

## Dual N-Channel MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 20           | 0.024 at $V_{GS} = 4.5$ V | 6.0       |
|              | 0.028 at $V_{GS} = 2.5$ V | 5.0       |

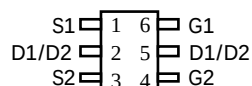
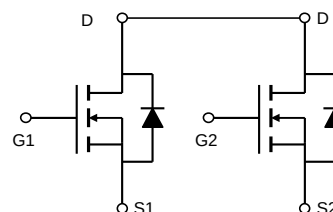
### FEATURES

- Halogen-free Option Available
- TrenchFET<sup>®</sup> Power MOSFETs
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS\***  
COMPLIANT

**TSOP6**  
**Top View**



### ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

| Parameter                                                 | Symbol         | 10 s        | Steady State | Unit |
|-----------------------------------------------------------|----------------|-------------|--------------|------|
| Drain-Source Voltage                                      | $V_{DS}$       | 20          |              | V    |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 12$    |              |      |
| Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>   | $I_D$          | 6.0         | 5.2          | A    |
|                                                           |                | 4.8         | 4.2          |      |
| Pulsed Drain Current                                      | $I_{DM}$       | 30          |              |      |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$          | 1.5         | 1.0          |      |
| Maximum Power Dissipation <sup>a</sup>                    | $P_D$          | 1.5         | 1.0          | W    |
|                                                           |                | 0.96        | 0.64         |      |
| Operating Junction and Storage Temperature Range          | $T_J, T_{stg}$ | - 55 to 150 |              | °C   |

### THERMAL RESISTANCE RATINGS

| Parameter                                | Symbol     | Typ. | Max. | Unit |
|------------------------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient <sup>a</sup> | $R_{thJA}$ | 72   | 83   | °C/W |
|                                          |            | 100  | 120  |      |
| Maximum Junction-to-Foot (Drain)         | $R_{thJF}$ | 55   | 70   |      |

Notes:

a. Surface Mounted on FR4 board,  $t \leq 10$  s.

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

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

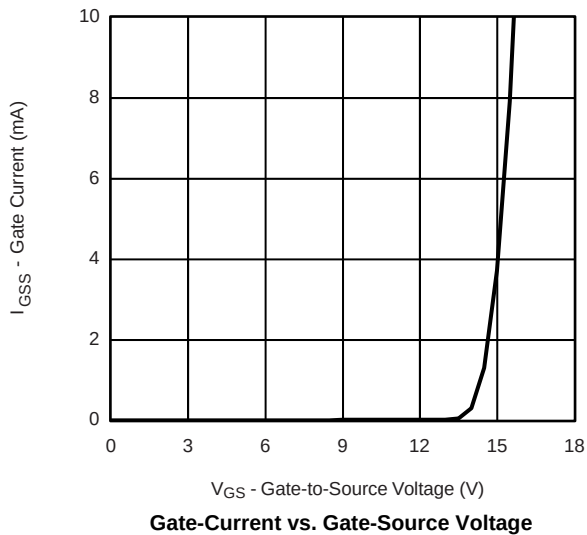
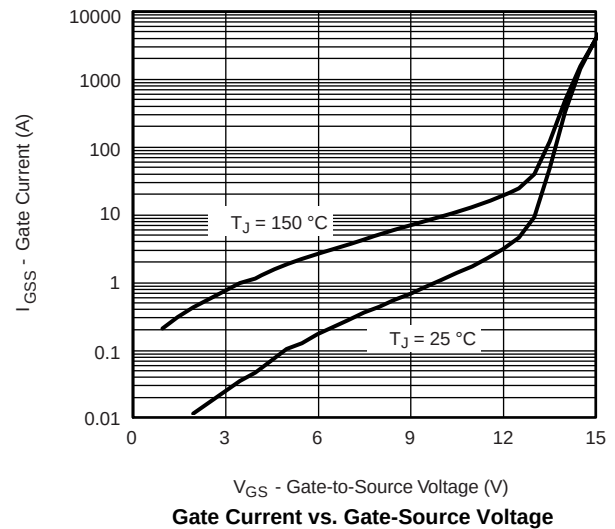
| Parameter                                     | Symbol       | Test Conditions                                                                                                                  | Min. | Typ. <sup>a</sup> | Max.      | Unit          |
|-----------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------|------|-------------------|-----------|---------------|
| <b>Static</b>                                 |              |                                                                                                                                  |      |                   |           |               |
| Gate Threshold Voltage                        | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                               | 0.5  |                   | 1.5       | V             |
| Gate-Body Leakage                             | $I_{GSS}$    | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 4.5\text{ V}$                                                                              |      |                   | $\pm 200$ | nA            |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                   |      |                   | 1         | $\mu\text{A}$ |
|                                               |              | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 70\text{ }^{\circ}\text{C}$                                              |      |                   | 25        |               |
| On-State Drain Current <sup>b</sup>           | $I_{D(on)}$  | $V_{DS} \leq 5\text{ V}$ , $V_{GS} = 4.5\text{ V}$                                                                               | 30   |                   |           | A             |
| Drain-Source On-State Resistance <sup>b</sup> | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}$ , $I_D = 5.5\text{ A}$                                                                                   |      | 0.024             |           | $\Omega$      |
|                                               |              | $V_{GS} = 2.5\text{ V}$ , $I_D = 3.5\text{ A}$                                                                                   |      | 0.028             |           |               |
| Forward Transconductance <sup>b</sup>         | $g_{fs}$     | $V_{DS} = 10\text{ V}$ , $I_D = 5.5\text{ A}$                                                                                    |      | 30                |           | S             |
| Diode Forward Voltage <sup>b</sup>            | $V_{SD}$     | $I_S = 1.5\text{ A}$ , $V_{GS} = 0\text{ V}$                                                                                     |      | 0.71              | 1.2       | V             |
| <b>Dynamic<sup>a</sup></b>                    |              |                                                                                                                                  |      |                   |           |               |
| Total Gate Charge                             | $Q_g$        | $V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 5.5\text{ A}$                                                          |      | 12                | 18        | nC            |
| Gate-Source Charge                            | $Q_{gs}$     |                                                                                                                                  |      | 2.2               |           |               |
| Gate-Drain Charge                             | $Q_{gd}$     |                                                                                                                                  |      | 3.6               |           |               |
| Turn-On Delay Time                            | $t_{d(on)}$  | $V_{DD} = 10\text{ V}$ , $R_L = 10\text{ }\Omega$<br>$I_D \cong 1\text{ A}$ , $V_{GEN} = 4.5\text{ V}$ , $R_G = 6\text{ }\Omega$ |      | 245               | 365       | ns            |
| Rise Time                                     | $t_r$        |                                                                                                                                  |      | 330               | 495       |               |
| Turn-Off Delay Time                           | $t_{d(off)}$ |                                                                                                                                  |      | 860               | 1300      |               |
| Fall Time                                     | $t_f$        |                                                                                                                                  |      | 510               | 765       |               |

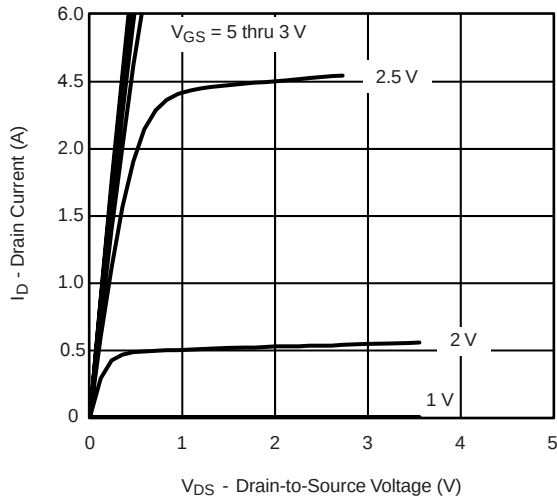
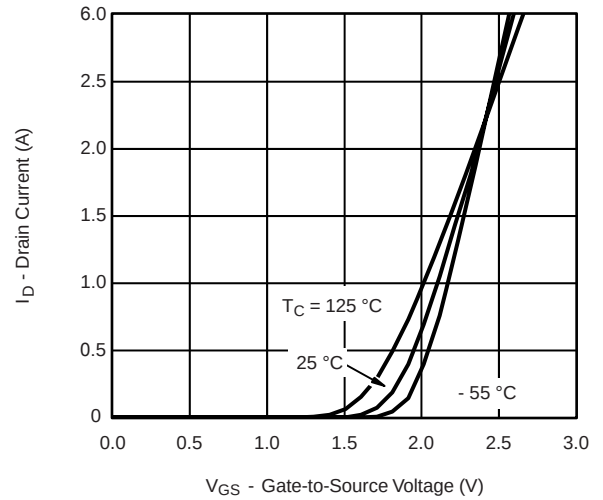
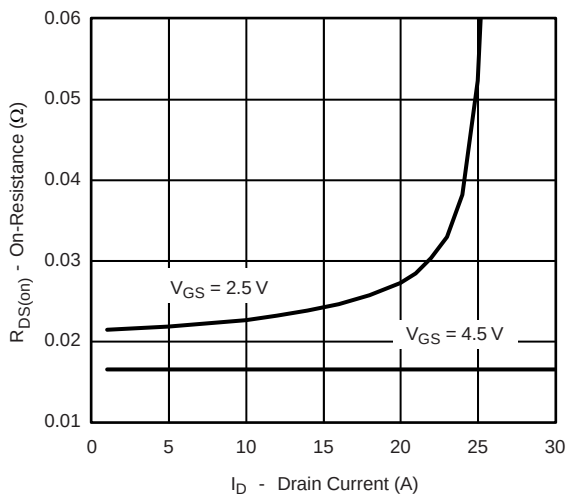
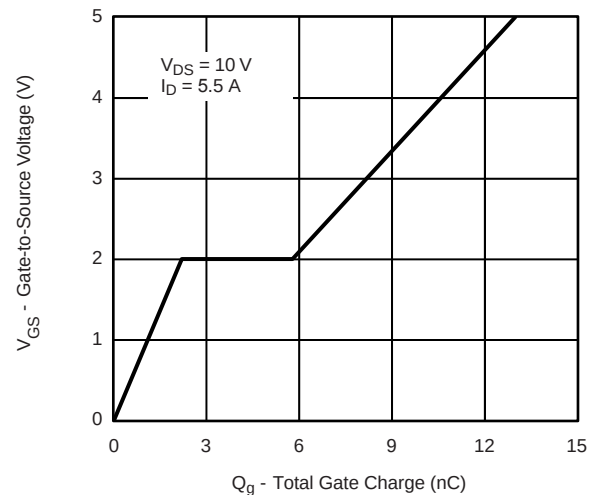
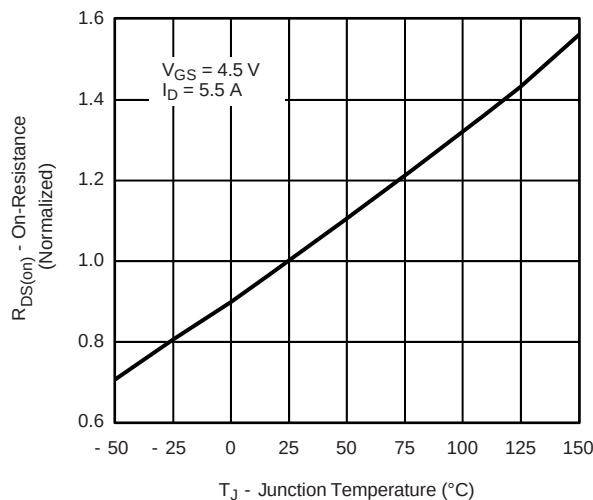
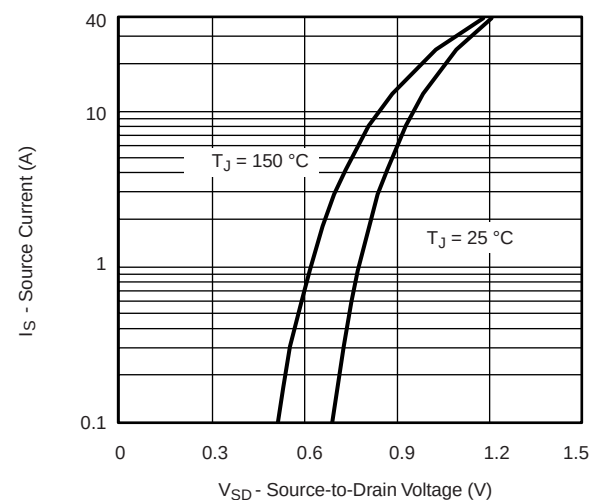
Notes:

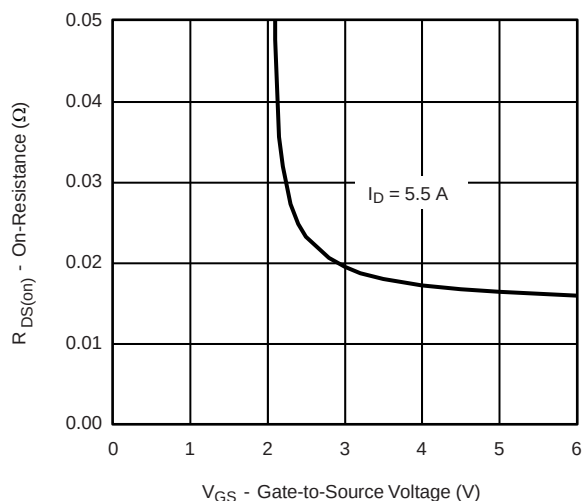
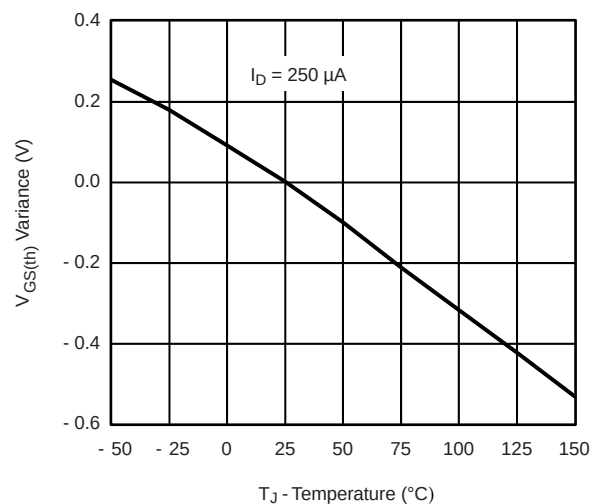
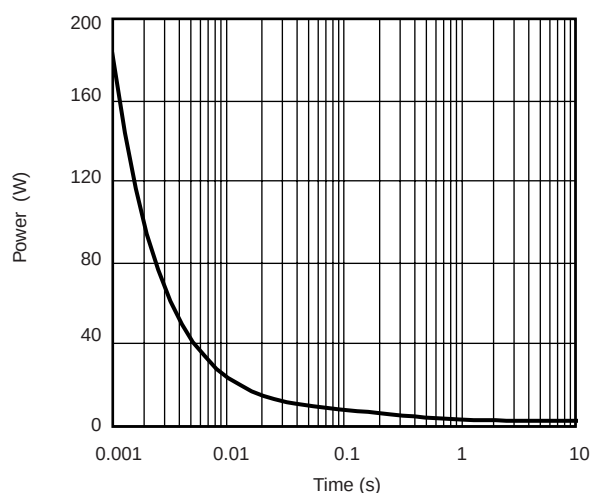
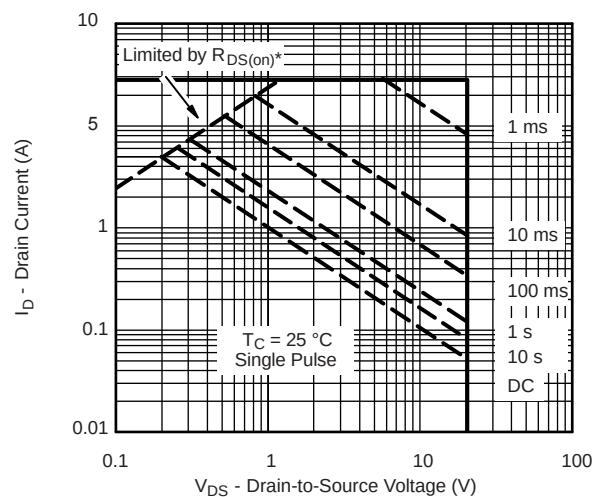
a. For design aid only; not subject to production testing.

b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

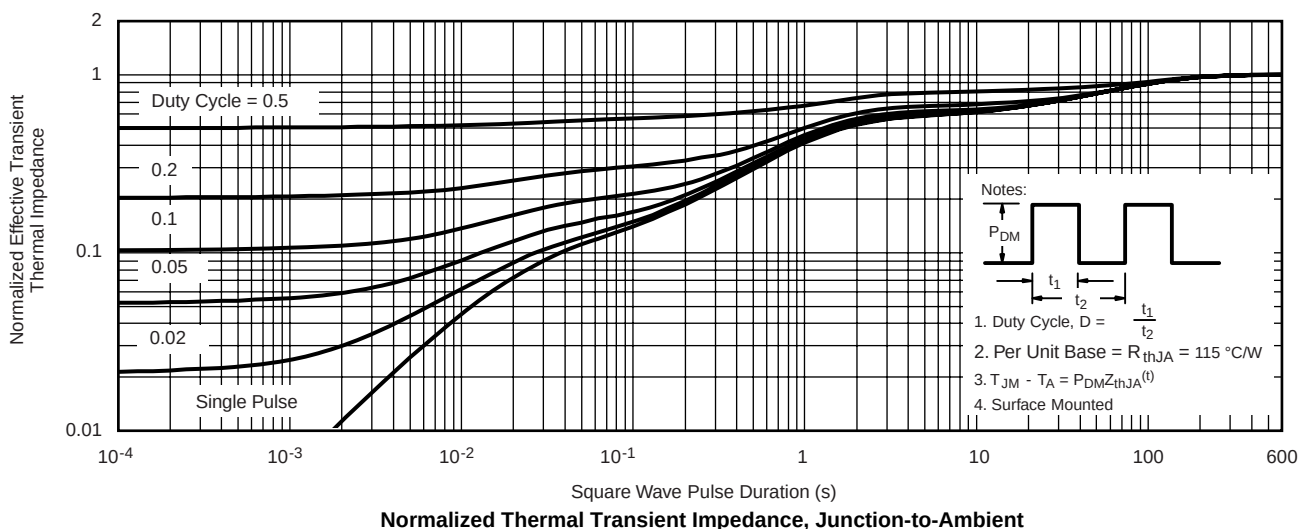
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

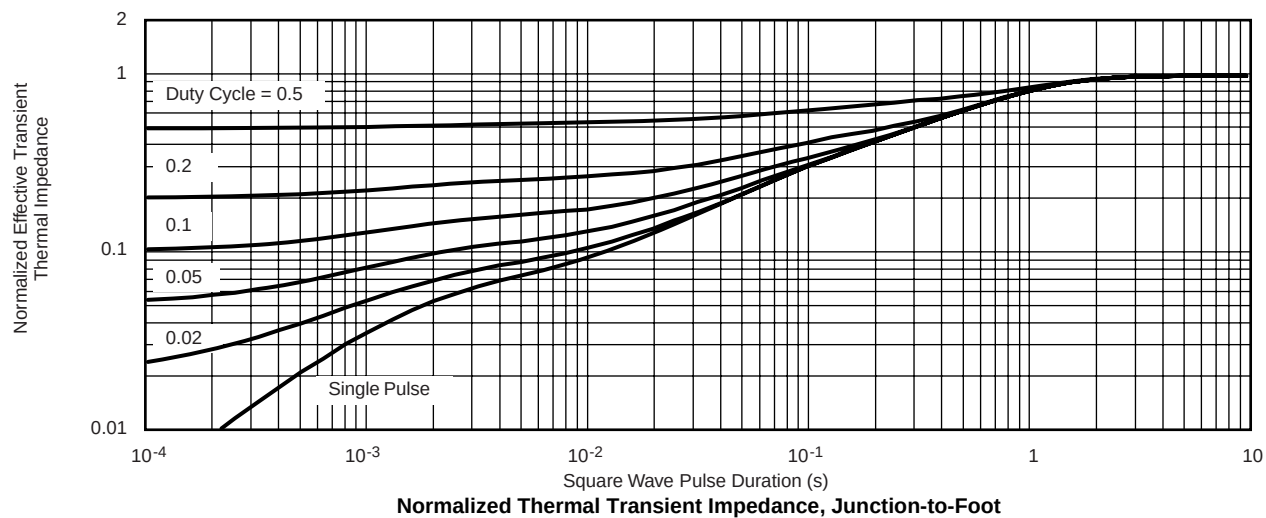
**TYPICAL CHARACTERISTICS**  $25\text{ }^{\circ}\text{C}$ , unless otherwise noted

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

**Source-Drain Diode Forward Voltage**

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

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

**Threshold Voltage**

**Single Pulse Power**


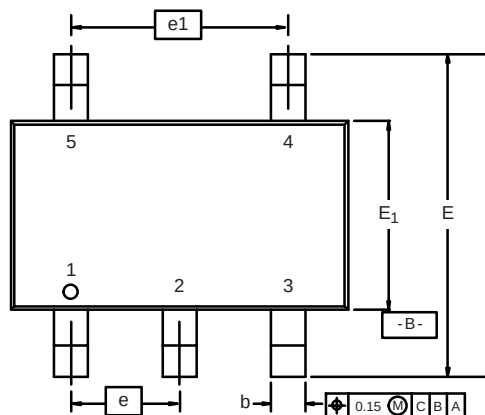
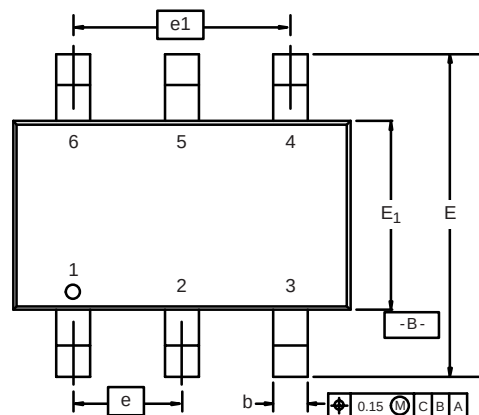
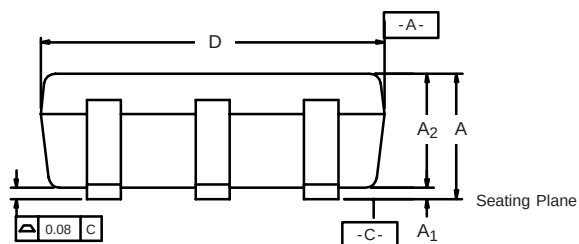
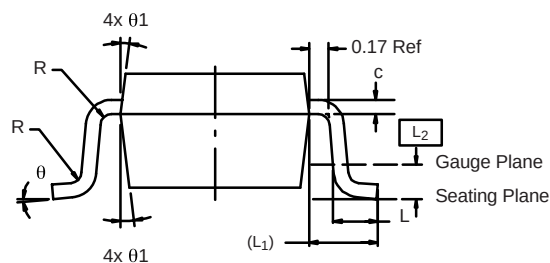
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified  
**Safe Operating Area, Junction-to-Case**



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

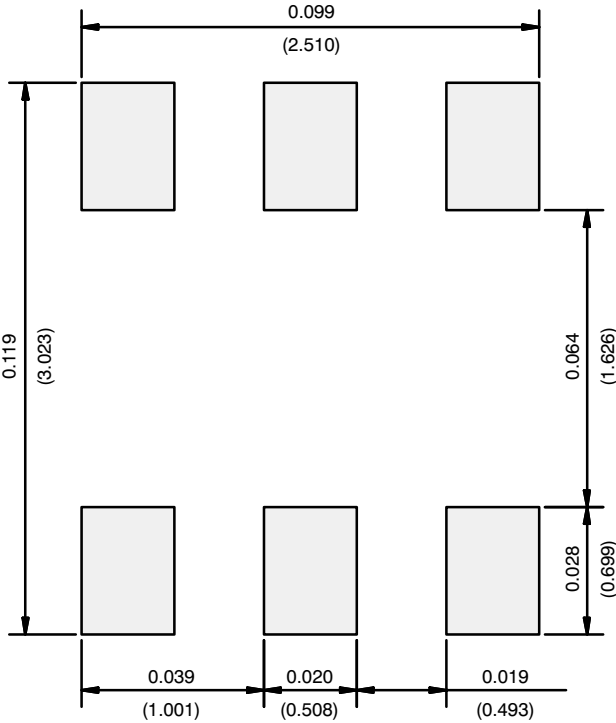
**TSOP: 5/6-LEAD**

JEDEC Part Number: MO-193C

**5-LEAD TSOP****6-LEAD TSOP**

|                                | MILLIMETERS |      |      | INCHES     |       |       |
|--------------------------------|-------------|------|------|------------|-------|-------|
| Dim                            | Min         | Nom  | Max  | Min        | Nom   | Max   |
| A                              | 0.91        | -    | 1.10 | 0.036      | -     | 0.043 |
| A <sub>1</sub>                 | 0.01        | -    | 0.10 | 0.0004     | -     | 0.004 |
| A <sub>2</sub>                 | 0.90        | -    | 1.00 | 0.035      | 0.038 | 0.039 |
| b                              | 0.30        | 0.32 | 0.45 | 0.012      | 0.013 | 0.018 |
| c                              | 0.10        | 0.15 | 0.20 | 0.004      | 0.006 | 0.008 |
| D                              | 2.95        | 3.05 | 3.10 | 0.116      | 0.120 | 0.122 |
| E                              | 2.70        | 2.85 | 2.98 | 0.106      | 0.112 | 0.117 |
| E <sub>1</sub>                 | 1.55        | 1.65 | 1.70 | 0.061      | 0.065 | 0.067 |
| e                              | 0.95 BSC    |      |      | 0.0374 BSC |       |       |
| e <sub>1</sub>                 | 1.80        | 1.90 | 2.00 | 0.071      | 0.075 | 0.079 |
| L                              | 0.32        | -    | 0.50 | 0.012      | -     | 0.020 |
| L <sub>1</sub>                 | 0.60 Ref    |      |      | 0.024 Ref  |       |       |
| L <sub>2</sub>                 | 0.25 BSC    |      |      | 0.010 BSC  |       |       |
| R                              | 0.10        | -    | -    | 0.004      | -     | -     |
| θ                              | 0°          | 4°   | 8°   | 0°         | 4°    | 8°    |
| θ <sub>1</sub>                 | 7° Nom      |      |      | 7° Nom     |       |       |
| ECN: C-06593-Rev. I, 18-Dec-06 |             |      |      |            |       |       |
| DWG: 5540                      |             |      |      |            |       |       |

RECOMMENDED MINIMUM PADS FOR TSOP-6



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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