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November 2013

# **FQP44N10**

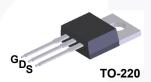
# N-Channel QFET<sup>®</sup> MOSFET 100 V, 43.5 A, 39 m $\Omega$

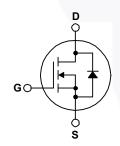
# **Description**

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

## **Features**

- 43.5 A, 100 V,  $R_{DS(on)}$  = 39 m $\Omega$  (Max.) @ $V_{GS}$  = 10 V,  $I_{D}$  = 21.75 A
- Low Gate Charge (Typ. 48 nC)
- Low Crss (Typ. 85 pF)
- · 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating





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

Symbol	Parameter		FQP44N10	Unit
$V_{DSS}$	Drain-Source Voltage		100	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)		43.5	Α
	- Continuous (T <sub>C</sub> = 100°C)	)	30.8	Α
I <sub>DM</sub>	Drain Current - Pulsed	(Note 1)	174	Α
V <sub>GSS</sub>	Gate-Source Voltage		± 25	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	530	mJ
AR	Avalanche Current	(Note 1)	43.5	Α
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	14.6	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C)		146	W
	- Derate above 25°C		0.97	W/°C
Г <sub>Ј</sub> , Т <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +175	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 seconds		300	°C

# **Thermal Characteristics**

Symbol	Parameter	FQP44N10	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.03	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W

# **Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP44N10	FQP44N10	TO-220	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	Units
Off Cha	racteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	100			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.1		V/°C
I <sub>DSS</sub>	Zana Cata Valta da Dasia Cumant	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V		-	1	μΑ
	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 80 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		I	-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> = 21.75 A		0.03	0.039	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 21.75 A	\	30		S
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		1400 425	1800 550	pF nF
Coss	Output Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0  MHz		425	550	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			85	110	pF
Switchi	ng Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time $V_{DD} = 50 \text{ V}, I_D = 43.5 \text{ A},$			19	45	ns
t <sub>r</sub>	Turn-On Rise Time	$R_{G} = 25 \Omega$		190	390	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	116 - 20 32		90	190	ns
t <sub>f</sub>	Turn-Off Fall Time			100	210	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 80 V, I <sub>D</sub> = 43.5 A,	/	48	62	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V		9.0		nC
Q <sub>gd</sub>	Gate-Drain Charge			24		nC
Drain-S	ource Diode Characteristics and Ma	aximum Ratings	•			
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Fo	rward Current			43.5	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward	d Current			174	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 43.5 A			1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 43.5 A,		98		ns
Q <sub>rr</sub>	Reverse Recovery Charge	$dI_F / dt = 100 A/\mu s$	_	360	+	nC

**Notes:** 1. Repetitive Rating : Pulse width limited by maximum junction temperature. 2. L = 0.42 mH,  $I_{AS}$  = 43.5 A,  $V_{DD}$  = 25 V,  $R_G$  = 25  $\Omega$ , starting  $T_J$  = 25°C. 3.  $I_{SD} \le 43.5$  A, di/dt  $\le 300$  A/µs,  $V_{DD} \le BV_{DSS}$ , starting  $T_J$  = 25°C. 4. Essentially independent of operating temperature.

# **Typical Characteristics**

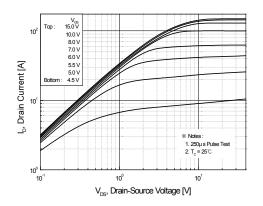


Figure 1. On-Region Characteristics

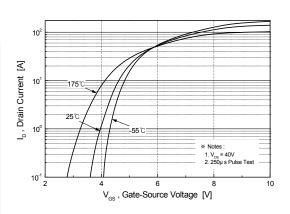


Figure 2. Transfer Characteristics

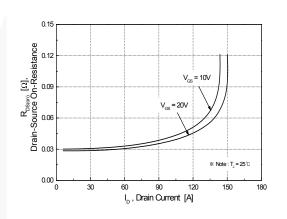


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

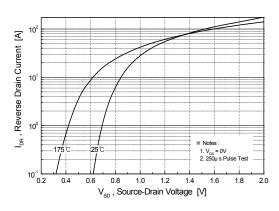


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

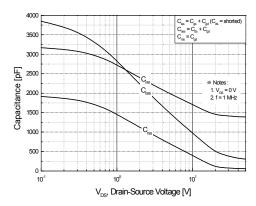


Figure 5. Capacitance Characteristics

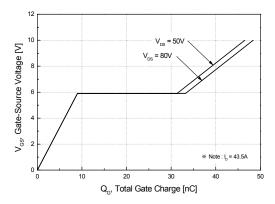


Figure 6. Gate Charge Characteristics

# **Typical Characteristics** (Continued)

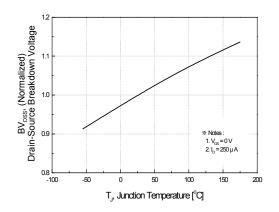


Figure 7. Breakdown Voltage Variation vs. Temperature

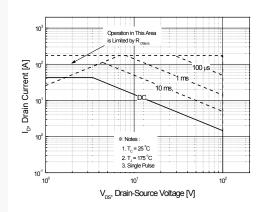


Figure 9. Maximum Safe Operating Area

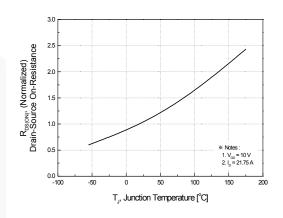


Figure 8. On-Resistance Variation vs. Temperature

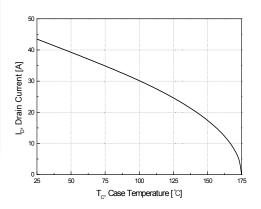


Figure 10. Maximum Drain Current vs. Case Temperature

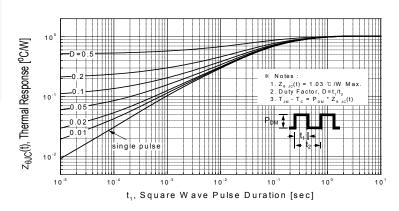


Figure 11. Transient Thermal Response Curve

Figure 12. Gate Charge Test Circuit & Waveform

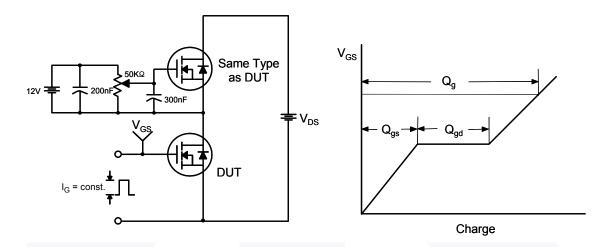


Figure 13. Resistive Switching Test Circuit & Waveforms

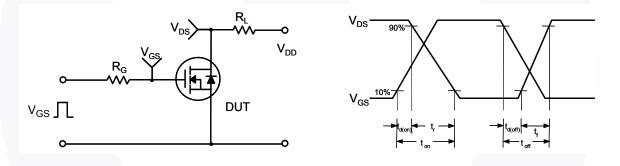
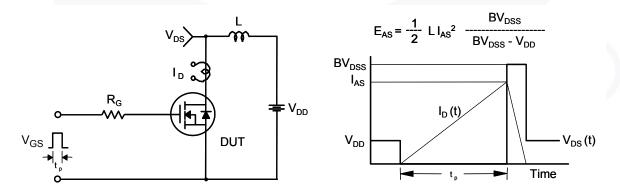
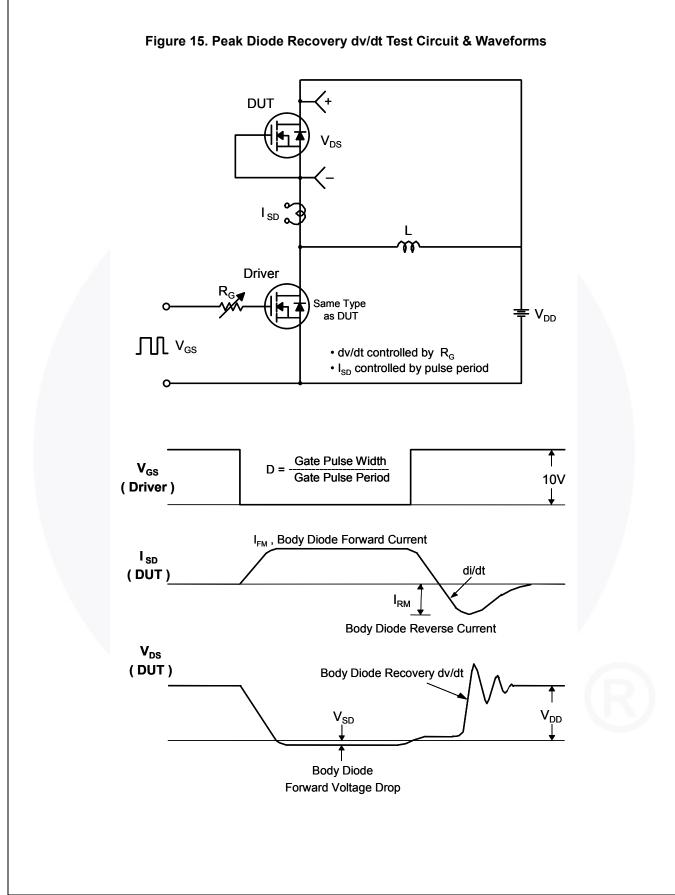
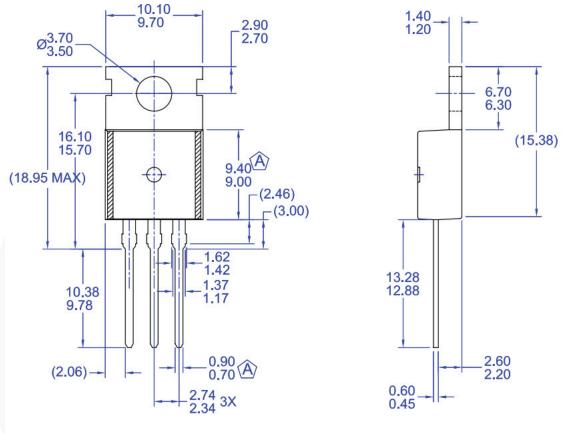


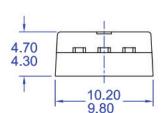
Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms





# **Mechanical Dimensions**





### NOTES:

- (A) CONFORMS TO JEDEC TO-220 VARIATION AB EXCEPT WHERE NOTED
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D) DRAWING FILE/REVISION: MKT-TO220Y03REV1

# Figure 16. TO220, Molded, 3-Lead, Jedec Variation AB

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