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June 2014

FDA69N25

N-Channel UniFET™ MOSFET

250 V, 69 A, 41 mΩ

Features

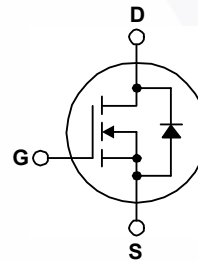
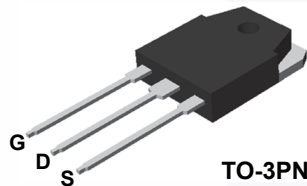
- $R_{DS(on)} = 34 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 34.5 \text{ A}$
- Low Gate Charge (Typ. 77 nC)
- Low C_{rss} (Typ. 84 pF)

Applications

- PDP TV
- Uninterruptible Power Supply
- AC-DC Power Supply

Description

UniFET™ 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 $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDA69N25	Unit
V_{DSS}	Drain-Source Voltage	250	V
$V_{DS(Avalanche)}$	Repetitive Avalanche Voltage (Note 1, 2)	300	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	69
		- Continuous ($T_C = 100^\circ\text{C}$)	44.2
I_{DM}	Drain Current - Pulsed (Note 1)	276	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1894	mJ
I_{AR}	Avalanche Current (Note 1)	69	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	48	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	480	W
		3.84	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FDA69N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.26	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA69N25	FDA69N25	TO-3PN	Tube	N/A	N/A	30 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	250	--	--	V	
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.25	--	V/ $^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA	
		$V_{DS} = 200\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA	
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA	
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA	
On Characteristics							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	3.0	--	5.0	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 34.5\text{ A}$	--	0.034	0.041	Ω	
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 34.5\text{ A}$	--	25	--	S	
Dynamic Characteristics							
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	--	3570	4640	pF	
C_{oss}	Output Capacitance		--	750	980	pF	
C_{rss}	Reverse Transfer Capacitance		--	84	130	pF	
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{ V}, I_D = 69\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 25\ \Omega$	--	95	200	ns	
t_r	Turn-On Rise Time		--	855	1720	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4)	--	130	270	ns
t_f	Turn-Off Fall Time		(Note 4)	--	220	450	ns
Q_g	Total Gate Charge	$V_{DS} = 200\text{ V}, I_D = 69\text{ A},$ $V_{GS} = 10\text{ V}$	--	77	100	nC	
Q_{gs}	Gate-Source Charge		(Note 4)	--	24	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	37	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	34	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	136	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 69\text{ A}$	--	--	1.4	V	
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 69\text{ A},$ $di_F / dt = 100\text{ A}/\mu\text{s}$	--	210	--	ns	
Q_{rr}	Reverse Recovery Charge		--	5.7	--	μC	

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. $L = 0.64\text{ mH}, I_{AS} = 69\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 69\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

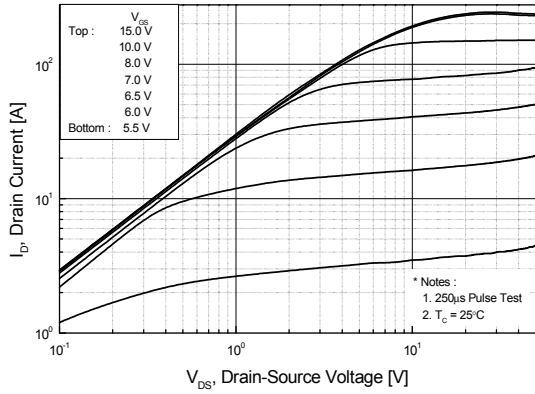


Figure 2. Transfer Characteristics

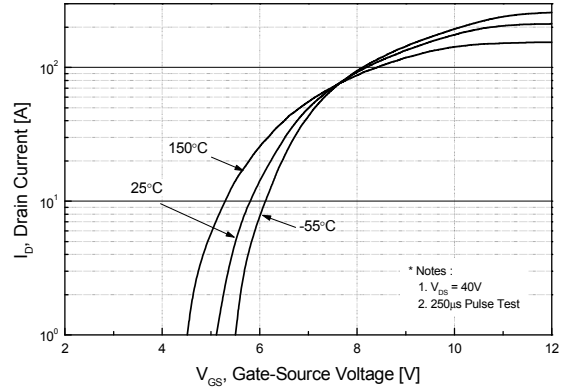


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

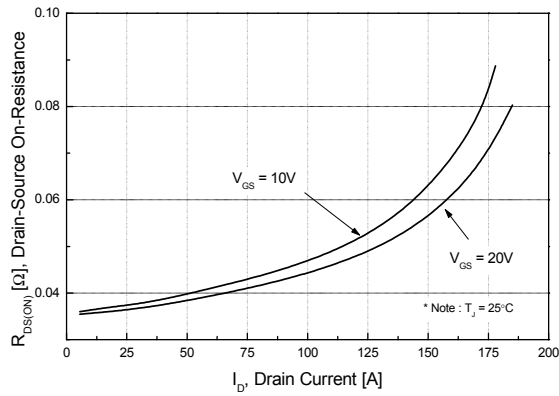


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

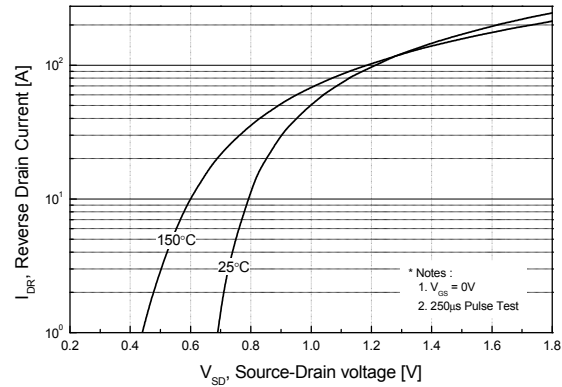


Figure 5. Capacitance Characteristics

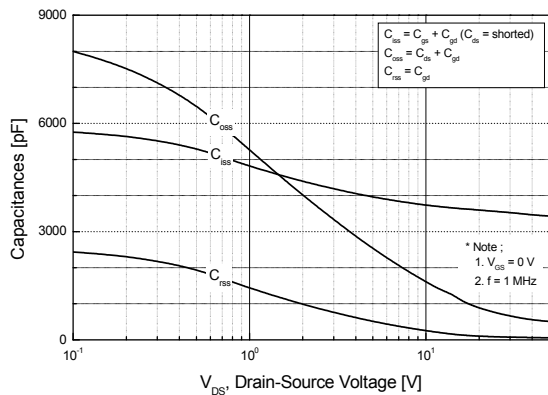
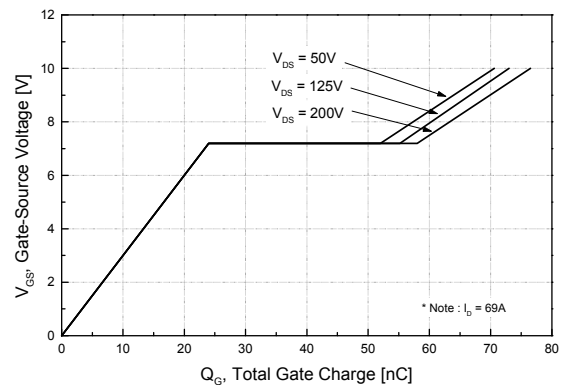


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

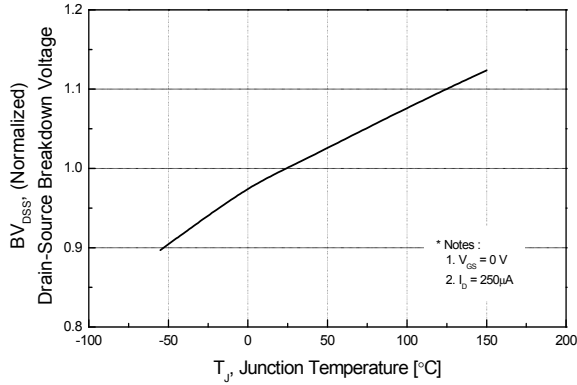


Figure 8. On-Resistance Variation vs. Temperature

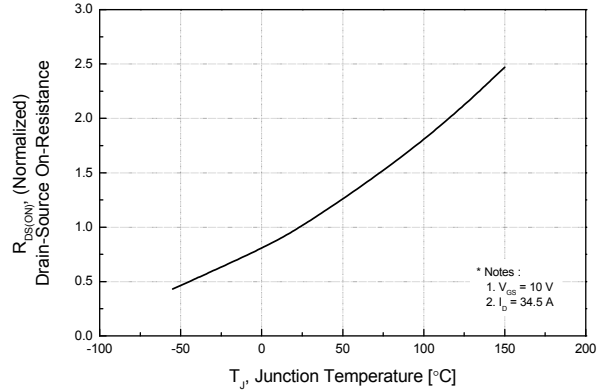


Figure 9. Maximum Safe Operating Area

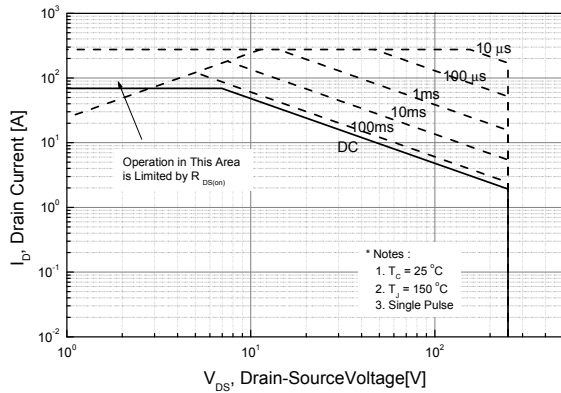


Figure 10. Maximum Drain Current vs. Case Temperature

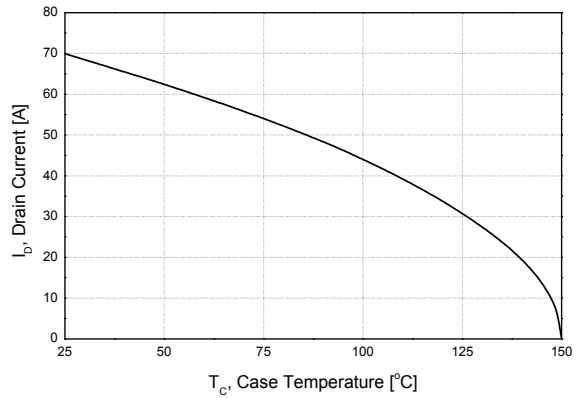


Figure 11. Transient Thermal Response Curve

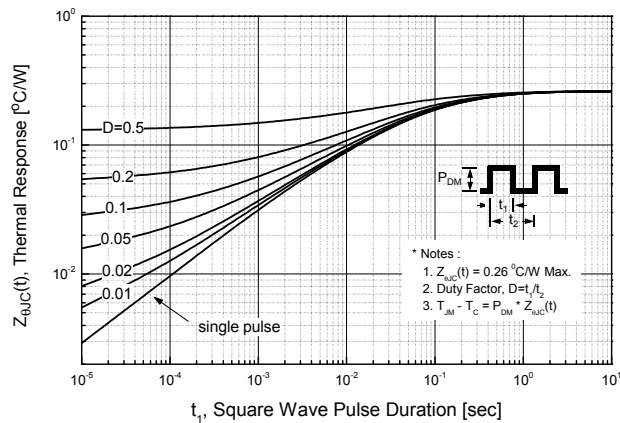




Figure 12. Gate Charge Test Circuit & Waveform

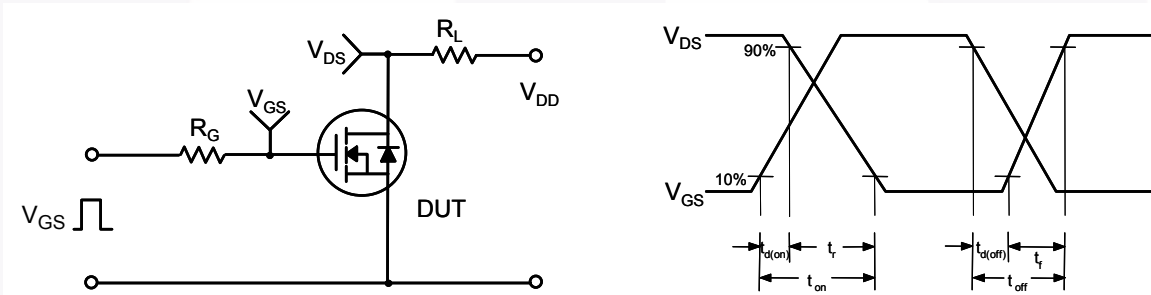


Figure 13. Resistive Switching Test Circuit & Waveforms

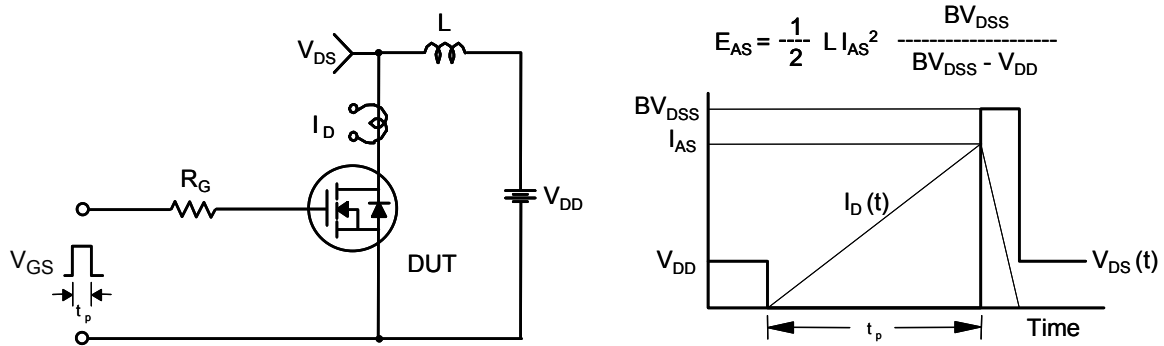
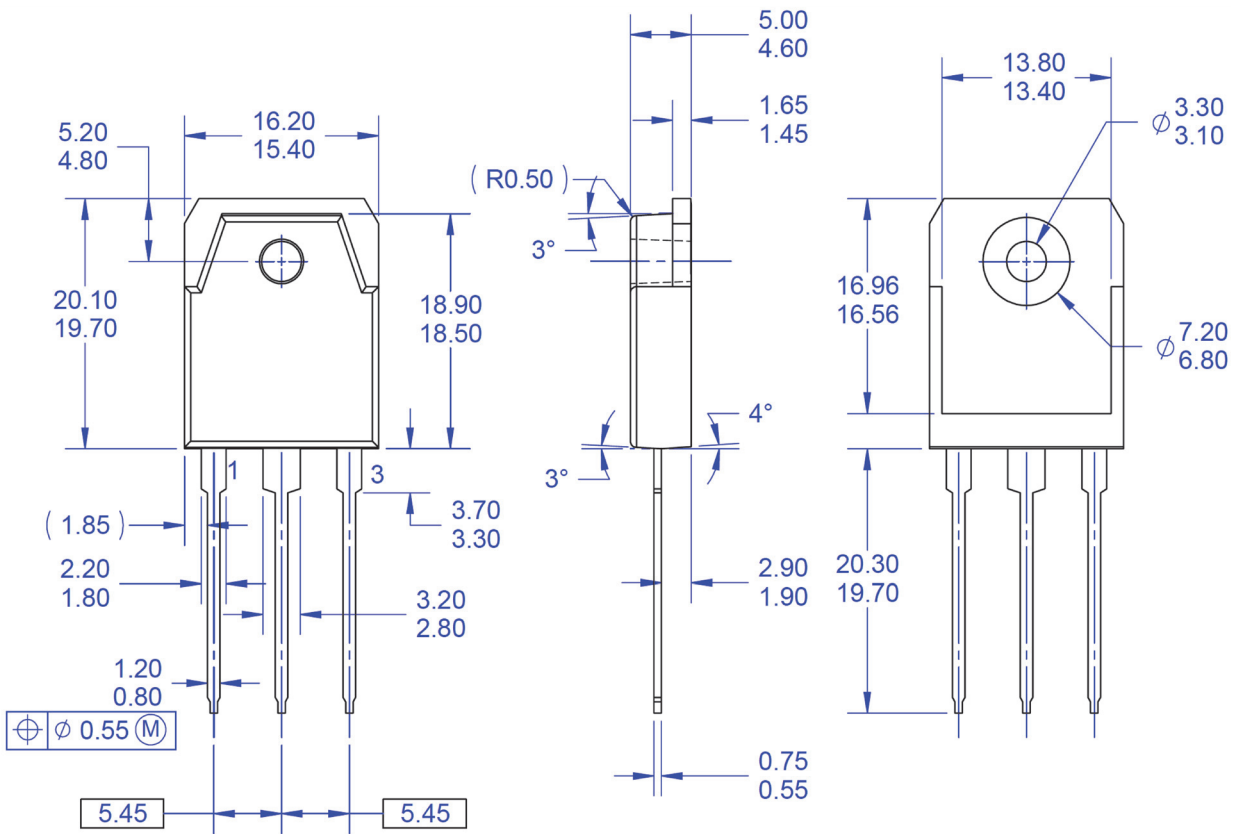


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



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

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

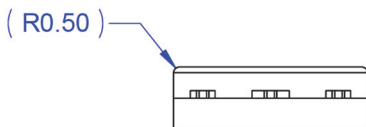


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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