

November 2013

FQB6N40C

N-Channel QFET® MOSFET

400 V, 6 A, 1.0 Ω

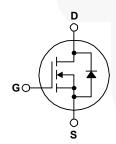
Description

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 onstate resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, electronic lamp ballasts based on half bridge topology.

Features

- 6 A, 400 V, $R_{DS(on)}$ = 1.0 Ω (Max.) @ V_{GS} = 10 V, I_D = 3 A
- Low Gate Charge (Typ. 16nC)
- Low Crss (Typ. 15pF)
- · 100% Avalanche Tested





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

Symbol	Parameter		FQB6N40CTM	Unit
V _{DSS}	Drain-Source Voltage		400	V
I _D	Drain Current - Continuous (T _C = 25°C	C)	6	Α
	- Continuous (T _C = 100°C)		3.6	A
I _{DM}	Drain Current - Pulsed	(Note 1)	24	А
V _{GSS}	Gate-Source Voltage		± 30	V
E _{AS}	Single Pulsed Avalanche Energy	(Note 2)	270	mJ
I _{AR}	Avalanche Current	(Note 1)	6	А
E _{AR}	Repetitive Avalanche Energy	(Note 1)	7.3	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_{D}	Power Dissipation (T _C = 25°C)		73	W
	- Derate above 25°C		0.58	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	FQB6N40CTM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.71	
D	Thermal Resistance, Junction to Ambient (minimum pad of 2 oz copper), Max.	62.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (*1 in ² pad of 2 oz copper), Max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQB6N40CTM	FQB6N40C	D ² -PAK	Tape and Reel	330 mm	24 mm	800 units

Electrical Characteristics T_c = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
Off Cha	aracteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	400			V
ΔBV_{DSS} / ΔT_{J}	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C		0.54		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 400 V, V _{GS} = 0 V			1	μΑ
		V _{DS} = 320 V, T _C = 125°C			10	μΑ
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$		I	-100	nA
On Cha	aracteristics					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	2.0		4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 3 A		0.83	1	Ω
9 _{FS}	Forward Transconductance	$V_{DS} = 40 \text{ V}, I_{D} = 3 \text{ A}$		4.7		S
Dynam	ic Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V,		480	625	pF
C _{oss}	Output Capacitance	f = 1.0 MHz		80	105	pF
C _{rss}	Reverse Transfer Capacitance			15	20	pF
Switchi	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 200 \text{ V}, I_{D} = 6 \text{ A},$		13	35	ns
t _r	Turn-On Rise Time	$R_{G} = 25 \Omega$		65	140	ns
t _{d(off)}	Turn-Off Delay Time			21	55	ns
t _f	Turn-Off Fall Time	(Note 4)		38	85	ns
Qg	Total Gate Charge	V _{DS} = 320 V, I _D = 6 A,		16	20	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10 V	/	2.3		nC
Q _{gd}	Gate-Drain Charge	(Note 4)		8.2		nC
Drain-S	Source Diode Characteristics a	nd Maximum Ratings				
I _S	Maximum Continuous Drain-Source Diode Forward Current				6	Α
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current				24	Α
V _{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 6 \text{ A}$)	1.4	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V, } I_{S} = 6 \text{ A,}$		230	//	ns
Q _{rr}	Reverse Recovery Charge	dl _F / dt = 100 A/μs		1.7		иС

Notes:

- Repetitive rating: pulse-width limited by maximum junction temperature. 2. L = 13.7 mH, I_{AS} = 6 A, V_{DD} = 50 V, R_{G} = 25 Ω , starting T_{J} = 25°C. 3. I_{SD} ≤ 6 A, di/dt ≤ 200 A/ μ s, V_{DD} ≤ BV $_{DSS}$, starting T_{J} = 25°C. 4. Essentially independent of operating temperature.

Typical Characteristics

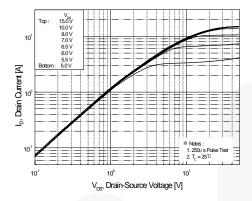


Figure 1. On-Region Characteristics

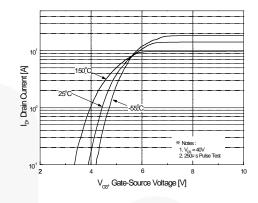


Figure 2. Transfer Characteristics

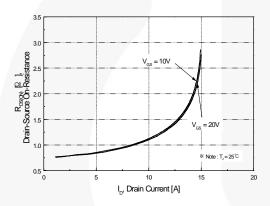


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

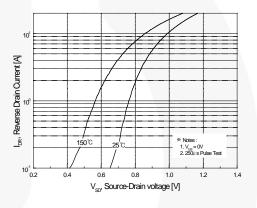


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

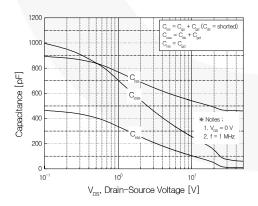


Figure 5. Capacitance Characteristics

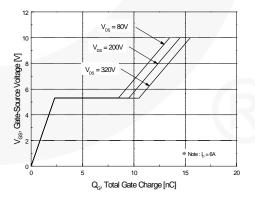


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

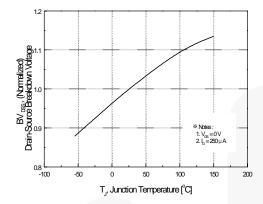


Figure 7. Breakdown Voltage Variation vs Temperature

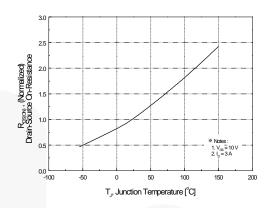


Figure 8. On-Resistance Variation vs Temperature

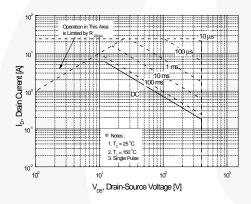


Figure 9. Maximum Safe Operating Area

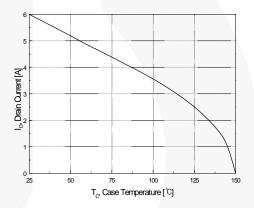


Figure 10. Maximum Drain Current vs Case Temperature

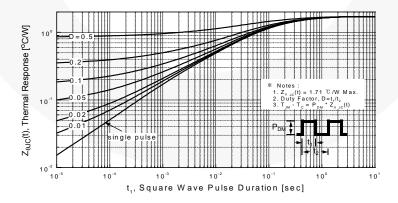


Figure 11. Transient Thermal Response Curve

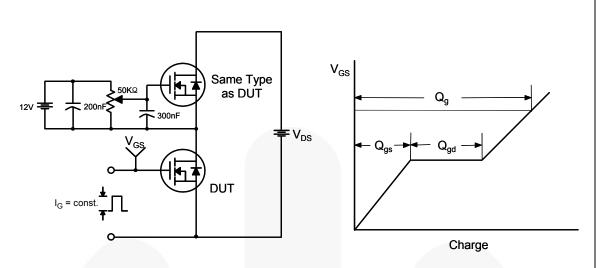


Figure 12. Gate Charge Test Circuit & Waveform

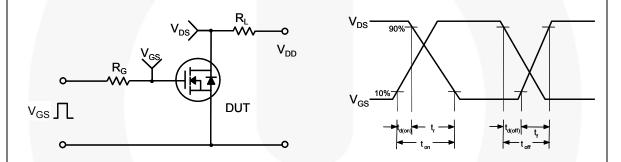


Figure 13. Resistive Switching Test Circuit & Waveforms

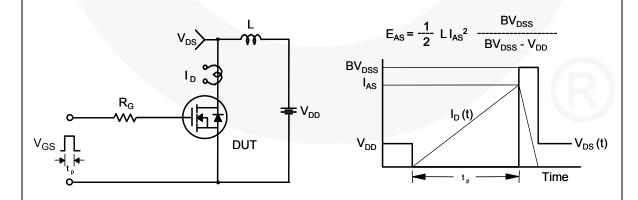
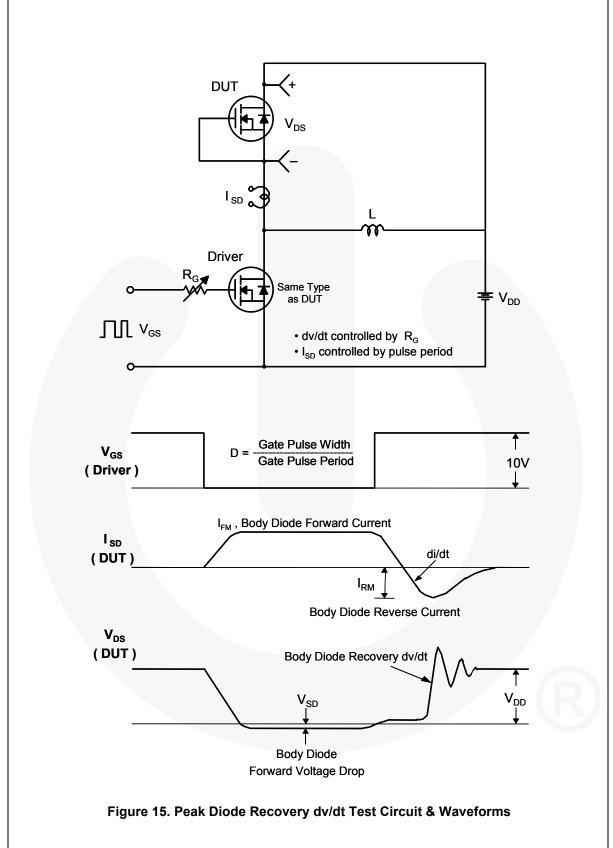


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

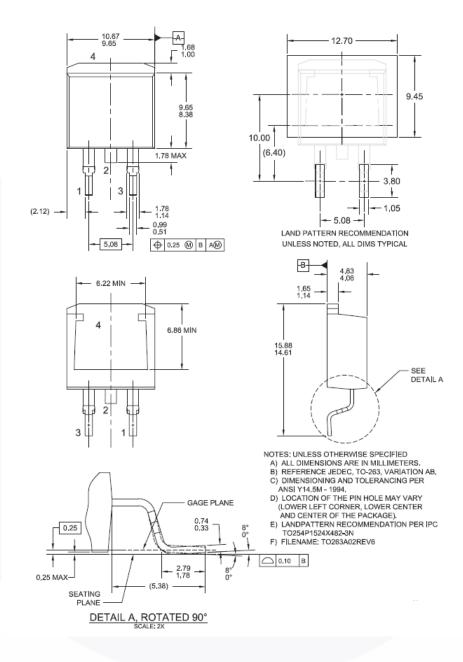


Figure 16. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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Rev. 166