

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ max               | Package | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|--------------------------------|---------|------------------------------|
| 20V           | 25m $\Omega$ @ $V_{GS} = 4.5V$ | SO-8    | 5.8A                         |
|               | 35m $\Omega$ @ $V_{GS} = 2.5V$ |         | 4.8A                         |

## 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

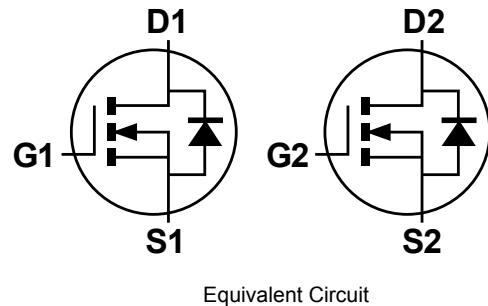
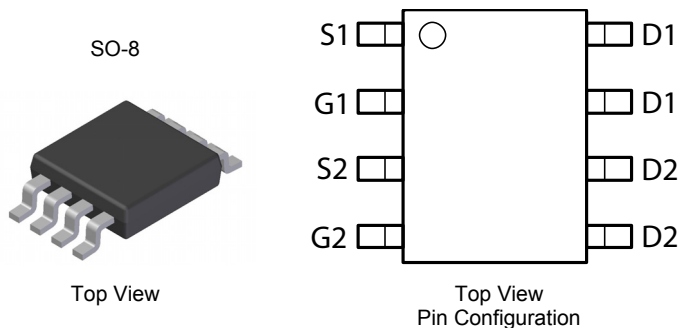
- DC-DC Converters
- Power Management Functions
- Backlighting

## Features

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **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: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish annealed over Copper leadframe.  
Solderable per MIL-STD-202, Method 208 
- Weight: 0.074 grams (approximate)

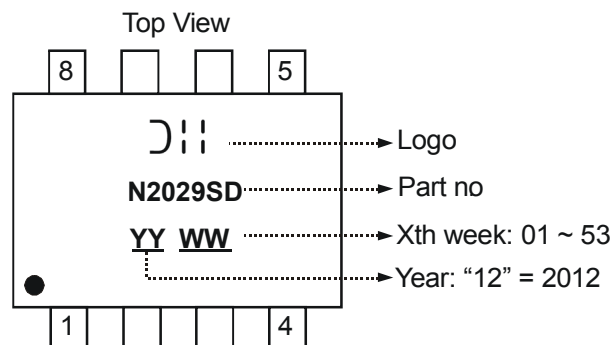


## Ordering Information (Note 4)

| Part Number   | Case | Packaging         |
|---------------|------|-------------------|
| DMN2029USD-13 | SO-8 | 2,500/Tape & Reel |

- 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



**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> | ±8         | 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>   | 5.8<br>4.7 | A     |
|                                                          | t < 10s      | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 6.9<br>5.7 | A     |
| Maximum Body Diode Forward Current (Note 6)              |              |                                                  | I <sub>S</sub>   | 2.1        | A     |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%)       |              |                                                  | I <sub>DM</sub>  | 30         | A     |
| Avalanche Current (Note 7) L = 0.1mH                     |              |                                                  | I <sub>AS</sub>  | 15         | A     |
| Avalanche Energy (Note 7) L = 0.1mH                      |              |                                                  | E <sub>AS</sub>  | 11.2       | mJ    |

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

| Characteristic                                   |                        | Symbol                            | Value       | Units |
|--------------------------------------------------|------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.2         | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.7         |       |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state           | R <sub>θJA</sub>                  | 115         | °C/W  |
|                                                  | t < 10s                |                                   | 70          |       |
| Total Power Dissipation (Note 6)                 | T <sub>A</sub> = +25°C | P <sub>D</sub>                    | 1.4         | W     |
|                                                  | T <sub>A</sub> = +70°C |                                   | 0.9         |       |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state           | R <sub>θJA</sub>                  | 95          | °C/W  |
|                                                  | t < 10s                |                                   | 60          |       |
| Thermal Resistance, Junction to Case (Note 6)    |                        | R <sub>θJC</sub>                  | 14.5        |       |
| 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            | 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> = ±8V, V <sub>DS</sub> = 0V                                                  |
| <b>ON CHARACTERISTICS (Note 8)</b>         |                     |     |       |      |      |                                                                                              |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | 0.6 | —     | 1.5  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                   |
| Static Drain-Source On-Resistance          | R <sub>DS(on)</sub> | —   | 14    | 25   | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6.5A                                                |
|                                            |                     | —   | 19    | 35   |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 5.4A                                                |
| Forward Transfer Admittance                | Y <sub>fs</sub>     | —   | 10    | —    | S    | V <sub>DS</sub> = 5V, I <sub>D</sub> = 6.5A                                                  |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.3A                                                  |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>    |                     |     |       |      |      |                                                                                              |
| Input Capacitance                          | C <sub>iss</sub>    | —   | 1171  | —    | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                    |
| Output Capacitance                         | C <sub>oss</sub>    | —   | 133   | —    |      |                                                                                              |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    | —   | 110   | —    |      |                                                                                              |
| Gate Resistance                            | R <sub>G</sub>      | —   | 1.2   | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                       |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>g</sub>      | —   | 10.4  | —    | nC   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 3A                                                   |
| Total Gate Charge (V <sub>GS</sub> = 8V)   | Q <sub>g</sub>      | —   | 18.6  | —    |      |                                                                                              |
| Gate-Source Charge                         | Q <sub>gs</sub>     | —   | 1.9   | —    |      |                                                                                              |
| Gate-Drain Charge                          | Q <sub>gd</sub>     | —   | 2.3   | —    |      |                                                                                              |
| Turn-On Delay Time                         | t <sub>D(on)</sub>  | —   | 16.5  | —    | nS   | V <sub>GS</sub> = 4.5V, V <sub>DD</sub> = 10V, R <sub>GEN</sub> = 6Ω,<br>I <sub>D</sub> = 1A |
| Turn-On Rise Time                          | t <sub>r</sub>      | —   | 33.3  | —    |      |                                                                                              |
| Turn-Off Delay Time                        | t <sub>D(off)</sub> | —   | 119.3 | —    |      |                                                                                              |
| Turn-Off Fall Time                         | t <sub>f</sub>      | —   | 53.5  | —    |      |                                                                                              |
| Body Diode Reverse Recovery Time           | t <sub>rr</sub>     | —   | 7.5   | —    | nS   | I <sub>S</sub> = 6.5A, dI/dt = 100A/μs                                                       |
| Body Diode Reverse Recovery Charge         | Q <sub>rr</sub>     | —   | 2.0   | —    | nC   | I <sub>S</sub> = 6.5A, dI/dt = 100A/μs                                                       |

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

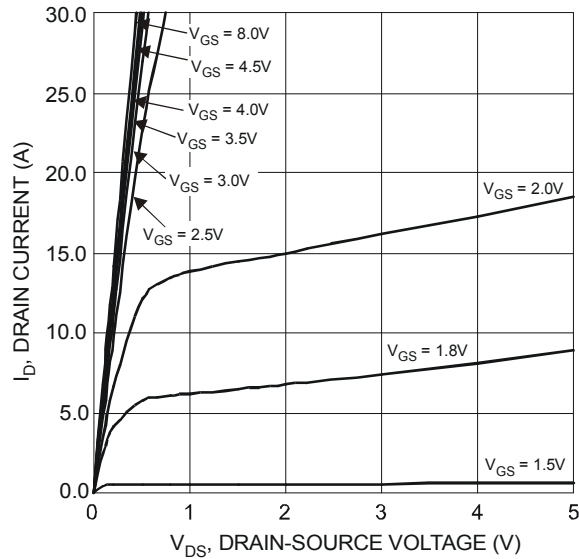


Figure 1 Typical Output Characteristics

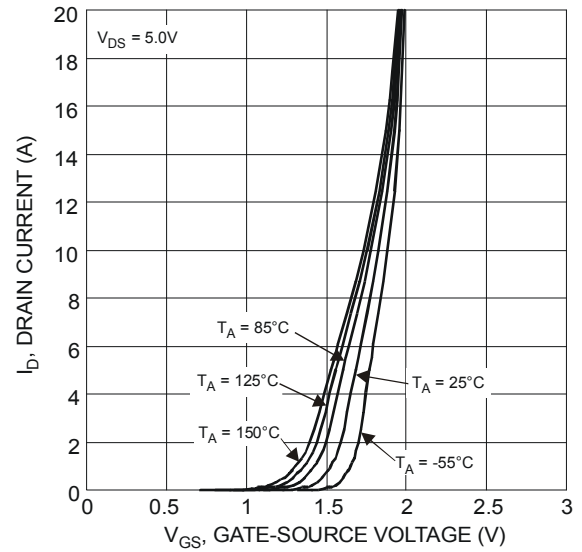


Figure 2 Typical Transfer Characteristics

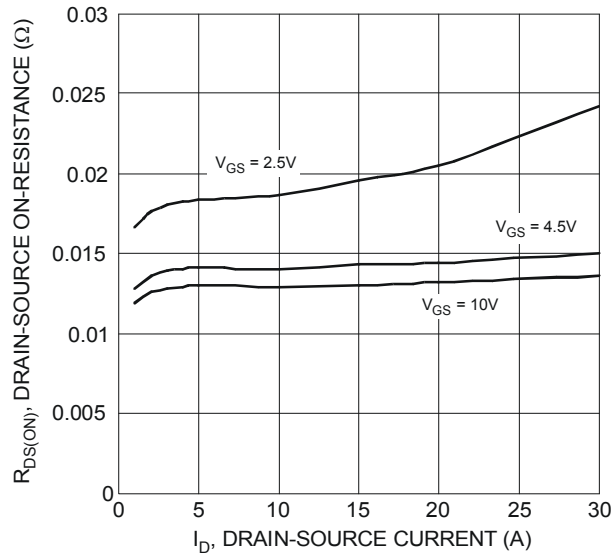


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

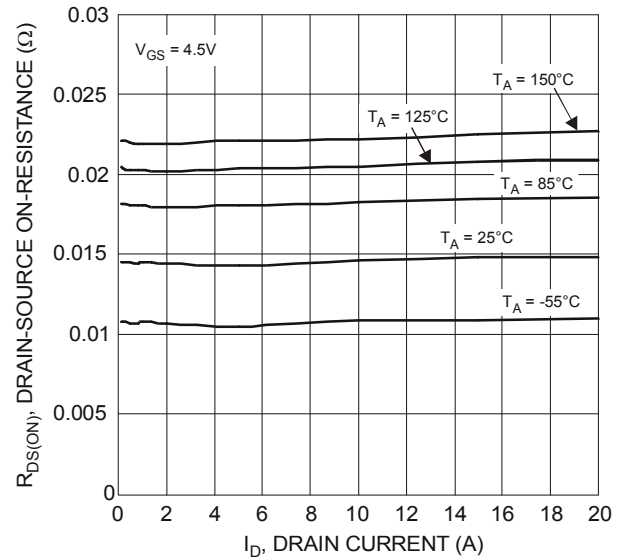


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

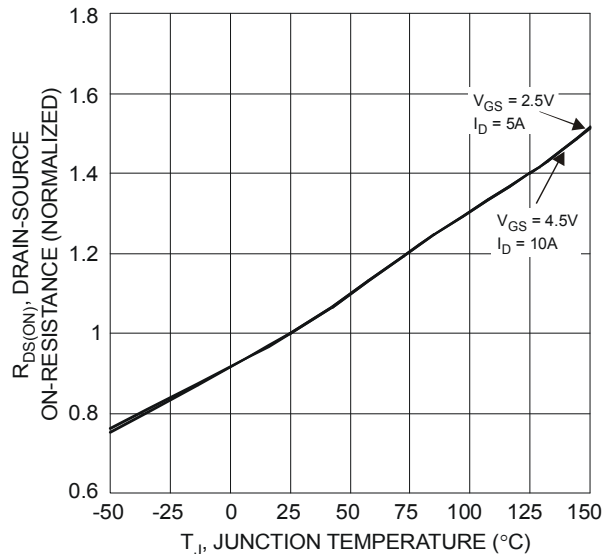


Figure 5 On-Resistance Variation with Temperature

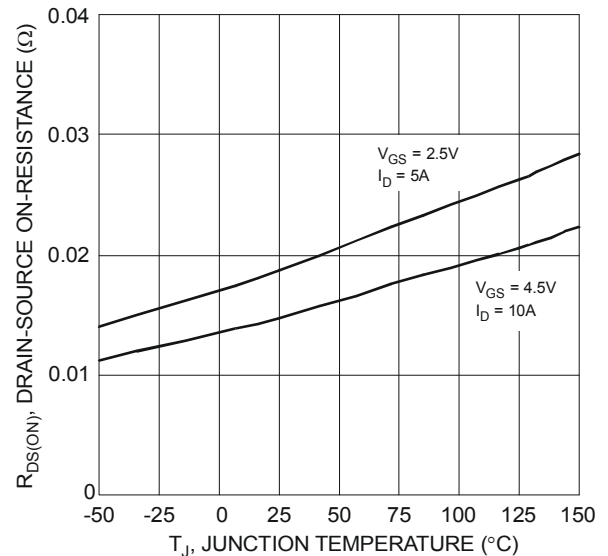


Figure 6 On-Resistance Variation with Temperature

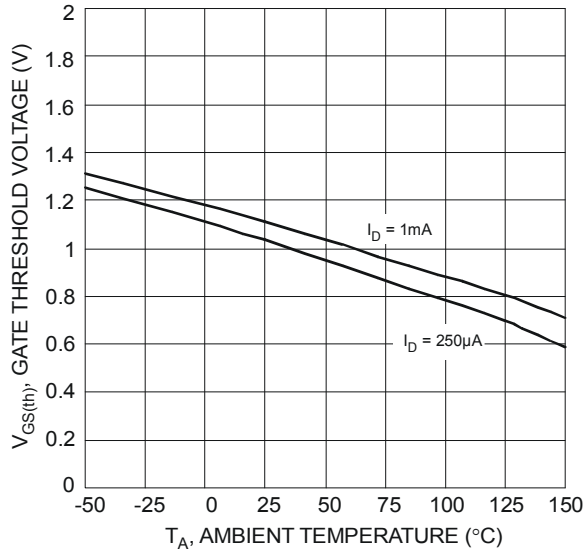


Figure 7 Gate Threshold Variation vs. Ambient Temperature

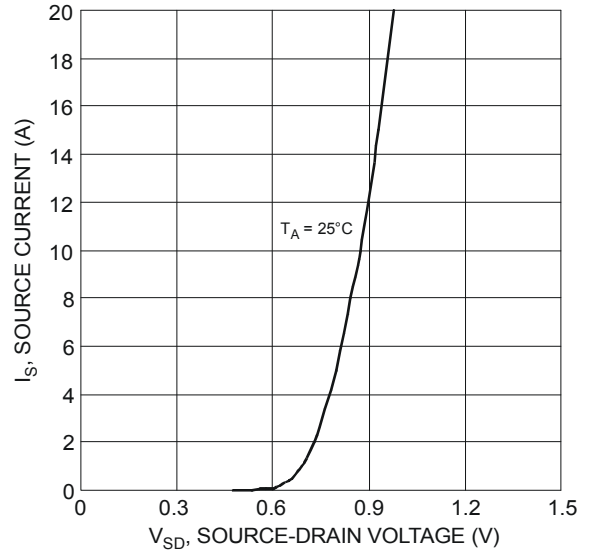


Figure 8 Diode Forward Voltage vs. Current

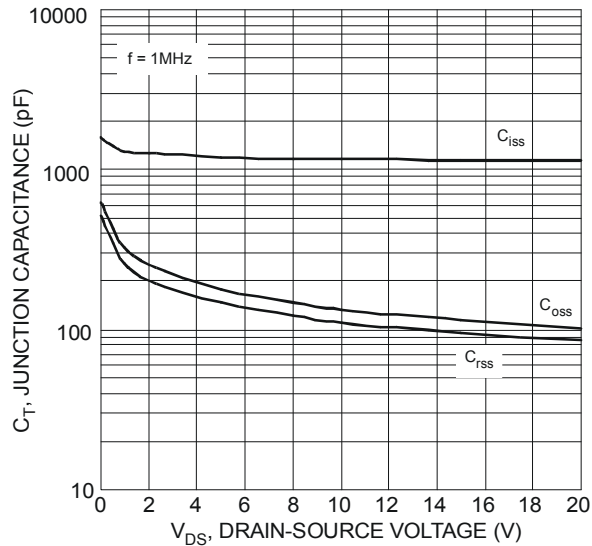


Figure 9 Typical Junction Capacitance

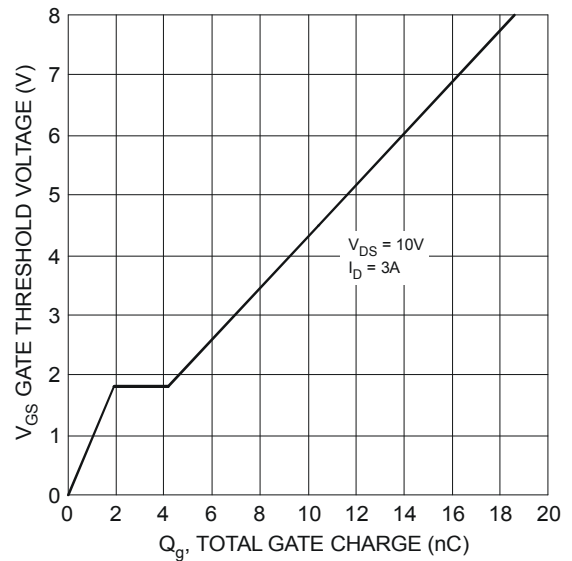


Figure 10 Gate Charge

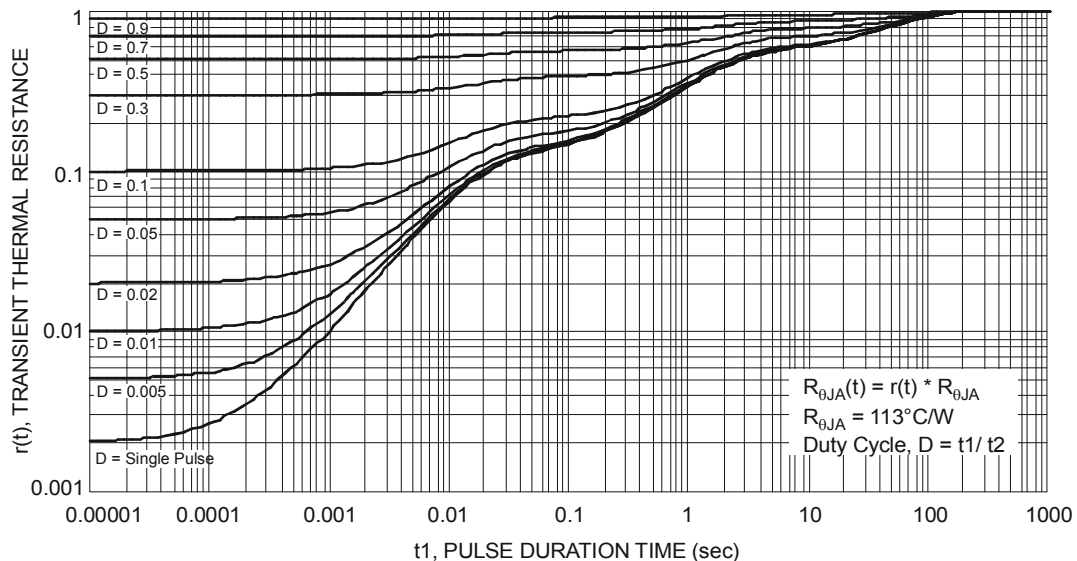
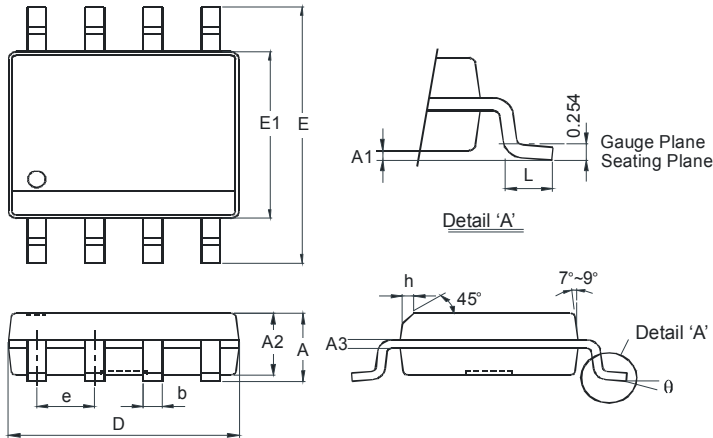


Figure 11 Transient Thermal Resistance

## Package Outline Dimensions

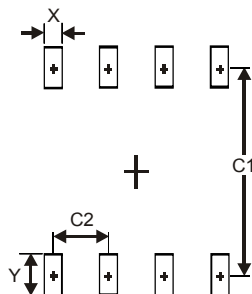
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SO-8                 |          |      |
|----------------------|----------|------|
| Dim                  | Min      | Max  |
| A                    | -        | 1.75 |
| A1                   | 0.10     | 0.20 |
| A2                   | 1.30     | 1.50 |
| A3                   | 0.15     | 0.25 |
| b                    | 0.3      | 0.5  |
| D                    | 4.85     | 4.95 |
| E                    | 5.90     | 6.10 |
| E1                   | 3.85     | 3.95 |
| e                    | 1.27 Typ |      |
| h                    | -        | 0.35 |
| L                    | 0.62     | 0.82 |
| θ                    | 0°       | 8°   |
| All Dimensions in mm |          |      |

## Suggested Pad Layout

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



| Dimensions | Value (in mm) |
|------------|---------------|
| X          | 0.60          |
| Y          | 1.55          |
| C1         | 5.4           |
| C2         | 1.27          |

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