

FDS8812NZ

N-Channel PowerTrench® MOSFET 30V, 20A, 4.0mΩ

Features

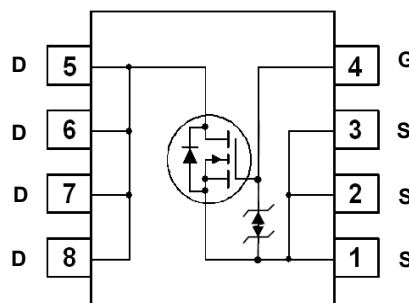
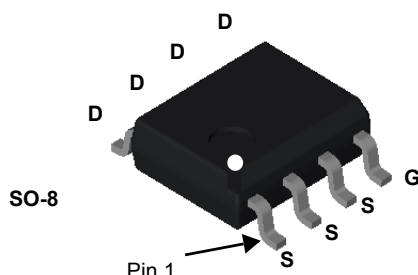
- Max $r_{DS(on)}$ = 4.0mΩ at V_{GS} = 10V, I_D = 20A
- Max $r_{DS(on)}$ = 4.9mΩ at V_{GS} = 4.5V, I_D = 18A
- HBM ESD protection level of 6.4KV typical (note 3)
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability
- RoHS compliant



General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance.

This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.



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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous	20	A
	-Pulsed	80	
E_{AS}	Single Pulse Avalanche Energy	661	mJ
P_D	Power Dissipation	2.5	W
	Power Dissipation	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	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	125	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDS8812NZ	FDS8812NZ	13"	12mm	2500 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		19		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$, $V_{GS} = 0\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$			± 10	μA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu\text{A}$	1	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		-7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$		3.1	4.0	m Ω
		$V_{GS} = 4.5\text{V}$, $I_D = 18\text{A}$		3.8	4.9	
		$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$, $T_J = 125^\circ\text{C}$		4.2	5.3	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}$, $I_D = 20\text{A}$		87		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		5205	6925	pF
C_{oss}	Output Capacitance			945	1260	pF
C_{rss}	Reverse Transfer Capacitance			580	870	pF
R_g	Gate Resistance	$f = 1\text{MHz}$		1.5		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}$, $I_D = 20\text{A}$ $V_{GS} = 10\text{V}$, $R_{GEN} = 6\Omega$		18	33	ns
t_r	Rise Time			13	24	ns
$t_{d(off)}$	Turn-Off Delay Time			55	88	ns
t_f	Fall Time			12	22	ns
Q_g	Total Gate Charge	$V_{GS} = 0\text{V}$ to 10V	$V_{DD} = 15\text{V}$ $I_D = 20\text{A}$	90	126	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{V}$ to 5V		49	69	nC
Q_{gs}	Gate to Source Charge			16		nC
Q_{gd}	Gate to Drain "Miller" Charge			18		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = 2.1\text{A}$ (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 20\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$		36	54	ns
Q_{rr}	Reverse Recovery Charge			33	50	nC

Notes:

- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



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



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

- Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty Cycle $< 2\%$.
- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.
- Starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 21\text{A}$, $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$.

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

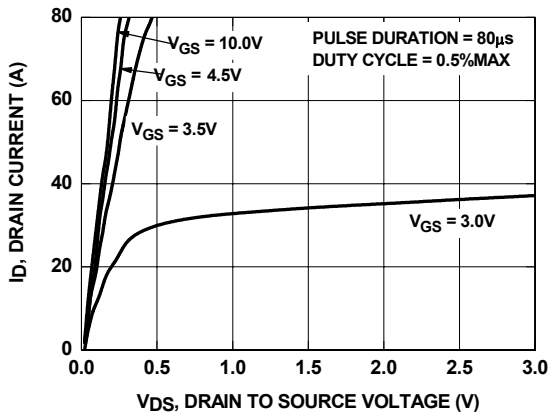


Figure 1. On-Region Characteristics

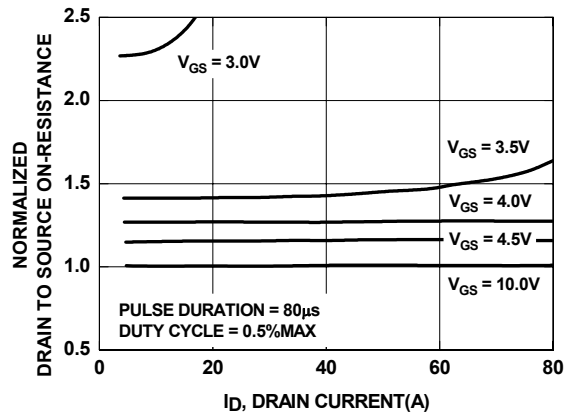


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

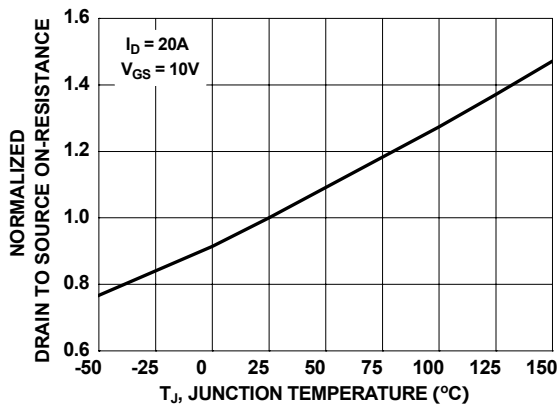


Figure 3. Normalized On-Resistance vs Junction Temperature

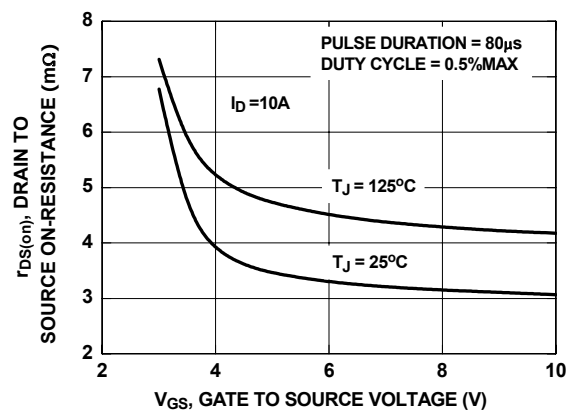


Figure 4. On-Resistance vs Gate to Source Voltage

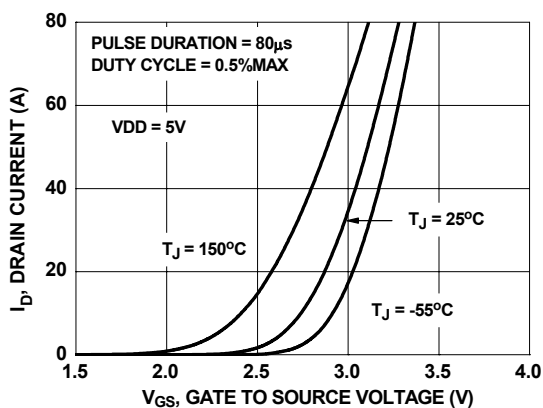


Figure 5. Transfer Characteristics

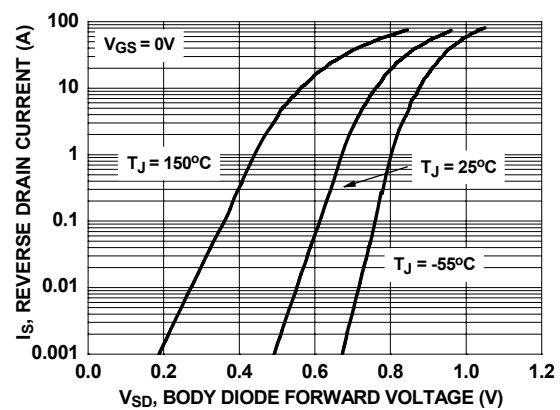


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

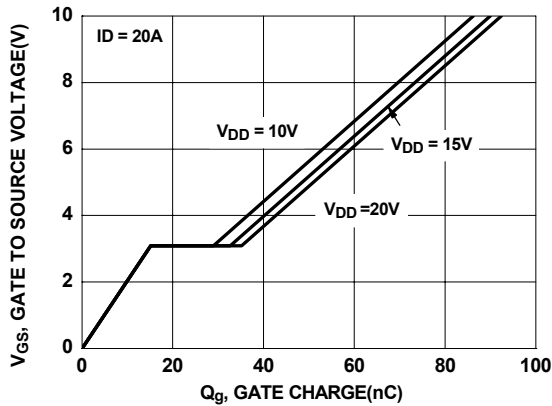


Figure 7. Gate Charge Characteristics

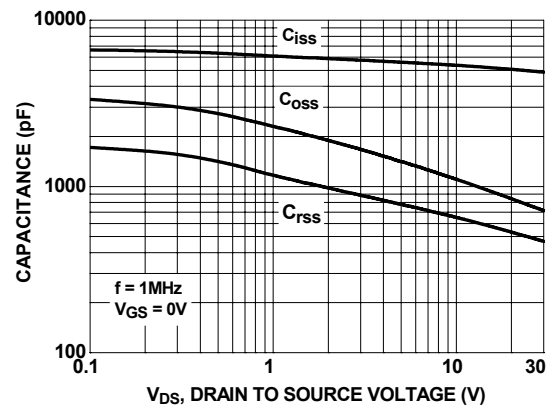


Figure 8. Capacitance vs Drain to Source Voltage

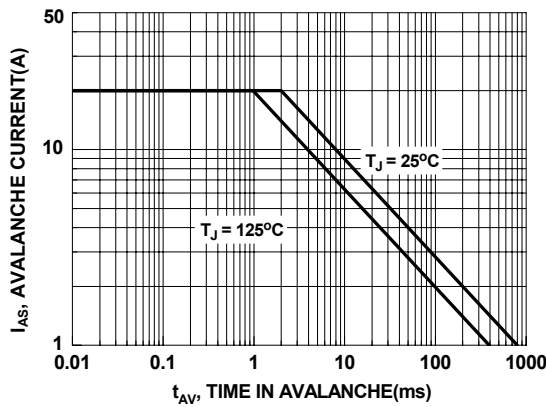


Figure 9. Unclamped Inductive Switching Capability

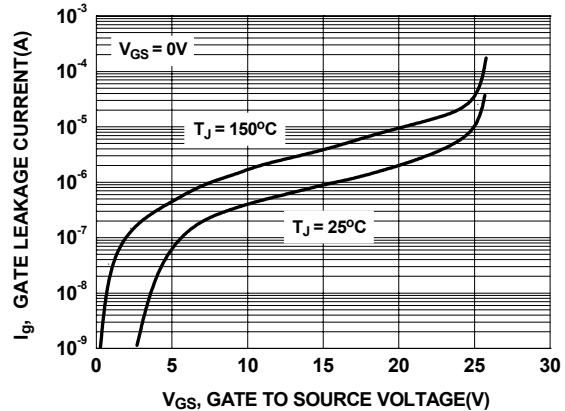


Figure 10. Gate Leakage Current vs Gate to Source Voltage

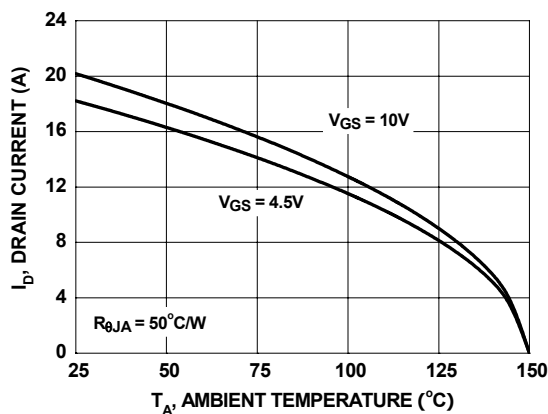


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

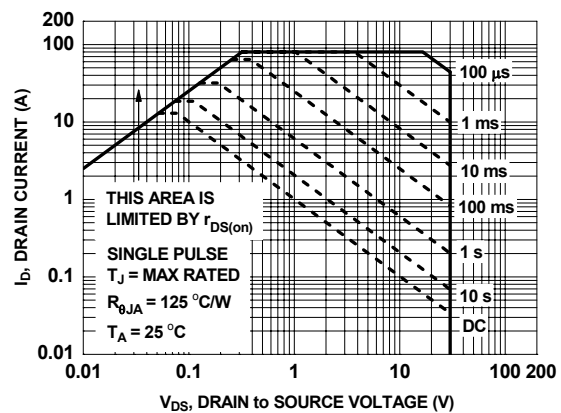


Figure 12. Forward Bias Safe Operating Area

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

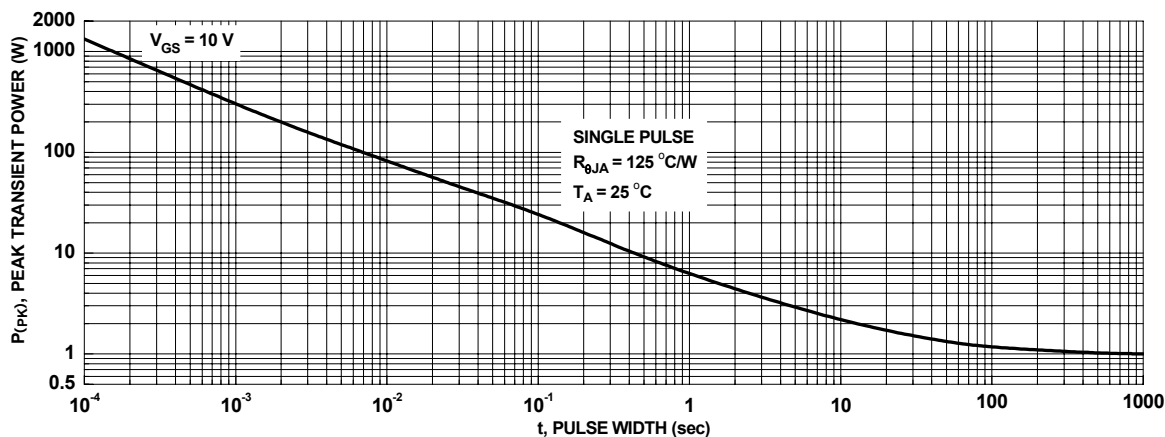


Figure 13. Single Pulse Maximum Power Dissipation

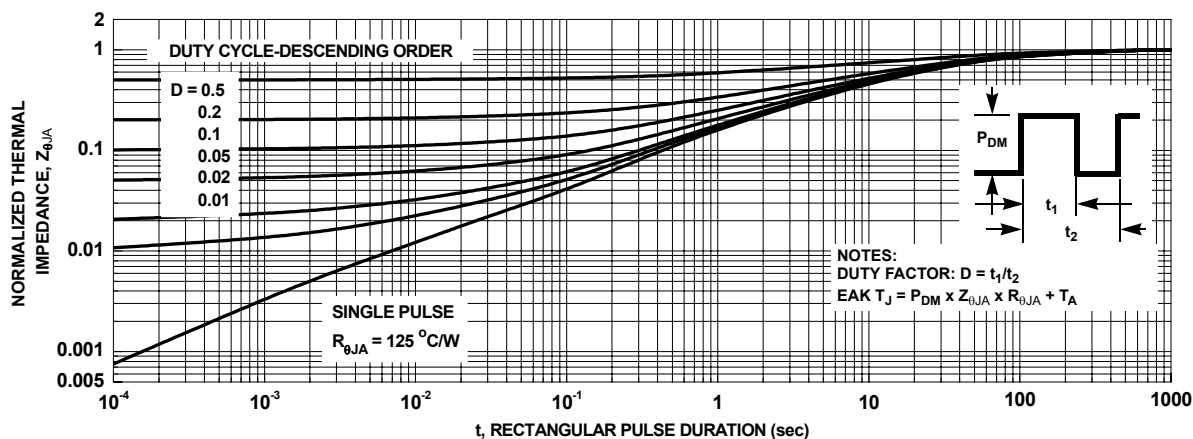


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

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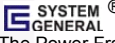
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