

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max       | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-------------------|-------------------------------|--|
| 60V               | 2Ω @ V <sub>GS</sub> = 5.0V   | 350mA  |
|                   | 2.5Ω @ V <sub>GS</sub> = 2.5V |  |

## Description

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

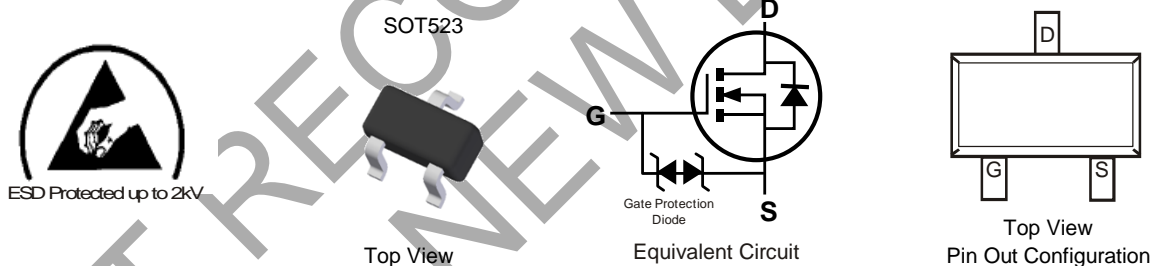
- Motor controls
- Power management functions

## Features

- Low On-Resistance: R<sub>DS(ON)</sub>
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected up to 2kV
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

## Mechanical Data

- Package: SOT523
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.002 grams (Approximate)

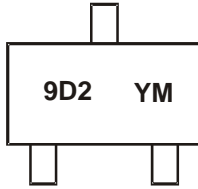


## Ordering Information (Note 4)

| Part Number  | Package | Packing |             |
|--------------|---------|---------|-------------|
|              |         | Qty.    | Carrier     |
| DMN61D9UT-7  | SOT523  | 3000    | Tape & Reel |
| DMN61D9UT-13 | SOT523  | 10000   | Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



9D2 = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: J = 2022)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year  | 2015 | .... | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code  | C    | .... | J    | K    | L    | M    | N    | O    | P    | R    | S    | T    |
| 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    |

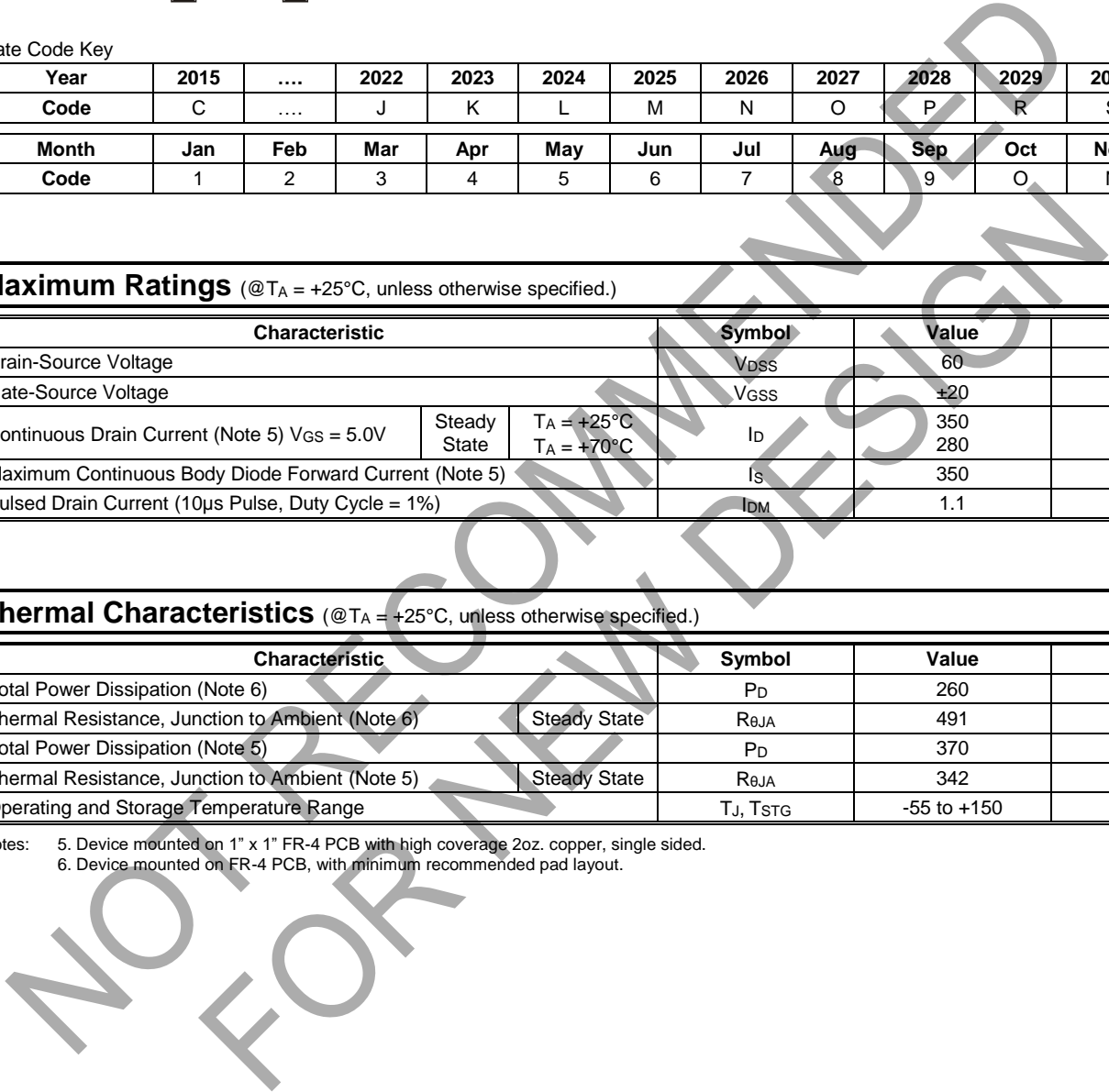
## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   |              |                        | Symbol           | Value | Unit |
|--|--------------|------------------------|------------------|-------|------|
| Drain-Source Voltage                                     |              |                        | V <sub>DSS</sub> | 60    | V    |
| Gate-Source Voltage                                      |              |                        | V <sub>GSS</sub> | ±20   | V    |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 5.0V | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | 350   | mA   |
|  |              | T <sub>A</sub> = +70°C |                  | 280   |      |
| Maximum Continuous Body Diode Forward Current (Note 5)   |              |                        | I <sub>S</sub>   | 350   | mA   |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)       |              |                        | I <sub>DM</sub>  | 1.1   | A    |

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

| Characteristic                                   |              |  | Symbol                            | Value       | Unit |
|--|--------------|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 6)                 |              |  | P <sub>D</sub>                    | 260         | mW   |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State |  | R <sub>θJA</sub>                  | 491         | °C/W |
| Total Power Dissipation (Note 5)                 |              |  | P <sub>D</sub>                    | 370         | mW   |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State |  | R <sub>θJA</sub>                  | 342         | °C/W |
| Operating and Storage Temperature Range          |              |  | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

Notes: 5. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. copper, single sided.  
 6. Device mounted on FR-4 PCB, with minimum recommended pad layout.



**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>   | 60  | —    | —   | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | —   | —    | 1.0 | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                     | I <sub>GSS</sub>    | —   | —    | ±10 | μA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS (Note 7)</b>      |                     |     |      |     |      |  |
| Gate Threshold Voltage                  | V <sub>GS(TH)</sub> | 0.5 | —    | 1.0 | V    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA  |
| Static Drain-Source On-Resistance       | R <sub>DS(ON)</sub> | —   | 1.2  | 2.0 | Ω    | V <sub>GS</sub> = 5.0V, I <sub>D</sub> = 0.05A   |
|   |                     | —   | 1.6  | 2.5 |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 0.05A   |
|   |                     | —   | 2.5  | 3.5 |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 0.05A   |
| Forward Transconductance                | Y <sub>fs</sub>     | 200 | —    | —   | mS   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A   |
| Diode Forward Voltage                   | V <sub>SD</sub>     | —   | 0.75 | 1.4 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 115mA   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b> |                     |     |      |     |      |  |
| Input Capacitance                       | C <sub>iss</sub>    | —   | 28.5 | —   | pF   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                    |
| Output Capacitance                      | C <sub>oss</sub>    | —   | 3.9  | —   | pF   |  |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    | —   | 2.5  | —   | pF   |  |
| Gate Resistance                         | R <sub>g</sub>      | —   | 65   | —   | Ω    | f = 1MHz, V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V   |
| Total Gate Charge                       | Q <sub>g</sub>      | —   | 0.4  | —   | nC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V<br>I <sub>D</sub> = 250mA                      |
| Gate-Source Charge                      | Q <sub>gs</sub>     | —   | 0.1  | —   | nC   |  |
| Gate-Drain Charge                       | Q <sub>gd</sub>     | —   | 0.1  | —   | nC   |  |
| Turn-On Delay Time                      | t <sub>D(ON)</sub>  | —   | 2.1  | —   | ns   | V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V<br>R <sub>G</sub> = 25Ω, I <sub>D</sub> = 200mA |
| Turn-On Rise Time                       | t <sub>R</sub>      | —   | 1.8  | —   | ns   |  |
| Turn-Off Delay Time                     | t <sub>D(OFF)</sub> | —   | 14.4 | —   | ns   |  |
| Turn-Off Fall Time                      | t <sub>F</sub>      | —   | 8.4  | —   | ns   |  |

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

NOT RECOMMENDED FOR NEW DESIGN

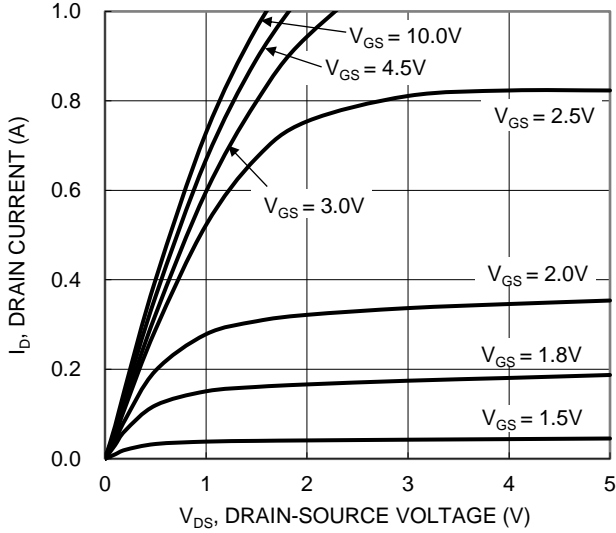


Figure 1. Typical Output Characteristic

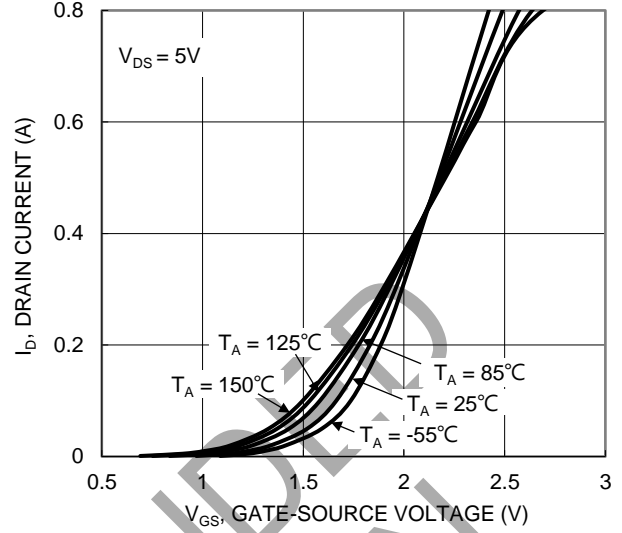


Figure 2. Typical Transfer Characteristic

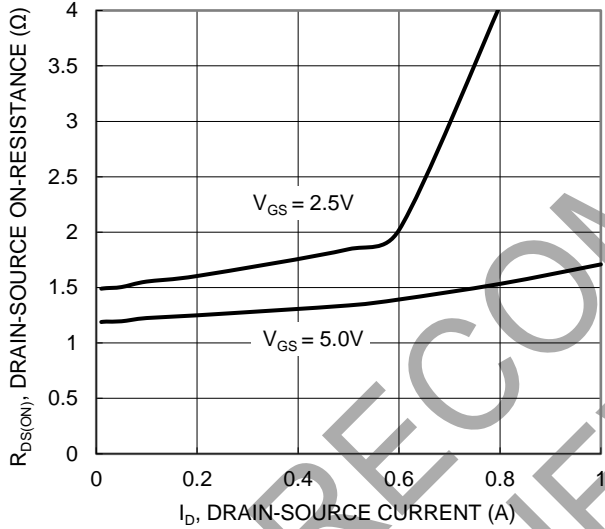


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

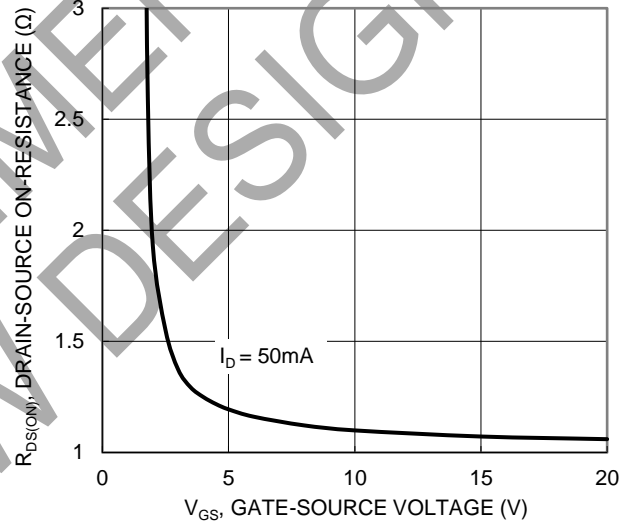


Figure 4. Typical Transfer Characteristic

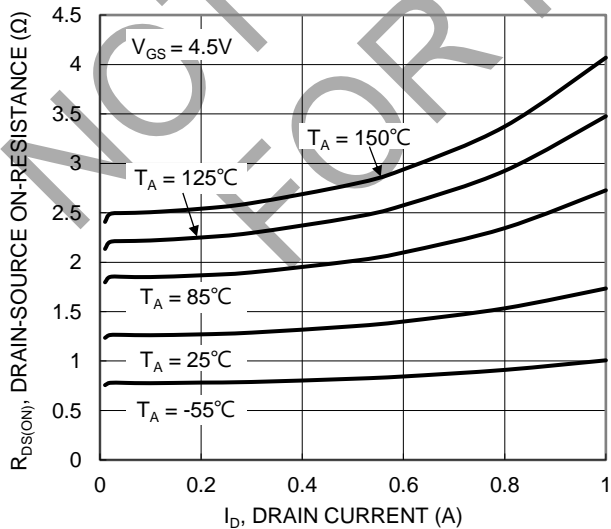


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

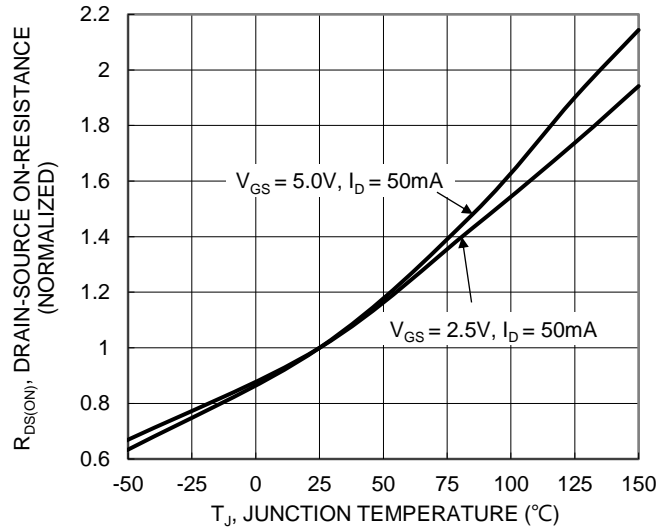


Figure 6. On-Resistance Variation with Junction Temperature

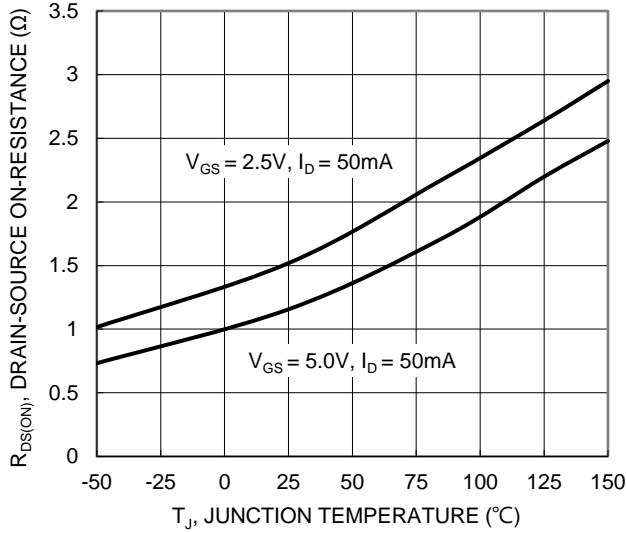


Figure 7. On-Resistance Variation with Junction Temperature

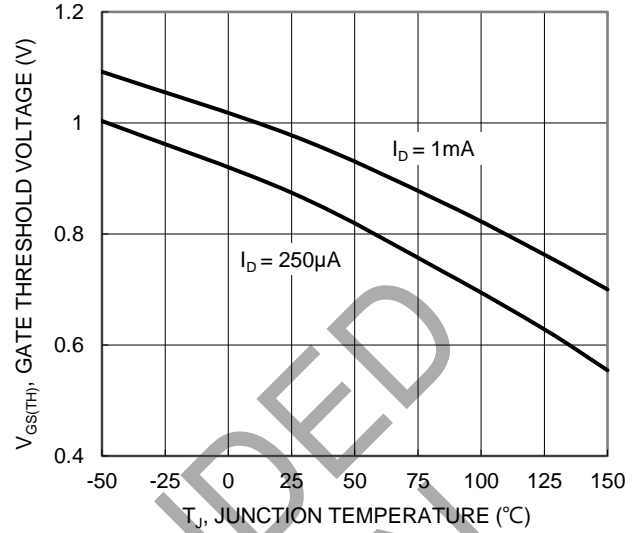


Figure 8. Gate Threshold Variation vs. Junction Temperature

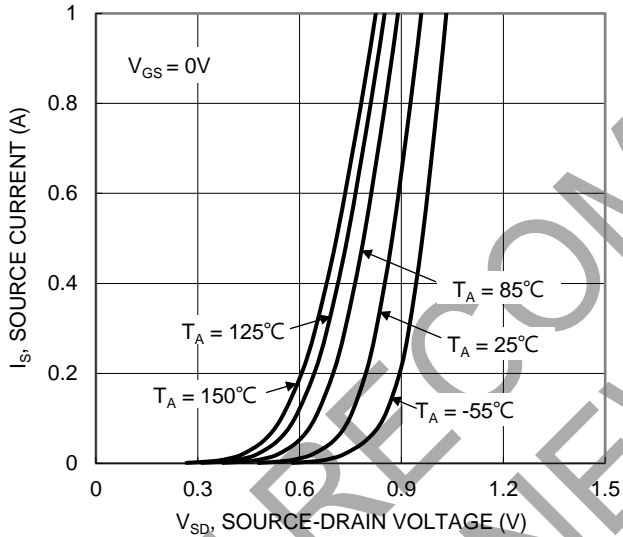


Figure 9. Diode Forward Voltage vs. Current

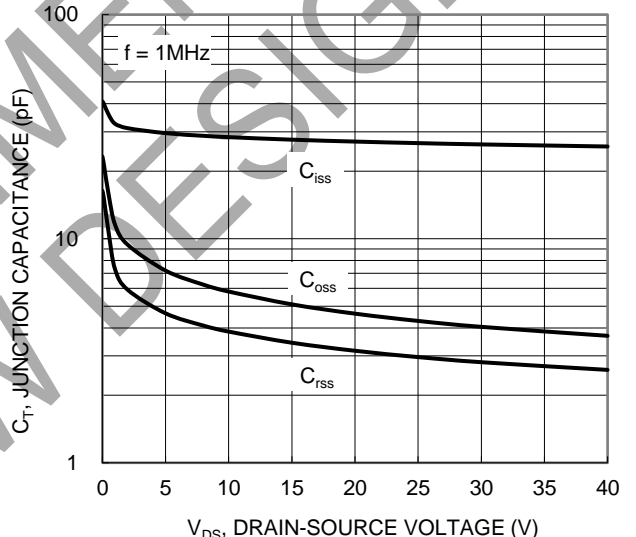


Figure 10. Typical Junction Capacitance

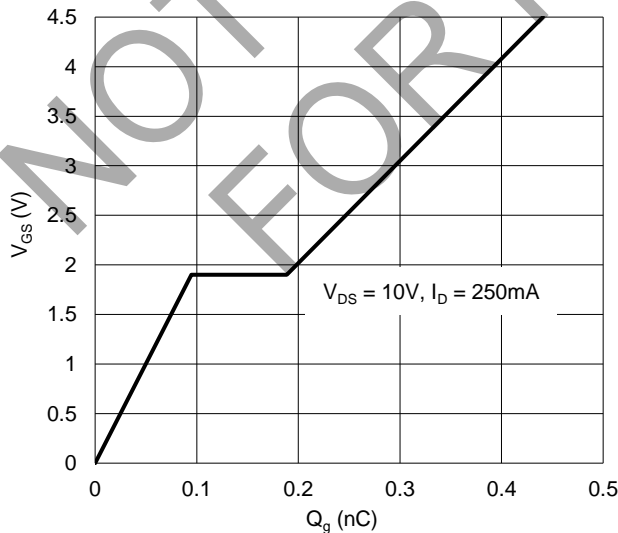


Figure 11. Gate Charge

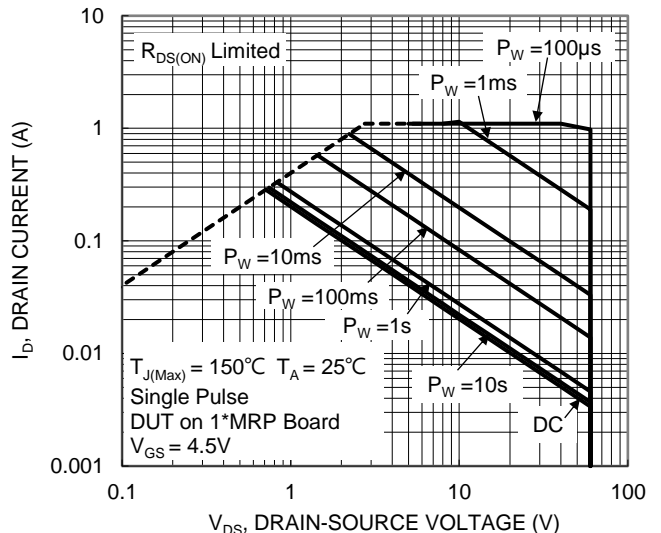
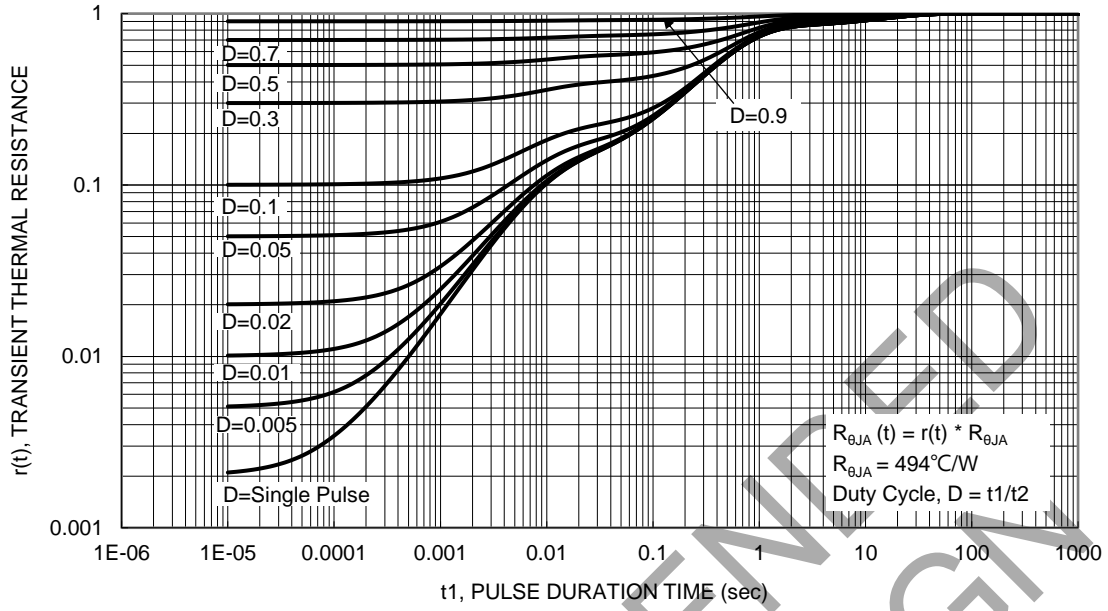


Figure 12. SOA, Safe Operation Area

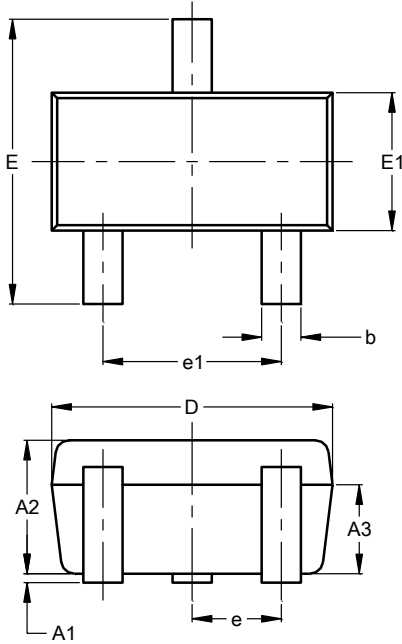


NOT RECOMMENDED FOR NEW DESIGN

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT523**

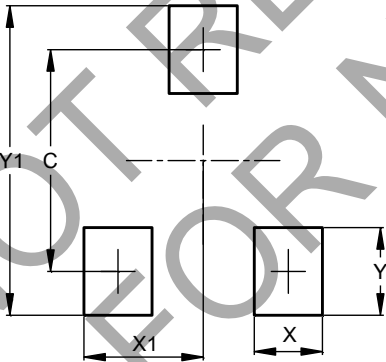


| SOT523               |          |      |      |
|----------------------|----------|------|------|
| Dim                  | Min      | Max  | Typ  |
| A1                   | 0.00     | 0.10 | 0.05 |
| A2                   | 0.60     | 0.80 | 0.75 |
| A3                   | 0.45     | 0.65 | 0.50 |
| b                    | 0.15     | 0.30 | 0.22 |
| c                    | 0.10     | 0.20 | 0.12 |
| D                    | 1.50     | 1.70 | 1.60 |
| E                    | 1.45     | 1.75 | 1.60 |
| E1                   | 0.75     | 0.85 | 0.80 |
| e                    | 0.50 BSC |      |      |
| e1                   | 0.90     | 1.10 | 1.00 |
| L                    | 0.20     | 0.40 | 0.33 |
| a                    | 0°       | --   | 8°   |
| All Dimensions in mm |          |      |      |

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT523**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 1.29          |
| X          | 0.40          |
| X1         | 0.70          |
| Y          | 0.51          |
| Y1         | 1.80          |

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