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December 2013

FQP6N40CF

N-Channel QFET $^{\rm R}$ FRFET $^{\rm R}$ MOSFET 400 V, 6 A, 1.1 Ω

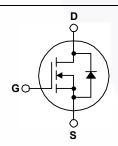
Description

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

- 6 A, 400 V, $R_{DS(on)} = 1.1 \Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 3 \text{ A}$
- Low Gate Charge (Typ. 16 nC)
- Low C_{rss} (Typ. 15 pF)
- · 100% Avalanche Tested





Absolute Maximum Ratings $T_C = 25$ °C unless otherwise noted.

Symbol	Parameter			FQP6N40CF	Unit
V _{DSS}	Drain-Source Voltage			400	V
I _D	Drain Current	- Continuous (T _C = 25°C)		6	Α
		- Continuous (T _C = 100°C)		3.6	А
I _{DM}	Drain Current	- Pulsed	(Note 1)	24	А
V_{GSS}	Gate-Source Voltage			± 30	V
E _{AS}	Single Pulsed Avalanche Energy		(Note 2)	270	mJ
I _{AR}	Avalanche Current		(Note 1)	6	А
E _{AR}	Repetitive Avalanche Energy		(Note 1)	73	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	20	V/ns
P_{D}	Power Dissipation (T _C = 25°C)			73	W
		- Derate above 25°C		0.58	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T _L	Maximum lead temperature for soldering, 1/8" from case for 5 seconds.			300	°C

Thermal Characteristics

Symbol	Parameter	FQP6N40CF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.71	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	C/VV

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP6N40CF	FQP6N40CF	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Characte	ristics				1	1
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	400			V
ΔBV _{DSS} / ΔΤ _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		0.54		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 400 V, V _{GS} = 0 V			1	μΑ
		V _{DS} = 320 V, T _C = 125°C			10	μΑ
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 V, V _{DS} = 0 V	-		-100	nA
On Characte	ristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0		4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 3 A		0.9	1.1	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 3 A		4.7		S
Dynamic Ch	aracteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V,		480	625	pF
C _{oss}	Output Capacitance	f = 1.0 MHz		80	105	pF
C _{rss}	Reverse Transfer Capacitance			15	20	pF
	haracteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 200 V, I _D = 6 A,		13	35	ns
t _r	Turn-On Rise Time	$R_G = 25 \Omega$		65	140	ns
t _{d(off)}	Turn-Off Delay Time			21	55	ns
t _f	Turn-Off Fall Time	(Note 4)		38	85	ns
Q _g	Total Gate Charge	V _{DS} = 320 V, I _D = 6 A,		16	20	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V		2.3		nC
Q _{gd}	Gate-Drain Charge	(Note 4)	/	8.2		nC
J.		(16.6.7)				
Drain-Source	e Diode Characteristics and Maximum R	atings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				6	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Fo	orward Current			24	Α
V_{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 6 A			1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 6 A,		70		ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs		0.12		μС

Notes:

- ${\bf 1.} \ {\bf Repetitive} \ {\bf rating: pulse} \ {\bf width} \ {\bf limited} \ {\bf by} \ {\bf maximum junction} \ {\bf temperature.}$
- 2. L = 13.7 mH, I $_{AS}$ = 6 A, V $_{DD}$ = 50 V, R $_{G}$ = 25 Ω , starting T $_{J}$ = 25 $^{\circ}$ C.
- $3.~I_{SD} \leq 6~A,~di/dt \leq 200~A/\mu s,~V_{DD} \leq BV_{DSS,}~starting~~T_J = 25^{\circ}C.$
- 4. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

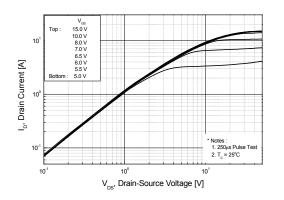


Figure 2. Transfer Characteristics

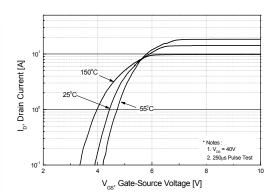
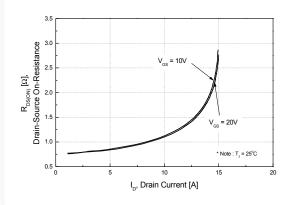


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage





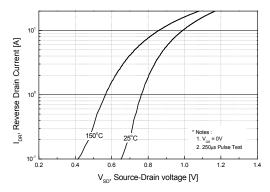


Figure 5. Capacitance Characteristics

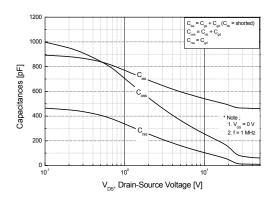
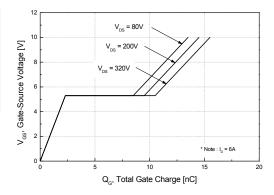


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

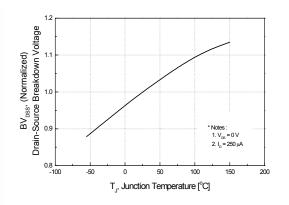


Figure 8. On-Resistance Variation vs. Temperature

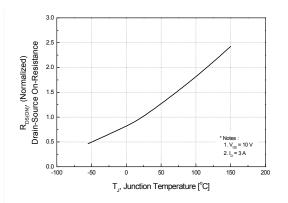


Figure 9. Maximum Safe Operating Area

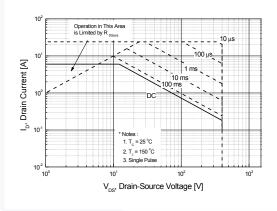


Figure 10. Maximum Drain Current vs. Case Temperature

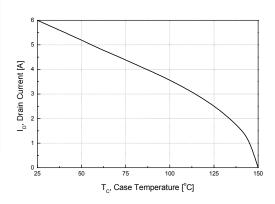
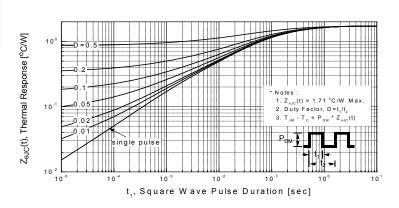


Figure 11. Transient Thermal Response Curve



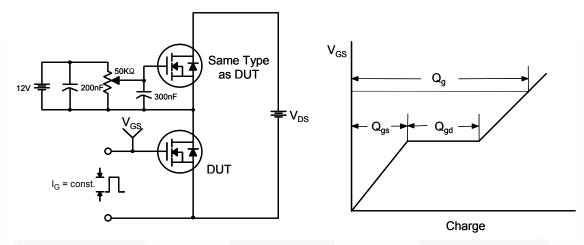


Figure 12. Gate Charge Test Circuit & Waveform

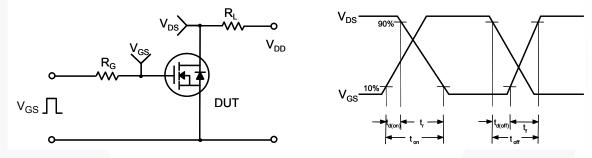


Figure 13. Resistive Switching Test Circuit & Waveforms

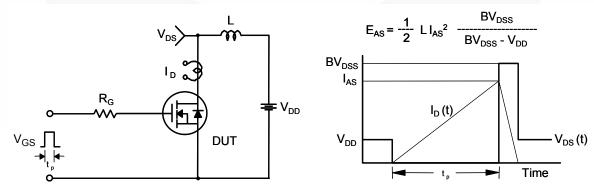


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

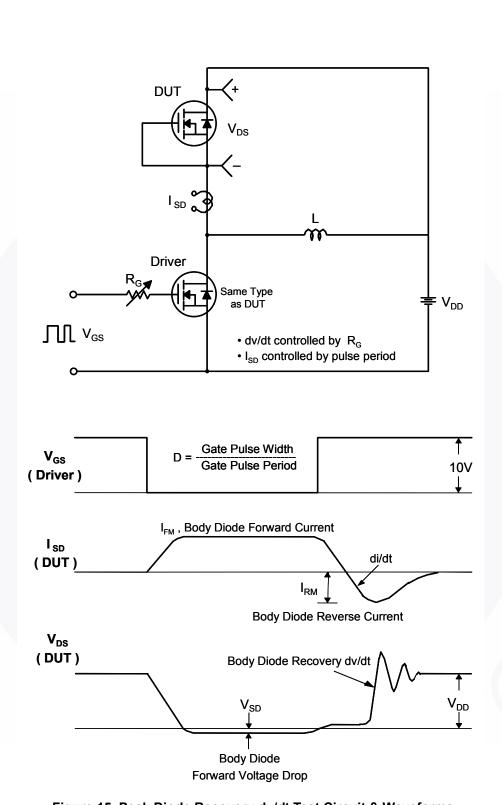


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

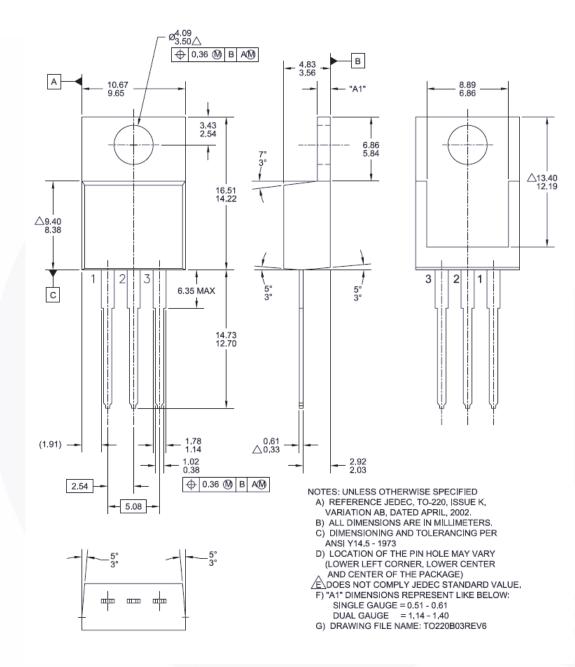


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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