

## Product Summary

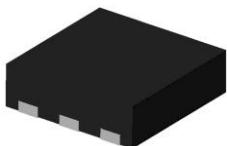
| BV <sub>DSS</sub> | R <sub>DSON</sub> Max           | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-------------------|---------------------------------|--|
| 24V               | 6.0mΩ @ V <sub>GS</sub> = 10V   | 14.1A  |
|                   | 7.2mΩ @ V <sub>GS</sub> = 4.5V  | 12.9A  |
|                   | 12.5mΩ @ V <sub>GS</sub> = 2.5V | 9.8A   |

## Description

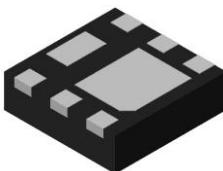
This MOSFET is designed to minimize the on-state resistance (R<sub>DSON</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

- Battery Management Application
- Power Management Functions
- DC-DC Converters

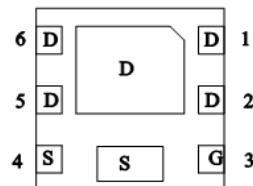


Top View

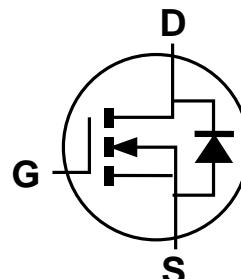


Bottom View

U-DFN2020-6 (Type F)



Pin Out



Internal Schematic

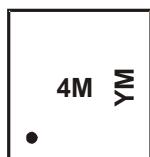
## Ordering Information (Note 4)

| Part Number    | Case                 | Reel Size (inches) | Quantity per Reel |
|----------------|----------------------|--------------------|-------------------|
| DMT2004UFDF-7  | U-DFN2020-6 (Type F) | 7                  | 3,000             |
| DMT2004UFDF-13 | U-DFN2020-6 (Type F) | 13                 | 10,000            |

## 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



4M = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: D = 2016)  
 M = Month (ex: 9 = September)

## Date Code Key

| Year  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |     |     |     |     |
|-------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|
| Code  | D    | E    | F    | G    | H    | I    | J    | K    |     |     |     |     |
| 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        | Unit        |
|--|--------------|--|-----------|--------------|-------------|
| Drain-Source Voltage   |              |  | $V_{DSS}$ | 24           | V           |
| Gate-Source Voltage  |              |  | $V_{GSS}$ | $\pm 12$     | V           |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$        | Steady State | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 14.1<br>11.2 | A           |
| Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%) |              |  | $I_{DM}$  | 70           | A           |
| Continuous Source-Drain Diode Current (Note 6)                 |              |  | $I_S$     | 2            | A           |
| Avalanche Current (Note 7) $L = 0.1\text{mH}$                  |              |  | $I_{AS}$  | 26           | A           |
| Avalanche Energy (Note 7) $L = 0.1\text{mH}$                   |              |  | $E_{AS}$  | 36           | $\text{mJ}$ |

**Thermal Characteristics**

| Characteristic                                   |                           | Symbol          | Value       | Unit                      |
|--|---------------------------|-----------------|-------------|---------------------------|
| Total Power Dissipation (Note 5)                 | $T_A = +25^\circ\text{C}$ | $P_D$           | 0.8         | W                         |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State              | $R_{\theta JA}$ | 149         | $^\circ\text{C}/\text{W}$ |
| Total Power Dissipation (Note 6)                 | $T_A = +25^\circ\text{C}$ | $P_D$           | 1.8         | W                         |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State              | $R_{\theta JA}$ | 70          | $^\circ\text{C}/\text{W}$ |
| Total Power Dissipation (Note 6)                 | $T_C = +25^\circ\text{C}$ | $P_D$           | 12.5        | W                         |
| Thermal Resistance, Junction to Case (Note 6)    | Steady State              | $R_{\theta JC}$ | 12          | $^\circ\text{C}/\text{W}$ |
| 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 (Note 8)</b>                           |                     |      |      |           |               |  |
| Drain-Source Breakdown Voltage                                | $BV_{DSS}$          | 24   | —    | —         | V             | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$                                 |
| Zero Gate Voltage Drain Current ( $T_J = +25^\circ\text{C}$ ) | $I_{DSS}$           | —    | —    | 1         | $\mu\text{A}$ | $V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$                                  |
| Gate-Source Leakage   | $I_{GSS}$           | —    | —    | $\pm 100$ | nA            | $V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$                              |
| <b>ON CHARACTERISTICS (Note 8)</b>                            |                     |      |      |           |               |  |
| Gate Threshold Voltage  | $V_{GS(\text{TH})}$ | 0.55 | —    | 1.45      | V             | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                                    |
| Static Drain-Source On-Resistance                             | $R_{DS(\text{ON})}$ | —    | 4.8  | 6         | m $\Omega$    | $V_{GS} = 10\text{V}, I_D = 9\text{A}$                                     |
|   |                     | —    | 5.8  | 7.2       |               | $V_{GS} = 4.5\text{V}, I_D = 8\text{A}$                                    |
|   |                     | —    | 9.6  | 12.5      |               | $V_{GS} = 2.5\text{V}, I_D = 5\text{A}$                                    |
| Diode Forward Voltage   | $V_{SD}$            | —    | 0.65 | 1.0       | V             | $V_{GS} = 0\text{V}, I_S = 2\text{A}$                                      |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                       |                     |      |      |           |               |  |
| Input Capacitance   | $C_{iss}$           | —    | 1683 | —         | pF            | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$               |
| Output Capacitance  | $C_{oss}$           | —    | 581  | —         |               |  |
| Reverse Transfer Capacitance                                  | $C_{rss}$           | —    | 559  | —         |               |  |
| Gate Resistance   | $R_G$               | —    | 1.6  | —         | $\Omega$      | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$                |
| Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )                  | $Q_g$               | —    | 29.6 | —         | nC            | $V_{DD} = 15\text{V}, I_D = 9\text{A}$                                     |
| Total Gate Charge ( $V_{GS} = 10\text{V}$ )                   | $Q_g$               | —    | 53.7 | —         |               |  |
| Gate-Source Charge  | $Q_{gs}$            | —    | 4.2  | —         |               |  |
| Gate-Drain Charge   | $Q_{gd}$            | —    | 13.4 | —         |               |  |
| Turn-On Delay Time  | $t_{D(\text{ON})}$  | —    | 3.9  | —         | ns            | $V_{DD} = 15\text{V}, V_{GS} = 10\text{V}, R_G = 3\Omega, I_D = 9\text{A}$ |
| Turn-On Rise Time   | $t_R$               | —    | 9.6  | —         |               |  |
| Turn-Off Delay Time   | $t_{D(\text{OFF})}$ | —    | 30.8 | —         |               |  |
| Turn-Off Fall Time  | $t_F$               | —    | 38.6 | —         |               |  |
| Reverse Recovery Time   | $t_{RR}$            | —    | 11.2 | —         | ns            | $I_F = 1.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$                       |
| Reverse Recovery Charge                                       | $Q_{RR}$            | —    | 22.9 | —         | nC            |  |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

7.  $I_{AS}$  and  $E_{AS}$  ratings are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .

8. Short duration pulse test used to minimize self-heating effect.

9. Guaranteed by design. Not subject to product testing.

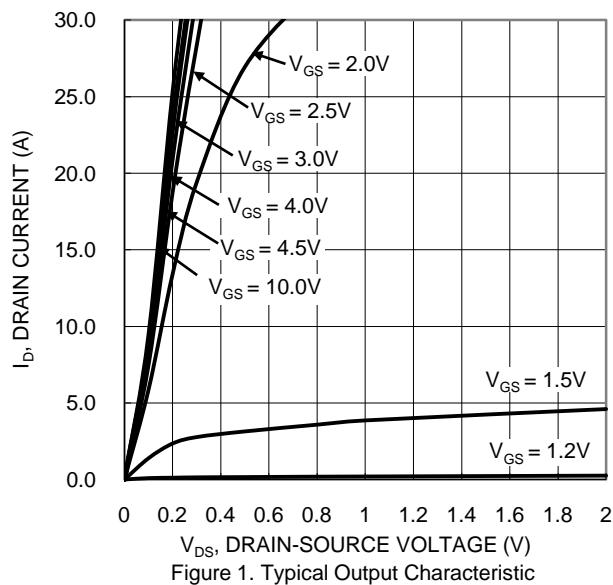


Figure 1. Typical Output Characteristic

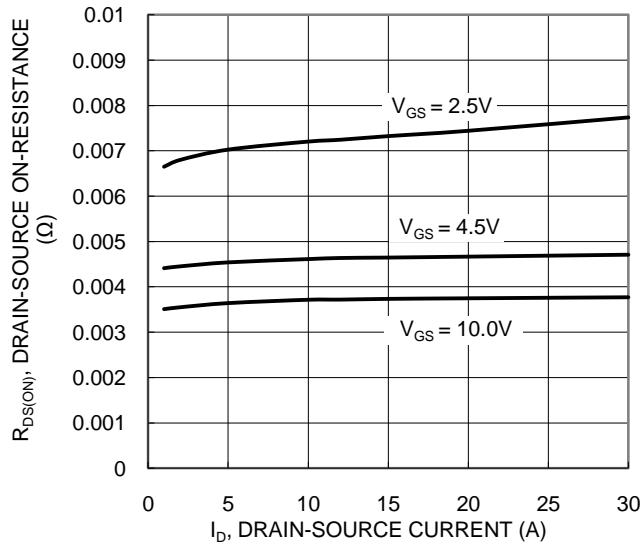


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

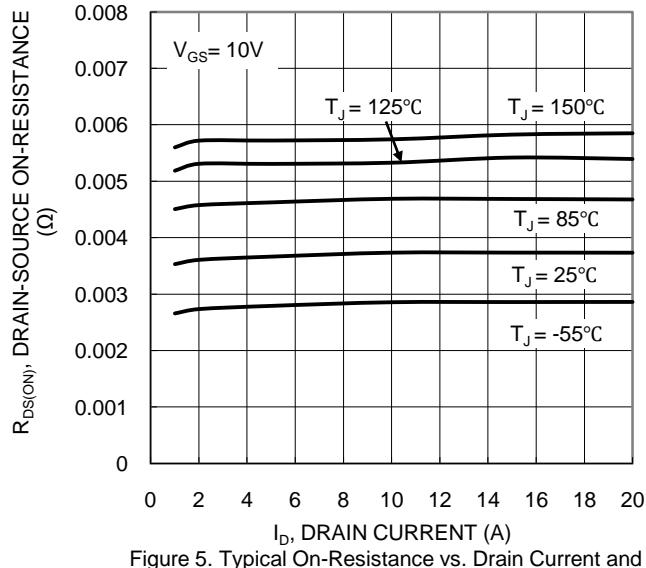


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

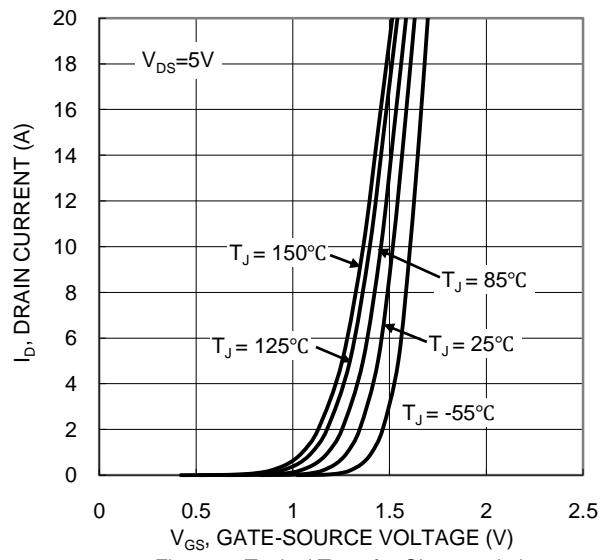


Figure 2. Typical Transfer Characteristic

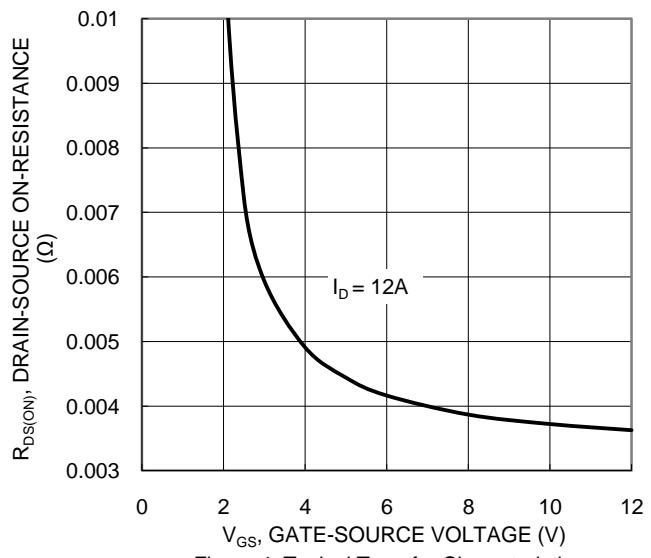


Figure 4. Typical Transfer Characteristic

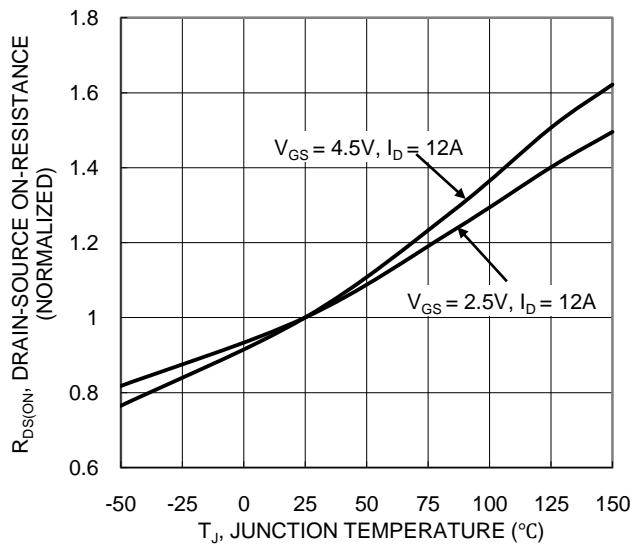
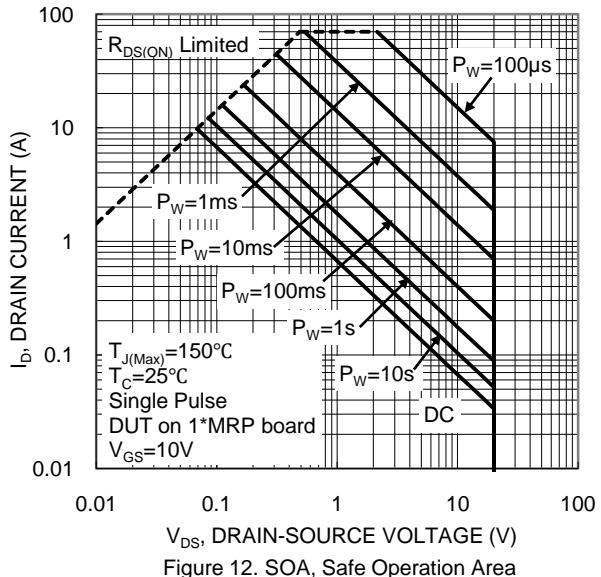
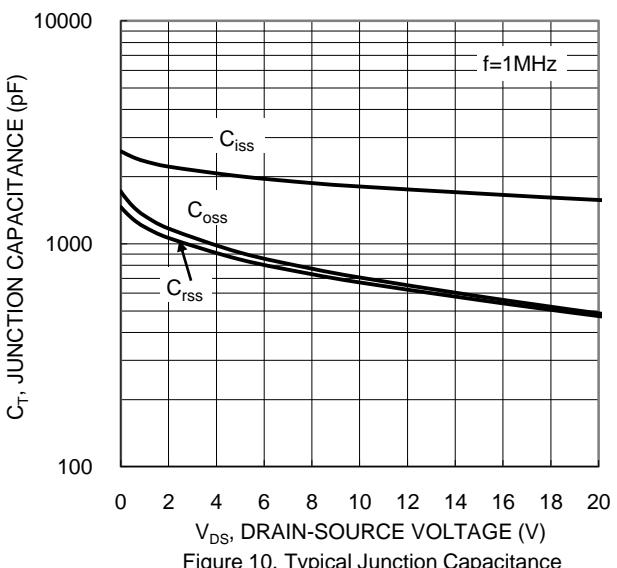
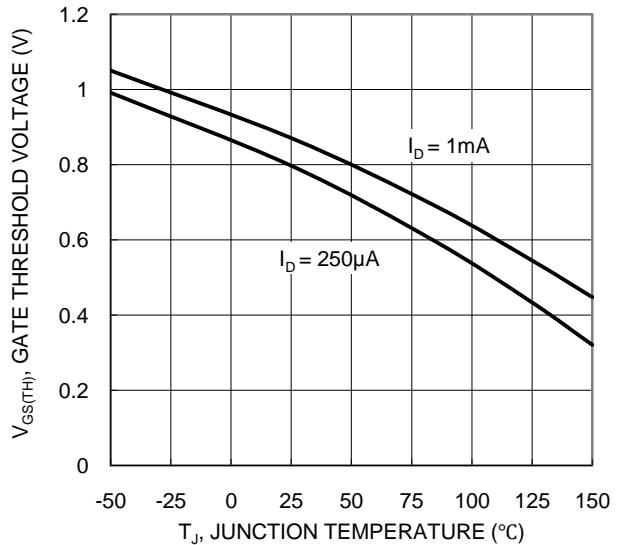
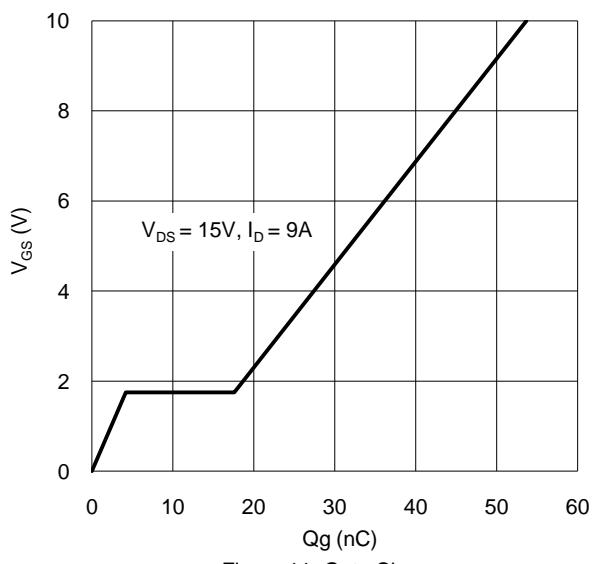
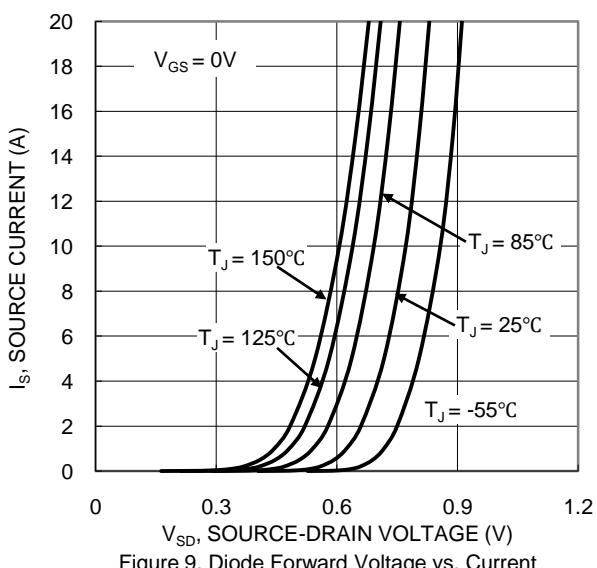
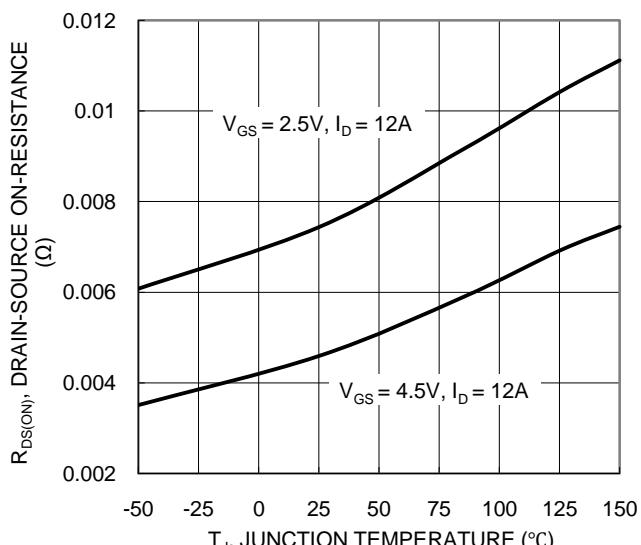


Figure 6. On-Resistance Variation with Temperature



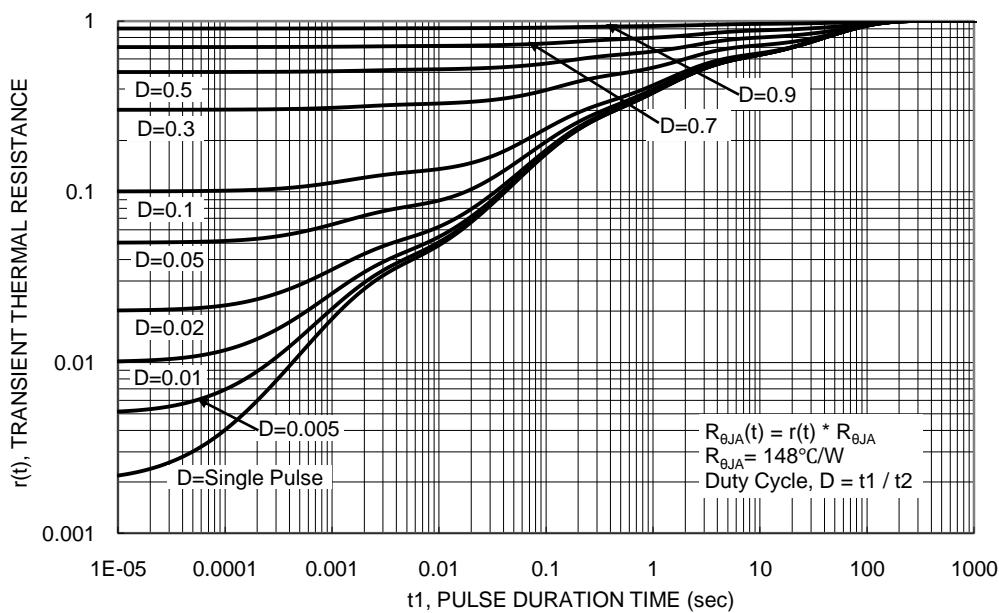
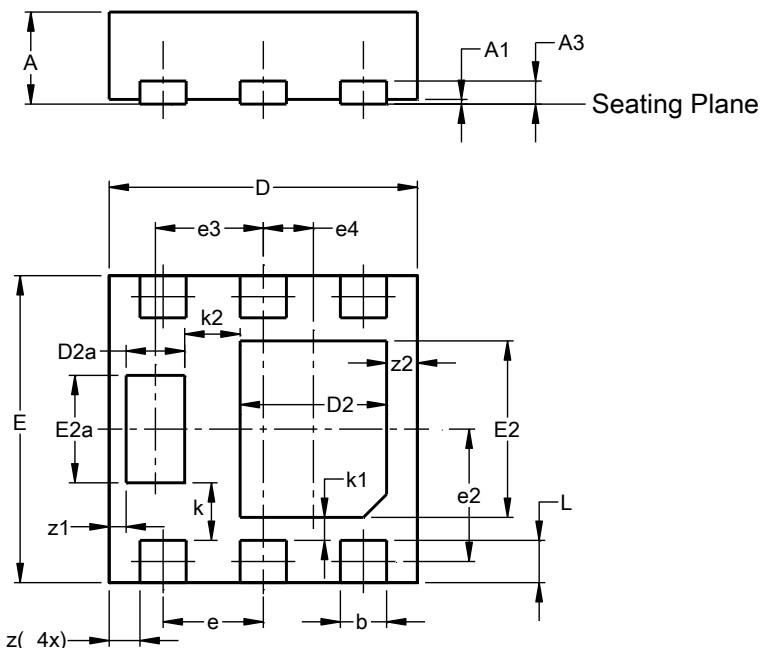


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

U-DFN2020-6 (Type F)

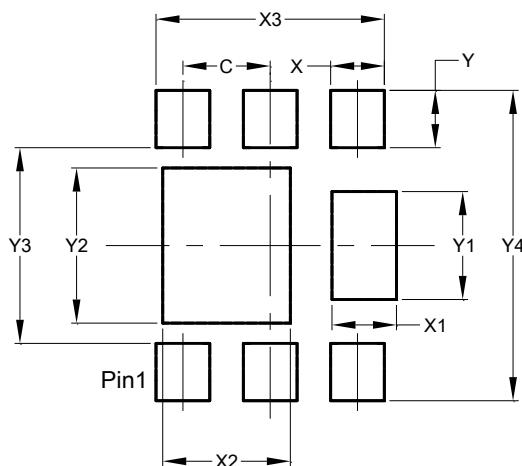


| U-DFN2020-6<br>(Type F) |           |       |       |
|-------------------------|-----------|-------|-------|
| Dim                     | Min       | Max   | Typ   |
| <b>A</b>                | 0.57      | 0.63  | 0.60  |
| <b>A1</b>               | 0.00      | 0.05  | 0.03  |
| <b>A3</b>               | -         | -     | 0.15  |
| <b>b</b>                | 0.25      | 0.35  | 0.30  |
| <b>D</b>                | 1.95      | 2.05  | 2.00  |
| <b>D2</b>               | 0.85      | 1.05  | 0.95  |
| <b>D2a</b>              | 0.33      | 0.43  | 0.38  |
| <b>E</b>                | 1.95      | 2.05  | 2.00  |
| <b>E2</b>               | 1.05      | 1.25  | 1.15  |
| <b>E2a</b>              | 0.65      | 0.75  | 0.70  |
| <b>e</b>                | 0.65 BSC  |       |       |
| <b>e2</b>               | 0.863 BSC |       |       |
| <b>e3</b>               | 0.70 BSC  |       |       |
| <b>e4</b>               | 0.325 BSC |       |       |
| <b>k</b>                | 0.37 BSC  |       |       |
| <b>k1</b>               | 0.15 BSC  |       |       |
| <b>k2</b>               | 0.36 BSC  |       |       |
| <b>L</b>                | 0.225     | 0.325 | 0.275 |
| <b>z</b>                | 0.20 BSC  |       |       |
| <b>z1</b>               | 0.110 BSC |       |       |
| <b>z2</b>               | 0.20 BSC  |       |       |
| All Dimensions in mm    |           |       |       |

## Suggested Pad Layout

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

U-DFN2020-6 (Type F)



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

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