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November 2013

# **FDD6N50 / FDU6N50** N-Channel UniFET<sup>TM</sup> MOSFET 500 V, 6 A, 900 mΩ

### Features

- $R_{DS(on)}$  = 900 m $\Omega$  (Max.) @  $V_{GS}$  = 10 V,  $I_D$  = 3 A
- Low Gate Charge (Typ. 12.8 nC)
- Low C<sub>rss</sub> (Typ. 9 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability

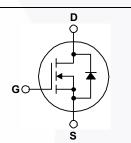
## Applications

- LCD/LED/PDP TV
- 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		FDD6N50TM / FDD6N50TM_WS / FDU6N50TU	Unit
V <sub>DSS</sub>	Drain-Source Voltage			500	V
I <sub>D</sub>	Drain Current	- Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 100°C)		6 3.8	A A
I <sub>DM</sub>	Drain Current	- Pulsed	(Note 1)	24	А
V <sub>GSS</sub>	Gate-Source voltage		±30	V	
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2		(Note 2)	270	mJ
I <sub>AR</sub>	Avalanche Current		(Note 1)	6	A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note		(Note 1)	8.9	mJ
dv/dt	Peak Diode Recovery dv/dt (Note		(Note 3)	4.5	V/ns
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C) - Derate Above 25°C		89 0.71	W W/°C
T <sub>J,</sub> T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C	
TL	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300	°C

# **Thermal Characteristics**

Symbol	Parameter	FDD6N50TM / FDD6N50TM_WS / FDU6N50TU	Unit
$R_{ extsf{ heta}JC}$	Thermal Resistance, Junction-to-Case, Max.	1.4	°C/W
$R_{\thetaJA}$	Thermal Resistance, Junction-to-Ambient, Max.	83	0/11

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDD6N50TM	FDD6N50	DPAK	Tape and Reel	330 mm	16 mm	2500 units
FDD6N50TM_WS	FDD6N50S	DPAK	Tape and Reel	330 mm	16 mm	2500 units
FDU6N50TU	FDU6N50	IPAK	Tube	N/A	N/A	75 units

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

Symbol	Parameter	Conditions	Min.	Тур.	Мах	Unit
Off Charac	teristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA				V
$\Delta BV_{DSS}$ / $\Delta T_{J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \ \mu\text{A}$ , Referenced to $25^{\circ}\text{C}$		0.5		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = 500 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 400 \text{ V}, T_{C} = 125^{\circ}\text{C}$			1 10	μΑ μΑ
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V			-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> = 10 V, I <sub>D</sub> = 3 A		0.76	0.9	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 3 A		2.5		S
Dynamic C	Characteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS}$ = 25 V, $V_{GS}$ = 0 V,		720	940	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz		95	190	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			9	13.5	pF
Switching	Characteristics				-	
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 250 V, I <sub>D</sub> = 6 A,		6	20	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{GS}$ = 10 V, $R_G$ = 25 $\Omega$		55	120	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			25	60	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)		35	80	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 400 V, I <sub>D</sub> = 6 A,		12.8	16.6	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V		3.7		nC
Q <sub>gd</sub>	Gate-Drain Charge	(Note 4)		5.8		nC
Drain-Sou	rce Diode Characteristics and Maximur	n Ratings		1		
I <sub>S</sub> Maximum Continuous Drain-Source Diode Forward Current					6	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				24	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 6 A			1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 6 A,		275		ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt =100 A/μs		1.7		μC

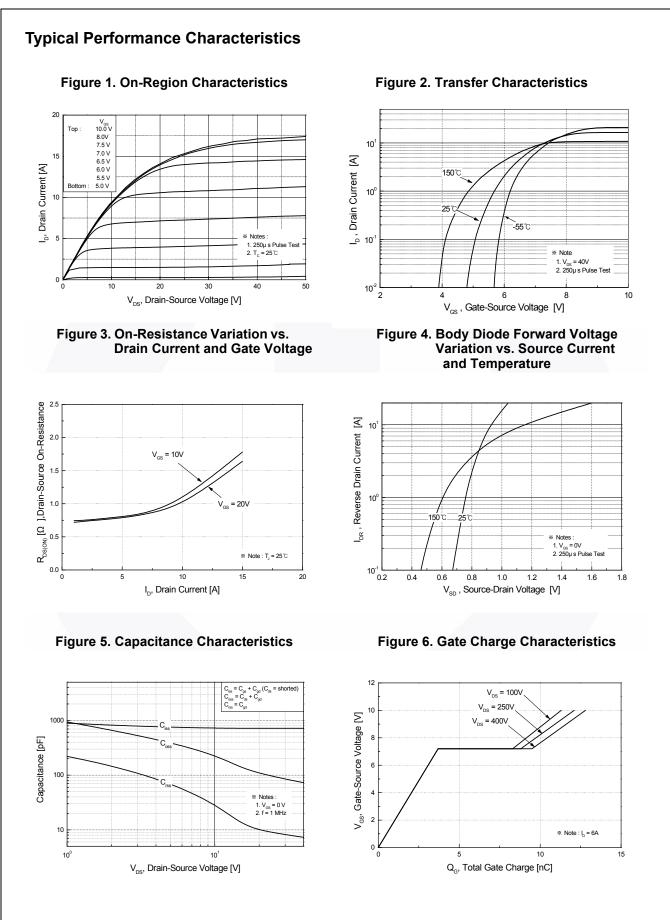
### Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.

2.  $I_{AS}$  = 6 A,  $V_{DD}$  = 50 V, L=13.5 mH,  $R_{G}$  = 25  $\Omega,$  starting  $T_{J}$  = 25°C.

3. I\_{SD}  $\leq$  6 A, di/dt  $\leq$  200 A/µs, V\_{DD}  $\leq$  BV\_{DSS}, starting T\_J = 25°C.

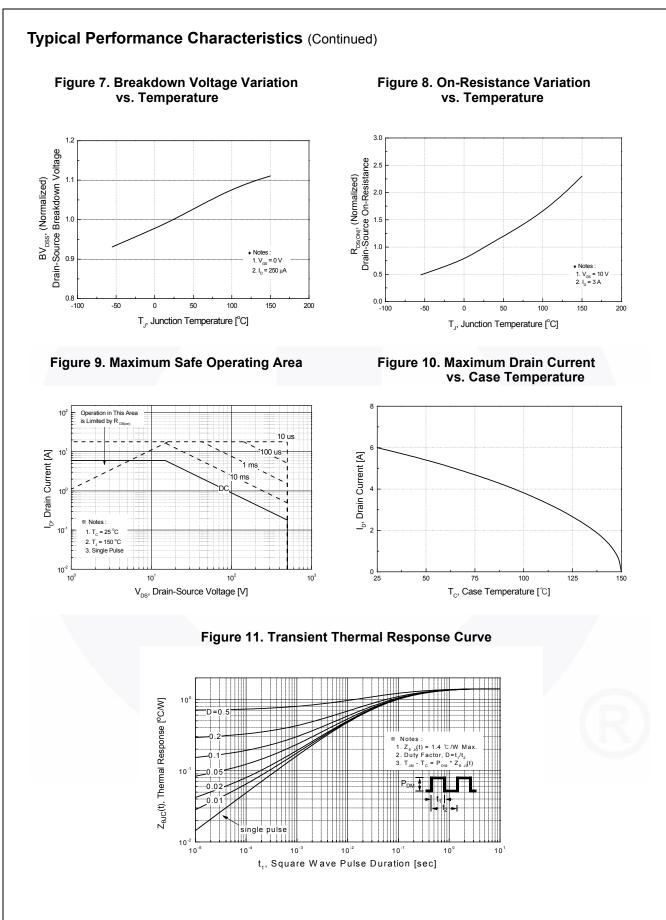
 $\label{eq:second} \textbf{4}. \ \textbf{Essentially independent of operating temperature typical characteristics}.$ 

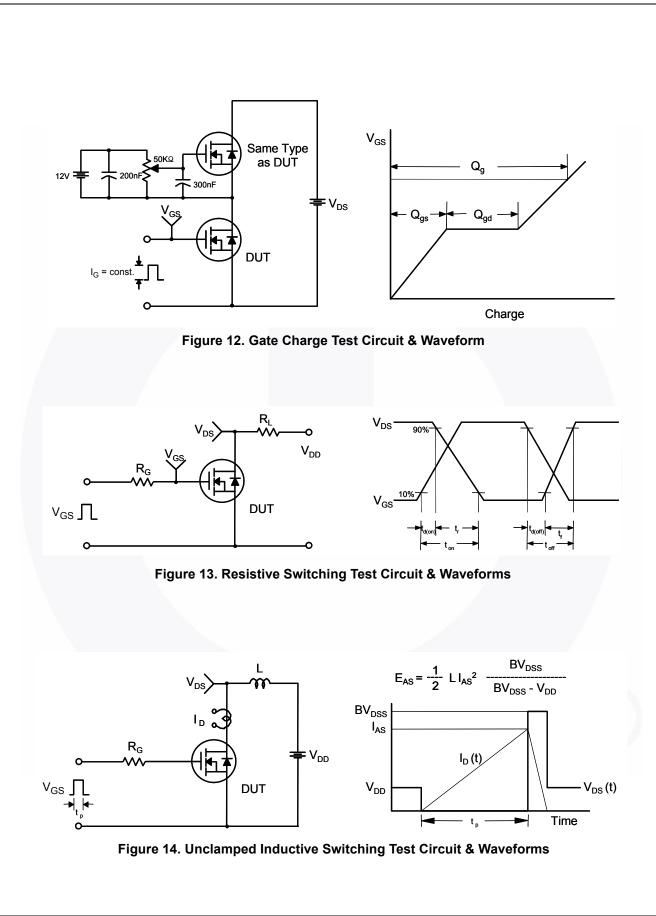


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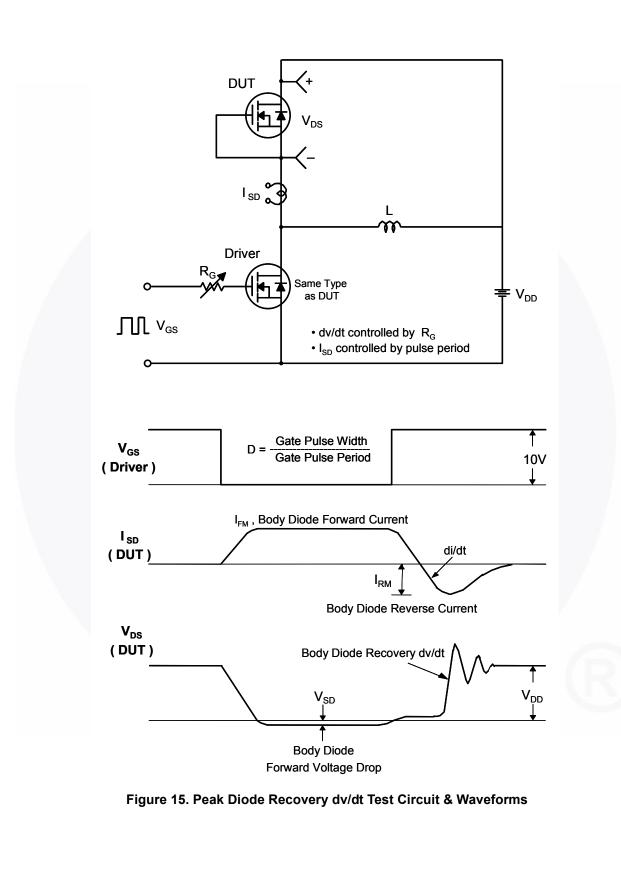
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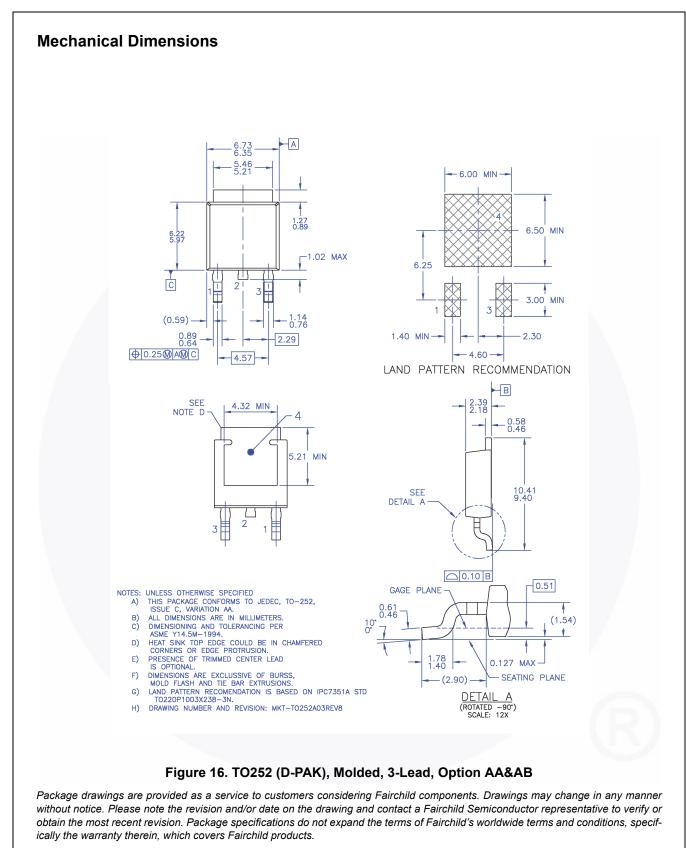
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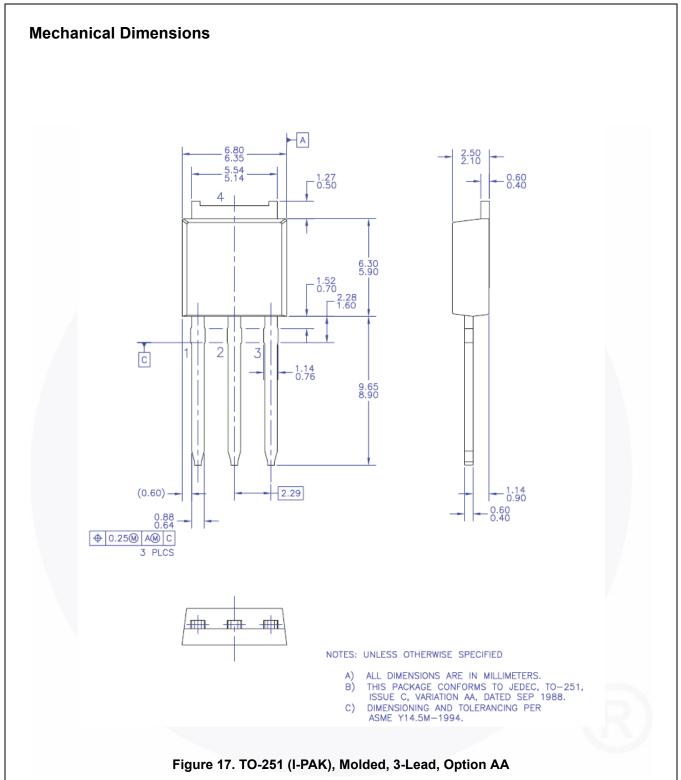




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