



ON Semiconductor®

FQD3P50

P-Channel QFET® MOSFET

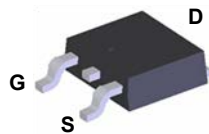
- 500 V, - 2.1 A, 4.9 Ω

Description

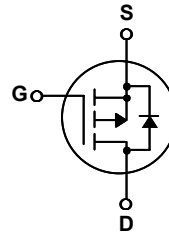
This P-Channel enhancement mode power MOSFET is produced using ON Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- - 2.1 A, - 500 V, $R_{DS(on)} = 4.9 \Omega$ (Max.) @ $V_{GS} = -10$ V, $I_D = -1.05$ A
- Low Gate Charge (Typ. 18 nC)
- Low Crss (Typ. 9.5 pF)
- 100% Avalanche Tested



**D-PAK
(TO252)**



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	FQD3P50	Unit
V _{DSS}	Drain-Source Voltage	-500	V
I _D	Drain Current - Continuous (T _C = 25°C) - Continuous (T _C = 100°C)	-2.1	A
		-1.33	A
I _{DM}	Drain Current - Pulsed (Note 1)	-8.4	A
V _{GSS}	Gate-Source Voltage	± 30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	250	mJ
I _{AR}	Avalanche Current (Note 1)	-2.1	A
E _{AR}	Repetitive Avalanche Energy (Note 1)	5.0	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	-4.5	V/ns
P _D	Power Dissipation (T _A = 25°C) *	2.5	W
	Power Dissipation (T _C = 25°C)	50	W
	- Derate above 25°C	0.4	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	FQD3P50	Unit
R _{θJC}	Thermal Resistance, Junction-to-Case, Max.	2.5	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient, Max. *	50	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient, Max.	110	°C/W

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

FQD3P50 P-Channel QFET® MOSFET

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-500	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, Referenced to 25°C	--	0.42	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -500\text{ V}, V_{GS} = 0\text{ V}$	--	--	-1	μA
		$V_{DS} = -400\text{ V}, T_C = 125^\circ\text{C}$	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-3.0	--	-5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -1.05\text{ A}$	--	3.9	4.9	Ω
g_{FS}	Forward Transconductance	$V_{DS} = -50\text{ V}, I_D = -1.05\text{ A}$	--	2.1	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	510	660	pF
C_{oss}	Output Capacitance		--	70	90	pF
C_{rss}	Reverse Transfer Capacitance		--	9.5	12	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -250\text{ V}, I_D = -2.7\text{ A},$ $R_G = 25\ \Omega$	--	12	35	ns	
t_r	Turn-On Rise Time		--	56	120	ns	
$t_{d(off)}$	Turn-Off Delay Time		--	35	80	ns	
t_f	Turn-Off Fall Time		(Note 4)	--	45	100	ns
Q_g	Total Gate Charge		$V_{DS} = -400\text{ V}, I_D = -2.7\text{ A},$ $V_{GS} = -10\text{ V}$	--	18	23	nC
Q_{gs}	Gate-Source Charge	(Note 4)	--	3.6	--	nC	
Q_{gd}	Gate-Drain Charge		--	9.2	--	nC	

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	-2.1	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	-8.4	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -2.1\text{ A}$	--	--	-5.0	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = -2.7\text{ A},$ $di_F / dt = 100\text{ A}/\mu\text{s}$	--	270	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.5	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 102\text{mH}, I_{AS} = -2.1\text{ A}, V_{DD} = -50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq -2.7\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially independent of operating temperature

Typical Characteristics

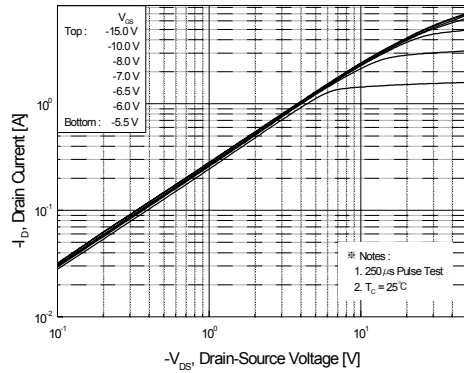


Figure 1. On-Region Characteristics

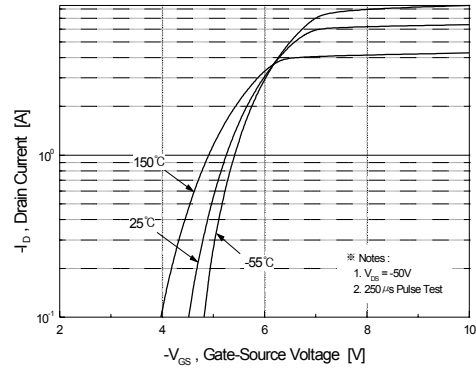


Figure 2. Transfer Characteristics

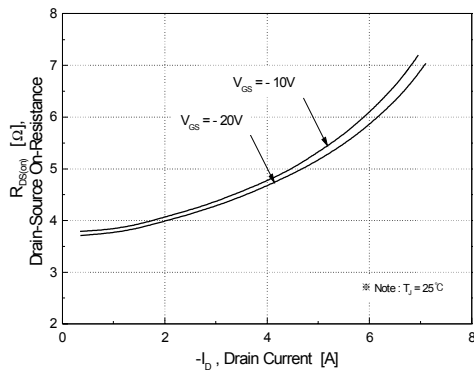


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

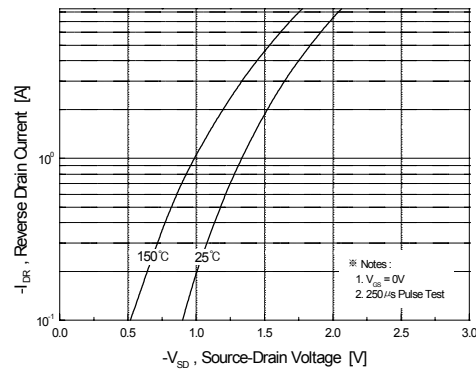


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

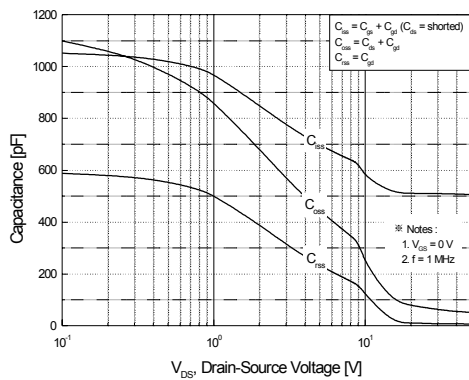


Figure 5. Capacitance Characteristics

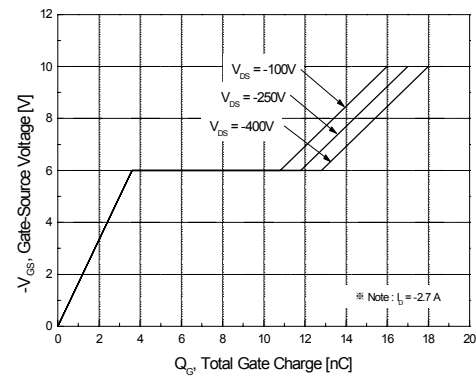


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

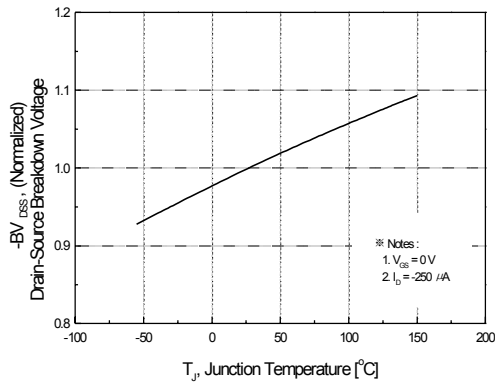


Figure 7. Breakdown Voltage Variation vs. Temperature

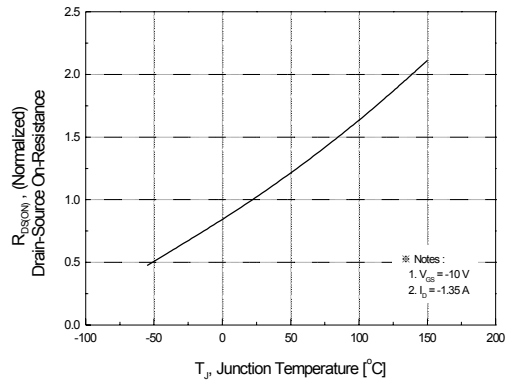


Figure 8. On-Resistance Variation vs. Temperature

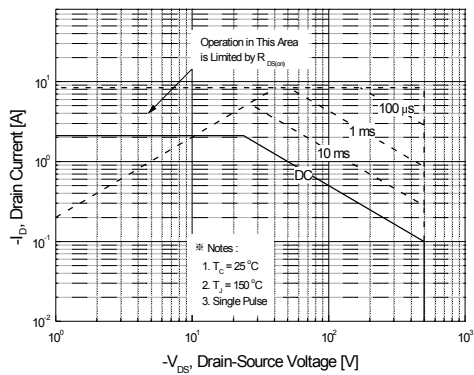


Figure 9. Maximum Safe Operating Area

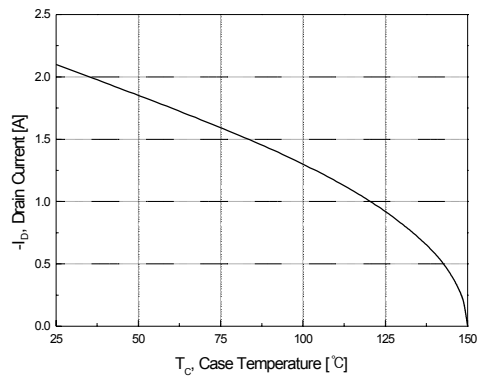


Figure 10. Maximum Drain Current vs. Case Temperature

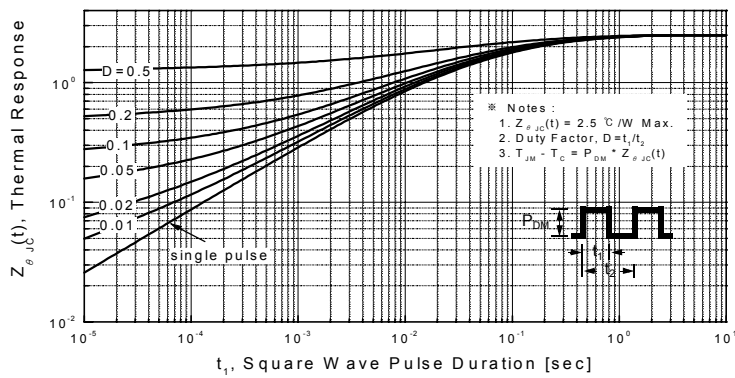
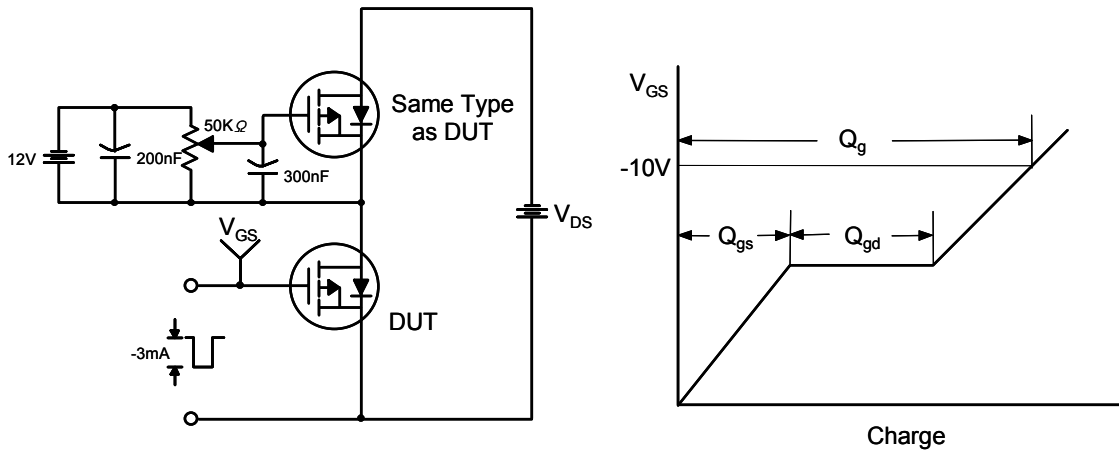
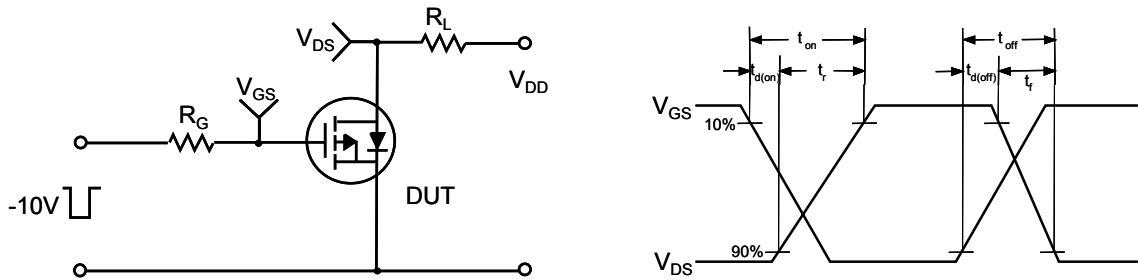


Figure 11. Transient Thermal Response Curve

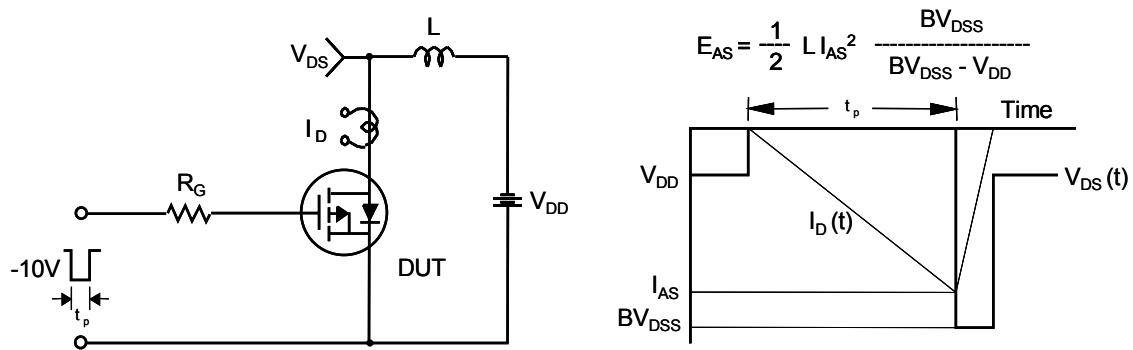
Gate Charge Test Circuit & Waveform



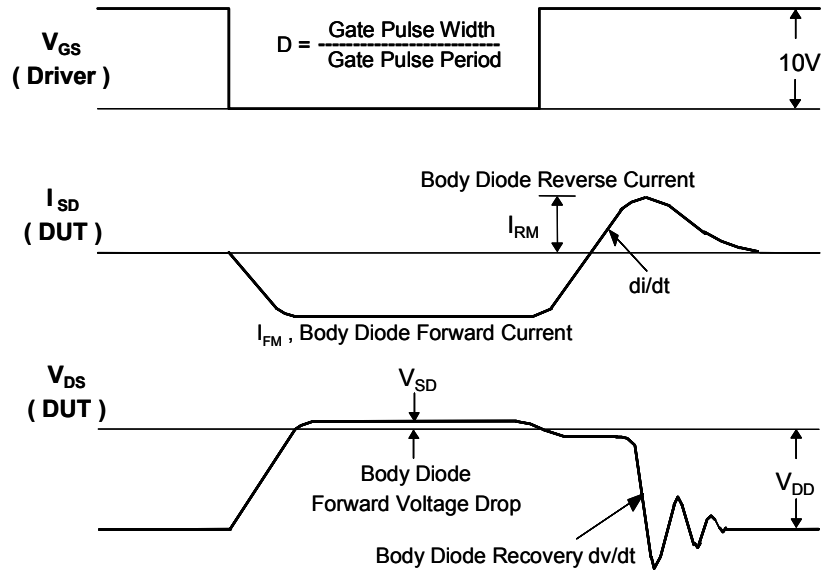
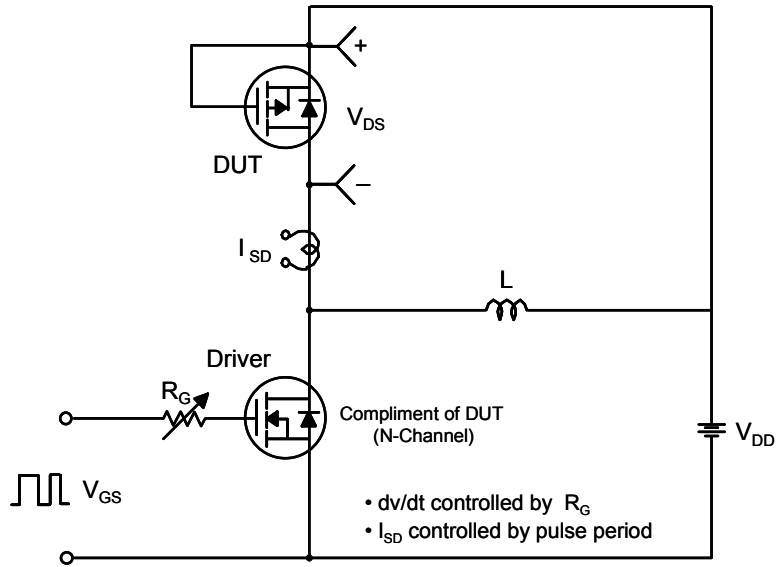
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



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