



FQP3N50C/FQPF3N50C 500V N-Channel MOSFET

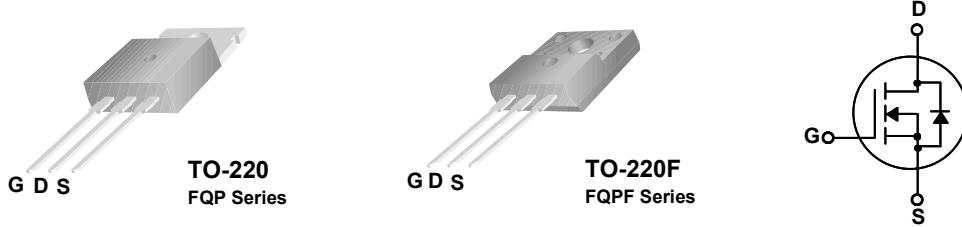
Features

- 3 A, 500 V, $R_{DS(on)} = 2.5 \Omega$ @ $V_{GS} = 10$ V
- Low gate charge (typical 10 nC)
- Low Crss (typical 8.5 pF)
- Fast switching
- 100 % avalanche tested
- Improved dv/dt capability

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		FQP3N50C	FQPF3N50C	Units
V_{DSS}	Drain-Source Voltage		500		V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	3	3 *	A
		- Continuous ($T_C = 100^\circ\text{C}$)	1.8	1.8 *	A
I_{DM}	Drain Current	- Pulsed (Note 1)	12	12 *	A
V_{GSS}	Gate-Source Voltage		± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		200		mJ
I_{AR}	Avalanche Current (Note 1)		3		A
E_{AR}	Repetitive Avalanche Energy (Note 1)		6.2		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)		62	25	W
	- Derate above 25°C		0.5	0.2	$\text{W}/^\circ\text{C}$
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	FQP3N50C	FQPF3N50C	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.0	4.9	$^\circ\text{C}/\text{W}$
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQP3N50C	FQP3N50C	TO-220	--	--	50
FQPF3N50C	FQPF3N50C	TO-220F	--	--	50

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	500	--	--	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.7	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 500 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$	--	--	1	μA
		$V_{\text{DS}} = 400 \text{ V}$, $T_C = 125^\circ\text{C}$	--	--	10	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	$V_{\text{GS}} = 10 \text{ V}$, $I_D = 1.5 \text{ A}$	--	2.1	2.5	Ω
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 40 \text{ V}$, $I_D = 1.5 \text{ A}$	(Note 4)	--	1.5	--
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$	--	280	365	pF
C_{oss}	Output Capacitance		--	50	65	pF
C_{rss}	Reverse Transfer Capacitance		--	8.5	11	pF
Switching Characteristics						
$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 250 \text{ V}$, $I_D = 3 \text{ A}$, $R_G = 25 \Omega$	--	10	30	ns
t_r	Turn-On Rise Time		--	25	60	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	35	80	ns
t_f	Turn-Off Fall Time		(Note 4, 5)	--	25	60
Q_g	Total Gate Charge	$V_{\text{DS}} = 400 \text{ V}$, $I_D = 3 \text{ A}$, $V_{\text{GS}} = 10 \text{ V}$	--	10	13	nC
Q_{gs}	Gate-Source Charge		--	1.5	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4, 5)	--	5.5	--
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	3	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	12	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 3 \text{ A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 3 \text{ A}$, $dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	170	--	ns
Q_{rr}	Reverse Recovery Charge		(Note 4)	--	0.7	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 40\text{mH}$, $I_{AS} = 3\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 3\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq \text{BV}_{\text{DSS}}$, 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

Typical Performance Characteristics

Figure 1. On-Region Characteristics

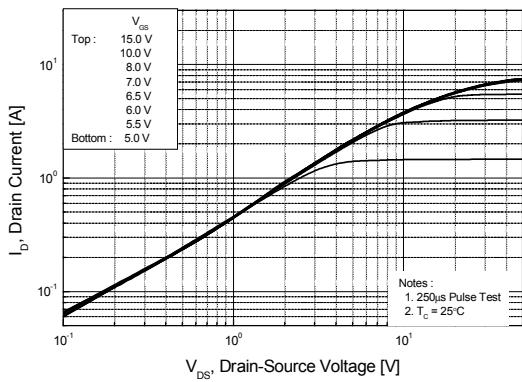


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

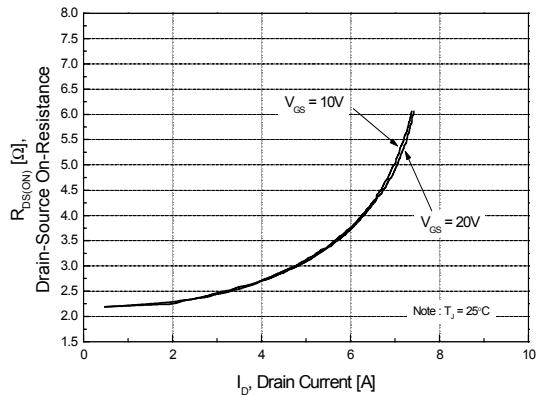


Figure 5. Capacitance Characteristics

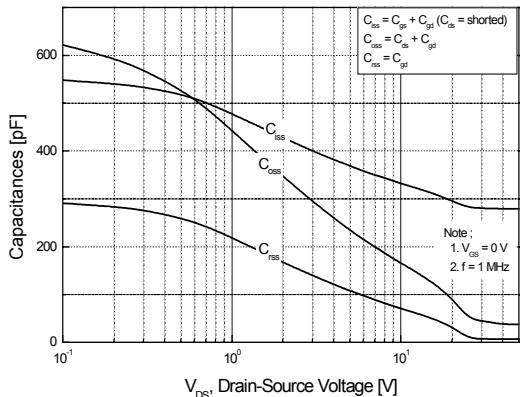


Figure 2. Transfer Characteristics

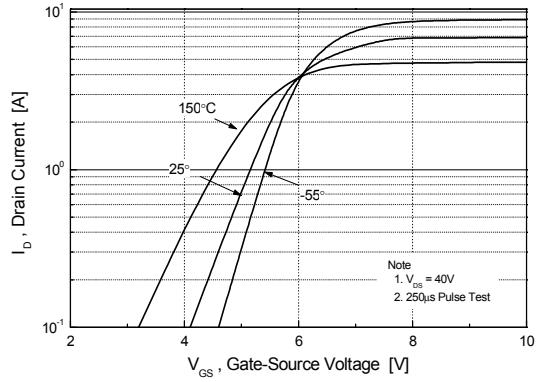


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

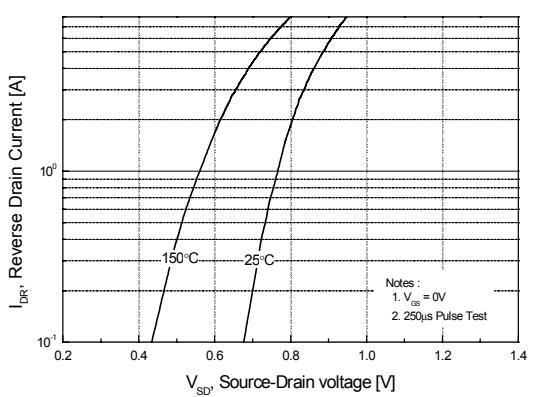


Figure 6. Gate Charge Characteristics

