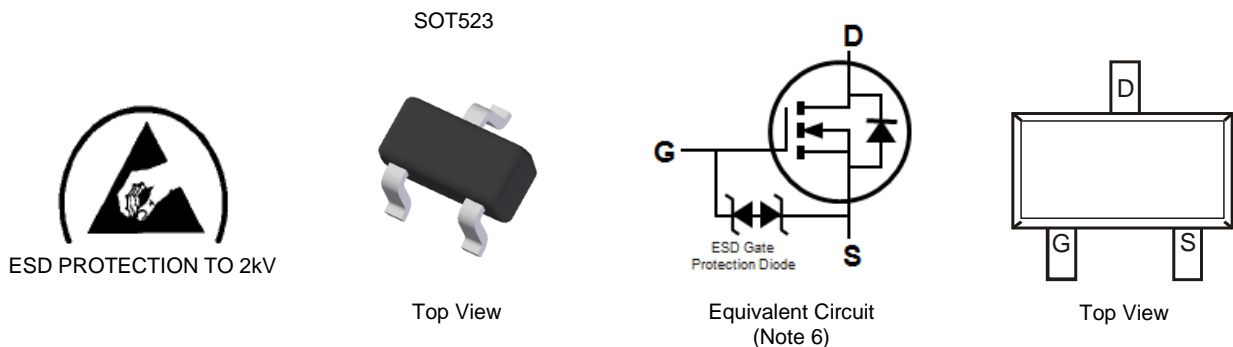


## Features

- Low On-Resistance
- 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)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

- Case: SOT523
- Case 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 <sup>(6)</sup>
- Terminal Connections: See Diagram
- Weight: 0.002 grams (Approximate)

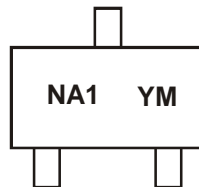


## Ordering Information (Note 5)

| Part Number | Qualification | Case   | Packaging         |
|-------------|---------------|--------|-------------------|
| DMG1012T-7  | Commercial    | SOT523 | 3000/Tape & Reel  |
| DMG1012T-13 | Commercial    | SOT523 | 10000/Tape & Reel |
| DMG1012TQ-7 | Automotive    | SOT523 | 3000/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. 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 <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.
  6. The ESD gate protection diode is only designed to protect against ESD events. No gate-source voltage greater than the maximum  $V_{GSS}$  rating (given on page 2) can be applied.

## Marking Information



NA1 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: F = 2018)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2009 | ... | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|------|------|-----|------|------|------|------|------|------|------|------|------|
| Code | W    | ... | F    | G    | H    | I    | J    | K    | L    | M    | N    |

| 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> | 20    | V    |
| Gate-Source Voltage               |              |                        | V <sub>GSS</sub> | ±6    | V    |
| Continuous Drain Current (Note 7) | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | 0.63  | A    |
|                                   |              | T <sub>A</sub> = +85°C |                  | 0.45  |      |
| Pulsed Drain Current              |              |                        | I <sub>DM</sub>  | 3     | A    |

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

| Characteristic                                   |  | Symbol                            | Value       | Unit |
|--------------------------------------------------|--|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 7)                 |  | P <sub>D</sub>                    | 0.28        | W    |
| Thermal Resistance, Junction to Ambient (Note 7) |  | R <sub>θJA</sub>                  | 452         | °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 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 T <sub>J</sub> = +25°C | I <sub>DSS</sub>    | —   | —     | 100  | nA   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V                                                                             |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —   | —     | ±1.0 | μA   | V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V                                                                           |
| <b>ON CHARACTERISTICS (Note 8)</b>                     |                     |     |       |      |      |                                                                                                                         |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | 0.5 | —     | 1.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                                              |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | —   | 0.3   | 0.4  | Ω    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 600mA                                                                          |
|                                                        |                     |     | 0.4   | 0.5  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA                                                                          |
|                                                        |                     |     | 0.5   | 0.7  |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA                                                                          |
| Forward Transfer Admittance                            | Y <sub>fs</sub>     | —   | 1.4   | —    | S    | V <sub>DS</sub> = 10V, I <sub>D</sub> = 400mA                                                                           |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —   | 0.7   | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 150mA                                                                            |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>                |                     |     |       |      |      |                                                                                                                         |
| Input Capacitance                                      | C <sub>iss</sub>    | —   | 60.67 | —    | pF   | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                                              |
| Output Capacitance                                     | C <sub>oss</sub>    | —   | 9.68  | —    | pF   |                                                                                                                         |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —   | 5.37  | —    | pF   |                                                                                                                         |
| Total Gate Charge                                      | Q <sub>g</sub>      | —   | 736.6 | —    | pC   | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V,<br>I <sub>D</sub> = 250mA                                                |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —   | 93.6  | —    | pC   |                                                                                                                         |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —   | 116.6 | —    | pC   |                                                                                                                         |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | —   | 5.1   | —    | ns   | V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V,<br>R <sub>L</sub> = 47Ω, R <sub>G</sub> = 10Ω,<br>I <sub>D</sub> = 200mA |
| Turn-On Rise Time                                      | t <sub>R</sub>      | —   | 7.4   | —    | ns   |                                                                                                                         |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | —   | 26.7  | —    | ns   |                                                                                                                         |
| Turn-Off Fall Time                                     | t <sub>F</sub>      | —   | 12.3  | —    | ns   |                                                                                                                         |

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

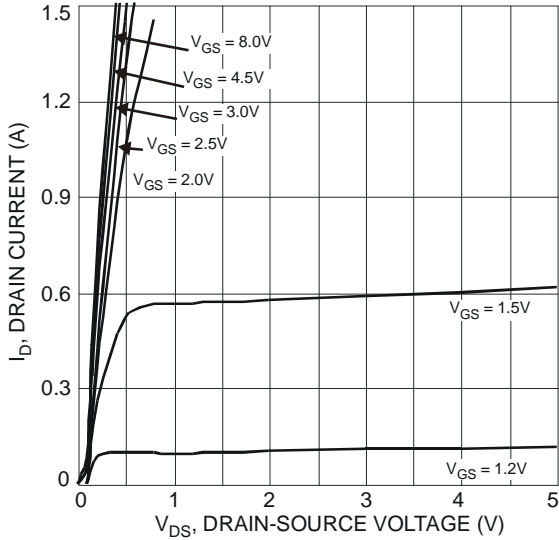


Fig. 1 Typical Output Characteristics

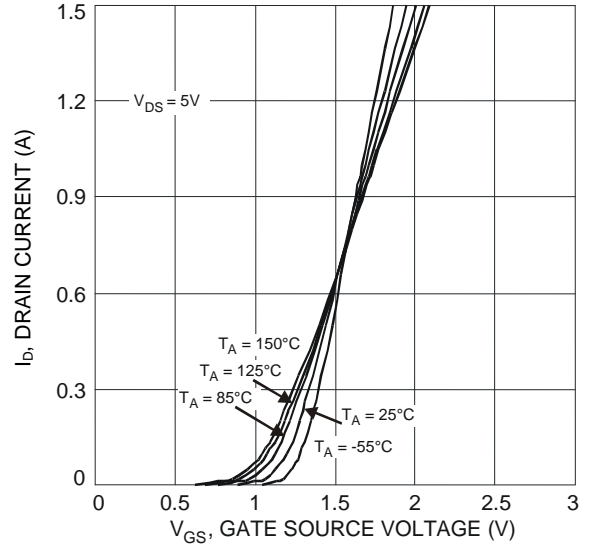


Fig. 2 Typical Transfer Characteristics

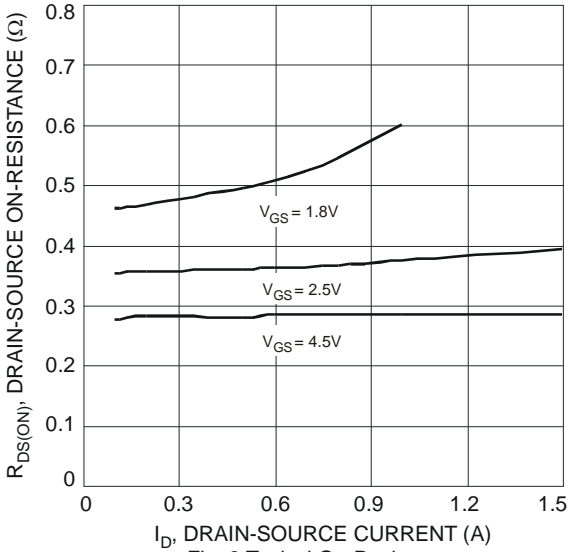


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

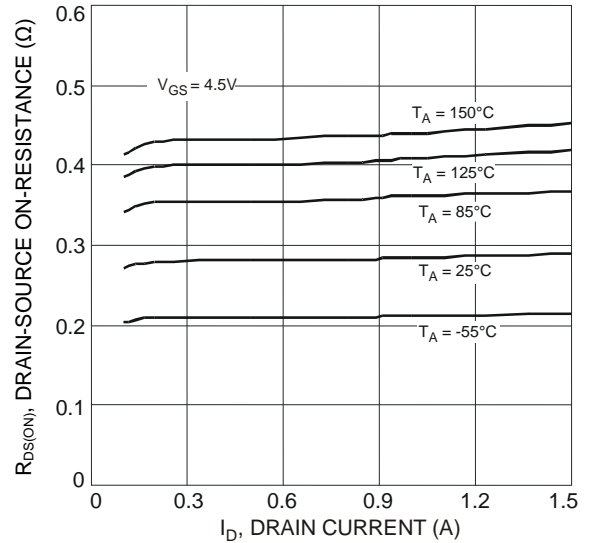


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

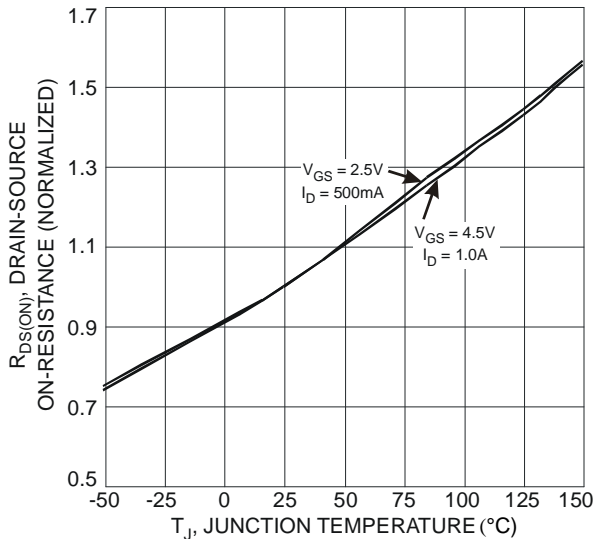


Fig. 5 On-Resistance Variation with Temperature

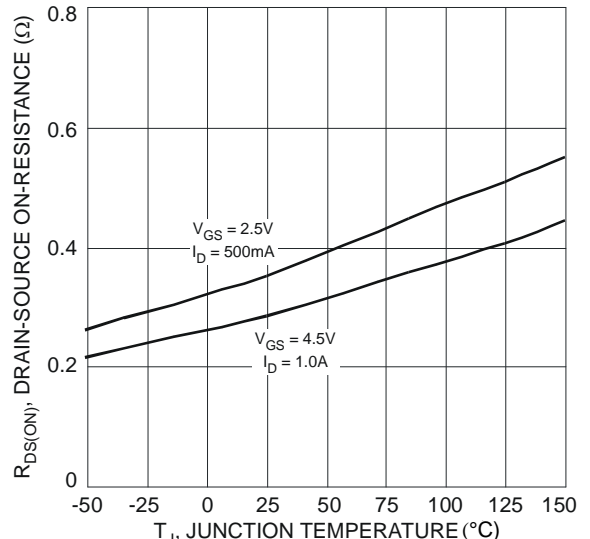


Fig. 6 On-Resistance Variation with Temperature

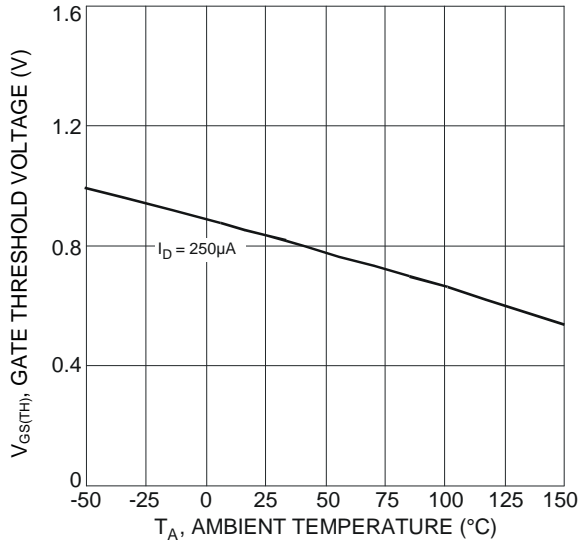


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

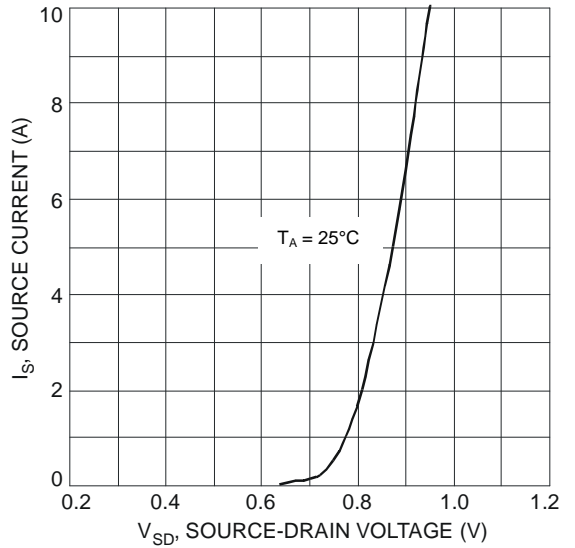


Fig. 8 Diode Forward Voltage vs. Current

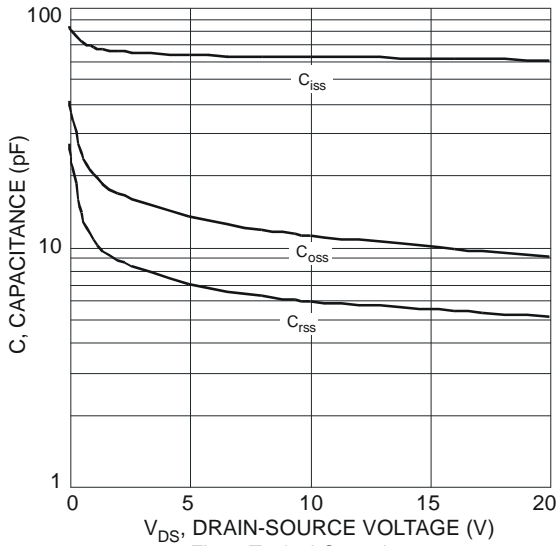


Fig. 9 Typical Capacitance

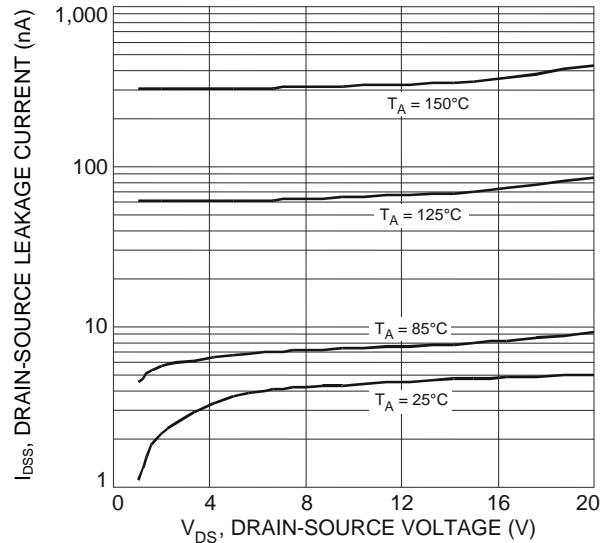


Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

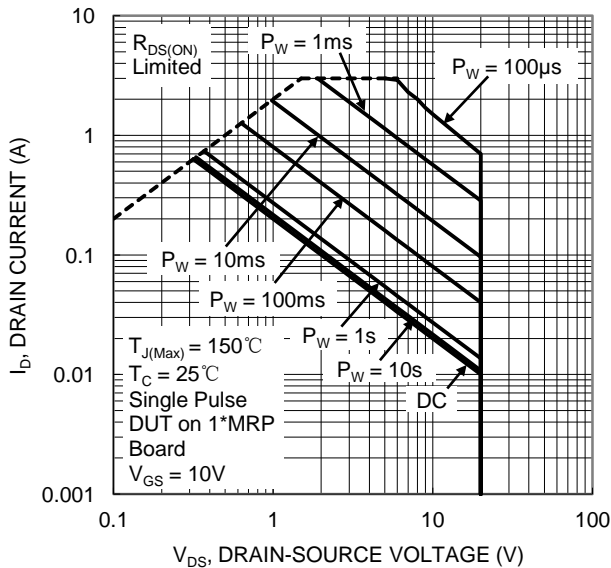


Fig. 11 SOA, Safe Operation Area

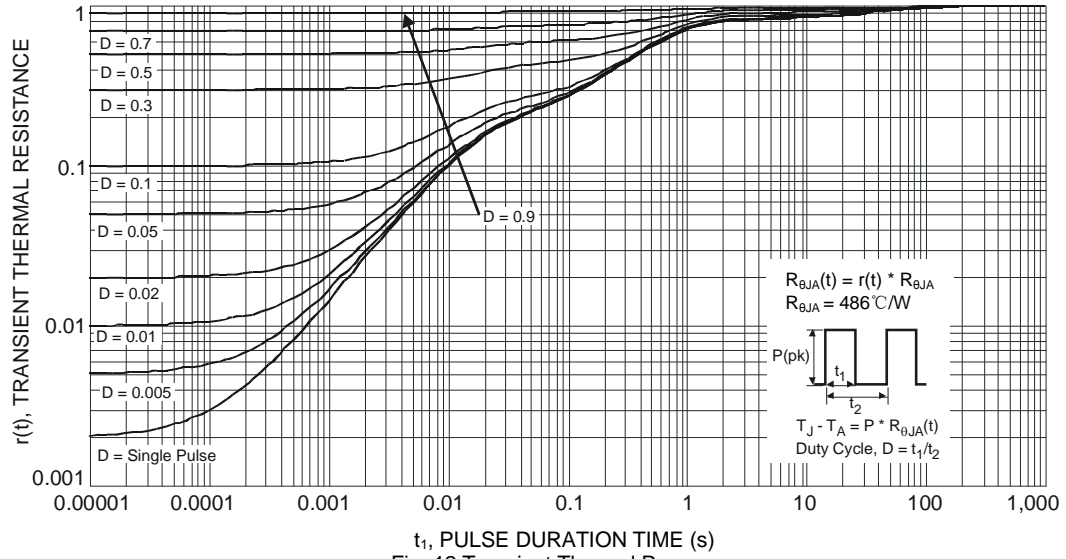
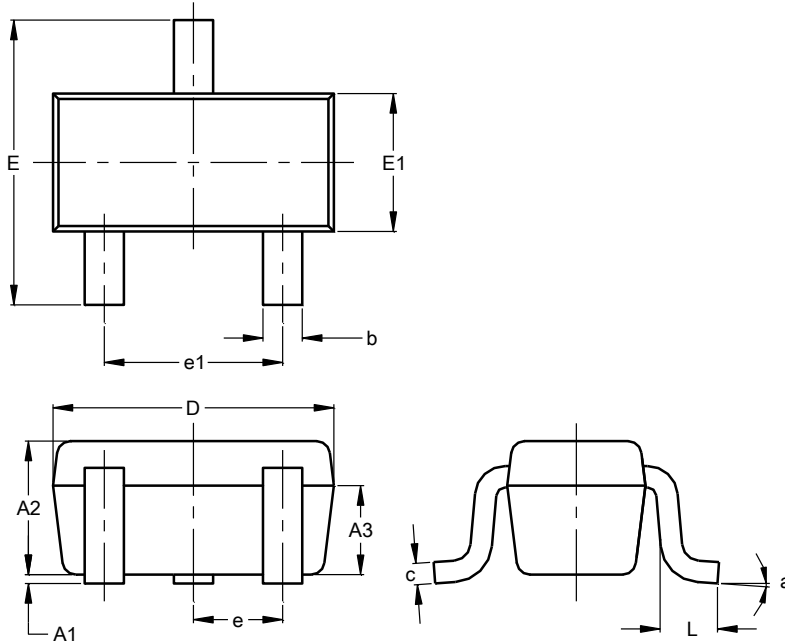


Fig. 12 Transient Thermal Response

**Package Outline Dimensions**

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

**SOT523**

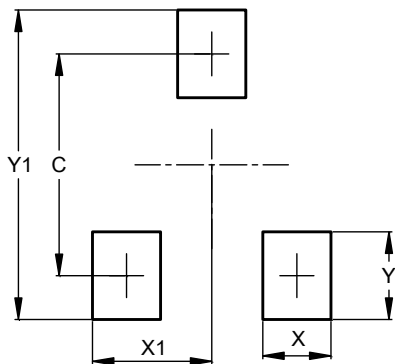


| SOT523               |          |      |      |
|----------------------|----------|------|------|
| Dim                  | Min      | Max  | Typ  |
| A1                   | 0.00     | 0.10 | 0.05 |
| A2                   | 0.60     | 0.80 | 0.75 |
| A3                   | 0.45     | 0.65 | 0.50 |
| 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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