

Power MOSFET

PRODUCT SUMMARY

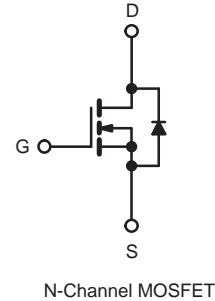
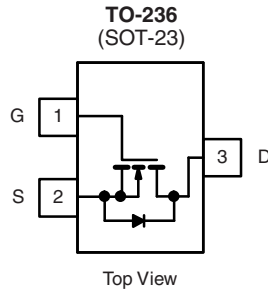
| | | |
|---------------------------|------------------------|---|
| V_{DS} (V) | 650 | |
| $R_{DS(on)}$ (Ω) | $V_{GS} = 10\text{ V}$ | 8 |
| Q_g (Max.) (nC) | 18 | |
| Q_{gs} (nC) | 3.0 | |
| Q_{gd} (nC) | 8.9 | |
| Configuration | Single | |

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Available in Tape and Reel
- Fast Switching
- Ease of Paralleling
- Compliant to RoHS Directive 2002/95/EC



RoHS*
 COMPLIANT
 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} | 650 | V |
| Gate-Source Voltage | | | V _{GS} | ± 20 | |
| Continuous Drain Current | V _{GS} at 10 V | T _C = 25 °C | I _D | 1.0 | A |
| | | T _C = 100 °C | | 0.7 | |
| Pulsed Drain Current ^a | | | I _{DM} | 2.0 | W/°C |
| Linear Derating Factor | | | | 0.33 | |
| Linear Derating Factor (PCB Mount) ^e | | | | 0.020 | |
| Single Pulse Avalanche Energy ^b | | | E _{AS} | 74 | mJ |
| Repetitive Avalanche Current ^a | | | I _{AR} | 2.0 | A |
| Repetitive Avalanche Energy ^a | | | E _{AR} | 4.2 | mJ |
| Maximum Power Dissipation | T _C = 25 °C | | P _D | 42 | W |
| Maximum Power Dissipation (PCB Mount) ^e | T _A = 25 °C | | | 2.5 | |
| Peak Diode Recovery dV/dt ^c | | | dV/dt | 3.0 | V/ns |
| Operating Junction and Storage Temperature Range | | | T _J , T _{stg} | - 55 to + 150 | °C |
| Soldering Recommendations (Peak Temperature) | for 10 s | | | 260 ^d | |

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 37\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 2.0\text{ A}$ (see fig. 12).
- $I_{SD} \leq 2.0\text{ A}$, $dI/dt \leq 40\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|------------------------------------------------------|------------|------|------|------|------|
| Maximum Junction-to-Ambient | R_{thJA} | - | - | 110 | °C/W |
| Maximum Junction-to-Ambient (PCB Mount) ^a | R_{thJA} | - | - | 50 | |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | - | 3.0 | |

Note

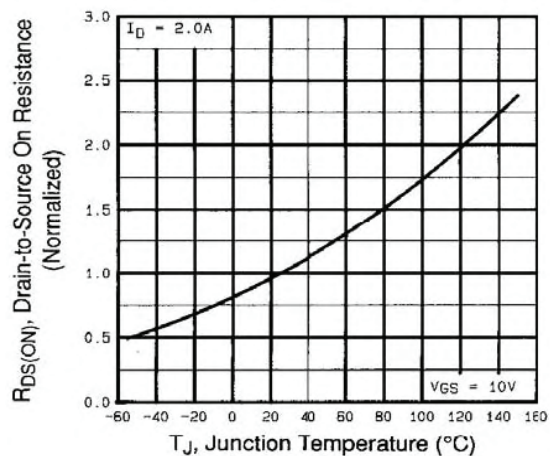
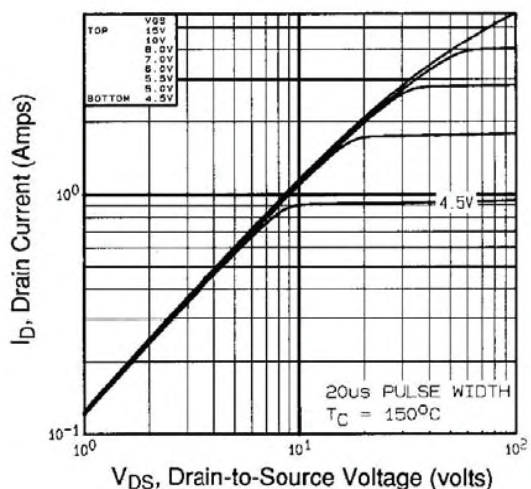
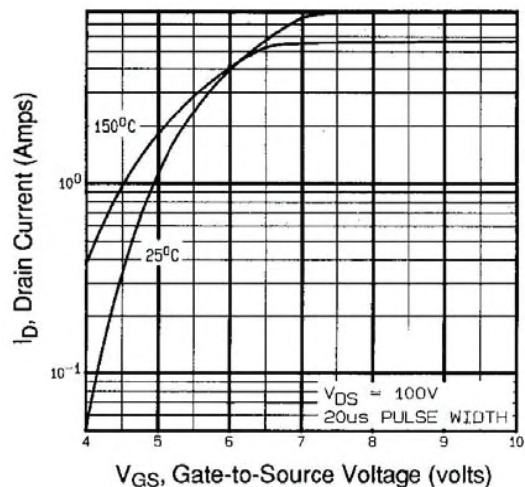
a. When mounted on 1" square PCB (FR-4 or G-10 material).

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 V, I _D = 250 μA | | 650 | - | - | V |
| V _{DS} Temperature Coefficient | ΔV _{DS} /T _J | Reference to 25 °C, I _D = 1 mA | | - | 0.88 | - | V/°C |
| Gate-Source Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | | 2.0 | - | 4.0 | V |
| Gate-Source Leakage | I _{GSS} | V _{GS} = ± 20 V | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 600 V, V _{GS} = 0 V | | - | - | 100 | μA |
| | | V _{DS} = 480 V, V _{GS} = 0 V, T _J = 125 °C | | - | - | 500 | |
| Drain-Source On-State Resistance | R _{DS(on)} | V _{GS} = 10 V | I _D = 1.0A ^b | - | 8 | - | Ω |
| Forward Transconductance | g _{fs} | V _{DS} = 50 V, I _D = 1.0 A | | 1.4 | - | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = - 25 V, f = 1.0 MHz, see fig. 5 | | - | 350 | - | pF |
| Output Capacitance | C _{oss} | | | - | 48 | - | |
| Reverse Transfer Capacitance | C _{rss} | | | - | 8.6 | - | |
| Total Gate Charge | Q _g | V _{GS} = 10 V | I _D = 1.0 A, V _{DS} = 360 V, see fig. 6 and 13 ^b | - | - | 18 | nC |
| Gate-Source Charge | Q _{gs} | | | - | - | 3.0 | |
| Gate-Drain Charge | Q _{gd} | | | - | - | 8.9 | |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = 300 V, I _D = 1.0 A, R _g = 18 Ω, R _D = 135 Ω, see fig. 10 ^b | | - | 10 | - | ns |
| Rise Time | t _r | | | - | 23 | - | |
| Turn-Off Delay Time | t _{d(off)} | | | - | 30 | - | |
| Fall Time | t _f | | | - | 25 | - | |
| 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 | | - | - | 2.0 | A |
| Pulsed Diode Forward Current ^a | I _{SM} | | | - | - | 8.0 | |
| Body Diode Voltage | V _{SD} | T _J = 25 °C, I _S = 2.0 A, V _{GS} = 0 V ^b | | - | - | 1.6 | V |
| Body Diode Reverse Recovery Time | t _{rr} | T _J = 25 °C, I _F = 2.0 A, dI/dt = 100 A/μs ^b | | - | 290 | 580 | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | | | - | 0.67 | 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


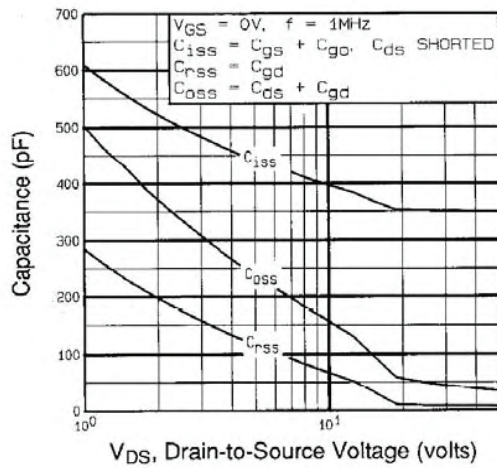


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

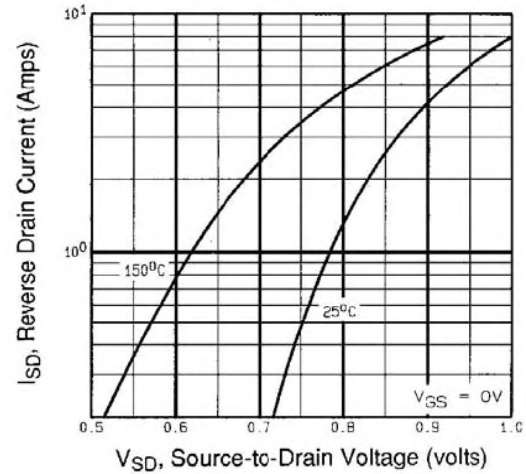


Fig. 7 - Typical Source-Drain Diode Forward Voltage

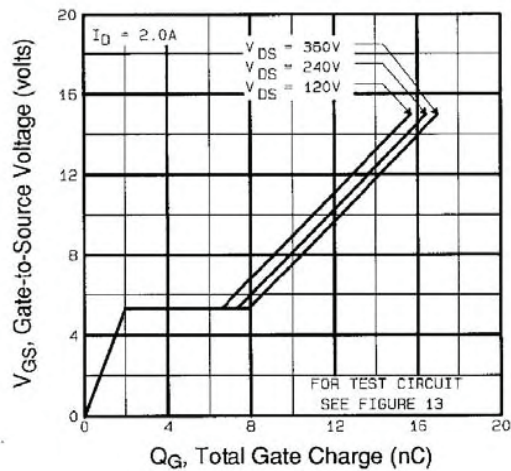


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

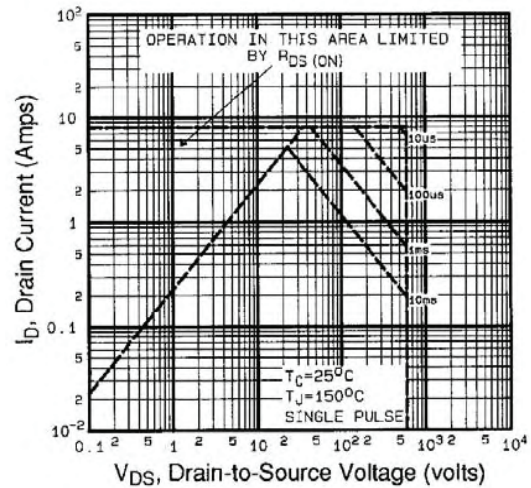


Fig. 8 - Maximum Safe Operating Area

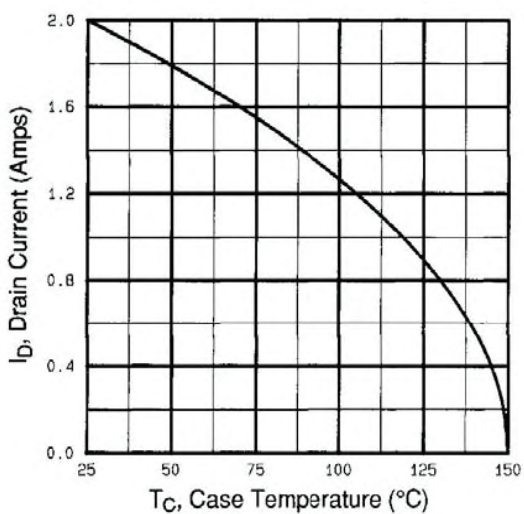


Fig. 9 - Maximum Drain Current vs. Case Temperature

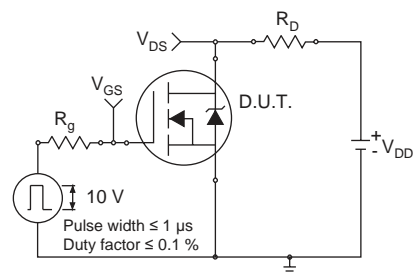


Fig. 10a - Switching Time Test Circuit

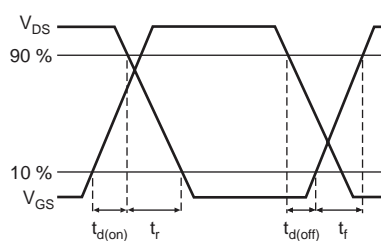


Fig. 10b - Switching Time Waveforms

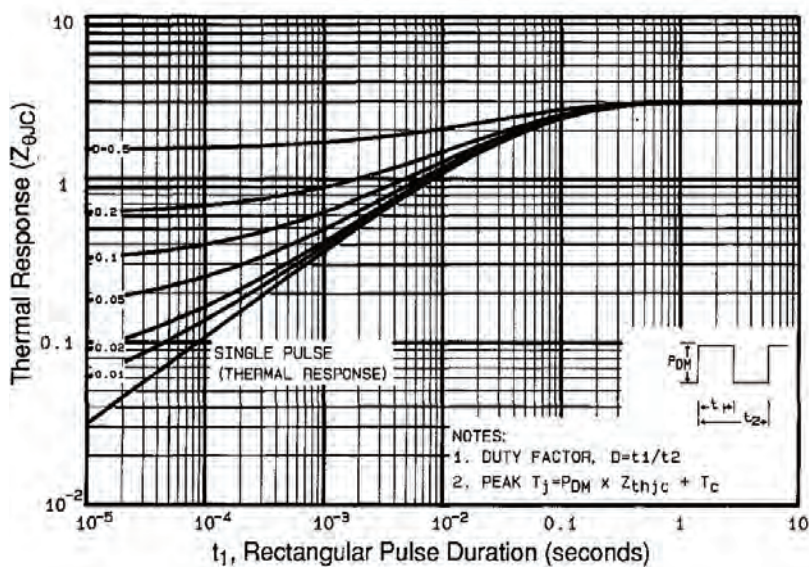


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

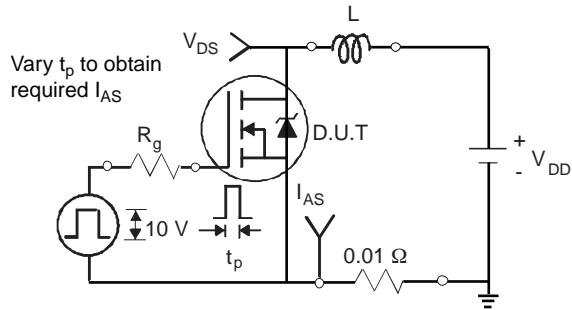


Fig. 12a - Unclamped Inductive Test Circuit

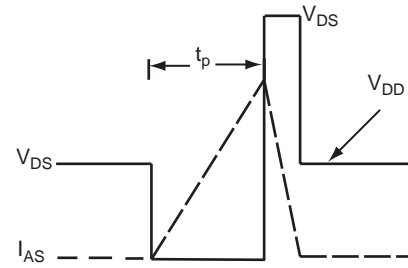


Fig. 12b - Unclamped Inductive Waveforms

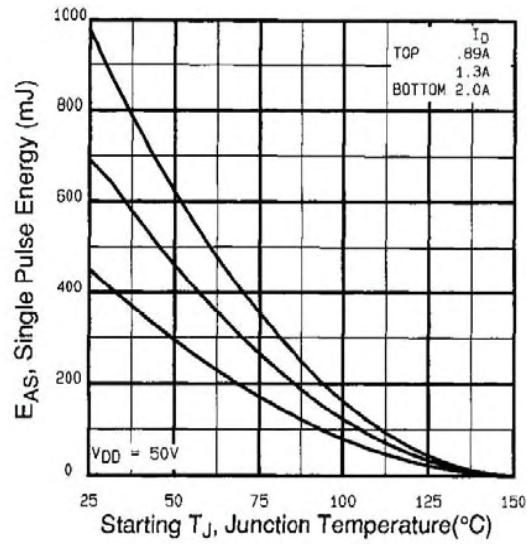


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

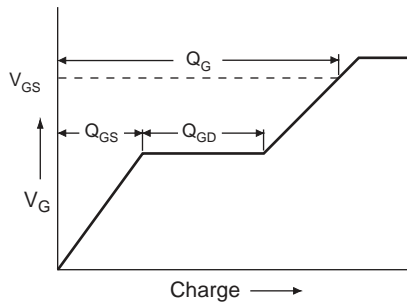


Fig. 13a - Basic Gate Charge Waveform

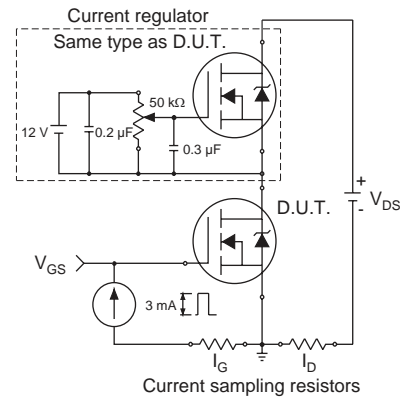
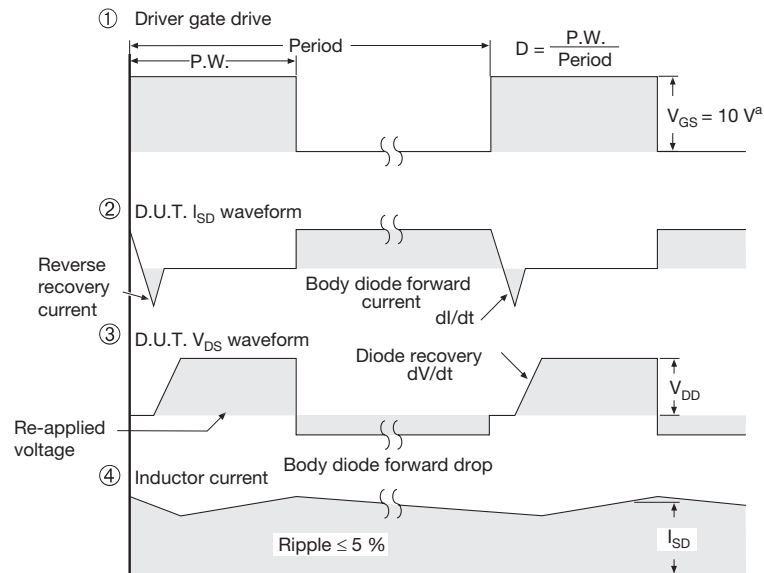
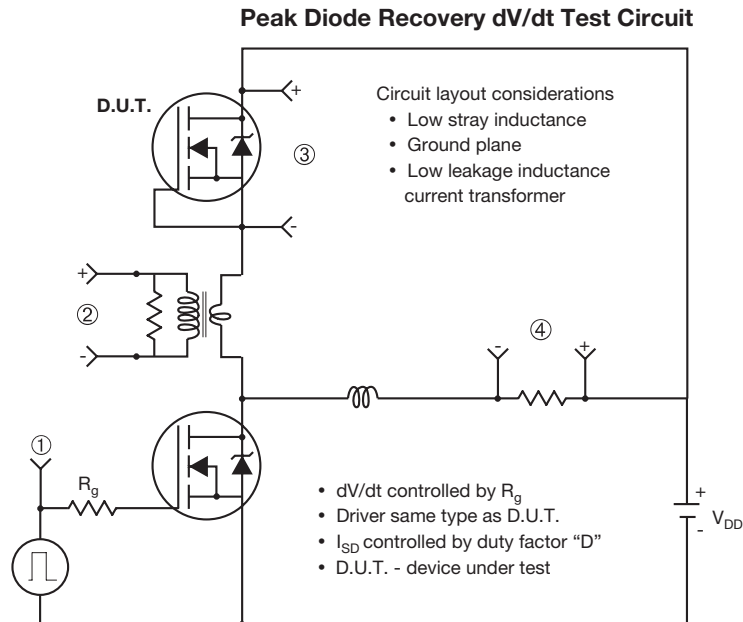


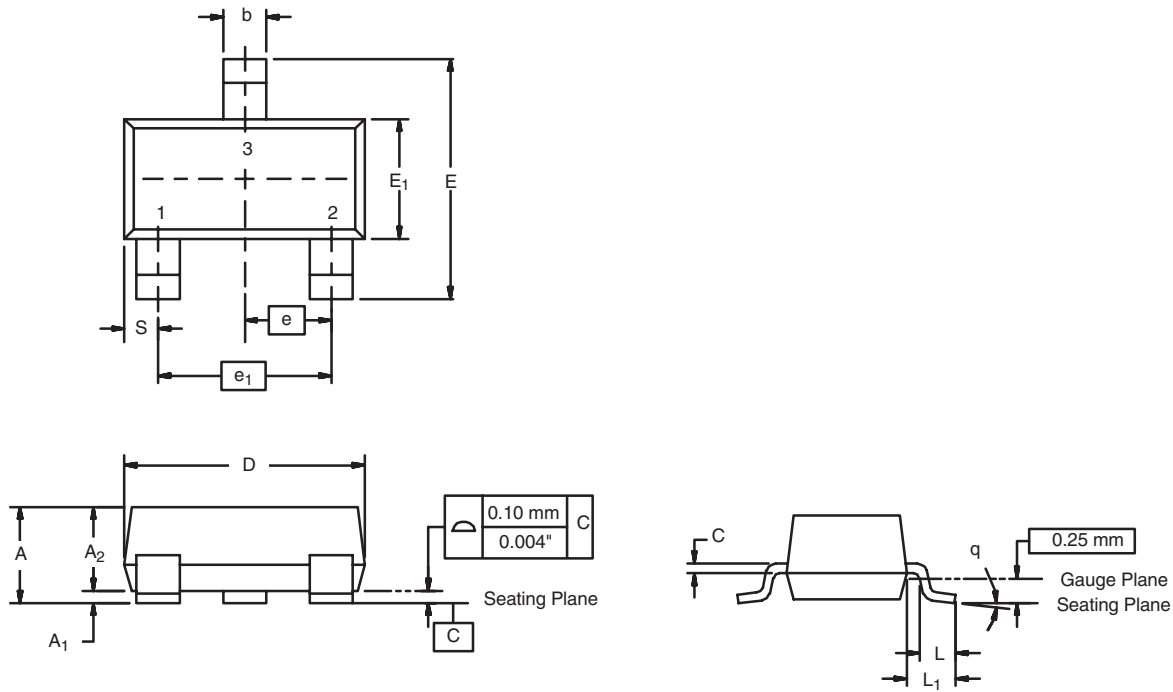
Fig. 13b - Gate Charge Test Circuit

**Note**

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

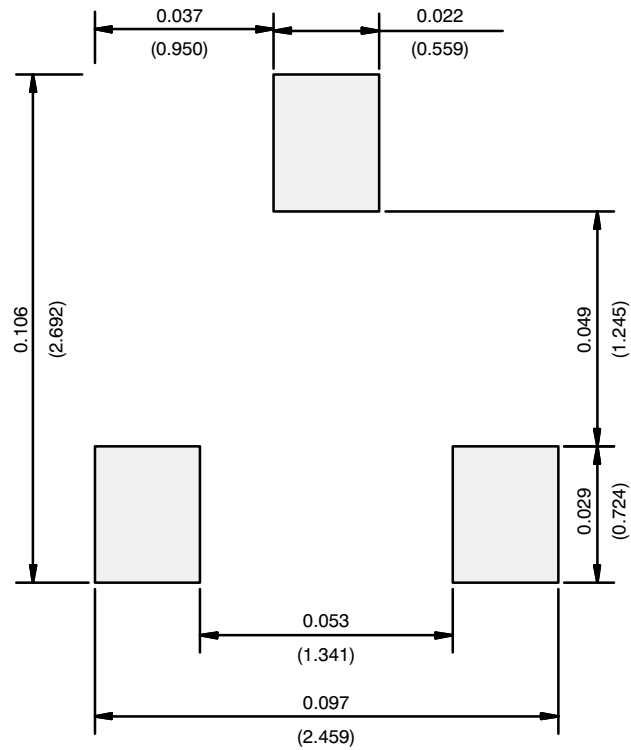
Fig. 14 - For N-Channel

SOT-23 (TO-236): 3-LEAD



| Dim | MILLIMETERS | | INCHES | |
|--------------------------------|-------------|------|------------|-------|
| | Min | Max | Min | Max |
| A | 0.89 | 1.12 | 0.035 | 0.044 |
| A ₁ | 0.01 | 0.10 | 0.0004 | 0.004 |
| A ₂ | 0.88 | 1.02 | 0.0346 | 0.040 |
| b | 0.35 | 0.50 | 0.014 | 0.020 |
| c | 0.085 | 0.18 | 0.003 | 0.007 |
| D | 2.80 | 3.04 | 0.110 | 0.120 |
| E | 2.10 | 2.64 | 0.083 | 0.104 |
| E ₁ | 1.20 | 1.40 | 0.047 | 0.055 |
| e | 0.95 BSC | | 0.0374 Ref | |
| e ₁ | 1.90 BSC | | 0.0748 Ref | |
| L | 0.40 | 0.60 | 0.016 | 0.024 |
| L ₁ | 0.64 Ref | | 0.025 Ref | |
| S | 0.50 Ref | | 0.020 Ref | |
| q | 3° | 8° | 3° | 8° |
| ECN: S-03946-Rev. K, 09-Jul-01 | | | | |
| DWG: 5479 | | | | |

RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads
Dimensions in Inches/(mm)

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