



# FQPF9N50CF

## 500V N-Channel MOSFET

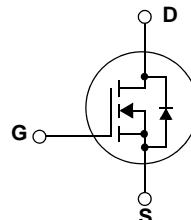
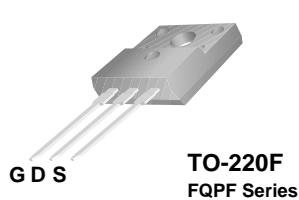
### Features

- 9A, 500V,  $R_{DS(on)} = 0.85\Omega$  @ $V_{GS} = 10\text{ V}$
- Low gate charge (typical 28 nC)
- Low Crss (typical 24pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- Fast recovery body diode (typical 100ns)

### Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.



### Absolute Maximum Ratings

Symbol	Parameter	FQPF9N50CF	Units
$V_{DSS}$	Drain-Source Voltage	500	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	9*	A
	- Continuous ( $T_C = 100^\circ\text{C}$ )	5.4*	A
$I_{DM}$	Drain Current - Pulsed	(Note 1)	A
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	mJ
$I_{AR}$	Avalanche Current	(Note 1)	A
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	44	W
	- Derate above $25^\circ\text{C}$	0.35	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

\* Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FQPF9N50CF	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.86	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQPF9N50CF	FQPF9N50CF	TO-220F	--	--	50

## Electrical Characteristics

$T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	500	--	--	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.57	--	$\text{V}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 500 \text{ V}, V_{\text{GS}} = 0 \text{ V}$	--	--	10	$\mu\text{A}$
		$V_{\text{DS}} = 400 \text{ V}, T_C = 125^\circ\text{C}$	--	--	100	$\mu\text{A}$
$I_{\text{GSSF}}$	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 30 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA
$I_{\text{GSSR}}$	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -30 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA
<b>On Characteristics</b>						
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}, I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}, I_D = 4.5 \text{ A}$	--	0.70	0.85	$\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}} = 40 \text{ V}, I_D = 4.5 \text{ A}$ (Note 4)	--	6.5	--	S
<b>Dynamic Characteristics</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}, V_{\text{GS}} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	790	1030	pF
$C_{\text{oss}}$	Output Capacitance		--	130	170	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		--	24	30	pF
<b>Switching Characteristics</b>						
$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 250 \text{ V}, I_D = 9 \text{ A}, R_G = 25 \Omega$	--	18	45	ns
$t_r$	Turn-On Rise Time		--	65	140	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	93	195	ns
$t_f$	Turn-Off Fall Time		--	64	125	ns
$Q_g$	Total Gate Charge	$V_{\text{DS}} = 400 \text{ V}, I_D = 9 \text{ A}, V_{\text{GS}} = 10 \text{ V}$	--	28	35	nC
$Q_{\text{gs}}$	Gate-Source Charge		--	4	--	nC
$Q_{\text{gd}}$	Gate-Drain Charge		--	15	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	9*	A	
$I_{\text{SM}}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	36*	A	
$V_{\text{SD}}$	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}, I_S = 9 \text{ A}$	--	--	1.4	V
$t_{\text{rr}}$	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}, I_S = 9 \text{ A}, dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	100	--	ns
$Q_{\text{rr}}$	Reverse Recovery Charge		--	0.3	--	$\mu\text{C}$

### NOTES:

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

2.  $L = 8\text{mH}$ ,  $I_{AS} = 9\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$

3.  $I_{SD} \leq 11\text{A}$ ,  $dI/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq \text{BV}_{\text{DSS}}$ , Starting  $T_J = 25^\circ\text{C}$

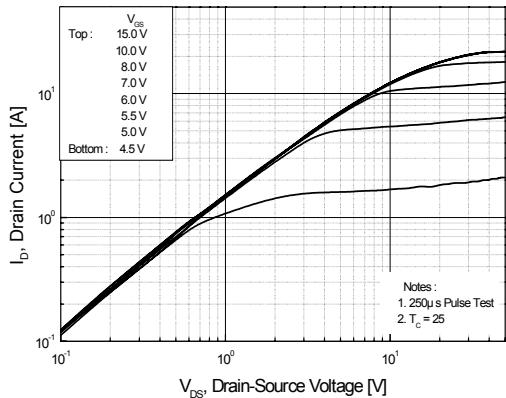
4. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

5. Essentially independent of operating temperature

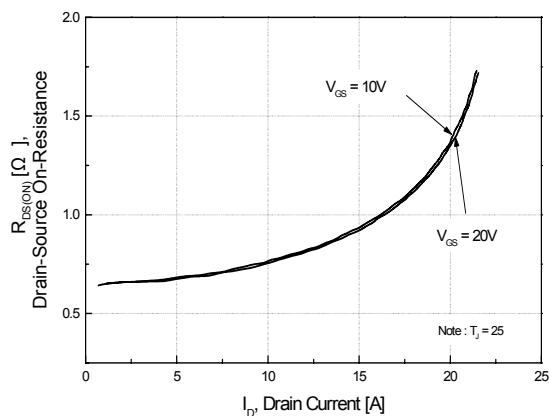
\* Current limited by maximum junction temperature

## Typical Performance Characteristics

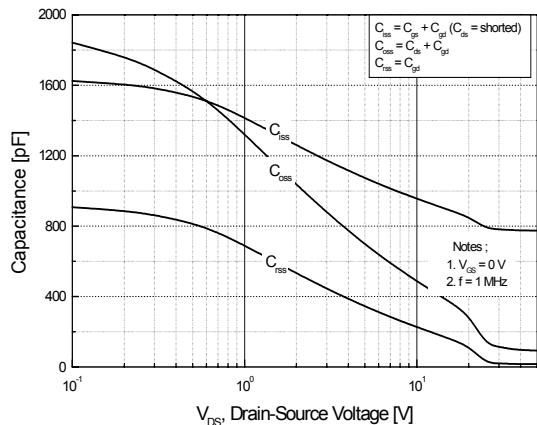
**Figure 1. On-Region Characteristics**



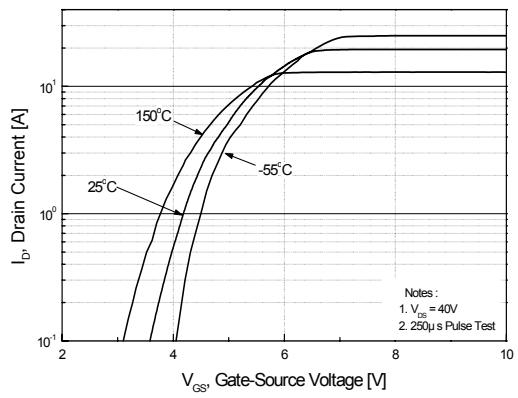
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



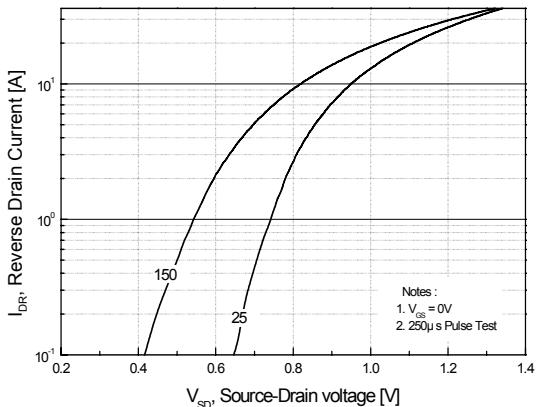
**Figure 5. Capacitance Characteristics**



**Figure 2. Transfer Characteristics**



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



**Figure 6. Gate Charge Characteristics**

