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November 2013

FQD30N06

N-Channel QFET® MOSFET

60 V, 22.7 A, 45 $m\Omega$

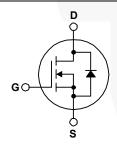
Description

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

- 22.7 A, 60 V, $R_{DS(on)}$ = 45 m Ω (Max.) @ V_{GS} = 10V, ID = 11.4 A
- Low Gate Charge (Typ. 19 nC)
- Low Crss (Typ. 40 pF)
- · 100% Avalanche Tested





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

Symbol	Parameter			FQD30N06TM	Unit	
V_{DSS}	Drain-Source V	ain-Source Voltage		60	V	
I _D	Drain Current - Continuous (T _C = 25°C)		°C)	22.7	Α	
		- Continuous (T _C = 100°C)		14.3	Α	
I _{DM}	Drain Current	- Pulsed	(Note 1)	90.8	Α	
V _{GSS}	Gate-Source Vo	/oltage		± 25	V	
E _{AS}	Single Pulsed A	Avalanche Energy (Note 2		280	mJ	
I _{AR}	Avalanche Current		(Note 1)	22.7	А	
E _{AR}	Repetitive Avala	epetitive Avalanche Energy		4.4	mJ	
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	7.0	V/ns	
P_{D}	Power Dissipation (T _A = 25°C) *			2.5	W	
_	Power Dissipation (T _C = 25°C)			44	W	
		- Derate above 25°C		0.35	W/°C	
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C	
T _L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		g purposes,	300	°C	
'L				300		

Thermal Characteristics

Symbol	Parameter	FQD30N06TM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.85	
P	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	110	°C/W
	Thermal Resistance, Junction to Ambient (*1 in ² Pad of 2-oz Copper), Max.	50	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQD30N06TM	FQD30N06	D-PAK	Tape and Reel	330 mm	16 mm	2500 units

Electrical Characteristics T_c = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions		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/°C
I _{DSS}	7 0 1 1/4 5 1 0 1	V _{DS} = 60 V, V _{GS} = 0 V			1	μΑ
	Zero Gate Voltage Drain Current	V _{DS} = 48 V, T _C = 125°C			10	μA
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	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0		4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 11.4 A		0.036	0.045	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 25 V, I _D = 11.4 A		15		S
Dynami	ic Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz		725	945	pF
C _{oss}	Output Capacitance			270	350	pF
C _{rss}	Reverse Transfer Capacitance			40	52	pF
Switchi	ng Characteristics					
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 30 \text{ V}, I_{D} = 15 \text{ A},$ $R_{G} = 25 \Omega$		10	30	ns
t _r	Turn-On Rise Time			85	180	ns
$t_{d(off)}$	Turn-Off Delay Time	2032		35	80	ns
t _f	Turn-Off Fall Time	(Note 4)		40	90	ns
Qg	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 a	nd Maximum Ratings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				22.7	Α
I _{SM}	Maximum Pulsed Drain-Source Diode F	Forward Current			90.8	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 22.7 A			1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _F = 30 A,		45		ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs		65	//	nC

Notes: 1. Repetitive rating : pulse-width limited by maximum junction temperature. 2. L = 630 μ H, I_{AS} = 22.7 A, V_{DD} = 25 V, R_G = 25 Ω , starting T_J = 25°C. 3. I_{SD} ≤ 30 A, di/dt ≤ 300 A/ μ s, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C. 4. Essentially independent of operating temperature.

Typical Characteristics

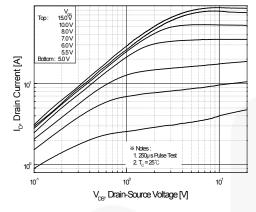


Figure 1. On-Region Characteristics

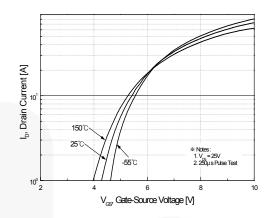


Figure 2. Transfer Characteristics

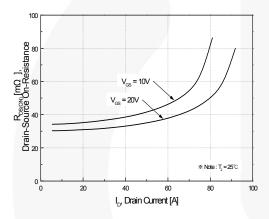


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

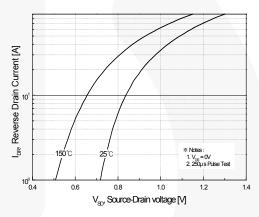


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

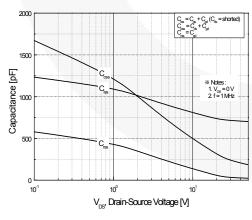


Figure 5. Capacitance Characteristics

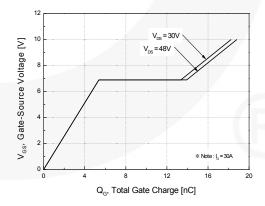


Figure 6. Gate Charge Characteristics

Por Source Breakdown Voltage *Normalized BV Ess.* (Normalized) *Normalized *Nor

0.8 L -100

Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

T,, Junction Temperature [°C]

150

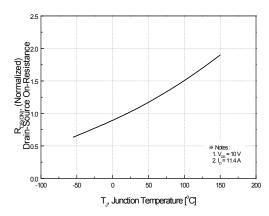


Figure 8. On-Resistance Variation vs. Temperature

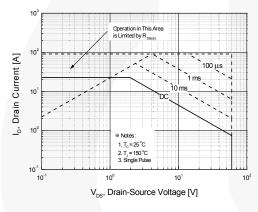


Figure 9. Maximum Safe Operating Area

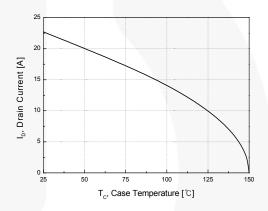


Figure 10. Maximum Drain Current vs. Case Temperature

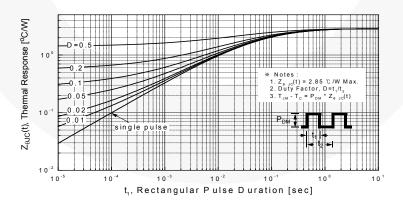


Figure 11. Transient Thermal Response Curve

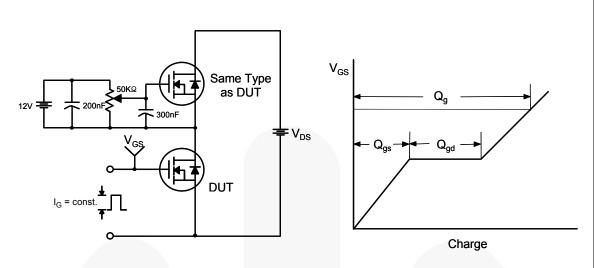


Figure 12. Gate Charge Test Circuit & Waveform

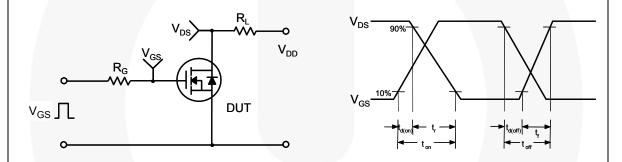


Figure 13. Resistive Switching Test Circuit & Waveforms

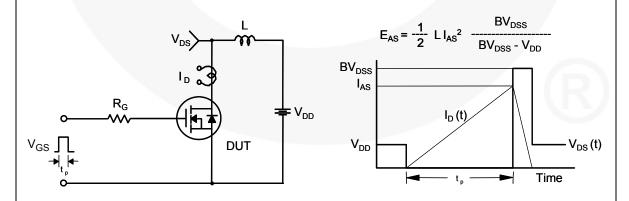
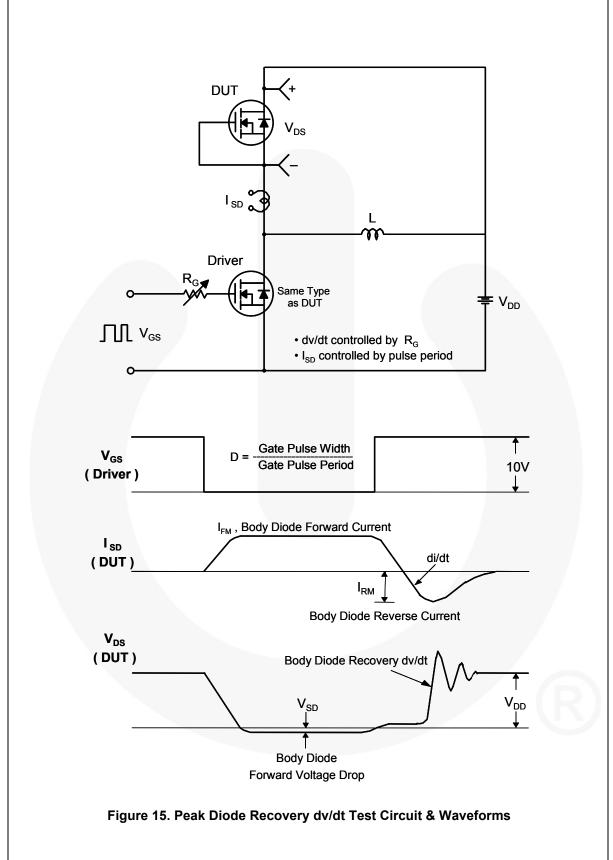


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

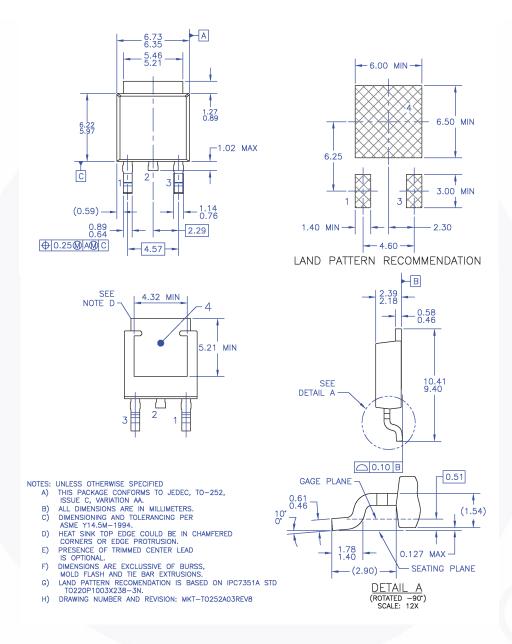


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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