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ON Semiconductor®

# FDMA1024NZ

## Dual N-Channel PowerTrench® MOSFET

20 V, 5.0 A, 54 mΩ

### Features

- Max  $r_{DS(on)}$  = 54 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 5.0$  A
- Max  $r_{DS(on)}$  = 66 mΩ at  $V_{GS} = 2.5$  V,  $I_D = 4.2$  A
- Max  $r_{DS(on)}$  = 82 mΩ at  $V_{GS} = 1.8$  V,  $I_D = 2.3$  A
- Max  $r_{DS(on)}$  = 114 mΩ at  $V_{GS} = 1.5$  V,  $I_D = 2.0$  A
- HBM ESD protection level = 1.6 kV (Note 3)
- Low profile - 0.8 mm maximum - in the new package MicroFET 2x2 mm
- RoHS Compliant
- Free from halogenated compounds and antimony oxides



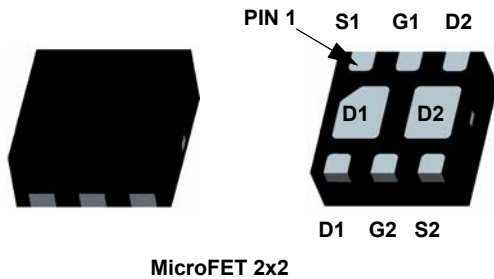
### General Description

This device is designed specifically as a single package solution for dual switching requirements in cellular handset and other ultra-portable applications. It features two independent N-Channel MOSFETs with low on-state resistance for minimum conduction losses.

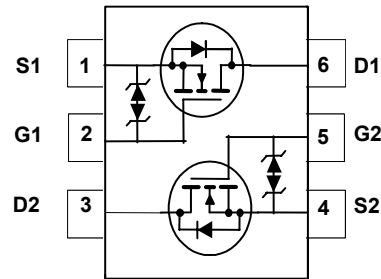
The MicroFET 2X2 package offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

### Applications

- Baseband Switch
- Loadswitch
- DC-DC Conversion



MicroFET 2x2



### MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	20	V
$V_{GS}$	Gate to Source Voltage	±8	V
$I_D$	Drain Current -Continuous	(Note 1a) 5.0	A
	-Pulsed	6.0	
$P_D$	Power Dissipation	(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

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

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
024	FDMA1024NZ	MicroFET 2X2	7"	8 mm	3000 units

FDMA1024NZ Dual N-Channel Power Trench® MOSFET

**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 $25\text{ }^\circ\text{C}$		19		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	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	0.4	0.7	1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-3		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On-Resistance	$V_{GS} = 4.5\text{ V}$ , $I_D = 5.0\text{ A}$		37	54	m $\Omega$
		$V_{GS} = 2.5\text{ V}$ , $I_D = 4.2\text{ A}$		43	66	
		$V_{GS} = 1.8\text{ V}$ , $I_D = 2.3\text{ A}$		52	82	
		$V_{GS} = 1.5\text{ V}$ , $I_D = 2.0\text{ A}$		67	114	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{ V}$ , $I_D = 5.0\text{ A}$		16		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		375	500	pF
$C_{oss}$	Output Capacitance			70	95	pF
$C_{rss}$	Reverse Transfer Capacitance			40	65	pF
$R_G$	Gate Resistance		$f = 1\text{ MHz}$		4.3	$\Omega$

**Switching Characteristics**

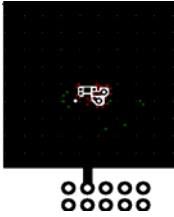
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10\text{ V}$ , $I_D = 5.0\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		5.3	11	ns
$t_r$	Rise Time			2.2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			18	33	ns
$t_f$	Fall Time			2.3	10	ns
$Q_g$	Total Gate Charge			5.2	7.3	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{GS} = 4.5\text{ V}$ , $V_{DD} = 10\text{ V}$ , $I_D = 5.0\text{ A}$		0.6		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			0.9		nC

**Drain-Source Diode Characteristics**

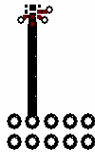
$I_S$	Maximum Continuous Source-Drain Diode Forward Current			1.1		A
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 1.1\text{ A}$ (Note 2)		0.7	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 5.0\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		19	35	ns
$Q_{rr}$	Reverse Recovery Charge			5	10	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)  $R_{\theta JA} = 86$  °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)  $R_{\theta JA} = 173$  °C/W when mounted on a minimum pad of 2 oz copper. For single operation.
  - (c)  $R_{\theta JA} = 69$  °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)  $R_{\theta JA} = 151$  °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.

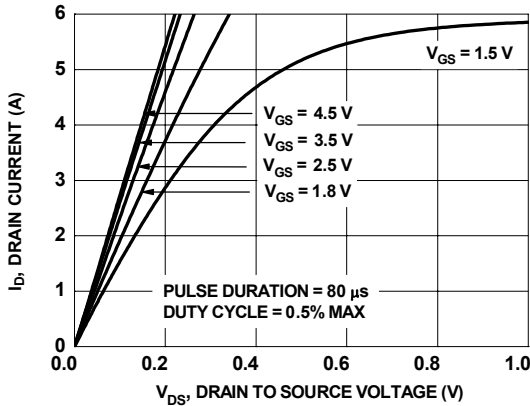


d) 151 °C/W when mounted on a minimum pad of 2 oz copper.

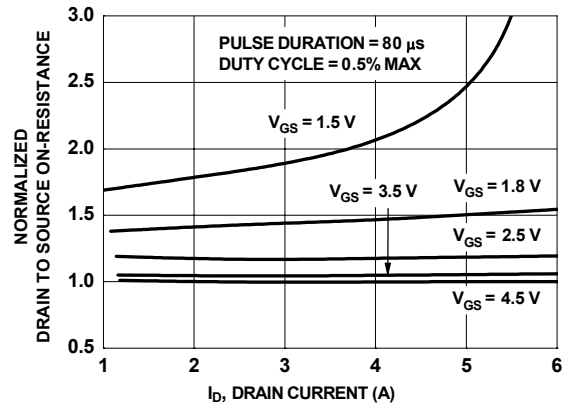
2. Pulse Test : Pulse Width < 300 us, Duty Cycle < 2.0 %

3: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

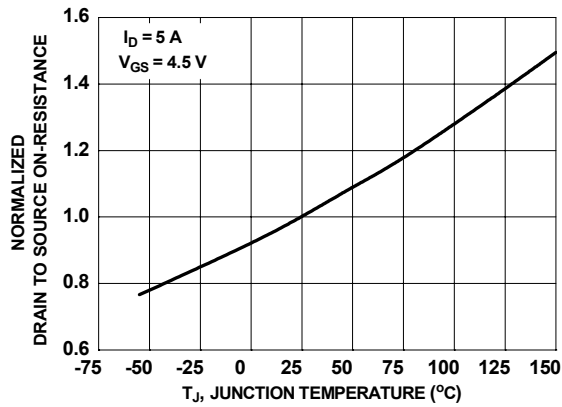
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



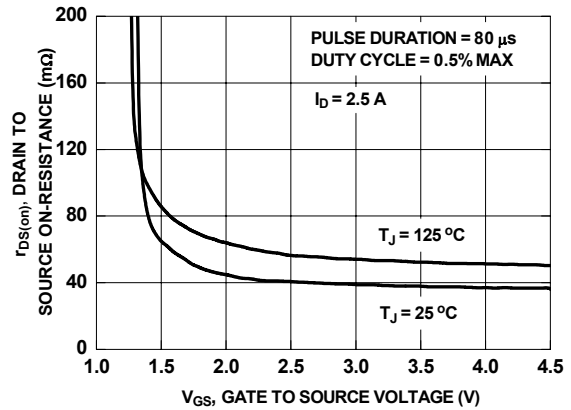
**Figure 1. On-Region Characteristics**



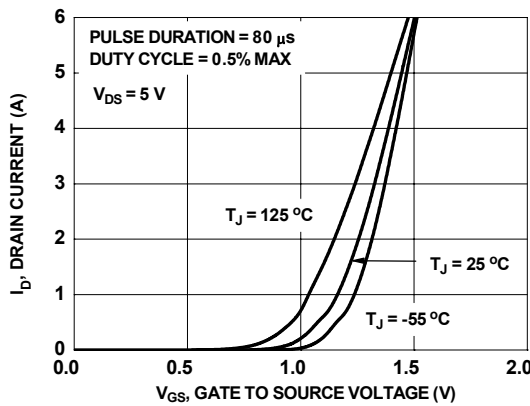
**Figure 2 Normalized On-Resistance vs Drain Current and Gate Voltage**



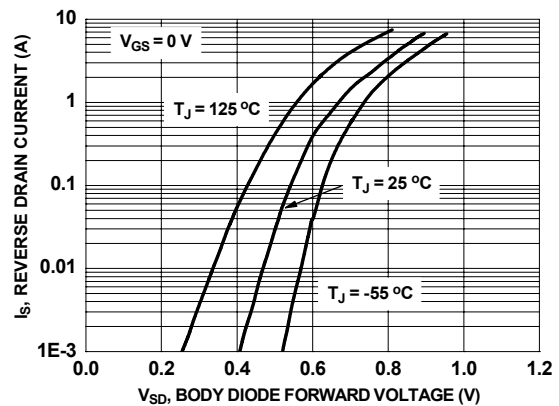
**Figure 3. Normalized On-Resistance vs Junction Temperature**



**Figure 4. On-Resistance vs Gate to Source Voltage**

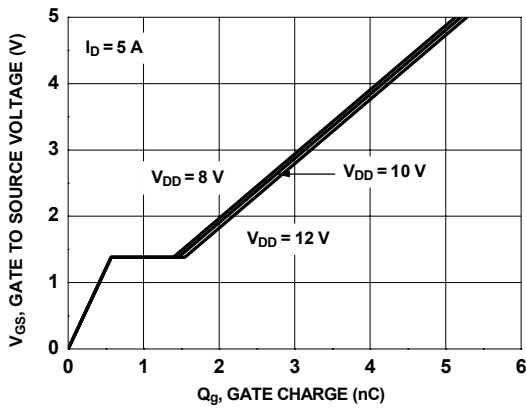


**Figure 5. Transfer Characteristics**

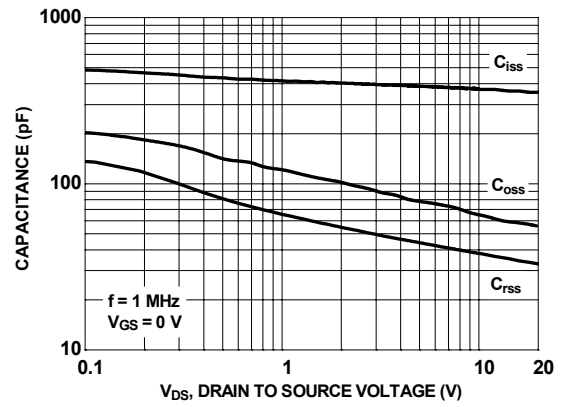


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

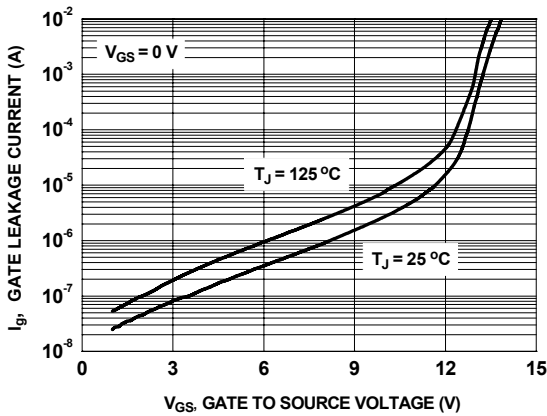
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



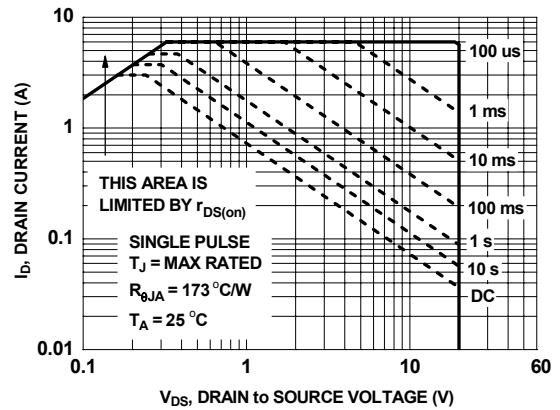
**Figure 7. Gate Charge Characteristics**



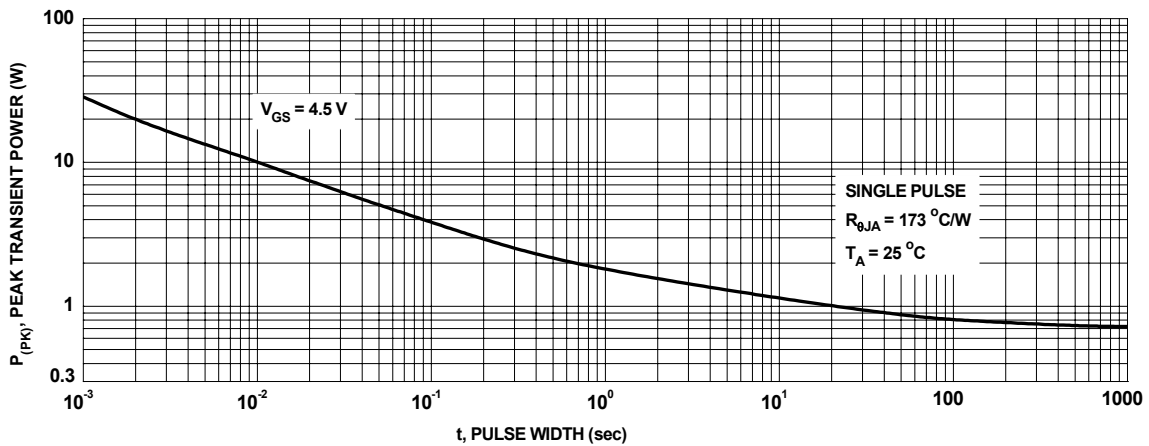
**Figure 8. Capacitance vs Drain to Source Voltage**



**Figure 9. Gate Leakage Current vs Gate to Source Voltage**

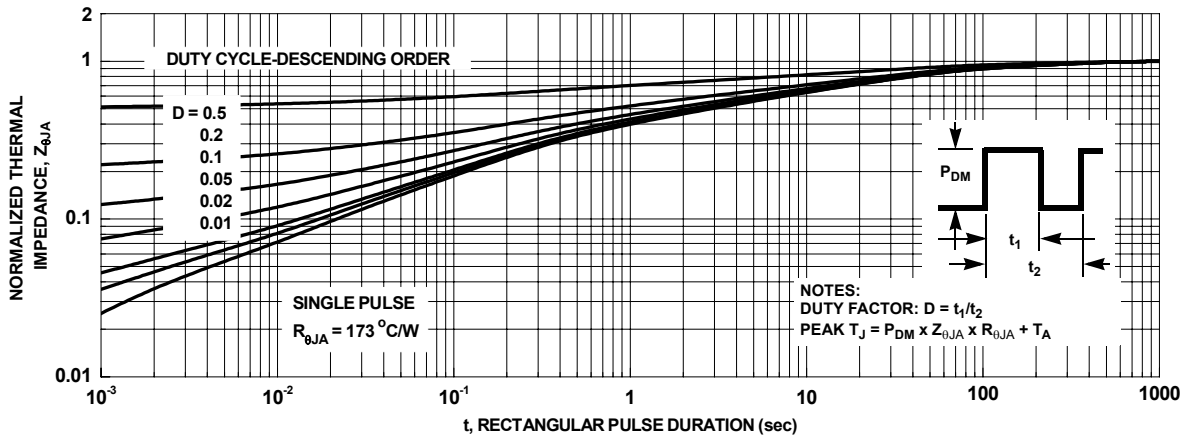


**Figure 10. Forward Bias Safe Operating Area**



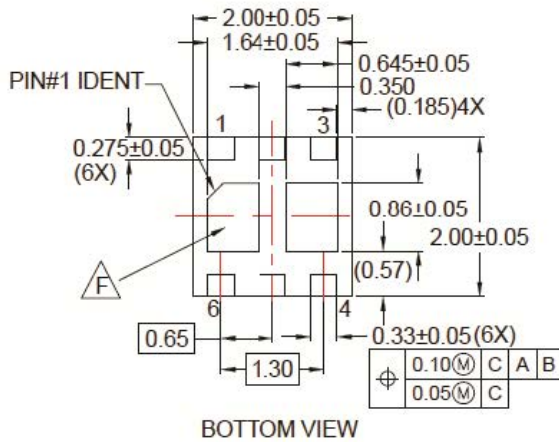
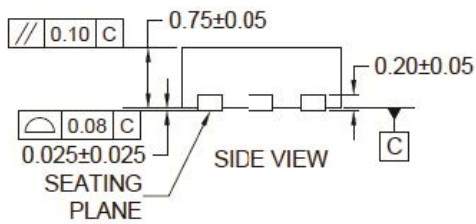
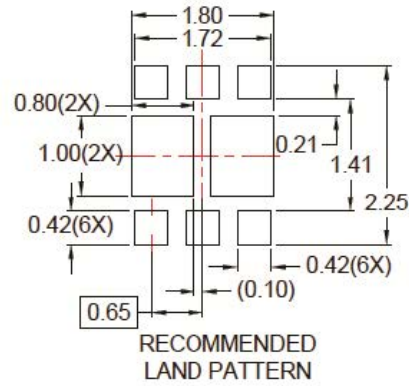
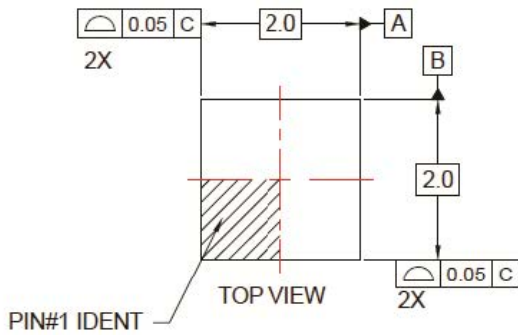
**Figure 11. Single Pulse Maximum Power Dissipation**

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



**Figure 12. Junction to Ambient Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout



### NOTES:

- A. CONFORM TO JEDEC REGISTRATIONS MO-229, VARIATION VCCC, EXCEPT WHERE NOTED.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
  - D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
  - E. DRAWING FILENAME: MKT-UMLP16Erev4
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