# NTMFS4833NS

# Power MOSFET
## 30 V, 156 A, Single N−Channel, SO−8 FL

### Features
- Accurate, Lossless Current Sensing
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications
- CPU Power Delivery
- DC−DC Converters
- Low Side Switching

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

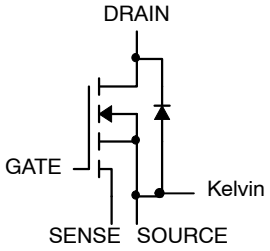
| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain−to−Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate−to−Source Voltage | | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current $R_{\theta JA}$ (Note 1) | Steady State | $T_A$ = 25°C | $I_D$ | 26 | A |
| | | $T_A$ = 85°C | | 18 | |
| Power Dissipation $R_{\theta JA}$ (Note 1) | | $T_A$ = 25°C | $P_D$ | 2.31 | W |
| Continuous Drain Current $R_{\theta JA}$ (Note 2) | | $T_A$ = 25°C | $I_D$ | 16 | A |
| | | $T_A$ = 85°C | | 11.6 | |
| Power Dissipation $R_{\theta JA}$ (Note 2) | | $T_A$ = 25°C | $P_D$ | 0.9 | W |
| Continuous Drain Current $R_{\theta JC}$ (Note 1) | | $T_C$ = 25°C | $I_D$ | 156 | A |
| | | $T_C$ = 85°C | | 113 | |
| Power Dissipation $R_{\theta JC}$ (Note 1) | | $T_C$ = 25°C | $P_D$ | 86.2 | W |
| Pulsed Drain Current | $T_A$ = 25°C, $t_p$ = 10 μs | | $I_{DM}$ | 312 | A |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{STG}$ | −55 to +150 | °C |
| Source Current (Body Diode) | | | $I_S$ | 86 | A |
| Drain to Source DV/DT | | | dV/dt | 6 | V/ns |
| Single Pulse Drain−to−Source Avalanche Energy ($T_J$ = 25°C, $V_{DD}$ = 30 V, $V_{GS}$ = 10 V, $I_L$ = 35 $A_{pk}$, L = 1.0 mH, $R_G$ = 25 Ω) | | | EAS | 612.5 | mJ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | $T_L$ | 260 | °C |

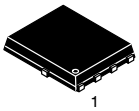
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
1. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size.

**ON Semiconductor®**

www.onsemi.com

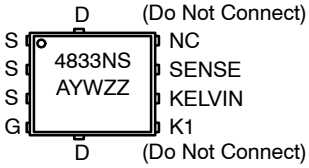
| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 30 V | 2.2 mΩ @ 10 V | 156 A |
| | 3.4 mΩ @ 4.5 V | 127 A |




**SO−8 FLAT LEAD CASE 506BQ**

**MARKING DIAGRAM**




A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| NTMFS4833NST1G | SO−8 FL (Pb−Free) | 1500 Tape / Reel |
| NTMFS4833NST3G | SO−8 FL (Pb−Free) | 5000 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 RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Junction−to−Case (Drain) | $R_{\theta JC}$ | 1.45 | °C/W |
| Junction−to−Ambient − Steady State (Note 3) | $R_{\theta JA}$ | 54 | |
| Junction−to−Ambient − Steady State (Note ) | $R_{\theta JA}$ | 138.7 | |

3. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
4. Surface−mounted on FR4 board using the minimum recommended pad size.

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

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain−to−Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | | 30 | | | V |
| Drain−to−Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | | | | 30 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 24 V | $T_J$ = 25 °C | | | 1 | μA |
| | | | $T_J$ = 125°C | | | 10 | |
| Gate−to−Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | | ±100 | nA |
| **ON CHARACTERISTICS** (Note 5) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | | 1.5 | | 2.5 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | | 6.8 | | mV/°C |
| Drain−to−Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V | $I_D$ = 30 A | | 1.4 | 2.2 | mΩ |
| | | | $I_D$ = 15 A | | 1.3 | | |
| | | $V_{GS}$ = 4.5 V | $I_D$ = 30 A | | 2.3 | 3.4 | |
| | | | $I_D$ = 15 A | | 2.3 | | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 15 V, $I_D$ = 15 A | | | 100 | | S |
| **CHARGES, CAPACITANCES & GATE RESISTANCE** | | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, f = 1 MHz, $V_{DS}$ = 12 V | | | 5250 | | pF |
| Output Capacitance | $C_{OSS}$ | | | | 1080 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | 500 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 15 V; $I_D$ = 30 A | | | 36 | 63 | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 3.8 | | |
| Gate−to−Source Charge | $Q_{GS}$ | | | | 15 | | |
| Gate−to−Drain Charge | $Q_{GD}$ | | | | 13 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 11.5 V, $V_{DS}$ = 15 V; $I_D$ = 30 A | | | 86 | | nC |
| **SWITCHING CHARACTERISTICS** (Note 6) | | | | | | | |
| Turn−On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 15 V, $I_D$ = 15 A, $R_G$ = 3.0 Ω | | | 21 | | ns |
| Rise Time | $t_r$ | | | | 60 | | |
| Turn−Off Delay Time | $t_{d(OFF)}$ | | | | 37 | | |
| Fall Time | $t_f$ | | | | 44 | | |

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.
7. With 0V potential from sense lead to source lead, i.e. using a virtual ground.

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

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **SWITCHING CHARACTERISTICS** (Note 6) | | | | | | | |
| Turn−On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = 11.5 V, $V_{DS}$ = 15 V, $I_D$ = 15 A, $R_G$ = 3.0 Ω | | | 11 | | ns |
| Rise Time | $t_r$ | | | | 34 | | |
| Turn−Off Delay Time | $t_{d(OFF)}$ | | | | 53 | | |
| Fall Time | $t_f$ | | | | 34 | | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 30 A | $T_J$ = 25°C | | 0.80 | 1.2 | V |
| | | | $T_J$ = 125°C | | 0.67 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, dIS/dt = 100 A/μs, $I_S$ = 30 A | | | 36 | | ns |
| Charge Time | $t_a$ | | | | 18 | | |
| Discharge Time | $t_b$ | | | | 18 | | |
| Reverse Recovery Charge | $Q_{RR}$ | | | | 32 | | nC |
| **PACKAGE PARASITIC VALUES** | | | | | | | |
| Source Inductance | $L_S$ | $T_A$ = 25°C | | | 0.65 | | nH |
| Drain Inductance | $L_D$ | | | | 0.005 | | nH |
| Gate Inductance | $L_G$ | | | | 1.84 | | nH |
| Gate Resistance | $R_G$ | | | | 1.4 | | Ω |
| **CURRENT SENSE CHARACTERISTICS** | | | | | | | |
| Current Sensing Ratio | $I_{ratio}$ | $V_{GS}$ = 5 V, 0-70°C, 5-20 A | | 357 | 387 | 417 | |
| Current Sensing Ratio | $I_{ratio}$ | $V_{GS}$ = 5 V, 0-70°C, 1−5 A | | 351 | 387 | 423 | |
| Current Sense Temperature Coefficient (Note 7) | | | | | 0.006 | | %/°C |
| Mirror Resistance | rm(on) | $V_{GS}$ = 5 V | | | 0.80 | | Ω |

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.
7. With 0V potential from sense lead to source lead, i.e. using a virtual ground.

## TYPICAL CHARACTERISTIC CURVES

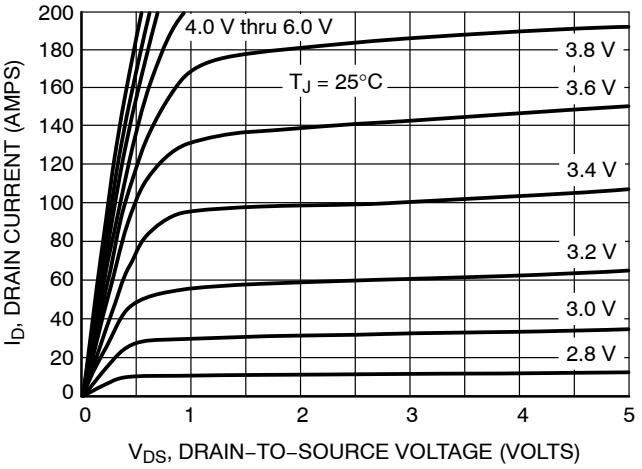



**Figure 1. On−Region Characteristics**

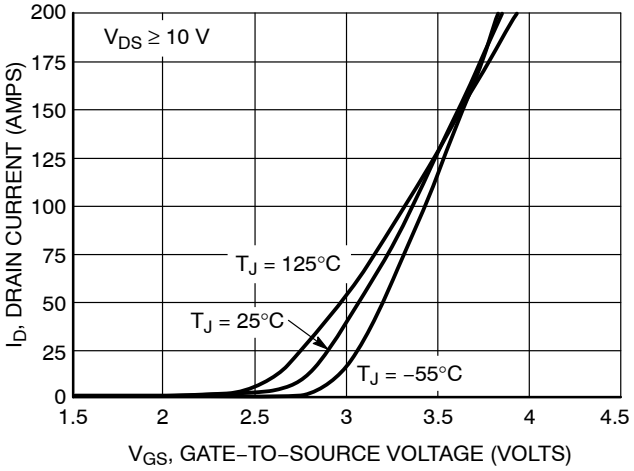



**Figure 2. Transfer Characteristics**

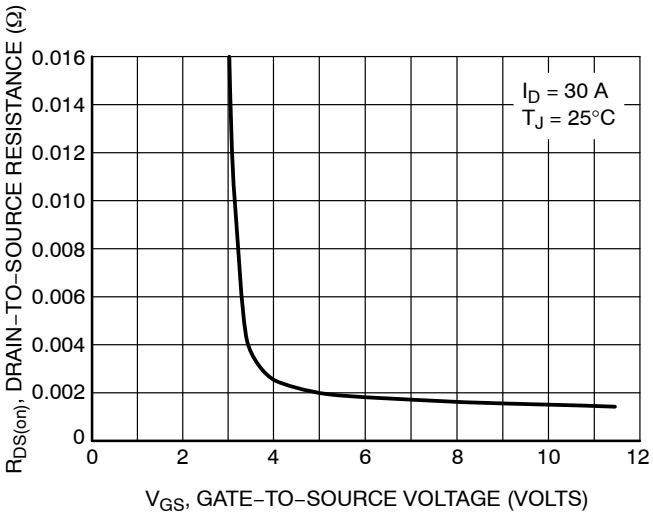



**Figure 3. On−Resistance vs. Gate−to−Source Voltage**

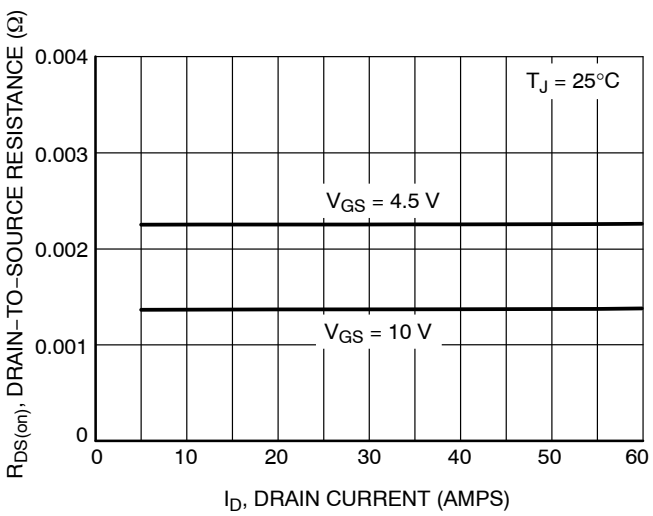



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

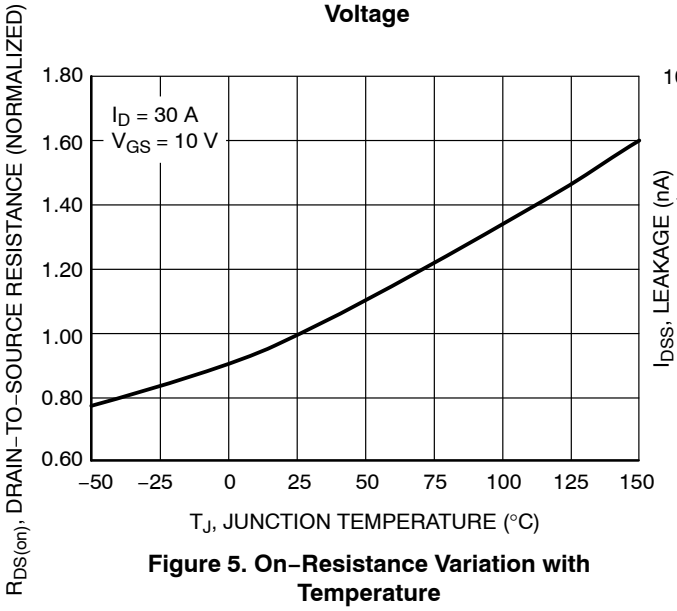



**Figure 5. On−Resistance Variation with Temperature**

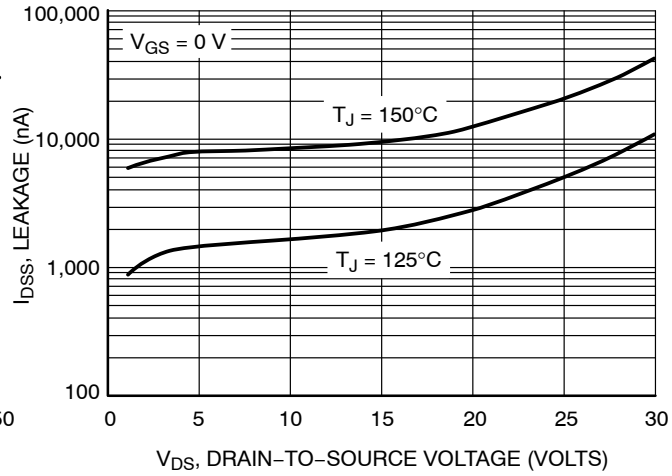



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

## TYPICAL CHARACTERISTIC CURVES

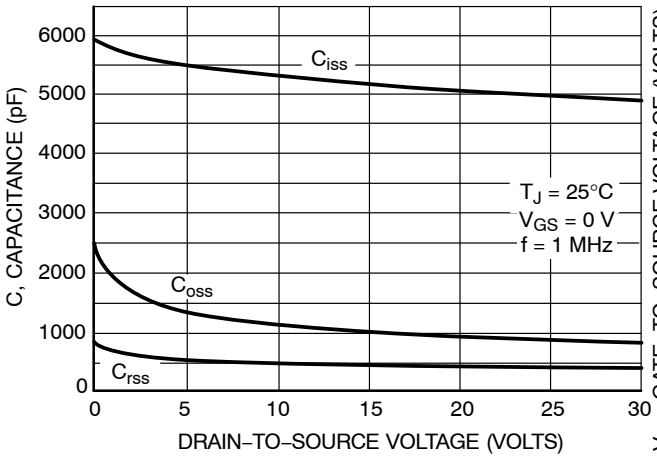



**Figure 7. Capacitance Variation**

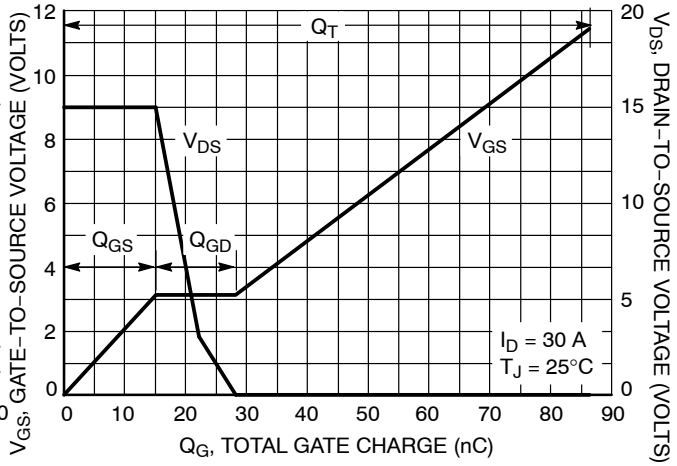



**Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge**

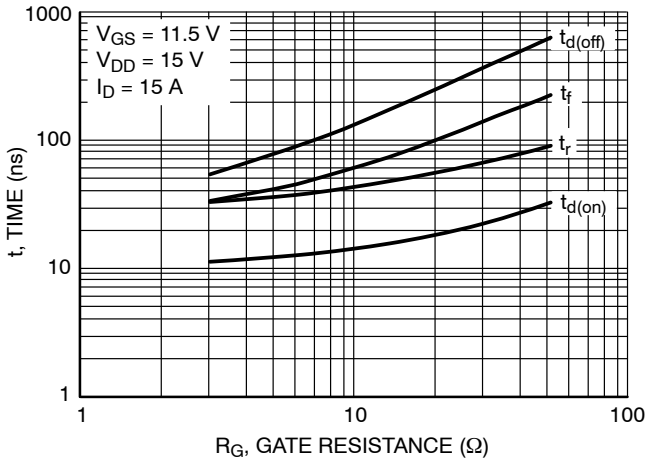



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

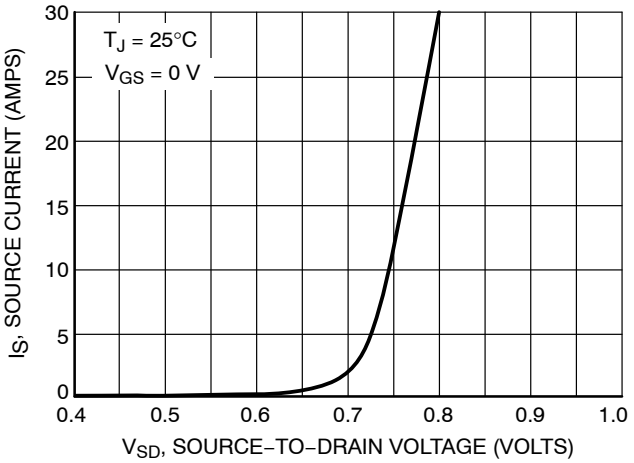



**Figure 10. Diode Forward Voltage vs. Current**

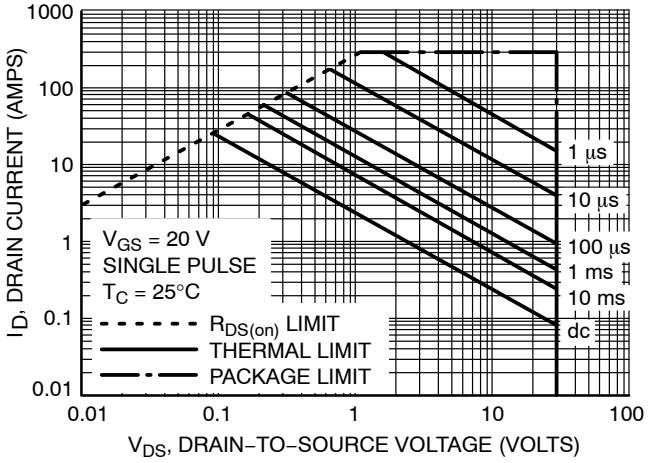



**Figure 11. Maximum Rated Forward Biased Safe Operating Area**

## TYPICAL CHARACTERISTIC CURVES

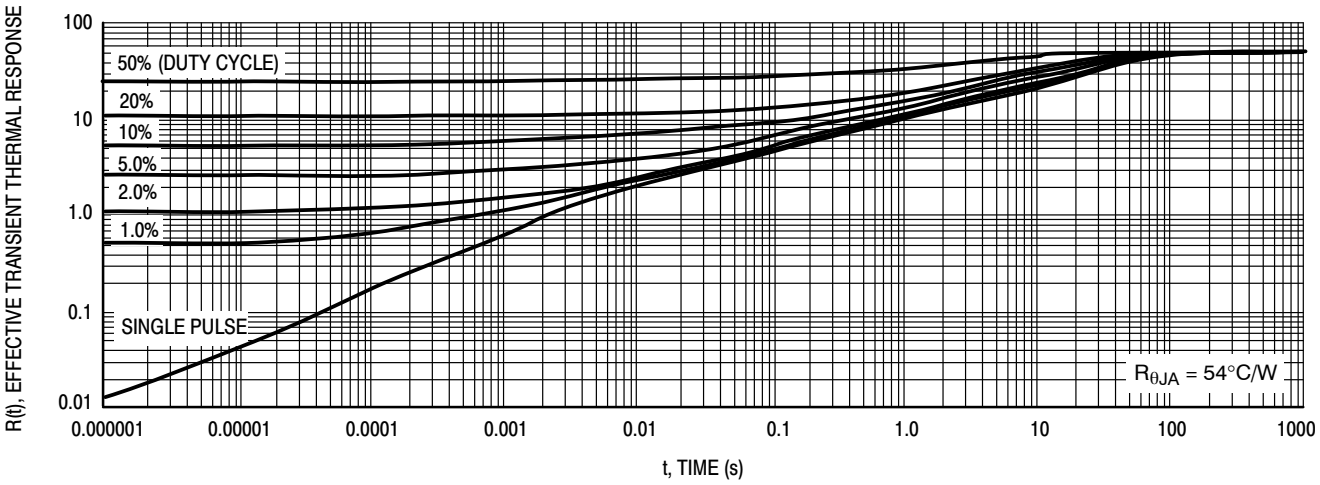
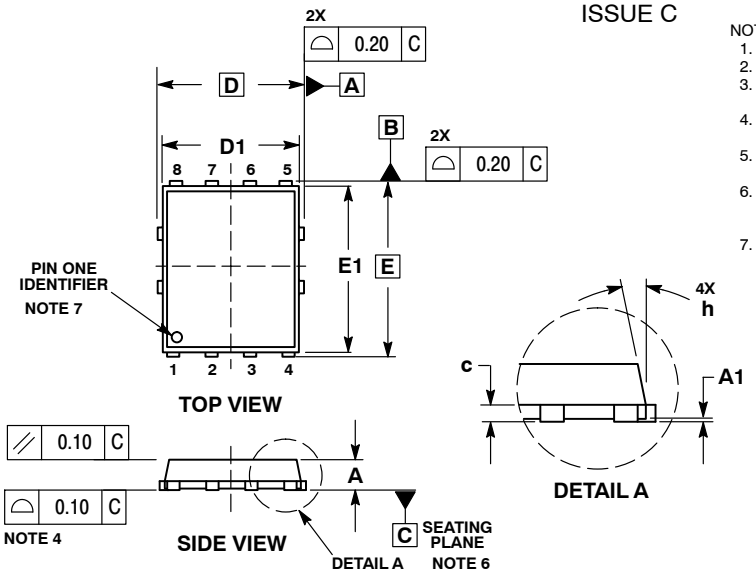
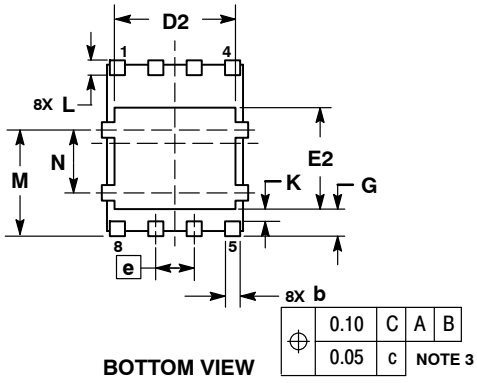



**Figure 12. FET Thermal Response**

## PACKAGE DIMENSIONS

**DFN8 5x6, 1.27P**
CASE 506BQ
ISSUE C

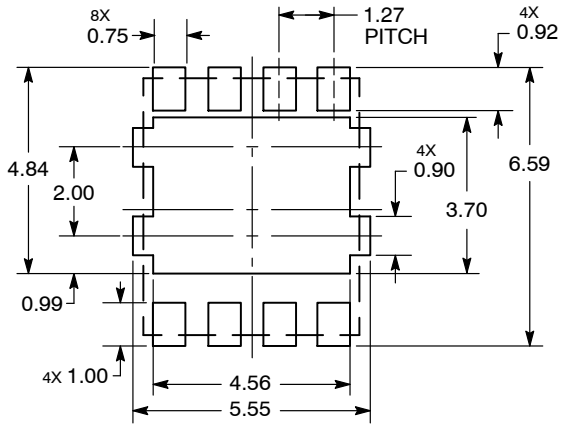



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
4. PROFILE TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINAL.
5. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
6. SEATING PLANE IS DEFINED BY THE TERMINALS. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
7. A VISUAL INDICATOR FOR PIN 1 MUST BE LOCATED IN THIS AREA.

| | MILLIMETERS | |
|---|---|---|
| DIM | MIN | MAX |
| A | 0.90 | 1.10 |
| A1 | --- | 0.05 |
| b | 0.33 | 0.51 |
| c | 0.20 | 0.33 |
| D | 5.15 BSC | |
| D1 | 4.50 | 5.10 |
| D2 | 3.90 | 4.30 |
| E | 6.15 BSC | |
| E1 | 5.50 | 6.10 |
| E2 | 3.00 | 3.50 |
| e | 1.27 BSC | |
| G | 0.80 | 1.20 |
| h | --- | 12 ° |
| K | 0.20 | --- |
| L | 0.51 | 0.71 |
| M | 3.25 | 3.75 |
| N | 1.80 | 2.20 |

### SOLDERING FOOTPRINT*




DIMENSION: MILLIMETERS

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



### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5817−1050

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative