

N-Channel 200 V (D-S) MOSFET

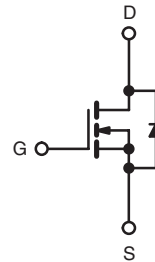
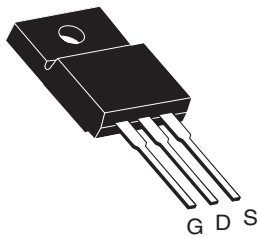
| PRODUCT SUMMARY | | |
|----------------------------|------------------------|-------|
| V _{DS} (V) | 200 | |
| R _{DS(on)} (Ω) | V _{GS} = 10 V | 0.265 |
| Q _g (Max.) (nC) | 16 | |
| Q _{gs} (nC) | 5 | |
| Q _{gd} (nC) | 8 | |
| Configuration | Single | |

FEATURES

- Isolated Package
- High Voltage Isolation = 2.5 kV_{RMS} (t = 60 s; f = 60 Hz)
- Sink to Lead Creepage Distance = 4.8 mm
- 175 °C Operating Temperature
- Dynamic dV/dt Rating
- Low Thermal Resistance
- Lead (Pb)-free Available



TO-220 FULLPAK



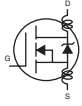

N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS T _C = 25 °C, unless otherwise noted | | | | | |
|---|-------------------------|-------------------------|-----------------------------------|------------------|----------|
| PARAMETER | SYMBOL | | LIMIT | UNIT | |
| Drain-Source Voltage | V _{DS} | | 200 | V | |
| Gate-Source Voltage | V _{GS} | | ± 20 | | |
| Continuous Drain Current | V _{GS} at 10 V | T _C = 25 °C | 10 | A | |
| | | T _C = 100 °C | 6.5 | | |
| Pulsed Drain Current ^a | I _{DM} | | 32 | | |
| Linear Derating Factor | | | 0.24 | W/°C | |
| Single Pulse Avalanche Energy ^b | E _{AS} | | 36 | mJ | |
| Repetitive Avalanche Current ^a | I _{AR} | | 7.2 | A | |
| Repetitive Avalanche Energy ^a | E _{AR} | | 3.7 | mJ | |
| Maximum Power Dissipation | T _C = 25 °C | | P _D | 37 | W |
| Peak Diode Recovery dV/dt ^c | | | dV/dt | 5.5 | V/ns |
| Operating Junction and Storage Temperature Range | | | T _J , T _{stg} | - 55 to + 175 | °C |
| Soldering Recommendations (Peak Temperature) | for 10 s | | | 300 ^d | |
| Mounting Torque | 6-32 or M3 screw | | | 10 | lbf · in |
| | | | | 1.1 | N · m |

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- V_{DD} = 25 V, starting T_J = 25 °C, L = 1.0 mH, R_G = 25 Ω, I_{AS} = 7.2 A (see fig. 12).
- I_{SD} ≤ 9.2 A, dI/dt ≤ 110 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 175 °C.
- 1.6 mm from case.

| THERMAL RESISTANCE RATINGS | | | | |
|----------------------------------|------------|------|------|------|
| PARAMETER | SYMBOL | TYP. | MAX. | UNIT |
| Maximum Junction-to-Ambient | R_{thJA} | - | 65 | °C/W |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | 4.1 | |

| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | | |
|--|---------------------|--|---|------|-------|-----------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | | 200 | - | - | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$ | | - | 0.13 | - | V/°C |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | | 2.0 | - | 4.0 | V |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 20\text{ V}$ | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$ | | - | - | 25 | μA |
| | | $V_{DS} = 160\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$ | | - | - | 250 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 4.3\text{ A}^b$ | - | 0.265 | - | Ω |
| Forward Transconductance | g_{fs} | $V_{DS} = 50\text{ V}, I_D = 4.3\text{ A}^b$ | | 2.3 | - | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$, see fig. 5 | | - | 560 | - | pF |
| Output Capacitance | C_{oss} | | | - | 260 | - | |
| Reverse Transfer Capacitance | C_{rss} | | | - | 110 | - | |
| Drain to Sink Capacitance | C | $f = 1.0\text{ MHz}$ | | - | 12 | - | |
| Total Gate Charge | Q_g | $V_{GS} = 10\text{ V}$ | $I_D = 9.2\text{ A}, V_{DS} = 80\text{ V}$, see fig. 6 and 13 ^b | - | - | 16 | nC |
| Gate-Source Charge | Q_{gs} | | | - | - | 4.4 | |
| Gate-Drain Charge | Q_{gd} | | | - | - | 7.7 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 100\text{ V}, I_D = 9.2\text{ A}, R_G = 18\text{ }\Omega, R_D = 5.2\text{ }\Omega$, see fig. 10 ^b | | - | 8.8 | - | ns |
| Rise Time | t_r | | | - | 30 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | - | 19 | - | |
| Fall Time | t_f | | | - | 20 | - | |
| Internal Drain Inductance | L_D | Between lead, 6 mm (0.25") from package and center of die contact  | | - | 4.5 | - | nH |
| Internal Source Inductance | L_S | | | - | 7.5 | - | |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I_S | MOSFET symbol showing the integral reverse p - n junction diode  | | - | 10 | - | A |
| Pulsed Diode Forward Current ^a | I_{SM} | | | - | 32 | - | |
| Body Diode Voltage | V_{SD} | $T_J = 25\text{ }^\circ\text{C}, I_S = 7.2\text{ A}, V_{GS} = 0\text{ V}^b$ | | - | - | 2.5 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $T_J = 25\text{ }^\circ\text{C}, I_F = 9.2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$ | | - | 130 | 260 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | - | 0.65 | 1.3 | μC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D) | | | | | |

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

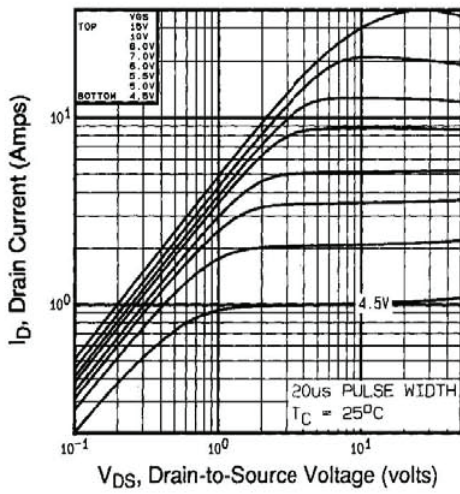


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^\circ\text{C}$

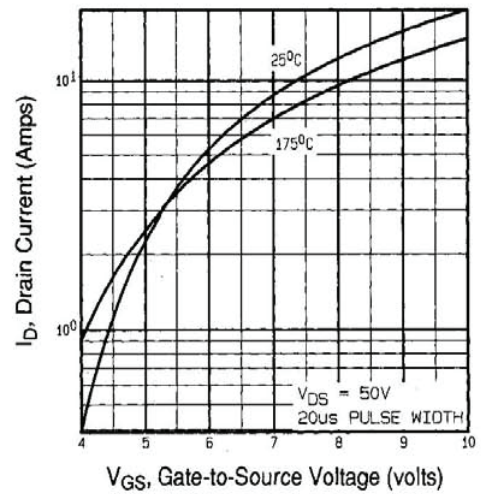


Fig. 3 - Typical Transfer Characteristics

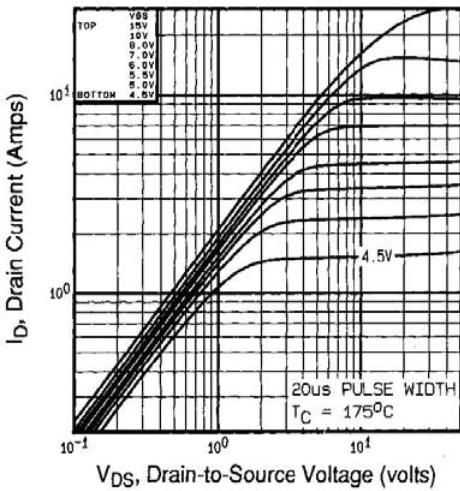


Fig. 2 - Typical Output Characteristics, $T_C = 175\text{ }^\circ\text{C}$

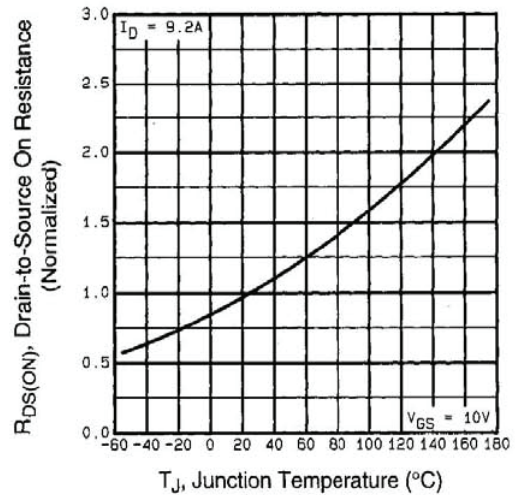


Fig. 4 - Normalized On-Resistance vs. Temperature

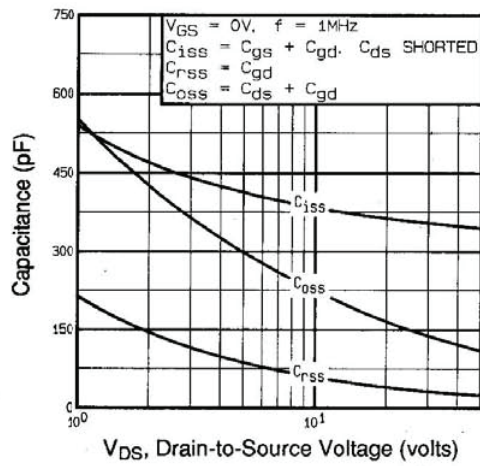


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

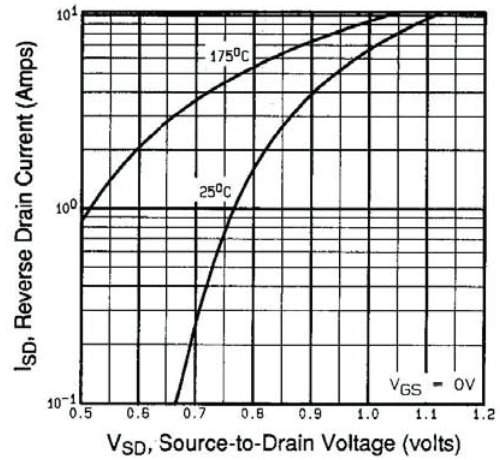


Fig. 7 - Typical Source-Drain Diode Forward Voltage

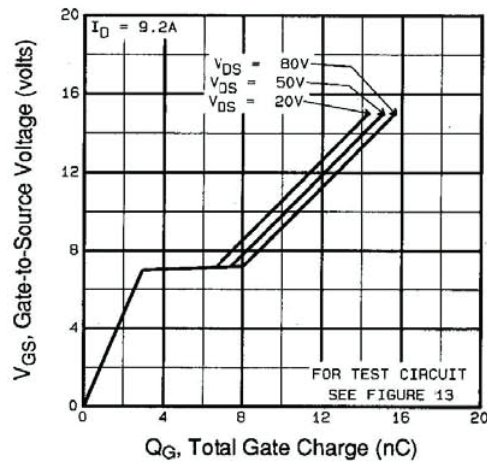


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

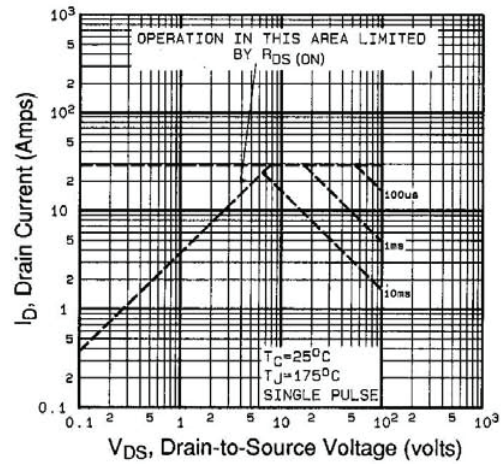


Fig. 5 - Fig. 8 - Maximum Safe Operating Area

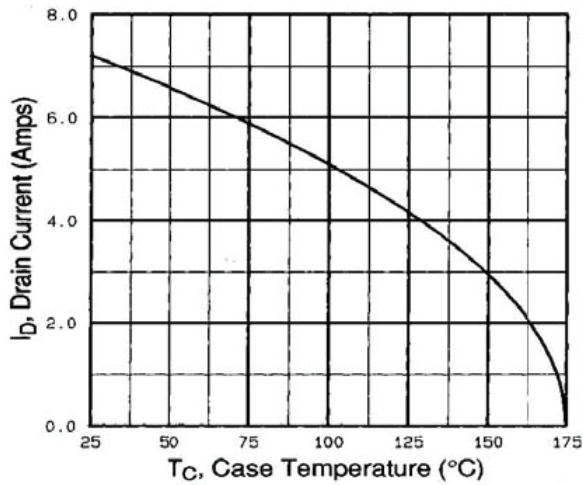


Fig. 9 - Maximum Drain Current vs. Case Temperature

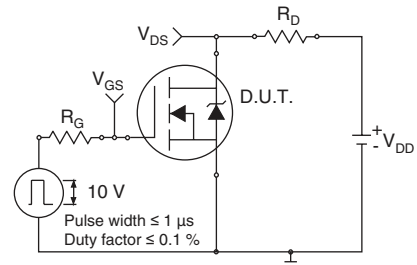


Fig. 10a - Switching Time Test Circuit

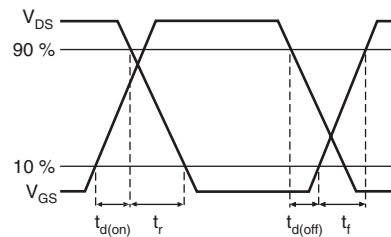


Fig. 10b - Switching Time Waveforms

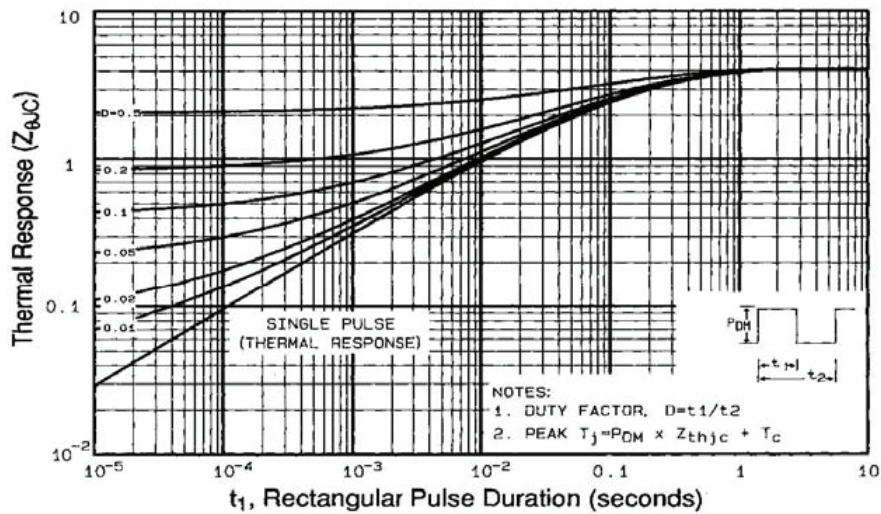


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

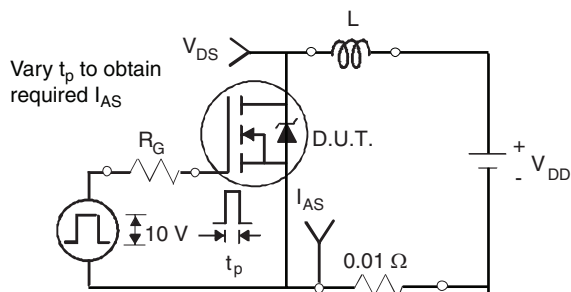


Fig. 12a - Unclamped Inductive Test Circuit

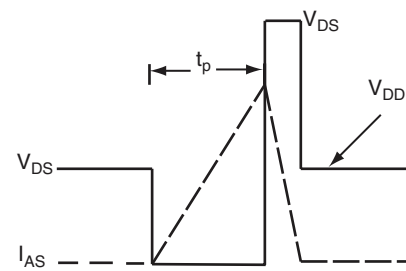


Fig. 12b - Unclamped Inductive Waveforms

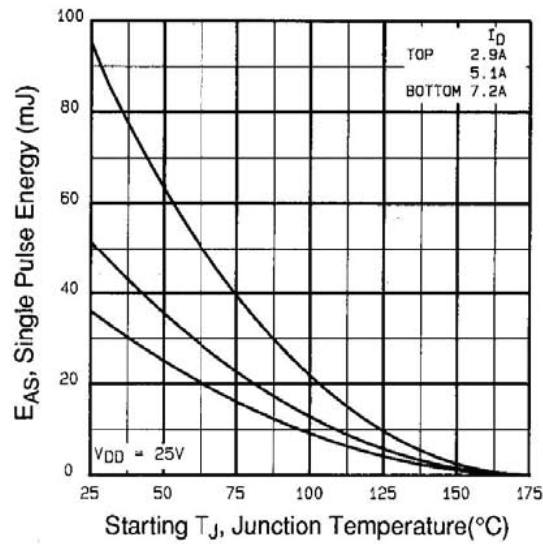


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

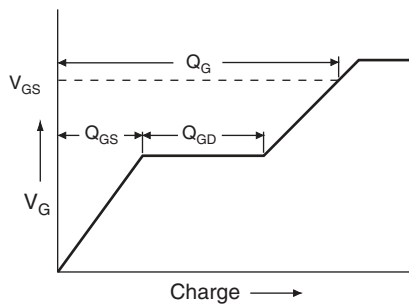


Fig. 13a - Basic Gate Charge Waveform

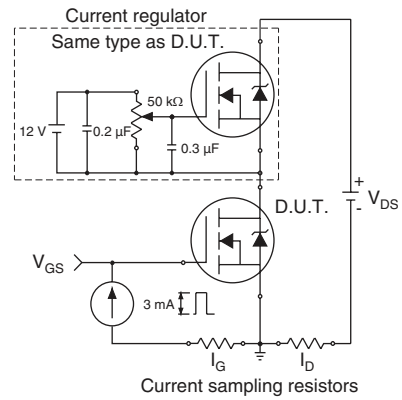
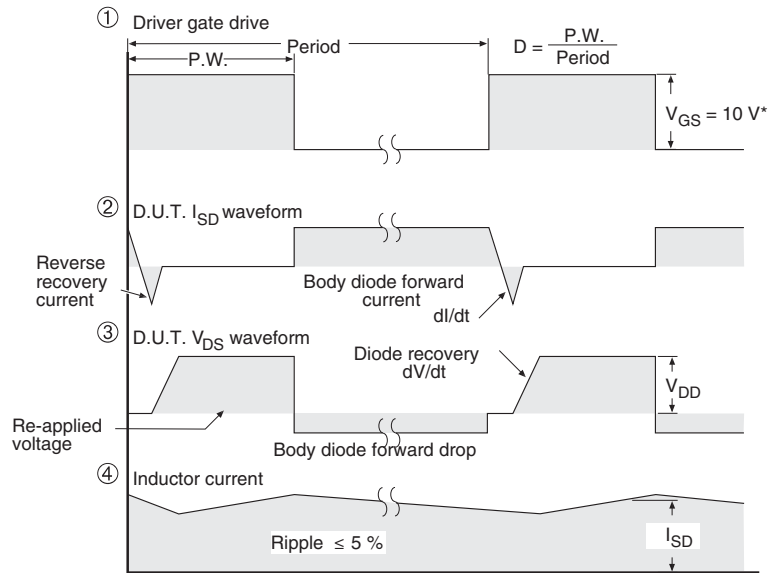
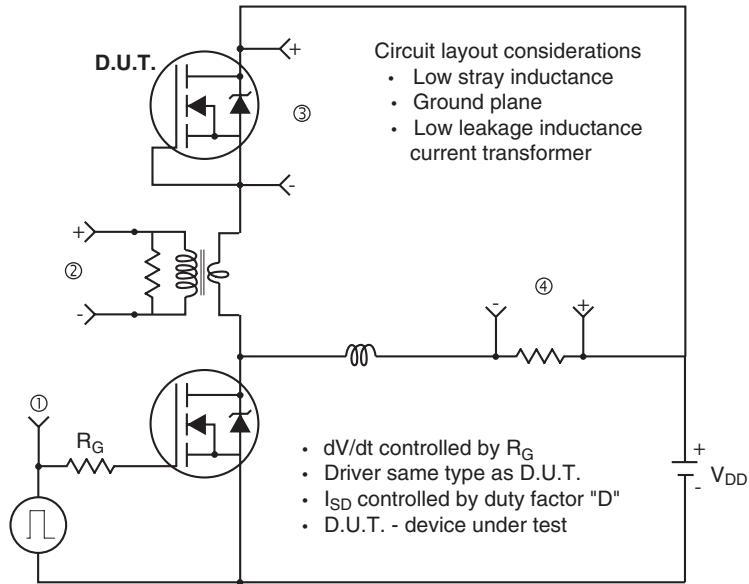


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



* $V_{GS} = 5 V$ for logic level devices

Fig. 14 - For N-Channel

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