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# FDB9503L-F085

P-Channel PowerTrench® MOSFET

- 40 V, - 110 A, 2.6 mΩ

Features

- Typical $R_{DS(on)}$ = 2.0 mΩ at V_{GS} = - 10V, I_D = - 80 A
- Typical $Q_{g(tot)}$ = 196 nC at V_{GS} = - 10V, I_D = - 80 A
- UIS Capability
- RoHS Compliant
- Qualified to AEC Q101

Applications

- Automotive Engine Control
- PowerTrain Management
- Solenoid and Motor Drivers
- Electrical Power Steering
- Integrated Starter/Alternator
- Distributed Power Architectures and VRM
- Primary Switch for 12V Systems

TO-263AB
FDB SERIES
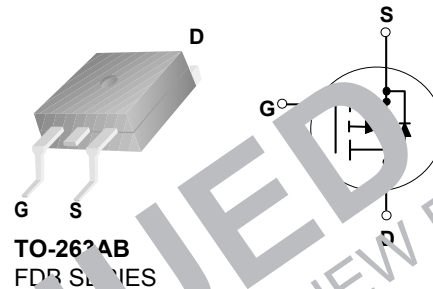
MOSFET Maximum Ratings T_J = 25°C unless otherwise noted.

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		-40	V
V_{GS}	Gate-to-Source Voltage		±16	V
I_D	Drain Current - Continuous (V_{GS}= -10) (Note 1)	T_C = 25°C	-110	A
	Pulsed Drain Current	T_C = 25°C	See Figure 4	
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	984	mJ
P_D	Power Dissipation		333	W
	Derate Above 25°C		2.22	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to + 175	°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case		0.45	°C/W
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient	(Note 3)	43	°C/W

Notes:
1: Current is limited by wirebond configuration.
2: Starting T_J = 25°C, L = 0.3mH, I_{AS} = -81A, V_{DD} = -40V during inductor charging and V_{DD} = 0V during time in avalanche.
3: $R_{\theta JA}$ 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 board design. The maximum rating presented here is based on mounting on a 1 in² pad of 2oz copper.

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB9503L	FDB9503L-F085	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
B_{VDSS}	Drain-to-Source Breakdown Voltage	I_D = -250µA, V_{GS} = 0V		-40	-	-	V
I_{DSS}	Drain-to-Source Leakage Current	V_{DS} = -40V, V_{GS} = 0V	T_J = 25°C	-	-	-1	µA
			T_J = 175°C (Note 4)	-	-	-1	mA
I_{GSS}	Gate-to-Source Leakage Current	V_{GS} = ±16V, V_{DS} = 0V		-	-	±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		-1.0	-1.5		V
$R_{DS(on)}$	Drain to Source On Resistance	I_D = -80A, V_{GS}= -4.5V, T_J = 25°C		-	2.	3.	mΩ
		I_D = -80A, V_{GS}= -10V	T_J = 25°C		2.0	2.6	mΩ
			T_J = 175°C (Note 4)		2.9	.7	mΩ

Dynamic Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
C_{iss}	Input Capacitance	V_{DS} = -20V, V_{GS} = 0V, f = 1MHz		-	832	-	pF
C_{oss}	Output Capacitance			-	5620	-	pF
C_{rss}	Reverse Transfer Capacitance			-	102	-	pF
R_g	Gate Resistance	f = 1MHz		-	20	-	Ω
$Q_{g(ToT)}$	Total Gate Charge at 10V	V_{GS} = 0 to -10V	V_{DD} = -32V, I_D = -80A	-	196	255	nC
$Q_{g(th)}$	Threshold Gate Charge	V_{GS} = 0 to 2V		-	26		nC
Q_{gs}	Gate-to-Source Gate Charge			-	14	-	nC
Q_{gd}	Gate-to-Drain "Miller" Charge			-	22	-	nC

Switching Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
t_{on}	Turn-On Time	V_{DD} = -20V, I_D = -80A, V_{GS} = -10V, R_{GEN} = 6Ω		-	-	146	ns
$t_{d(on)}$	Turn-On Delay			-	12	-	ns
t_r	Rise Time			-	86	-	ns
$t_{d(off)}$	Turn-Off Delay			-	700	-	ns
	Fall Time			-	310	-	ns
t_{off}	Turn-Off Time			-	-	1538	ns

Drain Source Diode Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{SD}	Source-to-Drain Diode Voltage	I_{SD} = -80A, V_{GS} = 0V		-	-	-1.25	V
		I_{SD} = -40A, V_{GS} = 0V		-	-	-1.2	V
t_r	Reverse-Recovery Time	I_{SD} = -80A, dI_{SD}/dt = 100A/µs, V_{DD}= -32V		-	124	186	ns
Q_{rr}	Reverse-Recovery Charge			-	214	321	nC

Note:

4: The maximum value is specified by design at T_J = 175°C. Product is not tested to this condition in production.
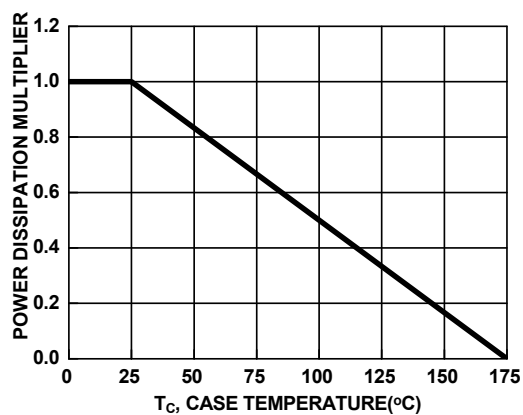
Typical Characteristics

Figure 1. Normalized Power Dissipation vs. Case Temperature
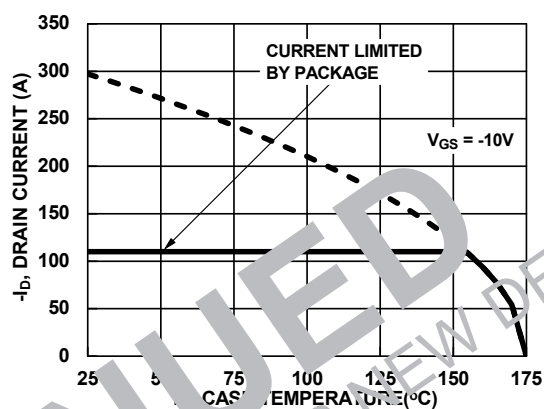

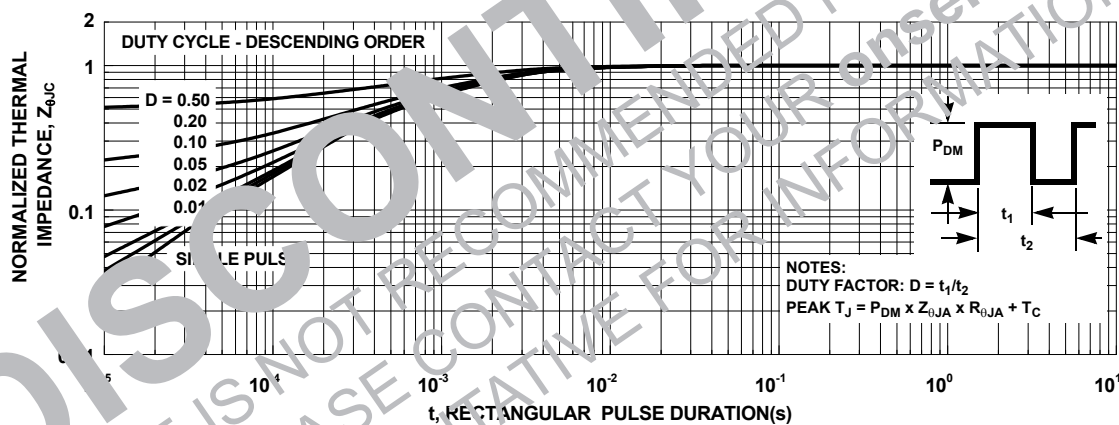**Figure 2. Maximum Continuous Drain Current vs. Case Temperature**

$V_{GS} = -10V$

CURRENT LIMITED BY PACKAGE

DUTY CYCLE - DESCENDING ORDER

D = 0.50
0.20
0.10
0.05
0.02
0.01

SINGLE PULSE

NOTES:
DUTY FACTOR: $D = t_1/t_2$
PEAK $T_J = P_{DM} \times Z_{\theta JA} \times R_{\theta JA} + T_C$

Figure 3. Normalized Maximum Transient Thermal Impedance

Typical Characteristics
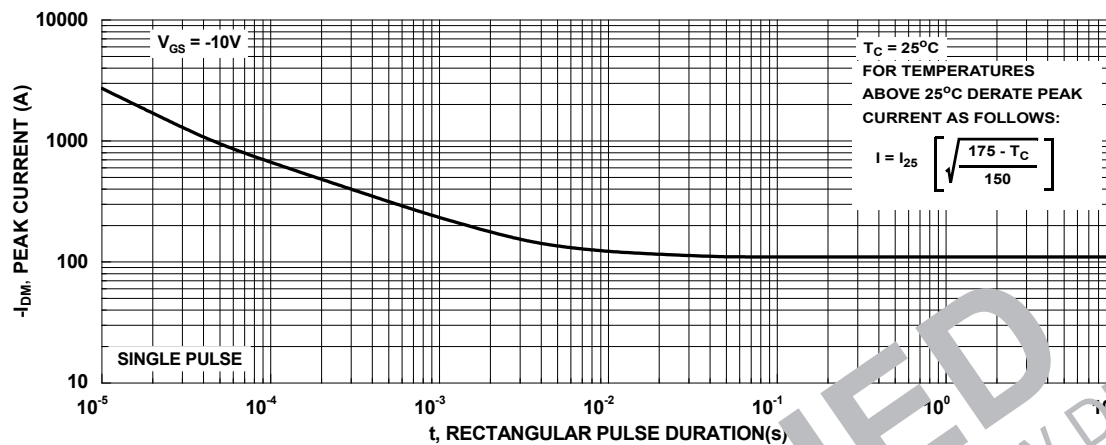
Figure 4. Peak Current Capability
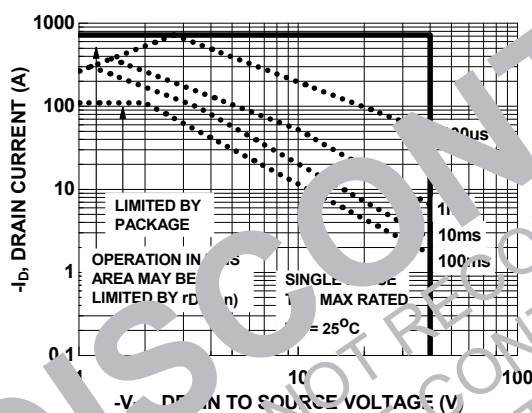
Figure 5. Forward Bias Safe Operating Area
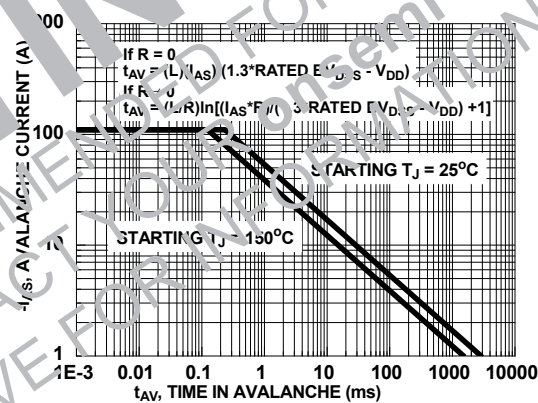
NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability
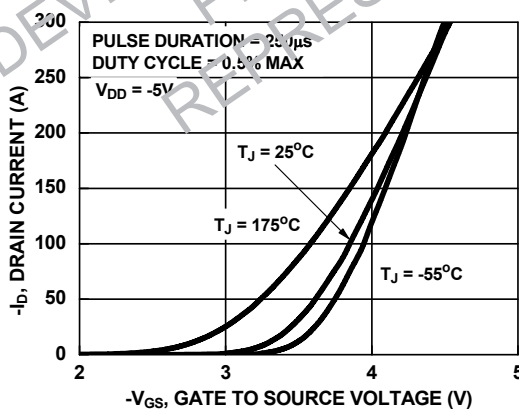
Figure 7. Transfer Characteristics
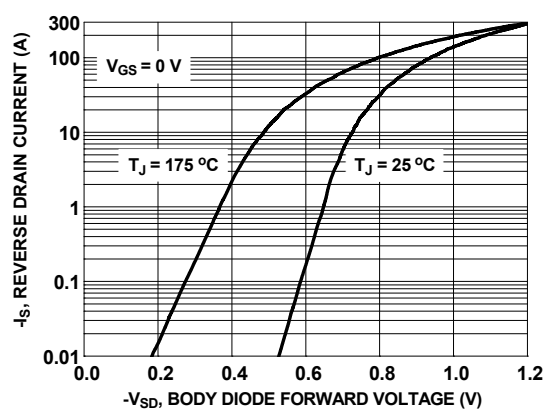
Figure 8. Forward Diode Characteristics

Typical Characteristics
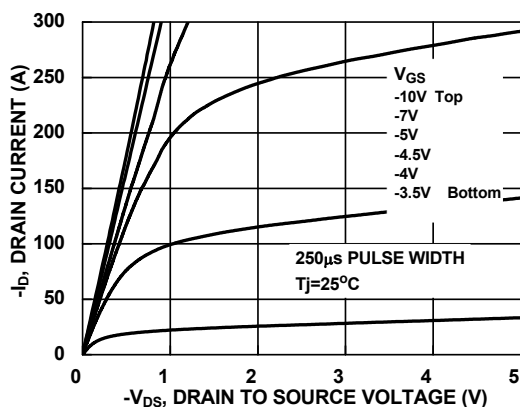
Figure 9. Saturation Characteristics
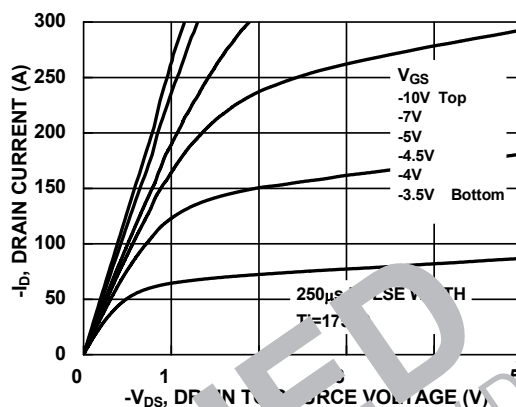
Figure 10. Saturation Characteristics
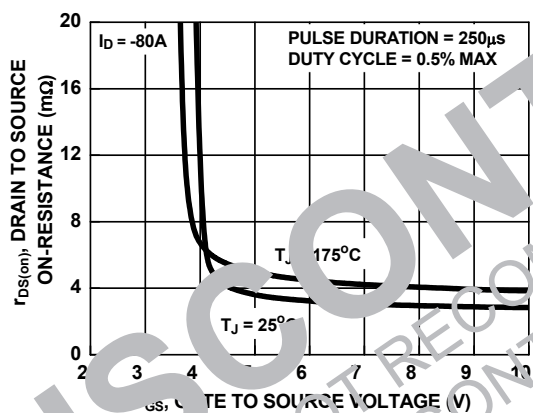
Figure 11. R$_{DSON}$ vs. Gate Voltage
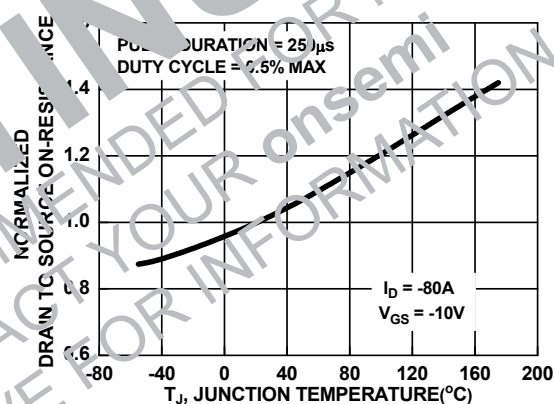
Figure 12. Normalized R$_{DSON}$ vs. Junction Temperature
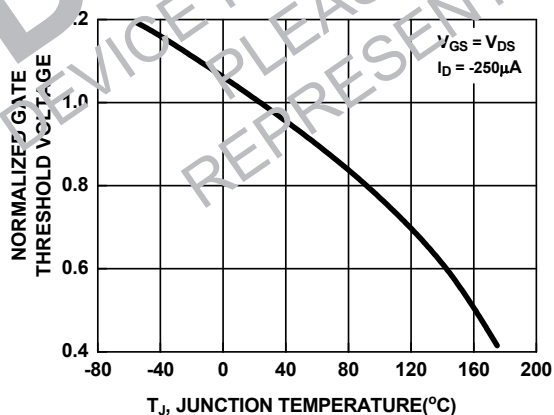
Figure 13. Normalized Gate Threshold Voltage vs. Temperature
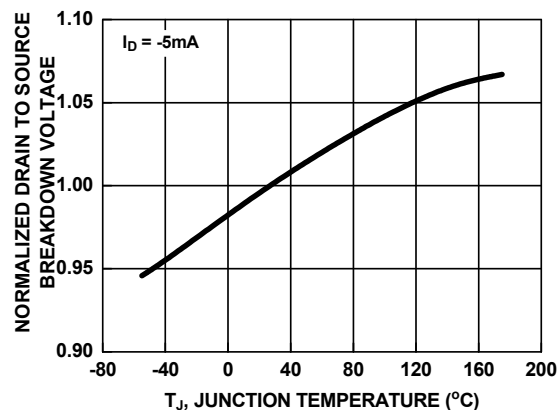
Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

DISCONTINUED

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN

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Typical Characteristics
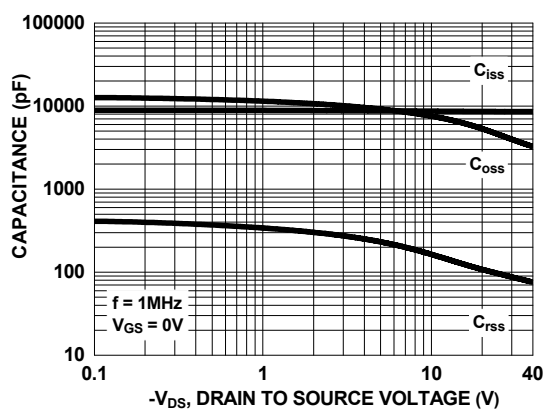
Figure 15. Capacitance vs. Drain to Source Voltage
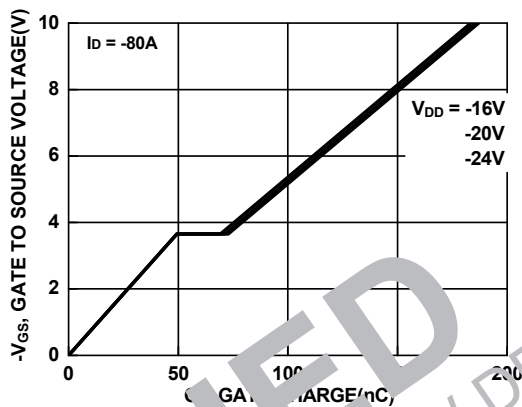
Figure 16. Gate Charge vs. Gate to Source Voltage

PUBLICATION ORDERING INFORMATION

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