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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

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

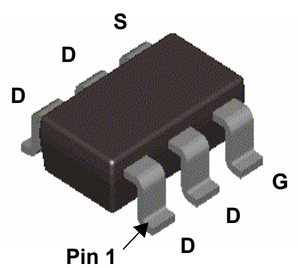
General Description

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.

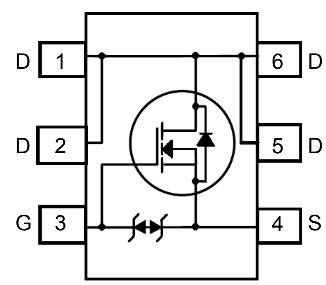
These devices have been designed to offer exceptional power dissipation in a very small footprint compared with bigger SO-8 and TSSOP-8 packages.

Applications

- DC - DC Conversion
- Load switch
- Battery Protection



SuperSOT^{TM} -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

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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

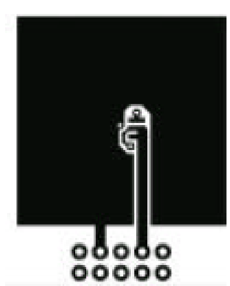
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10V, I_D = 6.2A V_{GS} = 4.5V, R_{GEN} = 6Ω		8	16	ns
t_r	Rise Time			6	12	ns
$t_{d(off)}$	Turn-Off Delay Time			22	36	ns
t_f	Fall Time			6	12	ns
Q_g	Total Gate Charge	V_{GS} = 4.5V, V_{DD} = 10V, I_D = 6.2A		8	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

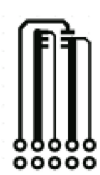
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Drain-Source Diode Forward Current				1.3	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 1.3A (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 6.2A, di/dt = 100A/µs		15	27	ns
Q_{rr}	Reverse Recovery Charge			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

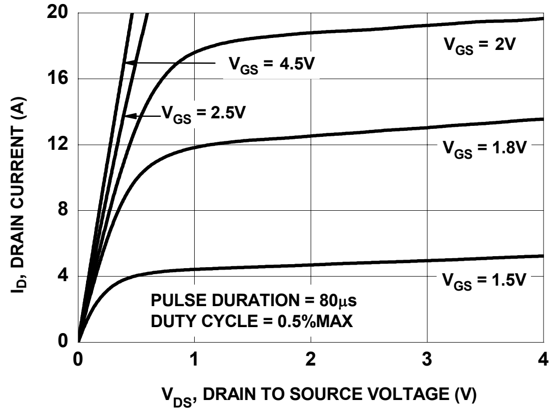


Figure 1. On-Region Characteristics

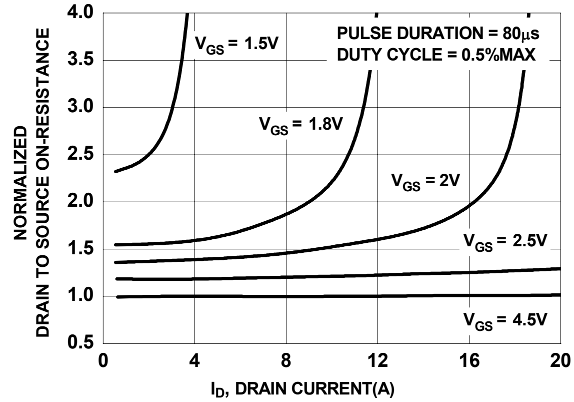


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

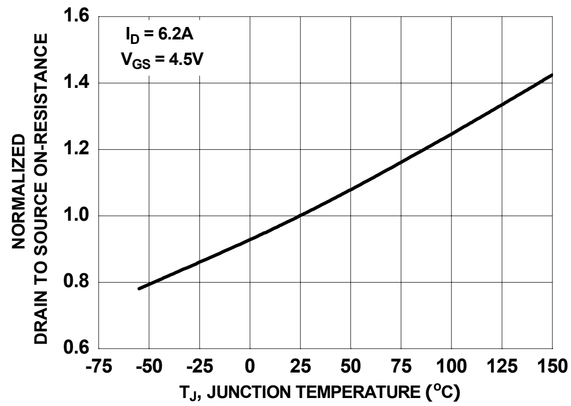


Figure 3. Normalized On-Resistance vs Junction Temperature

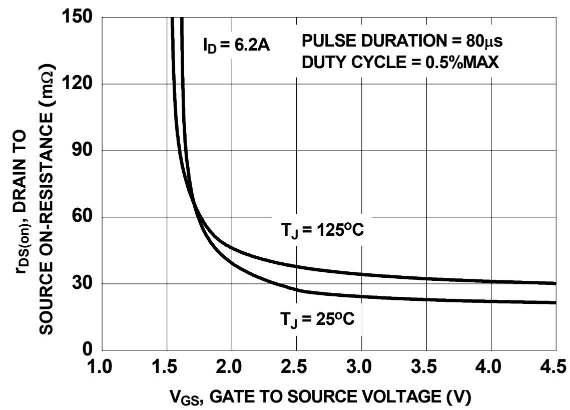


Figure 4. On-Resistance vs Gate to Source Voltage

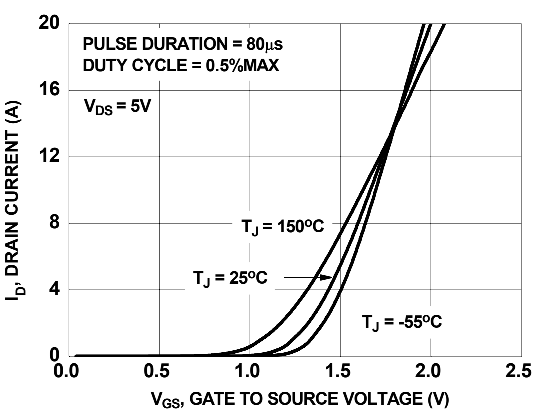


Figure 5. Transfer Characteristics

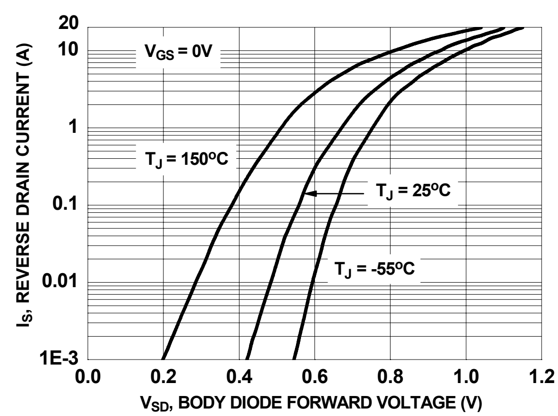


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

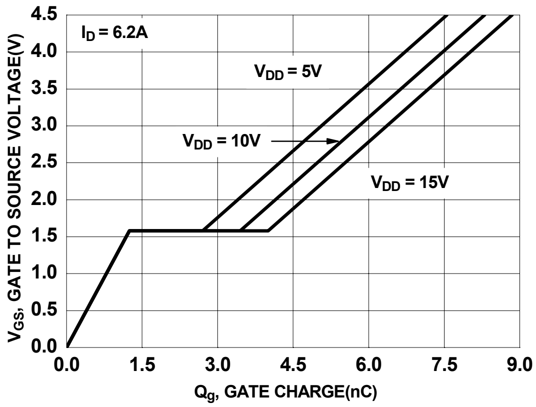


Figure 7. Gate Charge Characteristics

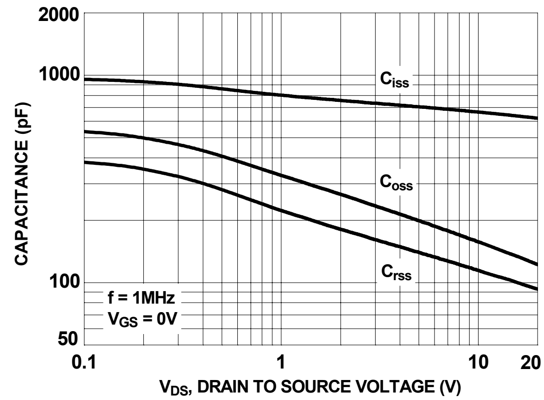


Figure 8. Capacitance vs Drain to Source Voltage

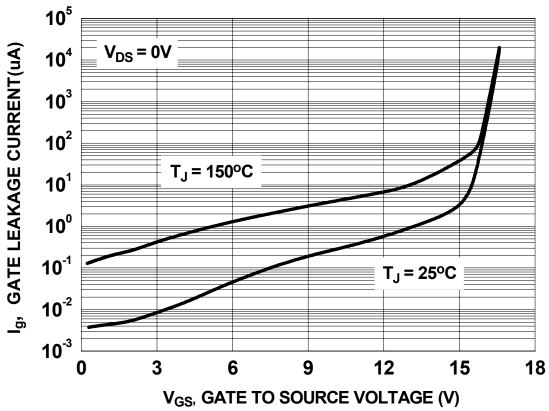


Figure 9. Gate Leakage Current vs Gate to Source Voltage

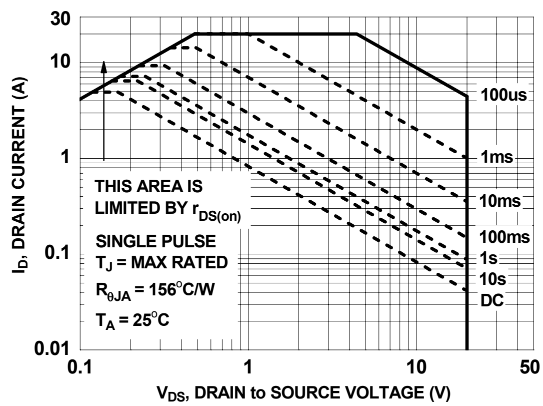


Figure 10. Forward Bias Safe Operating Area

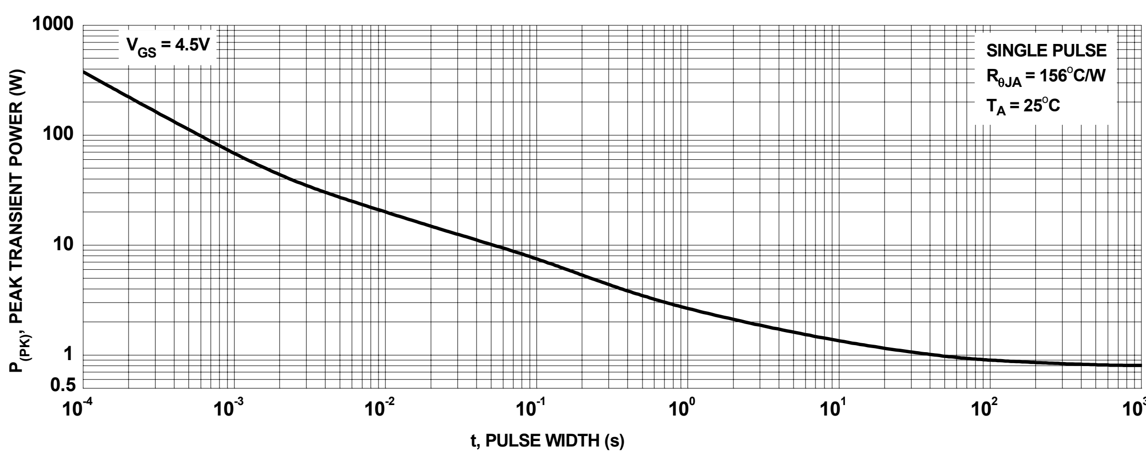


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

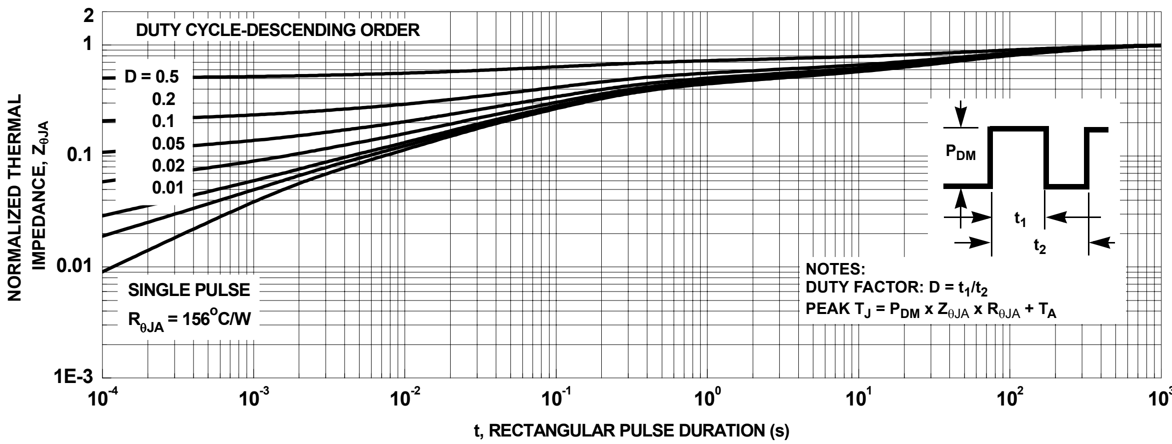


Figure 12. Transient Thermal Response Curve

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Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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