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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.

August 2016

FDMC013P030Z

P-Channel PowerTrench® MOSFET

-30 V, -54 A, 7.0 mΩ

Features

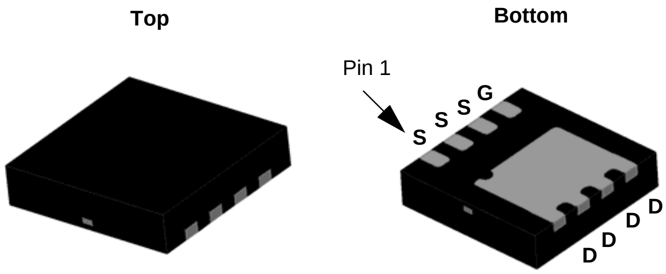
- Max $r_{DS(on)}$ = 7.0 mΩ at V_{GS} = -10 V, I_D = -14 A
- Max $r_{DS(on)}$ = 12.0 mΩ at V_{GS} = -4.5 V, I_D = -10 A
- High Performance Trench Technology for Extremely Low $r_{DS(on)}$
- High Power and Current Handling Capability in a Widely Used Surface Mount Package
- Termination is Lead-free and RoHS Compliant
- HBM ESD Capability Level > 4 kV Typical (Note 4)

General Description

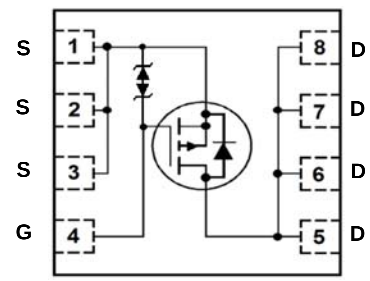
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been optimized for $r_{DS(on)}$, switching performance and ruggedness.

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			-30	V
V_{GS}	Gate to Source Voltage			±25	V
I_D	Drain Current -Continuous	T_C = 25 °C	(Note 5)	-54	A
	Drain Current -Continuous	T_C = 100 °C	(Note 5)	-35	
	-Continuous	T_A = 25 °C	(Note 1a)	-14	
	-Pulsed		(Note 4)	-309	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	54	mJ
P_D	Power Dissipation	T_C = 25 °C		30	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.4	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		4.2	°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
FDMC013P030Z	FDMC013P030Z	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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = -250 μA, V_{GS} = 0 V	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		-13		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -24 V, V_{GS} = 0 V			-1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±25 V, V_{DS} = 0 V			±10	μA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250 μA	-1	-1.6	-3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = -10 V, I_D = -14 A		5.0	7.0	mΩ
		V_{GS} = -4.5 V, I_D = -10 A		8.0	12.0	
		V_{GS} = -10 V, I_D = -14 A, T_J = 125 °C		6.2	10.4	
g_{FS}	Forward Transconductance	V_{DS} = -5 V, I_D = -14 A		60		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
C_{iss}	Input Capacitance	V_{DS} = -15 V, V_{GS} = 0 V, f = 1 MHz		4130	5785	pF
C_{oss}	Output Capacitance			1355	1895	pF
C_{rss}	Reverse Transfer Capacitance			1335	1870	pF

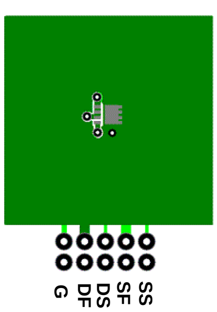
Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -15 V, I_D = -14 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω		34	55	ns
t_r	Rise Time			157	251	ns
$t_{d(off)}$	Turn-Off Delay Time			55	88	ns
t_f	Fall Time			94	150	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to -10 V; V_{DD} = -15 V, I_D = -14 A		96	135	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to -4.5 V		58	81	nC
Q_{gs}	Gate to Source Charge			11		nC
Q_{gd}	Gate to Drain “Miller” Charge			36		nC

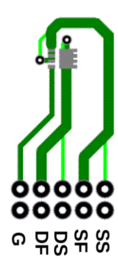
Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = -14 A (Note 2)		-0.8	-1.3	V
		V_{GS} = 0 V, I_S = -2 A (Note 2)		-0.7	-1.2	
t_{rr}	Reverse Recovery Time	I_F = -14 A, di/dt = 100 A/μs		44	77	ns
Q_{rr}	Reverse Recovery Charge			23	37	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

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0 %.
3. E_{AS} of 54 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 6 A, V_{DD} =30 V, V_{GS} = 10 V.
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.

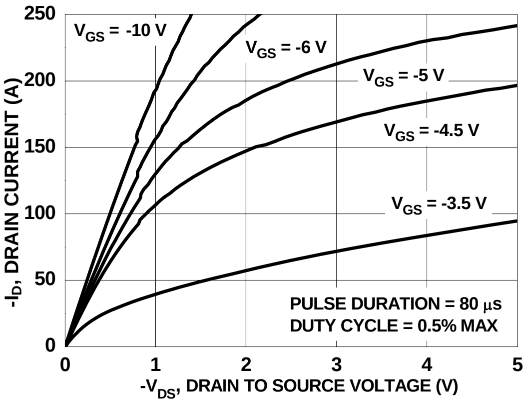


Figure 1. On Region Characteristics

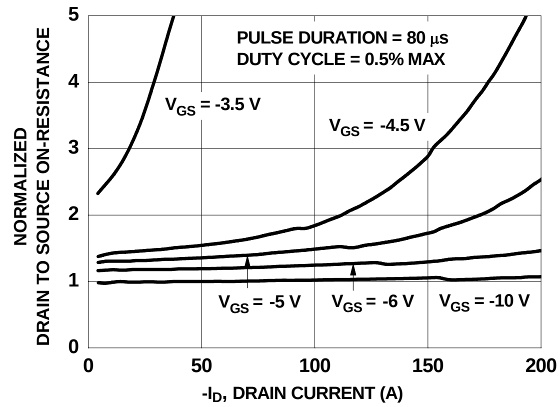


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

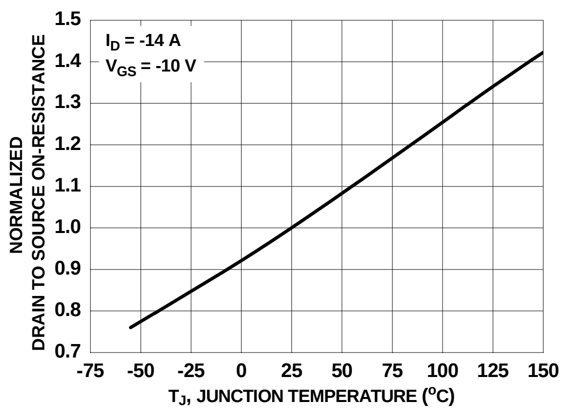


Figure 3. Normalized On Resistance vs. Junction Temperature

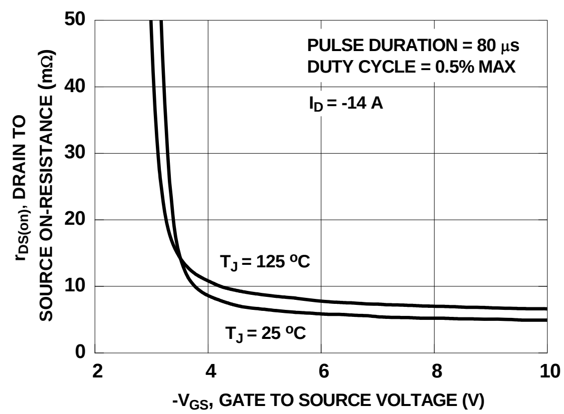


Figure 4. On-Resistance vs. Gate to Source Voltage

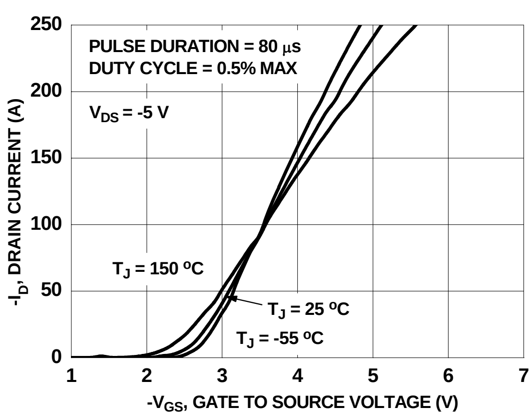


Figure 5. Transfer Characteristics

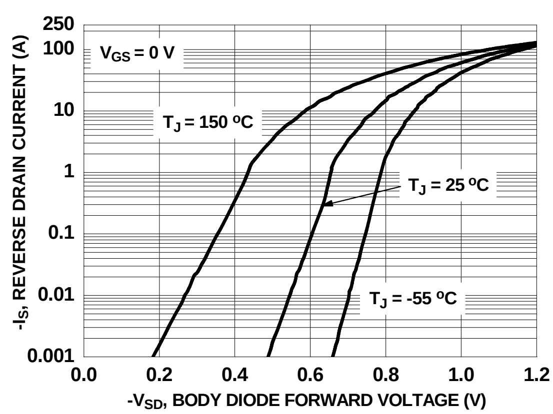


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

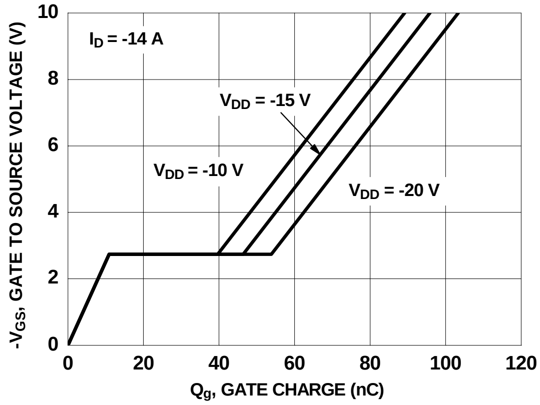


Figure 7. Gate Charge Characteristics

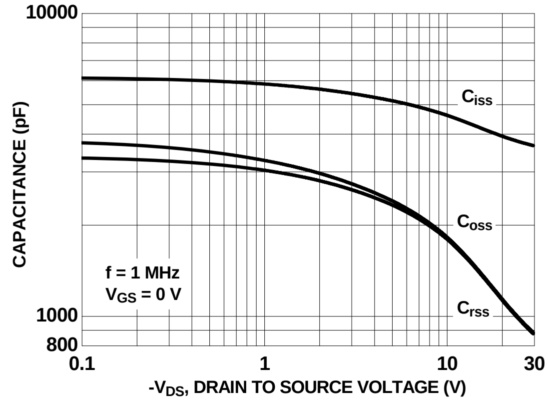


Figure 8. Capacitance vs. Drain to Source Voltage

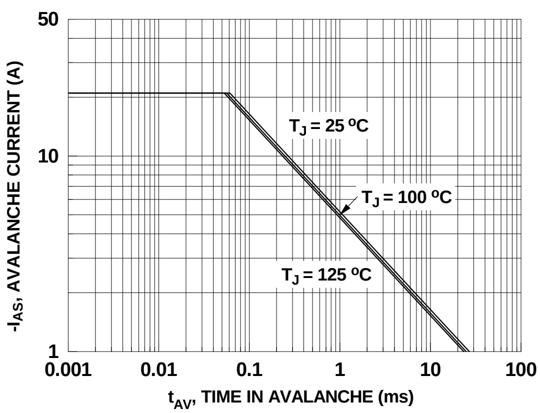


Figure 9. Unclamped Inductive Switching Capability

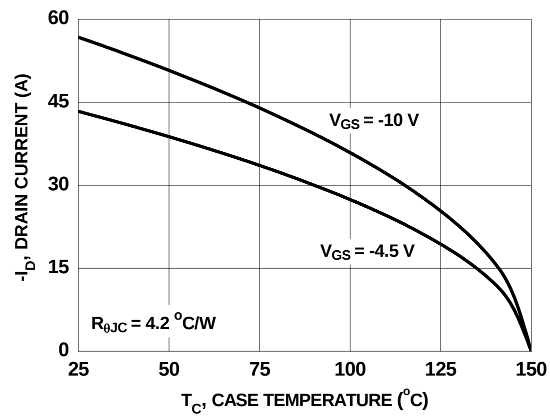


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

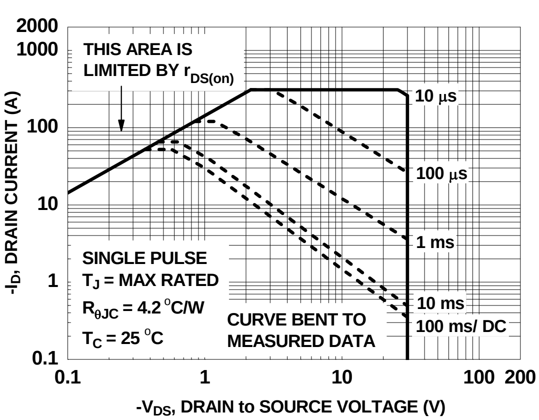


Figure 11. Forward Bias Safe Operating Area

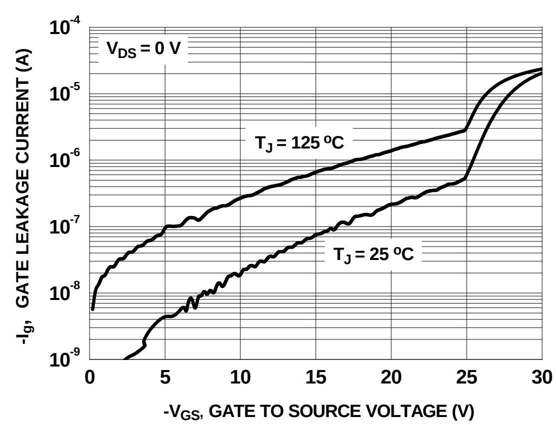


Figure 12. Igss vs. Vgss

Typical Characteristics T_J = 25 °C unless otherwise noted.

Figure 13. Single Pulse Maximum Power Dissipation

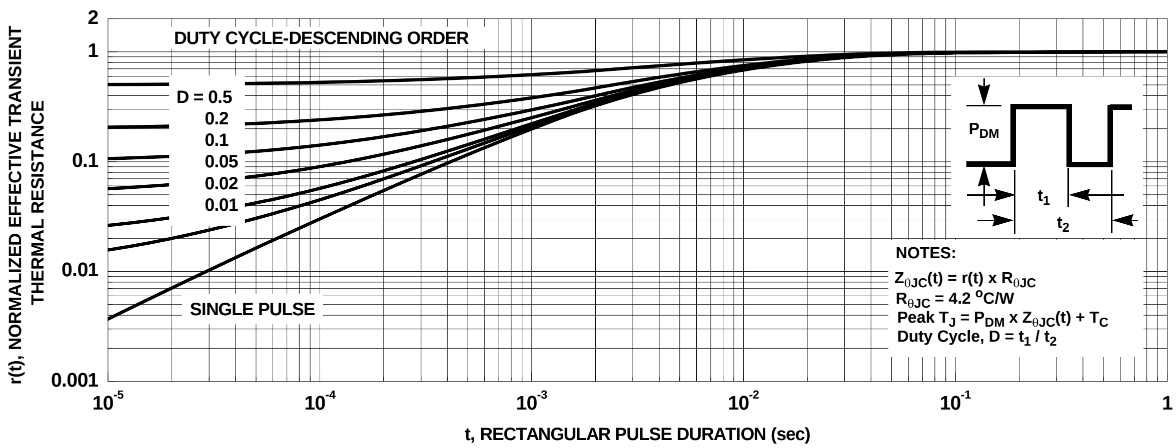
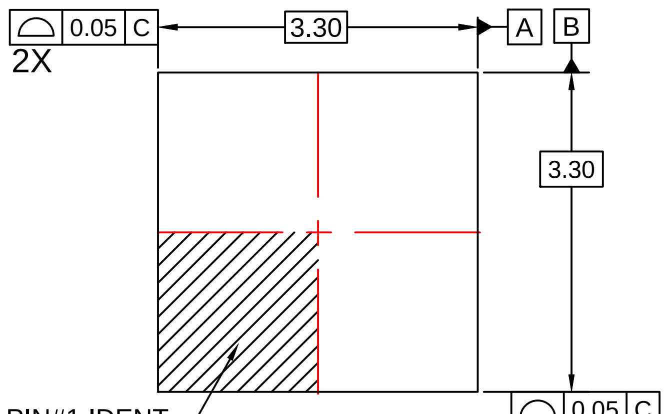
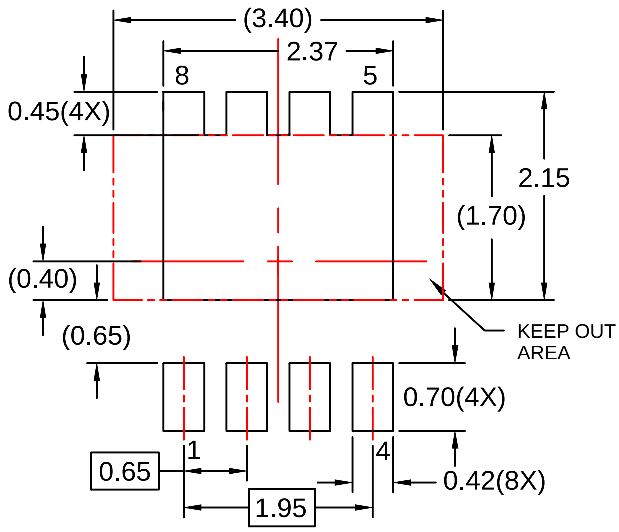


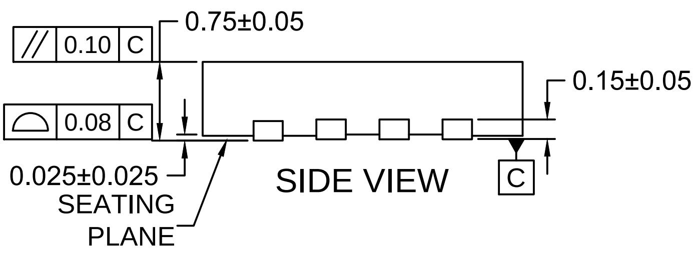
Figure 14. Junction to Case Transient Thermal Response Curve



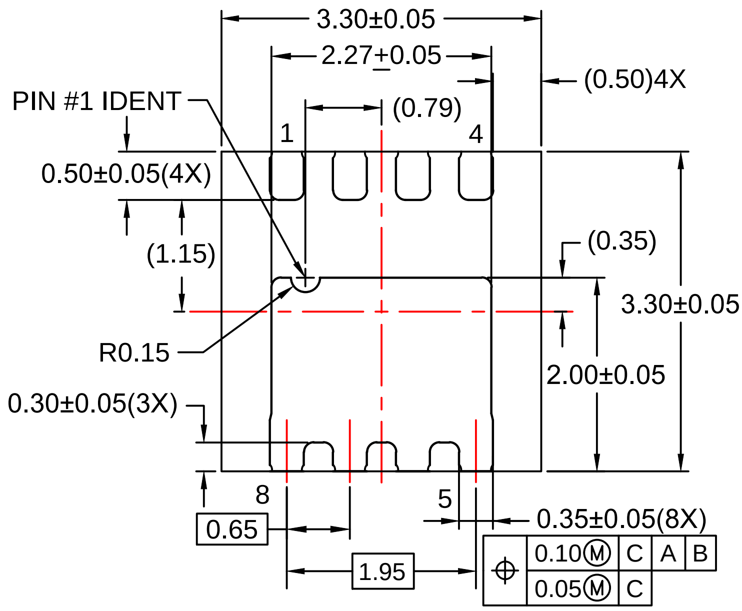
TOP VIEW



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.

E. DRAWING FILENAME: MKT-MLP08Srev3.

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