



FQP13N50CF / FQPF13N50CF 500V N-Channel MOSFET

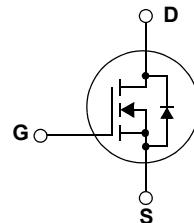
Features

- 13A, 500V, $R_{DS(on)} = 0.54\Omega$ @ $V_{GS} = 10\text{ V}$
- Low gate charge (typical 43 nC)
- Low Crss (typical 20pF)
- 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 efficient switched mode power supplies and active power factor correction.



Absolute Maximum Ratings

Symbol	Parameter	FQP13N50CF	FQPF13N50CF	Unit
V_{DSS}	Drain-Source Voltage		500	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	13	13*	A
	- Continuous ($T_C = 100^\circ\text{C}$)	8	8*	A
I_{DM}	Drain Current - Pulsed (Note 1)	52	52*	A
V_{GSS}	Gate-Source voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		530	mJ
I_{AR}	Avalanche Current (Note 1)		13	A
E_{AR}	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 ($T_C = 25^\circ\text{C}$)	195	48	W
	- Derate above 25°C	1.56	0.39	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 Purpose, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FQP13N50CF	FQPF13N50CF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.64	2.58	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQP13N50CF	FQP13N50CF	TO-220	-	-	50
FQPF13N50CF	FQPF13N50CF	TO-220F	-	-	50

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0\text{V}$, $I_D = 250\mu\text{A}$, $T_J = 25^\circ\text{C}$	500	--	--	V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	--	0.5	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 500\text{V}$, $V_{\text{GS}} = 0\text{V}$	--	--	10	μA
		$V_{\text{DS}} = 400\text{V}$, $T_C = 125^\circ\text{C}$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 30\text{V}$, $V_{\text{DS}} = 0\text{V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -30\text{V}$, $V_{\text{DS}} = 0\text{V}$	--	--	-100	nA
On Characteristics						
$V_{\text{GS(th)}}$	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	$V_{\text{GS}} = 10\text{V}$, $I_D = 6.5\text{A}$	--	0.43	0.54	Ω
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 40\text{V}$, $I_D = 6.5\text{A}$	(Note 4)	--	15	--
C_{iss}	Input Capacitance	$V_{\text{DS}} = 25\text{V}$, $V_{\text{GS}} = 0\text{V}$, $f = 1.0\text{MHz}$		1580	2055	pF
C_{oss}	Output Capacitance			180	235	pF
C_{rss}	Reverse Transfer Capacitance			20	25	pF
Switching Characteristics						
$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 250\text{V}$, $I_D = 13\text{A}$ $R_G = 25\Omega$	--	25	60	ns
t_r	Turn-On Rise Time		--	100	210	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	130	270	ns
t_f	Turn-Off Fall Time		--	100	210	ns
Q_g	Total Gate Charge	$V_{\text{DS}} = 400\text{V}$, $I_D = 13\text{A}$ $V_{\text{GS}} = 10\text{V}$	--	43	56	nC
Q_{gs}	Gate-Source Charge		--	7.5	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	18.5	--
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	13	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	52	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0\text{V}$, $I_S = 13\text{A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0\text{V}$, $I_S = 13\text{A}$	(Note 4)	--	100	160
Q_{rr}	Reverse Recovery Charge	$dI_F/dt = 100\text{A}/\mu\text{s}$		--	0.35	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 5.6\text{mH}$, $I_{AS} = 13\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 13\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, 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 Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

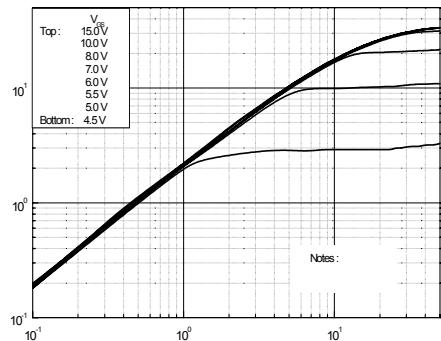


Figure 2. Transfer Characteristics



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

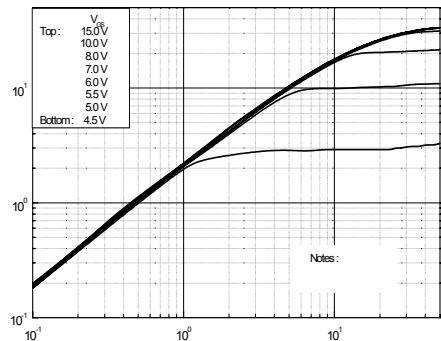


Figure 4. Body Diode Forward Voltage
Variation vs. Source Current
and Temperature

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics