FAIRCHILD SEMICONDUCTOR®

March 2006

FDD8796/FDU8796
N-Channel PowerTrench® MOSFET
25V, 35A, 5.7mΩ

General Description

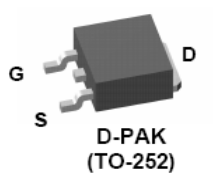
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

Application

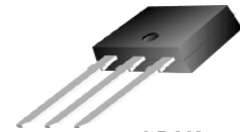
- Vcore DC-DC for Desktop Computers and Servers
- VRM for Intermediate Bus Architecture

Features

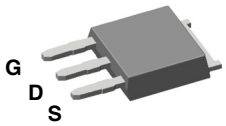
- Max $r_{DS(on)}$ = 5.7mΩ at V_{GS} = 10V, I_D = 35A
- Max $r_{DS(on)}$ = 8.0mΩ at V_{GS} = 4.5V, I_D = 35A
- Low gate charge: $Q_{g(10)}$ = 37nC(Typ), V_{GS} = 10V
- Low gate resistance
- Avalanche rated and 100% tested
- RoHS Compliant



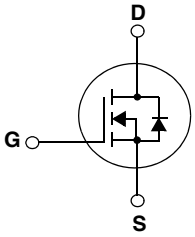
D-PAK
(TO-252)



I-PAK
(TO-251AA)



Short Lead I-PAK



MOSFET Maximum Ratings T_C= 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		25	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current -Continuous (Package Limited)		35	A
	-Continuous (Die Limited)		98	
	-Pulsed	(Note 1)	305	
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	91	mJ
P_D	Power Dissipation		88	W
T_J, T_{STG}	Operating and Storage Temperature		-55 to 175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case TO_252, TO_251	1.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO_252, TO_251	100	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO-252,1in^2 copper pad area	52	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD8796	FDD8796	TO-252AA	13”	12mm	2500 units
FDU8796	FDU8796	TO-251AA	N/A (Tube)	N/A	75 units
FDU8796	FDU8796_F071	TO-251AA	N/A (Tube)	N/A	75 units

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Electrical Characteristics T_J = 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	25			V
$\frac{\Delta B_{VDSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		7		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 20V, V_{GS} = 0V			1	μA
		V_{DS} = 20V, 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	1.2	1.8	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		-6.7		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 35A		4.5	5.7	mΩ
		V_{GS} = 4.5V, I_D = 35A		6.0	8.0	mΩ
		V_{DS} = 10V, I_D = 35A, T_J = 175°C		6.9	9.5	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 13V, V_{GS} = 0V, f = 1MHz		1960	2610	pF
C_{oss}	Output Capacitance			455	605	pF
C_{rss}	Reverse Transfer Capacitance			315	475	pF
R_G	Gate Resistance	f = 1MHz		1.1		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} =13V, I_D = 35A, V_{GS} = 10V, R_{GS} = 20Ω		10	20	ns
t_r	Rise Time			24	39	ns
$t_{d(off)}$	Turn-Off Delay Time			99	158	ns
t_f	Fall Time			57	91	ns
Q_g	Total Gate Charge	V_{GS} = 0 to10V, V_{DD} =13V, I_D = 35A, I_g = 1.0mA		37	52	nC
Q_g	Total Gate Charge	V_{GS} = 0 to 5V, V_{DD} =13V, I_D = 35A, I_g = 1.0mA		19	27	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} =13V, I_D = 35A, I_g = 1.0mA		6		nC
Q_{gd}	Gate to Drain Charge	V_{DD} =13V, I_D = 35A, I_g = 1.0mA		6		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	V_{GS} = 0V, I_S = 35A		0.9	1.25	V
		V_{GS} = 0V, I_S = 15A		0.8	1.0	V
t_{rr}	Reverse Recovery Time	I_F = 35A, di/dt = 100A/μs		30	45	ns
Q_{rr}	Reverse Recovery Charge	I_F = 35A, di/dt = 100A/μs		23	35	nC

Notes:

1: Pulse time < 300μs, Duty cycle = 2%.

2: Starting T_J = 25°C, L = 0.3mH, I_{AS} = 24.7A, V_{DD} = 23V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

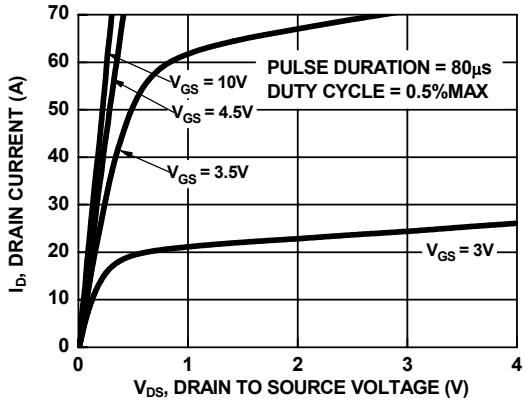


Figure 1. On Region Characteristics

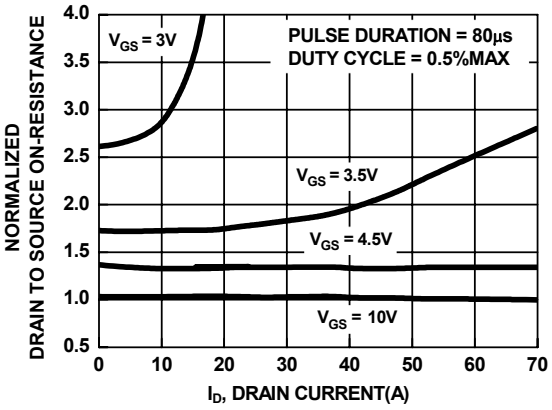


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

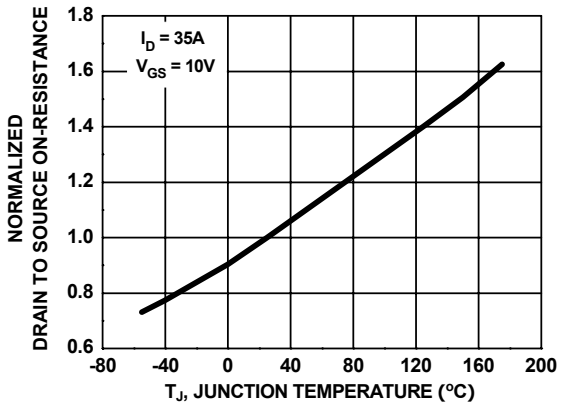


Figure 3. Normalized On Resistance vs Junction Temperature

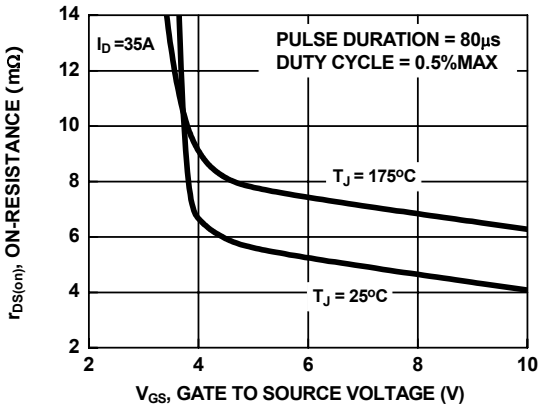


Figure 4. On-Resistance vs Gate to Source Voltage

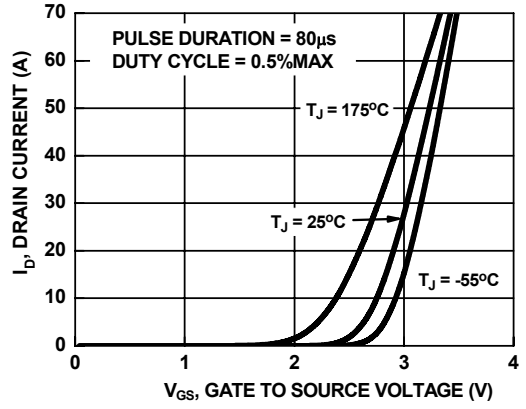


Figure 5. Transfer Characteristics

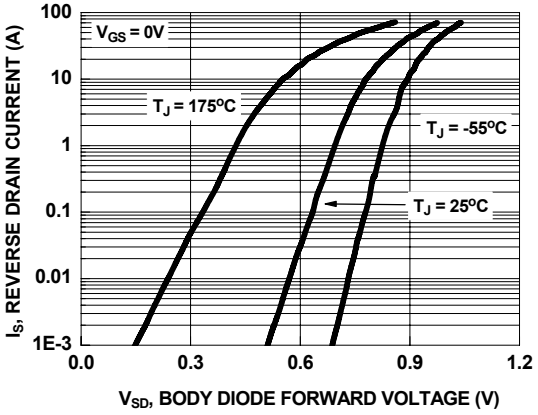


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

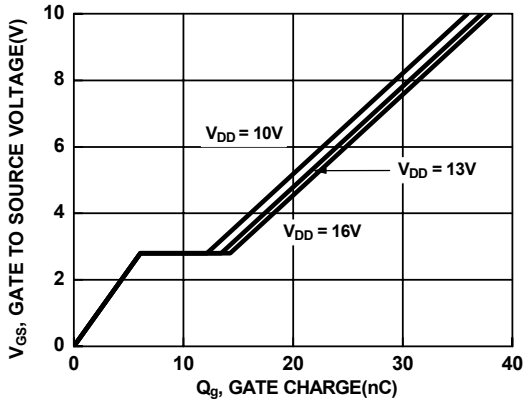


Figure 7. Gate Charge Characteristics

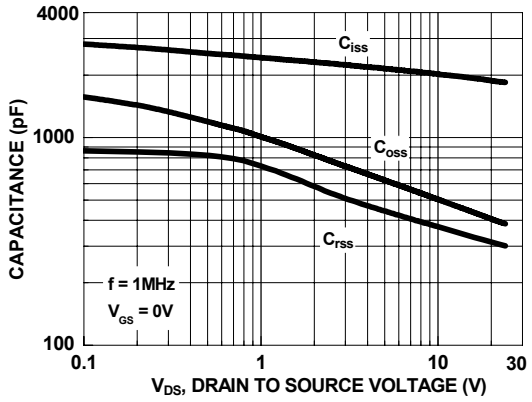


Figure 8. Capacitance vs Drain to Source Voltage

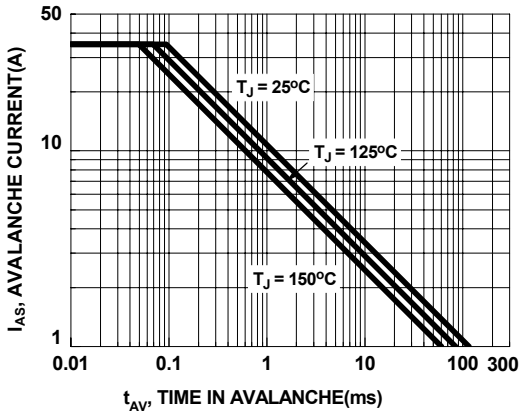


Figure 9. Unclamped Inductive Switching Capability

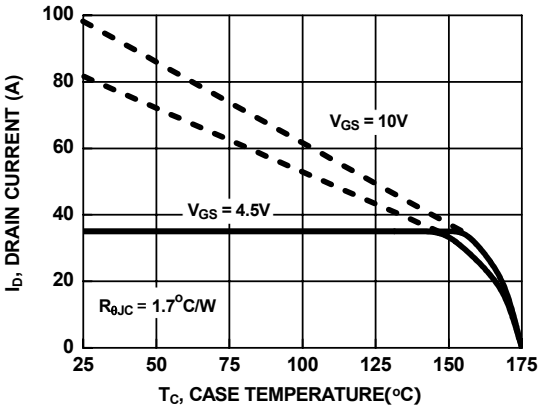


Figure 10. Maximum Continuous Drain Current vs Case Temperature

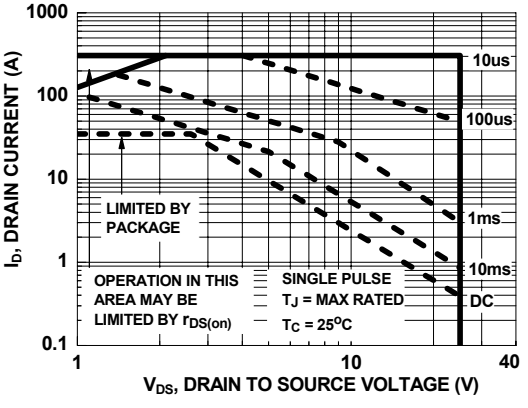


Figure 11. Forward Bias Safe Operating Area

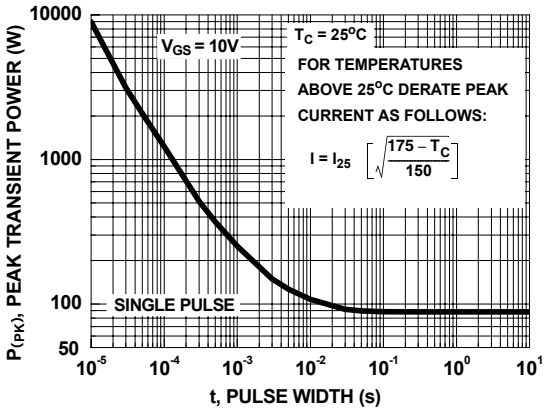


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

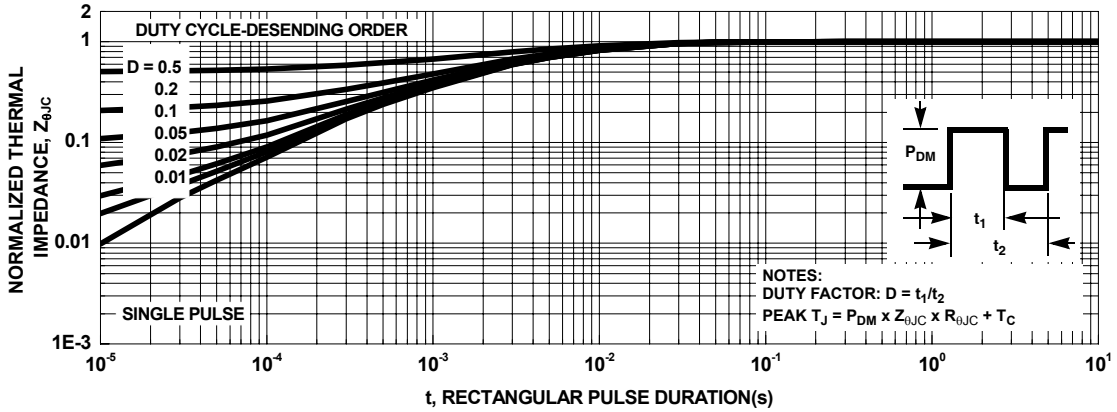


Figure 13. Transient Thermal Response Curve

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Rev. I18

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