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FAIRCHILD SEMICONDUCTOR®

June 2009

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

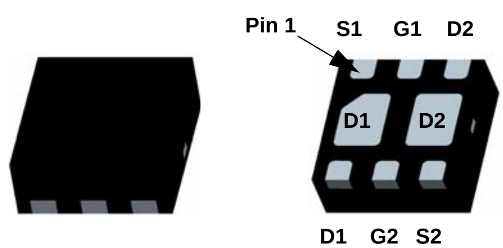
General Description

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.

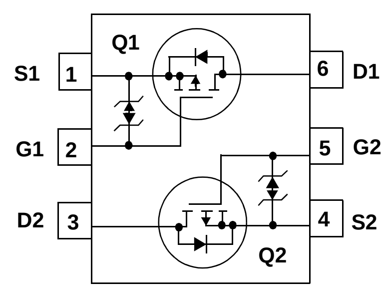
The MicroFET 2X2 Thin package offers exceptional thermal performance for it's physical size and is well suited to linear mode applications.

Applications

- Battery protection
- Battery management
- Load switch



MicroFET 2x2



MOSFET Maximum Ratings T_A = 25 °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 °C	(Note 1a)	-3.6	A
	-Pulsed			-15	
P_D	Power Dissipation	T_A = 25 °C	(Note 1a)	1.4	W
	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

$R_{\theta JA}$	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 °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	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		-12		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -16 V, V_{GS} = 0 V			-1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±8 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	-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 μA, referenced to 25 °C		-2.7		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = -4.5 V, I_D = -3.6 A		40	60	mΩ
		V_{GS} = -2.5 V, I_D = -3.0 A		49	80	
		V_{GS} = -1.8 V, I_D = -2.0 A		60	110	
		V_{GS} = -1.5 V, I_D = -1.0 A		70	170	
		V_{GS} = -4.5 V, I_D = -3.6 A, T_J = 125 °C		58	72	
g_{FS}	Forward Transconductance	V_{DD} = -5 V, I_D = -3.6 A		15		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz		665	885	pF
C_{oss}	Output Capacitance			115	155	pF
C_{rss}	Reverse Transfer Capacitance			100	150	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -10 V, I_D = -3.6 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω		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 V to -4.5 V; V_{DD} = -10 V, I_D = -3.6 A		12	17	nC
Q_{gs}	Gate to Source Charge	V_{DD} = -10 V, I_D = -3.6 A		1.4		nC
Q_{gd}	Gate to Drain "Miller" Charge			5.2		nC

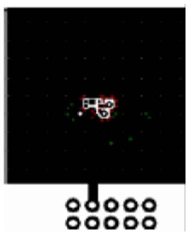
Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Drain-Source Diode Forward Current				-1.1	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = -1.1 A (Note 2)		-0.7	-1.2	V
t_{rr}	Reverse Recovery Time	I_F = -3.6 A, di/dt = 100 A/μs		33	53	ns
Q_{rr}	Reverse Recovery Charge			15	27	nC

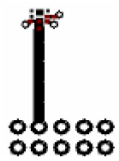
Electrical Characteristics T_J = 25 °C unless otherwise noted

Notes:

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

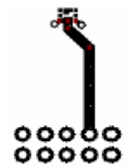


a) 86^{o}C/W when mounted on a 1in^2 pad of 2 oz copper.



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

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



d)151^{o}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 °C unless otherwise noted

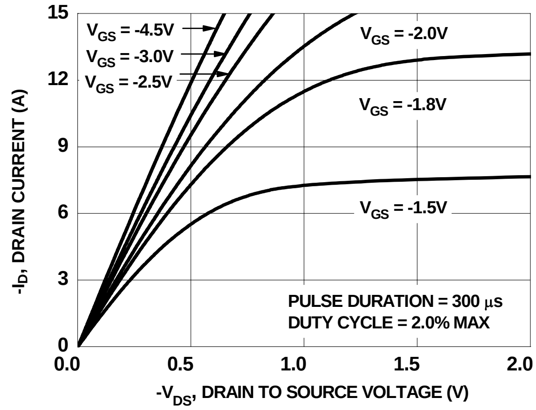


Figure 1. On-Region Characteristics

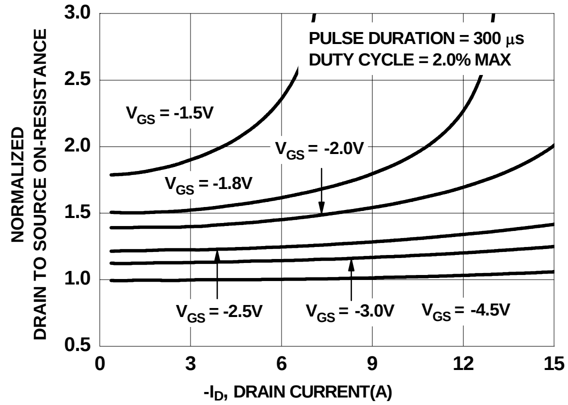


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

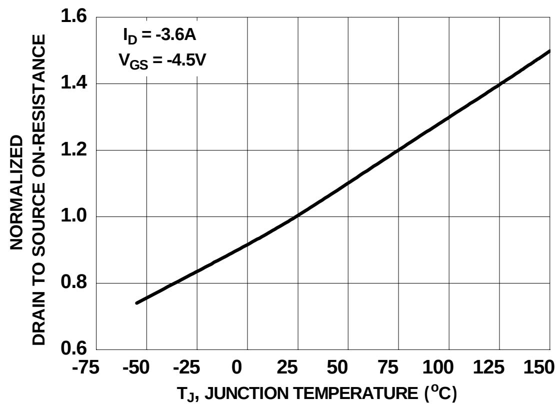


Figure 3. Normalized On-Resistance vs Junction Temperature

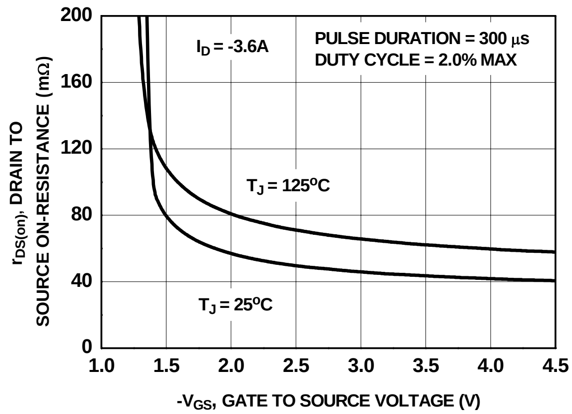


Figure 4. On-Resistance vs Gate to Source Voltage

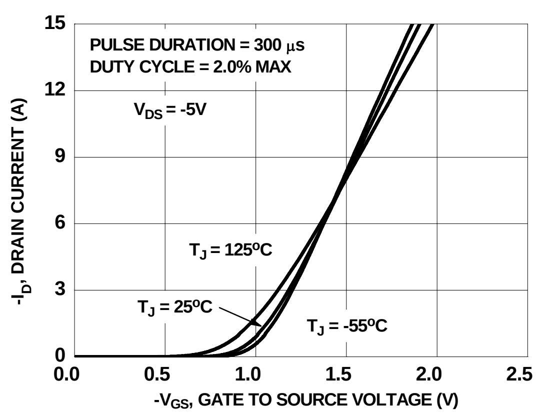


Figure 5. Transfer Characteristics

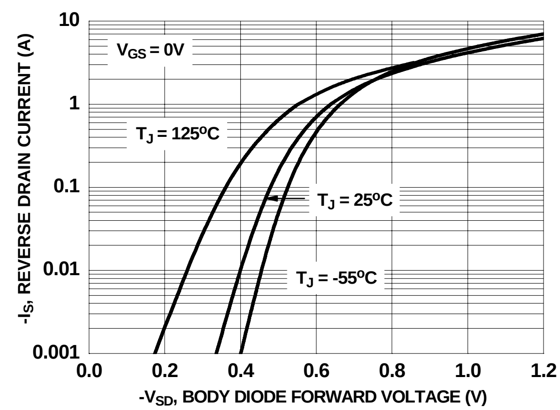


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

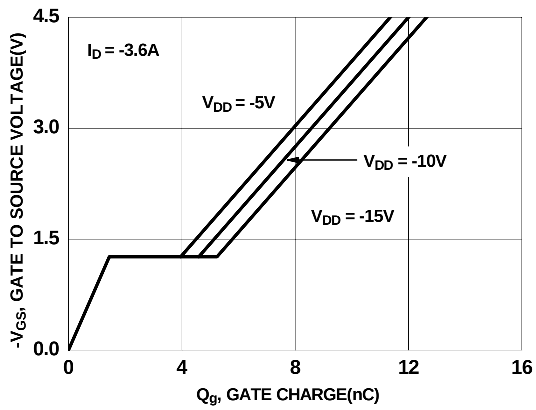


Figure 7. Gate Charge Characteristics

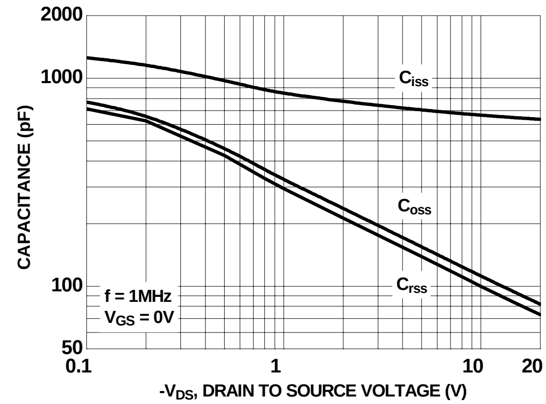


Figure 8. Capacitance vs Drain to Source Voltage

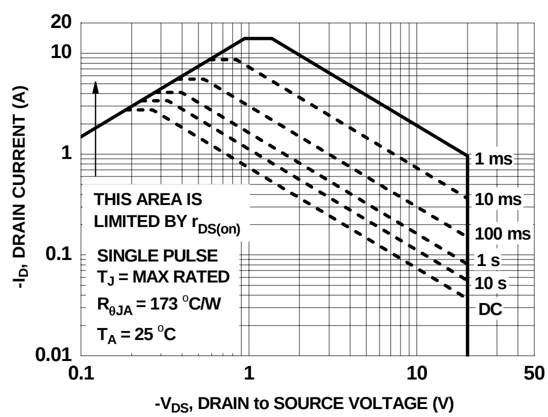


Figure 9. Forward Bias Safe Operation Area

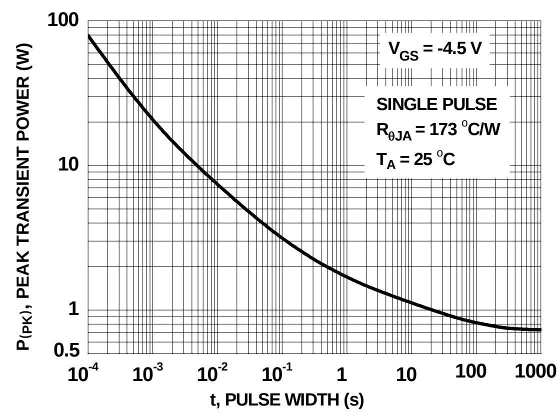


Figure 10. Single Pulse Maximum Power Dissipation

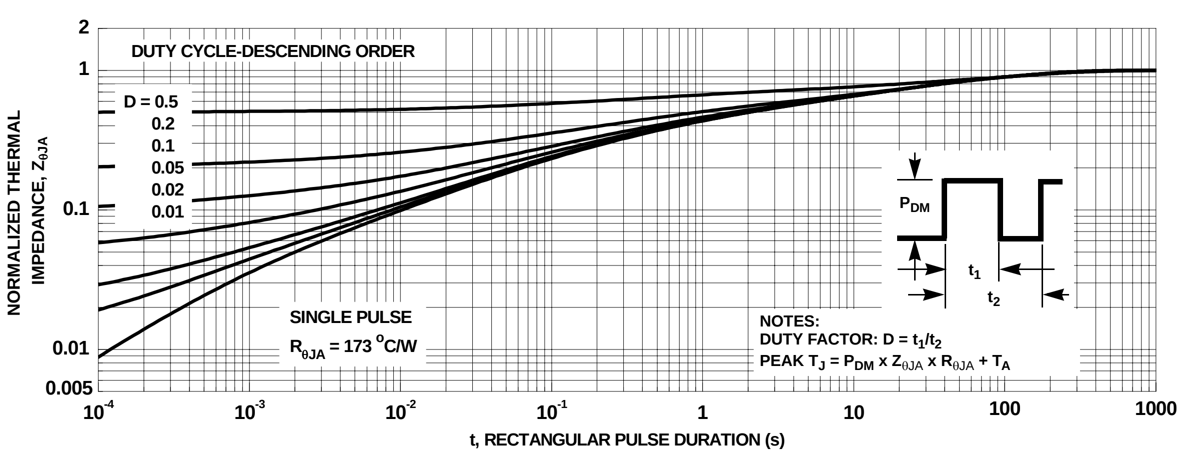
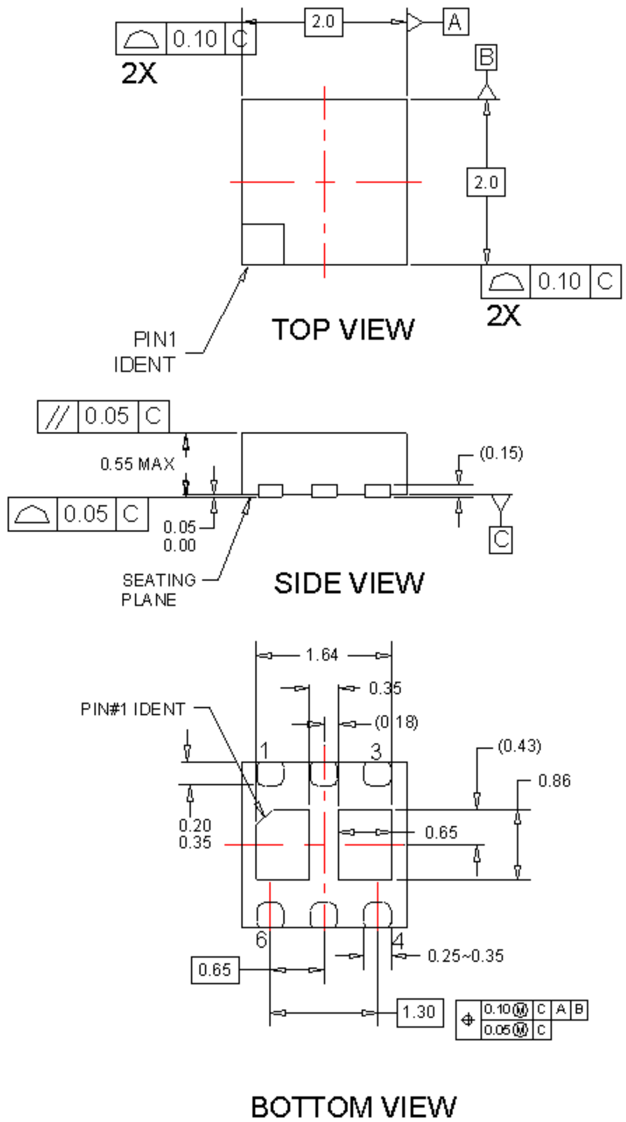
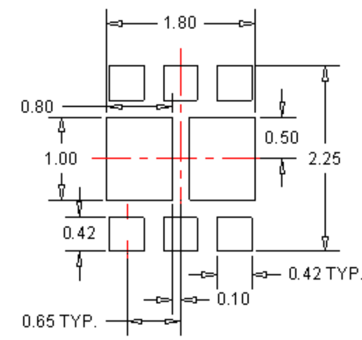


Figure 11. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout





RECOMMENDED LAND PATTERN

NOTES:

A. NO JEDEC STANDARD APPLIES

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

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Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А