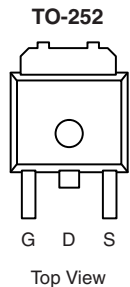


P-Channel 100-V (D-S) 175 °C MOSFET

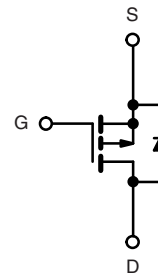
| PRODUCT SUMMARY | | | |
|-----------------|-----------------------------|------------------------|--------------|
| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) ^a | Q_g (Typ.) |
| - 100 | 0.043 at $V_{GS} = - 10$ V | - 37 | 54 nC |
| | 0.048 at $V_{GS} = - 4.5$ V | - 35 | |

FEATURES

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



Drain Connected to Tab



Ordering Information: SUD50P10-43L-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 ($T_J = 175$ °C) ^b | I_D | $T_C = 25$ °C | - 37.1 ^a | A |
| | | $T_C = 125$ °C | - 31 ^a | |
| | | $T_A = 25$ °C | - 9.2 ^{b, c} | |
| | | $T_A = 125$ °C | - 7.7 ^{b, c} | |
| Pulsed Drain Current | I_{DM} | - 40 | A | |
| Continuous Source Current (Diode Conduction) | I_S | $T_C = 25$ °C | | |
| | | $T_A = 25$ °C | - 6.9 ^{b, c} | |
| Avalanche Current | I_{AS} | - 35 | mJ | |
| Single Pulse Avalanche Energy | E_{AS} | 61 | | |
| Maximum Power Dissipation | P_D | $T_C = 25$ °C | 136 | W |
| | | $T_C = 70$ °C | 95 | |
| | | $T_A = 25$ °C | 8.3 ^{b, c} | |
| | | $T_A = 70$ °C | 5.8 ^{b, c} | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to 175 | °C | |

| THERMAL RESISTANCE RATINGS | | | | | |
|----------------------------------|------------|---------------|---------|------|------|
| Parameter | Symbol | Typical | Maximum | Unit | |
| Junction-to-Ambient ^a | R_{thJA} | $t \leq 10$ s | 15 | 18 | °C/W |
| | | Steady State | 40 | 50 | |
| Junction-to-Case (Drain) | R_{thJC} | 0.85 | 1.1 | | |

Notes:

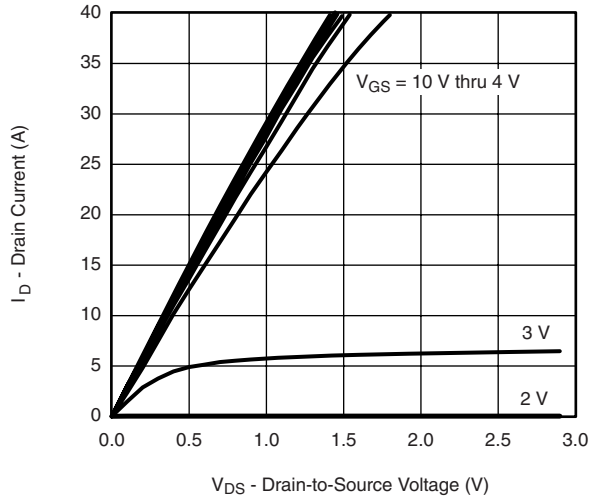
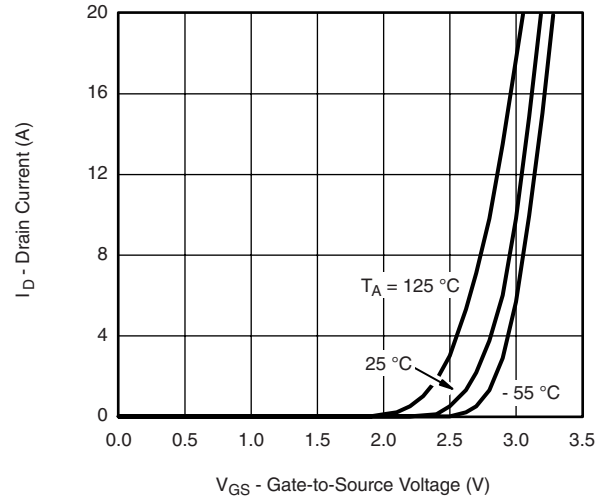
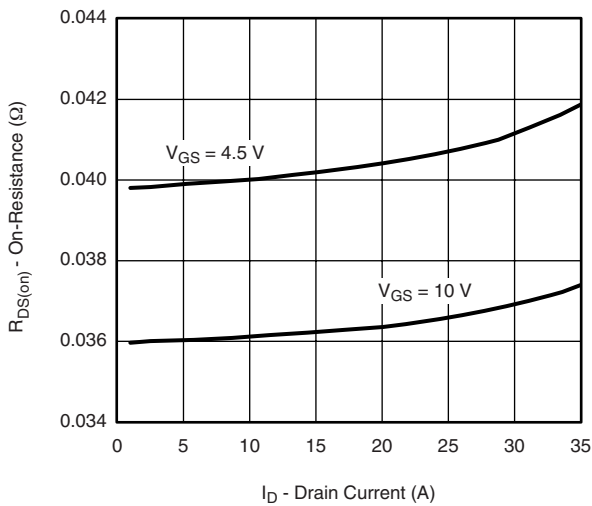
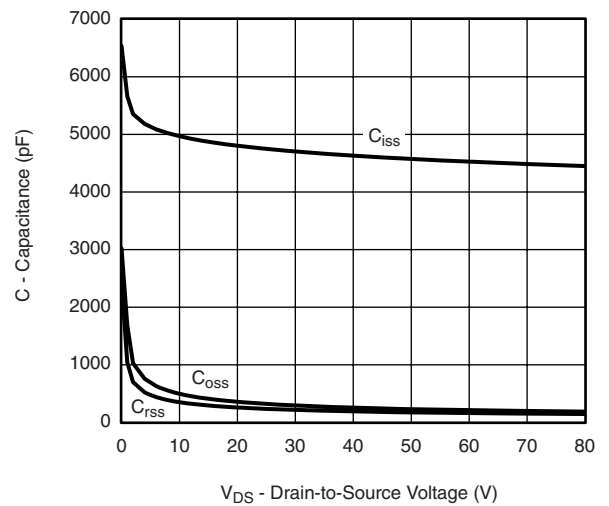
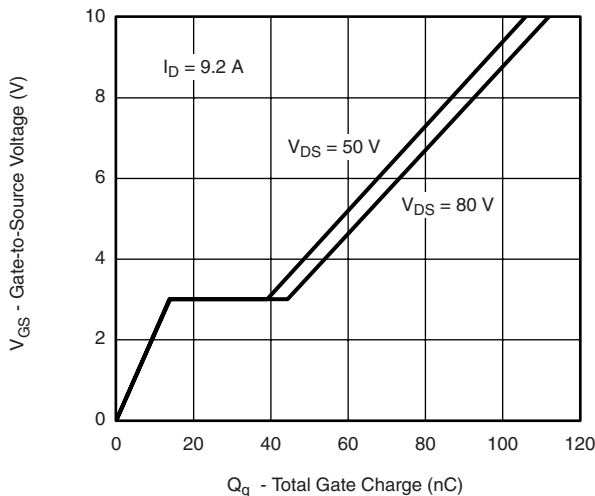
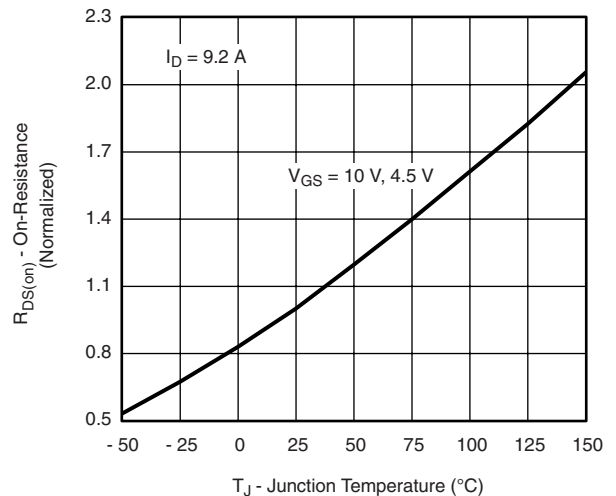
- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Maximum under Steady State conditions is 40 °C/W.

| 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} | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -100 | | | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = -250\text{ }\mu\text{A}$ | | -109 | | mV/ $^\circ\text{C}$ |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | | 5.9 | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -1 | | -3 | V |
| Gate-Source Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$ | | | -1 | μA |
| | | $V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$ | | | -10 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = -10\text{ V}$ | -40 | | | A |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = -10\text{ V}, I_D = -9.2\text{ A}$ | | 0.036 | 0.043 | Ω |
| | | $V_{GS} = -4.5\text{ V}, I_D = -7.7\text{ A}$ | | 0.040 | 0.048 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -15\text{ V}, I_D = -9.2\text{ A}$ | | 38 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 4600 | | pF |
| Output Capacitance | C_{oss} | | | 230 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 175 | | |
| Total Gate Charge | Q_g | $V_{DS} = -50\text{ V}, V_{GS} = -10\text{ V}, I_D = -9.2\text{ A}$ | | 106 | 160 | nC |
| | | | | 54 | 81 | |
| Gate-Source Charge | Q_{gs} | $V_{DS} = -50\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -9.2\text{ A}$ | | 14 | | |
| Gate-Drain Charge | Q_{gd} | | | 26 | | |
| Gate Resistance | R_g | $f = 1\text{ MHz}$ | | 4 | | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -50\text{ V}, R_L = 6.5\text{ }\Omega$ $I_D \cong -7.7\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$ | | 15 | 25 | ns |
| Rise Time | t_r | | | 20 | 30 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 110 | 165 | |
| Fall Time | t_f | | | 100 | 150 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -50\text{ V}, R_L = 6.5\text{ }\Omega$ $I_D \cong -7.7\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$ | | 42 | 65 | ns |
| Rise Time | t_r | | | 160 | 240 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 100 | 150 | |
| Fall Time | t_f | | | 100 | 150 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | | | -50 | A |
| Pulse Diode Forward Current ^a | I_{SM} | | | | -40 | |
| Body Diode Voltage | V_{SD} | $I_S = -7.7\text{ A}$ | | -0.8 | -1.2 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F = -7.7\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$ | | 60 | 90 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 150 | 225 | nC |
| Reverse Recovery Fall Time | t_a | | | 46 | | ns |
| Reverse Recovery Rise Time | t_b | | | 14 | | |

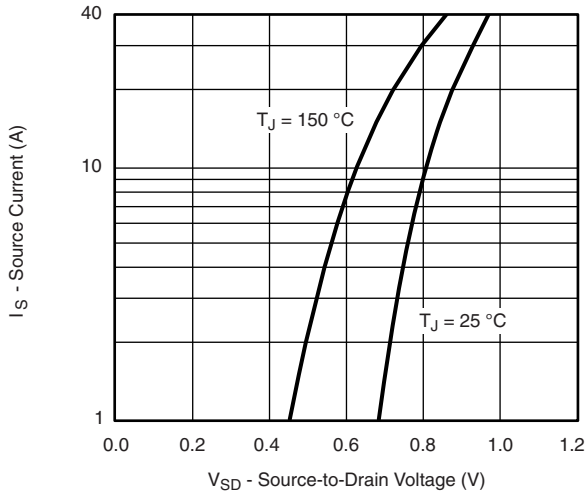
Notes:

- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

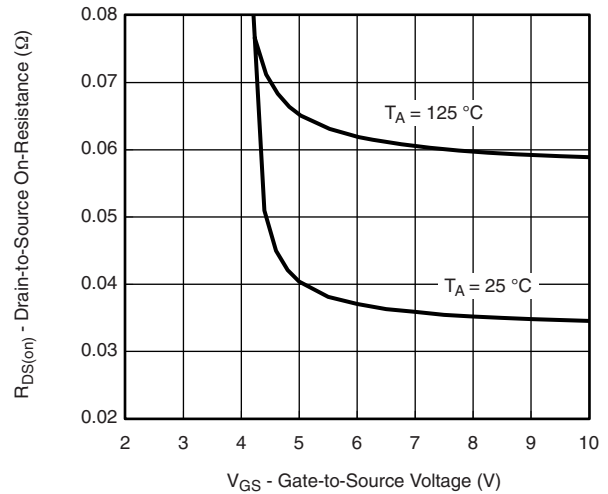
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure 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 and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

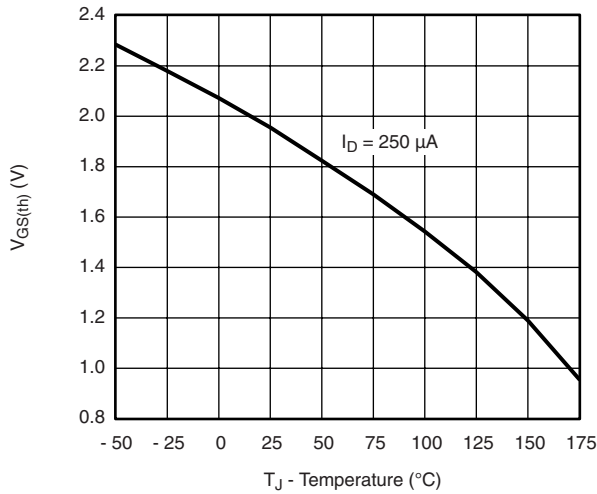
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



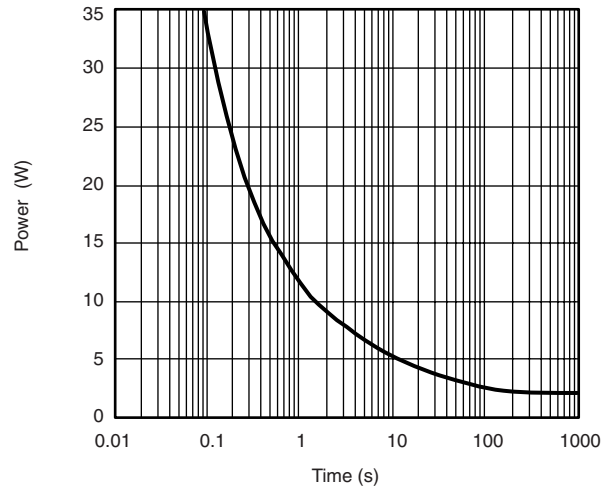
Source-Drain Diode Forward Voltage



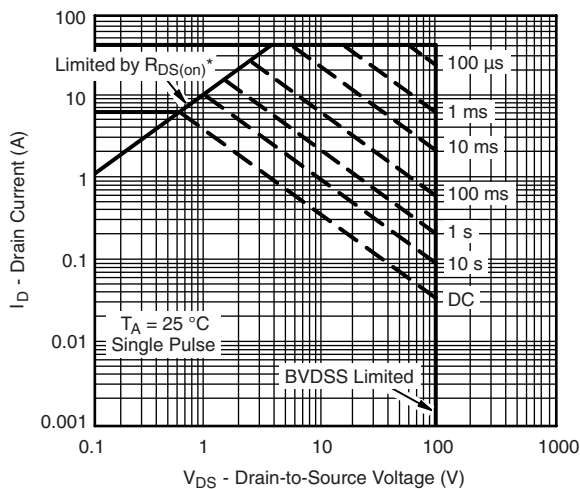
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



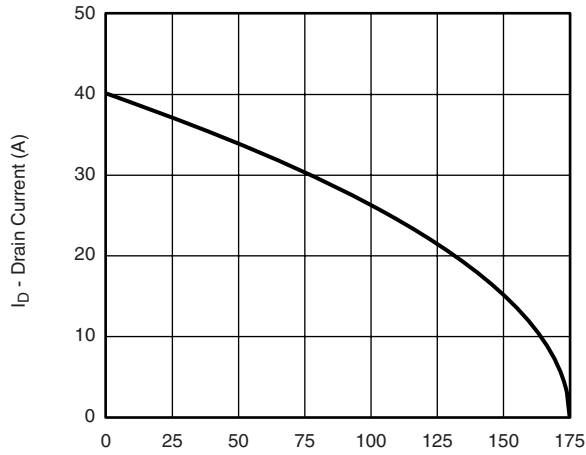
Single Pulse Power, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

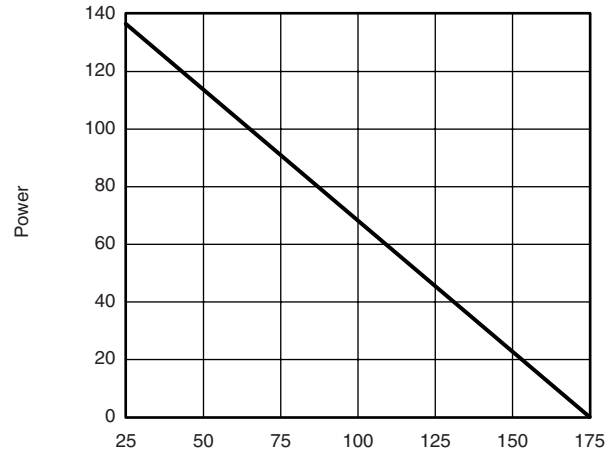
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



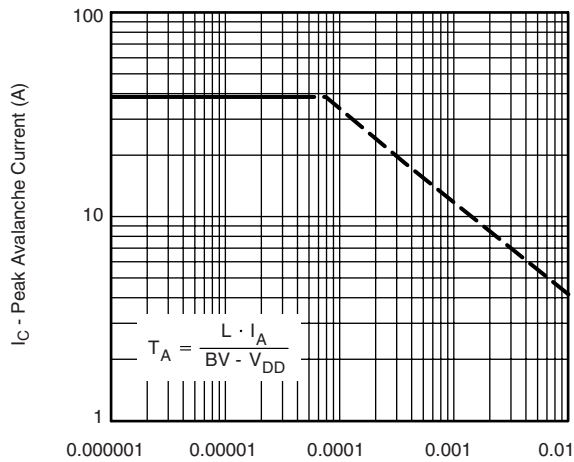
T_C - Case Temperature (°C)

Current Derating*



T_C - Case Temperature (°C)

Single Pulse Power, Junction-to-Ambient



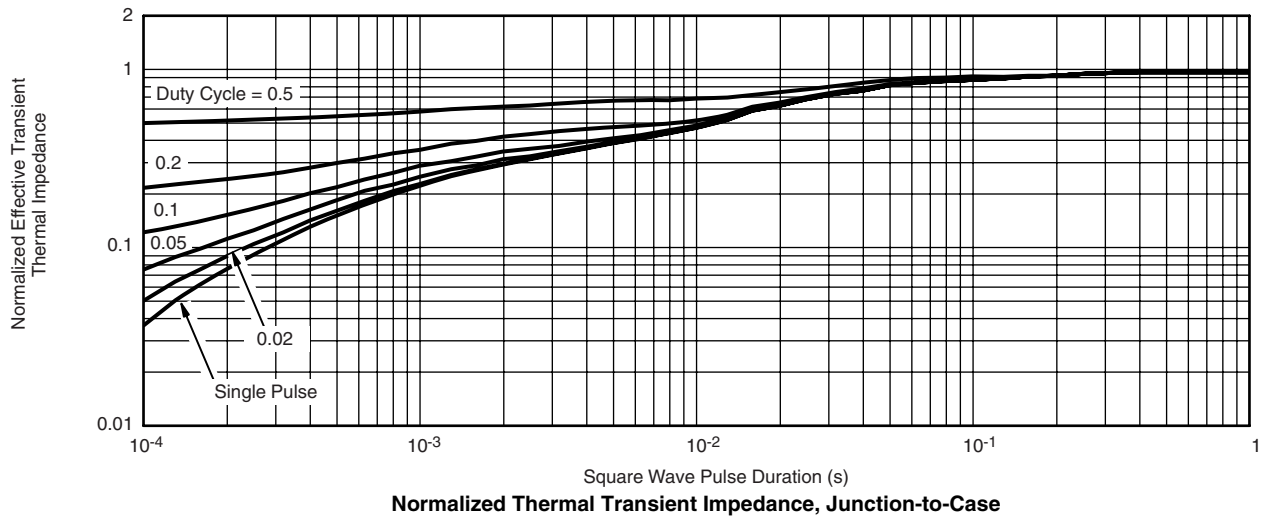
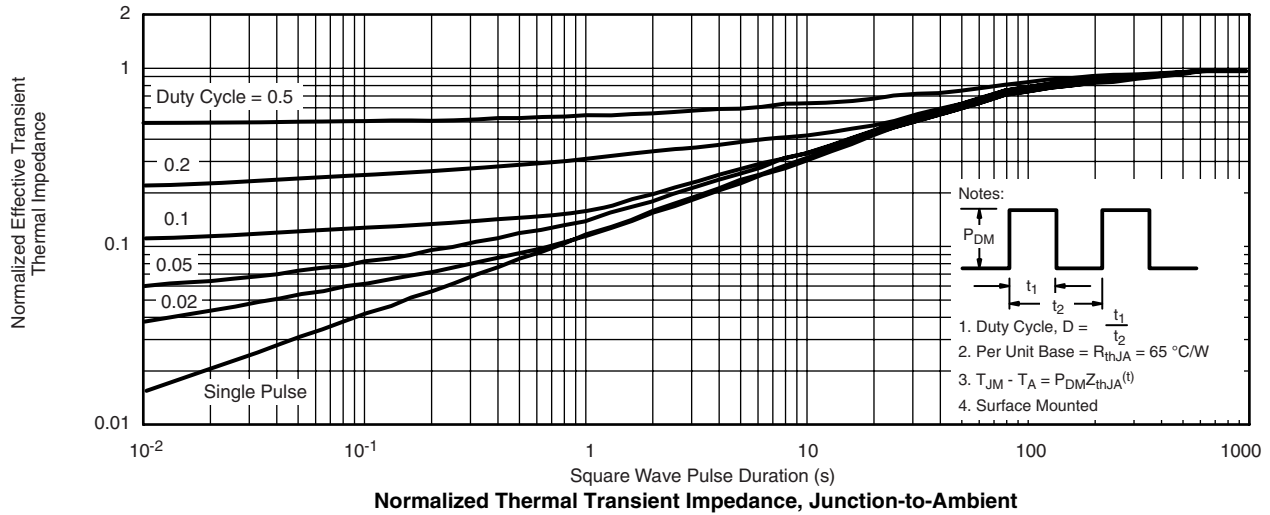
T_A - Time In Avalanche (s)

Single Pulse Avalanche Capability

$$T_A = \frac{L \cdot I_A}{BV - V_{DD}}$$

* The power dissipation P_D is based on $T_{J(max)} = 175$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

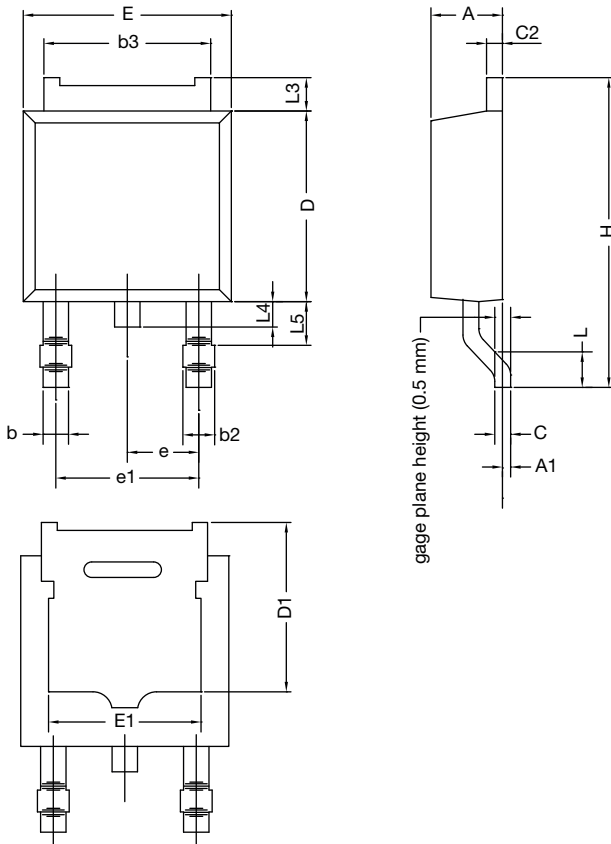
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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TO-252AA Case Outline

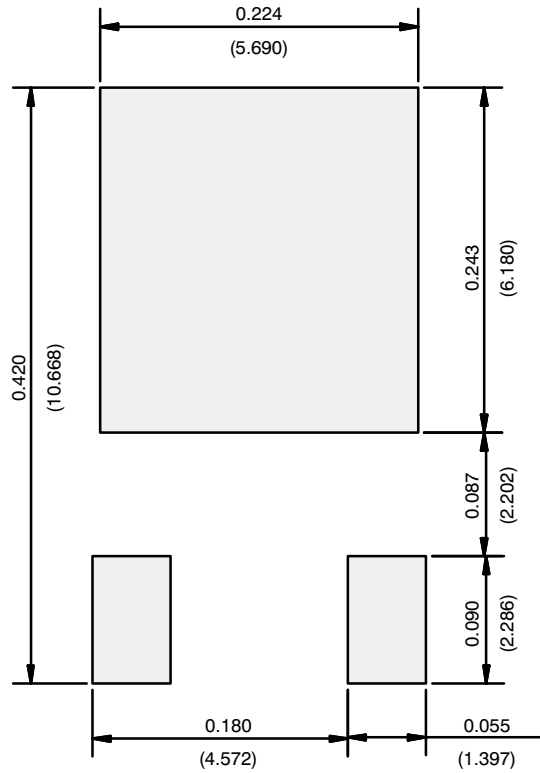


| DIM. | MILLIMETERS | | INCHES | |
|--|-------------|-------|-----------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 2.18 | 2.38 | 0.086 | 0.094 |
| A1 | - | 0.127 | - | 0.005 |
| b | 0.64 | 0.88 | 0.025 | 0.035 |
| b2 | 0.76 | 1.14 | 0.030 | 0.045 |
| b3 | 4.95 | 5.46 | 0.195 | 0.215 |
| C | 0.46 | 0.61 | 0.018 | 0.024 |
| C2 | 0.46 | 0.89 | 0.018 | 0.035 |
| D | 5.97 | 6.22 | 0.235 | 0.245 |
| D1 | 4.10 | - | 0.161 | - |
| E | 6.35 | 6.73 | 0.250 | 0.265 |
| E1 | 4.32 | - | 0.170 | - |
| H | 9.40 | 10.41 | 0.370 | 0.410 |
| e | 2.28 BSC | | 0.090 BSC | |
| e1 | 4.56 BSC | | 0.180 BSC | |
| L | 1.40 | 1.78 | 0.055 | 0.070 |
| L3 | 0.89 | 1.27 | 0.035 | 0.050 |
| L4 | - | 1.02 | - | 0.040 |
| L5 | 1.01 | 1.52 | 0.040 | 0.060 |
| ECN: T16-0236-Rev. P, 16-May-16 DWG: 5347 | | | | |

Notes

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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