



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

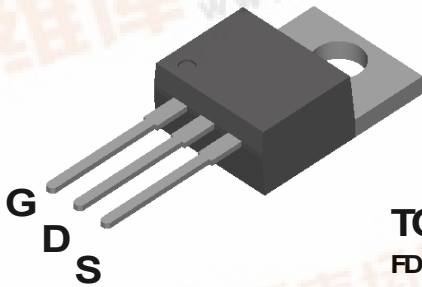


General Description

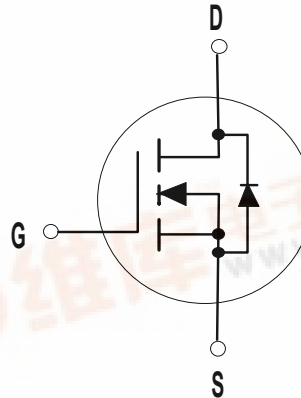
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

Application

- DC - DC Conversion
- Start / Alternator Systems



TO-220
FDP Series



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ 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 (Package limited) $T_C = 25^\circ\text{C}$	80	A
	-Continuous (Silicon limited) $T_C = 25^\circ\text{C}$	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	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case TO220	0.59	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	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 $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 1\text{mA}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{mA}$, referenced to 25°C		22		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$, $V_{GS} = 0\text{V}$, $T_J = 150^\circ\text{C}$			1 250	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.6	2.5	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		-9.6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 80\text{A}$		1.9	2.5	m Ω
		$V_{GS} = 5\text{V}, I_D = 80\text{A}$		2.0	2.8	
		$V_{GS} = 4.5\text{V}, I_D = 80\text{A}$		2.1	2.9	
		$V_{GS} = 10\text{V}, I_D = 80\text{A}, T_J = 150^\circ\text{C}$		2.9	3.8	
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 80\text{A}$		3.4		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		9200	12240	pF
C_{oss}	Output Capacitance			1700	2260	pF
C_{rss}	Reverse Transfer Capacitance			1060	1590	pF
R_g	Gate Resistance		$f = 1\text{MHz}$	1.7		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 80\text{A}$ $V_{GS} = 5\text{V}, R_{GEN} = 3\Omega$		35	56	ns
t_r	Rise Time			135	216	ns
$t_{d(off)}$	Turn-Off Delay Time			64	103	ns
t_f	Fall Time			59	95	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V		$V_{GS} = 0\text{V}$ to 10V	$V_{DD} = 15\text{V}$ $I_D = 80\text{A}$	158	222
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0\text{V}$ to 5V	81		114	nC
Q_{gs}	Gate to Source Gate Charge		27			nC
Q_{gd}	Gate to Drain "Miller" Charge		33			nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 80\text{A}$		0.88	1.25	V
		$V_{GS} = 0\text{V}, I_S = 40\text{A}$		0.81	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 80\text{A}, di/dt = 100\text{A}/\mu\text{s}$		60	90	ns
Q_{rr}	Reverse Recovery Charge			74	111	nC

Notes:

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

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

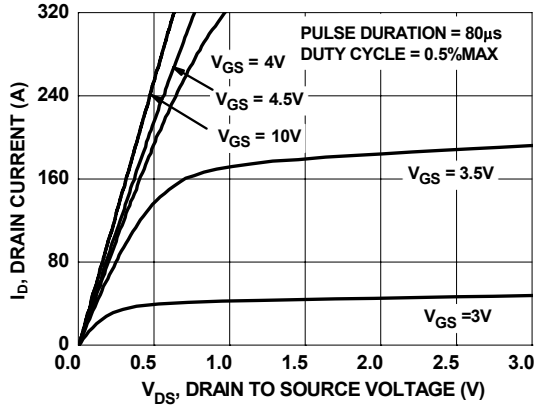


Figure 1. On Region Characteristics

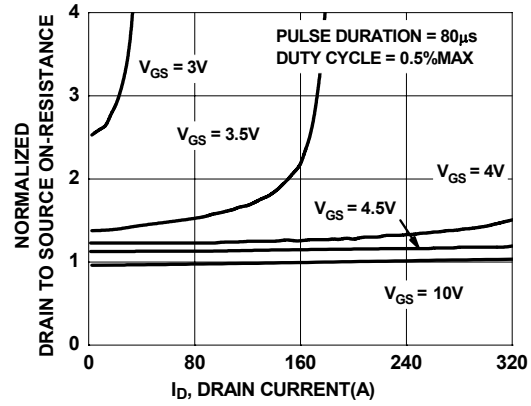


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

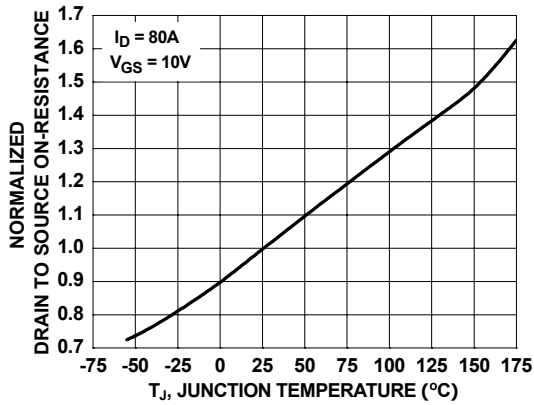


Figure 3. Normalized On Resistance vs Junction Temperature

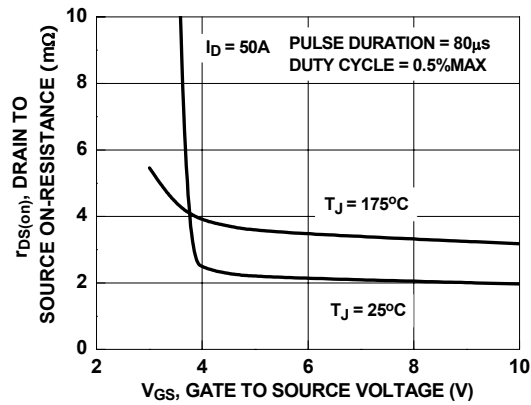


Figure 4. On-Resistance vs Gate to Source Voltage

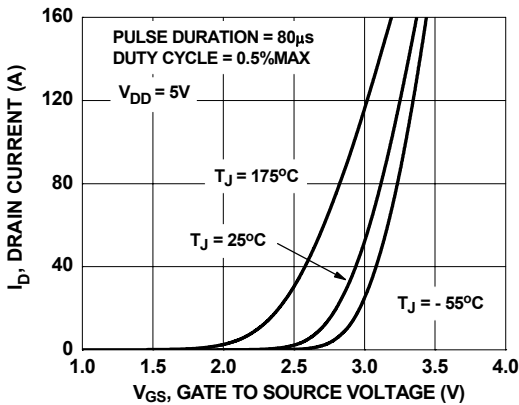


Figure 5. Transfer Characteristics

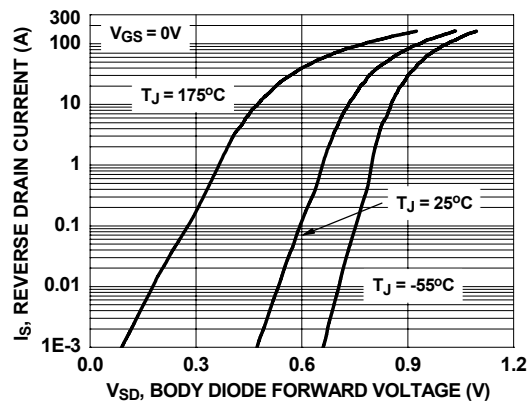


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

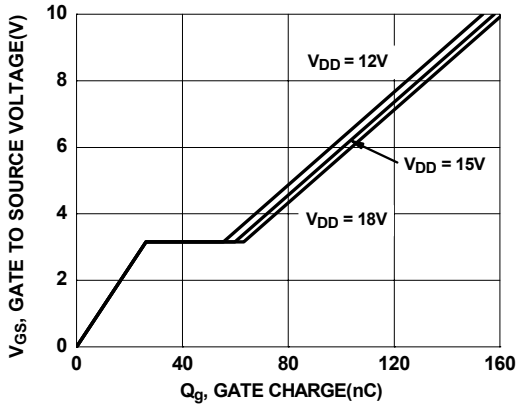


Figure 7. Gate Charge Characteristics

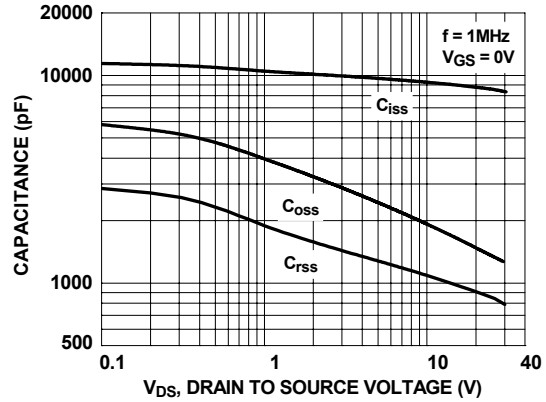


Figure 8. Capacitance vs Drain to Source Voltage

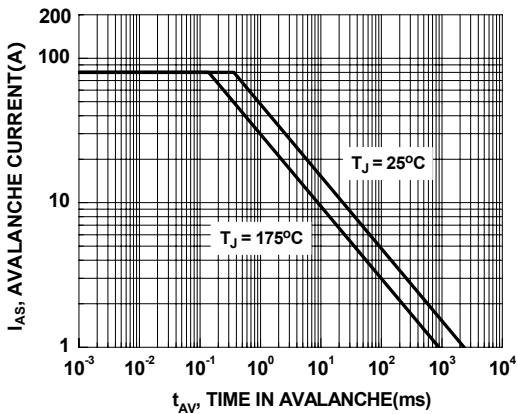


Figure 9. Unclamped Inductive Switching Capability

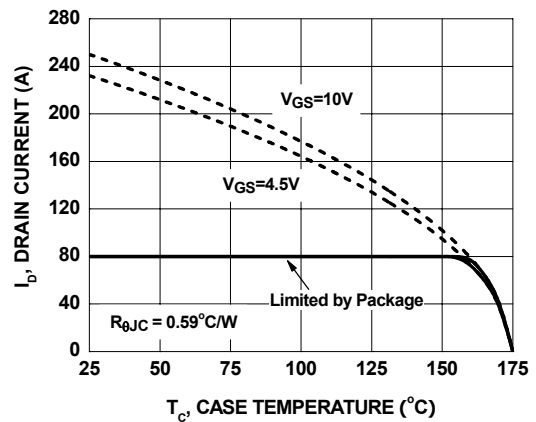


Figure 10. Maximum Continuous Drain Current vs Case Temperature

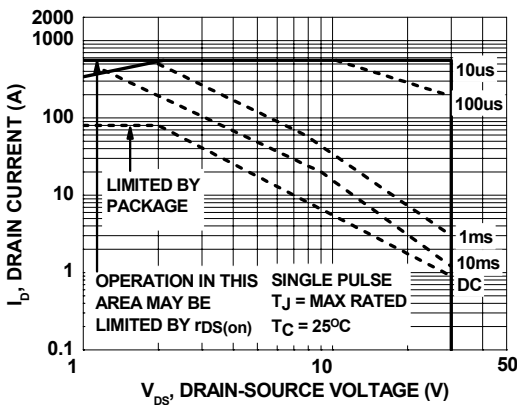


Figure 11. Forward Bias Safe Operating Area

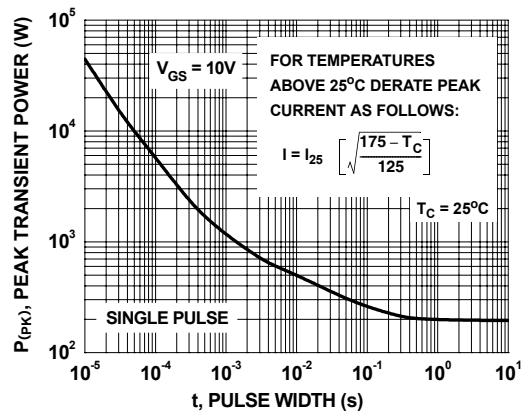


Figure 12. Single Pulse Maximum Power Dissipation

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

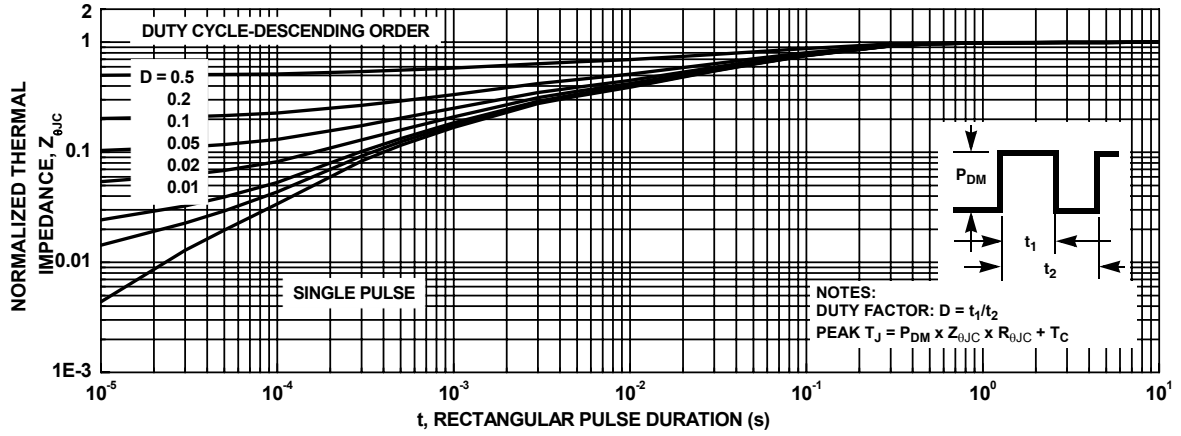


Figure 13. Transient Thermal Response Curve

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