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FDS8984 N-Channel PowerTrench® MOSFET

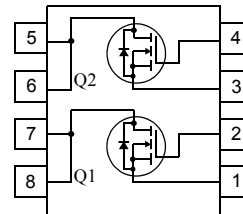
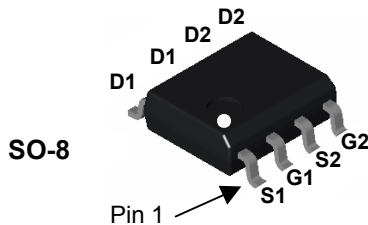
30V, 7A, 23mΩ

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.

Features

- Max $r_{DS(on)}$ = 23mΩ, V_{GS} = 10V, I_D = 7A
- Max $r_{DS(on)}$ = 30mΩ, V_{GS} = 4.5V, I_D = 6A
- Low gate charge
- 100% R_G tested
- RoHS Compliant



MOSFET 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)	7	A
	Pulsed	30	A
E_{AS}	Single Pulse Avalanche Energy (Note 2)	32	mJ
P_D	Power Dissipation for Single Operation	1.6	W
	Derate above 25°C	13	mW/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature	-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	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS8984	FDS8984	SO-8	330mm	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		23		$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$ $V_{GS} = 0\text{V}$ $T_J = 125^\circ\text{C}$			1 250	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			± 100	nA

On Characteristics (Note 3)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.2	1.7	2.5	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		-4.3		$\text{mV}/^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 7\text{A}$		19	23	m Ω
		$V_{GS} = 4.5\text{V}, I_D = 6\text{A}$		24	30	
		$V_{GS} = 10\text{V}, I_D = 7\text{A}$, $T_J = 125^\circ\text{C}$		26	32	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}$, $f = 1.0\text{MHz}$		475	635	pF
C_{oss}	Output Capacitance			100	135	pF
C_{rss}	Reverse Transfer Capacitance			65	100	pF
R_G	Gate Resistance	$f = 1\text{MHz}$		0.9	1.6	Ω

Switching Characteristics (Note 3)

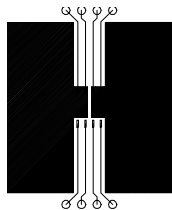
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 7\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 33\Omega$		5	10	ns
t_r	Rise Time			9	18	ns
$t_{d(off)}$	Turn-Off Delay Time			42	68	ns
t_f	Fall Time			21	34	ns
Q_g	Total Gate Charge	$V_{DS} = 15\text{V}, V_{GS} = 10\text{V}$, $I_D = 7\text{A}$		9.2	13	nC
Q_g	Total Gate Charge	$V_{DS} = 15\text{V}, V_{GS} = 5\text{V}$, $I_D = 7\text{A}$		5.0	7	nC
Q_{gs}	Gate to Source Gate Charge			1.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			2.0		nC

Drain-Source Diode Characteristics

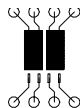
V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 7\text{A}$		0.9	1.25	V
		$I_{SD} = 2.1\text{A}$		0.8	1.0	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 7\text{A}, di/dt = 100\text{A}/\mu\text{s}$			33	ns
Q_{rr}	Diode Reverse Recovery Charge				20	nC

Notes:

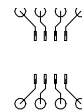
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) $78^\circ\text{C}/\text{W}$ when mounted on a 0.5in^2 pad of 2 oz copper



b) $125^\circ\text{C}/\text{W}$ when mounted on a 0.02in^2 pad of oz copper



c) $135^\circ\text{C}/\text{W}$ when mounted on a minimum pad

Scale 1 : 1 on letter size paper

2: Starting $T_J = 25^\circ\text{C}$, $L = 1\text{mH}$, $I_{AS} = 8\text{A}$, $V_{DD} = 27\text{V}$, $V_{GS} = 10\text{V}$.
3: Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty Cycle $< 2\%$.

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

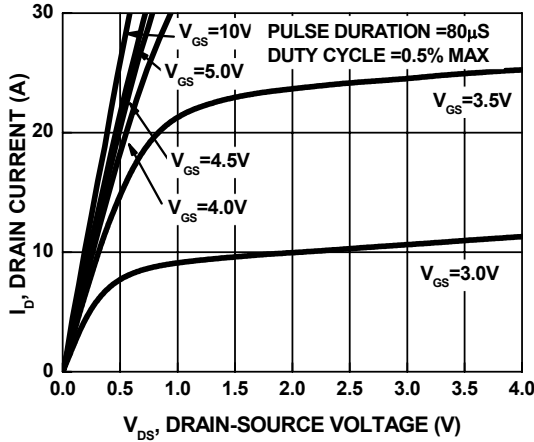


Figure 1. On Region Characteristics

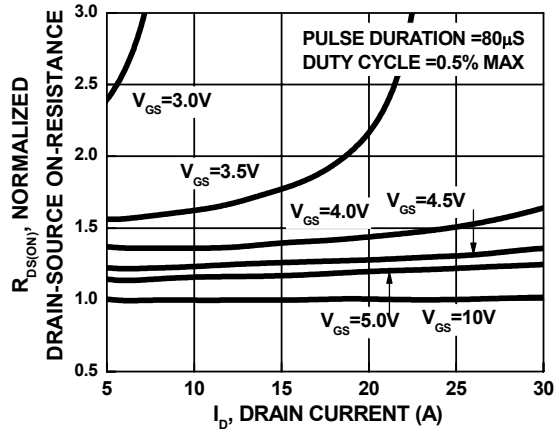


Figure 2. On-Resistance vs Drain Current and Gate Voltage

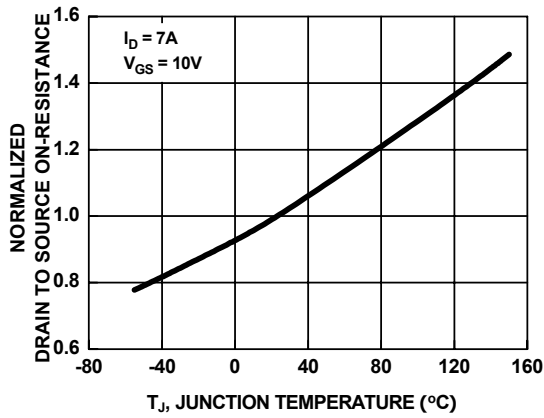


Figure 3. On Resistance vs Temperature

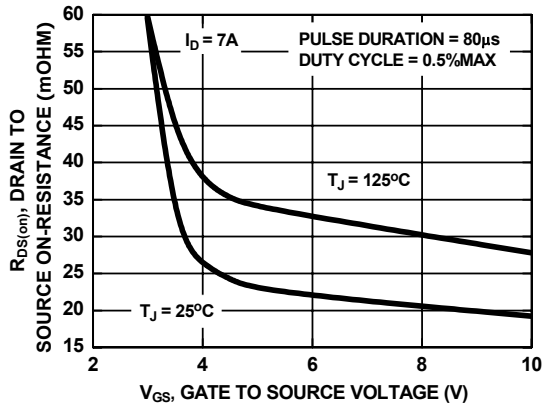


Figure 4. On-Resistance vs Gate to Source Voltage

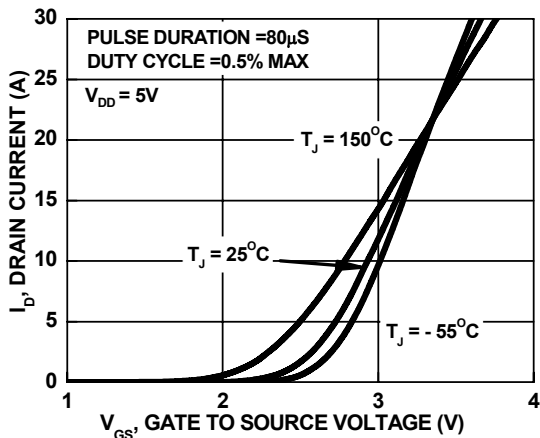


Figure 5. Transfer Characteristics

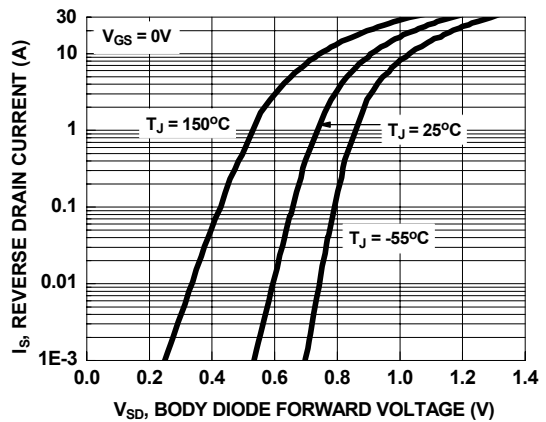


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

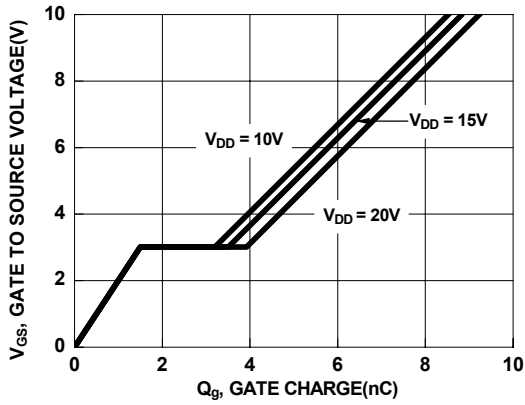


Figure 7. Gate Charge Characteristics

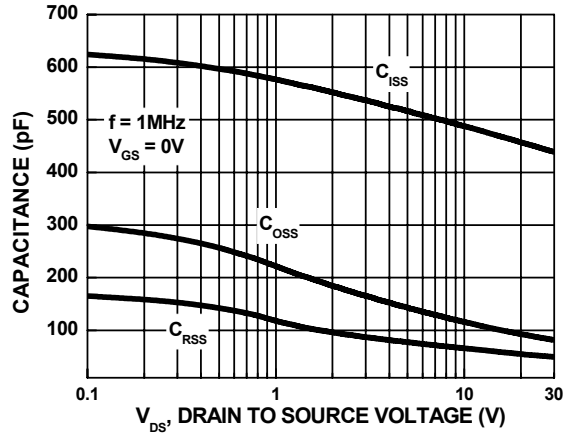


Figure 8. Capacitance vs Drain to Source Voltage

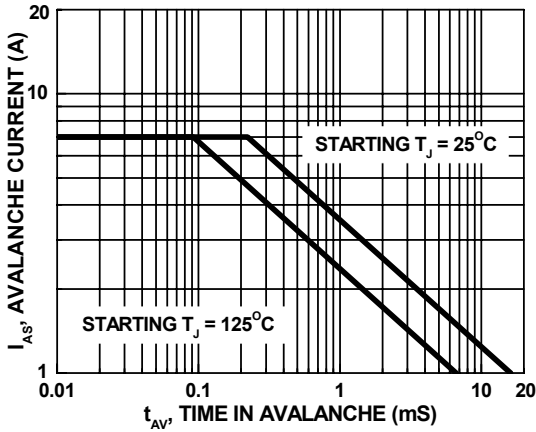


Figure 9. Unclamped Inductive Switching Capability

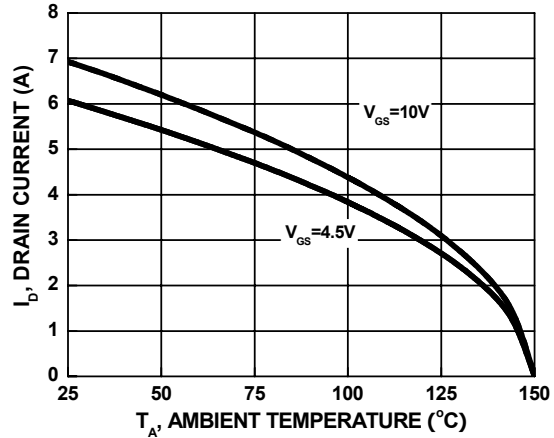


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

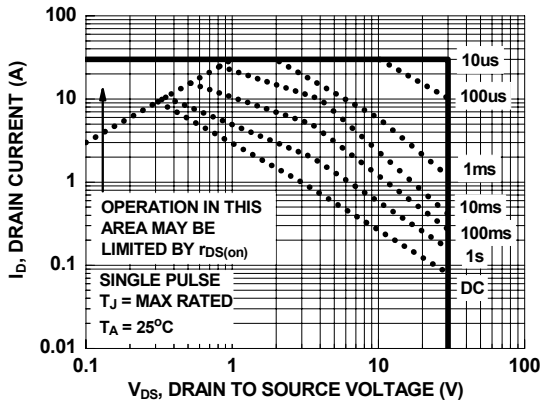


Figure 11. Forward Bias Safe Operating Area

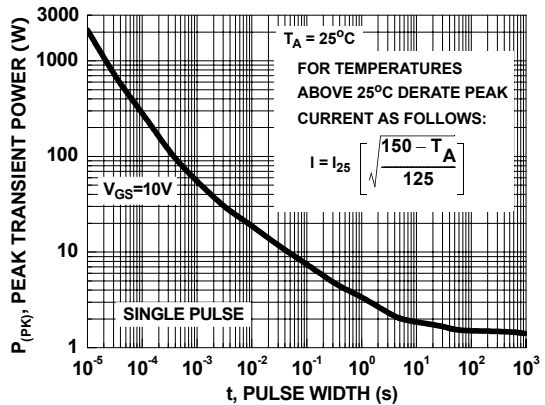


Figure 12. Single Pulse Maximum Power Dissipation

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

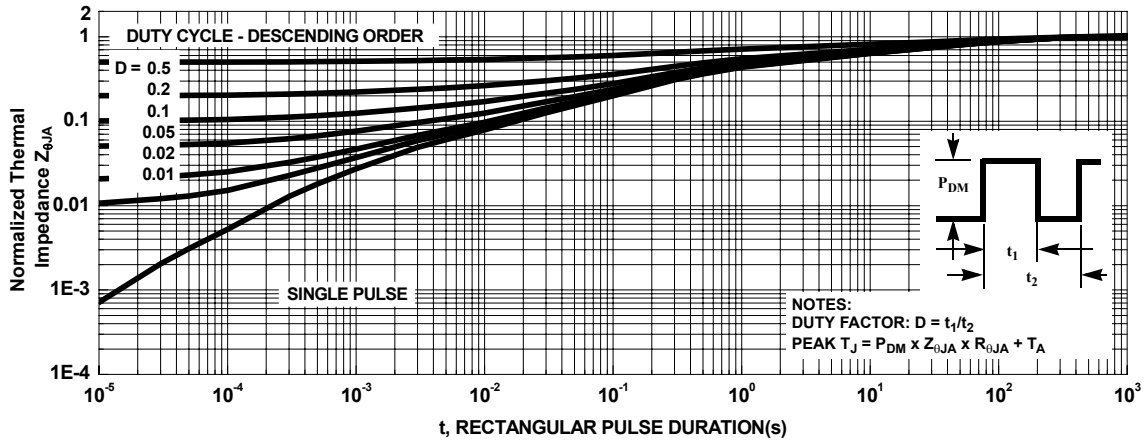


Figure 13. Transient Thermal Response Curve



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