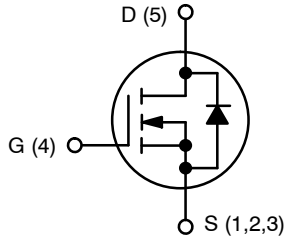
# MOSFET - Power, Single N-Channel, STD Gate, SO8FL

## 80 V, 2.6 mΩ, 154 A

## NTMFS3D0N08X

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 80 V | 2.6 mΩ @ 10 V | 154 A |




**N−CHANNEL MOSFET**

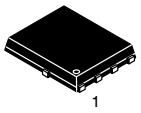
### Features

- Low $Q_{RR}$, Soft Recovery Body Diode
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low $Q_G$ and Capacitance to Minimize Driver Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

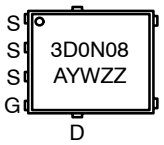
### Typical Applications

- Synchronous Rectification (SR) in DC−DC and AC−DC
- Primary Switch in Isolated DC−DC Converter
- Motor Drives

### MARKING DIAGRAM




**DFN5 (SO−8FL)**
**CASE 488AA**




3D0N08 = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceabililty

### MAXIMUM RATINGS ($T_J$ = 25°C unless otherwise stated)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain−to−Source Voltage | | $V_{DSS}$ | 80 | V |
| Gate−to−Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current (Note 1) | $T_C$ = 25°C | $I_D$ | 154 | A |
| | $T_C$ = 100°C | | 109 | |
| Power Dissipation (Note 1) | $T_C$ = 25°C | $P_D$ | 133 | W |
| Pulsed Drain Current | $T_C$ = 25°C, $t_p$ = 100 μs | $I_{DM}$ | 634 | A |
| Pulsed Source Current (Body Diode) | | $I_{SM}$ | 634 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | −55 to +175 | °C |
| Source Current (Body Diode) | | $I_S$ | 201 | A |
| Single Pulse Avalanche Energy ($I_{PK}$ = 53 A) (Note 3) | | $E_{AS}$ | 140 | mJ |
| Lead Temperature for Soldering Purposes (1/8″ from case for 10 s) | | $T_L$ | 260 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Actual continuous current will be limited by thermal & electromechanical application board design.
3. $E_{AS}$ of 140 mJ is based on started $T_J$ = 25°C, $I_{AS}$ = 53 A, $V_{DD}$ = 64 V, $V_{GS}$ = 10 V, 100% avalanche tested

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| NTMFS3D0N08XT1G | DFN5 (Pb−Free) | 1500 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

## THERMAL CHARACTERISTICS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Case | $R_{\theta JC}$ | 1.12 | °C/W |
| Thermal Resistance, Junction−to−Ambient | $R_{\theta JA}$ | 39 | |

4. Surface−mounted on FR4 board using 1 $in^2$ pad, 1 oz. Cu.
5. $R_{\theta JA}$ is determined by the user's board design.

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain−to−Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 1 mA | 80 | | | V |
| Drain−to−Source Breakdown Voltage Temperature Coefficient | $\Delta V_{(BR)DSS}/\Delta T_J$ | $I_D$ = 1 mA. Referenced to 25°C | | 31.6 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 80 V, $T_J$ = 25°C | | | 1 | μA |
| | | $V_{DS}$ = 80 V, $T_J$ = 125°C | | | 250 | |
| Gate−to−Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 20 V, $V_{DS}$ = 0 V | | | 100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Drain−to−Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 37 A | | 2.2 | 2.6 | mΩ |
| | | $V_{GS}$ = 6 V, $I_D$ = 18 A | | 3.3 | 5.2 | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 184 μA | 2.4 | | 3.6 | V |
| Gate Threshold Voltage Temperature Coefficient | $\Delta V_{GS(TH)}/\Delta T_J$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 184 μA | | −7.5 | | mV/°C |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 5 V, $I_D$ = 37 A | | 115 | | S |
| **CHARGES, CAPACITANCES & GATE RESISTANCE** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 40 V, f = 1 MHz | | 3200 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 930 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 14 | | |
| Output Charge | $Q_{OSS}$ | | | 66 | | nC |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 6 V, $V_{DD}$ = 40 V, $I_D$ = 37 A | | 28 | | |
| | | $V_{GS}$ = 10 V, $V_{DD}$ = 40 V, $I_D$ = 37 A | | 45 | | |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 10 | | |
| Gate−to−Source Charge | $Q_{GS}$ | | | 15 | | |
| Gate−to−Drain Charge | $Q_{GD}$ | | | 7 | | |
| Gate Plateau Voltage | $V_{GP}$ | | | 4.7 | | V |
| Gate Resistance | $R_G$ | f = 1 MHz | | 0.8 | | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn−On Delay Time | $t_{d(ON)}$ | Resistive Load, $V_{GS}$ = 0/10 V, $V_{DD}$ = 40 V, $I_D$ = 37 A, $R_G$ = 2.5 Ω | | 24 | | ns |
| Rise Time | $t_r$ | | | 8 | | |
| Turn−Off Delay Time | $t_{d(OFF)}$ | | | 35 | | |
| Fall Time | $t_f$ | | | 6 | | |
| **SOURCE−TO−DRAIN DIODE CHARACTERISTICS** | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 37 A, $T_J$ = 25°C | | 0.82 | 1.2 | V |
| | | $V_{GS}$ = 0 V, $I_S$ = 37 A, $T_J$ = 125°C | | 0.66 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, dI/dt = 1000 A/μs, $I_S$ = 37 A, $V_{DD}$ = 40 V | | 23 | | ns |
| Charge Time | $t_a$ | | | 13 | | |
| Discharge Time | $t_b$ | | | 11 | | |
| Reverse Recovery Charge | $Q_{RR}$ | | | 163 | | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## TYPICAL CHARACTERISTICS

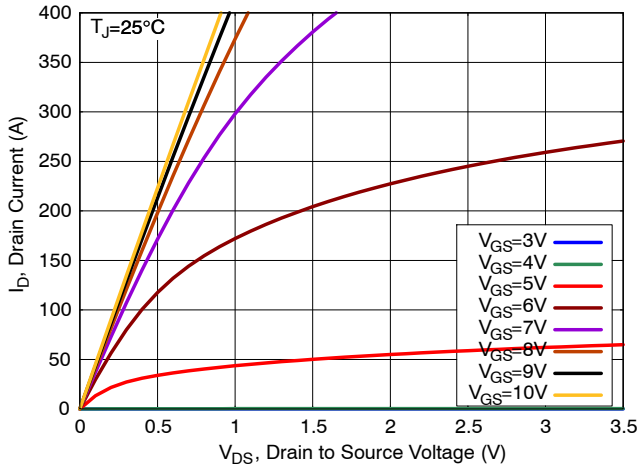



**Figure 1. On−Region Characteristics**

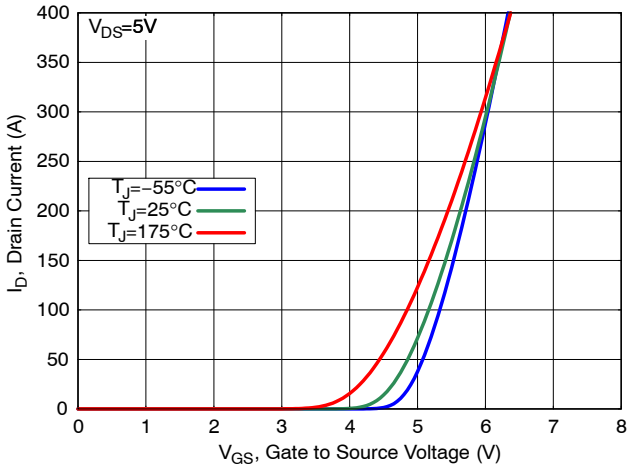



**Figure 2. Transfer Characteristics**

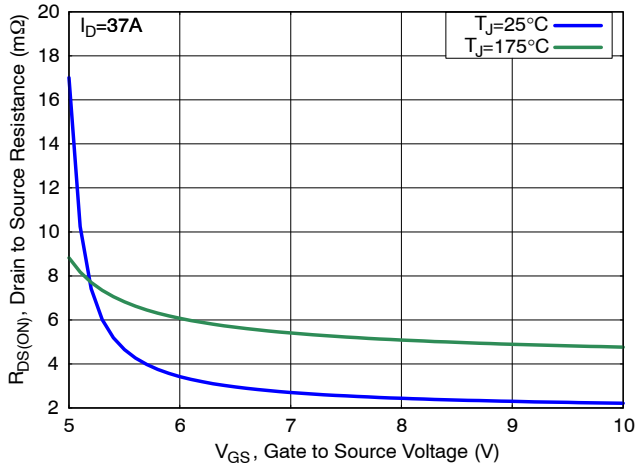



**Figure 3. On−Resistance vs. Gate Voltage**

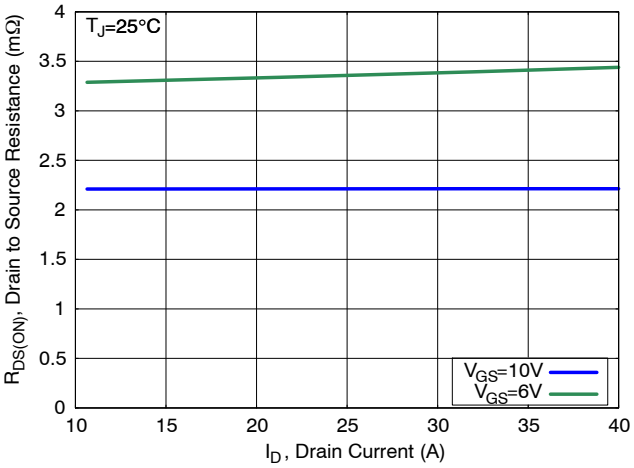



**Figure 4. On−Resistance vs. Drain Current**

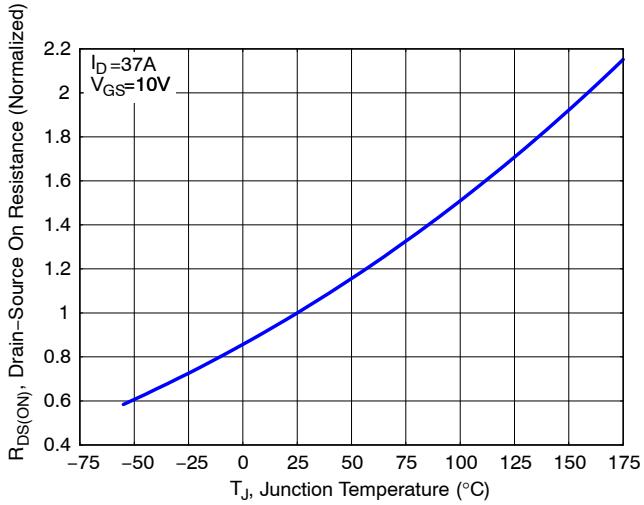



**Figure 5. Normalized ON Resistance vs. Junction Temperature**

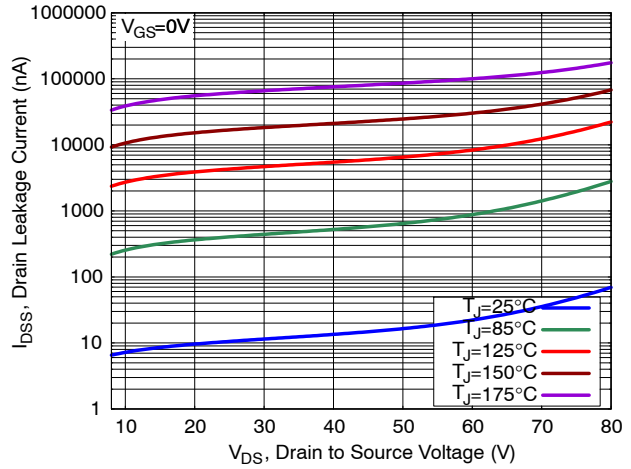



**Figure 6. Drain Leakage Current vs. Drain Voltage**

## TYPICAL CHARACTERISTICS

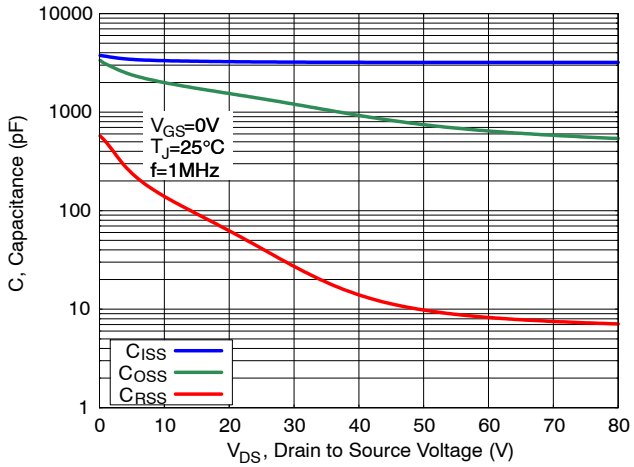



**Figure 7. Capacitance Characteristics**

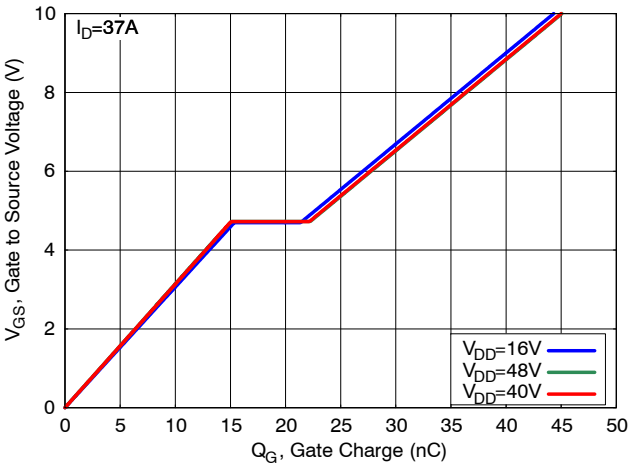



**Figure 8. Gate Charge Characteristics**

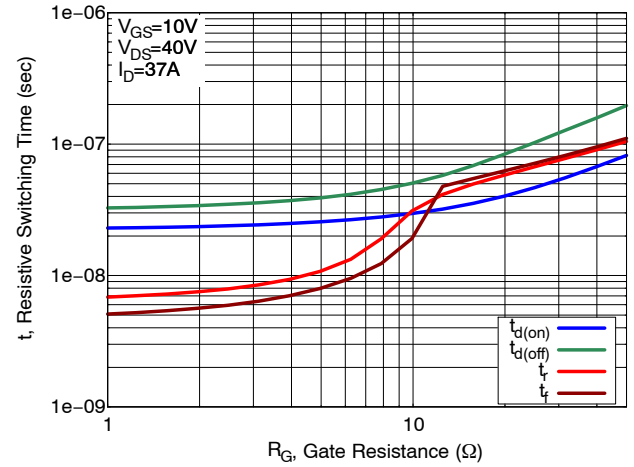



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

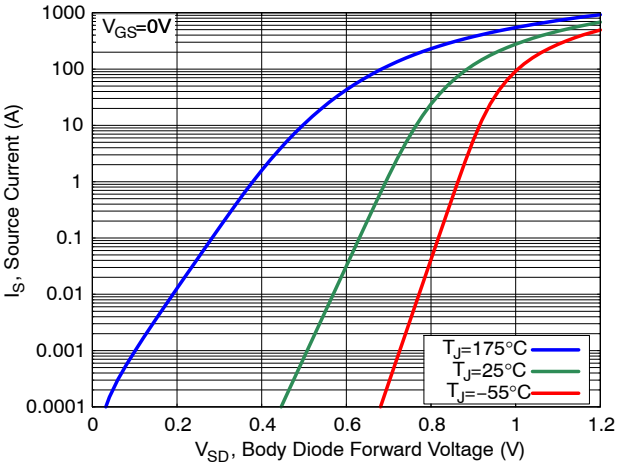



**Figure 10. Diode Forward Characteristics**

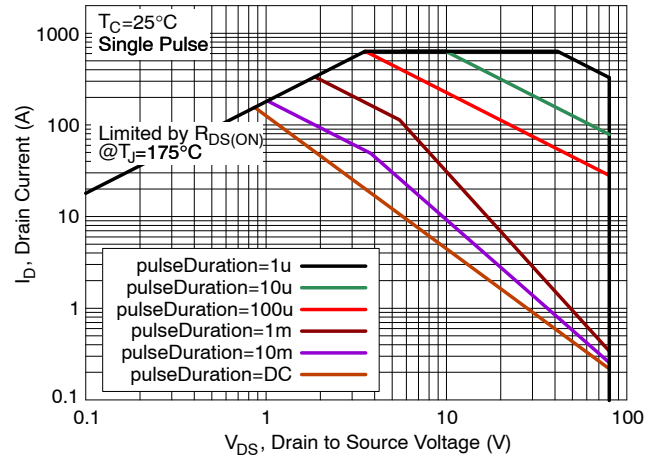



**Figure 11. Safe Operating Area (SOA)**

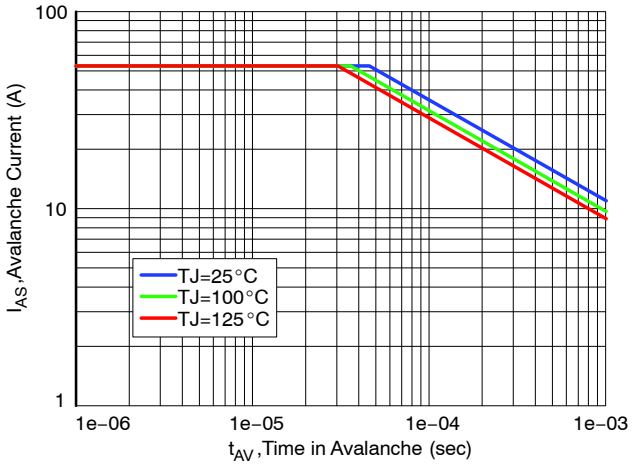



**Figure 12. Avalanche Current vs. Pulse Time (UIS)**

## TYPICAL CHARACTERISTICS

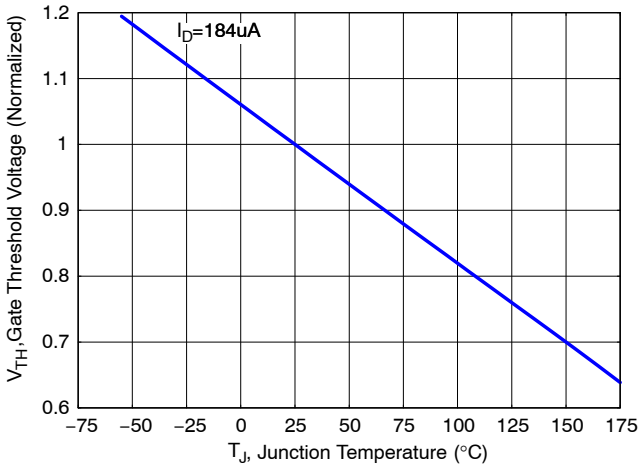



**Figure 13. Gate Threshold Voltage vs. Junction Temperature**

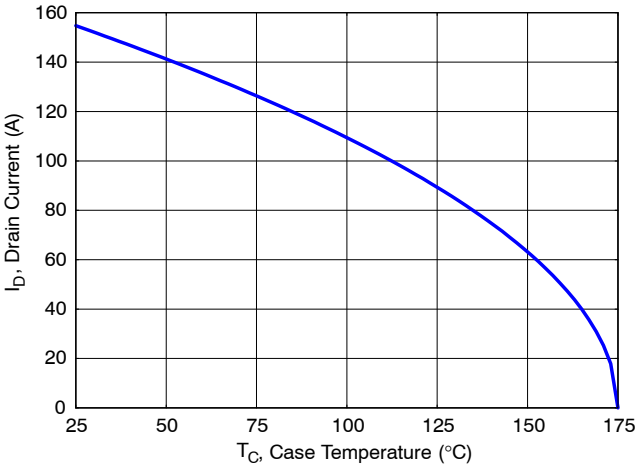



**Figure 14. Maximum Current vs. Case Temperature**

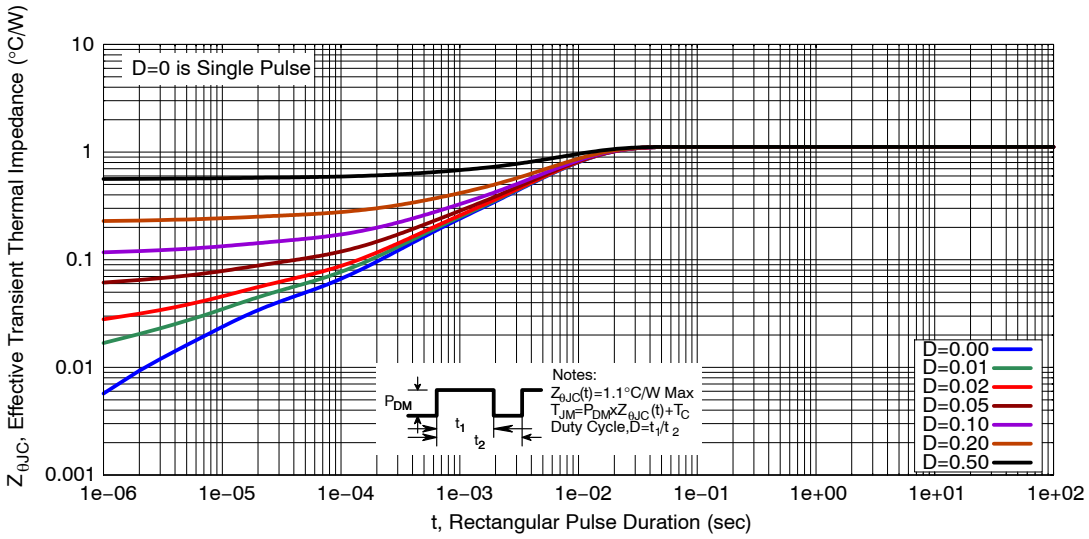
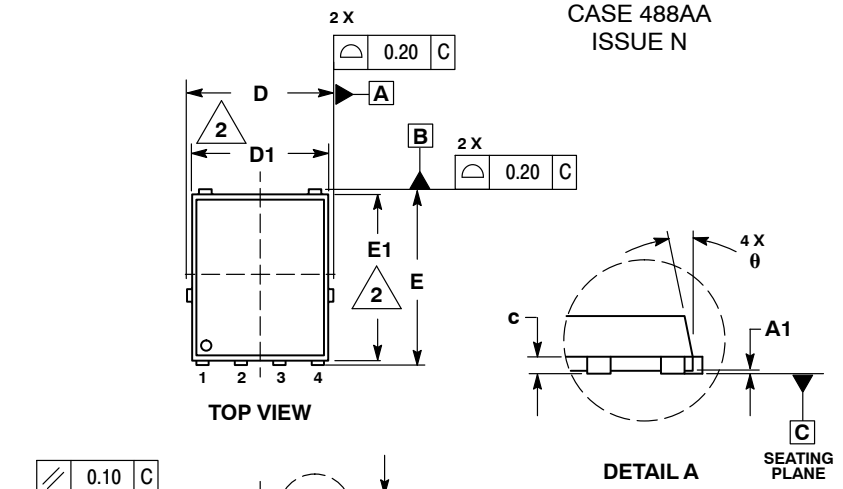
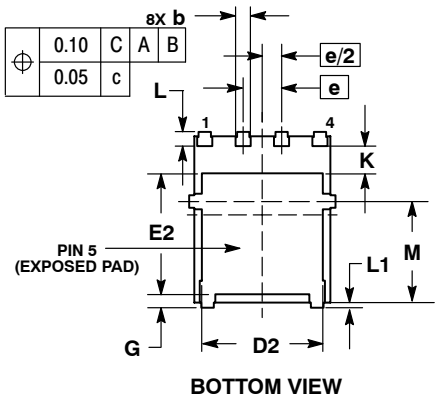



**Figure 15. Transient Thermal Response**

## PACKAGE DIMENSIONS

**DFN5 5x6, 1.27P**
**(SO−8FL)**
CASE 488AA
ISSUE N



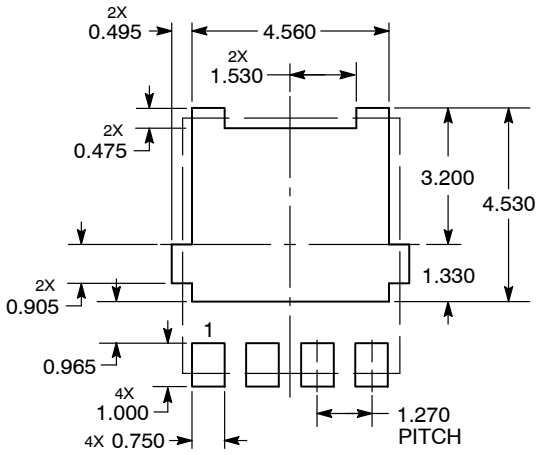




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| | MILLIMETERS | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | ––– | 0.05 |
| b | 0.33 | 0.41 | 0.51 |
| c | 0.23 | 0.28 | 0.33 |
| D | 5.00 | 5.15 | 5.30 |
| D1 | 4.70 | 4.90 | 5.10 |
| D2 | 3.80 | 4.00 | 4.20 |
| E | 6.00 | 6.15 | 6.30 |
| E1 | 5.70 | 5.90 | 6.10 |
| E2 | 3.45 | 3.65 | 3.85 |
| e | 1.27 BSC | | |
| G | 0.51 | 0.575 | 0.71 |
| K | 1.20 | 1.35 | 1.50 |
| L | 0.51 | 0.575 | 0.71 |
| L1 | 0.125 REF | | |
| M | 3.00 | 3.40 | 3.80 |
| θ | 0 ° | ––– | 12 ° |

STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

**RECOMMENDED SOLDERING FOOTPRINT***




DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



### ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT**: www.onsemi.com/support
**For additional information, please contact your local Sales Representative at** www.onsemi.com/support/sales

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