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# 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

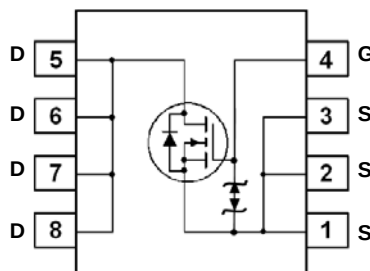
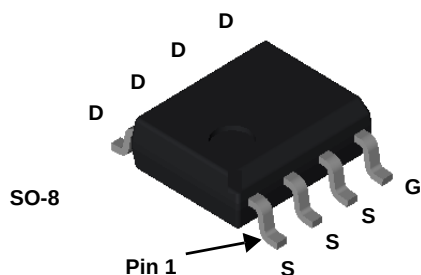


### General Description

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 $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                                            | Ratings     | Units            |
|----------------|------------------------------------------------------|-------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                              | 40          | V                |
| $V_{GS}$       | Gate to Source Voltage                               | $\pm 20$    | 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 $T_A = 25^\circ\text{C}$ (Note 1a) | 2.5         | W                |
|                | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b) | 1.0         |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range     | -55 to +150 | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |                                                   |    |                    |
|-----------------|---------------------------------------------------|----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case (Note 1)     | 25 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | 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**  $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted

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

**Off Characteristics**

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

**On Characteristics**

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

**Dynamic Characteristics**

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

**Switching Characteristics**

|              |                               |                                                                                                          |                                                   |     |    |    |
|--------------|-------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 20\text{ V}$ , $I_D = 14.9\text{ A}$ ,<br>$V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$ |                                                   | 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             | $V_{GS} = 0\text{ V to }10\text{ V}$                                                                     | $V_{DD} = 20\text{ V}$ ,<br>$I_D = 14.9\text{ A}$ | 52  | 73 | nC |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{ V to }5\text{ V}$                                                                      |                                                   | 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 | $V_{GS} = 0\text{ V}$ , $I_S = 14.9\text{ A}$              |  | 0.8 | 1.2 | V  |
|          |                                       | $V_{GS} = 0\text{ V}$ , $I_S = 2.1\text{ A}$               |  | 0.7 | 1.2 |    |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 14.9\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ |  | 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<sup>2</sup> 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  $^{\circ}\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b) 125  $^{\circ}\text{C}/\text{W}$  when mounted on a minimum pad.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.

3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

4. Starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = 13\text{ A}$ ,  $V_{DD} = 40\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

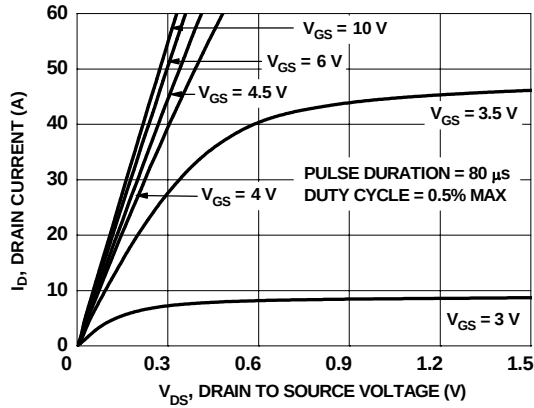


Figure 1. On-Region Characteristics

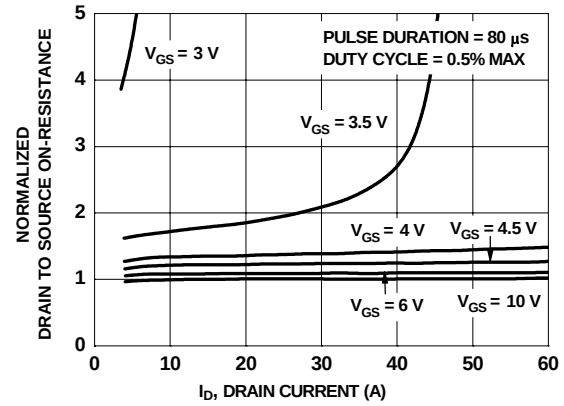


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

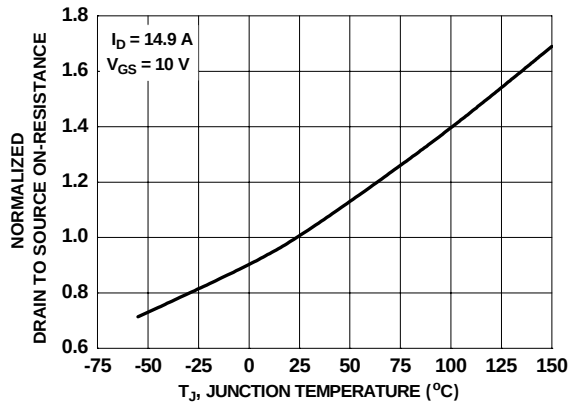


Figure 3. Normalized On-Resistance vs Junction Temperature

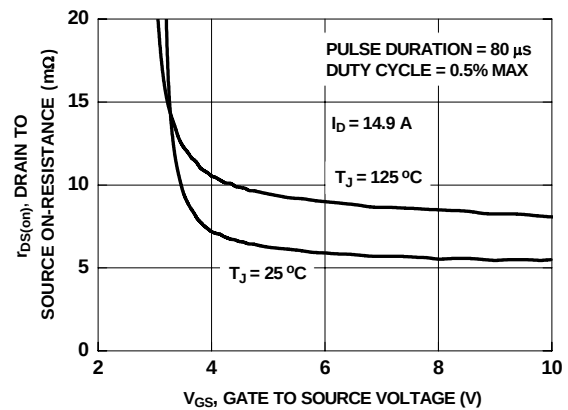


Figure 4. On-Resistance vs Gate to Source Voltage

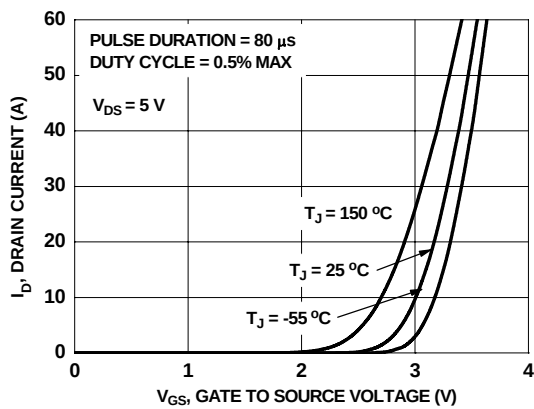


Figure 5. Transfer Characteristics

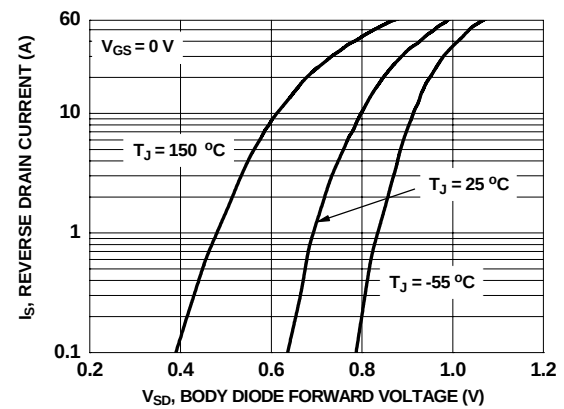


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

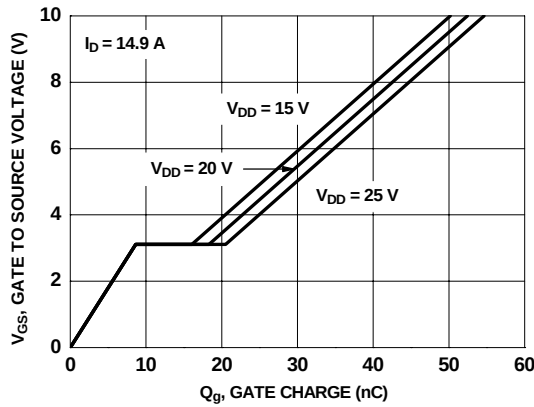


Figure 7. Gate Charge Characteristics

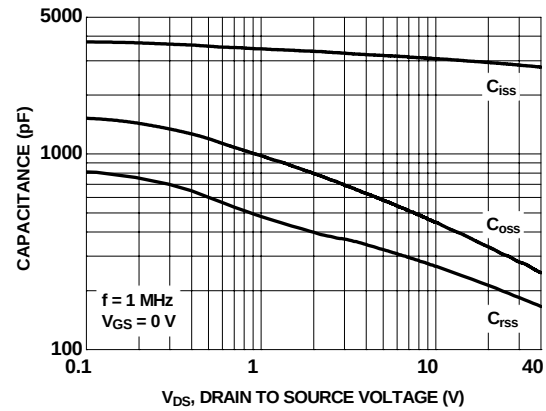


Figure 8. Capacitance vs Drain to Source Voltage

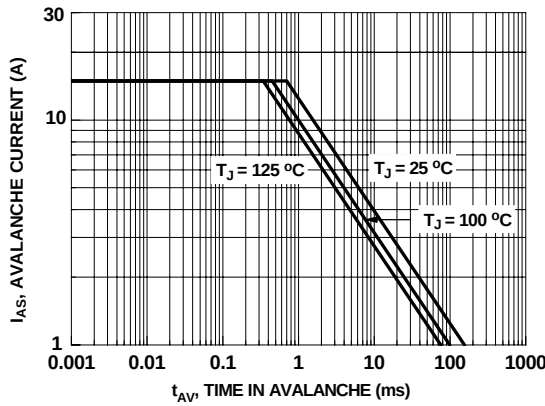


Figure 9. Unclamped Inductive Switching Capability

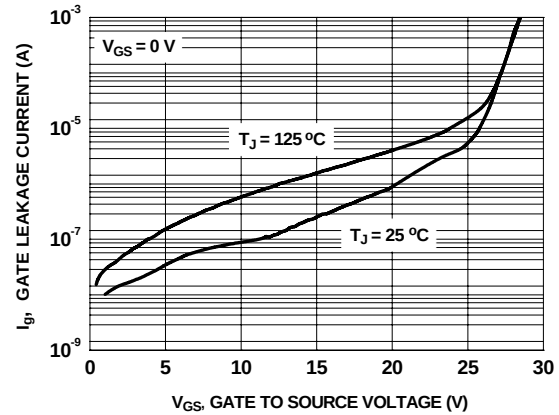


Figure 10.  $I_{gss}$  vs  $V_{GS}$

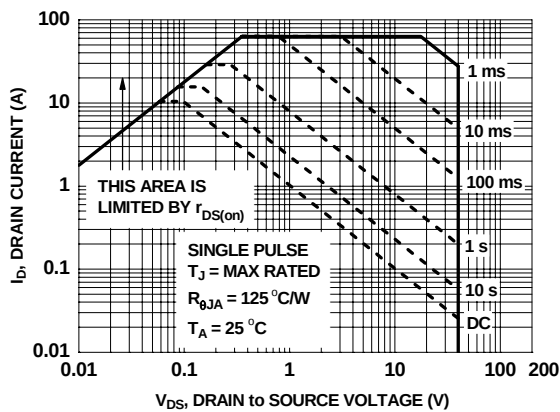


Figure 11. Forward Bias Safe Operating Area

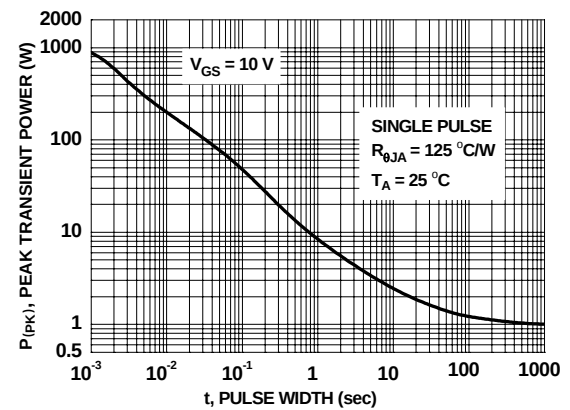
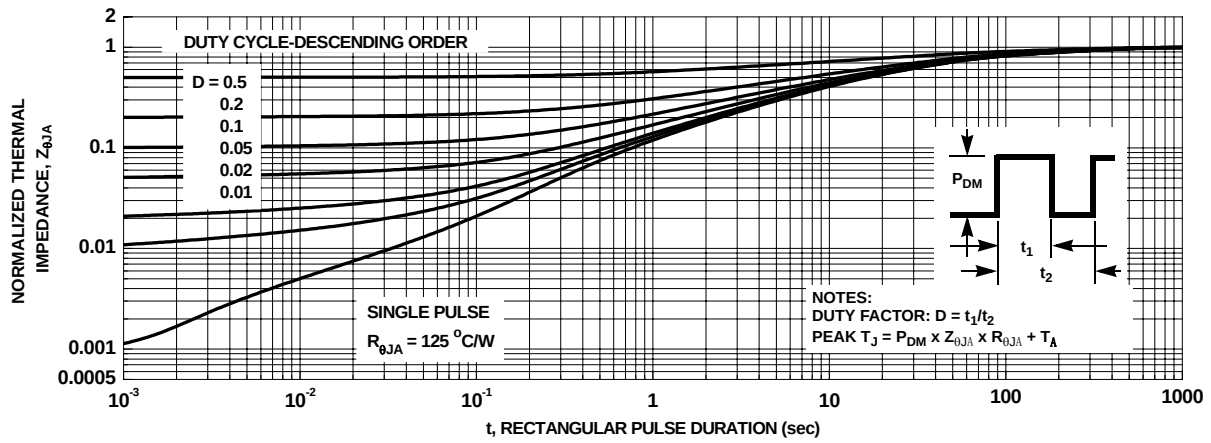


Figure 12. Single Pulse Maximum Power Dissipation

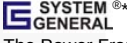
**Typical Characteristics**  $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted





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