

NEW PRODUCT

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max                       | $I_D$ max<br>$T_A = +25^\circ\text{C}$ |
|---------------|--|--|
| 20V           | 0.99 $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 250mA                                  |
|               | 1.2 $\Omega$ @ $V_{GS} = 2.5\text{V}$  | 230mA                                  |
|               | 1.8 $\Omega$ @ $V_{GS} = 1.8\text{V}$  | 180mA                                  |
|               | 2.4 $\Omega$ @ $V_{GS} = 1.5\text{V}$  | 150mA                                  |

## Description

This MOSFET is 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.

## Applications

- General Purpose Interfacing Switch
- Power Management Functions
- Analog Switch

## Features and Benefits

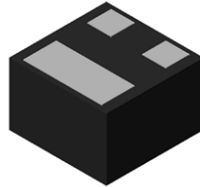
- Low Package Profile, 0.42mm Maximum Package Height
- 0.62mm x 0.62mm Package Footprint
- Low On-Resistance
- Very Low Gate Threshold Voltage, 1.0V Max
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 standards for High Reliability**

## Mechanical Data

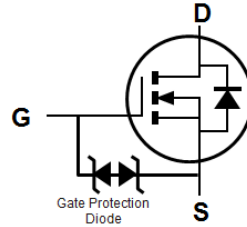
- Case: X2-DFN0606-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe Solderable per MIL-STD-202, Method 208  $\text{e4}$
- Weight: 0.001 grams (Approximate)



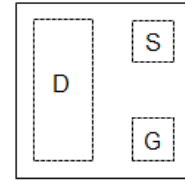
ESD PROTECTED

**X2-DFN0606-3**


Bottom View



Equivalent Circuit

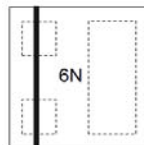

 Top View  
Package Pin Configuration

## Ordering Information (Note 4)

| Part Number   | Case         | Packaging       |
|---------------|--------------|-----------------|
| DMN2990UFZ-7B | X2-DFN0606-3 | 10K/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information

**X2-DFN0606-3**


6N = Product Type Marking Code

 Top View  
Bar Denotes Gate  
and Source Side

**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> | ±8    | V     |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | 250   | mA    |
|  |              | T <sub>A</sub> = +85°C |                  | 170   |       |
| Pulsed Drain Current (Note 6)                            |              |                        | I <sub>DM</sub>  | 800   | mA    |

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                   |              | Symbol                            | Value       | Units |
|--|--------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 | Steady state | P <sub>D</sub>                    | 320         | mW    |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | R <sub>θJA</sub>                  | 402         | °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</b> (Note 7)                     |                     |     |      |      |      |   |
| 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>C</sub> = +25°C | I <sub>DSS</sub>    | —   | —    | 100  | nA   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V   |
| Gate-Source Leakage                                     | I <sub>GSS</sub>    | —   | —    | ±100 | nA   | V <sub>GS</sub> = ±5V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS</b> (Note 7)                      |                     |     |      |      |      |   |
| Gate Threshold Voltage                                  | V <sub>GS(th)</sub> | 0.4 | —    | 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> | —   | 0.60 | 0.99 | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 100mA  |
|   |                     | —   | 0.75 | 1.2  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 50mA   |
|   |                     | —   | 0.90 | 1.8  |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 20mA   |
|   |                     | —   | 1.2  | 2.4  |      | V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 10mA   |
|   |                     | —   | 2.0  | —    |      | V <sub>GS</sub> = 1.2V, I <sub>D</sub> = 1mA  |
| Forward Transfer Admittance                             | Y <sub>fs</sub>     | 180 | —    | —    | mS   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA   |
| Diode Forward Voltage                                   | V <sub>SD</sub>     | —   | 0.6  | 1.0  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA  |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 8)                 |                     |     |      |      |      |   |
| Input Capacitance                                       | C <sub>iss</sub>    | —   | 28.2 | 55.2 | pF   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz  |
| Output Capacitance                                      | C <sub>oss</sub>    | —   | 4.0  | 8.0  | pF   |   |
| Reverse Transfer Capacitance                            | C <sub>rss</sub>    | —   | 2.8  | 5.6  | pF   |   |
| Total Gate Charge                                       | Q <sub>g</sub>      | —   | 0.5  | 1.0  | nC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V,<br>I <sub>D</sub> = 250mA  |
| Gate-Source Charge                                      | Q <sub>gs</sub>     | —   | 0.07 | 0.14 | nC   |   |
| Gate-Drain Charge                                       | Q <sub>gd</sub>     | —   | 0.07 | 0.14 | nC   |   |
| Turn-On Delay Time                                      | t <sub>D(on)</sub>  | —   | 3.5  | 10   | 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>      | —   | 2.1  | 10   | ns   |   |
| Turn-Off Delay Time                                     | t <sub>D(off)</sub> | —   | 22   | 35   | ns   |   |
| Turn-Off Fall Time                                      | t <sub>f</sub>      | —   | 7.7  | 15   | ns   |   |

- Notes:
5. Device mounted on FR-4 PCB, with minimum recommended pad layout.
  6. Device mounted on minimum recommended pad layout test board, 10μs pulse duty cycle = 1%.
  7. Short duration pulse test used to minimize self-heating effect.
  8. Guaranteed by design. Not subject to product testing.

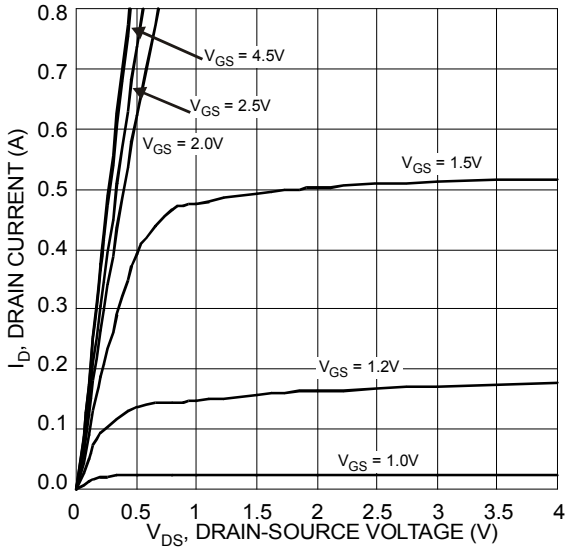


Figure 1 Typical Output Characteristic

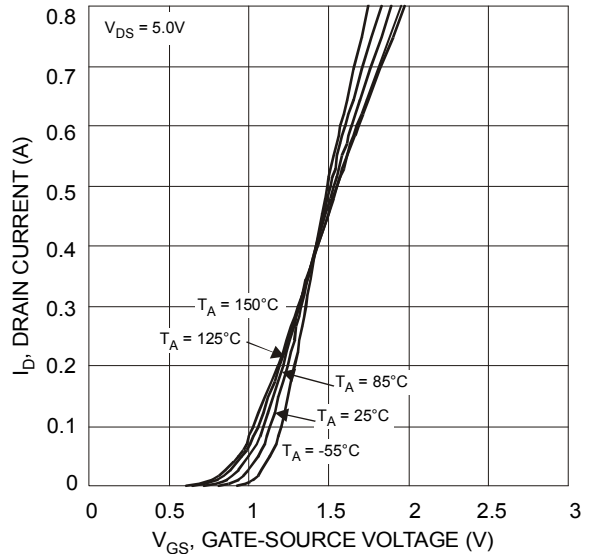


Figure 2 Typical Transfer Characteristics

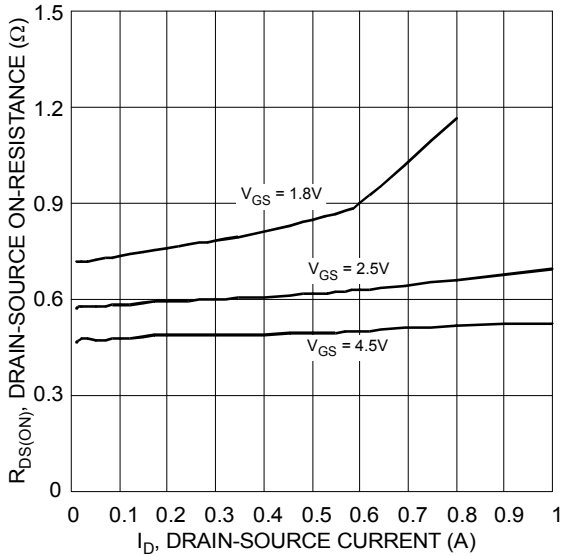


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

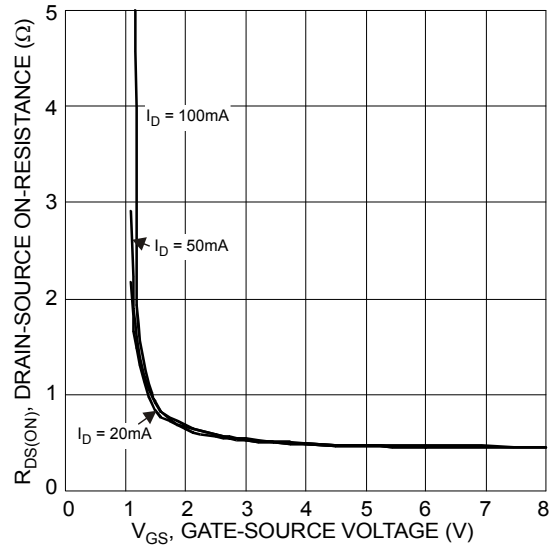


Figure 4 Typical Transfer Characteristics

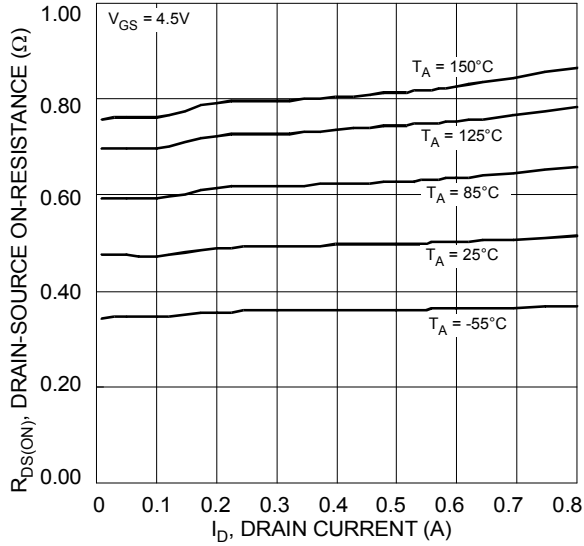


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

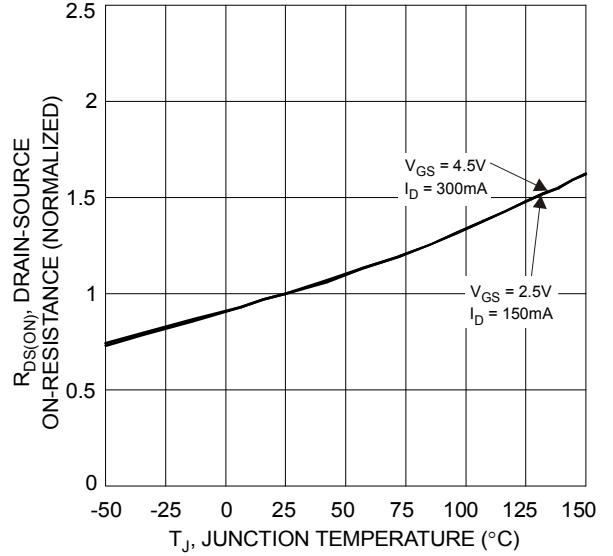


Figure 6 On-Resistance Variation with Temperature

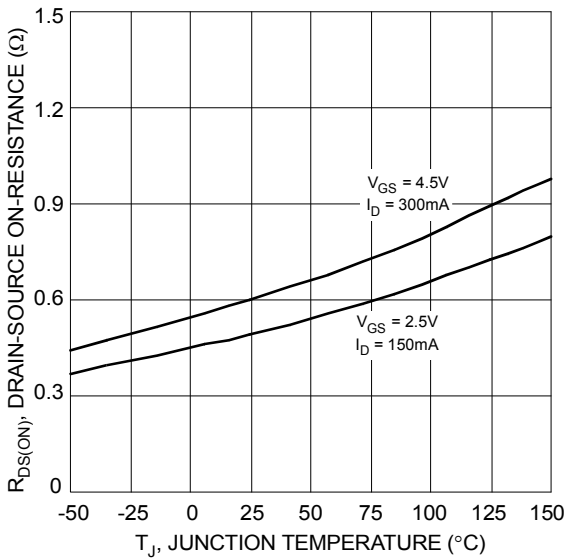


Figure 7 On-Resistance Variation with Temperature

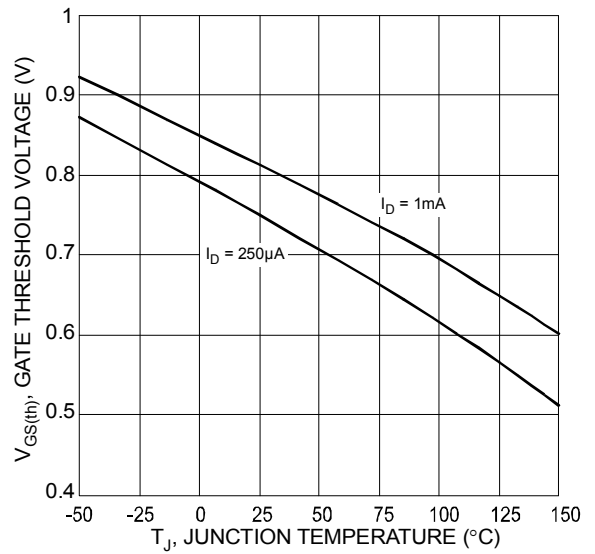
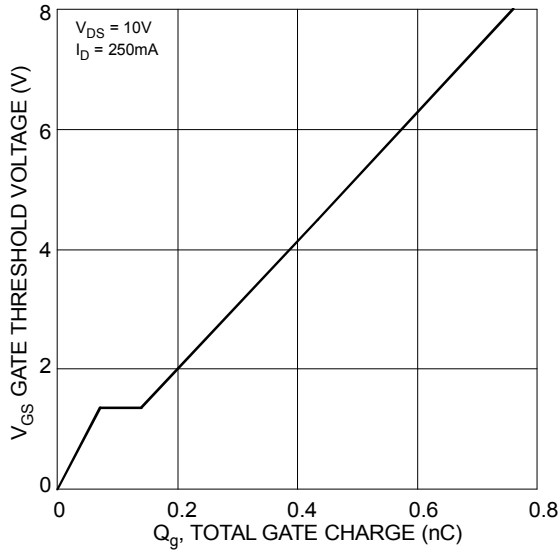
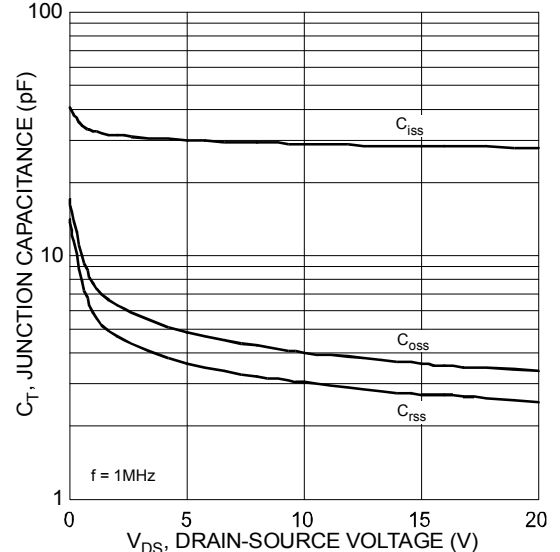
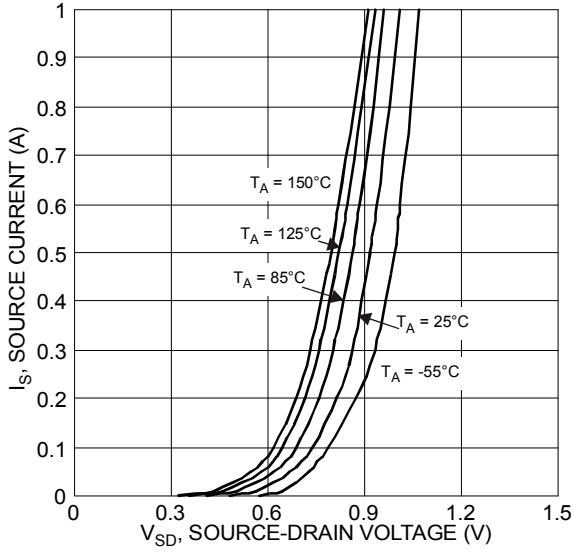
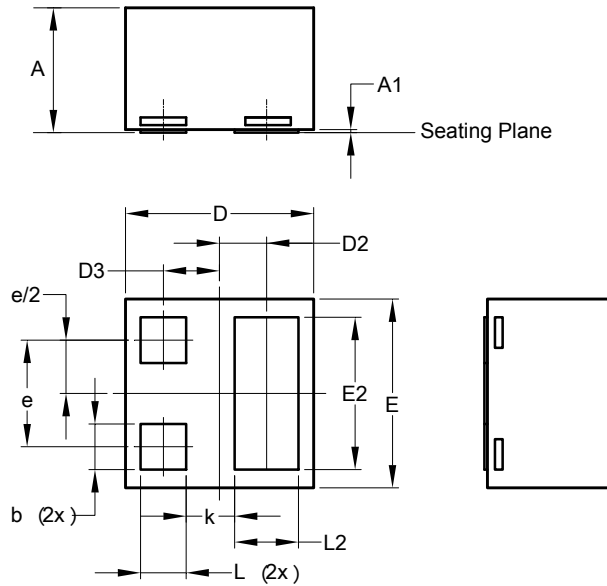


Figure 8 Gate Threshold Variation vs. Ambient Temperature



**Package Outline Dimensions**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

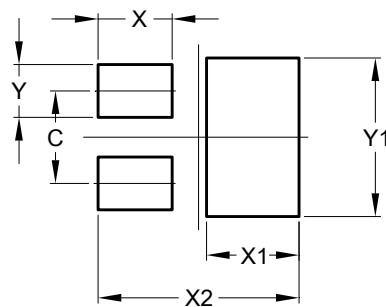


| X2-DFN0606-3         |           |      |      |
|----------------------|-----------|------|------|
| Dim                  | Min       | Max  | Typ  |
| A                    | 0.36      | 0.40 | 0.39 |
| A1                   | 0         | 0.05 | 0.02 |
| b                    | 0.10      | 0.20 | 0.15 |
| D                    | 0.57      | 0.67 | 0.62 |
| D2                   | 0.155 BSC |      |      |
| D3                   | 0.185 BSC |      |      |
| E                    | 0.57      | 0.67 | 0.62 |
| E2                   | 0.40      | 0.60 | 0.50 |
| e                    | 0.35 BSC  |      |      |
| k                    | 0.16 REF  |      |      |
| L                    | 0.09      | 0.21 | 0.15 |
| L2                   | 0.11      | 0.31 | 0.21 |
| All Dimensions in mm |           |      |      |

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

**X2-DFN0606-3**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.350         |
| X          | 0.280         |
| X1         | 0.350         |
| X2         | 0.760         |
| Y          | 0.200         |
| Y1         | 0.600         |

NEW PRODUCT

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