

## Product Summary

| BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max       | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-------------------|-------------------------------|--|
| -50V              | 10.0Ω @ V <sub>GS</sub> = -5V | -174mA                                       |

## Description and Applications

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

- Motor Control
- Power Management Functions
- Backlighting

## Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **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-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

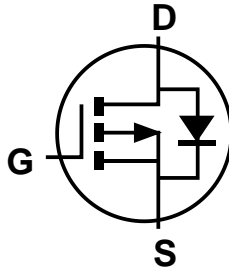
## Mechanical Data

- Case: SOT323
- 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 **(e3)**
- Weight: 0.006 grams (Approximate)

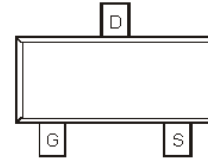
SOT323



Top View



Equivalent Circuit



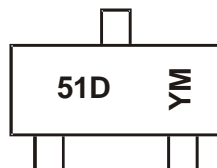
Top View

## Ordering Information (Note 4)

| Part Number  | Case   | Packaging         |
|--------------|--------|-------------------|
| DMP510DLW-7  | SOT323 | 3000/Tape & Reel  |
| DMP510DLW-13 | SOT323 | 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



51D= Product Type Marking Code  
YM = Date Code Marking  
Y or Y = Year (ex: H = 2020)  
M = Month (ex: 9 = September)

### Date Code Key

| Year | 2017 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Code | E    | ... | H    | I    | J    | K    | L    | M    | N    | O    | P    | R    |

| 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> | -50          | V    |
| Gate-Source Voltage   |              |  | V <sub>GSS</sub> | ±20          | V    |
| Continuous Drain Current (Note 6) V <sub>GS</sub> = -5V     | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | -174<br>-139 | mA   |
| Maximum Continuous Body Diode Forward Current (Note 6)      |              |  | I <sub>S</sub>   | -65          | mA   |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%) (Note 6) |              |  | I <sub>DM</sub>  | -1.0         | A    |

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

| Characteristic                                   |              | Symbol                            | Value       | Unit |
|--|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 |              | P <sub>D</sub>                    | 320         | mW   |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R <sub>θJA</sub>                  | 398         | °C/W |
| Total Power Dissipation (Note 6)                 |              | P <sub>D</sub>                    | 470         | mW   |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | R <sub>θJA</sub>                  | 273         | °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 7)</b>         |                     |      |       |      |      |   |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>   | -50  | —     | —    | 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> = -50V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                         | I <sub>GSS</sub>    | —    | —     | ±100 | nA   | V <sub>GS</sub> = ±16V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS (Note 7)</b>          |                     |      |       |      |      |   |
| Gate Threshold Voltage                      | V <sub>GS(TH)</sub> | -0.8 | —     | -2.0 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -1mA                                       |
| Static Drain-Source On-Resistance           | R <sub>DS(ON)</sub> | —    | —     | 10   | Ω    | V <sub>GS</sub> = -5V, I <sub>D</sub> = -0.1A   |
| Diode Forward Voltage                       | V <sub>SD</sub>     | —    | -0.78 | -1.5 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -100mA   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>     |                     |      |       |      |      |   |
| Input Capacitance                           | C <sub>iss</sub>    | —    | 24.6  | —    | pF   | V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V, f = 1.0MHz  |
| Output Capacitance                          | C <sub>oss</sub>    | —    | 4.8   | —    | pF   |   |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    | —    | 2.8   | —    | pF   |   |
| Gate Resistance                             | R <sub>g</sub>      | —    | 2000  | —    | Ω    | f = 1.0MHz, V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V  |
| Total Gate Charge (V <sub>GS</sub> = -4.5V) | Q <sub>g</sub>      | —    | 280   | —    | pC   | V <sub>GS</sub> = -4.5V, V <sub>DS</sub> = -10V, I <sub>D</sub> = -100mA                        |
| Total Gate Charge (V <sub>GS</sub> = -10V)  | Q <sub>g</sub>      | —    | 560   | —    | pC   |   |
| Gate-Source Charge                          | Q <sub>gs</sub>     | —    | 90    | —    | pC   |   |
| Gate-Drain Charge                           | Q <sub>gd</sub>     | —    | 77    | —    | pC   |   |
| Turn-On Delay Time                          | t <sub>D(ON)</sub>  | —    | 2.8   | —    | ns   | V <sub>DD</sub> = -30V, I <sub>D</sub> = -0.27A, R <sub>GEN</sub> = 50Ω, V <sub>GS</sub> = -10V |
| Turn-On Rise Time                           | t <sub>R</sub>      | —    | 2.6   | —    | ns   |   |
| Turn-Off Delay Time                         | t <sub>D(OFF)</sub> | —    | 11.1  | —    | ns   |   |
| Turn-Off Fall Time                          | t <sub>F</sub>      | —    | 7.2   | —    | ns   |   |

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
  - Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

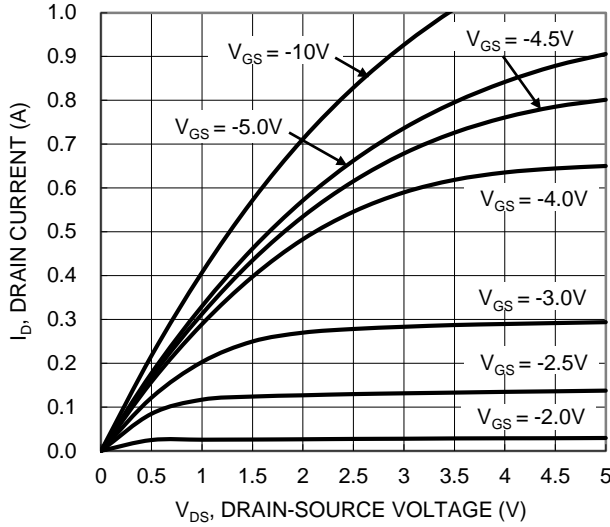


Figure 1. Typical Output Characteristic

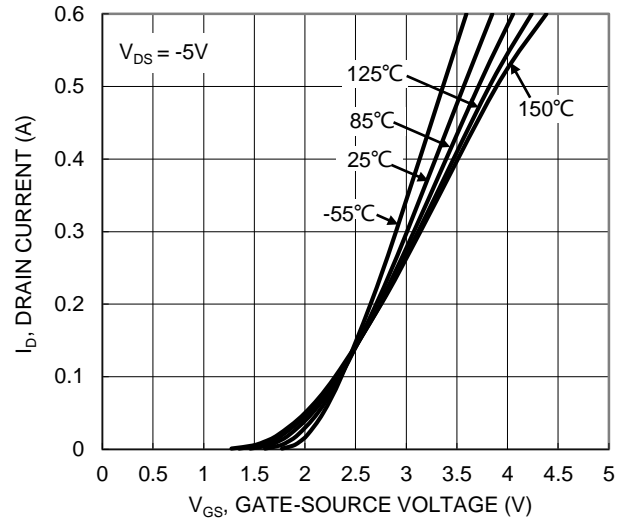


Figure 2. Typical Transfer Characteristic

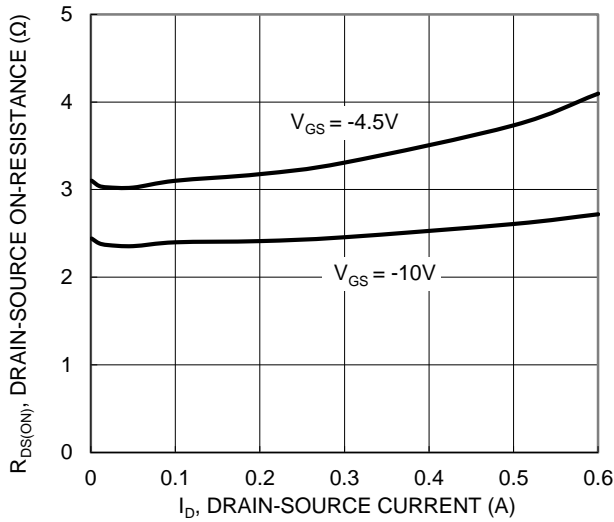


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

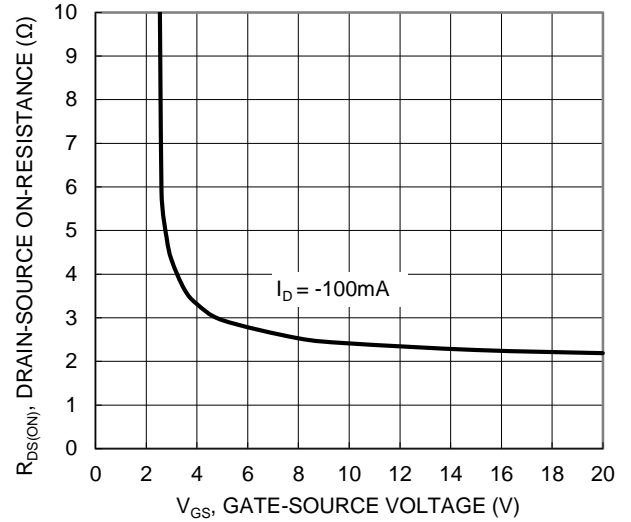


Figure 4. Typical Transfer Characteristic

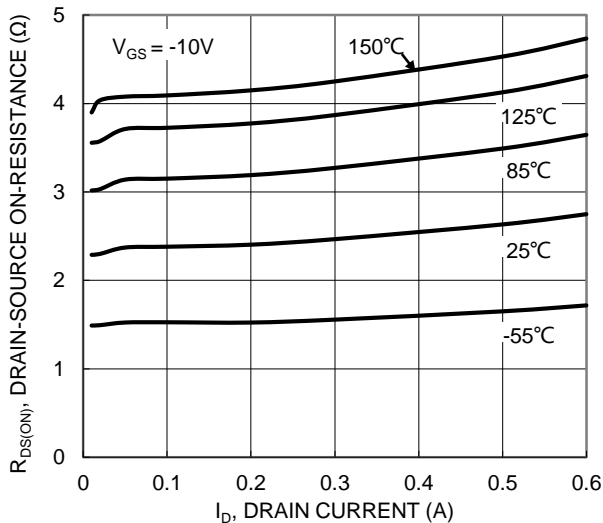


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

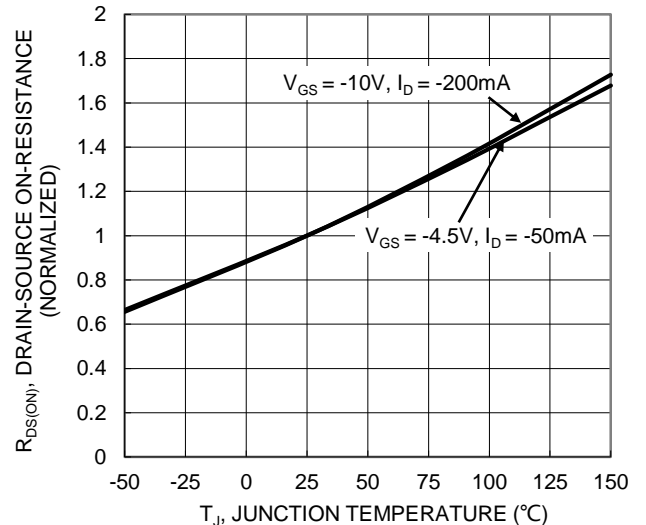


Figure 6. On-Resistance Variation with Temperature

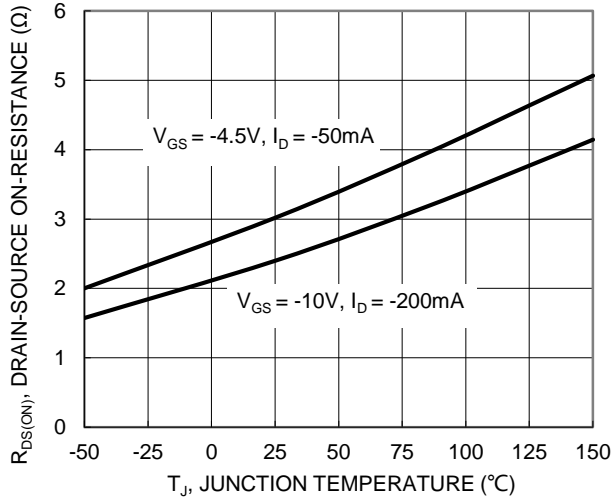


Figure 7. On-Resistance Variation with Temperature

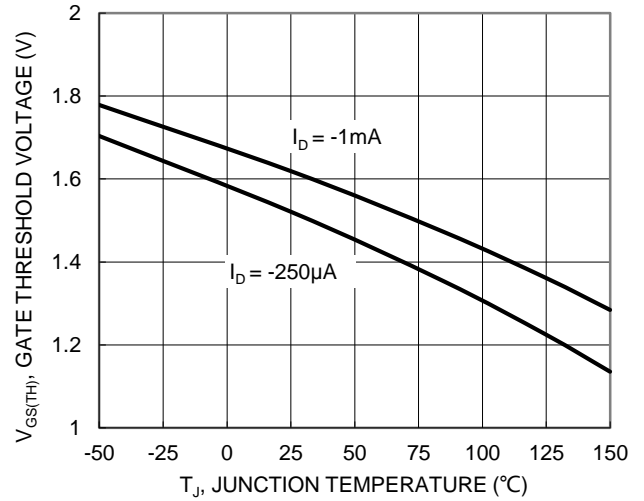


Figure 8. Gate Threshold Variation vs. Junction Temperature

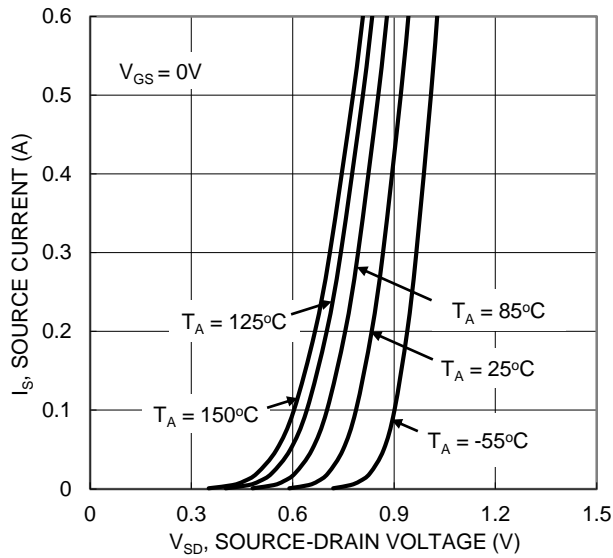


Figure 9. Diode Forward Voltage vs. Current

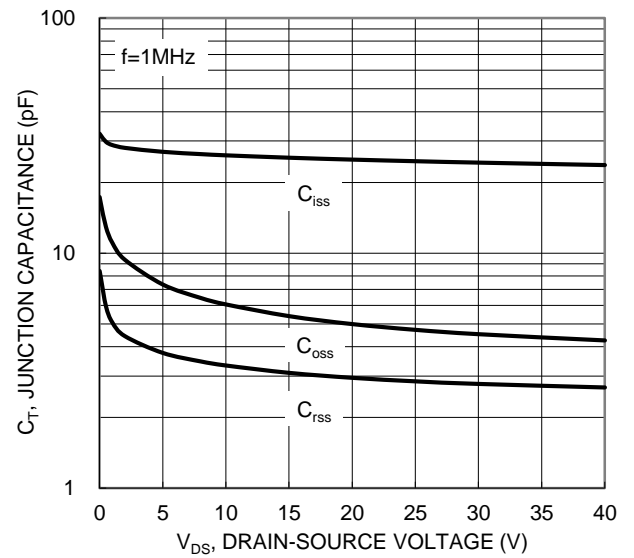


Figure 10. Typical Junction Capacitance

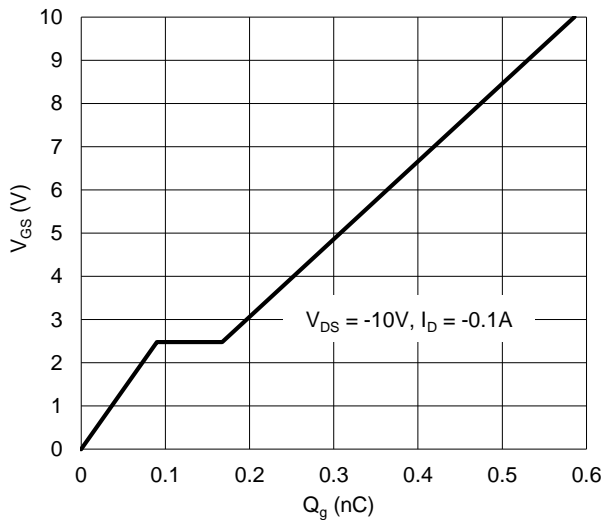


Figure 11. Gate Charge

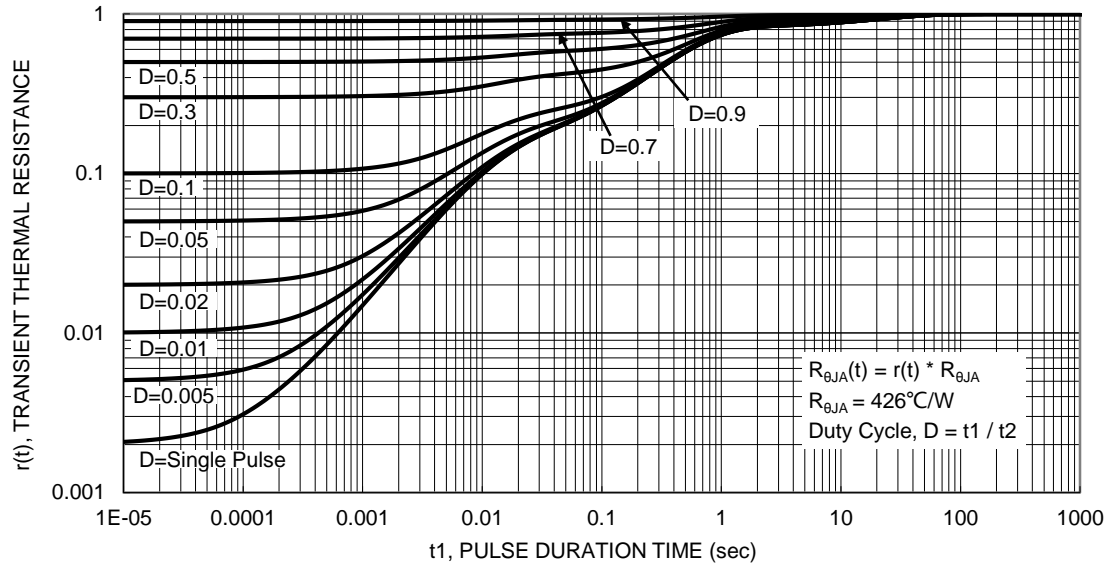
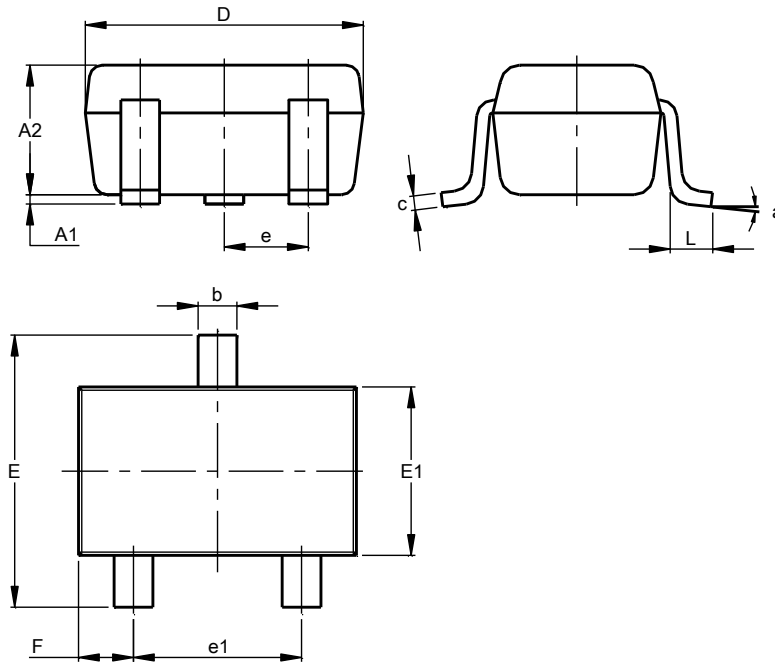


Figure 12. Transient Thermal Resistance

## Package Outline Dimensions

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

**SOT323**

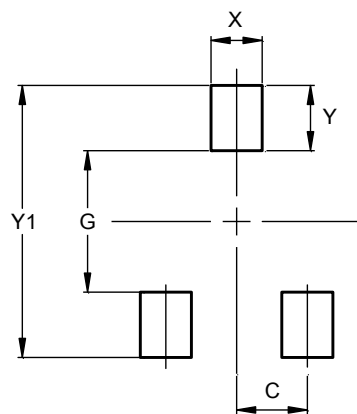


| SOT323               |           |       |       |
|----------------------|-----------|-------|-------|
| Dim                  | Min       | Max   | Typ   |
| A1                   | 0.00      | 0.10  | 0.05  |
| A2                   | 0.90      | 1.00  | 0.95  |
| b                    | 0.25      | 0.40  | 0.30  |
| c                    | 0.10      | 0.18  | 0.11  |
| D                    | 1.80      | 2.20  | 2.15  |
| E                    | 2.00      | 2.20  | 2.10  |
| E1                   | 1.15      | 1.35  | 1.30  |
| e                    | 0.650 BSC |       |       |
| e1                   | 1.20      | 1.40  | 1.30  |
| F                    | 0.375     | 0.475 | 0.425 |
| L                    | 0.25      | 0.40  | 0.30  |
| a                    | 0°        | 8°    | --    |
| All Dimensions in mm |           |       |       |

## Suggested Pad Layout

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

**SOT323**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.470         |
| Y          | 0.600         |
| Y1         | 2.500         |

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