# NTMFS4985NF

## [MOSFET](#) – Power, Single, N-Channel, SO-8 FL
### 30 V, 65 A

**ON Semiconductor®**

**http://onsemi.com**

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 30 V | 3.4 mΩ @ 10 V | 65 A |
| | 5.0 mΩ @ 4.5 V | |

### Features
- Integrated Schottky Diode
- 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 and are RoHS Compliant

### Applications
- CPU Power Delivery
- Synchronous Rectification for DC−DC Converters
- Low Side Switching
- Telecom Secondary Side Rectification

**N−CHANNEL MOSFET**

D O (5, 6)

G (4)

S O (1, 2, 3)

**SO−8 FLAT LEAD CASE 488AA STYLE 1**

**MARKING DIAGRAM**

```
4985NF
AYWZZ
```

4895NF = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

## 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 | $I_D$ | 23.9 | A |
| | | $T_A$ = 85°C | | 17.2 | |
| Power Dissipation $R_{\theta JA}$ (Note 1) | | $T_A$ = 25°C | $P_D$ | 3.04 | W |
| Continuous Drain Current $R_{\theta JA}$ ≤ 10 sec | | $T_A$ = 25°C | $I_D$ | 36 | A |
| | | $T_A$ = 85°C | | 26 | |
| Power Dissipation $R_{\theta JA}$, t ≤ 10 sec | | $T_A$ = 25°C | $P_D$ | 7.0 | W |
| Continuous Drain Current $R_{\theta JA}$ (Note 2) | | $T_A$ = 25°C | $I_D$ | 17.5 | A |
| | | $T_A$ = 85°C | | 12.6 | |
| Power Dissipation $R_{\theta JA}$ (Note 2) | | $T_A$ = 25°C | $P_D$ | 1.63 | W |
| Continuous Drain Current $R_{\theta JC}$ (Note 1) | | $T_C$ = 25°C | $I_D$ | 65 | A |
| | | $T_C$ = 85°C | | 47 | |
| Power Dissipation $R_{\theta JC}$ (Note 1) | | $T_C$ = 25°C | $P_D$ | 22.73 | W |
| Pulsed Drain Current | $t_p$=10µs | $T_A$ = 25°C | $I_{DM}$ | 195 | A |
| Current limited by package | | $T_A$ = 25°C | $I_{Dmaxpkg}$ | 100 | A |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{STG}$ | −55 to +150 | °C |
| Source Current (Body Diode) | | | $I_S$ | 64 | A |
| Drain to Source dV/dt | | | dV/dt | 6 | V/ns |

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| NTMFS4985NFT1G | SO−8FL (Pb−Free) | 1500 / Tape & Reel |
| NTMFS4985NFT3G | SO−8FL (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 Specifications Brochure, BRD8011/D.

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

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Single Pulse Drain−to−Source Avalanche Energy ($V_{DD}$ = 50 V, $V_{GS}$ = 10 V, $I_L$ = 33 $A_{pk}$, L = 0.1 mH, $R_G$ = 25 Ω) | EAS | 54 | mJ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | $T_L$ | 260 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**THERMAL RESISTANCE MAXIMUM RATINGS**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Junction–to–Case (Drain) | $R_{\theta JC}$ | 5.5 | °C/W |
| Junction–to–Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 41.15 | |
| Junction–to–Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 76.9 | |
| Junction–to–Ambient – t ≤ 10 sec | $R_{\theta JA}$ | 17.86 | |

1. Surface–mounted on FR4 board using 1 sq–in pad, 2 oz Cu.
2. Surface–mounted on FR4 board using the minimum recommended pad size of 100 mm$^2$.

**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, $I_D$ = 1.0 mA | | 30 | | | V |
| Drain–to–Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D$ = 10 mA, referenced to 25°C | | | 15 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 24 V | $T_J$ = 25°C | | | 500 | μA |
| Gate–to–Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | | ±100 | nA |
| **ON CHARACTERISTICS** (Note 3) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 1.0 mA | | 1.2 | 1.6 | 2.3 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D$ = 10 mA, referenced to 25°C | | | 5.0 | | mV/°C |
| Drain–to–Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V | $I_D$ = 30 A | | 2.7 | 3.4 | mΩ |
| | | | $I_D$ = 15 A | | 2.7 | | |
| | | $V_{GS}$ = 4.5 V | $I_D$ = 30 A | | 4.0 | 5.0 | |
| | | | $I_D$ = 15 A | | 4.0 | | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 1.5 V, $I_D$ = 15 A | | | 43 | | S |
| **CHARGES AND CAPACITANCES** | | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, f = 1 MHz, $V_{DS}$ = 15 V | | | 2100 | | pF |
| Output Capacitance | $C_{OSS}$ | | | | 900 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | 60 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 15 V; $I_D$ = 30 A | | | 14.2 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 1.8 | | |
| Gate–to–Source Charge | $Q_{GS}$ | | | | 5.9 | | |
| Gate–to–Drain Charge | $Q_{GD}$ | | | | 4.2 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 15 V, $I_D$ = 30 A | | | 30.5 | | nC |
| **SWITCHING CHARACTERISTICS** (Note 4) | | | | | | | |
| 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 | | | 11 | | ns |
| Rise Time | $t_r$ | | | | 32 | | |
| Turn–Off Delay Time | $t_{d(OFF)}$ | | | | 21 | | |
| Fall Time | $t_f$ | | | | 6.0 | | |

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

# NTMFS4985NF

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

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **SWITCHING CHARACTERISTICS** (Note 4) | | | | | | | |
| Turn–On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 15 V, $I_D$ = 15 A, $R_G$ = 3.0 Ω | | | 8.5 | | ns |
| Rise Time | $t_r$ | | | | 26.5 | | |
| Turn–Off Delay Time | $t_{d(OFF)}$ | | | | 26 | | |
| Fall Time | $t_f$ | | | | 4.5 | | |
| **DRAIN–SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 2 A | $T_J$ = 25°C | | 0.4 | 0.7 | V |
| | | | $T_J$ = 125°C | | 0.33 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, $dI_S/dt$ = 100 A/μs, $I_S$ = 2 A | | | 36.5 | | ns |
| Charge Time | $t_a$ | | | | 18 | | |
| Discharge Time | $t_b$ | | | | 18.5 | | |
| Reverse Recovery Charge | $Q_{RR}$ | | | | 32 | | nC |
| **PACKAGE PARASITIC VALUES** | | | | | | | |
| Source Inductance | $L_S$ | $T_A$ = 25°C | | | 0.65 | | nH |
| Drain Inductance | $L_D$ | | | | 0.20 | | |
| Gate Inductance | $L_G$ | | | | 1.5 | | |
| Gate Resistance | $R_G$ | | | | 1.0 | | Ω |

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

# NTMFS4985NF

## TYPICAL PERFORMANCE CURVES
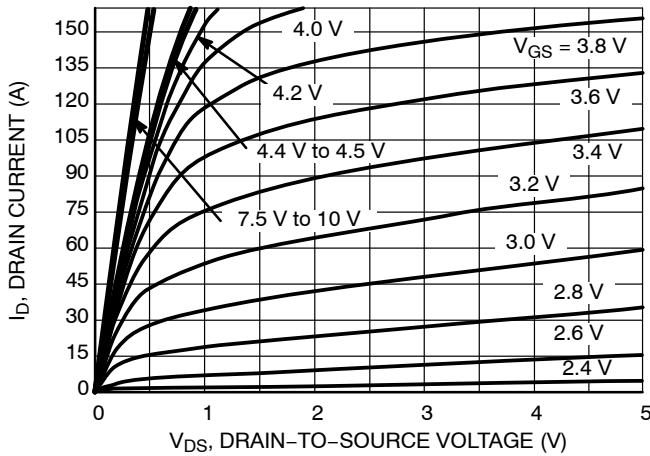
**Figure 1. On-Region Characteristics**
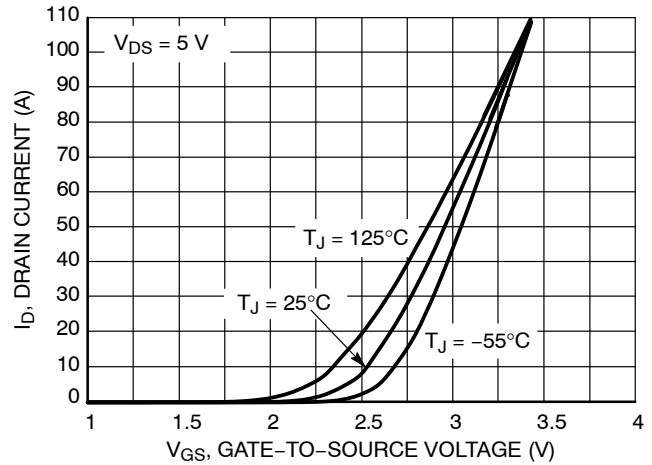
**Figure 2. Transfer Characteristics**
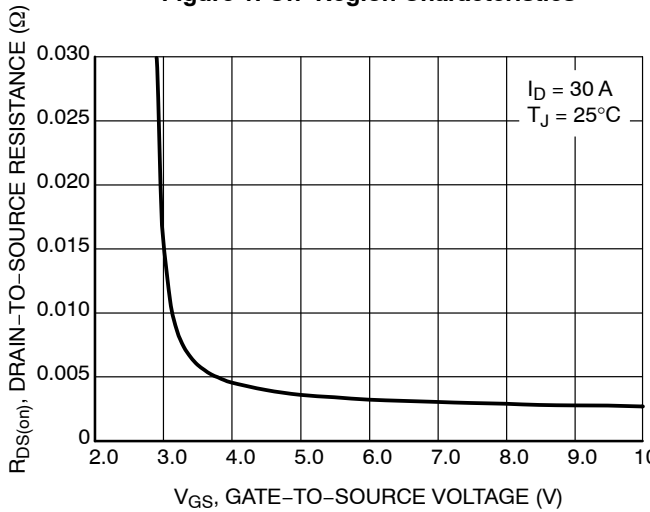
**Figure 3. On-Resistance vs. Gate-to-Source Voltage**
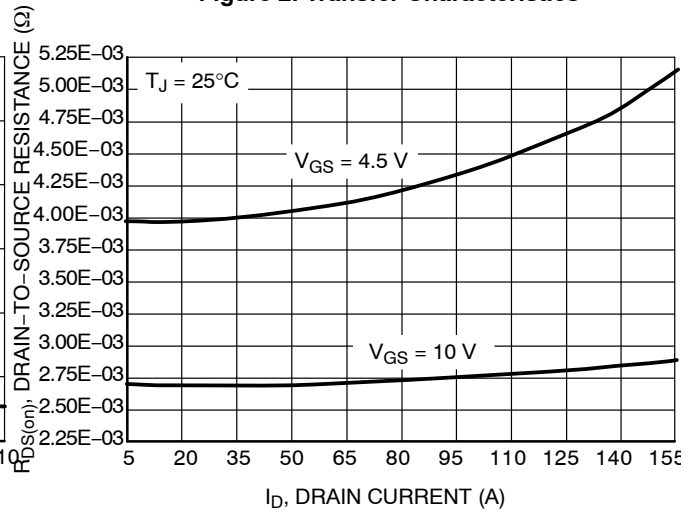
**Figure 4. On-Resistance vs. Drain Current and Gate Voltage**
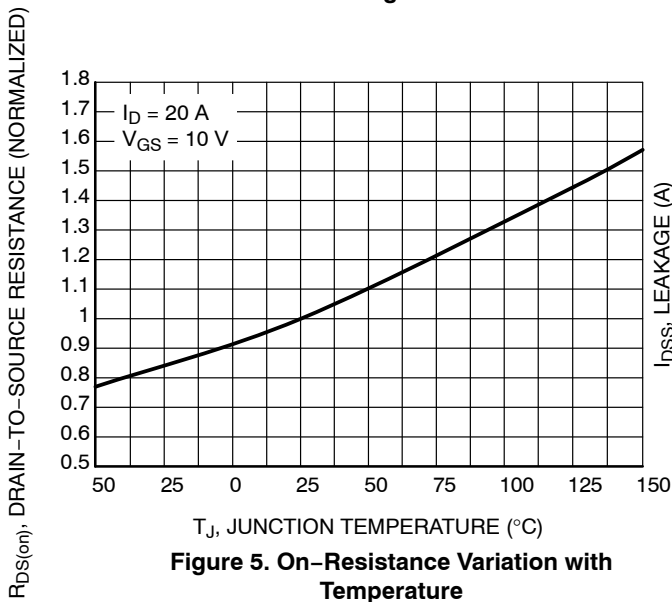
**Figure 5. On-Resistance Variation with Temperature**
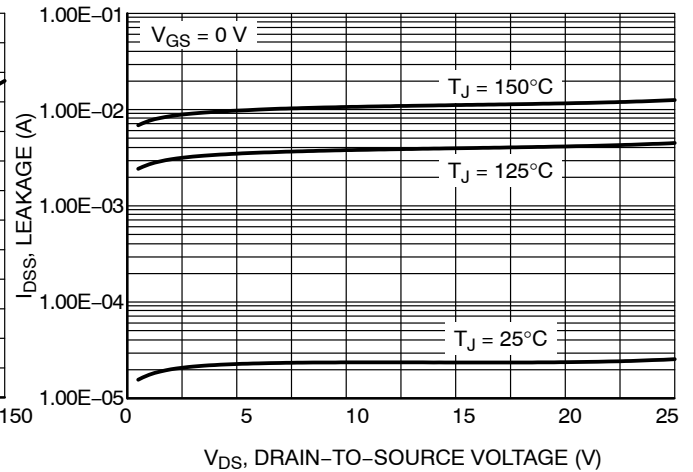
**Figure 6. Drain-to-Source Leakage Current vs. Voltage**

## TYPICAL PERFORMANCE CURVES
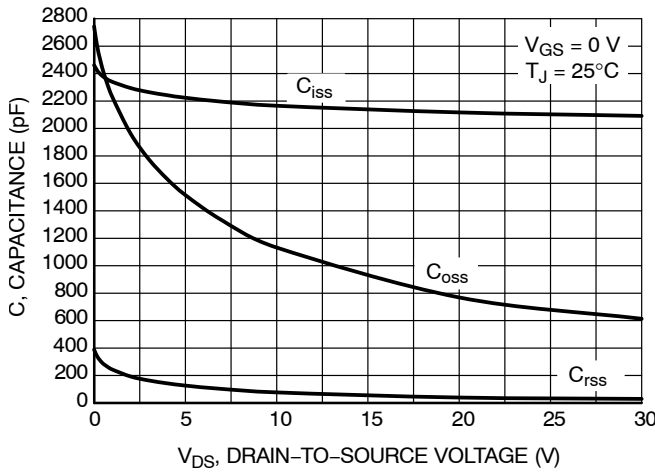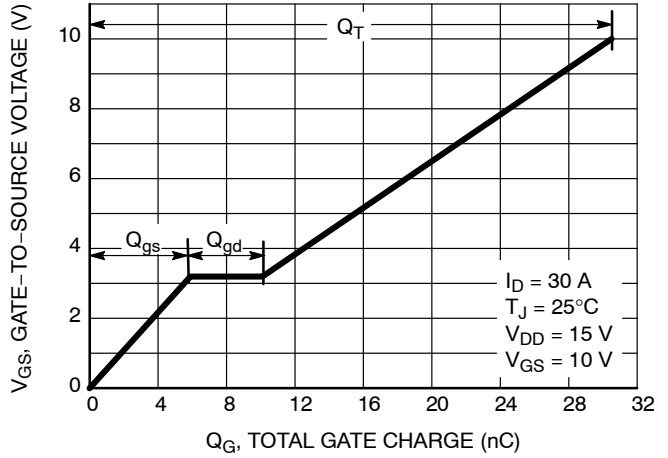
**Figure 7. Capacitance Variation**

$V_{GS} = 0 V$
$T_J = 25°C$

$C_{iss}$

$C_{oss}$

$C_{rss}$

C, CAPACITANCE (pF)

$V_{DS}$, DRAIN−TO−SOURCE VOLTAGE (V)

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

$Q_T$

$Q_{gs}$  $Q_{gd}$

$I_D = 30 A$
$T_J = 25°C$
$V_{DD} = 15 V$
$V_{GS} = 10 V$

$V_{GS}$, GATE−TO−SOURCE VOLTAGE (V)

$Q_G$, TOTAL GATE CHARGE (nC)
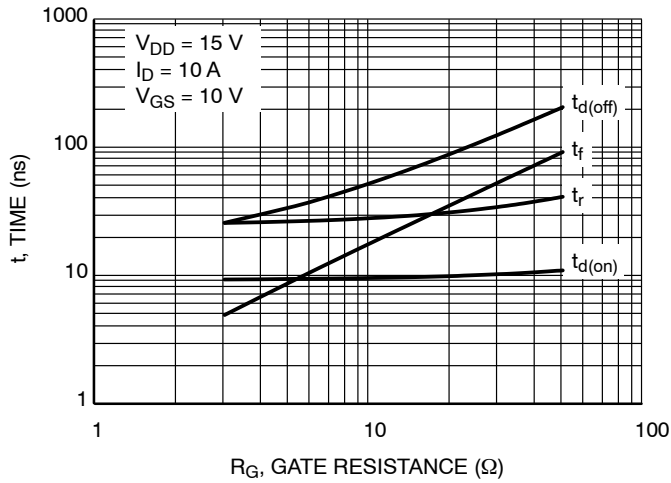
**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

$V_{DD} = 15 V$
$I_D = 10 A$
$V_{GS} = 10 V$

$t_{d(off)}$
$t_f$
$t_r$
$t_{d(on)}$

t, TIME (ns)

$R_G$, GATE RESISTANCE ($\Omega$)
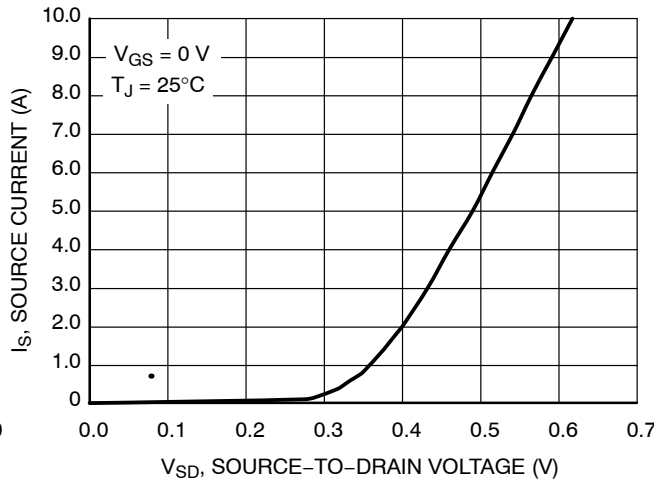
**Figure 10. Diode Forward Voltage vs. Current**

$V_{GS} = 0 V$
$T_J = 25°C$

$I_S$, SOURCE CURRENT (A)

$V_{SD}$, SOURCE−TO−DRAIN VOLTAGE (V)
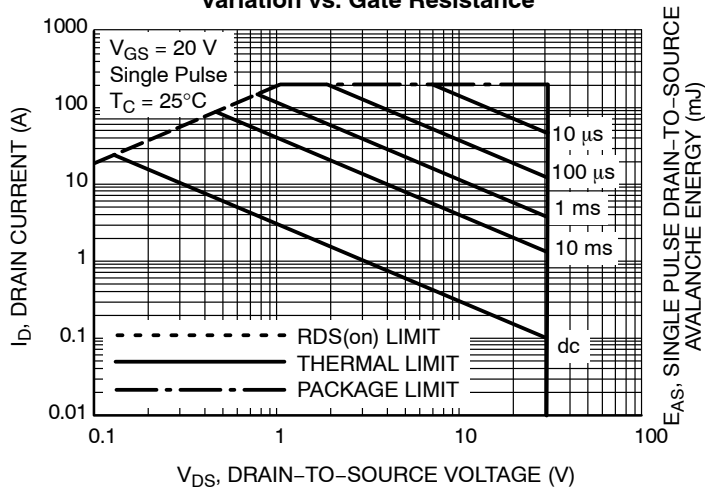
**Figure 11. Maximum Rated Forward Biased Safe Operating Area**

$V_{GS} = 20 V$
Single Pulse
$T_C = 25°C$

10 µs
100 µs
1 ms
10 ms
dc

RDS(on) LIMIT
THERMAL LIMIT
PACKAGE LIMIT

$I_D$, DRAIN CURRENT (A)

$V_{DS}$, DRAIN−TO−SOURCE VOLTAGE (V)
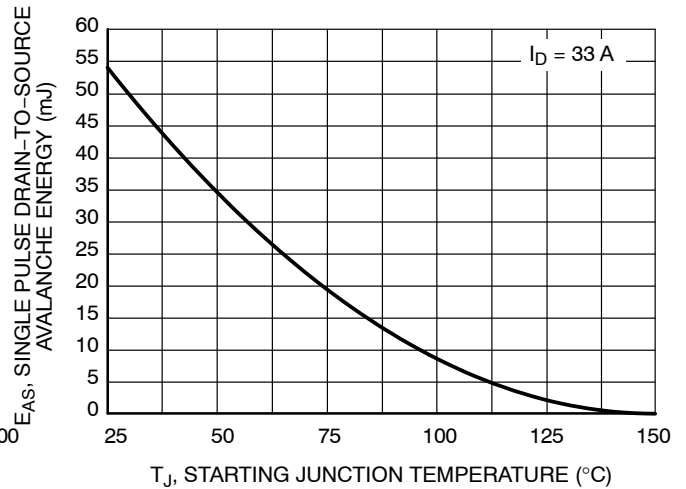
**Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature**

$I_D = 33 A$

$E_{AS}$, SINGLE PULSE DRAIN−TO−SOURCE AVALANCHE ENERGY (mJ)

$T_J$, STARTING JUNCTION TEMPERATURE (°C)

# NTMFS4985NF

## TYPICAL PERFORMANCE CURVES
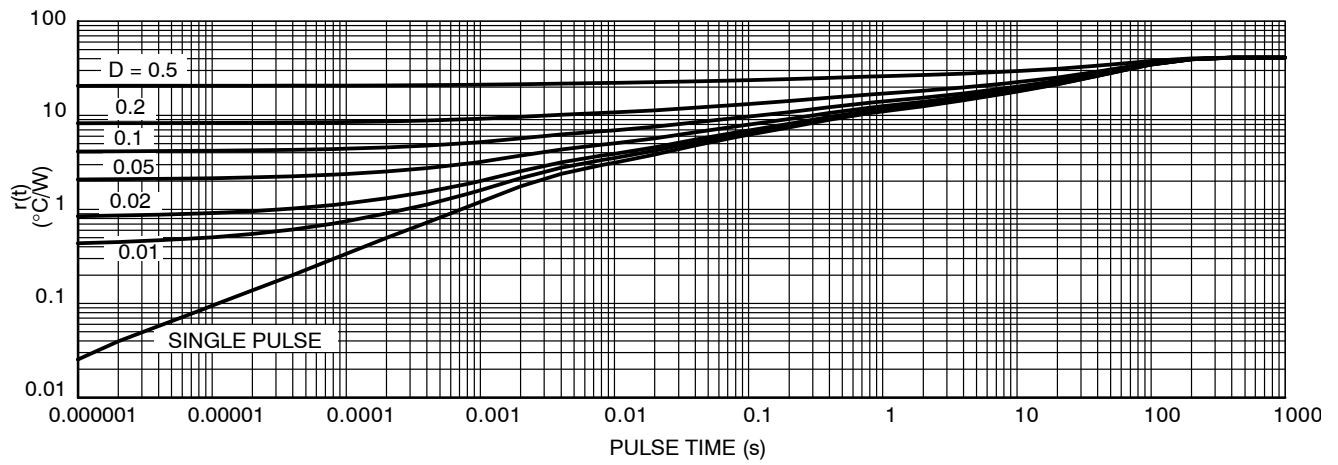


**Figure 13. Thermal Response**
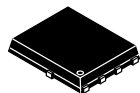
**DFN5 5x6, 1.27P**
**(SO−8FL)**
CASE 488AA
ISSUE N

SCALE 2:1

DATE 25 JUN 2018

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.

| DIM | MILLIMETERS | | |
|-----|------|------|------|
|     | 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 ° |

**TOP VIEW**

**DETAIL A**

**SEATING PLANE**

**SIDE VIEW**

**DETAIL A**

**BOTTOM VIEW**

PIN 5 (EXPOSED PAD)

**GENERIC**
**MARKING DIAGRAM***
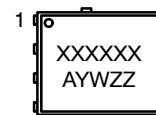
XXXXXX
AYWZZ

XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot " ▪", may or may not be present. Some products may not follow the Generic Marking.
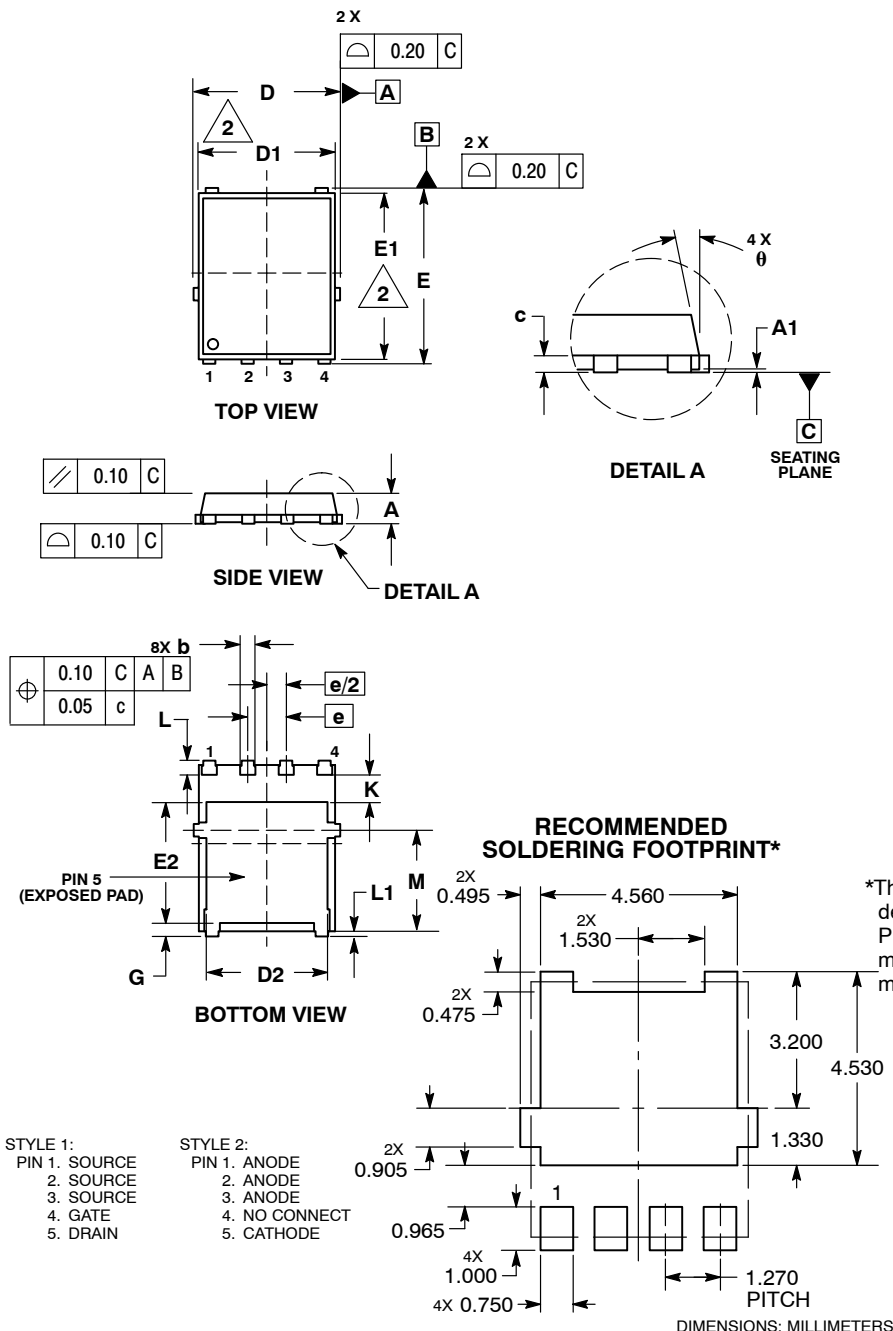
STYLE 1:
PIN 1. SOURCE
    2. SOURCE
    3. SOURCE
    4. GATE
    5. DRAIN

STYLE 2:
PIN 1. ANODE
    2. ANODE
    3. ANODE
    4. NO CONNECT
    5. CATHODE

**RECOMMENDED**
**SOLDERING FOOTPRINT***

2X 0.495
2X 4.560
2X 1.530
2X 0.475
3.200
4.530
1.330
2X 0.905
0.965
4X 1.000
4X 0.750
1.270 PITCH

DIMENSIONS: MILLIMETER

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

| DOCUMENT NUMBER: | 98AON14036D | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. | |
|---|---|---|---|
| DESCRIPTION: | DFN5 5x6, 1.27P (SO−8FL) | | PAGE 1 OF 1 |

## ADDITIONAL INFORMATION

◊