FAIRCHILD

SEMICONDUCTOR®

FDS8884

N-Channel PowerTrench® MOSFET

30V, 8.5A, 23mΩ

General Descriptions

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 at V_{GS} = 10V, I_D = 8.5A

- Max $r_{DS(on)}$ = 30mΩ at V_{GS} = 4.5V, I_D = 7.5A

- Low gate charge

- 100% R_G Tested

- RoHS Compliant

SO-8
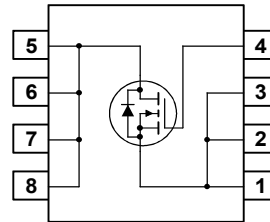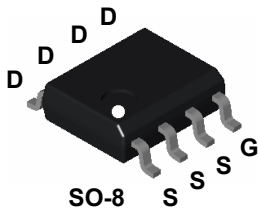
MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

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	(Note 1a)	8.5	A
	Pulsed		40	A
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	32	mJ
P_D	Power dissipation		2.5	W
	Derate above 25°C		20	mW/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to 150	°C

Thermal Characteristics

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

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS8884	FDS8884	SO-8	330mm	12mm	2500 units

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

| Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$	30			V
$\dfrac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, referenced to $25°C$		23		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24V$ $V_{GS} = 0V$			1	μA
		$T_J = 125°C$			250	
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm20V$			±100	nA
On Characteristics (Note 3)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	1.2	1.7	2.5	V
$\dfrac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu A$, referenced to $25°C$		-4.9		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 8.5A$,		19	23	mΩ
		$V_{GS} = 4.5V$, $I_D = 7.5A$,		23	30	
		$V_{GS} = 10V$, $I_D = 8.5A$, $T_J = 125°C$		26	32	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 15V$, $V_{GS} = 0V$, $f = 1MHz$		475	635	pF
C_{oss}	Output Capacitance			100	135	pF
C_{rss}	Reverse Transfer Capacitance			65	100	pF
R_G	Gate Resistance	$f = 1MHz$		0.9	1.6	Ω
Switching Characteristics (Note 3)						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15V$, $I_D = 8.5A$ $V_{GS} = 10V$, $R_{GS} = 33\Omega$		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	$V_{DS} = 15V$, $V_{GS} = 10V$ $I_D = 8.5A$		9.2	13	nC
Q_g	Total Gate Charge	$V_{DS} = 15V$, $V_{GS} = 5V$ $I_D = 8.5A$		5.0	7	nC
Q_{gs}	Gate to Source Gate Charge			1.5		nC
Q_{gd}	Gate to Drain Charge			2.0		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 8.5A$		0.9	1.25	V
		$I_{SD} = 2.1A$		0.8	1.0	V
t_{rr}	Reverse Recovery Time	$I_F = 8.5A$, $di/dt = 100A/\mu s$			33	ns
Q_{rr}	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.
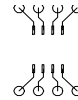
a) 50°C/W when mounted on a 1 in2 pad of 2 oz copper
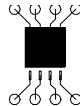
b) 105°C/W when mounted on a .04 in^2 pad of 2 oz copper

c) 125°C/W when mounted on a minimun pad

Scale 1 : 1 on letter size paper

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

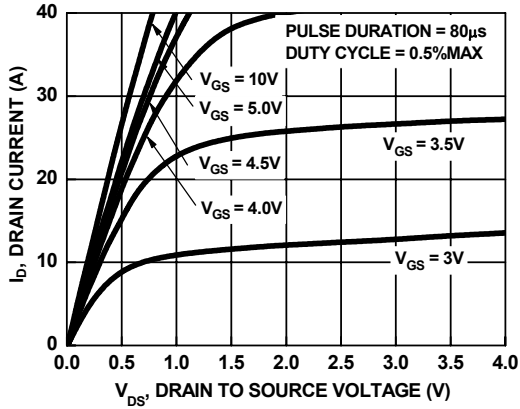## Typical Characteristics T_J = 25°C unless otherwise noted

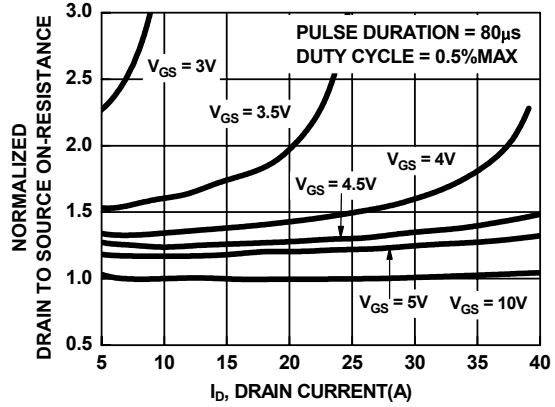**Figure 1. On Region Characteristics**

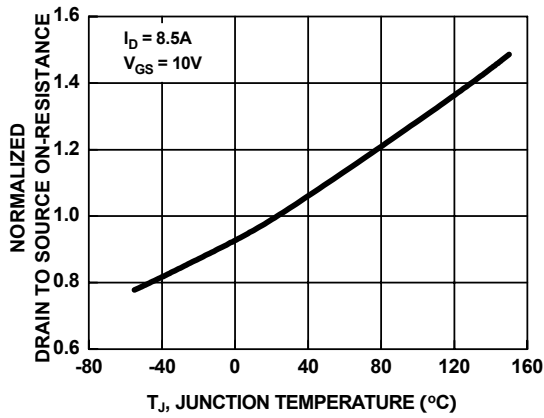**Figure 2. Normalized On-Resistance vs Drain current and Gate Voltage**

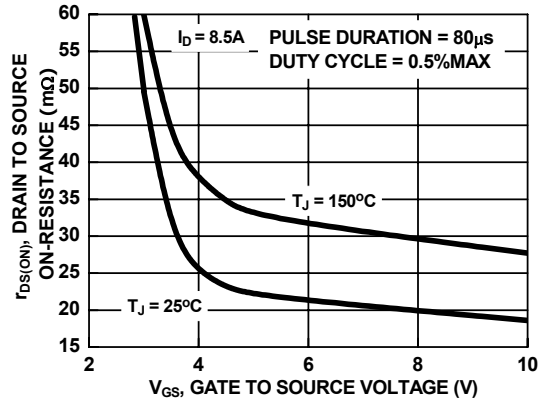**Figure 3. Normalized On Resistance vs Junction Temperature**

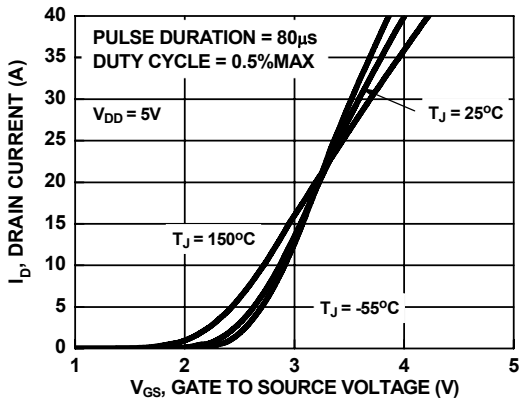**Figure 4. On-Resistance vs Gate to Source Voltage**

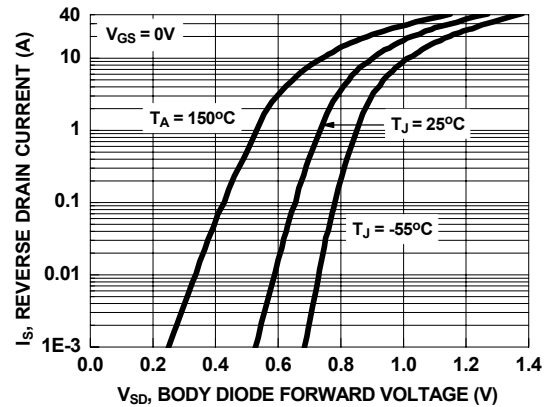**Figure 5. Transfer Characteristics**

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

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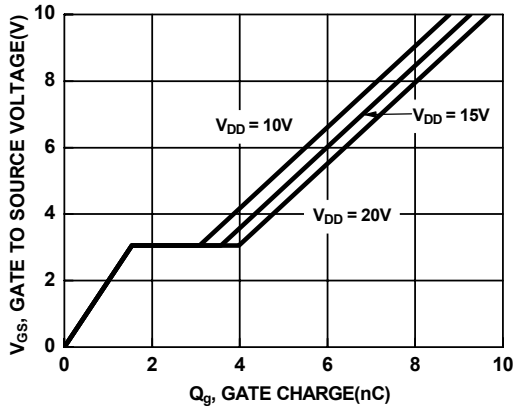**Typical Characteristics** $T_J = 25°C$ unless otherwise noted

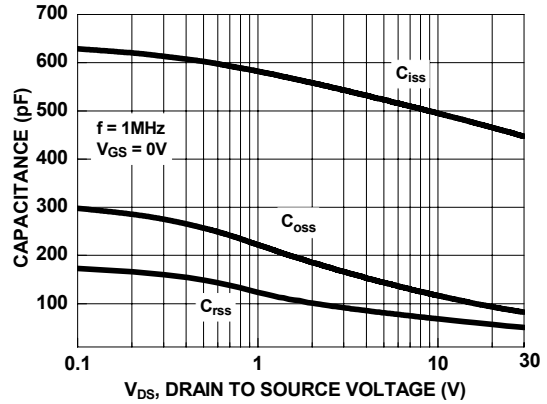Figure 7. Gate Charge Characteristics

Figure 8. Capacitance vs Drain to Source Voltage
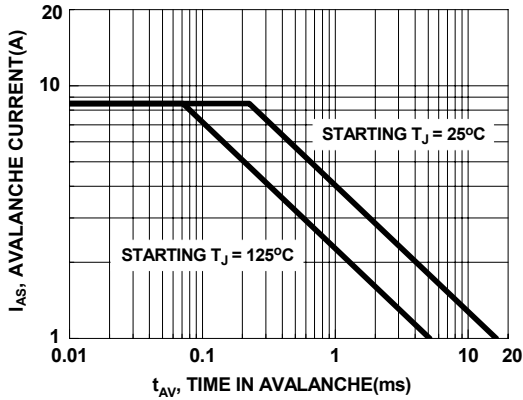

Figure 9. Unclamped Inductive Switching Capability
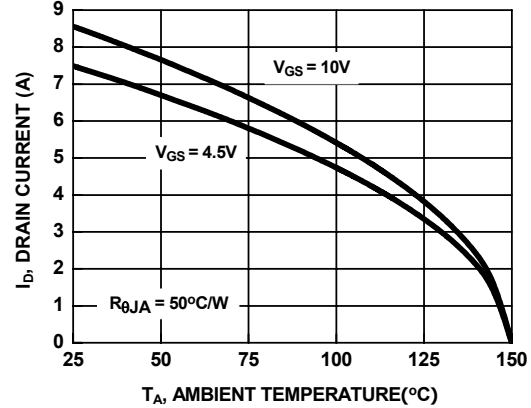
Figure 10. Maximum Continuous Drain Current vs Ambient Temperature
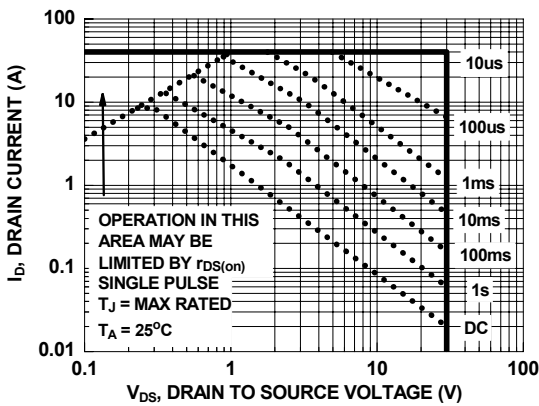
Figure 11. Forward Bias Safe Operating Area
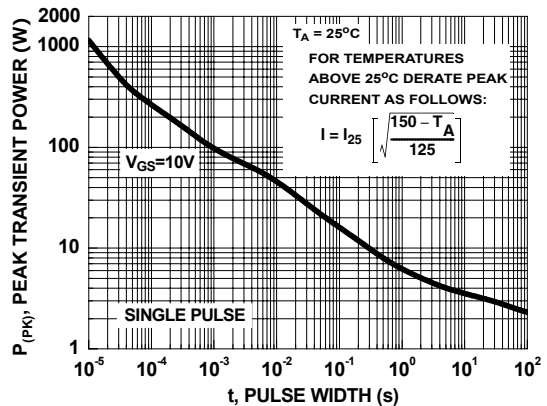
Figure 12. Single Pulse Maximum Power Dissipation

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

NORMALIZED THERMAL IMPEDANCE, $Z_{\theta JA}$

DUTY CYCLE-DESCENDING ORDER

D = 0.5
0.2
0.1
0.05
0.02
0.01

SINGLE PULSE

P_{DM}

t_1

t_2

NOTES:
DUTY FACTOR: $D = t_1/t_2$
PEAK $T_J = P_{DM} \times Z_{\theta JA} \times R_{\theta JA} + T_A$

t, RECTANGULAR PULSE DURATION(s)

Figure 13. Transient Thermal Response Curve

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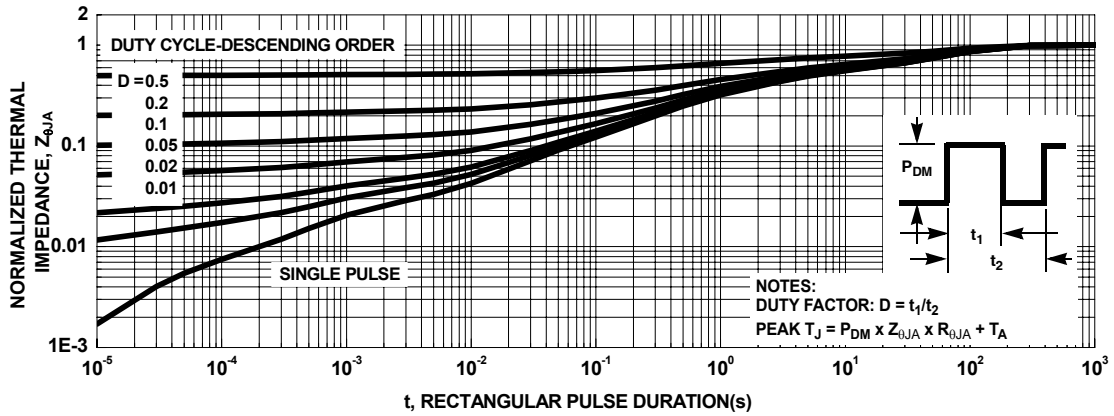|				
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