


UniFET™

FDPF44N25

250V N-Channel MOSFET

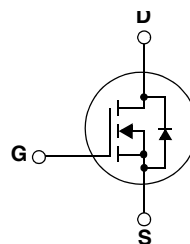
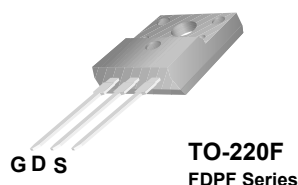
Features

- 18A, 250V, $R_{DS(on)} = 0.069\Omega$ @ $V_{GS} = 10\text{ V}$
- Low gate charge (typical 47 nC)
- Low C_{RSS} (typical 60 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficient switched mode power supplies and active power factor correction.



Absolute Maximum Ratings

Symbol	Parameter	FDPF44N25	Unit
V_{DSS}	Drain-Source Voltage	250	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	18 10.8	A A
I_{DM}	Drain Current - Pulsed (Note 1)	72	A
V_{GSS}	Gate-Source voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	2055	mJ
I_{AR}	Avalanche Current (Note 1)	18	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	5.6	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	56 0.45	W W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Min.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	2.23	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF44N25	FDPF44N25T	TO-220F Potting Type	--	--	50
FDPF44N25	FDPF44N25	TO-220F	--	--	50

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	250	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	--	0.25	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 250V, V _{GS} = 0V V _{DS} = 200V, T _C = 125°C	-- --	-- --	1 10	μA μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30V, V _{DS} = 0V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30V, V _{DS} = 0V	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	3.0	--	5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 9A	--	0.058	0.069	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 9A (Note 4)	--	32	--	S
Dynamic Characteristics						
C _{iSS}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	2210	2870	pF
C _{oSS}	Output Capacitance		--	450	585	pF
C _{rSS}	Reverse Transfer Capacitance		--	60	90	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 125V, I _D = 44A R _G = 25Ω (Note 4, 5)	--	53	117	ns
t _r	Turn-On Rise Time		--	402	814	ns
t _{d(off)}	Turn-Off Delay Time		--	85	179	ns
t _f	Turn-Off Fall Time		--	112	234	ns
Q _g	Total Gate Charge	V _{DS} = 200V, I _D = 44A V _{GS} = 10V (Note 4, 5)	--	47	61	nC
Q _{gs}	Gate-Source Charge		--	18	--	nC
Q _{gd}	Gate-Drain Charge		--	24	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	18	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	72	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 18A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _S = 44A dI _F /dt = 100A/μs (Note 4)	--	195	--	ns
Q _{rr}	Reverse Recovery Charge		--	1.8	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 10.1mH, I_{AS} = 18A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 18A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

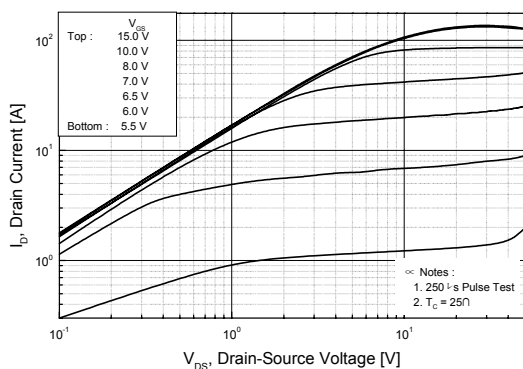


Figure 2. Transfer Characteristics

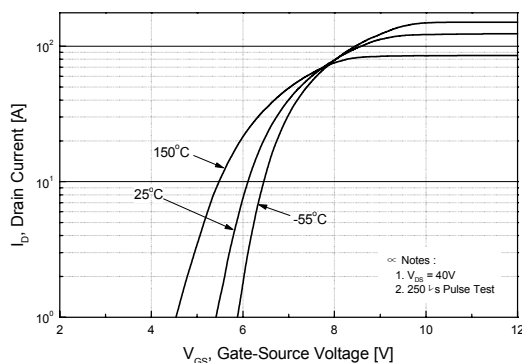


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

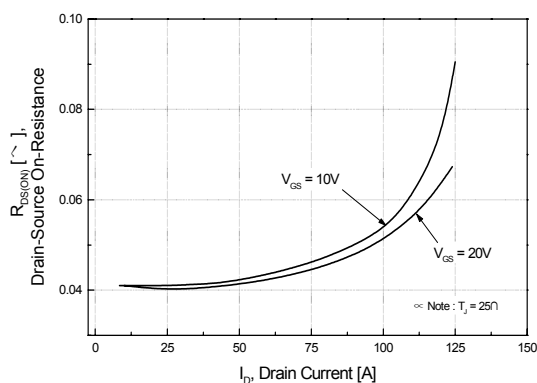


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

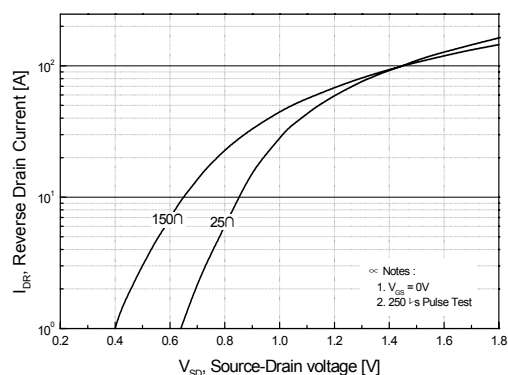


Figure 5. Capacitance Characteristics

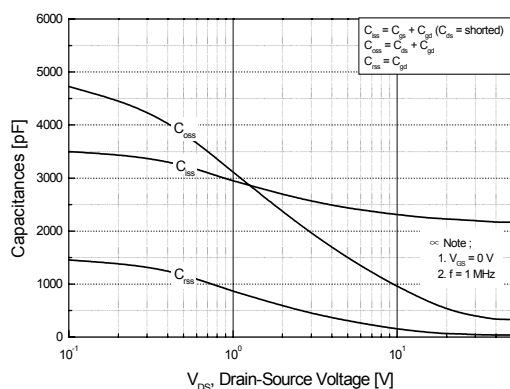
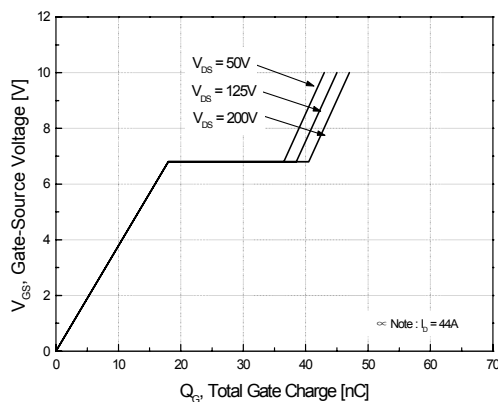


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

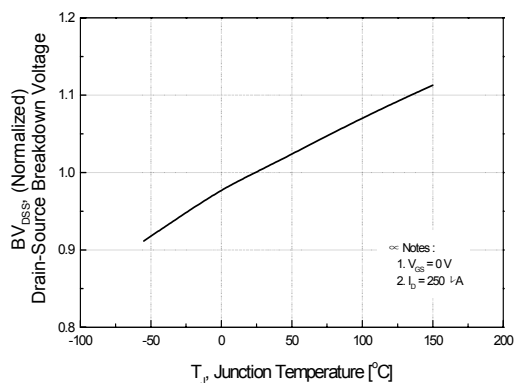


Figure 8. On-Resistance Variation vs. Temperature

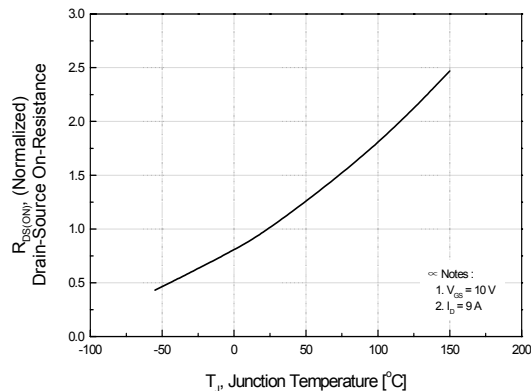


Figure 9. Maximum Safe Operating Area

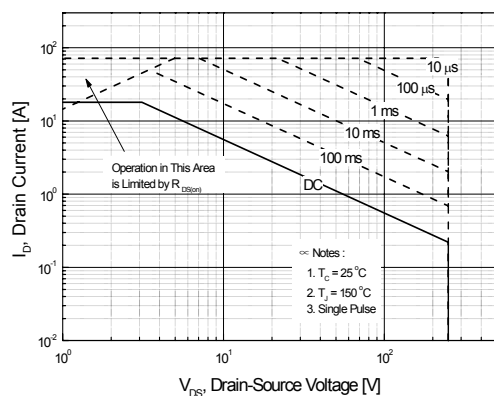


Figure 10. Maximum Drain Current vs. Case Temperature

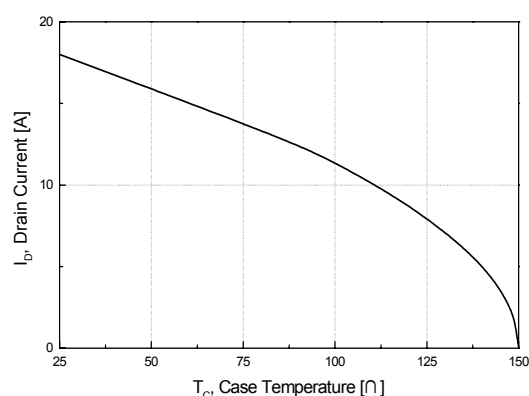
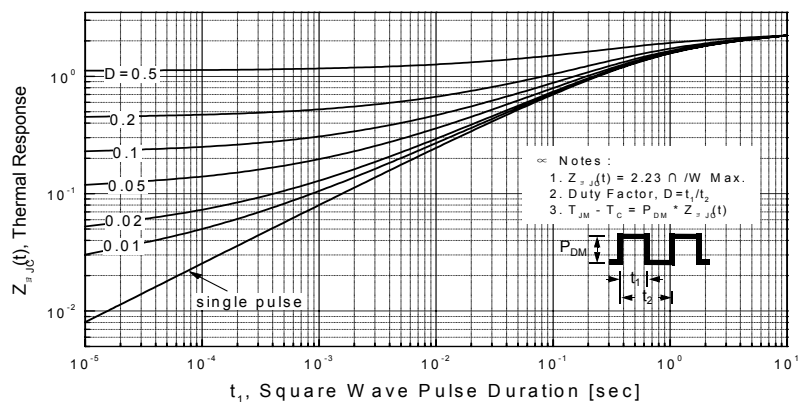
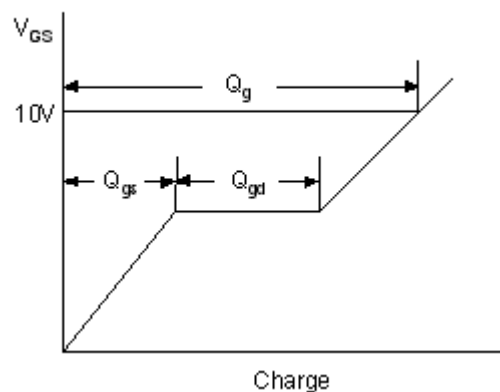
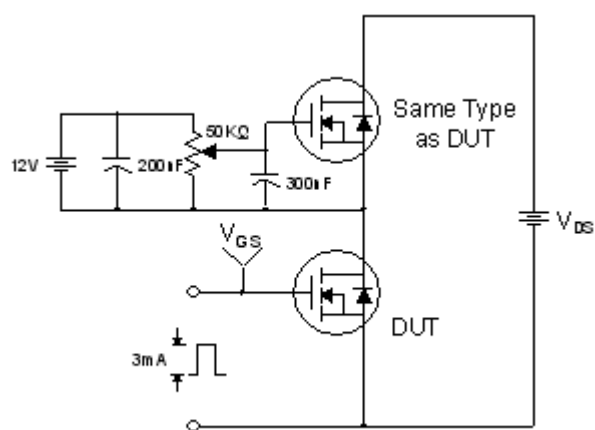


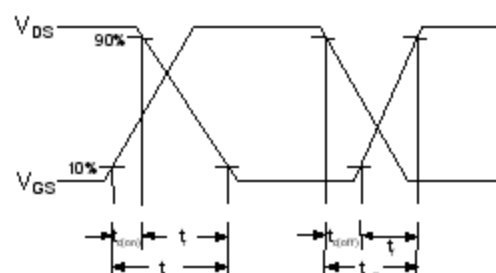
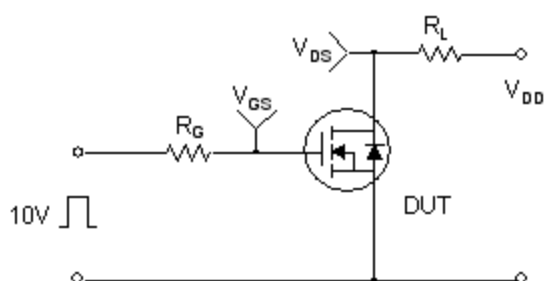
Figure 11. Transient Thermal Response Curve



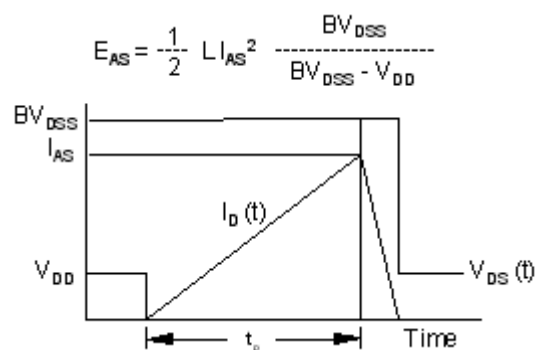
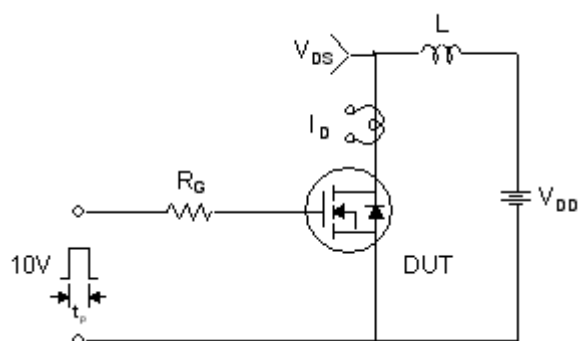
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



The diagram illustrates the test setup and waveforms for a MOSFET body diode. The circuit includes a DUT MOSFET, a driver MOSFET, a gate resistor R_G , a load inductor L , and a source-drain current source I_{SD} . The gate voltage V_{GS} is a pulse, and the drain-source voltage V_{DS} is a trapezoidal pulse. The source-drain current I_{SD} is a trapezoidal pulse with a reverse recovery current I_{RM} and a recovery time constant d/dt . The drain-source voltage V_{DS} is a trapezoidal pulse with a reverse recovery voltage V_{SD} and a recovery time constant d/dt .

Waveform Parameters:

- V_{GS} (Driver): Gate Pulse Width, Gate Pulse Period, 10V
- I_{SD} (DUT): I_{FM} (Body Diode Forward Current), I_{RM} (Body Diode Reverse Current), d/dt (Body Diode Recovery d/dt)
- V_{DS} (DUT): V_{SD} (Body Diode Forward Voltage Drop), d/dt (Body Diode Recovery d/dt)

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