

November 2013

# FQPF630

# N-Channel QFET<sup>®</sup> MOSFET 200 V, 6.3 A, 400 m $\Omega$

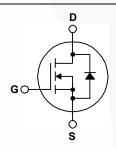
### **Description**

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**

- 6.3 A, 200 V,  $R_{DS(on)}$  = 400 m $\Omega$  (Max.) @  $V_{GS}$  = 10 V,  $I_D$  = 3.15 A
- Low Gate Charge (Typ. 19 nC)
- Low Crss (Typ. 35 pF)
- · 100% Avalanche Tested





# Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter	FQPF630	Unit
V <sub>DSS</sub>	Drain-Source Voltage	200	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)	6.3	Α
	- Continuous (T <sub>C</sub> = 100°C)	4.0	Α
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	25.2	Α
$V_{GSS}$	Gate-Source Voltage	± 25	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	164	mJ
I <sub>AR</sub>	Avalanche Current (Note 1)	6.3	Α
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	3.8	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C)	38	W
	- Derate Above 25°C	0.30	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

# **Thermal Characteristics**

Symbol	Parameter	FQPF630	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.32	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max. 62.5		- C/VV

# **Package Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQPF630	FQPF630	TO-220F	Tube	N/A	N/A	50 units

# **Electrical Characteristics**

T<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Uni
Off Cha	aracteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	200			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.20		V/°(
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V			1	μΑ
	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 160 V, T <sub>C</sub> = 125°C			10	μΑ
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 25 V, V <sub>DS</sub> = 0 V			100	n/
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -25 V, V <sub>DS</sub> = 0 V			-100	n/
On Cha	racteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	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> = 3.15 A		0.34	0.4	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 3.15 A		4.2		S
	ic Characteristics			T	T-	
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		420	550	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz		85	110	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			35	45	pF
Switchi	ing Characteristics	,				
$t_{d(on)}$	Turn-On Delay Time	V <sub>DD</sub> = 100 V, I <sub>D</sub> = 9 A,		8	30	ns
t <sub>r</sub>	Turn-On Rise Time	$R_G = 25 \Omega$		75	160	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			47	110	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)		64	140	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 160 V, I <sub>D</sub> = 9 A,		19	25	nC
		— DO ''' DO '-''				1

# **Drain-Source Diode Characteristics and Maximum Ratings**

I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				6.3	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				25.2	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 6.3 \text{ A}$	-		1.5	V
t <sub>rr</sub>	Reverse Recovery Time	$V_{GS} = 0 V, I_{S} = 9 A,$	-	150		ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> / dt = 100 A/μs	-	0.68		μС

 $V_{GS}$  = 10 V

### Notes

 $Q_{gs}$ 

 $Q_{gd}$ 

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. L = 6.2 mH, I  $_{AS}$  = 6.3 A, V  $_{DD}$  = 50 V, R  $_{G}$  = 25  $\Omega,$  starting  $\,$  T  $_{J}$  = 25  $^{\circ}C.$
- 3.  $I_{SD} \le$  9 A, di/dt  $\le$  300 A/ $\mu s$ ,  $V_{DD} \le BV_{DSS}$ , starting  $T_J$  = 25°C.

Gate-Source Charge

Gate-Drain Charge

Essentially independent of operating temperature.

3

9.5

(Note 4)

nC

nC

# **Typical Characteristics**

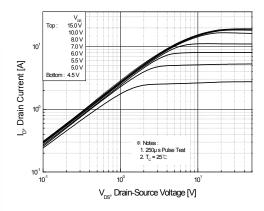


Figure 1. On-Region Characteristics

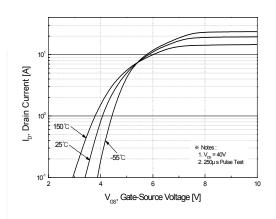


Figure 2. Transfer Characteristics

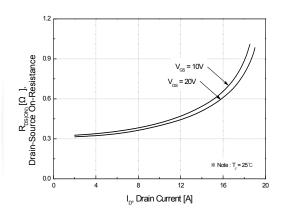


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

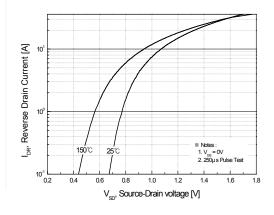


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

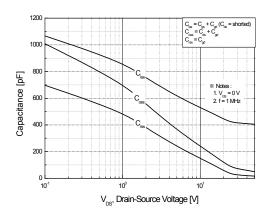


Figure 5. Capacitance Characteristics

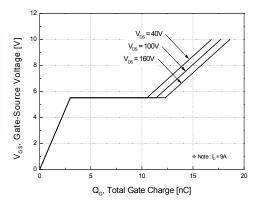
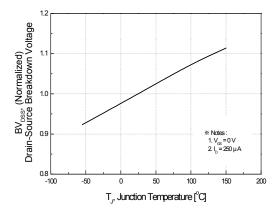


Figure 6. Gate Charge Characteristics

# Typical Characteristics (continued)

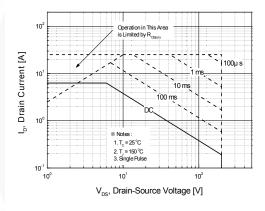


30

Operation Temperature [°C]

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



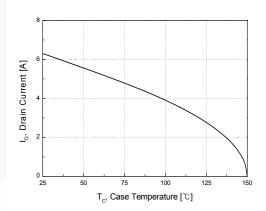


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

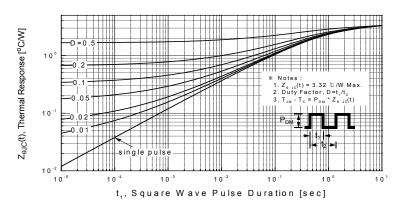


Figure 11. Transient Thermal Response Curve

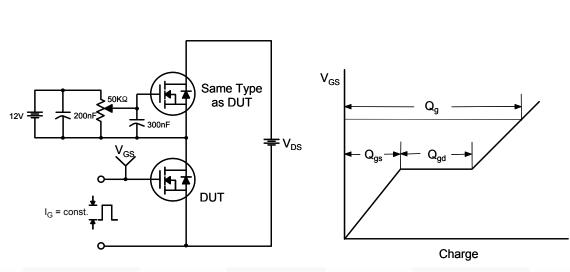


Figure 12. Gate Charge Test Circuit & Waveform

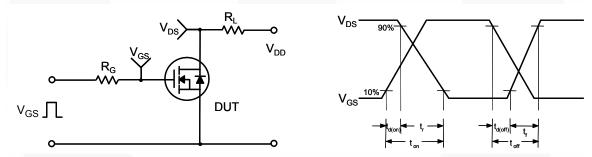


Figure 13. Resistive Switching Test Circuit & Waveforms

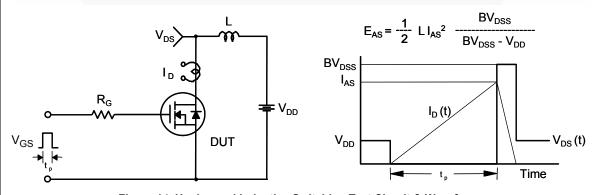
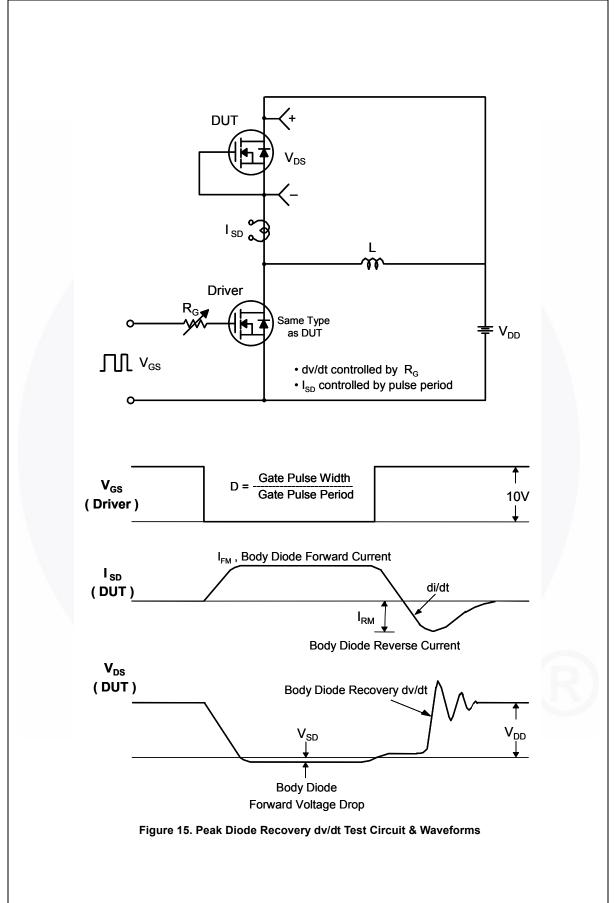


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



# **Mechanical Dimensions**

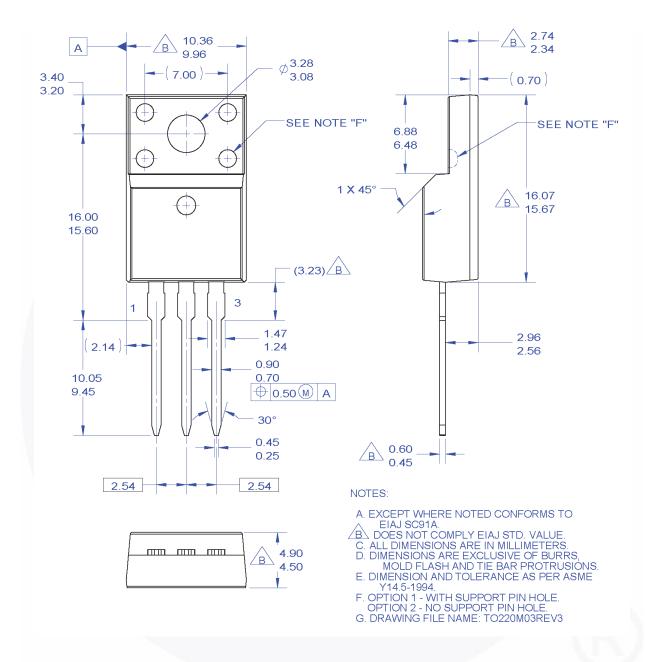


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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