

# NTMD4884NF

## Power MOSFET and Schottky Diode

30 V, 5.7 A, Single N-Channel with 30 V, 2.8 A, Schottky Barrier Diode

### Features

- FETKY™ Surface Mount Package Saves Board Space
- Independent Pin-Out for MOSFET and Schottky Allowing for Design Flexibility
- Low  $R_{DS(on)}$  MOSFET and Low  $V_F$  Schottky to Minimize Conduction Losses
- Optimized Gate Charge to Minimize Switching Losses
- This is a Pb-Free Device

### Applications

- Disk Drives
- DC-DC Converters
- Printers

### MOSFET MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

| Rating  | Symbol         | Value                    | Unit             |
|---|----------------|--------------------------|------------------|
| Drain-to-Source Voltage   | $V_{DSS}$      | 30                       | V                |
| Gate-to-Source Voltage  | $V_{GS}$       | $\pm 20$                 | V                |
| Continuous Drain Current $R_{\theta JA}$ (Note 1)                 | $I_D$          | $T_A = 25^\circ\text{C}$ | 4.7              |
|   |                | $T_A = 70^\circ\text{C}$ | 3.8              |
| Power Dissipation $R_{\theta JA}$ (Note 1)                        | $P_D$          | 1.6                      | W                |
| Continuous Drain Current $R_{\theta JA}$ (Note 2)                 | $I_D$          | $T_A = 25^\circ\text{C}$ | 3.3              |
|   |                | $T_A = 70^\circ\text{C}$ | 2.6              |
| Power Dissipation $R_{\theta JA}$ (Note 2)                        | $P_D$          | 0.77                     | W                |
| Continuous Drain Current $R_{\theta JA}$ $t < 10$ s (Note 1)      | $I_D$          | $T_A = 25^\circ\text{C}$ | 5.7              |
|   |                | $T_A = 70^\circ\text{C}$ | 4.5              |
| Power Dissipation $R_{\theta JA}$ $t < 10$ s (Note 1)             | $P_D$          | 2.3                      | W                |
| Pulsed Drain Current  | $I_{DM}$       | 19                       | A                |
| Operating Junction and Storage Temperature                        | $T_J, T_{STG}$ | -55 to +150              | $^\circ\text{C}$ |
| Source Current (Body Diode)                                       | $I_S$          | 1.3                      | A                |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | $T_L$          | 260                      | $^\circ\text{C}$ |

### SCHOTTKY MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

| Rating                                      | Symbol    | Value        | Unit |
|---|-----------|--------------|------|
| Peak Repetitive Reverse Voltage             | $V_{RRM}$ | 30           | V    |
| DC Blocking Voltage                         | $V_R$     | 30           | V    |
| Average Rectified Forward Current, (Note 1) | $I_F$     | Steady State | 2.8  |
|   |           | $t < 10$ s   | 4.1  |



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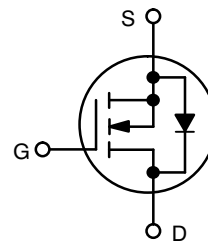
http://onsemi.com

### N-CHANNEL MOSFET

| $V_{(BR)DSS}$ | $R_{DS(on)}$ Max      | $I_D$ Max |
|---------------|-----------------------|-----------|
| 30 V          | 48 m $\Omega$ @ 10 V  | 5.7 A     |
|               | 70 m $\Omega$ @ 4.5 V |           |

### SCHOTTKY DIODE

| $V_R$ Max | $V_F$ Max | $I_F$ Max |
|-----------|-----------|-----------|
| 30 V      | 0.5 V     | 2.8 A     |

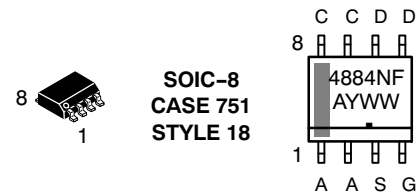


N-Channel MOSFET



Schottky Diode

### MARKING DIAGRAM & PIN ASSIGNMENT



4884NF = Device Code  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 ■ = Pb-Free Package

### ORDERING INFORMATION

| Device        | Package          | Shipping†        |
|---------------|------------------|------------------|
| NTMD4884NFR2G | SOIC-8 (Pb-Free) | 2500/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.

# NTMD4884NF

## THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter MOSFET & Schottky                               | Symbol          | Max | Unit |
|---|-----------------|-----|------|
| Junction-to-Ambient – Steady State (Note 1)               | $R_{\theta JA}$ | 79  | °C/W |
| Junction-to-Ambient – $t \leq 10$ s Steady State (Note 1) | $R_{\theta JA}$ | 54  |      |
| Junction-to-FOOT (Drain) Equivalent to $R_{\theta JC}$    | $R_{\theta JF}$ | 50  |      |
| Junction-to-Ambient – Steady State (Note 2)               | $R_{\theta JA}$ | 163 |      |

- Surface-mounted on FR4 board using 1 inch sq pad size, 1 oz Cu.
- Surface-mounted on FR4 board using the minimum recommended pad size.

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## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|----------------|--------|----------------|-----|-----|-----|------|
|----------------|--------|----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |                   |   |                           |    |           |               |
|---|-------------------|---|---------------------------|----|-----------|---------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$   | 30                        |    |           | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |   |                           | 24 |           | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$     | $T_J = 25^\circ\text{C}$  |    | 1.0       | $\mu\text{A}$ |
|   |                   |   | $T_J = 125^\circ\text{C}$ |    | 20        |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ |                           |    | $\pm 100$ | nA            |

### ON CHARACTERISTICS (Note 3)

|  |                  |   |     |     |     |            |
|--|------------------|---|-----|-----|-----|------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$   | 1.0 |     | 2.5 | V          |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |   |     | 5.0 |     | mV/°C      |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 10\text{ V}, I_D = 4.0\text{ A}$  |     | 34  | 48  | m $\Omega$ |
|  |                  | $V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$ |     | 50  | 70  |            |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = 5.0\text{ V}, I_D = 4.0\text{ A}$ |     | 10  |     | S          |
| Gate Resistance                            | $R_G$            |   |     | 2.4 | 3.6 | $\Omega$   |

### CHARGES, CAPACITANCES AND GATE RESISTANCE

|                              |              |   |  |     |     |    |
|------------------------------|--------------|---|--|-----|-----|----|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 15\text{ V}$   |  | 280 | 360 | pF |
| Output Capacitance           | $C_{OSS}$    |   |  | 60  | 80  |    |
| Reverse Transfer Capacitance | $C_{RSS}$    |   |  | 32  | 42  |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 4.0\text{ A}$ |  | 2.8 | 4.2 | nC |
| Threshold Gate Charge        | $Q_{G(TH)}$  |   |  | 0.4 |     |    |
| Gate-to-Source Charge        | $Q_{GS}$     |   |  | 1.2 |     |    |
| Gate-to-Drain Charge         | $Q_{GD}$     |   |  | 1.0 |     |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 4.0\text{ A}$  |  | 5.6 | 8.0 | nC |

### SWITCHING CHARACTERISTICS (Note 4)

|                     |              |   |  |     |     |    |
|---------------------|--------------|---|--|-----|-----|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 1.0\text{ A}, R_G = 6.0\ \Omega$ |  | 6.0 | 12  | ns |
| Rise Time           | $t_r$        |   |  | 6.5 | 13  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |   |  | 14  | 26  |    |
| Fall Time           | $t_f$        |   |  | 1.4 | 7.0 |    |

### DRAIN-TO-SOURCE CHARACTERISTICS

|                       |          |  |                           |  |      |     |    |
|-----------------------|----------|--|---------------------------|--|------|-----|----|
| Forward Diode Voltage | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_D = 1.3\text{ A}$  | $T_J = 25^\circ\text{C}$  |  | 0.8  | 1.0 | V  |
|                       |          |  | $T_J = 125^\circ\text{C}$ |  | 0.65 |     |    |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS} = 0\text{ V}, d_{IS}/d_t = 100\text{ A}/\mu\text{s}, I_S = 4.0\text{ A}$ |                           |  | 9.2  | 20  | ns |
| Charge Time           | $t_a$    |  |                           |  | 6.0  |     |    |
| Discharge Time        | $t_b$    |  |                           |  | 3.2  |     |    |
| Reverse Recovery Time | $Q_{RR}$ |  |                           |  | 3.3  |     | nC |

# NTMD4884NF

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|----------------|--------|----------------|-----|-----|-----|------|
|----------------|--------|----------------|-----|-----|-----|------|

### SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                             | Symbol | Test Conditions      | Min                       | Typ | Max   | Unit |    |
|---------------------------------------|--------|----------------------|---------------------------|-----|-------|------|----|
| Maximum Instantaneous Forward Voltage | $V_F$  | $I_F = 0.1\text{ A}$ | $T_J = 25^\circ\text{C}$  |     | 0.26  | 0.28 | V  |
|                                       |        |                      | $T_J = 125^\circ\text{C}$ |     | 0.11  | 0.13 |    |
|                                       |        | $I_F = 2.0\text{ A}$ | $T_J = 25^\circ\text{C}$  |     | 0.4   | 0.50 |    |
|                                       |        |                      | $T_J = 125^\circ\text{C}$ |     | 0.35  | 0.46 |    |
| Maximum Instantaneous Reverse Current | $I_R$  | $V_R = 10\text{ V}$  | $T_J = 25^\circ\text{C}$  |     | 0.020 | 0.25 | mA |
|                                       |        |                      | $T_J = 125^\circ\text{C}$ |     | 10    | 37   |    |

- Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

## TYPICAL CHARACTERISTICS

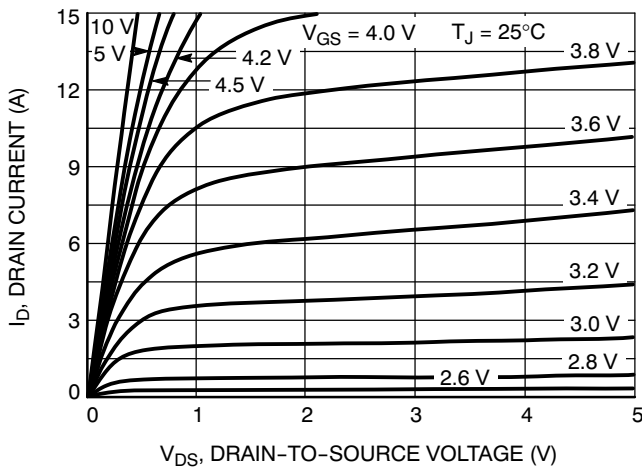


Figure 1. On-Region Characteristics

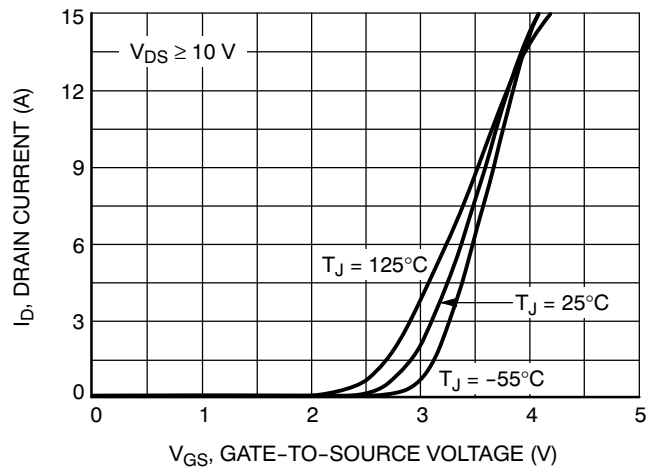


Figure 2. Transfer Characteristics

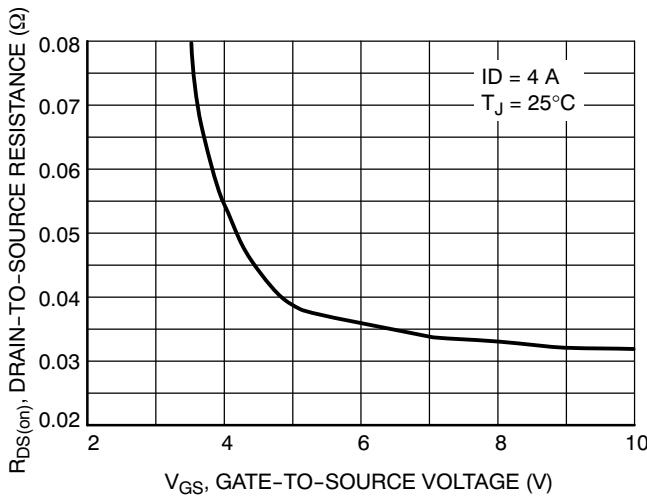


Figure 3. On-Resistance vs. Gate Voltage

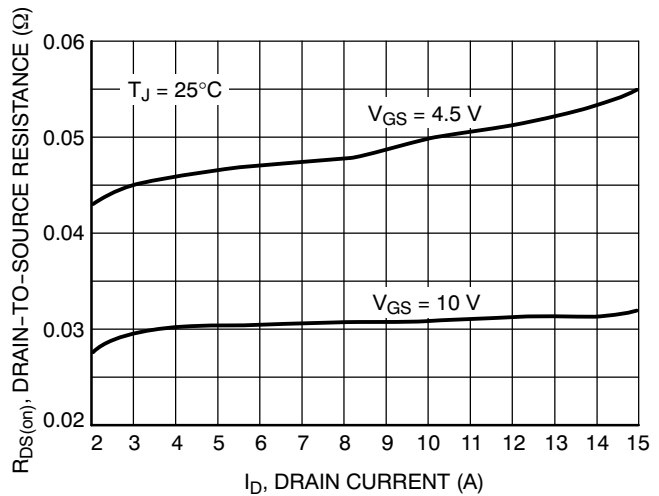


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

# NTMD4884NF

## TYPICAL CHARACTERISTICS

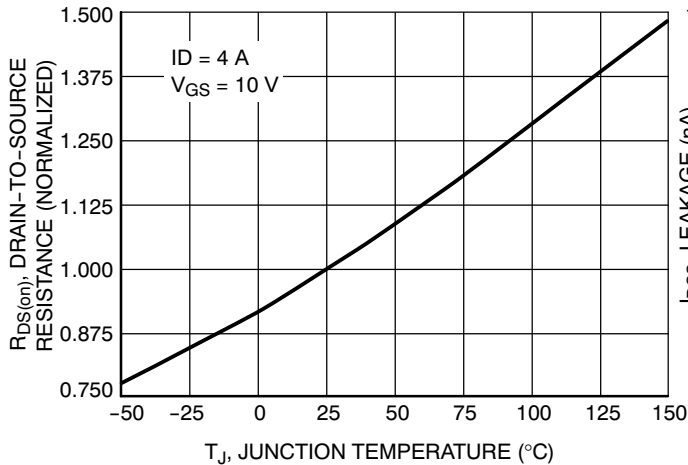


Figure 5. On-Resistance Variation with Temperature

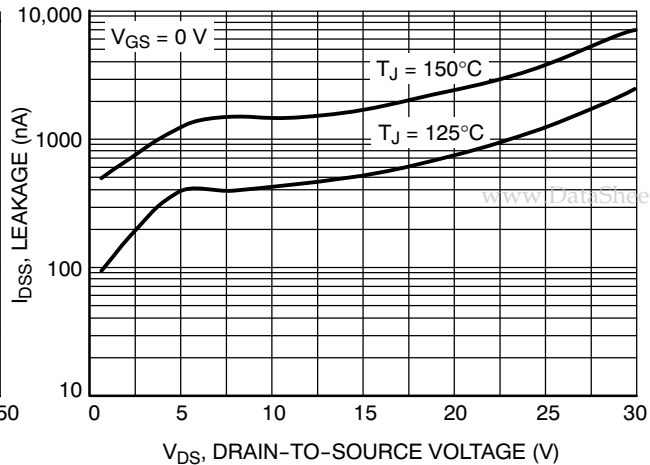


Figure 6. Drain-to-Source Leakage Current vs. Voltage

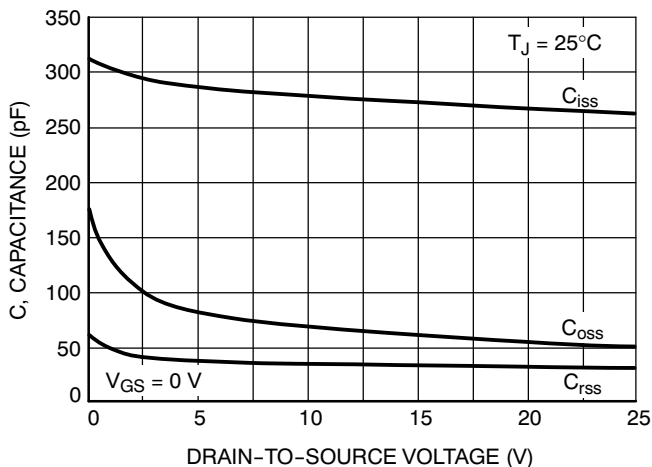


Figure 7. Capacitance Variation

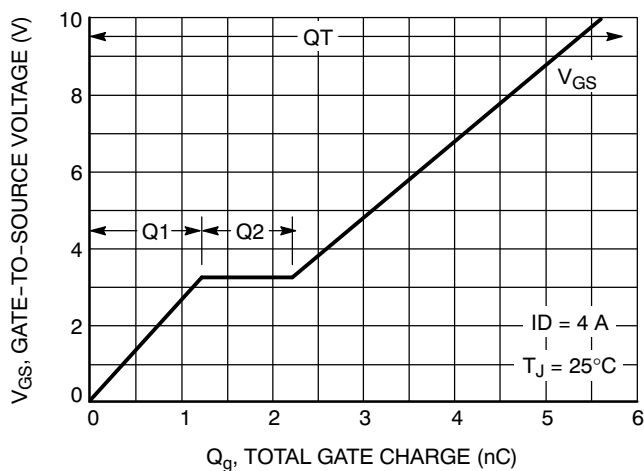


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

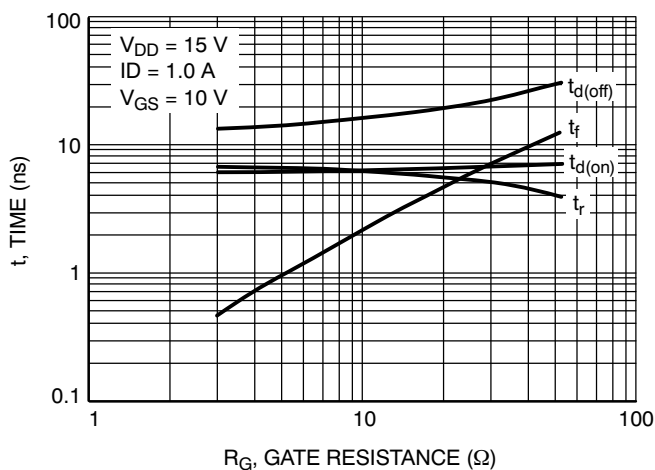


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

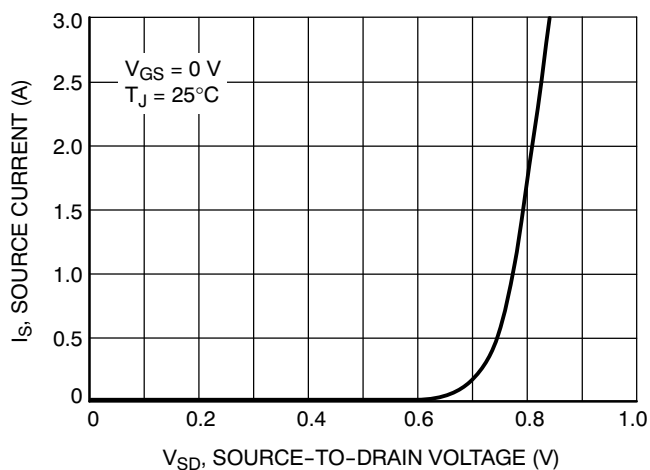


Figure 10. Diode Forward Voltage vs. Current

# NTMD4884NF

## TYPICAL CHARACTERISTICS

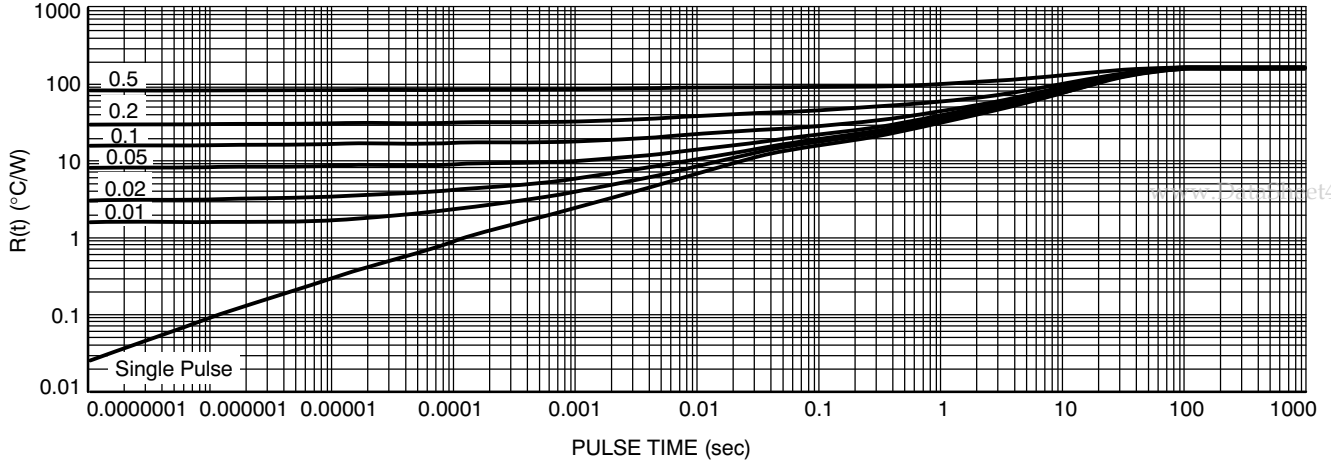


Figure 11. Thermal Response -  $R_{\theta JA}$  at Steady State (min pad)

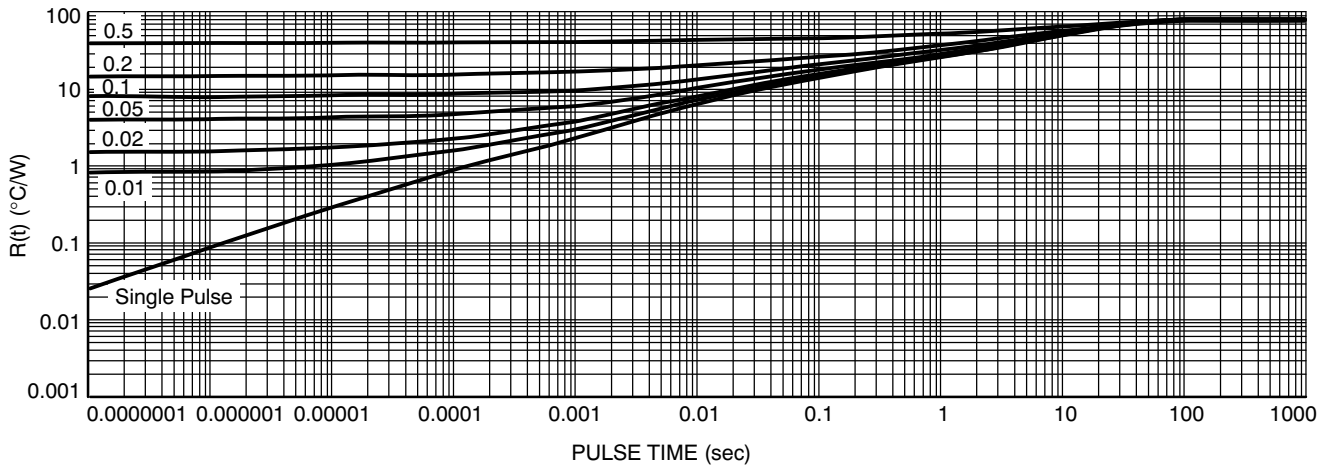


Figure 12. Thermal Response -  $R_{\theta JA}$  at Steady State (1 inch sq pad)

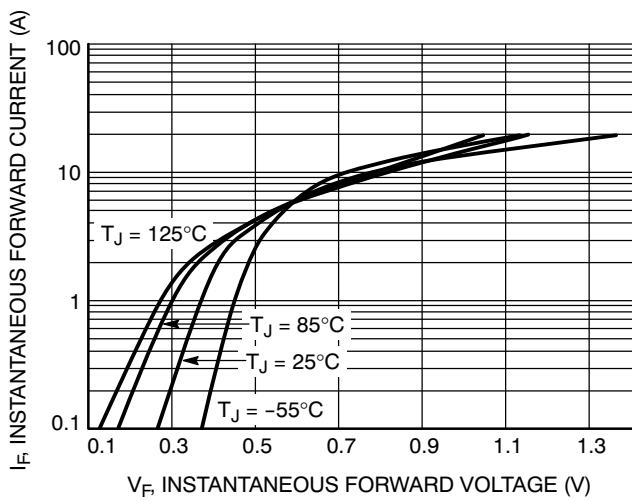


Figure 13. Typical Forward Voltage

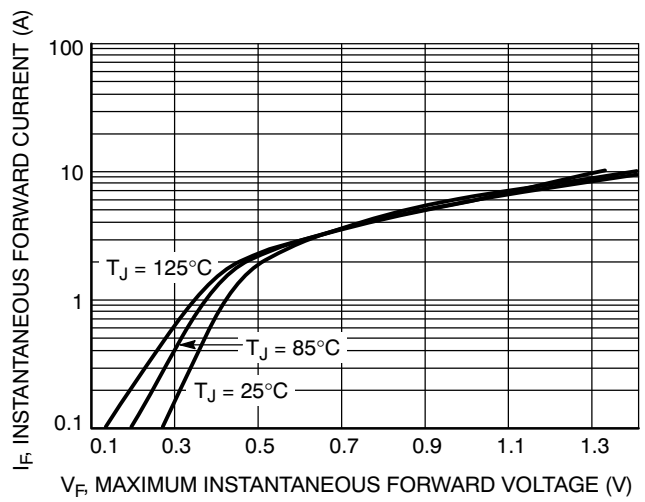


Figure 14. Maximum Forward Voltage

# NTMD4884NF

## TYPICAL CHARACTERISTICS

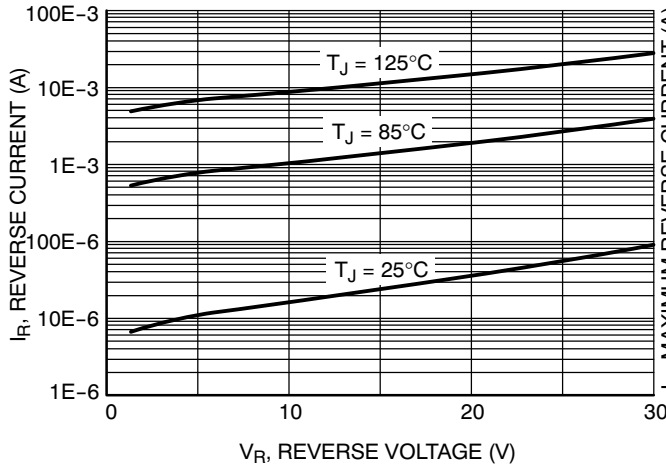


Figure 15. Typical Reverse Current

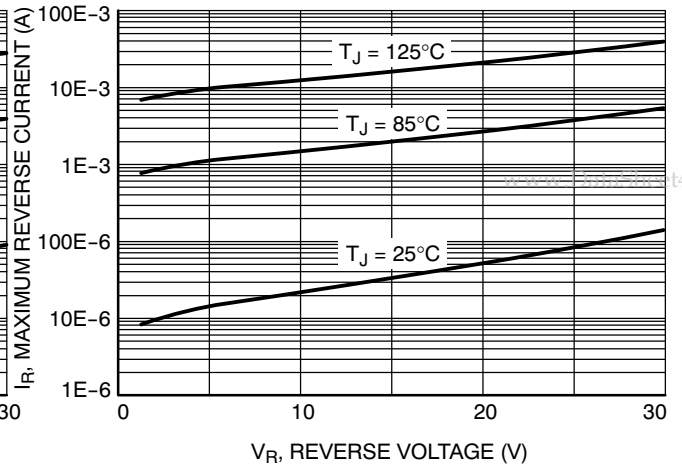


Figure 16. Maximum Reverse Current

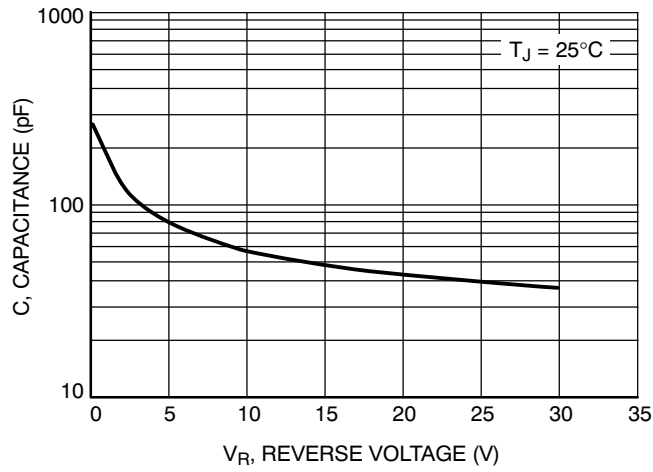
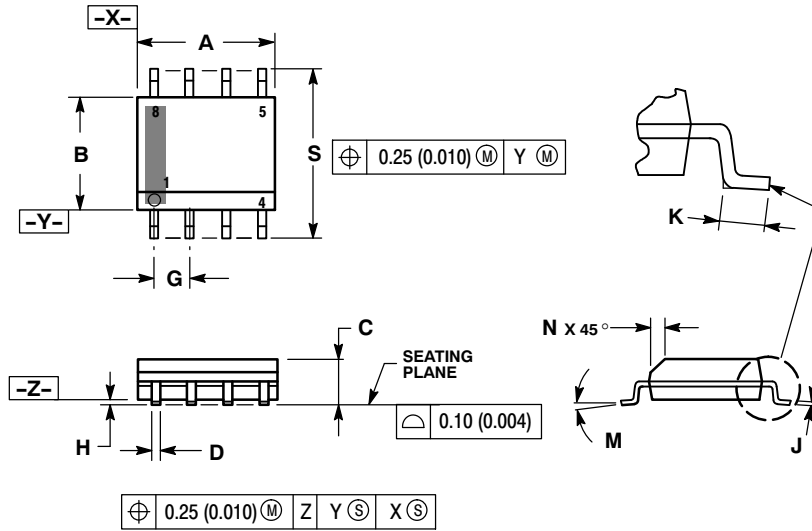


Figure 17. Capacitance

# NTMD4884NF

## PACKAGE DIMENSIONS

SOIC-8 NB  
CASE 751-07  
ISSUE AH

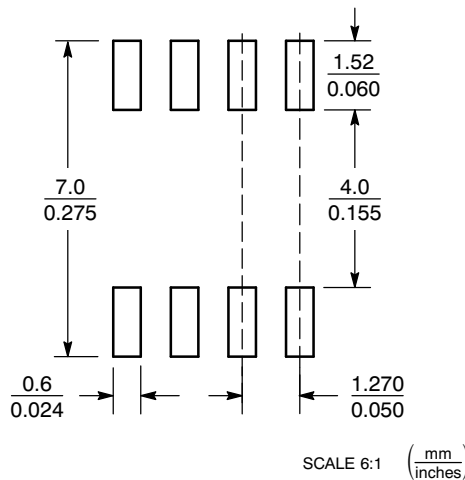


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

### SOLDERING FOOTPRINT\*



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

STYLE 18:

- PIN 1. ANODE
- 2. ANODE
- 3. SOURCE
- 4. GATE
- 5. DRAIN
- 6. DRAIN
- 7. CATHODE
- 8. CATHODE

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