# N-Channel 150 V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) MAX. | $I_D$ (A) | $Q_g$ (TYP.) |
| 150 | 0.0076 at $V_{GS}$ = 10 V | 110 | 63 nC |
| | 0.0081 at $V_{GS}$ = 7.5 V | 100 | |

## FEATURES

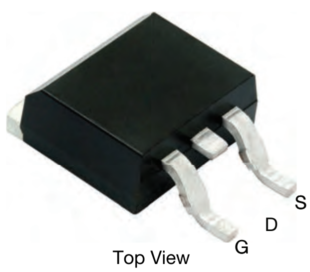
- DTFET® power MOSFET
- Maximum 175 °C junction temperature
- 100 % $R_g$ and UIS tested

RoHS
COMPLIANT
HALOGEN
FREE

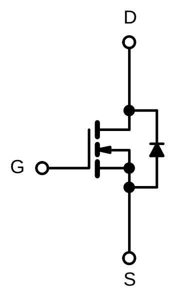
## APPLICATIONS

- Power supplies:
  - Uninterruptible power supplies
  - AC/DC switch-mode power supplies
  - Lighting
- Synchronous rectification
- DC/DC converter
- Motor drive switch
- DC/AC inverter
- Solar micro inverter
- Class D audio amplifier
- Battery management

TO-263




Top View




N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25 °C, unless otherwise noted) | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | | $V_{DS}$ | 150 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current ($T_J$ = 150 °C) | $T_C$ = 25 °C | $I_D$ | 110 | A |
| | $T_C$ = 125 °C | | 74 | |
| Pulsed Drain Current (t = 100 μs) | | $I_{DM}$ | 330 | |
| Avalanche Current | L = 0.1 mH | $I_{AS}$ | 60 | |
| Single Avalanche Energy [a] | | $E_{AS}$ | 180 | mJ |
| Maximum Power Dissipation [a] | $T_C$ = 25 °C | $P_D$ | 375 [b] | W |
| | $T_C$ = 125 °C | | 125 [b] | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55 to +175 | °C |

| THERMAL RESISTANCE RATINGS | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Junction-to-Ambient (PCB Mount) [c] | $R_{thJA}$ | 40 | °C/W |
| Junction-to-Case (Drain) | $R_{thJC}$ | 0.4 | |

**Notes**

a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When mounted on 1" square PCB (FR4 material).

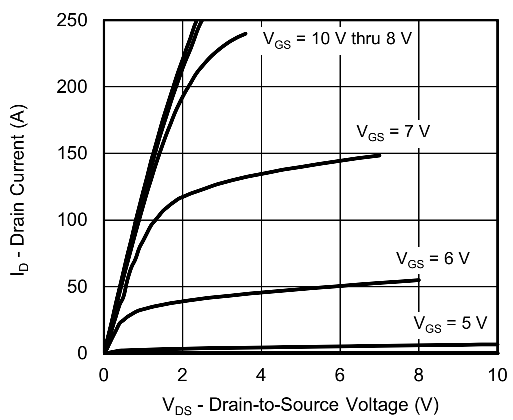
| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{DS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 150 | - | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 2 | - | 5 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 150 V, $V_{GS}$ = 0 V | - | - | 1 | μA |
| | | $V_{DS}$ = 150 V, $V_{GS}$ = 0 V, $T_J$ = 125 °C | - | - | 100 | |
| | | $V_{DS}$ = 150 V, $V_{GS}$ = 0 V, $T_J$ = 175 °C | - | - | 2 | mA |
| On-State Drain Current [a] | $I_{D(on)}$ | $V_{DS}$ ≥ 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 | - | 0.0076 | 0.0084 | Ω |
| | | $V_{GS}$ = 7.5 V, $I_D$ = 10 A | - | 0.0081 | 0.0089 | |
| Forward Transconductance [a] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 10 A | - | 52 | - | S |
| **Dynamic** [b] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 75 V, f = 1 MHz | - | 4225 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 535 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 26 | - | |
| Total Gate Charge [c] | $Q_g$ | $V_{DS}$ = 75 V, $V_{GS}$ = 10 V, $I_D$ = 10 A | - | 63 | 95 | nC |
| Gate-Source Charge [c] | $Q_{gs}$ | | - | 19.5 | - | |
| Gate-Drain Charge [c] | $Q_{gd}$ | | - | 20.5 | - | |
| Gate Resistance | $R_g$ | f = 1 MHz | 1.5 | 3 | 5 | Ω |
| Turn-On Delay Time [c] | $t_{d(on)}$ | $V_{DD}$ = 75 V, $R_L$ = 1.25 Ω<br>$I_D$ ≅ 30 A, $V_{GEN}$ = 10 V, $R_g$ = 1 Ω | - | 15 | 30 | ns |
| Rise Time [c] | $t_r$ | | - | 114 | 220 | |
| Turn-Off Delay Time [c] | $t_{d(off)}$ | | - | 28 | 56 | |
| Fall Time [c] | $t_f$ | | - | 8 | 16 | |
| **Drain-Source Body Diode Ratings and Characteristics** [b] ($T_C$ = 25 °C) | | | | | | |
| Pulsed Current (t = 100 μs) | $I_{SM}$ | | - | - | 330 | A |
| Forward Voltage [a] | $V_{SD}$ | $I_F$ = 10 A, $V_{GS}$ = 0 V | - | 0.73 | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 10 A, di/dt = 100 A/μs | - | 110 | 220 | ns |
| Peak Reverse Recovery Charge | $I_{RM(REC)}$ | | - | 10 | 20 | A |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 0.5 | 1 | μC |

**Notes**

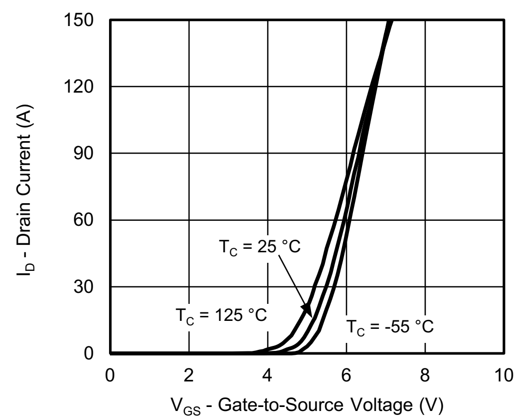
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

*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.*

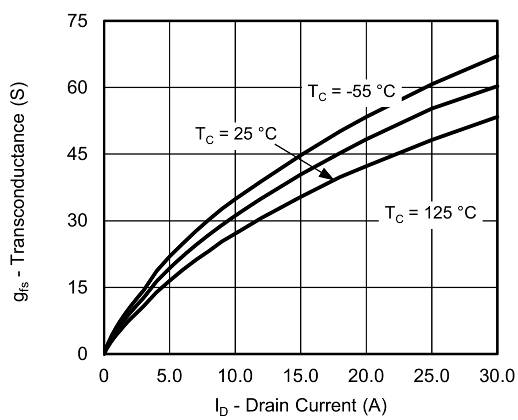
**TYPICAL CHARACTERISTICS** ($T_A$ = 25 °C, unless otherwise noted)



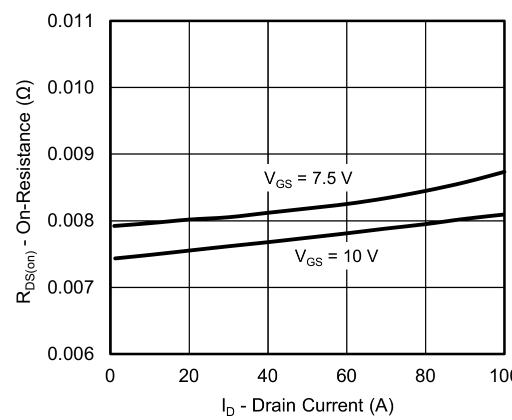

**Output Characteristics**



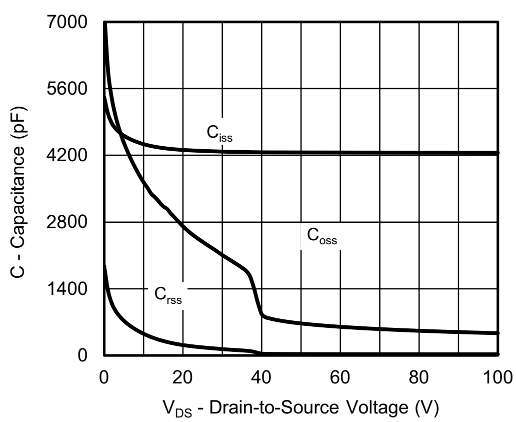

**Transfer Characteristics**



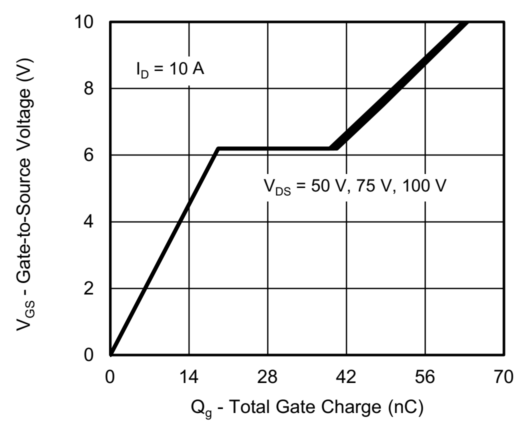

**Transconductance**




**On-Resistance vs. Drain Current**

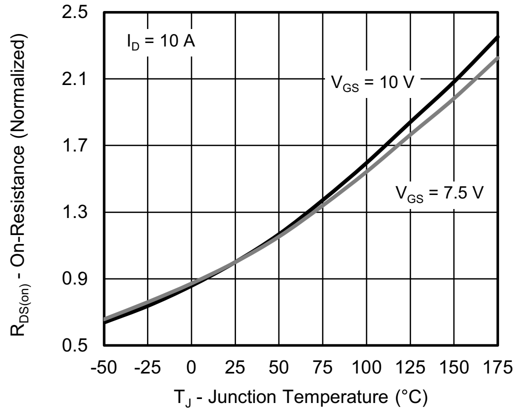



**Capacitance**

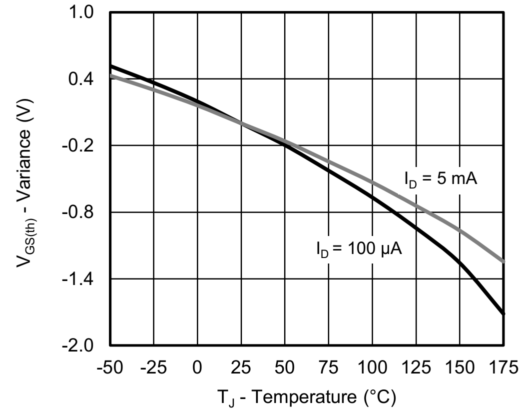



**Gate Charge**

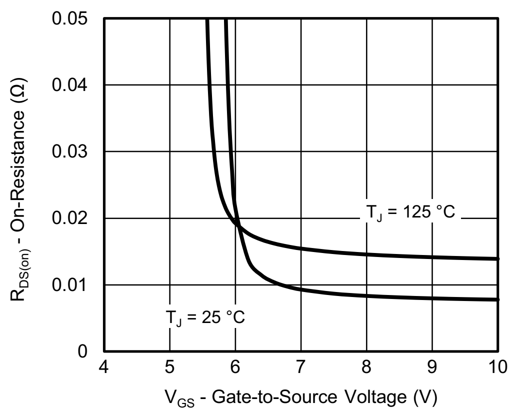
**TYPICAL CHARACTERISTICS** ($T_A$ = 25 °C, unless otherwise noted)



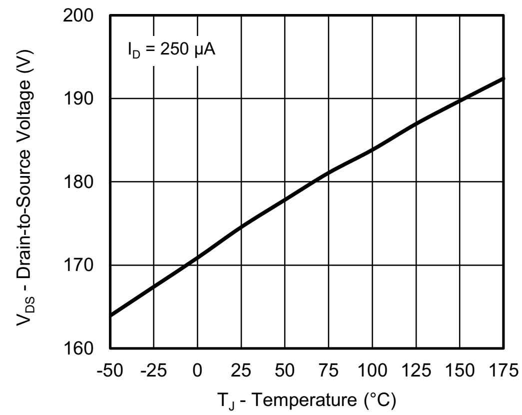

**On-Resistance vs. Junction Temperature**



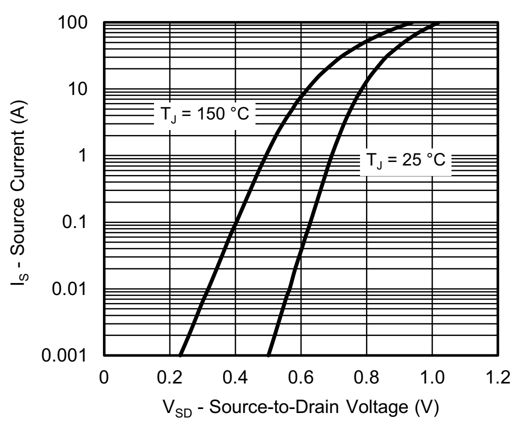

**Threshold Voltage**



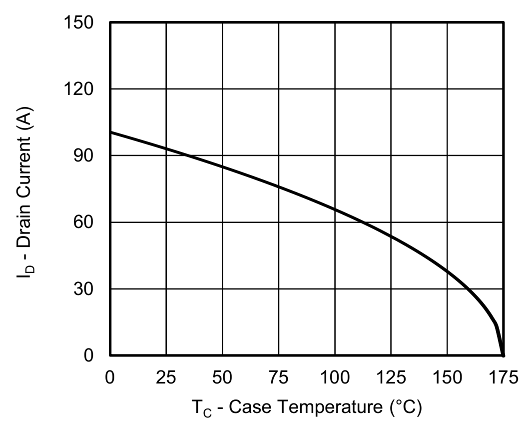

**On-Resistance vs. Gate-to-Source Voltage**




**Drain Source Breakdown vs. Junction Temperature**

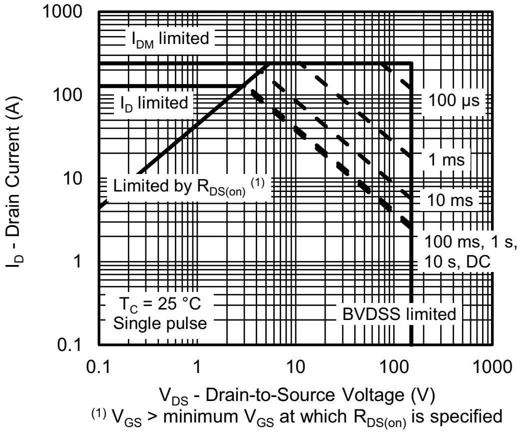



**Source Drain Diode Forward Voltage**

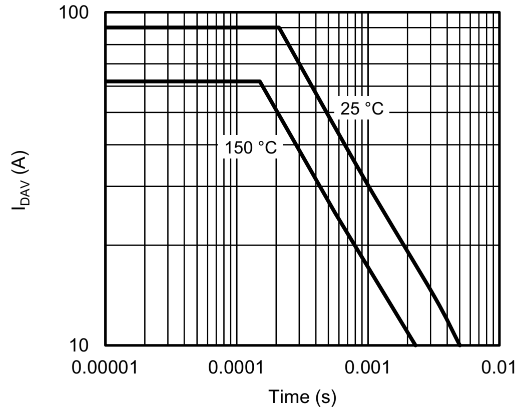



**Current De-Rating**

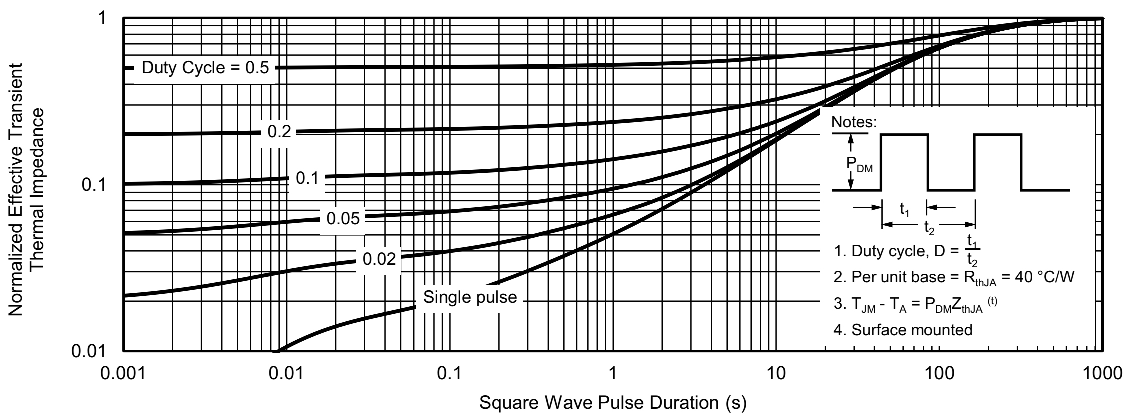
**THERMAL RATINGS** ($T_A$ = 25 °C, unless otherwise noted)




**Safe Operating Area**

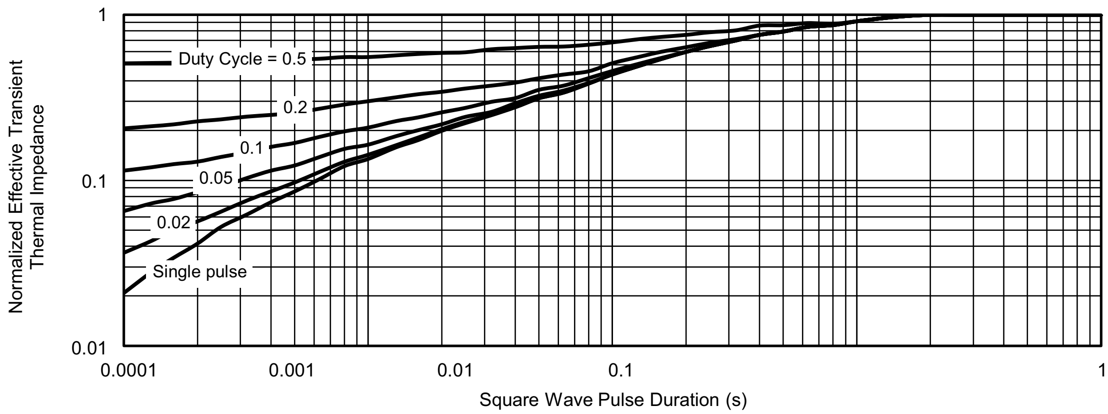



**$I_{DAV}$ vs. Time**




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

**THERMAL RATINGS** ($T_A$ = 25 °C, unless otherwise noted)



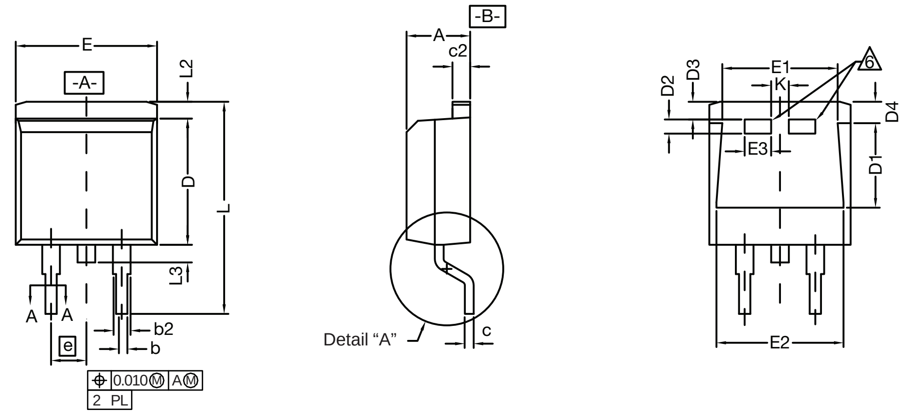

**Normalized Thermal Transient Impedance, Junction-to-Case**

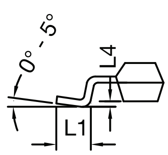
**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction to Case (25 °C)

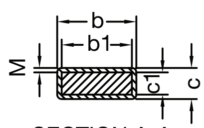
  are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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




DETAIL A (ROTATED 90°)



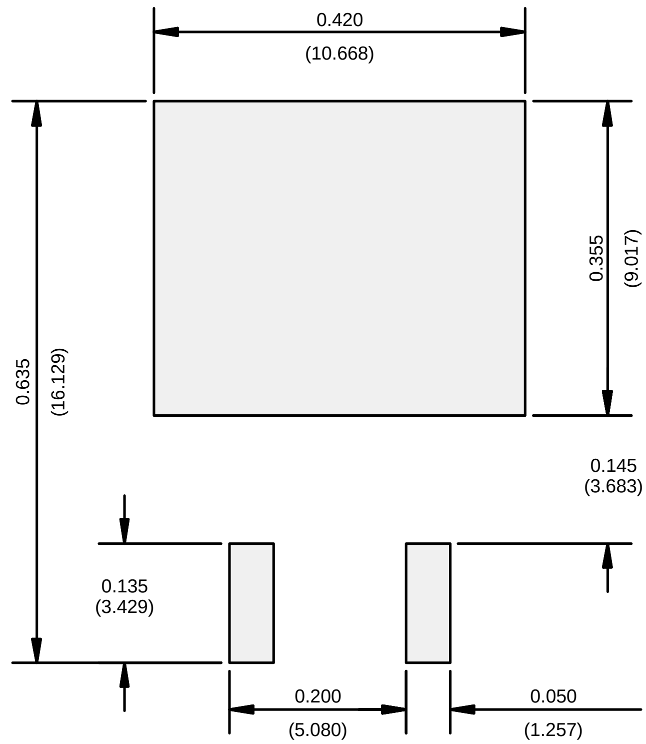

SECTION A-A

| 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 |
| D4 | | 0.044 | 0.052 | 1.118 | 1.321 |
| 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 |

**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 D$^2$PAK: 3-Lead**




Recommended Minimum Pads
Dimensions in Inches/(mm)

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