



FQD30N06L / FQU30N06L

60V LOGIC N-Channel MOSFET

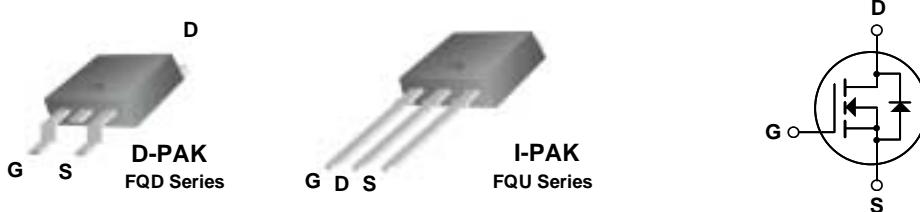
General Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for low voltage applications such as automotive, DC/DC converters, and high efficiency switching for power management in portable and battery operated products.

Features

- 24A, 60V, $R_{DS(on)} = 0.039\Omega$ @ $V_{GS} = 10V$
- Low gate charge (typical 15 nC)
- Low C_{rss} (typical 50 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- 150°C maximum junction temperature rating
- Low level gate drive requirements allowing direct operation from logic drivers



Absolute Maximum Ratings

$T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	FQD30N06L / FQR30N06L	Units
V_{DSS}	Drain-Source Voltage	60	V
I_D	Drain Current - Continuous ($T_C = 25^\circ C$)	24	A
	- Continuous ($T_C = 100^\circ C$)	15	A
I_{DM}	Drain Current - Pulsed	(Note 1)	A
V_{GSS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	mJ
I_{AR}	Avalanche Current	(Note 1)	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	V/ns
P_D	Power Dissipation ($T_A = 25^\circ C$) *	2.5	W
	Power Dissipation ($T_C = 25^\circ C$)	44	W
	- Derate above $25^\circ C$	0.35	W/ $^\circ C$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	2.85	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *	--	50	$^\circ C/W$
$R_{\theta CA}$	Thermal Resistance, Case-to-Ambient	--	110	$^\circ C/W$

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

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60	--	--	V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.07	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 60 \text{ V}, V_{\text{GS}} = 0 \text{ V}$	--	--	1	μA
		$V_{\text{DS}} = 48 \text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 20 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -20 \text{ V}, V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA

On Characteristics

$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = 5 \text{ V}, I_D = 250 \mu\text{A}$	1.0	--	2.5	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}, I_D = 12 \text{ A}$	--	0.031	0.039	Ω
		$V_{\text{GS}} = 5 \text{ V}, I_D = 12 \text{ A}$	--	0.038	0.047	
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 25 \text{ V}, I_D = 12 \text{ A}$ (Note 4)	--	23	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}, V_{\text{GS}} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	800	1040	pF
C_{oss}	Output Capacitance		--	270	350	pF
C_{rss}	Reverse Transfer Capacitance		--	50	65	pF

Switching Characteristics

$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 30 \text{ V}, I_D = 16 \text{ A}, R_G = 25 \Omega$	--	15	40	ns
t_r	Turn-On Rise Time		--	210	430	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	55	120	ns
t_f	Turn-Off Fall Time		--	110	230	ns
Q_g	Total Gate Charge	$V_{\text{DS}} = 48 \text{ V}, I_D = 32 \text{ A}, V_{\text{GS}} = 5 \text{ V}$	--	15	20	nC
Q_{gs}	Gate-Source Charge		--	3.5	--	nC
Q_{gd}	Gate-Drain Charge		--	8.5	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	24	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	96	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}, I_S = 24 \text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}, I_F = 32 \text{ A}, dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	55	--	ns
Q_{rr}	Reverse Recovery Charge	(Note 4)	--	80	--	nC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 0.8\text{mH}$, $I_{AS} = 24\text{A}$, $V_{DD} = 25\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 32\text{A}$, $dI/dt \leq 300\text{A}/\mu\text{s}$, $V_{DD} \leq \text{BV}_{\text{DSS}}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\text{\mu s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

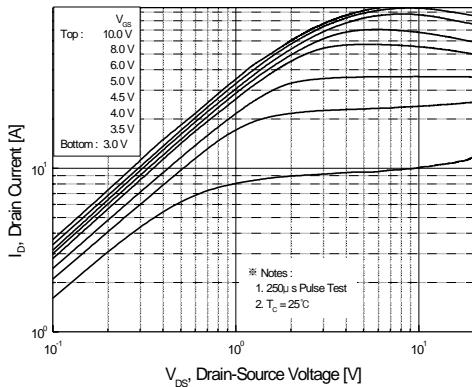


Figure 1. On-Region Characteristics

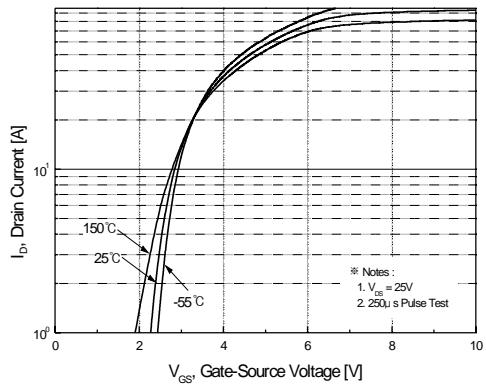


Figure 2. Transfer Characteristics

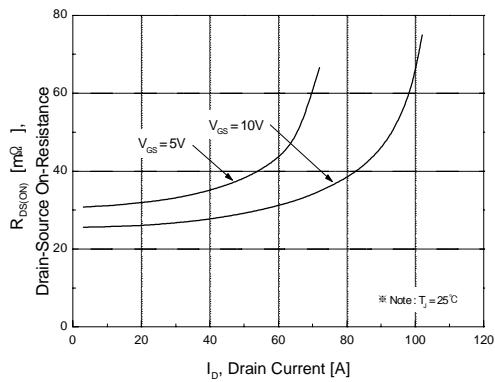


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

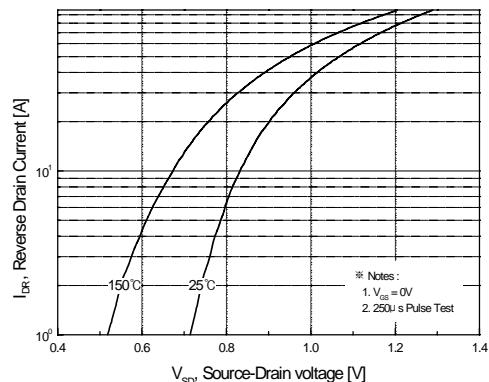


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

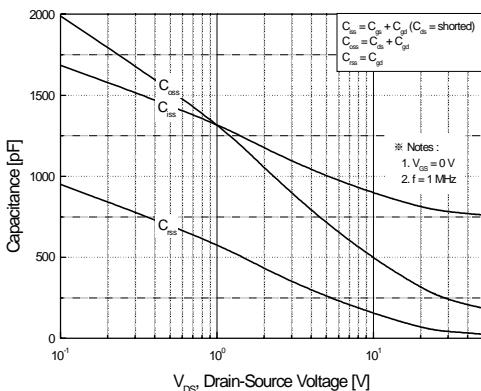


Figure 5. Capacitance Characteristics

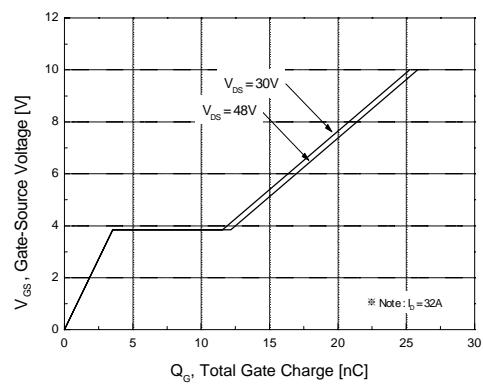


Figure 6. Gate Charge Characteristics