



#### 20V N-CHANNEL ENHANCEMENT MODE MOSFET

## **Product Summary**

V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> max T <sub>A</sub> = +25°C
20V	0.99Ω @ V <sub>GS</sub> = 4.5V	250mA
	1.2Ω @ V <sub>GS</sub> = 2.5V	230mA
	1.8Ω @ V <sub>GS</sub> = 1.8V	180mA
	2.4Ω @ V <sub>GS</sub> = 1.5V	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**

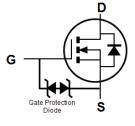
- Case: X2-DFN0606-3
- Case Material: Molded Plastic, "Green" Molding Compound.
   UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu over Copper Leadframe Solderable per MIL-STD-202, Method 208 4
- Weight: 0.001 grams (Approximate)

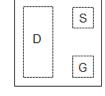
## X2-DFN0606-3





**Bottom View** 





**Equivalent Circuit** 

Top View Package Pin Configuration

# **Ordering Information** (Note 4)

Ī	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.
- 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**

### X2-DFN0606-3



Top View Bar Denotes Gate and Source Side 6N = Product Type Marking Code



# Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	20	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	I <sub>D</sub>	250 170	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>	320	mW
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	402	°C/W
Operating and Storage Temperature Range		$T_{J_i} T_{STG}$	-55 to +150	°C

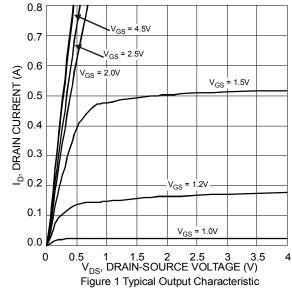
# Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

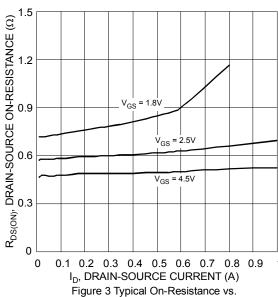
Observation and a first	Symbol	M!	T		1114	Total Consultation	
Characteristic		Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 7)	1		Т	1	1	T	
Drain-Source Breakdown Voltage		20	_	_	V	$V_{GS} = 0V, I_D = 250\mu A$	
Zero Gate Voltage Drain Current @T <sub>C</sub> = +25°C		_	_	100	nA	$V_{DS} = 16V, V_{GS} = 0V$	
Gate-Source Leakage		_	_	±100	nA	$V_{GS} = \pm 5V$ , $V_{DS} = 0V$	
ON CHARACTERISTICS (Note 7)					5	_	
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.4	_	1.0	V	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	
		_	0.60	0.99		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	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	_	0.90	1.8	Ω	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	_	1	V <sub>GS</sub> = 1.2V, I <sub>D</sub> = 1mA	
Forward Transfer Admittance		180	_	_	mS	V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA	
Diode Forward Voltage		_	0.6	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA	
DYNAMIC CHARACTERISTICS (Note 8)							
Input Capacitance		_	28.2	55.2	pF		
Output Capacitance		_	4.0	8.0	pF	$V_{DS} = 16V, V_{GS} = 0V,$ - f = 1.0MHz	
Reverse Transfer Capacitance	Crss	_	2.8	5.6	pF	-1 - 1.0WIHZ	
Total Gate Charge	Qg	_	0.5	1.0	nC		
Gate-Source Charge		_	0.07	0.14	nC	$V_{GS} = 4.5V, V_{DS} = 10V,$	
Gate-Drain Charge	Q <sub>gd</sub>	_	0.07	0.14	nC	-I <sub>D</sub> = 250mA	
Turn-On Delay Time	t <sub>D(on)</sub>	_	3.5	10	ns		
Turn-On Rise Time		_	2.1	10	ns	$V_{DD} = 10V, V_{GS} = 4.5V,$	
Turn-Off Delay Time		_	22	35	ns	$R_L = 47\Omega, R_G = 10\Omega,$ $I_D = 200 \text{mA}$	
Turn-Off Fall Time		_	7.7	15	ns	-1D - 200IIIA	

Notes:

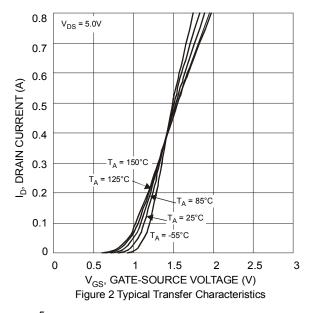
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
   Device mounted on minimum recommended pad layout test board, 10µs pulse duty cycle = 1%.
   Short duration pulse test used to minimize self-heating effect.
   Guaranteed by design. Not subject to product testing.

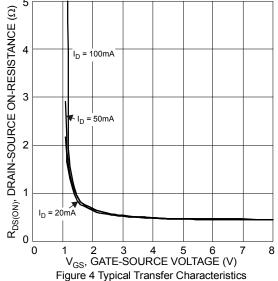




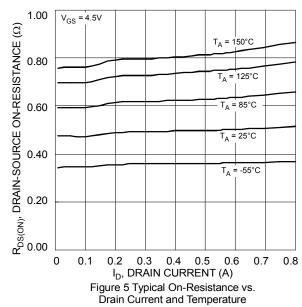


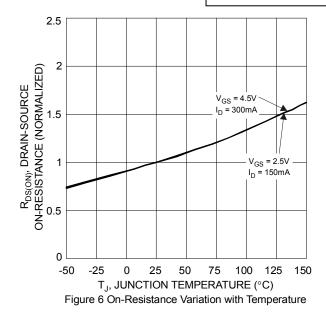
Drain Current and Gate Voltage











1.5  $R_{DS(ON)}$ , DRAIN-SOURCE ON-RESISTANCE  $(\Omega)$ V<sub>GS</sub> = 4.5V I<sub>D</sub> = 300mA V<sub>GS</sub> = 2.5V I<sub>D</sub> = 150mA -50 -25 25 50 75 100 125 150 T<sub>J</sub>, JUNCTION TEMPERATURE (°C) Figure 7 On-Resistance Variation with Temperature

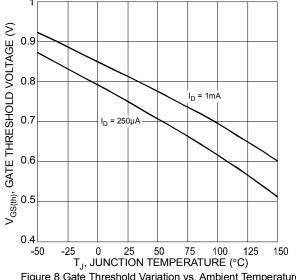
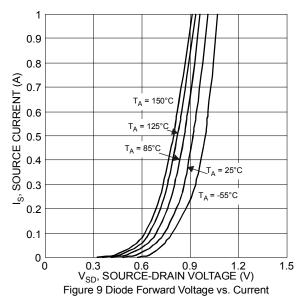
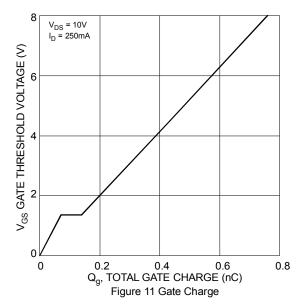
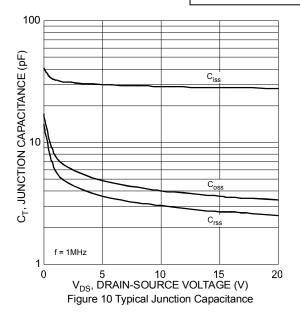


Figure 8 Gate Threshold Variation vs. Ambient Temperature





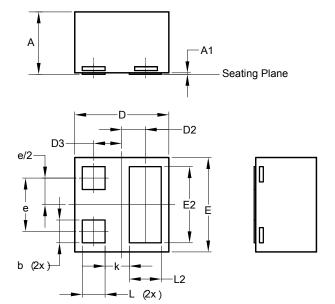






# **Package Outline Dimensions**

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

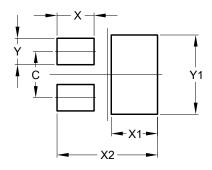


X2-DFN0606-3					
Dim	Min	Max	Тур		
Α	0.36	0.40	0.39		
A1	0	0.05	0.02		
b	0.10	0.20	0.15		
D	0.57 0.67 0.62				
D2	0.155 BSC				
D3	0.185 BSC				
Е	0.57	0.62			
E2	0.40 0.60 0.50				
е	0.35 BSC				
k	0.16 REF				
L	0.09	0.21	0.15		
L2	0.11	0.31	0.21		
All Dimensions in mm					

# **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)		
С	0.350		
Х	0.280		
X1	0.350		
X2	0.760		
Υ	0.200		
V1	0.600		



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