

## Product Summary

BV <sub>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	760mA
	1.2Ω @ V <sub>GS</sub> = 2.5V	700mA
	2.4Ω @ V <sub>GS</sub> = 1.8V	500mA
	3.0Ω @ V <sub>GS</sub> = 1.5V	350mA

## Description and Applications

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

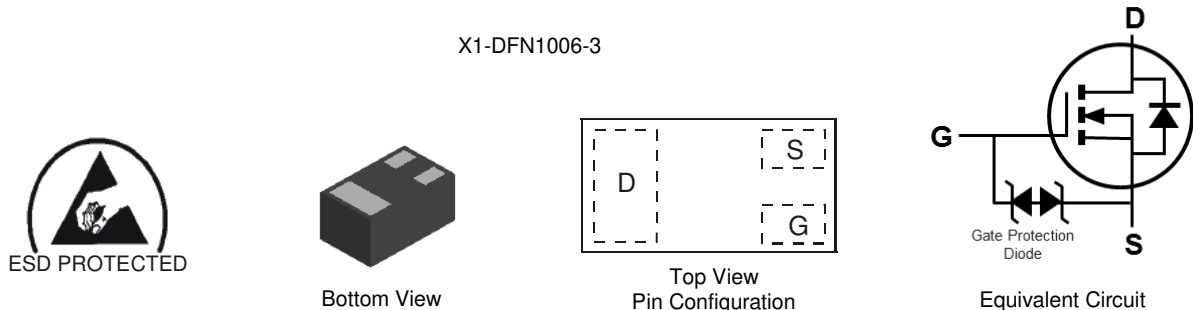
- General Purpose Interfacing Switch
- Power Management Functions
- Analog Switch

## Features and Benefits

- Low On-Resistance
- Very Low Gate Threshold Voltage, 1.0V Max
- Low Input Capacitance
- Fast Switching Speed
- Ultra-Small Surface Mount Package 1mm x 0.6mm
- Low Package Profile, 0.5mm Maximum Package Height
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**

## Mechanical Data

- Case: X1-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 Indicator: See Diagram
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.001 grams (Approximate)



## Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Tape Pitch (mm)	Quantity per Reel
DMN21D2UFB-7	NN	7	8	4	3,000
DMN21D2UFB-7B	NN	7	8	2	10,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



Top View  
Bar Denotes Gate and Source Side

NN = Product Type Marking Code

**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>	±12	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	I <sub>D</sub>	760 610	mA
	t < 5s	I <sub>D</sub>	850 700	mA
Maximum Continuous Body Diode Forward Current (Note 6)		I <sub>S</sub>	0.8	A
Pulsed Drain Current (Note 7)		I <sub>DM</sub>	1.0	A

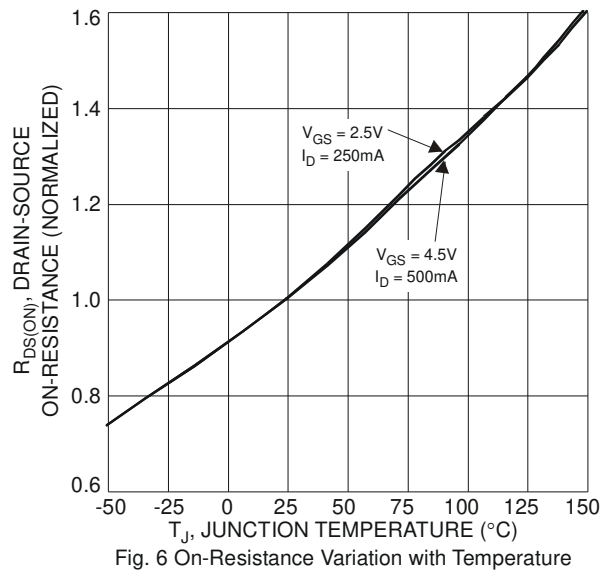
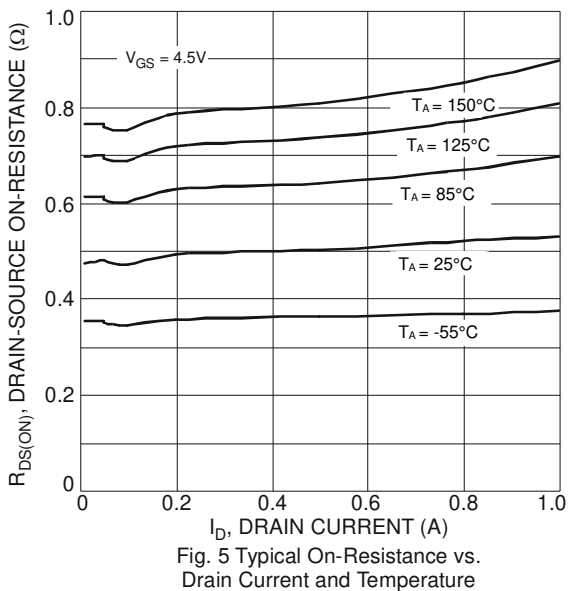
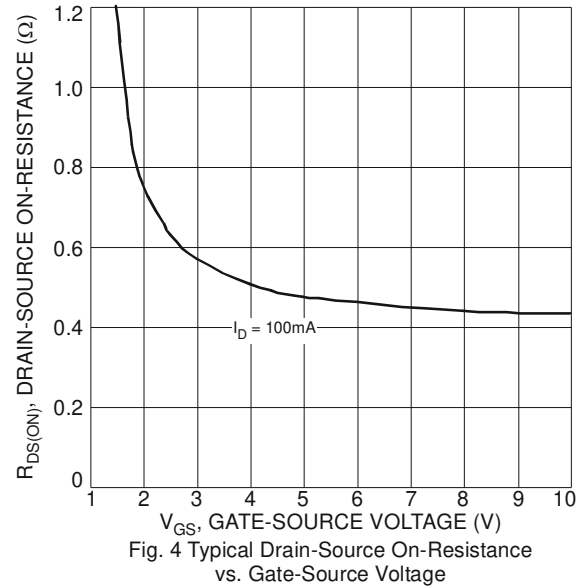
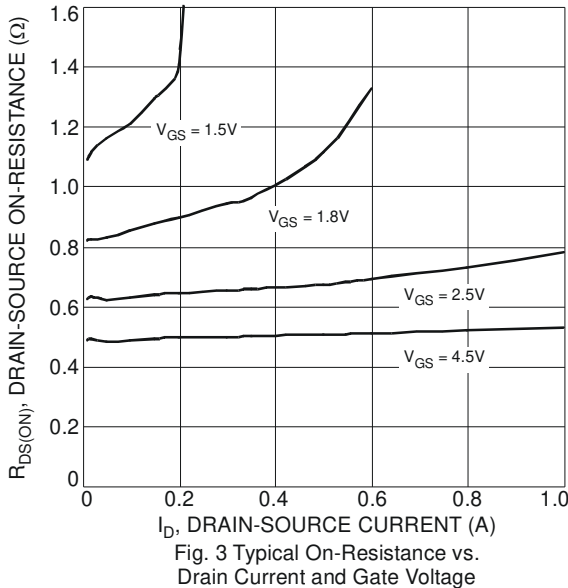
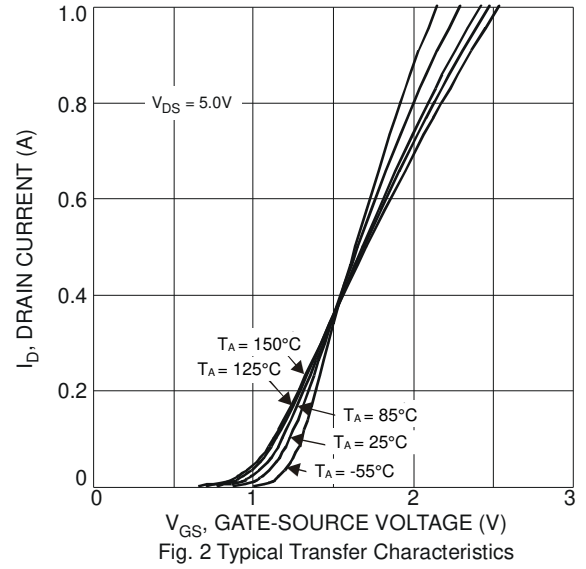
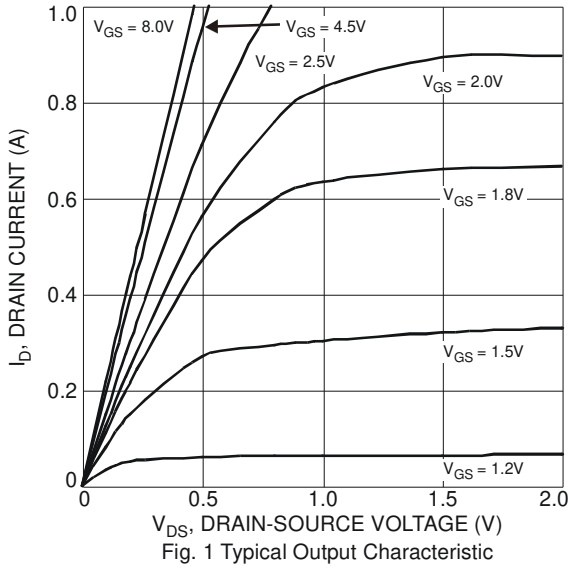
**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.38	W
	T <sub>A</sub> = +70°C		0.25	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	325	°C/W
	t < 5s		244	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.9	W
	T <sub>A</sub> = +70°C		0.57	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R <sub>θJA</sub>	141	°C/W
	t < 5s		106	
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 8)</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	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> = ±10V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.4	—	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>	—	0.6	0.99	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 100mA
		—	0.7	1.2		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 50mA
		—	0.9	2.4		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 20mA
		—	1.2	3.0		V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 10mA
Forward Transfer Admittance	Y <sub>fs</sub>	180	—	—	ms	V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA
Diode Forward Voltage	V <sub>SD</sub>	—	0.6	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	27.6	—	pF	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	4.0	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	2.8	—	pF	V <sub>DS</sub> = 10V, I <sub>D</sub> = 250mA
Total Gate Charge, V <sub>GS</sub> = 4.5V	Q <sub>g</sub>	—	0.41	—	nC	
Total Gate Charge, V <sub>GS</sub> = 10V	Q <sub>g</sub>	—	0.93	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	0.06	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	0.06	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	3.5	—	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>	—	4.2	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	19.6	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	9.8	—	ns	

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1 inch square copper plate.
  - 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.



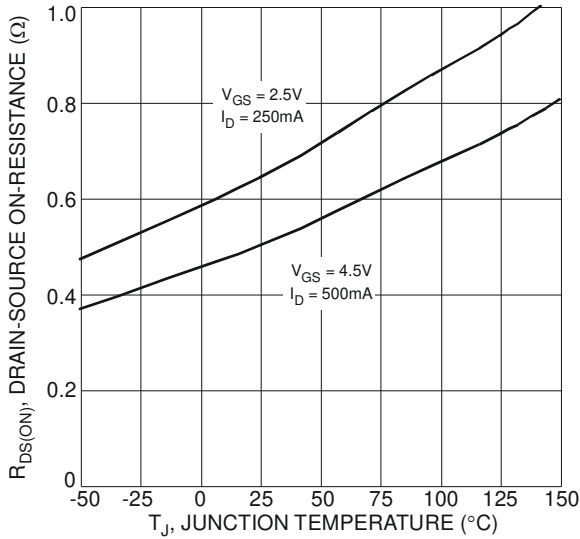


Fig. 7 On-Resistance Variation with Temperature

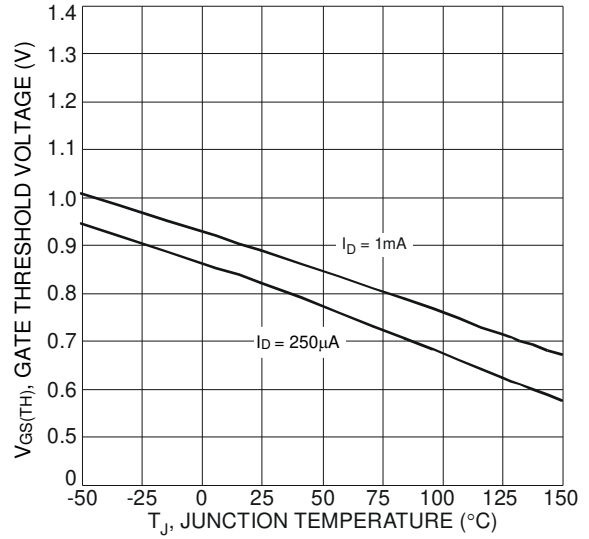


Fig. 8 Gate Threshold Variation vs. Junction Temperature

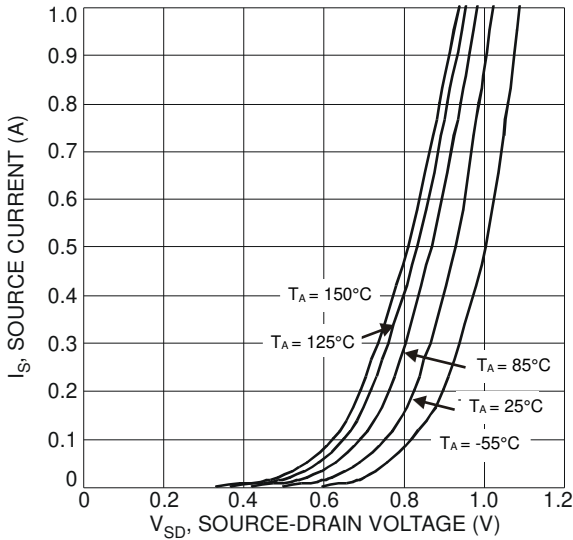


Fig. 9 Diode Forward Voltage vs. Current

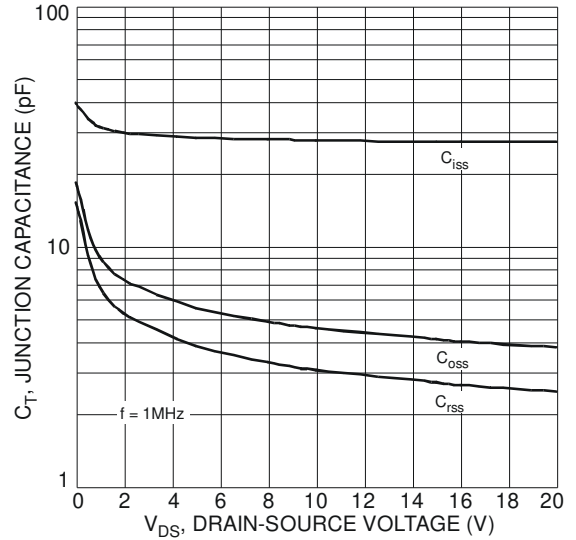


Fig. 10 Typical Junction Capacitance

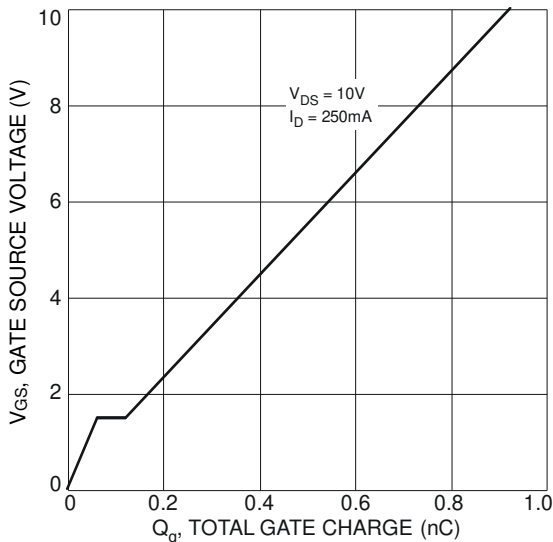


Fig. 11 Gate Charge

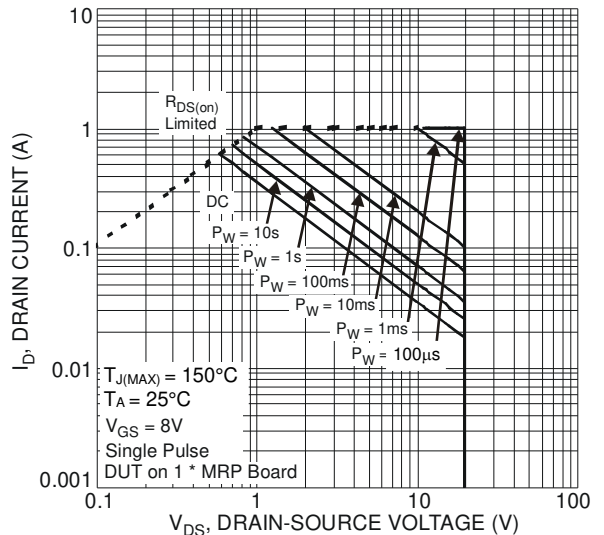
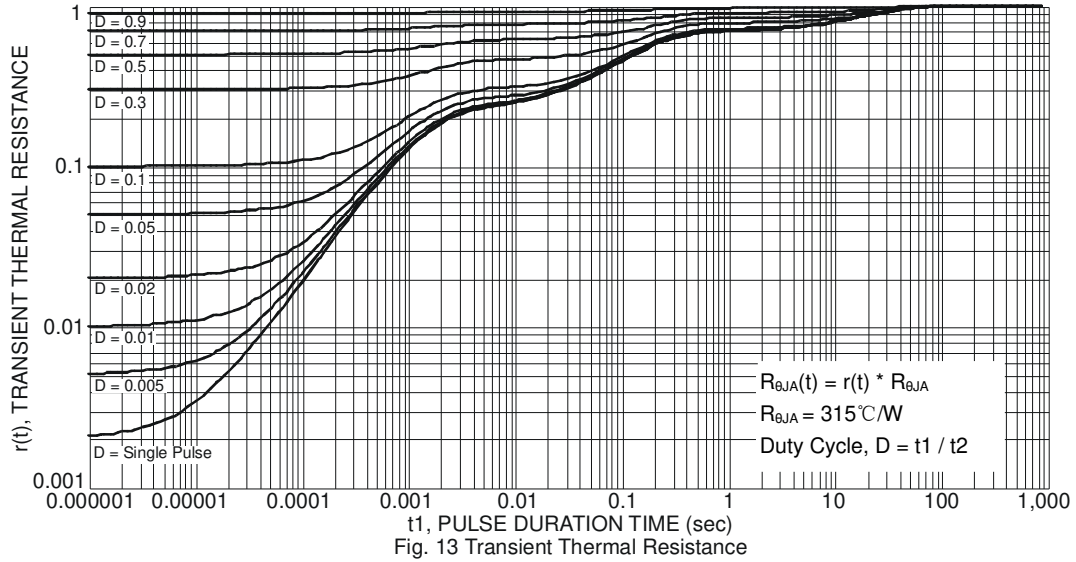


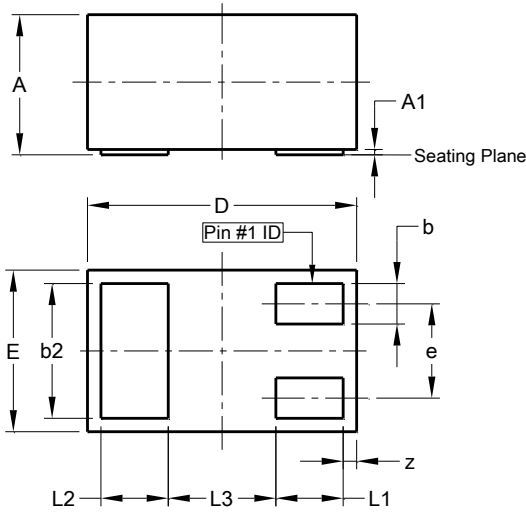
Fig. 12 SOA, Safe Operation Area



**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**X1-DFN1006-3**

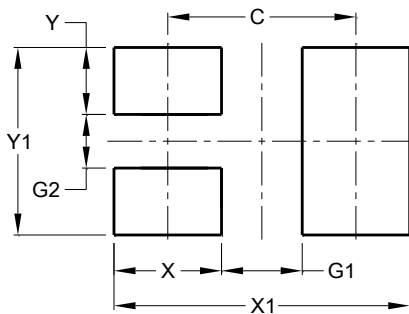


X1-DFN1006-3			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0.00	0.05	0.03
b	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.075	1.00
E	0.55	0.675	0.60
e	-	-	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	-	-	0.40
z	0.02	0.08	0.05
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**X1-DFN1006-3**



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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