

October 2013

FQB10N50CF

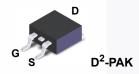
N-Channel QFET $^{\circledR}$ FRFET $^{\circledR}$ MOSFET 500 V, 10 A, 610 m Ω

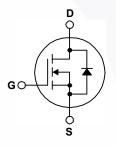
Features

- 10 A, 500 V, $R_{DS(on)}$ = 610 m Ω (Max.) @ V_{GS} = 10 V, I_D = 5 A
- Low gate charge (Typ. 45 nC)
- Low Crss (Typ. 17.5 pF)
- 100% avalanche tested
- · Fast recovery body diode

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.





MOSFET Maximum Ratings $T_C = 25^{\circ}C$ unless otherwise noted

Symbol		Parameter	Parameter		Unit
V_{DSS}	Drain to Source Voltage			500	V
V_{GSS}	Gate to Source Voltage			±30	V
I _D	Drain Current	- Continuous (T _C = 25°C) - Continuous (T _C = 100°C)		10 6.35	Α
I _{DM}	Drain Current	- Pulsed	(Note 1)	40	Α
E _{AS}	Single Pulsed Avalanch	e Energy	(Note 2)	825	mJ
I _{AR}	Avalanche Current		(Note 1)	10	Α
E _{AR}	Repetitive Avalanche Er	nergy	(Note 1)	14.3	mJ
dv/dt	Peak Diode Recovery de	v/dt	(Note 3)	2.0	V/ns
D	Dawar Dissipation	(T _C = 25°C)		143	W
P_{D}	Power Dissipation	- Derate above 25°C		1.14	W/°C
T _J , T _{STG}	Operating and Storage	Temperature Range		-55 to +150	°C
T _L	Maximum Lead Tempera 1/8" from Case for 5 Sec	ature for Soldering Purpose, conds		300	°C

Thermal Characteristics

Symbol	Parameter	FQB10N50CFTM_WS	Unit
R_{\thetaJC}	Thermal Resistance, Junction to Case, Max 0.87		
В	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 T_C = 25°C unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQB10N50CF	FQB10N50CFTM_WS	D2-PAK	330mm	24mm	800

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	cteristics					
BV_DSS	Drain to Source Breakdown Voltage	$I_D = 250\mu A, V_{GS} = 0V, T_J = 25^{\circ}C$	500	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	-	0.5	-	V/°C
I	Zero Gate Voltage Drain Current	V _{DS} = 500V , V _{GS} = 0V	-	-	10	μА
DSS	Zero Gate Voltage Drain Guirent	$V_{DS} = 400V, T_{C} = 125^{\circ}C$	-	-	100	μΛ
I _{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	±100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	2.0	-	4.0	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10V, I _D = 5A	-	0.51	0.61	Ω
9 _{FS}	Forward Transconductance	$V_{DS} = 20V, I_{D} = 5A$	-	105	ı	S

Dynamic Characteristics

C _{iss}	Input Capacitance	\\ - 25\\ \\ - 0\\	V _{DS} = 25V, V _{GS} = 0V		1660	2210	pF
C _{oss}	Output Capacitance				182	240	pF
C _{rss}	Reverse Transfer Capacitance	1 - 111112	,	-\	17.5	26	pF
Q _{g(tot)}	Total Gate Charge at 10V			- \	45	60	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DS} = 400V, I_{D} = 10A$,	-	8	-	nC
Q_{gd}	Gate to Drain "Miller" Charge	V _{GS} = 10V	(Note 4)	-	19	-	nC

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	25	60	ns
t _r	Turn-On Rise Time	$V_{DD} = 250V, I_{D} = 10A$	-	47	105	ns
t _{d(off)}	Turn-Off Delay Time	$R_G = 25\Omega$	-	138	285	ns
t _f	Turn-Off Fall Time	(Note 4)	-	55	120	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	10	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	40	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _{SD} = 10A	-	-	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _{SD} = 10A	-	91	-	ns
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	-	220	-	nC

- **Notes:**1. Repetitive Rating: Pulse width limited by maximum junction temperature 2: L = 16.5mH, I_{AS} = 10A, V_{DD} = 50V, R_G = 250, Starting T_J = 25°C 3: $I_{SD} \le$ 10A, di/dt \le 200A/ μ s, $V_{DD} \le$ BV $_{DSS}$, Starting T_J = 25°C 4: Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

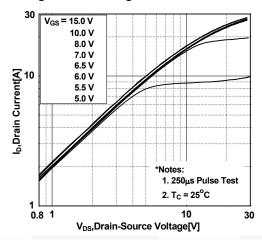


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

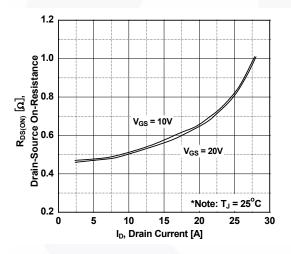


Figure 5. Capacitance Characteristics

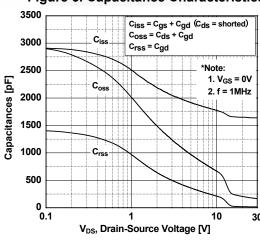


Figure 2. Transfer Characteristics

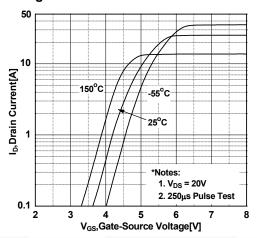


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

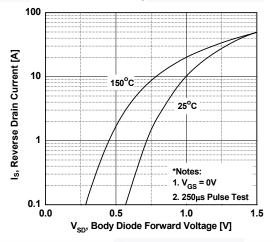
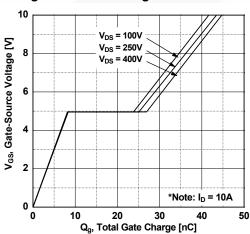


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

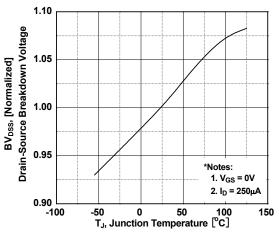


Figure 8. On-Resistance Variation vs. Temperature

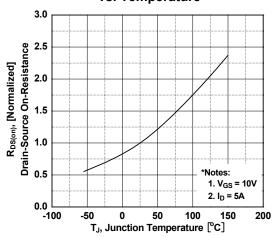


Figure 9. Maximum Safe Operating Area

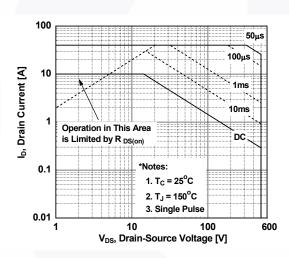


Figure 10. Maximum Drain Current vs. Case Temperature

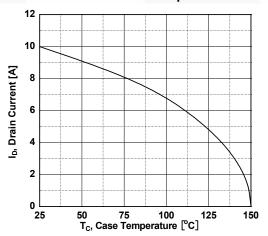


Figure 11. Transient Thermal Response Curve

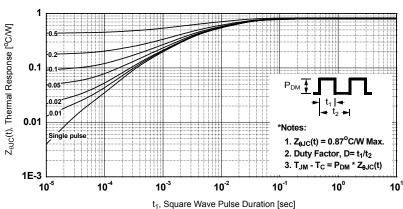


Figure 12. Gate Charge Test Circuit & Waveform

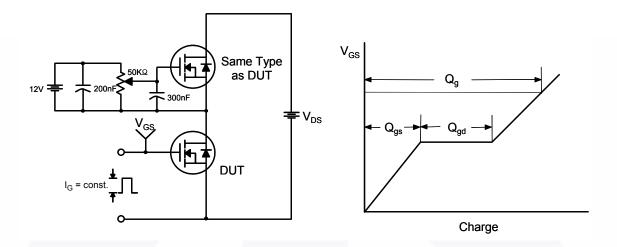


Figure 13. Resistive Switching Test Circuit & Waveforms

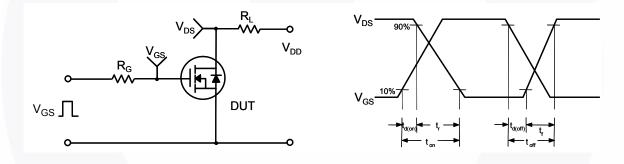
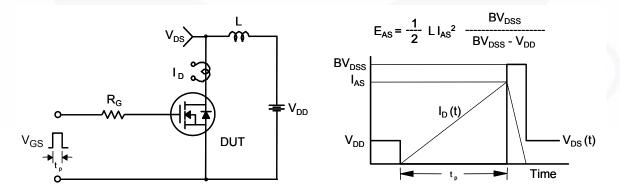


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



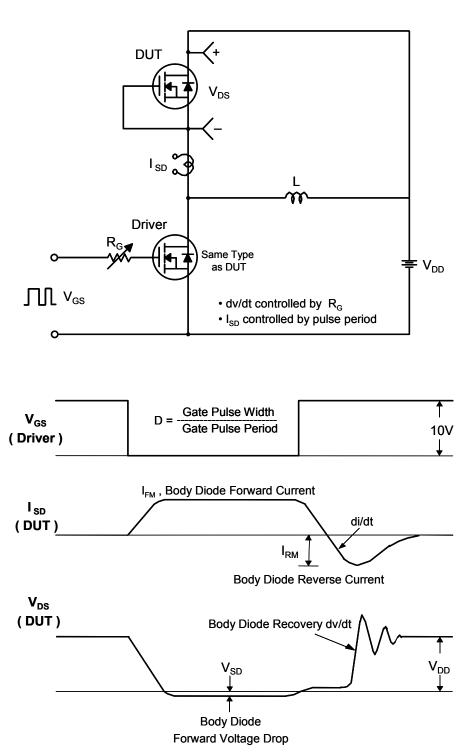


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

TO-263 2L (D²PAK)

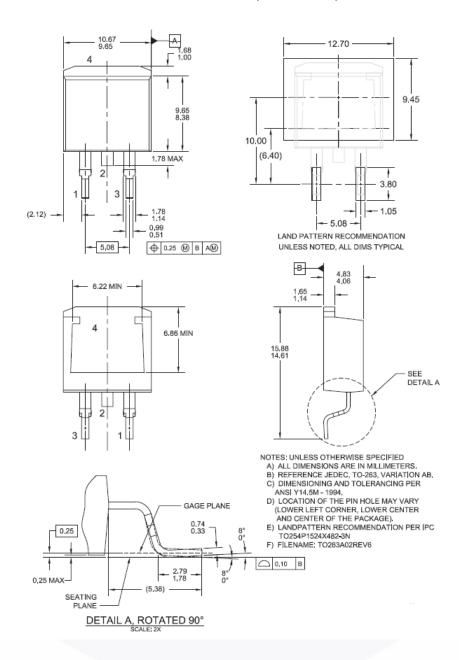


Figure 16. 2LD, TO263, Surface Mount

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Dimension in Millimeters





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