

## Product Summary

| Device    | BV <sub>DSS</sub> | R <sub>DS(ON)</sub> MAX       | I <sub>D</sub> MAX<br>T <sub>A</sub> = +25°C |
|-----------|-------------------|-------------------------------|----------------------------------------------|
| N-Channel | 20V               | 40mΩ @ V <sub>GS</sub> = 4.5V | 4.7A                                         |
|           |                   | 65mΩ @ V <sub>GS</sub> = 2.5V | 3.7A                                         |

## Description

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

- Load Switch
- Power Management Functions
- Portable Power Adaptors

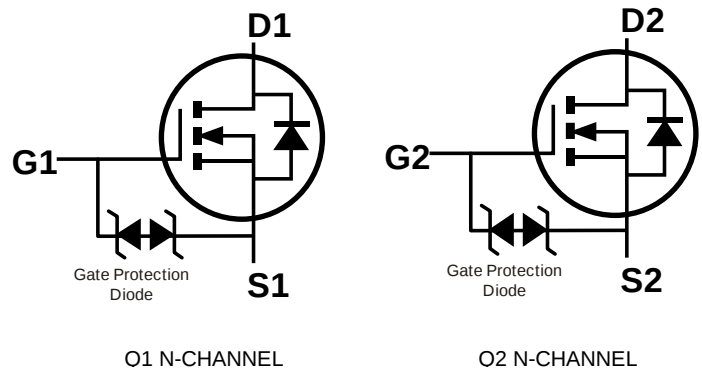
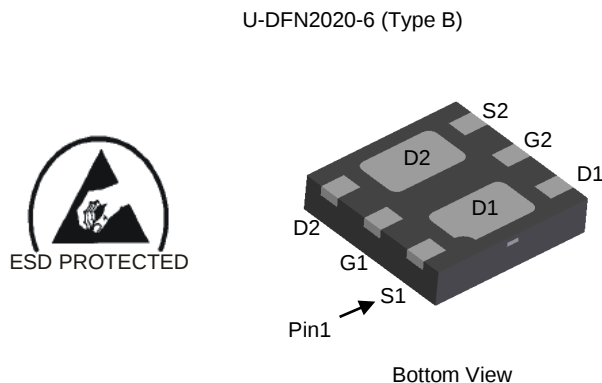
## Features

- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.**

<https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

- Case: U-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 (e4)
- Terminal Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)



Internal Schematic

## Ordering Information (Note 4)

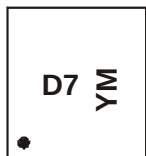
| Part Number    | Case                 | Packaging          |
|----------------|----------------------|--------------------|
| DMN2041UFDB-7  | U-DFN2020-6 (Type B) | 3,000/Tape & Reel  |
| DMN2041UFDB-13 | U-DFN2020-6 (Type B) | 10,000/Tape & Reel |

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

## Marking Information

Site 1

U-DFN2020-6 (Type B)



D7 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: H = 2020)  
 M = Month (ex: 9 = September)

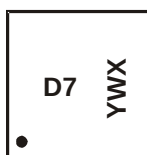
Date Code Key

| Year | 2014 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Code | B    | ... | H    | I    | J    | K    | L    | M    | N    | O    | P    | R    |

| 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   |

Site 2



D7 = Product Type Marking Code  
 YWX = Date Code Marking  
 Y = Year (ex: 0 = 2020)  
 W = Week (ex: a = week 27; z represents week 52 and 53)  
 X = Internal Code (ex: U = Monday)

Date Code Key

| Year | 2014 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Code | 4    | ... | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    |

| Week | 1-26 | 27-52 | 53 |
|------|------|-------|----|
| Code | A-Z  | a-z   | z  |

| Internal Code | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---------------|-----|-----|-----|-----|-----|-----|-----|
| Code          | T   | U   | V   | W   | X   | Y   | Z   |

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

| Characteristic                                           |              |                                                  | Symbol           | Value      | Unit |
|----------------------------------------------------------|--------------|--------------------------------------------------|------------------|------------|------|
| Drain-Source Voltage                                     |              |                                                  | V <sub>DSS</sub> | 20         | V    |
| Gate-Source Voltage                                      |              |                                                  | V <sub>GSS</sub> | ±12        | 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>   | 4.7<br>3.8 | A    |
|                                                          | t < 5s       | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 6.1<br>4.9 | A    |
| Maximum Continuous Body Diode Forward Current (Note 5)   |              |                                                  | I <sub>S</sub>   | 2          | A    |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)       |              |                                                  | I <sub>DM</sub>  | 20         | A    |

**Thermal Characteristics**

| Characteristic                                   |              | Symbol                            | Value       | Unit |
|--------------------------------------------------|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | Steady State | P <sub>D</sub>                    | 1.4         | W    |
|                                                  | t < 5s       |                                   | 2.2         |      |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R <sub>θJA</sub>                  | 92          | °C/W |
|                                                  | t < 5s       |                                   | 55          |      |
| Thermal Resistance, Junction to Case (Note 5)    |              | R <sub>θJC</sub>                  | 30          |      |
| 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 6)</b>                    |                     |      |      |     |      |                                                                                              |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | 20   | —    | —   | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                 |
| Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C | I <sub>DSS</sub>    | —    | —    | 1.0 | μA   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V                                                  |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —    | —    | ±10 | μA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V                                                  |
| <b>ON CHARACTERISTICS (Note 6)</b>                     |                     |      |      |     |      |                                                                                              |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | 0.35 | —    | 1.4 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                   |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | —    | 23   | 40  | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.2A                                                |
|                                                        |                     | —    | 26   | 65  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 3.3A                                                |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —    | 0.75 | 1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 4.4A                                                  |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b>                |                     |      |      |     |      |                                                                                              |
| Input Capacitance                                      | C <sub>iss</sub>    | —    | 713  | —   | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                   |
| Output Capacitance                                     | C <sub>oss</sub>    | —    | 80   | —   | pF   |                                                                                              |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —    | 68   | —   | pF   |                                                                                              |
| Gate Resistance                                        | R <sub>g</sub>      | —    | 15   | —   | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                         |
| Total Gate Charge (V <sub>GS</sub> = 4.5V)             | Q <sub>g</sub>      | —    | 8    | —   | nC   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 5.5A                                                 |
| Total Gate Charge (V <sub>GS</sub> = 8V)               |                     | —    | 15   | —   | nC   |                                                                                              |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —    | 1.0  | —   | nC   |                                                                                              |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —    | 1.1  | —   | nC   |                                                                                              |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | —    | 3.6  | —   | ns   | V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V,<br>R <sub>L</sub> = 2.3Ω, R <sub>G</sub> = 1Ω |
| Turn-On Rise Time                                      | t <sub>r</sub>      | —    | 15.9 | —   | ns   |                                                                                              |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | —    | 16.0 | —   | ns   |                                                                                              |
| Turn-Off Fall Time                                     | t <sub>f</sub>      | —    | 2.6  | —   | ns   |                                                                                              |
| Body Diode Reverse Recovery Time                       | t <sub>RR</sub>     | —    | 6.6  | —   | ns   | I <sub>S</sub> = 4.4A, dI/dt = 100A/μs                                                       |
| Body Diode Reverse Recovery Charge                     | Q <sub>RR</sub>     | —    | 1.2  | —   | nC   | I <sub>S</sub> = 4.4A, dI/dt = 100A/μs                                                       |

Notes: 5. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.  
6. Short duration pulse test used to minimize self-heating effect.  
7. Guaranteed by design. Not subject to product testing.

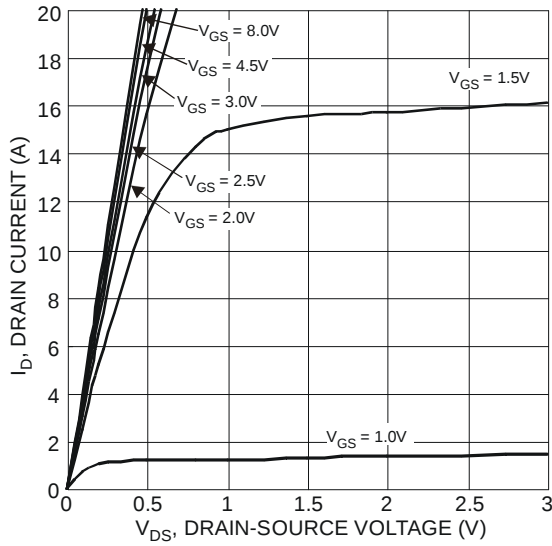


Figure 1 Typical Output Characteristics

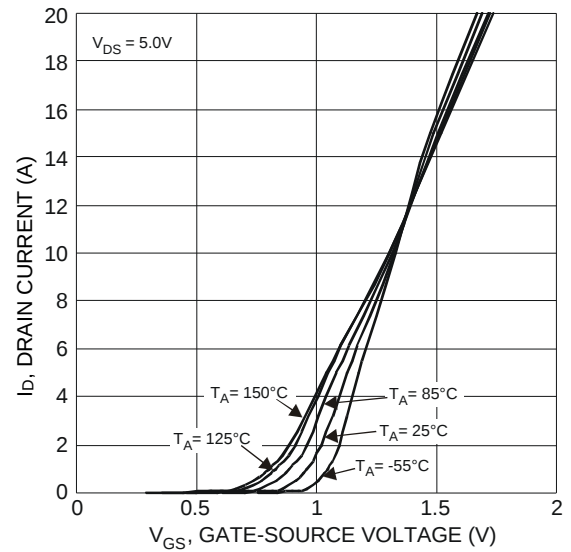


Figure 2 Typical Transfer Characteristics

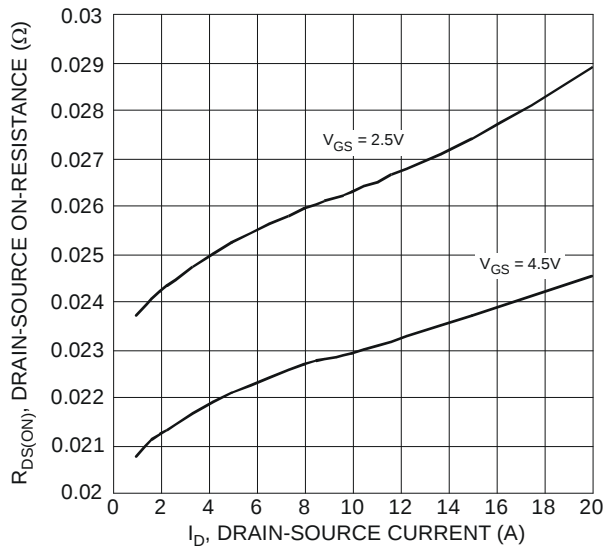


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

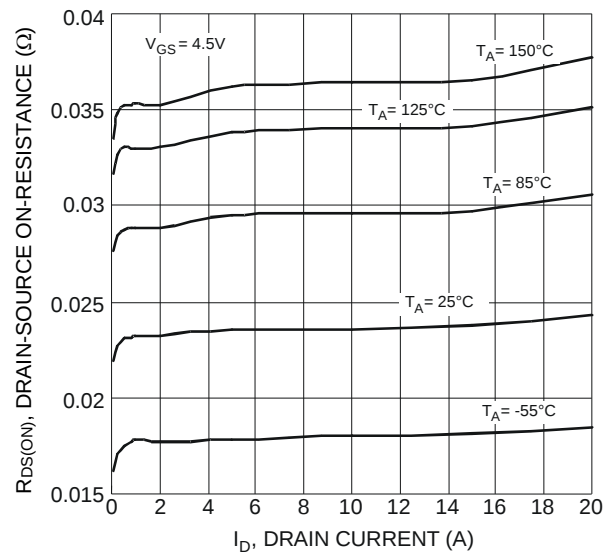


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

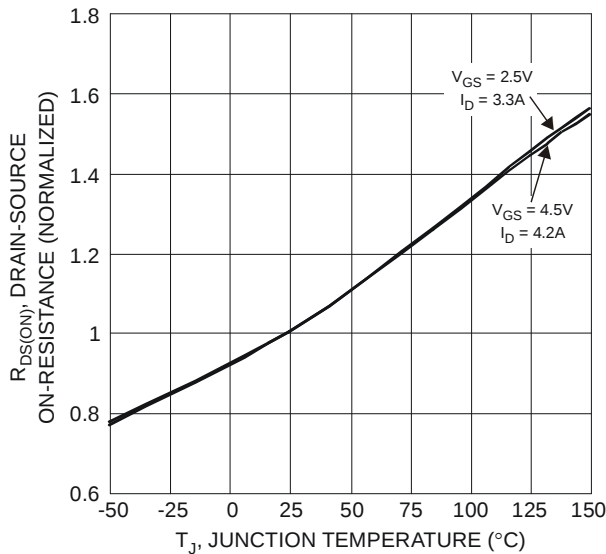


Figure 5 On-Resistance Variation with Temperature

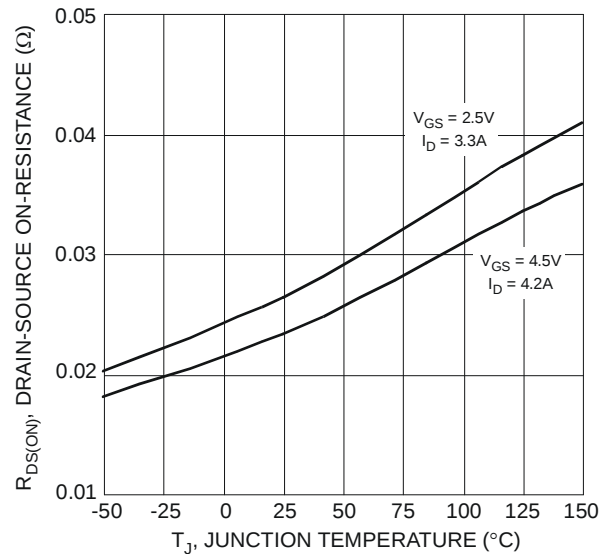


Figure 6 On-Resistance Variation with Temperature

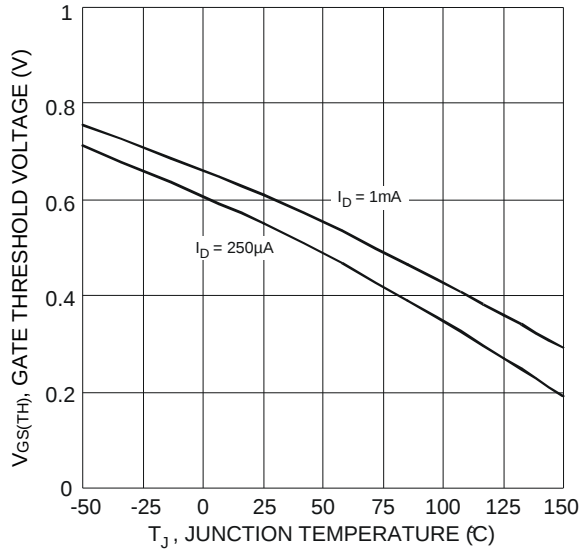


Figure 7 Gate Threshold Variation vs. Junction Temperature

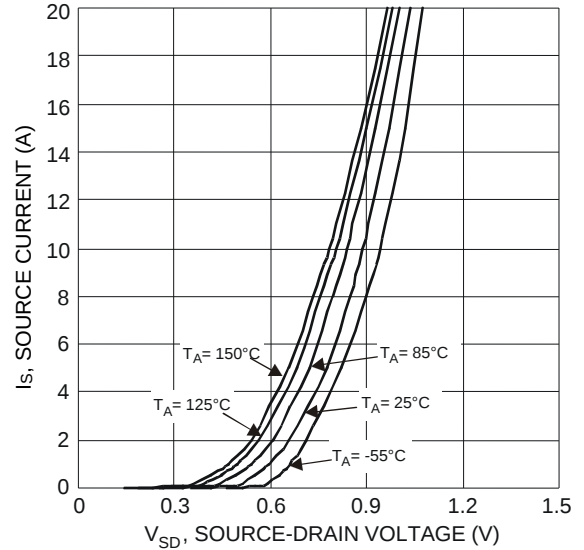


Figure 8 Diode Forward Voltage vs. Current

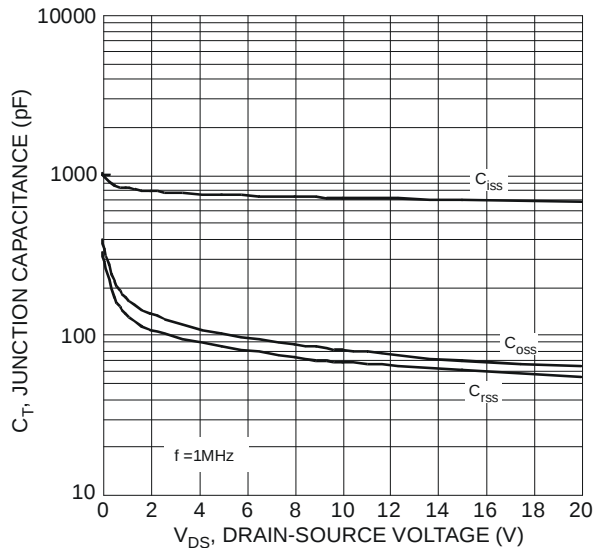


Figure 9 Typical Junction Capacitance

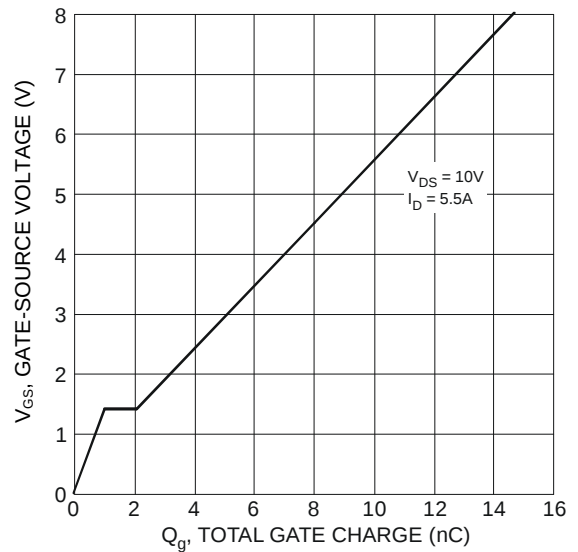


Figure 10 Gate Charge

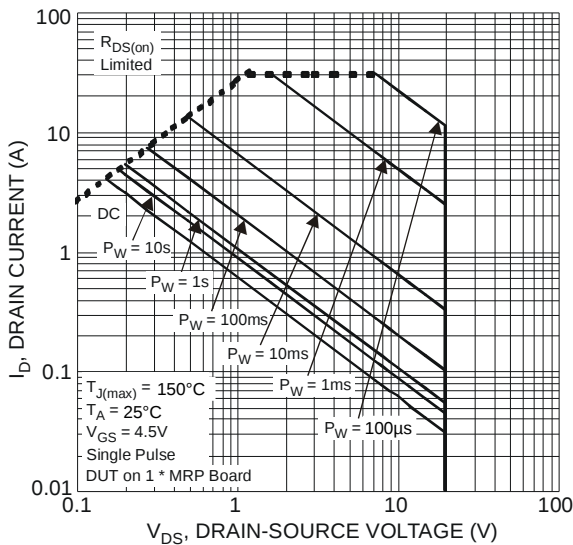


Figure 11 SOA Safe Operation Area

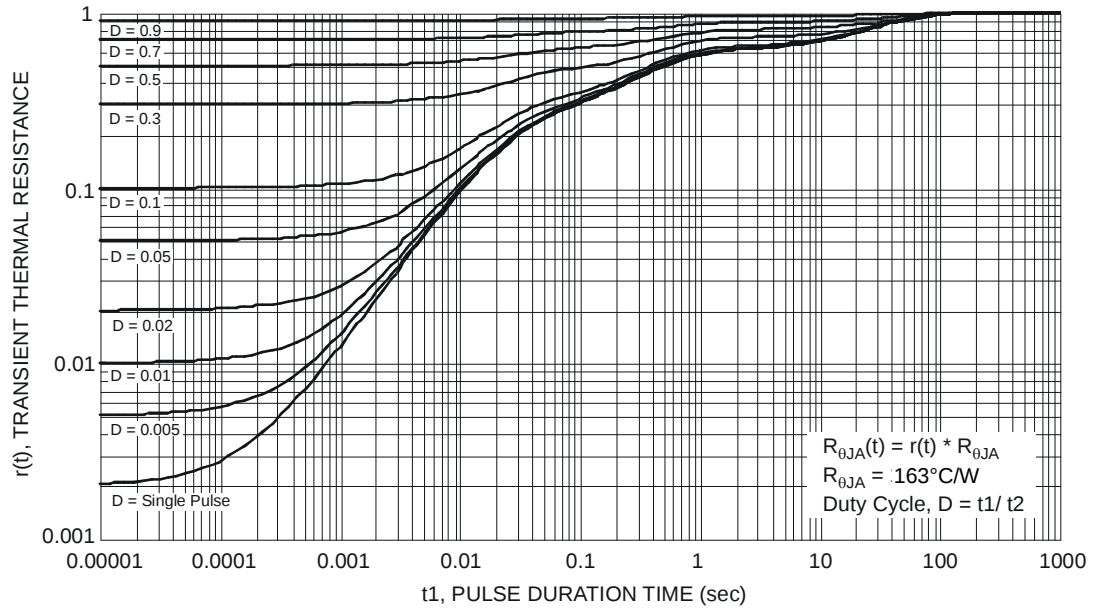
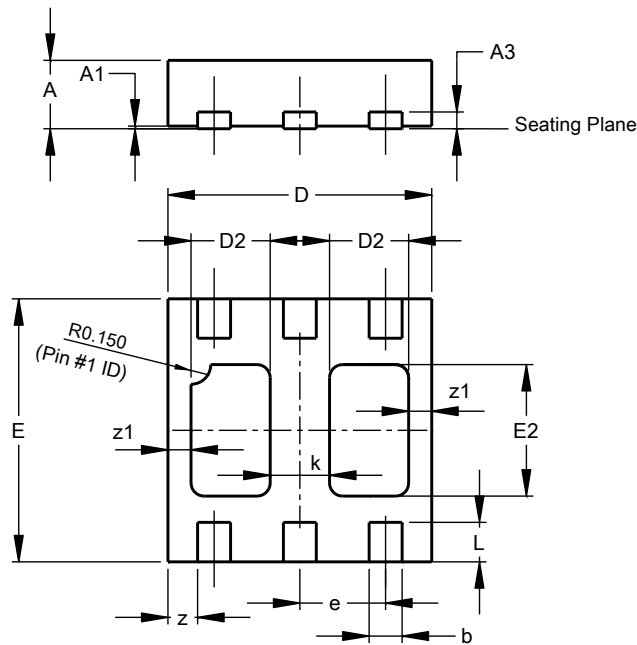


Figure 12 Transient Thermal Resistance

## Package Outline Dimensions

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

U-DFN2020-6 (Type B)

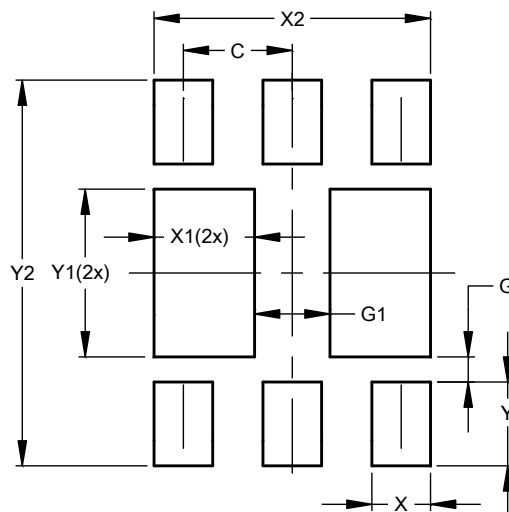


| U-DFN2020-6<br>Type B |       |       |       |
|-----------------------|-------|-------|-------|
| Dim                   | Min   | Max   | Typ   |
| A                     | 0.545 | 0.605 | 0.575 |
| A1                    | 0.00  | 0.05  | 0.02  |
| A3                    | -     | -     | 0.13  |
| b                     | 0.20  | 0.30  | 0.25  |
| D                     | 1.95  | 2.075 | 2.00  |
| D2                    | 0.50  | 0.70  | 0.60  |
| e                     | -     | -     | 0.65  |
| E                     | 1.95  | 2.075 | 2.00  |
| E2                    | 0.90  | 1.10  | 1.00  |
| k                     | -     | -     | 0.45  |
| L                     | 0.25  | 0.35  | 0.30  |
| z                     | -     | -     | 0.225 |
| z1                    | -     | -     | 0.175 |
| All Dimensions in mm  |       |       |       |

## Suggested Pad Layout

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

U-DFN2020-6 (Type B)



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 0.150         |
| G1         | 0.450         |
| X          | 0.350         |
| X1         | 0.600         |
| X2         | 1.650         |
| Y          | 0.500         |
| Y1         | 1.000         |
| Y2         | 2.300         |

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