

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max                | $I_D$<br>$T_A = +25^\circ C$ |
|------------|---------------------------------|------------------------------|
| -25V       | 40m $\Omega$ @ $V_{GS} = -4.5V$ | -5.4A                        |

## 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.

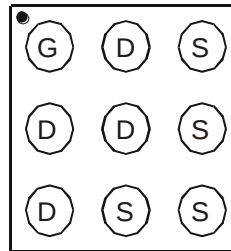
- Battery Management
- Load Switch
- Battery Protection

## Features and Benefits

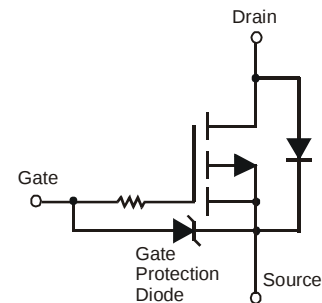
- Low  $Q_g$  &  $Q_{gd}$
- Small Footprint 1.5mm  $\times$  1.5mm
- Gate ESD Protection <HBM Class 3A>
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

- Case: U-WLB1515-9 (Type E)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal: Finish - SnAgCu. Solderable per MIL-STD-202 Method 208 <sup>(e1)</sup>
- Terminal Connections: See Diagram Below
- Weight: 0.0018 grams (Approximate)



Top View  
Pin Configuration



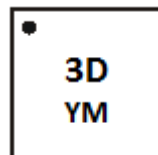
Equivalent Circuit

## Ordering Information (Note 4)

| Part Number   | Case                 | Packaging        |
|---------------|----------------------|------------------|
| DMP2541UCB9-7 | U-WLB1515-9 (Type E) | 3000/Tape & Reel |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  - See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



3D = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: F = 2018)  
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        | Unit |
|-----------------------------------------------------------------|--------------|--------------------------------------------------|------------------|--------------|------|
| Drain-Source Voltage                                            |              |                                                  | V <sub>DSS</sub> | -25          | 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>   | -3.9<br>-3.1 | 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>   | -5.4<br>-4.3 | A    |
| Pulsed Drain Current (Pulse Duration 10μs, Duty Cycle ≤1%)      |              |                                                  | I <sub>DM</sub>  | -35          | A    |
| Continuous Source Pin Current (Note 6)                          |              |                                                  | I <sub>S</sub>   | -1.9         | A    |
| Pulsed Source Pin Current (Pulse Duration 10μs, Duty Cycle ≤1%) |              |                                                  | I <sub>SM</sub>  | -35          | A    |

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

| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 0.94        | W    |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 1.78        | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 135         | °C/W |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 71          | °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>   | -25  | —     | —    | 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   | μA   | V <sub>DS</sub> = -20V, 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 | -0.78 | -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    | 40   | mΩ   | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2A                                               |
|                                                         |                     |      | 36    | 50   |      | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2A                                               |
|                                                         |                     |      | 51    | 60   |      | V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2A                                               |
| Diode Forward Voltage (Note 5)                          | V <sub>SD</sub>     | —    | -0.74 | -1   | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -2A                                                  |
| Reverse Recovery Charge                                 | Q <sub>RR</sub>     | —    | 6.8   | —    | nC   | V <sub>DD</sub> = -9.5V, I <sub>F</sub> = -2A, di/dt = 200A/μs                              |
| Reverse Recovery Time                                   | t <sub>RR</sub>     | —    | 13.6  | —    | ns   |                                                                                             |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>                 |                     |      |       |      |      |                                                                                             |
| Input Capacitance                                       | C <sub>iss</sub>    | —    | 566   | 850  | pF   | V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz                                    |
| Output Capacitance                                      | C <sub>oss</sub>    | —    | 343   | 515  | pF   |                                                                                             |
| Reverse Transfer Capacitance                            | C <sub>rss</sub>    | —    | 20    | 30   | pF   |                                                                                             |
| Series Gate Resistance                                  | R <sub>g</sub>      | —    | 12.1  | 18   | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                      |
| Total Gate Charge                                       | Q <sub>g</sub>      | —    | 4.7   | 7    | nC   | V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V, I <sub>D</sub> = -2A                       |
| Gate-Source Charge                                      | Q <sub>gs</sub>     | —    | 0.6   | —    | nC   |                                                                                             |
| Gate-Drain Charge                                       | Q <sub>gd</sub>     | —    | 1.0   | —    | nC   |                                                                                             |
| Turn-On Delay Time                                      | t <sub>D(ON)</sub>  | —    | 3.4   | 6.8  | 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>      | —    | 6.5   | —    | ns   |                                                                                             |
| Turn-Off Delay Time                                     | t <sub>D(OFF)</sub> | —    | 55    | 110  | ns   |                                                                                             |
| Turn-Off Fall Time                                      | t <sub>F</sub>      | —    | 43    | —    | ns   |                                                                                             |

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout.
  - Device mounted on FR-4 material with 1inch<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.

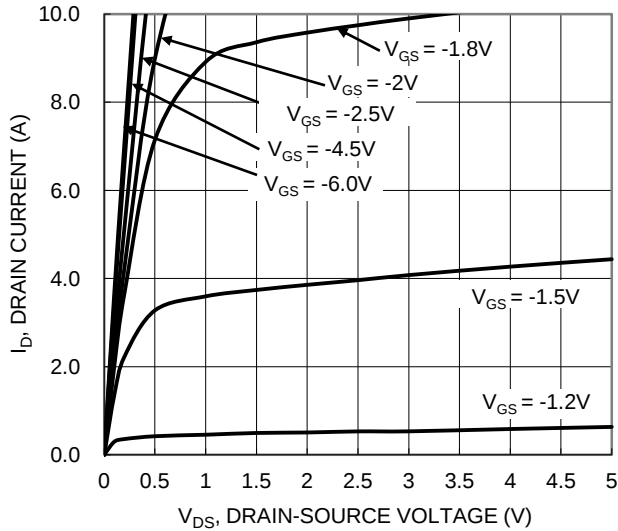


Figure 1. Typical Output Characteristic

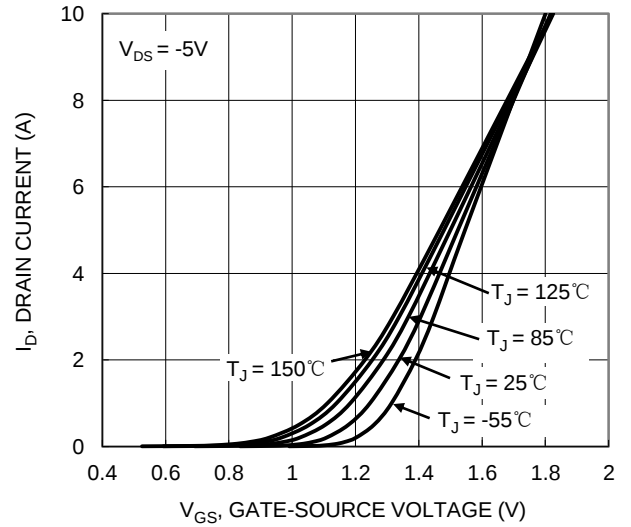


Figure 2. Typical Transfer Characteristic

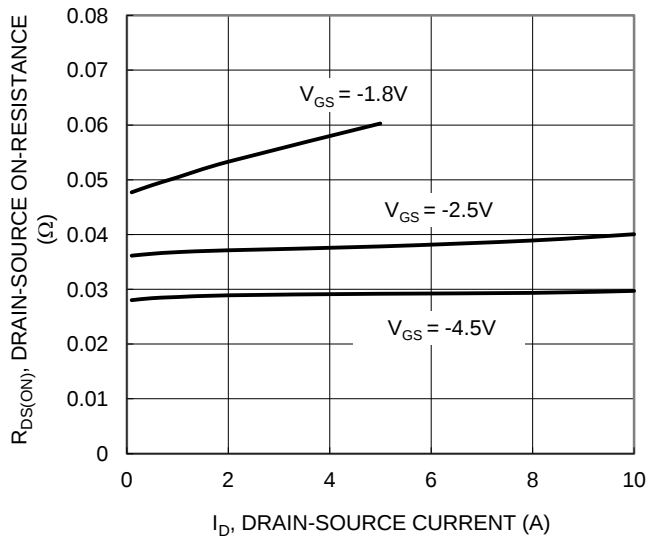


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

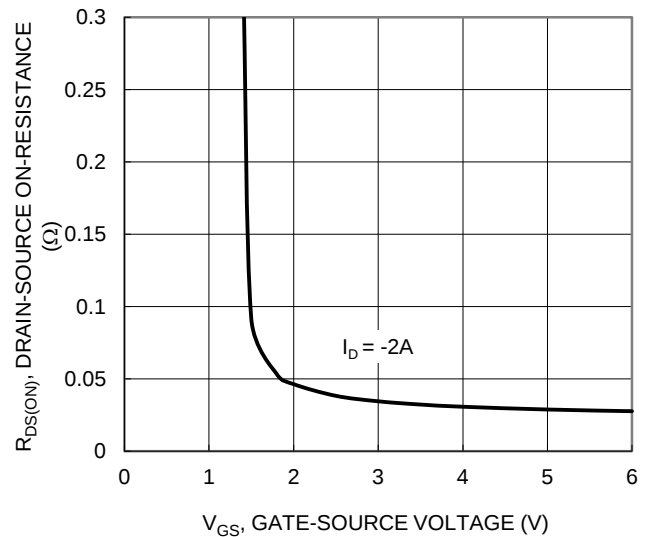


Figure 4. Typical Transfer Characteristic

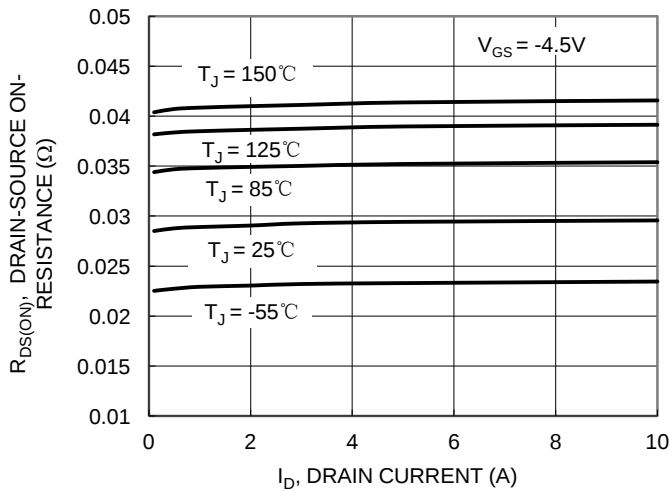


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

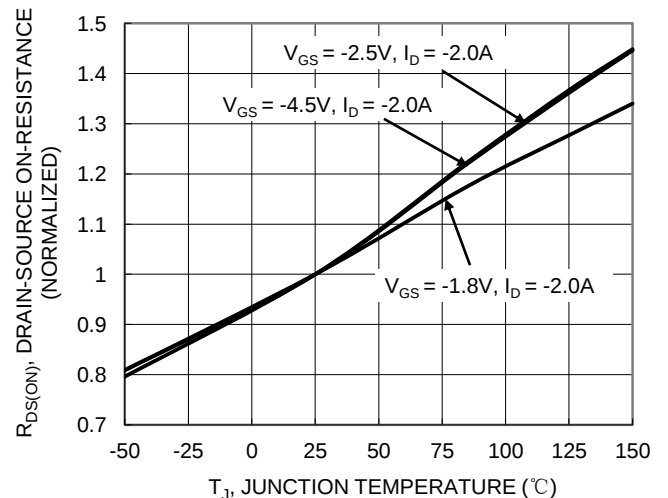


Figure 6. On-Resistance Variation with Junction Temperature

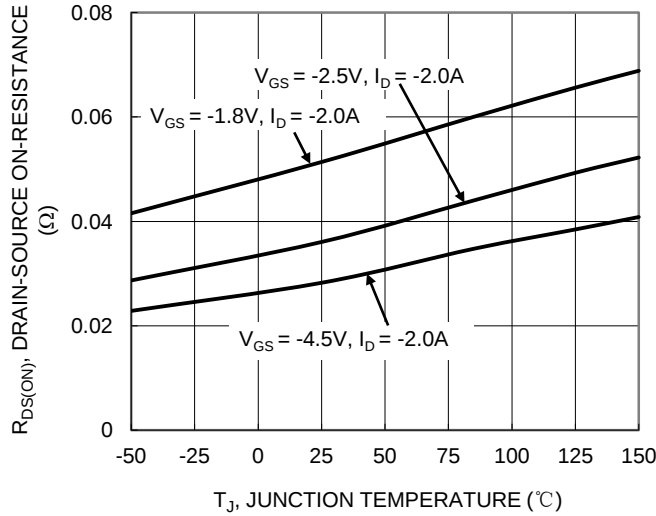


Figure 7. On-Resistance Variation with Junction Temperature

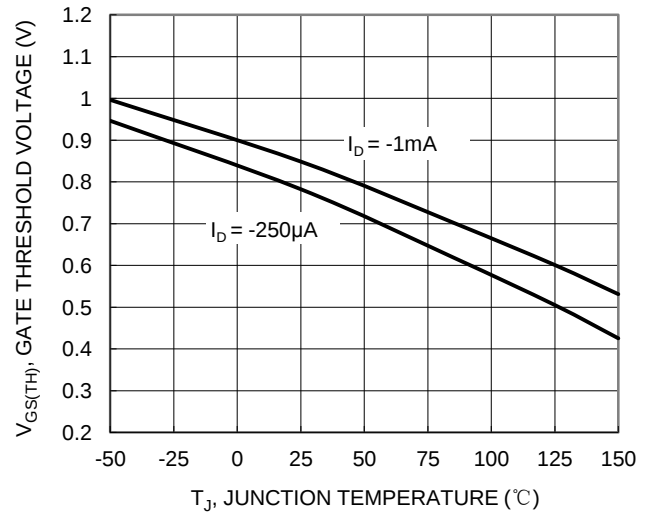


Figure 8. Gate Threshold Variation vs. Junction Temperature

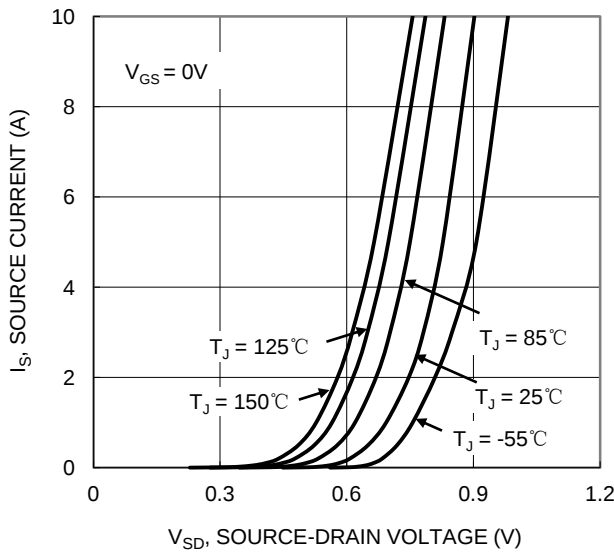


Figure 9. Diode Forward Voltage vs. Current

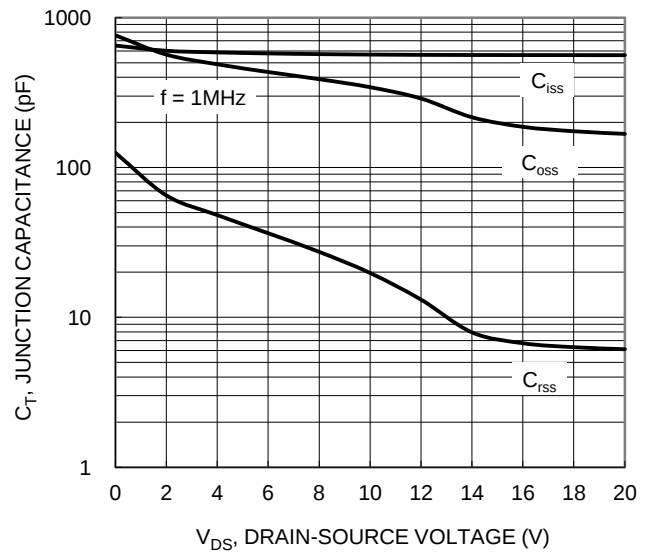


Figure 10. Typical Junction Capacitance

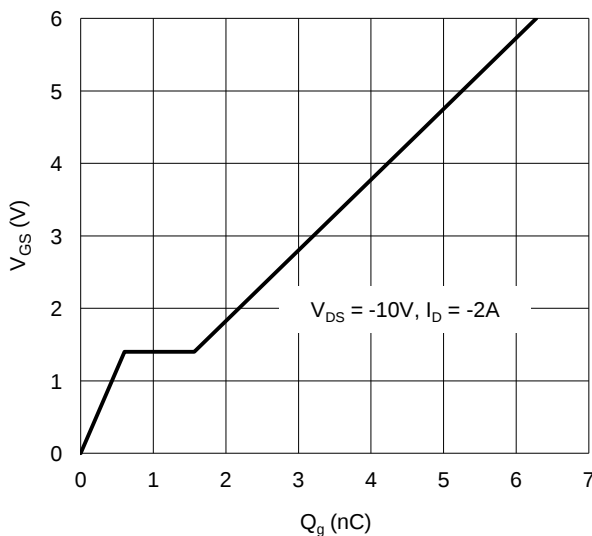


Figure 11. Gate Charge

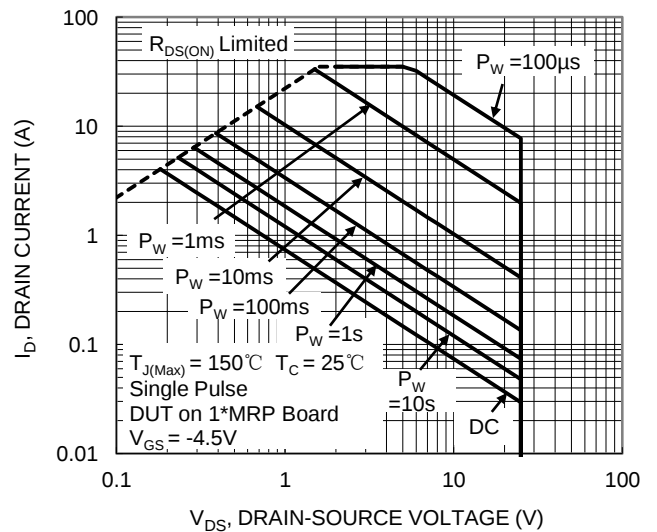


Figure 12. SOA, Safe Operation Area

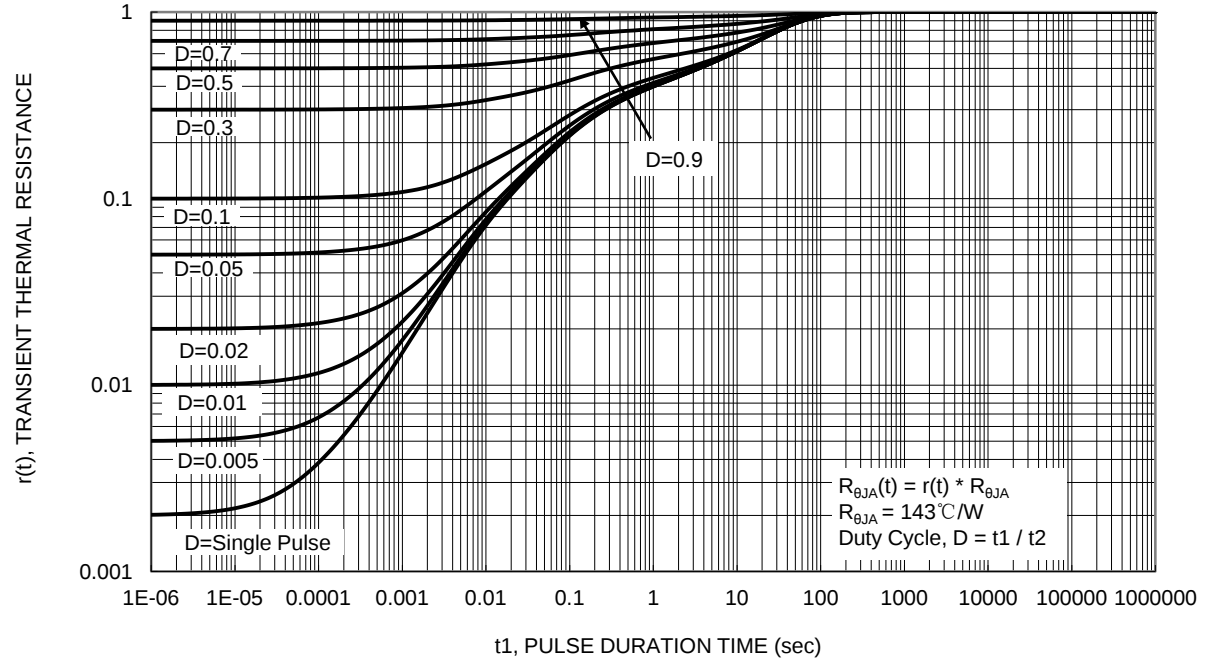
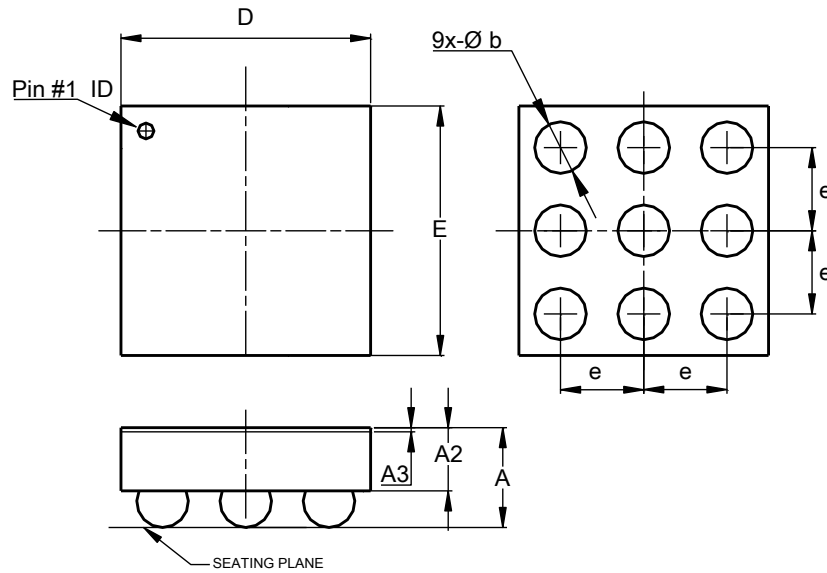


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

**U-WLB1515-9 (Type E)**

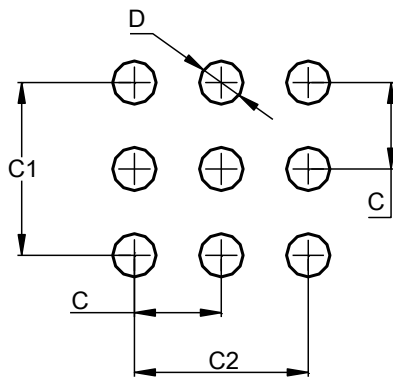


| U-WLB1515-9<br>(Type E) |       |       |       |
|-------------------------|-------|-------|-------|
| Dim                     | Min   | Max   | Typ   |
| A                       | --    | 0.62  | --    |
| A2                      | --    | 0.36  | 0.36  |
| A3                      | 0.020 | 0.030 | 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 <http://www.diodes.com/package-outlines.html> for the latest version.

**U-WLB1515-9 (Type E)**



| Dimensions | Value<br>(in mm) |
|------------|------------------|
| C          | 0.50             |
| C1         | 1.00             |
| C2         | 1.00             |
| D          | 0.25             |

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