FAIRCHILD SEMICONDUCTOR®

September 2006

FDP8860
N-Channel PowerTrench® MOSFET
30V, 80A, 2.5mΩ

Features

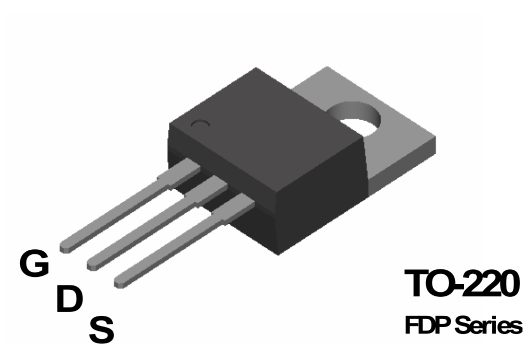
- Max $r_{DS(on)}$ = 2.5mΩ at V_{GS} = 10V, I_D = 80A
- Max $r_{DS(on)}$ = 2.9mΩ at V_{GS} = 4.5V, I_D = 80A
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIL Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant

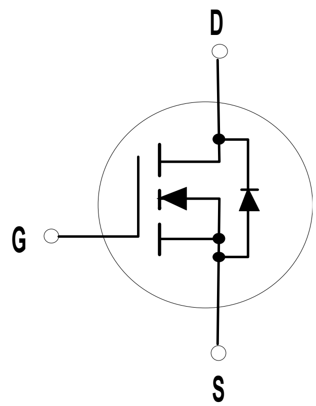
General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

Application

- DC - DC Conversion
- Start / Alternator Sytems





MOSFET Maximum Ratings T_C = 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 (Package limited) T_C = 25°C		80	A
	-Continuous (Silicon limited) T_C = 25°C		219	
	-Pulsed	(Note 1)	556	
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	673	mJ
P_D	Power Dissipation		254	W
T_J, T_{STG}	Operating and Storage Temperature		-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case TO220	0.59	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO220	62	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8860	FDP8860	TO220AB	Tube	N/A	50 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 = 1mA, V_{GS} = 0V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 1mA, referenced to 25°C		22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V			1	μA
		V_{DS} = 24V, V_{GS} = 0V, T_J = 150°C			250	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250μA	1	1.6	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		-9.6		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 80A		1.9	2.5	mΩ
		V_{GS} = 5V, I_D = 80A		2.0	2.8	mΩ
		V_{GS} = 4.5V, I_D = 80A		2.1	2.9	mΩ
		V_{GS} = 10V, I_D = 80A, T_J = 150°C		2.9	3.8	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 80A		3.4		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		9200	12240	pF
C_{oss}	Output Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		1700	2260	pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		1060	1590	pF
R_g	Gate Resistance	f = 1MHz		1.7		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 80A, V_{GS} = 5V, R_{GEN} = 3Ω		35	56	ns
t_r	Rise Time	V_{DD} = 15V, I_D = 80A, V_{GS} = 5V, R_{GEN} = 3Ω		135	216	ns
$t_{d(off)}$	Turn-Off Delay Time	V_{DD} = 15V, I_D = 80A, V_{GS} = 5V, R_{GEN} = 3Ω		64	103	ns
t_f	Fall Time	V_{DD} = 15V, I_D = 80A, V_{GS} = 5V, R_{GEN} = 3Ω		59	95	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V; V_{DD} = 15V, I_D = 80A		158	222	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0V to 5V; V_{DD} = 15V, I_D = 80A		81	114	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 15V, I_D = 80A		27		nC
Q_{gd}	Gate to Drain "Miller" Charge	V_{DD} = 15V, I_D = 80A		33		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 80A		0.88	1.25	V
		V_{GS} = 0V, I_S = 40A		0.81	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 80A, di/dt = 100A/μs		60	90	ns
Q_{rr}	Reverse Recovery Charge	I_F = 80A, di/dt = 100A/μs		74	111	nC

Notes:
1: Pulse Test: Pulse Width < 80μs, Duty cycle < 0.5%.
2: Starting T_J =25°C, L= 0.3mH, I_{AS} = 67A, V_{DD} = 27V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

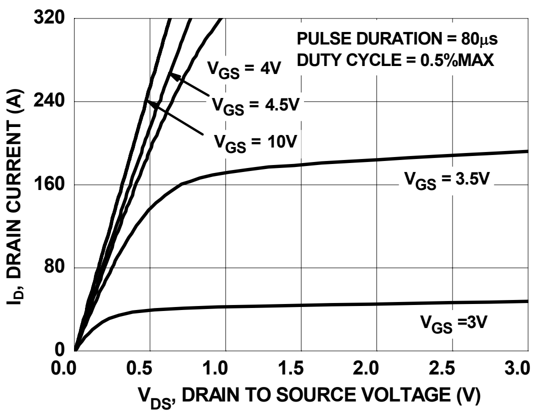


Figure 1. On Region Characteristics

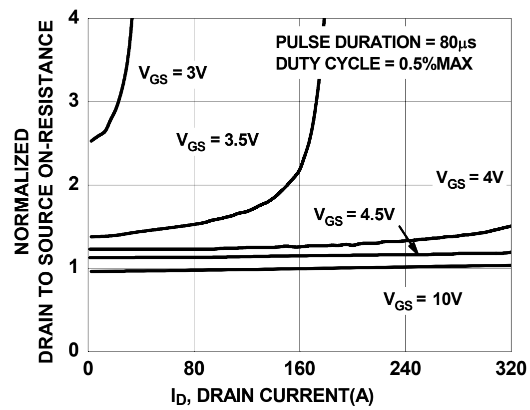


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

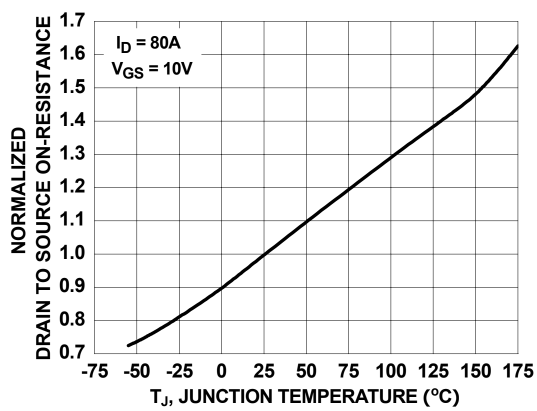


Figure 3. Normalized On Resistance vs Junction Temperature

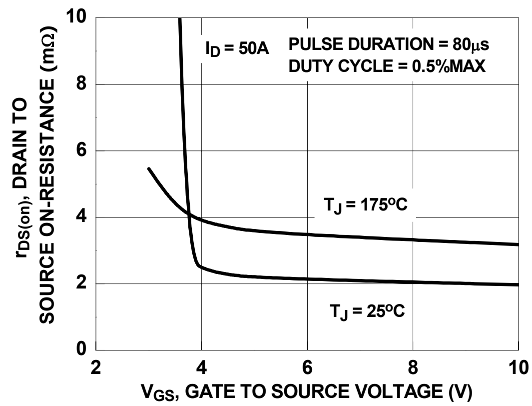


Figure 4. On-Resistance vs Gate to Source Voltage

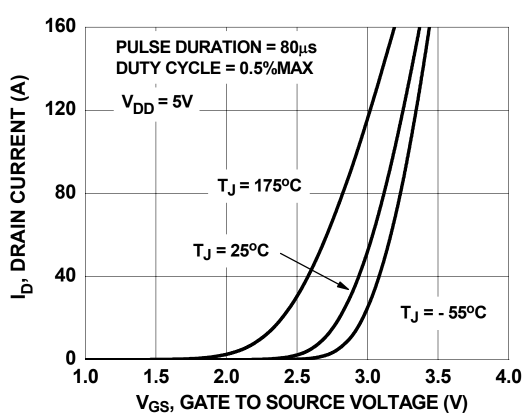


Figure 5. Transfer Characteristics

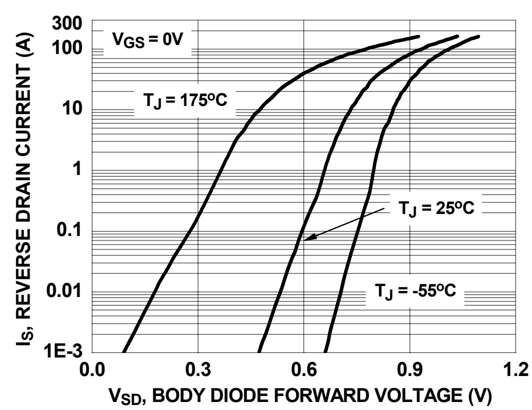


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

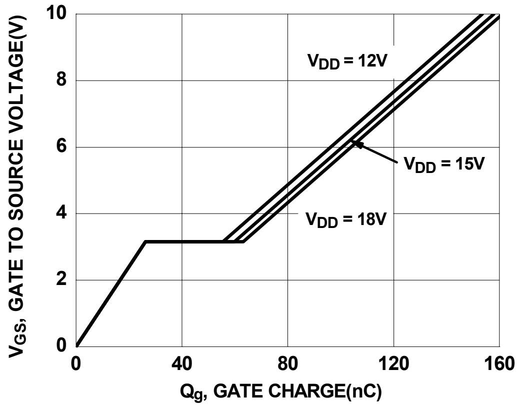


Figure 7. Gate Charge Characteristics

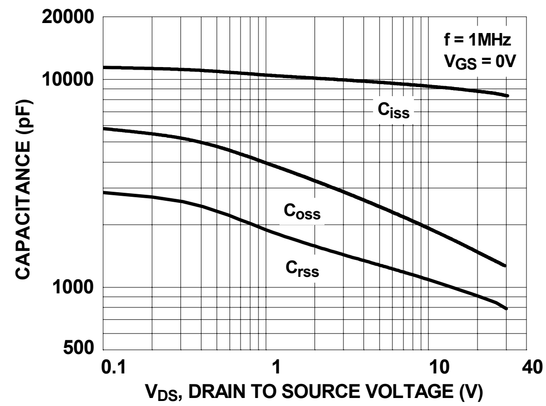


Figure 8. Capacitance vs Drain to Source Voltage

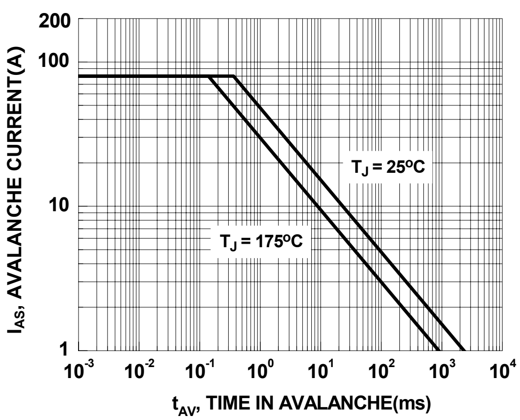


Figure 9. Unclamped Inductive Switching Capability

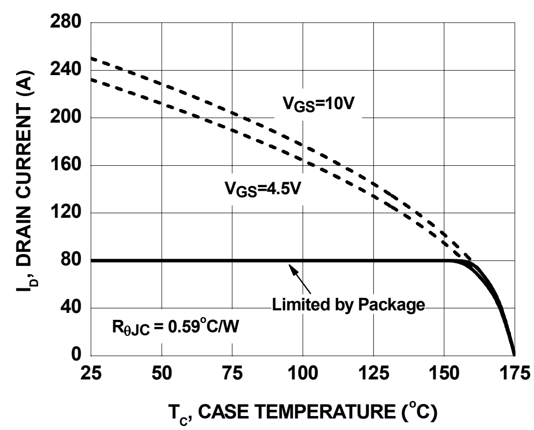


Figure 10. Maximum Continuous Drain Current vs Case Temperature

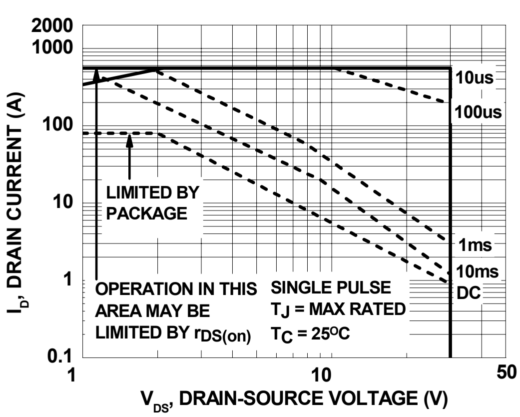


Figure 11. Forward Bias Safe Operating Area

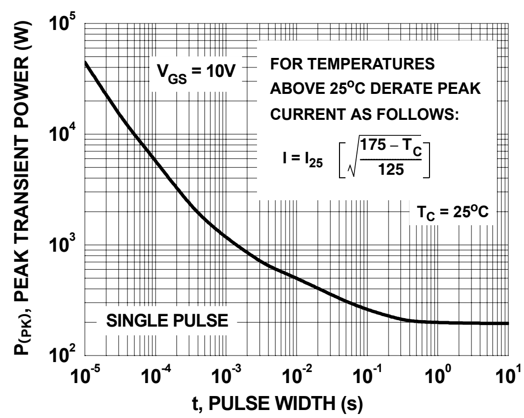


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

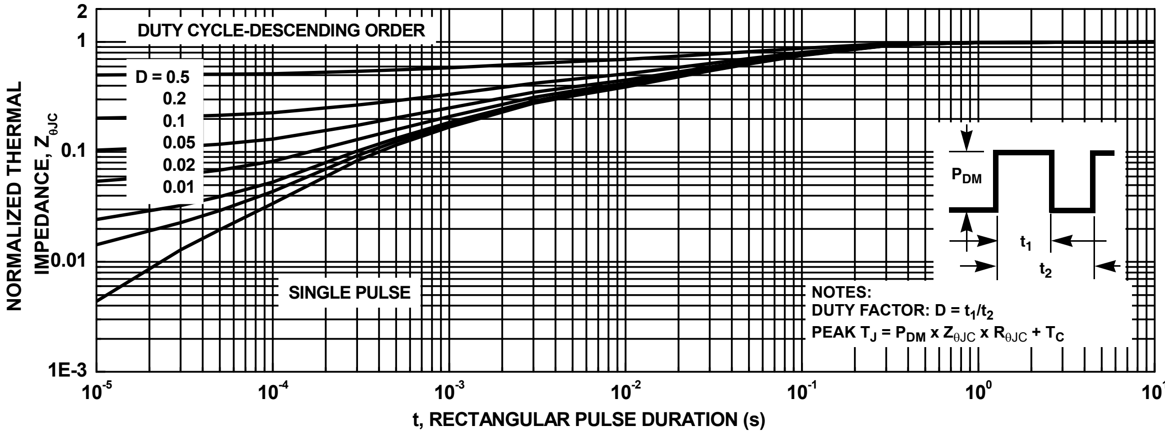


Figure 13. Transient Thermal Response Curve

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