

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = +25^\circ C$
12V	20m $\Omega$ @ $V_{GS} = 4.5V$	6.6A
	23m $\Omega$ @ $V_{GS} = 2.5V$	6.1A

## Description

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

## Applications

- Battery Management
- Load Switch
- Battery Protection

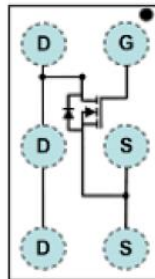
## Features and Benefits

- Low  $Q_G$  &  $Q_{GD}$
- Small Footprint
- Low Profile 0.62mm Height
- Totally Lead-Free & Full 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-WLB1510-6
- Terminal Connections: See Diagram Below
- Terminals: Finished – SnAgCu Ball (e)
- Weight: 0.0018 grams (Approximate)

U-WLB1510-6



Top View

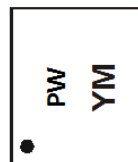
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN1016UCB6-7	U-WLB1510-6	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

U-WLB1510-6



PW = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: D = 2016)  
M = Month (ex: 9 = September)

### Date Code Key

Year	2015	2016	2017	2018	2019	2020	2021
Code	C	D	E	F	G	H	I

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>	12	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	5.5	A
		T <sub>A</sub> = +70°C		4.2	
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	6.6	A
		T <sub>A</sub> = +70°C		5.3	
Pulsed Drain Current (Note 7)			I <sub>DM</sub>	30	A

**Thermal Characteristics**

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	0.92	W
Total Power Dissipation (Note 6)	P <sub>D</sub>	1.47	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	136	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	94	°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</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	12	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current (@T <sub>C</sub> = +25°C)	I <sub>DSS</sub>	—	—	1.0	μA	V <sub>DS</sub> = 9.6V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.4	0.6	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>	—	16	20	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 1.5A
		—	20	23		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 1.5A
Forward Transfer Admittance	Y <sub>FS</sub>	—	14	—	S	V <sub>DS</sub> = 6V, I <sub>D</sub> = 1.5A
Diode Forward Voltage (Note 6)	V <sub>SD</sub>	—	0.7	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.5A
Reverse Recovery Charge	Q <sub>RR</sub>	—	8	—	nC	V <sub>DD</sub> = 6V, I <sub>F</sub> = 1.5A, di/dt = 200A/μs
Reverse Recovery Time	t <sub>RR</sub>	—	43.6	—	ns	
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>ISS</sub>	—	423	550	pF	V <sub>DS</sub> = 6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	238	310	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	41	55	pF	
Series Gate Resistance	R <sub>G</sub>	—	3	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (4.5V)	Q <sub>G</sub>	—	4.2	5.5	nC	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 6V, I <sub>D</sub> = 1.5A
Gate-Source Charge	Q <sub>GS</sub>	—	0.6	—	nC	
Gate-Drain Charge	Q <sub>GD</sub>	—	0.4	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	5	8	ns	V <sub>DS</sub> = 6V, V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 4Ω, I <sub>D</sub> = 1.5A
Turn-On Rise Time	t <sub>R</sub>	—	10	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	25	40	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	10	—	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.
  - 300ms pulse, pulse duty cycle ≤ 2%.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

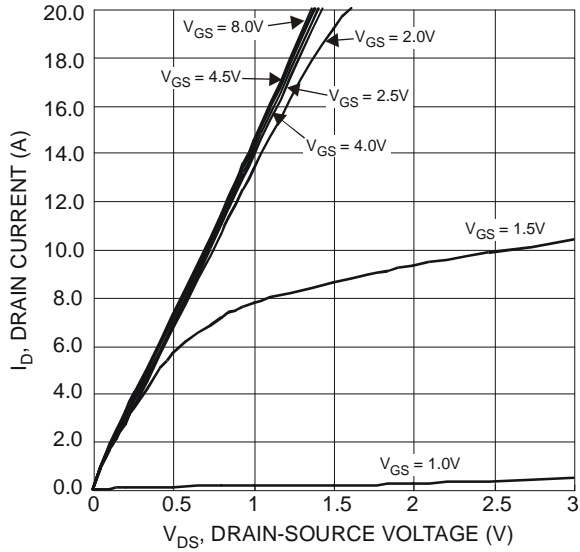


Figure 1 Typical Output Characteristics

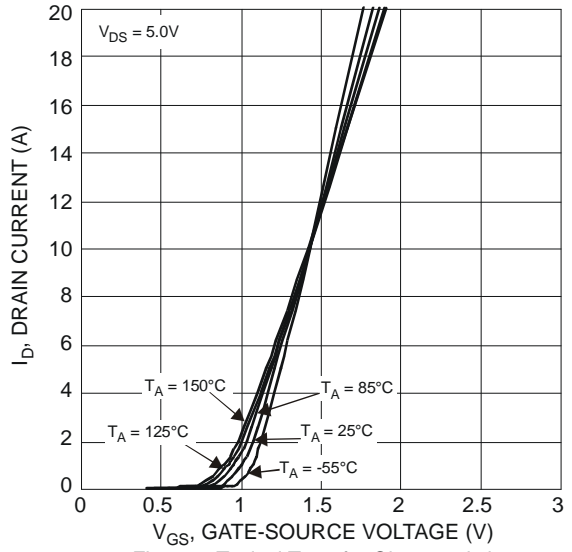


Figure 2 Typical Transfer Characteristics

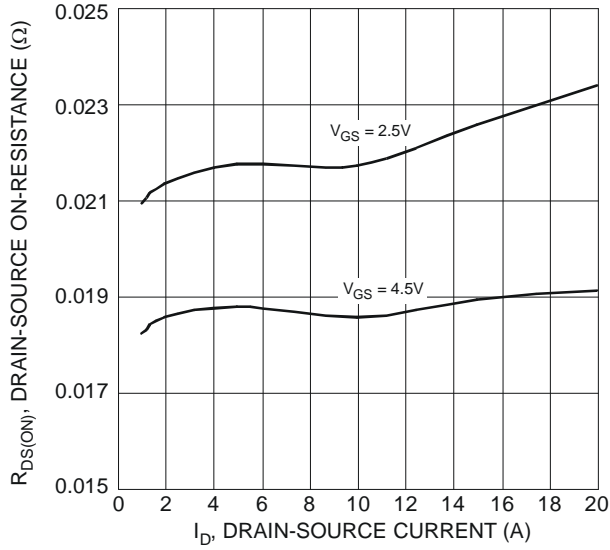


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

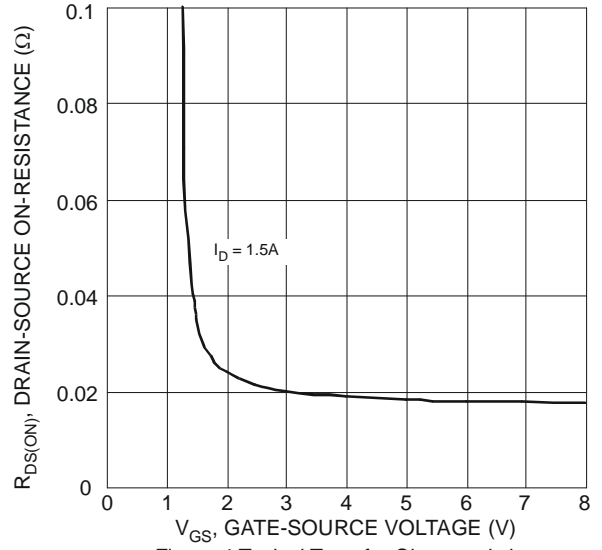


Figure 4 Typical Transfer Characteristics

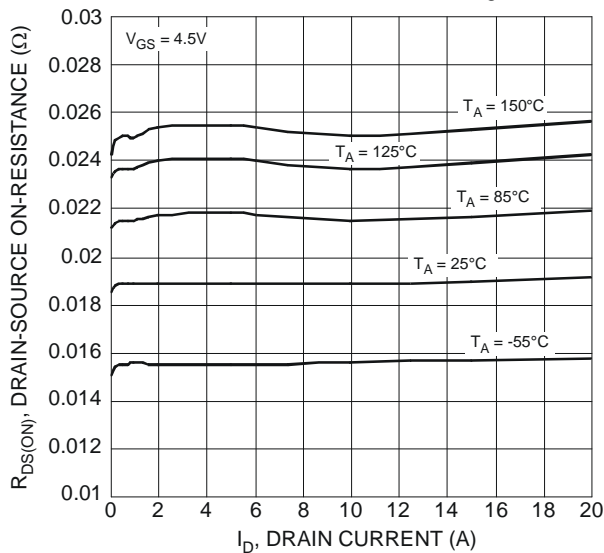


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

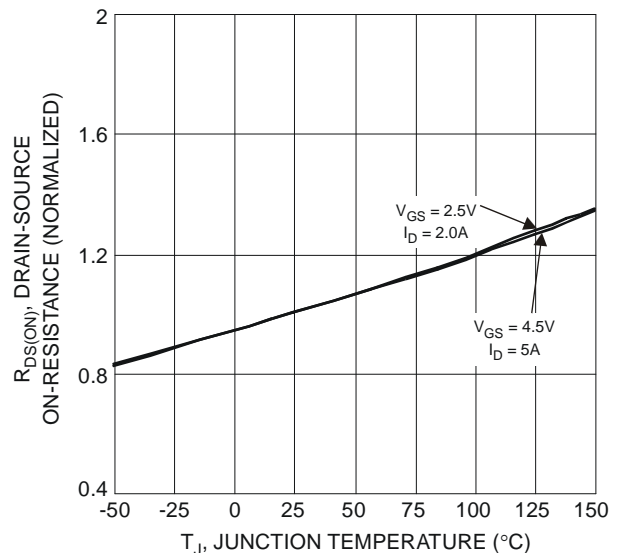


Figure 6 On-Resistance Variation with Temperature

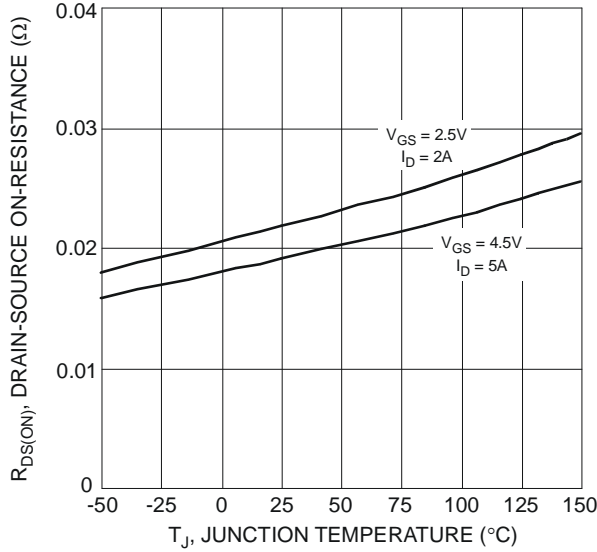


Figure 7 On-Resistance Variation with Temperature

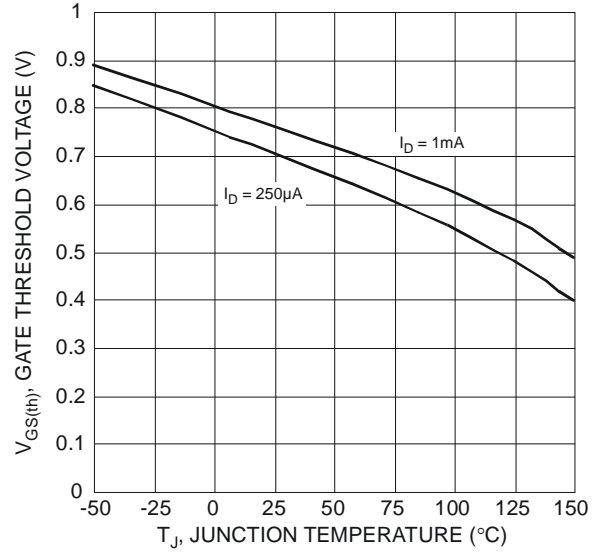


Figure 8 Gate Threshold Variation vs. Ambient Temperature

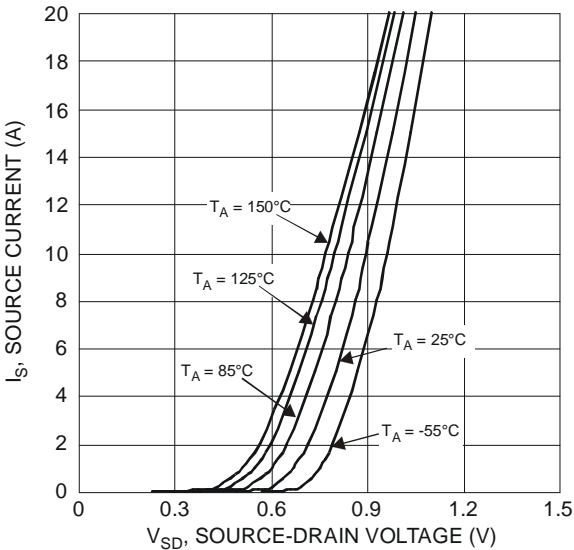


Figure 9 Diode Forward Voltage vs. Current

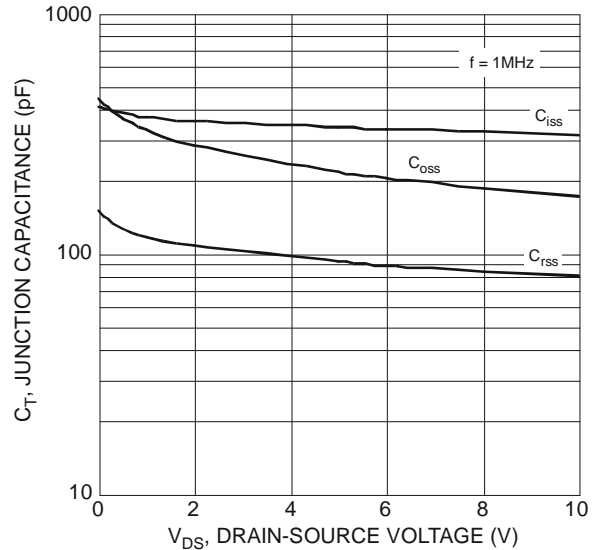


Figure 10 Typical Junction Capacitance

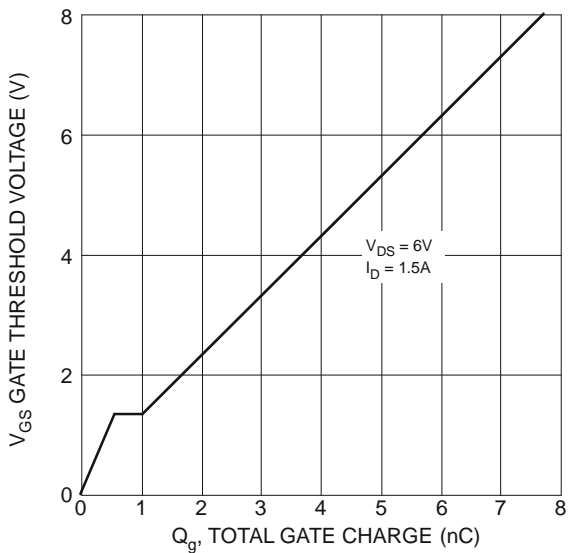


Figure 11 Gate Charge

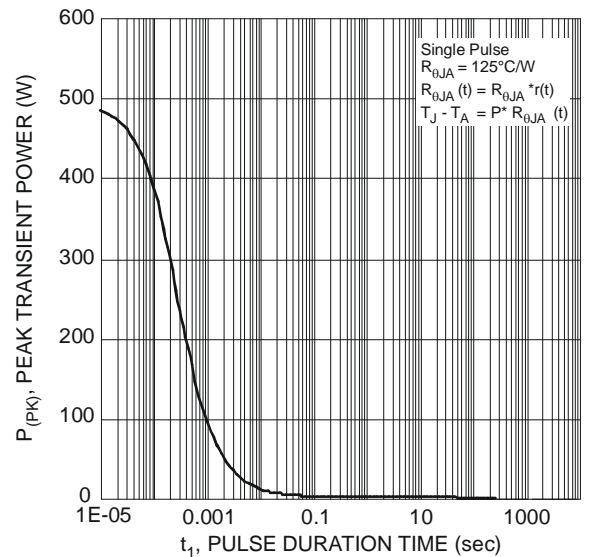


Figure 12 Single Pulse Maximum Power Dissipation

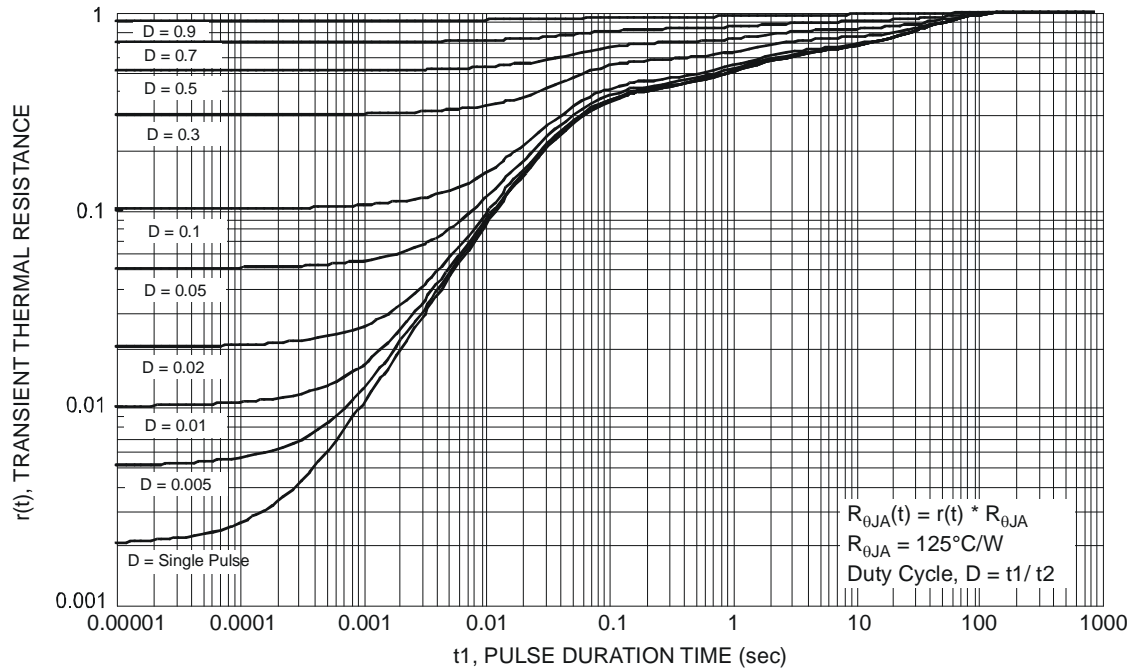
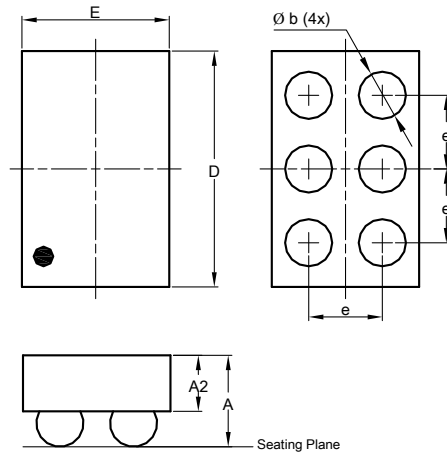


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

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

**U-WLB1510-6**

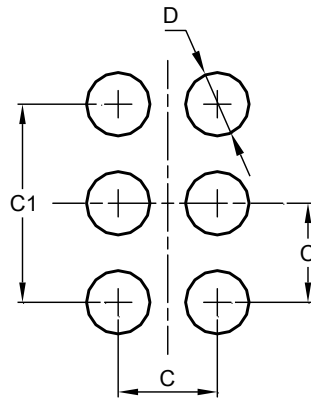


U-WLB1510-6			
Dim	Min	Max	Typ
A	—	0.62	—
A2	—	—	0.038
b	0.27	0.37	0.32
D	1.40	1.50	1.50
E	0.90	1.00	1.00
e	—	—	0.50
All Dimensions in mm			

**Suggested Pad Layout**

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

**U-WLB1510-6**



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

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