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November 2013

FDPF10N50FT

N-Channel UniFETTM FRFET[®] MOSFET 500 V, 9 A, 850 m Ω

Features

- $R_{DS(on)}$ = 710 m Ω (Typ.) @ V_{GS} = 10 V, I_D = 4.5 A
- Low Gate Charge (Typ. 18 nC)
- Low C_{rss} (Typ. 10 pF)
- · 100% Avalanche Tested
- · Improved dv/dt Capability
- · RoHS Compliant

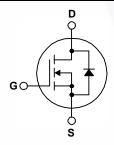
Applications

- LCD/LED/PDP TV
- · Lighting
- · Uninterruptible Power Supply

Description

UniFETTM MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. The body diode's reverse recovery performance of UniFET FRFET® MOSFET has been enhanced by lifetime control. Its t_{rr} is less than 100nsec and the reverse dv/dt immunity is 15V/ns while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore, it can remove additional component and improve system reliability in certain applications in which the performance of MOSFET's body diode is significant. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.





MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol		Parameter		FDPF10N50FT	Unit
V _{DSS}	Drain to Source Voltage			500	V
V _{GSS}	Gate to Source Voltage	te to Source Voltage			V
	- Continuous (T _C = 25°C)			9*	
ID	Drain Current	- Continuous (T _C = 100°C)		5.4*	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	36*	Α
E _{AS}	Single Pulsed Avalanche	e Energy	(Note 2)	364	mJ
I _{AR}	Avalanche Current		(Note 1)	9	Α
E _{AR}	Repetitive Avalanche En	ergy	(Note 1)	12.5	mJ
dv/dt	Peak Diode Recovery dv	r/dt	(Note 3)	20	V/ns
В	Dawar Dissination	$(T_C = 25^{\circ}C)$		42	W
P_{D}	Power Dissipation	- Derate Above 25°C		0.33	W/°C
T _J , T _{STG}	Operating and Storage T	ating and Storage Temperature Range		-55 to +150	°C
TL	Maximum Lead Tempera	ture for Soldering, 1/8" from Case for 5 S	Seconds	300	°C

^{*}Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter FDPF10N50FT		Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. 62.5		· C/VV

©2009 Fairchild Semiconductor Corporation FDPF10N50FT Rev. C1

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF10N50FT	FDPF10N50FT	TO-220F	Tube	N/A	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	cteristics					
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V, T_J = 25^{\circ} C$	500	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C	-	0.5	-	V/°C
1	Zero Gate Voltage Drain Current	$V_{DS} = 500 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	10	μA
IDSS	Zero Gate Voltage Drain Guirent	$V_{DS} = 400 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	100	μΑ
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	±100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu\text{A}$	3.0	-	5.0	V
R _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 4.5 \text{ A}$	-	0.71	0.85	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 4.5 A	-	8.5	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 05.V.V 0.V		-	880	1170	pF
C _{oss}	Output Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz		-	120	160	pF
C _{rss}	Reverse Transfer Capacitance	1 = 1 1/11/12		-\	10	15	pF
Qg	Total Gate Charge at 10V	V _{DS} = 400 V, I _D = 10 A,		- \	18	24	nC
Q _{gs}	Gate to Source Gate Charge	V _{GS} = 10 V		- \	5	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4)	-	7.5	-	nC

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	20	50	ns
t _r		$V_{DD} = 250 \text{ V}, I_D = 10 \text{ A},$	-	40	90	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 25 Ω	-	45	100	ns
t _f	Turn-Off Fall Time	(Note 4)	-	30	70	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Dioc	Maximum Continuous Drain to Source Diode Forward Current		-	9	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	60	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 9 A	-	-	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 9 A,	-	95	-	ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt = 100 A/μs	-	0.2	_	μC

Notes:

- 1: Repetitive rating: pulse-width limited by maximum junction temperature.
- 2: L = 9 mH, I_{AS} = 9 A, V_{DD} = 50 V, R_G = 25 Ω , starting T_J = 25°C.
- 3: $I_{SD} \le 8$ A, $di/dt \le 200$ A/ μ s, $V_{DD} \le BV_{DSS}$, starting $T_J = 25^{\circ}C$.
- 4: Essentially independent of operating temperature typical characteristics.



Typical Performance Characteristics

Figure 1. On-Region Characteristics

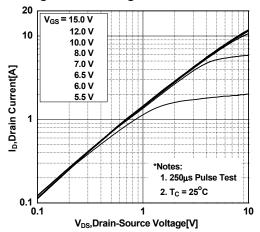


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

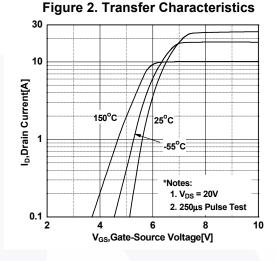


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

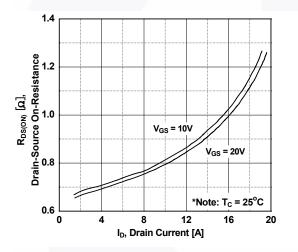
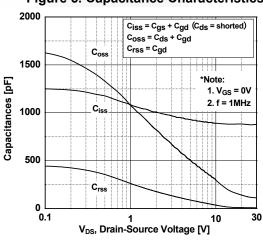


Figure 5. Capacitance Characteristics



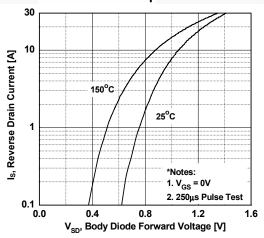
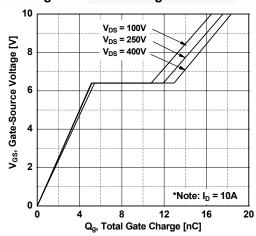


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

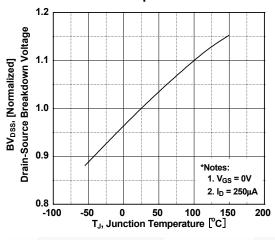


Figure 8. Maximum Safe Operating Area

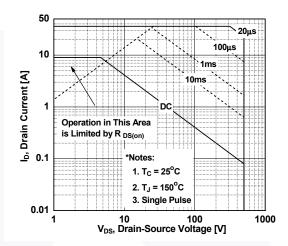


Figure 9. Maximum Drain Current vs. Case Temperature

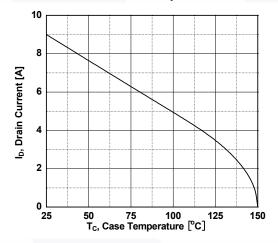
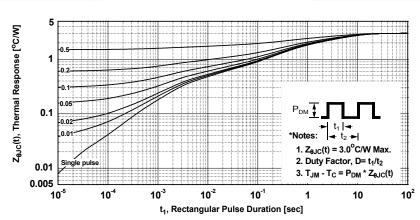


Figure 10. Transient Thermal Response Curve



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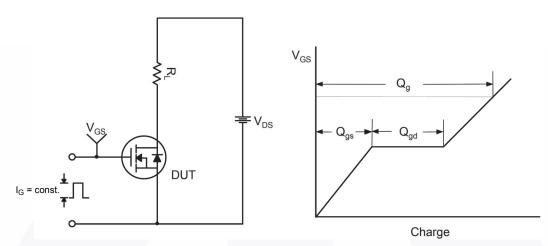


Figure 11. Gate Charge Test Circuit & Waveform

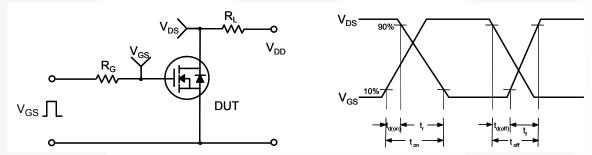


Figure 12. Resistive Switching Test Circuit & Waveforms

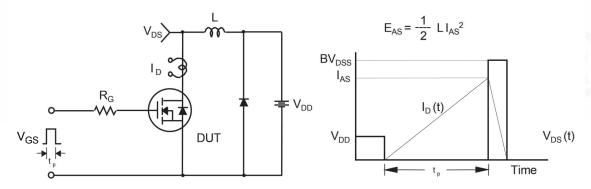


Figure 13. Unclamped Inductive Switching Test Circuit & Waveforms

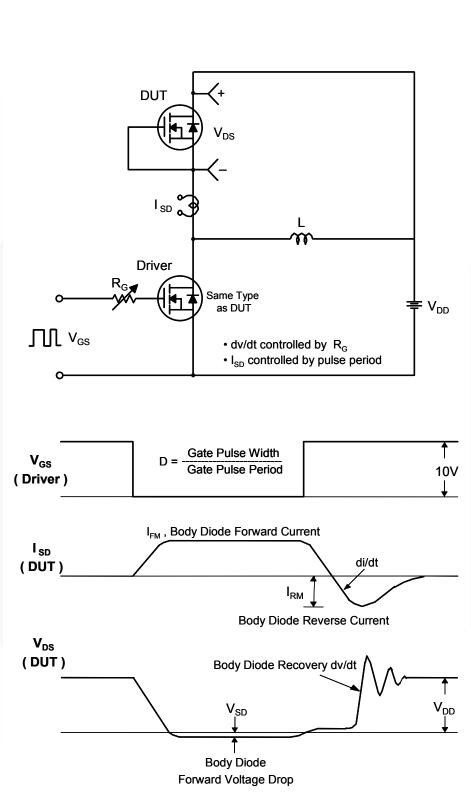


Figure 14. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

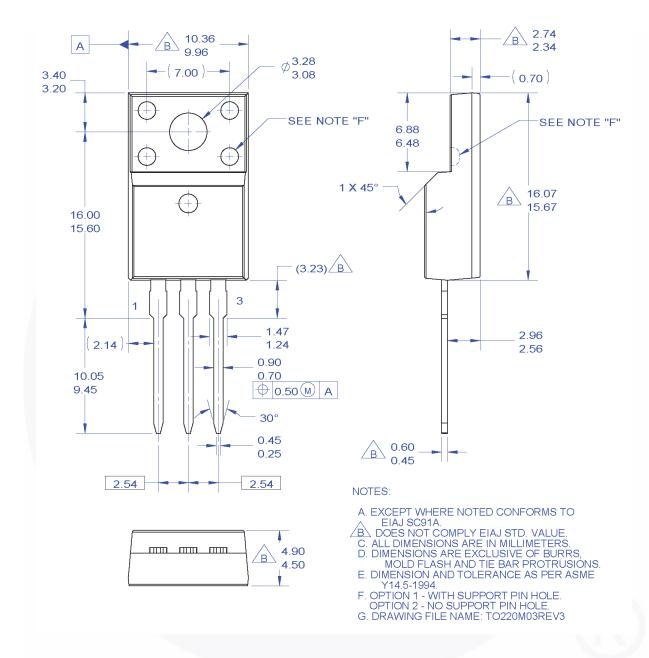


Figure 15. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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