

**DUAL N-CANNEL ENHANCEMENT MODE MOSFET**
**Product Summary**

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ\text{C}$
20V	9.5m $\Omega$ @ $V_{GS} = 4.5\text{V}$	12.2 A
	13m $\Omega$ @ $V_{GS} = 2.5\text{V}$	10.4 A

**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.

- General Purpose Interfacing Switch
- Power Management Functions

**Features and Benefits**

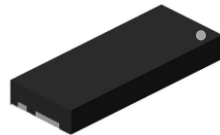
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability

**Mechanical Data**

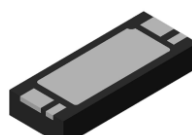
- Case: V-DFN2050-4
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe.  
Solderable per MIL-STD-202, Method 208④
- Weight: 0.01 grams (Approximate)



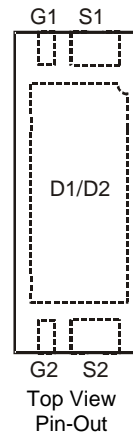
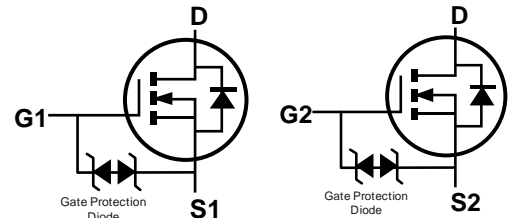
V-DFN2050-4



Top View



Bottom View

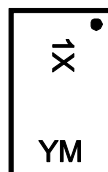

Top View  
Pin-Out


Equivalent Circuit

**Ordering Information (Note 4)**

Part Number	Case	Packaging
DMN2011UFX-7	V-DFN2050-4	3,000 / Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - 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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**


1X = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: B = 2014)  
M = Month (ex: 9 = September)

**Date Code Key**

Year	2014	2015	2016	2017	2018	2019	2020
Code	B	C	D	E	F	G	H

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

**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	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	12.2 9.8	A
Continuous Drain Current (Note 6) V <sub>GS</sub> = 2.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	10.4 8.3	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	80	A
Maximum Body Diode Continuous Current			I <sub>S</sub>	2.5	A
Avalanche Current (Note 7) L = 0.1mH			I <sub>AS</sub>	18	A
Repetitive Avalanche Energy (Note 7) L = 0.1mH			E <sub>AS</sub>	17	mJ

**Thermal Characteristics**

Characteristic	Symbol	Max	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	2.1	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 6)	R <sub>θJA</sub>	59.1	°C/W
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	7.1	°C/W
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 T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±10	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>	0.3	—	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>	—	—	9.5	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A
			—	10		V <sub>GS</sub> = 4.0V, I <sub>D</sub> = 10A
			—	10.5		V <sub>GS</sub> = 3.5V, I <sub>D</sub> = 9A
			—	11.5		V <sub>GS</sub> = 3.1V, I <sub>D</sub> = 9A
			—	13		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 8A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	2,248	—	pF	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	295	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	265	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.5	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	24	—	nC	V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	56	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	3.5	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	5.1	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	3.6	—	ns	V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 1.8Ω
Turn-On Rise Time	t <sub>r</sub>	—	2.6	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	21.6	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	13.5	—	ns	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	12.8	—	nS	I <sub>F</sub> = 8.5A, dI/dt = 210A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	6.9	—	nC	I <sub>F</sub> = 8.5A, dI/dt = 210A/μs

- 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 1inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

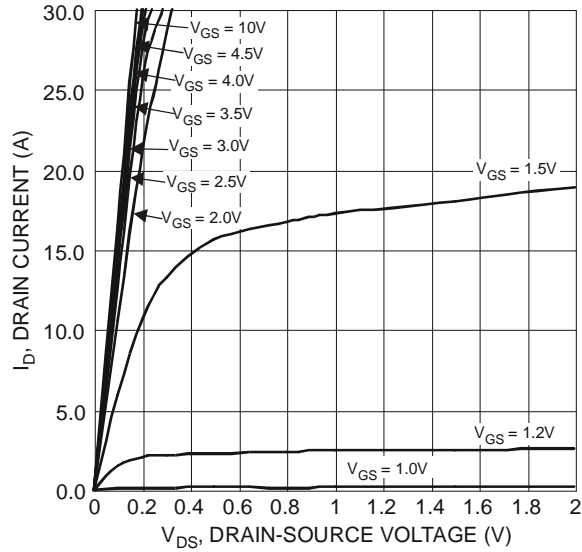


Figure 1 Typical Output Characteristics

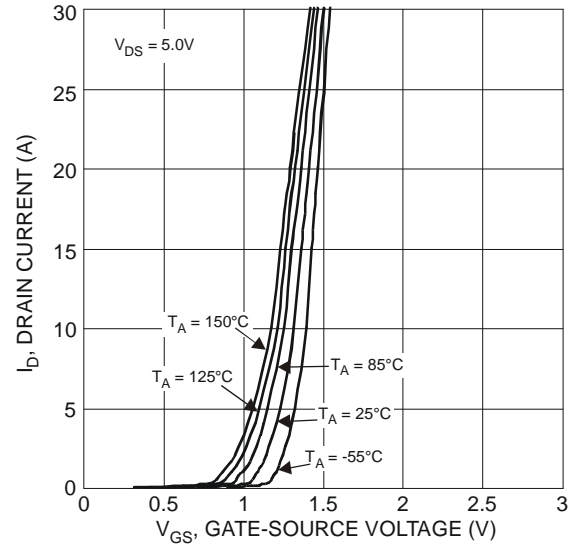


Figure 2 Typical Transfer Characteristics

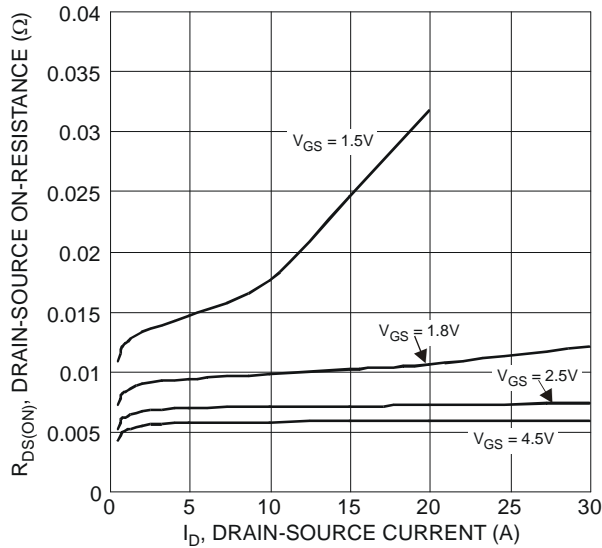


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

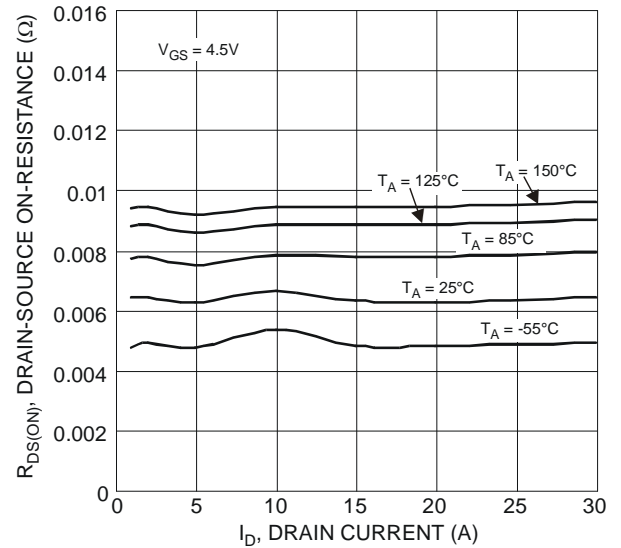


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

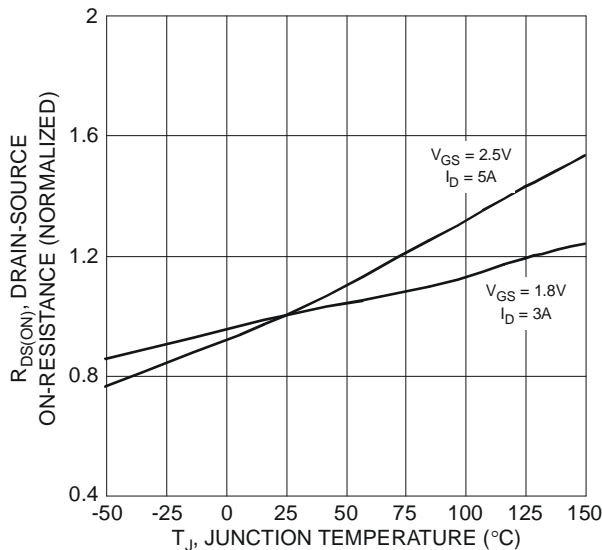


Figure 5 On-Resistance Variation with Temperature

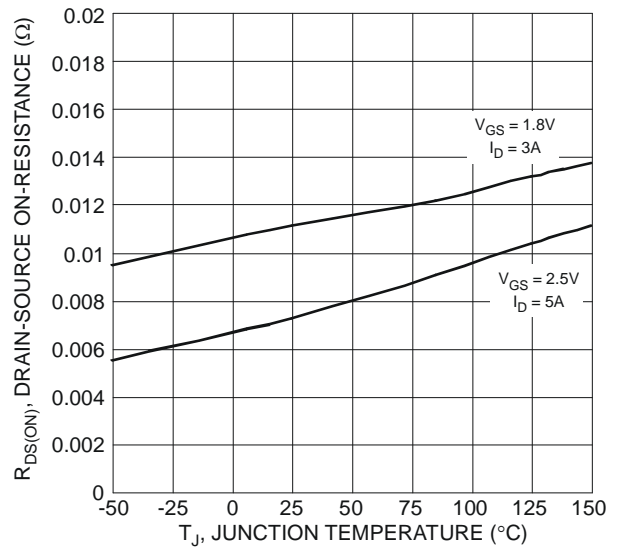


Figure 6 On-Resistance Variation with Temperature

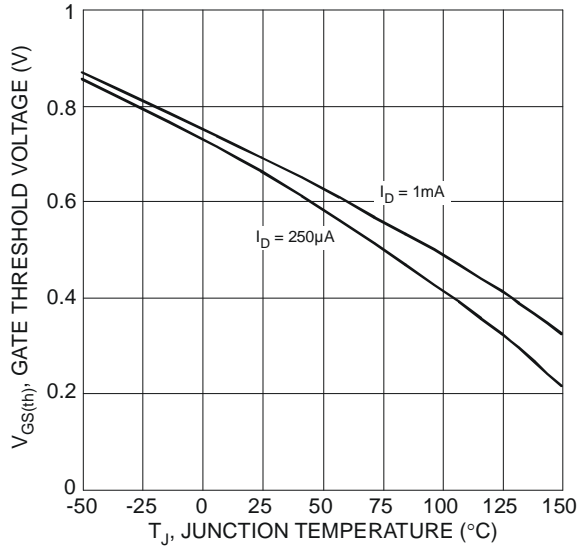


Figure 7 Gate Threshold Variation vs. Ambient Temperature

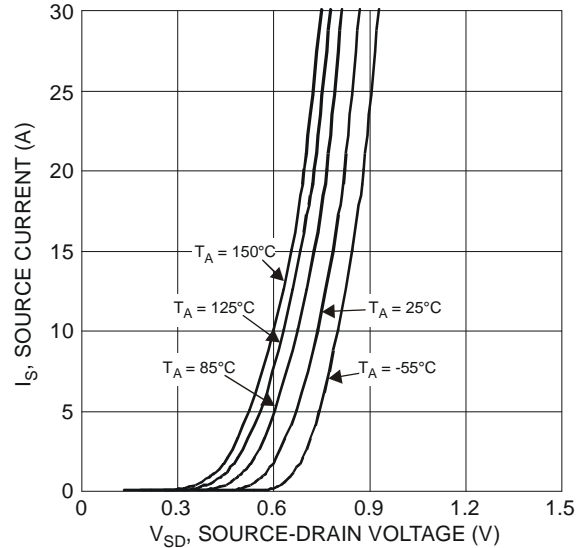


Figure 8 Diode Forward Voltage vs. Current

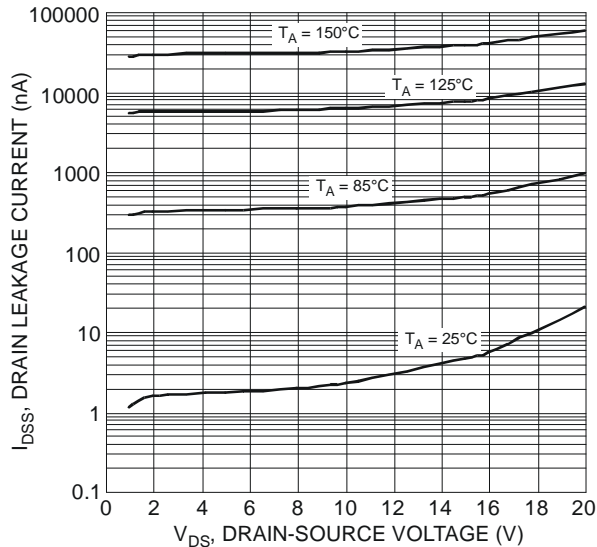


Figure 9 Typical Drain-Source Leakage Current vs. Voltage

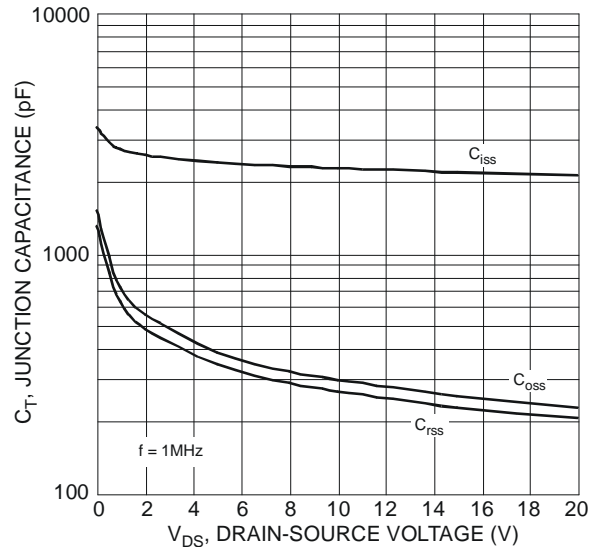


Figure 10 Typical Junction Capacitance

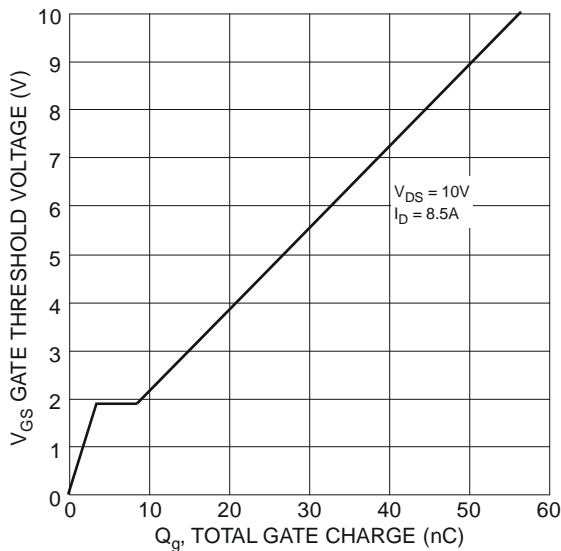


Figure 11 Gate Charge

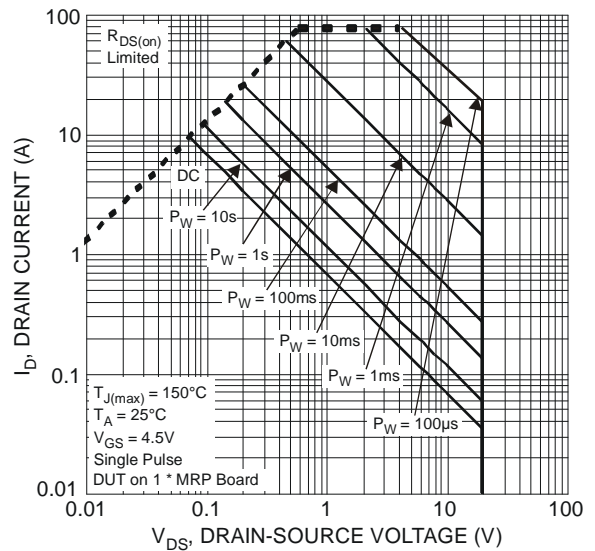
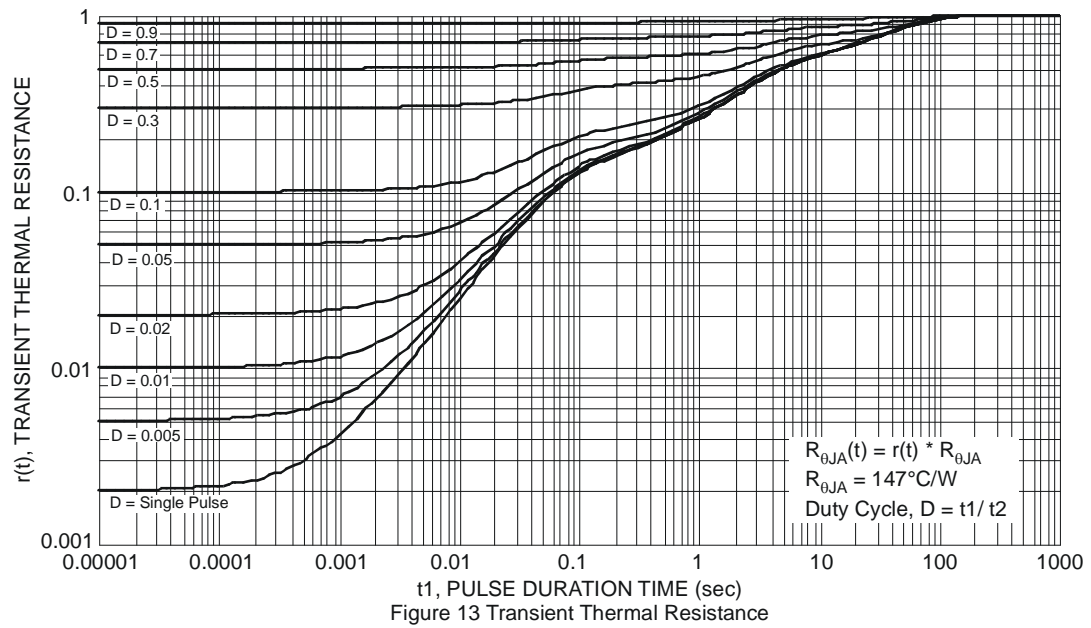
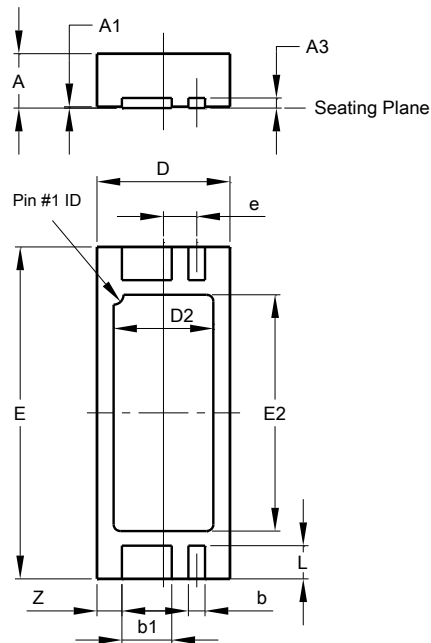


Figure 12 SOA, Safe Operation Area



## Package Outline Dimensions

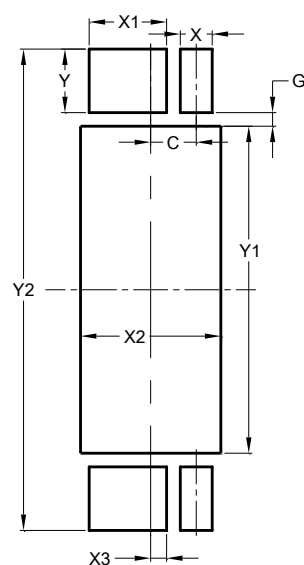
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



V-DFN2050-4			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0	0.05	0.02
A3	-	-	0.15
b	0.20	0.30	0.25
b1	0.70	0.80	0.75
D	1.90	2.10	2.00
D2	1.40	1.60	1.50
E	4.90	5.10	5.00
E2	3.46	3.66	3.56
e	0.50 BSC		
L	0.35	0.65	0.50
Z	-	-	0.375
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	0.500
G	0.150
X	0.350
X1	0.850
X2	1.540
X3	0.175
Y	0.700
Y1	3.600
Y2	5.300

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