

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ\text{C}$ (Note 6)
40V	31m $\Omega$ @ $V_{GS} = 10\text{V}$	7.0A
	50m $\Omega$ @ $V_{GS} = 4.5\text{V}$	5.6A

## 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.

- Motor Control
- Backlighting
- Power Management Functions
- DC-DC Converters

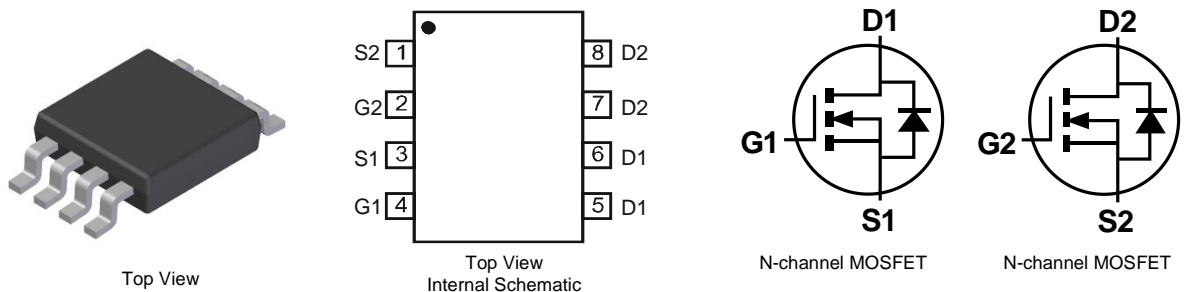
## Features and Benefits

- Low On-Resistance
- Low Input/Output Leakage
- **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**
- **PPAP Capable (Note 4)**

## Mechanical Data

- Case: SO-8
- 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 — Matte Tin Annealed over Copper Leadframe. Ⓢ  
Solderable per MIL-STD-202, Method 208
- Weight: 0.072 grams (Approximate)

SO-8

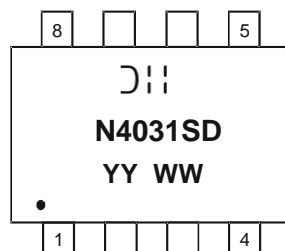


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN4031SSDQ-13	SO-8	2,500/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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_grade\\_definitions/](http://www.diodes.com/quality/product_grade_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



Ⓢ = Manufacturer's Marking  
 N4031SD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or YY = Year (ex: 13 = 2013)  
 WW = Week (01 - 53)  
 YY = Date Code Marking

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

Characteristic				Symbol	Value	Units
Drain-Source Voltage				V <sub>DSS</sub>	40	V
Gate-Source Voltage				V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6)	V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	5.2	A
			T <sub>A</sub> = +70°C		4.1	
Continuous Drain Current (Note 6)	V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	4.3	A
			T <sub>A</sub> = +70°C		3.4	
Continuous Drain Current (Note 7)	V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	7.0	A
			T <sub>A</sub> = +70°C		5.6	
Continuous Drain Current (Note 7)	V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	5.8	A
			T <sub>A</sub> = +70°C		4.7	
Pulsed Drain Current (Note 8)				I <sub>DM</sub>	20	A

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 6)	P <sub>D</sub>	1.42	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 5)	R <sub>θJA</sub>	88	°C/W
Total Power Dissipation (Note 7)	P <sub>D</sub>	2.6	W
Thermal Resistance, Junction to Ambient @T <sub>A</sub> = +25°C (Note 6)	R <sub>θJA</sub>	48	°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 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10mA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.6	2.4	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
On-state drain current	I <sub>D(ON)</sub>	20	—	—	A	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 5A
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	19	31	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 6A
		—	44	50		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5A
Forward Transfer Admittance	Y <sub>fs</sub>	—	11	—	S	V <sub>DS</sub> = 5V, I <sub>D</sub> = 6A
Diode Forward Voltage	V <sub>SD</sub>	—	0.74	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>iss</sub>	—	945	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	69	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	58	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.45	—	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>	—	8.4	—	nC	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 20V, I <sub>D</sub> = 12A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	18.6	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	3.3	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	2.2	—	nC	
Turn-On Delay Time	T <sub>D(on)</sub>	—	6.4	—	ns	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 20V, R <sub>L</sub> = 1.6Ω, R <sub>G</sub> = 3Ω
Turn-On Rise Time	T <sub>r</sub>	—	9.7	—	ns	
Turn-Off Delay Time	T <sub>D(off)</sub>	—	19.8	—	ns	
Turn-Off Fall Time	T <sub>f</sub>	—	3.1	—	ns	

- Notes:
6. Device mounted on FR-4 PCB, with minimum recommended pad layout. The value in any given application depends on user's specific board design.
  7. Device mounted on 1" x 1" FR-4PCB with high coverage 1 oz. Copper, single sided.
  8. Repetitive rating, pulse width limited by junction temperature.
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. No subject to production testing.

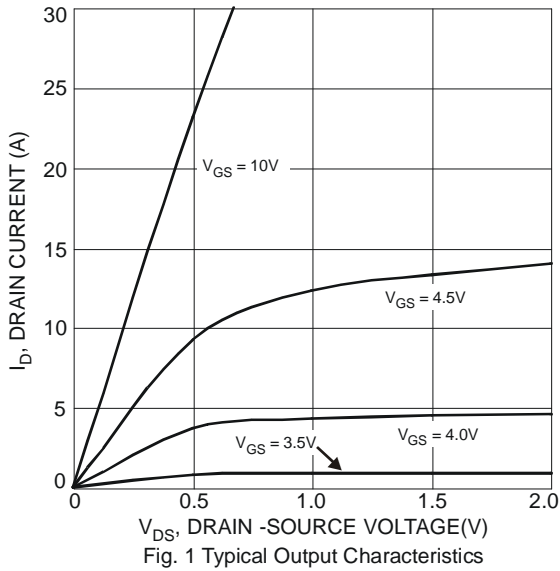


Fig. 1 Typical Output Characteristics

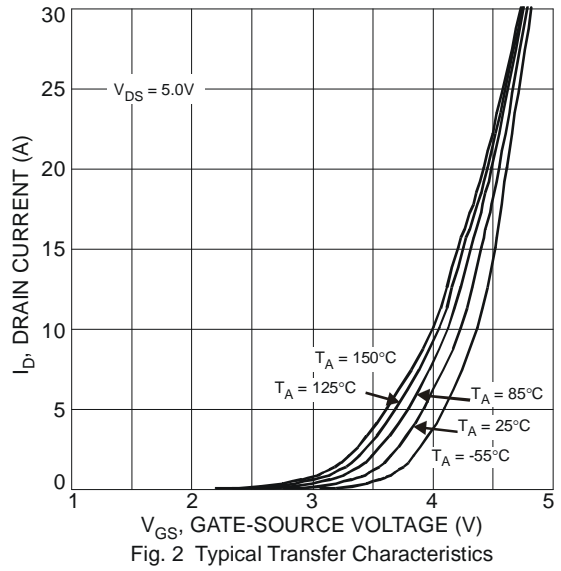


Fig. 2 Typical Transfer Characteristics

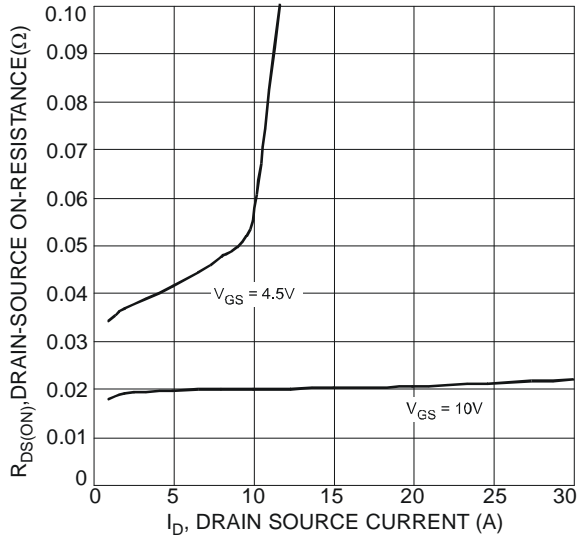


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

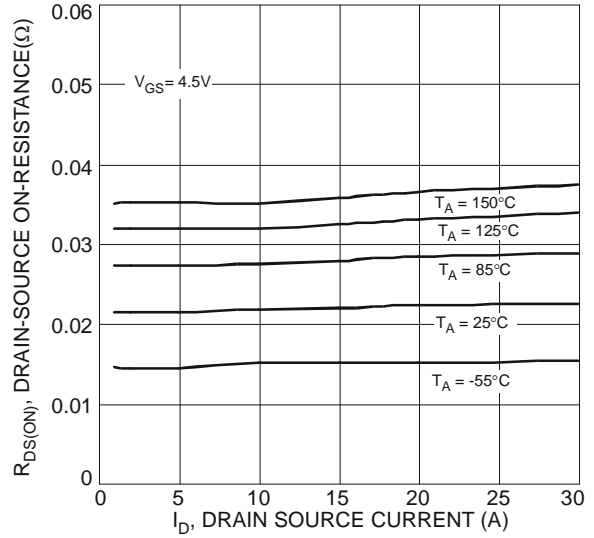


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

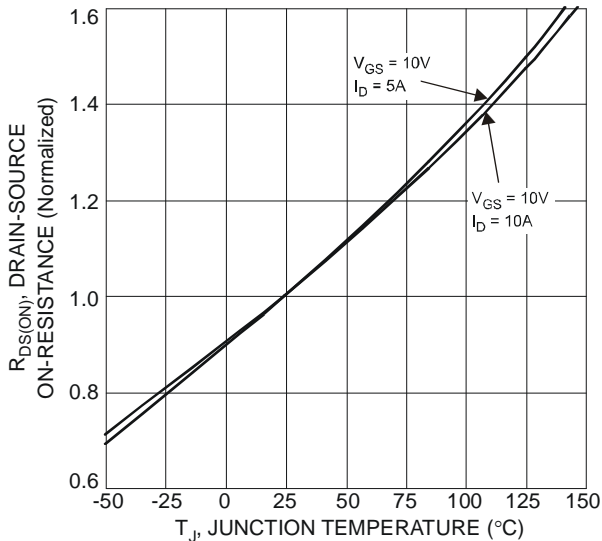


Fig. 5 On-Resistance Variation with Temperature

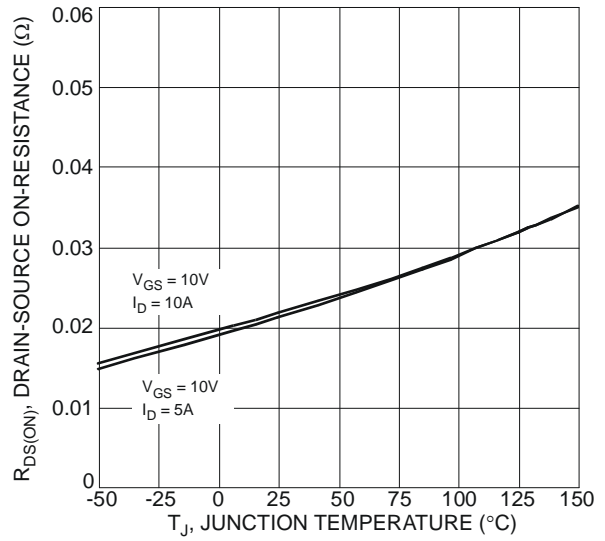


Fig. 6 On-Resistance Variation with Temperature

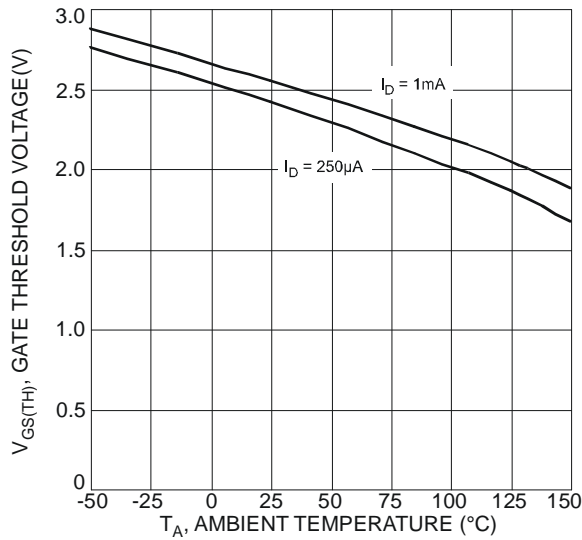


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

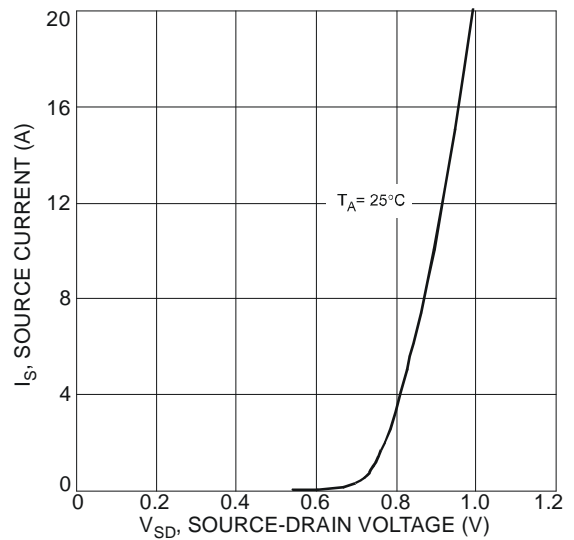


Fig. 8 Diode Forward Voltage vs. Current

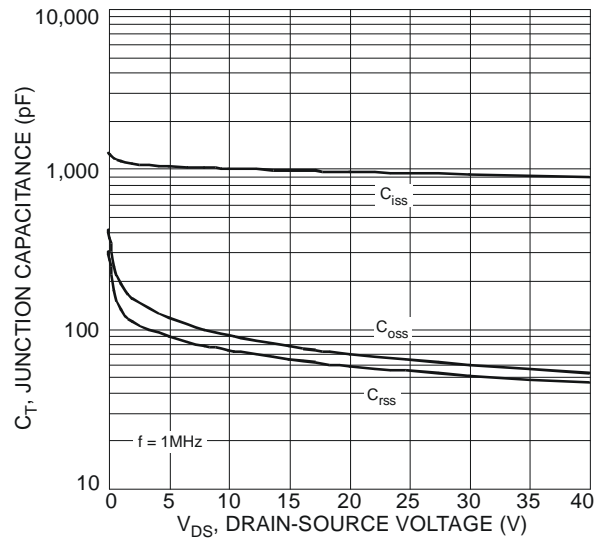


Fig. 9 Typical Junction Capacitance

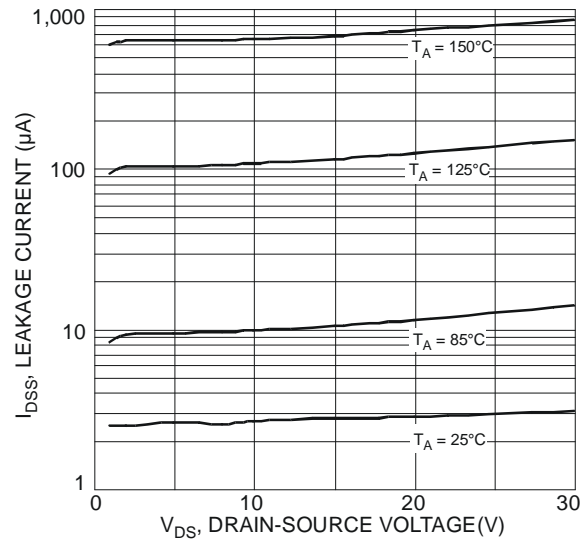


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

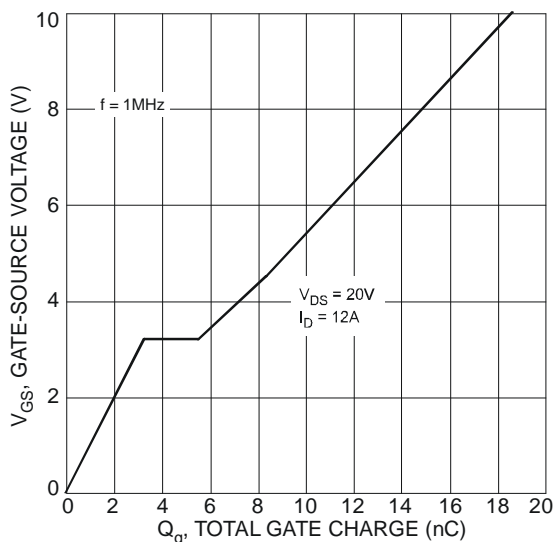


Fig. 11 Gate-Charge Characteristics

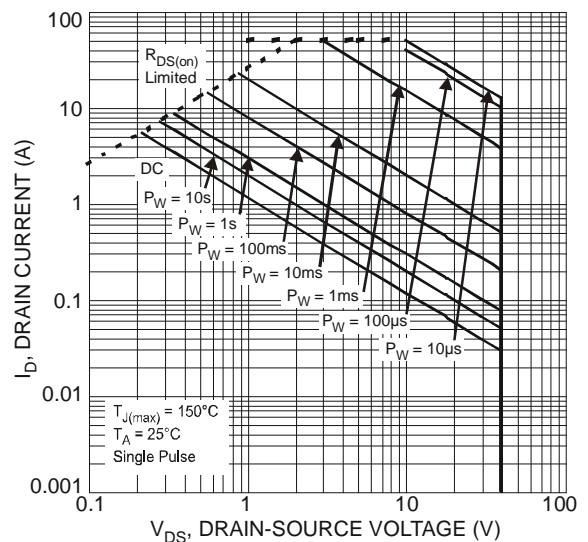
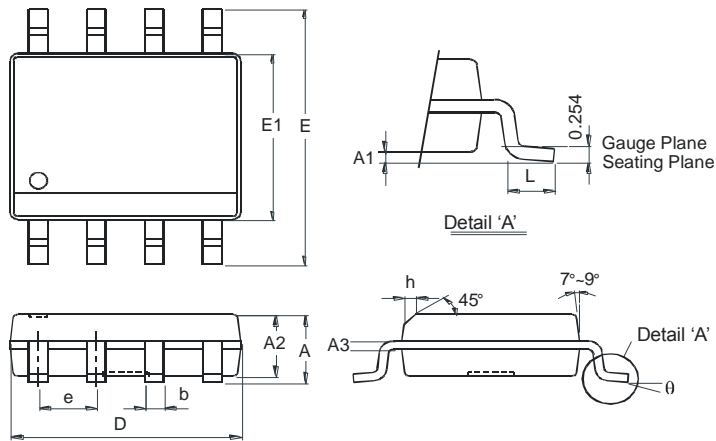


Fig. 12 SOA, Safe Operation Area

**Package Outline Dimensions**

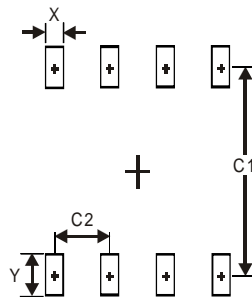
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
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)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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