FAIRCHILD SEMICONDUCTOR®

March 2006

FDD8780/FDU8780
N-Channel PowerTrench® MOSFET
25V, 35A, 8.5mΩ

General Description

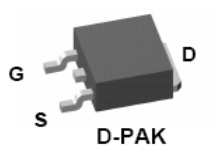
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

Application

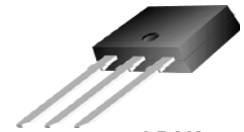
- Vcore DC-DC for Desktop Computers and Servers
- VRM for Intermediate Bus Architecture

Features

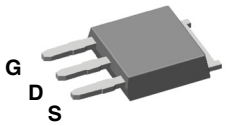
- Max $r_{DS(on)}$ = 8.5mΩ at V_{GS} = 10V, I_D = 35A
- Max $r_{DS(on)}$ = 12.0mΩ at V_{GS} = 4.5V, I_D = 35A
- Low gate charge: $Q_{g(10)}$ = 21nC(Typ), V_{GS} = 10V
- Low gate resistance
- Avalanche rated and 100% tested
- RoHS Compliant



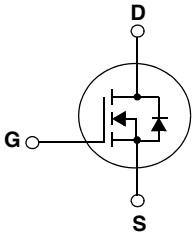
D-PAK
(TO-252)



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)		60	
	-Pulsed	(Note 1)	224	
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	73	mJ
P_D	Power Dissipation		50	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	3.0	°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
FDD8780	FDD8780	TO-252AA	13”	12mm	2500 units
FDU8780	FDU8780	TO-251AA	N/A(Tube)	N/A	75 units
FDU8780	FDU8780_F071	TO-251AA	N/A(Tube)	N/A	75 units

©2006 Fairchild Semiconductor Corporation

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		12		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		-6.3		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 35A		6.5	8.5	mΩ
		V_{GS} = 4.5V, I_D = 35A		9.1	12.0	mΩ
		V_{GS} = 10V, I_D = 35A, T_J = 175°C		10.4	15.0	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 13V, V_{GS} = 0V, f = 1MHz		1080	1440	pF
C_{oss}	Output Capacitance			265	355	pF
C_{rss}	Reverse Transfer Capacitance			180	270	pF
R_g	Gate Resistance	f = 1MHz		0.9		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 13V, I_D = 35A, V_{GS} = 10V, R_{GS} = 17Ω		7	14	ns
t_r	Rise Time			9	18	ns
$t_{d(off)}$	Turn-Off Delay Time			43	69	ns
t_f	Fall Time			24	38	ns
Q_g	Total Gate Charge	V_{GS} = 0V to 10V, V_{DD} = 13V, I_D = 35A, I_g = 1.0mA		21	29	nC
Q_g	Total Gate Charge	V_{GS} = 0V to 5V, V_{DD} = 13V, I_D = 35A, I_g = 1.0mA		11.2	16	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 13V, I_D = 35A, I_g = 1.0mA		3.5		nC
Q_{gd}	Gate to Drain “Miller”Charge	V_{DD} = 13V, I_D = 35A, I_g = 1.0mA		4.7		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 35A		0.92	1.25	V
		V_{GS} = 0V, I_S = 15A		0.84	1.0	V
t_{rr}	Reverse Recovery Time	I_F = 35A, di/dt = 100A/μs		28	42	ns
Q_{rr}	Reverse Recovery Charge	I_F = 35A, di/dt = 100A/μs		20	30	nC

Notes:
1: Pulse time < 300μs, Duty cycle = 2%.
2: Starting T_J = 25°C, L = 0.3mH, I_{AS} = 22A, V_{DD} = 23V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

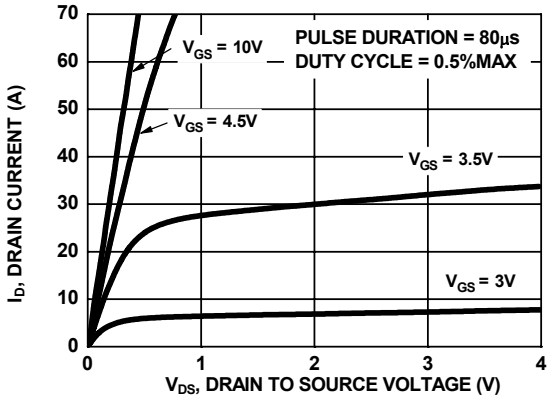


Figure 1. On Region Characteristics

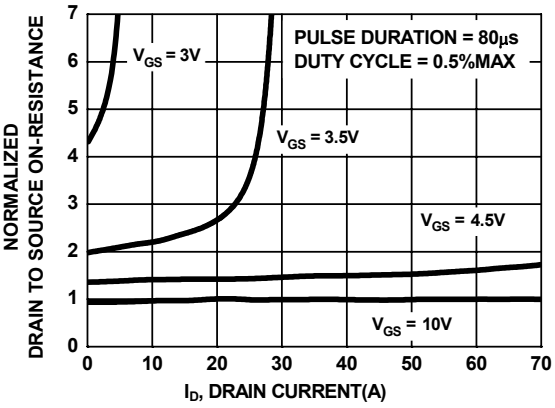


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

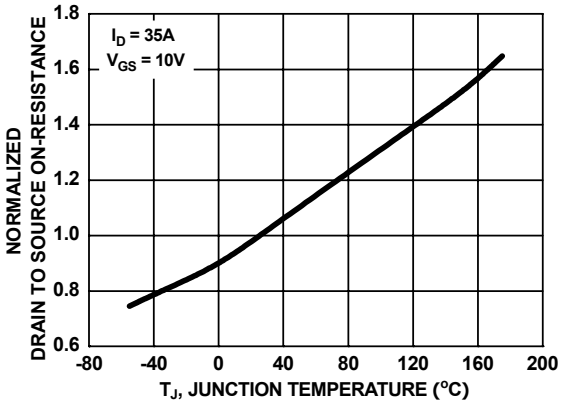


Figure 3. Normalized On Resistance vs Junction Temperature

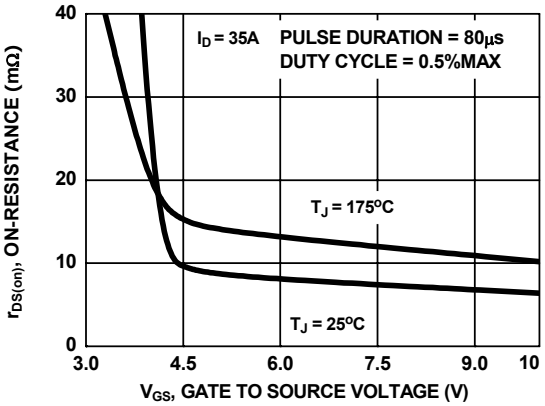


Figure 4. On-Resistance vs Gate to Source Voltage

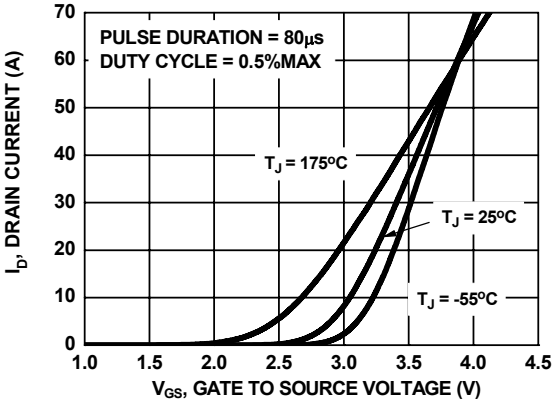


Figure 5. Transfer Characteristics

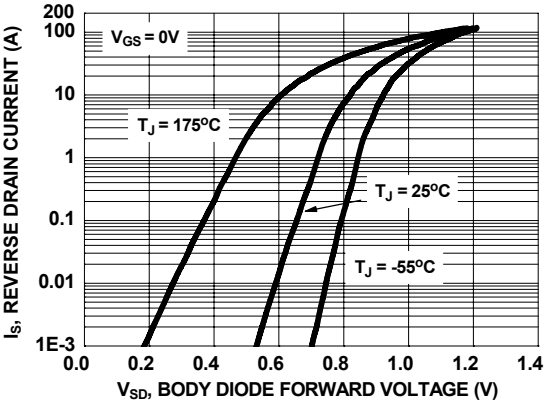


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

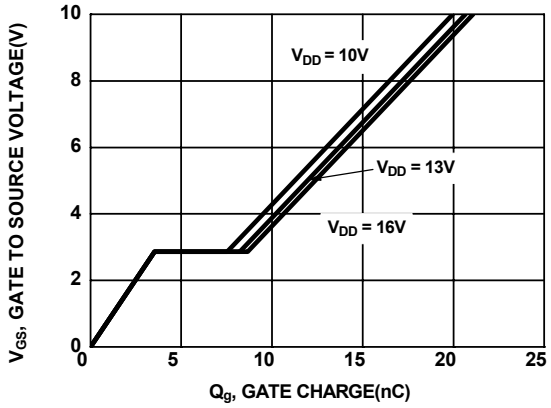


Figure 7. Gate Charge Characteristics

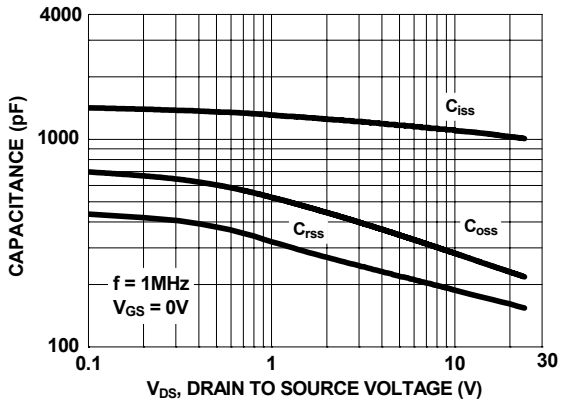


Figure 8. Capacitance vs Drain to Source Voltage

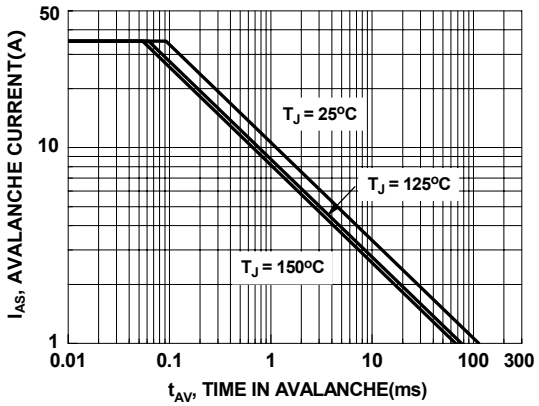


Figure 9. Unclamped Inductive Switching Capability

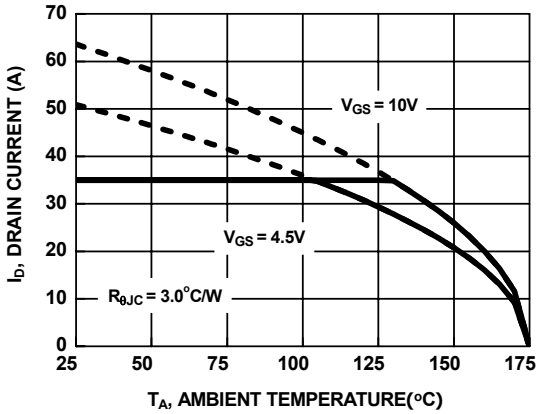


Figure 10. Maximum Continuous Drain Current vs Case Temperature

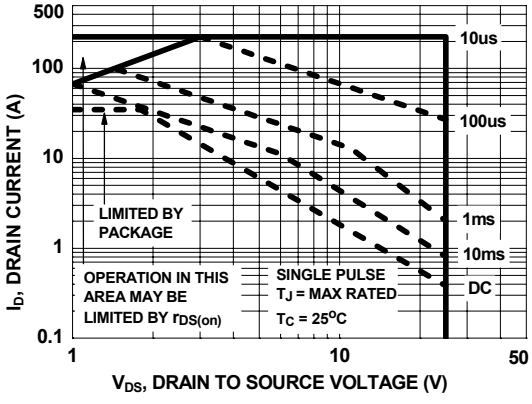


Figure 11. Forward Bias Safe Operating Area

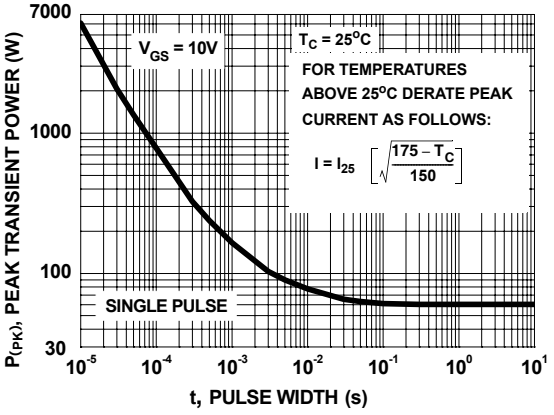


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

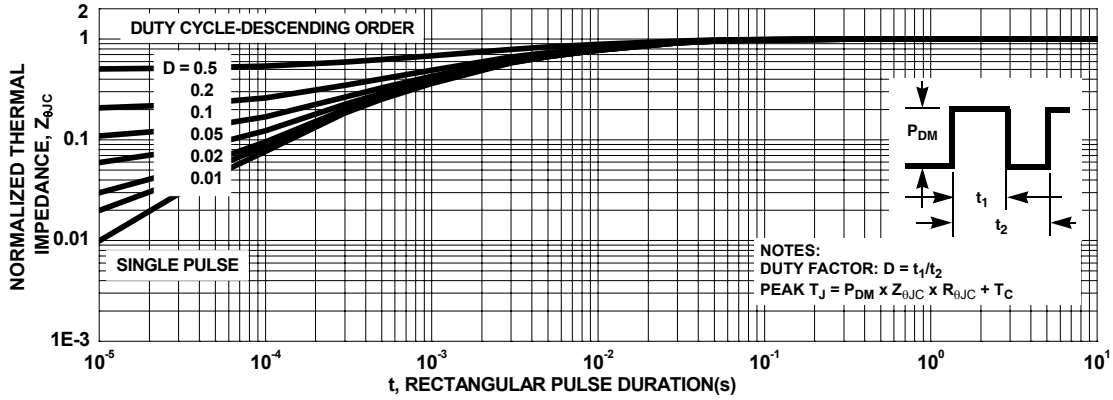


Figure 13. Transient Thermal Response Curve

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FAST®	ISOPLANAR™	PowerSaver™	SuperSOT™-6
ActiveArray™	FASTr™	LittleFET™	PowerTrench®	SuperSOT™-8
Bottomless™	FPS™	MICROCOUPLER™	QFET®	SyncFET™
Build it Now™	FRFET™	MicroFET™	QS™	TCM™
CoolFET™	GlobalOptoisolator™	MicroPak™	QT Optoelectronics™	TinyLogic®
CROSSVOLT™	GTO™	MICROWIRE™	Quiet Series™	TINYOPTO™
DOME™	HiSeC™	MSX™	RapidConfigure™	TruTranslation™
EcoSPARK™	I^2C™	MSXPro™	RapidConnect™	UHC™
E^2CMOS™	*i-Lo*™	OCX™	µSerDes™	UltraFET®
EnSigna™	ImpliedDisconnect™	OCXPro™	ScalarPump™	UniFET™
FACT™	IntelliMAX™	OPTOLOGIC®	SILENT SWITCHER®	VCX™
FACT Quiet Series™		OPTOPLANAR™	SMART START™	Wire™
		PACMAN™	SPM™	
Across the board. Around the world.™		POP™	Stealth™	
The Power Franchise®		Power247™	SuperFET™	
Programmable Active Droop™		PowerEdge™	SuperSOT™-3	

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I18

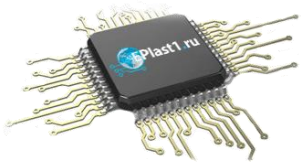
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.