

N-Channel 100-V (D-S) MOSFET

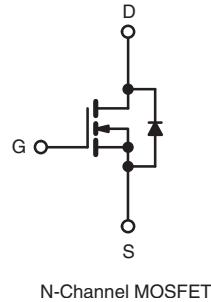
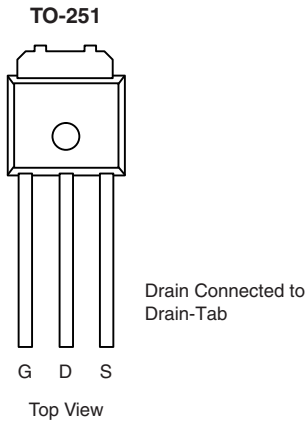
| PRODUCT SUMMARY | |
|---------------------------|-----------------------------|
| V_{DS} (V) | 100 |
| $R_{DS(on)}$ (Ω) | $V_{GS} = 10\text{ V}$ 0.20 |
| Q_g (Max.) (nC) | 16 |
| Q_{gs} (nC) | 4.4 |
| Q_{gd} (nC) | 7.7 |
| Configuration | Single |

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- 175 °C Operating Temperature
- Fast Switching
- Ease of Paralleling



RoHS*
Available
HALOGEN
FREE
Available

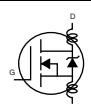



| ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted) | | | | |
|---|------------------|-----------------------------------|---------------------|---|
| PARAMETER | SYMBOL | LIMIT | UNIT | |
| Drain-Source Voltage | V_{DS} | 100 | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | | |
| Continuous Drain Current | V_{GS} at 10 V | $T_C = 25\text{ }^\circ\text{C}$ | 12 | A |
| | | $T_C = 100\text{ }^\circ\text{C}$ | 7.5 | |
| Pulsed Drain Current ^a | | 37 | W/ $^\circ\text{C}$ | |
| Linear Derating Factor | | 0.40 | | |
| Linear Derating Factor (PCB Mount) | | 0.025 | | |
| Single Pulse Avalanche Energy ^b | E_{AS} | 200 | mJ | |
| Avalanche Currenta | I_{AR} | 9.2 | A | |
| Repetitive Avalanche Energy ^a | E_{AR} | 6.0 | mJ | |
| Maximum Power Dissipation | | $T_C = 25\text{ }^\circ\text{C}$ | 60 | W |
| | | $T_A = 25\text{ }^\circ\text{C}$ | 3.7 | |
| 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 | $^\circ\text{C}$ | |
| Soldering Recommendations (Peak Temperature) | For 10 s | 300 ^d | | |

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3.5\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 9.2\text{ A}$ (see fig. 12).
- $I_{SD} \leq 9.2\text{ A}$, $dI/dt \leq 110\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 175\text{ }^\circ\text{C}$.

| THERMAL RESISTANCE RATINGS | | | | |
|--|------------|------|------|------|
| PARAMETER | SYMBOL | TYP. | MAX. | UNIT |
| Maximum Junction-to-Ambient | R_{thJA} | - | 62 | °C/W |
| Maximum Junction-to-Ambient (PCB Mount) ^a | R_{thJA} | - | 40 | |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | 2.5 | |

| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | | |
|---|---------------------|---|---|------|------|-----------|----------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0, I_D = 250 \mu A$ | | 100 | - | - | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to 25 °C, $I_D = 1 \text{ mA}$ | | - | 0.13 | - | V/°C |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250 \mu A$ | | 1.0 | - | 3.0 | V |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 20 \text{ V}$ | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$ | | - | - | 25 | μA |
| | | $V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 150 \text{ }^\circ\text{C}$ | | - | - | 250 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ | $I_D = 5.5 \text{ A}^b$ | - | 0.20 | - | Ω |
| Forward Transconductance | g_{fs} | $V_{DS} = 50 \text{ V}, I_D = 5.5 \text{ A}^b$ | | 2.7 | - | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1.0 \text{ MHz}, \text{ see fig. 5}$ | | - | 360 | - | μF |
| Output Capacitance | C_{oss} | | | - | 150 | - | |
| Reverse Transfer Capacitance | C_{rss} | | | - | 34 | - | |
| Total Gate Charge | Q_g | $V_{GS} = 10 \text{ V}$ | $I_D = 9.2 \text{ A}, V_{DS} = 80 \text{ V}, \text{ see fig. 6 and 13}^b$ | - | - | 16 | nC |
| Gate-Source Charge | Q_{gs} | | | - | - | 4.4 | |
| Gate-Drain Charge | Q_{gd} | | | - | - | 7.7 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 50 \text{ V}, I_D = 9.2 \text{ A}, R_g = 18 \Omega, R_D = 5.2 \Omega, \text{ see fig. 10}^b$ | | - | 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  | | - | - | 9.2 | A |
| Pulsed Diode Forward Current ^a | I_{SM} | | | - | - | 37 | |
| Body Diode Voltage | V_{SD} | $T_J = 25 \text{ }^\circ\text{C}, I_S = 9.2 \text{ A}, V_{GS} = 0 \text{ V}^b$ | | - | - | 1.8 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $T_J = 25 \text{ }^\circ\text{C}, I_F = 9.2 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}^b$ | | - | 110 | 260 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | - | 0.53 | 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 $\leq 300 \mu s$; duty cycle $\leq 2 \%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

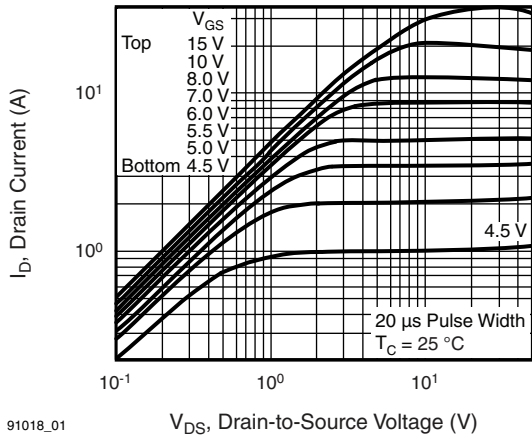


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^\circ\text{C}$

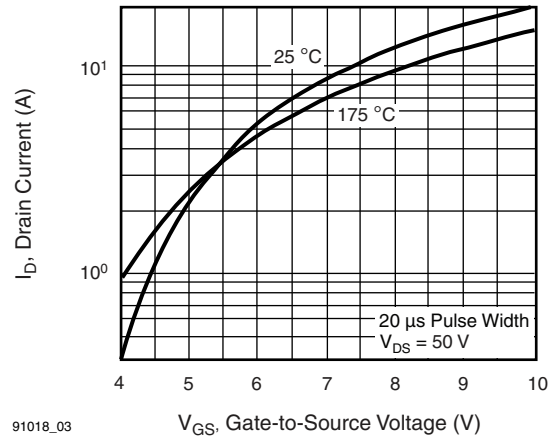


Fig. 3 - Typical Transfer Characteristics

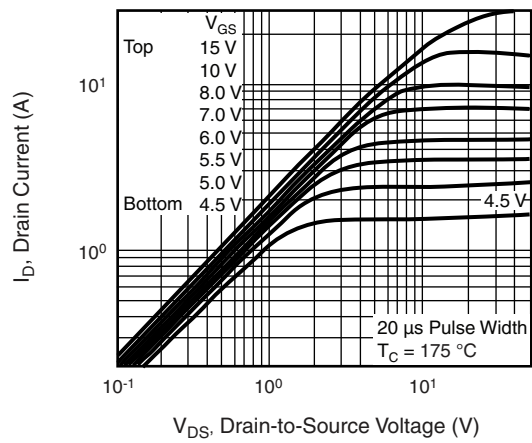


Fig. 2 - Typical Output Characteristics, $T_C = 175\text{ }^\circ\text{C}$

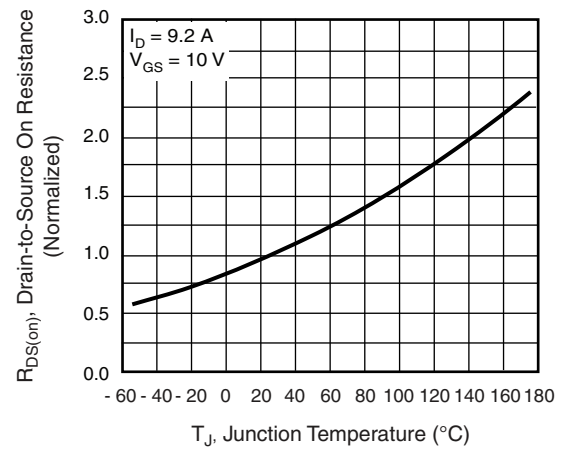
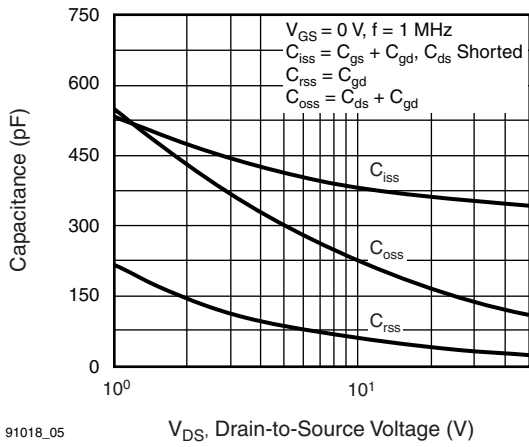
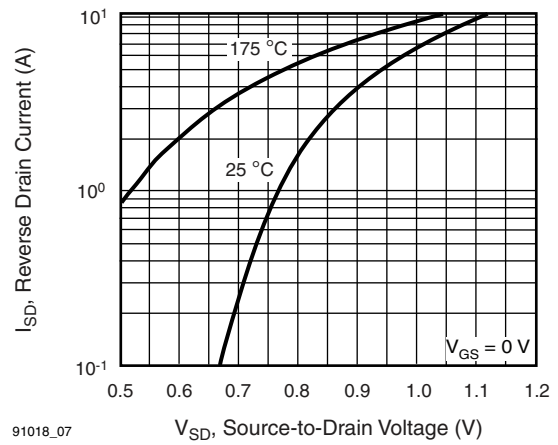


Fig. 4 - Normalized On-Resistance vs. Temperature



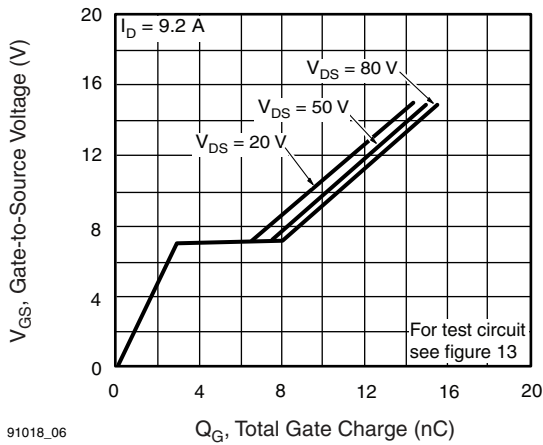
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



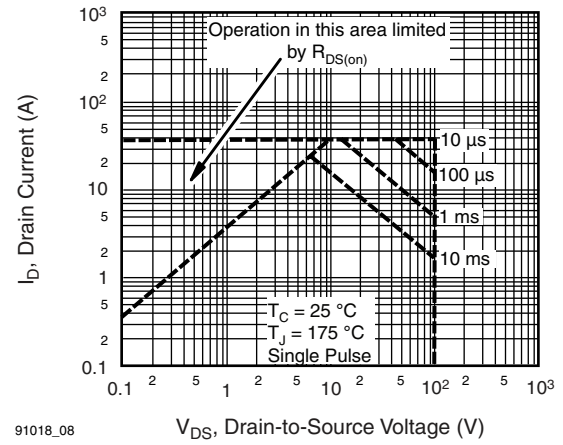
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



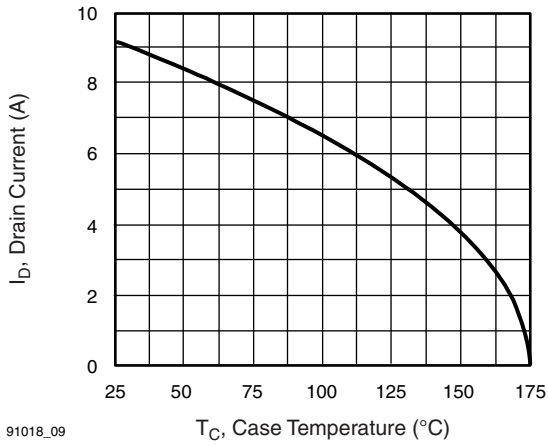
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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



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Fig. 8 - Maximum Safe Operating Area



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Fig. 9 - Maximum Drain Current vs. Case Temperature

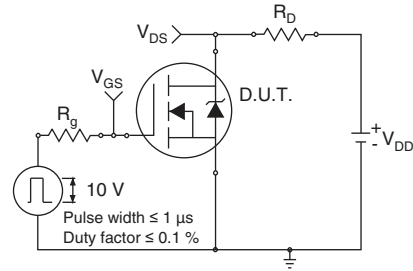


Fig. 10a - Switching Time Test Circuit

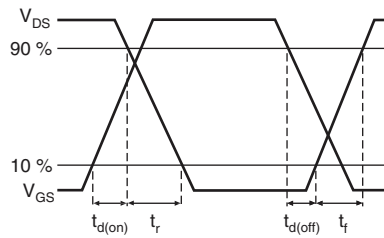
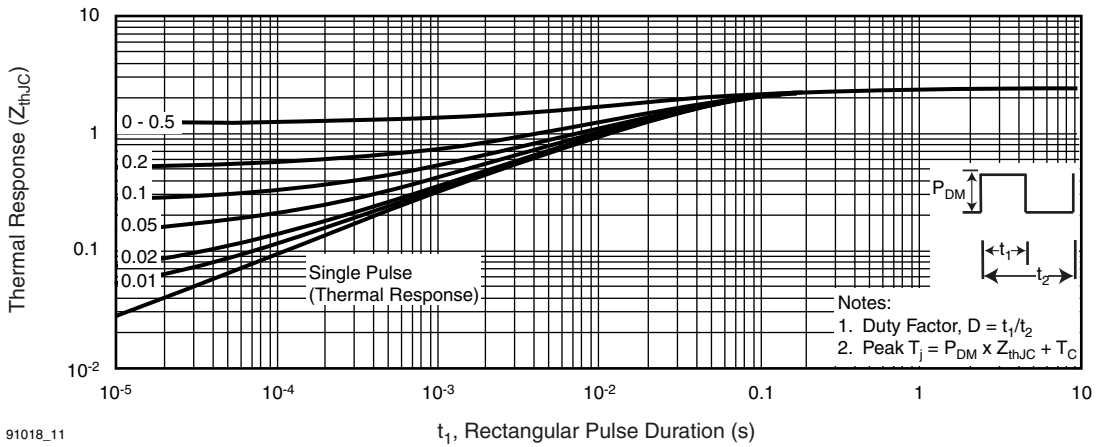


Fig. 10b - Switching Time Waveforms



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

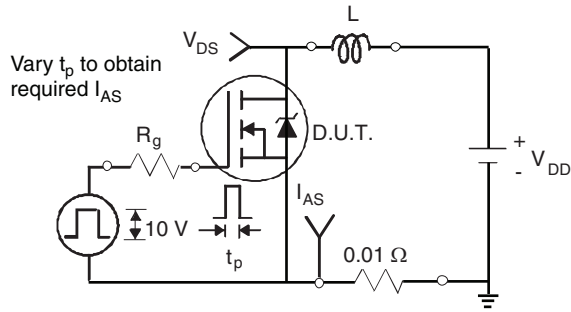


Fig. 12a - Unclamped Inductive Test Circuit

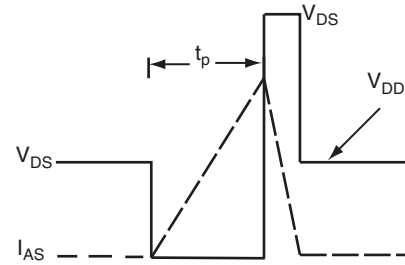


Fig. 12b - Unclamped Inductive Waveforms

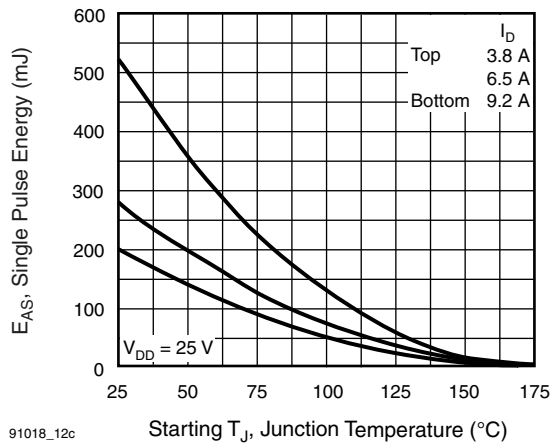


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

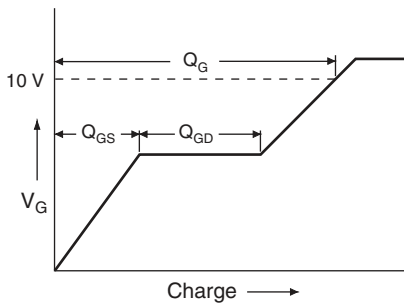


Fig. 13a - Basic Gate Charge Waveform

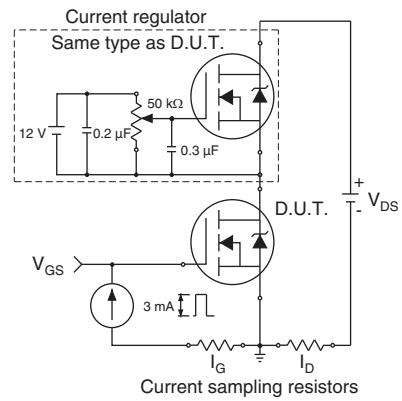
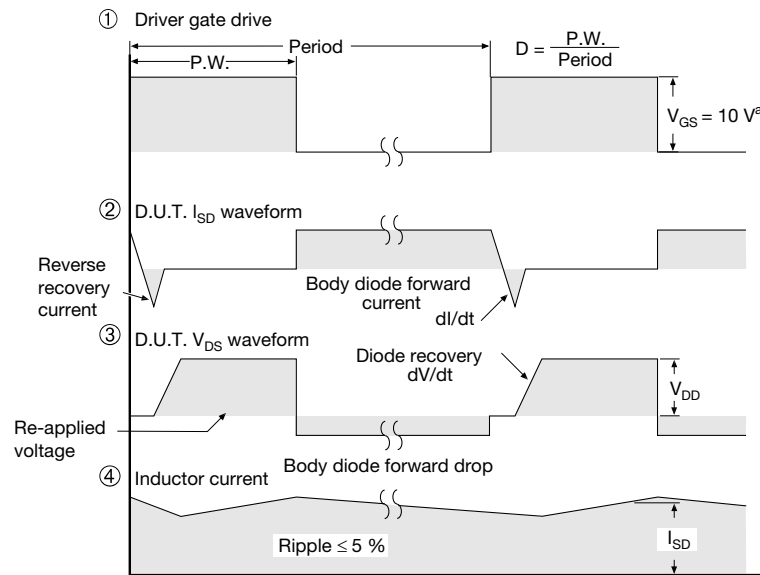
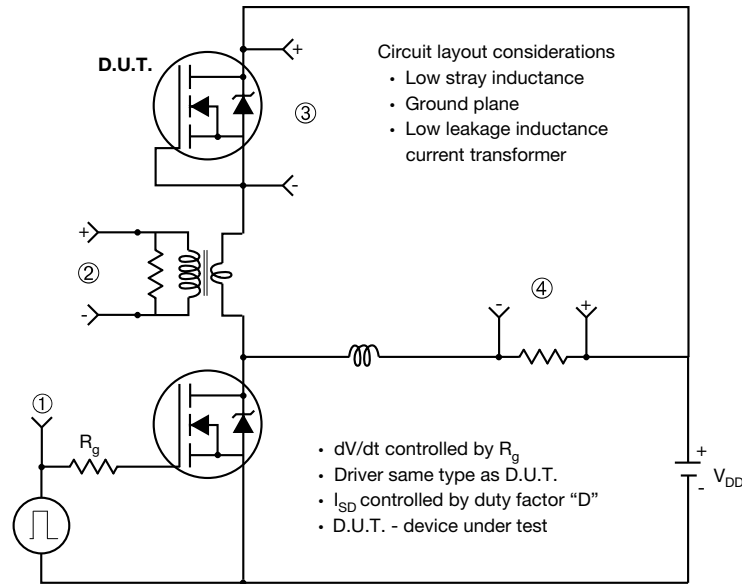


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

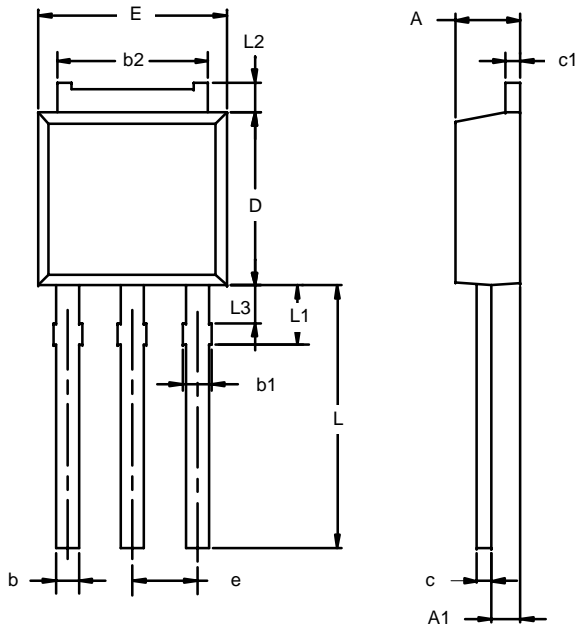


Note

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

Fig. 14 - For N-Channel

TO-251AA



Note: Dimension L3 is for reference only.

| Dim | MILLIMETERS | | INCHES | |
|-----------|-------------|------|-----------|-------|
| | Min | Max | Min | Max |
| A | 2.21 | 2.38 | 0.087 | 0.094 |
| A1 | 0.89 | 1.14 | 0.035 | 0.045 |
| b | 0.71 | 0.89 | 0.028 | 0.035 |
| b1 | 0.76 | 1.14 | 0.030 | 0.045 |
| b2 | 5.23 | 5.43 | 0.206 | 0.214 |
| c | 0.46 | 0.58 | 0.018 | 0.023 |
| c1 | 0.46 | 0.58 | 0.018 | 0.023 |
| D | 5.97 | 6.22 | 0.235 | 0.245 |
| E | 6.48 | 6.73 | 0.255 | 0.265 |
| e | 2.28 BSC | | 0.090 BSC | |
| L | 3.89 | 9.53 | 0.153 | 0.375 |
| L1 | 1.91 | 2.28 | 0.075 | 0.090 |
| L2 | 0.89 | 1.27 | 0.035 | 0.050 |
| L3 | 1.15 | 1.52 | 0.045 | 0.060 |

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