

# NTTFS4985NF

## MOSFET – Power, Single, N-Channel, WDFN8

30 V, 64 A

### 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

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

| Parameter   | 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)           | $I_D$  | $T_A = 25^\circ\text{C}$ | 22               |
|   |  | $T_A = 85^\circ\text{C}$ | 15.9             |
| Power Dissipation $R_{\theta JA}$ (Note 1)                  | $P_D$  | 2.69                     | W                |
| Continuous Drain Current $R_{\theta JA} \leq 10$ s (Note 1) | $I_D$  | $T_A = 25^\circ\text{C}$ | 32.4             |
|   |  | $T_A = 85^\circ\text{C}$ | 23.4             |
| Power Dissipation $R_{\theta JA} \leq 10$ s (Note 1)        | $P_D$  | $T_A = 25^\circ\text{C}$ | 5.85             |
|   |  | $T_A = 85^\circ\text{C}$ | 1.47             |
| Continuous Drain Current $R_{\theta JA}$ (Note 2)           | $I_D$  | $T_A = 25^\circ\text{C}$ | 16.3             |
|   |  | $T_A = 85^\circ\text{C}$ | 11.7             |
| Power Dissipation $R_{\theta JA}$ (Note 2)                  | $P_D$  | 1.47                     | W                |
| Continuous Drain Current $R_{\theta JC}$ (Note 1)           | $I_D$  | $T_C = 25^\circ\text{C}$ | 64               |
|   |  | $T_C = 85^\circ\text{C}$ | 46               |
| Power Dissipation $R_{\theta JC}$ (Note 1)                  | $P_D$  | 22.73                    | W                |
| Pulsed Drain Current  | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | $I_{DM}$                 | 192              |
| Operating Junction and Storage Temperature                  | $T_J, T_{stg}$                                 |                          | -55 to +150      |
|   |  |                          | $^\circ\text{C}$ |
| Source Current (Body Diode)                                 | $I_S$  | 32                       | A                |
| Drain to Source dV/dt                                       | dV/dt  | 6.0                      | V/ns             |

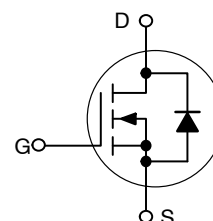


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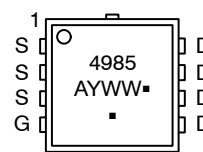
| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX       | $I_D$ MAX |
|---------------|------------------------|-----------|
| 30 V          | 3.5 m $\Omega$ @ 10 V  | 64 A      |
|               | 5.2 m $\Omega$ @ 4.5 V |           |

### N-Channel MOSFET



WDFN8  
( $\mu 8\text{FL}$ )  
CASE 511AB

### MARKING DIAGRAM



4985 = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device          | Package         | Shipping†          |
|-----------------|-----------------|--------------------|
| NTTFS4985NF TAG | WDFN8 (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.

# NTTFS4985NF

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

| Parameter  | Symbol   | Value | Unit             |
|--|----------|-------|------------------|
| Single Pulse Drain-to-Source Avalanche Energy<br>( $T_J = 25^\circ\text{C}$ , $V_{DD} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ ,<br>$I_L = 32\text{ A}_{pk}$ , $L = 0.1\text{ mH}$ , $R_G = 25\ \Omega$ ) | $E_{AS}$ | 52    | mJ               |
| Lead Temperature for Soldering Purposes<br>(1/8" from case for 10 s)   | $T_L$    | 260   | $^\circ\text{C}$ |

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.

- Surface-mounted on FR4 board using 1 sq-in pad, 2 oz Cu.
- Surface-mounted on FR4 board using the minimum recommended pad size of 90 mm<sup>2</sup>.

## THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter   | Symbol          | Value | Unit               |
|---|-----------------|-------|--------------------|
| Junction-to-Case (Drain)                                | $R_{\theta JC}$ | 5.5   | $^\circ\text{C/W}$ |
| Junction-to-Ambient – Steady State (Note 3)             | $R_{\theta JA}$ | 46.4  |                    |
| Junction-to-Ambient – Steady State (Note 4)             | $R_{\theta JA}$ | 84.8  |                    |
| Junction-to-Ambient – ( $t \leq 10\text{ s}$ ) (Note 3) | $R_{\theta JA}$ | 21.4  |                    |

- Surface-mounted on FR4 board using 1 sq-in pad, 2 oz Cu.
- Surface-mounted on FR4 board using the minimum recommended pad size of 90 mm<sup>2</sup>.

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

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

### OFF CHARACTERISTICS

|   |                   |  |    |    |           |                      |
|---|-------------------|--|----|----|-----------|----------------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$   | 30 |    |           | V                    |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |  |    | 15 |           | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}$ ,<br>$V_{DS} = 24\text{ V}$  |    |    | 500       | $\mu\text{A}$        |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$ |    |    | $\pm 100$ | nA                   |

### ON CHARACTERISTICS (Note 5)

|  |                  |   |                     |     |      |                      |            |
|--|------------------|---|---------------------|-----|------|----------------------|------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$  | 1.2                 | 1.6 | 2.3  | V                    |            |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |   |                     | 5.2 |      | mV/ $^\circ\text{C}$ |            |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 10\text{ V}$                        | $I_D = 20\text{ A}$ |     | 2.8  | 3.5                  | m $\Omega$ |
|  |                  |   | $I_D = 10\text{ A}$ |     | 2.8  |                      |            |
|  |                  | $V_{GS} = 4.5\text{ V}$                       | $I_D = 20\text{ A}$ |     | 4.16 | 5.2                  |            |
|  |                  |   | $I_D = 10\text{ A}$ |     | 4.13 |                      |            |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = 1.5\text{ V}$ , $I_D = 10\text{ A}$ |                     | 34  |      | S                    |            |

### CHARGES AND CAPACITANCES

|                              |              |  |  |      |  |    |
|------------------------------|--------------|--|--|------|--|----|
| Input Capacitance            | $C_{iss}$    | $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ , $V_{DS} = 15\text{ V}$  |  | 2075 |  | pF |
| Output Capacitance           | $C_{oss}$    |  |  | 876  |  |    |
| Reverse Transfer Capacitance | $C_{rss}$    |  |  | 46   |  |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}$ , $V_{DS} = 15\text{ V}$ , $I_D = 20\text{ A}$ |  | 13.6 |  | nC |
| Threshold Gate Charge        | $Q_{G(TH)}$  |  |  | 2.0  |  |    |
| Gate-to-Source Charge        | $Q_{GS}$     |  |  | 5.8  |  |    |
| Gate-to-Drain Charge         | $Q_{GD}$     |  |  | 4.1  |  |    |

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.

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

# NTTFS4985NF

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

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

### CHARGES AND CAPACITANCES

|                   |              |   |  |      |  |    |
|-------------------|--------------|---|--|------|--|----|
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 20\text{ A}$ |  | 29.4 |  | nC |
|-------------------|--------------|---|--|------|--|----|

### SWITCHING CHARACTERISTICS (Note 6)

|                     |              |  |  |     |  |    |
|---------------------|--------------|--|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V},$<br>$I_D = 15\text{ A}, R_G = 3.0\ \Omega$ |  | 11  |  | ns |
| Rise Time           | $t_r$        |  |  | 24  |  |    |
| Turn-Off Delay Time | $t_{d(off)}$ |  |  | 20  |  |    |
| Fall Time           | $t_f$        |  |  | 5.4 |  |    |
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$<br>$I_D = 15\text{ A}, R_G = 3.0\ \Omega$  |  | 8.5 |  | ns |
| Rise Time           | $t_r$        |  |  | 24  |  |    |
| Turn-Off Delay Time | $t_{d(off)}$ |  |  | 25  |  |    |
| Fall Time           | $t_f$        |  |  | 4.0 |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |          |   |                           |      |     |    |
|-------------------------|----------|---|---------------------------|------|-----|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V},$<br>$I_S = 2\text{ A}$  | $T_J = 25^\circ\text{C}$  | 0.4  | 0.7 | V  |
|                         |          |   | $T_J = 125^\circ\text{C}$ | 0.33 |     |    |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, d_{IS}/d_t = 100\text{ A}/\mu\text{s},$<br>$I_S = 2\text{ A}$ |                           | 35.7 |     | ns |
| Charge Time             | $t_a$    |   |                           | 18.2 |     |    |
| Discharge Time          | $t_b$    |   |                           | 17.5 |     |    |
| Reverse Recovery Charge | $Q_{RR}$ |   |                           | 32   |     | nC |

### PACKAGE PARASITIC VALUES

|                   |       |                          |  |      |  |          |
|-------------------|-------|--------------------------|--|------|--|----------|
| Source Inductance | $L_S$ | $T_A = 25^\circ\text{C}$ |  | 0.65 |  | nH       |
| Drain Inductance  | $L_D$ |                          |  | 0.20 |  |          |
| Gate Inductance   | $L_G$ |                          |  | 1.5  |  |          |
| Gate Resistance   | $R_G$ |                          |  | 1.0  |  | $\Omega$ |

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.

5. Pulse Test: pulse width = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$ .

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

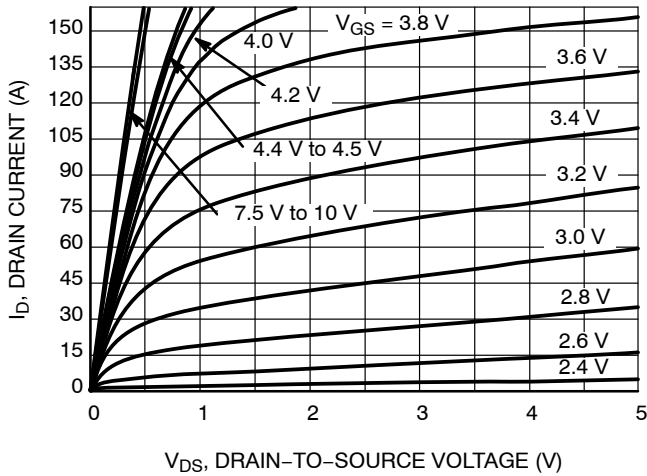


Figure 1. On-Region Characteristics

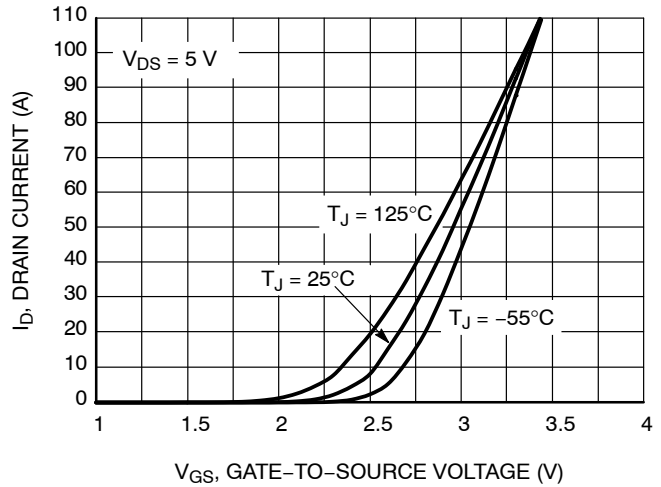


Figure 2. Transfer Characteristics

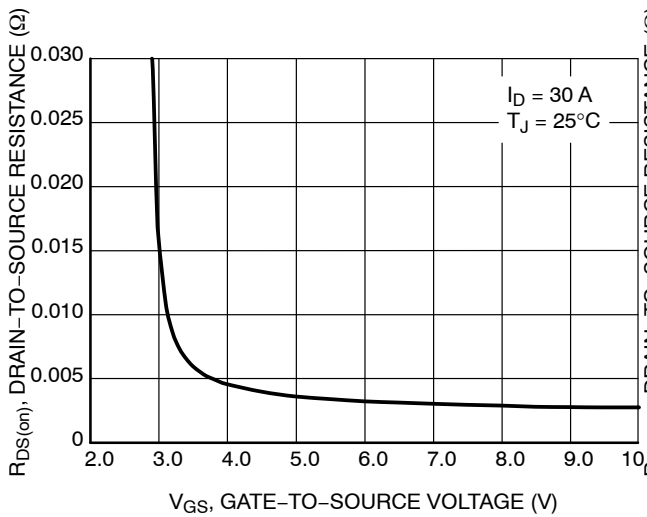


Figure 3. On-Resistance vs. Gate-to-Source Voltage

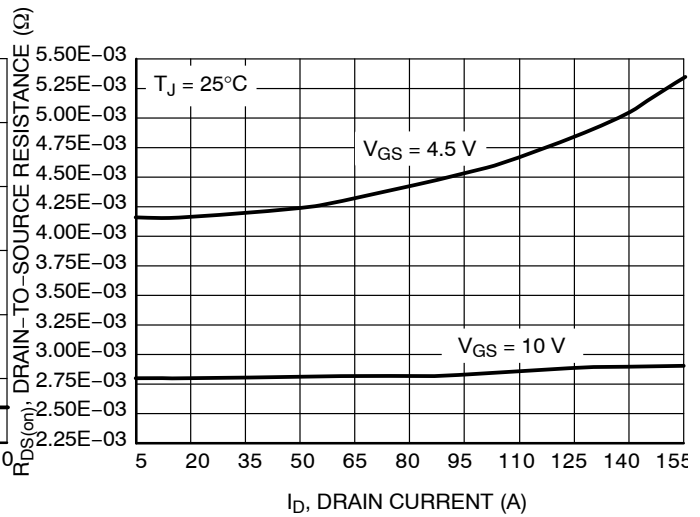


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

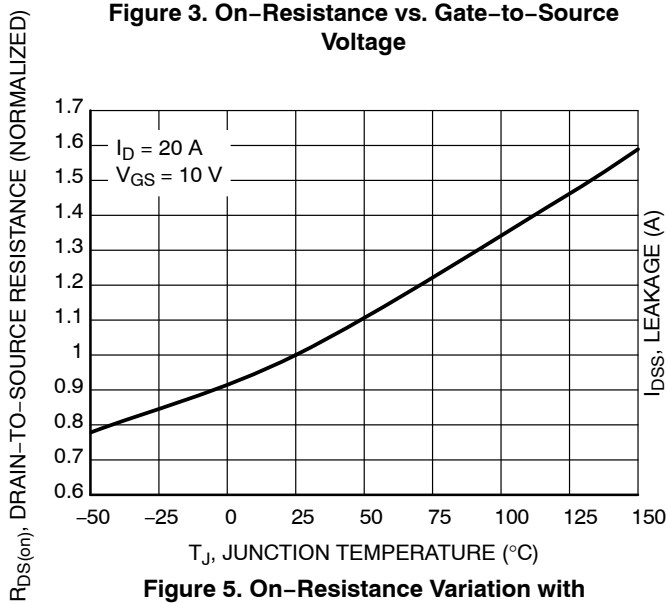


Figure 5. On-Resistance Variation with Temperature

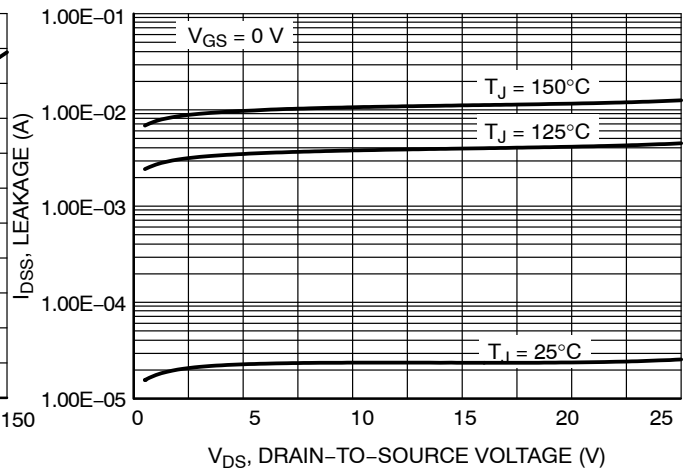


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

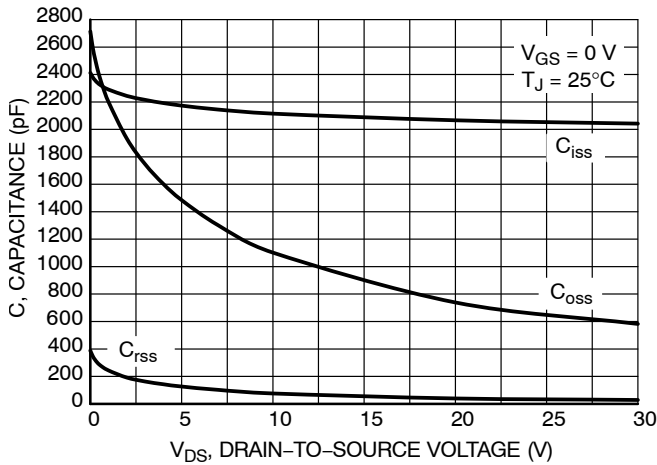


Figure 7. Capacitance Variation

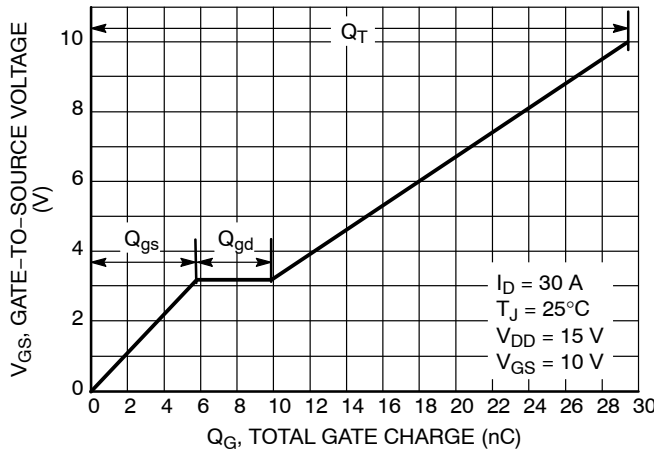


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

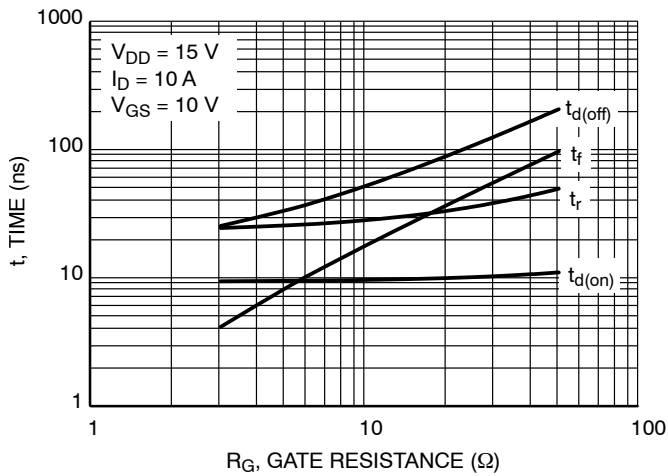


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

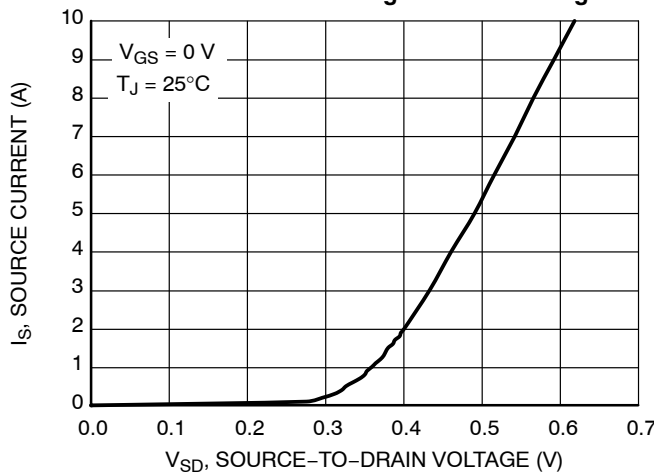


Figure 10. Diode Forward Voltage vs. Current

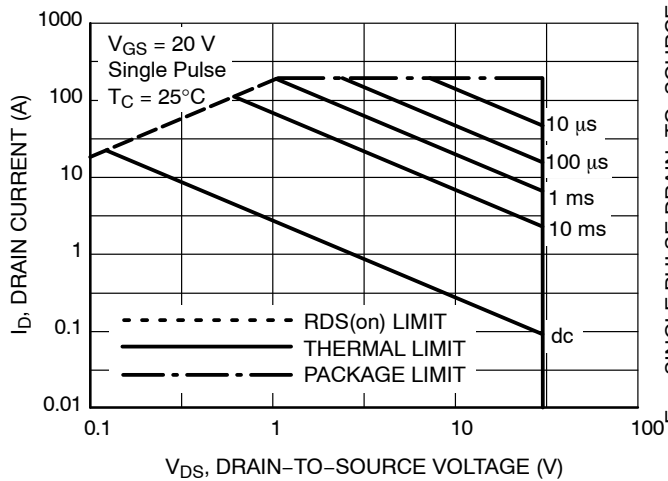


Figure 11. Maximum Rated Forward Biased Safe Operating Area

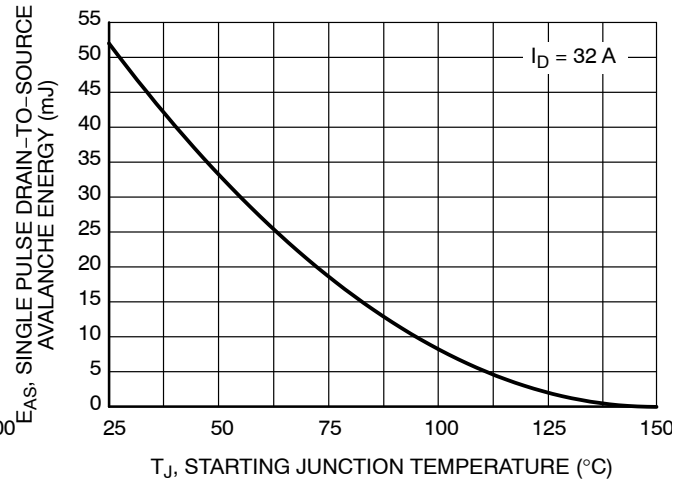


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

# NTTFS4985NF

## TYPICAL PERFORMANCE CURVES

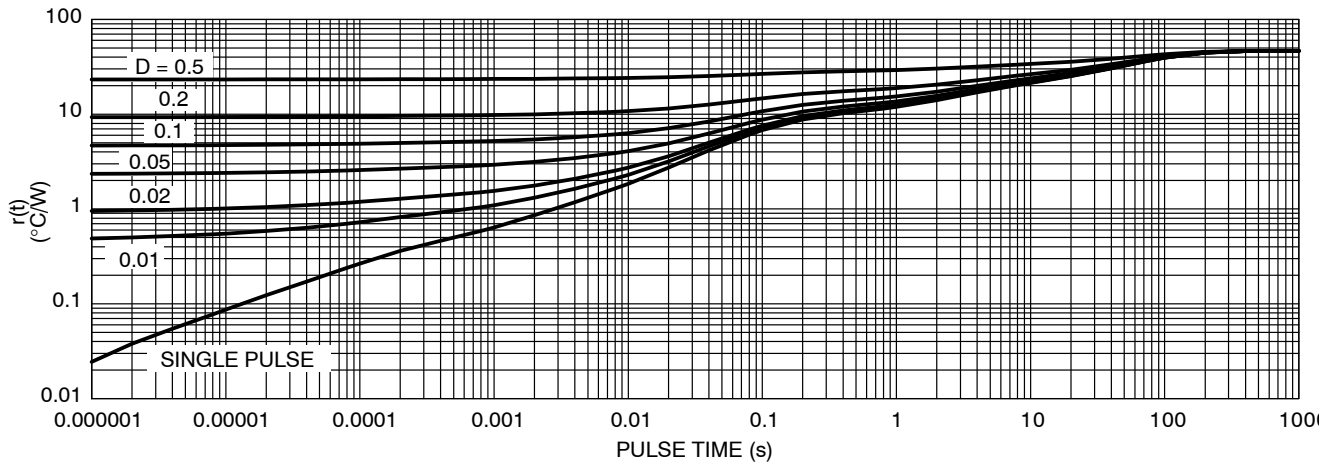


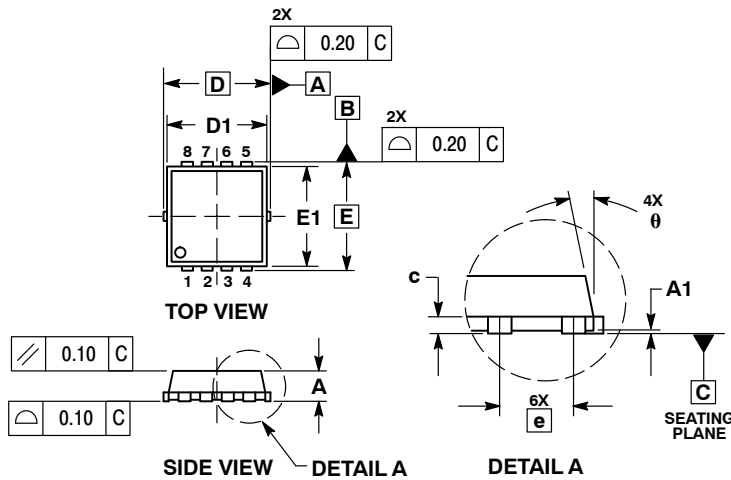
Figure 13. Thermal Response



SCALE 2:1

WDFN8 3.3x3.3, 0.65P  
CASE 511AB  
ISSUE D

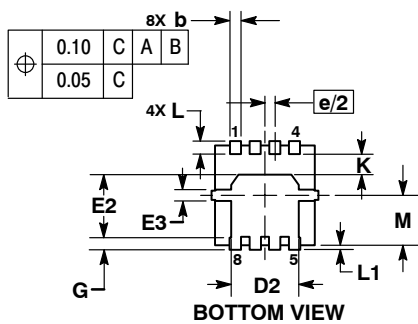
DATE 23 APR 2012



NOTES:

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

| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | 0.70        | 0.75 | 0.80 | 0.028     | 0.030 | 0.031 |
| A1  | 0.00        | ---  | 0.05 | 0.000     | ---   | 0.002 |
| b   | 0.23        | 0.30 | 0.40 | 0.009     | 0.012 | 0.016 |
| c   | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.010 |
| D   | 3.30 BSC    |      |      | 0.130 BSC |       |       |
| D1  | 2.95        | 3.05 | 3.15 | 0.116     | 0.120 | 0.124 |
| D2  | 1.98        | 2.11 | 2.24 | 0.078     | 0.083 | 0.088 |
| E   | 3.30 BSC    |      |      | 0.130 BSC |       |       |
| E1  | 2.95        | 3.05 | 3.15 | 0.116     | 0.120 | 0.124 |
| E2  | 1.47        | 1.60 | 1.73 | 0.058     | 0.063 | 0.068 |
| E3  | 0.23        | 0.30 | 0.40 | 0.009     | 0.012 | 0.016 |
| e   | 0.65 BSC    |      |      | 0.026 BSC |       |       |
| G   | 0.30        | 0.41 | 0.51 | 0.012     | 0.016 | 0.020 |
| K   | 0.65        | 0.80 | 0.95 | 0.026     | 0.032 | 0.037 |
| L   | 0.30        | 0.43 | 0.56 | 0.012     | 0.017 | 0.022 |
| L1  | 0.06        | 0.13 | 0.20 | 0.002     | 0.005 | 0.008 |
| M   | 1.40        | 1.50 | 1.60 | 0.055     | 0.059 | 0.063 |
| θ   | 0°          | ---  | 12°  | 0°        | ---   | 12°   |

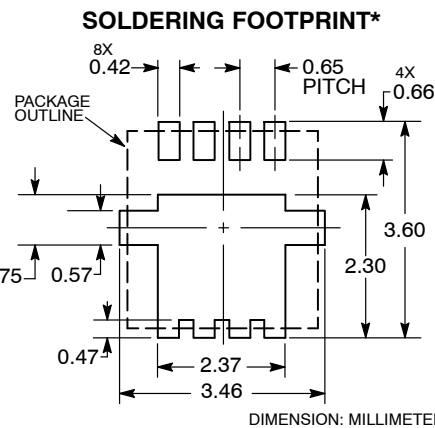


GENERIC MARKING DIAGRAM\*



- XXXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week
- = Pb-Free Package

\*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.



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

|                  |                      |  |
|------------------|----------------------|--|
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| DESCRIPTION:     | WDFN8 3.3X3.3, 0.65P | PAGE 1 OF 1  |

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