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## FDS6875

### Dual P-Channel 2.5V Specified PowerTrench™ MOSFET

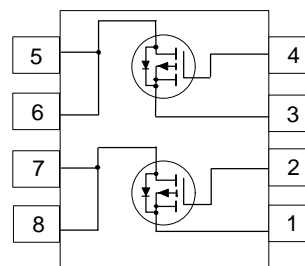
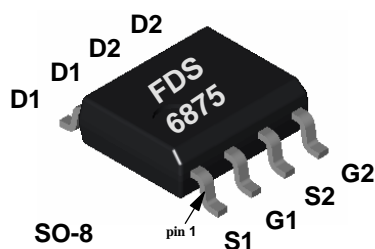
#### General Description

These P-Channel 2.5V specified MOSFETs are 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 portable electronics applications: load switching and power management, battery charging and protection circuits.

#### Features

- -6 A, -20 V.  $R_{DS(ON)} = 0.030 \Omega$  @  $V_{GS} = -4.5$  V,  
 $R_{DS(ON)} = 0.040 \Omega$  @  $V_{GS} = -2.5$  V.
- Low gate charge (23nC typical).
- High performance trench technology for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.



#### Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FDS6875	Units
$V_{DSS}$	Drain-Source Voltage	-20	V
$V_{GSS}$	Gate-Source Voltage	$\pm 8$	V
$I_D$	Drain Current - Continuous (Note 1a)	-6	A
	- Pulsed	-20	
$P_D$	Power Dissipation for Dual Operation	2	W
	Power Dissipation for Single Operation (Note 1a)	1.6	
	(Note 1b)	1	
	(Note 1c)	0.9	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

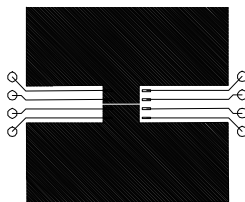
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	40	$^\circ\text{C/W}$

# Electrical Characteristics (T<sub>A</sub> = 25 °C unless otherwise noted)

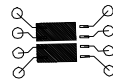
Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-20			V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	I <sub>D</sub> = -250 μA, Referenced to 25 °C		-21		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V T <sub>J</sub> = 55°C			-1 -10	μA
I <sub>GSSF</sub>	Gate - Body Leakage, Forward	V <sub>GS</sub> = 8 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate - Body Leakage, Reverse	V <sub>GS</sub> = -8 V, V <sub>DS</sub> = 0 V			-100	nA
ON CHARACTERISTICS (Note 2)						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-0.4	-0.8	-1.5	V
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Gate Threshold Voltage Temp. Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25 °C		2.8		mV/°C
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -6 A T <sub>J</sub> =125°C		0.024 0.033	0.03 0.048	Ω
I <sub>D(on)</sub>	On-State Drain Current	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -5 V	-20			A
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = -4.5 V, I <sub>D</sub> = -6 A		22		S
DYNAMIC CHARACTERISTICS						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz		2250		pF
C <sub>oss</sub>	Output Capacitance			500		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			200		pF
SWITCHING CHARACTERISTICS (Note 2)						
t <sub>D(on)</sub>	Turn - On Delay Time	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 A V <sub>GEN</sub> = -4.5 V, R <sub>GEN</sub> = 6 Ω		8	16	ns
t <sub>r</sub>	Turn - On Rise Time			15	27	ns
t <sub>D(off)</sub>	Turn - Off Delay Time			98	135	ns
t <sub>f</sub>	Turn - Off Fall Time			35	55	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -6 A, V <sub>GS</sub> = -5 V		23	31	nC
Q <sub>gs</sub>	Gate-Source Charge			3.9		nC
Q <sub>gd</sub>	Gate-Drain Charge			5.5		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				-1.3	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -1.3 A (Note 2)		-0.7	-1.2	V

Notes:

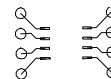
1. R<sub>JA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>JA</sub> is guaranteed by design while R<sub>JA</sub> is determined by the user's board design.



a. 78°C/W on a 0.5 in<sup>2</sup> pad of 2oz copper.



b. 125°C/W on a 0.02 in<sup>2</sup> pad of 2oz copper.



c. 135°C/W on a 0.003 in<sup>2</sup> pad of 2oz copper.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

## Typical Electrical Characteristics

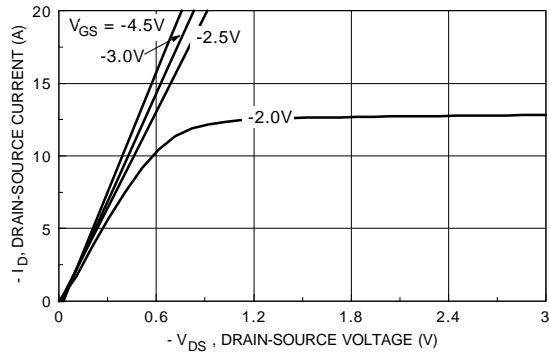


Figure 1. On-Region Characteristics.

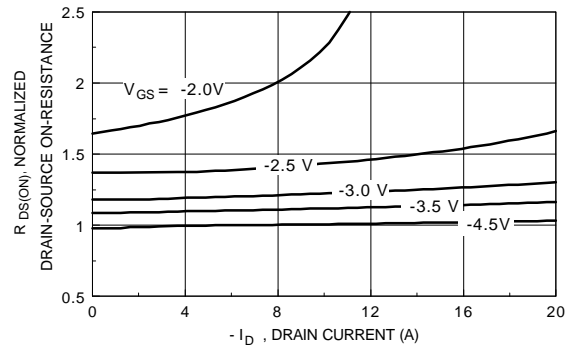


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

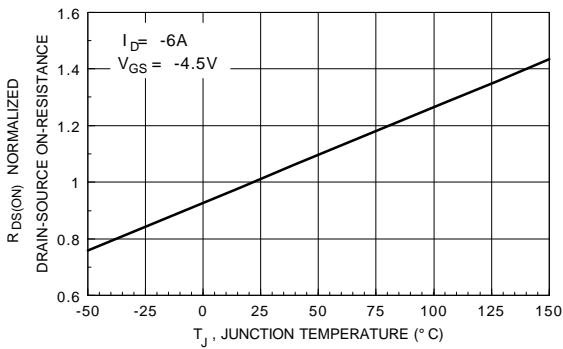


Figure 3. On-Resistance Variation with Temperature.

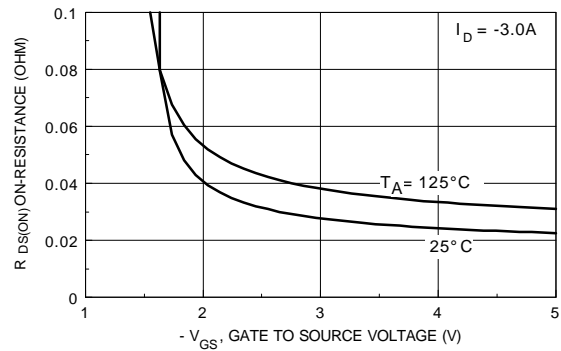


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

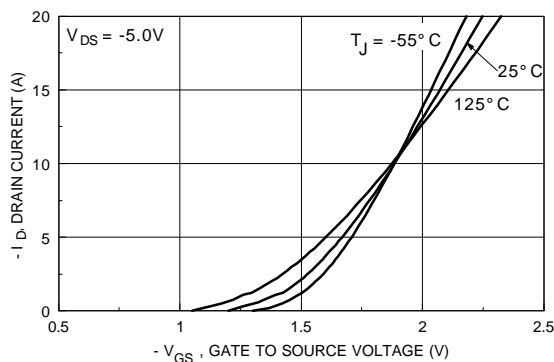


Figure 5. Transfer Characteristics.

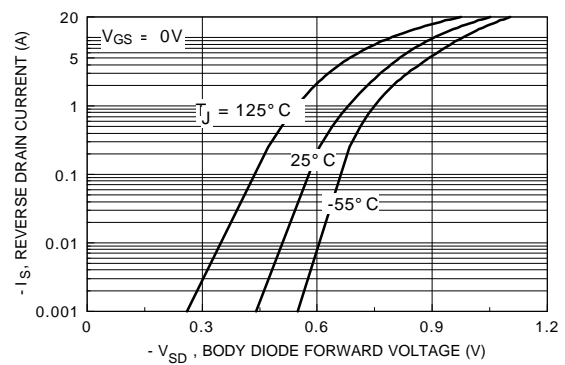


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (continued)

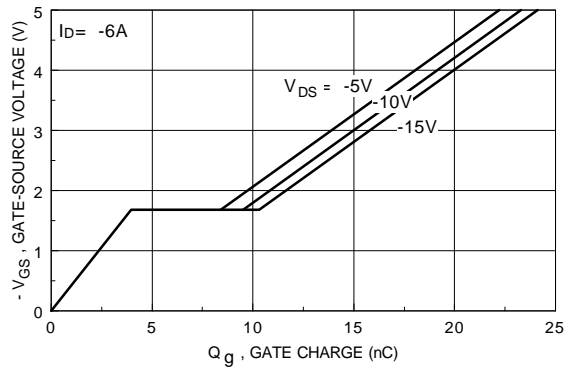


Figure 7. Gate Charge Characteristics.

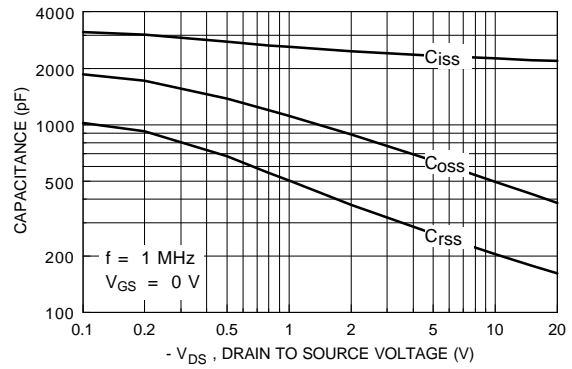


Figure 8. Capacitance Characteristics.

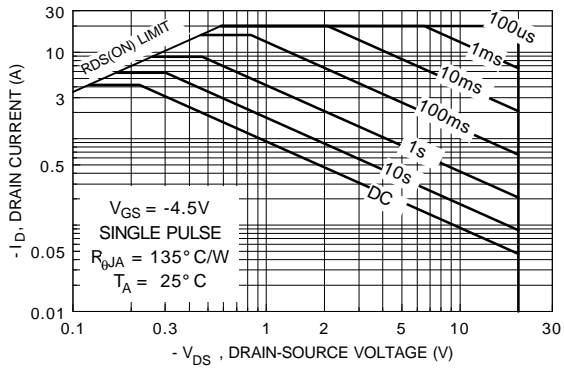


Figure 9. Maximum Safe Operating Area.

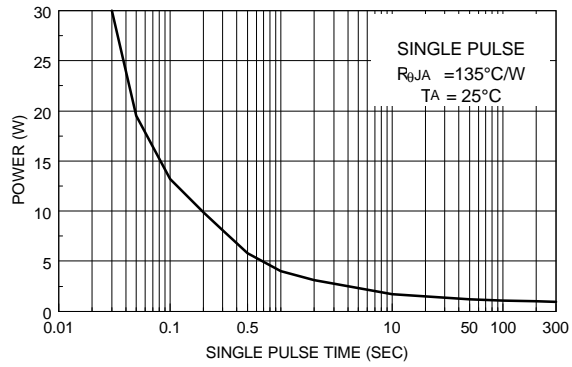


Figure 10. Single Pulse Maximum Power Dissipation.

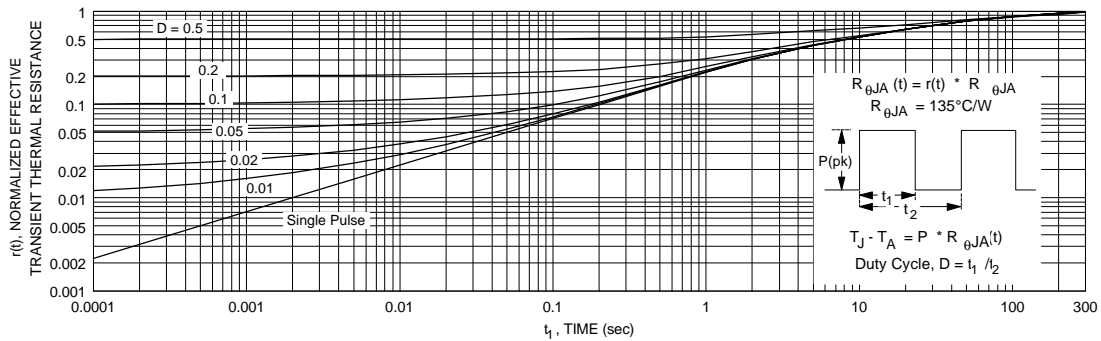


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1c.  
Transient thermal response will change depending on the circuit board design.

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