FAIRCHILD SEMICONDUCTOR®

December 2010

FDD4685_F085

P-Channel PowerTrench® MOSFET

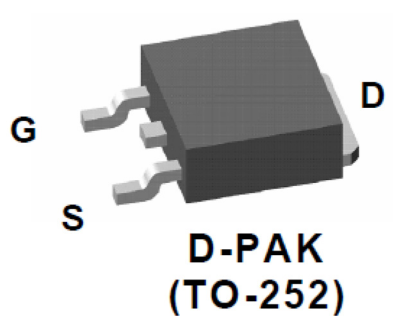
-40V, -32A, 35mΩ

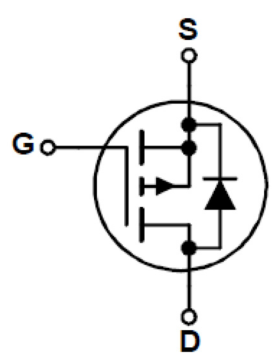
Features

- Typ $r_{DS(on)}$ = 23mΩ at V_{GS} = -10V, I_D = -8.4A
- Typ $r_{DS(on)}$ = 30mΩ at V_{GS} = -4.5V, I_D = -7A
- Typ $Q_{g(TOT)}$ = 19nC at V_{GS} = -5V
- High performance trench technology for extremely low $r_{DS(on)}$
- RoHS Compliant
- Qualified to AEC Q101

Applications

- Inverter
- Power Supplies





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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 (T_C<90^{o}C, V_{GS} = 10V)	-32	A
	Pulsed	See Figure 4	
E_{AS}	Single Pulse Avalanche Energe (Note 1)	121	mJ
P_D	Power Dissipation	83	W
	Dreate above 25^{o}C	0.56	W/^{o}C
T_J, T_{STG}	Operating and Storage Temperature	-55 to +175	^{o}C

Thermal Characteristics

$R_{\theta JC}$	Maximum Thermal Resistance Junction to Case	1.8	^{o}C/W
$R_{\theta JA}$	Maximum Thermal Resistance Junction to Ambient TO-252, 1in^2 copper pad area	40	^{o}C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD4685	FDD4685_F085	TO252	13"	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	I_D = -250µA, V_{GS} = 0V	-40	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	ID = -250µA, referenced to 25°C	-	-33	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -32V,	-	-	-1	µA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250µA	-1	-1.6	-3	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	ID = –250µA, referenced to 25°C	-	4.9	-	mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	I_D = -8.4A, V_{GS}= -10V	-	23	27	mΩ
		I_D = -7A, V_{GS}= -4.5V	-	30	35	
		I_D = -8.4A, V_{GS}= -10V, T_J = 150^{o}C	-	38	45	
g_{FS}	Forward Transconductance	I_D = –8.4A, V_{DS} = –5V,	-	23	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	V_{DS} = -20V, V_{GS} = 0V, f = 1MHz	-	1790	2380	pF
C_{oss}	Output Capacitance		-	260	345	pF
C_{rss}	Reverse Transfer Capacitance		-	140	205	pF
R_G	Gate Resistance	f = 1MHz	-	4	-	Ω
$Q_{g(TOT)}$	Total Gate Charge	V_{DD} = -20V, V_{GS} = -5V I_D = -8.4A	-	19	27	nC
Q_{gs}	Gate to Source Gate Charge		-	5.6	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	6.1	-	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
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -20V, I_D = -8.4A V_{GS} = -10V, R_{GEN} = 6Ω	-	8	16	ns
t_r	Rise Time		-	15	27	ns
$t_{d(off)}$	Turn-Off Delay Time		-	34	55	ns
t_f	Fall Time		-	14	26	ns

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Voltage	I_{SD} = -8.4A, V_{GS}=0V	-	-0.85	-1.2	V
t_{rr}	Reverse Recovery Time	I_{SD} = -8.4A, dI_{SD}/dt = 100A/μs	-	30	45	ns
Q_{rr}	Reverse Recovery Charge		-	31	47	nC

Notes:
1: Starting T_J= 25°C, L = 3mH, I_{AS}= 9A, V_{GS}= 10V, V_{DD}= 40V during the inductor charging time and 0V during the time in avalanche.

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

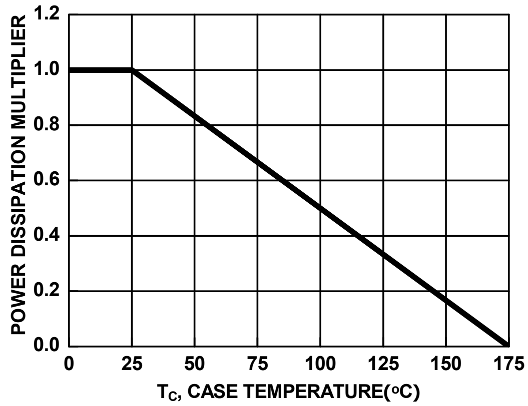


Figure 1. Normalized Power Dissipation vs Case Temperature

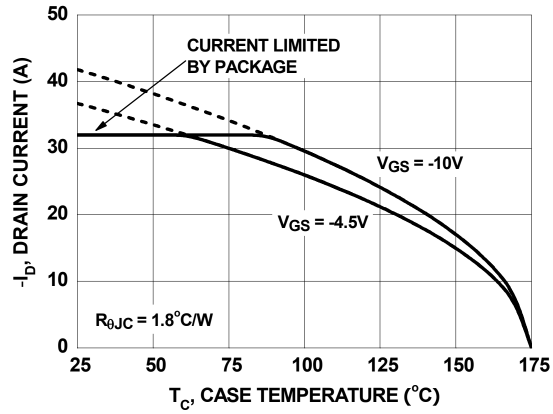


Figure 2. Maximum Continuous Drain Current vs Case Temperature

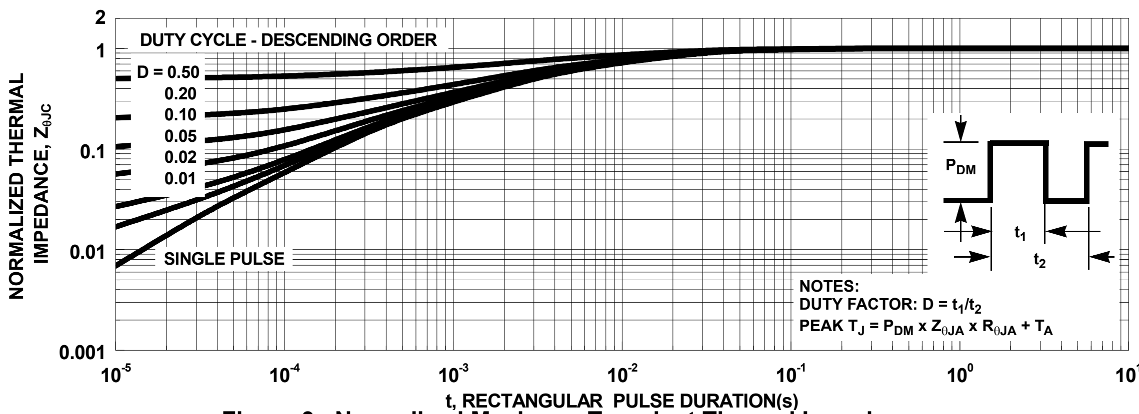


Figure 3. Normalized Maximum Transient Thermal Impedance

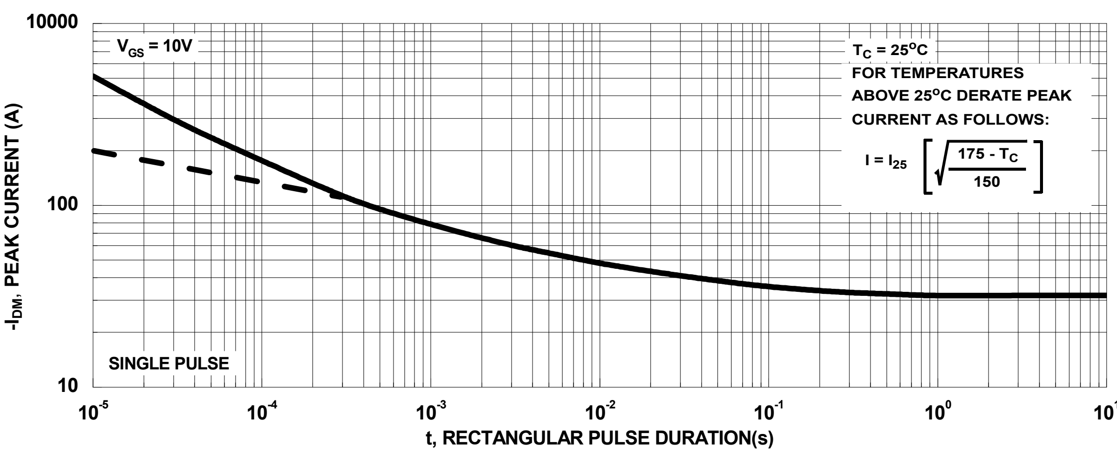


Figure 4. Peak Current Capability

Typical Characteristics

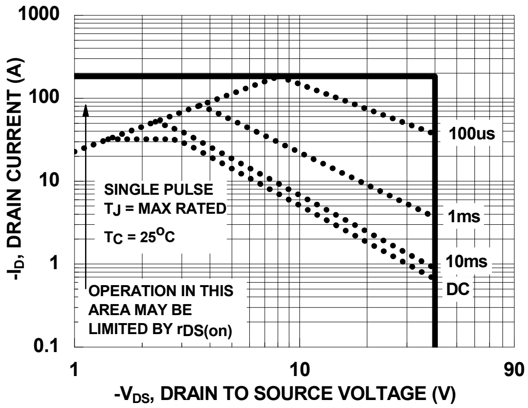
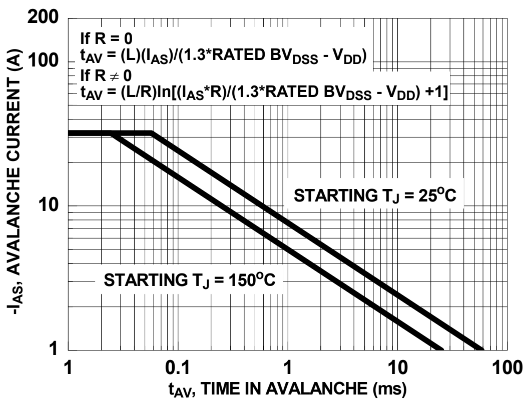


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

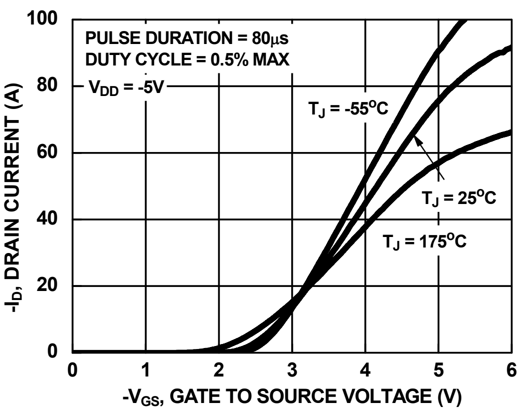


Figure 7. Transfer Characteristics

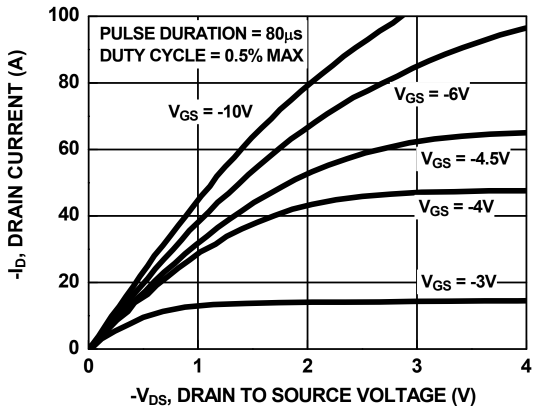


Figure 8. Saturation Characteristics

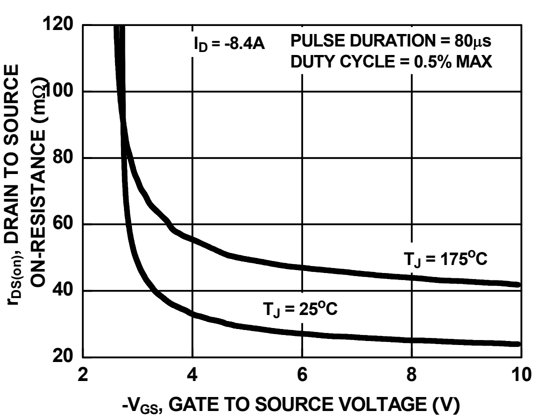


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

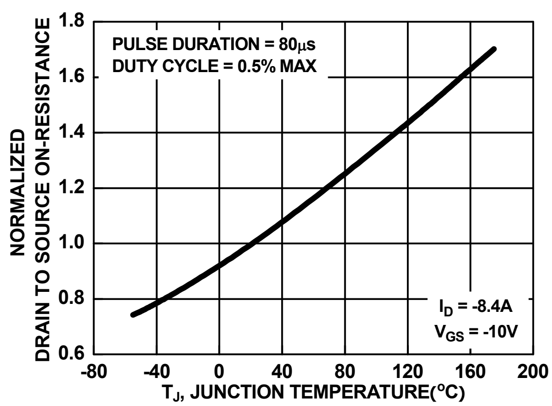


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics

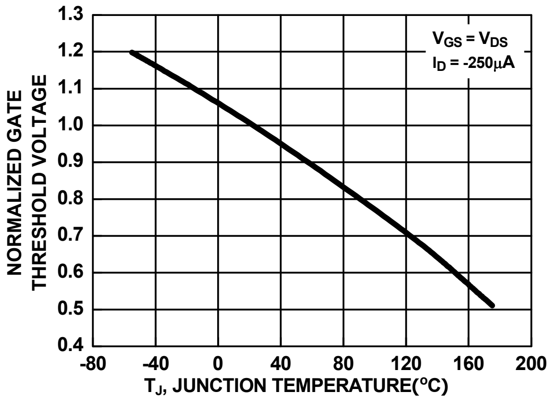


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

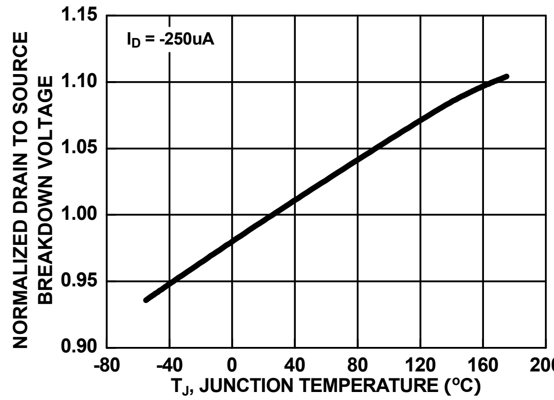


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

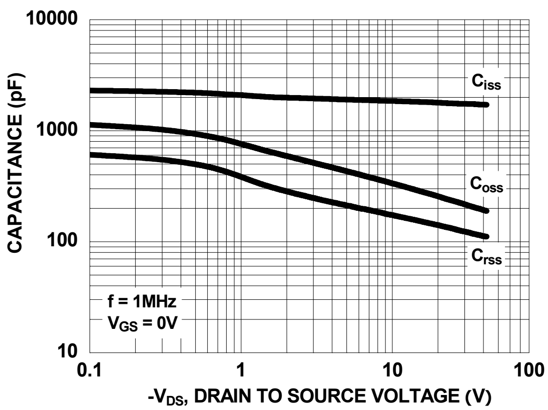


Figure 13. Capacitance vs Drain to Source Voltage

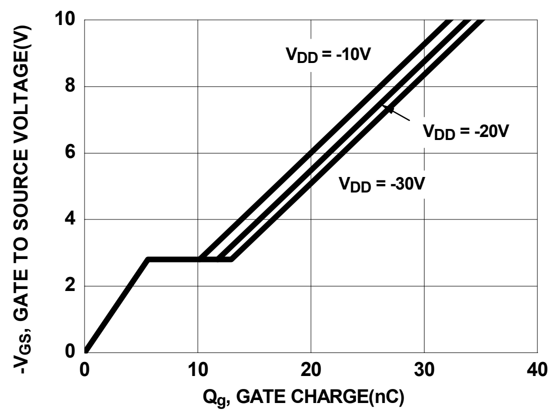


Figure 14. Gate Charge vs Gate to Source Voltage

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