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April 2014



FDA59N25

N-Channel UniFETTM MOSFET 250 V, 59 A, 49 m Ω

Features

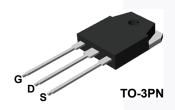
- $R_{DS(on)}$ = 49 m Ω (Max.) @ V_{GS} = 10 V, I_D = 29.5 A
- Low Gate Charge (Typ. 63 nC)
- Low C_{rss} (Typ. 70 pF)
- · 100% Avalanche Tested
- · RoHS Compliant

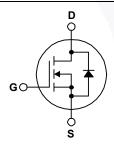
Applications

- 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.





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

Symbol		Parameter			Unit	
V_{DSS}	Drain to Source Voltage	Source Voltage		250	V	
V _{DS(Avalanche)}	Repetitive Avalanche Volt	tage	(Note 1,2)	300	V	
V _{GSS}	Gate to Source Voltage			±30	V	
	Desir Coment	- Continuous (T _C = 25°C)		59		
I _D Drain Current	- Continuous (T _C = 100°C)		35	Α		
I _{DM}	Drain Current	- Pulsed	- Pulsed (Note 1)			
E _{AS}	Single Pulsed Avalanche Energy		(Note 2)	1458	mJ	
I _{AR}	Avalanche Current		(Note 1)	59	Α	
E _{AR}	Repetitive Avalanche Energy		(Note 1)	39.2	mJ	
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	4.5	V/ns	
P _D	Power Dissipation	(T _C = 25°C)		392	W	
		- Derate Above 25°C		3.2	W/°C	
T _J , T _{STG}	Operating and Storage Te	perating and Storage Temperature Range		-55 to +150	°C	
TL	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		Seconds	300	°C	

Thermal Characteristics

Symbol	Parameter	FDA59N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max. 0.32		
$R_{\theta CS}$	Thermal Resistance, Case to Sink, Typ.	0.24	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. 40		

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA59N25	FDA59N25	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	teristics					
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 μA	3.0		5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 29.5 A		0.041	0.049	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 29.5 A		45		S
Dynamic C	Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V,	-	3090	4020	pF
C _{oss}	Output Capacitance	f = 1 MHz		630	820	pF
C _{rss}	Reverse Transfer Capacitance			70	110	pF
Switching	Characteristics			_		
t _{d(on)}	Turn-On Delay Time	V _{DD} = 125 V, I _D = 59 A		70	150	ns
t _r	Turn-On Rise Time	$V_{GS} = 10 \text{ V}, R_G = 25 \Omega$		480	970	ns
t _{d(off)}	Turn-Off Delay Time			90	190	ns
t _f	Turn-Off Fall Time	(Note 4)		170	350	ns
Qg	Total Gate Charge	V _{DS} = 200 V, I _D = 59 A		63	82	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V	-	18.5		nC
Q _{gd}	Gate-Drain Charge	(Note 4)	-/-	30		nC
Drain-Soul	rce Diode Characteristics and Maximum	n Ratings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				59	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current				236	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 59 A			1.4	٧
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _S = 59 A,		190		ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt =100 A/μs		4.4	-	μС

Notes

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. L = 0.67 mH, I $_{AS}$ = 59 A, V $_{DD}$ = 50 V, R $_{G}$ = 25 Ω , starting T $_{J}$ = 25°C.
- 3. I $_{SD}$ \leq 59 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

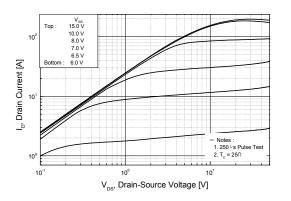


Figure 2. Transfer Characteristics

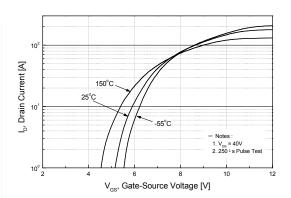


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

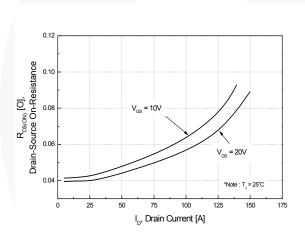


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

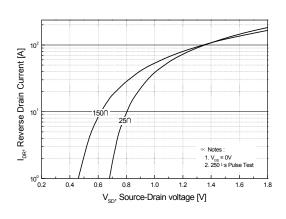


Figure 5. Capacitance Characteristics

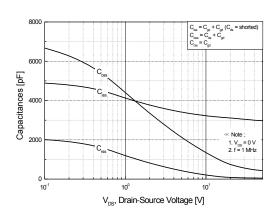
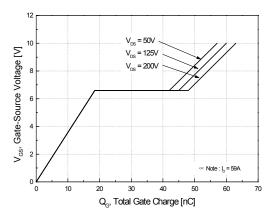


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

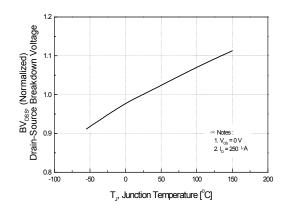


Figure 8. On-Resistance Variation vs. Temperature

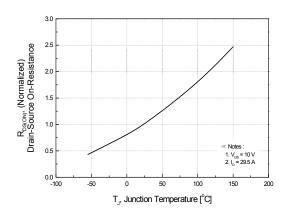


Figure 9. Maximum Safe Operating Area

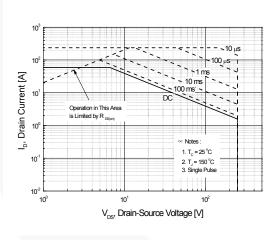


Figure 10. Maximum Drain Current vs. Case Temperature

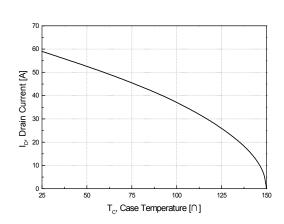
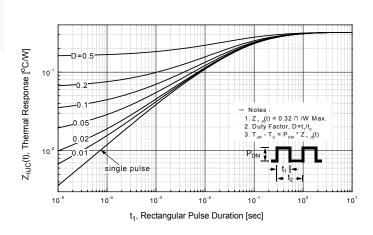


Figure 11. Transient Thermal Response Curve



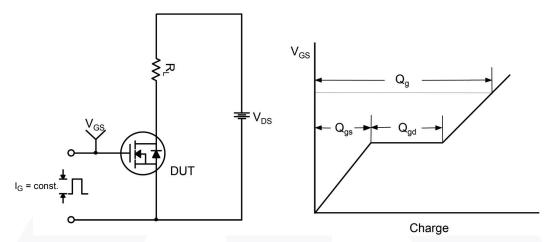


Figure 12. Gate Charge Test Circuit & Waveform

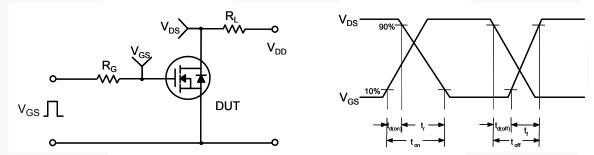


Figure 13. Resistive Switching Test Circuit & Waveforms

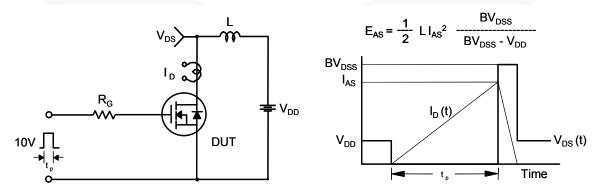


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

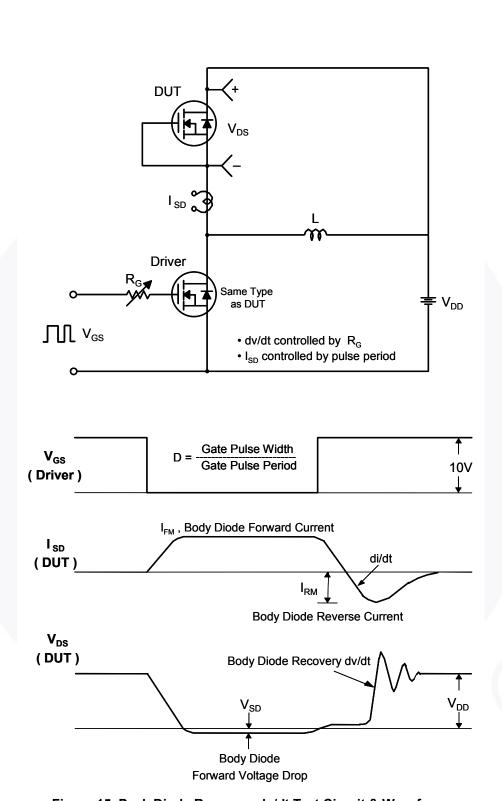
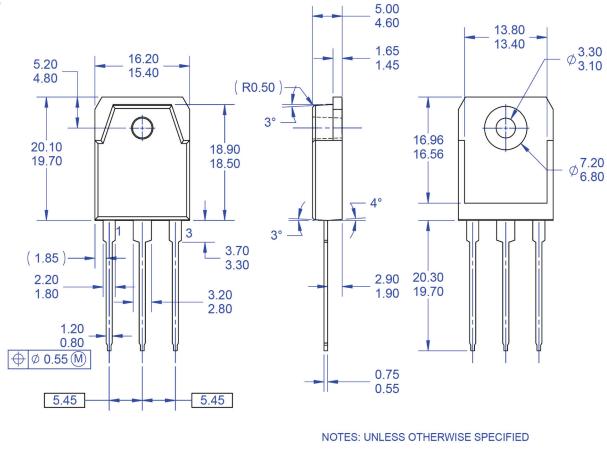
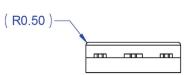


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions





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

Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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