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November 2013

FDB33N25

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

Features

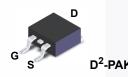
- $R_{DS(on)}$ = 94 $m\Omega$ (Max.) @ V_{GS} = 10 V, I_D = 16.5 A
- Low Gate Charge (Typ. 36.8 nC)
- Low C_{rss} (Typ. 39 pF)
- 100% Avalanche Tested

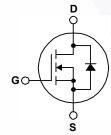
Applications

- 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		FDB33N25	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 Avalar	918	mJ	
I _{AR}	Avalanche Current (No		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 W/°C
T _{J,} T _{STG}	Operating and Stora	-55 to +150	°C	
T _L	Maximum Lead Temp	300	°C	

Thermal Characteristics

Symbol	Parameter	FDB33N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.53	
R _{θJA} *	Thermal Resistance, Junction-to-Ambient (1 in ² Pad of 2-oz Copper), Max.	40	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Minimum Pad of 2-oz Copper), Max.	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB33N25TM	FDB33N25	D ² -PAK	Tape and Reel	330 mm	24 mm	800 units

Electrical Characteristics $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Тур.	Max	Unit
Off Charac	teristics					I
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	250			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	haracteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 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
Qg	Total Gate Charge	V _{DS} = 200 V, I _D = 33 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-Sour	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		μC

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.} $I_{SD} \le 33$ 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

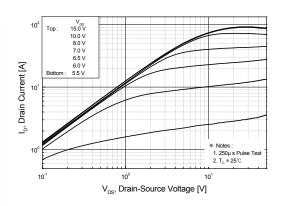


Figure 2. Transfer Characteristics

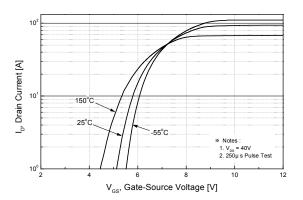
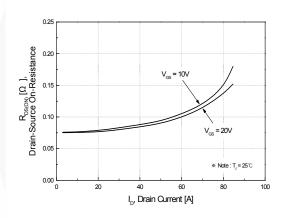


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

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



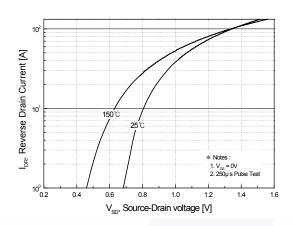


Figure 5. Capacitance Characteristics

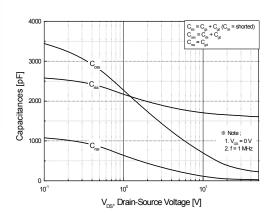
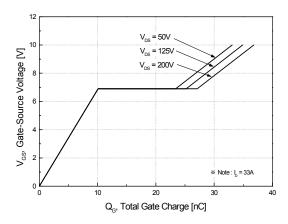


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

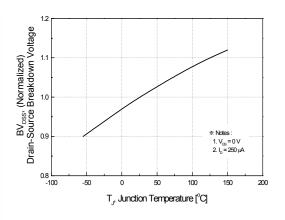


Figure 8. On-Resistance Variation vs. Temperature

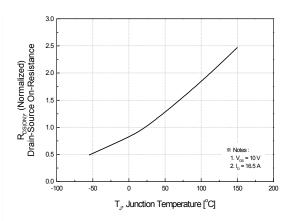


Figure 9. Maximum Safe Operating Area

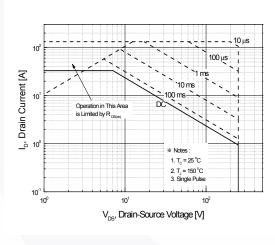


Figure 10. Maximum Drain Current vs. Case Temperature

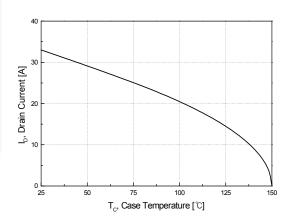
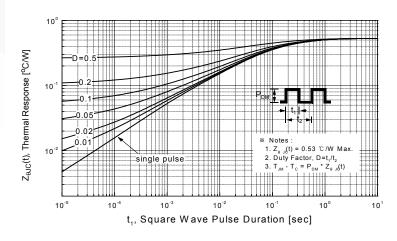


Figure 11. Transient Thermal Response Curve



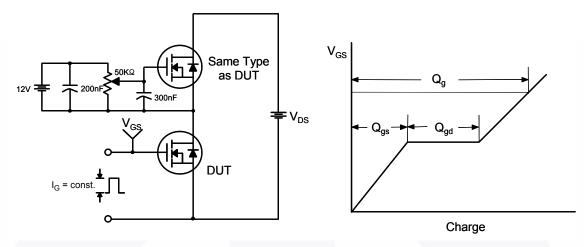


Figure 12. Gate Charge Test Circuit & Waveform

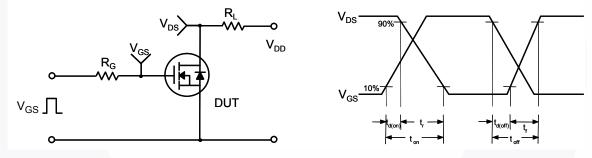


Figure 13. Resistive Switching Test Circuit & Waveforms

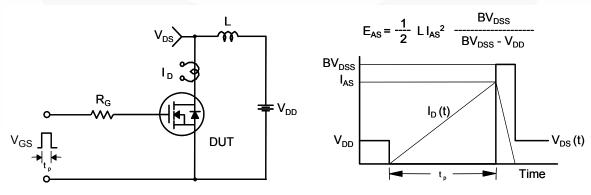


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

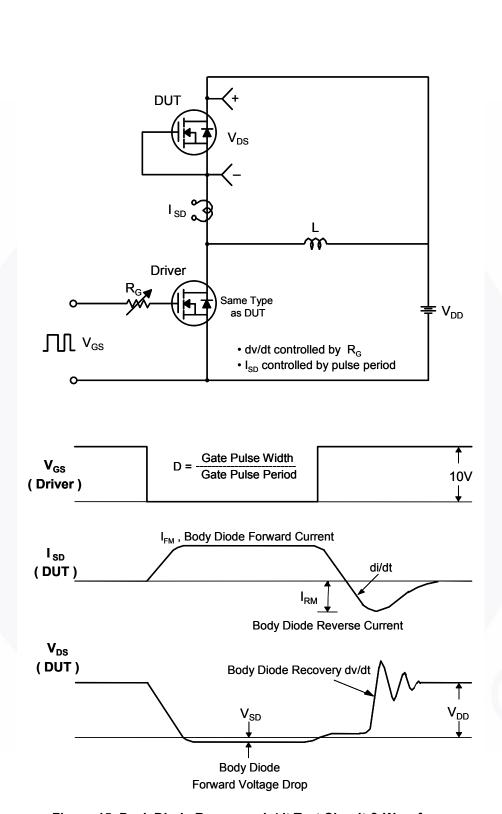


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

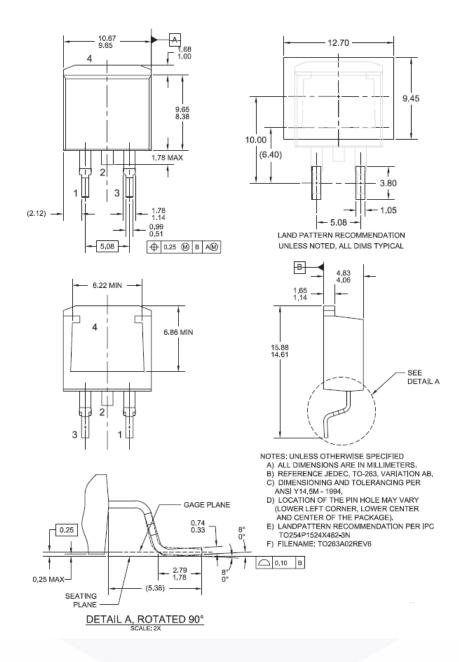


Figure 16. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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