

March 2013

# FDPF44N25T

# N-Channel UniFET<sup>TM</sup> MOSFET 250 V, 44 A, 69 m $\Omega$

#### **Features**

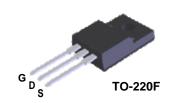
- $R_{DS(on)} = 69 \text{ m}\Omega \text{ (Max.)} @ V_{GS} = 10 \text{ V}, I_D = 22 \text{ A}$
- Low Gate Charge (Typ.7 nC)
- Low C<sub>rss</sub> (Typ> 60 pF)

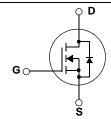
# **Applications**

- PDP TV
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

# **Description**

UniFET<sup>TM</sup> MOSFET is Fairchild Semiconductor<sup>®</sup>'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**

Symbol	Parameter			FDPF44N25T	Unit	
V <sub>DSS</sub>	Drain-Source Voltag	Orain-Source Voltage		250	V	
I <sub>D</sub>	Drain Current - Continuous ( $T_C = 25^{\circ}$ ) - Continuous ( $T_C = 100$ )			44* 26.4*	A A	
I <sub>DM</sub>	Drain Current	- Pulsed	(Note 1)	176*	A	
$V_{GSS}$	Gate-Source voltage		± 30		V	
E <sub>AS</sub>	Single Pulsed Avalanche Energy		(Note 2)	2055	mJ	
I <sub>AR</sub>	Avalanche Current		(Note 1)	44	А	
E <sub>AR</sub>	Repetitive Avalanche Energy		(Note 1)	30.7	mJ	
dv/dt	Peak Diode Recovery dv/d (Note 3)		(Note 3)	4.5	V/ns	
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C) - Derate above 25°C		38 0.3	W W/°C	
T <sub>J,</sub> T <sub>STG</sub>	Operating and Storage Temperature Range			-55 to +150	°C	
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		e,	300	°C	

<sup>\*</sup>Drain current limited by maximum junction temperature

## **Thermal Characteristics**

Symbol	Parameter	FDPF44N25T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W

# **Package Marking and Ordering Information**

<b>Device Marking</b>	Device	Package	Reel Size	Tape Width	Quantity
FDPF44N25T	FDPF44N25T	TO-220F	=	=	50

# **Electrical Characteristics** $T_C = 25$ °C unless otherwise noted

Symbol	Parameter	Conditions	Min	Тур	Max	Unit	
Off Charac	Off Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A, T_J = 25^{\circ}C$	250			V	
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C		0.25		V/°C	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 200V, T <sub>C</sub> = 125°C			1 10	μA μA	
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	$V_{GS} = 30V, V_{DS} = 0V$			100	nA	
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	$V_{GS} = -30V$ , $V_{DS} = 0V$			-100	nA	
On Charac	On Characteristics						
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	3.0		5.0	V	
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 22A		0.058	0.069	Ω	
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40V, I <sub>D</sub> = 22A		32		S	
Dynamic C	Characteristics				•	•	
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$		2210	2870	pF	
C <sub>oss</sub>	Output Capacitance	f = 1.0MHz		450	585	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance	]		60	90	pF	
Switching	Characteristics						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125V, I <sub>D</sub> = 44A		53	117	ns	
t <sub>r</sub>	Turn-On Rise Time	$R_G = 25\Omega$		402	814	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time			85	179	ns	
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)		112	234	ns	
Qg	Total Gate Charge	V <sub>DS</sub> = 200V, I <sub>D</sub> = 44A		47	61	nC	
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10V		18		nC	
Q <sub>gd</sub>	Gate-Drain Charge	(Note 4)		24		nC	
Drain-Sour	rce Diode Characteristics and Maximun	n Ratings		•	•	•	
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				44	Α	
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-		176	Α	
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 44A			1.4	V	
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 44A		195		ns	
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt =100A/μs		1.8		μС	

#### Notes

<sup>1.</sup> Repetitive Rating: Pulse width limited by maximum junction temperature

<sup>2.</sup> L = 1.7mH, I<sub>AS</sub> = 44A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25 $\Omega$ , Starting T<sub>J</sub> = 25 $^{\circ}$ C

<sup>3.</sup>  $I_{SD} \le 44A$ ,  $di/dt \le 200A/\mu s$ ,  $V_{DD} \le BV_{DSS}$ , Starting  $T_J = 25^{\circ}C$ 

<sup>4.</sup> Essentially Independent of Operating Temperature Typical Characteristics

# **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

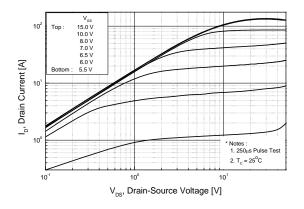


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

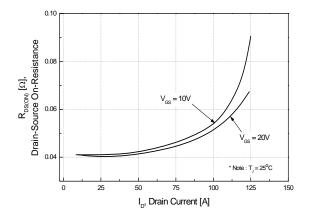


Figure 5. Capacitance Characteristics

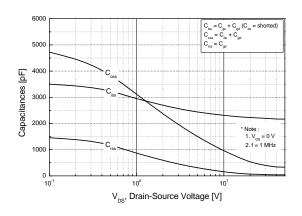


Figure 2. Transfer Characteristics

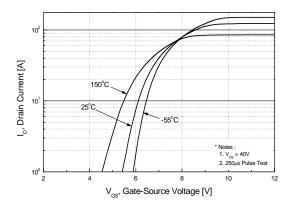
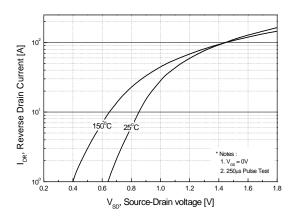
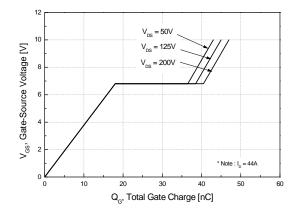


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue



**Figure 6. Gate Charge Characteristics** 



# Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

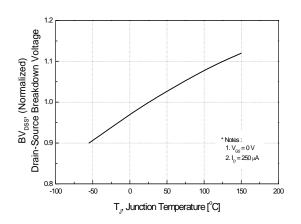


Figure 8. On-Resistance Variation vs. Temperature

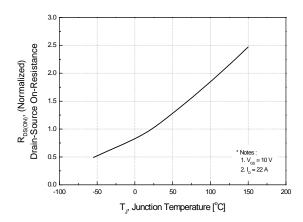


Figure 9. Maximum Safe Operating Area for FDPF44N25

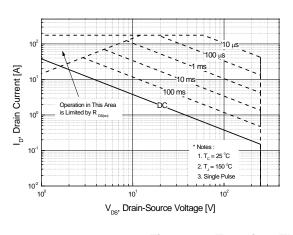


Figure 10. Maximum Drain Current vs. Case Temperature

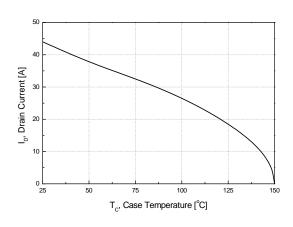
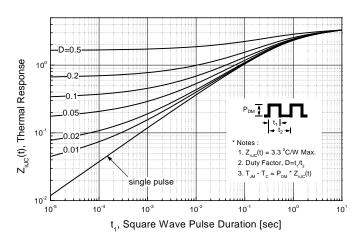
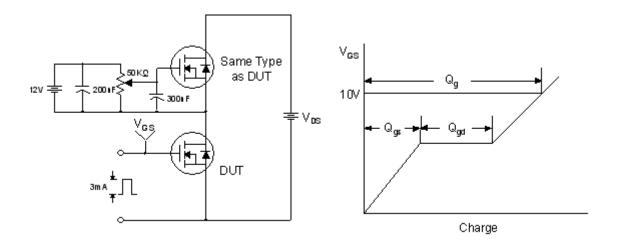


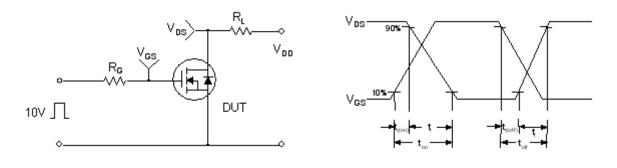
Figure 11. Transient Thermal Response Curve



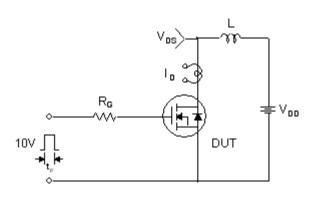
### **Gate Charge Test Circuit & Waveform**

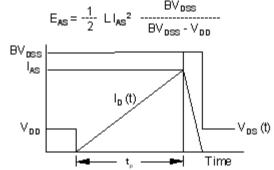


### **Resistive Switching Test Circuit & Waveforms**

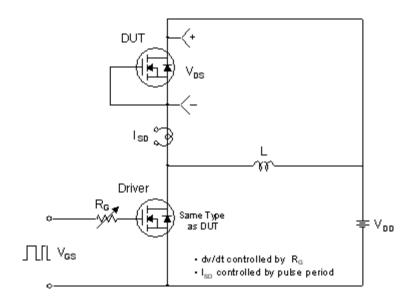


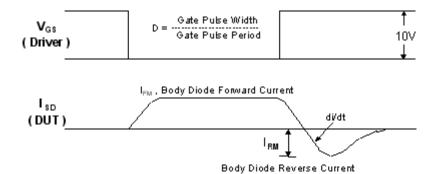
### **Unclamped Inductive Switching Test Circuit & Waveforms**

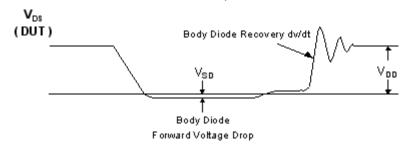




#### Peak Diode Recovery dv/dt Test Circuit & Waveforms







# **Mechanical Dimensions** TO-220M03 2.74 2.34 10.36 Α 9.96 Ø<sup>3.28</sup> 7.00 3.40 3.08 (0.70) 3.20 SEE NOTE "F" SEE NOTE "F" 6.88 6.48 $\oplus$ 1 X 45° 16.07 15.67 16.00 15.60 (3.23) B 3 1.47 2.96 1.24 2.14 2.56 0.90 10.05 0.70 9.45 ⊕ 0.50 M 30° 0.45 0.60 0.25 0.45 2.54 2.54 NOTES: A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A. B) DOES NOT COMPLY EIAJ STD. VALUE. C. ALL DIMENSIONS ARE IN MILLIMETERS. D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS. 4.90 B 4.50 E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994. F. OPTION 1 - WITH SUPPORT PIN HOLE. OPTION 2 - NO SUPPORT PIN HOLE. G. DRAWING FILE NAME: TO220M03REV3 **Dimensions in Millimeters**





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