

MOSFET - Power, Single N-Channel, WDFN8

25 V, 1.3 mΩ, 150 A

NTTFS1D8N02P1E

Features

- Small Footprint for Compact Design
- 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

- DC-DC Converters
- Power Load Switch
- Notebook Battery Management

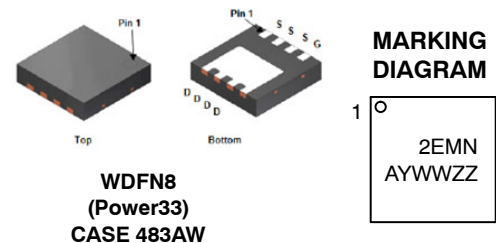
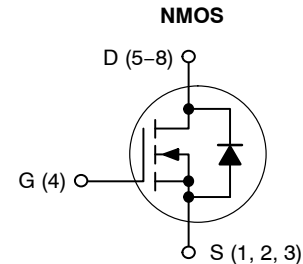
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | | Symbol | Value | Unit | |
|---|--|--------------------------|-------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 25 | V | |
| Gate-to-Source Voltage | | V_{GS} | +16, -12 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 1) | Steady State | $T_C = 25^\circ\text{C}$ | I_D | 150 | A |
| | | $T_C = 85^\circ\text{C}$ | | 108 | |
| Power Dissipation $R_{\theta JC}$ (Note 1) | Steady State | $T_C = 25^\circ\text{C}$ | P_D | 46 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 36 | A |
| | | $T_A = 85^\circ\text{C}$ | | 26 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 3) | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 2.7 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 20 | A |
| | | $T_A = 85^\circ\text{C}$ | | 14 | |
| Power Dissipation $R_{\theta JA}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 0.8 | W |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 508 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 48.3 \text{ A}, L = 0.1 \text{ mH}$) (Note 4) | | E_{AS} | 117 | mJ | |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ | |
| Lead Temperature Soldering Reflow for Soldering Purposes (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.

1. Surface-mounted on FR4 board using a 1 in² pad size, 2 oz Cu pad.
2. Surface-mounted on FR4 board using minimum pad size, 2 oz Cu pad.
3. The entire application environment impacts the thermal resistance values shown. They are not constants and are only valid for the particular conditions noted. Actual continuous current will be limited by thermal & electro-mechanical application board design. $R_{\theta CA}$ is determined by the user's board design.
4. 100% UIS tested at $L = 0.1 \text{ mH}, I_{AV} = 32 \text{ A}$.

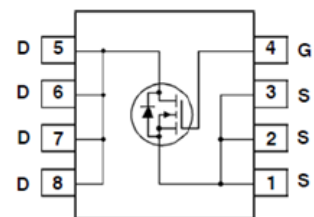
| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 25 V | 1.3 mΩ @ 10 V | 150 A |
| | 1.8 mΩ @ 4.5 V | |



WDFN8 (Power33) CASE 483AW

- 2EMN = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week
- ZZ = Assembly Lot Code

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|------|
| Junction-to-Case – Steady State (Note 1) | $R_{\theta JC}$ | 2.7 | °C/W |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 47 | |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 152 | |

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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$ | 25 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 1\text{ mA}$, ref to 25°C | | 16 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 10 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = +16\text{ V}, -12\text{ V}$ | | | ± 100 | $\pm\text{nA}$ |

ON CHARACTERISTICS (Note 5)

| | | | | | | |
|-----------------------------------|------------------|--|---------------------|------|-----|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 660\ \mu\text{A}$ | 1.2 | | 2.0 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 660\ \mu\text{A}$, ref to 25°C | | -4.4 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 17\text{ A}$ | 1.05 | 1.3 | m Ω |
| | | $V_{GS} = 4.5\text{ V}$ | $I_D = 13\text{ A}$ | 1.3 | 1.8 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 17\text{ A}$ | | 118 | | S |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.6 | | Ω |

CHARGES & CAPACITANCES

| | | | | | | |
|-----------------------|------------|--|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, V_{DS} = 13\text{ V}, f = 1\text{ MHz}$ | | 2980 | | pF |
| Output Capacitance | C_{OSS} | | | 805 | | |
| Reverse Capacitance | C_{RSS} | | | 41 | | |
| Total Gate Charge | $Q_G(TOT)$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 13\text{ V}; I_D = 17\text{ A}$ | | 17.1 | | nC |
| Threshold Gate Charge | $Q_G(TH)$ | | | 4 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 2.7 | | |
| Gate-to-Source Charge | Q_{GS} | | | 7 | | |
| Total Gate Charge | $Q_G(TOT)$ | $V_{GS} = 10\text{ V}, V_{DS} = 13\text{ V}; I_D = 17\text{ A}$ | | 39 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 5)

| | | | | | | |
|---------------------|--------------|---|--|------|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 4.5\text{ V}, V_{DD} = 13\text{ V}, I_D = 17\text{ A}, R_G = 6\ \Omega$ | | 21.3 | | ns |
| Rise Time | t_r | | | 8 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 30 | | |
| Fall Time | t_f | | | 7 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 5)

| | | | | | | |
|---------------------|--------------|--|--|-----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DD} = 13\text{ V}, I_D = 17\text{ A}, R_G = 6\ \Omega$ | | 13 | | ns |
| Rise Time | t_r | | | 2.8 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 44 | | |
| Fall Time | t_f | | | 5.4 | | |

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|--|---------------------------|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 17\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.77 | 1.2 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.61 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, di/dt = 100\text{ A}/\mu\text{s}, I_S = 17\text{ A}$ | | | 34 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | | 22 | | 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.

5. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

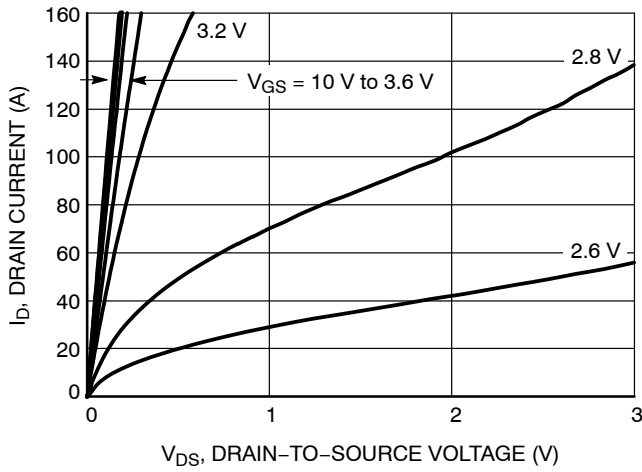


Figure 1. On-Region Characteristics

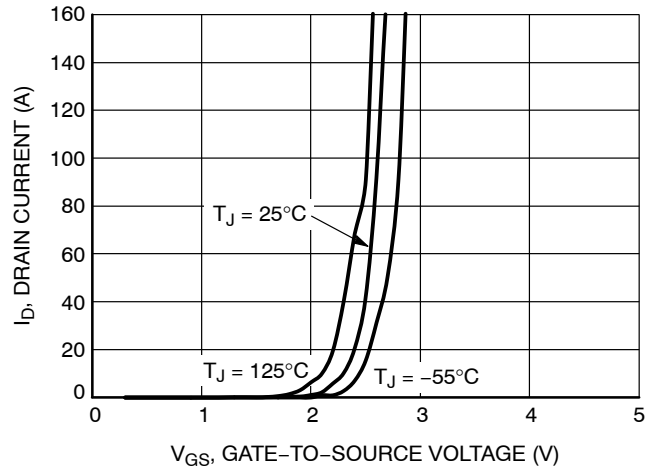


Figure 2. Transfer Characteristics

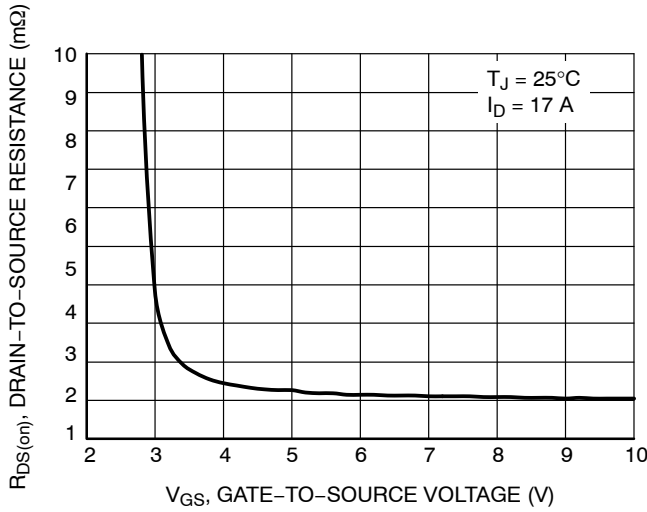


Figure 3. On-Resistance vs. Gate-to-Source Voltage

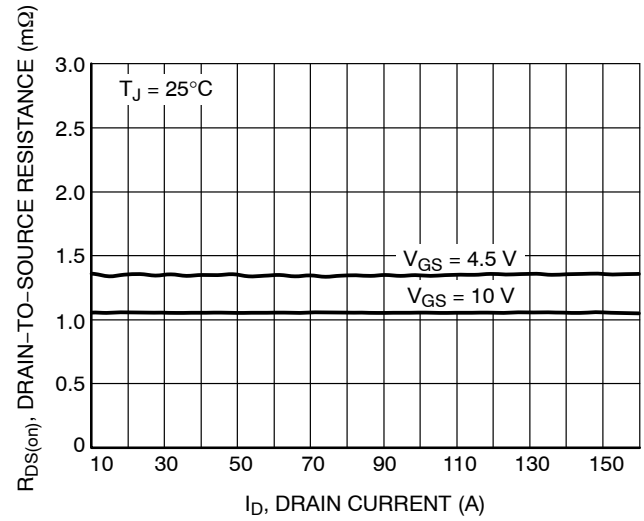


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

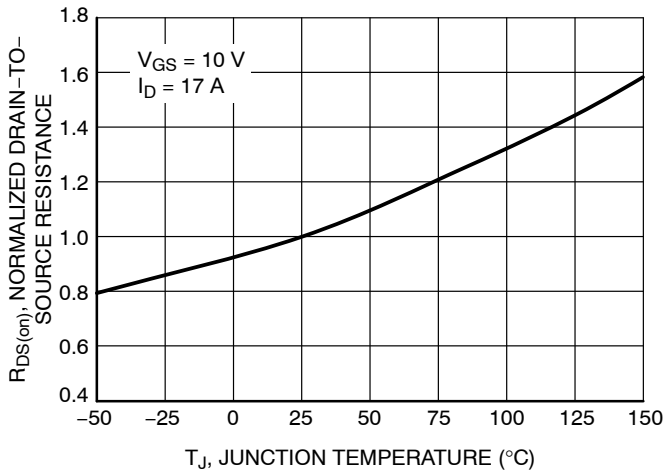


Figure 5. On-Resistance Variation with Temperature

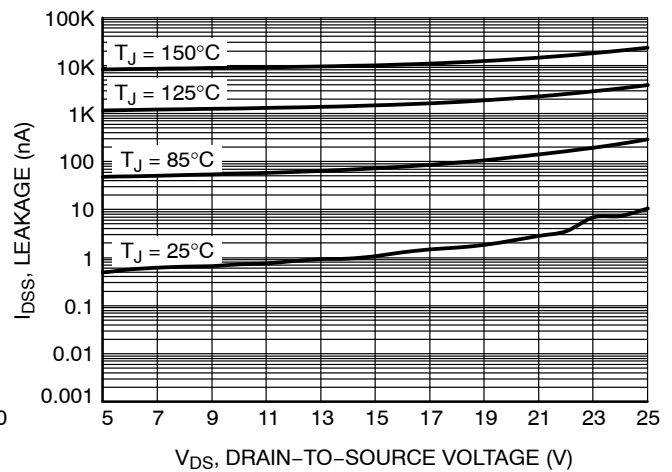


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

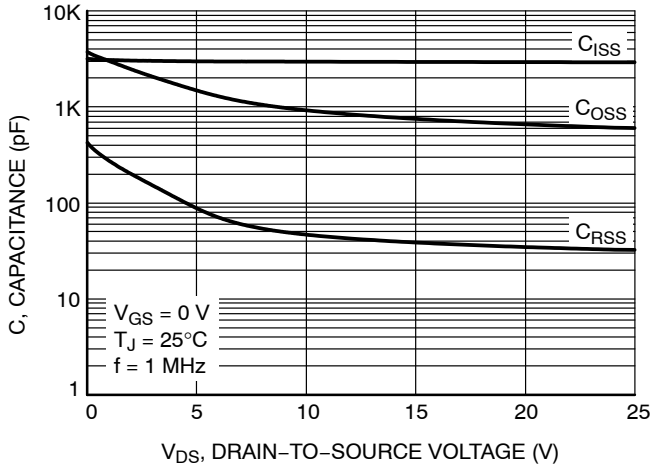


Figure 7. Capacitance Variation

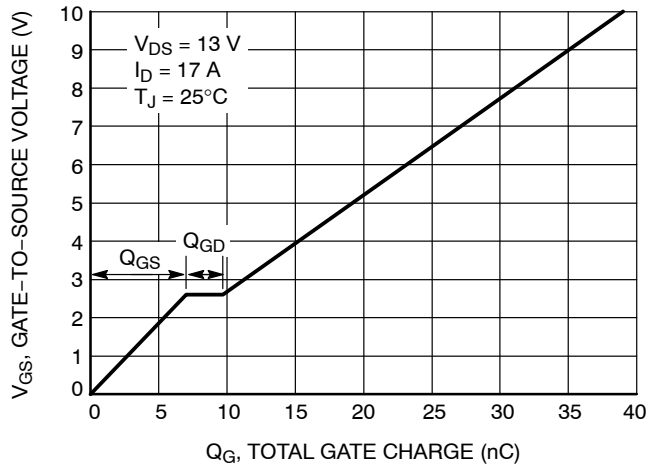


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

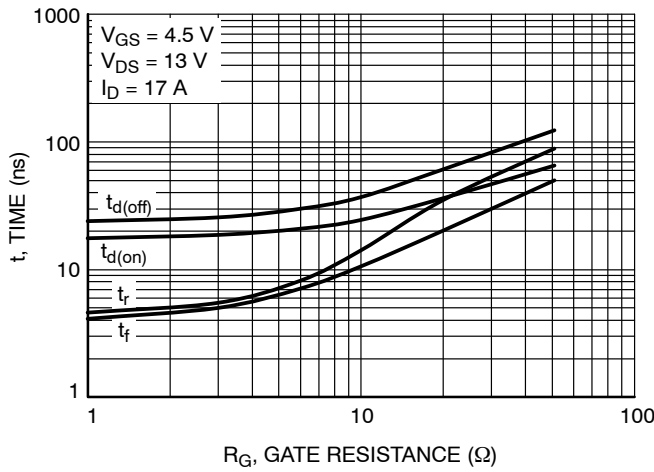


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

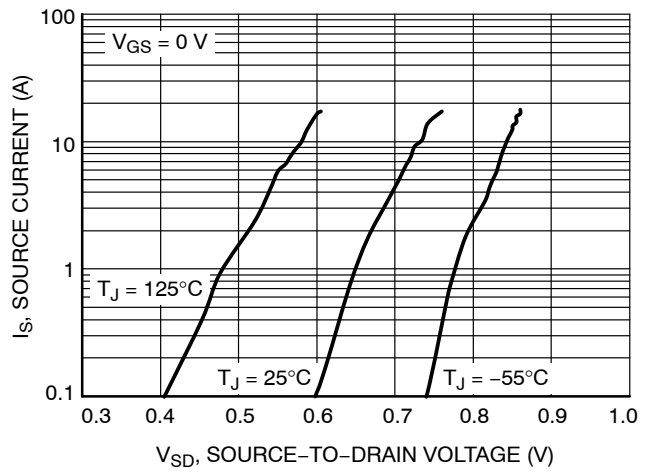


Figure 10. Diode Forward Voltage vs. Current

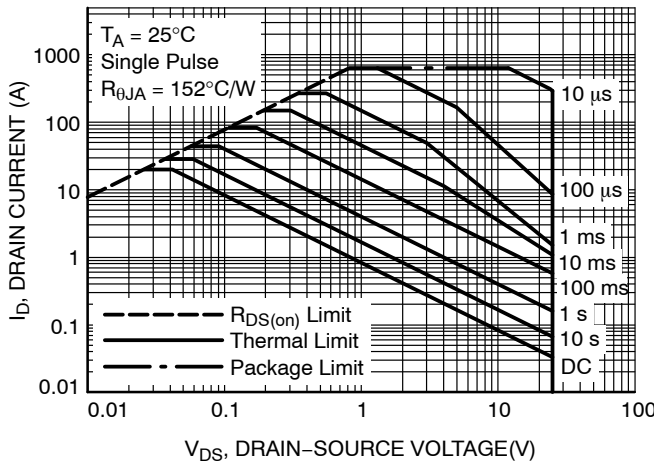


Figure 11. Safe Operating Area

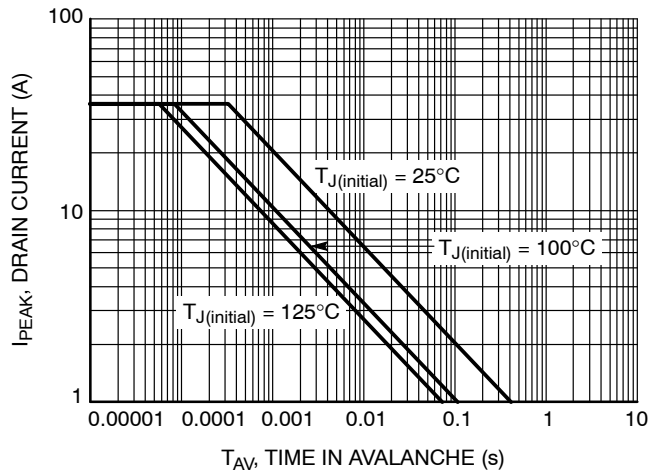


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

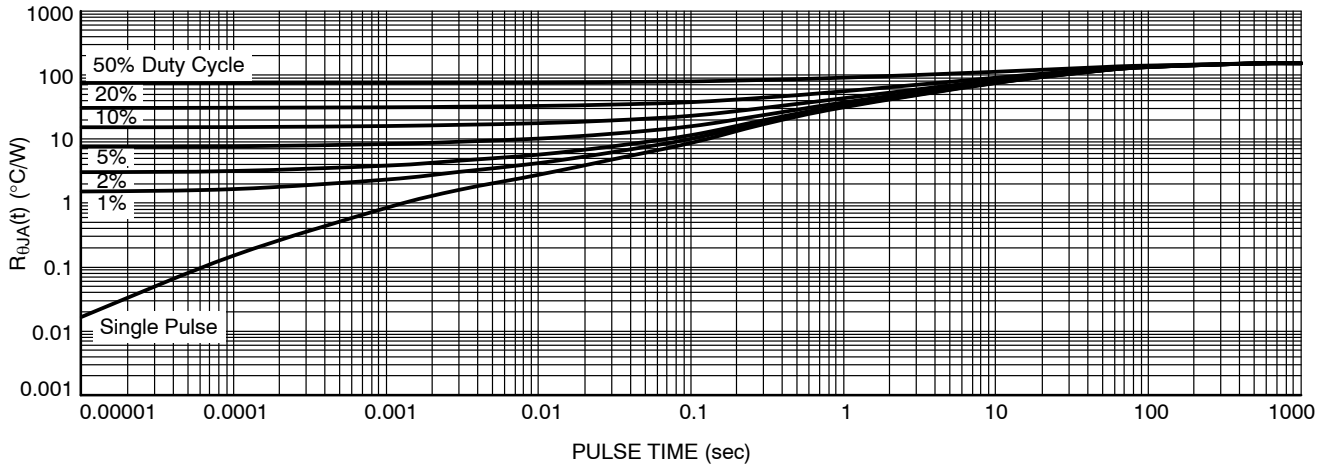


Figure 13. Thermal Characteristics

ORDERING INFORMATION

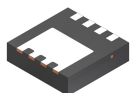
| Device | Marking | Package | Shipping [†] |
|----------------|---------|--------------------|-----------------------|
| NTTFS1D8N02P1E | 2EMN | WDFN8 (Pb-Free) | 3000 / Tape & Reel |

[†]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.

MECHANICAL CASE OUTLINE

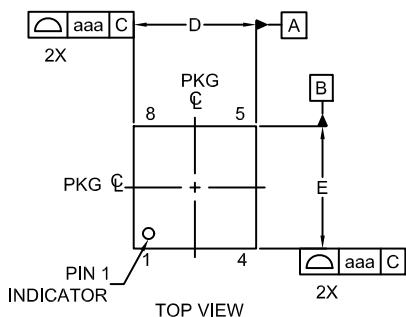
PACKAGE DIMENSIONS

ON Semiconductor®

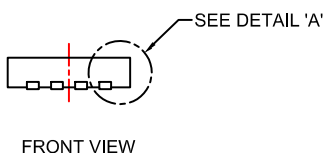


WDFN8 3.3X3.3, 0.65P
CASE 483AW
ISSUE A

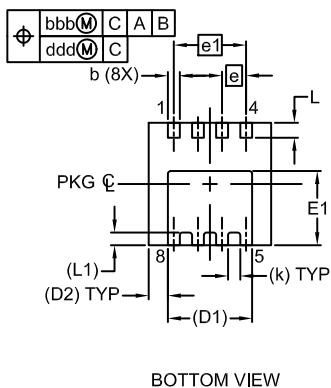
DATE 10 SEP 2019



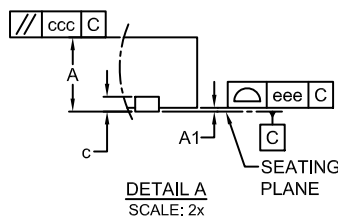
TOP VIEW



FRONT VIEW

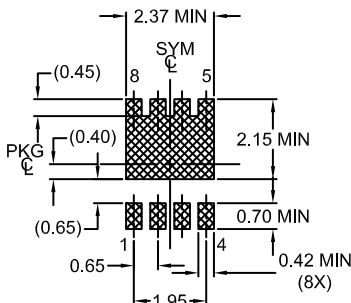


BOTTOM VIEW



DETAIL A
SCALE: 2x

LAND PATTERN RECOMMENDATION*



*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS.
2. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. 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.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| A1 | - | - | 0.05 |
| b | 0.27 | 0.32 | 0.37 |
| c | 0.15 | 0.20 | 0.25 |
| D | 3.20 | 3.30 | 3.40 |
| D1 | 2.27 REF | | |
| D2 | 0.52 REF | | |
| E | 3.20 | 3.30 | 3.40 |
| E1 | 1.85 | 1.95 | 2.05 |
| e | 0.65 BSC | | |
| e1 | 1.95 BSC | | |
| k | 0.33 REF | | |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.34 REF | | |
| aaa | 0.10 | | |
| bbb | 0.10 | | |
| ccc | 0.10 | | |
| ddd | 0.05 | | |
| eee | 0.05 | | |

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
 A = Assembly Location
 Y = Year
 WW = Work Week

*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.

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

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