# FDMC8878

# N-Channel POWERTRENCH® MOSFET

## 30 V, 16.5 A, 14 mΩ

This N−Channel MOSFET is a rugged gate version of ON Semiconductor's advanced PowerTrench process. It has been optimized for power management applications.

### Features

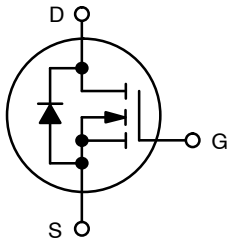
- $R_{DS(on)}$ = 14 mΩ (Max.) @ $V_{GS}$ = 10 V, $I_D$ = 9.6 A
- $R_{DS(on)}$ = 17 mΩ (Max.) @ $V_{GS}$ = 4.5 V, $I_D$ = 8.7 A
- Low Profile − 0.8 mm Max in MLP 3.3 x 3.3
- These Devices are Pb−Free and are RoHS Compliant

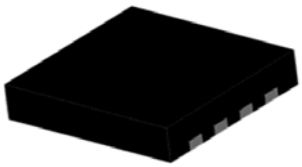
### Application

- DC − DC Conversion

ON Semiconductor®

www.onsemi.com



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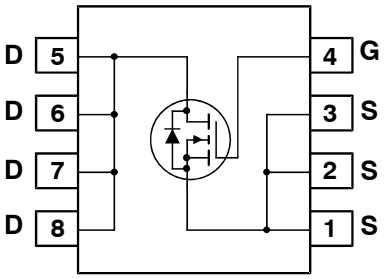
**CASE 511DH**




### MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain−to−Source Voltage | | $V_{DS}$ | 30 | V |
| Gate−to−Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$ = 25°C (Package limited) | $I_D$ | 16.5 | A |
| | $T_C$ = 25°C (Silicon limited) | | 38 | |
| | $T_A$ = 25°C (Figure 1) | | 9.6 | |
| Drain Current | Pulsed | $I_D$ | 60 | A |
| Power Dissipation | $T_C$ = 25°C | $P_D$ | 31 | W |
| | $T_A$ = 25°C (Figure 1) | | 2.1 | |
| Operating and Storage Junction Temperature Range | | $T_J$, $T_{STG}$ | −55 to +150 | °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.

### THERMAL CHARACTERISTICS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Case | $R_{\theta JC}$ | 4 | °C/W |
| Thermal Resistance, Junction−to−Ambient (Figure 1) | $R_{\theta JA}$ | 60 | |

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 1 of this data sheet.

### PACKAGE MARKING AND ORDERING INFORMATION

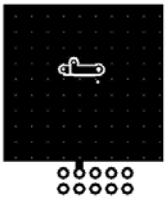
| Part Number | Top Mark | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDMC8878 | FDMC8878 | MLP 3.3 x 3.3 | 13″ | 12 mm | 3000 units |

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

| Symbol | Parameter | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain−to−Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 30 | – | – | V |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | – | 20 | – | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V | – | – | 1 | μA |
| | | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V, $T_J$ = 125°C | – | – | 100 | |
| $I_{GSS}$ | Gate−to−Source Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | – | – | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate−to−Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = $V_{DS}$ | 1 | 1.7 | 3 | V |
| $\Delta BV_{DSS}/\Delta T_J$ | Gate−to−Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | – | −5.7 | – | mV/°C |
| $R_{DS(on)}$ | Drain−to−Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 9.6 A | – | 9.6 | 14.0 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 8.7 A | – | 12.1 | 17.0 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 9.6 A, $T_J$ = 125°C | – | 13.5 | 20.0 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 9.6 A | – | 35 | – | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | – | 1000 | 1230 | pF |
| $C_{oss}$ | Output Capacitance | | – | 183 | 255 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 118 | 180 | pF |
| $R_g$ | Reverse Transfer Capacitance | f = 1 MHz | – | 1.1 | – | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(on)}$ | Turn−On Delay Time | $V_{DD}$ = 15 V, $I_D$ = 9.6 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | – | 8 | 16 | ns |
| $t_r$ | Rise Time | | – | 4 | 10 | |
| $t_{d(off)}$ | Turn−Off Delay Time | | – | 20 | 36 | |
| $t_f$ | Fall Time | | – | 3 | 10 | |
| $Q_{g(tot)}$ | Total Gate Charge | $V_{GS}$ = 10 V, $V_{DD}$ = 15 V, $I_D$ = 9.6 A | – | 18 | 26 | nC |
| $Q_{gs}$ | Gate−to−Source Gate Charge | | – | 2.8 | – | |
| $Q_{gd}$ | Gate−to−Drain “Miller” Charge | | – | 3.9 | – | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | |
| $V_{SD}$ | Source−to−Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 9.6 A (Note 2) | – | 0.8 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 9.6 A, di/dt = 100 A/μs | – | 23 | 35 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | – | 14 | 21 | 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.

1. $R_{\theta JA}$ is determined with the device mounted on a 1 $in^2$ pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR−4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user’s board design.



a. 60°C/W when mounted on a 1 $in^2$ pad of 2 oz copper

**Figure 1.**

b. 135°C/W when mounted on a minimum pad of 2 oz copper

**Figure 2.**

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

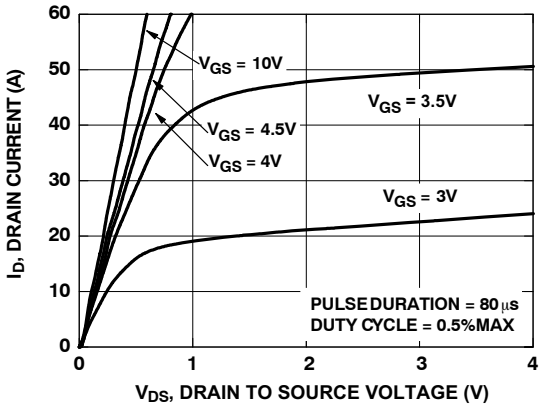



**Figure 3. Gate Charge Characteristics**

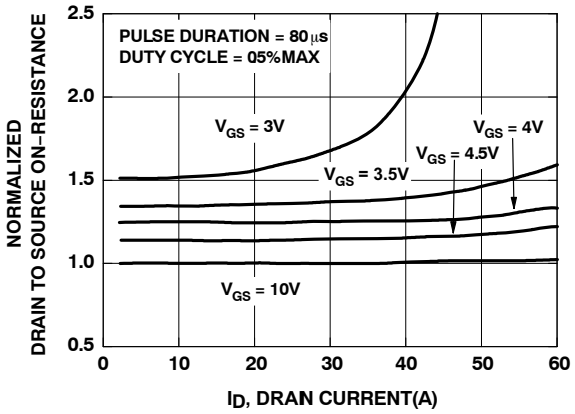



**Figure 4. Capacitance vs. Drain to Source Voltage**

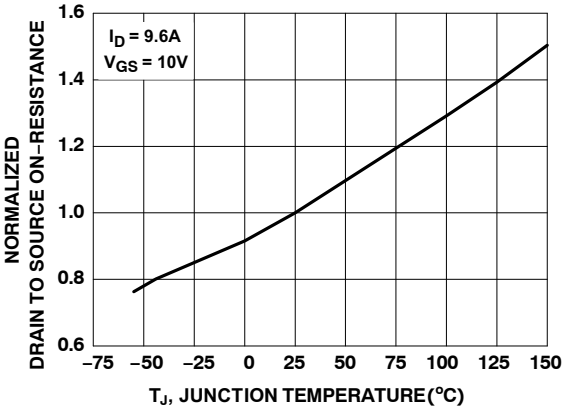



**Figure 5. Unclamped Inductive Switching Capability**

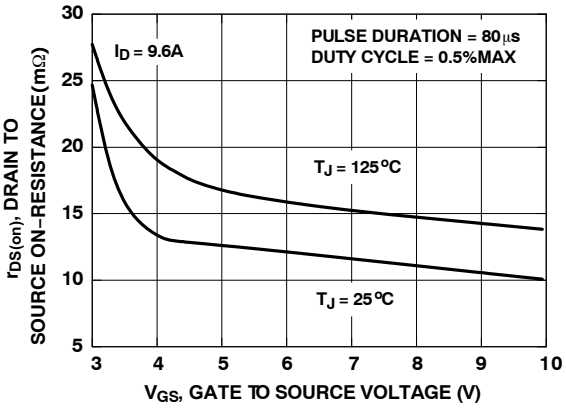



**Figure 6. Maximum Continuous Drain Current vs. Ambient Temperature**

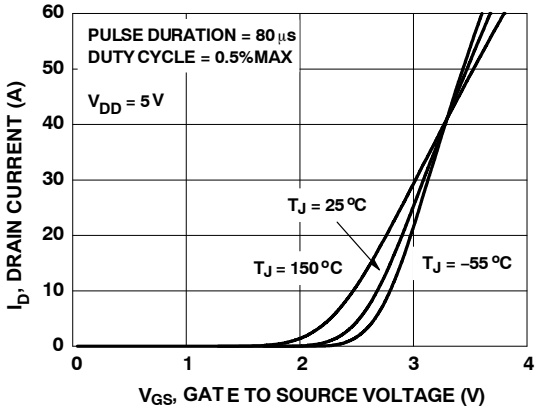



**Figure 7. Forward Bias Safe Operating Area**

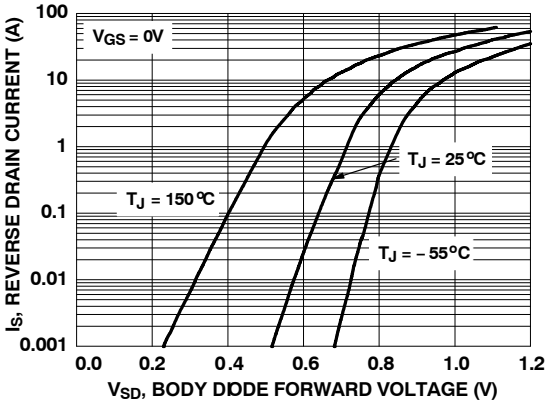



**Figure 8. Single Pulse Maximum Power Dissipation**

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

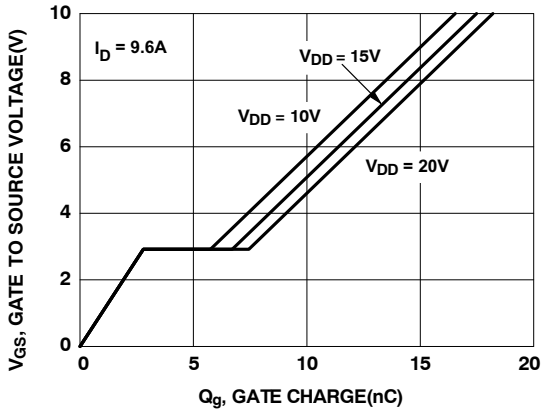



**Figure 9. On−Region Characteristics**

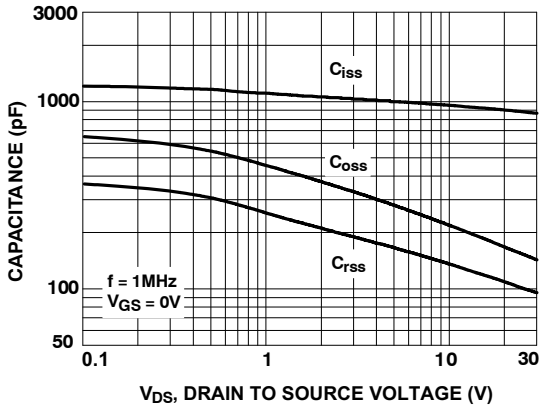



**Figure 10. Transfer Characteristics**

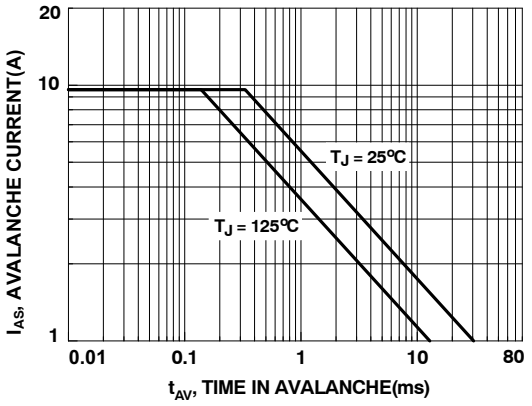



**Figure 11. On−Resistance Variation vs. Drain Current and Gate Voltage**

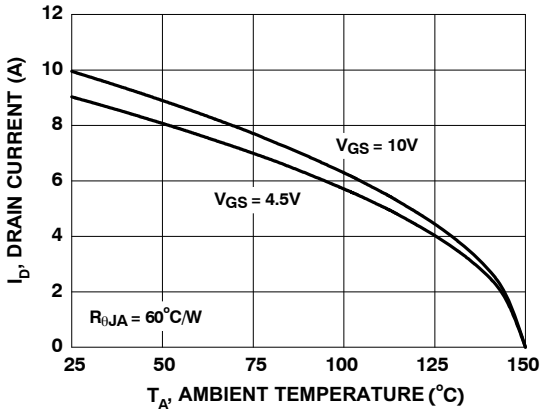



**Figure 12. Body Diode Forward Voltage Variation vs. Source Current and Temperature**

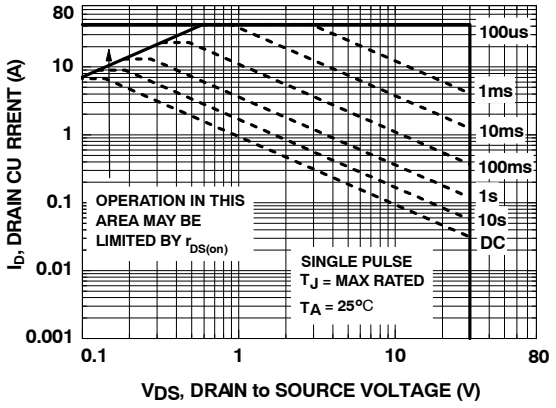



**Figure 13. Capacitance Characteristics**

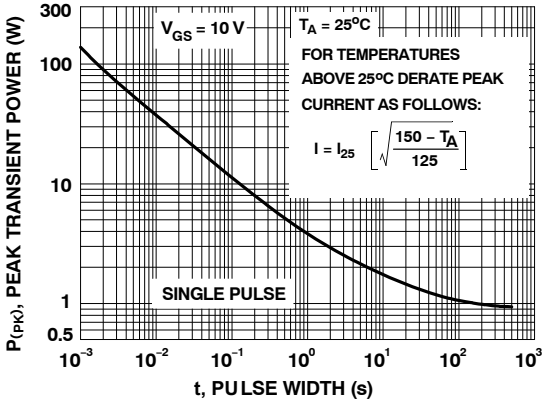



**Figure 14. Gate Charge Characteristics**

## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

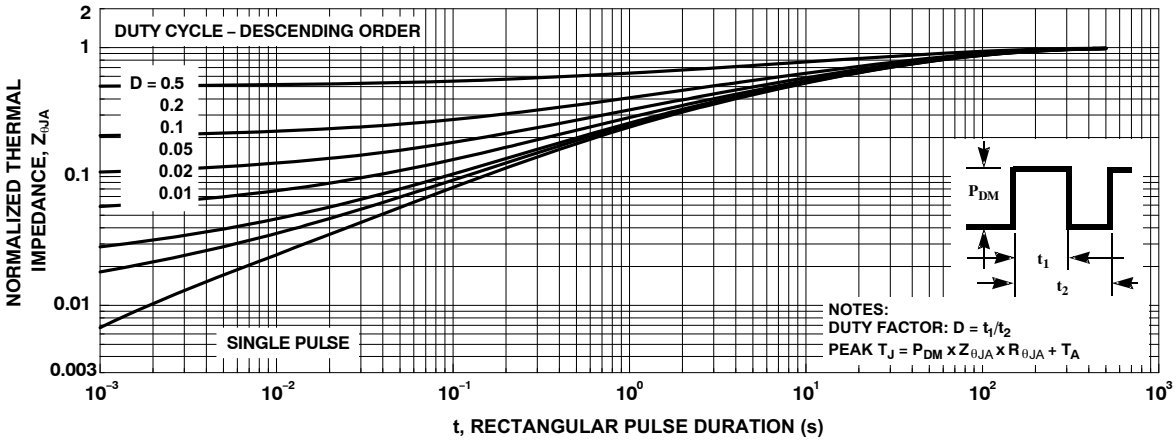



**Figure 15. Transient Thermal Response Curve**

**WDFN8 3.3x3.3, 0.65P**
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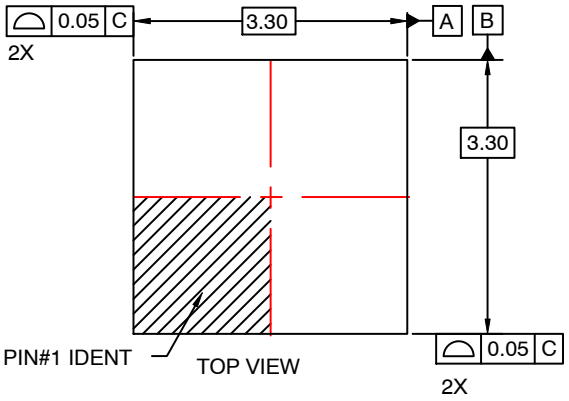
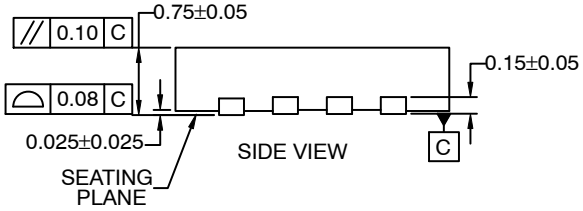
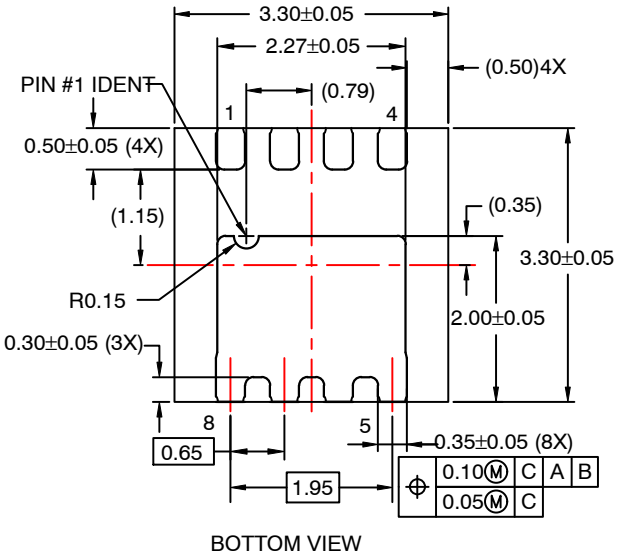
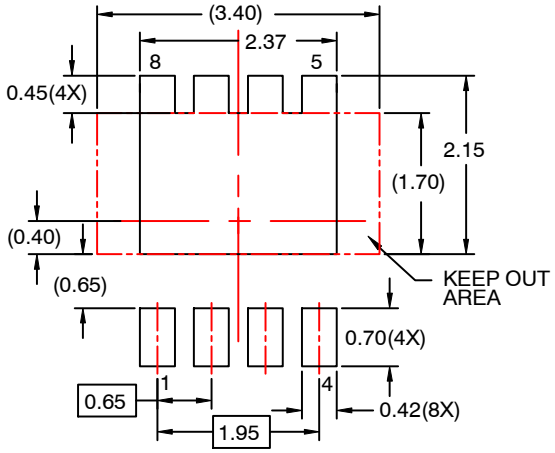



BOTTOM VIEW




RECOMMENDED LAND PATTERN

NOTES:

A. DOES NOT CONFORM TO JEDEC REGISTRATION MO−229

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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