FAIRCHILD SEMICONDUCTOR®

January 2006

FDS8690
N-Channel PowerTrench® MOSFET

30V, 14A, 7.6mΩ

General Description

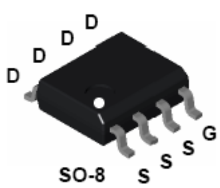
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

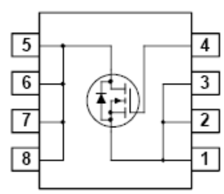
Applications

- Notebook CPU power supply
- Synchronous rectifier

Features

- Max $r_{DS(on)}$ = 7.6mΩ, V_{GS} = 10V, I_D = 14A
- Max $r_{DS(on)}$ = 11.4mΩ, V_{GS} = 4.5V, I_D = 11.5A
- High performance trench technology for extremely low $r_{DS(on)}$ and fast switching
- Very low gate charge
- High power and current handling capability
- 100% R_G tested
- RoHS Compliant





Absolute 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		±20	V
I_D	Drain Current -Continuous	(Note 1a)	14	A
	-Pulsed		100	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	210	mJ
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.2	
		(Note 1c)	1.0	
T_J, T_{STG}	Operating and Storage Temperature		-55 to +150	°C

Thermal Characteristics

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

Package Marking and Ordering Information

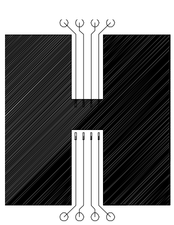
Device Marking	Device	Reel Size	Tape Width	Quantity
FDS8690	FDS8690	13”	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

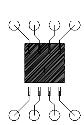
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		34.3		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1	1.6	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D=250μA, referenced to 25°C		- 4.5		mV/°C
$r_{DS(ON)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 14A		6.3	7.6	mΩ
		V_{GS} = 4.5V, I_D = 11.5A		8.6	11.4	
		V_{GS} = 10V, I_D = 14A, T_J = 125°C		9.0	10.9	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		1260	1680	pF
C_{oss}	Output Capacitance			535	715	pF
C_{rss}	Reverse Transfer Capacitance			80	120	pF
R_G	Gate Resistance	f = 1MHz		1.1		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 15V, I_D = 1A, V_{GS} = 10V, R_{GS} = 6Ω		8.0	16	ns
t_r	Rise Time			1.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			26	42	ns
t_f	Fall Time			19	35	ns
Q_g	Total Gate Charge	V_{DS} = 15V, V_{GS} = 10V I_D = 14A		18.8	27	nC
Q_g	Total Gate Charge	V_{DS} = 15V, V_{GS} = 5V I_D = 14A		10	14	nC
Q_{gs}	Gate to Source Gate Charge			3.5		nC
Q_{gd}	Gate to Drain Charge			2.9		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 2.1A		0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 14A, di/dt = 100A/μs			45	ns
Q_{rr}	Reverse Recovery Charge	I_F = 14A, di/dt = 100A/μs			33	nC

Notes:

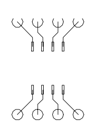
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



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



b)105°C/W when mounted on a .04 in^2 pad of 2 oz copper



c) 125°C/W when mounted on a minimun pad

2. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.
3. Starting T_J = 25°C, L = 3mH, I_{AS} = 11.8A , V_{DD} = 24V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

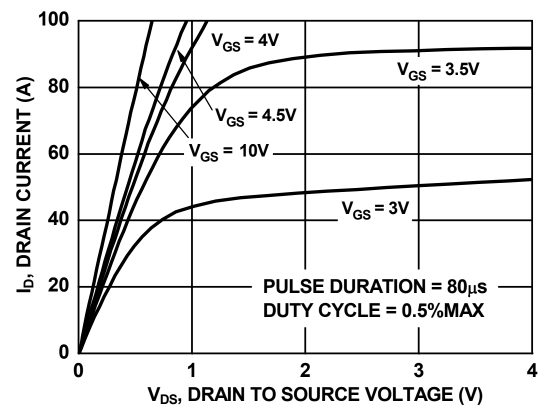


Figure 1. On Region Characteristics

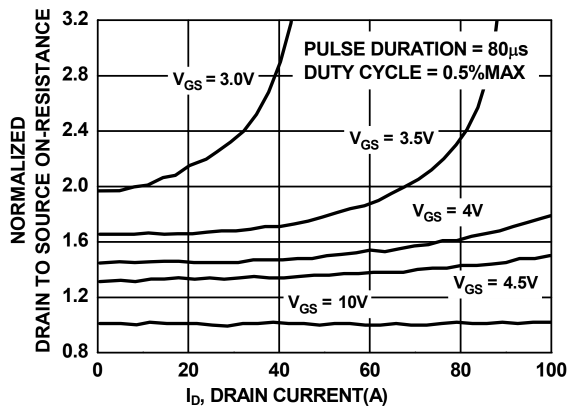


Figure 2. Normal On-Resistance vs Drain Current and Gate Voltage

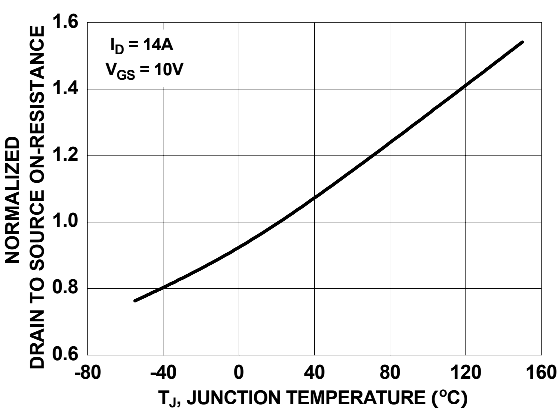


Figure 3. Normalized On Resistance vs Junction Temperature

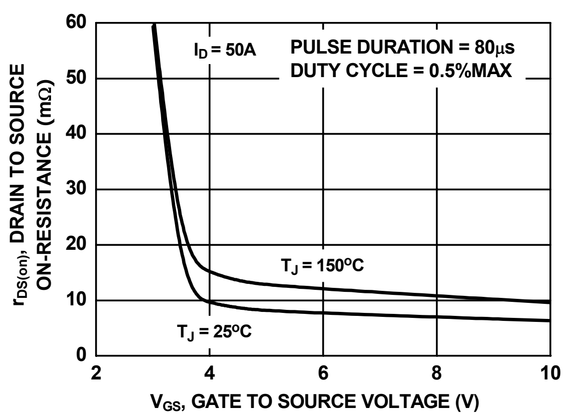


Figure 4. On-Resistance vs Gate to Source Voltage

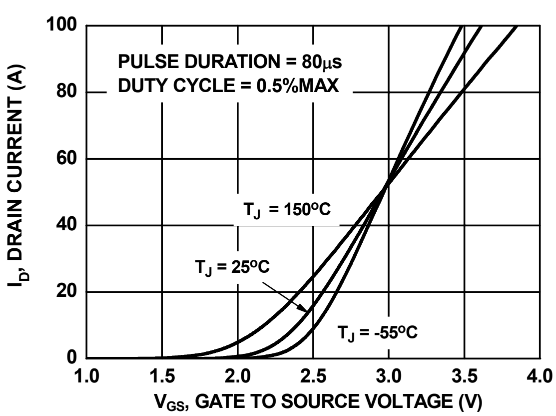


Figure 5. Transfer Characteristics

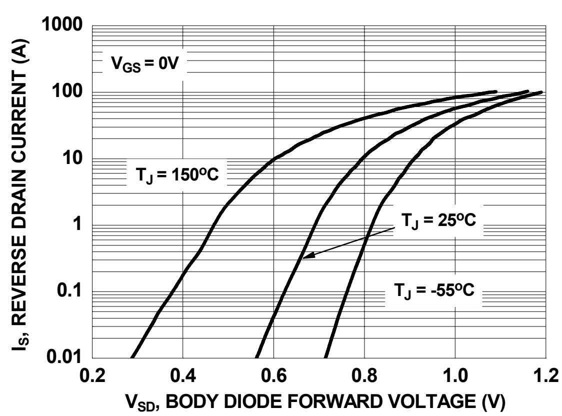


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

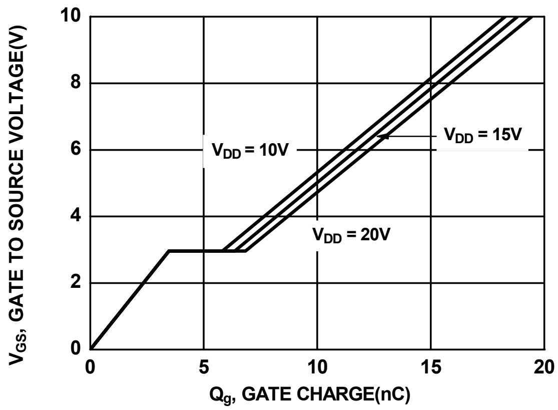


Figure 7. Gate Charge Characteristics

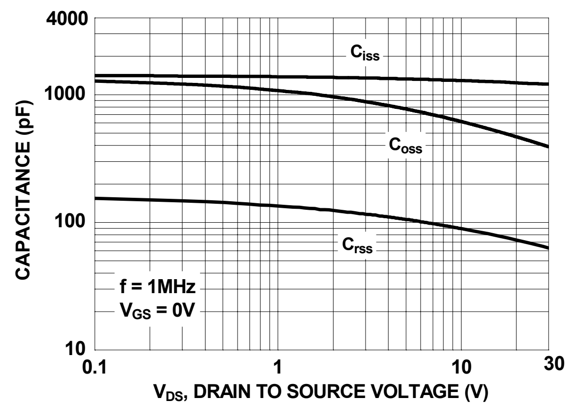


Figure 8. Capacitance vs Drain to Source Voltage

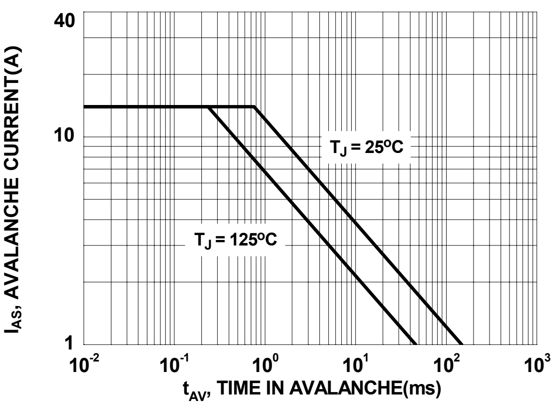


Figure 9. Unclamped Inductive Switching Capability

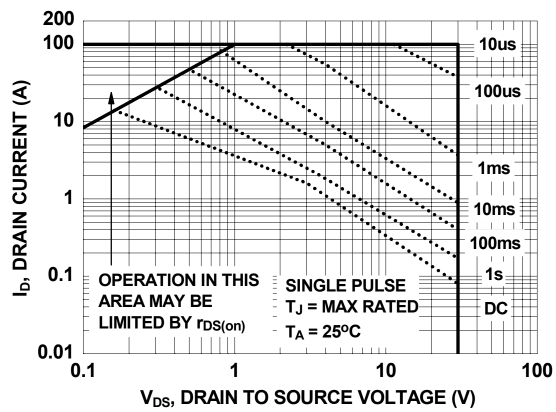


Figure 10. Forward Bias Safe Operating Area

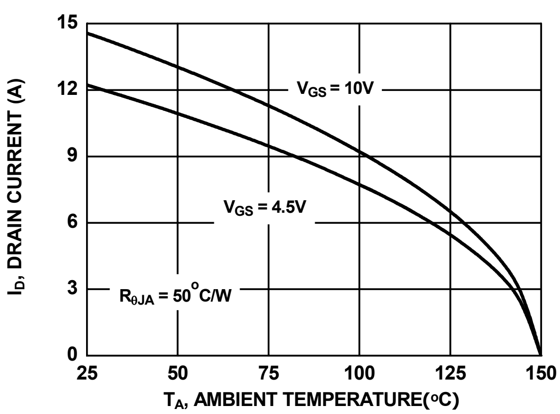


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

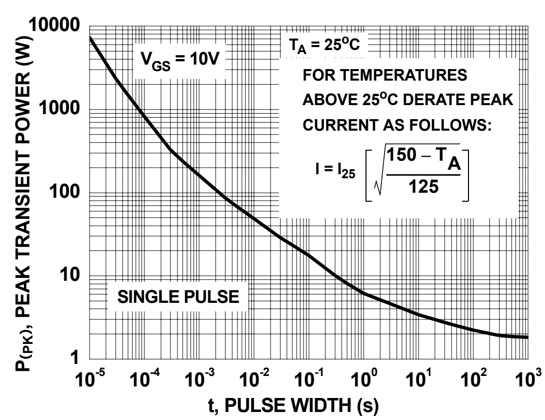


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

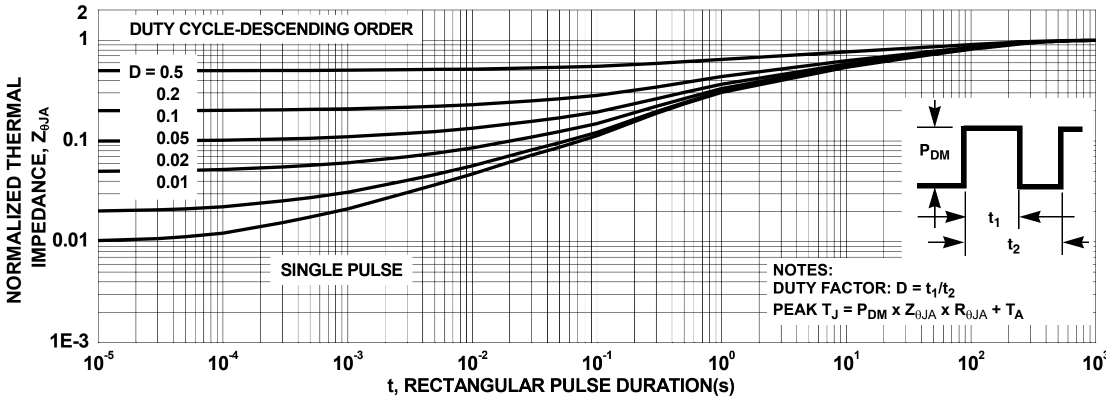


Figure 13. Transient Thermal Response Curve

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Rev. I18