

November 2013

### FQD16N25C

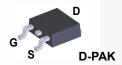
# N-Channel QFET $^{\rm @}$ MOSFET 250 V, 16 A, 270 m $\Omega$

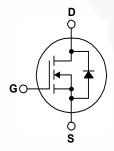
#### **Features**

- 16 A, 250 V,  $R_{DS(on)}$  = 270 m $\Omega$  (Max.) @  $V_{GS}$  = 10 V,
- Low Gate Charge (Typ. 41 nC)
- Low Crss (Typ. 68 pF)
- 100% Avalanche Tested

#### **Description**

This N-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, active power factor correction (PFC), and electronic lamp ballasts.





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

Symbol	Parameter		FQD16N25CTM	Unit
V <sub>DSS</sub>	Drain-Source Voltage		250	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)		16	Α
	- Continuous (T <sub>C</sub> = 100°C)		10.1	А
I <sub>DM</sub>	Drain Current - Pulsed	(Note 1)	64	А
V <sub>GSS</sub>	Gate-Source Voltage		± 30	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	432	mJ
I <sub>AR</sub>	Avalanche Current	(Note 1)	16	А
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	160	mJ
dv/dt	Peak Diode Recovery dv/dt (N		5.5	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C)		160	W
	- Derate above 25°C		1.28	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	FQD16N25CTM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.78	°C/W
$R_{\theta JA}$	A Thermal Resistance, Junction-to-Ambient, Max.		C/VV

### **Package Marking and Ordering Information**

Device Marking Device		Package	Package Reel Size		Quantity	
FQD16N25C	C FQD16N25CTM D-PAK 3		330 mm	16 mm	2500 units	

### **Electrical Characteristics** $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
Off Cha	aracteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	250			V
$\Delta BV_{DSS}$ $/\Delta T_{J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C		0.31		V/°C
	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V			10	μΑ
I <sub>DSS</sub>		V <sub>DS</sub> = 200 V, T <sub>C</sub> = 125°C			100	μΑ
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V			-100	nA
On Cha	aracteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0		4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 8A	/	0.22	0.27	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> =8 A		10.5		S
	ic Characteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		830	1080	pF
C <sub>oss</sub>	Output Capacitance	f = 1.0 MHz		170	220	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			68	89	pF
Switchi	ing Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 16A,		15	40	ns
t <sub>r</sub>	Turn-On Rise Time	$R_G = 25 \Omega$		130	270	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			135	280	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)	/	105	220	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 200 V, I <sub>D</sub> = 16 A,	-	41	53.5	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V	-	5.6		nC
Q <sub>gd</sub>	Gate-Drain Charge	(Note 4)		22.7		nC
Drain-S	Source Diode Characteristics ar	nd Maximum Ratings				
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				16	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				64	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 16 A			1.5	V
-	D D F	V = 0 V I = 40 A		260		ns
t <sub>rr</sub>	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{S} = 16 \text{ A},$		200		113

#### NOTES

<sup>1.</sup> Repetitive Rating : Pulse width limited by maximum junction temperature.

<sup>2.</sup> L = 2.7 mH, I  $_{AS}$  = 16 A, V  $_{DD}$  = 50 V, R  $_{G}$  = 25  $\Omega$ , starting T  $_{J}$  = 25  $^{\circ}$ C.

<sup>3.</sup>  $I_{SD} \le$  16 A, di/dt  $\le$ 300 A/ $\mu$ s,  $V_{DD} \le$  BV $_{DSS}$ , starting  $T_J$  = 25°C.

<sup>4.</sup> Essentially independent of operating temperature.

### **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

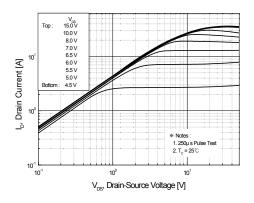


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

Figure 2. Transfer Characteristics

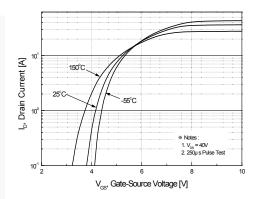


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

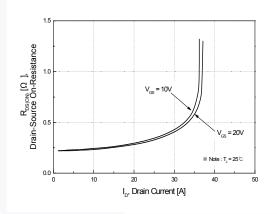
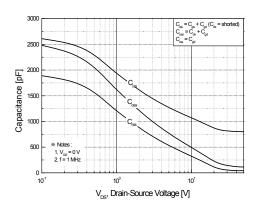


Figure 5. Capacitance Characteristics

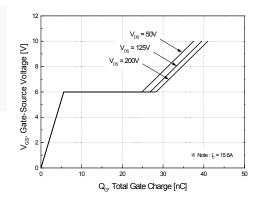


W Notes:

10'02 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8

V<sub>SD</sub>, Source-Drain voltage [V]

**Figure 6. Gate Charge Characteristics** 



### Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

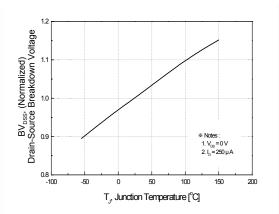


Figure 8. On-Resistance Variation vs. Temperature

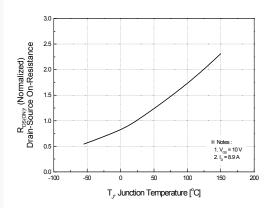
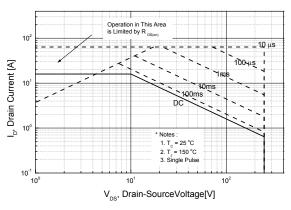


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature



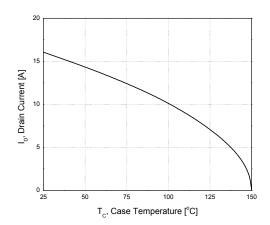


Figure 11. Transient Thermal Response Curve

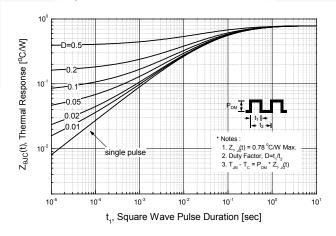


Figure 12. Gate Charge Test Circuit & Waveform

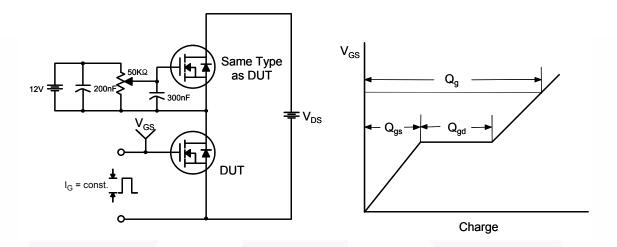


Figure 13. Resistive Switching Test Circuit & Waveforms

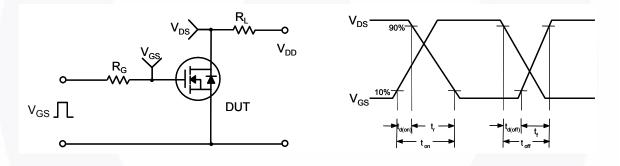
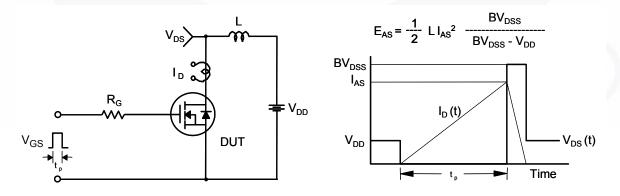


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



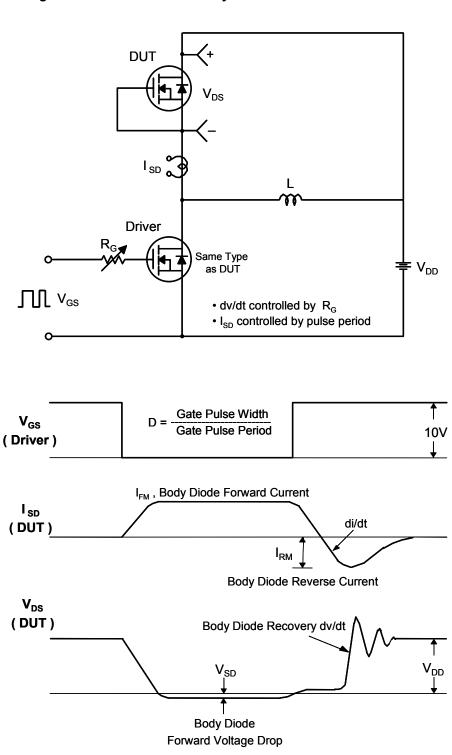


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

### **Mechanical Dimensions**

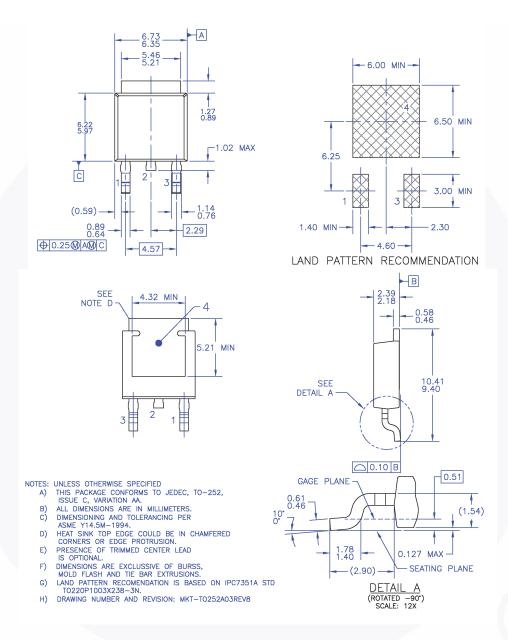


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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