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February 2004

FDS6682

30V N-Channel PowerTrench$^\Diamond$ MOSFET

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 side" synchronous rectifier operation, providing an extremely low $R_{DS(ON)}$ in a small package.

Applications

- DC/DC converter

Features

- 14 A, 30 V. $R_{DS(ON)}$ = 7.5 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 9.0 mΩ @ V_{GS} = 4.5 V

- Low gate charge (22 nC typical)

- High performance trench technology for extremely low $R_{DS(ON)}$

- High power and current handling capability

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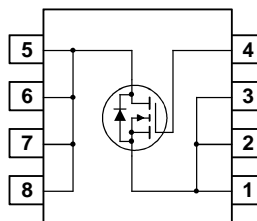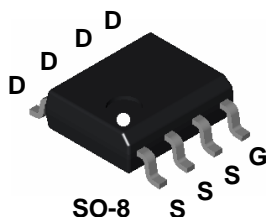
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current – Continuous	(Note 1a)	14	A
	– Pulsed		50	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1.2	
		(Note 1c)	1.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−55 to +150	°C

Thermal Characteristics

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

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS6682	FDS6682	13''	12mm	2500 units

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Electrical Characteristics

$T_A = 25°C$ unless otherwise noted

| Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ µA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C		23		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24$ V, $V_{GS} = 0$ V			10	µA
I_{GSSF}	Gate–Body Leakage, Forward	$V_{GS} = 20$ V, $V_{DS} = 0$ V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = –20$ V, $V_{DS} = 0$ V			–100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250$ µA	1	1.7	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C		–5.6		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10$ V, $I_D = 14$ A $V_{GS} = 4.5$ V, $I_D = 12.5$ A $V_{GS} = 4.5$ V, $I_D = 12.5$ A, $T_J = 125°C$		5.7 6.6 8	7.5 9 11.5	mΩ
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10$ V, $V_{DS} = 5$ V	50			A
g_{FS}	Forward Transconductance	$V_{DS} = 10$ V, $I_D = 14$ A		70		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 15$ V, $V_{GS} = 0$ V, f = 1.0 MHz		2310		pF
C_{oss}	Output Capacitance			582		pF
C_{rss}	Reverse Transfer Capacitance			237		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 15$ V, $I_D = 1$ A, $V_{GS} = 10$ V, $R_{GEN} = 6$ Ω		10	20	ns
t_r	Turn–On Rise Time			7	14	ns
$t_{d(off)}$	Turn–Off Delay Time			44	70	ns
t_f	Turn–Off Fall Time			16	29	ns
Q_g	Total Gate Charge	$V_{DS} = 15$ V, $I_D = 14$ A, $V_{GS} = 5$ V		22	31	nC
Q_{gs}	Gate–Source Charge			6.4		nC
Q_{gd}	Gate–Drain Charge			8		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.1	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0$ V, $I_S = 2.1$ A (Note 2)		0.7	1.2	V

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.
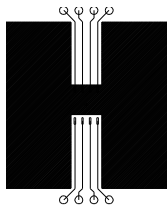
a) 50°C/W when mounted on a $1 in^2$ pad of 2 oz copper
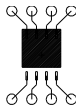
b) 105°C/W when mounted on a $.04 in^2$ pad of 2 oz copper
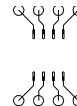
c) 125°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

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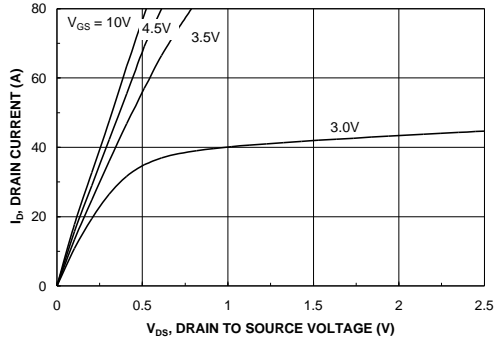
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Typical Characteristics
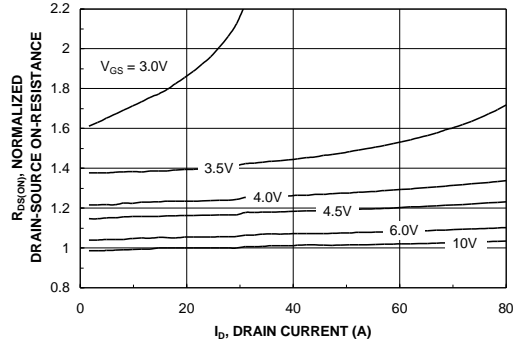

Figure 1. On-Region Characteristics.

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

Figure 3. On-Resistance Variation with
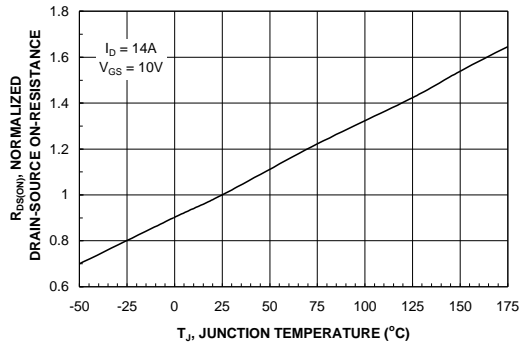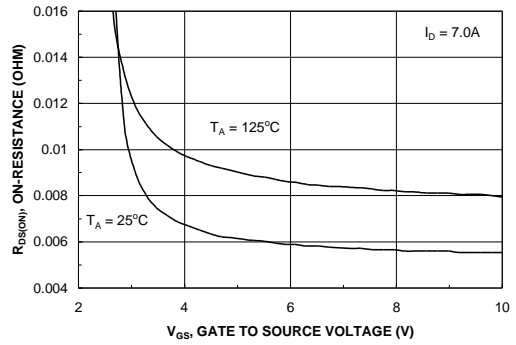Temperature.

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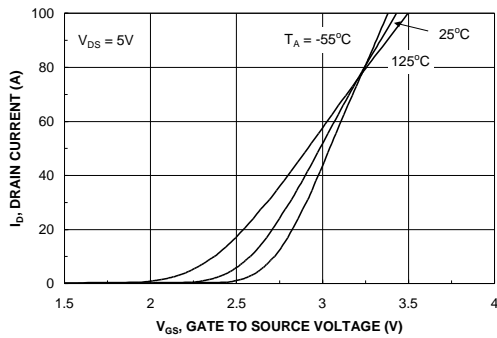Gate-to-Source Voltage.
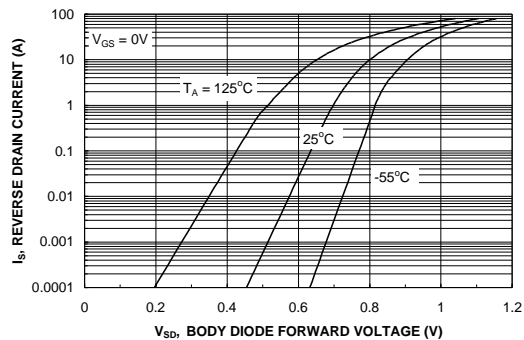

Figure 5. Transfer Characteristics.

Figure 6. Body Diode Forward Voltage Variation
with Source Current and Temperature.
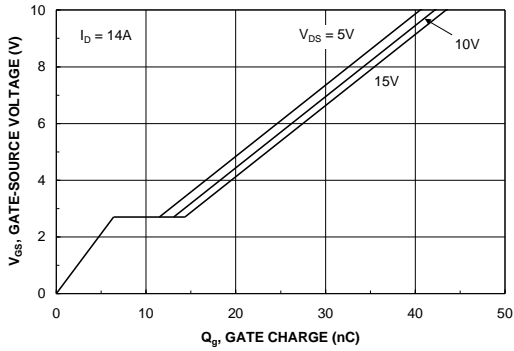
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Typical Characteristics

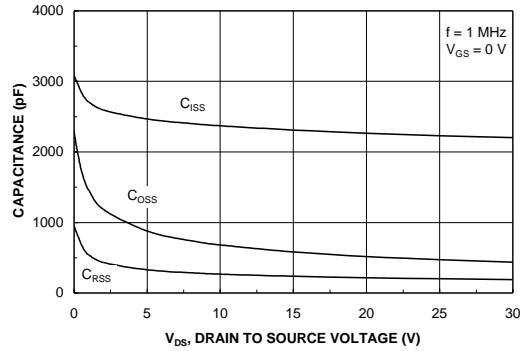Figure 7. Gate Charge Characteristics.
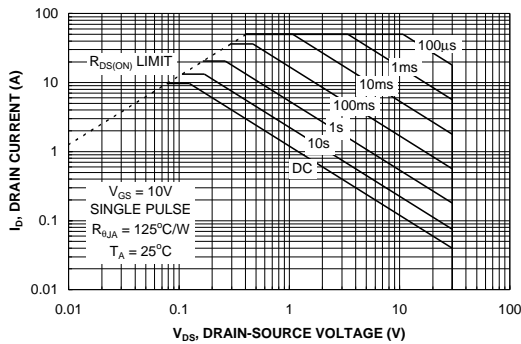

Figure 8. Capacitance Characteristics.

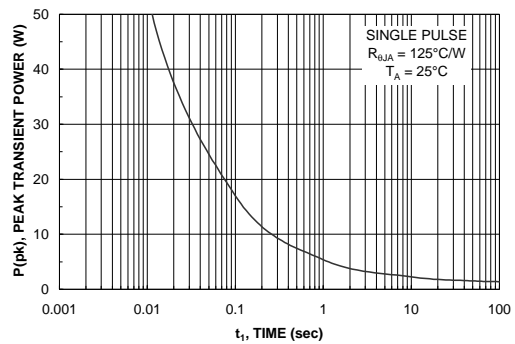Figure 9. Maximum Safe Operating Area.

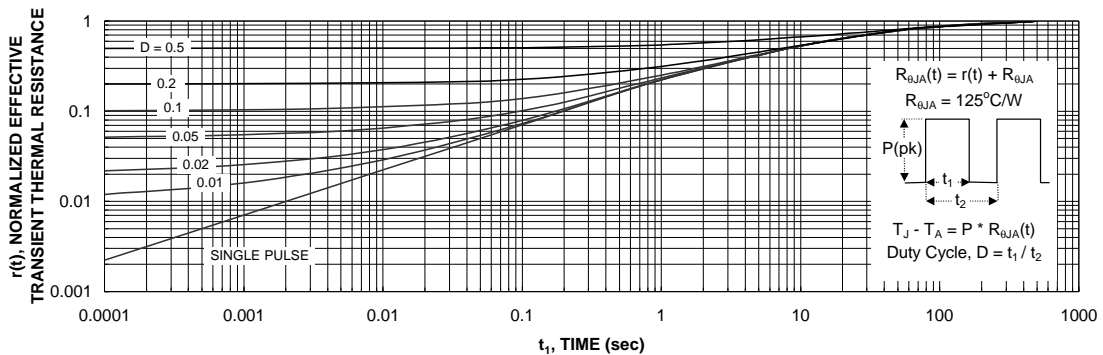Figure 10. Single Pulse Maximum
Power Dissipation.

Figure 11. Transient Thermal Response Curve.

**Thermal characterization performed using the conditions described in Note 1c.
Transient thermal response will change depending on the circuit board design.**

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