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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

March 2013

FDB8443

N-Channel PowerTrench® MOSFET

40 V, 182 A, 3.0 mΩ

Features

- $R_{DS(on)}$ = 2.3 mΩ (Typ.)@ V_{GS} = 10 V, I_D = 80 A
- $Q_{G(tot)}$ = 142 nC (Typ.)
- Low Miller Charge, Q_{GD} = 32 nC(Typ.)
- UIS Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant

Applications

- Power Tools
- Motor drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit

D2-PAK
(TO-263)
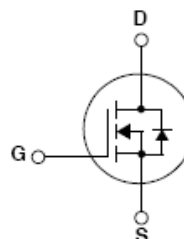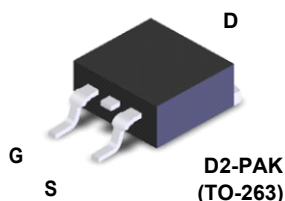
MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FDB8443	Unit
V_{DSS}	Drain to Source Voltage		40	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25°C, Silicon Limited)	182*	A
		- Continuous (T_C = 100°C, Silicon Limited)	129*	
		- Continuous (T_C = 25°C, Package Limited)	120	
		- Continuous (T_A = 25°C, $R_{\theta JA}$ = 43°C/W)	25	
I_{DM}	Drain Current	- Pulsed	See Figure 4	
E_{AS}	Single Pulse Avalanche Energy (Note 1)		531	mJ
P_D	Power Dissipation		188	W
	Derate above 25°C		1.25	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to +175	°C

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

Thermal Characteristics

Symbol	Parameter		FDB8443	Unit
$R_{\theta JC}$	Thermal Resistance Junction to Case, Max.		0.8	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient, Max.	(Note 2)	62	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, 1in² copper pad area, Max.		43	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8443	FDB8443	TO-263AB	330mm	24mm	800 units

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit

Off Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V		40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32V, V_{GS} = 0V		-	-	1	μA
			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	Unit
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA		2	2.8	4	V
$r_{DS(on)}$	Drain to Source On Resistance	I_D = 80A, V_{GS}= 10V		-	2.3	3.0	mΩ
		I_D = 80A, V_{GS}= 10V, T_J = 175°C		-	4.2	5.5	

Dynamic Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz		-	9310	-	pF
C_{oss}	Output Capacitance			-	800	-	pF
C_{rss}	Reverse Transfer Capacitance			-	510	-	pF
R_G	Gate Resistance	V_{GS} = 0.5V, f = 1MHz		-	0.9	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0 to 10V	V_{DD} = 20V I_D = 35A I_g = 1mA	-	142	185	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 to 2V		-	17.5	23	nC
Q_{gs}	Gate to Source Gate Charge			-	36	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau			-	18.8	-	nC
Q_{gd}	Gate to Drain "Miller" Charge			-	32	-	nC

Switching Characteristics (V_{GS} = 10V)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
t_{on}	Turn-On Time	V_{DD} = 20V, I_D = 35A V_{GS} = 10V, R_{GS} = 2Ω	-	-	58	ns
$t_{d(on)}$	Turn-On Delay Time		-	18.4	-	ns
t_r	Rise Time		-	17.9	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	55	-	ns
t_f	Fall Time		-	13.5	-	ns
t_{off}	Turn-Off Time		-	-	109	ns

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 35A	-	0.8	1.25	V
		I_{SD} = 15A	-	0.8	1.0	
t_{rr}	Reverse Recovery Time	I_{SD} = 35A, dI_{SD}/dt = 100A/μs	-	42	55	ns
Q_{rr}	Reverse Recovery Charge		-	48	62	nC

Notes:
1: Starting T_J = 25°C, L = 0.26mH, I_{AS} = 64A.
2: Pulse width = 100s.

Typical Characteristics

POWER DISSIPATION MULIPLIER vs **T_C, CASE TEMPERATURE(°C)**
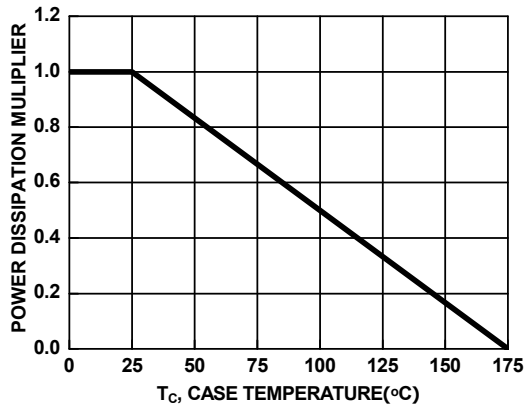
Figure 1. Normalized Power Dissipation vs Case Temperature

$V_{GS} = 10V$

I_D, DRAIN CURRENT (A) vs **T_C, CASE TEMPERATURE(°C)**

CURRENT LIMITED BY PACKAGE
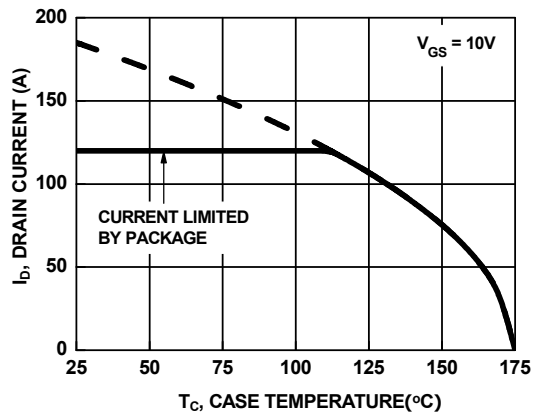
Figure 2. Maximum Continuous Drain Current vs Case Temperature

NORMALIZED THERMAL IMPEDANCE, $Z_{\theta JC}$ vs **t, RECTANGULAR PULSE DURATION(s)**

DUTY CYCLE - DESCENDING ORDER

D = 0.50
0.20
0.10
0.05
0.02
0.01

SINGLE PULSE

P_{DM}

t_1

t_2

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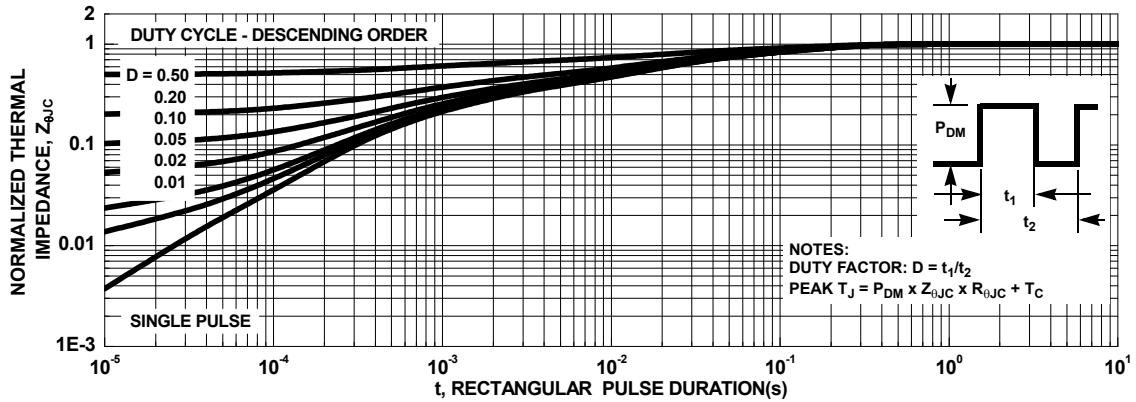
Figure 3. Normalized Maximum Transient Thermal Impedance

$V_{GS} = 10V$

TRANSCONDUCTANCE MAY LIMIT CURRENT IN THIS REGION

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

$$I = I_2 \left[\sqrt{\frac{175 - T_C}{150}} \right]$$

I_{DM}, PEAK CURRENT (A) vs **t, RECTANGULAR PULSE DURATION(s)**

SINGLE PULSE
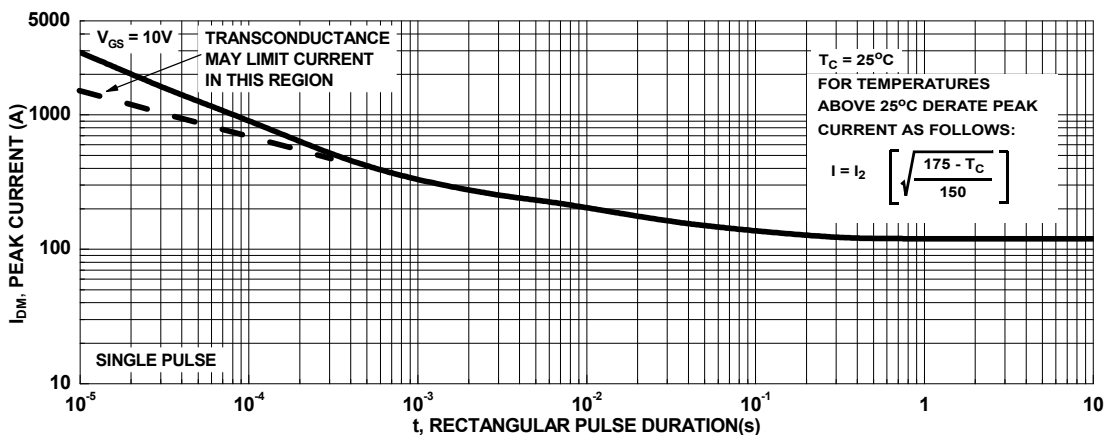
Figure 4. Peak Current Capability

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Typical Characteristics
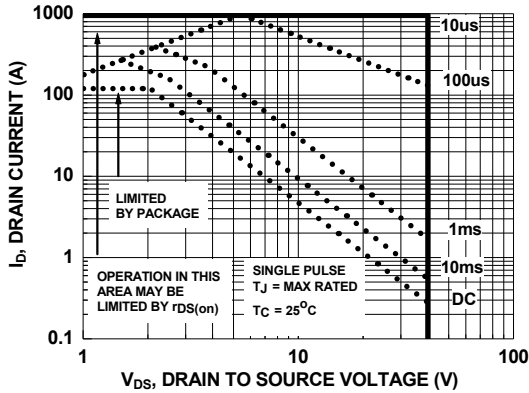
Figure 5. Forward Bias Safe Operating Area

If R = 0
$t_{AV} = (L)(I_{AS})/(1.3*RATED\ BV_{DSS} - V_{DD})$
If R ≠ 0
$t_{AV} = (L/R)ln[(I_{AS}*R)/(1.3*RATED\ BV_{DSS} - V_{DD}) +1]$

STARTING T_J = 25°C

STARTING T_J = 150°C
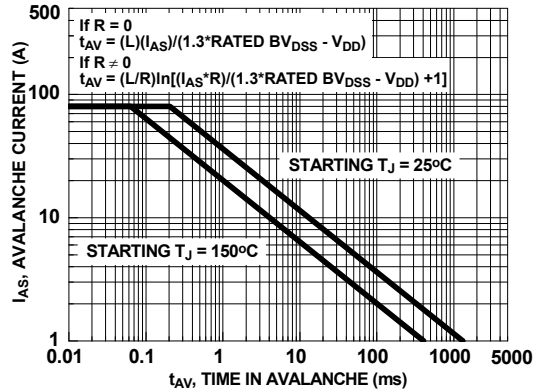
NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

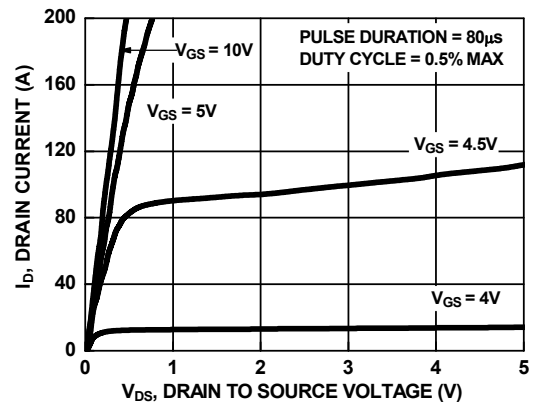**Figure 6. Unclamped Inductive Switching
Capability**

PULSE DURATION = 80μs
DUTY CYCLE = 0.5% MAX
V_{DD} = 5V

T_J = 175°C

T_J = 25°C

T_J = -55°C
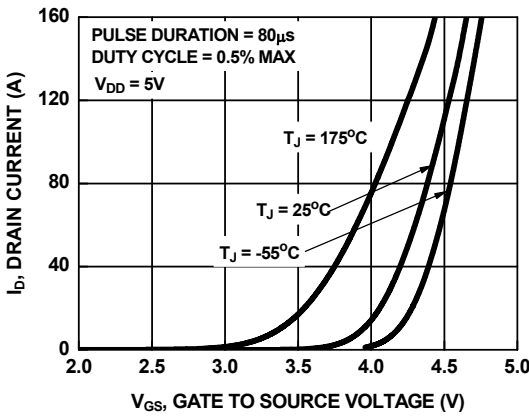
Figure 7. Transfer Characteristics

V_{GS} = 10V

V_{GS} = 5V

PULSE DURATION = 80μs
DUTY CYCLE = 0.5% MAX

V_{GS} = 4.5V

V_{GS} = 4V

Figure 8. Saturation Characteristics

I_D = 80A

PULSE DURATION = 80μs
DUTY CYCLE = 0.5% MAX

T_J = 25°C

T_J = 175°C
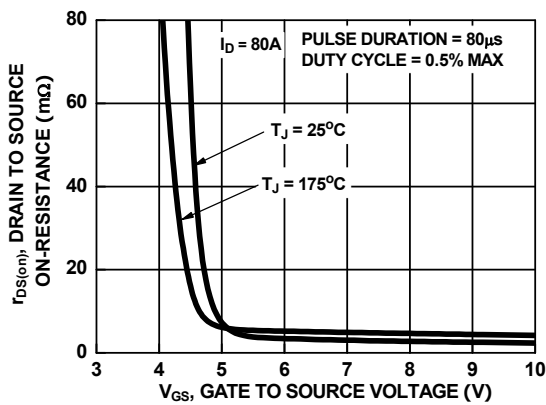
**Figure 9. Drain to Source On-Resistance
Variation vs Gate to Source Voltage**

PULSE DURATION = 80μs
DUTY CYCLE = 0.5% MAX

I_D = 80A
V_{GS} = 10V
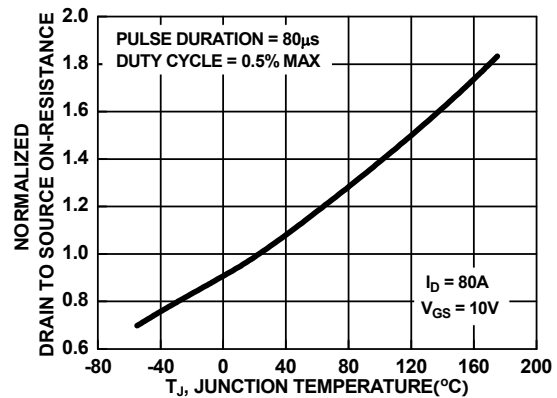
**Figure 10. Normalized Drain to Source On
Resistance vs Junction Temperature**

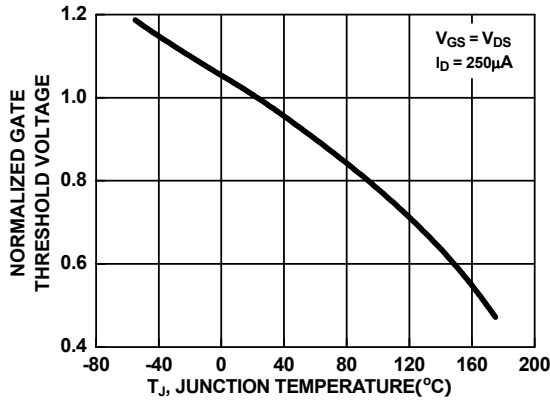## Typical Characteristics

Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature
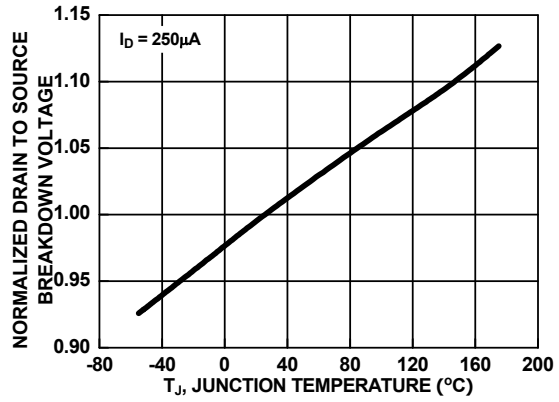

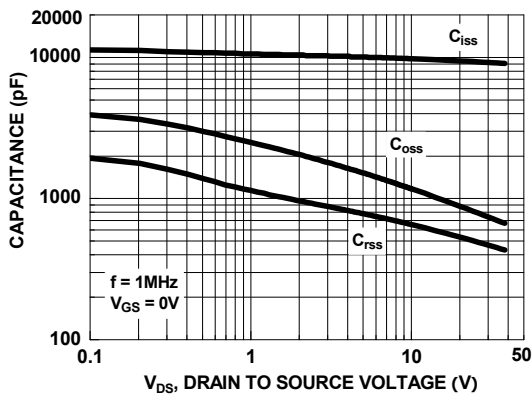Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

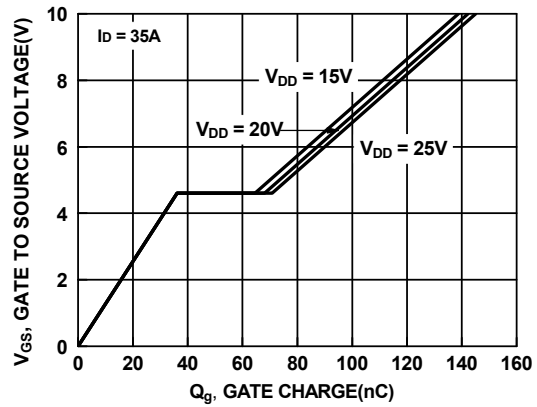

Figure 13. Capacitance vs Drain to Source Voltage

Figure 14. Gate Charge vs Gate to Source Voltage

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