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November 2013

FDP33N25

N-Channel UniFETTM MOSFET 250 V, 33 A, 94 m Ω

Features

- $R_{DS(on)}$ = 94 $m\Omega$ (Max.) @ V_{GS} = 10 V, I_D = 16.5 A
- Low Gate Charge (Typ. 36.8 nC)
- Low C_{rss} (Typ. 39 pF)
- · 100% Avalanche Tested

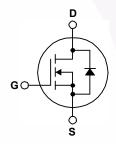
Applications

- PDP 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. 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		FDP33N25	Unit	
V _{DSS}	Drain-Source Voltage	250	V	
I _D	Drain Current	- Continuous (T _C = 25°C) - Continuous (T _C = 100°C)	33 20.4	A A
I _{DM}	Drain Current	- Pulsed (Note 1	132	Α
V _{GSS}	Gate-Source voltage	± 30	V	
E _{AS}	Single Pulsed Avalanche Energy		918	mJ
I _{AR}	Avalanche Current	(Note 1) 33	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		23.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
P_D	Power Dissipation	(T _C = 25°C) - Derate Above 25°C	235 1.89	W/°C
T _{J,} T _{STG}	Operating and Storag	e Temperature Range	-55 to +150	°C
TL	Maximum Lead Tempe	300	°C	

Thermal Characteristics

Symbol	Parameter	FDP33N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.53	°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
FDP33N25	FDP33N25	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25$ °C unless otherwise noted.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Off Charac	cteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}, T_J = 25^{\circ}\text{C}$				V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		0.25		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 250 V, V _{GS} = 0 V V _{DS} = 200 V, T _C = 125°C			1 10	μA μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 V, V _{DS} = 0 V			-100	nA
On Charac	teristics					•
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	3.0		5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 16.5 A		0.077	0.094	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 16.5 A		26.6		S
Dynamic C	Characteristics					
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		1640	2135	pF
C _{oss}	Output Capacitance			330	430	pF
C _{rss}	Reverse Transfer Capacitance			39	59	pF
Switching	Characteristics					
t _{d(on)}	Turn-On Delay Time	V_{DD} = 125 V, I_{D} = 33 A, V_{GS} = 10 V, R_{G} = 25 Ω (Note 4)		35	80	ns
t _r	Turn-On Rise Time			230	470	ns
t _{d(off)}	Turn-Off Delay Time			75	160	ns
t _f	Turn-Off Fall Time			120	250	ns
Q_g	Total Gate Charge	$V_{DS} = 200 \text{ V}, I_{D} = 33 \text{ A},$	/	36.8	48	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V		10		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		17		nC
Drain-Sou	rce Diode Characteristics and Maximur	n Ratings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				33	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current				132	Α
V_{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 33 A			1.4	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V, } I_{S} = 33 \text{ A,}$ $dI_{F}/dt = 100 \text{ A}/\mu\text{s}$		220		ns
Q _{rr}	Reverse Recovery Charge			1.71		μС

Notes

^{1.} Repetitive rating: pulse-width limited by maximum junction temperature.

^{2.} L = 1.35 mH, I $_{AS}$ = 33 A, V $_{DD}$ = 50 V, R $_{G}$ = 25 $\Omega,$ starting T $_{J}$ = 25 $^{\circ}C.$

^{3.} I $_{SD} \leq$ 33 A, di/dt \leq 200 A/µs, V $_{DD} \leq$ BV $_{DSS},$ starting T $_{J}$ = 25°C.

^{4.} Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

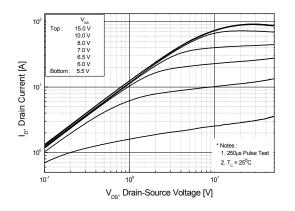


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

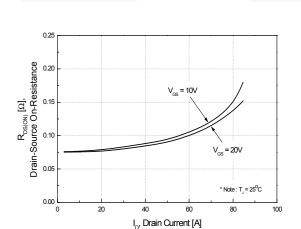


Figure 5. Capacitance Characteristics

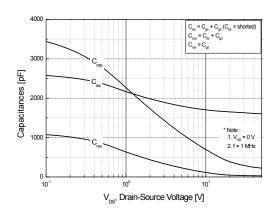


Figure 2. Transfer Characteristics

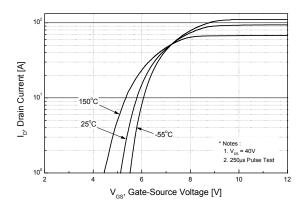


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

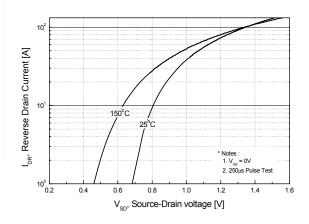
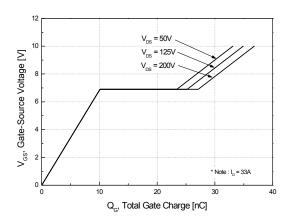


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

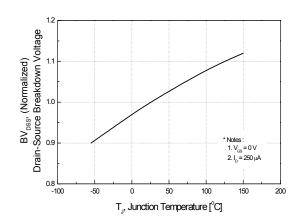


Figure 9. Maximum Safe Operating Area

Figure 8. On-Resistance Variation vs. Temperature

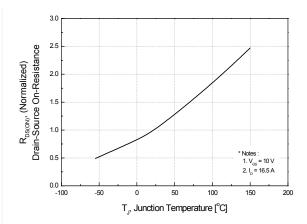
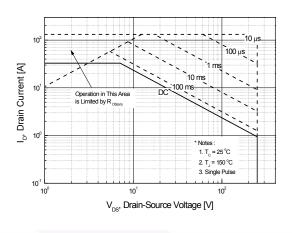


Figure 10. Maximum Drain Current vs. Case Temperature



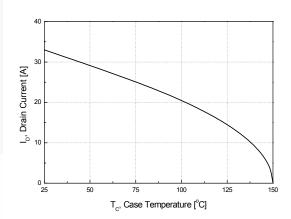
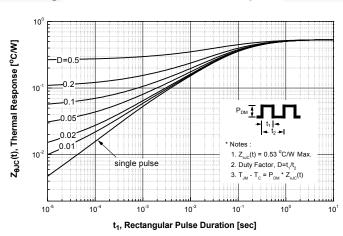


Figure 11. Transient Thermal Response Curve



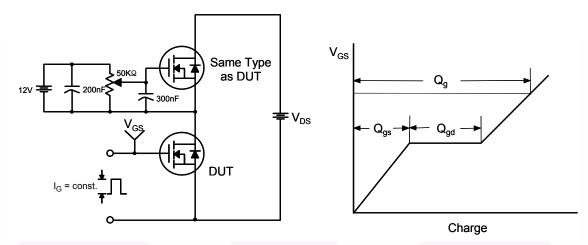


Figure 12. Gate Charge Test Circuit & Waveform

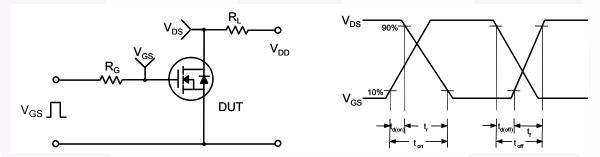


Figure 13. Resistive Switching Test Circuit & Waveforms

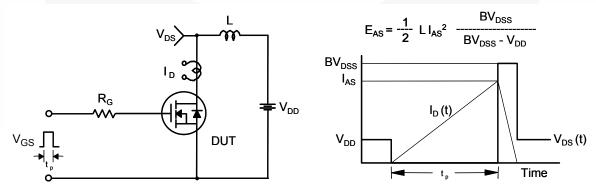


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

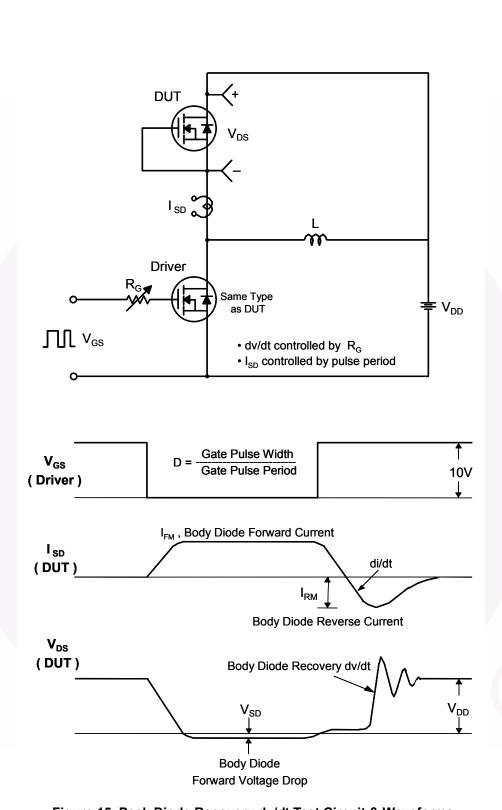


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

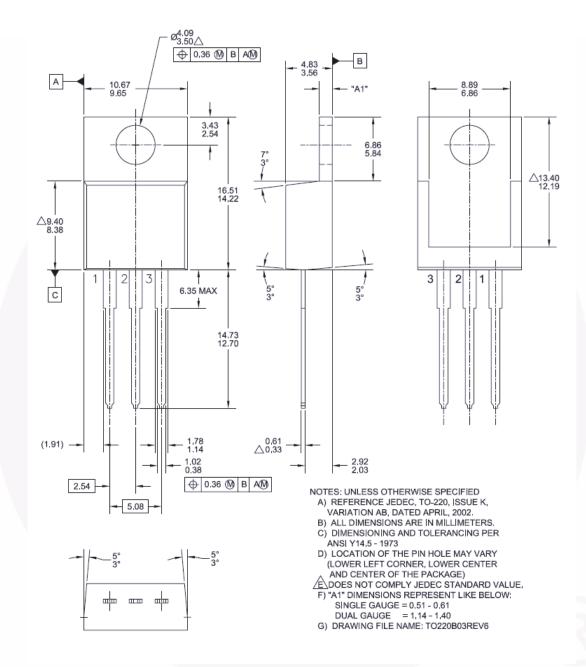


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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