FAIRCHILD SEMICONDUCTOR®

December 2005

FDS8449

40V N-Channel PowerTrench® MOSFET

General Description

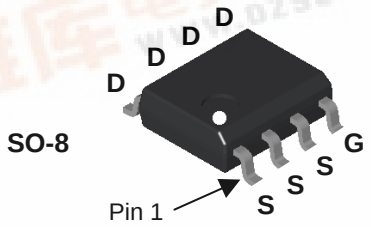
These N-Channel MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

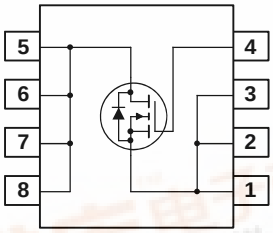
Application

- Inverter
- Power Supplies

Features

- 7.6 A, 40V $R_{DS(on)}$ = 29mΩ @ V_{GS} = 10V
  $R_{DS(on)}$ = 36mΩ @ V_{GS} = 4.5V
- High power handling capability in a widely used surface mount package
- RoHS compliant





Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		40	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current – Continuous	(Note 1a)	7.6	A
	– Pulsed		50	
P_D	Power Dissipation for Single Operation	(Note 1a)	2.5	W
		(Note 1b)	1	
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
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	125	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	25	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS8449	FDS8449	13"	12mm	2500 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 3)						
E_{AS}	Drain-Source Avalanche Energy	V_{DD} = 40 V, I_D = 7.3 A, L = 1 mH			27	mJ
I_{AS}	Drain-Source Avalanche Current			7.3		A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		34		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate–Body Leakage	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	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		–5		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 7.6 A V_{GS} = 4.5 V, I_D = 6.8 A V_{GS}= 10 V, I_D = 7.6 A, T_J=125°C		21 26 29	29 36 43	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 7.6 A		21		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 20 V, V_{GS} = 0 V, f = 1.0 MHz		760		pF
C_{oss}	Output Capacitance			100		pF
C_{rss}	Reverse Transfer Capacitance			60		pF
R_G	Gate Resistance	f = 1.0 MHz		1.2		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 20 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		9	18	ns
t_r	Turn–On Rise Time			5	10	ns
$t_{d(off)}$	Turn–Off Delay Time			23	17	ns
t_f	Turn–Off Fall Time			3	6	ns
Q_g	Total Gate Charge	V_{DS} = 20 V, I_D = 7.6 A, V_{GS} = 5 V		7.7	11	nC
Q_{gs}	Gate–Source Charge			2.4		nC
Q_{gd}	Gate–Drain Charge			2.8		nC
Drain–Source Diode Characteristics						
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.76	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 7.6 A, d_{iF}/d_t = 100 A/μs		17		nS
Q_{rr}	Diode Reverse Recovery Charge			7		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 1in^2 pad of 2 oz copper

b) 125°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

3. BV(avalanche) Single-Pulse rating is guaranteed if device is operated within the UIS SOA boundary of the device.

Typical Characteristics

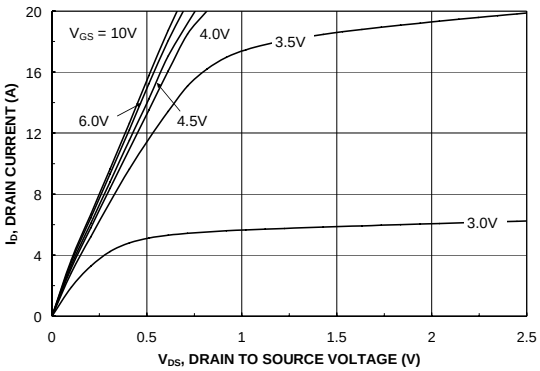


Figure 1. On-Region Characteristics.

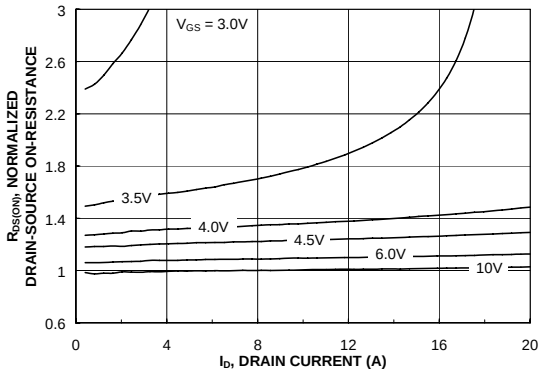


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

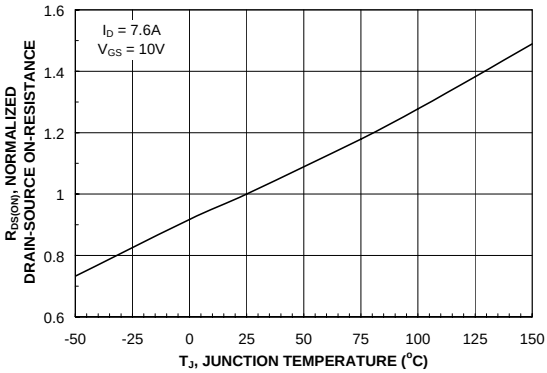


Figure 3. On-Resistance Variation with Temperature.

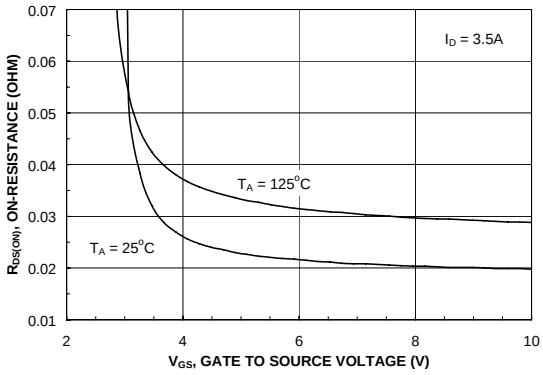


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

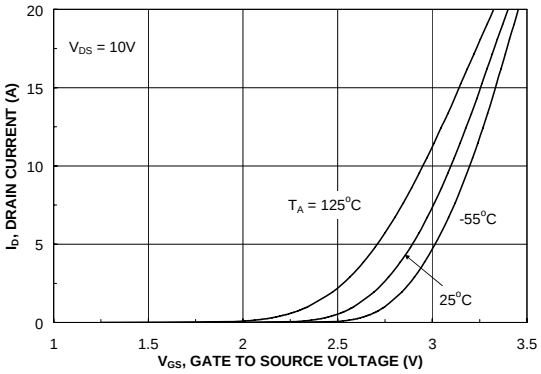


Figure 5. Transfer Characteristics.

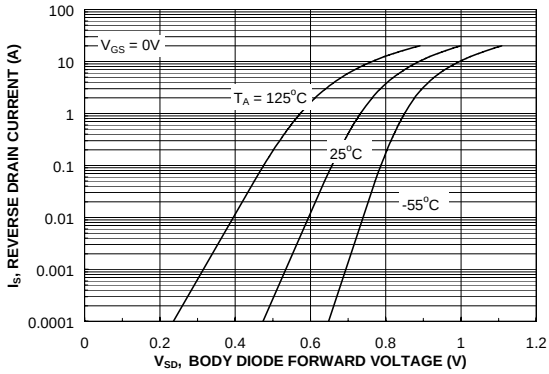


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

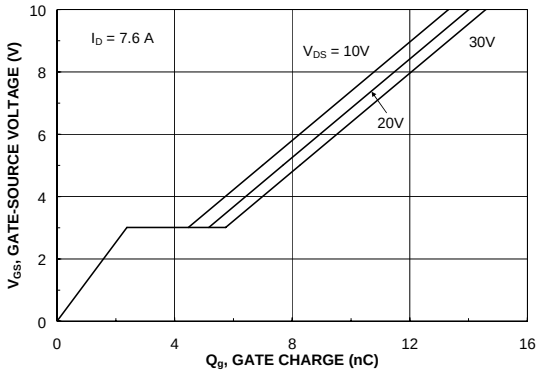


Figure 7. Gate Charge Characteristics.

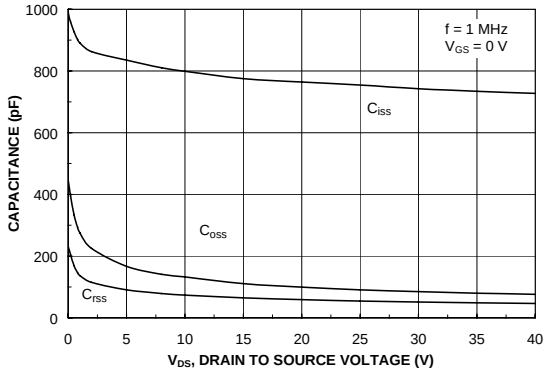


Figure 8. Capacitance Characteristics.

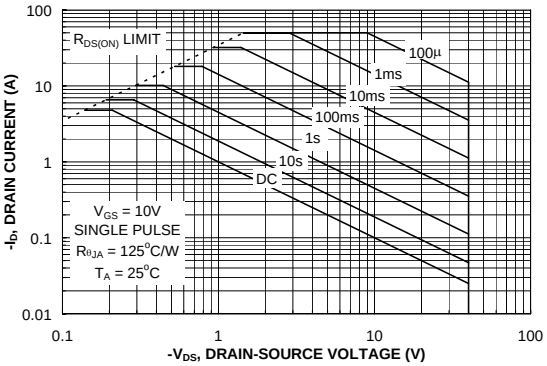


Figure 9. Maximum Safe Operating Area.

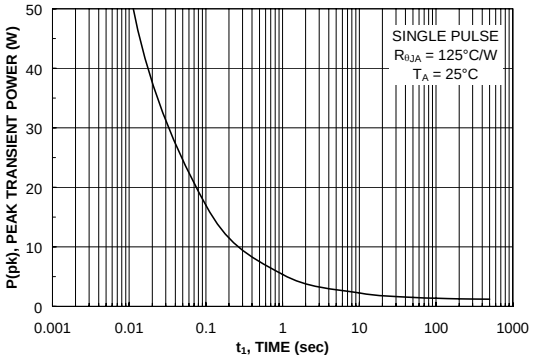


Figure 10. Single Pulse Maximum Power Dissipation.

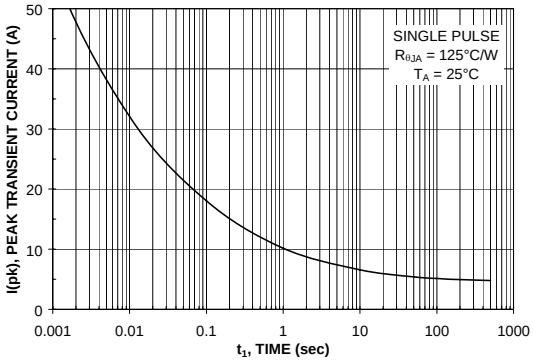


Figure 11. Single Pulse Maximum Peak Current.

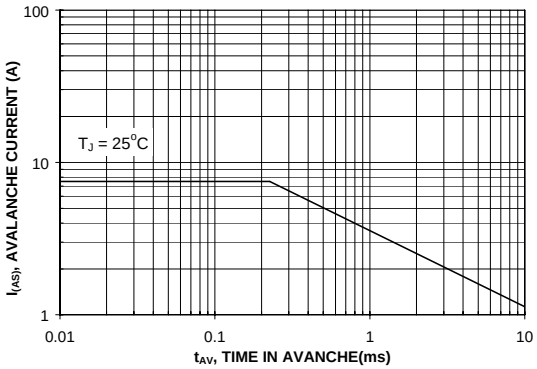


Figure 12. Unclamped Inductive Switching Capability.

Typical Characteristics

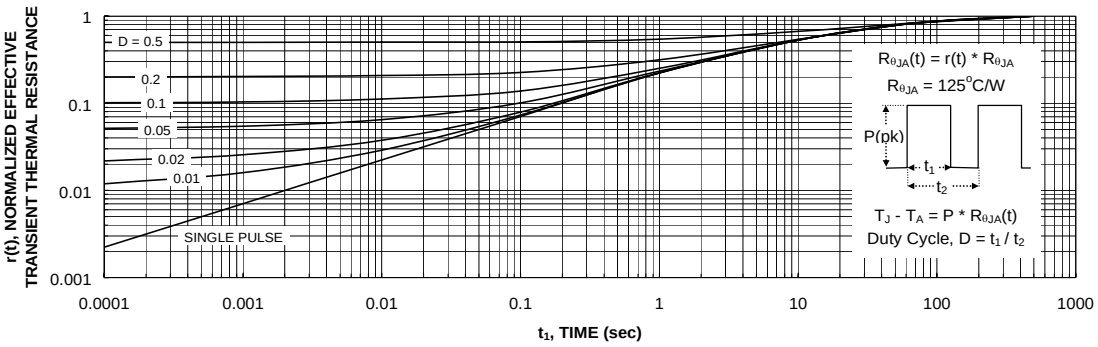


Figure 25. Transient Thermal Response Curve.

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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