

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on) \max}$                      | $I_D$<br>$T_A = +25^\circ\text{C}$ |
|---------------|----------------------------------------|------------------------------------|
| -40V          | 11m $\Omega$ @ $V_{GS} = -10\text{V}$  | -10.1A                             |
|               | 15m $\Omega$ @ $V_{GS} = -4.5\text{V}$ | -8.8A                              |

## 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

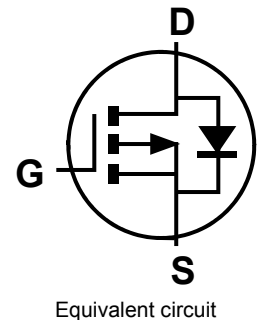
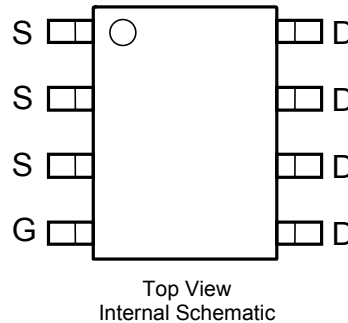
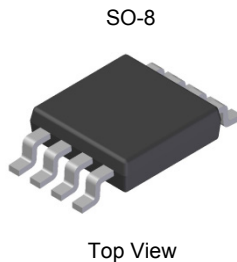
- DC-DC Converters
- Power management functions
- Analog Switch

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low Input Capacitance
- **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**
- **PPAP Available**

## 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 – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 **e3**
- Weight: 0.074 grams (approximate)

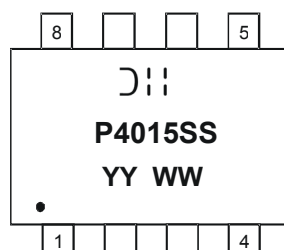


## Ordering Information (Note 4 & 5)

| Part Number    | Qualification | Case | Packaging         |
|----------------|---------------|------|-------------------|
| DMP4015SSSQ-13 | Automotive    | 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_grade\\_definitions/](http://www.diodes.com/quality/product_grade_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



☐☐☐ = Manufacturer's Marking  
 P4015SS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 13 = 2013)  
 WW = Week (01 - 53)

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

| Characteristic                                            |              |                                                  | Symbol           | Value        | Units |
|-----------------------------------------------------------|--------------|--------------------------------------------------|------------------|--------------|-------|
| Drain-Source Voltage                                      |              |                                                  | V <sub>DSS</sub> | -40          | V     |
| Gate-Source Voltage                                       |              |                                                  | V <sub>GSS</sub> | ±25          | 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>-7.2 | A     |
| 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>   | -7.8<br>-6.2 | A     |
| Continuous Drain Current (Note 7) V <sub>GS</sub> = -10V  | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -10.1<br>-8  | A     |
| Continuous Drain Current (Note 7) 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>   | -8.8<br>-7   | A     |
| Pulsed Drain Current (10μs pulse, duty cycle = 1%)        |              |                                                  | I <sub>DM</sub>  | -100         | A     |
| Avalanche Current (Note 8)                                |              |                                                  | I <sub>AS</sub>  | -22          | A     |
| Avalanche Energy (Note 8)                                 |              |                                                  | E <sub>AS</sub>  | 242          | mJ    |

**Thermal Characteristics**

| Characteristic                                   | Symbol                            | Value       | Units |
|--------------------------------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 6)                 | P <sub>D</sub>                    | 1.45        | W     |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 88          | °C/W  |
| Total Power Dissipation (Note 7)                 | P <sub>D</sub>                    | 1.82        | W     |
| Thermal Resistance, Junction to Ambient (Note 7) | R <sub>θJA</sub>                  | 70          | °C/W  |
| Thermal Resistance, Junction to Case (Note 7)    | R <sub>θJC</sub>                  | 7.6         | °C/W  |
| 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 9)</b>      |                     |      |       |      |      |                                                                                                                    |
| Drain-Source Breakdown Voltage           | BV <sub>DSS</sub>   | -40  | —     | —    | 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> = -40V, V <sub>GS</sub> = 0V                                                                       |
| Gate-Source Leakage                      | I <sub>GSS</sub>    | —    | —     | ±100 | nA   | V <sub>GS</sub> = ±25V, V <sub>DS</sub> = 0V                                                                       |
| <b>ON CHARACTERISTICS (Note 9)</b>       |                     |      |       |      |      |                                                                                                                    |
| Gate Threshold Voltage                   | V <sub>GS(th)</sub> | -1.5 | -2    | -2.5 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                                        |
| Static Drain-Source On-Resistance        | R <sub>DS(on)</sub> | —    | 7     | 11   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -9.8A                                                                     |
|                                          |                     | —    | 9     | 15   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -9.8A                                                                    |
| Forward Transfer Admittance              | Y <sub>fs</sub>     | —    | 26    | —    | S    | V <sub>DS</sub> = -20V, I <sub>D</sub> = -9.8A                                                                     |
| Diode Forward Voltage (Note 6)           | V <sub>SD</sub>     | —    | -0.7  | -1   | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A                                                                         |
| <b>DYNAMIC CHARACTERISTICS (Note 10)</b> |                     |      |       |      |      |                                                                                                                    |
| Input Capacitance                        | C <sub>iss</sub>    | —    | 4234  | —    | pF   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V<br>f = 1MHz                                                           |
| Output Capacitance                       | C <sub>oss</sub>    | —    | 1036  | —    |      |                                                                                                                    |
| Reverse Transfer Capacitance             | C <sub>rss</sub>    | —    | 526   | —    |      |                                                                                                                    |
| Gate Resistance                          | R <sub>G</sub>      | —    | 7.77  | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                                               |
| Total Gate Charge                        | Q <sub>g</sub>      | —    | 47.5  | —    | nC   | V <sub>DS</sub> = -20V, V <sub>GS</sub> = -5V<br>I <sub>D</sub> = -9.8A                                            |
| Gate-Source Charge                       | Q <sub>gs</sub>     | —    | 14.2  | —    |      |                                                                                                                    |
| Gate-Drain Charge                        | Q <sub>gd</sub>     | —    | 13.5  | —    |      |                                                                                                                    |
| Turn-On Delay Time                       | t <sub>D(on)</sub>  | —    | 13.2  | —    | ns   | V <sub>GS</sub> = -10V, V <sub>DD</sub> = -20V, R <sub>G</sub> = 6Ω,<br>I <sub>D</sub> = -1A, R <sub>L</sub> = 20Ω |
| Turn-On Rise Time                        | t <sub>r</sub>      | —    | 10    | —    |      |                                                                                                                    |
| Turn-Off Delay Time                      | t <sub>D(off)</sub> | —    | 302.7 | —    |      |                                                                                                                    |
| Turn-Off Fall Time                       | t <sub>f</sub>      | —    | 137.9 | —    |      |                                                                                                                    |

- Notes:
6. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  7. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1inch square copper plate
  8. UIS in production with L = 1mH, T<sub>J</sub> = +25°C
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. Not subject to production testing.

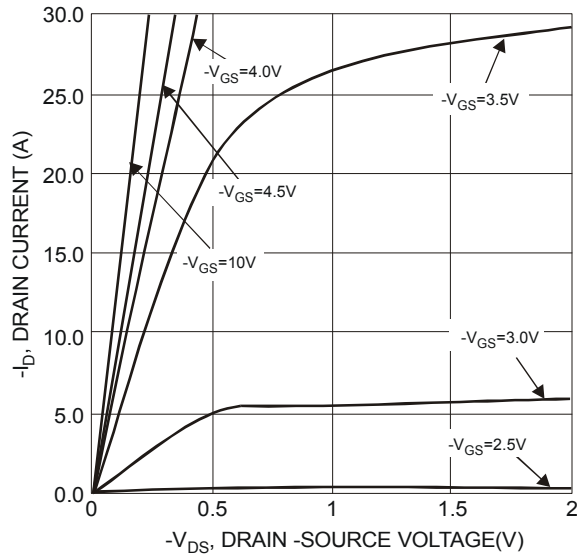


Fig. 1 Typical Output Characteristics

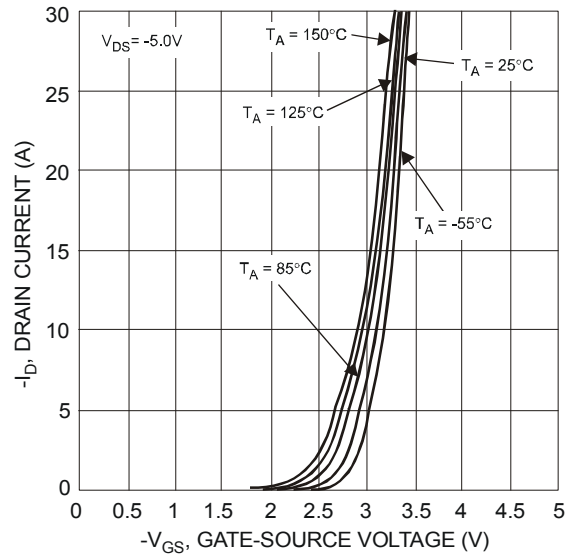


Fig. 2 Typical Transfer Characteristics

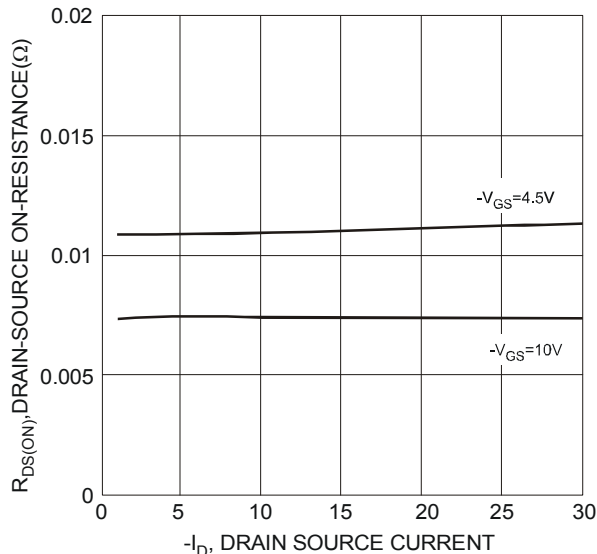


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

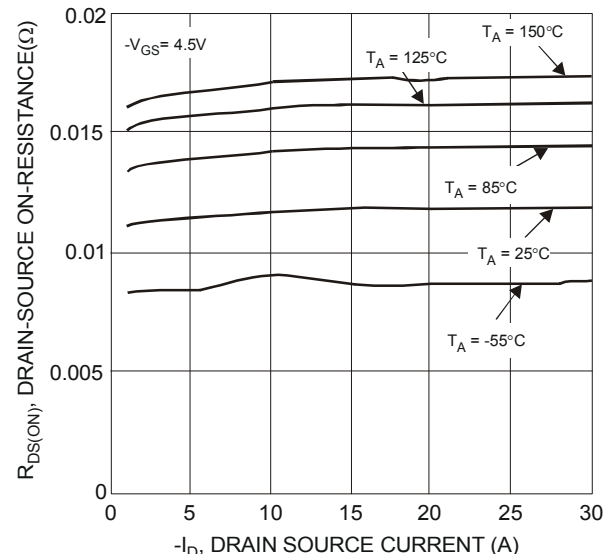


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

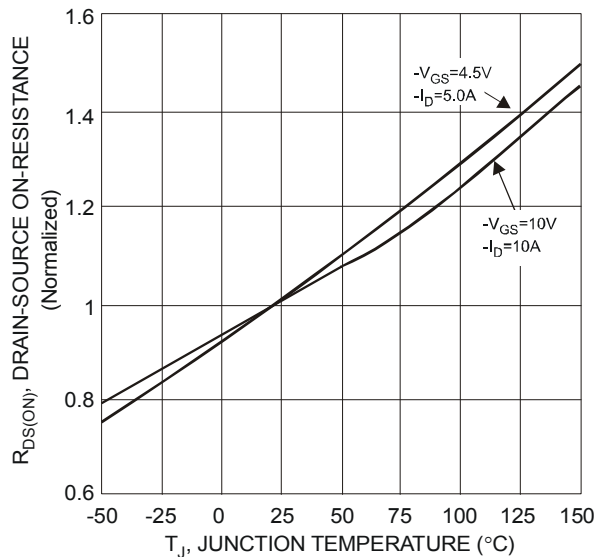


Fig. 5 On-Resistance Variation with Temperature

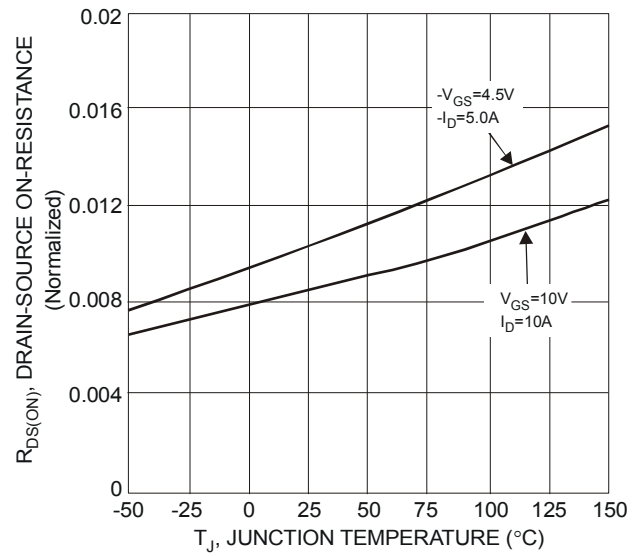


Fig. 6 On-Resistance Variation with Temperature

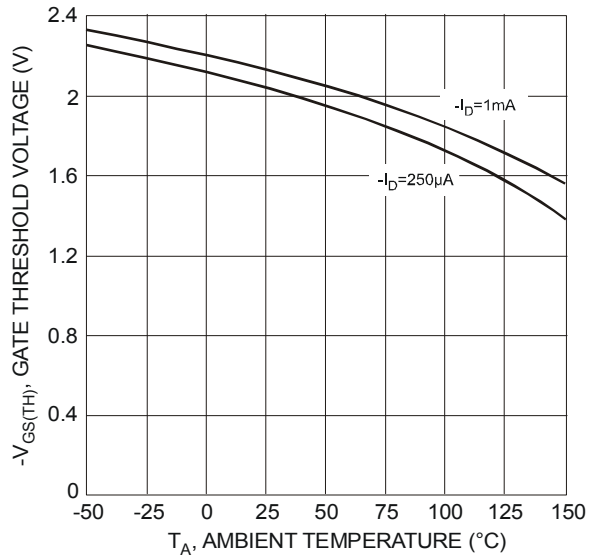


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

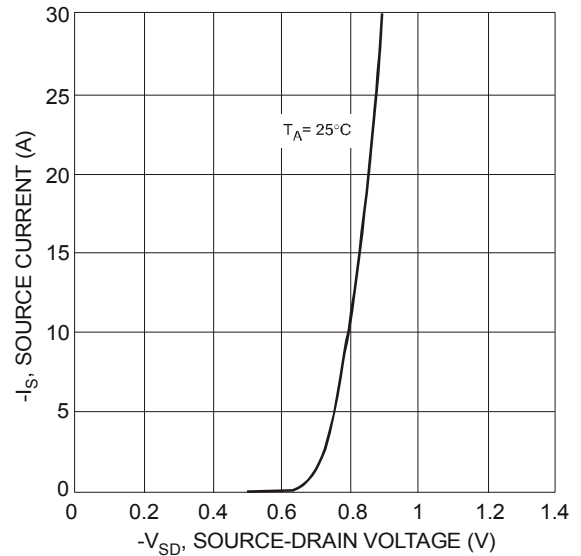


Fig. 8 Diode Forward Voltage vs. Current

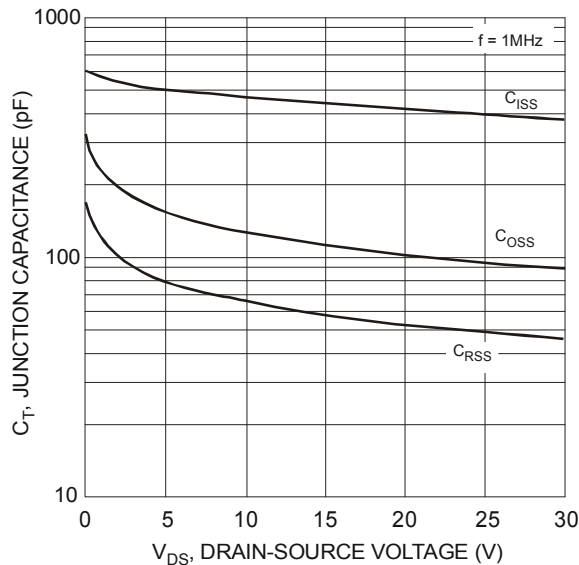


Fig. 9 Typical Junction Capacitance

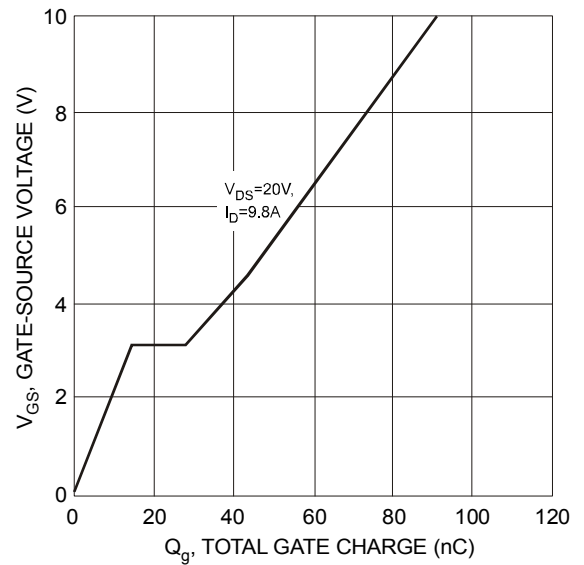


Fig. 10 Gate-Charge Characteristics

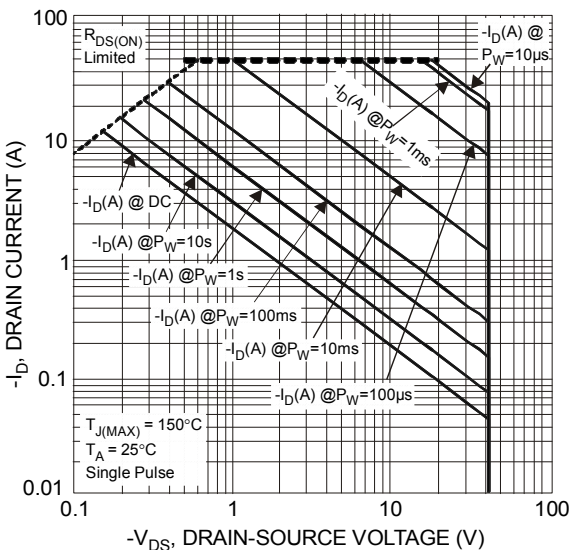


Fig. 11 SOA, Safe Operation Area

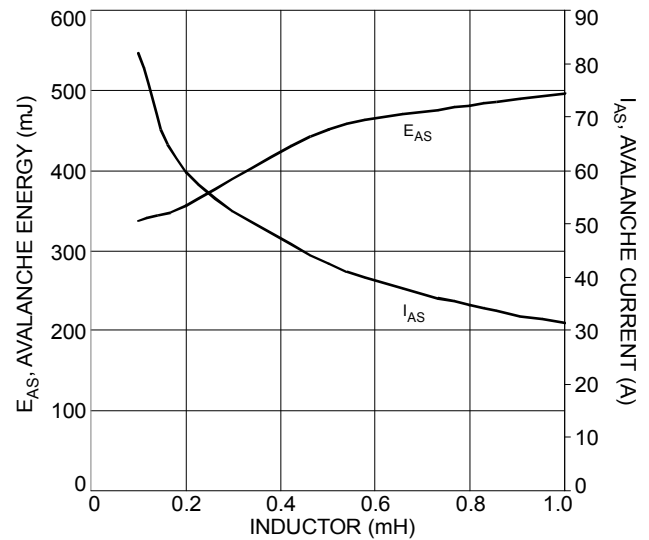
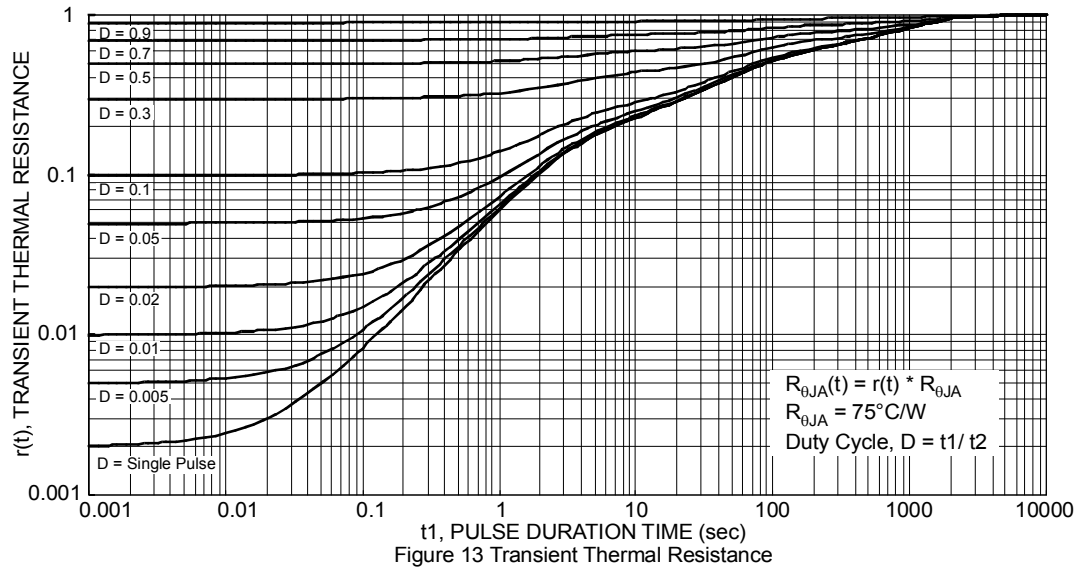
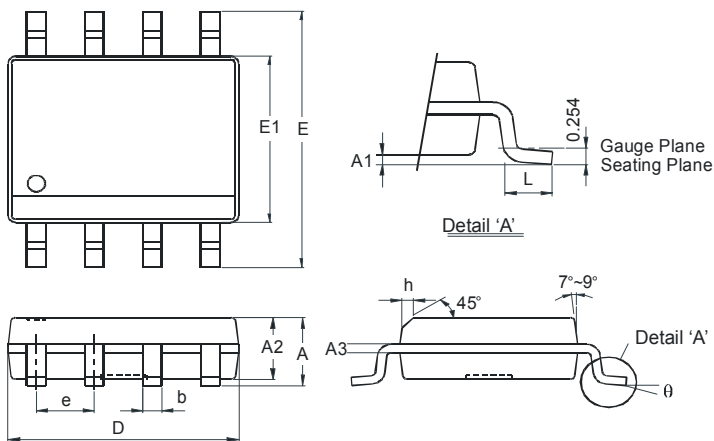


Fig. 12 Single-Pulse Avalanche Tested



## Package Outline Dimensions

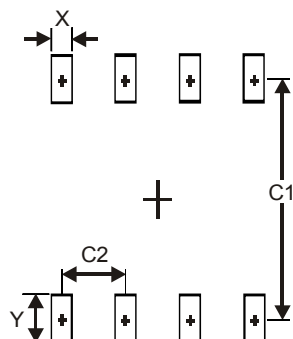
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

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