

**FAIRCHILD**  
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August 2007

# FDI8442

## N-Channel PowerTrench® MOSFET

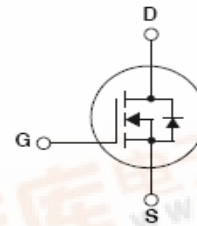
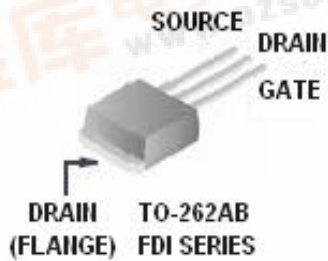
### 40V, 80A, 2.9mΩ

#### Features

- Typ  $r_{DS(on)}$  = 2.3mΩ at  $V_{GS}$  = 10V,  $I_D$  = 80A
- Typ  $Q_{g(10)}$  = 181nC 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



FDI8442 N-Channel PowerTrench® MOSFET



### 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 ( $T_C < 158^\circ\text{C}$ , $V_{GS} = 10\text{V}$ )	80	A
	Drain Current Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , with $R_{\theta JA} = 62^\circ\text{C/W}$ )	23	
	Pulsed	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	720	mJ
$P_D$	Power Dissipation	254	W
	Derate above $25^\circ\text{C}$	1.7	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	0.59	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 2)	62	$^\circ\text{C/W}$

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDI8442	FDI8442	TO-262	Tube	N/A	50 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	2.9	4	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 80\text{A}$ , $V_{GS} = 10\text{V}$	-	2.3	2.9	m $\Omega$
		$I_D = 80\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 175^\circ\text{C}$	-	3.9	5.0	

#### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	12200	-	pF	
$C_{oss}$	Output Capacitance		-	1040	-	pF	
$C_{rss}$	Reverse Transfer Capacitance		-	640	-	pF	
$R_G$	Gate Resistance	$V_{GS} = 0.5\text{V}$ , $f = 1\text{MHz}$	-	1.0	-	$\Omega$	
$Q_g(TOT)$	Total Gate Charge at 10V	$V_{GS} = 0$ to 10V	$V_{DD} = 20\text{V}$ $I_D = 80\text{A}$ $I_g = 1\text{mA}$	-	181	235	nC
$Q_g(TH)$	Threshold Gate Charge	$V_{GS} = 0$ to 2V		-	23	30	nC
$Q_{gs}$	Gate to Source Gate Charge			-	49	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau			-	26	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	41	-	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	$V_{DD} = 20\text{V}$ , $I_D = 80\text{A}$ $V_{GS} = 10\text{V}$ , $R_{GS} = 2\Omega$	-	-	62	ns
$t_{d(on)}$	Turn-On Delay Time		-	19.5	-	ns
$t_r$	Turn-On Rise Time		-	19.3	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	57	-	ns
$t_f$	Turn-Off Fall Time		-	17.2	-	ns
$t_{off}$	Turn-Off Time		-	-	118	ns

**Drain-Source Diode Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 80\text{A}$	-	0.9	1.25	V
		$I_{SD} = 40\text{A}$	-	0.8	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_F = 75\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$	-	49	64	ns
$Q_{rr}$	Reverse Recovery Charge	$I_F = 75\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$	-	70	91	nC

**Notes:**

- 1: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.35\text{mH}$ ,  $I_{AS} = 64\text{A}$   
 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

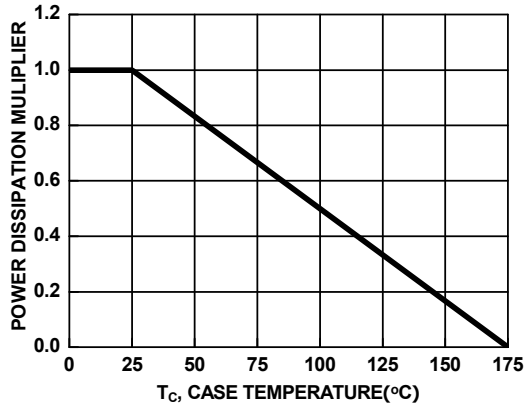


Figure 1. Normalized Power Dissipation vs Case Temperature

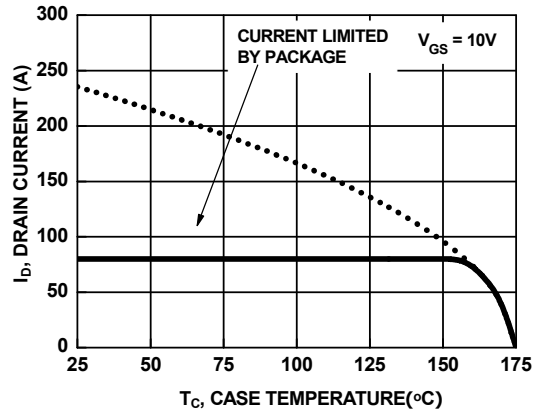


Figure 2. Maximum Continuous Drain Current vs Case Temperature

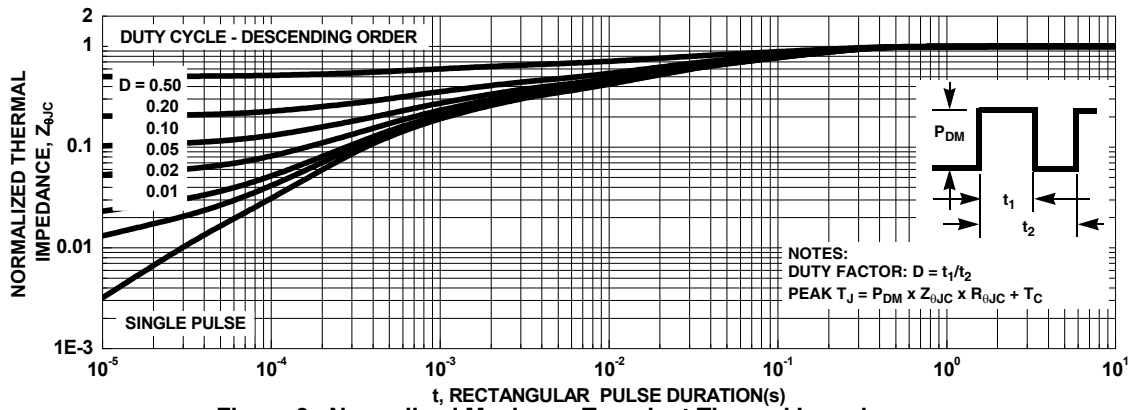


Figure 3. Normalized Maximum Transient Thermal Impedance

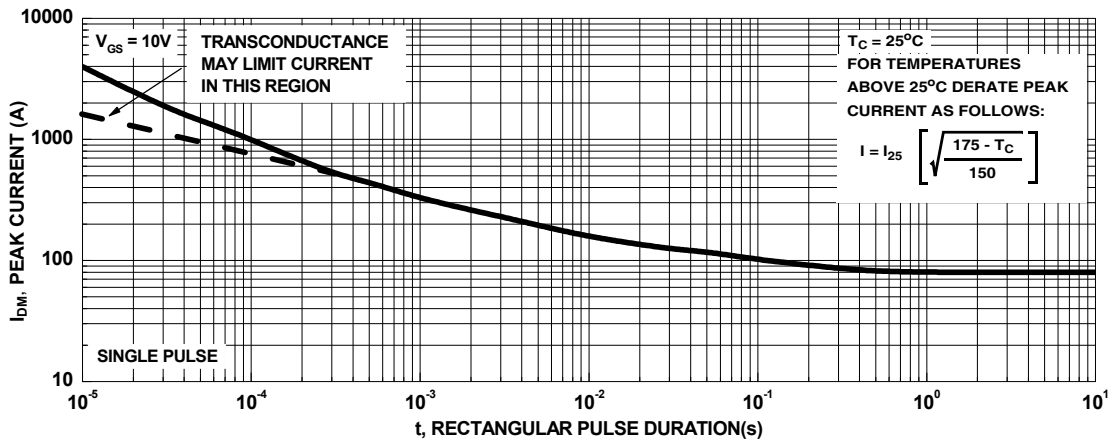
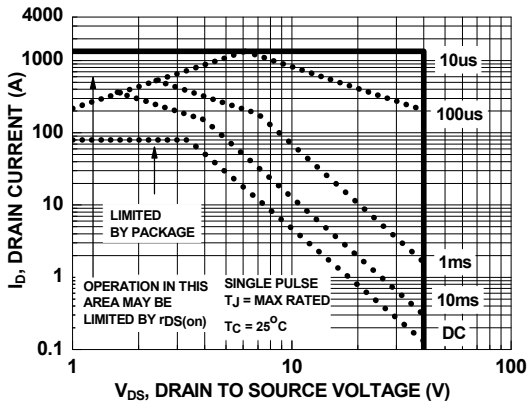
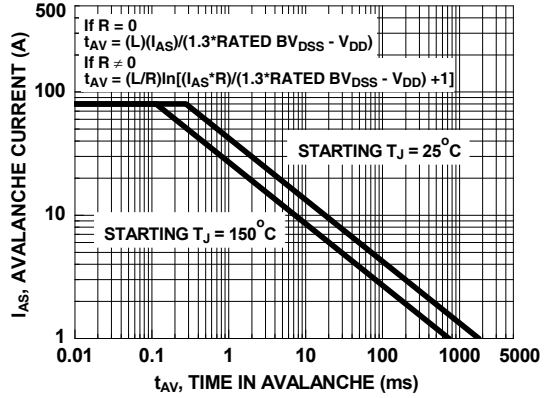


Figure 4. Peak Current Capability

**Typical Characteristics**

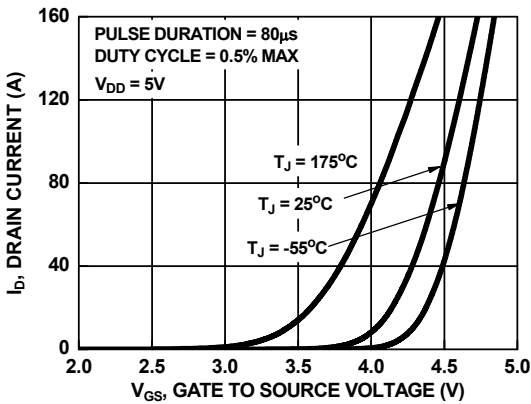


**Figure 5. Forward Bias Safe Operating Area**

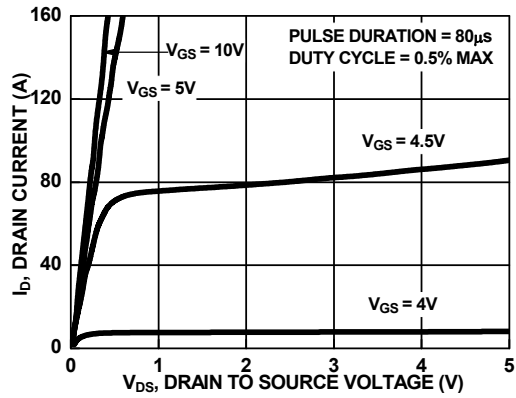


NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

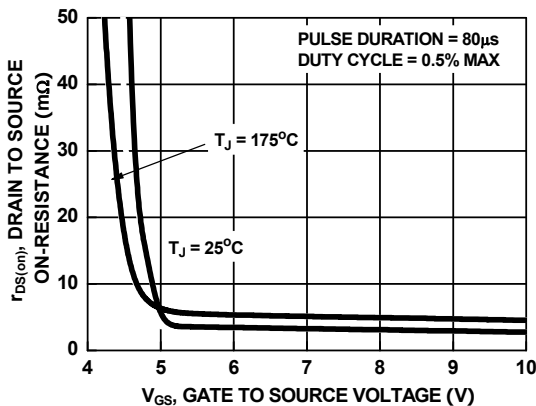
**Figure 6. Unclamped Inductive Switching Capability**



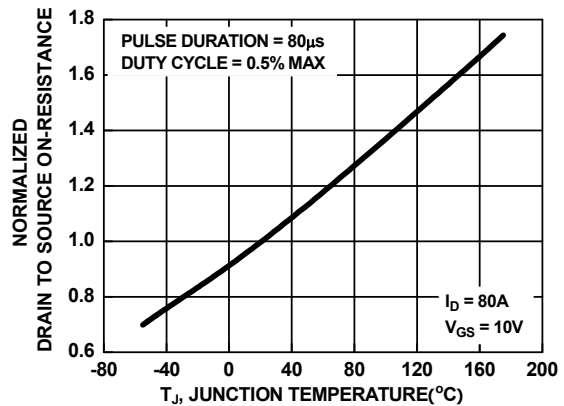
**Figure 7. Transfer Characteristics**



**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

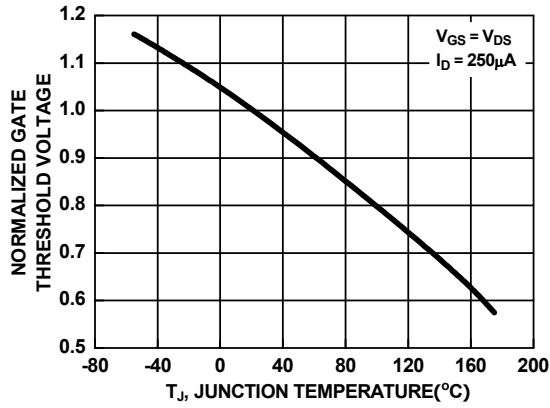


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

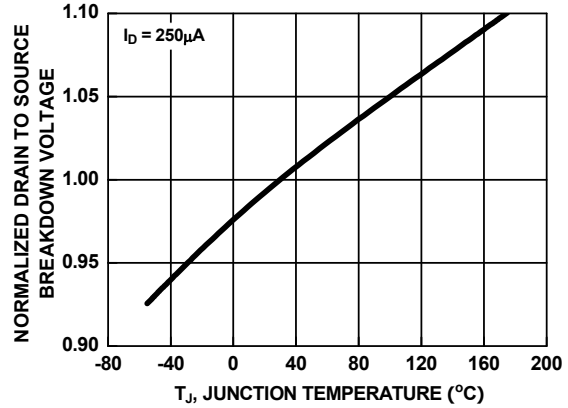


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

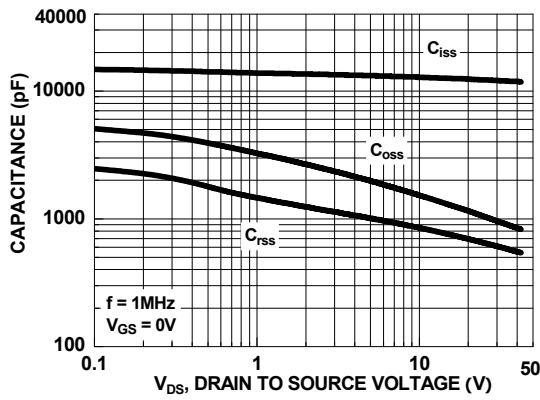


Figure 13. Capacitance vs Drain to Source Voltage

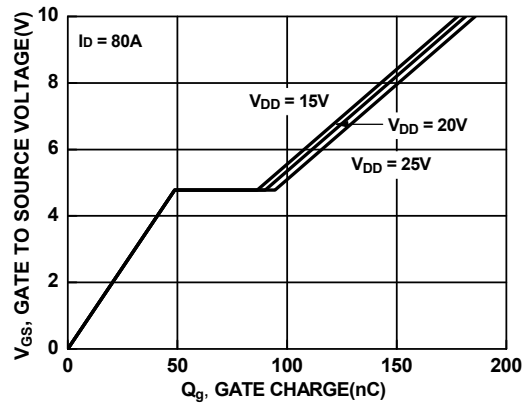


Figure 14. Gate Charge vs Gate to Source Voltage



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