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December 2013

### **FQP46N15**

## N-Channel QFET® MOSFET

150 V, 45.6 A, 42 mΩ

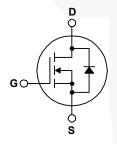
### **Description**

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, audio amplifier, DC motor control, and variable switching power applications.

#### **Features**

- 45.6 A, 150 V,  $R_{DS(on)}$  = 42 m $\Omega$  (Max.) @  $V_{GS}$  = 10 V,  $I_{D}$  = 22.6 A
- Low Gate Charge (Typ. 85 nC)
- Low Crss (Typ. 100 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating





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

Symbol	Parameter		FQP46N15	Unit
V <sub>DSS</sub>	Drain-Source Voltage		150	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)		45.6	А
	- Continuous (T <sub>C</sub> = 100°C)		32.2	А
I <sub>DM</sub>	Drain Current - Pulsed	(Note 1)	182.4	А
V <sub>GSS</sub>	Gate-Source Voltage		± 25	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy	nergy (Note 2) 650		mJ
I <sub>AR</sub>	Avalanche Current	(Note 1)	45.6	
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	21	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns
$P_{D}$	Power Dissipation (T <sub>C</sub> = 25°C)		210	W
	- Derate above 25°C		1.43	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +175	°C
T <sub>I</sub>	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds.		300	
· L			300	°C

### **Thermal Characteristics**

Symbol	Parameter	FQP46N15	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W

### **Package Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP46N15	FQP46N15	TO-220	Tube	N/A	N/A	50 units

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Uni
Off Cha	racteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	150			V
ΔBV <sub>DSS</sub> / ΔT	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.16		V/°C
I <sub>DSS</sub>	Zana Osta Vallana Basis Osmati	V <sub>DS</sub> = 150 V, V <sub>GS</sub> = 0 V			1	μА
	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 120 V, T <sub>C</sub> = 150°C			10	μА
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 25 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -25 V, V <sub>DS</sub> = 0 V			-100	nA
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> = 22.8 A		0.033	0.042	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 22.8 A		33		S
Dynami	ic Characteristics					
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V,		2500	3250	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz		520	670	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			100	130	pF
Switchi	ng Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 75 V, I <sub>D</sub> = 45.6 A,		35	80	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{DD} = 75 \text{ V}, I_D = 45.6 \text{ A},$ $R_G = 25 \Omega$		320	650	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	1.16 2011		210	430	ns
t <sub>f</sub>	Turn-Off Fall Time			200	410	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 120 V, I <sub>D</sub> = 45.6 A,		85	110	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V		15		nC
Q <sub>gd</sub>	Gate-Drain Charge		/	41		nC
Drain-S	ource Diode Characteristics a	nd Maximum Ratings				
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				45.6	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				182.4	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 45.6 A			1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 45.6 A,		130		ns
Q <sub>rr</sub>	Reverse Recovery Charge	$dl_{F}/dt = 100 A/\mu s$		0.55	/	μС

- 1. Repetitive rating : pulse-width limited by maximum junction temperature.
- 2. L = 0.52 mH, I $_{AS}$  = 45.6 A, V $_{DD}$  = 25 V, R $_{G}$  = 25  $\Omega$ , starting T $_{J}$  = 25°C.
- 3.  $I_{SD} \le$  45.6 A, di/dt  $\le$  300 A/ $\mu$ s .,  $V_{DD} \le$  BV $_{DSS_i}$  starting  $T_J$  = 25°C. 4. Essentially independent of operating temperature.

### **Typical Characteristics**

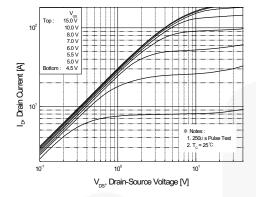


Figure 1. On-Region Characteristics

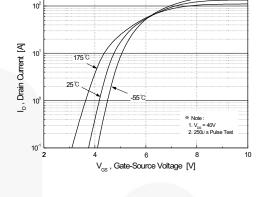


Figure 2. Transfer Characteristics

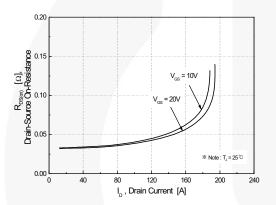


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

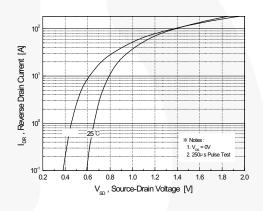


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

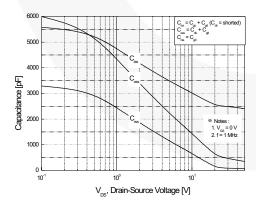


Figure 5. Capacitance Characteristics

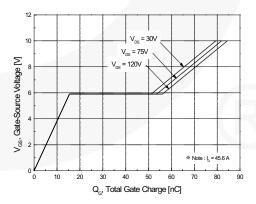


Figure 6. Gate Charge Characteristics

### Typical Characteristics (Continued)

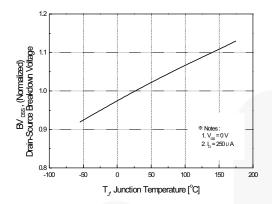
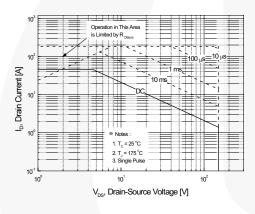


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



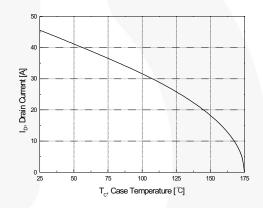


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

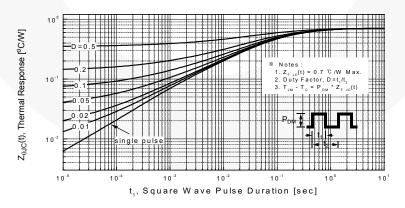


Figure 11. Transient Thermal Response Curve

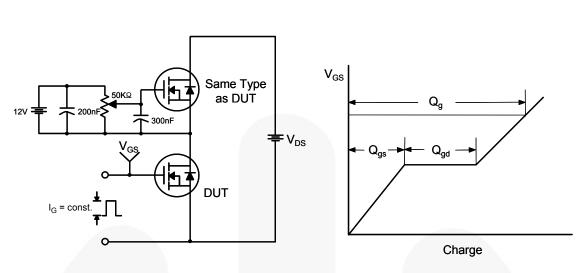


Figure 12. Gate Charge Test Circuit & Waveform

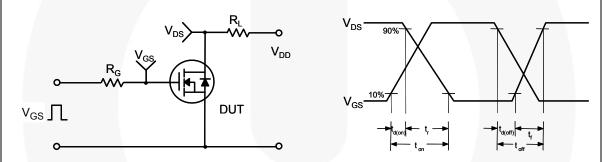


Figure 13. Resistive Switching Test Circuit & Waveforms

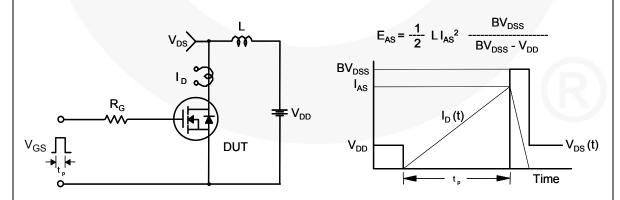
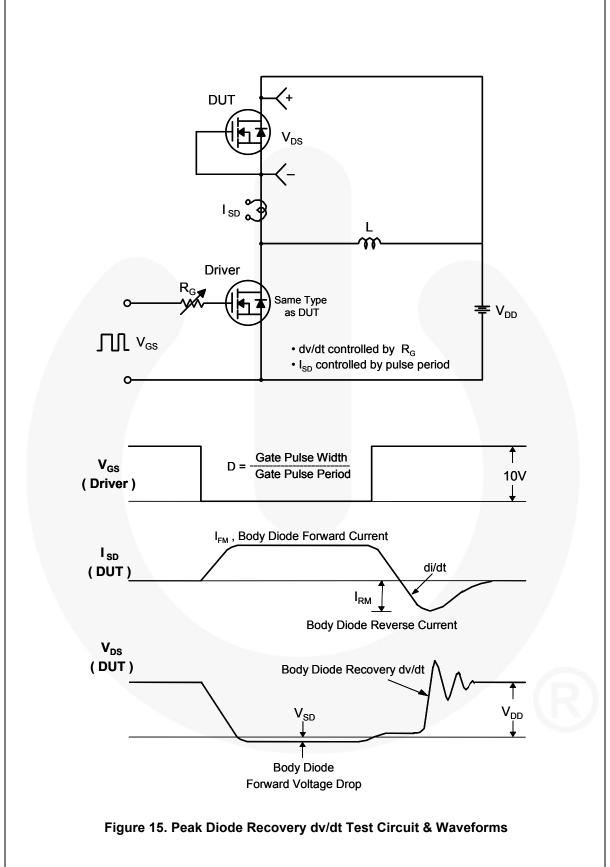


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



### **Mechanical Dimensions**

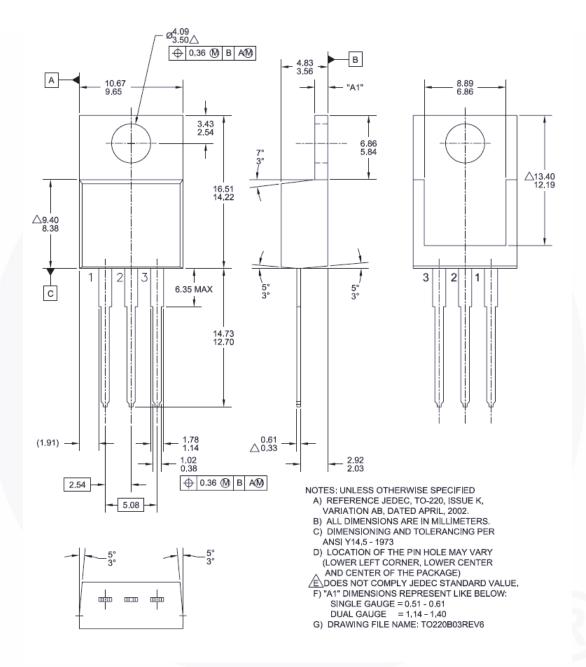


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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