

## 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**

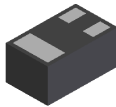
## Mechanical Data

- 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)

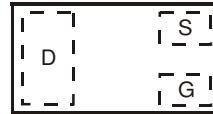


ESD PROTECTED TO 2kV

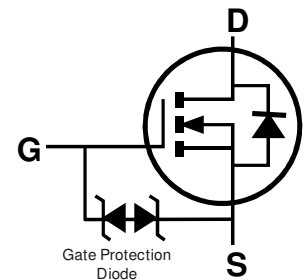
X2-DFN1006-3



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



Top View  
Bar Denotes Gate  
and Source Side

ND = Product Type Marking Code

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	20	V
Gate-Source Voltage	$V_{GSS}$	$\pm 8$	V
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	$I_D$	1.0	A
Steady State $T_A = +25^\circ\text{C}$ $T_A = +100^\circ\text{C}$		0.7	
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)	$I_{DM}$	6	A

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	$P_D$	0.52	W
Total Power Dissipation (Note 6)	$P_D$	1.07	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	240	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	117	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	-	-	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	-	-	1	$\mu\text{A}$	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	-	-	10	$\mu\text{A}$	$V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.50	-	0.95	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	-	-	320	m $\Omega$	$V_{GS} = 4.5\text{V}, I_D = 500\text{mA}$
		-	-	500		$V_{GS} = 2.5\text{V}, I_D = 400\text{mA}$
		-	-	1,000		$V_{GS} = 1.8\text{V}, I_D = 100\text{mA}$
Diode Forward Voltage	$V_{SD}$	-	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 300\text{mA}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	-	71	-	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	-	12	-	pF	
Reverse Transfer Capacitance	$C_{rss}$	-	9.4	-	pF	
Gate Resistance	$R_g$	-	69	-	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge	$Q_g$	-	0.89	-	nC	$V_{GS} = 4.5\text{V}, V_{DS} = 10\text{V}, I_D = 1\text{A}$
Gate-Source Charge	$Q_{gs}$	-	0.14	-	nC	
Gate-Drain Charge	$Q_{gd}$	-	0.16	-	nC	
Turn-On Delay Time	$t_{D(on)}$	-	4.9	-	ns	$V_{DS} = 10\text{V}, I_D = 1\text{A}, V_{GS} = 4.5\text{V}, R_G = 6\Omega$
Turn-On Rise Time	$t_r$	-	6.9	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	21.7	-	ns	
Turn-Off Fall Time	$t_f$	-	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.

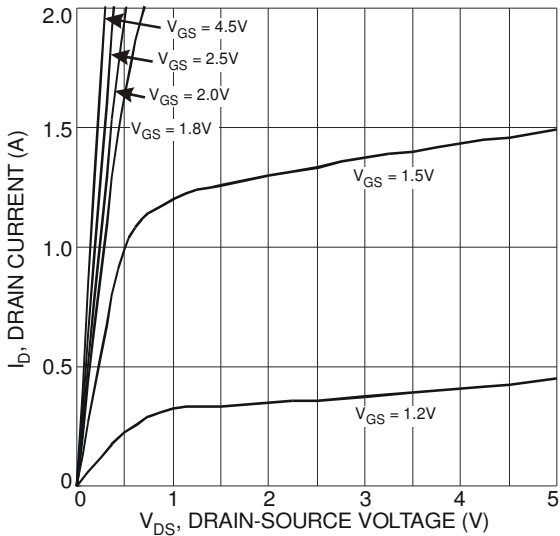


Fig. 1 Typical Output Characteristic

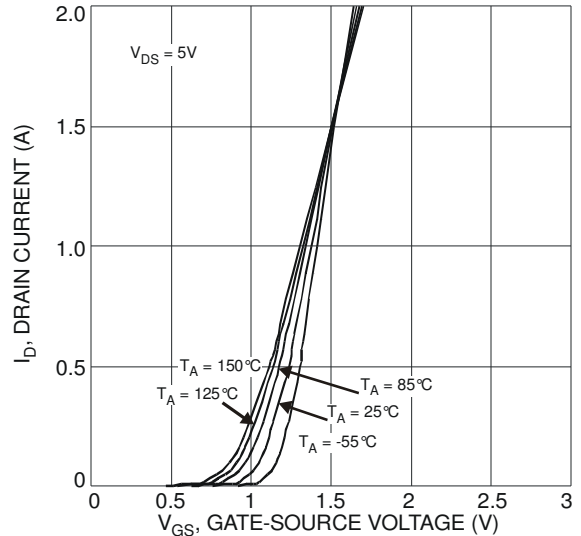


Fig. 2 Typical Transfer Characteristic

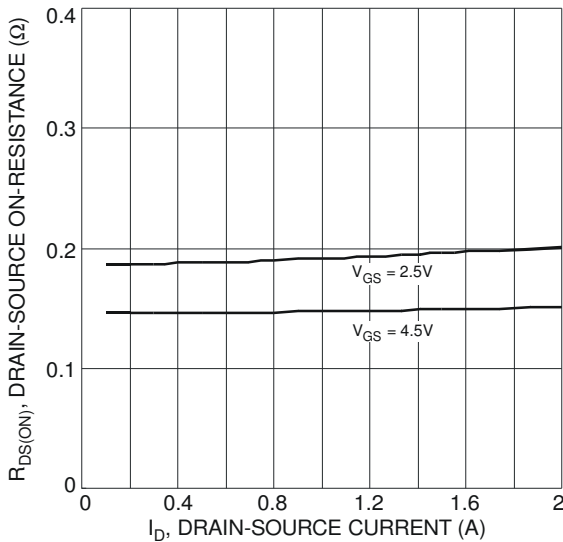


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

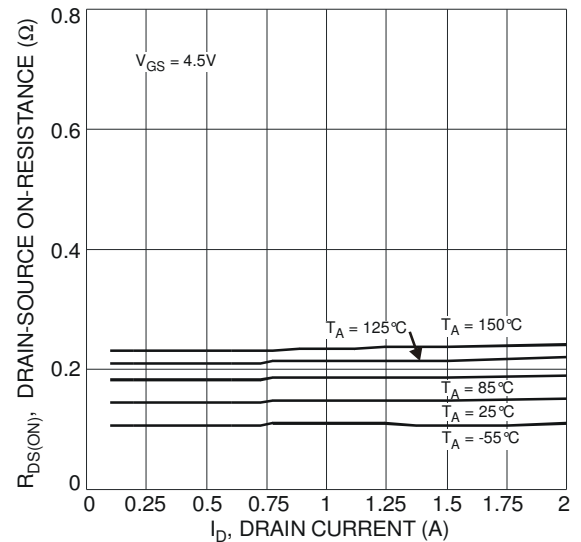


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

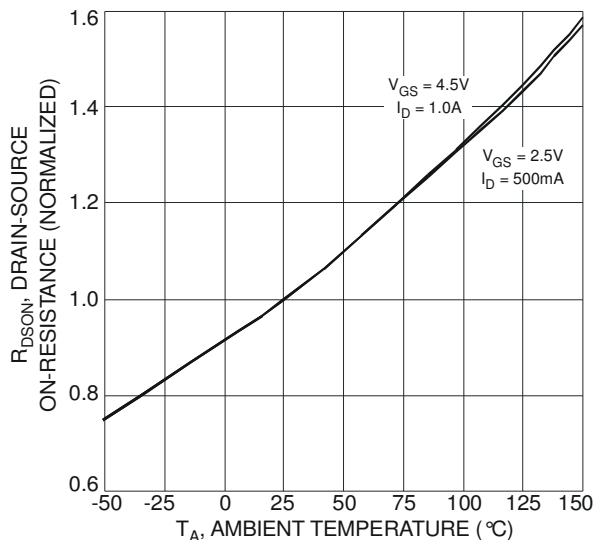


Fig. 5 On-Resistance Variation with Temperature

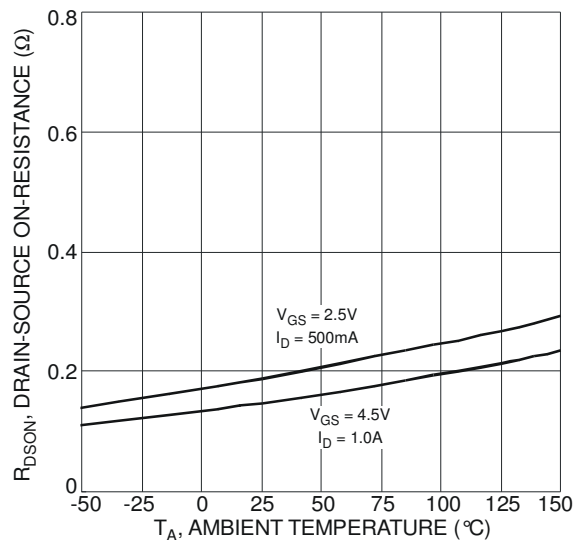


Fig. 6 On-Resistance Variation with Temperature

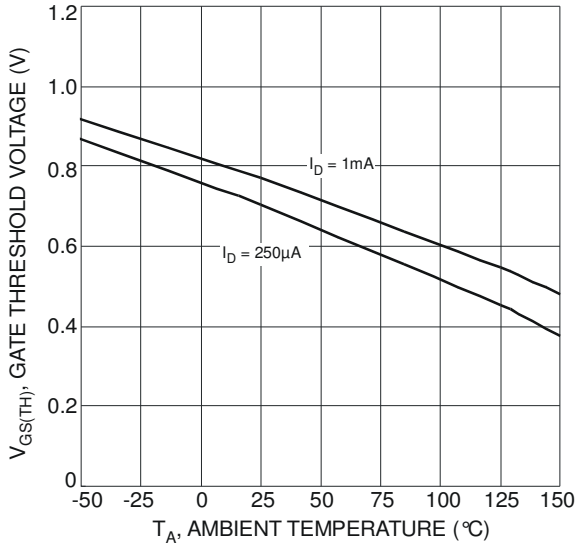


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

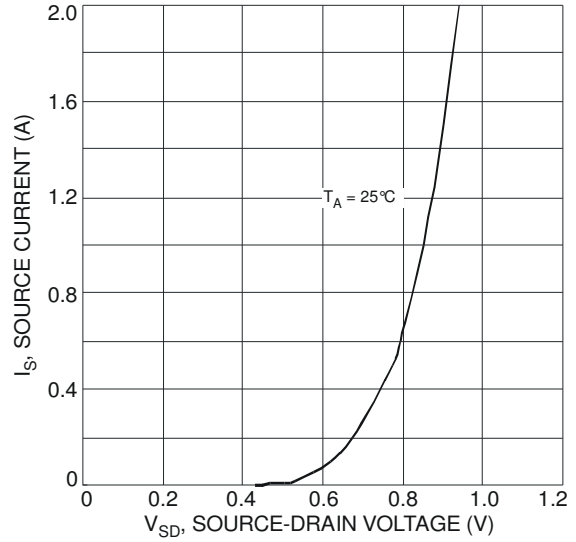


Fig. 8 Diode Forward Voltage vs. Current

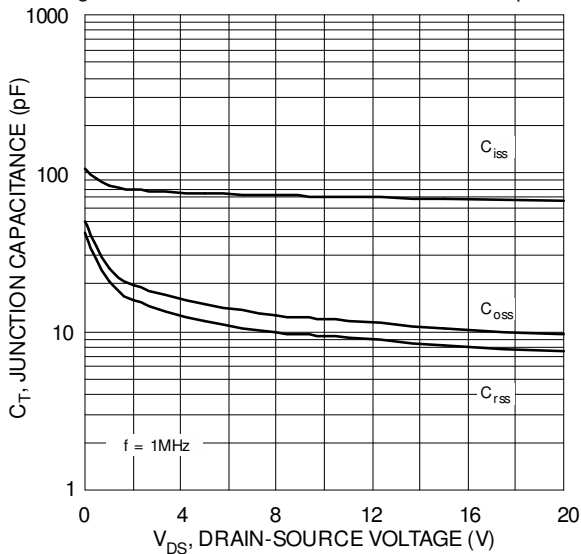


Fig. 9 Typical Junction Capacitance

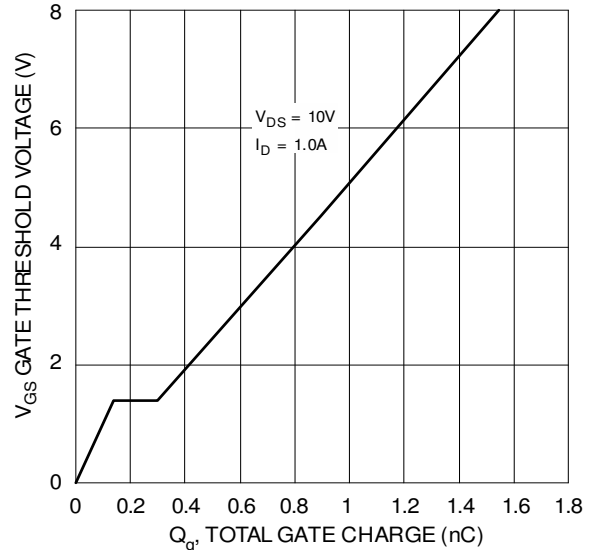


Fig. 10 Gate Charge

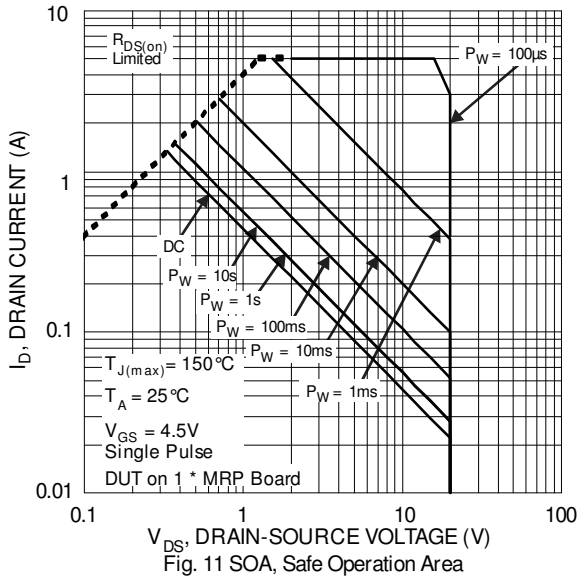
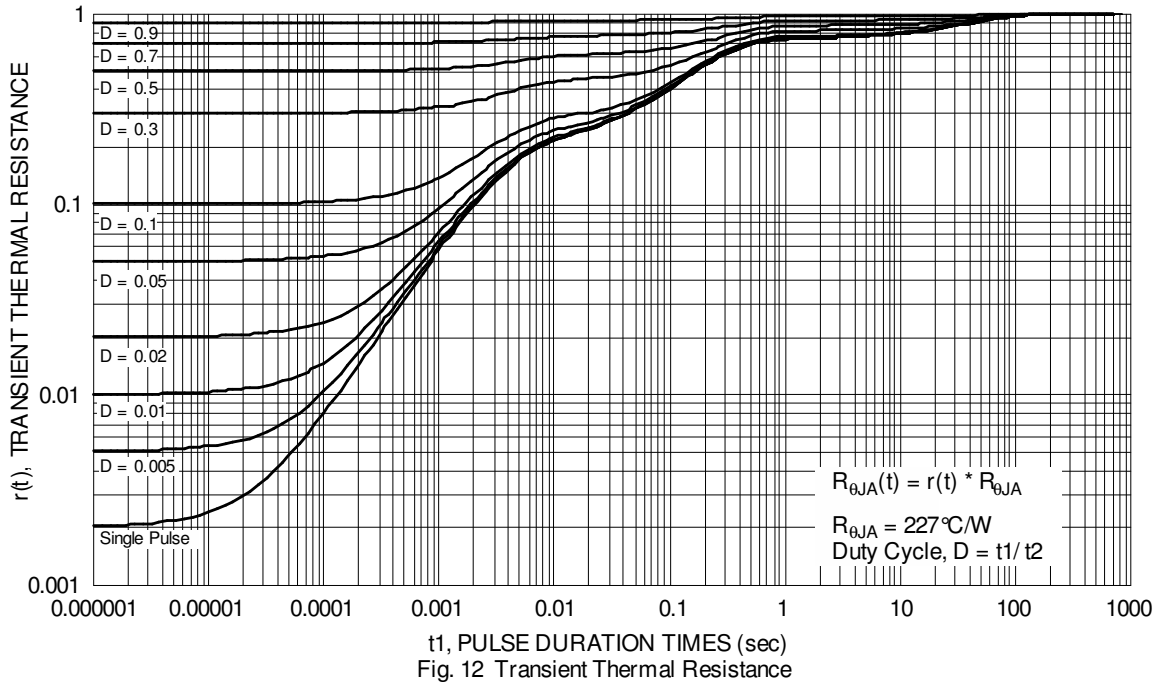
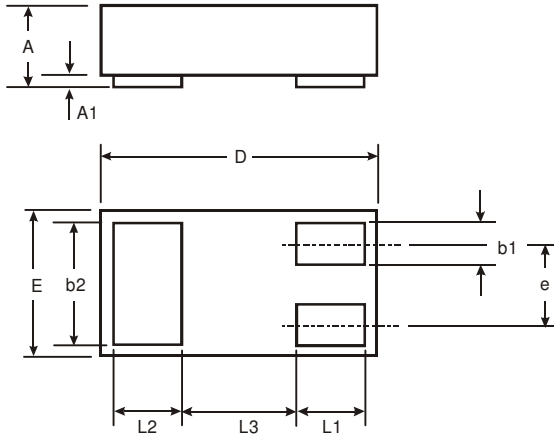


Fig. 11 SOA, Safe Operation Area



**Package Outline Dimensions**

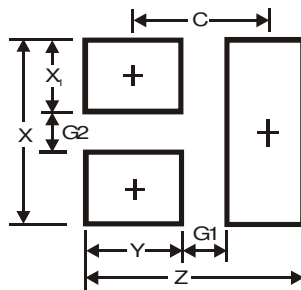
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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