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November 2013

FDPF4N60NZ

N-Channel UniFETTM II MOSFET 600 V, 3.8 A, 2.5 Ω

Features

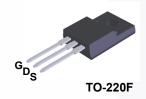
- $R_{DS(on)}$ = 1.9 Ω (Typ.) @ V_{GS} = 10 V, I_D = 1.9 A
- Low Gate Charge (Typ. 8.3 nC)
- Low C_{rss} (Typ. 3.7 pF)
- · 100% Avalanche Tested
- · Improved dv/dt Capability
- · ESD Improved Capability
- · RoHS Compliant

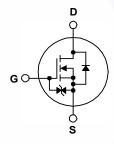
Applications

- · Consumer Appliances
- Lighting
- · Uninterruptible Power Supply
- · AC-DC Power Supply

Description

UniFETTM II MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on advanced planar stripe and DMOS technology. This advanced MOSFET family has the smallest on-state resistance among the planar MOSFET, and also provides superior switching performance and higher avalanche energy strength. In addition, internal gate-source ESD diode allows UniFET II MOSFET to withstand over 2kV HBM surge stress. 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		FDPF4N60NZ	Unit
V_{DSS}	Drain to Source Voltage	Drain to Source Voltage		600	V
V _{GSS}	Gate to Source Voltage		/	±25	V
	Drain Current	- Continuous (T _C = 25°C)		3.8*	Α
ID	Diam Current	- Continuous (T _C = 100°C)		2.3*	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	15*	Α
E _{AS}	Single Pulsed Avalanche Ene	rgy	(Note 2)	223.8	mJ
I _{AR}	Avalanche Current		(Note 1)	3.8	Α
E _{AR}	Repetitive Avalanche Energy	Repetitive Avalanche Energy (Note 1)		8.9	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	10	V/ns
D	Dower Discipation	$(T_C = 25^{\circ}C)$		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
T _L	Maximum Lead Temperature	for Soldering, 1/8" from Case for 5	Seconds	300	οС

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

Thermal Characteristics

Symbol	Parameter FDPF4N60NZ		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		- 0/00

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF4N60NZ	FDPF4N60NZ	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	$I_D = 250 \mu A, V_{GS} = 0 V, T_C = 25^{\circ} C$	600	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C	-	0.6	-	V/°C
1	Zero Gate Voltage Drain Current	V _{DS} = 600 V, V _{GS} = 0 V	-	-	1	μA
IDSS	Zero Gate voltage Drain Current	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	10	μΑ
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±25 V, V _{DS} = 0 V	-	-	±10	μΑ

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 V, I _D = 1.9 A	-	1.9	2.5	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 1.9 A	-	3.3	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V - 25 V V - 0 V		-	385	510	pF
C _{oss}	Output Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1 MHz	Ī	-	40	60	pF
C _{rss}	Reverse Transfer Capacitance	1 = 1 WH12	Ī	-\	3.7	5	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 480 V I _D = 3.8 A,		- \	8.3	10.8	nC
Q_{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	Ī	- \	2.1	-	nC
Q _{qd}	Gate to Drain "Miller" Charge	(Ne	ote 4)	-	3.3	-	nC

Switching Characteristics

t _{d(on)}	Turn-On Delay Time			-	12.7	35.4	ns
t _r	Turn-On Rise Time	$V_{DD} = 300 \text{ V}, I_{D} = 3.8 \text{ A},$		-	15.1	40.2	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 25 Ω		- /	30.2	70.4	ns
t _f	Turn-Off Fall Time		(Note 4)	-	12.8	35.6	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diod	Maximum Continuous Drain to Source Diode Forward Current		-	3.8*	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	15	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 3.8 A	-	-	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 3.8 A,	-	168	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	0.7	-	μС

Notes

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. L = 31 mH, I_{AS} = 3.8 A, V_{DD} = 50 V, R_G = 25 Ω , starting T_J = 25°C.
- 3. $I_{SD} \le 3.8$ 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

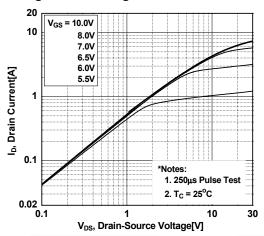


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

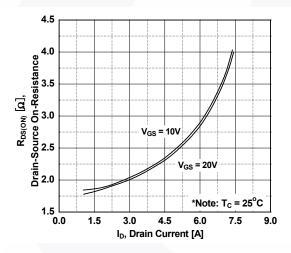


Figure 5. Capacitance Characteristics

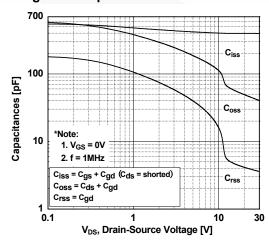


Figure 2. Transfer Characteristics

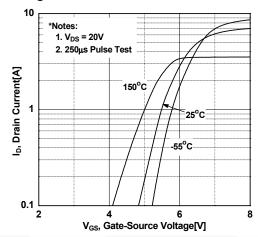


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

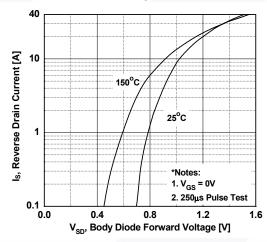
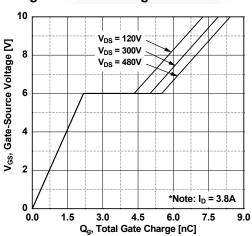


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

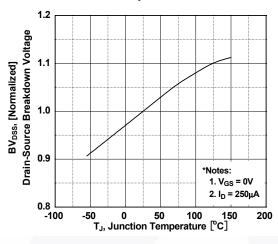


Figure 9. Maximum Safe Operating Area

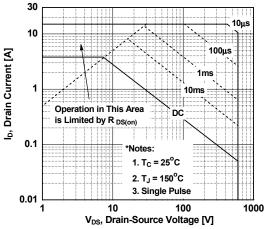


Figure 11. Unclamped Inductive Switching Capability

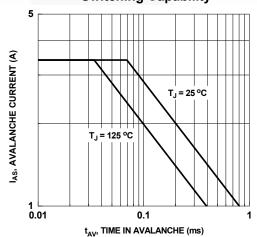


Figure 8. On-Resistance Variation vs. Temperature

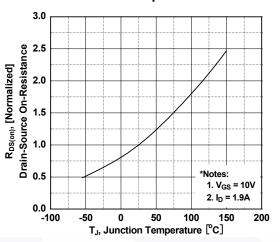
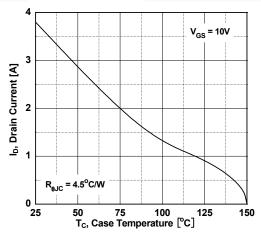
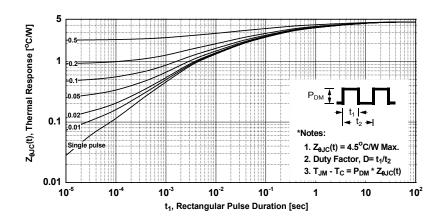


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



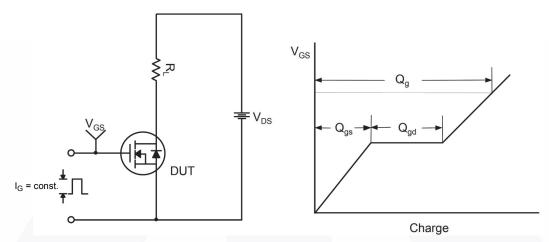


Figure 13. Gate Charge Test Circuit & Waveform



Figure 14. Resistive Switching Test Circuit & Waveforms

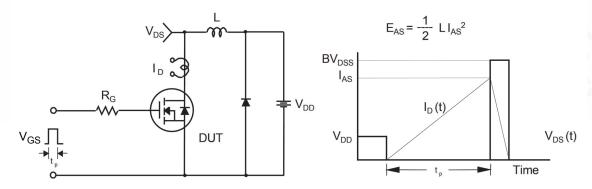


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

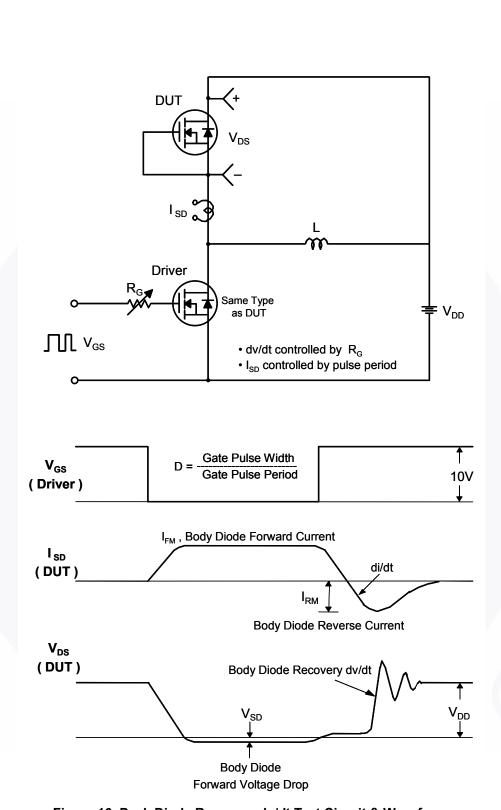


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

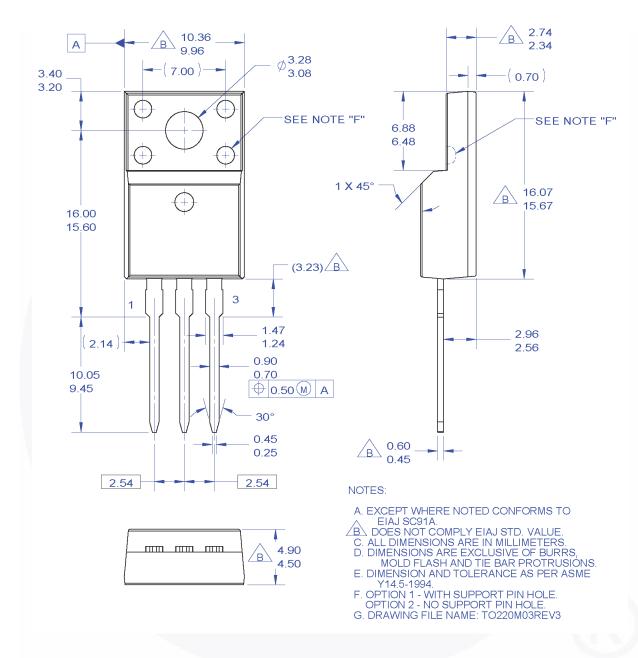


Figure 17. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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