

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, FIELD EFFECT TRANSISTOR, ENCAPSULATED PLASTIC,
N-CHANNEL, SILICON, TYPE 2N7558, 2N7559 2N7560,
JAN, JANTX, AND JANTXV

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 three plastic, N-channel, enhancement-mode, MOSFET, power transistors. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1, D² Pack (TO-262 with bent leads).

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

| Types | P _T (1) T _C = +25°C | P _{T(PCB)} T _A = +25°C | R _{θJC} (2) | V _{DS} | V _{DG} | V _{GS} | I _{D1} T _C =+25°C (3) | I _{D2} T _C =+100°C (3) | I _S | I _{DM} (4) (5) | T _J and T _{STG} | V _{ISO} 70,000 ft. altitude |
|--------|---|--|-------------------------|-----------------|-----------------|-----------------|---|--|----------------|----------------------------|--|--|
| | <u>W</u> | <u>W</u> | <u>°C/W</u> | <u>V dc</u> | <u>V dc</u> | <u>V dc</u> | <u>A dc</u> | <u>A dc</u> | <u>A dc</u> | <u>A dc</u> | <u>°C</u> | <u>V dc</u> |
| 2N7558 | 125 | 3.12 | 1.0 | 60 | 60 | ±20 | 72 | 51 | 72 | 288 | | 500 |
| 2N7559 | 167 | 3.12 | 0.75 | 100 | 100 | ±20 | 75 | 53 | 75 | 300 | -55 to +150 | 500 |
| 2N7560 | 270 | 3.12 | 0.50 | 200 | 200 | ±20 | 44 | 32 | 44 | 176 | | 500 |

(1) Derate linearly 1.0 W/°C (2N7558), 1.33 W/°C (2N7559), and 1.0 W/°C (2N7560) for T_C > +25°C.

(2) See figure 2, thermal impedance curves.

(3) The following formula derives the maximum theoretical I_D limit. I_D is limited by package and internal construction.

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

(4) I_{DM} = 4 X I_{D1} as calculated in note (3).

(5) See figure 3, 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@dsc.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://assist.daps.dla.mil/>.

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

| Type | Min | $V_{GS(TH)}$ | | Max I_{DSS1} $V_{GS} = 0$ $V_{DS} = \text{at rated VDS}$ | Max $r_{DS(ON)}$ (1) | | E_{AS} at I_{AS} | I_{AS} |
|--------|-------------------------------|----------------------|-----|--|------------------------------------|---------------------------|-------------------------|----------|
| | $V_{(BR)DSS}$ $V_{GS} = 0$ | $V_{DS} \geq V_{GS}$ | | | $V_{GS} = 10 \text{ V dc}$ | | | |
| | <u>V dc</u> | <u>V dc</u> | | | <u>$\mu\text{A dc}$</u> | $T_J = +25^\circ\text{C}$ | | |
| | | Min | Max | | | | | |
| 2N7558 | 60 | 2.0 | 4.0 | 25 | 0.012 | 0.024 | 166 | 72 |
| 2N7559 | 100 | 3.5 | 5.5 | 1 | 0.014 | 0.031 | 190 | 45 |
| 2N7560 | 200 | 3.0 | 5.0 | 25 | 0.054 | 0.122 | 460 | 26 |

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

2.3 Non-Government publications. The following documents 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.

| | |
|-------------|---|
| JESD22-A101 | Steady State Temperature Humidity Bias Life Test. |
| JESD22-A102 | Accelerated Moisture Resistance - Unbiased Autoclave. |
| JESD22-A113 | Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing |

(Copies of these documents are available from <http://www.jedec.org/default.cfm> or the Electronics Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834.)

2.4 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.

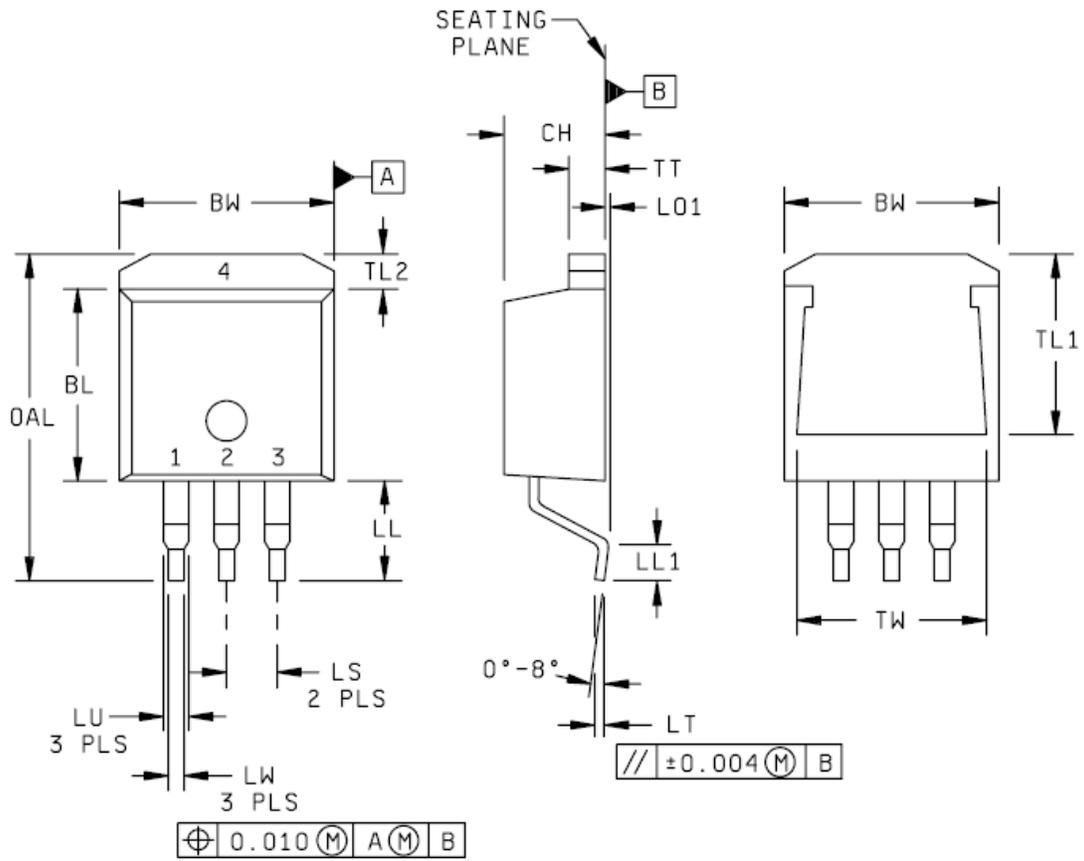


FIGURE 1. Physical dimensions for D²Pack (2N7558, 2N7559, 2N7560).

| Symbol | Dimensions | | | | Notes |
|-----------|------------|------|-------------|-------|-------|
| | Inches | | Millimeters | | |
| | Min | Max | Min | Max | |
| BL | .330 | .380 | 8.38 | 9.65 | |
| BW | .380 | .420 | 9.65 | 10.67 | |
| CH | .160 | .190 | 4.06 | 4.83 | 2, 3 |
| LL | .188 | .208 | 4.78 | 5.28 | |
| LL1 | .070 | .110 | 1.78 | 2.79 | |
| LO1 | | .010 | | 0.25 | |
| LS | .100 BSC | | 2.54 BSC | | |
| LT | .015 | .029 | 0.38 | 0.74 | |
| LU | .045 | .070 | 1.14 | 1.78 | |
| LW | .020 | .039 | 0.51 | 0.99 | |
| OAL | .575 | .625 | 14.61 | 15.88 | 3 |
| TL1 | .270 | | 6.86 | | 3 |
| TL2 | | .055 | | 1.40 | 3 |
| TT | .045 | .065 | 1.14 | 1.65 | |
| TW | .245 | | 6.22 | | 3 |
| Term 1 | Gate | | | | |
| Term 2, 4 | Drain | | | | |
| Term 3 | Source | | | | |

Notes:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimension BL and BW do not include mold flash. Mold flash shall not exceed .005 inches (0.127 mm) per side. These dimensions are measured at the outmost extremes of the plastic body.
3. Shape and dimensions of back plate are uncontrolled.
4. Dimensions and tolerancing shall be in accordance with ASME Y14.5M.
5. Center lead may or may not be present.
6. Dimensions for leads: only for pre solder tinned

FIGURE 1. Physical dimensions for D²Pack (2N7558, 2N7559, 2N7560) - Continued.

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.

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 finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2). Lead finish can be redone if needed after all screening tests.

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, $R \leq 100 \text{ k}\Omega$, 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 herein.

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

3.8 Marking. Marking shall be in accordance with MIL-PRF-19500, except as specified herein.

3.8.1 JAN brand. The "J" denotes the JAN brand. Refer to the certificate of conformance or unit packaging for quality assurance level.

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 table I).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table II tests, the tests specified in table II herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.3 Screening (JANTXV). Screening shall be in accordance with table E-IV of MIL-PRF-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

| Screen (see table E-IV of MIL-PRF-19500) | Measurement |
|--|---|
| | JANTXV Level |
| (1) | Gate stress test (see 4.3.1) |
| (1) | Method 3470 of MIL-STD-750, E _{As} (see 4.3.2) |
| 1a | Not applicable |
| 1b | Method 2069 of MIL-STD-750 required, Pre-cap internal visual inspection |
| 2 | Not required |
| 3a | Method 1051 of MIL-STD-750 required, temperature cycling |
| 3b | Not required |
| (1) 3c | Method 3161 of MIL-STD-750, thermal impedance (see 4.3.3) |
| 4 | Not required |
| 5 through 9 | Not applicable |
| 10 | Method 1042 of MIL-STD-750, test condition B required, V _{GS} = 16 V dc |
| 11 | Subgroup 2 of table I herein |
| 12 | Method 1042 of MIL-STD-750, test condition A required. |
| 13a | 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. $\Delta I_{DSS1} = \pm 10$ μ A dc (± 0.5 μ A dc for 2N7553) 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. |
| 13b through 16 | Not applicable |

- (1) Shall be performed anytime after temperature cycling, screen 3a; and does not need to be repeated in screening requirements.

4.3.1 Gate stress test. Apply $V_{GS} = 24\text{ V}$ minimum for $t = 250\text{ }\mu\text{s}$ minimum.

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

- a. Peak current (I_{AS}). $I_{AS(max)}$.
- b. Peak gate voltage (V_{GS})..... 10 V minimum (up to rated V_{GS}).
- c. Gate to source resistor (R_{GS}) $25\Omega \leq R_{GS} \leq 200\Omega$.
- d. Initial case temperature (T_C) $+25^\circ\text{C} +10^\circ\text{C}, -5^\circ\text{C}$.
- e. Inductance (L) $\left[\frac{2E_{AS}}{(I_{DI})^2} \right] \left[\frac{(V_{BR} - V_{DD})}{V_{BR}} \right] \text{mH minimum}$.
- f. Number of pulses to be applied 1 pulse minimum.
- g. Supply voltage (V_{DD}) 50 V maximum.

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

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I herein.

4.4.2 Group B inspection (JAN, JANTX, and JANTXV). Group B inspection shall be conducted in accordance with the conditions specified in 4.4.2.1 for JAN, JANTX, and JANTXV and as follows. Electrical measurements (end-points) for JAN, JANTX, and JANTXV shall be after each subgroup below and shall be in accordance with table I, subgroup 2. Separate samples may be used for each subgroup, $n = 45, c = 0$.

| <u>Subgroup</u> | <u>Method</u> | <u>Condition</u> |
|-----------------|-----------------|--|
| B1 | 2026 1022 | Solderability. Resistance to solvents (not required for laser marked devices). |
| B1 | JESD22-A113 (1) | Pre conditioning to level 1 for the following sequential tests: |
| B1 | JESD22-A102 (1) | Autoclave: condition C, 96 hours |
| B1 | 1051 | Temp cycle 168 cycles condition G. |
| B2 | 1056 | Thermal shock: 10 cycles, condition A. |
| B3 | 1042 | High temperature reverse bias: Condition B, 80 percent (minimum) of rated V_{GS} . |
| B3 | 1042 | Intermittent operation life: Condition D, 2,000 cycles. The heating cycle shall be 30 seconds minimum. |
| B4 | 2075 | Decap internal visual. |
| B4 | 2031 | $T = 260^\circ\text{C}, 10\text{ sec.}, n = 20, c = 0$. |

(1) Non-government standard document, see 2.3.

4.4.2.1 Group B sample selection (JAN, JANTX, and JANTXV). Samples for subgroups in group B shall be in accordance with MIL-PRF-19500 and as specified herein. Separate samples may be used for each subgroup. In the event of a group B failure, the manufacturer may pull a new sample at double size from either the failed assembly lot or from another assembly lot from the same wafer lot. If the new “assembly lot” option is exercised, the failed assembly lot shall be scrapped.

4.4.3 Group C inspection. Group C inspection shall be as specified in 4.4.3.1 and shall include tests which are performed periodically. Electrical measurements (end-points) for JAN, JANTX, and JANTXV shall be after each subgroup in 4.3.1 and as specified in table I, subgroup 2 herein. Separate samples may be used for each subgroup. For rules on resubmission for failed subgroup, see MIL-PRF-19500. Sample sizes shall be in accordance with the corresponding group C subgroup from table E-VII of MIL-PRF-19500.

4.4.3.1 Group C inspection (JAN, JANTX, and JANTXV) of MIL-PRF-19500. Separate samples may be used for each step, $n = 77$, $c = 0$

| <u>Subgroup</u> | <u>Method</u> | <u>Condition</u> |
|-----------------|--------------------|--|
| C1 | JESD22-A113 (1) | Pre conditioning to level 1 |
| C1 | 2066 | Physical dimensions: In accordance with figure 1 herein. |
| C2 | 1056 | Thermal shock: condition B. Electrical measurements. |
| C2 | 1051 | Temp. cycle: condition G, 500 cycles. |
| C3 | JESD22-A101 (1) | High temperature reverse bias: 500 hours, (85/85 biased): 80 percent V; max of 100 V. |
| C4 | 1042 | High temperature reverse bias: Condition B, 80 percent (minimum) of rated V_{GS} . |
| C4 | 1042 | Intermittent operation life: Condition D, 5,000 cycles. The heating cycle shall be 30 seconds minimum. |
| C5 | 3161 | Thermal resistance: $R_{\theta JC}(\max) = \text{rated } R_{\theta JC}$. |

(1) Non-government standard document, see 2.3.

4.4.3.2 Group C sample selection. Samples for subgroups in group C shall be in accordance with MIL-PRF-19500.

4.4.4 Group E inspection. Group E inspection shall be performed for qualification or re-qualification only. The tests specified in table II herein must be performed to maintain qualification. Separate samples may be used for each subgroup.

4.5 Method of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

TABLE I. Group A inspection.

| Inspection <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 4.3.3 | $Z_{\theta JC}$ | | | °C/W |
| Breakdown voltage, drain to source 2N7558 2N7559 2N7560 | 3407 | $V_{GS} = 0$ V dc, $I_D = 0.25$ mA dc, bias condition C | $V_{(BR)DSS}$ | 60 100 200 | | V dc |
| Gate to source voltage (threshold) 2N7558 2N7559 2N7560 | 3403 | $V_{DS} \geq V_{GS}$ $I_D = 0.25$ mA dc | $V_{GS(TH)1}$ | 2.0 3.5 3.0 | 4.0 5.5 5.0 | V dc |
| Gate current | 3411 | $V_{GS} = +20$ V dc and -20 V dc, bias condition C, $V_{DS} = 0$ | $I_{GSS(TH)1}$ | | ±100 | nA dc |
| Drain current 2N7558 2N7559 2N7560 | 3413 | $V_{GS} = 0$ V dc, bias condition C, $V_{DS} =$ at rated V_{DS} | I_{DSS1} | | 25 1 25 | μA dc |
| Static drain to source on-state resistance 2N7558 2N7559 2N7560 | 3421 | $V_{GS} = 10$ V dc, condition A, Pulsed (see 4.5.1) $I_D = 43$ A dc $I_D = 45$ A dc $I_D = 26$ A dc | $r_{DS(on)1}$ | | 0.012 0.014 0.054 | Ohm |
| Forward voltage 2N7558 2N7559 2N7560 | 4011 | Pulsed (see 4.5.1), $V_{GS} = 0$ V dc $I_D = 72$ A dc $I_D = 45$ A dc $I_D = 26$ A dc | V_{SD} | | 2.0 1.3 1.5 | V 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 | |
| <u>Subgroup 3</u> | | | | | | |
| High-temperature operation | | $T_C = T_J = +125^\circ\text{C}$ | | | | |
| Gate current | 3411 | $V_{GS} = +20\text{ V dc and } -20\text{ V dc, bias condition C, } V_{DS} = 0$ | I_{GSS2} | | ± 200 | nA dc |
| Drain current | 3413 | $V_{GS} = 0\text{ V dc, bias condition C, } V_{DS} = 80\text{ percent of rated } V_{DS}$ | I_{DSS2} | | | $\mu\text{A dc}$ |
| 2N7558 2N7559 2N7560 | | | | | 250 250 250 | |
| Static drain to source on-state resistance | 3421 | $V_{GS} = 10\text{ V dc, pulsed (see 4.5.1), } I_D = \text{rated } I_{D2}\text{ dc}$ | $r_{DS(on)3}$ | | | ohm |
| 2N7558 2N7559 2N7560 | | | | | 0.024 0.031 0.122 | |
| Gate to source voltage (thresholds) | 3403 | $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA dc}$ | $V_{GS(TH)2}$ | | | V dc |
| 2N7558 2N7559 2N7560 | | | | 1.0 2.5 2.0 | | |
| Low-temperature operation: | | $T_C = T_J = -55^\circ\text{C}$ | | | | |
| Gate to source voltage (threshold) | 3403 | $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA dc}$ | $V_{GS(TH)3}$ | | | V dc |
| 2N7558 2N7559 2N7560 | | | | | 5.0 6.5 6.0 | |
| <u>Subgroup 4</u> | | | | | | |
| Forward transconductance | 3475 | $V_{DD} \geq 25\text{ V (see 4.5.1)}$ | g_{FS} | | | S |
| 2N7558 2N7559 2N7560 | | $I_D = 43\text{ A dc}$ $I_D = 45\text{ A dc}$ $I_D = 26\text{ A dc}$ | | | 35 35 17 | |

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 (high voltage) | 3474 | See figure 4 of each P/N; $t_p = 10$ ms, $V_{DS} = 80$ percent of rated Voltage max 200 V dc | | | | |
| Electrical measurements | | See table I, subgroup 2 | | | | |
| <u>Subgroup 6</u> | | | | | | |
| Not applicable | | | | | | |
| <u>Subgroup 7</u> | | | | | | |
| Gate charge | 3471 | Condition B | | | | |
| On-state gate charge | | | $Q_{G(on)}$ | | | nC |
| 2N7558 | | $I_D = 72A$ | | | 110 | |
| 2N7559 | | $I_D = 45A$ | | | 170 | |
| 2N7560 | | $I_D = 26A$ | | | 110 | |
| Gate to source charge | | | Q_{GS} | | | nC |
| 2N7558 | | $I_D = 72A$ | | | 29 | |
| 2N7559 | | $I_D = 45A$ | | | 65 | |
| 2N7560 | | $I_D = 26A$ | | | 25 | |
| Gate to drain charge | | | Q_{GD} | | | nC |
| 2N7558 | | $I_D = 72A$ | | | 36 | |
| 2N7559 | | $I_D = 45A$ | | | 60 | |
| 2N7560 | | $I_D = 26A$ | | | 42 | |
| Reverse recovery time | 3473 | $d/d_t \leq 100$ A/ μ s, $V_{DD} \leq 30$ V, | t_{rr} | | | nS |
| 2N7558 | | $I_D = 72A$ | | | 100 | |
| 2N7559 | | $I_D = 45A$ | | | 110 | |
| 2N7560 | | $I_D = 26A$ | | | 240 | |

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 (JANTXV).
Group C, subgroup 5.
Group E, subgroup 1.

MIL-PRF-19500/714

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

| Inspection | MIL-STD-750 (unless otherwise noted) | | Sample size |
|----------------------------------|--------------------------------------|--|---------------|
| | Method | Conditions | |
| <u>Subgroup 1</u> | | | |
| Temperature cycling (air to air) | 1051 | Test condition G, 500cycles | n = 77, c = 0 |
| Electrical measurements | | See table I, subgroup 2 | |
| <u>Subgroup 2</u> | | | |
| Steady state operation life | 1042 | 1,000 hours, condition B. VGS = 16 V dc | n = 77, c = 0 |
| Electrical measurements | | See table I, subgroup 2 | |
| <u>Subgroup 2a</u> | | | |
| High temperature reverse bias | 1042 | 1,000 hours, condition A. | n = 77, c = 0 |
| Electrical measurements | | See table I, subgroup 2 | |
| <u>Subgroup 3</u> | | | |
| Switching time test | 3472 | $I_D = \text{below}, V_{GS} = 10 \text{ V dc}, R_G = 9.1\Omega,$ | n = 45, c = 0 |
| 2N7558 | | Typical measurements: $I_D = 72\text{A}, V_{DD} = 48 \text{ V}, t_{d(\text{on})} = 7.6 \text{ ns}; t_r = 200 \text{ ns};$ $t_{d(\text{off})} = 157 \text{ ns}; t_f = 166 \text{ ns}$ | |
| 2N7559 | | $I_D = 45 \text{ A}, V_{DD} = 50 \text{ V}, t_{d(\text{on})} = 35 \text{ ns}; t_r = 130 \text{ ns};$ $t_{d(\text{off})} = 41 \text{ ns}; t_f = 38 \text{ ns}$ | |
| 2N7560 | | $I_D = 26 \text{ A}, V_{DD} = 100 \text{ V}, t_{d(\text{on})} = 16 \text{ ns}; t_r = 95 \text{ ns};$ $t_{d(\text{off})} = 29 \text{ ns}; t_f = 47 \text{ ns}$ | |
| <u>Subgroup 4</u> | | | |
| Moisture resistance | JESD22-A101 1/ | 1,000 hours | n = 77, c = 0 |
| Electrical measurements | | See table I, subgroup 2 | |
| <u>Subgroup 4a</u> 2/ | | | |
| Autoclave | JESD22-A102 1/ | Condition C, 96 hours | n = 77, c = 0 |
| Temperature cycling | 1051 | Condition G, 500 cycles. | |
| Autoclave | JESD22-A102 1/ | Condition C, 96 hours | |
| Temperature cycling | 1051 | Condition G, 500 cycles. | |

See footnotes at end of table.

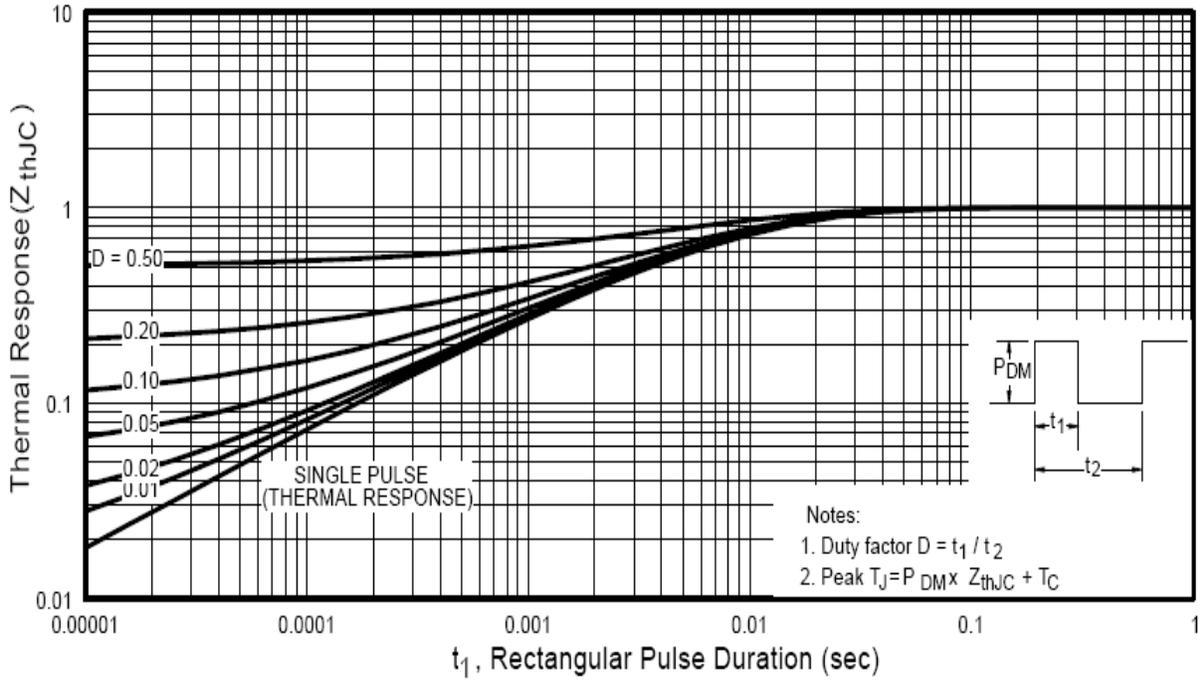
MIL-PRF-19500/714

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

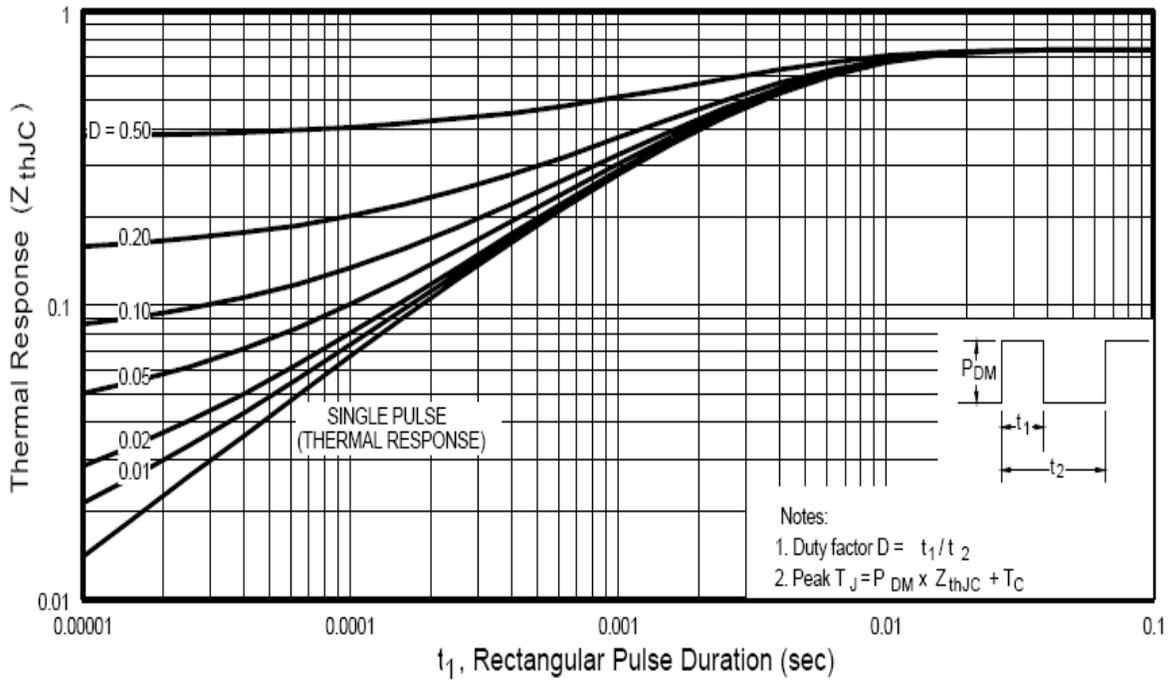
| Inspection | MIL-STD-750 (unless otherwise noted) | | Sample size |
|---|--------------------------------------|---|--------------------|
| | Method | Conditions | |
| <u>Subgroup 4b</u> (any order after preconditioning) | | | n = 77, c = 0 |
| Pre conditioning | JESD22-A113 <u>1/</u> | To level 1 for the following tests: | |
| Temperature cycling | 1051 | Condition G, 1000 cycles. | |
| High temperature reverse bias | JESD22-A101 <u>1/</u> | 1000 hrs (85/85 biased): 80 percent V; Max of 100V. | |
| High temperature reverse bias | 1042 | Condition A, T _A = +150°C, 1000 hours, 80 percent BVR | |
| Intermittent operation life | 1042 | Intermittent operation life: Condition D, ΔT _J = 100 °C, 8572 cycles, 3.5 minutes on, 3.5 minutes off. | |
| <u>Subgroup 4c</u> | | | Sample size N/A |
| Thermal impedance curves | | See MIL-PRF-19500, subgroup 4. | |
| <u>Subgroup 5</u> | | | n = 12, c = 0 |
| Barometric pressure (reduced) | 1001 | V _{DS} = rated V ISO V dc; I (ISO) < 0.25 mA | |

1/ Non-government standard document, see 2.3.

2/ These tests shall be performed in the order listed.

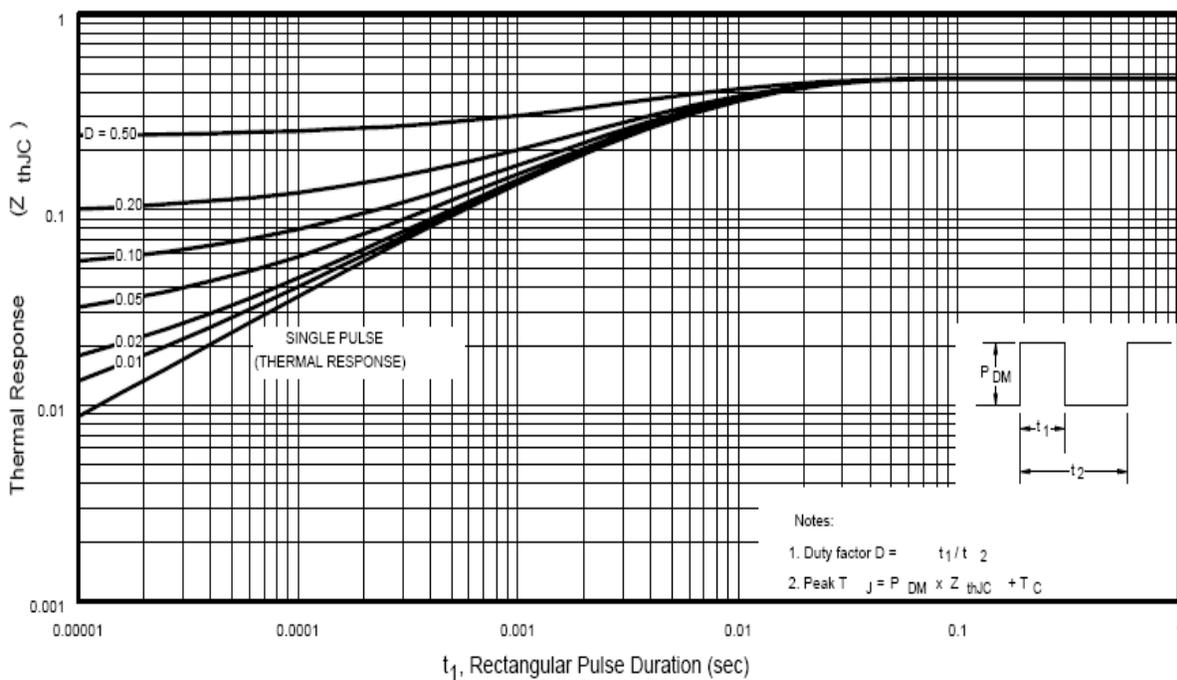


2N7558



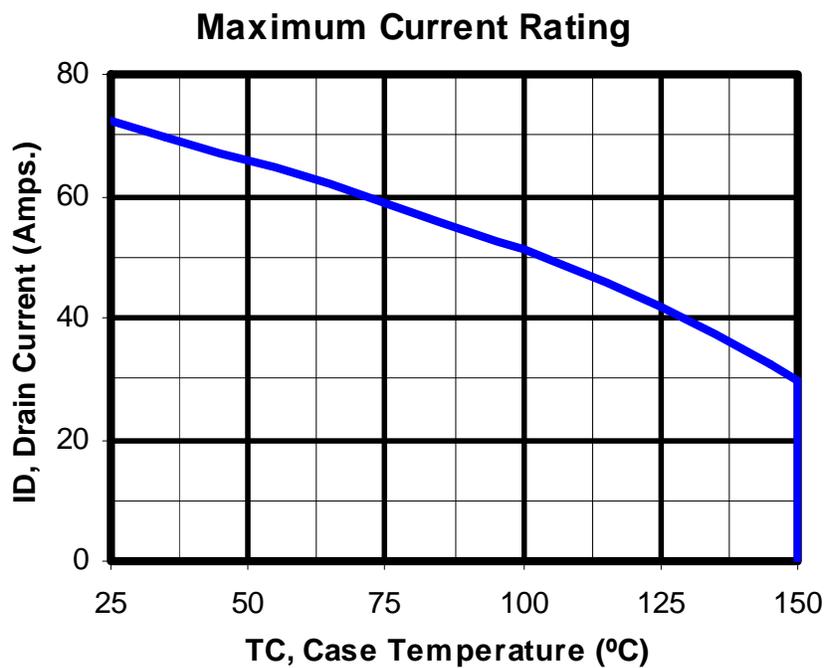
2N7559

FIGURE 2. Maximum effective transient thermal impedance, junction-to-case.

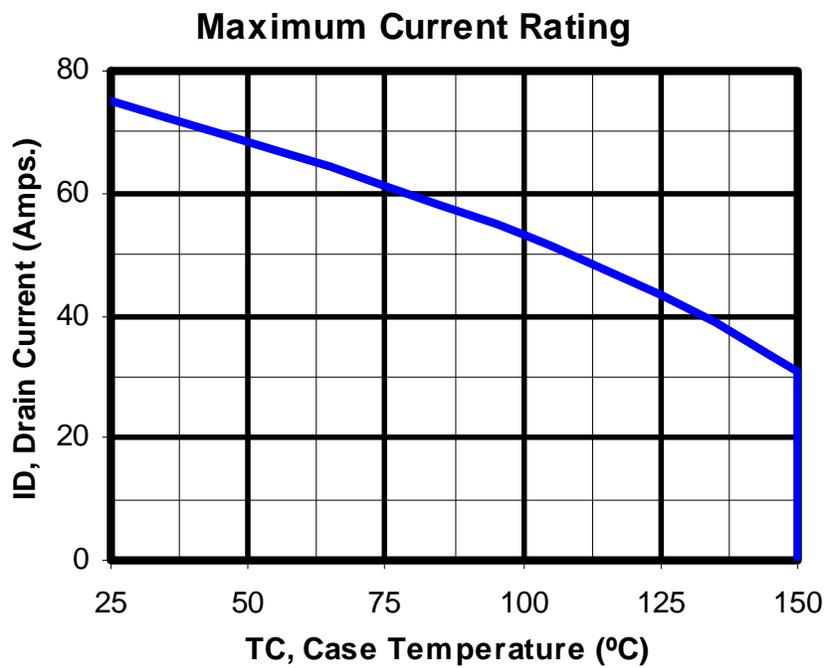


2N7560

FIGURE 2. Maximum effective transient thermal impedance, junction-to-case - Continued.

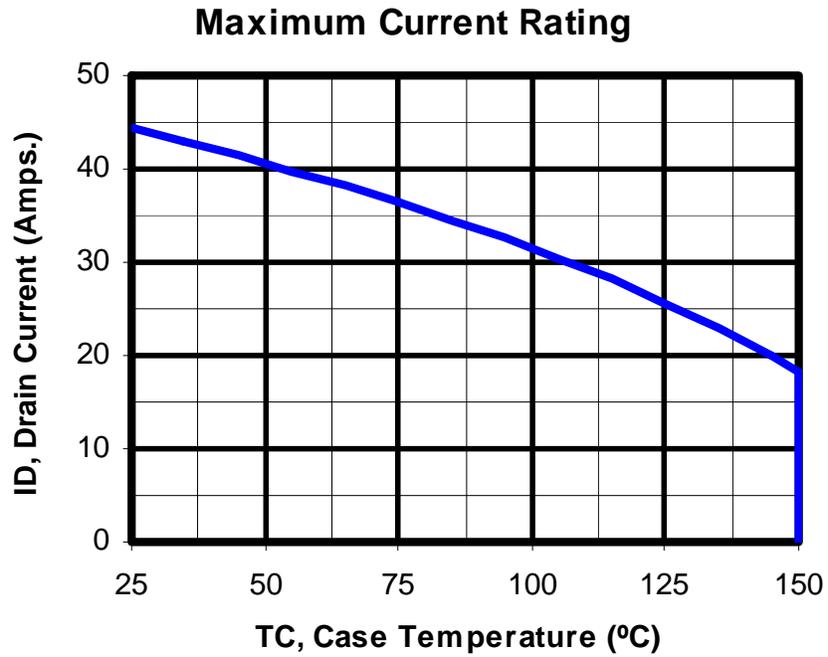


2N7558



2N7559

FIGURE 3. Maximum drain current versus case temperature graphs.



2N7560

FIGURE 3. Maximum drain current versus case temperature graphs - Continued.

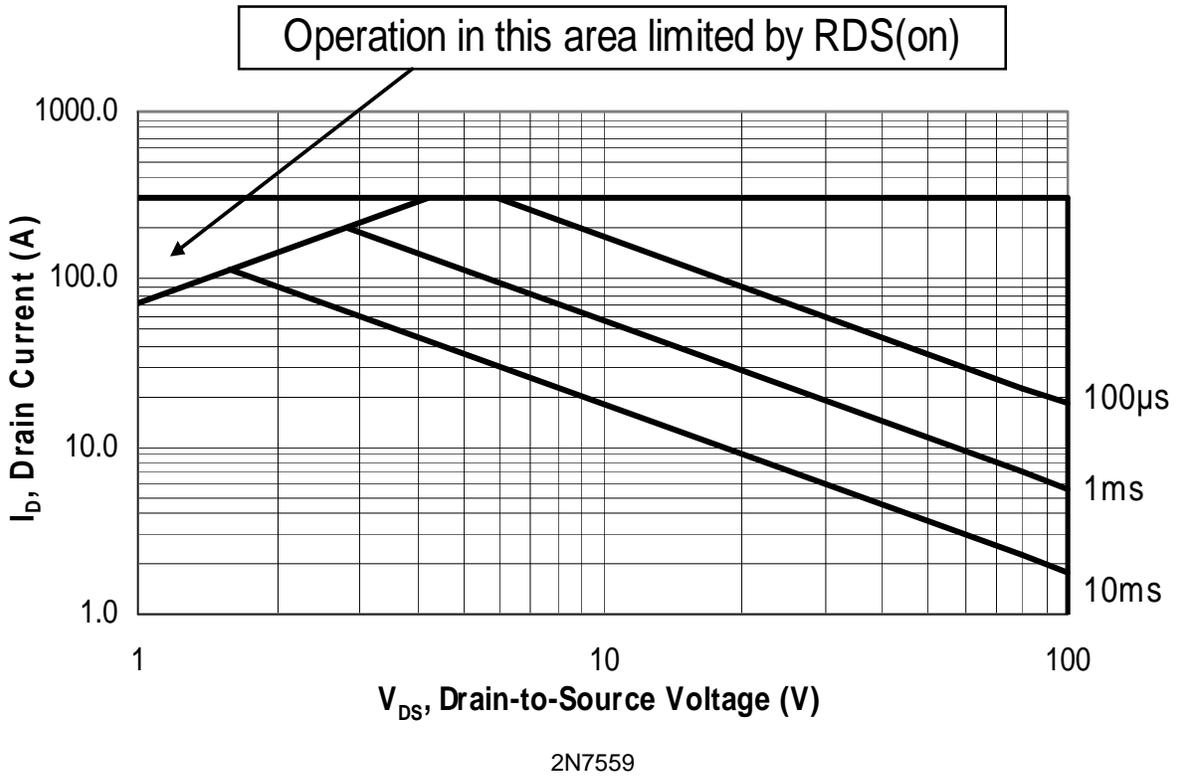
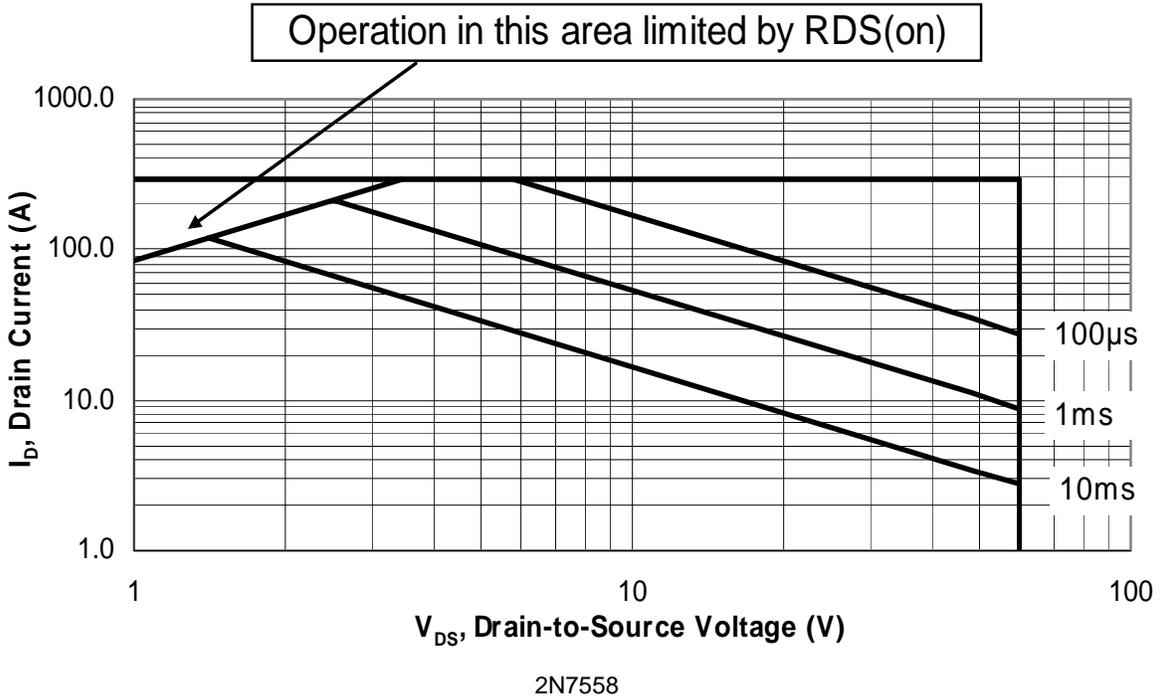
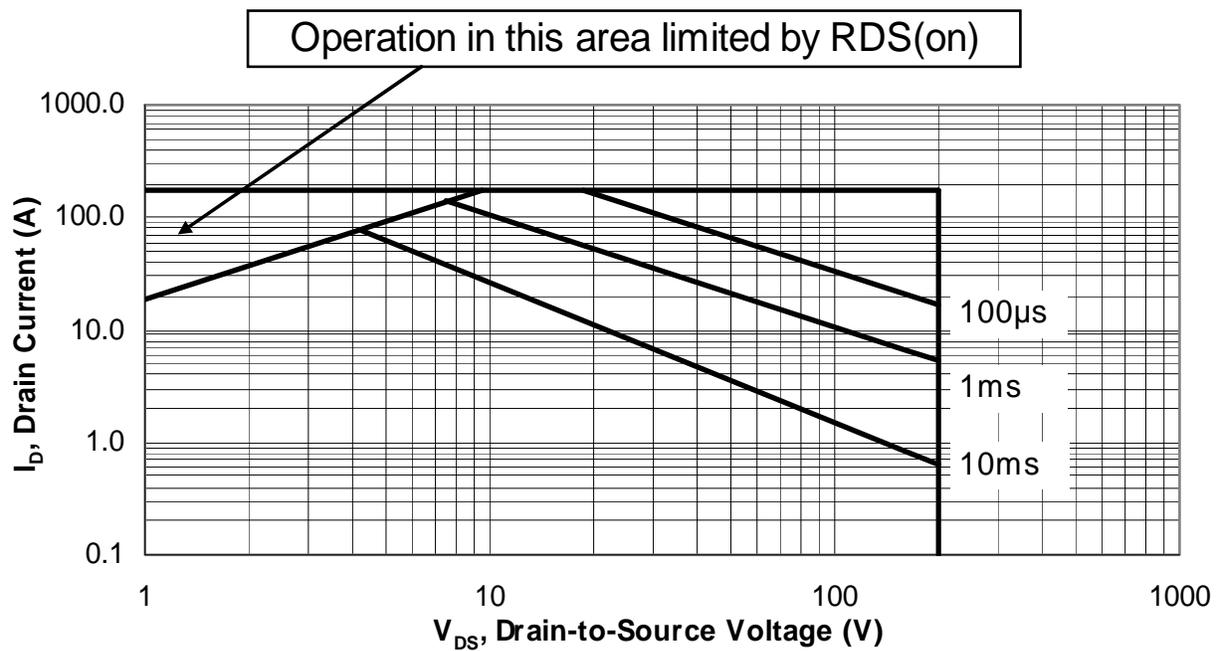


FIGURE 4. Maximum safe operating area.



2N7560

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 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.

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. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <http://assist.daps.dla.mil>.

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

Preparing activity:
DLA - CC

(Project 5961-2007-095)

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://assist.daps.dla.mil/>.