

K2167-VB Datasheet

N-Channel 200 V (D-S) MOSFET

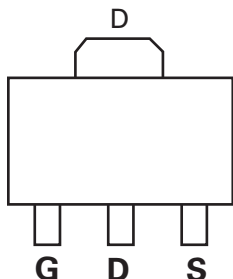
| PRODUCT SUMMARY | | |
|---------------------------|------------------------|-----|
| V_{DS} (V) | 200 | |
| $R_{DS(on)}$ (Ω) | $V_{GS} = 10\text{ V}$ | 1.6 |
| Q_g (Max.) (nC) | 8.2 | |
| Q_{gs} (nC) | 1.8 | |
| Q_{gd} (nC) | 4.5 | |
| Configuration | Single | |

FEATURES

- Available in tape and reel
- Dynamic dV/dt rating
- Repetitive avalanche rated
- Fast switching
- Ease of paralleling
- Simple drive requirements



RoHS
COMPLIANT
HALOGEN
FREE
Available



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 | I _D | 1.0 | A |
| | | T _C = 100 °C | | 0.6 | |
| Pulsed Drain Current ^a | | | I _{DM} | 3.7 | W/°C |
| Linear Derating Factor | | | | 0.025 | |
| Linear Derating Factor (PCB Mount) ^e | | | | 0.017 | |
| Single Pulse Avalanche Energy ^b | | | E _{AS} | 50 | mJ |
| Repetitive Avalanche Current ^a | | | I _{AR} | 0.96 | A |
| Repetitive Avalanche Energy ^a | | | E _{AR} | 0.31 | mJ |
| Maximum Power Dissipation | T _C = 25 °C | | P _D | 3.1 | W |
| Maximum Power Dissipation (PCB Mount) ^e | T _A = 25 °C | | | 2.0 | |
| Peak Diode Recovery dV/dt ^c | | | dV/dt | 5.0 | V/ns |
| Operating Junction and Storage Temperature Range | | | T _J , T _{stg} | -55 to +150 | °C |
| Soldering Recommendations (Peak Temperature) ^d | for 10 s | | | 300 | |

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 81\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AS} = 0.96\text{ A}$ (see fig. 12).
- $I_{SD} \leq 3.3\text{ A}$, $dI/dt \leq 70\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

THERMAL RESISTANCE RATINGS

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|--|------------|------|------|------|------|
| Maximum Junction-to-Ambient (PCB Mount) ^a | R_{thJA} | - | - | 40 | °C/W |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | - | 60 | |

Note

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

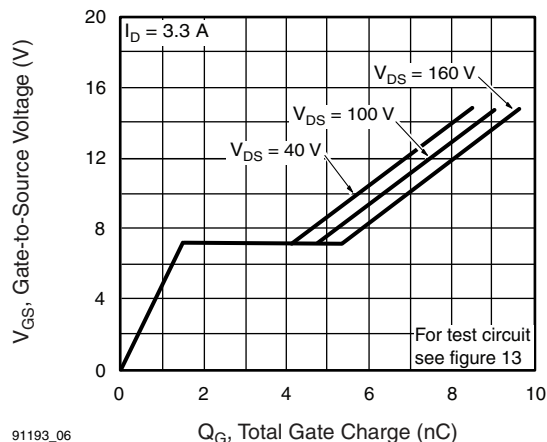
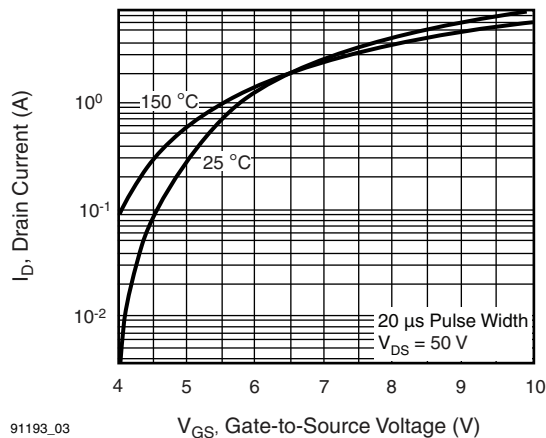
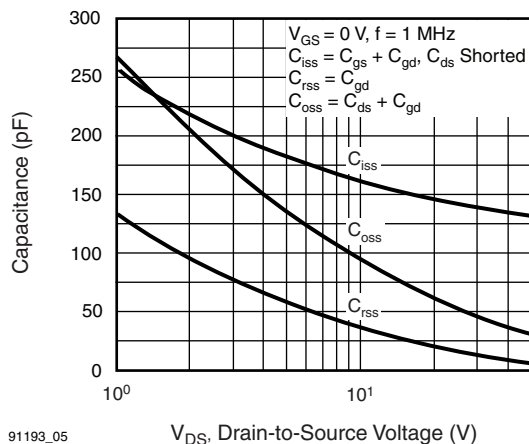
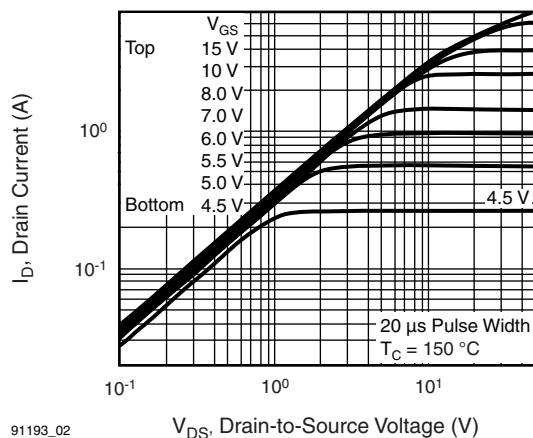
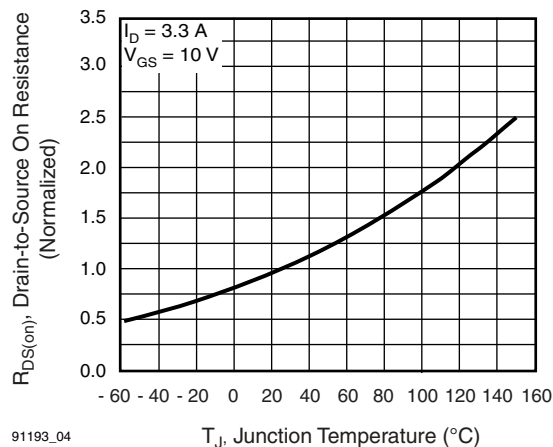
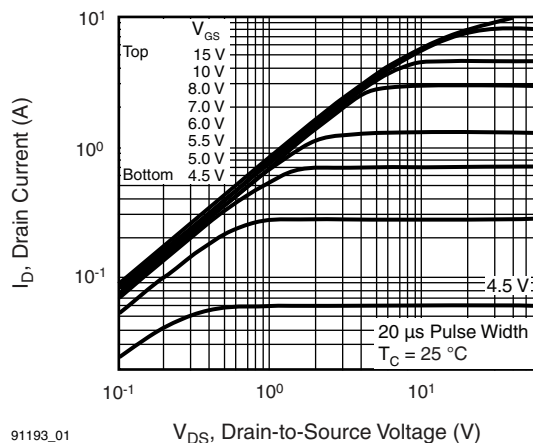
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---------------------|--|--|------|------|-----------|---------------------------|
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$ | | 200 | - | - | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$ | | - | 0.30 | - | $\text{V}/^\circ\text{C}$ |
| 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 |
| | | $V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$ | | - | - | 250 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 0.58\text{ A}^b$ | - | 1.6 | - | Ω |
| Forward Transconductance | g_{fs} | $V_{DS} = 50\text{ V}$, $I_D = 0.58\text{ A}$ | | 0.51 | - | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5 | | - | 140 | - | pF |
| Output Capacitance | C_{oss} | | | - | 53 | - | |
| Reverse Transfer Capacitance | C_{rss} | | | - | 15 | - | |
| Total Gate Charge | Q_g | $V_{GS} = 10\text{ V}$ | $I_D = 3.3\text{ A}$, $V_{DS} = 160\text{ V}$, see fig. 6 and 13 ^b | - | - | 8.2 | nC |
| Gate-Source Charge | Q_{gs} | | | - | - | 1.8 | |
| Gate-Drain Charge | Q_{gd} | | | - | - | 4.5 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 100\text{ V}$, $I_D = 3.3\text{ A}$, $R_g = 24\text{ }\Omega$, $R_D = 30\text{ }\Omega$, see fig. 10 ^b | | - | 8.2 | - | ns |
| Rise Time | t_r | | | - | 17 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | - | 14 | - | |
| Fall Time | t_f | | | - | 8.9 | - | |
| Internal Drain Inductance | L_D | Between lead, 6 mm (0.25") from package and center of die contact | | - | 4.0 | - | nH |
| Internal Source Inductance | L_S | | | - | 6.0 | - | |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I_S | MOSFET symbol showing the integral reverse p - n junction diode | | - | - | 0.96 | A |
| Pulsed Diode Forward Current ^a | I_{SM} | | | - | - | 7.7 | |
| Body Diode Voltage | V_{SD} | $T_J = 25\text{ }^\circ\text{C}$, $I_S = 0.96\text{ A}$, $V_{GS} = 0\text{ V}^b$ | | - | - | 2.0 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $T_J = 25\text{ }^\circ\text{C}$, $I_F = 3.3\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$ | | - | 150 | 310 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | - | 0.60 | 1.4 | 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)


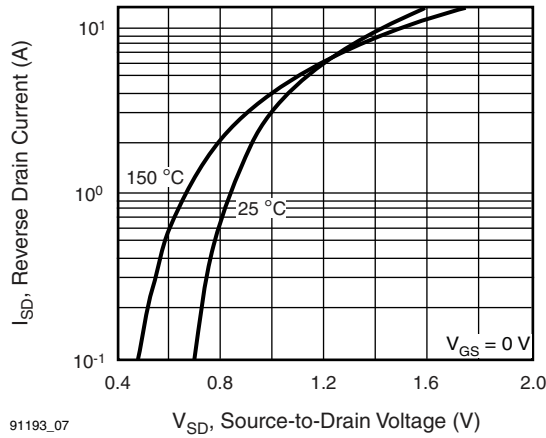


Fig. 7 - Typical Source-Drain Diode Forward Voltage

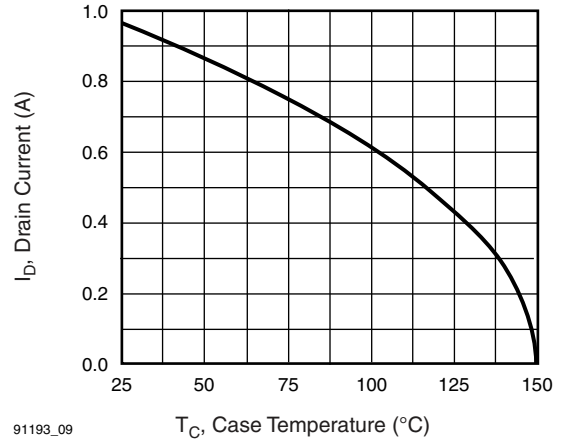


Fig. 9 - Maximum Drain Current vs. Case Temperature

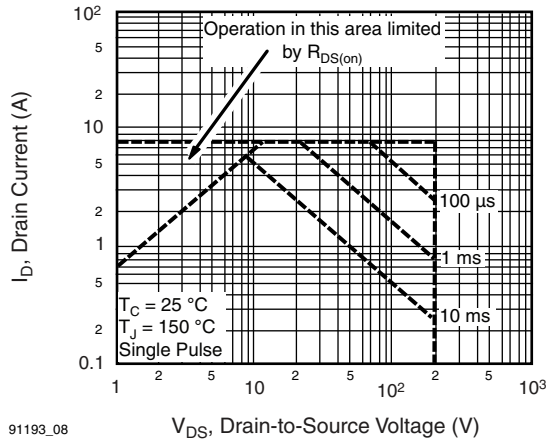


Fig. 8 - Maximum Safe Operating Area

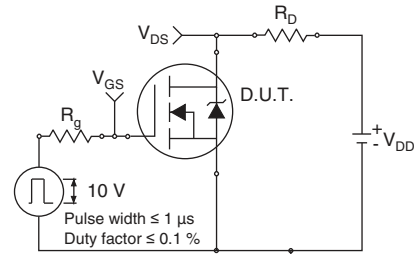


Fig. 10a - Switching Time Test Circuit

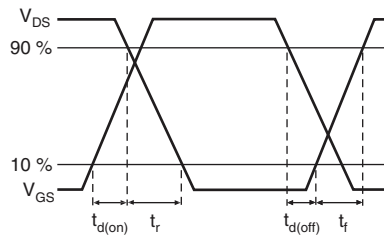


Fig. 10b - Switching Time Waveforms

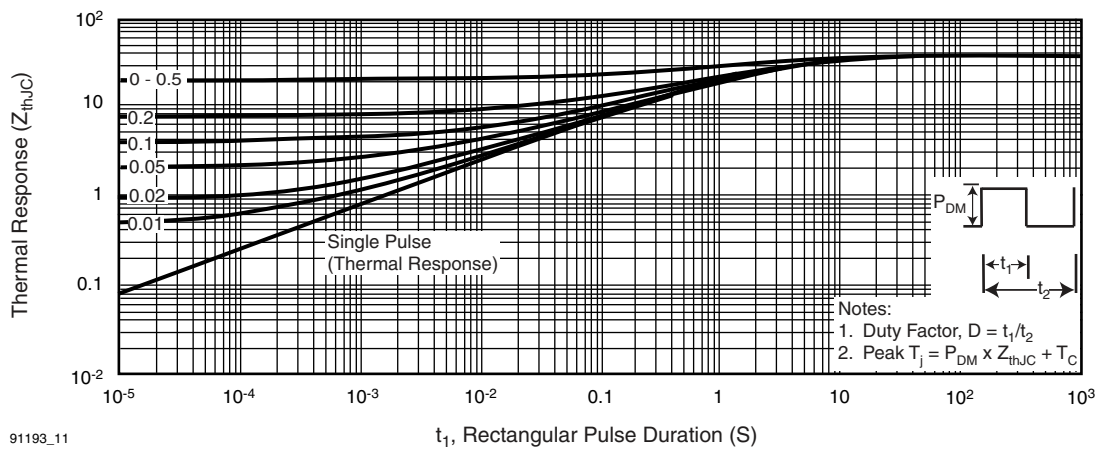


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

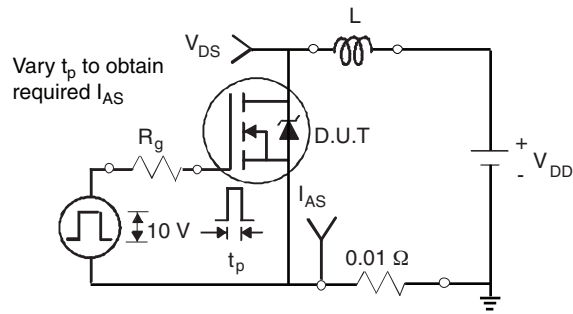


Fig. 12a - Unclamped Inductive Test Circuit

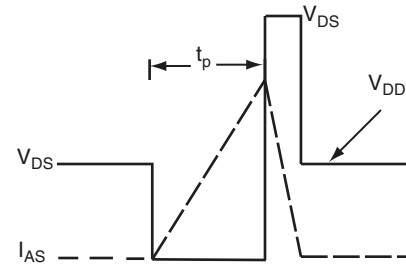
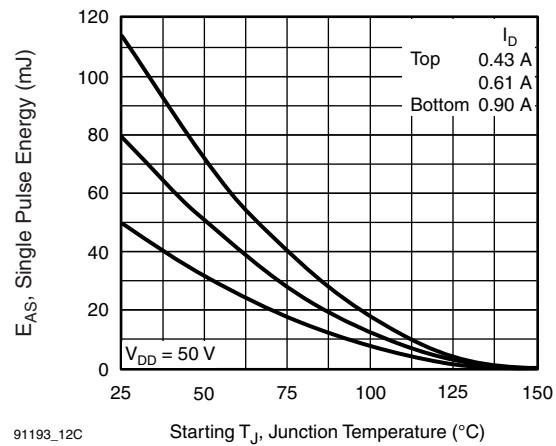


Fig. 12b - Unclamped Inductive Waveforms



91193_12C

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

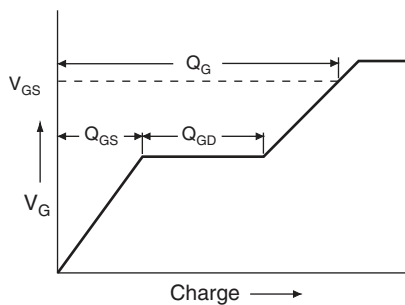


Fig. 13a - Basic Gate Charge Waveform

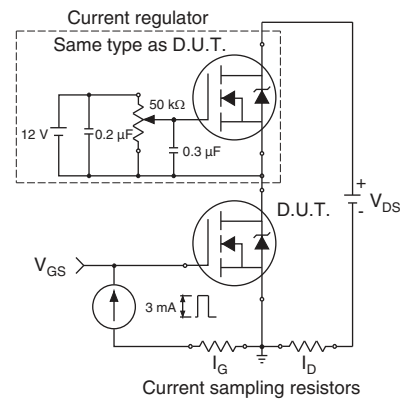
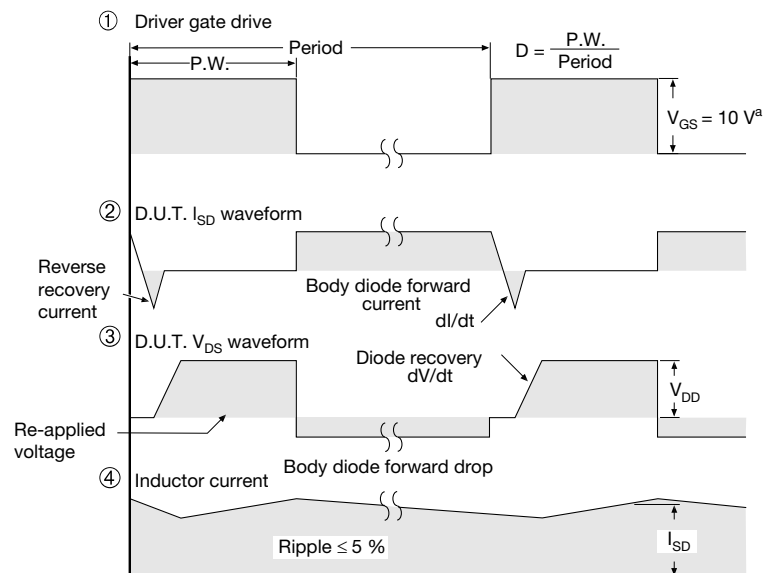
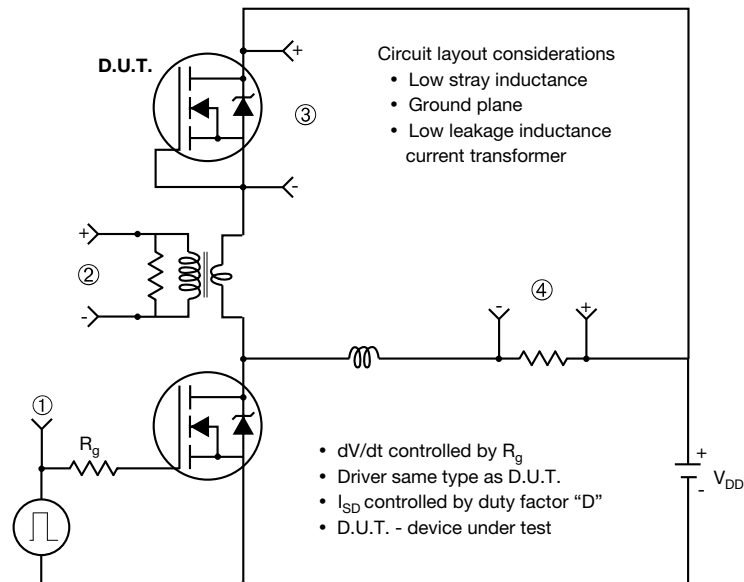


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

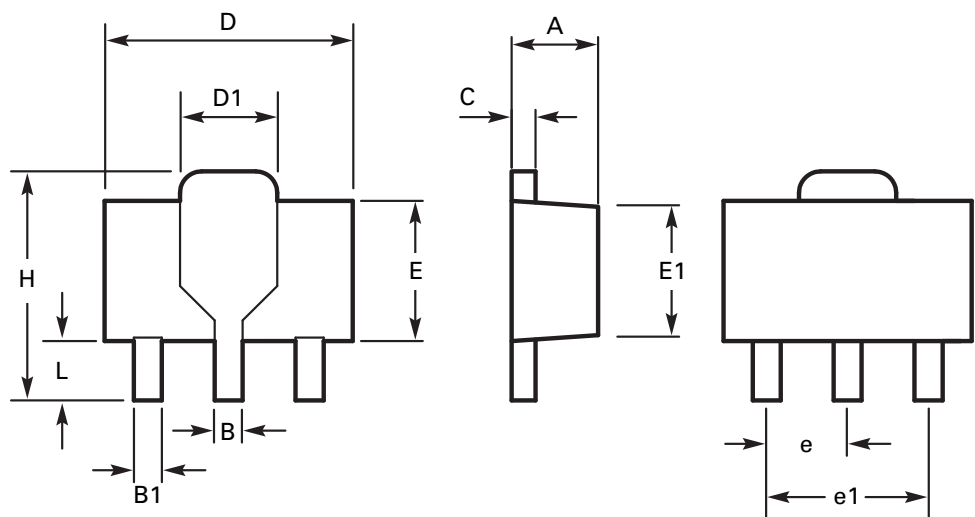


Note

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

Fig. 14 - For N-Channel

Package outline - SOT89



| DIM | Millimeters | | Inches | | DIM | Millimeters | | Inches | |
|-----|-------------|------|--------|-------|-----|-------------|------|-----------|-------|
| | Min | Max | Min | Max | | Min | Max | Min | Max |
| A | 1.40 | 1.60 | 0.550 | 0.630 | E | 2.29 | 2.60 | 0.090 | 0.102 |
| B | 0.44 | 0.56 | 0.017 | 0.022 | E1 | 2.13 | 2.29 | 0.084 | 0.090 |
| B1 | 0.36 | 0.48 | 0.014 | 0.019 | e | 1.50 BSC | | 0.059 BSC | |
| C | 0.35 | 0.44 | 0.014 | 0.017 | e1 | 3.00 BSC | | 0.118 BSC | |
| D | 4.40 | 4.60 | 0.173 | 0.181 | H | 3.94 | 4.25 | 0.155 | 0.167 |
| D1 | 1.62 | 1.83 | 0.064 | 0.072 | L | 0.89 | 1.20 | 0.035 | 0.047 |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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