



# FQD7N10L / FQU7N10L

## 100V LOGIC N-Channel MOSFET

### **General Description**

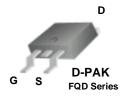
These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

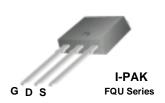
This advanced technology is especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation modes. These devices are well suited for low voltage applications such as high efficiency switching DC/DC converters, and DC motor control.

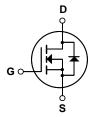
#### **Features**

- 5.8A, 100V,  $R_{DS(on)} = 0.35\Omega$  @ $V_{GS} = 10$  V
- Low gate charge (typical 4.6 nC)
- Low Crss (typical 12 pF)
- Fast switching
- 100% avalanche tested
- · Improved dv/dt capability
- Low level gate drive requirments allowing direct operation from logic drives
- · RoHS Compliant









# **Absolute Maximum Ratings** $T_C = 25$ °C unless otherwise noted

Symbol	Parameter		FQD7N10L / FQU7N10L	Units
V <sub>DSS</sub>	Drain-Source Voltage		100	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C	C)	5.8	Α
	- Continuous (T <sub>C</sub> = 100°C)		3.67	А
I <sub>DM</sub>	Drain Current - Pulsed	(Note 1)	23.2	А
V <sub>GSS</sub>	Gate-Source Voltage		± 20	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	50	mJ
I <sub>AR</sub>	Avalanche Current	(Note 1)	5.8	А
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	2.5	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>A</sub> = 25°C) *		2.5	W
	Power Dissipation (T <sub>C</sub> = 25°C)		25	W
	- Derate above 25°C		0.2	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C
T <sub>L</sub>	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

# **Thermal Characteristics**

Symbol	Parameter	Тур	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case		5.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *		50	°C/W
$R_{\theta JA}$	R <sub>BJA</sub> Thermal Resistance, Junction-to-Ambient		110	°C/W

<sup>\*</sup> When mounted on the minimum pad size recommended (PCB Mount)

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Cha	aracteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V, I}_{D} = 250 \mu\text{A}$				V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.1		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V			1	μΑ
		V <sub>DS</sub> = 80 V, T <sub>C</sub> = 125°C			10	μΑ
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -20 V, V <sub>DS</sub> = 0 V			-100	nA
On Cha	racteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	1.0		2.0	V
R <sub>DS(on)</sub>	Static Drain-Source	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.9 A		0.275	0.35	
	On-Resistance	V <sub>GS</sub> = 5 V, I <sub>D</sub> = 2.9 A		0.300	0.38 Ω	Ω
9 <sub>FS</sub>	Forward Transconductance	$V_{DS} = 30 \text{ V}, I_{D} = 2.9 \text{ A}$ (Note	4)	4.6		S
Dynam	ic Characteristics					
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V,		220	290	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz		55	72	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			12	15	pF
Switchi	ing Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	V 50 V L 72 A		9	30	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{DD} = 50 \text{ V}, I_{D} = 7.3 \text{ A},$ $R_{G} = 25 \Omega$		100	210	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	NG - 23 32		17	45	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4,	5)	50	110	ns
Qg	Total Gate Charge	$V_{DS} = 80 \text{ V}, I_{D} = 7.3 \text{ A},$		4.6	6.0	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 5 V		1.0		nC
Q <sub>gd</sub>	Gate-Drain Charge	(Note 4, 5)		2.6		nC
Drain S	Source Diode Characteristics as	ad Maximum Patings				
l <sub>S</sub>	Source Diode Characteristics and Maximum Ratings  Maximum Continuous Drain-Source Diode Forward Current				5.8	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				23.2	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V, } I_{S} = 5.8 \text{ A}$			1.5	V
t <sub>rr</sub>	Reverse Recovery Time	$V_{GS} = 0 \text{ V, } I_{S} = 7.3 \text{ A,}$		70		ns
Q <sub>rr</sub>	Reverse Recovery Charge	$dI_F / dt = 100 \text{ A/}\mu\text{s}$ (Note	4)	140		nC

- Notes: 
  1. Repetitive Rating : Pulse width limited by maximum junction temperature 2. L = 2.23mH, I<sub>AS</sub> = 5.8A, V<sub>DD</sub> = 25V, R<sub>G</sub> = 25 Ω, Starting T<sub>J</sub> = 25°C 3. I<sub>SD</sub> ≤ 7.3A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C 4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2% 5. Essentially independent of operating temperature

# **Typical Characteristics**

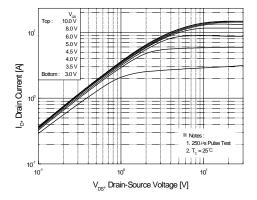


Figure 1. On-Region Characteristics

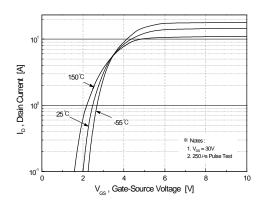


Figure 2. Transfer Characteristics

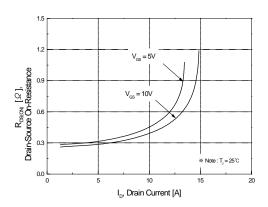


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

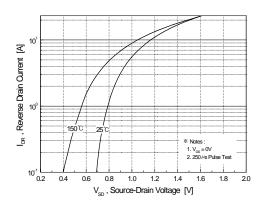


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

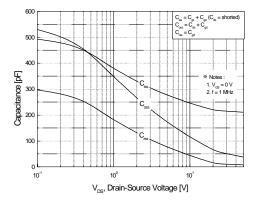


Figure 5. Capacitance Characteristics

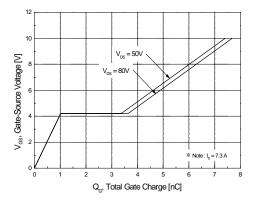


Figure 6. Gate Charge Characteristics

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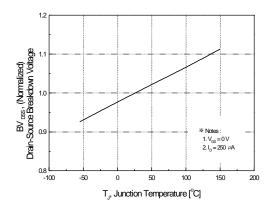
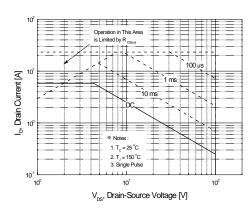


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



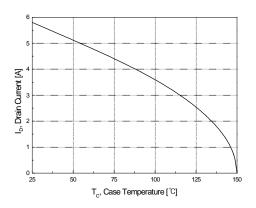


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

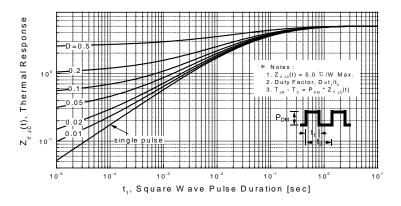
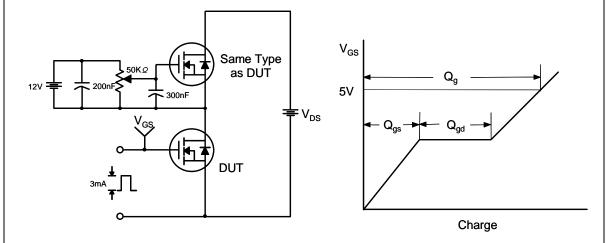


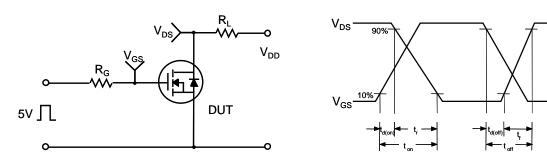
Figure 11. Transient Thermal Response Curve

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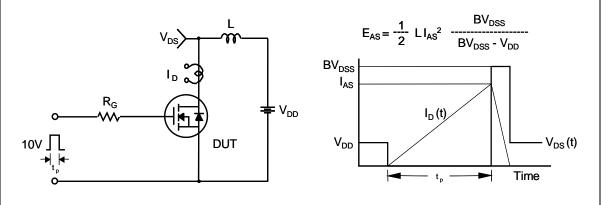
# **Gate Charge Test Circuit & Waveform**



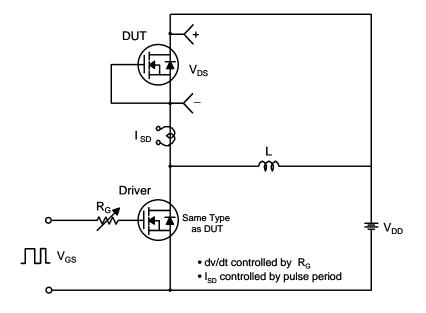
## **Resistive Switching Test Circuit & Waveforms**

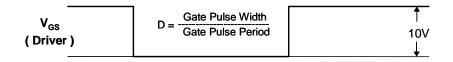


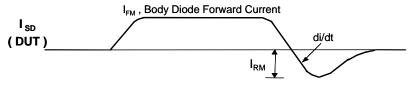
## **Unclamped Inductive Switching Test Circuit & Waveforms**



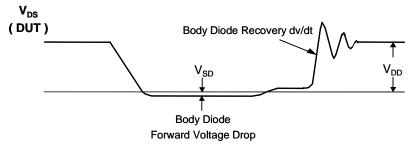
## Peak Diode Recovery dv/dt Test Circuit & Waveforms







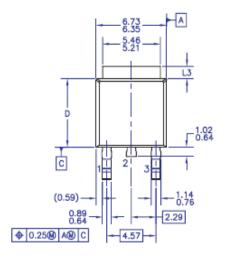
Body Diode Reverse Current

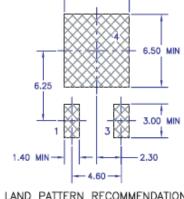


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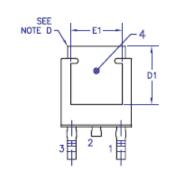
# **Mechanical Dimensions**

# D - PAK

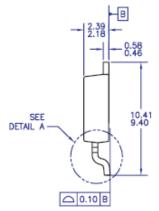


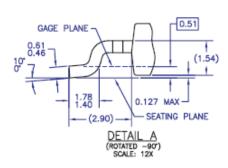


-6.00 MIN-





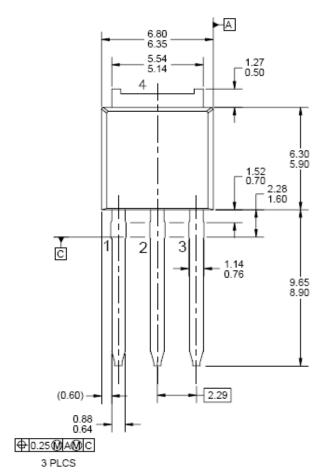


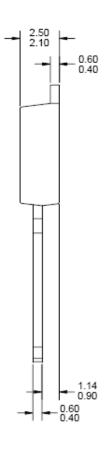


Dimensions in Millimeters



# I - PAK







Dimensions in Millimeters





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