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December 2006

FDC638APZ

P-Channel 2.5V PowerTrench® Specified MOSFET

–20V, **–4.5A**, **43m**Ω

Features

- Max $r_{DS(on)}$ = 43m Ω at V_{GS} = -4.5V, I_D = -4.5A
- Max $r_{DS(on)}$ = 68m Ω at V_{GS} = -2.5V, I_D = -3.8A
- Low gate charge (8nC typical).
- High performance trench technology for extremely low r_{DS(on)}.
- SuperSOTTM −6 package:small footprint (72% smaller than standard SO−8) low profile (1mm thick).
- RoHS Compliant



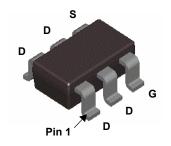
General Description

This P-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

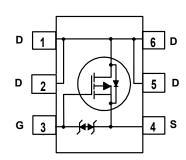
These devices are well suited for battery power applications:load switching and power management,battery charging circuits,and DC/DC conversion.

Application

■ DC - DC Conversion



SuperSOTTM -6



MOSFET Maximum Ratings TA = 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
1	Drain Current -Continuous	(Note 1a)	-4.5	^
'D	-Pulsed		-20	A
D	Power Dissipation	(Note 1a)	1.6	W
P_{D}	Power Dissipation	(Note 1b)	8.0	VV
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	C/VV

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
.638Z	FDC638APZ	7"	8mm	3000 units

Electrical Characteristics $T_J = 25$ °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	ecteristics					
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250 \mu A, V_{GS} = 0 V$	-20			V
ΔBV _{DSS} ΔΤ _J	Breakdown Voltage Temperature Coefficient	I_D = -250 μ A, referenced to 25°C		-9.4		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16V,$ $V_{GS} = 0V$ $T_{J} = 55^{\circ}C$			-1 -10	μА
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 12V, V_{DS} = 0V$			±10	μΑ

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = -250 \mu A$	-0.4	-0.8	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		2.9		mV/°C
		$V_{GS} = -4.5V, I_D = -4.5A$		37	43	
r _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = -2.5V, I_D = -3.8A$		52	68	mΩ
		$V_{GS} = -4.5V$, $I_D = -4.5A$, $T_J = 125$ °C		50	72	
I _{D(on)}	On-State Drain Current	$V_{GS} = -10V, V_{DS} = -4.5A$	-20			Α
9 _{FS}	Forward Transconductance	$V_{DS} = -10V$, $I_{D} = -4.5A$		18		S

Dynamic Characteristics

C _{iss}	Input Capacitance	V - 40V V - 0V	750	1000	pF
C _{oss}	Output Capacitance	$V_{DS} = -10V, V_{GS} = 0V,$ f = 1MHz	155	210	pF
C _{rss}	Reverse Transfer Capacitance	1 – 111112	130	195	pF

Switching Characteristics (Note 2)

t _{d(on)}	Turn-On Delay Time		6	12	ns
t _r	Rise Time	$V_{DD} = -5V, I_{D} = -4.5A$ $V_{GS} = -4.5V, R_{GEN} = 6\Omega$	20	31	ns
t _{d(off)}	Turn-Off Delay Time	V _{GS} 4.5V, K _{GEN} - 052	48	77	ns
t _f	Fall Time		47	72	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0V \text{ to } -4.5V$ $V_{DD} = -5V$	8	12	nC
Q_{gs}	Gate to Source Gate Charge	$I_{D} = -4.5A$	2		nC
Q_{gd}	Gate to Drain "Miller" Charge		2		nC

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain-Source Diode Forward Current				-1.3	Α
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0V, I_S = -1.3A$ (Note 2)		-0.8	-1.2	V
t _{rr}	Reverse Recovery Time	I _F = -4.5A, di/dt = 100A/μs		24	36	ns
Q _{rr}	Reverse Recovery Charge	1F = -4.5A, αι/αι = 100A/μs		13	20	nC

Notes:

1: R_{0,JA} is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.R_{0,JC} is guaranteed by design while R_{0,CA} is determined by user's board design.



a. 78°C/W when mounted on a 1 in2 pad of 2 oz copper on FR-4 board.



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

2: Pulse Test: Pulse Width < $300\mu s$, Duty cycle < 2.0%.

Typical Characteristics T_J = 25°C unless otherwise noted

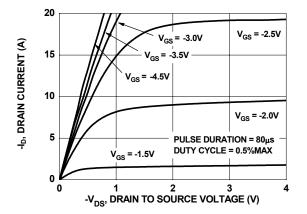


Figure 1. On-Region Characteristics

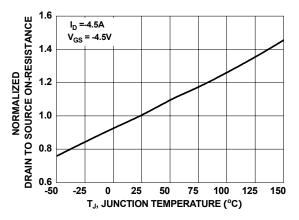


Figure 3. Normalized On-Resistance vs Junction Temperature

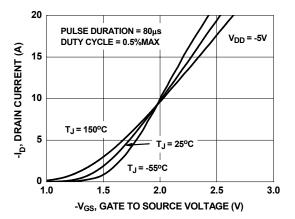


Figure 5. Transfer Characteristics

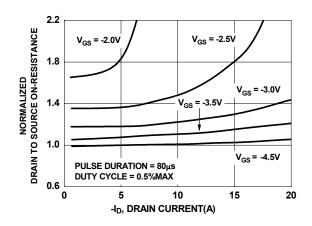


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

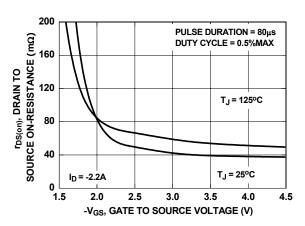


Figure 4. On-Resistance vs Gate to Source Voltage

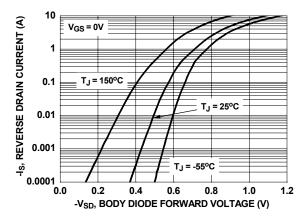


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^{\circ}C$ unless otherwise noted

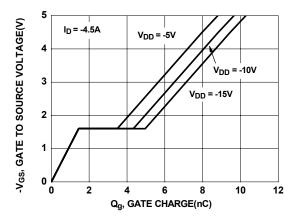


Figure 7. Gate Charge Characteristics

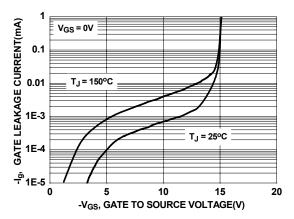


Figure 9. Gate Leakage Current vs Gate to Source Voltage

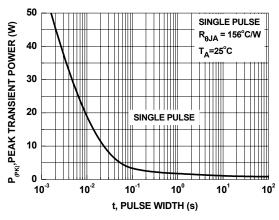


Figure 11. Single Pulse Maximum Power Dissipation

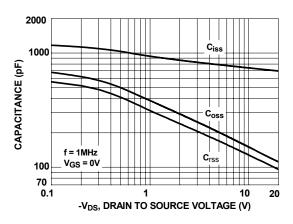


Figure 8. Capacitance vs Drain to Source Voltage

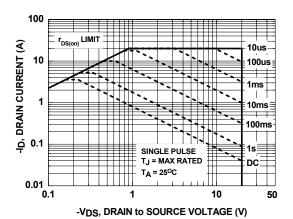


Figure 10. Forward Bias Safe Operating Area

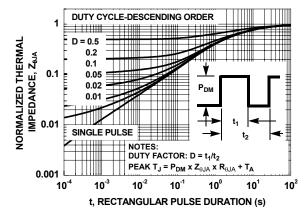


Figure 12. Transient Thermal Response Curve

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The Power Franchise[®]

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