FAIRCHILD SEMICONDUCTOR®

March 2007

FDS8812NZ

N-Channel PowerTrench® MOSFET

30V, 20A, 4.0mΩ

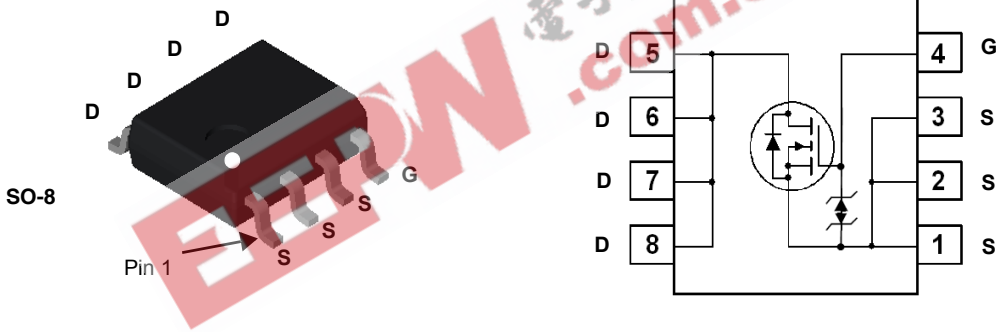
Features

- 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°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	(Note 1a)	20	A
	-Pulsed		80	
E_{AS}	Single Pulse Avalanche Energy	(Note 4)	661	mJ
P_D	Power Dissipation	(Note 1a)	2.5	W
	Power Dissipation	(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	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	125	

Package Marking and Ordering Information

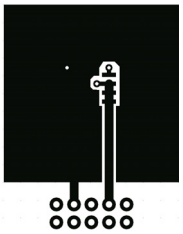
Device Marking	Device	Reel Size	Tape Width	Quantity
FDS8812NZ	FDS8812NZ	13"	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		19		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±10	μA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		–7		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 20A		3.1	4.0	mΩ
		V_{GS} = 4.5V, I_D = 18A		3.8	4.9	
		V_{GS} = 10V, I_D = 20A, T_J = 125°C		4.2	5.3	
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 20A		87		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		5205	6925	pF
C_{oss}	Output Capacitance			945	1260	pF
C_{rss}	Reverse Transfer Capacitance			580	870	pF
R_g	Gate Resistance	f = 1MHz		1.5		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 20A, V_{GS} = 10V, R_{GEN} = 6Ω		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} = 0V to 10V, V_{DD} = 15V, I_D = 20A		90	126	nC
Q_g	Total Gate Charge	V_{GS} = 0V to 5V, V_{DD} = 15V, I_D = 20A		49	69	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15V, I_D = 20A		16		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 15V, I_D = 20A		18		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 2.1A (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 20A, di/dt = 100A/μs		36	54	ns
Q_{rr}	Reverse Recovery Charge	I_F = 20A, di/dt = 100A/μs		33	50	nC

Notes:

1. $R_{\theta JA}$ 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 .

2. Pulse Test: Pulse Width < 300 us, Duty Cycle < 2%.
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°C, L = 3mH, I_{AS} = 21A, V_{DD} = 30V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

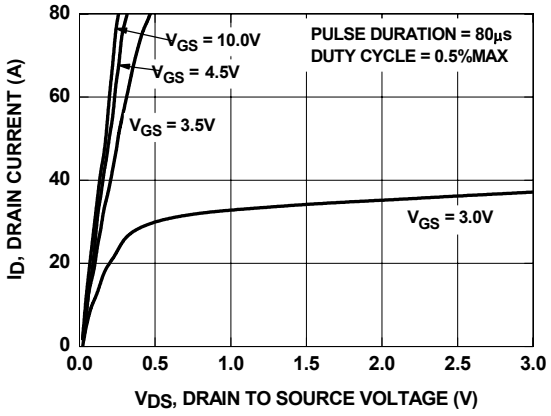


Figure 1. On-Region Characteristics

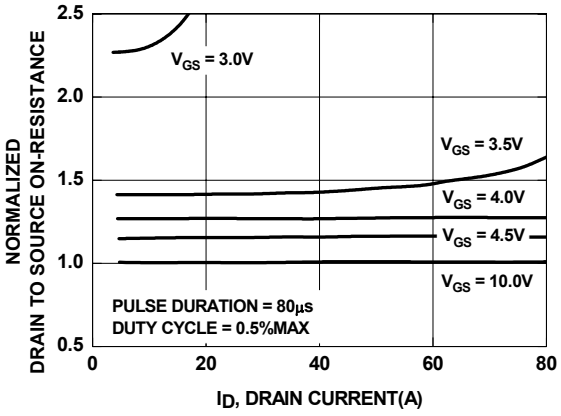


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

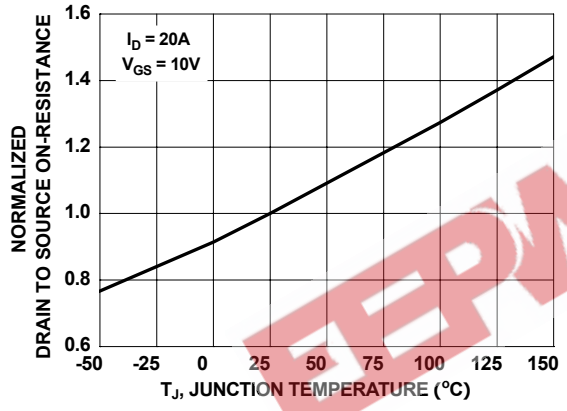


Figure 3. Normalized On-Resistance vs Junction Temperature

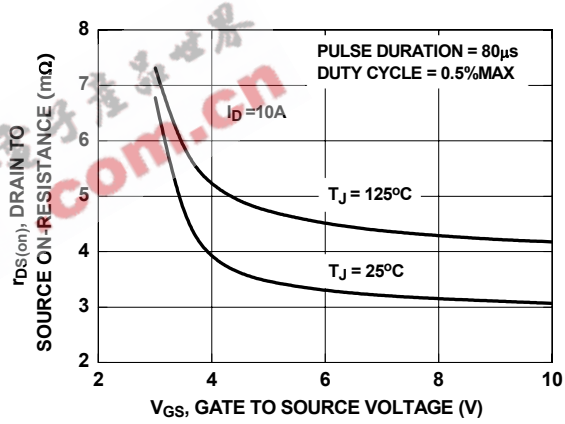


Figure 4. On-Resistance vs Gate to Source Voltage

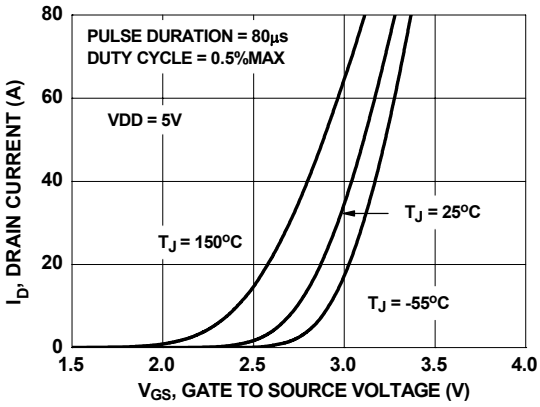


Figure 5. Transfer Characteristics

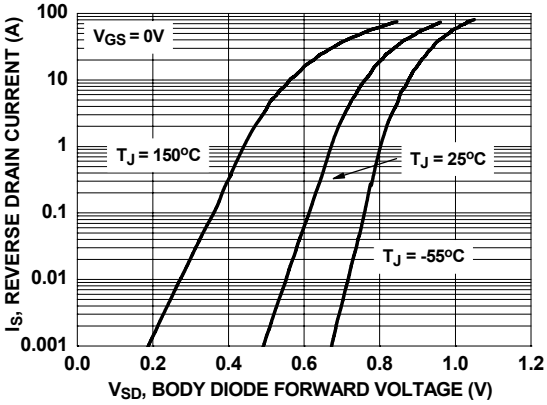


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

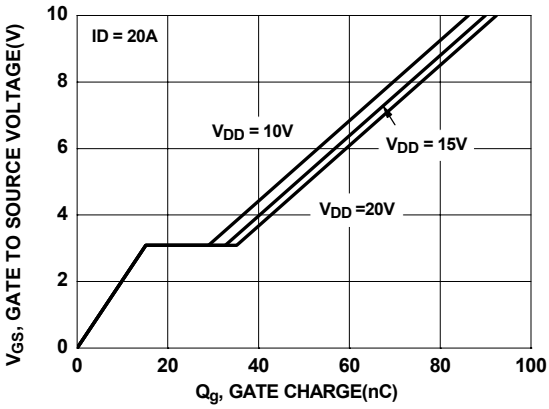


Figure 7. Gate Charge Characteristics

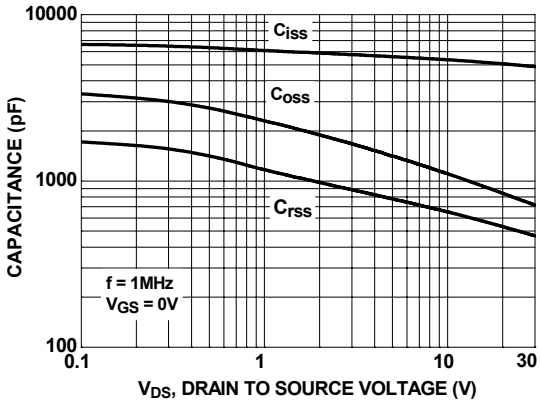


Figure 8. Capacitance vs Drain to Source Voltage

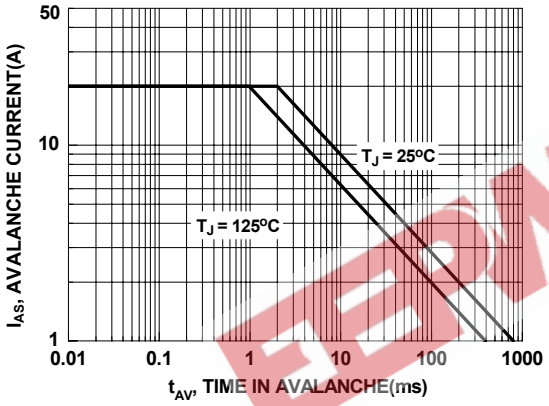


Figure 9. Unclamped Inductive Switching Capability

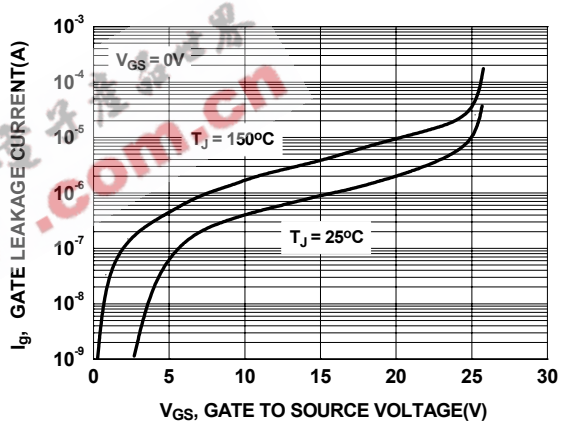


Figure 10. Gate Leakage Current vs Gate to Source Voltage

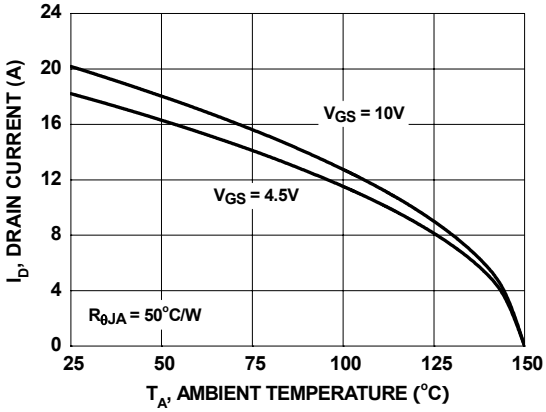


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

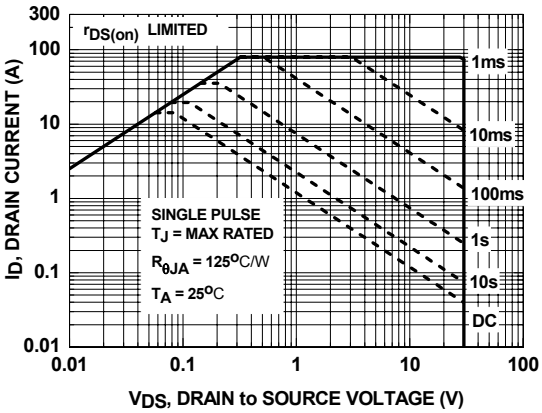


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics T_J = 25°C unless otherwise noted

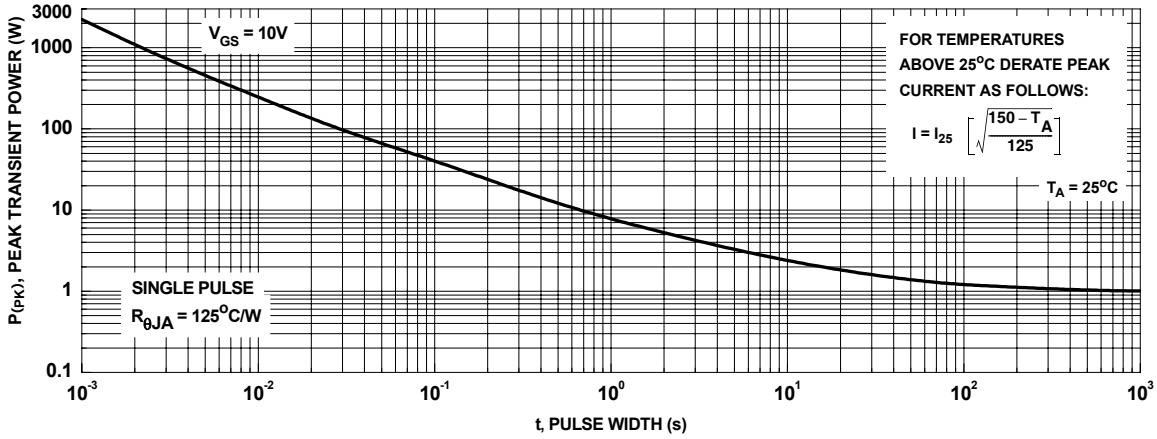


Figure 13. Single Pulse Maximum Power Dissipation

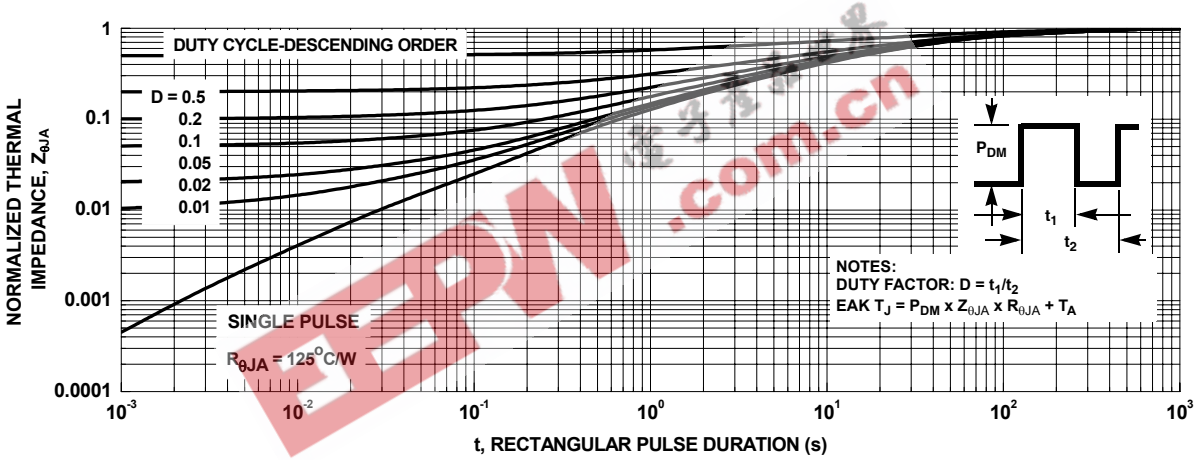


Figure 14. Transient Thermal Response Curve

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