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May 2014



FDA38N30

N-Channel UniFETTM MOSFET 300 V, 38 A, 85 m Ω

Features

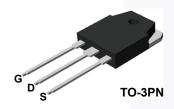
- $R_{DS(on)}$ = 70 m Ω (Typ.) @ V_{GS} = 10 V, I_D = 19 A
- Low Gate Charge (Typ. 60 nC)
- Low C_{rss} (Typ. 60 pF)
- · 100% Avalanche Tested
- · ESD Improved Capability
- · RoHS Compliant

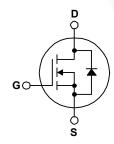
Applications

- PDP TV
- · 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.





MOSFET Maximum Ratings $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter			FDA38N30	Unit	
V_{DSS}	Drain to Source Voltage			300	V	
V_{GSS}	Gate to Source Voltage		/	±30	V	
I _D Drain Current	Drain Current	- Continuous (T _C = 25°C)		38	А	
	- Continuous (T _C = 100°C)		22	_ ^		
I _{DM}	Drain Current	- Pulsed	- Pulsed (Note 1)		Α	
E _{AS}	Single Pulsed Avalanche Energy		(Note 2)	1200	mJ	
I _{AR}	Avalanche Current		(Note 1)	38	Α	
E _{AR}	Repetitive Avalanche Energy		(Note 1)	31	mJ	
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	4.5	V/ns	
P _D	Power Dissipation	(T _C = 25°C)		312	W	
		- Derate Above 25°C		2.5	W/oC	
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C	
T _L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		Seconds	300	°C	

Thermal Characteristics

Symbol	Parameter	FDA38N30	Unit	
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.4	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. 40		- C/VV	

Package Marking and Ordering Infomation

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA38N30	FDA38N30	TO-3PN	Tube	N/A	N/A	30 units

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

Symbol	Parameter	Conditions	Min.	Тур.	Max	Unit
Off Charac	cteristics			1		
BV _{DSS}	Drain to Source Breakdown Voltage	own Voltage $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}, T_C = 25^{\circ}\text{C}$		-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	-	0.3	-	V/°C
_		V _{DS} = 300 V, V _{GS} = 0 V	-	-	1	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 240 V, T _C = 125°C		-	10	μΑ
I _{GSS}	Gate-Body Leakage Current	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 = 19 A	-	0.070	0.085	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 19 A	-	6.3	-	S
Dynamic C	Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz		2600	-	pF
C _{oss}	Output Capacitance			500	-	pF
C _{rss}	Reverse Transfer Capacitance			60	-	pF
Q _{g(tot)}	Total Gate Charge at 10V	$V_{DS} = 240 \text{ V}, I_D = 38 \text{ A}, V_{GS} = 10 \text{ V}$ (Note 4)		60	-	nC
Q _{gs}	Gate to Source Gate Charge			17	-	nC
Q _{gd}	Gate to Drain "Miller" Charge			28	-	nC
Switching	Characteristics					
t _{d(on)}	Turn-On Delay Time		-	53	69	ns
t _r	Turn-On Rise Time	V_{DD} = 150 V, I_{D} = 38 A, - R_{G} = 25 Ω , V_{GS} = 10 V	-/	110	143	ns
t _{d(off)}	Turn-Off Delay Time	R _G - 25 12, V _{GS} - 10 V	-	118	153	ns
t _f	Turn-Off Fall Time	(Note 4)	/ -	54	70	ns
Drain-Sou	rce Diode Characteristics					
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	38	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	150	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	$V_{GS} = 0 \text{ V, } I_{SD} = 38 \text{ A,}$ $dI_F/dt = 100 \text{ A/}\mu\text{s}$		315	-	ns
Q _{rr}	Reverse Recovery Charge			4.0	-	μС

Notes

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

^{2.} L = 1.7 mH, I $_{AS}$ = 38 A, V $_{DD}$ = 50 V, R $_{G}$ = 25 Ω , starting T $_{J}$ = 25°C.

^{3.} I $_{SD} \leq$ 38 A, di/dt \leq 200 A/ μ s, 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

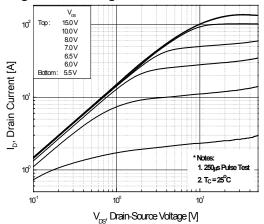


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

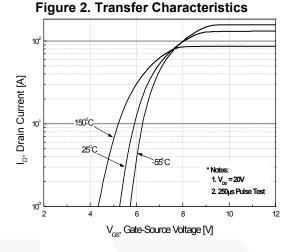


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

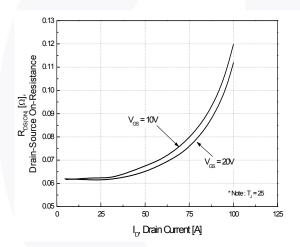
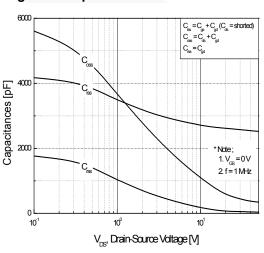


Figure 5. Capacitance Characteristics



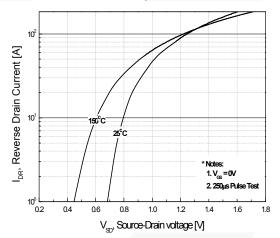
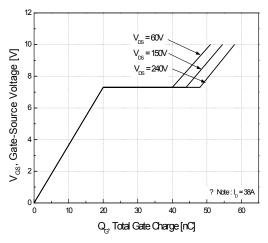


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

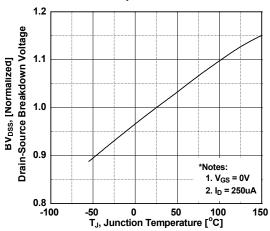


Figure 8. On-Resistance Variation vs. Temperature

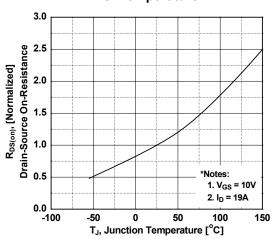


Figure 9. Maximum Safe Operating Area

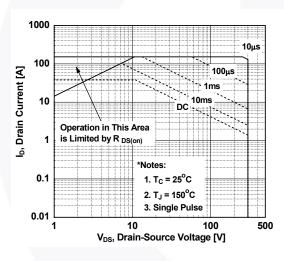


Figure 10. Maximum Drain Current vs. Case Temperature

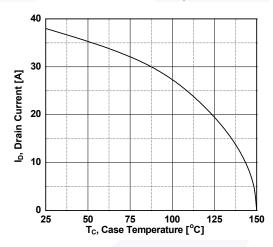
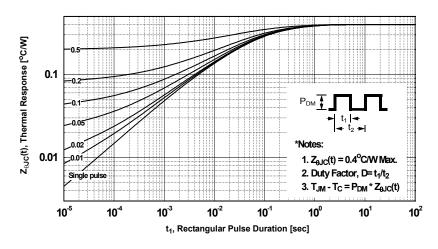


Figure 11. Transient Thermal Response Curve



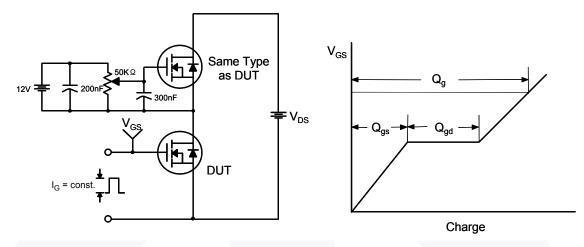


Figure 12. Gate Charge Test Circuit & Waveform

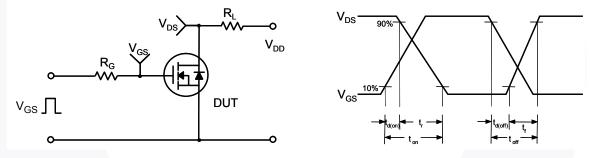


Figure 13. Resistive Switching Test Circuit & Waveforms

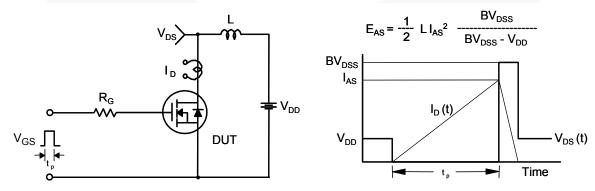


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

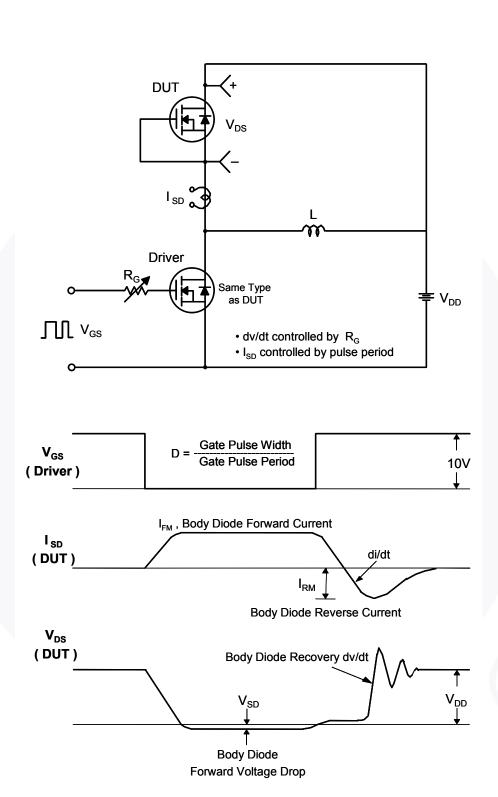
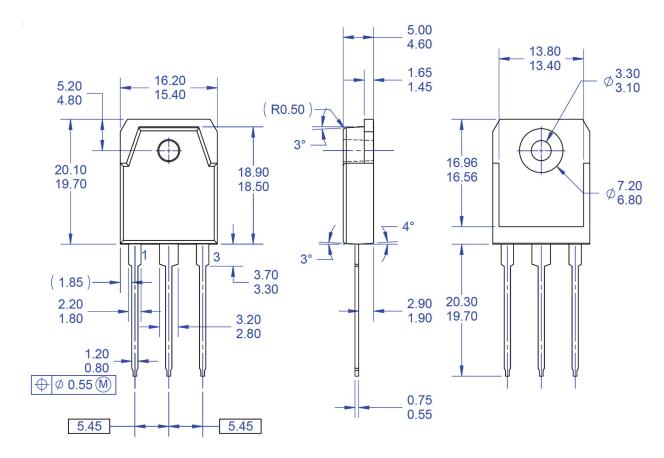
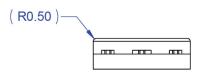


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions





NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSSIONS. DRAWING FILE NAME: TO3PN03AREV1.
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Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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