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Januray 2014

FQD11P06 / FQU11P06

P-Channel QFET® MOSFET

-60 V, -9.4 A, 185 mΩ

Description

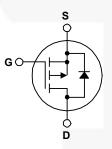
This P-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, • 100% Avalanche Tested DC motor control, and variable switching power applications...

Features

- -9.4 A, -60 V, $R_{DS(on)}$ = 185 m Ω (Max.) @ V_{GS} = -10 V, $I_D = -4.7 A$
- Low Gate Charge (Typ. 13 nC)
- Low Crss (Typ. 45 pF)







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

Symbol	Parameter		FQD11P06TM / FQU11P06TU	Unit
V _{DSS}	Drain-Source Voltage		-60	V
I _D	Drain Current - Continuous (T _C = 25°C)		-9.4	Α
	- Continuous (T _C = 100°C)		-5.95	Α
I _{DM}	Drain Current - Pulsed	(Note 1)	-37.6	Α
V _{GSS}	Gate-Source Voltage		± 30	V
E _{AS}	Single Pulsed Avalanche Energy		160	mJ
I _{AR}	Avalanche Current	(Note 1)	-9.4	Α
E _{AR}	Repetitive Avalanche Energy	(Note 1)	3.8	mJ
dv/dt	Peak Diode Recovery dv/dt (Note		-7.0	V/ns
P _D	Power Dissipation (T _A = 25°C) *		2.5	W
	Power Dissipation (T _C = 25°C)		38	W
	- Derate above 25°C		0.3	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T _L	Maximum lead temperature for soldering, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FQD11P06TM / FQU11P06TU	Unit	
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max. 3.28			
Ъ	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	110	°C/W	
$R_{\theta JA}$	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
FQD11P06TM	FQD11P06	D-PAK	Tape and Reel	330 mm	16 mm	2500 units
FQU11P06TU	FQU11P06	I-PAK	Tube	N/A	N/A	70 units

Flectrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Cha	aracteristics					
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		-0.07		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -60 V, V _{GS} = 0 V		-	-1	μΑ
		V _{DS} = -48 V, T _C = 125°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		ł	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 = -4.7 A		0.15	0.185	Ω
9 _{FS}	Forward Transconductance	V _{DS} = -30 V, I _D = -4.7 A		4.9		S
Dynam	ic Characteristics					
C _{iss}	Input Capacitance	V _{DS} = -25 V, V _{GS} = 0 V,		420	550	pF
C _{oss}	Output Capacitance	f = 1.0 MHz		195	250	pF
C _{rss}	Reverse Transfer Capacitance			45	60	pF
Switch	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = -30 V, I _D = -5.7 A,		6.5	25	ns
t _r	Turn-On Rise Time	$V_{DD} = -30 \text{ V, } I_{D} = -3.7 \text{ A,}$ $R_{G} = 25 \Omega$		40	90	ns
t _{d(off)}	Turn-Off Delay Time	11G - 20 sz		15	40	ns
t _f	Turn-Off Fall Time	(Note 4)		45	100	ns
Qg	Total Gate Charge	V _{DS} = -48 V, I _D = -11.4 A,		13	17	nC
Q _{gs}	Gate-Source Charge	V _{GS} = -10 V	/	2.0		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		6.3		nC
Drain-S	Source Diode Characteristics ar	nd Maximum Ratings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				-9.4	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current			-	-37.6	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = -9.4 A		-	-4.0	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = -11.4 A,		83	//	ns

- **Notes:** 1. Repetitive rating: pulse-width limited by maximum junction temperature. 2. L = 2.1 mH, I_{AS} = -9.4 A, V_{DD} = -25 V, R_G = 25 Ω , starting T_J = 25°C. 3. I_{SD} ≤ -11.4 A, di/dt ≤ 300 A/ μ s, V_{DD} ≤ BV $_{DSS}$, starting T_J = 25°C. 4. Essentially independent of operating temperature.

Typical Characteristics

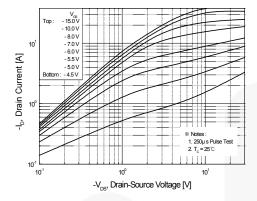
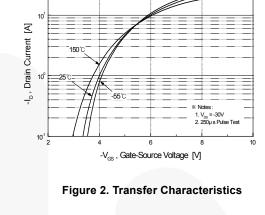


Figure 1. On-Region Characteristics



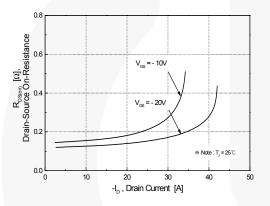


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

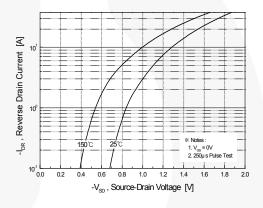


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

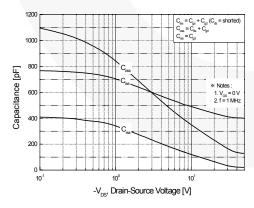


Figure 5. Capacitance Characteristics

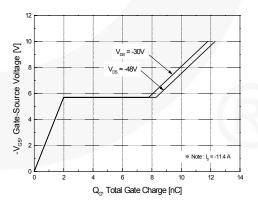


Figure 6. Gate Charge Characteristics

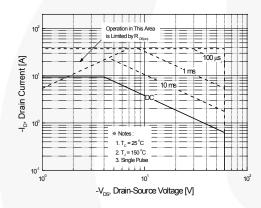
Drain-Source Breakdown Voltage 1.0 1.1 ** Notes: 1.V_{ox}=0V 2.V_b=-250µA

Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

T,, Junction Temperature [°C]

Figure 8. On-Resistance Variation vs. Temperature



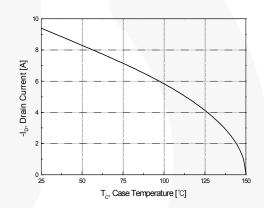


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

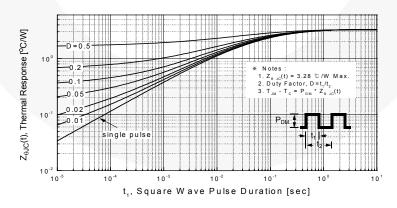


Figure 11. Transient Thermal Response Curve

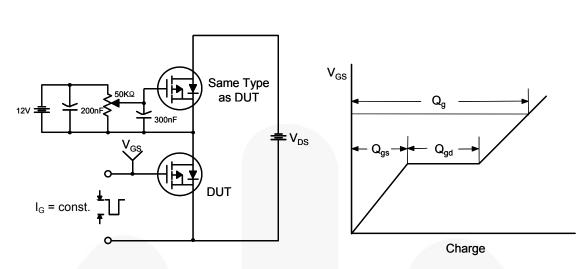


Figure 12. Gate Charge Test Circuit & Waveform

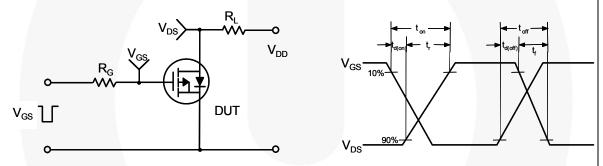


Figure 13. Resistive Switching Test Circuit & Waveforms

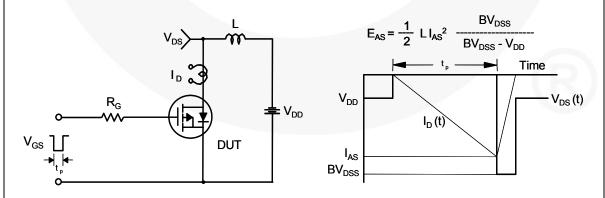
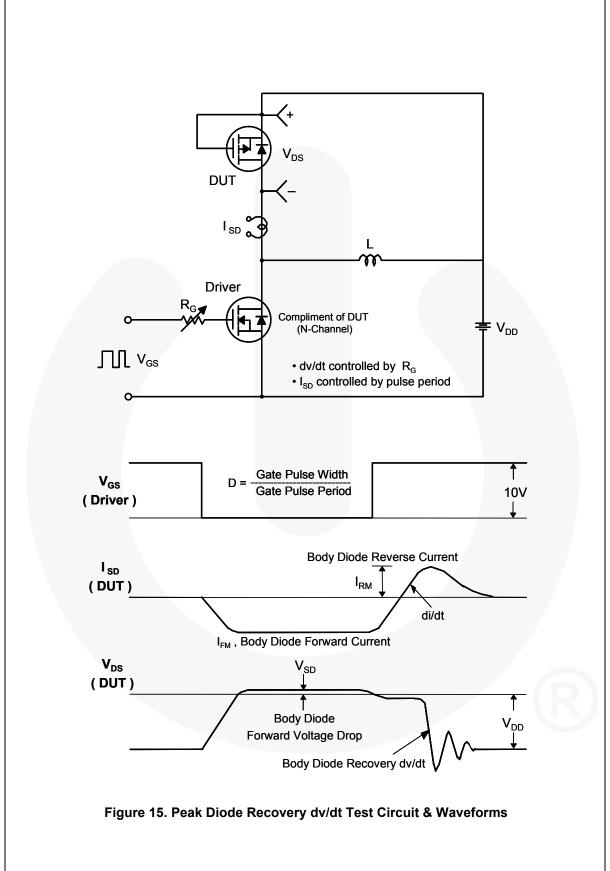


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



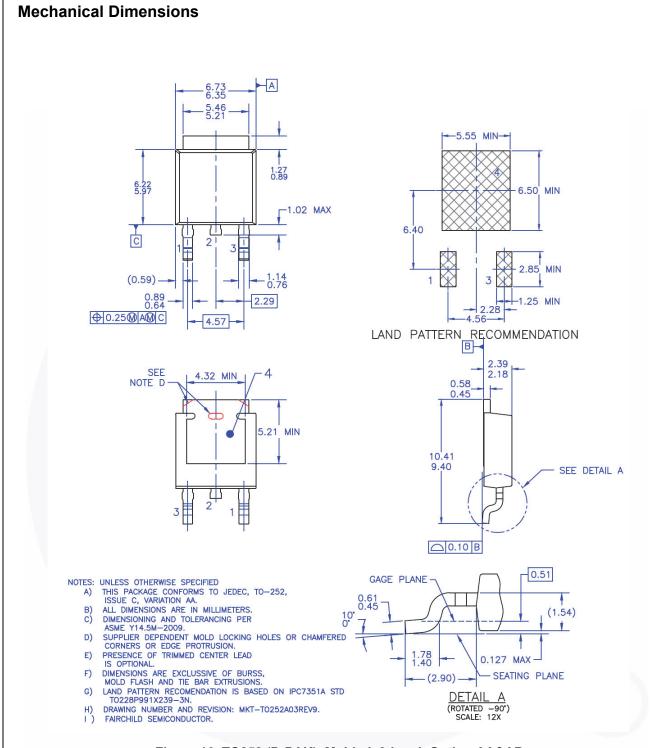


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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Figure 17. TO251 (I-PAK), Molded, 3-Lead

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