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FQPF10N50CF

N-Channel QFET® FRFET® MOSFET

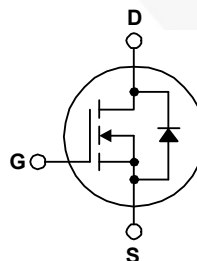
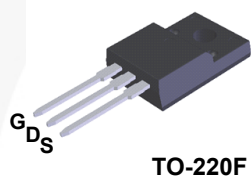
500 V, 10 A, 610 mΩ

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

- 10 A, 500 V, $R_{DS(on)} = 610 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 5 \text{ A}$
- Low Gate Charge (Typ. 43 nC)
- Low C_{rss} (Typ. 16 pF)
- 100% Avalanche Tested
- Fast Recovery Body Diode



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FQPF10N50CF	Unit
V_{DSS}	Drain-Source Voltage	500	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	10*	A
	- Continuous ($T_C = 100^\circ\text{C}$)	6.35*	A
I_{DM}	Drain Current - Pulsed (Note 1)	40*	A
V_{GSS}	Gate-Source voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	388	mJ
I_{AR}	Avalanche Current (Note 1)	10	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	14.3	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	48	W
	- Derate above 25°C	0.38	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 Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FQPF10N50CF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.58	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQPF10N50CF	FQPF10N50CF	TO-220F	Tube	N/A	50 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	500	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	--	0.5	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 500 V, V _{GS} = 0 V	--	--	10	μA
		V _{DS} = 400 V, T _C = 125°C	--	--	100	μA
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 Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	2.0	--	4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 5 A	--	0.5	0.61	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 5 A	--	15	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	--	1610	2096	pF
C _{oss}	Output Capacitance		--	177	230	pF
C _{rss}	Reverse Transfer Capacitance		--	16	24	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 250 V, I _D = 10 A R _G = 25 Ω (Note 4)	--	29	67	ns
t _r	Turn-On Rise Time		--	80	170	ns
t _{d(off)}	Turn-Off Delay Time		--	141	290	ns
t _f	Turn-Off Fall Time		--	80	165	ns
Q _g	Total Gate Charge	V _{DS} = 400 V, I _D = 10 A V _{GS} = 10 V (Note 4)	--	43	56	nC
Q _{gs}	Gate-Source Charge		--	7.5	--	nC
Q _{gd}	Gate-Drain Charge		--	18.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	10	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	40	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 10 A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 10 A dI _F /dt = 100 A/μs	--	50	--	ns
Q _{rr}	Reverse Recovery Charge		--	0.1	--	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 7 mH, I_{AS} = 10 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C
3. I_{SD} ≤ 10 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C
4. Essentially independent of operating temperature.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

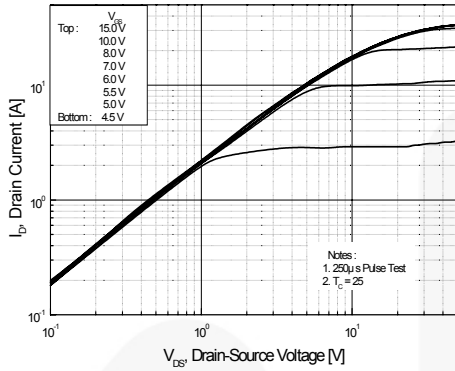


Figure 2. Transfer Characteristics

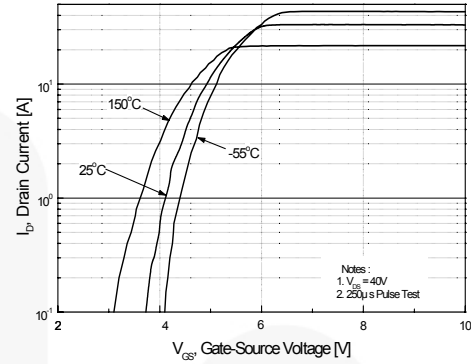


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

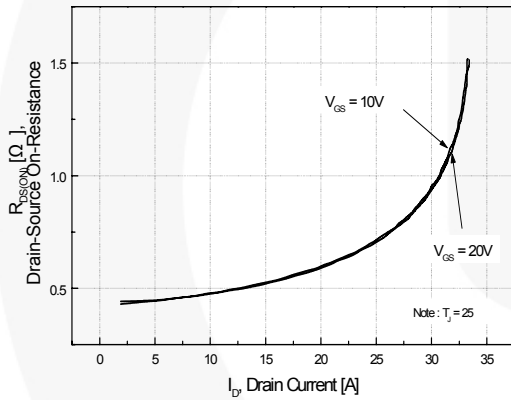


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

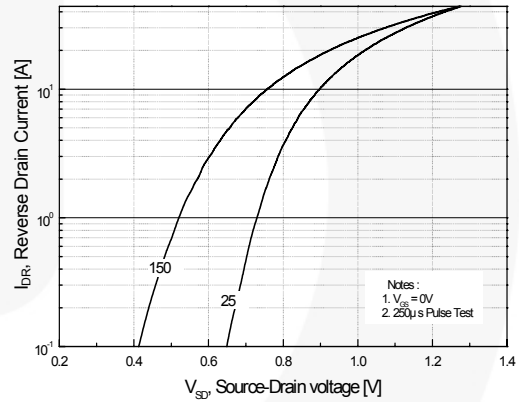


Figure 5. Capacitance Characteristics

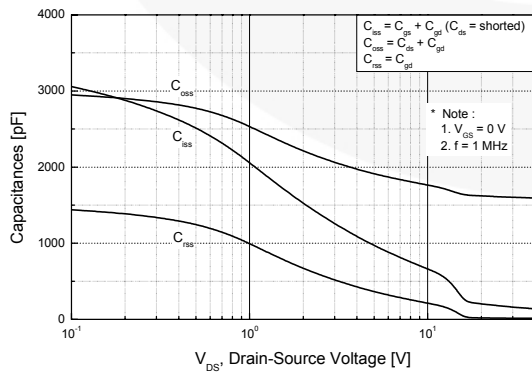
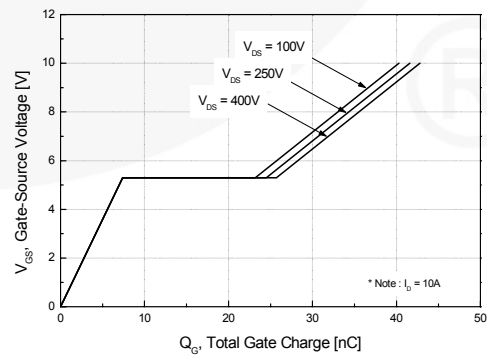


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

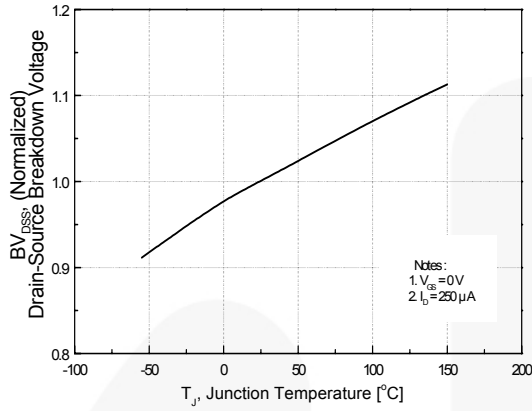


Figure 8. On-Resistance Variation vs. Temperature

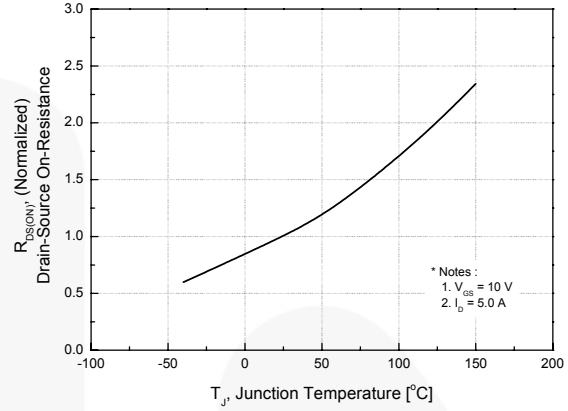


Figure 9. Maximum Safe Operating Area

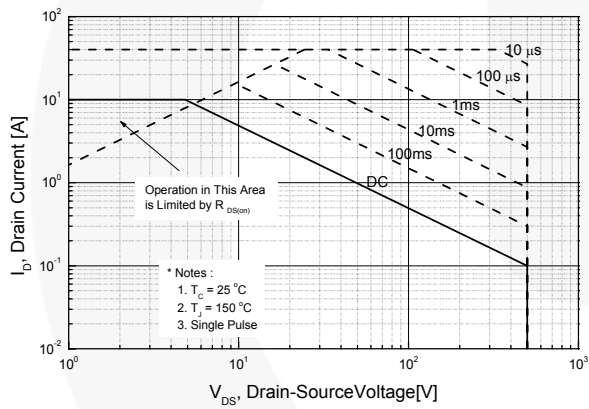


Figure 10. Maximum Drain Current vs. Case Temperature

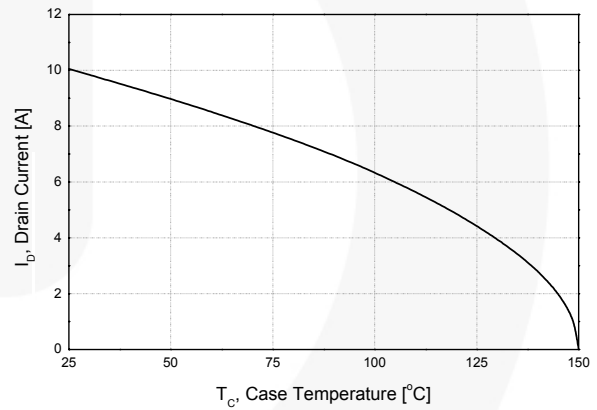


Figure 11. Transient Thermal Response Curve

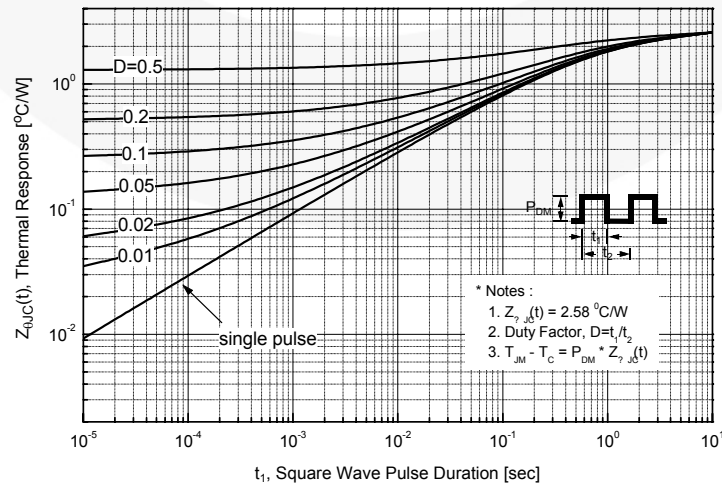


Figure 12. Gate Charge Test Circuit & Waveform

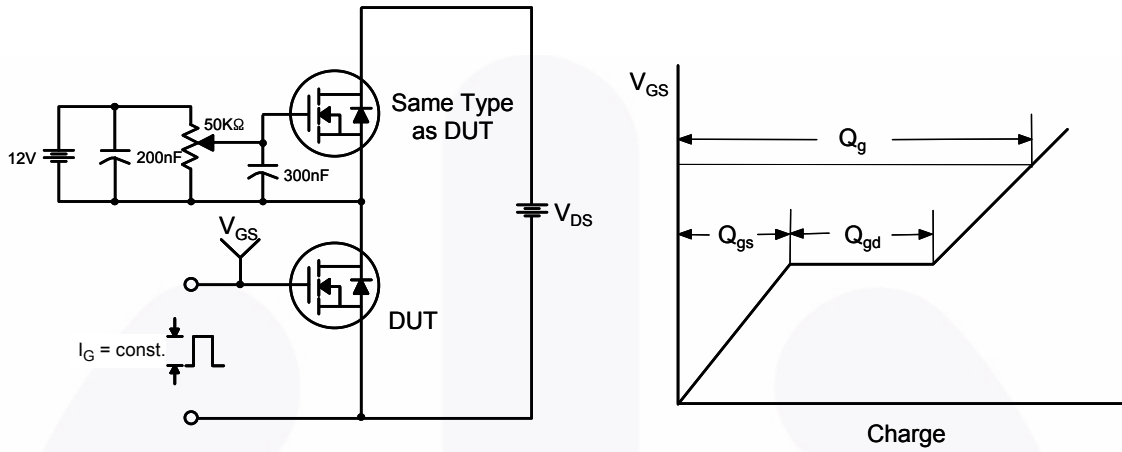


Figure 13. Resistive Switching Test Circuit & Waveforms

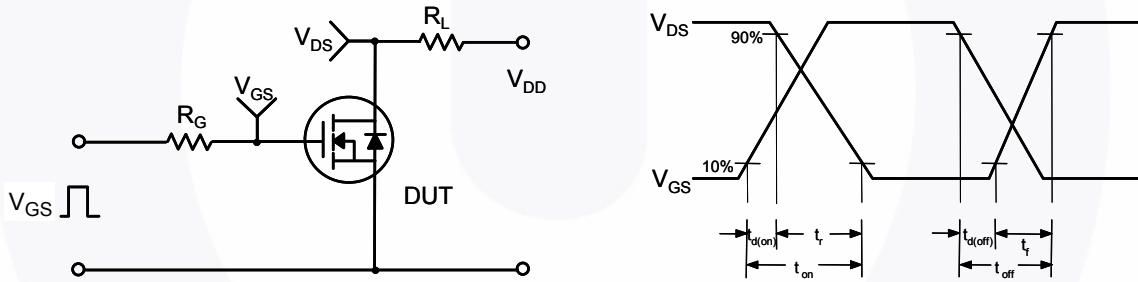


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

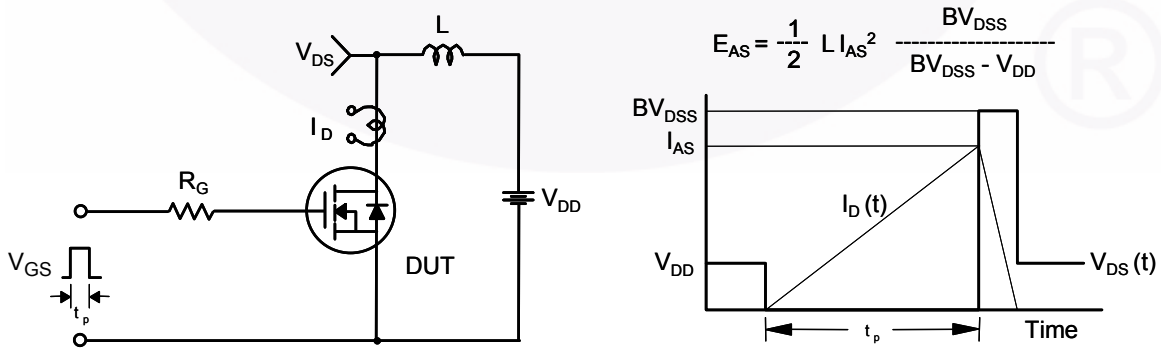
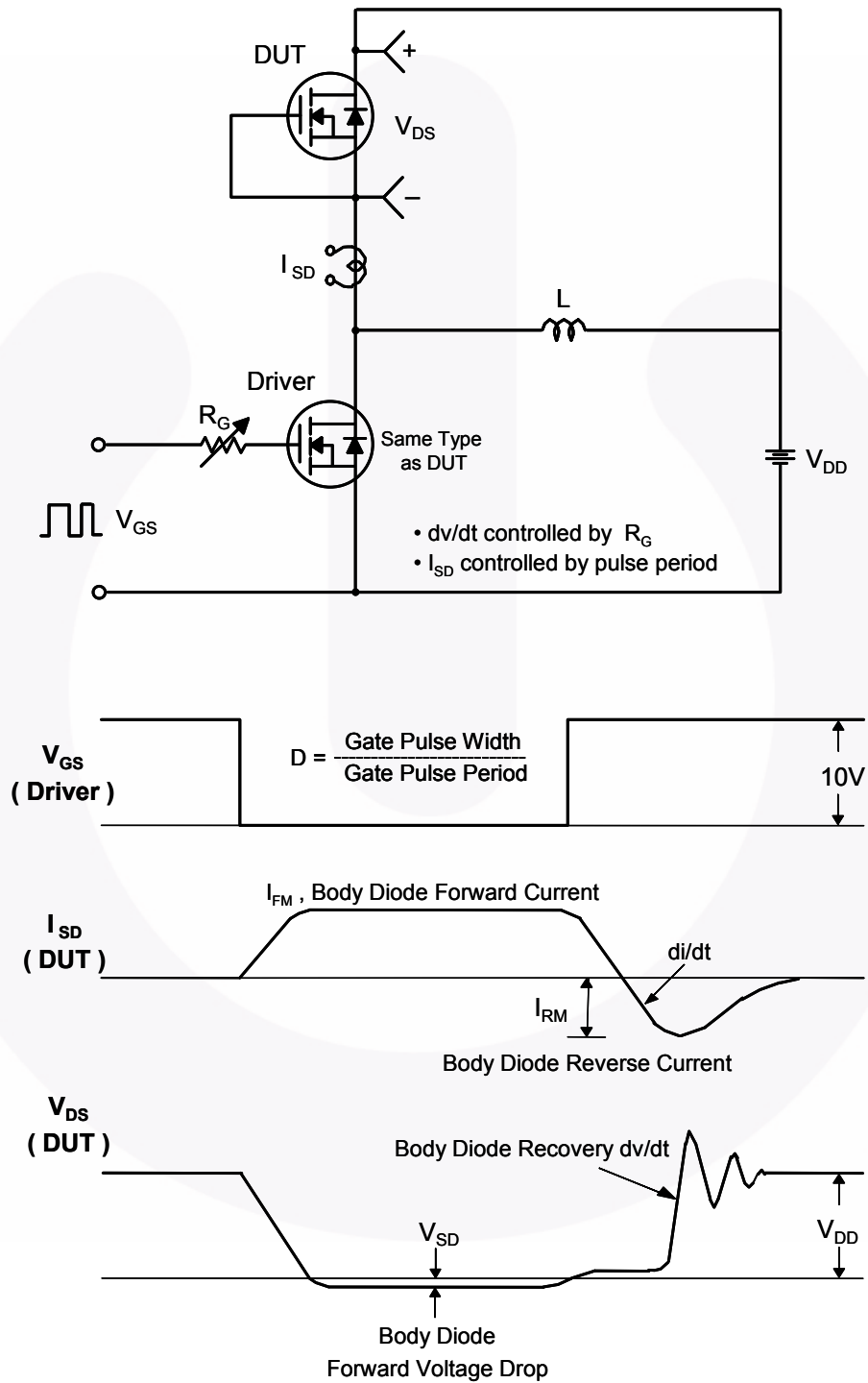


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





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105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

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