20V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max @ T_A = +25°C (Note 5)
-20V	495mΩ @ V_{GS} = -4.5V	-0.77A
	690mΩ @ V_{GS} = -2.5V	-0.67A
	960mΩ @ V_{GS} = -1.8V	-0.57A

Features and Benefits

- Footprint of Just 0.6mm^2—13 Times Smaller Than SOT23
- 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 3kV**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

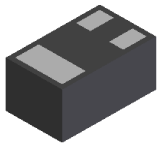
This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, which makes it ideal for high-efficiency power management applications.

- Portable Electronics

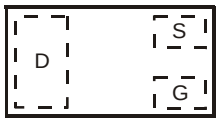
Mechanical Data

- 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
- Terminals: Finish—NiPdAu Over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.001 grams (Approximate)

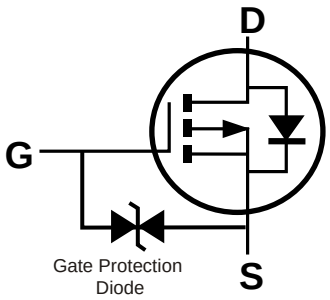
ESD PROTECTED TO 3kV



Bottom View



Top View
Internal Schematic



Equivalent Circuit

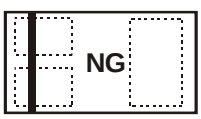
Ordering Information (Note 4)

Part Number	Case	Packaging
DMP21D0UFB-7B	X1-DFN1006-3	10,000/Tape & Reel

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, see https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

X1-DFN1006-3



Top View
Bar Denotes Gate
and Source Side

NG = Product Type Marking Code

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current	Steady State V_{GS}=-4.5V	T_A = +25°C (Note 5) T_A = +85°C (Note 5) T_A = +25°C (Note 6)	I_D	-0.77 -0.55 -1.17	A
Pulsed Drain Current (Note 7)			I_{DM}	-5.0	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	0.43	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	293	°C/W
Power Dissipation (Note 6)	P_D	0.99	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	126	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Thermal Characteristics

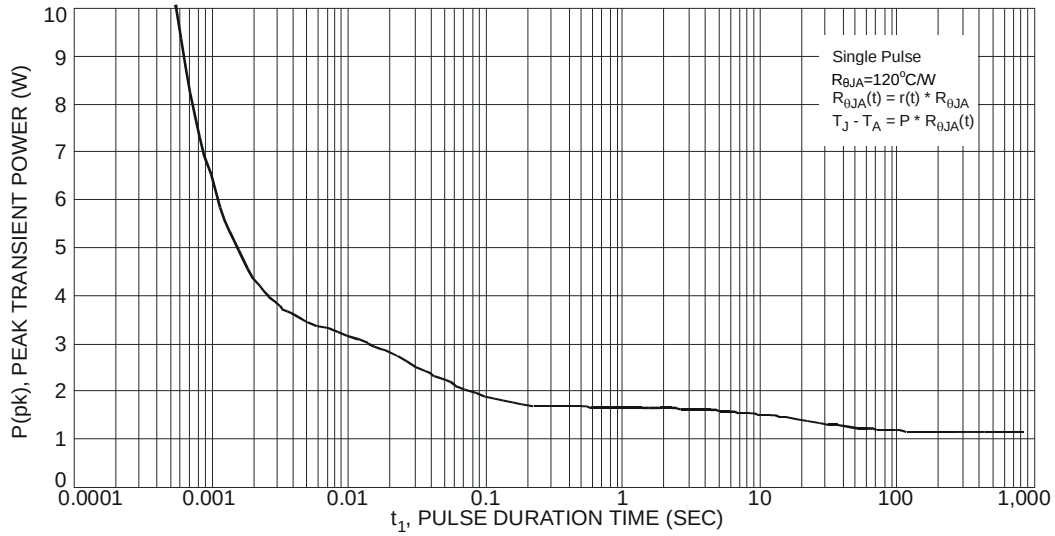

Fig. 1 Single Pulse Maximum Power Dissipation

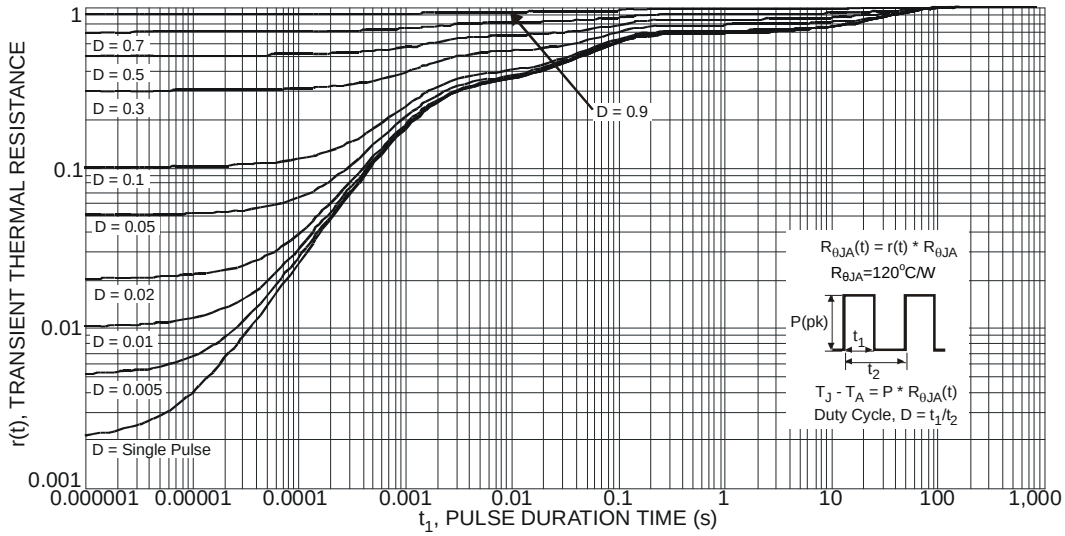

Fig. 2 Transient Thermal Response

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Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current, T_J = +25°C	I_{DSS}	—	—	-1	µA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±10	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.5	-0.7	-1.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	495	mΩ	V_{GS} = -4.5V, I_D = -400mA
				690		V_{GS} = -2.5V, I_D = -300mA
				960		V_{GS} = -1.8V, I_D = -100mA
Forward Transfer Admittance	$\|Y_{fs}\|$	50	-	—	mS	V_{DS} = -3V, I_D = -300mA
Diode Forward Voltage	V_{SD}	-	-	-1.2	V	V_{GS} = 0V, I_S = -300mA
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	76.5	—	pF	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	13.7	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	10.7	—	pF	
Gate Resistance	R_g	—	195	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	1.5	—	nC	V_{GS} = -8V, V_{DS} = -15V, I_D = -1A
Total Gate Charge	Q_g	—	1.0	—	nC	V_{GS} = -4.5V, V_{DS} = -15V, I_D = -1A
Gate-Source Charge	Q_{gs}	—	0.2	—	nC	
Gate-Drain Charge	Q_{gd}	—	0.3	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	7.1	—	ns	V_{DS} = -10V, I_D = -1A, V_{GS} = -4.5V, R_G = 6Ω
Turn-On Rise Time	t_R	—	8.0	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	31.7	—	ns	
Turn-Off Fall Time	t_F	—	18.5	—	ns	

Notes:
5. Device mounted on FR-4 substrate PCB, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PCB, 2oz copper, with thermal vias to bottom layer 1inch square copper plate.
7. Device mounted on minimum recommended pad layout test board, 10µs pulse duty cycle = 1%.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

Typical Characteristics

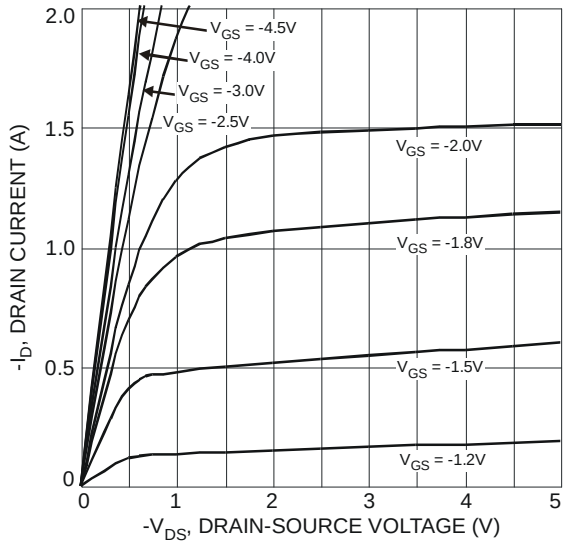

Fig. 3 Typical Output Characteristic

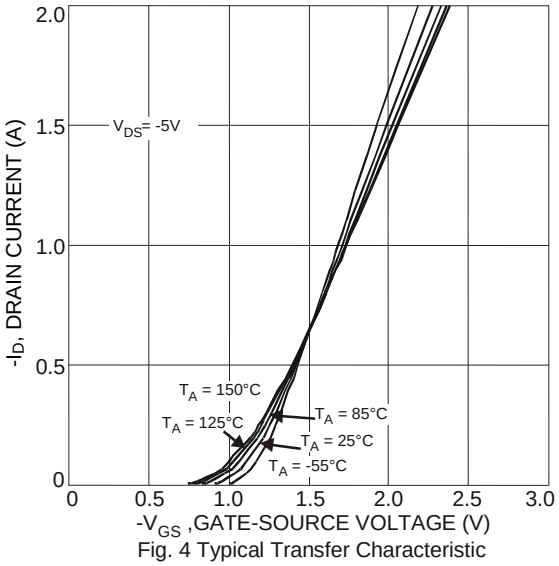

Fig. 4 Typical Transfer Characteristic

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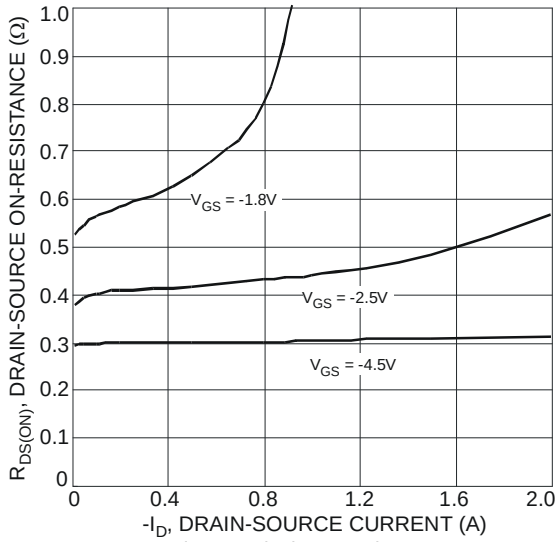

Fig. 5 Typical On-Resistance
vs. Drain Current and Gate Voltage

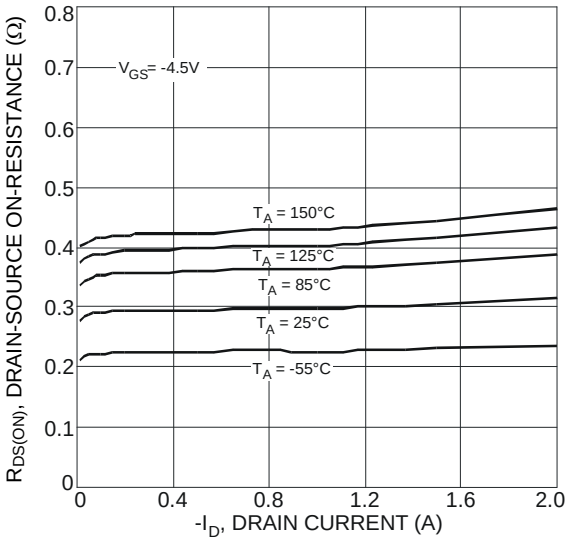

Fig. 6 Typical On-Resistance
vs. Drain Current and Temperature

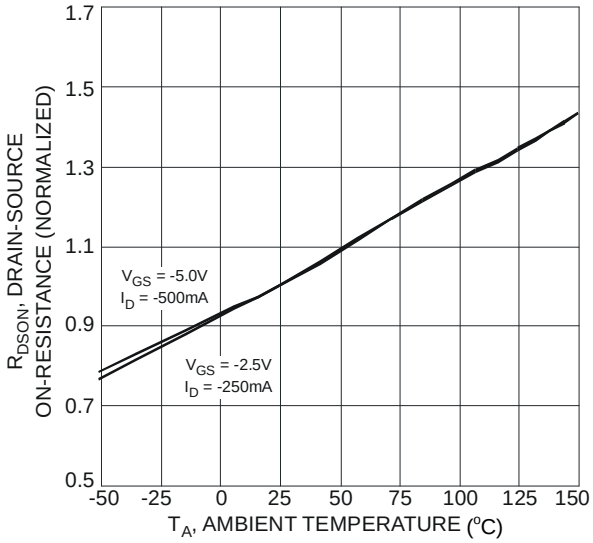

Fig. 7 On-Resistance Variation with Temperature

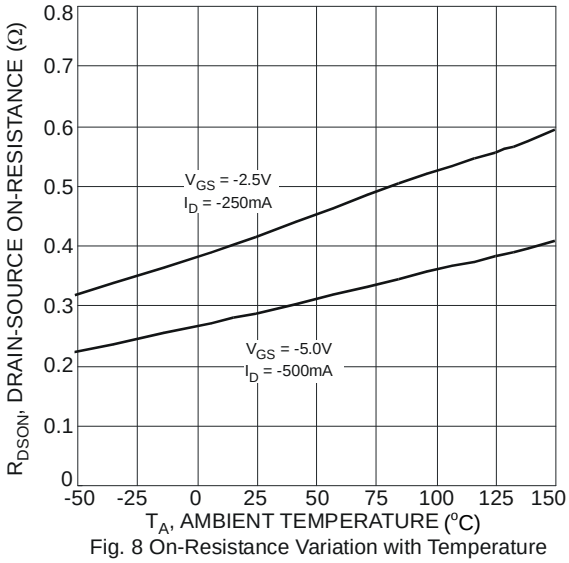

Fig. 8 On-Resistance Variation with Temperature

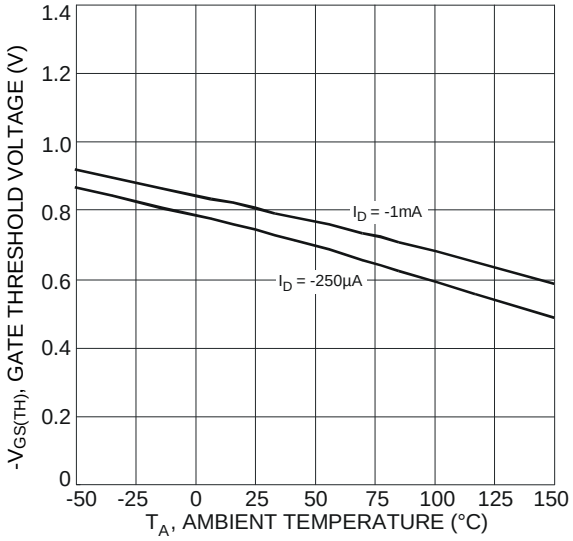

Fig. 9 Gate Threshold Variation vs. Ambient Temperature

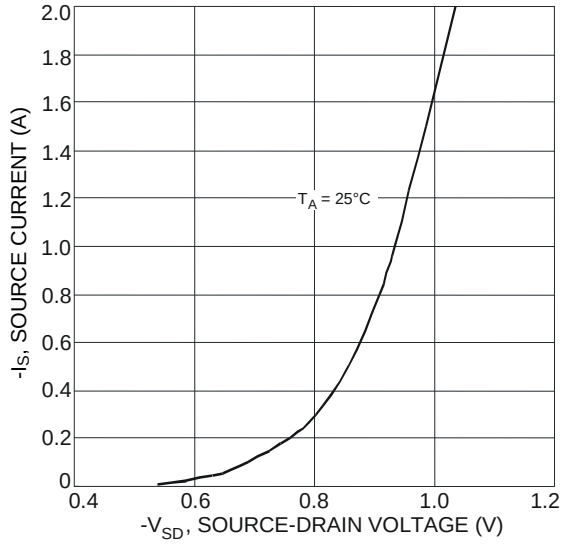

Fig. 10 Diode Forward Voltage vs. Current

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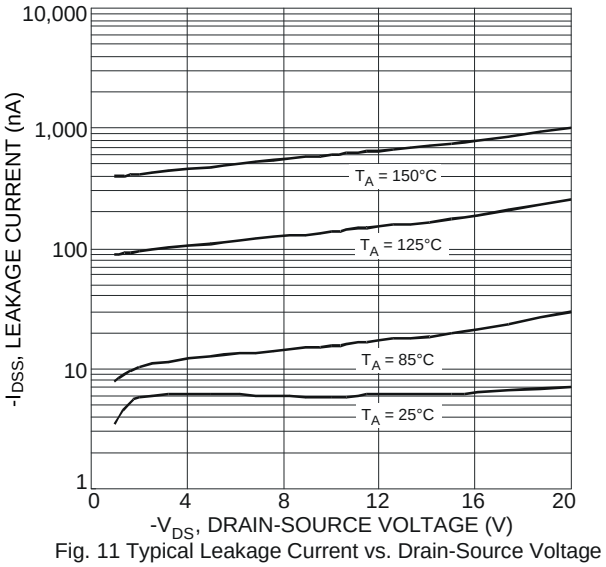

Fig. 11 Typical Leakage Current vs. Drain-Source Voltage

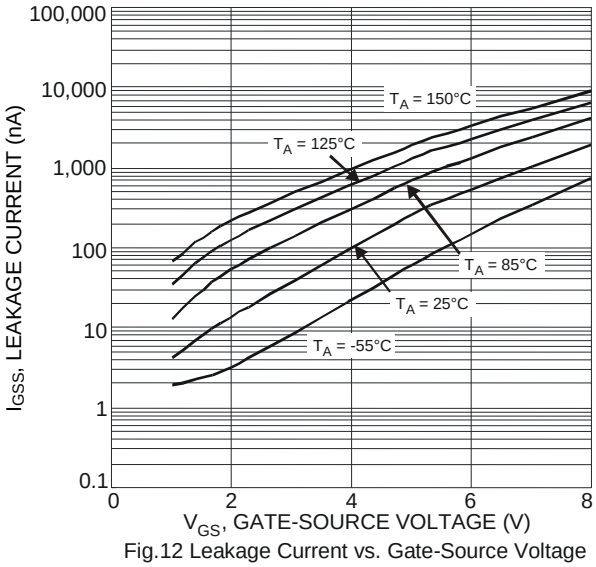

Fig.12 Leakage Current vs. Gate-Source Voltage

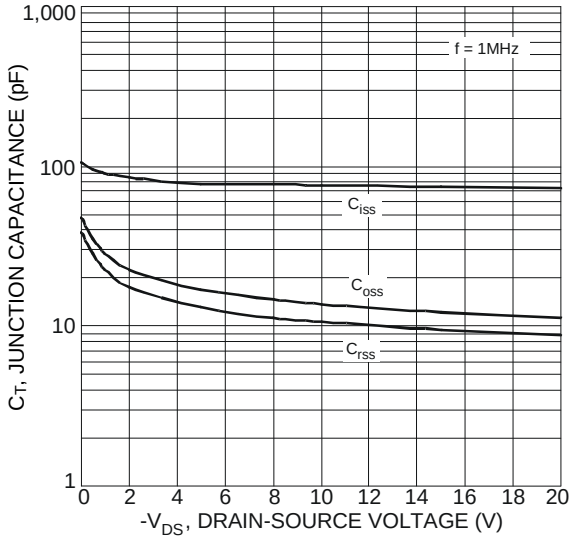

Fig. 13 Typical Junction Capacitance

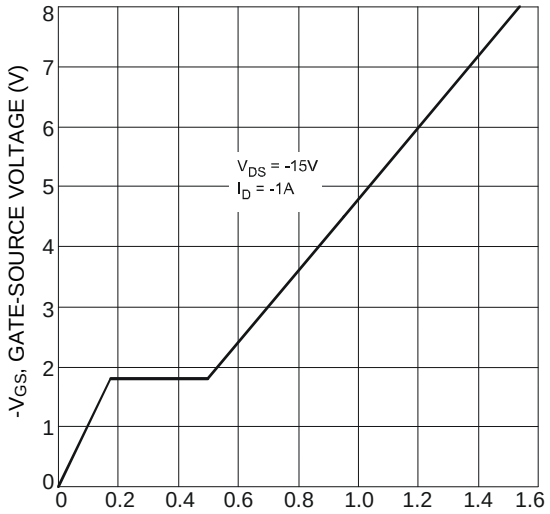

Fig. 14 Gate-Charge Characteristics

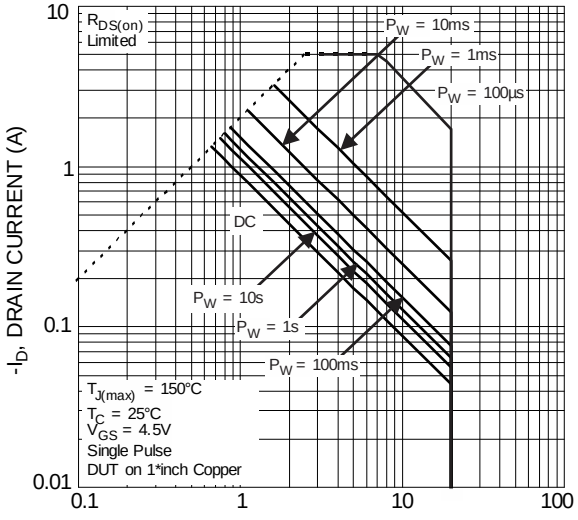

Figure 15 SOA, Safe Operation Area

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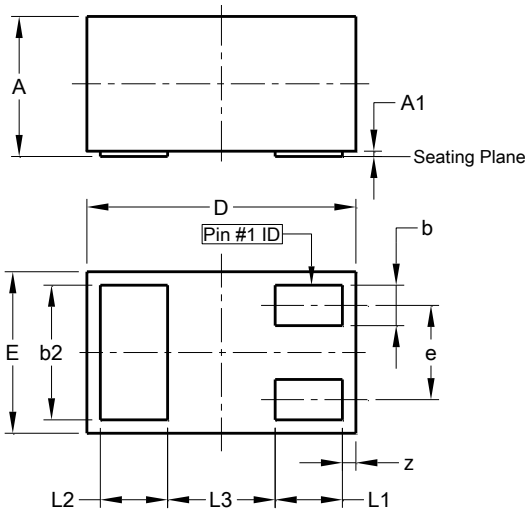
Package Outline Dimensions

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

X1-DFN1006-3

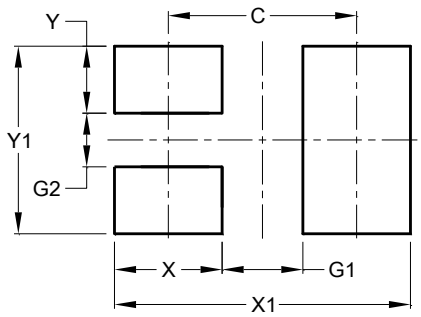


X1-DFN1006-3			
Dim	**Min**	**Max**	**Typ**
A	0.47	0.53	0.50
A1	0.00	0.05	0.03
b	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.075	1.00
E	0.55	0.675	0.60
e	-	-	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	-	-	0.40
z	0.02	0.08	0.05
All Dimensions in mm			

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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