



May 2001

QFET™

# FQT7N10L

## 100V LOGIC N-Channel MOSFET

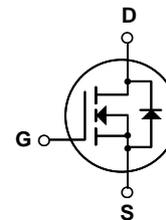
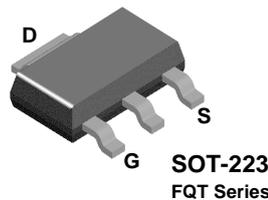
### General Description

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

This advanced technology 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 high efficiency switching DC/DC converters, and DC motor control.

### Features

- 1.7A, 100V,  $R_{DS(on)} = 0.35\Omega$  @  $V_{GS} = 10V$
- Low gate charge ( typical 4.6 nC)
- Low Crss ( typical 12 pF)
- Fast switching
- Improved dv/dt capability
- Low level gate drive requirements allowing direct operation from logic drives



### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	FQT7N10L	Units
V <sub>DSS</sub>	Drain-Source Voltage	100	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 70°C)	1.7	A
		1.36	A
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	6.8	A
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)	1.7	A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	0.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C) - Derate above 25°C	2.0	W
		0.016	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	Typ	Max	Units
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient *	--	62.5	°C/W

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

## Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	100	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.1	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 80\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

## On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.0	--	2.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 0.85\text{ A}$	--	0.275	0.35	$\Omega$
		$V_{GS} = 5\text{ V}, I_D = 0.85\text{ A}$	--	0.300	0.38	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 30\text{ V}, I_D = 0.85\text{ A}$ (Note 4)	--	2.75	--	S

## Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	220	290	pF
$C_{oss}$	Output Capacitance		--	55	72	pF
$C_{rss}$	Reverse Transfer Capacitance		--	12	15	pF

## Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}, I_D = 7.3\text{ A},$ $R_G = 25\ \Omega$	--	9	30	ns
$t_r$	Turn-On Rise Time		--	100	210	ns
$t_{d(off)}$	Turn-Off Delay Time		--	17	45	ns
$t_f$	Turn-Off Fall Time		(Note 4, 5)	--	50	110
$Q_g$	Total Gate Charge	$V_{DS} = 80\text{ V}, I_D = 7.3\text{ A},$ $V_{GS} = 5\text{ V}$	--	4.6	6.0	nC
$Q_{gs}$	Gate-Source Charge		--	1.0	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4, 5)	--	2.6	--

## Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	1.7	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	6.8	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1.7\text{ A}$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 7.3\text{ A},$	--	70	--	ns
$Q_{rr}$	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.  $L = 26\text{mH}, I_{AS} = 1.7\text{A}, V_{DD} = 25\text{V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 7.3\text{A}, di/dt \leq 300\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , 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

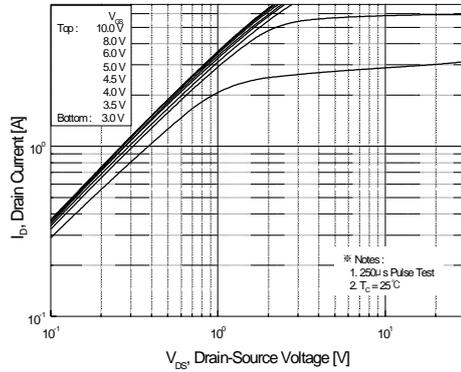


Figure 1. On-Region Characteristics

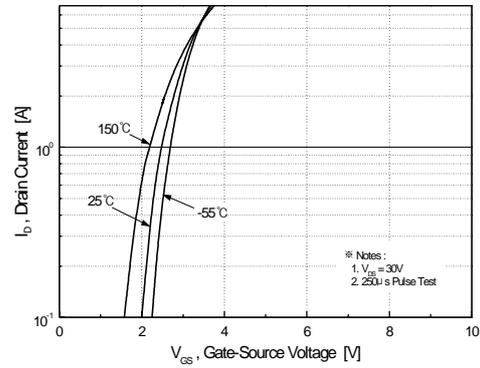


Figure 2. Transfer Characteristics

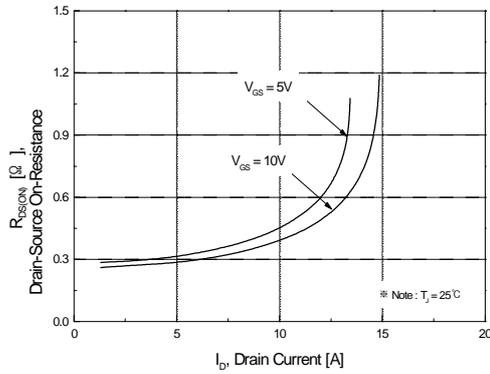


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

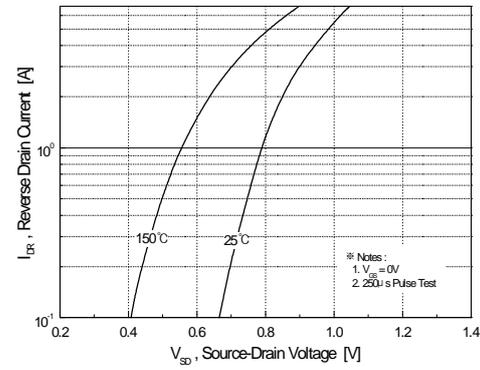


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

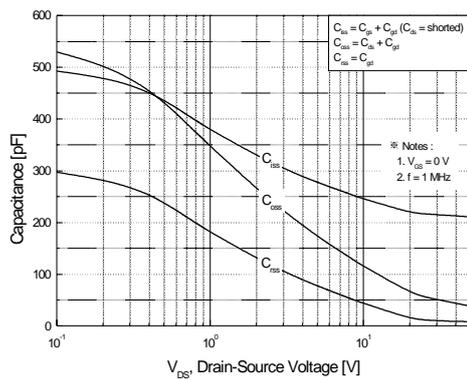


Figure 5. Capacitance Characteristics

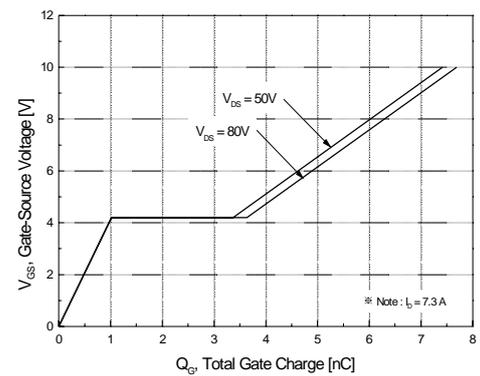


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

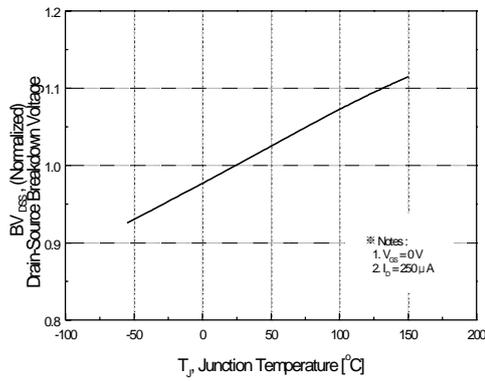


Figure 7. Breakdown Voltage Variation vs. Temperature

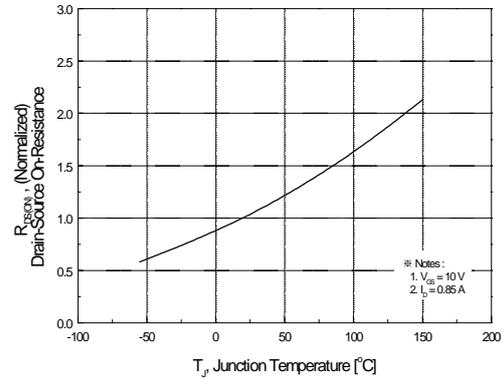


Figure 8. On-Resistance Variation vs. Temperature

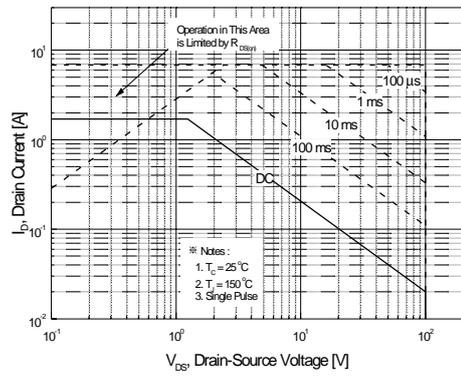


Figure 9. Maximum Safe Operating Area

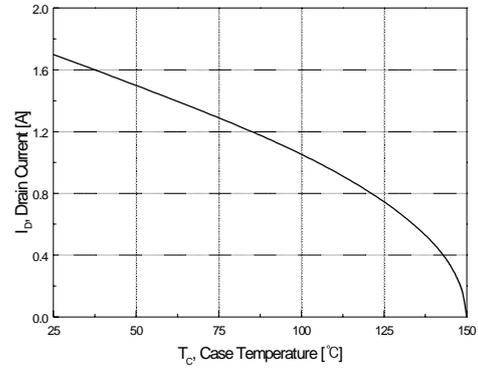


Figure 10. Maximum Drain Current vs. Case Temperature

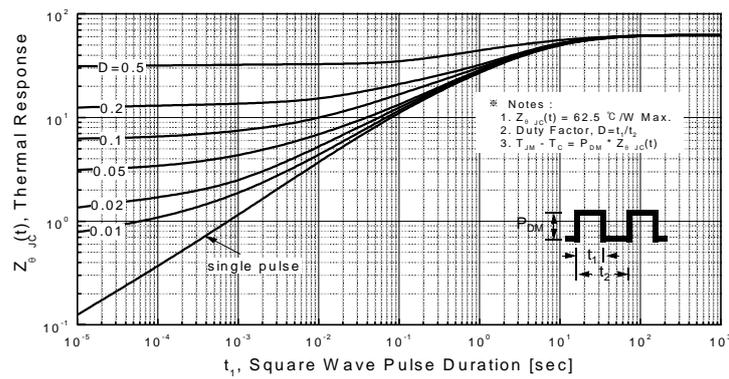
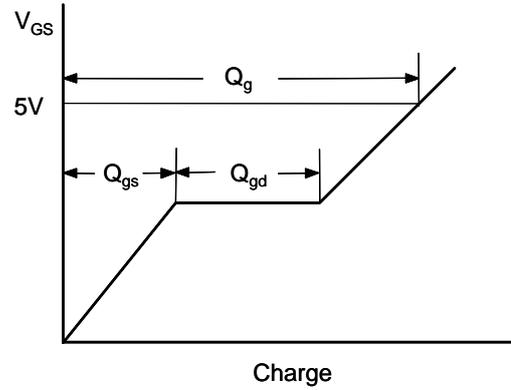
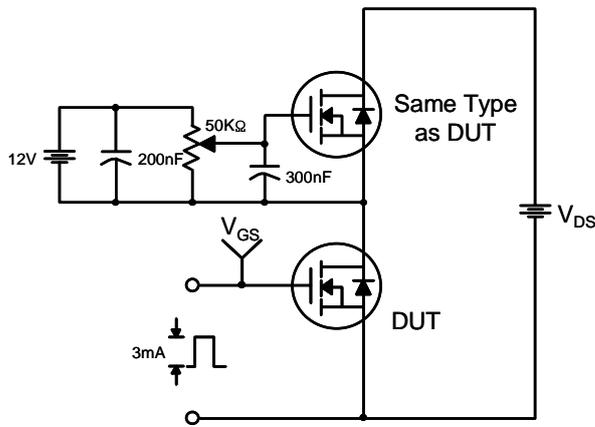
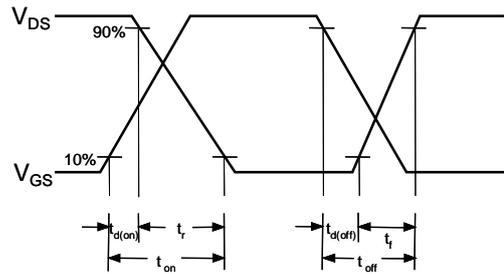
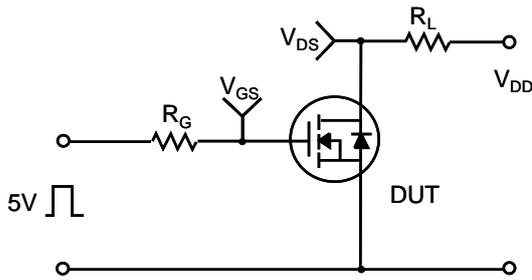


Figure 11. Transient Thermal Response Curve

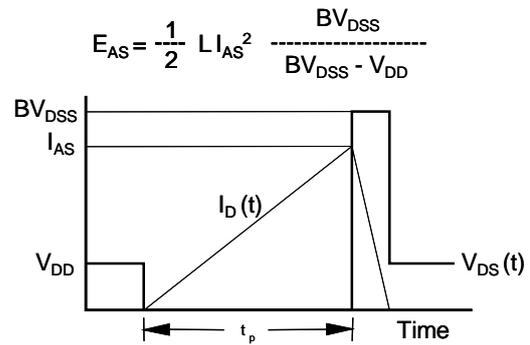
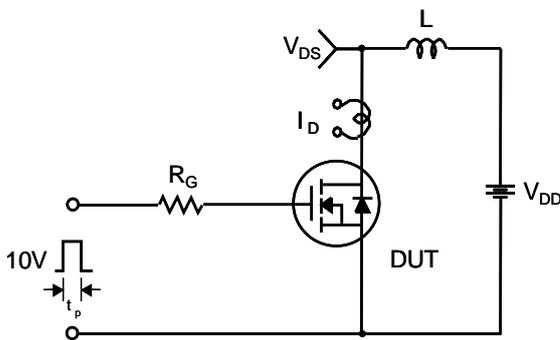
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



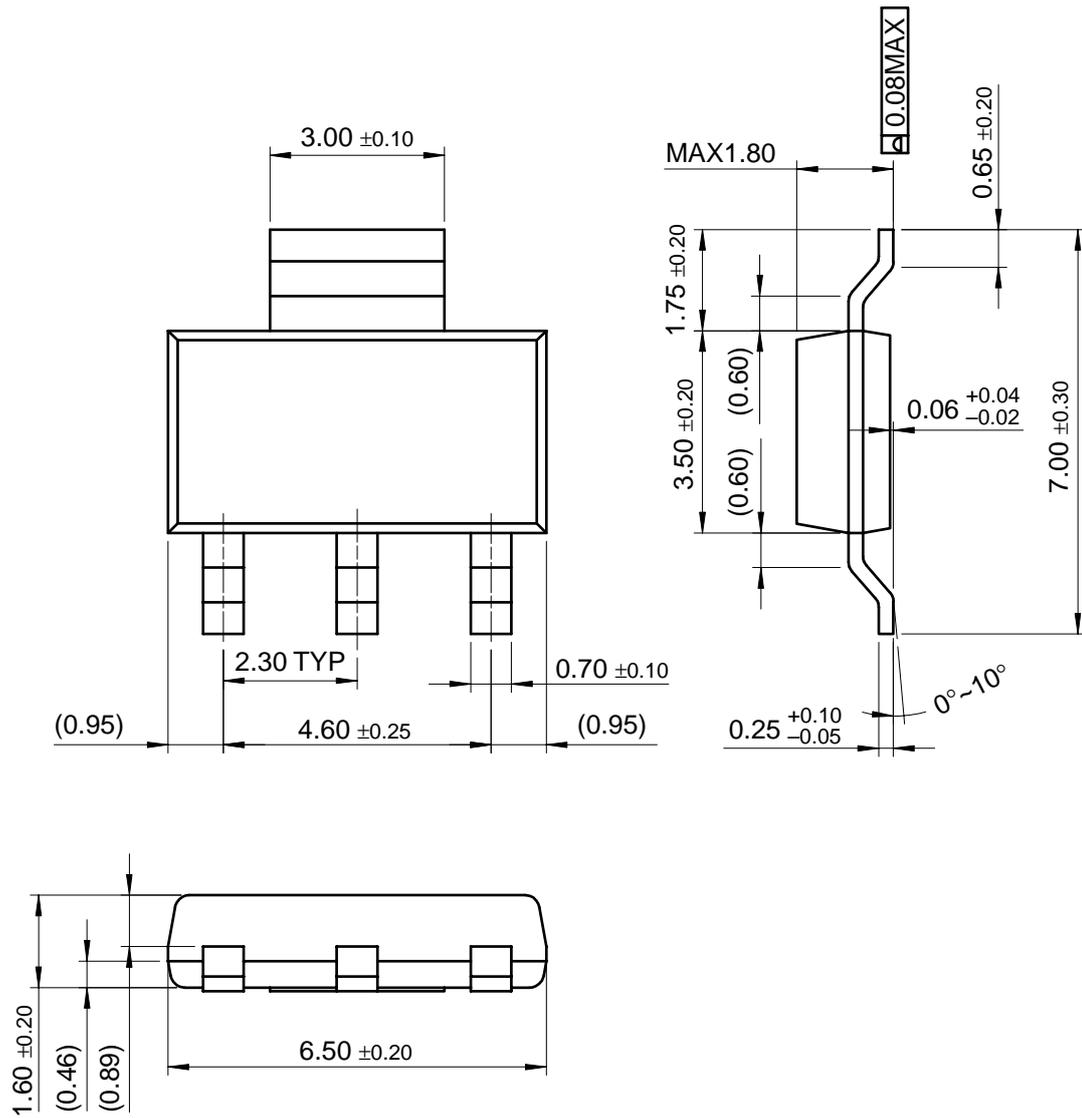
Unclamped Inductive Switching Test Circuit & Waveforms





Package Dimensions

SOT-223



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FQT7N10L

100V N-Channel Logic Level QFET

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General description

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Product	Product status	Pricing*	Package type	Lead	Package type
FQT7N10LTF	Full Production	\$0.311	SOT-223	3	TAPE REEL

\* 1,000 piece Budgetary Pricing

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Models

Package & leads	Condition	Temperature range	Software version	Revision date
PSPICE				
SOT-223-3	<a href="#">Electrical</a>	25°C	9.2	Apr 29, 2002

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