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ON Semiconductor®

FDD3860

N-Channel PowerTrench® MOSFET 100 V, 29 A, 36 mΩ

Features

- Max $r_{DS(on)}$ = 36 mΩ at $V_{GS} = 10$ V, $I_D = 5.9$ A
- High Performance Trench Technology for Extremely Low $r_{DS(on)}$
- 100% UIL Tested
- RoHS Compliant

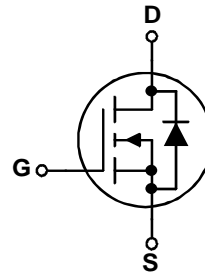
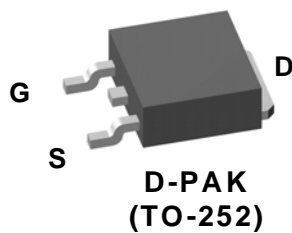


General Description

This N-Channel MOSFET is rugged gate version of ON Semiconductor's advanced Power Trench® process. This part is tailored for low $r_{DS(on)}$ and low Qg figure of merit, with avalanche ruggedness for a wide range of switching applications.

Applications

- DC-AC Conversion
- Synchronous Rectifier



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	100	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous	$T_C = 25^\circ\text{C}$	A
	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	
	-Pulsed		
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	W
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.8	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40 (Note 1a)	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD3860	FDD3860	D-PAK (TO-252)	13"	16 mm	2500 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		98		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$			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	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	3.8	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		-11.4		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 5.9\text{A}$		29	36	m Ω
		$V_{GS} = 10\text{V}, I_D = 5.9\text{A}, T_J = 125^\circ\text{C}$		51	64	
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 5.9\text{A}$		20		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$		1310	1740	pF
C_{oss}	Output Capacitance			100	130	
C_{riss}	Reverse Transfer Capacitance			45	70	
R_g	Gate Resistance	$f = 1\text{MHz}$		1.6		Ω

Switching Characteristics

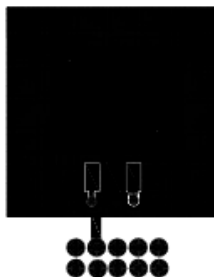
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{V}, I_D = 5.9\text{A},$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		16	29	ns
t_r	Rise Time			10	21	
$t_{d(off)}$	Turn-Off Delay Time			24	39	
t_f	Fall Time			7	15	
Q_g	Total Gate Charge at 10V		$V_{DD} = 50\text{V}, I_D = 5.9\text{A}$		22	
Q_{gs}	Gate to Source Charge			7.1		
Q_{gd}	Gate to Drain "Miller" Charge			6.3		

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2.0\text{A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{V}, I_S = 5.9\text{A}$ (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 5.9\text{A}, di/dt = 100\text{A}/\mu\text{s}$		34	55	ns
Q_{rr}	Reverse Recovery Charge			40	64	

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) $40^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $96^\circ\text{C}/\text{W}$ when mounted on a minimum pad.

- 2: Pulse Test: Pulse Width < $300\mu\text{s}$, Duty cycle < 2.0%.
 3: Starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 9\text{A}$, $V_{DD} = 100\text{V}$, $V_{GS} = 10\text{V}$.

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

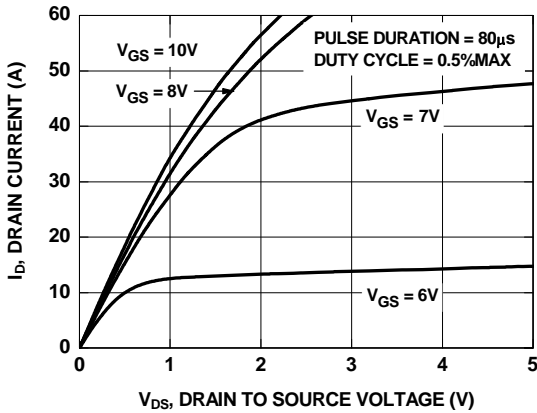


Figure 1. On-Region Characteristics

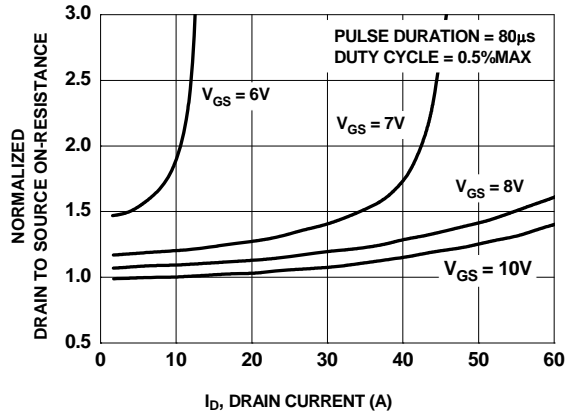


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

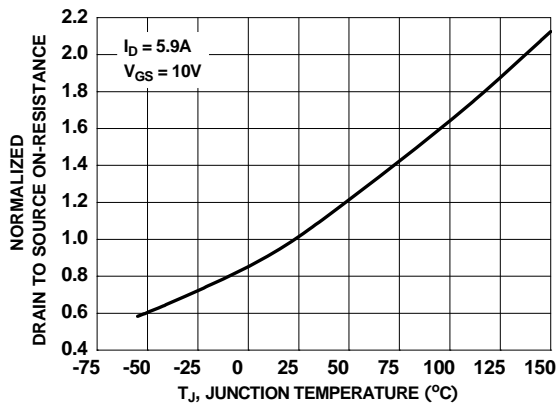


Figure 3. Normalized On-Resistance vs. Junction Temperature

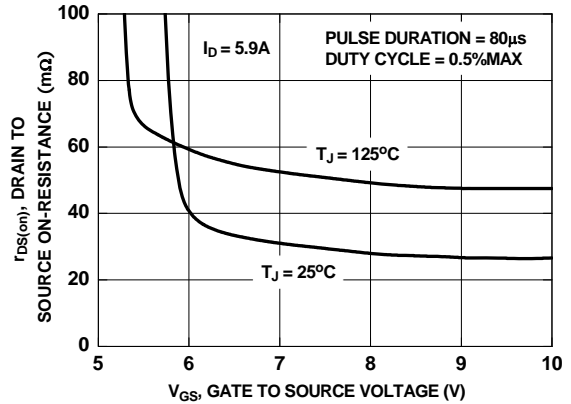


Figure 4. On-Resistance vs. Gate to Source Voltage

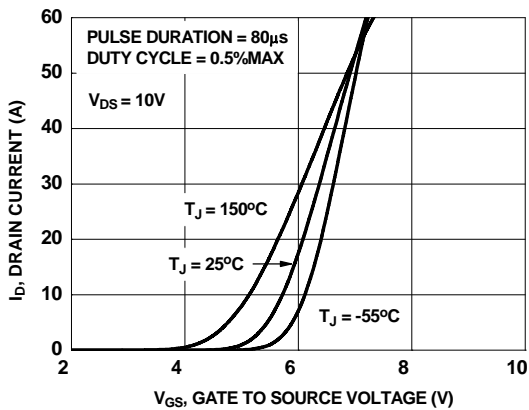


Figure 5. Transfer Characteristics

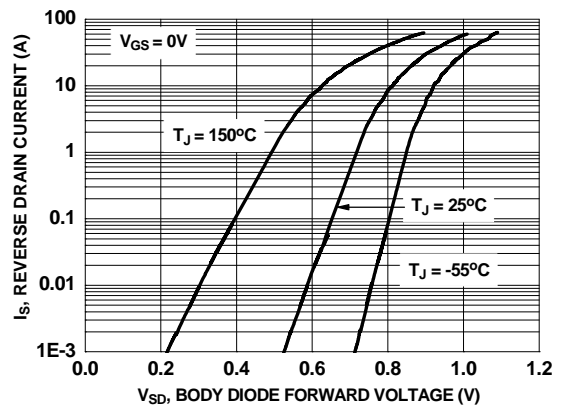


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

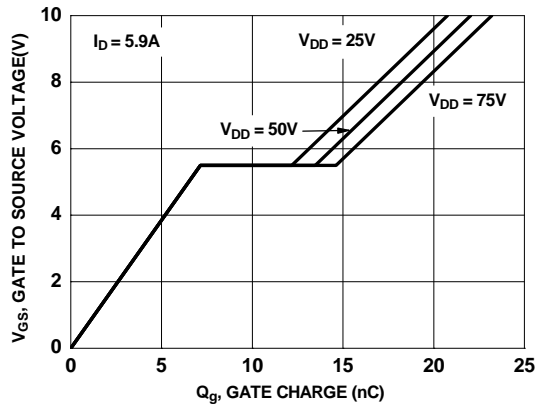


Figure 7. Gate Charge Characteristics

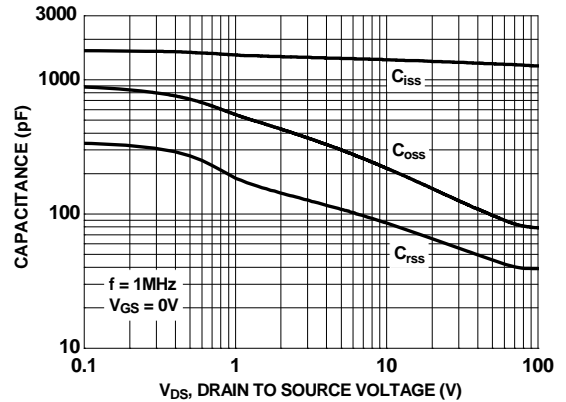


Figure 8. Capacitance vs. Drain to Source Voltage

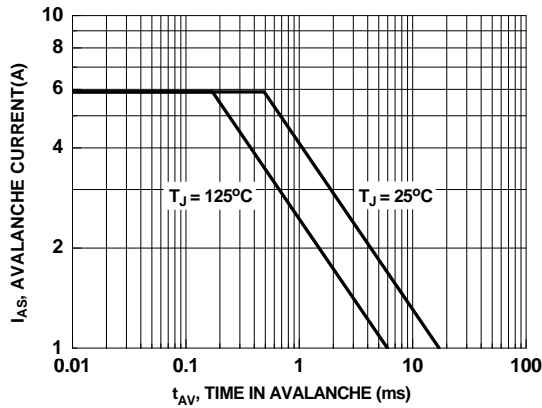


Figure 9. Unclamped Inductive Switching Capability

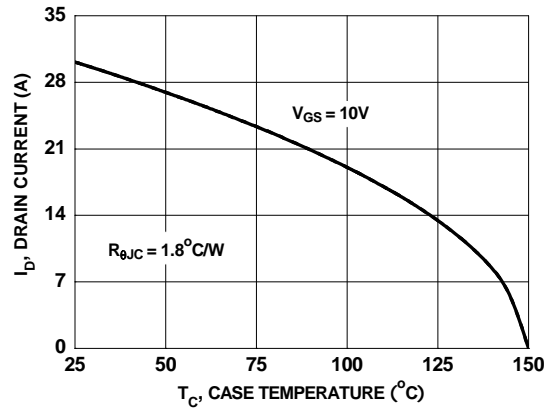


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

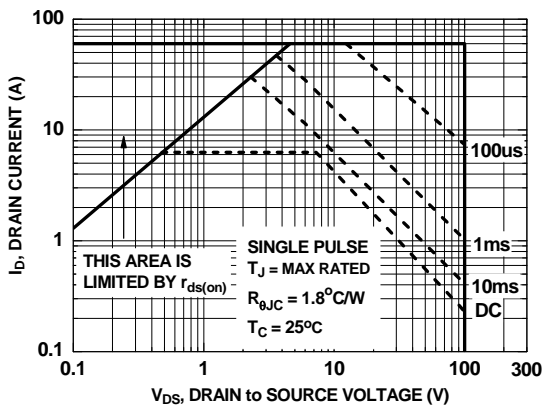


Figure 11. Forward Bias Safe Operating Area

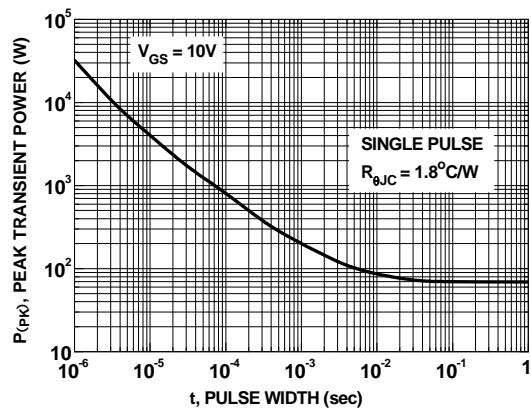


Figure 12. Single Pulse Maximum Power Dissipation

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

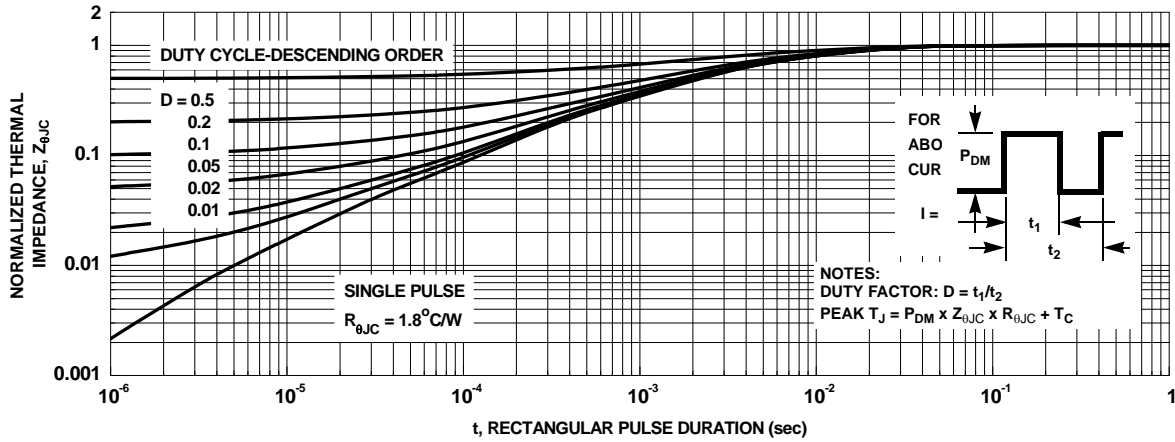


Figure 13. Transient Thermal Response Curve

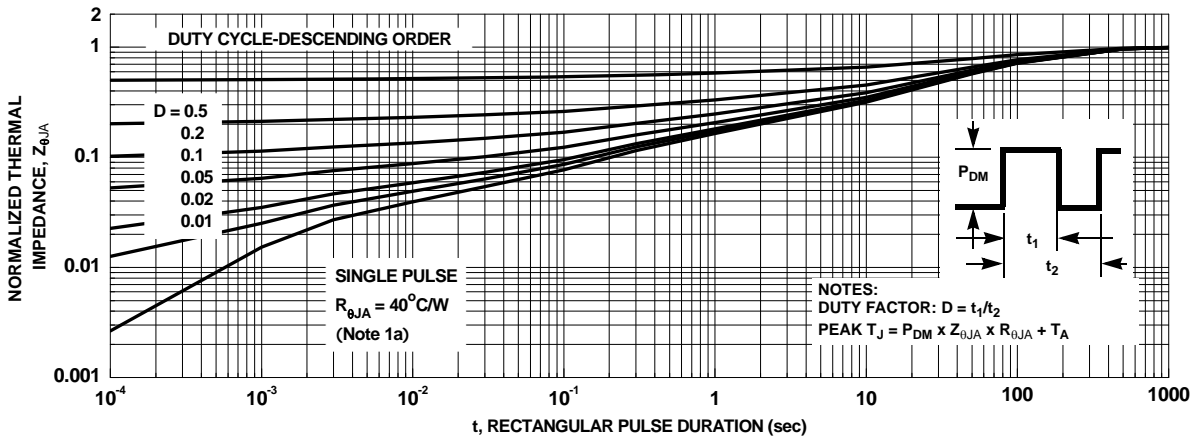


Figure 14. Transient Thermal Response Curve

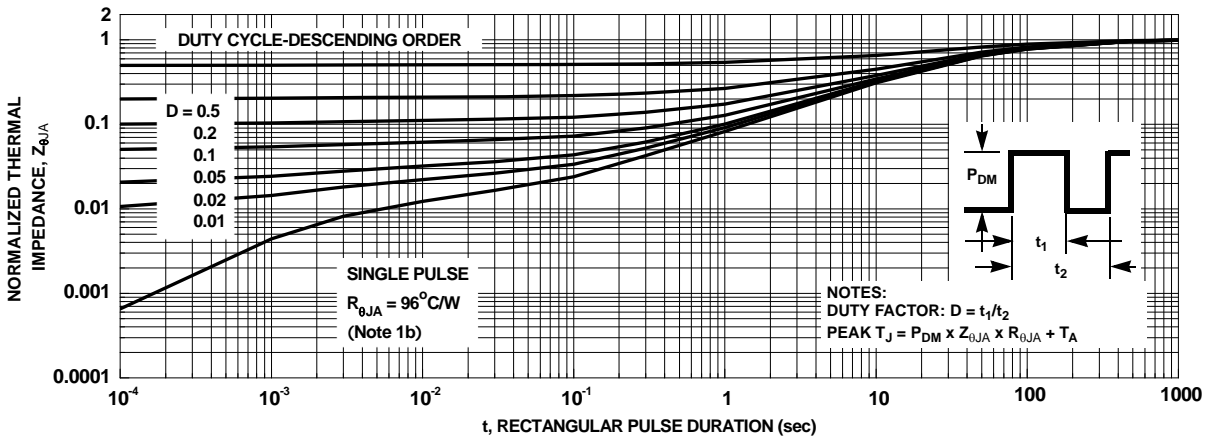


Figure 15. Transient Thermal Response Curve

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