

**Product Summary** (Typ. @  $V_{GS} = -4.5V$ ,  $T_A = +25^\circ C$ )

$V_{DSS}$	$R_{DS(on)}$	$Q_g$	$Q_{gd}$	$I_D$
-20V	28m $\Omega$	5.4nC	1.5nC	-5.8A

**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.

**Applications**

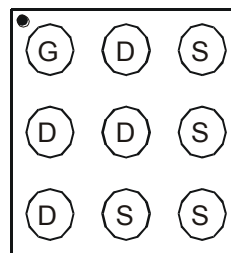
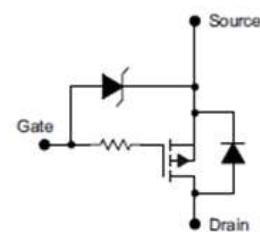
- Battery Management
- Load Switch
- Battery Protection

**Features and Benefits**

- LD-MOS Technology with the Lowest Figure of Merit:  
 $R_{DS(on)} = 28m\Omega$  to Minimize On-State Losses  
 $Q_g = 5.4nC$  for Ultra-Fast Switching
- $V_{gs(th)} = -0.6V$  typ. for a Low Turn-On Potential
- CSP with Footprint 1.5mm  $\times$  1.5mm
- Height = 0.62mm for Low Profile
- ESD = 3kV HBM Protection of 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**

**Mechanical Data**

- Case: U-WLB1515-9
- Terminal Connections: See Diagram Below
- Weight: 0.0018 grams (Approximate)

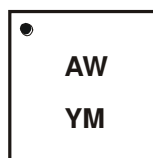

 Top-View  
Pin Configuration


Equivalent Circuit

**Ordering Information** (Note 4)

Part Number	Case	Packaging
DMP2033UCB9-7	U-WLB1515-9	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> 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>.

**Marking Information**


AW = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 M = Month (ex: 9 = September)

## Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

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	Units
Drain-Source Voltage			V <sub>DSS</sub>	-20	V
Gate-Source Voltage			V <sub>GSS</sub>	-6	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = -4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	-4.2A	A
		T <sub>A</sub> = +70°C		-3.3A	
Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	-5.8A	A
		T <sub>A</sub> = +70°C		-4.5A	
Pulsed Drain Current			I <sub>DM</sub>	-30	A

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	1.0	W
Total Power Dissipation (Note 6)	P <sub>D</sub>	1.8	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	126.8	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	69	°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 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	-	-	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Gate-Source Breakdown Voltage	BV <sub>GSS</sub>	-6.1	-	-	V	I <sub>GS</sub> = -250μA, V <sub>DS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	-	-	-1	μA	@T <sub>C</sub> = +25°C V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	-	-	-100	nA	V <sub>GS</sub> = -6V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.4	-0.6	-1.1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	-	28	33	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2A
			35	45		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2A
			45	65		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2A
Forward Transfer Admittance	Y <sub>fs</sub>	-	10.8	-	S	V <sub>DS</sub> = -10V, I <sub>D</sub> = -2A
Diode Forward Voltage (Note 6)	V <sub>SD</sub>	-	-0.7	-1	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -2A
Reverse Recovery Charge	Q <sub>rr</sub>	-	15	-	nC	V <sub>dd</sub> = -9.5V, I <sub>F</sub> = -2A,
Reverse Recovery Time	t <sub>rr</sub>	-	25	-	ns	di/dt = 200A/μs
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	-	382	500	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	204	270	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	86	115	pF	
Series Gate Resistance	R <sub>G</sub>	-	26.1	35	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (4.5V)	Q <sub>g</sub>	-	5.4	7.0	nC	V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V, I <sub>D</sub> = -2A
Gate-Source Charge	Q <sub>gs</sub>	-	0.7	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	1.5	-	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	-	8.5	-	ns	V <sub>DD</sub> = -10V, V <sub>GS</sub> = -4.5V, I <sub>DS</sub> = -2A, R <sub>G</sub> = 2Ω,
Turn-On Rise Time	t <sub>r</sub>	-	11.8	-	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	-	47	-	ns	
Turn-Off Fall Time	t <sub>f</sub>	-	56	-	ns	

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout.
  - Device mounted on FR4 material with 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 2-oz. (0.071-mm thick) Cu.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

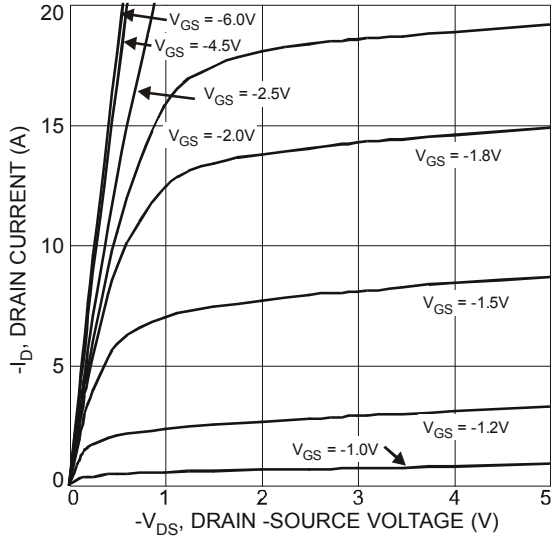


Fig. 1 Typical Output Characteristics

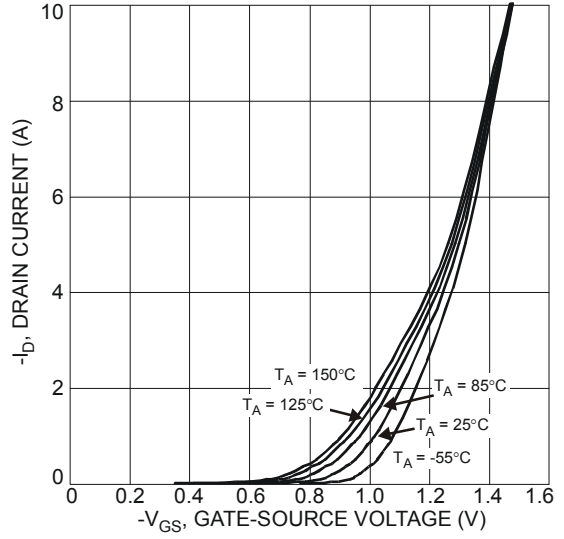


Fig. 2 Typical Transfer Characteristics

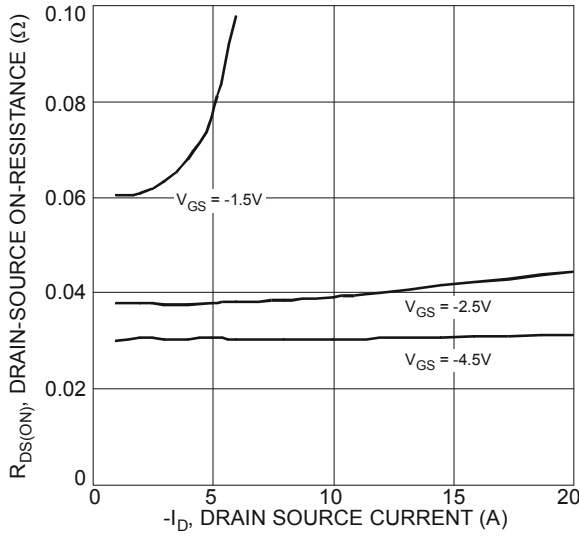


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

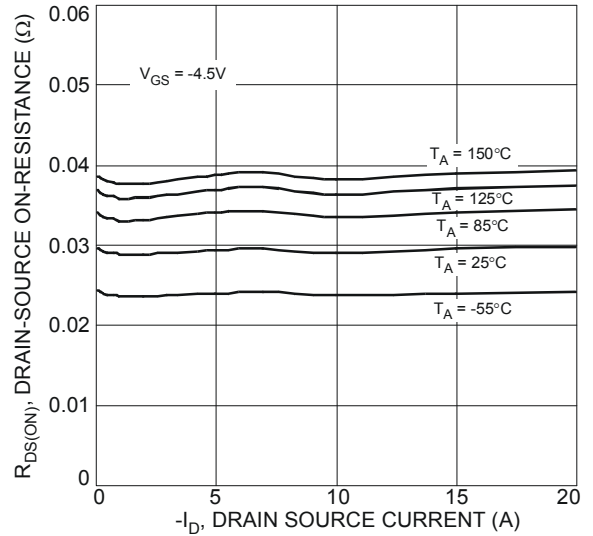


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

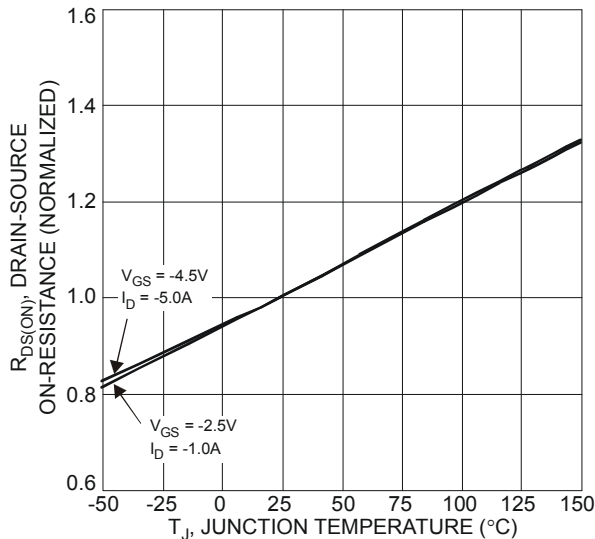


Fig. 5 On-Resistance Variation with Temperature

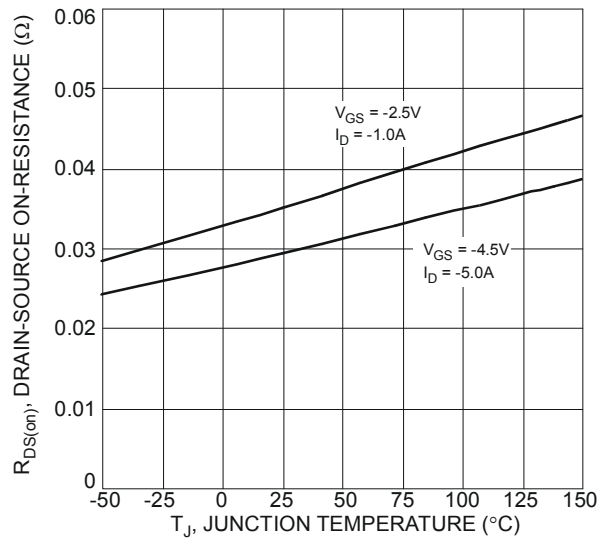


Fig. 6 On-Resistance Variation with Temperature

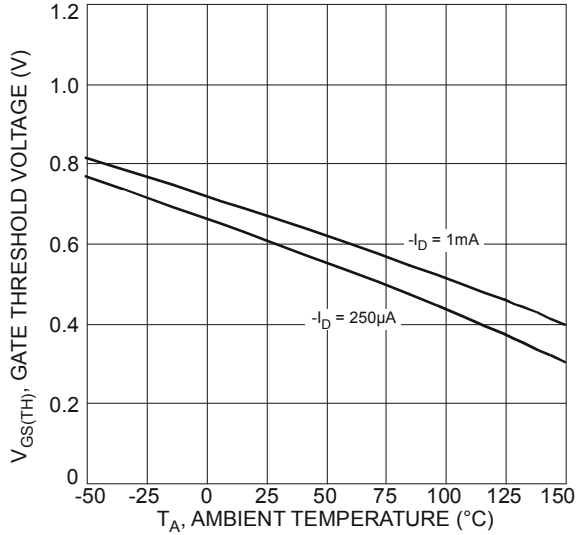


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

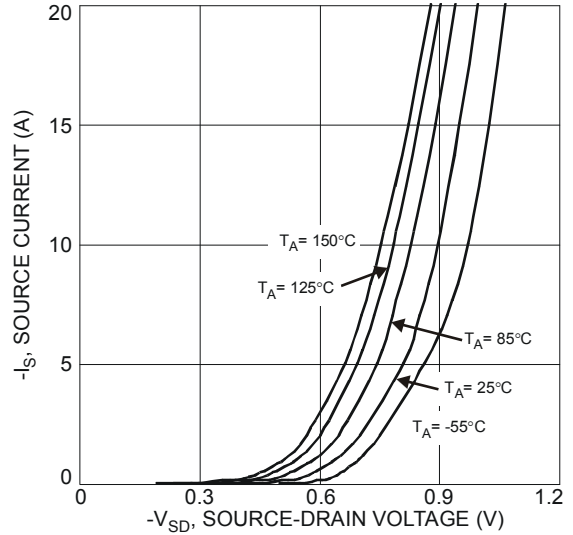


Fig. 8 Diode Forward Voltage vs. Current

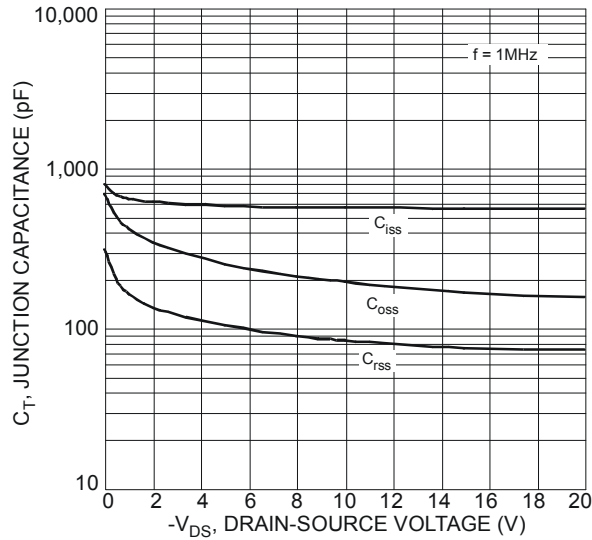


Fig. 9 Typical Junction Capacitance

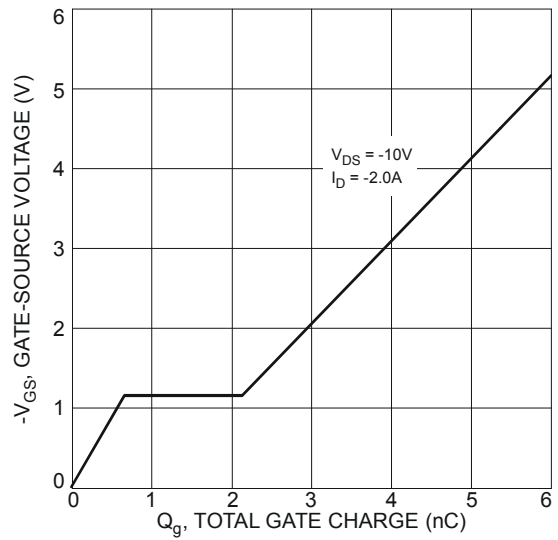


Fig. 10 Gate-Charge Characteristics

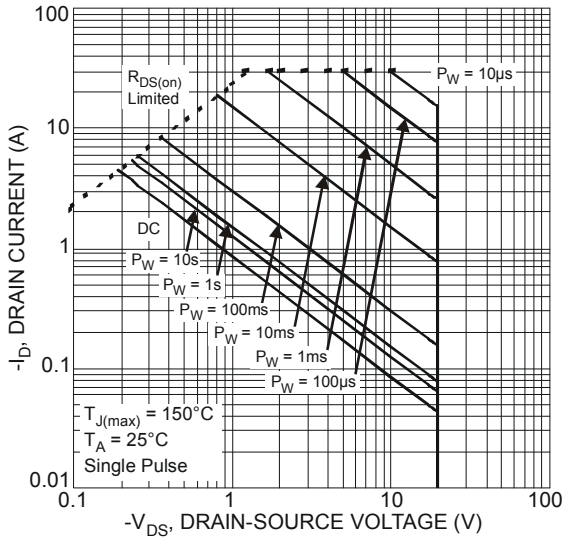


Fig. 11 SOA, Safe Operation Area

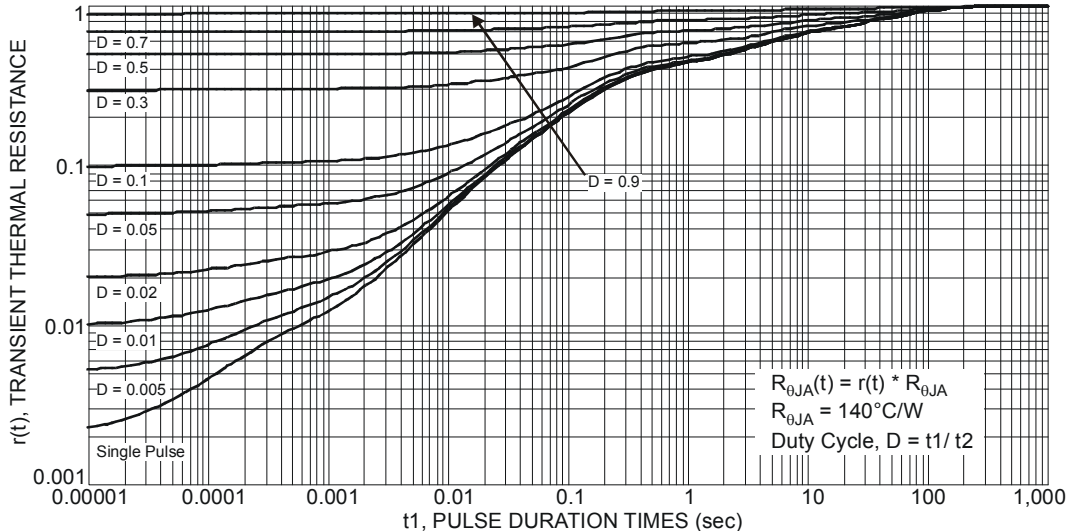
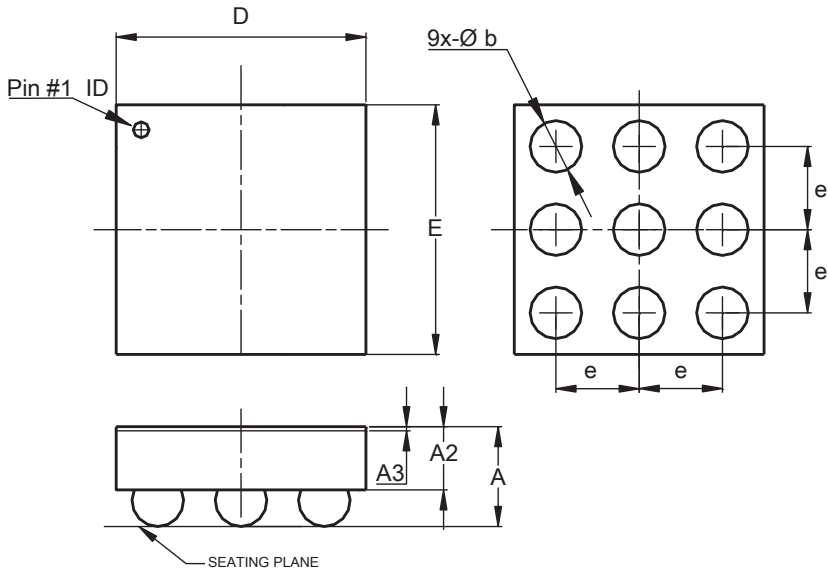


Fig. 12 Transient Thermal Resistance

**Package Outline Dimensions**

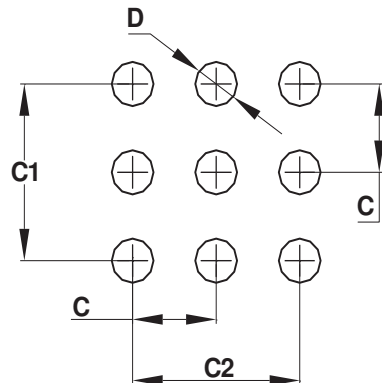
Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.



U-WLB1515-9			
Dim	Min	Max	Typ
A	-	0.62	-
A2	-	0.36	0.36
A3	0.020	0.030	0.025
b	0.27	0.37	0.32
D	1.47	1.51	1.49
E	1.47	1.51	1.49
e	-	-	0.50
All Dimensions in mm			

**Suggested Pad Layout**

Please see AP02001 at [http://www.diodes.com/\\_files/datasheets/ap02001.pdf](http://www.diodes.com/_files/datasheets/ap02001.pdf) for the latest version.



Dimensions	Value (in mm)
C	0.50
C1	1.00
C2	1.00
D	0.25

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