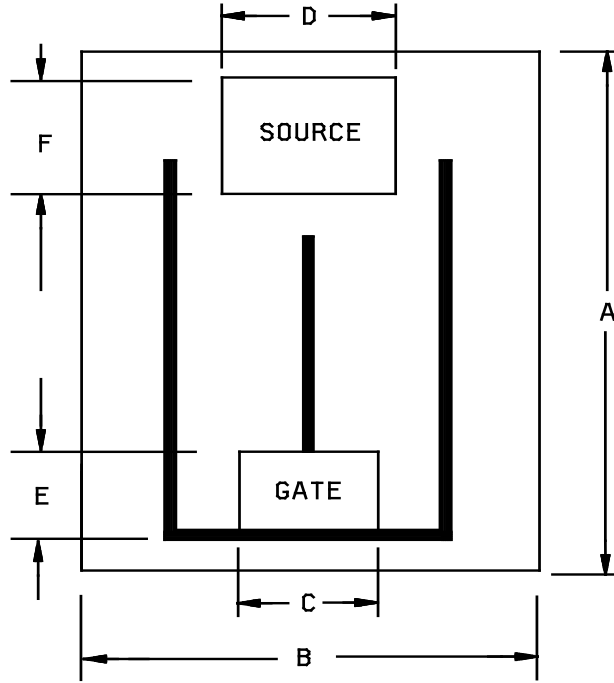
MIL-PRF-19500/555L

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.345	.360	8.77	9.14
BW	.280	.295	7.12	7.49
CH	.095	.115	2.42	2.92
LL ₁	.040	.055	1.02	1.39
LL ₂	.055	.065	1.40	1.65
LS	.050 BSC		1.27 BSC	
LS ₁	.025 BSC		0.635 BSC	
LS ₂	.008 BSC		0.203 BSC	
LW	.020	.030	0.51	0.76
Q ₁	.105 REF		2.67 REF	
Q ₂	.120 REF		3.05 REF	
Q ₃	.045	.055	1.15	1.39
TL	.070	.080	1.78	2.03
TW	.120	.130	3.05	3.30

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimensions and tolerancing shall be in accordance with ASME Y14.5M.

FIGURE 2. Physical dimensions for LCC (2N6788U, 2N6790U, 2N6792U, and 2N6794U) - Continued.



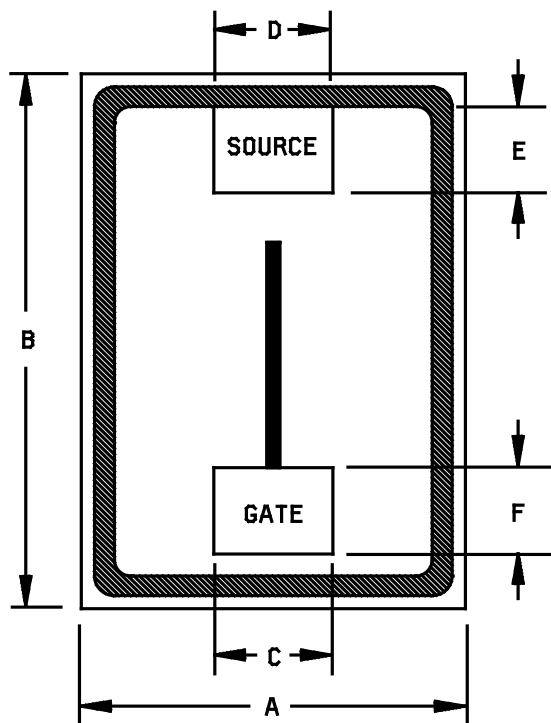
A version

Ltr	Dimensions - 2N6788				Dimensions - 2N6790				Dimensions - 2N6792, 2N6794			
	Inches		Millimeters		Inches		Millimeters		Inches		Millimeters	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
A	.107	.121	2.72	3.07	.094	.112	2.39	2.85	.131	.147	3.33	3.73
B	.078	.088	1.98	2.24	.083	.099	2.11	2.52	.090	.106	2.29	2.69
C	.020	.030	0.51	0.76	.018	.028	0.46	0.71	.022	.032	0.56	0.81
D	.027	.037	0.69	0.94	.028	.038	0.71	0.97	.028	.038	0.71	0.97
E	.013	.023	0.33	0.58	.015	.025	0.38	0.64	.015	.025	0.38	0.64
F	.019	.029	0.48	0.74	.018	.028	0.46	0.71	.020	.030	0.51	0.76

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Die thickness = .019 ± .005 inch (0.48 ± 0.13 mm).
4. Back metal: Cr - Ni - Ag.
5. Top metal: Al.
6. Back contact: Drain.
7. Layout of gate fingers shown is typical, specific layout register in accordance with DSCC Form 36D.
8. See 6.5.

FIGURE 3. Physical dimensions JANHCA and JANKCA.



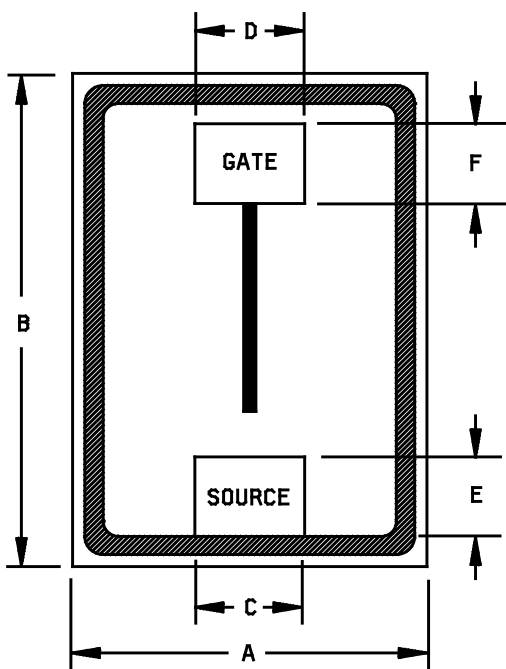
C version

Ltr	Dimensions 2N6788, 2N6790			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.0858	.0898	2.18	2.28
B	.087	.091	2.21	2.31
C	.0258	.0298	0.65	0.76
D	.0253	.0293	0.64	0.74
E	.017	.021	0.43	0.53
F	.016	.020	0.41	0.51

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Die thickness = $.015 \pm .005$ inch (0.38 ± 0.13 mm).
4. Back metal: Ag - Ti - Ni.
5. Top metal: Al.
6. Back contact: Drain.

FIGURE 4. Physical dimensions JANHCC and JANKCC.



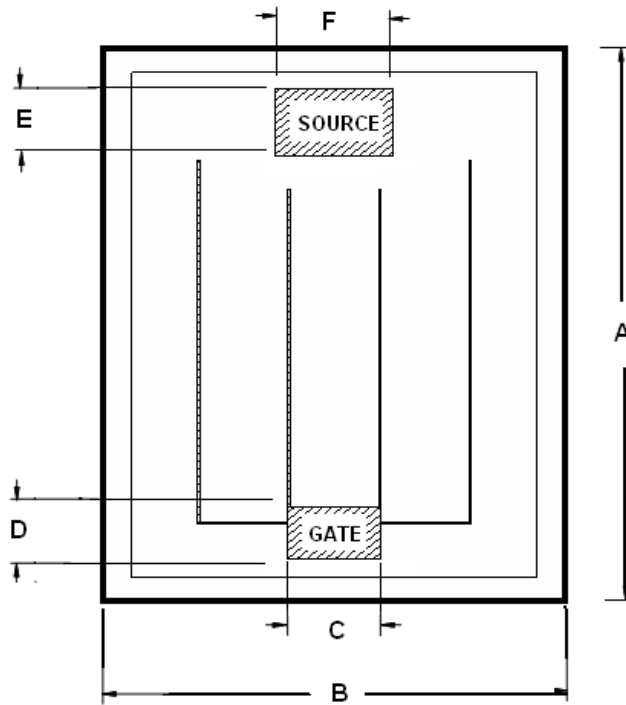
D version

Ltr	Dimensions 2N6792, 2N6794			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.093	.102	2.36	2.59
B	.140	.144	3.56	3.66
C	.025	.029	0.64	0.74
D	.026	.030	0.66	0.76
E	.016	.020	0.41	0.51
F	.017	.021	0.43	0.53

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Die thickness = .015 ± .005 inch (0.38 ± 0.13 mm).
4. Back metal: Ag - Ti - Ni.
5. Top metal: Al.
6. Back contact: Drain.
8. See 6.5.

FIGURE 5. Physical dimensions JANHCD and JANKCD.

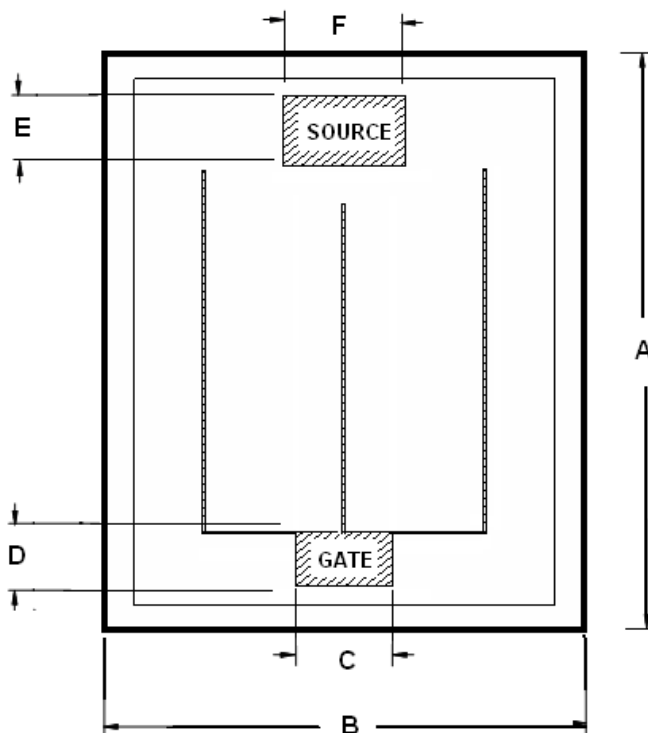


Ltr	Dimensions - 2N6788			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.093	.097	2.36	2.46
B	.123	.127	3.12	3.22
C	.021	.025	.53	.63
D	.013	.017	.33	.43
E	.014	.018	.36	.46
F	.023	.027	.58	.69

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.005 inch (0.13 mm).
4. The physical characteristics of the die are: The back metals are chromium, nickel, and silver and the back contact is the drain. The top metal is aluminum.
5. Die thickness is $.015$ inch (0.38 mm) ± 0.001 inch (0.025 mm).

FIGURE 6. JANHCE and JANKCE (E-version) die dimensions for 2N6788.



Ltr	Dimensions - 2N6790			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.091	.095	2.31	2.41
B	.123	.127	3.12	3.22
C	.021	.025	.53	.63
D	.011	.015	.28	.38
E	.013	.017	.33	.43
F	.023	.027	.58	.69

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.005 inch (0.13 mm).
4. The physical characteristics of the die are: The back metals are chromium, nickel, and silver and the back contact is the drain. The top metal is aluminum.
5. Die thickness is .015 inch (0.38 mm) ± 0.001 inch (0.025 mm).

FIGURE 7. JANHCF and JANKCF (F-version) die dimensions for 2N6790.

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 <https://assist.dla.mil/quicksearch/> or <https://assist.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 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 manufacturer's list (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 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 figures 1 (TO-205AF), 2 (LCC), and figures 3, 4, 5, 6, and 7 for JANHC and JANKC (die) herein.

3.4.1 Lead material and finish. Lead material shall be Kovar or Alloy 52; a copper core is permitted (for TO-205AF). 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 Internal construction. Multiple chip construction shall not be permitted.

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

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

3.6.1 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 3.6).

- a. Devices should be handled on benches with conductive and grounded surface.
- 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. $R \leq 100 \text{ k}\Omega$, whenever bias voltage is to be applied drain to source.

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

3.8 Electrical test requirements. The electrical test requirements shall be as specified in 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. Alternate flow is allowed for qualification inspection in accordance with MIL-PRF-19500.

4.2.1 JANHC and JANKC devices. Qualification for JANHC and JANKC devices shall be as specified in MIL-PRF-19500.

4.2.2 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 II tests, the tests specified in table II herein that were not performed in the prior revision shall be performed by the first inspection lot of this revision to maintain qualification.

4.3 Screening (JANS, JANTX 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 IV of MIL-PRF-19500) (1) (2)	Measurement	
	JANS level	JANTX and JANTXV levels
(3)	Gate stress test (see 4.3.2)	Gate stress test (see 4.3.2)
(3) (4)	Method 3470 of MIL-STD-750 (see 4.3.3) optional	Method 3470 of MIL-STD-750 (see 4.3.3) optional
(3) 3c	Method 3161 of MIL-STD-750 (see 4.3.4)	Method 3161 of MIL-STD-750 (see 4.3.4)
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	Subgroup 2 of table I herein; I_{GSSF1} , I_{GSSR1} , I_{DSS1} , $r_{DS(on)1}$, $V_{GS(TH)1}$, $\Delta I_{GSSF1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 25$ μ A dc or ± 100 percent of initial value, whichever is greater.	Subgroup 2 of table I herein, I_{GSSF1} , I_{GSSR1} , I_{DSS1} , $r_{DS(on)1}$, $V_{GS(TH)1}$
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 table I herein. $\Delta I_{GSSF1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 25$ μ A 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. $\Delta I_{GSSF1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{GSSR1} = \pm 20$ nA dc or ± 100 percent of initial value, whichever is greater. $\Delta I_{DSS1} = \pm 25$ μ A 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) 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) Method 3470 is optional if performed as a sample in group A, subgroup 5.

4.3.1 Screening (JANHC and JANKC). Screening of die shall be in accordance with MIL-PRF-19500, as a minimum, die shall be 100 percent probed in accordance with table I, subgroup 2, except test current shall not exceed 20 A.

4.3.2 Gate stress test. Apply $V_{GS} = +30$ V minimum for $t = 250$ μ s minimum.

* 4.3.3 Single pulsed unclamped inductive switching.

- a. Peak current, I_D 2.2 A.
- b. Peak gate voltage, V_{GS} 10 V.
- c. Gate to source resistor, R_{GS} $25 \leq R_g \leq 200\Omega$.
- d. Initial case temperature $+25^\circ\text{C}$, $+10^\circ\text{C}$, -5°C .
- * e. Inductance, L 100 μ H (minimum)
- f. Number of pulses to be applied 1 pulse.

4.3.4 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 μ s max. See table II, group E, subgroup 4 herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500. Alternate flow is allowed for 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, 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 table E-VIA (JANS) and table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and as follows. Electrical measurements (end-points) shall be in accordance with the inspections of table I, subgroup 2 herein.

* 4.4.2.1 Group B inspection table E-VIA (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B3	1051	Test condition G.
* B3	2037	Test condition D. All internal wires for each device shall be pulled separately.
* B4	1042	Test condition D. The heating cycle shall be 1 minute minimum. No heat sink or forced air cooling on the device shall be permitted during the "on" cycle.
B5	1042	A separate sample may be pulled for each test. Accelerated steady-state reverse bias; test condition A, $V_{DS} = \text{rated}$, $T_A = +175^\circ\text{C}$, $t = 120$ hours, read and record $V_{BR}(DSS)$ (pre and post) at $I_D = -1$ mA. Read and record I_{DSS} (pre and post).
B5	1042	Accelerated steady-state gate stress; test condition B, $V_{GS} = \text{rated}$, $T_A = +175^\circ\text{C}$, $t = 24$ hours.

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B2	1051	Test condition G.
B3	1042	Test condition D, 2,000 cycles. The heating cycle shall be 1 minute minimum. No heat sink or forced air cooling on the device shall be permitted during the "on" cycle.
B3	2037	Test condition D. All internal wires for each device shall be pulled separately. If group B3 is to be continued to C6, bond strength test may be performed after C6.

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. Electrical measurements (end-points) shall be in accordance with the inspections of table I, subgroup 2 herein.

* 4.4.3.1 Group C inspection (table E-VII of MIL-PRF-19500).

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	2036	Test condition E (not required for LCC).
C5	3161	See 4.3.4, for $R_{\theta JC} = 6.25^{\circ}\text{C/W}$ for 2N6788, 2N6790, 2N6792, and 2N6794 $R_{\theta JC} = 8.93^{\circ}\text{C/W}$ for 2N6788U, 2N6790U, 2N6792U, and 2N6794U
* C6	1042	Test condition D, 6,000 cycles. The heating cycle shall be 1 minute minimum. No heat sink nor forced air cooling on the device shall be permitted during the "on" cycle (for JANS level devices with .008 inch or larger bond wires, that have completed 6,000 cycles in group B subgroup 4, C6 is not applicable).

4.4.4 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 II 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 measurement shall be as specified in section 4 of MIL-STD-750.

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TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance <u>2/</u>	3161	See 4.3.4	$Z_{\theta JC}$			$^{\circ}C/W$
Breakdown voltage, drain to source 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	3407	$V_{GS} = 0$ V dc, $I_D = 1$ mA dc, condition C	$V_{(BR)DSS}$	100 200 400 500		V dc V dc V dc V dc
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	$V_{GS} = +20$ V dc, $V_{DS} = 0$, bias condition C	I_{GSSF1}		+100	nA dc
Gate current	3411	$V_{GS} = -20$ V dc, $V_{DS} = 0$, bias condition C	I_{GSSR1}		-100	nA dc
Drain current	3413	$V_{GS} = 0$ V dc, $V_{DS} = 80$ percent of rated V_{DS} ; bias condition C	I_{DSS1}		25	μ A dc
Static drain to source on-state resistance 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	3421	$V_{GS} = 10$ V dc, pulsed (see 4.5.1); condition A, $I_D =$ rated I_{D2} (see 1.3)	$r_{DS(on)1}$		0.30 0.8 1.8 3.0	Ω Ω Ω Ω
Static drain to source on-state resistance 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	3421	$V_{GS} = 10$ V dc, pulsed (see 4.5.1); condition A, $I_D =$ rated I_{D1} (see 1.3)	$r_{DS(on)2}$.35 .85 1.90 3.10	Ω Ω Ω Ω
Forward voltage (source drain diode) 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	4011	Pulsed (see 4.5.1), $I_S = I_{D1}$	V_{SD}		1.8 1.5 1.4 1.2	V V V V

See footnotes at end of table.

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TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 3</u>						
High temperature operation:						
Gate to source voltage threshold	3403	$V_{DS} \geq V_{GS}$, $I_D = 0.25 \text{ mA dc}$	$V_{GS(th)2}$	1.0		V dc
Gate current	3411	Bias condition C, $V_{GS} = \pm 20 \text{ V dc}$, $V_{DS} = 0 \text{ V dc}$	I_{GSS2}		± 200	nA dc
Drain current	3413	Bias condition C, $V_{GS} = 0 \text{ V dc}$, $V_{DS} = 80 \text{ percent of rated } V_{DS}$	I_{DSS2}		0.25	mA dc
Static drain to source on-state resistance 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	3421	$V_{GS} = 10 \text{ V dc}$, pulsed (see 4.5.1); $I_D = \text{rated } I_{D2}$	$r_{DS(on)3}$		0.54 1.50 4.00 6.60	Ω Ω Ω Ω
Low temperature operation:						
Gate to source voltage threshold	3403	$V_{DS} \geq V_{GS}$, $I_D = 0.25 \text{ mA dc}$	$V_{GS(th)3}$		5.0	V dc
<u>Subgroup 4</u>						
Switching time test						
Turn-on delay time 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	3472	$I_D = \text{rated } I_{D1}$, $V_{GS} = 10 \text{ V dc}$, gate drive impedance = 7.5Ω	$t_{d(on)}$		40 40 40 40	ns ns ns ns
Rise time 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U		$V_{DD} = 35 \text{ V dc}$ $V_{DD} = 74 \text{ V dc}$ $V_{DD} = 175 \text{ V dc}$ $V_{DD} = 225 \text{ V dc}$	t_r		70 50 35 30	ns ns ns ns
Turn-off delay time 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U		$V_{DD} = 35 \text{ V dc}$ $V_{DD} = 74 \text{ V dc}$ $V_{DD} = 175 \text{ V dc}$ $V_{DD} = 225 \text{ V dc}$	$t_{d(off)}$		40 50 60 60	ns ns ns ns
Fall time 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U		$V_{DD} = 35 \text{ V dc}$ $V_{DD} = 74 \text{ V dc}$ $V_{DD} = 175 \text{ V dc}$ $V_{DD} = 225 \text{ V dc}$	t_f		70 50 35 30	ns ns ns ns

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u>						
Safe operating area test	3474	See figure 10; $V_{DS} = 80$ percent of rated $V_{BR(DSS)}$, $V_{DS} \leq 200$ V; $t_p = 10$ ms				
Electrical measurements		See table I, subgroup 2				
Single pulse unclamped inductive switching <u>3/</u>	3470	See 4.3.3, $c = 0$, 116 devices				
Electrical measurements		See table I, subgroup 2				
<u>Subgroup 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Gate charge	3471	Condition B	$Q_{g(on)}$			
On-state charge 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U				18.0 14.3 22.0 25.0	nC nC nC nC	
Gate to source charge 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U			Q_{gs}	4.0 3.0 3.0 6.0	nC nC nC nC	
Gate to drain charge 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U			Q_{gd}	9.0 9.0 14.0 18.0	nC nC nC nC	
Reverse recovery time 2N6788, 2N6788U 2N6790, 2N6790U 2N6792, 2N6792U 2N6794, 2N6794U	3473	$di/dt = 100$ A/ μ s, $V_{DD} \leq 50$ V, $I_D = I_{D1}$	t_{rr}	240 400 650 900	ns ns ns ns	

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

2/ This test required for the following end-point measurements only:

Group B, subgroups 2 and 3 (JAN, JANTX, and JANTXV).

Group B, subgroups 3 and 4 (JANS).

Group C, subgroup 2 and 6.

Group E, subgroup 1.

3/ This test need not be performed in group A when performed as a 100-percent screen.

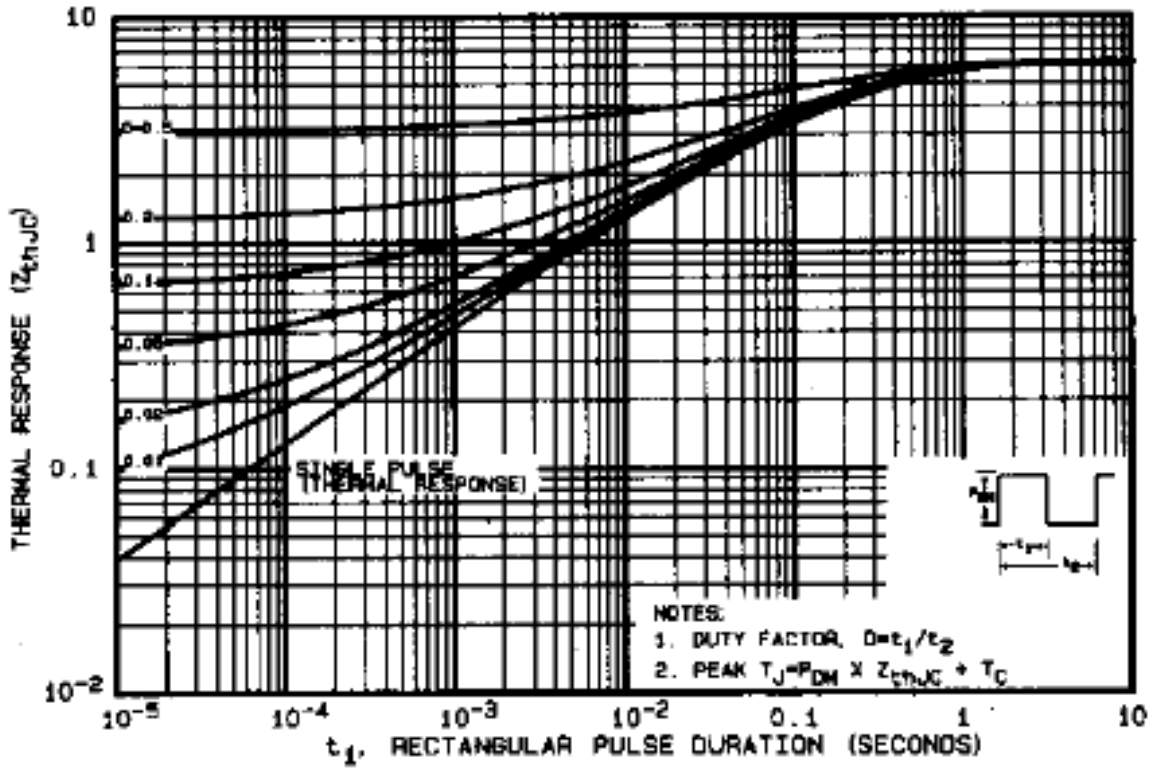
MIL-PRF-19500/555L

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

Inspection <u>1/</u>	MIL-STD-750		Sample plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycle	1051	Condition G, 500 cycles	
Hermetic seal Fine leak Gross leak	1071		
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 2 <u>2/</u></u>			45 devices c = 0
Steady-state reverse bias	1042	Condition A, 1,000 hours	
Electrical measurements		See table I, subgroup 2	
Steady-state gate bias	1042	Condition B, 1,000 hours, $V_{GS} = 80$ percent of rated (see 1.3)	
Electrical measurements		See table I, subgroup 2	
<u>Subgroup 4</u>			sample size N/A
Thermal impedance curves		See MIL-PRF-19500.	
<u>Subgroup 5</u>			3 devices c = 0
Barometric pressure (reduced)	1001	Test condition C, $V_{ISO} = V_{DS}$, $I_{(ISO)} = .25$ mA (max)	
2N6792, 2N6792U 2N6794, 2N6794U		$V_{DS} = 300$ V $V_{DS} = 300$ V	
<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	

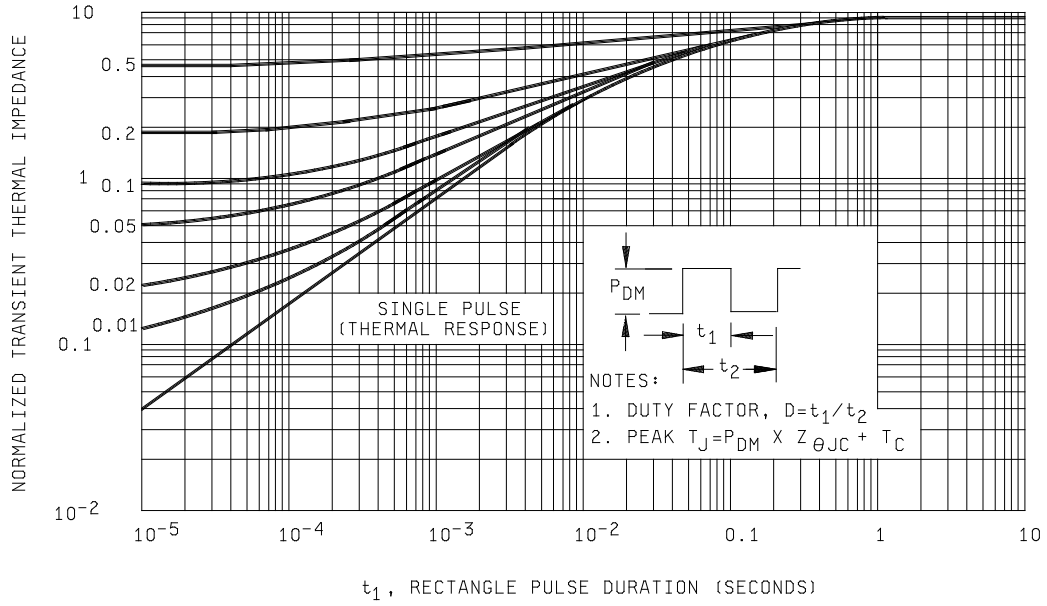
1/ JANHC and JANKC devices are qualified in accordance with MIL-PRF-19500.

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



2N6788, 2N6790, 2N6792, and 2N6794 only

FIGURE 8. Thermal impedance curves.



2N6788U, 2N6790U, 2N6792U, and 2N6794U only

FIGURE 8. Thermal impedance curves - Continued.

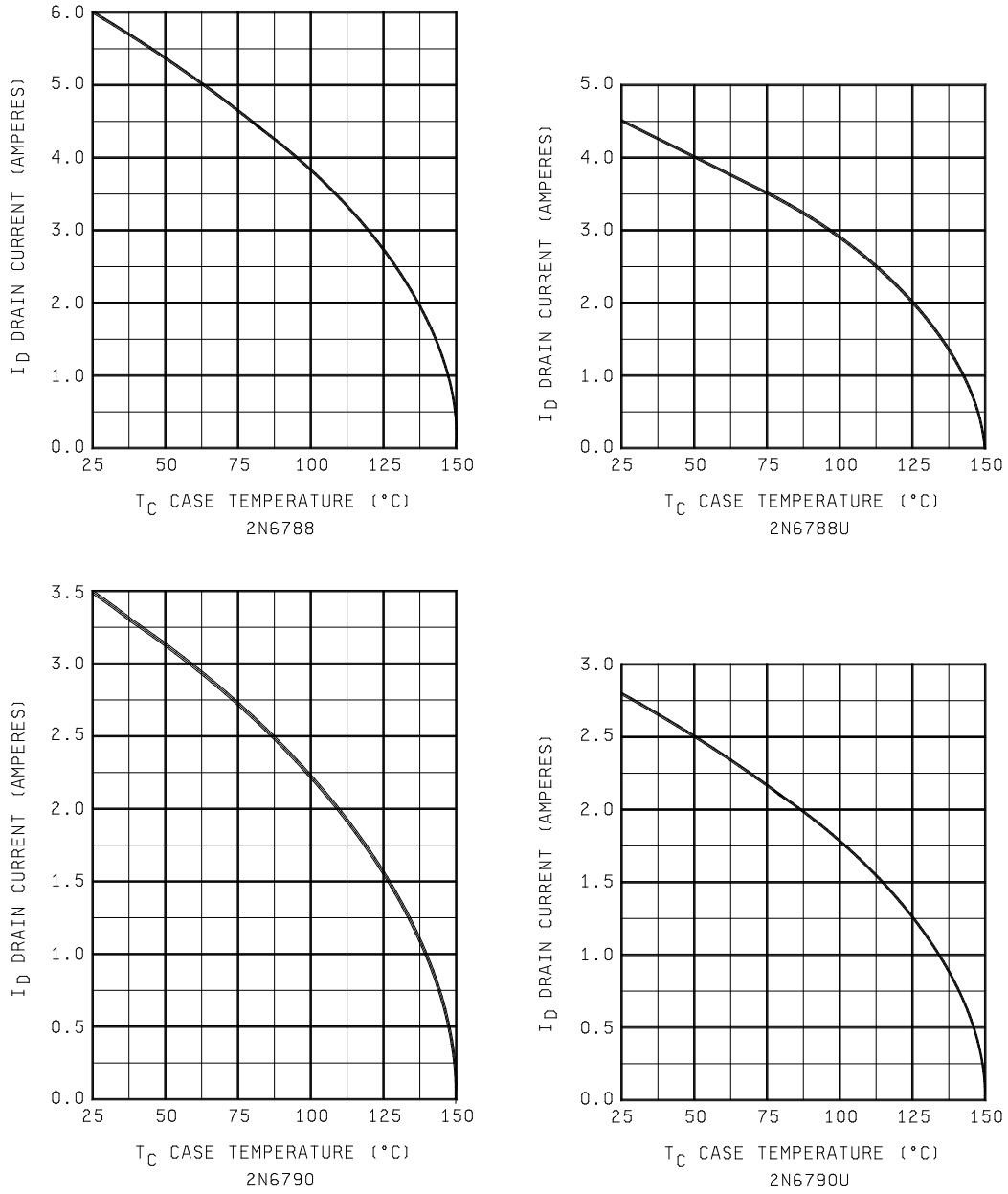


FIGURE 9. Maximum drain current versus case temperature graphs.

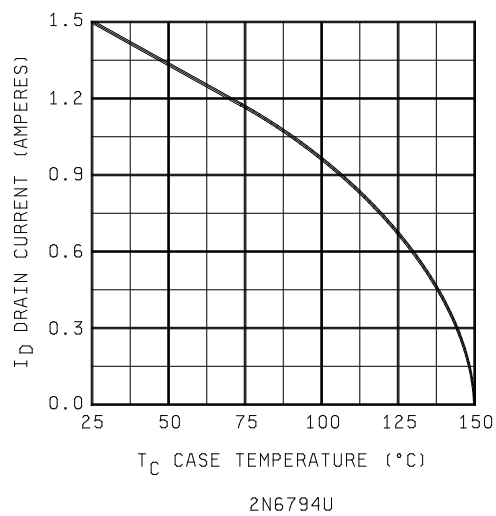
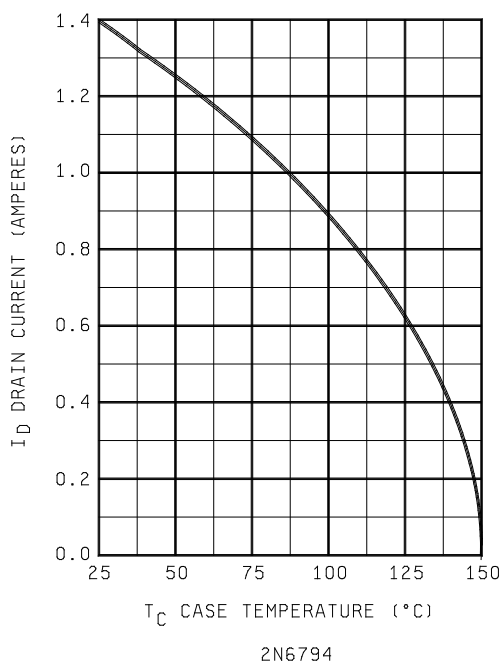
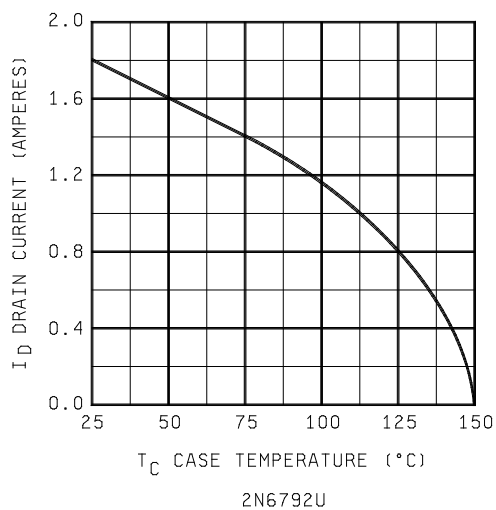
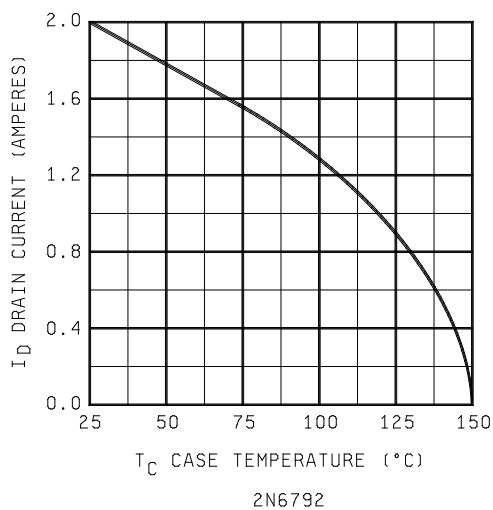
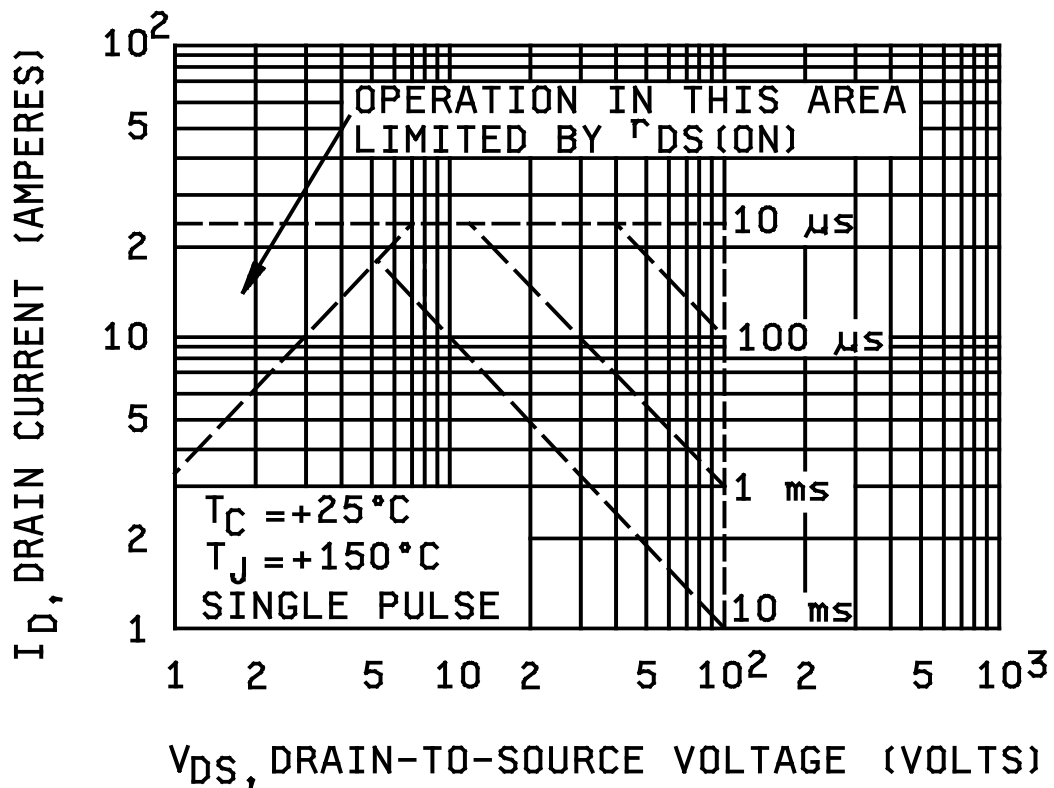
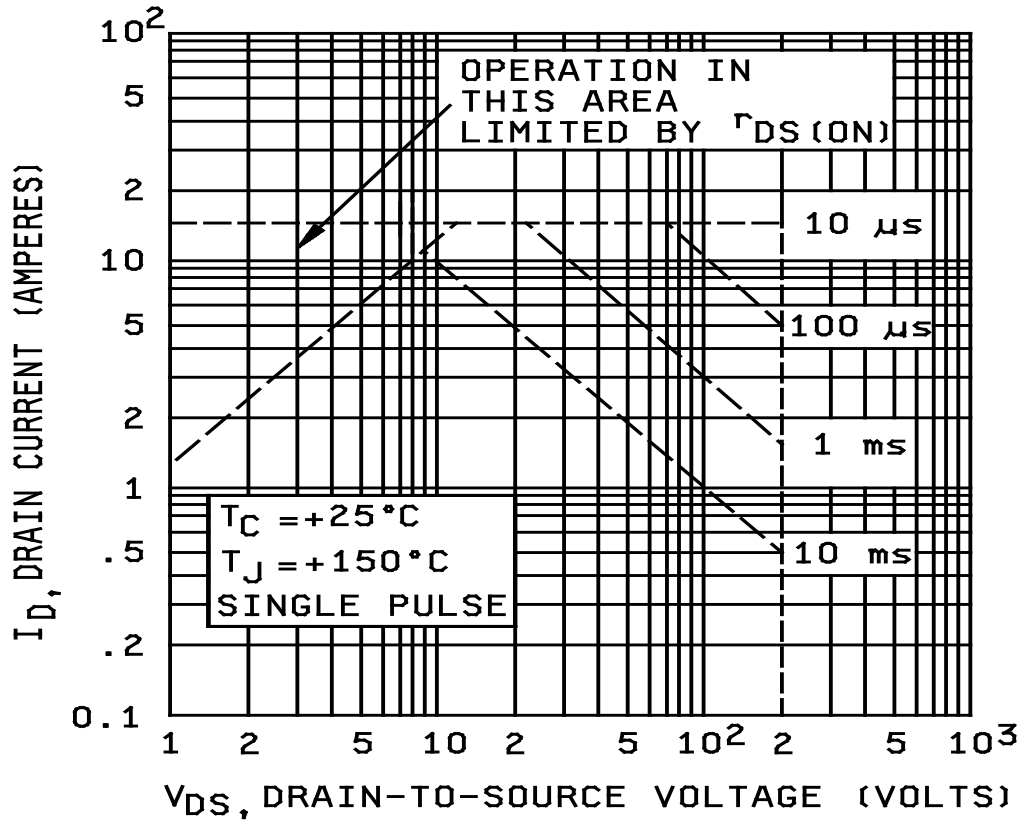


FIGURE 9. Maximum drain current versus case temperature graphs - Continued.



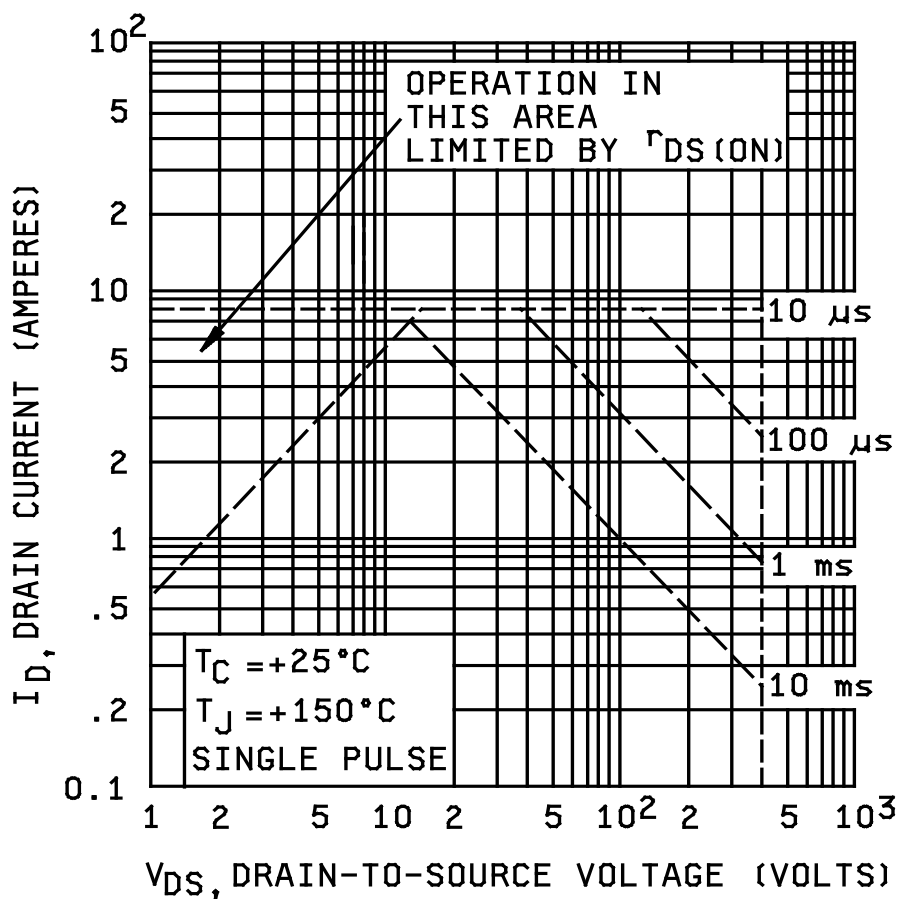
2N6788, 2N6788U

FIGURE 10. Maximum safe operating area.



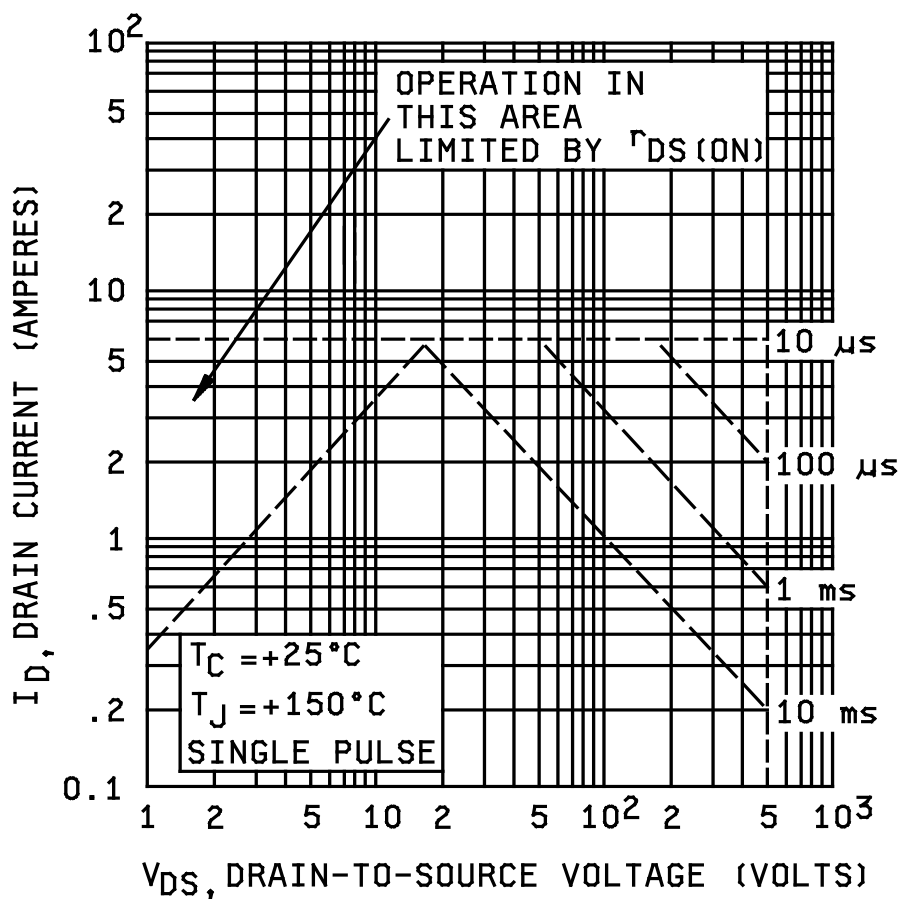
2N6790, 2N6790U

FIGURE 10. Maximum safe operating area - Continued.



2N6792, 2N6792U

FIGURE 10. Maximum safe operating area - Continued.



2N6794, 2N6794U

FIGURE 10. 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 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. Product assurance level and type designator.
- e. For die acquisition, the JANHC or JANKC letter version shall be specified (see figures 3, 4, 5, 6, and 7).

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

6.4 Cross-reference complement list. Parts from this specification may be used to supersede the following commercial Part or Identifying Number (PIN) listed below. Complementary transistors are covered by MIL-PRF-19500/564:

Preferred types (1)	Commercial types
2N6788	IRFF120
2N6790	IRFF220
2N6792	IRFF320
2N6794	IRFF420
2N6788U	IRFE120
2N6790U	IRFE220
2N6792U	IRFE320
2N6794U	IRFE420

(1) Prefixes are JAN, JANTX, JANTXV, or JANS

6.5 Suppliers of JANHC and JANKC die. The qualified die suppliers with the applicable letter version (example, JANHCA2N6788) will be identified on the QML.

JANC ordering information			
PIN	Manufacturer		
	59993	17856	43611
2N6788	JANHCA2N6788 JANKCA2N6788	JANHCC2N6788 JANKCC2N6788	JANHCE2N6788 JANKCE2N6788
2N6790	JANHCA2N6790 JANKCA2N6790	JANHCC2N6790 JANKCC2N6790	JANHCF2N6790 JANKCF2N6790
2N6792	JANHCA2N6792 JANKCA2N6792	JANHCD2N6792 JANKCD2N6792	
2N6794	JANHCA2N6794 JANKCA2N6794	JANHCD2N6794 JANKCD2N6794	

6.6 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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

Preparing activity:
 DLA - CC
 (Project 5961-2012-104)

Review activities:
 Army - AR, MI, SM
 Navy - AS, MC
 Air Force - 19, 71, 99

* 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/>.

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[JANTX2N6784U](#) [JANTXV2N5416U4](#) [SQM110N05-06L-GE3](#) [SIHF35N60E-GE3](#) [2SK2614\(TE16L1,Q\)](#)