

Product Summary

| V_{DSS} | $R_{DS(ON)}$ Max | I_D $T_A = +25^\circ C$ |
|-----------|-----------------------|------------------------------|
| -50V | 9.5Ω @ $V_{GS} = -5V$ | -196mA |

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- 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)**
- **The DMP510DLQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

Description and Application

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

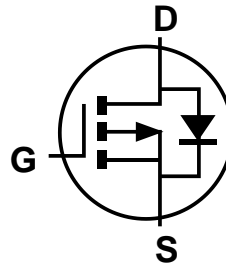
- General Purpose Interfacing Switch
- Power Management Functions
- Analog Switch

Mechanical Data

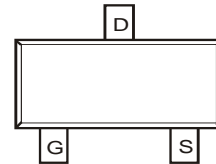
- Case: SOT23
- Case Material: UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish (Lead Free Plating). Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)



Top View



Equivalent Circuit



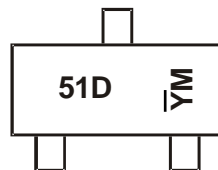
Top View

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|--------------|-------|--------------------|
| DMP510DLQ-7 | SOT23 | 3,000/Tape & Reel |
| DMP510DLQ-13 | SOT23 | 10,000/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 = Year (ex: I = 2021)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | I | J | K | L | M | N | O | P | R | S | T | U |

| 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 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|-----------|---------------------------|------|
| Drain-Source Voltage | V_{DSS} | -50 | V |
| Gate-Source Voltage | V_{GSS} | ± 30 | V |
| Continuous Drain Current (Note 6) $V_{GS} = -5\text{V}$ | I_D | $T_A = +25^\circ\text{C}$ | -196 |
| | | $T_A = +70^\circ\text{C}$ | -156 |
| Maximum Continuous Body Diode Forward Current (Note 6) | I_S | -196 | mA |
| Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%) | I_{DM} | -1.2 | A |

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|-----------------|----------------|-------------|
| Total Power Dissipation (Note 5) | P_D | 0.52 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | Steady State | 240 |
| Total Power Dissipation (Note 6) | | P_D | 0.69 |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | Steady State | 180 |
| Operating and Storage Temperature Range | | T_J, T_{STG} | -55 to +150 |

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|------|------|-----------|---------------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -50 | — | — | V | $V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | -1 | μA | $V_{DS} = -50\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | -0.8 | — | -2.0 | V | $V_{DS} = V_{GS}, I_D = -1\text{mA}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 1.9 | 9.5 | Ω | $V_{GS} = -5\text{V}, I_D = -0.1\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | -0.8 | -1.4 | V | $V_{GS} = 0\text{V}, I_S = -115\text{mA}$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | — | 40 | — | pF | $V_{DS} = -25\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 5 | — | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 3 | — | pF | |
| Gate Resistance | R_g | — | 242 | — | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Total Gate Charge ($V_{GS} = -5\text{V}$) | Q_g | — | 0.5 | — | nC | $V_{DS} = -10\text{V}, I_D = -0.1\text{A}$ |
| Gate-Source Charge | Q_{gs} | — | 0.1 | — | | |
| Gate-Drain Charge | Q_{gd} | — | 0.1 | — | | |
| Turn-On Delay Time | $t_{d(ON)}$ | — | 4 | — | ns | $V_{DD} = -30\text{V}, I_D = -0.27\text{A}, R_{GEN} = 50\Omega, V_{GS} = -10\text{V}$ |
| Turn-On Rise Time | t_r | — | 4 | — | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | — | 39.7 | — | | |
| Turn-Off Fall Time | t_f | — | 13.8 | — | | |
| Body Diode Reverse Recovery Time | t_{RR} | — | 26.6 | — | ns | $I_F = -1\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{RR} | — | 16.3 | — | nC | $I_F = -1\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |

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

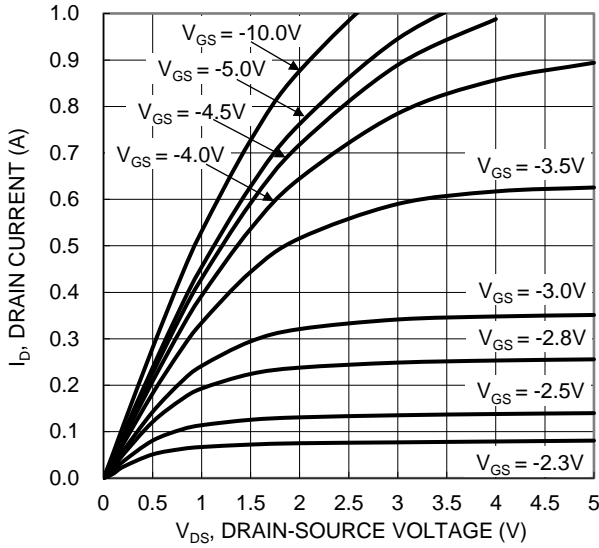


Figure 1. Typical Output Characteristic

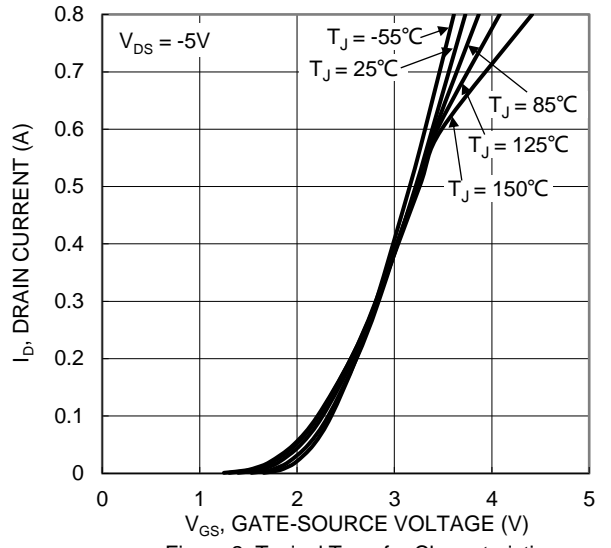


Figure 2. Typical Transfer Characteristic

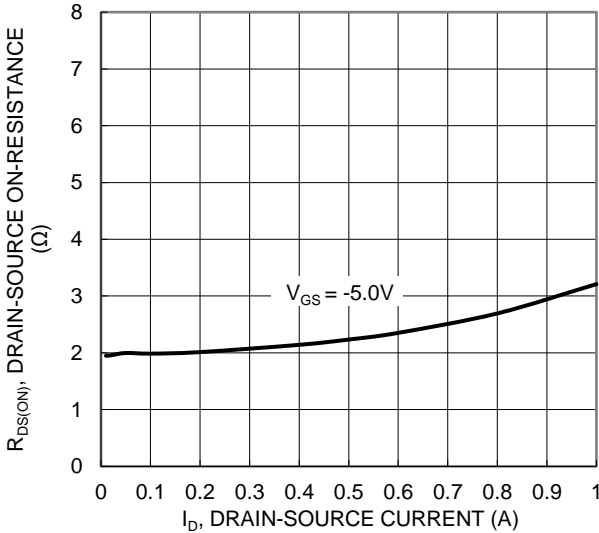


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

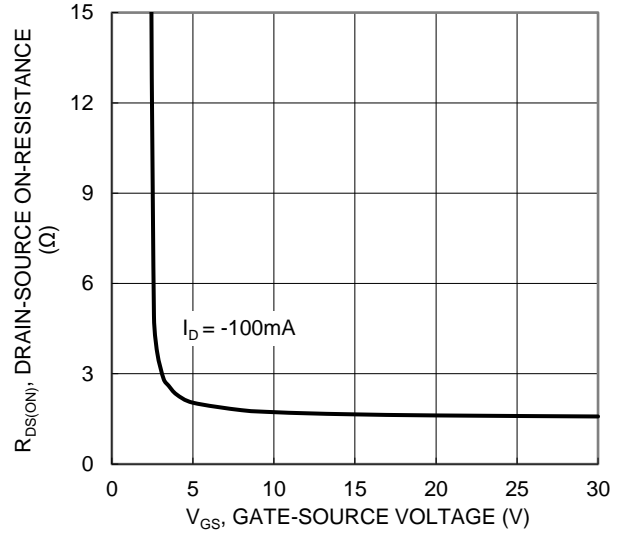


Figure 4. Typical Transfer Characteristic

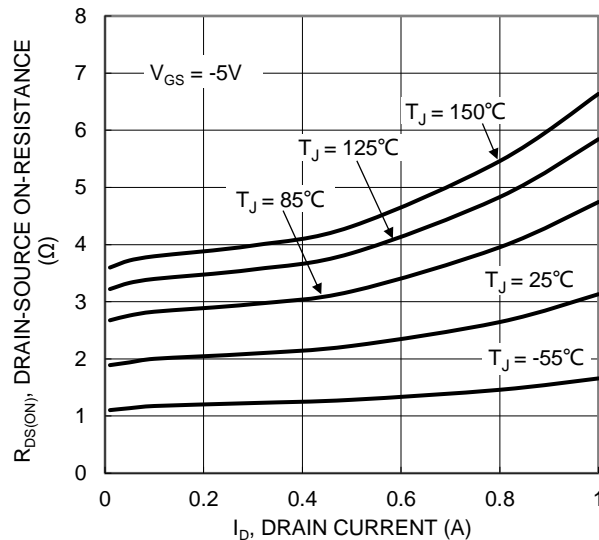


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

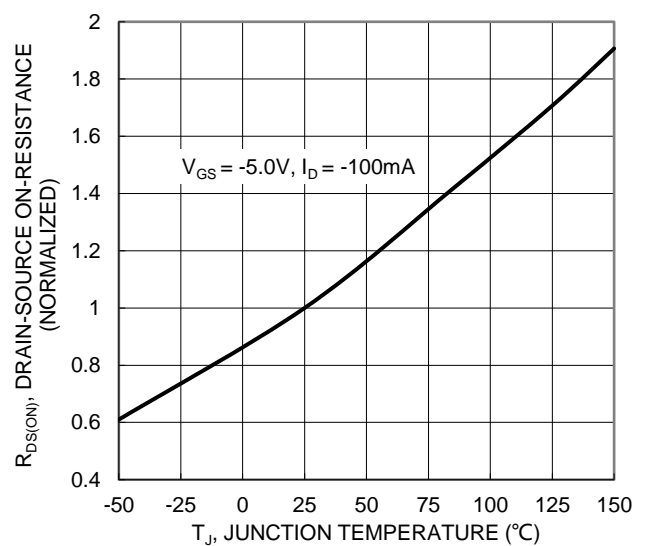


Figure 6. On-Resistance Variation with Temperature

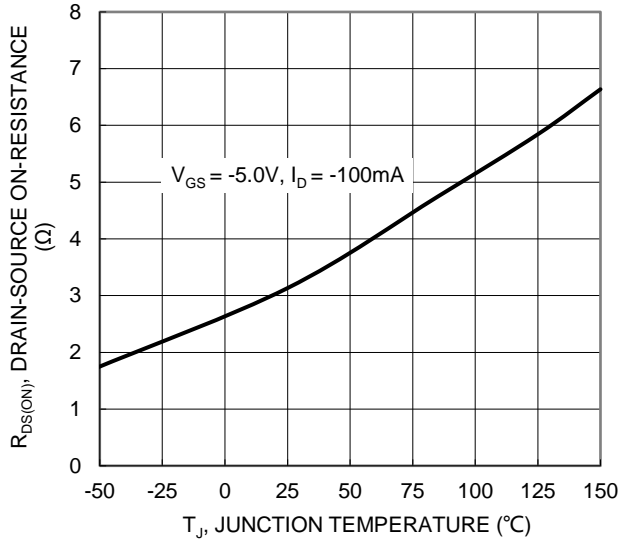


Figure 7. On-Resistance Variation with Temperature

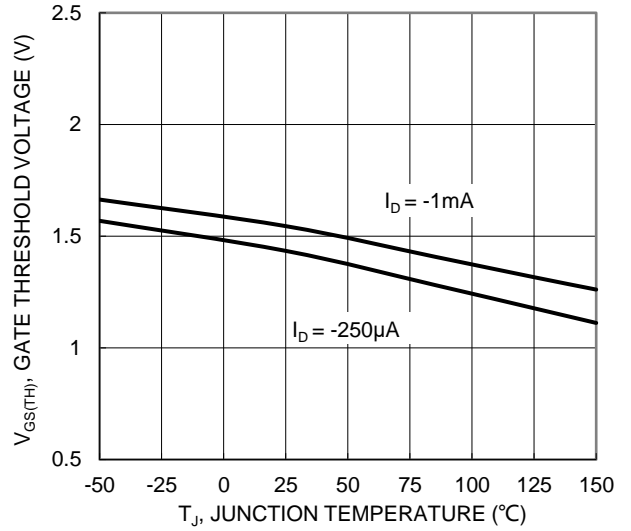


Figure 8. Gate Threshold Variation vs. Junction Temperature

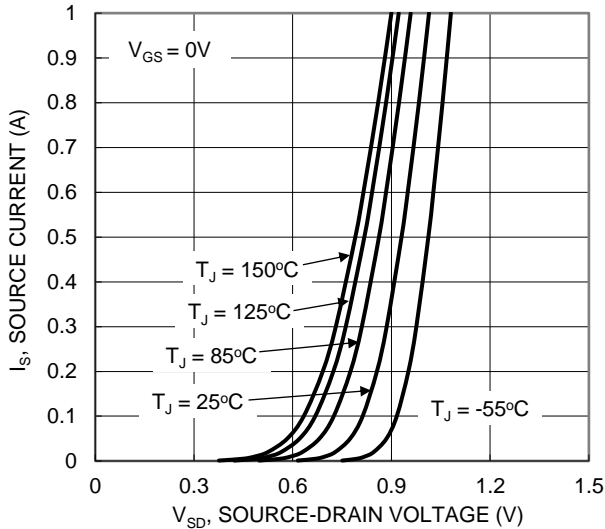


Figure 9. Diode Forward Voltage vs. Current

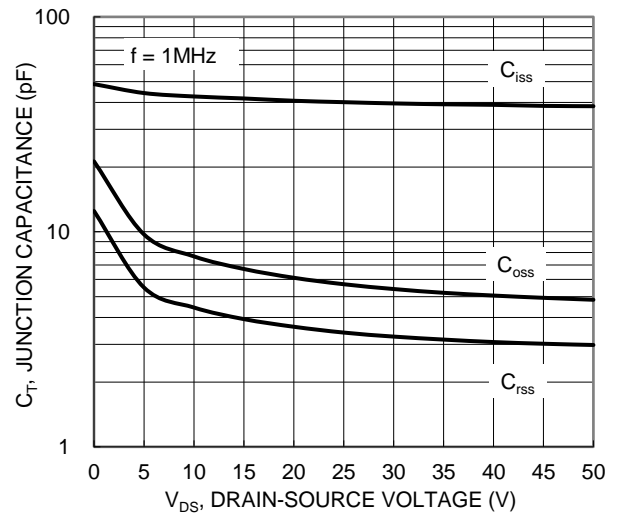


Figure 10. Typical Junction Capacitance

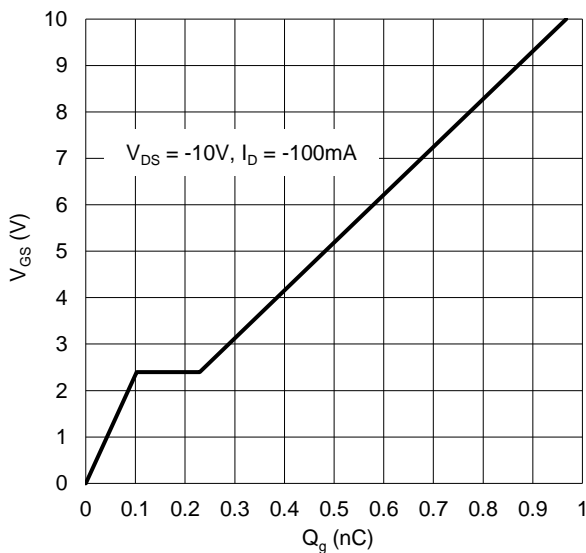


Figure 11. Gate Charge

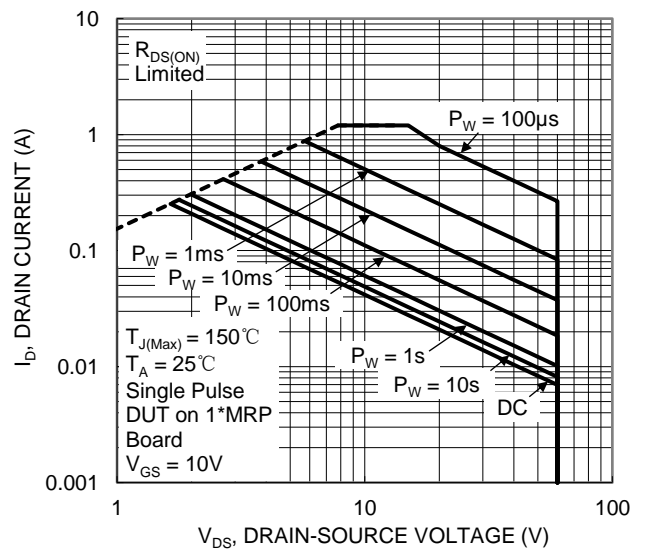


Figure 12. SOA, Safe Operation Area

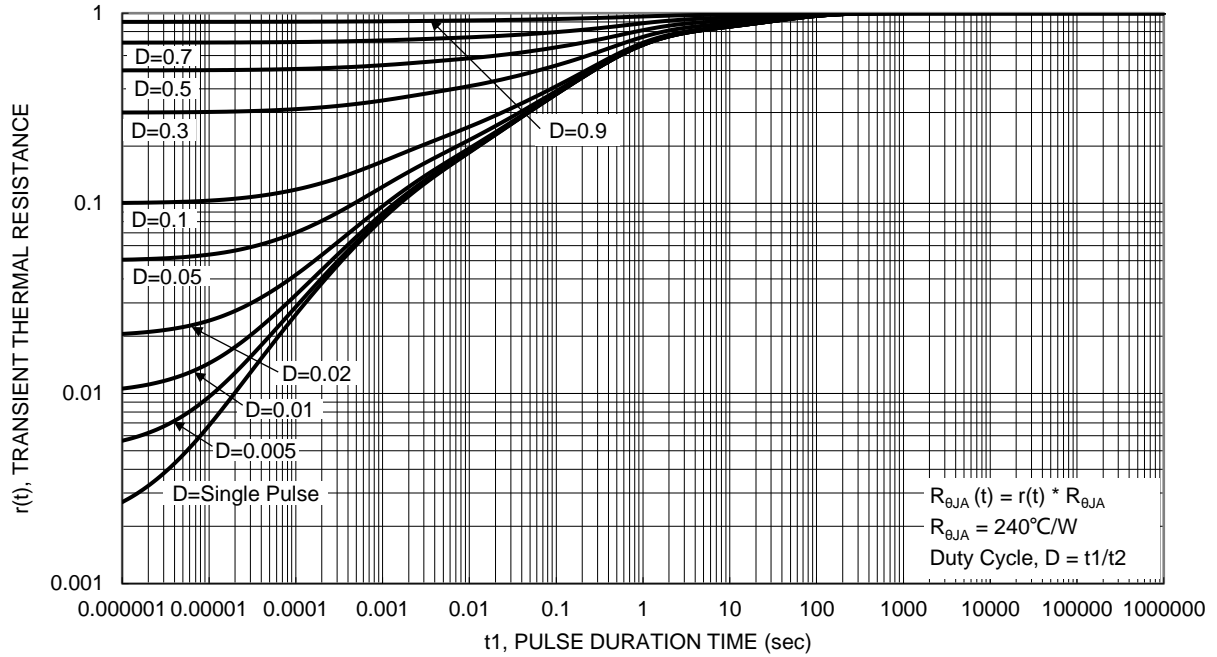
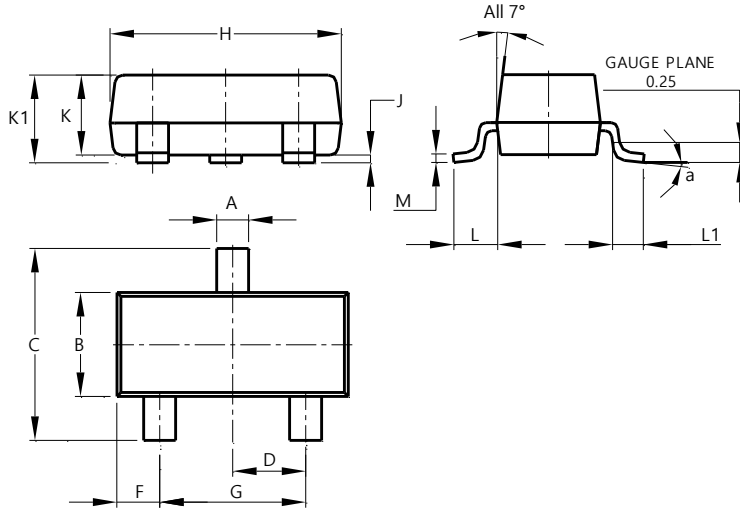


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

SOT23

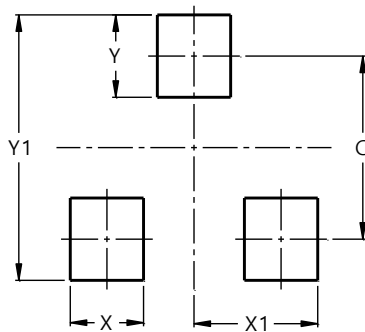


| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.890 | 1.00 | 0.975 |
| K1 | 0.903 | 1.10 | 1.025 |
| L | 0.45 | 0.61 | 0.55 |
| L1 | 0.25 | 0.55 | 0.40 |
| M | 0.085 | 0.150 | 0.110 |
| a | 0° | 8° | -- |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 2.0 |
| X | 0.8 |
| X1 | 1.35 |
| Y | 0.9 |
| Y1 | 2.9 |

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