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November 2013

## FQPF16N25C

## N-Channel QFET® MOSFET

250 V, 15.6 A, 270 mΩ

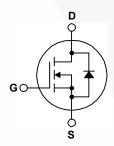
#### **Features**

- 15.6 A, 250 V,  $R_{DS(on)}$  = 270 m $\Omega$  (Max) @  $V_{GS}$  = 10 V,  $I_D$  = 7.8 A
- Low Gate Charge (Typ. 41 nC)
- Low Crss (Typ. 68 pF)
- · 100% Avalanche Tested

### **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.





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

Symbol	Parameter			FQPF16N25C	Unit
V <sub>DSS</sub>	Drain to Source Voltage			250	V
I <sub>D</sub>	Drain Current	- Continuous (T <sub>C</sub> = 25°C)		15.6 *	Α
	Drain Current	- Continuous (T <sub>C</sub> = 100°C)		9.8 *	Α
I <sub>DM</sub>	Drain Current	- Pulsed (Note 1)		62.4 *	Α
$V_{GSS}$	Gate to Source Voltage			± 30	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy		(Note 2)	410	mJ
I <sub>AR</sub>	Avalanche Current		(Note 1)	15.6	Α
E <sub>AR</sub>	Repetitive Avalanche Energy		Note 1) 13.9		mJ
dv/dt	Peak Diode Recovery dv/dt (Note		(Note 3)	5.5	V/ns
$P_D$	Power Dissipation	$(T_C = 25^{\circ}C)$		43	W
		- Derate Above 25°C		0.34	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range			-55 to +150	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300	°C

<sup>\*</sup>Drain current limited by maximum junction temperature

### **Thermal Characteristics**

Symbol	Parameter	FQPF16N25C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	2.89	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	62.5	°C/W

## **Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQPF16N25C	FQPF16N25C	TO-220F	Tube	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Cha	racteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	250			V
$\Delta BV_{DSS}$ / $\Delta T_{J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.31		V/°C
I <sub>DSS</sub> Z	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V			10	μА
		V <sub>DS</sub> = 200 V, T <sub>C</sub> = 125°C			100	μΑ
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	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$			-100	nA
On Cha	racteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	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> = 7.8 A	-	0.22	0.27	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 7.8 A		10.5		S
_	c Characteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		830	1080	pF
C <sub>oss</sub>	Output Capacitance			170	220	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			68	89	pF
Switchi	ng Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 15.6 A,		15	40	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{GS} = 10 \text{ V}, R_{G} = 25 \Omega$		130	270	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			135	280	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)		105	220	ns
$Q_g$	Total Gate Charge	V <sub>DS</sub> = 200 V, I <sub>D</sub> = 15.6 A,	/	41	53.5	nC
$Q_{gs}$	Gate-Source Charge	V <sub>GS</sub> = 10 V	-/	5.6		nC
$Q_{gd}$	Gate-Drain Charge	(Note 4)		22.7		nC
Drain-S	ource Diode Characteristics and	I Maximum Ratings				
Is	Maximum Continuous Drain-Source Diode Forward Current				15.6	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				62.4	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 15.6 A			1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 15.6 A,		260		ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> / dt = 100 A/μs		2.47		μС

#### Notes

<sup>1.</sup> Repetitive rating : pulse-width limited by maximum junction temperature

<sup>2.</sup> L = 2.7 mH, I<sub>AS</sub> = 15.6 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25  $\Omega$ , Starting T<sub>J</sub> = 25°C

<sup>3.</sup>  $I_{SD} \le 15.6$  A, di/dt  $\le 300$  A/ $\mu$ s,  $V_{DD} \le BV_{DSS}$ , Starting  $T_J$  = 25°C

<sup>4.</sup> Essentially independent of operating temperature

## **Typical Characteristics**

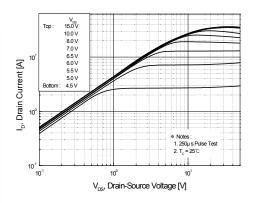


Figure 1. On-Region Characteristics

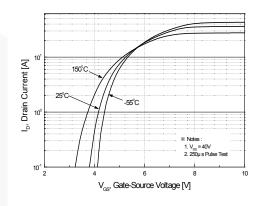


Figure 2. Transfer Characteristics

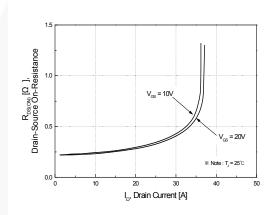


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

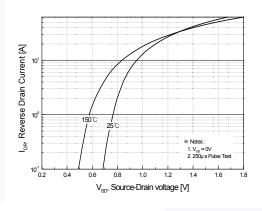


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

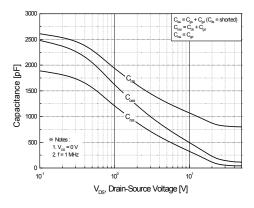


Figure 5. Capacitance Characteristics

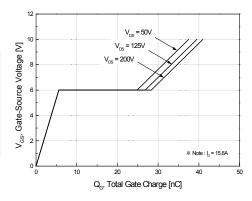
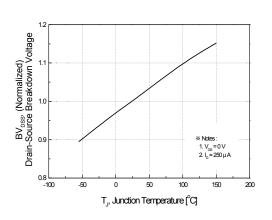


Figure 6. Gate Charge Characteristics

## Typical Characteristics (Continued)



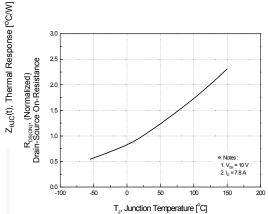
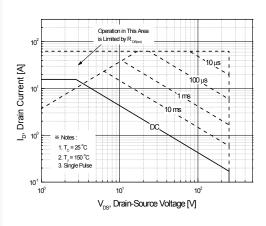


Figure 7. Breakdown Voltage Variation vs Temperature

Figure 8. On-Resistance Variation vs Temperature



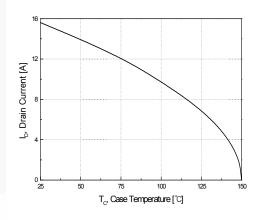


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs Case Temperature

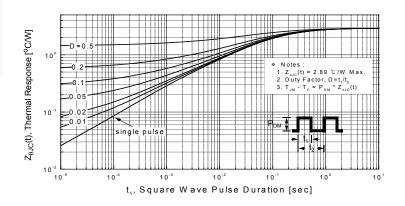


Figure 11. Transient Thermal Response Curve

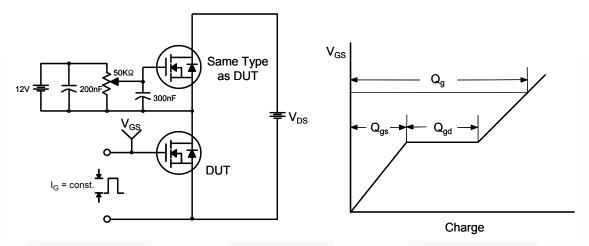


Figure 12. Gate Charge Test Circuit & Waveform

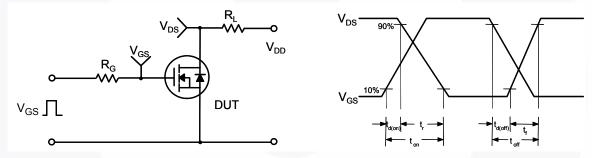


Figure 13. Resistive Switching Test Circuit & Waveforms

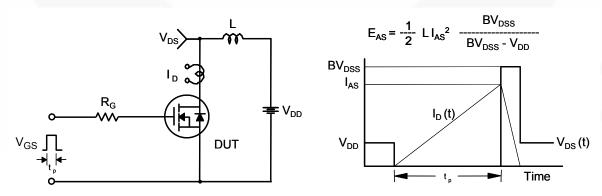


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

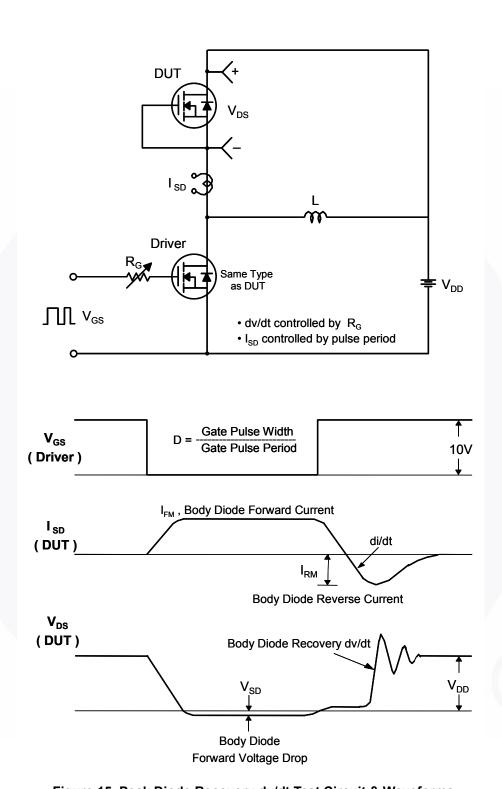


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

#### **Mechanical Dimensions**

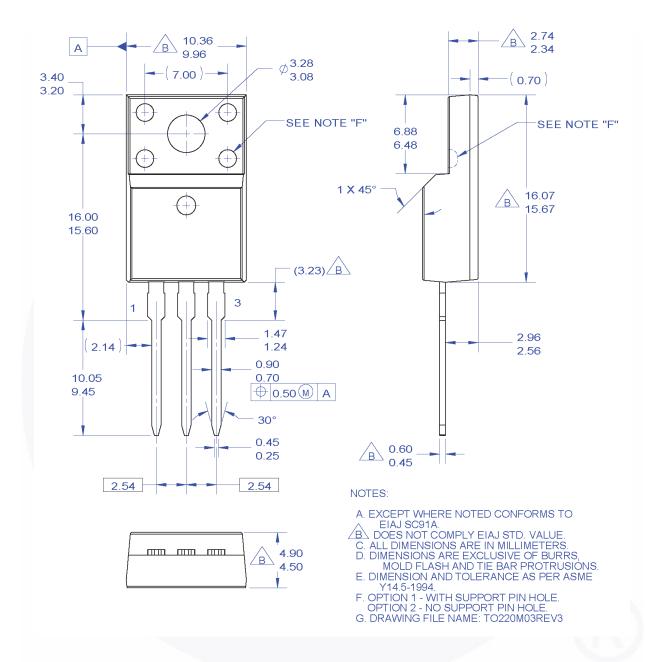


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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