

FDD8444L_F085

N-Channel PowerTrench® MOSFET

40V, 50A, 6.0mΩ

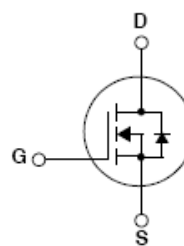
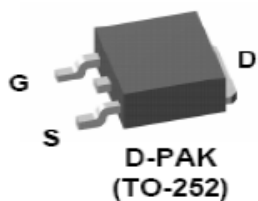
Features

- Typ $r_{DS(on)}$ = 3.8mΩ at V_{GS} = 5V, I_D = 50A
- Typ $Q_{g(tot)}$ = 46nC at V_{GS} = 5V
- 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 and 24V systems



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	± 20	V
I_D	Drain Current Continuous ($T_C < 150^\circ\text{C}$, $V_{GS} = 10\text{V}$) (Note 1)	50	A
	Continuous ($T_{amb} = 25^\circ\text{C}$, $V_{GS} = 10\text{V}$, with $R_{\theta JA} = 52^\circ\text{C/W}$)	16	
	Pulsed	See Figure 4	
E_{AS}	Single Pulse Avalanche Energy (Note 2)	295	mJ
P_D	Power Dissipation	153	W
	Derate above 25°C	1.02	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	0.98	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO-252, 1in ² copper pad area	52	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD8444L	FDD8444L_F085	TO-252AA	13"	12mm	2500 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	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	± 100	

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu\text{A}$	1	1.8	3	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 50\text{A}$, $V_{GS} = 10\text{V}$	-	3.5	5.2	$\text{m}\Omega$
		$I_D = 50\text{A}$, $V_{GS} = 5\text{V}$	-	3.8	6.0	
		$I_D = 50\text{A}$, $V_{GS} = 4.5\text{V}$	-	4.0	6.5	
		$I_D = 50\text{A}$, $V_{GS} = 5\text{V}$, $T_J = 175^\circ\text{C}$	-	6.8	10.7	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$	-	5530	-	pF
C_{oss}	Output Capacitance		-	605	-	pF
C_{rss}	Reverse Transfer Capacitance		-	400	-	pF
R_G	Gate Resistance	$f = 1\text{MHz}$	-	1.7	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 5V	$V_{GS} = 0$ to 5V	-	46	60	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0$ to 2V	-	5.4	7	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DD} = 20\text{V}$ $I_D = 50\text{A}$ $I_g = 1.0\text{mA}$	-	16.3	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	10.9	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	21	-	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

t_{on}	Turn-On Time	$V_{DD} = 20\text{V}, I_D = 50\text{A}$ $V_{GS} = 5\text{V}, R_{GS} = 2\Omega$	-	-	104	ns
$t_{d(on)}$	Turn-On Delay Time		-	18.7	-	ns
t_r	Turn-On Rise Time		-	46	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	42	-	ns
t_f	Turn-Off Fall Time		-	19.2	-	ns
t_{off}	Turn-Off Time		-	-	96	ns

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 50\text{A}$	-	0.9	1.25	V
		$I_{SD} = 25\text{A}$	-	0.8	1.0	
t_{rr}	Reverse Recovery Time	$I_F = 50\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$	-	34	44	ns
Q_{rr}	Reverse Recovery Charge		-	29	38	nC

Notes:

- 1: Package current limitation is 50A.
 2: Starting $T_J = 25^\circ\text{C}$, $L = 0.37\text{mH}$, $I_{AS} = 40\text{A}$.

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

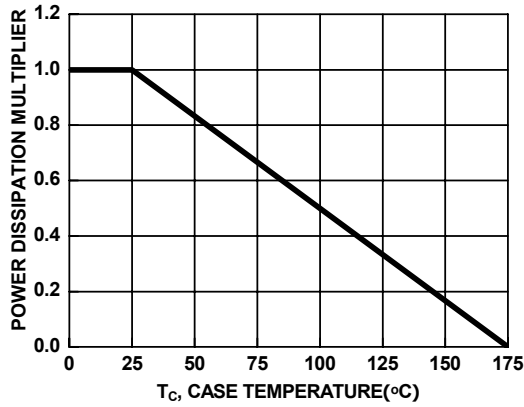


Figure 1. Normalized Power Dissipation vs Case Temperature

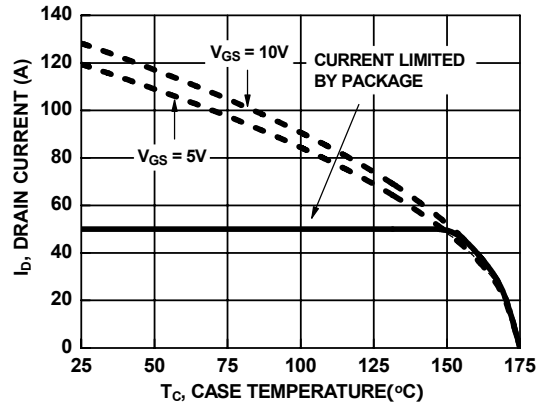


Figure 2. Maximum Continuous Drain Current vs Case Temperature

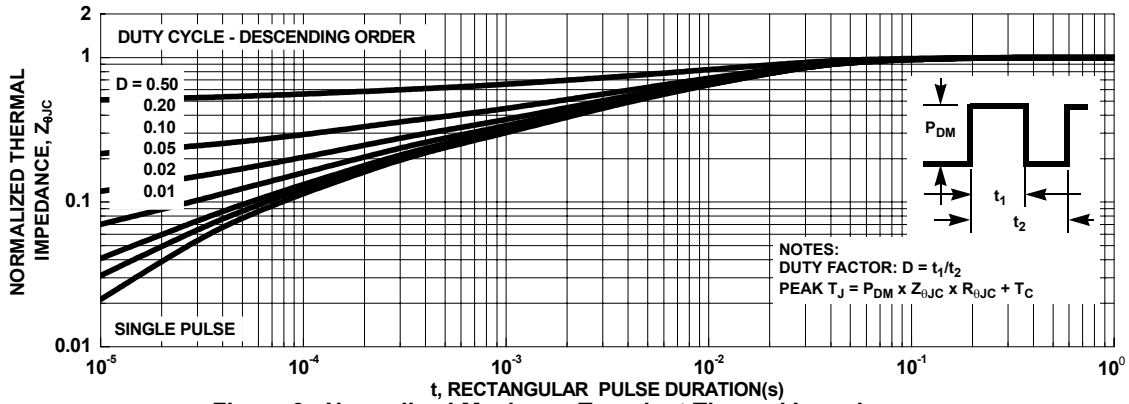


Figure 3. Normalized Maximum Transient Thermal Impedance

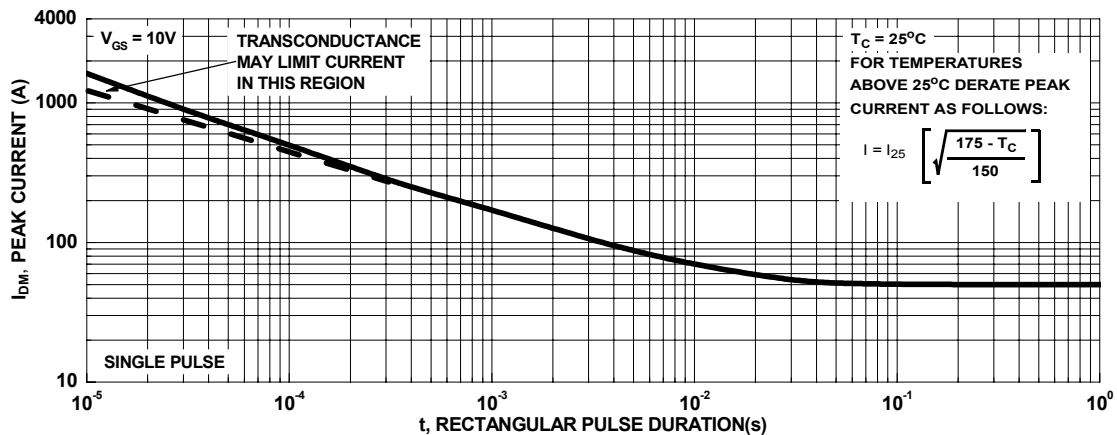


Figure 4. Peak Current Capability

Typical Characteristics

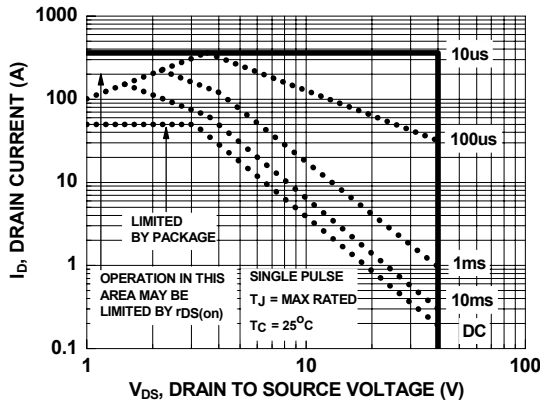
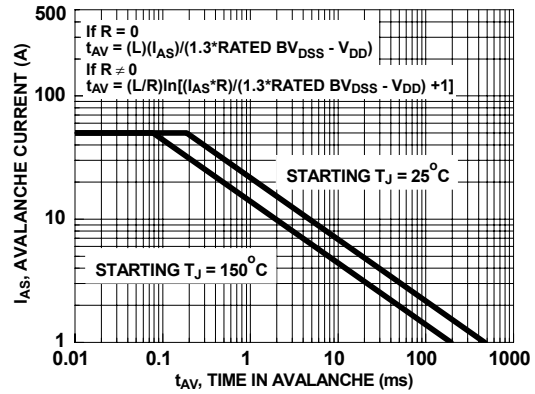


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

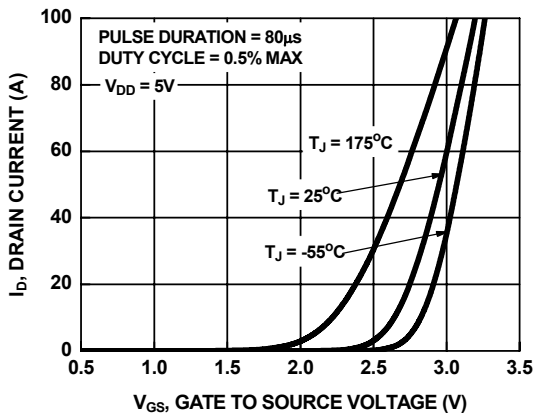


Figure 7. Transfer Characteristics

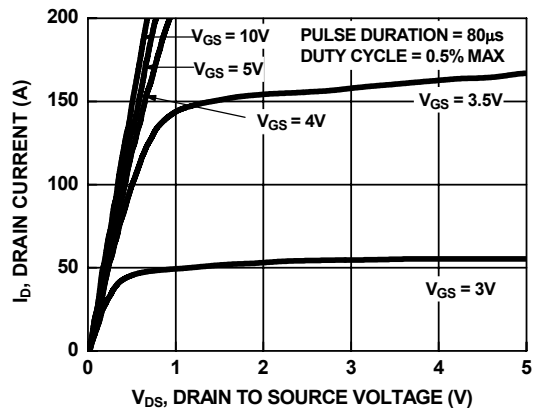


Figure 8. Saturation Characteristics

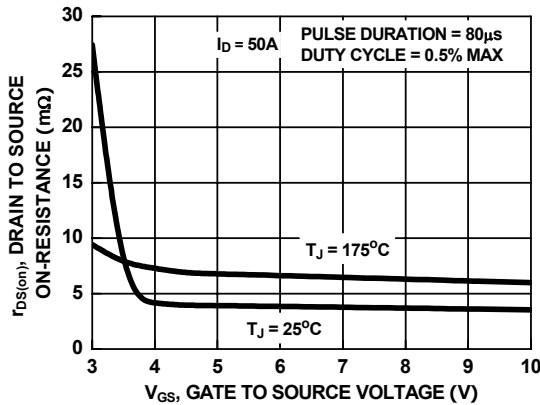


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

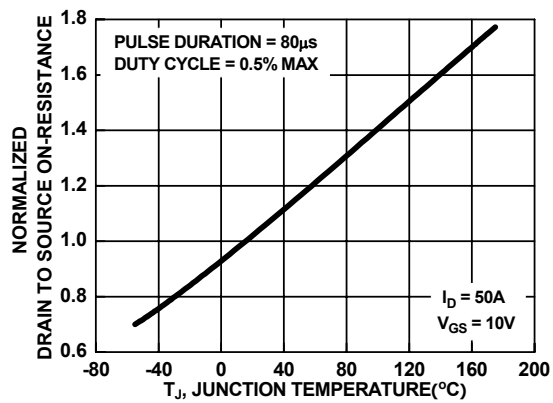


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

Typical Characteristics

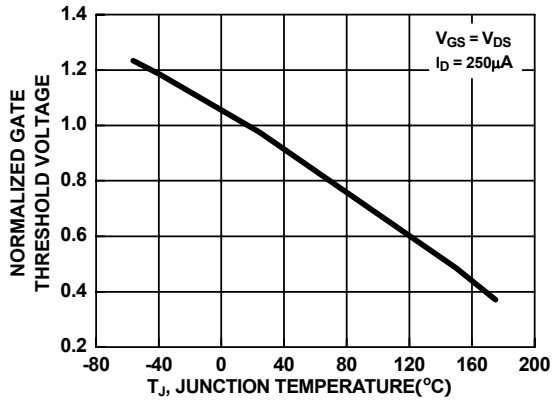


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

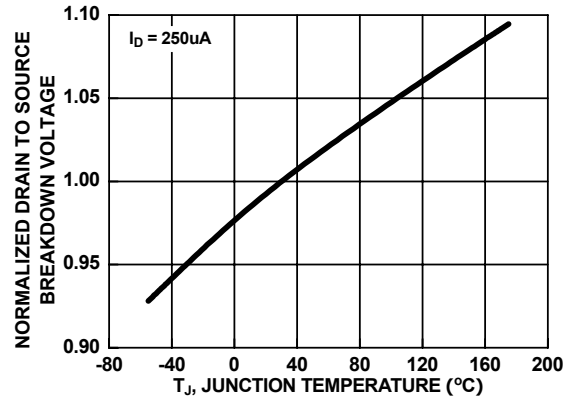


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

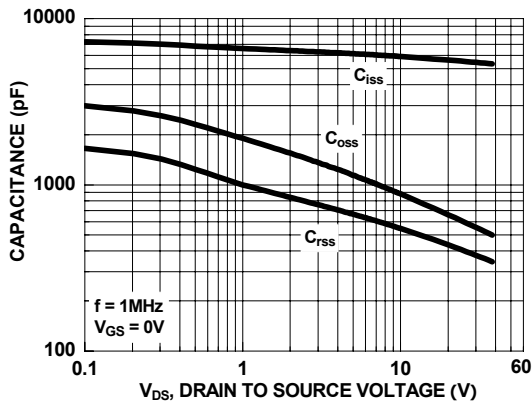


Figure 13. Capacitance vs Drain to Source Voltage

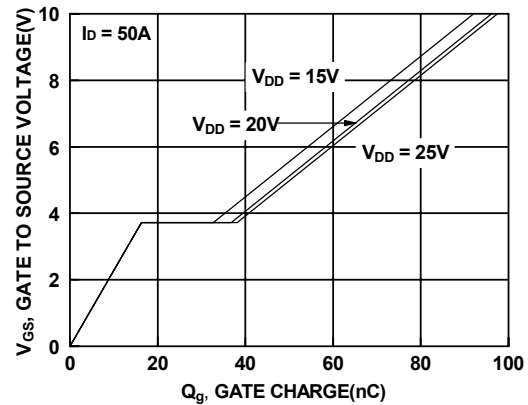


Figure 14. Gate Charge vs Gate to Source Voltage

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Rev. 137

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105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

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