ON Semiconductor

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ON Semiconductor®

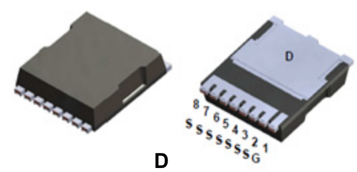
FDBL86561-F085

N-Channel PowerTrench® MOSFET

60 V, 300 A, 1.1 mΩ

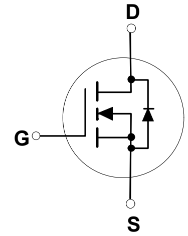
Features

- Typical $R_{DS(on)}$ = 0.85 mΩ at V_{GS} = 10V, I_D = 80 A
- Typical $Q_{g(tot)}$ = 170 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
- Integrated Starter/Alternator
- Primary Switch for 12V Systems



MOSFET Maximum Ratings T_J = 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}=10) (Note 1)	T_C = 25°C	300	A
	Pulsed Drain Current	T_C = 25°C	See Figure 4	
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	1167	mJ
P_D	Power Dissipation		429	W
	Derate Above 25°C		2.86	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to + 175	°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case		0.35	°C/W
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient	(Note 3)	43	°C/W

Notes:
1: Current is limited by bondwire configuration.
2: Starting T_J = 25°C, L = 0.57mH, I_{AS} = 64A, 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 in^2 pad of 2oz copper.

Package Marking and Ordering Information

Device Marking	Device	Package			
FDBL86561	FDBL86561-F085	MO-299A	-	-	-

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Electrical Characteristics T_J = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
B_{VDSS}	Drain-to-Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	60	-	-	V
I_{DSS}	Drain-to-Source Leakage Current	V_{DS} = 60V, V_{GS} = 0V, T_J = 25°C	-	-	1	μA
		V_{DS} = 60V, V_{GS} = 0V, T_J = 175°C (Note 4)	-	-	3	mA
I_{GSS}	Gate-to-Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.0	3.0	4.0	V
$R_{DS(on)}$	Drain to Source On Resistance	I_D = 80A, V_{GS}= 10V, T_J = 25°C	-	0.85	1.1	mΩ
		I_D = 80A, V_{GS}= 10V, T_J = 175°C (Note 4)	-	1.5	2.2	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz	-	13650	-	pF
C_{oss}	Output Capacitance		-	3375	-	pF
C_{rss}	Reverse Transfer Capacitance		-	255	-	pF
R_g	Gate Resistance	f = 1MHz	-	2.3	-	Ω
$Q_{g(ToT)}$	Total Gate Charge at 10V	V_{GS} = 0 to 10V; V_{DD} = 48V, I_D = 80A	-	170	220	nC
$Q_{g(th)}$	Threshold Gate Charge	V_{GS} = 0 to 2V; V_{DD} = 48V, I_D = 80A	-	24	32	nC
Q_{gs}	Gate-to-Source Gate Charge	V_{DD} = 48V, I_D = 80A	-	56	-	nC
Q_{gd}	Gate-to-Drain "Miller" Charge		-	24	-	nC
Switching Characteristics						
t_{on}	Turn-On Time	V_{DD} = 30V, I_D = 80A, V_{GS} = 10V, R_{GEN} = 6Ω	-	-	137	ns
$t_{d(on)}$	Turn-On Delay		-	45	-	ns
t_r	Rise Time		-	61	-	ns
$t_{d(off)}$	Turn-Off Delay		-	80	-	ns
t_f	Fall Time		-	41	-	ns
t_{off}	Turn-Off Time		-	-	156	ns
Drain-Source Diode Characteristics						
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_{rr}	Reverse-Recovery Time	I_F = 80A, dI_{SD}/dt = 100A/μs, V_{DD}=48V	-	107	139	ns
Q_{rr}	Reverse-Recovery Charge		-	183	265	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

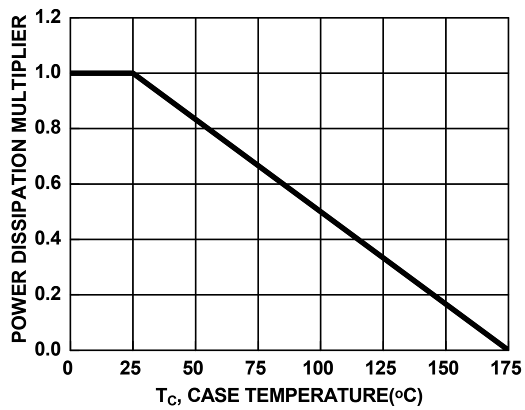


Figure 1. Normalized Power Dissipation vs. Case Temperature

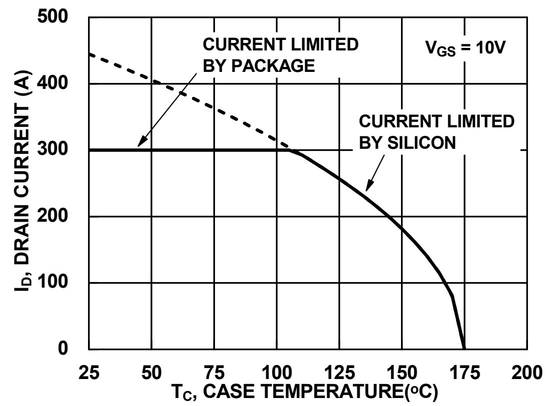


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

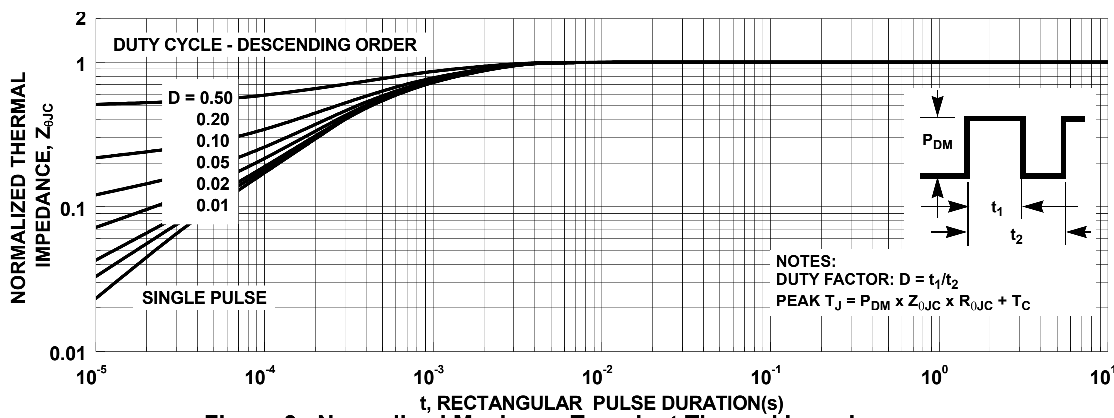


Figure 3. Normalized Maximum Transient Thermal Impedance

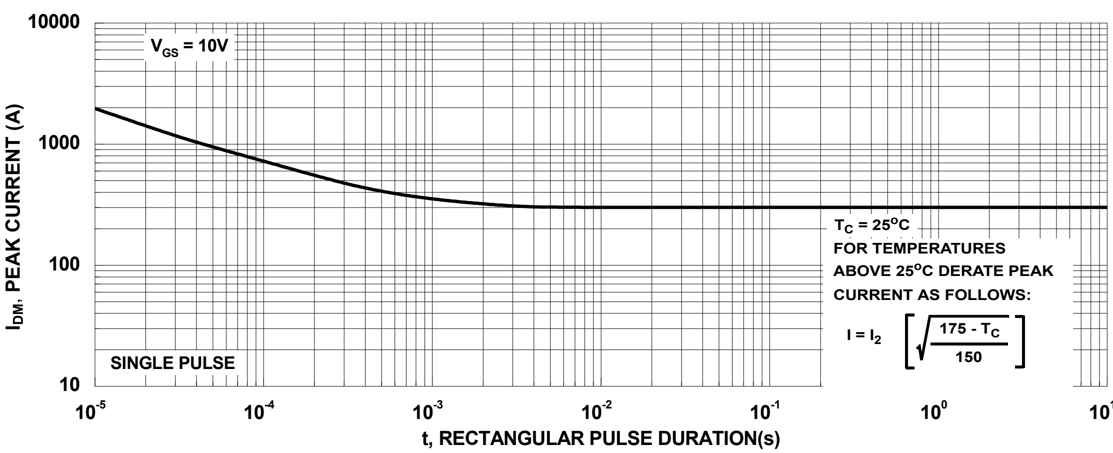


Figure 4. Peak Current Capability

Typical Characteristics

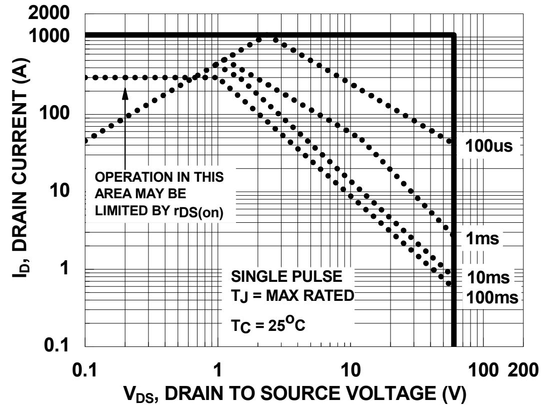
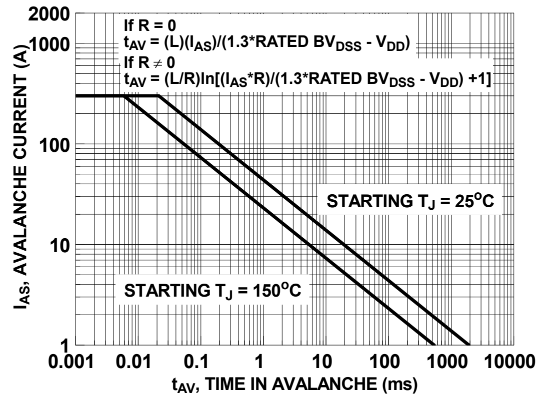


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

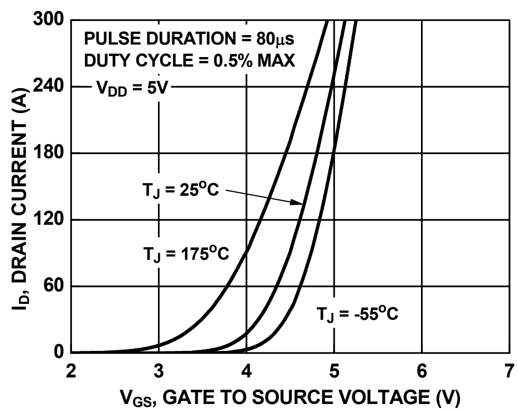


Figure 7. Transfer Characteristics

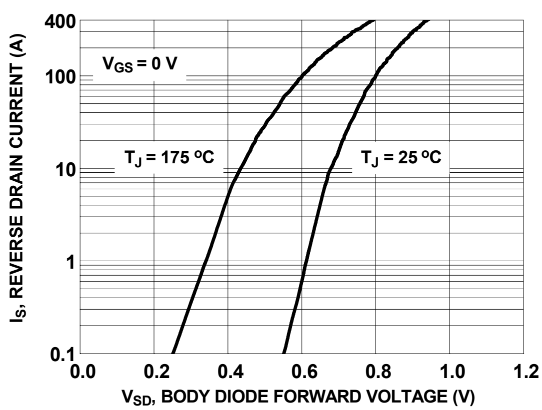


Figure 8. Forward Diode Characteristics

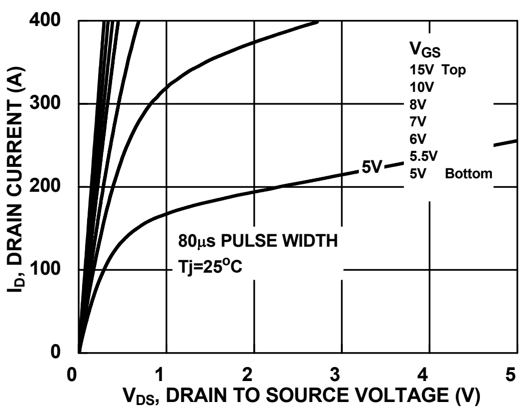


Figure 9. Saturation Characteristics

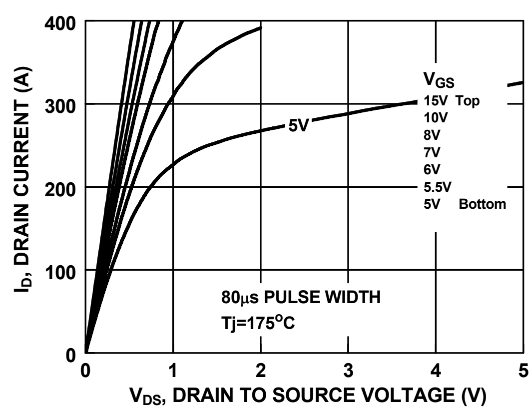


Figure 10. Saturation Characteristics

Typical Characteristics

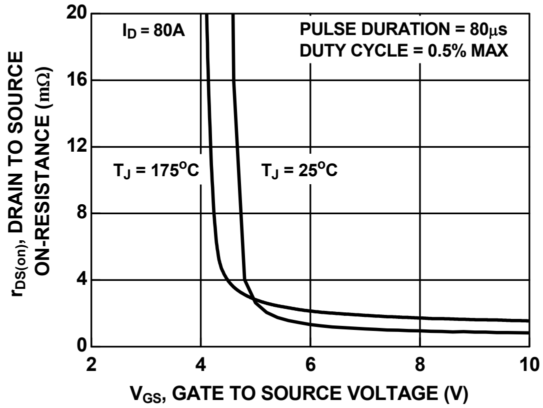


Figure 11. R_{DSON} vs. Gate Voltage

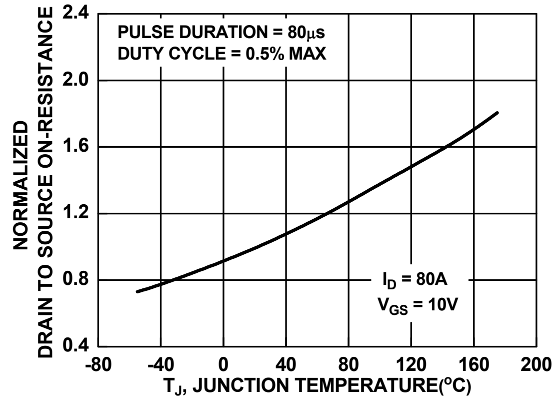


Figure 12. Normalized R_{DSON} vs. Junction Temperature

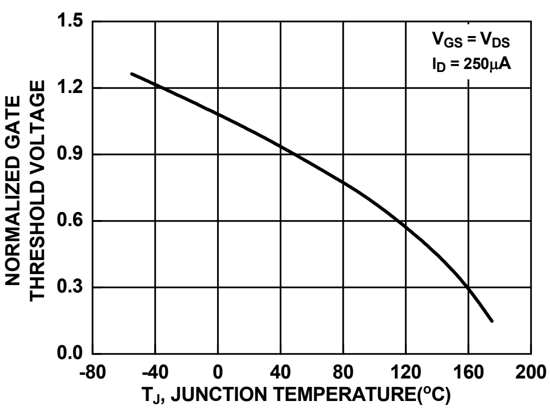


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

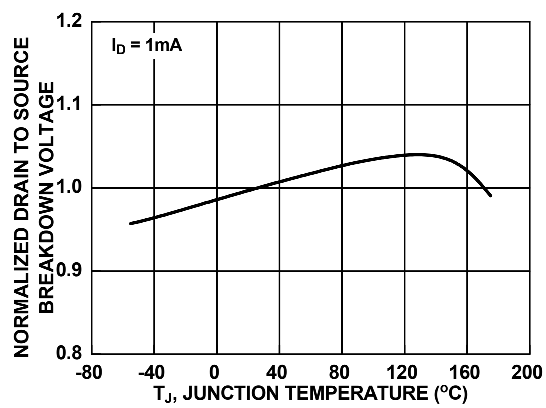


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

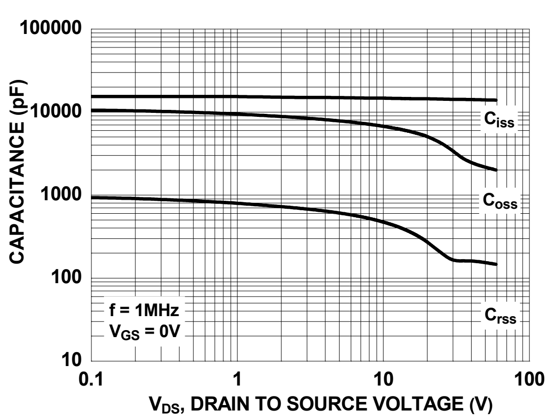


Figure 15. Capacitance vs. Drain to Source Voltage

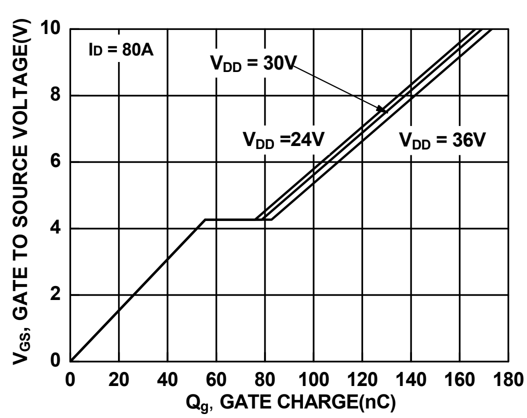


Figure 16. Gate Charge vs. Gate to Source Voltage

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