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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

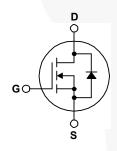
• Low Gate Charge (Typ. 6 nC) resistance, and to provide superior switching performance

• 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 (No		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 μA, Referenced to 25°C		0.48		V/°C
DSS Zara Cata Valtaga Drain Gurrant	V _{DS} = 500 V, V _{GS} = 0 V		-	1	μΑ	
Zero Gate Voltage Drain Current		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
()		$V_{DS} = V_{GS}, I_{D} = 250 \text{ mA}$	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					
C _{iss}	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz		180	230	pF
C _{oss}	Output Capacitance			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
t _{d(off)}	Turn-Off Delay Time	- · · · · · · · · · · · · · · · · · · ·		10	30	ns
t _f	Turn-Off Fall Time	(Note 3)		20	50	ns
4						
	Total Gate Charge	V _{DS} = 400 V, I _D = 2.1 A,		6.0	8.0	nC
Qg	Total Gate Charge Gate-Source Charge	V _{DS} = 400 V, I _D = 2.1 A, V _{GS} = 10 V		6.0 1.3	8.0	nC nC
Q_g Q_{gs} Q_{gd}		V_{DS} = 400 V, I_{D} = 2.1 A, V_{GS} = 10 V (Note 3)				
Q _g Q _{gs} Q _{gd}	Gate-Source Charge	V _{GS} = 10 V (Note 3)	/	1.3		nC
Q _g Q _{gs} Q _{gd}	Gate-Source Charge Gate-Drain Charge	V _{GS} = 10 V (Note 3)	/	1.3		nC
Q _g Q _{gs} Q _{gd} Drain-S	Gate-Source Charge Gate-Drain Charge Source Diode Characteristics and	V _{GS} = 10 V (Note 3) nd Maximum Ratings ode Forward Current		1.3		nC nC
Q_g Q_{gs} Q_{gd} Drain-S	Gate-Source Charge Gate-Drain Charge Source Diode Characteristics at Maximum Continuous Drain-Source Dio	V _{GS} = 10 V (Note 3) nd Maximum Ratings ode Forward Current		1.3	0.35	nC nC
Q_g Q_{gs} Q_{gd} Drain-S Q_{gd}	Gate-Source Charge Gate-Drain Charge Source Diode Characteristics at Maximum Continuous Drain-Source Diode Maximum Pulsed Drain-Source Diode F	V _{GS} = 10 V (Note 3) nd Maximum Ratings ode Forward Current Forward Current		1.3	0.35	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

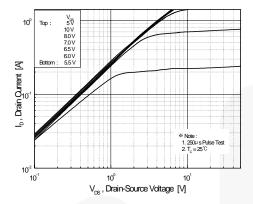


Figure 1. On-Region Characteristics

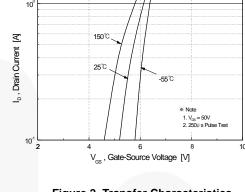


Figure 2. Transfer Characteristics

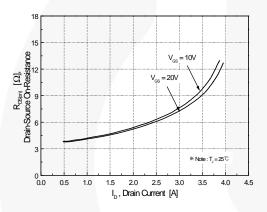


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

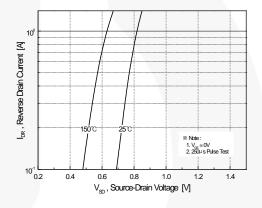


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

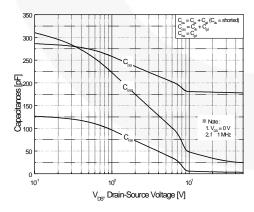


Figure 5. Capacitance Characteristics

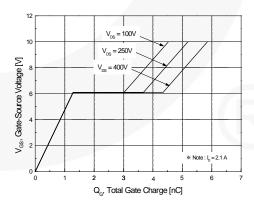


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

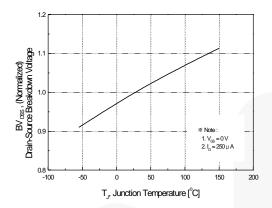
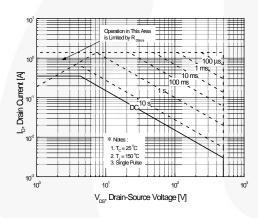


Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



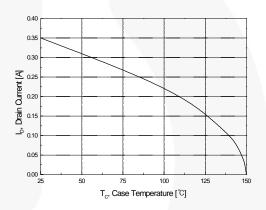


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

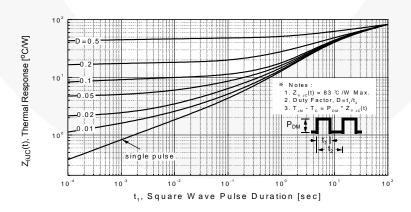


Figure 11. Transient Thermal Response Curve

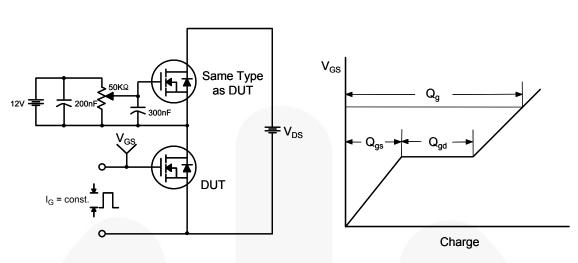


Figure 12. Gate Charge Test Circuit & Waveform

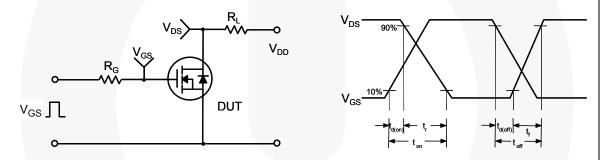


Figure 13. Resistive Switching Test Circuit & Waveforms

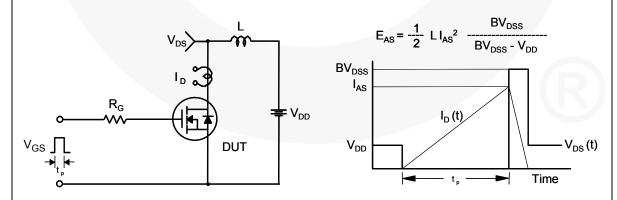
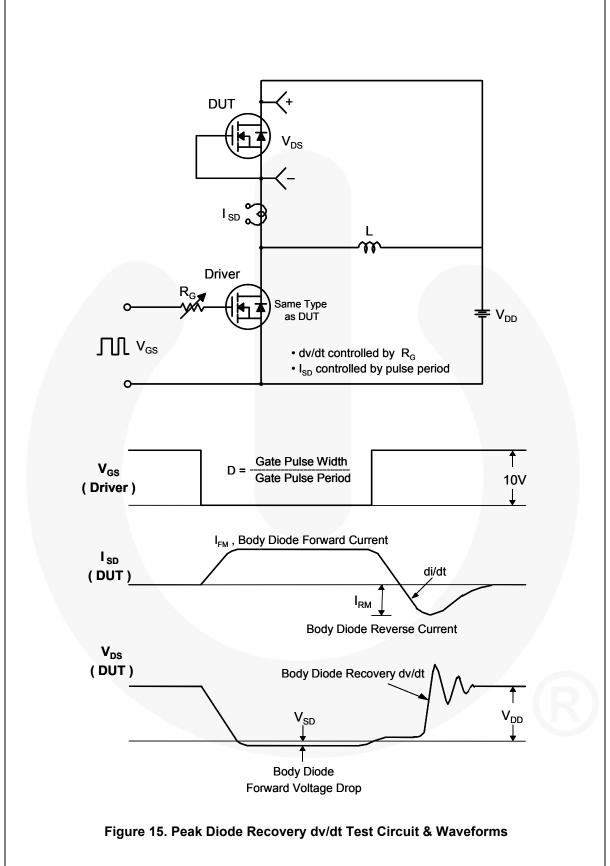
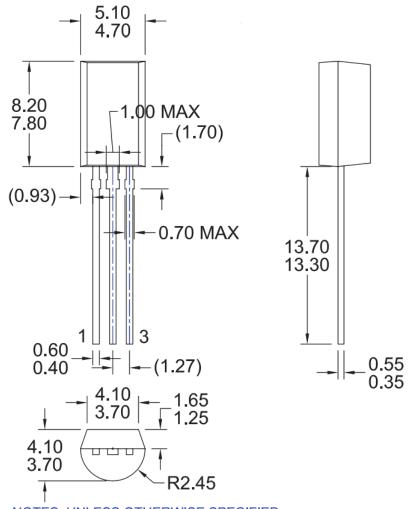


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions



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- D) FORMERLY NAMED BD1409
- E) DRAWING FILE NAME: MKT-ZA03HREV1

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

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