

December 2013

FQP4N90C / FQPF4N90C

N-Channel QFET® MOSFET

900 V, 4.0 A, 4.2 Ω

Description

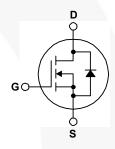
This N-Channel enhancement mode power MOSFET is • 4.0 A, 900 V, $R_{DS(on)}$ = 4.2 Ω (Max.) @ V_{GS} = 10 V, produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state • Low Gate Charge (Typ. 17 nC) resistance, and to provide superior switching performance • Low Crss (Typ. 5.6 pF) and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power • 100% Avalanche Tested factor correction (PFC), and electronic lamp ballasts.

Features

- $I_D = 2.0 A$







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

Symbol	Parameter		FQP4N90C	FQPF4N90C	Unit
V _{DSS}	Drain-Source Voltage	9	00	V	
I _D	Drain Current - Continuous (T _C = 25°C)		4	4 *	Α
	- Continuous (T _C = 100°C)		2.3	2.3 *	Α
I _{DM}	Drain Current - Pulsed	(Note 1)	16	16 *	Α
V _{GSS}	Gate-Source Voltage	± 30		V	
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	570		mJ
I _{AR}	Avalanche Current	(Note 1)	4		Α
E _{AR}	Repetitive Avalanche Energy	(Note 1)	14		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5		V/ns
P_{D}	Power Dissipation (T _C = 25°C)		140	47	W
	- Derate above 25°C		1.12	0.38	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

^{*}Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	FQP9N90C	FQPF9N90CT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.89	2.66	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ, Max.	0.5		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	62.5	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP4N90C	FQP4N90C	TO-220	Tube	N/A	N/A	50 units
FQPF4N90C	FQPF4N90C	TO-220F	Tube	N/A	N/A	50 units

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Cha	aracteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	900			V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		1.05		V/°C
I _{DSS} Z	Zero Gate Voltage Drain Current	V _{DS} = 900 V, V _{GS} = 0 V			10	μΑ
		V _{DS} = 720 V, T _C = 125°C			100	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	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$			-100	nΑ
On Cha	aracteristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	3.0		5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 2 A		3.5	4.2	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 50 V, I _D = 2 A		5		S
	ic Characteristics				T	
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		740	960	pF
C _{oss}	Output Capacitance	f = 1.0 MHz		65	85	pF
C _{rss}	Reverse Transfer Capacitance			5.6	7.3	pF
Switch	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 450 V, I _D = 4 A,		25	60	ns
t _r	Turn-On Rise Time	$R_G = 25 \Omega$		50	110	ns
t _{d(off)}	Turn-Off Delay Time	- 1.G - 2012		40	90	ns
t _f	Turn-Off Fall Time	(Note 4)		35	80	ns
Qg	Total Gate Charge	V _{DS} = 720 V, I _D = 4 A,		17	22	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V	/	4.5		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		7.5		nC
Q _{gs} Q _{gd}	Gate-Source Charge	V _{GS} = 10 V (Note 4)	/	4.5		
	Maximum Continuous Drain-Source Diode Forward Current				4	А
IS	Maximum Pulsed Drain-Source Diode Forward Current				16	Α
	Maximum Pulsed Drain-Source Diode F	orward Odriont				
I _S I _{SM} V _{SD}	Maximum Pulsed Drain-Source Diode F Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 4 A)	1.4	V
				 450	1.4	V

Notes:1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 67 mH, I_{AS} = 4 A, V_{DD} = 50 V, R_G = 25 Ω , starting T_J = 25°C.
3. $I_{SD} \le 4$ A, di/dt ≤ 200 A/ μ s, $V_{DD} \le BV_{DSS}$, starting T_J = 25°C.
4. Essentially independent of operating temperature.

Typical Characteristics

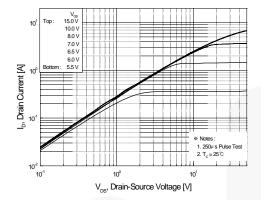


Figure 1. On-Region Characteristics

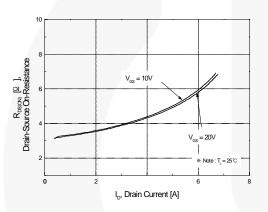


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

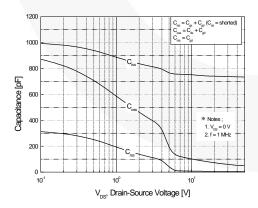


Figure 5. Capacitance Characteristics

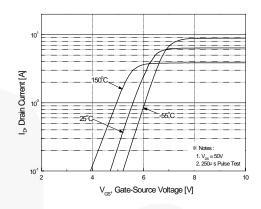


Figure 2. Transfer Characteristics

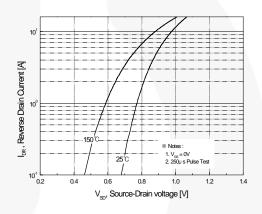


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

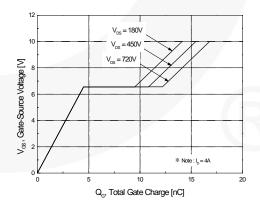


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

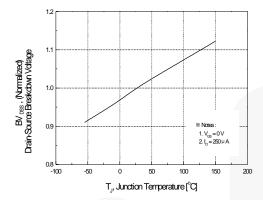
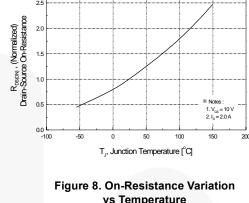


Figure 7. Breakdown Voltage Variation vs Temperature



vs Temperature

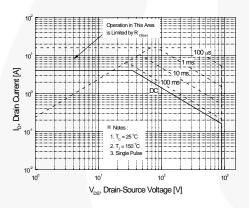


Figure 9-1. Maximum Safe Operating Area for FQP4N90C

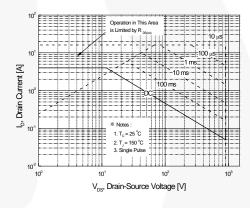


Figure 9-2. Maximum Safe Operating Area for FQPF4N90C

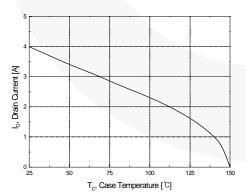


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

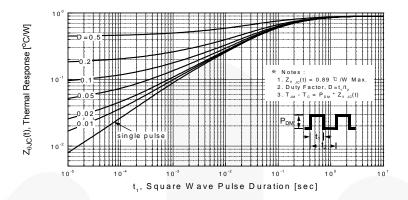


Figure 11-1. Transient Thermal Response Curve for FQP4N90C

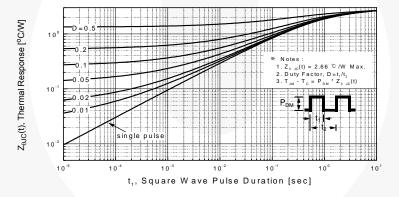


Figure 11-2. Transient Thermal Response Curve for FQPF4N90C

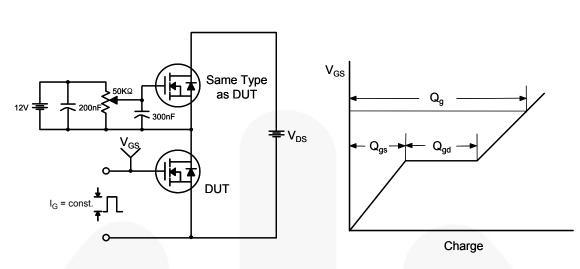


Figure 12. Gate Charge Test Circuit & Waveform

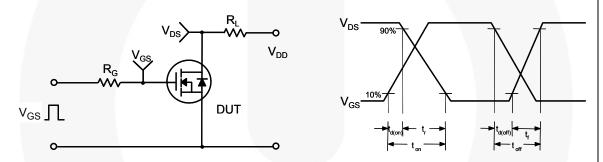


Figure 13. Resistive Switching Test Circuit & Waveforms

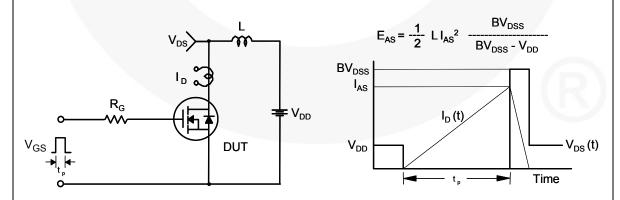
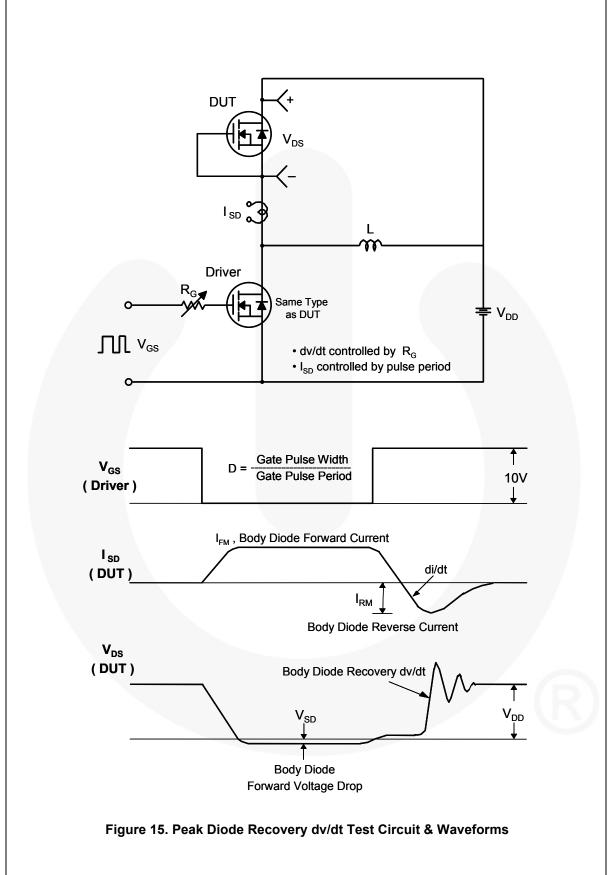


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

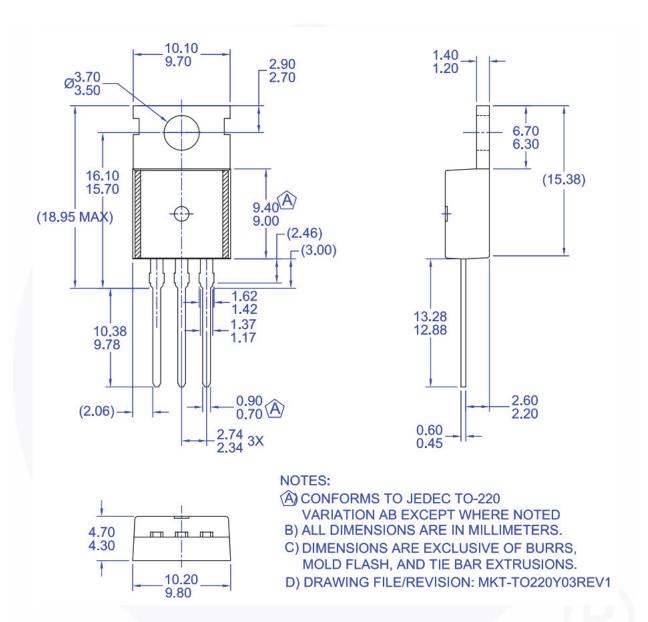


Figure 16. TO220, Molded, 3-Lead, Jedec Variation AB

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Mechanical Dimensions

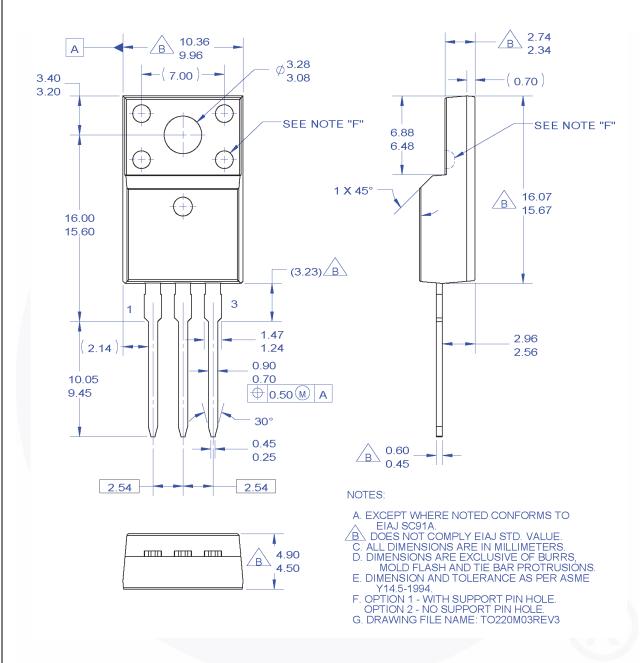


Figure 17. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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