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FDS8690 N-Channel PowerTrench® MOSFET

30V, 14A, 7.6mΩ

General Description

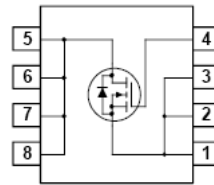
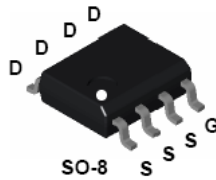
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

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 $T_A = 25^\circ\text{C}$ 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 $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		34.3		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.6	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		- 4.5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 14\text{A}$		6.3	7.6	m Ω
		$V_{GS} = 4.5\text{V}, I_D = 11.5\text{A}$		8.6	11.4	
		$V_{GS} = 10\text{V}, I_D = 14\text{A}, T_J = 125^\circ\text{C}$		9.0	10.9	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		1260	1680	pF
C_{oss}	Output Capacitance			535	715	pF
C_{rss}	Reverse Transfer Capacitance			80	120	pF
R_G	Gate Resistance	$f = 1\text{MHz}$		1.1		Ω

Switching Characteristics (Note 2)

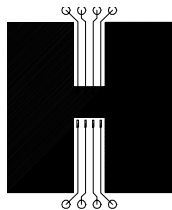
$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 15\text{V}, I_D = 1\text{A}, V_{GS} = 10\text{V}, R_{GS} = 6\Omega$		8.0	16	ns
t_r	Rise Time			1.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			26	42	ns
t_f	Fall Time			19	35	ns
Q_g	Total Gate Charge	$V_{DS} = 15\text{V}, V_{GS} = 10\text{V}, I_D = 14\text{A}$		18.8	27	nC
Q_g	Total Gate Charge	$V_{DS} = 15\text{V}, V_{GS} = 5\text{V}, I_D = 14\text{A}$		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

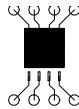
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2.1\text{A}$		0.7	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 14\text{A}, di/dt = 100\text{A}/\mu\text{s}$			45	ns
Q_{rr}	Reverse Recovery Charge	$I_F = 14\text{A}, di/dt = 100\text{A}/\mu\text{s}$			33	nC

Notes:

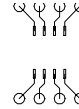
1. R_{thJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{thJC} is guaranteed by design while R_{thCA} is determined by the user's board design.



a) $50^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $105^\circ\text{C}/\text{W}$ when mounted on a $.04\text{ in}^2$ pad of 2 oz copper



c) $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad

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

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

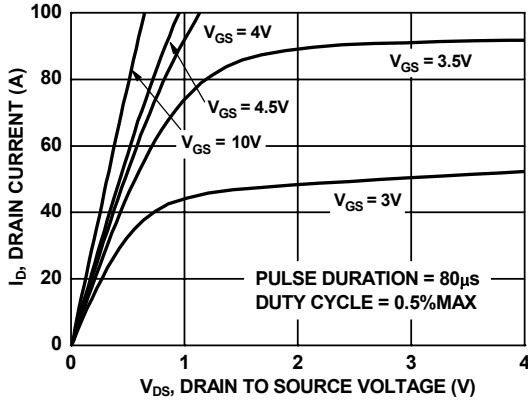


Figure 1. On Region Characteristics

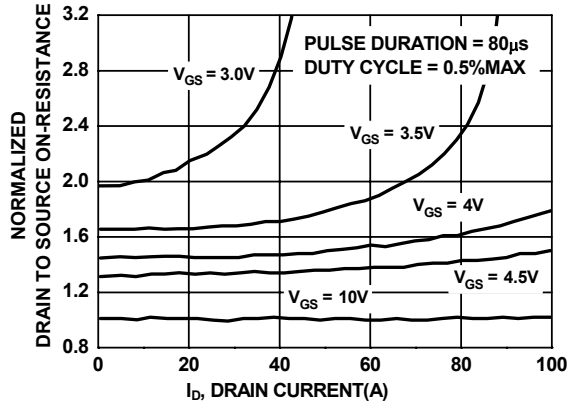


Figure 2. Normal On-Resistance vs Drain Current and Gate Voltage

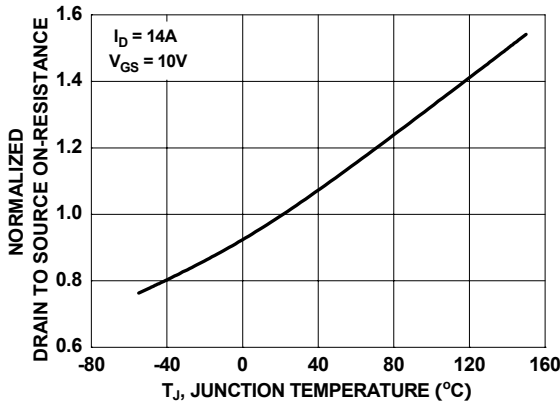


Figure 3. Normalized On Resistance vs Junction Temperature

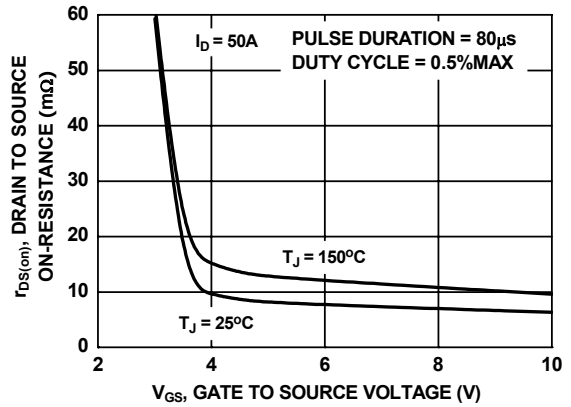


Figure 4. On-Resistance vs Gate to Source Voltage

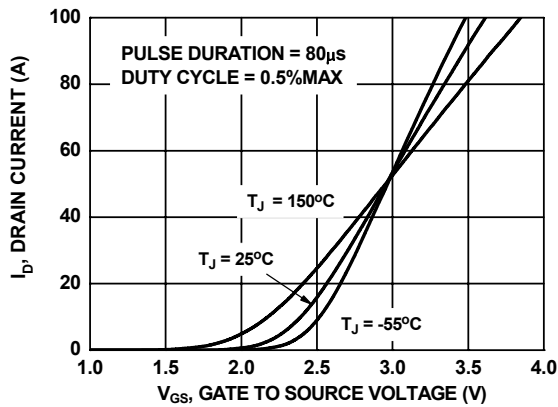


Figure 5. Transfer Characteristics

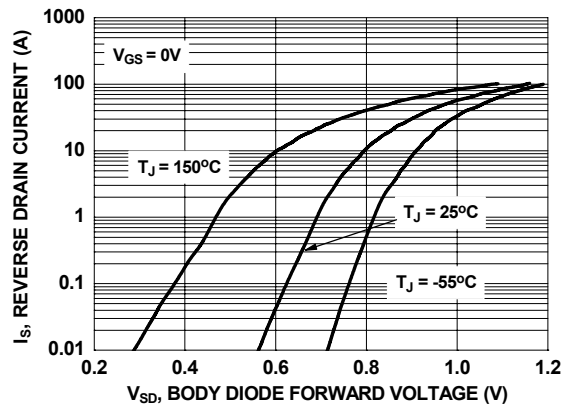


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

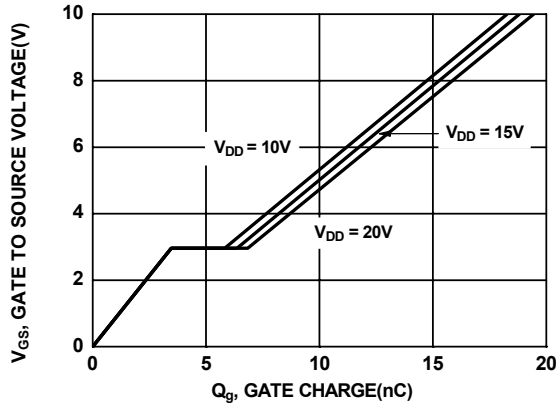


Figure 7. Gate Charge Characteristics

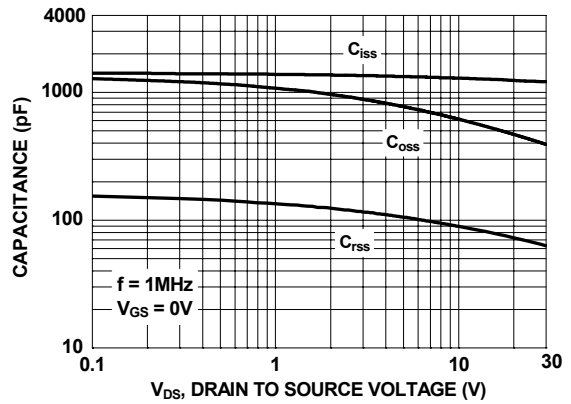


Figure 8. Capacitance vs Drain to Source Voltage

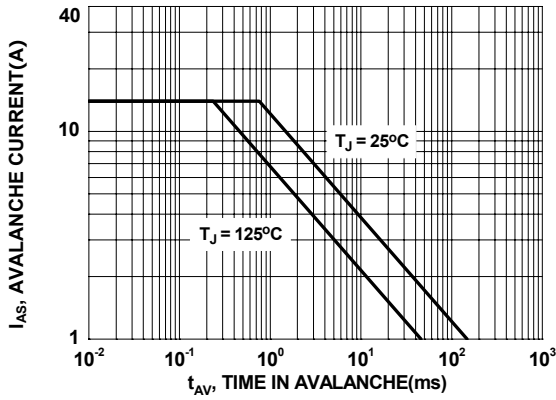


Figure 9. Unclamped Inductive Switching Capability

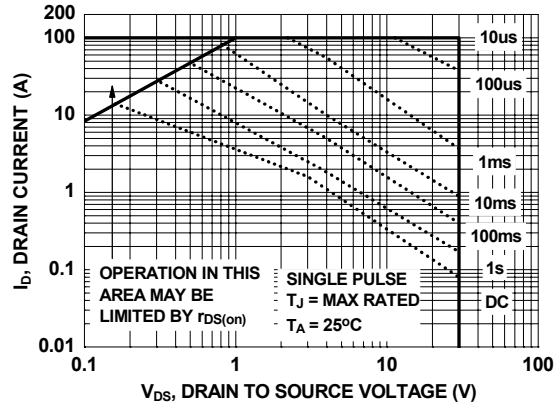


Figure 10. Forward Bias Safe Operating Area

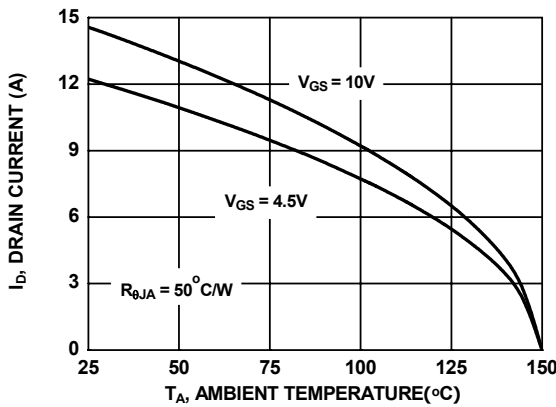


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

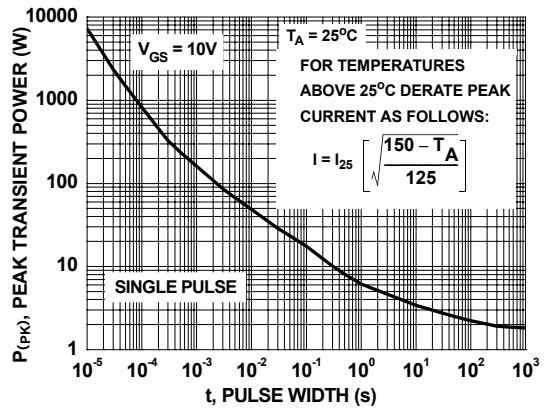


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

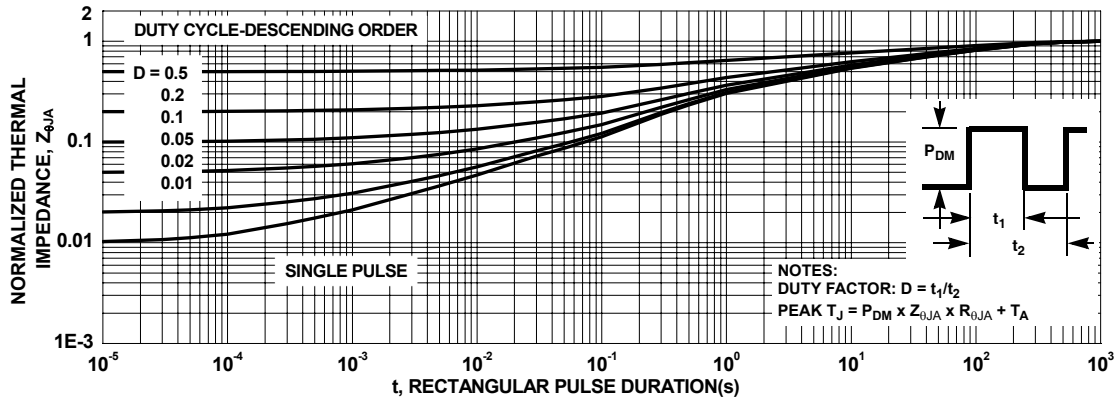


Figure 13. Transient Thermal Response Curve

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