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FAIRCHILD

SEMICONDUCTOR®

FDS6690A

## Single N-Channel, Logic-Level, PowerTrench^{ò} MOSFET

General Description

This N-Channel Logic Level MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Features

- 11 A, 30 V. $R_{DS(ON)}$ = 12.5 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 17.0 mΩ @ V_{GS} = 4.5 V

- Fast switching speed

- Low gate charge

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

- High power and current handling capability

SO-8

Pin 1
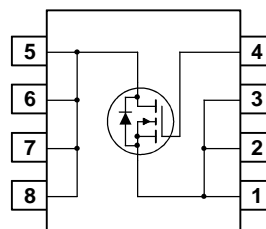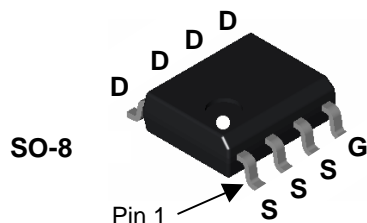
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current – Continuous	(Note 1a)	11	A
	– Pulsed		50	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−55 to +150	$^{\circ}$C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	50	$^{\circ}$C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	125	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	25	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS6690A	FDS6690A	13''	12mm	2500 units

FDS6690A Rev E (W)

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	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		25		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V,　　V_{GS} = 0 V			1	µA
		V_{DS} = 24 V, V_{GS} = 0 V, T_J=55°C			10	µA
I_{GSS}	Gate–Body Leakage	V_{GS} = ±20 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	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V,　　I_D = 11 A V_{GS} = 4.5 V,　　I_D = 10 A V_{GS}= 10 V, I_D = 11 A, T_J=125°C		9.8 12.0 13.7	12.5 17.0 22.0	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V,　　V_{DS} = 5 V	50			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V,　　I_D = 11 A		48		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V,　　V_{GS} = 0 V,		1205		pF
C_{oss}	Output Capacitance	f = 1.0 MHz		290		pF
C_{rss}	Reverse Transfer Capacitance			115		pF
R_G	Gate Resistance	V_{GS} = 15 mV,　f = 1.0 MHz		2.4		Ω
Switching Characteristics　(Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V,　　I_D = 1 A,		9	19	ns
t_r	Turn–On Rise Time	V_{GS} = 10 V,　　R_{GEN} = 6 Ω		5	10	ns
$t_{d(off)}$	Turn–Off Delay Time			28	44	ns
t_f	Turn–Off Fall Time			9	19	ns
Q_g	Total Gate Charge	V_{DS} = 15 V,　　I_D = 11 A,		12	16	nC
Q_{gs}	Gate–Source Charge	V_{GS} = 5 V		3.4		nC
Q_{gd}	Gate–Drain Charge			4.0		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.1	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V,　　I_S = 2.1 A　(Note 2)		0.74	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 11 A, d_{iF}/d_t = 100 A/µs		24		nS
Q_{rr}	Diode Reverse Recovery Charge			27		nC

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)　50°C/W when mounted on a 1in² pad of 2 oz copper

b)　125°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

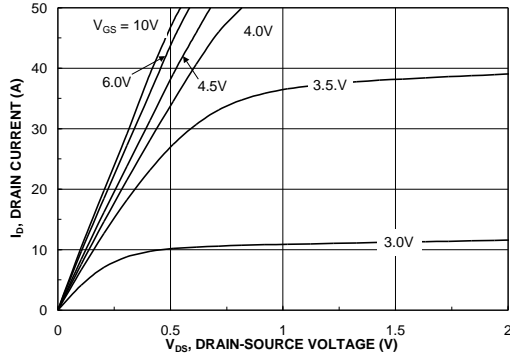**2** Test: Pulse Width < 300µs, Duty Cycle < 2.0%

Typical Characteristics
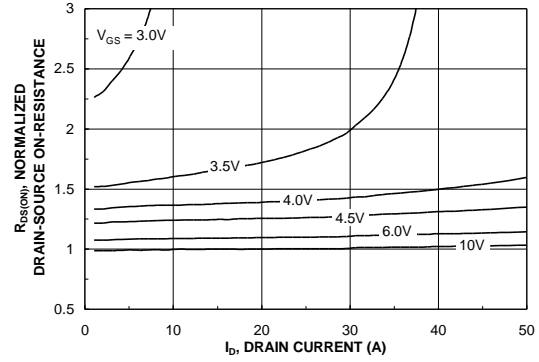

Figure 1. On-Region Characteristics.

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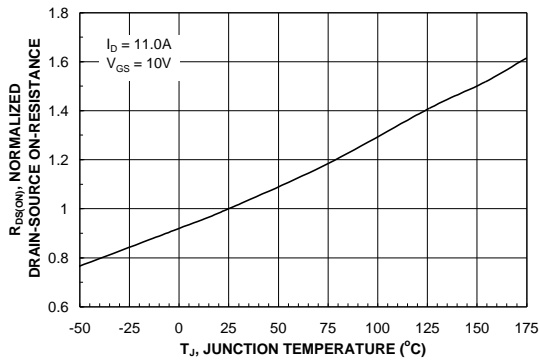

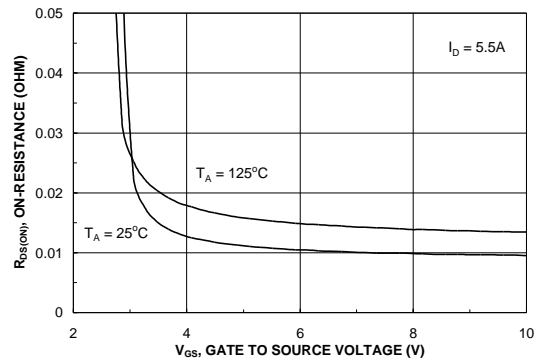**Figure 3. On-Resistance Variation with Temperature.**

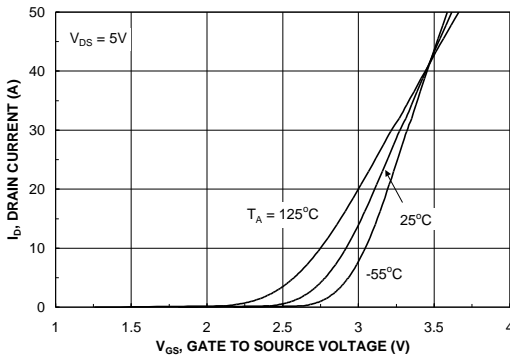**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**

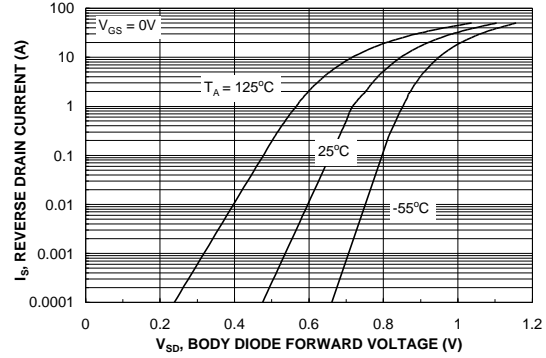**Figure 5. Transfer Characteristics.**

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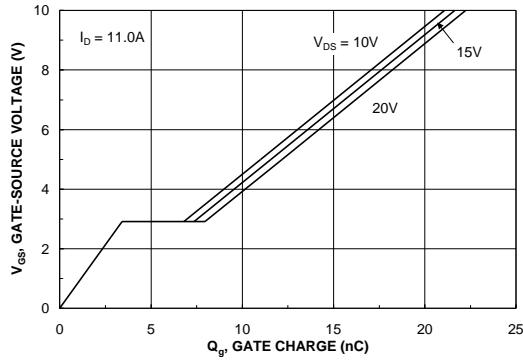
Typical Characteristics
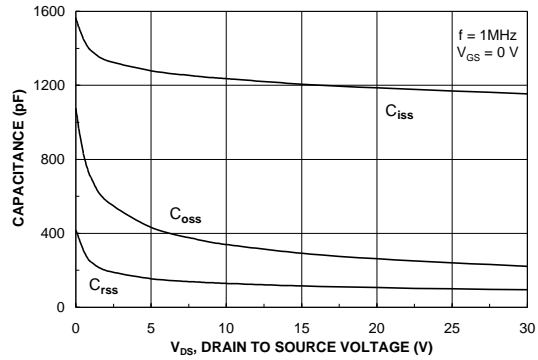

Figure 7. Gate Charge Characteristics.

Figure 8. Capacitance Characteristics.
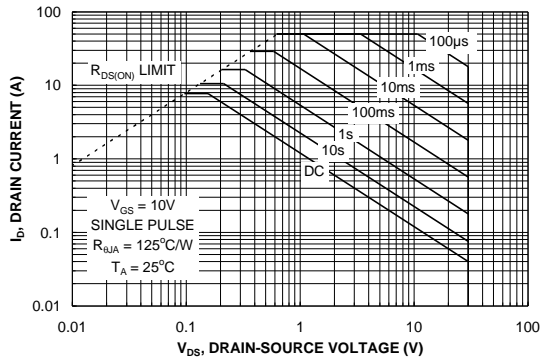

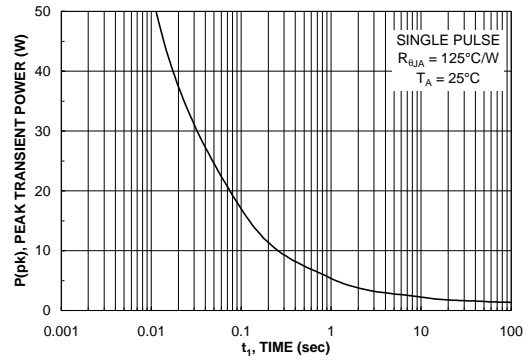**Figure 9. Maximum Safe Operating Area.**

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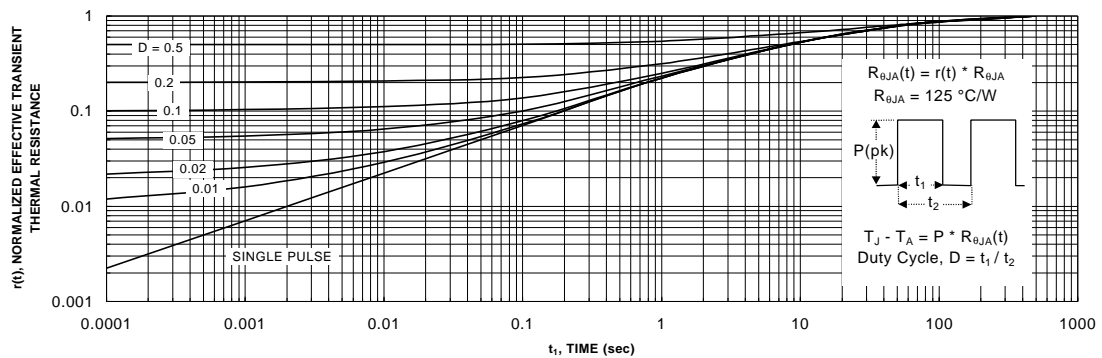Power Dissipation.**

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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