

## FDS3890-NL-VB Datasheet

### N-Channel 80 V (D-S) MOSFET

| PRODUCT SUMMARY |                           |                        |              |
|-----------------|---------------------------|------------------------|--------------|
| $V_{DS}$ (V)    | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>a</sup> | $Q_g$ (Typ.) |
| 80              | 0.062 at $V_{GS} = 10$ V  | 3.5                    | 7.3 nC       |

#### FEATURES

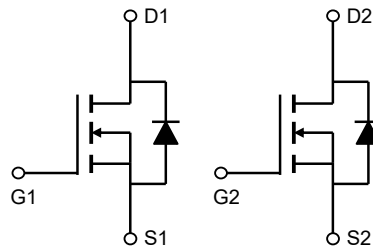
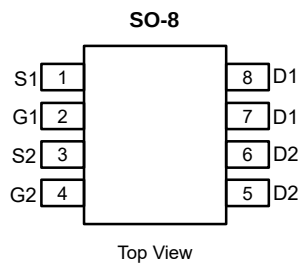
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



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

#### APPLICATIONS

- DC/DC Conversion
- Notebook System Power



#### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

| Parameter                                                 | Symbol         | Maximum    | Units            |
|-----------------------------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                                      | $V_{DS}$       | 80         | V                |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 30$   | V                |
| Continuous Drain Current                                  | $I_D$          | 3.5        | A                |
| $T_A=25^\circ\text{C}$                                    |                |            |                  |
| Current                                                   | $I_D$          | 2.9        | A                |
| $T_A=70^\circ\text{C}$                                    |                |            |                  |
| Pulsed Drain Current <sup>c</sup>                         | $I_{DM}$       | 18         | A                |
| Avalanche Current <sup>c</sup>                            | $I_{AR}$       | 16         | A                |
| Repetitive avalanche energy $L=0.1\text{mH}$ <sup>c</sup> | $E_{AR}$       | 12.8       | mJ               |
| Power Dissipation <sup>b</sup>                            | $P_D$          | 2          | W                |
| $T_A=25^\circ\text{C}$                                    |                |            |                  |
| $T_A=70^\circ\text{C}$                                    |                | 1.3        |                  |
| Junction and Storage Temperature Range                    | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |

#### Thermal Characteristics

| Parameter                                  | Symbol          | Typ | Max  | Units              |
|--------------------------------------------|-----------------|-----|------|--------------------|
| Maximum Junction-to-Ambient <sup>A</sup>   | $R_{\theta JA}$ | 48  | 62.5 | $^\circ\text{C/W}$ |
| $t \leq 10\text{s}$                        |                 |     |      |                    |
| Maximum Junction-to-Ambient <sup>A,D</sup> | $R_{\theta JA}$ | 74  | 90   | $^\circ\text{C/W}$ |
| Steady-State                               |                 |     |      |                    |
| Maximum Junction-to-Lead                   | $R_{\theta JL}$ | 32  | 40   | $^\circ\text{C/W}$ |
| Steady-State                               |                 |     |      |                    |

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

| Symbol                      | Parameter                              | Conditions                                                                       | Min | Typ         | Max    | Units         |
|-----------------------------|----------------------------------------|----------------------------------------------------------------------------------|-----|-------------|--------|---------------|
| <b>STATIC PARAMETERS</b>    |                                        |                                                                                  |     |             |        |               |
| $BV_{DSS}$                  | Drain-Source Breakdown Voltage         | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$                                        | 80  |             |        | V             |
| $I_{DSS}$                   | Zero Gate Voltage Drain Current        | $V_{DS}=80\text{V}$ , $V_{GS}=0\text{V}$<br>$T_J=55^\circ\text{C}$               |     |             | 1<br>5 | $\mu\text{A}$ |
| $I_{GSS}$                   | Gate-Body leakage current              | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 30\text{V}$                                     |     |             | 100    | nA            |
| $V_{GS(th)}$                | Gate Threshold Voltage                 | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$                                           | 3.5 | 4.2         | 5      | V             |
| $I_{D(ON)}$                 | On state drain current                 | $V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$                                         | 18  |             |        | A             |
| $R_{DS(ON)}$                | Static Drain-Source On-Resistance      | $V_{GS}=10\text{V}$ , $I_D=3.5\text{A}$<br>$T_J=125^\circ\text{C}$               |     | 62<br>113.0 |        | m $\Omega$    |
| $g_{FS}$                    | Forward Transconductance               | $V_{DS}=5\text{V}$ , $I_D=3.5\text{A}$                                           |     | 15          |        | S             |
| $V_{SD}$                    | Diode Forward Voltage                  | $I_S=1\text{A}$ , $V_{GS}=0\text{V}$                                             |     | 0.77        | 1      | V             |
| $I_S$                       | Maximum Body-Diode Continuous Current  |                                                                                  |     |             | 2.5    | A             |
| $I_{SM}$                    | Pulsed Body-diode Current <sup>C</sup> |                                                                                  |     |             | 18     | A             |
| <b>DYNAMIC PARAMETERS</b>   |                                        |                                                                                  |     |             |        |               |
| $C_{iss}$                   | Input Capacitance                      | $V_{GS}=0\text{V}$ , $V_{DS}=40\text{V}$ , $f=1\text{MHz}$                       | 510 | 640         | 770    | pF            |
| $C_{oss}$                   | Output Capacitance                     |                                                                                  | 28  | 40          | 52     | pF            |
| $C_{rss}$                   | Reverse Transfer Capacitance           |                                                                                  | 12  | 20          | 30     | pF            |
| $R_g$                       | Gate resistance                        | $V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$                        | 0.9 | 1.8         | 2.7    | $\Omega$      |
| <b>SWITCHING PARAMETERS</b> |                                        |                                                                                  |     |             |        |               |
| $Q_{g(10V)}$                | Total Gate Charge                      | $V_{GS}=10\text{V}$ , $V_{DS}=40\text{V}$ , $I_D=3.5\text{A}$                    | 8   | 11          | 13     | nC            |
| $Q_{g(4.5V)}$               | Total Gate Charge                      |                                                                                  | 4   | 5.5         | 7      |               |
| $Q_{gs}$                    | Gate Source Charge                     |                                                                                  | 4   | 5           | 6      | nC            |
| $Q_{gd}$                    | Gate Drain Charge                      |                                                                                  | 0.7 | 1.2         | 1.7    | nC            |
| $t_{D(on)}$                 | Turn-On DelayTime                      | $V_{GS}=10\text{V}$ , $V_{DS}=40\text{V}$ , $R_L=8\Omega$ ,<br>$R_{GEN}=3\Omega$ |     | 7.2         |        | ns            |
| $t_r$                       | Turn-On Rise Time                      |                                                                                  |     | 2.2         |        | ns            |
| $t_{D(off)}$                | Turn-Off DelayTime                     |                                                                                  |     | 17          |        | ns            |
| $t_f$                       | Turn-Off Fall Time                     |                                                                                  |     | 2           |        | ns            |
| $t_{rr}$                    | Body Diode Reverse Recovery Time       | $I_F=3.5\text{A}$ , $dI/dt=300\text{A}/\mu\text{s}$                              | 14  | 20          | 26     | ns            |
| $Q_{rr}$                    | Body Diode Reverse Recovery Charge     | $I_F=3.5\text{A}$ , $dI/dt=300\text{A}/\mu\text{s}$                              | 35  | 50          | 65     | nC            |

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design.

B. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^\circ\text{C}$ , using  $\leq 10\text{s}$  junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

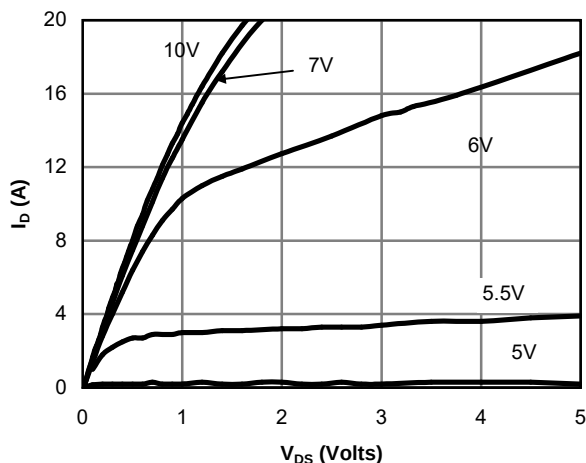


Fig 1: On-Region Characteristics (Note E)

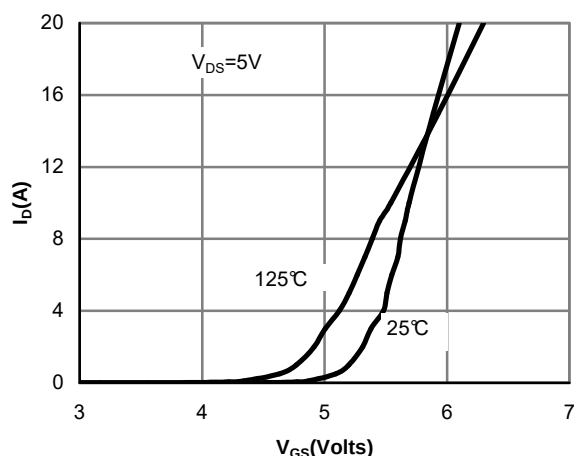


Figure 2: Transfer Characteristics (Note E)

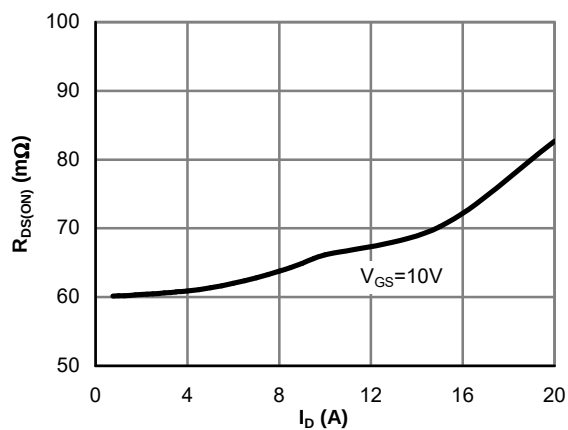


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

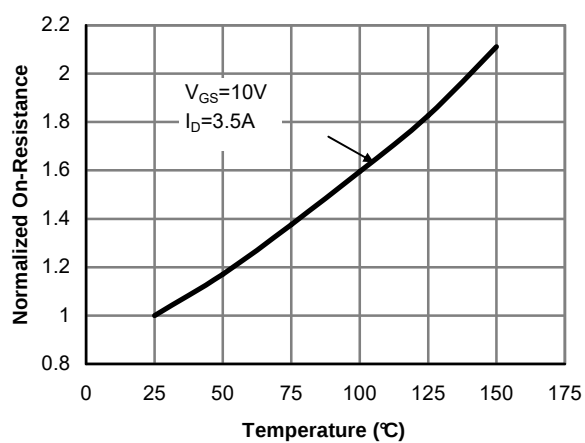


Figure 4: On-Resistance vs. Junction Temperature (Note E)

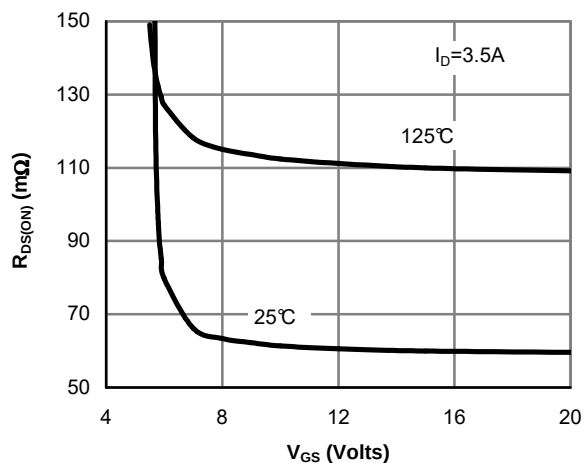


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

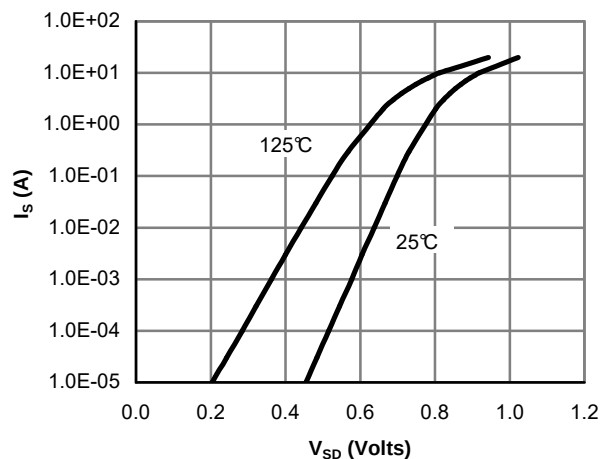
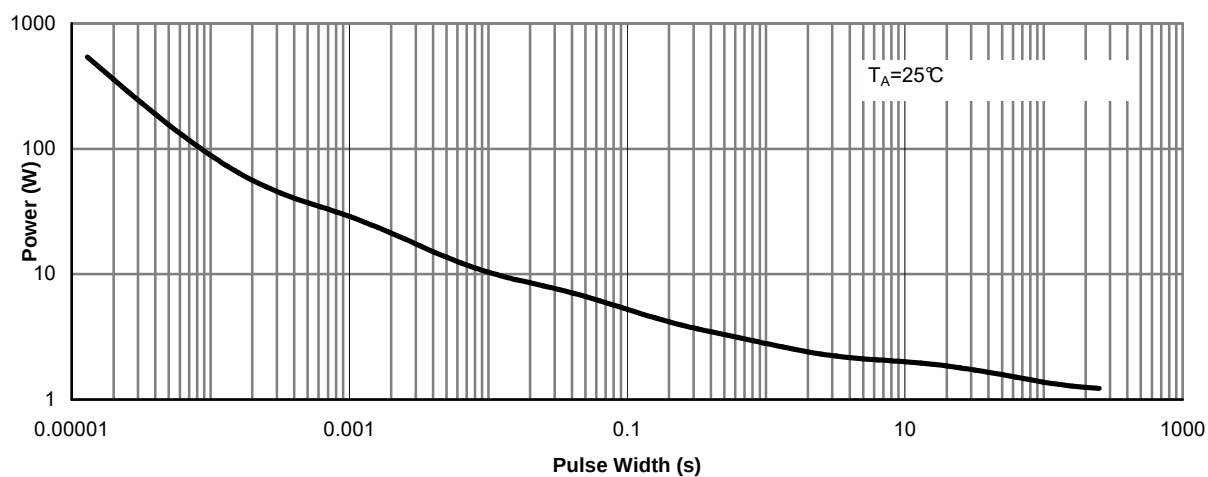
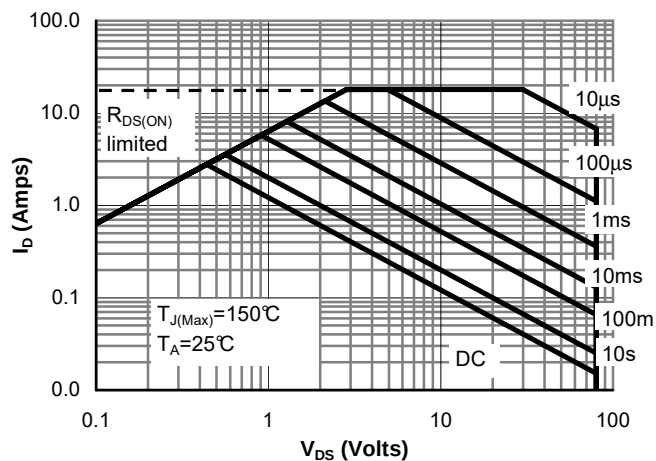
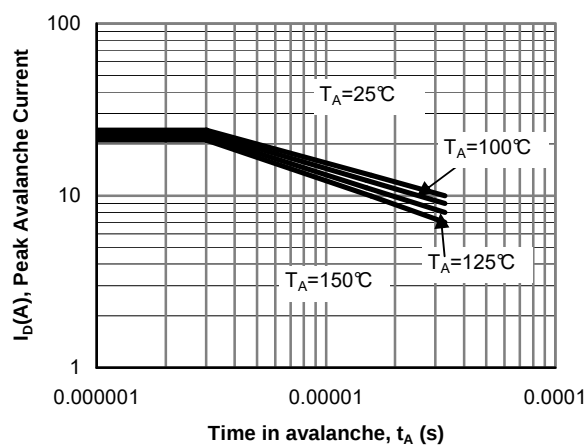
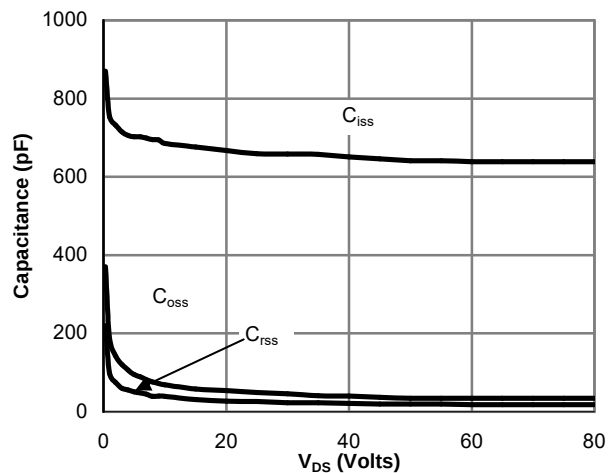
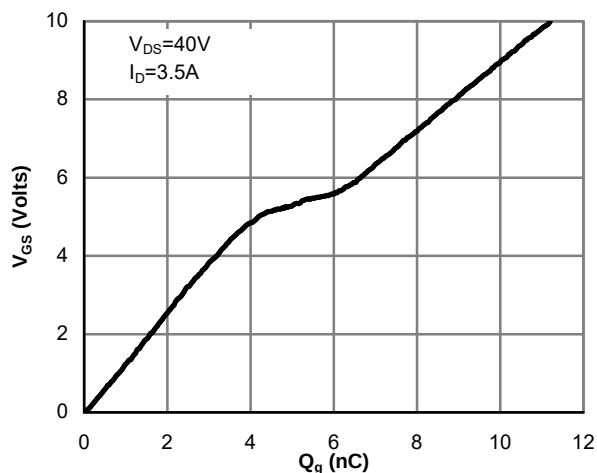


Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

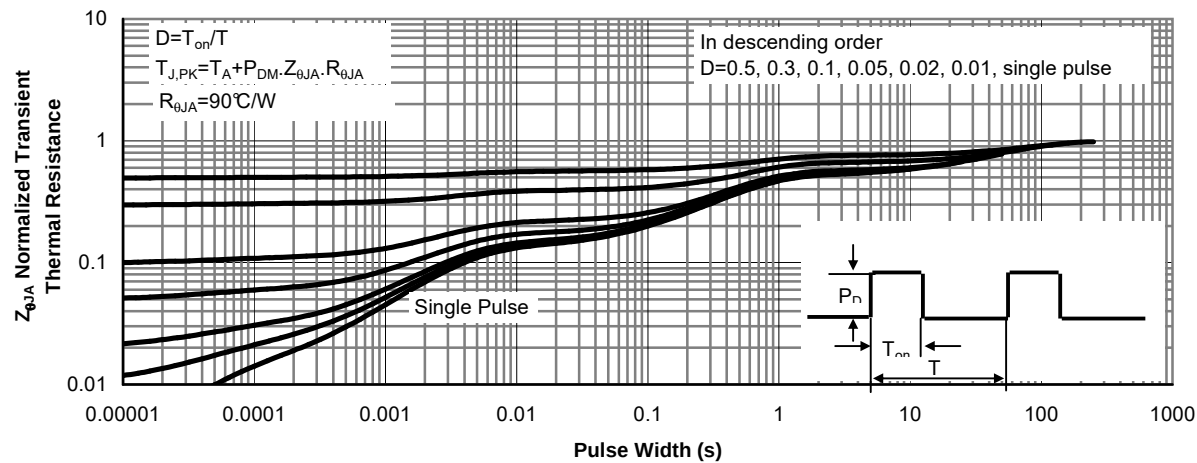
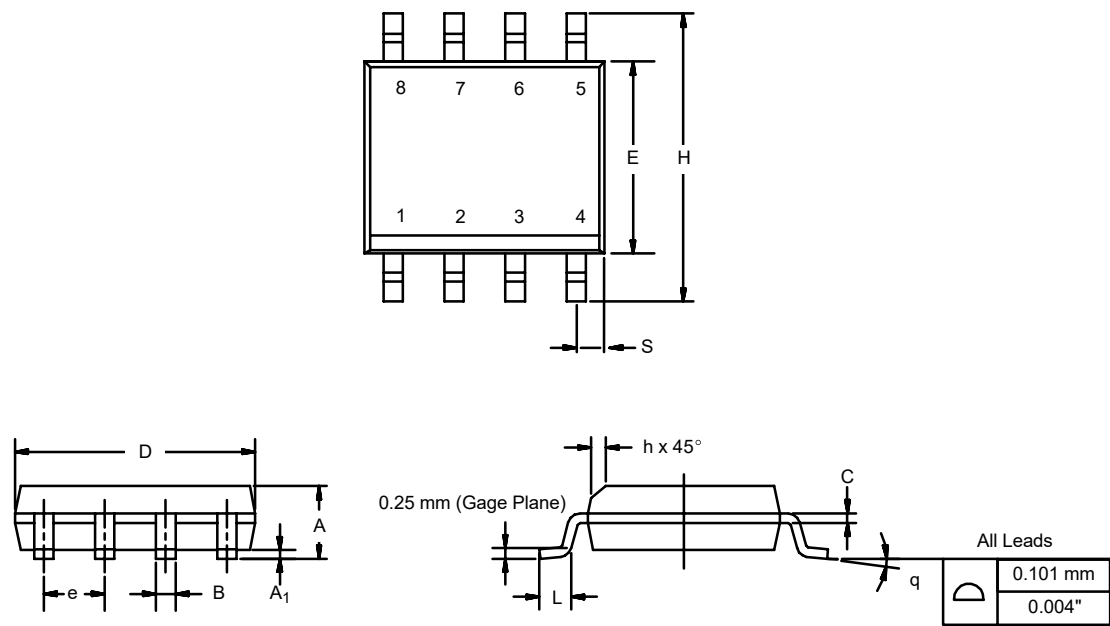


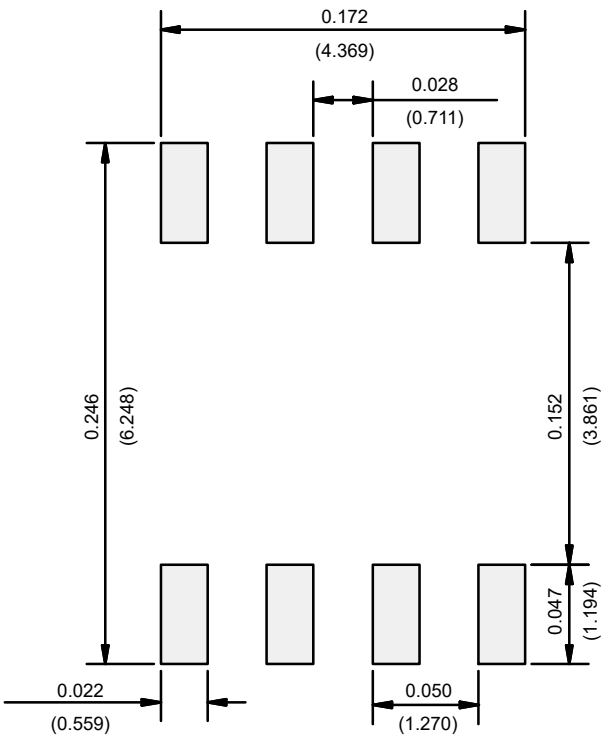
Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

**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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APPLICATION NOTE

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