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ON Semiconductor®

# FDMA1023PZ

## Dual P-Channel PowerTrench® MOSFET

–20V, –3.7A, 72mΩ

### Features

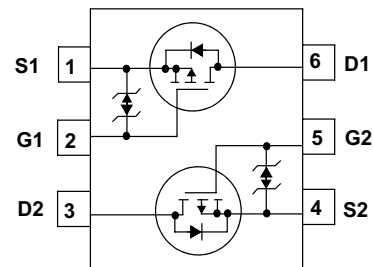
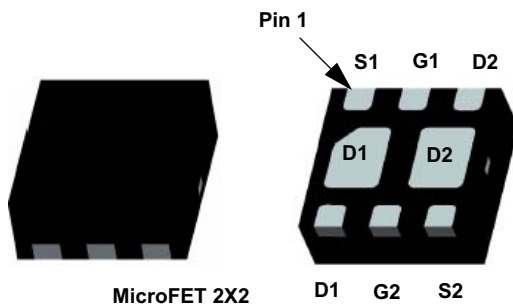
- Max  $r_{DS(on)}$  = 72mΩ at  $V_{GS} = -4.5V$ ,  $I_D = -3.7A$
- Max  $r_{DS(on)}$  = 95mΩ at  $V_{GS} = -2.5V$ ,  $I_D = -3.2A$
- Max  $r_{DS(on)}$  = 130mΩ at  $V_{GS} = -1.8V$ ,  $I_D = -2.0A$
- Max  $r_{DS(on)}$  = 195mΩ at  $V_{GS} = -1.5V$ ,  $I_D = -1.0A$
- Low profile - 0.8 mm maximum - in the new package MicroFET 2x2 mm
- HBM ESD protection level > 2kV typical (Note 3)
- RoHS Compliant
- Free from halogenated compounds and antimony oxides



### General Description

This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features two independent P-Channel MOSFETs with low on-state resistance for minimum conduction losses. When connected in the typical common source configuration, bi-directional current flow is possible.

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



### MOSFET Maximum Ratings $T_A = 25^\circ C$ 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) –3.7	A
	-Pulsed	–6	
$P_D$	Power Dissipation	(Note 1a) 1.5	W
		(Note 1b) 0.7	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	–55 to +150	°C

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance for Single Operation, Junction to Ambient	(Note 1a) 86	°C/W
$R_{\theta JA}$	Thermal Resistance for Single Operation, Junction to Ambient	(Note 1b) 173	
$R_{\theta JA}$	Thermal Resistance for Dual Operation, Junction to Ambient	(Note 1c) 69	
$R_{\theta JA}$	Thermal Resistance for Dual Operation, Junction to Ambient	(Note 1d) 151	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
023	FDMA1023PZ	MicroFET 2X2	7"	8mm	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
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-11		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{V}$ , $V_{GS} = 0\text{V}$			-1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 8\text{V}$ , $V_{DS} = 0\text{V}$			$\pm 10$	$\mu\text{A}$

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = -250\mu\text{A}$	-0.4	-0.7	-1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$		2.5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On-Resistance	$V_{GS} = -4.5\text{V}$ , $I_D = -3.7\text{A}$		60	72	m $\Omega$
		$V_{GS} = -2.5\text{V}$ , $I_D = -3.2\text{A}$		75	95	
		$V_{GS} = -1.8\text{V}$ , $I_D = -2.0\text{A}$		100	130	
		$V_{GS} = -1.5\text{V}$ , $I_D = -1.0\text{A}$		130	195	
		$V_{GS} = -4.5\text{V}$ , $I_D = -3.7\text{A}$ , $T_J = 125^\circ\text{C}$		81	91	
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{V}$ , $I_D = -3.7\text{A}$		12		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = -10\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$		490	655	pF
$C_{oss}$	Output Capacitance			100	135	pF
$C_{rss}$	Reverse Transfer Capacitance			90	135	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{V}$ , $I_D = -1\text{A}$ $V_{GS} = -4.5\text{V}$ , $R_{GEN} = 6\Omega$		9	18	ns
$t_r$	Rise Time			12	22	ns
$t_{d(off)}$	Turn-Off Delay Time			64	103	ns
$t_f$	Fall Time			37	60	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{DD} = -10\text{V}$ , $I_D = -3.7\text{A}$		8.6	12	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{GS} = -4.5\text{V}$		0.7		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.0		nC

**Drain-Source Diode Characteristics**

$I_S$	Maximum Continuous Source-Drain Diode Forward Current			-1.1		A
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_S = -1.1\text{A}$ (Note 2)		-0.8	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = -3.7\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		32	48	ns
$Q_{rr}$	Reverse Recovery Charge			15	23	nC

**Notes:**

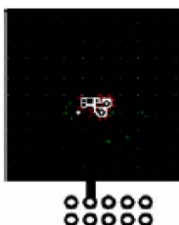
1:  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.

(a)  $R_{\theta JA} = 86^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB. For single operation.

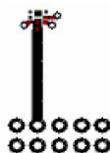
(b)  $R_{\theta JA} = 173^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper. For single operation.

(c)  $R_{\theta JA} = 69^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper, 1.5" x 1.5" x 0.062" thick PCB, For dual operation.

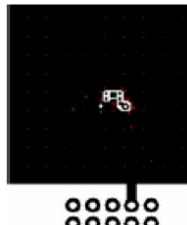
(d)  $R_{\theta JA} = 151^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper. For dual operation.



a)  $86^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b)  $173^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper.



c)  $69^{\circ}\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



d)  $151^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

2: Pulse Test : Pulse Width < 300us, 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

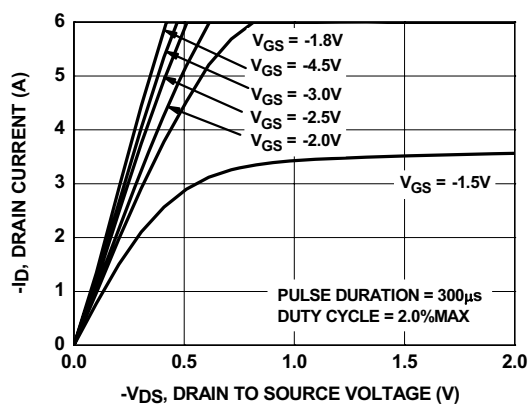


Figure 1. On Region Characteristics

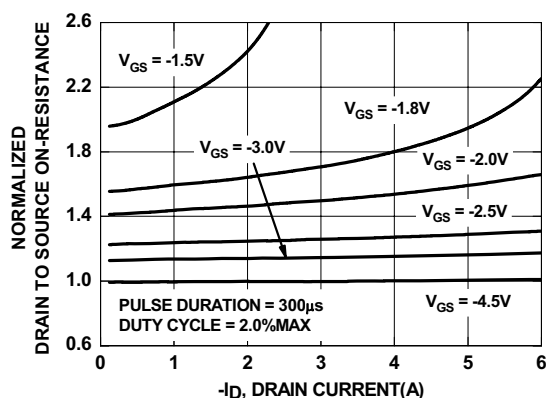


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

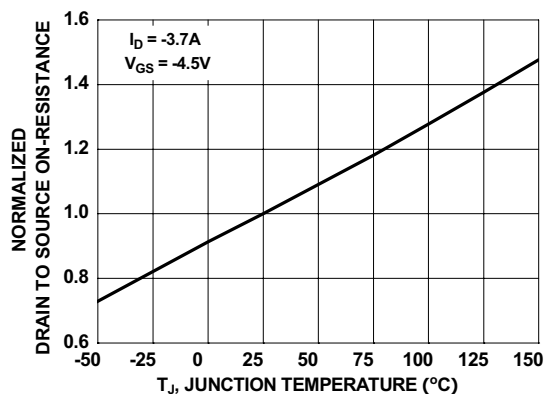


Figure 3. Normalized On-Resistance vs Junction Temperature

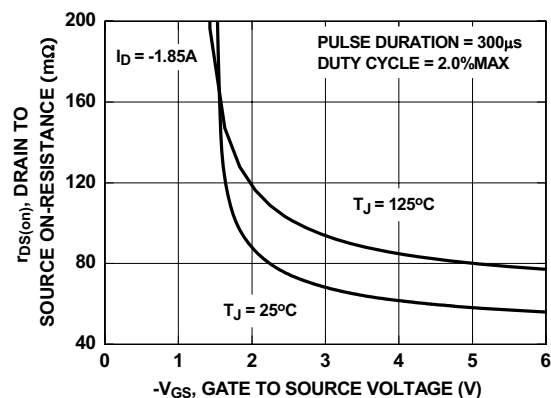


Figure 4. On-Resistance vs Gate to Source Voltage

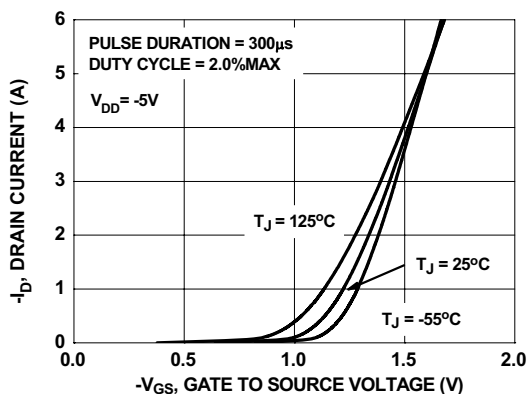


Figure 5. Transfer Characteristics

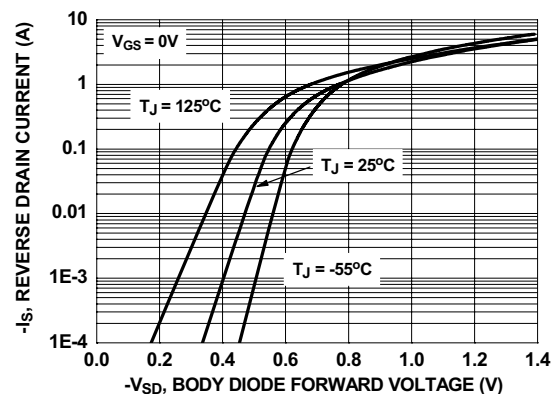


Figure 6. Source to Drain Diode Forward Voltage vs Source Current



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

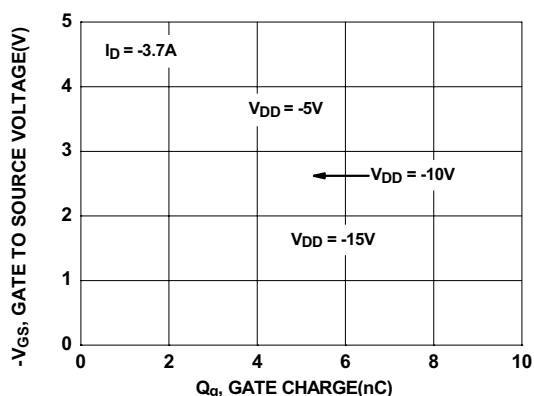


Figure 7. Gate Charge Characteristics

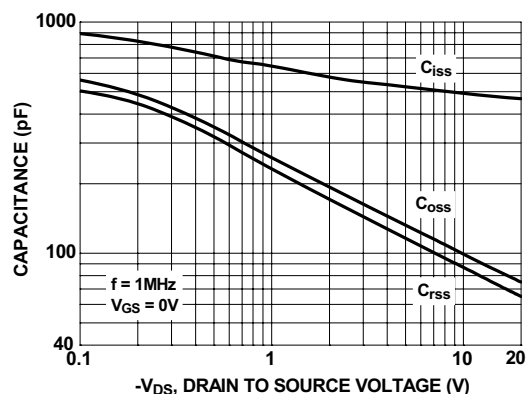


Figure 8. Capacitance Characteristics

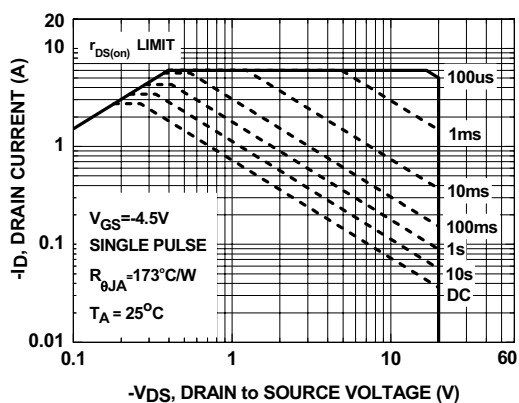


Figure 9. Forward Bias Safe Operating Area

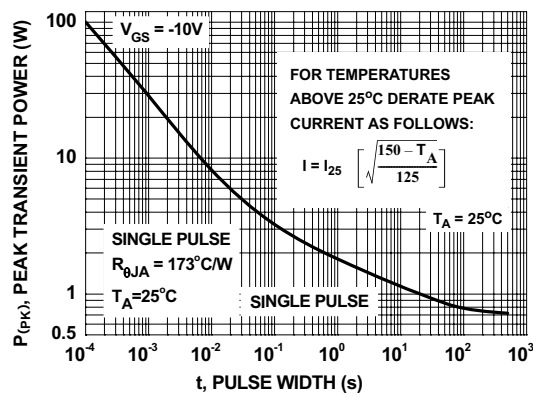


Figure 10. Single Pulse Maximum Power Dissipation

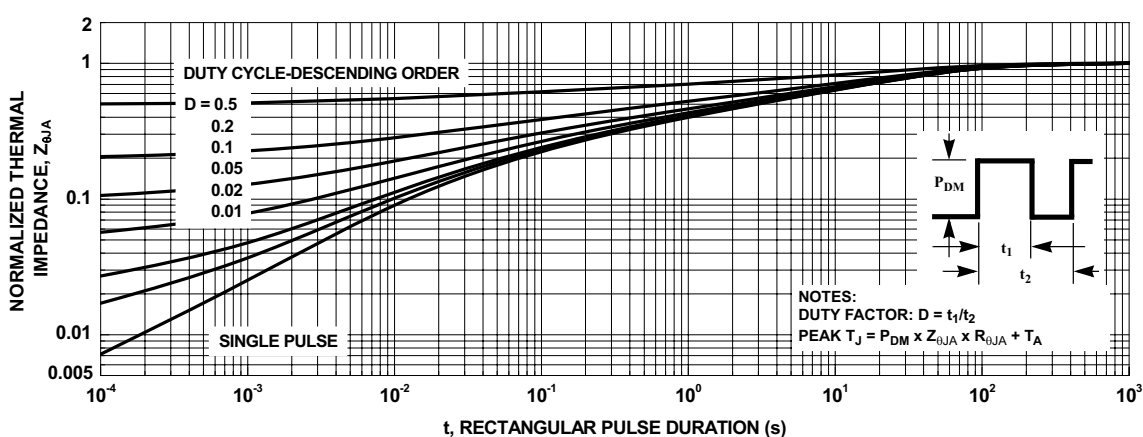
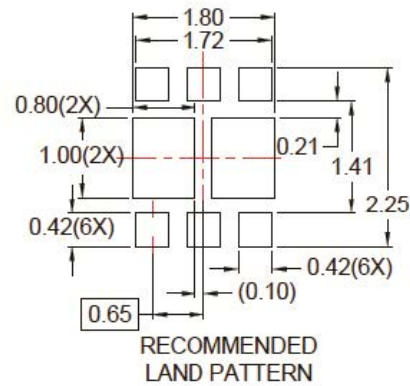
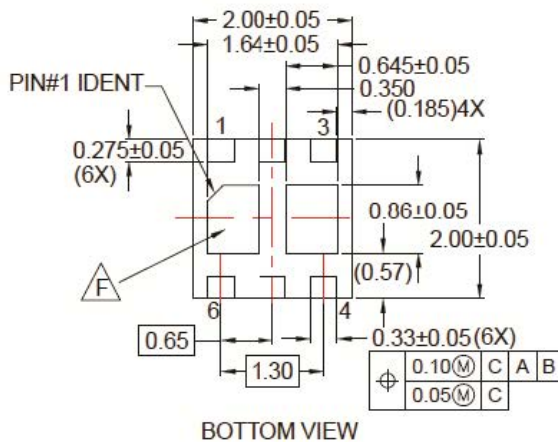
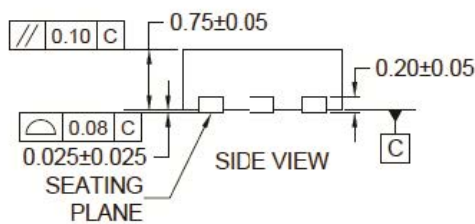
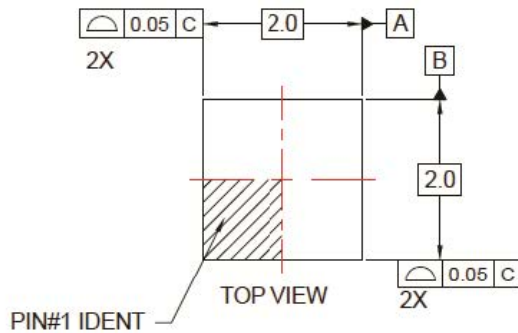


Figure 11. Transient Thermal Response Curve


## Dimensional Outline and Pad Layout



### NOTES:

- CONFORM TO JEDEC REGISTRATIONS MO-229, VARIATION VCCC, EXCEPT WHERE NOTED.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
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