

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ max $T_A = +25^\circ\text{C}$
20V	320m $\Omega$ @ $V_{GS} = 4.5\text{V}$	1.0A
	500m $\Omega$ @ $V_{GS} = 2.5\text{V}$	0.65A
	1000m $\Omega$ @ $V_{GS} = 1.8\text{V}$	0.4A

## Description and Applications

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.

- Load switch

## Features and Benefits

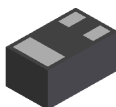
- Footprint of just 0.6mm<sup>2</sup> – thirteen times smaller than SOT23
- 0.4mm profile – ideal for low profile applications
- Low Gate Threshold Voltage
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **ESD Protected Gate 2KV**

## Mechanical Data

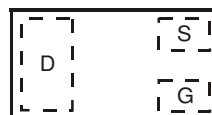
- Case: X2-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 <sup>(e4)</sup>
- Weight: 0.001 grams (Approximate)



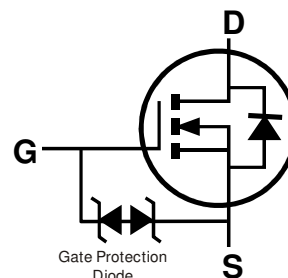
X2-DFN1006-3



Bottom View



Top View  
Internal Schematic



Equivalent Circuit

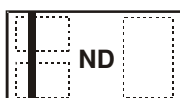
## Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN2320UFB4-7B	ND	7	8	10,000

- 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

DMN2320UFB4-7B



ND = 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	Unit
Drain-Source Voltage	V <sub>DSS</sub>	20	V
Gate-Source Voltage	V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	I <sub>D</sub>	1.0 0.7	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)	I <sub>DM</sub>	6	A

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	0.52	W
Total Power Dissipation (Note 6)	P <sub>D</sub>	1.07	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	240	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	117	°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>J</sub> = +25°C	I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	10	μA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.50	-	0.95	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	-	-	320	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 500mA
		-	-	500		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 400mA
		-	-	1,000		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 100mA
Diode Forward Voltage	V <sub>SD</sub>	-	0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 300mA
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	-	71	-	pF	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	12	-	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	9.4	-	pF	
Gate Resistance	R <sub>g</sub>	-	69	-	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	-	0.89	-	nC	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V, I <sub>D</sub> = 1A
Gate-Source Charge	Q <sub>gs</sub>	-	0.14	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	0.16	-	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	-	4.9	-	ns	V <sub>DS</sub> = 10V, I <sub>D</sub> = 1A V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 6Ω
Turn-On Rise Time	t <sub>r</sub>	-	6.9	-	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	-	21.7	-	ns	
Turn-Off Fall Time	t <sub>f</sub>	-	10.6	-	ns	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 25mm X 25mm square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

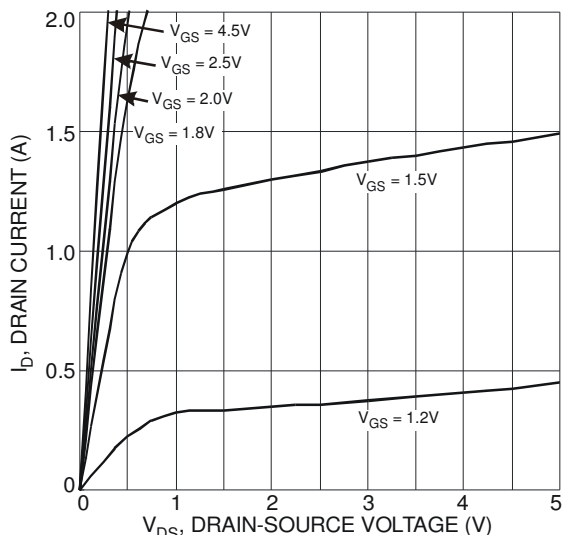


Fig. 1 Typical Output Characteristic

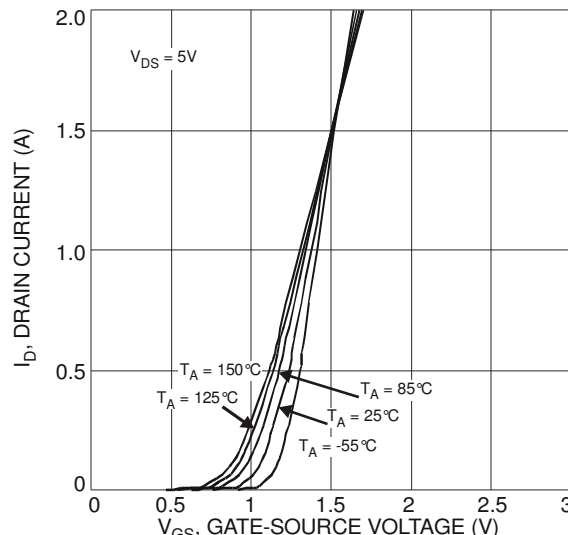


Fig. 2 Typical Transfer Characteristic

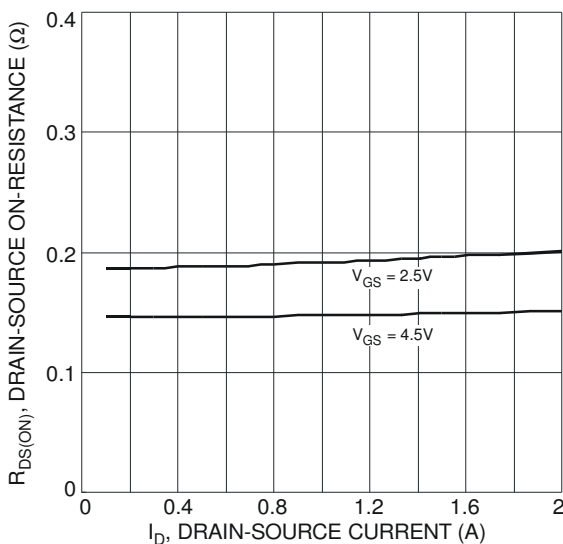


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

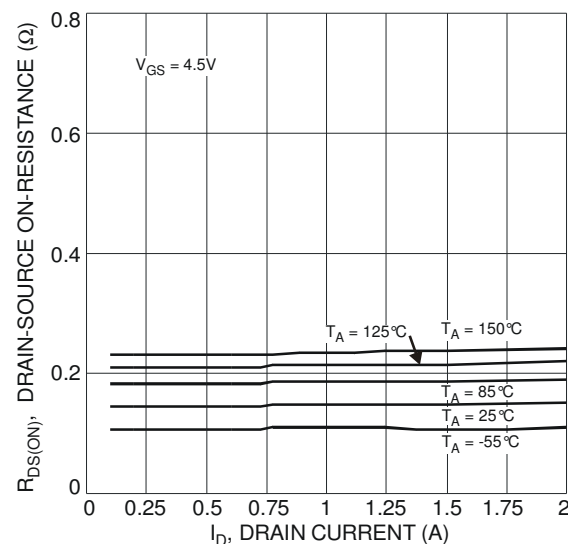


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

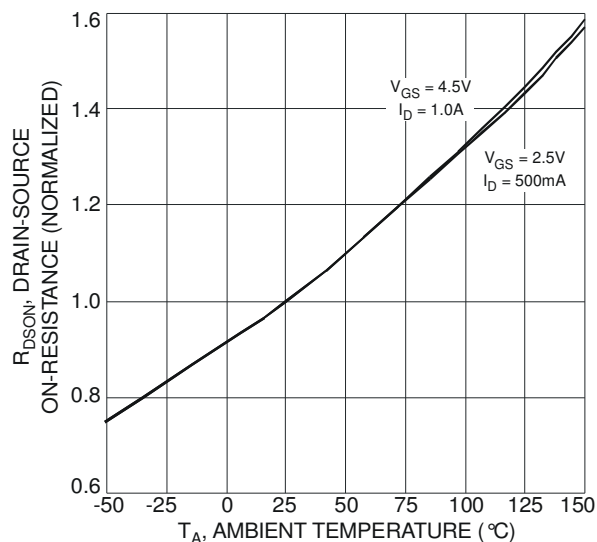


Fig. 5 On-Resistance Variation with Temperature

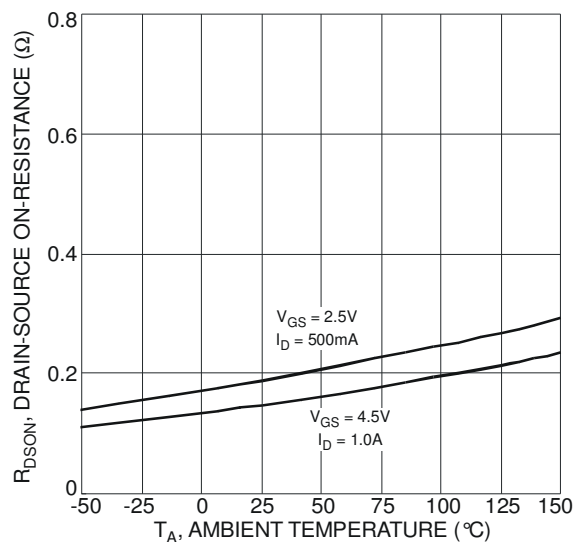


Fig. 6 On-Resistance Variation with Temperature

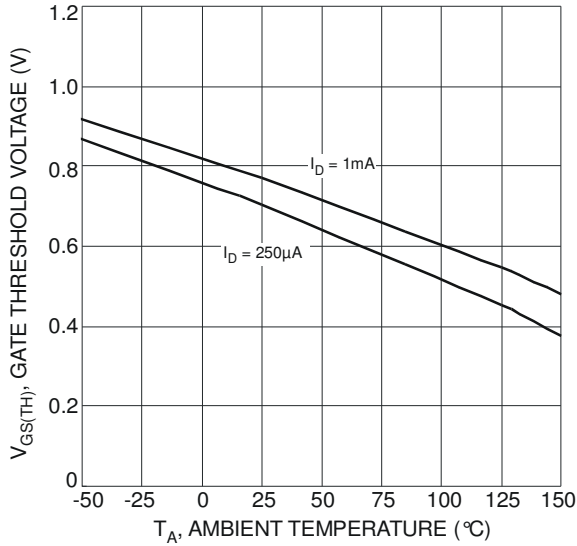


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

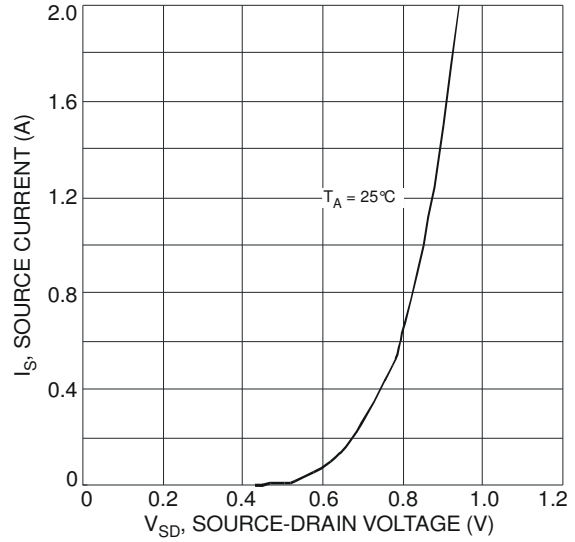


Fig. 8 Diode Forward Voltage vs. Current

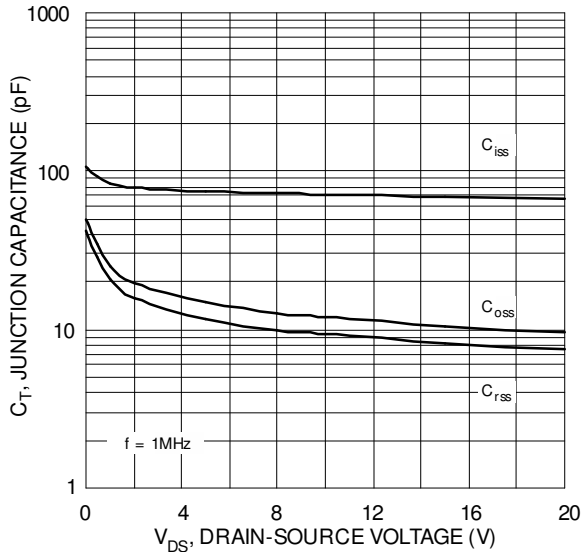


Fig. 9 Typical Junction Capacitance

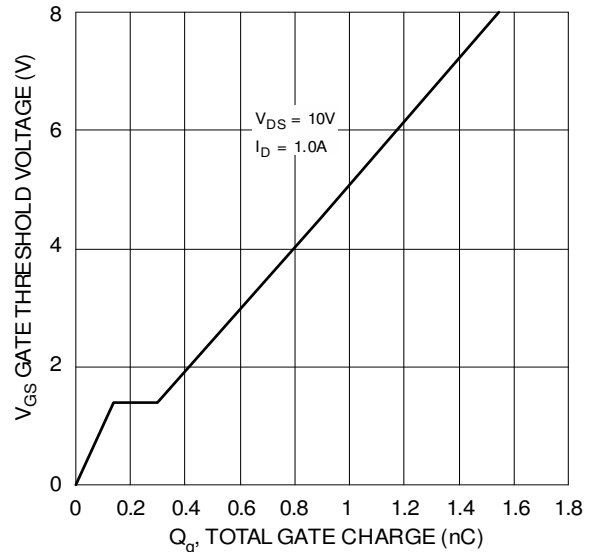


Fig. 10 Gate Charge

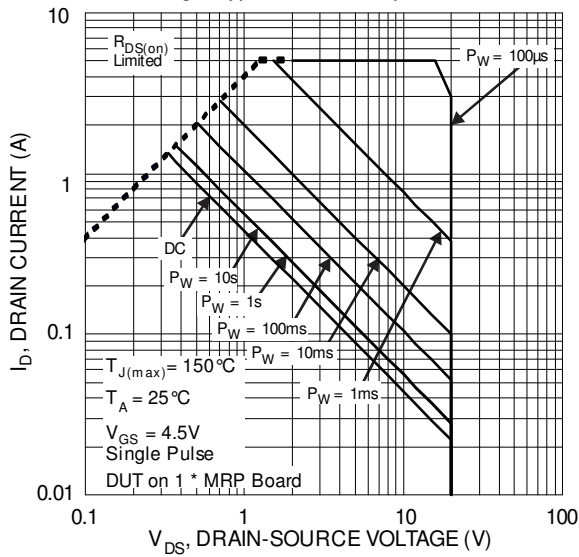
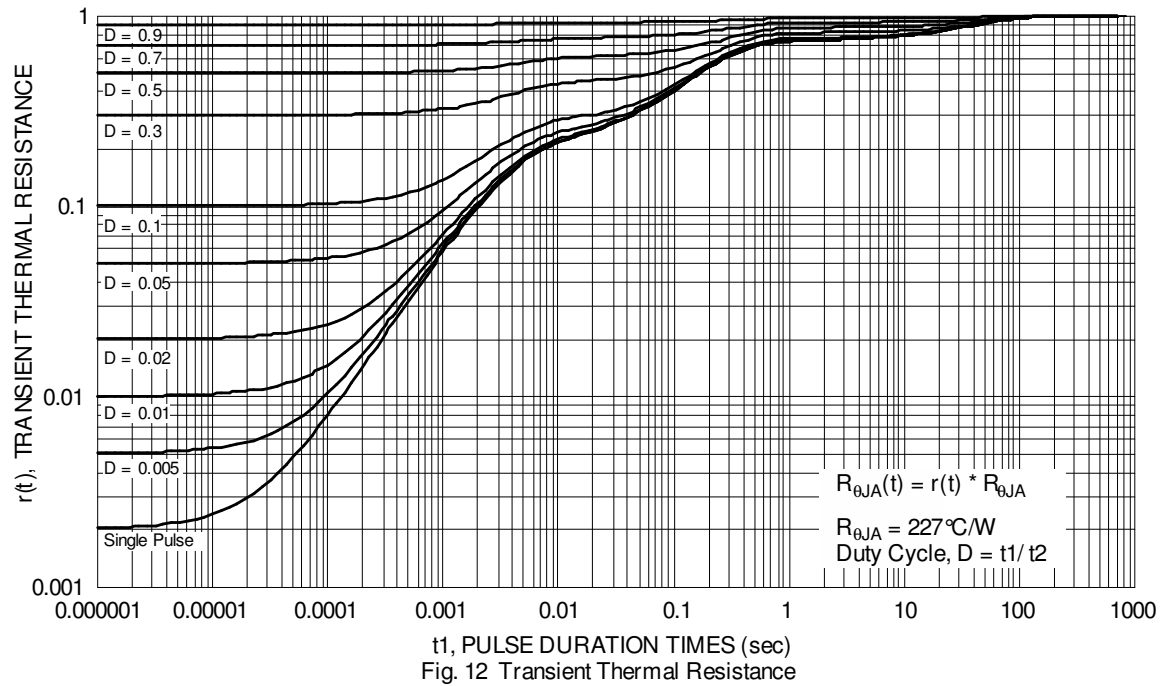
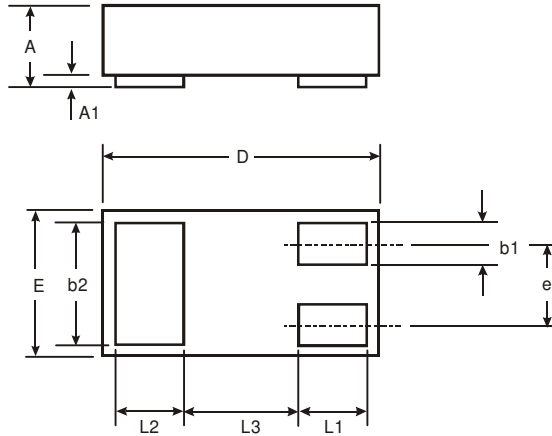


Fig. 11 SOA, Safe Operation Area



## Package Outline Dimensions

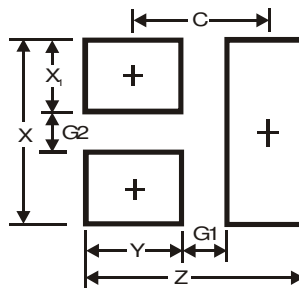
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



X2-DFN1006-3			
Dim	Min	Max	Typ
A	—	0.40	—
A1	0	0.05	0.03
b1	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.05	1.00
E	0.55	0.65	0.60
e	—	—	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	—	—	0.40
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)
Z	1.1
G1	0.3
G2	0.2
X	0.7
X1	0.25
Y	0.4
C	0.7

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