

## Product Summary

$V_{(BR)DSS}$	Max $R_{DS(on)}$	$I_D$ max $T_A = +25^\circ\text{C}$ (Note 6)
20V	195m $\Omega$ @ $V_{GS} = 4.5\text{V}$	2.11A
	260m $\Omega$ @ $V_{GS} = 2.5\text{V}$	1.83A
	380m $\Omega$ @ $V_{GS} = 1.8\text{V}$	1.51A
	520m $\Omega$ @ $V_{GS} = 1.5\text{V}$	1.29A

## Features and Benefits

- Footprint of Just 1.3 mm<sup>2</sup>
- Ultra Low Profile Package - 0.4mm Profile
- On Resistance <200m $\Omega$
- Low Gate Threshold Voltage
- Fast Switching Speed
- Ultra-Small Surface Mount Package
- **ESD Protected Gate 2KV**
- **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**

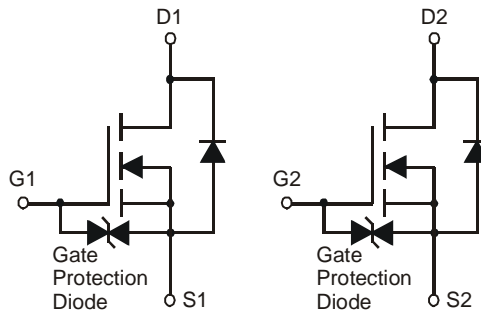
## Description and Applications

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.

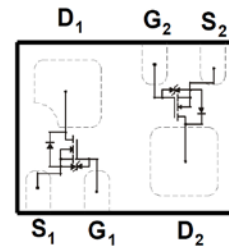
- Load switch

## Mechanical Data

- Case: X2-DFN1310-6
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208④



Device Symbol



Top View  
Pin-Out

## Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN2300UFL4-7	23N	7	8	3000

- 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



23N = 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)	Steady State	$T_A = +25^\circ\text{C}$	$I_D$	2.11	A
		$T_A = +85^\circ\text{C}$		1.19	
Pulsed Drain Current (Note 7)			$I_{DM}$	6.0	A

**Thermal Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	$P_D$	0.53	W
	(Note 6)		1.39	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	238	$^\circ\text{C/W}$
	(Note 6)		90	
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  7. Device mounted on minimum recommended pad layout test board, 10 $\mu\text{s}$  pulse duty cycle = 1%.

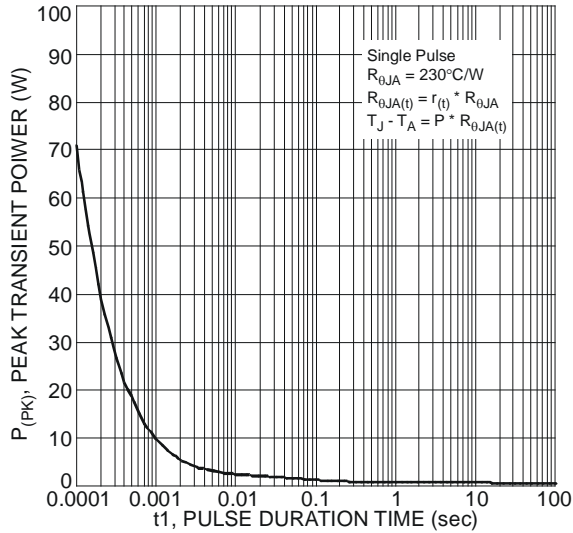


Fig. 1 Single Pulse Maximum Power Dissipation

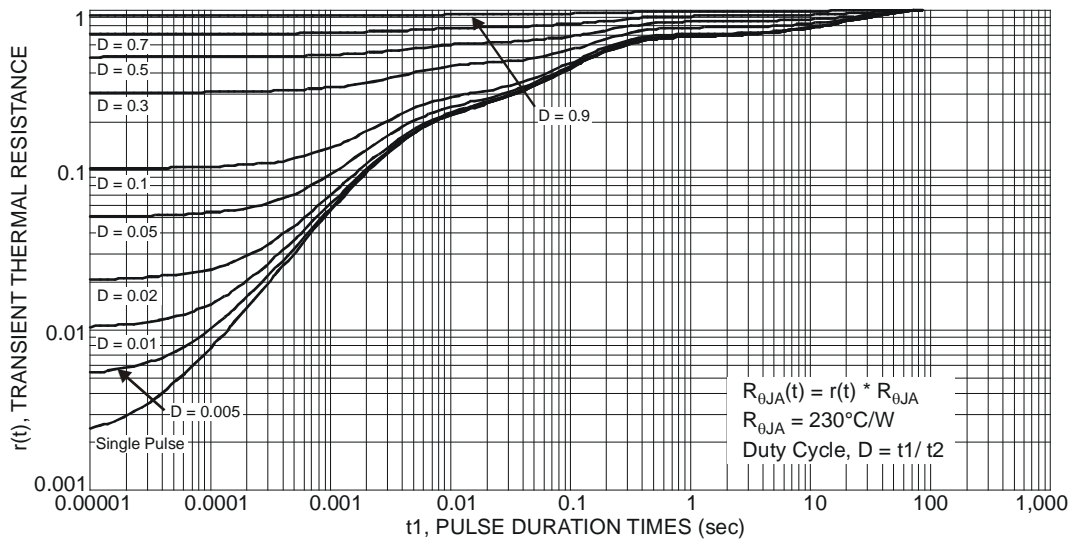
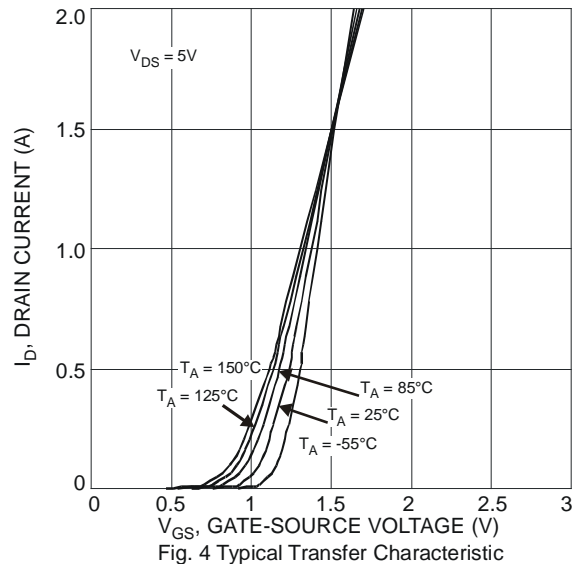
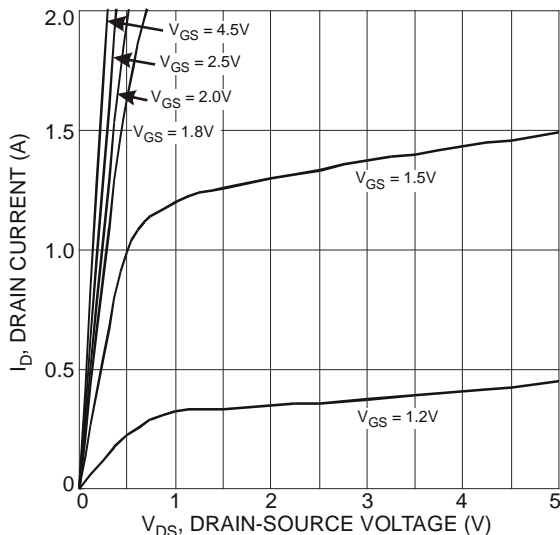


Fig. 2 Transient Thermal Resistance

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	-	-	V	$V_{GS} = 0V, I_D = 10\mu A$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	-	-	1	$\mu A$	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	-	-	10	$\mu A$	$V_{GS} = \pm 8V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.45	-	0.95	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(on)}$	-	-	195	m $\Omega$	$V_{GS} = 4.5V, I_D = 300mA$
		-	-	260		$V_{GS} = 2.5V, I_D = 250mA$
		-	-	380		$V_{GS} = 1.8V, I_D = 100mA$
		-	-	520		$V_{GS} = 1.5V, I_D = 50mA$
		-	-	-		-
Forward Transfer Admittance	$ Y_{fs} $	40	-	-	mS	$V_{DS} = 3V, I_D = 30mA$
Diode Forward Voltage	$V_{SD}$	-	0.7	1.2	V	$V_{GS} = 0V, I_S = 300mA$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{iss}$	-	64.3	128.6	pF	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$
Output Capacitance	$C_{oss}$	-	6.1	12.2	pF	
Reverse Transfer Capacitance	$C_{rss}$	-	4.5	9.0	pF	
Gate Resistance	$R_g$	-	70	140	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
Total Gate Charge	$Q_g$	-	1.6	3.2	nC	$V_{GS} = 4.5V, V_{DS} = 15V, I_D = 1A$
Gate-Source Charge	$Q_{gs}$	-	0.2	0.4	nC	
Gate-Drain Charge	$Q_{gd}$	-	0.2	0.4	nC	
Turn-On Delay Time	$t_{D(on)}$	-	3.5	10	ns	$V_{DS} = 10V, I_D = 1A, V_{GS} = 10V, R_G = 6\Omega$
Turn-On Rise Time	$t_r$	-	2.8	10	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	38	60	ns	
Turn-Off Fall Time	$t_f$	-	13	25	ns	

Note: 8. Short duration pulse test used to minimize self-heating effect.



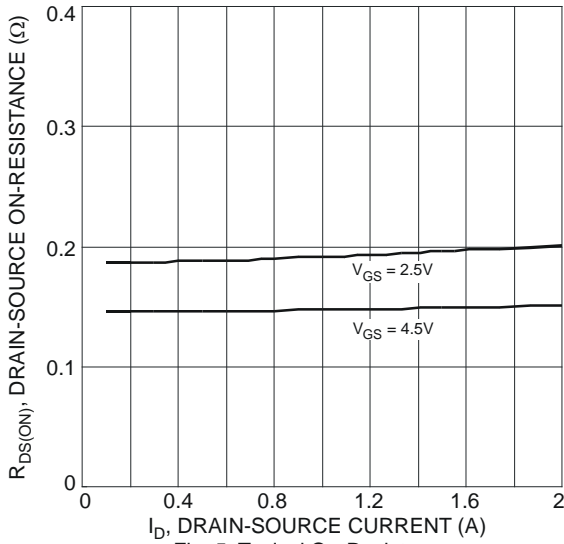


Fig. 5 Typical On-Resistance vs. Drain Current and Gate Voltage

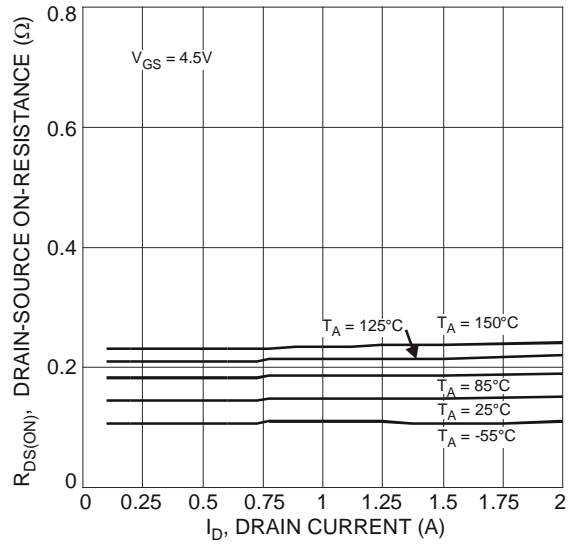


Fig. 6 Typical On-Resistance vs. Drain Current and Temperature

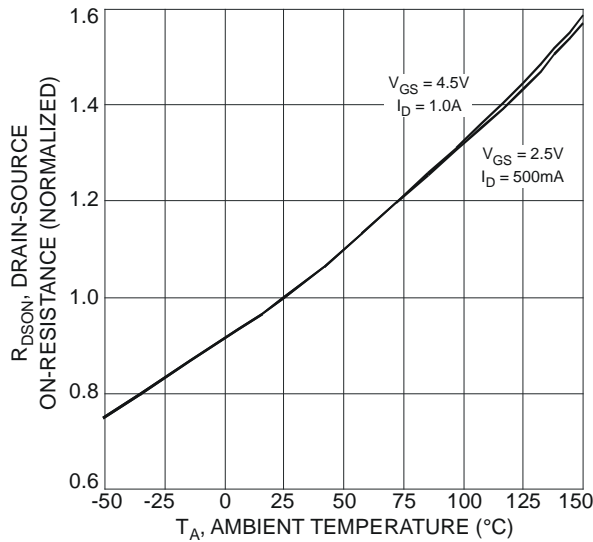


Fig. 7 On-Resistance Variation with Temperature

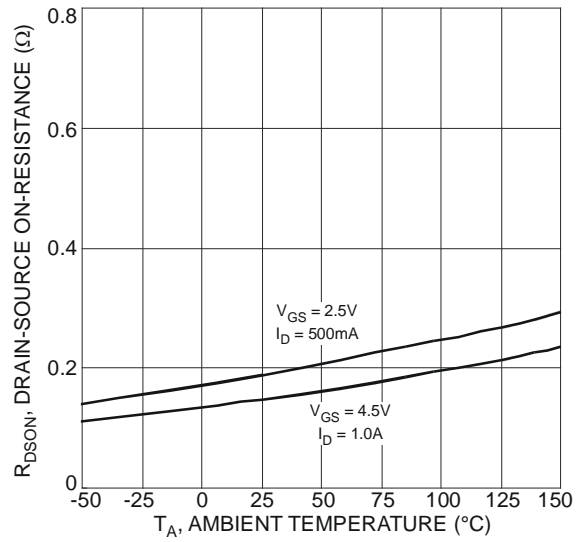


Fig. 8 On-Resistance Variation with Temperature

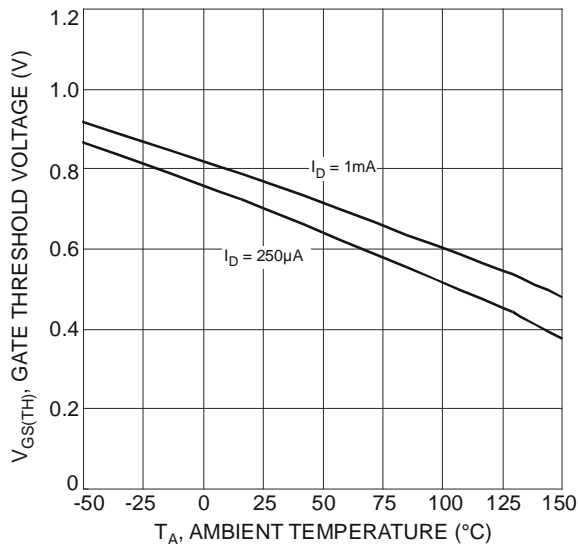


Fig. 9 Gate Threshold Variation vs. Ambient Temperature

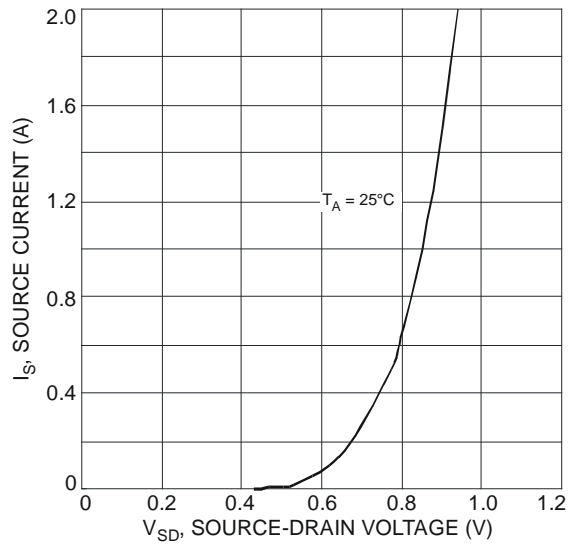


Fig. 10 Diode Forward Voltage vs. Current

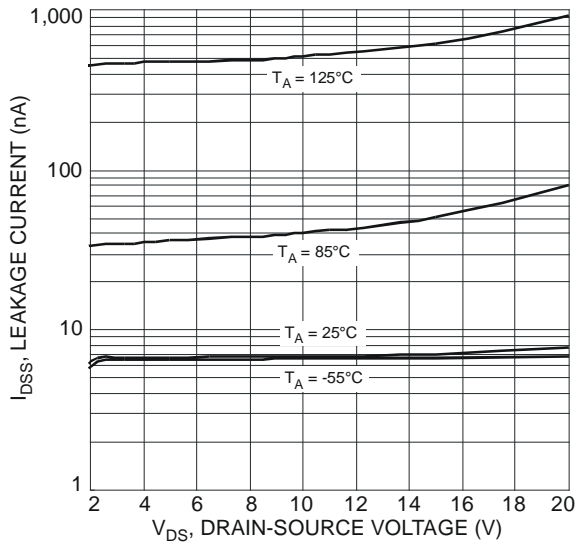


Fig. 11 Typical Leakage Current vs. Drain-Source Voltage

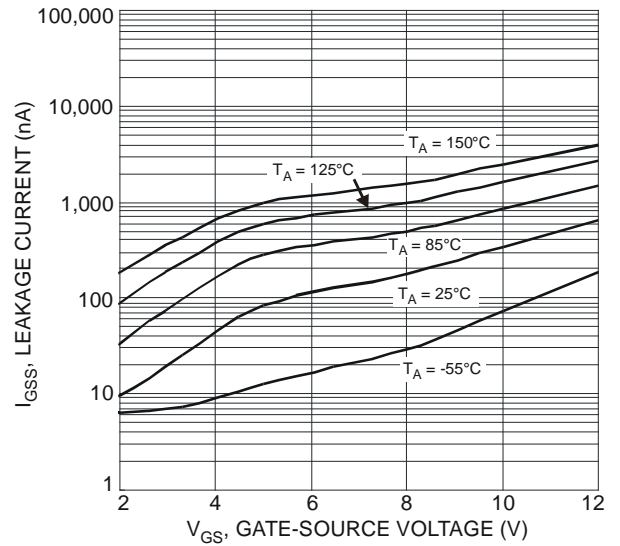


Fig. 12 Leakage Current vs. Gate-Source Voltage

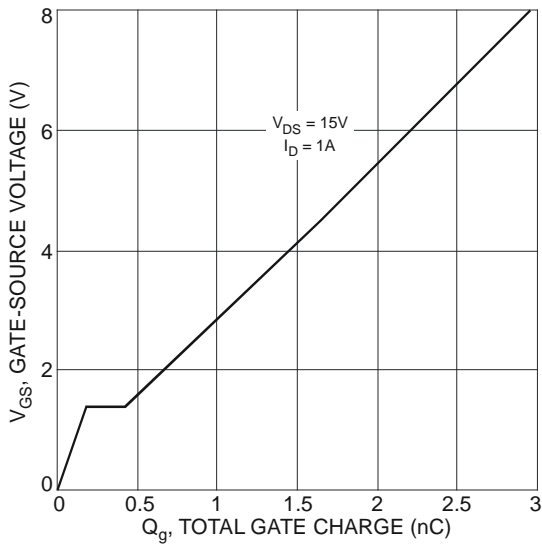
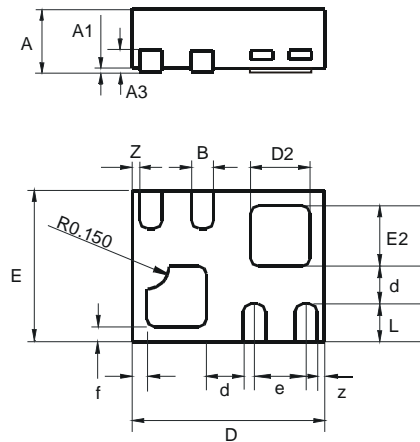


Fig. 13 Gate-Charge Characteristics

## Package Outline Dimensions

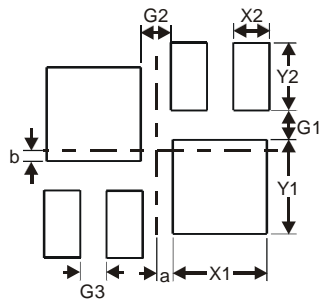
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



X2-DFN1310-6			
Dim	Min	Max	Typ
A	—	0.40	—
A1	0	0.05	0.02
A3	—	—	0.13
b	0.10	0.20	0.15
D	1.25	1.38	1.30
d	—	—	0.25
D2	0.30	0.50	0.40
E	0.95	1.075	1.00
e	—	—	0.35
E2	0.30	0.50	0.40
f	—	—	0.10
L	0.20	0.30	0.25
Z	—	—	0.05
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)
G1	0.16
G2	0.17
G3	0.15
X1	0.52
X2	0.20
Y1	0.52
Y2	0.375
a	0.09
b	0.06

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