

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) \max}$                      | $I_D \max$<br>$T_A = +25^\circ\text{C}$ |
|---------------|----------------------------------------|-----------------------------------------|
| 20V           | 9.5m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 11.7A                                   |
|               | 11m $\Omega$ @ $V_{GS} = 2.5\text{V}$  | 10.8A                                   |

## Description

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.

## Applications

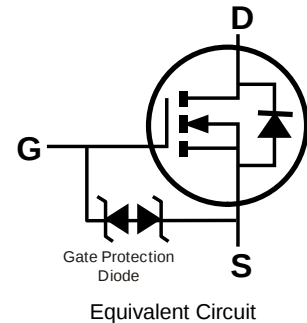
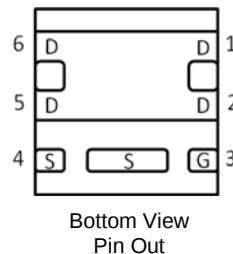
- General Purpose Interfacing Switch
- Power Management Functions

## Features

- 0.6mm Profile – Ideal for Low Profile Applications
- PCB Footprint of 4mm<sup>2</sup>
- Low Gate Threshold Voltage
- Low On-Resistance
- ESD Protected Gate
- 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**

## 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)
- Weight: 0.0065 grams (Approximate)

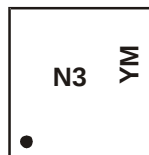


## Ordering Information (Note 4)

| Part Number    | Marking | Reel size (inches) | Quantity per reel |
|----------------|---------|--------------------|-------------------|
| DMN2011UFDE-7  | N3      | 7                  | 3,000             |
| DMN2011UFDE-13 | N3      | 13                 | 10,000            |

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - 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.
  - 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 <http://www.diodes.com/products/packages.html>.

## Marking Information



N3 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: A = 2013)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|
| Code | Y    | Z    | A    | B    | C    | D    | E    |

| 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> | 20           | V     |
| Gate-Source Voltage                                      |              |                                                  | V <sub>GSS</sub> | ±12          | V     |
| 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>   | 11.7<br>9.3  | A     |
|                                                          | t<10s        | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 14.2<br>11.4 | A     |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = 2.5V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 10.8<br>8.7  | A     |
|                                                          | t<10s        | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 13.2<br>10.6 | A     |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%)       |              |                                                  | I <sub>DM</sub>  | 80           | A     |
| Maximum Body Diode Continuous Current                    |              |                                                  | I <sub>S</sub>   | 2.5          | A     |
| Avalanche Current (Note 7) L = 0.1mH                     |              |                                                  | I <sub>AS</sub>  | 18           | A     |
| Avalanche Energy (Note 7) L = 0.1mH                      |              |                                                  | E <sub>AS</sub>  | 17           | mJ    |

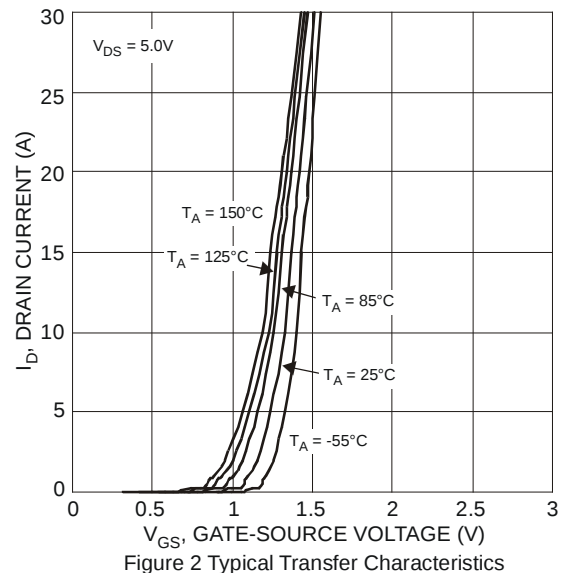
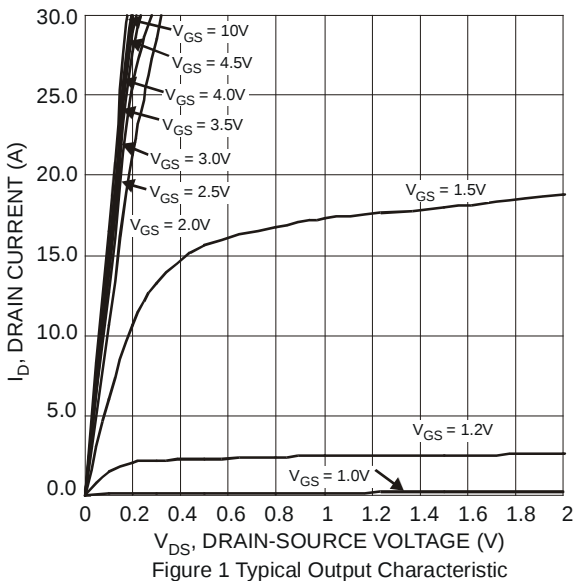
**Thermal Characteristics**

| Characteristic                                   |                        | Symbol                            | Value       | Units |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.61        | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.39        |       |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state           | R <sub>θJA</sub>                  | 209         | °C/W  |
|                                                  | t<10s                  |                                   | 142         |       |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.97        | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 1.27        |       |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 64          | °C/W  |
|                                                  | t<10s                  |                                   | 43          |       |
| Thermal Resistance, Junction to Case (Note 6)    |                        | R <sub>θJC</sub>                  | 9.8         |       |
| 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>   | 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    | μA   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V                                                   |
| Zero Gate Voltage Drain Current T <sub>J</sub> = +150°C (Note 9) | I <sub>DSS</sub>    | —   | —    | 100  | μA   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V                                                   |
| Gate-Source Leakage                                              | I <sub>GSS</sub>    | —   | —    | ±10  | μA   | V <sub>GS</sub> = ±10V, V <sub>DS</sub> = 0V                                                  |
| <b>ON CHARACTERISTICS (Note 8)</b>                               |                     |     |      |      |      |                                                                                               |
| Gate Threshold Voltage                                           | V <sub>GS(th)</sub> | 0.4 | —    | 1.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                    |
| Static Drain-Source On-Resistance                                | R <sub>DS(on)</sub> | —   | 6.5  | 9.5  | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 7A                                                   |
|                                                                  |                     |     | 7.5  | 11   |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 7A                                                   |
|                                                                  |                     |     | 10   | 20   |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 5A                                                   |
|                                                                  |                     |     | 15   | 35   |      | V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 3A                                                   |
| Diode Forward Voltage                                            | V <sub>SD</sub>     | —   | 0.7  | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 8.5A                                                   |
| On State Drain Current (Note 9)                                  | I <sub>D(on)</sub>  | 20  | —    | —    | A    | V <sub>DS</sub> ≤ 5V, V <sub>GS</sub> = 4.5V                                                  |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                          |                     |     |      |      |      |                                                                                               |
| Input Capacitance                                                | C <sub>iss</sub>    | —   | 2248 | 3372 | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                    |
| Output Capacitance                                               | C <sub>oss</sub>    | —   | 295  | 443  | pF   |                                                                                               |
| Reverse Transfer Capacitance                                     | C <sub>rss</sub>    | —   | 265  | 398  | pF   |                                                                                               |
| Gate Resistance                                                  | R <sub>g</sub>      | —   | 1.5  | 3    | 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>      | —   | 24   | 36   | nC   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A                                                  |
| Total Gate Charge (V <sub>GS</sub> = 10V)                        | Q <sub>g</sub>      | —   | 56   | 84   | nC   |                                                                                               |
| Gate-Source Charge                                               | Q <sub>gs</sub>     | —   | 3.5  | 6    | nC   |                                                                                               |
| Gate-Drain Charge                                                | Q <sub>gd</sub>     | —   | 5.1  | 8    | nC   |                                                                                               |
| Turn-On Delay Time                                               | t <sub>D(on)</sub>  | —   | 3.6  | 6    | ns   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A<br>V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 1.8Ω |
| Turn-On Rise Time                                                | t <sub>r</sub>      | —   | 2.6  | 4    | ns   |                                                                                               |
| Turn-Off Delay Time                                              | t <sub>D(off)</sub> | —   | 21.6 | 33   | ns   |                                                                                               |
| Turn-Off Fall Time                                               | t <sub>f</sub>      | —   | 13.5 | 21   | ns   | I <sub>F</sub> = 8.5A, di/dt = 210A/μs                                                        |
| Reverse Recovery Time                                            | T <sub>rr</sub>     | —   | 12.8 | 20   | ns   |                                                                                               |
| Reverse Recovery Charge                                          | Q <sub>rr</sub>     | —   | 6.9  | 11   | 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<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.



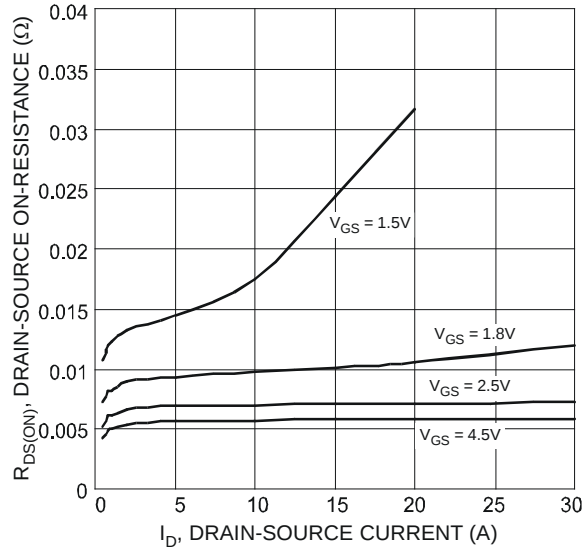


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

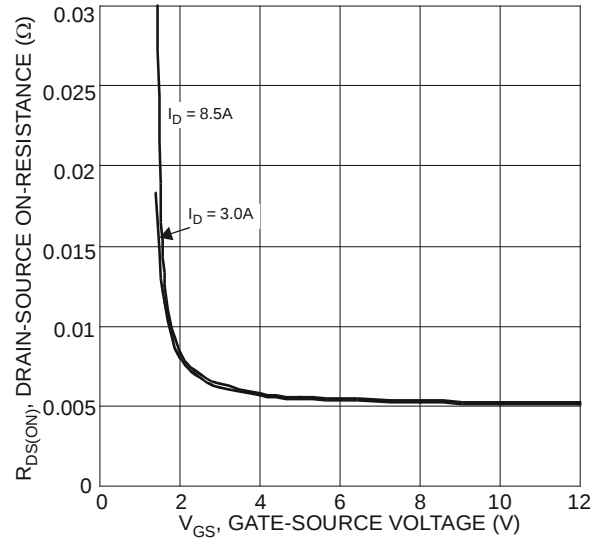


Figure 4 Typical Transfer Characteristics

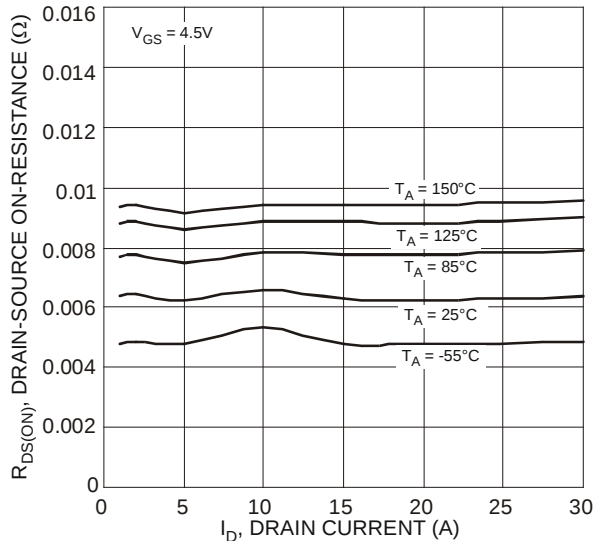


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

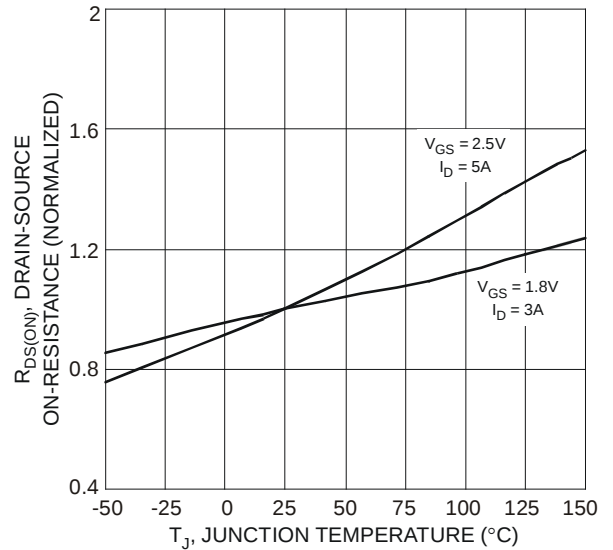


Figure 6 On-Resistance Variation with Temperature

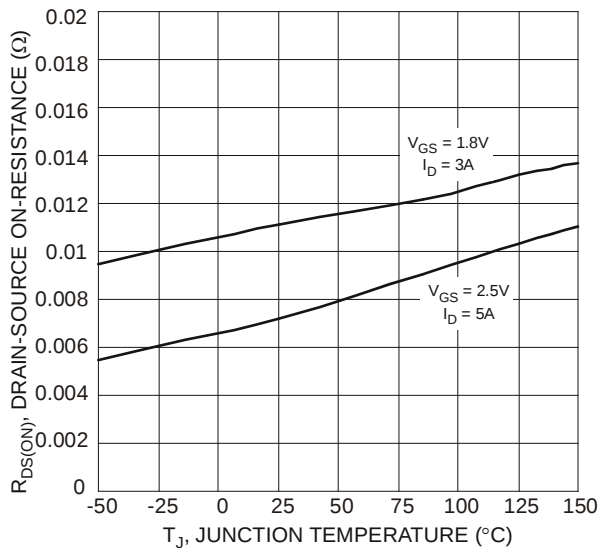


Figure 7 On-Resistance Variation with Temperature

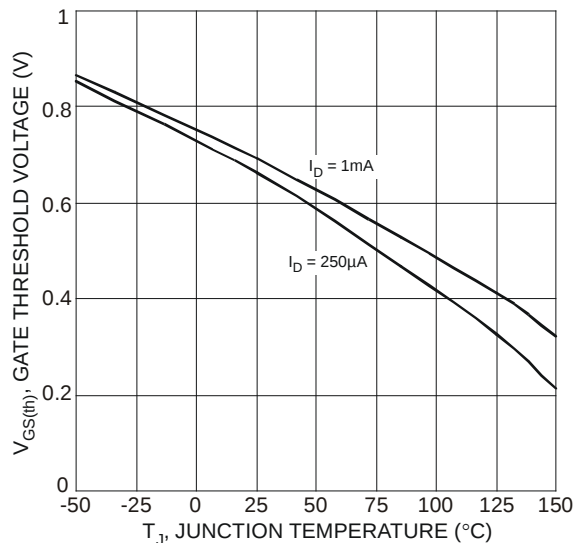
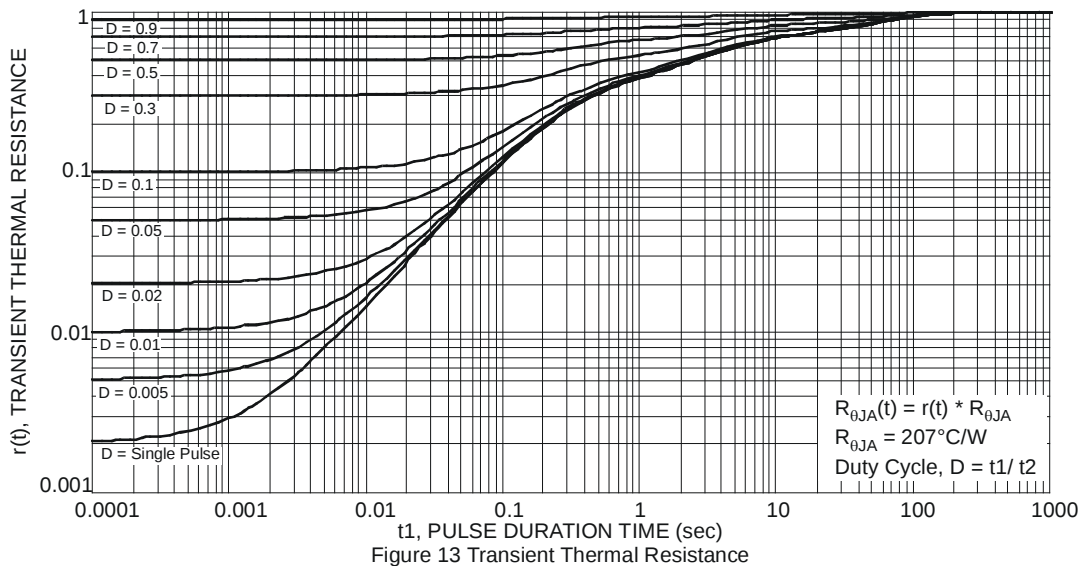
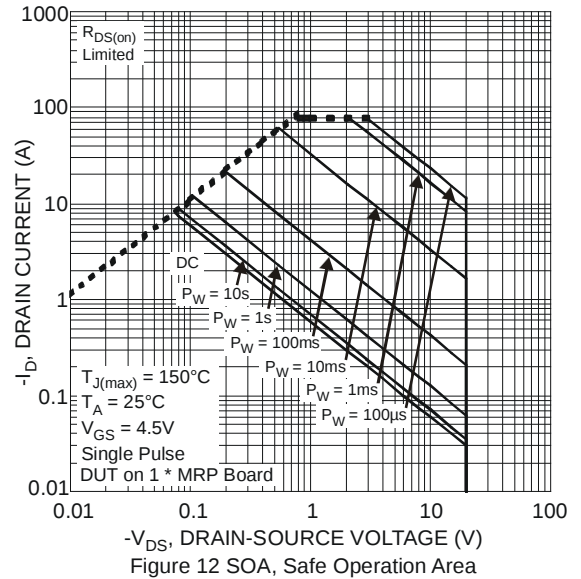
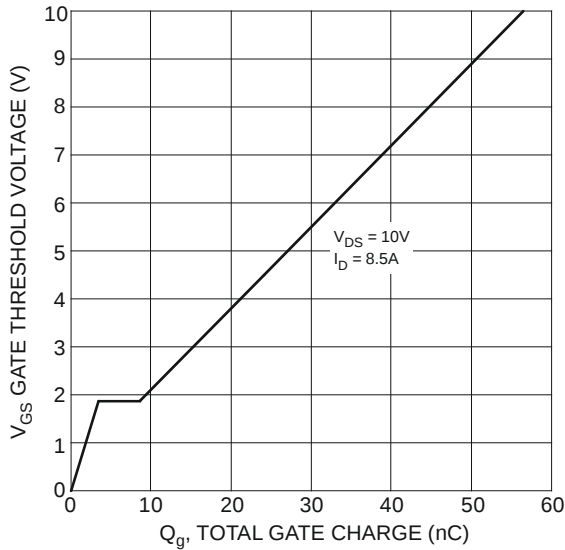
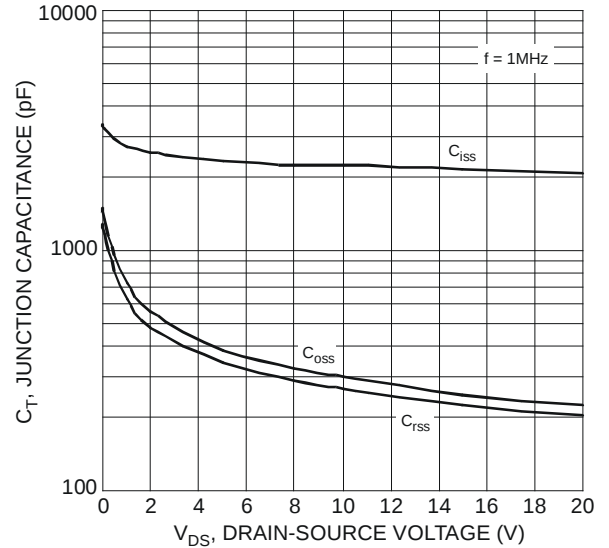
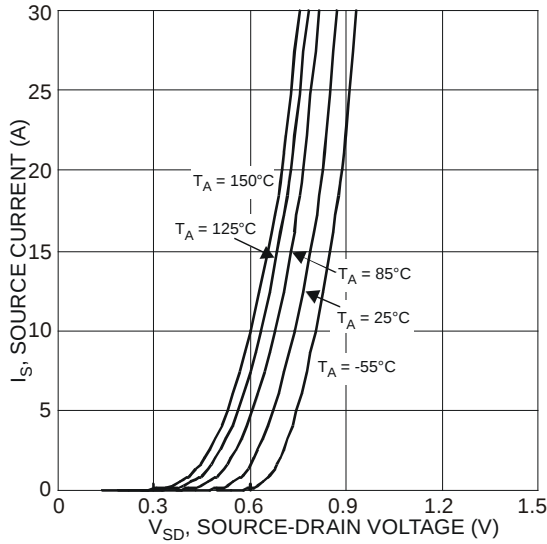
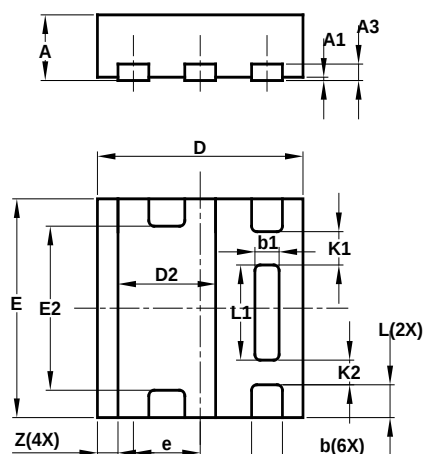


Figure 8 Gate Threshold Variation vs. Ambient Temperature



## Package Outline Dimensions

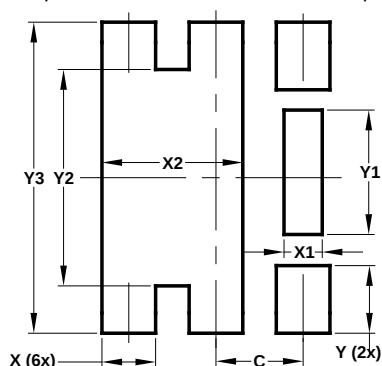
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| U-DFN2020-6<br>Type E |       |       |       |
|-----------------------|-------|-------|-------|
| 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  |
| b1                    | 0.185 | 0.285 | 0.235 |
| D                     | 1.95  | 2.05  | 2.00  |
| D2                    | 0.85  | 1.05  | 0.95  |
| E                     | 1.95  | 2.05  | 2.00  |
| E2                    | 1.40  | 1.60  | 1.50  |
| e                     | —     | —     | 0.65  |
| L                     | 0.25  | 0.35  | 0.30  |
| L1                    | 0.82  | 0.92  | 0.87  |
| K1                    | —     | —     | 0.305 |
| K2                    | —     | —     | 0.225 |
| Z                     | —     | —     | 0.20  |
| All Dimensions in mm  |       |       |       |

## Suggested Pad Layout

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



| Dimensions | Value<br>(in mm) |
|------------|------------------|
| C          | 0.650            |
| X          | 0.400            |
| X1         | 0.285            |
| X2         | 1.050            |
| Y          | 0.500            |
| Y1         | 0.920            |
| Y2         | 1.600            |
| Y3         | 2.300            |

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