

November 2013

FDPF5N50FT

N-Channel UniFETTM FRFET[®] MOSFET 500 V, 4.5 A, 1.55 Ω

Features

- $R_{DS(on)}$ = 1.25 Ω (Typ.) @ V_{GS} = 10 V, I_D = 2.25 A
- Low Gate Charge (Typ. 11 nC)
- Low C_{rss} (Typ. 5 pF)
- 100% Avalanche Tested

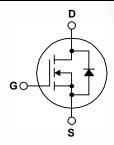
Applications

- LCD/LED/PDP TV
- · Lighting
- · Uninterruptible Power Supply
- · AC-DC 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 trr 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 hallasts





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

Symbol	Parameter			FDPF5N50FT	Unit
V _{DSS}	Drain to Source Voltage			500	V
V _{GSS}	Gate to Source Voltage		±30	V	
1	Drain Current - Continuous (T _C = 25°C)			4.5*	А
ID	Dialii Current	- Continuous (T _C = 100°C)	- Continuous (T _C = 100°C)		A
I _{DM}	Drain Current	- Pulsed	- Pulsed (Note 1)		Α
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		233	mJ	
I _{AR}	Avalanche Current (Note		(Note 1)	4.5	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		8.5	mJ	
dv/dt	Peak Diode Recovery dv/	dt	(Note 3)	4.5	V/ns
D	Dower Dissipation	(T _C = 25°C)		28	W
P_{D}	Power Dissipation	- Derate Above 25°C		0.22	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C
TL	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300	°C

^{*}Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter FDPF5N50FT		Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	4.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	*C/VV

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF5N50FT	FDPF5N50FT	TO-220F	Tube	N/A	N/A	50 units

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

Parameter	Test Conditions	Min.	Тур.	Max.	Unit
cteristics					
Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}, T_J = 25^{\circ}\text{C}$	500	-	-	V
Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C	-	0.6	-	V/°C
Zoro Gato Voltago Drain Current	V _{DS} = 500 V, V _{GS} = 0 V	-	-	10	μА
Zelo Gate Voltage Diain Current	$V_{DS} = 400 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	100	μΑ
Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	±100	nA
	Cteristics Drain to Source Breakdown Voltage Breakdown Voltage Temperature Coefficient Zero Gate Voltage Drain Current				

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 V, I _D = 2.25 A	-	1.25	1.55	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 2.25 A	-	4.3	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V - 25 V V - 0 V	-	490	650	pF
C _{oss}	Output Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1 MHz		66	88	pF
C _{rss}	Reverse Transfer Capacitance	1 11112	-\	5	7.5	pF
Q _{g(tot)}	Total Gate Charge at 10V		- \	11	15	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DS} = 400 \text{ V}, I_{D} = 5 \text{ A},$	- 1	3	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	$V_{GS} = 10 \text{ V}$ (Note 4)	-	5	-	nC

Switching Characteristics

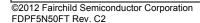
t _{d(on)}	Turn-On Delay Time		-	13	36	ns
t _r		$V_{DD} = 250 \text{ V}, I_{D} = 5 \text{ A},$	-	22	54	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 25 Ω	-	28	66	ns
t _f	Turn-Off Fall Time	(Note 4)	-	20	50	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current			-	4.5	Α
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current			-	18	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 4.5 A	-	-	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 5 A,	-	65	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	120	-	nC

Notes

- 1: Repetitive rating: pulse-width limited by maximum junction temperature.
- 2: L = 23 mH, I_{AS} = 4.5 A, V_{DD} = 50 V, R_G = 25 Ω , starting T_J = 25°C.
- 3: $I_{SD} \le 4.5$ A, di/dt ≤ 200 A/ μ s, $V_{DD} \le BV_{DSS}$, starting T_J = 25°C.
- 4: Essentially independent of operating temperature typical characteristics.



Typical Performance Characteristics

Figure 1. On-Region Characteristics

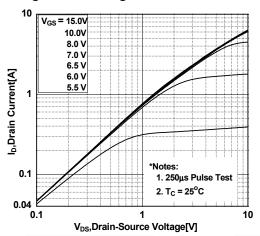


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

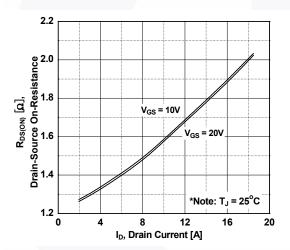


Figure 5. Capacitance Characteristics

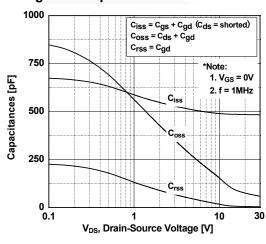


Figure 2. Transfer Characteristics

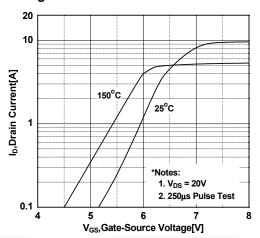


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

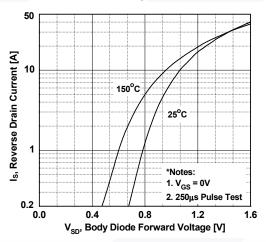
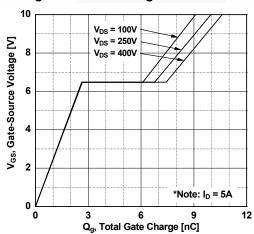


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

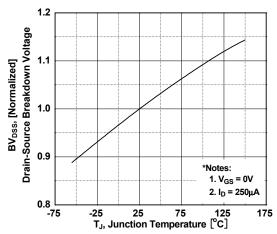


Figure 8. Maximum Safe Operating Area

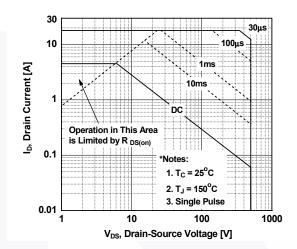


Figure 9. Maximum Drain Current vs. Case Temperature

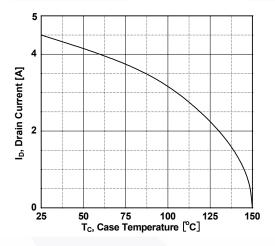
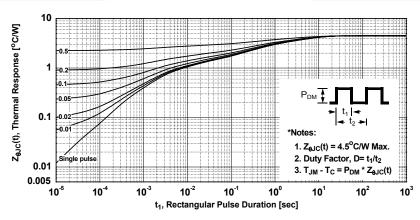


Figure 10. Transient Thermal Response Curve



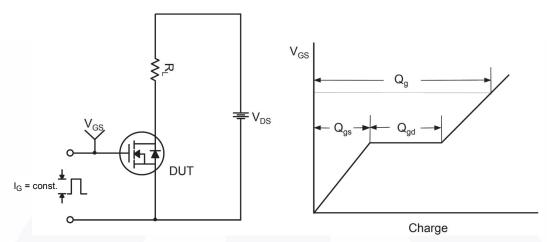


Figure 11. Gate Charge Test Circuit & Waveform

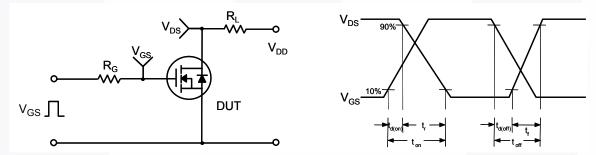


Figure 12. Resistive Switching Test Circuit & Waveforms

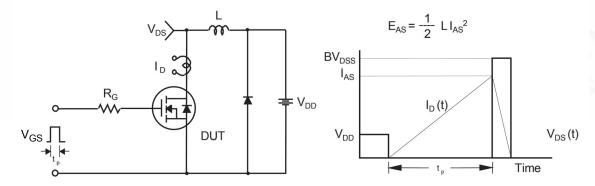


Figure 13. Unclamped Inductive Switching Test Circuit & Waveforms

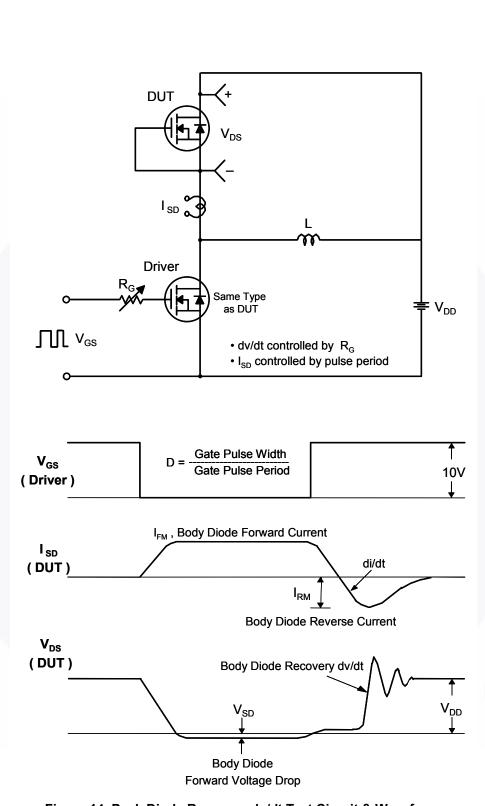


Figure 14. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

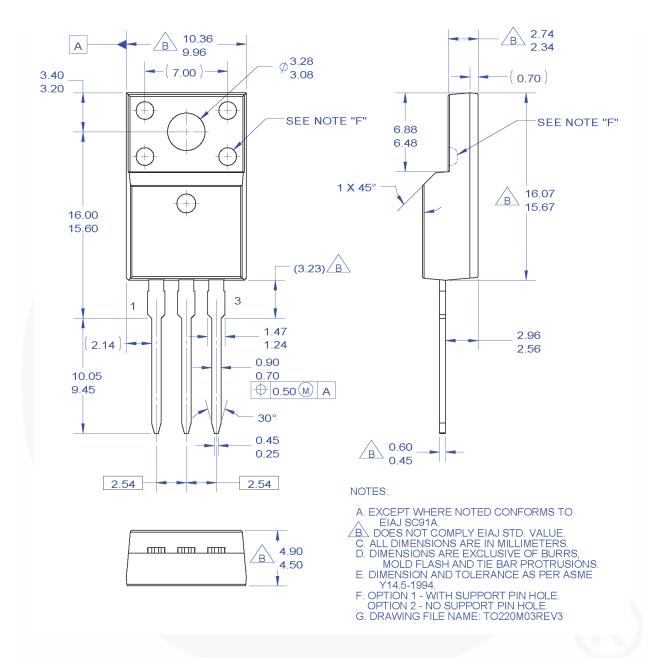


Figure 15. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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