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DMN2990UFA

20V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) \max}$ | $I_D \max$ $T_A = +25^\circ C$ |
|---------------|-------------------------|-----------------------------------|
| 20V | 0.99Ω @ $V_{GS} = 4.5V$ | 510mA |
| | 1.2Ω @ $V_{GS} = 2.5V$ | 470mA |
| | 1.8Ω @ $V_{GS} = 1.8V$ | 380mA |
| | 2.4Ω @ $V_{GS} = 1.5V$ | 330mA |

Description

This 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.

Applications

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

Features and Benefits

- Low Package Profile, 0.4mm Maximum Package height
- 0.48mm² package footprint, 16 times smaller than SOT23
- 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-DFN0806-3
- 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 (e4)
- Weight: 0.001 grams (approximate)



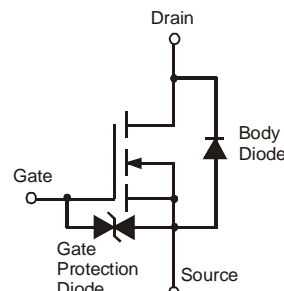
ESD PROTECTED



Bottom View



Top View
Package Pin Configuration



Equivalent Circuit

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|--------------|-----------------|
| DMN2990UFA-7B | X2-DFN0806-3 | 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 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

DMN2990UFA-7B



NW = Product Type Marking Code

Top View
Bar Denotes Gate and Source Side

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|--|--------------|--|------------------|------------|-------|
| Drain-Source Voltage | | | V _{DSS} | 20 | V |
| Gate-Source Voltage | | | V _{GSS} | ±8 | V |
| Continuous Drain Current (Note 5) V _{GS} = 4.5V | Steady State | T _A = +25°C T _A = +70°C | I _D | 510 410 | mA |
| | t<10s | T _A = +25°C T _A = +70°C | I _D | 610 490 | mA |
| Continuous Drain Current (Note 5) V _{GS} = 1.8V | Steady State | T _A = +25°C T _A = 70°C | I _D | 380 300 | mA |
| | t<10s | T _A = +25°C T _A = +70°C | I _D | 450 360 | mA |
| Pulsed Drain Current (Note 6) | | | I _{DM} | 800 | mA |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Units |
|--|--------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5) | Steady state | P _D | 400 | mW |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | R _{θJA} | 310 | °C/W |
| | t<10s | | 220 | °C/W |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 20 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current @T _C = +25°C | I _{DSS} | — | — | 100 | nA | V _{DS} = 16V, V _{GS} = 0V |
| | | — | — | 50 | | V _{DS} = 5V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±5V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 0.4 | — | 1.0 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 0.60 | 0.99 | Ω | V _{GS} = 4.5V, I _D = 100mA |
| | | — | 0.75 | 1.2 | | V _{GS} = 2.5V, I _D = 50mA |
| | | — | 0.90 | 1.8 | | V _{GS} = 1.8V, I _D = 20mA |
| | | — | 1.2 | 2.4 | | V _{GS} = 1.5V, I _D = 10mA |
| | | — | 2.0 | — | | V _{GS} = 1.2V, I _D = 1mA |
| Forward Transfer Admittance | Y _{fs} | 180 | — | — | mS | V _{DS} = 10V, I _D = 400mA |
| Diode Forward Voltage | V _{SD} | - | 0.6 | 1.0 | V | V _{GS} = 0V, I _S = 150mA |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iSS} | — | 27.6 | 55.2 | pF | V _{DS} = 16V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oSS} | — | 4.0 | 8.0 | pF | |
| Reverse Transfer Capacitance | C _{rSS} | — | 2.8 | 5.6 | pF | |
| Total Gate Charge | Q _g | — | 0.5 | — | nC | V _{GS} = 4.5V, V _{DS} = 10V, I _D = 250mA |
| Gate-Source Charge | Q _{gs} | — | 0.07 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 0.07 | — | nC | |
| Turn-On Delay Time | t _{D(on)} | — | 4.0 | — | ns | V _{DD} = 10V, V _{GS} = 4.5V, R _L = 47Ω, R _G = 10Ω, I _D = 200mA |
| Turn-On Rise Time | t _r | — | 3.3 | — | ns | |
| Turn-Off Delay Time | t _{D(off)} | — | 19.0 | — | ns | |
| Turn-Off Fall Time | t _f | — | 6.4 | — | ns | |

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



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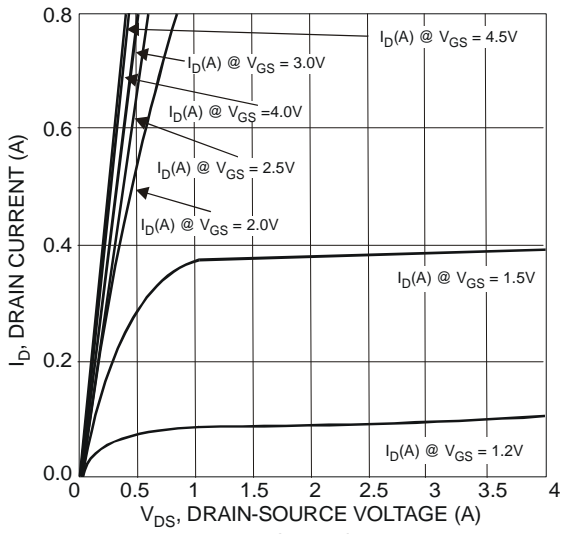


Fig. 1 Typical Output Characteristics

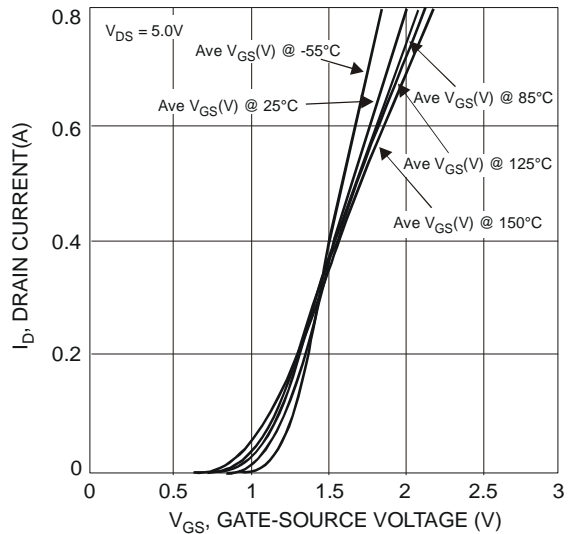


Fig. 2 Typical Transfer Characteristics

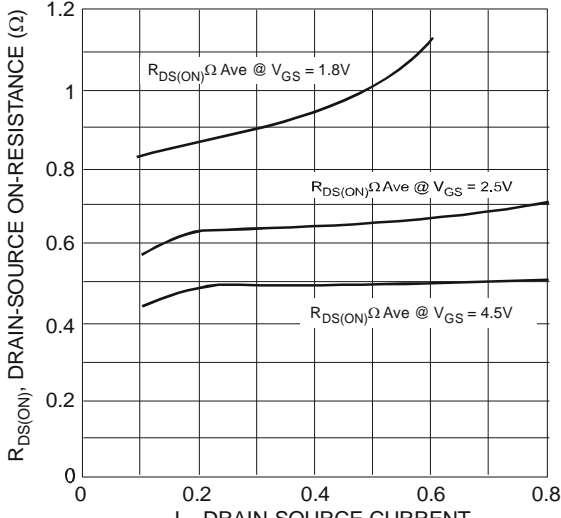


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

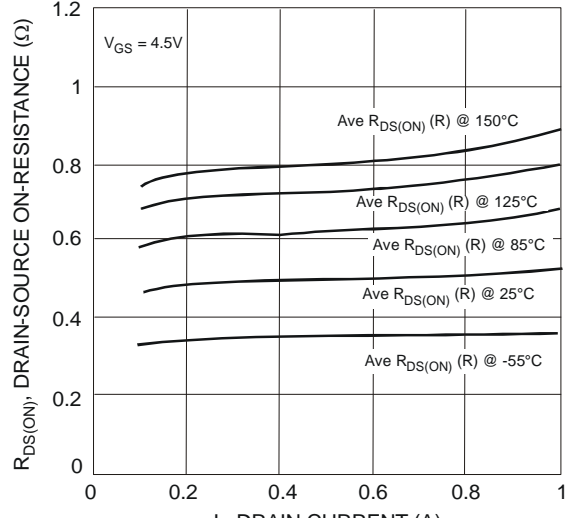


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

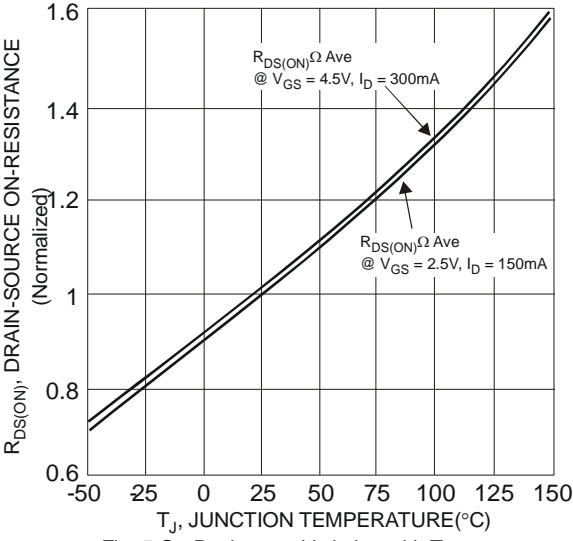


Fig. 5 On-Resistance Variation with Temperature

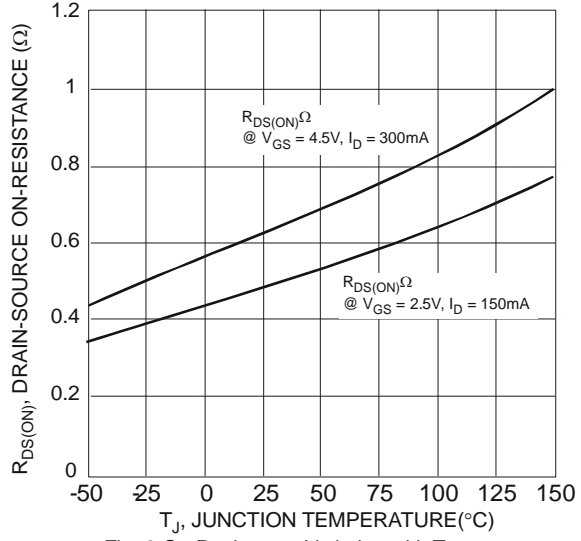


Fig. 6 On-Resistance Variation with Temperature



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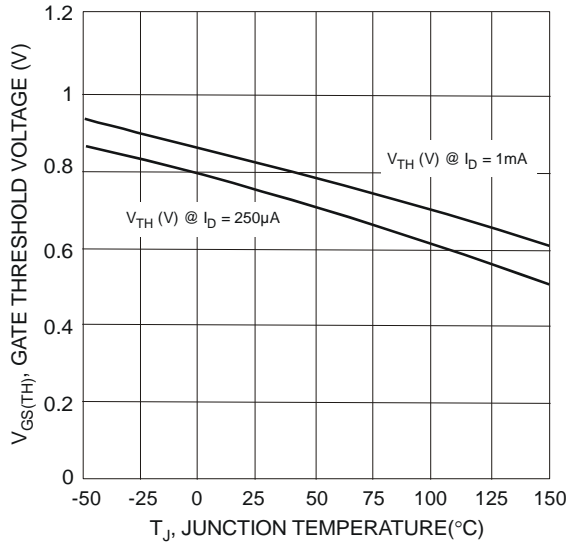


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

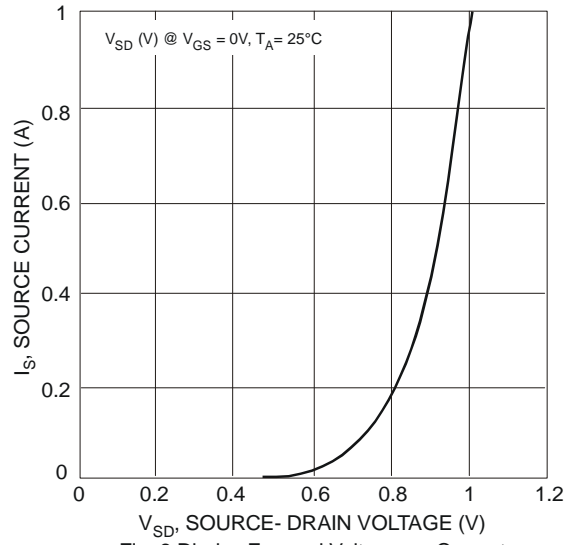


Fig. 8 Diodes Forward Voltage vs. Current

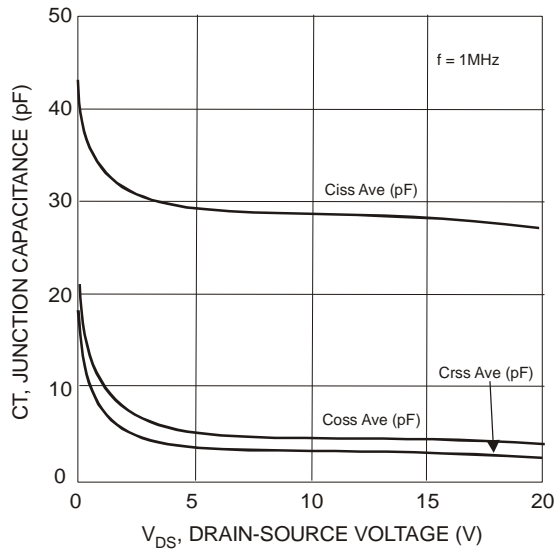


Fig. 9 Typical Junction Capacitance

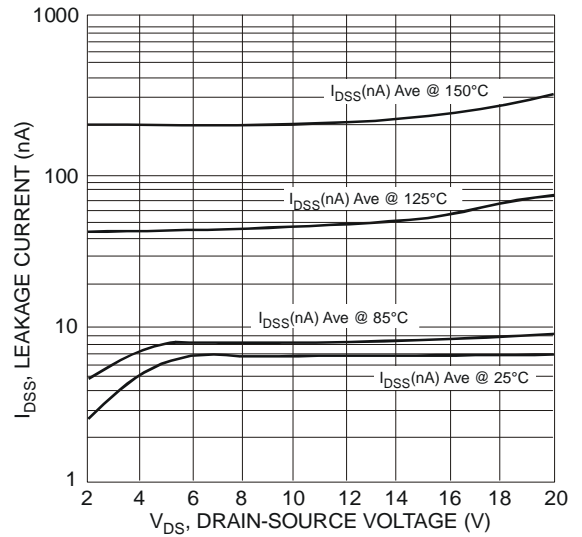


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

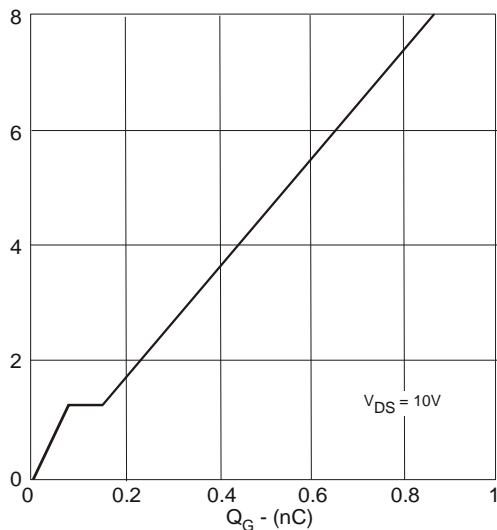
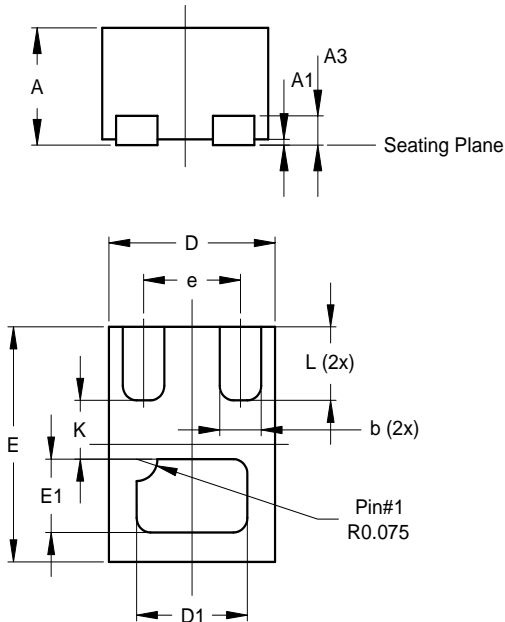


Fig. 11 Gate Charge Characteristics

Package Outline Dimensions

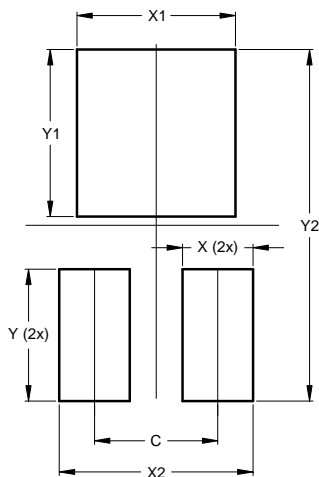
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| X2-DFN0806-3 | | | |
|----------------------|-------|------|------|
| Dim | Min | Max | Typ |
| A | 0.375 | 0.40 | 0.39 |
| A1 | 0 | 0.05 | 0.02 |
| A3 | - | - | 0.10 |
| b | 0.10 | 0.20 | 0.15 |
| D | 0.55 | 0.65 | 0.60 |
| D1 | 0.35 | 0.45 | 0.40 |
| E | 0.75 | 0.85 | 0.80 |
| E1 | 0.20 | 0.30 | 0.25 |
| e | - | - | 0.35 |
| K | - | - | 0.20 |
| L | 0.20 | 0.30 | 0.25 |
| All Dimensions in mm | | | |

Suggested Pad Layout

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



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.350 |
| X | 0.200 |
| X1 | 0.450 |
| X2 | 0.550 |
| Y | 0.375 |
| Y1 | 0.475 |
| Y2 | 1.000 |

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