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FAIRCHILD SEMICONDUCTOR®

February 2009

# FDS8842NZ
## N-Channel PowerTrench® MOSFET
### 40 V, 14.9 A, 7.0 mΩ

## Features

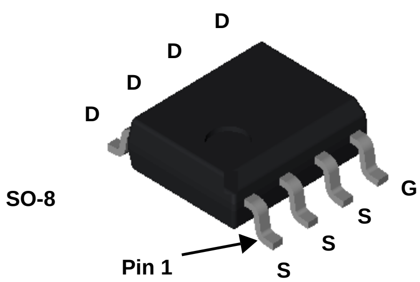
- Max $r_{DS(on)}$ = 7.0 mΩ at $V_{GS}$ = 10 V, $I_D$ = 14.9 A
- Max $r_{DS(on)}$ = 11.6 mΩ at $V_{GS}$ = 4.5 V, $I_D$ = 11.6 A
- HBM ESD protection level of 4.4 kV typical(note 3)
- High performance trench technology for extremely low $r_{DS(on)}$ and fast switching
- High power and current handling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

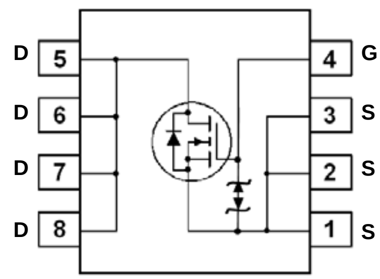
## General Description

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




## 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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | 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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | 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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $C_{iss}$ | 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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | 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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $V_{SD}$ | 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

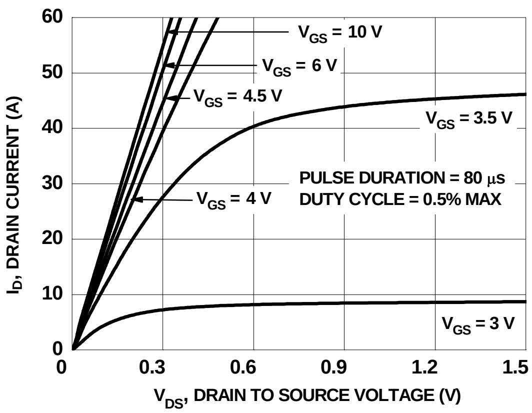



**Figure 1. On-Region Characteristics**

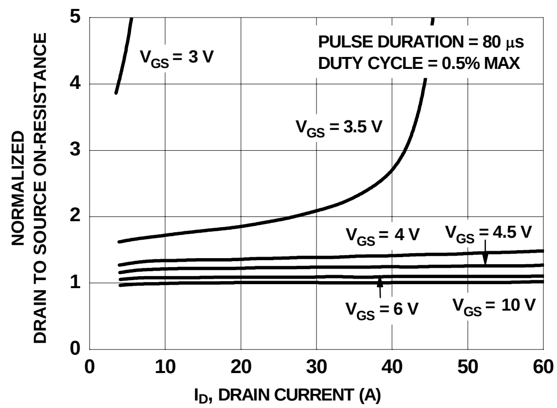



**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**

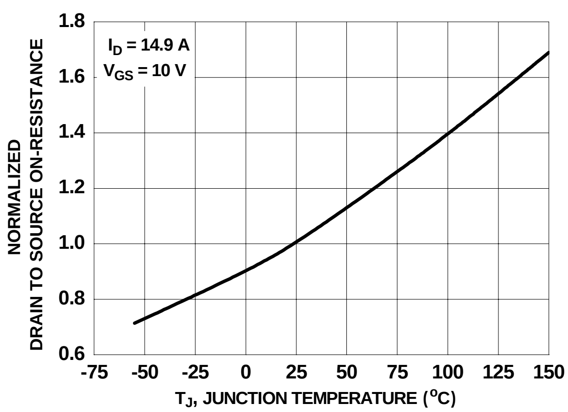



**Figure 3. Normalized On-Resistance vs Junction Temperature**

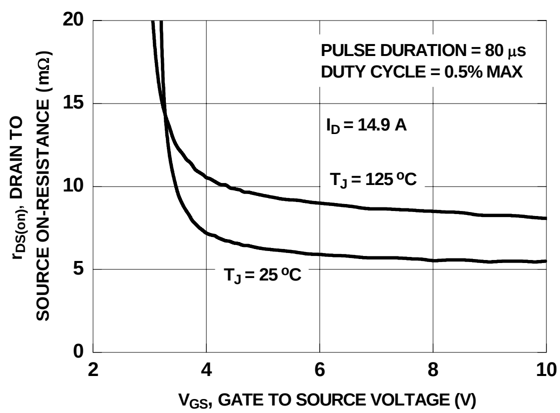



**Figure 4. On-Resistance vs Gate to Source Voltage**

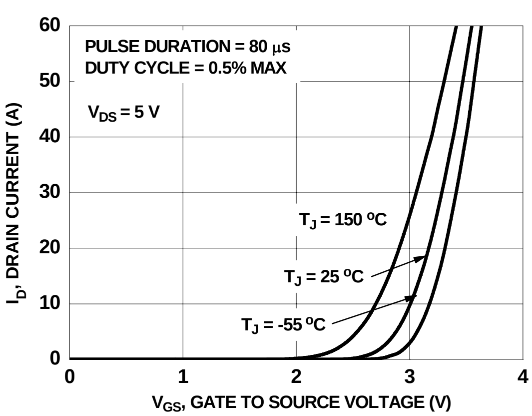



**Figure 5. Transfer Characteristics**

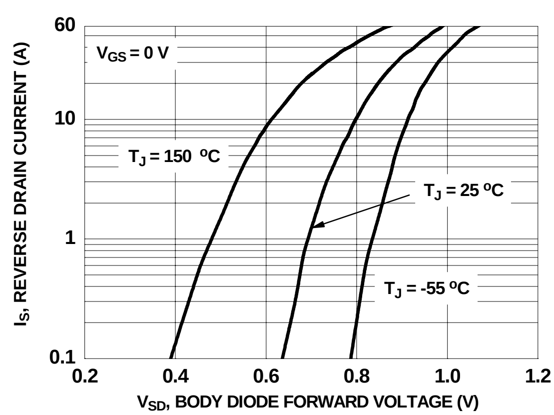



**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

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

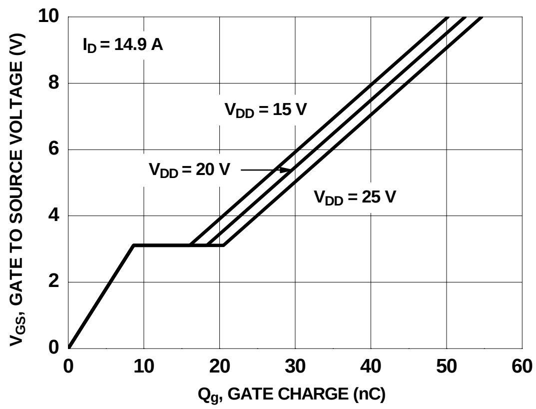



Figure 7. Gate Charge Characteristics

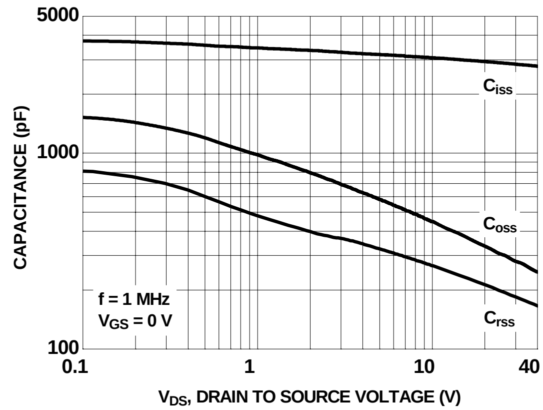



Figure 8. Capacitance vs Drain to Source Voltage

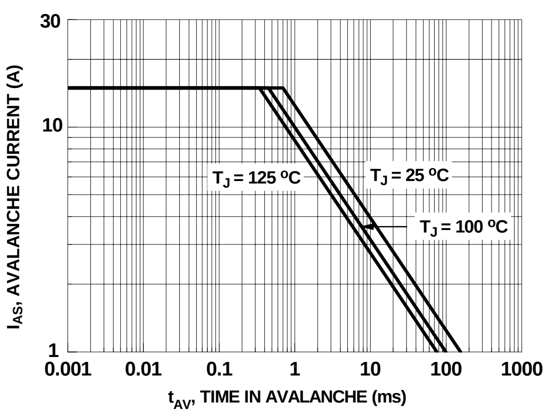



Figure 9. Unclamped Inductive Switching Capability

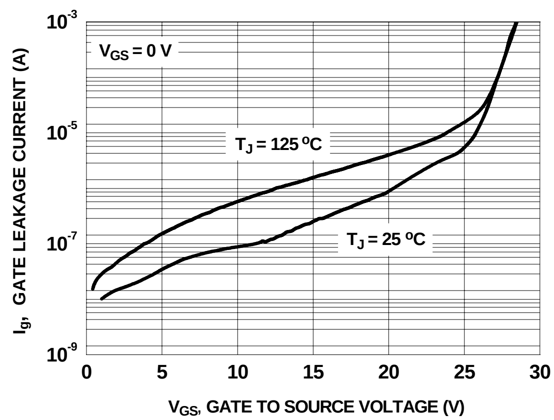



Figure 10. Igss vs Vgs

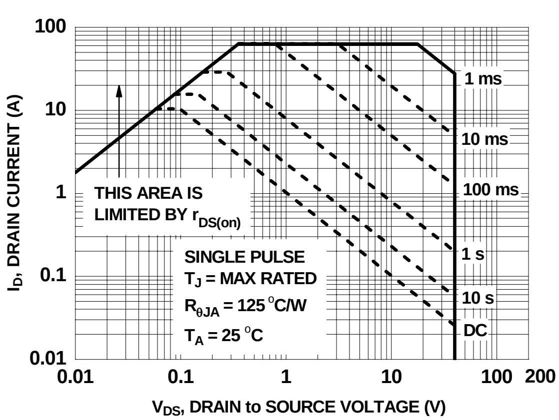



Figure 11. Forward Bias Safe Operating Area

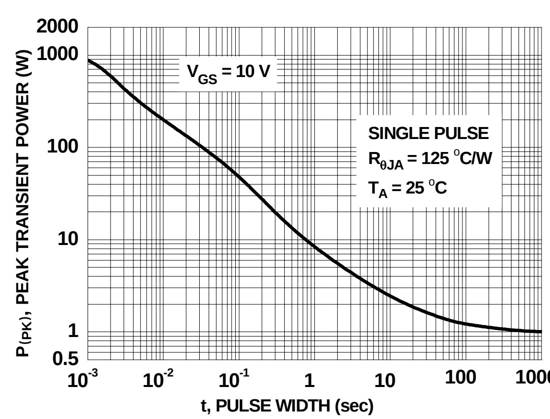



Figure 12. Single Pulse Maximum Power Dissipation

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

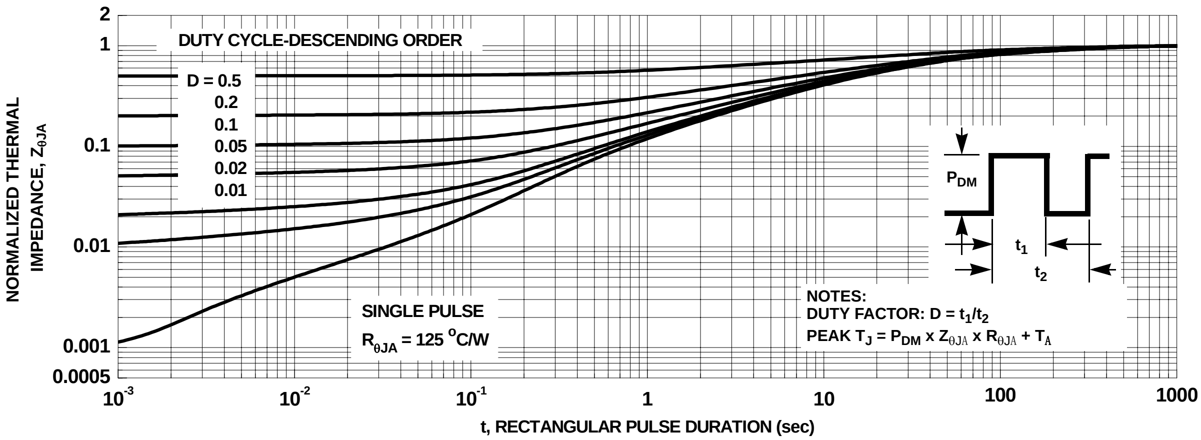



**Figure 13. Transient Thermal Response Curve**

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