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# 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

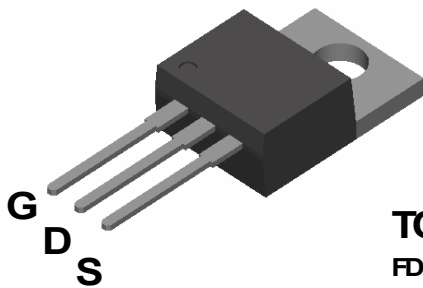


### General Description

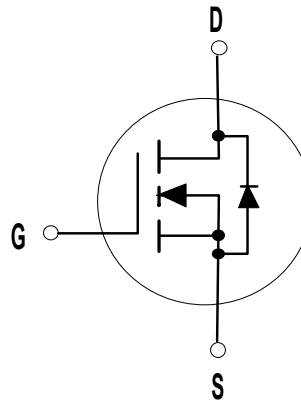
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $r_{DS(on)}$  and fast switching speed.

### 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	$^\circ\text{C/W}$
$R_{\theta JA}$	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 $25^\circ\text{C}$		22		$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 150^\circ\text{C}$			1 250	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$			$\pm 100$	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 $25^\circ\text{C}$		-9.6		$\text{mV}/^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 80\text{A}$		1.9	2.5	m $\Omega$
		$V_{GS} = 5\text{V}$ , $I_D = 80\text{A}$		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		$\Omega$

**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 $10\text{V}$		158	222	nC
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0\text{V}$ to $5\text{V}$	$V_{DD} = 15\text{V}$ $I_D = 80\text{A}$		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

**Notes:**

 1: Pulse Test: Pulse Width  $< 80\mu\text{s}$ , 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

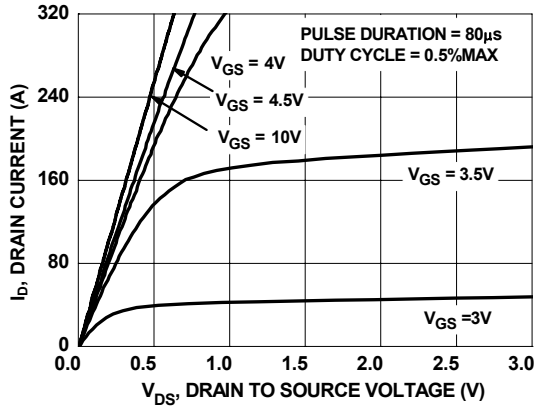


Figure 1. On Region Characteristics

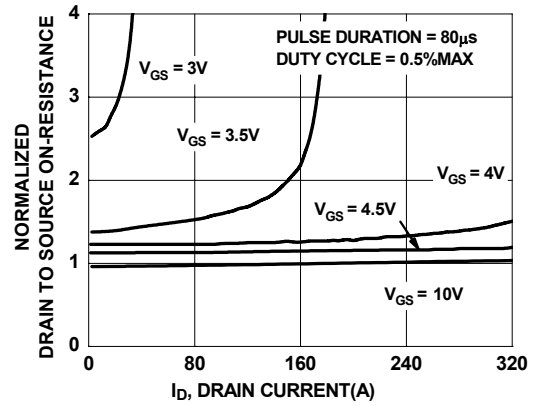


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

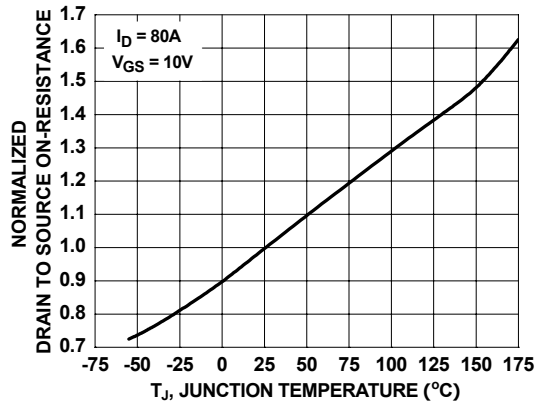


Figure 3. Normalized On Resistance vs Junction Temperature

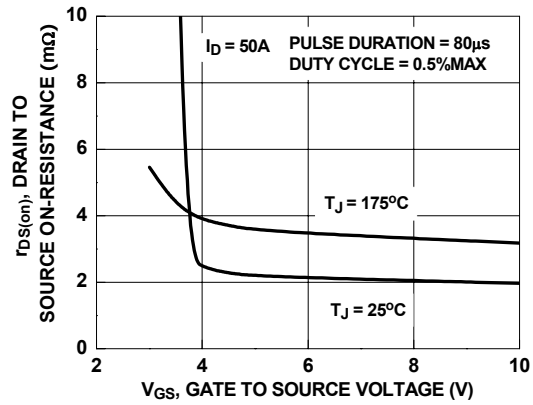


Figure 4. On-Resistance vs Gate to Source Voltage

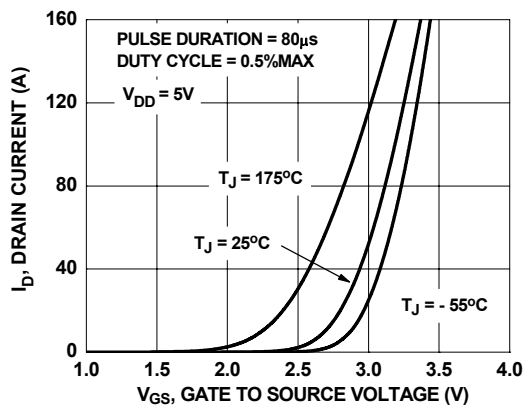


Figure 5. Transfer Characteristics

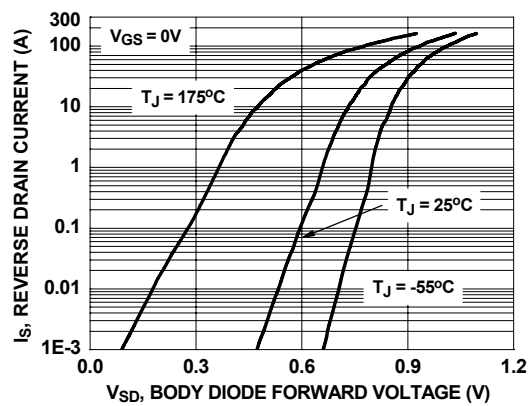
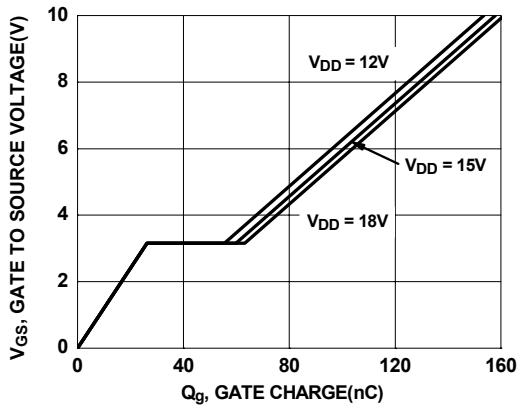
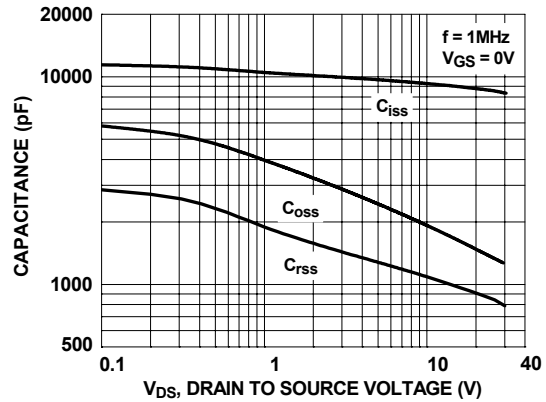


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

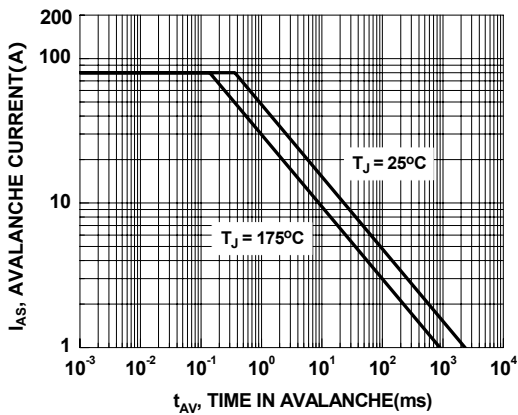
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



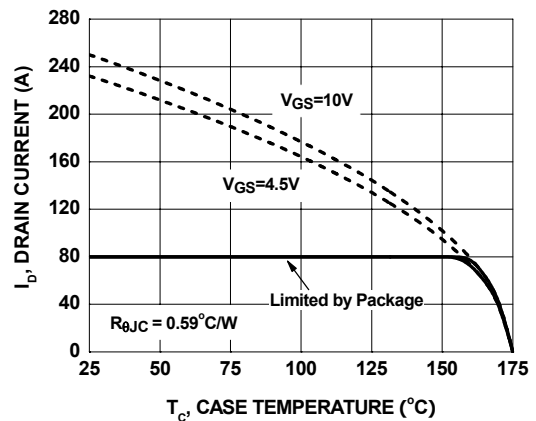
**Figure 7. Gate Charge Characteristics**



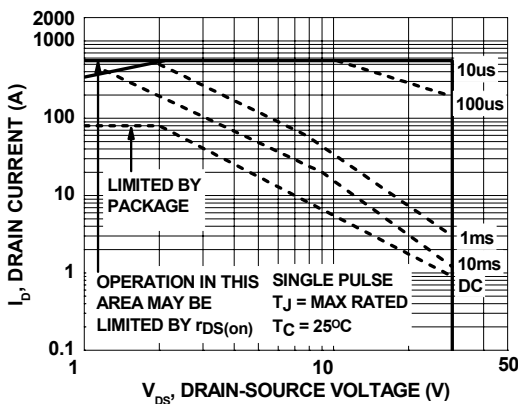
**Figure 8. Capacitance vs Drain to Source Voltage**



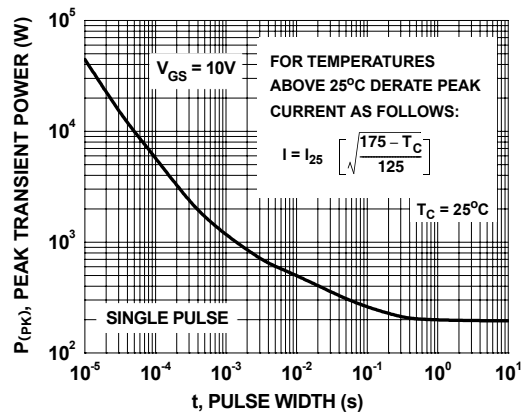
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

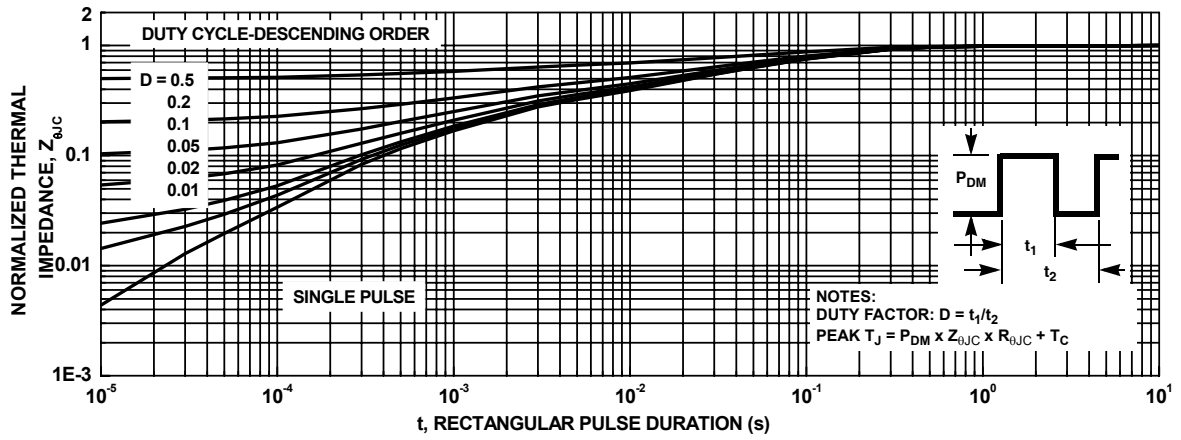


**Figure 11. Forward Bias Safe Operating Area**



**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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