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November 2013

# **FDB14N30**

# N-Channel UniFET<sup>TM</sup> MOSFET

**300 V, 14 A, 290 m**Ω

### **Features**

- $R_{DS(on)} = 290 \text{ m}\Omega \text{ (Max.)} @ V_{GS} = 10 \text{ V, } I_D = 7 \text{ A}$
- Low Gate Charge (Typ. 18 nC)
- Low C<sub>rss</sub> (Typ.17 pF)
- · 100% Avalanche Tested
- · Improved dv/dt Capability

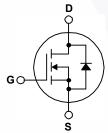
## **Applications**

- Lighting
- · Uninterruptible Power Supply
- · AC-DC Power Supply

# Description

UniFET<sup>TM</sup> 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<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter			FDB14N30TM	Unit
V <sub>DSS</sub>	Drain-Source Voltage			300	V
I <sub>D</sub>	Drain Current	- Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 100°C)	,		A A
I <sub>DM</sub>	Drain Current	- Pulsed	(Note 1)	56	Α
V <sub>GSS</sub>	Gate-Source voltage			±30	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy		(Note 2)	330	mJ
I <sub>AR</sub>	Avalanche Current		(Note 1)	14	Α
E <sub>AR</sub>	Repetitive Avalanche Energy		(Note 1)	14	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	4.5	V/ns
$P_{D}$	Power Dissipation	(T <sub>C</sub> = 25°C) - Derate above 25°C	, ,		W/°C
T <sub>J,</sub> T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C	
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C	

### **Thermal Characteristics**

Symbol	Parameter	FDB14N30TM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.87	
В	Thermal Resistance, Junction to Ambient (minimum pad of 2 oz copper), Max.	62.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (1 in <sup>2</sup> pad of 2 oz copper), Max.	40	

# **Package Marking and Ordering Information**

<b>Device Marking</b>	Device	Package	Reel Size	Tape Width	Quantity
FDB14N30	FDB14N30TM	D2-PAK	330mm	24mm	800 units

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

Symbol	Parameter	Conditions	Min.	Тур.	Max	Unit
Off Charac	teristics			I		
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	300			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C		0.3		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 300V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 240V, T <sub>C</sub> = 125°C			1 10	μ <b>Α</b> μ <b>Α</b>
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V	-		100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V	-		-100	nA
On Charac	teristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	3.0		5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7A		0.24	0.29	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40V, I <sub>D</sub> = 7A	-	10.5		S
Dynamic C	haracteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ f = 1.0MHz		815	1060	pF
C <sub>oss</sub>	Output Capacitance			150	195	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			17	25	pF
Switching	Characteristics				•	
t <sub>d(on)</sub>	Turn-On Delay Time	$V_{DD}$ = 150V, $I_{D}$ = 14A $R_{G}$ = 25 $\Omega$ (Note 4)		20	50	ns
t <sub>r</sub>	Turn-On Rise Time			105	120	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			30	70	ns
t <sub>f</sub>	Turn-Off Fall Time			75	160	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 240V, I <sub>D</sub> = 14A		18	25	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10V (Note 4)		4.5		nC
Q <sub>gd</sub>	Gate-Drain Charge			8		nC
Drain-Sour	ce Diode Characteristics and Maximus	n Ratings				
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				14	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				56	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 14A			1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 14A		235		ns
Q <sub>rr</sub>	Reverse Recovery Charge	dl <sub>F</sub> /dt =100Å/μs		1.6		μС

#### NOTES:

 $<sup>{\</sup>bf 1.}\ {\bf Repetitive}\ {\bf Rating:}\ {\bf Pulse}\ {\bf width}\ {\bf limited}\ {\bf by}\ {\bf maximum}\ {\bf junction}\ {\bf temperature}$ 

<sup>2.</sup> L = 2.8mH, I $_{AS}$  = 14A, V $_{DD}$  = 50V, R $_{G}$  = 25 $\Omega$ , Starting T $_{J}$  = 25°C

<sup>3.</sup>  $I_{SD} \le 14A$ , di/dt  $\le 200A/\mu s$ ,  $V_{DD} \le BV_{DSS}$ , Starting  $T_J$  = 25°C

<sup>4.</sup> Essentially Independent of Operating Temperature Typical Characteristics

# **Typical Characteristics**

Figure 1. On-Region Characteristics

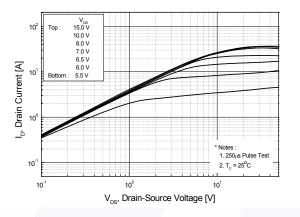


Figure 2. Transfer Characteristics

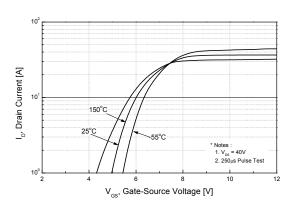
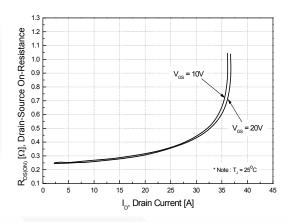
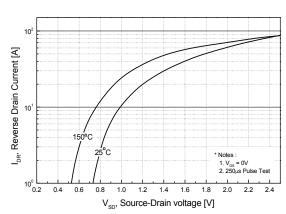


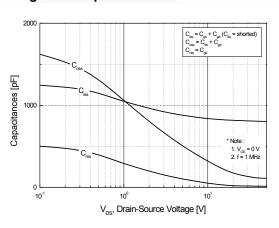
Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage



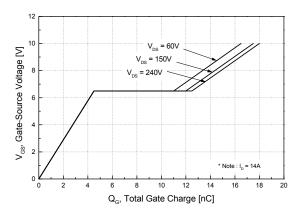




**Figure 5. Capacitance Characteristics** 



**Figure 6. Gate Charge Characteristics** 



# Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

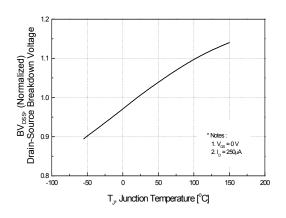


Figure 9. Maximum Safe Operating Area

Figure 8. On-Resistance Variation vs. Temperature

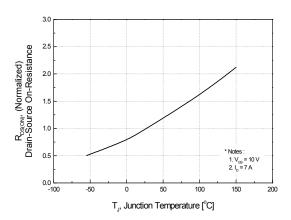
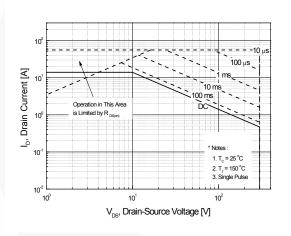


Figure 10. Maximum Drain Current vs. Case Temperature



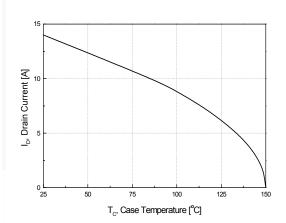


Figure 11. Transient Thermal Response Curve

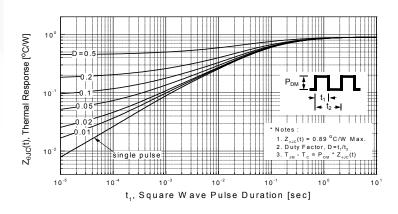


Figure 12. Gate Charge Test Circuit & Waveform

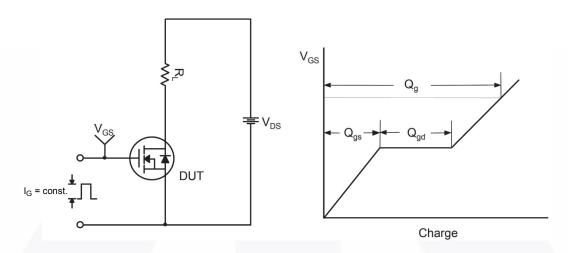


Figure 13. Resistive Switching Test Circuit & Waveforms

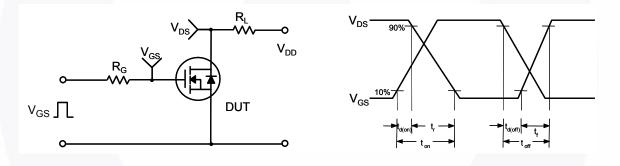
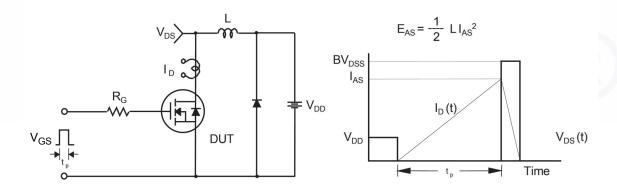


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



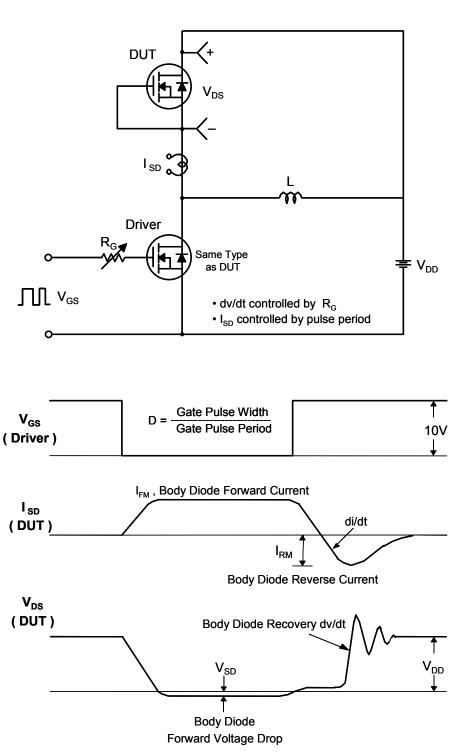


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

### **Mechanical Dimensions**

# TO-263 2L (D<sup>2</sup>PAK)

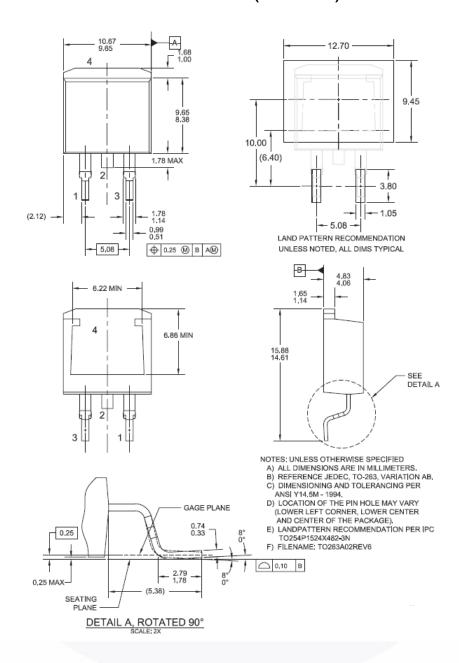


Figure 16. 2LD, TO263, Surface Mount

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Dimension in Millimeters





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