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November 2013

FDB38N30U

N-Channel UniFETTM Ultra FRFETTM MOSFET 300 V, 38 A, 120 m Ω

Features

- $R_{DS(on)}$ = 120 $m\Omega$ (Max.) @ V_{GS} = 10 V, I_D = 19 A
- Low Gate Charge (Typ. 56 nC)
- Low C_{rss} (Typ. 55 pF)
- · 100% Avalanche Tested
- · RoHS Compliant

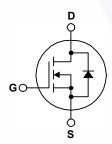
Applications

- · Uninterruptible Power Supply
- LCD/LED/PDP TV
- · 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. UniFET Ultra FRFETTM MOSFET has much superior body diode reverse recovery performance. Its trr is less than 50nsec and the reverse dv/dt immunity is 20V/nsec while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore UniFET Ultra FRFET MOSFET can remove additional component and improve system reliability in certain applications that require performance improvement of the MOSFET's body diode. 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.





MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol		Parameter		FDB38N30U	Unit
V_{DSS}	Drain to Source Voltage			300	V
V_{GSS}	Gate to Source Voltage			±30	V
	Drain Current - Continuous (T _C = 25°C)			38	A
ID	DrainCurrent	- Continuous (T _C = 100°C	5)	22.8	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	152	Α
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		(Note 2)	722	mJ
I _{AR}	Avalanche Current		(Note 1)	38	Α
E _{AR}	Repetitive Avalanche En	ergy	(Note 1)	31.3	mJ
dv/dt	Peak Diode Recovery dv	/dt	(Note 3)	20	V/ns
D	Power Dissination	$(T_C = 25^{\circ}C)$		313	W
P_{D}	Power Dissipation	- Derate Above 25°C		2.5	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Tempera	ture for Soldering, 1/8" from Case	for 5 Seconds	300	°C

Thermal Characteristics

Symbol	Parameter	FDB38N30U	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.4	°C/W
$R_{\theta,JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Unit

Max.

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB38N30U	FDB38N30U	D ² -PAK	Tape and Reel	330 mm	24 mm	800 units

Test Conditions

Min.

Тур.

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

				,		
Off Chara	acteristics					
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V, T_J = 25^{\circ} C$	300	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C	-	0.33	-	V/°C
Jaro Cata Valtaga Drain Current	Zero Gate Voltage Drain Current	V _{DS} = 300 V, V _{GS} = 0 V	-	-	25	
IDSS	Zero Gate voltage Drain Current	$V_{DS} = 240 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	250	μA
I _{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	±100	nA

On Characteristics

Symbol

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	3.0	-	5.0	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10 V, I _D = 19 A	-	0.103	0.120	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 19 A	-	30	i	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 05 V V 0 V	-	2510	3340	pF
Coss	Output Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz		470	625	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1 1011 12	-\	55	85	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{DS} = 240 V, I _D = 38 A	-	56	73	nC
Q _{gs}	Gate to Source Gate Charge	V _{GS} = 10 V	-	14	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	(Note	4) _	24	-	nC

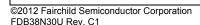
Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	33	76	ns
t _r	Turn-On Rise Time	$V_{DD} = 150 \text{ V}, I_D = 38 \text{ A},$	-	80	170	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 10 V, R_G = 25 Ω	-	133	276	ns
t _f	Turn-Off Fall Time	(Note 4)	-	62	134	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Dioc	Maximum Continuous Drain to Source Diode Forward Current		-	38	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	152	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 38 A	-	-	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 38 A,	-	60	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	0.097	_	μC

- ${\it 1:} \ \ {\it Repetitive\ rating: pulse-width\ limited\ by\ maximum\ junction\ temperature.}$
- 2: L = 1 mH, I_{AS} = 38 A, V_{DD} = 50 V, R_{G} = 25 Ω , starting T_{J} = 25°C.
- 3: $I_{SD} \le 38$ A, di/dt ≤ 200 A/ μ s, $V_{DD} \le BV_{DSS}$, starting $T_J = 25^{\circ}C$.
- 4: Essentially Independent of Operating Temperature Typical Characteristics.



Typical Performance Characteristics

Figure 1. On-Region Characteristics 100 V_{GS} = 15.0V 10.0V 8.0V 7.0V 6.5V Ip, Drain Current[A] 6.0V 1. 250µs Pulse Test 2. $T_C = 25^{\circ}C$ 0.1 0.1 10 1 V_{DS}, Drain-Source Voltage[V] 20

Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

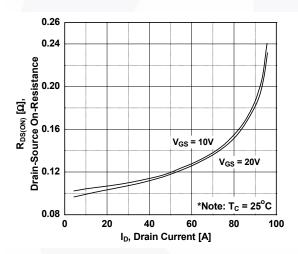


Figure 5. Capacitance Characteristics

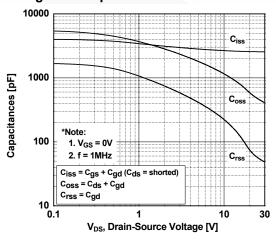


Figure 2. Transfer Characteristics

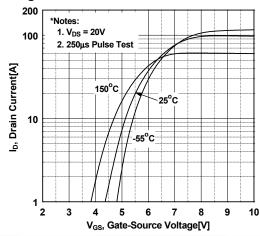


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

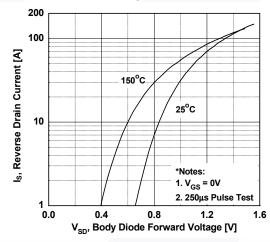
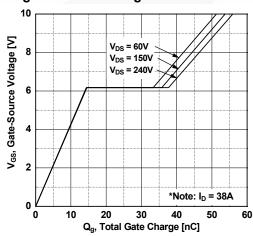


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

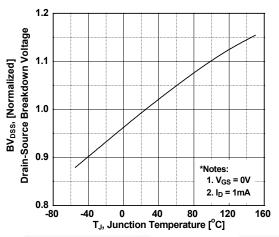


Figure 9. Maximum Drain Current vs. Case Temperature

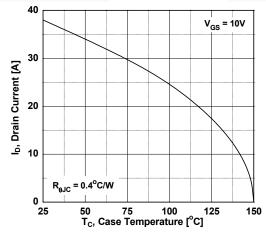


Figure 8. Maximum Safe Operating Area

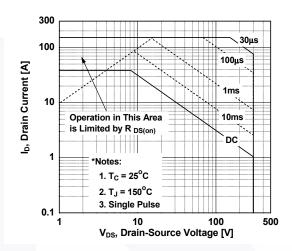


Figure 10. Unclamped Inductive Switching Capability

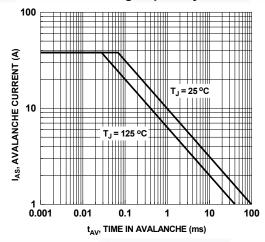
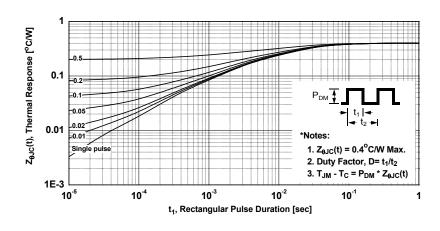


Figure 11. Transient Thermal Response Curve



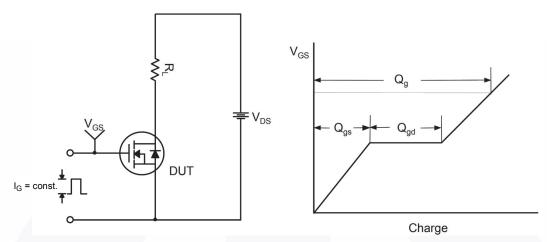


Figure 12. Gate Charge Test Circuit & Waveform

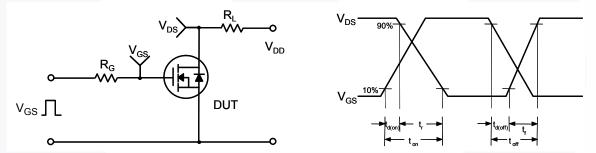


Figure 13. Resistive Switching Test Circuit & Waveforms

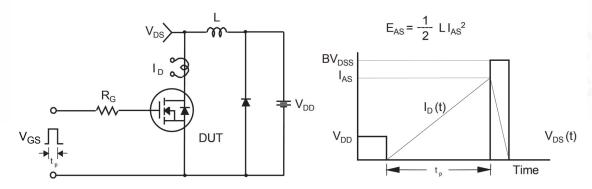


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

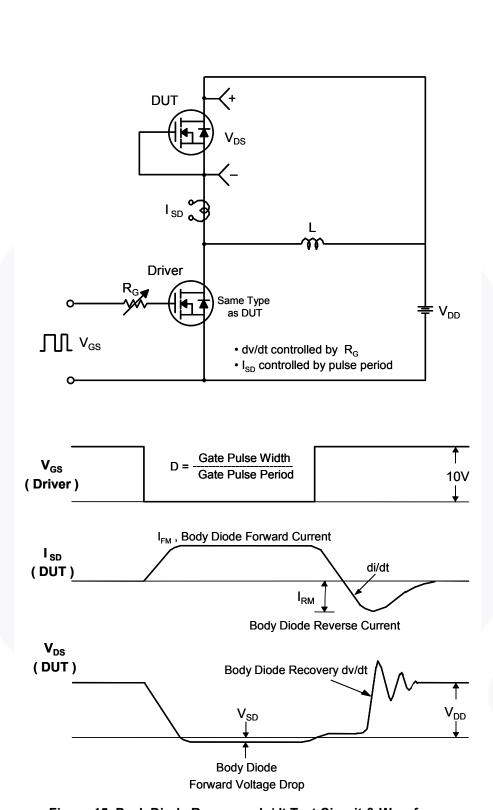


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

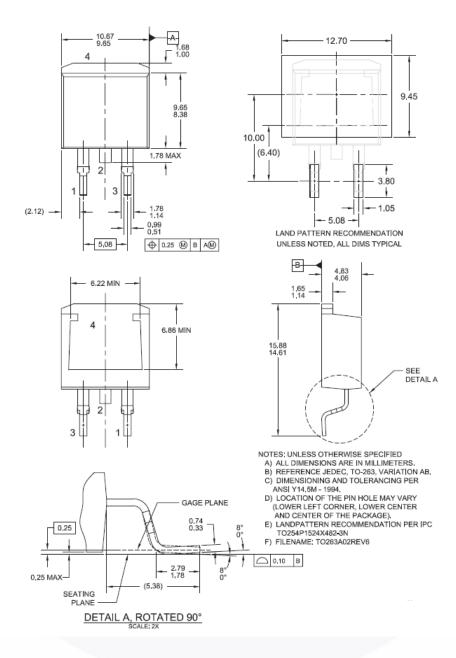


Figure 16. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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