

## FDB8441

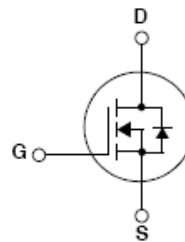
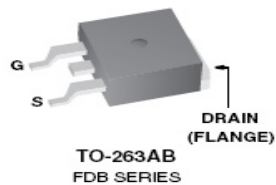
### N-Channel PowerTrench® MOSFET 40V, 80A, 2.5mΩ

#### Features

- Typ  $r_{DS(on)} = 1.9m\Omega$  at  $V_{GS} = 10V$ ,  $I_D = 80A$
- Typ  $Q_{g(10)} = 215nC$  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 Steering
- Integrated Starter / Alternator
- Distributed Power Architectures and VRMs
- Primary Switch for 12V Systems



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	40	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current Continuous ( $T_C < 160^\circ\text{C}$ , $V_{GS} = 10\text{V}$ )	80	A
	Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , with $R_{\theta JA} = 43^\circ\text{C/W}$ )	28	
	Pulsed	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	947	mJ
$P_D$	Power dissipation	300	W
	Derate above $25^\circ\text{C}$	2	$\text{W}/^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to 175	$^\circ\text{C}$

**Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance Junction to Case	0.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 2)	62	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient, $1\text{in}^2$ copper pad area	43	$^\circ\text{C/W}$

**Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8441	FDB8441	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
--------	-----------	-----------------	-----	-----	-----	-------

**Off Characteristics**

$B_{V_{DSS}}$	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	$V_{DS} = 32\text{V}$ $V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
		$T_J = 150^\circ\text{C}$	-	-	250	
$I_{GSS}$	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	2.8	4	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 80\text{A}$ , $V_{GS} = 10\text{V}$	-	1.9	2.5	m $\Omega$
		$I_D = 80\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 175^\circ\text{C}$	-	3.3	4.3	

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	15000	-	pF	
$C_{oss}$	Output Capacitance		-	1250	-	pF	
$C_{rss}$	Reverse Transfer Capacitance		-	685	-	pF	
$R_G$	Gate Resistance	$V_{GS} = 0.5\text{V}$ , $f = 1\text{MHz}$	-	1.1	-	$\Omega$	
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0$ to $10\text{V}$	$V_{DD} = 20\text{V}$ $I_D = 35\text{A}$ $I_g = 1\text{mA}$	-	215	280	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0$ to $2\text{V}$		-	29	38	nC
$Q_{gs}$	Gate to Source Gate Charge			-	60	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau			-	32	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	49	-	nC

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{(on)}$	Turn-On Time	$V_{DD} = 20\text{V}, I_D = 35\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 1.5\Omega$	-	-	77	ns
$t_{d(on)}$	Turn-On Delay Time		-	23	-	ns
$t_r$	Turn-On Rise Time		-	24	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	75	-	ns
$t_f$	Turn-Off Fall Time		-	17.9	-	ns
$t_{off}$	Turn-Off Time		-	-	147	ns

**Drain-Source Diode Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 35\text{A}$	-	0.8	1.25	V
		$I_{SD} = 15\text{A}$	-	0.8	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_F = 35\text{A}, di/dt = 100\text{A}/\mu\text{s}$	-	52	68	ns
$Q_{rr}$	Reverse Recovery Charge	$I_F = 35\text{A}, di/dt = 100\text{A}/\mu\text{s}$	-	76	99	nC

**Notes:**

- 1: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.46\text{mH}$ ,  $I_{AS} = 64\text{A}$ .
- 2: Pulse width = 100s.

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

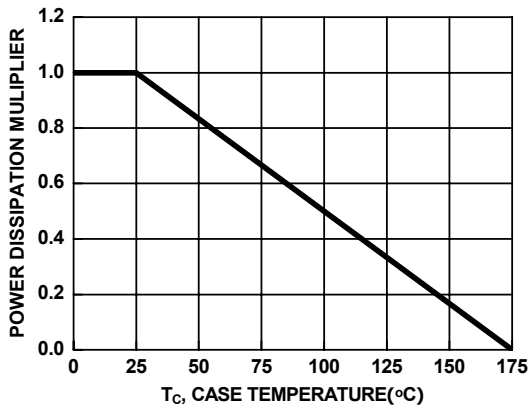


Figure 1. Normalized Power Dissipation vs Case Temperature

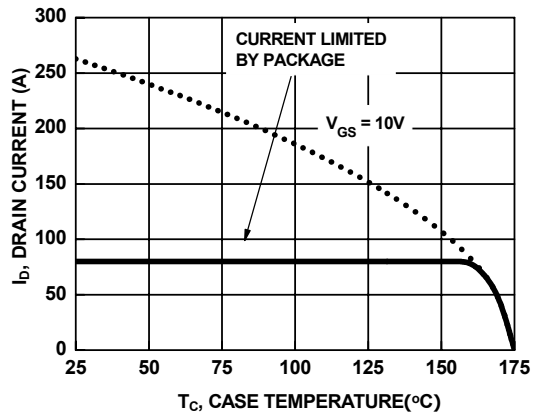


Figure 2. Maximum Continuous Drain Current vs Case Temperature

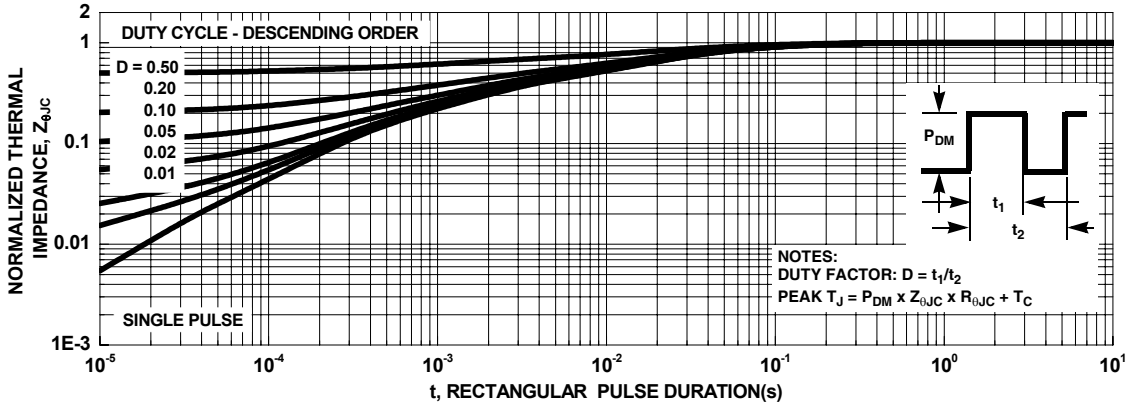


Figure 3. Normalized Maximum Transient Thermal Impedance

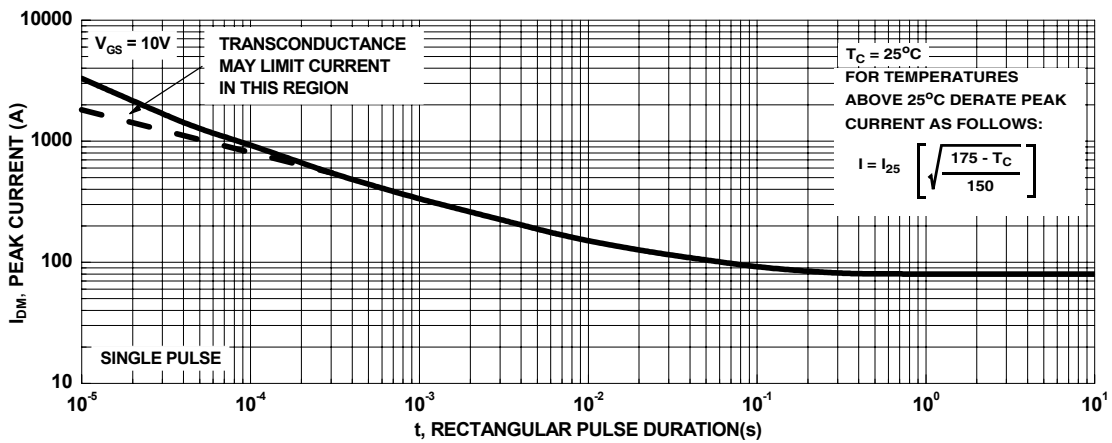


Figure 4. Peak Current Capability

## Typical Characteristics

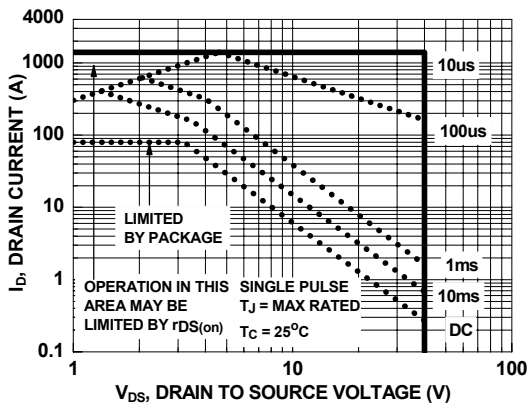
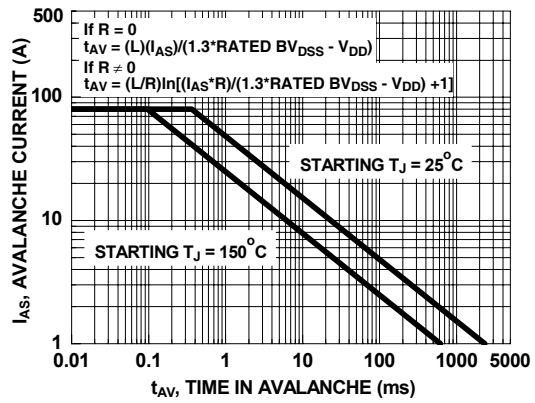


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

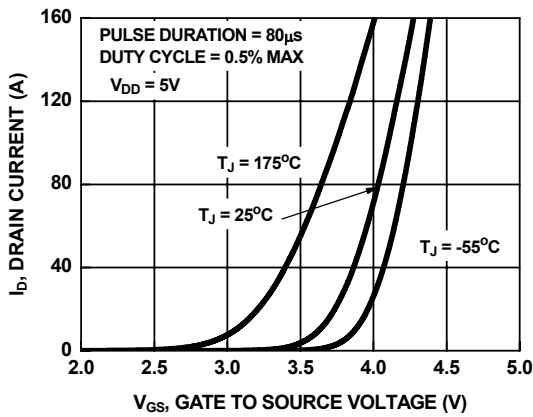


Figure 7. Transfer Characteristics

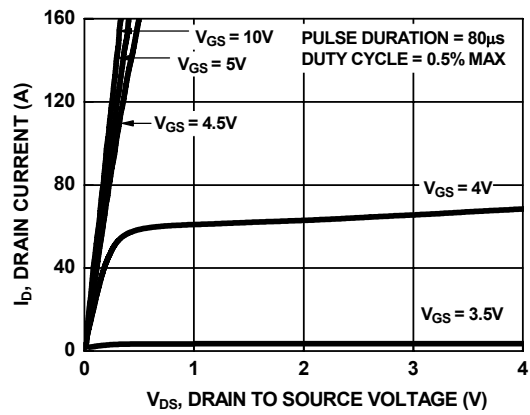


Figure 8. Saturation Characteristics

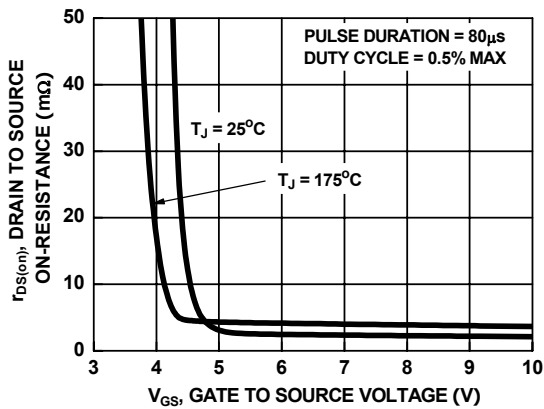


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

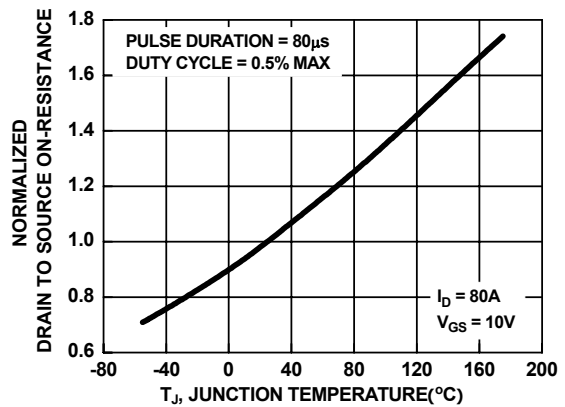


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

### Typical Characteristics

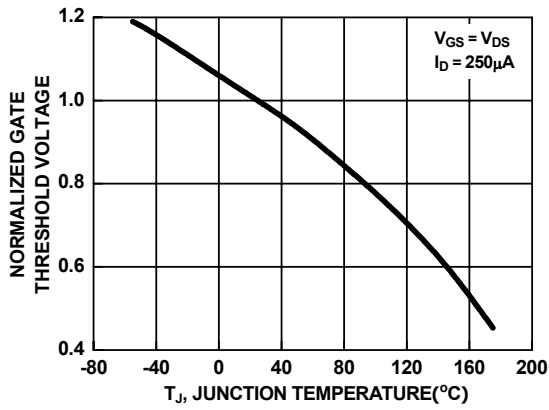


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

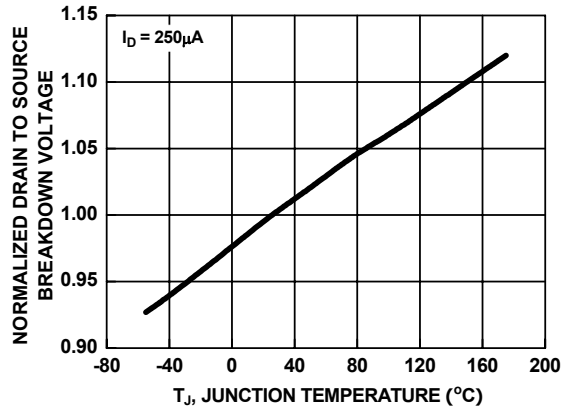


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

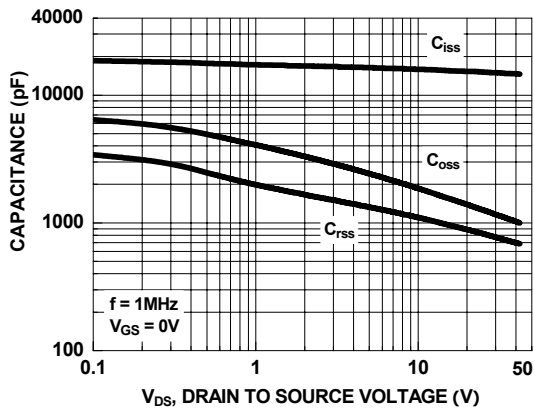


Figure 13. Capacitance vs Drain to Source Voltage

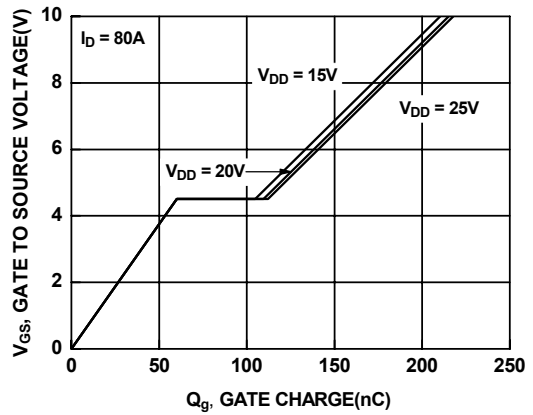


Figure 14. Gate Charge vs Gate to Source Voltage

**TRADEMARKS**

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FACT Quiet Series™	OCX™	SILENT SWITCHER®	UniFET™
ActiveArray™	GlobalOptoisolator™	OCXPro™	SMART START™	UltraFET®
Bottomless™	GTO™	OPTOLOGIC®	SPM™	VCX™
Build it Now™	HiSeC™	OPTOPLANAR™	Stealth™	Wire™
CoolFET™	I <sup>2</sup> C™	PACMAN™	SuperFET™	
CROSSVOLT™	i-Lo™	POP™	SuperSOT™-3	
DOMET™	ImpliedDisconnect™	Power247™	SuperSOT™-6	
EcoSPARK™	IntelliMAX™	PowerEdge™	SuperSOT™-8	
E <sup>2</sup> CMOS™	ISOPLANAR™	PowerSaver™	SyncFET™	
EnSigna™	LittleFET™	PowerTrench®	TCM™	
FACT™	MICROCOUPLER™	QFET®	TinyBoost™	
FAST®	MicroFET™	QS™	TinyBuck™	
FASTr™	MicroPak™	QT Optoelectronics™	TinyPWM™	
FPS™	MICROWIRE™	Quiet Series™	TinyPower™	
FRFET™	MSX™	RapidConfigure™	TinyLogic®	
	MSXPro™	RapidConnect™	TINYOPTO™	
Across the board. Around the world.™		µSerDes™	TruTranslation™	
The Power Franchise®		ScalarPump™	UHC™	
Programmable Active Droop™				

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
- A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**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, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order 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 in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I20