

FQU20N06L N-Channel QFET® MOSFET 60 V, 17.2 A, 42 mΩ

July 2013

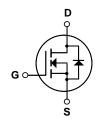
Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor® 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

- 17.2 A, 60 V, $R_{DS(on)}$ =42 $m\Omega(Max.)@V_{GS}$ =10 V, I_D =8.6A
- Low Gate Charge (Typ. 9.5 nC)
- Low C_{rss} (Typ. 35 pF)
- · 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating





Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FQU20N06L	Unit
V _{DSS}	Drain-Source Voltage		60	V
I _D	Drain Current - Continuous (T _C = 25°C) - Continuous (T _C = 100°C)		17.2	А
			10.9	А
I _{DM}	Drain Current - Pulsed	(Note 1)	68.8	А
V_{GSS}	Gate-Source Voltage		± 20	V
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	170	mJ
I _{AR}	Avalanche Current	(Note 1)	17.2	А
E _{AR}	Repetitive Avalanche Energy	(Note 1)	3.8	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)		38	W
- Derate above 25°C			0.30	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		300	°C

Thermal Characteristics

Symbol	Parameter	FQU20N06L	Unit	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.28	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max. *	50	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	110	°C/W	

* When mounted on the minimum pad size recommended (PCB Mount)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
Off Cha	aracteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$				V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C		0.06		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} = 20 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -20 V, V _{DS} = 0 V			-100	nA
On Cha	racteristics		1			
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	1.0		2.5	V
R _{DS(on)}	Static Drain-Source	V _{GS} = 10 V, I _D = 8.6 A		0.046	0.06	
. D2(on)	On-Resistance	V _{GS} =5V,I _D =8.6A		0.040	0.075	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 25 V, I _D = 8.6 A		11		S
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		480 175	630	pF nF
C _{oss}	Output Capacitance	f = 1.0 MHz		175	230	pF
C _{rss}	Reverse Transfer Capacitance			35	45	pF
Switch	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	V 20 V I 40 F A		10	30	ns
t _r	Turn-On Rise Time	$V_{DD} = 30 \text{ V}, I_{D} = 10.5 \text{ A},$ $R_{G} = 25 \Omega$		165	340	ns
t _{d(off)}	Turn-Off Delay Time	NG - 23 22		35	80	ns
t _f	Turn-Off Fall Time	(Note 4)		70	150	ns
Qg	Total Gate Charge	V _{DS} = 48 V, I _D = 21 A,		9.5	13	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 5 V		2.5		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		5.5		nC
⊶ga	Gale-Dialii Charge			5.5		TIC
Drain-S	Source Diode Characteristics a	nd Maximum Ratings				
Drain-S	Source Diode Characteristics at Maximum Continuous Drain-Source Dio				17.2	Α
I _S		ode Forward Current			17.2 68.8	A
I _S	Maximum Continuous Drain-Source Did Maximum Pulsed Drain-Source Diode F	ode Forward Current Forward Current				
I _S	Maximum Continuous Drain-Source Dic	ode Forward Current			68.8	Α

- Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature 2. L = $670\mu H$, $I_{AS} = 17.2A$, $V_{DD} = 25V$, $R_G = 25~\Omega$. Starting $T_J = 25^\circ C$ 3. $I_{SD} \le 21A$, $di/dt \le 300A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25^\circ C$ 4. Essentially independent of operating temperature

Typical Characteristics

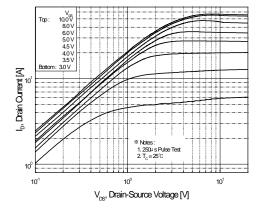


Figure 1. On-Region Characteristics

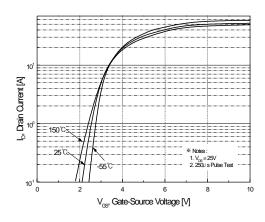


Figure 2. Transfer Characteristics

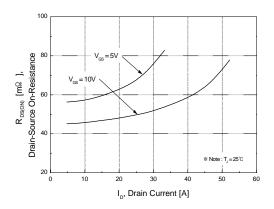


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

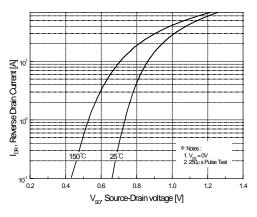


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

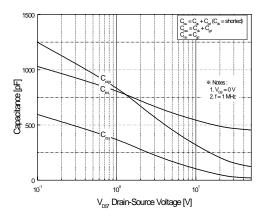


Figure 5. Capacitance Characteristics

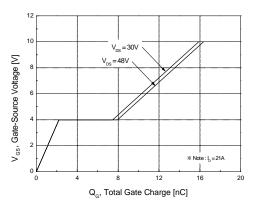
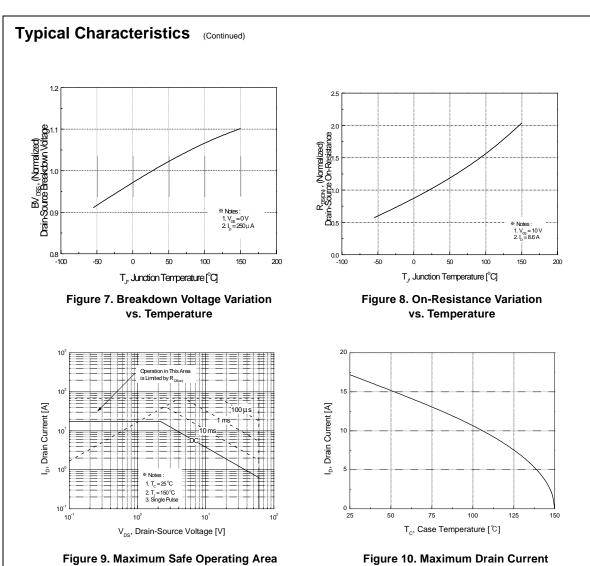


Figure 6. Gate Charge Characteristics



vs. Case Temperature

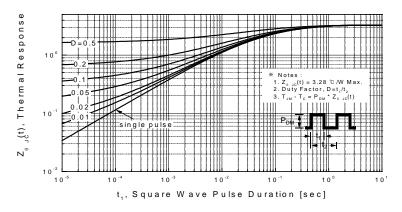
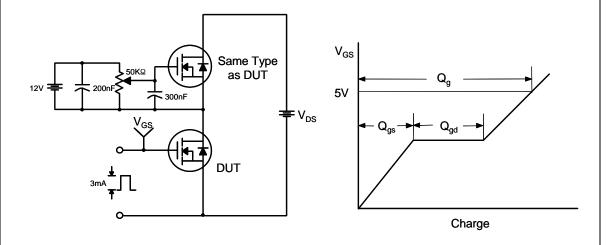
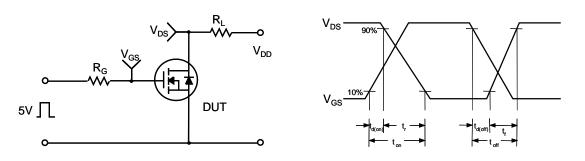


Figure 11. Transient Thermal Response Curve

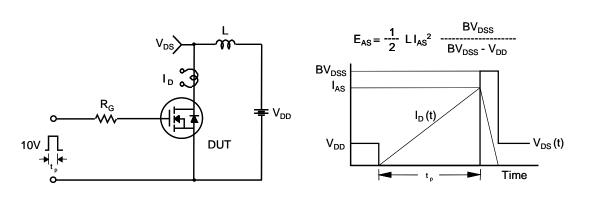
Gate Charge Test Circuit & Waveform



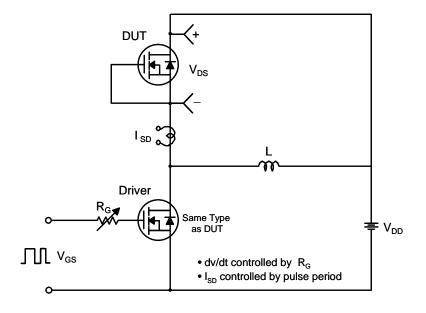
Resistive Switching Test Circuit & Waveforms

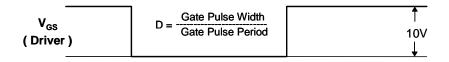


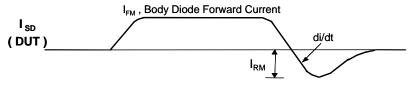
Unclamped Inductive Switching Test Circuit & Waveforms



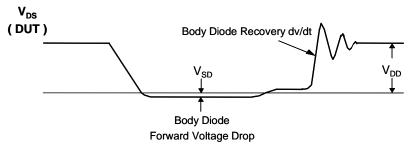
Peak Diode Recovery dv/dt Test Circuit & Waveforms

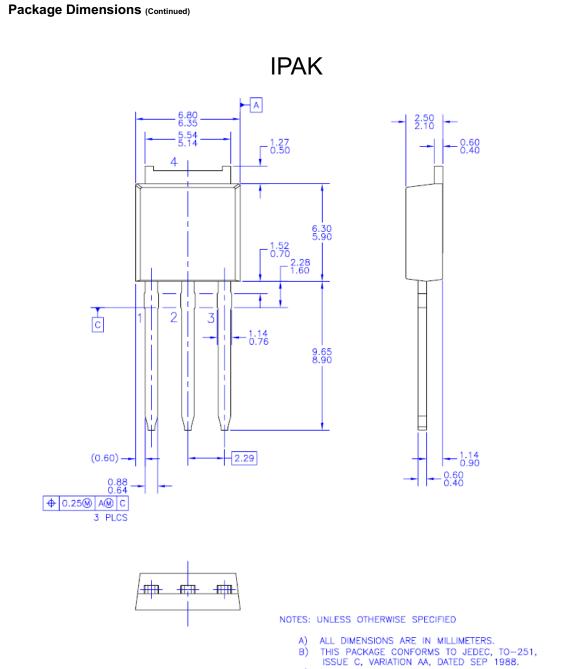






Body Diode Reverse Current





- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

TO-251 (IPAK) MOLDED, 3LEAD, OPTION AA

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Dimensions in Millimeters





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