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November 2013

FQNL2N50B

N-Channel QFET® MOSFET

500 V, 0.35 A, 5.3 Ω

Description

This N-Channel enhancement mode power MOSFET is • 0.35 A, 500 V, $R_{DS(on)}$ = 5.3 Ω (Max.) @ V_{GS} = 10 V, produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state

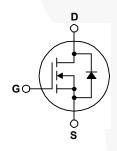
• Low Gate Charge (Typ. 6 nC) resistance, and to provide superior switching performance

• Low Crss (Typ. 4 pF) and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- $I_D = 0.175 A$





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

Symbol	Parameter		FQNL2N50BTA	Unit
V _{DSS}	Drain-Source Voltage		500	V
I _D	Drain Current - Continuous (T _C = 25°C)		0.35	А
	- Continuous (T _C = 100°C)		0.22	Α
I _{DM}	Drain Current - Pulsed (Note 1)	1.4	Α
V _{GSS}	Gate-Source Voltage		± 30	V
I _{AR}	Avalanche Current (Note 1)	0.35	Α
E _{AR}	Repetitive Avalanche Energy (Not		0.15	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 2)		4.5	V/ns
P_{D}	Power Dissipation (T _C = 25°C)		1.5	W
	- Derate above 25°C		0.012	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	FQNL2N50BTA	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	83	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQNL2N50BTA	FQNL2N50B	TO-92L	AMMO	N/A	N/A	2000 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	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	500			V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, Referenced to 25°C		0.48		V/°C
I _{DSS} Zero Gate Voltage Drain Current		V _{DS} = 500 V, V _{GS} = 0 V		-	1	μΑ
		V _{DS} = 400 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 V, V _{DS} = 0 V		I	-100	nA
On Cha	racteristics					
V _{GS(th)} Gate Threshold Voltage		$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	2.3	3.0	3.7	V
33()		$V_{DS} = V_{GS}, I_{D} = 250 \text{ mA}$	3.6	4.3	5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 0.175 A		4.2	5.3	Ω
9 _{FS}	Forward Transconductance	V _{DS} = 50 V, I _D = 0.175 A		0.72		S
	ic Characteristics			100		
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$		180	230	pF
C _{oss}	Output Capacitance	f = 1.0 MHz		30	40	pF
C _{rss}	Reverse Transfer Capacitance			4	6	pF
Switchi	ing Characteristics					
t _{d(on)}	Turn-On Delay Time	V _{DD} = 250 V, I _D = 2.1 A,		6	20	ns
t _r	Turn-On Rise Time	$R_G = 25 \Omega$		25	60	ns
+	Turn Off Dolov Time	- 1.6		10	30	ns
$t_{d(off)}$	Turn-Off Delay Time					
t _f	Turn-Off Fall Time	(Note 3)		20	50	ns
t _f	· ·	, ,		20 6.0	50 8.0	
t _f Q _g	Turn-Off Fall Time	V _{DS} = 400 V, I _D = 2.1 A,		_		ns
	Turn-Off Fall Time Total Gate Charge	, ,		6.0	8.0	ns nC
t _f Q _g Q _{gs} Q _{gd}	Turn-Off Fall Time Total Gate Charge Gate-Source Charge	$V_{DS} = 400 \text{ V}, I_D = 2.1 \text{ A},$ $V_{GS} = 10 \text{ V}$ (Note 3)		6.0	8.0	ns nC nC
t _f Q _g Q _{gs} Q _{gd}	Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DS} = 400 \text{ V}, I_D = 2.1 \text{ A},$ $V_{GS} = 10 \text{ V}$ (Note 3)		6.0	8.0	ns nC nC
$\begin{aligned} & t_f & \\ & Q_g & \\ & Q_{gs} & \\ & Q_{gd} & \\ & \textbf{Drain-S} & \end{aligned}$	Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge Source Diode Characteristics and	V _{DS} = 400 V, I _D = 2.1 A, V _{GS} = 10 V (Note 3)		6.0 1.3 3.0	8.0	ns nC nC
$\begin{aligned} & t_f & \\ & Q_g & \\ & Q_{gs} & \\ & Q_{gd} & \\ & & \textbf{Drain-S} \\ & I_{SM} & \end{aligned}$	Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge Source Diode Characteristics and Maximum Continuous Drain-Source Diode	V _{DS} = 400 V, I _D = 2.1 A, V _{GS} = 10 V (Note 3)		6.0 1.3 3.0	8.0	ns nC nC nC
$t_{\rm f}$ $Q_{\rm g}$ $Q_{\rm gs}$ $Q_{\rm gd}$ Drain-S	Turn-Off Fall Time Total Gate Charge Gate-Source Charge Gate-Drain Charge Source Diode Characteristics at Maximum Continuous Drain-Source Diode Faxing Characteristics at Maximum Pulsed Drain-Source Diode Faxing Characteristics at Maximum Pulsed Drain-Source Diode Faxing Characteristics	V _{DS} = 400 V, I _D = 2.1 A, V _{GS} = 10 V (Note 3) And Maximum Ratings and Forward Current Forward Current		6.0 1.3 3.0	8.0 0.35 1.4	ns nC nC nC

- **Notes:**1. Repetitive rating : pulse-width limited by maximum junction temperature. 2. $I_{SD} \le 2.1$ A, $di/dt \le 200$ A/µs, $V_{DD} \le BV_{DSS}$, starting $T_J = 25^{\circ}C$.
 3. Essentially independent of operating temperature.

Typical Characteristics

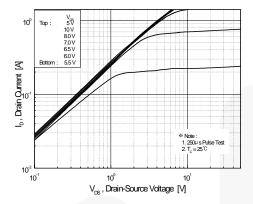


Figure 1. On-Region Characteristics

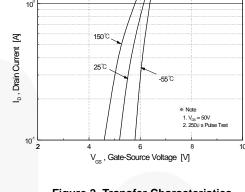


Figure 2. Transfer Characteristics

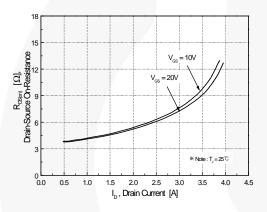


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

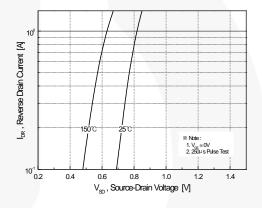


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

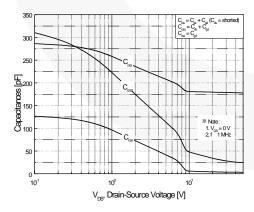


Figure 5. Capacitance Characteristics

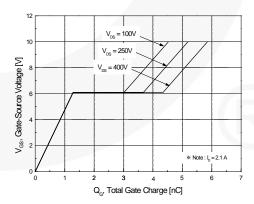


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

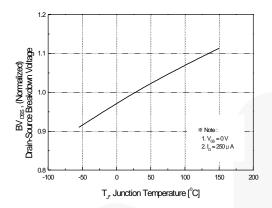
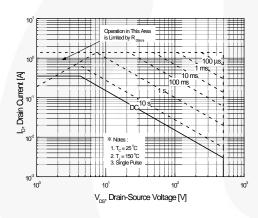


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



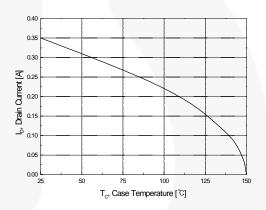


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

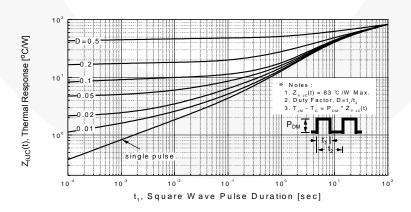


Figure 11. Transient Thermal Response Curve

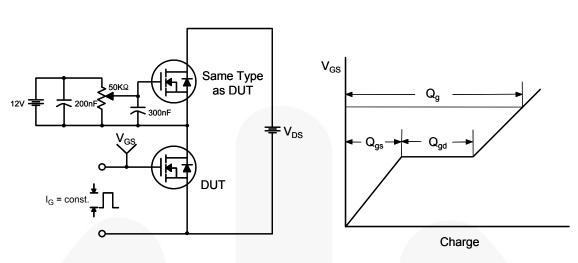


Figure 12. Gate Charge Test Circuit & Waveform

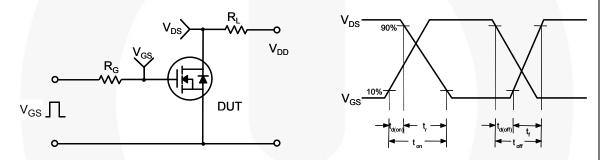


Figure 13. Resistive Switching Test Circuit & Waveforms

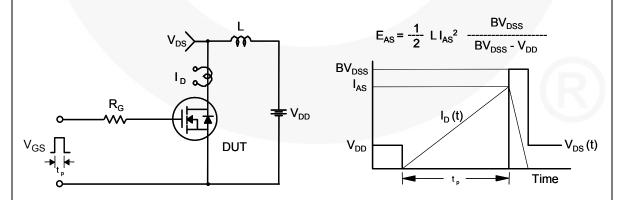
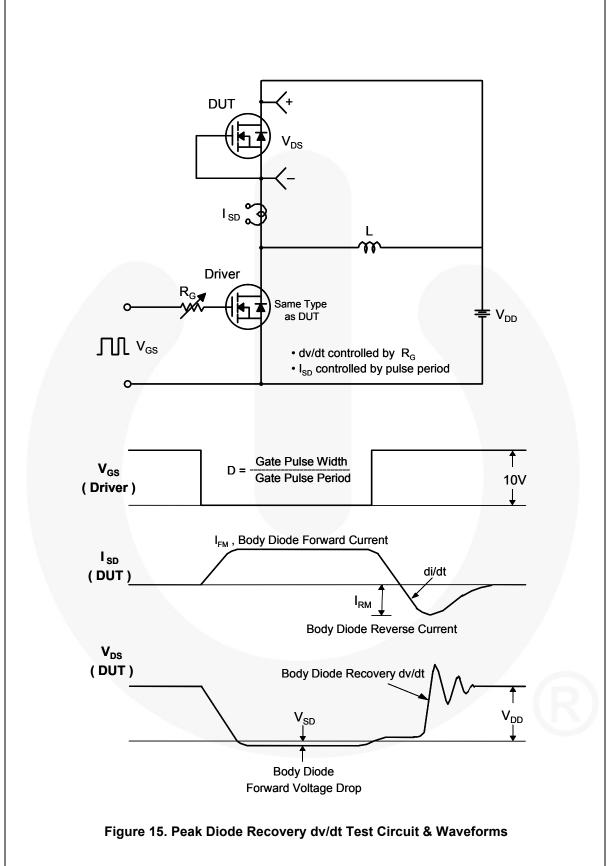
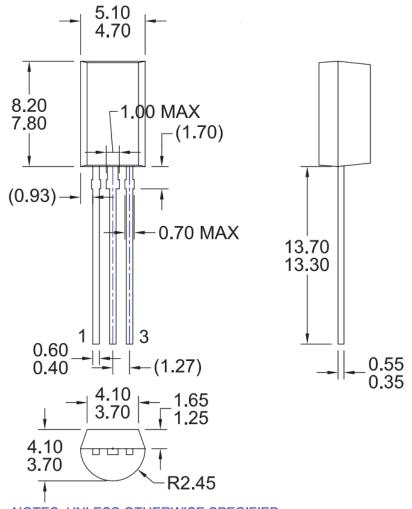


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions



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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D) FORMERLY NAMED BD1409
- E) DRAWING FILE NAME: MKT-ZA03HREV1

Figure 16. TO92L, 3-Lead, 8 mm Long Body

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