

## P-Channel 40 V (D-S) MOSFET

| PRODUCT SUMMARY     |                                     |                    |                       |
|---------------------|-------------------------------------|--------------------|-----------------------|
| V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω) Max.        | I <sub>D</sub> (A) | Q <sub>g</sub> (Typ.) |
| - 40                | 0.0176 at V <sub>GS</sub> = - 10 V  | - 8 <sup>d</sup>   | 35.4 nC               |
|                     | 0.0208 at V <sub>GS</sub> = - 4.5 V | - 7 <sup>d</sup>   |                       |

### FEATURES

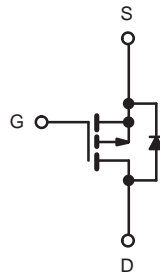
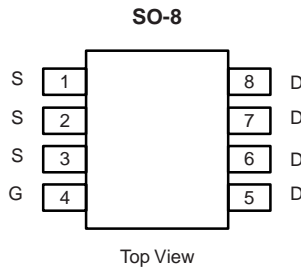
- 100% R<sub>g</sub> and UIS Tested



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Adaptor Switch
- Load Switch
- Power Management
- Mobile Computing



P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted) |                                   |                        |                       |
|---|-----------------------------------|------------------------|-----------------------|
| Parameter   | Symbol                            | Limit                  | Unit                  |
| Drain-Source Voltage  | V <sub>DS</sub>                   | - 40                   | V                     |
| Gate-Source Voltage   | V <sub>GS</sub>                   | ± 20                   |                       |
| Continuous Drain Current (T <sub>J</sub> = 150 °C)                        | I <sub>D</sub>                    | T <sub>C</sub> = 25 °C | - 8 <sup>d</sup>      |
|   |                                   | T <sub>C</sub> = 70 °C | - 7 <sup>d</sup>      |
|   |                                   | T <sub>A</sub> = 25 °C | - 7.7 <sup>a, b</sup> |
|   |                                   | T <sub>A</sub> = 70 °C | - 7.7 <sup>a, b</sup> |
| Pulsed Drain Current (t = 300 μs)   | I <sub>DM</sub>                   | - 32                   | A                     |
| Continuous Source-Drain Diode Current                                     | I <sub>S</sub>                    | T <sub>C</sub> = 25 °C |                       |
|   |                                   | T <sub>A</sub> = 25 °C | - 3 <sup>a, b</sup>   |
| Avalanche Current   | I <sub>AS</sub>                   | - 20                   | mJ                    |
| Single-Pulse Avalanche Energy   | E <sub>AS</sub>                   | 20                     |                       |
| Maximum Power Dissipation   | P <sub>D</sub>                    | T <sub>C</sub> = 25 °C | 52                    |
|   |                                   | T <sub>C</sub> = 70 °C | 33                    |
|   |                                   | T <sub>A</sub> = 25 °C | 3.7 <sup>a, b</sup>   |
|   |                                   | T <sub>A</sub> = 70 °C | 2.4 <sup>a, b</sup>   |
| Operating Junction and Storage Temperature Range                          | T <sub>J</sub> , T <sub>stg</sub> | - 55 to 150            | °C                    |
| Soldering Recommendations (Peak Temperature) <sup>e, f</sup>              |                                   | 260                    |                       |

| THERMAL RESISTANCE RATINGS                  |              |                   |         |         |      |
|---|--------------|-------------------|---------|---------|------|
| Parameter                                   |              | Symbol            | Typical | Maximum | Unit |
| Maximum Junction-to-Ambient <sup>a, c</sup> | t ≤ 10 s     | R <sub>thJA</sub> | 26      | 33      | °C/W |
| Maximum Junction-to-Case                    | Steady State | R <sub>thJC</sub> | 1.9     | 2.4     |      |

Notes:

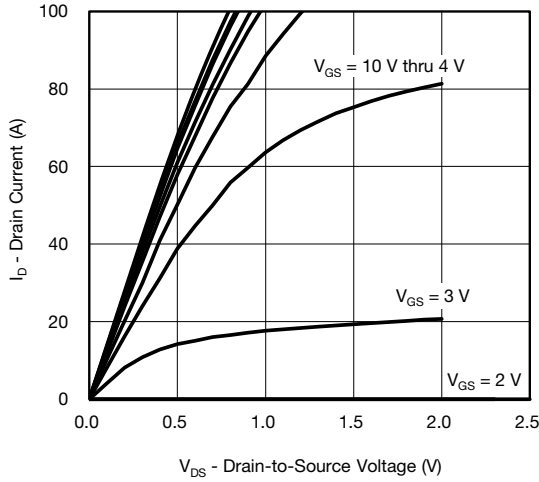
- a. Surface mounted on 1" x 1" FR4 board.
- b. t = 10 s.
- c. Maximum under steady state conditions is 81 °C/W.
- d. Package limited.

| <b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |                         |  |      |        |           |                      |
|--|-------------------------|--|------|--------|-----------|----------------------|
| Parameter  | Symbol                  | Test Conditions  | Min. | Typ.   | Max.      | Unit                 |
| <b>Static</b>  |                         |  |      |        |           |                      |
| Drain-Source Breakdown Voltage   | $V_{DS}$                | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$   | -40  |        |           | V                    |
| $V_{DS}$ Temperature Coefficient   | $\Delta V_{DS}/T_J$     | $I_D = -250\text{ }\mu\text{A}$  |      | -23    |           | mV/ $^\circ\text{C}$ |
| $V_{GS(th)}$ Temperature Coefficient   | $\Delta V_{GS(th)}/T_J$ |  | 4.6  |        |           |                      |
| Gate-Source Threshold Voltage  | $V_{GS(th)}$            | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$   | -1   |        | -2.5      | V                    |
| Gate-Source Leakage  | $I_{GSS}$               | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$  |      |        | $\pm 100$ | nA                   |
| Zero Gate Voltage Drain Current  | $I_{DSS}$               | $V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$   |      |        | -1        | $\mu\text{A}$        |
|  |                         | $V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$   |      |        | -5        |                      |
| On-State Drain Current <sup>a</sup>  | $I_{D(on)}$             | $V_{DS} \geq -10\text{ V}, V_{GS} = -10\text{ V}$  | -30  |        |           | A                    |
| Drain-Source On-State Resistance <sup>a</sup>                                      | $R_{DS(on)}$            | $V_{GS} = -10\text{ V}, I_D = -15\text{ A}$  |      | 0.0176 |           | $\Omega$             |
|  |                         | $V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$   |      | 0.0208 |           |                      |
| Forward Transconductance <sup>a</sup>  | $g_{fs}$                | $V_{DS} = -10\text{ V}, I_D = -15\text{ A}$  |      | 50     |           | S                    |
| <b>Dynamic<sup>b</sup></b>   |                         |  |      |        |           |                      |
| Input Capacitance  | $C_{iss}$               | $V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$   |      | 3280   |           | $\mu\text{F}$        |
| Output Capacitance   | $C_{oss}$               |  | 427  |        |           |                      |
| Reverse Transfer Capacitance   | $C_{rss}$               |  | 382  |        |           |                      |
| Total Gate Charge  | $Q_g$                   | $V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -10\text{ A}$   |      | 73     | 110       | nC                   |
|  |                         |  |      | 35.4   | 53        |                      |
| Gate-Source Charge   | $Q_{gs}$                | $V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$  |      | 10.6   |           |                      |
| Gate-Drain Charge  | $Q_{gd}$                |  |      | 11.6   |           |                      |
| Gate Resistance  | $R_g$                   | $f = 1\text{ MHz}$   | 0.4  | 1.6    | 3.2       | $\Omega$             |
| Turn-On Delay Time   | $t_{d(on)}$             | $V_{DD} = -15\text{ V}, R_L = 1.5\text{ }\Omega$<br>$I_D \cong -10\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$  |      | 11     | 22        | ns                   |
| Rise Time  | $t_r$                   |  |      | 11     | 22        |                      |
| Turn-Off Delay Time  | $t_{d(off)}$            |  |      | 45     | 90        |                      |
| Fall Time  | $t_f$                   |  |      | 8      | 16        |                      |
| Turn-On Delay Time   | $t_{d(on)}$             | $V_{DD} = -15\text{ V}, R_L = 1.5\text{ }\Omega$<br>$I_D \cong -10\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$ |      | 55     | 100       |                      |
| Rise Time  | $t_r$                   |  |      | 82     | 150       |                      |
| Turn-Off Delay Time  | $t_{d(off)}$            |  |      | 40     | 80        |                      |
| Fall Time  | $t_f$                   |  |      | 13     | 26        |                      |
| <b>Drain-Source Body Diode Characteristics</b>                                     |                         |  |      |        |           |                      |
| Continuous Source-Drain Diode Current  | $I_S$                   | $T_C = 25\text{ }^\circ\text{C}$   |      |        | -18       | A                    |
| Pulse Diode Forward Current  | $I_{SM}$                |  |      |        | -70       |                      |
| Body Diode Voltage   | $V_{SD}$                | $I_S = -3\text{ A}, V_{GS} = 0\text{ V}$   |      | -0.74  | -1.2      | V                    |
| Body Diode Reverse Recovery Time   | $t_{rr}$                | $I_F = -10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$                                       |      | 18     | 36        | ns                   |
| Body Diode Reverse Recovery Charge   | $Q_{rr}$                |  |      | 8      | 16        | nC                   |
| Reverse Recovery Fall Time   | $t_a$                   |  |      | 7      |           | ns                   |
| Reverse Recovery Rise Time   | $t_b$                   |  |      | 11     |           |                      |

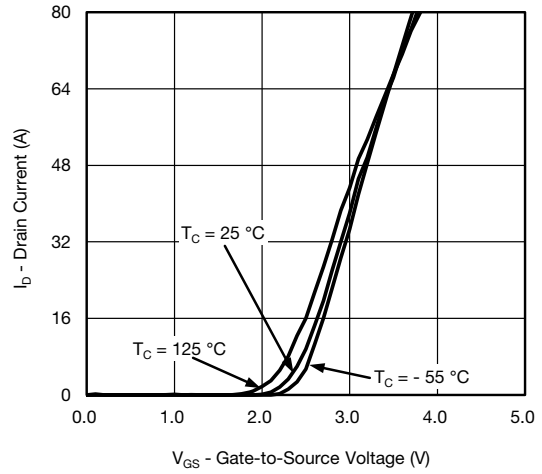
Notes:

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

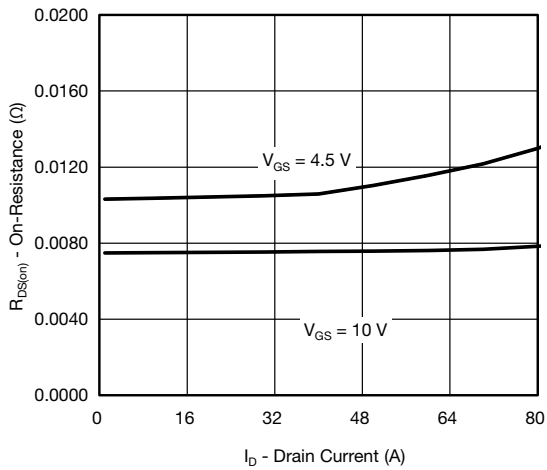
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



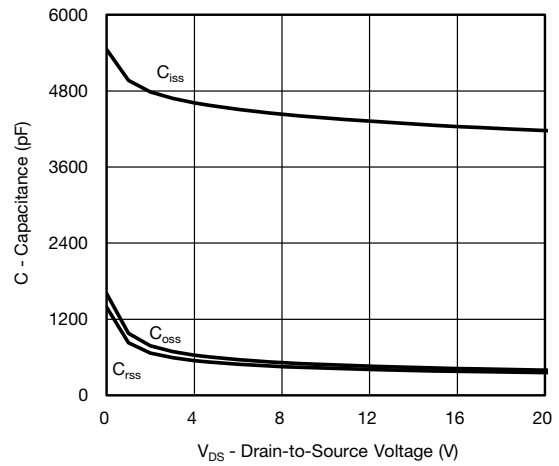
**Output Characteristics**



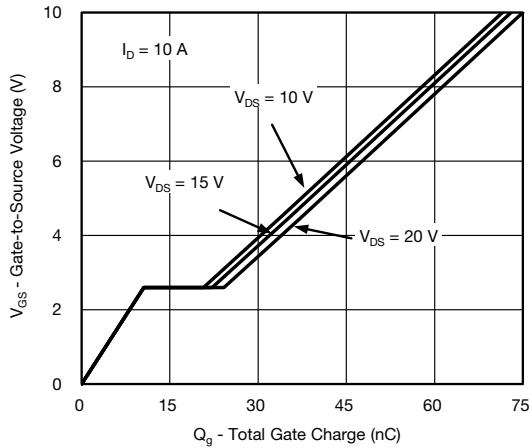
**Transfer Characteristics**



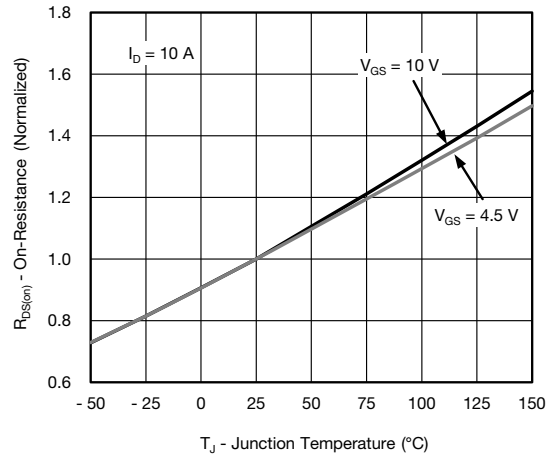
**On-Resistance vs. Drain Current**



**Capacitance**

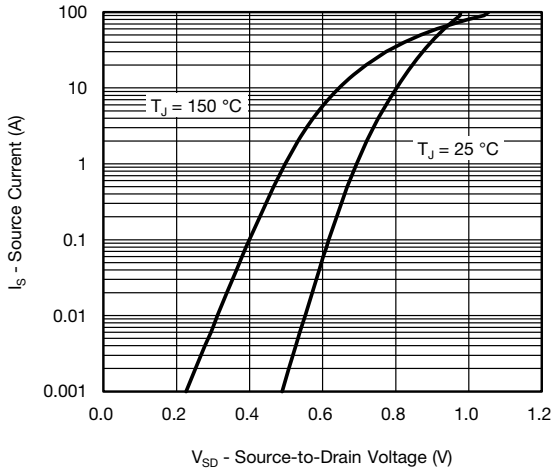


**Gate Charge**

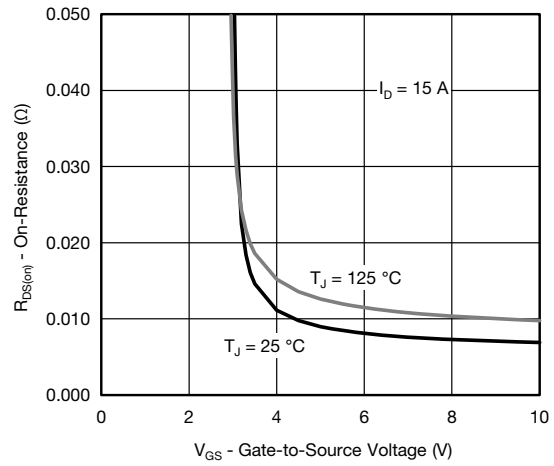


**On-Resistance vs. Junction Temperature**

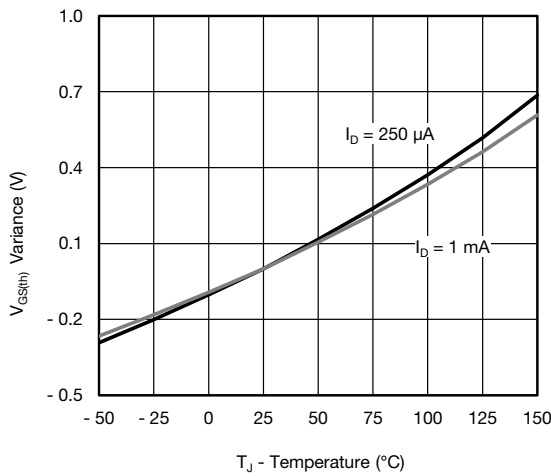
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



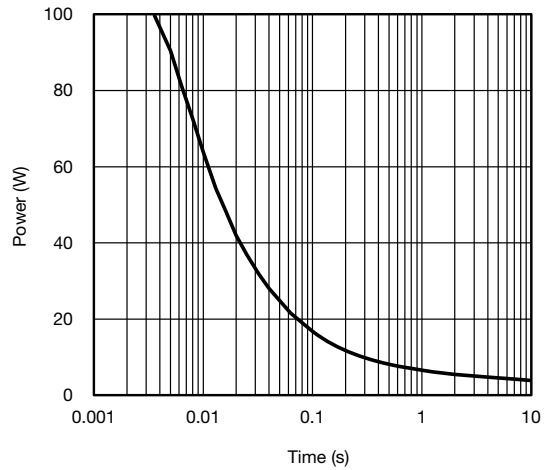
**Source-Drain Diode Forward Voltage**



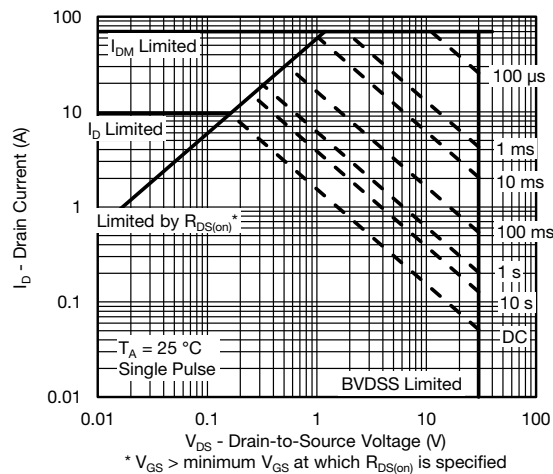
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**

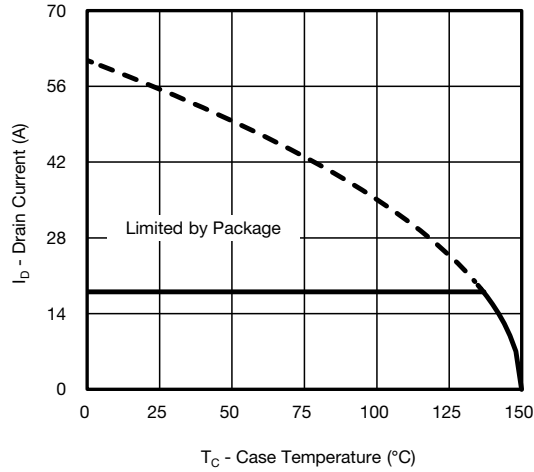


**Single Pulse Power, Junction-to-Ambient**

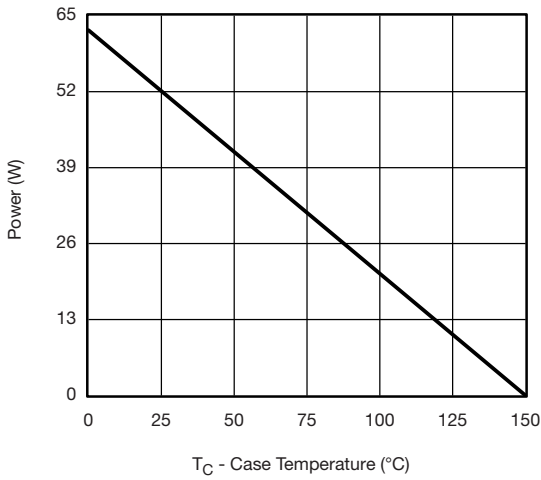


**Safe Operating Area**

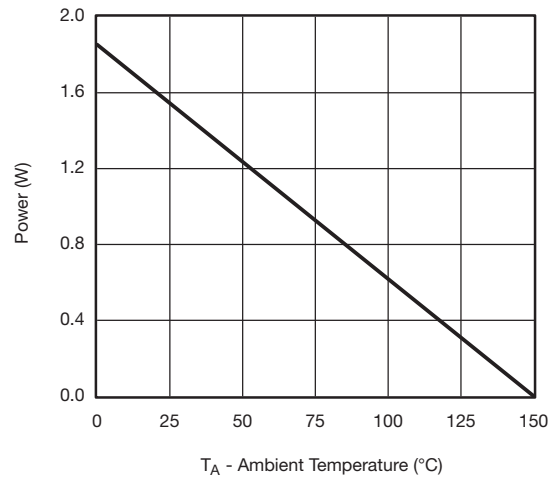
**MOSFET TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Current Derating\***



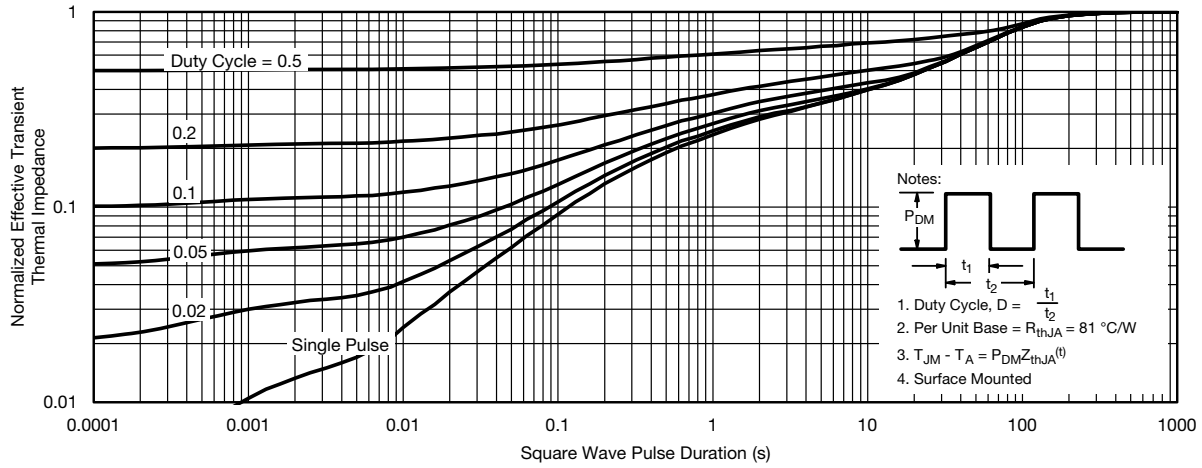
**Power, Junction-to-Case**



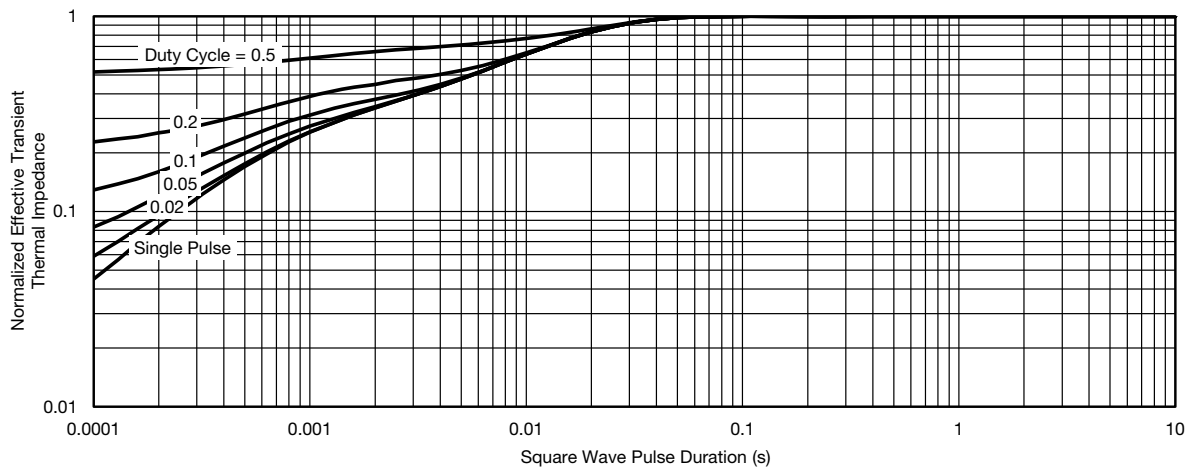
**Power, Junction-to-Ambient**

\* The power dissipation  $P_D$  is based on  $T_{J(max.)} = 150$  °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)



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



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

**SOIC (NARROW): 8-LEAD**

JEDEC Part Number: MS-012



| DIM                            | MILLIMETERS |      | INCHES    |       |
|--------------------------------|-------------|------|-----------|-------|
|                                | Min         | Max  | Min       | Max   |
| A                              | 1.35        | 1.75 | 0.053     | 0.069 |
| A <sub>1</sub>                 | 0.10        | 0.20 | 0.004     | 0.008 |
| B                              | 0.35        | 0.51 | 0.014     | 0.020 |
| C                              | 0.19        | 0.25 | 0.0075    | 0.010 |
| D                              | 4.80        | 5.00 | 0.189     | 0.196 |
| E                              | 3.80        | 4.00 | 0.150     | 0.157 |
| e                              | 1.27 BSC    |      | 0.050 BSC |       |
| H                              | 5.80        | 6.20 | 0.228     | 0.244 |
| h                              | 0.25        | 0.50 | 0.010     | 0.020 |
| L                              | 0.50        | 0.93 | 0.020     | 0.037 |
| q                              | 0°          | 8°   | 0°        | 8°    |
| S                              | 0.44        | 0.64 | 0.018     | 0.026 |
| ECN: C-06527-Rev. I, 11-Sep-06 |             |      |           |       |
| DWG: 5498                      |             |      |           |       |

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads  
Dimensions in Inches/(mm)



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