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FAIRCHILD SEMICONDUCTOR®

November 2005

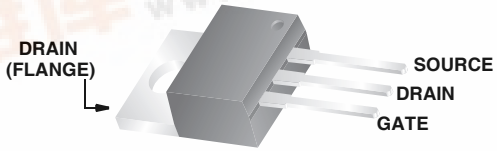
FDP8876
N-Channel PowerTrench® MOSFET
30V, 71A, 8.5mΩ

General Descriptions

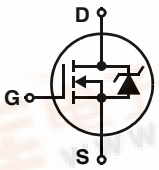
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(ON)}$ and fast switching speed.

Features

- $r_{DS(ON)}$ = 8.5mΩ, V_{GS} = 10V, I_D = 40A
- $r_{DS(ON)}$ = 10.3mΩ, V_{GS} = 4.5V, I_D = 40A
- High performance trench technology for extremely low $r_{DS(ON)}$
- Low gate charge
- High power and current handling capability
- RoHS Compliant



TO-220AB
FDP SERIES



MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current		
	Continuous (T_C = 25°C, V_{GS} = 10V)	70	A
	Continuous (T_C = 25°C, V_{GS} = 4.5V)	64	A
	Pulsed	Figure 4	A
E_{AS}	Single Pulse Avalanche Energy (Note 1)	180	mJ
P_D	Power dissipation	70	W
T_J, T_{STG}	Operating and Storage Temperature	-55 to 175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case TO-263	2.14	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263,1in^{2}copper pad area	62	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8876	FDP8876	TO-220AB	Tube	N/A	50 units

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Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off Characteristics							
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V		30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V				1	μA
		V_{GS} = 0V	T_A = 150°C	-	-	250	
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		1.2	-	2.5	V
$r_{DS(ON)}$	Drain to Source On Resistance	I_D = 40A, V_{GS} = 10V		-	6.1	8.7	mΩ
		I_D = 40A, V_{GS} = 4.5V		-	7.7	10.5	
		I_D = 40, V_{GS} = 10V, T_A = 175°C		-	11	14	
Dynamic Characteristics							
C_{ISS}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		-	1700	-	pF
C_{OSS}	Output Capacitance			-	340	-	pF
C_{RSS}	Reverse Transfer Capacitance			-	210	-	pF
R_G	Gate Resistance	V_{GS}=0.5V, f = 1MHz		-	2.3	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V	V_{DD} = 15V, I_D = 40A, I_g = 1.0mA	-	32	45	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0V to 5V		-	17	24	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0V to 1V		-	1.6	2.4	nC
Q_{gs}	Gate to Sourse Gate Charge			-	4.7	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau			-	3.1	-	nC
Q_{gd}	Gate to Drain “Miller” Charge			-	7.0	-	nC
Switching Characteristics (V_{GS} = 10V)							
t_{ON}	Turn-On Time	V_{DD} = 15V, I_D = 40A, V_{GS} = 10V, R_{GS} = 10Ω		-	-	189	ns
$t_{d(ON)}$	Turn-On Delay Time			-	9	-	ns
t_r	Rise Time			-	97	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time			-	51	-	ns
t_f	Fall Time			-	39	-	ns
t_{OFF}	Turn-Off Time			-	-	135	ns
Drain-Source Diode Characteristic							
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 40A		-	-	1.25	V
		I_{SD} = 3.2A		-	-	1.0	V
t_{rr}	Reverse Recovery Time	I_{SD} = 40A, dI_{SD}/dt=100A/μs		-	-	22	ns
Q_{RR}	Reverse Recovered Charge	I_{SD} = 40A, dI_{SD}/dt=100A/μs		-	-	9	nC

Notes:

1: Starting T_J=25°C,L=1mH,I_{AS}=19A,V_{DD}=27V,V_{GS}=10V

2: Pulse width=100s

Typical Characteristics T_A = 25°C unless otherwise noted

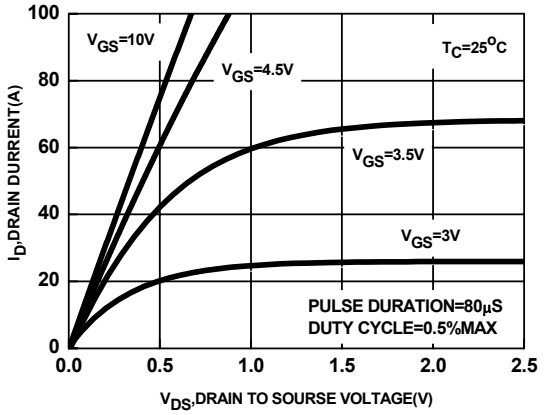

Figure 1. On Region Characteristics

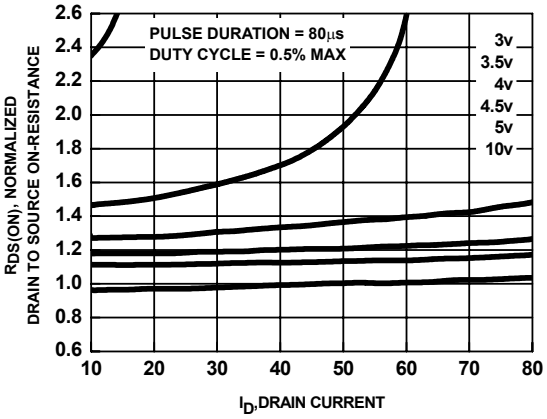

Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

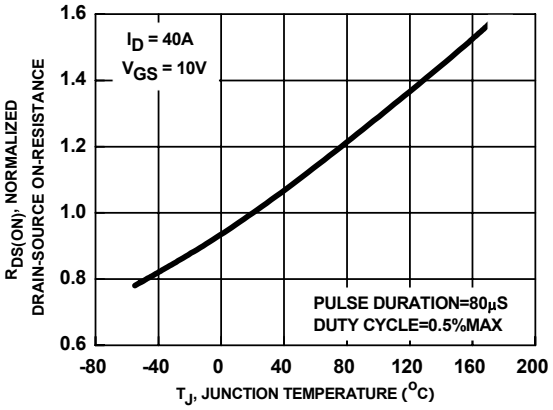

Figure 3. On Resistance Variation with Temperature

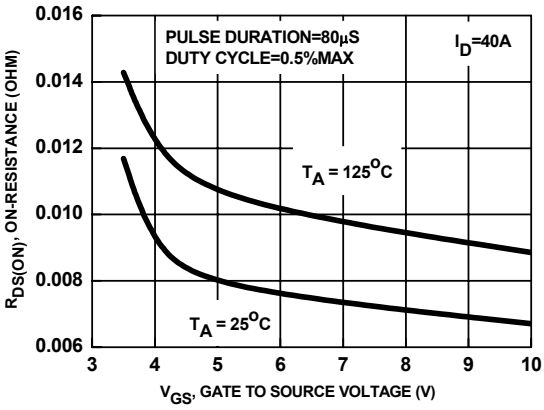

Figure 4. On-Resistance Variation with Gate-to-Source Votlage

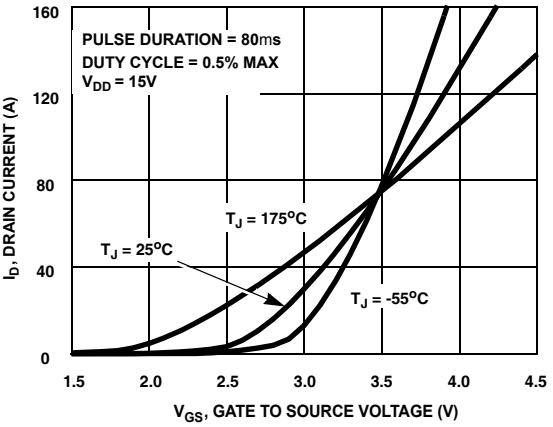

Figure 5. Transfer Characteristics

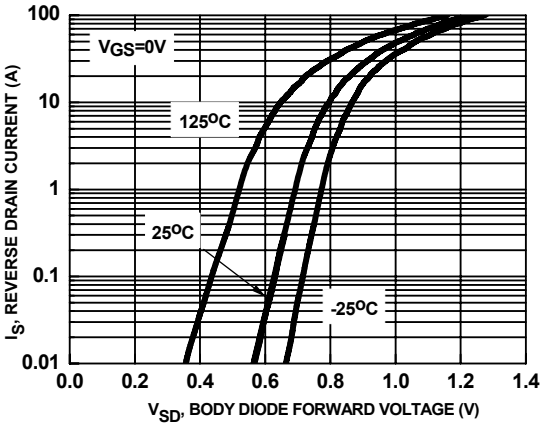

Figure 6. Body Diode Forward Voltage Variation With Source Current and Temperature

Typical Characteristics T_A = 25°C unless otherwise noted

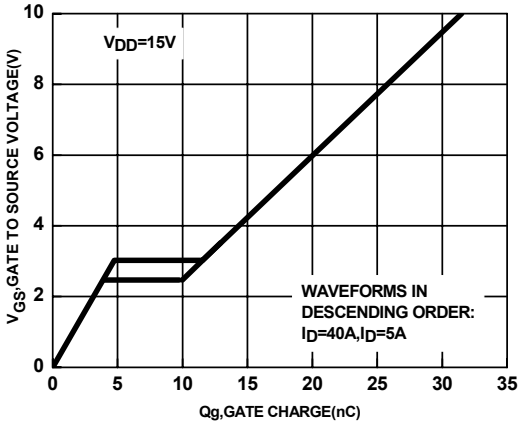

Figure 7. Gate Charge characteristics

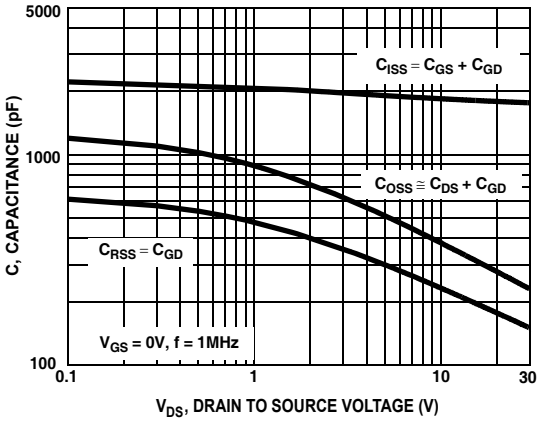

Figure 8. Saturation characteristics

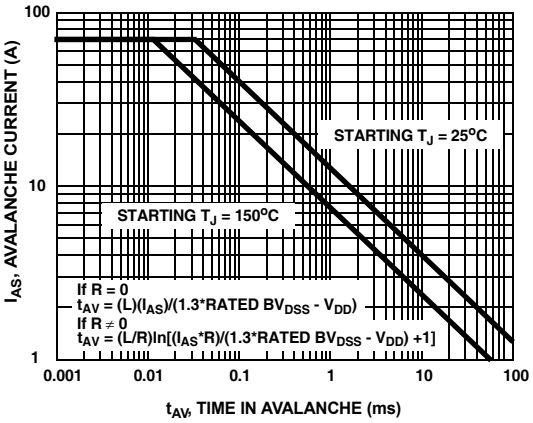

Figure 9. Unclamped Inductive Switching Capability

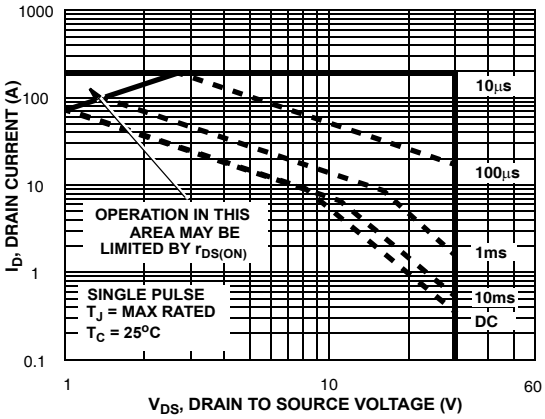

Figure 10. Safe Operating Area

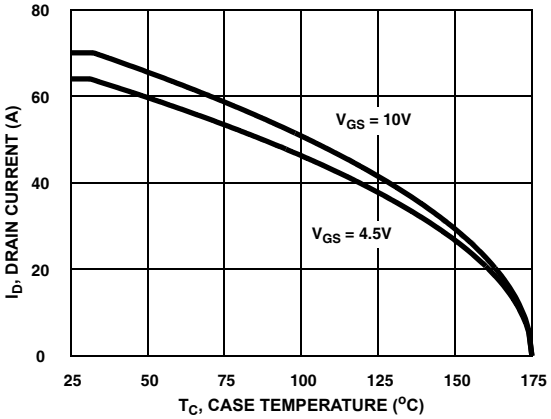

Figure 11. Maximum Continuous Drain Current vs Case Temperature

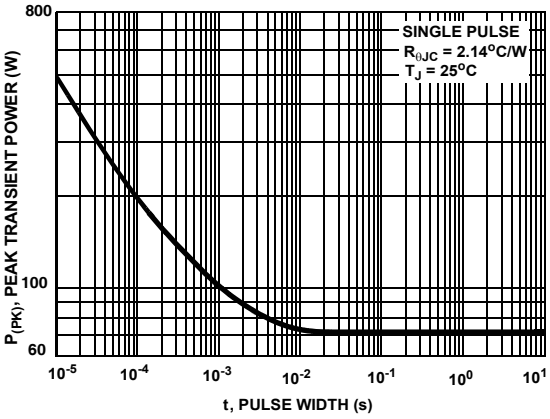

Figure 12. Normalized Drain to Source Breake Down Voltage vs Junction Temperature

Typical Characteristics T_A = 25°C unless otherwise noted

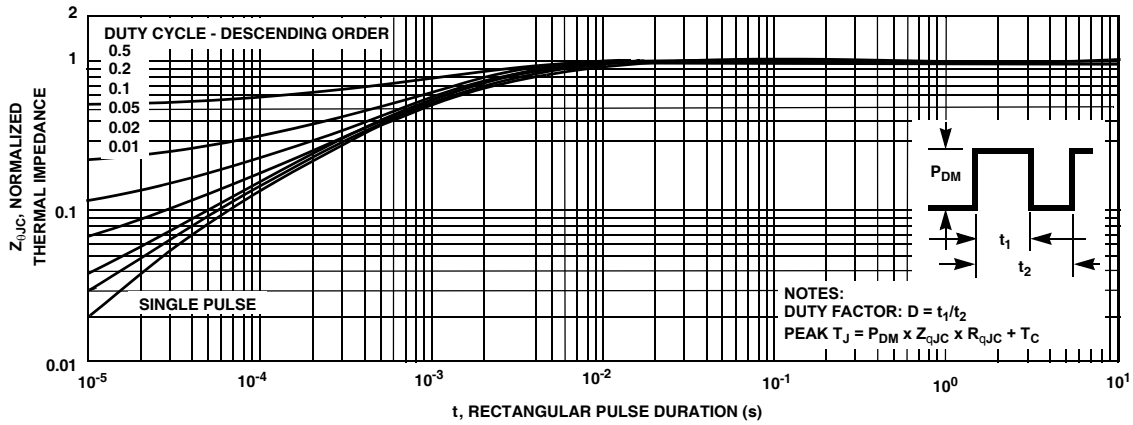

Figure 13. Normolized Maximum Transient Thermal Impedance

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