FAIRCHILD

SEMICONDUCTOR®

FDD8444_F085

N-Channel PowerTrench® MOSFET

40V, 50A, 5.2mΩ

Features

- Typ $r_{DS(on)}$ = 4mΩ at V_{GS} = 10V, I_D = 50A

- Typ $Q_{g(10)}$ = 89nC at V_{GS} = 10V

- Low Miller Charge

- Low Q_{rr} Body Diode

- UIS Capability (Single Pulse/ 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

D-PAK
(TO-252)
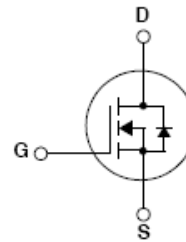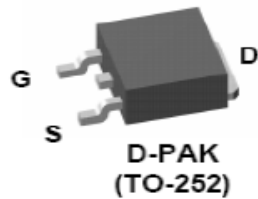
MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

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 (V_{GS} = 10V) (Note 1)		145	A
	Continuous (V_{GS} = 10V, with $R_{\theta JA}$ = 52°C/W)		20	
	Pulsed		Figure 4	
E_{AS}	Single Pulse Avalanche Energy (Note 2)		535	mJ
P_D	Power Dissipation		153	W
	Derate above 25°C		1.02	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Maximum Thermal Resistance, Junction to Case	0.98	°C/W
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient TO-252, 1in² copper pad area	52	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD8444	FDD8444_F085	TO-252AA	13"	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
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		-	-	1	μA
		V_{GS} = 0V	T_J = 150°C	-	-	250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V		-	-	±100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2	2.5	4	V
$r_{DS(on)}$	Drain to Source On Resistance	I_D = 50A, V_{GS}= 10V	-	4	5.2	mΩ
		I_D = 50A, V_{GS}= 10V, T_J = 175°C	-	7.2	9.4	

Dynamic Characteristics

Symbol	Parameter	Test Conditions			Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz			-	6195	-	pF
C_{oss}	Output Capacitance				-	585	-	pF
C_{rss}	Reverse Transfer Capacitance				-	332	-	pF
R_G	Gate Resistance	f = 1MHz			-	1.9	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0 to 10V	V_{DD} = 20V I_D = 50A I_g = 1.0mA		-	89	116	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0 to 5V				43	56	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 to 2V			-	11	14.3	nC
Q_{gs}	Gate to Source Gate Charge				-	23	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau				-	11	-	nC
Q_{gd}	Gate to Drain "Miller" Charge				-	20	-	nC

Electrical Characteristics T_J = 25°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		-	-	135	ns
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 20V, I_D = 50A V_{GS} = 10V, R_{GS} = 2Ω	-	12	-	ns
t_r	Turn-On Rise Time		-	78	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	48	-	ns
t_f	Turn-Off Fall Time		-	15	-	ns
t_{off}	Turn-Off Time		-	-	95	ns

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 50A	-	0.9	1.25	V
		I_{SD} = 25A	-	0.8	1.0	
t_{rr}	Reverse Recovery Time	I_F = 50A, dI_F/dt = 100A/μs	-	39	51	ns
Q_{rr}	Reverse Recovery Charge		-	45	59	nC

Notes:
1: Package current limitation is 50A.
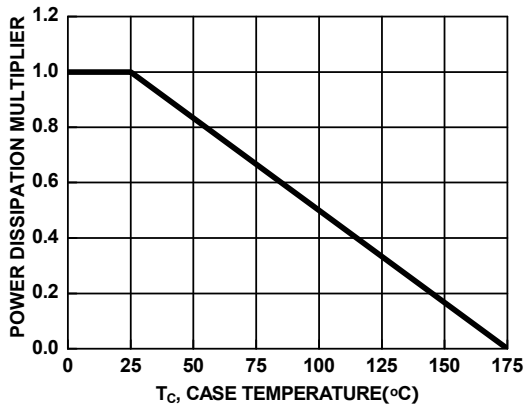**2:** Starting T_J = 25°C, L = 0.67mH, I_{AS} = 40A

Typical Characteristics

Figure 1. Normalized Power Dissipation vs Case Temperature
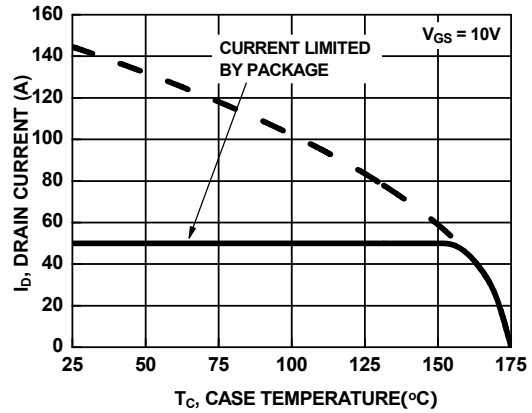
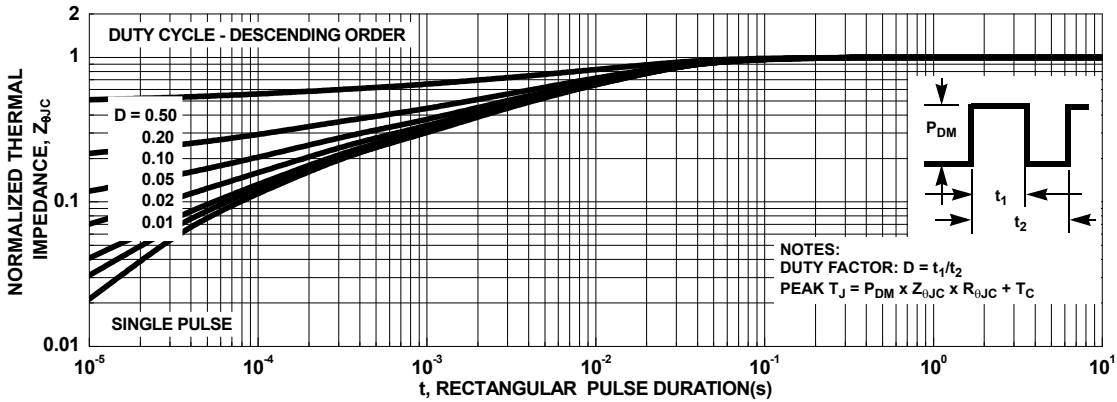Figure 2. Maximum Continuous Drain Current vs Case Temperature

NOTES:
DUTY FACTOR: D = t_1/t_2
PEAK T_J = P_{DM} x $Z_{\theta JC}$ x $R_{\theta JC}$ + T_C

Figure 3. Normalized Maximum Transient Thermal Impedance

$T_C = 25^oC$
FOR TEMPERATURES
ABOVE 25°C DERATE PEAK
CURRENT AS FOLLOWS:

$I = I_{25} \left[\sqrt{\dfrac{175 - T_C}{150}} \right]$
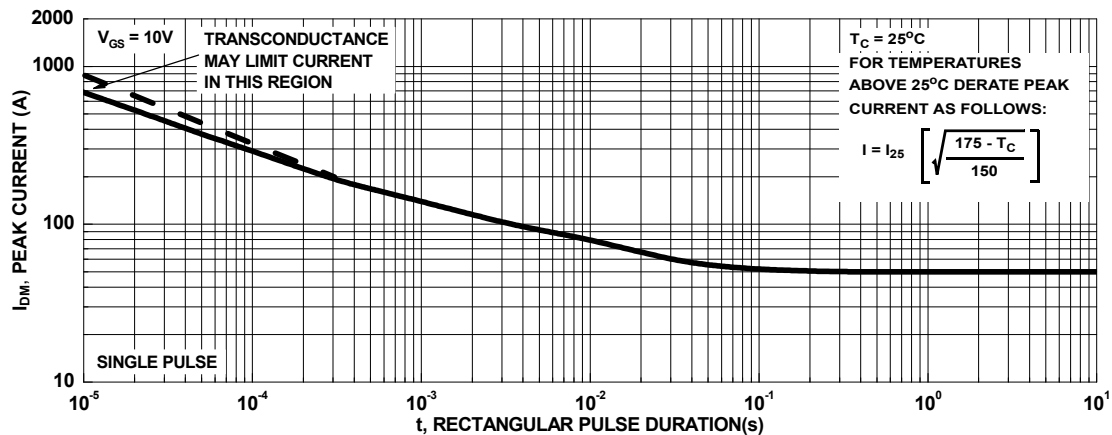
Figure 4. Peak Current Capability

Typical Characteristics
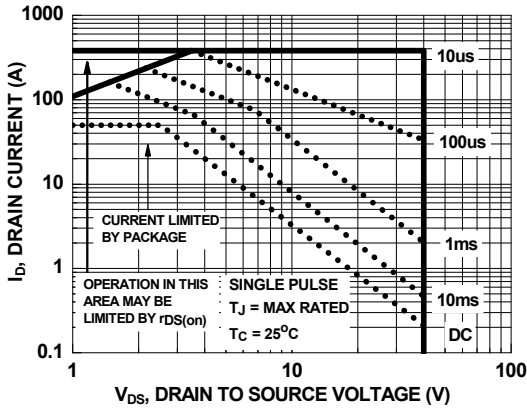
Figure 5. Forward Bias Safe Operating Area

$$\text{If } R = 0$$
$$t_{AV} = (L)(I_{AS})/(1.3 \cdot \text{RATED } BV_{DSS} - V_{DD})$$
$$\text{If } R \neq 0$$
$$t_{AV} = (L/R)\ln[(I_{AS} \cdot R)/(1.3 \cdot \text{RATED } BV_{DSS} - V_{DD}) + 1]$$
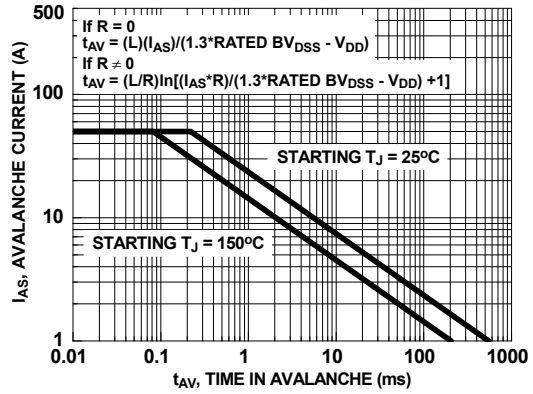
NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability
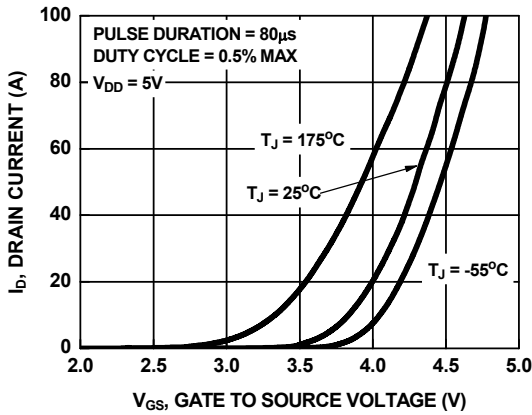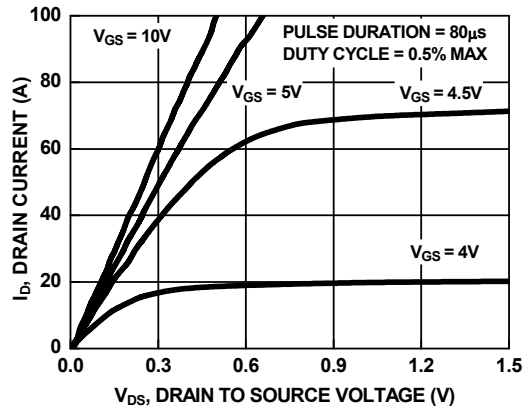

Figure 7. Transfer Characteristics
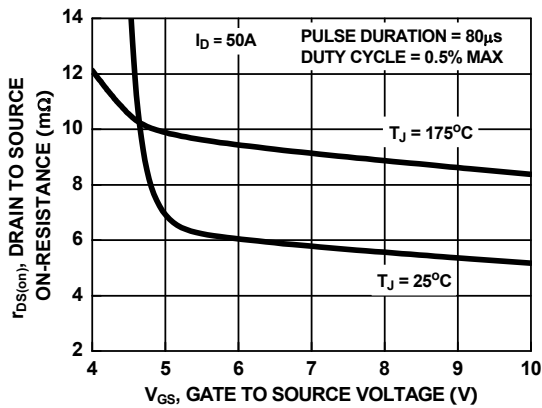

Figure 8. Saturation Characteristics

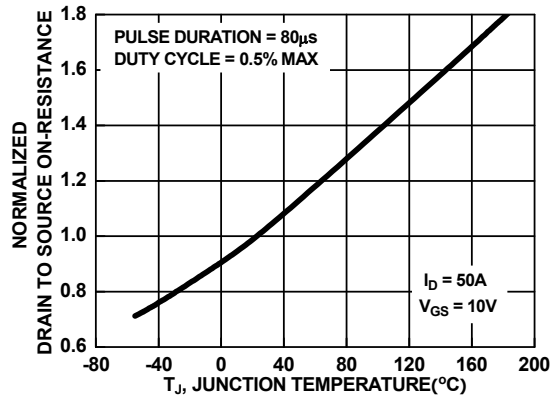**Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage**

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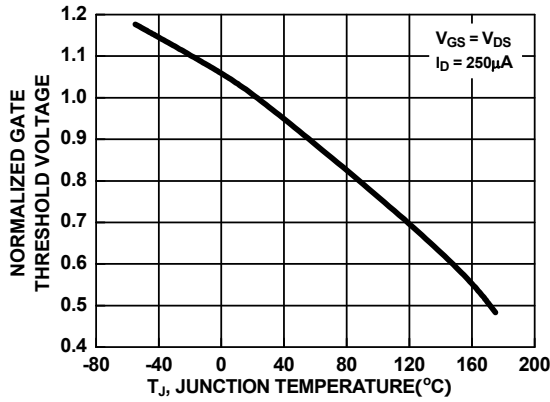
Typical Characteristics

Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature
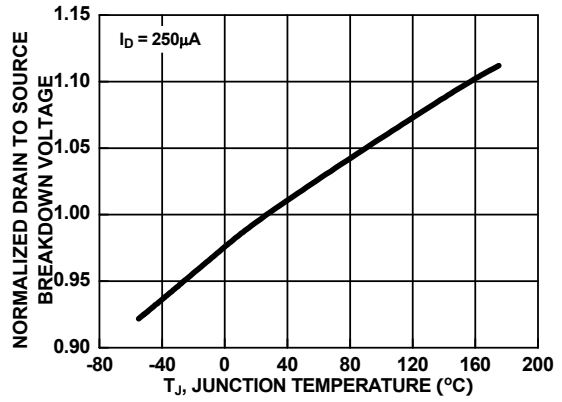

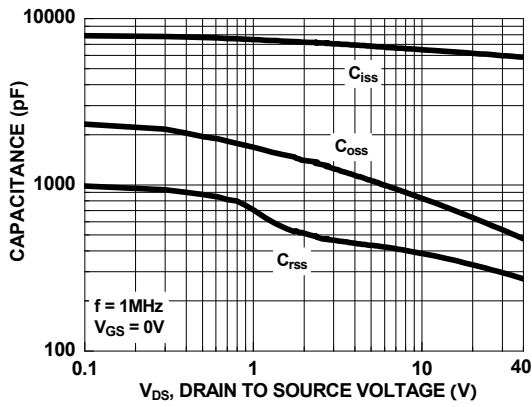**Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

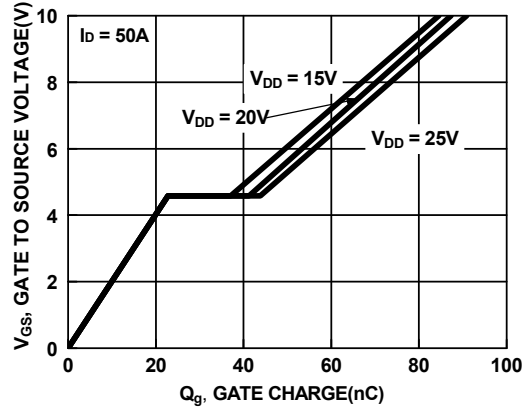**Figure 13. Capacitance vs Drain to Source Voltage**

Figure 14. Gate Charge vs Gate to Source Voltage

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