

## Product Summary

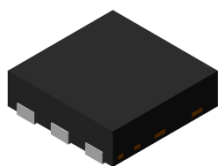
| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-------------------|--------------------------------|----------------------------------------------|
| 40V               | 11.5mΩ @ V <sub>GS</sub> = 10V | 11.6A                                        |
|                   | 18mΩ @ V <sub>GS</sub> = 4.5V  | 9.3A                                         |

## Description

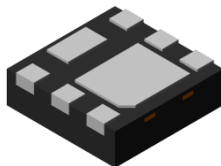
This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications:

- Power Management Functions
- DC-DC Converters
- Backlighting

U-DFN2020-6 (SWP) (Type F)



Top View



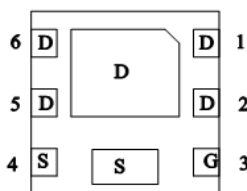
Bottom View

## Features

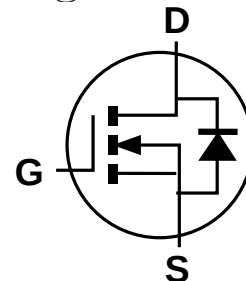
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching, Test in Production – Ensures More Reliable and Robust End Application
- Low R<sub>DS(ON)</sub> – Ensures On State Losses Are Minimized
- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- **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**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMTH4008LFDFWQ](#))**

## Mechanical Data

- Case: U-DFN2020-6 (SWP) (Type F)
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.007 grams (Approximate)



Pin Out  
Bottom View



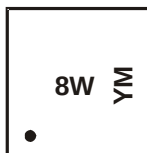
Internal Schematic

## Ordering Information (Note 4)

| Part Number      | Case                       | Quantity Per Reel |
|------------------|----------------------------|-------------------|
| DMTH4008LFDFW-7  | U-DFN2020-6 (SWP) (Type F) | 3,000             |
| DMTH4008LFDFW-13 | U-DFN2020-6 (SWP) (Type F) | 10,000            |

- 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



8W = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: F = 2018)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|------|------|------|------|------|------|------|------|------|
| Code | E    | F    | G    | H    | I    | J    | K    | L    |

| 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> | 40          | V    |
| Gate-Source Voltage                                             | V <sub>GSS</sub> | ±20         | V    |
| Continuous Drain Current (Note 7) V <sub>GS</sub> = 10V         | I <sub>D</sub>   | 11.6<br>8.2 | A    |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)              | I <sub>DM</sub>  | 80          | A    |
| Continuous Source-Drain Diode Current (Note 7)                  | I <sub>S</sub>   | 2.55        | A    |
| Pulsed Source-Drain Diode Current (10μs Pulse, Duty Cycle = 1%) | I <sub>SM</sub>  | 80          | A    |
| Avalanche Current, L = 0.3mH (Note 8)                           | I <sub>AS</sub>  | 14.7        | A    |
| Avalanche Energy, L = 0.3mH (Note 8)                            | E <sub>AS</sub>  | 32.4        | mJ   |

**Thermal Characteristics**

| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | P <sub>D</sub>                    | 0.99        | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 153         | °C/W |
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 2.35        | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 64.5        | °C/W |
| Thermal Resistance, Junction to Case (Note 7)    | R <sub>θJC</sub>                  | 14.8        | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +175 | °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 9)        |                     |     |      |      |      |                                                                                            |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 40  | —    | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                               |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —   | —    | 1    | μA   | V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V                                                |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —   | —    | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                               |
| <b>ON CHARACTERISTICS</b> (Note 9)         |                     |     |      |      |      |                                                                                            |
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub> | 1   | 1.7  | 3    | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                 |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | —   | 9.1  | 11.5 | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A                                                |
|                                            |                     |     | 12.9 | 18   |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 8.5A                                              |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —   | 0.8  | 1.0  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A                                                 |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 10)   |                     |     |      |      |      |                                                                                            |
| Input Capacitance                          | C <sub>iss</sub>    | —   | 1030 | —    | pF   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V,<br>f = 1MHz                                   |
| Output Capacitance                         | C <sub>oss</sub>    | —   | 324  | —    |      |                                                                                            |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —   | 27   | —    |      |                                                                                            |
| Gate Resistance                            | R <sub>g</sub>      | —   | 1.82 | —    | 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>      | —   | 6.8  | —    | nC   | V <sub>DD</sub> = 20V, I <sub>D</sub> = 10A                                                |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>g</sub>      | —   | 14.2 | —    |      |                                                                                            |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —   | 2.0  | —    |      |                                                                                            |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —   | 2.7  | —    |      |                                                                                            |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —   | 3.1  | —    | ns   | V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V,<br>R <sub>g</sub> = 6Ω, I <sub>D</sub> = 10A |
| Turn-On Rise Time                          | t <sub>r</sub>      | —   | 3.1  | —    |      |                                                                                            |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —   | 14.2 | —    |      |                                                                                            |
| Turn-Off Fall Time                         | t <sub>f</sub>      | —   | 5.8  | —    |      |                                                                                            |
| Reverse Recovery Time                      | t <sub>RR</sub>     | —   | 19.6 | —    | ns   | I <sub>F</sub> = 10A, di/dt = 100A/μs                                                      |
| Reverse Recovery Charge                    | Q <sub>RR</sub>     | —   | 8.2  | —    | nC   |                                                                                            |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = + 25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

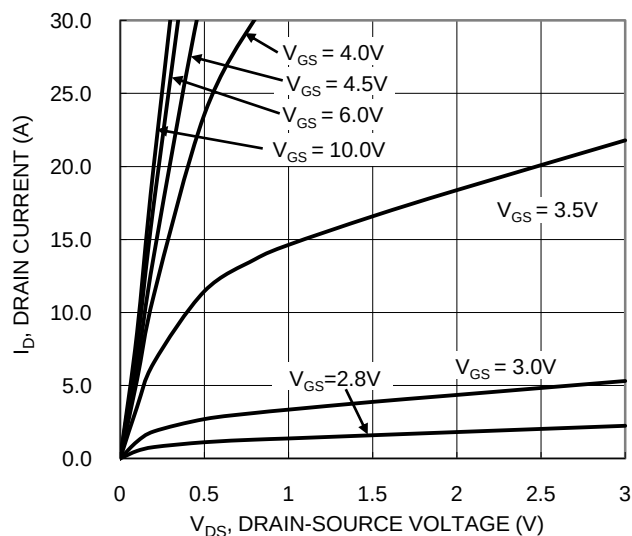


Figure 1. Typical Output Characteristic

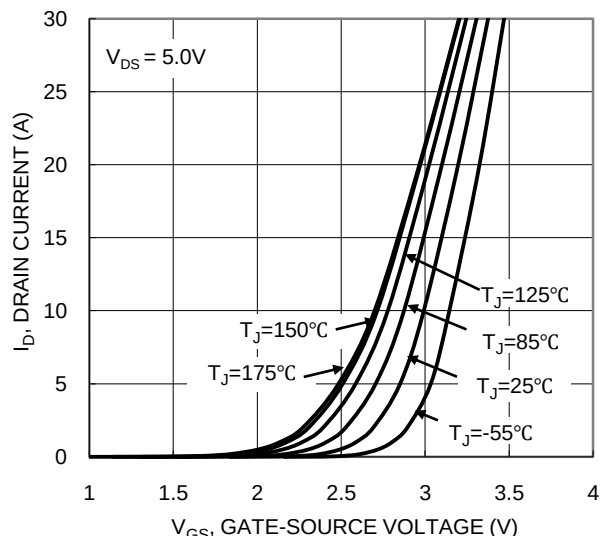


Figure 2. Typical Transfer Characteristic

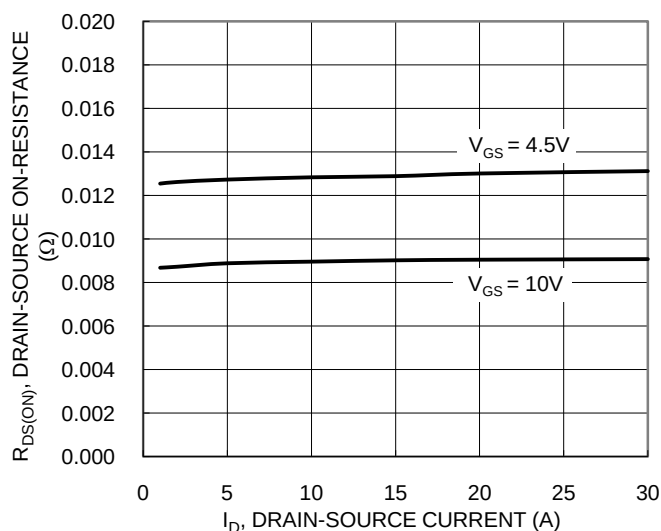


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

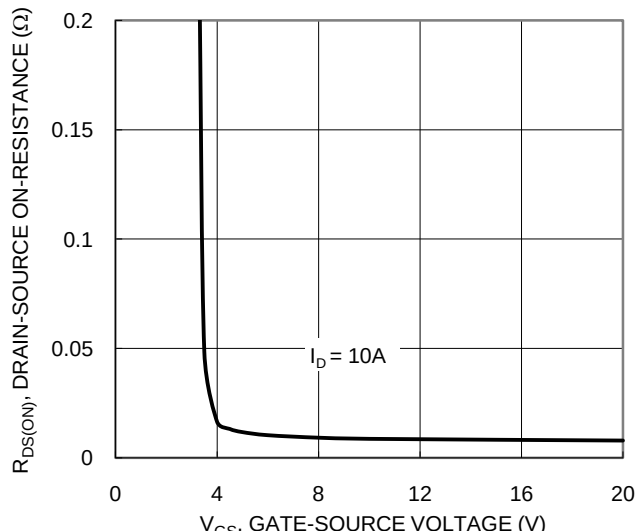


Figure 4. Typical Transfer Characteristic

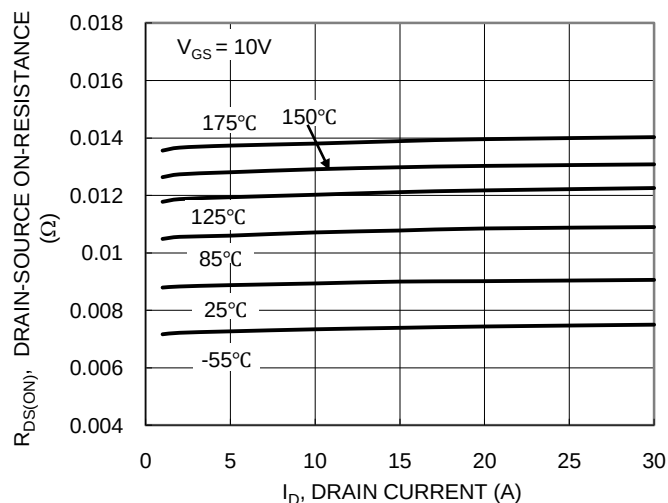


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

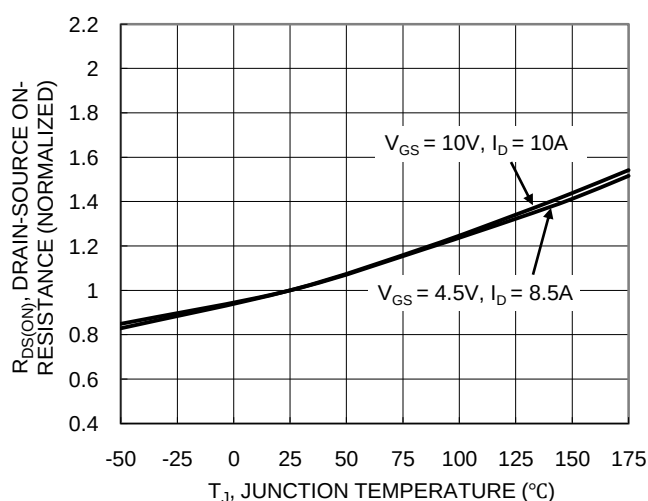
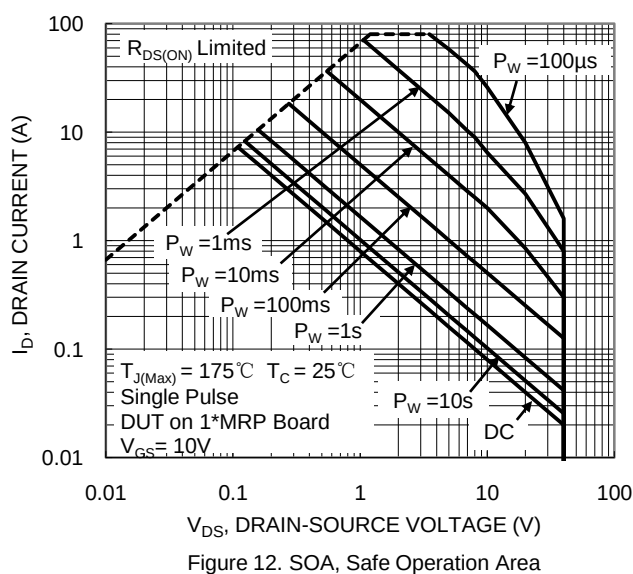
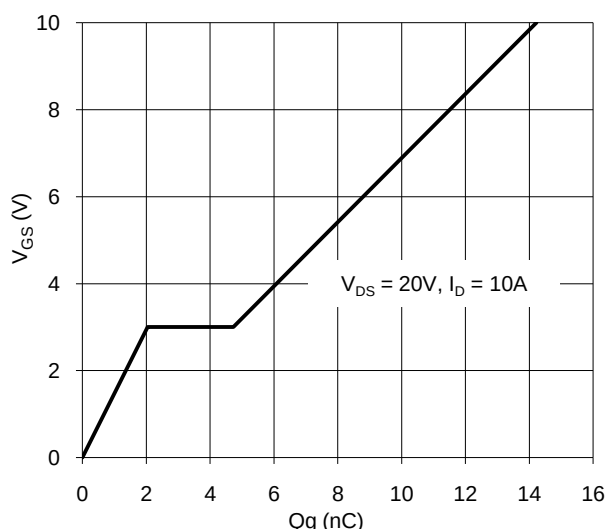
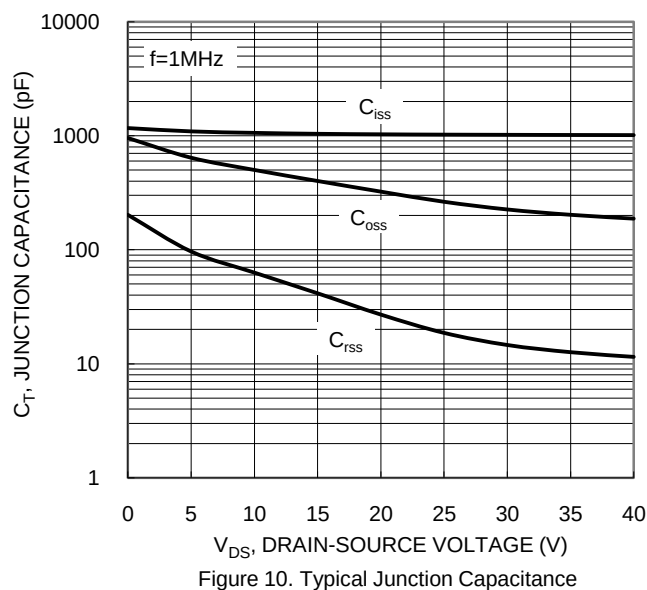
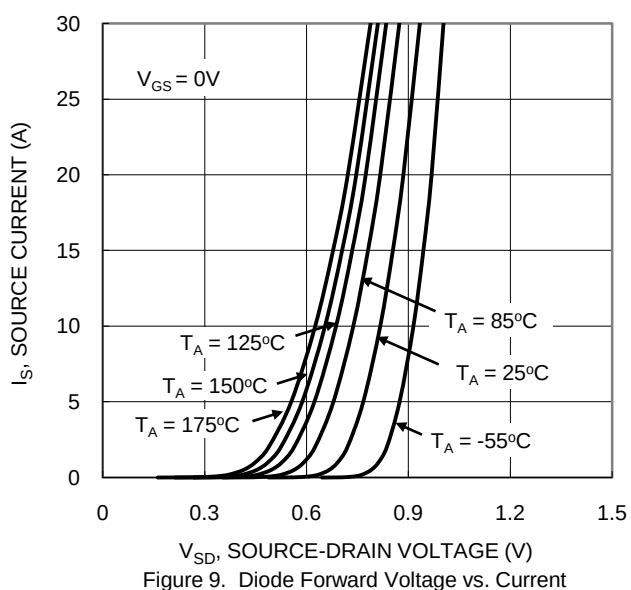
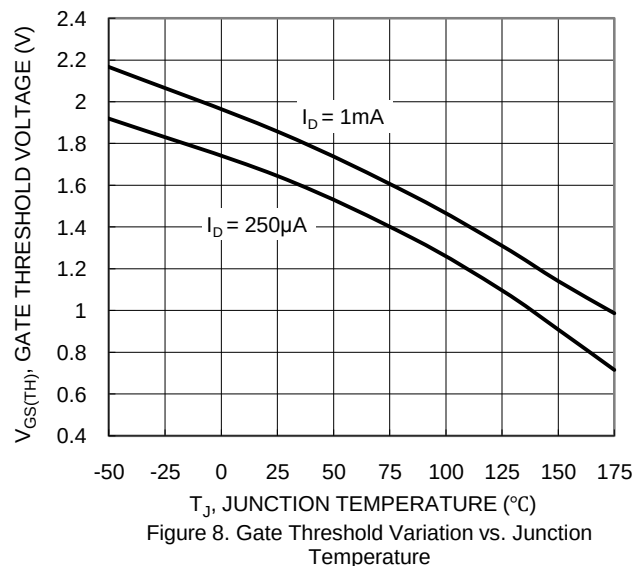
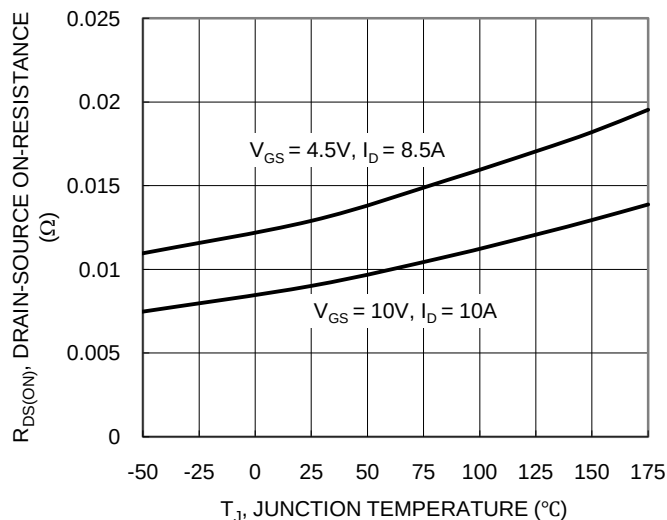


Figure 6. On-Resistance Variation with Temperature



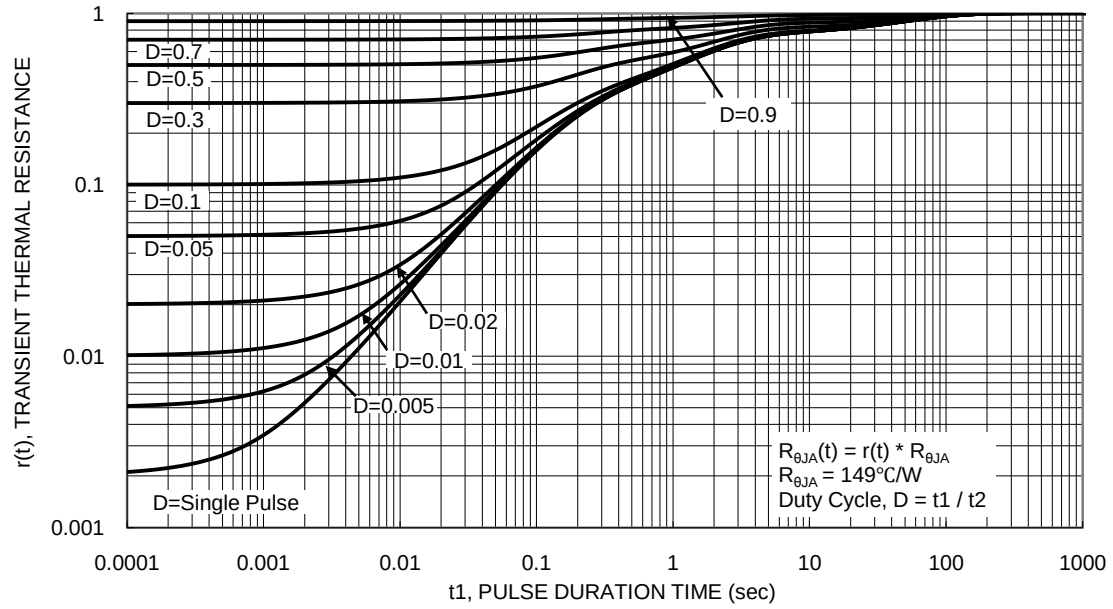
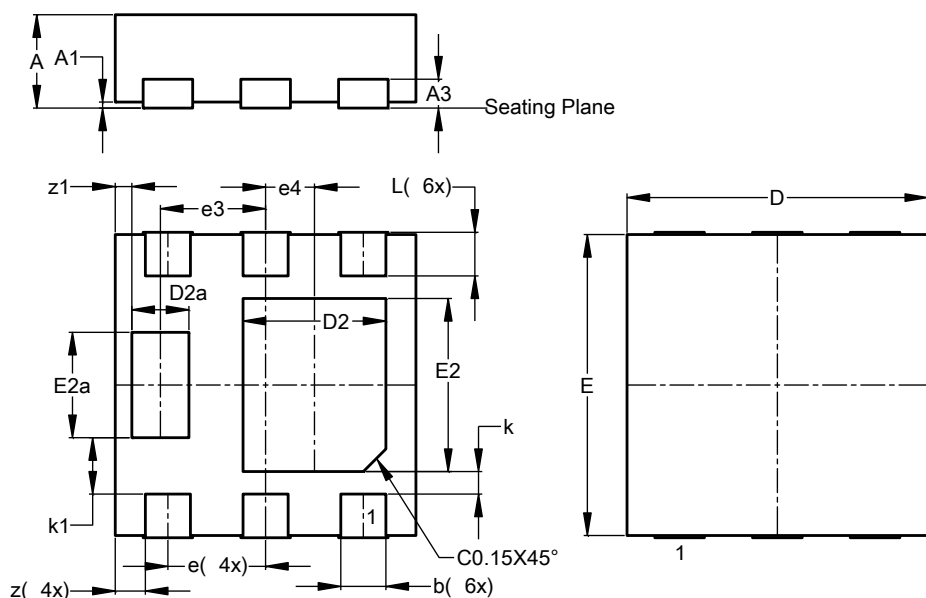


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

U-DFN2020-6 (SWP) (Type F)

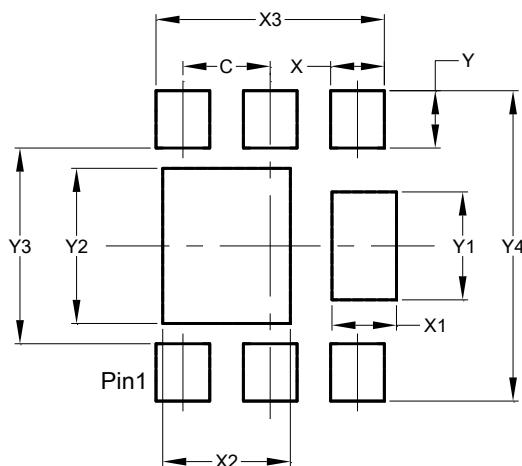


| U-DFN2020-6 (SWP)<br>(Type F) |           |       |       |
|-------------------------------|-----------|-------|-------|
| Dim                           | Min       | Max   | Typ   |
| A                             | 0.59      | 0.65  | 0.62  |
| A1                            | 0.00      | 0.05  | 0.03  |
| A3                            | -         | -     | 0.192 |
| b                             | 0.28      | 0.38  | 0.33  |
| D                             | 1.95      | 2.05  | 2.00  |
| D2                            | 0.87      | 1.07  | 0.97  |
| D2a                           | 0.35      | 0.45  | 0.40  |
| E                             | 1.95      | 2.05  | 2.00  |
| E2                            | 1.07      | 1.27  | 1.17  |
| E2a                           | 0.67      | 0.77  | 0.72  |
| e                             | 0.65 BSC  |       |       |
| e3                            | 0.70 BSC  |       |       |
| e4                            | 0.325 BSC |       |       |
| k                             | --        | --    | 0.15  |
| k1                            | --        | --    | 0.375 |
| L                             | 0.225     | 0.355 | 0.305 |
| z                             | --        | --    | 0.20  |
| z1                            | --        | --    | 0.11  |
| All Dimensions in mm          |           |       |       |

## Suggested Pad Layout

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

U-DFN2020-6 (SWP) (Type F)



| Dimensions | Value<br>(in mm) |
|------------|------------------|
| C          | 0.650            |
| X          | 0.400            |
| X1         | 0.480            |
| X2         | 0.950            |
| X3         | 1.700            |
| Y          | 0.425            |
| Y1         | 0.800            |
| Y2         | 1.150            |
| Y3         | 1.450            |
| Y4         | 2.300            |

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