

# MOSFET – Dual, N-Channel, POWERTRENCH<sup>®</sup>

**30 V, 2.9 A, 123 mΩ**

## FDMA2002NZ

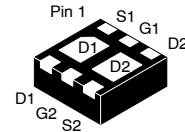
### General Description

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<sup>™</sup> 2x2 offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

### Features

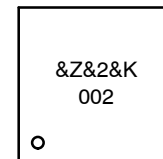
- 2.9 A, 30 V  
 $R_{DS(on)} = 123\text{ m}\Omega$  at  $V_{GS} = 4.5\text{ V}$   
 $R_{DS(on)} = 140\text{ m}\Omega$  at  $V_{GS} = 3.0\text{ V}$   
 $R_{DS(on)} = 163\text{ m}\Omega$  at  $V_{GS} = 2.5\text{ V}$
- Low Profile – 0.8 mm Maximum – In the New Package MicroFET 2x2 mm
- HBM ESD Protection Level > 1.8 kV (Note 3)
- Free from Halogenated Compounds and Antimony Oxides
- This Device is Pb-Free, Halide Free and is RoHS Compliant

| $V_{DS}$ | $R_{DS(on)}$ MAX | $I_D$ MAX |
|----------|------------------|-----------|
| 30 V     | 123 mΩ @ 4.5 V   | 2.9 A     |
|          | 140 mΩ @ 3.0 V   |           |
|          | 163 mΩ @ 2.5 V   |           |



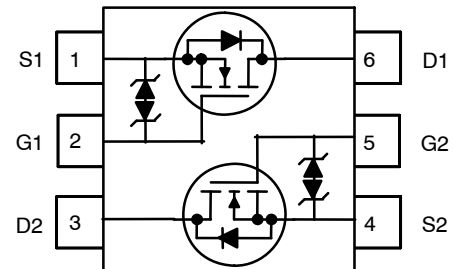
**WDFN6 2x2, 0.65P  
(MicroFET 2x2)  
CASE 511DA**

### MARKING DIAGRAM



&Z = Assembly Plant Code  
&2 = 2-Digit Date Code  
&K = 2-Digits Lot Run Traceability Code  
002 = Device Code

### PIN CONNECTIONS



### ORDERING INFORMATION

| Device     | Package                            | Shipping <sup>†</sup> |
|------------|------------------------------------|-----------------------|
| FDMA2002NZ | WDFN6<br>(Pb-Free,<br>Halide Free) | 3000 /<br>Tape & Reel |

For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

# FDMA2002NZ

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

| Symbol                            | Parameter                                                                                                                                     | Ratings     | Unit |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|
| V <sub>DS</sub>                   | Drain–Source Voltage                                                                                                                          | 30          | V    |
| V <sub>GS</sub>                   | Gate–Source Voltage                                                                                                                           | ±12         | V    |
| I <sub>D</sub>                    | Drain Current<br>–Continuous (T <sub>C</sub> = 25°C, V <sub>GS</sub> = 4.5 V)<br>–Continuous (T <sub>C</sub> = 25°C, V <sub>GS</sub> = 2.5 V) | 2.9<br>2.7  | A    |
|                                   | –Pulsed                                                                                                                                       | 10          | A    |
| P <sub>D</sub>                    | Power Dissipation for Single Operation<br>(Note 1a)<br>(Note 1b)                                                                              | 1.5<br>0.65 | W    |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Junction Temperature Range                                                                                              | –55 to +150 | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

| Symbol           | Parameter                                         | Ratings                | Unit |
|------------------|---------------------------------------------------|------------------------|------|
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient (Note 1a) | 83 (Single Operation)  | °C/W |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient (Note 1b) | 193 (Single Operation) |      |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient (Note 1c) | 68 (Dual Operation)    |      |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient (Note 1d) | 145 (Dual Operation)   |      |

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------------|-----|-----|-----|------|
|--------|-----------|-----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                      |                                           |                                                |    |    |     |       |
|--------------------------------------|-------------------------------------------|------------------------------------------------|----|----|-----|-------|
| BV <sub>DSS</sub>                    | Drain–Source Breakdown Voltage            | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V | 30 | –  | –   | V     |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | I <sub>D</sub> = 250 μA, referenced to 25°C    | –  | 25 | –   | mV/°C |
| I <sub>DSS</sub>                     | Zero Gate Voltage Drain Current           | V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V  | –  | –  | 1   | μA    |
| I <sub>GSS</sub>                     | Gate–Body Leakage                         | V <sub>GS</sub> = ±12 V, V <sub>DS</sub> = 0 V | –  | –  | ±10 | μA    |

### ON CHARACTERISTICS

|                                        |                                                |                                                                         |     |     |     |       |
|----------------------------------------|------------------------------------------------|-------------------------------------------------------------------------|-----|-----|-----|-------|
| V <sub>GS(th)</sub>                    | Gate Threshold Voltage                         | I <sub>D</sub> = 250 μA, V <sub>DS</sub> = V <sub>GS</sub>              | 0.4 | 1.0 | 1.5 | V     |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | I <sub>D</sub> = 250 μA, referenced to 25°C                             | –   | –3  | –   | mV/°C |
| R <sub>DS(on)</sub>                    | Static Drain–Source On–Resistance              | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.9 A                         | –   | 75  | 123 | mΩ    |
|                                        |                                                | V <sub>GS</sub> = 3.0 V, I <sub>D</sub> = 2.7 A                         | –   | 84  | 140 |       |
|                                        |                                                | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 2.5 A                         | –   | 92  | 163 |       |
|                                        |                                                | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.9 A, T <sub>C</sub> = 85°C  | –   | 95  | 166 |       |
|                                        |                                                | V <sub>GS</sub> = 3.0 V, I <sub>D</sub> = 2.7 A, T <sub>C</sub> = 150°C | –   | 138 | 203 |       |
|                                        |                                                | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 2.5 A, T <sub>C</sub> = 150°C | –   | 150 | 268 |       |

### DYNAMIC CHARACTERISTICS

|                  |                              |                                                            |   |     |     |    |
|------------------|------------------------------|------------------------------------------------------------|---|-----|-----|----|
| C <sub>iss</sub> | Input Capacitance            | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz | – | 190 | 220 | pF |
| C <sub>oss</sub> | Output Capacitance           |                                                            | – | 30  | 40  | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance |                                                            | – | 20  | 30  | pF |

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

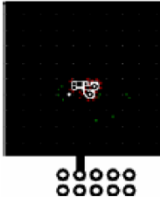
| Symbol                                    | Parameter           | Test Conditions                                                                                | Min | Typ  | Max | Unit |
|-------------------------------------------|---------------------|------------------------------------------------------------------------------------------------|-----|------|-----|------|
| <b>SWITCHING CHARACTERISTICS</b> (Note 2) |                     |                                                                                                |     |      |     |      |
| $t_{d(on)}$                               | Turn-On Delay Time  | $V_{DD} = 15\text{ V}$ , $I_D = 1\text{ A}$<br>$V_{GS} = 4.5\text{ V}$ , $R_{GEN} = 6\ \Omega$ | –   | 6    | 12  | ns   |
| $t_r$                                     | Turn-On Rise Time   |                                                                                                | –   | 8    | 16  | ns   |
| $t_{d(off)}$                              | Turn-Off Delay Time |                                                                                                | –   | 12   | 21  | ns   |
| $t_f$                                     | Turn-Off Fall Time  |                                                                                                | –   | 2    | 10  | ns   |
| $Q_g$                                     | Total Gate Charge   | $V_{DS} = 15\text{ V}$ , $I_D = 2.9\text{ A}$ ,<br>$V_{GS} = 4.5\text{ V}$                     | –   | 2.4  | 3.0 | nC   |
| $Q_{gs}$                                  | Gate–Source Charge  |                                                                                                | –   | 0.35 | –   | nC   |
| $Q_{gd}$                                  | Gate–Drain Charge   |                                                                                                | –   | 0.75 | –   | nC   |

**DRAIN–SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS**

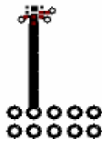
|          |                                                       |                                                             |   |     |     |    |
|----------|-------------------------------------------------------|-------------------------------------------------------------|---|-----|-----|----|
| $I_S$    | Maximum Continuous Source–Drain Diode Forward Current |                                                             | – | –   | 2.9 | A  |
| $V_{SD}$ | Source–Drain Diode Forward Voltage                    | $I_S = 2.0\text{ A}$                                        | – | 0.9 | 1.2 | V  |
|          |                                                       | $I_S = 1.1\text{ A}$                                        | – | 0.8 | 1.2 |    |
| $t_{rr}$ | Diode Reverse Recovery Time                           | $I_F = 2.9\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ | – | 10  | –   | ns |
| $Q_{rr}$ | Diode Reverse Recovery Charge                         |                                                             | – | 2   | –   | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- $R_{\theta JA}$  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.
  - $R_{\theta JA} = 83^\circ\text{C}/\text{W}$  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.
  - $R_{\theta JA} = 193^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.. For single operation.
  - $R_{\theta JA} = 68^\circ\text{C}/\text{W}$  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.
  - $R_{\theta JA} = 145^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper. For dual operation.



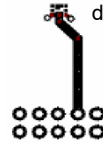
a.  $83^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b.  $193^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.



c.  $68^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



d.  $145^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%
- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

## TYPICAL CHARACTERISTICS

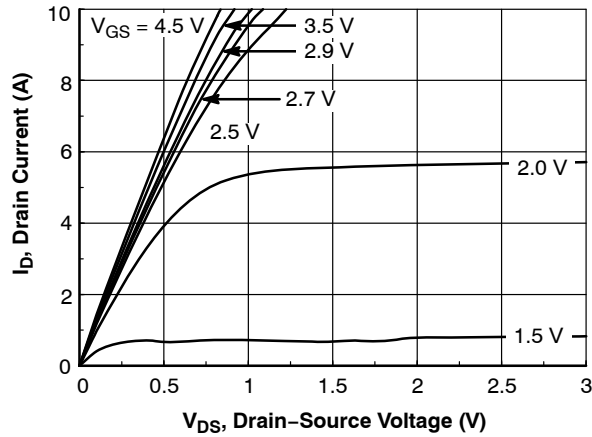


Figure 1. On-Region Characteristics

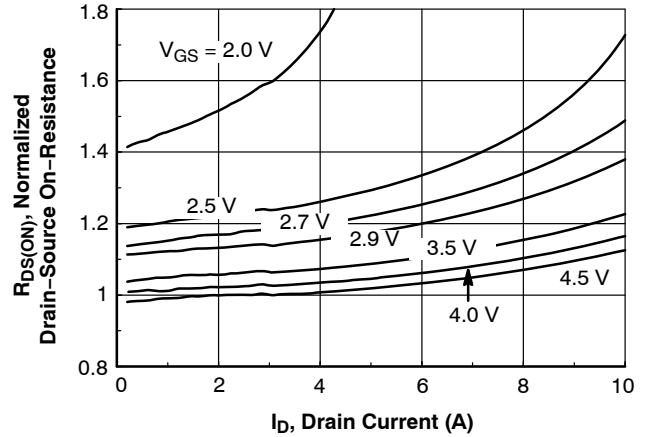


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

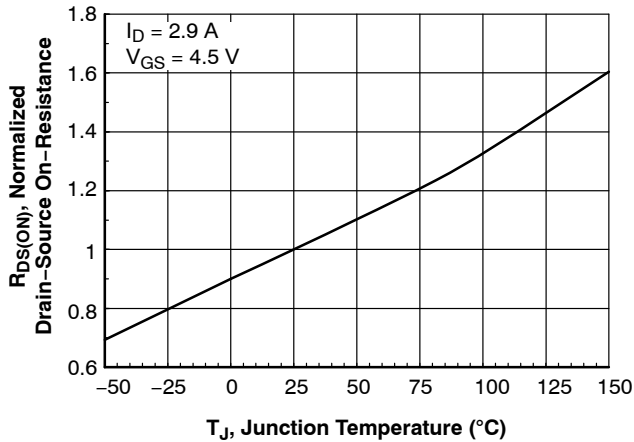


Figure 3. On-Resistance Variation with Temperature

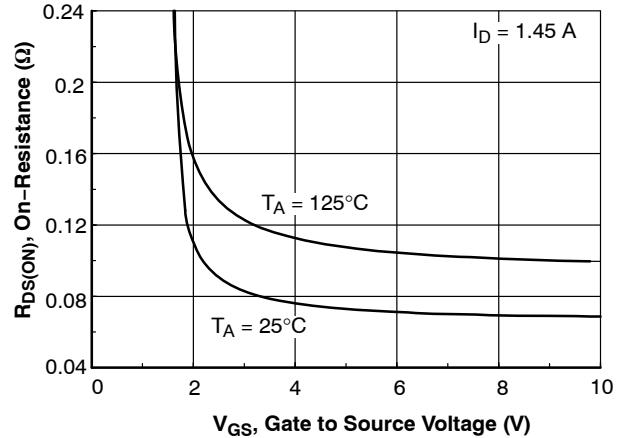


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

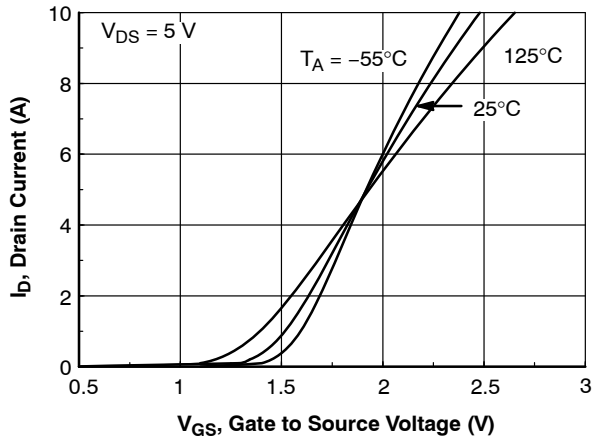


Figure 5. Transfer Characteristics

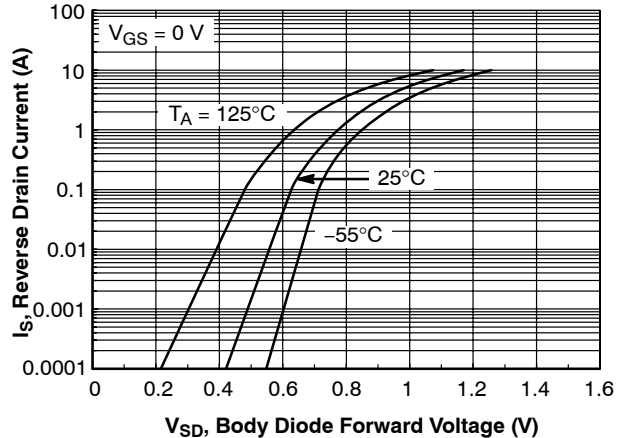
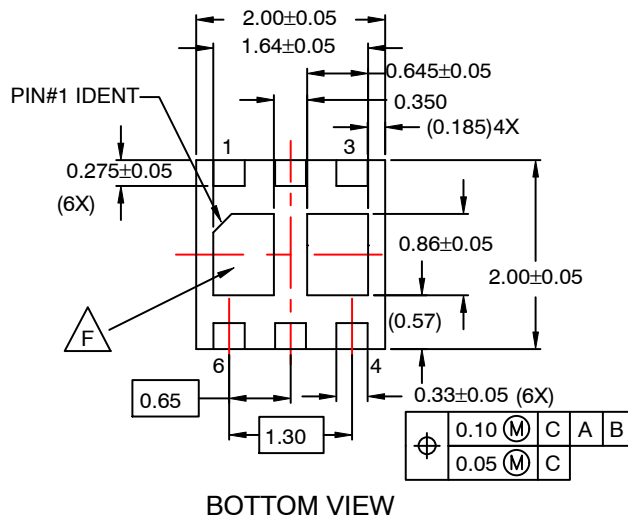
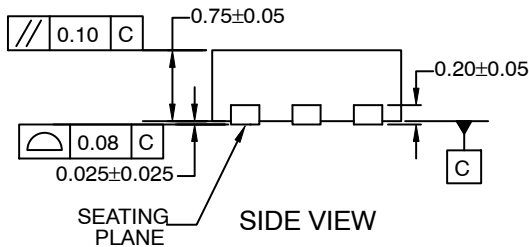
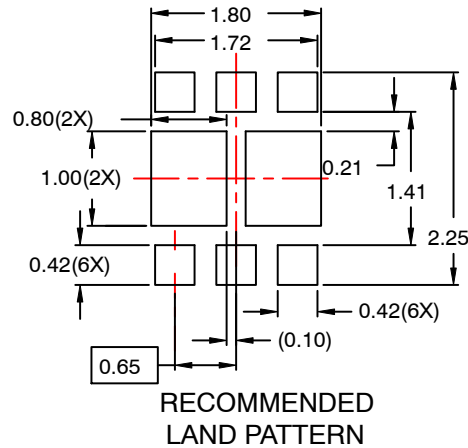
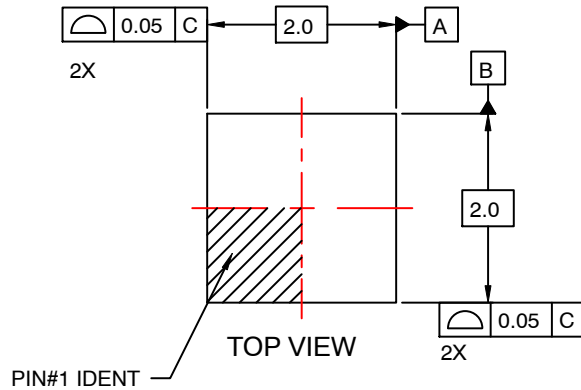


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

**WDFN6 2x2, 0.65P**  
**CASE 511DA**  
**ISSUE O**

DATE 31 JUL 2016



**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.

**F** NON-JEDEC DUAL DAP

|                         |                         |                                                                                                                                                                                     |
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