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FAIRCHILD SEMICONDUCTOR®

November 2006

FDS8447
Single N-Channel PowerTrench® MOSFET
40V, 12.8A, 10.5mΩ

Features

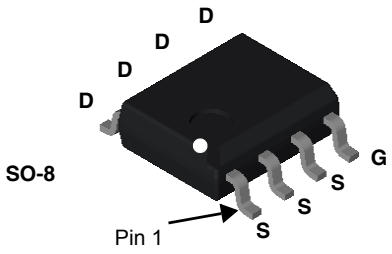
- Max $r_{DS(on)}$ = 10.5mΩ at V_{GS} = 10V, I_D = 12.8A
- Max $r_{DS(on)}$ = 12.3mΩ at V_{GS} = 4.5V, I_D = 11.4A
- Low gate charge
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability
- RoHS compliant

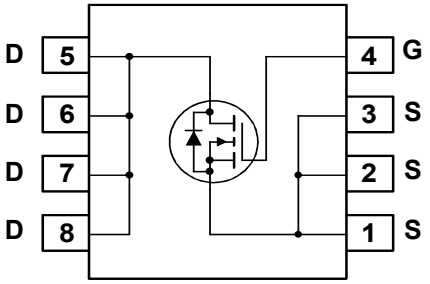
General Description

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

Applications

- DC - DC conversion





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	(Note 1a)	12.8	A
	-Pulsed		50	
E_{AS}	Drain-Source Avalanche Energy	(Note 3)	150	mJ
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to 150	°C

Thermal Characteristics

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

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDS8447	FDS8447	13"	12mm	2500 units

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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	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		34		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32V, V_{GS} = 0V			1	μA
		T_J = 55°C			10	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
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		-5		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 12.8A		9	10.5	mΩ
		V_{GS} = 4.5V, I_D = 11.4A		10	12.3	
		V_{GS} = 10V, I_D = 12.8A,T_J = 125°C		13	15	
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 12.8A		75.3		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 20V, V_{GS} = 0V, f = 1MHz		2000	2600	pF
C_{oss}	Output Capacitance			250	350	pF
C_{rss}	Reverse Transfer Capacitance			150	250	pF
R_g	Gate Resistance	f = 1MHz		1.3		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 20V, I_D = 12.8A, V_{GS} = 10V, R_{GEN} = 4.5Ω		11	20	ns
t_r	Rise Time			14	25	ns
$t_{d(off)}$	Turn-Off Delay Time			27	42	ns
t_f	Fall Time			7	14	ns
Q_g	Total Gate Charge at V_{GS} = 10V	V_{DS} = 20V, I_D = 12.8A,		35	49	nC
Q_g	Total Gate Charge at V_{GS} = 5V			19	27	nC
Q_{gs}	Gate to Source Gate Charge			6		nC
Q_{gd}	Gate to Drain “Miller”Charge			7		nC

Drain-Source Diode Characteristics and Maximum Ratings

V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 12.8A (note 2)		0.84	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 12.8A, d_{iF}/d_t = 100A/μs		19	29	ns
Q_{rr}	Reverse Recovery Charge			9.5	19	nC

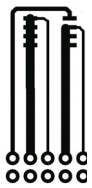
Notes:

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

Scale 1:1 on letter size paper



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

2: Pulse Test: Pulse Width < 300 us, Duty Cycle < 2.0%.

3: Starting T_J = 25°C, L = 3mH, I_{AS} = 10A, V_{DD} = 40V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

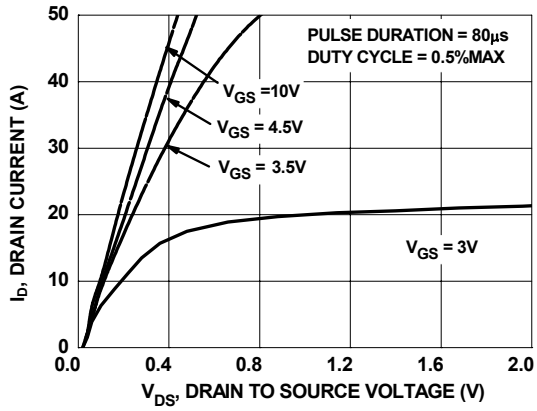


Figure 1. On Region Characteristics

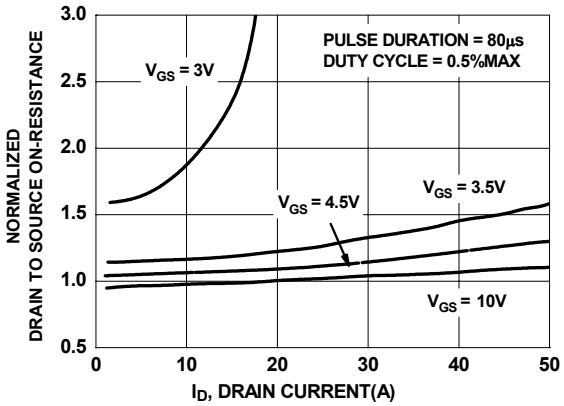


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

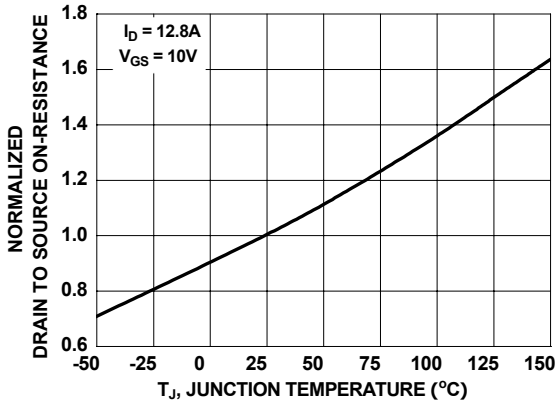


Figure 3. Normalized On Resistance vs Junction Temperature

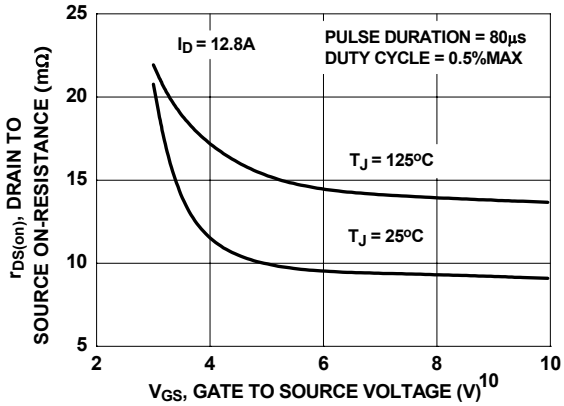


Figure 4. On-Resistance vs Gate to Source Voltage

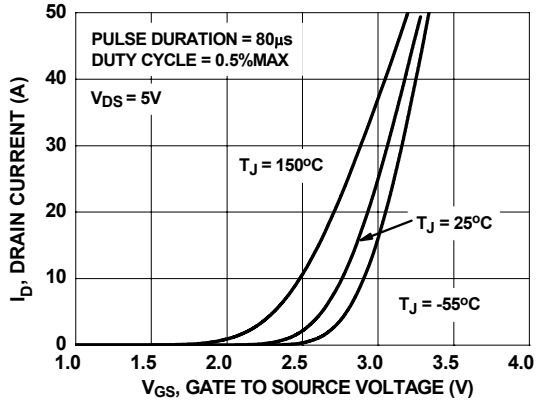


Figure 5. Transfer Characteristics

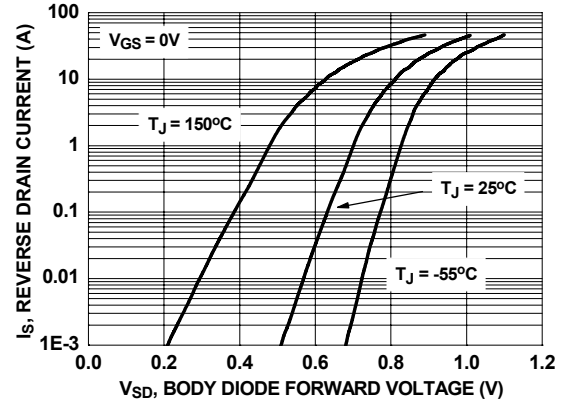


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

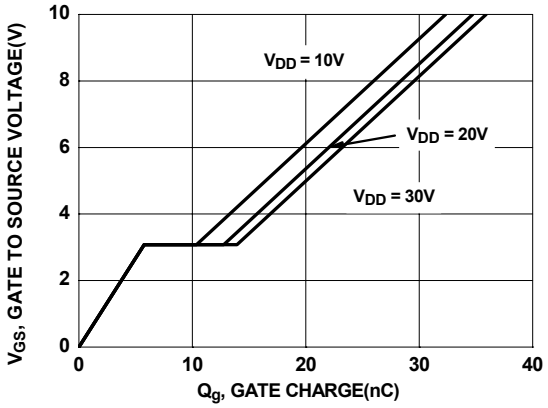


Figure 7. Gate Charge Characteristics

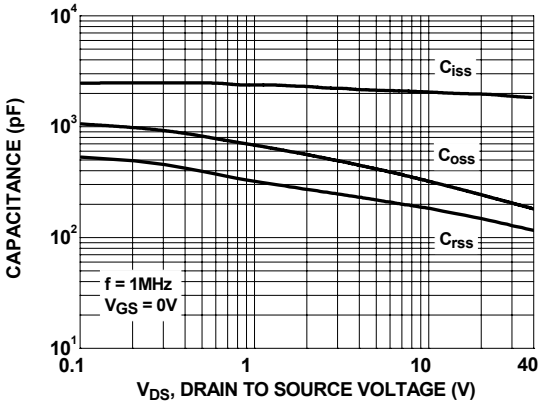


Figure 8. Capacitance vs Drain to Source Voltage

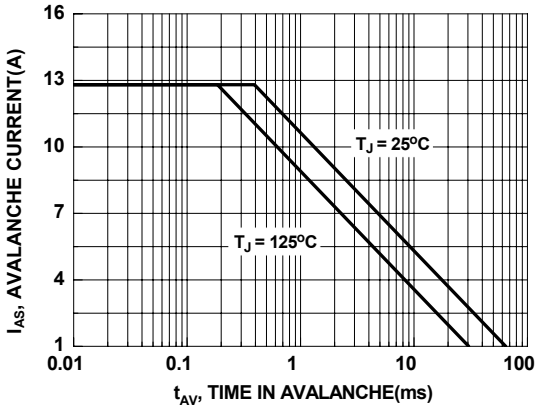


Figure 9. Unclamped Inductive Switching Capability

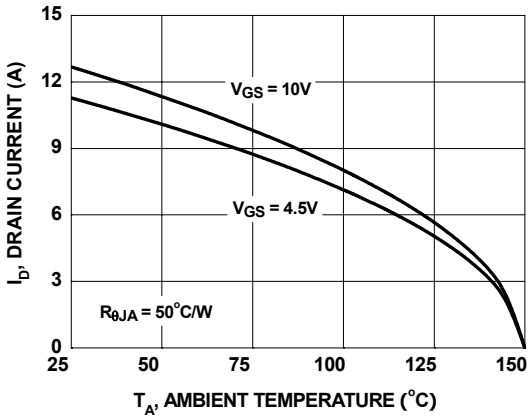


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

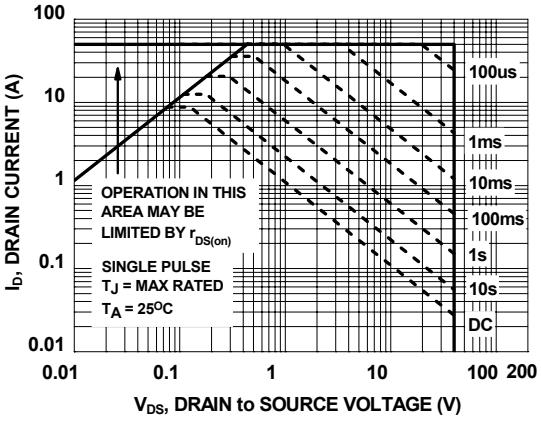


Figure 11. Forward Bias Safe Operating Area

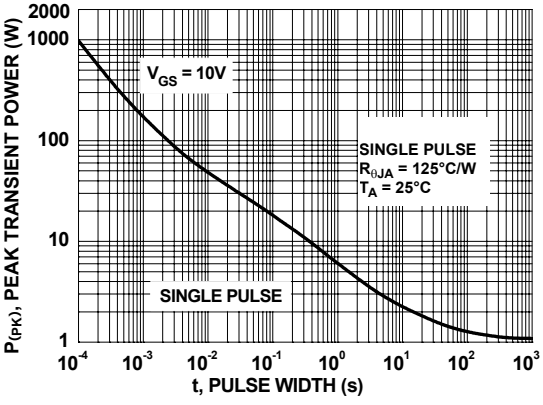


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

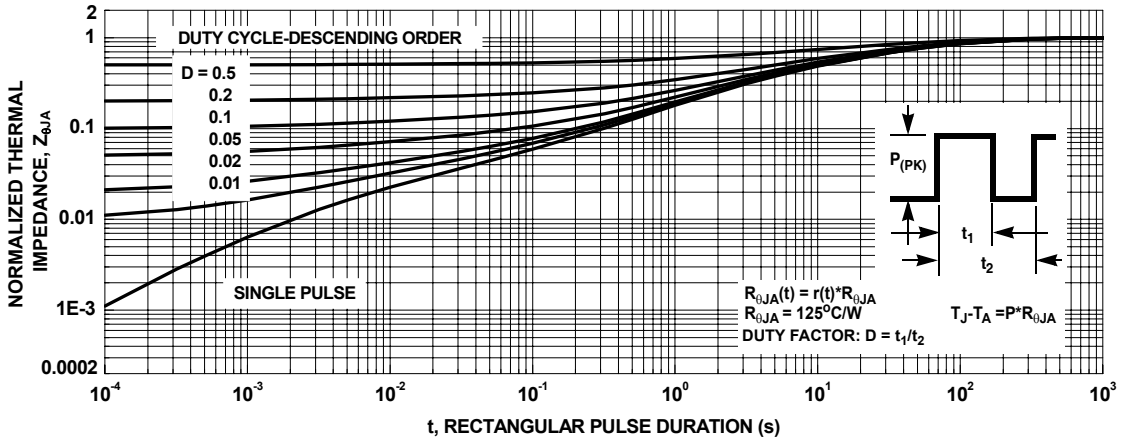


Figure 13. Transient Thermal Response Curve

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