

FQP6N40CF/FQPF6N40CF 400V N-Channel MOSFET

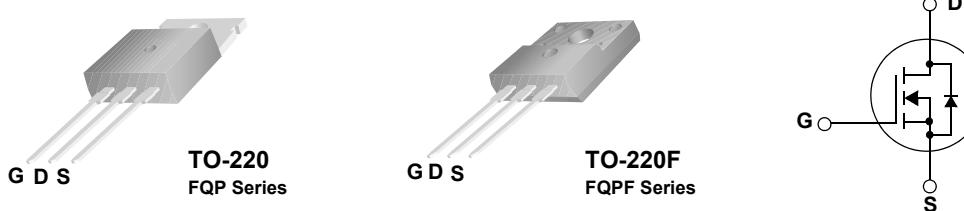
Features

- 6A, 400V, $R_{DS(on)} = 1.1 \Omega$ @ $V_{GS} = 10$ V
- Low gate charge (typical 16nC)
- Low Crss (typical 15pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- Fast recovery body diode (typical 70ns)

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, electronic lamp ballasts based on half bridge topology.



Absolute Maximum Ratings

Symbol	Parameter	FQP6N40CF	FQPF6N40CF	Units
V_{DSS}	Drain-Source Voltage	400		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	6	6*	A
	- Continuous ($T_C = 100^\circ\text{C}$)	3.6	3.6*	A
I_{DM}	Drain Current - Pulsed	(Note 1)	24	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	270	mJ
I_{AR}	Avalanche Current	(Note 1)	6	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	73	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	73	38	W
	- Derate above 25°C	0.58	0.3	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			

Thermal Characteristics

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQP6N40CF	FQP6N40CF	TO-220	-	-	50
FQPF6N40CF	FQPF6N40CF	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	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	400	--	--	V	
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.54	--	$\text{V}/^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 400 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	1	μA	
		$V_{DS} = 320 \text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA	
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	100	nA	
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	-100	nA	
On Characteristics							
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2.0	--	4.0	V	
$R_{DS(\text{on})}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 3 \text{ A}$	--	0.9	1.1	Ω	
g_{FS}	Forward Transconductance	$V_{DS} = 40 \text{ V}, I_D = 3 \text{ A}$	(Note 4)	--	4.7	--	S
Dynamic Characteristics							
C_{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	480	625	pF	
C_{oss}	Output Capacitance		--	80	105	pF	
C_{rss}	Reverse Transfer Capacitance		--	15	20	pF	
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 200 \text{ V}, I_D = 6 \text{ A}, R_G = 25 \Omega$	--	13	35	ns	
t_r	Turn-On Rise Time		--	65	140	ns	
$t_{d(off)}$	Turn-Off Delay Time		--	21	55	ns	
t_f	Turn-Off Fall Time		--	38	85	ns	
Q_g	Total Gate Charge		--	16	20	nC	
Q_{gs}	Gate-Source Charge	$V_{DS} = 320 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V}$	--	2.3	--	nC	
Q_{gd}	Gate-Drain Charge		--	8.2	--	nC	
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	6	A		
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	24	A		
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 6 \text{ A}$	--	--	1.4	V	
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_S = 6 \text{ A}, dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	70	--	ns	
Q_{rr}	Reverse Recovery Charge		--	0.12	--	μC	

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 13.7\text{mH}$, $I_{AS} = 6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 6\text{A}$, $dI/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, 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 Performance Characteristics

Figure 1. On-Region Characteristics

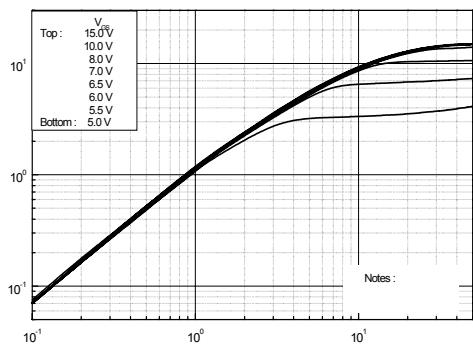


Figure 2. Transfer Characteristics

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