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FAIRCHILD

SEMICONDUCTOR ™

FDS6890A

Dual N-Channel 2.5V Specified PowerTrench™ MOSFET

General Description

These N-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.

Applications

- DC/DC converter
- Motor drives

Features

- 7.5 A, 20 V. $R_{DS(ON)} = 0.018\ \Omega$ @ $V_{GS} = 4.5$ V
  $R_{DS(ON)} = 0.022\ \Omega$ @ $V_{GS} = 2.5$ V.

- Low gate charge (23nC typical).

- Fast switching speed.

- High performance trench technology for extremely low $R_{DS(ON)}$.

- High power and current handling capability.

SO-8
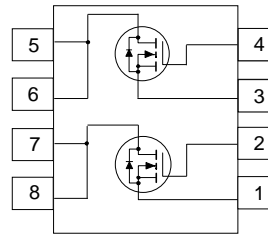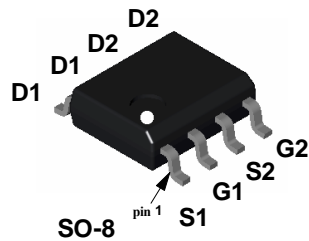
Absolute Maximum Ratings $T_A=25^{o}C$ unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate-Source Voltage		±8	V
I_D	Drain Current - Continuous	(Note 1a)	7.5	A
	- Pulsed		20	
P_D	Power Dissipation for Dual Operation		2.0	W
	Power Dissipation for Single Operation	(Note 1a)	1.6	
		(Note 1b)	1.0	
		(Note 1c)	0.9	
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
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	40	°C/W
			90	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDS6890A	FDS6890A	13	12mm	2500 units

Electrical Characteristics T_A = 25 C unless otherwise noted

| Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		14		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 8 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -8 V, V_{DS} = 0 V			-100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.5	0.8	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		-3.5		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 4.5 V, I_D =7.5 A V_{GS} = 4.5 V, I_D =7.5 A, T_J =125°C V_{GS} = 2.5 V, I_D =6.5 A		0.013 0.021 0.016	0.018 0.034 0.022	Ω
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	20			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 7.5 A		35		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz		2130		pF
C_{oss}	Output Capacitance			545		pF
C_{rss}	Reverse Transfer Capacitance			270		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10 V, I_D = 1 A, V_{GS} = 4.5 V, R_{GEN} = 6 Ω		13	24	ns
t_r	Turn-On Rise Time			26	42	ns
$t_{d(off)}$	Turn-Off Delay Time			65	90	ns
t_f	Turn-Off Fall Time			23	37	ns
Q_g	Total Gate Charge	V_{DS} = 10 V, I_D = 7.5 A, V_{GS} = 4.5 V,		23	32	nC
Q_{gs}	Gate-Source Charge			3.2		nC
Q_{gd}	Gate-Drain Charge			4.4		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				1.3	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.3 A (Note 2)		0.65	1.2	V

Notes:

1. $R_{\theta JA}$ 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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.
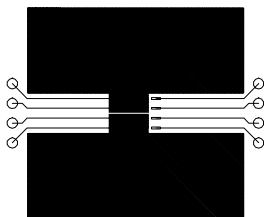
a) 78° C/W when mounted on a 0.5 in² pad of 2 oz. copper.
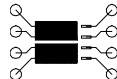
b) 125° C/W when mounted on a 0.02 in² pad of 2 oz. copper.
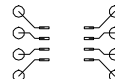
c) 135° C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper
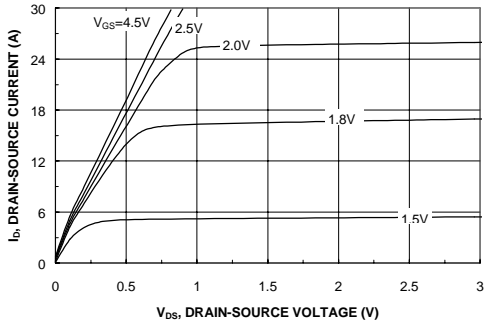
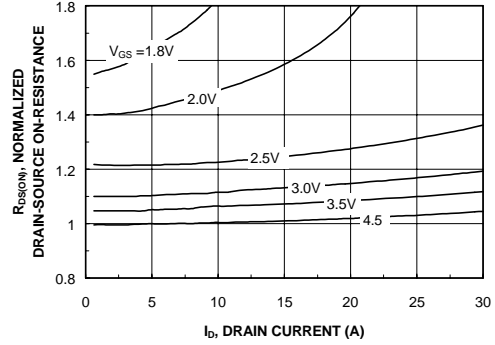# Typical Characteristics (continued)

Figure 1. On-Region Characteristics.

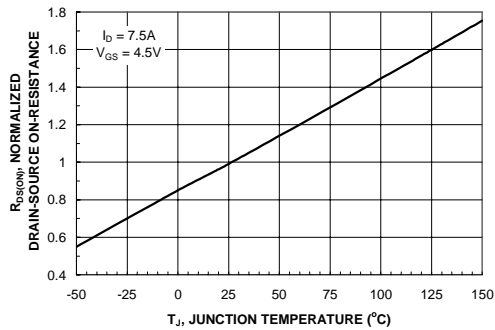**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**

Figure 3. On-Resistance Variation withTemperature.
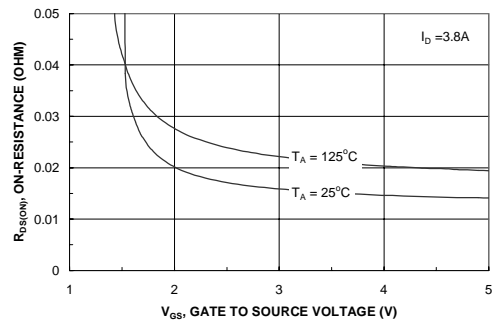

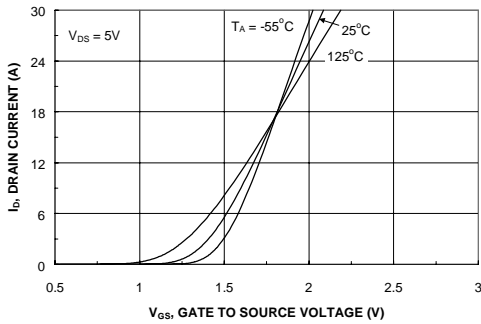**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**
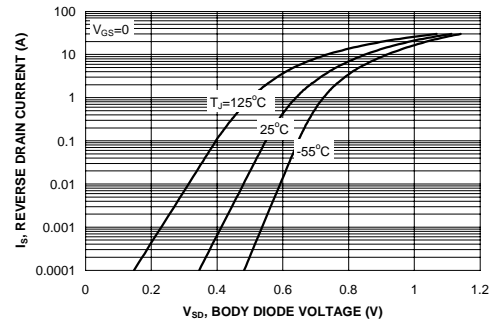

Figure 5. Transfer Characteristics.

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.
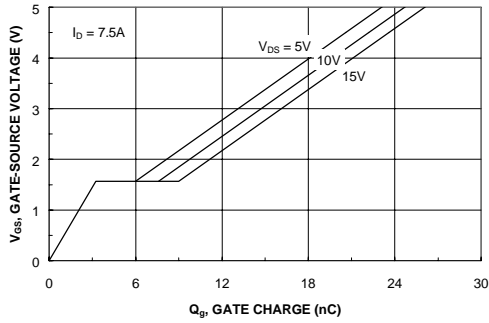
Typical Characteristics (continued)

Figure 7. Gate Charge Characteristics.
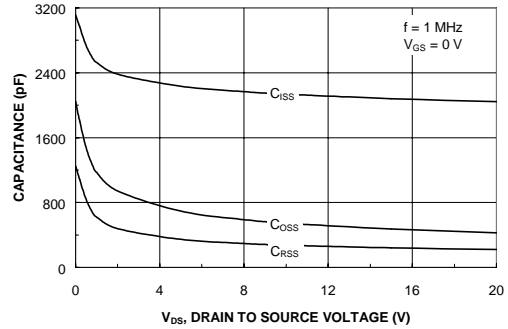
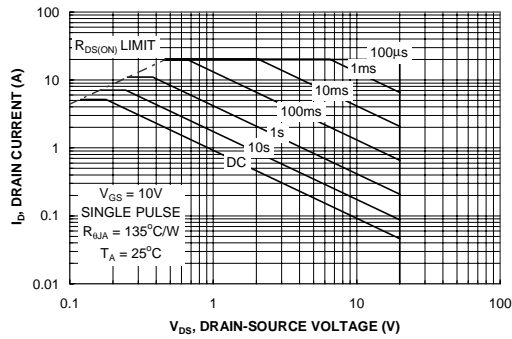**Figure 8. Capacitance Characteristics.**

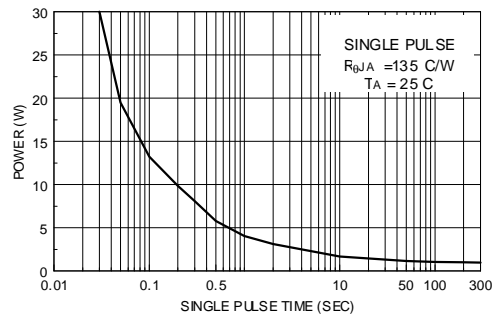**Figure 9. Maximum Safe Operating Area.**

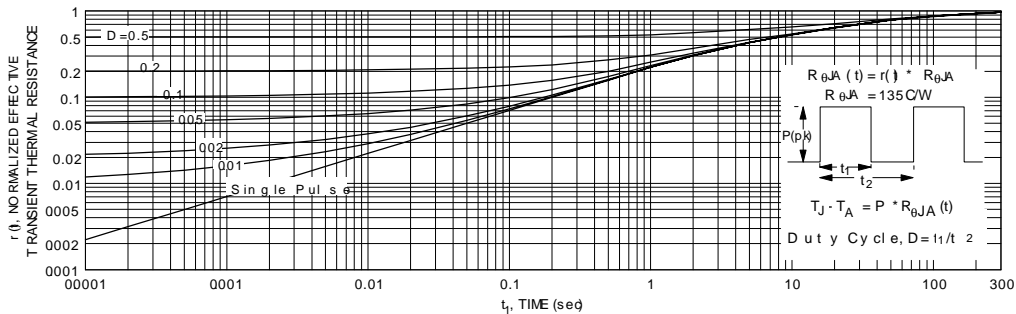**Figure 10. Single Pulse Maximum Power Dissipation.**

Figure 11. Transient Thermal Response Curve.
Thermal characterization performed using the conditions described in Note 1c.
Transient themal response will change depending on the circuit board design.

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