

November 2013

FDPF5N50T

N-Channel UniFETTM MOSFET 500 V, 5 A, 1.4 Ω

Features

- $R_{DS(on)}$ = 1.15 Ω (Typ.) @ V_{GS} = 10 V, I_D = 2.5 A
- Low Gate Charge (Typ. 11 nC)
- Low C_{rss} (Typ. 5 pF)
- · 100% Avalanche Tested
- · Improved dv/dt Capability
- · RoHS Compliant

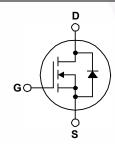
Applications

- · LCD/LED TV
- · Lighting
- · Uninterruptible Power Supply
- · AC-DC Power Supplylications

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. 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			FDPF5N50T	Unit
V_{DSS}	Drain to Source Voltage			500	V
V_{GSS}	Gate to Source Voltage			±30	V
	Drain Current	- Continuous (T _C = 25°C)		5*	А
,D	Diam Current	- Continuous (T _C = 100°C)		3*	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	20*	Α
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		(Note 2)	225	mJ
I _{AR}	Avalanche Current (Note 1)		(Note 1)	5	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		(Note 1)	8.5	mJ
dv/dt	Peak Diode Recovery dv/d	dt	(Note 3)	4.5	V/ns
Б	Dawer 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 Te	mperature Range		-55 to +150	°C
T _L	Maximum Lead Temperate	ure for Soldering, 1/8" from Case for 5	Seconds	300	°C

^{*}Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter FDPF5N50T		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
FDPF5N50T	FDPF5N50T	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	-	0.6	-	V/°C
1	Zero Gate Voltage Drain Current	V _{DS} = 500 V, V _{GS} = 0 V	-	-	1	μA
IDSS	Zero Gate voltage Drain Current	$V_{DS} = 400 \text{ V}, T_C = 125^{\circ}\text{C}$	-	-	10	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	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	3.0	-	5.0	V
R _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 2.5 \text{ A}$	-	1.15	1.4	Ω
9 _{FS}	Forward Transconductance	$V_{DS} = 20 \text{ V}, I_{D} = 2.5 \text{ A}$	-	4.3	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 05.V.V 0.V	-	480	640	pF
Coss	Output Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1 MHz	-	66	88	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1 1011 12	-	5	8	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 400 V, I _D = 5 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		-	13	36	ns
t _r	Turn-On Rise Time	$V_{DD} = 250 \text{ V}, I_D = 5 \text{ A},$	-	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

Is	Maximum Continuous Drain to Source Diode Forward Current		/ -	-	5	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	20	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 5 A	-	-	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 5 A,	-	300	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	1.8	-	μC

Notes

- 1: Repetitive rating: pulse-width limited by maximum junction temperature.
- 2: L = 18 mH, I_{AS} = 5 A, V_{DD} = 50 V, R_{G} = 25 Ω , starting T_{J} = 25°C.
- 3: $I_{SD} \le 5$ 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

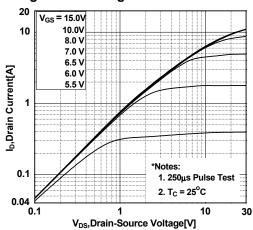


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

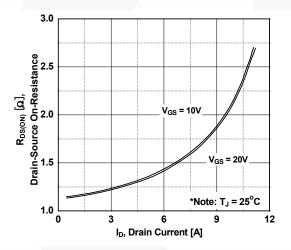


Figure 5. Capacitance Characteristics

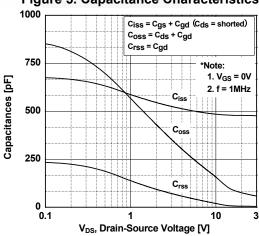


Figure 2. Transfer Characteristics

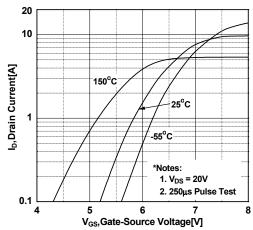


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

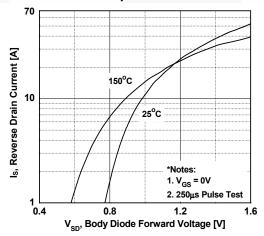
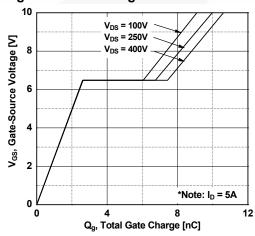


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

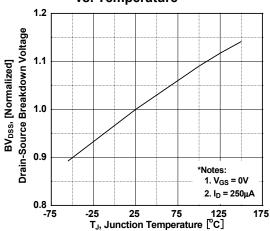


Figure 8. On-Resistance Variation vs. Temperature

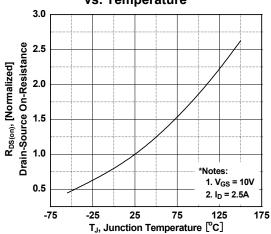


Figure 9. Maximum Safe Operating Area

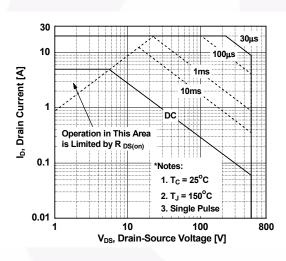


Figure 10. Maximum Drain Current vs. Case Temperature

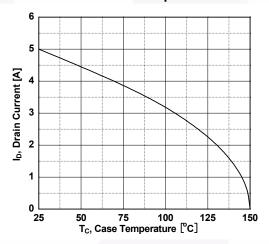
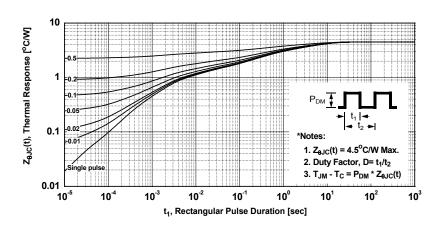


Figure 11. Transient Thermal Response Curve



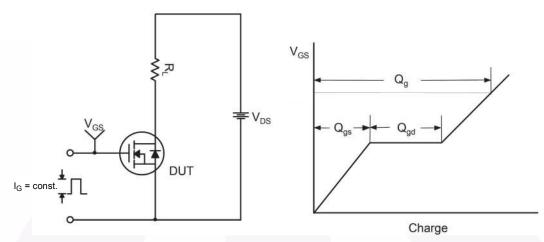


Figure 12. Gate Charge Test Circuit & Waveform

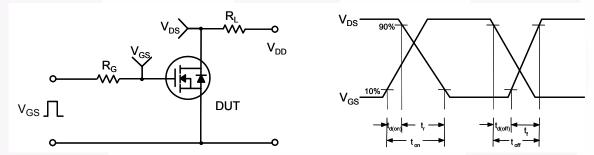


Figure 13. Resistive Switching Test Circuit & Waveforms

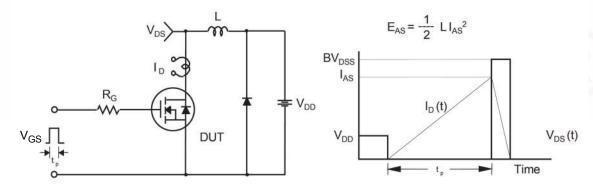


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

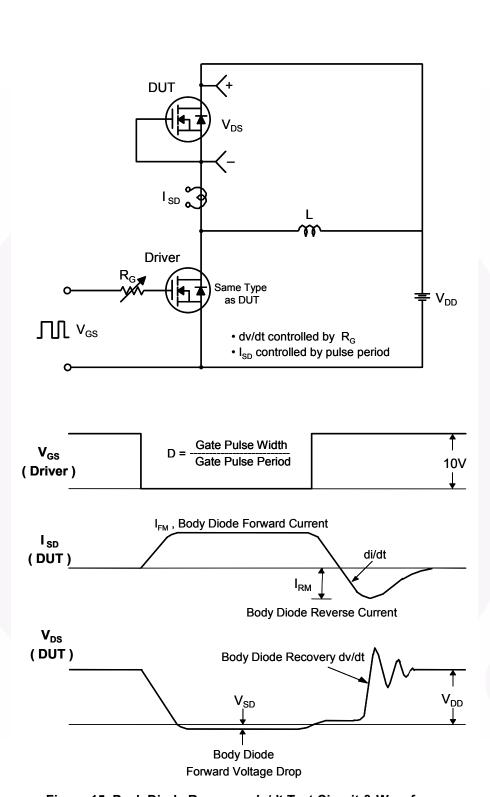


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

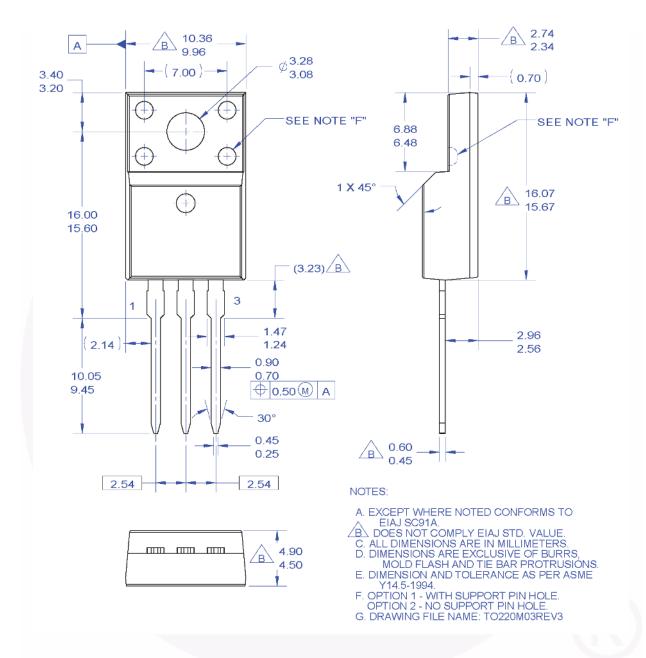


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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