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June 2014

FDMC510P

P-Channel PowerTrench® MOSFET

-20 V, -18 A, 8.0 mΩ

Features

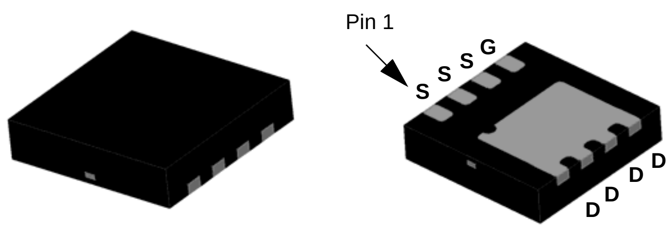
- Max $r_{DS(on)}$ = 8.0 mΩ at V_{GS} = -4.5 V, I_D = -12 A
- Max $r_{DS(on)}$ = 9.8 mΩ at V_{GS} = -2.5 V, I_D = -10 A
- Max $r_{DS(on)}$ = 13 mΩ at V_{GS} = -1.8 V, I_D = -9.3 A
- Max $r_{DS(on)}$ = 17 mΩ at V_{GS} = -1.5 V, I_D = -8.3 A
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- 100% UIL Tested
- Termination is Lead-free and RoHS Compliant
- HBM ESD capability level >2 KV typical (Note 4)

General Description

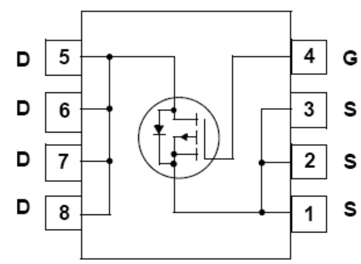
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench® process that has been optimized for $r_{DS(ON)}$, switching performance and ruggedness.

Applications

- Battery Management
- Load Switch



MLP 3.3x3.3



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			-20	V
V_{GS}	Gate to Source Voltage			±8	V
I_D	Drain Current -Continuous	T_C = 25 °C		-18	A
	-Continuous	T_A = 25 °C	(Note 1a)	-12	
	-Pulsed			-50	
E_{AS}	Single Pulse Avalanche Energy			37	mJ
P_D	Power Dissipation	T_C = 25 °C		41	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	53	

Package Marking and Ordering Information

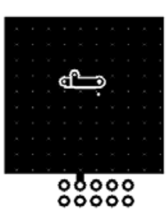
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC510P	FDMC510P	MLP 3.3X3.3	13 ”	12 mm	3000 units

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	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		-12		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -16 V, V_{GS} = 0 V			-1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±8 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	-0.4	-0.5	-1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		3		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = -4.5 V, I_D = -12 A		6.4	8.0	mΩ
		V_{GS} = -2.5 V, I_D = -10 A		7.6	9.8	
		V_{GS} = -1.8 V, I_D = -9.3 A		9.2	13	
		V_{GS} = -1.5 V, I_D = -8.3 A		11	17	
		V_{GS} = -4.5 V, I_D = -12 A, T_J = 125 °C		8.5	12	
g_{FS}	Forward Transconductance	V_{DS} = -5 V, I_D = -12 A		75		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz		5910	7860	pF
C_{oss}	Output Capacitance			840	1120	pF
C_{rss}	Reverse Transfer Capacitance			738	1110	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -10 V, I_D = -12 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω		15	27	ns
t_r	Rise Time			34	55	ns
$t_{d(off)}$	Turn-Off Delay Time			338	540	ns
t_f	Fall Time			170	272	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to -4.5 V; V_{DD} = -10 V, I_D = -12 A		83	116	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to -2.5 V		50	70	nC
Q_{gs}	Gate to Source Charge			6.3		nC
Q_{gd}	Gate to Drain “Miller” Charge			20.4		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = -12 A (Note 2)		-0.70	-1.3	V
		V_{GS} = 0 V, I_S = -2 A (Note 2)		-0.53	-1.2	
t_{rr}	Reverse Recovery Time	I_F = -12 A, di/dt = 100 A/μs		35	57	ns
Q_{rr}	Reverse Recovery Charge			20	32	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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ 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: Starting T_J = 25^{o}C; P-Ch: L = 3 mH, I_{AS} = -5 A, V_{DD} = -20 V, V_{GS} = -4.5 V.
4: No gate overvoltage rating is implied.

Typical Characteristics T_J = 25 °C unless otherwise noted

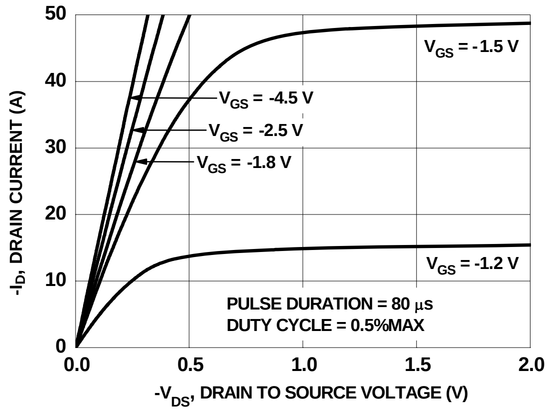


Figure 1. On Region Characteristics

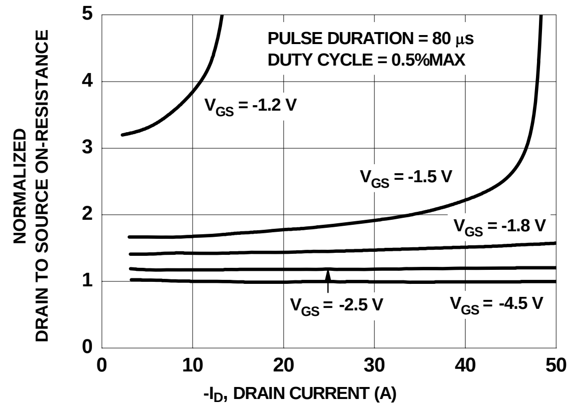


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

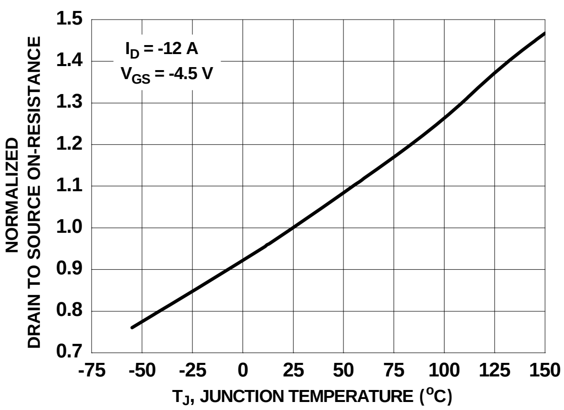


Figure 3. Normalized On Resistance vs. Junction Temperature

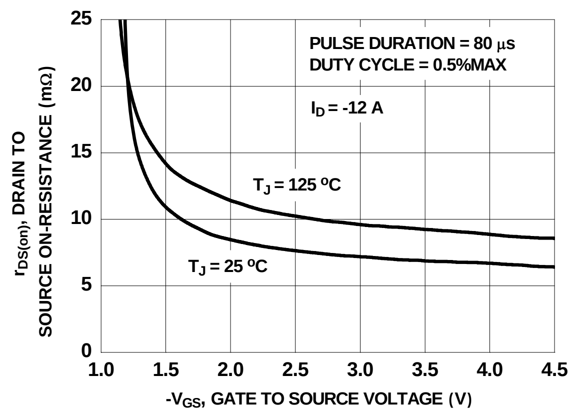


Figure 4. On-Resistance vs. Gate to Source Voltage

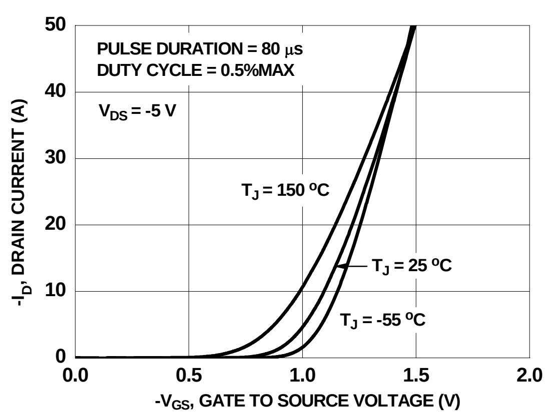


Figure 5. Transfer Characteristics

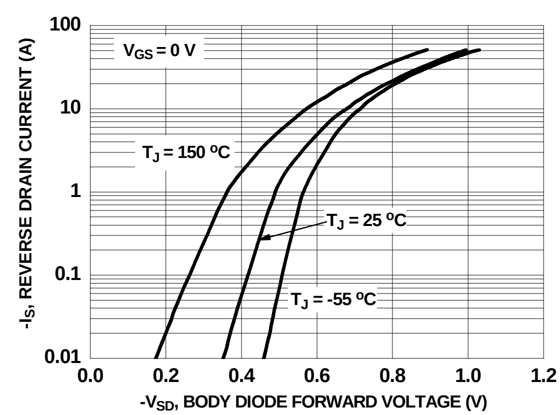


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

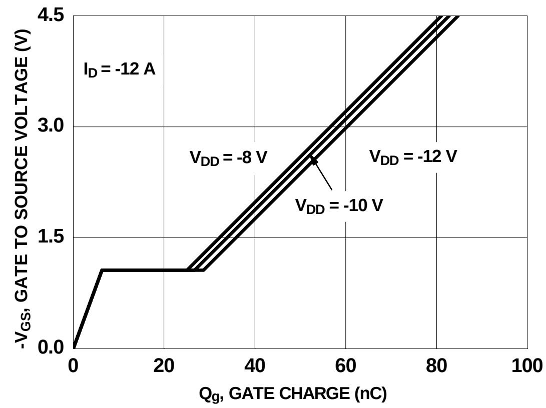


Figure 7. Gate Charge Characteristics

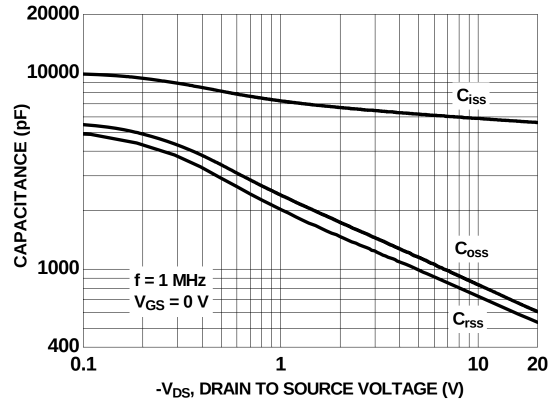


Figure 8. Capacitance vs. Drain to Source Voltage

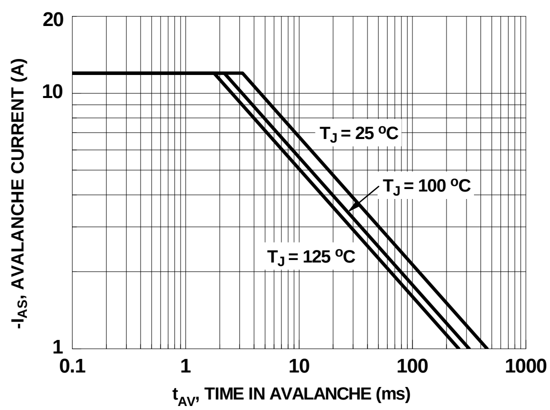


Figure 9. Unclamped Inductive Switching Capability

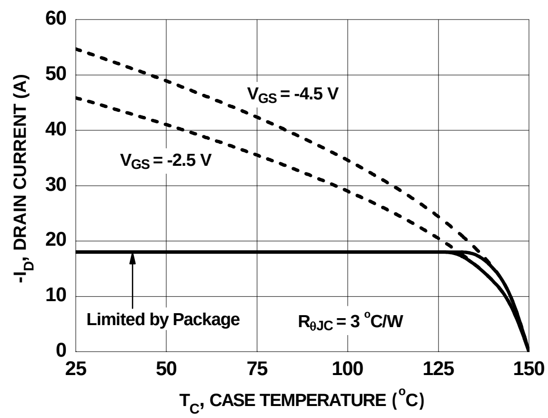


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

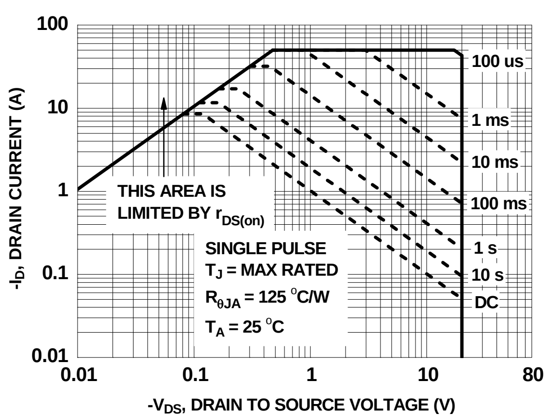


Figure 11. Forward Bias Safe Operating Area

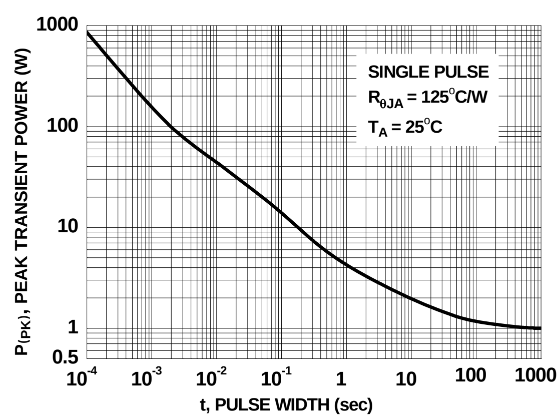


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

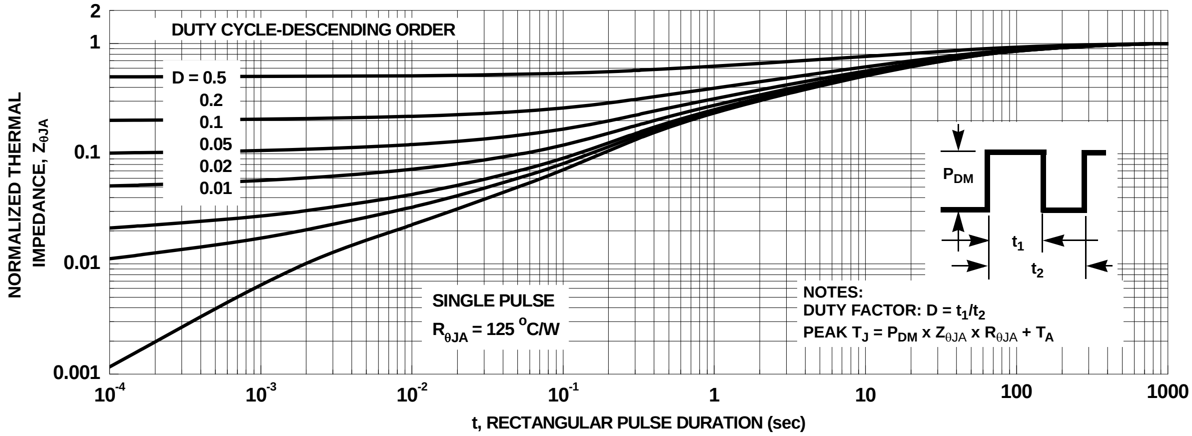
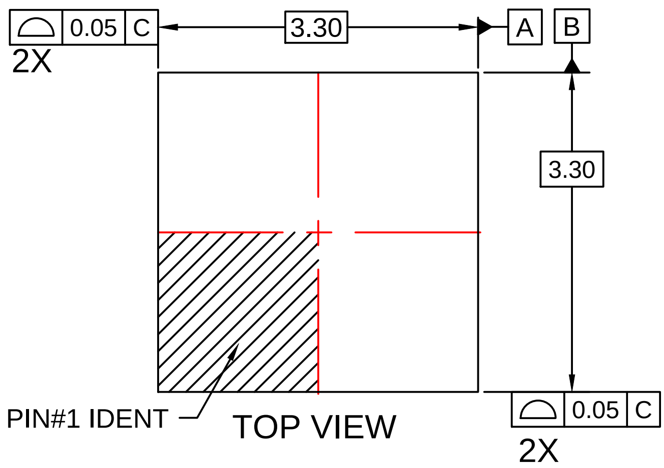
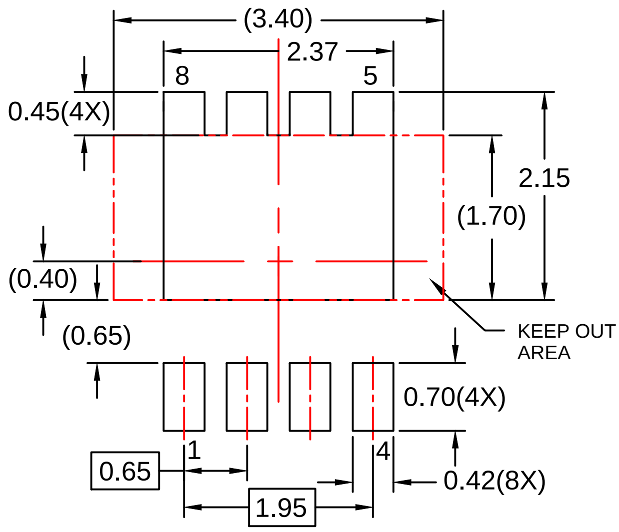


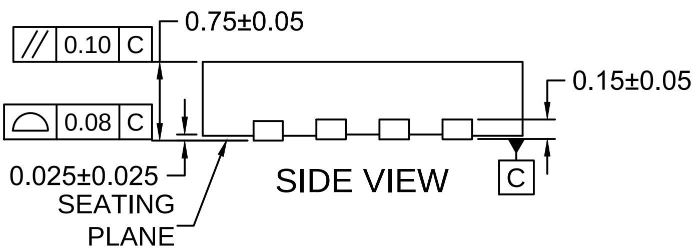
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



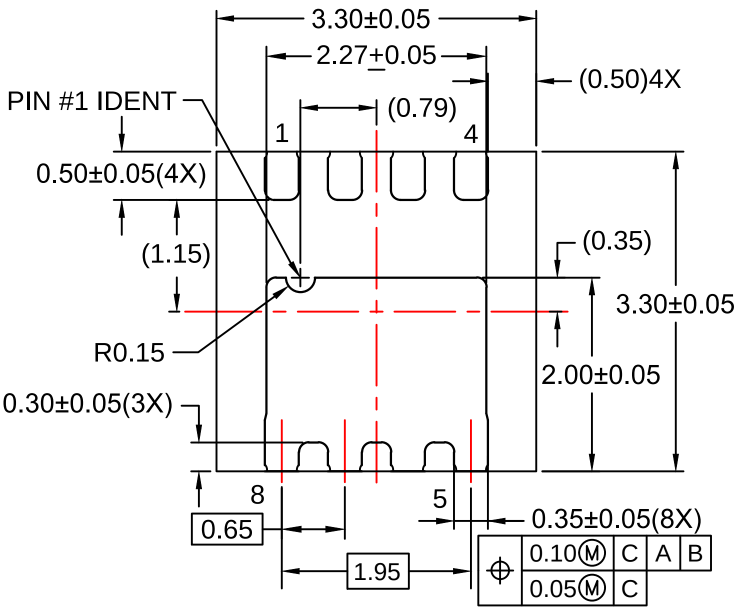
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW

NOTES:

A. DOES NOT CONFORM TO JEDEC REGISTRATION MO-229

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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