FAIRCHILD

SEMICONDUCTOR®

FDD5810

N-Channel PowerTrench® MOSFET
60V, 35A, 27mΩ

Features

- $R_{DS(ON)}$ = 20.5mΩ (Typ.), V_{GS} = 5V, I_D = 35A
- $Q_{g(5)}$ = 13nC (Typ.), V_{GS} = 5V
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse / Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

Applications

- Motor / Body Load Control
- ABS Systems
- Powertrain Management
- Injection System
- DC-DC converters and Off-line UPS
- Distributed Power Architecture and VRMs
- Primary Switch for 12V and 24V systems

LEAD-FREE IMPLEMENTATION

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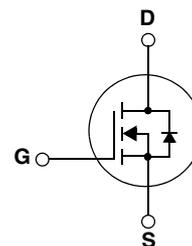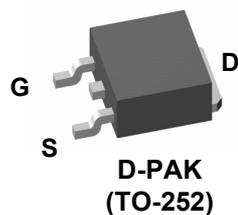
Absolute Maximum Ratings $T_C = 25°C$ unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		60	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current Continuous (V_{GS} = 10V, T_C = 52°C)	(Note 1)	35	A
	Drain Current Continuous (V_{GS} = 5V, T_C = 42°C)	(Note 1)	35	A
	Continuous (T_A = 25°C, V_{GS} = 10V, with $R_{\theta JA}$ = 52°C/W)		7.7	A
	Pulsed		Figure 4	A
E_{AS}	Single Pulse Avalanche Energy (Note 2)		45	mJ
P_D	Power Dissipation		88	W
	Derate above 25°C		0.59	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to 175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case TO-252	1.7	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-252, $1in^2$ copper pad area	52	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD5810	FDD5810	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		60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48V		-	-	1	µA
		V_{GS} = 0V	T_C = 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		1	1.6	2	V
$R_{DS(ON)}$	Drain to Source On Resistance	I_D = 35A, V_{GS} = 10V		-	16.5	20	mΩ
		I_D = 35A, V_{GS} = 5V		-	20.5	27	
		I_D = 35A, V_{GS} = 10V, T_J = 175°C		-	39	48	

Dynamic Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz		-	1420	1890	pF
C_{oss}	Output Capacitance			-	150	200	pF
C_{rss}	Reverse Transfer Capacitance			-	65	100	pF
R_G	Gate Resistance	f = 1MHz		-	3.5	-	Ω
Q_g	Total Gate Charge at 10V	V_{GS} = 0V to 10V	V_{DD} = 30V, I_D = 35A	-	24	34	nC
Q_g	Total Gate Charge at 5V	V_{GS} = 0V to 5V		-	13	18	nC
$Q_{g(th)}$	Threshold Gate Charge	V_{GS} = 0V to 1V		-	1.3	-	nC
Q_{gs}	Gate to Source Gate Charge			-	4.0	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau			-	2.7	-	nC
Q_{gd}	Gate to Drain "Miller" Charge			-	5.0	-	nC

Switching Characteristics

t_{on}	Turn-On Time		-	-	130	ns
$t_{d(on)}$	Turn-On Delay Time		-	12	-	ns
t_r	Rise Time	V_{DD} = 30V, I_D = 35A	-	75	-	ns
$t_{d(off)}$	Turn-Off Delay Time	V_{GS} = 5V, R_{GS} = 11Ω	-	26	-	ns
t_f	Fall Time		-	34	-	ns
t_{off}	Turn-Off Time		-	-	90	ns

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Voltage	I_{SD} = 35A	-	-	1.25	V
		I_{SD} = 16A	-	-	1.0	V
t_{rr}	Reverse Recovery Time	I_F = 35A, di/dt = 100A/μs	-	-	39	ns
Q_{rr}	Reverse Recovery Charge	I_F = 35A, di/dt = 100A/μs	-	-	35	nC

Notes:
1: Package Limitation is 35A.
2: Starting T_J = 25°C, L = 110μH, I_{AS} = 28A, V_{DD} = 54V, V_{GS} = 10V.

FDD5810 N-Channel PowerTrench® MOSFET

Typical Characteristics $T_J = 25°C$ unless otherwise noted
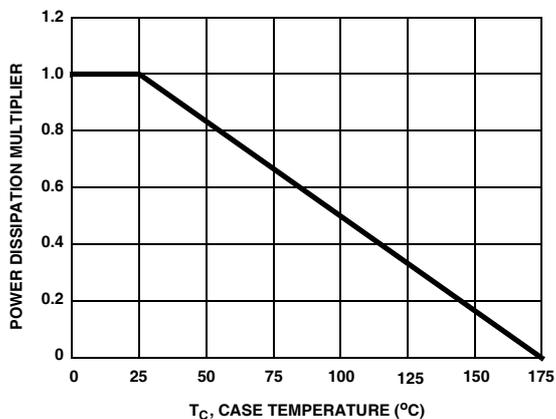
Figure 1. Normalized Power Dissipation vs Case Temperature
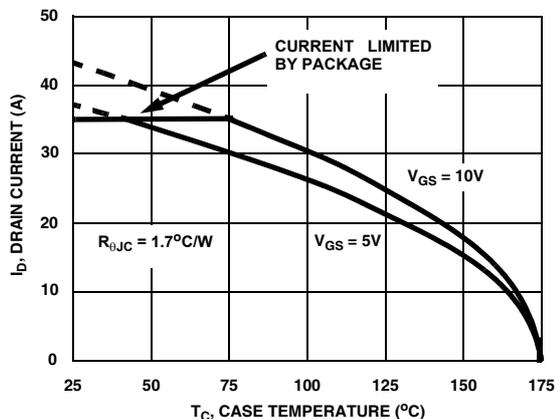
Figure 2. Maximum Continuous Drain Current vs Case Temperature

NOTES:
DUTY FACTOR: $D = t_1/t_2$
PEAK $T_J = P_{DM} \times R_{\theta JC} + T_C$
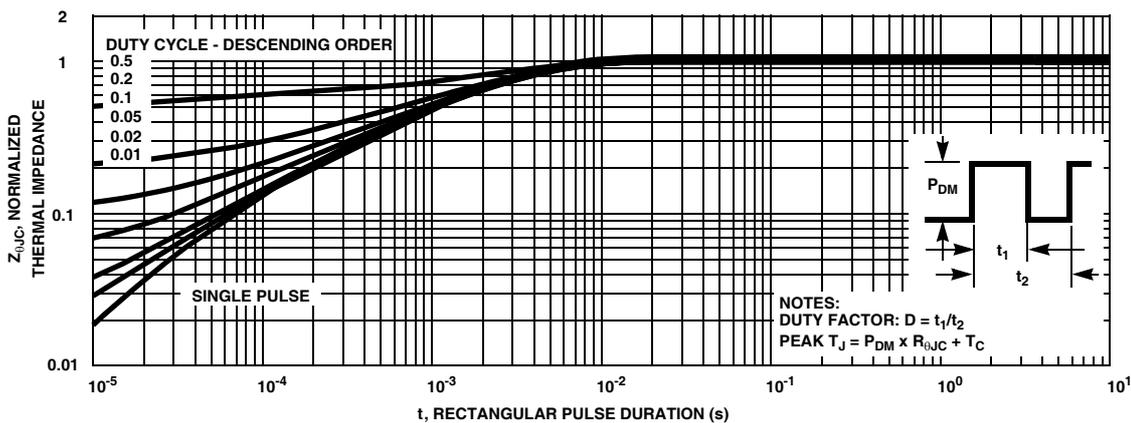
Figure 3. Normalized Maximum Transient Thermal Impedance

TRANSCONDUCTANCE MAY LIMIT CURRENT IN THIS REGION

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

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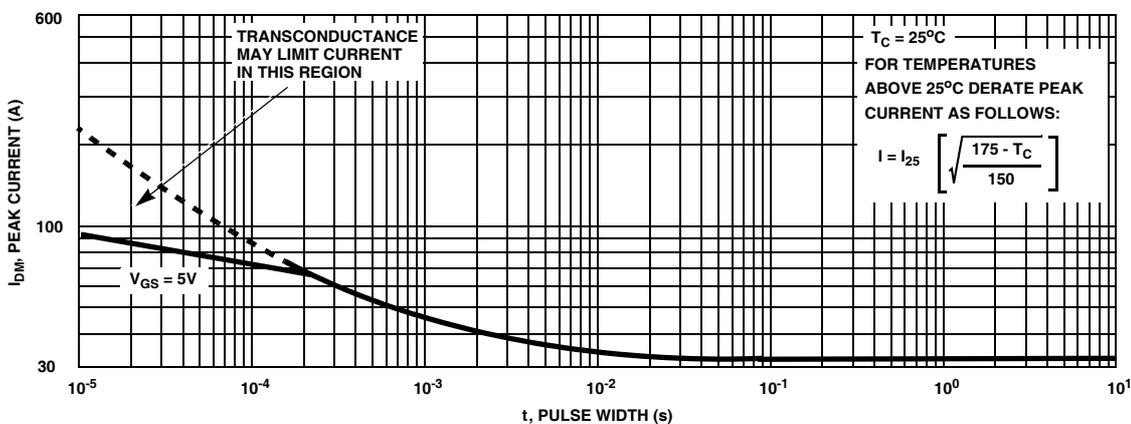
Figure 4. Peak Current Capability

Typical Characteristics $T_J = 25°C$ unless otherwise noted
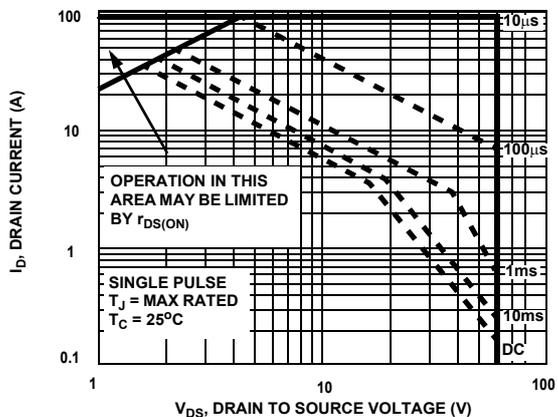
Figure 5. Forward Bias Safe Operating Area
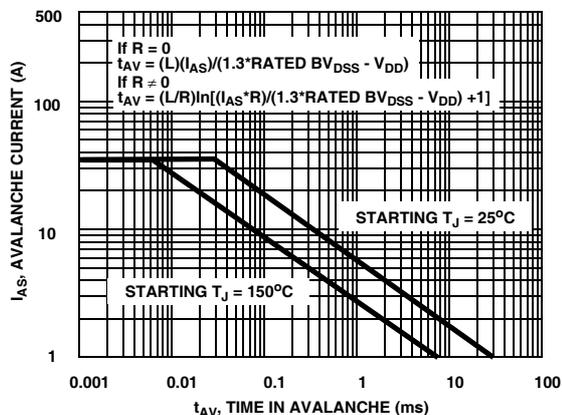
NOTE: Refer to Fairchild Application Notes AN7514 and AN7515
Figure 6. Unclamped Inductive Switching Capability
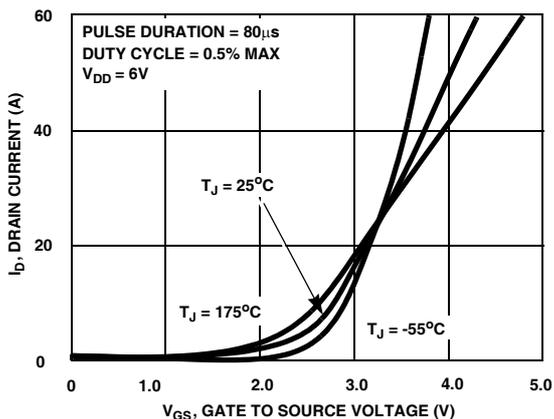
Figure 7. Transfer Characteristics
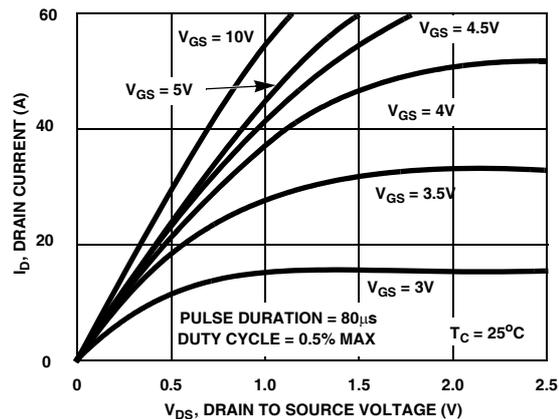
Figure 8. Saturation Characteristics
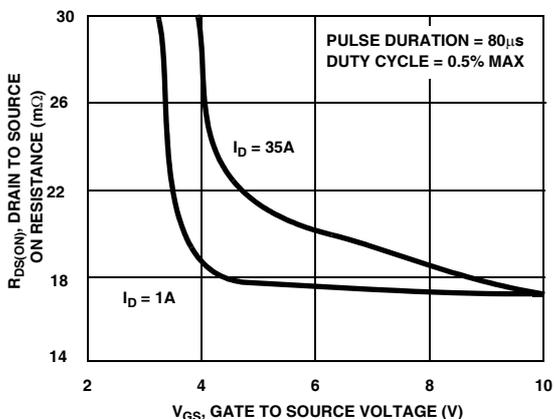
Figure 9. Drain to Source On Resistance vs Gate Voltage and Drain Current
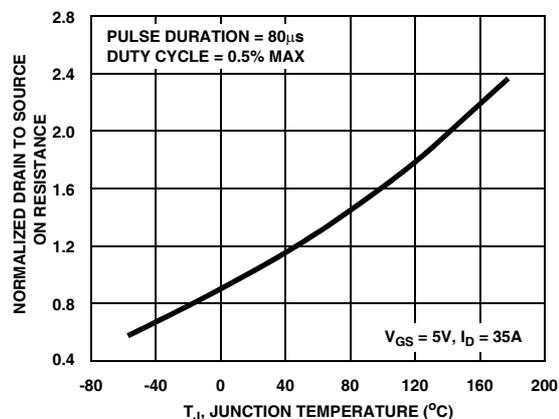
Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics $T_J = 25°C$ unless otherwise noted
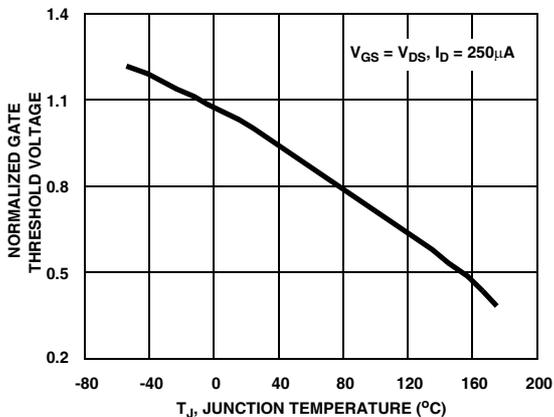

Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature
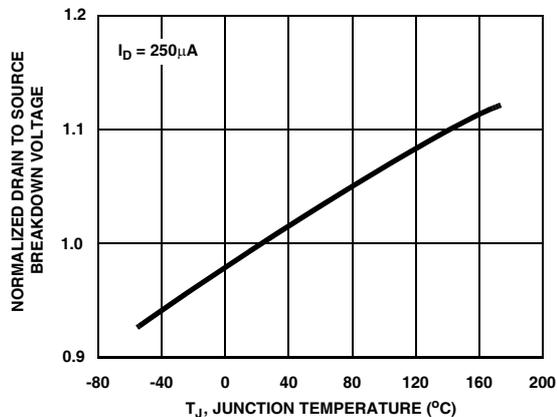
Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature
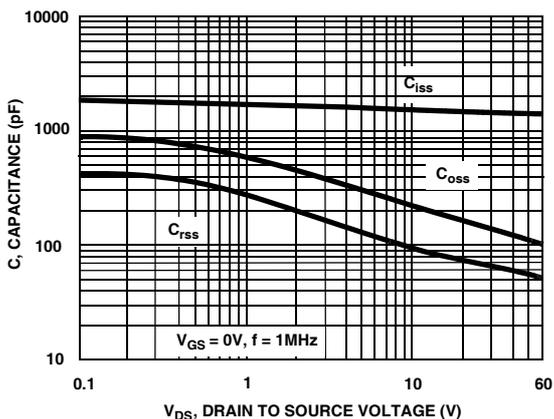
Figure 13. Capacitance vs Drain to Source Voltage
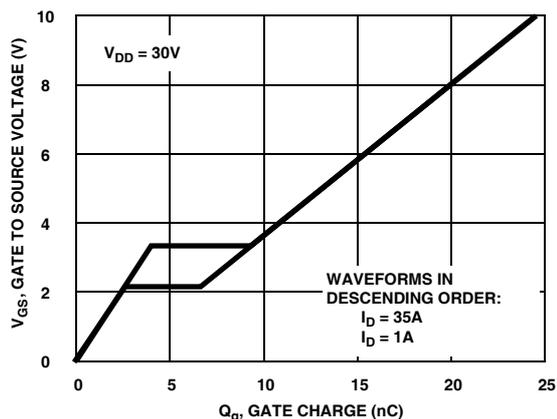
Figure 14. Gate Charge Waveforms for Constant Gate Current

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