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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD

January 2015

FDMC86160ET100

N-Channel Shielded Gate PowerTrench® MOSFET

100 V, 43 A, 14 mΩ

Features

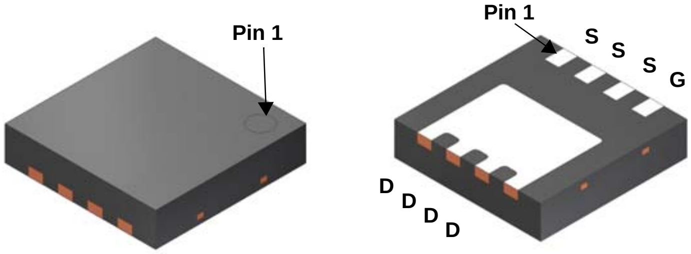
- Extended T_J rating to 175°C
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 14 mΩ at V_{GS} = 10 V, I_D = 9 A
- Max $r_{DS(on)}$ = 23 mΩ at V_{GS} = 6 V, I_D = 7 A
- High performance technology for extremely low $r_{DS(on)}$
- Termination is Lead-free and RoHS Compliant

General Description

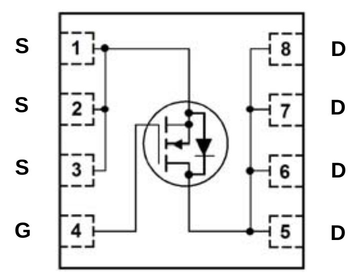
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance. This device is well suited for applications where ulta low $R_{DS(on)}$ is required in small spaces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

Applications

- Bridge Topologies
- Synchronous Rectifier



Power 33



MOSFET Maximum Ratings T_A = 25 °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 °C	(Note 5)	43	A
		-Continuous	T_C = 100 °C	(Note 5)	31	
		-Continuous	T_A = 25 °C	(Note 1a)	9	
		-Pulsed		(Note 4)	204	
E_{AS}	Single Pulse Avalanche Energy			(Note 3)	181	mJ
P_D	Power Dissipation		T_C = 25 °C		65	W
	Power Dissipation		T_A = 25 °C	(Note 1a)	2.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range				-55 to +175	°C

Thermal Characteristics

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

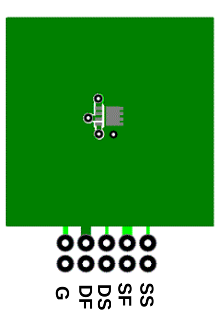
Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86160ET	FDMC86160ET100	Power33	13 "	12 mm	3000 units

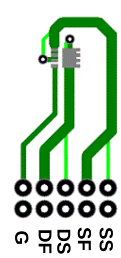
Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		73		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 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						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2	2.9	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 9 A		11.2	14	mΩ
		V_{GS} = 6 V, I_D = 7 A		16	23	
		V_{GS} = 10 V, I_D = 9 A, T_J = 125 °C		21	26	
g_{FS}	Forward Transconductance	V_{DD} = 10 V, I_D = 9 A		43		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 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 V, I_D = 9 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		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 V to 10 V; V_{DD} = 50 V, I_D = 9 A		15	22	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 6 V; V_{DD} = 50 V, I_D = 9 A		9.8	15	nC
Q_{gs}	Total Gate Charge	V_{DD} = 50 V, I_D = 9 A		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 V, I_S = 9 A (Note 2)		0.79	1.3	V
		V_{GS} = 0 V, I_S = 1.9 A (Note 2)		0.72	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 9 A, di/dt = 100 A/μs		47	75	ns
Q_{rr}	Reverse Recovery Charge			45	73	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. $R_{\theta CA}$ is determined by the user's board design.



a. 53 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b. 125 °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 181 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 11 A, V_{DD} = 100 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 35 A.

4. Pulsed Id please refer to Fig 11 SOA graph for more details.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

Typical Characteristics T_J = 25 °C unless otherwise noted

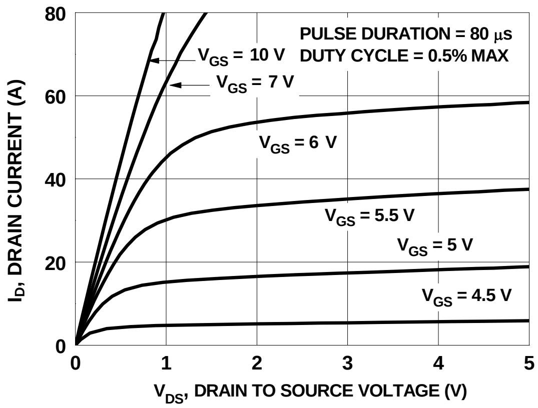


Figure 1. On-Region Characteristics

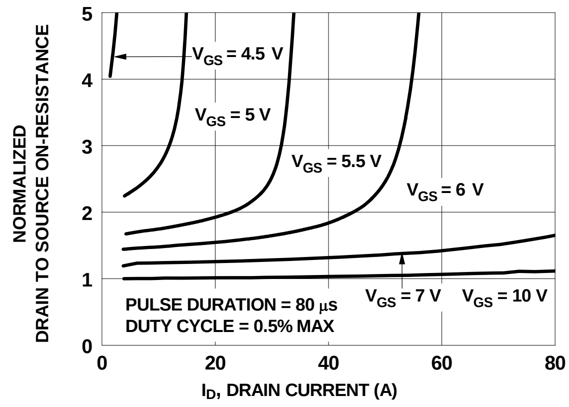


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

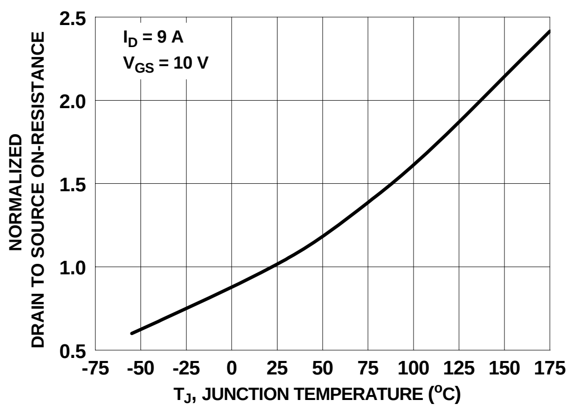


Figure 3. Normalized On-Resistance vs Junction Temperature

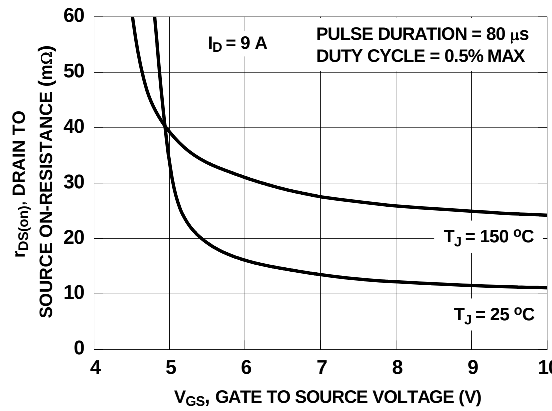


Figure 4. On-Resistance vs Gate to Source Voltage

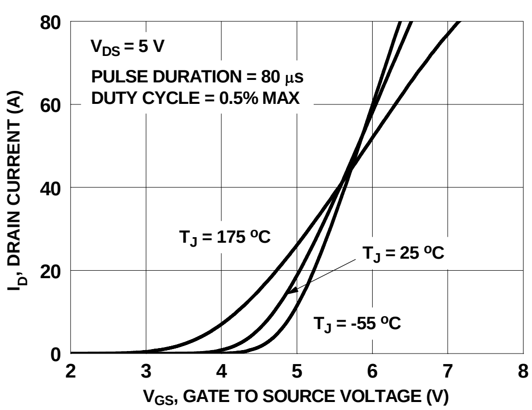


Figure 5. Transfer Characteristics

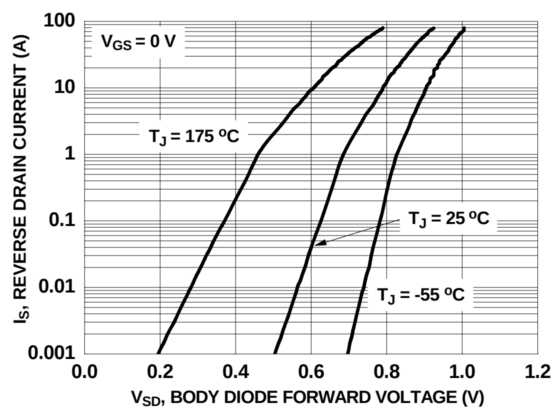


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

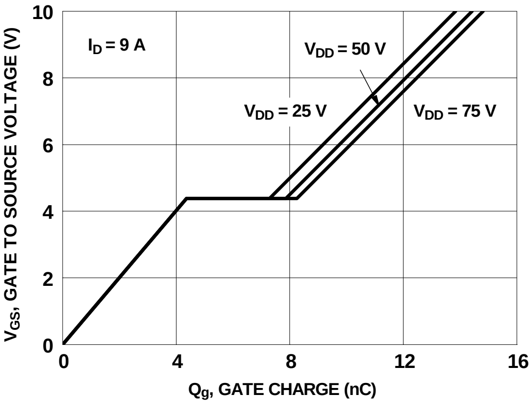


Figure 7. Gate Charge Characteristics

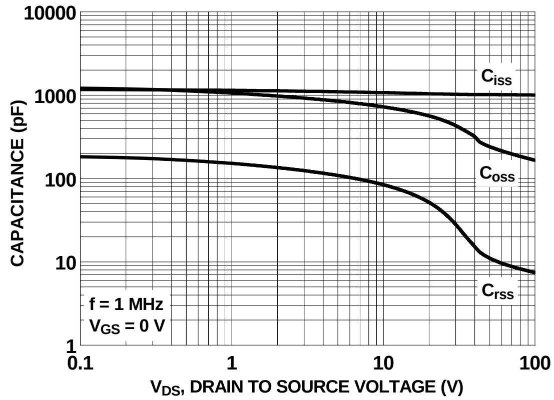


Figure 8. Capacitance vs Drain to Source Voltage

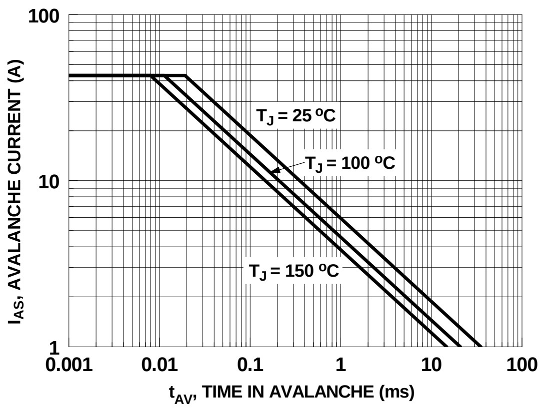


Figure 9. Unclamped Inductive Switching Capability

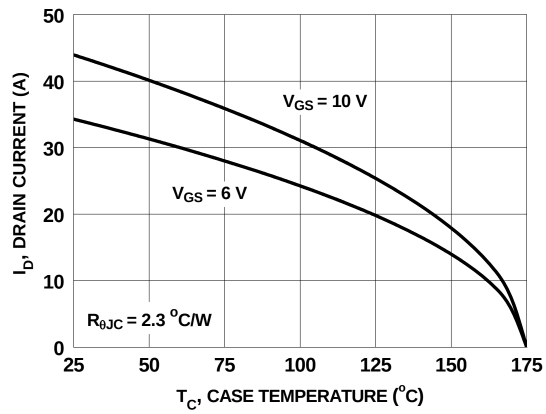


Figure 10. Maximum Continuous Drain Current vs Case Temperature

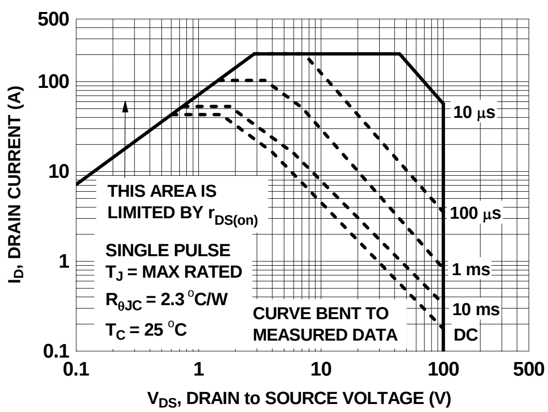


Figure 11. Forward Bias Safe Operating Area

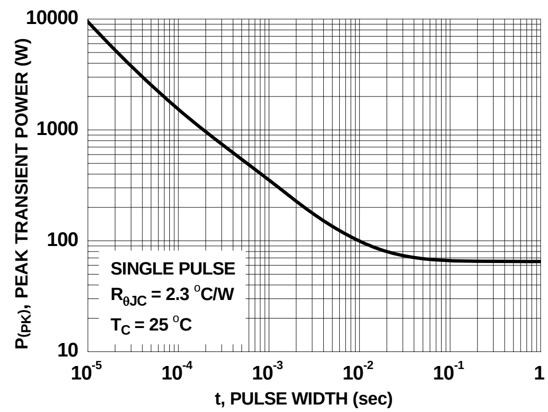


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

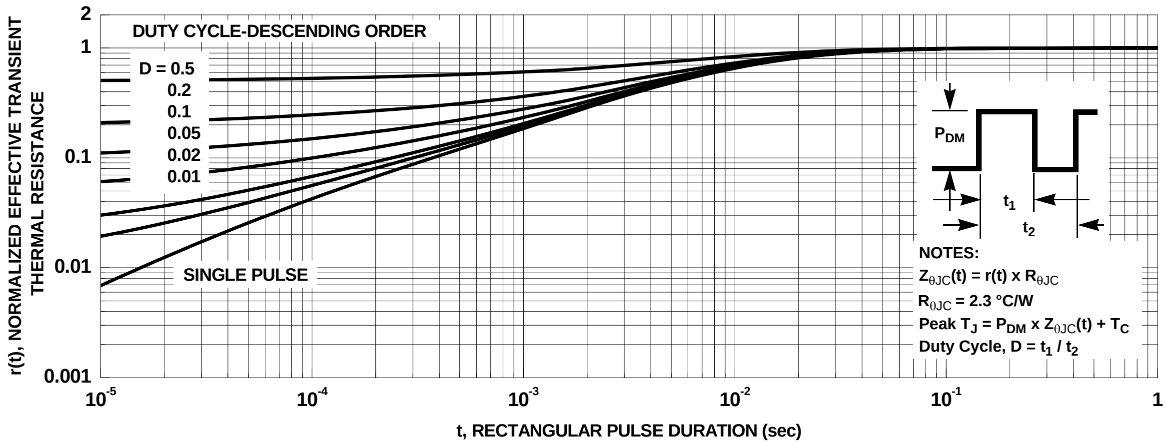
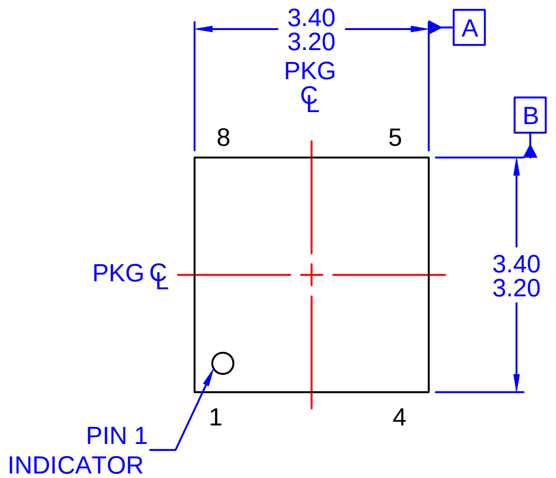
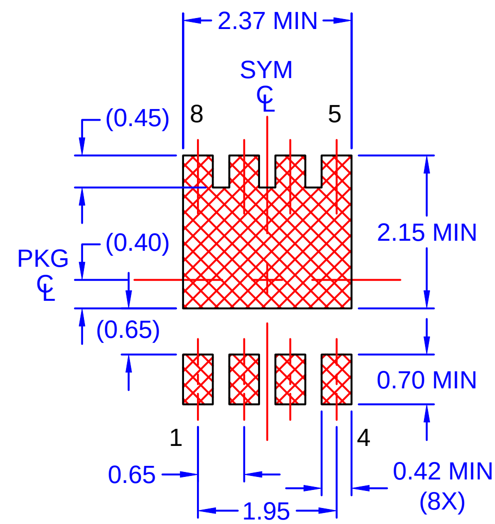
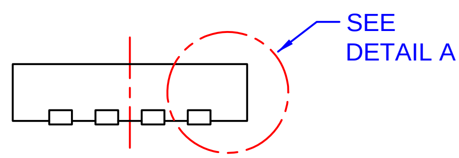


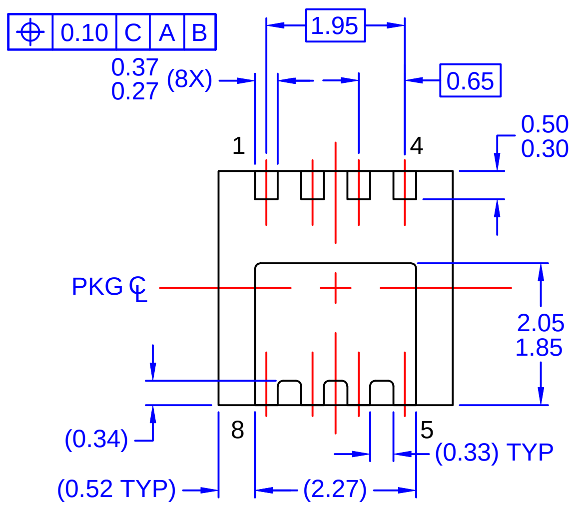
Figure 13. Junction-to-Case Transient Thermal Response Curve





LAND PATTERN
RECOMMENDATION





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BURRS DOES NOT EXCEED 0.10MM.
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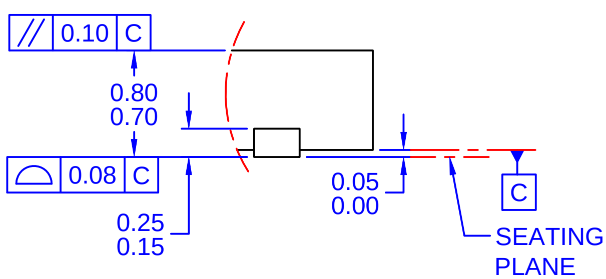

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Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А