

## Product Summary

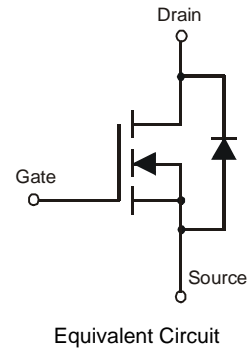
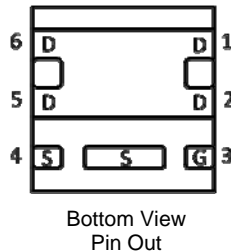
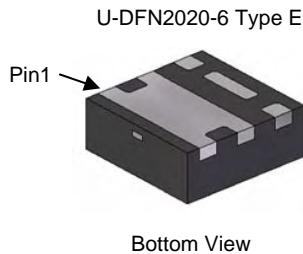
| $V_{(BR)DSS}$ | $R_{DS(ON) \max}$                       | Package               | $I_{D \max}$<br>$T_A = +25^\circ\text{C}$ |
|---------------|---|-----------------------|---|
| 20V           | 11.6m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | U-DFN2020-6<br>Type E | 10.5A                                     |
|               | 15m $\Omega$ @ $V_{GS} = 2.5\text{V}$   |                       | 9.4A                                      |

## Description

This new generation MOSFET has been 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
- **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

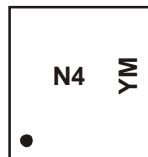
- Case: U-DFN2020-6 Type E
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0065 grams (approximate)

## Ordering Information (Note 4)

| Part Number    | Marking | Reel size (inches) | Quantity per reel |
|----------------|---------|--------------------|-------------------|
| DMN2015UFDE-7  | N4      | 7                  | 3,000             |
| DMN2015UFDE-13 | N4      | 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> 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>.

## Marking Information



N4 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 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 | 10.5<br>8.5  | A     |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | 12.5<br>10.0 | 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 | 9.4<br>7.5   | A     |
|  | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | 11.2<br>8.8  | 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     |

**Thermal Characteristics**

| Characteristic                                   |                        | Symbol                            | Value       | Units |
|--|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 0.66        | W     |
|  | T <sub>A</sub> = +70°C |                                   | 0.42        |       |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state           | R <sub>θJA</sub>                  | 189         | °C/W  |
|  | t < 10s                |                                   | 132         |       |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 2.03        | W     |
|  | T <sub>A</sub> = +70°C |                                   | 1.31        |       |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 61          | °C/W  |
|  | t < 10s                |                                   | 43          |       |
| Thermal Resistance, Junction to Case (Note 6)    |                        | R <sub>θJC</sub>                  | 9.3         | °C    |
| 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 7)</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   |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —   | —    | ±100 | nA   | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS (Note 7)</b>                     |                     |     |      |      |      |   |
| Gate Threshold Voltage                                 | V <sub>GS(th)</sub> | 0.5 | —    | 1.1  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                    |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | —   | 9.3  | 11.6 | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 8.5A   |
|  |                     |     | 11.4 | 15   |      |   |
|  |                     |     | 17   | 30   |      |   |
|  |                     |     | 24   | 50   |      |   |
|  |                     |     | 24   | 50   |      |   |
| Forward Transfer Admittance                            | Y <sub>fs</sub>     | —   | 11.3 | —    | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 8.5A  |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —   | —    | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 8.5A   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>                |                     |     |      |      |      |   |
| Input Capacitance                                      | C <sub>iss</sub>    | —   | 1779 | —    | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                    |
| Output Capacitance                                     | C <sub>oss</sub>    | —   | 175  | —    | pF   |   |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —   | 154  | —    | pF   |   |
| Gate Resistance  | R <sub>g</sub>      | —   | 0.94 | —    | 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>      | —   | 19.7 | —    | nC   |   |
| Total Gate Charge (V <sub>GS</sub> = 10V)              | Q <sub>g</sub>      | —   | 45.6 | —    | nC   |   |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —   | 2.9  | —    | nC   |   |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —   | 3.8  | —    | nC   |   |
| Turn-On Delay Time                                     | t <sub>D(on)</sub>  | —   | 7.4  | —    | ns   |   |
| Turn-On Rise Time                                      | t <sub>r</sub>      | —   | 16.8 | —    | 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-Off Delay Time                                    | t <sub>D(off)</sub> | —   | 43.6 | —    | ns   |   |
| Turn-Off Fall Time                                     | t <sub>f</sub>      | —   | 10.9 | —    | ns   |   |
| Reverse Recovery Time                                  | T <sub>rr</sub>     | —   | 8.6  | —    | ns   | I <sub>F</sub> = 8.5A, di/dt = 210A/µs  |
| Reverse Recovery Charge                                | Q <sub>rr</sub>     | —   | 3.7  | —    | nC   |   |

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

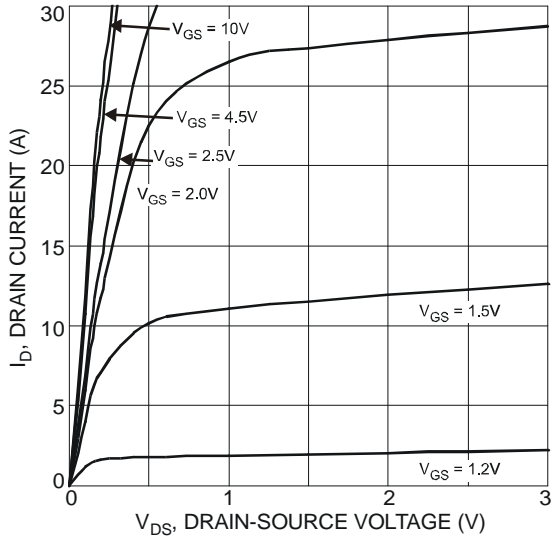


Fig. 1 Typical Output Characteristic

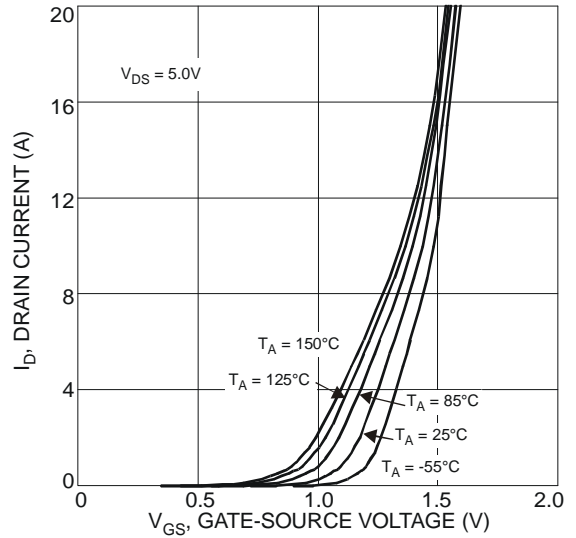


Fig. 2 Typical Transfer Characteristics

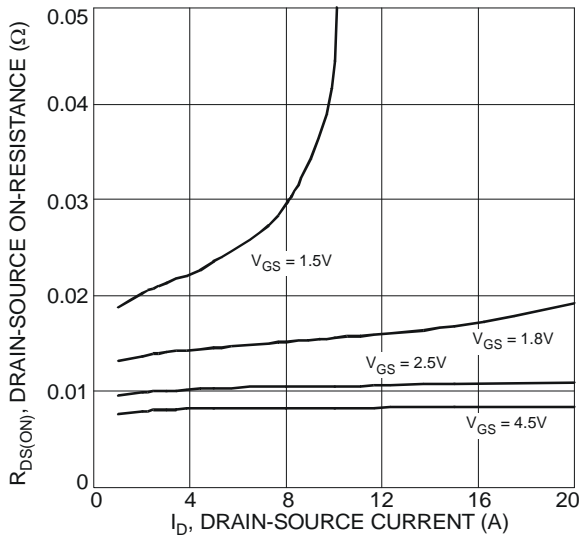


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

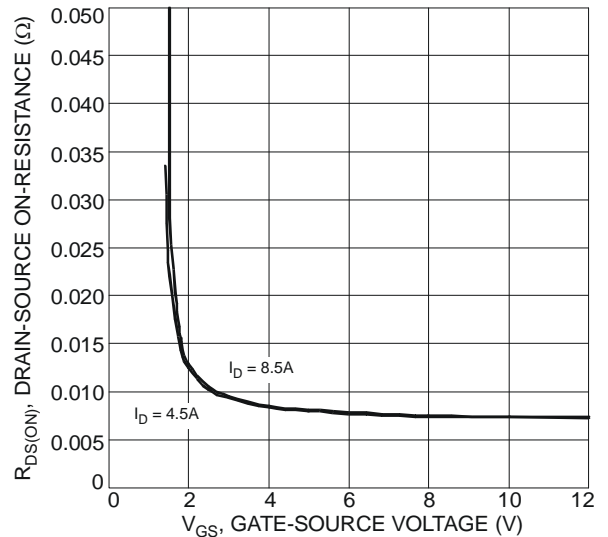


Fig. 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

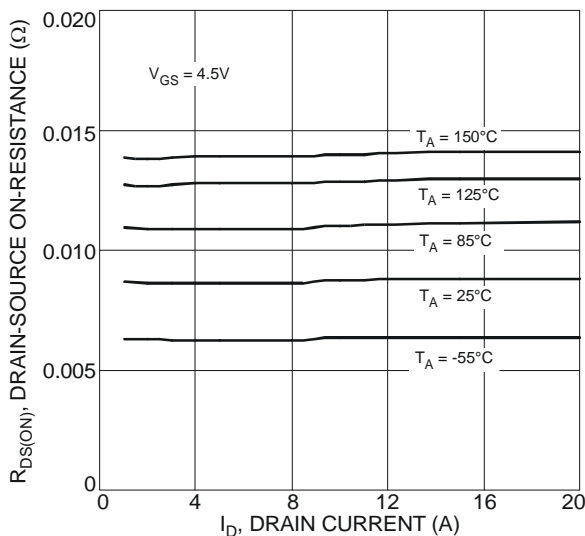


Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

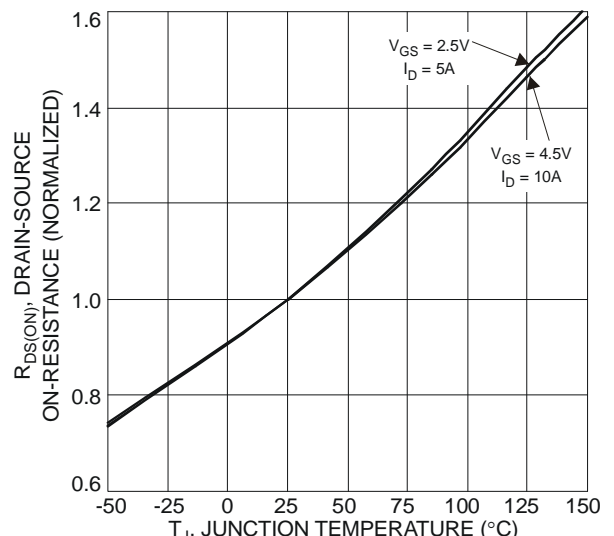


Fig. 6 On-Resistance Variation with Temperature

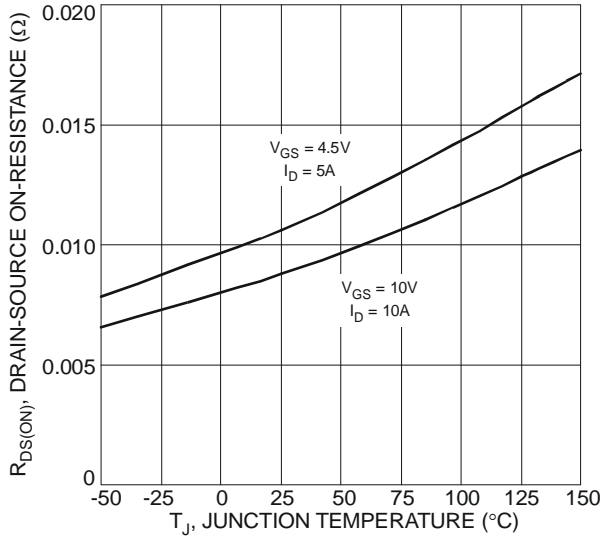


Fig. 7 On-Resistance Variation with Temperature

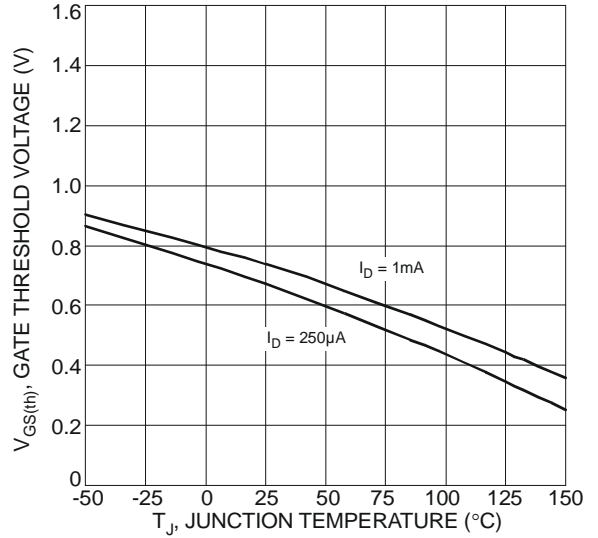


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

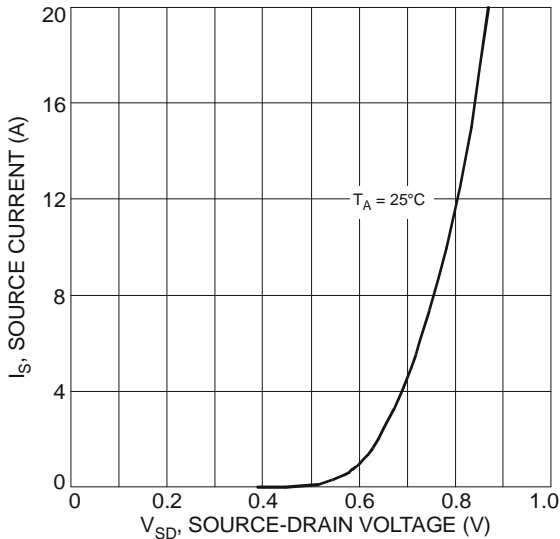


Fig. 9 Diode Forward Voltage vs. Current

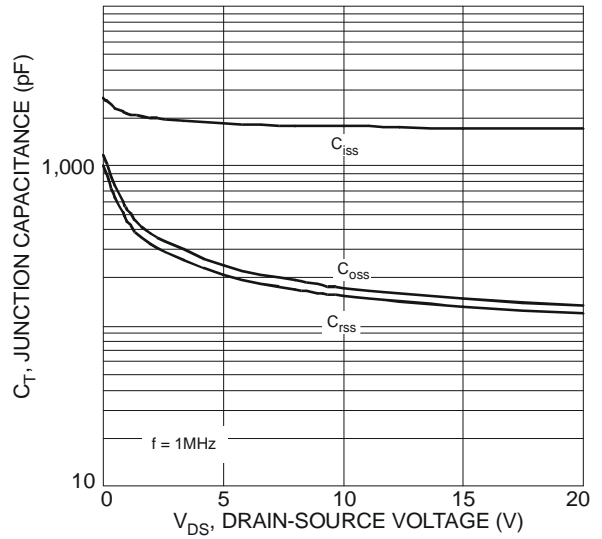


Fig. 10 Typical Junction Capacitance

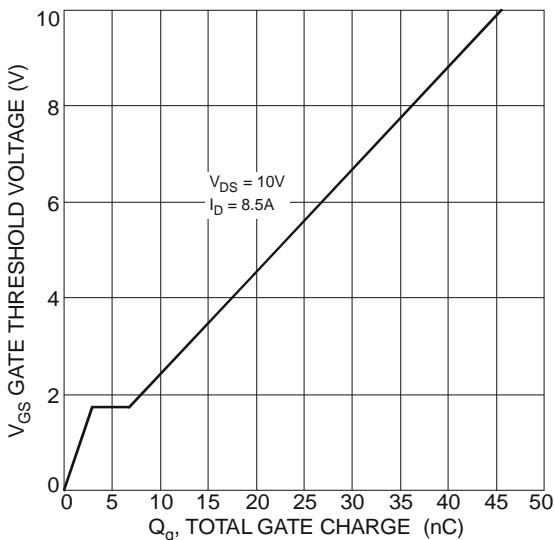


Fig. 11 Gate Charge

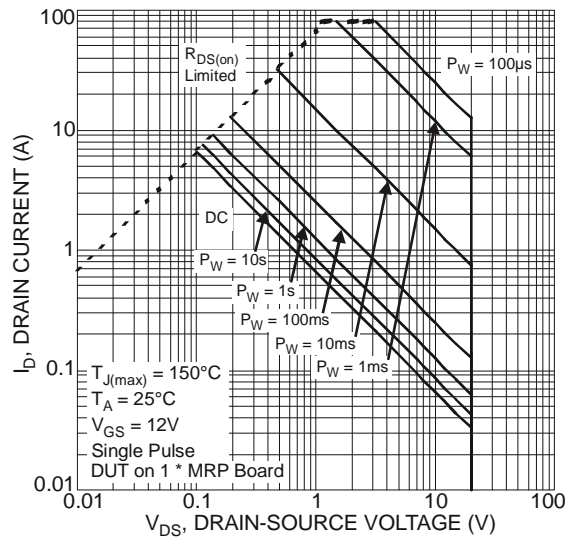
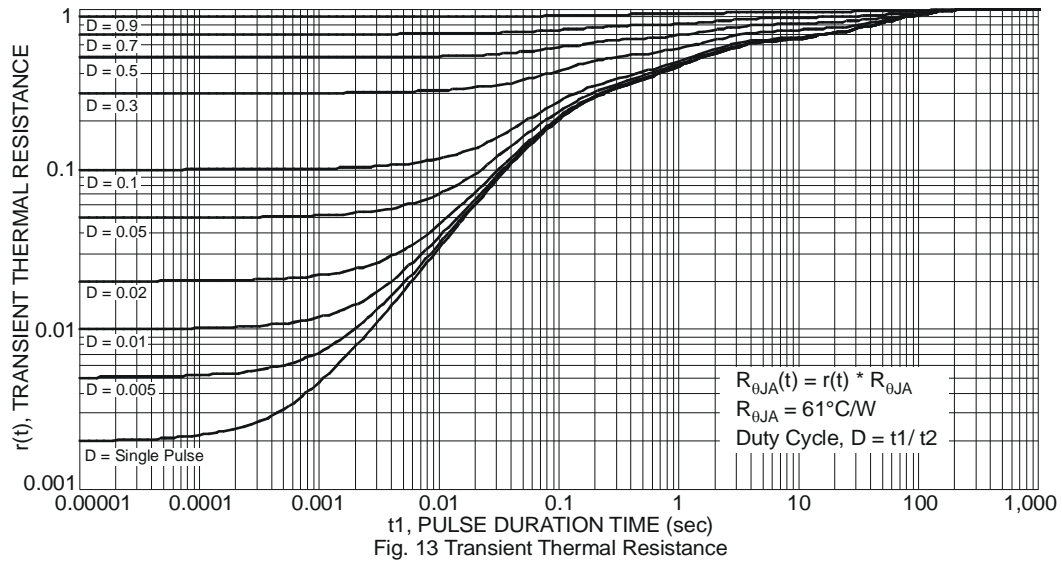
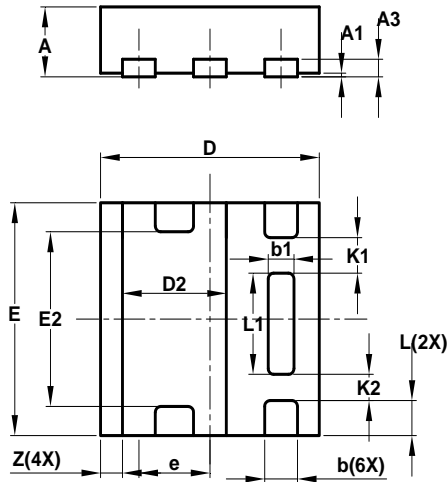


Fig. 12 SOA, Safe Operation Area



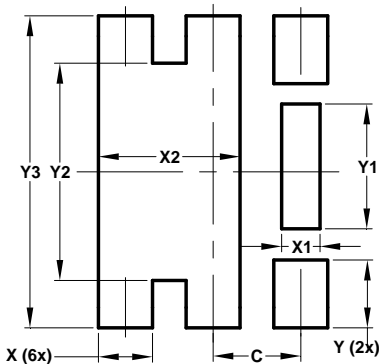
**Package Outline Dimensions**



| 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**



| Dimensions | Value (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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