

## Product Summary

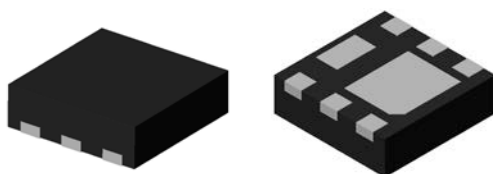
| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max                      | $I_D$ max<br>$T_A = +25^\circ\text{C}$ |
|---------------|---------------------------------------|----------------------------------------|
| 50V           | 15m $\Omega$ @ $V_{GS} = 10\text{V}$  | 9.1A                                   |
|               | 23m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 7.4A                                   |

## Description and Applications

This 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.

- Load Switch
- Adaptor Switch
- Notebook PC

U-DFN2020-6



Top View

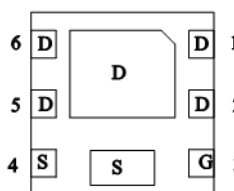
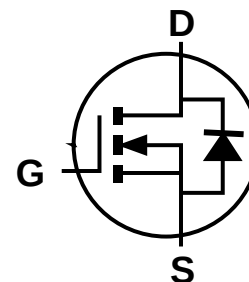
Bottom View

## Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## 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 208④
- Weight: 0.007 grams (Approximate)


 Pin Out  
Bottom View


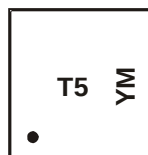
Internal Schematic

## Ordering Information (Note 4)

| Part Number    | Marking | Reel size (inches) | Quantity per reel |
|----------------|---------|--------------------|-------------------|
| DMT5015LFDF-7  | T5      | 7                  | 3,000             |
| DMT5015LFDF-13 | T5      | 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



T5 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: A = 2014)  
 M = Month (ex: 9 = September)

### Date Code Key

Date Code Key

| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|------|------|------|------|------|------|------|------|
| Code | B    | C    | D    | E    | F    | G    | H    |

| 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       | Units |
|---------------------------------------------------------|--------------|--------------------------------------------------|------------------|-------------|-------|
| Drain-Source Voltage                                    |              |                                                  | V <sub>DSS</sub> | 50          | V     |
| Gate-Source Voltage                                     |              |                                                  | V <sub>GSS</sub> | ±16         | V     |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 9.1<br>7.3  | A     |
|                                                         | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 11.5<br>9.2 | A     |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%)      |              |                                                  | I <sub>DM</sub>  | 60          | A     |
| Continuous Source-Drain Diode Current                   |              |                                                  | I <sub>S</sub>   | 2.2         | A     |
| Avalanche Current (Note 7) L = 0.1mH                    |              |                                                  | I <sub>AS</sub>  | 14.4        | A     |
| Avalanche Energy (Note 7) L = 0.1mH                     |              |                                                  | E <sub>AS</sub>  | 10.4        | mJ    |

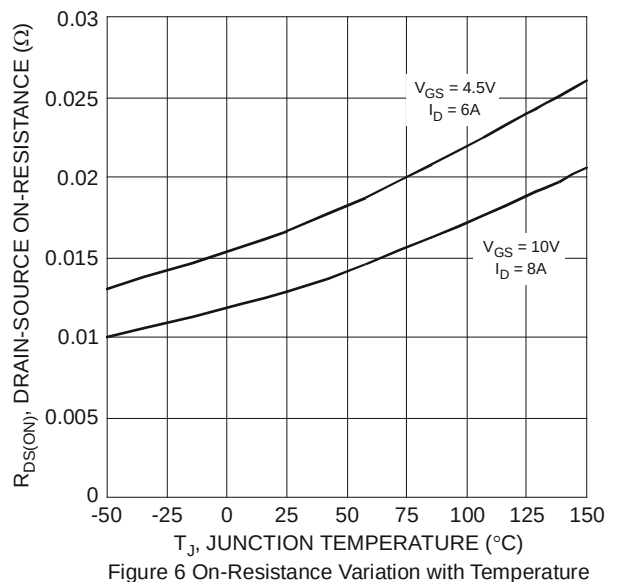
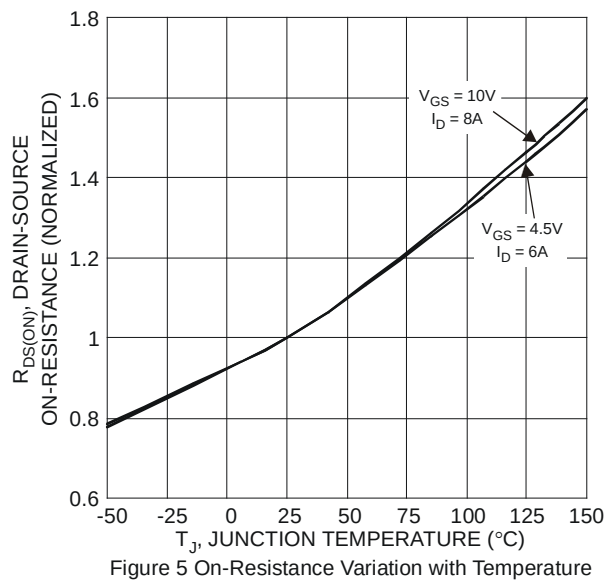
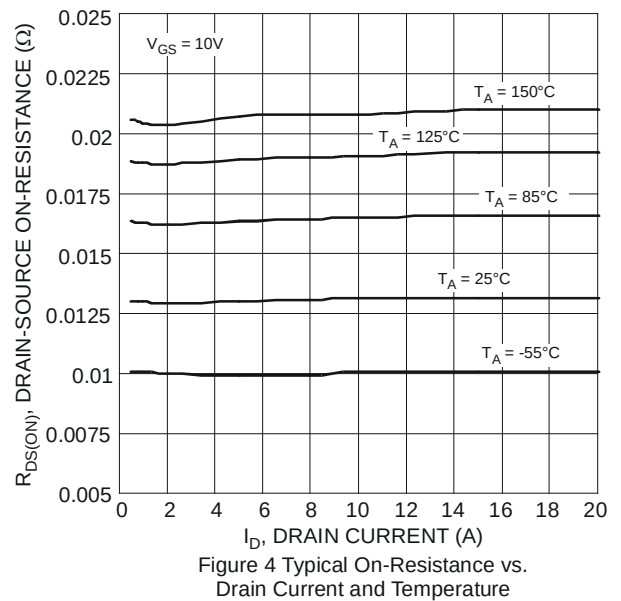
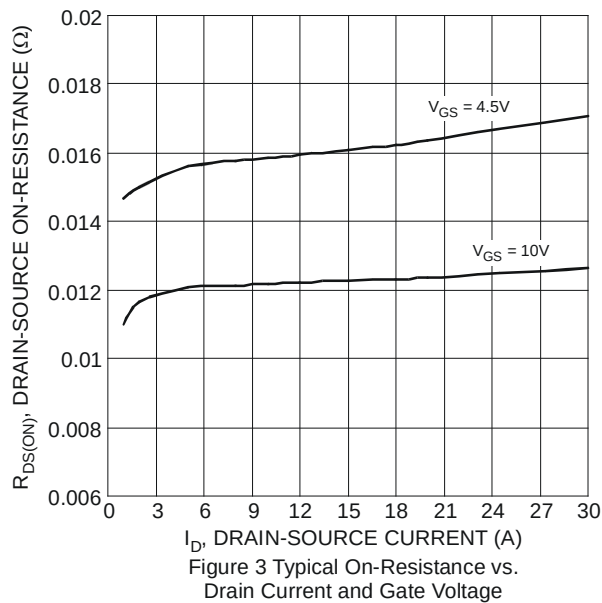
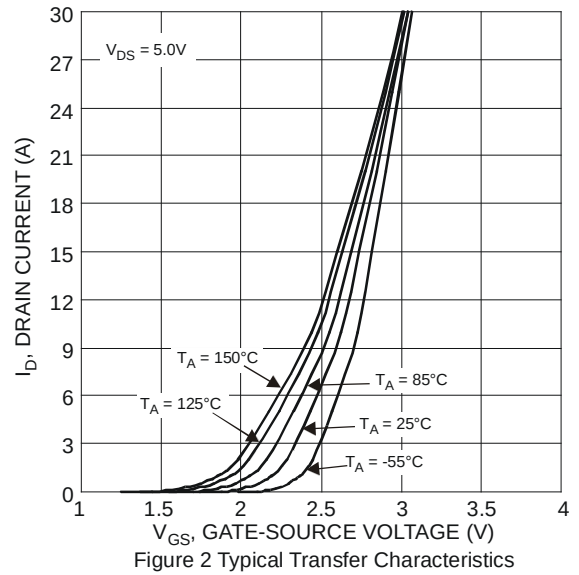
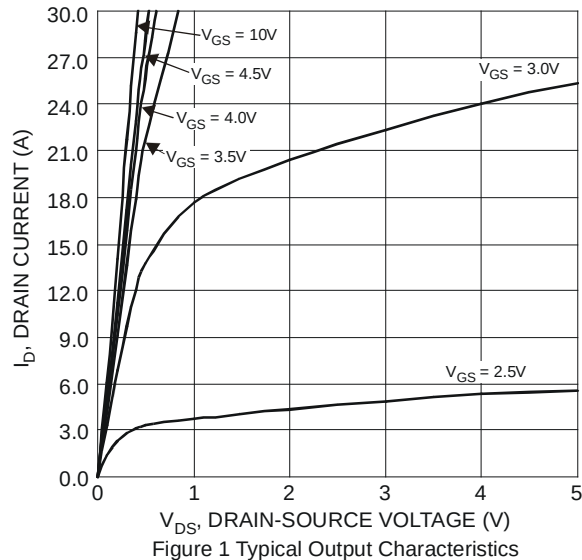
**Thermal Characteristics**

| Characteristic                                   |                        | Symbol                            | Value       | Units |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.82        | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.52        |       |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state           | R <sub>θJA</sub>                  | 153         | °C/W  |
|                                                  | t < 10s                |                                   | 96          |       |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.97        | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 1.2         |       |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 67          | °C/W  |
|                                                  | t < 10s                |                                   | 42          |       |
| Thermal Resistance, Junction to Case (Note 6)    | Steady state           | R <sub>θJC</sub>                  | 14          |       |
| 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 8)</b>                    |                     |     |       |      |      |                                                                                           |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | 50  | —     | —    | 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    | μA   | V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V                                               |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —   | —     | ±100 | nA   | V <sub>GS</sub> = ±16V, V <sub>DS</sub> = 0V                                              |
| <b>ON CHARACTERISTICS (Note 8)</b>                     |                     |     |       |      |      |                                                                                           |
| Gate Threshold Voltage                                 | V <sub>GS(th)</sub> | 0.5 | —     | 2.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                |
| Static Drain-Source On-Resistance                      | R <sub>DS(on)</sub> | —   | —     | 15   | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 8A                                                |
|                                                        |                     |     | —     | 23   |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A                                               |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —   | 0.7   | 1.0  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 5A                                                 |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                |                     |     |       |      |      |                                                                                           |
| Input Capacitance                                      | C <sub>iss</sub>    | —   | 902.7 | —    | pF   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                |
| Output Capacitance                                     | C <sub>oss</sub>    | —   | 301.4 | —    |      |                                                                                           |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —   | 15.2  | —    |      |                                                                                           |
| Gate Resistance                                        | R <sub>g</sub>      | —   | 1.9   | —    | 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>      | —   | 6.1   | —    | nC   | V <sub>DS</sub> = 25V, I <sub>D</sub> = 8A                                                |
| Total Gate Charge (V <sub>GS</sub> = 10V)              | Q <sub>g</sub>      | —   | 14    | —    |      |                                                                                           |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —   | 2.4   | —    |      |                                                                                           |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —   | 1.6   | —    |      |                                                                                           |
| Turn-On Delay Time                                     | t <sub>D(on)</sub>  | —   | 2.8   | —    | ns   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 10V,<br>R <sub>G</sub> = 3Ω, I <sub>D</sub> = 8A |
| Turn-On Rise Time                                      | t <sub>r</sub>      | —   | 5.1   | —    |      |                                                                                           |
| Turn-Off Delay Time                                    | t <sub>D(off)</sub> | —   | 10.6  | —    |      |                                                                                           |
| Turn-Off Fall Time                                     | t <sub>f</sub>      | —   | 2.7   | —    |      |                                                                                           |
| Reverse Recovery Time                                  | t <sub>rr</sub>     | —   | 18.9  | —    | ns   | I <sub>F</sub> = 8A, di/dt = 100A/μs                                                      |
| Reverse Recovery Charge                                | Q <sub>rr</sub>     | —   | 9.2   | —    | nC   | I <sub>F</sub> = 8A, di/dt = 100A/μs                                                      |

- 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<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to product testing.



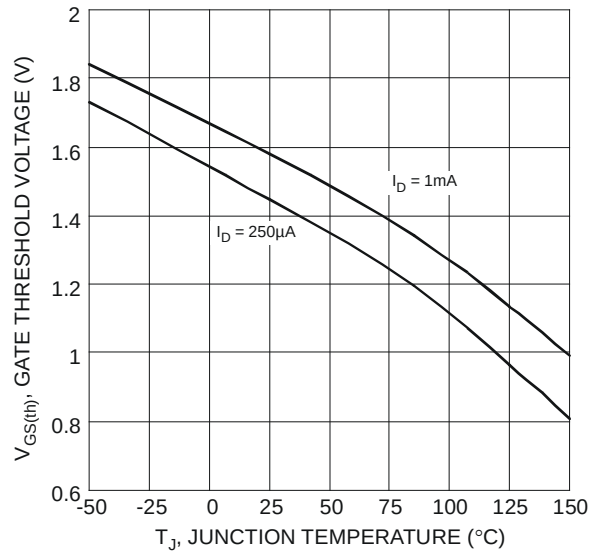


Figure 7 Gate Threshold Variation vs. Ambient Temperature

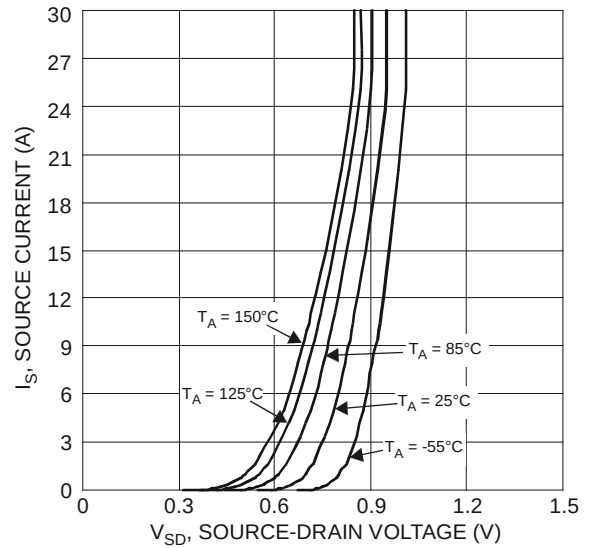


Figure 8 Diode Forward Voltage vs. Current

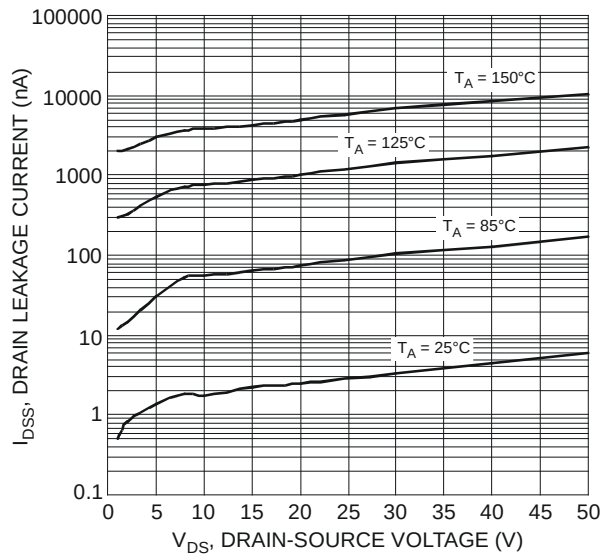


Figure 9 Typical Drain-Source Leakage Current vs. Voltage

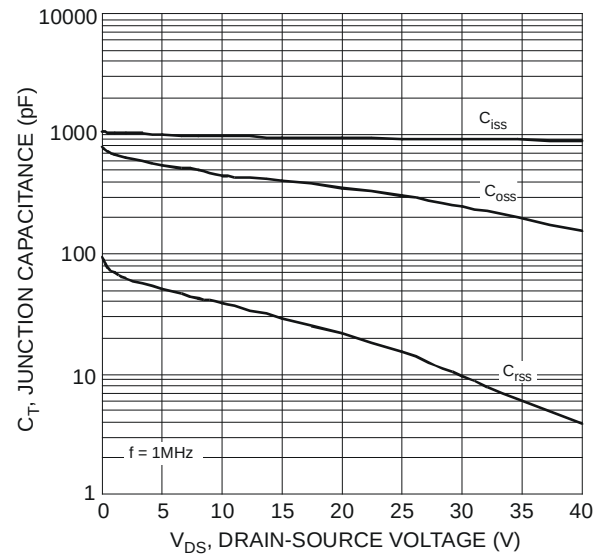


Figure 10 Typical Junction Capacitance

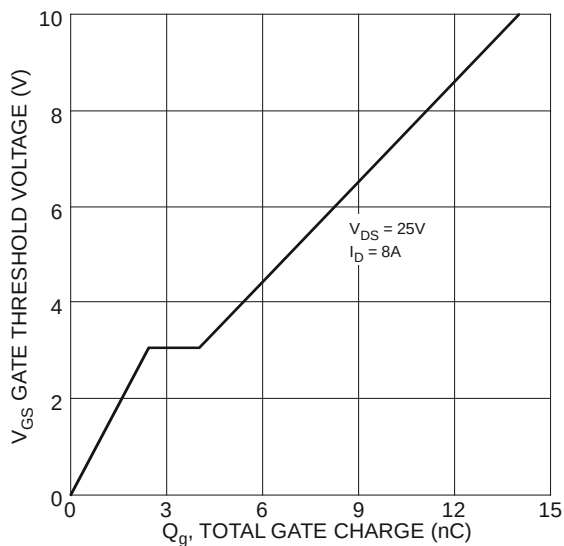


Figure 11 Gate Charge

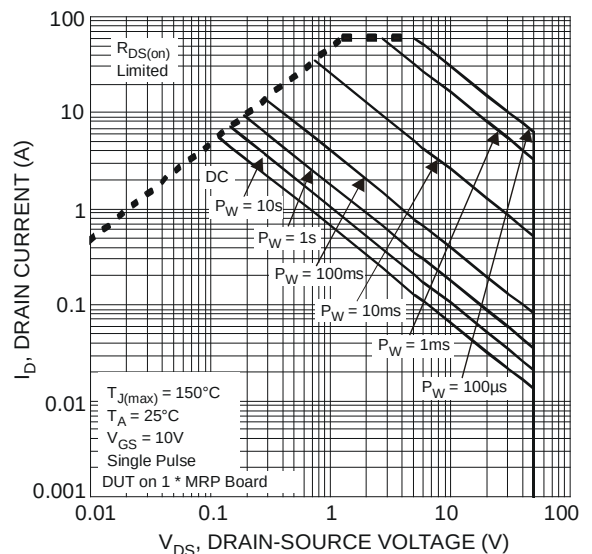
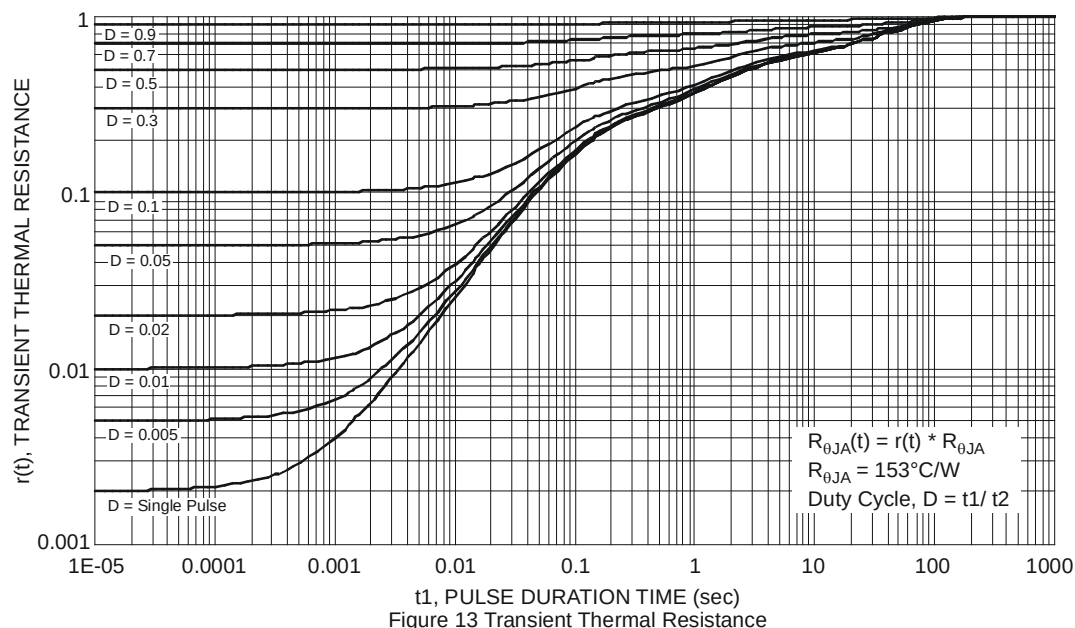
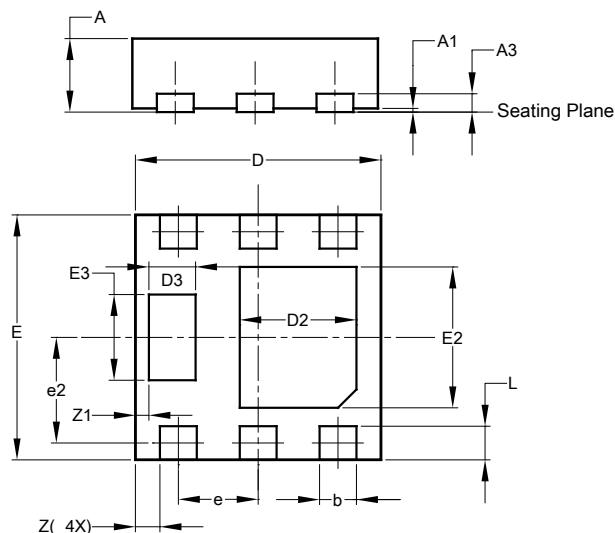


Figure 12 SOA, Safe Operation Area



## Package Outline Dimensions

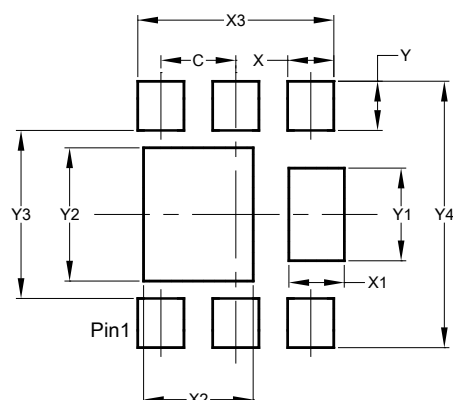
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| U-DFN2020-6<br>(Type F) |           |       |       |
|-------------------------|-----------|-------|-------|
| Dim                     | Min       | Max   | Typ   |
| A                       | 0.57      | 0.63  | 0.60  |
| A1                      | 0         | 0.05  | 0.03  |
| A3                      | -         | -     | 0.15  |
| b                       | 0.25      | 0.35  | 0.30  |
| D                       | 1.95      | 2.05  | 2.00  |
| D2                      | 0.85      | 1.05  | 0.95  |
| D3                      | 0.33      | 0.43  | 0.38  |
| e                       | 0.65 BSC  |       |       |
| e2                      | 0.863 BSC |       |       |
| E                       | 1.95      | 2.05  | 2.00  |
| E2                      | 1.05      | 1.25  | 1.15  |
| E3                      | 0.65      | 0.75  | 0.70  |
| L                       | 0.225     | 0.325 | 0.275 |
| Z                       | 0.20 BSC  |       |       |
| Z1                      | 0.110 BSC |       |       |
| All Dimensions in mm    |           |       |       |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



U-DFN2020-6 (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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