

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

| $V_{DS}$ | $R_{DS(on)}$  | $Q_g$ | $Q_{gd}$ | $I_D$ |
|----------|---------------|-------|----------|-------|
| -8V      | 8.2m $\Omega$ | 8.1nC | 1.8nC    | -10A  |

**Description**

This 3<sup>rd</sup> generation Lateral MOSFET (LD-MOS) is engineered to minimize on-state losses and switch ultra-fast, making it ideal for high-efficiency power transfer. It uses Chip-Scale Package (CSP) to increase power density by combining low thermal impedance with minimal  $R_{DS(on)}$  per footprint area.

**Applications**

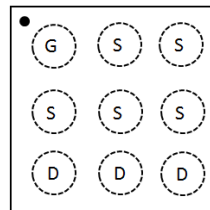
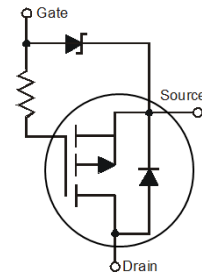
- DC-DC Converters
- Battery Management
- Load Switch

**Features**

- LD-MOS Technology with the Lowest Figure of Merit:  
 $-R_{DS(on)} = 8.2m\Omega$  to Minimize On-State Losses  
 $-Q_g = 8.1nC$  for Ultra-Fast Switching
- $V_{GS(th)} = -0.8V$  typ. for a Low Turn-On Potential
- CSP with Footprint 1.5mm  $\times$  1.5mm
- Height = 0.60mm for Low Profile
- ESD = 6kV 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

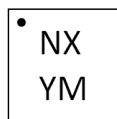
**U-WLB1515-9**

 Top-View  
 Pin Configuration


Equivalent Circuit

**Ordering Information** (Note 4)

| Part Number   | Case        | Packaging         |
|---------------|-------------|-------------------|
| DMP1011UCB9-7 | U-WLB1515-9 | 3,000/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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**
**U-WLB1515-9**


NX = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\overline{Y}$  = Year (ex: B = 2014)  
 M or  $\overline{M}$  = Month (ex: 9 = September)

**Date Code Key**

| Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|------|------|------|------|------|------|------|------|
| Code | Z    | A    | B    | C    | D    | E    | F    |

| 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> | -8           | 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<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -10<br>-8    | A     |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = -4.5V       | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -7.4<br>-6.0 | A     |
| Pulsed Drain Current (Pulse duration 10μs, duty cycle ≤1%)      |              |                                                  | I <sub>DM</sub>  | -50          | A     |
| Continuous Source Pin Current (Note 6)                          |              |                                                  | I <sub>S</sub>   | -2           | —     |
| Pulsed Source Pin Current (Pulse duration 10μs, duty cycle ≤1%) |              |                                                  | I <sub>SM</sub>  | -15          | —     |
| Continuous Gate Current                                         |              |                                                  | I <sub>G</sub>   | -0.5         | 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>                    | 0.89        | W     |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 1.57        | W     |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | +142.1      | °C/W  |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | +80.5       | °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>   | -8   | —    | —     | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                   |
| Gate to Source Voltage                                  | BV <sub>GSS</sub>   | -6   | —    | —     | V    | V <sub>DS</sub> = 0V, I <sub>D</sub> = -250μA                                                   |
| Zero Gate Voltage Drain Current @T <sub>C</sub> = +25°C | I <sub>DSS</sub>    | —    | —    | -1    | μA   | V <sub>DS</sub> = -4.0V, V <sub>GS</sub> = 0V                                                   |
| Gate-Source Leakage                                     | I <sub>GSS</sub>    | —    | —    | -100  | nA   | V <sub>GS</sub> = -4.0V, V <sub>DS</sub> = 0V                                                   |
| <b>ON CHARACTERISTICS (Note 7)</b>                      |                     |      |      |       |      |                                                                                                 |
| Gate Threshold Voltage                                  | V <sub>GS(th)</sub> | -0.4 | -0.8 | -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> | —    | 8.2  | 10    | mΩ   | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2A                                                   |
|                                                         |                     |      | 10   | 13    |      | V <sub>GS</sub> = -3.0V, I <sub>D</sub> = -2A                                                   |
|                                                         |                     |      | 11   | 14    |      | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2A                                                   |
| Forward Transfer Admittance                             | Y <sub>fs</sub>     | —    | 16.8 | —     | S    | V <sub>DS</sub> = -4V, 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>     | —    | 6.3  | —     | nC   | V <sub>dd</sub> = -5V, I <sub>F</sub> = -2A,                                                    |
| Reverse Recovery Time                                   | t <sub>rr</sub>     | —    | 18.5 | —     | ns   | di/dt = 200A/μs                                                                                 |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>                 |                     |      |      |       |      |                                                                                                 |
| Input Capacitance                                       | C <sub>iss</sub>    | —    | 817  | 1,060 | pF   | V <sub>DS</sub> = -4V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                      |
| Output Capacitance                                      | C <sub>oss</sub>    | —    | 595  | 770   | pF   |                                                                                                 |
| Reverse Transfer Capacitance                            | C <sub>rss</sub>    | —    | 269  | 350   | pF   |                                                                                                 |
| Series Gate Resistance                                  | R <sub>G</sub>      | —    | 1.9  | —     | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                          |
| Total Gate Charge (-4.5V)                               | Q <sub>g</sub>      | —    | 8.1  | 10.5  | nC   | V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -4V,<br>I <sub>D</sub> = -2A                         |
| Gate-Source Charge                                      | Q <sub>gs</sub>     | —    | 0.9  | —     | nC   |                                                                                                 |
| Gate-Drain Charge                                       | Q <sub>gd</sub>     | —    | 1.8  | —     | nC   |                                                                                                 |
| Turn-On Delay Time                                      | t <sub>D(on)</sub>  | —    | 6.2  | 10    | ns   | V <sub>DD</sub> = -4V, V <sub>GS</sub> = -4.5V,<br>I <sub>DS</sub> = -2A, R <sub>G</sub> = 10Ω, |
| Turn-On Rise Time                                       | t <sub>r</sub>      | —    | 22.6 | —     | ns   |                                                                                                 |
| Turn-Off Delay Time                                     | t <sub>D(off)</sub> | —    | 30.1 | 48    | ns   |                                                                                                 |
| Turn-Off Fall Time                                      | t <sub>f</sub>      | —    | 22.7 | —     | ns   |                                                                                                 |

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

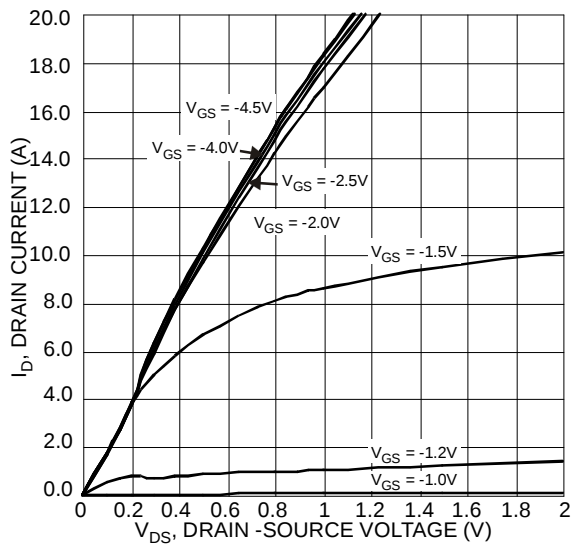


Figure 1 Typical Output Characteristics

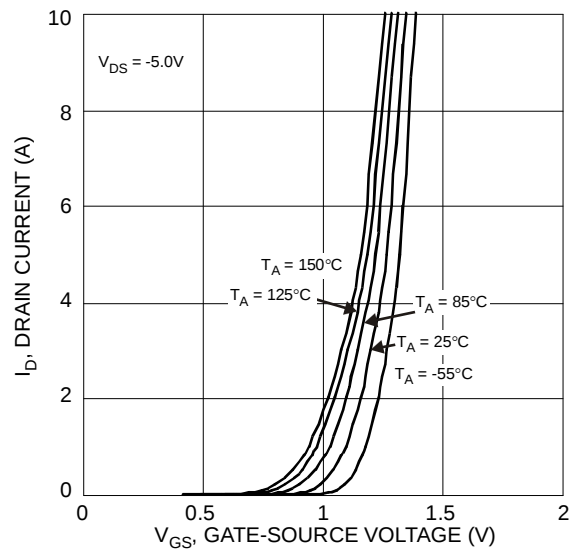


Figure 2 Typical Transfer Characteristics

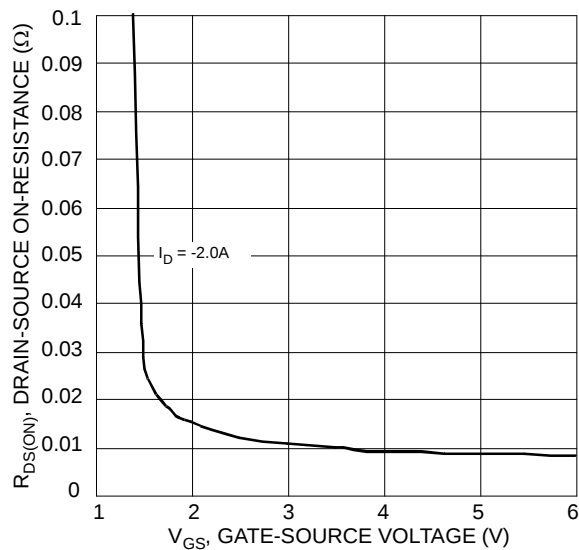


Figure 3 Typical Transfer Characteristic

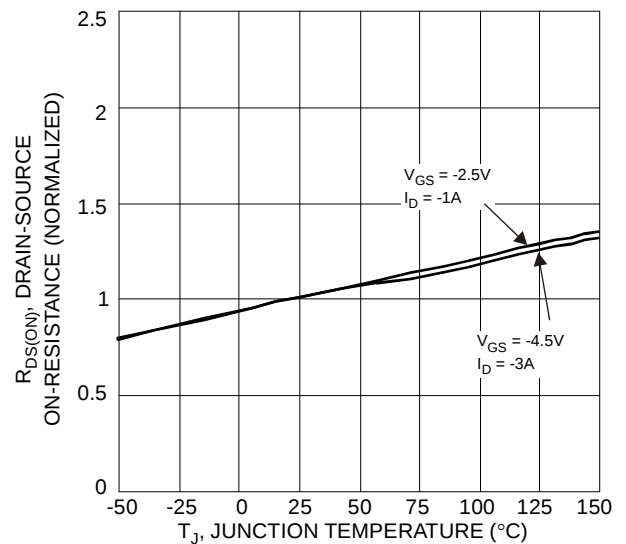


Figure 4 On-Resistance Variation with Temperature

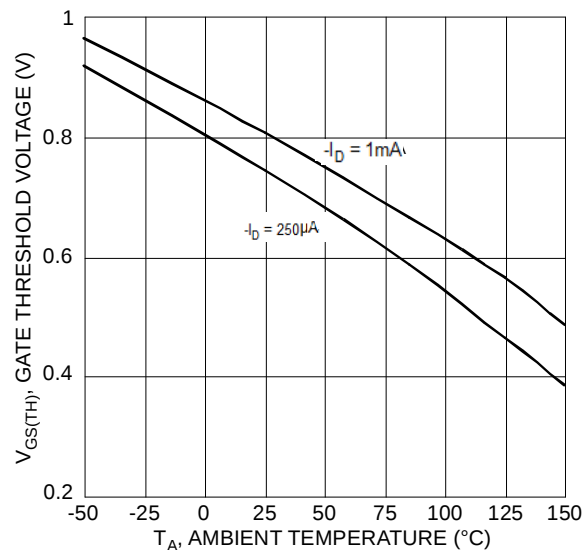


Figure 5 Gate Threshold Variation vs. Ambient Temperature

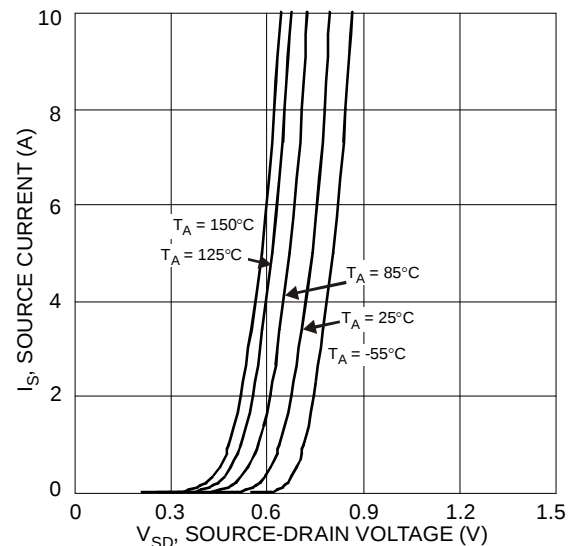
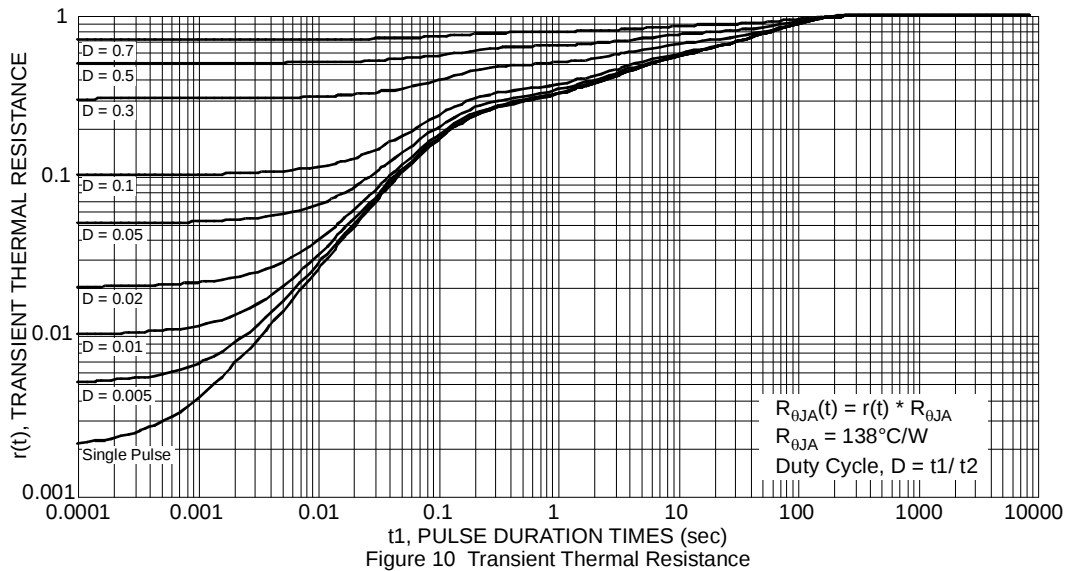
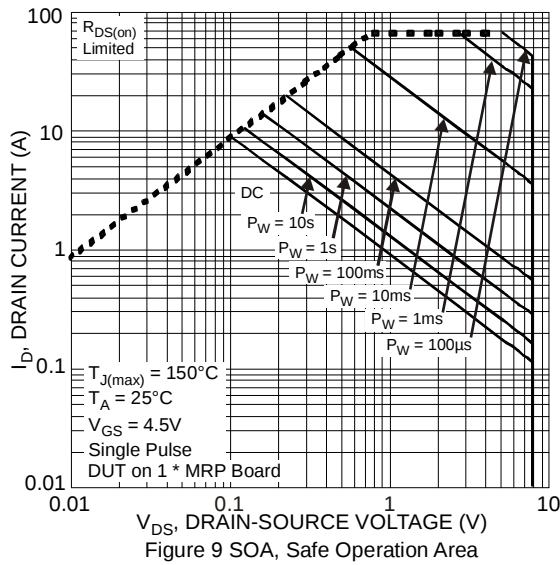
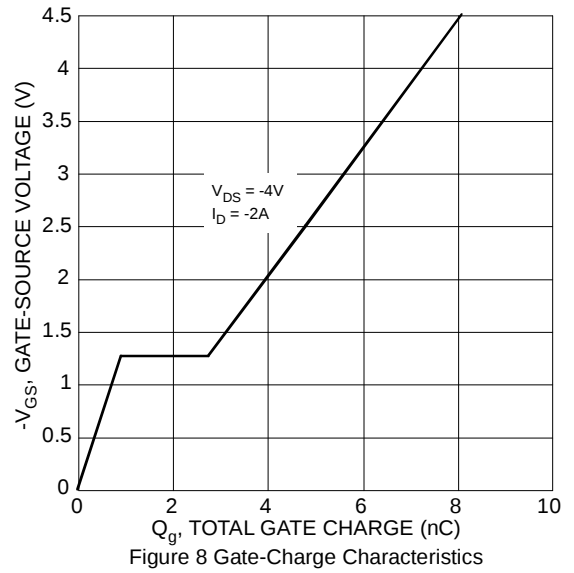
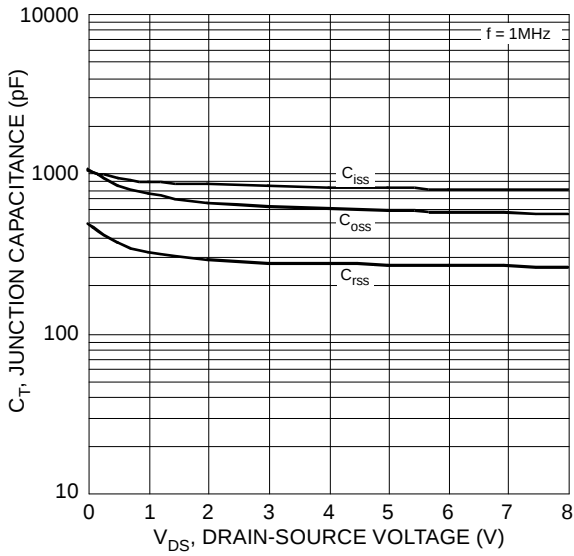
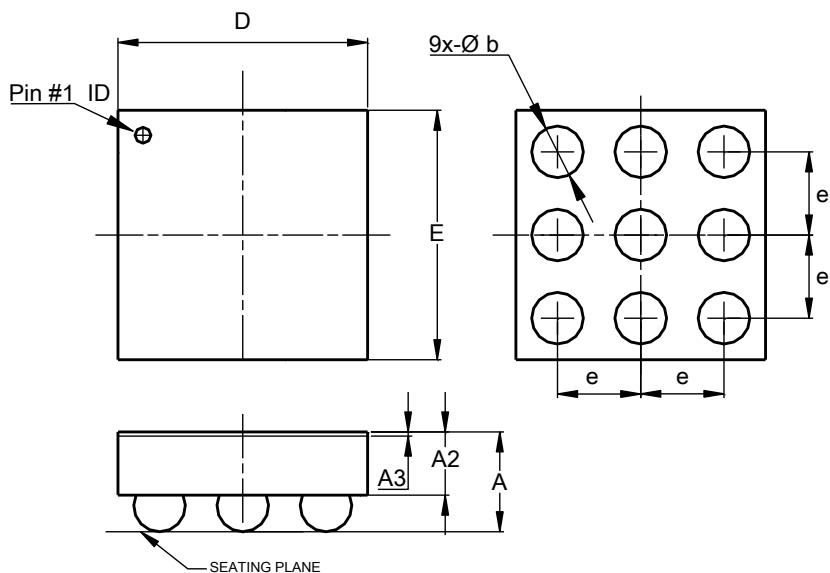


Figure 6 Diode Forward Voltage vs. Current



## Package Outline Dimensions

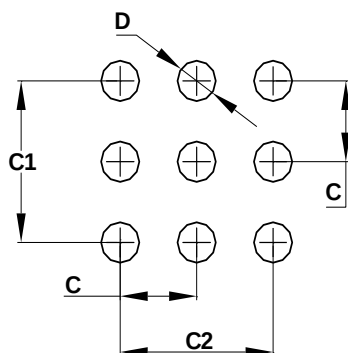
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| U-WLB1515-9          |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | -     | 0.60  | -     |
| A2                   | -     | 0.36  | 0.36  |
| A3                   | 0.020 | 0.030 | 0.025 |
| b                    | 0.22  | 0.32  | 0.27  |
| D                    | 1.47  | 1.50  | 1.49  |
| E                    | 1.47  | 1.50  | 1.49  |
| e                    | -     | -     | 0.50  |
| 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          | 0.50          |
| C1         | 1.00          |
| C2         | 1.00          |
| D          | 0.25          |

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