



**THE DATASHEET OF
AD5686RTCPZ-EP-RL7**



Product Summary

| BV_{DSS} | $R_{DS(ON)}$ Max | I_D Max $T_A = +25^\circ\text{C}$ |
|------------|---|--|
| -60V | 155m Ω @ $V_{GS} = -10\text{V}$ | -2.4A |
| | 240m Ω @ $V_{GS} = -4.5\text{V}$ | -1.9A |

Features and Benefits

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- 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)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

Description and Applications

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:

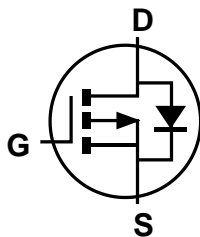
- Battery Charging
- Power Management Functions
- DC-DC Converters
- Load Switch

Mechanical Data

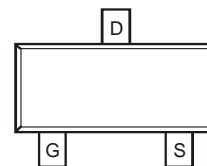
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Terminals Connections: See Diagram Below
- Weight: 0.008 grams (Approximate)



Top View



Internal Schematic



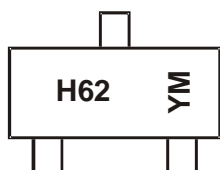
Top View

Ordering Information (Note 5)

| Part Number | Case | Packaging |
|---------------|-------|--------------------|
| DMPH6250SQ-7 | SOT23 | 3000/Tape & Reel |
| DMPH6250SQ-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. Automotive products are AEC-Q101 qualified and are PPAP capable. 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/>.

Marking Information



H62 = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: F = 2018)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | | | | |
|-------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|
| Code | E | F | G | H | I | J | K | L | | | | |
| 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°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|------------------|--|------|
| Drain-Source Voltage | V _{DSS} | -60 | V |
| Gate-Source Voltage | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 7) V _{GS} = -10V | I _D | Steady State T _A = +25°C | -2.4 |
| | | T _A = +100°C | -1.5 |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | I _{DM} | -13 | A |
| Maximum Continuous Body Diode Forward Current (Note 7) | I _S | -1.6 | A |
| Pulsed Body Diode Forward Current (380µs Pulse, Duty Cycle = 1%) | I _{SM} | -13 | A |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Power Dissipation (Note 6) | P _D | 0.92 | W |
| Thermal Resistance, Junction to Ambient @T _A = +25°C (Note 6) | R _{θJA} | 165 | °C/W |
| Power Dissipation (Note 7) | P _D | 1.62 | W |
| Thermal Resistance, Junction to Ambient @T _A = +25°C (Note 7) | R _{θJA} | 93.1 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +175 | °C |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|------|------|------|------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -60 | — | — | V | V _{GS} = 0V, I _D = -250µA |
| Zero Gate Voltage Drain Current T _J = +25°C | I _{DSS} | — | — | -1.0 | µA | V _{DS} = -60V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | -1.0 | -1.9 | -3.0 | V | V _{DS} = V _{GS} , I _D = -250µA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 112 | 155 | mΩ | V _{GS} = -10V, I _D = -2A |
| | | — | 149 | 240 | | V _{GS} = -4.5V, I _D = -2A |
| Diode Forward Voltage | V _{SD} | — | -0.8 | -1.2 | V | V _{GS} = 0V, I _S = -1A |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iss} | — | 512 | — | pF | V _{DS} = -30V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 31.3 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 23.2 | — | pF | |
| Gate Resistance | R _g | — | 11.9 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = -4.5V) | Q _g | — | 4.0 | — | nC | V _{DS} = -30V, I _D = -2A |
| Total Gate Charge (V _{GS} = -10V) | Q _g | — | 8.3 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 1.2 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 1.7 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 12.5 | — | ns | V _{DD} = -30V, V _{GS} = -10V, I _D = -1.0A, R _G = 50Ω |
| Turn-On Rise Time | t _R | — | 13.4 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 96.0 | — | ns | |
| Turn-Off Fall Time | t _F | — | 39.1 | — | ns | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 9.6 | — | ns | I _F = -1A, di/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 3.1 | — | nC | I _F = -1A, di/dt = 100A/µs |

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

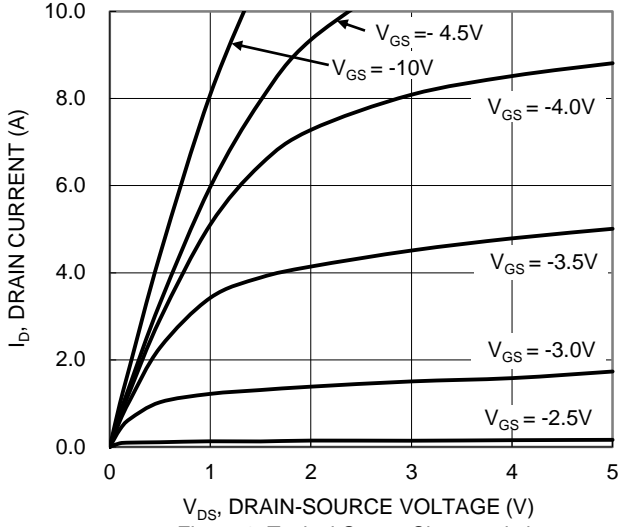


Figure 1. Typical Output Characteristic

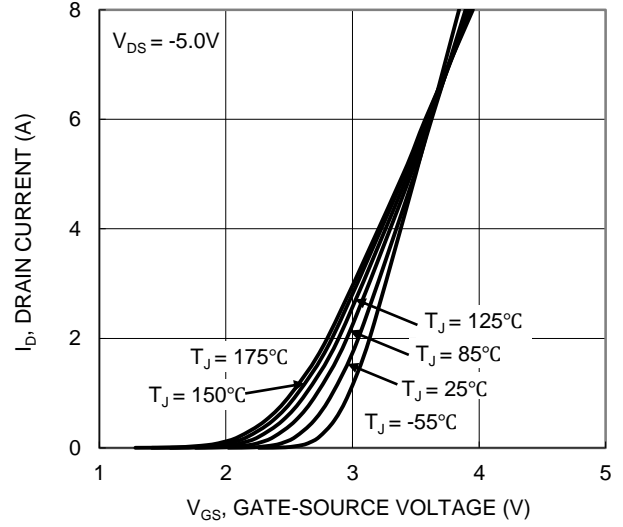


Figure 2. Typical Transfer Characteristic

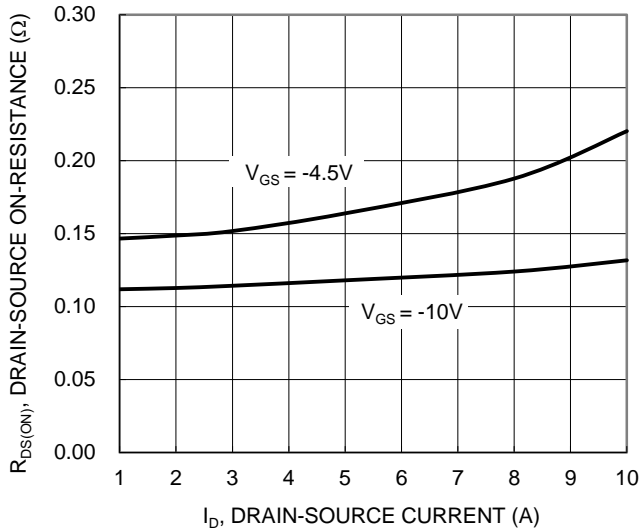


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

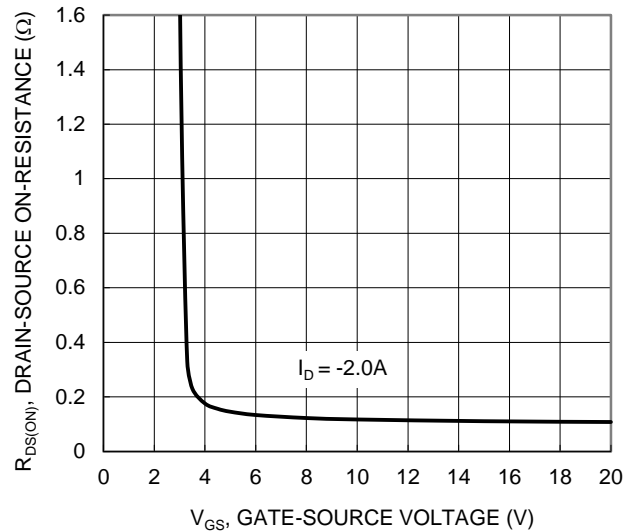


Figure 4. Typical Transfer Characteristic

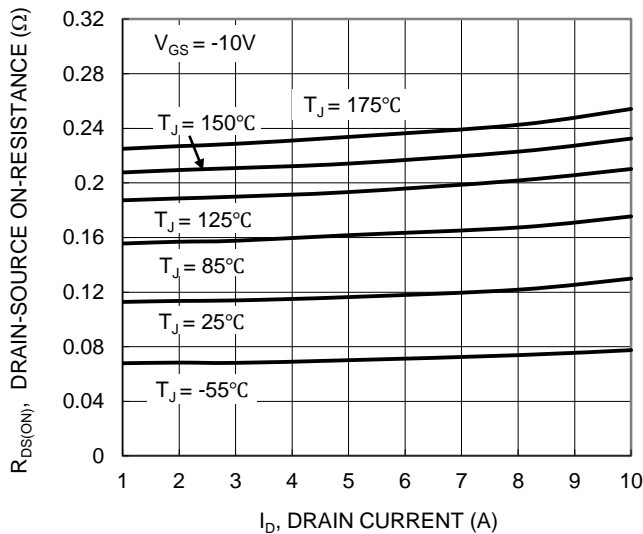


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

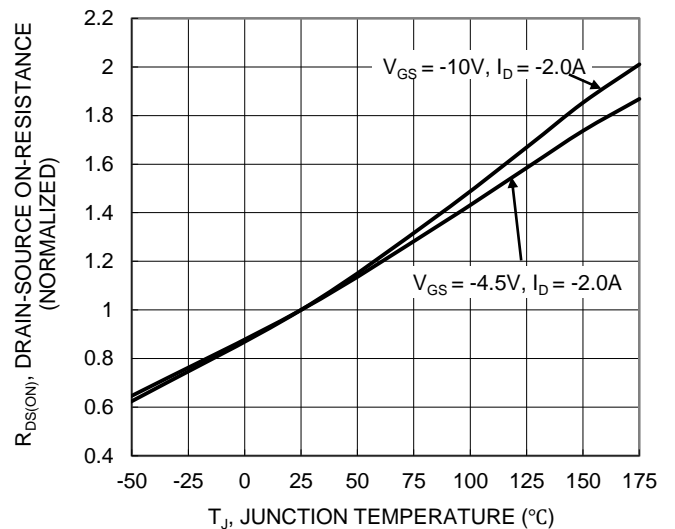
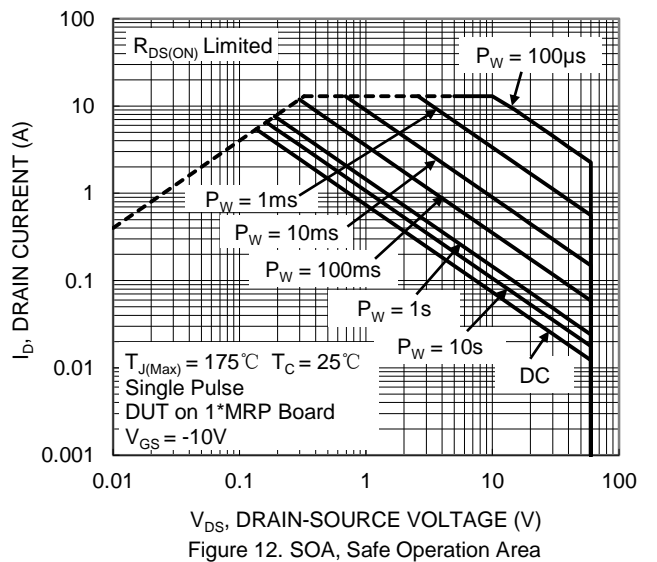
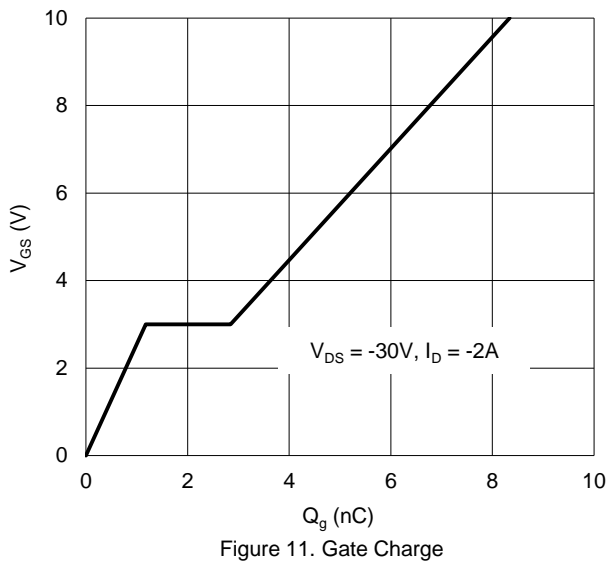
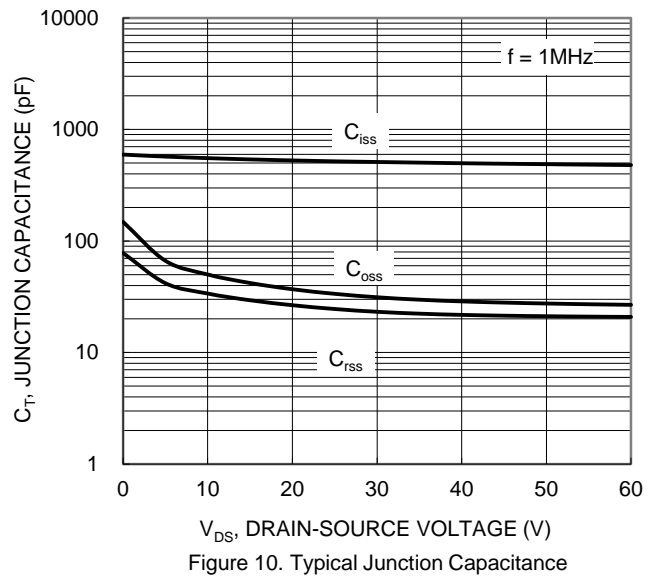
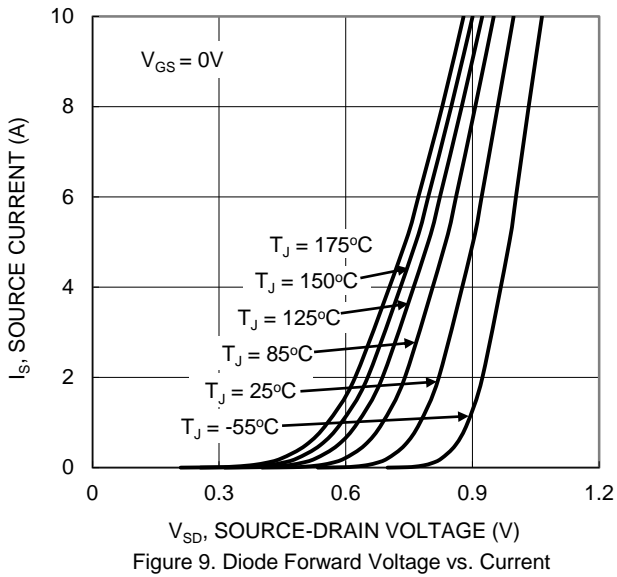
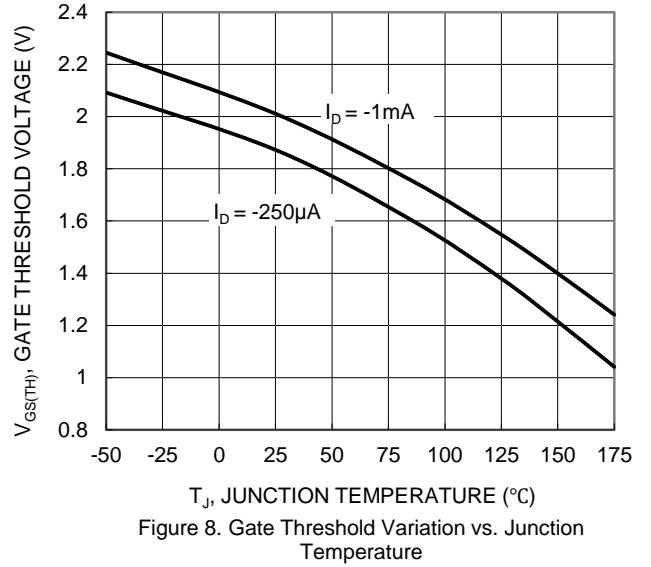
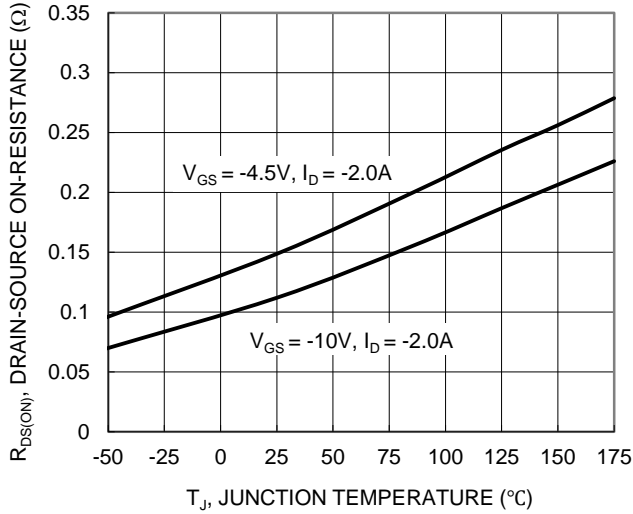


Figure 6. On-Resistance Variation with Temperature



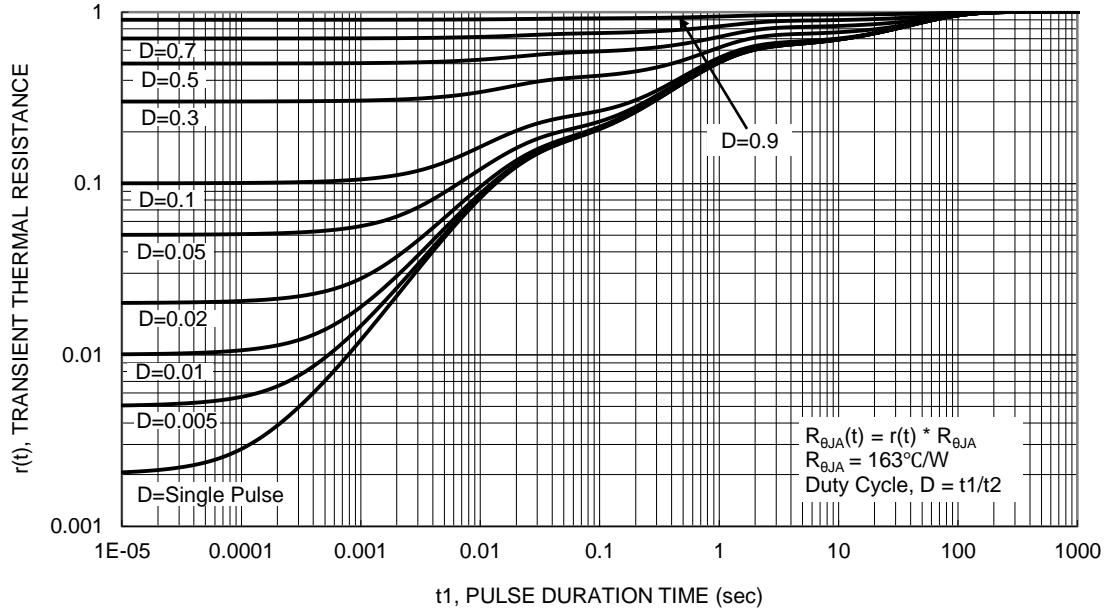
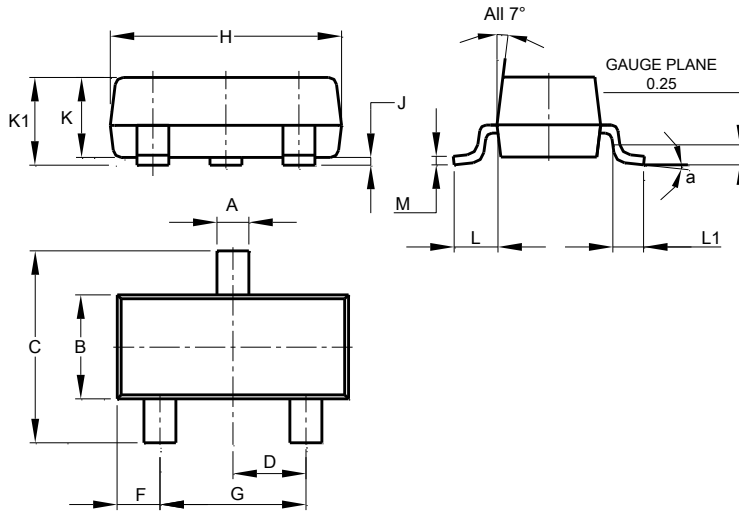


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

SOT23

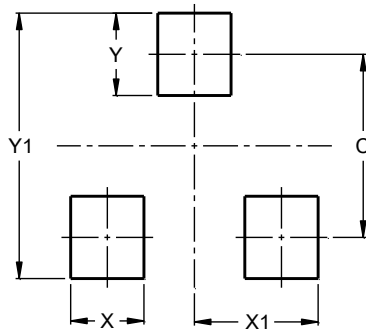


| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 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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