ON Semiconductor®

FDMS86350

N-Channel PowerTrench® MOSFET

80 V, 130 A, 2.4 mΩ

Features

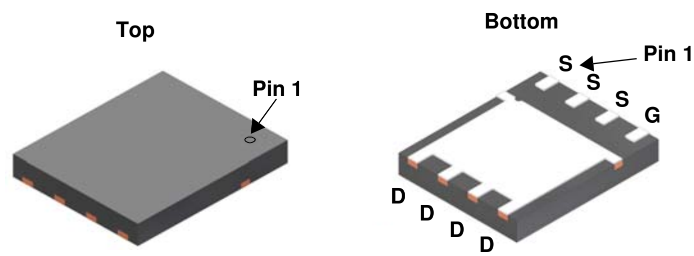
- Max $r_{DS(on)}$ = 2.4 mΩ at V_{GS} = 10 V, I_D = 25 A
- Max $r_{DS(on)}$ = 3.2 mΩ at V_{GS} = 8 V, I_D = 22 A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

General Description

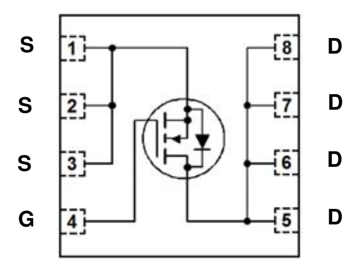
This N-Channel MOSFET is produced using ON Semiconductor's advanced Power Trench® process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Applications

- Primary MOSFET
- Synchronous Rectifier
- Load Switch
- Motor Control Switch



Power 56



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			80	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous	T_C = 25 °C		130	A
	-Continuous	T_A = 25 °C	(Note 1a)	25	
	-Pulsed		(Note 4)	300	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	864	mJ
P_D	Power Dissipation	T_C = 25 °C		156	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.7	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		0.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86350	FDMS86350	Power 56	13 ”	12 mm	3000 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 = 250 μA, V_{GS} = 0 V	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		45		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 64 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±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 = 250 μA	2.5	3.8	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-12		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 25 A		2.0	2.4	mΩ
		V_{GS} = 8 V, I_D = 22 A		2.5	3.2	
		V_{GS} = 10 V, I_D = 25 A, T_J = 125 °C		3.1	3.8	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 25 A		70		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 40 V, V_{GS} = 0 V, f = 1 MHz		8030	10680	pF
C_{oss}	Output Capacitance			1370	1825	pF
C_{rss}	Reverse Transfer Capacitance			31	50	pF
R_g	Gate Resistance		0.1	1.1	3	Ω

Switching Characteristics

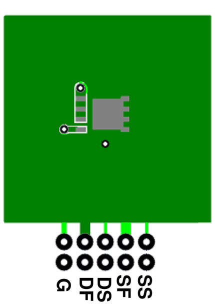
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 40 V, I_D = 25 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		50	80	ns
t_r	Rise Time			34	55	ns
$t_{d(off)}$	Turn-Off Delay Time			40	65	ns
t_f	Fall Time			11	20	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 40 V, I_D = 25 A		110	155	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 8 V; V_{DD} = 40 V, I_D = 25 A		90	127	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 40 V, I_D = 25 A		46		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 40 V, I_D = 25 A		23		nC

Drain-Source Diode Characteristics

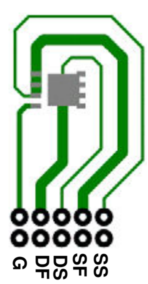
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Diode Continuous Forward Current	T_C = 25 °C			130	A
$I_{S, pulse}$	Diode Pulse Current	T_C = 25 °C			300	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.71	1.2	V
		V_{GS} = 0 V, I_S = 25 A (Note 2)		0.79	1.3	
t_{rr}	Reverse Recovery Time	I_F = 25 A, di/dt = 100 A/μs		63	101	ns
Q_{rr}	Reverse Recovery Charge			62	100	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 45 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 115 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 864 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 24 A, V_{DD} = 80 V, V_{GS} = 10 V, 100% test at L = 0.1 mH, I_{AS} = 74 A.
4. Pulse Id limited by junction temperature, td <= 100 μs, please refer to SOA curve for more details.

Typical Characteristics T_J = 25 °C unless otherwise noted

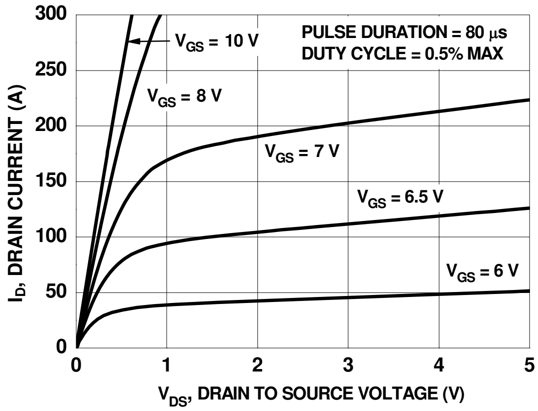


Figure 1. On-Region Characteristics

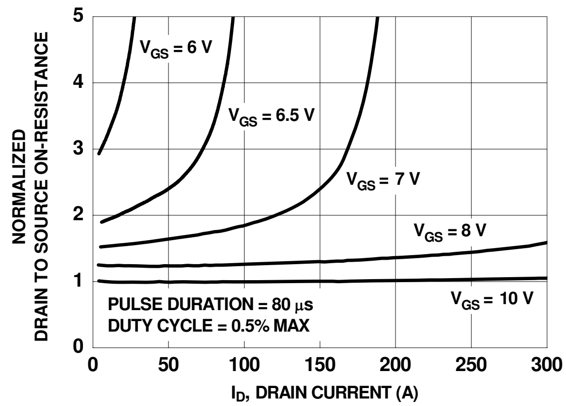


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

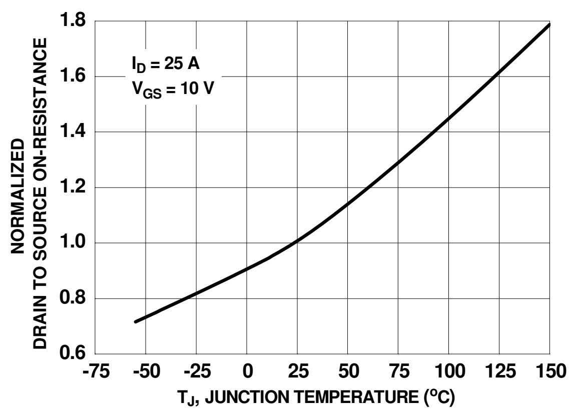


Figure 3. Normalized On- Resistance vs Junction Temperature

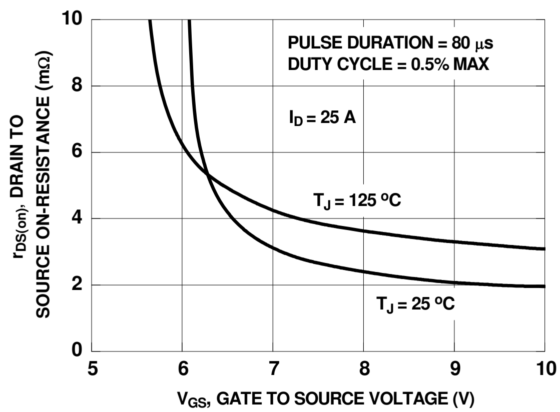


Figure 4. On-Resistance vs Gate to Source Voltage

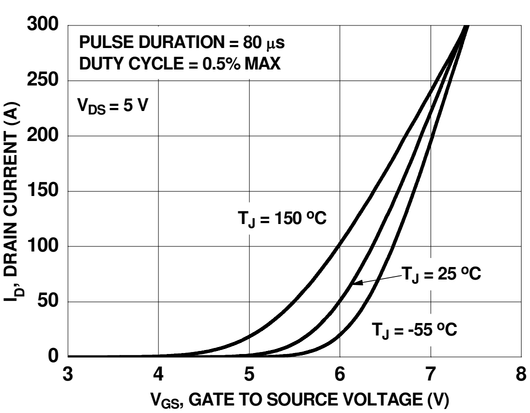


Figure 5. Transfer Characteristics

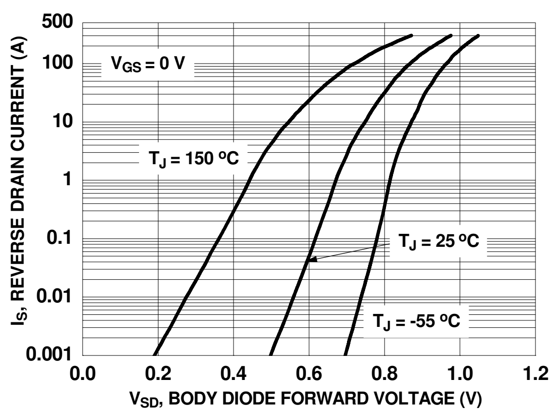


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

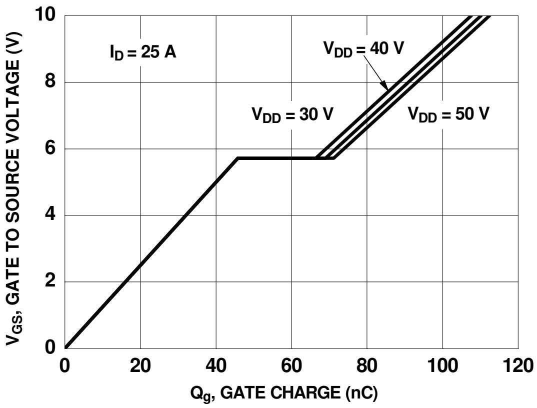


Figure 7. Gate Charge Characteristics

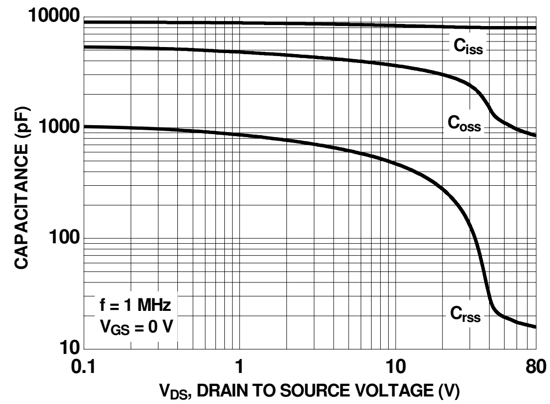


Figure 8. Capacitance vs Drain to Source Voltage

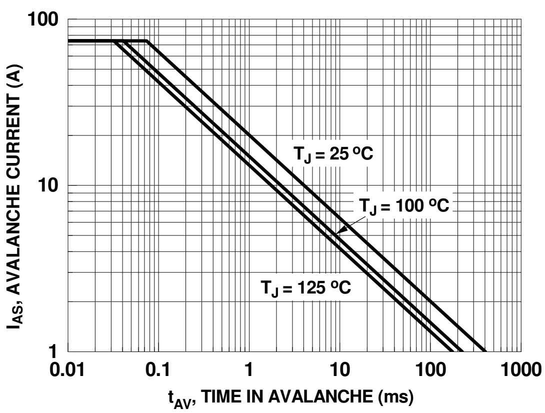


Figure 9. Unclamped Inductive Switching Capability

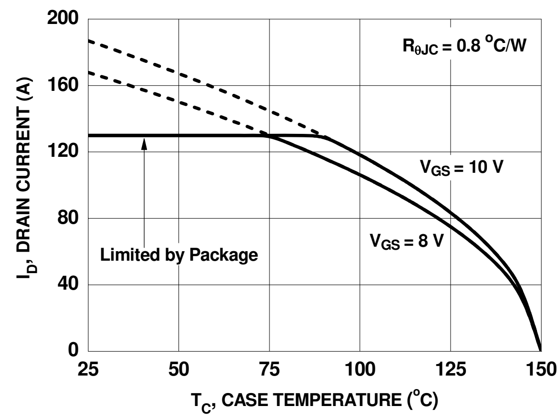


Figure 10. Maximum Continuous Drain Current vs Case Temperature

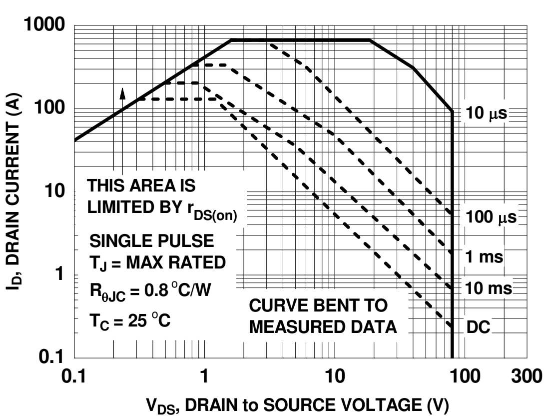


Figure 11. Forward Bias Safe Operating Area

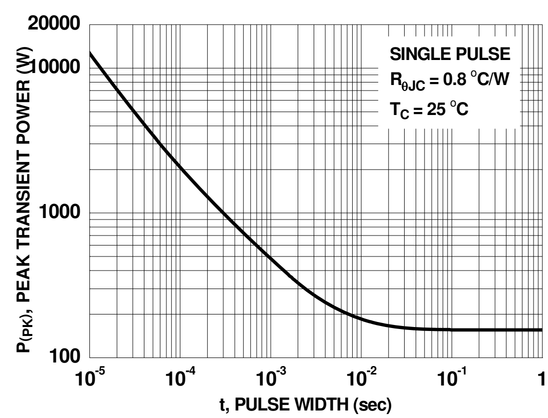


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

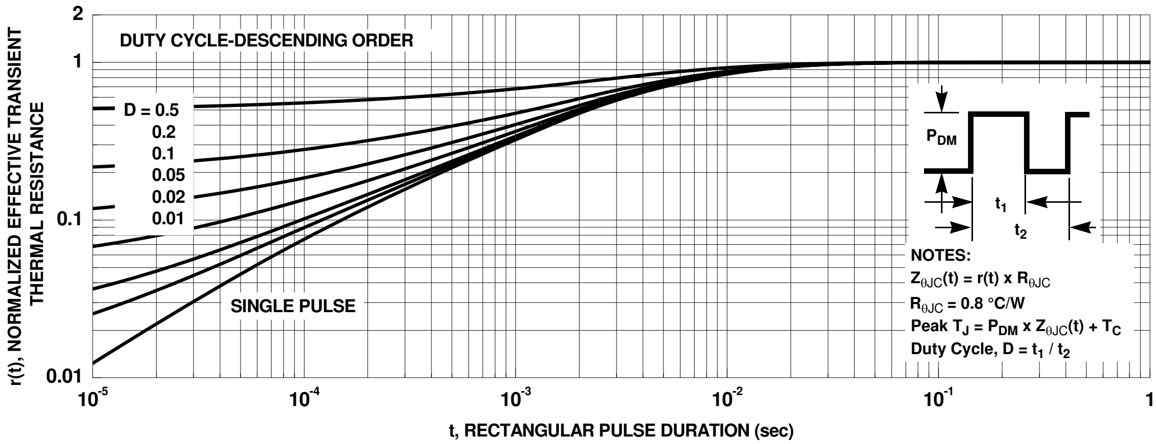


Figure 13. Junction-to-Case Transient Thermal Response Curve

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