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FDMA910PZ

Single P-Channel PowerTrench® MOSFET -20 V, -9.4 A, 20 mΩ

Features

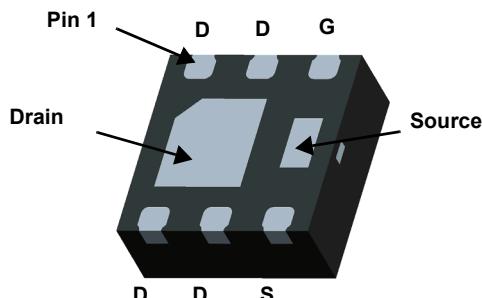
- Max $r_{DS(on)}$ = 20 mΩ at V_{GS} = -4.5 V, I_D = -9.4 A
- Max $r_{DS(on)}$ = 24 mΩ at V_{GS} = -2.5 V, I_D = -8.6 A
- Max $r_{DS(on)}$ = 34 mΩ at V_{GS} = -1.8 V, I_D = -7.2 A
- Low Profile - 0.8 mm maximum in the new package MicroFET 2x2 mm
- HBM ESD protection level > 2.8k V typical (Note 3)
- Free from halogenated compounds and antimony oxides
- RoHS Compliant

June 2014

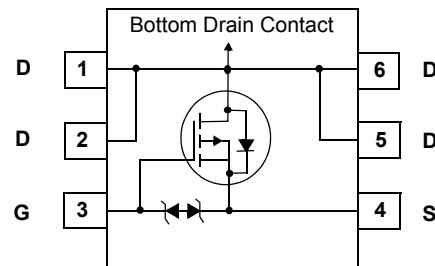
®

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 and zener diode protection against ESD. 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	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-9.4	A
	-Pulsed	-45	
P_D	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.4	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b)	0.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

R_{0JA}	Thermal Resistance, Junction to Ambient (Note 1a)	52	°C/W
R_{0JA}	Thermal Resistance, Junction to Ambient (Note 1b)	145	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
910	FDMA910PZ	MicroFET 2X2	7"	8 mm	3000 units

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
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$, referenced to 25°C		-12		$\text{mV/}^\circ\text{C}$
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	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$			± 1	μA

On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250 \mu\text{A}$	-0.4	-0.5	-1.5	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$, referenced to 25°C		3		$\text{mV/}^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = -4.5 \text{ V}, I_D = -9.4 \text{ A}$		16	20	$\text{m}\Omega$
		$V_{GS} = -2.5 \text{ V}, I_D = -8.6 \text{ A}$		19	24	
		$V_{GS} = -1.8 \text{ V}, I_D = -7.2 \text{ A}$		24	34	
		$V_{GS} = -4.5 \text{ V}, I_D = -9.4 \text{ A}, T_J = 125^\circ\text{C}$		20	25	
g_{FS}	Forward Transconductance	$V_{DD} = -5 \text{ V}, I_D = -9.4 \text{ A}$		52		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		2110	2805	pF
C_{oss}	Output Capacitance			414	620	pF
C_{rss}	Reverse Transfer Capacitance			388	580	pF

Switching Characteristics

$t_{d(\text{on})}$	Turn-On Delay Time	$V_{DD} = -10 \text{ V}, I_D = -9.4 \text{ A}, V_{GS} = -4.5 \text{ V}, R_{\text{GEN}} = 6 \Omega$		9.4	19	ns
t_r	Rise Time			19	34	ns
$t_{d(\text{off})}$	Turn-Off Delay Time			135	216	ns
t_f	Fall Time			103	165	ns
Q_g	Total Gate Charge	$V_{GS} = -4.5 \text{ V}, V_{DD} = -10 \text{ V}, I_D = -9.4 \text{ A}$		21	29	nC
Q_{gs}	Gate to Source Charge			2.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			6		nC

Drain-Source Diode Characteristics

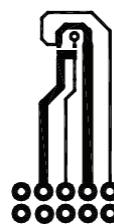
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = -2 \text{ A}$ (Note 2)		-0.6	-1.2	V
		$V_{GS} = 0 \text{ V}, I_S = -9.4 \text{ A}$ (Note 2)		-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -9.4 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		23	37	ns
				6.3	13	nC

NOTES:

1. R_{QJA} 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_{QJC} is guaranteed by design while R_{QJA} is determined by the user's board design.



a. 52 °C/W when mounted on a 1 in² pad of 2 oz copper.



b. 145 °C/W when mounted on a minimum pad of 2 oz copper.

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

3. 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

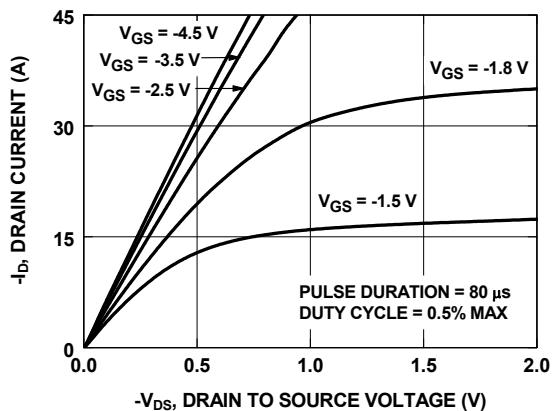


Figure 1. On-Region Characteristics

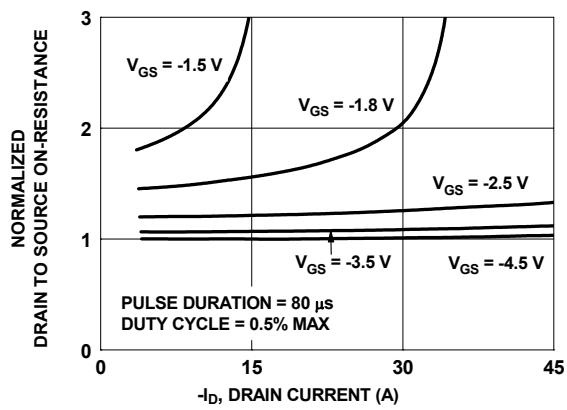


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

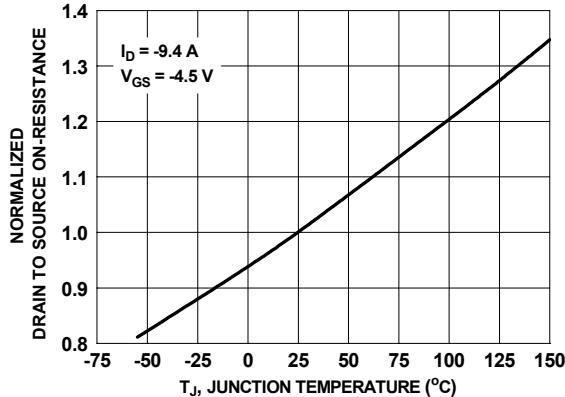


Figure 3. Normalized On-Resistance vs Junction Temperature

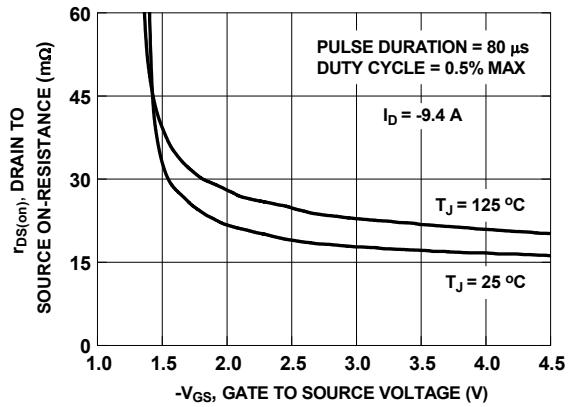


Figure 4. On-Resistance vs Gate to Source Voltage

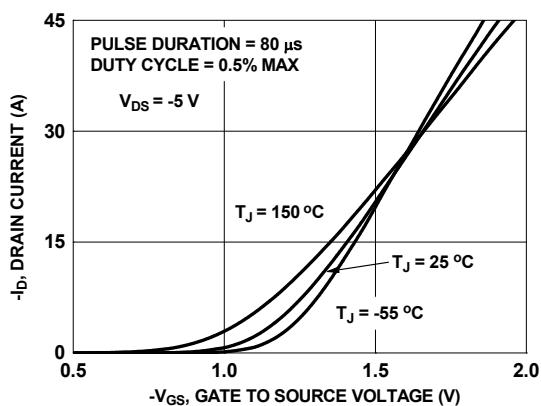


Figure 5. Transfer Characteristics

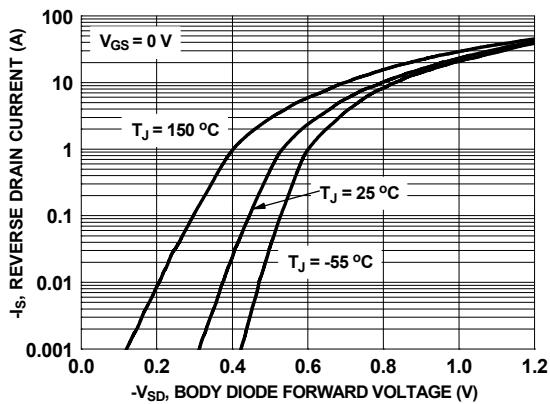


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

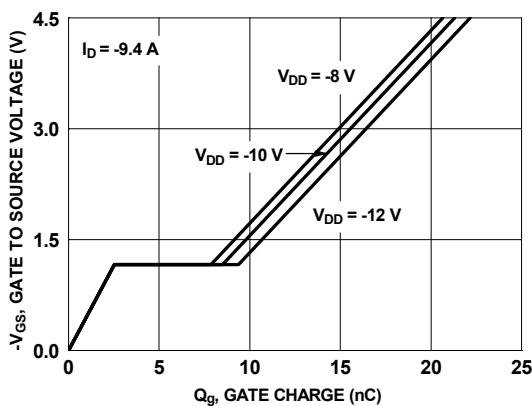


Figure 7. Gate Charge Characteristics

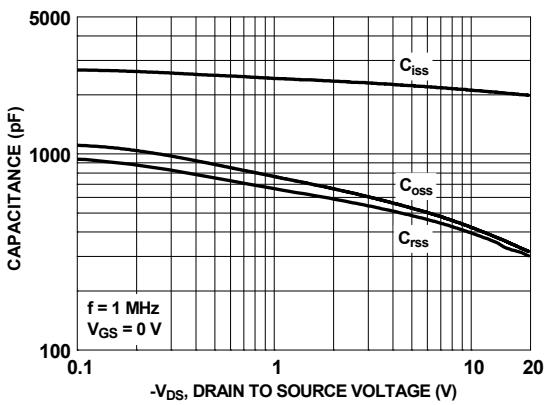


Figure 8. Capacitance vs Drain to Source Voltage

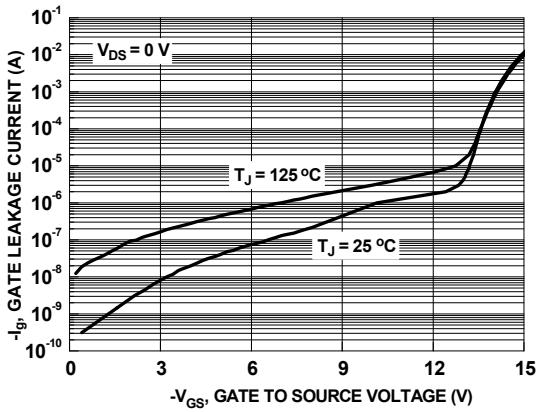


Figure 9. Gate Leakage Current vs Gate to Source Voltage

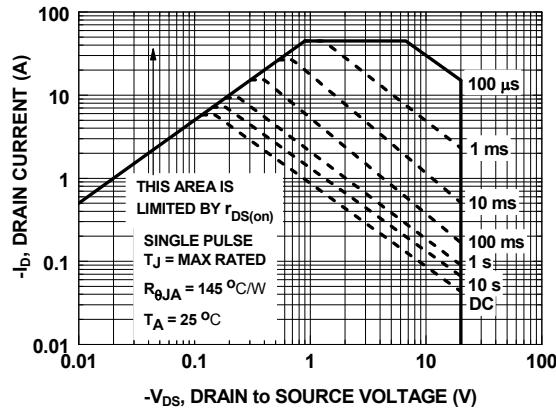


Figure 10. Forward Bias Safe Operating Area

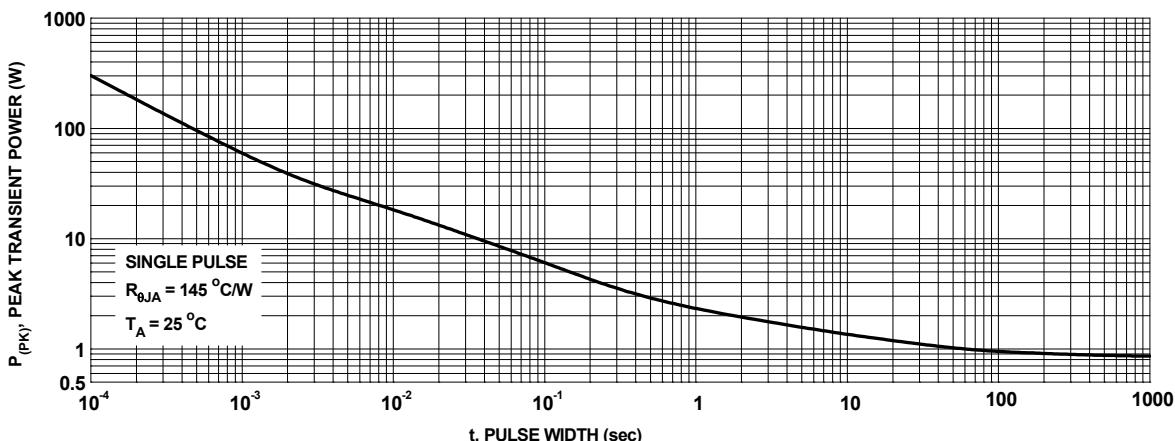
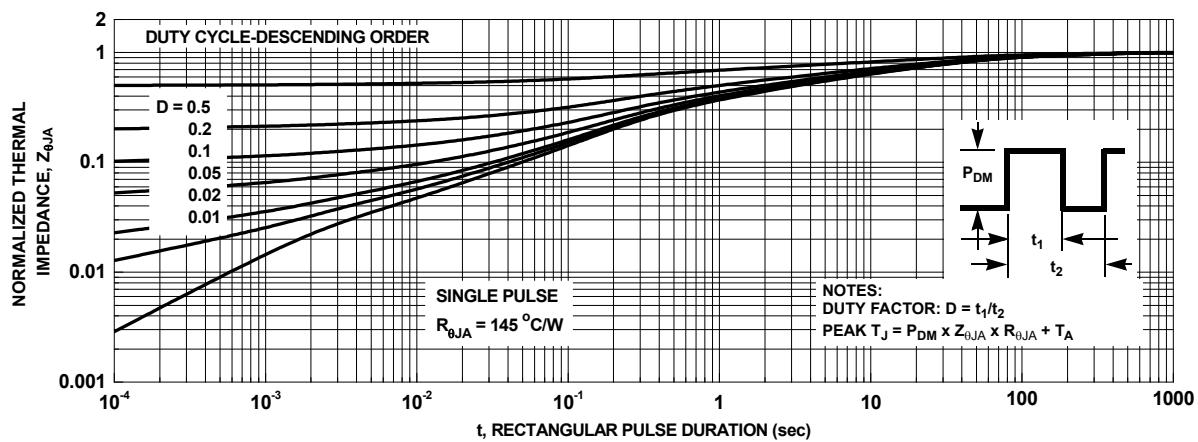
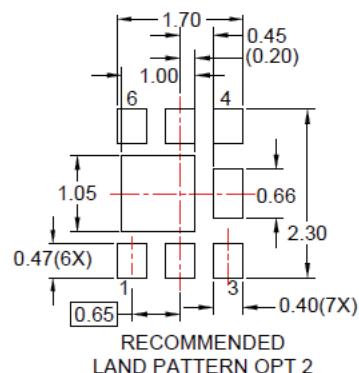
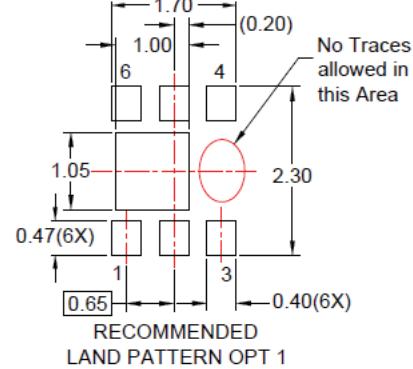
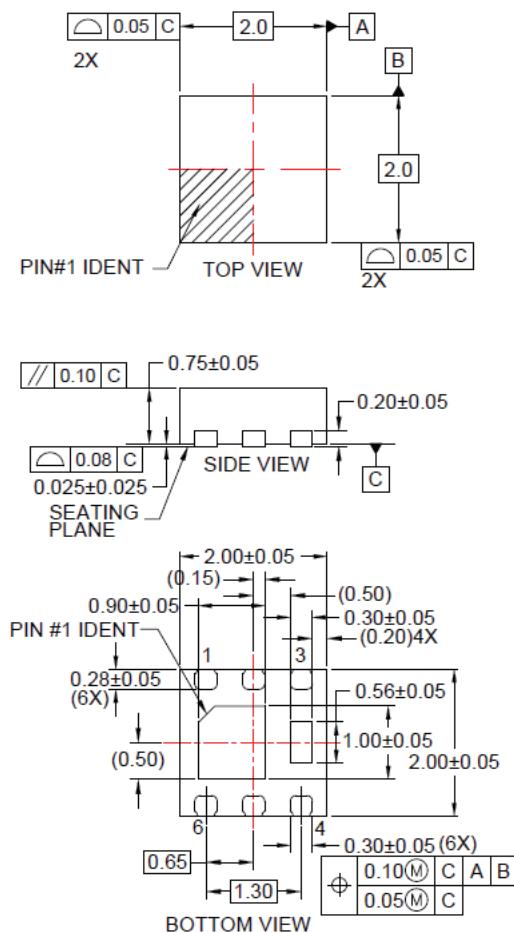


Figure 11. Single Pulse Maximum Power Dissipation

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



Dimensional Outline and Pad Layout



NOTES:

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- 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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