FAIRCHILD SEMICONDUCTOR®

August 2007

FDB8444TS

N-Channel PowerTrench® MOSFET with Temperature Sensor

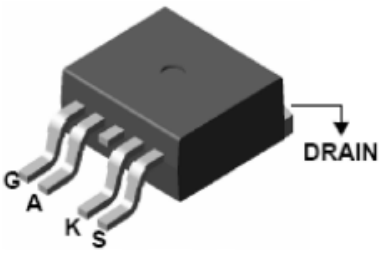
40V, 70A, 5mΩ

Features

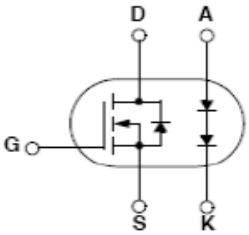
- Typ $r_{DS(on)}$ = 3.8mΩ at V_{GS} = 10V, I_D = 70A
- Typ $Q_{g(TOT)}$ = 130nC at V_{GS} = 10V
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

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



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current Continuous (T_C = 140°C, V_{GS} = 10V)	70	A
	Continuous (T_{amb} = 25°C, V_{GS} = 10V, with $R_{\theta JA}$ = 43°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°C	1.2	W/°C
T_J, T_{STG}	Operating and Storage Temperature	-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case	0.83	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, 1in^2 copper pad area	43	°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°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 32V, V_{GS} = 0V, T_C = 150°C	-	-	250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2	2.8	4	V
$r_{DS(on)}$	Drain to Source On Resistance	I_D = 70A, V_{GS}= 10V	-	3.8	5	mΩ
		I_D = 70A, V_{GS}= 10V, T_J = 175°C	-	6.5	8.5	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	8410	-	pF
C_{oss}	Output Capacitance		-	765	-	pF
C_{rss}	Reverse Transfer Capacitance		-	485	-	pF
R_G	Gate Resistance	f = 1MHz	-	1.8	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 20V	V_{GS} = 0 to 20V; V_{DD} = 20V, I_D = 70A	-	260	338	nC
$Q_{g(10)}$	Total Gate Charge at 10V	V_{GS} = 0 to 10V; V_{DD} = 20V, I_D = 70A	-	130	169	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 to 2V; V_{DD} = 20V, I_D = 70A	-	15.5	-	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 20V, I_D = 70A	-	33	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau	V_{DD} = 20V, I_D = 70A	-	17.7	-	nC
Q_{gd}	Gate to Drain “Miller“ Charge	V_{DD} = 20V, I_D = 70A	-	30	-	nC

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Switching Characteristics						
t_{on}	Turn-On Time	V_{DD} = 20V, I_D = 70A V_{GS} = 10V, R_{GS} = 2Ω	-	-	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} = 70A	-	1.0	1.25	V
		I_{SD} = 40A	-	0.9	1.0	
t_{rr}	Reverse Recovery Time	I_{SD} = 70A, dI_{SD}/dt = 100A/μs	-	51	66	ns
Q_{rr}	Reverse Recovery Charge		-	70	91	nC
Temperature Sense Diode Characteristics						
V_f	Temperature Sense Diode Voltage	I_f = 1mA	1.58	1.61	1.63	V
S_f	Temperature Sense Diode Temperature Coefficient	I_f = 1mA, -55°C < T_J < 175°C	-2.55	-2.74	-3.11	mV/°C

Notes:

1: Starting T_J = 25°C, L = 0.28mH, I_{AS} = 56A.

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

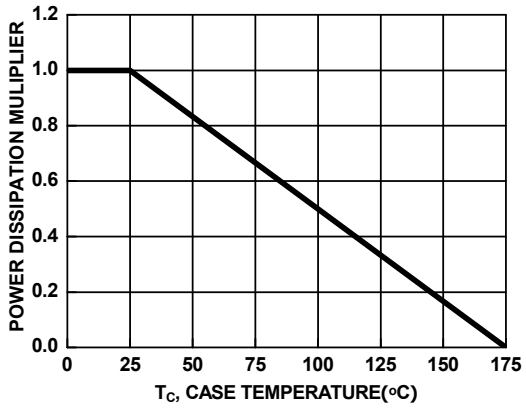


Figure 1. Normalized Power Dissipation vs Case Temperature

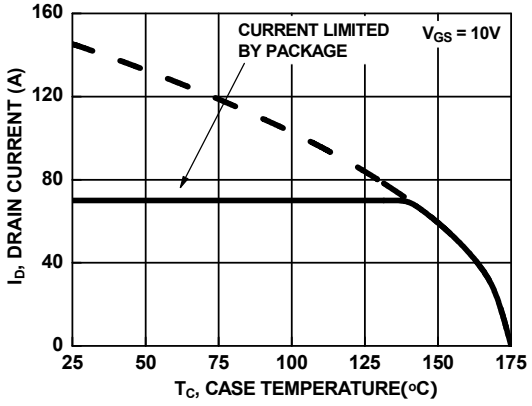


Figure 2. Maximum Continuous Drain Current vs Case Temperature

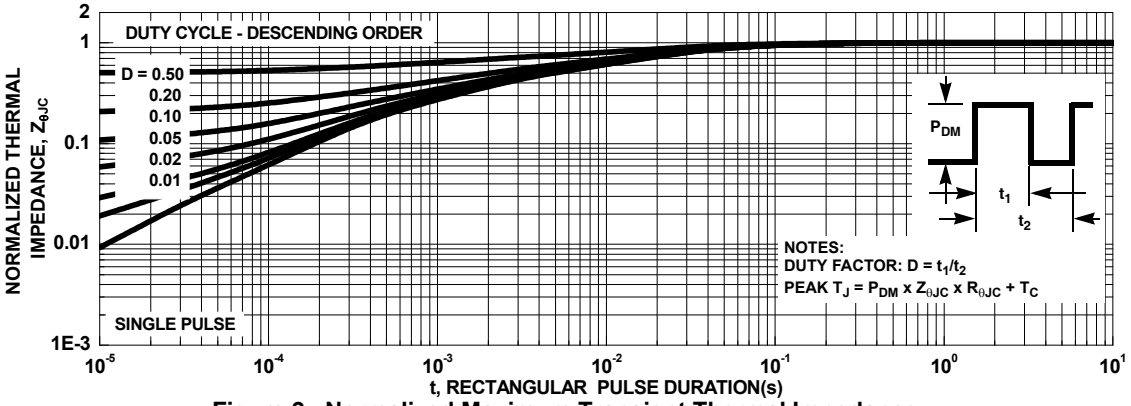


Figure 3. Normalized Maximum Transient Thermal Impedance

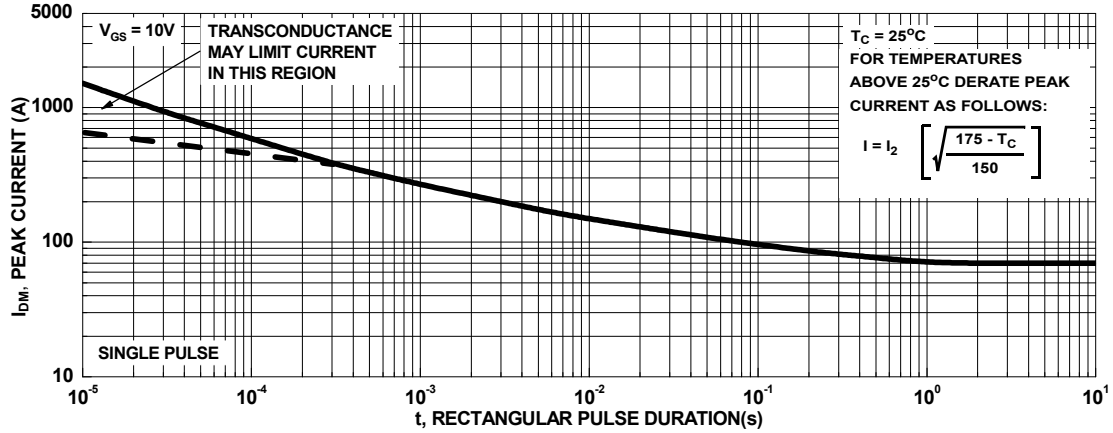


Figure 4. Peak Current Capability

Typical Characteristics

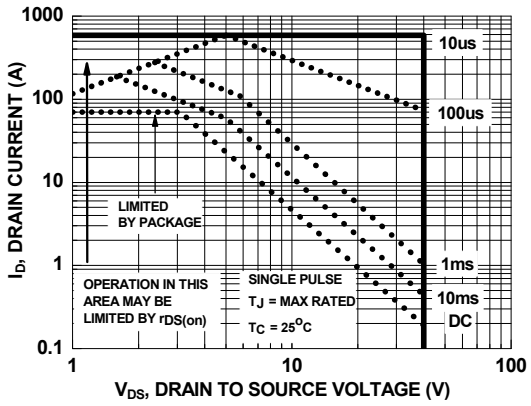
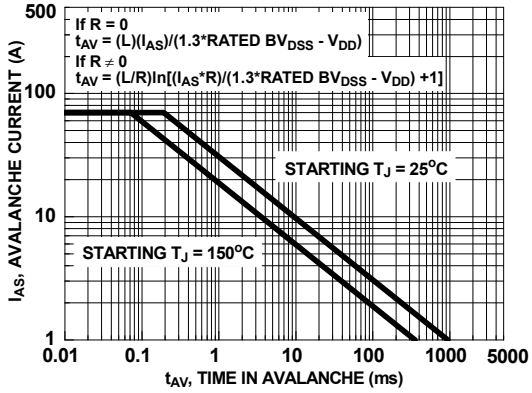


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

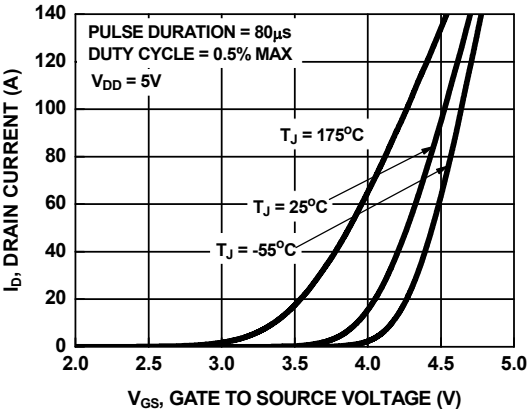


Figure 7. Transfer Characteristics

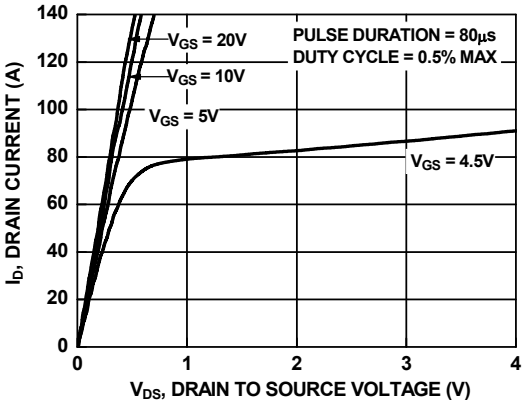


Figure 8. Saturation Characteristics

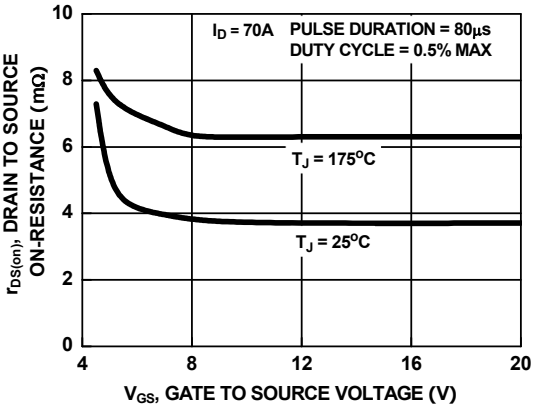


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

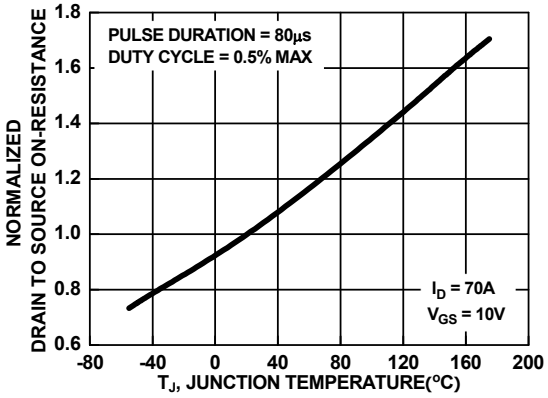


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics

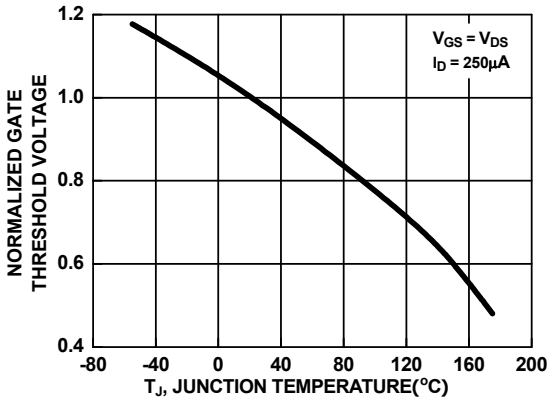


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

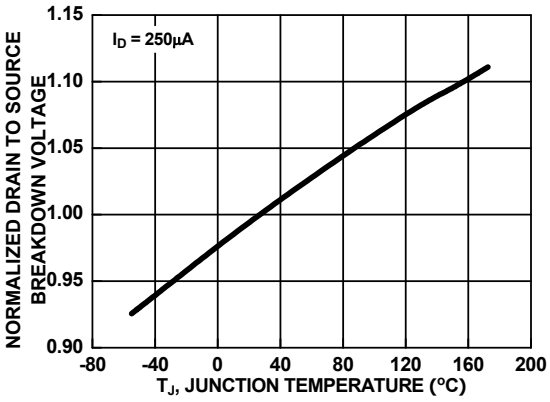


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

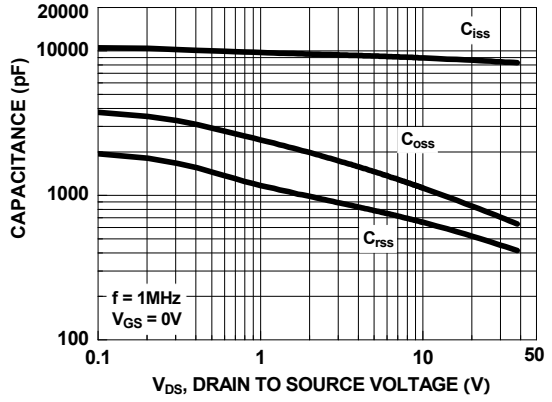


Figure 13. Capacitance vs Drain to Source Voltage

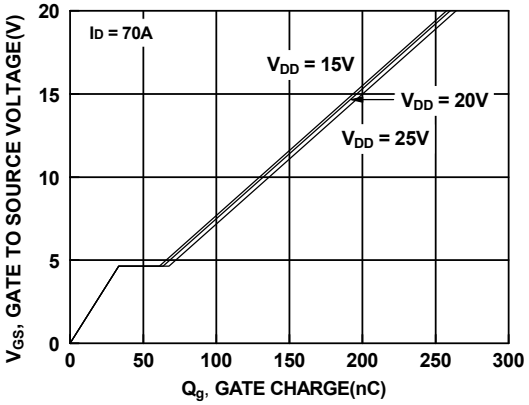


Figure 14. Gate Charge vs Gate to Source Voltage

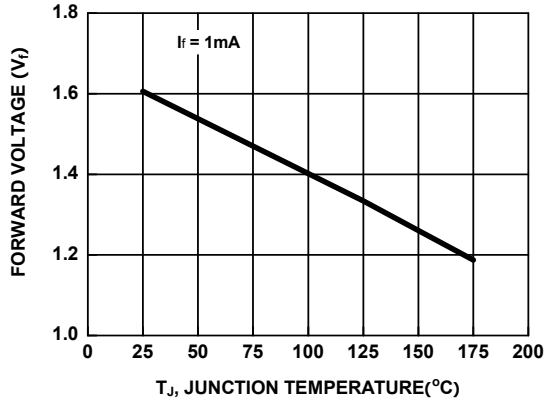


Figure 15. Temperature Sense Diode Forward Voltage vs. Juction Temperature

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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Rev. I31