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# FDB5800

## N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

### Features

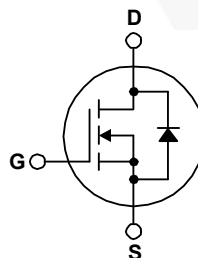
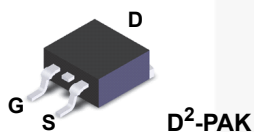
- $R_{DS(on)} = 4.6 \text{ m}\Omega$  (Typ.),  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- High Performance Trench Technology for Externly Low  $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability
- RoHs Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Power tools
- Motor drives and Uninterruptible Power Supplies



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDB5800	Unit
$V_{DSS}$	Drain to Source Voltage	60	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current		
	- Continuous ( $T_C < 102^\circ\text{C}$ , $V_{GS} = 10 \text{ V}$ )	80	A
	- Continuous ( $T_C < 90^\circ\text{C}$ , $V_{GS} = 5 \text{ V}$ )	80	A
	- Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10 \text{ V}$ , with $R_{\theta JA} = 43^\circ\text{C/W}$ )	14	A
	- Pulsed	Figure 4	A
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	652	mJ
$P_D$	- Power Dissipation	242	W
	- Derate above $25^\circ\text{C}$	1.61	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 TO-263, Max.	0.62	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, Max. (Note 2)	62.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, $1\text{in}^2$ copper pad area	43	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDB5800	FDB5800	D <sup>2</sup> -PAK	Tape and Reel	330 mm	24 mm	800 units

## Electrical Characteristics T<sub>c</sub> = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### Off Characteristics

B <sub>VDSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	60	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 48 V V <sub>GS</sub> = 0 V	-	-	1	μA
		T <sub>C</sub> = 150°C	-	-	250	
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V	-	-	±100	nA

### On Characteristics

V <sub>GS(TH)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.0	-	2.5	V
r <sub>DS(ON)</sub>	Drain to Source On Resistance	I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V	-	4.6	6.0	mΩ
		I <sub>D</sub> = 80 A, V <sub>GS</sub> = 4.5 V	-	5.8	7.2	
		I <sub>D</sub> = 80 A, V <sub>GS</sub> = 5 V	-	5.5	7.0	
		I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V, T <sub>J</sub> = 175°C	-	10	12.6	

### Dynamic Characteristics

C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	6625	-	pF
C <sub>OSS</sub>	Output Capacitance		-	628	-	pF
C <sub>RSS</sub>	Reverse Transfer Capacitance		-	262	-	pF
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> = 0.5 V, f = 1 MHz	-	1.4	-	Ω
Q <sub>g(TOT)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 0 V to 10 V	-	104	135	nC
Q <sub>g(5)</sub>	Total Gate Charge at 5V	V <sub>GS</sub> = 0 V to 5 V	-	55	72	nC
Q <sub>g(TH)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 0 V to 1 V	-	6.0	-	nC
Q <sub>gs</sub>	Gate to Source Gate Charge	V <sub>DD</sub> = 30 V I <sub>D</sub> = 80 A I <sub>g</sub> = 1.0 mA	-	18.4	-	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau		-	12.5	-	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		-	20.1	-	nC

### Switching Characteristics (V<sub>GS</sub> = 5V)

t <sub>ON</sub>	Turn-On Time	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 80 A V <sub>GS</sub> = 5 V, R <sub>GS</sub> = 2 Ω	-	-	62.1	ns
t <sub>d(ON)</sub>	Turn-On Delay Time		-	20.3	-	ns
t <sub>r</sub>	Rise Time		-	22.0	-	ns
t <sub>d(OFF)</sub>	Turn-Off Delay Time		-	27.1	-	ns
t <sub>f</sub>	Fall Time		-	12.1	-	ns
t <sub>OFF</sub>	Turn-Off Time		-	-	59.0	ns

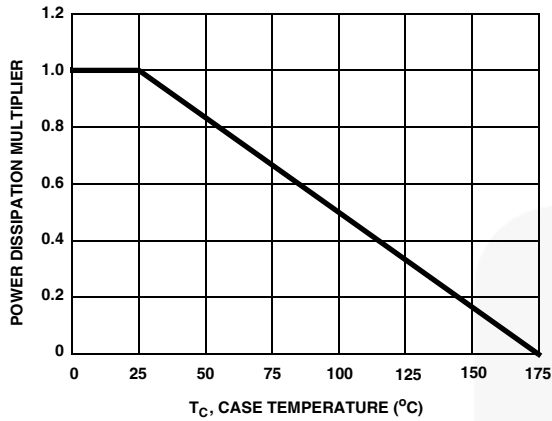
### Drain-Source Diode Characteristics

V <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 80 A	-	-	1.25	V
		I <sub>SD</sub> = 40 A	-	-	1.0	V
t <sub>r</sub>	Reverse Recovery Time	I <sub>SD</sub> = 60 A, di <sub>SD</sub> /dt = 100 A/μs	-	-	44	ns
Q <sub>SD</sub>	Reverse Recovered Charge	I <sub>SD</sub> = 60 A, di <sub>SD</sub> /dt = 100 A/μs	-	-	57	nC

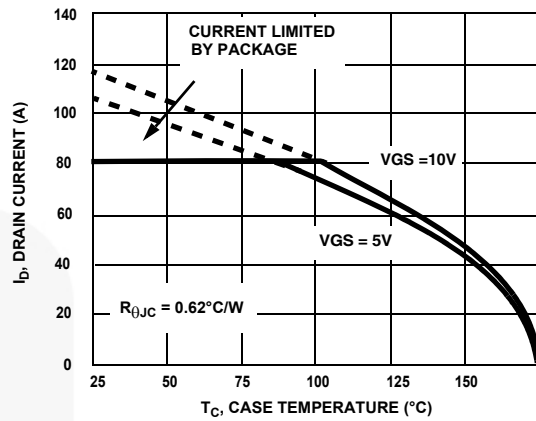
#### Notes:

- Starting T<sub>J</sub> = 25°C, L = 1mH, I<sub>AS</sub> = 36A, V<sub>DD</sub> = 54V, V<sub>GS</sub> = 10V.
- Pulse width = 100s.

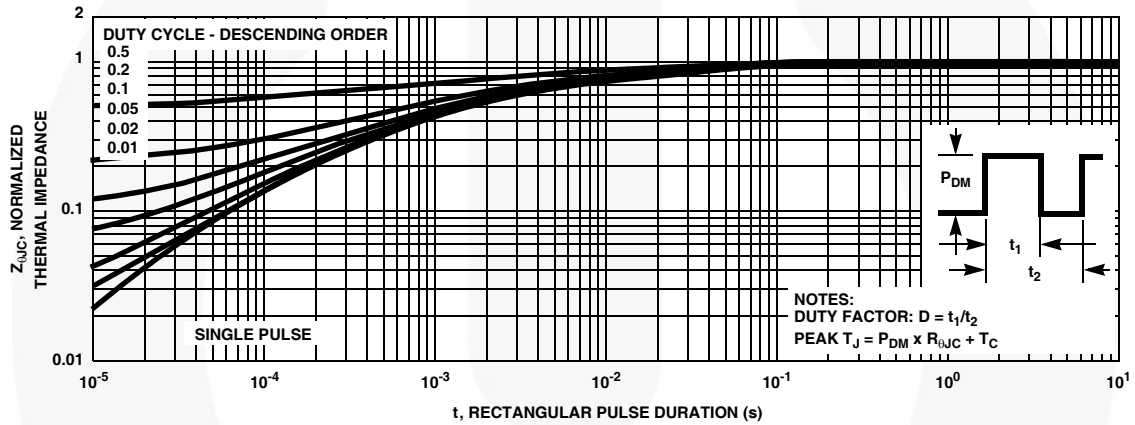
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



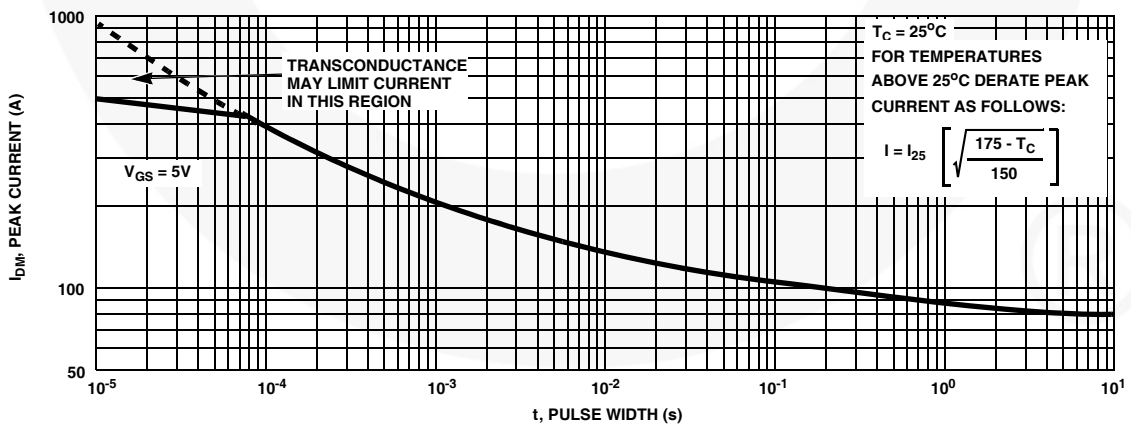
**Figure 1. Normalized Power Dissipation vs Case Temperature**



**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

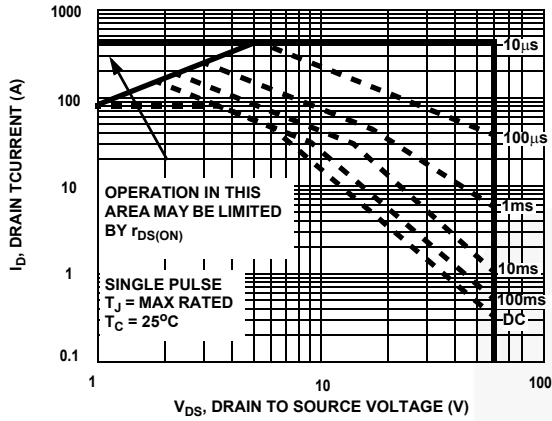


**Figure 3. Normalized Maximum Transient Thermal Impedance**

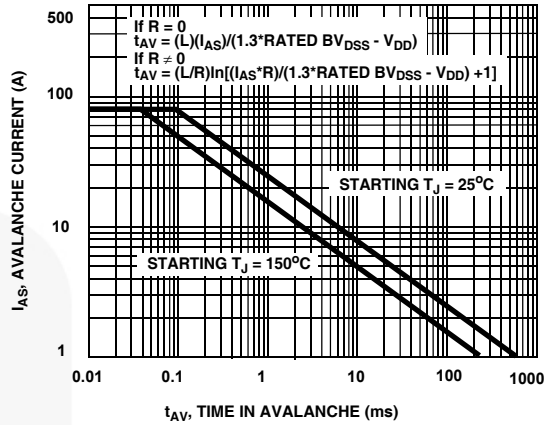


**Figure 4. Peak Current Capability**

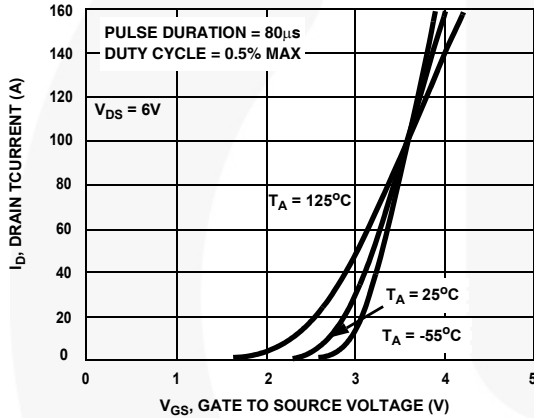
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



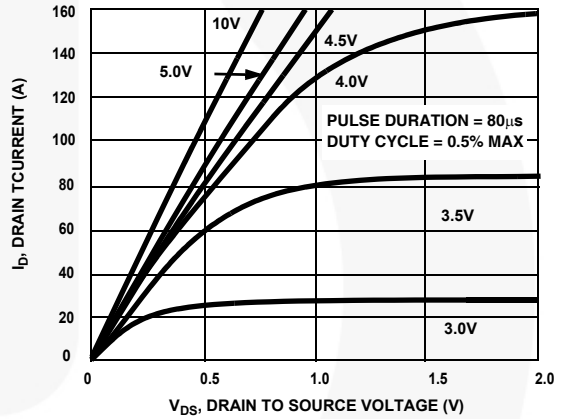
**Figure 5. Forward Bias Safe Operating Area**



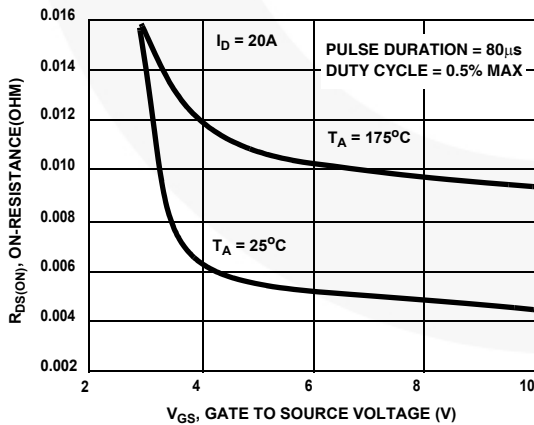
NOTE: Refer to Fairchild Application Notes AN7514 and AN7515  
**Figure 6. Unclamped Inductive Switching Capability**



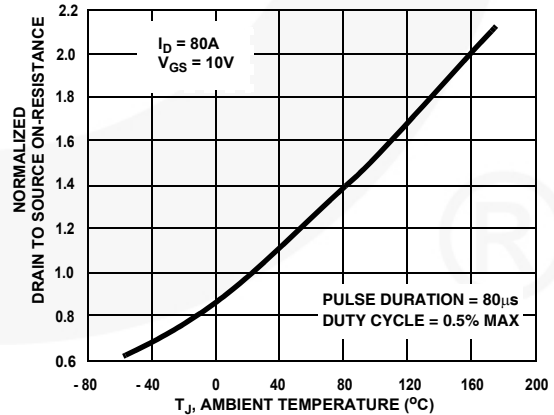
**Figure 7. Transfer Characteristics**



**Figure 8. Saturation Characteristics**

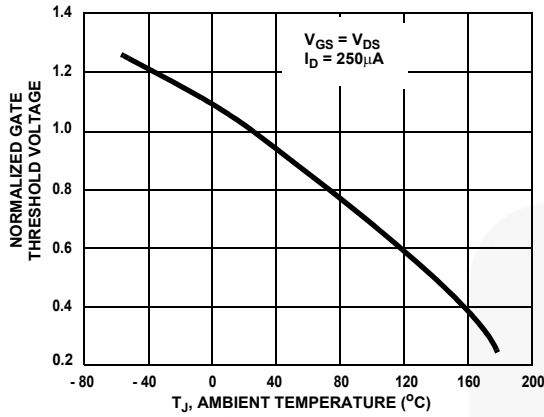


**Figure 9. On-Resistance Variation vs Gate-to-**

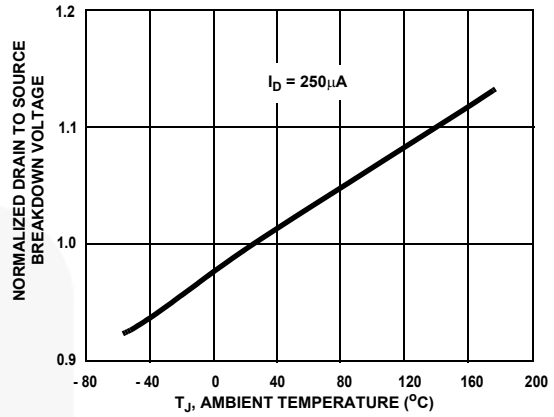


**Figure 10. Normalized Drain to Source On**

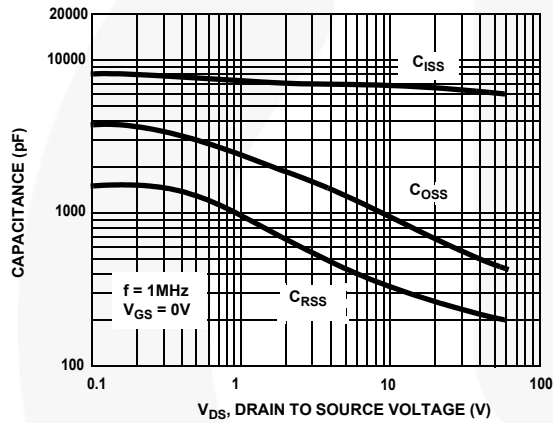
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



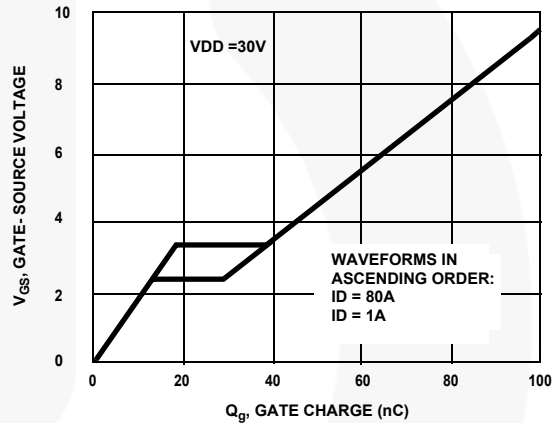
**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**



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

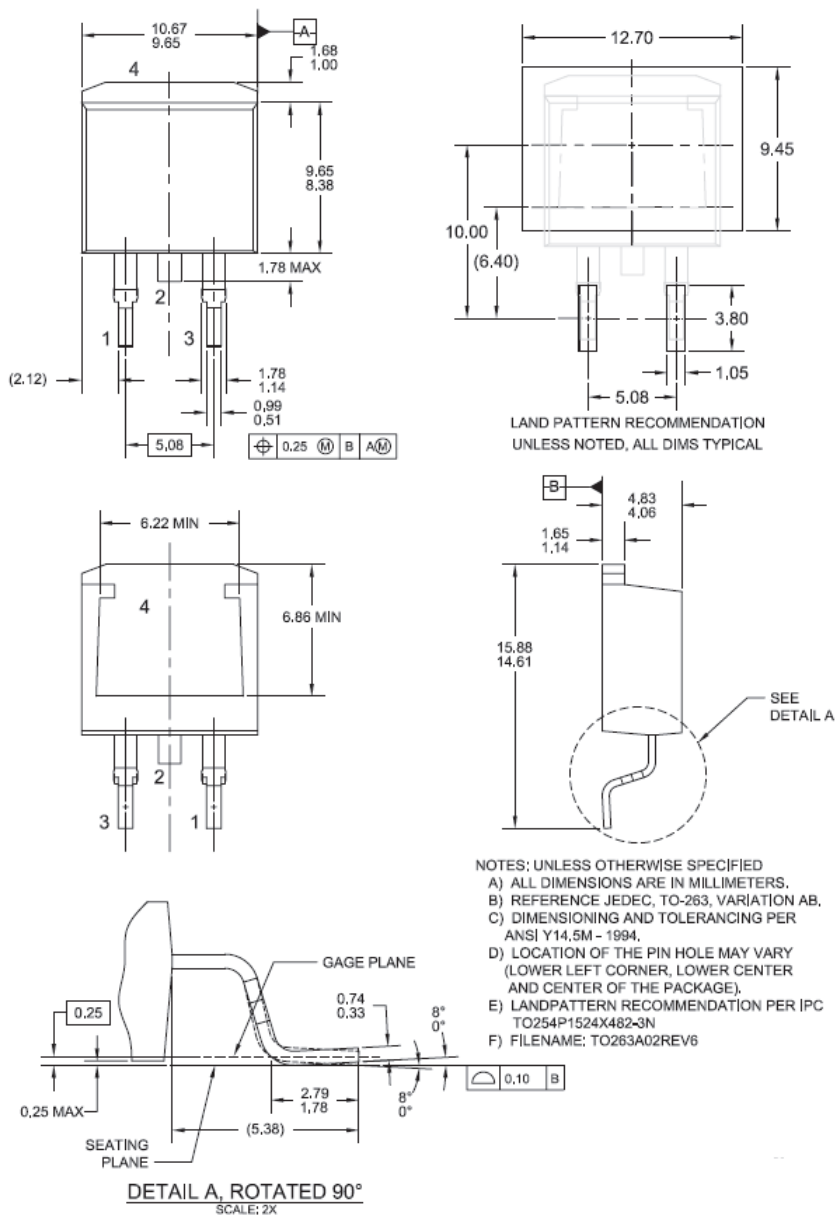


**Figure 13. Capacitance vs Drain to Source Voltage**



**Figure 14. Gate Charge Waveforms for Constant Gate Current**

## Mechanical Dimensions



**Figure 15. TO263 (D<sup>2</sup>PAK), Molded, 2-Lead, Surface Mount**

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