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ON Semiconductor®

FDMA6023PZT

Dual P-Channel PowerTrench® MOSFET

-20 V, -3.6 A, 60 mΩ

Features

- Max $r_{DS(on)}$ = 60 mΩ at $V_{GS} = -4.5$ V, $I_D = -3.6$ A
- Max $r_{DS(on)}$ = 80 mΩ at $V_{GS} = -2.5$ V, $I_D = -3.0$ A
- Max $r_{DS(on)}$ = 110 mΩ at $V_{GS} = -1.8$ V, $I_D = -2.0$ A
- Max $r_{DS(on)}$ = 170 mΩ at $V_{GS} = -1.5$ V, $I_D = -1.0$ A
- Low Profile-0.55 mm maximum - in the new package MicroFET 2x2 mm Thin
- HBM ESD protection level > 2.4 kV typical (Note 3)
- RoHS Compliant
- Free from halogenated compounds and antimony oxides



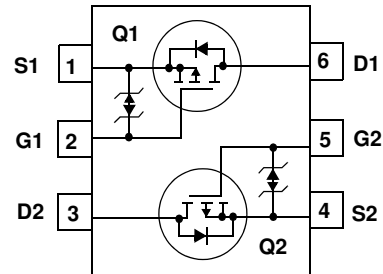
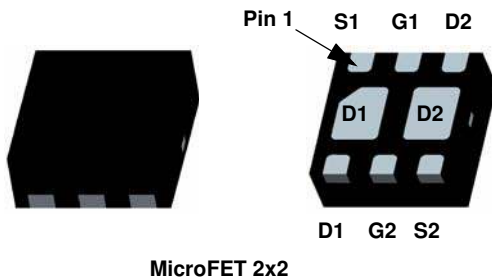
General Description

This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultraportable 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 Thin package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

Applications

- Battery protection
- Battery management
- Load switch



MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	-20	V
V_{GS}	Gate to Source Voltage	±8	V
I_D	-Continuous	$T_A = 25$ °C (Note 1a)	-3.6
	-Pulsed		-15
P_D	Power Dissipation	$T_A = 25$ °C (Note 1a)	1.4
	Power Dissipation	$T_A = 25$ °C (Note 1b)	0.7
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

Symbol	Parameter	Rated	Units
$R_{\theta JA}$	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
623	FDMA6023PZT	MicroFET 2X2 Thin	7"	8mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-12		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	$V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	-0.4	-0.5	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-2.7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -4.5\text{ V}$, $I_D = -3.6\text{ A}$		40	60	m Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -3.0\text{ A}$		49	80	
		$V_{GS} = -1.8\text{ V}$, $I_D = -2.0\text{ A}$		60	110	
		$V_{GS} = -1.5\text{ V}$, $I_D = -1.0\text{ A}$		70	170	
		$V_{GS} = -4.5\text{ V}$, $I_D = -3.6\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		58	72	
g_{FS}	Forward Transconductance	$V_{DD} = -5\text{ V}$, $I_D = -3.6\text{ A}$		15		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		665	885	pF
C_{oss}	Output Capacitance			115	155	pF
C_{rss}	Reverse Transfer Capacitance			100	150	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{ V}$, $I_D = -3.6\text{ A}$, $V_{GS} = -4.5\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		13	23	ns
t_r	Rise Time			11	20	ns
$t_{d(off)}$	Turn-Off Delay Time			75	120	ns
t_f	Fall Time			47	75	ns
Q_g	Total Gate Charge		$V_{GS} = 0\text{ V to } -4.5\text{ V}$		12	17
Q_{gs}	Gate to Source Charge	$V_{DD} = -10\text{ V}$, $I_D = -3.6\text{ A}$		1.4		nC
Q_{gd}	Gate to Drain "Miller" Charge			5.2		nC

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain-Source 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)		-0.7	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -3.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		33	53	ns
Q_{rr}	Reverse Recovery Charge			15	27	nC

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

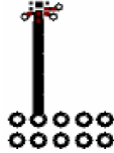
Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 oz. copper pad on a $1.5 \times 1.5\text{ in.}$ 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) $R_{\theta JA} = 86\text{ }^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper, $1.5 \times 1.5 \times 0.062\text{ in.}$ thick PCB. For single operation.
- (b) $R_{\theta JA} = 173\text{ }^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper. For single operation.
- (c) $R_{\theta JA} = 69\text{ }^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper, $1.5 \times 1.5 \times 0.062\text{ in.}$ thick PCB. For dual operation.
- (d) $R_{\theta JA} = 151\text{ }^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper. For dual operation.



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



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



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



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

2. Pulse Test: Pulse Width $< 300\text{ }\mu\text{s}$, 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

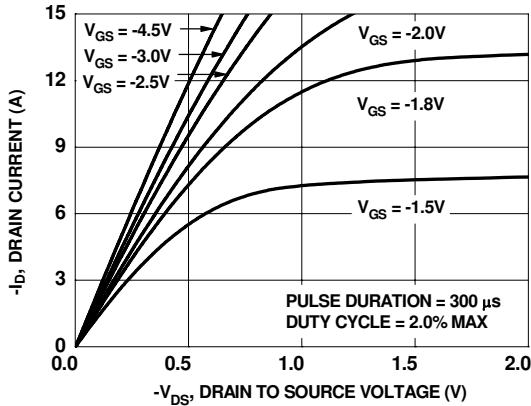


Figure 1. On-Region Characteristics

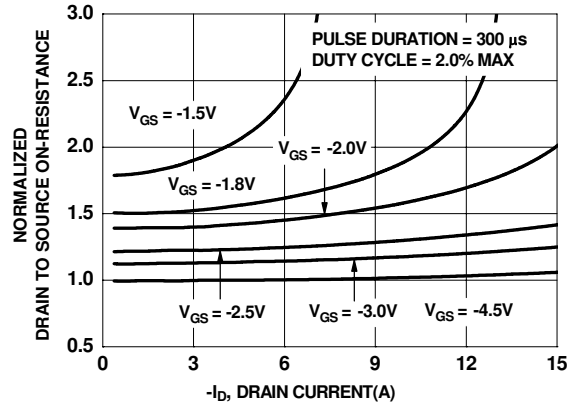


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

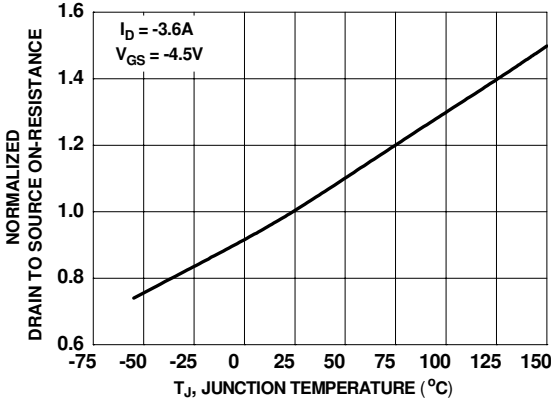


Figure 3. Normalized On-Resistance vs Junction Temperature

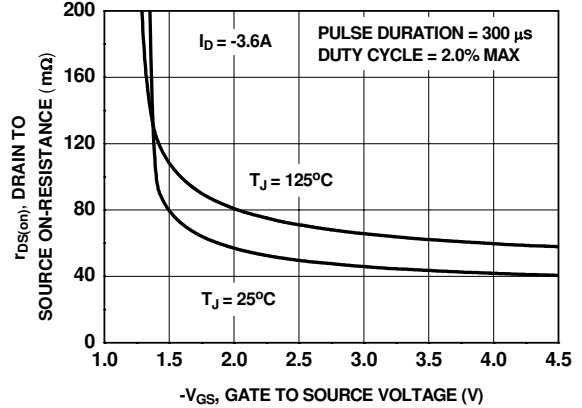


Figure 4. On-Resistance vs Gate to Source Voltage

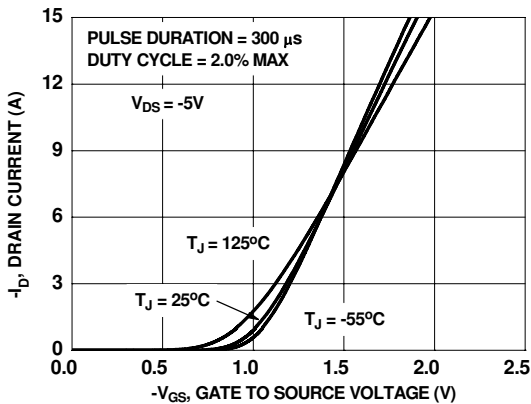


Figure 5. Transfer Characteristics

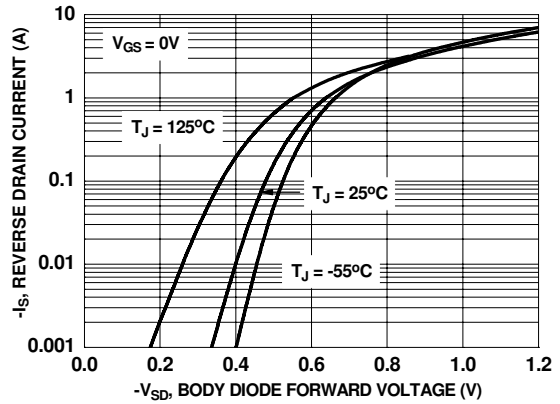


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

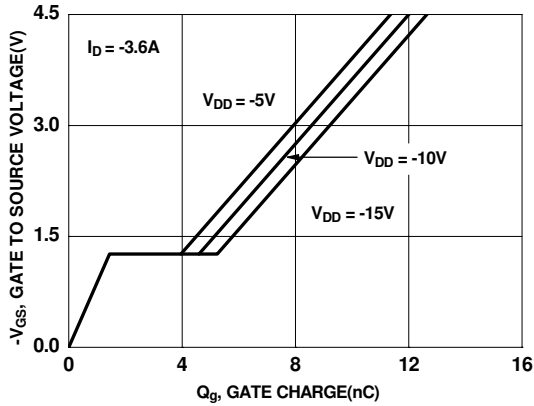


Figure 7. Gate Charge Characteristics

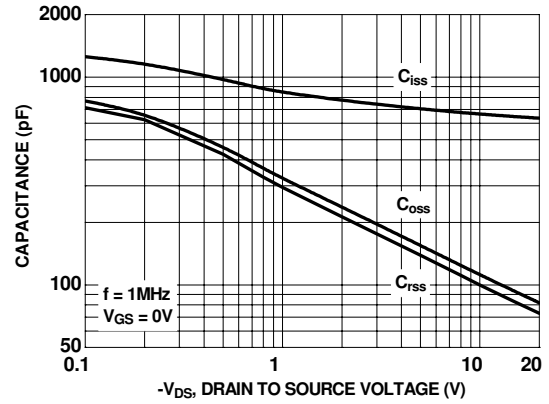


Figure 8. Capacitance vs Drain to Source Voltage

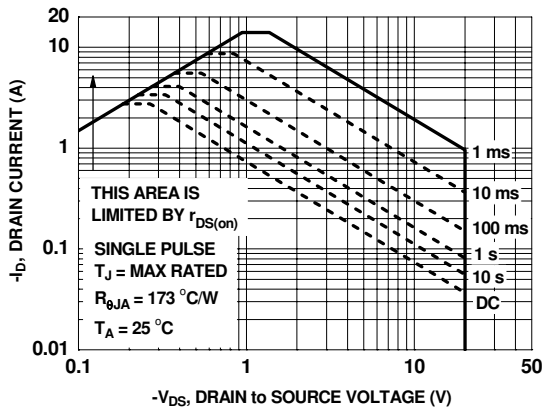


Figure 9. Forward Bias Safe Operation Area

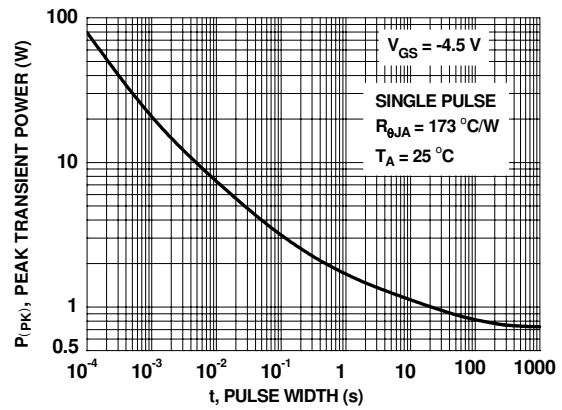


Figure 10. Single Pulse Maximum Power Dissipation

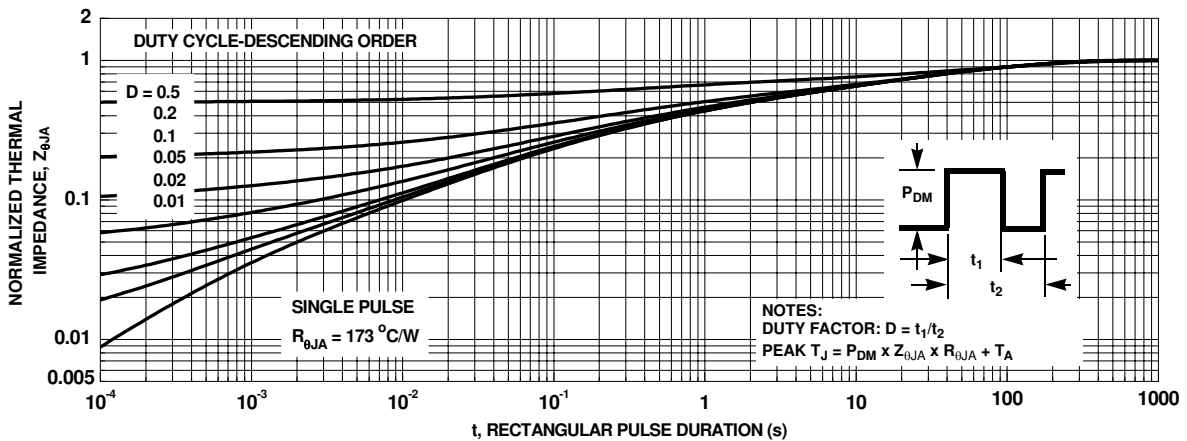
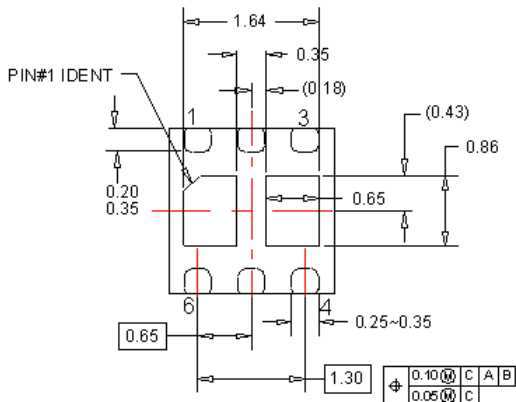
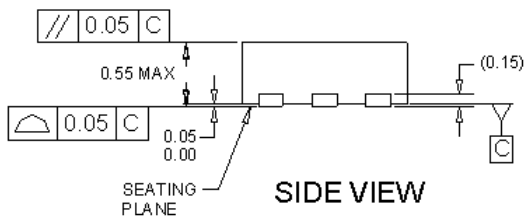
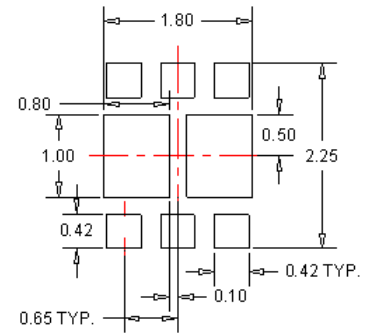
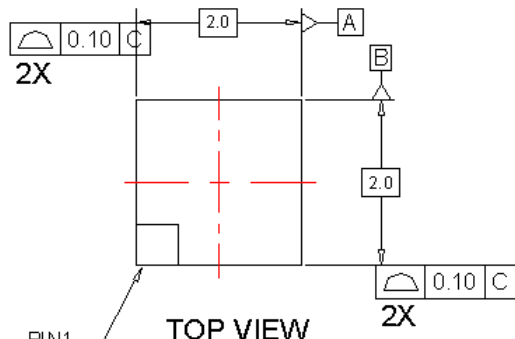



Figure 11. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

- A. NO JEDEC STANDARD APPLIES
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. DRAWING FILENAME: MKT-UMLP06Brev 1.

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