

December 2013

## FQP7N80C / FQPF7N80C

## N-Channel QFET® MOSFET

800 V, 6.6 A, 1.9 Ω

## **Description**

This N-Channel enhancement mode power MOSFET is • 6.6 A, 800 V,  $R_{DS(on)}$  = 1.9  $\Omega$  (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

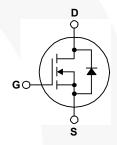
• Low Gate Charge (Typ. 27 nC) resistance, and to provide superior switching performance • Low Crss (Typ. 10 pF) and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power • 100% Avalanche Tested factor correction (PFC), and electronic lamp ballasts.

#### **Features**

- $I_D = 3.3 A$







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

Symbol	Parameter		FQP7N80C	FQPF7N80C	Unit
$V_{DSS}$	Drain-Source Voltage		800		V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)		6.6	6.6 *	Α
	- Continuous (T <sub>C</sub> = 100°C)	Ī	4.2	4.2 *	Α
I <sub>DM</sub>	Drain Current - Pulsed	Note 1)	26.4	26.4 *	Α
V <sub>GSS</sub>	Gate-Source Voltage	± 30		V	
E <sub>AS</sub>	Single Pulsed Avalanche Energy	Note 2)	580		mJ
I <sub>AR</sub>	Avalanche Current	Note 1)	6.6		Α
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)		16.7		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5		V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C)		167	56	W
	- Derate above 25°C	1.33	0.44	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	FQP7N80C	FQPF7N80C	Unit	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.75	2.25	°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
FQP7N80C	FQP7N80C	TO-220	Tube	N/A	N/A	50 units
FQPF7N80C	FQPF7N80C	TO-220F	Tube	N/A	N/A	50 units

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Cha	aracteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	800			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.93		V/°C
I <sub>DSS</sub> Zero	Zana Oata Vallana Busin Ourrant	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = 0 V			10	μΑ
	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 640 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 <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V		-	-100	nA
On Cha	aracteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	3.0		5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.3 A		1.57	1.9	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 50 V, I <sub>D</sub> = 3.3 A		5.5		S
<b>Dynam</b> C <sub>iss</sub>	Input Capacitance	V 05 V V 0 V		1290	1680	pF
Coss	Output Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		120	155	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	1 - 1.0 MH2		10	13	pF
	ing Characteristics			0.5	00	
t <sub>d(on)</sub>	Turn-On Delay Time	$V_{DD} = 400 \text{ V}, I_D = 6.6 \text{ A},$		35	80	ns
t <sub>r</sub>	Turn-On Rise Time	$R_G = 25 \Omega$		100	210	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	(Note 4)		50	110	ns
t <sub>f</sub>	Turn-Off Fall Time	,		60	130	ns
Q <sub>g</sub>	Total Gate Charge	$V_{DS} = 640 \text{ V}, I_{D} = 6.6 \text{ A},$		27	35	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V (Note 4)		8.2		nC
$Q_{gd}$	Gate-Drain Charge	(Note 4)		11		nC
Drain-S	Source Diode Characteristics ar	nd Maximum Ratings				
	Source Diode Characteristics an Maximum Continuous Drain-Source Dio				6.6	Α
Is		ode Forward Current			6.6 26.4	A
I <sub>S</sub>	Maximum Continuous Drain-Source Dic	ode Forward Current				
Is	Maximum Continuous Drain-Source Diode F Maximum Pulsed Drain-Source Diode F	ode Forward Current Forward Current			26.4	Α

<sup>1.</sup> Repetitive rating : pulse-width limited by maximum junction temperature. 2. L = 25 mH, I $_{AS}$  = 6.6 A, V $_{DD}$  = 50 V, R $_{G}$  = 25  $\Omega$ , starting T $_{J}$  = 25°C. 3.I $_{SD}$   $\leq$  8 A, di/dt  $\leq$  200 A/ $\mu$ s , V $_{DD}$   $\leq$  BV $_{DSS}$ , starting T $_{J}$  = 25°C.

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

## **Typical Characteristics**

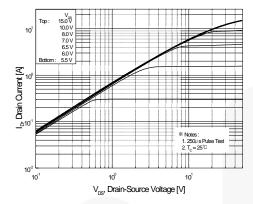
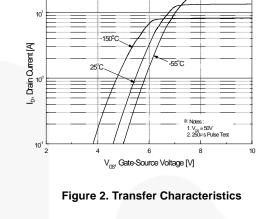


Figure 1. On-Region Characteristics



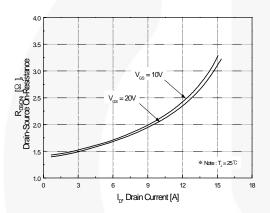


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

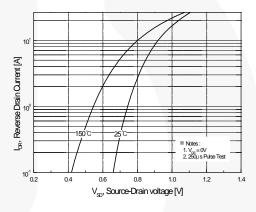


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

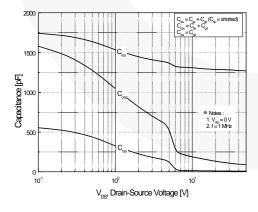


Figure 5. Capacitance Characteristics

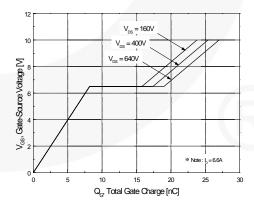


Figure 6. Gate Charge Characteristics

## Typical Characteristics (Continued)

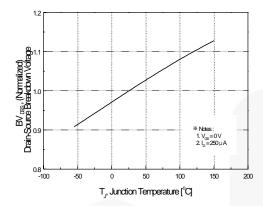


Figure 7. Breakdown Voltage Variation vs Temperature

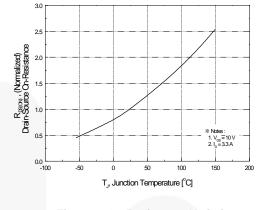


Figure 8. On-Resistance Variation vs Temperature

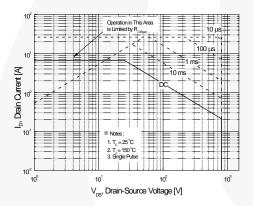


Figure 9-1. Maximum Safe Operating Area for FQP7N80C

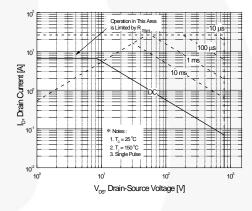


Figure 9-2. Maximum Safe Operating Area for FQPF7N80C

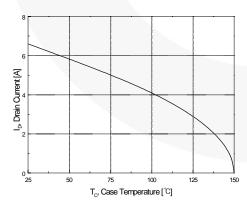


Figure 10. Maximum Drain Current vs Case Temperature

## Typical Characteristics (Continued)

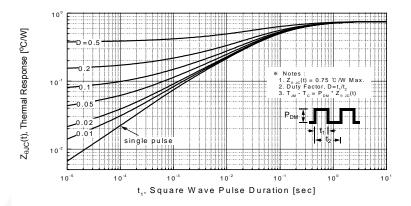


Figure 11-1. Transient Thermal Response Curve for FQP7N80C

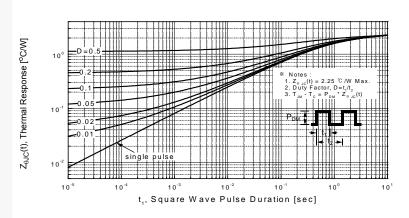


Figure 11-2. Transient Thermal Response Curve for FQPF7N80C

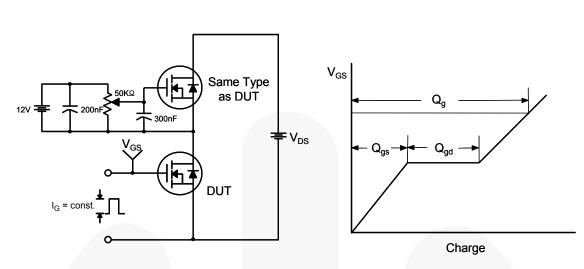


Figure 12. Gate Charge Test Circuit & Waveform

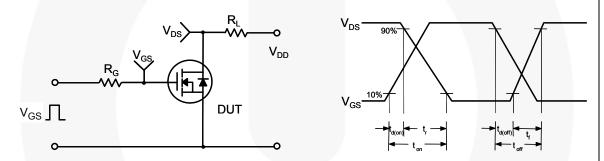


Figure 13. Resistive Switching Test Circuit & Waveforms

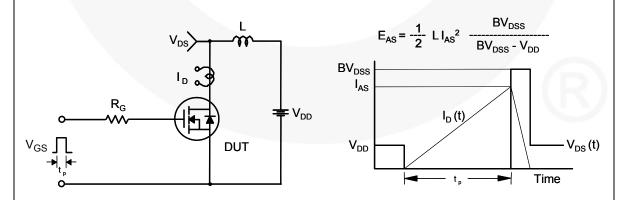
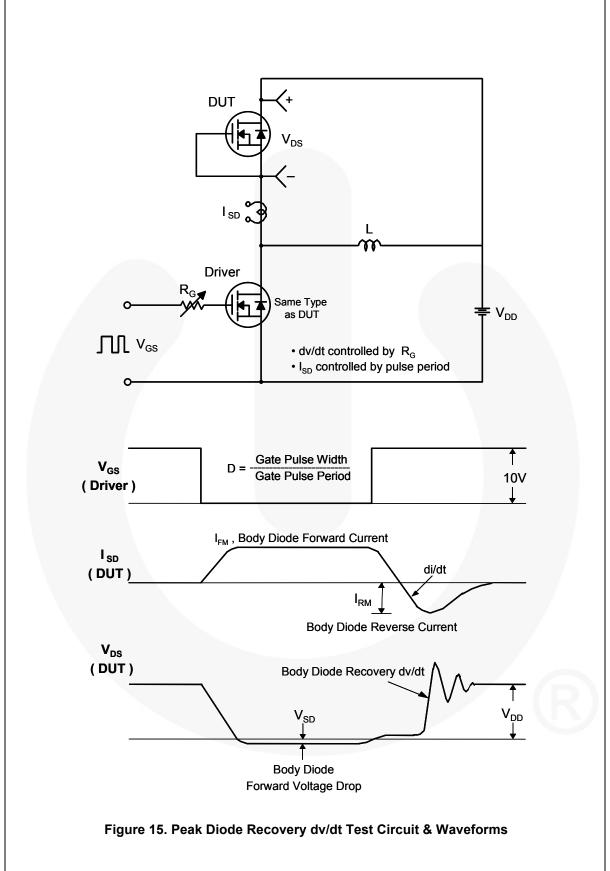


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



### **Mechanical Dimensions**

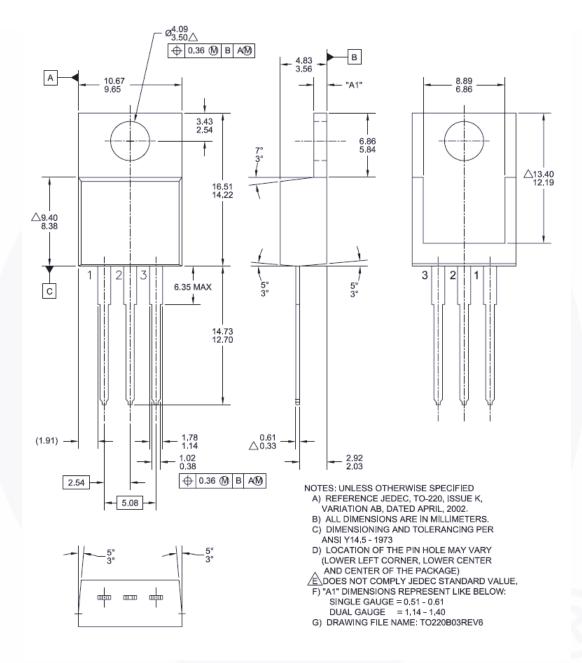


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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### **Mechanical Dimensions**

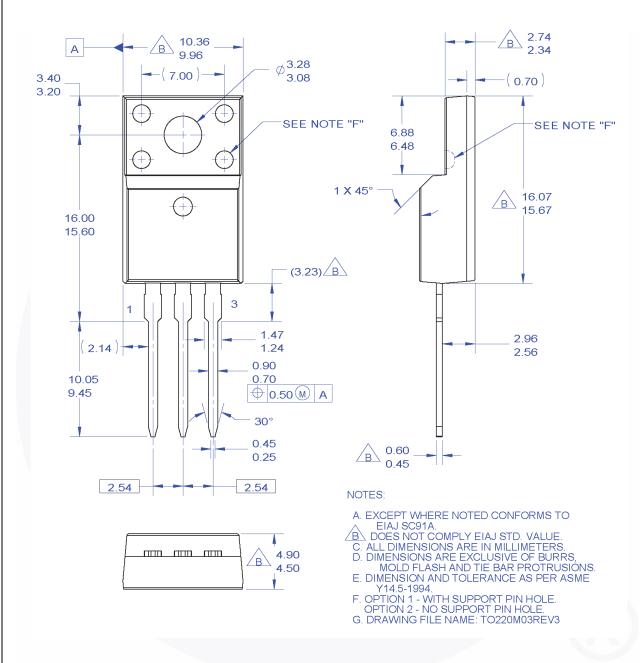


Figure 17. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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