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FAIRCHILD SEMICONDUCTOR®

February 2009

# FDS8842NZ

## N-Channel PowerTrench® MOSFET

### 40 V, 14.9 A, 7.0 mΩ

## Features

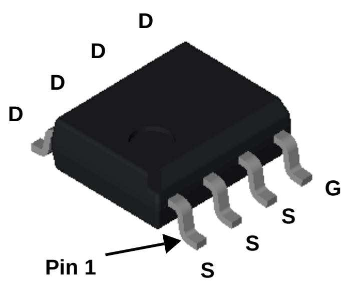
- Max $r_{DS(on)}$ = 7.0 mΩ at $V_{GS}$ = 10 V, $I_D$ = 14.9 A
- Max $r_{DS(on)}$ = 11.6 mΩ at $V_{GS}$ = 4.5 V, $I_D$ = 11.6 A
- HBM ESD protection level of 4.4 kV typical(note 3)
- High performance trench technology for extremely low $r_{DS(on)}$ and fast switching
- High power and current handling capability
- Termination is Lead-free and RoHS Compliant

## General Description

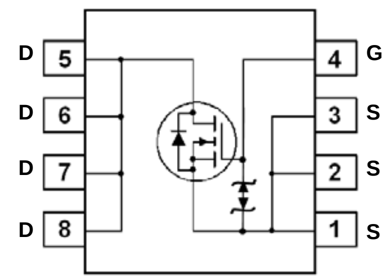
The FDS8842NZ has been designed to minimize losses in power conversion application. Advancements in both silicon and package technologies have been combined to offer the lowest $r_{DS(on)}$ while maintaining excellent switching performance.

## Applications

- Synchronous Buck for Notebook Vcore and Server
- Notebook Battery
- Load Switch




SO-8




## MOSFET Maximum Ratings $T_A$ = 25 °C unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | 40 | V |
| $V_{GS}$ | Gate to Source Voltage | ±20 | V |
| $I_D$ | Drain Current -Continuous | 14.9 | A |
| | -Pulsed | 93 | |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note 4) | 253 | mJ |
| $P_D$ | Power Dissipation $T_A$ = 25 °C (Note 1a) | 2.5 | W |
| | Power Dissipation $T_A$ = 25 °C (Note 1b) | 1.0 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | °C |

### Thermal Characteristics

| | | | |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1) | 25 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | |

### Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDS8842NZ | FDS8842NZ | SO8 | 13 ” | 12 mm | 2500 units |

## Electrical Characteristics $T_J$ = 25 °C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|

### Off Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 40 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25 °C | | 35 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 32 V, $V_{GS}$ = 0 V | | | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | | | ±10 | μA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$, $I_D$ = 250 μA | 1.0 | 1.9 | 3.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, referenced to 25 °C | | -6 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 14.9 A | | 5.6 | 7.0 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 11.6 A | | 6.7 | 11.6 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 14.9 A, $T_J$ =125 °C | | 8.9 | 11.1 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 14.9 A | | 111 | | S |

### Dynamic Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | | 2890 | 3845 | pF |
| $C_{oss}$ | Output Capacitance | | | 340 | 455 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 220 | 330 | pF |
| $R_g$ | Gate Resistance | f = 1 MHz | | 0.8 | | Ω |

### Switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 20 V, $I_D$ = 14.9 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | | 13 | 23 | ns |
| $t_r$ | Rise Time | | | 7 | 14 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 34 | 54 | ns |
| $t_f$ | Fall Time | | | 5 | 10 | ns |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 10 V; $V_{DD}$ = 20 V, $I_D$ = 14.9 A | | 52 | 73 | nC |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 V to 5 V | | 27 | 38 | nC |
| $Q_{gs}$ | Gate to Source Charge | | | 8.6 | | nC |
| $Q_{gd}$ | Gate to Drain "Miller" Charge | | | 9.7 | | nC |

### Drain-Source Diode Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 14.9 A | | 0.8 | 1.2 | V |
| | | $V_{GS}$ = 0 V, $I_S$ = 2.1 A | | 0.7 | 1.2 | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 14.9 A, di/dt = 100 A/μs | | 26 | 42 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 15 | 27 | nC |

NOTES:

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) 50 °C/W when mounted on a 1 in$^2$ pad of 2 oz copper.

b) 125 °C/W when mounted on a minimum pad.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. The diode connected between the gate and source servers only as protection against ESD. No gate overvoltage rating is implied.
4. Starting $T_J$ = 25 °C, L = 3 mH, $I_{AS}$ = 13 A, $V_{DD}$ = 40 V, $V_{GS}$ = 10 V.

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

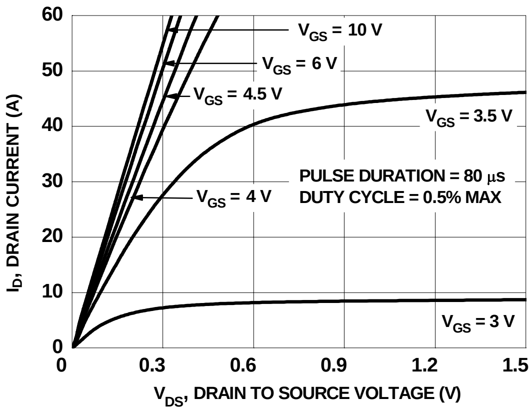



**Figure 1. On-Region Characteristics**

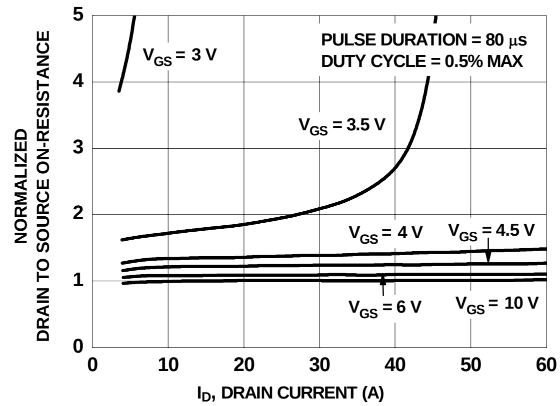



**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**

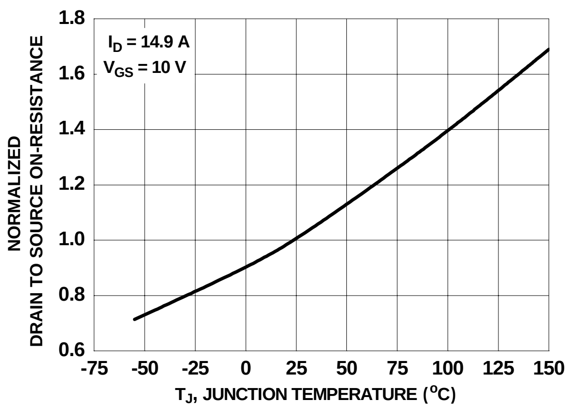



**Figure 3. Normalized On-Resistance vs Junction Temperature**

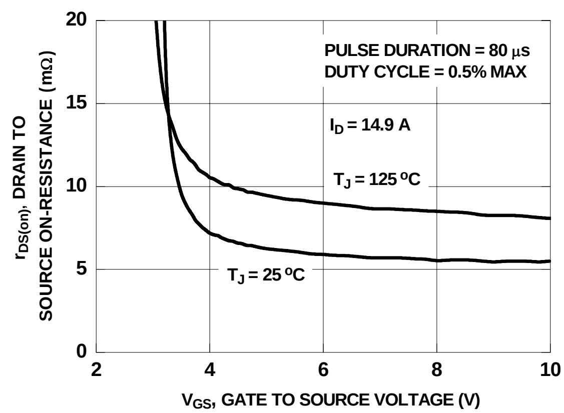



**Figure 4. On-Resistance vs Gate to Source Voltage**

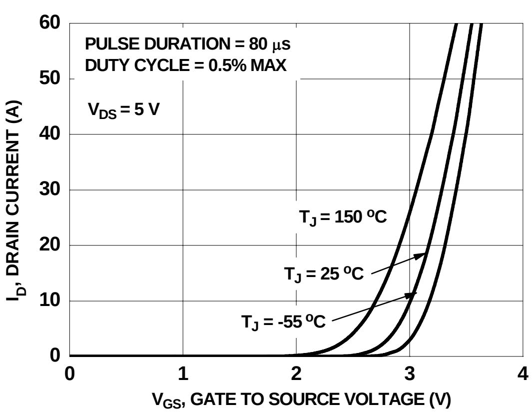



**Figure 5. Transfer Characteristics**

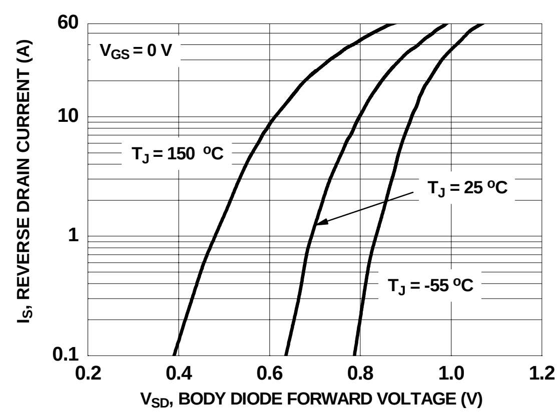



**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

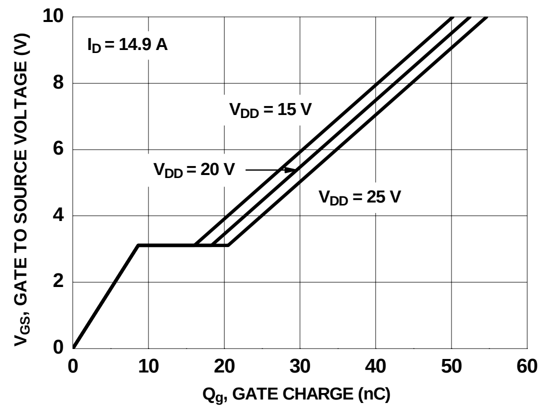



**Figure 7. Gate Charge Characteristics**

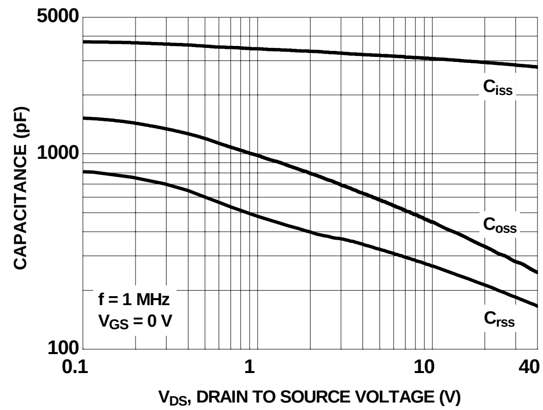



**Figure 8. Capacitance vs Drain to Source Voltage**

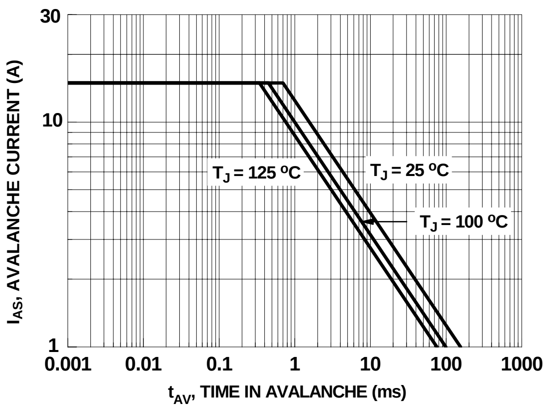



**Figure 9. Unclamped Inductive Switching Capability**

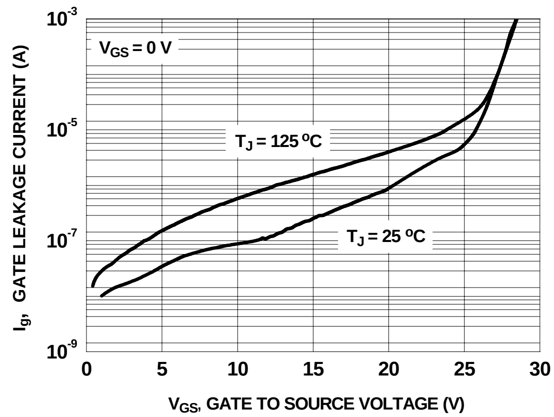



**Figure 10. Igss vs Vgs**

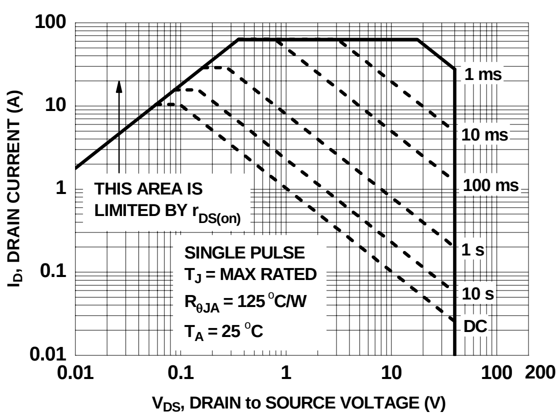



**Figure 11. Forward Bias Safe Operating Area**

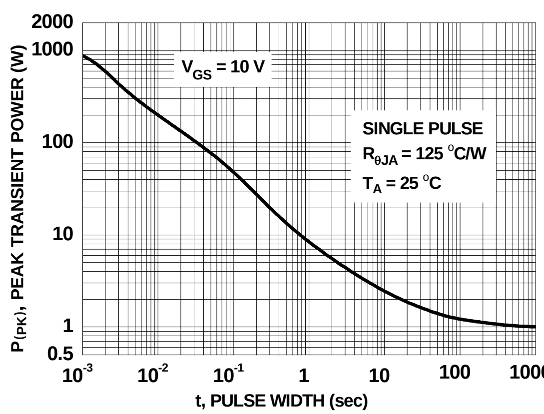



**Figure 12. Single Pulse Maximum Power Dissipation**

## Typical Characteristics $T_J$ = 25 °C unless otherwise noted

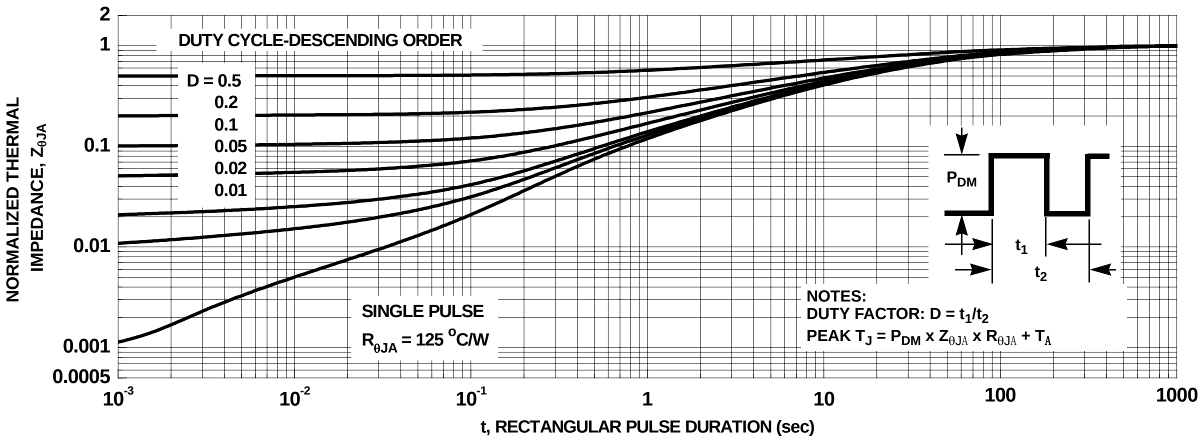



**Figure 13. Transient Thermal Response Curve**

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