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January 2010

# FDS6692A N-Channel PowerTrench<sup>®</sup> MOSFET 30V, 9A, 11.5m $\Omega$

#### **Features**

- $R_{DS(ON)} = 11.5 \text{m}\Omega$ ,  $V_{GS} = 10 \text{V}$ ,  $I_D = 9 \text{A}$
- $R_{DS(ON)} = 14.5 \text{m}\Omega$ ,  $V_{GS} = 4.5 \text{V}$ ,  $I_D = 8.2 \text{A}$
- $\blacksquare$  High performance trench technology for extremely low  $R_{DS(ON)}$
- Low gate charge
- High power and current handling capability
- RoHS Compliant

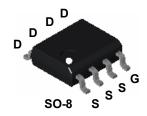
## **Applications**

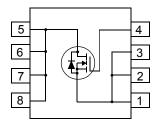
■ DC/DC converters

#### **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  $\rm R_{DS(ON)}$  and fast switching speed.







<b>MOSFET Maximum Rati</b>	<b>S</b> $T_A = 25^{\circ}C$	unless otherwise noted
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Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	±20	V
	Drain Current		
1.	Continuous ( $T_A = 25^{\circ}$ C, $V_{GS} = 10$ V, $R_{\theta JA} = 85^{\circ}$ C/W)	9	Α
ID	Continuous ( $T_A = 25^{\circ}$ C, $V_{GS} = 4.5$ V, $R_{\theta JA} = 85^{\circ}$ C/W)	8.2	Α
	Pulsed	48	Α
E <sub>AS</sub>	Single Pulse Avalanche Energy (Note 1)	79	mJ
$P_{D}$	Power dissipation	1.47	W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature	-55 to 150	°C

#### **Thermal Characteristics**

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient at 10 seconds (Note 3)	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient at 1000 seconds (Note 3)	85	°C/W

## **Package Marking and Ordering Information**

Device Marking	Device	Package	Package Reel Size Tape Width		Quantity
FDS6692A	FDS6692A	SO-8	330mm	12mm	2500 units

#### **Electrical Characteristics** $T_J = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	octeristics					
B <sub>VDSS</sub>	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	30	-	-	V
$\Delta B_{VDSS} \over \Delta T_J$	Breakdown Voltage Temp. Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C	-	21	-	mV/°C
1	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 24V	-	-	1	μА
IDSS	Zero Gate Voltage Drain Current	$V_{GS} = 0V$ $T_J = 150^{\circ}C$	-	-	250	μΑ
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20V	-	-	±100	nA

#### On Characteristics

V <sub>GS(TH)</sub>	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	1.2	-	2.5	V
$\Delta V_{GS(TH)} \over \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C	-	-5	-	mV/°C
		I <sub>D</sub> = 9A, V <sub>GS</sub> = 10V	-	8.2	11.5	
R <sub>DS(ON)</sub>	R <sub>DS(ON)</sub> Drain to Source On Resistance	$I_D = 8.2A, V_{GS} = 4.5V$	-	11	14.5	mΩ
Diam to Source Off Resistance	$I_D = 9A, V_{GS} = 10V,$ $T_J = 150^{\circ}C$	-	13	19	11152	

#### **Dynamic Characteristics**

C <sub>ISS</sub>	Input Capacitance	V 45V V	0)/	-	1210	1610	pF
C <sub>OSS</sub>	Output Capacitance	V <sub>DS</sub> = 15V, V <sub>GS</sub> = f = 1MHz	= UV,	-	330	440	pF
C <sub>RSS</sub>	Reverse Transfer Capacitance	1 - 11/11/2		-	138	210	pF
$R_G$	Gate Resistance	f = 1MHz		-	2.0	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0V \text{ to } 10V$		-	22	29	nC
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0V \text{ to } 5V$	$V_{DD} = 15V$	-	12	16	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0V \text{ to } 1V$	$I_D = 9A$	-	0.93	1.2	nC
$Q_{gs}$	Gate to Source Gate Charge		$I_g = 1.0 \text{mA}$	-	3	-	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau			-	2.1	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	4.8	-	nC

#### Switching Characteristics (V<sub>GS</sub> = 10V)

t <sub>ON</sub>	Turn-On Time		-	-	60	ns
t <sub>d(ON)</sub>	Turn-On Delay Time		-	8	-	ns
t <sub>r</sub>	Rise Time	V <sub>DD</sub> = 15V, I <sub>D</sub> = 9A	-	32	-	ns
t <sub>d(OFF)</sub>	Turn-Off Delay Time	$V_{GS} = 10V, R_{GS} = 6.2\Omega$	-	33	-	ns
t <sub>f</sub>	Fall Time		-	13	-	ns
t <sub>OFF</sub>	Turn-Off Time		-	-	69	ns

#### **Drain-Source Diode Characteristics**

V	Source to Drain Diode Voltage	I <sub>SD</sub> = 9A	-	-	1.25	V
$V_{SD}$	Source to Drain blode Voltage	I <sub>SD</sub> = 2.1A	-	-	1.0	V
t <sub>rr</sub>	Reverse Recovery Time	$I_{SD} = 9A$ , $dI_{SD}/dt=100A/\mu s$	-	-	27	ns
Q <sub>RR</sub>	Reverse Recovered Charge	$I_{SD} = 9A$ , $dI_{SD}/dt=100A/\mu s$	-	-	17	nC

#### Notes:

Starting T<sub>J</sub> = 25°C, L = 0.3mH, I<sub>AS</sub> = 23A, V<sub>DD</sub> = 27V, V<sub>GS</sub> = 10V.
 R<sub>θ,JA</sub> 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<sub>θ,JC</sub> is guaranteed by design while R<sub>θ,JA</sub> is determined by the user's board design.
 R<sub>θ,JA</sub> is measured with 1.0 in<sup>2</sup> copper on FR-4 board

#### Typical Characteristics T<sub>J</sub> = 25°C unless otherwise noted

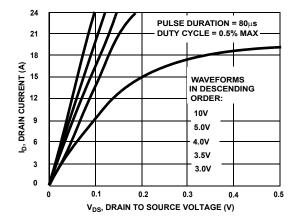


Figure 1. On Region Characteristics

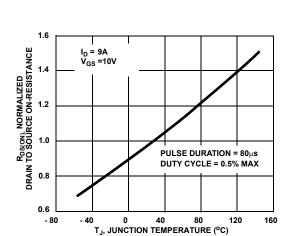


Figure 3. On Resistance Variation with Temperature

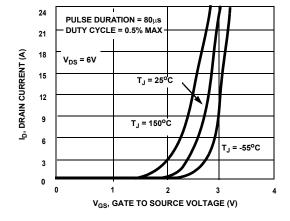


Figure 5. Transfer Characteristics

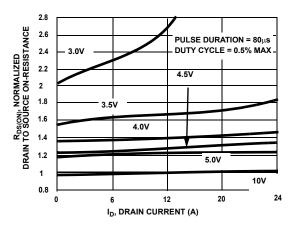


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

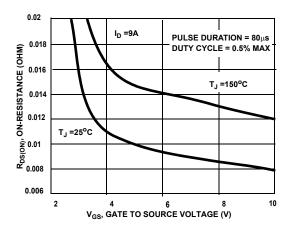


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

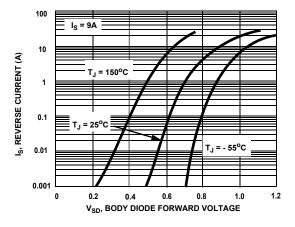
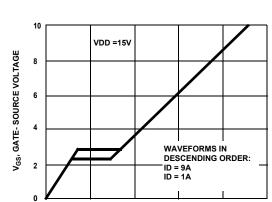


Figure 6. Body Diode Forward Voltage Variation With Source Current and Temperature



Typical Characteristics  $T_J = 25$ °C unless otherwise noted

Figure 7. Gate Charge Characteristics

20

10

1 L 0.01

0.1

IAS, AVALANCHE CURRENT (A)

15

= 25 °C

Q<sub>g</sub>, GATE CHARGE (nC)

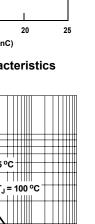


Figure 9. Unclamped Inductive Switching Capability

t<sub>AV</sub>, TIME IN AVALANCHE (ms)

 $T_J = 150$  °C

10

100

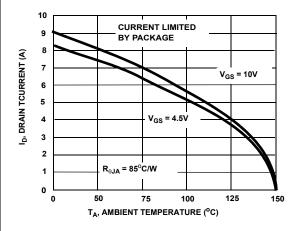


Figure 11. Maximum Continuous Drain Current vs
Ambient Temperature

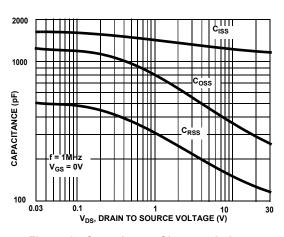


Figure 8. Capacitance Characteristics

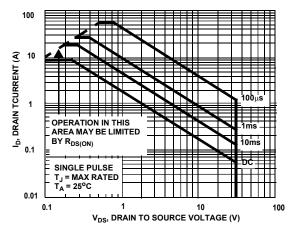


Figure 10. Safe Operating Area

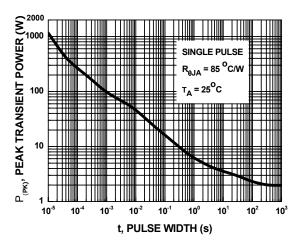


Figure 12. Single Maximum Power Dissipation

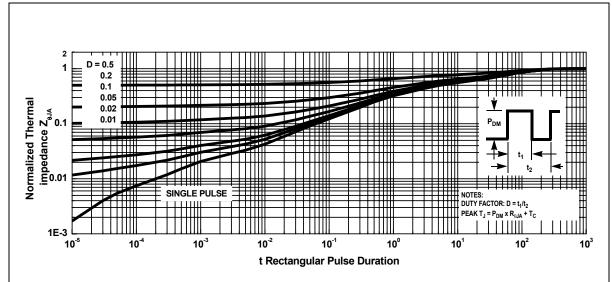


Figure 13. Transient Thermal Response Curve





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