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November 2013

FQP4P40

P-Channel QFET® MOSFET

-400 V, -3.5 A, 3.1 Ω

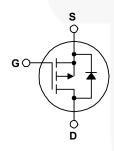
Description

This P-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 • Low Crss (Typ. 11 pF) and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, • 100% Avalanche Tested DC motor control, and variable switching power applications.

Features

- -3.5 A, -400 V, $R_{DS(on)}$ = 3.1 Ω (Max.) @ V_{GS} = -10 V, $I_D = -1.75 A$
- Low Gate Charge (Typ. 18 nC)





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

Symbol	Parameter		FQP4P40	Unit
V _{DSS}	Drain-Source Voltage		-400	V
I _D	Drain Current - Continuous (T _C = 25°C)		-3.5	Α
	- Continuous (T _C = 100°C)		-2.2	Α
I _{DM}	Drain Current - Pulsed	(Note 1)	-14	Α
V _{GSS}	Gate-Source Voltage		± 30	V
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	260	mJ
I _{AR}	Avalanche Current	(Note 1)	-3.5	A
E _{AR}	Repetitive Avalanche Energy	(Note 1)	8.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		-4.5	V/ns
P_{D}	Power Dissipation (T _C = 25°C)		85	W
	- Derate above 25°C		0.68	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T _I	Maximum lead temperature for soldering, 1/8" from case for 5 seconds		300	°C
'L			300	

Thermal Characteristics

Symbol	Parameter	FQP4P40	Unit	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.47	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP4P40	FQP4P40	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Cha	aracteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$				V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, Referenced to 25°C		0.36		V/°C
I _{DSS}		V _{DS} = -400 V, V _{GS} = 0 V			-1	μΑ
	Zero Gate Voltage Drain Current	V _{DS} = -320 V, T _C = 125°C			-10	μΑ
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 V, V _{DS} = 0 V			100	nA
On Cha	aracteristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = -250 \mu\text{A}$	-3.0		-5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = -10 V, I _D = -1.75 A		2.44	3.1	Ω
9 _{FS}	Forward Transconductance	V _{DS} = -50 V, I _D = -1.75 A		2.7		S
Dynam C _{iss}	ic Characteristics Input Capacitance	V _{DS} = -25 V, V _{GS} = 0 V.		520	680	pF
Coss	Output Capacitance	$V_{DS} = -25 \text{ V}, V_{GS} = 0 \text{ V},$		80	105	pF
C _{rss}	Reverse Transfer Capacitance	f = 1.0 MHz		11	15	pF
						-
	ing Characteristics			10	25	
t _{d(on)}	Turn-On Delay Time	$V_{DD} = -200 \text{ V}, I_D = -3.5 \text{ A},$		13	35	ns
t _r	Turn-Off Delay Time	$R_G = 25 \Omega$		55 35	120 80	ns
t _{d(off)} t _f	Turn-Off Delay Time Turn-Off Fall Time	(Note 4)		37	85	ns ns
Q _q	Total Gate Charge	V 000 V I 0 5 A		18	23	nC
Q _{gs}	Gate-Source Charge	$V_{DS} = -320 \text{ V}, I_{D} = -3.5 \text{ A},$ $V_{GS} = -10 \text{ V}$		3.8		nC
Q _{gd}	Gate-Drain Charge	(Note 4)	/	9.4		nC
	, and the second	, ,		<u> </u>		/
Drain-S	Source Diode Characteristics as Maximum Continuous Drain-Source Did				-3.5	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current				-14	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = -3.5 A			-5.0	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{S} = -3.5 \text{ A},$		260	-5.0	ns
Q _{rr}	Reverse Recovery Charge	$dl_F / dt = 100 \text{ A/}\mu\text{s}$		1.4	//	μС
∽ ır	Neverse Necestry Charge	α.ρ / α. = 100 / υμο		1.4		μ

- 1. Repetitive rating : pulse-width limited by maximum junction temperature.
- 2. L = 37 mH, I_{AS} = -3.5 A, V_{DD} = -50 V, R_G = 25 Ω , starting T_J = 25°C. 3. I_{SD} \leq -3.5 A, di/dt \leq 200 A/ μ s , V_{DD} \leq BV $_{DSS}$, starting T_J = 25°C.
- 4. Essentially independent of operating temperature.

Typical Characteristics

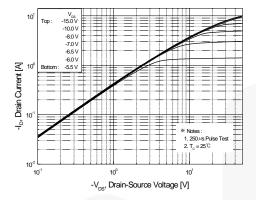


Figure 1. On-Region Characteristics

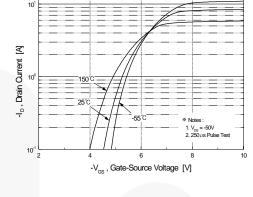


Figure 2. Transfer Characteristics

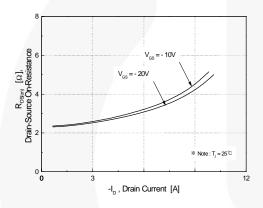


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

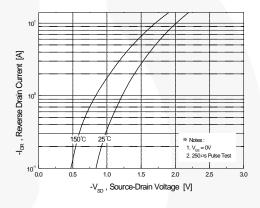


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

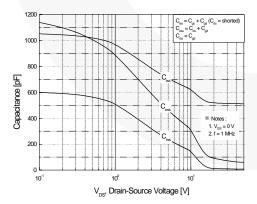


Figure 5. Capacitance Characteristics

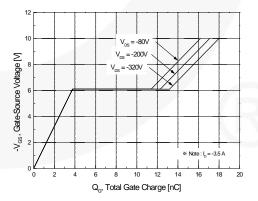


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

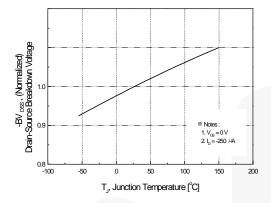


Figure 7. Breakdown Voltage Variation vs. Temperature

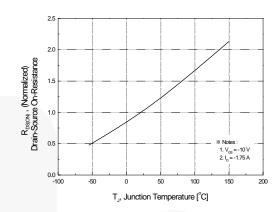


Figure 8. On-Resistance Variation vs. Temperature

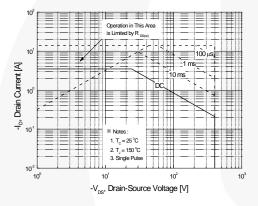


Figure 9. Maximum Safe Operating Area

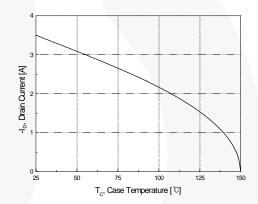


Figure 10. Maximum Drain Current vs. Case Temperature

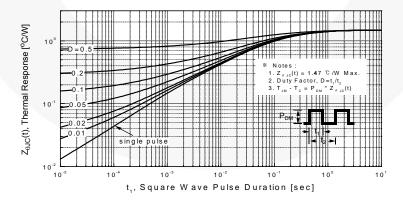


Figure 11. Transient Thermal Response Curve

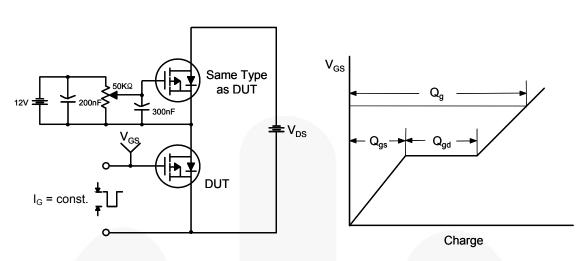


Figure 12. Gate Charge Test Circuit & Waveform

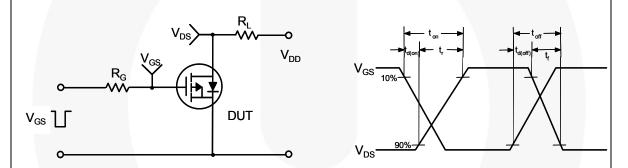


Figure 13. Resistive Switching Test Circuit & Waveforms

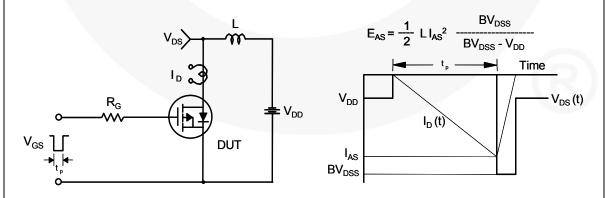
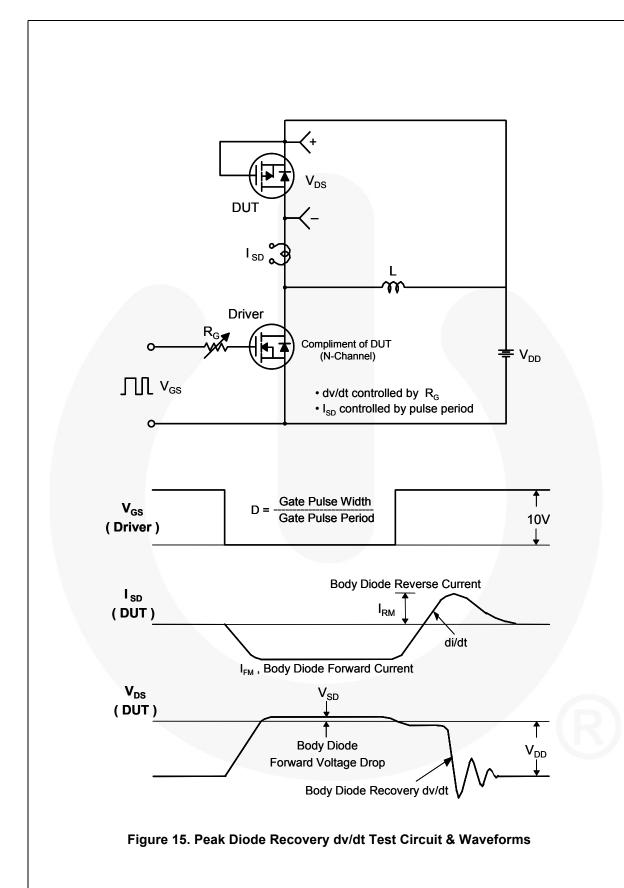


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

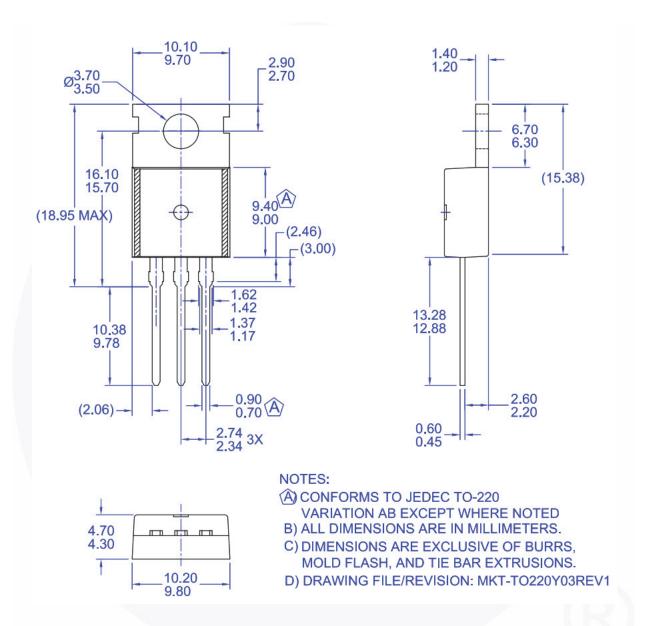


Figure 16. TO220, Molded, 3-Lead, Jedec Variation AB

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