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# FQPF9N25C / FQPF9N25CT

## N-Channel QFET® MOSFET

250 V, 8.8 A, 430 mΩ

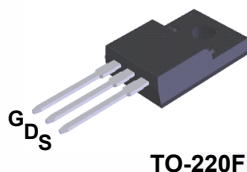
### Features

- 8.8 A, 250 V,  $R_{DS(on)} = 430 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 4.4 \text{ A}$
- Low Gate Charge (Typ. 26.5 nC)
- Low  $C_{rss}$  (Typ. 45.5 pF)
- 100% Avalanche Tested

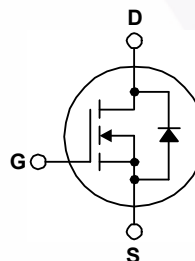
### Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters, switch mode power supplies, DC-AC converters for uninterrupted power supplies and motor controls.



TO-220F



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

Symbol	Parameter	FQPF9N25C / FQPF9N25CT	Unit
$V_{DSS}$	Drain to Source Voltage	250	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	8.8 *
		- Continuous ( $T_C = 100^\circ\text{C}$ )	5.6 *
$I_{DM}$	Drain Current	- Pulsed (Note 1)	35.2 *
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	285
$I_{AR}$	Avalanche Current	(Note 1)	8.8
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	7.4
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	5.5
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	38
		- Derate Above $25^\circ\text{C}$	0.3
$T_J, T_{STG}$	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	FQPF9N25C / FQPF9N25CT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.29	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQPF9N25C	FQPF9N25C	TO-220F	Tube	N/A	50 units
FQPF9N25CT	FQPF9N25CT	TO-220F	Tube	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	250	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	--	0.30	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V	--	--	10	μA
		V <sub>DS</sub> = 200 V, T <sub>C</sub> = 125°C	--	--	100	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V	--	--	-100	nA
On Characteristics						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.0	--	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.4 A	--	0.35	0.43	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 4.4 A	--	7.0	--	S
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	--	545	710	pF
C <sub>oss</sub>	Output Capacitance		--	115	150	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	45.5	60	pF
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 8.8 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 25 Ω  (Note 4)	--	15	40	ns
t <sub>r</sub>	Turn-On Rise Time		--	85	180	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	90	190	ns
t <sub>f</sub>	Turn-Off Fall Time		--	65	140	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 200 V, I <sub>D</sub> = 8.8 A, V <sub>GS</sub> = 10 V  (Note 4)	--	26.5	35	nC
Q <sub>gs</sub>	Gate-Source Charge		--	3.5	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	13.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	8.8	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	35.2	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8.8 A	--	--	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8.8 A, dI <sub>F</sub> / dt = 100 A/μs	--	218	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	1.58	--	μC

### Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2.  $L = 5.9\text{ mH}$ ,  $I_{AS} = 8.8\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\text{ }\Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 8.8\text{ A}$ ,  $dI/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature.

## Typical Characteristics

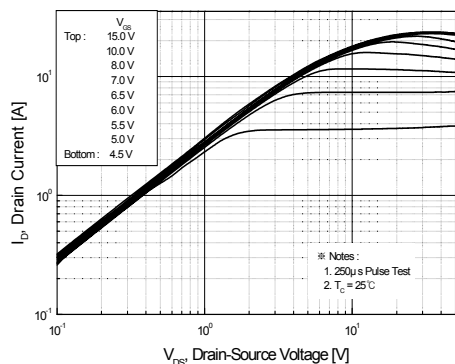


Figure 1. On-Region Characteristics

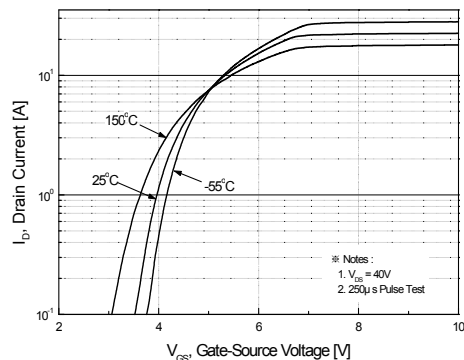


Figure 2. Transfer Characteristics

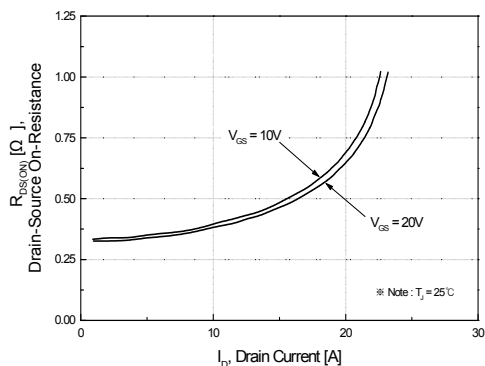


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

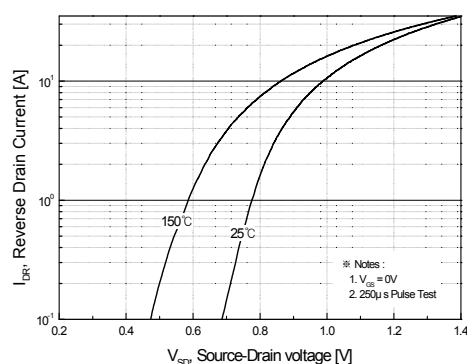


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

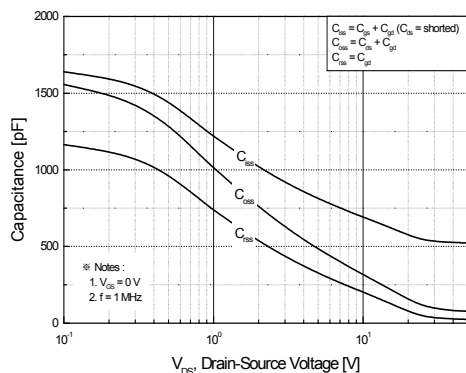


Figure 5. Capacitance Characteristics

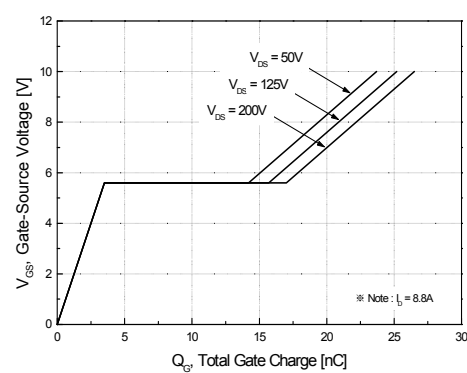


Figure 6. Gate Charge Characteristics

# Typical Characteristics (Continued)

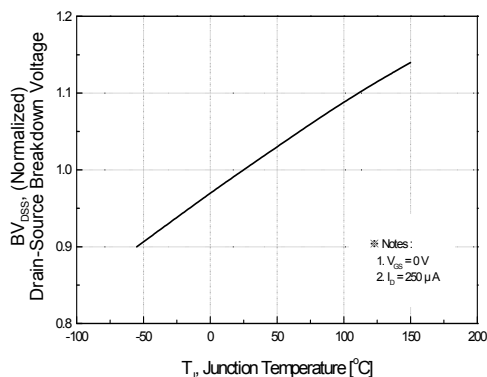


Figure 7. Breakdown Voltage Variation vs Temperature

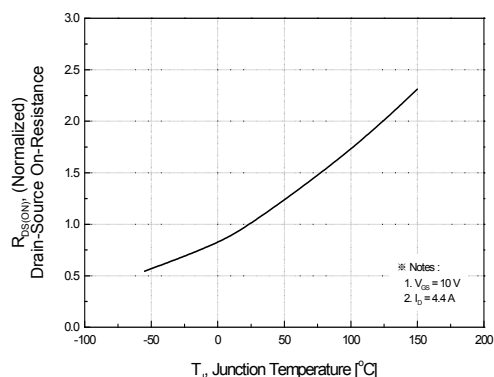


Figure 8. On-Resistance Variation vs Temperature

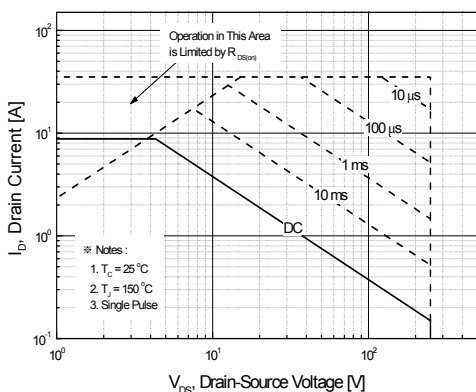


Figure 9. Maximum Safe Operating Area

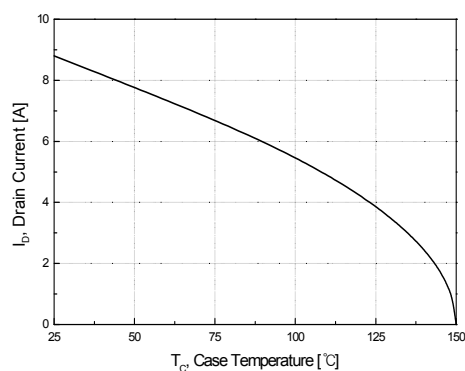


Figure 10. Maximum Drain Current vs Case Temperature

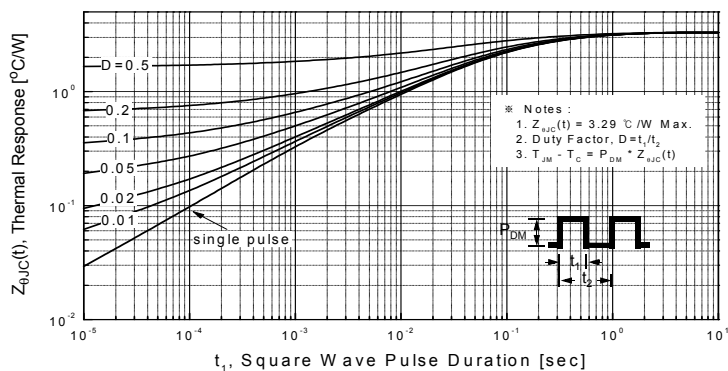


Figure 11. Transient Thermal Response Curve

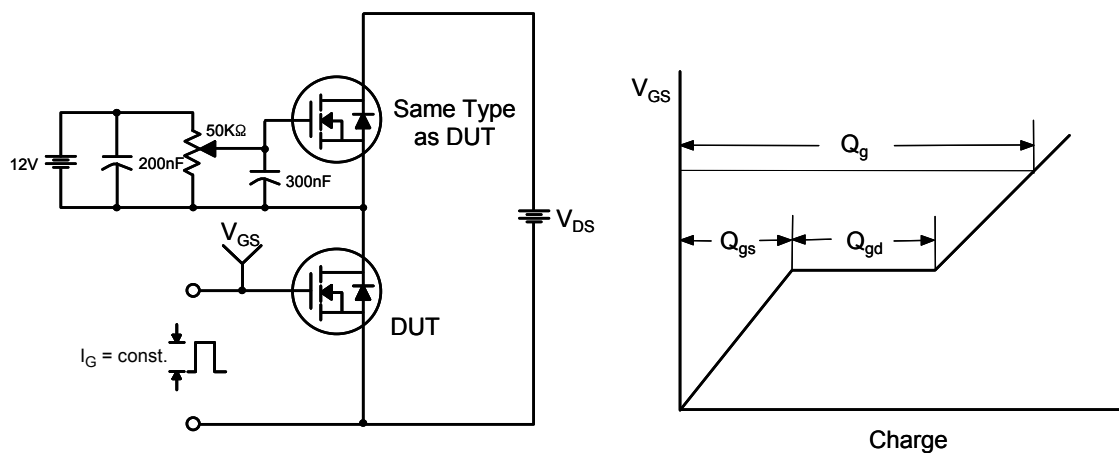


Figure 12. Gate Charge Test Circuit & Waveform

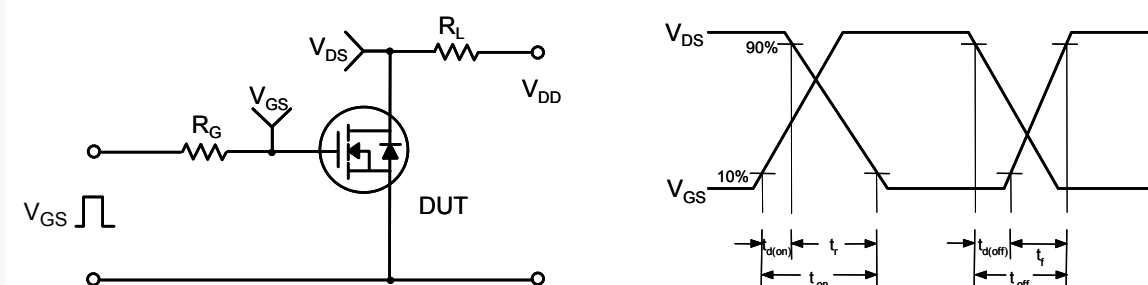


Figure 13. Resistive Switching Test Circuit & Waveforms

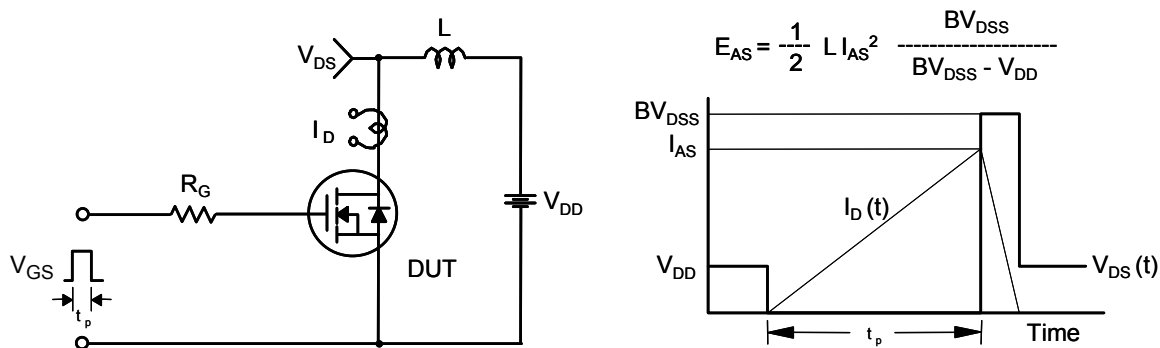


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms









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