

November 2013

FQD4P25TM_WS

P-Channel QFET® MOSFET

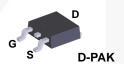
-250 V, -3.1 A, 2.1 Ω

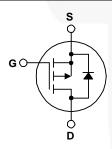
Description

This P-Channel enhancement mode power MOSFET is produced using Fairchild 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, audio amplifier, DC motor control, and variable switching power applications.

Features

- -3.1 A, -250 V, $R_{DS(on)}$ = 2.1 Ω (Max.) @ V_{GS} = 10 V, I_{D} = -1.55 A
- Low Gate Charge (Typ. 10 nC)
- Low Crss (Typ. 10.3 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant





Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter		FQD4P25TM_WS	Unit
V_{DSS}	Drain-Source Voltage		-250	V
I_D	Drain Current - Continuous (T _C = 25°C)		-3.1	Α
	- Continuous (T _C = 100°C)		-1.96	Α
I _{DM}	Drain Current - Pulsed	(Note 1)	-12.4	Α
V _{GSS}	Gate-Source Voltage		± 30	V
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	280	mJ
I _{AR}	Avalanche Current	(Note 1)	-3.1	Α
E _{AR}	Repetitive Avalanche Energy	(Note 1)	4.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		-5.5	V/ns
P _D	Power Dissipation (T _A = 25°C) *		2.5	W
	Power Dissipation (T _C = 25°C)		45	W
	- Derate above 25°C		0.36	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T _L	Maximum lead temperature for soldering, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FQD4P25TM_WS	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.78	
Ъ	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	110	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (*1 in ² Pad of 2-oz Copper), Max.	50	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQD4P25TM WS	FQD4P25S	DPAK	Tape and Reel	330 mm	16 mm	2500 units

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Cha	aracteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V, } I_D = -250 \mu\text{A}$	-250			V
ΔBV_{DSS} / ΔT_{J}	Breakdown Voltage Temperature Coefficient	I _D = -250 μA, Referenced to 25°C		-0.21		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -250 V, V _{GS} = 0 V		-	-1	μА
		V _{DS} = -200 V, T _C = 125°C	-	-	-10	μА
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = -30 V, V _{DS} = 0 V	-	-	-100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = 30 V, V _{DS} = 0 V	-	1	100	nA
On Cha	aracteristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	-3.0		-5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = -10 V, I _D = -1.55 A		1.63	2.1	Ω
g _{FS}	Forward Transconductance	V _{DS} = -40 V, I _D = -1.55 A		2.0		S
	ic Characteristics					
C _{iss}	Input Capacitance	$V_{DS} = -25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		325	420	pF
C _{oss}	Output Capacitance			65	85	pF
C _{rss}	Reverse Transfer Capacitance			10	13	pF
Switchi	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = -125 V, I _D = -4.0 A,		9.5	30	ns
t _r	Turn-On Rise Time	$R_G = 25 \Omega$	-	60	130	ns
t _{d(off)}	Turn-Off Delay Time	11.6 2032	-	14	40	ns
t _f	Turn-Off Fall Time	(Note 4)	-	27	65	ns
Qg	Total Gate Charge	V _{DS} = -200 V, I _D = -4.0 A,	-	10.3	14	nC
Q _{gs}	Gate-Source Charge	V _{GS} = -10 V		2.7		nC
Q _{gd}	Gate-Drain Charge	(Note 4)	/	5.2		nC
Drain-S	Source Diode Characteristics ar	nd Maximum Ratings	4			
I _S	Maximum Continuous Drain-Source Diode Forward Current				-3.1	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	-12.4	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = -3.1 A	-	-	-5.0	V
	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{S} = -4.0 \text{ A},$		140		ns
t _{rr}	Reverse Recovery Time	VGS 0 V, IS 4.071,		1 10		110

Notes:
1. Repetitive rating : pulse-width limited by maximum Hunction temperature.
2. L = 46.6 mH, I $_{AS}$ = -3.1 A, V $_{DD}$ = -50V, R $_{G}$ = 25 Ω , starting T $_{J}$ = 25°C.
3. I $_{SD}$ \leq -4.0 A, dIVdt \leq 300 AVµs, V $_{DD}$ \leq BV $_{DSS}$, starting T $_{J}$ = 25°C .
4. Essentially independent of operating temperature.

Typical Characteristics

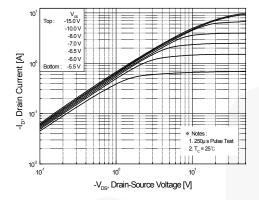


Figure 1. On-Region Characteristics

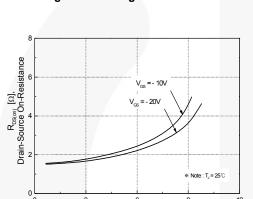


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

-I_D, Drain Current [A]

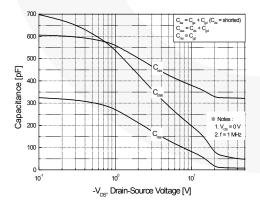


Figure 5. Capacitance Characteristics

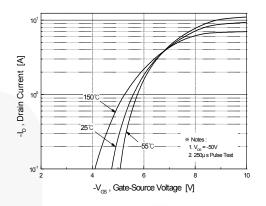


Figure 2. Transfer Characteristics

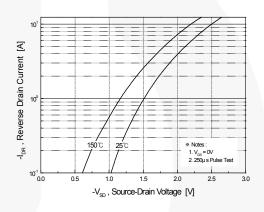


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

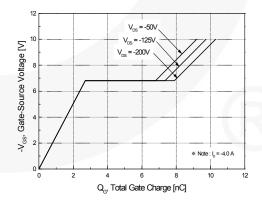
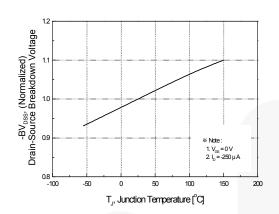


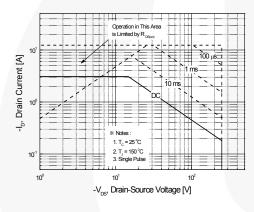
Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



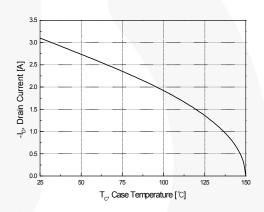


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

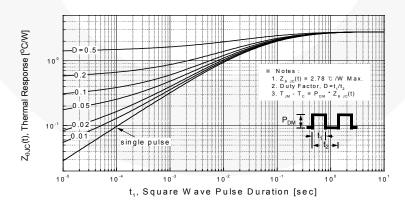


Figure 11. Transient Thermal Response Curve

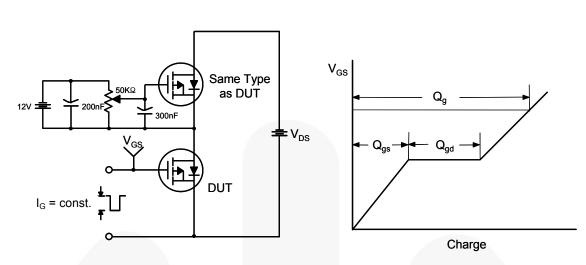


Figure 12. Gate Charge Test Circuit & Waveform

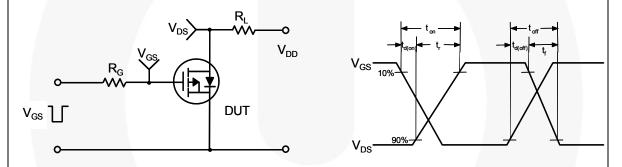


Figure 13. Resistive Switching Test Circuit & Waveforms

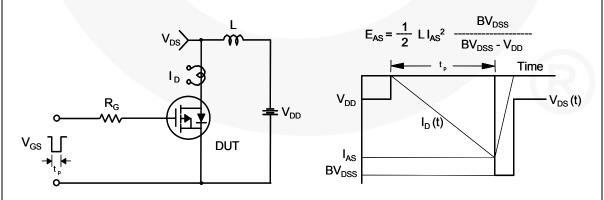
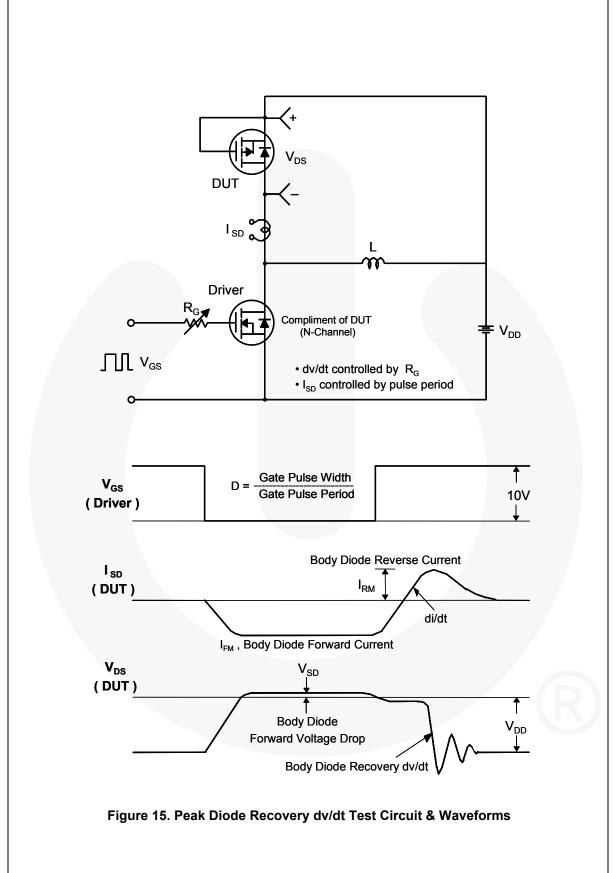


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

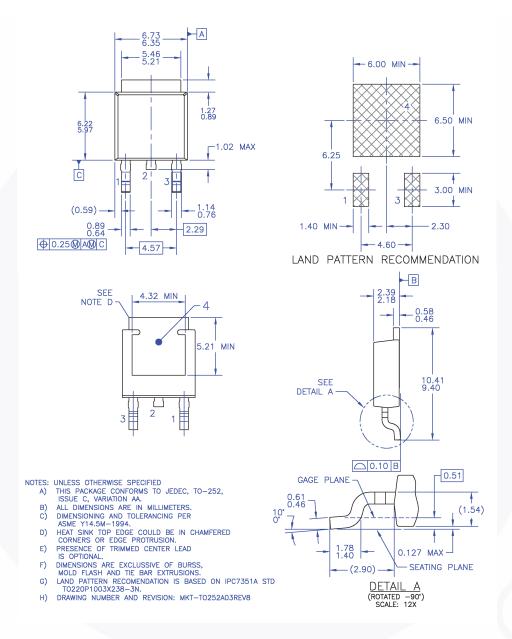


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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