May 2006

# FDMA2002NZ

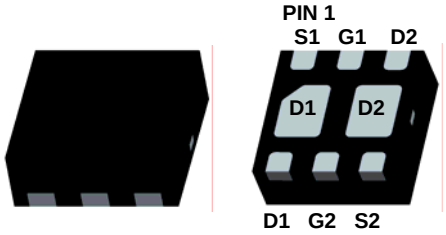
## Dual N-Channel PowerTrench® MOSFET

### General Description

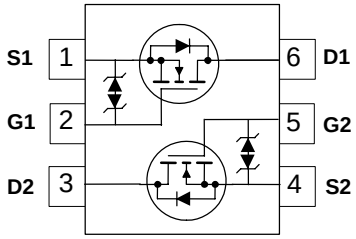
This device is designed specifically as a single package solution for dual switching requirements in cellular handset and other ultra-portable applications. It features two independent N-Channel MOSFETs with low on-state resistance for minimum conduction losses. The MicroFET 2x2 offers exceptional thermal performance for its physical size and is well suited to linear mode applications.

### Features

- 2.9 A, 30 V $R_{DS(ON)}$ = 123 mΩ @ $V_{GS}$ = 4.5 V
  $R_{DS(ON)}$ = 140 mΩ @ $V_{GS}$ = 3.0 V
  $R_{DS(ON)}$ = 163 mΩ @ $V_{GS}$ = 2.5 V
- Low profile – 0.8 mm maximum – in the new package MicroFET 2x2 mm
- RoHS Compliant




MicroFET 2x2




## Absolute Maximum Ratings

$T_A$=25°C unless otherwise noted

| Symbol | Parameter | | Ratings | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | | ±12 | V |
| $I_D$ | Drain Current – Continuous ($T_C$ = 25°C, $V_{GS}$ = 4.5V) | | 2.9 | A |
| | – Continuous ($T_C$ = 25°C, $V_{GS}$ = 2.5V) | | 2.7 | |
| | – Pulsed | | 10 | |
| $P_D$ | Power Dissipation for Single Operation | (Note 1a) | 1.5 | W |
| | Power Dissipation for Single Operation | (Note 1b) | 0.65 | |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature | | –55 to +150 | °C |

## Thermal Characteristics

| | | | | |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1a) | 83 (Single Operation) | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1b) | 193 (Single Operation) | |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1c) | 68 (Dual Operation) | |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1d) | 145 (Dual Operation) | |

## Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape width | Quantity |
|---|---|---|---|---|
| 002 | FDMA2002NZ | 7'' | 8mm | 3000 units |

## Electrical Characteristics

$T_A$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain–Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | | 25 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V | | | 1 | μA |
| $I_{GSS}$ | Gate–Body Leakage Current | $V_{GS}$ = ± 12 V, $V_{DS}$ = 0 V | | | ±10 | μA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 0.4 | 1.0 | 1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | | –3 | | mV/°C |
| $R_{DS(on)}$ | Static Drain–Source On–Resistance | $V_{GS}$ = 4.5V, $I_D$ = 2.9A | | 75 | 123 | mΩ |
| | | $V_{GS}$ = 3.0V, $I_D$ = 2.7A | | 84 | 140 | |
| | | $V_{GS}$ = 2.5V, $I_D$ = 2.5A | | 92 | 163 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 2.9A, $T_C$ = 85°C | | 95 | 166 | |
| | | $V_{GS}$ = 3.0V, $I_D$ = 2.7A, $T_C$ = 150°C | | 138 | 203 | |
| | | $V_{GS}$ = 2.5V, $I_D$ = 2.5A, $T_C$ = 150°C | | 150 | 268 | |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1.0 MHz | | 190 | 220 | pF |
| $C_{oss}$ | Output Capacitance | | | 30 | 40 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 20 | 30 | pF |
| **Switching Characteristics** (Note 2) | | | | | | |
| $t_{d(on)}$ | Turn–On Delay Time | $V_{DD}$ = 15 V, $I_D$ = 1 A, $V_{GS}$ = 4.5 V, $R_{GEN}$ = 6 Ω | | 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 V, $I_D$ = 2.9 A, $V_{GS}$ = 4.5 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 Drain–Source Diode Forward Current | | | | 2.9 | A |
| $V_{SD}$ | Drain–Source Diode Forward Voltage | $I_S$ = 2.0 A | | 0.9 | 1.2 | V |
| | | $I_S$ = 1.1 A | | 0.8 | 1.2 | |
| $t_{rr}$ | Diode Reverse Recovery Time | $I_F$ = 2.9 A, $dI_F/dt$ = 100 A/μs | | 10 | | ns |
| $Q_{rr}$ | Diode Reverse Recovery Charge | | | 2 | | nC |

## Electrical Characteristics

$T_A$ = 25°C unless otherwise noted

**Notes:**

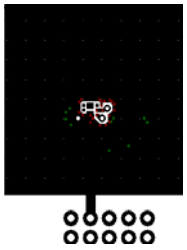
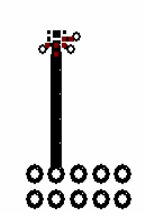
**1.** $R_{\theta JA}$ is determined with the device mounted on a 1 $in^2$ oz. copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

**(a)** $R_{\theta JA}$ = 83°C/W when mounted on a 1$in^2$ pad of 2 oz copper, 1.5” x 1.5” x 0.062” thick PCB

**(b)** $R_{\theta JA}$ = 193°C/W when mounted on a minimum pad of 2 oz copper

**(c)** $R_{\theta JA}$ = 68°C/W when mounted on a 1$in^2$ pad of 2 oz copper, 1.5” x 1.5” x 0.062” thick PCB

**(d)** $R_{\theta JA}$ = 145°C/W when mounted on a minimum pad of 2 oz copper

| | | | |
|---|---|---|---|
|  | a) 83°C/W when mounted on a 1$in^2$ pad of 2 oz copper |  | b) 193°C/W when mounted on a minimum pad of 2 oz copper |

Scale 1 : 1 on letter size paper

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

## Typical Characteristics

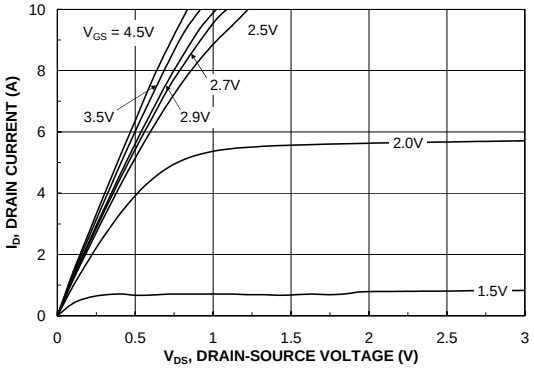



**Figure 1. On-Region Characteristics.**

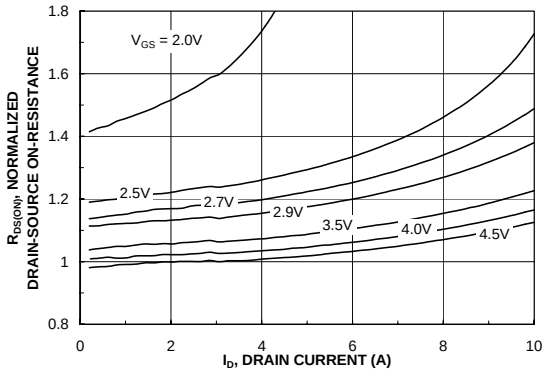



**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**

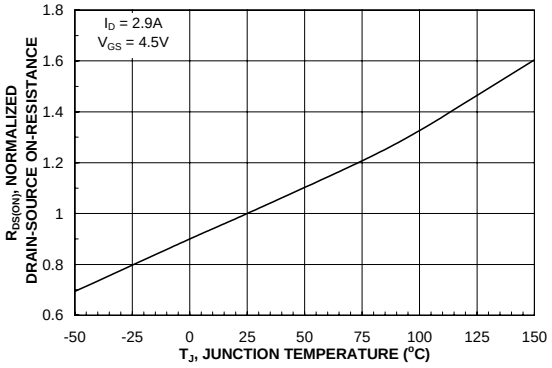



**Figure 3. On-Resistance Variation with Temperature.**

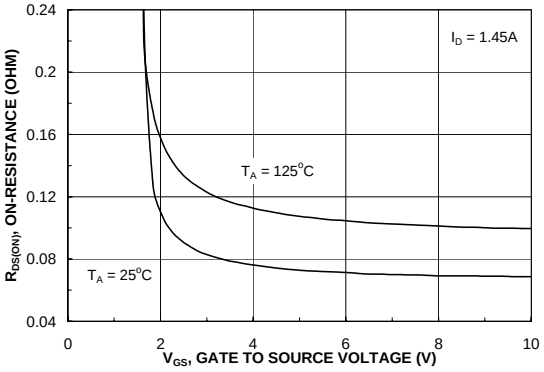



**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**

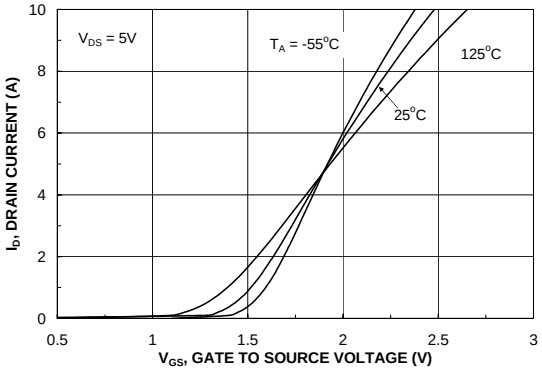



**Figure 5. Transfer Characteristics.**

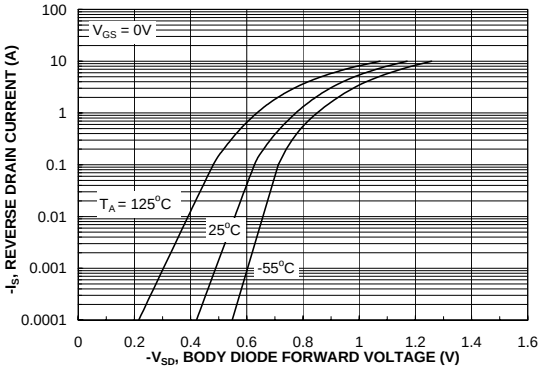



**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.**

## Typical Characteristics

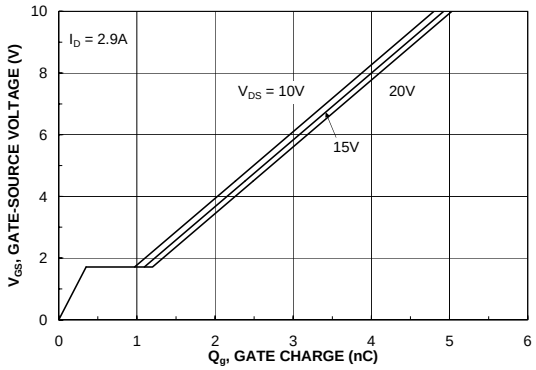



**Figure 7. Gate Charge Characteristics.**

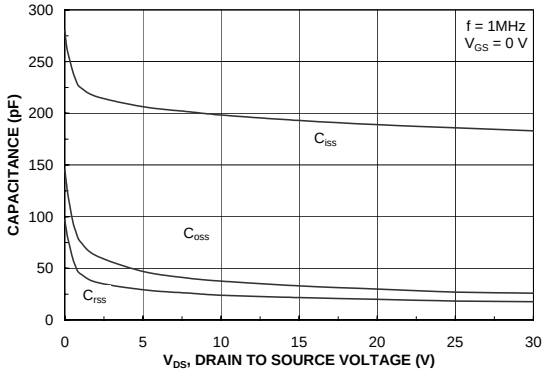



**Figure 8. Capacitance Characteristics.**

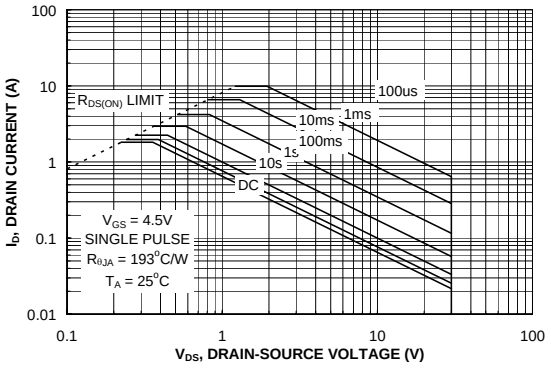



**Figure 9. Maximum Safe Operating Area.**

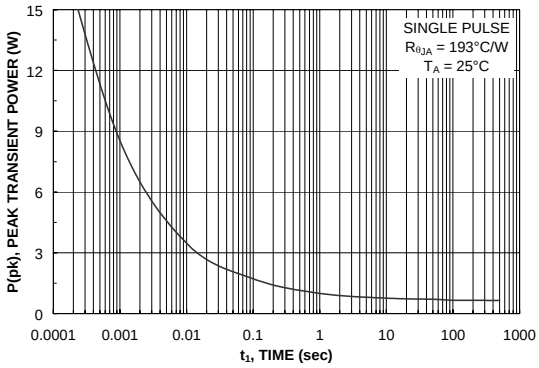



**Figure 10. Single Pulse Maximum Power Dissipation.**

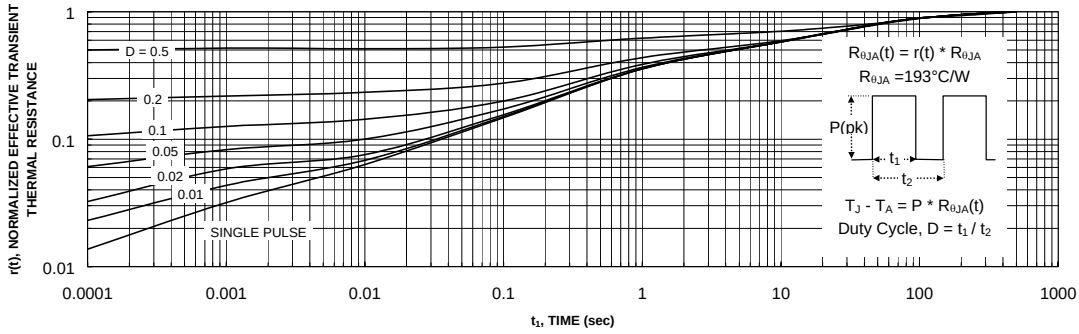
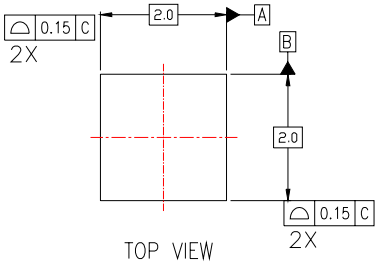
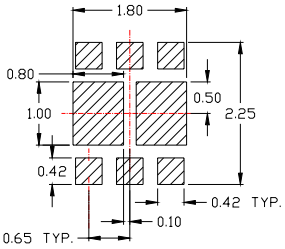



**Figure 11. Transient Thermal Response Curve.**

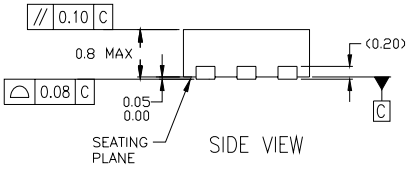
**Thermal characterization performed using the conditions described in Note 1b.**
**Transient thermal response will change depending on the circuit board design.**



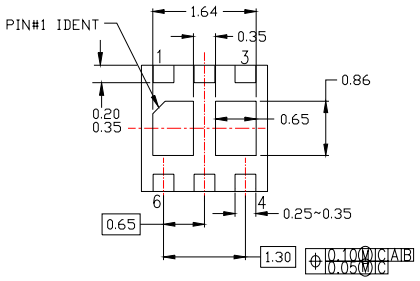

TOP VIEW




RECOMMENDED LAND PATTERN




SIDE VIEW




BOTTOM VIEW

NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-229, VARIATION VCCC, DATED 11/2001

B. DIMENSIONS ARE IN MILLIMETERS.

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

MLP06JrevB

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