

**FAIRCHILD**  
SEMICONDUCTOR®

February 2006

# FDB8444

## N-Channel PowerTrench® MOSFET

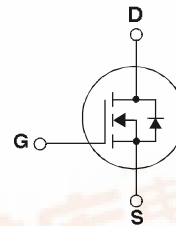
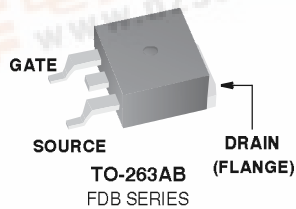
### 40V, 70A, 5.5mΩ

#### Features

- Typ  $r_{DS(on)}$  = 3.9mΩ at  $V_{GS} = 10V$ ,  $I_D = 70A$
- Typ  $Q_g(TOT)$  = 91nC at  $V_{GS} = 10V$
- Low Miller Charge
- Low  $Q_{rr}$  Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

#### Applications

- Automotive Engine Control
- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Transmission
- Distributed Power Architecture and VRMs
- Primary Switch for 12V Systems



FDB8444 N-Channel PowerTrench® MOSFET



**Absolute Maximum Ratings**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current Continuous ( $V_{GS} = 10\text{V}$ ) (Note 1)	70	A
	Pulsed	Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 2)	307	mJ
$P_D$	Power Dissipation	167	W
	Derate above $25^\circ\text{C}$	1.1	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to +175	$^\circ\text{C}$

**Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.9	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO-263, $1\text{in}^2$ copper pad area	43	$^\circ\text{C}/\text{W}$

**Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8444	FDB8444	TO-263AB	330mm	24mm	800 units

**Electrical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$B_{VDSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}, T_J = 150^\circ\text{C}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2	2.6	4	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 70\text{A}, V_{GS} = 10\text{V}$	-	3.9	5.5	$\text{m}\Omega$
		$I_D = 70\text{A}, V_{GS} = 10\text{V}, T_J = 175^\circ\text{C}$	-	7	9.9	

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	6040	8035	pF	
$C_{oss}$	Output Capacitance		-	480	640	pF	
$C_{rss}$	Reverse Transfer Capacitance		-	290	435	pF	
$R_G$	Gate Resistance	$f = 1\text{MHz}$	-	2	-	$\Omega$	
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0$ to 10V	$V_{DD} = 20\text{V}, I_D = 70\text{A},$	-	91	128	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0$ to 2V		-	7	10	nC
$Q_{gs}$	Gate to Source Gate Charge			-	23	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau			-	17	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	20	-	nC

**Electrical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{(on)}$	Turn-On Time	$V_{DD} = 20\text{V}, I_D = 70\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 2\Omega$	-	-	135	ns
$t_{d(on)}$	Turn-On Delay Time		-	12	-	ns
$t_r$	Turn-On Rise Time		-	78	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	48	-	ns
$t_f$	Turn-Off Fall Time		-	15	-	ns
$t_{off}$	Turn-Off Time		-	-	95	ns

**Drain-Source Diode Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 70\text{A}$	-	-	1.25	V
		$I_{SD} = 35\text{A}$	-	-	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_F = 70\text{A}, di/dt = 100\text{A}/\mu\text{s}$	-	-	62	ns
$Q_{rr}$	Reverse Recovery Charge	$I_F = 70\text{A}, di/dt = 100\text{A}/\mu\text{s}$	-	-	82	nC

**Notes:**

- 1: Maximum wire current carrying capacity is 70A.
- 2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.2\text{mH}$ ,  $I_{AS} = 56\text{A}$ .

This product has been designed to meet the extreme test conditions and environment demanded by the automotive industry. For a copy of the requirements, see AEC Q101 at: <http://www.aecouncil.com/>  
 All Fairchild Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.

### Typical Characteristics

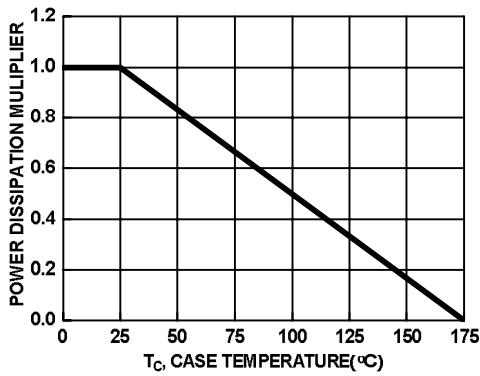


Figure 1. Normalized Power Dissipation vs Case Temperature

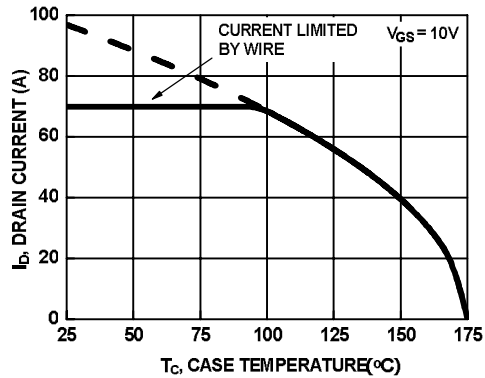


Figure 2. Maximum Continuous Drain Current vs Case Temperature

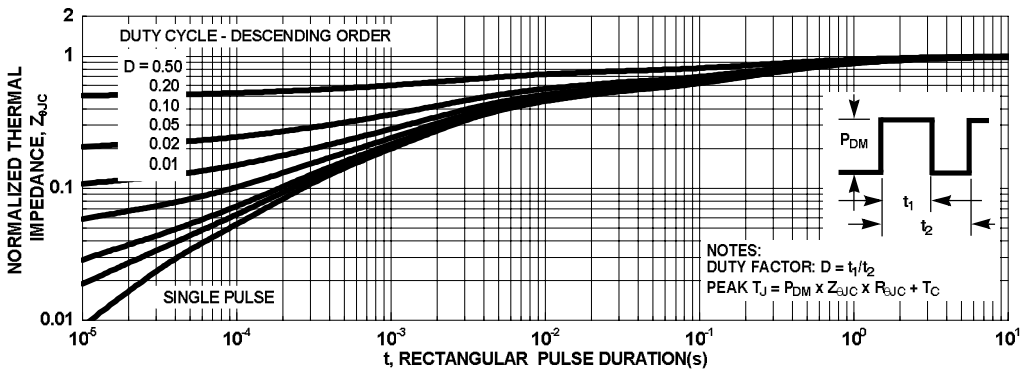


Figure 3. Normalized Maximum Transient Thermal Impedance

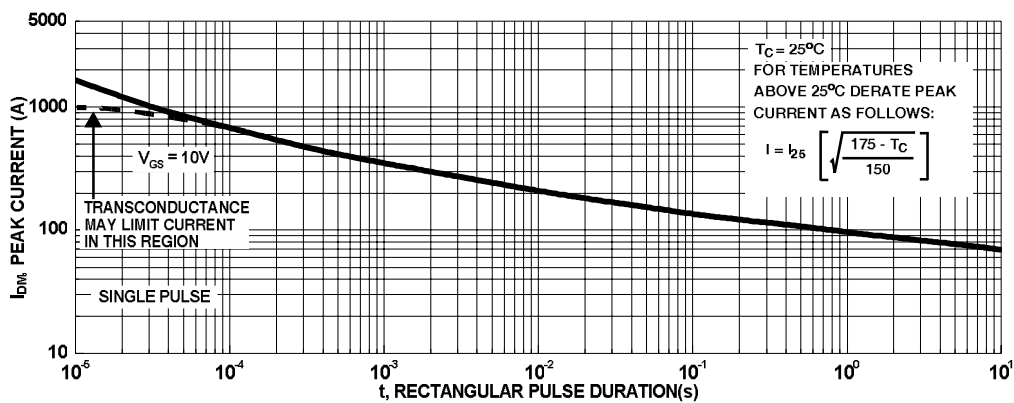
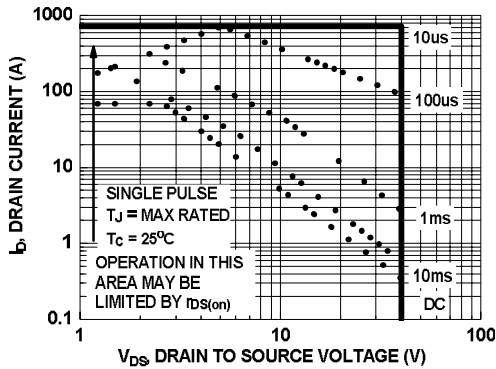
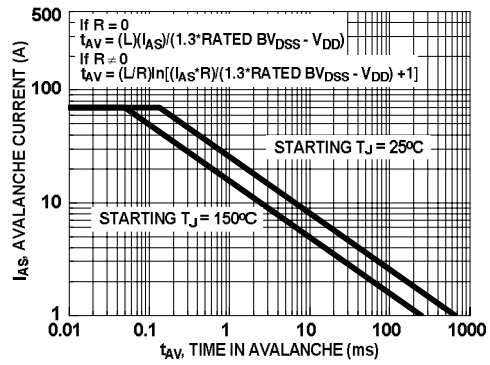


Figure 4. Peak Current Capability

**Typical Characteristics**

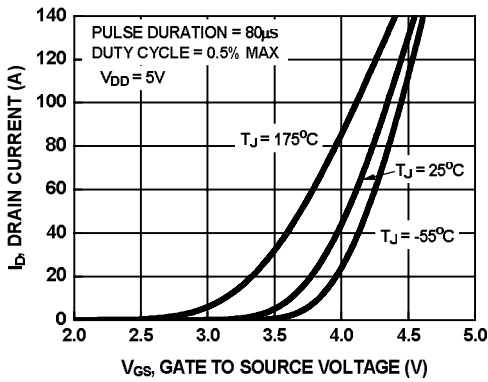


**Figure 5. Forward Bias Safe Operating Area**

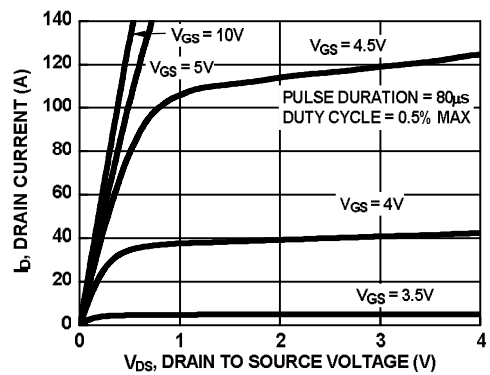


NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

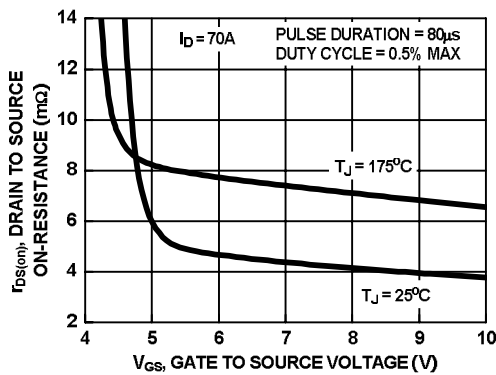
**Figure 6. Unclamped Inductive Switching Capability**



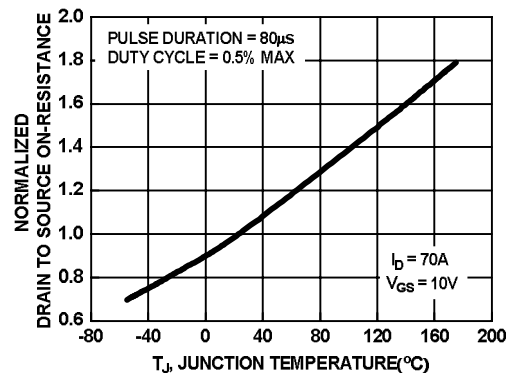
**Figure 7. Transfer Characteristics**



**Figure 8. Saturation Characteristics**



**Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage**



**Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature**

### Typical Characteristics

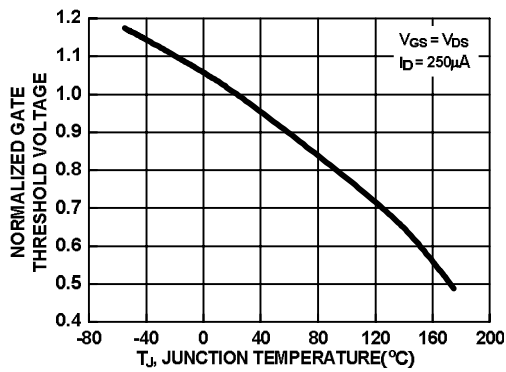


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

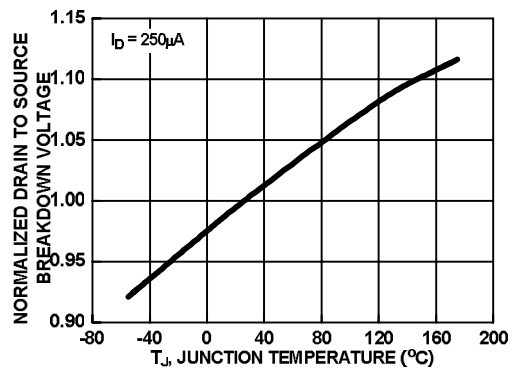


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

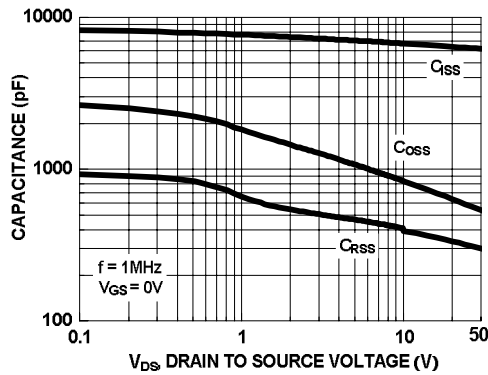


Figure 13. Capacitance vs Drain to Source Voltage

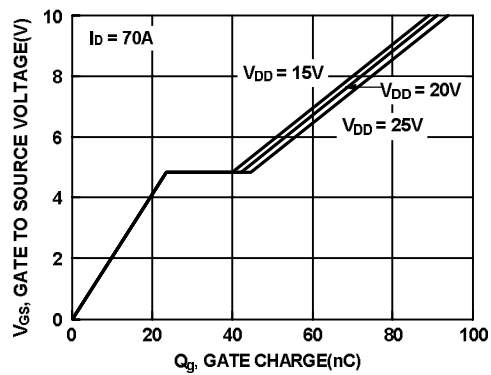


Figure 14. Gate Charge vs Gate to Source Voltage

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EcoSPARK™	I <sup>2</sup> C™	MSXPro™	RapidConnect™	UHC™
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