

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$                                  | $I_D$<br>$T_A = 25^\circ\text{C}$ |
|---------------|---|-----------------------------------|
| 30V           | $760\text{m}\Omega$ @ $V_{GS} = 4.5\text{V}$  | 0.65A                             |
|               | $930\text{m}\Omega$ @ $V_{GS} = 2.5\text{V}$  | 0.58A                             |
|               | $1500\text{m}\Omega$ @ $V_{GS} = 1.8\text{V}$ | 0.45A                             |

## Description

This 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

- Load switch
- Portable applications
- Power Management Functions

## Features

- 0.4mm ultra low profile package for thin application
- $0.48\text{mm}^2$  package footprint, 16 times smaller than SOT23
- Low  $V_{GS(th)}$ , can be driven directly from a battery
- Low  $R_{DS(on)}$
- **ESD Protected**
- **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

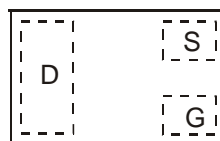
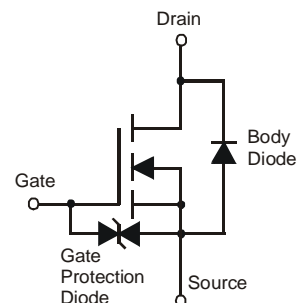
- Case: X2-DFN0806-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208 <sup>(e4)</sup>
- Weight: 0.00043 grams (approximate)



X2-DFN0806-3



Bottom View


 Top View  
 Package Pin Configuration


Equivalent Circuit

## Ordering Information (Note 4)

| Part Number   | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---------------|---------|--------------------|-----------------|-------------------|
| DMN3900UFA-7B | NU      | 7                  | 8               | 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

DMN3900UFA-7B


 Top View  
 Bar Denotes Gate  
 and Source Side

NU = Product Type Marking Code

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic           |                        |                                 | Symbol           | Value | Unit |
|--------------------------|------------------------|---------------------------------|------------------|-------|------|
| Drain-Source Voltage     |                        |                                 | V <sub>DSS</sub> | 30    | V    |
| Gate-Source Voltage      |                        |                                 | V <sub>GSS</sub> | ±8    |      |
| Continuous Drain Current | V <sub>GS</sub> = 4.5V | (Note 6)                        | I <sub>D</sub>   | 0.65  | A    |
|                          |                        | T <sub>A</sub> = +70°C (Note 6) |                  | 0.52  |      |
|                          |                        | (Note 5)                        | I <sub>D</sub>   | 0.55  |      |
| Pulsed Drain Current     |                        | (Note 7)                        | I <sub>DM</sub>  | 2.5   |      |

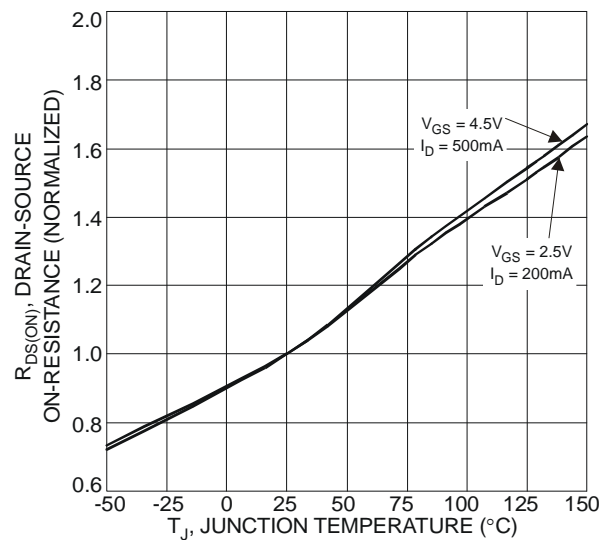
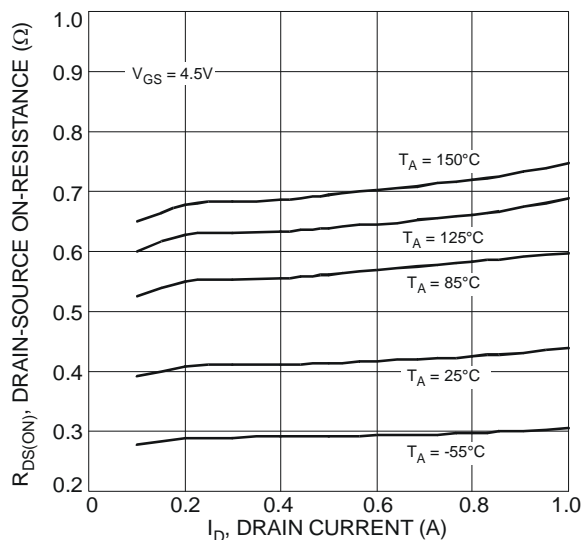
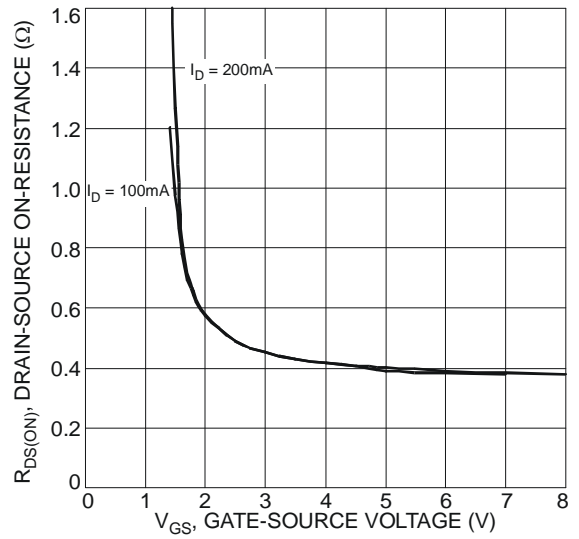
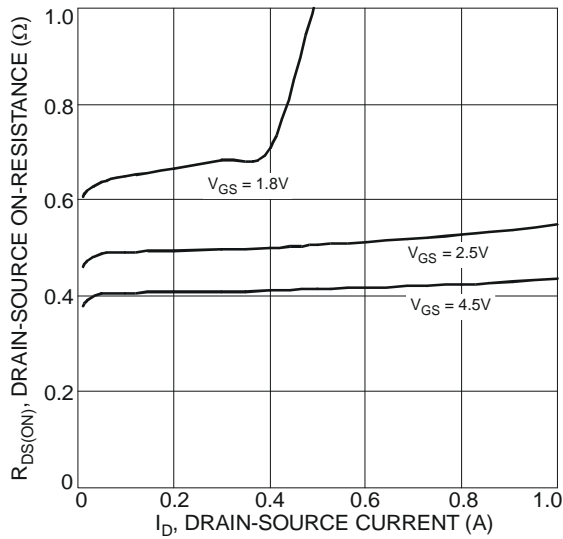
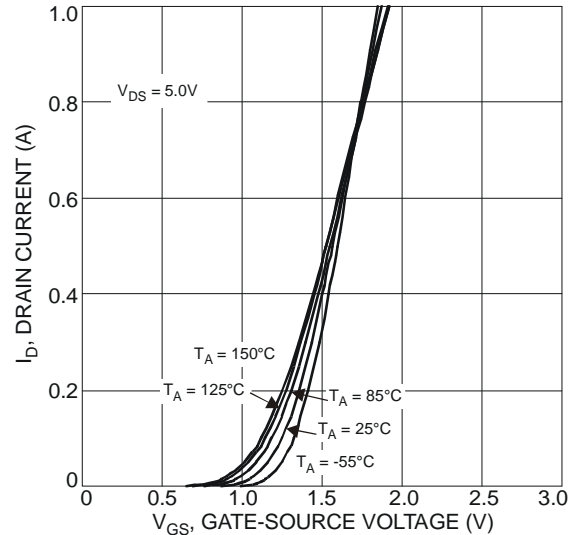
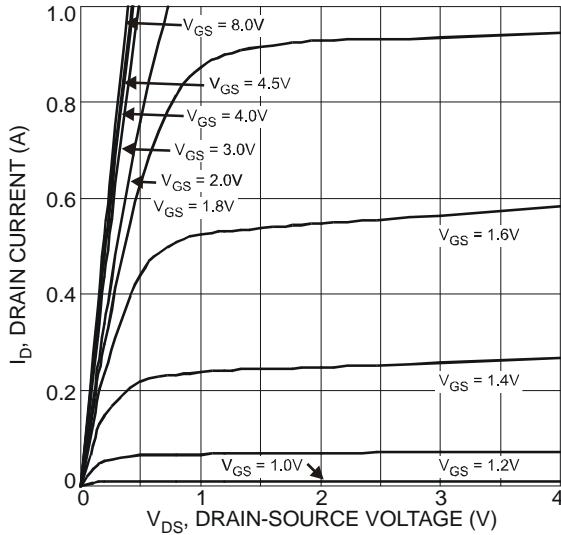
## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                          |          | Symbol                            | Value       | Unit |
|---|----------|-----------------------------------|-------------|------|
| Power Dissipation                       | (Note 6) | P <sub>D</sub>                    | 490         | mW   |
|   | (Note 5) |                                   | 390         |      |
| Thermal Resistance, Junction to Ambient | (Note 6) | R <sub>θJA</sub>                  | 255         | °C/W |
|   | (Note 5) |                                   | 327         |      |
| 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</b>                 |                     |      |      |      |      |  |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 30   | -    | -    | 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> = 30V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | -    | -    | 3    | μA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS</b>                  |                     |      |      |      |      |  |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | 0.45 | -    | 0.95 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                 |
| Static Drain-Source On-Resistance (Note 8) | R <sub>DS(on)</sub> | -    | -    | 760  | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 200mA   |
|  |                     |      |      | 930  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 100mA   |
|  |                     |      |      | 1500 |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 75mA  |
| Forward Transfer Admittance                | Y <sub>fs</sub>     | 40   | -    | -    | mS   | V <sub>DS</sub> = 3V, I <sub>D</sub> = 10mA  |
| Diode Forward Voltage (Note 8)             | V <sub>SD</sub>     | -    | 0.7  | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 300mA   |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>    |                     |      |      |      |      |  |
| Input Capacitance                          | C <sub>iss</sub>    | -    | 42.2 | -    | pF   | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz                                    |
| Output Capacitance                         | C <sub>oss</sub>    | -    | 4.5  | -    | pF   |  |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | -    | 3.4  | -    | pF   |  |
| Gate Resistance                            | R <sub>g</sub>      | -    | 468  | -    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                       |
| Total Gate Charge                          | Q <sub>g</sub>      | -    | 0.7  | -    | nC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 200mA                      |
| Gate-Source Charge                         | Q <sub>gs</sub>     | -    | 0.11 | -    | nC   |  |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | -    | 0.15 | -    | nC   |  |
| Turn-On Delay Time                         | t <sub>D(on)</sub>  | -    | 10.5 | -    | ns   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 200mA, V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 6Ω |
| Turn-On Rise Time                          | t <sub>r</sub>      | -    | 7.8  | -    | ns   |  |
| Turn-Off Delay Time                        | t <sub>D(off)</sub> | -    | 80.6 | -    | ns   |  |
| Turn-Off Fall Time                         | t <sub>f</sub>      | -    | 23.4 | -    | ns   |  |

- Notes:
- For a device surface mounted on a minimum recommended pad layout of an FR4 PCB, in still air conditions; the device is measured when operating in steady-state condition.
  - Same as note 4, except the device measured at t ≤ 10 sec.
  - Same as note 4, except the device is pulsed at duty cycle of 1% for a pulse width of 10μs.
  - Measured under pulsed conditions to minimize self-heating effect. Pulse width ≤ 300μs; duty cycle ≤ 2%.
  - For design aid only, not subject to production testing.



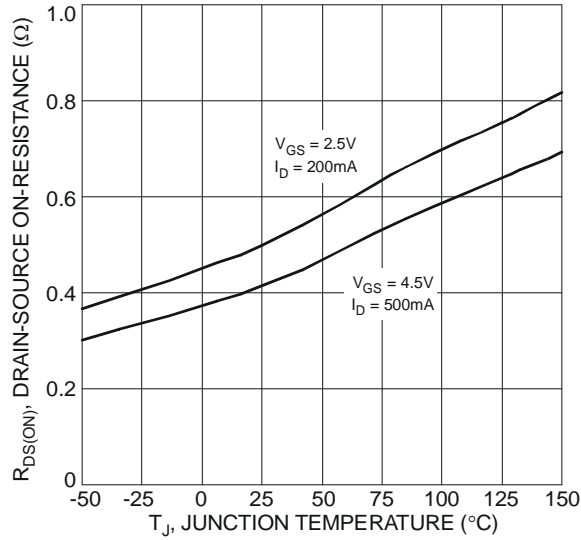


Fig. 7 On-Resistance Variation with Temperature

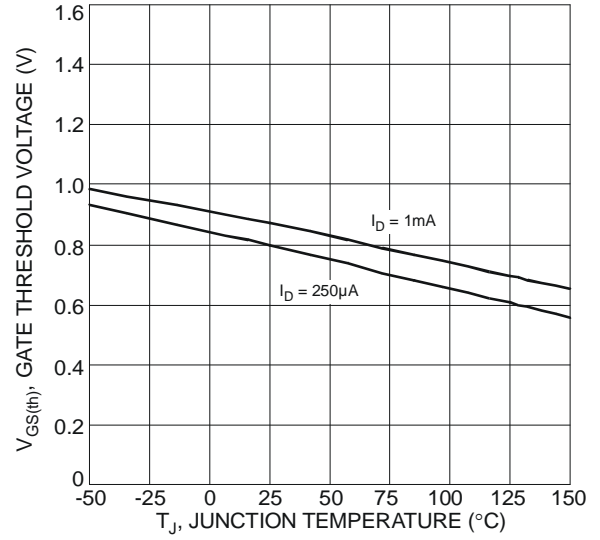


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

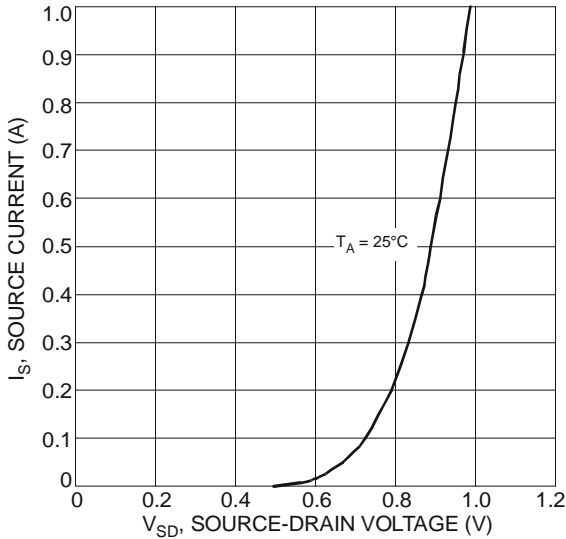


Fig. 9 Diode Forward Voltage vs. Current

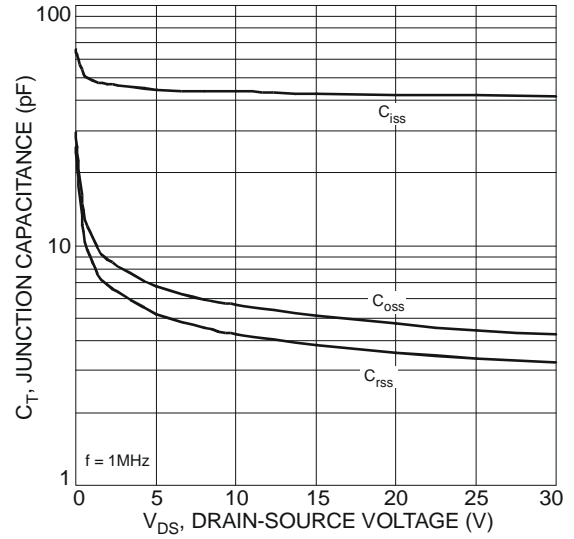


Fig. 10 Typical Junction Capacitance

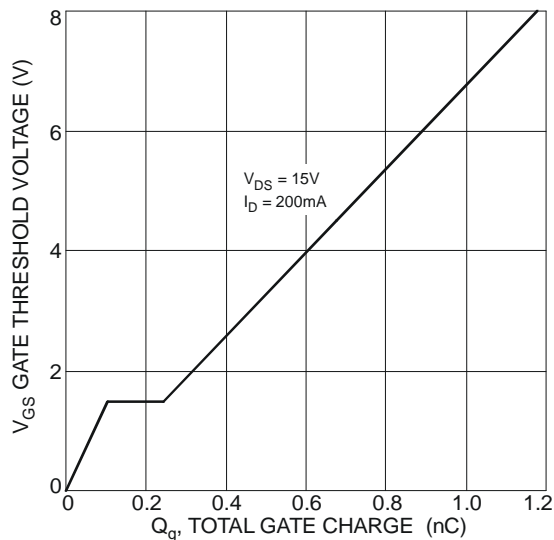


Fig. 11 Gate Charge

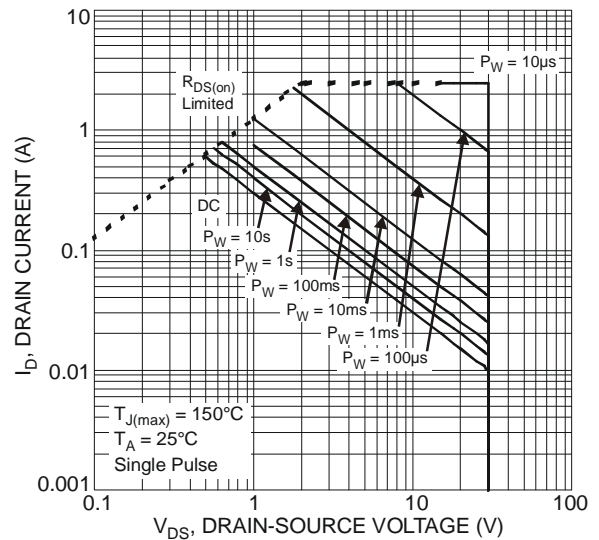


Fig. 12 SOA, Safe Operation Area

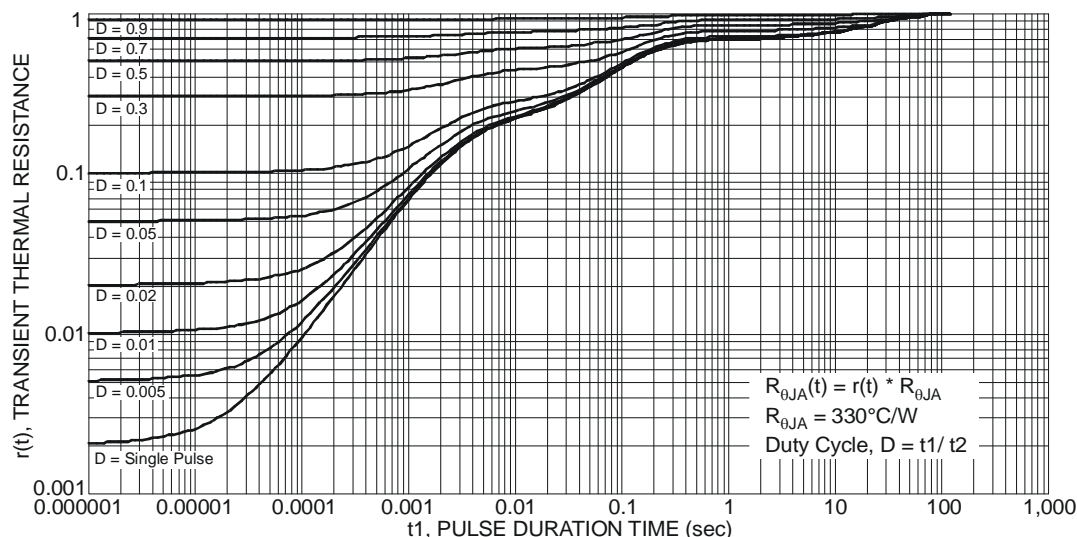
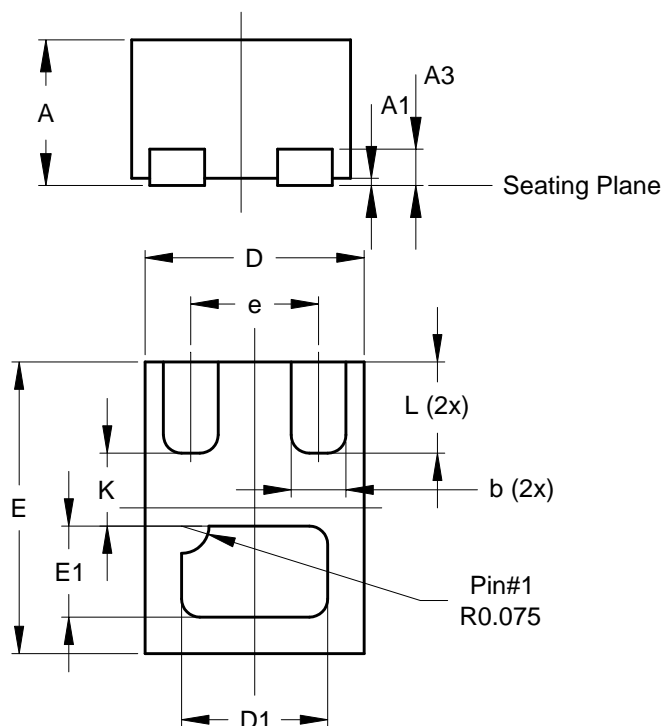


Fig. 13 Transient Thermal Resistance

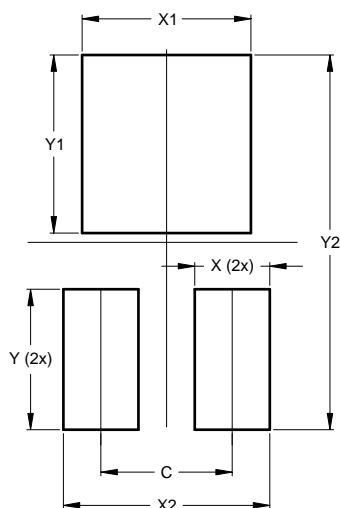
## Package Outline Dimensions

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


| X2-DFN0806-3         |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 0.375 | 0.40 | 0.39 |
| A1                   | 0     | 0.05 | 0.02 |
| A3                   | -     | -    | 0.10 |
| b                    | 0.10  | 0.20 | 0.15 |
| D                    | 0.55  | 0.65 | 0.60 |
| D1                   | 0.35  | 0.45 | 0.40 |
| E                    | 0.75  | 0.85 | 0.80 |
| E1                   | 0.20  | 0.30 | 0.25 |
| e                    | -     | -    | 0.35 |
| K                    | -     | -    | 0.20 |
| L                    | 0.20  | 0.30 | 0.25 |
| All Dimensions in mm |       |      |      |

## Suggested Pad Layout

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



| Dimensions | Value<br>(in mm) |
|------------|------------------|
| C          | 0.350            |
| X          | 0.200            |
| X1         | 0.450            |
| X2         | 0.550            |
| Y          | 0.375            |
| Y1         | 0.475            |
| Y2         | 1.000            |

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