20V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = +25°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
- 0.48mm^2 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

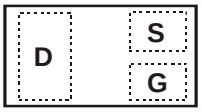
- Case: X2-DFN0806-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.001 grams (approximate)



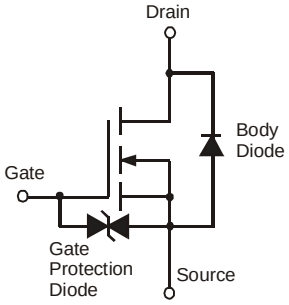
ESD PROTECTED



Bottom View



Top View
Package Pin Configuration



Equivalent Circuit

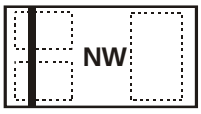
Ordering Information (Note 4)

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

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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	$R_{\theta JA}$	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: 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.

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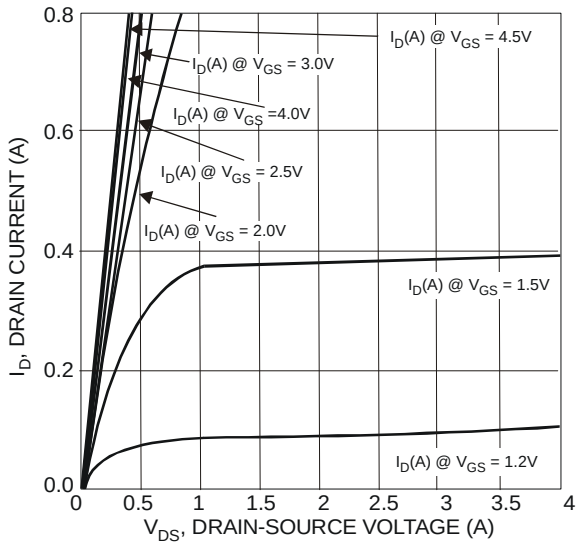


Fig. 1 Typical Output Characteristics

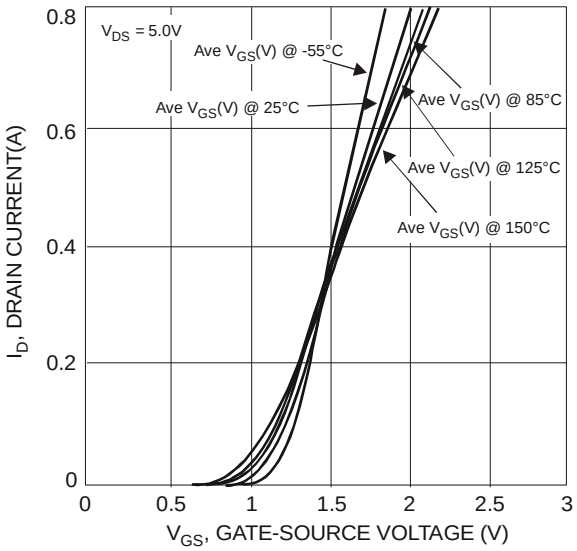


Fig. 2 Typical Transfer Characteristics

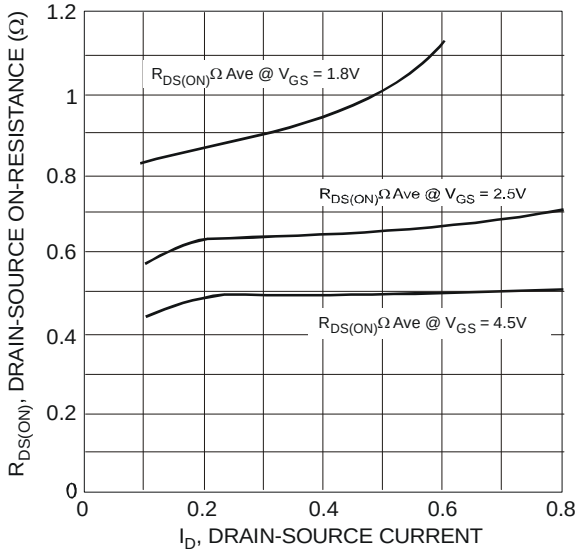


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

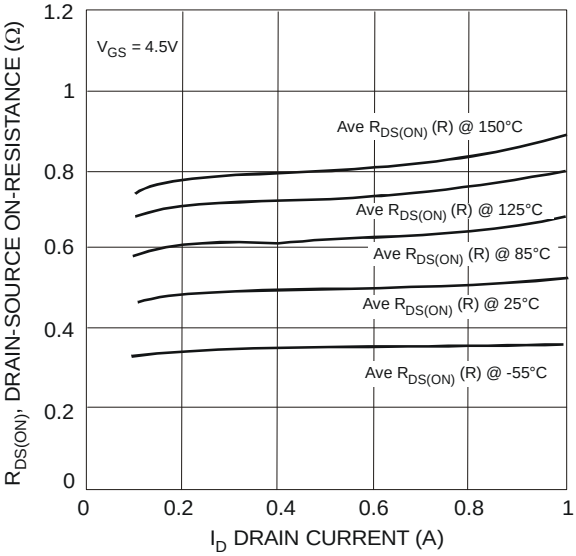


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

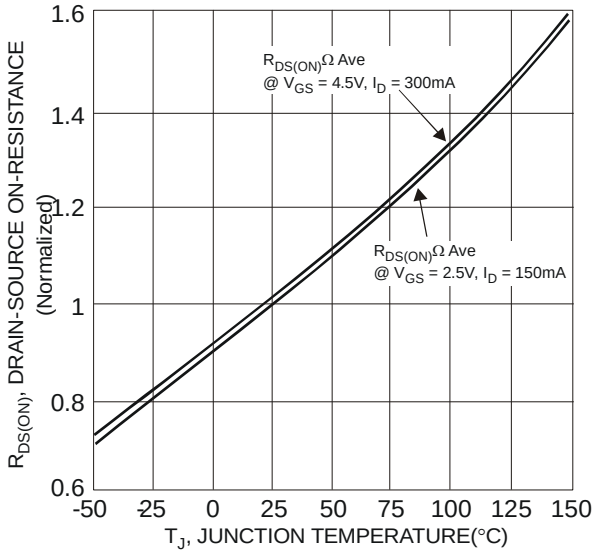


Fig. 5 On-Resistance Variation with Temperature

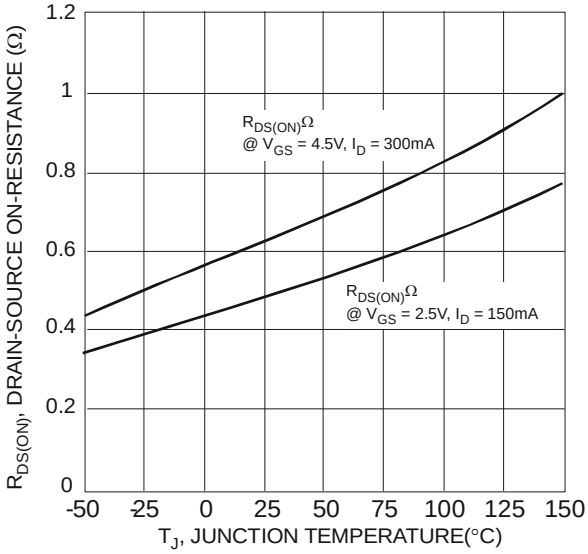


Fig. 6 On-Resistance Variation with Temperature

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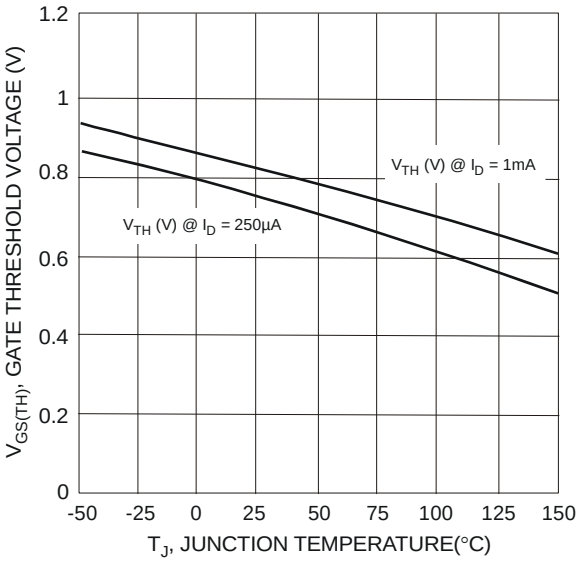


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

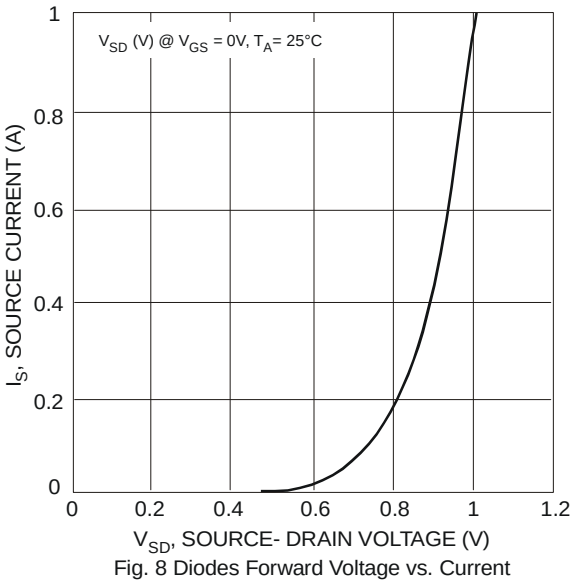


Fig. 8 Diodes Forward Voltage vs. Current

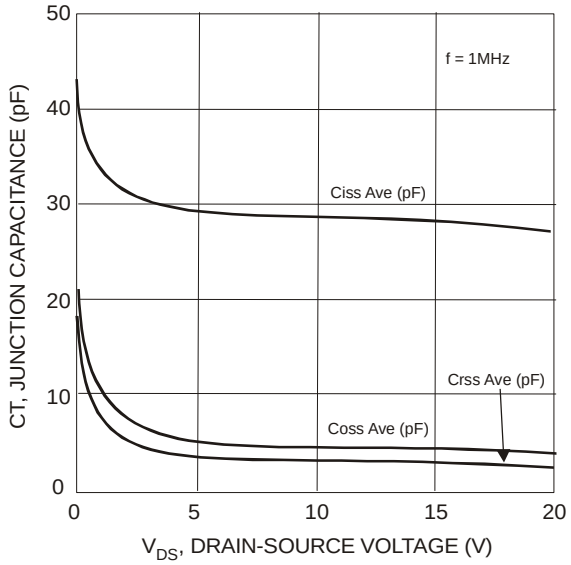


Fig. 9 Typical Junction Capacitance

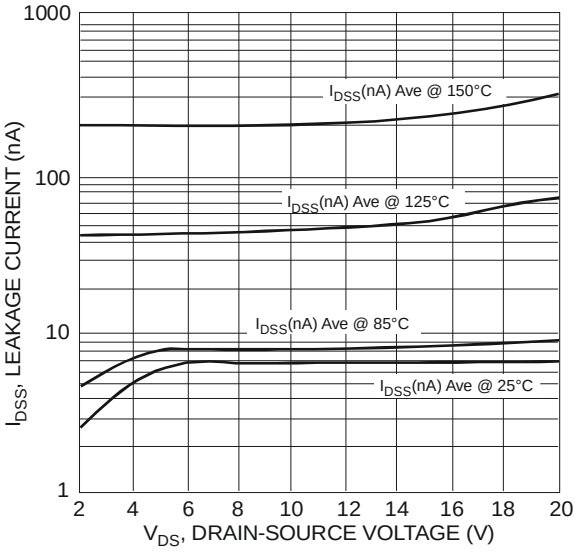


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

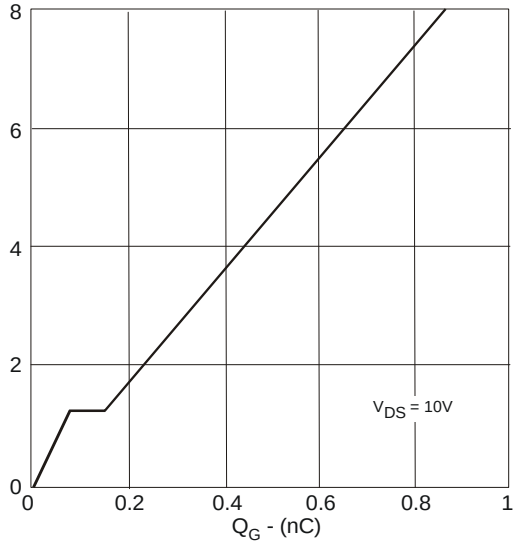
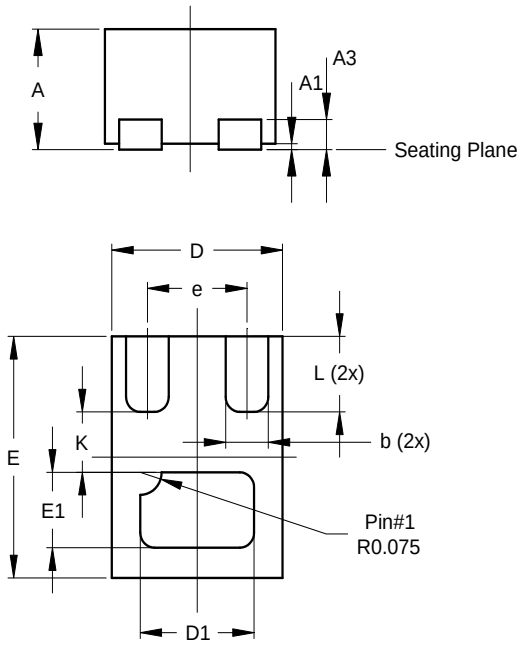


Fig. 11 Gate Charge Characteristics

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Package Outline Dimensions

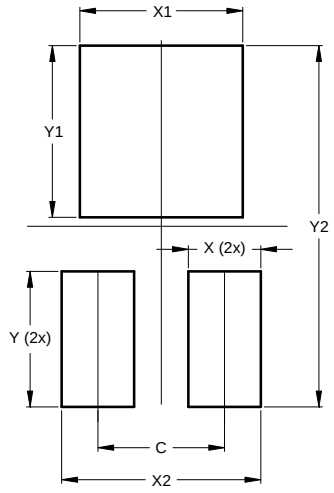
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



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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