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November 2013

FDB52N20

N-Channel UniFETTM MOSFET 200 V, 52 A, 49 m Ω

Features

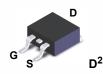
- $R_{DS(on)}$ = 49 $m\Omega$ (Max.) @ V_{GS} = 10 V, I_D = 26 A
- Low Gate Charge (Typ. 49 nC)
- Low C_{rss} (Typ. 66 pF)
- 100% Avalanche Tested

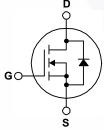
Applications

- 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		FDB52N20	Unit	
V _{DSS}	Drain-Source Voltage		200	V
I _D	Drain Current	- Continuous (T _C = 25°C) - Continuous (T _C = 100°C)	52 33	A A
I _{DM}	Drain Current	- Pulsed (Note 1)	208	Α
V _{GSS}	Gate-Source voltage	±30	V	
E _{AS}	Single Pulsed Avala	2520	mJ	
I _{AR}	Avalanche Current (Note 1)		52	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		35.7	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	357 2.86	W/°C
T _{J,} T _{STG}	Operating and Stora	-55 to +150	°C	
T _L	Maximum Lead Tem	300	°C	

Thermal Characteristics

Symbol	Parameter	FDB52N20	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max. 0.35		
$R_{\theta JA}$	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
FDB52N20TM	FDB52N20	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			ı		I
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	200			V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		0.2		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 200 V, V _{GS} = 0 V V _{DS} = 160 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 μA	3.0		5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 26 A		0.041	0.049	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 26 A	-	35		S
Dynamic C	haracteristics			•		
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		2230	2900	pF
C _{oss}	Output Capacitance			540	700	pF
C _{rss}	Reverse Transfer Capacitance			66	100	pF
Switching	Characteristics					
t _{d(on)}	Turn-On Delay Time	V_{DD} = 100 V, I_{D} = 52 A, V_{GS} = 10 V, R_{G} = 25 Ω		53	115	ns
t _r	Turn-On Rise Time			175	359	ns
t _{d(off)}	Turn-Off Delay Time			48	107	ns
t _f	Turn-Off Fall Time			29	68	ns
Qg	Total Gate Charge	V _{DS} = 160 V, I _D = 52 A,		49	63	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V		19		nC
Q_{gd}	Gate-Drain Charge	(Note 4)		24		nC
Drain-Sour	ce Diode Characteristics and Maximur	n Ratings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				52	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-		204	Α
V_{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 52 A			1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 52 A,		162		ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt =100 A/μs		1.3		μC

Notes

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

^{2.} L = 1.4 mH, I $_{AS}$ = 52 A, V $_{DD}$ = 50 V, R $_{G}$ = 25 $\Omega,$ starting T $_{J}$ = 25 $^{\circ}C.$

^{3.} I $_{SD}$ \leq 52 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

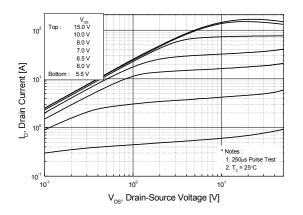


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

Figure 2. Transfer Characteristics

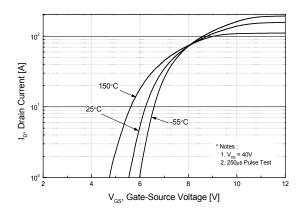


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

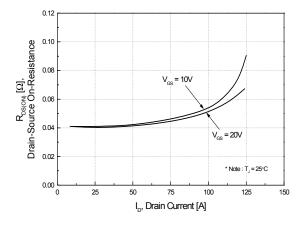
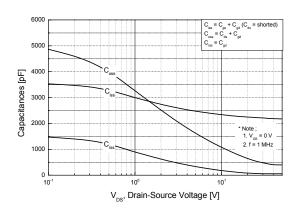


Figure 5. Capacitance Characteristics



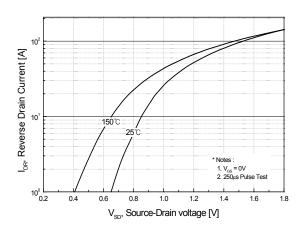
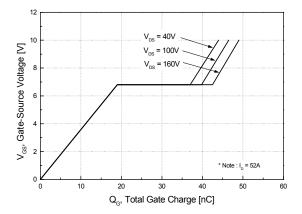


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

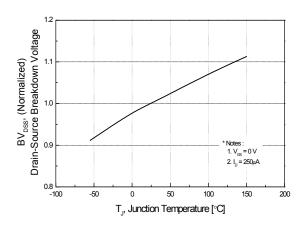


Figure 8. On-Resistance Variation vs. Temperature

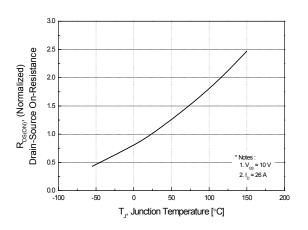
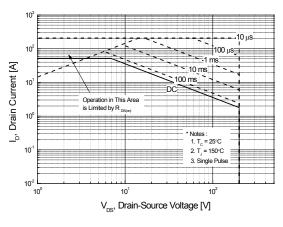


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature



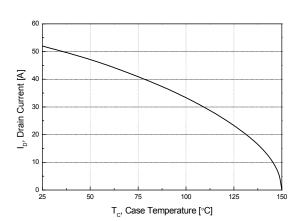
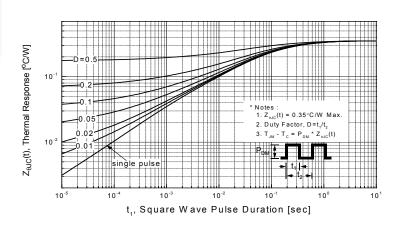


Figure 11. Transient Thermal Response Curve



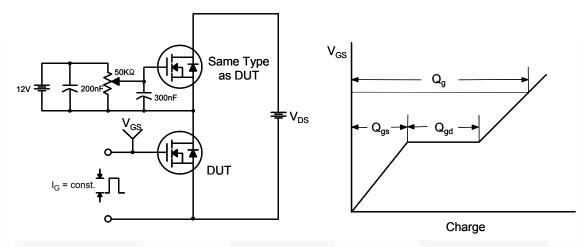


Figure 12. Gate Charge Test Circuit & Waveform

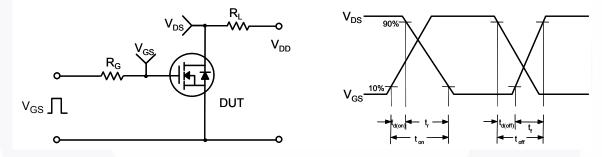


Figure 13. Resistive Switching Test Circuit & Waveforms

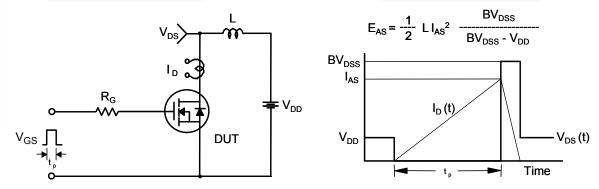


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

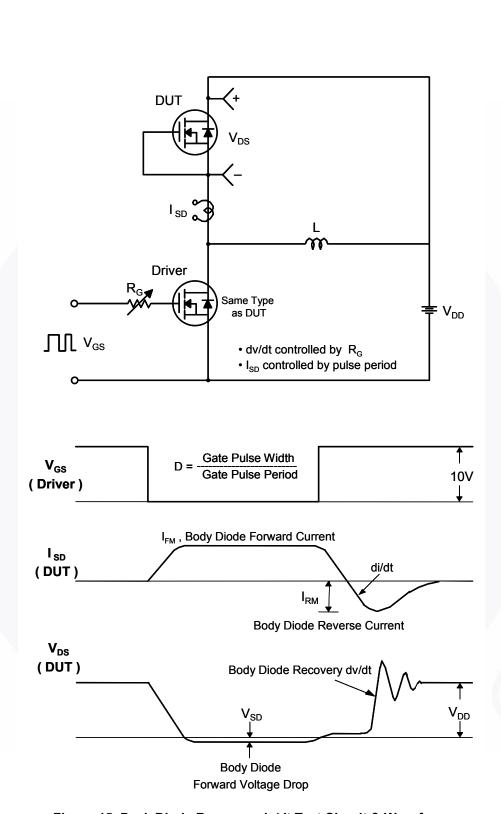


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

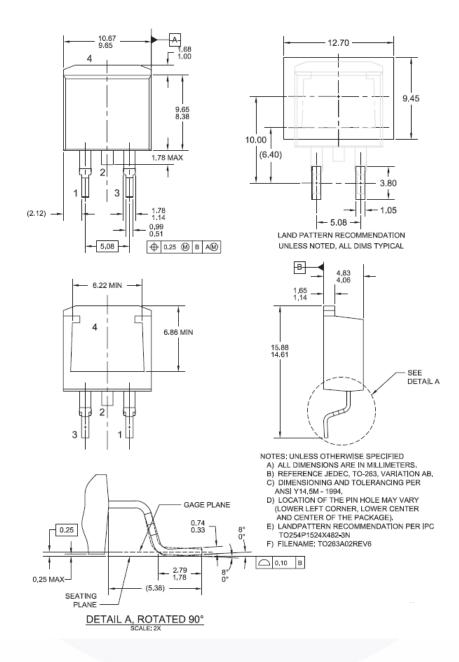


Figure 16. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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