

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$                   | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------------|------------------------------|
| 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

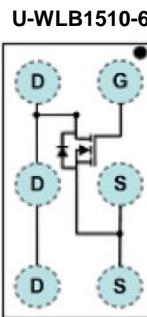
- Battery Management
- Load Switch
- Battery Protection

## 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 (e1)
- Weight: 0.0018 grams (Approximate)



Top View

## Ordering Information (Note 4)

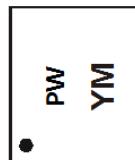
| Part Number   | Case        | Packaging         |
|---------------|-------------|-------------------|
| DMN1016UCB6-7 | U-WLB1510-6 | 3,000/Tape & Reel |

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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   |              |  | Symbol    | Value      | Units |
|--|--------------|--|-----------|------------|-------|
| Drain-Source Voltage                                     |              |  | $V_{DSS}$ | 12         | V     |
| Gate-Source Voltage                                      |              |  | $V_{GSS}$ | $\pm 8$    | V     |
| Continuous Drain Current (Note 5) $V_{GS} = 4.5\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 5.5<br>4.2 | A     |
| Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 6.6<br>5.3 | A     |
| Pulsed Drain Current (Note 7)                            |              |  | $I_{DM}$  | 30         | A     |

**Thermal Characteristics**

| Characteristic                                   | Symbol          | Value       | Units                     |
|--|-----------------|-------------|---------------------------|
| Total Power Dissipation (Note 5)                 | $P_D$           | 0.92        | W                         |
| Total Power Dissipation (Note 6)                 | $P_D$           | 1.47        | W                         |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 136         | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 94          | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$          |

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic   | Symbol       | Min | Typ  | Max       | Unit             | Test Condition   |
|--|--------------|-----|------|-----------|------------------|--|
| <b>OFF CHARACTERISTICS</b> (Note 8)                            |              |     |      |           |                  |  |
| Drain-Source Breakdown Voltage                                 | $BV_{DSS}$   | 12  | —    | —         | V                | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$                                       |
| Zero Gate Voltage Drain Current (@ $T_C = +25^\circ\text{C}$ ) | $I_{DSS}$    | —   | —    | 1.0       | $\mu\text{A}$    | $V_{DS} = 9.6\text{V}, V_{GS} = 0\text{V}$                                       |
| Gate-Source Leakage  | $I_{GSS}$    | —   | —    | $\pm 100$ | nA               | $V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$                                     |
| <b>ON CHARACTERISTICS</b> (Note 8)                             |              |     |      |           |                  |  |
| Gate Threshold Voltage   | $V_{GS(TH)}$ | 0.4 | 0.6  | 1.0       | V                | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$  |
| Static Drain-Source On-Resistance                              | $R_{DS(ON)}$ | —   | 16   | 20        | $\text{m}\Omega$ | $V_{GS} = 4.5\text{V}, I_D = 1.5\text{A}$  |
|  |              | —   | 20   | 23        |                  | $V_{GS} = 2.5\text{V}, I_D = 1.5\text{A}$  |
| Forward Transfer Admittance                                    | $ Y_{FS} $   | —   | 14   | —         | S                | $V_{DS} = 6\text{V}, I_D = 1.5\text{A}$  |
| Diode Forward Voltage (Note 6)                                 | $V_{SD}$     | —   | 0.7  | 1.0       | V                | $V_{GS} = 0\text{V}, I_S = 1.5\text{A}$  |
| Reverse Recovery Charge  | $Q_{RR}$     | —   | 8    | —         | nC               | $V_{DD} = 6\text{V}, I_F = 1.5\text{A}, \frac{dI}{dt} = 200\text{A}/\mu\text{s}$ |
| Reverse Recovery Time  | $t_{RR}$     | —   | 43.6 | —         | ns               |  |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 9)                        |              |     |      |           |                  |  |
| Input Capacitance  | $C_{iss}$    | —   | 423  | 550       | pF               | $V_{DS} = 6\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$                      |
| Output Capacitance   | $C_{oss}$    | —   | 238  | 310       | pF               |  |
| Reverse Transfer Capacitance                                   | $C_{rss}$    | —   | 41   | 55        | pF               | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$                        |
| Series Gate Resistance   | $R_G$        | —   | 3    | —         | $\Omega$         |  |
| Total Gate Charge (4.5V)                                       | $Q_G$        | —   | 4.2  | 5.5       | nC               | $V_{GS} = 4.5\text{V}, V_{DS} = 6\text{V}, I_D = 1.5\text{A}$                    |
| Gate-Source Charge   | $Q_{GS}$     | —   | 0.6  | —         | nC               |  |
| Gate-Drain Charge  | $Q_{GD}$     | —   | 0.4  | —         | nC               |  |
| Turn-On Delay Time   | $t_{D(ON)}$  | —   | 5    | 8         | ns               | $V_{DS} = 6\text{V}, V_{GS} = 4.5\text{V}, R_G = 4\Omega, I_D = 1.5\text{A}$     |
| Turn-On Rise Time  | $t_R$        | —   | 10   | —         | ns               |  |
| Turn-Off Delay Time  | $t_{D(OFF)}$ | —   | 25   | 40        | ns               |  |
| Turn-Off Fall Time   | $t_f$        | —   | 10   | —         | ns               |  |

Notes:

5. Device mounted on FR-4 PCB with minimum recommended pad layout.
6. Device mounted on FR4 material with 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 2-oz (0.071-mm thick) Cu.
7. 300ms pulse, pulse duty cycle<=2%.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to production testing.

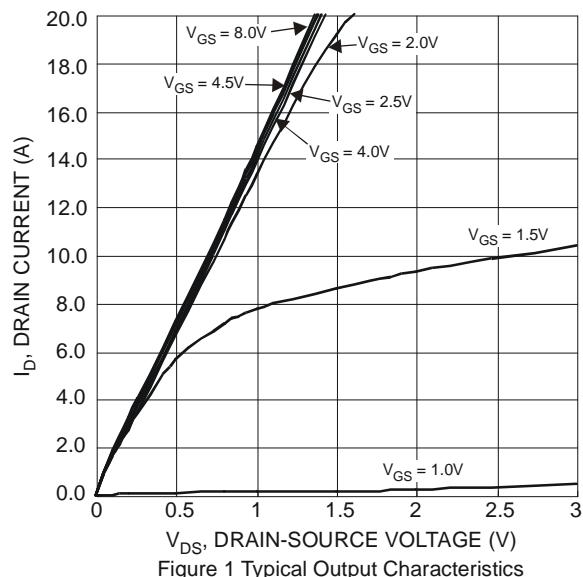


Figure 1 Typical Output Characteristics

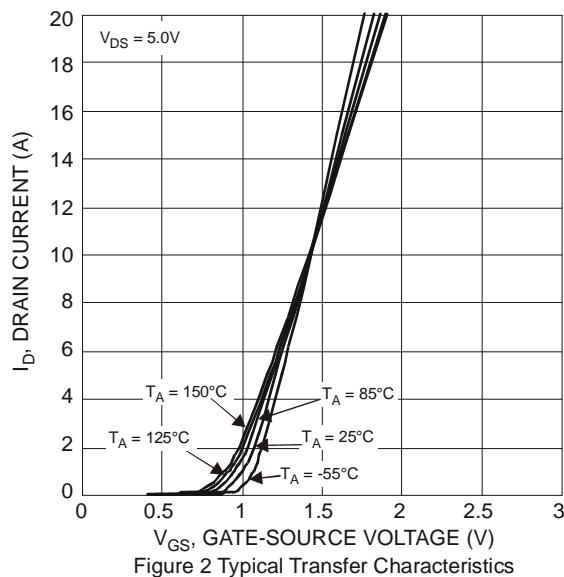


Figure 2 Typical Transfer Characteristics

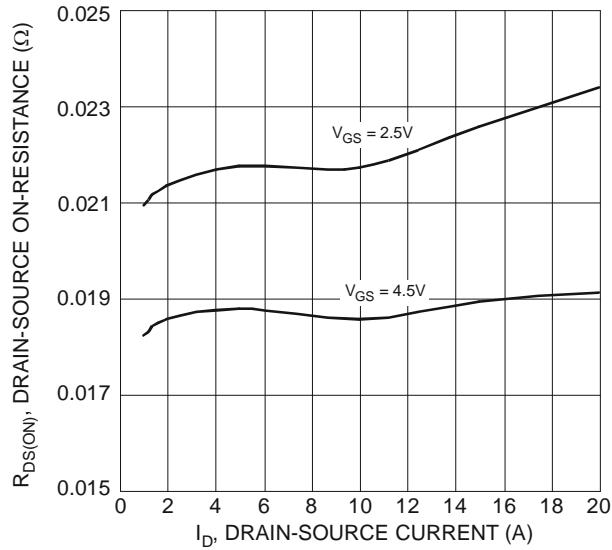


Figure 3 Typical On-Resistance vs.  
Drain Current and Gate Voltage

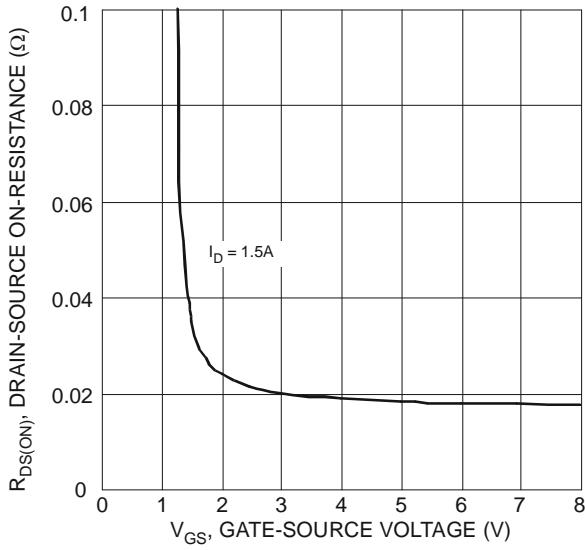


Figure 4 Typical Transfer Characteristics

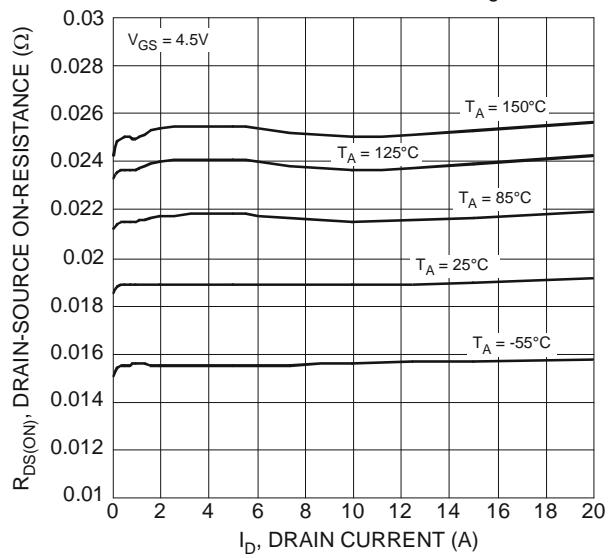


Figure 5 Typical On-Resistance vs.  
Drain Current and Temperature

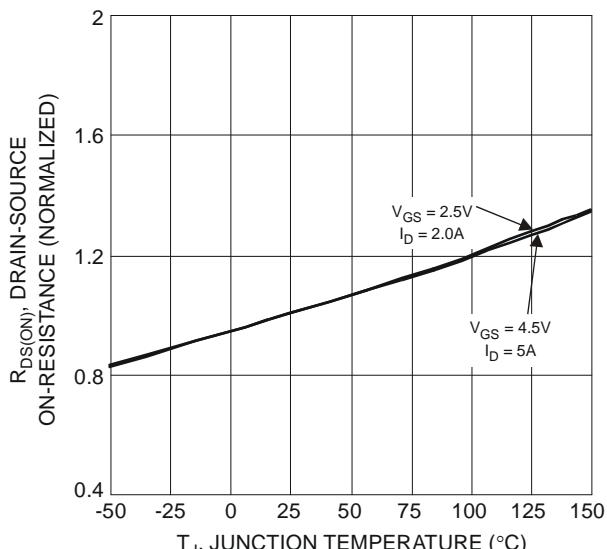
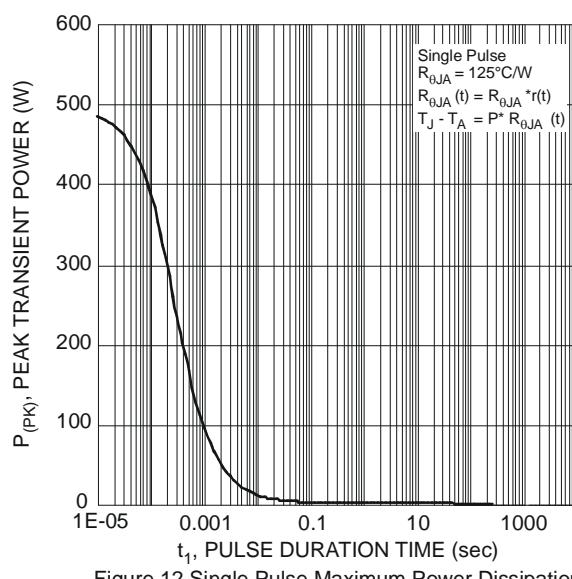
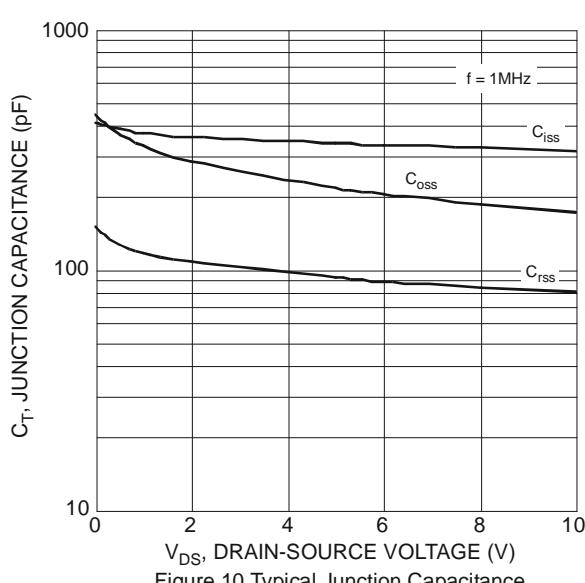
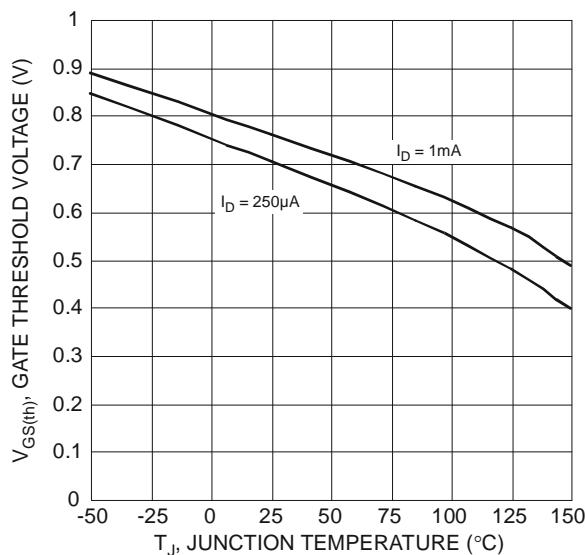
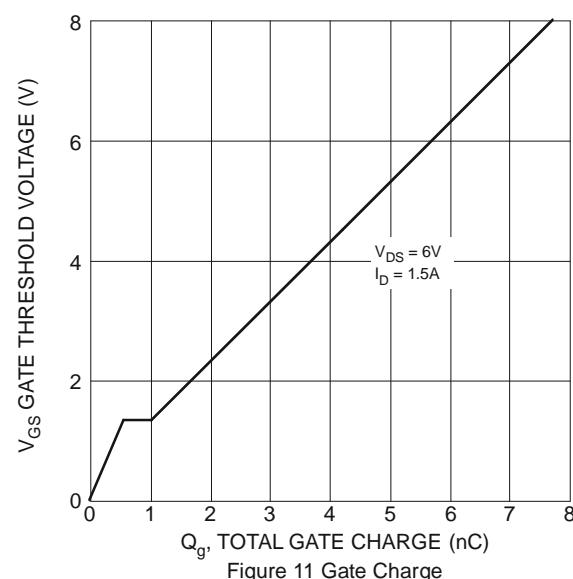
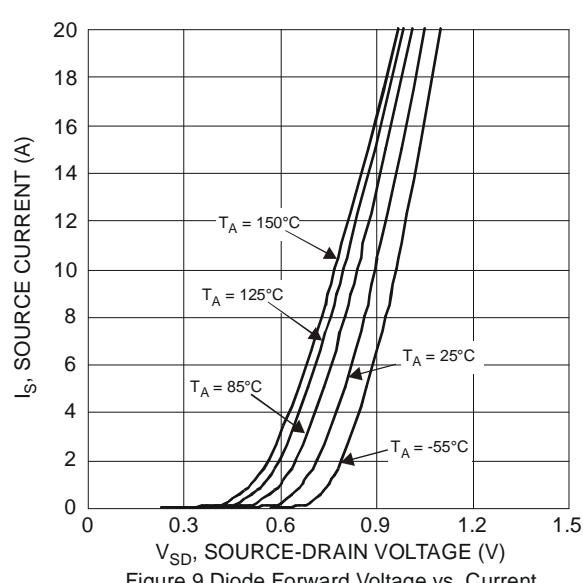
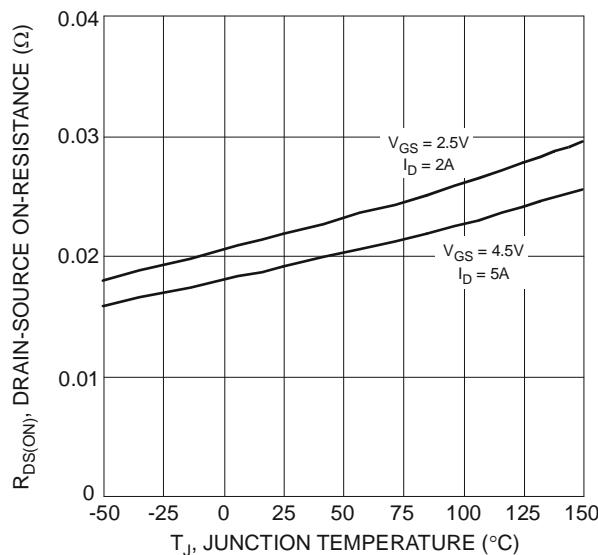


Figure 6 On-Resistance Variation with Temperature



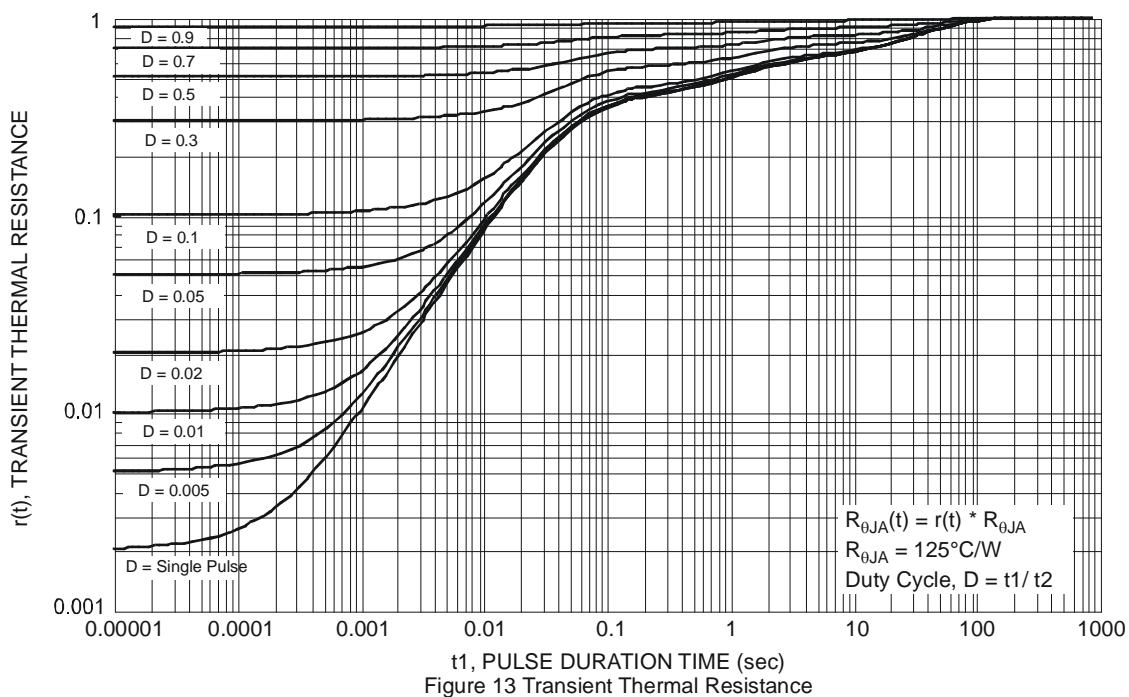
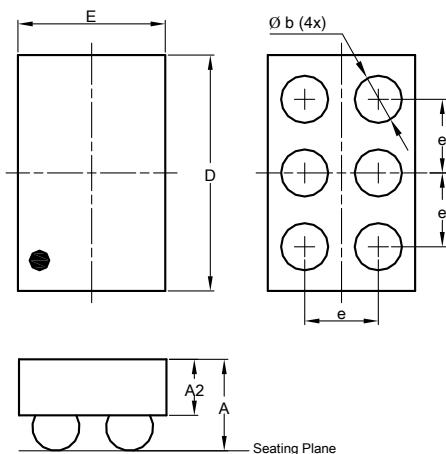


Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

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

U-WLB1510-6



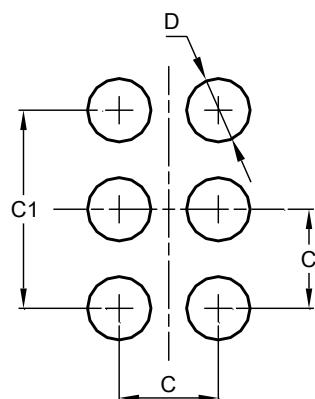
| U-WLB1510-6 |      |      |       |
|-------------|------|------|-------|
| Dim         | Min  | Max  | Typ   |
| <b>A</b>    | —    | 0.62 | —     |
| <b>A2</b>   | —    | —    | 0.038 |
| <b>b</b>    | 0.27 | 0.37 | 0.32  |
| <b>D</b>    | 1.40 | 1.50 | 1.50  |
| <b>E</b>    | 0.90 | 1.00 | 1.00  |
| <b>e</b>    | —    | —    | 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) |
|------------|---------------|
| <b>C</b>   | 0.50          |
| <b>C1</b>  | 1.00          |
| <b>D</b>   | 0.25          |

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