

January 2007

FDD8586/FDU8586

N-Channel PowerTrench® MOSFET

20V, **35A**, **5.5m** Ω

Features

- Max $r_{DS(on)} = 5.5m\Omega$ at $V_{GS} = 10V$, $I_D = 35A$
- Max $r_{DS(on)} = 8.5 \text{m}\Omega$ at $V_{GS} = 4.5 \text{V}$, $I_D = 33 \text{A}$
- Low gate charge: $Q_{g(TOT)} = 34nC(Typ)$, $V_{GS} = 10V$
- Low gate resistance
- 100% Avalanche tested
- RoHS compliant

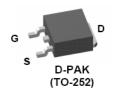


General Description

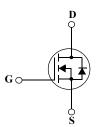
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{\mbox{\scriptsize DS(on)}}$ and fast switching speed.

Application

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







MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units	
V_{DS}	Drain to Source Voltage		20	V
V_{GS}	Gate to Source Voltage	Gate to Source Voltage		
	Drain Current -Continuous (Package Limited)		35	
I_{D}	-Continuous (Die Limited)		93	Α
	-Pulsed	(Note 1)	354	
E _{AS}	Single Pulse Avalanche Energy	(Note 2)	144	mJ
P_{D}	Power Dissipation		77	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	1.94	°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
FDD8586	FDD8586	TO-252AA	13"	12mm	2500 units
FDU8586	FDU8586	TO-251AA	N/A(Tube)	N/A	75 units

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

Parameter

Off Characteristics						
BV _{DSS}	Drain to Source Breakdown Voltage	n to Source Breakdown Voltage $I_D = 250\mu A, V_{GS} = 0V$				V
$\Delta BV_{DSS} \ \Delta T_{J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, referenced to 25°C		14.6		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16V,$ $V_{GS} = 0V$ $T_{J} = 150^{\circ}C$			1 250	μА
I _{GSS}	Gate to Source Leakage Current	V _{GS} = ±20V			±100	nA

Test Conditions

Min

Тур

Max

Units

On Characteristics

Symbol

V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	1.2	1.6	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μ A, referenced to 25°C		-6.7		mV/°C
	Drain to Source On Resistance	$V_{GS} = 10V, I_D = 35A$		4.0	5.5	mΩ
r _{DS(on)}		$V_{GS} = 4.5V, I_D = 33A$		5.7	8.5	
		V_{GS} = 10V, I_{D} = 35A T_{J} = 175°C		6.5	8.9	
g _{FS}	Forward Transcondductance	$V_{DS} = 10V, I_{D} = 35A$		175		S

Dynamic Characteristics

C _{iss}	Input Capacitance	101/11/	1865	2480	pF
C _{oss}	Output Capacitance	V _{DS} = 10V, V _{GS} = 0V, f = 1MHz	550	730	pF
C _{rss}	Reverse Transfer Capacitance	1 - 111112	335	445	pF
R _g	Gate Resistance	f = 1MHz	1.2		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time		9	18	ns
t _r	Rise Time	$V_{DD} = 10V, I_{D} = 35A$ $V_{GS} = 10V, R_{GS} = 10\Omega$	11	20	ns
t _{d(off)}	Turn-Off Delay Time	V _{GS} = 10V, K _{GS} = 1022	47	75	ns
t _f	Fall Time		25	40	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	V _{GS} = 0V to 10V	34	48	nC
Q _{g(5)}	Total Gate Charge at 5V	$V_{GS} = 0V \text{ to } 5V$ $V_{DD} = 10V$ $I_{D} = 35A$	16	22	nC
Q_{gs}	Gate to Source Gate Charge	$I_{\rm p} = 35A$ $I_{\rm q} = 1.0 {\rm mA}$	3.2		nC
Q _{gd}	Gate to Drain "Miller" Charge	.g	5.9		nC

Drain-Source Diode Characteristics

V	Source to Drain Diode Forward Voltage	$V_{GS} = 0V, I_{S} = 35A$	0.89	1.25	V	
V _{SD}	Source to Drain Diode 1 of ward voltage	$V_{GS} = 0V, I_{S} = 15A$	0.82	1.2	v	
t _{rr}	Reverse Recovery Time	$I_F = 35A$, di/dt = 100A/ μ s	30	45	ns	
Q _{rr}	Reverse Recovery Charge	$I_F = 35A$, di/dt = 100A/ μ s	23	35	nC	

Notes:
1: Pulse time < 300µs, Duty cycle = 2%.
2: Starting T_J = 25°C, L = 0.3mH, I_{AS} = 31A, V_{DD} = 18V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

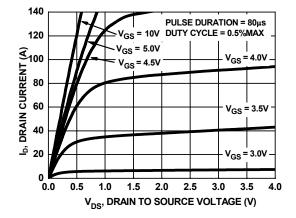


Figure 1. On Region Characteristics

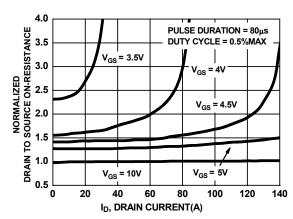


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

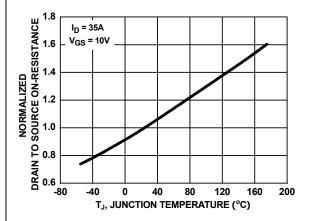


Figure 3. Normalized On Resistance vs Junction Temperature

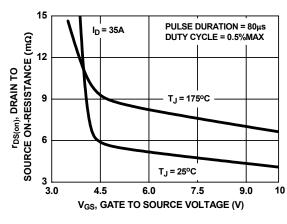


Figure 4. On-Resistance vs Gate to Source Voltage

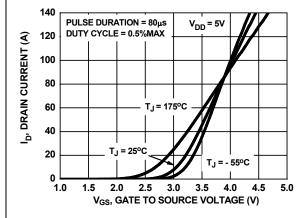


Figure 5. Transfer Characteristics

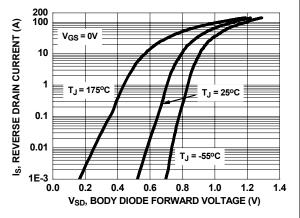
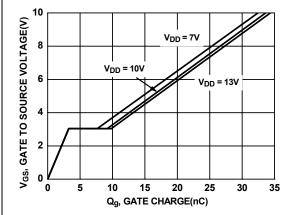


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

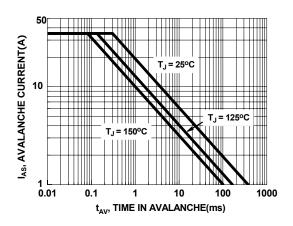


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Figure 7. Gate Charge Characteristics

Figure 8. Capacitance vs Drain to Source Voltage



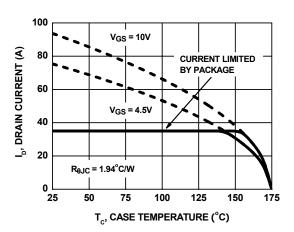
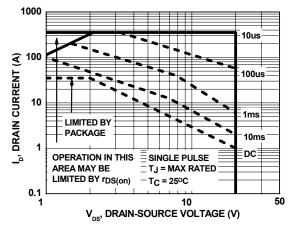


Figure 9. Unclamped Inductive Switching Capability

Figure 10. Maximum Continuous Drain Current vs Case Temperature



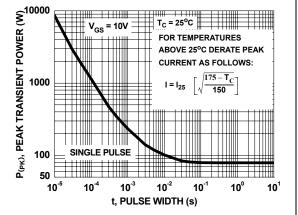


Figure 11. Forward Bias Safe Operating Area

Figure 12. Single Pulse Maximum Power Dissipation

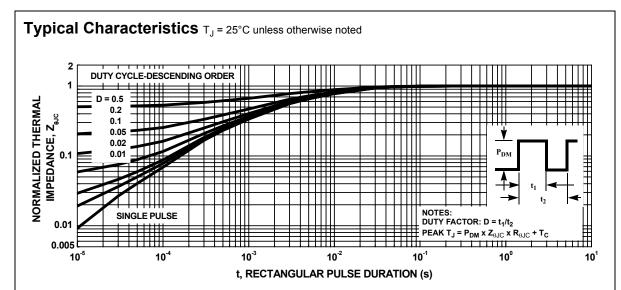
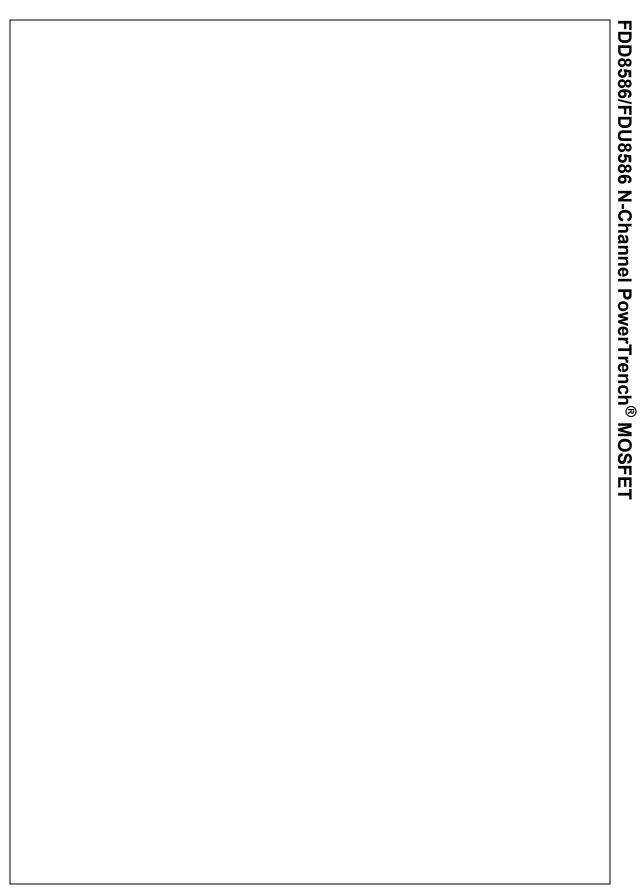


Figure 13. Transient Thermal Response Curve



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