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FDMC86160

N-Channel Shielded Gate PowerTrench[®] MOSFET 100 V, 43 A, 14 mΩ

Features

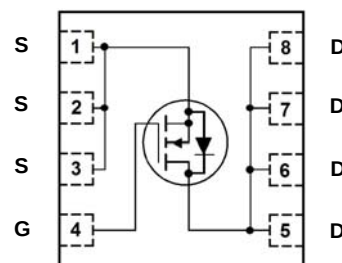
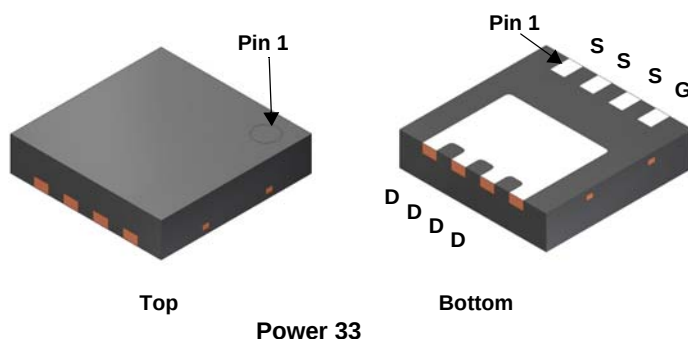
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 14 mΩ at V_{GS} = 10 V, I_D = 9 A
- Max $r_{DS(on)}$ = 23 mΩ at V_{GS} = 6 V, I_D = 7 A
- High performance technology for extremely low $r_{DS(on)}$
- Termination is Lead-free and RoHS Compliant

General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance. This device is well suited for applications where ultra low $R_{DS(on)}$ is required in small spaces such as High performance VRM, POL and orring functions.

Applications

- Bridge Topologies
- Synchronous Rectifier



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ 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 $T_C = 25^\circ\text{C}$	43	A
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	9	
	-Pulsed (Note 4)	50	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	181	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	54	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	2.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86160	FDMC86160	Power33	13 "	12 mm	3000 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		73		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	2.9	4	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		-9		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 9\ \text{A}$		11.2	14	m Ω
		$V_{GS} = 6\ \text{V}$, $I_D = 7\ \text{A}$		16	23	
		$V_{GS} = 10\ \text{V}$, $I_D = 9\ \text{A}$, $T_J = 125^\circ\text{C}$		21	26	
g_{FS}	Forward Transconductance	$V_{DD} = 10\ \text{V}$, $I_D = 9\ \text{A}$		43		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		968	1290	pF
C_{oss}	Output Capacitance			241	320	pF
C_{rss}	Reverse Transfer Capacitance			11	20	pF
R_g	Gate Resistance		0.1	0.6	2.5	Ω

Switching Characteristics

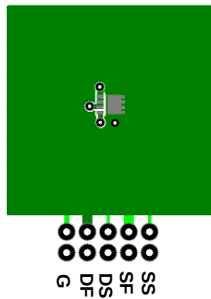
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$, $I_D = 9\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$		9.7	19	ns
t_r	Rise Time			3.6	10	ns
$t_{d(off)}$	Turn-Off Delay Time			16	30	ns
t_f	Fall Time			3.4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$	$V_{DD} = 50\ \text{V}$, $I_D = 9\ \text{A}$	15	22	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $6\ \text{V}$		9.8	15	nC
Q_{gs}	Total Gate Charge			4.4		nC
Q_{gd}	Gate to Drain "Miller" Charge			3.5		nC

Drain-Source Diode Characteristics

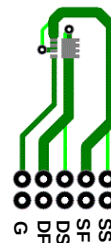
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = 9\ \text{A}$ (Note 2)		0.79	1.3	V
		$V_{GS} = 0\ \text{V}$, $I_S = 1.9\ \text{A}$ (Note 2)		0.72	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 9\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		47	75	ns
Q_{rr}	Reverse Recovery Charge			45	73	nC

Notes:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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. 53°C/W when mounted on a 1 in² pad of 2 oz copper



b. 125°C/W when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

- E_{AS} of 181 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3\ \text{mH}$, $I_{AS} = 11\ \text{A}$, $V_{DD} = 100\ \text{V}$, $V_{GS} = 10\ \text{V}$. 100% test at $L = 0.1\ \text{mH}$, $I_{AS} = 35\ \text{A}$.

- Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.

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

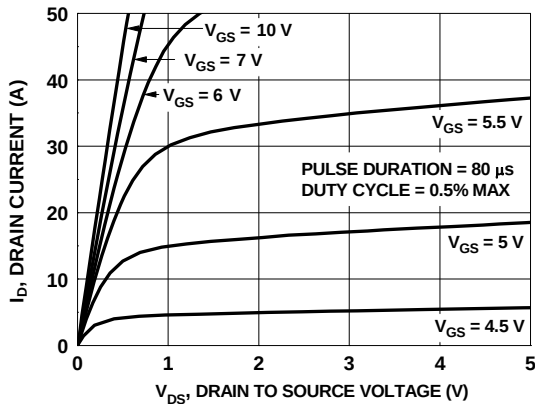


Figure 1. On-Region Characteristics

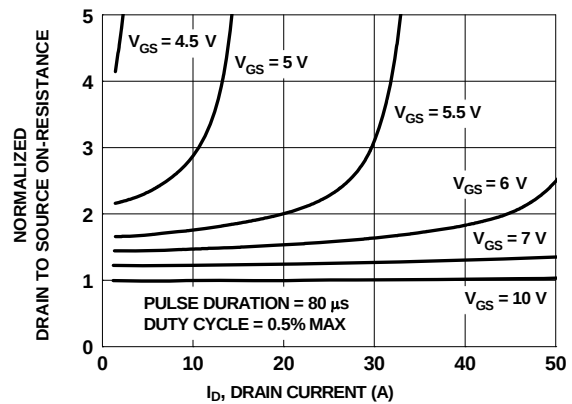


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

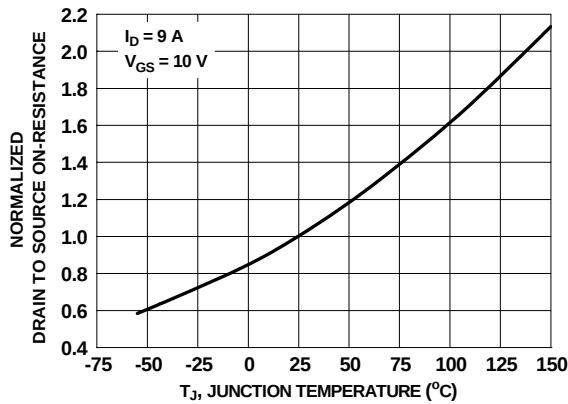


Figure 3. Normalized On-Resistance vs Junction Temperature

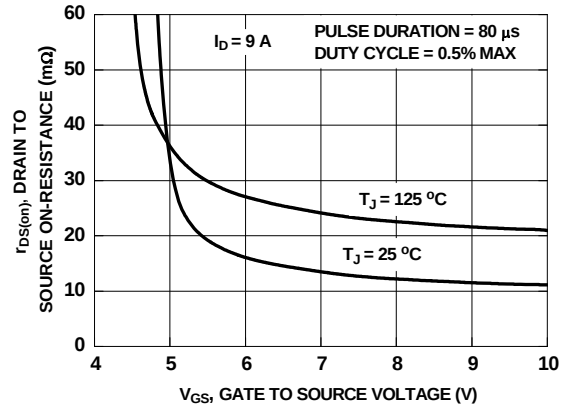


Figure 4. On-Resistance vs Gate to Source Voltage

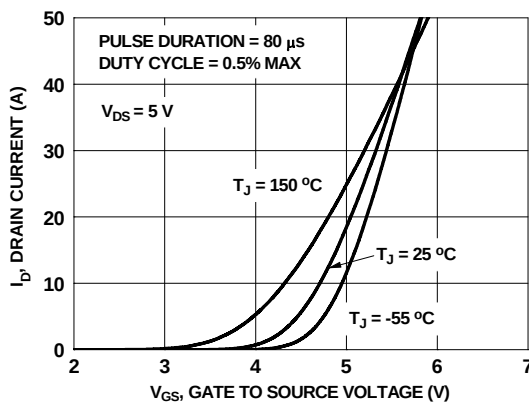


Figure 5. Transfer Characteristics

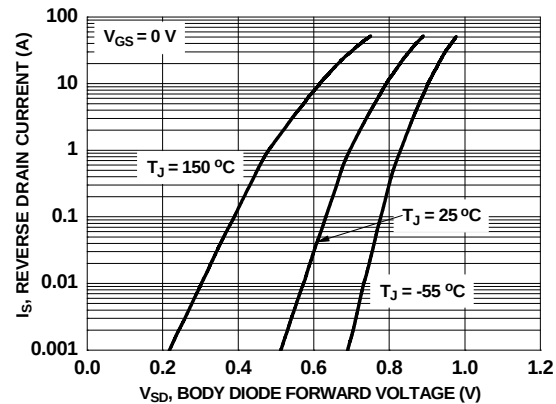


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

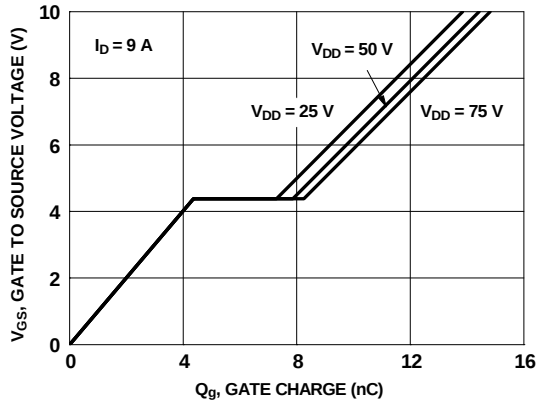


Figure 7. Gate Charge Characteristics

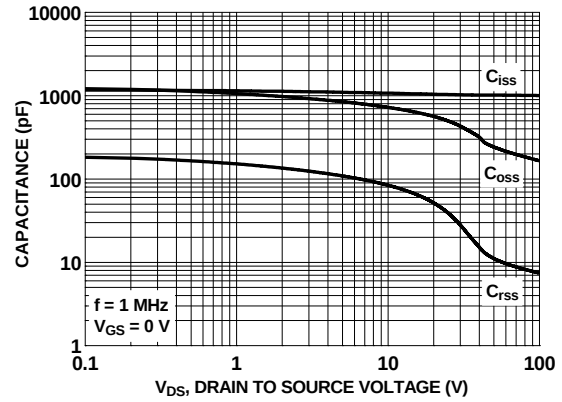


Figure 8. Capacitance vs Drain to Source Voltage

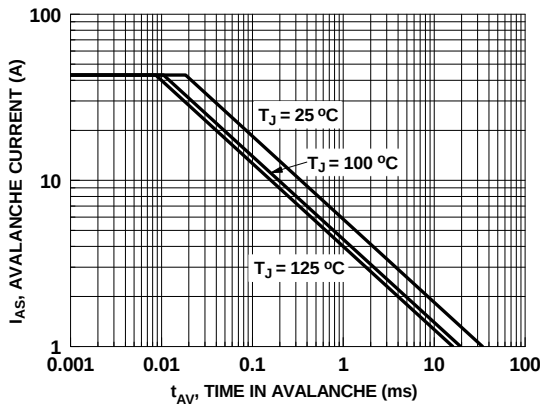


Figure 9. Unclamped Inductive Switching Capability

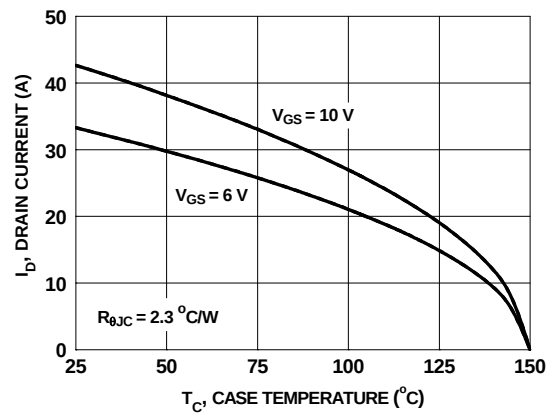


Figure 10. Maximum Continuous Drain Current vs Case Temperature

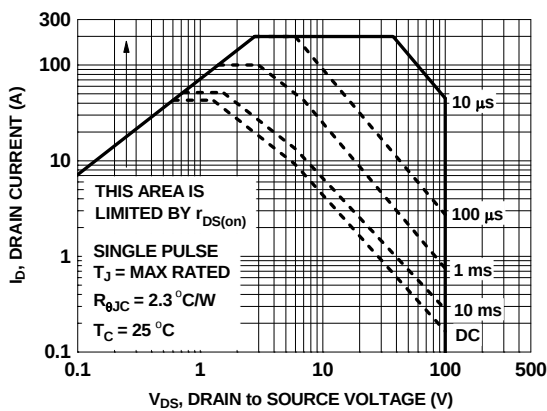


Figure 11. Forward Bias Safe Operating Area

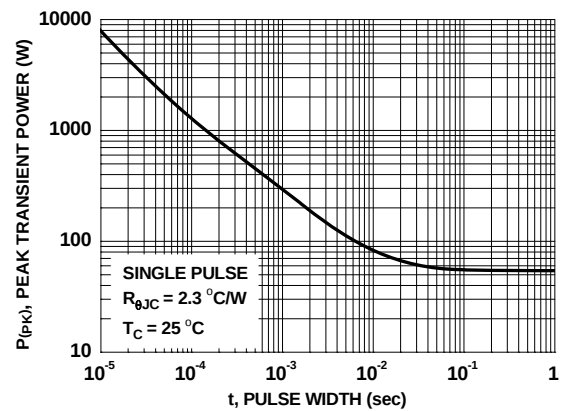


Figure 12. Single Pulse Maximum Power Dissipation

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

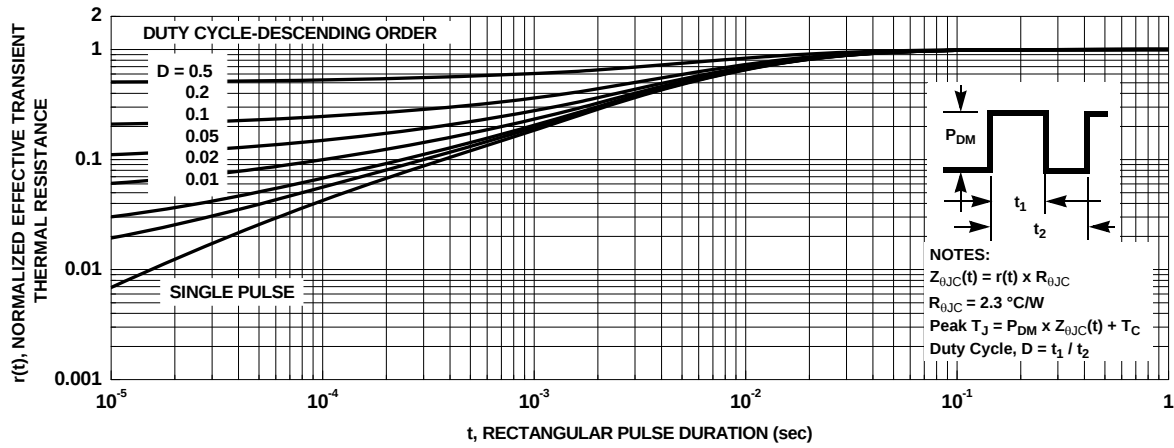


Figure 13. Junction-to-Case Transient Thermal Response Curve

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