

Fabruary 2010

# FDS8984 F085

# N-Channel PowerTrench® MOSFET

30V, 7A, 23m $\Omega$ 

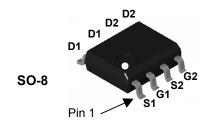
### **General Description**

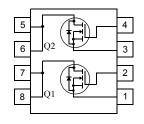
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $r_{\mbox{\scriptsize DS(ON)}}$  and fast switching speed.

#### **Features**

- Max  $r_{DS(on)} = 23m\Omega$ ,  $V_{GS} = 10V$ ,  $I_D = 7A$
- Max  $r_{DS(on)}$  = 30m $\Omega$ ,  $V_{GS}$  = 4.5V,  $I_D$  = 6A
- Low gate charge
- 100% R<sub>G</sub> tested
- Qualified to AEC Q101
- RoHS Compliant







#### **MOSFET Maximum Ratings** T<sub>A</sub> = 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
	Drain Current Continuous (Note 1a)	7	Α
ID	Pulsed	30	Α
E <sub>AS</sub>	Single Pulse Avalache Energy (Note 2)	32	mJ
В	Power Dissipation for Single Operation	1.6	W
$P_{D}$	Derate above 25°C	13	mW/°C
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	(Note 1a)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	40	°C/W

### **Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS8984	FDS8984_F085	SO-8	330mm	12mm	2500 units

Max

Тур

Min

Units

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

Parameter

Off Characteristics							
BV <sub>DSS</sub>	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		23		mV/°C	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = 24V$ $V_{GS} = 0V$ $T_{J} = 125^{\circ}C$			1 250	μА	
I <sub>GSS</sub>	Gate to Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			±100	nA	

**Test Conditions** 

#### On Characteristics (Note 3)

Symbol

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	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 $\mu$ A, referenced to 25°C		- 4.3		mV/°C
	Drain to Source On Resistance	$V_{GS} = 10V, I_D = 7A$		19	23	
r		$V_{GS} = 4.5V, I_D = 6A$		24	30	mΩ
r <sub>DS(on)</sub>	Brain to course on resistance	$V_{GS} = 10V, I_D = 7A,$ $T_J = 125^{\circ}C$		26	32	11152

#### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	\\ -45\\\\\ -0\\	475	635	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz	100	135	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	1 - 1.0Wii 12	65	100	pF
$R_G$	Gate Resistance	f = 1MHz	0.9	1.6	Ω

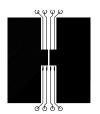
#### **Switching Characteristics (Note 3)**

t <sub>d(on)</sub>	Turn-On Delay Time			5	10	ns
t <sub>r</sub>	Rise Time	V <sub>DD</sub> = 15V, I <sub>D</sub> = 7A		9	18	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 10V, R_{GS} = 33\Omega$		42	68	ns
t <sub>f</sub>	Fall Time			21	34	ns
$Q_g$	Total Gate Charge	$V_{DS} = 15V, V_{GS} = 10V,$ $I_{D} = 7A$		9.2	13	nC
$Q_g$	Total Gate Charge	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 5V,		5.0	7	nC
Q <sub>gs</sub>	Gate to Source Gate Charge	I <sub>D</sub> = 7A		1.5		nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge			2.0		nC

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

V	Source to Drain Diode Voltage	I <sub>SD</sub> = 7A	0.9	1.25	V
V <sub>SD</sub> Source to Drain blode voltage		I <sub>SD</sub> = 2.1A	0.8	1.0	V
t <sub>rr</sub>	Diode Reverse Recovery Time	I <sub>F</sub> = 7A, di/dt = 100A/μs		33	ns
$Q_{rr}$	Diode Reverse Recovery Charge			20	nC

<sup>13</sup> R<sub>0,IA</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>0,IC</sub> is guaranteed by design while R<sub>0,CA</sub> is determined by the user's board design.



a) 78°C/W when mounted on a 0.5in<sup>2</sup> pad of 2 oz copper



လွပ္*မွ* b) 125°C/W when mounted on a 0.02 in<sup>2</sup> pad of oz copper



c) 135°C/W when mounted on a mounted on a minimun pad



Scale 1: 1 on letter size paper

- 2: Starting T  $_J$  = 25°C, L = 1mH, I  $_{AS}$  = 8A, V  $_{DD}$  = 27V, V  $_{GS}$  = 10V. 3: Pulse Test:Pulse Width <300  $\mu$ S, Duty Cycle <2%.



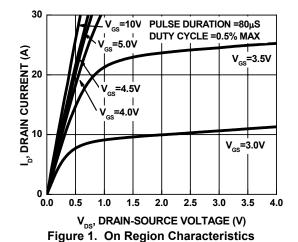
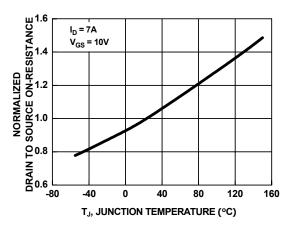


Figure 2. On-Resistance vs Drain Current and Gate Voltage



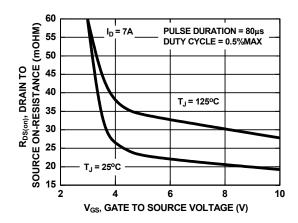
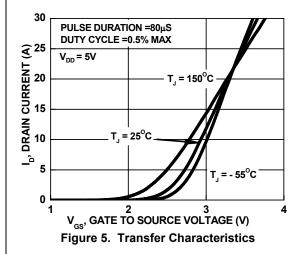


Figure 3. On Resistance vs Temperature

Figure 4. On-Resistance vs Gate to Source Votlage



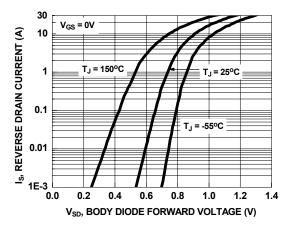


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

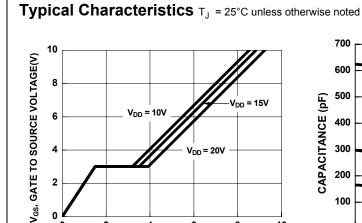


Figure 7. Gate Charge Characteristics

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

10

2

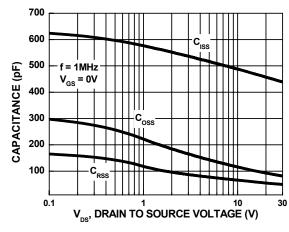


Figure 8. Capacitance vs Drain to Source Voltage

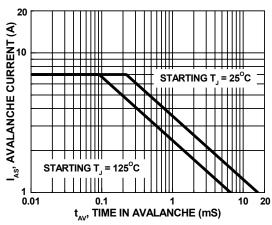


Figure 9. Unclamped Inductive Switching Capability

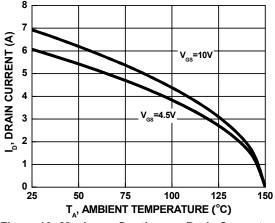


Figure 10. Maximum Continuous Drain Current vs
Ambient Temperature

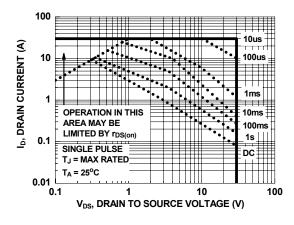


Figure 11. Forward Bias Safe Operating Area

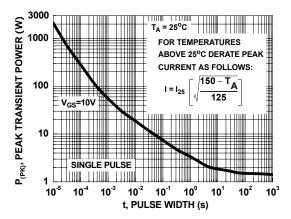


Figure 12. Single Pulse Maximum Power Dissipation

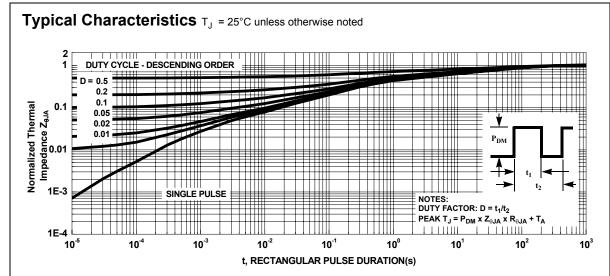


Figure 13. Transient Thermal Response Curve





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