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FDS9412A
N-Channel PowerTrench® MOSFET
30V, 8A, 21mΩ

General Description

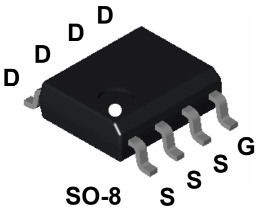
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge ,low $r_{DS(on)}$ and fast switching speed.

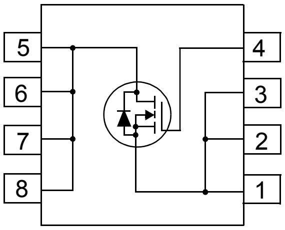
Application

- DC/DC converters

Features

- Max $r_{DS(on)}$ = 21mΩ at V_{GS} = 10V, I_D = 8A
- Max $r_{DS(on)}$ = 25mΩ at V_{GS} = 4.5V, I_D = 6.6A
- Low gate charge
- RoHS Compliant





MOSFET 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 (T_A = 25°C, V_{GS} = 10V, $R_{\theta JA}$ = 50°C/W)	8	A
	-Continuous (T_A = 25°C, V_{GS} = 4.5V, $R_{\theta JA}$ = 50°C/W)	6.6	
	-Pulsed	30	A
E_{AS}	Single Pulse Avalanche Energy (Note 3)	54	mJ
P_D	Power dissipation	2.5	W
T_J, T_{STG}	Operating and Storage Temperature	-55 to 150	°C

Thermal Characteristics

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

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS9412A	FDS9412A	SO-8	330mm	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, referenced to 25°C		22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24V$, $V_{GS} = 0V$			1	µA
		$T_J = 150°C$			250	
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20V$			±100	µA

On Characteristics (Note 2)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	1.2	1.9	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu A$, referenced to 25°C		-5.8		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 8A$		14	21	mΩ
		$V_{GS} = 4.5V$, $I_D = 6.6A$		18	25	
		$V_{GS} = 10V$, $I_D = 8A$ $T_J = 150^oC$		20	30	

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	$V_{DS} = 15V$, $V_{GS} = 0V$, f = 1MHz		740	985	pF
C_{oss}	Output Capacitance			150	200	pF
C_{rss}	Reverse Transfer Capacitance			95	145	pF
R_G	Gate Resistance	f = 1MHz		3		Ω

Switching Characteristics (Note 2)

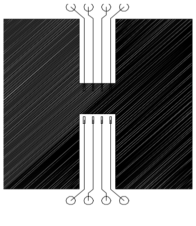
Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15V$, $I_D = 1A$ $V_{GS} = 10V$, $R_{GS} = 6\Omega$			5	10	ns
t_r	Rise Time				13	23	ns
$t_{d(off)}$	Turn-Off Delay Time				13	24	ns
t_f	Fall Time				12	22	ns
Q_g	Total Gate Charge at 10V	$V_{GS} = 0V$ to $10V$	$V_{DD} = 15V$ $I_D = 8A$ $I_G = 1.0mA$		14	20	nC
Q_g	Total Gate Charge at 5V	$V_{GS} = 0V$ to $5V$			8	12	nC
Q_{gs}	Gate to Source Gate Charge				2.3		nC
Q_{gd}	Gate to Drain “Miller” Charge				3.0		nC

Drain-Source Diode Characteristics

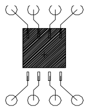
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Voltage	$V_{GS} = 0V$, $I_S = 8A$		0.85	1.25	V
		$V_{GS} = 0V$, $I_S = 2.1A$		0.76	1.0	V
t_{rr}	Reverse Recovery Time	$I_F = 8A$, $di/dt = 100A/\mu s$		18	27	ns
Q_{rr}	Reverse Recovery Charge	$I_F = 8A$, $di/dt = 100A/\mu s$		9.6	14	nC

Notes:

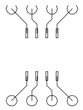
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



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

Scale 1 : 1 on letter size paper

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

3: Starting $T_J = 25^oC$, L = 3mH, $I_{AS} = 6A$, $V_{DD} = 30V$, $V_{GS} = 10V$.

Typical Characteristics T_J = 25°C unless otherwise noted

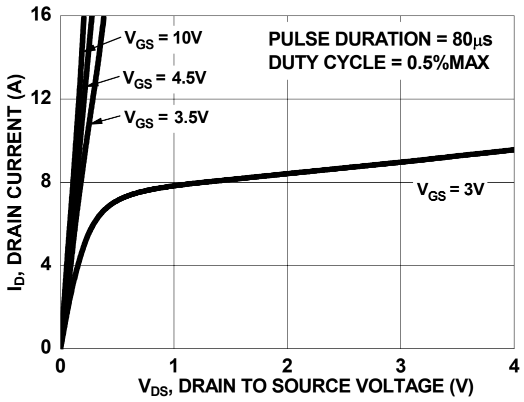


Figure 1. On Region Characteristics

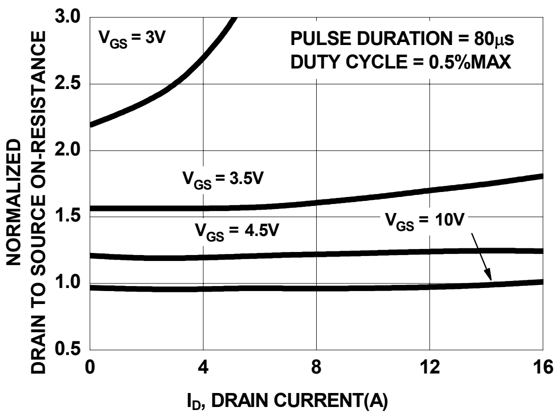


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

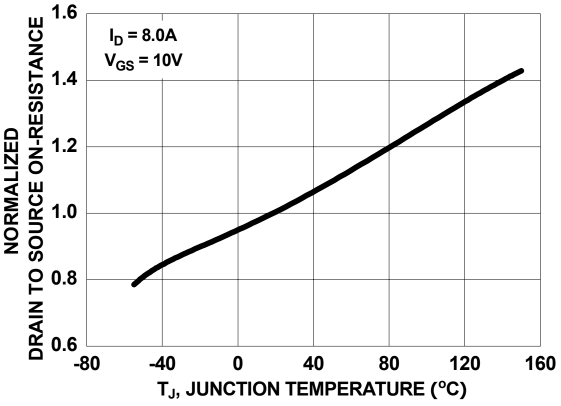


Figure 3. Normalized On Resistance vs Junction Temperature

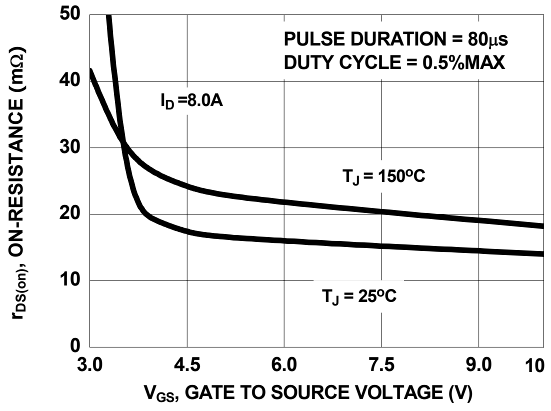


Figure 4. On-Resistance vs Gate to Source Voltage

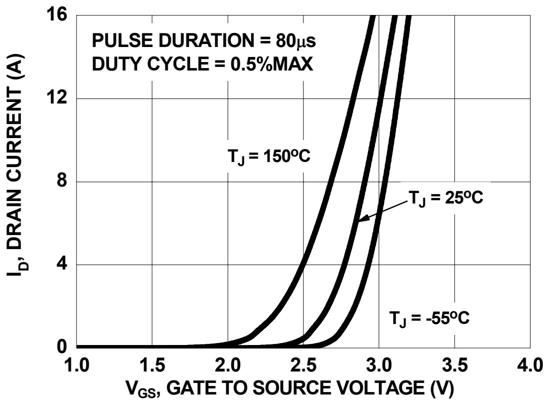


Figure 5. Transfer Characteristics

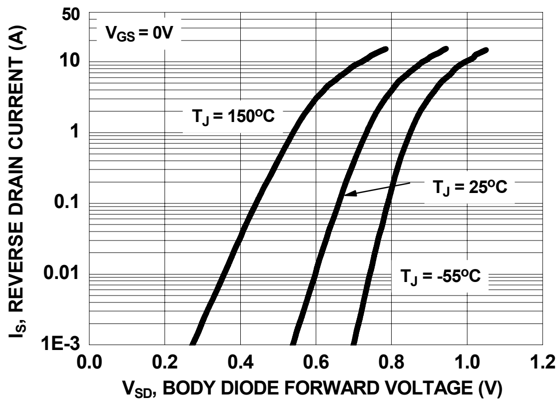


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

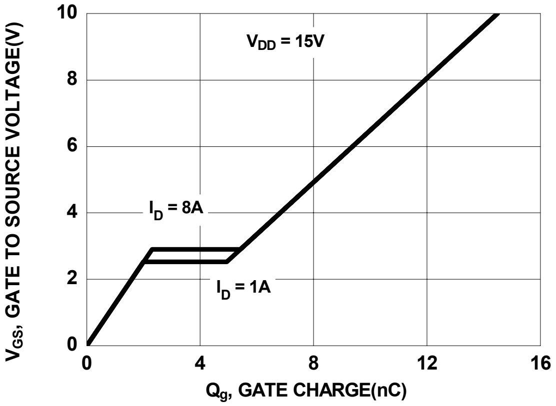


Figure 7. Gate Charge Characteristics

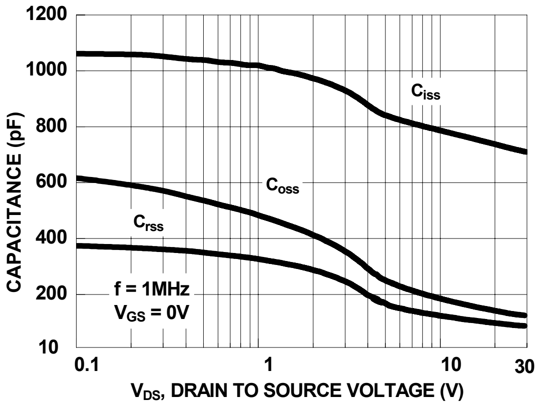


Figure 8. Capacitance vs Drain to Source Voltage

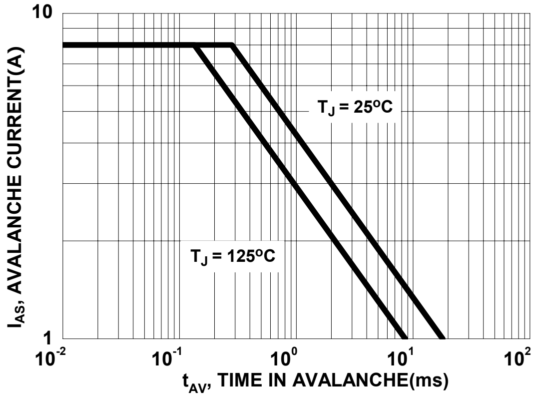


Figure 9. Unclamped Inductive Switching Capability

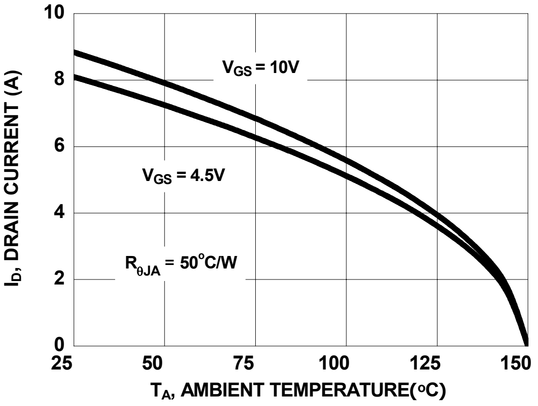


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

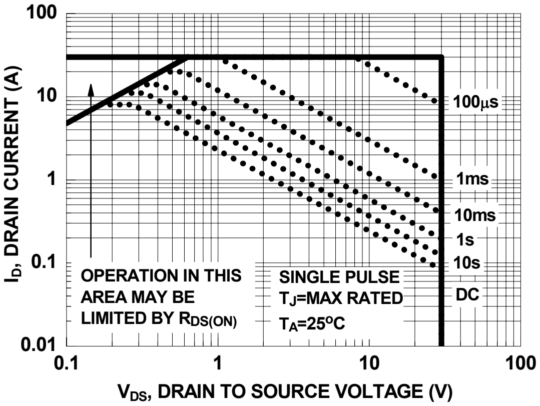


Figure 11. Forward Bias Safe Operating Area

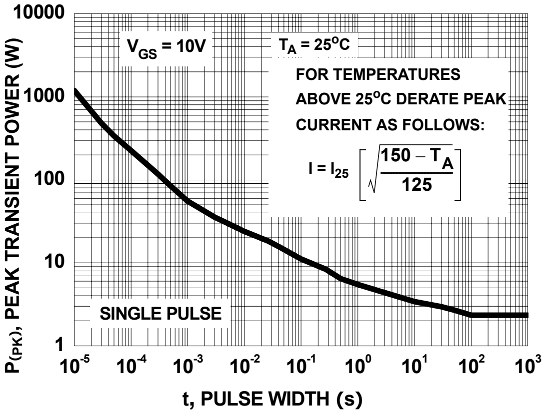


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

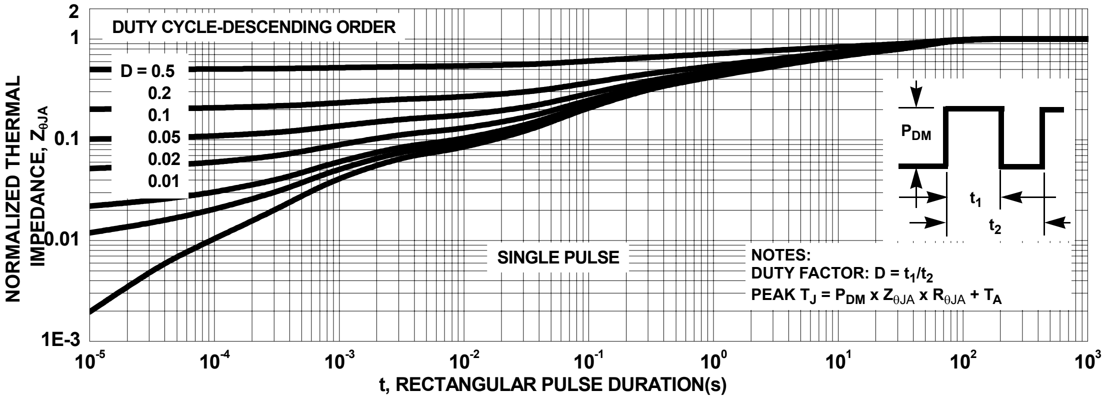


Figure 13. Transient Thermal Response Curve

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