

November 2013

FQP30N06

N-Channel QFET $^{\circledR}$ MOSFET 60 V, 30 A, 40 m Ω

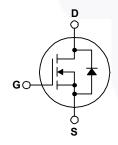
Description

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

- 30 A, 60 V, R_{DS(on)} = 40 m Ω (Max.) @ V_{GS} = 10 V, I_D = 15 A
- Low Gate Charge (Typ. 19 nC)
- · Low Crss (Typ. 40 pF)
- · 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating





Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter		FQP30N06	Unit	
V_{DSS}	Drain-Source Voltage		60	V	
I _D	Drain Current - Continuous (T _C = 25°C)		30	Α	
	- Continuous (T _C = 100°C)		21.3	Α	
I _{DM}	Drain Current - Pulsed	(Note 1)	120	Α	
V _{GSS}	Gate-Source Voltage		± 25	V	
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	280	mJ	
I _{AR}	Avalanche Current	(Note 1)	30	Α	
E _{AR}	Repetitive Avalanche Energy	(Note 1)	7.9	mJ	
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	7.0	V/ns	
P_{D}	Power Dissipation (T _C = 25°C)		79	W	
	- Derate above 25°C		0.53	W/°C	
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +175	°C	
T _L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 seconds		300	°C	

Thermal Characteristics

Symbol	Parameter	FQP30N06	Unit	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.90	°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
FQP30N06	FQP30N06	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
Off Cha	racteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V, } I_D = 250 \mu\text{A}$	60			V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C		0.06		V/°(
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 60 V, V _{GS} = 0 V			1	μΑ
	Zero Gate voltage Drain Current	V _{DS} = 48 V, T _C = 150°C			10	μΑ
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 25 V, V _{DS} = 0 V			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -25 V, V _{DS} = 0 V			-100	nA
On Cha	racteristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	2.0		4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 15 \text{ A}$		0.031	0.04	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 25 V, I _D = 15 A		16		S
Dynam i C _{iss}	ic Characteristics Input Capacitance	V - 25 V V - 0 V		725	945	pF
C _{oss}	Output Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		270	350	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1.0 WINZ		40	52	pF
	ng Characteristics					
t _{d(on)}	Turn-On Delay Time			10	30	ns
t _r	Turn-On Rise Time	$V_{DD} = 30 \text{ V}, I_D = 15 \text{ A},$		85	180	ns
t _{d(off)}	Turn-Off Delay Time	$R_G = 25 \Omega$		35	80	ns
t _f	Turn-Off Fall Time	(Note 4)		40	90	ns
Q _g	Total Gate Charge	V _{DS} = 48 V, I _D = 30 A,		19	25	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V		5.4		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		8.5		nC
Drain-S	ource Diode Characteristics and Ma	kimum Ratings	I.	I.		
I _S	Maximum Continuous Drain-Source Diode Forward Current				30	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward	Current			120	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 30 A		/	1.5	V
t _{rr}	Reverse Recovery Time			45		ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs		65		nC

Notes:

Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature. 2. L = $360 \, \mu H$, $I_{AS} = 30 \, A$, $V_{DD} = 25 \, V$, $R_G = 25 \, \Omega$, starting $T_J = 25^{\circ}C$. 3. $I_{SD} \leq 30 \, A$, $di/dt \leq 300 \, A/\mu s$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^{\circ}C$. 4. Essentially Independent of Operating Temperature.

Typical Characteristics

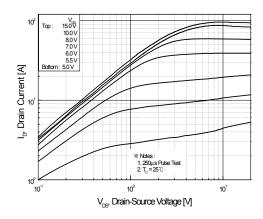


Figure 1. On-Region Characteristics

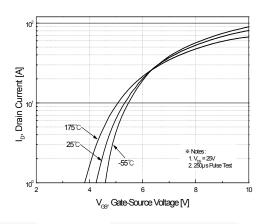


Figure 2. Transfer Characteristics

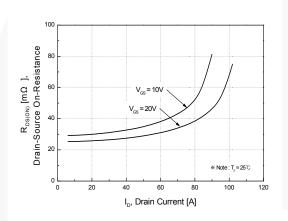


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

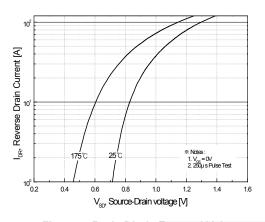


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

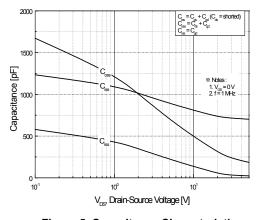


Figure 5. Capacitance Characteristics

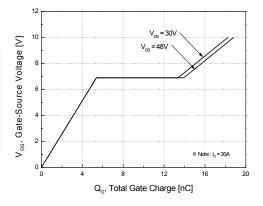


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

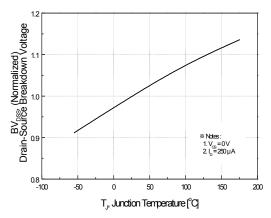


Figure 7. Breakdown Voltage Variation vs. Temperature

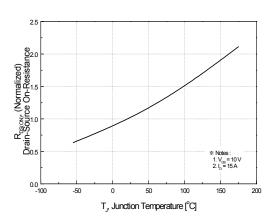


Figure 8. On-Resistance Variation vs. Temperature

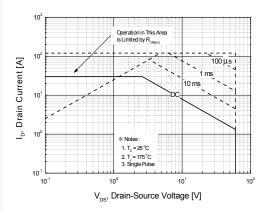


Figure 9. Maximum Safe Operating Area

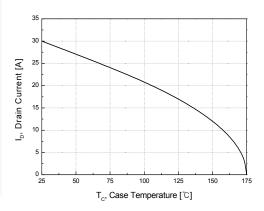


Figure 10. Maximum Drain Current vs. Case Temperature

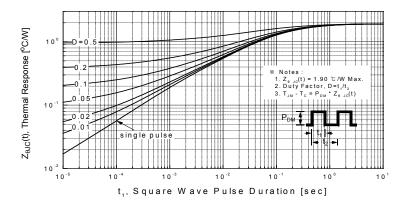


Figure 11. Transient Thermal Response Curve

Figure 12. Gate Charge Test Circuit & Waveform

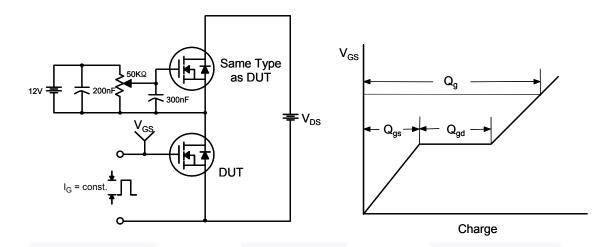


Figure 13. Resistive Switching Test Circuit & Waveforms

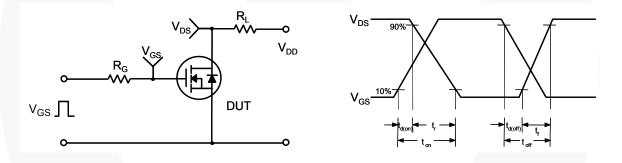
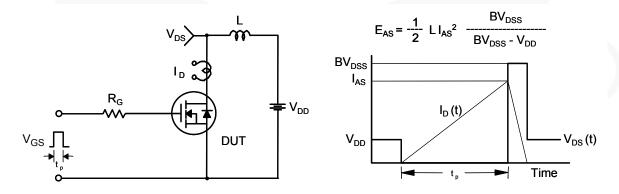


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



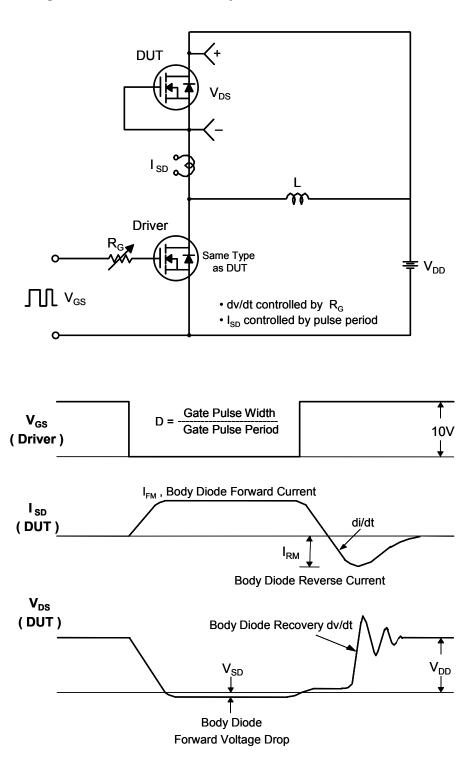
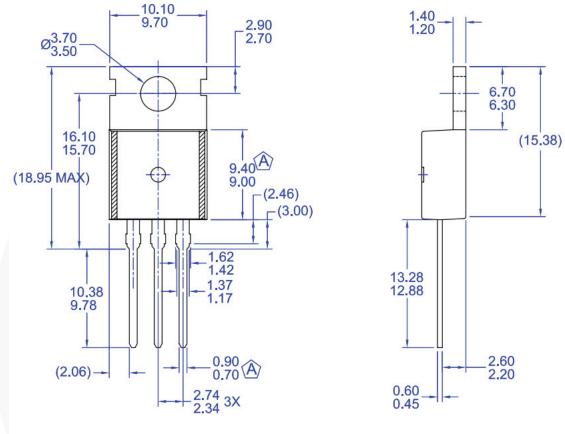
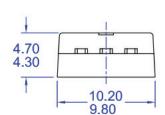


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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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