



ON Semiconductor®

FDMS86350

N-Channel PowerTrench® MOSFET 80 V, 130 A, 2.4 mΩ

Features

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

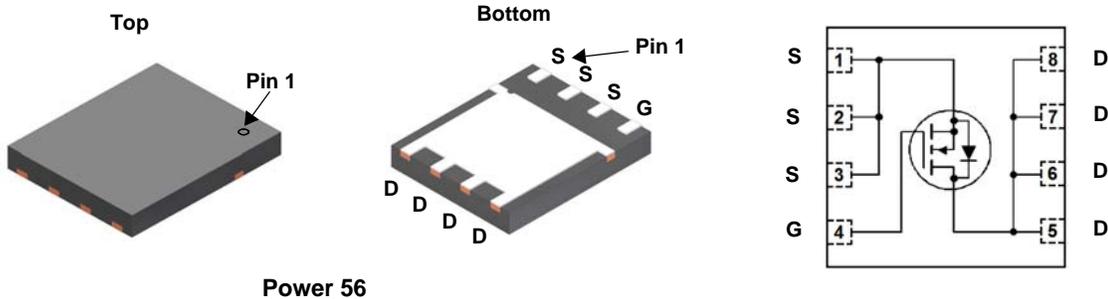


General Description

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 $T_A = 25\text{ °C}$ unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	80	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous	$T_C = 25\text{ °C}$	A
	-Continuous	$T_A = 25\text{ °C}$ (Note 1a)	
	-Pulsed	(Note 4)	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	mJ
P_D	Power Dissipation	$T_C = 25\text{ °C}$	W
	Power Dissipation	$T_A = 25\text{ °C}$ (Note 1a)	
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 $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		45		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	2.5	3.8	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-12		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$		2.0	2.4	m Ω
		$V_{GS} = 8\text{ V}$, $I_D = 22\text{ A}$		2.5	3.2	
		$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		3.1	3.8	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 25\text{ A}$		70		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		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

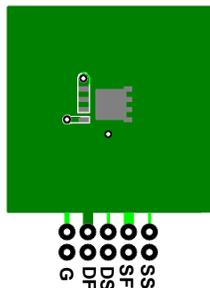
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{ V}$, $I_D = 25\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		50	80	ns
t_r	Rise Time			34	55	ns
$t_{d(off)}$	Turn-Off Delay Time			40	65	ns
t_f	Fall Time			11	20	ns
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } 10\text{ V}$	$V_{DD} = 40\text{ V}$, $I_D = 25\text{ A}$	110	155	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } 8\text{ V}$		90	127	nC
Q_{gs}	Gate to Source Charge			46		nC
Q_{gd}	Gate to Drain "Miller" Charge			23		nC

Drain-Source Diode Characteristics

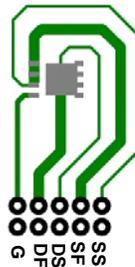
I_S	Diode Continuous Forward Current	$T_C = 25\text{ }^\circ\text{C}$			130	A
$I_{S, pulse}$	Diode Pulse Current	$T_C = 25\text{ }^\circ\text{C}$			300	A
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.1\text{ A}$ (Note 2)		0.71	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = 25\text{ A}$ (Note 2)		0.79	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 25\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		63	101	ns
Q_{rr}	Reverse Recovery Charge			62	100	nC

Notes:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{ in.}$ 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. $45\text{ }^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper.



b. $115\text{ }^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < $300\text{ }\mu\text{s}$, Duty cycle < 2.0%.

- E_{AS} of 864 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 24\text{ A}$, $V_{DD} = 80\text{ V}$, $V_{GS} = 10\text{ V}$, 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 74\text{ A}$.

- Pulse I_d limited by junction temperature, $t_d \leq 100\text{ }\mu\text{s}$, please refer to SOA curve for more details.

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

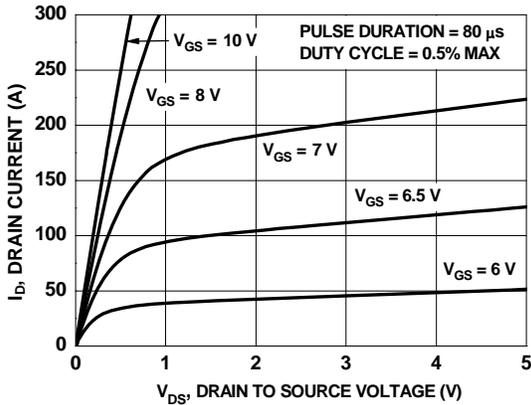


Figure 1. On-Region Characteristics

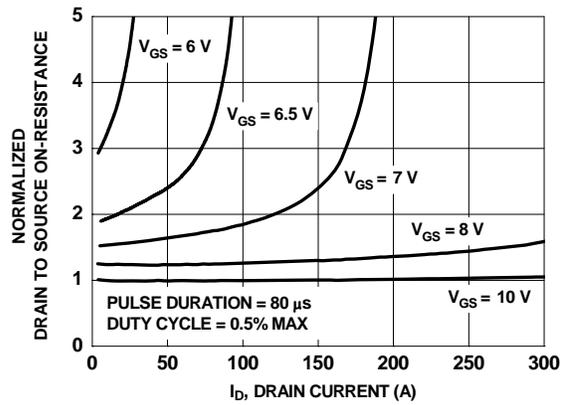


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

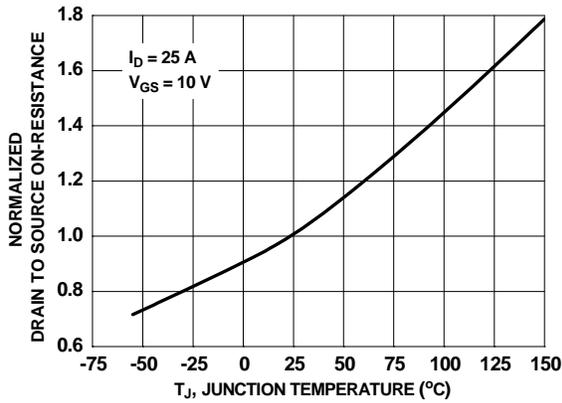


Figure 3. Normalized On-Resistance vs Junction Temperature

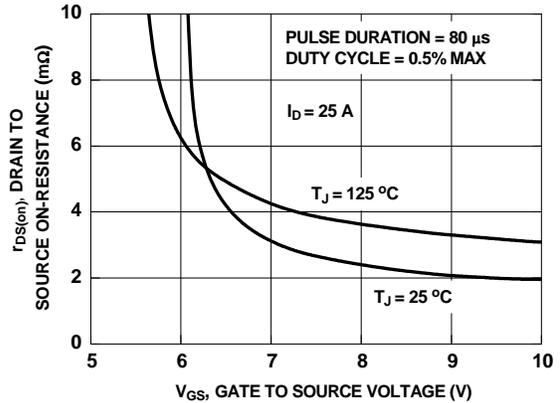


Figure 4. On-Resistance vs Gate to Source Voltage

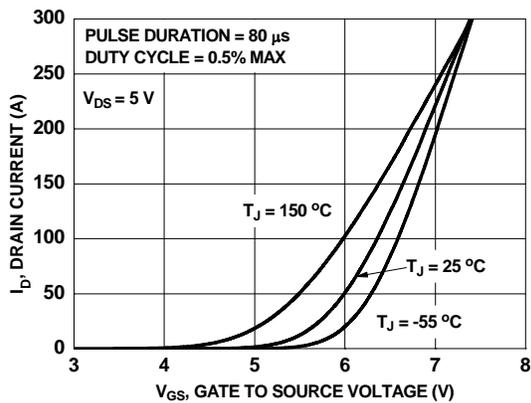


Figure 5. Transfer Characteristics

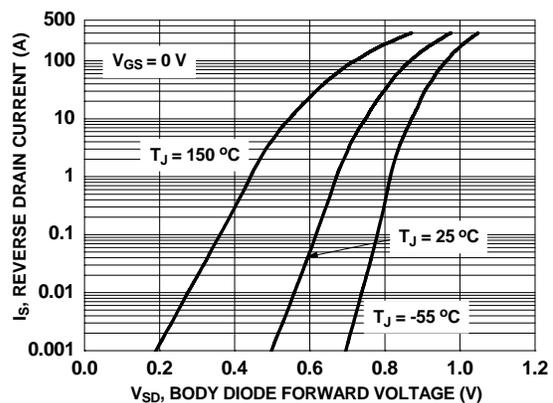


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

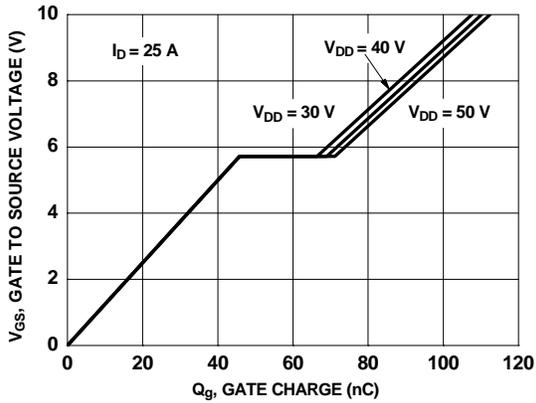


Figure 7. Gate Charge Characteristics

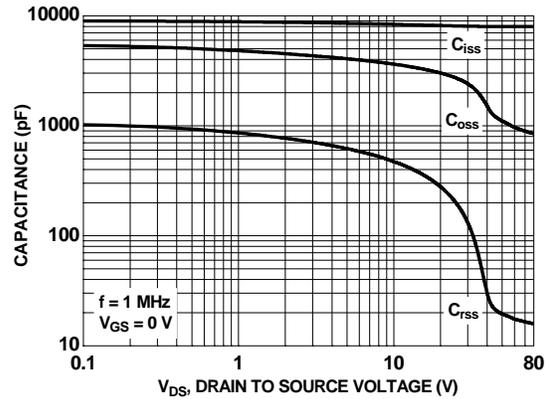


Figure 8. Capacitance vs Drain to Source Voltage

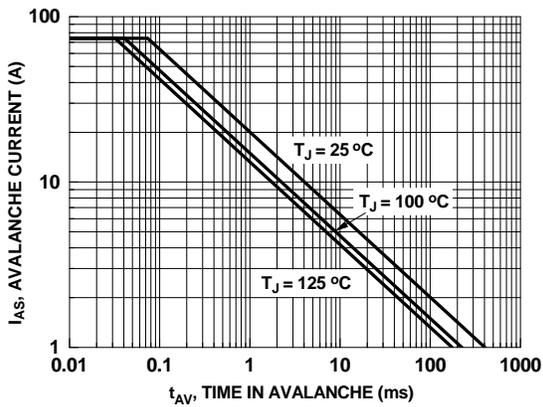


Figure 9. Unclamped Inductive Switching Capability

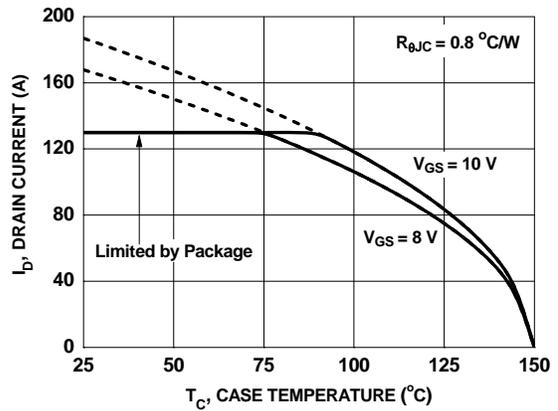


Figure 10. Maximum Continuous Drain Current vs Case Temperature

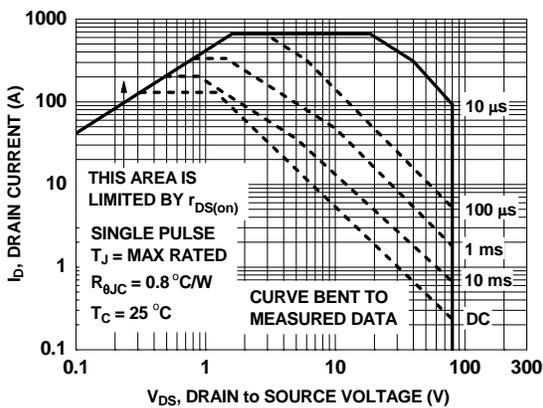


Figure 11. Forward Bias Safe Operating Area

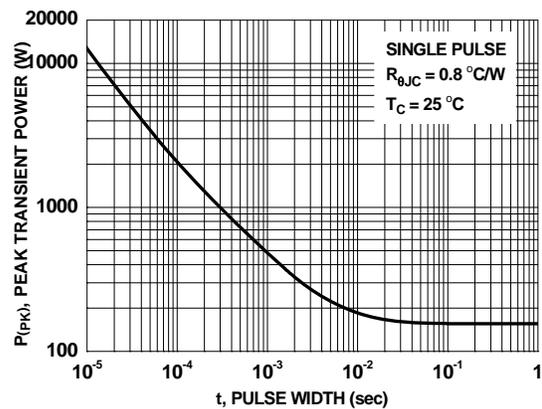


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

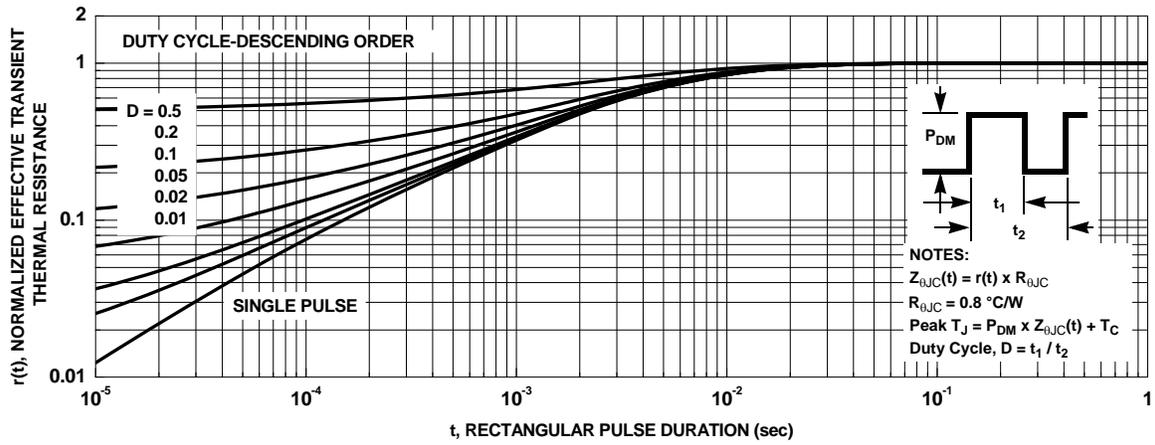


Figure 13. Junction-to-Case Transient Thermal Response Curve

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