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ON Semiconductor®

FDMA510PZ

Single P-Channel PowerTrench® MOSFET

-20V, -7.8A, 30mΩ

Features

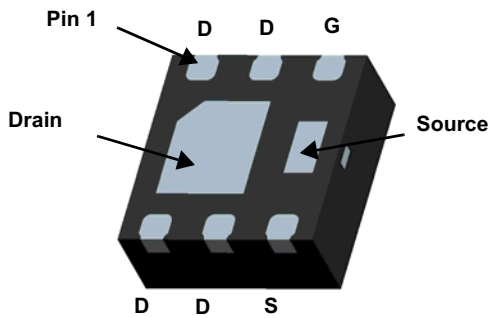
- Max $r_{DS(on)}$ = 30mΩ at $V_{GS} = -4.5V$, $I_D = -7.8A$
- Max $r_{DS(on)}$ = 37mΩ at $V_{GS} = -2.5V$, $I_D = -6.6A$
- Max $r_{DS(on)}$ = 50mΩ at $V_{GS} = -1.8V$, $I_D = -5.5A$
- Max $r_{DS(on)}$ = 90mΩ at $V_{GS} = -1.5V$, $I_D = -2.0A$
- Low profile - 0.8mm maximum - in the new package MicroFET 2X2 mm
- HBM ESD protection level > 3KV typical (Note 3)
- Free from halogenated compounds and antimony oxides
- RoHS Compliant



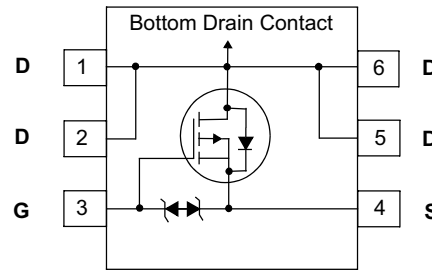
General Description

This device is designed specifically for battery charge or load switching in cellular handset and other ultraportable applications. It features a MOSFET with low on-state resistance.

The MicroFET 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.



MicroFET 2X2 (Bottom View)



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ 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 (Note 1a)	-7.8	A
	-Pulsed	-24	
P_D	Power Dissipation (Note 1a)	2.4	W
	Power Dissipation (Note 1b)	0.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	52	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	145	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
510	FDMA510PZ	MicroFET 2X2	7"	8mm	3000units

FDMA510PZ Single P-Channel PowerTrench® MOSFET

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	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		-13		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{V}, V_{GS} = 0\text{V}$			-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$			± 10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	-0.4	-0.7	-1.5	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		3		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -4.5\text{V}, I_D = -7.8\text{A}$		27	30	m Ω
		$V_{GS} = -2.5\text{V}, I_D = -6.6\text{A}$		34	37	
		$V_{GS} = -1.8\text{V}, I_D = -5.5\text{A}$		46	50	
		$V_{GS} = -1.5\text{V}, I_D = -2.0\text{A}$		60	90	
		$V_{GS} = -4.5\text{V}, I_D = -7.8\text{A}, T_J = 125^\circ\text{C}$		36	40	
g_{FS}	Forward Transconductance	$V_{DD} = -5\text{V}, I_D = -7.8\text{A}$		26		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		1110	1480	pF
C_{oss}	Output Capacitance			205	275	pF
C_{rss}	Reverse Transfer Capacitance			185	280	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{V}, I_D = -7.8\text{A}, V_{GS} = -4.5\text{V}, R_{GEN} = 6\Omega$		7	14	ns
t_r	Rise Time			9	18	ns
$t_{d(off)}$	Turn-Off Delay Time			125	200	ns
t_f	Fall Time			64	103	ns
Q_g	Total Gate Charge			19	27	nC
Q_{gs}	Gate to Source Charge	$V_{DD} = -5\text{V}, I_D = -7.8\text{A}, V_{GS} = -4.5\text{V}$		2.1		nC
Q_{gd}	Gate to Drain "Miller" Charge			4.2		nC

Drain-Source Diode Characteristics

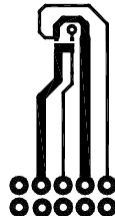
I_S	Maximum Continuous Drain-Source Diode Forward Current			-2	A	
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -2\text{A}$		-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -7.8\text{A}, di/dt = 100\text{A}/\mu\text{s}$		66	106	ns
Q_{rr}	Reverse Recovery Charge			44	71	nC

Notes:

- $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5×1.5 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. $52^\circ\text{C}/\text{W}$ when mounted on a 1in^2 pad of 2 oz copper.



b. $145^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$.

- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

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

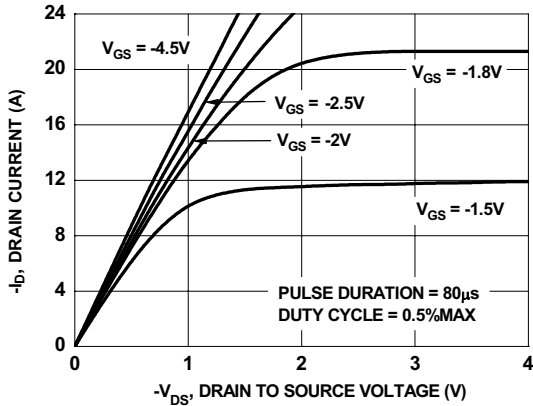


Figure 1. On-Region Characteristics

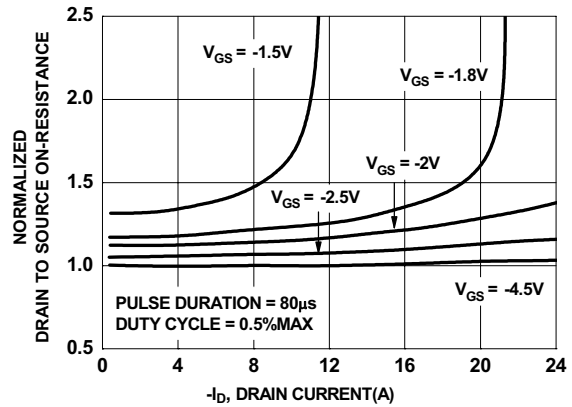


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

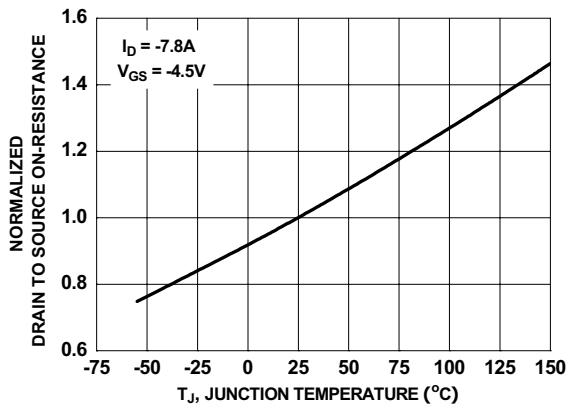


Figure 3. Normalized On-Resistance vs Junction Temperature

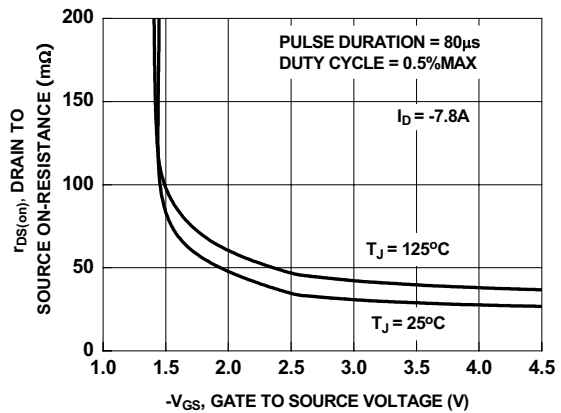


Figure 4. On-Resistance vs Gate to Source Voltage

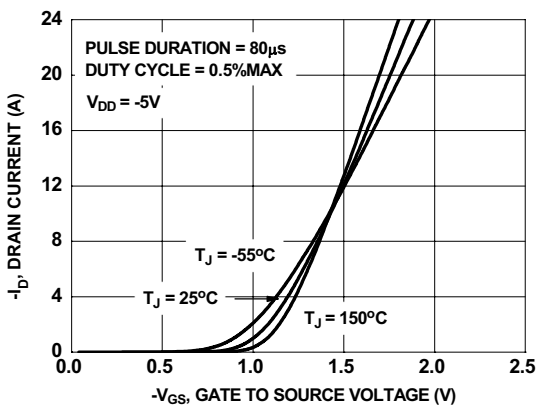


Figure 5. Transfer Characteristics

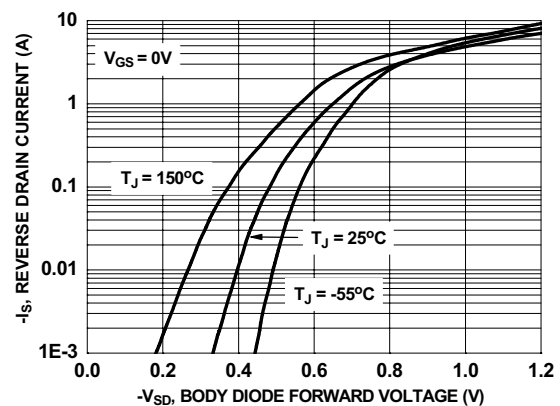


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

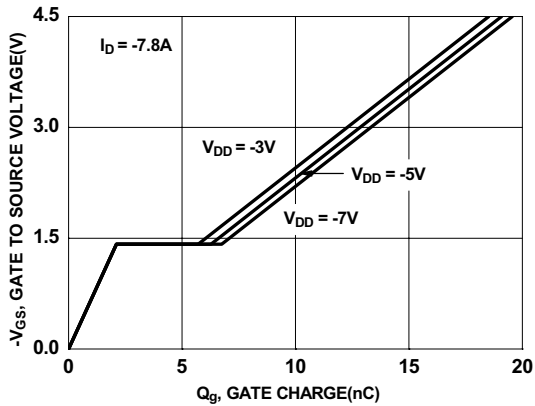


Figure 7. Gate Charge Characteristics

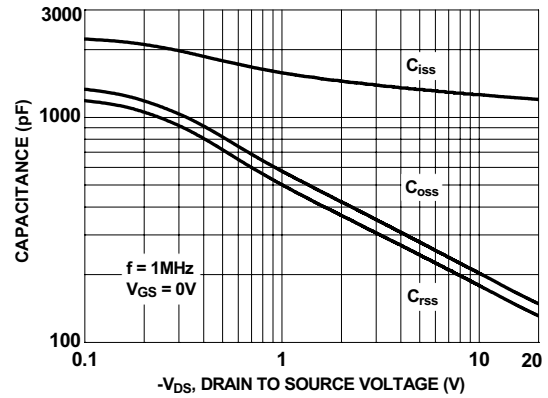


Figure 8. Capacitance vs Drain to Source Voltage

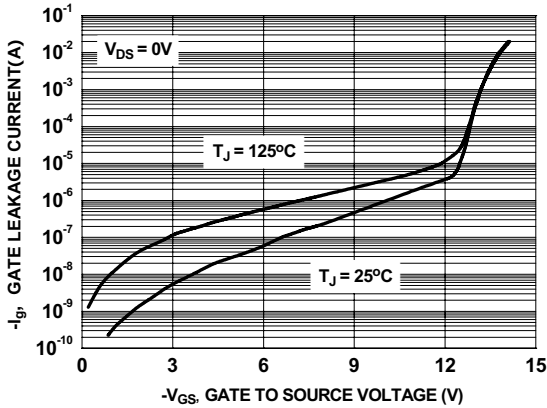


Figure 9. Gate Leakage Current vs Gate to Source Voltage

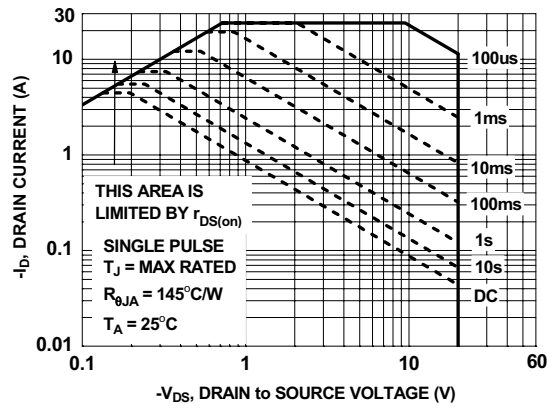


Figure 10. Forward Bias Safe Operating Area

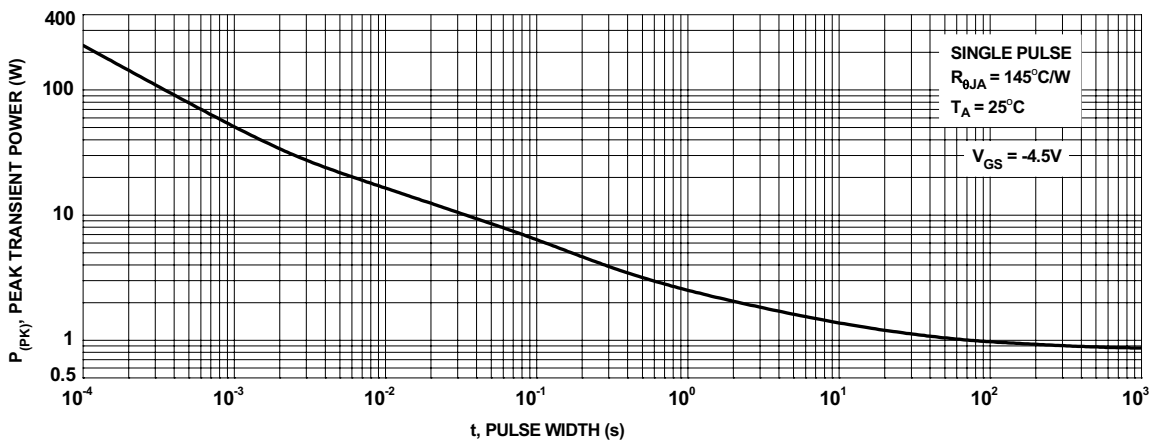


Figure 11. Single Pulse Maximum Power Dissipation

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

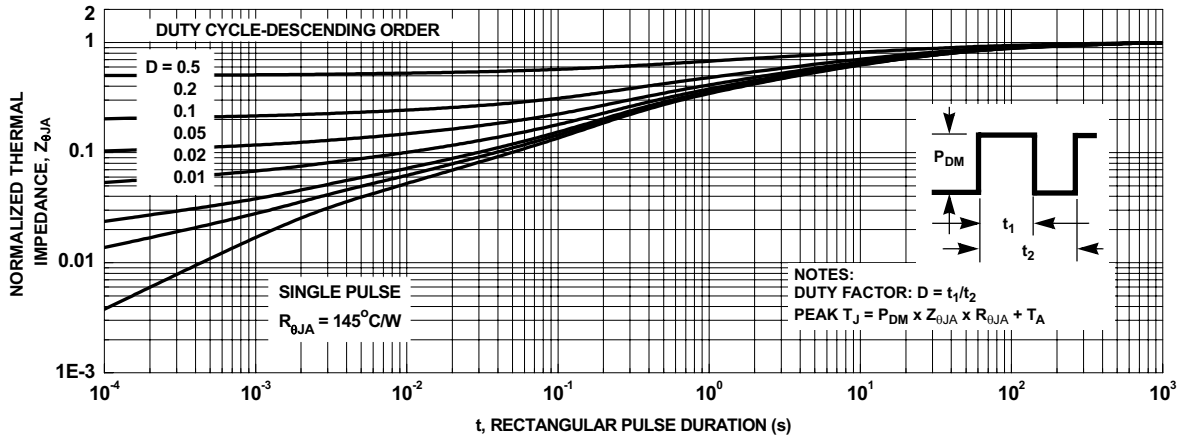
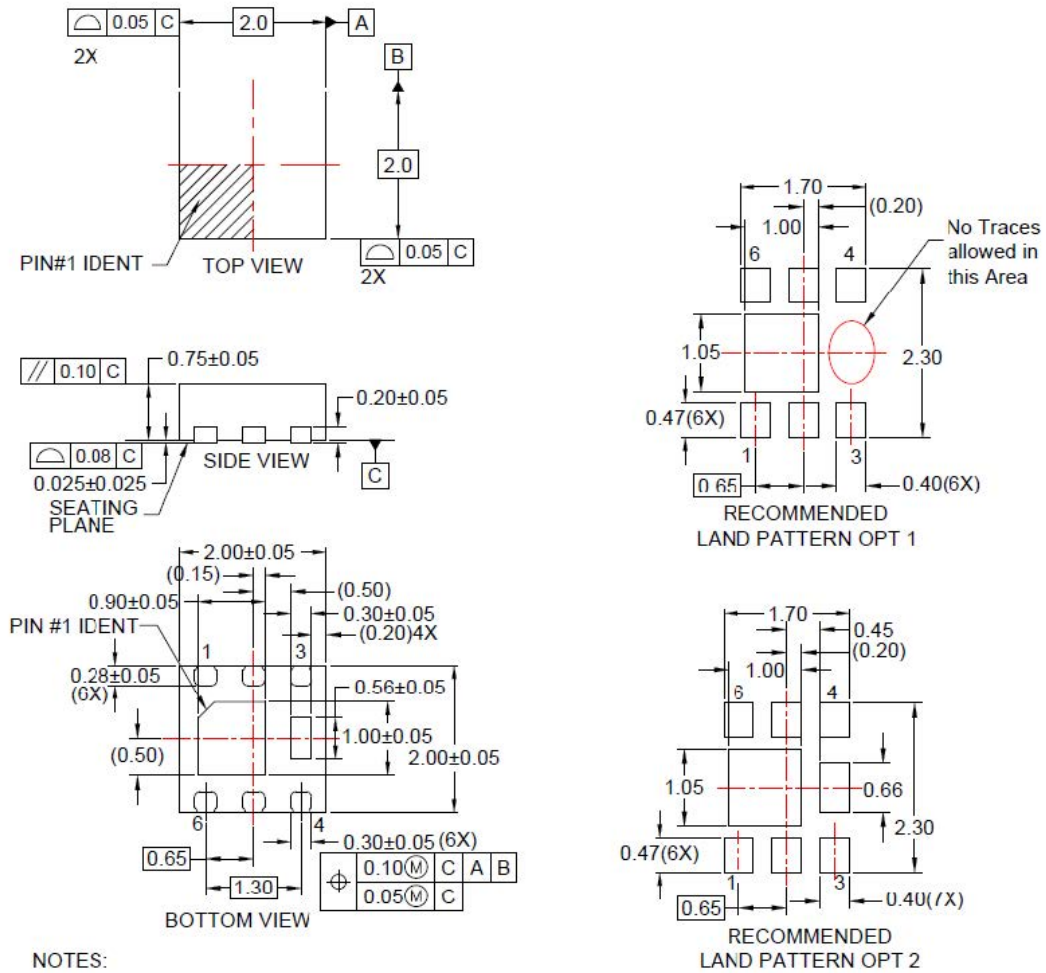


Figure 12. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

- A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION
- 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-MLP06Lrev4.

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