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## FDB8441

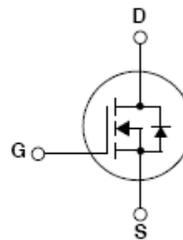
### N-Channel PowerTrench® MOSFET 40V, 120A, 2.5mΩ

#### Features

- Typ  $r_{DS(on)}$  = 1.9mΩ 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)
- RoHS Compliant

#### Applications

- 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 ( $T_C = 25^\circ\text{C}$ , Silicon limited)	262*	A
	Drain Current Continuous ( $T_C = 100^\circ\text{C}$ , Silicon limited)	185*	
	Drain Current Continuous ( $T_C = 25^\circ\text{C}$ , Package limited)	120	
	Drain Current Continuous ( $T_A = 25^\circ\text{C}$ , $R_{\theta JA} = 43^\circ\text{C/W}$ )	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	$^\circ\text{C}$

\*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

## 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
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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	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$	-	-	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 10V	-	215	280	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0$ to 2V	-	29	38	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DD} = 20\text{V}, I_D = 35\text{A}, I_g = 1\text{mA}$	-	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
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**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{(on)}$	Turn-On Time	$V_{DD} = 20\text{V}, I_D = 35\text{A}$ $V_{GS} = 10\text{V}, R_{GS} = 1.5\Omega$	-	-	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 = 100 $\mu\text{s}$ .

### Typical Characteristics

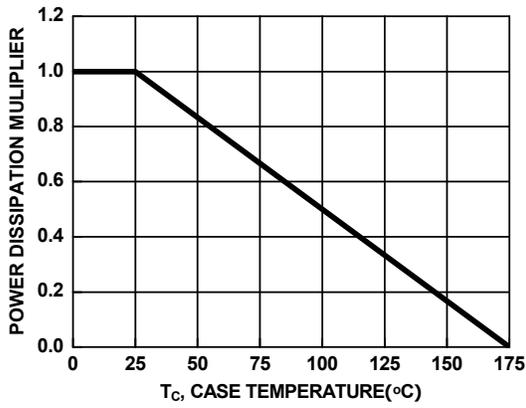


Figure 1. Normalized Power Dissipation vs Case Temperature

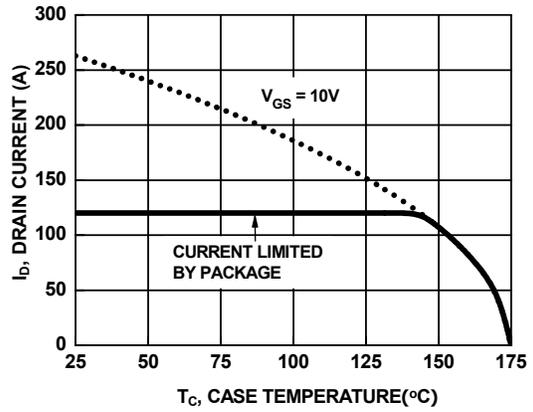


Figure 2. Maximum Continuous Drain Current vs Case Temperature

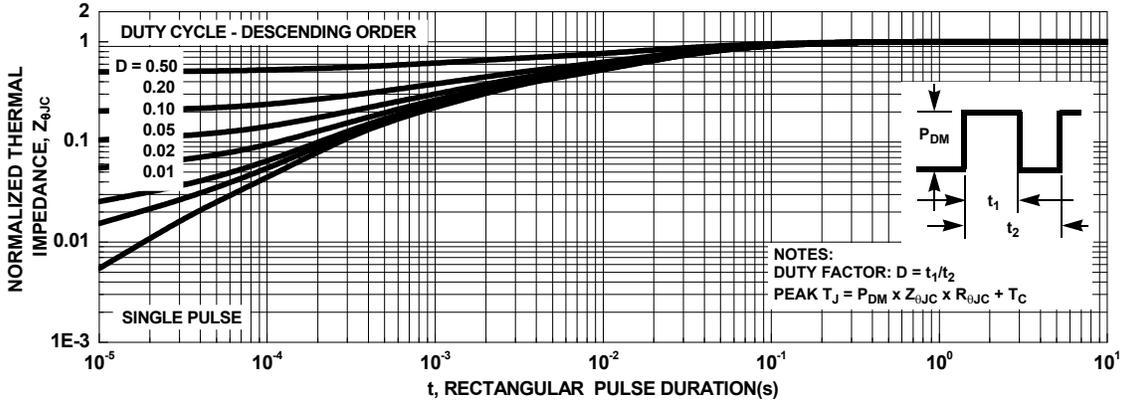


Figure 3. Normalized Maximum Transient Thermal Impedance

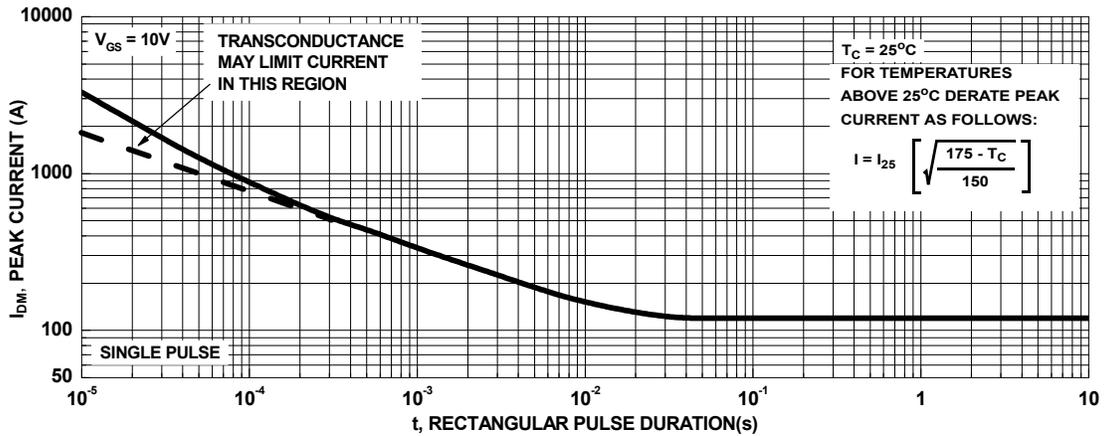


Figure 4. Peak Current Capability

## Typical Characteristics

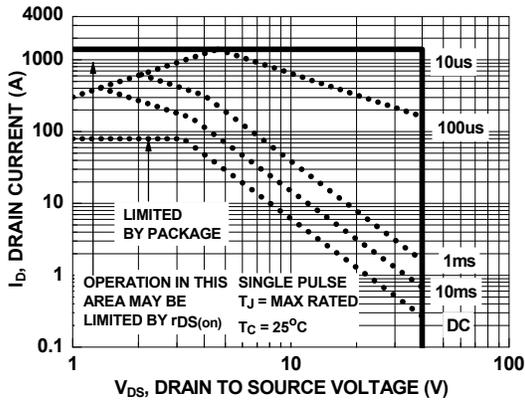
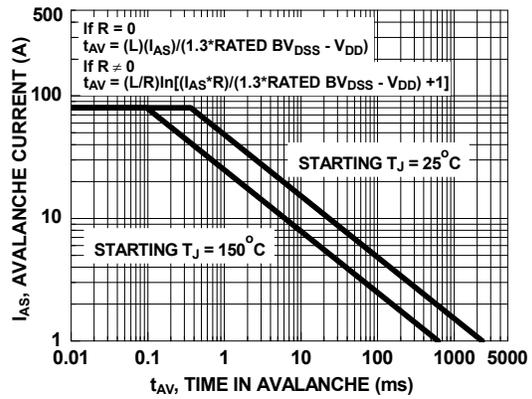


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

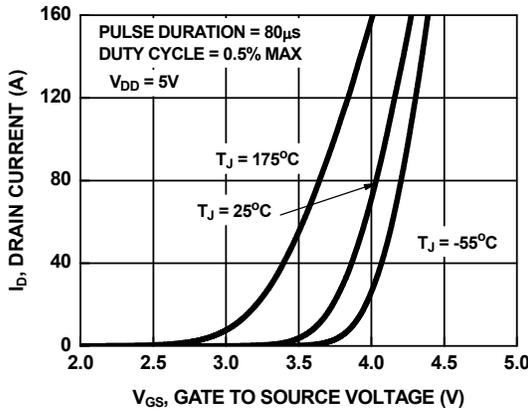


Figure 7. Transfer Characteristics

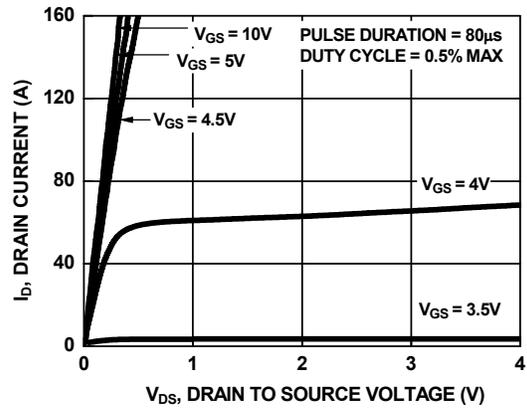


Figure 8. Saturation Characteristics

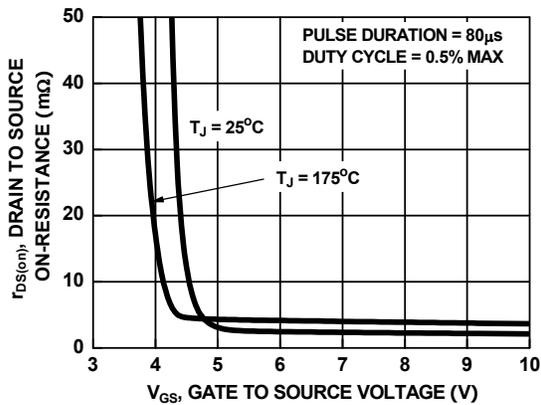


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

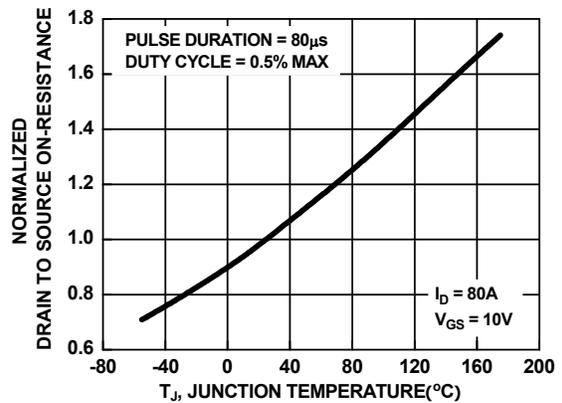


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

### Typical Characteristics

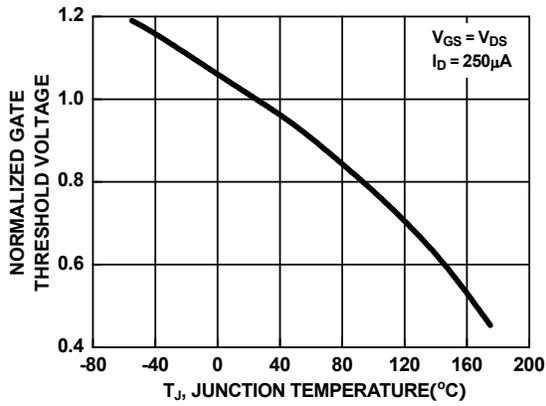


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

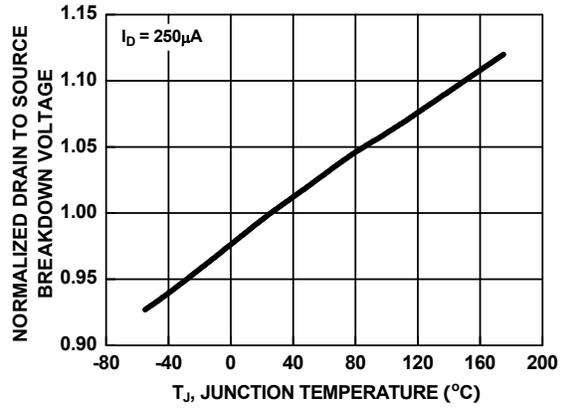


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

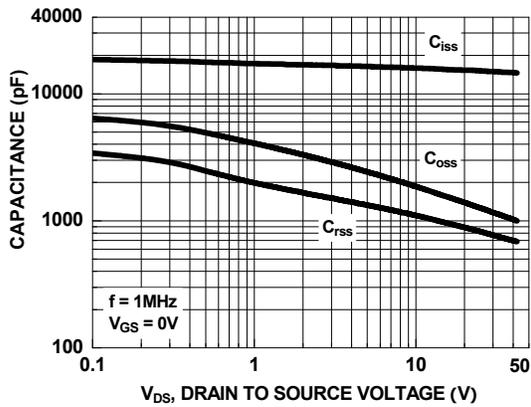


Figure 13. Capacitance vs Drain to Source Voltage

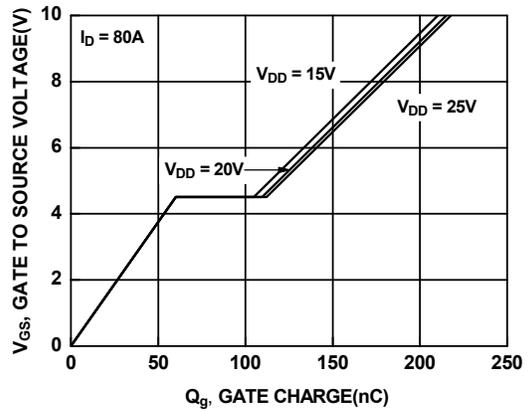


Figure 14. Gate Charge vs Gate to Source Voltage



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