# P-Channel 100-V (D-S) MOSFET

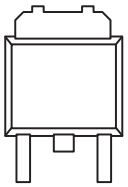
| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) | $I_D$ (A) | $Q_g$ (Typ.) |
| - 100 | 0.019 at $V_{GS}$ = - 10 V | - 90 | 97 nC |
| | 0.021 at $V_{GS}$ = - 4.5 V | - 85 | |

## FEATURES

- TrenchFET® Power MOSFET
- Compliant to RoHS Directive 2002/95/EC

RoHS COMPLIANT

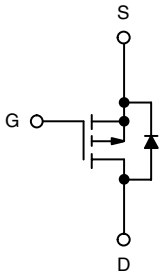
TO-263




Drain Connected to Tab

Top View

**Ordering Information:** SUM90P10-19L-E3 (Lead (Pb)-free)




P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_A$ = 25 °C, unless otherwise noted | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Limit** | **Unit** |
| Drain-Source Voltage | | $V_{DS}$ | - 100 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current ($T_J$ = 150 °C) | $T_C$ = 25 °C | $I_D$ | - 90 | A |
| | $T_C$ = 125 °C | | - 52 | |
| | $T_A$ = 25 °C | | - 17.2[b, c] | |
| | $T_A$ = 125 °C | | - 9.9[b, c] | |
| Pulsed Drain Current | | $I_{DM}$ | - 90 | |
| Continuous Source-Drain Diode Current | $T_C$ = 25 °C | $I_S$ | - 250 | |
| | $T_A$ = 25 °C | | - 9[b, c] | |
| Avalanche Current | L = 0.1 mH | $I_{AS}$ | - 70 | |
| Single-Pulse Avalanche Energy | | $E_{AS}$ | 245 | mJ |
| Maximum Power Dissipation | $T_C$ = 25 °C | $P_D$ | 375 | W |
| | $T_C$ = 125 °C | | 125 | |
| | $T_A$ = 25 °C | | 13.6[b, c] | |
| | $T_A$ = 125 °C | | 4.5[b, c] | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to 175 | °C |

| THERMAL RESISTANCE RATINGS | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Typical** | **Maximum** | **Unit** |
| Maximum Junction-to-Ambient[b, d] | t ≤ 10 s | $R_{thJA}$ | 8 | 11 | °C/W |
| Maximum Junction-to-Case (Drain) | Steady State | $R_{thJC}$ | 0.33 | 0.4 | |

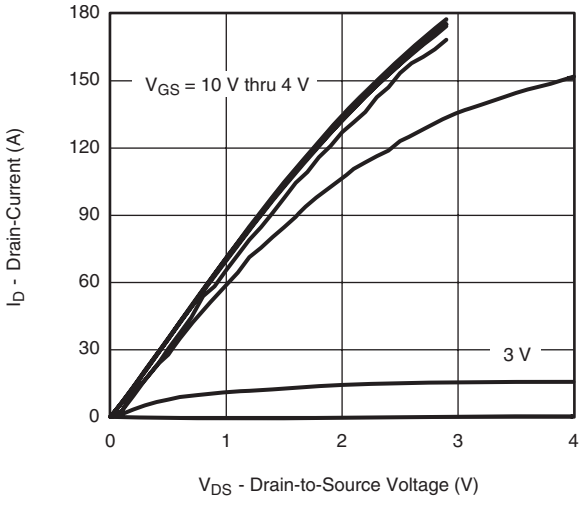
Notes:
a. Package Limited.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under Steady State conditions is 40 °C/W.

| **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 V, $I_D$ = - 250 µA | - 100 | | | V |
| $V_{DS}$ Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D$ = - 250 µA | | - 125 | | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | | 5.9 | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$ , $I_D$ = - 250 µA | - 1 | | - 3 | V |
| Gate-Source Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = - 100 V, $V_{GS}$ = 0 V | | | - 1 | µA |
| | | $V_{DS}$ = - 100 V, $V_{GS}$ = 0 V, $T_J$ = 175 °C | | | - 500 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS} \geq$ 10 V, $V_{GS}$ = - 10 V | - 90 | | | A |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = - 10 V, $I_D$ = - 20 A | | 0.0156 | 0.019 | Ω |
| | | $V_{GS}$ = - 4.5 V, $I_D$ = - 15 A | | 0.0173 | 0.021 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = - 15 V, $I_D$ = - 20 A | | 80 | | S |
| **Dynamic[b]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = - 50 V, $V_{GS}$ = 0 V, f = 1 MHz | | 11100 | | pF |
| Output Capacitance | $C_{oss}$ | | | 700 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 1690 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = - 50 V, $V_{GS}$ = - 10 V, $I_D$ = - 90 A | | 217 | 326 | nC |
| | | $V_{DS}$ = - 50 V, $V_{GS}$ = - 4.5 V, $I_D$ = - 90 A | | 97 | 146 | |
| Gate-Source Charge | $Q_{gs}$ | | | 42 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 51 | | |
| Gate Resistance | $R_g$ | f = 1 MHz | | 3.5 | | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = - 50 V, $R_L$ = 0.56 Ω<br>$I_D \cong$ - 90 A, $V_{GEN}$ = - 10 V, $R_g$ = 1 Ω | | 20 | 30 | ns |
| Rise Time | $t_r$ | | | 510 | 855 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 145 | 220 | |
| Fall Time | $t_f$ | | | 870 | 1300 | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continous Source-Drain Diode Current | $I_S$ | $T_C$ = 25 °C | | | - 90 | A |
| Pulse Diode Forward Current[a] | $I_{SM}$ | | | | - 250 | |
| Body Diode Voltage | $V_{SD}$ | $I_S$ = - 20 A | | - 0.8 | - 1.5 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = - 20 A, dI/dt = 100 A/µs, $T_J$ = 25 °C | | 80 | 120 | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | | 220 | 330 | nC |
| Reverse Recovery Fall Time | $t_a$ | | | 56 | | ns |
| Reverse Recovery Rise Time | $t_b$ | | | 24 | | |

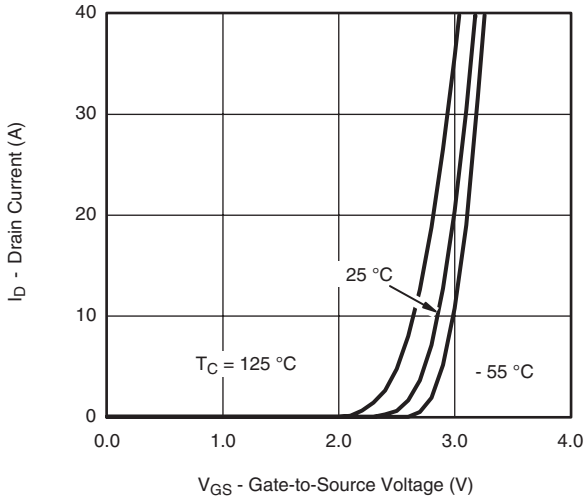
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

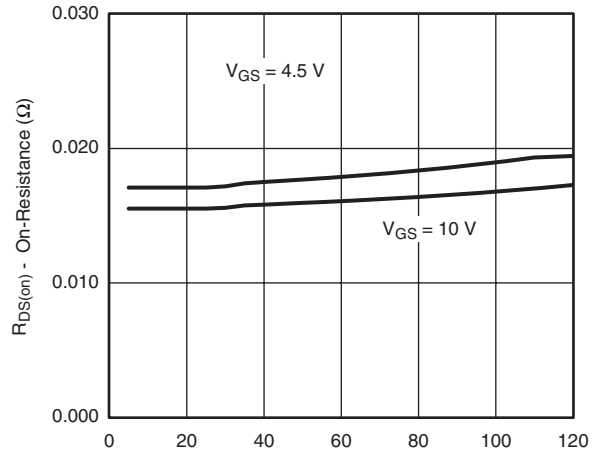
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



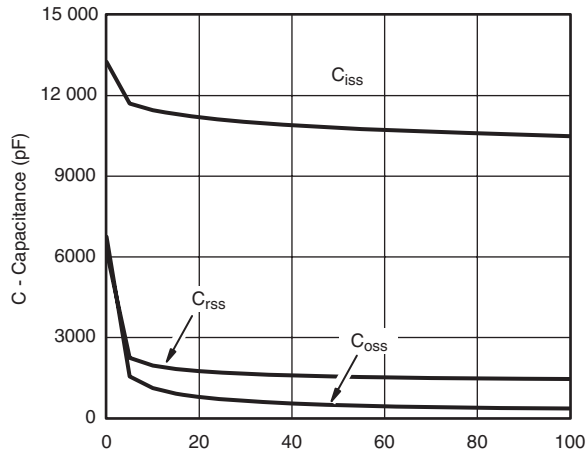

**Output Characteristics**



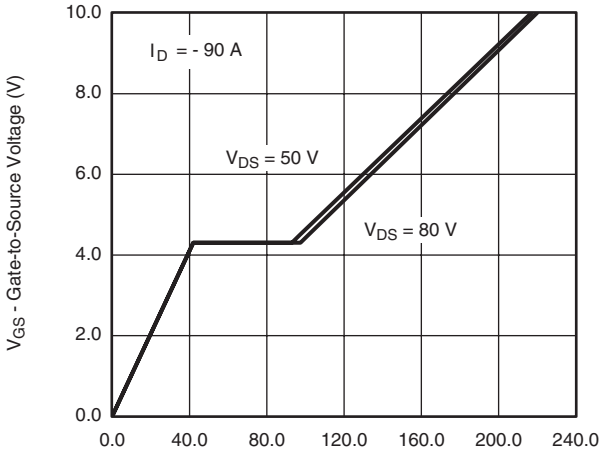

**Transfer Characteristics**



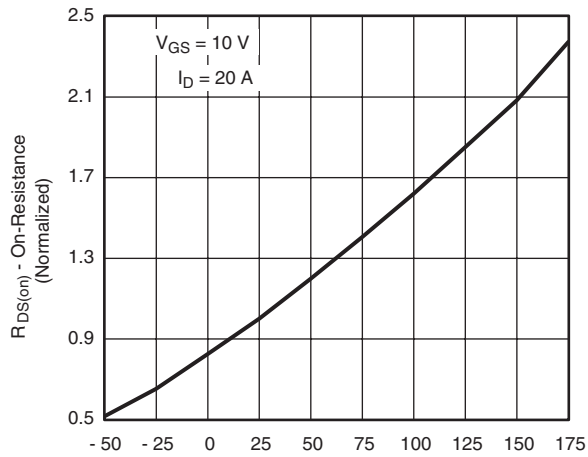

**On-Resistance vs. Drain Current**




**Capacitance**

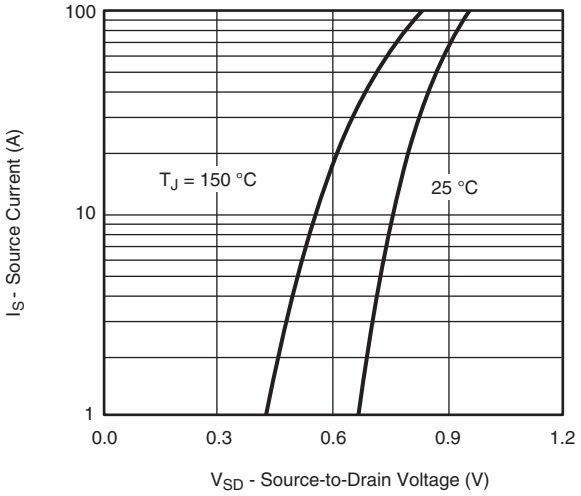



**Gate Charge**

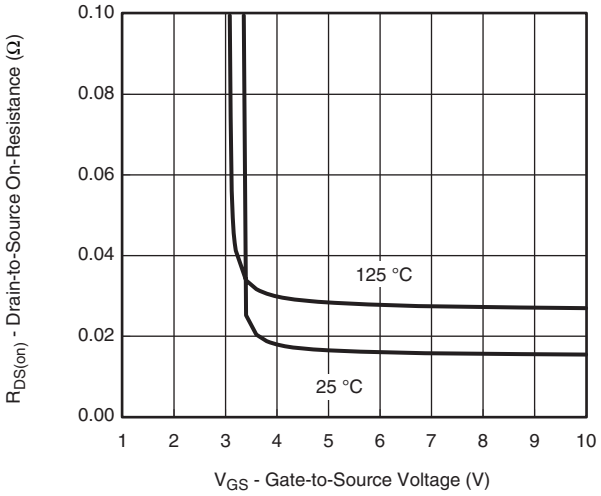



**On-Resistance vs. Junction Temperature**

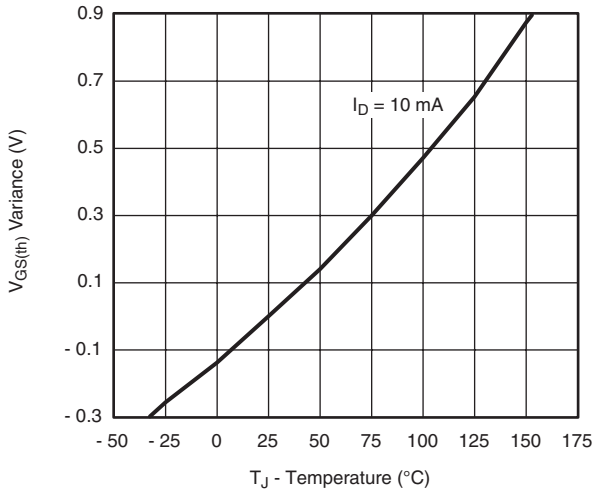
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



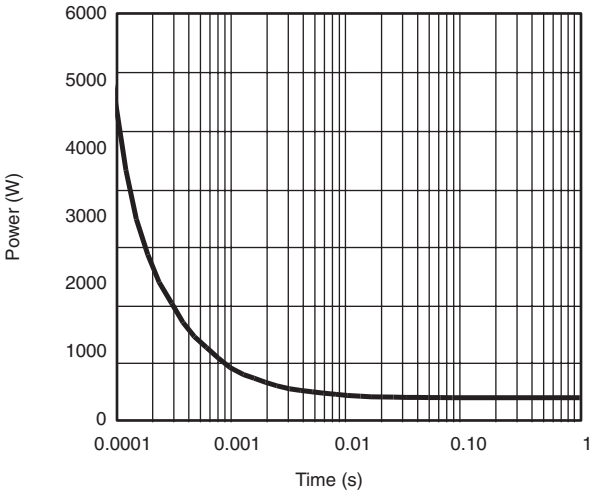

**Source-Drain Diode Forward Voltage**



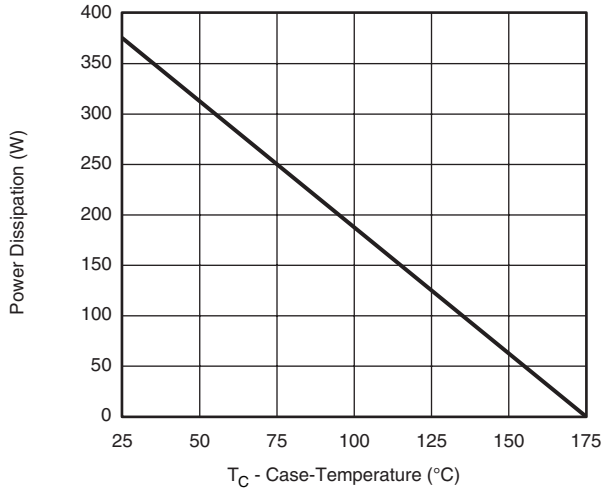

**On-Resistance vs. Gate-to-Source Voltage**



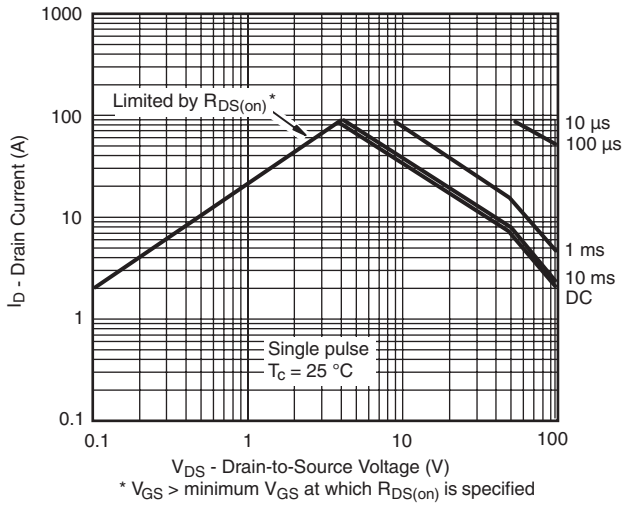

**Threshold Voltage**




**Single Pulse, Junction-to-Case ($T_C$ = 25 °C)**

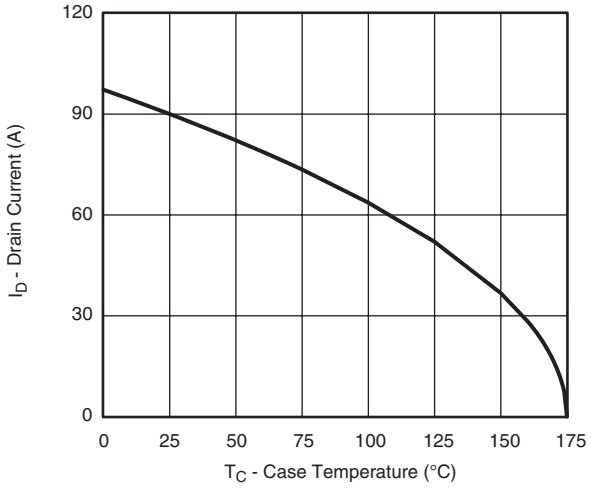



**Power Derating (Junction-to-Case)**

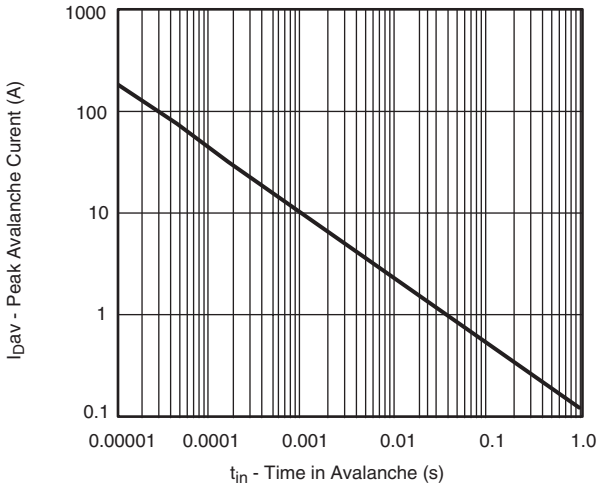



**Safe Operating Area**

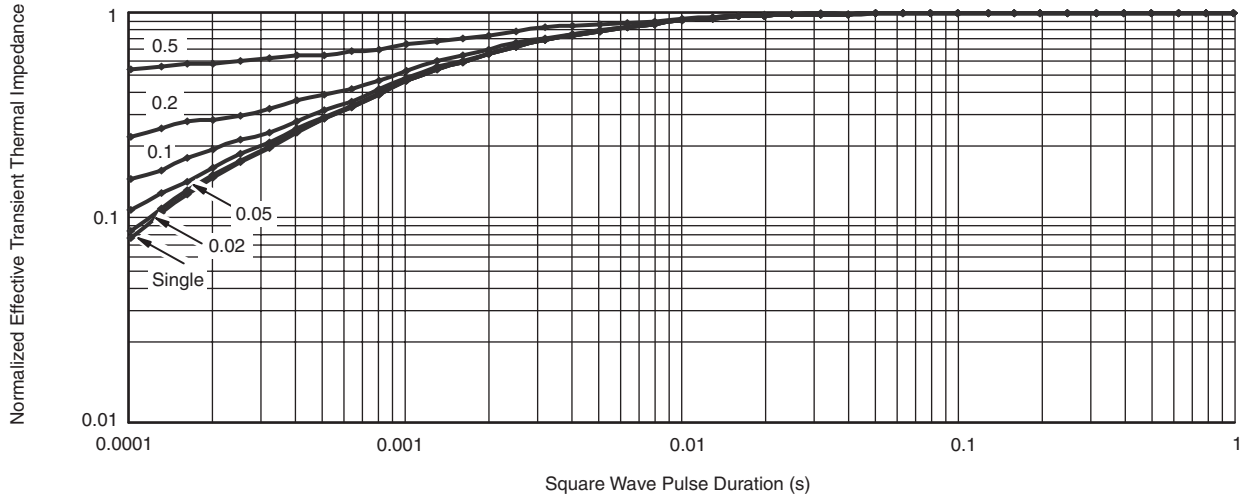
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted




**Max Avalanche and Drain Current vs. Case Temperature**




**Avalanche Current vs. Time**




**Normalized Thermal Transient Impedance, Junction-to-Case**

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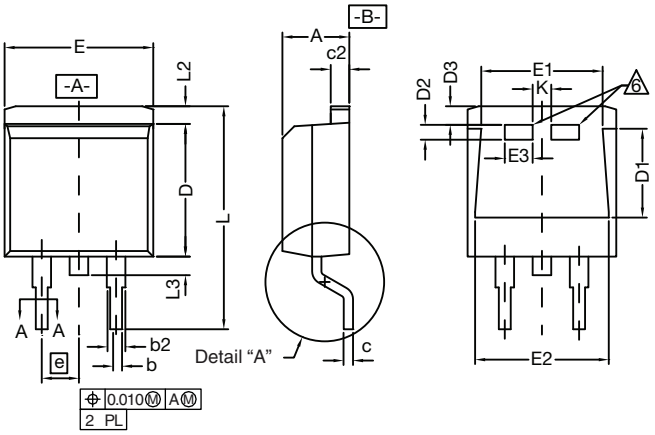
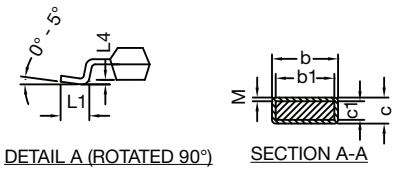
## TO-263 ($D^2PAK$): 3-LEAD



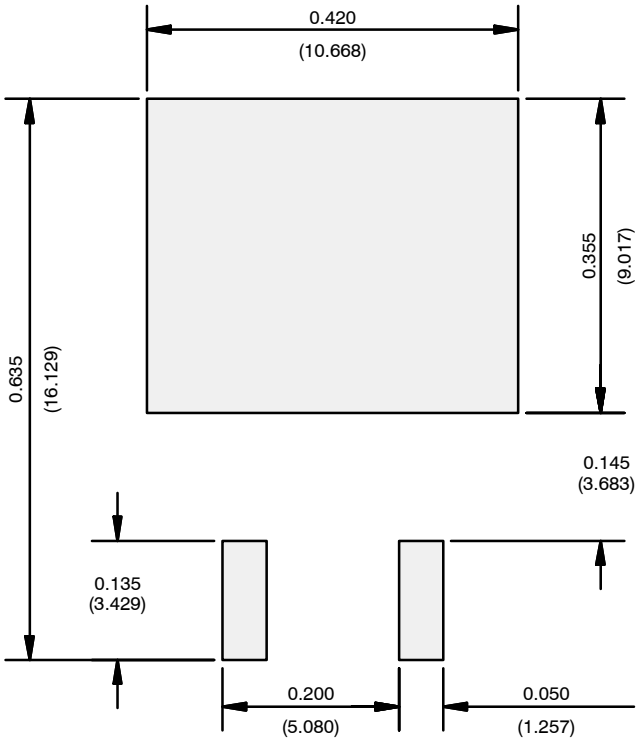

| DIM. | | INCHES | | MILLIMETERS | |
|---|---|---|---|---|---|
| | | MIN. | MAX. | MIN. | MAX. |
| A | | 0.160 | 0.190 | 4.064 | 4.826 |
| b | | 0.020 | 0.039 | 0.508 | 0.990 |
| b1 | | 0.020 | 0.035 | 0.508 | 0.889 |
| b2 | | 0.045 | 0.055 | 1.143 | 1.397 |
| c* | Thin lead | 0.013 | 0.018 | 0.330 | 0.457 |
| | Thick lead | 0.023 | 0.028 | 0.584 | 0.711 |
| c1 | Thin lead | 0.013 | 0.017 | 0.330 | 0.431 |
| | Thick lead | 0.023 | 0.027 | 0.584 | 0.685 |
| c2 | | 0.045 | 0.055 | 1.143 | 1.397 |
| D | | 0.340 | 0.380 | 8.636 | 9.652 |
| D1 | | 0.220 | 0.240 | 5.588 | 6.096 |
| D2 | | 0.038 | 0.042 | 0.965 | 1.067 |
| D3 | | 0.045 | 0.055 | 1.143 | 1.397 |
| E | | 0.380 | 0.410 | 9.652 | 10.414 |
| E1 | | 0.245 | - | 6.223 | - |
| E2 | | 0.355 | 0.375 | 9.017 | 9.525 |
| E3 | | 0.072 | 0.078 | 1.829 | 1.981 |
| e | | 0.100 BSC | | 2.54 BSC | |
| K | | 0.045 | 0.055 | 1.143 | 1.397 |
| L | | 0.575 | 0.625 | 14.605 | 15.875 |
| L1 | | 0.090 | 0.110 | 2.286 | 2.794 |
| L2 | | 0.040 | 0.055 | 1.016 | 1.397 |
| L3 | | 0.050 | 0.070 | 1.270 | 1.778 |
| L4 | | 0.010 BSC | | 0.254 BSC | |
| M | | - | 0.002 | - | 0.050 |
| ECN: T10-0738-Rev. J, 03-Jan-11<br>DWG: 5843 | | | | | |

**Notes**

1. Plane B includes maximum features of heat sink tab and plastic.
2. No more than 25 % of L1 can fall above seating plane by max. 8 mils.
3. Pin-to-pin coplanarity max. 4 mils.
4. *: Thin lead is for SUB, SYB.
   Thick lead is for SUM, SYM, SQM.
5. Use inches as the primary measurement.

6. This feature is for thick lead.

## RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead




Recommended Minimum Pads
Dimensions in Inches/(mm)

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