FAIRCHILD

SEMICONDUCTOR®

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FDD8750
N-Channel PowerTrench® MOSFET
25V, 2.7A, 40mΩ

Features

■ Max $r_{DS(on)}$ = 40mΩ at V_{GS} = 10V, I_D = 2.7A

■ Max $r_{DS(on)}$ = 60mΩ at V_{GS} = 4.5V, I_D = 2.7A

■ Low gate charge: $Q_{g(10)}$ = 6nC(Typ)

■ Low gate resistance

■ Avalanche rated and 100% tested

■ RoHS Compliant

General Description

This N-Channel MOSFET has been designed specifically to improve the overall effciency 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.

Application

■ Low current DC-DC switching

■ Linear regulation

D-PAK (TO-252)
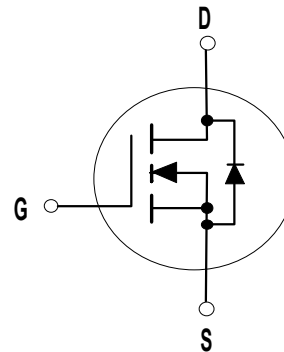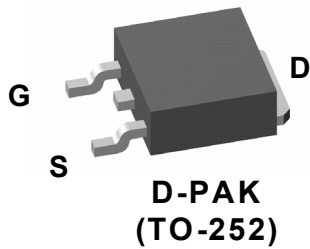
MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			25	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous(Package Limited)	T_C= 25°C		2.7	A
	-Continuous(Silicon Limited)	T_C= 25°C	(Note 1)	16	
	-Continuous	T_A= 25°C	(Note 1a)	6.5	
	-Pulsed			14	
E_{AS}	Drain-Source Avalanche Energy		(Note 3)	19	mJ
P_D	Power Dissipation	T_C= 25°C		18	W
	Power Dissipation		(Note 1a)	3.7	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			–55 to +175	°C

Thermal Characteristics

			Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case		8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD8750	FDD8750	D-PAK(TO-252)	13''	12mm	2500 units

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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$_D$ = 250μA, V$_{GS}$ = 0V	25			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I$_D$ = 250μA, referenced to 25°C		18		mV/°C
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$ =20V, V$_{GS}$ = 0V			1	μA
		T$_J$=150°C			250	
I$_{GSS}$	Gate to Source Leakage Current	V$_{GS}$ = ±20V, V$_{GS}$ = 0V			±100	nA
On Characteristics (Note 2)						
V$_{GS(th)}$	Gate to Source Threshold Voltage	V$_{GS}$ = V$_{DS}$, I$_D$ = 250μA	1.2	2.0	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I$_D$ = 250μA, referenced to 25°C		-5		mV/°C
r$_{DS(on)}$	Static Drain to Source On Resistance	V$_{GS}$ = 10V, I$_D$ = 2.7A		28	40	mΩ
		V$_{GS}$ = 4.5V, I$_D$ = 2.7A		39	60	
		V$_{GS}$ = 10V, I$_D$ = 2.7A, T$_J$=150°C		44	63	
Dynamic Characteristics						
C$_{iss}$	Input Capacitance	V$_{DS}$ = 13V, V$_{GS}$ = 0V, f = 1MHz		320	425	pF
C$_{oss}$	Output Capacitance			80	110	pF
C$_{rss}$	Reverse Transfer Capacitance			50	75	pF
R$_g$	Gate Resistance	f = 1MHz		1.8		Ω
Switching Characteristics						
t$_{d(on)}$	Turn-On Delay Time	V$_{DD}$ = 13V, I$_D$ = 2.7A V$_{GS}$ = 10V, R$_{GEN}$ = 6Ω		3	10	ns
t$_r$	Rise Time			12	22	ns
t$_{d(off)}$	Turn-Off Delay Time			8	16	ns
t$_f$	Fall Time			5	10	ns
Q$_g$	Total Gate Charge	V$_{GS}$ = 0V to 10V		6	9	nC
Q$_{g(5)}$	Total Gate Charge	V$_{GS}$ = 0V to 5V, V$_{DD}$ =13V, I$_D$ = 2.7A		3.4	5	nC
Q$_{gs}$	Gate to Source Gate Charge			1.1		nC
Q$_{gd}$	Gate to Drain "Miller" Charge			1.2		nC
Drain-Source Diode Characteristics						
V$_{SD}$	Source to Drain Diode Forward Voltage	V$_{GS}$ = 0V, I$_S$ = 2.7A (Note 2)		0.8	1.6	V
t$_{rr}$	Reverse Recovery Time	I$_F$ = 2.7A, di/dt = 100A/μs		16	24	ns
Q$_{rr}$	Reverse Recovery Charge			7	11	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$_{\theta JA}$ is determined by the user's board design.
  a. 40°C/W when mounted on a 1 in^2 pad of 2 oz copper;
  b. 96°C/W when mounted on a minimum pad.
2: Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.
3: Starting T$_J$ = 25°C, L = 3mH, I$_{AS}$ = 3.6A, V$_{DD}$ = 25V, V$_{GS}$ = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

V_{GS} = 10V

V_{GS} = 5V

V_{GS} = 4.5V

V_{GS} = 4V
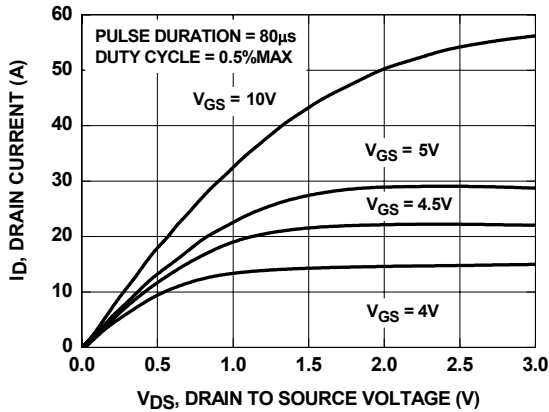
Figure 1. On Region Characteristics

PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

V_{GS} = 4V

V_{GS} = 4.5V

V_{GS} = 5V

V_{GS} = 10V
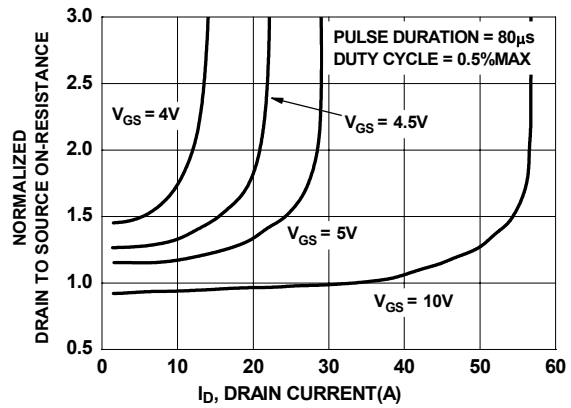
Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

I_D = 2.7A
V_{GS} = 10V
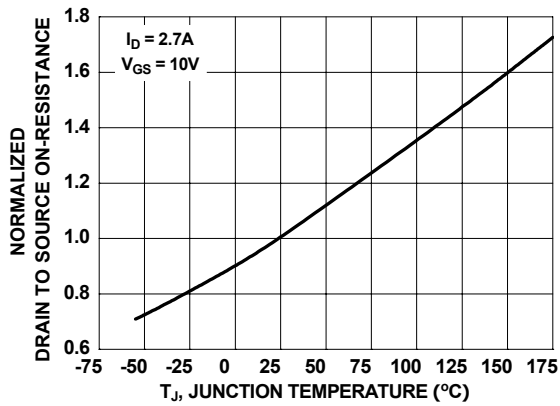
Figure 3. Normalized On Resistance vs Junction Temperature

I_D = 7.4A   **PULSE DURATION = 80μs**
DUTY CYCLE = 0.5%MAX

T_J = 150°C
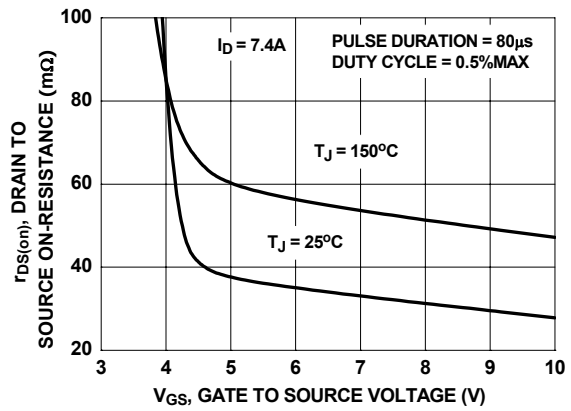
T_J = 25°C

Figure 4. On-Resistance vs Gate to Source Voltage

PULSE DURATION = 80μs
DUTY CYCLE = 0.5%MAX

T_J = -55°C T_J = 25°C

T_J = 175°C
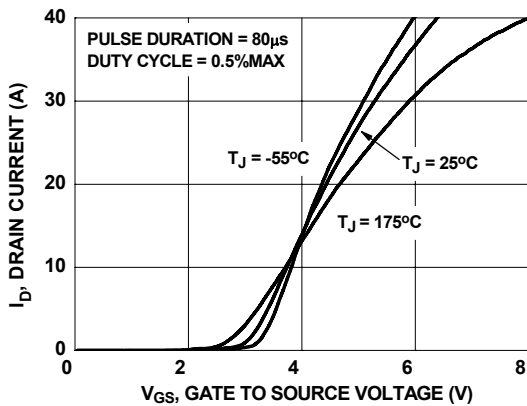
Figure 5. Transfer Characteristics

V_{GS} = 0V

T_J = 175°C T_J = 25°C

T_J = -55°C
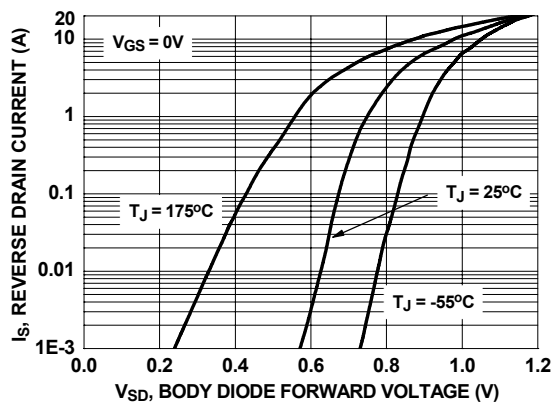
Figure 6. Source to Drain Diode Forward Voltage vs Source Current

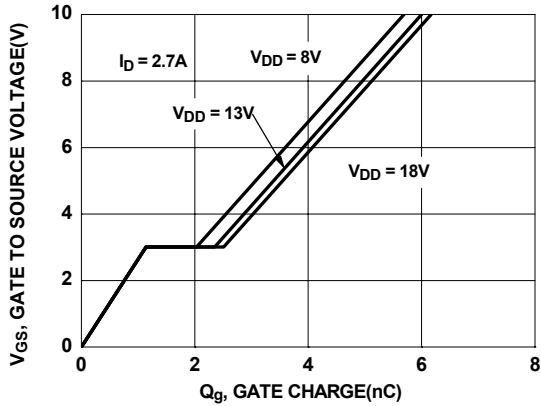## Typical Characteristics T_J = 25°C unless otherwise noted

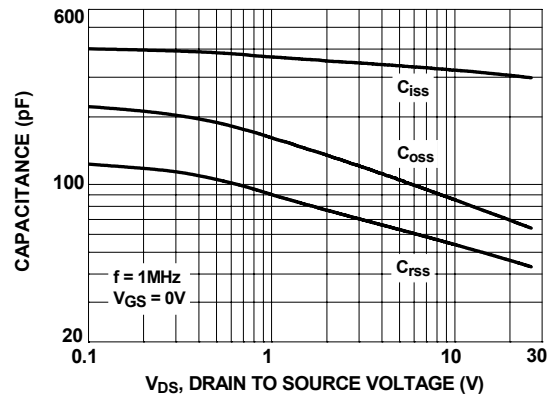**Figure 7. Gate Charge Characteristics**

Figure 8. Capacitance vs Drain to Source Voltage
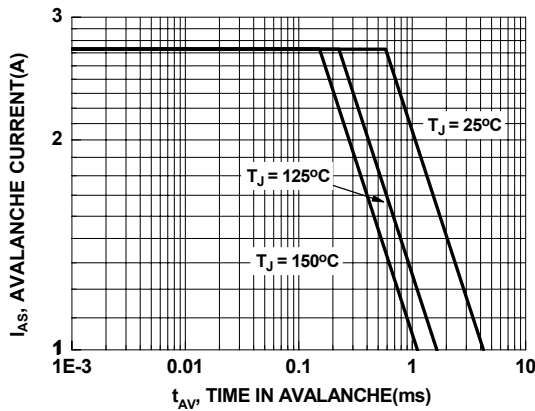

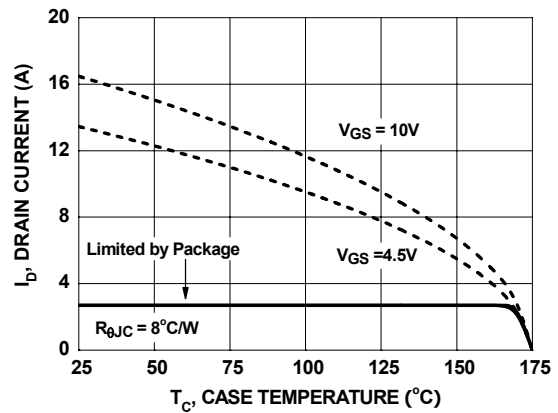**Figure 9. Unclamped Inductive Switching Capability**

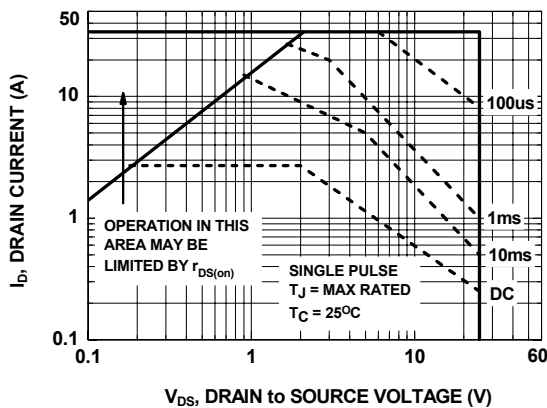**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

Figure 11. Forward Bias Safe Operating Area
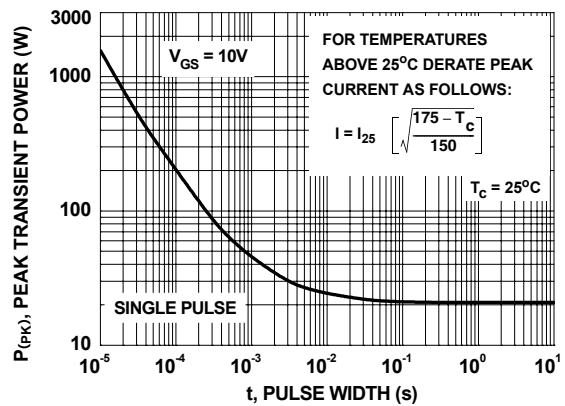
Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted
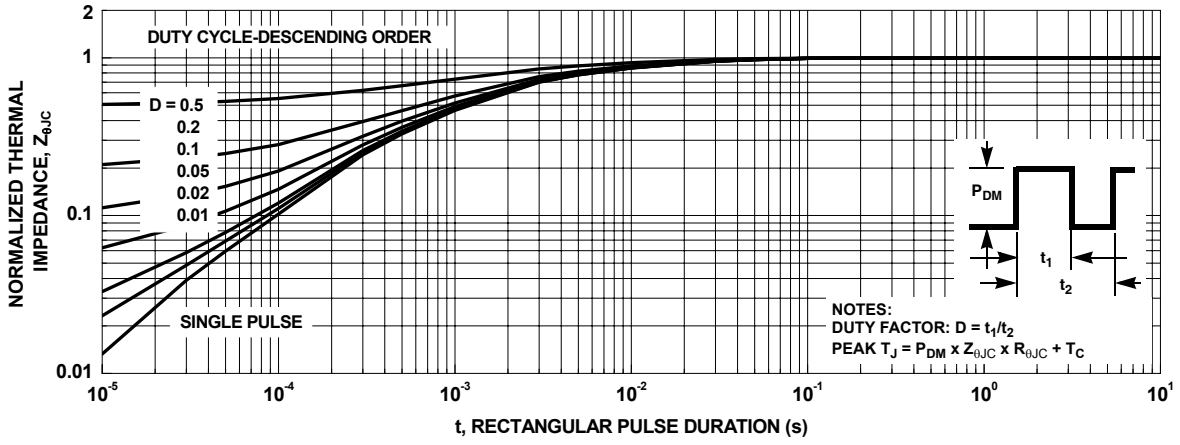
Figure 13. Transient Thermal Response Curve

Within the figure:

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

t, RECTANGULAR PULSE DURATION (s)

DUTY CYCLE-DESCENDING ORDER

D = 0.5
0.2
0.1
0.05
0.02
0.01

SINGLE PULSE

NOTES:
DUTY FACTOR: D = t_1/t_2
PEAK T_J = P_{DM} x $Z_{\theta JC}$ x $R_{\theta JC}$ + T_C

P_{DM}

t_1

t_2

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