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November 2013

FQP70N10

N-Channel QFET[®] MOSFET 100 V, 57 A, 23 m Ω

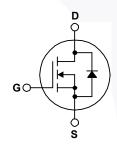
Description

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, audio amplifier, DC motor control, and variable switching power applications.

Features

- 57 A, 100 V, $R_{DS(on)}$ = 23 m Ω (Max.) @ V_{GS} = 10 V, I_D = 28.5 A
- Low Gate Charge (Typ. 85 nC)
- Low Crss (Typ. 150 pF)
- · 100% Avalanche Tested
- · 175°C Maximum Junction Temperature Rating





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

Symbol	Parameter		FQP70N10	Unit	
V _{DSS}	Drain-Source Voltage		100	V	
I _D	Drain Current - Continuous (T _C = 25°	C)	57	Α	
	- Continuous (T _C = 100)°C)	40.3	Α	
I _{DM}	Drain Current - Pulsed	(Note 1)	228	Α	
V_{GSS}	Gate-Source Voltage		± 25	V	
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	1300	mJ	
I _{AR}	Avalanche Current	(Note 1)	57	Α	
E _{AR}	Repetitive Avalanche Energy	(Note 1)	16	mJ	
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0	V/ns	
P _D	Power Dissipation (T _C = 25°C)		160	W	
	- Derate above 25°C		1.06	W/°C	
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +175	°C	
T _L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 seconds		300	°C	

Thermal Characteristics

Symbol	Parameter	FQP70N10	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.94	°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
FQP70N10	FQP70N10	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics

T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
Off Cha	aracteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	100			V
ΔBV_{DSS} / ΔT_{J}	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		0.1		V/°C
I _{DSS}	Zoro Coto Voltago Droin Current	V _{DS} = 100 V, V _{GS} = 0 V			1	μΑ
	Zero Gate Voltage Drain Current	V _{DS} = 80 V, T _C = 150°C			10	μΑ
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 25 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -25 V, V _{DS} = 0 V			-100	nA
On Cha	racteristics					
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 = 28.5 A		0.019	0.023	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 28.5 A		45		S
•	ic Characteristics					
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		2500	3300	pF
C _{oss}	Output Capacitance	f = 1.0 MHz		720	940	pF
C _{rss}	Reverse Transfer Capacitance			150	200	pF
Switchi	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 50 V, I _D = 70 A,		30	70	ns
t _r	Turn-On Rise Time	$R_G = 25 \Omega$		470	950	ns
$t_{d(off)}$	Turn-Off Delay Time			130	270	ns
t _f	Turn-Off Fall Time	(Note 4)		160	330	ns
Qg	Total Gate Charge	V _{DS} = 80 V, I _D = 70 A,		85	110	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V	/	16		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		42		nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current				57	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current				228	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 57 A			1.5	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V, } I_{S} = 70 \text{ A,}$		110		ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs		430		nC

- Notes: Notes: Notes: Notes: A Repetitive Rating: Pulse width limited by maximum junction temperature.
 2. L = 0.6 mH, I_{AS} = 57 A, V_{DD} = 25 V, R_{G} = 25 Ω , starting T_{J} = 25°C.
 3. I_{SD} \leq 70 A, di/dt \leq 300 A/µs, V_{DD} \leq BV_{DSS}, starting T_{J} = 25°C.
 4. Essentially Independent of Operating Temperature.

Typical Characteristics

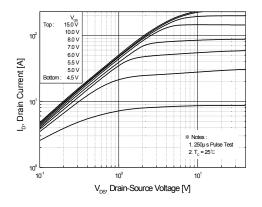


Figure 1. On-Region Characteristics

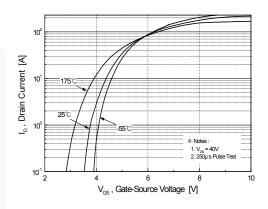


Figure 2. Transfer Characteristics

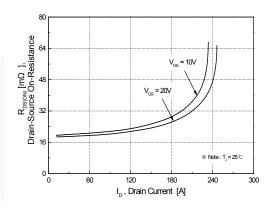


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

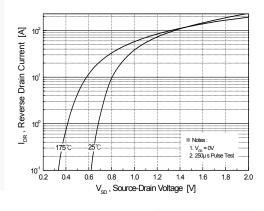


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

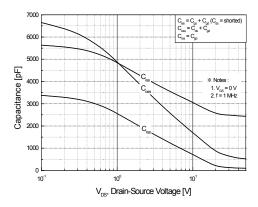


Figure 5. Capacitance Characteristics

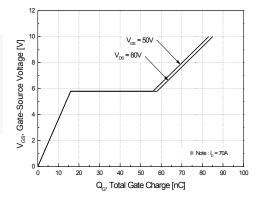


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

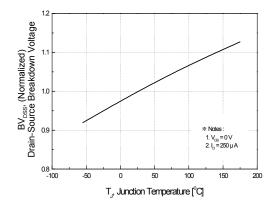
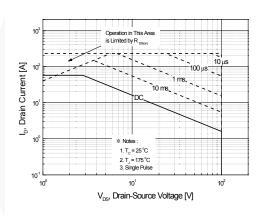


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



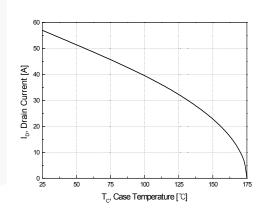


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

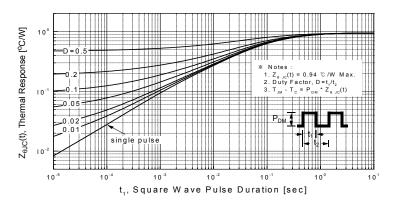


Figure 11. Transient Thermal Response Curve

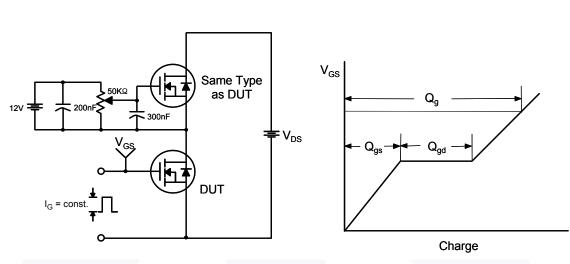


Figure 12. Gate Charge Test Circuit & Waveform

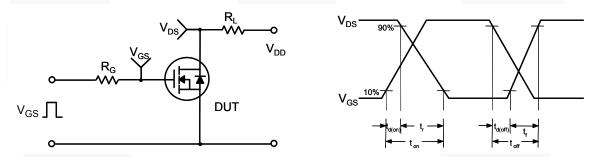


Figure 13. Resistive Switching Test Circuit & Waveforms

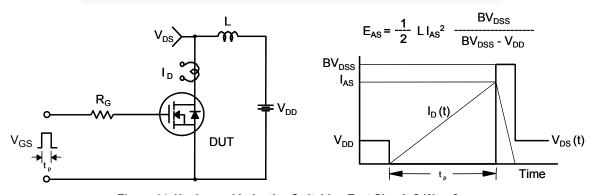
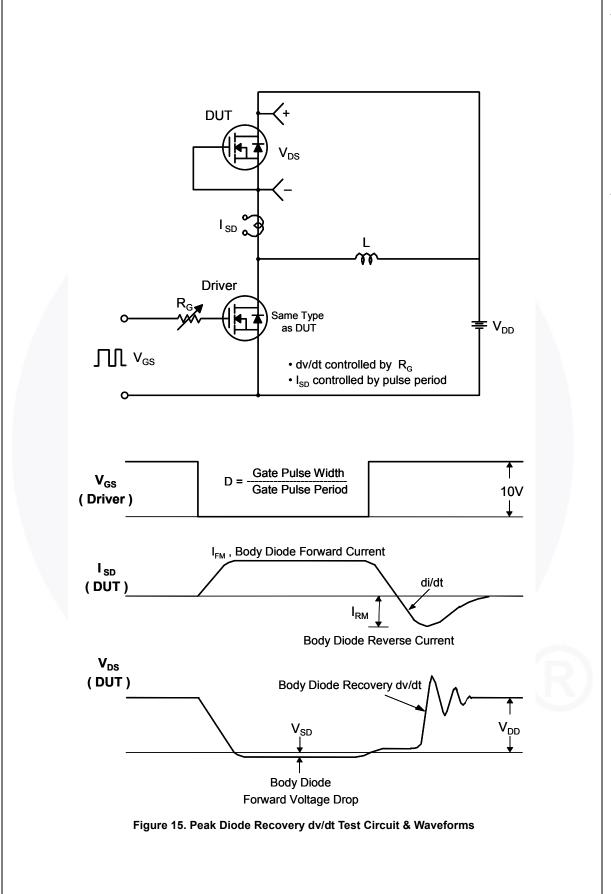


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

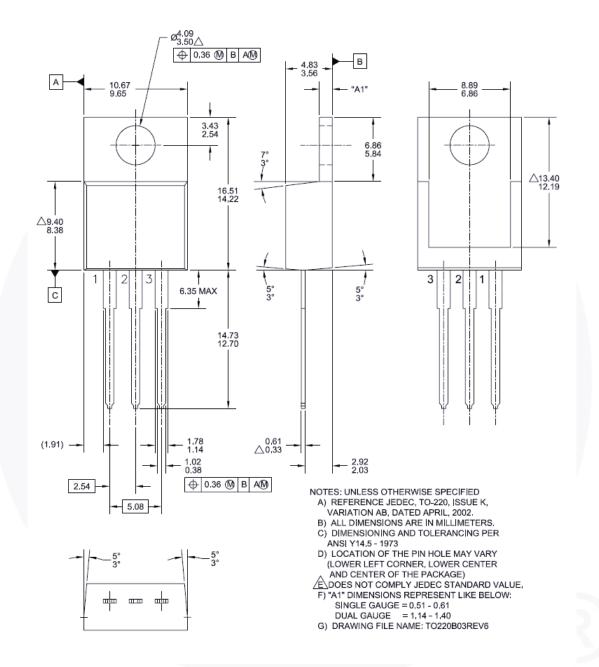


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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Наши контакты:

Телефон: +7 812 627 14 35

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Промышленная ул, дом № 19, литера Н,

помещение 100-Н Офис 331