

MOSFET - N-Channel, **UniFET™**

500 V, 16.5 A, 380 mΩ

FDA16N50-F109

Description

UniFET MOSFET is onsemi'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.

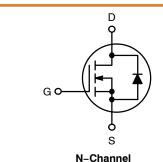
Features

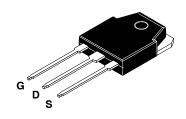
- $R_{DS(on)} = 380 \text{ m}\Omega \text{ (Max.)} @ V_{GS} = 10 \text{ V}, I_D = 8.3 \text{ A}$
- Low Gate Charge (Typ. 32 nC)
- Low C_{rss} (Typ. 20 pF)
- 100% Avalanche Tested
- This is a Pb-Free Device

Applications

- PDP TV
- Uninterruptible Power Supply

V _{DS} R _{DS(on)} MAX		I _D MAX	
500 V	380 mΩ @ 10 V	16.5 A	





TO-3P-3LD CASE 340BZ

MARKING DIAGRAM



FDA16N50 = Specific Device Code = Assembly Location YWW = Date Code (Year & Week) ZZ

= Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping
FDA16N50-F109	TO-3P-3LD (Pb-Free)	450 Units / Tube

1

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	FDA16N50-F109	Unit	
V _{DSS}	Drain-Source Voltage		500	V
Ι _D		tinuous (T _C = 25°C) tinuous (T _C = 100°C)	16.5 9.9	A A
I _{DM}	Drain Current -Puls	ed (Note 1)	66	Α
V_{GSS}	Gate-Source Voltage		±30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		780	mJ
I _{AR}	Avalanche Current (Note 1)		16.5	Α
E _{AR}	Repetitive Avalanche Energy (Note 1)		20.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
P_{D}	,	= 25°C) ate Above 25°C	205 2.1	W W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150	°C
TL	Maximum Lead Temperature for Soldering Purpose, 1/8	" from Case for 5 Second	300	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. L = 5.1 mH, I_{AS} = 16.5 A, V_{DD} = 50 V, R_{G} = 25 Ω , Starting T_{J} = 25 °C.

3. $I_{SD} \le$ 16.5 A, $I_{SD} \le$ 10.5 A,

THERMAL CHARACTERISTICS

Symbol	Parameter	FDA16N50-F109	Unit
$R_{ heta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
OFF CHARA	ACTERISTICS	•	•	•	•	
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	500	_	-	V
$\Delta BV_{DSS} / \Delta T_{J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C	_	0.5	_	V/°C
I _{DSS} Zero	I _{DSS} Zero Gate Voltage Drain Current	V _{DS} = 500 V, V _{GS} = 0 V	-	-	1	μΑ
		V _{DS} = 400 V, T _C = 125°C	-	-	10	μΑ
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
N CHARA	CTERISTICS					
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 = 8.3 A	-	0.31	0.38	Ω
9FS	Forward Transconductance	V _{DS} = 40 V, I _D = 8.3 A	-	23	_	S
YNAMIC C	HARACTERISTICS					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	1495	1945	pF
C _{oss}	Output Capacitance		-	235	310	pF
C _{rss}	Reverse Transfer Capacitance	1	-	20	30	pF
WITCHING	CHARACTERISTICS					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 250 V, I _D = 16 A,	_	40	90	ns
t _r	Turn-On Rise Time	$R_G = 25 \Omega$ (Note 4)	-	150	310	ns
t _{d(off)}	Turn-Off Delay Time	1	-	65	140	ns
t _f	Turn-Off Fall Time	1	-	80	170	ns
Qg	Total Gate Charge	V _{DS} = 400 V, I _D = 16 A,	-	32	45	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V (Note 4)	_	8.5	-	nC
Q_{gd}	Gate-Drain Charge	1	-	14	-	nC
RAIN-SOU	RCE DIODE CHARACTERISTICS AND N	IAXIMUM RATINGS				
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	9.2	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	37	Α
V_{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 16.5 A	-	_	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 16 A,	-	490	-	ns
Q _{rr}	Reverse Recovery Charge	dl _F /dt = 100 A/μs	_	5.0	-	μС

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Essentially Independent of Operating Temperature Typical Characteristics.

TYPICAL CHARACTERISTICS

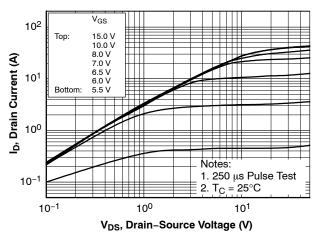


Figure 1. On-Region Characteristics

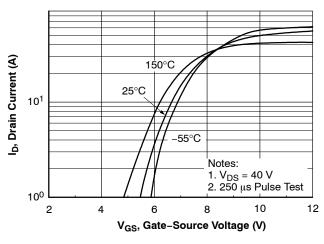


Figure 2. Transfer Characteristics

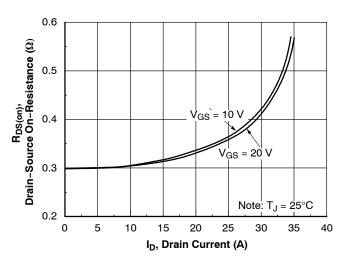


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

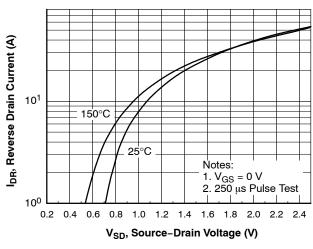


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

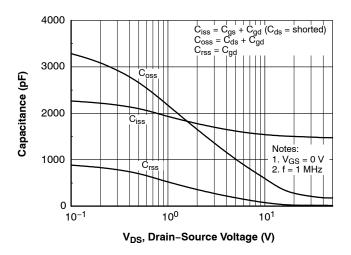


Figure 5. Capacitance Characteristics

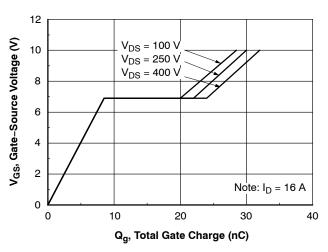


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (Continued)

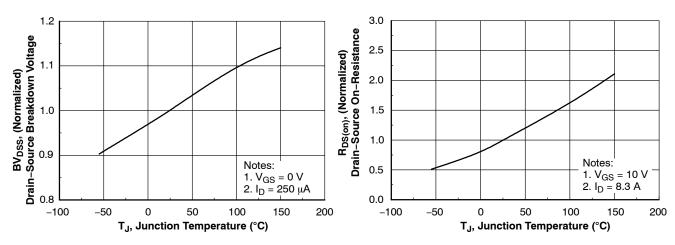


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On–Resistance Variation vs. Temperature

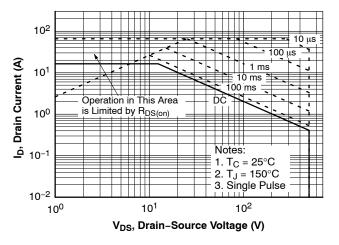


Figure 9. Maximum Safe Operating Area

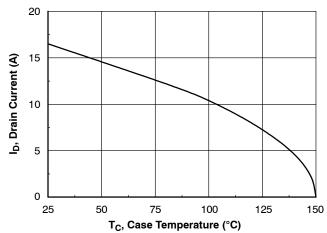


Figure 10. Maximum Drain Current vs. Case Temperature

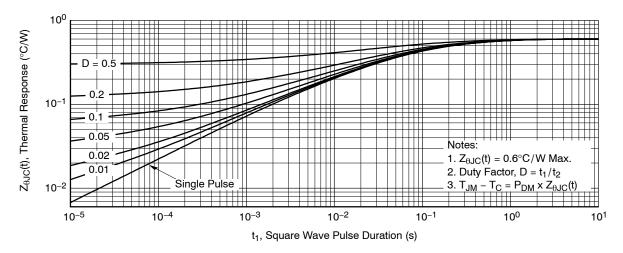


Figure 11. Transient Thermal Response Curve

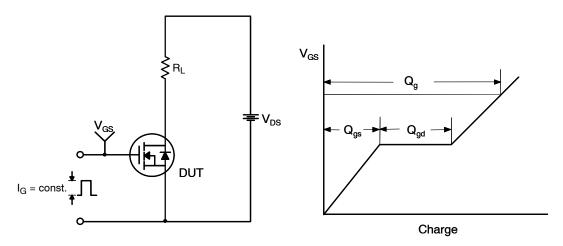


Figure 12. Gate Charge Test Circuit & Waveform

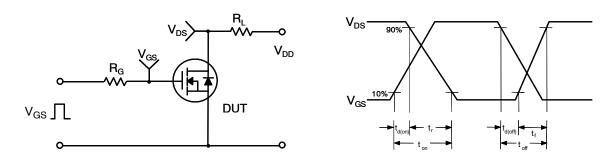


Figure 13. Resistive Switching Test Circuit & Waveforms

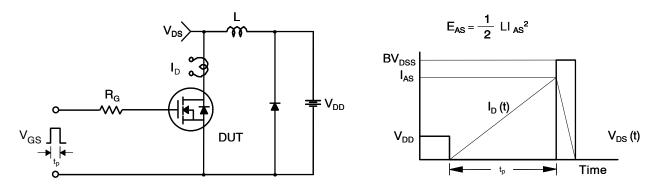
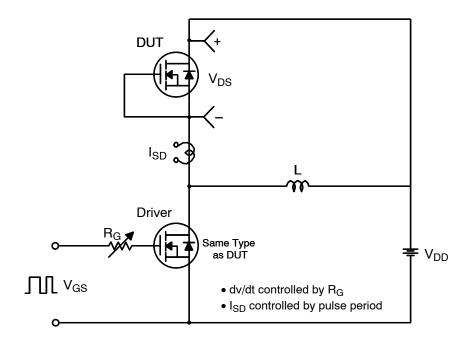


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



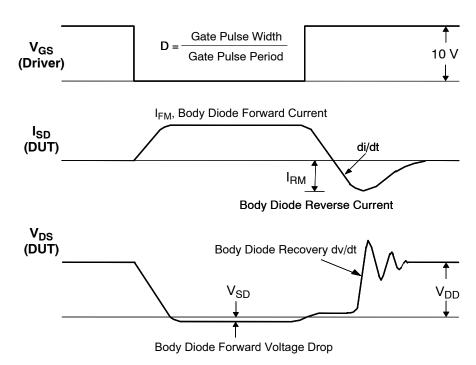
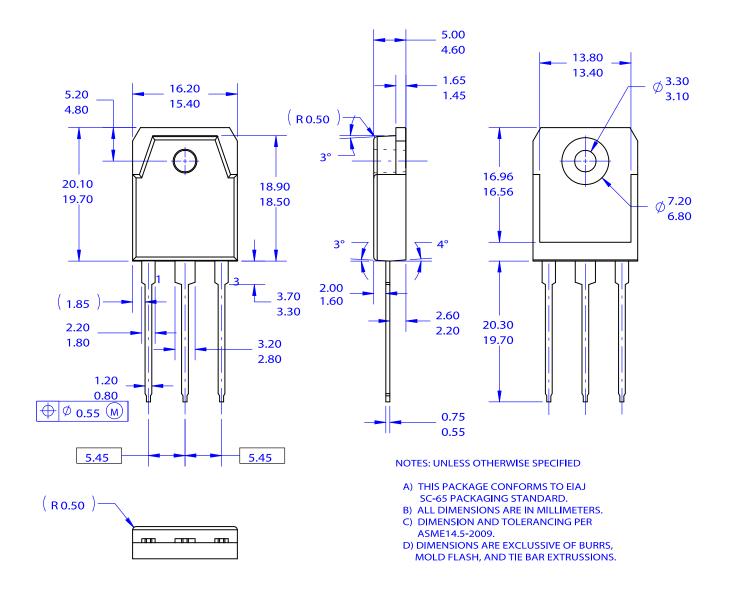


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

UniFET is a trademark of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.

TO-3P-3LD / EIAJ SC-65, ISOLATED CASE 340BZ ISSUE O

DATE 31 OCT 2016



DOCUMENT NUMBER:	98AON13862G Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	TO-3P-3LD / EIAJ SC-65, ISOLATED		PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, ONSEMI., and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems. or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

 $\textbf{Technical Library:} \ \underline{www.onsemi.com/design/resources/technical-documentation}$

onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at

www.onsemi.com/support/sales