

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on) \max}$             | $I_D$<br>$T_A = 25^\circ\text{C}$ |
|---------------|-------------------------------|-----------------------------------|
| 20V           | 0.4Ω @ $V_{GS} = 4.5\text{V}$ | 1A                                |
|               | 0.7Ω @ $V_{GS} = 1.8\text{V}$ | 0.8A                              |

## Features and Benefits

- Low On-Resistance
- Very Low Gate Threshold Voltage  $V_{GS(TH)}$ , 1.0V max
- Low Input Capacitance
- Fast Switching Speed
- Ultra-Small Surfaced Mount Package
- Ultra-low package profile, 0.4mm maximum package height
- **ESD Protected Gate**
- **Lead, Halogen, and Antimony Free, RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

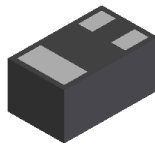
- DC-DC Converters
- Power management functions

## Mechanical Data

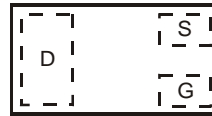
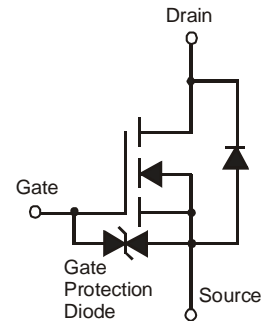
- Case: X2-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.001 grams (approximate)



X2-DFN1006-3



Bottom View


 Top View  
Internal Schematic


EQUIVALENT CIRCUIT

## Ordering Information (Note 3)

| Part Number    | Case         | Packaging          |
|----------------|--------------|--------------------|
| DMN2500UFB4-7  | X2-DFN1006-3 | 3,000/Tape & Reel  |
| DMN2500UFB4-7B | X2-DFN1006-3 | 10,000/Tape & Reel |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free
  2. Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>.

## Marking Information

DMN2500UFB4-7


 Top View  
Dot Denotes  
Drain Side

DMN2500UFB4-7B


 Top View  
Bar Denotes Gate  
and Source Side

NT = Product Type Marking Code

**Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic   |              |  | Symbol           | Value        | Units |
|--|--------------|--|------------------|--------------|-------|
| Drain-Source Voltage                                     |              |  | V <sub>DSS</sub> | 20           | V     |
| Gate-Source Voltage                                      |              |  | V <sub>GSS</sub> | ±6           | V     |
| Continuous Drain Current (Note 4) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = 25°C<br>T <sub>A</sub> = 70°C | I <sub>D</sub>   | 810<br>640   | mA    |
|  | t < 10s      | T <sub>A</sub> = 25°C<br>T <sub>A</sub> = 70°C | I <sub>D</sub>   | 950<br>750   | mA    |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = 25°C<br>T <sub>A</sub> = 70°C | I <sub>D</sub>   | 1000<br>800  | mA    |
|  | t < 10s      | T <sub>A</sub> = 25°C<br>T <sub>A</sub> = 70°C | I <sub>D</sub>   | 1200<br>1000 | mA    |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%)       |              |  | I <sub>DM</sub>  | 4            | A     |
| Maximum Body Diode continuous Current                    |              |  | I <sub>S</sub>   | 850          | mA    |

**Thermal Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                                   |                       | Symbol                            | Value       | Units |
|--|-----------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 4)                 | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 0.46        | W     |
|  | T <sub>A</sub> = 70°C |                                   | 0.29        |       |
| Thermal Resistance, Junction to Ambient (Note 4) | Steady state          | R <sub>θJA</sub>                  | 279         | °C/W  |
|  | t < 10s               |                                   | 210         | °C/W  |
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 0.95        | W     |
|  | T <sub>A</sub> = 70°C |                                   | 0.6         |       |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state          | R <sub>θJA</sub>                  | 134         | °C/W  |
|  | t < 10s               |                                   | 100         | °C/W  |
| Operating and Storage Temperature Range          |                       | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

**Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic  | Symbol              | Min | Typ   | Max  | Unit | Test Condition  |
|---|---------------------|-----|-------|------|------|---|
| <b>OFF CHARACTERISTICS (Note 6)</b>                   |                     |     |       |      |      |   |
| Drain-Source Breakdown Voltage                        | BV <sub>DSS</sub>   | 20  | -     | -    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA  |
| Zero Gate Voltage Drain Current T <sub>J</sub> = 25°C | I <sub>DSS</sub>    | -   | -     | 100  | nA   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V   |
| Gate-Source Leakage                                   | I <sub>GSS</sub>    | -   | -     | ±1.0 | μA   | V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS (Note 6)</b>                    |                     |     |       |      |      |   |
| Gate Threshold Voltage                                | V <sub>GS(th)</sub> | 0.5 | -     | 1.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA  |
| Static Drain-Source On-Resistance                     | R <sub>DS(on)</sub> | -   | 0.3   | 0.4  | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 600mA  |
|   |                     |     | 0.4   | 0.5  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA  |
|   |                     |     | 0.5   | 0.7  |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA  |
| Forward Transfer Admittance                           | Y <sub>fs</sub>     | -   | 1.4   | -    | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA   |
| Diode Forward Voltage                                 | V <sub>SD</sub>     | -   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA  |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b>               |                     |     |       |      |      |   |
| Input Capacitance                                     | C <sub>iSS</sub>    | -   | 60.67 | -    | pF   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz  |
| Output Capacitance                                    | C <sub>oss</sub>    | -   | 9.68  | -    | pF   |   |
| Reverse Transfer Capacitance                          | C <sub>rSS</sub>    | -   | 5.37  | -    | pF   |   |
| Gate resistance                                       | R <sub>g</sub>      | -   | 93    | -    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz  |
| Total Gate Charge                                     | Q <sub>g</sub>      | -   | 736.6 | -    | pC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V,<br>I <sub>D</sub> = 250mA  |
| Gate-Source Charge                                    | Q <sub>gs</sub>     | -   | 93.6  | -    | pC   |   |
| Gate-Drain Charge                                     | Q <sub>gd</sub>     | -   | 116.6 | -    | pC   |   |
| Turn-On Delay Time                                    | t <sub>D(on)</sub>  | -   | 5.1   | -    | ns   | V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V,<br>R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω,<br>I <sub>D</sub> = 200mA |
| Turn-On Rise Time                                     | t <sub>r</sub>      | -   | 7.4   | -    | ns   |   |
| Turn-Off Delay Time                                   | t <sub>D(off)</sub> | -   | 26.7  | -    | ns   |   |
| Turn-Off Fall Time                                    | t <sub>f</sub>      | -   | 12.3  | -    | ns   |   |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1 inch square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

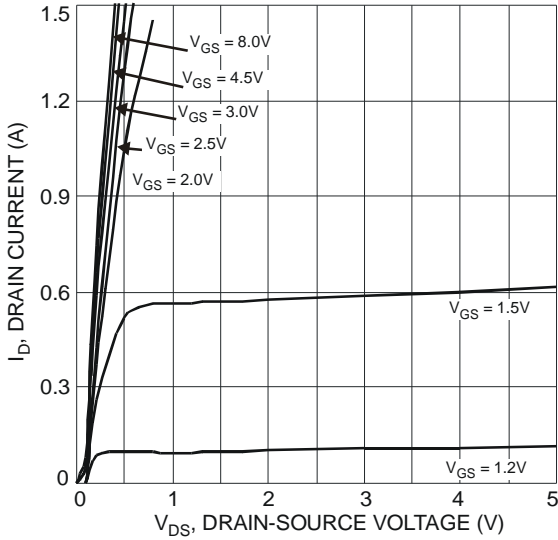


Fig. 1 Typical Output Characteristics

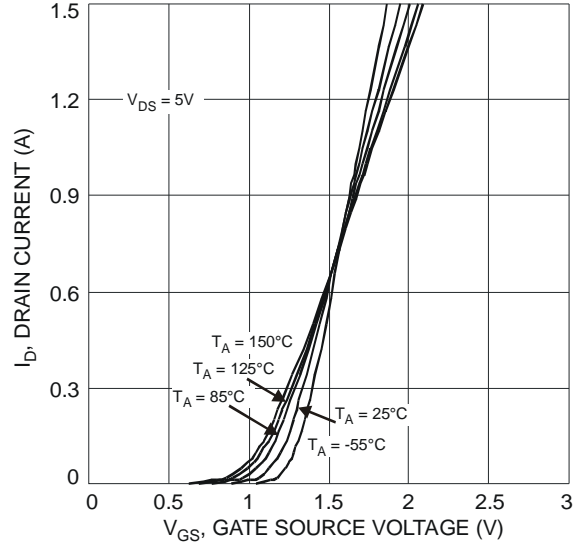


Fig. 2 Typical Transfer Characteristics

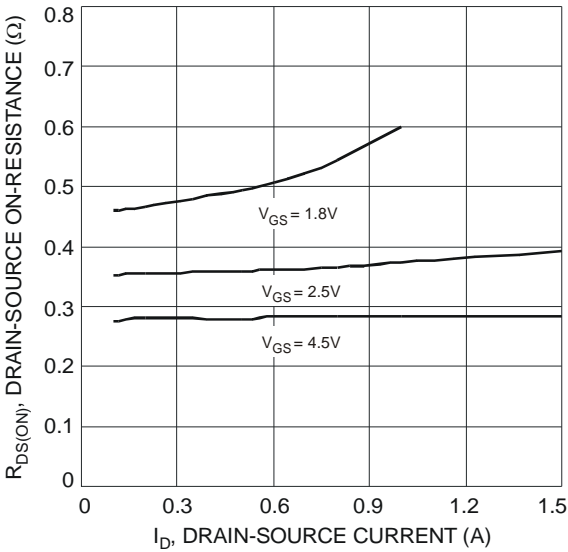


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

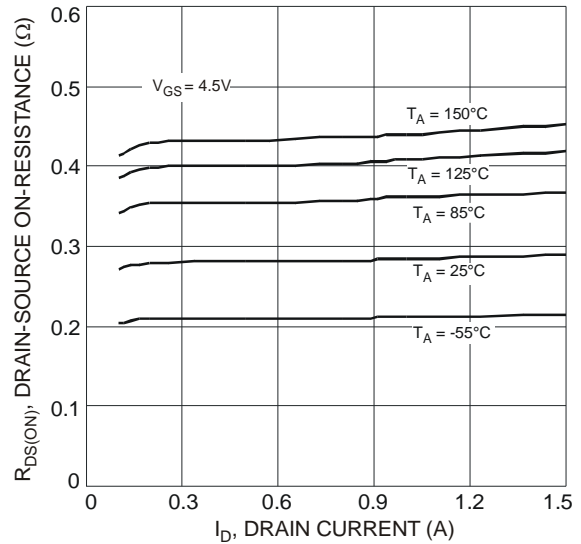


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

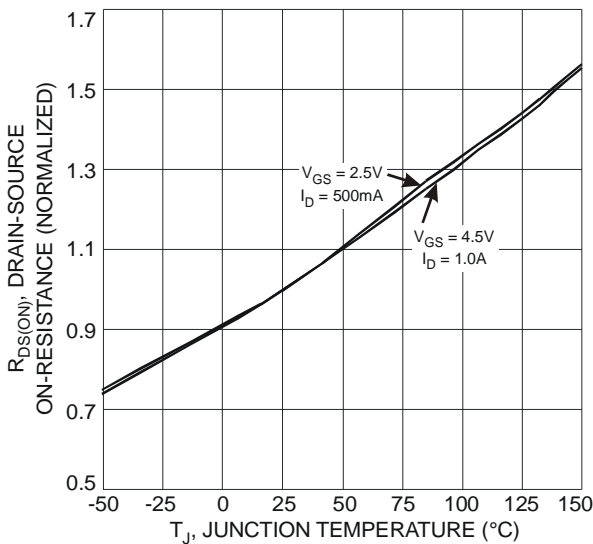


Fig. 5 On-Resistance Variation with Temperature

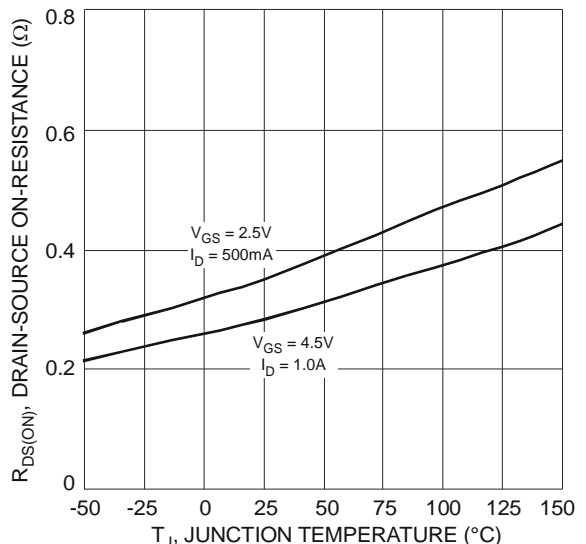


Fig. 6 On-Resistance Variation with Temperature

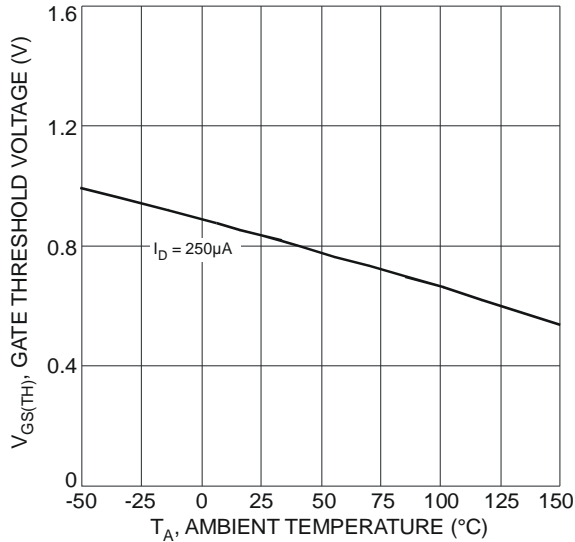


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

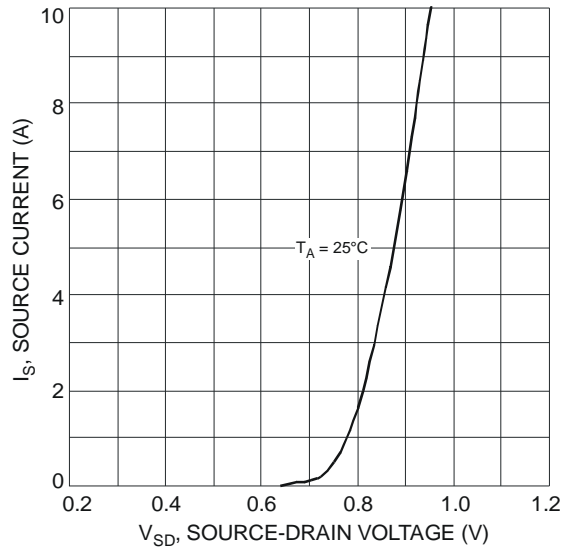


Fig. 8 Diode Forward Voltage vs. Current

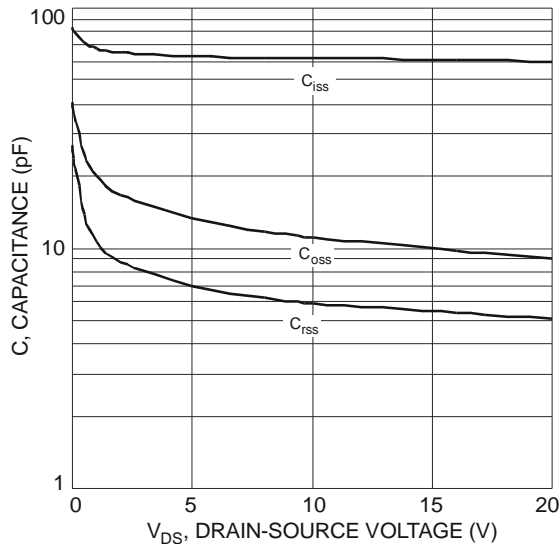


Fig. 9 Typical Capacitance

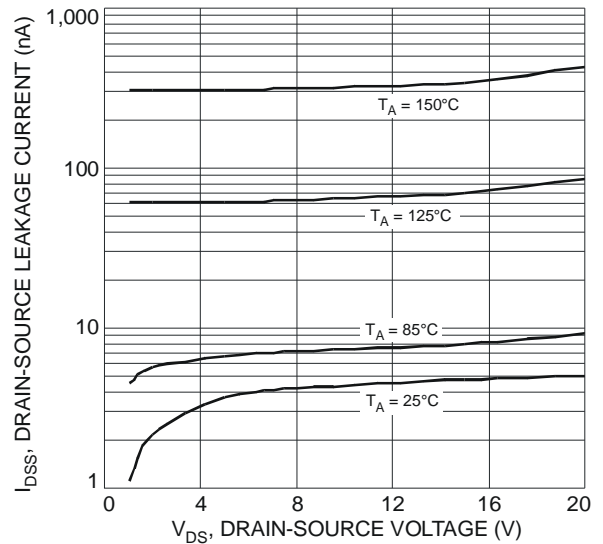
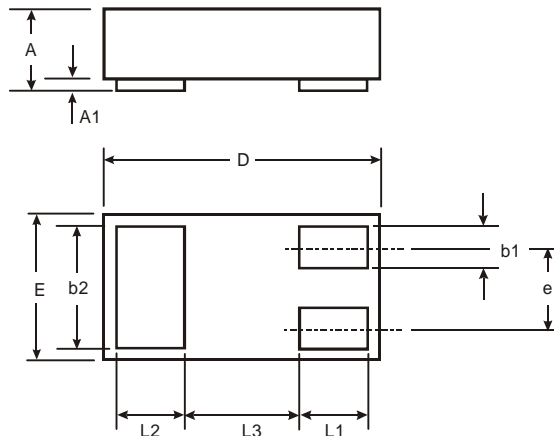


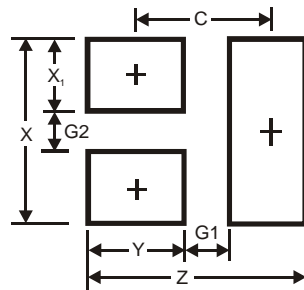
Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

**Package Outline Dimensions**



| X2-DFN1006-3         |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | —    | 0.40 | —    |
| A1                   | 0    | 0.05 | 0.02 |
| b1                   | 0.10 | 0.20 | 0.15 |
| b2                   | 0.45 | 0.55 | 0.50 |
| D                    | 0.95 | 1.05 | 1.00 |
| E                    | 0.55 | 0.65 | 0.60 |
| e                    | —    | —    | 0.35 |
| L1                   | 0.20 | 0.30 | 0.25 |
| L2                   | 0.20 | 0.30 | 0.25 |
| L3                   | —    | —    | 0.40 |
| All Dimensions in mm |      |      |      |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 1.1           |
| G1         | 0.3           |
| G2         | 0.2           |
| X          | 0.7           |
| X1         | 0.25          |
| Y          | 0.4           |
| C          | 0.7           |

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