FAIRCHILD SEMICONDUCTOR®

August 2007

FDB8453LZ

N-Channel PowerTrench® MOSFET

40V, 50A, 7.0mΩ

Features

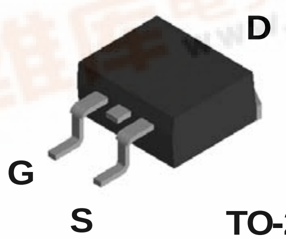
- Max $r_{DS(on)}$ = 7.0mΩ at V_{GS} = 10V, I_D = 17.6A
- Max $r_{DS(on)}$ = 9.0mΩ at V_{GS} = 4.5V, I_D = 14.9A
- HBM ESD protection level of 7.6kV typical (note 4)
- Fast Switching
- RoHS Compliant

General Description

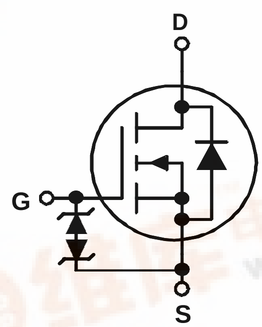
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and switching loss. G-S zener has been added to enhance ESD voltage level.

Applications

- Inverter
- Power Supplies



TO-263AB
FDB Series



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous (Package limited) T_C = 25°C	50	A
	-Continuous (Silicon limited) T_C = 25°C	74	
	-Continuous T_A = 25°C (Note 1a)	16.1	
	-Pulsed	100	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	253	mJ
P_D	Power Dissipation T_C = 25°C	66	W
	Power Dissipation T_A = 25°C (Note 1a)	3.1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.88	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8453LZ	FDB8453LZ	TO-263AB	330mm	24mm	800 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
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		36		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32V, V_{GS} = 0V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±10	μA

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	1.0	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		-6.0		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 17.6A		6.3	7.0	mΩ
		V_{GS} = 4.5V, I_D = 14.9A		7.3	9.0	
		V_{GS} = 10V, I_D = 17.6A, T_J = 125°C		9.9	11	
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 17.6A		84		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 20V, V_{GS} = 0V, f = 1MHz		2665	3545	pF
C_{oss}	Output Capacitance			325	430	pF
C_{rss}	Reverse Transfer Capacitance			200	295	pF
R_g	Gate Resistance	f = 1MHz		2.2		Ω

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 20V, I_D = 17.6A, V_{GS} = 10V, R_{GEN} = 6Ω		11	20	ns
t_r	Rise Time			6	13	ns
$t_{d(off)}$	Turn-Off Delay Time			37	60	ns
t_f	Fall Time			5	11	ns
Q_g	Total Gate Charge	V_{GS} = 0V to 10V; V_{DD} = 20V, I_D = 17.6A		47	66	nC
Q_g	Total Gate Charge	V_{GS} = 0V to 5V		25	35	nC
Q_{gs}	Gate to Source Charge			7		nC
Q_{gd}	Gate to Drain "Miller" Charge			9		nC

Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 2.6A (Note 2)		0.7	1.2	V
		V_{GS} = 0V, I_S = 17.6A (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	I_F = 17.6A, di/dt = 100A/μs		24	38	ns
Q_{rr}	Reverse Recovery Charge			15	27	nC

Notes:

1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

a. 40°C/W when mounted on a 1 in^2 pad of 2 oz copper

b. 62.5°C/W when mounted on a minimum pad.

2: Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

3: Starting T_J = 25°C, L = 3mH, I_{AS} = 13A, V_{DD} = 40V, V_{GS} = 10V.

4: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics T_J = 25°C unless otherwise noted

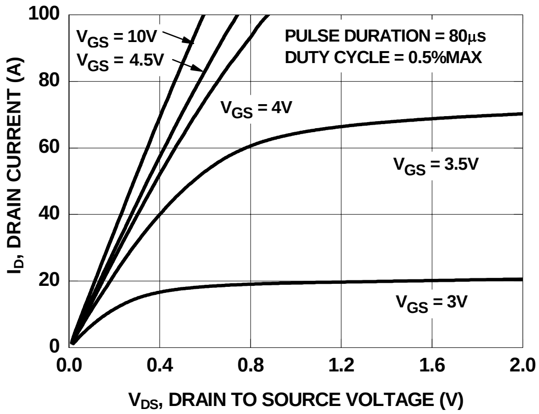


Figure 1. On-Region Characteristics

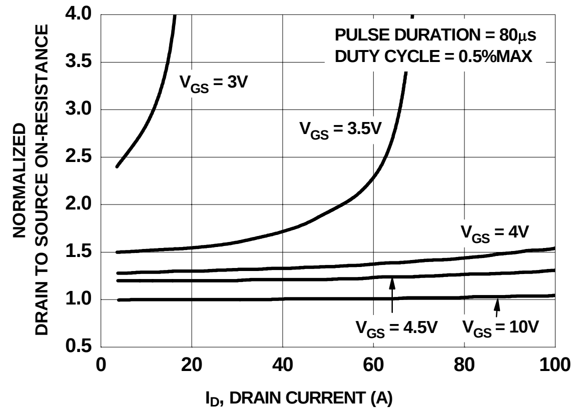


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

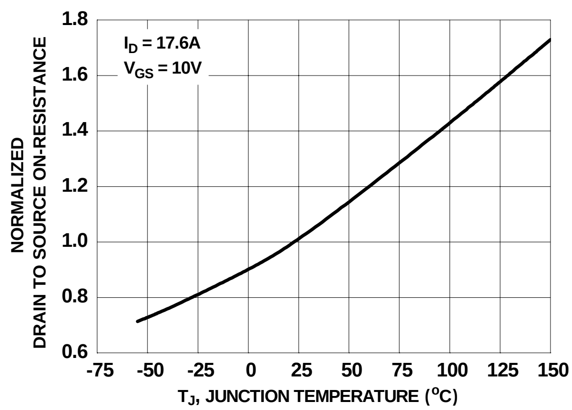


Figure 3. Normalized On- Resistance vs Junction Temperature

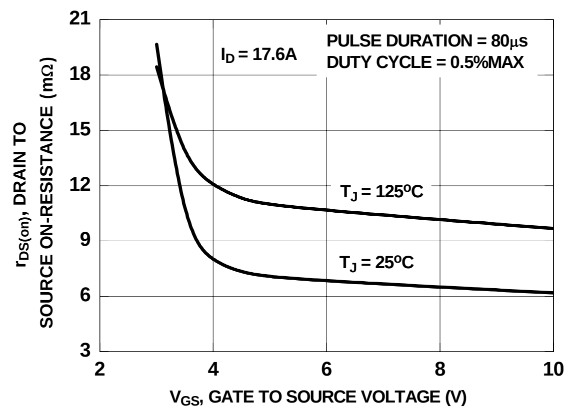


Figure 4. On-Resistance vs Gate to Source Voltage

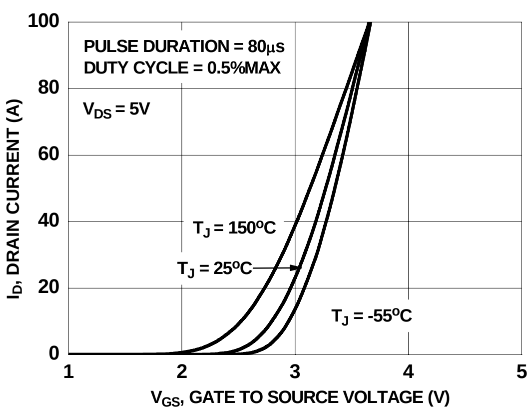


Figure 5. Transfer Characteristics

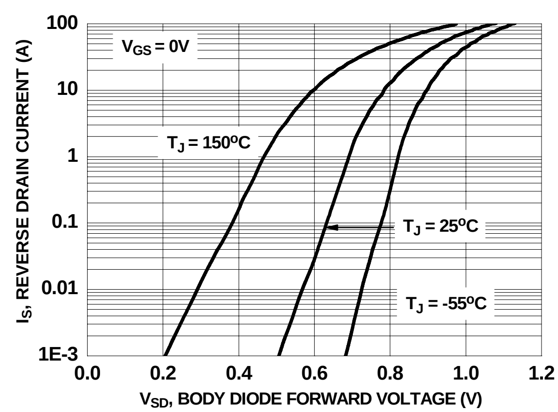


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

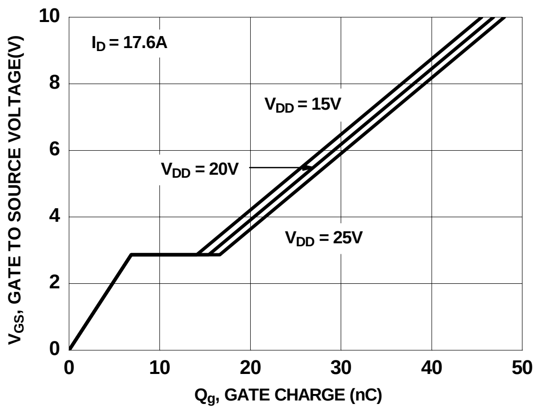


Figure 7. Gate Charge Characteristics

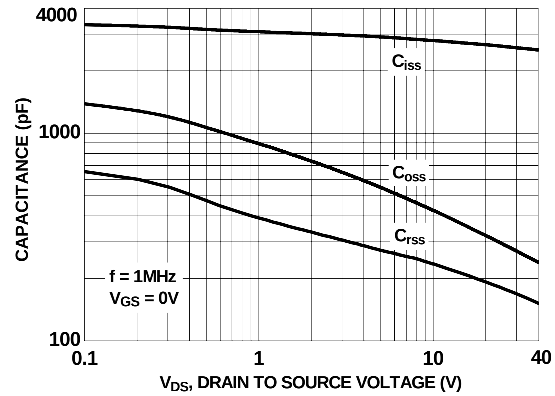


Figure 8. Capacitance vs Drain to Source Voltage

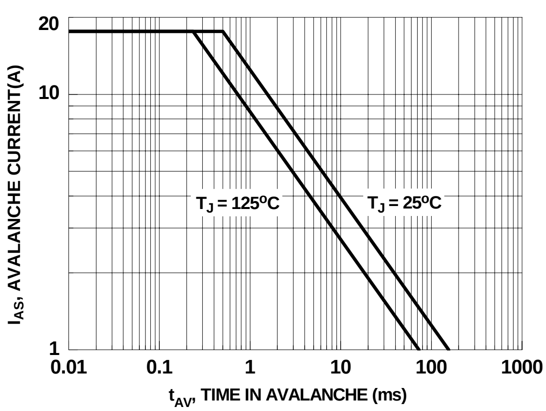


Figure 9. Unclamped Inductive Switching Capability

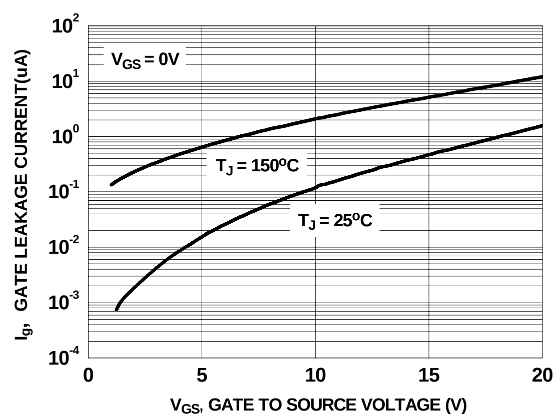


Figure 10. Gate Leakage Current vs Gate to Source Voltage

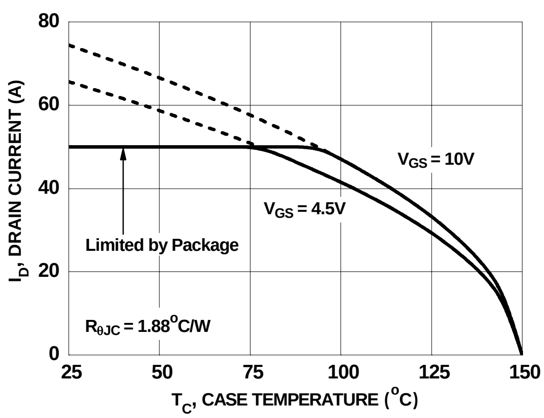


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

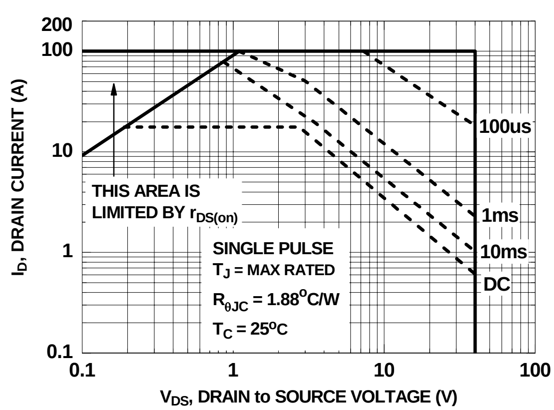


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics T_J = 25°C unless otherwise noted

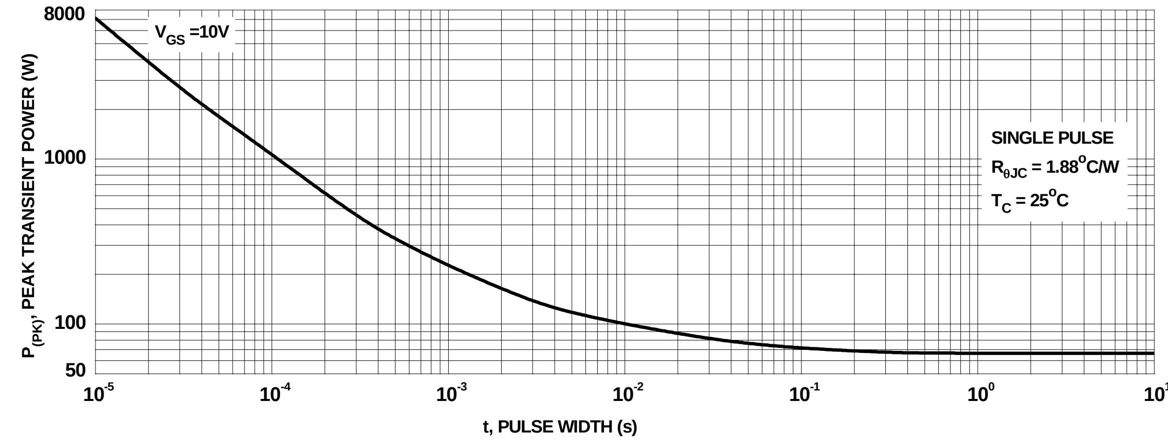


Figure 13. Single Pulse Maximum Power Dissipation

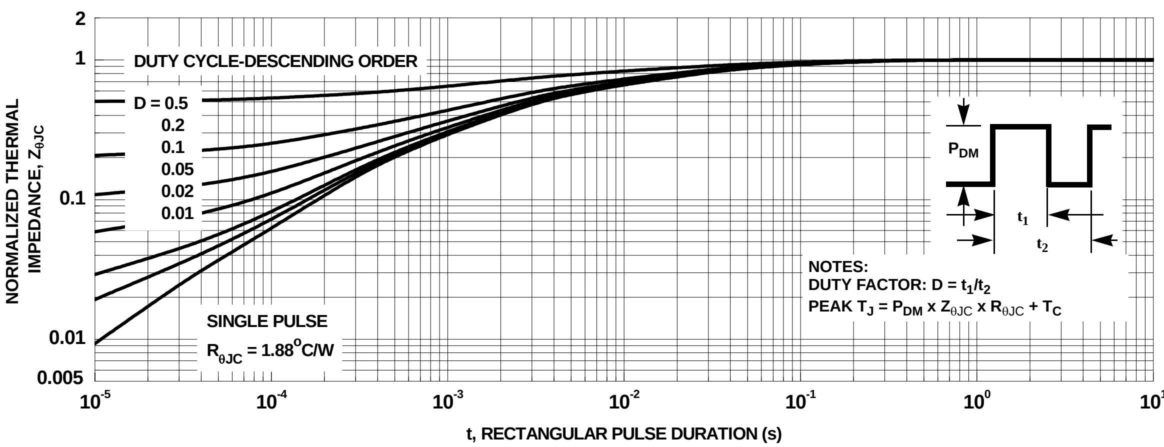


Figure 14. Transient Thermal Response Curve

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