FAIRCHILD SEMICONDUCTOR®

November 2013

FDP12N50 / FDPF12N50T

N-Channel UniFET™ MOSFET

500 V, 11.5 A, 650 mΩ

Features

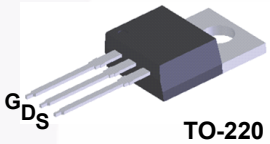
- $R_{DS(on)}$ = 550 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 6 A
- Low Gate Charge (Typ. 22 nC)
- Low C_{rss} (Typ. 11 pF)
- 100% Avalanche Tested
- RoHS Compliant

Applications

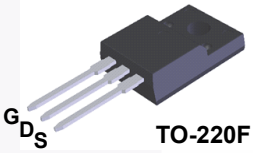
- LCD/LED/PDP TV
- Lighting
- Uninterruptible Power Supply

Description

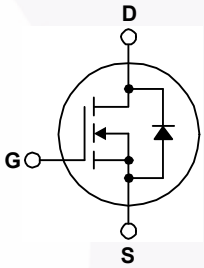
UniFET™ MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.



TO-220



TO-220F



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

Symbol	Parameter			FDP12N50	FDPF12N50T	Unit
V_{DSS}	Drain to Source Voltage			500		V
V_{GSS}	Gate to Source Voltage			±30		V
I_D	Drain Current	- Continuous (T_C = 25°C)		11.5	11.5 *	A
		- Continuous (T_C = 100°C)		6.9	6.9 *	
I_{DM}	Drain Current	- Pulsed	(Note 1)	46	46 *	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	456		mJ
I_{AR}	Avalanche Current		(Note 1)	11.5		A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	16.7		mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	4.5		V/ns
P_D	Power Dissipation	(T_C = 25°C)		165	42	W
		- Derate Above 25°C		1.33	0.3	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150		°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300		°C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FDP12N50	FDPF12N50T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.75	3.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	62.5	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDP12N50	FDP12N50	TO-220	Tube	N/A	N/A	50 units
FDPF12N50T	FDPF12N50T	TO-220F	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V, $T_J = 25^oC$	500	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25^oC	-	0.5	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 400 V, $T_C = 125^oC$	-	-	10	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250 μA	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 6 A	-	0.55	0.65	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 6 A	-	11.5	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	-	985	1315	pF
C_{oss}	Output Capacitance		-	140	190	pF
C_{rss}	Reverse Transfer Capacitance		-	11	17	pF
Q_g	Total Gate Charge at 10V	V_{DS} = 400 V, I_D = 11.5 A, V_{GS} = 10 V (Note 4)	-	22	30	nC
Q_{gs}	Gate to Source Gate Charge		-	6	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	9	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250 V, I_D = 11.5 A, V_{GS} = 10 V, R_G = 25 Ω (Note 4)	-	24	60	ns
t_r	Turn-On Rise Time		-	50	110	ns
$t_{d(off)}$	Turn-Off Delay Time		-	45	100	ns
t_f	Turn-Off Fall Time		-	30	70	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	11.5	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	46	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 11.5 A	-	-	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 11.5 A, dI_F/dt = 100 A/μs	-	375	-	ns
Q_{rr}	Reverse Recovery Charge		-	3.5	-	μC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 6.9 mH, I_{AS} = 11.5 A, V_{DD} = 50 V, R_G = 25 Ω, starting $T_J = 25°C$.
3. $I_{SD} \leq 11.5$ A, di/dt ≤ 200 A/μs, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25°C$.
4. Essentially independent of operating temperature typical characteristics.