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November 2013

# FQPF11N50CF

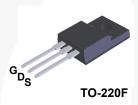
# N-Channel QFET® FRFET® MOSFET 500 V, 11 A, 550 m $\Omega$

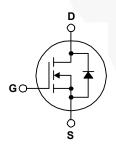
# **Description**

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

#### **Features**

- 11 A, 500 V,  $R_{DS(on)}$  = 550 m $\Omega$  (Max.) @  $V_{GS}$  = 10 V,  $I_D$  = 5.5 A
- Low Gate Charge (Typ. 43 nC)
- Low C<sub>rss</sub> (Typ. 20 pF)
- · 100% Avalanche Tested
- · Fast Recovery Body Diode





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

Symbol	Parameter	FQPF11N50CF	Unit	
$V_{DSS}$	Drain-Source Voltage	500	V	
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)	11*	Α	
	- Continuous (T <sub>C</sub> = 100°C)	7*	Α	
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	44*	Α	
V <sub>GSS</sub>	Gate-Source voltage	± 30	V	
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	670	mJ	
I <sub>AR</sub>	Avalanche Current (Note 1)	11	Α	
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	19.5	mJ	
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns	
$P_D$	Power Dissipation (T <sub>C</sub> = 25°C)	48	W	
	- Derate above 25°C	0.39	W/°C	
T <sub>J,</sub> T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C	
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C	

<sup>\*</sup>Drain current limited by maximum junction temperature

## **Thermal Characteristics**

Symbol	Parameter	FQPF11N50CF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	sistance, Junction to Case, Max. 2.58	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	°C/W

# **Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQPF11N50CF	FQPF11N50CF	TO-220F	Tube	N/A	50 units

# Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Off Charac	teristics			•		
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	500			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.5		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0 V			10	μА
		V <sub>DS</sub> = 400 V, T <sub>C</sub> = 125°C			100	μА
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	$V_{DS} = V_{GS}$ , $I_{D} = 250 \mu A$	2.0		4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5.5 A		0.48	0.55	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 5.5 A		15		S
Dynamic C	Characteristics			I.		
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V,		1515	2055	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz	\	185	235	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			25	30	pF
Switching	Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 250 V, I <sub>D</sub> = 11 A		24	57	ns
t <sub>r</sub>	Turn-On Rise Time	$R_G = 25 \Omega$		70	150	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			120	250	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)		75	160	ns
Q <sub>q</sub>	Total Gate Charge	V <sub>DS</sub> = 400 V, I <sub>D</sub> = 11 A		43	55	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V		8		nC
Q <sub>gd</sub>	Gate-Drain Charge	(Note 4)	/	19		nC
	rce Diode Characteristics and Maximu	m Ratings		ı		
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				11	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				44	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 11 A			1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 11 A		90	/	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> /dt =100 A/μs		1.5		μС

#### Notes

- 1. Repetitive Rating: Pulse width limited by maximum junction temperature
- 2. L = 10 mH, I $_{AS}$  = 11 A, V $_{DD}$  = 50 V, R $_{G}$  = 25  $\Omega$ , starting T $_{J}$  = 25°C
- 3.  $I_{SD} \le$  11 A, di/dt  $\le$  200 A/ $\mu$ s,  $V_{DD} \le BV_{DSS,}$  starting  $T_J$  = 25°C
- 4. Essentially independent of operating temperature.

# **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

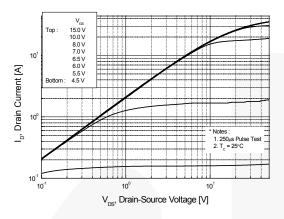


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

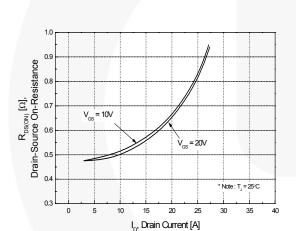
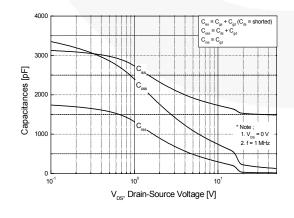


Figure 5. Capacitance Characteristics



**Figure 2. Transfer Characteristics** 

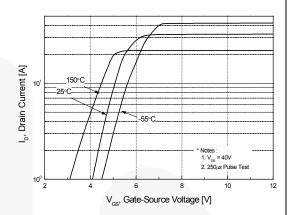


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

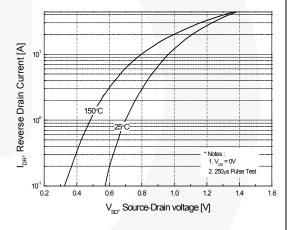
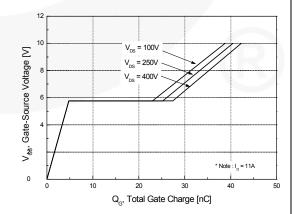


Figure 6. Gate Charge Characteristics



# **Typical Performance Characteristics** (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

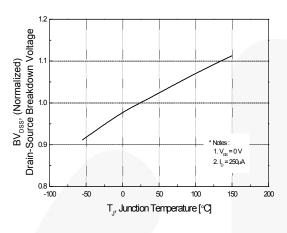


Figure 8. On-Resistance Variation vs. Temperature

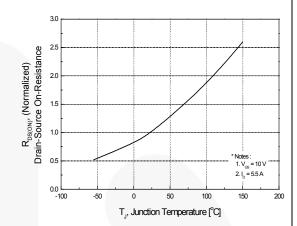
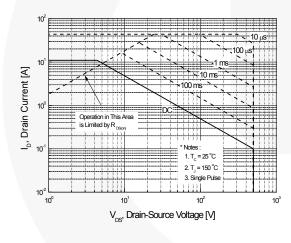


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature



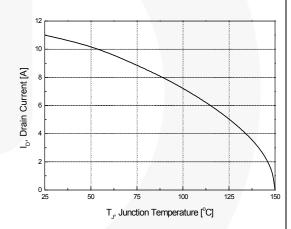
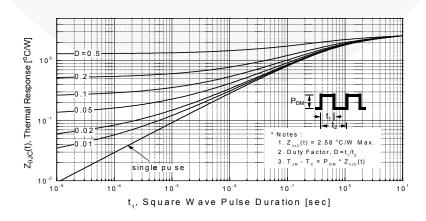


Figure 11. Transient Thermal Response Curve





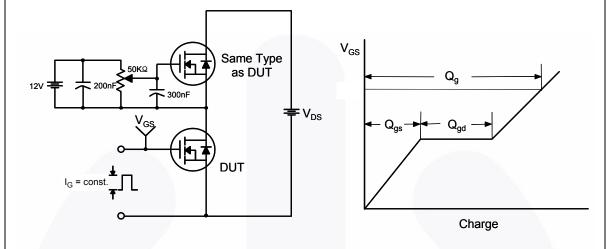


Figure 13. Resistive Switching Test Circuit & Waveforms

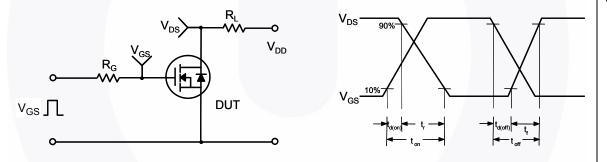
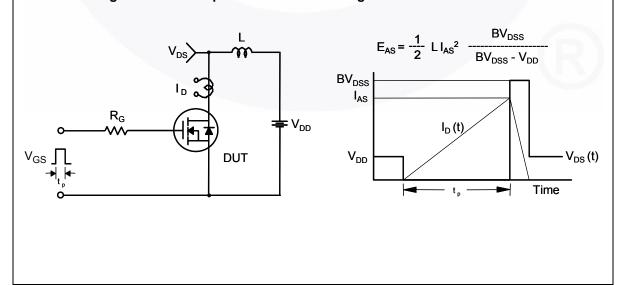
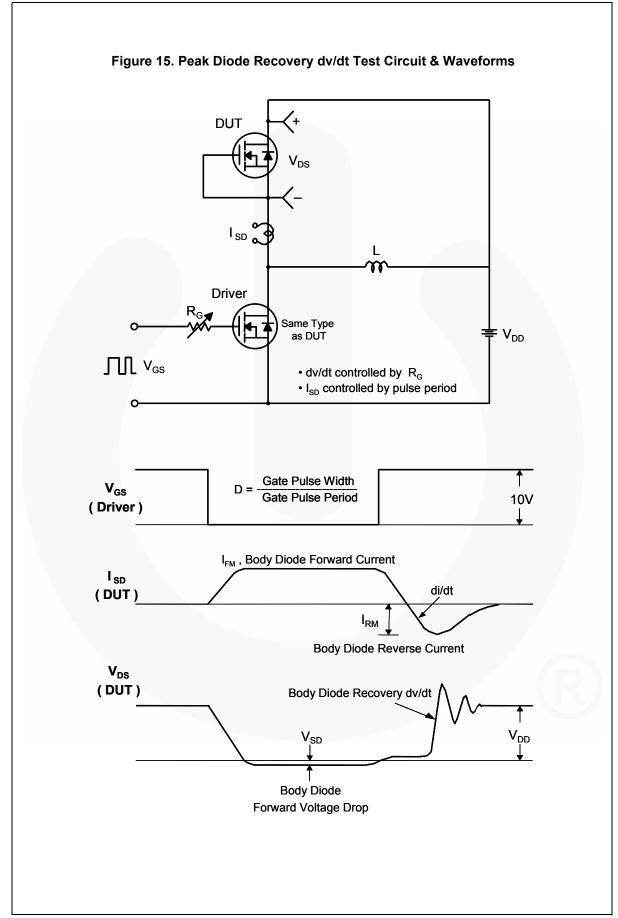


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms





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# **Mechanical Dimensions**

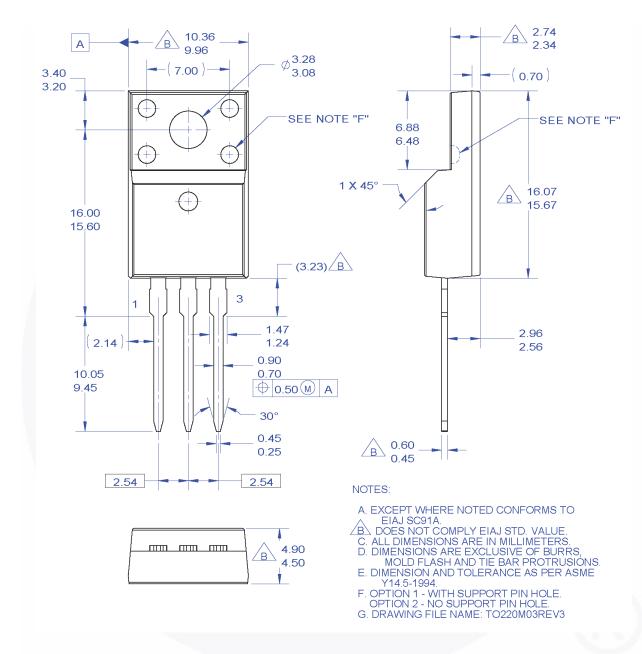


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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