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November 2013

FDPF5N50UT

N-Channel UniFETTM Ultra FRFETTM MOSFET 500 V, 4 A, 2 Ω

Features

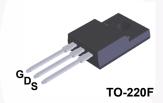
- $R_{DS(on)}$ = 1.65 Ω (Typ.) @ V_{GS} = 10 V, I_D = 2 A
- Low Gate Charge (Typ. 11 nC)
- Low C_{rss} (Typ. 5 pF)
- · 100% Avalanche Tested
- · Improved dv/dt Capability
- · RoHS Compliant

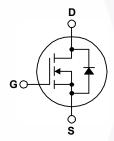
Applications

- · LCD/LED 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. UniFET Ultra FRFETTM MOSFET has much superior body diode reverse recovery performance. Its trr is less than 50nsec and the reverse dv/dt immunity is 20V/nsec while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore UniFET Ultra FRFET MOSFET can remove additional component and improve system reliability in certain applications that require performance improvement of the MOSFET's body diode. 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.





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

Symbol	Parameter			FDPF5N50UT	Unit
V_{DSS}	Drain to Source Voltage	Drain to Source Voltage		500	V
V_{GSS}	Gate to Source Voltage			±30	V
	Drain Current	- Continuous (T _C = 2	25°C)	4*	Δ.
'D	Drain Current	- Continuous (T _C = 1	100°C)	2.4*	Α
I _{DM}	Drain Current	- Pulsed	(Note 1)	16*	Α
E _{AS}	Single Pulsed Avalanch	Pulsed Avalanche Energy (Note 2)		216	mJ
I _{AR}	Avalanche Current		(Note 1)	4	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		(Note 1)	8.5	mJ
dv/dt	Peak Diode Recovery d	v/dt	(Note 3)	20	V/ns
Б	Dawar Dissination	$(T_C = 25^{\circ}C)$		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
	Maximum Lead Temperature for Soldering			300	°C
TL	1/8" from Case for 5 Seconds			300	C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FDPF5N50UT	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	30/00

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF5N50UT	FDPF5N50UT	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 μA, Referenced to 25°C	-	0.7	-	V/°C
1	Zero Gate Voltage Drain Current	V _{DS} = 500 V, V _{GS} = 0 V	-	-	25	μА
IDSS	Zero Gate voltage Drain Current	$V_{DS} = 400 \text{ V}, T_C = 125^{\circ}\text{C}$	-	-	250	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	-	5	V
R _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 2 \text{ A}$	-	1.65	2	Ω
9 _{FS}	Forward Transconductance	$V_{DS} = 40 \text{ V}, I_{D} = 2 \text{ A}$	-	4.8	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 05.V.V 0.V	-	485	650	pF
C _{oss}	Output Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	65	90	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1 101112	-	5	8	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 400 V, I _D = 4 A,	-	11	15	nC
Q _{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	3	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	(Note 4	-	5	-	nC

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	14	38	ns
t _r		$V_{DD} = 250 \text{ V}, I_D = 4 \text{ A},$	-	21	52	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 25 Ω	-	27	64	ns
t _f	Turn-Off Fall Time	(Note 4)	- /	20	50	ns

Drain-Source Diode Characteristics

Is	Maximum Continuous Drain to Source Dioc	Maximum Continuous Drain to Source Diode Forward Current			4	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	16	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 4 A	-	-	1.6	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 4 A,	-	36	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	-	33	_	nC

- 1: Repetitive rating: pulse-width limited by maximum junction temperature.
- 2: L = 27 mH, I_{AS} = 4 A, V_{DD} = 50 V, R_G = 25 Ω , starting T_J = 25°C.
- 3: $I_{SD} \le 4$ A, di/dt ≤ 20 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

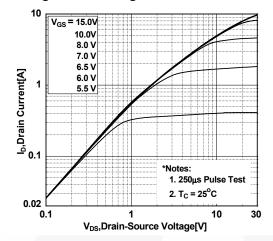


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

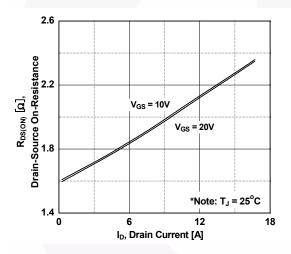


Figure 5. Capacitance Characteristics

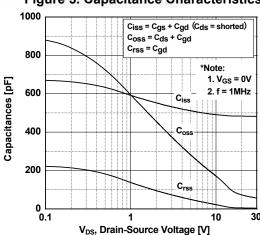


Figure 2. Transfer Characteristics

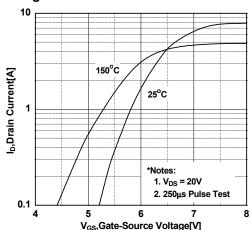


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

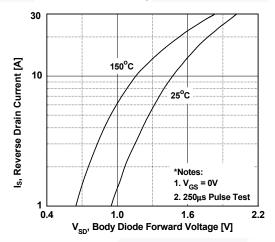
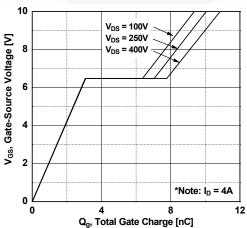


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

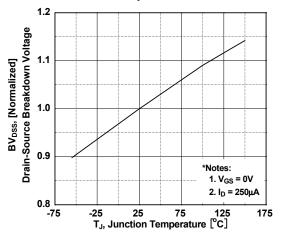


Figure 8. Maximum Safe Operating Area

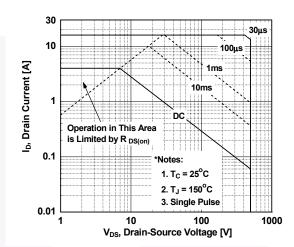


Figure 9. Maximum Drain Current vs. Case Temperature

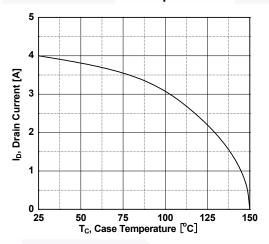
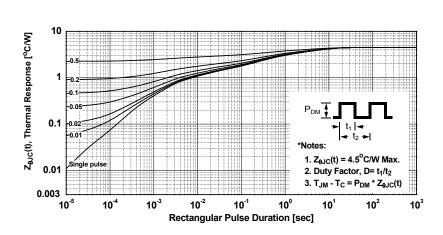


Figure 10. Transient Thermal Response Curve



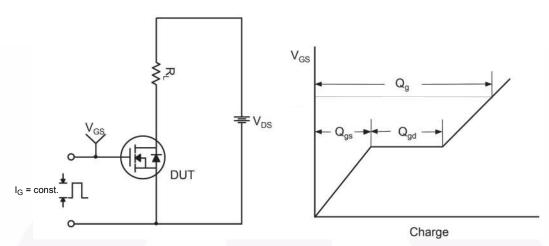


Figure 11. Gate Charge Test Circuit & Waveform

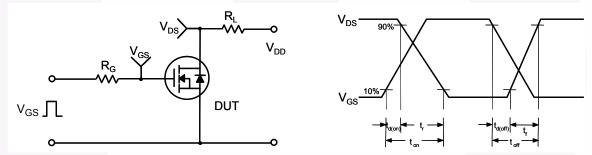


Figure 12. Resistive Switching Test Circuit & Waveforms

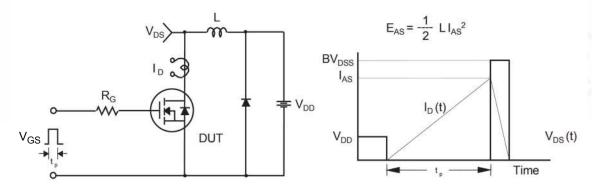


Figure 13. Unclamped Inductive Switching Test Circuit & Waveforms

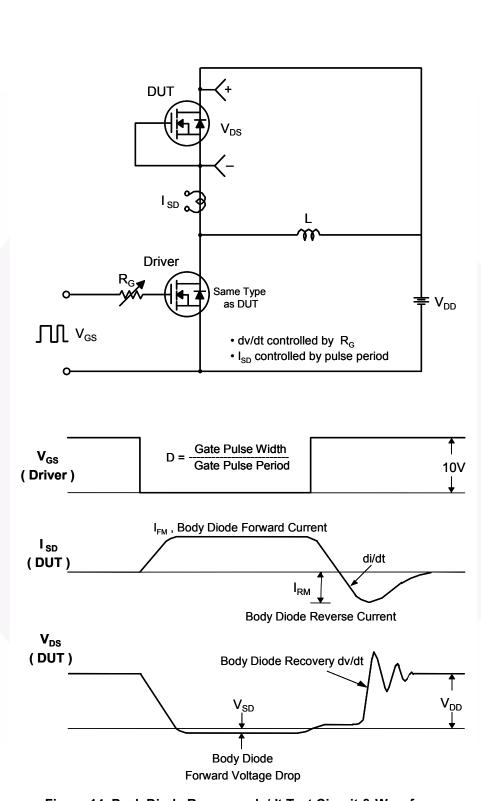


Figure 14. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

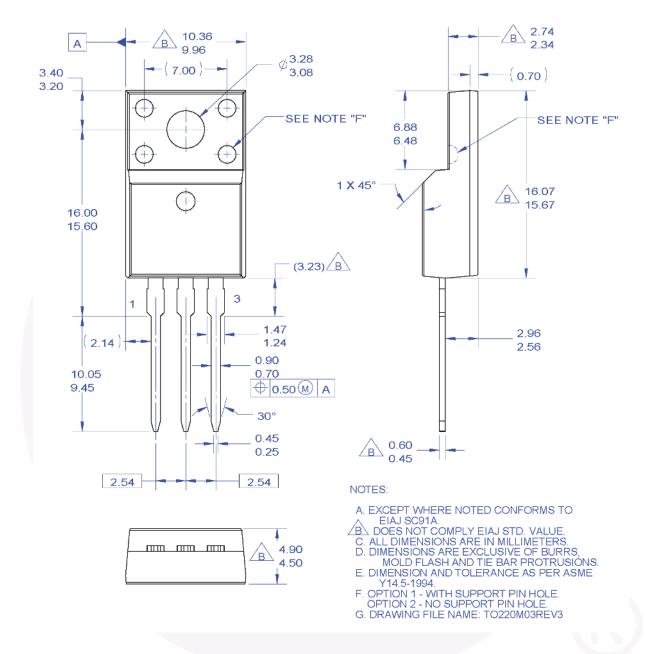


Figure 15. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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