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# FDMA1025P

## Dual P-Channel PowerTrench<sup>®</sup> MOSFET

-20V, -3.1A, 155mΩ

### Features

- Max  $r_{DS(on)}$  = 155mΩ at  $V_{GS} = -4.5V$ ,  $I_D = -3.1A$
- Max  $r_{DS(on)}$  = 220mΩ at  $V_{GS} = -2.5V$ ,  $I_D = -2.3A$
- Low profile - 0.8mm maximum - in the new package MicroFET 2X2 mm
- RoHS Compliant
- Free from halogenated compounds and antimony oxides



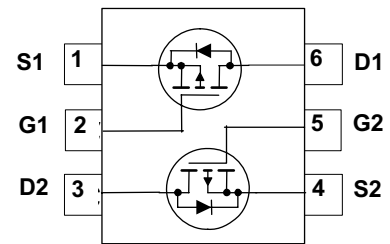
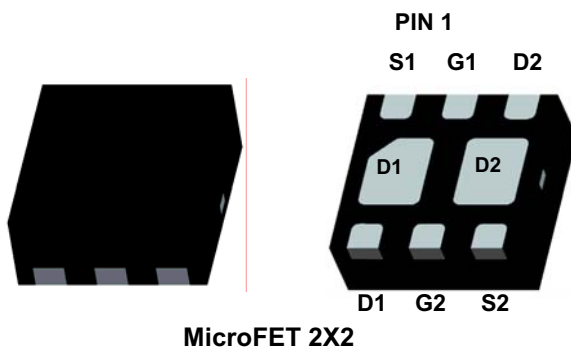
### General Description

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 well suited to linear mode applications.

### Application

- DC - DC Conversion



### 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	±12	V
$I_D$	Drain Current -Continuous	(Note 1a) -3.1	A
	-Pulsed	-6	
$P_D$	Power Dissipation for Single Operation	(Note 1a) 1.4	W
	Power Dissipation	(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 Single Operation, Junction to Ambient	(Note 1a)	86	°C/W
$R_{\theta JA}$	Thermal Resistance Single Operation, Junction to Ambient	(Note 1b)	173	
$R_{\theta JA}$	Thermal Resistance Dual Operation, Junction to Ambient	(Note 1c)	69	
$R_{\theta JA}$	Thermal Resistance Dual Operation, Junction to Ambient	(Note 1d)	151	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
025	FDMA1025P	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 $25^\circ\text{C}$		14		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 125^\circ\text{C}$			-1 -100	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 12\text{V}$ , $V_{DS} = 0\text{V}$			$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = -250\mu\text{A}$	-0.4	-0.9	-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 $25^\circ\text{C}$		-3.8		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -4.5\text{V}$ , $I_D = -3.1\text{A}$ $V_{GS} = -2.5\text{V}$ , $I_D = -2.3\text{A}$ $V_{GS} = -4.5\text{V}$ , $I_D = -3.1\text{A}$ , $T_J = 125^\circ\text{C}$		88 144 121	155 220 220	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{V}$ , $I_D = -3.1\text{A}$		6.2		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = -10\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$		340	450	pF
$C_{oss}$	Output Capacitance			80	105	pF
$C_{rss}$	Reverse Transfer Capacitance			45	70	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{V}$ , $I_D = -3.1\text{A}$ $V_{GS} = -4.5\text{V}$ , $R_{GEN} = 6\Omega$		5	10	ns
$t_r$	Rise Time			14	26	ns
$t_{d(off)}$	Turn-Off Delay Time			13	24	ns
$t_f$	Fall Time			8	16	ns
$Q_{g(TOT)}$	Total Gate Charge at 4.5V	$V_{GS} = 0\text{V}$ to $-4.5\text{V}$	$V_{DD} = -10\text{V}$ $I_D = -3.1\text{A}$	3.4	4.8	nC
$Q_{gs}$	Gate to Source Gate Charge			0.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			1.0		nC

**Drain-Source Diode Characteristics**

$I_S$	Maximum Continuous Source-Drain Diode Forward			-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	$I_F = -3.1\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		17	26	ns
$Q_{rr}$	Reverse Recovery Charge			10	15	nC

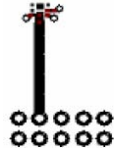
**Notes:**

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)  $R_{\theta JA} = 86\text{ }^{\circ}\text{C/W}$  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)  $R_{\theta JA} = 173\text{ }^{\circ}\text{C/W}$  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<sup>2</sup> pad of 2 oz copper, 1.5 " x 1.5 " x 0.062 " thick PCB. For dual operation.
- (d)  $R_{\theta JA} = 151\text{ }^{\circ}\text{C/W}$  when mounted on a minimum pad of 2 oz copper. For dual operation.



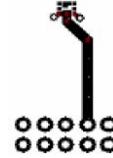
a) 86 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b) 173 °C/W when mounted on a minimum pad of 2 oz copper.



c) 69 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



d) 151 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test : Pulse Width < 300 us, Duty Cycle < 2.0

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

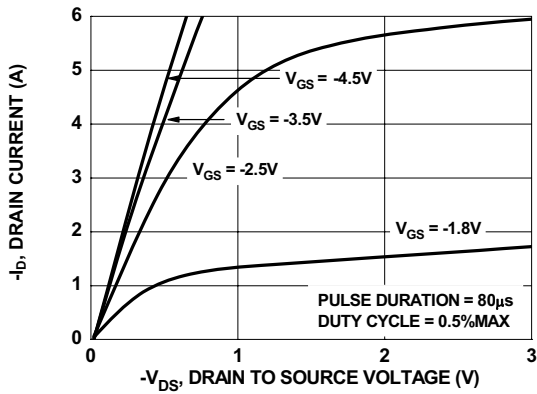


Figure 1. On Region Characteristics

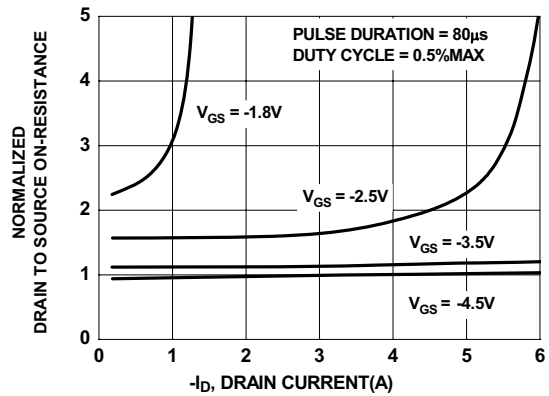


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

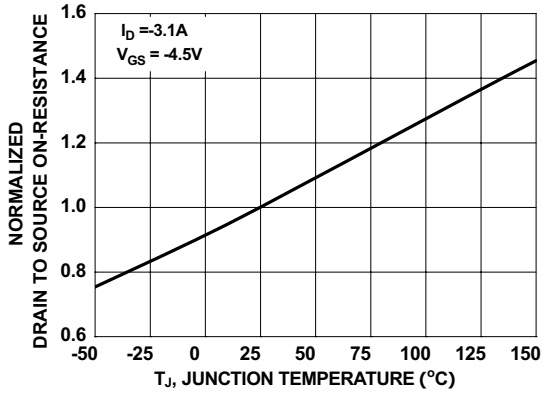


Figure 3. Normalized On Resistance vs Junction Temperature

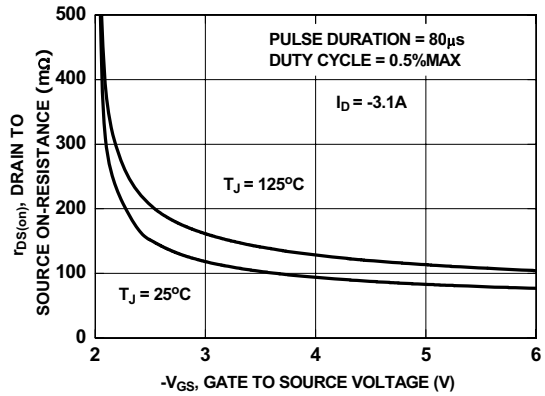


Figure 4. On-Resistance vs Gate to Source Voltage

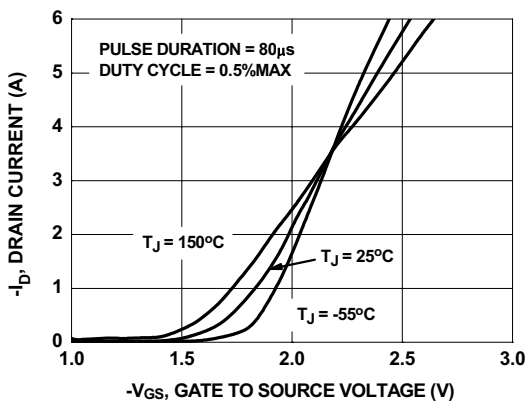


Figure 5. Transfer Characteristics

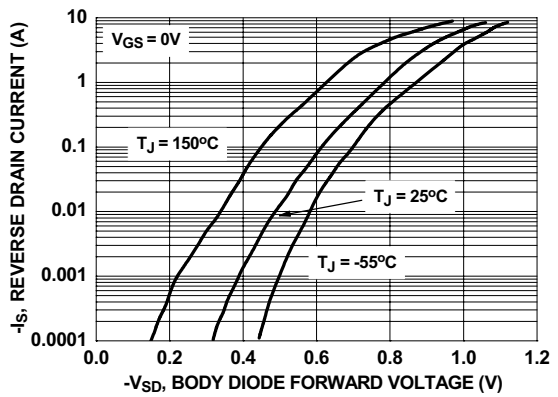


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

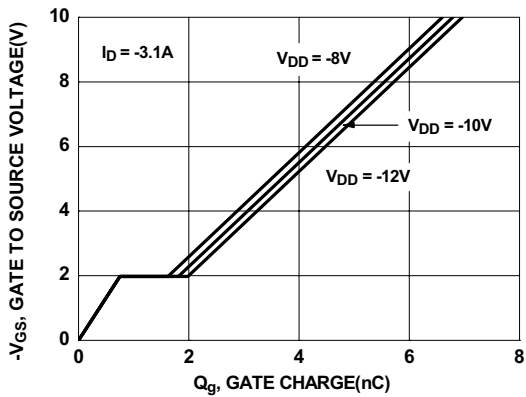


Figure 7. Gate Charge Characteristics

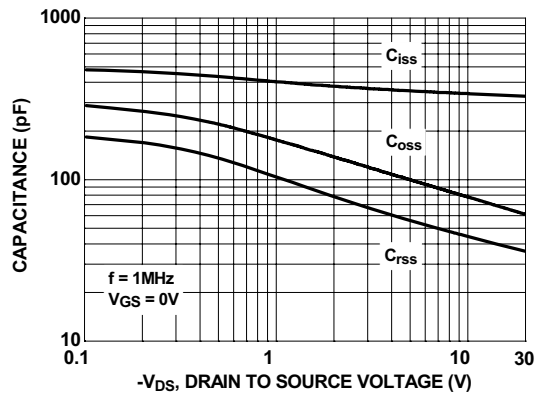


Figure 8. Capacitance vs Drain to Source Voltage

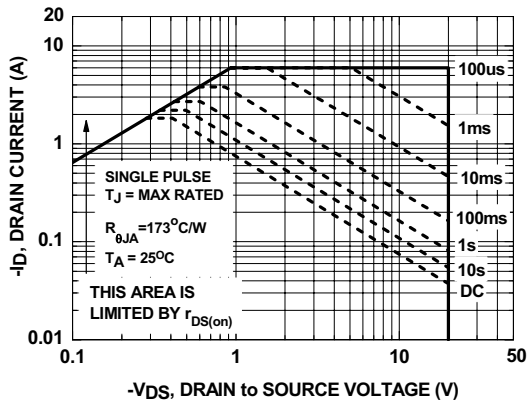


Figure 9. Forward Bias Safe Operating Area

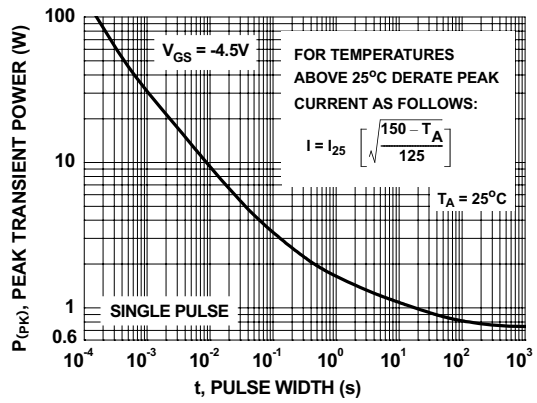


Figure 10. Single Pulse Maximum Power Dissipation

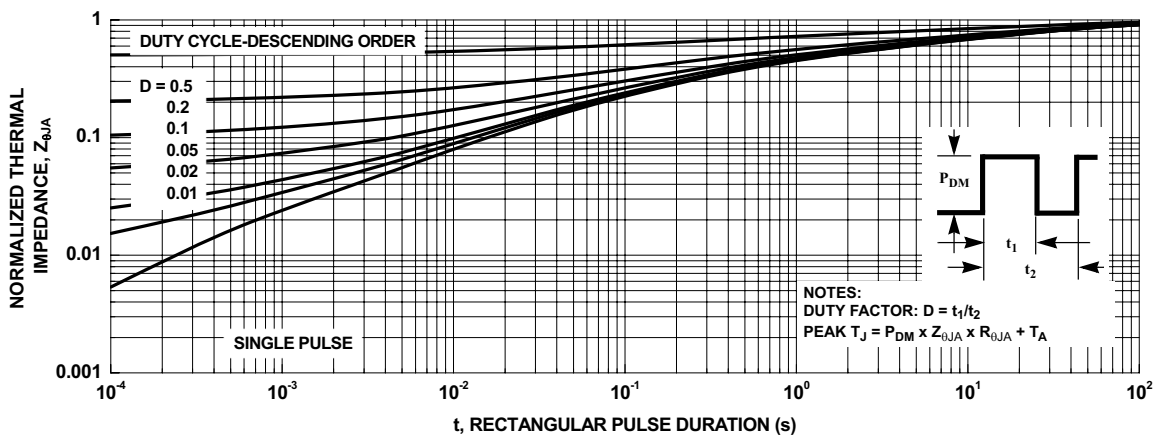
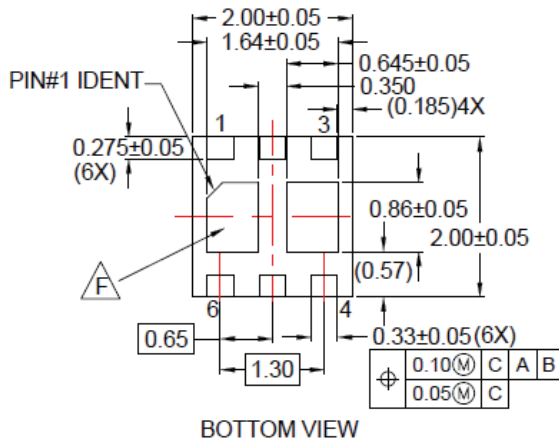
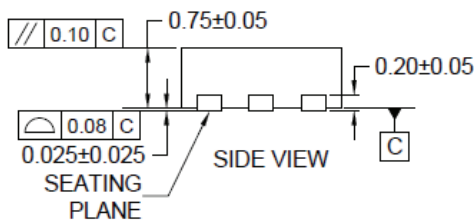
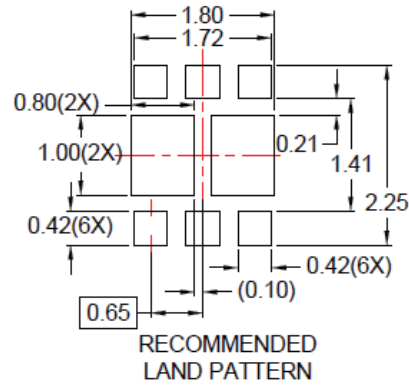
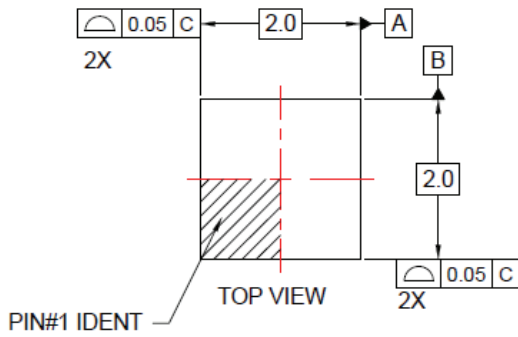


Figure 11. Transient Thermal Response Curve

## Dimensional Outline and Pad Layout



### NOTES:

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