

# FDP20N50 / FDPF20N50 / FDPF20N50T N-Channel UniFET<sup>TM</sup> MOSFET

500 V, 20 A, 230 m $\Omega$ 

# Features

- +  $R_{DS(on)}$  = 200 m $\Omega$  (Typ.) @  $V_{GS}$  = 10 V, I<sub>D</sub> = 10 A
- Low Gate Charge (Typ. 45.6 nC)
- Low C<sub>rss</sub> (Typ. 27 pF)
- 100% Avalanche Tested

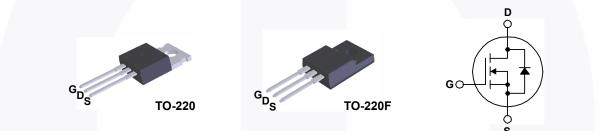
# Applications

- 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.

November 2013



# Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted.

Symbol		Parameter		FDP20N50	FDPF20N50 / FDPF20N50T	Unit
V <sub>DSS</sub>	Drain-Source Voltage			500		
ID	Drain Current - Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 100°C			20 20 * 12.9 12.9 *		A A
I <sub>DM</sub>	Drain Current	- Pulsed	(Note 1)	80	80 *	Α
V <sub>GSS</sub>	Gate-Source voltage			±30		V
E <sub>AS</sub>	Single Pulsed Avalanche Energy		(Note 2)	1110		mJ
I <sub>AR</sub>	Avalanche Current		(Note 1)	20		А
E <sub>AR</sub>	Repetitive Avalanche Energy (Note		(Note 1)	25		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		(Note 3)	4.5		V/ns
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C) - Derate above 25°C		250 2.0	38.5 0.3	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	FDP20N50	FDPF20N50/ FDPF20N50T	Unit	
$R_{ extsf{ heta}JC}$	Thermal Resistance, Junction-to-Case, Max.	0.5	3.3	°C/W	
$R_{ extsf{ heta}JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	62.5	0/10	

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Part Number		er Top Mark I		ackage Packing Method Re		Ta	Tape Width		Quantity	
FDP20N50		FDP20N50	TO-220	Tube	N/A		N/A		50 units	
FDPF20N50 FDPF20N50		TO-220F	TO-220F Tube N			N/A	50	50 units		
FDPF2	0N50T	FDPF20N50	TO-220F	Tube	N/A	N/A		50	50 units	
Electric	al Char	racteristics T <sub>C</sub> = 25	°C unless ot	herwise noted.						
Symbol		Parameter		Conditions		Min.	Тур.	Max.	Unit	
Off Charac	teristics									
BV <sub>DSS</sub>	V <sub>DSS</sub> Drain-Source Breakdown Voltage		$V_{GS} = 0$	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA					V	
$\Delta BV_{DSS}$ / $\Delta T_{J}$	Breakdown Voltage Temperature Coefficient		I <sub>D</sub> = 25	$I_D$ = 250 µA, Referenced to 25°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-Bod	y Leakage Current, Forwar	d V <sub>GS</sub> = 3	30 V, V <sub>DS</sub> = 0 V				100	nA	
I <sub>GSSR</sub>	Gate-Bod	y Leakage Current, Revers	e V <sub>GS</sub> = -	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$				-100	nA	
On Charac	teristics									
V <sub>GS(th)</sub>	Gate Threshold Voltage		V <sub>DS</sub> = V	/ <sub>GS</sub> , I <sub>D</sub> = 250 μA		3.0		5.0	V	
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance		V <sub>GS</sub> = <sup>2</sup>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A			0.20	0.23	Ω	
9 <sub>FS</sub>	Forward Transconductance		V <sub>DS</sub> = 4	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 10 A			24.6		S	
Dynamic C	haracteris	tics						1		
C <sub>iss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance			V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V,			2400	3120	pF	
C <sub>oss</sub>			f = 1.0	f = 1.0 MHz			355	465	pF	
C <sub>rss</sub>							27		pF	
Switching	Characteri	stics								
t <sub>d(on)</sub>	Turn-On Delay Time			V <sub>DD</sub> = 250 V, I <sub>D</sub> = 20 A,			95	200	ns	
t <sub>r</sub>	Turn-On F	Rise Time	V <sub>GS</sub> = <sup>2</sup>	$V_{GS}$ = 10 V, $R_{G}$ = 25 $\Omega$ (Note 4)			375	760	ns	
t <sub>d(off)</sub>	Turn-Off	Delay Time					100	210	ns	
t <sub>f</sub>	Turn-Off F	all Time					105	220	ns	
Qg	Total Gate	e Charge		V <sub>DS</sub> = 400 V, I <sub>D</sub> = 20 A,			45.6	59.5	nC	
Q <sub>gs</sub>	Gate-Source Charge		V <sub>GS</sub> = 7	V <sub>GS</sub> = 10 V			14.8		nC	
Q <sub>gd</sub>	Gate-Drai	n Charge		(Note 4)			21.6		nC	
	rce Diode O	Characteristics and Maxir	num Rating	6						
I <sub>S</sub>	Maximum Continuous Drain-Source Dio		Diode Forwa	de Forward Current				20	Α	
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode F		e Forward C	orward Current				80	А	
V <sub>SD</sub>	Drain-Sou	rce Diode Forward Voltage	$V_{GS} = 0$	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 20 A				1.4	V	
t <sub>rr</sub>	Reverse F	Recovery Time		) V, I <sub>S</sub> = 20 A,			507		ns	
Q <sub>rr</sub>	Reverse F	Recovery Charge	dl <sub>F</sub> /dt =	100 A/μs			7.20		μC	

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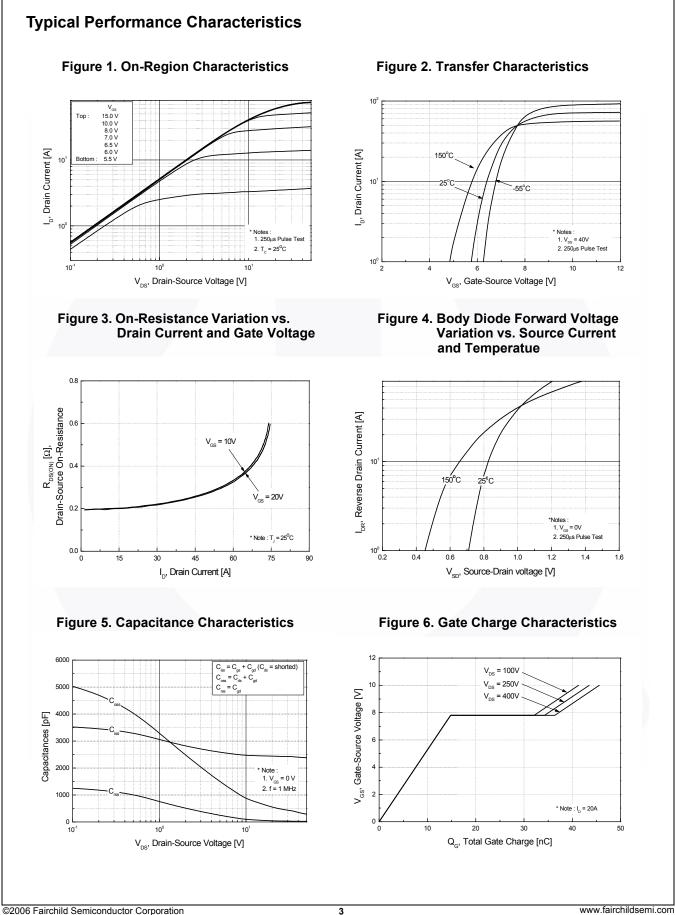
Notes:

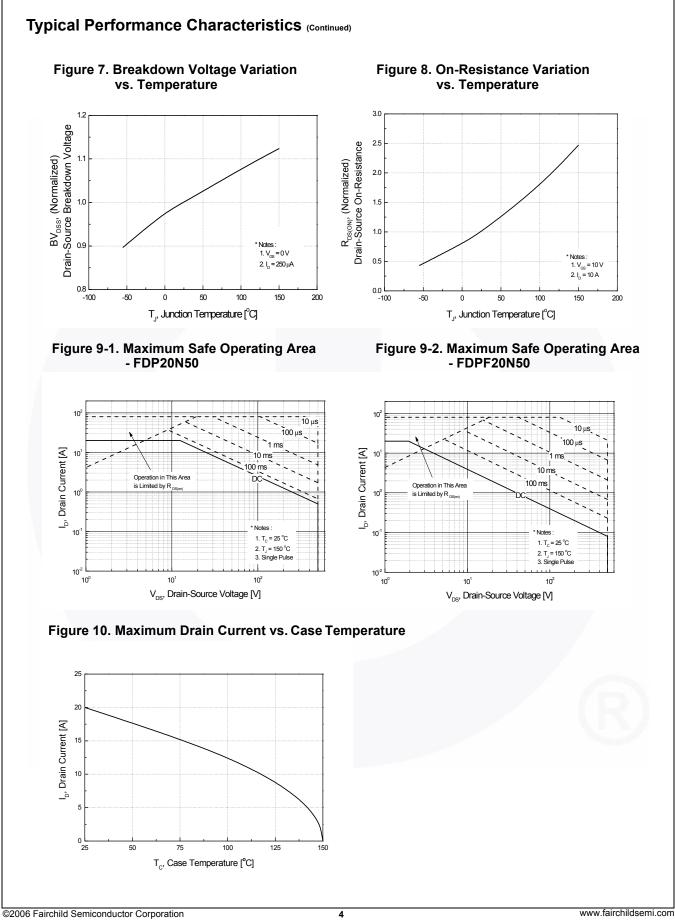
1. Repetitive rating: pulse-width limited by maximum junction temperature.

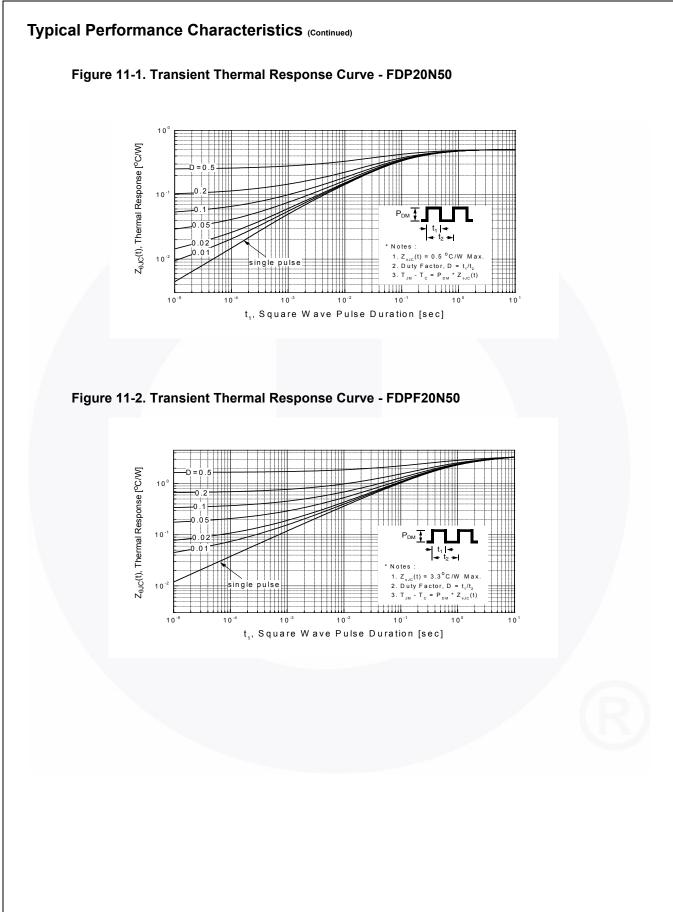
2. L = 5.0 mH, I\_{AS} = 20 A, V\_{DD} = 50 V, R\_G = 25  $\Omega,$  starting T\_J = 25°C.

3. I\_{SD}  $\leq$  20 A, di/dt  $\leq$  200 A/µs, V\_{DD}  $\leq$  BV\_{DSS}, starting T\_J = 25°C.

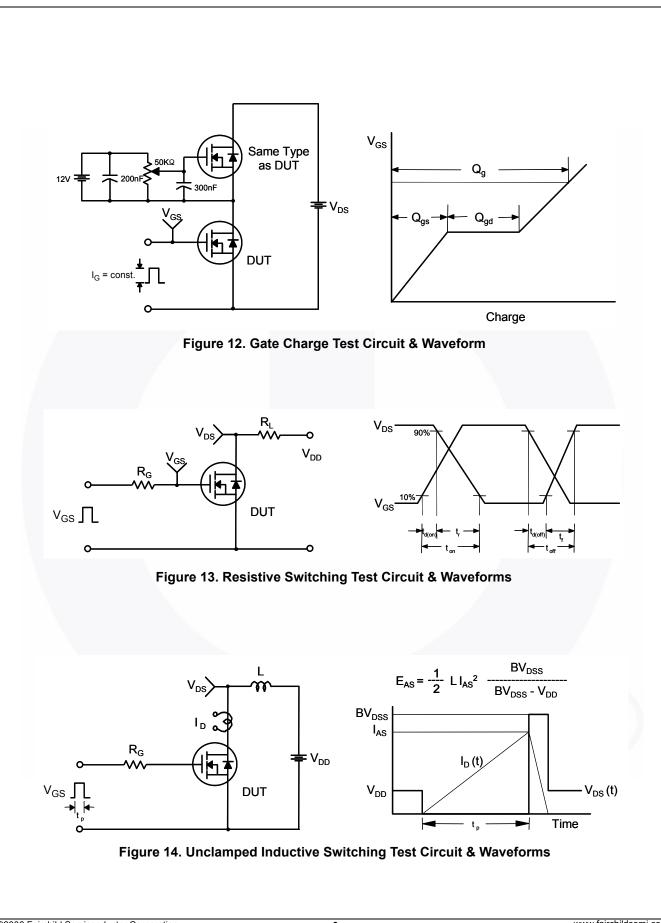
 $\label{eq:second} \textbf{4}. \ \textbf{Essentially independent of operating temperature typical characteristics}.$ 



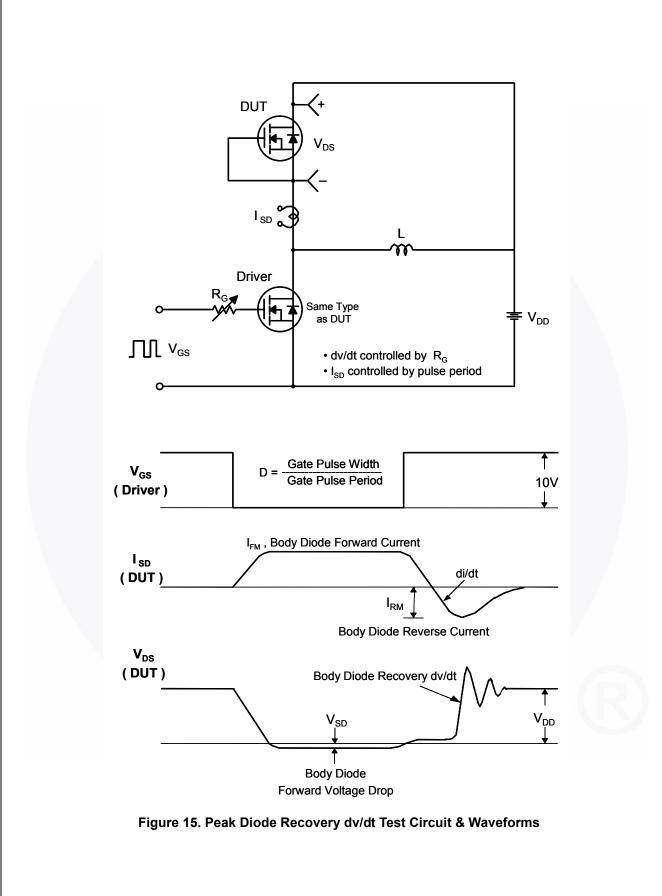


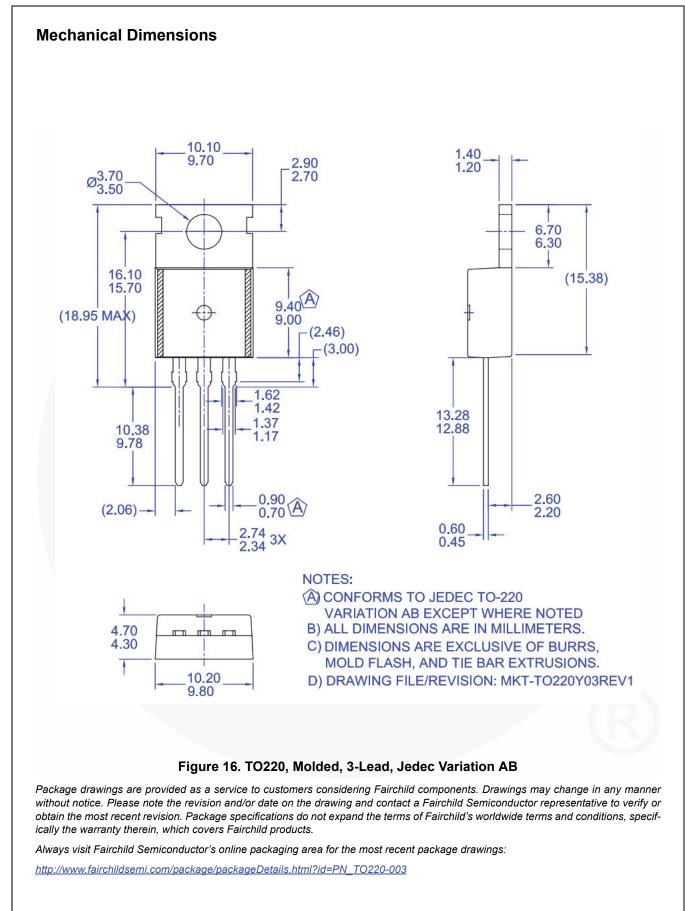


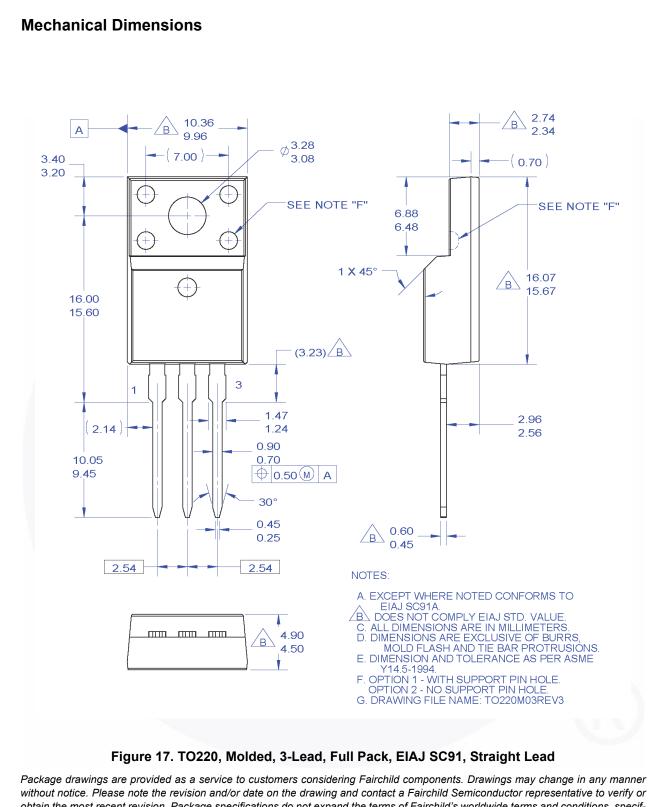
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