![FAIRCHILD SEMICONDUCTOR®]

August 2007

FDC610PZ

P-Channel PowerTrench® MOSFET

–30V, –4.9A, 42mΩ

Features

- Max $r_{DS(on)}$ = 42mΩ at V_{GS} = –10V, I_D = –4.9A

- Max $r_{DS(on)}$ = 75mΩ at V_{GS} = –4.5V, I_D = –3.7A

- Low gate charge (17nC 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).

- RoHS Compliant

General Description

This P-Channel 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

SuperSOT™ -6
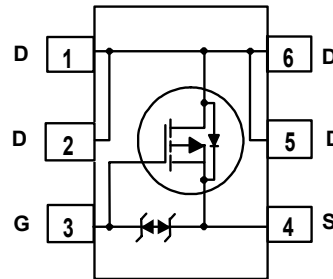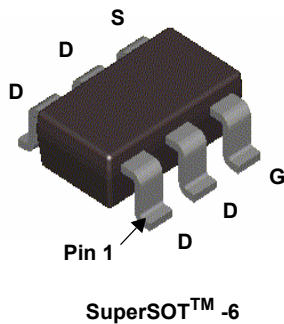
MOSFET Maximum Ratings T_A= 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		–30	V
V_{GS}	Gate to Source Voltage		±25	V
I_D	Drain Current -Continuous	(Note 1a)	–4.9	A
	-Pulsed		–20	
P_D	Power Dissipation	(Note 1a)	1.6	W
	Power Dissipation	(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
.610Z	FDC610PZ	SSOT6	7''	8mm	3000units

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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	–30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250µA, referenced to 25°C		–22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –24V, V_{GS} = 0V			–1	µA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±25V, 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	–1	–2.2	–3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = –250µA, referenced to 25°C		6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = –10V, I_D = –4.9A		36	42	mΩ
		V_{GS} = –4.5V, I_D = –3.7A		58	75	
		V_{GS} = –10V, I_D = –4.9A, T_J = 125°C		50	60	
g_{FS}	Forward Transconductance	V_{DD} = –10V, I_D = –4.9A		15		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = –15V, V_{GS} = 0V, f = 1MHz		755	1005	pF
C_{oss}	Output Capacitance			145	195	pF
C_{rss}	Reverse Transfer Capacitance			125	190	pF
R_g	Gate Resistance	f = 1MHz		13		Ω

Switching Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = –15V, I_D = –4.9A V_{GS} = –10V, R_{GEN} = 6Ω			7	14	ns
t_r	Rise Time				4	10	ns
$t_{d(off)}$	Turn-Off Delay Time				33	53	ns
t_f	Fall Time				23	37	ns
Q_g	Total Gate Charge	V_{GS} = 0V to –10V	V_{DD} = –15V, I_D = –4.9A		17	24	nC
Q_g	Total Gate Charge	V_{GS} = 0V to –4.5V			9	13	nC
Q_{gs}	Gate to Source Gate Charge				2.9		nC
Q_{gd}	Gate to Drain "Miller" Charge				4.3		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)		–0.8	–1.2	V
t_{rr}	Reverse Recovery Time	I_F = –4.9A, di/dt = 100A/µs		19	35	ns
Q_{rr}	Reverse Recovery Charge			9	18	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 $R_{\theta CA}$ is determined by the user's board design.
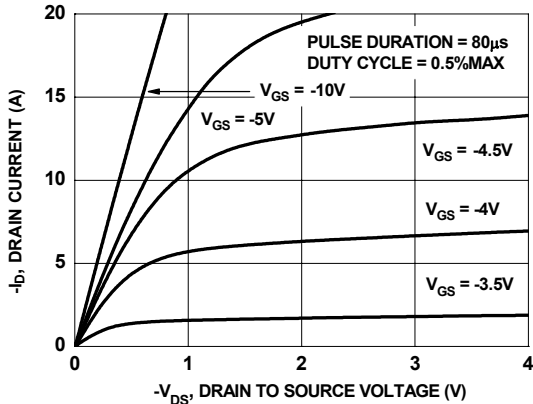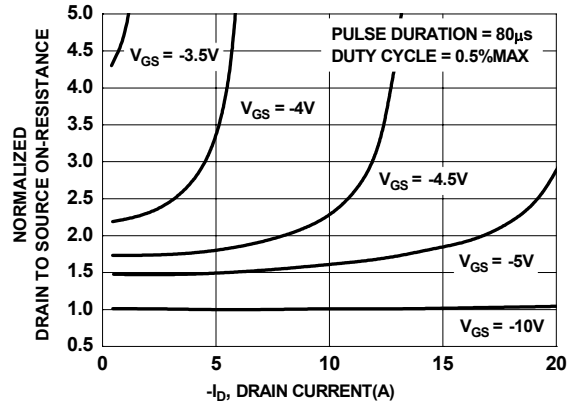

a. 78°C/W when mounted on a 1 in^2 pad of 2 oz copper.

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

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

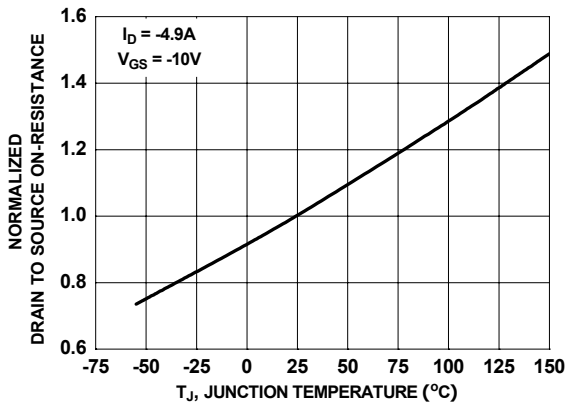## Typical Characteristics T_J = 25°C unless otherwise noted
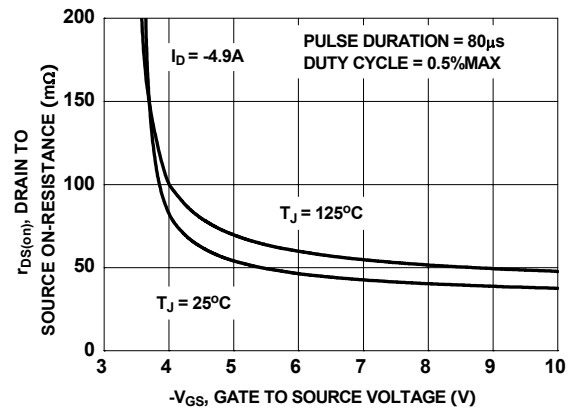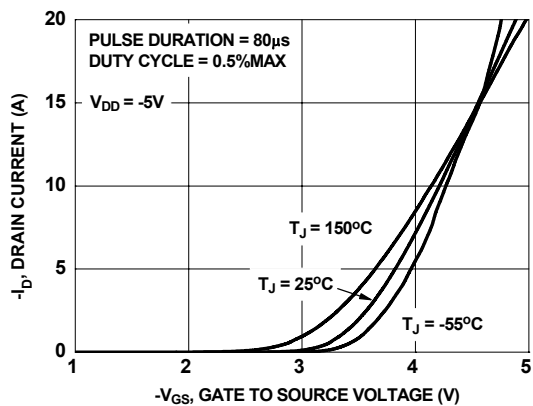

Figure 1. On-Region Characteristics

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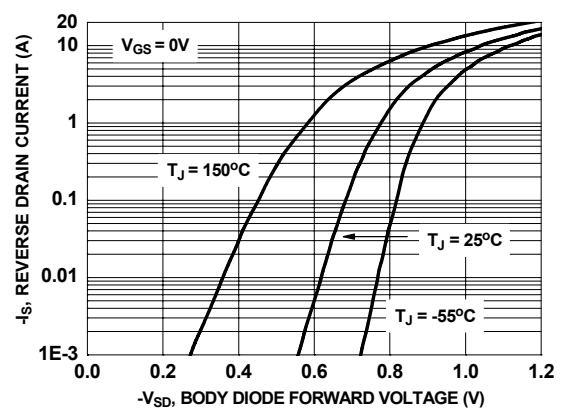

Figure 3. Normalized On-Resistance vs Junction Temperature

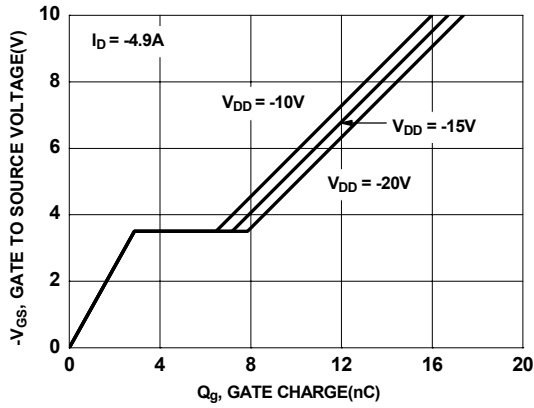**Figure 4. On-Resistance vs Gate to Source Voltage**
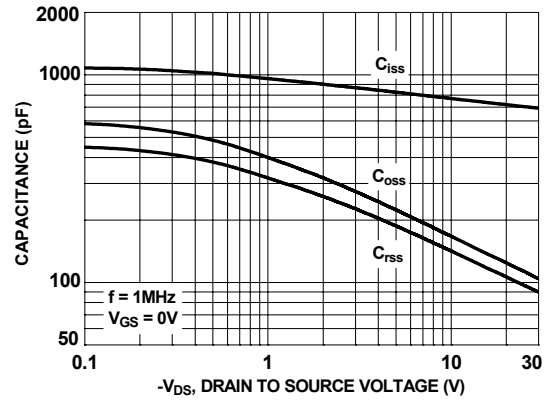

Figure 5. Transfer Characteristics

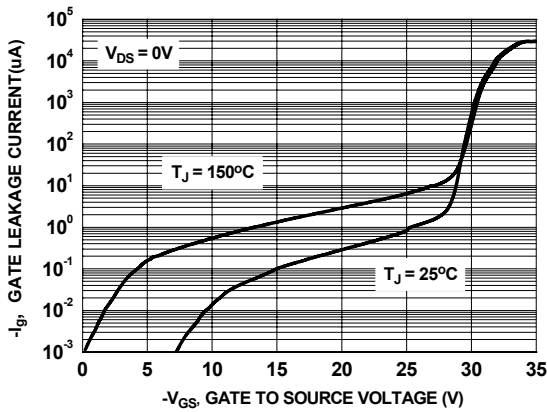**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

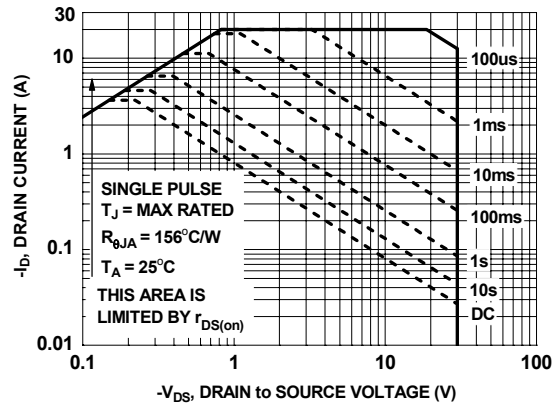## Typical Characteristics T_J = 25°C unless otherwise noted

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
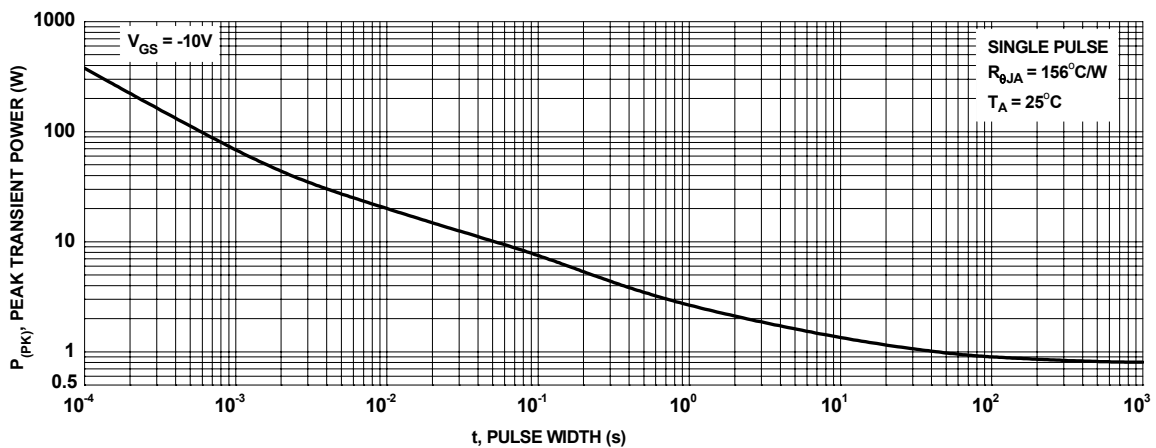
Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25°C$ unless otherwise noted
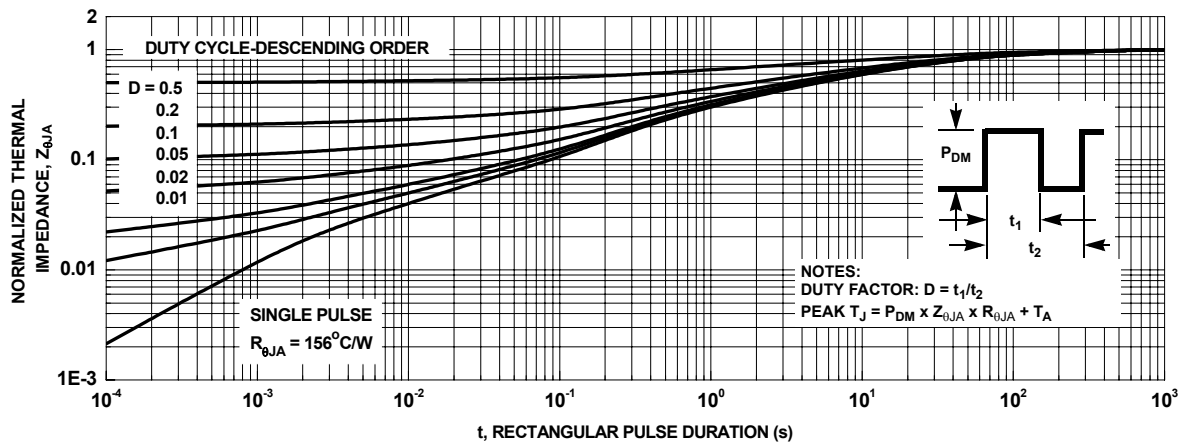
Figure 12. Transient Thermal Response Curve

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