

# FDS6692A

## N-Channel PowerTrench® MOSFET

30V, 9A, 11.5mΩ

### Features

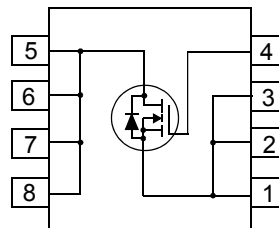
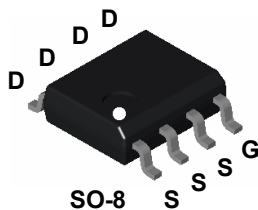
- $R_{DS(ON)} = 11.5m\Omega$ ,  $V_{GS} = 10V$ ,  $I_D = 9A$
- $R_{DS(ON)} = 14.5m\Omega$ ,  $V_{GS} = 4.5V$ ,  $I_D = 8.2A$
- High performance trench technology for extremely low  $R_{DS(ON)}$
- Low gate charge
- High power and current handling capability
- RoHS Compliant

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



**MOSFET Maximum Ratings**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	9	A
	Continuous ( $T_A = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , $R_{\theta JA} = 85^\circ\text{C/W}$ )		
	Continuous ( $T_A = 25^\circ\text{C}$ , $V_{GS} = 4.5\text{V}$ , $R_{\theta JA} = 85^\circ\text{C/W}$ )	8.2	A
	Pulsed	48	A
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	79	mJ
$P_D$	Power dissipation	1.47	W
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to 150	$^\circ\text{C}$

**Thermal Characteristics**

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

**Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS6692A	FDS6692A	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**

$B_{VDSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	30	-	-	V
$\frac{\Delta B_{VDSS}}{\Delta T_J}$	Breakdown Voltage Temp. Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	21	-	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$	-	-	1	$\mu\text{A}$
		$V_{GS} = 0\text{V}$ , $T_J = 150^\circ\text{C}$	-	-	250	
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(TH)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	1.2	-	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 $25^\circ\text{C}$	-	-5	-	$\text{mV}/^\circ\text{C}$
$R_{DS(ON)}$	Drain to Source On Resistance	$I_D = 9\text{A}$ , $V_{GS} = 10\text{V}$	-	8.2	11.5	m $\Omega$
		$I_D = 8.2\text{A}$ , $V_{GS} = 4.5\text{V}$	-	11	14.5	
		$I_D = 9\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 150^\circ\text{C}$	-	13	19	

**Dynamic Characteristics**

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

**Switching Characteristics** ( $V_{GS} = 10V$ )

$t_{ON}$	Turn-On Time	$V_{DD} = 15V, I_D = 9A$ $V_{GS} = 10V, R_{GS} = 6.2\Omega$	-	-	60	ns
$t_{d(ON)}$	Turn-On Delay Time		-	8	-	ns
$t_r$	Rise Time		-	32	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	33	-	ns
$t_f$	Fall Time		-	13	-	ns
$t_{OFF}$	Turn-Off Time		-	-	69	ns

**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 9A$	-	-	1.25	V
		$I_{SD} = 2.1A$	-	-	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 9A, di_{SD}/dt=100A/\mu s$	-	-	27	ns
$Q_{RR}$	Reverse Recovered Charge	$I_{SD} = 9A, di_{SD}/dt=100A/\mu s$	-	-	17	nC

**Notes:**

- 1: Starting  $T_J = 25^\circ C$ ,  $L = 0.3mH$ ,  $I_{AS} = 23A$ ,  $V_{DD} = 27V$ ,  $V_{GS} = 10V$ .
- 2:  $R_{\theta JA}$  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  $R_{\theta JA}$  is determined by the user's board design.
- 3:  $R_{\theta JA}$  is measured with 1.0 in<sup>2</sup> copper on FR-4 board

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

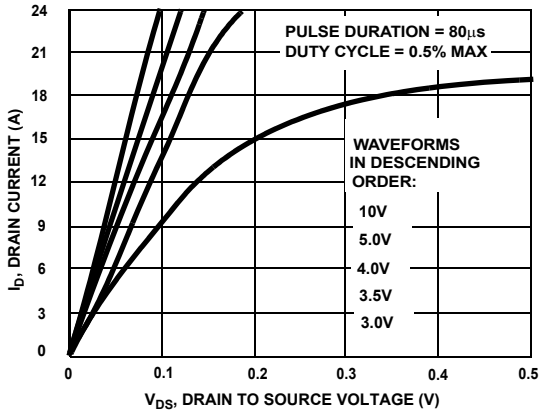


Figure 1. On Region Characteristics

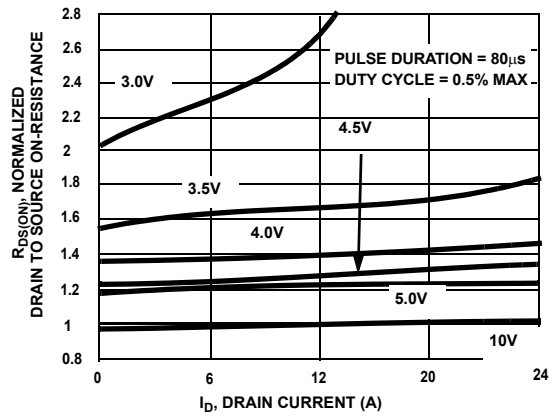


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

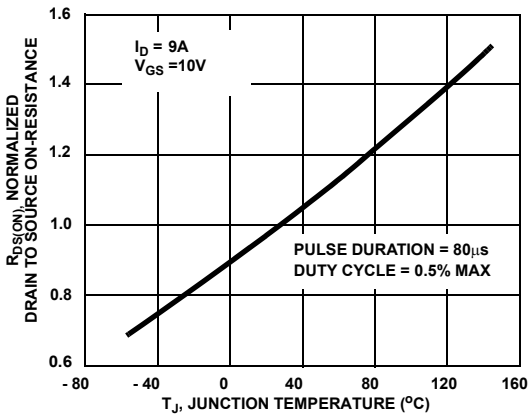


Figure 3. On Resistance Variation with Temperature

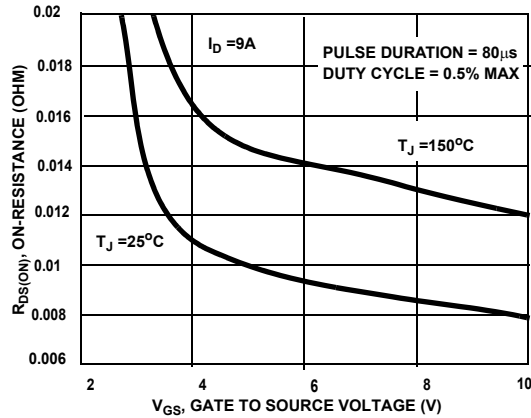


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

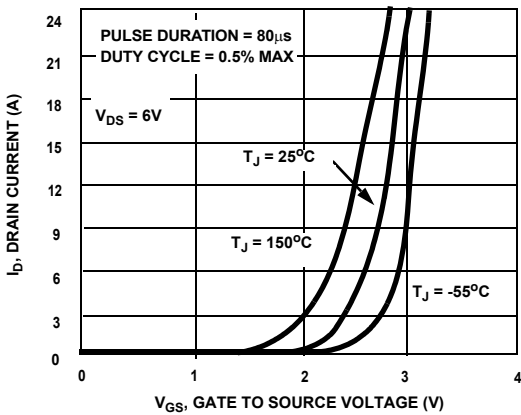


Figure 5. Transfer Characteristics

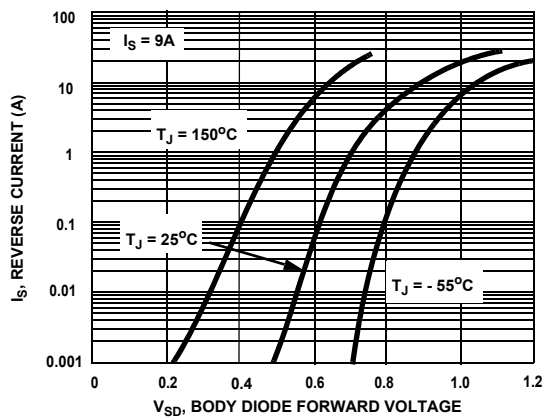
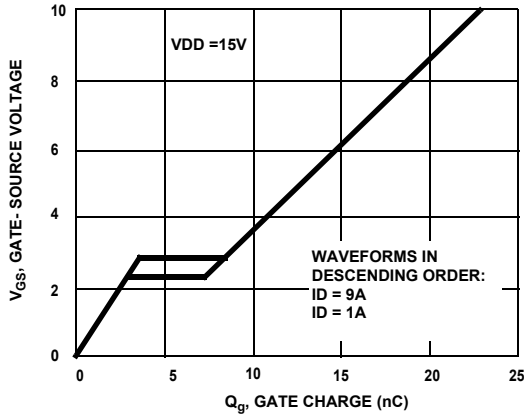
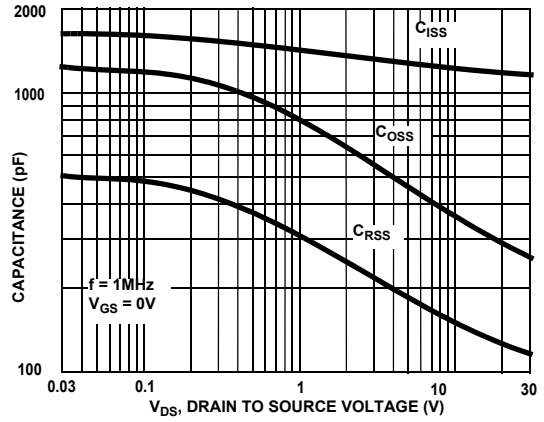


Figure 6. Body Diode Forward Voltage Variation With Source Current and Temperature

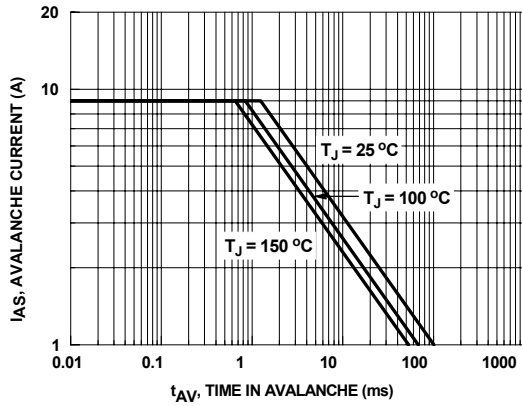
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



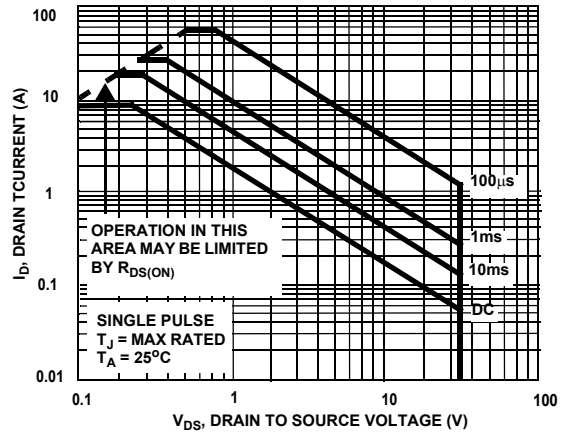
**Figure 7. Gate Charge Characteristics**



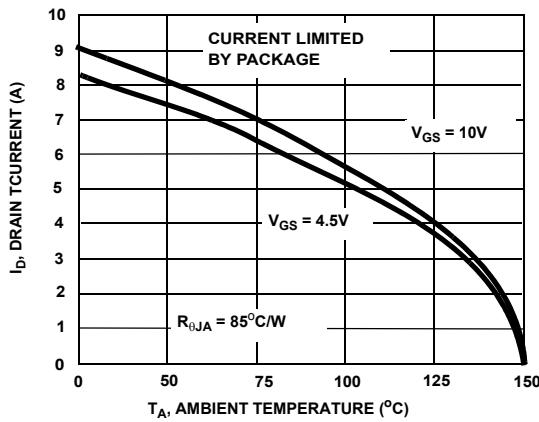
**Figure 8. Capacitance Characteristics**



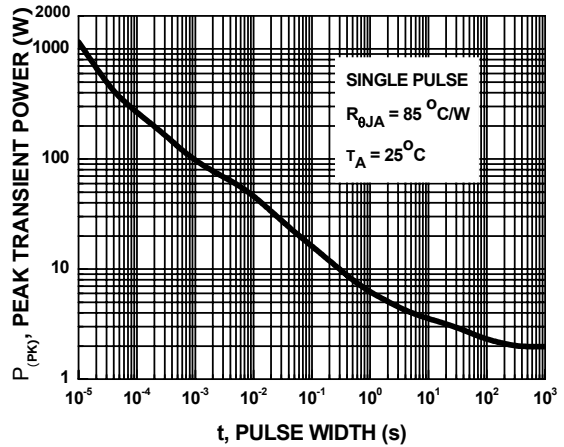
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Safe Operating Area**



**Figure 11. Maximum Continuous Drain Current vs Ambient Temperature**



**Figure 12. Single Maximum Power Dissipation**

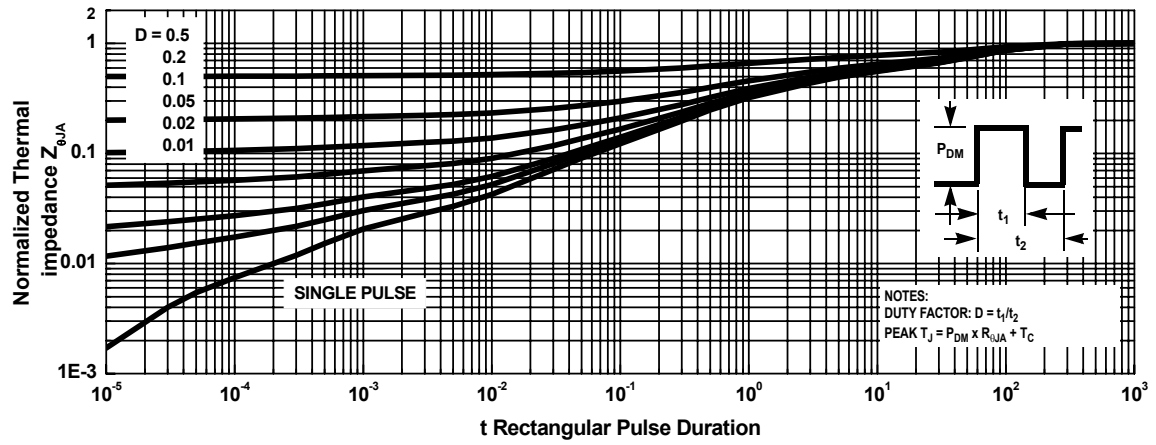
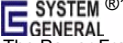





Figure 13. Transient Thermal Response Curve



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