

FQPF50N06L

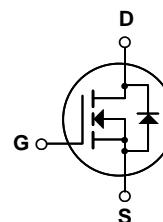
60V LOGIC N-Channel MOSFET

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

- 32.6A, 60V, $R_{DS(on)} = 0.021\Omega @ V_{GS} = 10\text{ V}$
- Low gate charge (typical 24.5 nC)
- Low C_{RSS} (typical 90 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- 175°C maximum junction temperature rating



Absolute Maximum Ratings

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

Symbol	Parameter	FQPF50N06L	Units
V_{DSS}	Drain-Source Voltage	60	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	32.6	A
	- Continuous ($T_C = 100^\circ\text{C}$)	23.1	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 ($T_C = 25^\circ\text{C}$)	47	W
	- Derate above 25°C	0.31	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	3.22	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics

$T_C = 25^\circ\text{C}$ 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	--	0.06	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 60 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$	--	--	1	μA
		$V_{\text{DS}} = 48 \text{ V}$, $T_C = 150^\circ\text{C}$	--	--	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	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250 \mu\text{A}$	1.0	--	2.5	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}$, $I_D = 16.3 \text{ A}$	--	0.017	0.021	Ω
		$V_{\text{GS}} = 5 \text{ V}$, $I_D = 16.3 \text{ A}$	--	0.020	0.025	
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 25 \text{ V}$, $I_D = 16.3 \text{ A}$ (Note 4)	--	35	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$	--	1250	1630	pF
C_{oss}	Output Capacitance		--	445	580	pF
C_{rss}	Reverse Transfer Capacitance		--	90	120	pF

Switching Characteristics

$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 30 \text{ V}$, $I_D = 26.2 \text{ A}$, $R_G = 25 \Omega$	--	20	50	ns
t_r	Turn-On Rise Time		--	380	770	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	80	170	ns
t_f	Turn-Off Fall Time		--	145	300	ns
Q_g	Total Gate Charge	$V_{\text{DS}} = 48 \text{ V}$, $I_D = 52.4 \text{ A}$, $V_{\text{GS}} = 5 \text{ V}$	--	24.5	32	nC
Q_{gs}	Gate-Source Charge		--	6	--	nC
Q_{gd}	Gate-Drain Charge		--	14.5	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	32.6	A		
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	130	A		
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 32.6 \text{ A}$	--	--	1.5	V	
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 52.4 \text{ A}$,	--	65	--	ns	
Q_{rr}	Reverse Recovery Charge	$dI_F / dt = 100 \text{ A}/\mu\text{s}$	(Note 4)	--	125	--	nC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 1.1\text{mH}$, $I_{AS} = 32.6\text{A}$, $V_{DD} = 25\text{V}$, $R_G = 25 \Omega$. Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 52.4\text{A}$, $dI/dt \leq 300\text{A}/\mu\text{s}$, $V_{DD} \leq \text{BV}_{\text{DSS}}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

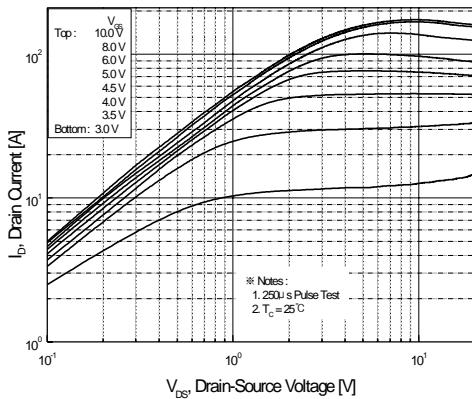


Figure 1. On-Region Characteristics

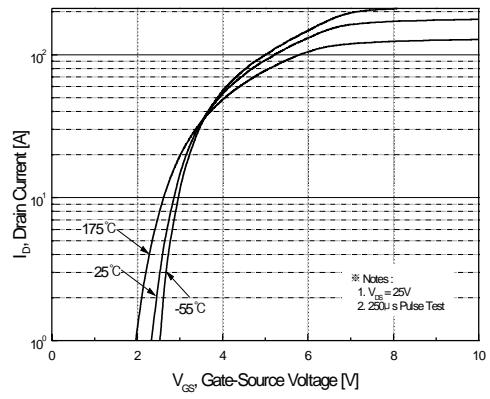


Figure 2. Transfer Characteristics

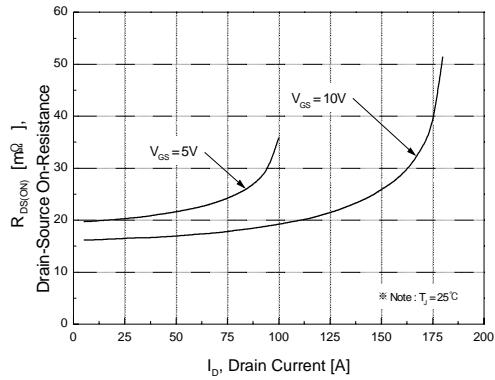


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

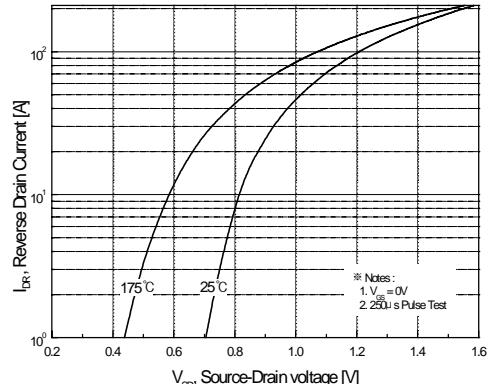


Figure 4. Body Diode Forward Voltage
Variation vs. Source Current
and Temperature

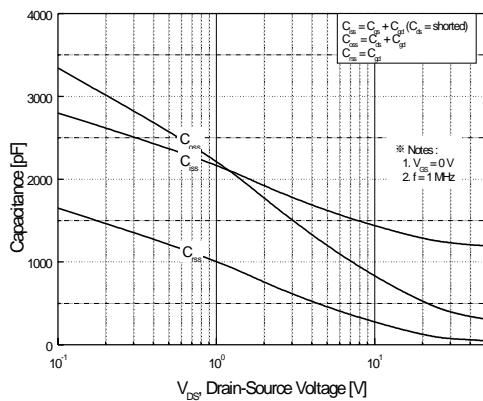


Figure 5. Capacitance Characteristics

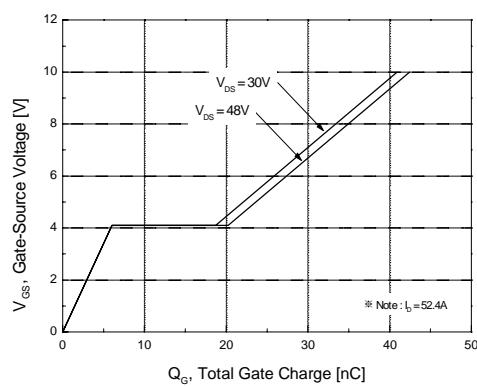


Figure 6. Gate Charge Characteristics