



FDD4685_F085

P-Channel PowerTrench® MOSFET

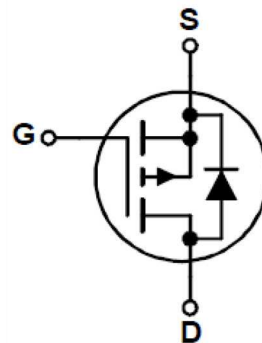
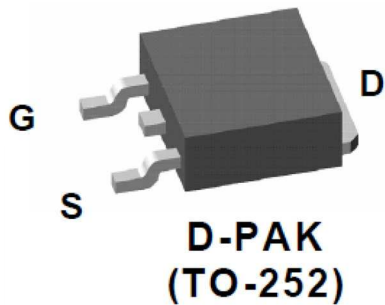
-40V, -32A, 35mΩ

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



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

Thermal Characteristics

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

Package Marking and Ordering Information

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

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

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

On Characteristics

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

Dynamic Characteristics

C_{ISS}	Input Capacitance	$V_{DS} = -20\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$	-	1790	2380	pF
C_{OSS}	Output Capacitance		-	260	345	pF
C_{RSS}	Reverse Transfer Capacitance		-	140	205	pF
R_G	Gate Resistance	$f = 1\text{MHz}$	-	4	-	Ω
$Q_{g(TOT)}$	Total Gate Charge	$V_{DD} = -20\text{V}$, $V_{GS} = -5\text{V}$, $I_D = -8.4\text{A}$	-	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 $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -20\text{V}, I_D = -8.4\text{A}$ $V_{GS} = -10\text{V}, R_{GEN} = 6\Omega$	-	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

V_{SD}	Source to Drain Diode Voltage	$I_{SD} = -8.4\text{A}, V_{GS} = 0\text{V}$	-	-0.85	-1.2	V
t_{rr}	Reverse Recovery Time	$I_{SD} = -8.4\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	30	45	ns
Q_{rr}	Reverse Recovery Charge		-	31	47	nC

Notes:

1: Starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 9\text{A}$, $V_{GS} = 10\text{V}$, $V_{DD} = 40\text{V}$ 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

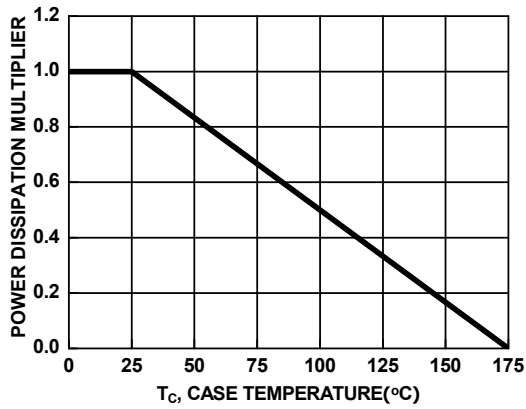


Figure 1. Normalized Power Dissipation vs Case Temperature

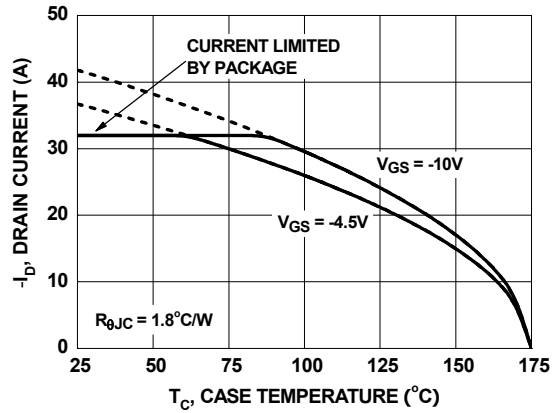


Figure 2. Maximum Continuous Drain Current vs Case Temperature

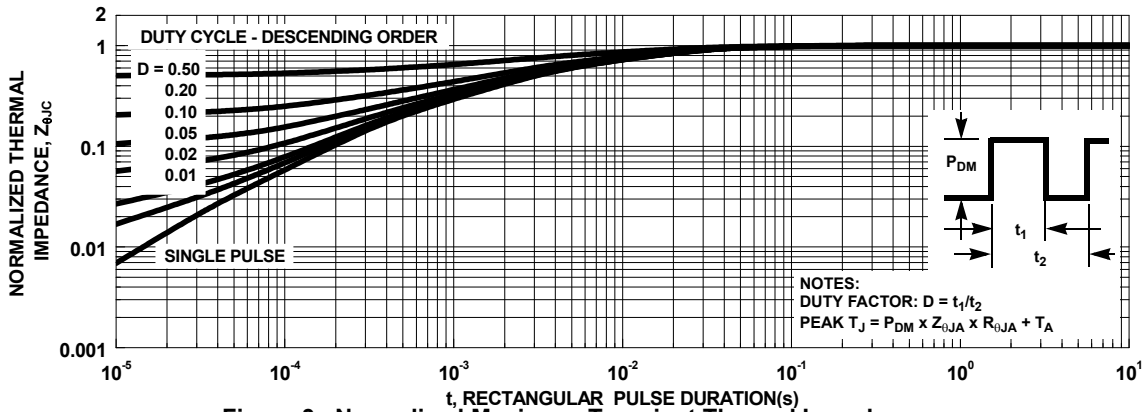


Figure 3. Normalized Maximum Transient Thermal Impedance

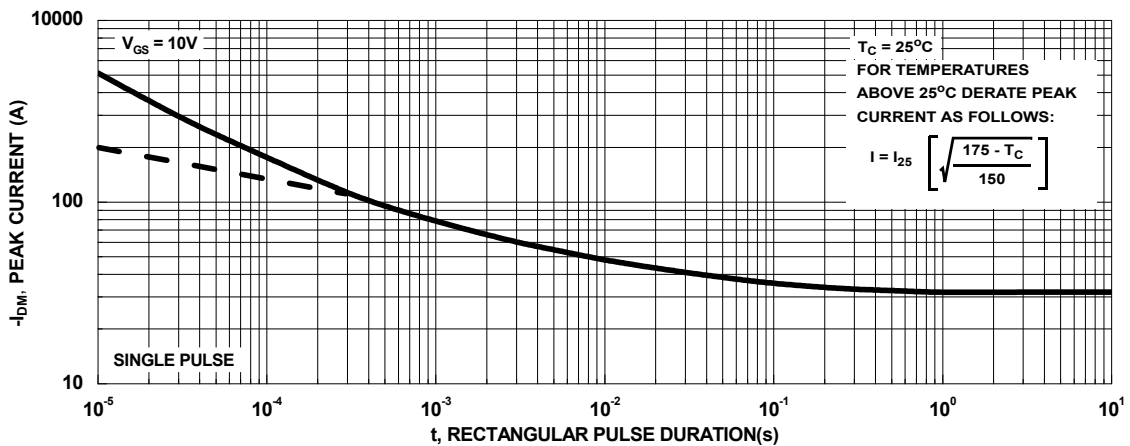


Figure 4. Peak Current Capability

Typical Characteristics

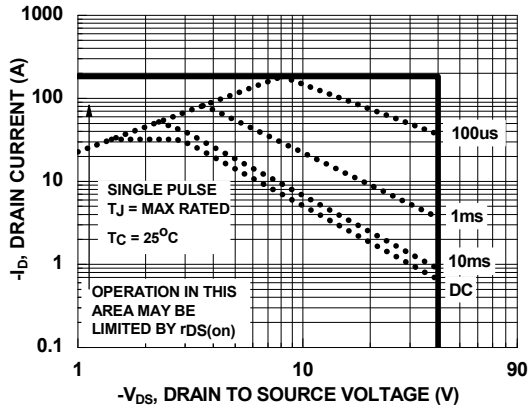
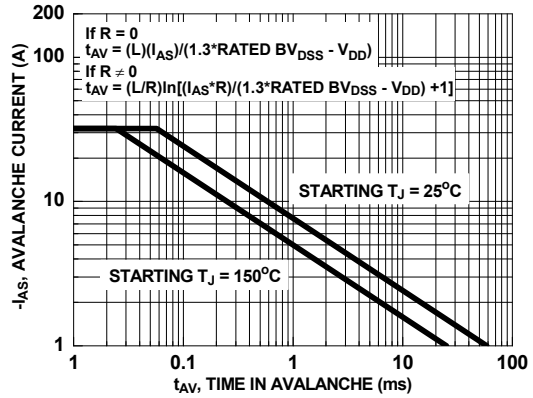


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515
Figure 6. Unclamped Inductive Switching Capability

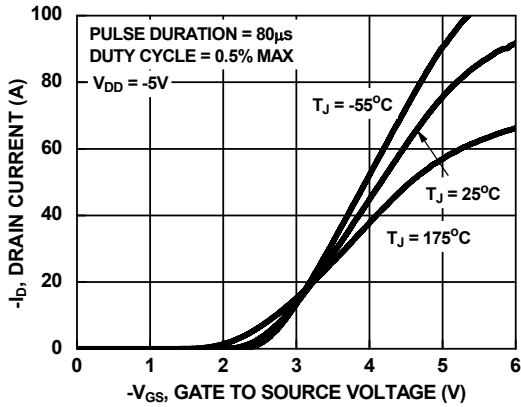


Figure 7. Transfer Characteristics

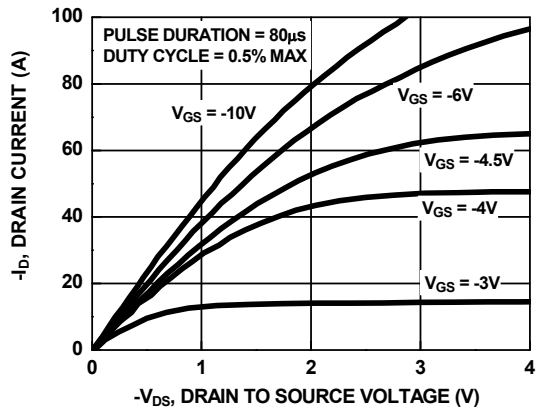


Figure 8. Saturation Characteristics

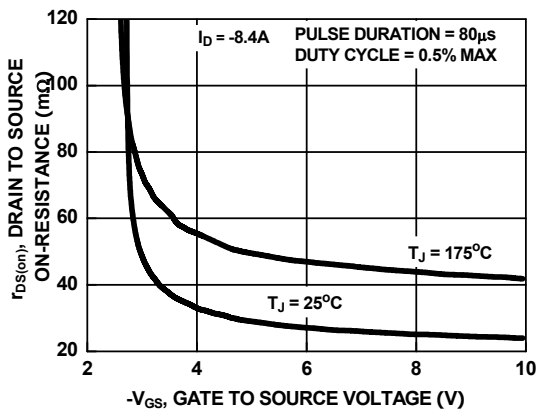


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

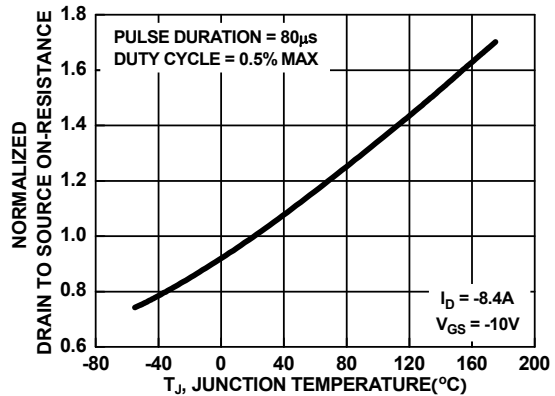


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

Typical Characteristics

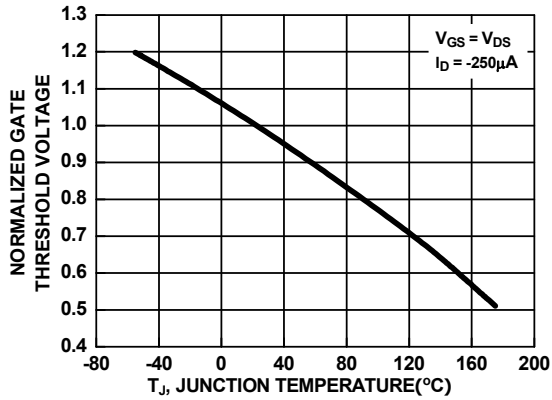


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

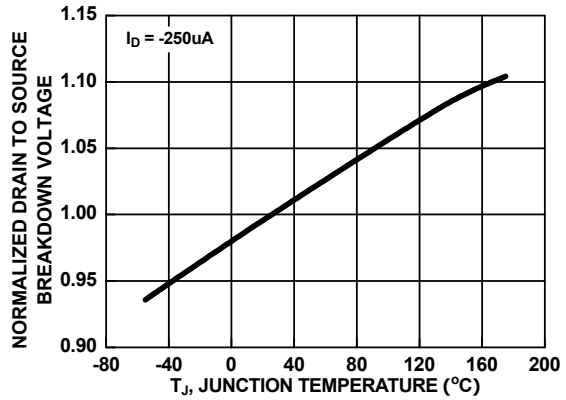


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

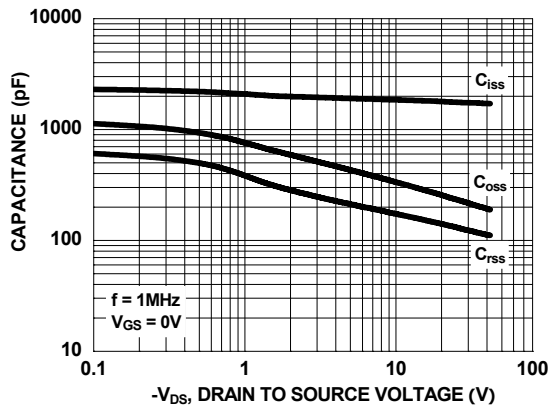


Figure 13. Capacitance vs Drain to Source Voltage

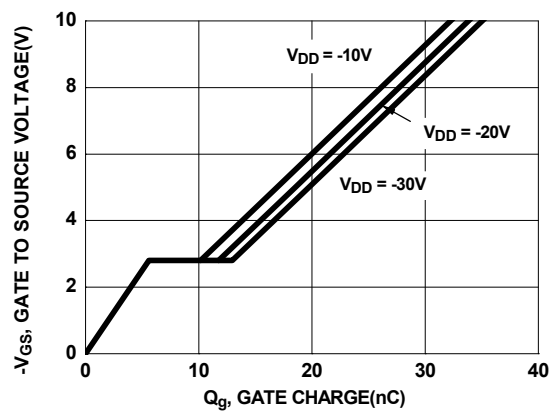





Figure 14. Gate Charge vs Gate to Source Voltage



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