

## Product Summary

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

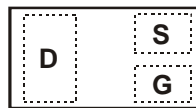
- Low Package Profile, 0.4mm Maximum Package height
- 0.48mm<sup>2</sup> package footprint, 16 times smaller than SOT23
- Low On-Resistance
- Very low Gate Threshold Voltage, 1.0V max
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 standards for High Reliability**

## Mechanical Data

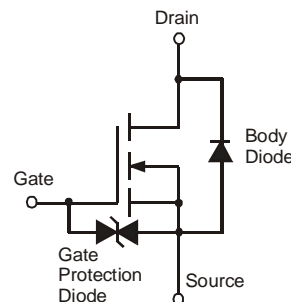
- Case: X2-DFN0806-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 (e4)
- Weight: 0.001 grams (approximate)



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](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



Top View  
Bar Denotes Gate  
and Source Side

NW = 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>	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	510 410	mA
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	610 490	mA
Continuous Drain Current (Note 5) V <sub>GS</sub> = 1.8V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	380 300	mA
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	450 360	mA
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>	400	mW
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	310	°C/W
	t < 10s		220	°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 7)</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>C</sub> = +25°C	I <sub>DSS</sub>	—	—	100	nA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
		—	—	50		V <sub>DS</sub> = 5V, 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 (Note 7)</b>						
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 (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	27.6	55.2	pF	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	4.0	8.0	pF	
Reverse Transfer Capacitance	C <sub>rfs</sub>	—	2.8	5.6	pF	
Total Gate Charge	Q <sub>g</sub>	—	0.5	—	nC	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V, I <sub>D</sub> = 250mA
Gate-Source Charge	Q <sub>gs</sub>	—	0.07	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	0.07	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	4.0	—	ns	V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V, R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω, I <sub>D</sub> = 200mA
Turn-On Rise Time	t <sub>r</sub>	—	3.3	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	19.0	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	6.4	—	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.

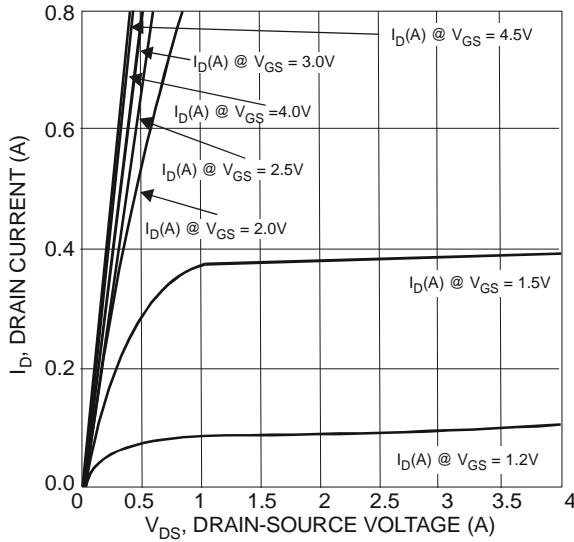


Fig. 1 Typical Output Characteristics

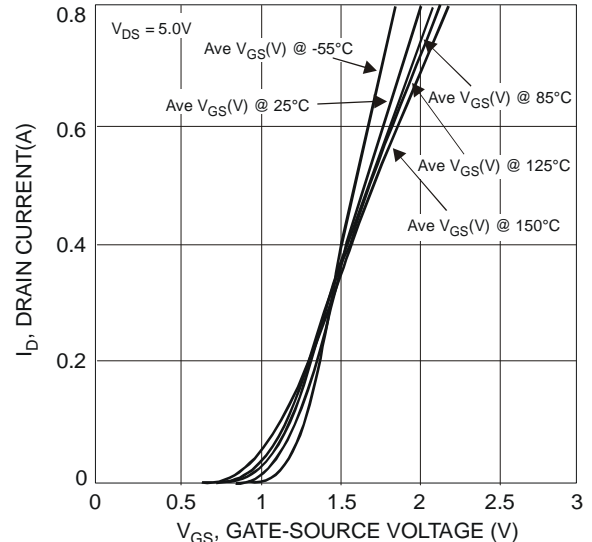


Fig. 2 Typical Transfer Characteristics

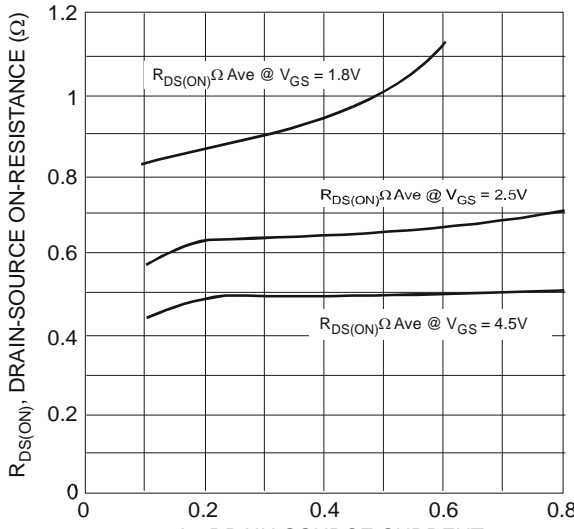


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

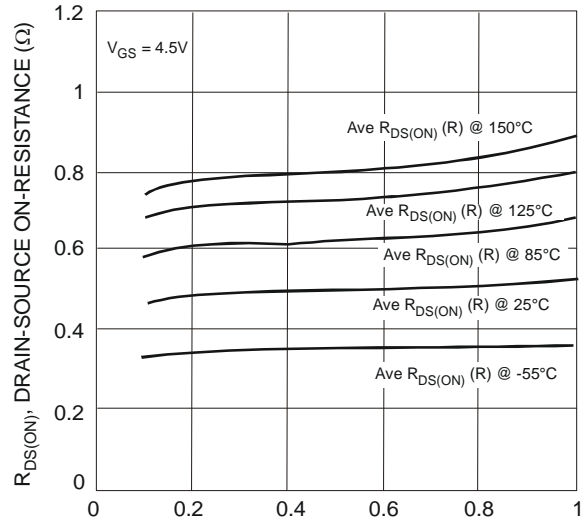


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

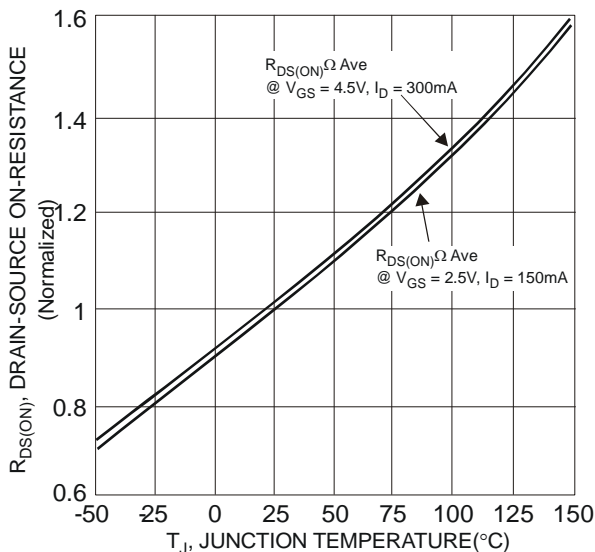


Fig. 5 On-Resistance Variation with Temperature

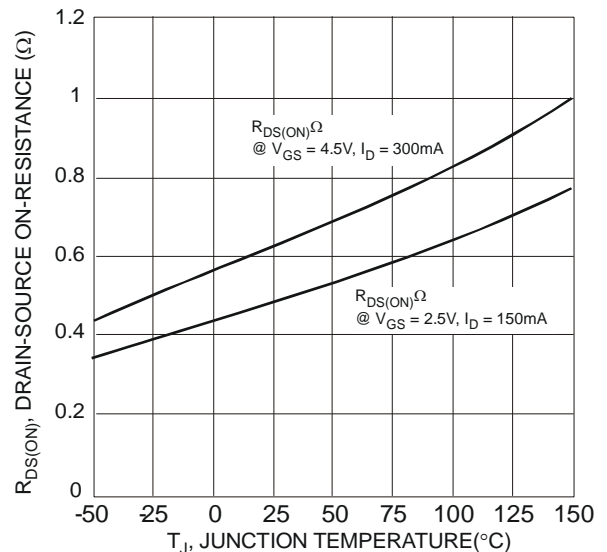


Fig. 6 On-Resistance Variation with Temperature

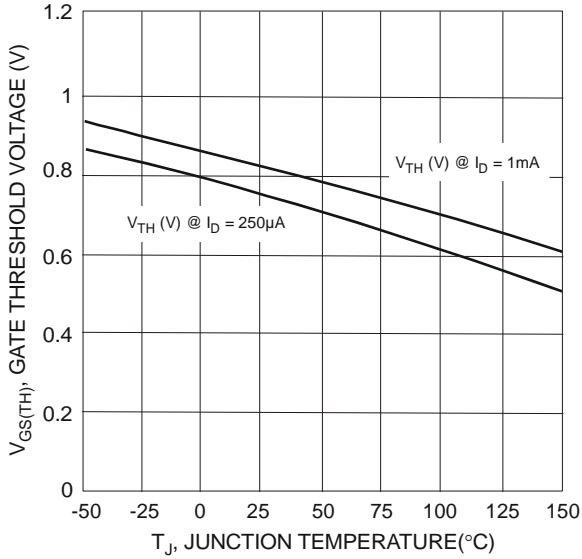


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

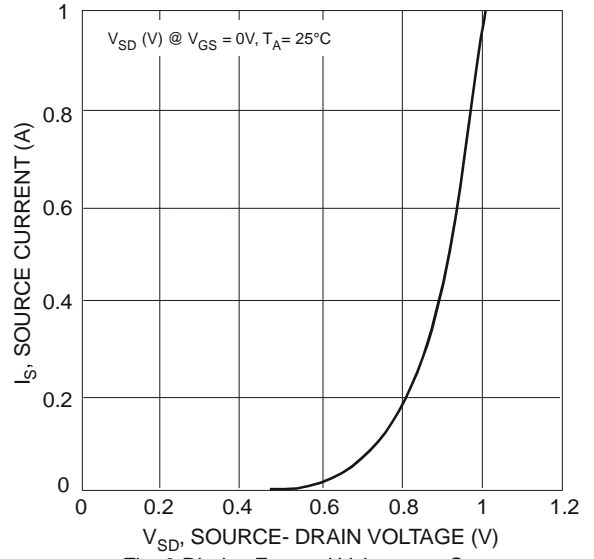


Fig. 8 Diodes Forward Voltage vs. Current

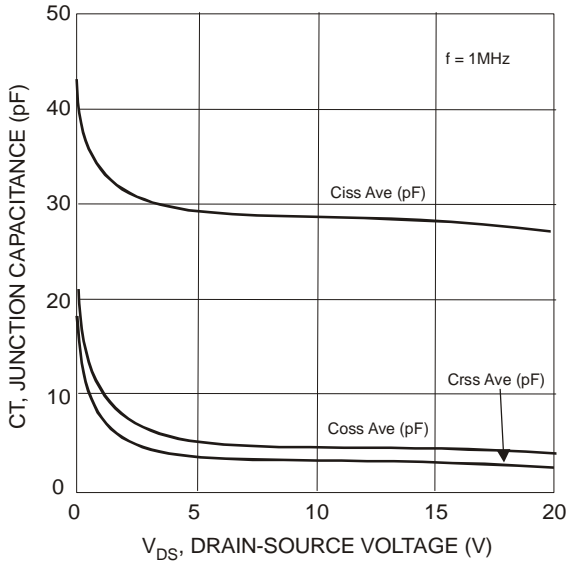


Fig. 9 Typical Junction Capacitance

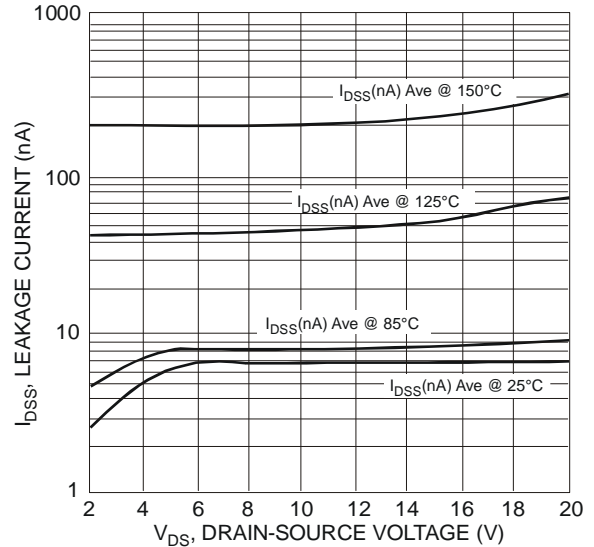


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

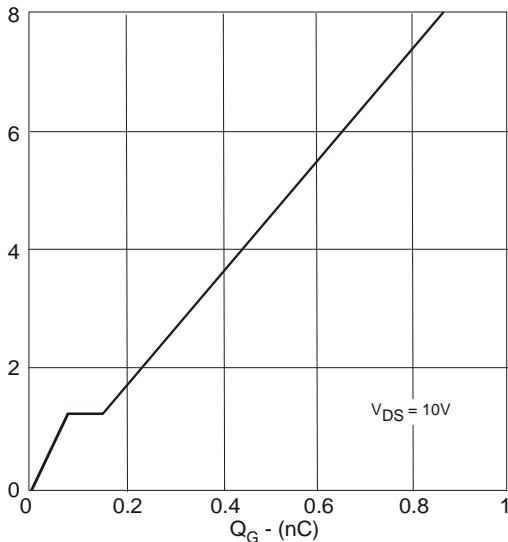
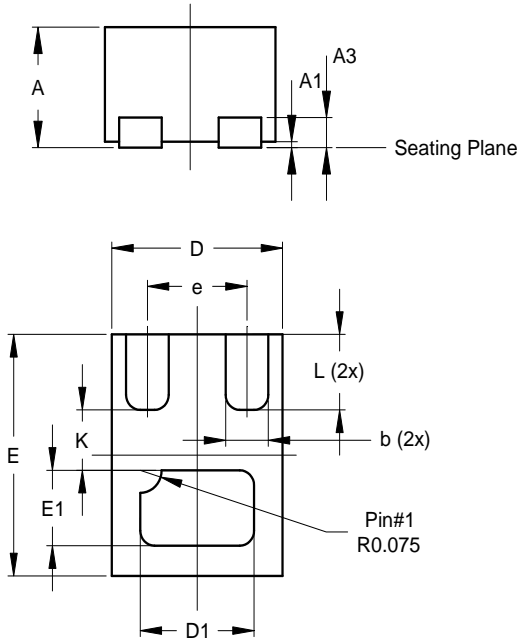


Fig. 11 Gate Charge Characteristics

**Package Outline Dimensions**

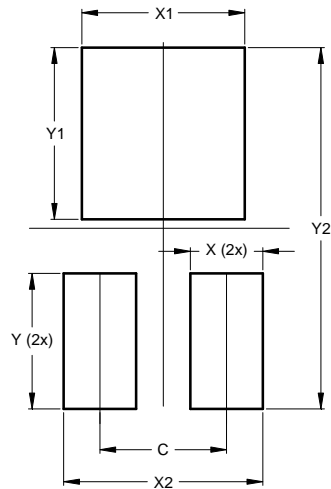
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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