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FAIRCHILD SEMICONDUCTOR®

September 2007

FDC637BNZ

N-Channel 2.5V Specified PowerTrench® MOSFET

20V, 6.2A, 24mΩ

Features

- Max $r_{DS(on)}$ = 24mΩ at V_{GS} = 4.5V, I_D = 6.2A
- Max $r_{DS(on)}$ = 32mΩ at V_{GS} = 2.5V, I_D = 5.2A
- Fast switching speed
- Low gate charge (8nC typical)
- High performance trench technology for extremely low $r_{DS(on)}$
- SuperSOT™–6 package: small footprint (72% smaller than standard SO-8; low profile (1mm thick)
- HBM ESD protection level > 2kV typical (Note 3)
- Manufactured using green packaging material
- Halide-Free
- RoHS Compliant

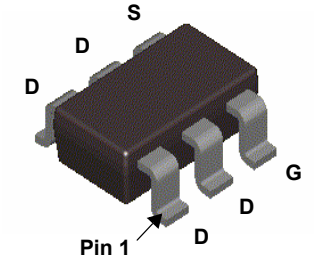
General Description

This N-Channel 2.5V specified MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

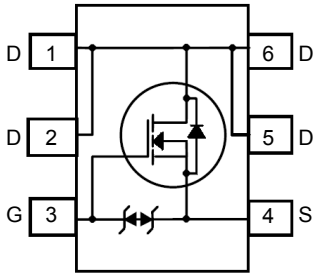
These devices have been designed to offer exceptional power dissipation in a very small footprint compared with bigger SO-8 and TSSOP-8 packages.

Applications

- DC - DC Conversion
- Load switch
- Battery Protection



SuperSOT™ -6



MOSFET Maximum Ratings T_A= 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			20	V
V_{GS}	Gate to Source Voltage			±12	V
I_D	Drain Current -Continuous	T_A = 25°C	(Note 1a)	6.2	A
	-Pulsed			20	
P_D	Power Dissipation	T_A = 25°C	(Note 1a)	1.6	W
	Power Dissipation	T_A = 25°C	(Note 1b)	0.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			–55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	78	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	156	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.637Z	FDC637BNZ	SSOT6	7''	8mm	3000 units

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Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		10		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16V, V_{GS} = 0V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12V, V_{DS} = 0V			±10	μA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	0.6	0.8	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		-3		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 4.5V, I_D = 6.2A		21	24	mΩ
		V_{GS} = 2.5V, I_D = 5.2A		26	32	
		V_{GS} = 4.5V, I_D = 6.2A, T_J = 125°C		30	41	
g_{FS}	Forward Transconductance	V_{DD} = 5V, I_D = 6.2A		27		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz		670	895	pF
C_{oss}	Output Capacitance			160	215	pF
C_{rss}	Reverse Transfer Capacitance			115	175	pF
R_g	Gate Resistance	f = 1MHz		2.1		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10V, I_D = 6.2A, V_{GS} = 4.5V, R_{GEN} = 6Ω		8	16	ns
t_r	Rise Time			6	12	ns
$t_{d(off)}$	Turn-Off Delay Time			22	36	ns
t_f	Fall Time			6	12	ns
Q_g	Total Gate Charge	V_{GS} = 4.5V, V_{DD} = 10V, I_D = 6.2A		8	12	nC
Q_{gs}	Gate to Source Gate Charge			1.3		nC
Q_{gd}	Gate to Drain “Miller” Charge			2.2		nC
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain-Source Diode Forward Current				1.3	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 1.3A (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 6.2A, di/dt = 100A/μs		15	27	ns
Q_{rr}	Reverse Recovery Charge			5	10	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a. 78°C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 156°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics T_J = 25°C unless otherwise noted

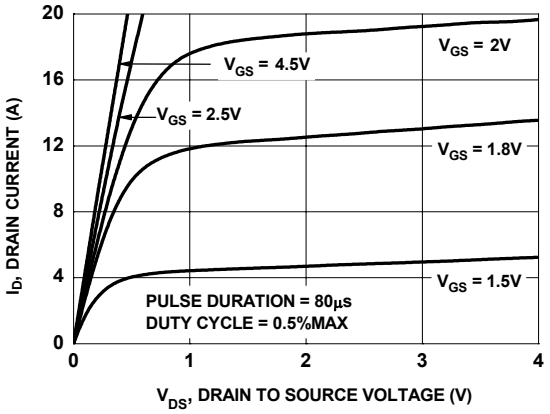

Figure 1. On-Region Characteristics

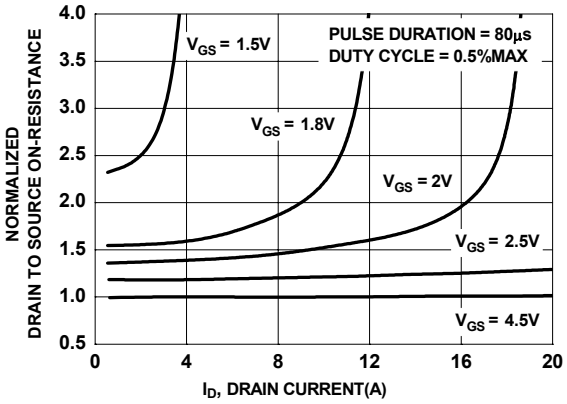

Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

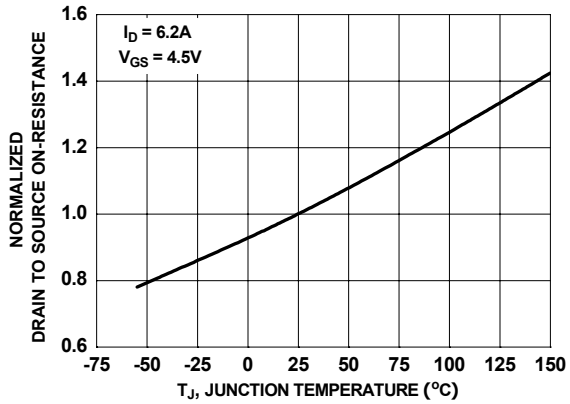

Figure 3. Normalized On-Resistance vs Junction Temperature

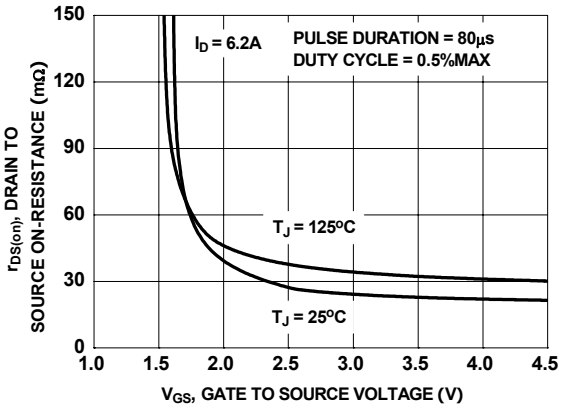

Figure 4. On-Resistance vs Gate to Source Voltage

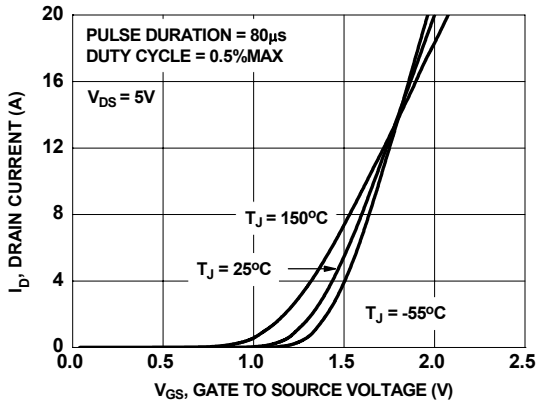

Figure 5. Transfer Characteristics

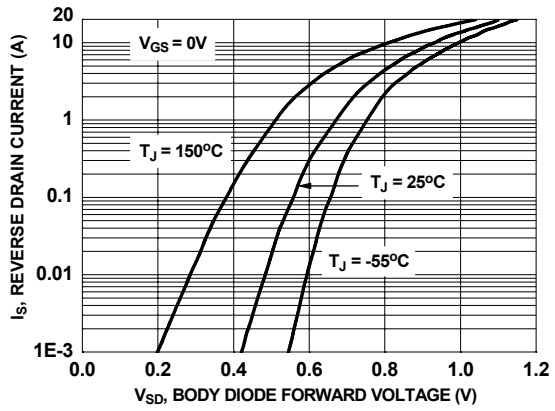

Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

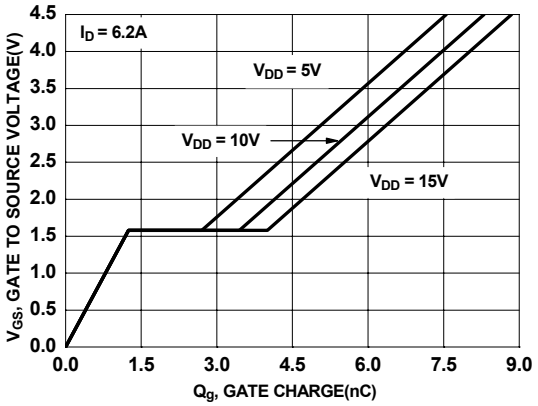

Figure 7. Gate Charge Characteristics

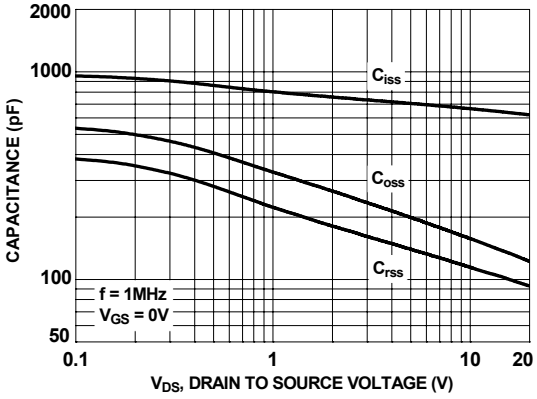

Figure 8. Capacitance vs Drain to Source Voltage

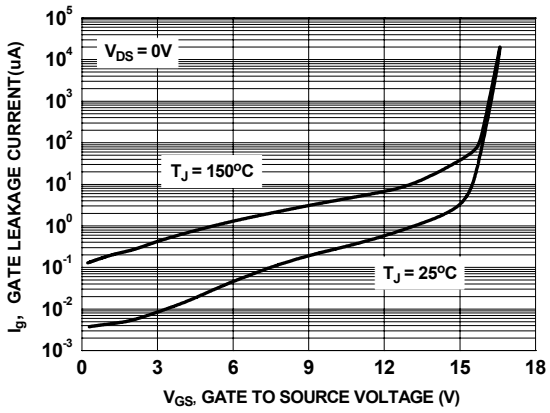

Figure 9. Gate Leakage Current vs Gate to Source Voltage

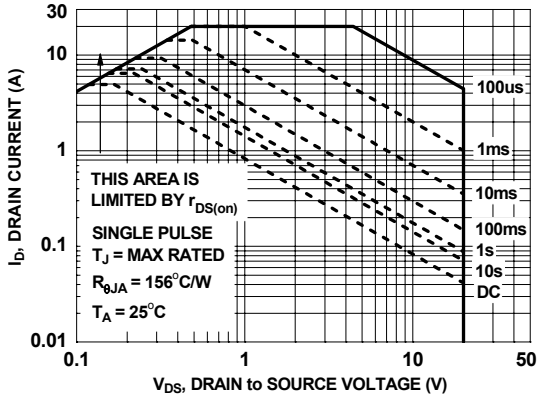

Figure 10. Forward Bias Safe Operating Area

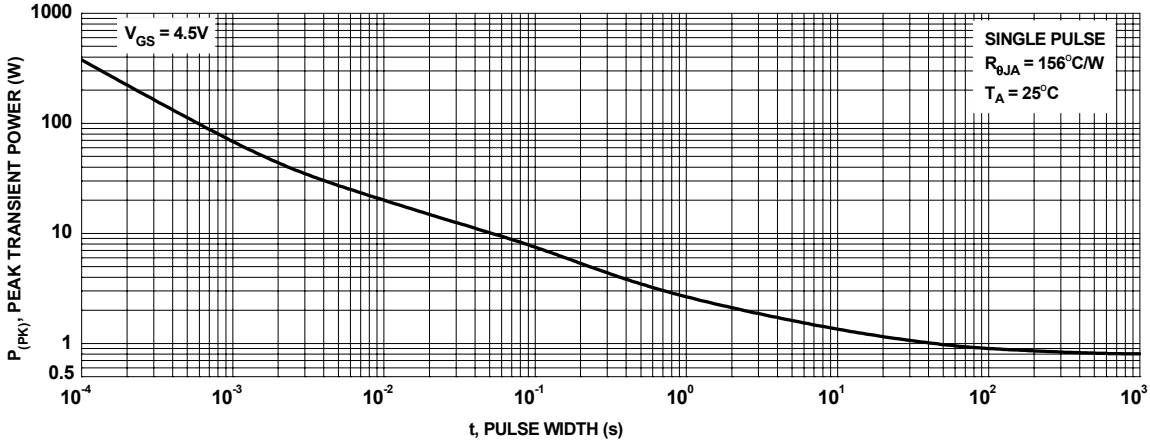

Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

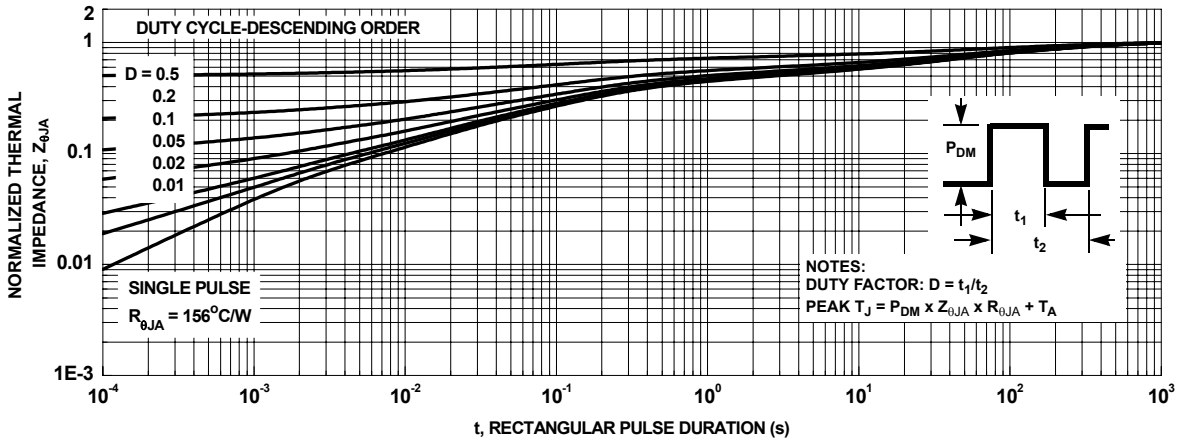

Figure 12. Transient Thermal Response Curve

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