

**FAIRCHILD**  
SEMICONDUCTOR®

August 2007

## FDB8444TS

### N-Channel PowerTrench® MOSFET with Temperature Sensor

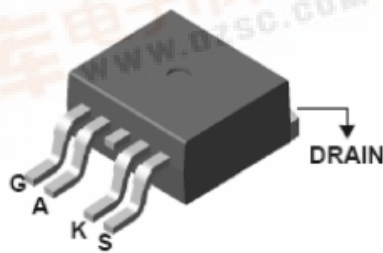
40V, 70A, 5mΩ

#### Features

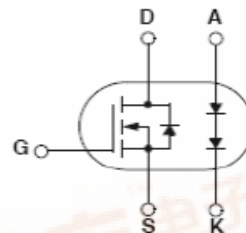
- Typ  $r_{DS(on)}$  = 3.8mΩ at  $V_{GS}$  = 10V,  $I_D$  = 70A
- Typ  $Q_{g(TOT)}$  = 130nC at  $V_{GS}$  = 10V
- Low Miller Charge
- Low  $Q_{rr}$  Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

#### Applications

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



TO263 5 LEADS



FDB8444TS N-Channel PowerTrench® MOSFET with Temperature Sensor

**MOSFET 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 ( $T_C = 140^\circ\text{C}$ , $V_{GS} = 10\text{V}$ )	70	A
	Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , with $R_{\theta JA} = 43^\circ\text{C/W}$ )	20	
	Pulsed	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	439	mJ
$P_D$	Power Dissipation	181	W
	Derate above $25^\circ\text{C}$	1.2	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	0.83	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, 1in <sup>2</sup> copper pad area	43	$^\circ\text{C/W}$

**Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8444TS	FDB8444TS	TO-263 5LDS	330mm	24mm	800 units

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  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	$V_{DS} = 32\text{V}$ , $V_{GS} = 0\text{V}$ $T_C = 150^\circ\text{C}$	-	-	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	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	2	2.8	4	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 70\text{A}$ , $V_{GS} = 10\text{V}$	-	3.8	5	m $\Omega$
		$I_D = 70\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 175^\circ\text{C}$	-	6.5	8.5	

**Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz		-	8410	-	pF
C <sub>oss</sub>	Output Capacitance			-	765	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			-	485	-	pF
R <sub>G</sub>	Gate Resistance	f = 1MHz		-	1.8	-	Ω
Q <sub>g(TOT)</sub>	Total Gate Charge at 20V	V <sub>GS</sub> = 0 to 20V	V <sub>DD</sub> = 20V I <sub>D</sub> = 70A	-	260	338	nC
Q <sub>g(10)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 0 to 10V		-	130	169	nC
Q <sub>g(TH)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 0 to 2V		-	15.5	-	nC
Q <sub>gs</sub>	Gate to Source Gate Charge			-	33	-	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau			-	17.7	-	nC
Q <sub>gd</sub>	Gate to Drain “Miller” Charge			-	30	-	nC

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

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

$t_{on}$	Turn-On Time	$V_{DD} = 20\text{V}, I_D = 70\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 2\Omega$	-	-	96	ns
$t_{d(on)}$	Turn-On Delay Time		-	14.6	-	ns
$t_r$	Rise Time		-	19.1	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	44	-	ns
$t_f$	Fall Time		-	17.3	-	ns
$t_{off}$	Turn-Off Time		-	-	98	ns

**Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 70\text{A}$	-	1.0	1.25	V
		$I_{SD} = 40\text{A}$	-	0.9	1.0	
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 70\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	51	66	ns
$Q_{rr}$	Reverse Recovery Charge		-	70	91	nC

**Temperature Sense Diode Characteristics**

$V_f$	Temperature Sense Diode Voltage	$I_f = 1\text{mA}$	1.58	1.61	1.63	V
$S_f$	Temperature Sense Diode Temperature Coefficient	$I_f = 1\text{mA}, -55^\circ\text{C} < T_J < 175^\circ\text{C}$	-2.55	-2.74	-3.11	mV/°C

**Notes:**

1: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.28\text{mH}$ ,  $I_{AS} = 56\text{A}$ .

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

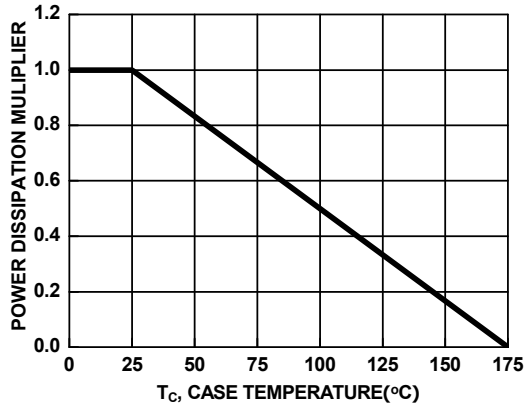


Figure 1. Normalized Power Dissipation vs Case Temperature

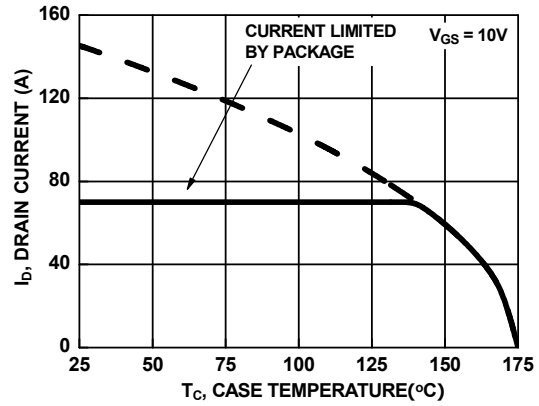


Figure 2. Maximum Continuous Drain Current vs Case Temperature

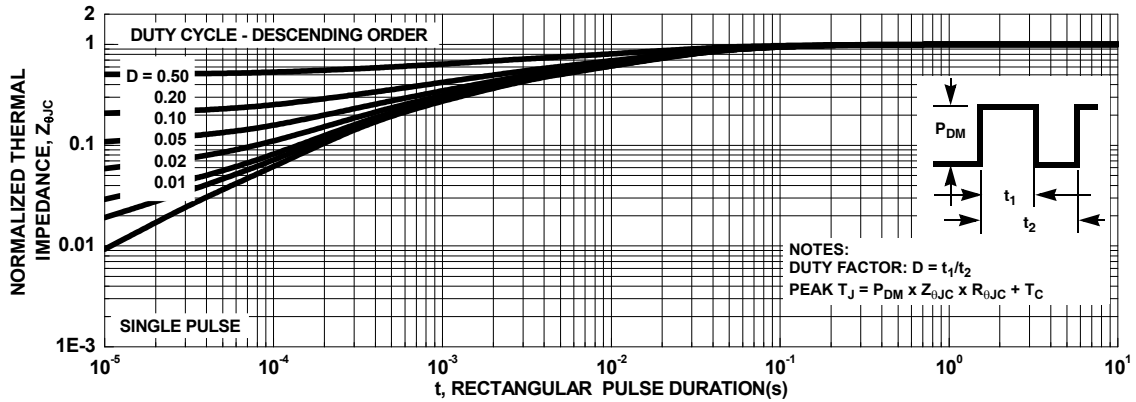


Figure 3. Normalized Maximum Transient Thermal Impedance

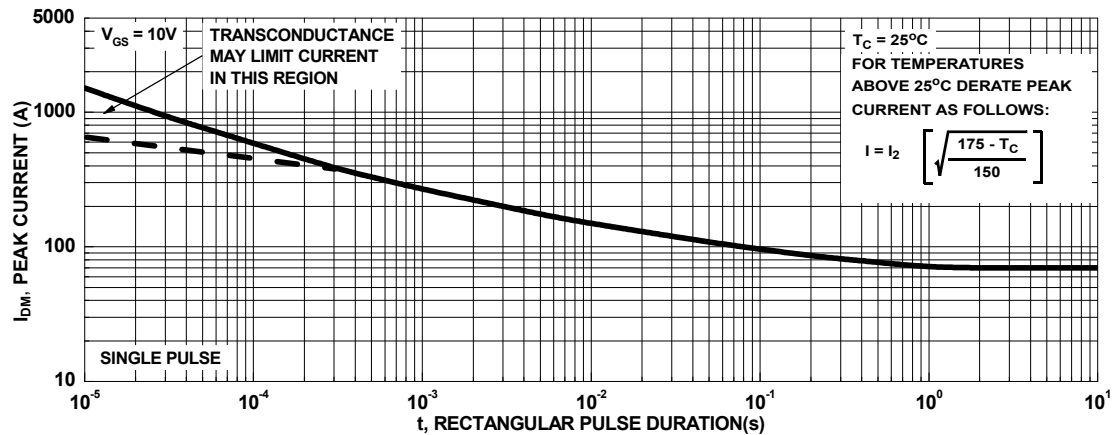


Figure 4. Peak Current Capability

## Typical Characteristics

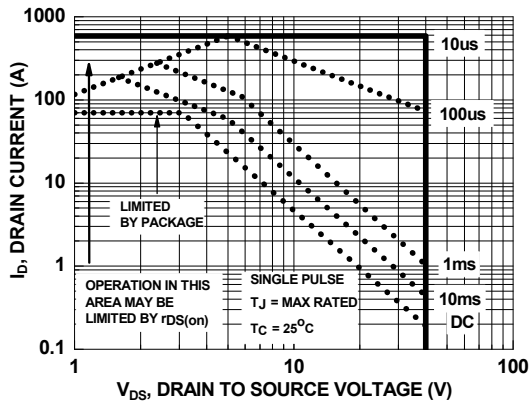
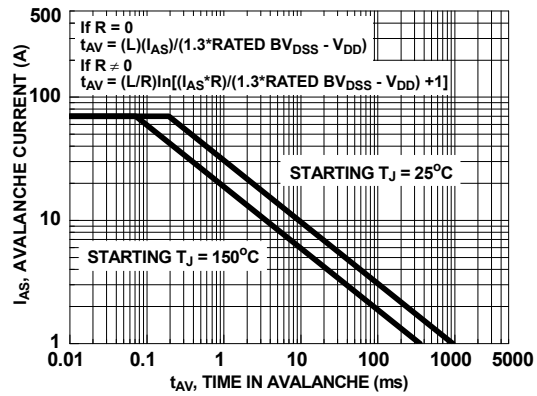


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

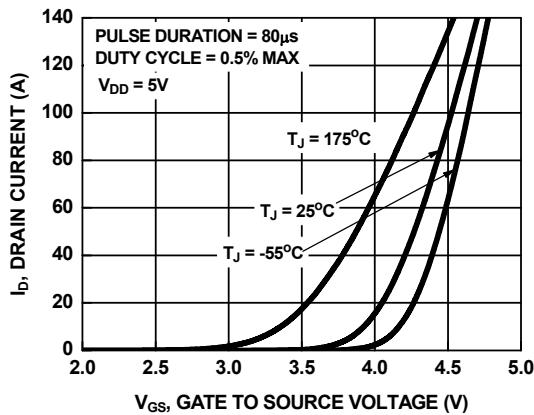


Figure 7. Transfer Characteristics

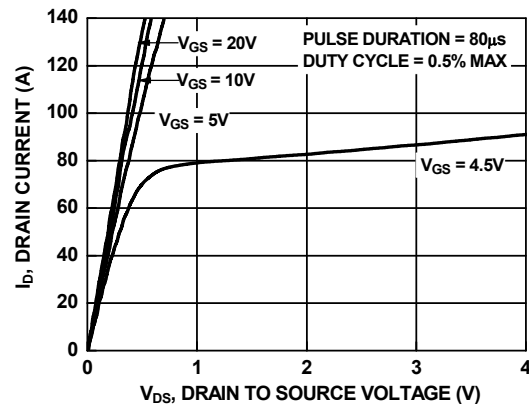


Figure 8. Saturation Characteristics

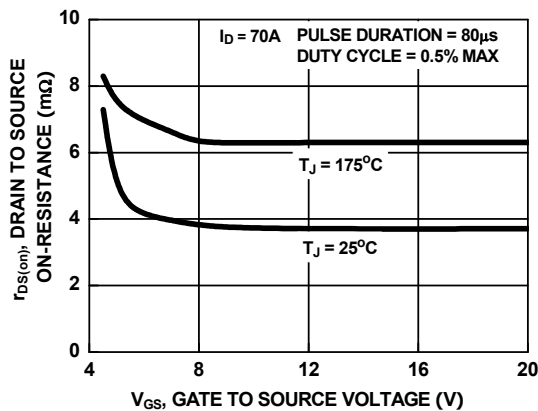


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

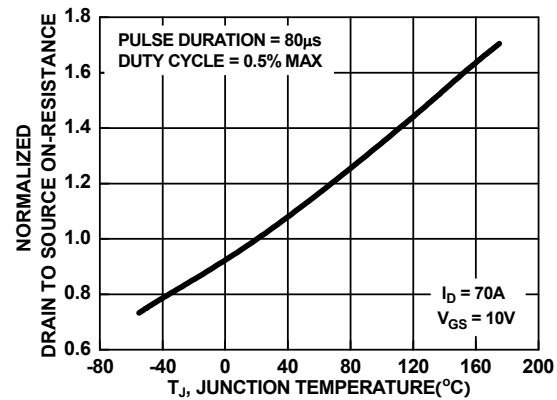


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

## Typical Characteristics

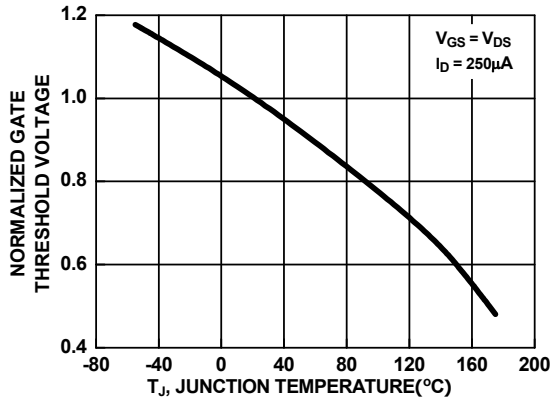


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

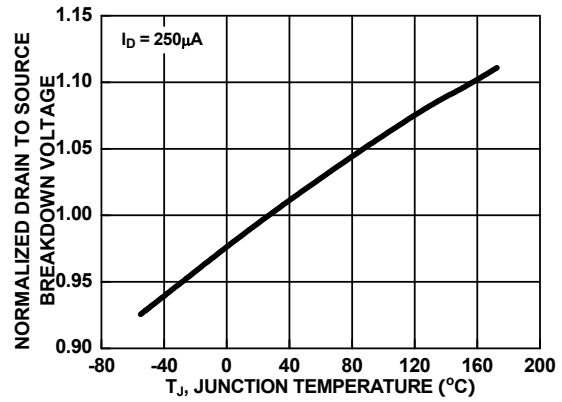


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

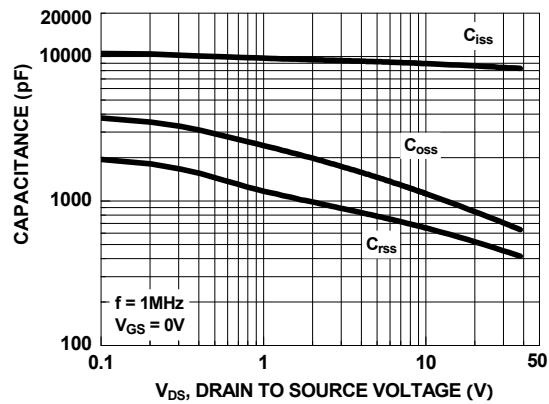


Figure 13. Capacitance vs Drain to Source Voltage

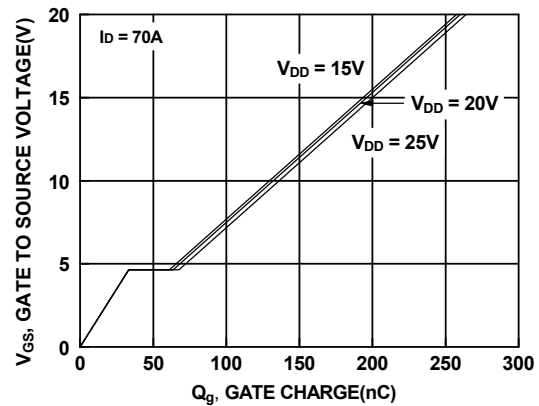


Figure 14. Gate Charge vs Gate to Source Voltage

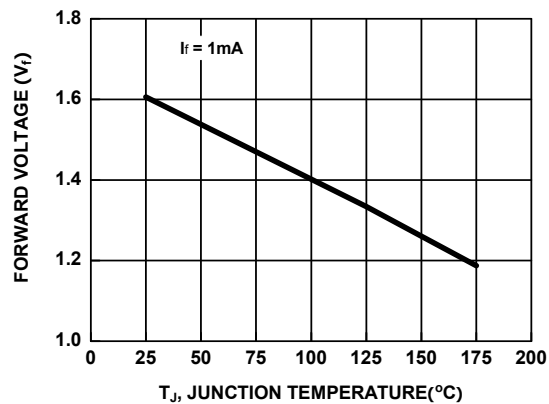


Figure 15. Temperature Sense Diode Forward Voltage vs. Junction Temperature



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