

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ max	$I_D$ $T_A = +25^\circ\text{C}$
20V	$0.4\Omega$ @ $V_{GS} = 4.5\text{V}$	1.5A
	$0.5\Omega$ @ $V_{GS} = 2.5\text{V}$	1.3A
	$0.7\Omega$ @ $V_{GS} = 1.8\text{V}$	1.1A

## Features and Benefits

- Low On-Resistance
- Very Low Gate Threshold Voltage  $V_{GS(TH)}$ , 1.0V Max.
- Low Input Capacitance
- Fast Switching Speed
- Ultra-Small Surfaced Mount Package
- Ultra-Low Package Profile, 0.4mm Maximum Package Height
- 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**

## Description and Applications

This new generation 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.

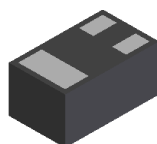
- DC-DC Converters
- Power Management Functions

## Mechanical Data

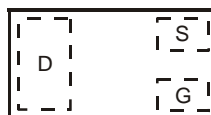
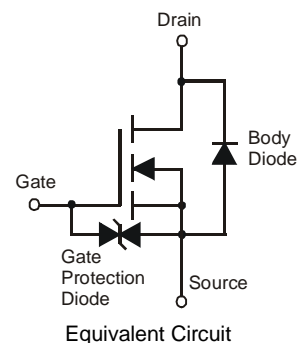
- Case: X2-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208④
- Weight: 0.001 grams (Approximate)



X2-DFN1006-3



Bottom View


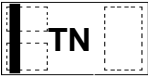
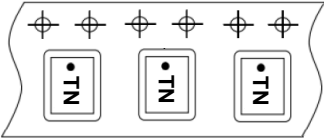
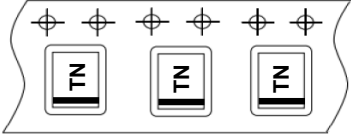
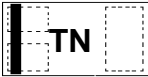
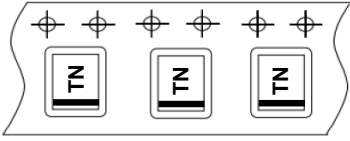

 Top View  
 Internal Schematic


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2501UFB4-7	X2-DFN1006-3	3,000/Tape & Reel
DMN2501UFB4-7B	X2-DFN1006-3	10,000/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](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>.

## Marking Information

<b>DMN2501UFB4-7</b>	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Top View Dot Denotes Drain Side</p> </div> <div style="text-align: center;"> <p>From date code 1527 (YYWW), this changes to:</p>  <p>Top View Bar Denotes Gate and Source Side</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;">   </div>
<b>DMN2501UFB4-7B</b>	<div style="text-align: center; margin-bottom: 10px;">  <p>Top View Bar Denotes Gate and Source Side</p> </div> <div style="text-align: center; margin-bottom: 10px;"> <p>TN = Part Marking Code</p> </div> <div style="text-align: center;">  </div>

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	20	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	1.0 0.8	A
	t < 10s	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	1.2 0.9	A
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	1.5 1.2	A
	t < 10s	T <sub>A</sub> = 25°C T <sub>A</sub> = 70°C	I <sub>D</sub>	1.8 1.4	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	6	A
Maximum Body Diode continuous Current			I <sub>S</sub>	1	A

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.5	W
	T <sub>A</sub> = +70°C		0.3	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	251	°C/W
	t < 10s		188	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.2	W
	T <sub>A</sub> = +70°C		0.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R <sub>θJA</sub>	110	°C/W
	t < 10s		82	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°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 1-inch square copper plate.

**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>	-	-	100	nA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	±1	μA	V <sub>GS</sub> = ±6V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.5	0.76	1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	-	170	400	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 600mA
			200	500		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA
			260	700		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA
Forward Transfer Admittance	Y <sub>fs</sub>	-	1.4	-	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA
Diode Forward Voltage	V <sub>SD</sub>		0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	-	82	-	pF	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	12	-	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	10	-	pF	
Gate resistance	R <sub>g</sub>	-	83	-	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	-	1.1	-	nC	V <sub>DS</sub> = 10V, I <sub>D</sub> = 250mA
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	-	2.0	-	nC	
Gate-Source Charge	Q <sub>gs</sub>	-	0.14	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	0.19	-	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	-	6.6	-	ns	V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V, R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω, I <sub>D</sub> = 200mA
Turn-On Rise Time	t <sub>r</sub>	-	6.4	-	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	-	40.4	-	ns	
Turn-Off Fall Time	t <sub>f</sub>	-	17.3	-	ns	

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

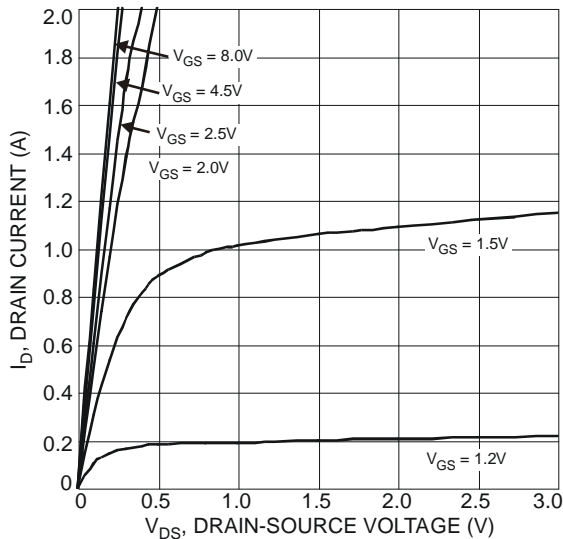


Fig. 1 Typical Output Characteristic

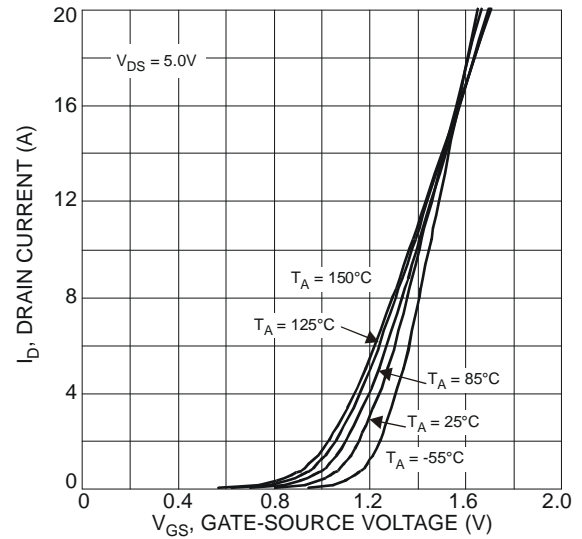


Fig. 2 Typical Transfer Characteristics

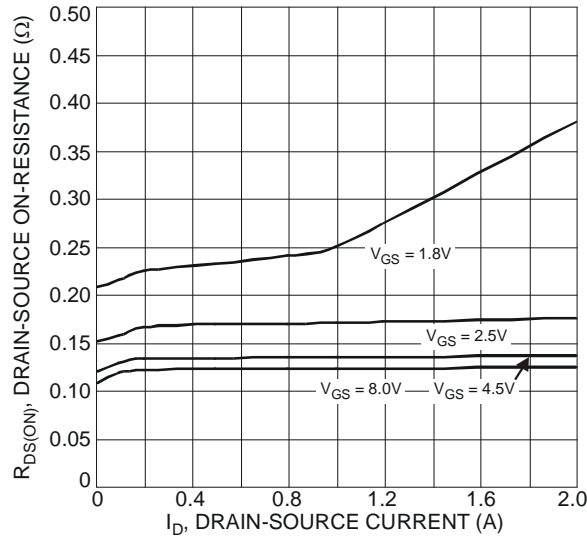


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

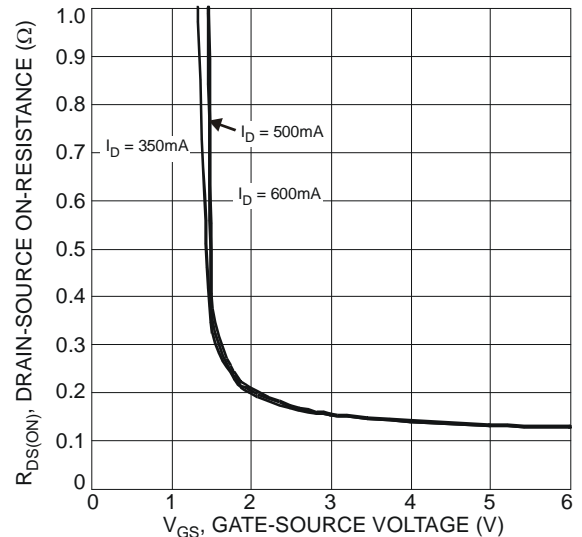


Fig. 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

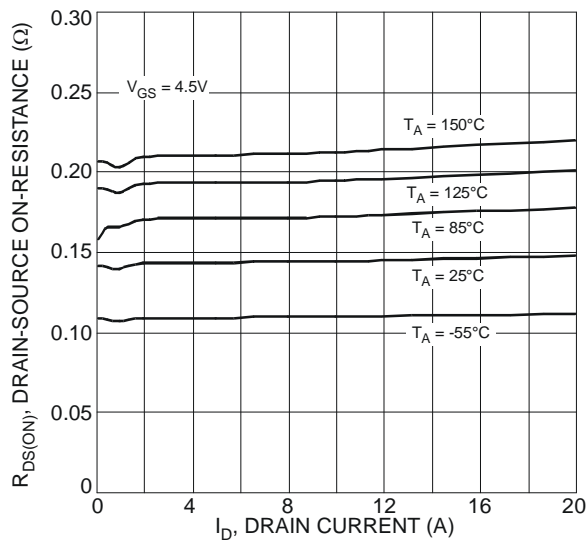


Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

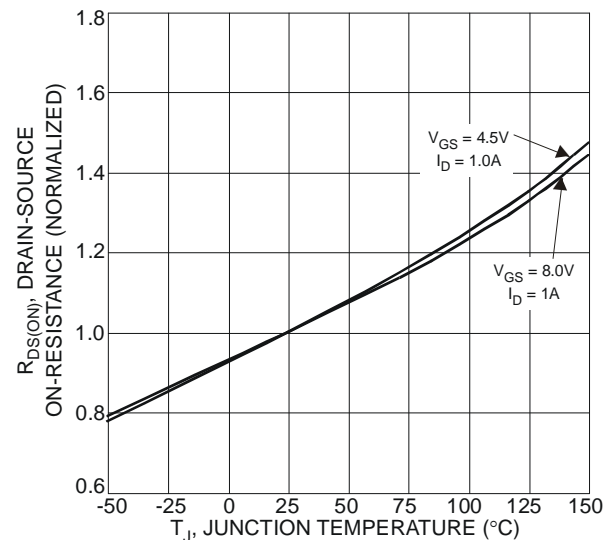


Fig. 6 On-Resistance Variation with Temperature

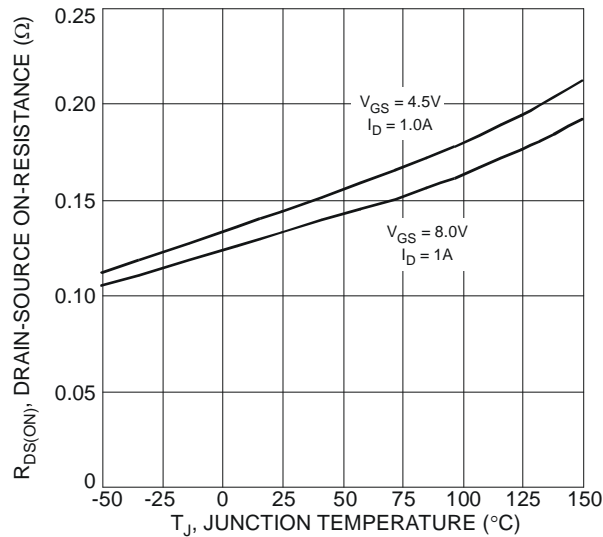


Fig. 7 On-Resistance Variation with Temperature

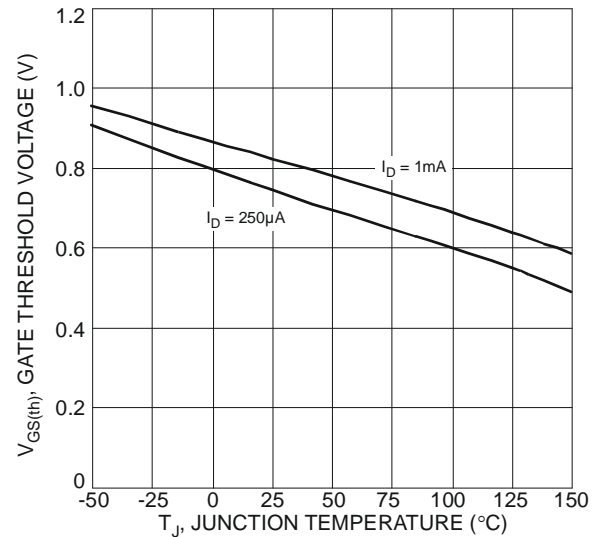


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

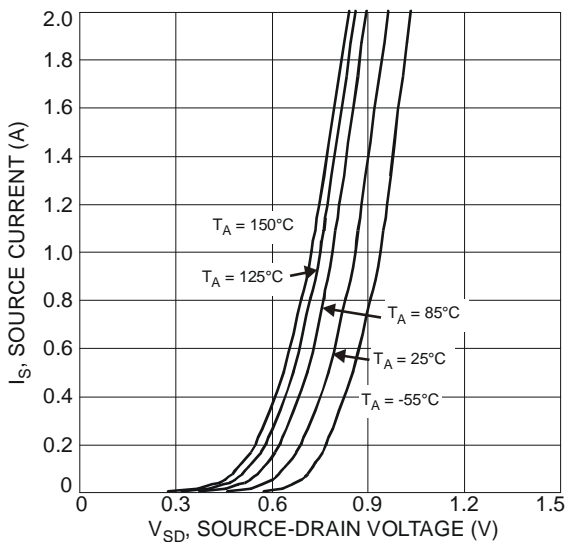


Fig. 9 Diode Forward Voltage vs. Current

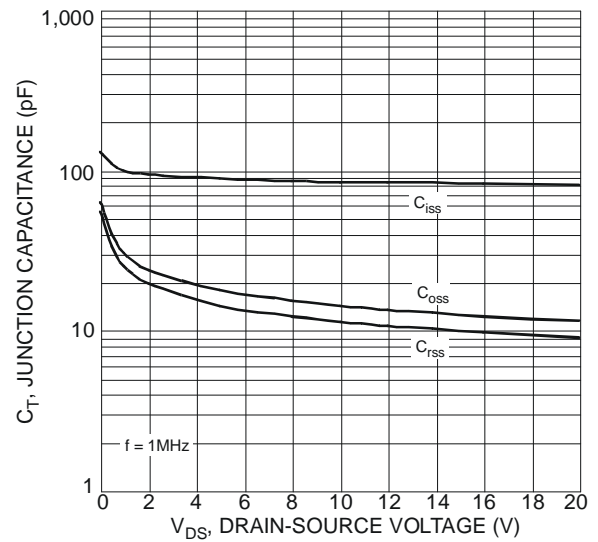


Fig. 10 Typical Junction Capacitance

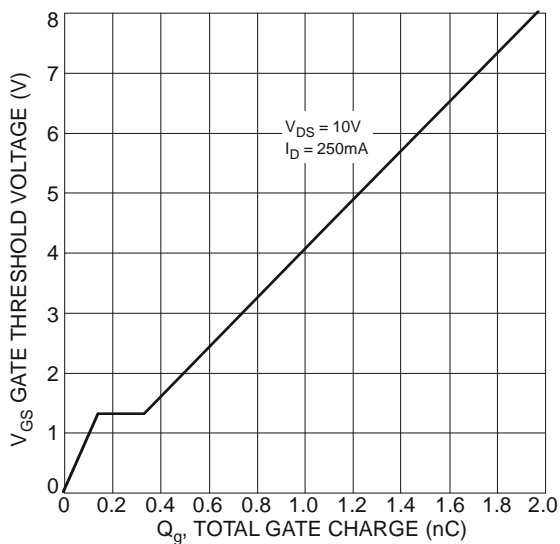


Fig. 11 Gate Charge

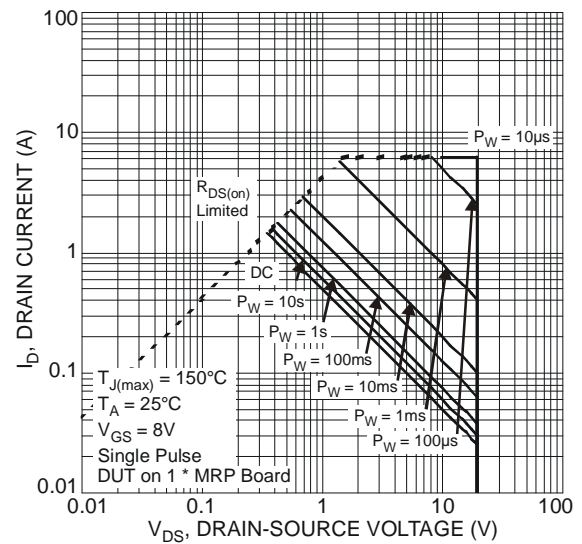
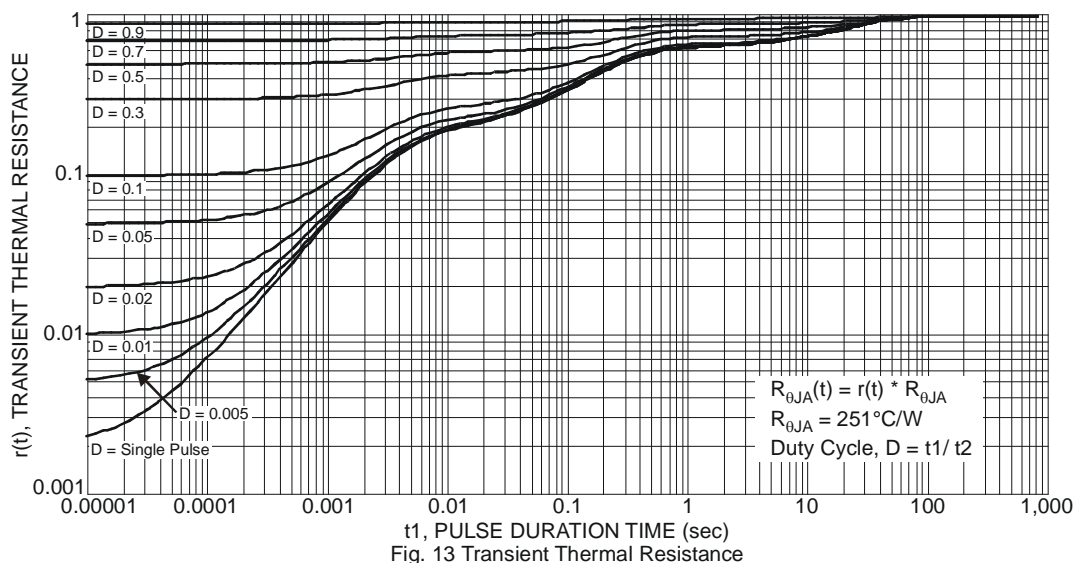
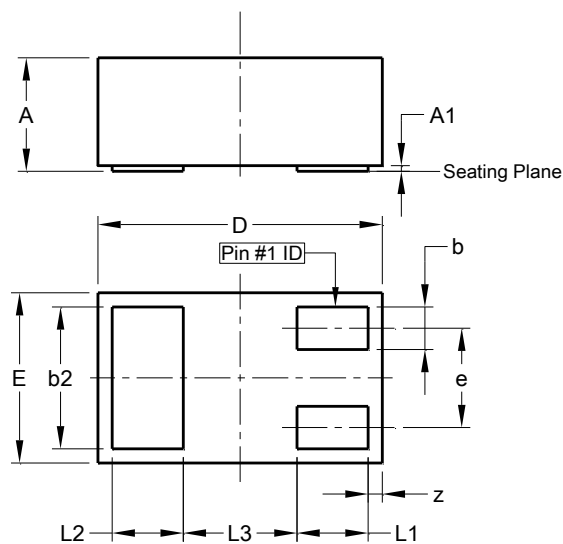


Fig. 12 SOA, Safe Operation Area



## Package Outline Dimensions

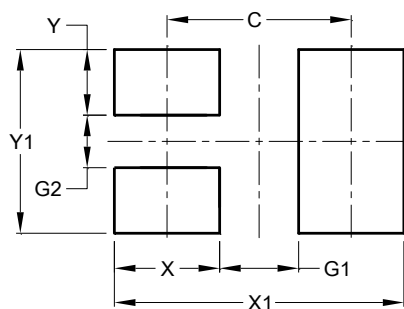
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



X2-DFN1006-3			
Dim	Min	Max	Typ
A	—	0.40	—
A1	0.00	0.05	0.03
b	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
z	0.02	0.08	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)
C	0.70
G1	0.30
G2	0.20
X	0.40
X1	1.10
Y	0.25
Y1	0.70

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