

FDMC86139P

P-Channel PowerTrench® MOSFET -100 V, -15 A, 67 mΩ

Features

- Max $r_{DS(on)}$ = 67 mΩ at $V_{GS} = -10$ V, $I_D = -4.4$ A
- Max $r_{DS(on)}$ = 89 mΩ at $V_{GS} = -6$ V, $I_D = -3.6$ A
- Very low RDS-on mid voltage P channel silicon technology optimised for low Qg
- This product is optimised for fast switching applications as well as load switch applications
- 100% UIL Tested
- RoHS Compliant

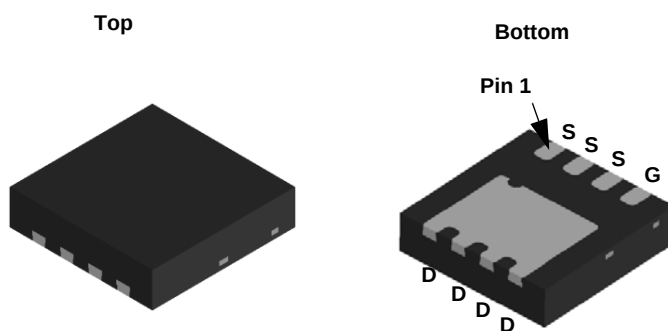


General Description

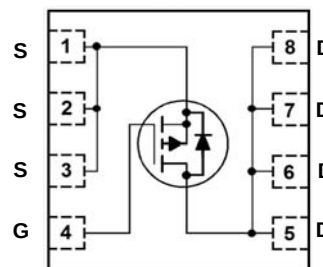
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® technology. This very high density process is especially tailored to minimize on-state resistance and optimized for superior switching performance.

Applications

- Active Clamp Switch
- Load Switch



MLP 3.3x3.3



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	±25	V
I_D	Drain Current -Continuous $T_C = 25^\circ\text{C}$	-15	A
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-4.4	
	-Pulsed	-30	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	121	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	40	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	3.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86139P	FDMC86139P	Power 33	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	$I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	-100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-63		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	$V_{GS} = \pm 25\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	-2	-3	-4	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 $25\text{ }^\circ\text{C}$		7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\text{ V}$, $I_D = -4.4\text{ A}$		56	67	m Ω
		$V_{GS} = -6\text{ V}$, $I_D = -3.6\text{ A}$		69	89	
		$V_{GS} = -10\text{ V}$, $I_D = -4.4\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		87	104	
g_{FS}	Forward Transconductance	$V_{DS} = -10\text{ V}$, $I_D = -4.4\text{ A}$		12		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -50\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		1001	1335	pF
C_{oss}	Output Capacitance			178	240	pF
C_{rss}	Reverse Transfer Capacitance			10	15	pF
R_g	Gate Resistance		0.1	1.6	3.2	Ω

Switching Characteristics

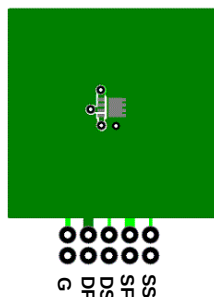
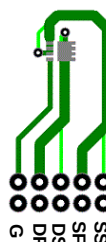
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -50\text{ V}$, $I_D = -4.4\text{ A}$, $V_{GS} = -10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		11	20	ns
t_r	Rise Time			2.5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			17	30	ns
t_f	Fall Time			4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to } -10\text{ V}$	$V_{DD} = -50\text{ V}$, $I_D = -4.4\text{ A}$	16	22	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to } -6\text{ V}$		9.8	14	nC
Q_{gs}	Total Gate Charge			4.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			3.2		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -4.4\text{ A}$ (Note 2)		-0.84	-1.3	V
		$V_{GS} = 0\text{ V}$, $I_S = -1.9\text{ A}$ (Note 2)		-0.79	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -4.4\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		70	112	ns
Q_{rr}	Reverse Recovery Charge			141	225	nC

NOTES:

1. $R_{\theta JA}$ 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 $^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copperb) 125 $^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

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

3. Starting $T_J = 25\text{ }^\circ\text{C}$; P-ch: $L = 3\text{ mH}$, $I_{AS} = -9\text{ A}$, $V_{DD} = -100\text{ V}$, $V_{GS} = -10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = -28\text{ A}$.

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

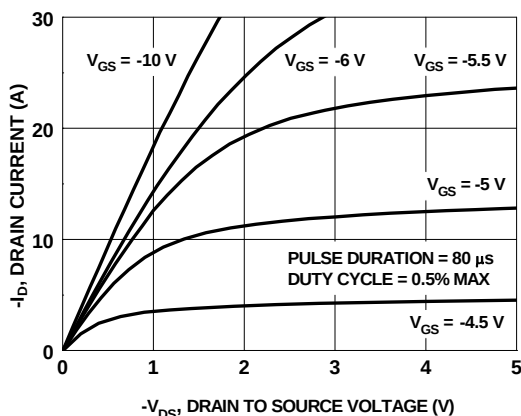


Figure 1. On Region Characteristics

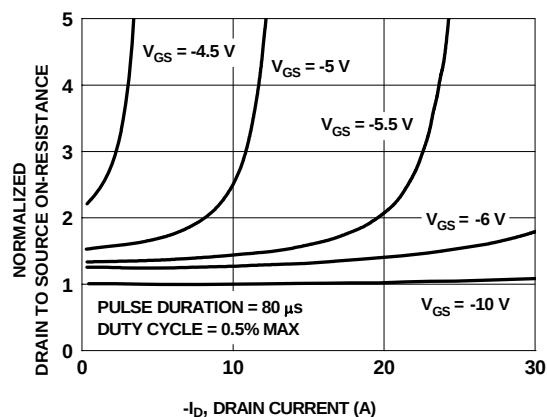


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

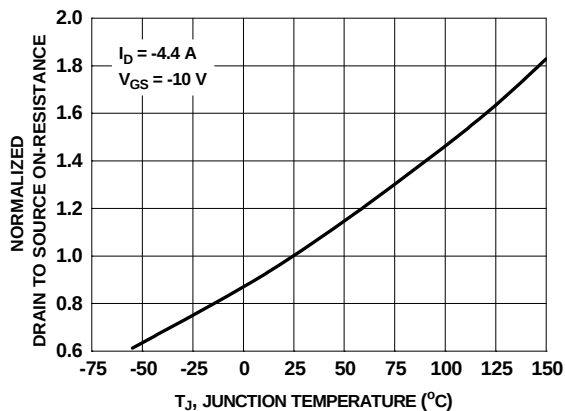


Figure 3. Normalized On Resistance vs Junction Temperature

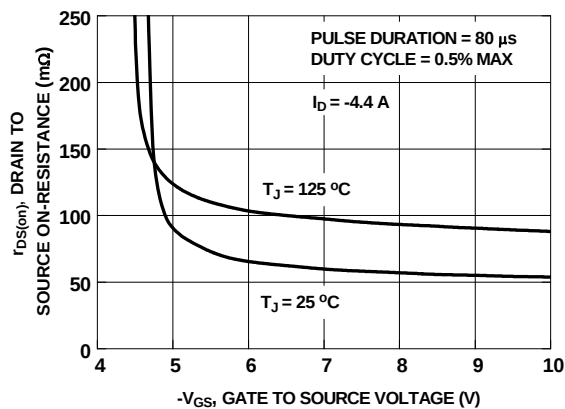


Figure 4. On-Resistance vs Gate to Source Voltage

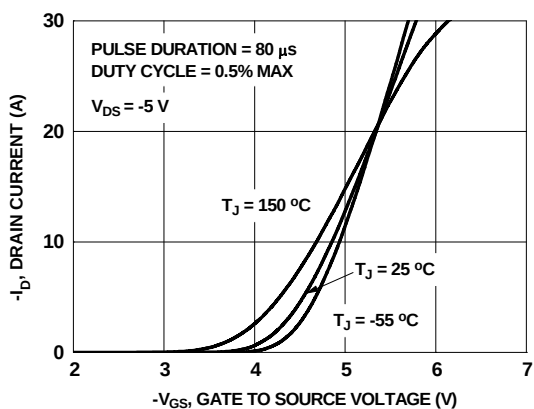


Figure 5. Transfer Characteristics

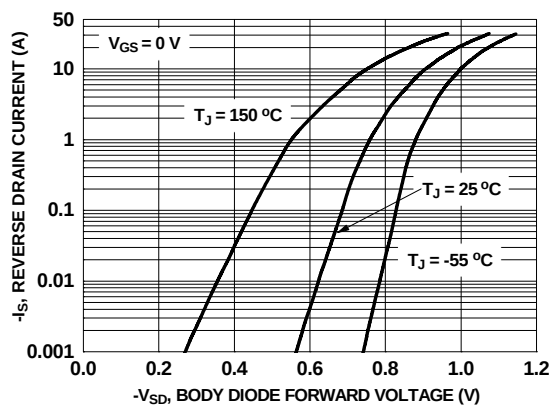


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

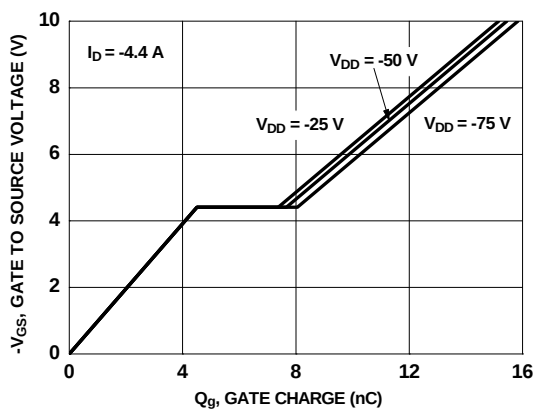


Figure 7. Gate Charge Characteristics

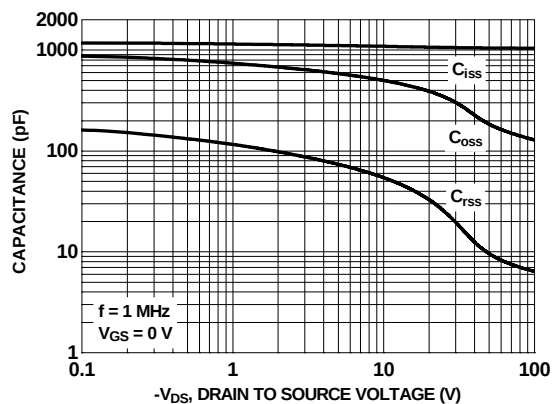


Figure 8. Capacitance vs Drain to Source Voltage

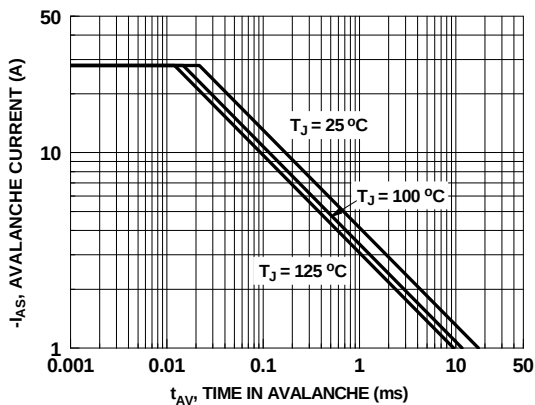


Figure 9. Unclamped Inductive Switching Capability

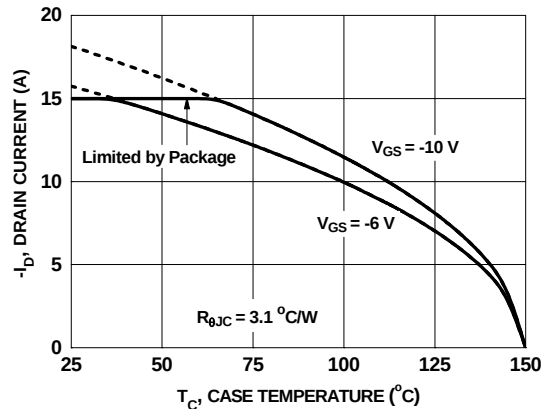


Figure 10. Maximum Continuous Drain Current vs Case Temperature

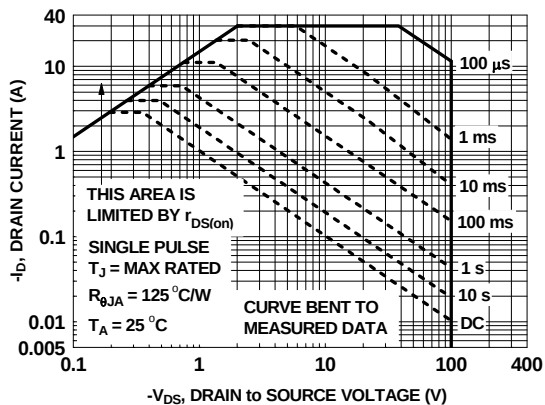


Figure 11. Forward Bias Safe Operating Area

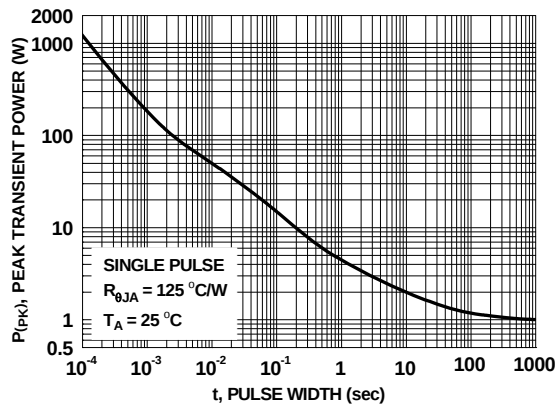


Figure 12. Single Pulse Maximum Power Dissipation

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

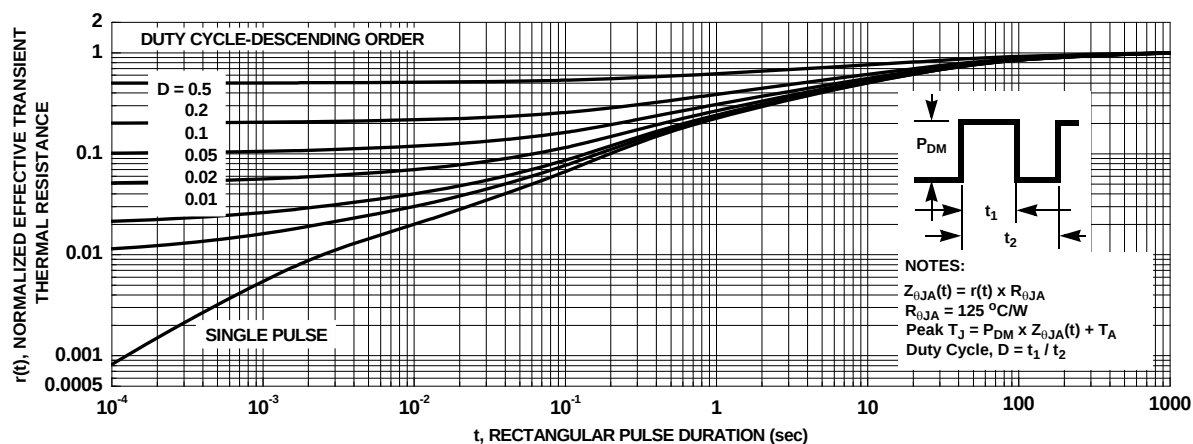
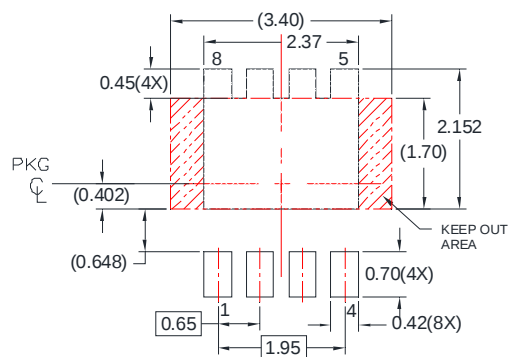
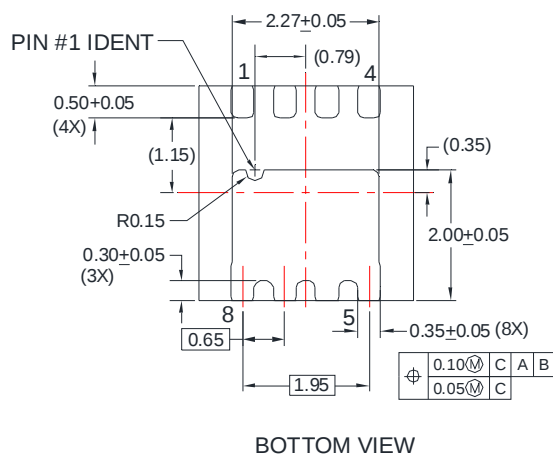
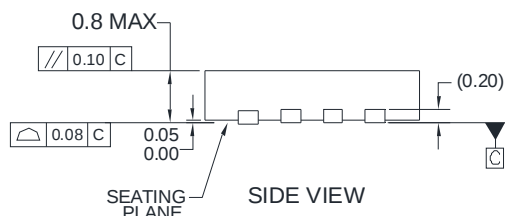
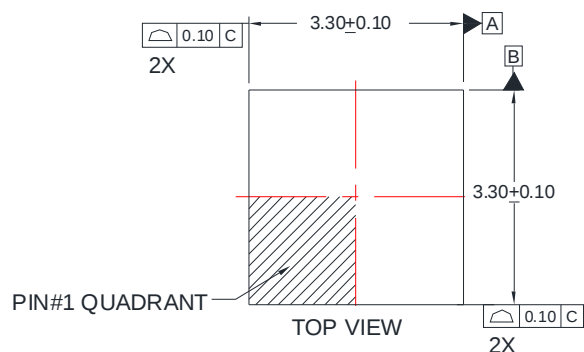


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

- DOES NOT CONFORM TO JEDEC REGISTRATION MO-229
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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